



UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D.C. 20555-0001

March 14, 1998

Ronald A. Milner, Director
for Program Management and Integration
Office of Civilian Radioactive Waste Management
U.S. Department of Energy, RW 30
1000 Independence Avenue, S.W.
Washington, DC 20585

SUBJECT: MINUTES OF THE JANUARY 14, 1998, TECHNICAL EXCHANGE ON THE
VIABILITY ASSESSMENT

Dear Mr. Milner:

On January 14, 1998, a technical exchange was held between the staff of the U.S. Nuclear Regulatory Commission and representatives of the U.S. Department of Energy (DOE). The purpose of the meeting was for DOE to provide NRC staff with details of the purpose and content of its Viability Assessment documents. The agenda for the technical exchange is provided as Enclosure 1. The extensive viewgraphs presented by DOE are provided as Enclosure 2 and will constitute the minutes of the technical exchange. The meeting was a video conference between DOE headquarters in Washington, D.C., NRC headquarters in Rockville, Maryland, DOE office in Las Vegas, Nevada, and the Center for Nuclear Waste Regulatory Analysis in San Antonio, Texas. Other attendees at the technical exchange were representatives of the State of Nevada; Nye and Clark County, Nevada; Nevada Indian Environmental Coalition; United States Nuclear Waste Technical Review Board (NWTRB); and DOE contractors. A complete list of attendees is provided as Enclosure 3.

If you have any questions regarding this letter, please contact Sandra L. Wastler of my staff. Ms. Wastler can be reached at (301) 415-6724.

Sincerely,

Michael J. Bell, Chief
Performance Assessment and HLW
Integration Branch
Division of Waste Management
Office of Nuclear Material Safety
and Safeguards

Enclosures: As stated
FILED IN JACKET

cc: See attached list

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Letter to R: Milner from M. Bell dated: March 14, 1998

- cc: R. Loux, State of Nevada
 B. Price, Nevada Legislative Committee
 J. Meder, Nevada Legislative Counsel Bureau
 W. Barnes, YMPO
 C. Einberg, DOE/Wash, DC
 N. Slater, DOE/Wash, DC
 A. Brownstein, DOE/Wash, DC
 M. Murphy, Nye County, NV
 M. Baughman, Lincoln County, NV
 D. Bechtel, Clark County, NV
 D. Weigel, GAO
 P. Niedzielski-Eichner, Nye County, NV
 B. Mettam, Inyo County, CA
 V. Poe, Mineral County, NV
 W. Cameron, White Pine County, NV
 T. Manzeni, Lander County, NV
 L. Fiorenzi, Eureka County, NV
 J. Regan, Churchill County, NV
 L. Bradshaw, Nye County, NV
 W. Barnard, NWTRB
 R. Holden, NCAI
 A. Collins, NIEC
 S. Brocoum, YMPO
 R. Arnold, Pahrump County, NV
 N. Stellavato, Nye County, NV
 J. Lyznicky, AMA
 R. Clark, EPA
 F. Marcinowski
 A. Gil, YMPO
 R. Anderson, NEI
 C. Henkel, NEI
 S. Frishman, Agency for Nuclear Projects

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NAME	SWastler	MBell							
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Sincerely,

A handwritten signature in black ink that reads "Michael J. Bell".

Michael J. Bell, Chief
Performance Assessment and HLW
Integration Branch
Division of Waste Management
Office of Nuclear Material Safety
and Safeguards

Enclosures: As stated

cc: See attached list

R. Milner

- 2 -

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S. Frishman, Agency for Nuclear Projects

Enclosure 1

AGENDA

Technical Exchange on Viability Assessment Product: Introduction and Status
NRC Offices at White Flint with Video connection to YMSCO Hillshire Blue Room
January 14, 1998

Objectives:

- o review with the NRC the purpose of the Viability Assessment (VA) and the Appropriations Act
- o describe the scope and content of the VA product
- o describe the role of the VA in DOE's licensing program and NRC's role
- o describe the completion schedule and DOE's preliminary plans for distribution of the VA product
- o discuss future interactions on the VA

EST

10:00	Opening Remarks	DOE/NRC
10:15	NRC's Role in Viability Assessment	NRC (Bell)
10:45	Overview of Viability Assessment	DOE (Brocoum)
11:00	Introduction to Viability Assessment	DOE (Sullivan)
11:30	MGDS Cost Estimate	DOE (Brodsky)
12:00	Design	DOE(Harrington)
1:00-2:00	Break	
2:00	TSPA VA	DOE (VanLuik)
3:00	License Application Plan	DOE (Hanlon)
3:30	Site Description	DOE (Levich)
3:45	Regulatory Interactions on VA	DOE (Gil)
4:00	Summary of VA	DOE (Sullivan)
	Closing Remarks	ALL
	Adjourn	

Enclosure 2

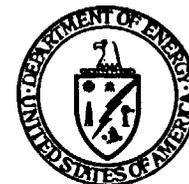
**YUCCA
MOUNTAIN
PROJECT**

DOE Overview

**NRC/DOE Technical Exchange
on the Viability Assessment**

**Presented by:
Stephan J. Brocoum
Assistant Manager for Licensing
Yucca Mountain Site Characterization Office**

January 14, 1998



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

Background

- **The Energy and Water Development Appropriations Acts of 1997 directed DOE to prepare and submit a viability assessment (VA) by September 1998.**
- **The Program's principal objectives for the Yucca Mountain Project for 1998 are to:**
 - **prepare the VA and supporting documentation**
 - **prepare groundwork for a complete LA**
 - **continue site investigations and design activities leading to resolution of technical issues including the NRC's KTIs**

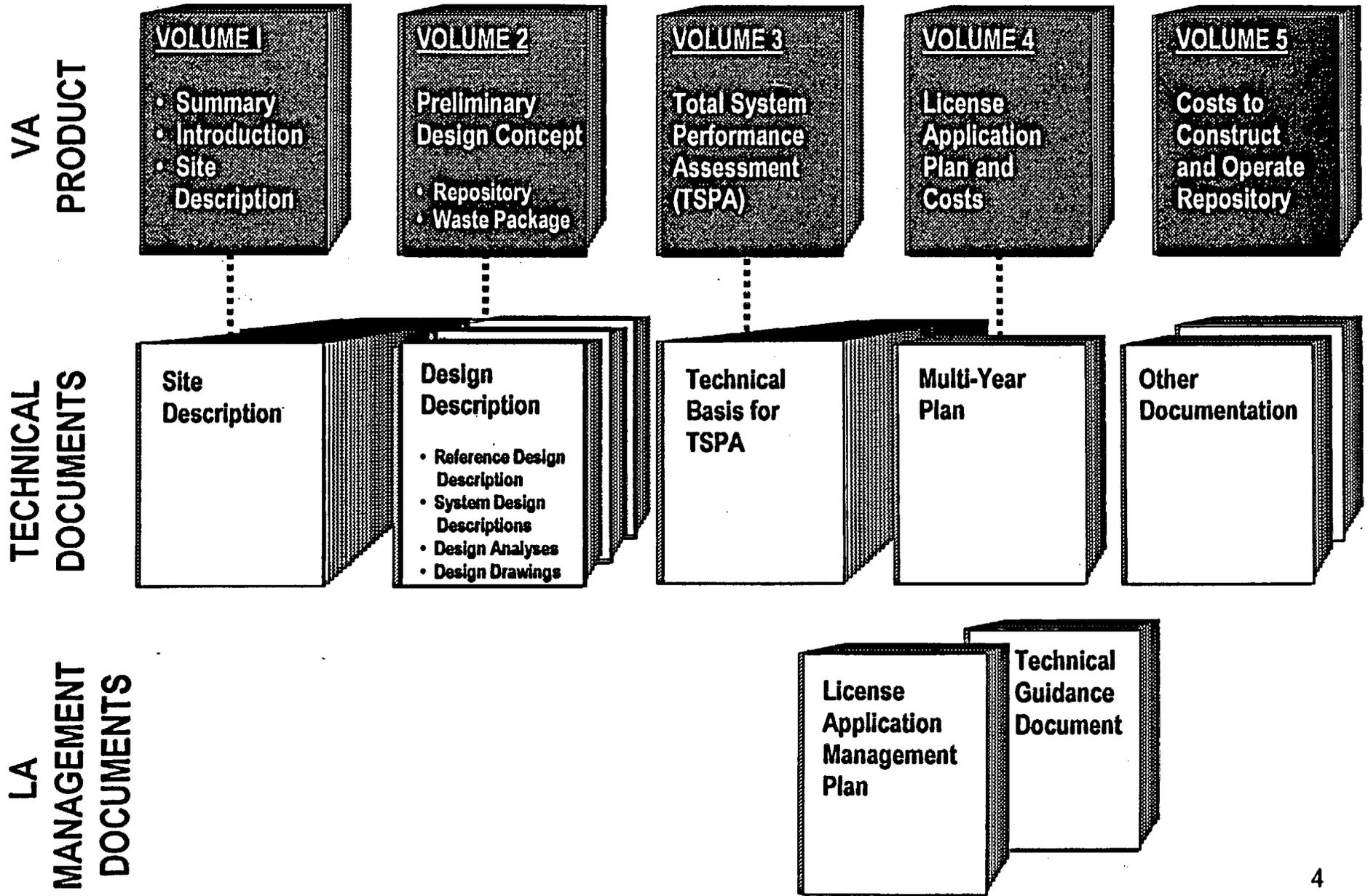


Background (Cont'd)

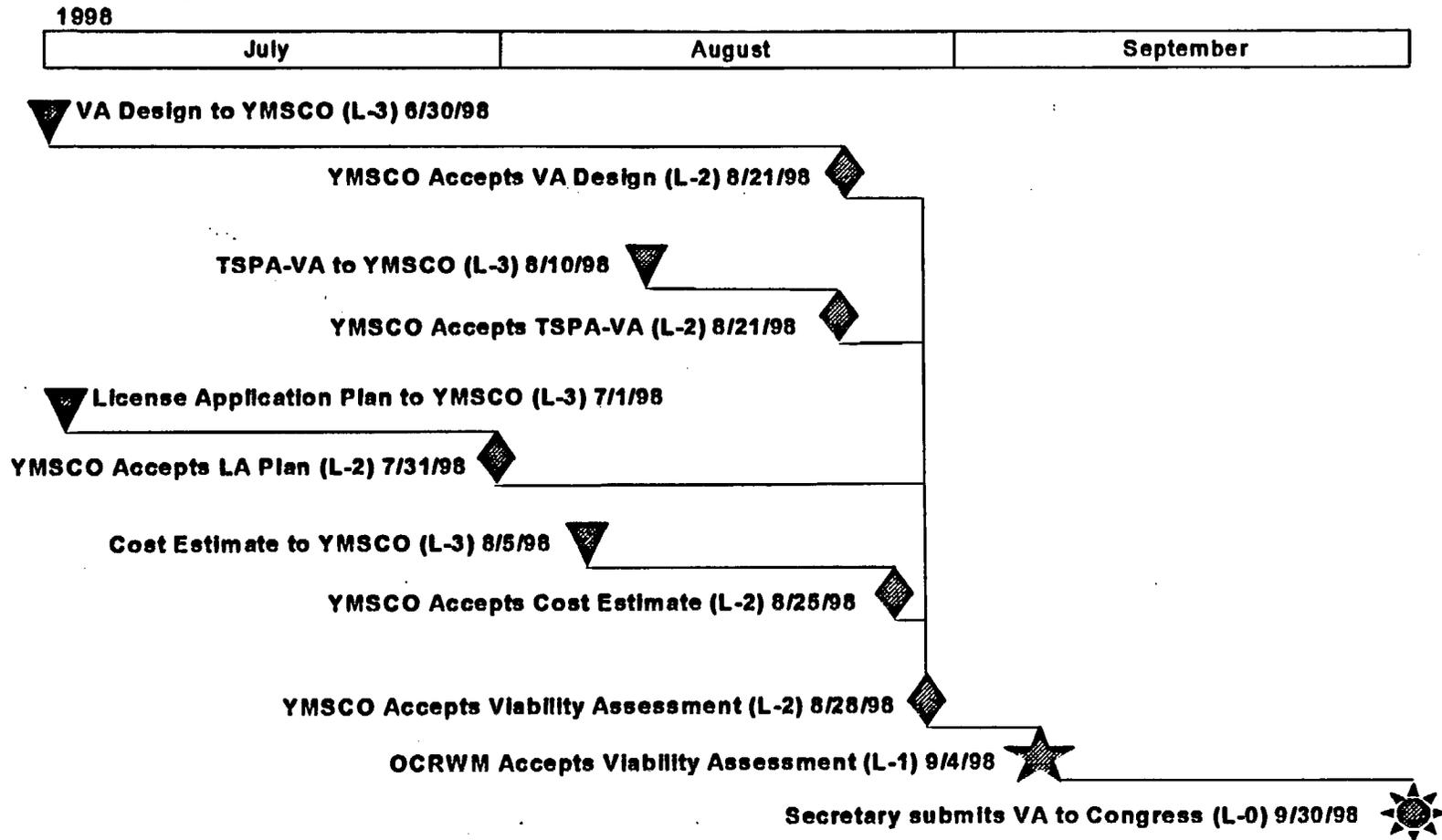
- **The VA will provide a basis for making an informed assessment of the feasibility to proceed with the process of licensing and constructing a repository at Yucca Mountain based on a current understanding of:**
 - **a preliminary design concept**
 - **system performance**
 - **a plan leading to LA**
 - **cost to develop and operate a repository**



PROGRAM DOCUMENTATION



Summary Schedule for Completion of the Viability Assessment



Managing the Viability Assessment (VA)

- **Overall responsibility for the VA lies with the YMSCO**
- **Major policy issues are the responsibility of RW-1**
- **Management groups have been chartered to ensure that:**
 - **timely decisions are made on key VA issues and policies**
 - **decisions and policies are adequately documented**
 - **decisions are immediately communicated to line and VA product managers**

VA Management Teams

- **Management Teams specified in the Charter have been assembled and are operational, they consist of:**
 - **Program Review Group (PRG)**
 - **Viability Assessment Integration Group (VAIG) and subgroups**
 - **VA (Product) Teams**
 - **VA External Parties Information and Outreach Working Group**



VA Management Groups

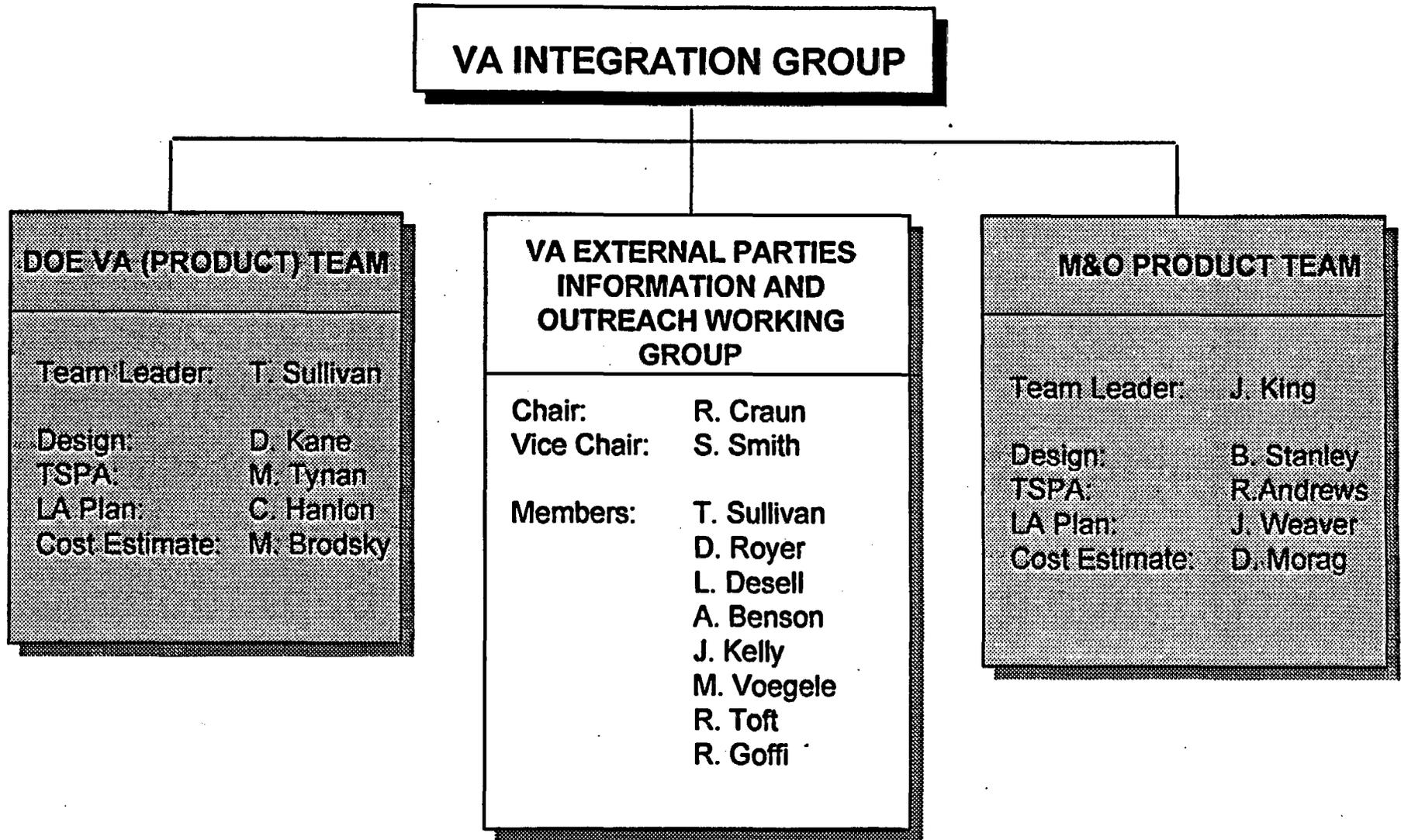
PROGRAM REVIEW GROUP

Chairman: L. Barrett
Members: R. Dyer
D. Shelor
S. Brocoum
R. Strickler
C. Metzger
Secretary: L. Desell

VA INTEGRATION GROUP

Chairman: S. Brocoum
Members: R. Craun
T. Sullivan
D. Foust
G. Vawter
M. Voegele
M. Lugo
M. Cline
Secretary: D. Royer

Management Groups Supporting VAIG



NRC Interactions

- **To assure that the NRC has the opportunity to gain a full understanding of the VA and its supporting documents, we intend to continue regular interactions with a focus on:**
 - **informing the NRC on results of analyses related to the TSPA VA**
 - **addressing technical issues, including KTI's, as they relate to the elements of the VA**
 - **informing the NRC of DOE's licensing approach as described in the LA Plan**
- **We are providing a list of supporting documents with availability dates.**



Maintain Progress Toward LA

- **The goal of submitting a timely and docketable LA in 2002 remains the overall focus of the Program.**
- **The site investigations and design activities used for the VA are an integral part of the process leading to a site recommendation and license application.**
- **Many of the technical issues being addressed for the VA encompass the NRC's KTIs.**
- **Recent correspondence from the NRC clearly indicates progress has been made toward resolution of technical issues and the overall Program goal.**



Perspective

- **The VA addresses the feasibility of proceeding forward with the repository program at Yucca Mountain, it is a “snap shot” in time.**
- **The VA design and TSPA will continue to be developed as we proceed toward site recommendation and LA.**
- **The LA Plan is the roadmap for the Program’s achievement of a timely and docketable LA.**



Summary

- **Our goal for this and subsequent interactions in 1998 is to provide a basis for the NRC to develop a full understanding of the VA and its supporting documentation.**
- **As a result of these interactions, our goal is to reach a common understanding of the VA objectives and content.**

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MOUNTAIN
PROJECT**

Studies

Viability Assessment Introduction

**Presented to:
DOE/NRC Technical Exchange
on Viability Assessment**

**Presented by:
J. Timothy Sullivan
Viability Assessment Team Leader
Yucca Mountain Site Characterization Office**

January 14, 1998



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

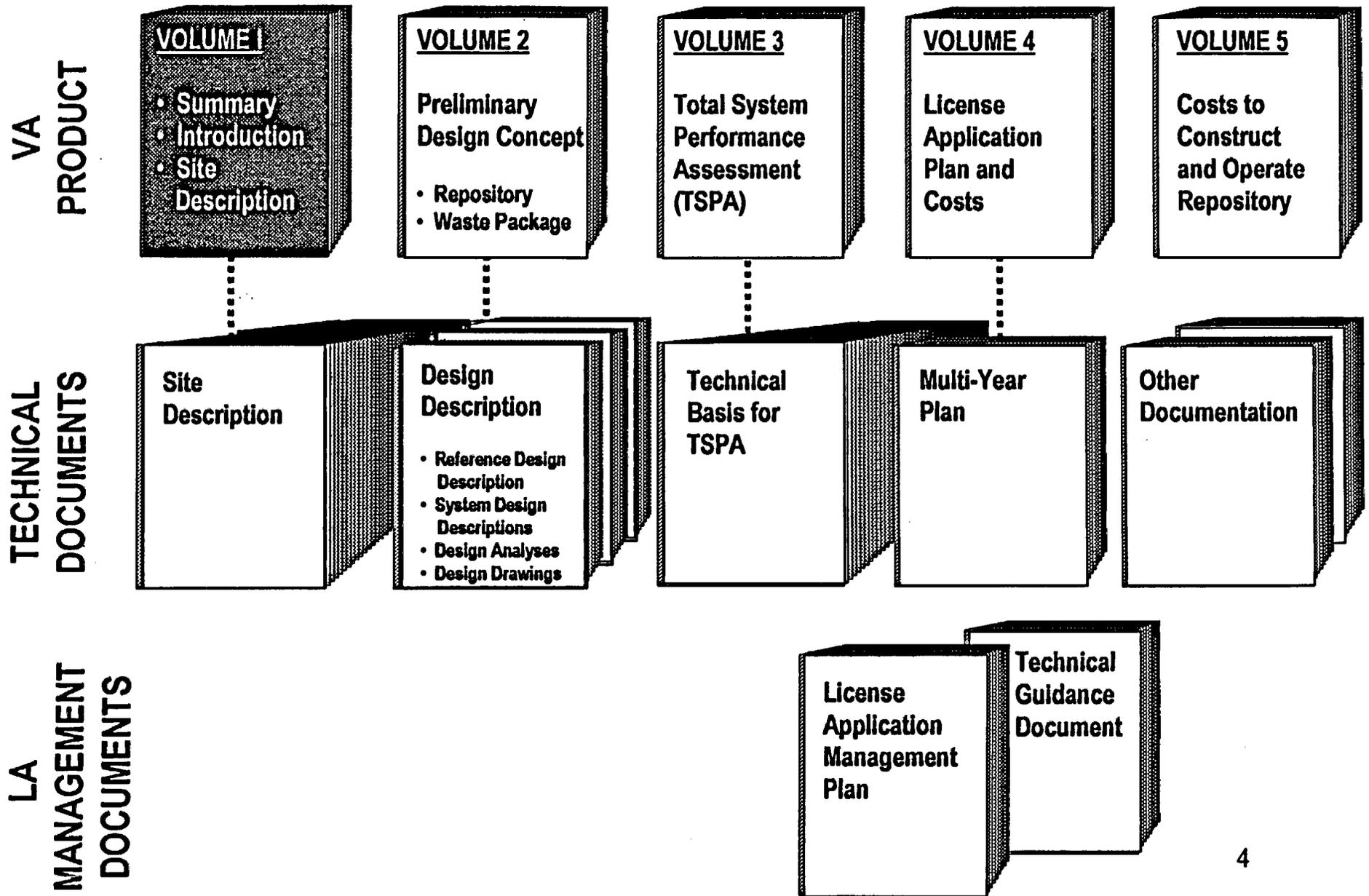
VA PRODUCT

- VA is a DOE document containing 5 volumes
 - I Introduction
 - II VA Design
 - III Total System Performance Assessment - VA
 - IV License Application Plan
 - V Cost from License Application to Decommissioning

VA PRODUCT (Cont'd.)

- **Total length of the Congressional submittal is estimated to be about 1,000 pages**
- **It is a technical report: target audience is Administration, Congress, and Congressional staff**
- **Detailed outline nearing completion**

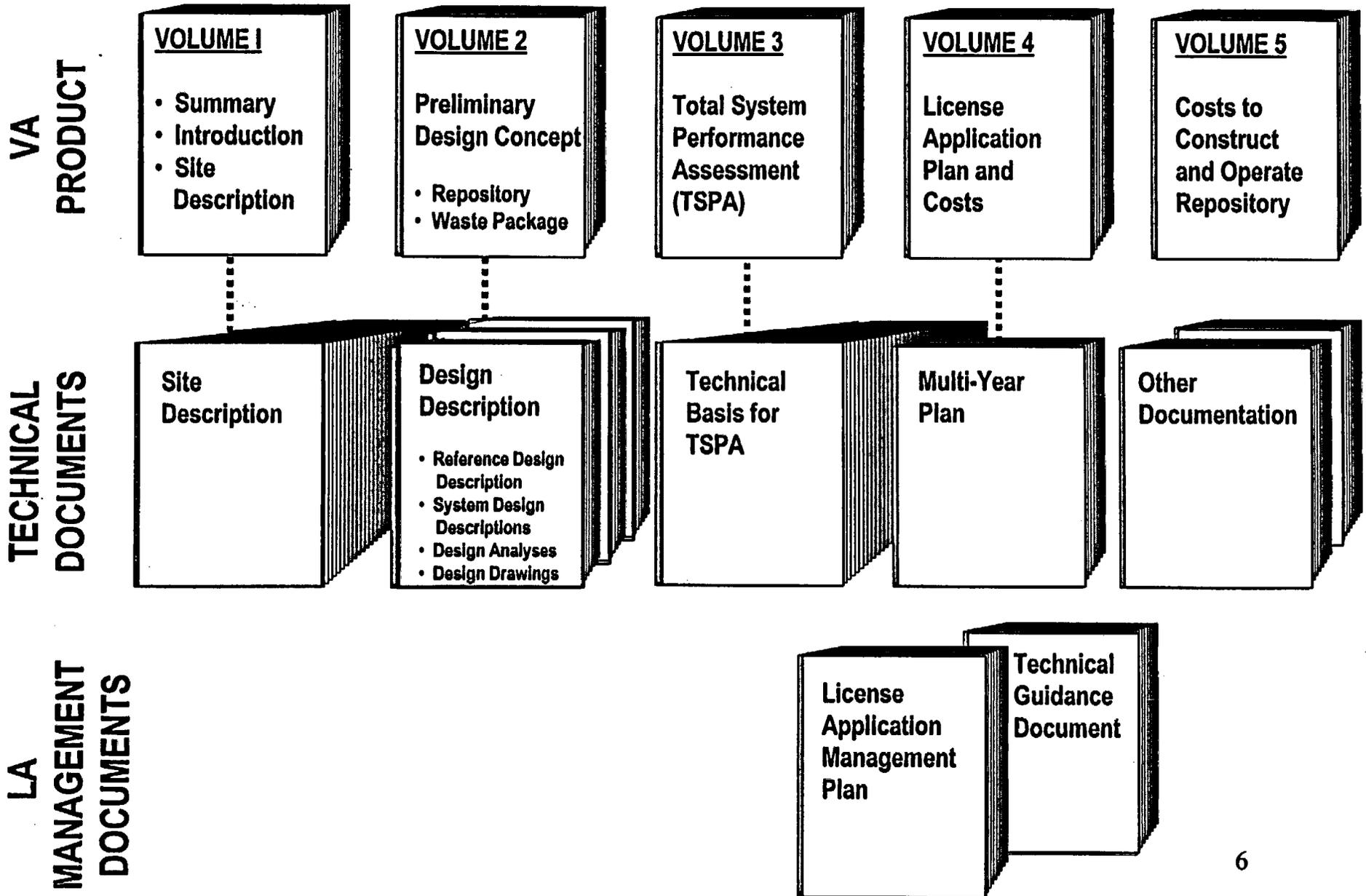
PROGRAM DOCUMENTATION



VOLUME 1 INTRODUCTION

- **Background Information**
- **Site Description - geologic setting and natural system process description**
- **Organizing principles for VA Product**
 - **Repository Safety Strategy**
 - **Critical Development Areas from TSPA-VA**
 - **Information for repository safety case**

PROGRAM DOCUMENTATION



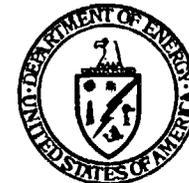
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Studies

**Volume 5
Viability Assessment Cost Estimate**

**Presented to:
Nuclear Regulatory Commission**

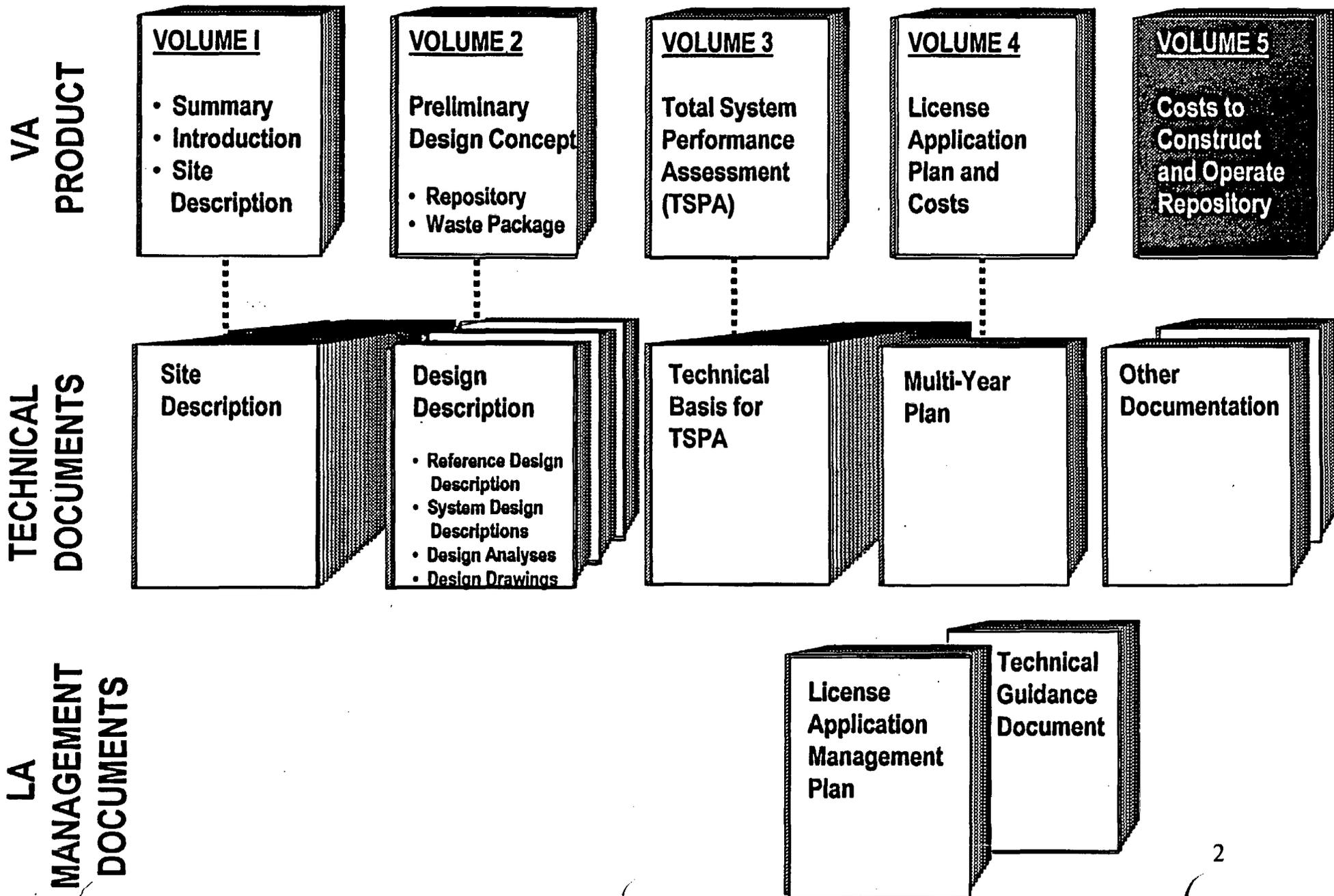
**Presented by:
Mitchell G. Brodsky
Viability Assessment Team
Yucca Mountain Site Characterization Office**



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

January 14, 1998

PROGRAM DOCUMENTATION



OUTLINE

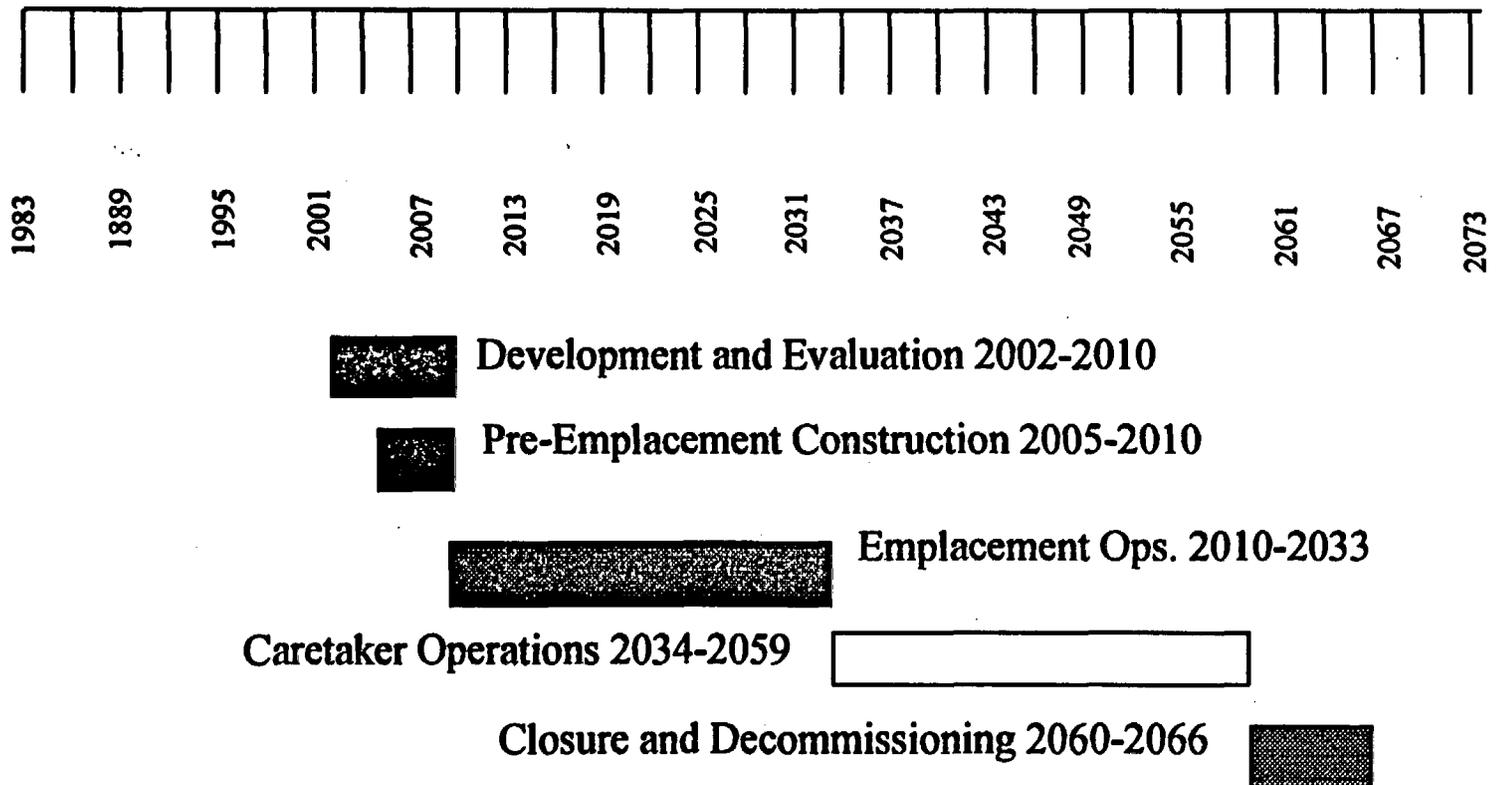
- **MGDS-VA Cost Estimate - Purpose**
- **VA Cost Estimate - Phases**
- **MGDS-VA Cost Estimate - Elements**
- **Other Cost Estimates**
- **Independent MGDS-VA Cost Reviews**
- **MGDS-VA Cost Estimate - Milestones**

MGDS-VA COST ESTIMATE PURPOSE

- **Required by the Energy and Water Development Appropriation Bill, 1997**
- **Provides the cost to build, operate and close the VA reference repository design**
- **Used as a basis for preparing program cost estimates**
- **Supports project trade and optimization studies**

VA COST ESTIMATE - PHASES

98 MGDS-VA Cost Estimate



MGDS-VA COST ESTIMATE ELEMENTS

- **MGDS development and evaluation (D&E)
Costs**
- **Capital and Operating Costs**
 - **Surface facilities**
 - **Subsurface facilities**
 - **Disposal containers**
 - **Performance confirmation**
 - **Nevada transportation**

OTHER COST ESTIMATES

(Not Made Part MGDS-VA Cost Estimate)

- **Some cost are covered elsewhere and will not be part of the MGDS-VA Cost Estimate**
 - **Historical MGDS D&E costs (i.e., costs prior to 1998)**
 - **License application cost (i.e., costs 10/98 - 3/02)**
 - **Program costs (e.g., waste acceptance, storage, Regional Servicing Contractor concept, others)**

INDEPENDENT MGDS-VA COST REVIEWS

- **Third Party External Review Team**
 - **Performed by team of experienced cost professionals from Foster Wheeler under contract to DOE-FM**
 - **Review includes evaluation of estimate segments**
 - **Assumptions (started 10/97)**
 - **Waste Package (begin 1/98)**
 - **D&E - Multi-year Segments(begin 2/98)**
 - **Repository and O&M (begin 4/98)**
 - **Final Report (draft 6/98)**

INDEPENDENT MGDS-VA COST REVIEWS (Cont.)

- **Other Independent YMP Reviews**
 - **Multi-year planning January - February 1998**
 - **MGDS estimate April 1998 and July 1998**



MGDS-VA COST ESTIMATE MILESTONES

- **Cost Analysis Report - VA Assumptions - 9/97**
- **Kickoff External Review - 10/97**
- **Waste Package Cost - 12/97**
- **Design Freeze (for cost) - 2/98**
- **MYP D&E Costs - 2/98**
- **Construction and Operations Costs - 3/98**
- **External Review Complete - 6/98**
- **VA Cost Document Draft - 7/98**
- **VA Document Issuance - 9/98**

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Studies

Volume 2
Viability Assessment Design

Presented to:
DOE/NRC Technical Exchange
on Viability Assessment

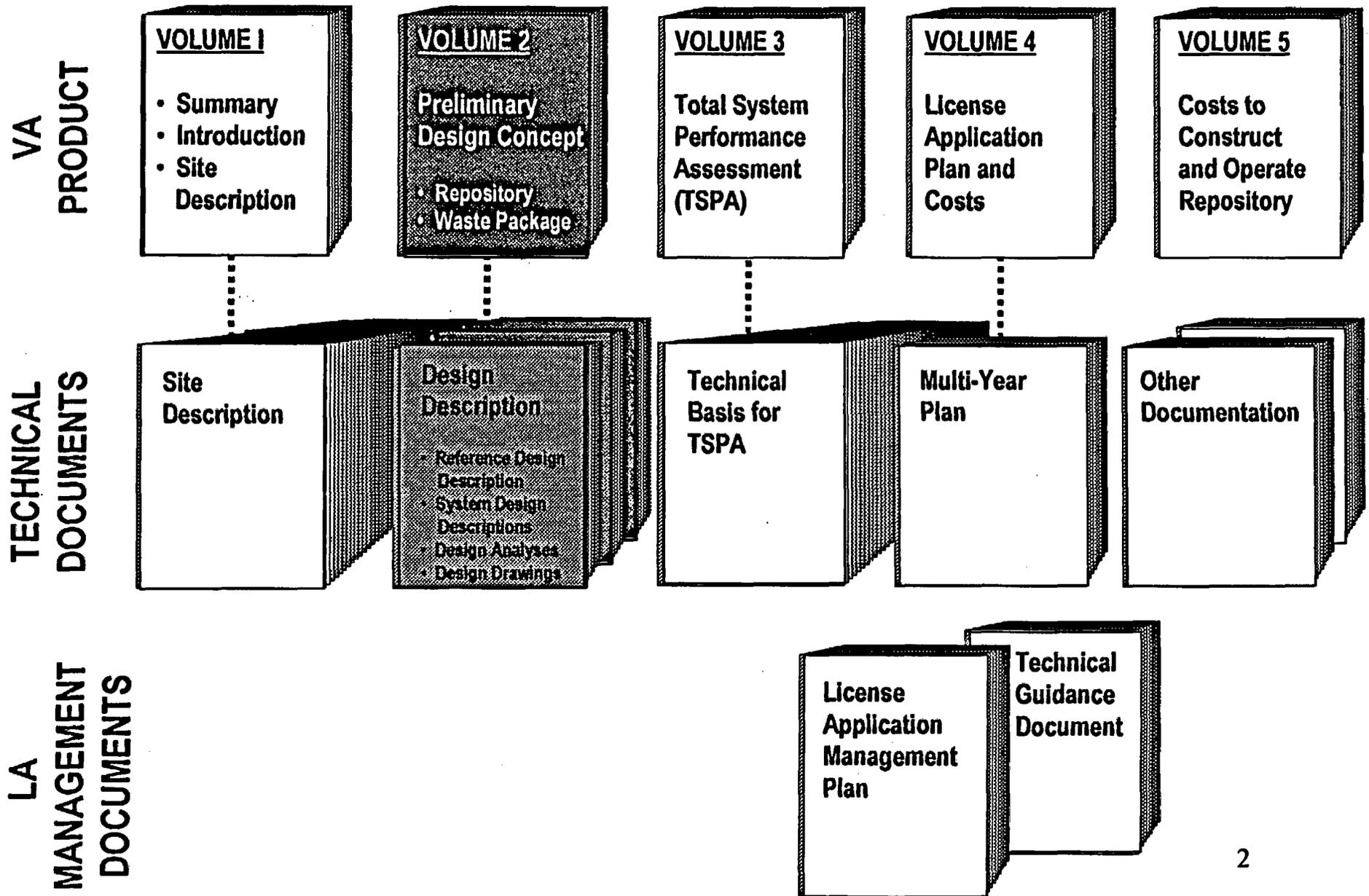
Presented by:
Paul Harrington
Design Team Leader
Yucca Mountain Site Characterization Office

January 14, 1997



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

PROGRAM DOCUMENTATION



OUTLINE

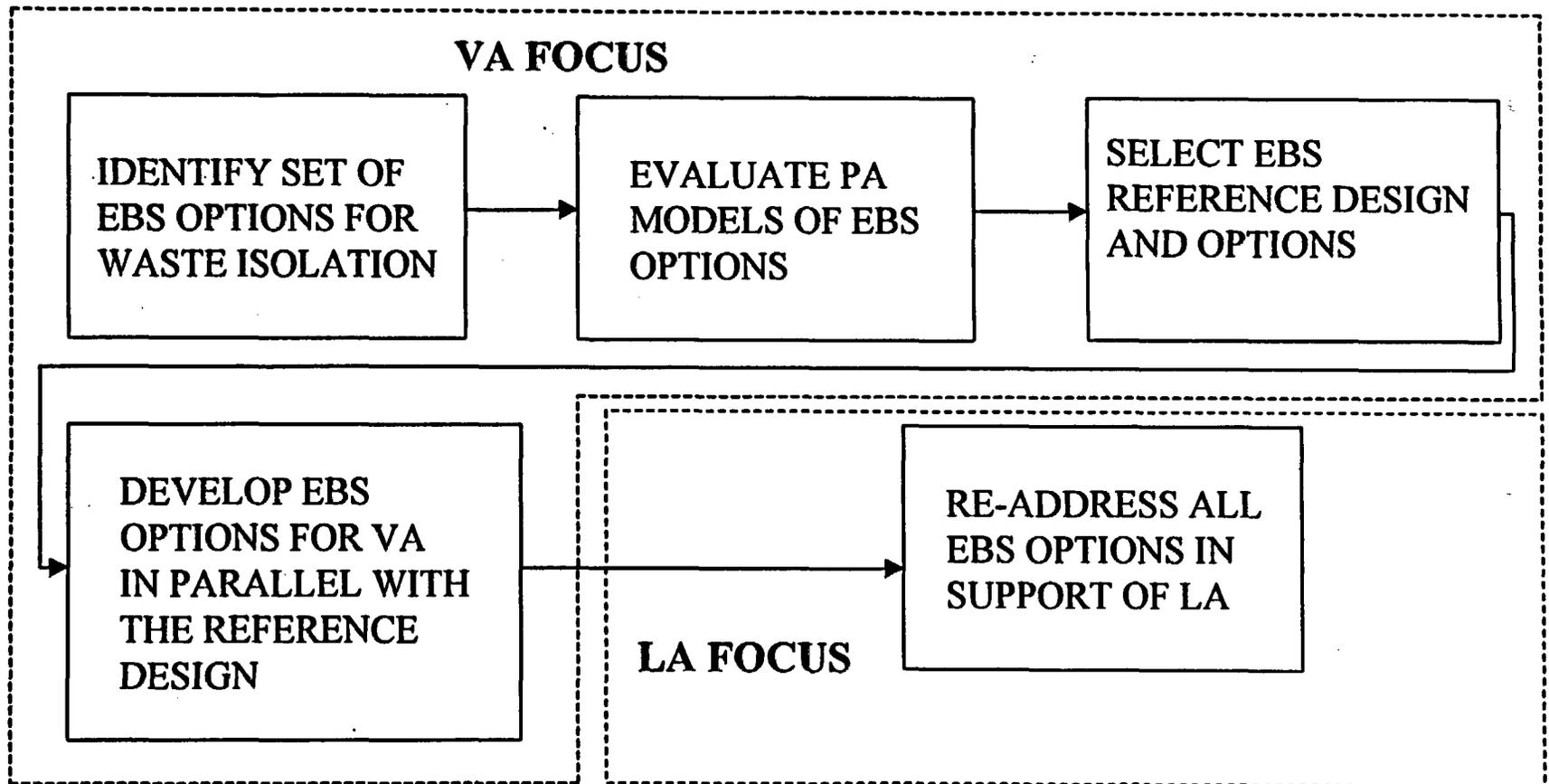
- **Design basis**
- **Design inputs from site description and site data**
- **Design of surface and subsurface facilities and EBS**
- **Construction and operations concepts**
- **Design options and flexibility**
- **VA design issues**



OVERVIEW

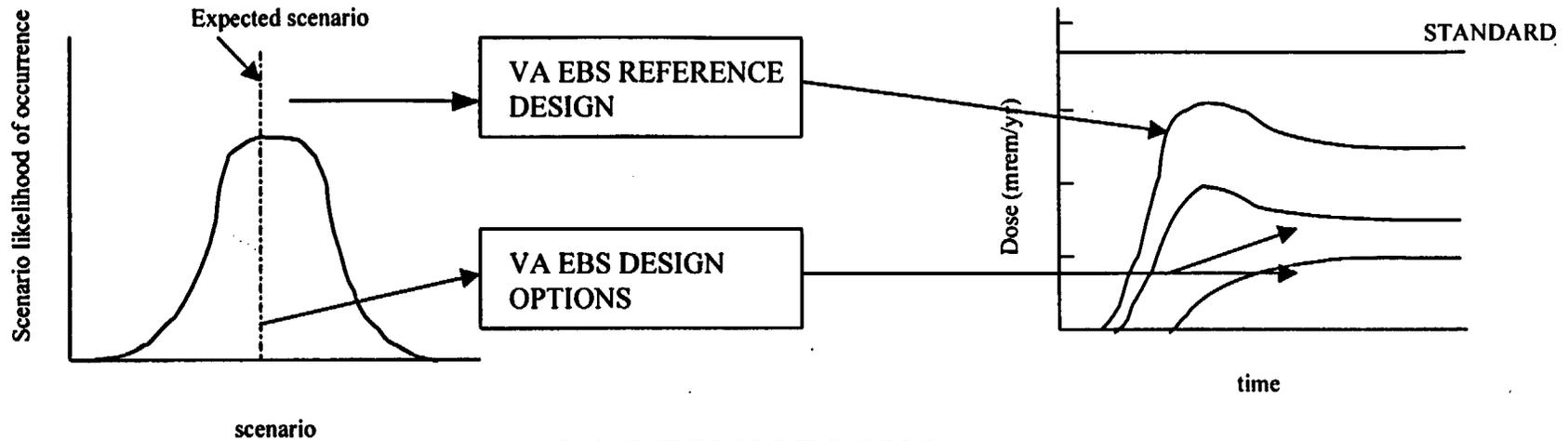
- **Approximately 200-300 page volume presents a preliminary reference design and options to support TSPA-VA, estimate costs and develop a licensing plan**
- **Supporting detail is contained in multiple analyses and drawings which are not part of the VA product**
- **The design information is integrated with the other VA product volumes**
- **Design is focused on bin 2 and 3 systems (important to waste isolation and safety) to demonstrate functionality and feasibility**
- **Key design issues for VA are addressed**

Systematic Approach in Development of EBS Design

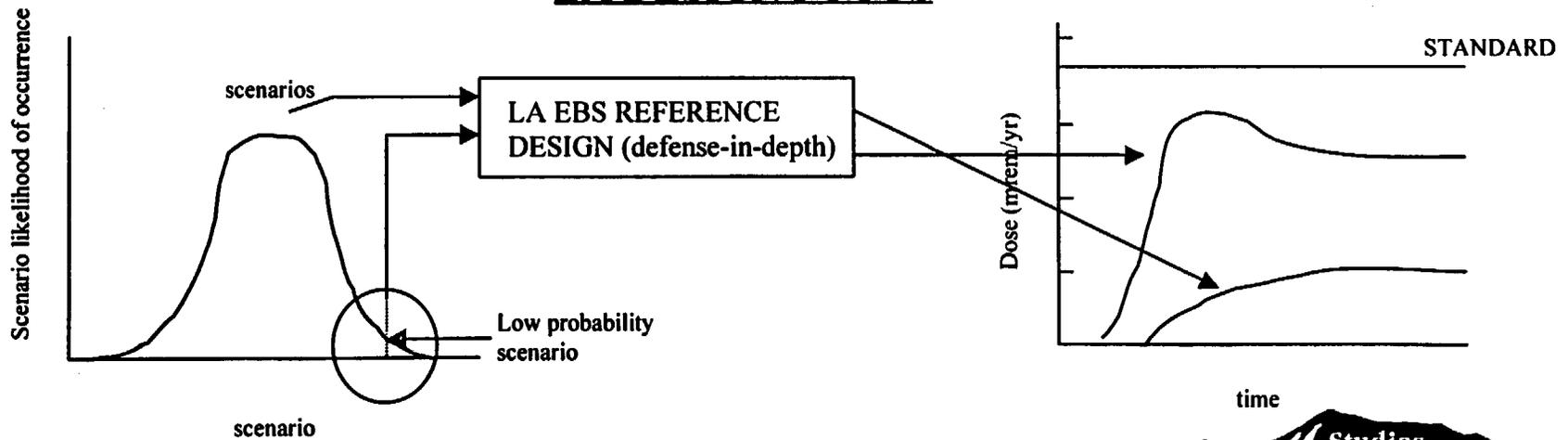


EBS Design Development Strategy

VA DESIGN FOCUS



LA DESIGN FOCUS



DESIGN BASES

- **Design basis drivers are identified**
 - **Geologic setting**
 - **Thermal limits**
 - **Engineered materials and waste form characteristics**
 - **Transportation system**
 - **Performance confirmation**
 - **Retrievability**
 - **Postclosure performance**

SITE DESCRIPTION

- **The design volume describes the site in sufficient detail to provide an understanding of the interfaces between the natural and engineered features**
- **Synergy between natural and engineered features is demonstrated**



SITE DATA

- **Site data which have significant influence on the design are noted, e.g. percolation flux, geochemistry, geologic structures, thermomechanical properties**
- **Included are numerical values and spatial dimensions of the proposed geologic emplacement unit**
- **Physical geotechnical parameters of the rock mass, hydrology and meteorology are presented**

SURFACE FACILITY DESIGN

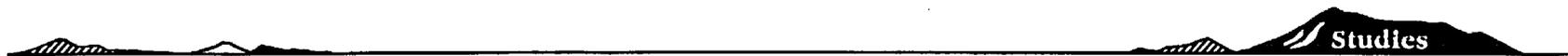
- **Surface facility design describes the operational areas, major facilities, and site support system. Features described include overall site plan, Radiologically Controlled Area and Balance of Plant area. Major design descriptions include:**
 - **Preliminary design for the primary mechanical systems associated with SNF and HLW waste handling systems within the Waste Handling Building**
 - **Preliminary design for the primary process systems associated with site-generated radiological waste handling within the Waste Treatment Building**

SURFACE FACILITY DESIGN (continued)

- Preliminary design for the Waste Handling Building, Waste Treatment Building, and Carrier Preparation Building structures and support systems**
- Preliminary design for the site systems and associated facilities including support operations**
- Preliminary design for utilities routed into the site from offsite locations, and utilities supporting offsite functions within the State of Nevada such as transportation and an intermodal transfer station**
- Nevada transportation section includes a discussion of rail and heavy haul alternatives**

SUBSURFACE FACILITY DESIGN

- **Subsurface facility design describes major design considerations, demonstrating solutions to allocated functions**
 - **Waste emplacement utilizes in-drift emplacement of large waste packages using remote handling technology**
 - **Thermal loading is 85 MTU for the reference design**



SUBSURFACE FACILITY DESIGN (continued)

- Ground control consists of precast concrete segments in the emplacement drifts, and other suitable systems in the remaining subsurface area**
- Construction methodology and sequence focuses on mechanical excavation of emplacement panels that blends ongoing development with operations**
- Description of composite seal construction and location in ramps and shafts is provided**

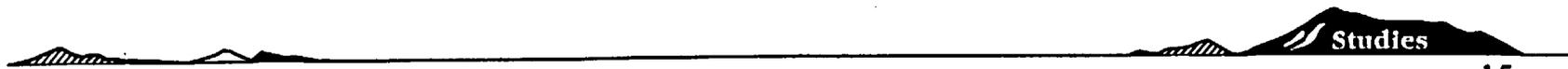


ENGINEERED BARRIER SYSTEM DESIGN

- **Waste package components design is presented in sufficient detail to demonstrate that solutions satisfy allocated requirements and functions**
 - **Metallic multibarrier disposal containers incorporate an outer corrosion allowance barrier over an inner corrosion resistant material**
 - **Multiple WP design configurations are required to dispose of canistered and uncanistered CSNF, DOE and Navy SNF, and DHLW**

ENGINEERED BARRIER SYSTEM DESIGN (continued)

- **The underground portion of the Engineered Barrier System describes emplacement drift openings and the drift inverts in their capacity as engineered barriers**
- **Waste package materials and waste form testing programs supporting material selection is discussed**



CONSTRUCTION AND OPERATION CONCEPTS

- **Each major construction step is described in a separate subsection to include the interaction between construction and operation areas underground**
- **MGDS operation describes the significant activities required to perform the MGDS operation function, and covers both the surface and subsurface facilities**
 - **Major activities include waste receipt, waste handling, waste emplacement, retrieval, monitoring and control, and closure**

PERFORMANCE CONFIRMATION DESIGN

- **Text describes the incorporation of specific features in the design to support the performance confirmation program, both during construction and operation**
- **Discussion includes equipment necessary for monitoring and testing, including the remote inspection gantry, the data acquisition system components, and borehole instrumentation**
 - **Special consideration is given to thermal and radiation shielding of components**

DESIGN OPTIONS

- **Several design options are being carried which could be used to enhance the performance of the EBS- these include drip shields, backfill, ceramic coating, and cladding**
- **Cladding already exists for the SNF, but is not currently being credited**
- **These options are being evaluated in TSPA-VA**
- **Options are developed to a lesser level of detail than for the base case reference design**

DESIGN ACTIVITY PLANS

- **Design activities leading to License Application and beyond are described**
- **Level of detail needed for each phase and schedule for completion is presented to provide a view of the long term strategy**
 - **Bin 2 and 3 and some bin 1 final procurement and construction design is scheduled to coincide with construction authorization**
 - **Prototype testing and modification is planned to integrate with license application update in 2008**

VA DESIGN ISSUES

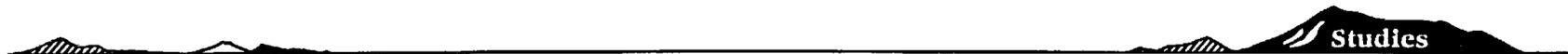
- **Section identifies the VA design issues (20 total) that are being worked during the VA design phase**
- **Each issue is described with regard to its significance, interfaces, effects on VA and ties to TSPA, cost estimating and LA planning**
- **Degree of closure required for VA is identified**

VA DESIGN ISSUES

- **Thermal management**
- **EBS performance enhancements**
- **Criticality control**
- **Emplacement drift ground support concept**
- **Performance confirmation concept**
- **Retrievability concept**
- **Confirmation of high volume and long period waste handling capability and DBE consequences**
- **Disposal of site generated waste**
- **Strategy for mapping repository subsurface**
- **Postclosure performance standards**

VA DESIGN ISSUES (cont'd.)

- **Viability of underground remote control concepts**
- **Repository seals requirements and concepts**
- **RSC/ISF interface**
- **Additional waste forms**
- **Waste package sizes and weights**
- **Waste package materials**
- **Design basis model**
- **Subsurface development**
- **Surface development**
- **Site development**



CONCLUSION

- **The overall design at VA is a compilation of analyses, drawings and other design output developed to support TSPA-VA, the cost estimate, and the progression of design toward LA**
- **The design volume of the VA product summarizes the detail contained in the design output into a concise form**
- **References and appendices are included to identify the appropriate source design output**

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Studies

Volume 3

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

**Presented to:
DOE/NRC Technical Exchange
on Viability Assessment**

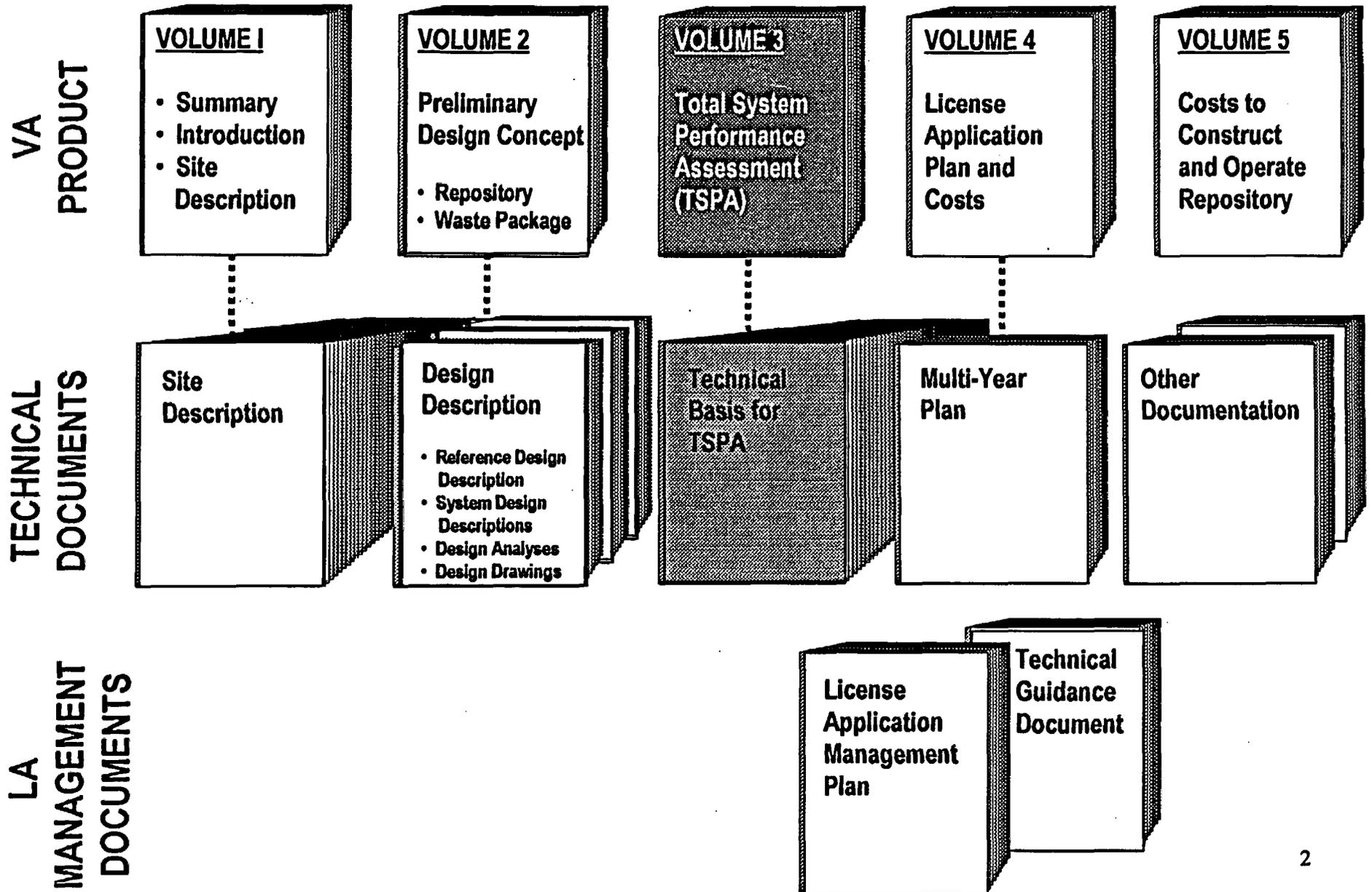
**Presented by:
Dr. Abraham Van Luik
Senior Technical Advisor
Assistant Manager for Licensing
Yucca Mountain Site Characterization Office**

January 14, 1998



**U. S. Department of Energy
Office of Civilian radioactive
Waste Management**

PROGRAM DOCUMENTATION



PHILOSOPHY FOR VOLUME 3: TSPA

- **Volume 3, the TSPA volume, needs to provide transparency and clarity for the primary target audiences of the Viability Assessment**
 - **It is organized to present results after a minimum amount of introductory material**
 - **The results section provides a context for somewhat more detailed information that follows for each of the analysis' major components**

PHILOSOPHY FOR VOLUME 3: TSPA (Continued)

- **Volume 3 will defer more detailed discussions and descriptions of supporting work to a technical report called the Technical Basis for TSPA**
 - **It will include a comprehensive description of the development, implementation, and results of the analyses for individual components**
 - **Its outline will be similar to the outline previously submitted for NRC staff information as part of the TSPA-VA Methodology and Assumptions Document**

PRELIMINARY OUTLINE FOR VOLUME 3: TSPA

- **Introduction**
- **Yucca Mountain TSPA-VA**
- **Total System Analyses**
- **Individual Component Model Development**
- **Critical Development Areas**
- **Closing Sections and Appendices**



INTRODUCTION

- **This section will be a "primer" on the performance assessment (PA) process. The objective will be to describe how and why PA analyses are applied in a general sense. It will include the following subsections:**
 - **Definition of Performance Assessment and Total System Performance Assessment**
 - **Philosophy of Performance Assessment**
 - **Approach**
 - **Methodology**

YUCCA MOUNTAIN TSPA-VA

- **The objective of this section will be to demonstrate how the general philosophy, approach, and methodology described in the Introduction has been specifically applied to Yucca Mountain.**
 - **Objectives of TSPA-VA**
 - **Approach**
 - **Components of the Yucca Mountain repository system**
 - **Development and Screening of Scenarios**
 - **Development of Abstractions**
 - **Combining the Components into a Total-System Representation**
 - **Differences from Previous YMP TSPAs**



YUCCA MOUNTAIN TSPA-VA (Continued)

– Methodology

- **Development and Utilization of Process Model Information**
- **Supplementing Information with Expert Elicitations**
- **Form of the Abstracted Models**
- **Architecture of TSPA Models and Codes**
- **Application of Sensitivity Analyses**
- **Treatment of Alternative Conceptual Models and Uncertainty**



TOTAL SYSTEM ANALYSES

- **This section will present the results of the TSPA-VA "base case". It will also present the suite of probabilistic analyses used to evaluate the uncertainty in the long term behavior of the system. It will revisit the relative importance of the critical elements of the performance evaluation.**
 - **Description of Total-System Models**
 - **Base Case**
 - **Other Probabilistic Analyses**
 - **Results of the "Base Case" Analysis**
 - **Results of other Probabilistic Analyses**
 - **Comparison of Results**

INDIVIDUAL COMPONENT MODEL DEVELOPMENT

List of Components

- **Unsaturated Zone Flow**
- **Thermohydrology**
- **Near-Field Geochemical Environment**
- **Waste Package Degradation**
- **Waste Form Alteration and Mobilization**
- **Unsaturated Zone Transport**
- **Saturated Zone Flow and Transport**
- **Biosphere**
- **Disturbed Features, Events, and Processes**

Individual Component Model Development (Cont'd)

- **In this section, the technical foundation for evaluating the long term performance of the Yucca Mountain repository system will be discussed. Each subsection will include:**
 - **the information obtained from the process models**
 - **the important issues identified by the TSPA model abstraction workshops and the method of treating the issues,**
 - **the selection of analyses from the scenario screening process,**

INDIVIDUAL COMPONENT MODEL DEVELOPMENT (Cont'd)

- **Each subsection will also include:**
 - **the linkage of each individual component with other components that either provided input or received output from that component,**
 - **a discussion of the types of sensitivity analyses performed and their results,**
 - **a discussion of the form of information provided to the TSPA modelers,**
 - **a synopsis of the importance of the component to overall performance,**
 - **a discussion of information needs for TSPA-LA.**

CRITICAL DEVELOPMENT AREAS

- **Site Characterization**
 - This section will discuss the parameters, models, and other information needs required from site characterization to refine sensitive elements.
- **Design**
 - This section will discuss the parameters, models, and other information needs required from design to refine the sensitive elements.
- **Performance Assessment**
 - This section will discuss the parameters, models, and other information needs as well as computational tool developments needed to refine the sensitive elements.

CLOSING CHAPTERS

- **Summary**
 - This section will provide summary remarks on the TSPA-VA document.
- **References**
 - This section will contain all cited references including RIS accession number or TIC catalog number, as applicable.
- **Appendix A. Acronyms**
- **Appendix B. Glossary**

POST-VA REVIEWS AND DOCUMENTATION

- **Volume 3: TSPA, as well as the technical basis document for TSPA -VA will be subject to review by the NRC, the YMP PA Peer Review team, the NWTRB, and others**
 - all of the comments from these reviews will be considered in the development of the TSPA-LA
- **Using Volume 3: TSPA (and the technical basis document as appropriate) materials will be developed to communicate more effectively with the public**
 - electronic/web-based formats
 - hard-copy brochures and short documents
 - presentations for public meetings

IMPLICATIONS FOR THE TSPA LICENSE APPLICATION

- **The experience gained in the VA process will help shape the LA documentation**
- **The primary audience of the LA is the regulator, as well as external technical review and oversight organizations**
- **Other, less technical audiences may be addressed using a document not unlike Volume 3 of the VA**

**YUCCA
MOUNTAIN
PROJECT**

Studies

**Volume 4
License Application Plan**

**Presented to:
DOE/NRC Technical Exchange
on Viability Assessment**

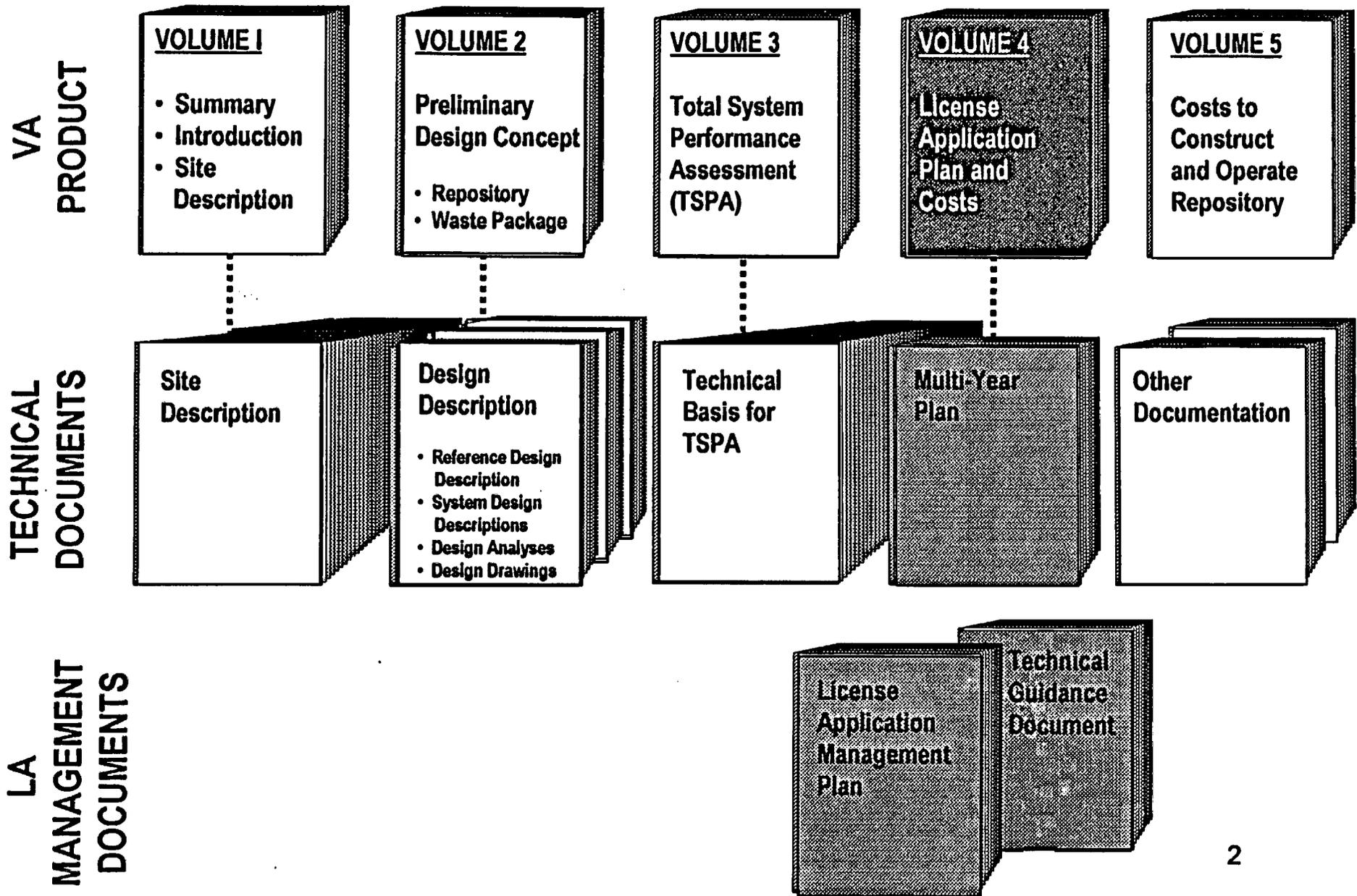
**Presented by:
Carol L. Hanlon
License Application Team
Yucca Mountain Site Characterization Office**

January 14, 1997



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

PROGRAM DOCUMENTATION



OUTLINE

- **Introduction**
- **Contents**
- **Organizing Principles**
- **Key Technical Issues**
- **Transition to License Application**

LICENSE APPLICATION PLAN

Introduction

- **One of the major elements of the Viability Assessment**
- **Will be presented in Volume 4**
- **Identifies work to be performed to complete the License Application**
 - includes cost of that additional work
- **Provides a link between the Viability Assessment and the License Application**

LICENSE APPLICATION PLAN

Contents

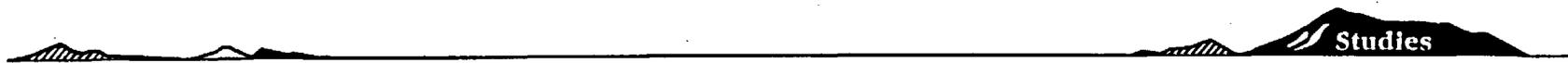
- **Describes remaining information to be developed to support a docketable license application**
- **Describes additional tests supporting the repository safety strategy**
- **Describes remaining design work**
- **Describes planned TSPA analyses**
- **Describes performance confirmation program**

ORGANIZING PRINCIPLES FOR THE WORK DESCRIPTIONS

- **The testing, design, performance assessment, and performance confirmation work will be described in terms of:**
- **Repository safety strategy**
 - Key attributes
 - Evaluation of disruptive processes and events
 - Hypotheses
- **Information to support postclosure safety case**
- **Information to support preclosure safety case**

ORGANIZING PRINCIPLES FOR THE WORK DESCRIPTIONS (Cont.)

- **The work will also be correlated with the planned critical development areas described in Volume 3, TSPA (Site Characterization, Design, Performance Assessment)**



LICENSE APPLICATION PLAN

- **Will also describe other work necessary to support the License Application Submittal**
 - **Site Recommendation**
 - **Environmental Impact Statement and Environmental Compliance**
 - **Licensing**
 - **Field Construction and Operation**
 - **Etc**

LICENSE APPLICATION PLAN

Key Technical Issues

- **The License Application Plan will identify the NRC's Key Technical Issues and describe the ongoing and planned issue resolution process**
- **The descriptions of testing, design, and performance assessment work in the License Application Plan will reference the associated Key Technical Issues**
- **The work and process descriptions in Volume 2, Preliminary Design Concept, and Volume 3, TSPA, will also reference associated Key Technical Issues**

LICENSE APPLICATION PLAN

Outline (200-300 pages)

- 1. Introduction**
- 2. Work activities leading to License Application**
 - 2.1 Testing activities**
 - 2.2 Design activities**
 - 2.3 Performance Assessment activities**
 - 2.4 Statutory Activities**
 - 1) Site Recommendation**
 - 2) Environmental Impact Statement and Environmental Compliance**
 - 3) Licensing**
 - 4) Field Construction and Operations**
 - 5) Support Activities**
 - 6) Performance Confirmation**
- 3. Costs**
- 4. Schedule**
- 5. References**

TRANSITION TO LICENSE APPLICATION

- **LA Management Plan**
 - Provides management framework and process for developing the License Application (completed 9/97)
- **Technical Guidance Document**
 - Provides guidance to authors on contents and format for use in preparing the License Application (Rev. 0 due July 1998)
 - Incorporates 11 chapters defined in Project Integrated Safety Assessment, plus 3 additional chapters required to provide a complete safety analysis report.

TRANSITION TO LICENSE APPLICATION

License Application Outline

- 1. Introduction & General Description**
- 2. Important Features of Natural & Engineered Systems**
- 3. Site Description**
- 4. Repository Design**
- 5. Waste Package Design**
- 6. Engineered Barrier System Design**
- 7. Preclosure Radiological Safety**
- 8. Postclosure Total Systems Performance Assessment**
- 9. Radioactive Waste Management**
- 10. Radiation Protection**
- 11. Conduct of Operations**
- 12. Performance Confirmation**
- 13. Land Ownership & Control**
- 14. Quality Assurance**

CONCLUSION

- **License Application Plan uses information provided in the VA design, TSPA-VA, and current site description to define work activities necessary for completion of the License Application.**
- **License Application Plan will continue to evolve over next months with Multi-Year Planning effort.**
- **License Application Plan will provide solid basis for moving into the licensing effort following successful completion of Viability Assessment.**

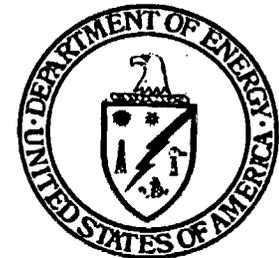
YUCCA MOUNTAIN PROJECT

Studies

Site Description Overview

**Presented to:
DOE/NRC Technical Exchange on
Viability Assessment**

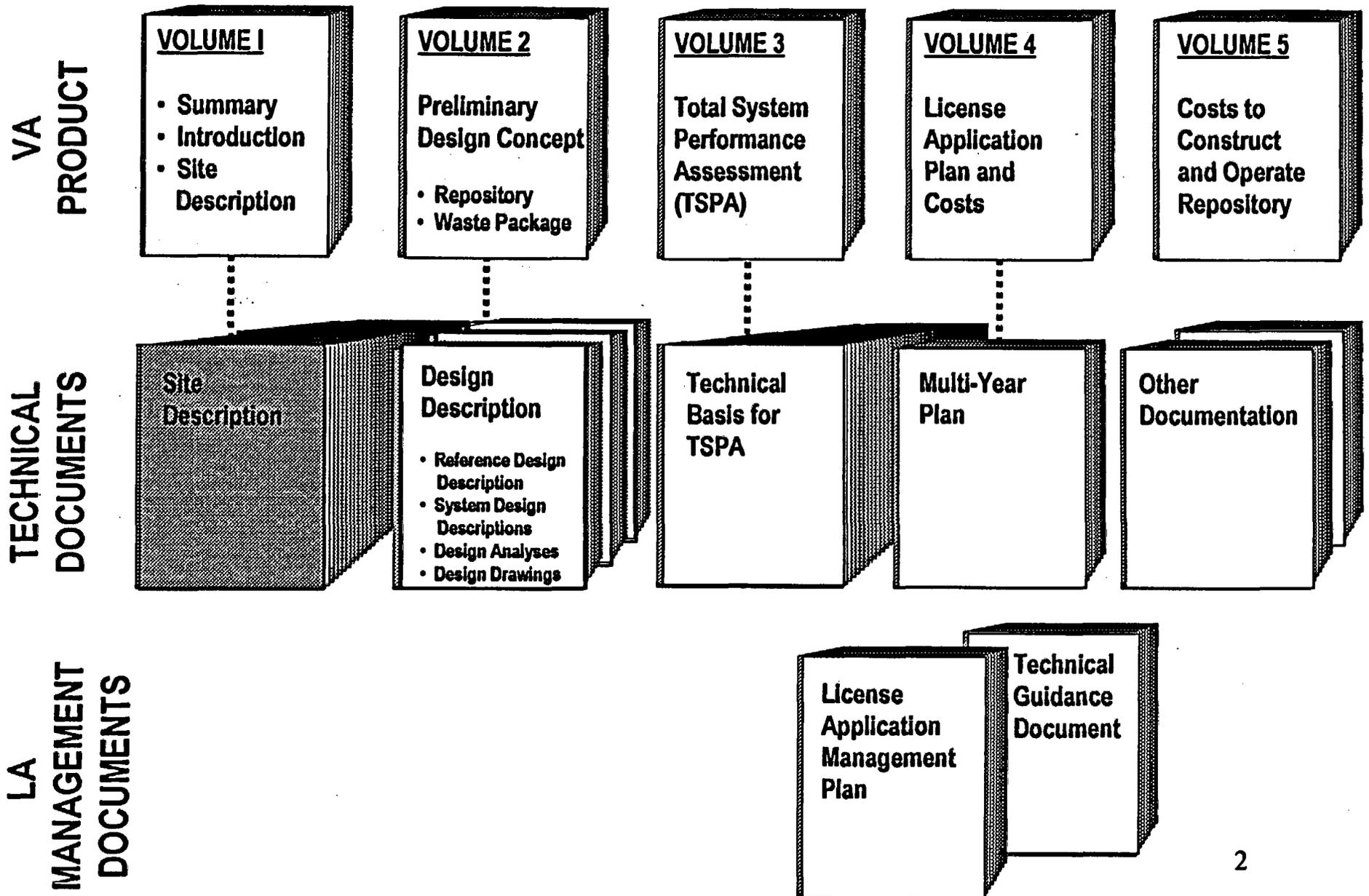
**Presented by:
Bob Levich
Viability Assessment Team
Yucca Mountain Site Characterization Office**



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

January 14, 1997

PROGRAM DOCUMENTATION



SITE DESCRIPTION

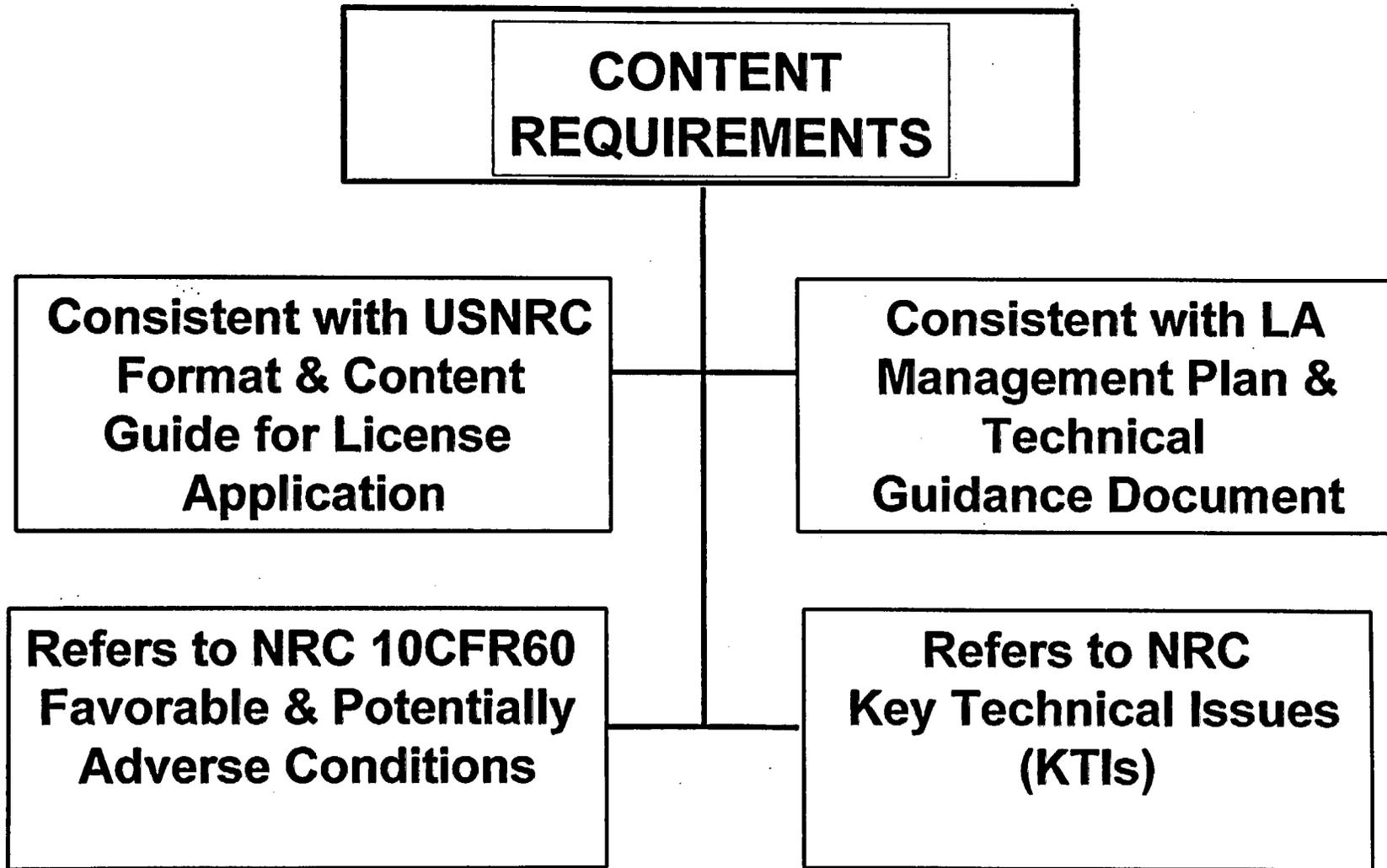
- In Fiscal years 1997 & 1998, an integrated Draft **SITE DESCRIPTION** that supports the Viability Assessment is being prepared in parallel but separate from the VA product
- The **SITE DESCRIPTION** will consist of five chapters and will be a comprehensive document of 3,000 - 4,000 pages that will include hundreds of figures & tables
- The **SITE DESCRIPTION** will evolve into Chapter 3 of the License Application and will provide the technical basis for regulatory findings relative to **10CFR60**

SITE DESCRIPTION

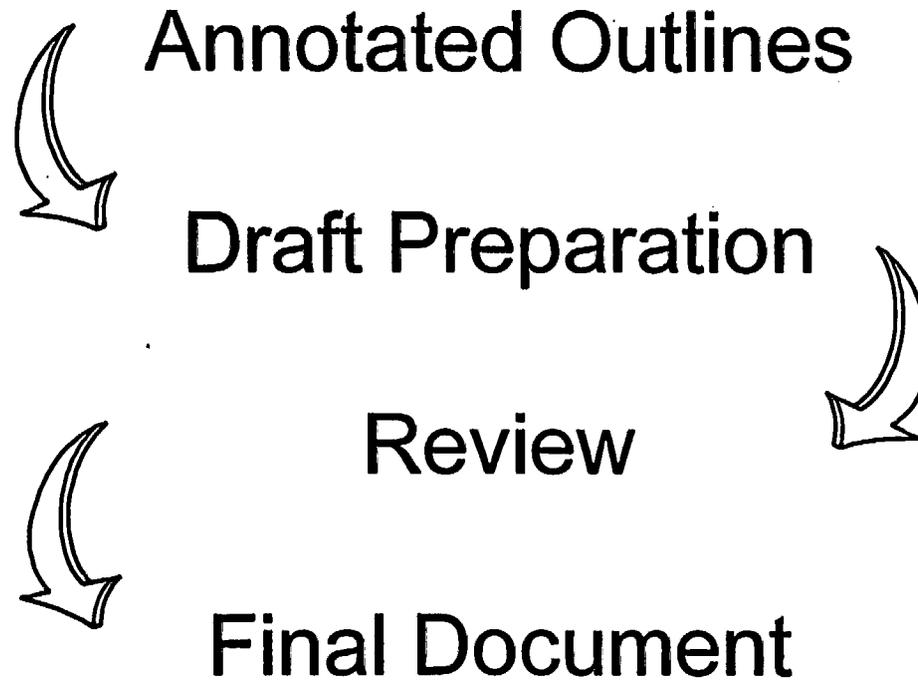
- **Presents descriptions & results from Site Characterization Studies and supporting Scientific Program Activities in Geology, Hydrology, Climate/Meteorology, Geochemistry & Thermal Effects**
- **Identifies information that supports regulatory compliance arguments and findings for favorable & potentially adverse conditions relative to 10CFR60 and NRC's Key Technical Issues**



SITE DESCRIPTION

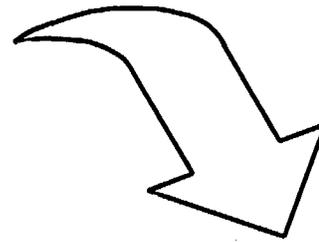


SITE DESCRIPTION DEVELOPMENT PROCESS



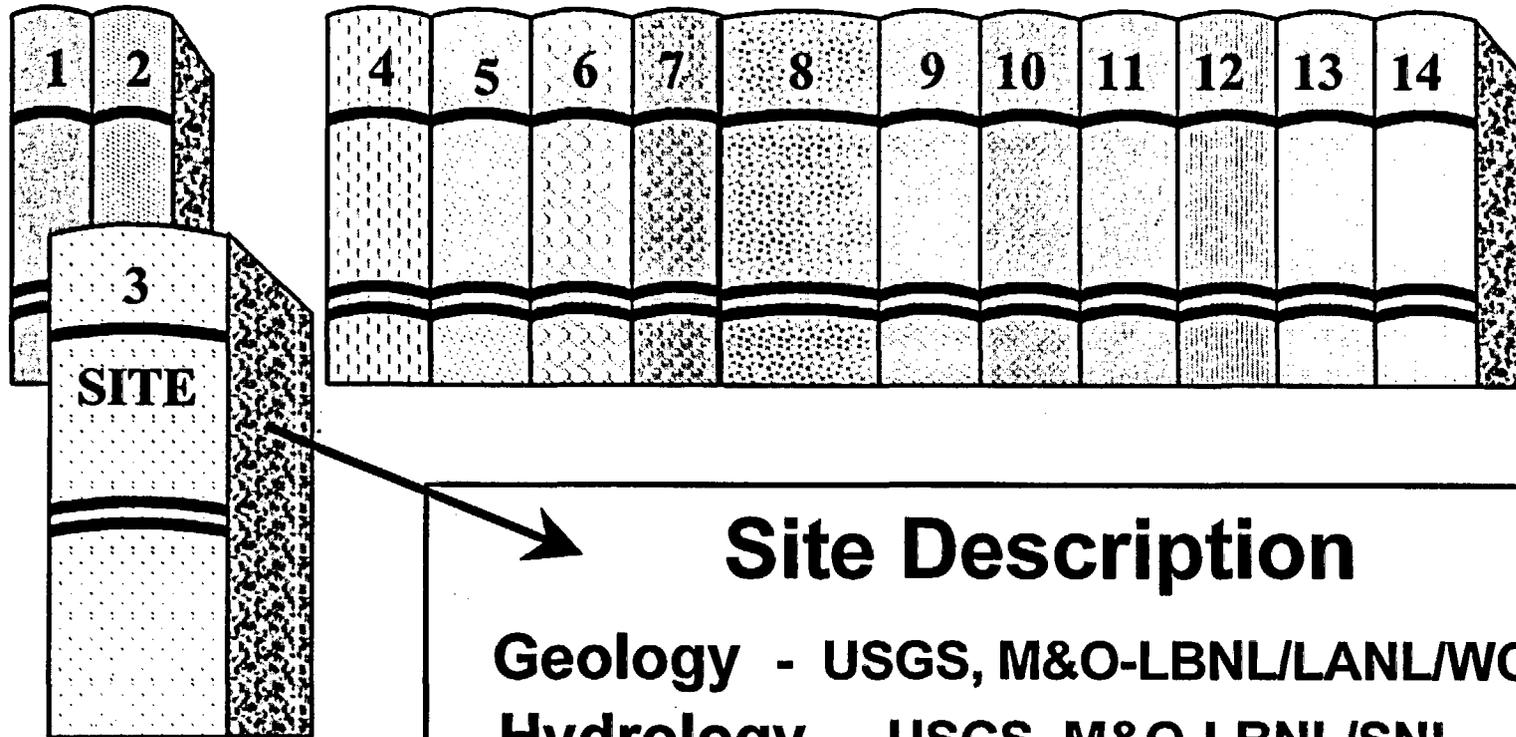
SITE DESCRIPTION ANNOTATED OUTLINES

**Annotated
Outlines
Developed for
Each Chapter**



**Annotated Outlines:
Reviewed & Discussed
in Meetings
&
Distributed to ALL
Chapter Lead Authors**

LA CHAPTER 3



Site Description

Geology - USGS, M&O-LBNL/LANL/WCFS

Hydrology - USGS, M&O-LBNL/SNL

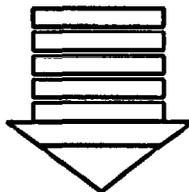
Climate - USGS, M&O-SAIC

Geochemistry - M&O-LANL, USGS

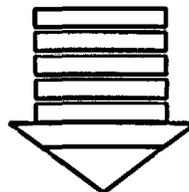
Thermal Effects - M&O-LLNL

SITE DESCRIPTION REVIEW

**USGS/M&O Internal Draft Review
Comment Resolution Process**



**All Chapters Compiled/Integrated Into Final Draft
Formal Review by External & Internal Reviewers
Comment Resolution Process**



Final Site Description: August 1998



**YUCCA
MOUNTAIN
PROJECT**

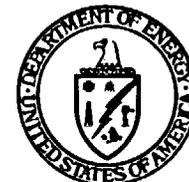
Studies

Regulatory Interactions on Viability Assessment

**Presented to:
DOE/NRC Technical Exchange
on Viability Assessment**

**Presented by:
April Gil, Team Leader
License Application and Site Recommendation
Yucca Mountain Site Characterization Office**

January 14, 1998



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

GOAL FOR 1998 INTERACTIONS

- **Ensure that NRC is adequately informed on the technical basis and content for VA**
- **Continue discussions of DOE's approach and plans to support LA**

APPROACH TO INTERACTIONS

- **Inform the NRC throughout the VA process**
 - **provide clarification on purpose and content of VA**
 - **provide key supporting documents as soon as available**
 - **focus interactions on areas of mutual concern to gain understanding**

APPROACH TO INTERACTIONS (Cont.)

- **Maintain communication and momentum on topics related to licensing. For example:**
 - **Criticality**
 - **PSHA**
 - **NRC's KTIs and their resolution**

DOE/NRC 1998 Interactions Schedule

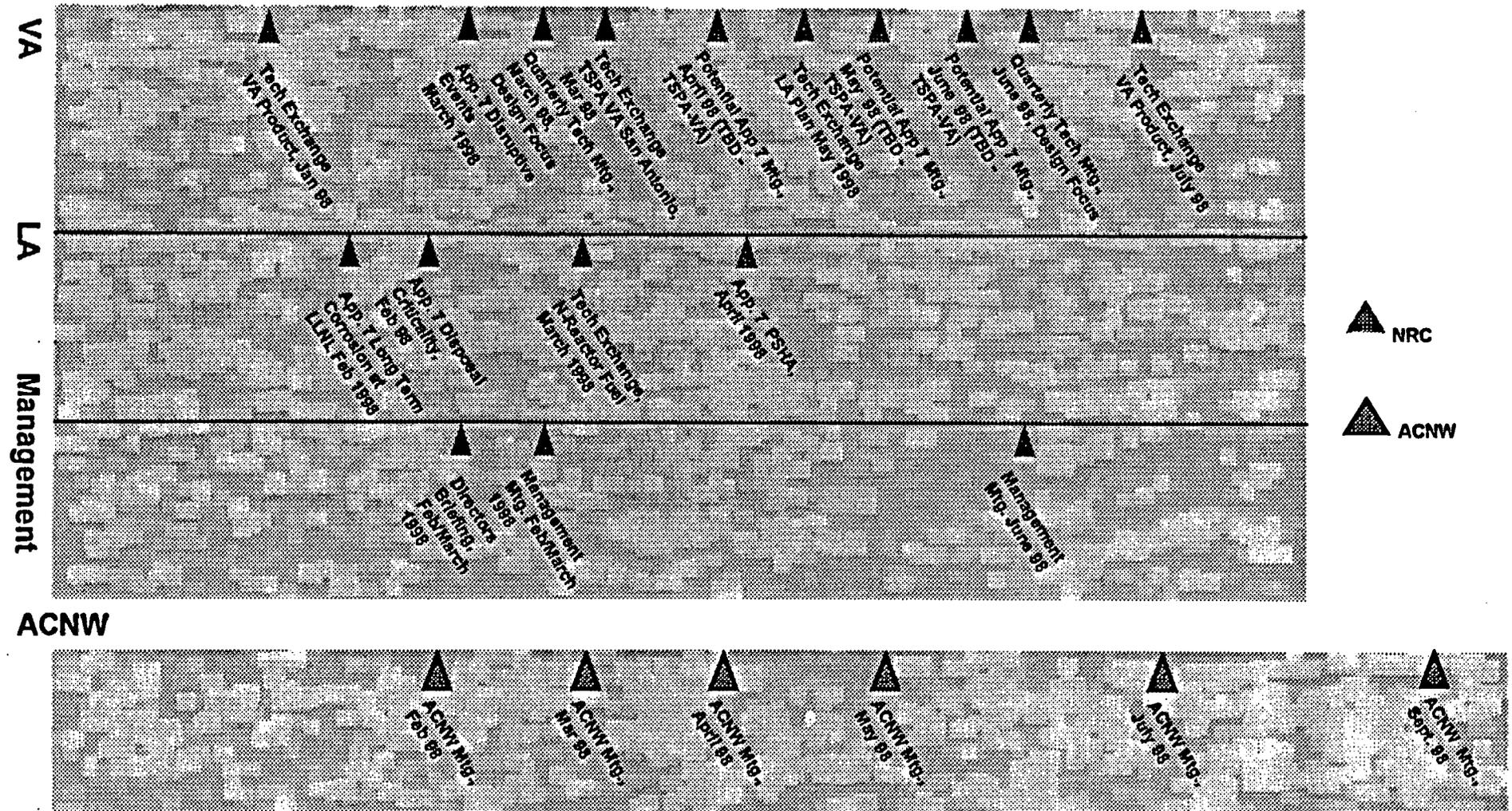


Release Schedule for VA

VA to Congress
and President, 9/30/98



DOE / NRC Interactions



DOE/NRC INTERACTIONS ON VA

- **Viability Assessment**
 - **Technical Exchanges**
 - **Jan 98, VA Product: Introduction and Status**
 - **July 98, VA Product: Review draft VA analyses**
 - **Discuss the TSPA-VA submitted for peer review, complete any follow up discussion on the Design, Site and Performance Assessment outstanding items**
 - **May 98, LA Plan:**
 - **Review with the NRC the draft LA Plan developed as a part of the VA. Discuss the approach described to achieve an acceptable License Application**

DOE/NRC INTERACTIONS ON VA

- **Performance Assessment**
 - **Technical Exchange, March/April 98: TSPA VA,**
 - Review results of Base Case analyses
 - **Appendix 7 Meeting, March 98: Disruptive Events:**
 - Discuss the approach and treatment of disruptive events and scenario development in the use of models and data in a TSPA
 - **Appendix 7 Meetings, April, May, and June 98:**
 - Tentatively scheduled meetings to resolve any issues identified in the previously held TSPA Technical Exchanges

DOE/NRC INTERACTIONS ON VA

- **Design**
 - **March 98: Quarterly Technical Meeting**
 - Review the design parameters used in the development of the VA
 - **June 98: Quarterly Technical Meeting**
 - Discuss the reference design used in support of the TSPA-VA. Review draft design analyses

NRC'S ROLE IN THE VA

- **DOE anticipates Congress to ask for NRC review**
 - **DOE seeks to keep NRC informed on the VA as it is developed**
- **The LA Plan will provide a path to developing a docketable LA**
 - **Experience gained from the VA will assist DOE in developing the LA**
- **DOE and NRC have been regularly communicating on VA**
 - **We will continue to interact with NRC**

CONCLUSIONS

- **Our goal for this and subsequent interactions in 1998 is to:**
 - **Provide a basis for the NRC to develop a full understanding of the VA and its supporting documentation.**
 - **Provide assurance that DOE's program to LA is sound**

**YUCCA
MOUNTAIN
PROJECT**

Studies

Viability Assessment Summary

**Presented to:
DOE/NRC Technical Exchange
on Viability Assessment**

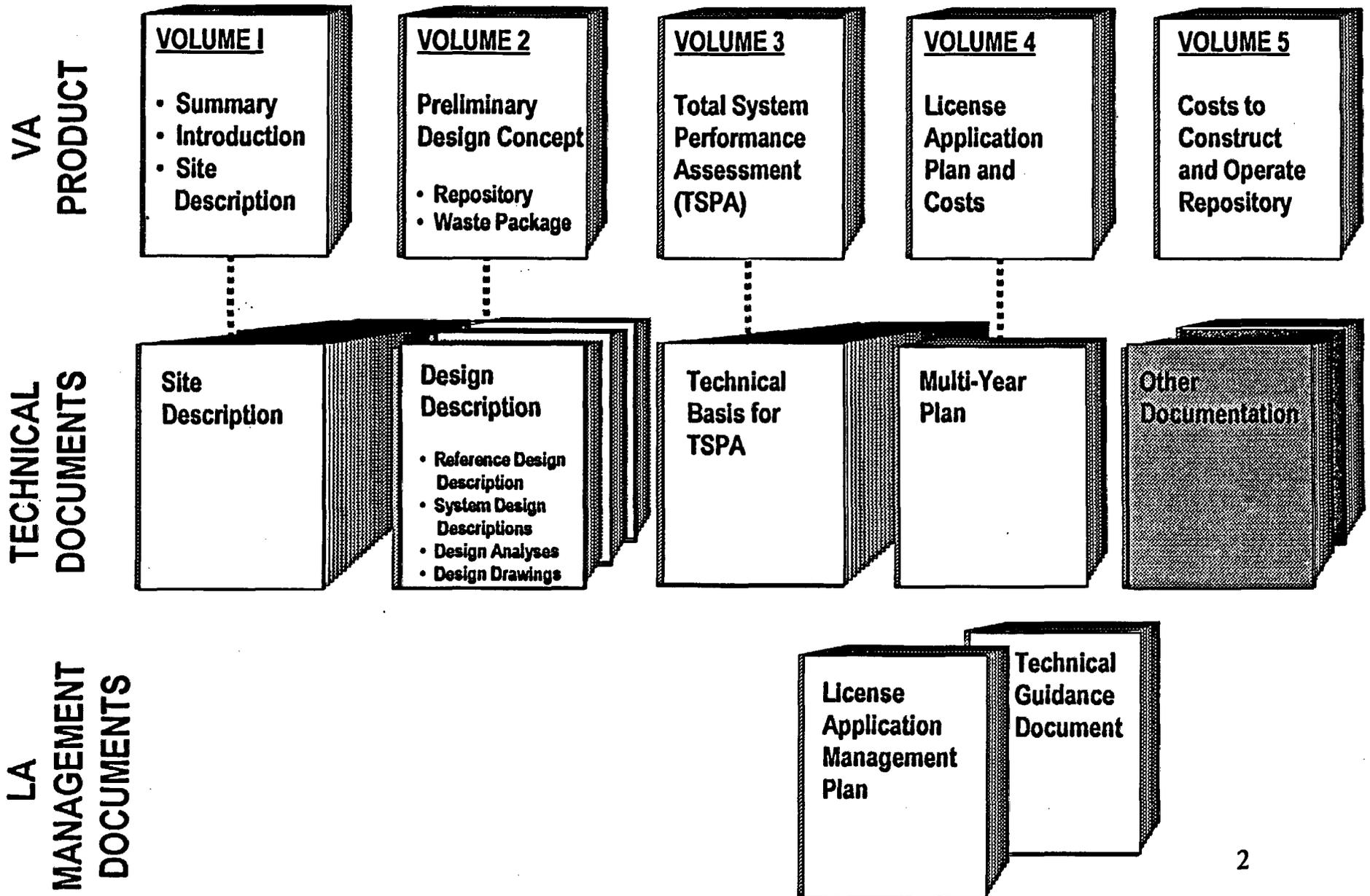
**Presented by:
J. Timothy Sullivan
Viability Assessment Team Leader
Yucca Mountain Site Characterization Office**

January 14, 1998



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

PROGRAM DOCUMENTATION



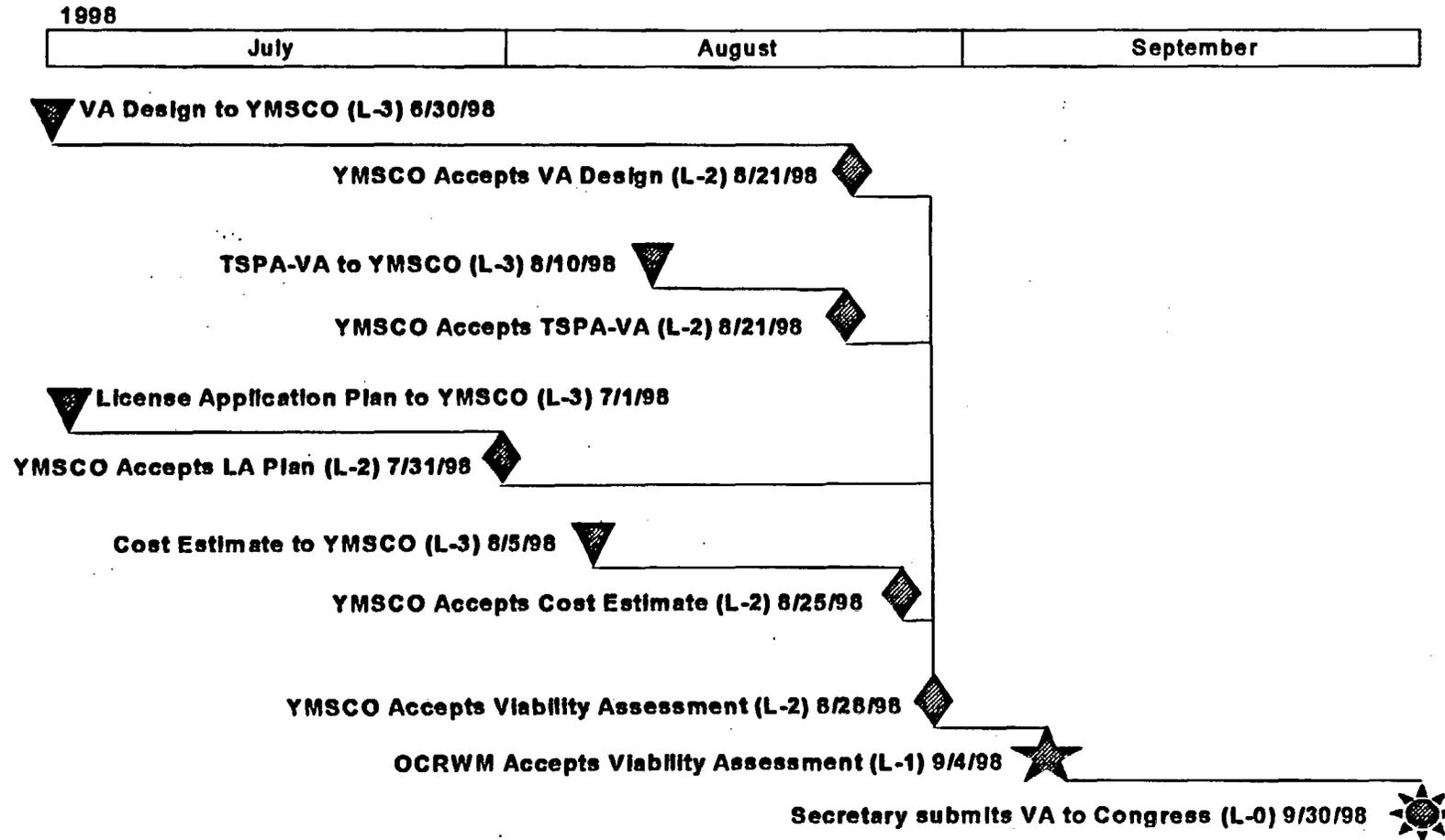
OTHER DOCUMENTATION SUPPORTING THE VA AND LA

- **Site Characterization Data and Technical Reports**
- **Process model documentation**
- **Expert elicitation reports**
- **Design analyses**
- **Relevant information from outside the Program**
- **Peer Reviews and Independent Reviews**
- **Key Documents are made available to the NRC**

CONSISTENT WITH CONGRESSIONAL MANDATE, THE VA IS COMPOSED OF FOUR TECHNICAL ELEMENTS

- **A preliminary design concept for the critical elements of the repository and waste package**
- **A total system performance assessment based on the design concept and available scientific data**
- **A plan and cost estimate for the remaining work required to complete a license application**
- **An estimate of the costs to construct and operate a repository in accordance with the design concept**

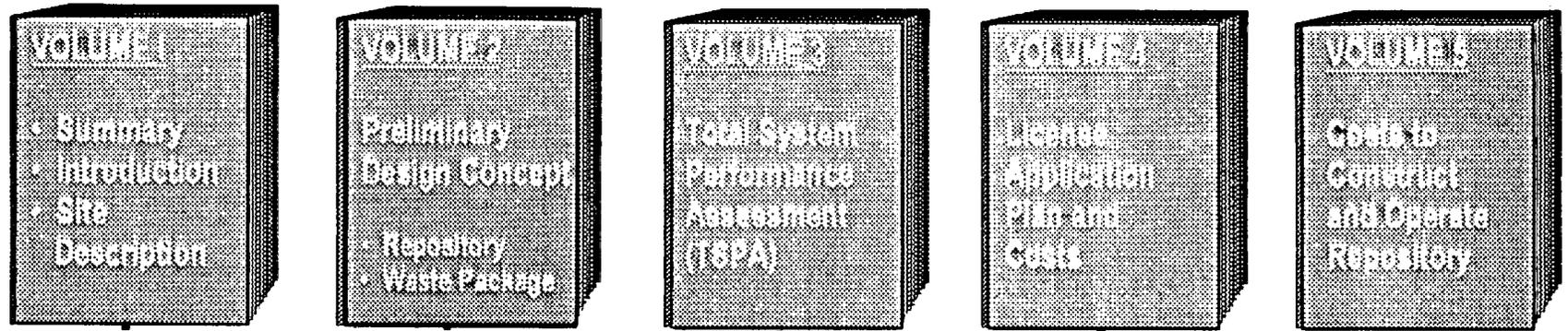
Summary Schedule for Completion of the Viability Assessment



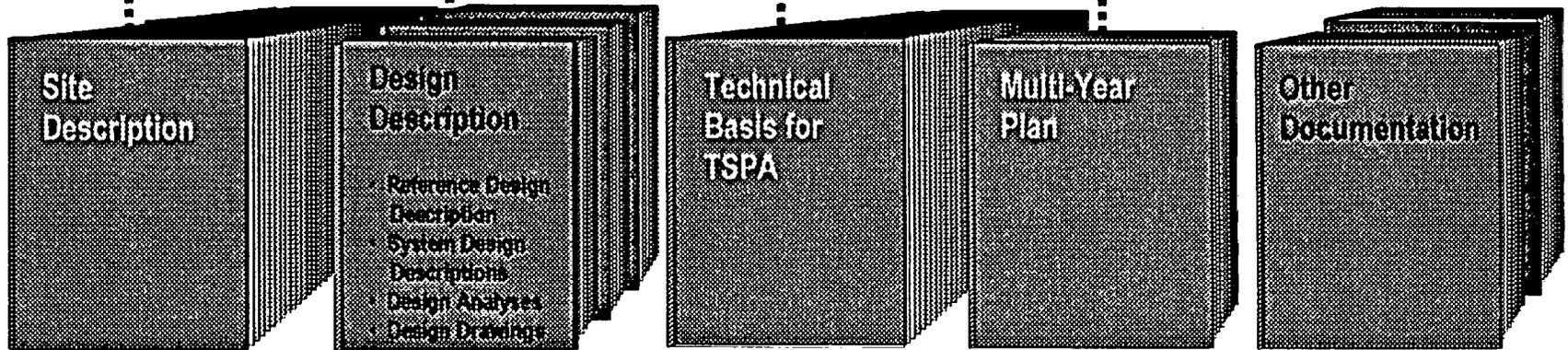
VA IS A CONVERGENCE POINT

- **Comprehensive results from surface-based testing are available**
- **Results from underground testing are now also available**
- **Significant advances in design since the Advanced Conceptual Design Report**
- **YMP has been using performance assessment as an integrating tool**

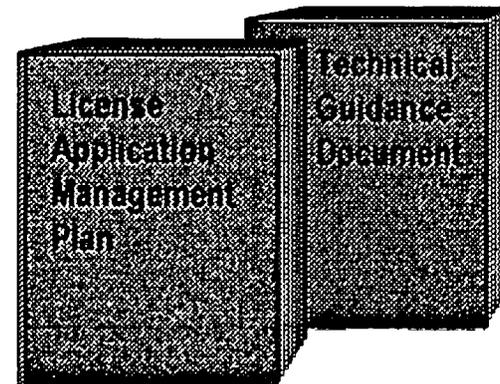
PROGRAM DOCUMENTATION



TECHNICAL
DOCUMENTS



LA
MANAGEMENT
DOCUMENTS



SUMMARY

- **VA provides an evaluation of system performance based on a reference design and current site information as a “snap-shot” in time**
- **VA serves to focus the technical program for the LA as described in the LA Plan**
- **VA provides a cost estimate for construction and operation**
- **Continuing site, design, and performance assessment activities maintain our progress toward the LA**

Enclosure 3

NRC-DOE TECHNICAL EXCHANGE ON VIABILITY ASSESSMENT

January 14, 1998

Videoconference between

DOE DC/Forestal - Las Vegas/YMSCO

NRC/Rockville - CNWRA/San Antonio

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Judy Treichel	NV/NW Task Force	702-248-1127
Michael Bell	NRC/NMSS/DWM	301-415-7286
John Rosenthal	YMP/MTS	702-794-1393
Nick Stallavato	Nye County	702-295-6142
Mike Lugo	M&O/TRW	702-795-4761
Chris Einbert	DOE	202-586-8869
James Duguid	M&O/Duke	703-204-8851
Michael Voegel	M&O/SAIC	702-295-5520
Mal Murphy	Nye County	360-943-5610
E. von Tiesenhausen	Clark Count	702-455-5184
Ken Ashe	M&O	702-295-5563
Abe Van Luik	DOE/YMP	702-794-1424
Jim York	Booz-Allen & Hamilton	202-484-8375
Stan Echols	Winston & Strawn	202-371-5777
Paul Harrington	DOE/YMP	702-794-5415
Stephen Brocoum	DOE/YMP	702-794-1359
Dan Kane	DOE	202-586-4970
Boby Eid	NRC/DWM	301-415-5811
Bakr Ibrahim	NRC/DWM	301-415-6651
Tae Ahn	NRC/DWM	301-415-5812
Klen Chang	NRC/DWM	301-415-6612
Bret Leslie	NRC/DWM	301-415-6652
Ray Wallace	USGS	202-589-1244
Mitch Brodsky	DOE/YMP	702-794-5437
Carol Hanlon	DOE/YMP	702-794-1324
Tim Sullivan	DOE/YMP	702-794-5589

NRC-DOE TECHNICAL EXCHANGE ON VIABILITY ASSESSMENT

January 14, 1998

Videoconference between
DOE DC/Forestal - Las Vegas/YMSCO
NRC/Rockville - CNWRA/San Antonio

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Wes Patrick	CNWRA	210-522-5158
Ali Hagi	M&O	702-794-4873
Kim Gruss	NRC	301-415-6680
Jack Bailey	M & O	702-794-4251
Dennis R. Williams	DOE/AML	702-794-1417
Ralph Anderson	NEI	202-739-8111
Ronald Stevens	Licensing	702-295-4872
Sandra Wastler	NRC/DWM	301-415-6724
Phil Hammond	M&O	702-295-4876
Bill Belke	NRC/OR	702-794-5046
Dan Fehringer	NWTRB	703-235-4473
Robert Johnson	NRC/DWM	301-415-7282
D.M. Franks	M&O	702-295-4895
Nancy Hardwick	Booz, Allen & Hamilton	202-484-8338
Steve Dana	OQA/QATSS	702-295-5497
Mike Lee	NRC/DWM	301-415-6677
R.E.Spense	AML	702-295-1455
Latif Hamdan	NRC/DWM	301-415-6639
Mysore Nataraja	NRC/DWM	301-415-6695
John Trapp	NRC/DWM	301-415-8063
Christiana Lui	NRC/DWM	301-415-6200
Buhdi Sagar	CNWRA	210-522-5252

NRC-DOE TECHNICAL EXCHANGE ON VIABILITY ASSESSMENT**January 14, 1998****Videoconference between
DOE DC/Forestal - Las Vegas/YMSCO
NRC/Rockville - CNWRA/San Antonio**

PRINTED NAME	ORGANIZATION/COMPANY	PHONE
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Phil Justus	NRC/DWM	301-415-6745
Ted Carter	NRC/DWM	301-415-6684
Gene Roseboom	USGS retired	301-530-1059
Tim McCartin	NRC/DWM	301-415-6681
Richard Codell	NRC/DWM	301-415-8167
Lynn Deering	ACNW	301-415-6887
Giorgio Gnugnoli	ANCW	301-415-7135
Elaine Keegan	NRC/SFPO	301-415-8517
Steve Unglessee	NEI	202-739-8010