SUMMARY OF U.S. NUCLEAR REGULATORY COMMISSION AND
U.S. DEPARTMENT OF ENERGY TECHNICAL EXCHANGE ON
THE EXPLORATORY STUDIES FACILITY
October 4-5, 1993, Las Vegas, NV

On October 4-5, 1993, representatives of the U.S. Nuclear Regulatory Commission, U.S. Department of Energy (DOE), and State of Nevada Nuclear Waste Project Office participated in a Technical Exchange on the Exploratory Studies Facility (ESF) held in Las Vegas, Nevada. The meeting was also attended by representatives of the Affected Units of Local Government, the Civilian Radioactive Waste Management Systems Management and Operating Contractor and other DOE project participants, Edison Electric Institute, U.S. Nuclear Waste Technical Review Board, and the U.S. Environmental Protection Agency. An attendance list is included as Attachment 1. The purpose of the Meeting was to hold discussions related to the ESF design and design control process and encourage more effective dialogue between the NRC staff and DOE.

In the opening remarks (Attachment 2), DOE focused on the expected meeting results and the present methods of communicating with the NRC staff such as the Site Characterization Plan, Site Characterization Progress Reports, Site Characterization Program Baseline, ESF Technical Baseline, communications with the NRC staff On-Site Representatives, 50% and 90% design reviews, and Technical Exchanges, site visits, and Appendix 7 meetings. DOE then offered methods to enhance communications between DOE and NRC by: 1) improving the timing of Progress Report submittals; 2) having bi-monthly status meetings; 3) more frequently using informal telephonic communications; 4) having design-change review meetings; and 5) NRC increasing its technical presence during design reviews so that DOE receives NRC input prior to finalizing design.

Following the opening remarks, DOE and its representatives presented information on the following topics: (1) management of the project baseline; (2) scientific investigation control process; (3) design/construction process; (4) design/control improvement plan; (5) corrective action program; (6) ESF design strategy; (7) proposed ESF design changes; (8) phased approach to ESF design and construction; (9) architect/engineer and DOE requirements hierarchy: (10) determination of importance evaluations; (11) ESF construction and ventilation impact; (12) surface based testing; (13) fire supression; (14) underground diesel emissions in ESF; (15) ESF seismic design basis; (16) roofbolt and ground control operations; (17) ESF construction; (18) ESF/geologic repository operation area interfaces; and (19) ESF design interfaces with surface based testing and in-situ testing (Attachments 3-21). Due to time constraints, two presentations (Attachments 22-23) pertaining to ESF design to accommodate in-situ testing and ESF surface water systems were postponed.

In its closing comments, the NRC staff stated that it needs to gain confidence that the design process in place is being conducted properly and that the design is adequate. In order to acquire this confidence in the design process, the NRC staff needs to be better informed and be able to understand and observe the design process without severely impacting DOE. When new ESF design concepts are being considered by DOE, the NRC staff requested DOE to


Part 1

consider informing the NRC staff. The NRC recommended that future meetings be scheduled between NRC and DOE on a regular basis similar to the process in which the NRC/DOE quality assurance meetings are held. The NRC staff recommended that the first of these technical exchanges be considered to be scheduled on or about the first week in December 1993.

It would assist the NRC staff in better understanding the ESF design process if DOE could indicate all DOE and M&O documents (e.g., implementing procedures, instructions, drawings) in a schematic or flowdown chart accompanied by a brief explanation of what each document is intended to accomplish. The NRC staff also indicated that when important technical meetings concerning milestones are being conducted, NRC will consider sending appropriate technical personnel to the particular activity for a specified period of time in order to become sufficiently familiar with that activity. The NRC representatives acknowledged that DOE and its representatives were well prepared and knowledgeable in the subject matter presented. The NRC staff also observed that an aggressive corrective action program was in process to correct previously identified conditions adverse to quality in the ESF design/construction/test phases.

The State of Nevada representative said that because of DOE's schedule pressure in construction of the first 60 meters of the ESF, rapid tunnel construction in poor ground resulted in worker safety hazards that required very early ground stabilization. The early covering of the tunnel walls precluded field checking of the geologic maps of the wall that are being drawn from wall photographs. It is generally accepted that without field checks, the accuracy of such maps drawn from photographs is questionable. The State representative inquired whether it was necessary that this important data be foregone.

The Clark County representative agreed with the State's concern and suggested that DOE evaluate the extent to which such loss of data was important to site characterization objectives. The DOE pointed out that mapping and scientific evaluation was taking place in sequence with construction and that all means to collect data are pursued in a manner that protects worker health and safety.

11/2/93

William Belke, Sr. QA Engineer
Quality Assurance Section
Repository Licensing and Quality
Assurance Project Directorate
Division of High-Level Waste
Management
Office of Nuclear Material Safety
and Safeguards
U.S. Nuclear Regulatory Commission

11/3/93

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

	NAME (PLEASE PRINT)	COMPANY	TITLE
1	Chris Einberg	DOE/HQ	General Engineer
2	HOMI MIRWALLA	WESTON	Task Leader, Nuc Licensi
3	TOM LEONARD	REECO	Const. Dept Mgr
4	William Beeke	USNRC	SR QA ENGR.
5	NICK STELLAVATO	NYE Cnty	ON-site Geotech. Rep
6	Dean Stuth	DOE/YMP	Field Proj Branch Chief
7	RANDY SCHREINER	RSN	SR P.E / SYSTEMS.
8	Raymond A. Mele	M&O/WCFS	SR. Project Engineer
9	Ron Ballard	NRC	Cf Geol/Eng Branch
10	Mysore (Raj) Nataraja	NRC	Geotech. Eng. Sec. Chief
11	SAMI DOUARA	WESTON	Systems Mng.
12	WAYNE BOOTH	WESTON	QA Mgr.
13	TOM COLANDREA	EET U WASTE	QA CONSULTANT
14	JOHN JENKINS	ILF/WESTON	CONSULTANT
15	Michael Voegele	SAIC	Proj Mgr
16	Russ Dyer	DOE/YMPO	DIR RSED
17	ROBERT HOWARD	BATTELLE	QA SPECIALIST
18	DANA ROGERS	M&O/MK	Subsurface Engineer
19	OTA SPACEK	PK/PB	PROJ. ENG.
20	DAN MCKENZIE	M&O/MK	ESF PE
21	Steve Young	BATTELLE	Lead QA Engr
22	RF PRITCHETT	REECO	TPA
23	T. ARUL MOZHI	WESTON	Senior Engineer
24	RM Sandifer	M&O/TRW	MGDS Dev. Mgr.

DOE / NRC Technical Exchange on ESF
OCTOBER 4-5, 1993

ATTACHMENT 1

	NAME (PLEASE PRINT)	COMPANY	TITLE
25	PHILIP JUSTUS	USNRC	ON-Site Lic. Rep.
26	[illegible]	[illegible]	
27	Bill Arnold	DOE	Dir Engr, YMPO
28	Bernard Vera	DOE	Nuc. Engr.
29	Mona Othman	State	Tech Engineer
30	Carl Johnson	Nevada	Adm Tech Prog.
31	Sam Kundahoy	TRW	Ramnts Mgr
32	Tom Fiehler	DOE	Const MGR
33	Paul Pimentel	M&O	MGDS Surface Design
34	L.D. Foust	M&O	Nevada Site Mgr.
35	A V Gil	DOE	Geologist
36	Robin St Clair	M&O	Mgr. Strategic Planning
37	Jim Grubb	State	VP - Thompson Eng.
38	William H. Hansmire	Kleinf/133	PB - Engr Mgr.
39	Robert Saunders	M+O	Subsurface Design
40	Doc McNeely	M&O	ESF/P.E. Group
41	Peter Hastings	M&O	ESF/Sys Eng/Dies
42	[illegible]	[illegible]	[illegible]
43	Judy Treichel	NNWTF	Exec Dir.
44	Robin N. Datta	M&O	Rock Mechanics.
45	Steve Sobolik	SNL	Fire Suppression
46	Hemi N. Kalia	Los Alamos	
47	J. C. De La Garza	DOE	Civil Engr.
48	Ned Z. Elkins	Los Alamos	Deputy Tech. Project Officer

DOE/NRC Technical Exchange on ESF
October 4-5, 1993

	NAME (PLEASE PRINT)	COMPANY	TITLE
1	Raymond H WALLACE JR	USGS/HQ	Hydrologist
2	DONALD G. HORTON	DOE	DIRECTOR, OFFICE OF QA
3	STANLEY D. BAILEY	M+O	MGDS INTEGRATION
4	STEVEN E. LE ROY	M&O/Duke	Senior Scientist
5	Richard Powe	SAIC	SR QA SPECIALIST
6	EDGAR H. PERRIE	DOE	DEP DIR E+DP
7	Joe Holonich	NRC	Project Director
8	KEITH LOBO	SAIC	SENIOR PROJECT ENGINEER
9	EARL GANN	INYO COUNTY	MINING ENGINEER
10	MIKKO AHOLA	CNWRA	Senior Research Eng.
11	CARL GEER	VS DOE	PROJ MGR
12	Bruce Stanley	M+O	Princ Mining Eng.
13	JIM KENNEDY	DOE	ESF
14	WILLIAM BOYLE	US NRC	GEOTECHNICAL ENGINEER
15	SHIANN-JANG CHERN	US NRC	Geotechnical Engineer
16	BRUCE MABRITO	CNWRA	NRC OBSERVER
17	[illegible]	DOE	[illegible]
18	Maxwell Blanchard	DOE	Deputy P.M
19	JACK NESBITT	M+O	SR ESF PE
20	[illegible]	USGS	GS STAFF
21	Jean Younker	M+O	Mgr
22	JIM BLAYLOCK	DOE	SR ENGINEER
23	TOM GEER	M+O	MGDS S.E. MGR
24	KEITH ROBERTS	M&O	ESF PE

DOE/NRC Technical Exchange on ESF
October 4-5, 1993

	NAME (PLEASE PRINT)	COMPANY	TITLE
25	Steve Frishman	State of NV	
26	DENNIS ROMEL	DOE/YMPO	
27	~~[illegible]~~	~~DOE/HQ~~	~~Emp Dep Dir~~
28	James Thompson	Thompson Engineering	President
29	E V TIESENHAUSEN	CLARK COUNTY	
30	SAM MULLIKIN	DOE	Washington
31	C Blatton	M&O	Site
32	JAMES BENETTI	USEPA	Health Physicists
33	T. Fr. Wendel	USEPA	QA Specialist
34	G. UAIA de	USEPA	QA Specialist.
35	D. GLASSEL	REECO	QA MANAGER
36	JERRY HEANEY	SAIC	QAE
37	William H. Ford	NRC	Hydrogeologist
38	Kenneth Elder	DOE	Engr
39	D.R. Williams	DOE/YM	Chief Site Br. RSED
40	Robert R. Romine	REECO Consult	Proj. Engr.
41	Robert W. Craig	USGS	Deputy TPO
42	~~[illegible]~~		
43	~~Robert St Clair~~	~~M&O~~	~~Planning~~
44	James E. Houseworth	INTERA	Senior Staff Consultant
45	MALACHY T. MURPHY	DOE/YMPO	Reg & Licensing Advisor
46	PHILIP J. RICHTER	M&O FLUOR DANIEL	SR TECHNICAL DIRECTOR
47	RICHARD QUITTMEYER	M&O/WLFS	SITE INVEST. MANAGER
48	Rick Wolfsberg	M&O	Subsurface Design

DOE-NRC Technical Exchange on ESF
Oct. 4-5, 1993

U.S. DEPARTMENT OF ENERGY

OCRWM

YUCCA MOUNTAIN

YUCCA MOUNTAIN SITE CHARACTERIZATION PROJECT

DOE-NRC TECHNICAL EXCHANGE ON THE EXPLORATORY STUDIES FACILITY TITLE II DESIGN

OPENING REMARKS

PRESENTED BY:

EDGAR H. PETRIE
DEPUTY DIRECTOR

ENGINEERING & DEVELOPMENT DIVISION
YUCCA MOUNTAIN SITE CHARACTERIZATION PROJECT OFFICE
U.S. DEPARTMENT OF ENERGY

102.8

Received NRC/NWTRB
Oct 11/3/93

EXPLORATORY STUDIES FACILITY UPDATE

Major Progess Since the 1991 DOE-NRC Technical Exchange

- Title I Complete
- First Phase Title II Complete
- Construction Started
- Tunneling in Process
- Architect/Engineer Transition

Design Input	Design Activities	Design Output	Construction
• Process • Plan • Requirements	• Determination of of Importance (Die) Analyses	• Strategy (Products) • Interfaces • Surface Test • Subsurface Test	• Construct • Inspect

AGENDA
DOE-NRC EXPLORATORY STUDIES FACILITY TECHNICAL EXCHANGE

October 4

8:00	Opening Remarks	DOE, NRC, State, Counties
8:05	NRC / OCRWM Communications • Site Characterization Program Baseline • Semiannual Progress Report • NRC On-Site Licensing Representatives • ESF Design Reviews • Technical Exchanges • Communications Improvements	DOE (T. Petrie-YMP)
8:25	Baseline Control Process	DOE (M. Blanchard-YMP)
8:45	Scientific Investigations Process	DOE (R. Dyer-YMP)
9:05	Design/Construction Process	DOE (B. Sandifer-M&O)
9:30	Design Control Improvements Plan	DOE (B. Sandifer-M&O)
10:00	Corrective Action Report Evaluations	DOE (D. Horton-YMP)

AGENDA
DOE-NRC EXPLORATORY STUDIES FACILITY TECHNICAL EXCHANGE

(CONTINUED)

10:20 BREAK

10:35 Design Strategy — **DOE (B. Stanley-M&O)**

- **Background**
  - **Option 30 & Modified Option 30**
- **Title I Design Summary Report**
  - **ESF Technical Baseline**
  - **Modifications to Title I Baseline & Control Process**
  - **Connection to Title II Design**

AGENDA
DOE-NRC EXPLORATORY STUDIES FACILITY TECHNICAL EXCHANGE

(CONTINUED)

11:00	**Proposed ESF Design Changes**	DOE (B. Sandifer-M&O)
12:00	**LUNCH**	
1:00	**Design/Construction Plan** • Phases • Design & Construction Sequence - Surface - Subsurface	DOE (J. Nesbitt-M&O)
1:45	**DOE Requirements Hierarchy through ESFDR (SCA 130C)** • Documents Description Old/New • Transition Plan	DOE (S. Rindskopf-M&O)

AGENDA
DOE-NRC EXPLORATORY STUDIES FACILITY TECHNICAL EXCHANGE

(CONTINUED)

2:45 Architect / Engineer Requirements Hierarchy — DOE (P. Pimentel-M&O)
- Transition RSN / M&O
- Basis for Design

3:30 BREAK

3:45 Determination of Importance Evaluations — DOE (P. Hastings-M&O)
- Q-List
- Importance to Safety
- Importance to Waste Isolation
- Importance to Test Interference
- Analyses Completed

5:00 ADJOURN

AGENDA
DOE-NRC EXPLORATORY STUDIES FACILITY TECHNICAL EXCHANGE

(CONTINUED)

October 5

8:00	ESF Ventilation Impact on Testing (SCA 123C) and Accelerated Surface-Based Testing to Provide Information on the Undisturbed Site Ahead of ESF Construction	DOE (D. Williams-YMP, B. Craig, USGS)
9:00	Fire Suppression	DOE (S. Sobolik-SNL)
9:30	Impact of Underground Diesel Emissions in ESF	DOE (J. Houseworth-M&O)
10:00	Results of ESF Technical Assessment for Seismic Design Basis (SCA 121C)	DOE (R. Quittmeyer-M&O)
10:30	BREAK	
10:45	Roof Bolts & Ground Control Options	DOE (B. Saunders-M&O)

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AGENDA
DOE-NRC EXPLORATORY STUDIES FACILITY TECHNICAL EXCHANGE

(CONTINUED)

11:15	ESF Water Storage Tanks, Waste Lagoon, & Septic Field (SCA 55Q)	DOE (L. Engwall-M&O)
11:30	Flexibility of ESF to Accommodate In Situ Testing of Waste Package (SCA 58Q)	DOE (N. Elkins-LANL)
12:00	LUNCH	

DNTEESFT9.125/10-4-93

AGENDA
DOE-NRC EXPLORATORY STUDIES FACILITY TECHNICAL EXCHANGE

(CONTINUED)

1:00	**Design Interfaces** • ESF / Geologic Repository Operation Area Interfaces - Connectivity Between Waste Package, Repository Alternative Conceptual Designs, and ESF	DOE (D. Rogers-YMP)
1:30	- Surfaced Based / Underground Based Test Interfaces	DOE (M. Pendleton-M&O)
2:30	**Construction Status** • Construction, Construction Inspections, & Title III Inspections (Items Important to Safety, Waste Isolation, & Test Interference) • Inspection Documents • Photos	DOE (L. Renegar-M&O)

AGENDA
DOE-NRC EXPLORATORY STUDIES FACILITY TECHNICAL EXCHANGE

(CONTINUED)

3:15	**BREAK**	
3:30	**Open Discussion**	**All**
3:55	**Closing Remarks**	**DOE, NRC, State, Counties**
4:45	**ADJOURN**	

NOTE: EACH TOPIC ON THE AGENDA INCLUDES TIME ALLOTTED FOR DISCUSSION

EXPECTED MEETING RESULTS

- **NRC Understand**
  - **Recent history**
  - **Present status**
  - **Direction DOE is headed**
- **DOE Communication with NRC**

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. 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

- ESF technical baseline submitted May 1993
  - Design description of ESF
  - References, drawings, specifications

DNTEESFT14.125/10-4-93

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

ESF Design Reviews

- 50% Design Review
- 90% Design Review
- Design Review
- NRC Involvement
  - NRC Staff
  - NRC On-Site Representatives
  - Staff from Center for Nuclear Waste Regulatory Analysis
  - Comment Resolution

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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
  - 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 10CFR 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

NRC / OCRWM COMMUNICATIONS

(CONTINUED)

Communications Improvements

- Improved Timing of PR Submittals
- DOE / NRC ESF Status Meetings Bi-Monthly
  - Key ESF Documents
  - ESF Design Updates
- Telephonic Communications Per Site Specific Agreement
  - In-Process Changes
  - Planned Transmittals
- Design Review Changes
  - Preliminary Meeting to Distribute Review Materials
  - Design Review Meeting for Comment Submittal and Resolution
  - Observers Comment Resolution Summarized in Observation Report

DOE-NRC EXPLORATORY STUDIES FACILITY
TECHNICAL EXCHANGE

MANAGEMENT OF THE PROJECT BASELINE

PRESENTED BY
MAXWELL B. BLANCHARD
DEPUTY PROJECT MANAGER

LAS VEGAS, NEVADA
OCTOBER 4-5, 1993

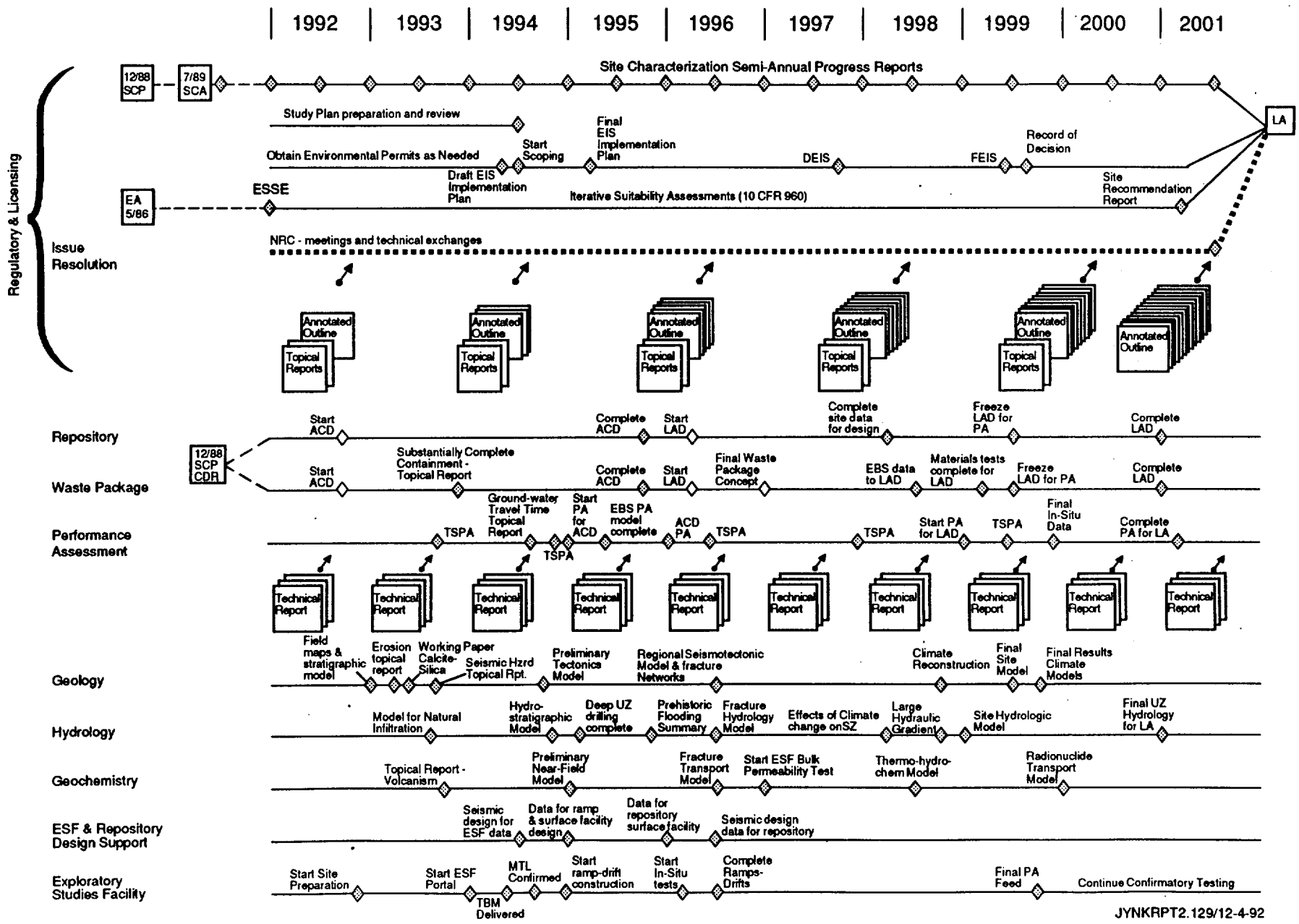
ATTACHMENT (3)

#2

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



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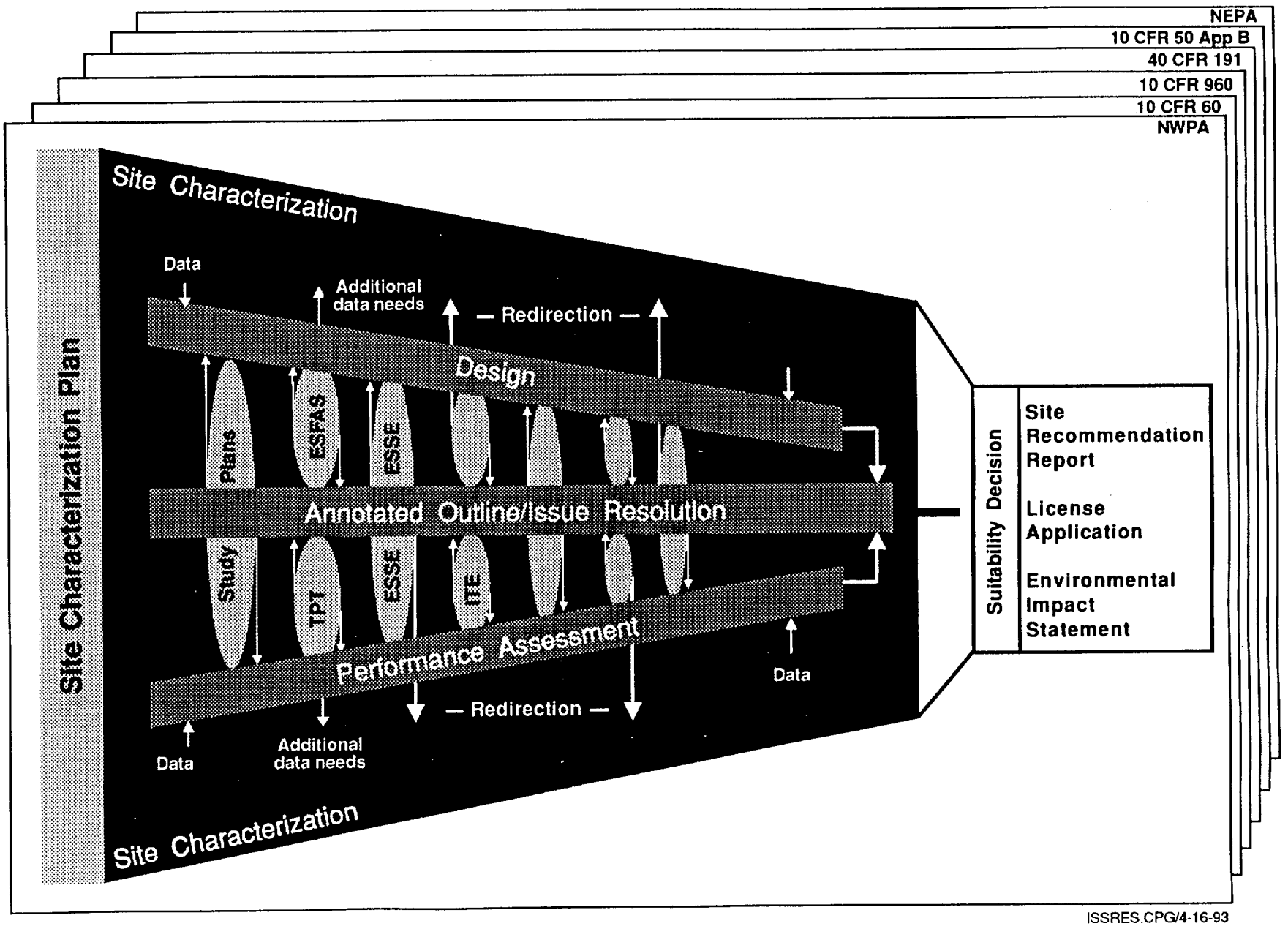
MANAGING CONVERGENCE



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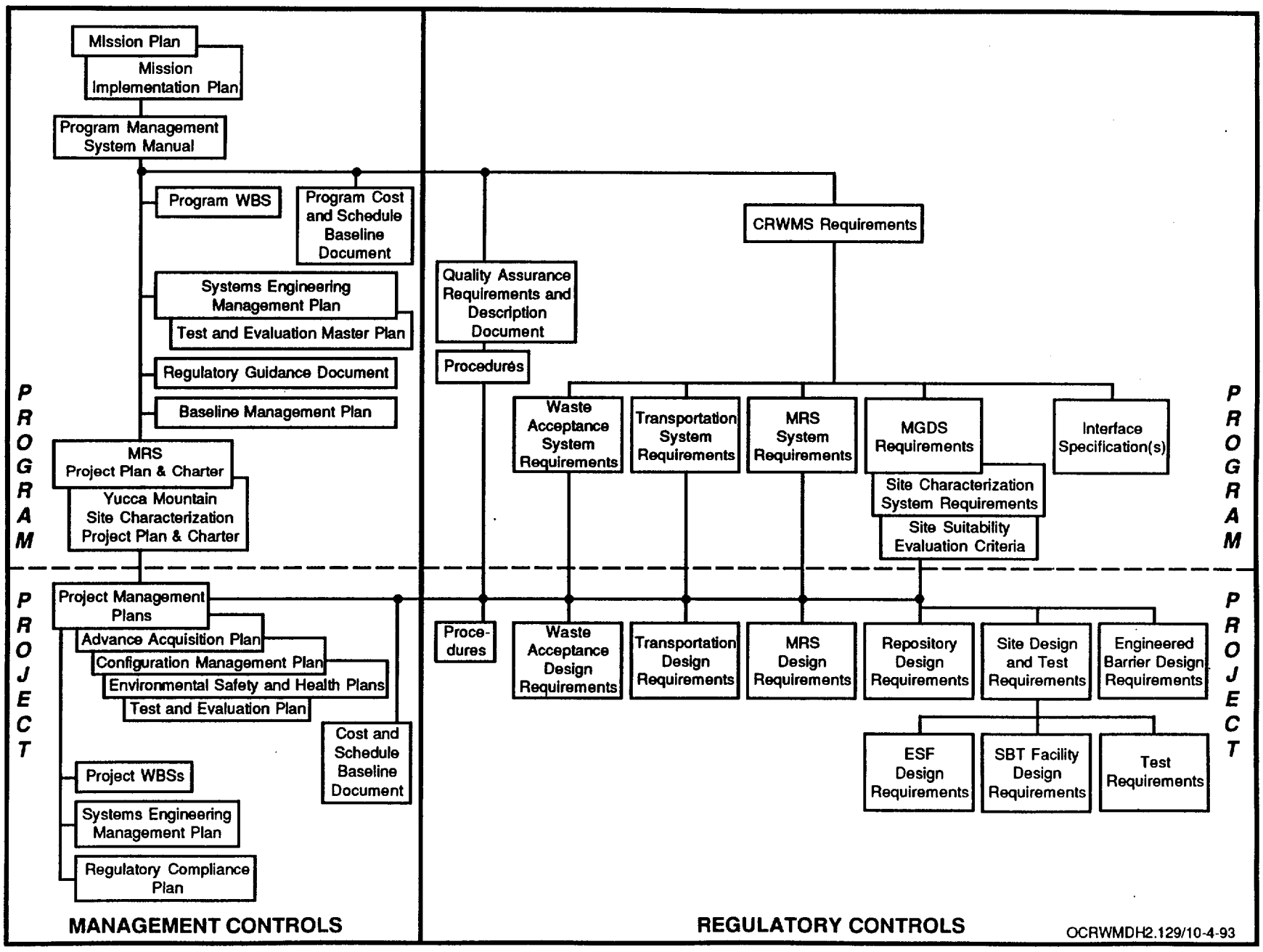
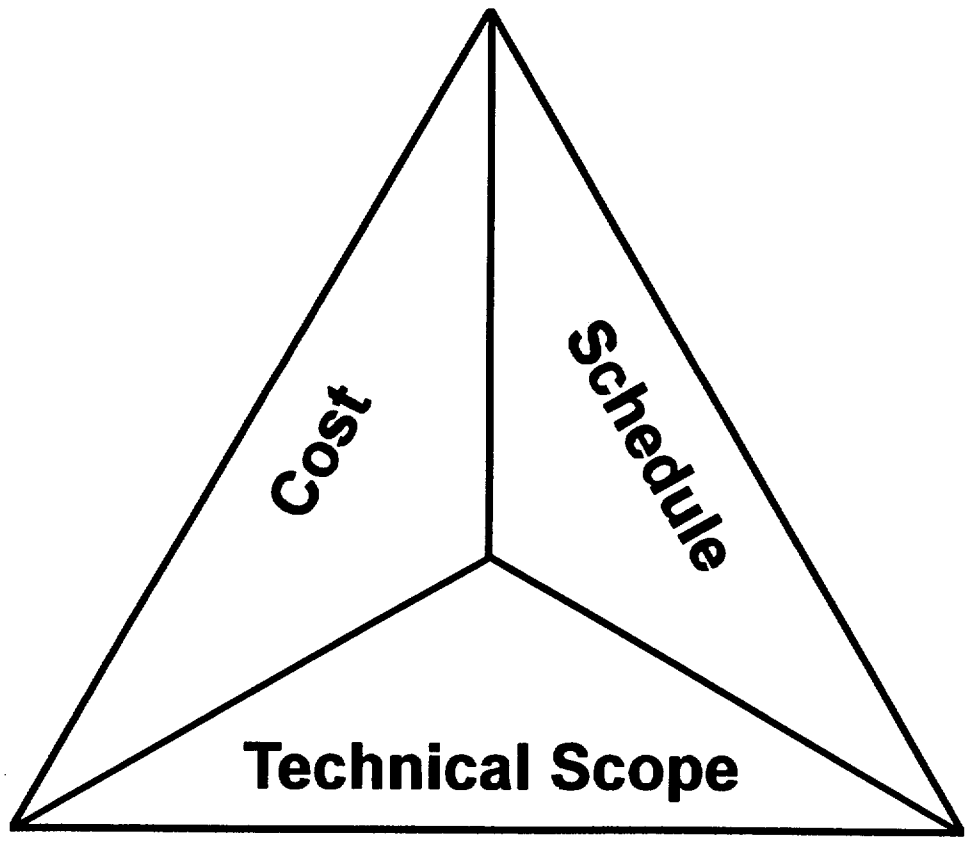
OCRWM DOCUMENT HIERARCHY



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

ELEMENTS OF THE BASELINE



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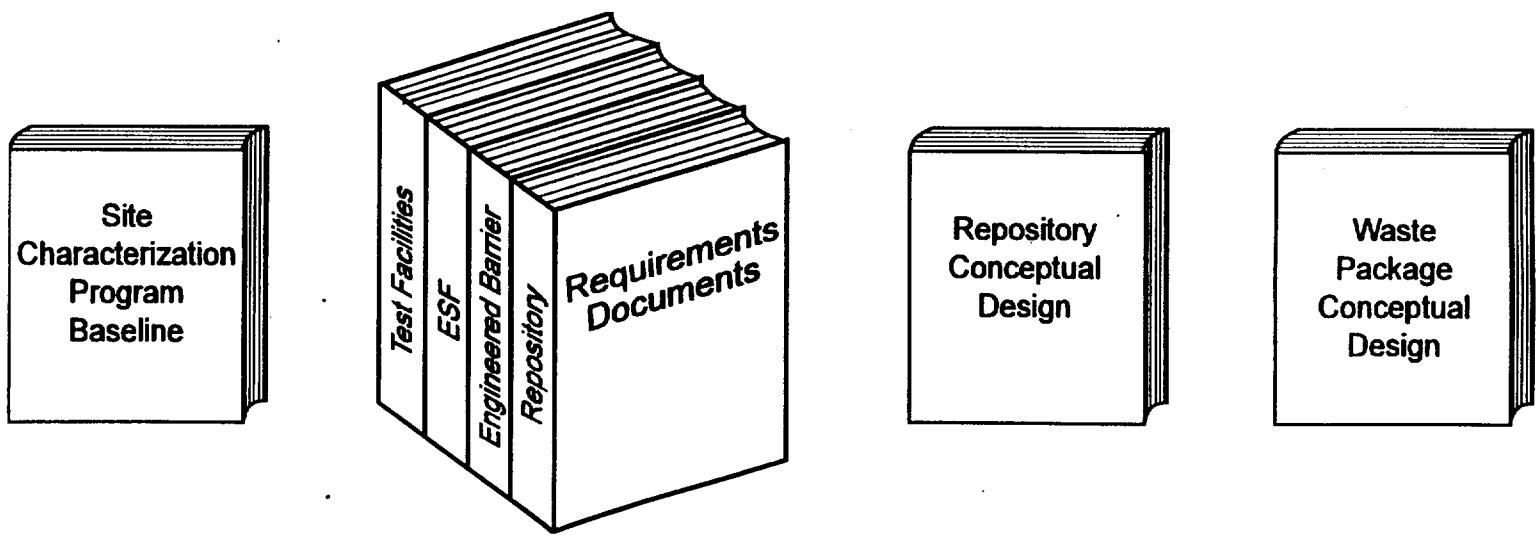
WHAT IS THE TECHNICAL BASELINE?

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**



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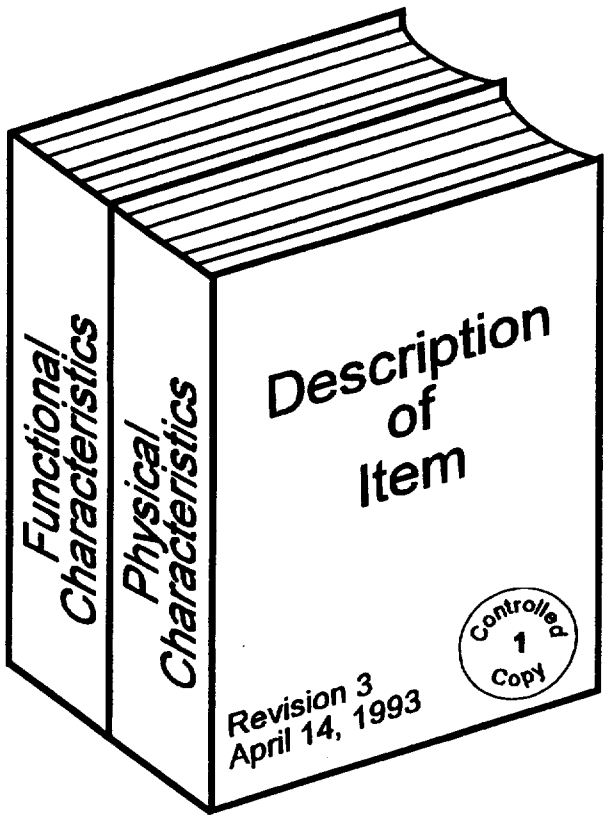
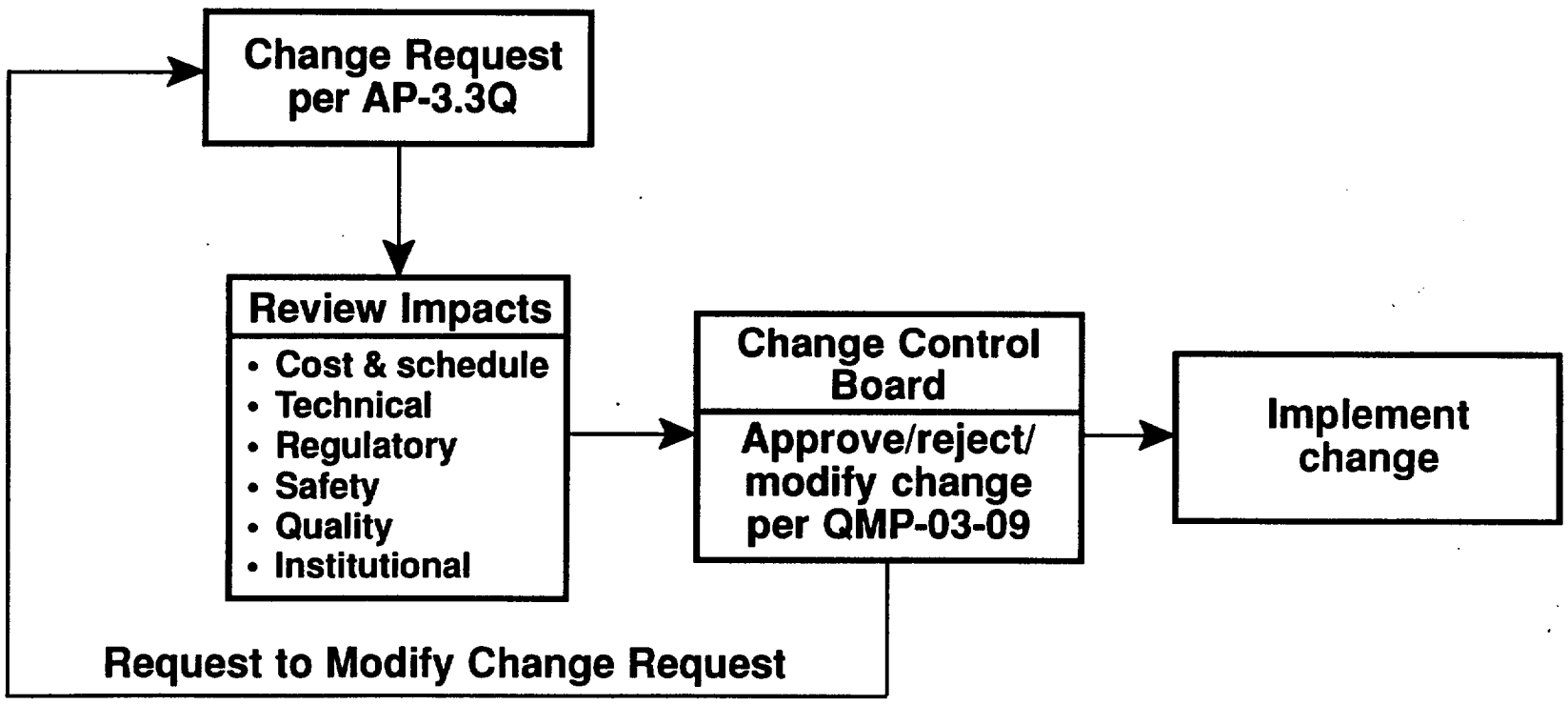
HOW IS THE TECHNICAL BASELINE CONTROLLED?

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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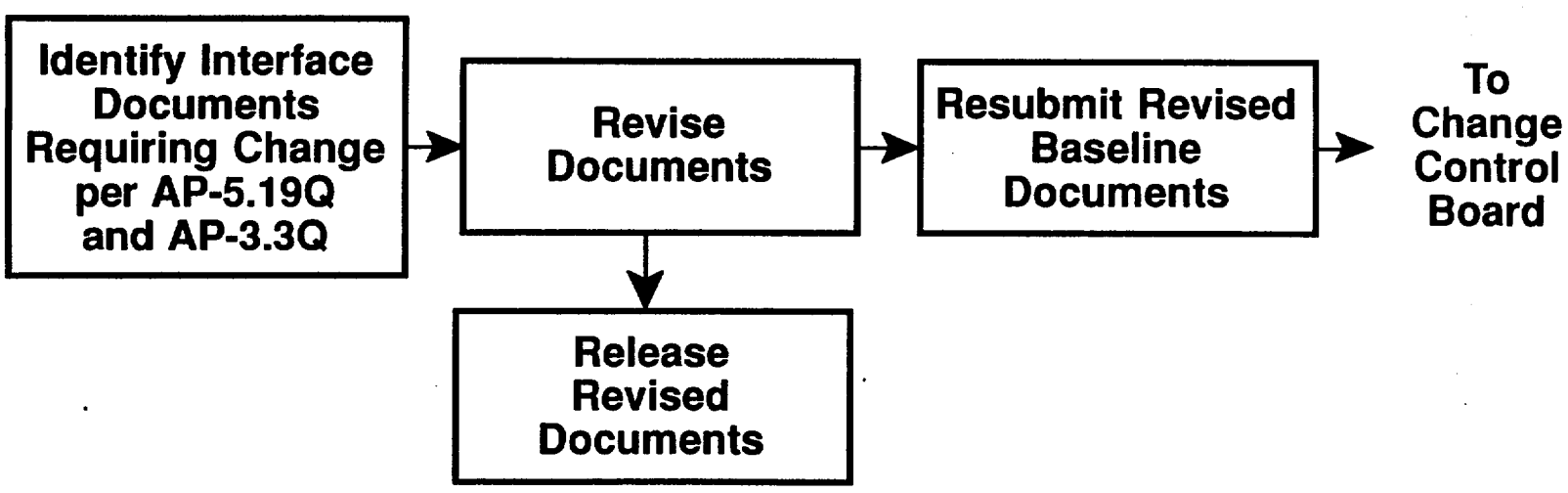
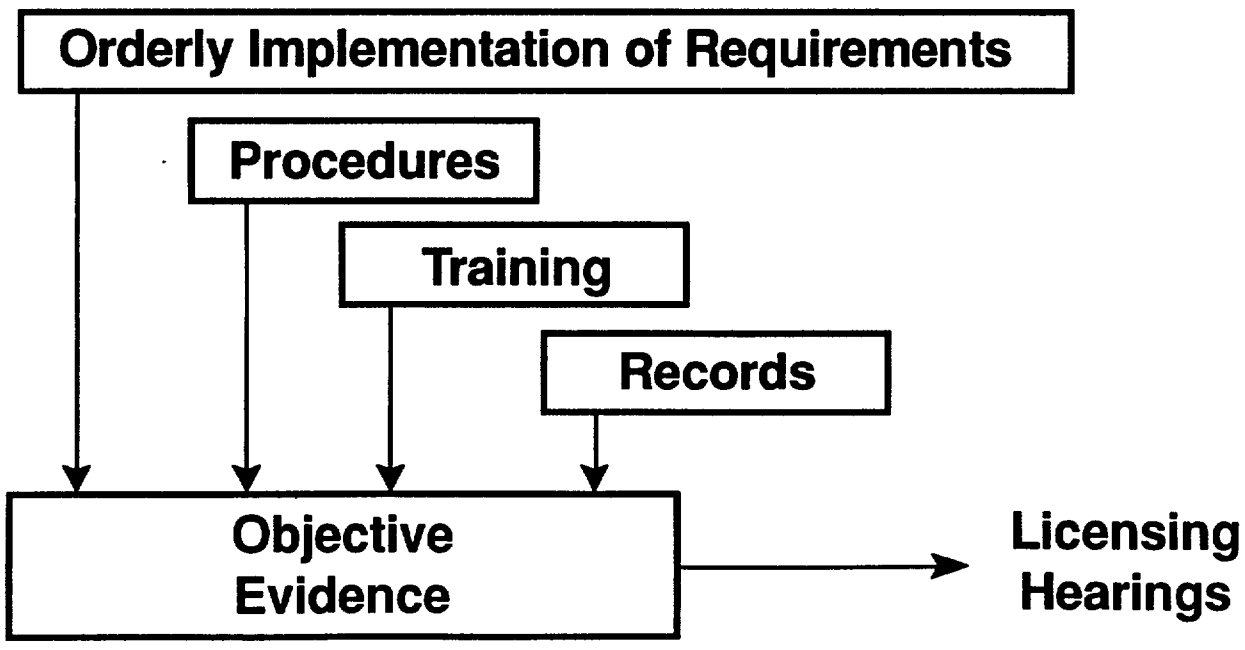
IMPLEMENTING THE CHANGE



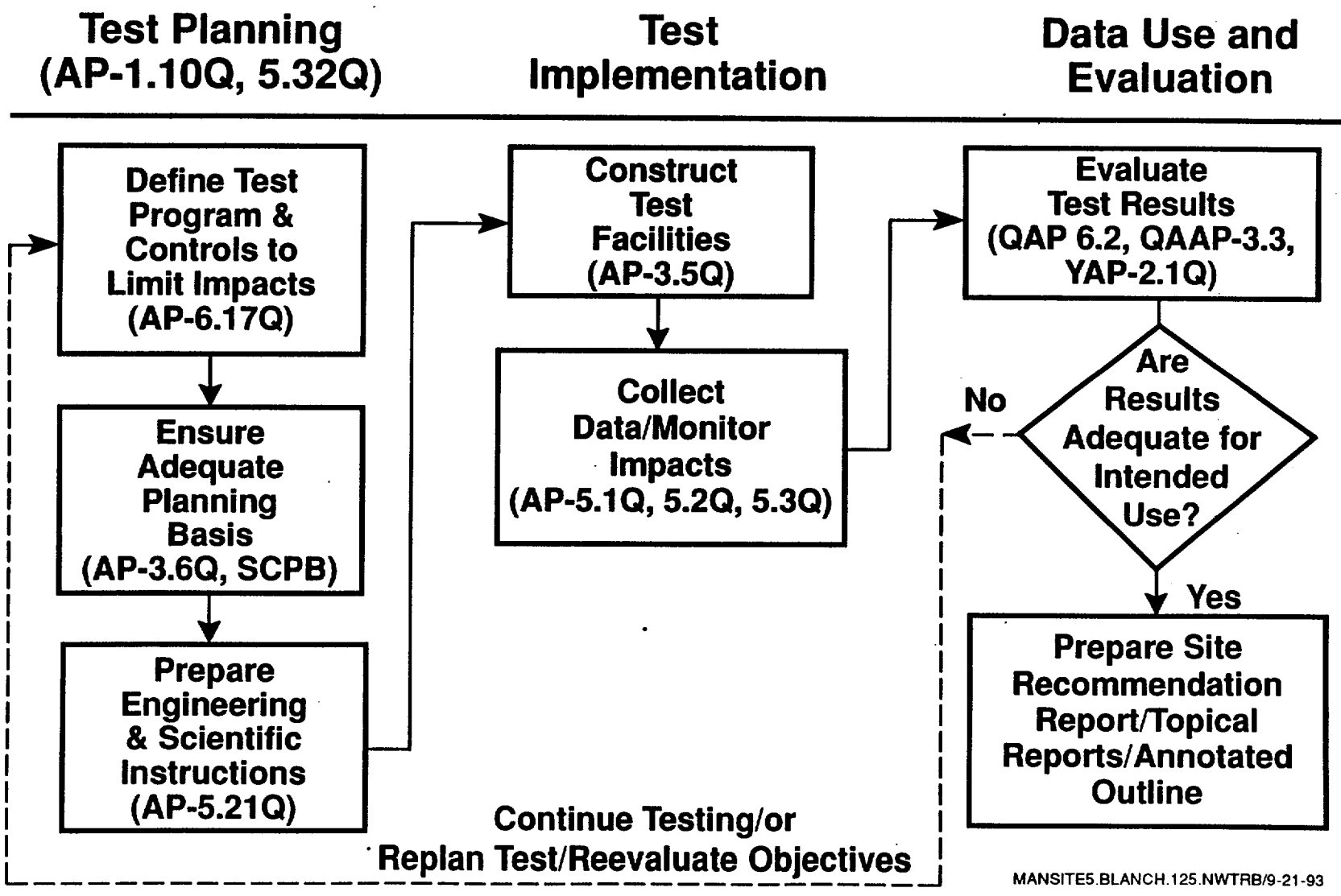
HOW IMPORTANT IS QA AT THIS PHASE OF SITE CHARACTERIZATION?

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



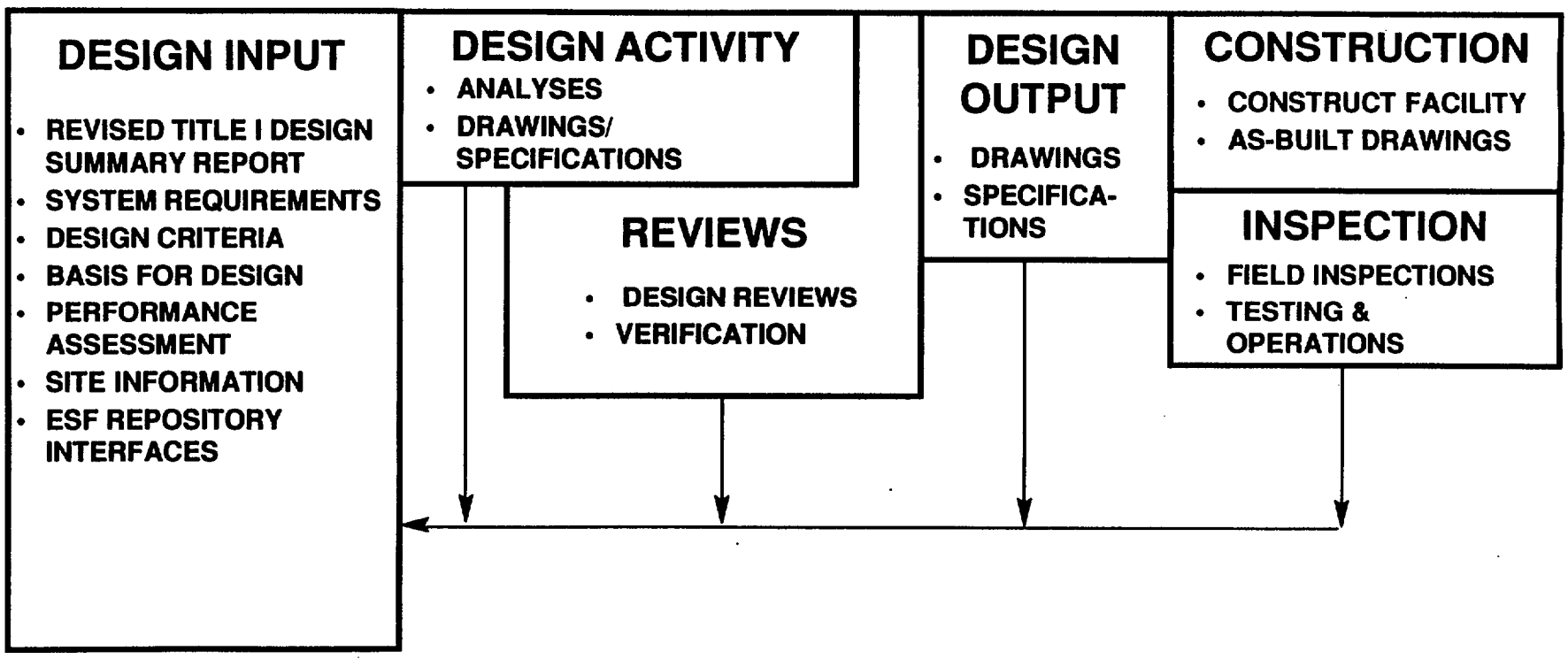
MANSITE3.BLANCH.125.NWTRB/9-21-93

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



MANSITE5.BLANCH.125.NWTRB/9-21-93

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

NRCTEBCP.DOE.BLANCHARD/10-4/5-93

U.S. DEPARTMENT OF ENERGY

OCRWM

YUCCA MOUNTAIN

YUCCA MOUNTAIN SITE CHARACTERIZATION PROJECT

GENERIC SCIENTIFIC INVESTIGATION CONTROL PROCESS

PRESENTED TO

NUCLEAR REGULATORY COMMISSION

PRESENTED BY

J.R. DYER

U.S. DEPARTMENT OF ENERGY
YUCCA MOUNTAIN SITE CHARACTERIZATION PROJECT

OCTOBER 4-5, 1993

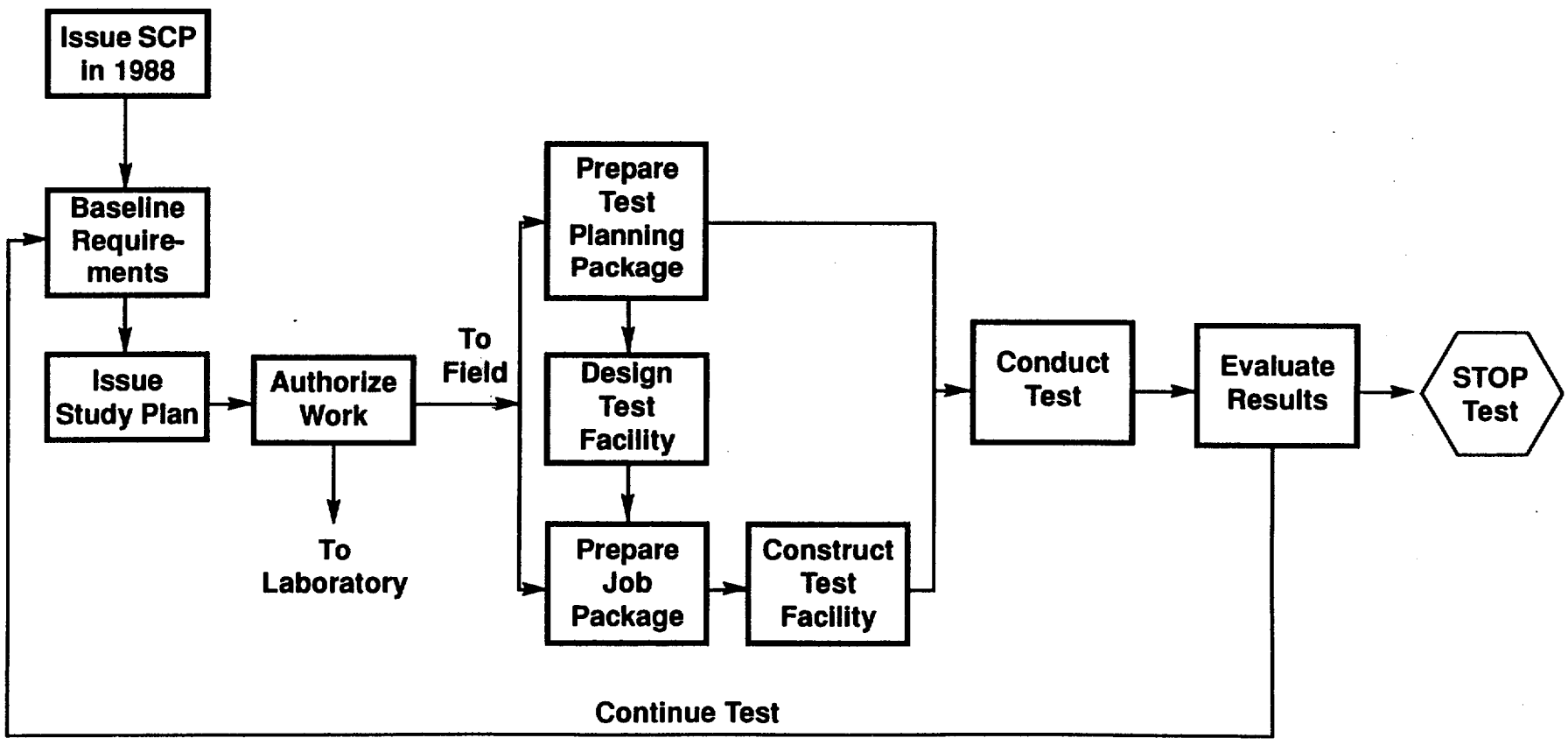
ATTACHMENT (4) #3

TEST & EVALUATION PLAN

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

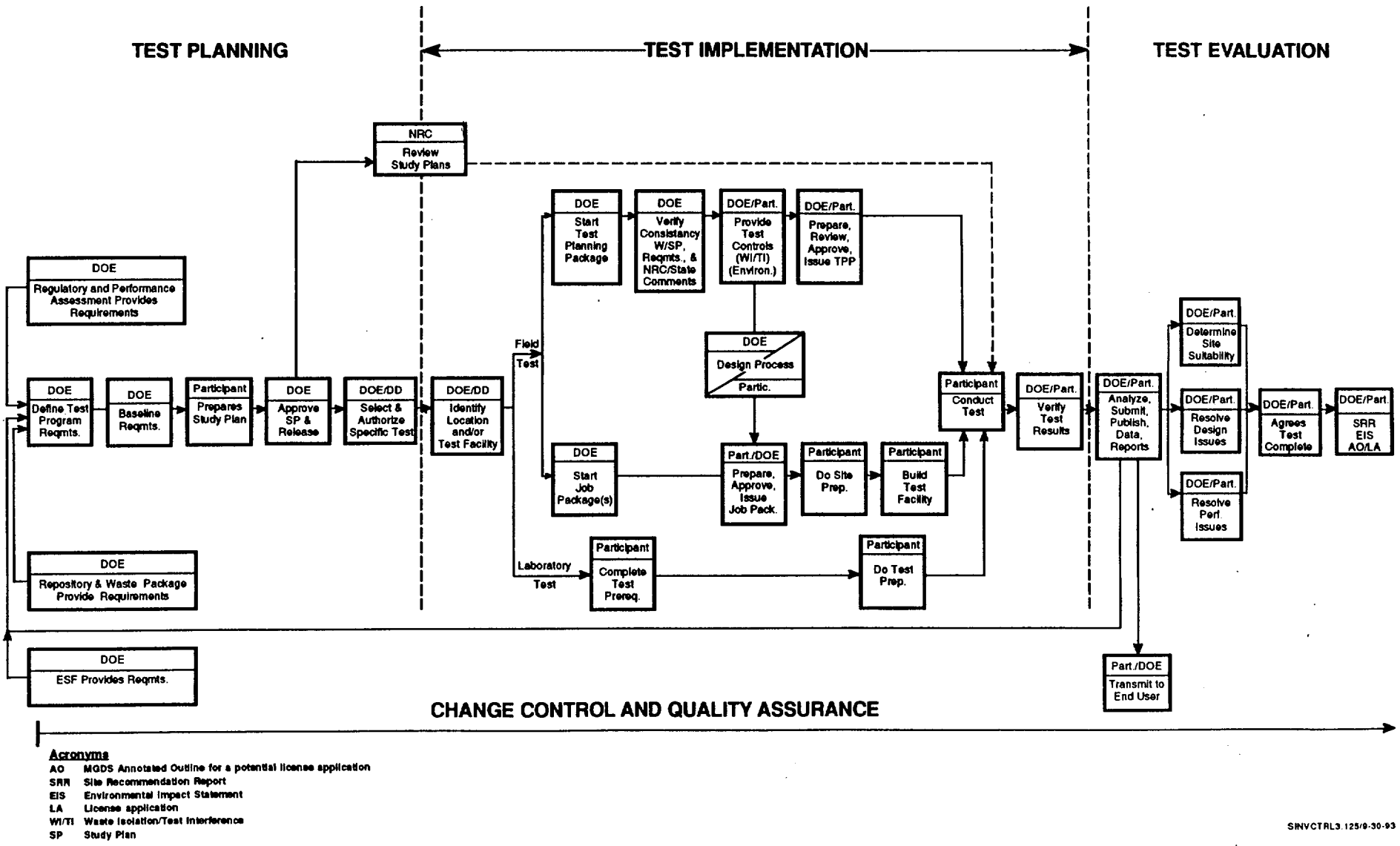
- **Plan the work**
- **Implement the tests**
- **Evaluate results**

Generic Scientific Investigations Control Process



GESICPS1.PM5.125/10-1-93

SCIENTIFIC INVESTIGATION CONTROL PROCESS
(SITE CHARACTERIZATION)

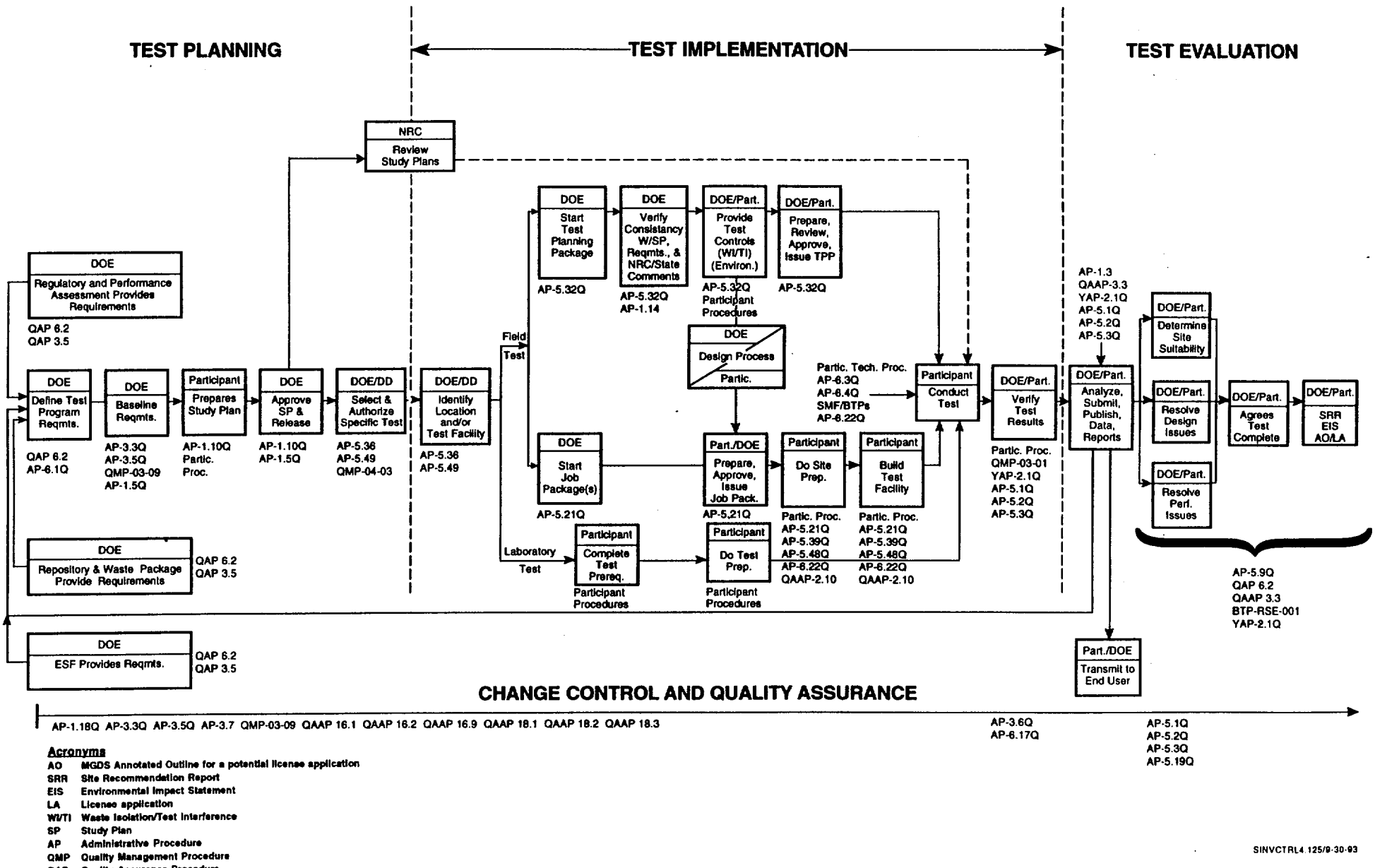


Acronyms

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

SINVCTRL3.125/9-30-93

SCIENTIFIC INVESTIGATION CONTROL PROCESS (SITE CHARACTERIZATION)

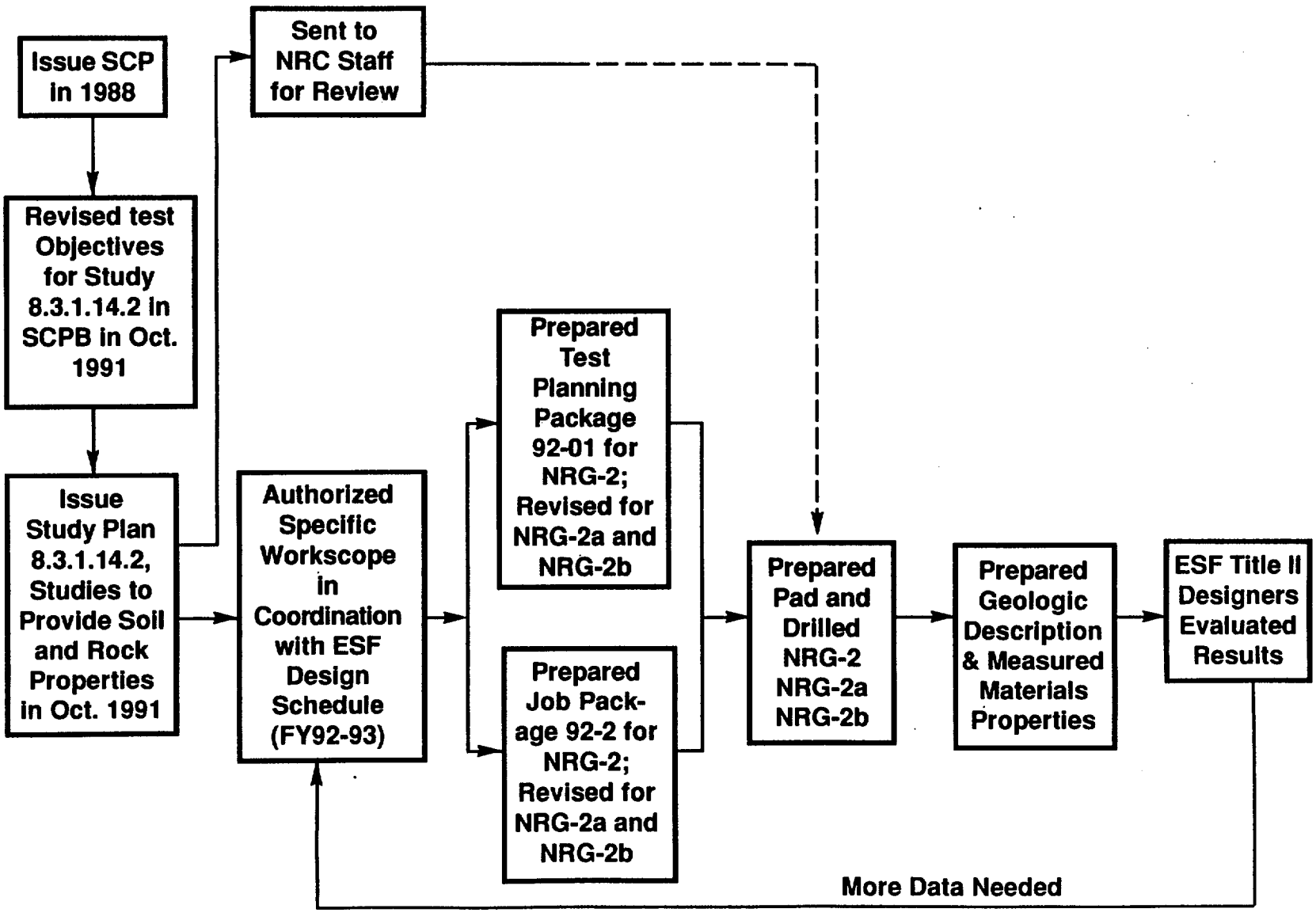


Acronyms

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.PM5.125/10-1-93

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 remobilized 5/27/93. Drilling initiated 5/27/93 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 and Testing of Borehole UE-25 NRG 2A" (Signed off 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 5/12/93 Drilling completed 5/19/93 Ending core depth 220.00 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

Civilian Radioactive Waste Management System

Management & Operating Contractor

TRW Environmental Safety Systems Inc.

Design/Construction Process

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

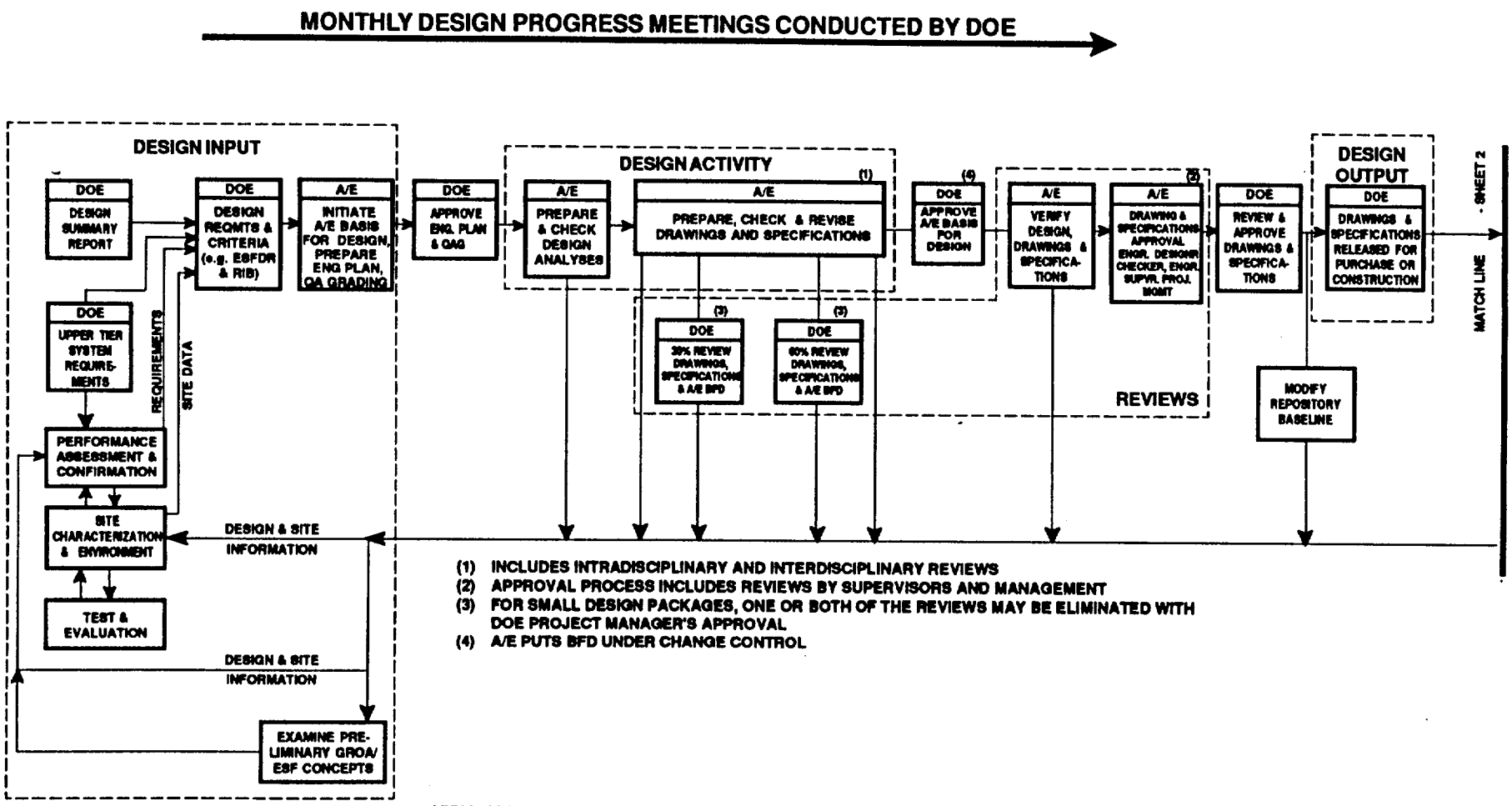
ATTACHMENT (5) #17

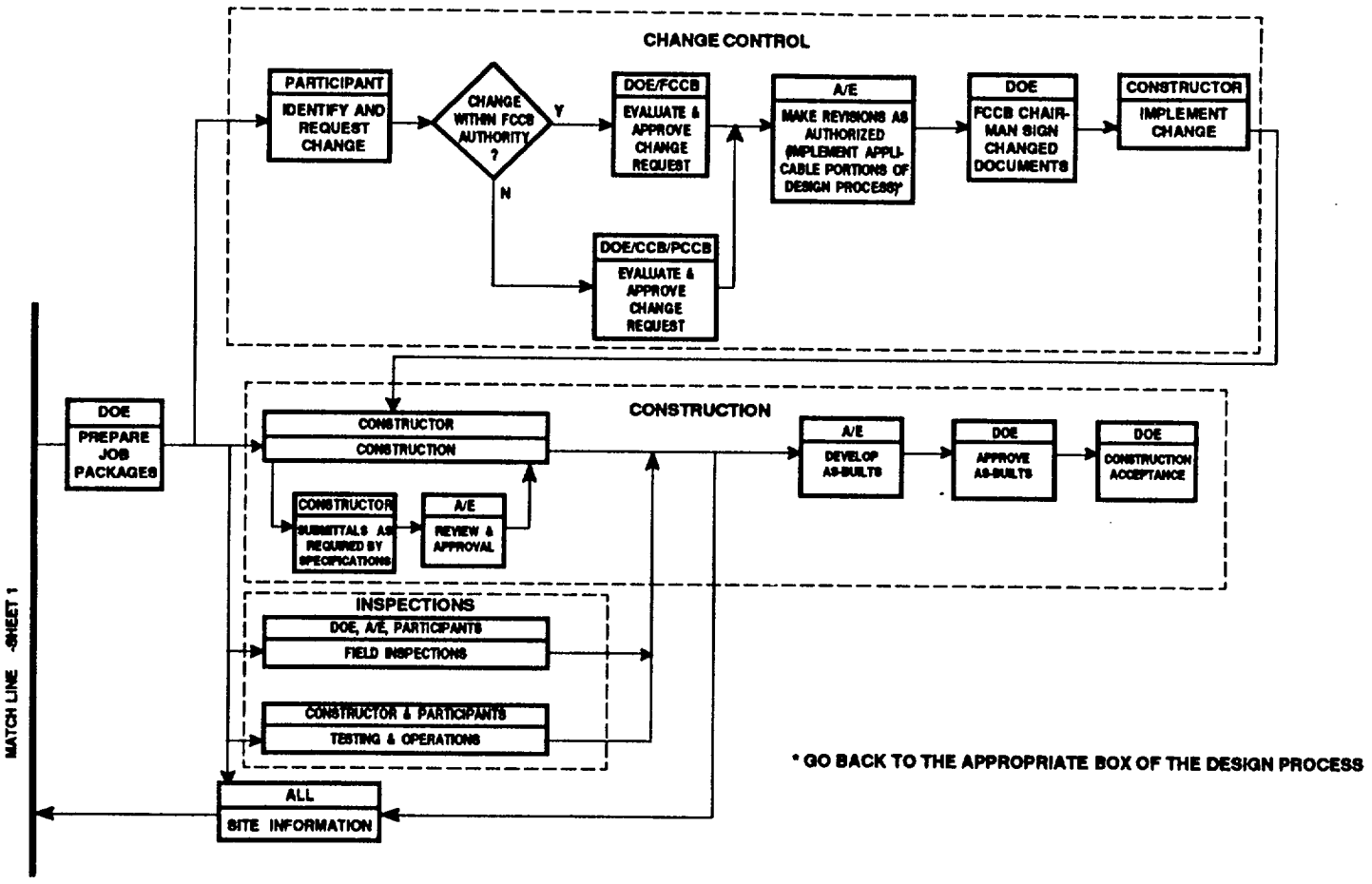
MGDS DESIGN PROCESS

- 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
(Con't)

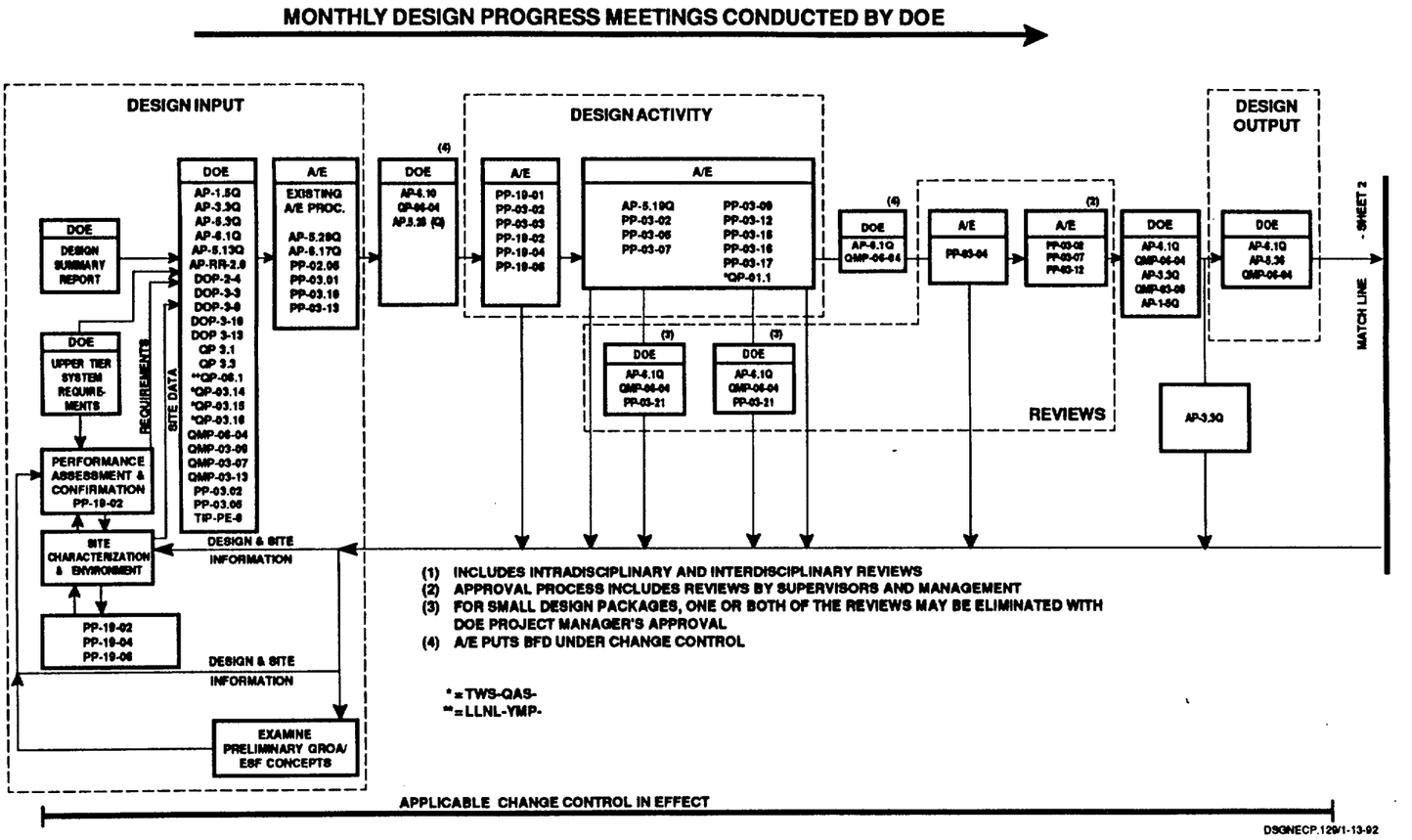
- **Insures orderly, systematic flowdown of requirements**
- **Provides for requirements verification**

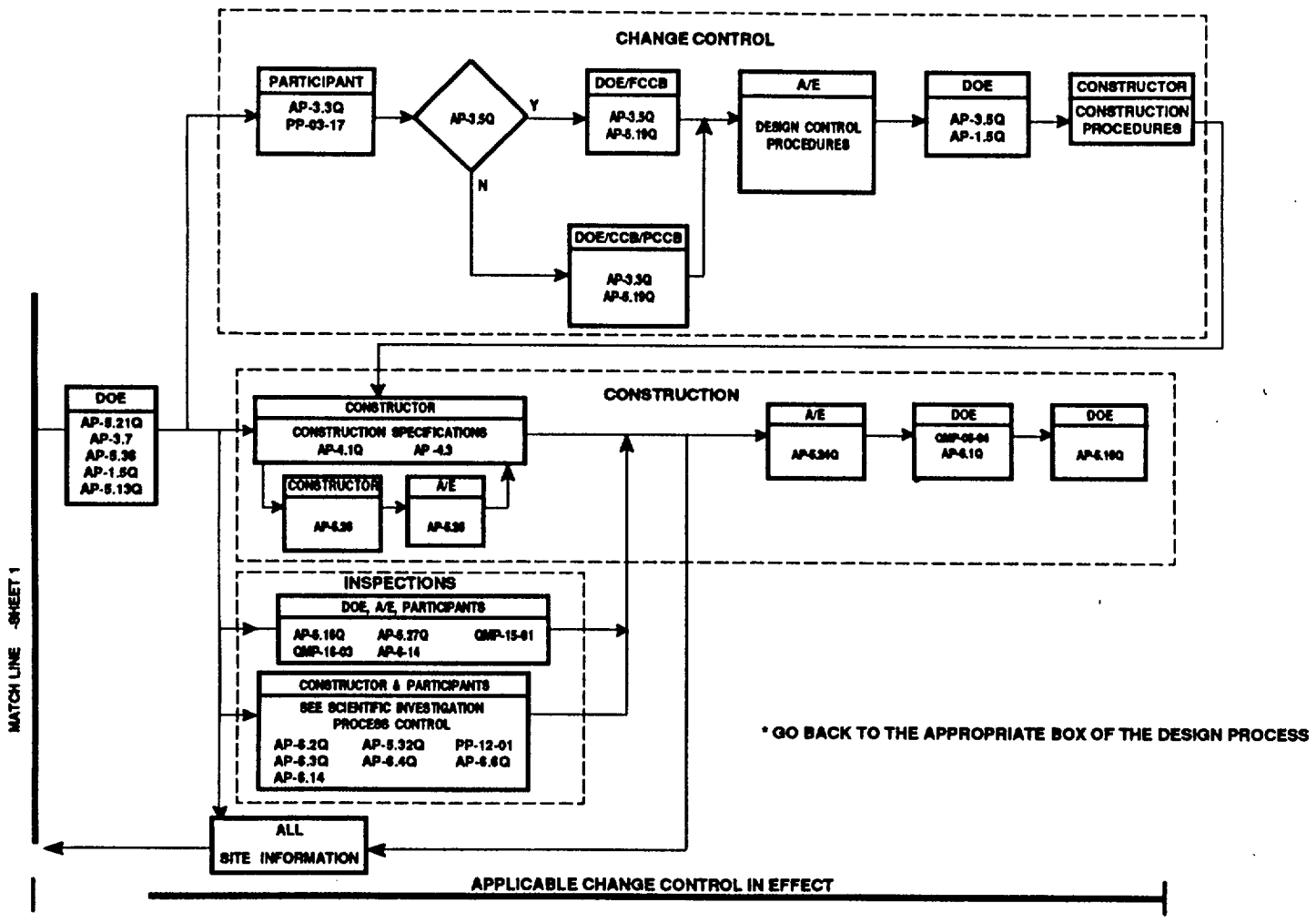

MONTHLY DESIGN PROGRESS MEETINGS CONDUCTED BY DOE
DESIGN INPUT
DESIGN ACTIVITY
DESIGN OUTPUT
DOE
DESIGN SUMMARY REPORT
DESIGN REQMTS & CRITERIA (e.g. ESFDR & RIB)
A/E
INITIATE A/E BASIS FOR DESIGN, PREPARE ENG PLAN, QA GRADING
APPROVE ENG. PLAN & QAG
PREPARE & CHECK DESIGN ANALYSES
PREPARE, CHECK & REVISE DRAWINGS AND SPECIFICATIONS
(1)
(4)
APPROVE A/E BASIS FOR DESIGN
VERIFY DESIGN, DRAWINGS & SPECIFICA-TIONS
DRAWING & SPECIFICATIONS APPROVAL ENGR, DESIGNR CHECKER, ENGR. SUPVR. PROJ. MGMT
(2)
REVIEW & APPROVE DRAWINGS & SPECIFICA-TIONS
DRAWINGS & SPECIFICATIONS RELEASED FOR PURCHASE OR CONSTRUCTION
UPPER TIER SYSTEM REQUIRE-MENTS
REQUIREMENTS
SITE DATA
(3)
30% REVIEW DRAWINGS, SPECIFICATIONS & A/E BFD
60% REVIEW DRAWINGS, SPECIFICATIONS & A/E BFD
REVIEWS
MODIFY REPOSITORY BASELINE
PERFORMANCE ASSESSMENT & CONFIRMATION
SITE CHARACTERIZATION & ENVIRONMENT
TEST & EVALUATION
DESIGN & SITE INFORMATION
DESIGN & SITE INFORMATION
EXAMINE PRE-LIMINARY GROA/ ESF CONCEPTS
- SHEET 2
MATCH LINE
(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
DSGNECP.120/1-13-92



APPLICABLE CHANGE CONTROL IN EFFECT

DSGNECP.12/1-13-92


MONTHLY DESIGN PROGRESS MEETINGS CONDUCTED BY DOE
DESIGN INPUT
DESIGN ACTIVITY
DESIGN OUTPUT
DOE
DESIGN SUMMARY REPORT
DOE
UPPER TIER SYSTEM REQUIREMENTS
REQUIREMENTS
SITE DATA
PERFORMANCE ASSESSMENT & CONFIRMATION PP-19-02
SITE CHARACTERIZATION & ENVIRONMENT
PP-19-02
PP-19-04
PP-19-06
DOE
AP-1.5Q
AP-3.3Q
AP-5.3Q
AP-6.1Q
AP-5.13Q
AP-RR-2.0
DOP-2-4
DOP-3-3
DOP-3-8
DOP-3-10
DOP 3-13
QP 3.1
QP 3.3
**QP-06.1
*QP-03.14
*QP-03.15
*QP-03.16
QMP-06-04
QMP-03-06
QMP-03-07
QMP-03-13
PP-03.02
PP-03.05
TIP-PE-0
A/E
EXISTING A/E PROC.
AP-5.28Q
AP-6.17Q
PP-02.06
PP-03.01
PP-03.10
PP-03-13
(4)
DOE
AP-6.1Q
QP-06-04
AP-3.2Q (Q)
A/E
PP-19-01
PP-03-02
PP-03-03
PP-19-02
PP-19-04
PP-19-06
A/E
AP-5.19Q
PP-03-02
PP-03-05
PP-03-07
PP-03-09
PP-03-12
PP-03-15
PP-03-16
PP-03-17
*QP-01.1
(3)
DOE
AP-6.1Q
QMP-06-04
PP-03-21
(3)
DOE
AP-6.1Q
QMP-06-04
PP-03-21
REVIEWS
(4)
DOE
AP-6.1Q
QMP-06-04
A/E
PP-03-04
(2)
A/E
PP-03-02
PP-03-07
PP-03-12
DOE
AP-6.1Q
QMP-06-04
AP-3.3Q
QMP-03-06
AP-1-6Q
AP-3.3Q
DOE
AP-6.1Q
AP-5.3Q
QMP-06-04
- SHEET 2
MATCH LINE
DESIGN & SITE INFORMATION
DESIGN & SITE INFORMATION
EXAMINE PRELIMINARY GROA/ ESF CONCEPTS
(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
*=TWS-QAS-
**=LLNL-YMP-
APPLICABLE CHANGE CONTROL IN EFFECT
DSGNECP.129/1-13-92



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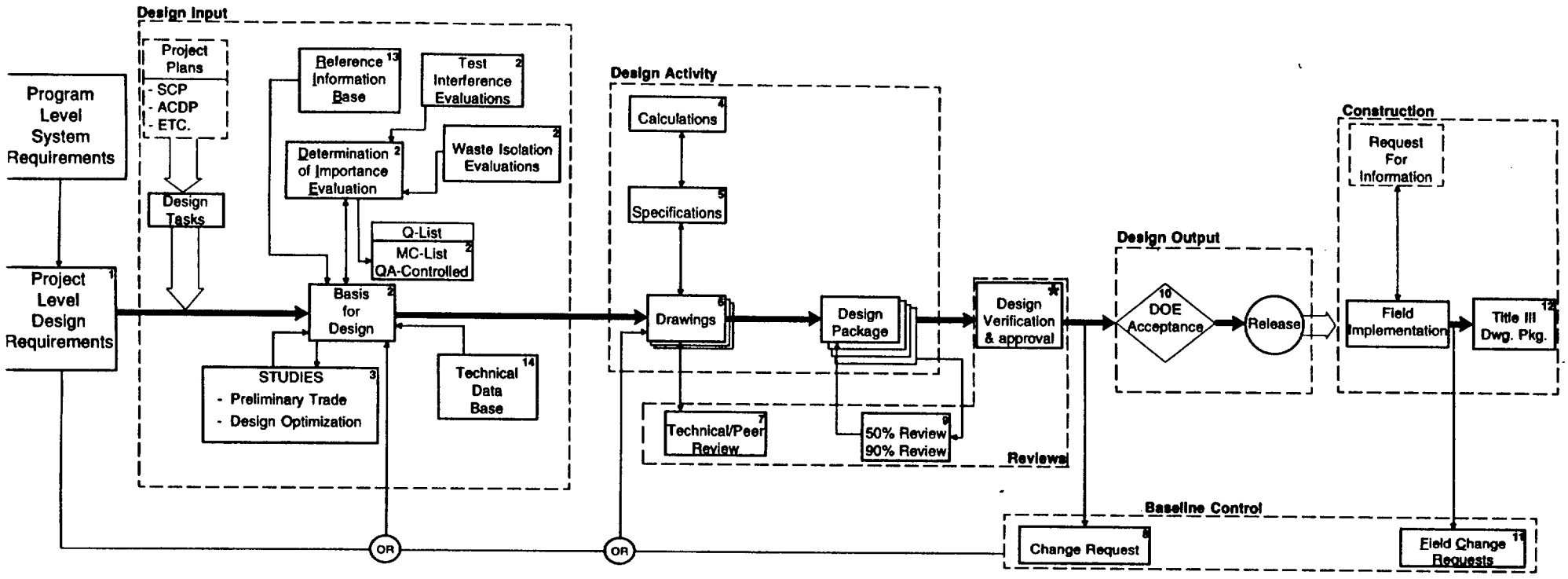
MGDS DESIG PROCESS

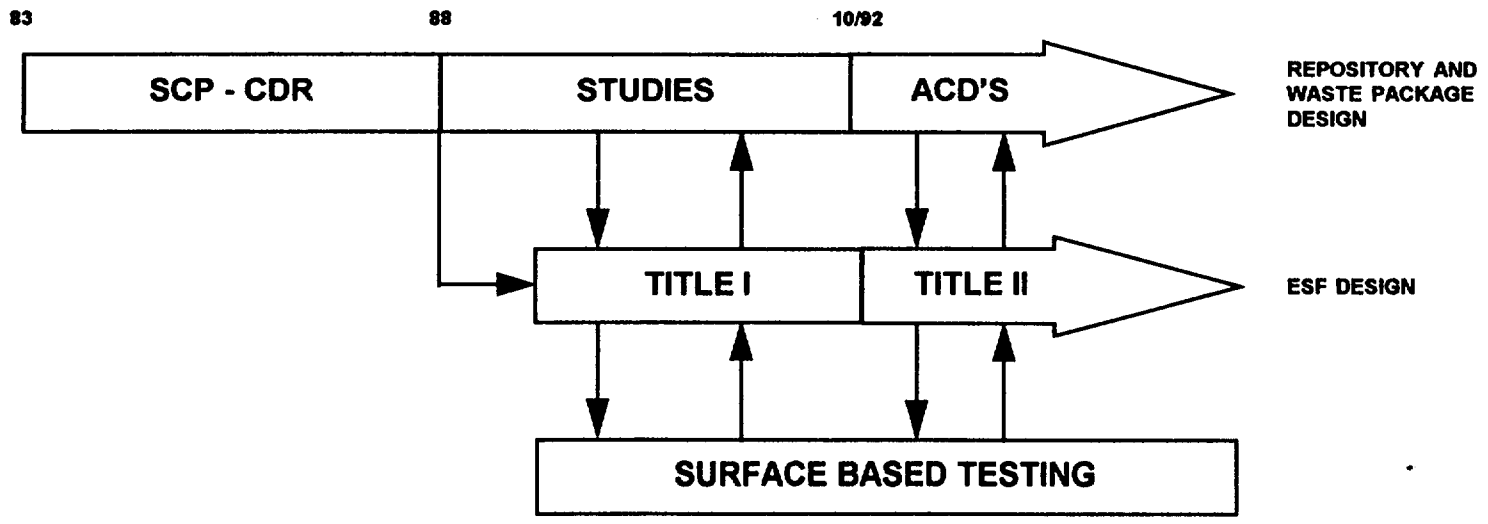


GOVERNING DOCUMENTS			
(1)	QAP-3-1, QAP-3-5, AP-6.1Q	(8)	QAP-3-4
(2)	QAP-2-3, QAP-3-5, QAP-3-9, QAP-3-11, QAP-3-12, QAP-17-1, AP-6.17Q, YMP/92-1	(9)	QAP-3-1, QAP 3-14
(3)	QAP-3-5	(10)	AP-3.3Q, AP-6.1Q, BTP-EDD-002, QMP-03-09, YMP/93-06
(4)	QAP-3-9, QAP-6-1, QAP-17-1	(11)	AP-3.5Q, NLP-3-10
(5)	QAP-6-1, 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.

MGDS DESIGN PROCESS
(Con't)

- **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
(Con't)

- **Begins with decomposition of requirements in technical requirements document hierarchy**

e.g.

└► <u>CRWMS Requirements Document (CRD)</u>

└► <u>MGDS Requirements Document (MGDSRD)</u>

└► <u>Site Design & Test Requirements Document (SDTRD)</u>

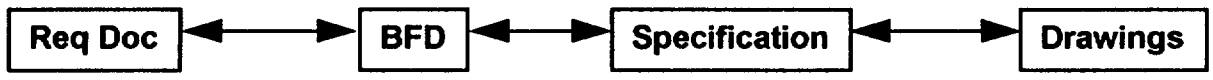
<u>ESF Design Requirements (ESFDR)</u>

MGDS DESIGN PROCESS
(Con't)

- **Process originated and structured under <u>old</u> hierarchy - will transition and conform to new hierarchy requirements**
- **Consistent with ESF design process as described in FY 1993 ESF Engineering Plan**

MGDS DESIGN PROCESS
(Con't)

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



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

MGDS DESIGN PROCESS
(Con't)

- **Design Package**
  - **Logical division by function or engineering discipline**
  - **Manageable**
  - **Peer/technical review**
  - **Disciplined change process**

MGDS DESIGN PROCESS
(Con't)

- **Field Implementation**
  - **Quality affecting (Q-List) inspection process**
  - **Title III inspection**
  - **Field change request process**
  - **Request for information**

MGDS DESIGN PROCESS
(Con't)

- **Title III Design Package**
  - **As built product configuration baseline**
  - **Basis for in-service changes**
    - » **Controlled by change process**
  - **Maintained for life cycle of system**

SUMMARY

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

Civilian Radioactive Waste Management System

Management & Operating Contractor

TRW Environmental Safety Systems Inc.

Design/Control Improvement Plan

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

ATTACHMENT (6) #5

INTRODUCTION

- **Numerous findings associated with Design Control**
- **Good quality products, but trends in design processes that could impair quality if not changed**
- **M&O has committed to developing action plan in response to CARs and self-examination**

M&O MGDS DESIGN CONTROL IMPROVEMENT PLAN

- Provide immediate response to open CARs
- Ensure any conditions adverse to quality are identified, evaluated, and corrected
- Commit to development of a series of improvements to the design control process to preclude similar future incidents
- Increase confidence of external agencies and DOE in M&O's ability to properly control our design procedures and processes

RELATIONSHIP TO CAR's

- **Not a direct response to any particular CAR**
- **Does not supplant any CAR responses**
- **Documents responses, 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)**

RELATIONSHIP TO CAR's (Con't)

- Allow for a thorough review of our design control process in general, to identify any weaknesses or shortcomings
- Plan is referenced in response to CAR YM-93-070

ACTION ITEMS

- Three sets of action items
- Grouped by time frame and scope of expected response
- Near-Term Response Actions (Table 1)
- Process Improvement Actions (Table 2)
- Verification/Confirmation Actions (Table 3)

NEAR-TERM RESPONSE ACTIONS
(TABLE 1)

- **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**

IMMEDIATE CORRECTIVE ACTIONS
(TABLE 1)

A. Problem/Discussion: MGDS Development experiencing continuing difficulties complying with QA requirements, as indicated by relatively high number of design process related CARs received.

Solution(s): Address immediate compliance issues by reinforcing among MGDS staff the importance of 100% compliance with QA requirements and procedures.

IMMEDIATE CORRECTIVE ACTIONS
(TABLE 1) (Con't)

A1. Immediate "Importance of QA briefings - Foust, Sandifer (Complete)

A2. Management Steering Committee - Monitor progress - Foust (Complete - established 8/6/93, meeting regularly)

A3. QA Working Committee - focal point for ensuring procedure enhancements in place - all line organizations represented - local resource for QA compliance or procedural problems (see L2) Foust (Complete - established 8/6/93, meeting regularly)

IMMEDIATE CORRECTIVE ACTIONS
(TABLE 1)

A. (continued)

A4. Develop and distribute action plan for corrective actions. Sandifer, Geer (Complete - Revision 0 issued 8/13/93; Rev. 1 issued 9/15 incorporating DOE & QA comments)

A5. Reinforce CCB Secretary's responsibility (at both level 2 and 3) for ensuring completeness of change documentation Geer (Complete)

IMMEDIATE CORRECTIVE ACTIONS
(TABLE 1) (Con't)

B. Problem/Discussion: RSN BFD has not been evaluated for changes necessary as a result of M&0-generated Package 1A design changes.

Solution(s):

B1. Complete ILP for revising RSN BFD. Buckey (Complete)

B2. Tabulate and collect copies of relevant change requests. Cruz (Complete)

IMMEDIATE CORRECTIVE ACTIONS
(TABLE 1) (Con't)

B3. Review CRs/FCRs for potential impact to BFD. Engwall, Naaf (Complete)

B4. Provide redline version of BFD incorporating changes. Naaf (Complete)

B5. Submit Baseline Change Request to request changes. Naaf (Complete)

B6. Complete revision of RSN BFD and baseline new document. Naaf (10/8)

IMMEDIATE CORRECTIVE ACTIONS
(TABLE 1) (Con't)

C. Problem/Discussion: Change Request 93/405 resulted in a hand-written "TBV" being dropped from a drawing; problems with completeness of CR submittals (see A5 also).

Solution(s):

C1. Review current drawings/specs for similar error; document review and results as part of CAR response. Engwall, Naaf (Complete)

C2. Process necessary changes to resolve any findings as a result of review. Engwall, Naaf (Complete)

IMMEDIATE CORRECTIVE ACTIONS
(TABLE 1) (Con't)

C. (Continued)

C3. Provide dedicated resources to review change request paperwork prior to the processing until assurance exists that preparers are fully compliant with the governing procedures. Review all CRs for procedural compliance prior to issuing the change request (see also J1). Jackson (ongoing)

IMMEDIATE CORRECTIVE ACTIONS (TABLE 1) (Con't)

D. Problem/Discussion: No M&O procedure for formal documentation and tracking of TBVs/TBDs on design inputs/outputs.

Solution(s):

D1. Complete ILP for documenting and tracking TBDs/TBVs and begin tracking activities. Taipale, Cruz (Complete)

D2. Implement M&O TBD/TBV tracking system prior to releasing the first M&O design package. Cruz, Leitner (Process in place. Developing inputs and incorporating improvements to the procedure. Complete implementation expected 10/31)

IMMEDIATE CORRECTIVE ACTIONS
(TABLE 1) (Con't)

E. Problem/Discussion: No process for documenting interdisciplinary (ID) design reviews.

Solution(s):

E1. Evaluate need for an MGDS implementing line procedure for documenting ID reviews. Engwall, Naaf, Jackson, SI rep. (Complete - NLP was developed to ensure documentation of MGDS ID reviews)

IMMEDIATE CORRECTIVE ACTIONS
(TABLE 1) (Con't)

F. **Problem/Discussion: QA requirements are described in specifications, but QA classification is not shown on drawings.**

Solution(s):

F1. **Ensure QAP-2-3 completed and approved for use at MGDS (OQA acceptance required per contract). Hastings (QAP-2-3 approved by the M&O and currently in QAP 6.2 review by DOE OQA. Acceptance by DOE expected 10/31)**

IMMEDIATE CORRECTIVE ACTIONS
(TABLE 1) (Con't)

F. (Continued)

F2. Develop ILPs or QAP revisions for identifying QA classification on design outputs (including drawings/specs with QA and Non-QA components). Engwall, Naaf, Hastings (Pending completion of F1 10/31)

F3. Implement QAP/ILPs prior to final verification for 1B & 2A. Engwall, Naaf (Pending completion of F1 10/31)

F4. Begin incorporating into 1A as outputs are revised. Engwall, Naaf (Pending completion of F1 10/31)

IMMEDIATE CORRECTIVE ACTIONS (TABLE 1) (Con't)

G. Problem/Discussion: Design inputs not consistently shown on drawings; M&O process for demonstrating traceability of requirements no explicit.

Solution(s):

G1. Identify most effective method of ensuring traceability. Rindskopf, Peters, Leonard (Complete)

IMMEDIATE CORRECTIVE ACTIONS
(TABLE 1) (Con't)

G. (Continued)

G2. Resolve CI/Architecture definition issues to ensure basis for establishing traceability exists. Rindskopf, Peters, Leonard, Robinson (Complete)

G3. Revise/create procedures for implementation as appropriate. Rindskopf, Robinson (Complete - No additional procedures deemed necessary)

IMMEDIATE CORRECTIVE ACTIONS
(TABLE 1) (Con't)

G. (Continued)

G4. Revise 2A/1B BFD to demonstrate traceability (see G1). Rindskopf, Peters, Leonard (10/15)

G5. Revise drawings/specs appropriately based on BFD changes. Engwall, Naaf (10/15)

IMMEDIATE CORRECTIVE ACTIONS
(TABLE 1) (Con't)

H. Problem/Discussion: Line procedures needed for waste isolation and test interference evaluations.

Solution(s):

H1. Develop ILP to formalize guidance on waste isolation evaluations. Younker (Complete)

H2. Develop ILP to formalize guidance on test interference evaluations. Statton (Complete)

IMMEDIATE CORRECTIVE ACTIONS
(TABLE 1) (Con't)

I. Problem/Discussion: Review design-related CARS to ensure corrective actions are being accomplished.

Solution(s):

I1. Tabulate & summarize open and closed CARS affecting or involving M&O design process. Verdery (Complete)

I2. Establish MGDS point of contact for all CAR responses for MGDS Development. Sandifer (Complete - Verdery is contact point)

IMMEDIATE CORRECTIVE ACTIONS
(TABLE 1) (Con't)

I3. Review outstanding actions to ensure timely completion. Verdery (Ongoing)

I4. Provide Rev. 1 of Design Control Improvement Plan with cross reference to relevant CAR(s), where appropriate. Geer, Hastings (Complete)

PROCESS IMPROVEMENT ACTIONS
(TABLE 2)

- **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**

PROCESS IMPROVEMENT ACTIONS (TABLE 2) (Con't)

- **Issues include (Con't):**
  - **Improvement of design products and associated procedures**
  - **Promotion of constructive attitudes toward design control and other QA processes**

PROCESS IMPROVEMENT ACTIONS
(TABLE 2) (Con't)

J. Problem/Discussion: Recurrent instances of non-compliance with procedural requirements.

Solution(s): Develop "Culture of Compliance".

J1. Involve M&O QA more proactively during design development by increasing consultation and surveillances (see C3). Jackson, Franks (Ongoing)

PROCESS IMPROVEMENT ACTIONS
(TABLE 2) (Con't)

J. (Continued)

J2. Invite DOE QA to review M&O design process. Sandifer (Start 8/6)

J3. Implement systems conformance reviews involving Systems Engineering, Regulatory & Licensing, QA. Geer (FY 1994)

PROCESS IMPROVEMENT ACTIONS
(TABLE 2) (Con't)

K. Problem/Discussion: Perception exists that schedule pressures are impacting quality of work.

Solution(s):

K1. Provide letter to M&O staff reinforcing management commitment to verbatim compliance with quality assurance requirements, even at the expense of schedule. Foust, Sandifer (Complete)

PROCESS IMPROVEMENT ACTIONS (TABLE 2) (Con't)

L. **Problem/Discussion: Perception persists that design procedures are overly complex and difficult to follow; not developed or maintained by those performing work; feedback mechanism (to authors) is inadequate; revisions and improvement are not easily facilitated.**

PROCESS IMPROVEMENT ACTIONS
(TABLE 2) (Con't)

L. (Continued)

Solution(s):

L1. Evaluate process for M&O review of procedures to identify potential improvements. Hodgson, Geer, Carruth (Complete)

PROCESS IMPROVEMENT ACTIONS
(TABLE 2) (Con't)

L. (Continued)

L2. Procedure review team to trial run the existing procedures and revisions to ensure procedures are adequate (subcommittee to the QA Working Committee in A3). Hodgson, Geer (Implementation began on 8/6)

L3. Formal training on appropriate procedures (include instruction on where each procedure fits into the design process using guidance document in M1. Penovich (Start 9/1)

PROCESS IMPROVEMENT ACTIONS
(TABLE 2) (Con't)

L. (Continued)

L4. Add J. Schmit (OQA Quality Improvement Team) to the Procedure Review Team. Hodgson (Complete)

PROCESS IMPROVEMENT ACTIONS
(TABLE 2) (Con't)

M. Problem/Discussion: M&O design process not universally understood within the M&O and not well documented from an overall standpoint.

Solution(s):

M1. Develop detailed MGDS Design Process Guidelines Manual to provide guidelines to engineering staff for implementing design process (tool for indoctrination of new employees and for providing common basis for communication with external parties). Geer (1st draft expected 10/31)

PROCESS IMPROVEMENT ACTIONS
(TABLE 2) (Con't)

M. (Continued)

M2. Interface with formal FCR/CR working group to ensure recommendations are integrated into guidelines manual. Pimentel (Complete. Incorporated lessons learned into revisions. The Guidelines manual will describe the process as proceduralized)

M3. Ensure manual reflects changes to CCB/CM processes when necessary. Cruz (Pending completion of CM realignment activities. Expected completion 10/31)

PROCESS IMPROVEMENT ACTIONS
(TABLE 2) (Con't)

N. Problem/Discussion: Change Control and Configuration Management (CM) processes are overly cumbersome.

Solution(s):

N1. Review OCRWM Baseline Management Plan, DOE 4700.1, and QARD for CM requirements; ensure interfaces between CM and design control process are properly reflected in procedures. Hodgson, Cruz (Complete)

PROCESS IMPROVEMENT ACTIONS
(TABLE 2) (Con't)

N. (Continued)

N2. Implement necessary procedure changes from N1. Cruz, Hodgson (Complete)

N3. Ensure process exists to track required changes to impacted documents. Cruz (Complete)

PROCESS IMPROVEMENT ACTIONS
(TABLE 2) (Con't)

O. Problem/Discussion: M&O needs to incorporate RSN BFD & design products into M&O baseline (see B).

Solution(s):

O1. Incorporate relevant RSN BFD sections for 1A into M&O BFD; prepare baseline change for combined BFD. Naaf, Engwall (1/31/94)

O2. Revise drawings, specifications, calculations for new traceability; adopt fully as M&O products. Naaf, Engwall (4/30/94)

VERIFICATION/CONFIRMATION ACTIONS (TABLE 3)

- Intended to explicitly document effectiveness of the plan and associated action items
- Systematic review of problems discussed in the plan
- Identification of the associated root causes
- Evaluation of the effectiveness of the completed actions in correcting these problems and preventing recurrence

VERIFICATION/CONFIRMATION ACTIONS (TABLE 3) (Con't)

P. Problem/Discussion: Root causes need to be identified for design control problems.

Solution(s):

P1. Perform root cause analysis for each CAR related to design control process (as part of each CAR); perform and overall analysis of the design control process relative to design control improvement. Jackson (10/31)

VERIFICATION/CONFIRMATION ACTIONS (TABLE 3) (Con't)

P. (Continued)

P2. Include root cause analysis documentation in related CAR response(s) for supplemental responses. Jackson (begin 10/31 - ongoing effort for future CARs)

VERIFICATION/CONFIRMATION ACTIONS (TABLE 3) (Con't)

Q. Problem/Discussion: Follow-up evaluation is needed to verify effectiveness of plan actions.

Solutions(s):

Q1. Concur with DOE on appropriate scope/methodology for follow-up line organization verification activities. Sandifer, Petrie (10/15)

VERIFICATION/CONFIRMATION ACTIONS (TABLE 3) (Con't)

Q. (Continued)

Q2. Document plan/schedule for surveillance/evaluation(s). Franks (10/31)

Q3. Implement surveillance/evaluation(s) and document results in final follow-up report. Franks (TBD)

CORRECTIVE ACTION REQUEST EVALUATIONS*

CAR # / STATUS	DATE ISSUED	DESCRIPTION	REMARKS
YM-92-056 CLOSED	7/20/92	The M&O has performed test interference evaluations for Phase 2, Neutron-Access Boreholes and Drillhole NRG-1 without a required procedure.	No previous CARs issued concerning the subject Although the M&O had no specific procedure that addressed Test Interference Evaluations or Waste Isolation Evaluations, the M&O had indicated that they had actually performed the evaluations in accordance with the process described in QAP 3-5 "Technical Document Review."
HQ-93-013 ECD: 10/30/93	2/17/93	M&O QAPs do not meet all M&O QAPD requirements and in some instances do not reflect current practice, e.g. QAP 3-9 "Engineering Calculations and Analysis" did not require technical review criteria for engineering analyses or require the results of the review to be documented.	Not repetitive. Not significant to radiological safety. Only one design control procedure was identified as deficient. At the time of this CAR there was no need to stop design activities.

Backup Slides for D. Horton Presentation

CORRECTIVE ACTION REQUEST EVALUATIONS*

CAR # / STATUS	DATE ISSUED	DESCRIPTION	REMARKS
YM-93-035 ECD: 10/31/93	3/11/93	FCRs are not being completed per AP-3.5Q requirements, e.g. FCR QA Classification is missing or shown as QA related when it is not. (Issued to YMPO)	All work underground is installed to Q specification i.e. Drill and Blast Spec.
YM-93-040 ECD: 10/29/93	3/30/93	Design procedures do not address various QA requirements or define all M&O Design functions	Full implementation M&O design functions were not needed for ESF Design Packages 1B & 2A
YM-93-062 CLOSED	7/1/93	No program for commercial grade procurements and subsequent upgrade for Quality Affecting application	Not repetitive. Not significant to radiological safety. The procurement was being performed to an approved procedure; however confusion was caused in the Design Specification because of unclear definition of Commercial Grade.

CORRECTIVE ACTION REQUEST EVALUATIONS*

CAR # / STATUS	DATE ISSUED	DESCRIPTION	REMARKS
YM-93-063 CLOSED	7/2/93	NCRs dispositioned without technical justification. NCRs were dispositioned based on unqualified supplier submittals	Not repetitive. Not significant to radiological safety. The procurement and disposition of NCRs was performed to approved procedures; however, confusion was caused in the Design Specification because of unclear definition of Commercial Grade.
YM-93-064 CLOSED	7/1/93	Specification does not require an NCR when shotcrete tests do not meet requirements	Isolated case. The spec was actually more restrictive by requiring removal of shotcrete vs. engineering evaluation thru NCR process

CORRECTIVE ACTION REQUEST EVALUATIONS*

CAR # / STATUS	DATE ISSUED	DESCRIPTION	REMARKS
YM-93-070 ECD: 3/1/94	7/14/93	M&O has a repetitive deficiency regarding: 1) Implementing procedures addressing upper-tier QA program requirements, and 2) implementing procedures inadequate or non-existent for QA activities being performed Ref: CARs YM-92-056, -040, and HQ-93-013	Design Package 1A was completed by RSN with the M&O participating in the design review. As of 7/14/93 very little quality affecting design work had been performed by the M&O. As part of corrective action dealing with this CAR the M&O immediately inserted a QA Enginering review of all design work. The M&O Design Control Improvement Plan was developed.
YM-93-072 Amended Response due 9/27/93	7/19/93	TBV identifiers omitted from drawings	RSN placed TBVs by hand on Dwgs. When M&O revised dwgs. via CAD System, TBVs were dropped. This only occurred for 5 revised dwgs

CORRECTIVE ACTION REQUEST EVALUATIONS*

CAR # / STATUS	DATE ISSUED	DESCRIPTION	REMARKS
YM-93-073 **Amended Response due 9/27/93**	7/19/93	Drawings associated with Change Directive 93/405 do not list all Quality Affecting design inputs per M&O procedure requirements	RSN had documented original design inputs in the BFD. M&O is reverting back to this practice

* **SIGNIFICANT CONDITIONS ADVERSE TO QUALITY THAT DEAL WITH THE MGDS DESIGN CONTROL PROCESS i. e. Significant OQA CARs Issued to the M&O/YMPO That Deal With The MGDS Design Control Process**

DOE-NRC TECHNICAL EXCHANGE

EXPLORATORY STUDIES FACILITY
TITLE II DESIGN AND DESIGN CONTROL

CORRECTIVE ACTION REQUEST EVALUATIONS

Donald G. Horton
Director, Office of Quality Assurance

ATTACHMENT (7)

CORRECTIVE ACTION REQUEST EVALUATIONS

SIGNIFICANT CONDITION ADVERSE TO QUALITY

- **Conditions adverse to quality are evaluated in accordance with the following criteria of QAAP 16.1, Rev. 4, Corrective Action, to determine if the identified condition is a significant condition adverse to quality:**

  A. A condition determined to be repetitive in nature

  B. A condition indicating a QA breakdown

  C. A condition that, were it to remain uncorrected, could have an adverse impact on waste form production, high-level nuclear waste transport, safety, or waste isolation

CORRECTIVE ACTION REQUEST EVALUATIONS

STOP WORK EVALUATION

- **Significant conditions adverse to quality are evaluated against the following criteria contained in QAAP 16.1, to determine if a Stop Work Order is appropriate:**

  A. Repetitive deficiencies affecting items or activities important to radiological safety, storage, transport, or disposal of high-level nuclear waste when previous corrective actions have not precluded recurrences

  B. Significant deficiencies that could affect activities important to radiological safety aspects of storage, transport, or disposal of high-level nuclear waste

  C. Activities affecting quality are being performed without approved procedures or by unqualified personnel

  D. Other significant conditions determined by the Director, OQA to have major impacts on the overall QA Program or quality of items or related activities.

OFFICE OF CIVILIAN RADIOACTIVE WASTE MANAGEMENT
U.S. DEPARTMENT OF ENERGY
WASHINGTON, D.C.

8 CAR NO.: YM-93-062
DATE: 07/02/93
SHEET: 1 OF 2
QA

CORRECTIVE ACTION REQUEST

1 Controlling Document	2 Related Report No.
QARD DOE/RW-0333P, Revision 0	YMP-93-12

3 Responsible Organization	4 Discussed With
CRWMS M&O-Nevada	R. Justice/P. Hastings/H. Benton

5 Requirement:

1) QARD DOE/RW-0333P, Section 3.0, Design Control
Paragraph 3.2.2, Design Process

Item I- Drawings, specifications, and other design output documents shall contain appropriate inspection and testing acceptance.

2) QARD DOE/RW-0333P, Section 8.0, Identification and Control of Items
Paragraph 8.2.3, Traceability

(Continued on next page)

6 Adverse Condition:

Contrary to the cited requirements:

1) Specification YMP-025-1-SP09, Section 1400 and Item Specifications 02165, 02310, and 03361 are unclear on the definition of commercial-grade for quality-affecting procurements, receiving inspection, including testing. There is no program in place for commercial-grade procurements, and the subsequent upgrade and dedication for use in a quality-affecting application.

2) a. The Specification YMP-025-1-SP09, Sections 1400, 02165, 02310, and 03361 currently do not address traceability.

(Continued on next page)

9 Does a significant condition adverse to quality exist?	10 Does a stop work condition exist?	11 Response Due Date:
Yes X No___	Yes___ No X ; if Yes - Attach copy of SWO	20 Working Days from Issuance
If Yes, Circle One: A B (C)	If Yes, Circle One: A B C D	

12 Required Actions: [X] Remedial [X] Extent of Deficiency [X] Preclude Recurrence [X] Root Cause Determination

13 Recommended Actions:

1. Clarify Specification YMP-025-1-SP09 quality requirement.
2. Develop a commercial-grade upgrade and dedication program.
3. Meet traceability requirements.

7 Initiator Donald J. Harris Donald J. Harris Date 7-1-93	14 Issuance Approved by: QADD [signature] Date 7.0793
15 Response Accepted QAR Donald J. Harris Date 8/6/93	16 Response Accepted QADD [signature] Date 8/11/93
17 Amended Response Accepted QAR Date	18 Amended Response Accepted QADD Date
19 Corrective Actions Verified QAR Date	20 Closure Approved by: QADD Date

OFFICE OF CIVILIAN RADIOACTIVE WASTE MANAGEMENT
U.S. DEPARTMENT OF ENERGY
WASHINGTON, D.C.

8 CAR NO.: YM-93-062
DATE: 07/02/93
SHEET: 2 OF 2
QA

CORRECTIVE ACTION REQUEST (Continuation Page)

5 Requirements (continued)

A. Item identification methods shall ensure that traceability is established and maintained in a manner that allows an item to be traced to applicable design or other specifying documents.

B. Item traceability documentation shall ensure that the item can be traced at all times from its source through installation or end use.

6 Adverse Condition (continued)

b. FCR 93/321 against Specification Section 02165, removed the traceability requirements for (commercial-grade) important to radiological safety or waste escalation due to production delays. This precludes traceability from source through installation or end use.

CORRECTIVE ACTION REQUEST EVALUATIONS

CAR YM-93-062

- **Significant Condition Adverse to Quality**

  No program for commercial grade procurements and subsequent upgrade for Quality Affecting application.

- **Stop Work Evaluation**

  - **This was not a repetitive condition with previous corrective actions**

  - **This condition was not significant to radiological safety aspect of disposal**

  - **The procurement was being performed to approved procedures; however, confusion was caused by an unclear definition of commercial grade**

CAR YM-93-062 (continued)

The design specifications in question were generated by the previous A/E, RSN. The current A/E was not involved in the generation or review of these released specifications.

A meeting was held on 6/24/93, during the audit, between DOE, REECo, M&O, NRC and State of Nevada personnel to discuss Commercial Grade Items. REECo agreed not to allow any procurements of commercial grade items that have an IITS or ITWI end use, unless the supplier was on the REECo YMP Approved Supplier List or the item's critical characteristics were identified by the A/E in the specification.

REECo generated a list of procurements that were made for commercial grade items with an IITS or ITWI end use. REECo agreed to determine the adequacy of inspections/tests performed on material received to date based on receipt of an FCR that addressed the critical characteristics of the material in question and identify any deficient material on an NCR.

In other words, the sufficient controls were put in place during the audit to preclude any further impacts to ongoing work.

CORRECTIVE ACTION REQUEST EVALUATIONS

ESF DESIGN/CONSTRUCTION/TEST PHASES

- **1A Site preparation and partial portal of North Ramp (First 200' of tunnel)**
  - **A/E was RSN**
  - **M&O participated in design review process**
  - **Quality Affecting work**
    Line and Grade - Drill and Blast & Rock Bolt installation

- **1B Surface facilities at North Portal**
  - **No Quality Affecting activities**

- **2A North Ramp from 200' to Bow Ridge Fault**
  - **90% Design Review has been completed and comments are being resolved**

Civilian Radioactive Waste Management System

Management & Operating Contractor

TRW

TRW Environmental Safety Systems Inc.

DOE-NRC Technical Exchange on The Exploratory Studies Facility Title II Design

Design Strategy

Bruce T. Stanley

October 4, 1993

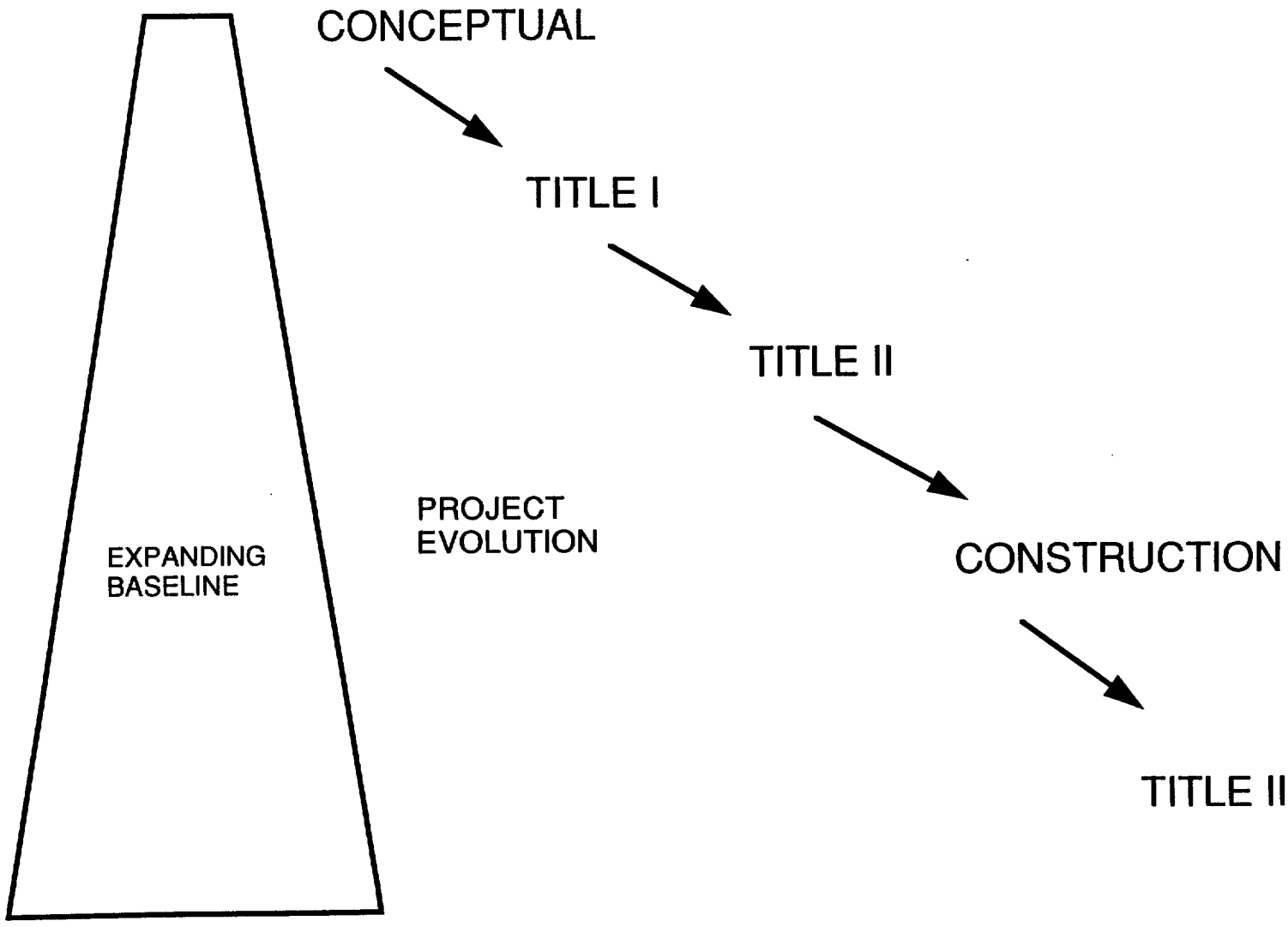
B&W Fuel Company
Duke Engineering & Services, Inc.
Fluor Daniel, Inc.

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

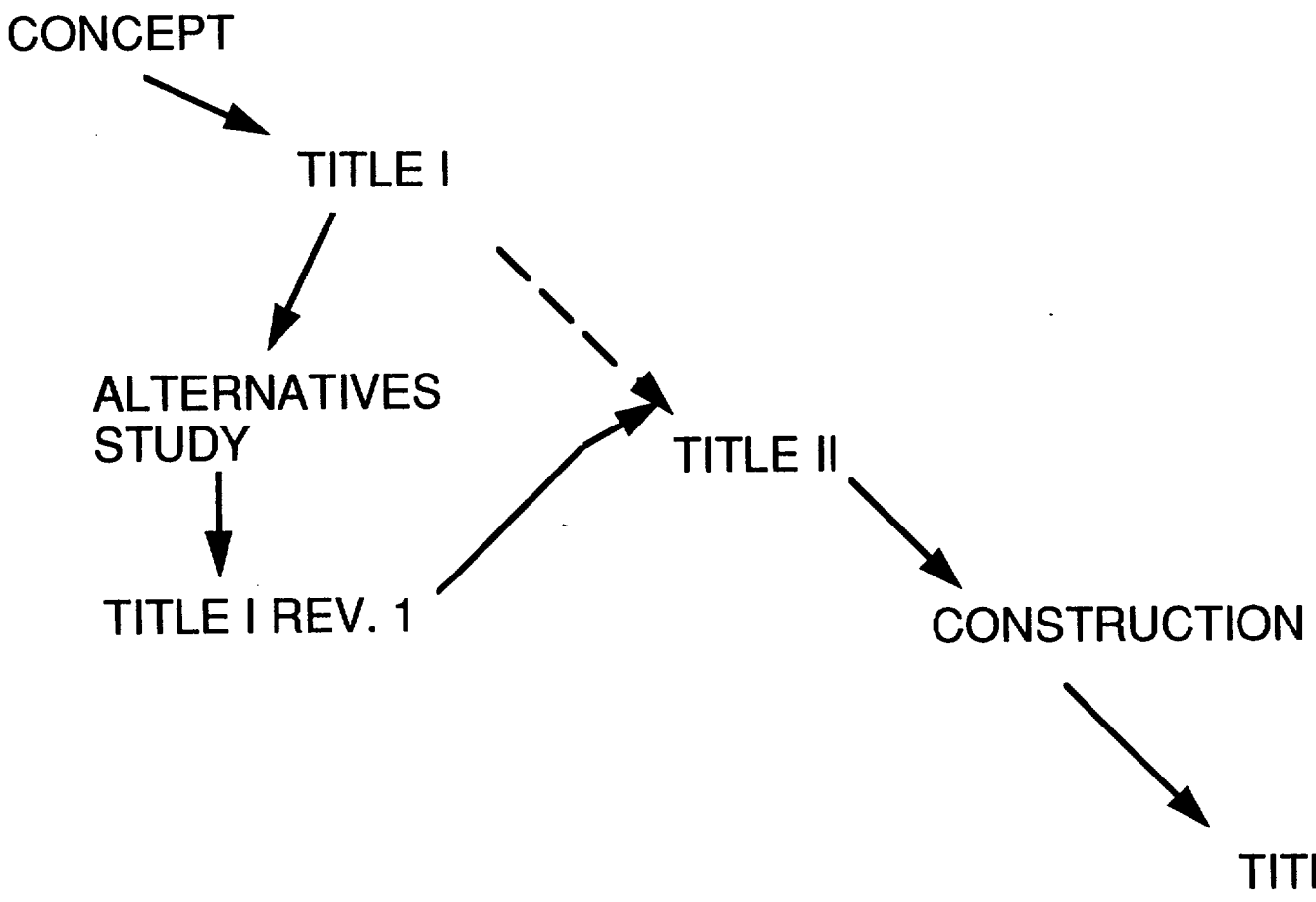
Logicon RDA
Morrison Knudsen Corporation
Woodward-Clyde Federal Services

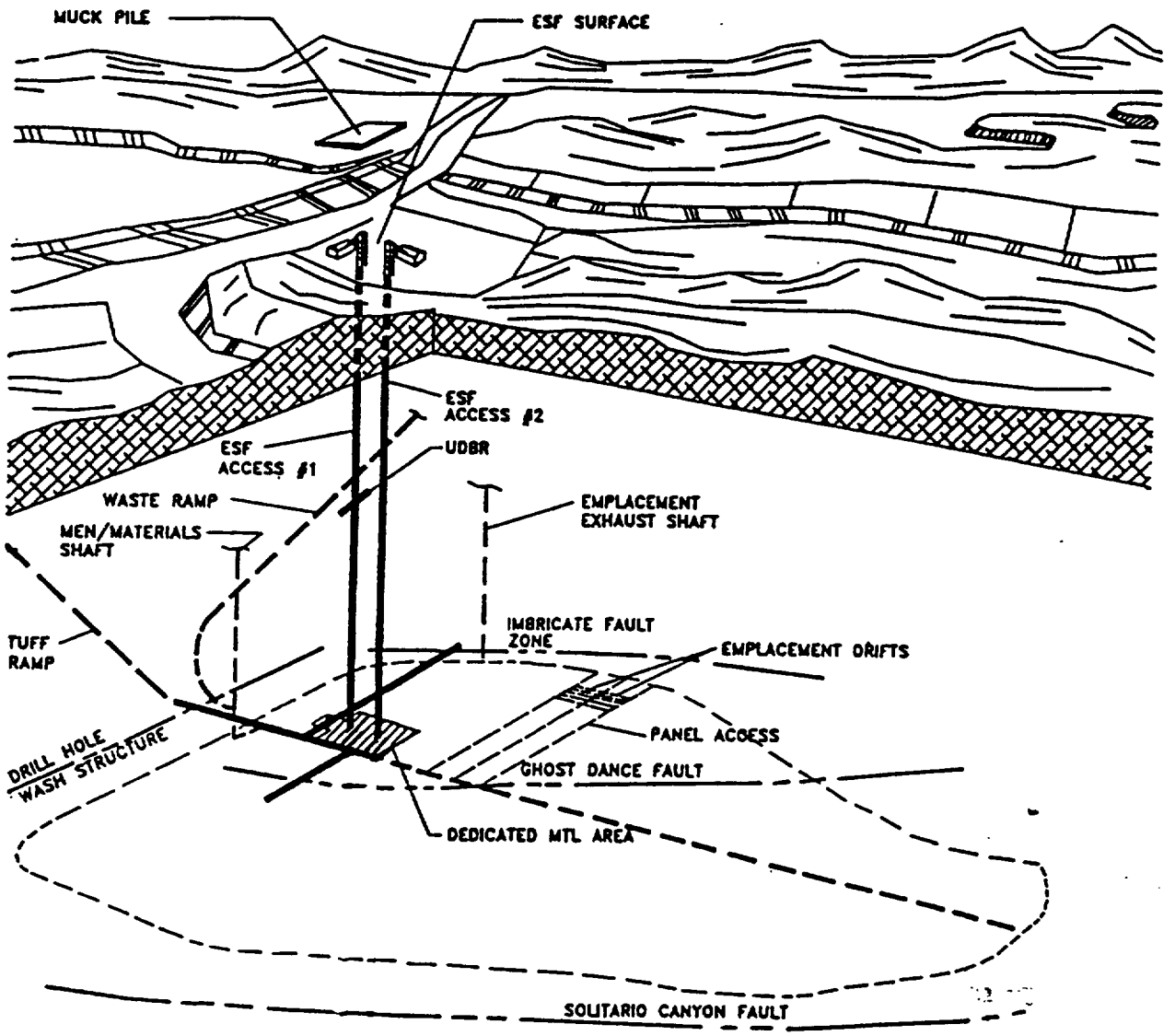
ATTACHMENT (8)

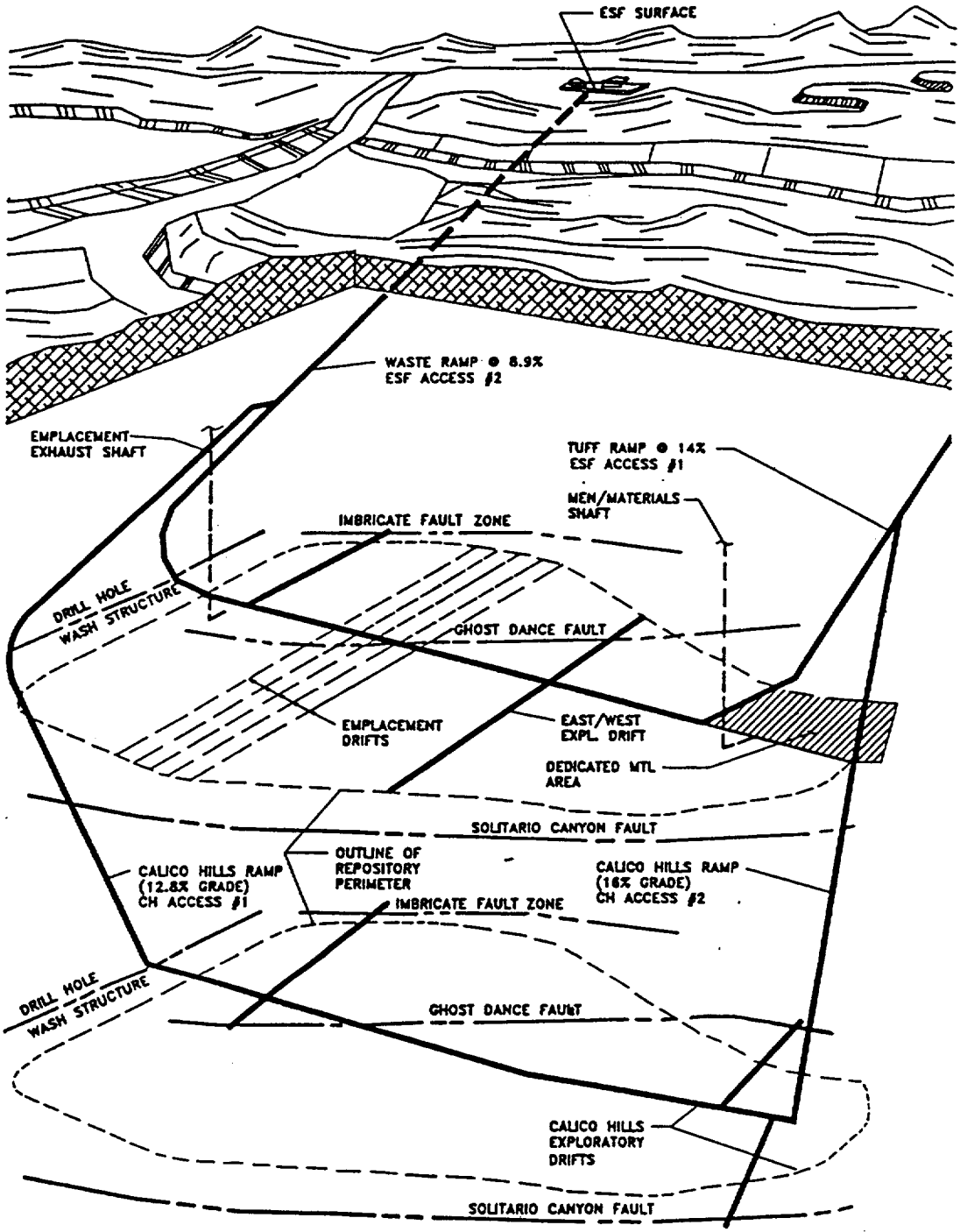
DOE Design Strategy



DOE Design Strategy




MUCK PILE
ESF SURFACE
ESF ACCESS #2
ESF ACCESS #1
UDBR
WASTE RAMP
EMPLACEMENT EXHAUST SHAFT
MEN/MATERIALS SHAFT
IMBRICATE FAULT ZONE
TUFF RAMP
EMPLACEMENT DRIFTS
PANEL ACCESS
DRILL HOLE WASH STRUCTURE
GHOST DANCE FAULT
DEDICATED MTL AREA
SOLITARIO CANYON FAULT



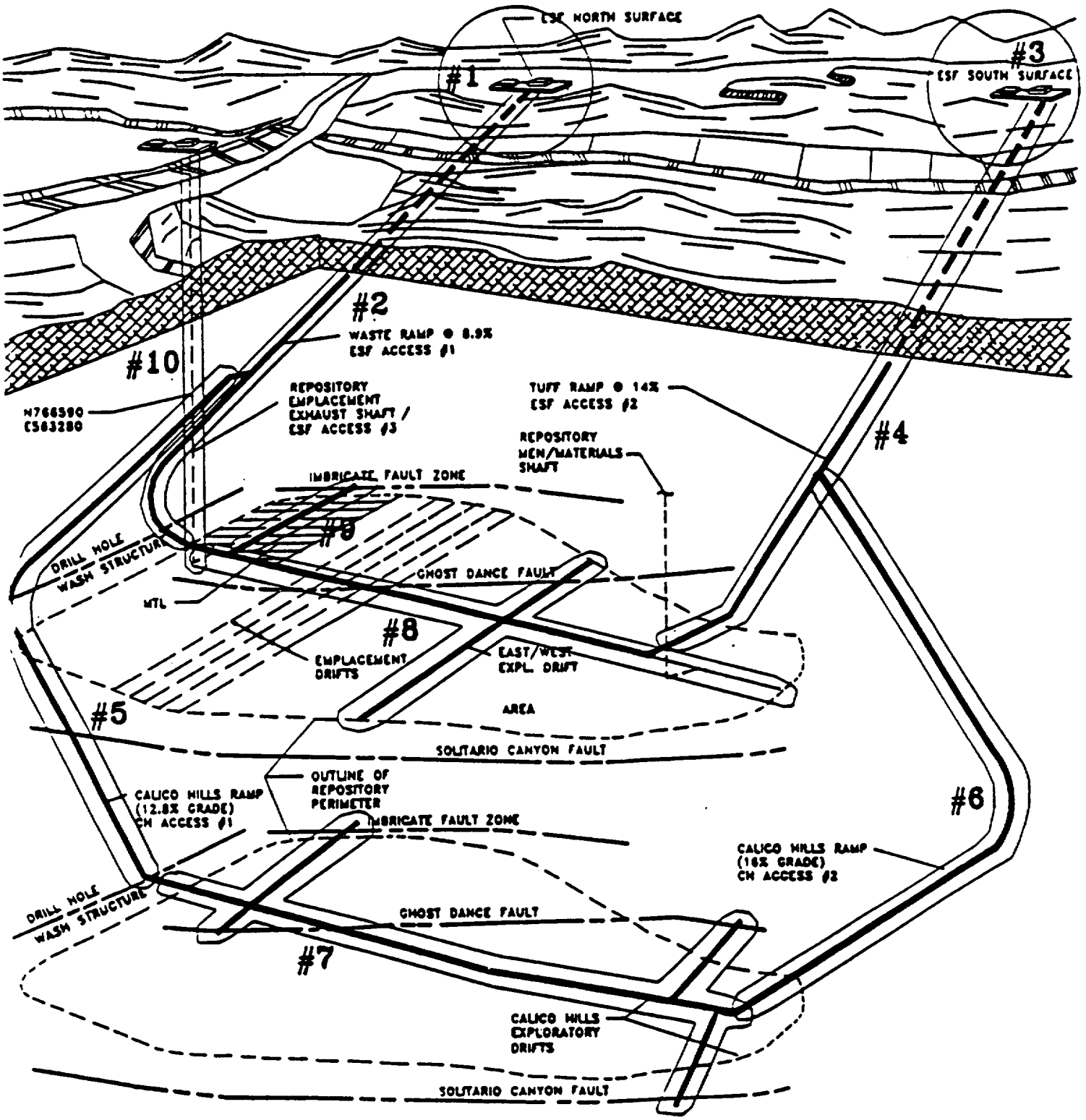
ESF ALTERNATIVES STUDY
TASK NO. 4

OPTION NO. B7

ISOMETRIC SCENARIO #2

DATE DEC 1 3 1990

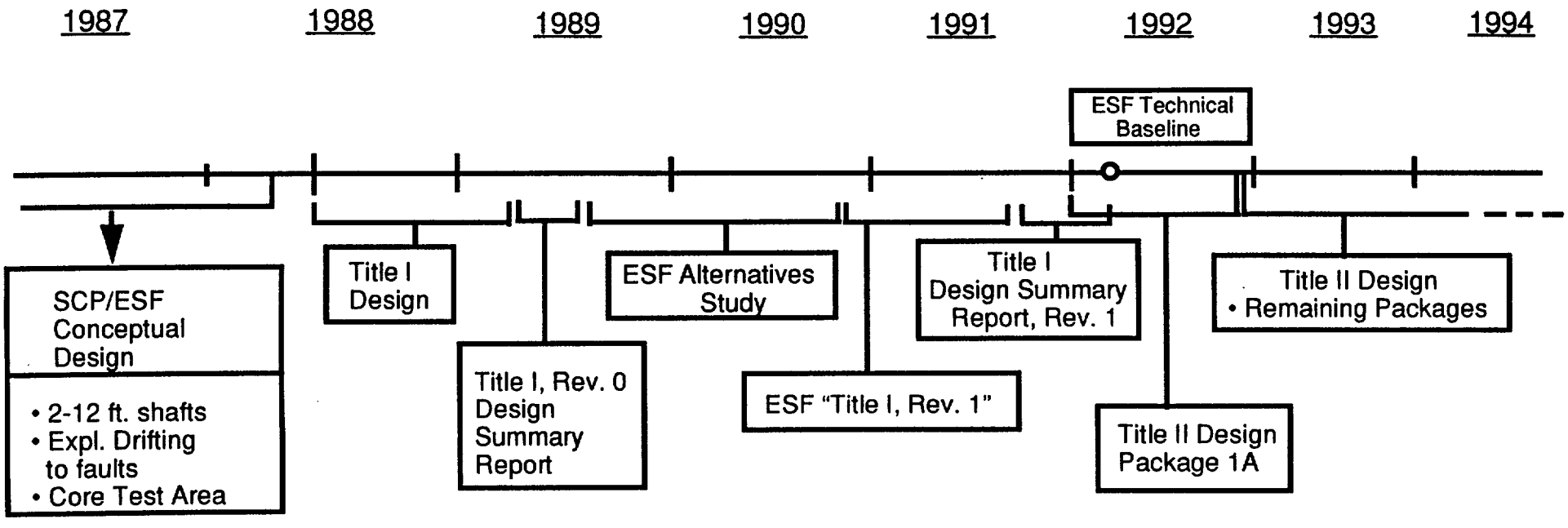
Figure 5-30. Option 30 (B7 - S2)



SCPB Figure 8.4.2-3. Reference design concept for commencing study

Design Strategy

Timeline Background



Background

- SCP/ESF Layout
  - 2 - 12 FT. DIAMETER SHAFTS
  - Exploratory Drifting to:
    - Imbricate fault zone
    - Drill Hole Wash
    - Ghost Dance Fault
  - Core test area
- 1989 Completed a Title I Design based on the SCP layout
  - Included expanded underground shop area North of Imbricate Drift
  - Core test area layout was modified for update testing information

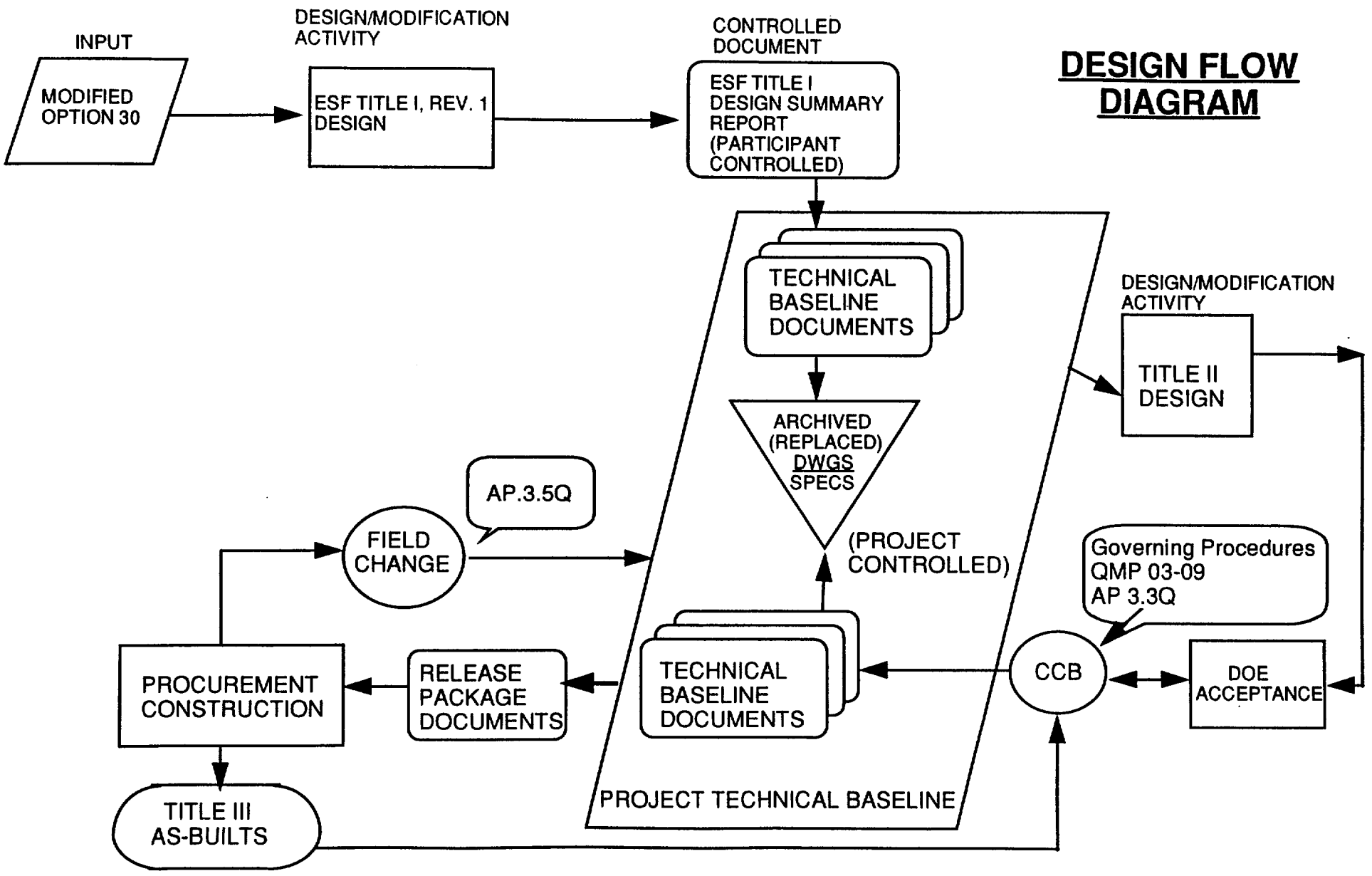
Background (con't)

- November 1989 Alternatives Study Plan Approved
  - Selection criteria established
  - 34 Options were developed based on:
    - Ability to accommodate testing
    - Access to major geologic features
    - Interface with potential repository layouts (known/alternative)
    - Schedule and Cost
    - Rapid access to Calico Hills
- Fall 1990 Option #30 Selected
  - Selection included Modifications:
    - Move main test area from the south to north end of block
    - Include an optional shaft for testing purposes (if needed)

Background (con't)

- December 1990 began design work on "ESF Title I, Rev. 1"
  - Completely modified the first Title I Design to conform to Option 30 Modified
- Fall 1991 the Title I Design Summary report is developed and submitted to DOE for acceptance
  - Five volume set including:
    - Narrative
    - Design Documents
    - Test Configurations
- 1992 ESF Technical Baseline was created
  - Two volume set extracted from Title I Design Summary Report, Rev. 1
  - Excludes extraneous backup material

DESIGN FLOW DIAGRAM



ESF Title II Design

- Based on Title I Baseline
- Phased Approach
  - 10 Design Packages
  - Accommodates Integration of new information
- Title I Design may be modified in Title II
  - M&O Review Process
  - Project Review Process

ESF Design

- Title I Baseline Design is not modified to reflect Title II changes
- Title I Baseline may be supplemented with new Title II Design of additional components, e.g. Support Facilities, Power Supply, etc.

Civilian Radioactive Waste Management System

Management & Operating Contractor

TRW Environmental Safety Systems Inc.

Proposed ESF Design Changes

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

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

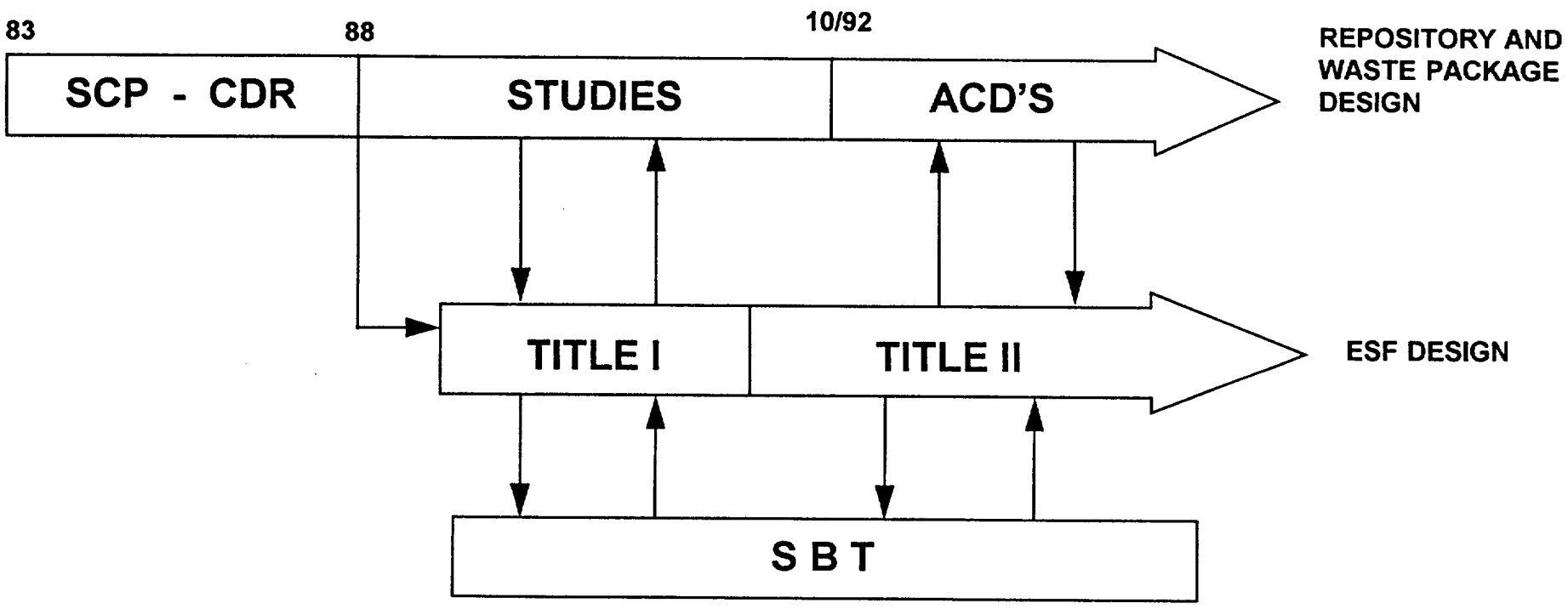
Logicon RDA
Morrison Knudsen Corporation
Woodward-Clyde Federal Services

ATTACHMENT (9)

ESF CHANGES UNDER CONSIDERATION

- Introduction, Managing Design Change
- ESF Reconfiguration
- SBT Adjustments To Support Reconfiguration
- North Portal Entrance Redesign

MANAGING DESIGN CHANGE



MANAGING DESIGN CHANGE

- Title I/Title II
- Change Drivers
  - New information (ACD's, Underground testing, and SBT)
  - Vendor problems/inputs
  - Design Refinements

ESF RECONFIGURATION

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. (ie: 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 previously 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
(Con't)

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

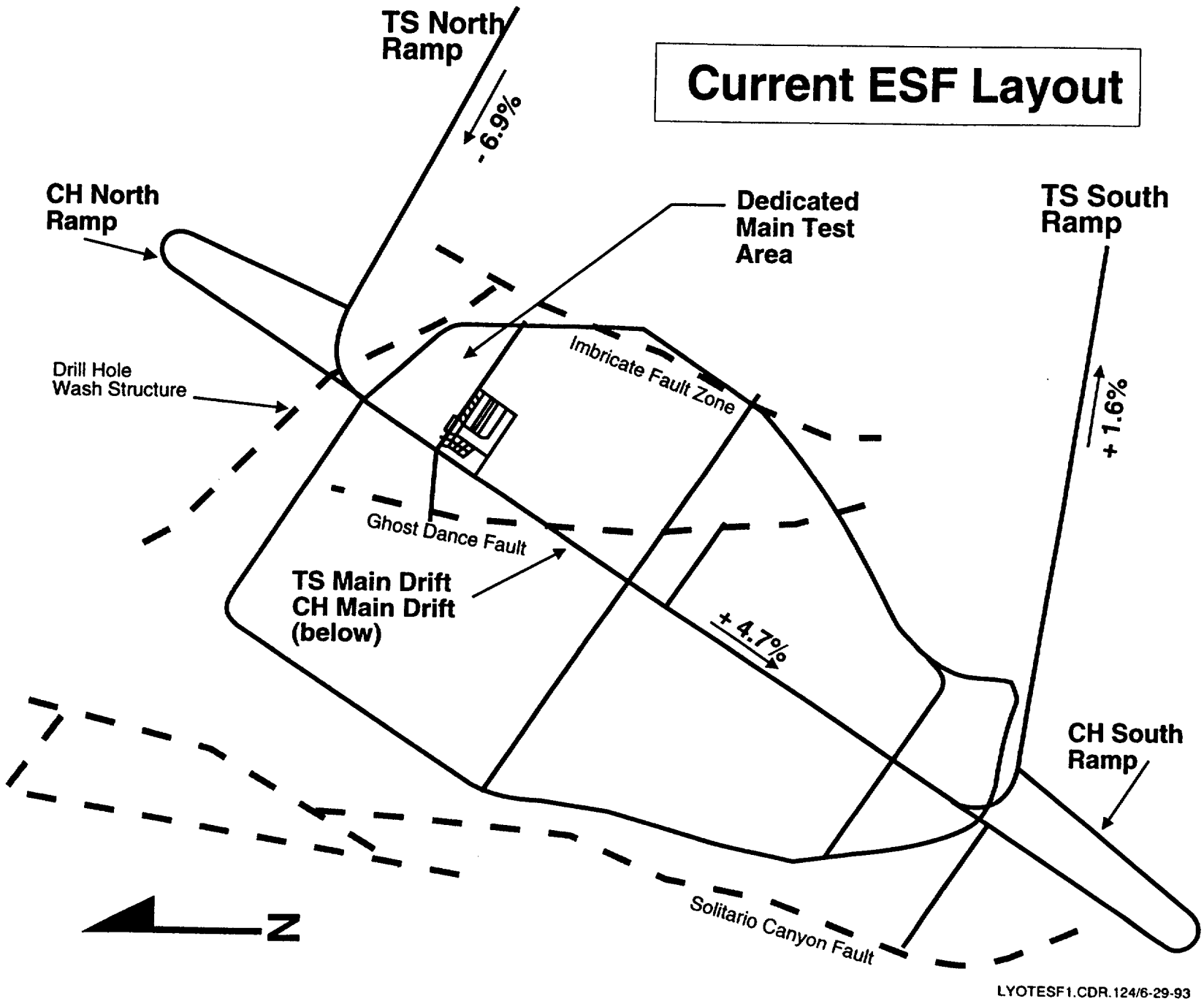
LINK TO PREVIOUS WORK

- **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

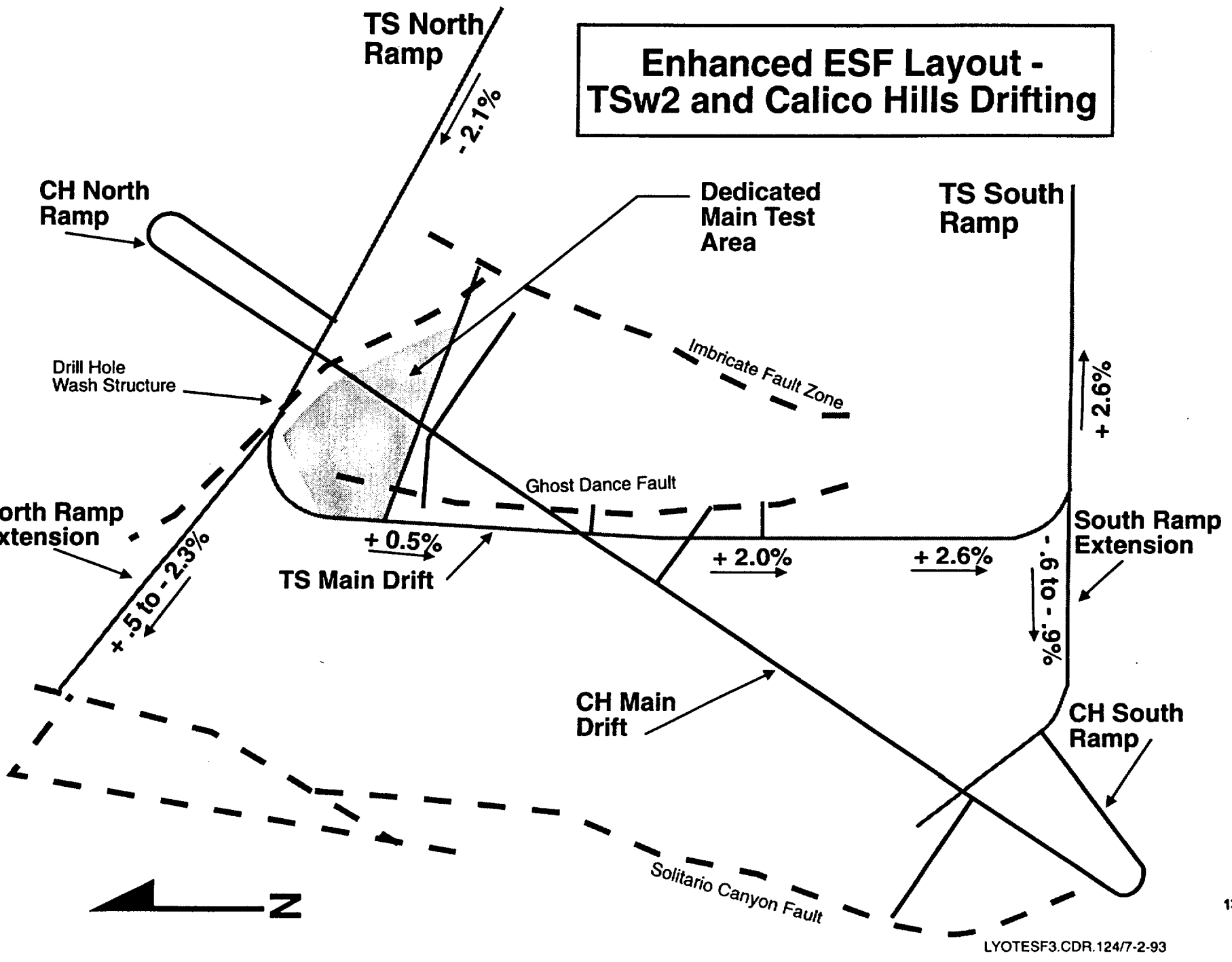
		1	2	3	4	5	6	7	8	9	10	11	12	13
RANK	TOP-RANKED OPTIONS	NUMBER OF RAMP(S)	NUMBER OF SHAFT(S)	NUMBER OF ACCESSES	MTL LOCATION FLEXIBILITY	MECHANICAL MINED ACCESSES	NO GRAVITY FLOW PATHWAY FROM TS UNIT TO ChM	MAXIMIZE DISTANCE FROM EMPLACEMENT LEVEL TO WATER TABLE	AVOID EMPLACEMENT DRIFTS CROSSING GHOST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

Current ESF Layout



LYOTESF1.CDR.124/6-29-93

Enhanced ESF Layout - TSw2 and Calico Hills Drifting



LYOTESF3.CDR.124/7-2-93

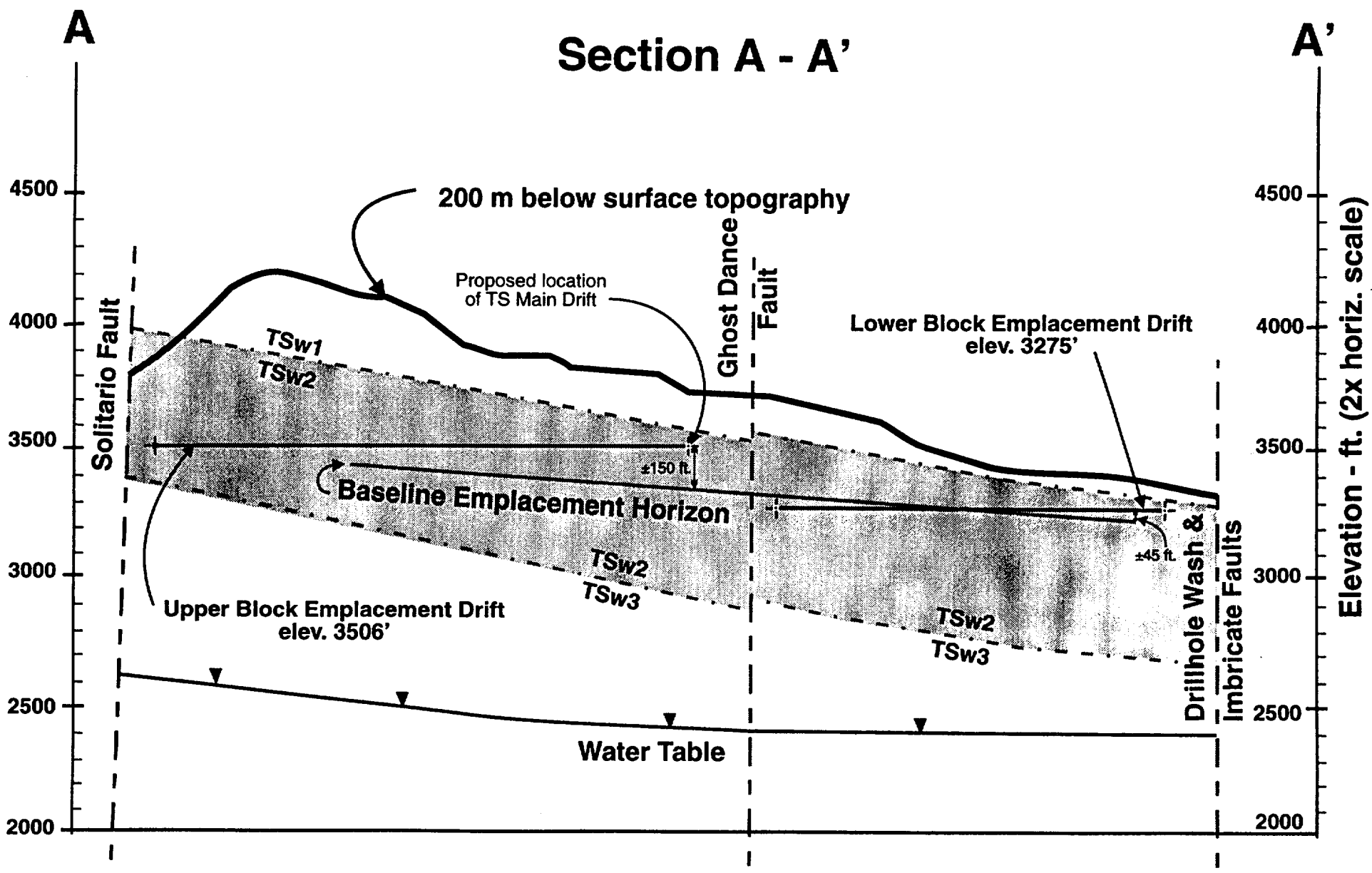


Figure 5 - Section A - A'

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

SECTA-AR.CDR.124/6-29-93

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

ADVANTAGES OF THE ENHANCED ESF LAYOUT (Con't)

- **Enhances Repository Design Flexibility**
  - **Preserves option for conventional rail haulage**
  - **Preserves option to increase distance from emplacement drifts to water table**
  - **Preserves option to avoid multiple crossings of Ghost Dance Fault with emplacement drifts**
  - **Does not preclude any conceivable repository layout option**

ADVANTAGES OF THE ENHANCED ESF LAYOUT (Con't)

- **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

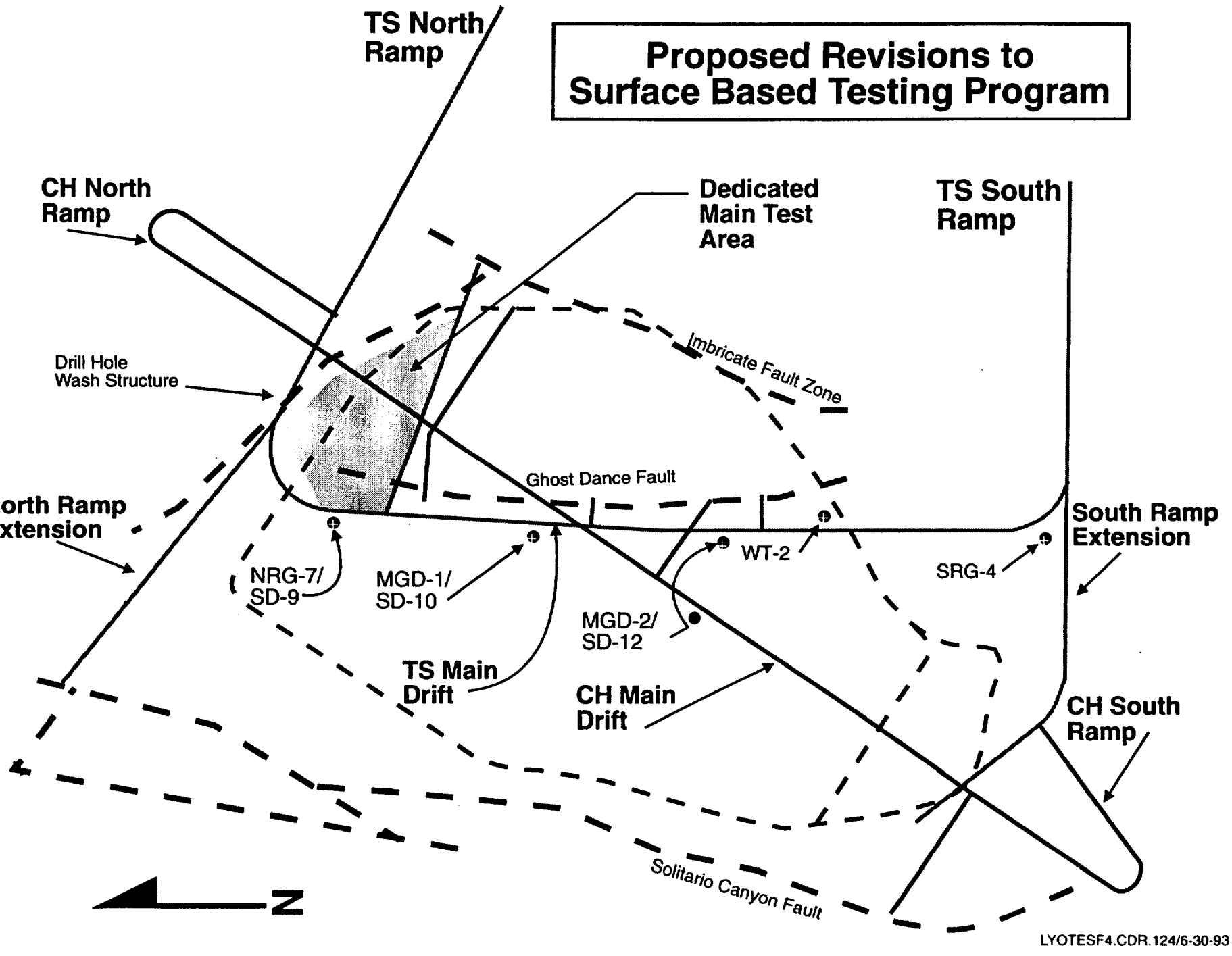
- Requires redirection of SBT program
- Delays gathering of drill hole data regarding water table gradient and unsaturated zone conditions
- Potential programmatic impacts (NRC, TRB, State)
- Requires more definitive understanding of Ghost Dance Faulting prior to excavation of TS main drift

PROJECT ACTION PLAN

- **Proceed with construction of the starter tunnel at the reduced gradient (Package 2A)**
- **Continue analysis - prepare revised drawings showing details of the proposed change**
- **Prepare impact analysis which defines changes to baseline cost and schedule resulting from implementation of the proposed enhancement**
- **Present to the Project Change Control Board**
- **If approved by the CCB, proceed with change to Technical Baseline using normal change control procedures**

SBT ADJUSTMENTS
TO SUPPORT
ESF RECONFIGURATION

Proposed Revisions to Surface Based Testing Program



LYOTESF4.CDR.124/6-30-93

NORTH PORTAL
ENTRANCE REDESIGN

MULTI-PLATE ORIGINALLY CHOSEN BECAUSE:

- Lack of rock properties data for high wall
- Concern about safety of original high wall concept
- Concern with appearance and large scar on mountain

WHY RE-EVALUATE NORTH PORTAL ENTRANCE DESIGN?

- Rock properties data now known
- Opportunity to use less costly, but just as safe solution
- Difficulties with ARMCO procurement
- Design process is inherently interactive and subject to re-evaluation

CONCEPT 1
MULTI-PLATE STRUCTURE

- **Box Cut with ARMCO and Backfill. Looks like highway culvert**
- **Use Cut and Cover Concept - cut out box, install tin whistle, and cover with soil**

CONCEPT 2
SHOTCRETE

- **Remove temporary chain link fencing, add wire mesh, and shotcrete (or gunite) the wall or walls**

CONCEPT 3
STEEL SETS

- **Specially designed, curved steel girders at 4' on-center with plate spanning between**
- **Or use pre-cast concrete arches**
- **Use cut and cover concept-similar to Concept #1**

PROJECT ACTION PLAN

- ARMCO Procurement Cancelled
- Existing box cut is safe in the short term, but seismic analysis will be performed soon
- Perform Value Engineering Study to determine optimal design solution
- Develop recommendation and implement through CCB

THE PHASED APPROACH TO ESF DESIGN AND CONSTRUCTION

PRESENTED TO

DOE/NRC TECHNICAL EXCHANGE

PRESENTED BY

C.J. NESBITT, III

ATTACHMENT (10)

ESF PHASED DESIGN AND CONSTRUCTION APPROACH

The advantages of a phased approach are:

- **The ability to evaluate newly acquired test data and to determine if any modifications or changes to the existing designs or testing strategies are necessary prior to starting the next construction phase**

- **Optional design and construction items (such as the optional shaft) are segregated for ease of decision making. No cost impact until authorized to proceed**

- **A smaller and more stable design staff**

PHASE2.129/7-27,28-93

ESF TITLE II DESIGN PACKAGES

Site Characterization Progress Report: Yucca Mountain, Nevada; Number 4 (October, 1991), referenced the Plan for the Phased Approach to ESF Design Development and Implementation (February, 1991) that presented the ESF Design Packages in the following sequence:

- **Package 1** — **Site preparation and portal of North Ramp**
- **Package 2** — **North Ramp from portal to Topopah Spring level (TSL)**
- **Package 3** — **Site preparation and portal of South Ramp**
- **Package 4** — **South Ramp from portal to TSL**
- **Package 5** — **North Ramp from Calico Hills (CH) turnout to CH level(CHL)**

PHASE3.129/7-27,28-93

ESF TITLE II DESIGN PACKAGES

(Continued)

- **Package 6** — South Ramp from CH turnout to CHL
- **Package 7** — Drifting on the CHL
- **Package 8** — Drifting on the TSL
- **Package 9** — Main test level core area at the TSL
- **Package 10** — Optional shaft at the north end - surface to TSL

PHASE4.129/7-27,28-93

ESF TITLE II DESIGN PACKAGES

The design packages have been redefined to the following packages and sub-packages:

- **Package 1A** **Site preparation - North Portal**
- **Package 1B** **Surface facilities - North Portal**
- **Package 1C** **Surface facilities - North Portal**
- **Package 1D** **Surface facilities - North Portal**
- **Package 2A** **North Ramp - Conveyor specifications, electrical switchgear, transportation study**

PHASE5.129/10-5-93

ESF TITLE II DESIGN PACKAGES

(Continued)

- **Package 2B** North Ramp design studies, and specifications
- **Package 2C** North Ramp to Topopah Spring level (TSL)
- **Package 3A** Site preparation - South Portal
- **Package 3B** Surface facilities - South Portal

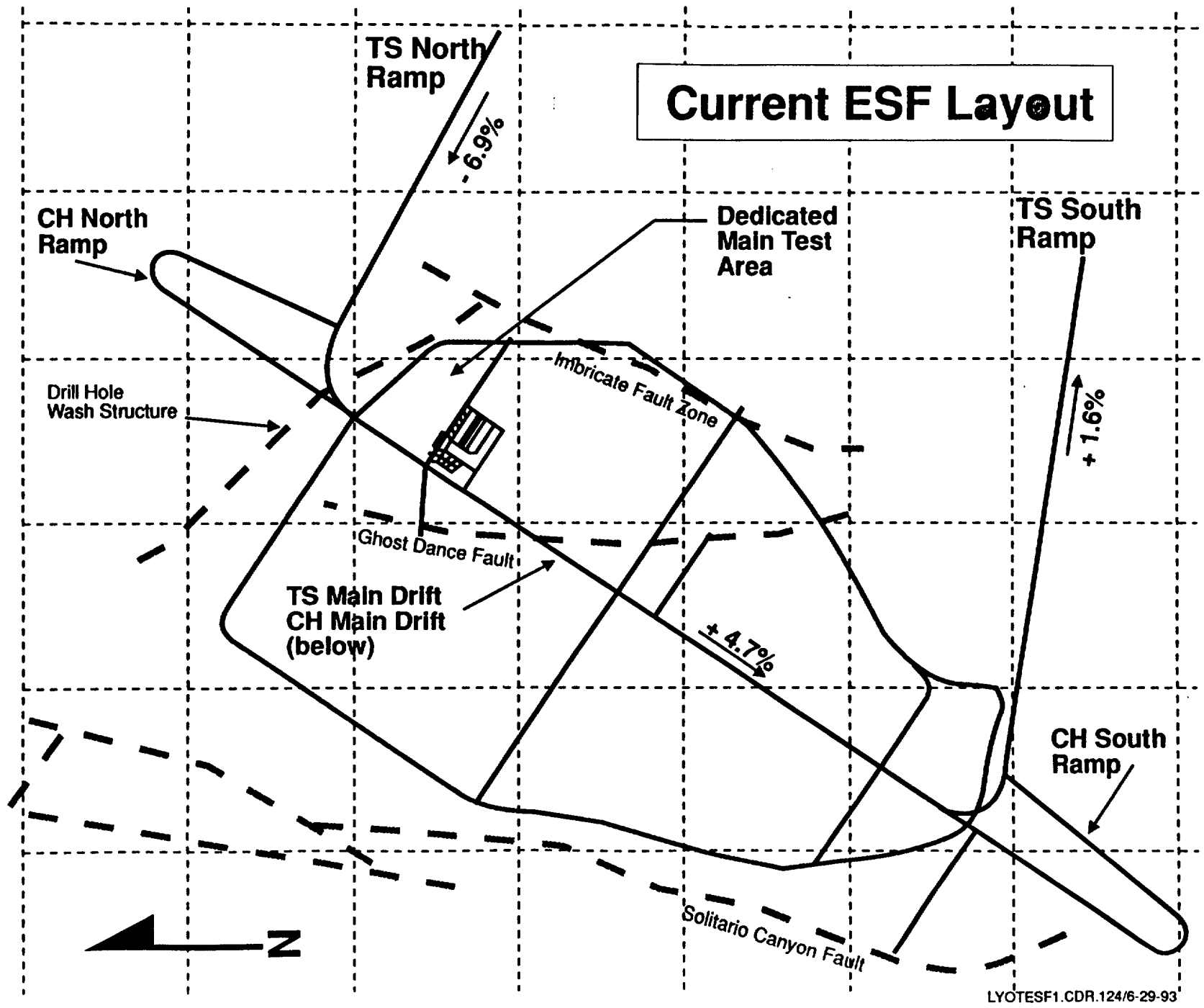
PHASE6.129/10-5-93

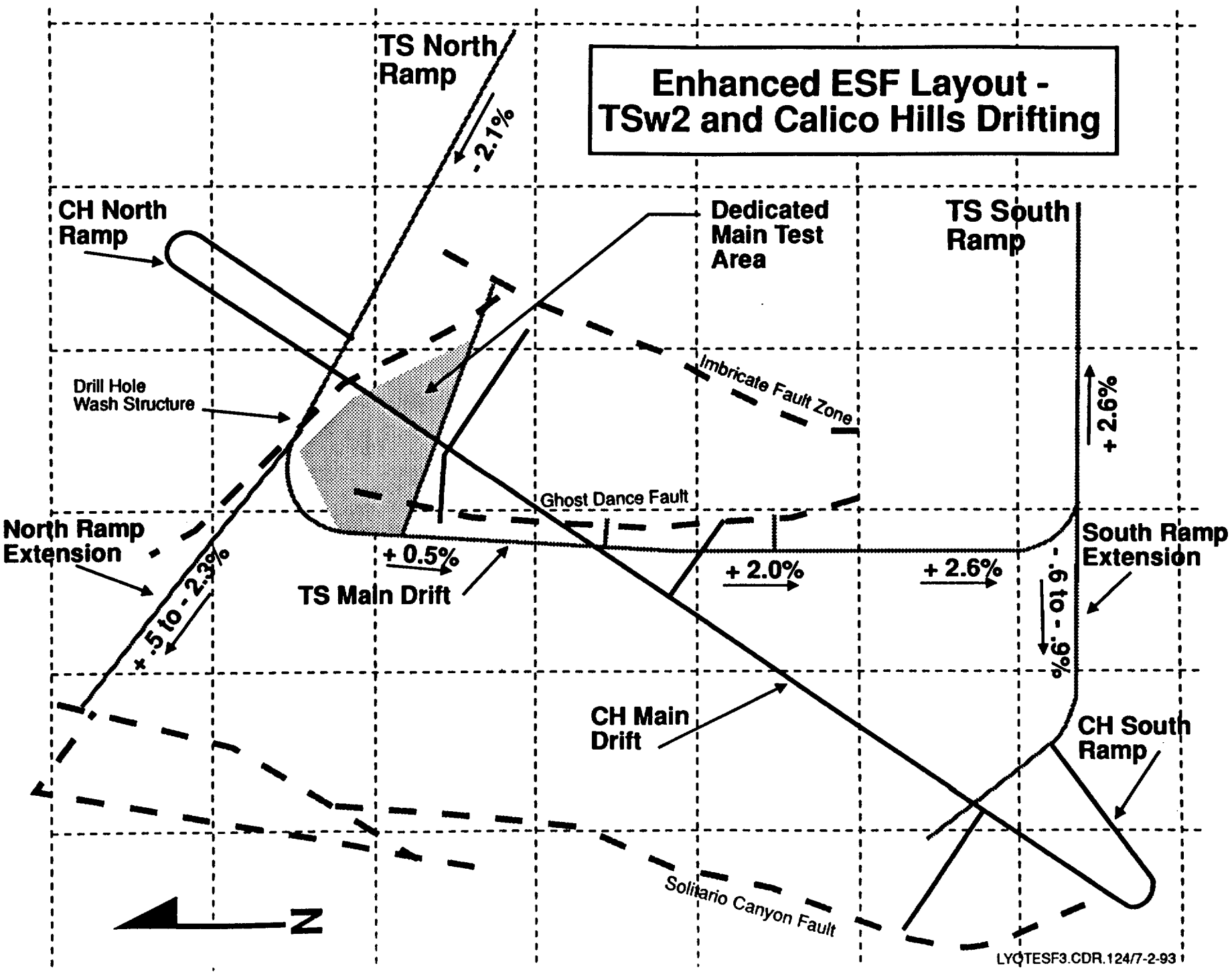
ESF TITLE II DESIGN PACKAGE

(Continued)

- **Package 4** South Ramp - Surface to TSL
- **Package 5** North Ramp to the Calico Hills (CH) level
- **Package 6** South Ramp to the CH level
- **Package 7** Drifting at the CH level
- **Package 8A** Main drift at the TSL
- **Package 8B** Exploratory drifting in the TSL
- **Package 9** Main test area
- **Package 10** Optional shaft

PHASE7.129/7-27,28-93


Current ESF Layout
TS North Ramp
-6.9%
CH North Ramp
Dedicated Main Test Area
TS South Ramp
Drill Hole Wash Structure
Imbricate Fault Zone
+1.6%
Ghost Dance Fault
TS Main Drift
CH Main Drift
(below)
+4.7%
CH South Ramp
N
Solitario Canyon Fault
LYOTESF1.CDR.124/6-29-93


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
+ 0.5%
TS Main Drift
+ 2.0%
+ 2.6%
South Ramp Extension
+.5 to -2.3%
-.6 to -.9%
CH Main Drift
CH South Ramp
N
Solitario Canyon Fault
LYCTESF3.CDR.124/7-2-93

Schedule information on the following pages is based on an ESF funding profile of:

FY93 - $48.0 M
FY94 - $55.5 M
FY95 - $69.5 M
FY96 - $68.0 M

- **Based on 2 TBM scenario**

PHASE10.129/10-5-93

ESF TITLE II DESIGN PACKAGES

(Continued)

- **Package 1A (site preparation - North Portal) includes:**

  - North Portal pad
  - Topsoil storage area
  - Access road
  - Sewage collection and treatment system
  - North Portal pad water supply system
  - TBM starter tunnel
  - Rock storage area
  - Switchgear buidling

- **Package 1A Status: Design - Complete**
  Construction - In Progress
  (FY93-94)

PHASE11.129/7-27,28-93

ESF TITLE II DESIGN PACKAGES

(Continued)

- **Package 1B (surface facilities - North Portal) includes:**

  - Change house building
  - Shop building
  - Sanitary sewer system
  - 138 kV power distribution
  - Access road
  - Water distribution system
  - Subsurface wastewater pond
  - 69kV power & feeder
  - H-road, site grading & paving
  - Switchgear building

- **Package 1B status: Design - In progress**
  Complete in early FY94

  Construction - Start in FY94
  Complete in FY95

PHASE12.129/10-5-93

ESF TITLE II DESIGN PACKAGES

(Continued)

- **Package 1C (surface facilities - North Portal) Includes:**

  - Muck storage area
  - 138kV substation pad
  - Site lighting
  - Conveyor maintenance access road
  - Stand-by power generators
  - Fuel storage system
  - Compressed air system

- **Package 1C status: Design - In progress**
  Complete in FY94 2nd quarter

  Construction - Start in FY94
  Complete in FY95

PHASE13.129/7-27,28-93

ESF TITLE II DESIGN PACKAGES

(Continued)

- **Package 1D (surface facilities - North Portal) Includes:**

  - Warehouse
  - Covered storage
  - Off site communication system
  - Operations building
  - Steam cleaning system

- **Package 1D status:** Design - In progress
  Complete in FY94 4th quarter

  Construction - Start in FY95
  Complete in FY96

PHASE14.129/7-27,28-93

ESF TITLE II DESIGN PACKAGES

(Continued)

- **Package 2A Conveyor specifications, electrical switchgear, transportation study**

  - Surface and subsurface conveyor specifications
  - Electrical switchgear and transformer
  - TBM operation specification
  - Transportation alternatives study

- **Package 2A status:** Design - In progress
  Complete in early FY94

  Construction - Start in FY94
  Complete in FY94

PHASE16.129/10-5-93

ESF TITLE II DESIGN PACKAGES

(Continued)

- **Package 2B (North Ramp designs, studies, and specs) includes:**

  - Design of concrete and structural steel for the surface and subsurface conveyors
  - Waste water removal system design
  - Tunnel ventilation specification
  - Rail haulage system and mapping platform procurement specifications
  - Excavation, ventilation, and muck storage trade studies

- **Package 2B status: Design - In progress**

  Complete in FY94 1st quarter

PHASE17.129/7-27,28-93

ESF TITLE II DESIGN PACKAGES

(Continued)

- **Package 2C (North Ramp to Topopah Spring level) includes:**

  - North Ramp to the TSL
  - Any remaining utilities, systems, and equipment for the North Ramp

- **Package 2C status:** Design - In progress
  Complete in FY94 2nd quarter
  Construction - Start in FY94
  Complete in FY95

PHASE18.129/10-5-93

ESF TITLE II DESIGN PACKAGES

(Continued)

- **3A (site preparation - South Portal) includes:**

  - South Portal pad
  - South Portal grading
  - South Portal access road
  - Drainage improvements

- **Package 3A status: Design - Start in FY95 1st quarter**

  Construction - Start in FY95
  Complete in FY95

PHASE19.129/7-27,28-93

ESF TITLE II DESIGN PACKAGES

(Continued)

- **Package 3B (surface facilities - South Portal) includes:**

  - Main ventilation fan /airlock structure
  - South Portal control building
  - Shop / warehouse building
  - Test support facility
  - All on-pad utilities to service the buildings

- **Package 3B status:** Design - Start in FY95 1st quarter
  Construction - Start in FY95

  Complete in FY96

PHASE20.129/7-27,28-93

ESF TITLE II DESIGN PACKAGES

(Continued)

- **Package 4 (South Ramp - surface to TSL) includes:**

  - South Ramp excavation to North Ramp breakthrough
  - South Ramp power and water supply
  - South Ramp conveyor, ventilation, and compressed air systems
  - Waste water removal system

- **Package 4 status:** Design - Start in FY95 1st quarter

  Construction - Start FY95
  Complete in FY96

PHASE21.129/10-5-93

ESF TITLE II DESIGN PACKAGES

(Continued)

- **Package 5 (North Ramp to CH level) includes:**

  - North Ramp excavation to the CH level
  - Extension of power and water supply
  - Extension of conveyor, ventilation, and compressed air systems
  - Extension of the waste water removal system

- **Package 5 status:** Design - Start in FY96 1st quarter

  Construction - Start in FY98
  Complete in FY00

PHASE22.129/7-27,28-93

ESF TITLE II DESIGN PACKAGES

(Continued)

- **Package 6 (South Ramp to CH level) includes:**

  - South Ramp excavation to the CH level
  - Extension of power and water supply
  - Extension of conveyor, ventilation, and compressed air systems
  - Extension of the waste water removal system

- **Package 6 status:** Design - Start in FY96 1st quarter

  Construction - Start in FY97
  Complete in FY99

PHASE23.129/7-27,28-93

ESF TITLE II DESIGN PACKAGES

(Continued)

- **Package 7 (drifting at the CH level) includes:**

  - All excavations planned at the CH level
  - Extension of power and water supply
  - Extension of conveyor, ventilation, and compressed air systems
  - Extension of the waste water removal system

- **Package 7 status:** Design - Start in FY96 1st quarter
  Construction - Start in FY99

  Complete in FY01

PHASE24.129/7-27,28-93

ESF TITLE II DESIGN PACKAGES

(Continued)

- **Package 8A (main drift at the TSL) includes:**

  - North Ramp excavation to the CH level
  - Extension of power and water supply
  - Extension of conveyor, ventilation, and compressed air systems
  - Extension of the waste water removal system

- **Package 8A status:** Design - Start in FY94 2nd quarter
  Construction - Start in FY95

  Complete in FY95

PHASE25.129/10-5-93

ESF TITLE II DESIGN PACKAGES

(Continued)

- **Package 8B (exploratory drifting in the TSL) includes:**

  - Balance of planned drifting in the TSL
  - Extension of power and water supply
  - Extension of conveyor, ventilation, and compressed air systems
  - Extension of the waste water removal system

- **Package 8B status:** Design - Start in FY95 2nd quarter
  Construction - Start in FY97

  Complete in FY98

PHASE26.129/10-5-93

ESF TITLE II DESIGN PACKAGES

(Continued)

- **Package 9 (main test area) includes:**

  - All drifting required in the main test area
  - Extension of power and water supply
  - Extension of conveyor, ventilation, and compressed air systems
  - Extension of the waste water removal system

- **Package 9 status:** Design - Start in FY96 1st quarter
  Construction - Start in FY97

  Complete in FY98

PHASE27.129/10-5-93

ESF TITLE II DESIGN PACKAGES

(Continued)

- **Package 10 (optional shaft) includes:**

  - Optional vertical shaft if required to adequately characterize the site
  - Shaft site preparation activities
  - All surface facilities required to support shaft excavation
  - All supporting utilities for shaft excavation

- **Package 10 status:** Design - Start in FY97
  Construction - Start in FY98

  Complete in FY00

PHASE28.129/7-27,28-93

Civilian Radioactive Waste Management System

Management & Operating Contractor

TRW Environmental Safety Systems Inc.

DOE-NRC Technical Exchange

ESF Technical Exchange on ESF Design

DOE Requirements Hierarchy Through ESFDR

M. Sam Rindskopf

M&O/TRW

Briefing LV-MD-488

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

ATTACHMENT (11) #2

Preliminary Draft

Document Description - Old/New

Old to New Hierarchy Transition Objectives

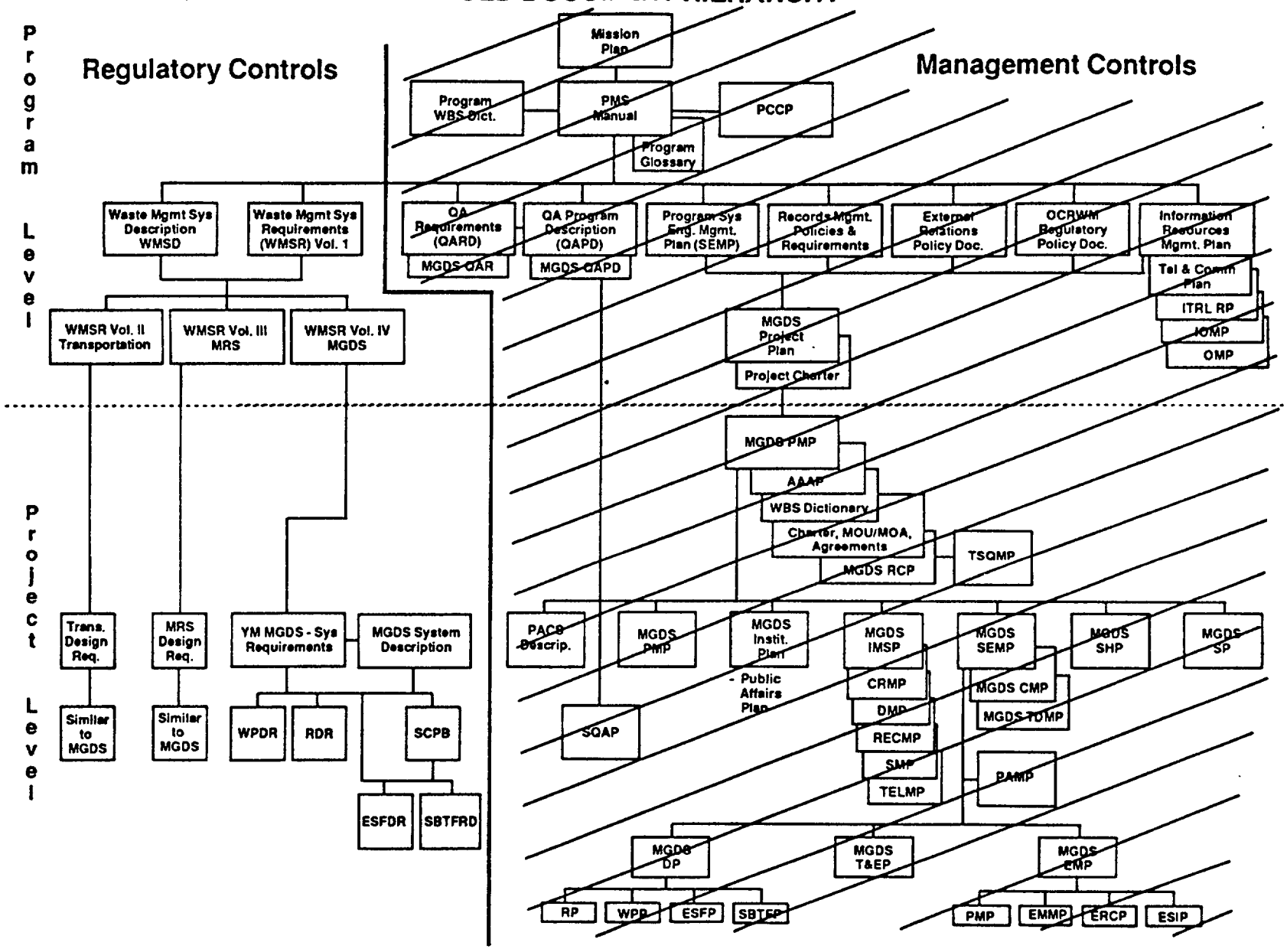
Old Hierarchy

- Had no single top level requirements document
- Waste Acceptance (WA), Monitored Retrievable Storage (MRS), Transportation & Mined Geologic Disposal System (MGDS) Requirements & Interfaces not integrated

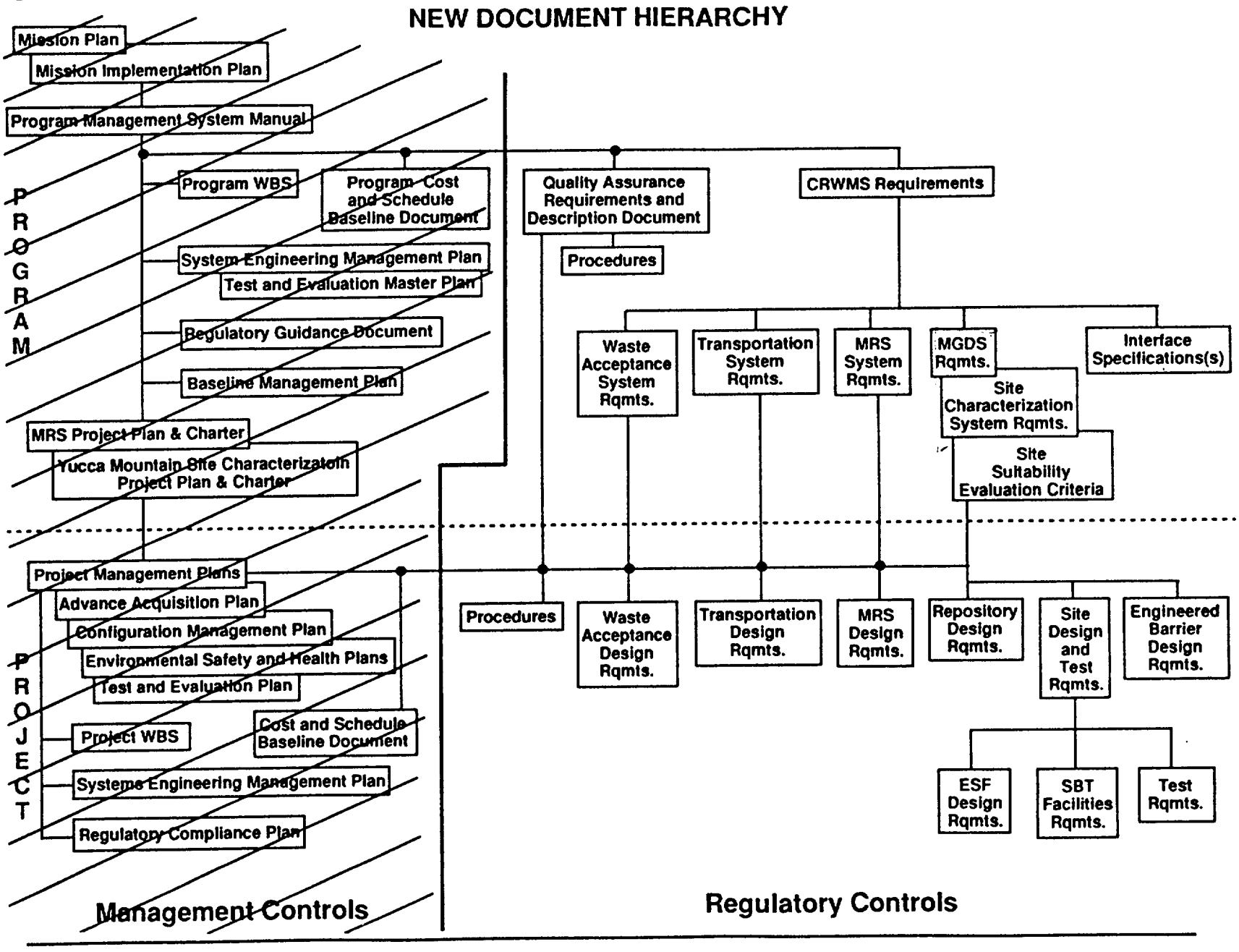
New Hierarchy

- Establishes a single top level requirements document
- Top level requirements and interfaces identified in top requirements document and allocated to WA, MRS, Transportation, & MGDS
- Identifies interfaces between system elements (system level interface specifications)

OLD DOCUMENT HIERARCHY

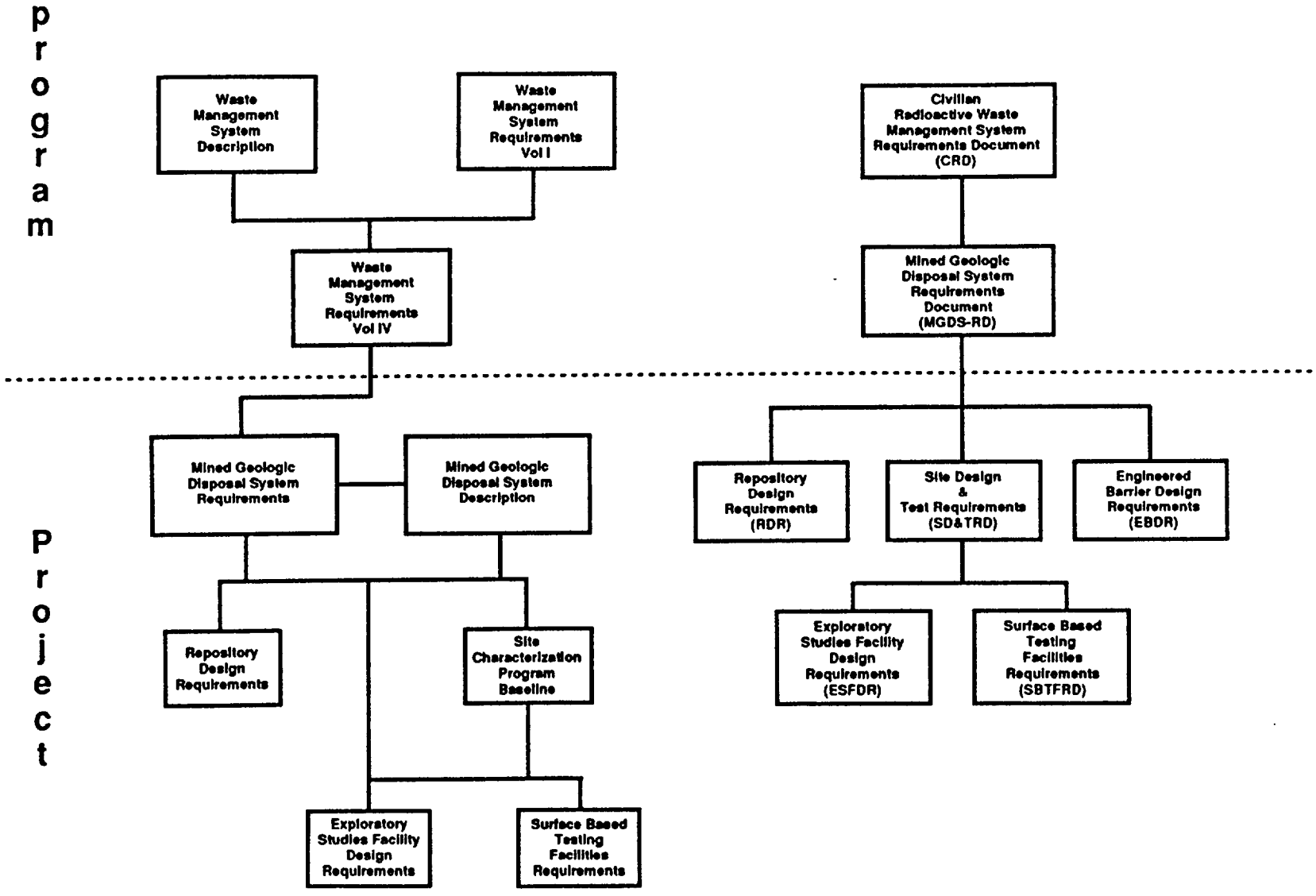


NEW DOCUMENT HIERARCHY



OldTechnical Requirements Document Hierarchy

New Technical Requirements Document Hierarchy



Document Status

Document	Current Action
CRD	Approved (12/92)
MGDS-RD	Approved (1/93)
SD&TRD	Approved (6/93)
ESFDR	Approved (7/93)
SBTFRD	Approved (7/93)
EBDR	Approved (7/93)
RDR	Approved (7/93)

Transition Plan

Objectives for Transition

1. Effect a "seamless" transition

2. Minimize redesign/redocumentation efforts

3. Support near term Yucca Mountain Project Office (YMPO) milestones

1. Seamless Transition

- Vertical traceability matrices have been prepared as part of each document to document the flow down and allocation of requirements
- Horizontal traceability matrices have been prepared for the System Requirements Documents to ensure top-level requirements from the old hierarchy were captured
- Horizontal traceability matrices have been prepared for the SD&TRD, ESFDR, SBTFRD, RDR, and EBDR, to identify new requirements and show where old requirements are captured

Traceability

- **Vertical**
  - Traceability to all requirements allocated from parent document

- **Horizontal**
  - Traceability to all requirements in current baseline

Baseline RDR	→	New RDR
Baseline ESFDR	→	New ESFDR
Baseline SBTFRD	→	New SBTFRD
Baseline SCPB	→	SD&TRD

Vertical Traceab[illegible]Matrix Example
taken from the new ESFDR (YMP/CM-0019)

SOURCE	SD&TRD	ESFDR
10 CFR 60.15(c)(3)	3.2.7.1.A.2, 3.7.B.1	3.2.2.4.L
10 CFR 60.15(c)(3)	3.2.7.1.A.2, 3.7.B.1	3.2.2.4.L.1
10 CFR 60.15(c)(3)	3.2.7.1.A.2, 3.7.B.1	3.2.2.4.L.2
10 CFR 60.15(c)(3)	3.2.7.1.A.2, 3.7.B.1	3.2.2.4.L.6
10 CFR 60.15(c)(3)	3.2.7.1.A.2, 3.7.B.1	3.2.2.4.L.6(a)
10 CFR 60.15(c)(3)	3.2.7.1.A.2, 3.7.B.1	3.2.2.4.L.8
10 CFR 60.15(c)(3)	DERIVED	3.2.2.4.L.8(a)
10 CFR 60.15(c)(3)	3.2.7.1.A.2, 3.7.B.1	3.2.2.4.L.8(b)
10 CFR 60.15(c)(3)	3.2.7.1.A.2, 3.7.B.1	3.2.2.4.L.9
10 CFR 60.15(c)(3)	3.2.7.1.A.2, 3.7.B.1	3.2.2.4.L.10
10 CFR 60.15(c)(4)	3.7.2.2.D, 3.7.B.1	3.2.1.H.1(a)
10 CFR 60.15(c)(4)	3.7.2.2.D, 3.7.B.1	3.2.1.H.1(b)
10 CFR 60.15(c)(4)	3.7.2.2.D, 3.7.B.1	3.2.1.H.1(c)
10 CFR 60.15(c)(4)	3.7.2.2.D, 3.7.B.1	3.2.1.H.1(d)
10 CFR 60.15(c)(4)	3.2.7.1.A.3, 3.7.B.1	3.2.1.1.E
10 CFR 60.15(c)(4)	3.2.7.1.A.3, 3.7.B.1	3.2.1.2.B
10 CFR 60.15(c)(4)	3.2.7.1.A.3, 3.7.B.1	3.2.1.3.C
10 CFR 60.15(c)(4)	3.2.7.1.A.3, 3.7.B.1	3.2.1.4.H
10 CFR 60.15(c)(4)	3.2.7.1.A.3, 3.7.B.1	3.2.1.5.H
10 CFR 60.15(c)(4)	3.2.7.1.A.3, 3.7.B.1	3.2.1.6.E
10 CFR 60.15(c)(4)	3.2.7.1.A.3, 3.7.B.1	3.2.1.6.F
10 CFR 60.15(c)(4)	3.2.7.1.A.3, 3.7.2.2.D, 3.7.B.1	3.2.2.G
10 CFR 60.15(c)(4)	3.7.B.1	3.2.2.4.L.2

Horizontal Trace Matrix Example

taken from the New ESFDR

ESFDR Volume 1 Cross-Reference			
ESFDR Rev. 7/2/92, ICN-2	**ESFDR**	**Comment**	**DAA**
1.2.6.* B&I	3.2. 1 Z2	* Applies to all sections except 1.2.6.0; Changed "repository" to "potential repository"	N/A
1.2.6.0 B&I	3.2. 1 Z		N/A
1.2.6.0 C A	3.2. 1 L	Deleted everything after 'DOE' and replaced with ', with the exception of environmental requirements which are addressed in 3.2.1.24.A'	N/A
1.2.6.0 C B	3.2. 7		N/A
1.2.6.0 C C1	3.2. 1 M		N/A
1.2.6.0 C C2	3.2. 2 E		N/A
1.2.6.0 C C3	3.2. 2 F		N/A
1.2.6.0 C C4	3.2. 2 G		N/A
1.2.6.0 C Ci	3.2. 1 M1		N/A
1.2.6.0 C Cii	3.2. 1 M2	Changed "repository" to "potential repository"	N/A
1.2.6.0 C Ciii	3.2. 1 M3	Replaced repository testing with performance confirmation testing	N/A
1.2.6.0 C Civ	3.2. 1 M4		N/A
1.2.6.0 C Cv	3.2. 1 M5		N/A
1.2.6.0 C Cv [2]	3.2. 1 M5a		N/A
1.2.6.0 C Cv [3]	3.2. 1 M5b		N/A
1.2.6.0 C Cvi	3.2. 8		N/A

2. Redesign/Redocumentation Areas Reviewed for Potential Impact

a. Study Plans

b. Procedures

c. Basis for Design

d. Design Specifications and Drawings

e. Job Packages in Progress or Completed

f. Test Planning Packages in Progress or Completed

g. Ongoing Design for Exploratory Studies Facility (ESF) and Surface Based Testing Facilities (SBTF)

h. Ongoing Construction for ESF and SBTF

i. Current YMP0 Baseline Documents

j. Project Controlled Documents

k. FY '93 Workscope and Milestones loaded in PACS

l. Funding Allocated to Participants for FY '93

m. Training Requirements

3. Near Term YMPO Milestones Supported by the Technical Requirements Document Hierarchy

- 90% Design Review and preparation of the Basis for Design for ESF Packages 2A and 1B

- Development of the initial Basis for Design of the potential Repository (in support of ESF Design)

Implementation of the New Technical Hierarchy

- Completed the QAP 6.2 review process for each document
- Complete the backup QA package for each document (horizontal traceability matrices, requirements allocation sheets)
- Division Directors & Technical Project Officers identify affected documents and define the schedule for revising the affected documents
- Modify Hold Point to allow implementation of new hierarchy documents

Design Acceptability Analysis

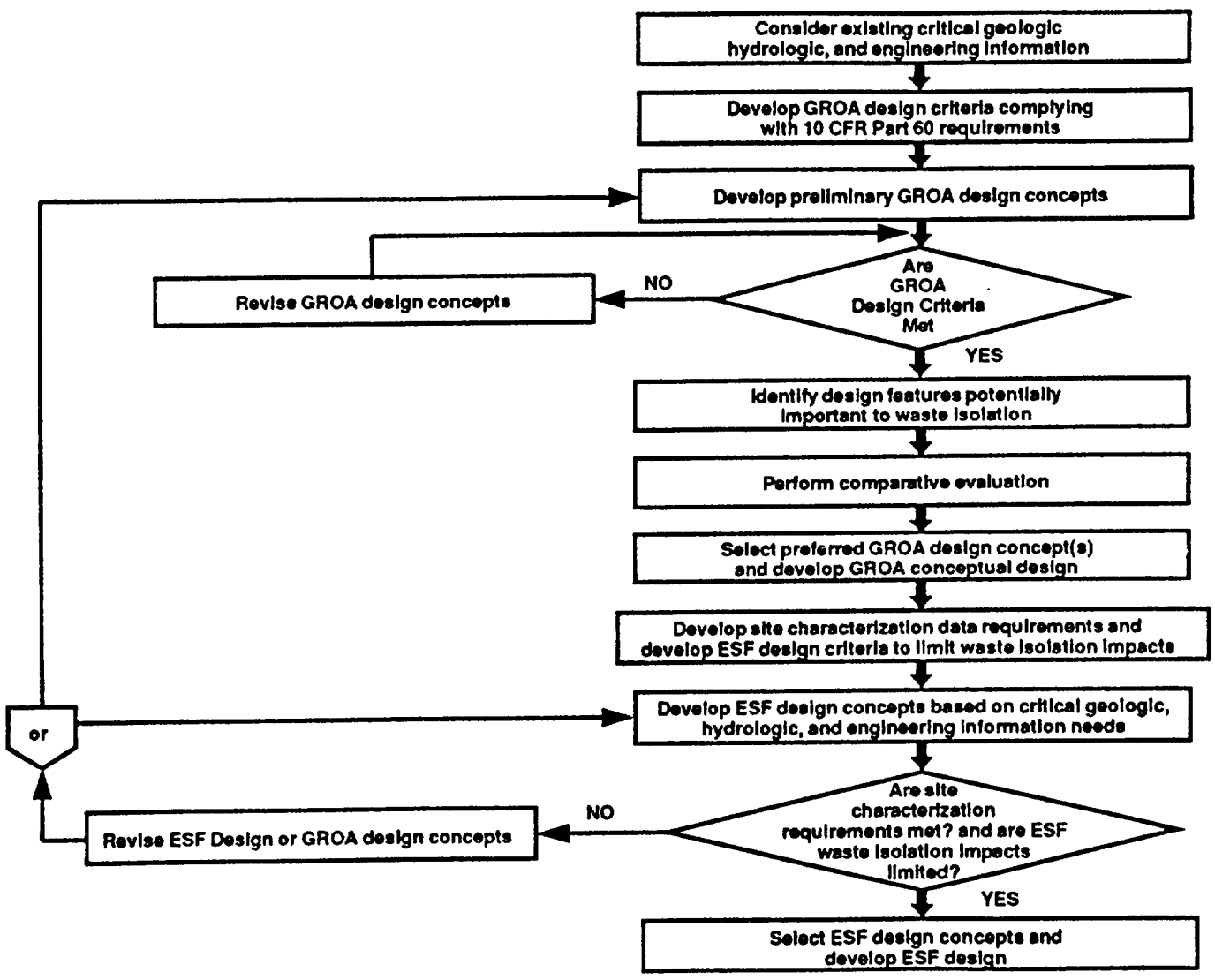
SCA Comment 130

Design Acceptability Analysis

SCA Comment 130

Out of the fifty-two (52) 10 CFR 60 requirements considered applicable to ESF design by the DOE in reviewing the acceptability of Title I design, the DAA focuses on only 22 requirements that belong to the three areas specifically outlined by NRC. Other requirements (e.g., retrievability, preclosure radiological safety, performance confirmation, and QA program) are said to be qualitatively evaluated (see p. 2-1, second paragraph). The approach adopted in the DAA raise questions about completeness and rigor of the design acceptability analysis, as detailed design criteria were not developed for all applicable requirements.

NUREG 1439
Process for Addressing 10 CFR 60 Requirements in the ESF Design



Documentation

	OLD	NEW
Consider existing critical geologic hydrologic, and engineering information	SCP/SCPB	SD&TRD
Develop GROA design criteria complying with 10 CFR Part 60 requirements	WMSR/RDR	MGDS-RD/RDR
Develop preliminary GROA design concepts	SCP	SCPCDR
Identify design features potentially important to waste isolation	SCP	SCP CDR
Perform comparative evaluation	SYSTEMS ANALYSIS & TRADE STUDIES	
Select preferred GROA design concept(s) and develop GROA conceptual design	SCP	SCP CDR
Develop site characterization data requirements and develop ESF design criteria to limit waste isolation impacts	SCP/SCPB	SD&TRD/ ESFDR/ ESF BFD
Develop ESF design concepts based on critical geologic, hydrologic, and engineering information needs	TITLE I	TITLE II
Select ESF design concepts and develop ESF design	TITLE I	TITLE II & III

From NUREG 1439

10 CFR 60 Allocation Examples

10 CFR 60 Requirements Considered Applicable to the ESF

MGDS-RD

- *53* requirements from 10 CFR 60 "Mandatory for Site Characterization Facilities"
- *13* requirements from 10 CFR 60 "To be Considered by Site Characterization Facilities"

SD&TRD

- Allocates all *53* "Mandatory" 10 CFR 60 requirements to the ESFDR
- Allocates all *13* "To be Considered" 10 CFR 60 requirements to the ESFDR

supply, distribute, and control various utilities such as electrical power, water, and communications.

The SBTF is envisioned to include small, distributed test sites for drilling and trenching activities, roads and trails, and a pool of transportable support equipment such as generators, fuel and water tanks, chemical latrines, and the like.

A. **Limitations.** Site characterization activities (including but not limited to design, development, ESF construction, and site investigations) at Yucca Mountain shall be limited to those necessary to provide the data required for evaluation of the suitability of the site for an application for construction authorization[16]. [NWPA, 113(c)(1), as amended]

B. **Requirements.** Project-level DRDs shall apply the requirements listed below in the design of site characterization systems and facilities, as appropriate (some are not applicable to the SBTF). [Derived]

1. **Mandatory Design Requirements.** The Site characterization facilities and systems shall be designed and constructed in accordance with the applicable[17] design requirements derived from the regulations, included in, but not limited to, those listed in Table 3-6 such that they do not preclude the ability of the Repository and EBS Segments to meet the requirements in this MGDS-RD.
[DOE Letter 2/27/90]

Table 3-6. Mandatory 10CFR60 Requirements for Site Characterization Facilities

10CFR60 REQUIREMENT	SUBJECT
10CFR60.4(b)	Communications and records
10CFR60.15(b)	In situ exploration
10CFR60.15(c)(1)	Limit adverse effects on repository
10CFR60.15(c)(2)	Limit borings
10CFR60.15(c)(3)	Boring locations
10CFR60.15(c)(4)	Coordinate with repository design
10CFR60.16	SCP required
10CFR60.21(c)(1)(ii)(D)	SAR: effectiveness of barriers
10CFR60.21(c)(1)(ii)(E)	SAR: analysis of SSC important to safety
10CFR60.21(c)(11)	SAR: Close and Decommission

[16] Section 113(c)(1) of the NWPA also allows activities necessary to provide data required for compliance with the National Environmental Policy Act of 1969 (42USC4321 et seq) (activities that are not considered part of site characterization).

[17] This recognizes that not all of the regulations are applicable to the facility design.

10CFR60 REQUIREMENT	SUBJECT
10CFR60.72(a)	Construction records
10CFR60.72(b)	Construction records
10CFR60.74	Tests
10CFR60.111(a)	Protection against rad exposures
10CFR60.111(b)(1)	Retrievability
10CFR60.111(b)(3)	Retrievability: schedule
10CFR60.112	Overall system performance
10CFR60.113(a)(1)(i)	EBS
10CFR60.113(a)(1)(ii)(A)	Waste package
10CFR60.113(a)(1)(ii)(B)	EBS
10CFR60.130	Scope of design criteria
10CFR60.131(b)(1)	Natural phenomena/environmental conditions
10CFR60.131(b)(2)	Equipment failure
10CFR60.131(b)(3)	Fire and explosions
10CFR60.131(b)(4)(i)	Control of radioactive materials
10CFR60.131(b)(6)	Maintainability
10CFR60.131(b)(9)	MSHA regulations
10CFR60.133(a)(1)	Configuration of underground facility
10CFR60.133(a)(2)	Disruptive events
10CFR60.133(b)	Flexibility
10CFR60.133(c)	Retrievability
10CFR60.133(d)	Control of water/gas
10CFR60.133(e)(1)	Underground openings: safe operations
10CFR60.133(e)(2)	Underground openings: stability
10CFR60.133(f)	Rock excavation
10CFR60.133(g)	Ventilation
10CFR60.133(h)	EBS
10CFR60.133(i)	Thermal loads
10CFR60.137	Performance confirmation: Comply with following paragraphs
10CFR60.140(b)	Performance confirmation: Start ASAP [Performance confirmation program is defined in 10CFR60.140(a)]
10CFR60.140(c)	Performance confirmation: field tests
10CFR60.140(d)(1)	Performance confirmation: Don't compromise repository
10CFR60.141(a)	Confirmation of parameters
10CFR60.141(b)	Evaluate conditions against assumptions
10CFR60.141(c)	Measure rock parameters
10CFR60.141(d)	Evaluate observations against assumptions
10CFR60.141(e)	Monitor until permanent closure

10CFR60 REQUIREMENT	SUBJECT
10CFR60.142(a)	Seal, backfill tests and thermal interaction
10CFR60.142(b)	Early testing
10CFR60.142(c)	Backfill tests
10CFR60.142(d)	Seal tests
10CFR60.151	QA
10CFR60.152	QA

[PSR-ESF S5]

2. **NRC Requirements to be Considered.** Requirements from the 10CFR60 sections listed in Table 3-7 shall be considered to the extent that they actually impact design, construction, or operation of site characterization facilities and systems. [DOE Letter 2/27/90]

Table 3-7. 10CFR60 Site Characterization Facility Requirements To Be Considered[18]

10CFR60 REQUIREMENT	SUBJECT
10CFR60.17	Contents of SCP
10CFR60.24(a)	Completeness of EIS
10CFR60.113(a)(2)	Geologic setting: GWTT
10CFR60.113(b)(2)	Radionuclide release rate: thermal pulse
10CFR60.113(b)(3)	Radionuclide release rate: geochemical characteristics
10CFR60.113(b)(4)	Radionuclide release rate: uncertainty
10CFR60.122	Siting criteria
10CFR60.131(a)	Radiological protection
10CFR60.131(b)(4)(ii)	Emergency response capability
10CFR60.131(b)(8)	Instrumentation
10CFR60.131(b)(10)	Shaft conveyances
10CFR60.134	Design of seals
10CFR60.143	Monitor/test waste package

3. **Additional Requirements.** Requirements from the various sources listed in Table 3-8 shall be imposed, only to the extent that they actually impact the design, construction, or operation of site characterization facilities and systems. [Derived]

[18] to the extent that they actually impact on design, construction or operations as determined in project-level design analysis

Title: Site Design and Test Requirements

Table 3-8 Mandatory 10 CFR 60 Requirements for Site Characterization Facilities

10 CFR 60.4(b)	Communications and records
10 CFR 60.15(b)	In situ exploration
10 CFR 60.15(c)(1)	Limit adverse effects on repository
10 CFR 60.15(c)(2)	Limit borings
10 CFR 60.15(c)(3)	Boring locations
10 CFR 60.15 (c)(4)	Coordinate with repository design
10 CFR 60.16	SCP required
10 CFR 60.21(c)(1)(ii)(D)	SAR: effectiveness of barriers
10 CFR 60.21(c)(1)(ii)(E)	SAR: analysis of SSC ITS
10 CFR 60.21(c)(11)	SAR: close and decommission
10 CFR 60.72(a)	Construction records
10 CFR 60.72(b)	Construction records
10 CFR 60.74	Tests
10 CFR 60.111(a)	Protection against radiation exposures
10 CFR 60.111(b)(1)	Retrievability
10 CFR 60.111(b)(3)	Retrievability: schedule
10 CFR 60.112	Overall system performance
10 CFR 60.113(a)(1)(i)	EBS
10 CFR 60.113(a)(1)(ii)(A)	Waste package
10 CFR 60.113(a)(1)(ii)(B)	EBS
10 CFR 60.130	Scope of design criteria
10 CFR 60.131(b)(1)	Natural phenomena/environmental conditions
10 CFR 60.131(b)(2)	Equipment failure

Title: Site Design and Test Requirements

Table 3-8 Mandatory 10 CFR 60 Requirements for Site Characterization Facilities

10 CFR 60.133(b)	Flexibility
10 CFR 60.133(c)	Retrievability
10 CFR 60.133(d)	Control of water/gas
10 CFR 60.133(e)(1)	Underground openings: safe operations
10 CFR 60.133(e)(2)	Underground openings: stability
10 CFR 60.133(f)	Rock excavation
10 CFR 60.133(g)	Ventilation
10 CFR 60.133(h)	EBS
10 CFR 60.133(i)	Thermal loads
10 CFR 60.137	Performance confirmation: comply with following paragraphs
10 CFR 60.140(b)	Performance confirmation: start as soon as possible (performance confirmation program is defined in 10 CFR 60.140(a))
10 CFR 60.140(c)	Performance confirmation: field tests
10 CFR 60.140(d)(1)	Performance confirmation: don't compromise repository
10 CFR 60.141(a)	Confirmation of parameters
10 CFR 60.141(b)	Evaluate conditions against assumptions
10 CFR 60.141(c)	Measure rock parameters
10 CFR 60.141(d)	Evaluate observations against assumptions
10 CFR 60.141(e)	Monitor until permanent closure
10 CFR 60.142(a)	Seal, backfill tests and thermal interactions
10 CFR 60.142(b)	Early testing
10 CFR 60.142(c)	Backfill tests
10 CFR 60.142(d)	Seal tests

Table 3-9 10 CFR 60 Site Characterization Facility Requirements to be Considered

10 CFR 60.17	Contents of SCP
10 CFR 60.24(a)	Completeness of EIS
10 CFR 60.113(a)(2)	Geologic setting: GWTT
10 CFR 60.113(b)(2)	Radionuclide release rate: thermal pulse
10 CFR 60.113(b)(3)	Radionuclide release rate: geochemical characteristics
10 CFR 60.113(b)(4)	Radionuclide release rate: uncertainty
10 CFR 60.122	Siting criteria
10 CFR 60.131(a)	Radiological protection
10 CFR 60.131(b)(4)(ii)	Emergency response capability
10 CFR 60.131(b)(8)	Instrumentation
10 CFR 60.131(b)(10)	Shaft conveyances
10 CFR 60.134	Design of seals
10 CFR 60.143	Monitor/test waste package

Requirements Traceability

Example

10 CFR 60.15(c)(4)

↓ Coordinate Site Characterization Subsurface exploratory drilling excavation and in-situ testing with GROA design and construction

CRD

↓ Allocates 10 CFR 60 to the MGDS-RD in Appendix A (Table A-2)

MGDS-RD

↓ Allocates 10 CFR 60.15(c)(4) to SD&TRD in Section 3.7.1.3.B.1 (Table 3-6) mandatory 10 CFR 60 requirements for Site Characterization Facilities

SD&TRD

Allocates 10 CFR 60.15(c)(4) to ESFDR in Section 3.7.1.B (Table 3-8)

Requirements Traceability (Cont'd.)

SD&TRD

↓

ESFDR

↓ Allocates 10 CFR 60.15(c)(4) to 24 ESF Subsystems addressed in the ESF Basis of Design

ESF Basis for Design

Provides detailed design criteria based on 10 CFR 60 (c)(4) for use in developing specifications, calculations, and drawings.

10 CFR 60.15(c)(4) Requirements
Allocation/Design Criteria

Vertical Traceability Matrix Example
taken from the new ESFDR (YMP/CM-0019)

SOURCE	SD&TRD	ESFDR
10 CFR 60.15(c)(3)	3.2.7.1.A.2, 3.7.B.1	3.2.2.4.L
10 CFR 60.15(c)(3)	3.2.7.1.A.2, 3.7.B.1	3.2.2.4.L.1
10 CFR 60.15(c)(3)	3.2.7.1.A.2, 3.7.B.1	3.2.2.4.L.2
10 CFR 60.15(c)(3)	3.2.7.1.A.2, 3.7.B.1	3.2.2.4.L.6
10 CFR 60.15(c)(3)	3.2.7.1.A.2, 3.7.B.1	3.2.2.4.L.6(a)
10 CFR 60.15(c)(3)	3.2.7.1.A.2, 3.7.B.1	3.2.2.4.L.8
10 CFR 60.15(c)(3)	DERIVED	3.2.2.4.L.8(a)
10 CFR 60.15(c)(3)	3.2.7.1.A.2, 3.7.B.1	3.2.2.4.L.8(b)
10 CFR 60.15(c)(3)	3.2.7.1.A.2, 3.7.B.1	3.2.2.4.L.9
10 CFR 60.15(c)(3)	3.2.7.1.A.2, 3.7.B.1	3.2.2.4.L.10
10 CFR 60.15(c)(4)	3.7.2.2.D, 3.7.B.1	3.2.1.H.1(a)
10 CFR 60.15(c)(4)	3.7.2.2.D, 3.7.B.1	3.2.1.H.1(b)
10 CFR 60.15(c)(4)	3.7.2.2.D, 3.7.B.1	3.2.1.H.1(c)
10 CFR 60.15(c)(4)	3.7.2.2.D, 3.7.B.1	3.2.1.H.1(d)
10 CFR 60.15(c)(4)	3.2.7.1.A.3, 3.7.B.1	3.2.1.1.E
10 CFR 60.15(c)(4)	3.2.7.1.A.3, 3.7.B.1	3.2.1.2.B
10 CFR 60.15(c)(4)	3.2.7.1.A.3, 3.7.B.1	3.2.1.3.C
10 CFR 60.15(c)(4)	3.2.7.1.A.3, 3.7.B.1	3.2.1.4.H
10 CFR 60.15(c)(4)	3.2.7.1.A.3, 3.7.B.1	3.2.1.5.H
10 CFR 60.15(c)(4)	3.2.7.1.A.3, 3.7.B.1	3.2.1.6.E
10 CFR 60.15(c)(4)	3.2.7.1.A.3, 3.7.B.1	3.2.1.6.F
10 CFR 60.15(c)(4)	3.2.7.1.A.3, 3.7.2.2.D, 3.7.B.1	3.2.2.G
10 CFR 60.15(c)(4)	3.7.B.1	3.2.2.4.L.2
10 CFR 60.15(c)(4)	3.7.B.1	3.2.2.4.L.3
10 CFR 60.15(c)(4)	3.7.B.1	3.2.2.4.L.4
10 CFR 60.15(c)(4)	3.7.B.1	3.2.2.4.L.5

10 CFR 60.15(c)(4)	3.7.B.1	3.2.2.4.L.6(b)
10 CFR 60.15(c)(4)	3.2.7.1.A.3, 3.7.B.1	3.2.2.4.M
10 CFR 60.15(c)(4)	3.2.7.1.A.3, 3.7.B.1	3.2.2.4.M.1
10 CFR 60.15(c)(4)	3.2.7.1.A.3, 3.7.B.1	3.2.2.4.M.2
10 CFR 60.15(c)(4)	3.2.7.1.A.3, 3.7.B.1	3.2.2.4.M.3
10 CFR 60.15(c)(4)	3.2.7.1.A.3, 3.7.B.1	3.2.2.4.M.4
10 CFR 60.15(c)(4)	3.2.7.1.A.3, 3.7.B.1	3.2.2.4.M.5
10 CFR 60.15(c)(4)	3.7.2.2.D, 3.7.B.1	3.2.2.6.B
10 CFR 60.16	3.7.F, 3.7.B.1	3.2.1.O
10 CFR 60.21(c)(1)(ii)(D)	3.7.B.1, 3.7.2.2.E	3.2.1.4.C
10 CFR 60.21(c)(1)(ii)(D)	3.7.B.1	3.2.1.4.C.1
10 CFR 60.21(c)(1)(ii)(D)	3.7.B.1	3.2.1.4.C.2
10 CFR 60.21(c)(1)(ii)(D)	3.7.B.1	3.2.1.4.C.3
10 CFR 60.21(c)(1)(ii)(D)	3.7.B.1	3.2.1.4.C.4
10 CFR 60.21(c)(1)(ii)(D)	3.7.B.1	3.2.1.4.C.5
10 CFR 60.21(c)(1)(ii)(E)	3.7.B.1	3.2.1.J.1
10 CFR 60.21(c)(11)	3.7.2.2.11, 3.7.B.1	3.2.1.Y
10 CFR 60.21(c)(11)	3.7.B.1	3.2.2.4.S.2
10 CFR 60.71(b)	3.4.8	3.2.1.25.8
10 CFR 60.72	3.4.6.B, 3.7.B.1	3.2.1.25.6.B
10 CFR 60.72	3.4.6.B, 3.7.B.1	3.2.1.25.6.B.1
10 CFR 60.72	3.4.6.B, 3.7.B.1	3.2.1.25.6.B.2
10 CFR 60.72	3.4.6.B, 3.7.B.1	3.2.1.25.6.B.3
10 CFR 60.72	3.4.6.B, 3.7.B.1	3.2.1.25.6.B.4
10 CFR 60.72	3.4.6.B, 3.7.B.1	3.2.1.25.6.B.5
10 CFR 60.72	3.4.6.B, 3.7.B.1	3.2.1.25.6.B.6
10 CFR 60.72	3.4.6.B, 3.7.B.1	3.2.1.25.6.B.7
10 CFR 60.72	3.4.6.B, 3.7.B.1	3.2.1.25.6.B.8
10 CFR 60.72	3.4.6.B, 3.7.B.1	3.2.1.25.6.B.9

Conclusions

The document preparation and review process for the New Hierarchy did not identify any new requirements in the areas of radiological safety, waste isolation, occupational health and safety, or environmental.

No technical changes to completed work have been identified to date as a result of the new hierarchy.

Completion of the hierarchy transition action will be reported in Semi-Annual Progress Report #9.

10 CFR 60 requirements are being considered in the ESF design, resulting in the development of detailed design criteria in the ESF BFD.

Civilian Radioactive Waste Management System

Management & Operating Contractor

TRW Environmental Safety Systems Inc.

DOE-NRC TECHNICAL EXCHANGE ON THE EXPLORATORY STUDIES FACILITY TITLE II DESIGN

ARCHITECT/ENGINEER REQUIREMENTS HIERARCHY

Name: PAUL A. PIMENTEL

Date: OCTOBER 4, 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

ATTACHMENT #1

DOE-NRC TECHNICAL EXCHANGE ON THE EXPLORATORY STUDIES FACILITY TITLE II DESIGN

TRANSITION RSN/M&O

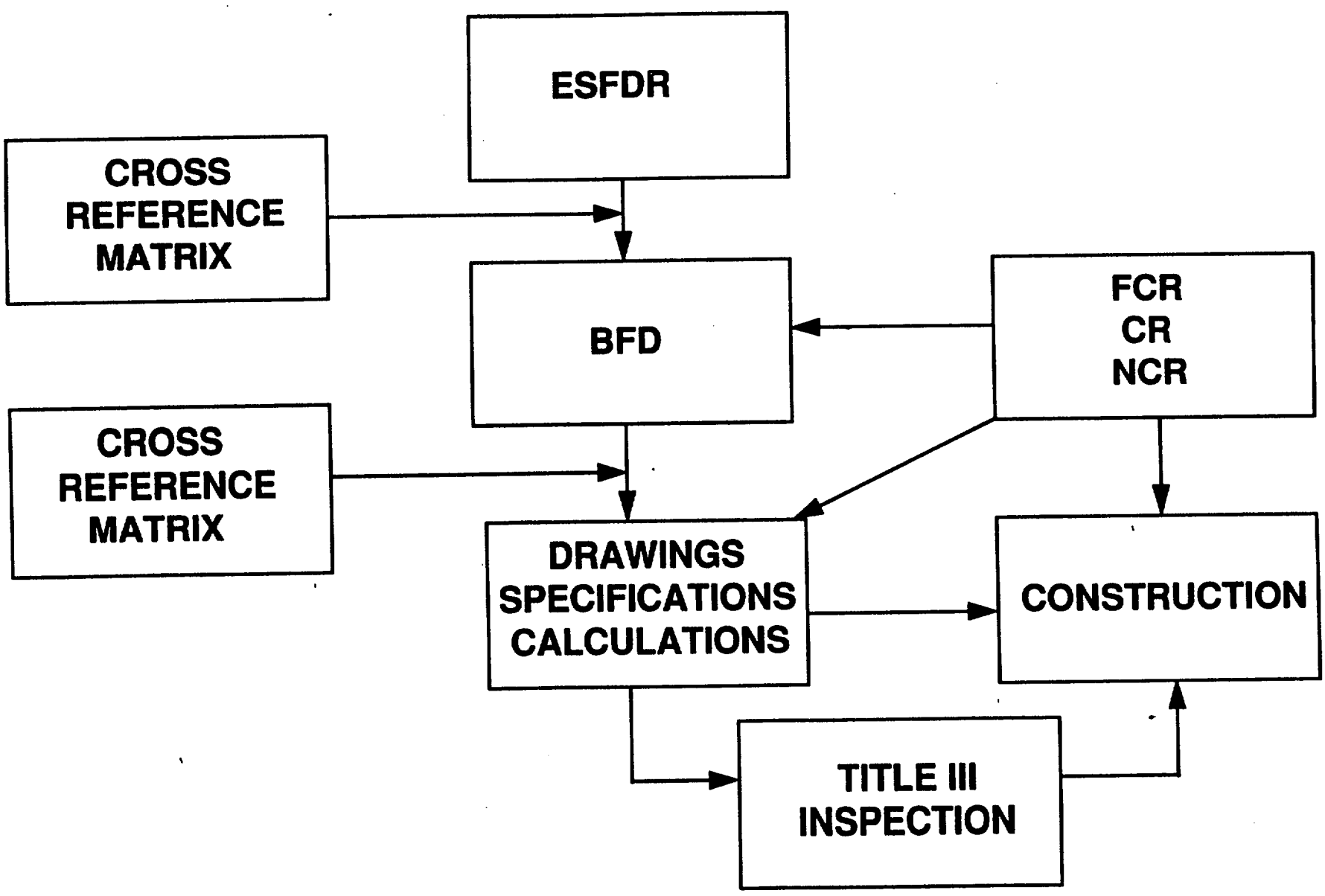
- DESIGN RESPONSIBILITY TRANSITIONED ON OCTOBER 1, 1992
- PACKAGE 1A RELEASED FOR CONSTRUCTION, EXCEPT FOR BOX CUT
- M&O COMPLETED DETERMINATION OF IMPORTANCE EVALUATIONS (DIE) TO REMOVE TBV'S FROM DESIGN DOCUMENTS.
- M&O PERFORMING TITLE III OF PACKAGE 1A
- M&O PERFORMING TITLE II OF FOLLOW-ON PACKAGES
- PACKAGE 1A BASIS FOR DESIGN (BFD) TRANSITIONED TO M&O

DOE-NRC TECHNICAL EXCHANGE ON THE EXPLORATORY STUDIES FACILITY TITLE II DESIGN

TRANSITION RSN/M&O CONFIGURATION CONTROL

- PACKAGE 1A DOCUMENTS BASELINED
- FORMAL CHANGE CONTROL PROCESS
  - CHANGE REQUEST (AP-3.3Q)
  - FIELD CHANGE REQUEST (AP-3.5Q)
- DIE TO ELIMINATE TBVs
- BFD WILL BE MAINTAINED WITH PACKAGE 1A FOR THE LIFE OF THE PROJECT ALONG WITH THE APPROPRIATE REVISION OF THE SYSTEMS REQUIREMENTS DOCUMENT

ESF PACKAGE 1A
TRACEABILITY OF REQUIREMENTS



DOE-NRC TECHNICAL EXCHANGE ON THE EXPLORATORY STUDIES FACILITY TITLE II DESIGN

M&O BASIS FOR DESIGN (BFD)

- RESPONSIVE TO APPLICABLE ESFDR REQUIREMENTS
- PROVIDES DESIGN CRITERIA
- REVISED AS DESIGN PACKAGES ARE ADDED TO SCOPE
- PROVIDES RECORD OF DESIGN INPUTS APPLIED TO ESF DESIGN

DOE-NRC TECHNICAL EXCHANGE ON THE EXPLORATORY STUDIES FACILITY TITLE II DESIGN

CONTENTS OF M&O BASIS FOR DESIGN

- **Flow Down of ESFDR Requirements**
- **Definition of Subsystem Elements**
- **Applicable Regulations, Codes, Acceptance Standards, and DOE Orders**
- **Methods for calculations**

DOE-NRC TECHNICAL EXCHANGE ON THE EXPLORATORY STUDIES FACILITY TITLE II DESIGN

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DOE-NRC TECHNICAL EXCHANGE ON THE EXPLORATORY STUDIES FACILITY TITLE II DESIGN

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