

U.S. DEPARTMENT OF ENERGY
OFFICE OF CIVILIAN RADIOACTIVE WASTE MANAGEMENT

**NUCLEAR WASTE TECHNICAL REVIEW BOARD
FULL BOARD MEETING**

**SUBJECT: FISCAL YEAR 1996 ACCOMPLISHMENTS
AND FISCAL YEAR 1997 OVERVIEW**

PRESENTER: DR. STEPHAN J. BROCOUM

**PRESENTER'S TITLE
AND ORGANIZATION: ASSISTANT MANAGER, FOR SUITABILITY AND LICENSING
YUCCA MOUNTAIN SITE CHARACTERIZATION PROJECT OFFICE
LAS VEGAS, NEVADA**

TELEPHONE NUMBER: (702) 794-1359

**ARLINGTON, VA
OCTOBER 9-10, 1996**

Overview

- **Fiscal Year 1996 Major Accomplishments**
- **Fiscal Year 1997 Budget and Objectives**
- **Fiscal Year 1997 Key Milestones Supporting Viability Assessment, EIS, and Site Recommendation/License Application Objectives**
- **Overview of Major FY 1997 Activities**
- **Overview of Remaining Presentations**

FY 1996 Major Accomplishments Supporting Program Objectives

- **Completed concurrence draft of the Waste Containment and Isolation Strategy Highlights**
- **Drafted notice of proposed rulemaking to amend 10 CFR Part 960**
- **Completed TBM excavation of the main drift and started excavation of the south ramp**
- **Completed construction of Alcove 4 at the base of the nonwelded Paintbrush Tuff (PTn)**

FY 1996 Major Accomplishments Supporting Program Objectives

(continued)

- **Completed initial phases of construction for**
 - **Alcove 5 - Thermal Testing Facility**
 - **Alcove 6 - Northern Ghost Dance Fault Alcove**
- **Completed the Mined Geologic Disposal System Advanced Conceptual Design Report (MGDS ACD)**
- **Published the third Total System Performance Assessment, TSPA-95**
- **Supported revision 1 of the Program Plan; and completed and baselined the Long Range Plan milestones supporting the Program Plan objectives**

FY 1996 Major Accomplishments Supporting Program Objectives

(continued)

- **Completed conceptual models of site geologic and hydrologic processes and framework**
 - **Preliminary 3-D Framework Model**
 - **Site Scale Unsaturated Zone Flow Model**
 - **Preliminary Site Scale Saturated Zone Flow Model**
 - **Regional Saturated Flow Model**
 - **Unsaturated Zone Transport Model Phase 1**
 - **Saturated Zone Transport Model Phase 1**

FY 1996 Major Accomplishments Supporting Program Objectives

(continued)

- **Continued field testing**
 - **Hydrologic testing in ESF Alcove 2 (Bow Ridge fault)**
 - **Installed equipment and initiated hydrologic testing in Alcove 3 (upper contact nonwelded Paintbrush Tuff) and Alcove 4 (lower contact nonwelded Paintbrush Tuff)**
 - **Continued unsaturated zone pneumatic testing and monitoring in surface boreholes along the ESF main drift and north ramp**

FY 1996 Major Accomplishments Supporting Program Objectives

(continued)

- **Completed processing and analysis of surface geophysics data at the site and in Crater Flat to support developments of tectonic models**
- **Completed surface geologic mapping of the potential repository area**
- **Completed initial saturated zone tracer/transport tests at C-wells**
- **Initiated the single element heater test on schedule**
- **Completed public scoping for the repository EIS**

Photographs Representing Some FY 1996 Activities

- *TBM at turn to South ramp, looking forward*
- *TBM at turn to South ramp, looking backward*
- *Site preparation at South portal pad*
- *Cross-cut drilling activities in Access/Observation drift in Alcove 5*
- *Construction activities in Alcove 6*
- *Alcove 6 looking toward main tunnel*
- *Water tracing at C-wells*
- *Installing heater assembly in Alcove 5 (2 photos)*
- *Heater being turned on for single element heater test*

















#1: ESF-TMA-H-1

PRIMARY BOREHOLE PURPOSE (INSTRUMENTATION):
HEATER ASSEMBLY
(5 METER LONG, 4.0 KW MAXIMUM BOREHOLE HEATER)

NOMINAL HOLE DIMENSIONS:
9.50 cm DIA (HQ-3 DIAMOND BIT) (FIRST 9.873 m)
DATE DRILLED/COMPLETED: April 26, 1996
For Additional Details: Contact Tom ESF TCO (5-4180)



#29: ESF-TMA-RB-2

PRIMARY BOREHOLE PURPOSE (INSTRUMENTATION):
ROCKBOLT WITH MEASUREMENTS
ROUTED SINGLE ANCHOR ROCKBOLT WITH LOADCELL
(STANDARD DRILL BIT, 4.0 m LONG)
May 17, 1996

#28:

PRIMARY BOREHOLE PURPOSE (INSTRUMENTATION):
ROCKBOLT
(GROUTED SINGLE ANCHOR)
NOMINAL HOLE DIMENSIONS:
7.72 cm DIAMETER (S)
DATE DRILLED/COMPLETED: MAY 17, 1996

S
ELL)



Project Share of OCRWM Appropriation (\$ in millions)

FY 1996

\$250

FY 1997

\$325

**FY 1997 Key Milestones
Supporting VA, EIS, SR/LA Objectives**

Viability Assessment FY 1997 Objectives

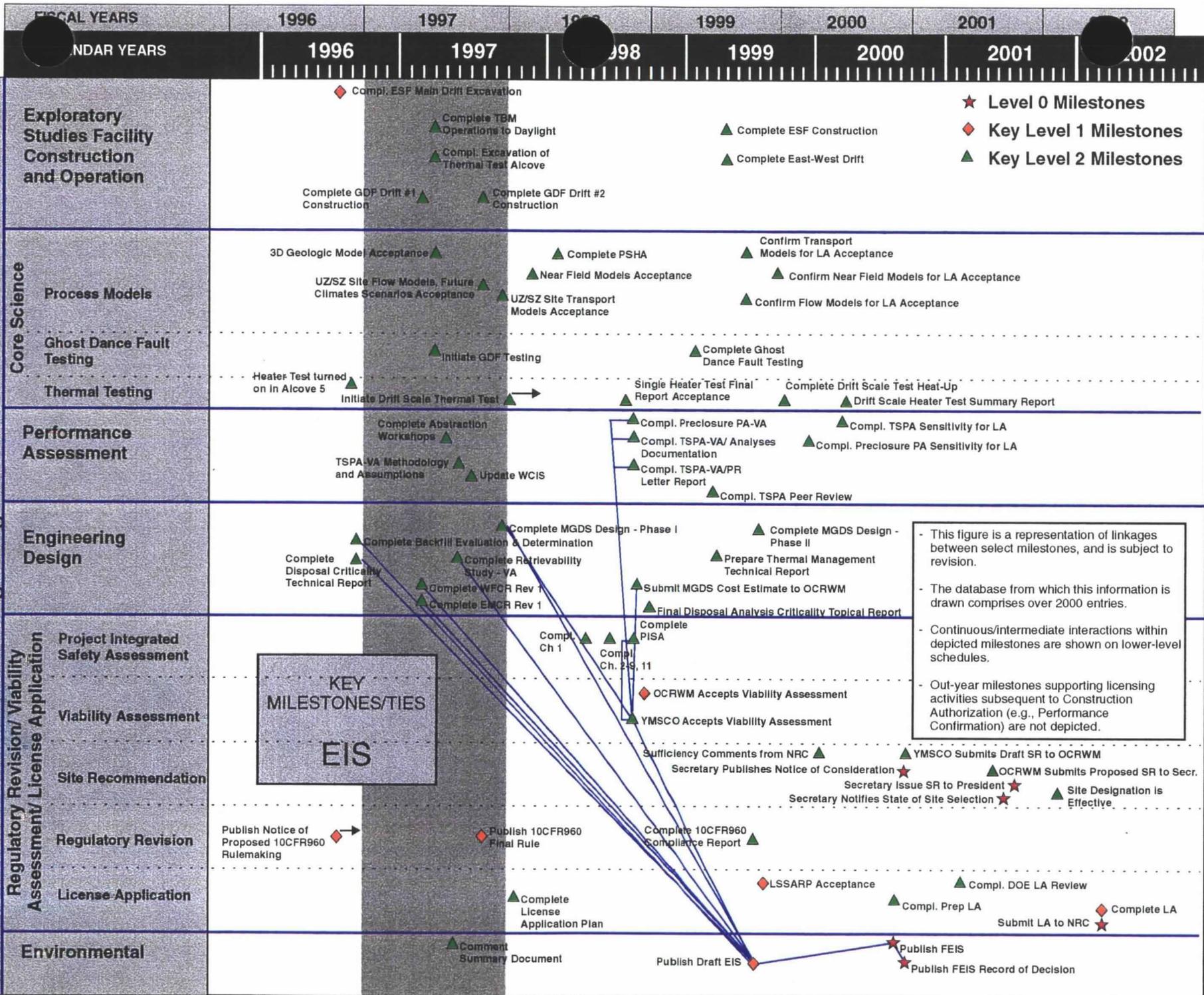
- **Develop a site description that utilizes available data and model results**
- **Provide robust site and engineered system process models and integrate them into TSPA-VA**
- **Conduct testing and abstraction of science and design process models for use in TSPA-VA**
- **Select a TSPA peer review panel and conduct orientation**

Viability Assessment FY 1997 Objectives

(continued)

- **Focus Phase 1 design on resolution of key design issues and design of repository and waste package systems, structures and components that have little or no NRC precedent**
- **Develop the License Application Plan**
- **Initiate development of a cost estimate to construct and operate a repository**

Key Levels 0-2 Milestones from Yucca Mountain Site Characterization Project Long-Range Plan

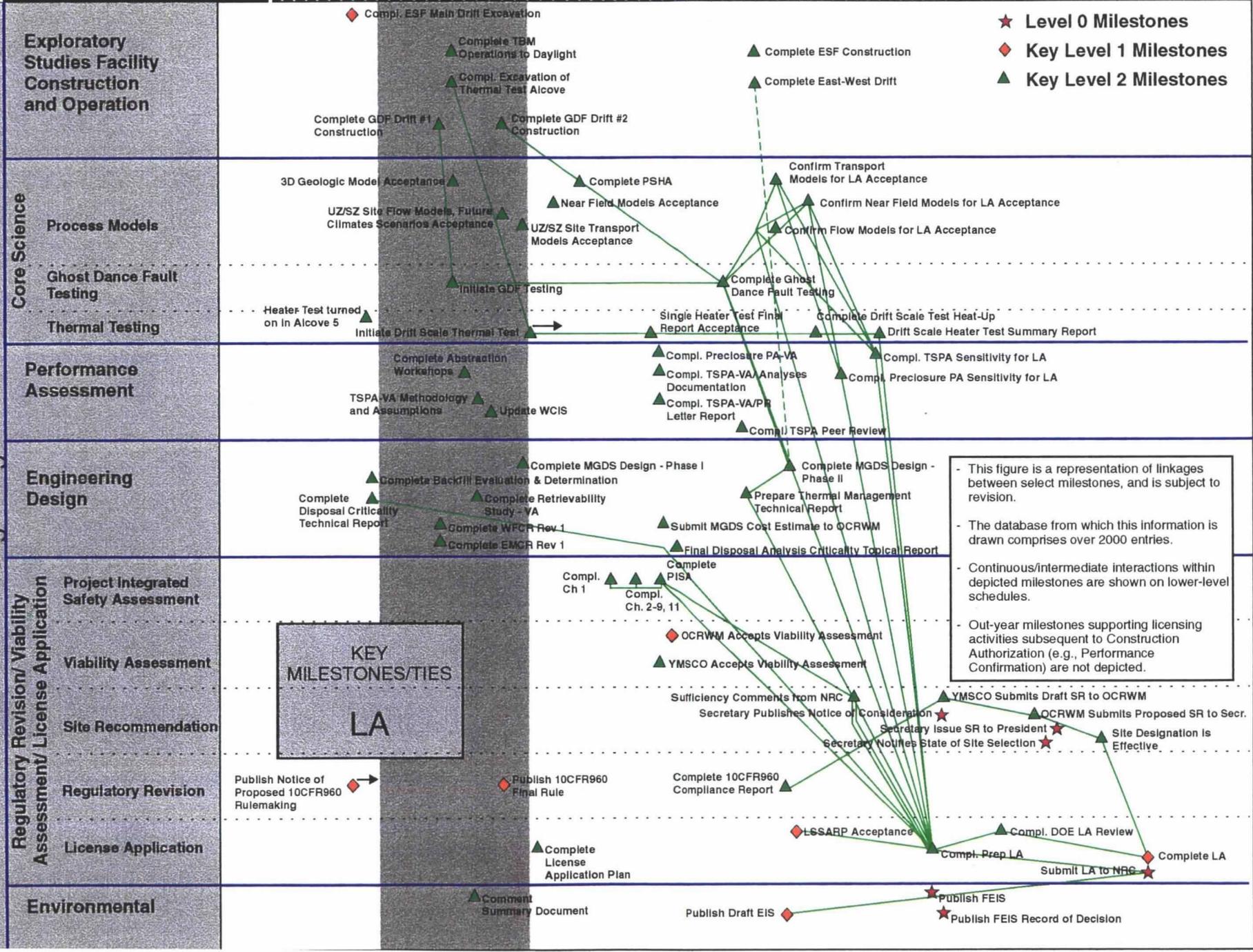


Environment Impact Statement FY 1997 Objectives

- **Restart NEPA Process**
 - **Orient EIS contractor**
 - **Develop Comment Summary Document**
 - **Initiate consultations with other agencies**

Key Levels 0-2 Milestones from Yucca Mountain Site Characterization Project Long-Range Plan

CAL YEARS	1996	1997	1998	1999	2000	2001	2002
CALENDAR YEARS	1996	1997	1998	1999	2000	2001	2002



- This figure is a representation of linkages between select milestones, and is subject to revision.

- The database from which this information is drawn comprises over 2000 entries.

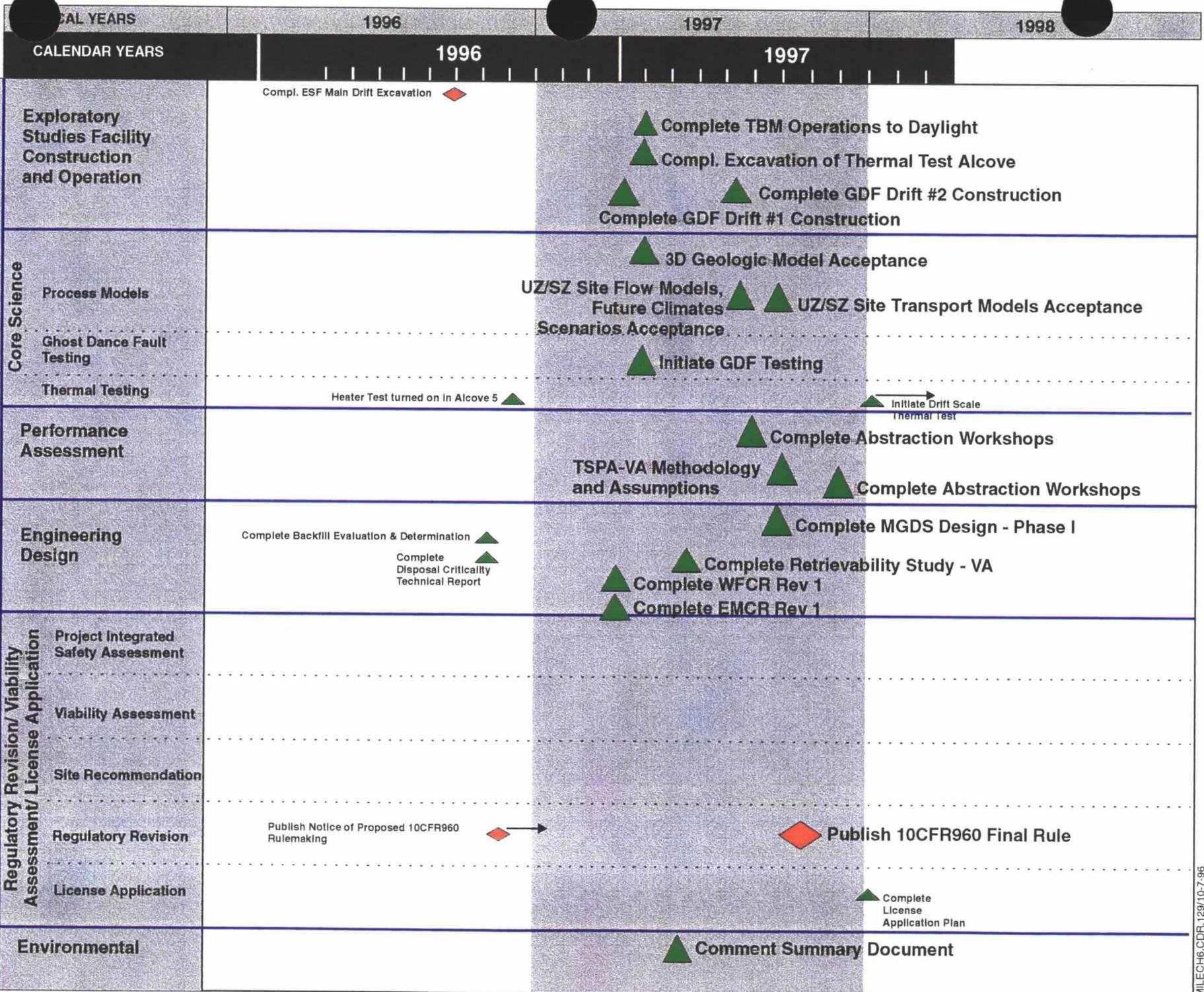
- Continuous/intermediate interactions within depicted milestones are shown on lower-level schedules.

- Out-year milestones supporting licensing activities subsequent to Construction Authorization (e.g., Performance Confirmation) are not depicted.

Site Recommendation and License Application FY 1997 Objectives

- **Complete implementation document for the Waste Containment and Isolation Strategy**
- **Complete construction of ESF 5 mile loop and planned testing alcoves**
- **Develop integrated technical and engineering syntheses to support site recommendation, license application, and EIS**

Key Levels 0-2 Milestones from Yucca Mountain Site Characterization Project Long-Range Plan



FY 1997 Key Milestone Graphic

- **Shows 17 key milestones out of 28 key milestones in the baseline for FY 1997**
- **Emphasizes scientific and engineering work that will support tracking progress toward the viability assessment**

Overview of Major FY1997 Activities

Overview of Major FY 1997 Activities

- **Waste Containment and Isolation Strategy**
- **Scientific process model development**
- **Testing in the ESF, on the surface, and in the laboratory**
- **Mined Geologic Disposal System (MGDS)
Phase 1 design for VA**
- **Performance assessment**

Waste Containment and Isolation Strategy

- **Presents DOE's approach to addressing and resolving postclosure performance issues**
- **Incorporates new site information and designs, realistic performance predictions, and potential regulatory changes**
- **Focuses science and design work necessary to determine postclosure performance of a repository**
- **Strategy relies on five natural and engineered attributes and associated hypotheses to demonstrate safe performance**

Waste Containment and Isolation Strategy

(continued)

- **Status**
 - **Highlights to be issued as a DOE document**
 - **Multidisciplinary team established including representatives from M&O (USGS and National Labs). Developed a comprehensive draft document that provides a technical basis for the strategy**
 - **Extensive cross functional integration has occurred in development of document**
 - **Internal M&O review started in early October**

Scientific Process Model Development in FY 1997

- **Scientific Program will provide process models to performance assessment as a basis for abstraction**
 - **Processes considered/excluded**
 - **Comparison of model predictions with observations**
 - **Sensitivity and uncertainty analyses**
 - **Alternative models that could explain observations**

Testing in FY 1997 Will Be Conducted In the ESF, On the Surface, and In the Laboratory

- **ESF Testing**
 - **Characterization of in-situ conditions for drift scale thermal test in Thermal Testing Facility (alcove 5)**
 - **Thermo-mechanical data collection from ongoing single element heater test**
 - » **Predictive calculations of heater tests**
 - **Moisture monitoring to evaluate effects of ESF ventilation**
 - **Heat flow, moisture distribution and pneumatic properties of the Ghost Dance Fault**

Testing in FY 1997 Will Be Conducted In the ESF, On the Surface, and In the Laboratory

(continued)

- Analyze fracture minerals for apparent age**
- Sample and analyze isotope tracers (CI 36)**
- Planning for in-situ unsaturated zone
transport test**

Testing in FY 1997 Will Be Conducted In the ESF, On the Surface, and In the Laboratory

(continued)

- **Surface-Based Testing**
 - Tracer testing at C-Wells Complex
 - Ongoing pneumatic monitoring
 - Initiate Large Block Test (Fran Ridge)
 - Fracture coating and isotope analyses
- **Laboratory/Analytical**
 - Refine Zeolite stratigraphy
 - Complete sorption tests
 - Investigate coupled processes in the thermally altered zone

Mined Geologic Disposal System Phase 1 Design for Viability Assessment

- **Concentrate on those elements that have little or no regulatory precedent and those that have major impacts on performance assessment, schedule, constructability, and cost**
- **Modify the design of the waste handling operations to reflect Multi-Purpose Canister elimination**
- **Consolidate nuclear operations into a single integrated facility to provide an accurate cost basis**

Mined Geologic Disposal System Phase 1 Design

(continued)

- **Conduct design analysis for waste package to accommodate uncanistered spent fuel**
 - **Structural**
 - **Thermal**
 - **Shielding**
 - **Criticality**
- **Conduct laboratory tests on waste package material and waste forms to develop materials and waste form degradation process models to support TSPA-VA**

Total System Performance Assessment-Viability Assessment (TSPA-VA)

- **Teams of site, engineering, and performance assessment staff are being formed to support performance abstraction process**
 - **Ensure current process models used for TSPA**
 - **Bound uncertainties in process models**
- **Use sensitivity analyses to quantify effects of uncertainties in process models**
- **Where required, identify means to reduce uncertainties through testing (e.g. performance confirmation) or design**

Total System Performance Assessment-Viability Assessment (TSPA-VA)

(continued)

- **TSPA-VA will be peer-reviewed by an external panel of experts comprised mainly of process modelers with expertise in specific components of the TSPA**
 - **Detailed planning for the phased peer review of TSPA-VA results has been initiated, and work will start early in FY 1997**
 - **Objective of review is to provide recommendations for preparing TSPA for license application (TSPA-LA)**

By FY 1997 Year End

- **Waste Containment and Isolation Strategy will be updated**
- **Review and comment on the 10 CFR Part 960 proposed rule will be completed and the final rule will be issued**
- **Completed construction of ESF south ramp and planned testing alcoves**
- **Saturated and unsaturated zone flow and transport models will be updated**
- **Probabilistic Seismic Hazard Assessment will be underway**
- **Phase I design for VA will be completed**

Overview of Remaining Presentations

Natural System

- **Unsaturated zone process models utilizing new data on potential flux rates**
- **Being used in sensitivity analyses for TSPA-95**
- **Performance assessment abstraction process**

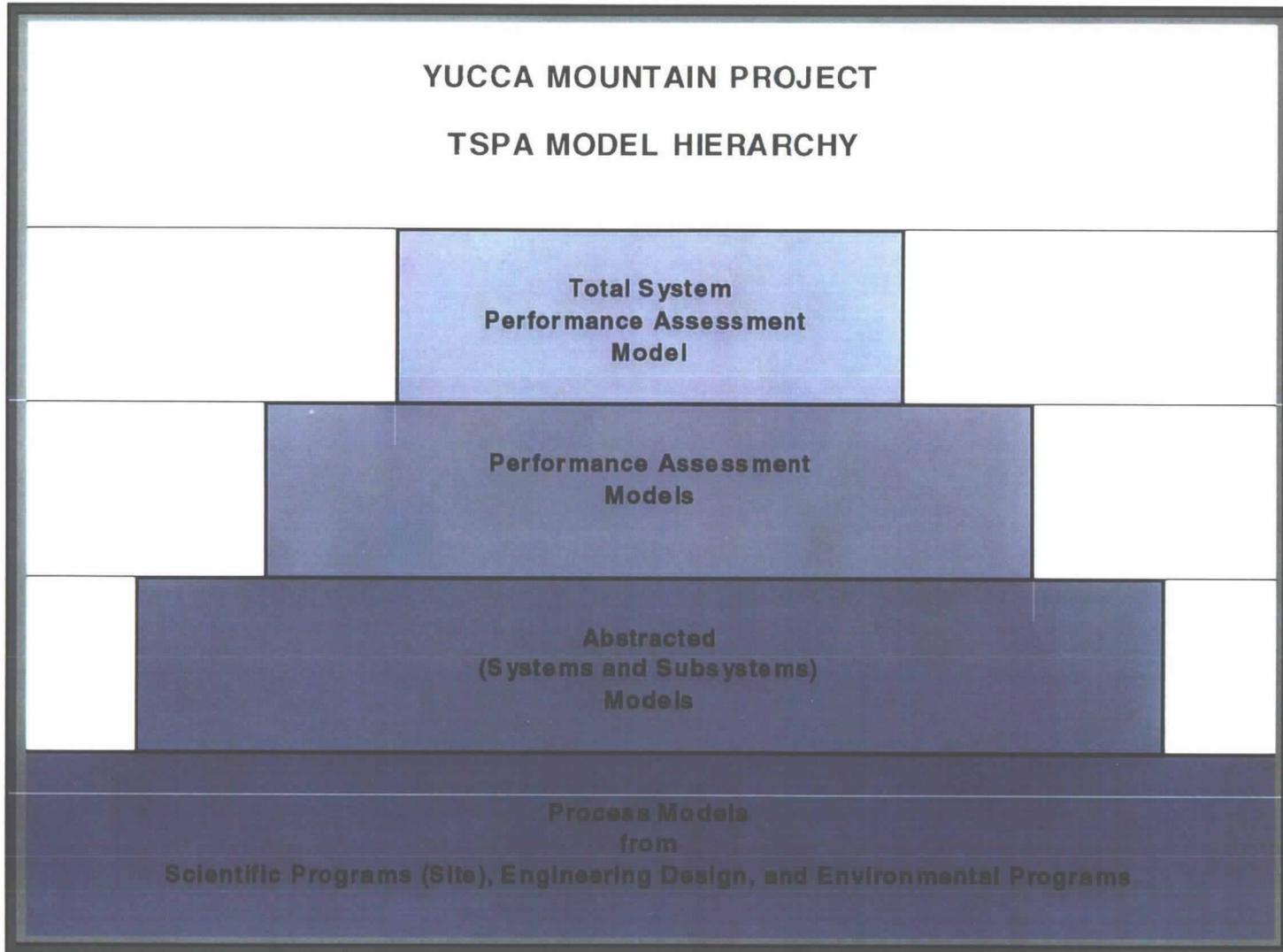
By FY 1997 Year End

(continued)

- **Waste package material and waste form degradation process models supporting TSPA-VA will be completed**
- **Orientation of the TSPA peer review panel will be completed**
- **Site and design process models abstraction workshops will be completed and scenario development will have started**
- **NEPA process will be underway**
- **License Application Plan will be essentially complete**

YUCCA MOUNTAIN PROJECT

TSPA MODEL HIERARCHY



Overview of Remaining Presentations

(continued)

Engineered System

- **Concept of repository operations and key design issues**
- **Design status for waste package and emplacement drifts**
- **Feasibility of technology for Viability Assessment design**
 - Remote handling
- **Repository thermal management**