



U.S. Department of Energy  
Office of Civilian Radioactive Waste Management

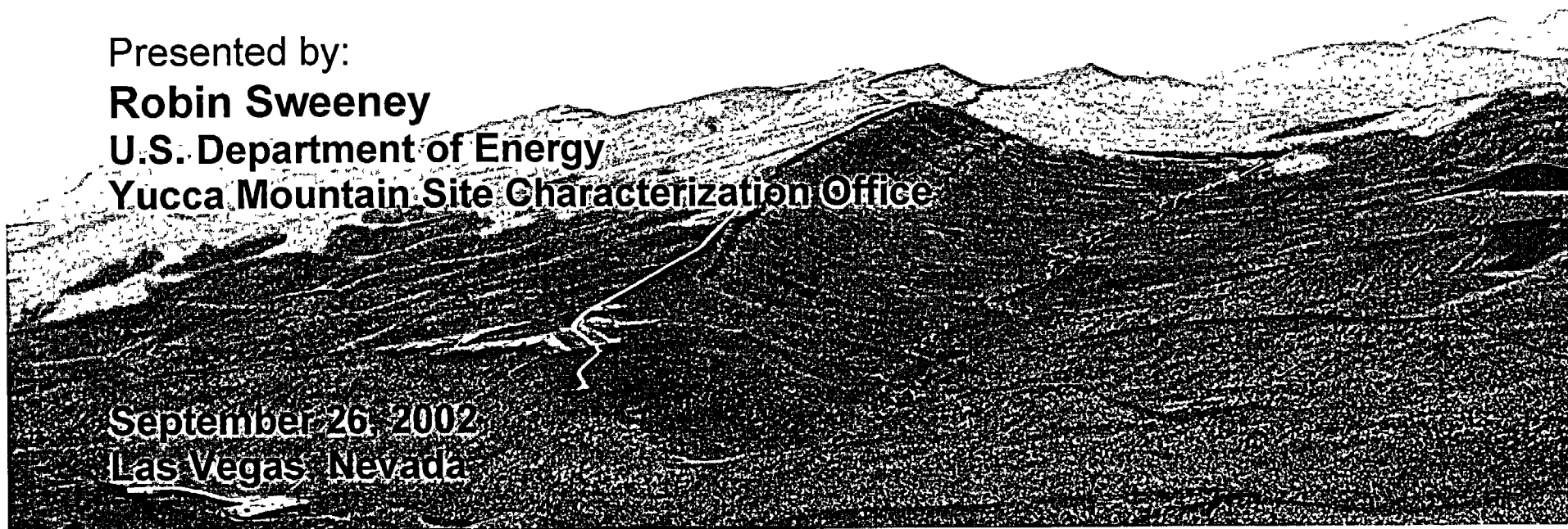


# Final Environmental Impact Statement for a Geologic Repository at Yucca Mountain

Presented to:  
**Advisory Committee on Nuclear Waste**

Presented by:  
**Robin Sweeney**  
U.S. Department of Energy  
Yucca Mountain Site Characterization Office

September 26, 2002  
Las Vegas, Nevada



# Outline

- **Review of prior interactions**
- **Current status of Environmental Impact Statement**
- **Final Environmental Impact Statement - changes and conclusions**
- **Next steps**



# **16 Months Ago - May 16, 2001**

- **Draft Environmental Impact Statement**
  - August 13, 1999 - EPA Notice of Availability
  - 199-day public comment period with 21 public hearings
  - More than 11,000 comments
- **Supplement to the Draft Environmental Impact Statement**
  - May 11, 2001 - EPA Notice of Availability
  - 45-day public comment period with 3 public hearings
  - More than 1,100 comments



# **Last 7 Months**

- **February 14, 2002 - Secretary of Energy recommended the site as scientifically and technically suitable**
  - **Basis of recommendation included Final Environmental Impact Statement**
- **February 15, 2002 - President recommended site to Congress**
- **April 8, 2002 - Governor of Nevada disapproved the site**
- **July 9, 2002 - Congress voted to override the Governor**
- **July 23, 2002 - President signed joint resolution into law**



# Publication/Distribution

- **Final Environmental Impact Statement made available to the public on February 14, 2002 - Internet**
- **Final Environmental Impact Statement delivered to General Printing Office contracted printer on August 26, 2002**



# Major Conclusions from the Final Environmental Impact Statement

- **Proposed Action would cause small, short-term public health impacts, primarily due to transportation**
  - Specific impacts at repository site would be very small
  - Transportation impacts associated mainly with nonradiological traffic fatalities and very low doses
- **Long-term performance of proposed repository, over 10,000 years would result in very low mean peak annual dose (0.00002 millirem)**
- **DOE does not expect the proposed repository to result in impacts to public health beyond prescribed standards**



# **Final Environmental Impact Statement**

## **Areas of Change**

- **More information regarding potential impacts, particularly transportation impacts**
- **Use of representative fuel assembly in accident analyses**
- **Use of updated data, particularly population data**
- **More detailed discussion of perception-based impacts**
- **Use of updated computer models**
- **Editorial changes and corrections**
- **Addition of appendix on general transportation information**
- **Addition of U.S. Fish and Wildlife Service Biological Opinion**
- **Addition of Readers' Guide**



# **Why DOE Introduced Changes**

- **Response to public comments**
  - Volume III contains all public comments and DOE responses
  - Some comments led DOE to change or update the Environmental Impact Statement
    - ♦ Primarily to enhance understanding
    - ♦ Also to correct errors
- **Correct errors**
  - DOE internal reviewers identified typographical or editorial errors - corrected in Final Environmental Impact Statement
- **Provide new information or improved analyses**



# **Comment Response Document Volume III**

- **DOE received more than 12,000 comments from letters, e-mails, and transcripts of public hearings**
  - **Comments received through August 31, 2001 were included in Final Environmental Impact Statement**
    - ♦ **Comments received after August 31, 2001 were considered and evaluated - none raised new issues not already considered**
- **Similar comments were summarized**
- **DOE responded to all comments, either individual or summarized**
- **Some comments led DOE to change or update the Environmental Impact Statement**



# Preferred Alternative

- **Proposed Action identified as preferred alternative**
  - Construct, operate and monitor, and eventually close a geologic repository at Yucca Mountain
- **Mostly rail identified as preferred mode of transportation - nationally and in Nevada**
  - Commercial sites without rail capability would ship by legal-weight truck



# Next Steps

- **DOE Record of Decision on transportation mode**
  - No sooner than 30 days following EPA Notice of Availability
  - Any such decision will consider public comment on the Final Environmental Impact Statement
- **If mostly rail is selected, DOE would then identify a preference for one rail corridor in Nevada**
  - In consultation with affected stakeholders
- **DOE Record of Decision on rail corridor in Nevada**
  - No sooner than 30 days after announcement of a preference



# Next Steps

(Continued)

- **Similar process would occur if DOE selected heavy-haul truck as mode in Nevada**
- **Other transportation decisions, such as selection of a rail alignment, would require additional National Environmental Policy Act analysis**
- **Review on-going project activities and potential design changes to ensure continuing National Environmental Policy Act compliance**
- **Support adoption of the Final Environmental Impact Statement by the NRC**





U.S. Department of Energy  
Office of Civilian Radioactive Waste Management

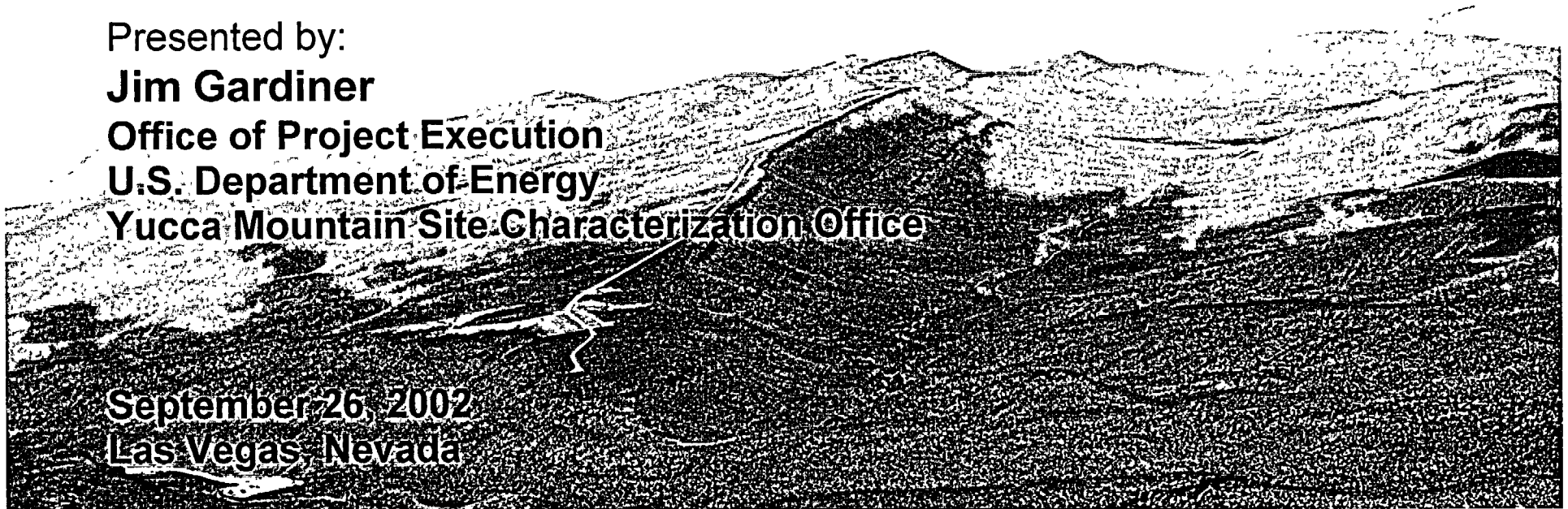


# Repository Design Update

Presented to:  
**Advisory Committee on Nuclear Waste**

Presented by:  
**Jim Gardiner**  
**Office of Project Execution**  
**U.S. Department of Energy**  
**Yucca Mountain Site Characterization Office**

**September 26, 2002**  
**Las Vegas, Nevada**



# Overview

- **Provide basis for proceeding with the license application design**
- **Describe the design evolution from site recommendation design to license application design**



# Repository Design Evolution for License Application

- **Reasons for moving toward a design concept that supports a phased implementation approach**
  - **Consistent with findings of National Academies Panel on Staged Repository Development**
  - **Allows for the implementation of a small initial disposal capability**
    - ♦ **Adopts lessons learned approach consistent with National Academies Panel**
    - ♦ **Increases confidence in meeting schedule for 2010 initial operation**
    - ♦ **Consistent with NRC regulatory requirements for in situ testing**
  - **Provides maximum flexibility to adjust to future changes**
    - ♦ **Funding**
    - ♦ **Schedule**
    - ♦ **Incoming waste stream**



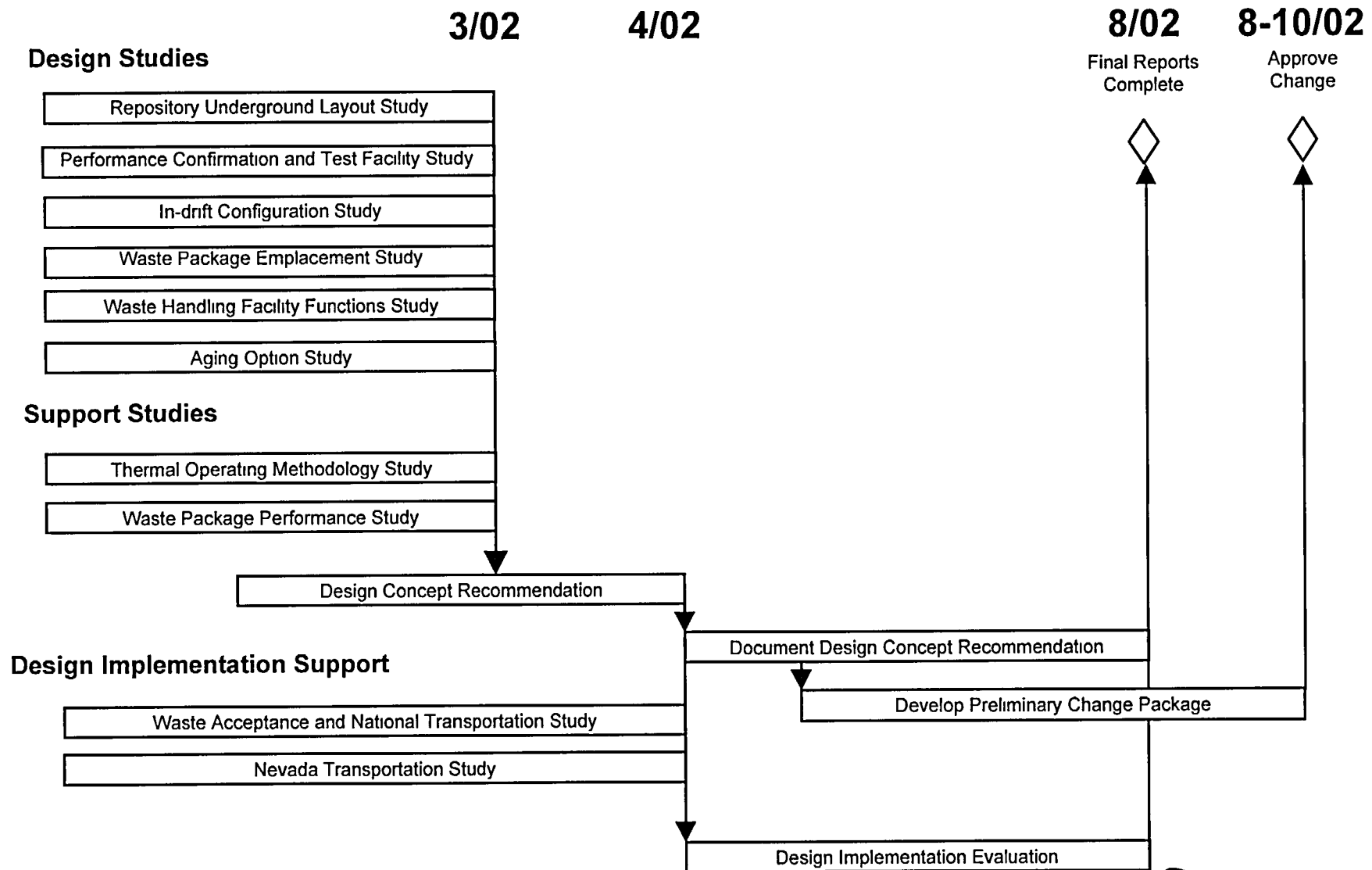
# Design Evolution

- The preliminary design that will support the License Application will consist of additional detail and refinements to the design concept for Site Recommendation
- Final decisions and approvals of the License Application Design have not been made
- The License Application Design is expected to fall within the bounds established for the design concept described in the Site Recommendation and Environmental Impact Statement
- LA Design will continue to be capable of a range of thermal operating conditions, with base case analyses performed at the high end of the range
- Environmental impact analyses are part of the evaluation and selection process for potential design refinements — must be part of decision making process





# Design Evolution Study Process



# Potential Changes to Design Solutions for License Application

- **Surface Facilities**

- Changed from one large, full capacity waste handling building to multiple, smaller capacity buildings
- Changed predominant waste handling environment from wet (in a pool) to dry (in a hot cell)
- Reduced crane handling by using wheeled transporter inside and between buildings

- **Subsurface Facilities**

- Changed from one large emplacement panel to five smaller panels
- Changed from rail to wheeled transporter to transport waste packages from surface to subsurface

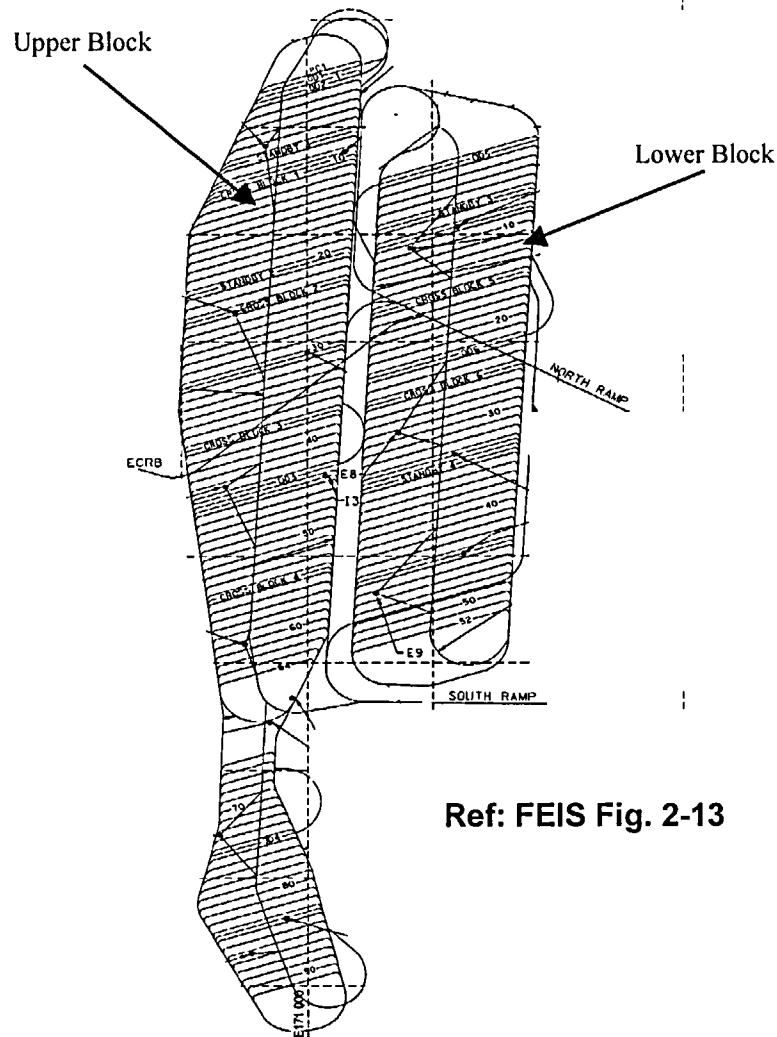


# Potential Changes to Design Solutions for License Application

- **Waste Package**
  - Replacing large full penetration weld on stainless steel closure lid with shear ring and smaller seal welds is under consideration
  - A Value Engineering Study is under way to identify potential improvements to design and fabrication
- **Off-Site Training Facility**
  - Non-nuclear (“cold”) facility
  - Constructed off-site (not part of repository)
  - Use for prototyping, testing and operator training



# Site Recommendation Design Subsurface Layout



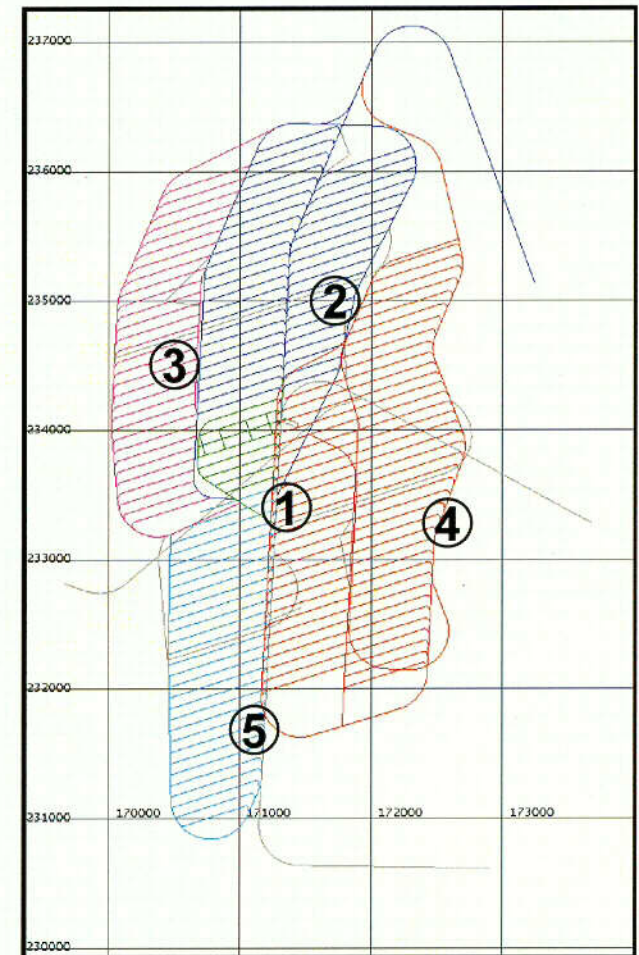
Ref: FEIS Fig. 2-13

- Upper Block for reference design emplacement (70,000 MT)
- Lower Block for expansion

Note: FEIS - Final Environmental Impact Statement

# Potential Underground Layout

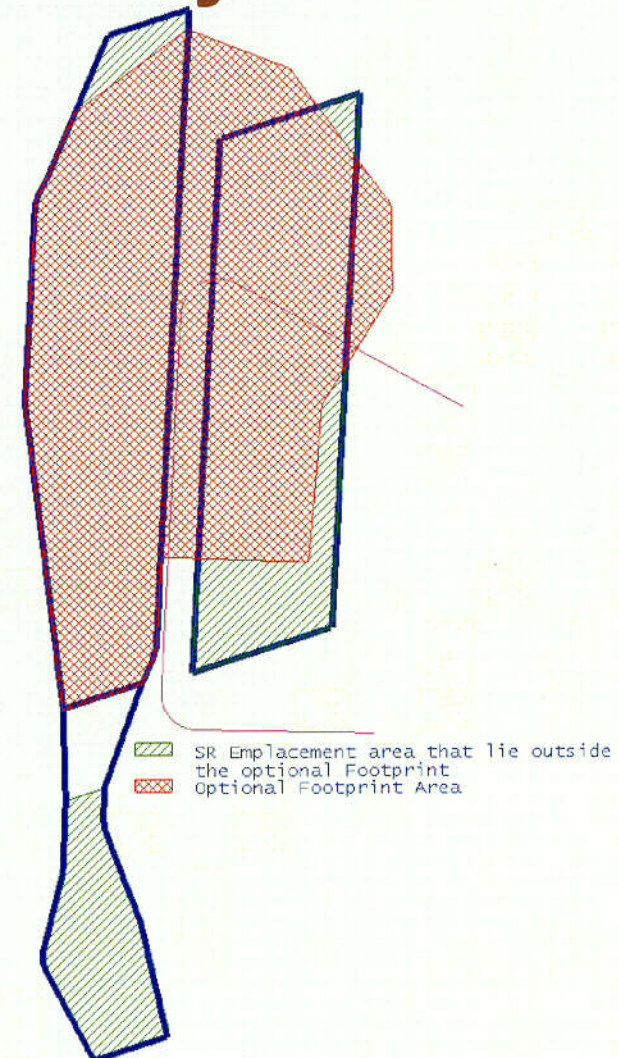
- **Modular panel layout**
  - Panels 1-4 sufficient for 70,000 MTHM at up to 2 meter waste package spacing
  - Contingency of approximately 25% with addition of Panel 5
  - Improved ventilation scheme
  - Adds optional 3rd access ramp
  - Modular development allows “adaptive staging” to applying lessons learned in one phase to the next
- **Utilizes Exploratory Studies Facility for construction of small initial emplacement Panel by 2010**
  - A portion of Panel 1 is planned for use for additional scientific and engineering testing, such as performance confirmation testing
- **Construction schedule to first emplacement in Panel 1 approximately 27 months**





# Comparison of Site Recommendation Design and Proposed Layout

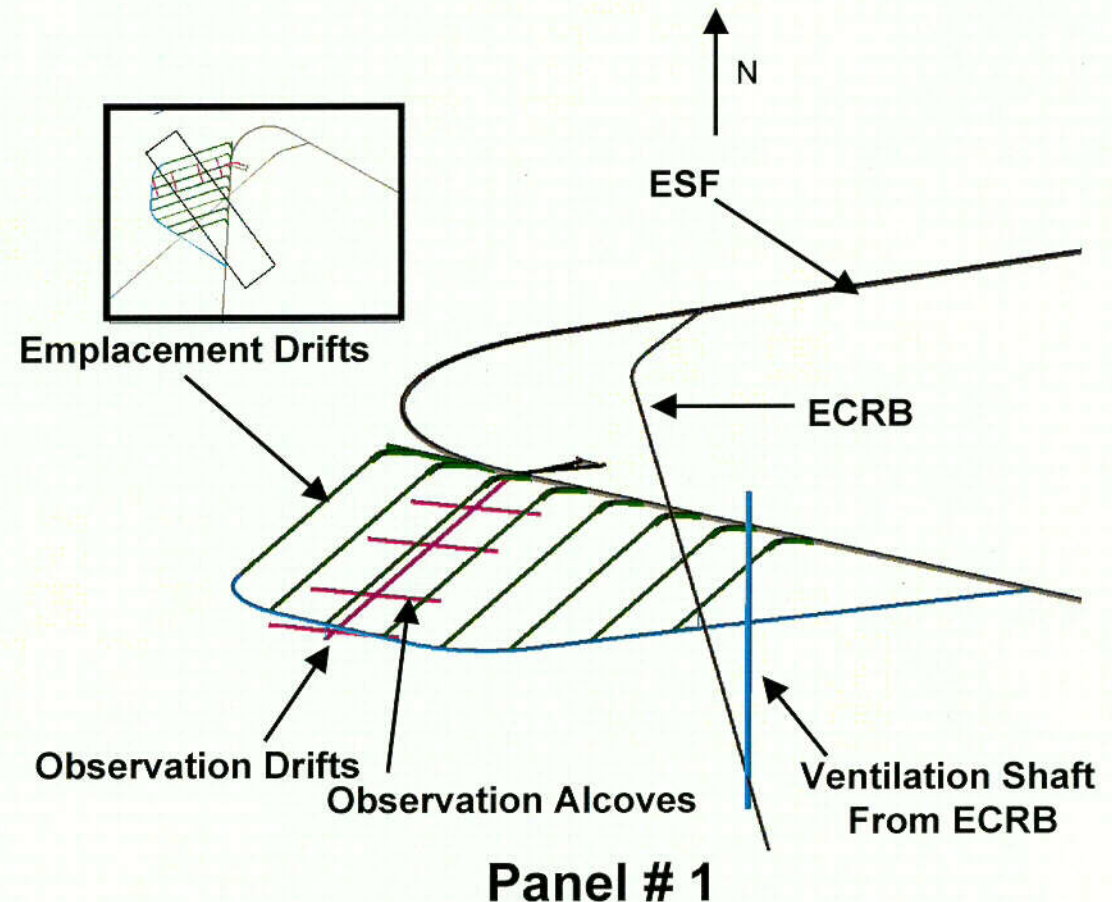
- Potential layout essentially located within the primary and lower blocks shown in the Site Recommendation design
- Potential layout has:
  - Approximately 69 miles (110 km) emplacement drift in all 5 panels
  - Approximately 5.5 miles (9 km) less total excavation than Site Recommendation design for 70,000 MTHM case
- Eliminates concerns with water table in the north and rock fracture in the south





# Potential Test Facility

- Utilizes a portion of Panel 1 to acquire engineering and scientific data to support performance confirmation activities
- Provides flexibility for defining the performance confirmation testing program in the future
- Allows starting the performance confirmation testing program during the early stages of emplacement operations
- Representative location to evaluate the overall repository performance
- Minimal impact on the underground development schedule



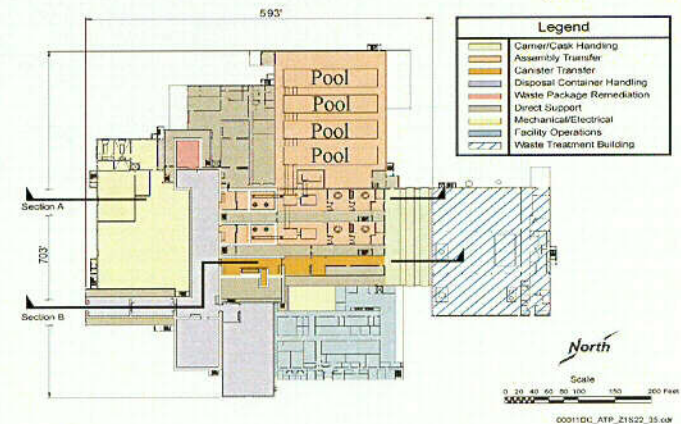
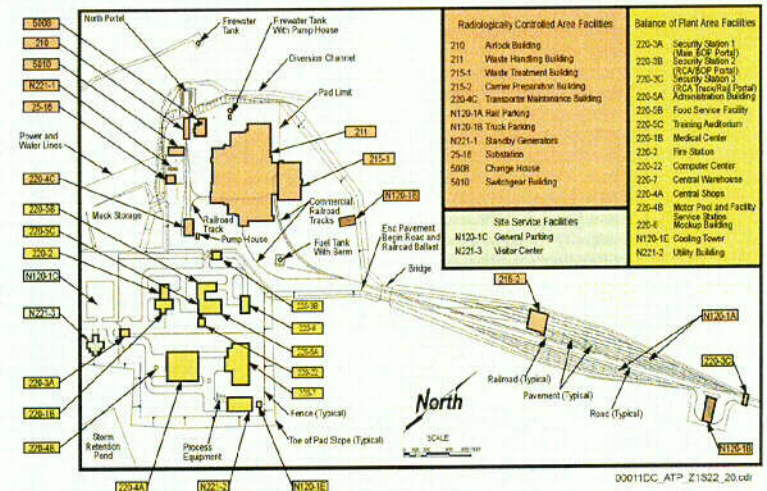
Note: ESF - Exploratory Studies Facility  
ECRB - Enhanced Characterization of the Repository Block





# Site Recommendation Design Waste Handling Facility

- **Single Waste Handling Building**
- **Includes all waste handling functions**
  - Cask receipt
  - Waste transfer (Wet for Commercial Spent Nuclear Fuel, dry for High Level Waste/DOE Spent Nuclear Fuel)
  - Waste Package prep and welding
  - 4 Commercial Spent Nuclear Fuel blending pools = 5,000 MT



Ref: S&ER Figure 2-22

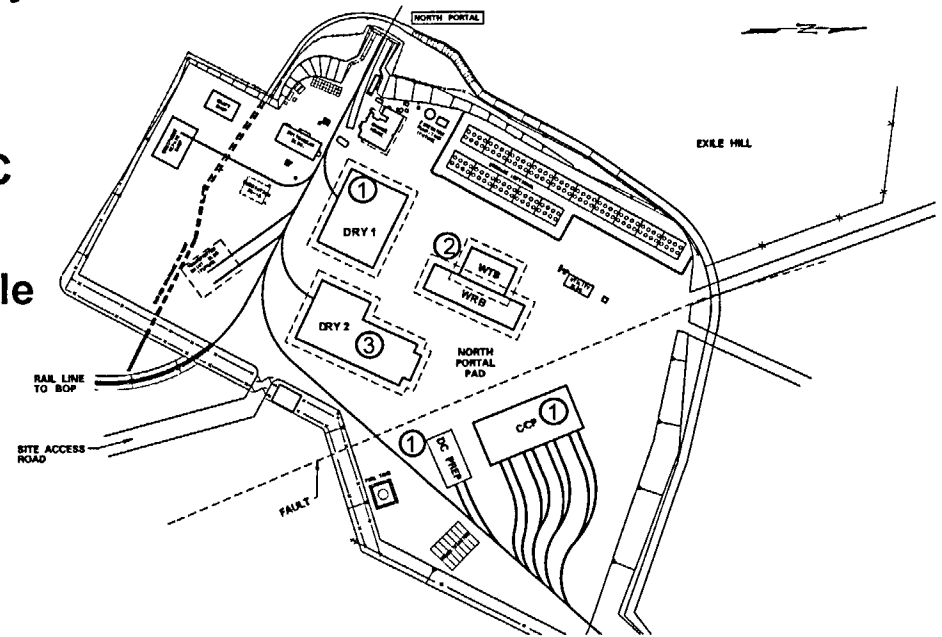




# Phased Surface Facilities Approach

- **Phase 1:**

- Partial-capacity finishing building with waste receipt & dry transfer capability (DRY 1) (~500-1,000 MT/yr)
- Cask / carrier prep building (CCP)
- Disposal container prep building (DC Prep)
  - ♦ Shortened construction schedule
  - ♦ Can process wastes for emplacement or storage



- **Phase 2**

- Waste Remediation Building (WRB)
- Waste Treatment Building (WTB)

- **Phase 3**

- Partial-capacity finishing building plus dry waste transfer line (DRY 2) (2,000 - 3,000 MT/yr):

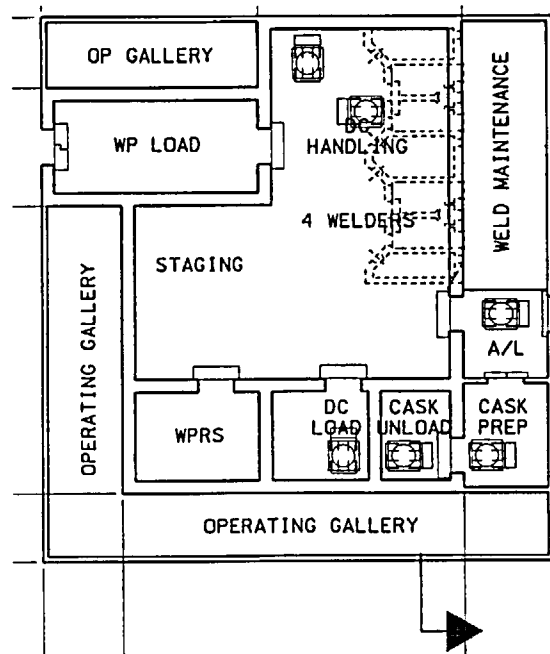
- **Fits inside Site Recommendation footprint**

- **Same capabilities as Site Recommendation design**

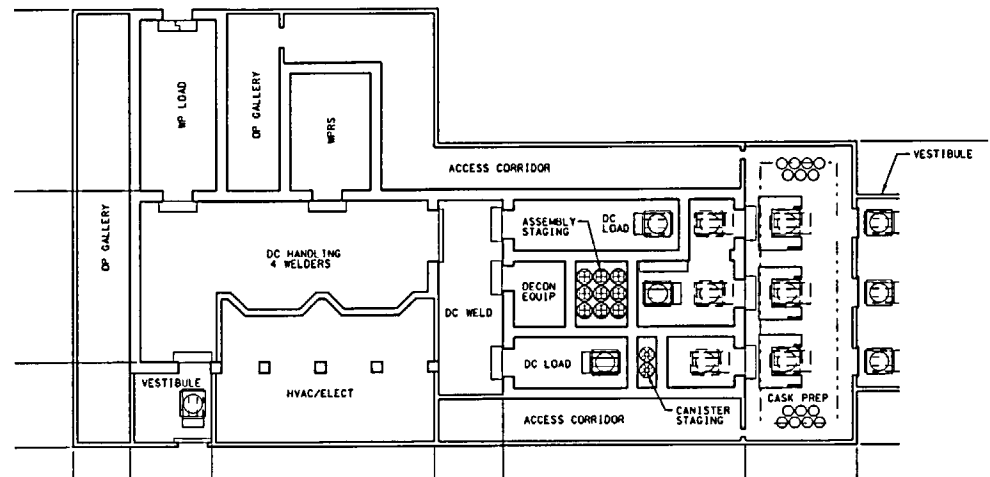


# Phased Surface Facilities Approach

(Continued)



Partial Capacity Finishing Building  
with Initial Processing (Dry 1)  
(Phase 1)

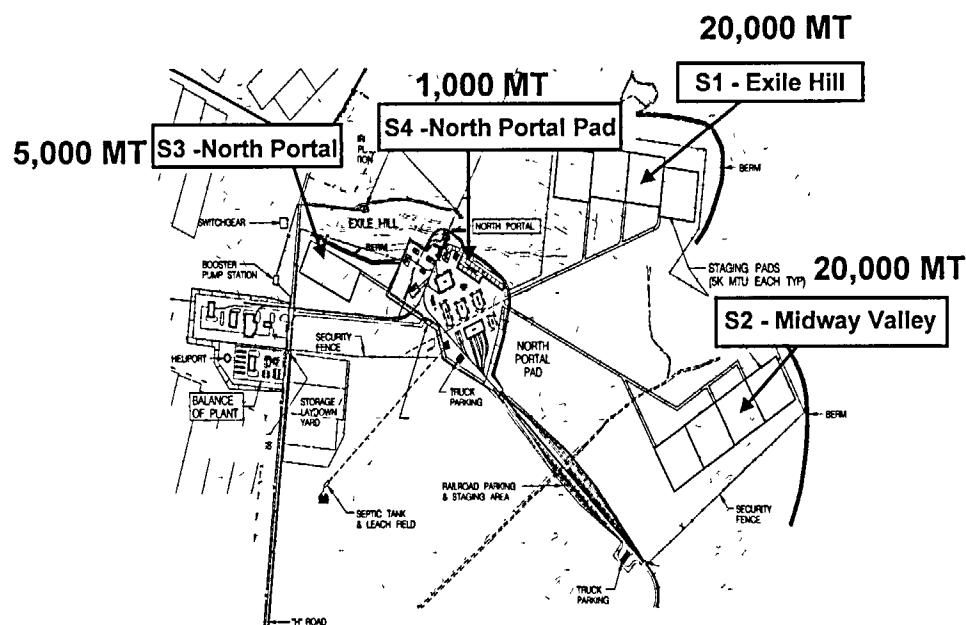


Partial Capacity Finishing Building  
with Dry Transfer Line (Dry 2)  
(Phase 3)

**NOTE: Floor Plans are Conceptual Only**

# Pre-Emplacement Aging Option

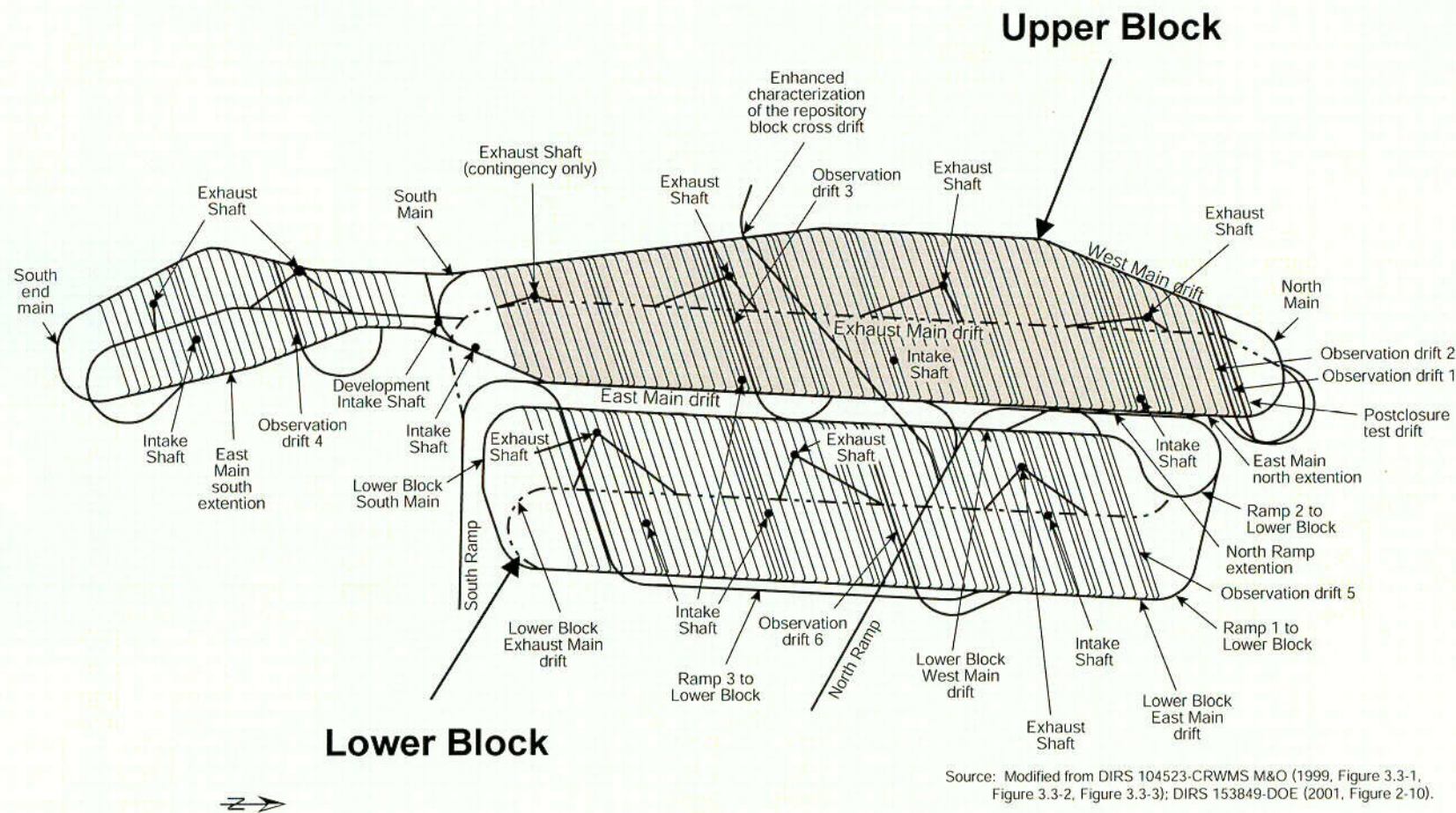
- Modular dry surface pre-emplacement aging identified as an option
- 4 potential surface locations identified for up to 40,000 MT of spent fuel



Potential Surface Aging Locations

# Backup

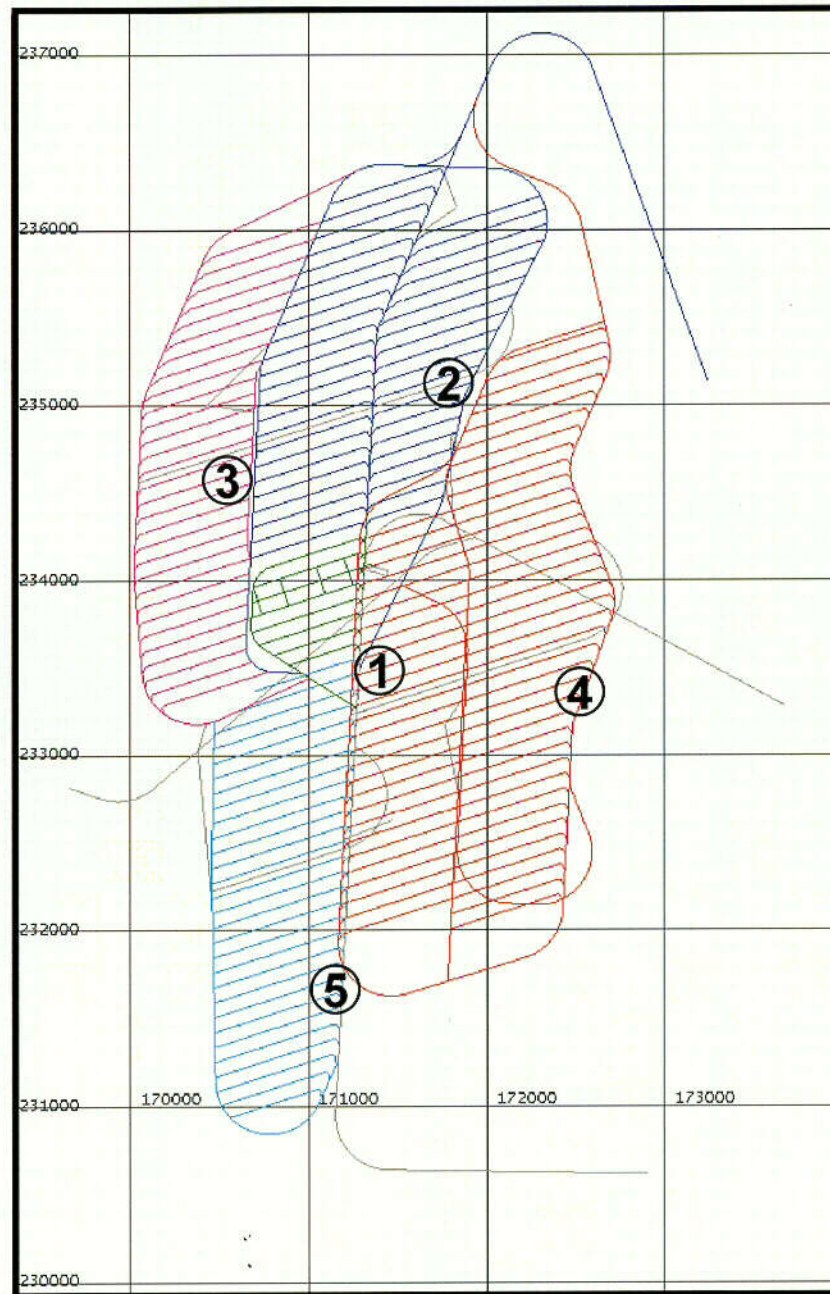




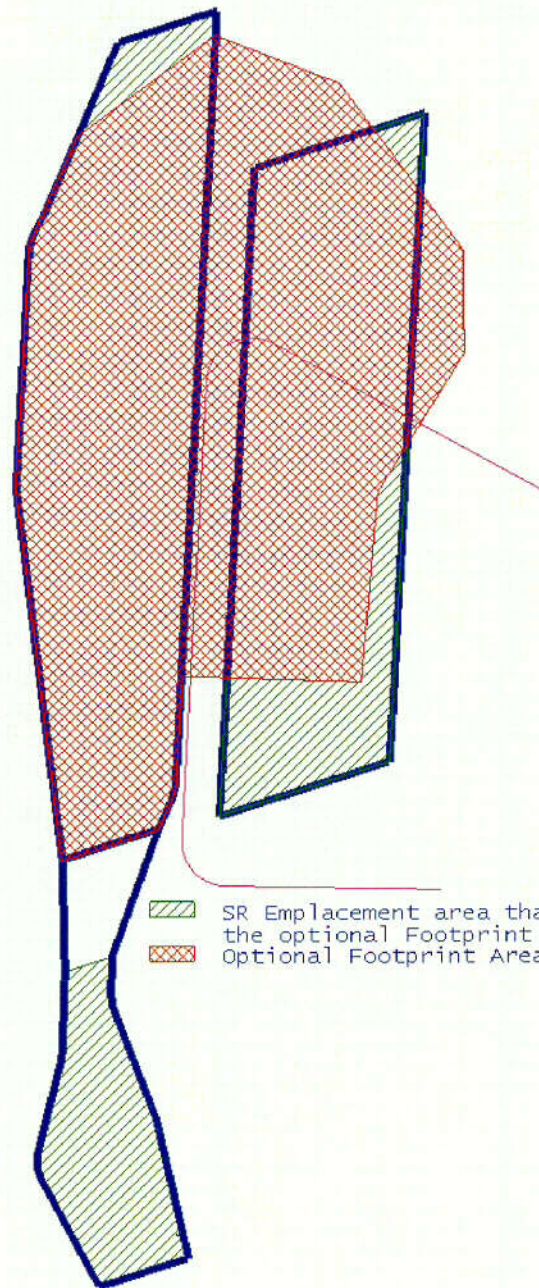
Reference: Final Impact Statement (FEIS) Figure 2-13

505



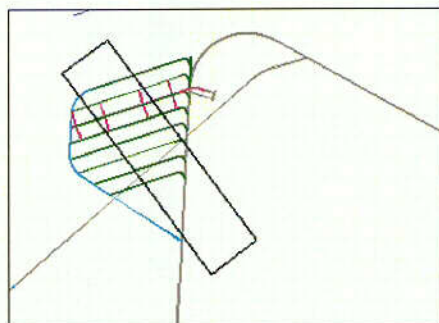


906



- SR Emplacement area that lie outside the optional Footprint
- Optional Footprint Area





Emplacement Drifts

ESF

ECRB

Observation Drifts

Observation Alcoves

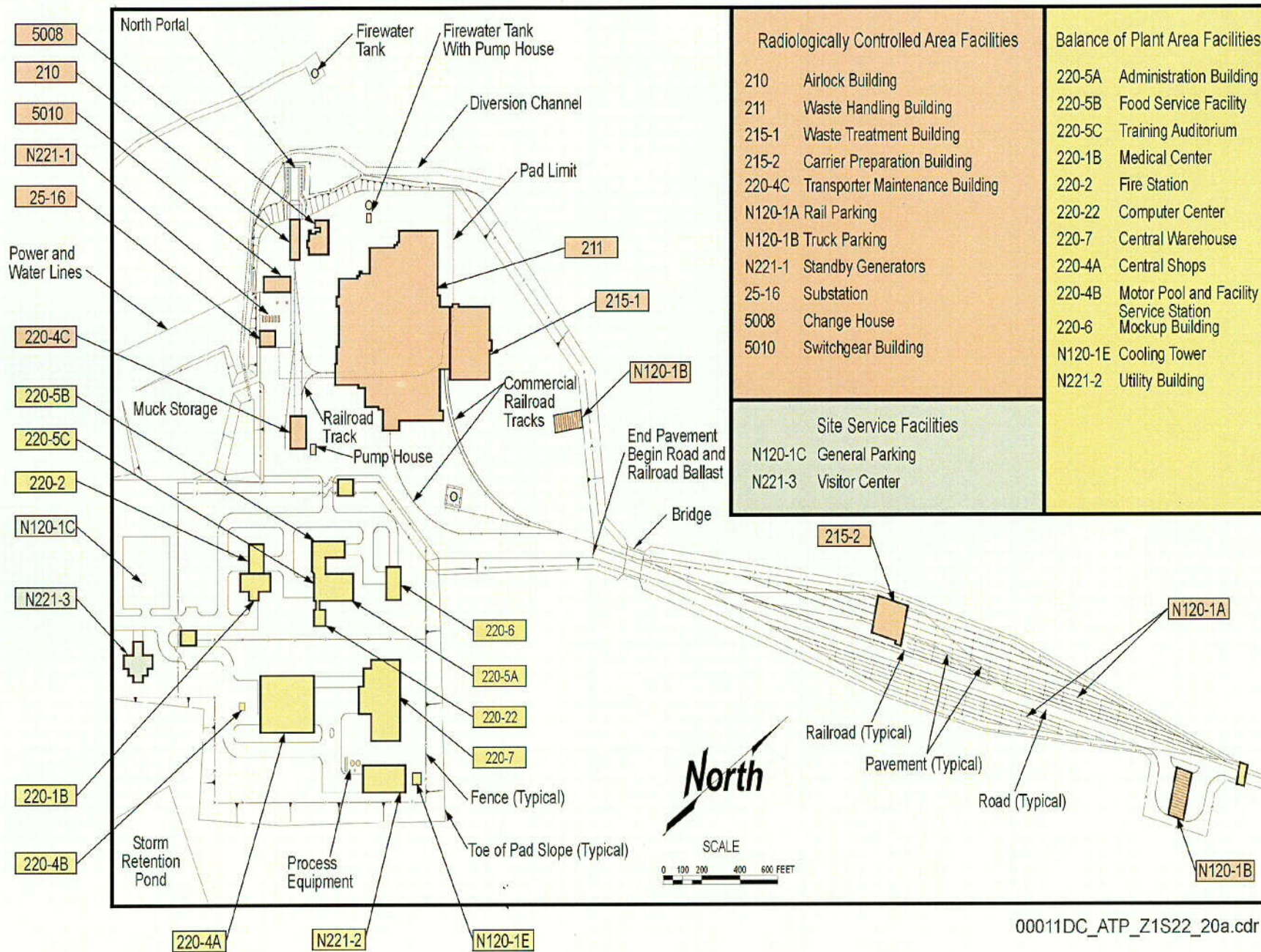
Ventilation Shaft  
From ECRB

Panel # 1

Note: ESF - Exploratory Studies Facility  
ECRB - Enhanced Characterization of the Repository Block

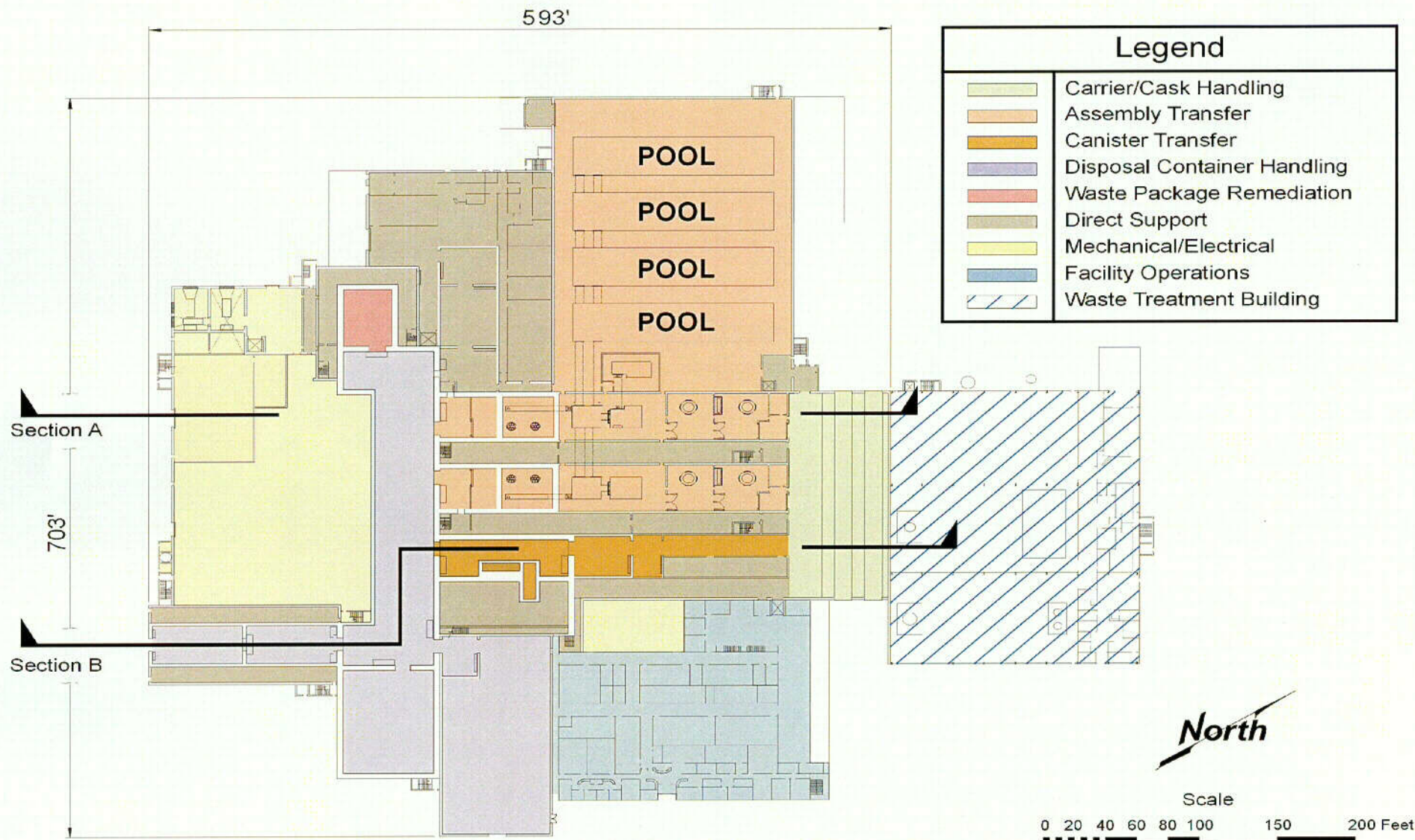






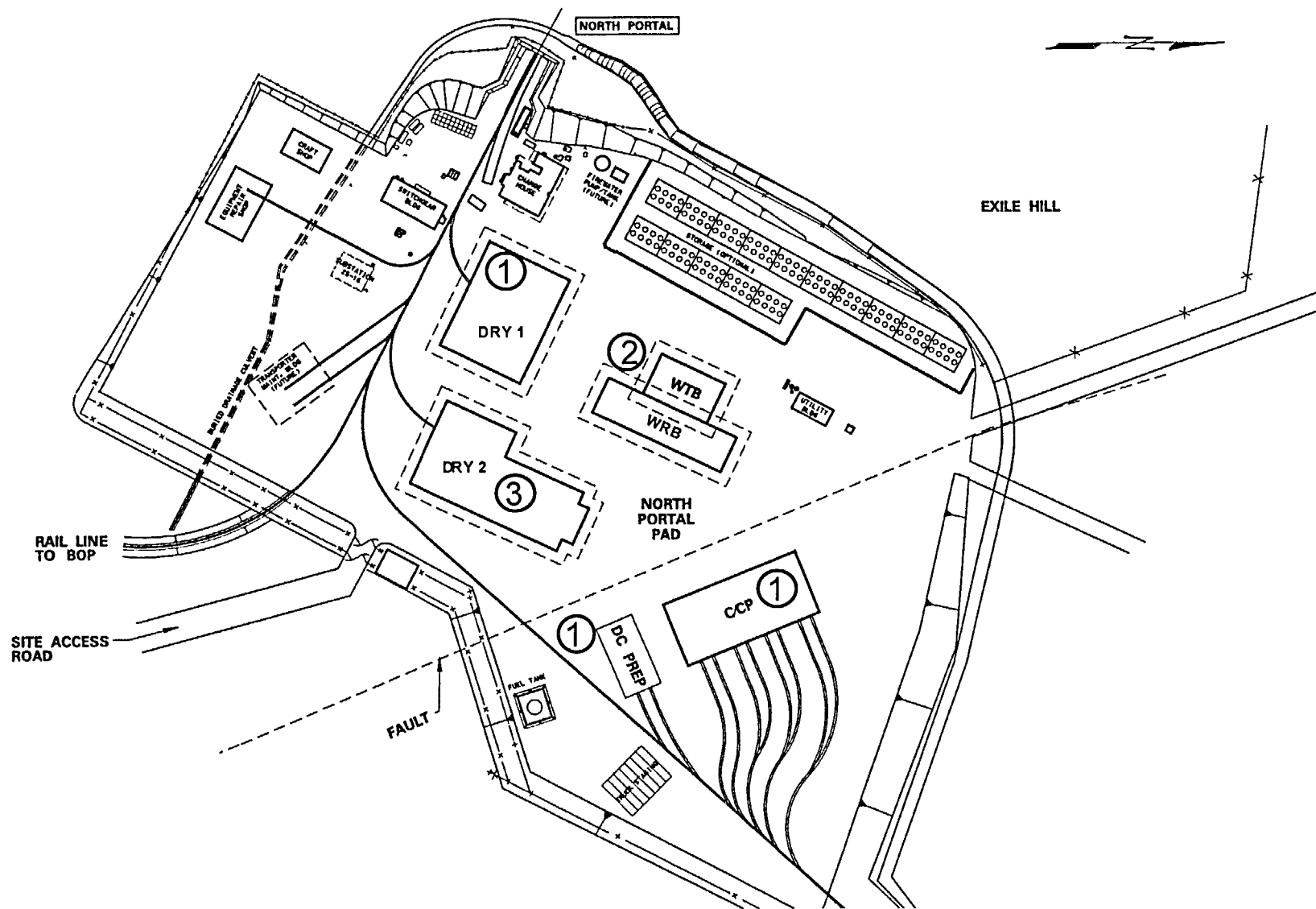
00011DC\_ATP\_Z1S22\_20a.cdr

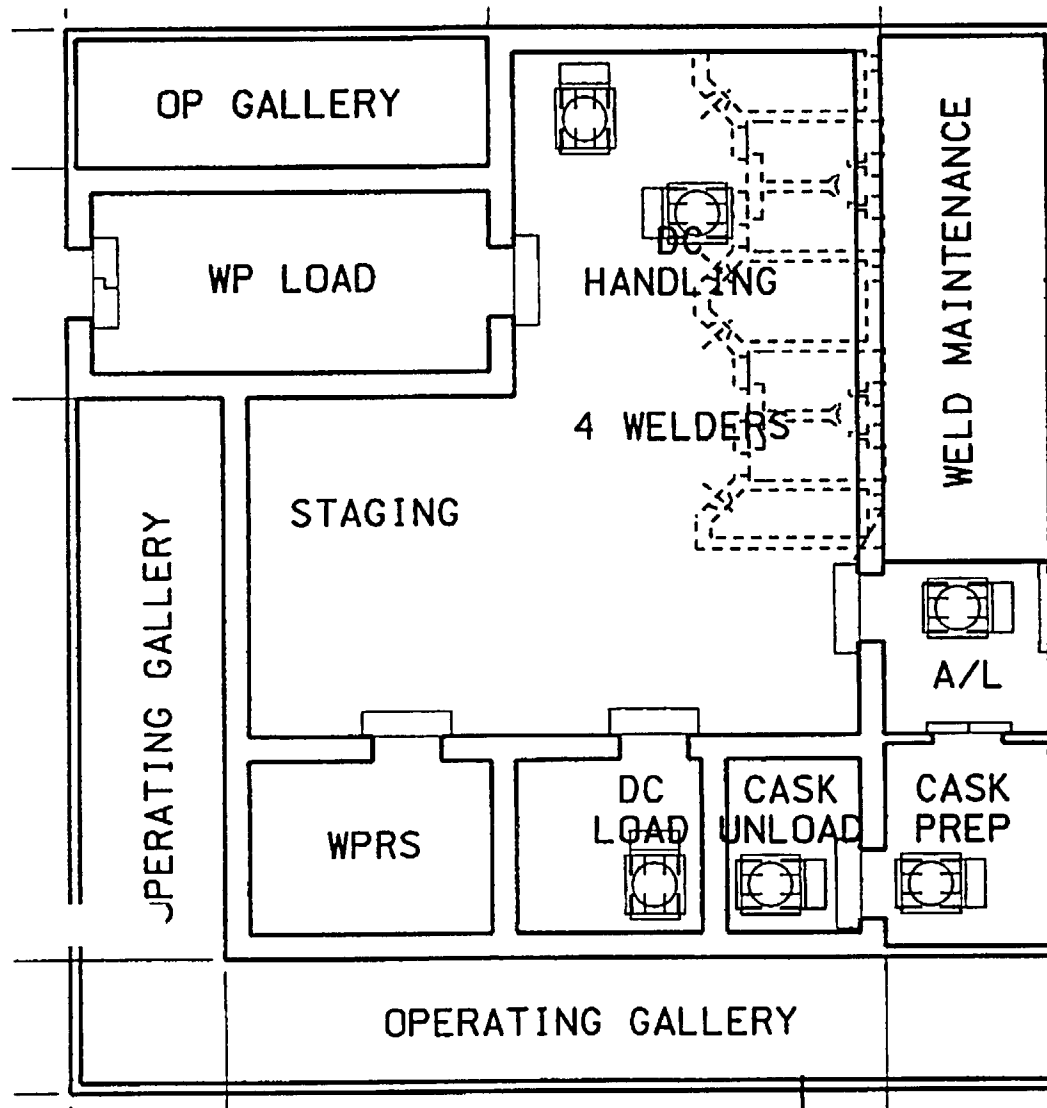




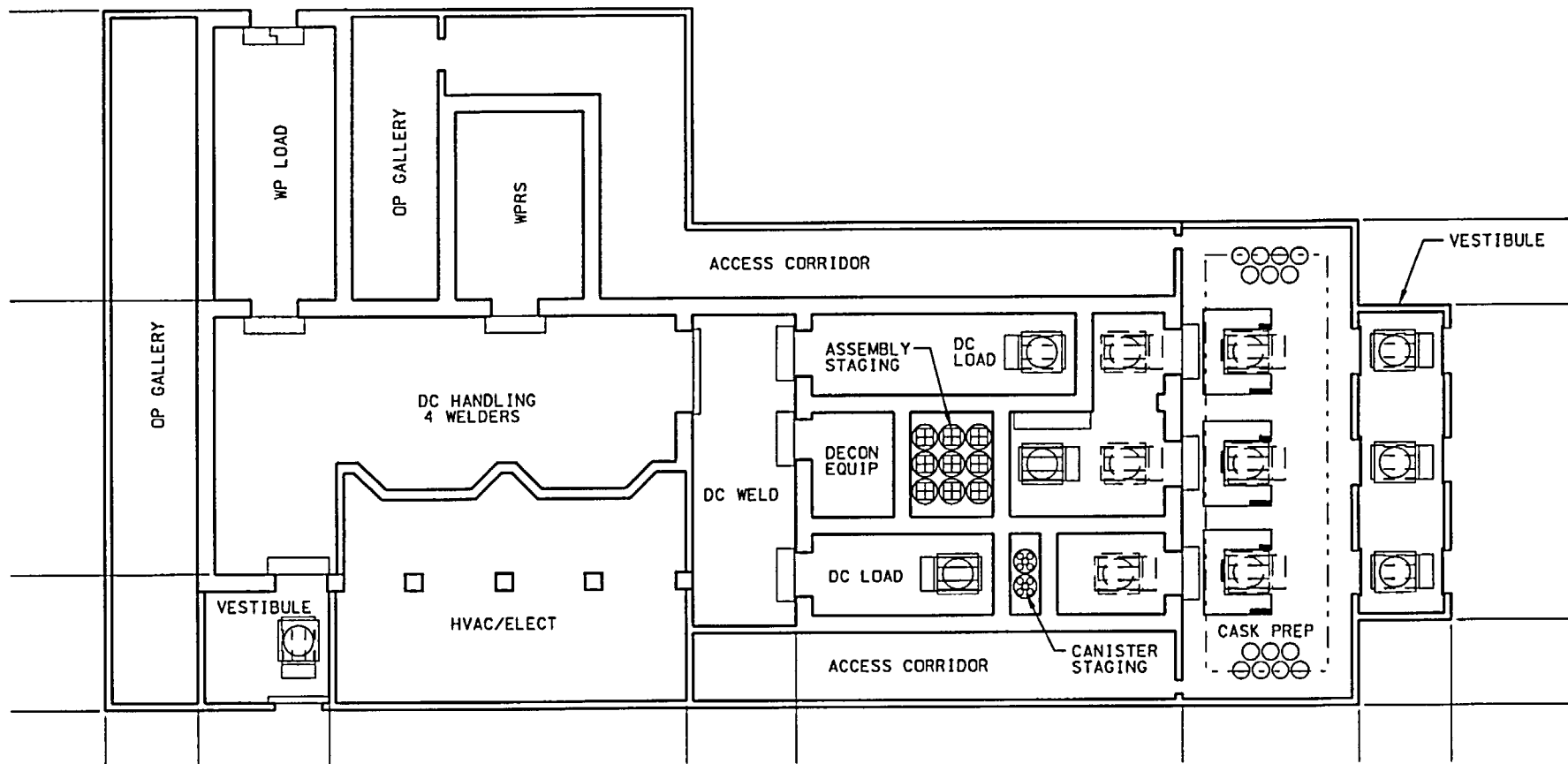
00011DC\_ATP\_Z1S22\_35.cdr



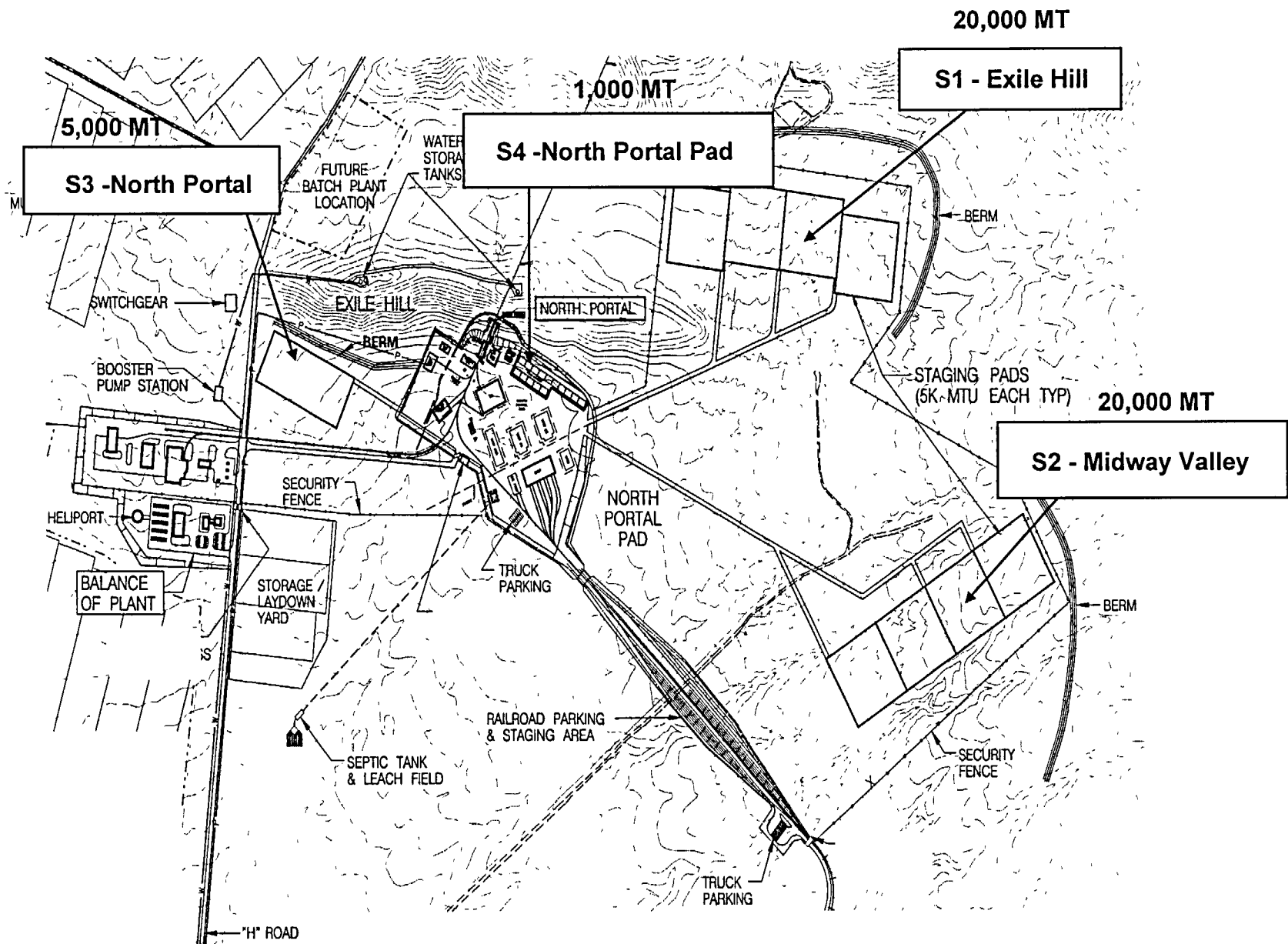




**Partial Capacity Finishing Building  
with Initial Processing (Dry 1)  
(Phase 1)**



**Partial Capacity Finishing Building  
with Dry Transfer Line (Dry 2)  
(Phase 3)**



## Potential Surface Aging Locations





U.S. Department of Energy  
Office of Civilian Radioactive Waste Management

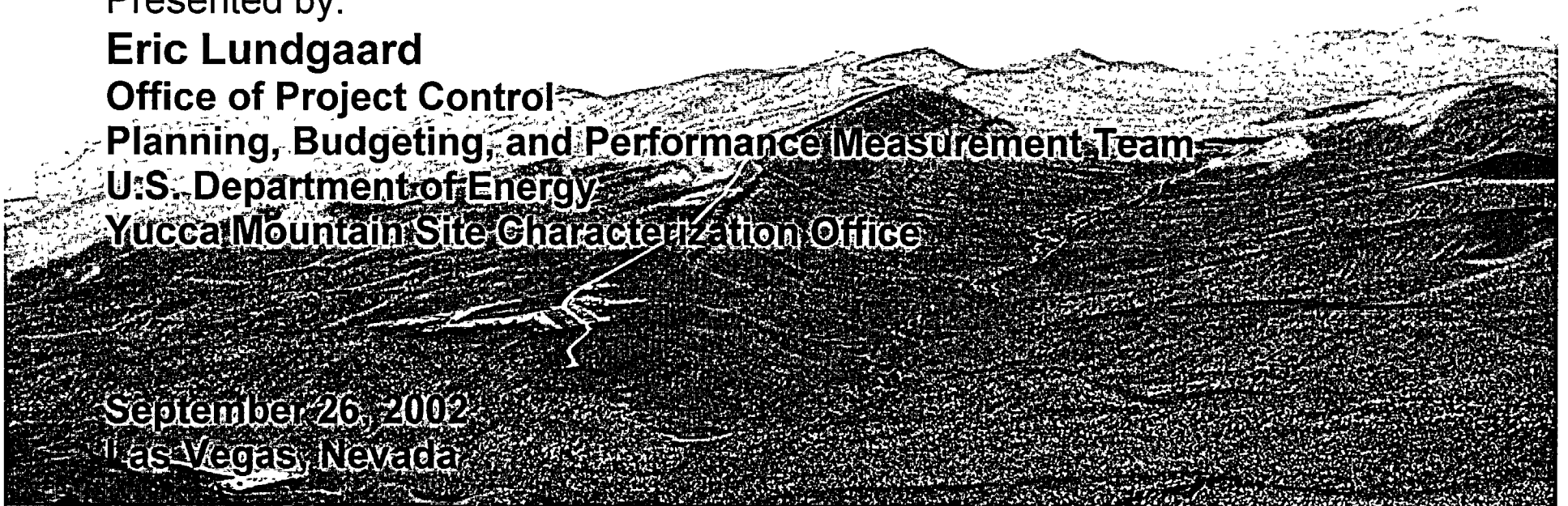


# Repository Baseline Update

Presented to:  
**Advisory Committee on Nuclear Waste**

Presented by:  
**Eric Lundgaard**  
Office of Project Control  
Planning, Budgeting, and Performance Measurement Team  
U.S. Department of Energy  
Yucca Mountain Site Characterization Office

September 26, 2002  
Las Vegas, Nevada



# Outline

- **Fiscal Year 2003 Budget Status**
- **Baseline Design Phase (Preliminary and Final)**
  - **Project Baseline Overview**
  - **Contractor's Proposed Approach to Emplacement in 2010**
  - **Contractor's Proposed Approach to Waste Receipt and Emplacement by Calendar Year 2010**
  - **Fiscal Year 2003 - 2008 Budget**





# Fiscal Year 2003 Budget Status

- **OCRWM initial request** **\$527 million**
- **OCRWM supplemental request** **\$66 million**
- **House of Representatives mark** **\$525 million**
- **Senate mark** **\$336 million**
- **Continuing Resolution pending conference committee action and Presidential approval**



# Project Baseline Overview

- **Baseline Change Proposal for design phase delivered September 3rd is under review**
- **License Application change from March 2002 to December 2004**
- **Waste Acceptance in 2010**



# **Contractor's Proposed Approach to Emplacement in 2010**

- **Strategy**

- A phased surface facility built over time in stages
- Initial receipt rate of 400 MTU per year
- Surface facility to “ramp up” to 3000 MTU per year over the 2010-2014 period
- Surface facility (and subsurface) can accommodate modifications as lessons learned are obtained from early operations
- No receipt waste characterization provisions in facility

# **Contractor's Proposed Approach to Emplacement in 2010**

(Continued)

- **Initial Operations**
  - Existing power supply adequate for initial operations (Panel 1)
  - Need additional capacity for full facility operation of Panel 2, etc.
  - Balance of Plant to be completed to support initial operations
  - Construction continues beyond initial operations

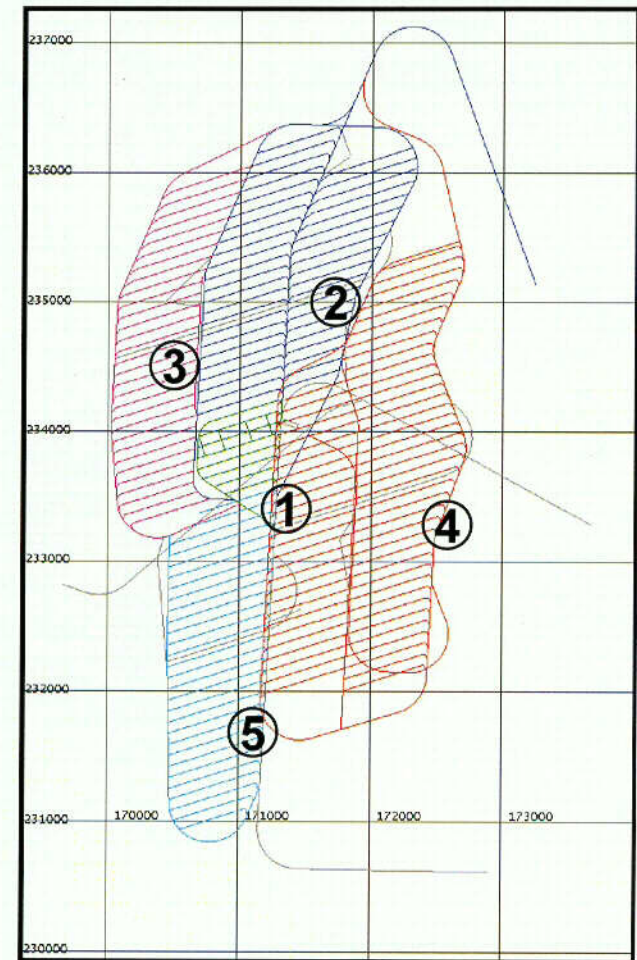


# Contractor's Proposed Approach to Emplacement in 2010

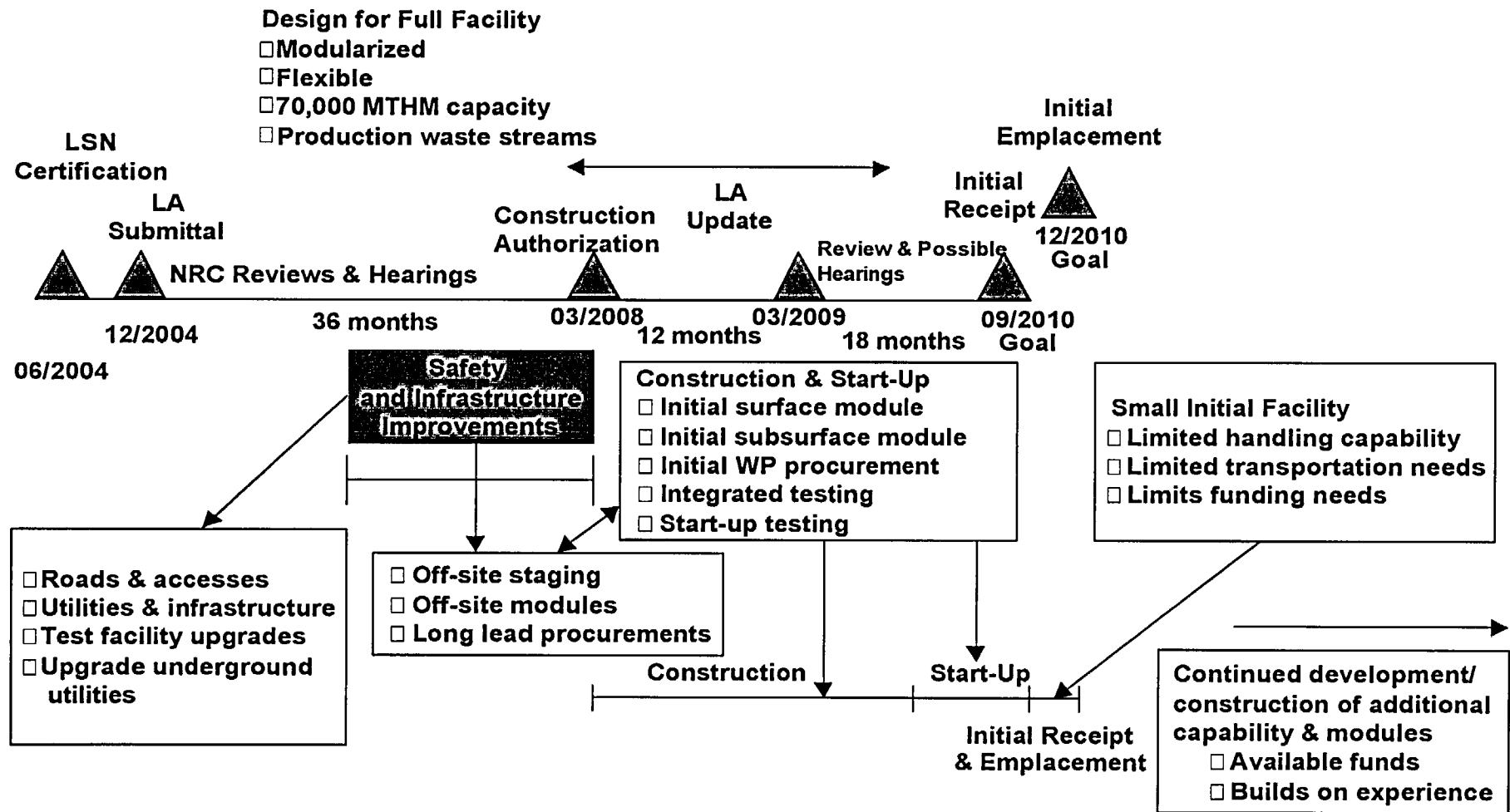
(Continued)

- **Underground**

- Located within the primary and lower blocks shown in the Final Environmental Impact Statement
- Modular panel layout
  - ♦ 5 panels developed independently and in sequence
- Utilizes Exploratory Studies Facility for construction of small initial emplacement Panel by 2010
- Construction schedule to first emplacement: ~28 months
- Eliminates need for total Perimeter Drift excavation prior to initial operations
- Requires third underground access



# Contractor's Proposed Approach to Waste Receipt and Emplacement by Calendar Year 2010



# Fiscal Year 2003 - 2008 Budget

<u>FY 2003</u>	<u>FY 2004</u>	<u>FY 2005</u>	<u>FY 2006</u>	<u>FY 2007</u>	<u>FY 2008</u>
\$593 million	\$610 million	\$1,118 million	\$1,260 million	\$1,101 million	\$1,645 million





U.S. Department of Energy  
Office of Civilian Radioactive Waste Management



# Yucca Mountain Project Plans

Presented to:  
**Advisory Committee on Nuclear Waste**

Presented by:  
**Joseph Ziegler**  
**Acting Assistant Manager for Licensing and Regulatory Compliance**  
**U.S. Department of Energy**  
**Yucca Mountain Site Characterization Office**

**September 26, 2002**  
**Las Vegas, Nevada**



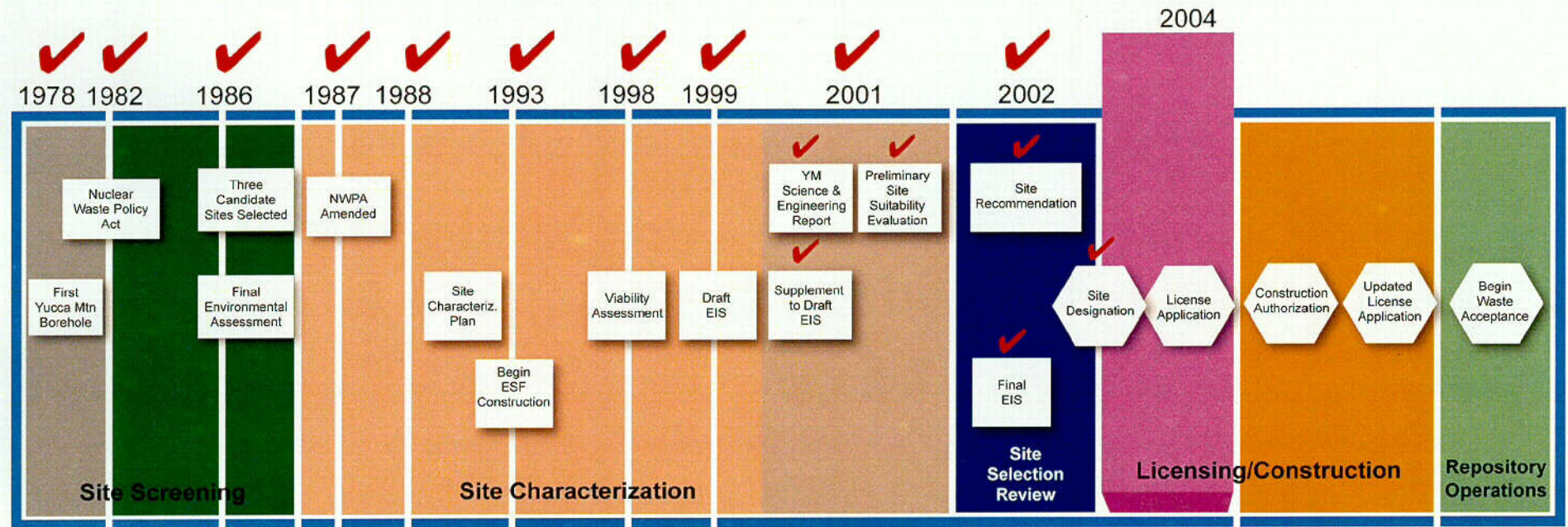


# Outline

- **Yucca Mountain Project Status**
- **Preliminary Design**
- **Preclosure Safety Analysis**
- **Total System Performance Assessment**
- **Summary**



# Yucca Mountain Project Status



Q:\Charts & Diagrams\Repository Milestones\Repository Milestones\_04-29-02.ai



C12

# **Yucca Mountain Project Status**

(Continued)

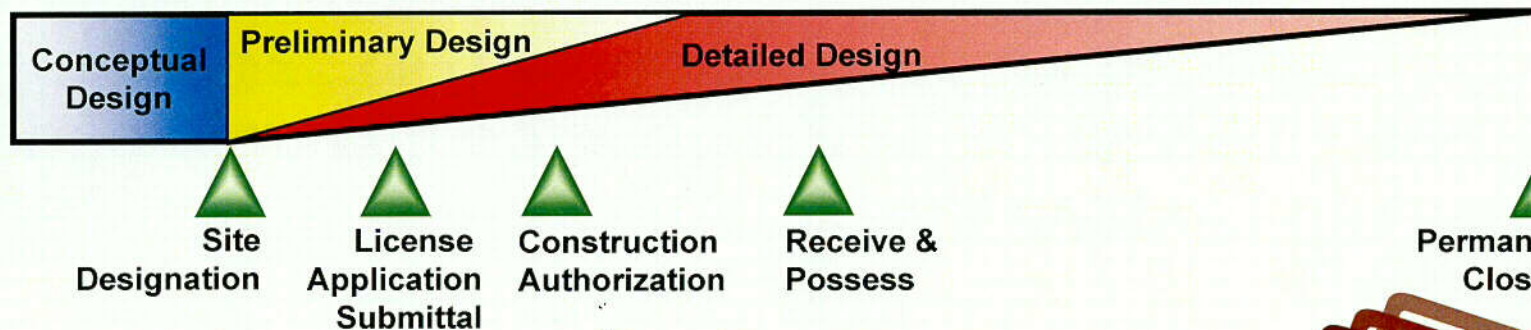
- **DOE's highest priority is protecting the health and safety of workers and the public, and protecting the environment**
  - **Instill a safety conscious culture across the Project**
  - **Develop a license application that successfully meets the Nuclear Regulatory Commission's requirements**
- **DOE plans to submit the license application to the NRC in December 2004**
  - **Programmatic sections of the license application currently in development**
- **Focus of technical work is on engineering and design, performance assessment, scientific activities, and continuing testing and performance confirmation**





# Preliminary Design

- Preliminary design at license application submittal will emphasize systems important to safety and waste isolation
  - Includes concept of operations that will be included in license application and provides a basis to safety analyses
  - Design will evolve and the level of detail will increase, as DOE learns more and adjusts to changes in our understanding of the systems
- Progress toward completion of the preliminary design will be tracked through interim design reviews



# Design Evolution

- The preliminary design that will support the license application will consist of additional detail and refinements to the design concept for Site Recommendation
- Final decisions and approvals of the license application design have not been made
- The license application design will be a refinement of the flexible design concept described in the site recommendation and the Environmental Impact Statement
- Environmental impact analyses are part of the evaluation and selection process for design changes





# Preclosure Safety Analysis

- **Preclosure safety analysis is a quantitative analysis of potential events during operations and their consequences (doses to workers and/or public)**
  - Start with descriptions of the site and design
  - Identify potential events and their probabilities of occurrence
  - Assess adequacy of facilities to perform as intended
  - Identify any limits on design or operations
  - Describe means to mitigate or prevent accidents
- **Preclosure safety analysis iterates with design to achieve preclosure performance objectives**
  - Provides mechanism to integrate design concepts and evaluate performance



# Total System Performance Assessment

- **Major elements in the development of Total System Performance Assessment - License Application**
  - Incorporate new scientific data and information
  - Qualify and validate Supplemental Science and Performance Analyses and Final Environmental Impact Statement models
  - Address NRC-DOE Key Technical Issue Agreement Items
  - Improve treatment of features, events, and processes, and scenario analyses
  - Perform licensing compliance analyses
    - ♦ Evaluate dose-based performance objectives
    - ♦ Demonstrate multiple barriers



# **Total System Performance Assessment**

(Continued)

- **Documentation milestones include**
  - **Total System Performance Assessment - License Application Methods and Approach Document (9/02)**
  - **Process Model and Abstraction Analysis and Modeling Reports (6/03)**
  - **Features, Events, and Processes Database for License Application (10/03)**
  - **Total System Performance Assessment - License Application Model Analysis and Modeling Report (12/03)**
  - **Total System Performance Assessment - License Application Analysis Report (5/04)**



# Summary

- **DOE has developed plans and schedules to submit a license application to NRC in December 2004**
- **Focus for License Application:**
  - **Progress toward completion of the preliminary design will be tracked through interim design reviews**
  - **Preclosure safety analysis will be developed iteratively with design**
  - **Total System Performance Assessment emphasis will be on enhancing confidence and adequately representing uncertainty**
  - **Continued science, testing, and performance confirmation will be managed in an integrated manner**

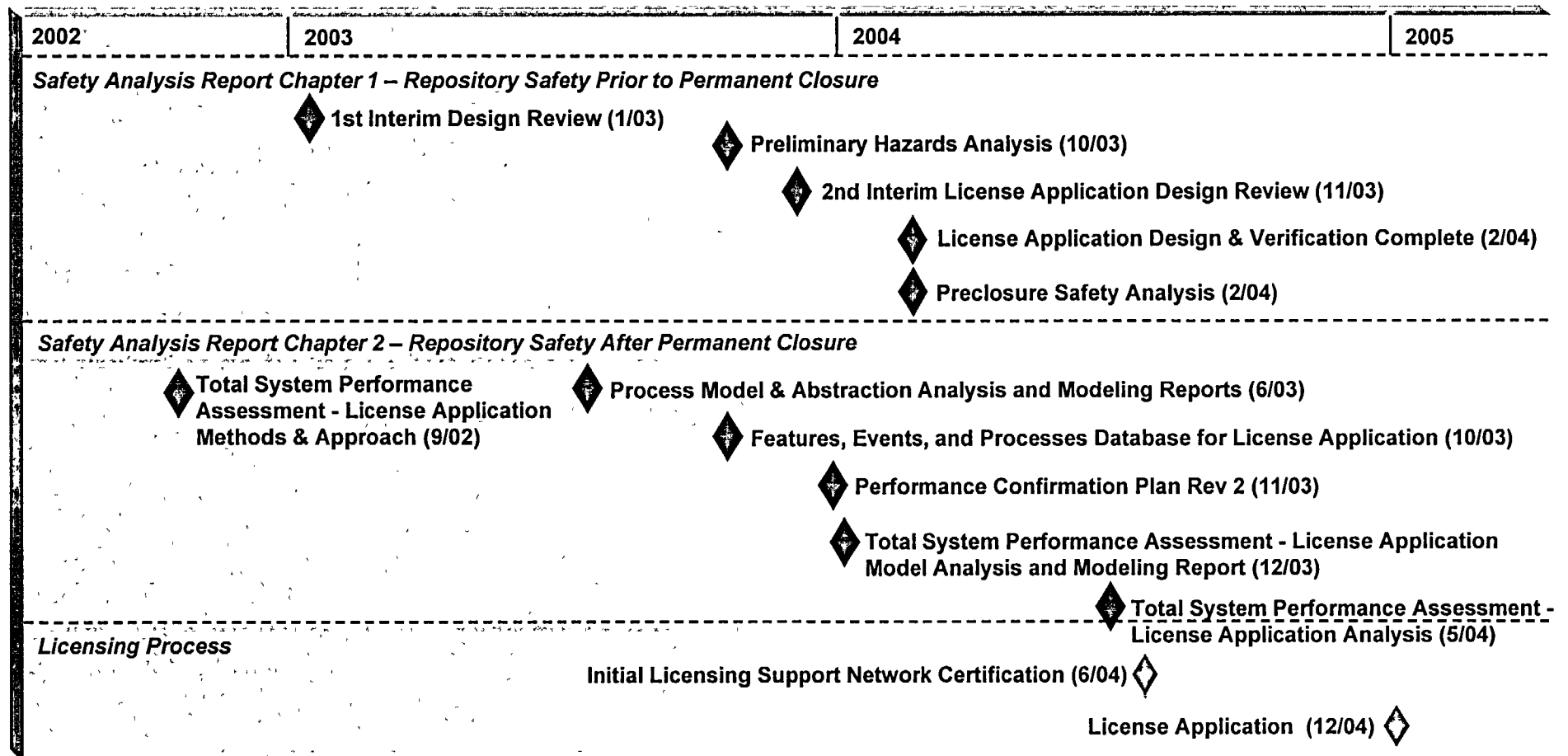


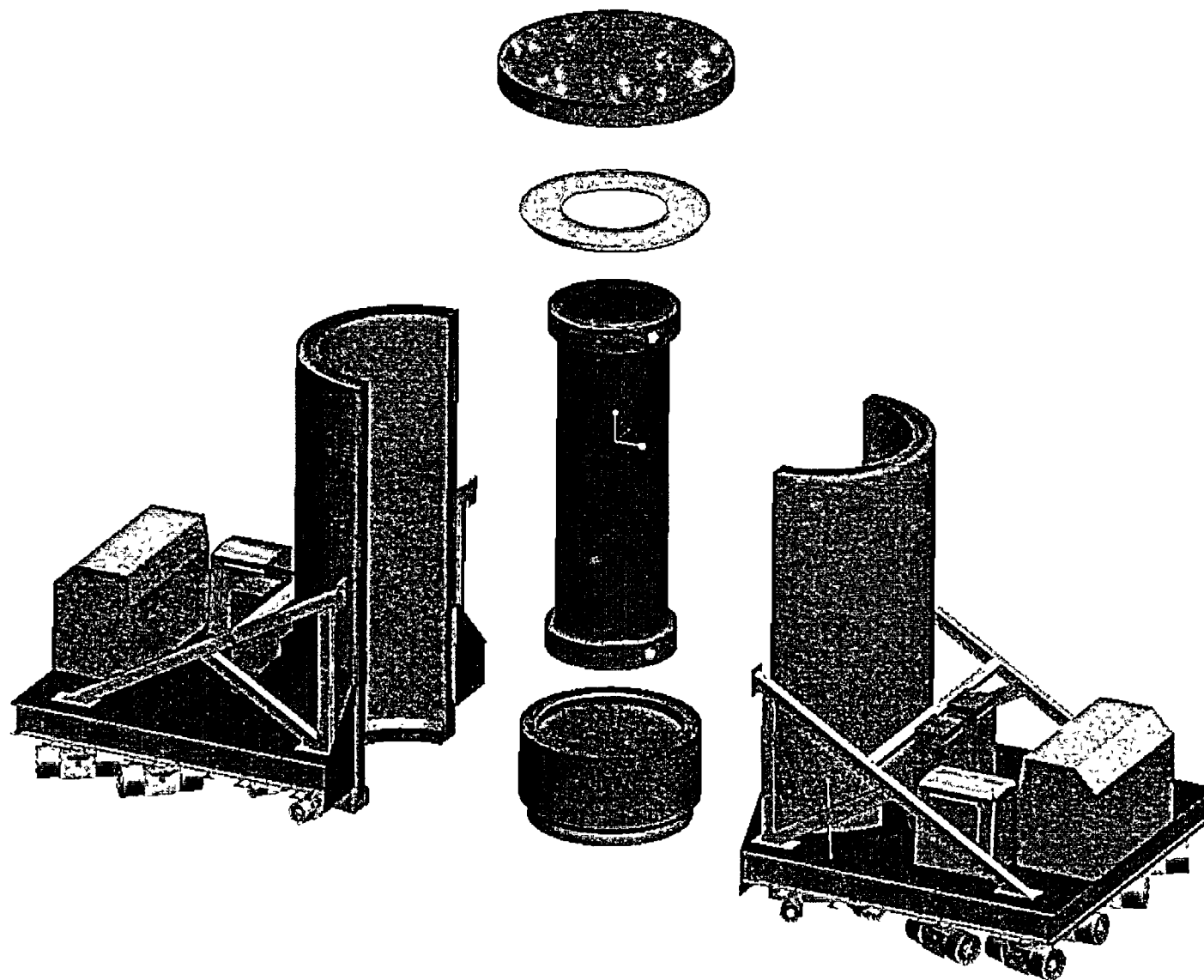
# Backup



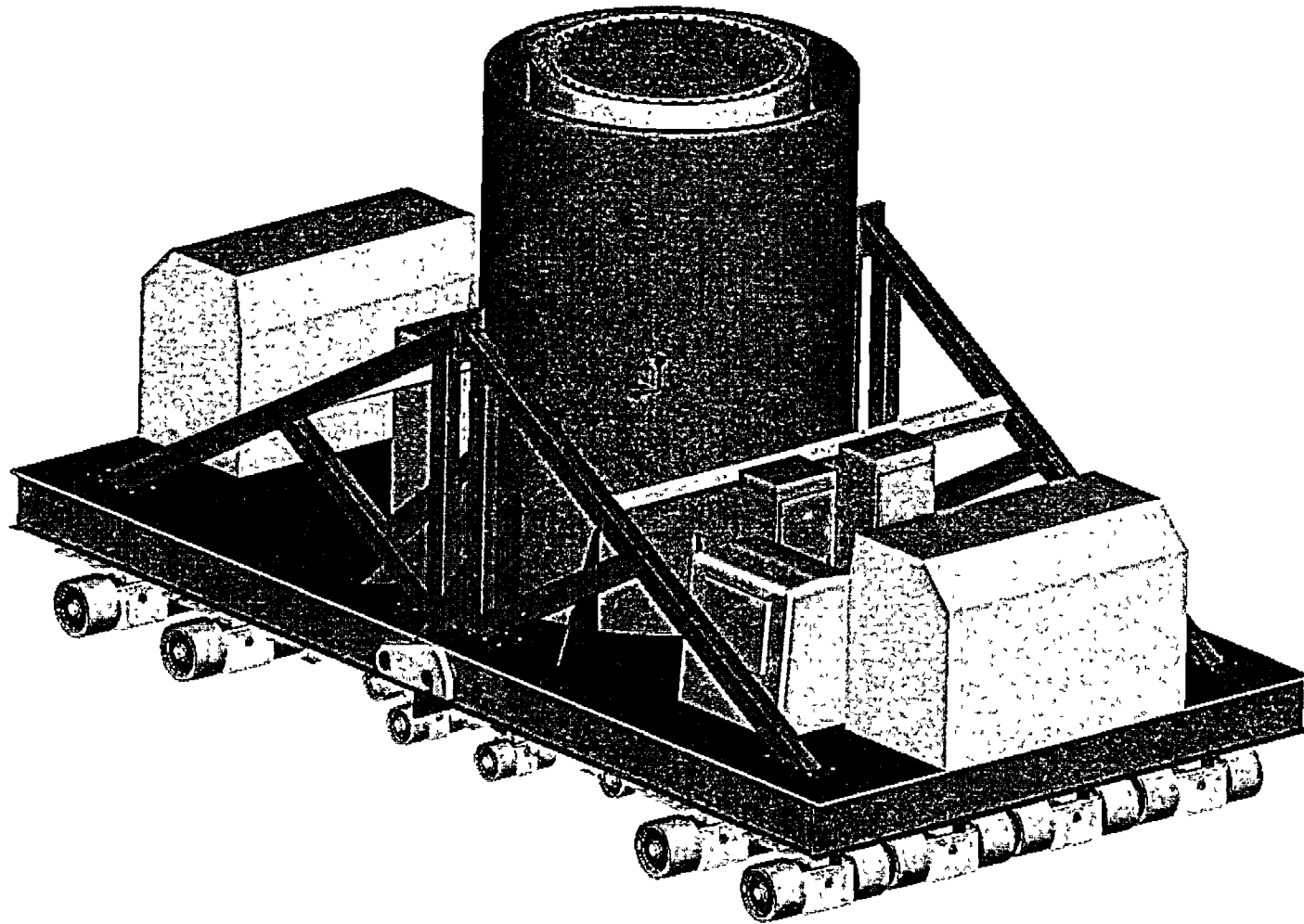


# Pre-Submittal Technical Products Schedule





Waste Package OLT



Cask OLT