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Repository Sealing Plan for the Nevada Nuclear Waste Storage Investigations Project Fiscal Years 1984 Through 1990

Joseph A. Fernandez

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REPOSITORY SEALING PLAN FOR THE NEVADA NUCLEAR WASTE STORAGE INVESTIGATIONS PROJECT FISCAL YEARS 1984 THROUGH 1990

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ABSTRACT

This report presents a plan to develop acceptable sealing methods for a prospective nuclear waste repository in unsaturated tuff in Yucca Mountain, which is on and adjacent to the Nevada Test Site. Sealing is the permanent closure of the underground facility, shafts, ramps, and boreholes. Questions associated with the performance of the sealing system form the basis for this plan. Tasks that contribute to the resolution of these questions and support the documentation required for the construction authorization application are proposed. The approach to answering the performance-related questions is divided into six steps: (1) assess the need for sealing, (2) define the design requirements, (3) measure the material properties, (4) assess the performance of sealing designs, (5) perform laboratory analyses and field testing, and (6) reassess the performance of sealing designs. Organization of the tasks supporting each step is illustrated by detailed work-flow diagrams.

ACKNOWLEDGMENT

Special thanks are extended to the participants of the NNWSI repository sealing activity for the suggestions made during the development of this program plan. These individuals include: Joe R. Tillerson, Sandia National Laboratories; Clarence Duffy, Los Alamos National Laboratory; Della Roy and Pat Licastro, Pennsylvania State University; G. Sam Wong, Waterways Experiment Station; and F. Harvey Dove, Pacific Northwest Laboratory. Thanks are also extended to Al Stevens and Paul O'Brien, Sandia National Laboratories, and Peter Kelsall, International Technology Corporation, for reviewing this report and to SNL's Project Management Support Division, especially Ron Snidow, for assisting in the preparation of the work-flow diagrams.

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ACRONYMS

CAA	Construction Authorization Application
CRWM	Civilian Radioactive Waste Management
DOE	Department of Energy
FEIS	Final Environmental Impact Statement
ITC	International Technology Corporation
LANL	Los Alamos National Laboratory
MGRC	Materials (Geochemical) Research Contractor
MMRC	Materials (Mechanical) Research Contractor
NNWSI	Nevada Nuclear Waste Storage Investigations
NRC	Nuclear Regulatory Commission
PNL	Pacific Northwest Laboratory
PostWDS	Postclosure Waste Disposal System
PreWDS	Preclosure Waste Disposal System
PSAR	Preliminary Safety Analysis Report
PSU	Pennsylvania State University
SNL	Sandia National Laboratories
WBS	Work Breakdown Structure
WES	Waterways Experiment Station
YMMGDS	Yucca Mountain Mined Geologic Disposal System

I. INTRODUCTION

The Nevada Nuclear Waste Storage Investigations (NNWSI) Project, managed by the Nevada Operations Office of the U.S. Department of Energy, is examining the feasibility of developing a nuclear waste repository, described here as the Yucca Mountain Mined Geologic Disposal System (YMMGDS), in an unsaturated tuff formation beneath Yucca Mountain. Yucca Mountain is located on and adjacent to the Nevada Test Site, Nye County, Nevada. The overall performance objective for the YMMGDS following permanent closure is "to assure that releases of radioactive materials to the accessible environment . . . conform to such generally applicable environmental standards for radioactivity as may have been established by the Environmental Protection Agency . . . ." (10 CFR 60, Section 60.112; U.S. NRC, 1983). The sealing system which is part of the YMMGDS may be important in achieving this overall performance objective. Sealing is the permanent closure of the underground facility, shafts, ramps, and boreholes. It includes: emplacing backfill, seals, plugs in shafts, ramps, drifts, and boreholes; isolating discrete, water-producing zones from waste packages; and emplacing a surface barrier at entry points of the shafts and boreholes. It does not include backfilling around waste packages because this aspect of the YMMGDS is included in the waste package system.

Sealing concepts were developed as the first task (Fernandez and Freshley, 1984) in accomplishing the ultimate goal of the repository sealing activity, which is permanent closure of the repository in an acceptable manner. This report represents the second task, which is development of a program plan. This program plan proposes additional tasks needed to resolve performance-related questions associated with the sealing system. In addition, specific tasks required to develop sealing designs are defined. This program plan will be updated, accordingly, as specific needs for sealing become more apparent.

This plan covers the time span from the development of sealing concepts to the submittal of the construction authorization application (CAA) to the U.S. Nuclear Regulatory Commission (NRC). The resolution of performance-related questions and development of sealing designs will be accomplished by (a) assessing the need for sealing for specific conditions present in the unsaturated zone in Yucca Mountain; (b) establishing desired hydrologic, structural, thermal, and geochemical design requirements; (c) determining the initial material properties of potentially suitable sealing materials; (d) assessing the performance of sealing designs using initial and long-term material properties; (e) measuring altered, material properties through laboratory studies designed to simulate exposure of seal materials to extreme environmental conditions; and

(f) reassessing the performance of the sealing designs using the results from the laboratory and field testing. In addition to the tasks described in this program plan, the hydrologic characterization of Topopah Spring Member and the Tuffaceous Beds of Calico Hills, which will be assessed through the exploratory shaft testing, will be used to verify the need for sealing and to support the resolution of the performance-related questions.

This report, therefore, includes

- Presentation of project schedule (Chapter II)
- Descriptions of the sealing system (Chapter III), the hydrogeologic setting, the repository design concepts, and the sealing concepts (Chapter IV)
- Description of the plan used in the repository sealing activity (Chapter V)
- Identification and brief discussions of the significance of the performance-related questions associated with the sealing system (Chapter V)
- Identification and description of the steps proposed to resolve these questions and to develop sealing designs (Chapter VI)
- Description of the licensing process (Chapter VII)
- Discussion of quality assurance (Chapter VIII)
- Review of the schedule for the repository sealing activity (Chapter IX)
- Work-flow diagrams, which include the tasks, their durations, and the relationship to other tasks (Plates 1 through 5, Appendix B)

II. PROJECT SCHEDULE AND APPLICABLE REGULATIONS

The sealing activities described in this report will support the construction authorization application (CAA), currently scheduled for submittal to the NRC in August 1990 (U.S. DOE, 1984a). The extent of information required for the CAA can be inferred from the existing regulation, 10 CFR 60, Section 60.21, which states that a license application shall consist of "general information and a Safety Analysis Report." The regulations associated with the content of the Safety Analysis Report state the need for a description and an assessment of the engineered and natural barriers. The pertinent regulations are

Section 60.21.c.1.ii.D "The assessment shall contain . . . (D) The effectiveness of engineered and natural barriers, including barriers that may not be themselves a part of the geologic repository operations area, against release of radioactive material to the environment. The analysis shall also include a comparative evaluation of the alternatives to the major design features that are important to waste isolation, with particular attention to the alternatives that would provide longer radionuclide containment and isolation."

Section 60.21.c.2 "A description and discussion of the design, both surface and subsurface, of the geologic repository operations area including: (i) the principal design criteria and their relationship to any general performance objectives promulgated by the Commission, (ii) the design bases and the relation of the design bases to the principal design criteria, (iii) information relative to materials of construction (including geologic media, general arrangement, and approximate dimensions), and (iv) codes and standards that DOE proposes to apply to the design and construction of the geologic repository operations area."

Specific documents contributing to the CAA include the Preliminary Safety Analysis Report (PSAR), the Final Environmental Impact Statement (FEIS), and Title I design of the repository. The PSAR and the FEIS primarily provide the assessment of the performance of the YMMGDS, and Title I design provides the description of the engineered repository system, part of which is the sealing system. The current schedule for completing these documents and related activities is:

Complete conceptual design studies	7/87
Issue Draft EIS	9/89
Complete Title I design	2/90
Issue FEIS	3/90
Complete PSAR	8/90
Submit CAA to NRC	8/90

Through the NNWSI repository sealing activity specific designs will be developed for engineered barriers (defined in this report as sealing components) and their performance will be evaluated. The results from the tasks, identified in this program plan, will be integrated into the NNWSI Project documents identified above. The schedule for completing sealing-related documents is:

Define sealing concepts	4/84
• Prepare a draft program plan for the NNWSI repository sealing activity	10/84
Develop a preliminary report on conceptual designs for sealing components	9/86
Complete final report on the conceptual design for sealing components	3/87
Complete Title I sealing design criteria	9/87
Complete sealing subsystem performance report	4/89
Complete Title I design for sealing components	1/90

All sealing activities are structured into three work breakdown structure (WBS) categories: WBS 1.2.4.2.3.1 - Seal Performance/Requirements, WBS 1.2.4.2.3.2 - Materials Evaluation, and WBS 1.2.4.2.3.3 Seal Design/Field Testing. Work-flow networks are included in this report for each WBS correlating the major documents mentioned above with specific sealing tasks. These interrelationships are illustrated on Plate 1, the overall network, and Plate 2, the milestone overview network.

III. THE SEALING SYSTEM

The Yucca Mountain Mined Geologic Disposal System (YMMGDS) is divided into the Preclosure Waste Disposal System (PreWDS) and the Postclosure Waste Disposal System (PostWDS) (Figure 1). The PreWDS includes sytems which provide for the development and operation of a radioactive waste disposal facility prior to permanent closure. The PostWDS includes sytems which isolate radioactive waste from the accessible environment following permanent closure. The sealing system, as used in this report, includes the underground-facility-barrier subsystem and the shaft and borehole seal subsystem under the PostWDS and the underground closure subsystem in the PreWDS.

Functional Requirements for the Sealing System

Specific functional requirements have been established for the sealing system (Fernandez and Freshley, 1984) and for each of the subsystems that collectively form the sealing system (Yeager et al, 1984). A functional requirement indicates what the system must do to contribute to the overall performance of the YMMGDS. The functional requirements for the underground closure subsystem are

- Provide for the removal of equipment and hardware needed to construct and operate the repository, if it is not to be part of the PostWDS

- Provide sealing components that will serve postclosure as well as preclosure functions, eg, during the preclosure period a fault seal can control water inflow into the repository and during the postclosure period a fault seal can restrict the amount of water reaching the waste package

The functional requirements for the underground-facility-barrier subsystem and the shaft and borehole seal subsystem include

- Reducing or preventing any increase in the amount of ground water that will contact the waste packages by preventing preferential pathways for ground water that might enter emplacement drifts via shafts or ramps and by diverting water away from the waste packages

- Contributing to the retention of radionuclides, where possible, by sealing off discharge pathways to preclude a more rapid transit time to the accessible environment, by sorbing radionuclides downgradient from the waste package and by retarding flow downgradient from the waste package to optimize contact with sorbing materials

Based on these functional requirements, the overall function of the sealing system is to contribute to the performance of the YMMGDS in preventing unacceptable radionuclide releases to the accessible environment by use of suitable engineered barriers. This program plan has therefore been structured to address the performance of the sealing system.

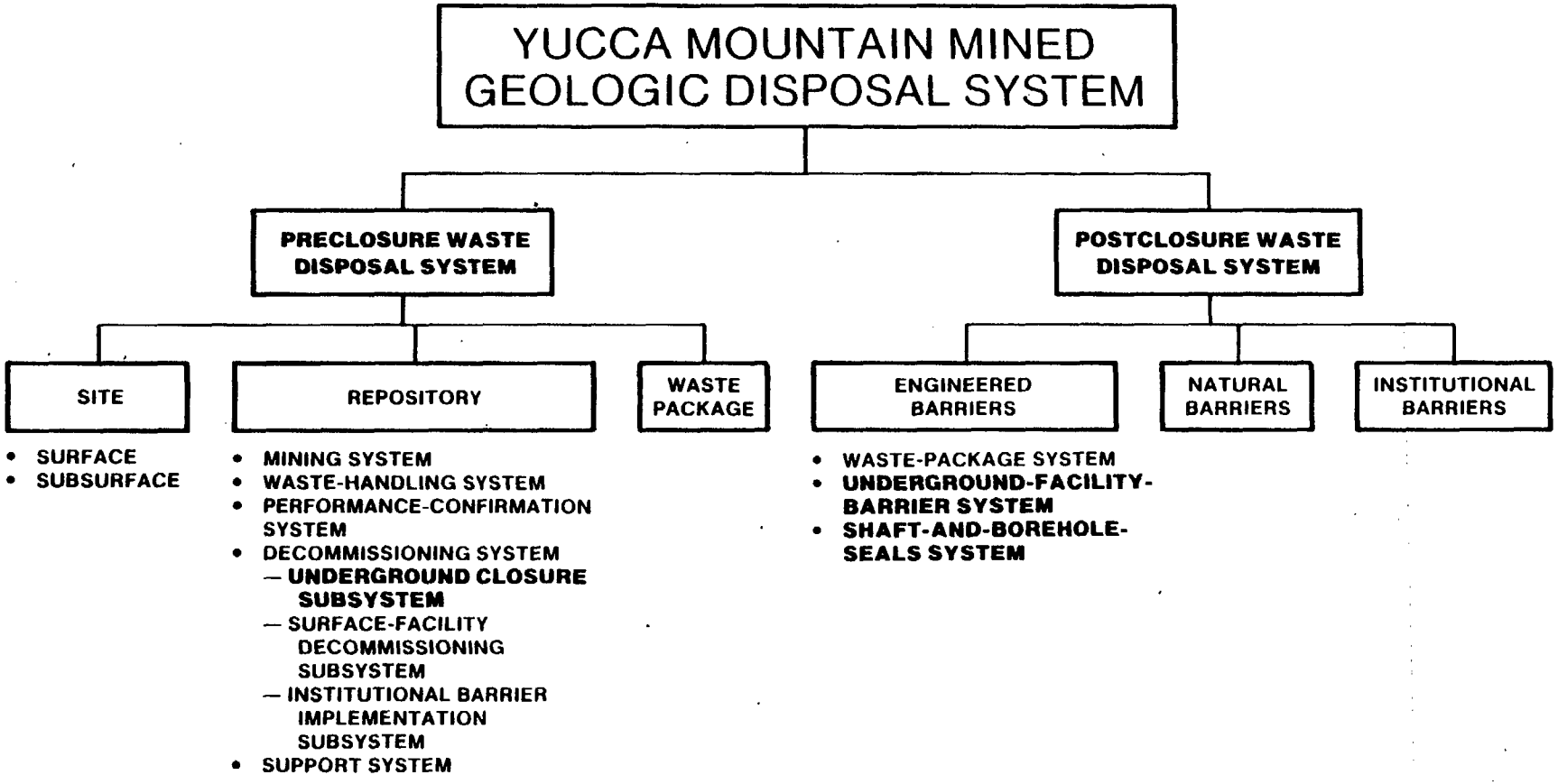


Figure 1. Systems Comprising the Yucca Mountain Mined Geologic Disposal System With Emphasis on Systems Contributing to the Sealing System (modified from Yeager et al, 1984)

IV. DESCRIPTION OF THE HYDROGEOLOGIC SETTING, THE REPOSITORY DESIGN, AND THE SEALING CONCEPTS

To assess the performance of the sealing system it is important to consider the hydrogeologic setting, the modifictions to this setting from exploration and construction activities, and the sealing concepts. Brief descriptions of the hydrogeology, repository design, and the sealing concepts are given below. A more complete description of the geology and hydrology is given in NNWSI Project environmental assessment (U.S. DOE, 1984b). More complete descriptions of the repository design concepts and the sealing concepts are provided by Jackson (1984) and Fernandez and Freshley (1984), respectively.

Hydrogeologic Setting

The stratigraphy of Yucca Mountain is comprised of alternating layers of tuff having different degrees of welding. The Topopah Spring Member of the Paintbrush Tuff Formation has been selected (Johnstone and Peters, 1984) as the most suitable geologic unit in which to construct a repository at Yucca Mountain (Figure 2). The Topopah Spring Member is relatively thick, generally greater than 300 m (1000 ft); is composed predominantly of densely welded tuff; and is located in the unsaturated zone at Yucca Mountain. Below this unit are the Tuffaceous Beds of Calico Hills, composed of massive homogeneous nonwelded tuff. The Yucca Mountain and Pah Canyon Members, composed of nonwelded to partially welded tuffs, and the Tiva Canyon Member, composed of densely welded tuff, are located above the Topopah Spring Member. Surficial deposits are generally thin on the sloping portions of Yucca Mountain while they are thicker in the washes.

Hydrologically these tuff units can be broadly grouped into three categories:

- Densely welded, low-porosity, but highly fractured units with high hydraulic conductivity; e.g., the densely welded portions of the Tiva Canyon and Topopah Spring Members

- Nonwelded, porous, zeolitized, but relatively nonfractured units with low hydraulic conductivity; e.g., portions of the Tuffaceous Beds of Calico Hills

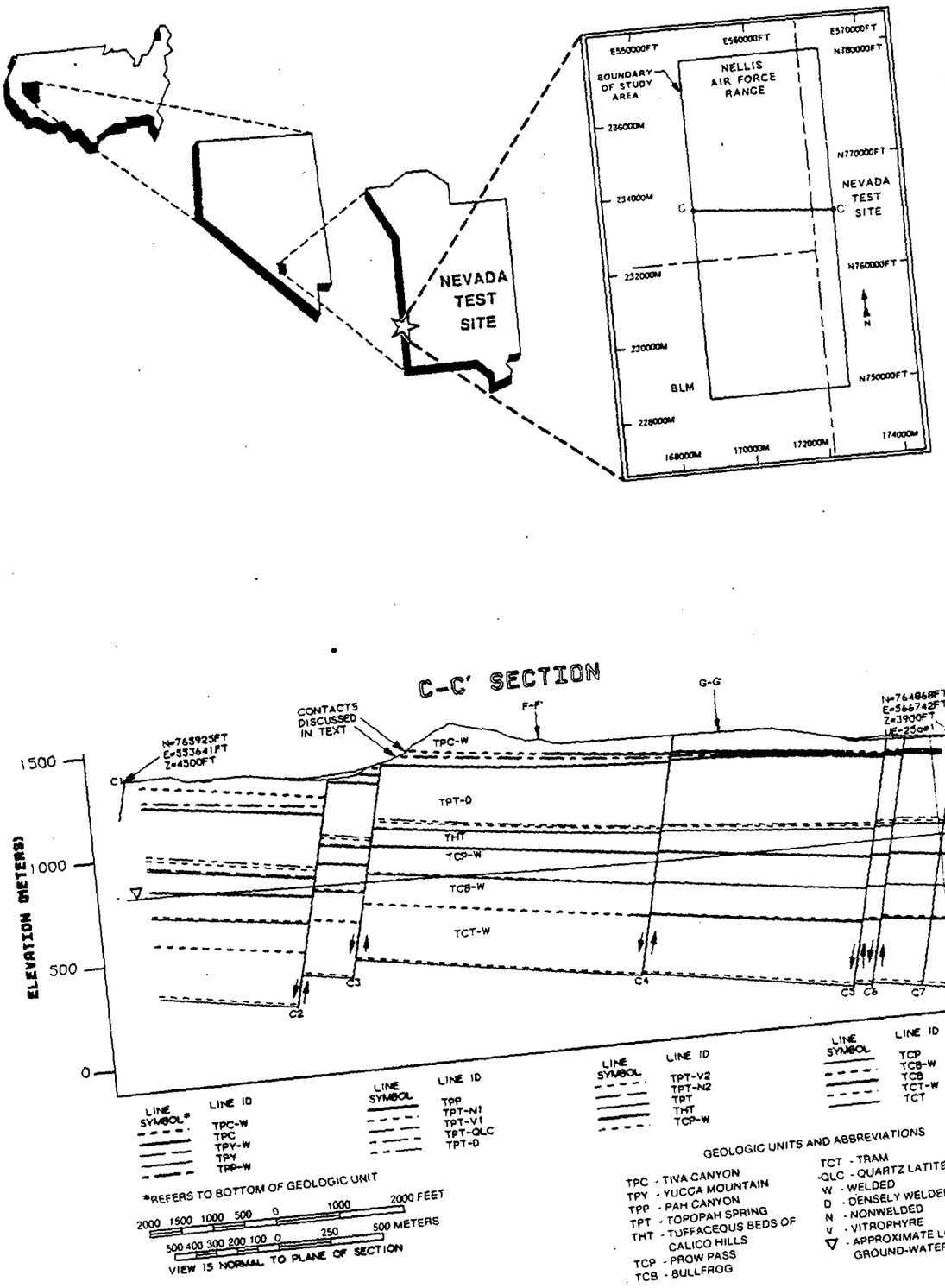


Figure 2. Geologic Cross Section Through Yucca Mountain (modified from Nimick and Williams, 1984)

- Nonwelded, porous, vitric, but relatively nonfractured units with high hydraulic conductivity; e.g., portions of the Tuffaceous Beds of Calico Hills and portions of the Pah Canyon and Yucca Mountain Members

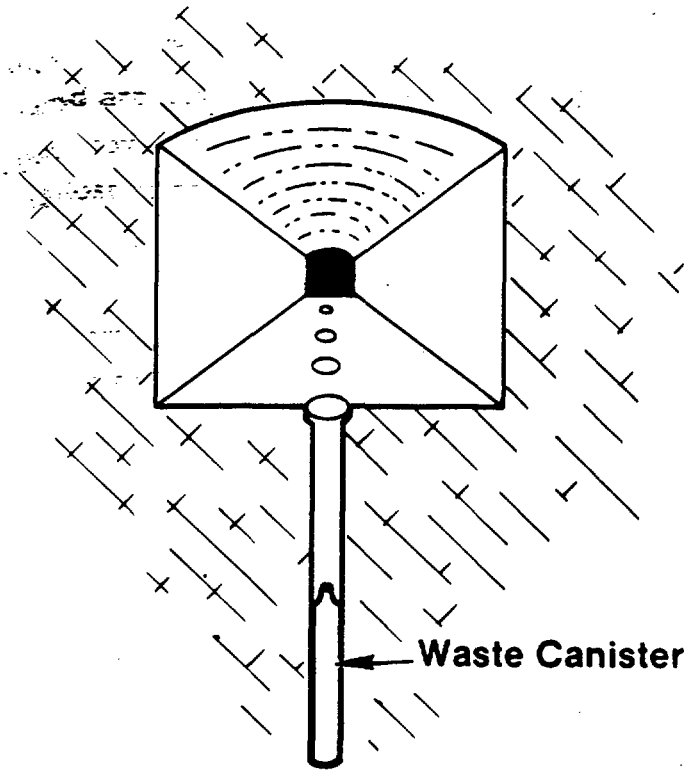
Repository Design Concept

The design of repository depends on the disposal option selected. Two disposal options are currently being considered for the NNWSI Project (Jackson, 1984). These disposal options are vertical emplacement of waste packages in shallow, one-package boreholes, and horizontal emplacement of waste packages in long, multipackage boreholes (Figure 3). A study comparing these options has been prepared (Scully et al, 1984) which identifies numerous advantages of the horizontal emplacement options. This study also indicates the need for prototype equipment development to resolve uncertainties associated with horizontal drilling, lining the boreholes, and emplacing and retrieving the waste packages. Until these uncertainties are resolved and the emplacement option selected, both options will be considered in developing the sealing component designs.

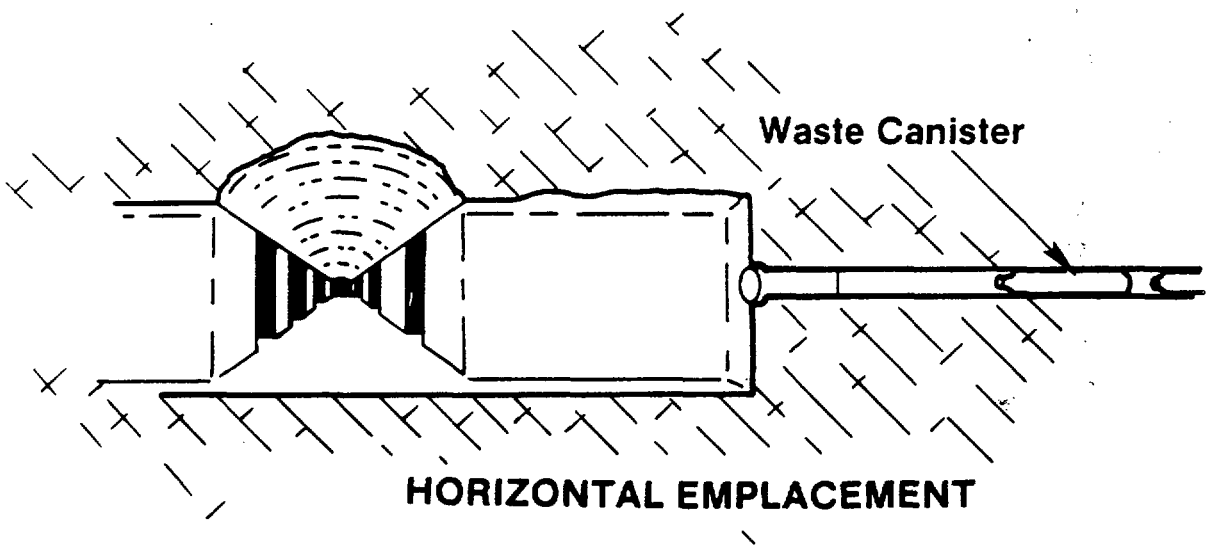
Additional repository design features are shafts and ramps which are used to gain access to the repository. A recently completed study (Beall, 1984) investigated various ways in which access to an exploratory shaft facility could be achieved. One important objective established in the study was to consider the ultimate use of the exploratory shaft and the second access shaft or ramp in the development of the prospective repository at Yucca Mountain. To achieve this objective it was necessary to consider potential layouts for the repository and a variety of access means to the repository. These access means included shafts and waste-handling and muck-handling ramps. Because ramps are preferred to shafts for removal of muck (Beall, 1984) and for waste transfer operations (Jackson, 1984), they are being considered as part of the repository design. Therefore, shafts and ramps will be considered in the NNWSI repository sealing activity.

Repository Sealing Concepts

The engineered features considered in the repository sealing activity include the underground facility, all penetrations providing access to it, and the exploratory boreholes. The underground facility includes the "underground structure and the rock required for support, including mined openings and backfill materials . . . ."



VERTICAL EMPLACEMENT



HORIZONTAL EMPLACEMENT

Figure 3. Vertical and Horizontal Waste Emplacement Configurations

(U.S. DOE, 1984d) The penetrations providing access to the repository include both ramps and shafts and are tentatively located on the east side of Yucca Mountain. Currently, there are approximately 30 exploratory boreholes in the vicinity of a prospective repository. Most of these boreholes are located outside or on the edge of the prospective repository boundary.

The sealing concepts proposed for the prospective repository in the unsaturated tuff of Yucca Mountain (Fernandez and Freshley, 1984) include closure of the penetrations described above and provide the basis for continuing NNWSI repository sealing activities. These concepts were developed considering the hydrologic setting and the repository design concepts. The concepts are described briefly here and in Chapter V.

The surface barrier (Figure 5) associated with the shafts and ramps is intended primarily to reduce the water entry into the shaft. Appropriately graded and unreactive fill, such as crushed tuff, settlement plugs, and station plugs, are proposed for the lower portion of the shaft. The lower portion of the shaft is that portion of the shaft beneath the surface barrier. Sealing of ramps is similar to sealing of shafts with the possible exception of dams positioned at selected intervals. These dams, if emplaced, will divert the flow of water downward through the tuff rather than allowing lateral flow down the ramp. Suggested methods of controlling water flow in the vicinity of horizontally emplaced waste packages include: grouting, restricting the emplacement of waste packages, and placing seals in horizontal emplacement holes. Water-producing zones in drifts can be isolated by one of four options: drains or dams (options 1 and 2) to increase the drainage of the drift floor and to control the lateral migration of water in the drift; grouting of the rock above the drift (option 3); and massive seals (option 4) to isolate large flows, if encountered. For those boreholes that may act as potential paths for radionuclide release to the accessible environment, emplacement of a seal in the zone penetrating the Tuffaceous Beds of Calico Hills and emplacement of granular fill, grout, and plugs in the remainder of the hole are suggested. The sealing concepts, including schematic drawings of the concepts, are presented further in Chapter V.

V. PLAN USED IN THE NNWSI REPOSITORY SEALING ACTIVITY

The overall plan used in the NNWSI repository sealing activity to determine the acceptable performance of sealing components is illustrated in Figure 4. Key issues, issues, and informational needs have been defined in the Civilian Radioactive Waste Management (CRWM) Program (U.S. DOE, 1984a). These informational needs are restated in this program plan in terms of seven performance-related questions specific to the NNWSI Project. In this sense these questions replace the informational needs. Therefore, once the performance-related questions are resolved the informational needs will also be satisfied. Steps and tasks are then proposed to answer these performance-related questions.

Significance of the Performance-Related Questions to the Issues Hierarchy in the Civilian Radioactive Waste Management Program

Within the CRWM Program, informational needs required to site, design, construct, operate, and permanently close a repository have been identified (U.S. DOE, 1984a). Three levels of detail--key issues, issues, and informational needs--are provided in what is termed the issues hierarchy. Key issues are broad questions of overall suitability, issues are more specific questions about the natural system or major design components, and informational needs are data or analyses about the natural or engineered systems required to address the issues.

The issues hierarchy pertinent to the sealing system is presented in Table 1. The primary sealing concern addressed by the issues hierarchy is the development of sealing designs that preserve the long-term containment and isolation capability of the site (key issue 1) and can be emplaced in a cost-effective manner (key issue 4).

Through the performance evaluations associated with each question, it will be possible to contrast the effectiveness of various designs with the cost to emplace the sealing designs. These trade-off analyses will be part of the conceptual design and Title I design activities and will result in sealing designs that perform acceptably and can be emplaced cost effectively.

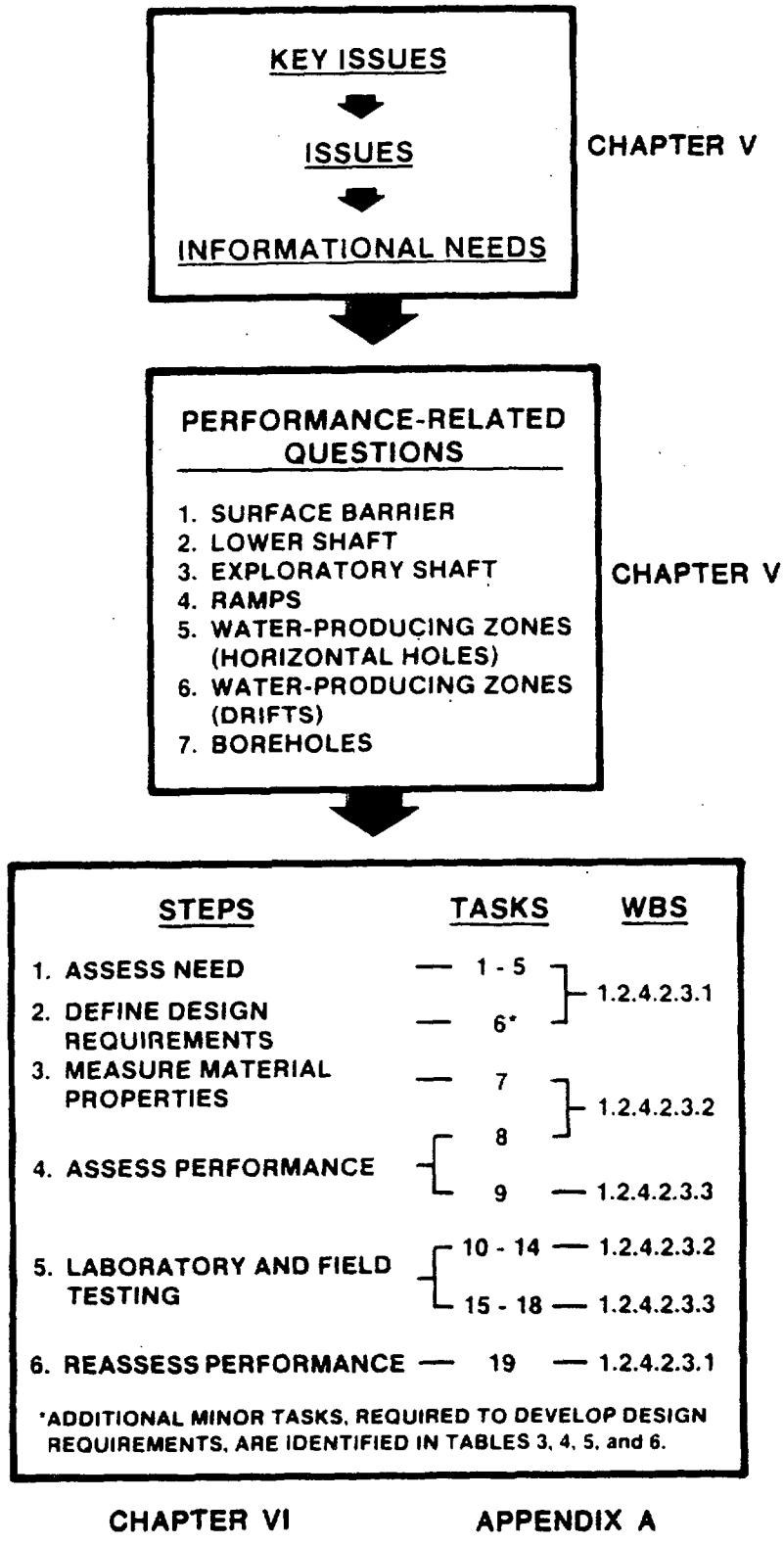


Figure 4. Schematic Diagram of the Plan for the NNWSI Repository Sealing Activity

Table 1. Selected Key Issues, Issues, and Informational Needs Significant to the NNWSI Repository Sealing Activity*

KEY ISSUE 1: Will the geologic repository, consisting of multiple natural and engineered barriers, isolate the radioactive waste from the accessible environment after closure in accordance with the requirements set forth in 10 CFR Part 60 and the proposed Environmental Protection Agency rule to be codified as 40 CFR Part 191?

ISSUE 1.9: Will the long-term containment and isolation capability of the site be compromised by repository construction, operation, and closure?

Informational Need 1.9.9
Description of the sealing design for underground drifts,shafts, ramps and boreholes.

KEY ISSUE 4: Are repository construction, operation, closure, and decommissioning feasible on the basis of reasonably available technology and are the associated costs reasonable?

ISSUE 4.7: Can the repository be closed in a cost-effective manner?

Informational Need 4.7.1
Characteristics of the environment in which plugs and seals are to be placed, such as stratigraphy and geohydrology, load conditions (temperature and pressure), rock properties, borehole and shaft characteristics, and the geochemical environment.

Informational Need 4.7.2
Character and extent of damage caused by the excavation of access shafts and underground workings.

Informational Need 4.7.3
Performance characteristics of sealing materials, including their long-term stability.

Informational Need 4.7.4
Emplacement techniques and operational procedures for acceptable materials and seal geometries.

Informational Need 4.7.5
Repository design information important to the design and analysis of the sealing system.

Informational Need 4.7.6
Detailed closure requirements and implementation plans.

*(From U.S. DOE, 1984a)

Performance-Related Questions

The NNWSI repository sealing activity is structured to answer specific performance-related questions so that acceptable sealing designs for a repository in the unsaturated tuff in Yucca Mountain can be developed. The basis for these performance-related questions is the sealing concepts. These performance-related questions, therefore, deal with

- The surface barriers, i.e., the upper portion of the shafts or ramps (Question 1)
- The lower portion of the shaft (Question 2)
- Penetration of the exploratory shaft into the Tuffaceous Beds of Calico Hills (Question 3)
- Ramps (Question 4)
- Water-producing zones in horizontal emplacement holes (Question 5)
- Water-producing zones in drifts (Question 6)
- Exploratory boreholes (Question 7)

In the remainder of this chapter performance-related questions for all sealing components are identified. Additionally, a discussion is provided for each question which

- Describes how radionuclide release could be affected
- Specifies the sealing components associated with the question
- Presents pertinent background information, if available
- Presents areas of uncertainty which should be considered in answering the question

An area of uncertainty associated with each question is the variation of the properties of the seal materials after prolonged exposure in its emplacement environment.

Question 1. Surface Barrier

Does the surface barrier provide an effective and sufficiently redundant means of controlling water entering the upper portion of the shaft?

Discussion

One means of minimizing the potential for radionuclide release is to limit the ground water contacting the waste packages. One conceivable mechanism for waters to contact the waste packages is for precipitation or surface runoff to enter the shafts, percolate to the shaft bottom, and migrate laterally to the waste packages. If this volume of water contacting the waste enhances the release of radionuclides, it may be necessary to emplace a surface barrier to control these sources of water.

The surface barrier can include the following sealing components: a surface cover, a surface core, an anchor-to-bedrock plug/seal, and a construction liner (Figure 5). As illustrated, the unconsolidated overburden is assumed to be shallow, i.e., about 10 m or less. The waste-handling ramps (see Question 4) will be associated with the surface, waste-handling facility. Limited analyses of the alluvial fan deposits, where surface, waste-handling facility sites are being considered, indicate the presence of coarse-grained alluvium with alluvial thicknesses as high as 37 m (120 ft) (Neal, 1984). Locations for shafts are also still under consideration.

An important consideration associated with this question is the ability of the overburden to reduce the surface water entering the shaft. The extent of water migration is ultimately dependent on the hydrologic properties, the saturation states of the geologic unit above the bedrock, and the frequency and magnitude of precipitation events. Therefore, one criterion that might be used to aid in siting openings of shafts and ramps is--locate these openings in areas where the unconsolidated overburden acts as an effective barrier to water migration. Additionally, areas having low flood potential would also be desirable.

Question 2. Lower Shaft

Can the lower portion of the shaft (i.e., that portion of the shaft below the surface barrier) effectively dissipate waters entering the shaft from surface and subsurface sources while providing adequate settlement control?

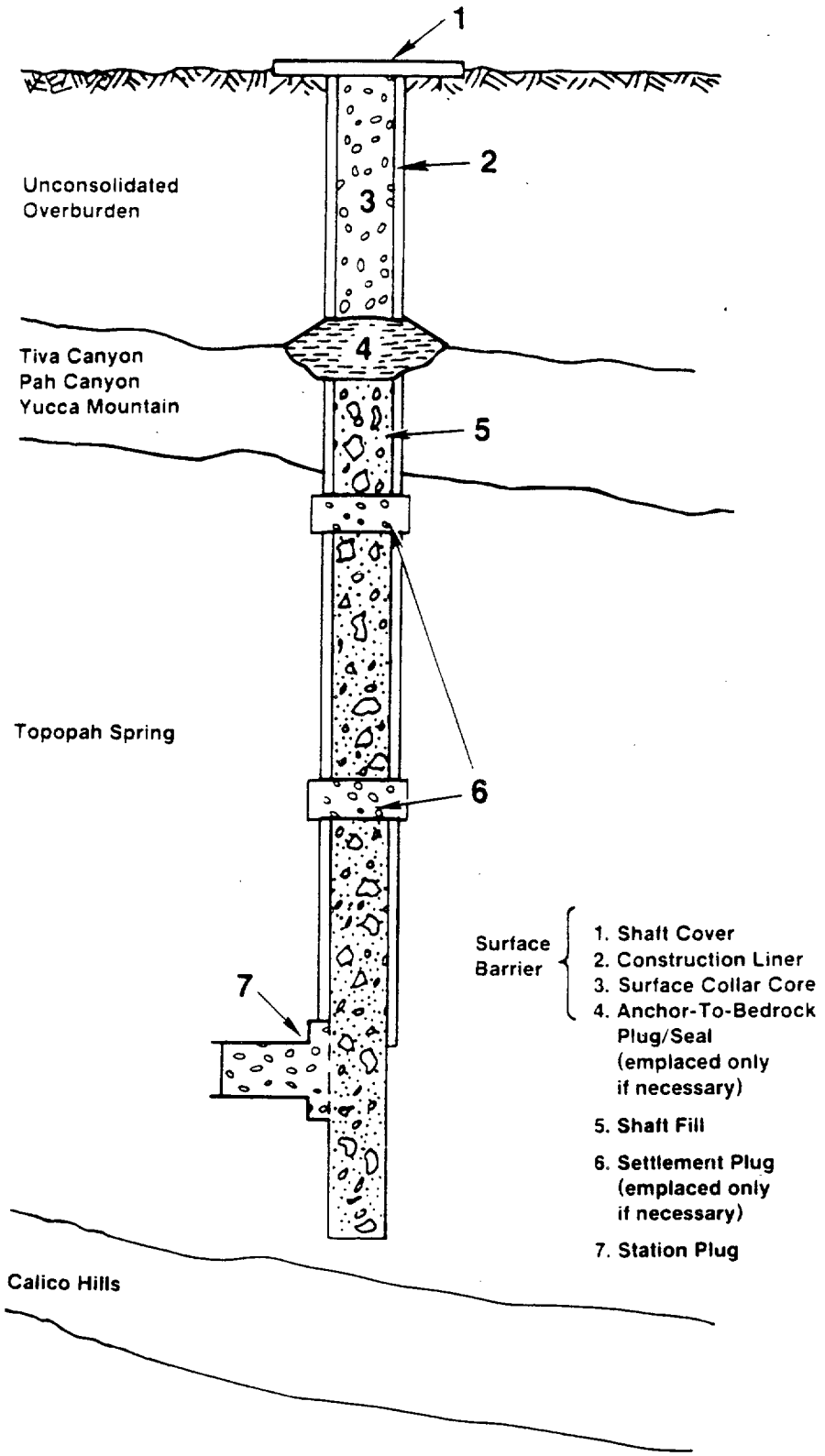


Figure 5. Sealing Concept Proposed for a Shaft

Discussion

Formation of a depression around the shaft opening, resulting from settlement of shaft fill, could funnel precipitation and surface runoff into the shaft. If water entering the shaft could not be effectively dissipated in that portion of the shaft which extends below the repository emplacement area because of excessive amounts of inflow or a decrease in the effective hydraulic conductivity of the Topopah Spring Member, then water flow to the waste disposal area could increase. If this source of water increased the potential for radionuclide release, then settlement control or modification of the shaft sealing concept would be required.

The sealing components in the lower portion of a shaft include: shaft fill, settlement plugs, and a station plug (Figure 5). The primary concern associated with this question is the effectiveness of the Topopah Spring Member to dissipate waters in the lower portion of the shaft. Several uncertainties exist concerning this effectiveness. These include the presence of the shaft liner, the hydraulic properties of the rock, and processes that can reduce the effective hydraulic conductivity of the rock by filling fractures. Three processes can modify the capacity of the Topopah Spring Member by fracture filling: (1) migration of fine-sized particles to the base of the shaft, (2) dissolution of the minerals from the shaft fill and reprecipitation of these minerals at the base of the shaft, and (3) biofouling (primarily a microfloral/microbial problem).

Question 3. Penetration of the Exploratory Shaft Into the Tuffaceous Beds of Calico Hills

What design modifications and additions are required for the exploratory shaft as a result of its penetration into the Tuffaceous Beds of Calico Hills?

Discussion

The exploratory shaft represents a potential discharge pathway through which water flow to the underlying saturated zone might be increased. The significance of the penetration of the exploratory shaft into the Tuffaceous Beds of Calico Hills will be assessed based on a combination of (a) the ability of the geologic units beneath the repository to transport radionuclides laterally to the exploratory shaft and (b) the potential radionuclide release rate through the remaining portion of the Calico Hills unit to the water table.

The planned penetration of the exploratory shaft into the Tuffaceous Beds of Calico Hills will provide an opportunity to characterize the hydrology of the Calico Hills unit. The exploratory shaft is the only shaft planned that will penetrate into this unit. Three objectives for testing in the Calico Hills unit include a determination of (1) the degree of fracturing, (2) transport properties of the fractures, and (3) conditions in which perched water can occur (Myers, 1984--Note: this reference is a draft report and is used here for planning purposes). To achieve these objectives, the main construction features include penetration of the shaft into the Calico Hills unit, a breakout room approximately 6 m x 12 m (20 ft wide x 40 ft long); a horizontal, 76-m (250-ft) borehole that is parallel to the final orientation of the main breakout room in the Topopah Spring Member (currently proposed to be N30°W); and a horizontal borehole drilled from the base of the exploratory shaft to a geologic structure identified in the Topopah Spring Member. These activities are being planned as part of the site characterization activities. Through this testing the hydrologic nature of the Calico Hills unit will be better understood and the need for design modifications for the exploratory shaft will be more apparent. Until this hydrologic testing is completed, however, assumptions will be made on the range of hydrologic conditions that are possible in the Calico Hills unit. Design modifications can then be developed to accommodate the varying hydrologic conditions.

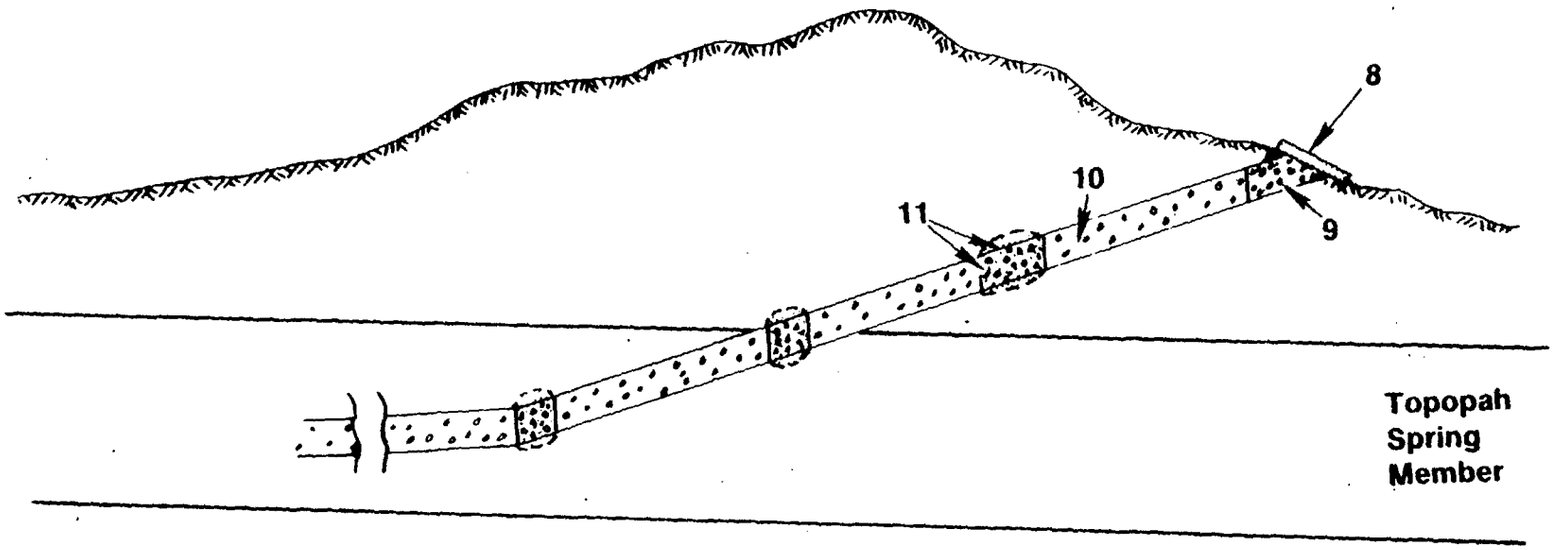
Question 4. Ramps

Do the components associated with the ramp, but excluding the surface barrier, effectively divert water downward into the host rock?

Discussion

Water migration into the repository is possible through man-made penetration. Water can originate from the surface or from discrete, water-producing fault and fracture zones. The most likely flow in the ramp is believed to occur through fault zones. Where water does enter the ramp, it should be dissipated into the host rock through the floor of the ramp or could be diverted to the base of the ramp where it can then be effectively dissipated into the host rock.

The concept for ramp sealing is illustrated in Figure 6. Currently, two ramp accesses are proposed for the potential repository at Yucca Mountain--a waste-handling ramp inclined 10 percent (5.7°) and a 20 percent (11.3°) ramp to be used for removal of mined



8 - Ramp Cover
9 - Collar Core
10 - Fill
11 - Dam (only if necessary)

Figure 6. Sealing Concept Proposed for a Ramp

materials. The inclined ramps will use rockbolts, wire mesh, shotcrete, concrete liner, or steel sets as appropriate to maintain stability. Concrete floors may be emplaced but their emplacement depends on the mining method selected and the ramp usage.

Several uncertainties exist concerning the ability to dissipate water if encountered in the ramp. These include (a) the effectiveness of the dam component to interrupt flow and encourage dissipation into the floor of the ramp, (b) the effect of the excavation-induced damage zone on the effectiveness of the dam component, and (c) the need (from a hydrologic perspective) for removal or perforation of the liner or the concrete floor.

Question 5. Water-Producing Zones in Horizontal Emplacement Holes

Can the water from a freely draining fault or fracture zone that intersects a horizontal waste emplacement hole be effectively controlled to reduce the amount of water that can potentially contact waste packages?

Discussion

Sealing discrete, water-producing fault or fracture zones can contribute to the containment and isolation of radionuclides by preventing an influx of water to the emplacement holes and then to the waste packages. During the isolation period, the characteristics of the geologic repository, including the site and engineered barriers, are relied upon to keep radionuclide releases within prescribed limits. The fault seal represents one kind of engineered barrier.

The current concept for sealing discrete, water-producing zones is to prevent ground water in these zones from contacting and possibly enhancing the dissolution of the waste packages. This can be accomplished by not storing waste packages in the vicinity of the water-producing zones, by emplacing barriers within the emplacement hole, and by grouting these zones (Figure 7). Grouting can be performed using current grouting technology and can be emplaced remotely or directly. Portland-cement-based grouts are normally used for sealing large fractures. Chemical grouts such as sodium silicate, acrylamide, lignin, and resin are commonly used in sealing fine fissures. Because of the high temperatures surrounding the waste package, some of these grouts may be inappropriate.

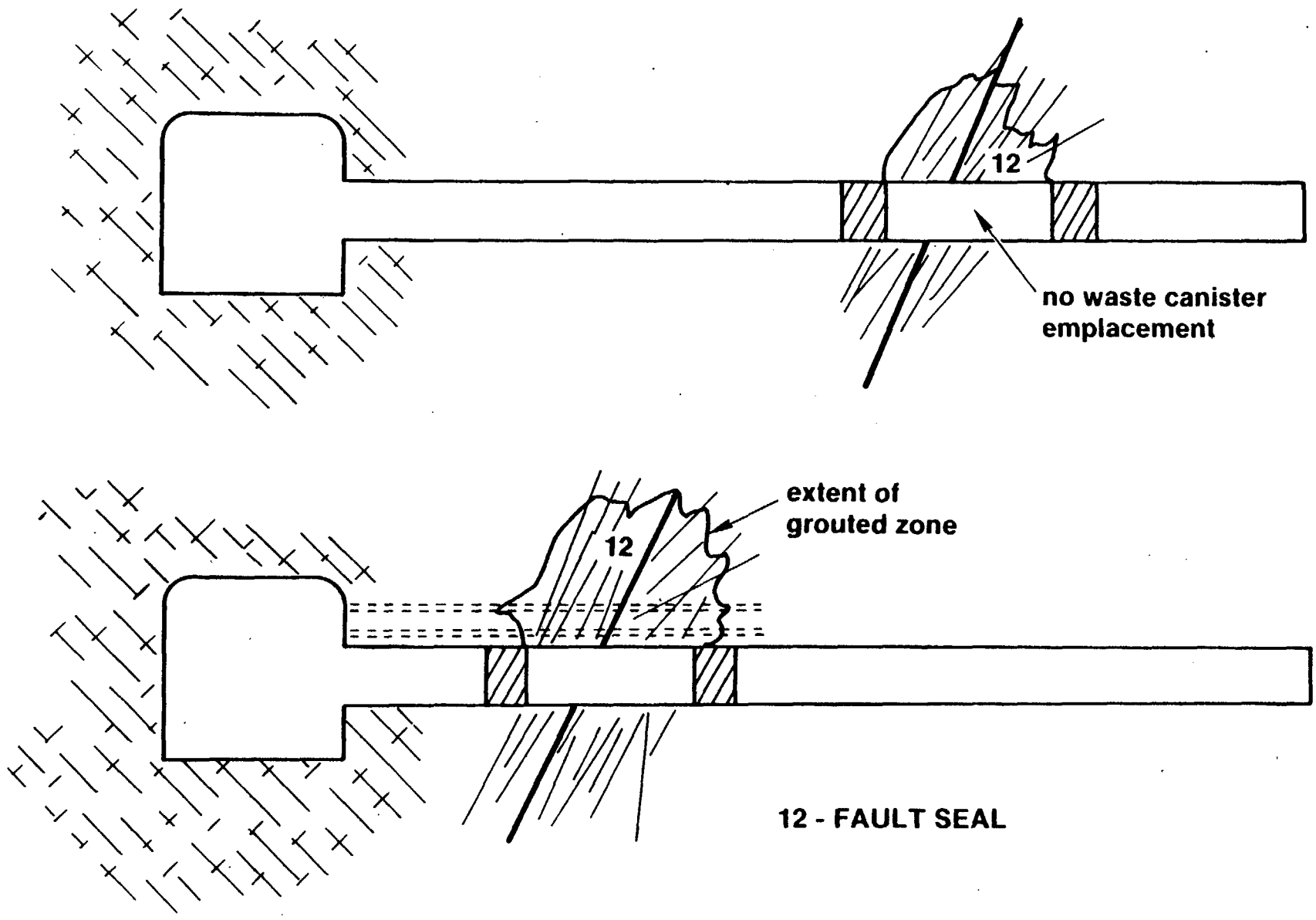


Figure 7. Sealing Concept Proposed for Isolating Discrete, Water-Producing Faults or Fracture Zones in Horizontal Emplacement Holes

There are two concerns asssociated with this concept: (1) the ability to emplace a grout seal which effectively controls fluid flow past the waste package and (2) the effect of modified ground-water chemistry, due to interaction with the fault seal, on the waste canister and the waste form solubilities.

Question 6. Water-Producing Zones in Drifts

Do fault seals and drains in access and emplacement drifts effectively control water by diverting water below the disposal horizon?

Discussion

A water-producing fault and fracture zone encountered in a drift in the vicinity of a vertically emplaced waste package is a condition that could enhance the migration of radionuclides. Emplacement of fault seals and drains can contribute to the containment and isolation of radionuclides by diverting water away from the waste packages.

Two conditions associated with the water-producing fault/fracture zones encountered in drifts were addressed by the sealing concepts (Fernandez and Freshley, 1984): (1) a design value of 0.057 m^3 of water/day (15 gpd) and (2) larger, unspecified volumes. Options one and two (Figures 8 and 9) were developed to dissipate waters equivalent to the design value. Options three and four (Figures 10 and 11) were developed for the larger flows.

These concepts are intended to restrict lateral movement of water in drifts and reduce the waste package/water contact. Options one, two, and three can be implemented during the preclosure period and their performance observed during this period. Option 4 can only be implemented during the postclosure period if access through the drift intersecting the water-producing zone is required for repository development or waste emplacement operations. Lateral migration of water in drifts associated with horizontally emplaced waste packages is of limited concern because the drifts have the capacity to dissipate waters before contacting the waste packages.

Because options 1 and 2 involve limited use of emplaced materials, the potential effectiveness of these drainage options can be determined by assessing the capacity of the drift floor to dissipate water. An assessment of this nature will evaluate the performance of the drainage system of option 1 (Figure 8), and the material dams and grout curtains of

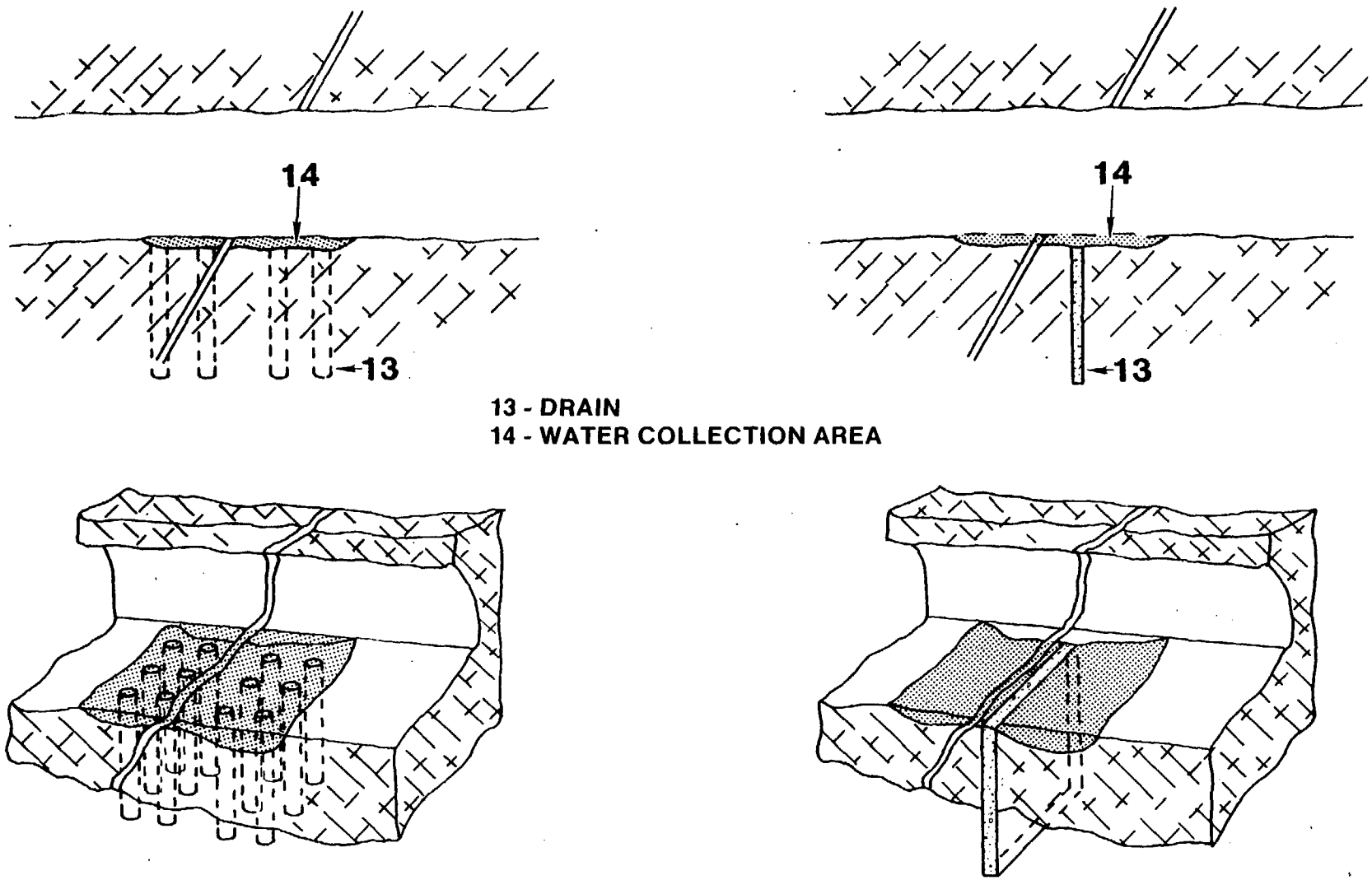
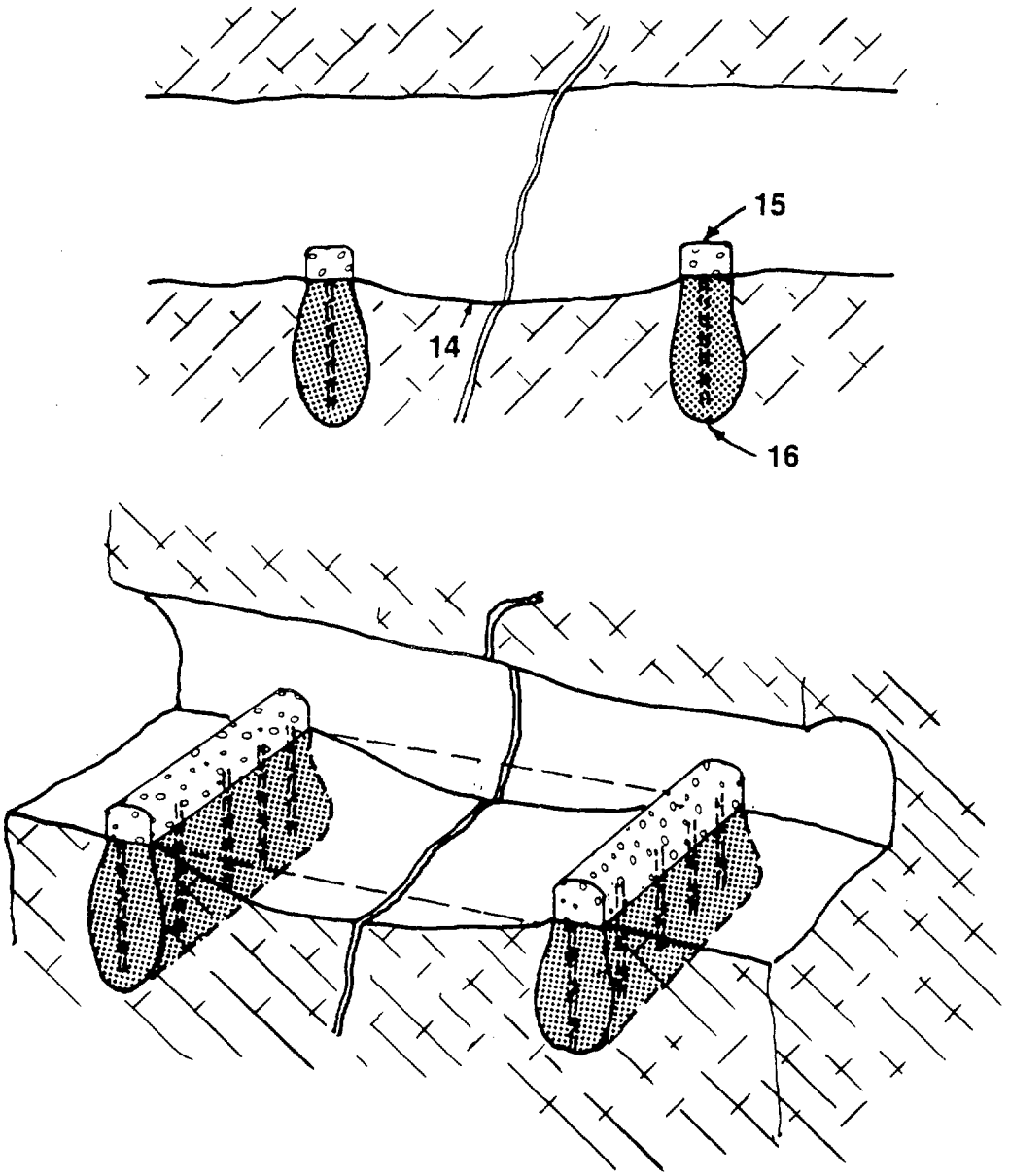


Figure 8. Sealing Concept Proposed for Isolating a Discrete, Water-Producing Fault or Fracture Zone in Access or Emplacement Drifts (First Option)



14 - WATER COLLECTION AREA
15 - DAM
16 - GROUT CURTAIN

Figure 9. Sealing Concept Proposed for Isolating a Discrete, Water-Producing Fault or Fracture Zone in Access or Emplacement Drifts (Second Option)

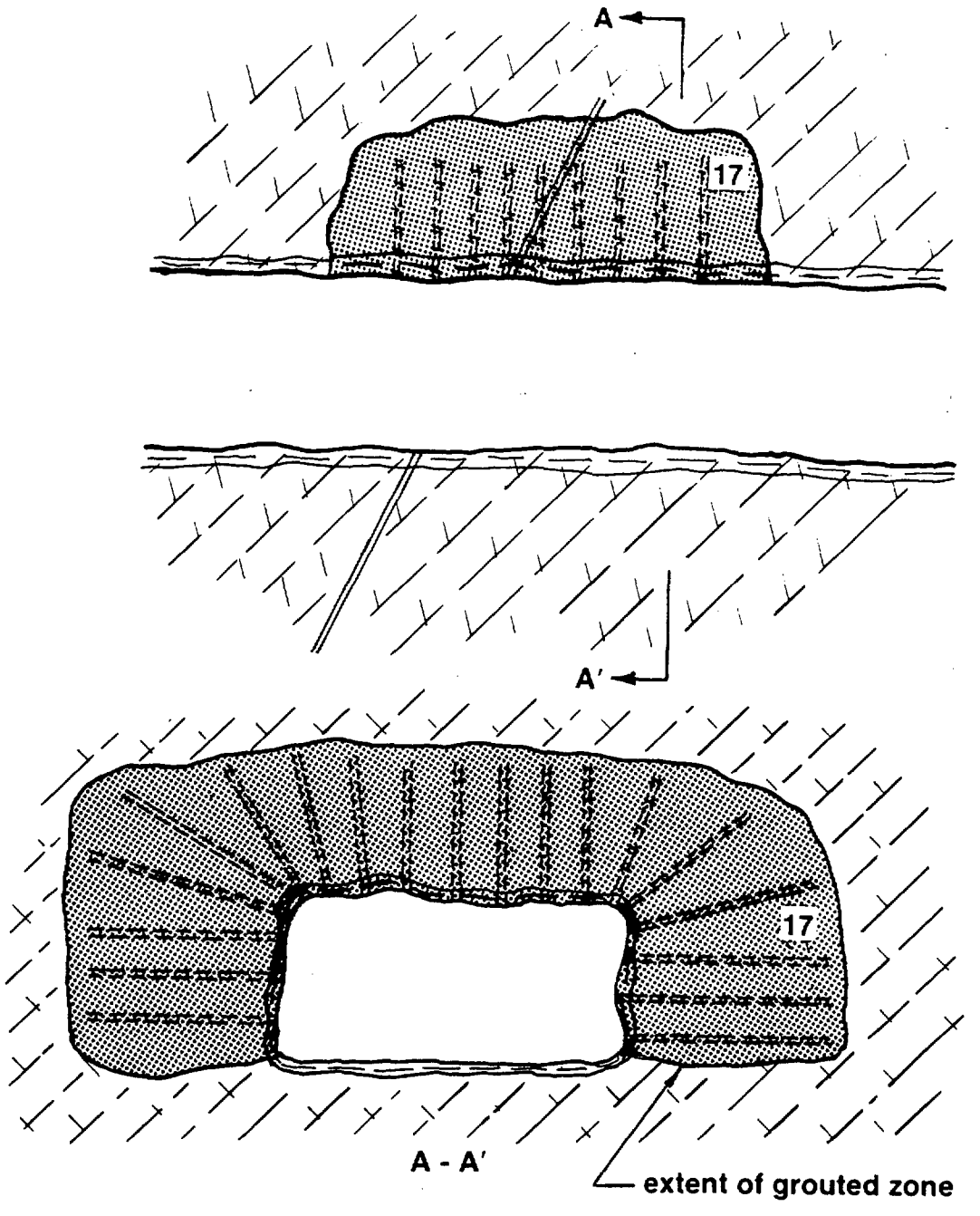


Figure 10. Sealing Concept Proposed for Isolating a Discrete, Water-Producing Fault or Fracture Zone in Access or Emplacement Drifts (Third Option)

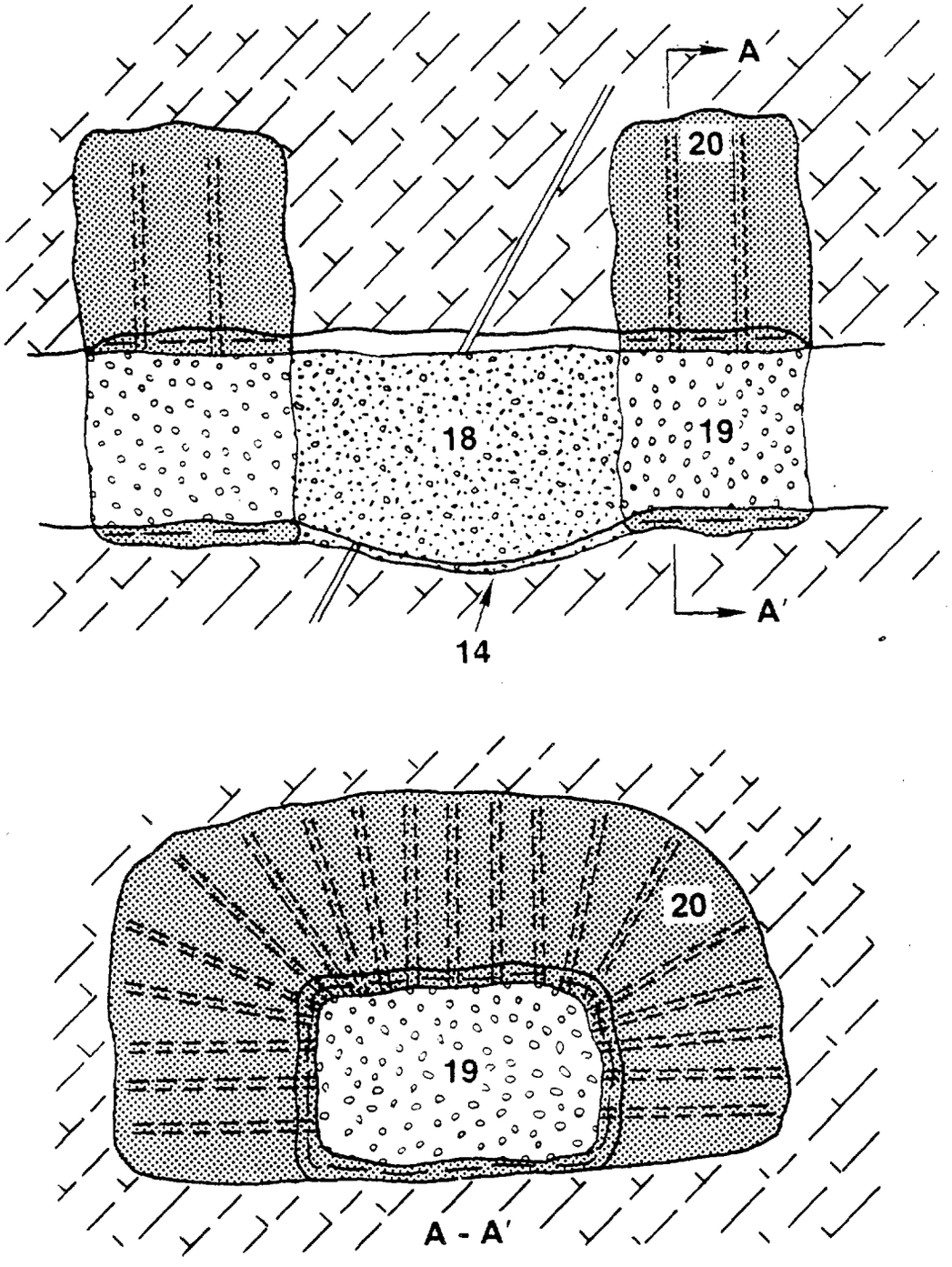


Figure 11. Sealing Concept Proposed for Isolating a Discrete, Water-Producing Fault or Fracture Zone in Access or Emplacement Drifts (Fourth Option)

option 2 (Figure 9). Effectiveness of options 3 and 4 can be determined by assessing the capability of the floor to dissipate waters and the ability of the fault seal and the external fault seal to divert waters away from the waste packages.

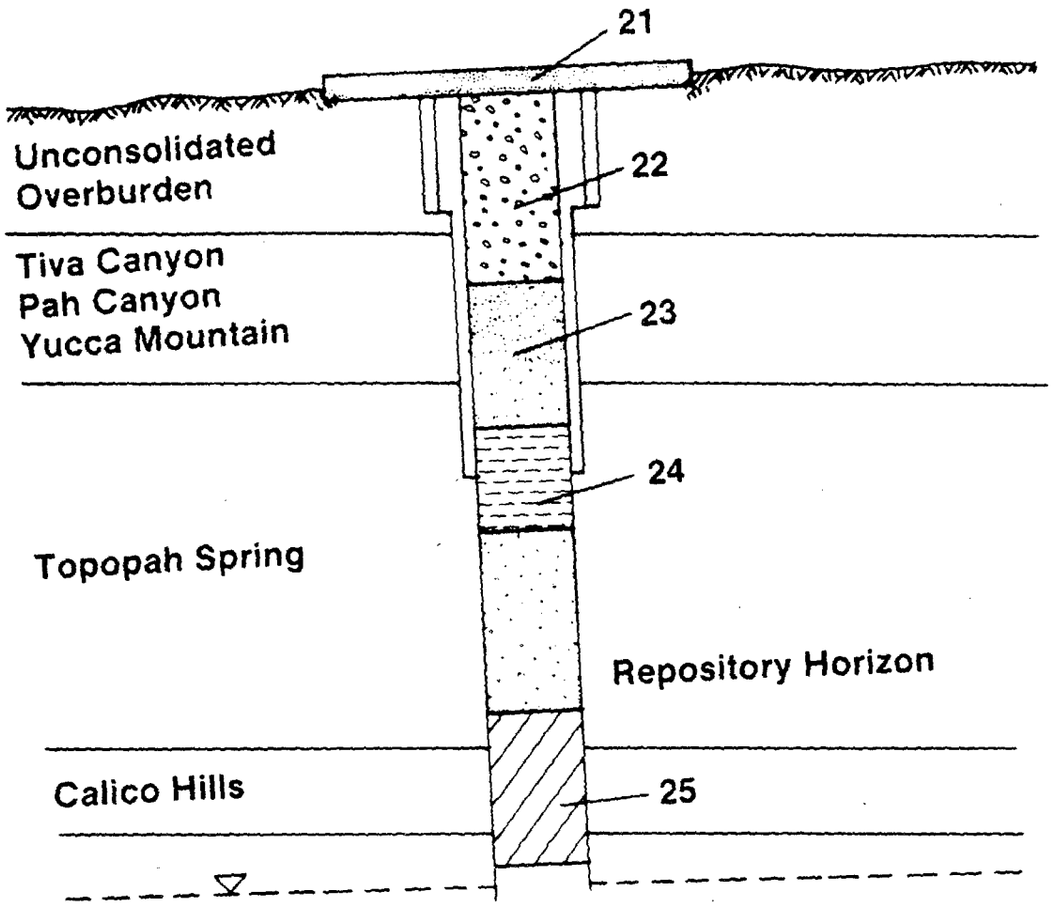
Question 7. Sealing Exploratory Boreholes

Do the exploratory boreholes compromise the isolation capability provided by the geologic setting?

Discussion

One possible means of compromising the isolation capability of the geologic setting is through the few surface exploratory boreholes; e.g., USW H-3, USW G-3/GU-3, and USW H-5, which penetrate the repository, the Tuffaceous Beds of Calico Hills, and into the saturated zone. Until the consequence of radionuclide releases can be more clearly evaluated, it is considered prudent to recommend sealing of the boreholes that penetrate the Tuffaceous Beds of Calico Hills to reduce the potential for radionuclide transport from the repository horizon to the accessible environment (Figure 12). Therefore, the primary objective in sealing these boreholes is to control preferential water movement through the Tuffaceous Beds of Calico Hills by emplacing a low permeability material. Additional considerations include achieving a low interface hydraulic conductivity, removing the casing, and developing a seal which is chemically and mechanically compatible to the host rock.

Exploratory drilling associated with the exploratory shaft include lateral exploratory corings from within the exploratory shaft and lateral corings from the drifts. The first activity involves drilling four horizontal, NQ-sized (7.57 cm, 2.98 in.), 15- to 30-m (49- to 98-ft)coreholes into the Topopah Spring Member at two planned levels, 160 m (520 ft) and 365 m (1200 ft). The second activity involves drilling a series of six horizontal, NQ-sized, 610-m (2000-ft) coreholes from the drifts in the exploratory shaft (Myers, 1984). Currently, there are no major concerns associated with sealing of these coreholes. Their significance, however, will be evaluated and sealing designs developed, as appropriate.



21 - Borehole Cover
22 - Surface Core
23 - Fill
24 - Settlement Plug (only if necessary)
25 - Seal

Figure 12. Sealing Concept Proposed for Borehole Sealing

VI. STEPS USED TO DETERMINE ACCEPTABLE PERFORMANCE OF SEALING COMPONENTS

The sequence of steps proposed to answer the performance-related questions are illustrated in Figure 13. These steps are:

Conceptual Design

Step 1: Assess the need for sealing

Step 2: Define the design requirements

Step 3: Measure material properties

Step 4: Assess the performance of sealing designs

Title I Design

Step 5: Perform laboratory analyses and field testing

Step 6: Reassess the performance of sealing designs

Establishing the need for sealing is the first step in arriving at sealing designs that contribute to the performance of the YMMGDS. If needs for sealing are established, design requirements will be defined for specific sealing components. Design requirements are specific values for parameters, such as permeability, compressive strength, and coefficient of thermal expansion, which must be met to achieve acceptable performance. Acceptable materials can then be identified and their material properties measured to confirm the ability to achieve the design requirements. Evaluation of specific designs can then be performed to determine how well the design requirements are met. If the performance is marginal or unacceptable, it may be necessary to modify sealing designs, to more accurately determine the material properties (through laboratory testing) or to better understand the performance of the sealing component or geologic unit (through field testing). Laboratory and field testing may be a suitable alternative to modify the initially assumed long-term material properties. Design or material modifications may be necessary and performance reevaluated if the performance is still unsatisfactory using the measured long-term material properties. As part of the Title I design, sealing designs that perform acceptably and require no further verification activities will be selected.

Specific tasks associated with each step are presented in Appendix A to evaluate the performance of the sealing components associated with each of the seven questions. Tasks are specific work packages to be performed as part of the NNWSI repository sealing activity. In addition to these tasks, it is also recognized that significant input, such as

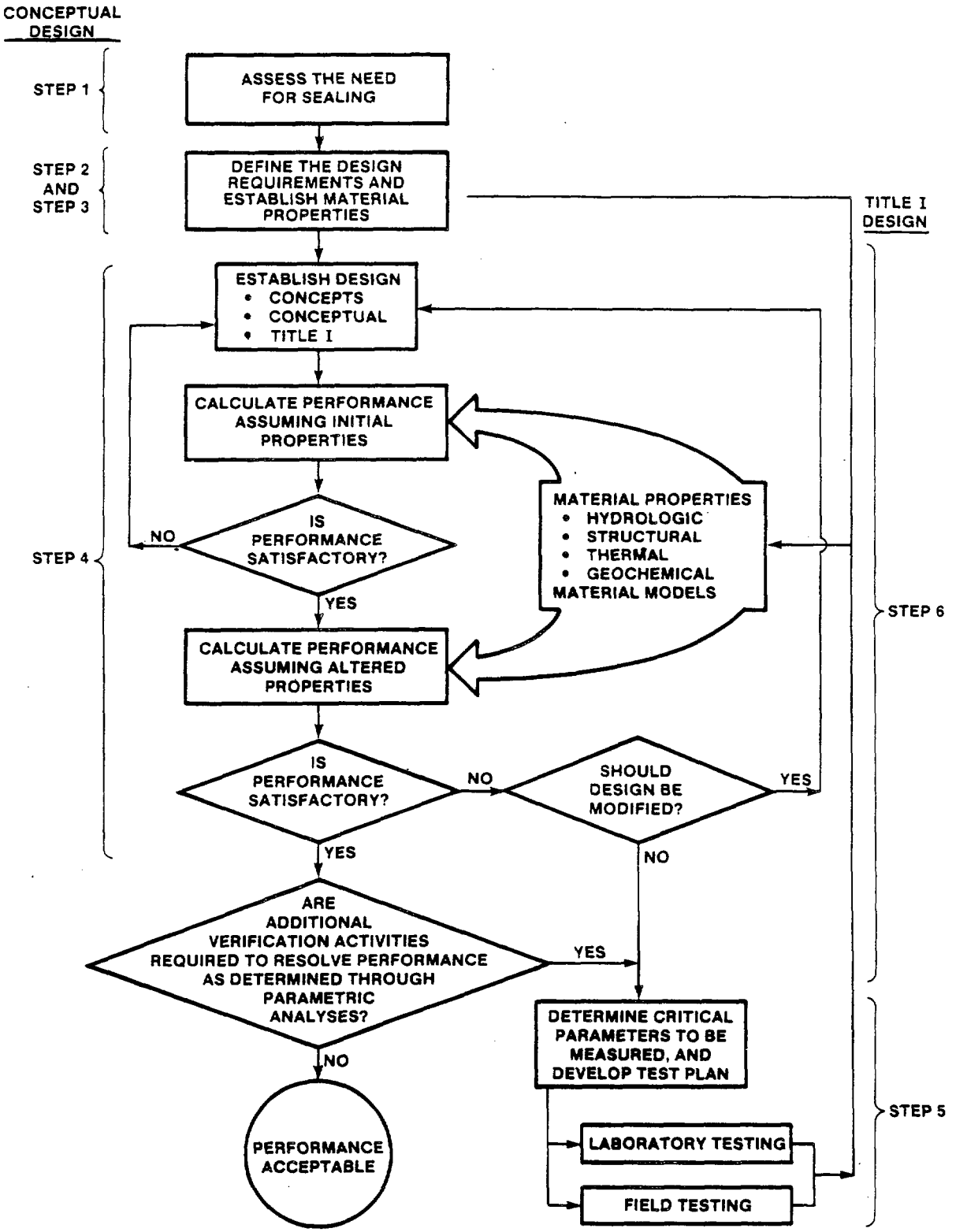


Figure 13. Flowchart Illustrating the Approach for Answering the Performance-Related Questions

in situ stresses, thermal environment surrounding the sealing components, and hydraulic conductivity of various stratagraphic units, will be obtained from different portions of the NNWSI Project. This information will be used to define the environment in which plugs and seals are to be placed.

Step 1: Assess Need for Sealing

The tasks defined to assess the need for sealing are separated into preliminary assessments, included as part of the conceptual design effort, and confirmation tests and analyses, included as part of the exploratory shaft testing and the sealing system performance assessment effort. A correlation between the performance-related questions and the tasks is provided in Table 2. As shown in Table 2, tasks associated with exploratory shaft testing (Tasks 16 and 18) and the performance assessment analysis (Task 19) will provide additional information useful in determining the need for sealing.

Surface Barrier and Lower Shaft

The logic used to assess the need for the surface barrier and the lower shaft sealing components is illustrated in Figure 14. The three tasks identified in Figure 14 are lateral migration of water from the base of the shaft (Task 1), the water flow into the shaft (Task 2), and the potential for airborne release through shafts (Task 3). Tasks 1, 2, and 3 will be performed as part of the conceptual design effort. Field confirmation of the volume of water entering the shaft from subsurface sources will be obtained by the field testing described in Task 18. Also, the drainage capacity of the Topopah Spring Member will be assessed by the field test described in Task 16. The performance assessment evaluation (Task 19) will provide additional confirmation for the need to seal the shaft.

Penetration of the Exploratory Shaft and Boreholes Into the Tuffaceous Beds of Calico Hills

The need for sealing penetrations into the Calico Hills unit will be better established following the performance assessment analysis of the sealing system (Task 19) and hydrologic testing of the Calico Hills unit (Task 18). At this time the design requirements will be reevaluated for the shaft and borehole seals. If it is determined that mechanisms

Table 2. Correlation Between the Performance-Related Questions and the Tasks Used to Assess the Need for the Sealing Components Associated With Each Question

Question	Tasks*	
	Preliminary Assessment (Conceptual Design)	Detailed Analyses or Field Confirmation (Title I Design)
1 Surface Barrier	1, 2, 3	18
2 Lower Shaft	1, 2, 3	16, 18, 19
3 Penetration of the Exploratory Shaft Into the Tuffaceous Beds of Calico Hills	4	18, 19
4 Ramps	5	16, 18, 19
5 Water-Producing Zones in the Horizontal Emplacement Hole	5	16, 18, 19
6 Water-Producing Zones in Drifts	5	16, 18, 19
7 Exploratory Boreholes	4	18, 19

*For description of Tasks see Appendix A.

exist which could focus radionuclide-containing waters into the shaft or borehole, then a new design requirement can be established, if appropriate. The new design requirement can then be used to develop Title I sealing designs.

Until a definitive need for emplacing a seal at the base of the exploratory shaft or boreholes can be established, it will be assumed that hydrologic restoration is desirable and design requirements will be defined as part of the conceptual design activity. Using the approach of restoring the Calico Hills unit is considered conservative because

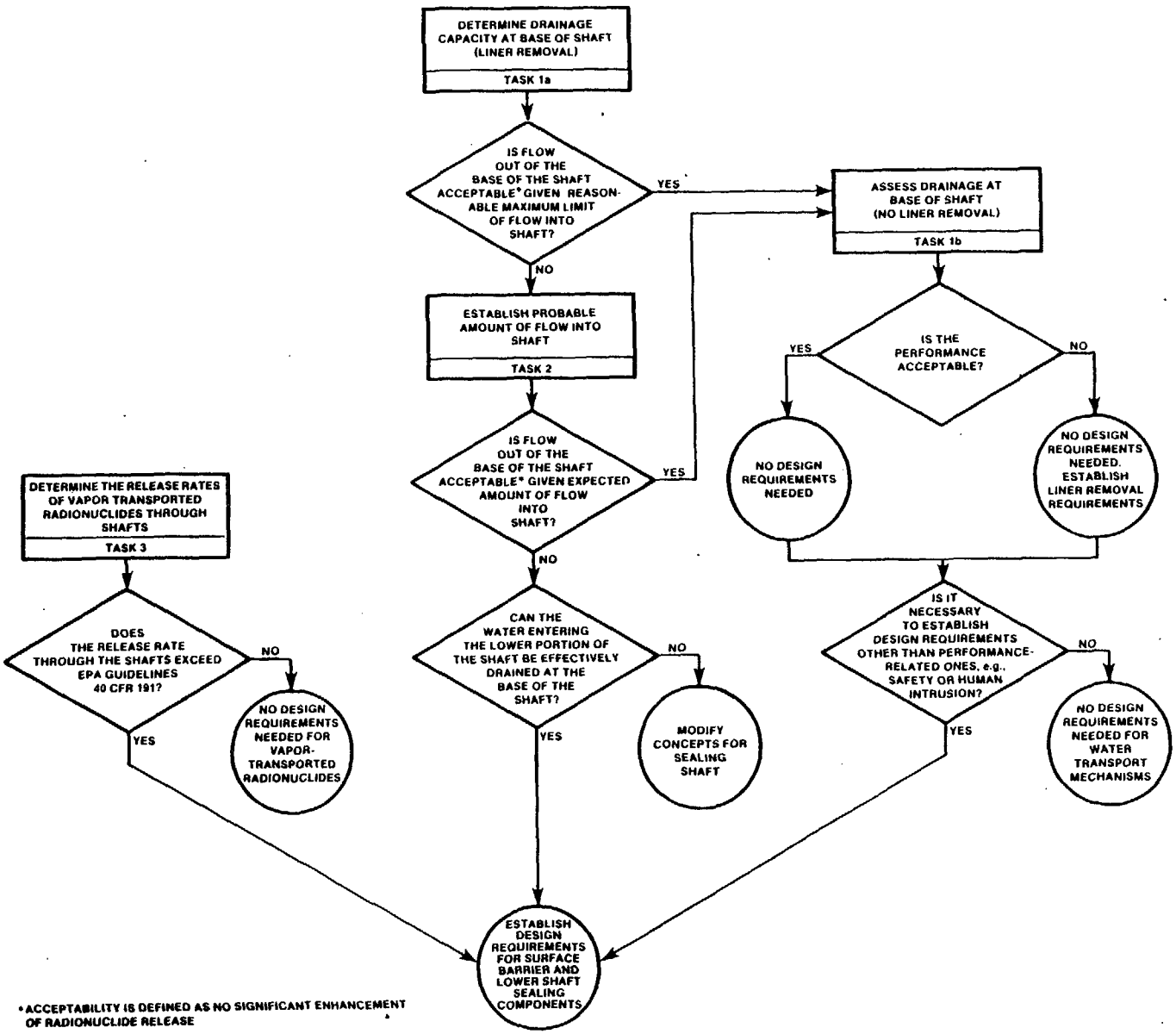


Figure 14. Logic Used to Establish the Need for Surface Barrier and Lower Shaft Sealing Components

- There are few boreholes penetrating through the waste storage area and the Tuffaceous Beds of Calico Hills, and into the water table
- The exploratory shaft is the only shaft which will penetrate into the Calico Hills unit
- The flux through the unsaturated zone is believed to be extremely low, possibly less than 0.1 mm/yr (U.S. DOE, 1984b)

Water-Producing Zones in Ramps, Horizontal Emplacement Holes, and Drifts

Because of the limited understanding of the fracture flow at the repository horizon, an analysis will be initiated to understand the possible quantities and distribution of fracture flow. Using the results from Task 5 the need for material dams, drains, grout curtains, and fault seals used in the ramp, drifts, and horizontal emplacement holes will be established. Additional information, obtained as part of these analyses, would include the required frequency and spacing of the material dams and grout curtains and the distance required between waste packages and water-producing zones in horizontal emplacement holes. As confirmation testing and detailed hydrologic analyses are completed, the need for emplacing sealing components in drifts, ramps, and emplacement boreholes will become more apparent. This testing, analyses, and observations will include

- Hydrologic testing of the Topopah Spring Member in the exploratory shaft (Task 16)
- The performance assessment activity (Task 19)
- Observations made during the mining of the repository

Step 2: Define the Design Requirements

The design requirements are specific values of engineering properties that sealing components must meet to achieve a desired performance. These requirements will provide the guidance needed to select the appropriate designs and materials for the conceptual design of the sealing components. For the purpose of this report, these design requirements are divided into four categories: hydrologic, structural, thermal, and geochemical. Tables 3 through 6 indicate possible approaches to obtaining design requirements for the sealing components. (The design requirements will be modified, as appropriate, as the need for sealing is assessed, Step 1, and as additional information is obtained on the site characteristics.) The information and source of the information

Table 3. Hydrologic Properties, Information Required, Approach and Considerations Used in Obtaining the Design Requirements

Component(s)	Proposed[1] Engineering Property	Information Required [Informational Need Supported] (2)	Source in Obtaining Information Required	Approach or Analytical Tool Used to Compute Design Requirement	Design and Modeling Considerations
SURFACE BARRIER . Surface Cover . Surface Core . Anchor-to-Bedrock Plug/Seal	. Composite, effective hydraulic conductivity	. Near-surface stratigraphy and gradation of soils of potential, surface-facility sites [4.7.1]	. From activities associated with the PreWDS, site system	. Unsaturated zone flow assuming a dual porosity model or equivalent porous flow model and using TRUST (Reisenauer et al, 1982, McKeon et al, 1983), UNSAT2 (Davis and Neuman, 1983), SAGUARO (Eaton et al, 1983) or other suitable computer code	. Acceptable amount of water entering the shaft through the anchor-to-bedrock plug/seal will be determined from Task 1 and 2, Step 1 [4.7.1].
		. Saturated and unsaturated hydraulic conductivity of surface soils [4.7.1]	. Catalogue of soils (Maulem, 1976a)		
		. Saturated and unsaturated hydraulic conductivity of seal material and concrete liner [4.7.3]	. Assumed		
LOWER SHAFT . Shaft Fill	. Permeability . Void Ratio	. Saturated hydraulic conductivity of typical backfill material [4.7.3]	. From textbooks or journals (e.g., Freeze and Cheery, 1979 and Lambe and Whitman, 1969)	. Comparative analyses will be performed to correlate gradation with permeability	. Permeability should be sufficiently high to freely drain waters entering the shaft while maintaining acceptable settlement control (as determined by Tasks 1 and 2, Step 1).
. Station Plug	. Permeability	. Fracture and matrix hydraulic conductivity of densely welded tuff [4.7.1]	. From USW GU-3 and USW G-4 core (Peters et al, 1984)	. Saturated flow assuming dual porosity model or equivalent pourous flow model using Darcian flow analysis, MARIAH (Gartling and Hickox, 1982), or another suitable code	. Low permeability may be required to control water entering the drift.
		. Damaged zone model [4.7.2]	. Task 1, Step 1		. Volume of water that can potentially enter drift will be determined from Tasks 1 & 2, Step 1.
		. Saturated hydraulic conductivity of seal component [4.7.3]	. Assumed		
Settlement Plug	No design requirements	--	--	--	. It is assumed that designs can accommodate water transport to base of shaft.
EXPLORATORY SHAFT SEAL	. Permeability-versus-suction-head relationship	. Stratigraphy at base of shaft [4.7.1]	. Geologic log of USW G-4 (Bentley, 1984)	. Same approach as that used for the surface barrier	. Assess with and without liner.
		. Matrix and fracture hydraulic conductivity of tuff [4.7.1]	. From USW GU-3 and USW G-4 core (Peters et al, 1984)		. Volumes of water entering shaft will be determined from Task 2, Step 1.
		. Damaged zone model [4.7.2]	. Task 1, Step 1		
		. Saturated and unsaturated permeability of seal component [4.7.3]	. Assumed		
RAMP . Material Dams Grout Curtains	. Spacing of material dams . Effective, permeability of material dams and grout curtain	. Matrix and fracture hydraulic conductivity of tuff penetrated by ramp, densely welded and nonwelded tuff [4.7.1]	. From Peters et al, 1984	. Same approach as that used for the station plug	. Both removal and emplacement of concrete floor are assumed. . Spacing of components depends on drainage capacity of ramp floor and amount of water entering drift (from Task 5, Step 1).
		. Damaged zone model [4.7.2]	. Task 1, Step 1		
		. Effective hydraulic conducity of emplaced seal component [4.7.3]	. Assumed		
. Backfill	. Same as shaft fill	--	--	--	
WATER-PRODUCING ZONE IN A HORIZONTAL EMPLACEMENT HOLE . Fault Seal	. Permeability-versus-suction-head relationship	. Matrix and fracture hydraulic conductivity of densely welded tuff [4.7.1]	. From USW GU-3 and USW G-4 core (Peters et al, 1984)	. Same approach as that used for the station plug	. Uncertainties associated with fracture apertures and volumes of water flowing in fractures will be factored into these analyses (from Task 5, Step 1).
		. Damaged zone model [4.7.2]	. Task 1, Step 1		
		. Saturated and unsaturated permeability of seal component [4.7.3]	. Assumed		
WATER-PRODUCING ZONE IN DRIFTS . Drift Fill	. Same as shaft fill	--	--	--	--
. Grout Curtain	. Same as fault seal in horizontal emplacement hole	--	--	--	. Damaged or fractured zone should be grouted sufficiently to control effectively tne movement of water.
. External Fault Seal	. Permeability	. Effective, hydraulic conductivity of drift floor [4.7.1]	. Task 5, Step 1	. Same as that used for ramp	. Saturated conditions will be assumed. . Amounts of water entering drifts will be based on analysis supporting Task 5, Step 1.
		. Damaged zone model [4.72]	. Task 1, Step 1		
		. Saturated hydraulic conductity of seal material [4.7.3]	. Assumed		
. Material Dams and Grout Curtain	. Same as those for the material dams and grout curtains associated with ramp	--	--	--	--
BOREHOLE SEAL	. Permeability-versus-suction-head relationship	. Hydrogeologic model of the Calico Hills unit and the units immediately above and below the Calico Hills unit [4.7.1]	. Same as that developed for exploratory shaft seal	. Same as that used for exploratory shaft seal	. Restoration of Calico Hills unit is assumed, i.e., the hydrologic performance of the damaged zone, the borehole seal, and the interface zone is equivalent to tnat of the unpenetrated portion of the Calico Hills unit. . Assess witn and witnout casing.
		. Damaged zone model [4.7.2]	. Task 1, Step 1		
		. Saturated and unsaturated hydraulic conductivity of seal material [4.7.3]	. Assumed		

(1) As the need for the sealing components is established, the pertinent engineering properties will be modified as appropriate.
(2) The information required for all sealing components supports informational need 1.9.9.

Table 4. Structural Properties, Information Required, Approach and Considerations Used in Obtaining the Design Requirements

Component(s)	(1) Proposed Engineering Property	(2) Information Required [Informational Need Supported]	(3) Source in Obtaining Information Required	Approach or Analytical Tool Used to Compute Design Requirement	Design and Modeling Considerations
SURFACE BARRIER . Surface Cover . Surface Core . Anchor-to-Bedrock Plug/Seal	. Drillability index for surface core (Hardness) . Strength properties (compressive, tensile and shear) and Young's modulus for surface cover, surface core, and anchor-to-bedrock plug/seal	. Strength properties of unconsolidated overburden and bedrock [4.7.1] . Strength properties of seal components [4.7.3]	. From analysis of soil at NTS and Price (1983) . Assumed	. Standard elastic analyses	. The surface cover should remain intact for as long as is practicable to indicate the nature of the penetration. . The difficulty of penetrating through the surface barrier should be equivalent to or greater than that of the unpenetrated, unconsolidated overburden.
LOWER SHAFT . Shaft Fill	. Gradation requirements	. Settlement behavior of engineered materials [4.7.3]	. From soil and rock mechanics technical journals (eg, Marascni et al, 1972)	. Settlement theory	--
. Settlement Plug	. Frequency of settlement plugs . Strength (compressive, tensile, and shear), Young's modulus, Poisson's ratio	. In situ stresses [4.7.1] . Strength properties for settlement plug [4.7.3]	. Assumed depending on density of materials penetrated and depth . Assumed	. Standard elastic analysis	. Settlement plugs will be considered only if the desired settlement cannot be acnieved by proper selection of materials and emplacement techniques for the shaft backfill. . Settlement plugs should be able to support overlying shaft fill. . Design should consider portals to permit passage of water through the settlement plugs.
. Station Plug	. Strength (compressive, tensile, and shear), Young's Modulus, Poisson's ratio	. In situ stresses [4.7.1] . Strength properties for station plug [4.7.3]	. See settlement plug analysis . Assumed	. Standard elastic analyses	. Station plug should resist the forces created by the shaft fill.
EXPLORATORY SHAFT SEAL	. Strength properties (compressive, tensile, shear), Young's modulus, Poisson's ratio, creep behavior	. Mechanical and bulk properties for Calico Hills unit, including Poisson's ratio, Young's Modulus, angle of internal friction and cohesion [4.7.1] . Creep behavior [4.7.1] . In situ stress state [4.7.1] . Strength properties of seal materials [4.7.3]	. Rock mechanics properties available in unpublished form as part of PWDS, mining system and from Price 1983. . Existing information will be used. Bounds on creep-induced loading will be considered in design process . Currently unavailable but can be computed knowing the density, thickness, and mechanical properties of units above the Calico Hills unit . Assumed	. ADINA (Klaus-Jurgen Bathe, 1978), ABAQUS (Hibbitt et al, 1982)	. The seal should be sufficiently resilient to fracturing. This might suggest a material similar in mechanical properties to the Calico Hills unit or one which was ductile and resistant to fracturing. Therefore, two sets of design requirements are possible.
RAMP . Material Dams . Grout Curtains . Backfill	. Same as station plug . Same as fault seal in drift No design requirements	--	--	--	--
WATER-PRODUCING ZONE IN HORIZONTAL EMPLACEMENT HOLE . Fault Seal	. Tensile and shear strengths . Shear strength between fault seal and fracture surface	. In situ stresses [4.7.1] . Thermal field surrounding fault seal [4.7.1] . Thermal and mechanical properties of Topopah Spring Member [4.7.3]	. See settlement plug analysis . From activities performed as part of the PreWDS, mining system or the sealing system using ADINAT (Klaus-Jurgen Bathe, 1978) . Available from activities in PreWDS, mining system, in unpublished form and from Price (1983)	. SASL (Calabresi and Heidleberg, Jr., 1972)	. Because of the potential variability in the orientation of faults and fractures relative to the horizontal emplacement hole, varying orientations of the faults will be assumed. . Preclude stress-induced failure along the rock/grout interface or within the grout, due to thermal loading.
WATER-PRODUCING ZONE IN DRIFTS . External Fault Seal	. Design requirements similar to station plug	--	--	--	--
. Fault Seal	. Design requirements similar to fault seal in a horizontal emplacement hole	--	--	--	. The thermal environment in a horizontal emplacement hole is greater than that in a drift. Because of this difference, the design requirements for a fault seal in an emplacement or access drift would not be as restrictive compared to the design requirements of a fault seal in a horizontal emplacement hole.
. Material Dams and Grout Curtains	No design requirements	--	--	--	--
BOREHOLE SEAL	. Strength (compressive, tensile, and shear), Young's modulus, Poisson's ratio, creep behavior	. The input for the material model and the analytical tools given for the exploratory shaft seal could be used to establish the design requirements for a borehole seal.		--	. Same as for exploratory shaft seal.
ALL SEALING COMPONENTS	. Viscosity . Set time . Workability	. Emplacement constraints considering repository design [4.7.5]	. From Jackson (1984) or updated repository design from PreWDS, Mining System		. Rheological properties are important in the emplacement of a mixture to achieve satisfactory in situ properties and penetration into rock mass as in the case of a fault seal.

(1) As the need for the sealing components is established, the engineering properties will be modified, as appropriate
(2) To assess the thermal-induced stresses in sealing components, the thermal environment similar to that described for the fault seal will be determined if unavailable from activities on the PreWDS, mining system.
(3) The information required for all sealing components supports informational need 1.9.9.

Table 5. Thermal Properties, Information Required, Approach and Considerations Used in Obtaining the Design Requirements

Component(s)	Proposed[1] Engineering Property	Information Required [Informational Need Supported]	(2) Source in Obtaining Information Required	Approach or Analytical Tool Used to Compute Design Requirement	Design and Modeling Considerations
All cementitious-based sealing components which may include the: . Surface Cover . Surface Core . Anchor-to-Bedrock Plug/Seal . Settlement Plug . Station Plug . Exploratory Shaft Seal . External Fault Seal . Borehole Seal	. Maximum allowable heat of hydration and rate of hydration	. Thermal conductivity and coefficient of thermal expansion of the surrounding environment [4.7.1] . Restraining capacity of the surrounding environment [4.7.1] . Heat of hydration and rate of hydration of sealing material [4.7.3]	. Available from unpublished sources compiled within PreWDS, mining system . Currently unavailable, must be assumed. . Assumed.	. ATHENAN (Gotsis, 1984), SAPV (a WES modification of SAP IV, Wilson, 1973), or another suitable code	. Assure that the stresses generated by the hydration of Portland cement do not induce microcracking.
. Fault Seal[3]	. Thermal conductivity and coefficient of thermal expansion for fault seal	. Thermal and mechanical properties of Topopah Spring Member . Thermal and mechanical properties of fault seal . Thermal field surrounding fault seal[4]	. Available from activities in PreWDS, mining system, in unpublished form and from Price, 1983 . Assumed. Results from the materials development portions of the sealing activity can be used as a starting point . From activities performed as part of the PWDS, mining system or the the sealing system using ADINAT (Klaus-Jurgen Bathe, 1978) or another suitable code	. SASL (Callabresi and Heidelberg, Jr., 1972)	. Because of the potential variability in the orientation of faults and fractures relative to the horizontal emplacement hole, varying orientations of the faults will be assumed. . Preclude continuous failure, along the rock/grout interface or within the grout, due to thermal loading.

(1) As the need for the sealing components is established, the engineering properties will be modified, as appropriate.
(2) The information required for all sealing components supports informational need 1.9.9.
(3) The analyses performed to determine the structural design requirements can be coupled with this analysis.
(4) If the temperature of the emplacement environment for the other sealing components is significant, additional thermal design requirements will be established to reduce the potential for stress-induced cracking.

Table 6. Geochemical Properties, Information Required, Approach and Considerations Used in Obtaining the Design Requirements

Component(s)	Proposed(1) Engineering Property	Information Required [Informational Need Supported]	Source in Obtaining Information Required (2)	Approach or Analytical Tool Used to Compute Design Requirement	Design and Modeling Considerations
SURFACE ENVIRONMENT (Unconsolidated overburden)	. Chemical composition compatible with the surface environment	. Alluvial composition [4.7.1]	. From soil surveys at NTS	. Select sealing materials with mineral phases that are thermodynamically stable within the emplacement environment	. The surface cover should be resistant to atmospheric variations, especially freeze-thaw phenomenon. Therefore, a material with a low porosity and having low, entrapped water content would be desirable.
		. Analog studies of concrete exposed to atmospheric conditions (surface cover and core) [4.7.3]	. Studies of ancient (~2000 years old) cementitious materials (mortars and concrete), particularly those materials containing tuff constituents (eg, Roy and Langton, 1983)		
		. Thermodynamic studies [4.7.3]	. Task 11		
SUBSURFACE ENVIRONMENT (Topopah Spring and Tiva Canyon Members and Tuffaceous Beds of Calico Hills)	. Chemical composition compatible with subsurface emplacement environment (for bulk pours of concrete or grout in environments where the temperatures are near ambient conditions)	. Reactivity studies between seal material and emplacement environment [4.7.3]	. From Roy et al (1984a), Roy Scheetz and Vidale (1984), and Scheetz and Roy (1984)		. Uncertainies associated with volume of waters flowing in fractures will be factored into analyses (see Task 5 Step 1).
		. Chemical composition of tuff [4.7.1]	. From Bish et al, 1983		
	. Chemical composition resistent to dissolution (fault seal only)	. Dissolution model of fault seal [4.7.3]	. See Task 6		. Lower the pH of the waters leaching the grout.
		. Solubility of seal material [4.7.3]	. Assumed		. Avoid using chemical species in the grout, such as sulphate, that may facilitate the transport of radionuclides.
					. Use constituents of grout, such as silica, that will diminish the potential leaching of the grout.

(1) As the need for sealing components is established, the engineering properties will be modified as appropriate.
(2) The information required for all sealing components supports informational need 1.9.9.

needed to compute the design requirement are also given. The majority of the information will be obtained through tasks associated with the sealing activity. Where information is obtained outside the sealing activity, the source is clearly indicated. Analytical tools or approaches are indicated to illustrate potential ways of computing the design requirements. Other approaches or analytical tools may also be suitable. Finally, design or modeling considerations are stated that are important in establishing the design requirements.

Two uncertainties in developing the design requirements are: (1) the variability of some of the input parameters and (2) the potential for the sealing material to alter to a degraded state. Therefore, a reasonable range of values, particularly that of water entering the repository horizon, must be used to obtain a range of design requirements and to determine the sensitivity of the design requirements to the input parameters. For example, if the flow through the anchor-to-bedrock plug/seal is relatively insensitive to variations in the hydrologic properties of the sealing components, then no hydrologic design requirement may be necessary. The second uncertainty includes the degradation of sealing materials and subsequently the alteration of their properties. Alteration of the properties of sealing components can be reduced through the selection of materials that are thermodynamically compatible with the surrounding environment and materials that achieve the desired initial properties. To enhance the reliability that material properties will not significantly degrade, i.e., the long-term properties remain similar to the initially emplaced properties, geochemical and thermal design requirements are established. These design requirements are directed to man-made materials such as grouts or concretes; however, the geochemical design requirements are also applicable to natural materials that may be compatible to the emplacement environment.

Step 3: Measure Material Properties

This step involves the formulation of man-made materials that could meet the design requirements established in Step 2. The engineering properties of these materials will then be measured by laboratory analyses to confirm the ability to achieve the design requirements of concern. Because cementitious materials, such as concrete and grout,

- are versatile construction materials,
- have well established characteristics, and
- are adaptable in meeting construction needs,

the materials that will be formulated will be cementitious-based. However, other materials may be equally suitable as sealing materials. In fact, if non-cementitious materials clearly fulfill the design requirements, their material properties will be determined in lieu of the properties of cementitious materials. The results from this analysis will provide the basis for the material models that will be used in the performance calculations of each component or group of components. Task 7 provides more detail on the testing to be performed.

Step 4. Assess the Performance of Sealing Designs

The performance of specific sealing designs will be evaluated to determine if their performance is comparable to or better than the performance of the conceptual models used in establishing the design requirements. Laboratory analyses and/or field testing may be needed (a) if the performance of a sealing component or a sealing design is marginally acceptable or unacceptable or (b) if the performance is sensitive to expected changes to specific engineering properties or modelling assumptions.

The analytical tools and approaches used in evaluating the performance of the sealing components or sealing designs will be the same as those used in Step 2. However, the material properties used in the revised material models will be taken from Step 3. Where non-cementitious materials are used in the sealing designs, material properties will be taken primarily from available literature.

In addition to evaluating sealing designs using initial properties, the performance will also be evaluated using degraded material properties. Degraded material properties will be derived by evaluating qualitatively how mineral alterations can affect the hydrological and structural properties. Therefore, it will be necessary to use the results from past laboratory testing (Roy et al, 1984a, 1984b; Roy, Scheetz, and Vidale, 1984; and Scheetz and Roy, 1984) to select the ultimate, thermodynamically stable phase assemblage and develop a model that indicates the degree of alteration that a sealing material could experience (Task 8).

In addition to the degradation of sealing materials due to mineralogical changes, consideration must also be given to other processes or circumstances causing degraded performance. Three circumstances, in addition to degraded performance of materials, will also be considered:

(1) Decrease in the drainage capacity of the lower portion of the shaft due to fracture filling by silting, biofouling, and reprecipitation

(2) Decrease in the drainage capacity of the drift floor due to fracture filling by silting

(3) Alteration of water travel times through boreholes by leaving the casing in boreholes (The hydraulic conductivity of the casing can be assumed to be equivalent to that of a compacted sand assumed to be a worst case assumption. If the performance of the restored portion of the borehole is acceptable with this assumption, then removal of the casing may not be required. If the flow through the borehole zone is greater than the flow through the undisturbed Calico Hills unit and removal of the casing is not contemplated, laboratory studies may have to be carried out to determine the effect of corrosion on the hydrologic properties of the emplaced seal.)

Step 5. Perform Laboratory Analyses and Field Testing

Laboratory analyses can be performed to refine or confirm the assumed long-term properties of sealing materials. Field testing can demonstrate the performance of sealing materials or the hydrologic flow characteristics of the Topopah Spring Member or the Tuffaceous Beds of Calico Hills. Therefore, several laboratory and field-testing tasks are proposed which can provide supportive information on the durability of sealing materials or the hydrologic performance of specified stratigraphic units. Table 7 correlates these tasks with the seven performance-related questions.

Laboratory Analyses (Tasks 10, 11, 12, 13, and 14)

The laboratory testing and analyses described in Task 11 in Appendix A provides the theoretical basis for selecting new materials or modifying the formulation of currently used materials in the sealing activity. It will also support laboratory testing Task 12, by indicating the phase assemblages that are most likely to occur under elevated temperatures and pressures. Three systems are appropriate to simulate through laboratory testing:

(1) Seal material/Topopah Spring Member tuff system (supporting the fault seal, grout curtain, external fault seal, settlement plugs, station plugs, and shaft fill)
(2) Seal material/Tuffaceous Beds of Calico Hills (supporting the borehole and exploratory shaft seals)

Table 7. Laboratory and Field Testing Tasks Proposed to Support the Performance-Related Questions

	Question	Task	
		Laboratory	Field
1	Surface Barrier	10, 11, 12	(a)
2	Lower Shaft	11, 12, 13, 14	16, 18
3	Penetration of the Exploratory Shaft into the Tuffaceous Beds of Calico Hills	11, 12	18
4	Ramps	11, 12, 13	16, 18
5	Water-Producing Zones in the Horizontal Emplacement Holes	11, 12	15(b), 16 18
6	Water-Producing Zones in Drifts	11, 12, 13	16, 18
7	Exploratory Boreholes	11, 12	17(b), 18

(a) No field testing planned to confirm in situ performance prior to CAA.

(b) Field testing currently defined as tentative. May be implemented prior to the CAA if need is indicated.

(3) Seal material/Tiva Canyon Member tuff system (supporting the anchor-to-bedrock plug/seal)

The proposed laboratory testing includes accelerating (through elevated temperature and pressure) the rate of formation of end products in the systems evaluated and characterizing the altered properties of the material. It is recognized that artificially accelerating end-product formation through laboratory testing may result in end products that are different than those likely to occur at lower temperatures and pressures in the

actual environment. This can be partially resolved by subjecting the sealing material/tuff system to a range of temperatures—38°C, 90°C, and 200°C--and varying the duration of exposure to these temperatures, 3, 6, 12, and 24 weeks. This provides a progression of alteration products and subsequently, potentially different material properties.

To establish the time when the grouts or concretes have fully cured, strength and x-ray diffraction analyses will be conducted on a limited number of samples at 2, 4, 8, 12, 18, and 25 weeks. Laboratory testing is scheduled to begin after the 12th week of curing. By then, the samples should be fully cured and will have achieved generally constant material properties. Limited testing will continue beyond this time to verify the assumed steady-state conditions. Samples of grout and concrete then will be subjected to the accelerated conditions described above. Characterization, including primarily phase identification and hydrologic property determination, then will be performed on all samples, in addition to the design requirements specified through analytical assessments.

Long-term durability of the surface cover can be evaluated by assessing the reactivity between the constituents within the surface cover, and the exposure of the surface cover to a simulated surface environment (see Task 10). Reactivity will be evaluated by the standard mortar-bar test to determine volumetric changes. Exposure to the surface environment can be assessed by performing freeze-thaw tests to simulate rapid freeze-thaw cycles and slower, more realistic freezing cycles. However, before any laboratory investigations are initiated, the design requirements, both hydrologic and structural, must be determined. If durability of the surface cover is required, these activities will be implemented.

The activities described above address the long-term durability concerns. Adequate, as-built properties may have to be considered if a high integrity sealing component is required (i.e., one which is effective in preventing preferential movement of radionuclides through an interface zone or through its interior). Two approaches are possible to enhance the reliability that the desired, as-built properties of the cementitious-based sealing material can be obtained. First, one can determine the threshold values that can cause unacceptable properties in the sealing material, and stay well below the values. Second, one can characterize the sealing material, if cementitious based, during the curing period (1) to prevent structural and possibly hydrologic defects within the material due to rapid or excessive heat development that can induce large stresses within the material and (2) to prevent excessive expansion that could fracture the surrounding emplacement environment. To verify the stress field exerted by the proposed cementitious-based material, it may be necessary to evaluate the expansive plug effects

in a restrained environment (see Task 10, Appendix A) (Pace and Gulick, 1983; Pace, 1984). The pressure-versus-restraint relationship would be developed to determine the stress induced within the surrounding medium and the seal material. The application of this technique extends to all seal or plug installations (anchor-to-bedrock plug/seal, borehole seal, external fault seal, and surface core).

Field Testing (Tasks 15, 16, 17, and 18)

Prior to submitting the CAA, field testing within the NNWSI Project will be performed, in part to determine the hydrologic characteristics of the Topopah Spring Member. To establish these hydrologic characteristics, tests of varying scales are proposed to determine the flow mechanisms through the welded and highly fractured portion of the Topopah Spring Member. Of particular usefulness from a sealing perspective will be the infiltration test conducted to characterize the unsaturated flow and transport through a large volume of fractured tuff. The bulk permeability test, in addition to assessing unsaturated flow and transport, will examine the effect of excavation on the hydrologic properties of tuff. Both of these tests are being performed to characterize subsurface units and are included in the PreWDS, site system.

The only sealing-related field test (Task 16) proposed prior to the CAA is the discrete, fault/seal drain test. This test will be combined with either the bulk permeability or infiltration tests, both of which are planned as part of the exploratory shaft testing in the Topopah Spring Member. This test is a demonstration of the concept to dissipate water from a discrete fault or fracture zone through the drift floor. Additionally, it is designed to assess the in situ drainage capacity of the drift floor, the drainage capacity of a passive, engineered drainage system (see Figure 8), and the necessity for material dams and grout curtains to restrict lateral flow (see Figures 6 and 8). The results from the discrete fault seal/drain test will be used

- To establish stand-off distances near water-producing fault or fracture zones (Stand-off distance is the horizontal distance from the water-producing zone to the waste package. It is the distance required to prevent the water from the water-producing zone from contacting the waste package.)

- To evaluate the shaft drainage capacity

- To evaluate the necessity for continuing the design of alternative fault seal options

The need for additional testing will be evaluated concurrently with the development of the conceptual design activity. The sensitivity of the design requirements in achieving acceptable performance will also indicate if additional field tests are required. Because fault seals and external fault seals have been successfully emplaced for mining projects, and because the probability of encountering massive flows in fault/ fracture zones is low, demonstration projects to illustrate the emplaceability of these sealing components will not be proposed until occurrence of water in fractured zones is established through the mining operations at the base of the exploratory shaft and mining of the repository. An observation of rare or no continuously flowing water will further diminish the need for and importance of these tests.

If the horizontal drilling tests are performed in the upper breakout and lower breakout rooms associated with the exploratory shaft, a test (Task 15) demonstrating the ability to place a fault seal in a horizontal emplacement hole will also be performed. A second, optional field test may include the emplacement of borehole seals at the base of the exploratory shaft (Task 17) to evaluate the in situ response of borehole seals emplaced in the Calico Hills unit.

Step 6. Reassess the Performance of Sealing Designs

The reassessment of sealing designs will be a progression of the analyses performed in Steps 2 and 4. This step differs from previous steps because of the additional information that will be available from laboratory analyses and field testing. The results from these analyses and testing, together with the sealing conceptual design, can be used to refine the material and hydrogeologic models.

With this new input, a more complete performance of the entire sealing system can be assessed. To accomplish this step, it will also be necessary to develop a method to prepare failure scenarios, to construct failure scenarios, to compute the probabilities of occurence for each scenario, and to compute the consequence of each scenario. In developing these scenarios, all engineered barriers will be considered. In this way, the collective performance of the sealing designs can be assessed, and contribution of the sealing system to isolating and containing radionuclides can be compared to the overall performances of the YMMGDS. Additionally, because several designs may be acceptable, as determined through performance assessments of Step 4, their relative performance can

be established by observing their response to the failure scenarios. Therefore, a comparative evaluation of the sealing alternatives will be possible. The results from these analyses will be contained primarily in the sealing system performance assessment report and will support the FEIS and the PSAR. Additional analyses would continue as appropriate during the development of Title I.

VII. LICENSING PROCESS

The results of the tasks described in this program plan will be presented in the documentation required for the licensing process. The sealing-related documentation supporting a CAA includes the conceptual design report, the sealing system performance assessment report, and the Title I design report. This documentation will be incorporated into the PSAR and the FEIS, as appropriate. In addition to the tasks described in Appendix A, additional tasks will be required to complete the reports described below. For example, documentation that will support these three reports includes a program plan update, a design requirements and materials recommendation report, and development of Title I design criteria, and periodic topical reports. Additionally, special reports may be required to establish quality assurance levels for construction features, such as the exploratory shaft, that must consider sealing.

Sealing System Conceptual Design Report

The sealing concepts forming the basis for the conceptual sealing design have been completed (Fernandez and Freshley, 1984). The sealing conceptual design is the initial design for the repository sealing components. It includes

- A compilation of requirements for the sealing conceptual design, specifically design, construction, quality assurance, energy consumption and utility requirements
- Identification of specific R&D activities to verify performance and emplacement of sealing components
- Cost estimates for emplacing sealing components
- Schedules for the design and construction activities

The sequence of tasks required for the completion of the conceptual design is illustrated in Figure 15. The basis for the conceptual design will be the determination of design requirements. The performance of specific designs can then be compared against these requirements. Task 9 includes the specific subtasks required for the completion of the conceptual design. Plate 5 (Appendix B), Sealing Conceptual Design and Field Test Planning, further illustrates the manner in which these subtasks will be integrated. The

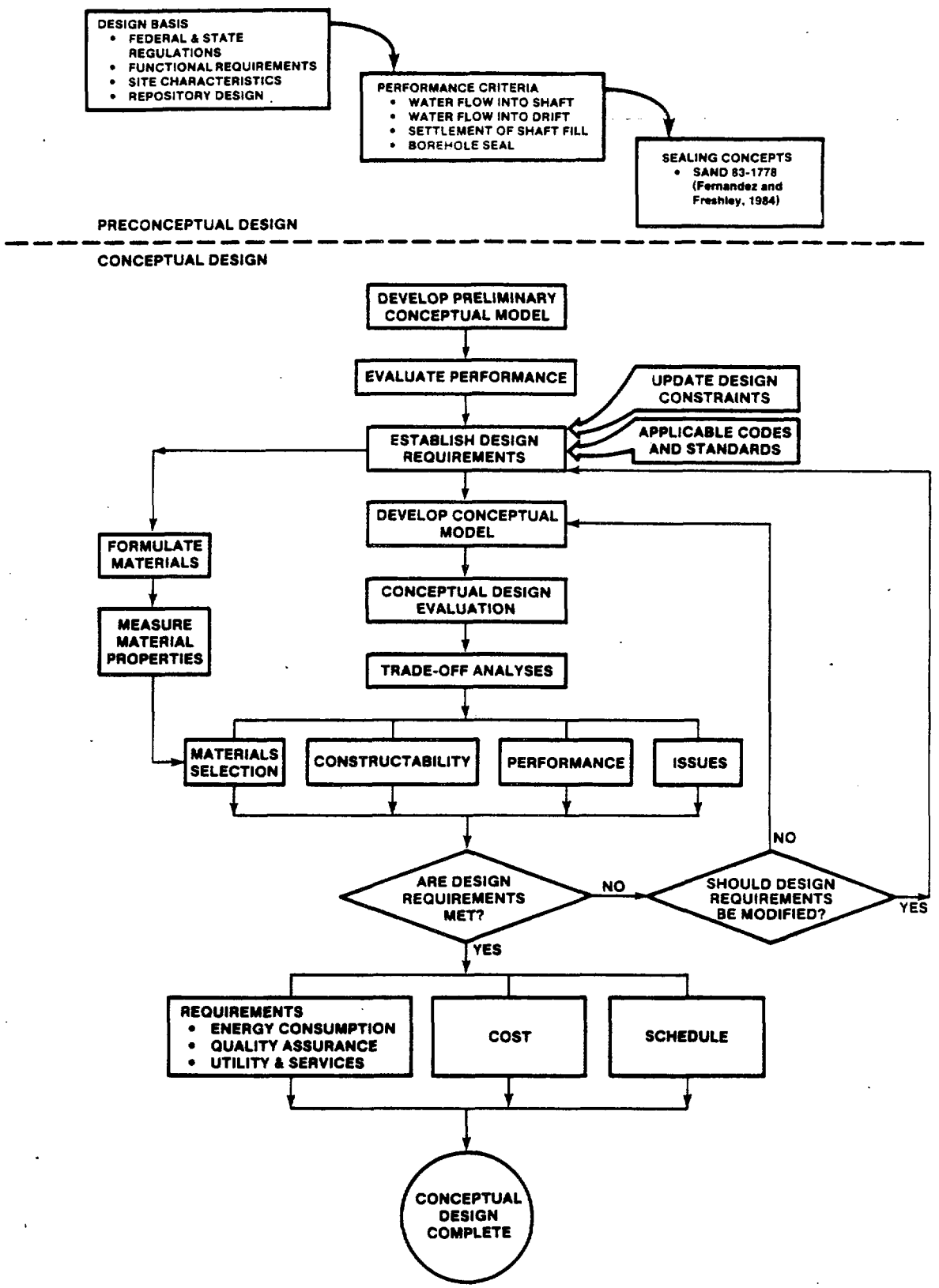


Figure 15. Flowchart for Developing the Sealing Conceptual Design

sealing conceptual design report will be combined with the conceptual design report for the rest of the repository system, as described elsewhere (Jackson, 1984), to satisfy the U.S. DOE conceptual design requirements.

Sealing System Performance Assessment Report

This report will contain a description of the sealing designs and performance analyses of these designs. The relative merit of each sealing design will be assessed by comparing its performance, i.e., its ability to reduce the release of radionuclies to the accessible environment. Important input needed for these analyses are a material model developed using the results of the laboratory testing defined in Task 12, the failure scenarios developed specifically for this report, and a hydrogeologic model developed using the results from field testing in the exploratory shaft. Task 19 describes the subtasks required to complete this report. These subtasks are to be performed following the conceptual design activity and completed concurrently with the Title I design activities.

Title I Design—Preparatory Activities

Title I design, or preliminary design, is a continuation of the design process. The requirements and criteria used for Title II are developed during this phase. Title II design or definitive design follows Title I and includes the preparation of the final working drawings, specifications, bidding documents, cost estimates, and construction and procurement schedules. Design criteria will be prepared using the latest designs identified in the conceptual design report, the results from the consolidation of crushed tuff, and the results from the laboratory testing of seal materials. The Title I design criteria and the results from the laboratory (Tasks 10, 11, 12, 13, 14) and field testing (Tasks 15, 16, 17, 18) will constitute the input needed to develop a Title I design. Because Title I is currently envisioned to be part of the overall repository design, no specific tasks are identified for its preparation.

VIII. QUALITY ASSURANCE

The purpose for implementing quality assurance in the NNWSI repository sealing activity is to obtain the highest quality of technical data through each sealing task and to provide documentation and review of all results. The Sandia National Laboratories (SNL) has implemented a quality assurance program that meets the requirements given in the "Nevada Nuclear Waste Storage Investigations Quality Assurance Plan" (U.S. DOE, 1984c). To meet these requirements, SNL has established quality assurance procedures. These procedures are based on the categories in ANSI/ASME NQA-1-1979 (American Society of Mechanical Engineers, 1979) and supplements (ANSI/ASME NQA-1a-1981 and ANSI/ASME NQA-1b-1981), ANSI/ASME NQA-2.20-1983 as modified in U.S. DOE (1984c), and 10 CFR 50, Appendix B (U.S. NRC, 1984). The primary quality assurance requirements applicable to the sealing activities include design and document control; control of purchase items and services; control of measuring and test equipment; instructions, procedures, and drawings; quality assurance records; and audits.

IX. SCHEDULE

The overall schedule for the sealing activity is controlled by the licensing documentation required for CAA, scheduled for submittal in August 1990. In preparation for this milestone, the PSAR and FEIS will be prepared. The sealing design activities will primarily support the PSAR through the Title I design development, and the sealing system performance assessment activities will primarily support the FEIS.

The overall logic of the sealing program as proposed in this report is illustrated in Figure 16. The detailed task interactions for the entire sealing activity are illustrated in Plate 1. An overview of the milestones is provided in Plate 2. Detailed nets are given for the longevity testing (Plate 3), hydrologic calculations (Plate 4), and the conceptual design activity (Plate 5). All plates are located in Appendix B. Appendices C and D correlate all sealing tasks with their dates for completion.

As illustrated in Figure 16, the design requirements will be prepared from the results of current material studies, the sealing concepts, and hydrologic calculations. These design requirements will be continually revised and will support conceptual design and Title I design. If required, a series of position papers will be completed on the potential transport mechanisms for radionuclides in the unsaturated zone; the silting, biofouling, and reprecipitation potentials at the base of the shafts; and the corrosion effects of the steel liner on the concrete liner at the surface and the borehole seal. Additionally, hydrologic calculations will be performed to establish the need for shaft liner removal, a hydrologic design requirement for the station plug, emplacement of a grout curtain under the drift dam or the external fault seal, concrete floor removal in ramps, and borehole casing removal. The position papers and the hydrologic calculations will form the basis for revising the performance-related questions pertinent to repository sealing.

The next phase represented in Figure 16 is a materials development phase in parallel with a limited field testing program. Both of these major activities support the performance evaluation of the sealing system. A limited number of field test results will be available for construction authorization application following this performance evaluation.

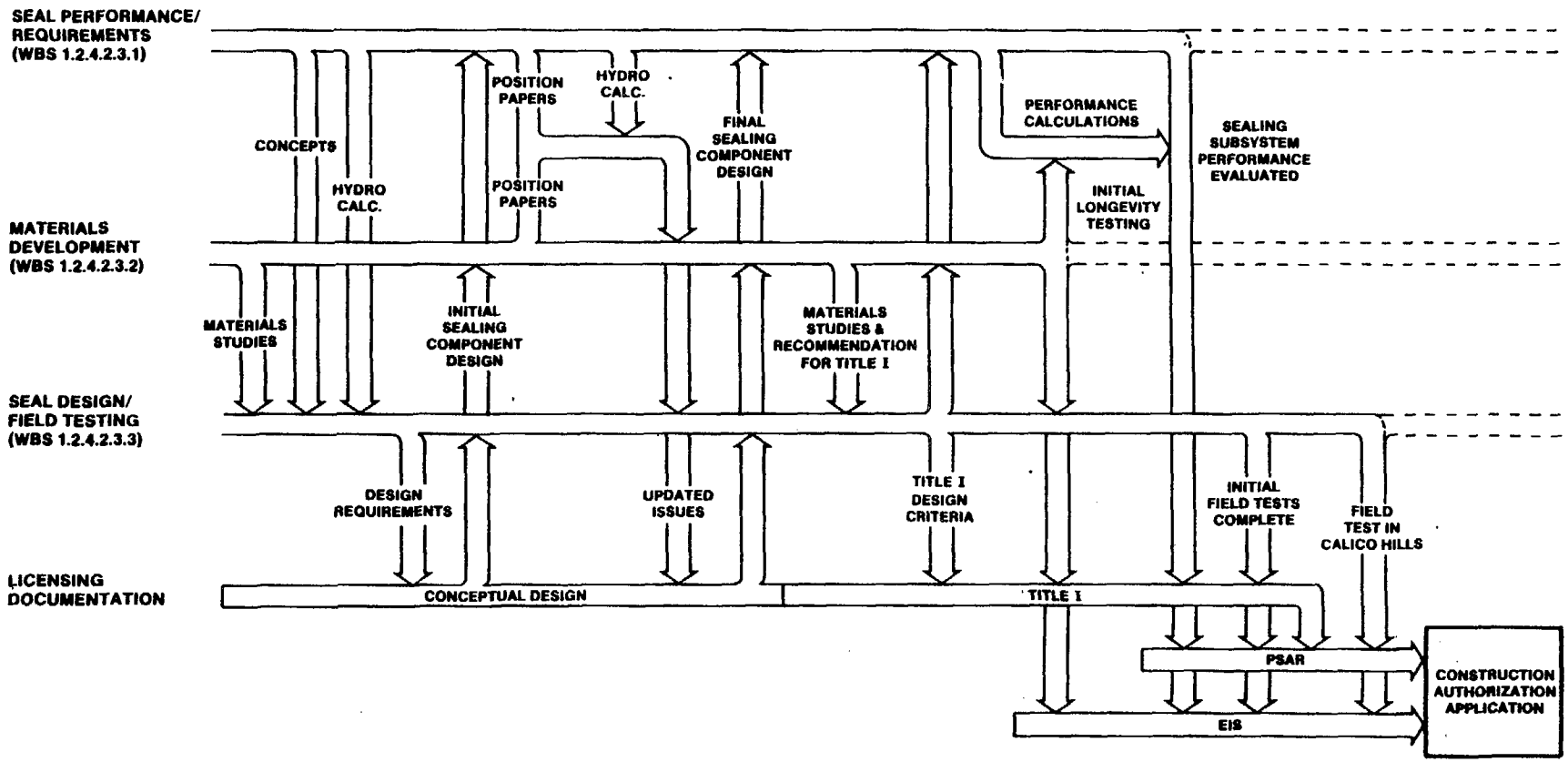


Figure 16. Schematic of the NNWSI Repository Sealing Activity Through Construction Authorization Application

APPENDIX A

Tasks Proposed for the NNWSI Repository Sealing Activity Prior to Construction Authorization Application

TASK 1

Determine the capacity of the lower shaft to dissipate water entering the shaft.

Two sets of analyses will be performed: (a) the drainage capacity of the lower shaft, assuming liner removal from the repository station to the base of the shaft, and (b) the drainage capacity of the lower shaft, assuming no liner removal. These calculations will be performed using a simple analytical approach, an appropriate hydrologic model and, if necessary, a code such as TRUST.

The hydrologic model will be developed using

(i) The USW G-4 geologic log (Spengler and Muller, 1983)

(ii) The three-dimensional representation of Yucca Mountain (Nimick and Williams, 1984)

(iii) The matrix and fracture hydrologic properties of core from USW GU-3 and USW G-4 (Peters et al, 1984) (Hydraulic-conductivity-versus-suction-head curves will be used in defining the hydrologic response of tuff representative of the Topopah Spring Member)

(iv) A damaged zone model using a technique similar to that discussed elsewhere (Kelsall et al, 1984)

If flow conditions warrant, a material model incorporating fracture and matrix hydraulic conductivities or a dual porosity model will be used to represent a realistic response of drainage.

TASK 2

Establish probable amount of flow into shaft from surface and subsurface sources.

Water can enter the shaft from the surface and from discrete, water-producing zones as the shaft is penetrated. Surface infiltration can be computed as follows

(a) Determine the maximum annual precipitation at repository entry points by considering
   (i) The rainfall-intensity-versus-duration data from available meteorological reports (Quiring, 1968; Bowen and Egami, 1983) and recent meteorological surveys at Yucca Mountain .
   (ii) The maximum credible rainfall which would contribute to the maximum credible flood
(b) Define the extent of the watershed using topographic maps of the area under investigation
(c) Compute the amount of runoff which could potentially enter the shaft using the maximum annual precipitation as determined in (a) and the extent of the watershed as determined in (b)

Subsurface infiltration can be estimated by postulating a portion of the surface water (overland flow or ephemeral stream flow) infiltration through a fracture system that is penetrated by a shaft or ramp.

TASK 3

Determine the release rates of gaseous radioactive elements or compounds through shafts.

Potential release of radionuclides through the shafts via gaseous transport will be assessed to determine if the EPA guidelines given in 40 CFR 191 are exceeded. Standard mine ventilation techniques, similar to those described elsewhere (Hartman et al, 1982), will be reviewed and possibly used to assess this potential. Possible analyses could include (a) a shaft connected to an emplacement drift containing waste, which provides a variable or constant rate of airborne radionuclides to the drift or (b) two shafts, the collars of each being at different elevations, connected to a common drift. Because the pressures at each of the shaft openings would be different, a pressure gradient could be created causing a lateral component of flow into the drift, in addition to the vertical flow through the fractures of the Topopah Spring Member. Following these analyses, the effectiveness of drift and shaft sealing components in controlling the release of gaseous radionuclides to the accessible environments will be assessed.

TASK 4

Determine the relative importance of the damaged zone, the interface zone, and the seal in controlling flow through the Calico Hills unit.

To determine the relative importance of the damaged zone, the interface zone, and the seal, the following subtasks will be performed:

(a) Establish the saturated and unsaturated hydraulic properties of the seal material. This hydraulic property will be initially assumed. Laboratory analyses of grouts will confirm the reasonableness of the properties selected. The approach used to establish the hydraulic properties will be similar to that used in Peters et al (1984).

(b) Use the hydrogeologic model of the Calico Hills unit, and the units immediately above and below the Calico Hills unit, based on

(i) The USW G-4 geologic log (Bentley, 1984)

(ii) The matrix and fracture hydraulic properties of the core from USW GU-3 and USW G-4 (Peters et al, 1984) (Hydraulic-conductivity-versus-suction-head curves will be used in defining the hydrologic response of tuff representative of the Calico Hills unit and the Topopah Spring Member.)

The model developed can be an equivalent porous flow model or a dual porosity model.

(c) Using the computer code TRUST, another suitable computer, or an analytical procedure, compute the flow through the hydrogeologic model developed in subtask 4b (undisturbed case) and then compute the flow through sealed penetrations similar to those of a borehole and at the base of the exploratory shaft (disturbed case). To support these later calculations, hydrologic properties of seal materials will be assumed (subtask 4a) and a damaged zone model will be developed using a technique similar to that described elsewhere (Kelsall et al, 1984).

The effect of sealing a penetration can therefore be compared to the undisturbed case. In addition, the relative merit of one seal material to another can be made. The flow conditions surrounding the modelled zone will be varied, as well as the material properties of the seal material. In this way, the significance and need in placing a seal adjacent to the Calico Hills unit, in a borehole or at the base of the exploratory shaft, can be assessed.

TASK 5

Determine (a) the floor area of drifts and ramps required to dissipate anticipated waters entering the repository from discrete, water-producing zones and (b) the total length of horizontal emplacement holes required to dissipate water that can potentially enter the holes.

To determine the need for sealing components to control water entering the repository, dissipation of water through drift and ramp floors and horizontal emplacement holes will be computed.

(a) To assess the available disposal area for vertical emplacement of waste packages, determine the total amount of the drift and ramp floor area required to dissipate water entering the repository.

The following subtasks will be required to determine the amount of drift and ramp floor area required to dissipate water entering the repository:

(i) Develop a hydrogeologic model for the floor of the drift and ramp using
- A variation of the damaged zone model developed in Tasks 1 and 3
- The matrix and fracture hydraulic characteristics of the Topopah Spring Member (Peters et al, 1984)
- The fracture frequency of the Topopah Spring Member (Spengler et al, 1979; Spengler et al, 1981; Scott and Castellanos, 1983; and Scott et al, 1983)

From this information an equivalent porous flow model or a dual porosity model can be developed.

(ii) Compute the infiltration through the floor of the drift or the ramp, and the lateral migration of the water in the drifts, using TRUST (or another suitable code), the hydrogeologic model developed in subtask 5.a.i and the range of water conditions encountered at the repository horizon as determined in subtask 5.b.i.

Knowing the percentage of drift floor required to dissipate waters entering the drifts, compute the decrease in the available disposal area. If the available disposal area is less than that required to dispose all the waste, sealing components such as material dams, grout curtains, drains, and external fault seals may be required to increase the available disposal area.

(b) To assess the available disposal area for horizontal emplacement of waste packages, compute the total length of horizontal emplacement holes required to dissipate water that can potentially enter the emplacement hole. It will be necessary to compute frequency in which the horizontal emplacement holes will intercept water-producing zones. This frequency is in turn dependent on the statistical variation of discrete, water-producing zones and the repository design. Therefore, to compute the total length of horizontal holes, it will be necessary to

(i) Establish the range of water conditions encountered at the repository horizon. Information required to determine this variation includes
- The surface distribution of faulting and fracturing (Scott et al, 1983; Scott and Bonk, 1984),
- The three-dimensional representation of Yucca Mountain (Nimick and Williams, 1984), and
- Assumptions on the amount of water which can be transported by the water-producing zones from surface and subsurface sources

(ii) Compute the percentage of horizontal emplacement holes that will be required to dissipate waters encountered in the holes by using the results from subtasks 5.a.ii and 5.b.i and the repository design (Jackson, 1984; or updated repository design).

Knowing this percentage and the required disposal capacity of the repository, determine if the reduced disposal capacity is adequate. If it is not adequate, it may be necessary to control the water flow entering the drift.

TASK 6

Evaluate the stability of a fault seal exposed to a high-temperature and high-moisture environment.

The effective control of water in the vicinity of a waste package can be achieved by selecting a fault seal material that can maintain a low matrix permeability and interface permeability. A dissolution model will be used to assess qualitatively the durability of the fault seal. The thermomechanical evaluations used to compute thermal and mechanical design requirements for the fault seal will indicate the potential for failure of the fault seal along the interface zone.

The dissolution model will consider the removal of seal material from the interfacial region between a station plug and the surrounding tuff in a drift. Analyses will also be performed to evaluate the removal of a fault seal. For the analyses associated with the fault seal, two potential fluid paths are possible: (1) flow along the leading edge of the grouted zone and (2) flow along the interface zone. The rate of dissolution of the fault seal will be assessed by using steady-state mass balance equations based on the solubility equilibrium. An integrated-calcium-equilibrium constant will be used. This constant will be determined from existing experimental data. Relevant minerals containing dissolved calcium include: anhydrite, calcite, and calcium-silicate hydrates. Additionally, the aperture dimension of the fractures and a maximum flow rate will be considered.

The thermomechanical calculations will evaluate the potential for mechanical failure along the interfacial zone. A range of properties will be considered for the fault seal. The grout properties measured from the materials development portion of the repository sealing activity will be used to define this range of properties. A range of temperatures will also be considered.

The final outputs from the dissolution and thermomechanical calculations, i.e., (1) the time required to remove the grout sheet and to remove various thicknesses of the grout sheet, and (2) the required thermal and mechanical properties to preclude failure along the interfacial zone, can then be used to establish the feasibility of sealing effectively a water-producing zone and to recommend a grout that is suitable as a fault seal.

TASK 7

Determine the initial material properties for materials potentially suitable as sealing components.

The properties that may be measured can include the design requirements given in Tables 3, 4, 5, and 6 (in Chapter VI). Because the design requirements defined on these tables are proposed, some may not be required and others may be added depending on the need that is established through Step 1. Additional properties such as viscosity and slump will be measured, as appropriate, to support the conceptual design activity.

The hydrologic properties, permeability and hydraulic-conductivity-versus-suction-head relationship, will be obtained by using the procedure defined in Peters et al (1984). This procedure includes the measurement of the relative humidity, using a thermocouple psychrometer, in a vapor-tight chamber containing the tested sample. The suction head can then be computed using the relative humidity and an equation relating these two parameters. From the preceding computations and measurements, a moisture retention relationship can be developed. A permeameter is used to determine the saturated hydraulic conductivity. Then, using the moisture retention relationship, the saturated hydraulic conductivity, and Maulem's (1976b) algorithm (or another suitable algorithm), the hydraulic-conductivity-versus-suction-head relationship is established.

The structural properties, e.g., strengths (compressive, tensile, shear) and Young's modulus, will be determined for 7-, 14-, and 28-day samples, to obtain a more complete understanding of the curing behavior of the seal material as well as the structural properties. To obtain the thermal properties, e.g., heat of hydration, rate of hydration, and coefficient of thermal expansion, American Society for Testing and Materials (ASTM) standards or other acceptable standards will be used. To determine the similarity between the geochemical design requirements and the actual chemical composition of the seal material, chemical analyses, x-ray diffraction, and optical petrography will be performed on the seal material.

TASK 8

Develop a degradation model that will provide insite into how material properties of sealing components, especially permeability and strength, could alter after being in contact with tuff.

Because the phase assemblages of grout and concrete probably will not be in thermodynamic equilibrium with tuff, mineral changes are likely to occur. The rate of alteration will be enhanced because of the elevated temperatures surrounding the waste package. Therefore, one approach in developing a degradation model is to assess the impact that mineral changes can have on the material properties of concern.

Changes in mineralogy may affect solubility of the grout, induce volumetric changes that could increase or decrease the permeability and strength of the grout, and change the matrix and bond strengths by altering its cementitious qualities. Therefore, the final output from this task will be a qualitative assessment of how the structural, hydrologic, and chemical properties of cementitious-based sealing materials can change in their emplacement environment.

TASK 9

Develop the conceptual design for the sealing system.

The following subtasks will be performed to develop a conceptual design for the sealing system:

(a) Compile general project criteria and design parameters including applicable codes and standards.

(b) Develop conceptual designs for a surface cover, a surface core, an anchor-to-bedrock plug/seal, a seal at the base of the exploratory shaft, an external fault seal, and a borehole seal by (i) developing design requirements and (ii) evaluating the designs of sealing components to assure that the design requirements are met.

(c) Select the appropriate gradation for the shaft and drift fill. If materials from the exploratory shaft are unavailable prior to the development of the conceptual design report, only an analytical assessment of shaft settlement will be performed using a simple consolidation theory and available material properties.

(d) Design plugs at the shaft/access drift intersection which will resist in situ stresses and the forces induced by the shaft fill. Standard elastic analyses will be used.

(e) Design shaft and borehole settlement plugs if the need is indicated by the analytical assessment in Step 1. Standard elastic analysis will be used.

(f) Develop a strategy for sealing discrete, water-producing fault or fracture zones encountered in horizontal emplacement holes and drifts considering the design requirements established in Step 2.

(g) Develop a strategy for dissipating water at the floor of ramp and drifts using the hydrologic calculation provided as part of Steps 1, 2, and 4.

(h) Determine acceptable emplacement procedures for all sealing components considering the designs developed in b to e and the strategies developed in f and g.

(i) Quantify the physical construction requirements for the emplacement procedures established in h.

(j) Develop a reliable cost estimate and a schedule of construction activities needed to emplace the sealing components in the repository. The cost estimates will include a detailed statement of the costs incurred to complete seal component emplacement. This cost estimate will also include the cost associated with additional R&D which may be required to answer the performance-related questions and finalize designs.

(k) Identify project risks associated with the emplacement of any seal component(s).

(l) Identify quality assurance requirements for repository construction (including shafts, ramps, and drifts) which must be considered from a sealing perspective.

(m) Identify health, safety, and environmental issues and how each is resolved or mitigated in the design or emplacement of the component.

(n) Specify the utility service requirements and energy consumption anticipated for the emplacement operations. This will also include the requirements for material preparation.

TASK 10

Assess the durability of the proposed sealing material for the surface barrier through laboratory testing.

The following laboratory analyses will be performed, if necessary, to assess the durability of the surface barrier:

(a) It may be possible that extended durability will be required to assure that the surface cover acts as a permanent marker. If laboratory testing is needed, a laboratory test plan will be prepared. The laboratory study described in this plan will include a comparative assessment of durability between the material selected for the surface cover/core and a standard concrete mix as determined through freeze-thaw testing. Reactivity between the concrete constituents will also be evaluated. Specific tests will include

(i) Characterize the constituents in the concrete mixture through petrographic (ASTM: C 295-79) and mechanical and chemical analyses (ASTM: C 289-81 and ASTM: C 441)

(ii) Conduct a mortar bar test (ASTM: C 289-81) to determine the potential reactivity of constituents in the proposed concrete

(iii) Perform freeze-thaw susceptibility tests using ASTM: C 666-80 to obtain a maximum number of freeze-thaw cycles in a short period of time and using ASTM: C 671-77 to obtain a more realistic prediction of durability

(iv) Periodically characterize the material at varying stages of environmental exposure

(b) If the water flow through the interface zones (defined as the contacts between the concrete liner and the surface core and between the anchor-to-bedrock plug/seal and the Tiva Canyon Member) is significant, then two tests can be performed to assess the potential for interfacial flow:

(i) An expansive bar test can be conducted to determine the potential volumetric changes within the surface core or the anchor-to-bedrock plug/seal. If the seal material tested can be shown to provide a slight expansion, a greater degree of confidence will be obtained in the integrity of the quality of the bond and subsequently a potentially lower interface zone permeability. A total of 15 expansive bar tests should be conducted--five, 2" x 2" unrestrained; five, 2" x 2" restrained; and five, 3" x 3" restrained.

(ii) Restraint pipe tests can also be conducted to determine the positive force which can be exerted after initial curing takes place. By obtaining the pressure exerted in various size pipes, representing different restraints, the pressure-versus-restraint relationship can be developed, thereby indicating qualitatively the interface zone permeability. A series of five pipe tests would be sufficient to establish this relationship.

(c) If a reasonable variation in the permeability of the zone defined by the concrete and steel liner significantly affects the flow into the shaft, the following tests are possible to assess the stability of the concrete in the presence of a steel liner:

(i) Total immersion testing to verify by-product formation and corrosion rates of steel

(ii) Laboratory tests which expose the concrete to the by-products of steel corrosion

TASK 11

Determine the thermodynamic properties of the sealing material-tuff systems to determine a material which is chemically similar to the stratigraphic unit in contact with the sealing material. (This is a screening effort which will precede the detailed laboratory testing described in Task 12.)

Because the durability of sealing materials in anticipated environments cannot be evaluated in real time, thermodynamic evaluations and hydrothermal experiments will be used to understand the potential for alteration of sealing materials. Therefore, a laboratory testing program is tentatively scheduled to be initiated upon completion of the thermodynamic property estimation, a screening activity to establish the minerals which are most stable in a tuff environment. The approach described below, which is suggested to determine the thermodynamic properties of the minerals associated with the concrete/grout-tuff system, is similar to that proposed by Lambert (1980).

Thermodynamic property estimation can assist in understanding the compatability between the seal material and the tuff. To minimize the potential for adverse interactions, tuff will be selected as a fill material where possible, as in the case of crushed tuff for the shaft fill. To determine the thermodynamic properties and subsequently the potential for mineralogical phase changes, it will be necessary to

(a) Identify mineral phases which are thermodynamically stable at room temperatures and stable at elevated temperatures with the sealing material bulk chemistry
(b) Define possible reactions for the system under investigation
(c) Review the existing thermodynamic data available on the possible reactions, including free energy, heat capacity, entropy, and enthalpy
(d) Determine the chemical reactions which are thermodynamically possible
(e) Conduct appropriate hydrothermal experimentation to validate anticipated mineralogic changes
(f) Calculate the stable mineral phases through free-energy minimization
(g) Compare the end products as determined through hydrothermal experimentation
(h) Select the most stable assemlage, i.e., the phase assemblage with the lowest available free energy

TASK 12

Initiate laboratory testing to determine the degraded mechanical, bulk, and hyrologic properties of the potential seal materials. (If all of these properties must be confirmed, the testing program can include analyses of approximately 350 samples of concrete and grout for each geochemical system.)

Prior to initiating a laboratory testing study, a detailed plan will be prepared indicating the parameters to be measured and how these parameters will be used to resolve the issue. Input from Task 11 will be used to define suitable materials for testing. The testing program will include

(a) Periodic characterization of the seal materials to determine progressive alteration in the material properties. The proposed seal material will be subjected to different curing times (3, 6, 12, and 24 weeks) and at various temperatures (38°C, 90°C, and 200°C) for the purpose of accelerating material interactions. X-ray diffraction, chemical analyses, optical petrography, and scanning electron microscopy can be used to determine the phase composition, mineralogy, and microstructure. These chemical post-test analyses will determine if mineral alterations have occurred. Additionally, the mineral alterations, together with the measured material properties of the seal material, will provide insight into how mineral alterations affect material properties. The bulk and mechanical properties will include Young's modulus, Poisson's ratio, compressive and tensile strengths, angle of internal friction, cohesion, and density.

(b) Determine the hydrologic properties of the degraded seal material at progressive times of exposure as defined above. The unsaturated-permeability-versus-suction-head relationship can be established using the gamma-beam attenuation technique described in Reda et al, (1981). Efforts are currently underway to experimentally determine directly the moisture content and unsaturated-hydrologic-conductivity-versus-pressure-head relationships. The sample size which can be tested would be suitable for concrete samples. If this technique is unavailable, then the technique described in Peters et al (1984) can be used.

(c) Determine the volume stability of the seal material within a block of tuff to determine the interface characteristics. Microstructural analyses of the interface zone and the seal material will be used to determine the alteration products and subsequently the potential for volume change. Push-out and bond strength tests will be used to assess the interface permeability indirectly, while permeability testing will be performed to determine the interface permeability directly.

(d) Determine the stress generated by the proposed seal material to verify that the stresses generated by the cementitious material during curing are acceptable. These stresses can be determined by performing expansion bar and restraint pipe tests as described in Subtask 10.b.ii and by measuring the heat of hydration and the rate of hydration of the proposed material.

TASK 13

Assess the potential for microbial growth, silting, and reprecipitation at the base of a shaft.

To determine how microbial growth, silting, and reprecipitation at the base of a shaft can modify the drainage capacity of the Topopah Spring Member (at the base of a shaft) several subtasks can be performed.

(a) Assess the potential for growth of microorganisms. Three substrates from the repository area and available water from the matrix, fractures, and surface will be examined for organic content and for the capacity to support microbial growth. The crushed tuff will also be studied under varying environmental conditions in airlift percolators to determine the potential for microbial growth and products of drain-plugging slimes. This activity will be limited in scope and will be performed only if calculations associated with Steps 1 and 2 indicate a potential problem. The results from this study will be included in a position paper,

(b) Determine the silting and reprecipitation potential by subjecting columns of backfill material to ground waters at different rates up to maximum credible rates. This activity will be limited and will only be performed if scoping calculations indicate a potential problem. The results of this study will be included in a position paper.

TASK 14

Establish the consolidation behavior of crushed tuff as a backfill to ensure that the criteria for shaft fill settlement is acceptable.

To establish an acceptable gradation and density of compacted shaft fill, laboratory studies will be required. Because mining and processing of tuff creates fines, tests will be performed on at least two gradations of welded tuff: one optimally graded to enhance drainage and reduce settlement and one which contains fine-sized particles. The source material for this laboratory analysis will be the tuff extracted through the mining of the exploratory shaft.

The following tests will be performed to verify the settlement and hydrologic performance of the shaft fill:

(a) Determine the gradation of welded and nonwelded tuff after it is mined from the exploratory shaft and after it is processed in a standard laboratory rock crusher. Through these analyses the particle-size variation of the processed tuff can be established.

(b) Determine the maximum density of several gradations of tuff using ASTM-D-2049-69 to establish the optimal gradation of welded and nonwelded tuff.

(c) Measure the saturated hydraulic conductivity of the samples prepared as part of Subtask 14b.

(d) Determine the load settlement curves for materials with varying gradations so that the shaft fill settlement potential can be assessed. A series of consolidation tests will be performed under anticipated overburden pressures in large triaxial cells to determine the load-versus-settlement relationships for the tuff samples. Replicate samples will be tested to guarantee the accuracy of the results.

TASK 15

Assess the feasibility of emplacing a fault seal in a horizontal emplacement hole. (Optional)

Field testing could be performed in conjunction with the horizontal drilling demonstration test if implemented. A horizontal drilling demonstration hole is planned for the upper and the lower breakout areas for the exploratory shaft. The 213-m (700-ft) hole will be drilled at the lower demonstration area while a 61-m (200-ft) hole will be drilled in the upper demonstration area. Because the horizontal drilling machine utilizes a vacuum removal system for rock chips, the occurrence of water will be instantaneously detected. If a discrete, water-producing zone is encountered while drilling, water flow can be monitored and, once characterized, grouted off. Before testing is begun, a detailed test plan will be prepared to include how the test results will be used to support the resolution of the issue. This activity, if initiated, will begin during the preparation of the Title I design criteria. General tasks associated with this testing are indicated on Plate 1.

TASK 16

Initiate field testing to verify the capability of the drift floor to dissipate water entering a drift or the ability to emplace the sealing components. (Possibly performed in combination with the infiltration or permeability tests in the exploratory shaft.)

Because an understanding of the drift drainage capability is important in limiting the contact between water and the waste package, a field test will be performed as part of the exploratory shaft activities to determine this drainage capability. This test is designed to quantify the flow (magnitude and direction) occurring in the drainage area and to assess the effectiveness of the design features such as "French" drains and possibly grout curtains in enhancing or retarding flow. Constructability of the seal/drain and the optional design features will also be demonstrated.

This field test will include the following activities:

(a) Determine the extent and orientation of the mining-induced and naturally occurring fractures to determine the potential direction of water movement. Mapping of the floor of the drift, together with the mapping of fractures, in monitoring boreholes drilled as part of this test will provide insight into the extent and orientation of the mining-induced and naturally occurring fractures. An understanding of the extent of the mechanically disturbed zone will also be obtained through other exploratory shaft tests.

(b) Measure the hydraulic conductivity of discrete fractures in the boreholes using a procedure similar to that described elsewhere (Zimmerman and Vollendorf, 1982) and compute the aperture sizes using the parallel plate model for fracture flow. This information will be used as input for the modeling effort to arrive at a predictive capability of drainage capacity.

(c) Excavate the drift floor, construct the material dams on either side of the test area, and instrument the boreholes. Following these activities, test the capacity of the test area.

(d) Construct a "French" drain or a series of boreholes to determine how the drainage capacity of the test area can be enhanced.

(e) Model the flow through the floor of the drift to predict the drainage capacity of fractured tuff so that adequate floor area can be provided to drain water entering the drift. This flow can be computed using a TRUST, SAGUARO, or FLUMP (Narasimhan et al, 1978), the fracture characteristics as determined in a and b, and the hydraulic conductivity as measured in b.

TASK 17

Assess the in situ response of borehole seals in the Tuffaceous Beds of Calico Hills. (Optional)

Field testing will be performed to verify the as-emplaced properties of the borehole seal. At least four horizontal holes should be drilled at the base of the exploratory shaft into the Calico Hills unit and borehole seals emplaced. Prior to seal emplacement, neutron, caliper, and geologic logs will be taken to facilitate post-test evaluation. The quality of the in situ bond and the seal itself will be assessed periodically by overcoring the seals and measuring the hydrologic, structural, and geochemical properties.

TASK 18

Perform hydrologic testing of the units penetrated by the exploratory shaft. (Performed as part of the site characterization tests in the exploratory shaft.)

Hydrologic testing and sampling of the unsaturated zone, primarily shaft and drift wall mapping, photography, and hand specimen sampling, performed as part of the exploratory shaft activities, will provide specific site information on water flux into the shaft. These observations will, therefore, refine or confirm the amount of water that could enter the shaft. A preliminary assessment of water flow into the shaft will be available upon completion of the exploratory shaft, assumed in this plan to be in CY 1987. The detailed influx characterization will be tentatively completed during the first quarter of CY 1989. As additional shafts are drilled, a better perspective of water flow into shafts will be obtained.

TASK 19

Evaluate the performance of the sealing system.

The following subtasks will be performed in evaluating the performance of the sealing system:

(a) Develop the following matrices for the materials and designs specified in the conceptual design report:

  (i) Events versus processes (Which events are responsible for enhancing or possibly initiating processes?)
  (ii) Processes (static, dynamic, and man-induced) versus failure mechanisms (Which processes contribute to specific failure mechanisms?)
  (iii) Failure mechanisms versus potential materials and designs (Which materials or designs will resist, partially resist, or will not resist specific failure mechanisms?)

(b) Use the results from laboratory and field testing to develop material and hydrologic models. Contributing to the understanding of sealing material properties and the hydrogeology are

  (i) The laboratory testing of sealing materials in contact with tuff
  (ii) The consolidation behavior of mined materials and optimally graded materials from the exploratory shaft
  (iii) The durability of concrete subjected to surficial processes
  (iv) The early curing behavior of cementitious materials in restrained environments
  (v) The field testing of the Topopah Spring Member and the Tuffaceous Beds of Calico Hills

(c) Develop conceivable scenarios for the transport of radionuclides in the unsaturated zone. Emphasis will be placed on the events which can alter the properties of the sealing designs and the hydrogeologic behavior of the stratigraphic units of concern.

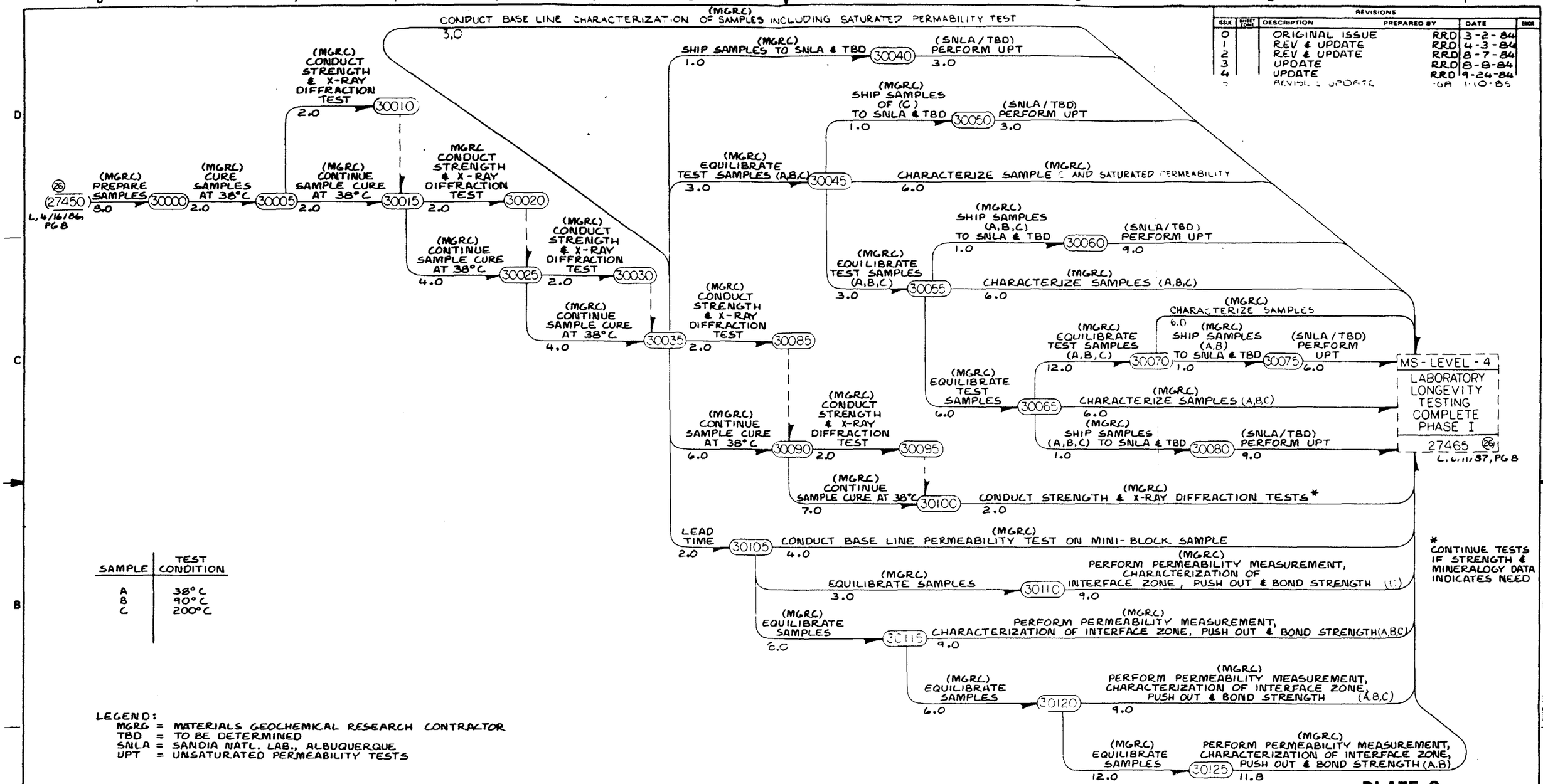
(d) Calculate the effect of the postclosure sealing system on the migration time and concentrations of radionuclides considered important from a long-term hazard standpoint, as currently listed in the EPA criteria or other available criteria. Radionuclide travel times to the ground-water table will be recorded for input to the overall repository performance assessment. This effort will, therefore, be coordinated with the system performance assessments for a repository at Yucca Mountain.

APPENDIX B

Work-Flow Diagrams (Plates 1 through 5)
for the NNWSI Repository Sealing Activity

Plate 1. Repository Sealing Activity
(A microfilm copy of this plate is provided in the inside portion of the back cover. A paper copy of Plate 1 can be obtained from the author.)

REVISIONS				
ISSUE	SHEET ZONE	DESCRIPTION	PREPARED BY	DATE
0		ORIGINAL ISSUE	RRD	3-2-84
1		REV & UPDATE	RRD	4-3-84
2		REV & UPDATE	RRD	8-7-84
3		UPDATE	RRD	8-8-84
4		UPDATE	RRD	9-24-84
5		REVISION & UPDATE	GA	1-10-85



SAMPLE	TEST CONDITION
A	38°C
B	90°C
C	200°C

* CONTINUE TESTS IF STRENGTH & MINERALOGY DATA INDICATES NEED

LEGEND:
- MGRG = MATERIALS GEOCHEMICAL RESEARCH CONTRACTOR
- TBD = TO BE DETERMINED
- SNLA = SANDIA NATL. LAB., ALBUQUERQUE
- UPT = UNSATURATED PERMEABILITY TESTS

PLATE 3

PMS - 6041		TEL
ENGR	R. SNIDOW	846-0345
NA	I. LEYBA	844-8437
SUPVR	M. BECKTELL	844-2752

ORG	NAME
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6313	J. TILLERSON
6313	J. FERNANDEZ
LANL	C. DUFFY
PSU	D. ROY

SHEET 1 ISSUE 5 SHEET INDEX PART CLASSIFICATION Sandia

DWG CLASSIFICATION LEVEL **UNCLASSIFIED**

TITLE (26) MATERIALS INVESTIGATION PHASE I

SIZE D FSCM NO 14213 DWG NUMBER SFNW26P IEL NW55=RES SCALE — SHEET 11 OF 12

REVISIONS				
ISSUE	SHEET ZONE	DESCRIPTION	PREPARED BY	DATE
0		ORIGINAL ISSUE	RRD	3-2-84
1		REV & UPDATE (PH 2 IS NEW)	RRD	4-3-84
2		REV & UPDATE	RRD	8-7-84
3		UPDATE	RRD	8-8-84
4		UPDATE	RRD	9-24-84
5		REVISE & UPDATE	GA	1-10-85

(MGRC) CONDUCT BASE LINE CHARACTERIZATION OF SAMPLES INCLUDING SATURATED PERMABILITY TEST 3.0

(26) 27505 L, 5/6/86 PG 8

(MGRC) PREPARE SAMPLES 8.0 → 31000

(MGRC) CURE SAMPLES AT 38°C 2.0 → 31005

(MGRC) CONTINUE SAMPLE CURE AT 38°C 2.0 → 31015

(MGRC) CONDUCT STRENGTH & X-RAY DIFFRACTION TEST 2.0 → 31020

(MGRC) CONTINUE SAMPLE CURE AT 38°C 4.0 → 31025

(MGRC) CONDUCT STRENGTH & X-RAY DIFFRACTION TEST 2.0 → 31030

(MGRC) CONTINUE SAMPLE CURE AT 38°C 4.0 → 31035

(MGRC) CONDUCT STRENGTH & X-RAY DIFFRACTION TEST 2.0 → 31085

(MGRC) CONDUCT STRENGTH & X-RAY DIFFRACTION TEST 2.0 → 31010

(MGRC) CONTINUE SAMPLE CURE AT 38°C 6.0 → 31090

(MGRC) CONDUCT STRENGTH & X-RAY DIFFRACTION TEST 2.0 → 31095

(MGRC) CONTINUE SAMPLE CURE AT 38°C 7.0 → 31100

(MGRC) CONDUCT STRENGTH & X-RAY DIFFRACTION TESTS* 2.0

LEAD TIME 2.0 → 31105 (MGRC) CONDUCT BASE LINE PERMEABILITY TEST ON MINI-BLOCK SAMPLE 4.0

(MGRC) EQUILIBRATE SAMPLES 3.0 → 31110 (MGRC) PERFORM PERMEABILITY MEASUREMENT, CHARACTERIZATION OF INTERFACE ZONE, PUSH OUT & BOND STRENGTH (C) 9.0

(MGRC) EQUILIBRATE SAMPLES 6.0 → 31115 (MGRC) PERFORM PERMEABILITY MEASUREMENT, CHARACTERIZATION OF INTERFACE ZONE, PUSH OUT & BOND STRENGTH (A,B,C) 9.0

(MGRC) EQUILIBRATE SAMPLES 6.0 → 31120 (MGRC) PERFORM PERMEABILITY MEASUREMENT, CHARACTERIZATION OF INTERFACE ZONE, PUSH OUT & BOND STRENGTH (A,B,C) 9.0

(MGRC) EQUILIBRATE SAMPLES 12.0 → 31125 (MGRC) PERFORM PERMEABILITY MEASUREMENT, CHARACTERIZATION OF INTERFACE ZONE, PUSH OUT & BOND STRENGTH (A,B) 9.0

(MGRC) SHIP SAMPLES TO SNLA & TBD 1.0 → 31040 (SNLA/TBD) PERFORM UPT 3.0

(MGRC) SHIP SAMPLES OF (C) TO SNLA & TBD 1.0 → 31050 (SNLA/TBD) PERFORM UPT 3.0

(MGRC) EQUILIBRATE TEST SAMPLES (A,B,C) 3.0 → 31045 (MGRC) CHARACTERIZE SAMPLE C AND SATURATED PERMEABILITY 6.0

(MGRC) SHIP SAMPLES (A,B,C) TO SNLA & TBD 1.0 → 31060 (SNLA/TBD) PERFORM UPT 9.0

(MGRC) EQUILIBRATE TEST SAMPLES (A,B,C) 3.0 → 31055 (MGRC) CHARACTERIZE SAMPLES (A,B,C) 6.0

(MGRC) CHARACTERIZE SAMPLES 6.0

(MGRC) EQUILIBRATE TEST SAMPLES (A,B,C) 12.0 → 31070 (MGRC) SHIP SAMPLES (A,B) TO SNLA & TBD 1.0 → 31075 (SNLA/TBD) PERFORM UPT 6.0

(MGRC) EQUILIBRATE TEST SAMPLES 6.0 → 31065 (MGRC) CHARACTERIZE SAMPLES (A,B,C) 6.0

(MGRC) SHIP SAMPLES (A,B,C) TO SNLA & TBD 1.0 → 31080 (SNLA/TBD) PERFORM UPT 9.0

MS - LEVEL - 4
LABORATORY LONGEVITY TESTING COMPLETE PHASE II
27520 (26) L, 2/25/88, PG 8

* CONTINUE TESTS IF STRENGTH & MINERALOGY DATA INDICATES NEED

SAMPLE	TEST CONDITION
A	38° C
B	90° C
C	200° C

LEGEND:
- MGRC = MATERIALS GEOCHEMICAL RESEARCH CONTRACTOR
- TBD = TO BE DETERMINED
- SNLA = SANDIA NATL. LAB., ALBUQUERQUE
- UPT = UNSATURATED PERMEABILITY TESTS

PLATE 3 CONTINUED

PMS - 6041		TEL
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LANL	C. DUFFY
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SHEET 1 ISSUE 5 SHEET INDEX PART CLASSIFICATION Sandia

DWG CLASSIFICATION LEVEL **UNCLASSIFIED**

TITLE (26)
MATERIALS INVESTIGATION PHASE II

SIZE D FSCM NO 14213 DWG NUMBER BFNW22P IGLNWSS-RGS SCALE — SHEET 12 OF 12

WASH-OFF FILM

REVISIONS				
ISSUE	SHEET/FORM	DESCRIPTION	PREPARED BY	DATE
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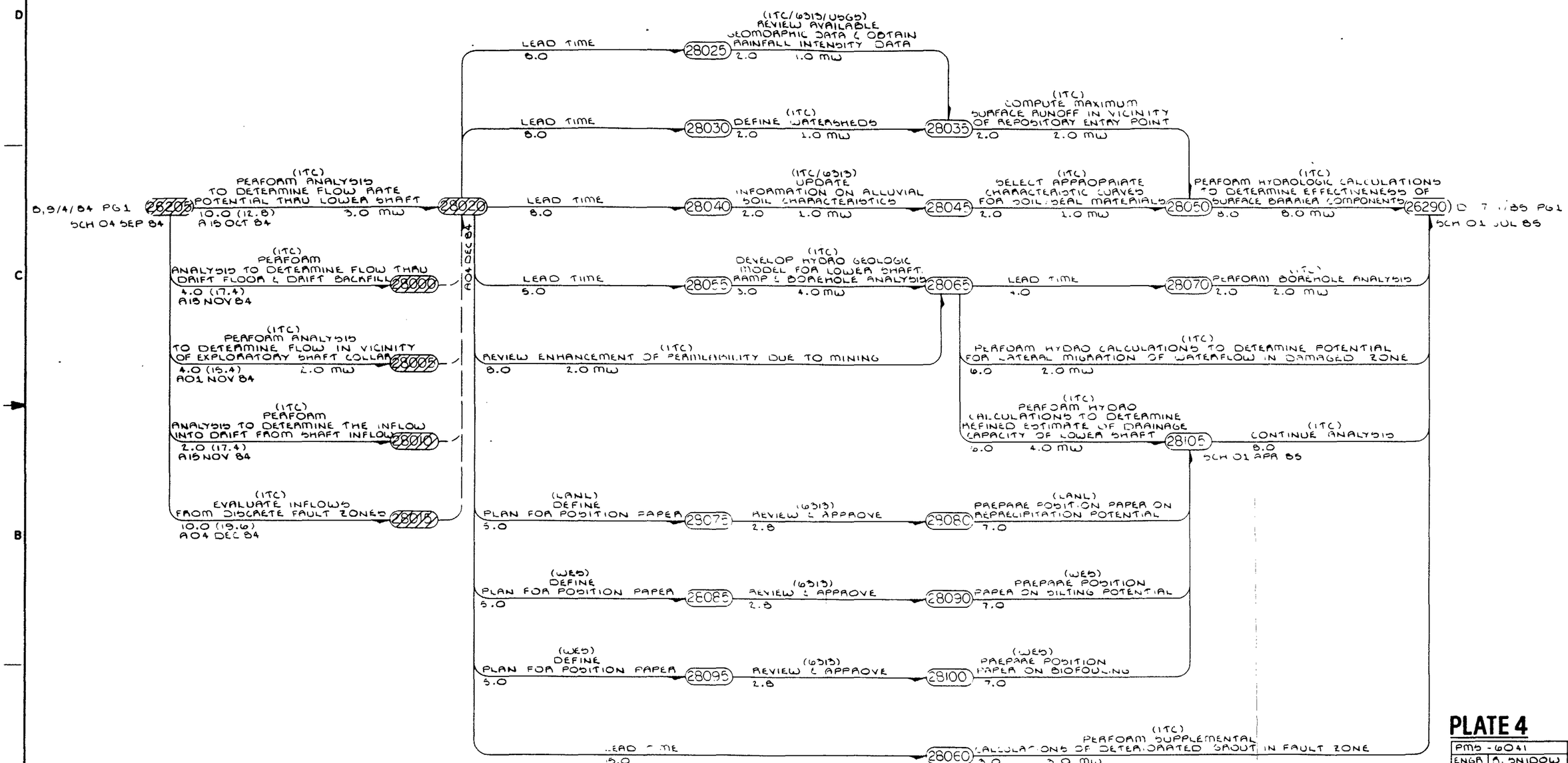

PLATE 4

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SHEET 2
ISSUE 5
SHEET INDEX
PART CLASSIFICATION: Sandia
DWG CLASSIFICATION LEVEL: UNCLASSIFIED

TITLE: HYDROLOGIC CALCULATIONS (26)
HC

SIZE D | FSCM NO 14213 | DWG NUMBER ILNW26P (ELNW55=AE5)
SCALE | SHEET 10 OF 12

REVISIONS				
ISSUE	SHEET(S) AFFECTED	DESCRIPTION	PREPARED BY	DATE
0		ORIGINAL ISSUE -GA		7-23-84
4		REVISE & UPDATE (SHT 1 & 2)-GA		11-30-84
5		REV (ALL SHT, ADD 4) & UPDATE RRD		1-9-85

(PSU)
EXAMINE & CHARACTERIZE ANCIENT CONCRETES
50.6 (49.8)
A 01 OCT 84

50002

(NIC) 24 28880 A 05 OCT 84

(50033)
7D, PG2

A01 OCT 84

50001 START
A03 OCT 83

50000 LEAD TIME
52.2 (39.4)
A 18 JUL 84

50007 (2.0)
A 01 AUG 84

(WES)
ESTABLISH GRADATION CURVES & CHARACTERISTICS OF ROCK FRAGMENTS

MS-LEVEL-3
. DRAFT TUFF CONCRETE STUDY COMPLETE
50004

(50155) 2D, PG2

(WES/6313)
MEASURE PROPERTIES OF TUFF CONCRETE & PREPARE DRAFT REPORT
70.0

(SNL) PERFORM PEER REVIEW 2.0 → 50006
(6313) INCORPORATE COMMENTS 2.0 → 50008
(6310/6313) PERFORM LINE REVIEW 4.0 → 50012
(6313) INCORPORATE COMMENTS 2.0 → 50014
(DOE/NV) REVIEW REPORT 4.0 → 50016
(6300/6310) PERFORM LINE REVIEW & INCORPORATE COMMENTS 4.0 → 50017
(SNL) PUBLISH REPORT 4.0 → 50019

LEAD TIME (20.2) A02 MAR 84 → 50022

(PSU)
DEVELOP MODEL FOR DISSOLUTION OF GROUT IN FAULT ZONE
(17.0)
A02 JUL 84

50024 (LANL/SNL)
REVIEW DISSOLUTION MODEL
(14.4)
A12 OCT 84

(LANL/PSU)
COLLECT GEOCHEMICAL INFORMATION ON TOPOPAH SPRING MEMBER & CALICO HILLS UNIT
50.6 (54.4)
A 01 NOV 84

(6313)
CONTRACTOR PREPARES INITIAL WBS & NETWORK ANALYSIS
(1.6)
A 06 AUG 84

(6313/ITC)
PREPARE ANNOTATED OUTLINE FOR MATERIAL RECOMMENDATION & DESIGN REQUIREMENTS REPORT
1.0 (1.4)
A12 NOV 84

50020 (6313)
RESPONSIBILITY FOR PREPARATION OF REPORT
1.0 (0.8)
A16 NOV 84

(50080) 8C, PG2

50001 START
A23 JUL 84

50002 (6313) PREPARE & PRESENT SITE & SEALING INFO TO ITC
(0.4)
A 25 JUL 84

50003 (6313) COMPILE & SEND BACKGROUND INFO TO ITC
(0.6)
A 30 JUL 84

50010 (ITC) REVIEW SITE & SEALING INFO
(1.0)
A 06 AUG 84

50015 (ITC) REVIEW WBS & NETWORKS
(0.6)
A 09 AUG 84

50040 (ITC) FINALIZE WBS & NETWORK ANALYSIS
(1.0)
A 16 AUG 84

50043 (ITC) DEVELOP PRELIMINARY CONCEPTUAL MODELS
1.0 (9.4)
A25 OCT 84

50050 (ITC) PERFORM PRELIMINARY STRUCTURAL ANALYSES
2.2 (1.0)
A01 NOV 84

50065 (ITC/6313) EVALUATE ANALYSES
(0.2)
A02 NOV 84

50070 (ITC/6313) ESTABLISH PRELIMINARY DESIGN REQUIREMENTS FOR SEALING COMPONENTS
0.2 (1.2)
A12 NOV 84

A. SIZE & GRADING SHAFT & DRIFT FILL
B. BOREHOLE & SHAFT SETTLEMENT PLUGS
C. STATION PLUGS
D. FAULT/FRACTURE SEALS
E. BOREHOLE SEALS
F. SURFACE BARRIER COMPONENTS

50075 (ITC/6313/LANL/WES/PSU) HOLD FIRST DESIGN REQUIREMENTS & MATERIALS WORKSHOP
0.4 (0.6)
A15 NOV 84

50076 58, PG2

(50080) 8D, PG2
A12 NOV 84

(ITC)
REVIEW SITE & SEALING INFO & ESTABLISH DATA BASE
(2.0)
A 20 AUG 84

(ITC) PREPARE QA PLAN FOR TASK 1
(10.0)
A 16 OCT 84

MS-LEVEL-4
QA PLAN COMPLETE
50025
A 16 OCT 84

50029 A 16 OCT 84

(ITC) PREPARE QA PLAN FOR TASK 2
(13.8)
A12 NOV 84

MS-LEVEL-4
QA PLAN FOR TASK 2 COMPLETE
50030
A 12 NOV 84

5A, PG2
(50465)

(ITC) PREPARE PRELIMINARY RECOMMENDATION OF FIELD TEST
2.0
50035

(ITC) PERFORM PRELIMINARY THERMAL ANALYSES
2.2 (1.0)
A01 NOV 84
50055

(ITC) PERFORM PRELIMINARY HYDROLOGIC ANALYSES
1.2 (1.0)
A01 NOV 84
50060

A01 NOV 84
A01 NOV 84

(ITC) CONTINUE ANALYSES TO DEVELOP DESIGN REQUIREMENTS
13.8

8B, PG2
(50445)
(50155) 2D, PG2

LEGEND:
NIC = NOT IN COMPUTER

PLATE 5

PMS - 6041		TEL
ENG	A. SN. DOW	846-0345
NA	D. FORREST	846-3775
SUPVR	M. BECKTELL	844-2782

NNWSI

ORG	NAME
6310	T. HUNTER
6313	J. TILLERSON
6313	J. FERNANDEZ
ITC	O. SHUKLA
ITC	P. NELSALL

SHEET 1 2 3 4
ISSUE 5 5 3 1
SHEET INDEX
PART CLASSIFICATION
Sandia
DWG CLASSIFICATION LEVEL
UNCLASSIFIED

TITLE
SEALING CONCEPTUAL DESIGN & FIELD TEST PLANNING
SCDFTP
50

SIZE D | FSCM NO 14213 | DWG NUMBER ILNW50P
SCALE | SHEET 1 OF 4

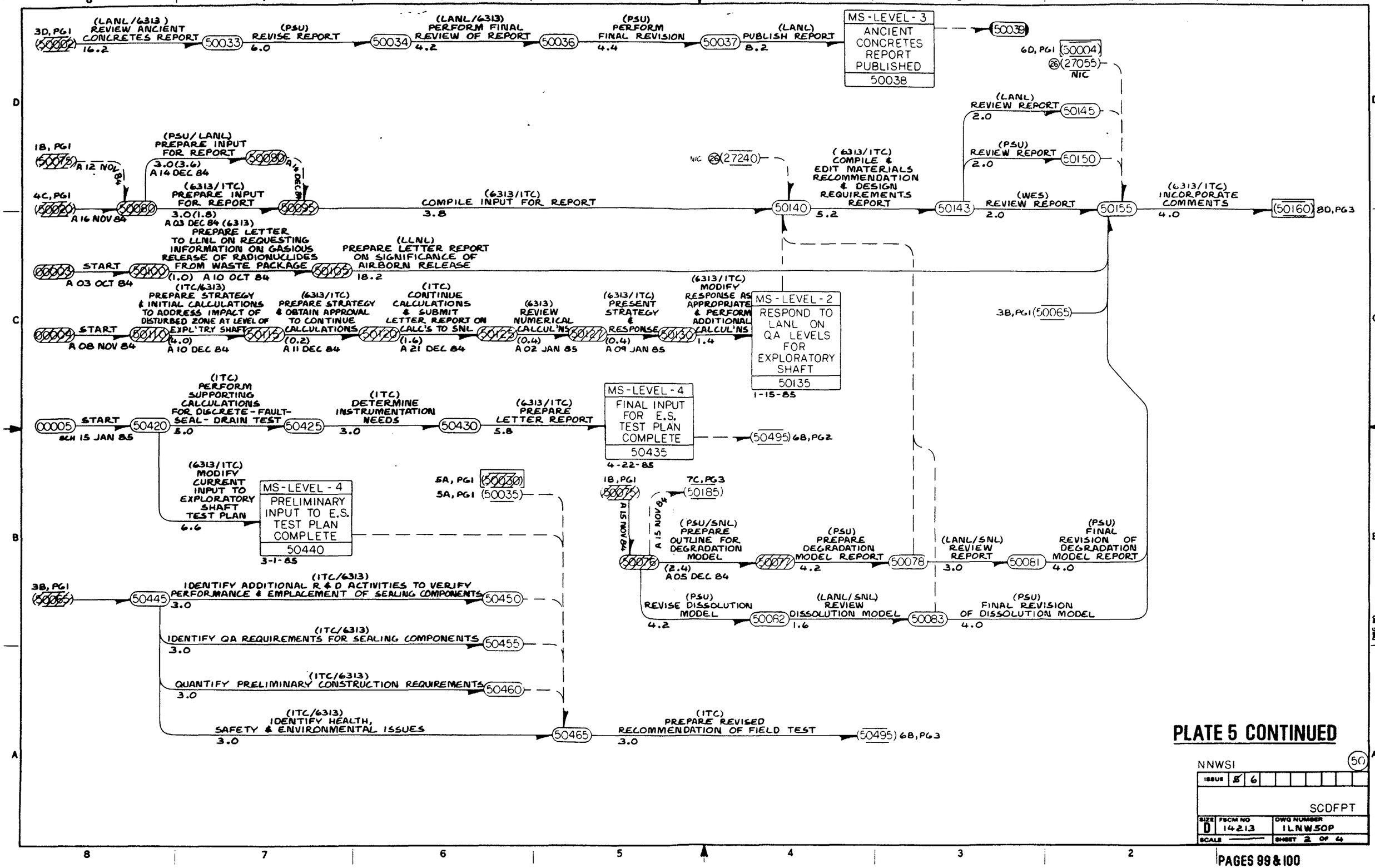

PLATE 5 CONTINUED

NNWSI

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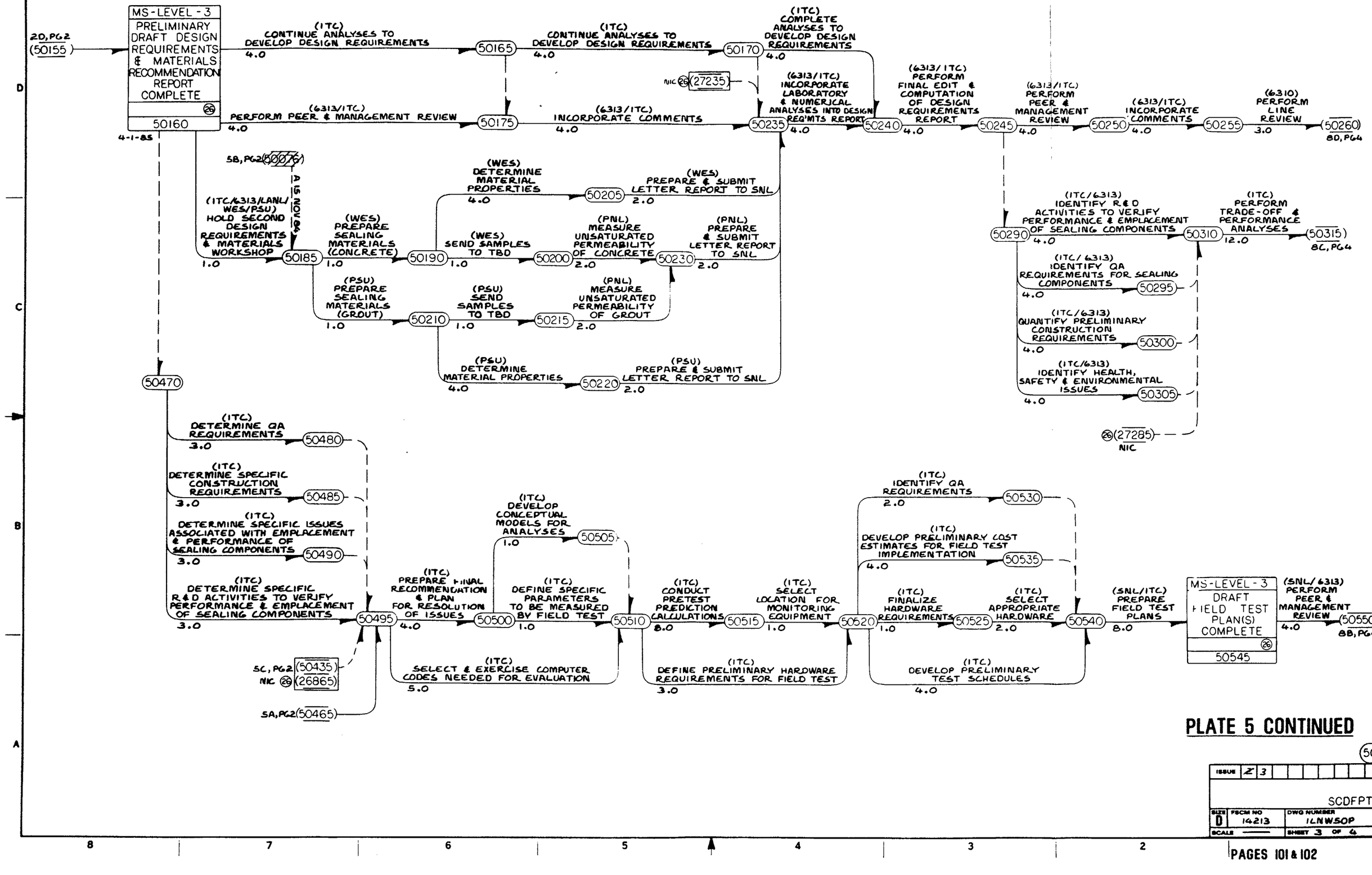
ISSUE	5	6							

SCDFPT

SIZE	FSCM NO	DWG NUMBER
D	14213	ILNWSOP
SCALE ——		SHEET 2 OF 4



PAGES 101 & 102

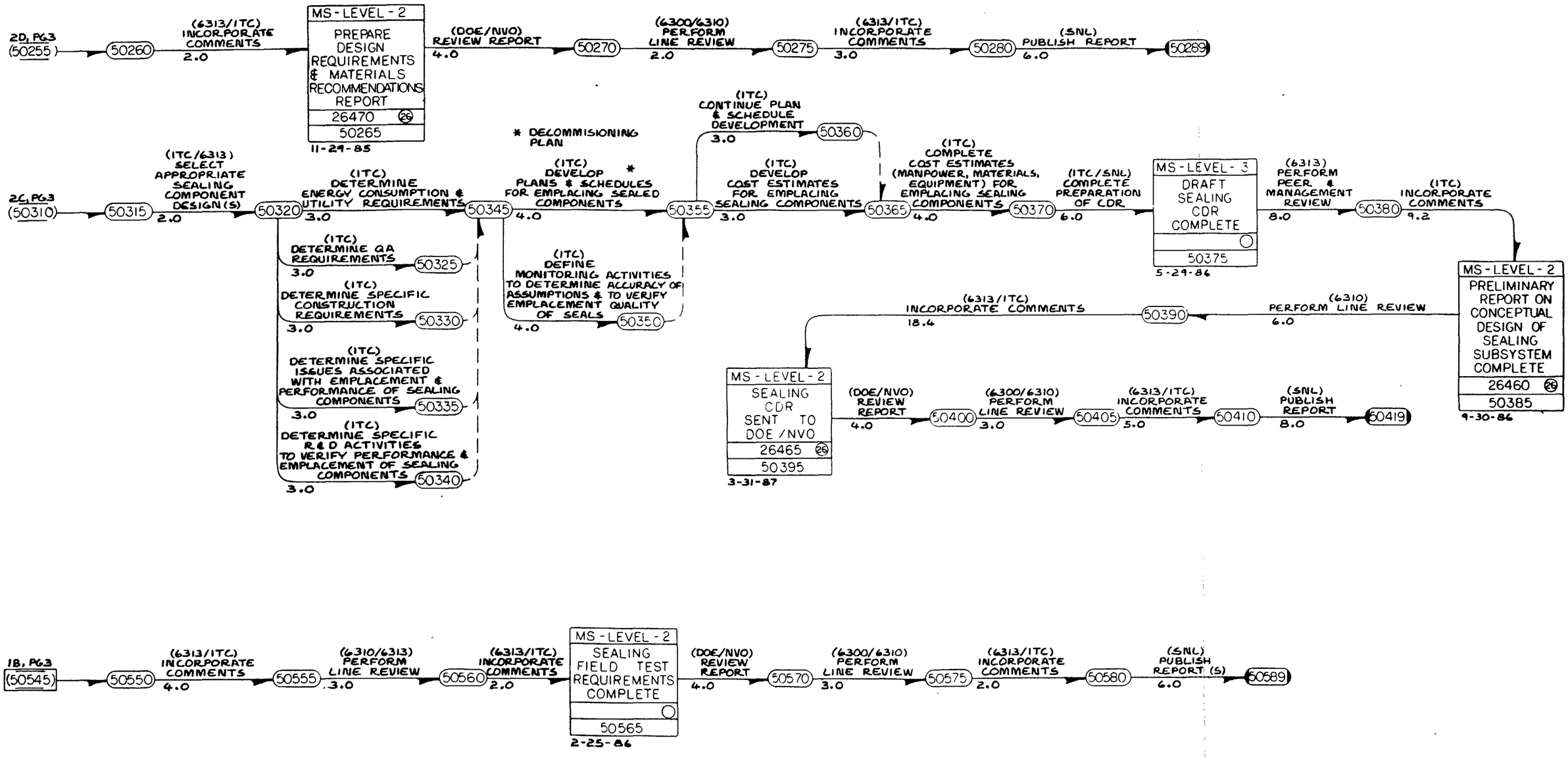


PLATE 5 CONTINUED

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ISSUE	O								

SCDFTP

SIZE	FSCM NO	DWG NUMBER
D	14213	ILNWSOP
SCALE		SHEET 4 OF 44

APPENDIX C

Sealing Activities and Completion Dates--Net 26

SANDIA NATIONAL LABORATORIES
PROJECT MANAGEMENT SUPPORT DIVISION
PROJECT PLANNING ANALYSIS AND REPORTING SYSTEM

THIS NETWORK WAS UPDATED 1/10/85

NETWORK NNWSI

EVENT PRED	EVENT SUCC	NETWORK OR INTERFACE	ACTIVITY DESCRIPTION	TIME EST	EXPECTED START	EXPECTED FINISH	LATEST ALLOWED	*ACT/SCHD DATE	SLACK	ORG/ AGEN
26225M	26225M	WBS 124231	DEFINE SEAL CONC/RPT COMP					*12/23/83		26MS-2
26260M	26260M	WBS 124231	DEFINE SEAL ISS/PLAN COMP					*03/30/84		26MS-2
26435M	26435M	WBS 124233	CONT PLACED/CONC DSN SEAL					*07/23/84		26MS-4
26265M	26265M	WBS 124231	DRFT PROG PLAN RPT COMP					*10/15/84		26MS-1
26250M	26250M	WBS 124231	FINAL SEAL CONC RPT COMP					*11/01/84		26MS-2
26480M	26480M	WBS 124233	PREL INPUT TST COMPLETE	0.0	03/01/85	03/01/85	03/01/85		0.0	26MS-4
26445M	26445M	WBS 124233	PREL DRFT DSN/MR COMPLETE	0.0	04/08/85	04/08/85	04/08/85		0.0	26MS-3
26865M	26865M	WBS 124233	FINAL INPUT/ES TEST COMP	0.0	04/22/85	04/22/85	04/22/85		0.0	26MS-4
27005M	27005M	WBS 124232	DRAFT WEAP SEAL STDY COMP	0.0	05/01/85	05/01/85	05/01/85		0.0	26MS-3
27235M	27235M	WBS 124232	CON-14 RPT PUBLISHED	0.0	05/15/85	05/15/85	05/15/85		0.0	26MS-3
27265M	27265M	WBS 124232	MORTAR/GROUT RPT PUBLHD	0.0	07/22/85	07/22/85	07/22/85		0.0	26MS-3
27075M	27075M	WBS 124232	MECHANICAL PROP RPT COMP	0.0	08/15/85	08/15/85	08/15/85		0.0	26MS-3
27290M	27290M	WBS 124232	ATHENAN CODE RPT PUBLD	0.0	09/03/85	09/03/85	09/03/85		0.0	26MS-3
27035M	27035M	WBS 124232	INTERFACE STUDY COMPLETE	0.0	09/12/85	09/12/85	09/12/85		0.0	26MS-3
26040M	26040M	WBS 243	START CONCEPT DESIGN	0.0	09/30/85	09/30/85	01/16/86		14.0	26MS-1
26485M	26485M	WBS 124233	DRFT FLD TST PLANS COMP	0.0	11/14/85	11/14/85	11/14/85		0.0	26MS-3
26470M	26470M	WBS 243	PREP DSN REQ & MATL RPT	0.0	11/27/85	11/27/85	11/27/85		0.0	26MS-2
26870M	26870M	WBS 124233	SEAL FLD TST RQMTS COMP	0.0	02/25/86	02/25/86	02/25/86		0.0	26MS-2
26305M	26305M	WBS 124231	UPDATE PLAN & STATUS RPT	0.0	04/28/86	04/28/86	04/28/86		0.0	26MS-2
26455M	26455M	WBS 124233	DRAFT SEALING CDR COMPLT	0.0	05/29/86	05/29/86	05/29/86		0.0	26MS-3
26325M	26325M	WBS 243	PROGRAM PLAN UPDATE COMP	0.0	08/07/86	08/07/86	08/07/86		0.0	26MS-1
26070M	26070M	WBS 243	EST BOARD/TITLE I AE	0.0	08/15/86	08/15/86	08/21/86		.8	26MS-2
26460M	26460M	WBS 243	PREL RPT SEAL SUB COMP	0.0	09/30/86	09/30/86	09/30/86		0.0	26MS-2
26050M	26050M	WBS 243	DRFT CDR AVAIL F/INT REVW	0.0	03/02/87	03/02/87	03/02/87		0.0	26MS-3
26465M	26465M	WBS 124233	SEALING CDR SENT DOE/NVO	0.0	03/31/87	03/31/87	03/31/87		0.0	26MS-2
27410M	27410M	WBS 124232	RECOMM SEAL MATL RPT DSN	0.0	06/01/87	06/01/87	10/16/87		19.4	26MS-3
26080M	26080M	WBS 243	SELECT TITLE I AE	0.0	06/30/87	06/30/87	07/07/87		.8	26MS-1
26055M	26055M	WBS 243	SUBMIT CDR TO DOE/NVO	0.0	07/31/87	07/31/87	07/31/87		0.0	26MS-1
26580M	26580M	WBS 124233	PREL DRFT G-TUNN TST COMP	0.0	08/19/87	08/19/87	08/02/88		47.6	26MS-3
26620M	26620M	WBS 124231	TITLE I SEAL CRIT COMPETE	0.0	09/30/87	09/30/87	12/04/87		9.0	26MS-2
26075M	26075M	WBS 243	COMP TITLE I DSN CRITERIA	0.0	11/30/87	11/30/87	12/04/87		.8	26MS-1
26595M	26595M	WBS 124233	G-TUNN DRAIN TST RPT COMP	0.0	12/21/87	12/21/87	12/02/88		47.6	26MS-3
27205M	27205M	WBS 124232	RPTS SUSCEPT/RST TST COMP	0.0	01/04/88	01/04/88	01/04/88		0.0	26MS-3
27465M	27465M	WBS 124232	LAB LONG TST COMPLTE (I)	0.0	01/07/88	01/07/88	01/07/88		0.0	26MS-4
26990M	26990M	WBS 124232	CONSOLID BEHAVR RPT COMP	0.0	01/18/88	01/18/88	01/18/88		0.0	26MS-3
26085M	26085M	WBS 243	BEGIN TITLE I DESIGN	0.0	02/26/88	02/26/88	03/03/88		.8	26MS-1
27520M	27520M	WBS 124232	LAB LONG TST COMP (II)	0.0	03/18/88	03/18/88	03/18/88		0.0	26MS-4
27435M	27435M	WBS 124232	FINAL RECOMM/TITLE I COMP	0.0	11/01/88	11/01/88	11/01/88		0.0	26MS-3
27495M	27495M	WBS 124232	REPORT SEAL MATL/TOP COMP	0.0	01/09/89	01/09/89	01/09/89		0.0	26MS-3
27550M	27550M	WBS 124232	RPT COMPAT SEAL MATL/CALC	0.0	03/20/89	03/20/89	03/20/89		0.0	26MS-3
26860M	26860M	WBS 124233	FAULT SEAL TEST RPT COMP	0.0	03/30/89	03/30/89	03/30/89		0.0	26MS-3
26425M	26425M	WBS 243	RPT SEAL SUBSYS PFM COMP	0.0	04/03/89	04/03/89	04/07/89		.8	26MS-2
26015M	26015M	WBS 243	DRAFT DEIS COMPLETE	0.0	09/01/89	09/01/89	09/01/89		0.0	26MS-1
26020M	26020M	WBS 243	DEIS HEARINGS COMPLETE	0.0	10/09/89	10/09/89	10/09/89		0.0	26MS-1

SANDIA NATIONAL LABORATORIES
PROJECT MANAGEMENT SUPPORT DIVISION
PROJECT PLANNING ANALYSIS AND REPORTING SYSTEM

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NETWORK NNWSI

EVENT PRED	EVENT SUCC	NETWORK OR INTERFACE	ACTIVITY DESCRIPTION	TIME EST	EXPECTED START	EXPECTED FINISH	LATEST ALLOWED	*ACT/SCHD DATE	SLACK	ORG/ AGEN
26135M	26135M	WBS 243	TITLE I SEAL DSN COMPLETE	0.0	01/02/90	01/02/90	01/02/90		0.0	26MS-2
26112M	26112M	WBS 243	TITLE I DESIGN COMPLETE	0.0	02/01/90	02/01/90	02/01/90		0.0	26MS-1
26810M	26810M	WBS 124233	FLT SEAL DRN TST RPT COMP	0.0	02/09/90	02/09/90	02/09/90		0.0	26MS-3
26030M	26030M	WBS 243	FEIS PUBLISHED	0.0	03/01/90	03/01/90	03/01/90		0.0	26MS-1
26175M	26175M	WBS 243	PSAR DRAFT COMPLETE	0.0	08/01/90	08/01/90	08/01/90		0.0	26MS-1
26180M	26180M	WBS 243	CAA SUBMITTED TO NRC	0.0	08/01/90	08/01/90	08/01/90		0.0	26MS-1

SANDIA NATIONAL LABORATORIES
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NETWORK NNWSI

EVENT PRED	EVENT SUCC	NETWORK OR INTERFACE	ACTIVITY DESCRIPTION	TIME EST	EXPECTED START	EXPECTED FINISH	LATEST ALLOWED	*ACT/SCHD DATE	SLACK	ORG/ AGEN
0001S	26000	WBS 243	START					*10/03/83		26
0002S	26200	WBS 243	START					*03/12/84		26
0004S	26625	WBS 243	START	0.0	05/16/86	05/16/86	05/16/86	S05/16/86	0.0	26
0005S	26535	WBS 243	START	0.0	08/22/85	08/22/85	08/22/85	S08/22/85	15.2	26
0005S	27310	WBS 243	START					*11/26/84		26
0006S	26475	WBS 124233	START	0.0	01/15/85	01/15/85	01/15/85	S01/15/85	0.0	26
0007S	26650	WBS 243	START	0.0	09/15/87	09/15/87	09/15/87	S09/15/87	0.0	26
0008S	26660	WBS 243	START	0.0	11/17/87	11/17/87	11/17/87	S11/17/87	0.0	26
0009S	26070	WBS 243	START	0.0	08/15/86	08/15/86	08/15/86	S08/15/86	.8	26
0010S	27080	WBS 243	START	0.0	01/09/86	01/09/86	01/09/86	S01/09/86	0.0	26
0011S	27105	WBS 243	START	0.0	07/15/85	07/15/85	07/15/85	S07/15/85	.8	26
0012S	26140	WBS 243	START	0.0	03/31/88	03/31/88	03/31/88	S03/31/88	.8	26
0013S	26360	WBS 243	START	0.0	12/16/86	12/16/86	12/16/86	S12/16/86	4.6	26
0014S	26600	WBS 243	START	0.0	10/29/86	10/29/86	10/29/86	S10/29/86	15.0	26
26000	26010	WBS 243	PREP&UPDATE SCP/DEIS	280.0	10/03/83	05/11/89	05/11/89		0.0	266312
26000	26035	WBS 243	LEAD TIME					*05/15/84		26
26000	26185	WBS 243	LEAD TIME	63.0	10/03/83	01/11/85	01/11/85		0.0	26
26000	26225	WBS 124231	DEFINE SEAL COND/DRFT RPT					*12/23/83		266313
26000	26255	WBS 243	LEAD TIME					*12/23/83		26
26000	26290	WBS 124231	ESTAB POSIT/GASEOUS MIGRN	87.0	10/03/83	07/01/85	07/01/85		0.0	26LLNL
26000	26430	WBS 243	LEAD TIME					*11/01/83		26
26000	26940	WBS 243	LEAD TIME	107.4	10/03/83	11/22/85	12/10/86		52.0	26
26000	27000	WBS 124232	MEAS PROP/TEST SEALS&PREP	70.0	10/03/83	03/01/85	03/01/85		0.0	26WES
26000	27040	WBS 124232	MEAS PROP&PREP DRFT RPT					*10/05/84		26PSU
26000	27210	WBS 124232	PREP CON-14 RPT (GEOCH)					*09/14/84		26PSU
26000	27240	WBS 124232	PREP RPT MORTAR/GROUT	63.2	10/03/83	01/14/85	01/14/85		0.0	26PSU
26000	27270	WBS 124232	PREP RPT ATHENAN CODE					*10/01/84		26PSU
26000	27300	WBS 243	LEAD TIME					*08/08/84		26
26000	27440	WBS 243	LEAD TIME	116.6	10/03/83	02/06/86	09/08/86		29.8	26
26010	26015	WBS 243	CONTINUE PREP OF DEIS	15.8	05/11/89	09/01/89	09/01/89		0.0	266312
26015M	26015M	WBS 243	DRAFT DEIS COMPLETE	0.0	09/01/89	09/01/89	09/01/89		0.0	26MS-1
26015	26020	WBS 243	CONDUCT PUBLIC HEARINGS	5.0	09/01/89	10/09/89	10/09/89		0.0	26DOE
26020M	26020M	WBS 243	DEIS HEARINGS COMPLETE	0.0	10/09/89	10/09/89	10/09/89		0.0	26MS-1
26020	26030	WBS 243	UPDATE DEIS	19.0	10/09/89	03/01/90	03/01/90		0.0	266312
26030M	26030M	WBS 243	FEIS PUBLISHED	0.0	03/01/90	03/01/90	03/01/90		0.0	26MS-1
26030	26180	WBS 243	LEAD TIME	21.4	03/01/90	08/01/90	08/01/90		0.0	26
26035	26040	WBS 243	PREP CDR OUTLINE	69.0	05/15/84	09/30/85	01/16/86		14.0	266311
26040M	26040M	WBS 243	START CONCEPT DESIGN	0.0	09/30/85	09/30/85	01/16/86		14.0	26MS-1
26040	26045	WBS 243	PREP CONC DSN RPT DRFT	36.0	09/30/85	06/20/86	09/30/86		14.0	266310
26045	26050	WBS 243	CONT PREP CDR DRFT	20.2	09/30/86	03/02/87	03/02/87		0.0	266310
26045	26075	WBS 243	PREPARE TITLE I DSN CRITA	58.2	09/30/86	11/30/87	12/04/87		.8	266310
26050M	26050M	WBS 243	DRFT CDR AVAIL F/INT REVW	0.0	03/02/87	03/02/87	03/02/87		0.0	26MS-3
26050	26055	WBS 243	PREP CDR F/SUB DOE	21.4	03/02/87	07/31/87	07/31/87		0.0	26SNLA
26055M	26055M	WBS 243	SUBMIT CDR TO DOE/NVO	0.0	07/31/87	07/31/87	07/31/87		0.0	26MS-1

SANDIA NATIONAL LABORATORIES
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NETWORK NNWSI

EVENT PRED	EVENT SUCC	NETWORK OR INTERFACE	ACTIVITY DESCRIPTION	TIME EST	EXPECTED START	EXPECTED FINISH	LATEST ALLOWED	*ACT/SCHD DATE	SLACK	ORG/ AGEN
26055	26060	WBS 243	PREP REVISED CDR & PUBLSH	20.2	07/31/87	12/24/87	12/24/87		0.0	266310
26060	26069E	WBS 243	UNSCHEDULED END	0.0	12/24/87	12/24/87	12/24/87		0.0	26
26070M	26070M	WBS 243	EST BOARD/TITLE I AE	0.0	08/15/86	08/15/86	08/21/86		.8	26MS-2
26070	26080	WBS 243	PREP RFQ/EVAL SELECT AE	43.4	08/15/86	06/30/87	07/07/87		.8	266310
26075M	26075M	WBS 243	COMP TITLE I DSN CRITERIA	0.0	11/30/87	11/30/87	12/04/87		.8	26MS-1
26075	26085	WBS 243	INTERNAL RVW&APPROVAL	11.6	11/30/87	02/26/88	03/03/88		.8	266310
26080M	26080M	WBS 243	SELECT TITLE I AE	0.0	06/30/87	06/30/87	07/07/87		.8	26MS-1
26080	26085	WBS 243	PLACE CONTRACT WITH AE	32.6	06/30/87	02/26/88	03/03/88		.8	266310
26085M	26085M	WBS 243	BEGIN TITLE I DESIGN	0.0	02/26/88	02/26/88	03/03/88		.8	26MS-1
26085	26090	WBS 243	DEVELP TITLE I DESIGN	8.4	02/26/88	04/26/88	11/08/88		27.4	266310
26085	26120	WBS 243	DVLP TITLE I DSN/COMPONTS	55.0	02/26/88	04/03/89	04/07/89		.8	266310
26090	26100	WBS 243	DEVELP TITLE I DESIGN	20.0	09/06/88	02/03/89	04/07/89		9.0	266310
26100	26105	WBS 243	DEVELOP TITLE I DESIGN	28.2	04/03/89	10/20/89	10/26/89		.8	266310
26105	26110	WBS 243	DVLP TIT I DSN	8.0	10/26/89	01/02/90	01/02/90		0.0	266310
26110	26112	WBS 243	DEVELOP TITLE I DESIGN	4.4	01/02/90	02/01/90	02/01/90		0.0	266310
26112M	26112M	WBS 243	TITLE I DESIGN COMPLETE	0.0	02/01/90	02/01/90	02/01/90		0.0	26MS-1
26112	26170	WBS 243	RESTRAINT	0.0	02/01/90	02/01/90	02/01/90		0.0	26
26120	26125	WBS 243	CONTINUE TITLE I DESIGN	8.0	04/03/89	05/30/89	06/05/89		.8	266310
26125	26130	WBS 243	CONT TIT I DSN CEIL CMP	20.2	05/30/89	10/20/89	10/26/89		.8	266310
26130	26135	WBS 243	CONT TIT I DSN CEIL CMP	8.0	10/26/89	01/02/90	01/02/90		0.0	266310
26135	26110	WBS 243	RESTRAINT	0.0	01/02/90	01/02/90	01/02/90		0.0	26
26135M	26135M	WBS 243	TITLE I SEAL DSN COMPLETE	0.0	01/02/90	01/02/90	01/02/90		0.0	26MS-2
26135	26170	WBS 243	RESTRAINT	0.0	01/02/90	01/02/90	02/01/90		4.4	26
26140	26150	WBS 243	ORGANIZE INPUT/DRFT PSAR	50.2	03/31/88	04/03/89	04/07/89		.8	266312
26150	26155	WBS 243	CONTINUE INPUT/DRFT PSAR	8.0	04/03/89	05/30/89	06/05/89		.8	266312
26155	26165	WBS 243	CONT INPUT&BEGN PREP PSAR	20.2	05/30/89	10/20/89	10/26/89		.8	266312
26165	26170	WBS 243	CONT PREP PSAR	12.4	10/26/89	02/01/90	02/01/90		0.0	266311
26170	26175	WBS 243	COMPLETE PSAR DRAFT	25.4	02/01/90	08/01/90	08/01/90		0.0	266311
26175M	26175M	WBS 243	PSAR DRAFT COMPLETE	0.0	08/01/90	08/01/90	08/01/90		0.0	26MS-1
26175	26180	WBS 243	RESTRAINT	0.0	08/01/90	08/01/90	08/01/90		0.0	26
26180M	26180M	WBS 243	CAA SUBMITTED TO NRC	0.0	08/01/90	08/01/90	08/01/90		0.0	26MS-1
26180	26189E	WBS 243	UNSCHEDULED END	0.0	08/01/90	08/01/90	08/01/90		0.0	26
26185	26190	WBS 243	DEFINE PLAN F/POSIT PAPER	4.4	01/11/85	02/12/85	02/12/85		0.0	26PSU
26190	26195	WBS 243	REVIEW & APPROVE	4.0	02/12/85	03/12/85	03/12/85		0.0	266313
26195	26290	WBS 243	PREP POS PAPER/CONCR LINR	15.6	03/12/85	07/01/85	07/01/85		0.0	26PSU
26200	26205	WBS 124231	EVAL LITERATURE/FRE SURF					*07/16/84		26PNL
26200	26215	WBS 124231	EVAL NEAR SURF SOIL PROP					*07/16/84		26PNL
26200	26220	WBS 124231	RE-EVAL CURR FRACT DATA					*07/16/84		26PNL
26205	26435	WBS 243	RESTRAINT					*07/16/84		26
26205	28000	WBS 124231	PFRM ANALYSIS/FLOW THRU					*11/15/84		26ITC
26205	28005	WBS 124231	PER ANAL FLOW SHFT COLLAR					*11/01/84		26ITC
26205	28010	WBS 124231	PERF ANAL INFLW/SHFT INFW					*11/15/84		26ITC
26205	28015	WBS 124231	EVAL INFLWS F/FAULT ZONES					*12/04/84		26ITC
26205	28020	WBS 124231	PERF ANAL RATE LOW SHAFT					*10/15/84		26ITC

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26215	26205	WBS 243	RESTRAINT					*07/16/84		26
26220	26205	WBS 243	RESTRAINT					*07/16/84		26
26225	26200	WBS 243	RESTRAINT					*12/23/83		26
26225M	26225M	WBS 124231	DEFINE SEAL CONC/RPT COMP					*12/23/83		26MS-2
26225	26230	WBS 124231	CONDUCT PEER RVW & REVISE					*05/29/84		26SNLA
26225	26435	WBS 243	RESTRAINT					*12/23/83		26
26230	26235	WBS 124231	REVIEW REPORT					*06/26/84		26DOE
26235	26240	WBS 124231	CONDUCT LINE REVIEW					*08/08/84		266310
26240	26245	WBS 124231	MODIFY REPORT					*09/06/84		266313
26245	26250	WBS 124231	PUBLISH REPORT					*11/01/84		26SNLA
26250M	26250M	WBS 124231	FINAL SEAL CONC RPT COMP					*11/01/84		26MS-2
26250	26259E	WBS 124231	UNSCHEDULED END					*11/01/84		26
26255	26260	WBS 124231	DEFINE SEAL ISS/DRFT PLAN					*03/30/84		266313
26260	26200	WBS 243	RESTRAINT					*03/30/84		26
26260M	26260M	WBS 124231	DEFINE SEAL ISS/PLAN COMP					*03/30/84		26MS-2
26260	26265	WBS 124231	CONDUCT PEER RVW & REVISE					*10/15/84		266313
26265M	26265M	WBS 124231	DRFT PROG PLAN RPT COMP					*10/15/84		26MS-1
26265	26270	WBS 124231	REVIEW REPORT					*12/03/84		26DOE
26270	26275	WBS 124231	CONDUCT LINE REVIEW					*12/12/84		266310
26275	26280	WBS 124231	MODIFY REPORT	4.0	12/12/84	01/17/85	01/17/85		0.0	266313
26280	26289E	WBS 124231	PUBLISH REPORT	4.2	01/17/85	02/15/85	02/15/85		0.0	26SNLA
26290	26295	WBS 124231	PREP DRFT RPT RESOL ISSUS	21.0	07/01/85	11/27/85	11/27/85		0.0	266313
26290	26299E	WBS 243	SCHEDULED END	0.0	07/01/85	07/01/85	07/01/85	07/01/85	0.0	26
26295	26300	WBS 124231	CONDUCT PEER REVIEW	4.0	11/27/85	01/06/86	01/06/86		0.0	26SNLA
26300	26305	WBS 124231	MODIFY & ISSUE REPORT	16.0	01/06/86	04/28/86	04/28/86		0.0	266313
26305M	26305M	WBS 124231	UPDATE PLAN & STATUS RPT	0.0	04/28/86	04/28/86	04/28/86		0.0	26MS-2
26305	26310	WBS 124231	REVIEW REPORT	3.2	04/28/86	05/20/86	05/20/86		0.0	26DOE
26305	26330	WBS 124231	PREP PLAN/PERF ASSES ACTY	14.0	04/28/86	08/06/86	08/12/86		.8	266313
26310	26315	WBS 124231	CONDUCT LINE REVIEW	3.0	05/20/86	06/11/86	06/11/86		0.0	266310
26315	26320	WBS 124231	MODIFY REPORT	3.0	06/11/86	07/02/86	07/02/86		0.0	266313
26320	26325	WBS 124231	PUBLISH REPORT	5.0	07/02/86	08/07/86	08/07/86		0.0	26SNLA
26325M	26325M	WBS 243	PROGRAM PLAN UPDATE COMP	0.0	08/07/86	08/07/86	08/07/86		0.0	26MS-1
26325	26329E	WBS 243	UNSCHEDUED END	0.0	08/07/86	08/07/86	08/07/86		0.0	26
26330	26335	WBS 124231	REVIEW & APPROVE PLAN	4.0	08/06/86	09/04/86	09/10/86		.8	266310
26335	26340	WBS 124231	GAIN FAMLR W/COMPTR CODE	12.0	09/04/86	12/01/86	12/05/86		.8	26TBD
26335	26345	WBS 243	RESTRAINT	0.0	09/04/86	09/04/86	09/10/86		.8	26
26335	26355	WBS 124231	SURVEY CURR HYDROGLG INFO	12.0	09/04/86	12/01/86	12/05/86		.8	266313
26340	26355	WBS 243	RESTRAINT	0.0	12/01/86	12/01/86	12/05/86		.8	26
26345	26350	WBS 124231	PREP CONC MODL/SEAL SUSYS	12.0	09/04/86	12/01/86	12/05/86		.8	266313
26350	26355	WBS 243	RESTRAINT	0.0	12/01/86	12/01/86	12/05/86		.8	26
26355	26365	WBS 124231	CALC EFFECT SEAL SUBSYS	22.0	12/01/86	05/12/87	05/18/87		.8	266313
26360	26365	WBS 124231	COMP SEAL SUBSYS FAIL AYS	16.0	12/16/86	04/15/87	05/18/87		4.6	266313
26365	26370	WBS 124231	DVLP SCENARIOS F/TRANSPRT	12.0	05/12/87	08/06/87	08/12/87		.8	266313
26370	26375	WBS 124231	DVLP DEGRAD SEAL SUB MODL	12.0	08/06/87	10/30/87	11/05/87		.8	266313

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26375	26380	WBS 124231	CALC EFFECT DEGRDED MODEL	9.2	10/30/87	01/14/88	01/20/88		.8	266313
26380	26385	WBS 124231	CALC EFFECT DEGRAD MODEL	14.8	01/14/88	04/27/88	05/03/88		.8	266313
26385	26390	WBS 124231	PREP RPT SEAL SYS PERFORM	7.0	04/27/88	06/16/88	06/22/88		.8	266313
26390	26395	WBS 124231	COMP RPT SEAL SYS PRF RPT	6.2	06/16/88	08/01/88	08/05/88		.8	266313
26395	26400	WBS 124231	REVIEW REPORT	6.0	08/01/88	09/13/88	09/19/88		.8	266310
26400	26405	WBS 124231	INCORP COMMENTS/RVSE RPT	6.0	09/13/88	10/25/88	10/31/88		.8	266313
26405	26410	WBS 124231	FINAL REVIEW & APPROVAL	2.2	10/25/88	11/09/88	11/15/88		.8	266310
26410	26415	WBS 124231	REVIEW BY DOE/NVO	4.0	11/09/88	12/09/88	12/15/88		.8	26DOE
26415	26420	WBS 124231	INCORP DOE REVIEW COMMNTS	7.0	12/09/88	02/06/89	02/10/89		.8	266313
26420	26425	WBS 124231	FINAL REVIEW,APPRVL&PUBLH	8.0	02/06/89	04/03/89	04/07/89		.8	26SNLA
26425	26010	WBS 243	RESTRAINT	0.0	04/03/89	04/03/89	05/11/89		5.6	26
26425	26100	WBS 243	RESTRAINT	0.0	04/03/89	04/03/89	04/07/89		.8	26
26425	26120	WBS 243	RESTRAINT	0.0	04/03/89	04/03/89	04/07/89		.8	26
26425	26150	WBS 243	RESTRAINT	0.0	04/03/89	04/03/89	04/07/89		.8	26
26425M	26425M	WBS 243	RPT SEAL SUBSYS PFM COMP	0.0	04/03/89	04/03/89	04/07/89		.8	26MS-2
26430	26435	WBS 124233	PRE&NEGOT CONC DSN/SEAL					*07/23/84		266313
26435M	26435M	WBS 124233	CONT PLACED/CONC DSN SEAL					*07/23/84		26MS-4
26435	26440	WBS 124233	PREP PREL DRFT RPT/DSN RQ	27.2	07/23/84	02/11/85	02/11/85		0.0	26SNLA
26440	26445	WBS 124233	CONDUCT INTERNAL REVIEW	8.0	02/11/85	04/08/85	04/08/85		0.0	26SNLA
26445M	26445M	WBS 124233	PREL DRFT DSN/MR COMPLETE	0.0	04/08/85	04/08/85	04/08/85		0.0	26MS-3
26445	26450	WBS 124233	PREP FINAL DRAFT REPORT	16.2	04/08/85	08/01/85	08/01/85		0.0	26SNLA
26445	26485	WBS 243	RESTRAINT	0.0	04/08/85	04/08/85	11/14/85		31.0	26
26450	26455	WBS 243	PREP DRFT SEAL CDR	41.0	08/01/85	05/29/86	05/29/86		0.0	26ITC
26450	26470	WBS 243	COMP FINAL DRFT RPT	16.6	08/01/85	11/27/85	11/27/85		0.0	26SNLA
26455M	26455M	WBS 124233	DRAFT SEALING CDR COMPLT	0.0	05/29/86	05/29/86	05/29/86		0.0	26MS-3
26455	26460	WBS 124233	MODIFY DRFT SEAL/CDR DOE	17.2	05/29/86	09/30/86	09/30/86		0.0	26SNLA
26460	26045	WBS 243	RESTRAINT	0.0	09/30/86	09/30/86	09/30/86		0.0	26
26460M	26460M	WBS 243	PREL RPT SEAL SUB COMP	0.0	09/30/86	09/30/86	09/30/86		0.0	26MS-2
26460	26465	WBS 243	MODIFY REPORT	24.4	09/30/86	03/31/87	03/31/87		0.0	26SNLA
26465M	26465M	WBS 124233	SEALING CDR SENT DOE/NVO	0.0	03/31/87	03/31/87	03/31/87		0.0	26MS-2
26465	26469E	WBS 124233	PREP REVISE PUB CDR	20.0	03/31/87	08/20/87	08/20/87		0.0	266310
26470	26295	WBS 243	RESTRAINT	0.0	11/27/85	11/27/85	11/27/85		0.0	26
26470M	26470M	WBS 243	PREP DSN REQ & MATL RPT	0.0	11/27/85	11/27/85	11/27/85		0.0	26MS-2
26475	26480	WBS 124233	MOD CURR INPUT/ES TST	6.6	01/15/85	03/01/85	03/01/85		0.0	266313
26475	26865	WBS 124233	PREP FNL INPUT/ES PLAN	13.8	01/15/85	04/22/85	04/22/85		0.0	266313
26480M	26480M	WBS 124233	PREL INPUT TST COMPLETE	0.0	03/01/85	03/01/85	03/01/85		0.0	26MS-4
26480	26485	WBS 124233	PREP FLD TST PLAN	36.2	03/01/85	11/14/85	11/14/85		0.0	266313
26485M	26485M	WBS 124233	DRFT FLD TST PLANS COMP	0.0	11/14/85	11/14/85	11/14/85		0.0	26MS-3
26485	26490	WBS 124233	SEND FLD TST PLANS F/REVW	2.0	11/14/85	12/02/85	10/06/86		42.2	266313
26485	26520	WBS 243	LEAD TIME	8.4	11/14/85	01/23/86	11/17/86		41.8	26
26485	26530	WBS 243	LEAD TIME	4.4	11/14/85	12/18/85	12/18/85		0.0	26
26485	26815	WBS 243	LEAD TIME	70.0	11/14/85	04/15/87	04/15/87		0.0	26
26485	26870	WBS 124233	REVW RVSE PUBL FLD TST(S)	13.0	11/14/85	02/25/86	02/25/86		0.0	266313
26485	26880	WBS 243	LEAD TIME	16.2	11/14/85	03/19/86	03/20/87		50.2	26

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26490	26495	WBS 124233	PRETEST VERF MTG/MAN RESO	1.0	12/02/85	12/09/85	10/13/86		42.2	266313
26495	26500	WBS 124233	PREP PR'S F/DATA & MONIT	1.0	12/09/85	12/16/85	12/17/86		50.2	26SNLA
26495	26515	WBS 124233	PREP CONT FLD TST SUPPORT	5.0	12/09/85	01/21/86	11/17/86		42.2	266313
26500	26505	WBS 124233	PROC DATA REQ SNSRS&MONT	16.0	12/16/85	04/15/86	04/16/87		50.2	26SNLA
26505	26510	WBS 124233	DELIVER&ASSEM TST HDWARE	4.0	04/15/86	05/13/86	05/14/87		50.2	26TBD
26510	26555	WBS 124233	DTRM PERM/DISC FRACT-ZONS	8.0	05/13/86	07/10/86	07/13/87		50.2	26TBD
26515	26525	WBS 124233	SELECT CONTS SPT FLD TST	16.0	01/21/86	05/13/86	03/19/87		42.2	266313
26520	26525	WBS 124233	PROC COMP CODE OR DVLP MD	16.0	01/23/86	05/15/86	03/19/87		41.8	266313
26525	26555	WBS 124233	EXER CODE TO GAIN EXPERCE	16.0	05/15/86	09/09/86	07/13/87		41.8	26TBD
26530	26540	WBS 124233	SELECT TST LOC IN G-TUNEL	2.0	12/18/85	01/09/86	01/09/86		0.0	266313
26535	26540	WBS 124233	PREP LTRS CRIT/G-TUN TSTS	3.0	08/22/85	09/13/85	01/09/86		15.2	266313
26540	26545	WBS 124233	MAP DRIFT	4.0	01/09/86	02/06/86	02/06/86		0.0	26F&S
26545	26550	WBS 124233	DRILL MONITORING BOREHOLE	2.0	02/06/86	02/20/86	02/20/86		0.0	26REEC
26550	26555	WBS 124233	MAP FRACTURE PATT/BORHOLE	6.0	02/20/86	04/03/86	07/13/87		63.8	26TBD
26550	26559E	WBS 124233	CONT TO DRILL MONIT BORHL	4.0	02/20/86	03/20/86	03/20/86		0.0	26REEC
26555	26560	WBS 124233	CONDUCT PRETST PRED CALCS	8.0	09/09/86	11/04/86	09/08/87		41.8	26TBD
26560	26565	WBS 124233	SELECT LOC/MON EQ & INSTL	6.0	11/04/86	12/18/86	10/20/87		41.8	266313
26565	26570	WBS 124233	COND VERIF TSTG IN G-TUNL	12.0	12/18/86	03/20/87	01/22/88		41.8	266313
26570	26575	WBS 124233	EVAL TST RSLTS W/PERFORM	6.0	03/20/87	05/01/87	03/04/88		41.8	266313
26575	26580	WBS 124233	PREP RPT G-TUNN VERIF TST	15.2	05/01/87	08/19/87	08/02/88		47.6	266313
26575	26675	WBS 243	RESTRAINT	0.0	05/01/87	05/01/87	03/04/88		41.8	26
26580M	26580M	WBS 124233	PREL DRFT G-TUNN TST COMP	0.0	08/19/87	08/19/87	08/02/88		47.6	26MS-3
26580	26585	WBS 124233	REVIEW & COMMENT	4.0	08/19/87	09/17/87	08/30/88		47.6	266310
26585	26590	WBS 124233	REVISE & INCORP COMMENTS	6.2	09/17/87	10/30/87	10/13/88		47.6	266313
26590	26595	WBS 124233	FINAL APPROVAL	6.8	10/30/87	12/21/87	12/02/88		47.6	266310
26595M	26595M	WBS 124233	G-TUNN DRAIN TST RPT COMP	0.0	12/21/87	12/21/87	12/02/88		47.6	26MS-3
26595	26695	WBS 243	RESTRAINT	0.0	12/21/87	12/21/87	12/02/88		47.6	26
26600	26605	WBS 124231	DEF SEAL CRIT/TITLE I DSN	9.0	10/29/86	01/12/87	04/27/87		15.0	266313
26605	26610	WBS 124231	DEF SEAL CRIT/TITLE I DSN	16.2	01/12/87	05/05/87	08/20/87		15.0	266313
26610	26615	WBS 124231	DEF SEAL CRIT/TITLE I DSN	8.0	05/05/87	07/01/87	10/16/87		15.0	266313
26615	26375	WBS 124231	RESTRAINT	0.0	08/13/87	08/13/87	11/05/87		11.8	26
26615	26620	WBS 124231	CONT TO DEFINE SEAL CRIT	6.6	08/13/87	09/30/87	12/04/87		9.0	266313
26620	26075	WBS 243	RESTRAINT	0.0	09/30/87	09/30/87	12/04/87		9.0	26
26620M	26620M	WBS 124231	TITLE I SEAL CRIT COMPETE	0.0	09/30/87	09/30/87	12/04/87		9.0	26MS-2
26625	26630	WBS 124233	DRILL EXPLORATORY SHAFT	15.6	05/16/86	09/08/86	09/08/86		0.0	26TBD
26630	26635	WBS 124233	DRILL EXPLORATORY SHAFT	4.0	09/08/86	10/06/86	10/06/86		0.0	26REEC
26630	26940	WBS 243	RESTRAINT	0.0	09/08/86	09/08/86	12/10/86		13.0	26
26635	26640	WBS 124233	DRILL EXPLORATORY SHAFT	13.0	10/06/86	01/15/87	01/15/87		0.0	26REEC
26635	27445	WBS 243	RESTRAINT	0.0	10/06/86	10/06/86	10/06/86		0.0	26
26640	26645	WBS 124233	COMP DRILL OF EXPLOR SHFT	19.6	01/15/87	06/03/87	06/22/87		2.6	26REEC
26640	26945	WBS 243	RESTRAINT	0.0	01/15/87	01/15/87	01/15/87		0.0	26
26640	27500	WBS 124233	RESTRAINT	0.0	01/15/87	01/15/87	01/15/87		0.0	26
26645	26649E	WBS 243	SCHEDULED END	0.0	06/03/87	06/03/87	07/10/87	07/10/87	5.2	26
26645	26655	WBS 243	MINE DRIFTS	15.8	06/03/87	09/24/87	10/13/87		2.6	26CONT

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26650	26655	WBS 124233	PREP LTRS CRIT/EXPL BRHLS	4.0	09/15/87	10/13/87	10/13/87		0.0	266313
26655	26665	WBS 124233	DRILL EXPL BRHOL/SEL DRFT	8.0	10/13/87	12/10/87	01/08/88		3.0	26REEC
26655	26890	WBS 124233	RESTRAINT	0.0	10/13/87	10/13/87	10/13/87		0.0	26
26660	26665	WBS 124233	PREP LTRS ACTIV F/FLD TST	6.0	11/17/87	01/08/88	01/08/88		0.0	266313
26665	26670	WBS 124233	MINE DRIFT	4.0	01/08/88	02/05/88	02/05/88		0.0	26REEC
26670	26675	WBS 124233	MAP DRIFT IN EXPLOR SHAFT	4.0	02/05/88	03/04/88	03/04/88		0.0	26F&S
26675	26680	WBS 124233	INIT PRETST PRED WTR FLOW	16.0	03/04/88	06/27/88	06/27/88		0.0	26TBD
26675	26715	WBS 124233	SELECT BRHLE&TST SECT LOC	4.0	03/04/88	04/01/88	04/01/88		0.0	266313
26680	26685	WBS 124233	CONTINUE PRETEST CALCULTS	8.0	06/27/88	08/23/88	08/23/88		0.0	26TBD
26685	26690	WBS 124233	PRFM HYDRO CALCS/FR DRAIN	8.6	08/23/88	10/24/88	12/02/88		5.4	26TBD
26685	26745	WBS 124233	ESTAB FINAL LOC/EQP&BRHOL	2.0	08/23/88	09/07/88	09/07/88		0.0	266313
26690	26695	WBS 243	RESTRAINT	0.0	10/24/88	10/24/88	12/02/88		5.4	26
26690	26765	WBS 124233	PREPARE LETTER OF CRITERA	4.0	10/24/88	11/21/88	02/20/89		11.4	266313
26695	26700	WBS 124233	INIT PREP DRFT RPT FAULT	10.0	12/02/88	02/20/89	02/20/89		0.0	266313
26700	26705	WBS 124233	CONTINUE DRFT RPT PREPATN	8.0	02/20/89	04/17/89	04/17/89		0.0	266313
26705	26710	WBS 124233	CONTINUE DRFT RPT PREPATN	12.0	04/17/89	07/12/89	07/12/89		0.0	266313
26710	26790	WBS 124233	CONT DRFT RPT PREPARATION	4.0	07/12/89	08/09/89	08/09/89		0.0	266313
26715	26720	WBS 124233	DRILL MONITORING BOREHLS	2.0	04/01/88	04/15/88	04/15/88		0.0	26REEC
26720	26725	WBS 124233	DETMN PERM/FRACT OR ZONES	10.0	04/15/88	06/27/88	06/27/88		0.0	266313
26720	26730	WBS 124233	MAP FRACTURE PATTN/BRHOLS	8.0	04/15/88	06/13/88	06/27/88		2.0	26TBD
26720	26735	WBS 124233	VERIFY FINAL EFCT MONSYS	6.0	04/15/88	05/27/88	09/07/88		14.0	266313
26720	26740	WBS 124233	CONTINUE TO DRILL BOREHOL	6.0	04/15/88	05/27/88	09/07/88		14.0	26REEC
26725	26680	WBS 243	RESTRAINT	0.0	06/27/88	06/27/88	06/27/88		0.0	26
26730	26695	WBS 124233	PREP DRFT RPT/FRACT PATTN	4.0	06/13/88	07/12/88	12/02/88		20.0	266313
26730	26725	WBS 243	RESTRAINT	0.0	06/13/88	06/13/88	06/27/88		2.0	26
26735	26740	WBS 243	RESTRAINT	0.0	05/27/88	05/27/88	09/07/88		14.0	26
26740	26745	WBS 243	RESTRAINT	0.0	05/27/88	05/27/88	09/07/88		14.0	26
26745	26750	WBS 124233	INSTALL MONITORING EQPT	8.0	09/07/88	11/02/88	11/02/88		0.0	26SNLA
26750	26755	WBS 124233	CONDUCT FLOW EXPERIMENT	4.0	11/02/88	12/02/88	12/02/88		0.0	266313
26755	26695	WBS 243	RESTRAINT	0.0	12/02/88	12/02/88	12/02/88		0.0	26
26755	26760	WBS 124233	DRILL&GROUT HOLES INZONE	6.0	12/02/88	01/23/89	01/23/89		0.0	26REEC
26760	26765	WBS 124233	CONDUCT FLOW EXPERIMENTS	4.0	01/23/89	02/20/89	02/20/89		0.0	266313
26765	26700	WBS 243	RESTRAINT	0.0	02/20/89	02/20/89	02/20/89		0.0	26
26765	26770	WBS 124233	CONSTRUCT FR DRAINS/SPOT	4.0	02/20/89	03/20/89	03/20/89		0.0	26REEC
26770	26775	WBS 124233	CONDUCT FLOW EXPERIMENT	4.0	03/20/89	04/17/89	04/17/89		0.0	266313
26775	26705	WBS 243	RESTRAINT	0.0	04/17/89	04/17/89	04/17/89		0.0	26
26775	26780	WBS 124233	OBTAIN CORE FROM GROUT ZN	4.0	04/17/89	05/15/89	05/15/89		0.0	26REEC
26775	26785	WBS 124233	PRFORM POST-TEST EVALUTON	12.0	04/17/89	07/12/89	07/12/89		0.0	266313
26780	26785	WBS 124233	CHARACTERIZE GROUTED ZONE	8.0	05/15/89	07/12/89	07/12/89		0.0	26MGRC
26785	26710	WBS 243	RESTRAINT	0.0	07/12/89	07/12/89	07/12/89		0.0	26
26785	26790	WBS 124233	COMPLETE POST-TST EVALUAT	4.0	07/12/89	08/09/89	08/09/89		0.0	266313
26790	26795	WBS 124233	COMPLETE DRAFT REPORT	11.0	08/09/89	10/26/89	10/26/89		0.0	266313
26795	26105	WBS 243	RESTRAINT	0.0	10/26/89	10/26/89	10/26/89		0.0	26
26795	26130	WBS 243	RESTRAINT	0.0	10/26/89	10/26/89	10/26/89		0.0	26

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26795	26165	WBS 243	RESTRAINT	0.0	10/26/89	10/26/89	10/26/89		0.0	26
26795	26800	WBS 124233	RVW&COMNT FULT SEAL TST	3.4	10/26/89	11/20/89	11/20/89		0.0	266310
26800	26805	WBS 124233	REVISE&INCORPORATE COMNTS	6.2	11/20/89	01/12/90	01/12/90		0.0	266313
26805	26810	WBS 124233	FINAL APPROVAL	4.0	01/12/90	02/09/90	02/09/90		0.0	266310
26810M	26810M	WBS 124233	FLT SEAL DRN TST RPT COMP	0.0	02/09/90	02/09/90	02/09/90		0.0	26MS-3
26810	26819E	WBS 243	UNSCHEDULED END	0.0	02/09/90	02/09/90	02/09/90		0.0	26
26815	26820	WBS 124233	ESTAB ADDL RQMNTS TST PLN	17.2	04/15/87	08/17/87	08/17/87		0.0	266313
26820	26825	WBS 124233	PROC&FAB PARTS TST EQPT	20.4	08/17/87	01/19/88	01/19/88		0.0	26MMRC
26820	26830	WBS 124233	PROC MATLS FLT SEAL&BRHOL	28.3	08/17/87	03/17/88	03/17/88		0.0	26MMRC
26825	26830	WBS 124233	FIELD TEST EQUIPMENT	8.4	01/19/88	03/17/88	03/17/88		0.0	26MMRC
26830	26835	WBS 124233	CONDUCT FLD TST/EMPL SEAL	8.4	03/17/88	05/16/88	05/16/88		0.0	266313
26835	26840	WBS 124233	CONDUCT FLD TST/SEAL TST	17.2	05/16/88	09/16/88	09/16/88		0.0	266313
26840	26845	WBS 124233	PREP DRFT RPT/FLT SEAL	11.6	09/16/88	12/09/88	12/09/88		0.0	266313
26845	26010	WBS 243	RESTRAINT	0.0	12/09/88	12/09/88	05/11/89		20.6	26
26845	26125	WBS 243	RESTRAINT	0.0	12/09/88	12/09/88	06/05/89		23.8	26
26845	26155	WBS 243	RESTRAINT	0.0	12/09/88	12/09/88	06/05/89		23.8	26
26845	26850	WBS 124233	REVIEW & COMMENT	4.6	12/09/88	01/19/89	01/19/89		0.0	266310
26850	26855	WBS 124233	REVISE&INCORPORATE COMNTS	4.0	01/19/89	02/16/89	02/16/89		0.0	266313
26855	26860	WBS 124233	FINAL APPROVAL	6.0	02/16/89	03/30/89	03/30/89		0.0	266310
26860M	26860M	WBS 124233	FAULT SEAL TEST RPT COMP	0.0	03/30/89	03/30/89	03/30/89		0.0	26MS-3
26860	26869E	WBS 124233	UNSCHEDULED END	0.0	03/30/89	03/30/89	03/30/89		0.0	26
26865M	26865M	WBS 124233	FINAL INPUT/ES TEST COMP	0.0	04/22/85	04/22/85	04/22/85		0.0	26MS-4
26865	26889E	WBS 124233	UNSCHEDULED END	0.0	04/22/85	04/22/85	04/22/85		0.0	26
26870M	26870M	WBS 124233	SEAL FLD TST RQMTS COMP	0.0	02/25/86	02/25/86	02/25/86		0.0	26MS-2
26870	26879E	WBS 124233	UNSCHEDULED END	0.0	02/25/86	02/25/86	02/25/86		0.0	26
26880	26885	WBS 124233	UPDATE FIELD TEST PLANS	16.0	03/19/86	07/11/86	07/14/87		50.2	266313
26885	26890	WBS 124233	PROC EQPT&MATLS BASE SHFT	12.8	07/11/86	10/10/86	10/13/87		50.2	26SNLA
26890	26895	WBS 124233	SET SEALS&CURE 4 LOCATNS	8.6	10/13/87	12/15/87	12/15/87		0.0	26SNLA
26895	26900	WBS 124233	OVERCORE SEAL	4.2	12/15/87	01/21/88	01/21/88		0.0	26REEC
26900	26905	WBS 124233	CHARACTERIZE CORE	8.4	01/21/88	03/21/88	03/21/88		0.0	26MGRC
26905	26910	WBS 124233	FIELD CURE TIME	37.8	03/21/88	12/16/88	12/16/88		0.0	26MGRC
26910	26915	WBS 124233	OVERCORE SEAL	4.2	12/16/88	01/24/89	01/24/89		0.0	26REEC
26915	26920	WBS 124233	CHARACTERIZE CORE	8.4	01/24/89	03/23/89	03/23/89		0.0	26MGRC
26920	26925	WBS 124233	FIELD CURE TIME	37.6	03/23/89	12/19/89	12/19/89		0.0	26MGRC
26925	26930	WBS 124233	OVERCORE SEAL	4.0	12/19/89	01/24/90	01/24/90		0.0	26REEC
26930	26939E	WBS 124233	CHARACTERIZE SEAL	8.6	01/24/90	03/26/90	03/26/90		0.0	26MGRC
26940	26945	WBS 124232	PROC MATL FROM EXPL SHAFT	4.0	09/08/86	10/06/86	01/15/87		13.0	26MMRC
26945	26950	WBS 124232	PROCURE ADDTL MINED SAMP	8.6	01/15/87	03/17/87	03/17/87		0.0	26MMRC
26945	26955	WBS 124232	CONDUCT CONS TSTNG/SHFT	8.6	01/15/87	03/17/87	03/17/87		0.0	26MMRC
26950	26955	WBS 243	RESTRAINT	0.0	03/17/87	03/17/87	03/17/87		0.0	26
26950	26960	WBS 124232	PROC ADDTL MINED SAMPLES	10.6	03/17/87	06/01/87	06/01/87		0.0	26MMRC
26955	26960	WBS 124232	CONTINUE CONSOLID TESTING	10.6	03/17/87	06/01/87	06/01/87		0.0	26MMRC
26960	26965	WBS 124232	CONTINUE CONSOLIDTN TSTNG	6.4	06/01/87	07/16/87	07/16/87		0.0	26MMRC
26965	26970	WBS 124232	EVAL TSTNG RSLTS/EST CRIT	4.0	07/16/87	08/13/87	10/16/87		9.0	266313

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26965	26975	WBS 124232	PREP RPT CONS SHFT FILL	12.0	07/16/87	10/09/87	10/09/87		0.0	26MMRC
26970	26615	WBS 243	RESTRAINT	0.0	08/13/87	08/13/87	10/16/87		9.0	26
26975	26980	WBS 124232	REVIEW REPORT	4.2	10/09/87	11/09/87	11/09/87		0.0	266313
26980	26985	WBS 124232	REVISE&INCORPORATE COMNTS	4.0	11/09/87	12/09/87	12/09/87		0.0	266313
26985	26990	WBS 124232	REVIEW & APPROVAL	4.4	12/09/87	01/18/88	01/18/88		0.0	266310
26990M	26990M	WBS 124232	CONSOLID BEHAVR RPT COMP	0.0	01/18/88	01/18/88	01/18/88		0.0	26MS-3
26990	26999E	WBS 124232	UNSCHEDULED END	0.0	01/18/88	01/18/88	01/18/88		0.0	26
27000	27005	WBS 124232	CONT MEAS SEALS/PREP RPT	8.6	03/01/85	05/01/85	05/01/85		0.0	26WES
27005M	27005M	WBS 124232	DRAFT WEAP SEAL STDY COMP	0.0	05/01/85	05/01/85	05/01/85		0.0	26MS-3
27005	27010	WBS 124232	PERFORM PEER REVIEW	4.0	05/01/85	05/30/85	05/30/85		0.0	26SNLA
27010	27015	WBS 124232	INCORPORATE COMMENTS	4.0	05/30/85	06/27/85	06/27/85		0.0	266313
27015	27020	WBS 124232	REVIEW REPORT	4.0	06/27/85	07/26/85	07/26/85		0.0	26SNLA
27020	27025	WBS 124232	PERFORM LINE REVIEW	1.0	07/26/85	08/02/85	08/02/85		0.0	26SNLA
27025	27030	WBS 124232	INCORPORATE COMMENTS	1.6	08/02/85	08/14/85	08/14/85		0.0	266313
27030	27035	WBS 124232	PUBLISH REPORT	4.0	08/14/85	09/12/85	09/12/85		0.0	26SNLA
27035M	27035M	WBS 124232	INTERFACE STUDY COMPLETE	0.0	09/12/85	09/12/85	09/12/85		0.0	26MS-3
27035	27039E	WBS 124232	UNSCHEDULED END	0.0	09/12/85	09/12/85	09/12/85		0.0	26
27040	27045	WBS 124232	REVIEW REPORT					*12/05/84		266313
27040	27305	WBS 243	RESTRAINT					*10/05/84		26
27045	27050	WBS 124232	REVISE REPORT	4.4	12/05/84	01/14/85	01/14/85		0.0	26PSU
27050	27055	WBS 124232	REVIEW & MODIFY RPT	6.0	01/14/85	02/25/85	02/25/85		0.0	26SNLA
27055	27060	WBS 124232	PERFORM LINE REVIEW	6.0	02/25/85	04/08/85	04/08/85		0.0	266300
27060	27065	WBS 124232	MODIFY RPT	3.0	04/08/85	04/29/85	04/29/85		0.0	26PSU
27065	27066	WBS 124232	REVIEW REPORT	4.0	04/29/85	05/28/85	05/28/85		0.0	26DOE
27066	27070	WBS 124232	RESUBMIT LINE RVW/MOD	5.2	05/28/85	07/03/85	07/03/85		0.0	266313
27070	27075	WBS 124232	PUBLISH REPORT	6.0	07/03/85	08/15/85	08/15/85		0.0	26SNLA
27075M	27075M	WBS 124232	MECHANICAL PROP RPT COMP	0.0	08/15/85	08/15/85	08/15/85		0.0	26MS-3
27075	27079E	WBS 124232	UNSCHEDULED END	0.0	08/15/85	08/15/85	08/15/85		0.0	26
27080	27085	WBS 124232	PREP PLAN/RESIST PIPE TST	4.0	01/09/86	02/06/86	02/06/86		0.0	26MMRC
27085	27090	WBS 124232	REVIEW & APPROVE PLAN	4.0	02/06/86	03/06/86	03/06/86		0.0	266313
27090	27095	WBS 243	RESTRAINT	0.0	03/06/86	03/06/86	03/20/86		2.0	26
27090	27100	WBS 124232	DETERM RESTRAINT VALUES	5.0	03/06/86	04/10/86	04/10/86		0.0	26MMRC
27095	27100	WBS 124232	TST & DETRMN HEAT HYDRATN	3.0	03/06/86	03/27/86	04/10/86		2.0	26MMRC
27100	27160	WBS 124232	PRFM CALC DETMN TEMP/PLUG	3.0	04/10/86	05/01/86	05/01/86		0.0	26MMRC
27105	27110	WBS 124232	PREP PLAN F/FRZ-THW TESTS	4.0	07/15/85	08/12/85	08/16/85		.8	26MMRC
27110	27115	WBS 124232	REVIEW & APPROVE PLAN	4.0	08/12/85	09/10/85	09/16/85		.8	266313
27115	27120	WBS 124232	OBTAIN ALLUV&MATLS F/TSTG	8.0	09/10/85	11/05/85	11/11/85		.8	26MMRC
27115	27125	WBS 124232	LIT SEARCH/ENVIRN CONDTN	1.0	09/10/85	09/17/85	10/21/85		4.8	26MMRC
27120	27130	WBS 243	RESTRAINT	0.0	11/05/85	11/05/85	11/11/85		.8	26
27120	27135	WBS 124232	CHAR CONSTIT USED/CONCRE	4.0	11/05/85	12/05/85	12/11/85		.8	26MMRC
27125	27130	WBS 124232	PROCURE MATERIAL & REVIEW	3.0	09/17/85	10/08/85	11/11/85		4.8	26MMRC
27130	27135	WBS 124232	PRFM SOIL/SURF WTR ANALYS	4.0	11/05/85	12/05/85	12/11/85		.8	26MMRC
27135	27140	WBS 124232	PREPARE SAMPLES F/TESTING	1.0	12/05/85	12/12/85	12/18/85		.8	26MMRC
27140	27145	WBS 124232	CURE SAMPLES FOR 28 DAYS	4.0	12/12/85	01/17/86	01/23/86		.8	26MMRC

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27145	27150	WBS 124232	CONDUCT MORTAR BAR TESTS	50.0	01/17/86	01/19/87	01/23/87		.8	26MMRC
27145	27155	WBS 124232	CONDUCT FRZE THAW TST 666	12.0	01/17/86	04/11/86	01/23/87		38.8	26MMRC
27145	27175	WBS 124232	CONDUCT FRZE THAW TST 671	50.0	01/17/86	01/19/87	01/23/87		.8	26MMRC
27150	27175	WBS 243	RESTRAINT	0.0	01/19/87	01/19/87	01/23/87		.8	26
27155	27175	WBS 243	RESTRAINT	0.0	04/11/86	04/11/86	01/23/87		38.8	26
27160	27165	WBS 124232	PRFM EXPAN BAR&PIPE TESTS	16.0	05/01/86	08/25/86	08/25/86		0.0	26MMRC
27165	27170	WBS 124232	CORRELATE DATA/MAKE PREDN	2.0	08/25/86	09/09/86	11/04/86		8.0	26MMRC
27165	27175	WBS 124232	CONTINUE TESTING	20.0	08/25/86	01/23/87	01/23/87		0.0	26MMRC
27170	27175	WBS 124232	RUN FE ANALY/STRESS CONDT	10.0	09/09/86	11/18/86	01/23/87		8.0	26MMRC
27175	27180	WBS 124232	EVALUATE TEST RESULTS	6.0	01/23/87	03/06/87	03/06/87		0.0	26MMRC
27180	27185	WBS 124232	PREPARE DRAFT REPORTS	12.0	03/06/87	06/01/87	06/01/87		0.0	26MMRC
27185	27190	WBS 124232	INTERNAL SNLA REVIEW	17.0	06/01/87	09/30/87	09/30/87		0.0	266310
27190	27195	WBS 124232	DOE REVIEW	4.0	09/30/87	10/28/87	10/28/87		0.0	26DOE
27195	27200	WBS 124232	FINAL REVIEW & APPROVAL	2.0	10/28/87	11/11/87	11/11/87		0.0	266310
27200	*27205	WBS 124232	PRINT REPORTS	6.0	11/11/87	01/04/88	01/04/88		0.0	26SNLA
27205	26380	WBS 243	RESTRAINT	0.0	01/04/88	01/04/88	01/20/88		2.4	26
27205M	27205M	WBS 124232	RPTS SUSCEPT/RST TST COMP	0.0	01/04/88	01/04/88	01/04/88		0.0	26MS-3
27205	27415	WBS 243	RESTRAINT	7.8	01/04/88	02/26/88	02/26/88		0.0	26
27210	27215	WBS 124232	RVW CON-14 RPT	15.8	09/14/84	01/15/85	01/15/85		0.0	26LANL
27215	27220	WBS 124232	REVISE REPORT	4.6	01/15/85	02/15/85	02/15/85		0.0	26PSU
27220	27225	WBS 124232	REVIEW REPORT	4.0	02/15/85	03/15/85	03/15/85		0.0	26DOE
27225	27230	WBS 124232	PRFM FNL REVISION CON-14	4.2	03/15/85	04/15/85	04/15/85		0.0	26PSU
27230	27235	WBS 124232	PUBLISH REPORT	4.4	04/15/85	05/15/85	05/15/85		0.0	26LANL
27235M	27235M	WBS 124232	CON-14 RPT PUBLISHED	0.0	05/15/85	05/15/85	05/15/85		0.0	26MS-3
27235	27239E	WBS 124232	UNSCHEDULED END	0.0	05/15/85	05/15/85	05/15/85		0.0	26
27240	27245	WBS 124232	REVIEW REPORT	5.8	01/14/85	02/22/85	02/22/85		0.0	26LANL
27245	27250	WBS 124232	REVISE REPORT	4.0	02/22/85	03/22/85	03/22/85		0.0	26PSU
27250	27255	WBS 124232	REVIEW REPORT	4.2	03/22/85	04/22/85	04/22/85		0.0	26DOE
27255	27260	WBS 124232	PERFORM FINAL REVISION	4.4	04/22/85	05/22/85	05/22/85		0.0	26PSU
27260	27265	WBS 124232	PUBLISH RPT	8.2	05/22/85	07/22/85	07/22/85		0.0	26LANL
27265M	27265M	WBS 124232	MORTAR/GROUT RPT PUBLHD	0.0	07/22/85	07/22/85	07/22/85		0.0	26MS-3
27265	27269E	WBS 124232	UNSHCEDULED END	0.0	07/22/85	07/22/85	07/22/85		0.0	26
27270	27275	WBS 124232	REVIEW CODE REPORT	16.2	10/01/84	02/01/85	02/01/85		0.0	26SNLA
27275	27280	WBS 124232	REVISE ATHENAN CODE RPT	8.2	02/01/85	04/01/85	04/01/85		0.0	26PSU
27280	27282	WBS 124232	REVIEW REPORT	4.0	04/01/85	04/29/85	04/29/85		0.0	26DOE
27282	27284	WBS 124232	PERFORM LINE REVIEW	4.8	04/29/85	06/03/85	06/03/85		0.0	266300
27284	27285	WBS 124232	REVISE REPORT	4.0	06/03/85	07/01/85	07/01/85		0.0	26PSU
27285	27290	WBS 124232	PUBLISH REPORT	8.8	07/01/85	09/03/85	09/03/85		0.0	26SNLA
27290M	27290M	WBS 124232	ATHENAN CODE RPT PUBLD	0.0	09/03/85	09/03/85	09/03/85		0.0	26MS-3
27290	27299E	WBS 124232	UNSCHEDULED END	0.0	09/03/85	09/03/85	09/03/85		0.0	26
27300	27305	WBS 124232	IDENTIFY LOW TEMP MINERLS	21.0	08/08/84	01/15/85	04/30/85		15.0	26PSU
27305	27315	WBS 124232	DEFINE POSS REACTIONS	5.0	01/15/85	02/19/85	06/05/85		15.0	26PSU
27305	27320	WBS 124232	SEARCH LITERATURE F/DATA	5.0	01/15/85	02/19/85	06/05/85		15.0	26PSU
27305	27325	WBS 124232	DEFINE TESTS/EXPERMNTATN	5.0	01/15/85	02/19/85	06/05/85		15.0	26PSU

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27310	27325	WBS 124232	SELECT PROCEDURES/ESTS	11.0	11/26/84	02/19/85	06/05/85		15.0	26PSU
27315	27325	WBS 124232	RESTRAINT	0.0	02/19/85	02/19/85	06/05/85		15.0	26
27320	27325	WBS 243	RESTRAINT	0.0	02/19/85	02/19/85	06/05/85		15.0	26
27320	27330	WBS 124232	CONT SEARCH LIT/THERMDATA	5.0	02/19/85	03/26/85	07/11/85		15.0	26PSU
27325	27330	WBS 124232	APPROVE PLAN & MODIFY	5.0	02/19/85	03/26/85	07/11/85		15.0	26SNLA
27330	27335	WBS 124232	THERMODYN PROP ESTIMATN	10.0	03/26/85	06/05/85	04/02/86		41.0	26MGRC
27330	27340	WBS 124232	SELE COMP CODE/MAKE OPER	24.0	03/26/85	09/13/85	04/02/86		27.0	26MGRC
27330	27345	WBS 124232	SYNTHESIZE/CHAR/MATERIALS	12.0	03/26/85	06/19/85	10/04/85		15.0	26MGRC
27335	27355	WBS 243	RESTRAINT	0.0	06/05/85	06/05/85	04/02/86		41.0	26
27340	27355	WBS 243	RESTRAINT	0.0	09/13/85	09/13/85	04/02/86		27.0	26
27345	27350	WBS 124232	CONDUCT HYDRO/TH EXPM	12.0	06/19/85	09/13/85	01/08/86		15.0	26MGRC
27350	27355	WBS 124232	CONDUCT POST TST CHAR	12.0	09/13/85	12/10/85	04/02/86		15.0	26MGRC
27355	27360	WBS 124232	COMP RESULTS EXP W/THEORY	6.0	12/10/85	01/29/86	05/14/86		15.0	26MGRC
27355	27365	WBS 124232	CALC STABLE PHASES	6.0	12/10/85	01/29/86	05/14/86		15.0	26MGRC
27360	27365	WBS 124232	RESTRAINT	0.0	01/29/86	01/29/86	05/14/86		15.0	26
27365	27370	WBS 124232	SELECT MINERAL ASSEMBY	2.0	01/29/86	02/12/86	05/29/86		15.0	26MGRC
27370	27375	WBS 124232	PREP DETAILED TEST PLAN	12.0	02/12/86	05/07/86	08/22/86		15.0	26MGRC
27375	27380	WBS 124232	REVIEW & APPROVE PLAN	4.0	05/07/86	06/05/86	09/22/86		15.0	266313
27380	27385	WBS 243	RESTRAINT	0.0	06/05/86	06/05/86	09/22/86		15.0	26
27380	27450	WBS 124232	RESTRAINT	0.0	06/05/86	06/05/86	11/03/86		21.0	26
27385	27390	WBS 243	LEAD TIME	20.4	06/05/86	10/29/86	02/23/87		15.0	26
27390	27395	WBS 124232	PREP MATL RECOMMDS REPORT	12.0	10/29/86	02/02/87	05/18/87		15.0	26MGRC
27395	26365	WBS 243	RESTRAINT	0.0	02/02/87	02/02/87	05/18/87		15.0	26
27395	27400	WBS 124232	RVW MATL RECOMMDN REPORT	4.0	02/02/87	03/02/87	07/17/87		19.4	266313
27400	27405	WBS 124232	RVW & INCORP COMMENTS	8.8	03/02/87	05/01/87	09/18/87		19.4	26MGRC
27405	27410	WBS 124232	REVIEW & APPROVE	4.0	05/01/87	06/01/87	10/16/87		19.4	266313
27410	26615	WBS 243	RESTRAINT	0.0	06/01/87	06/01/87	10/16/87		19.4	26
27410M	27410M	WBS 124232	RECOMM SEAL MATL RPT DSN	0.0	06/01/87	06/01/87	10/16/87		19.4	26MS-3
27410	27415	WBS 243	RESTRAINT	0.0	06/01/87	06/01/87	02/26/88		36.8	26
27415	27420	WBS 124232	PREP UPDATE MATL RECM RPT	13.0	02/26/88	05/27/88	05/27/88		0.0	266313
27420	26390	WBS 243	RESTRAINT	0.0	05/27/88	05/27/88	06/22/88		3.4	26
27420	27425	WBS 124232	REVIEW REPORT	4.4	05/27/88	06/29/88	06/29/88		0.0	266310
27425	27430	WBS 124232	REVISE&INCORPOR COMMENTS	9.4	06/29/88	09/06/88	09/06/88		0.0	266313
27430	26090	WBS 243	RESTRAINT	0.0	09/06/88	09/06/88	11/08/88		9.0	26
27430	27435	WBS 124232	RVW&APPVL/MATL RECMM RPT	8.0	09/06/88	11/01/88	11/01/88		0.0	266310
27435M	27435M	WBS 124232	FINAL RECOMM/TITLE I COMP	0.0	11/01/88	11/01/88	11/01/88		0.0	26MS-3
27435	27439E	WBS 124232	UNSCHEDULED END	0.0	11/01/88	11/01/88	11/01/88		0.0	26
27440	27445	WBS 124232	DEFINE QTY ROCK SAMP&SEAL	4.0	02/06/86	03/06/86	10/06/86		29.8	26MGRC
27445	27450	WBS 124232	PROC MATLS FOR LAB TESTS	4.0	10/06/86	11/03/86	11/03/86		0.0	26MGRC
27450	30000	WBS 124232	PREPARE SAMPLES	8.0	11/03/86	01/08/87	01/08/87		0.0	26MGRC
27465	26385	WBS 243	RESTRAINT	0.0	01/07/88	01/07/88	05/03/88		16.6	26
27465	27415	WBS 243	RESTRAINT	0.0	01/07/88	01/07/88	02/26/88		7.2	26
27465M	27465M	WBS 124232	LAB LONG TST COMPLTE (I)	0.0	01/07/88	01/07/88	01/07/88		0.0	26MS-4
27465	27470	WBS 124232	EVALUATE TEST RESULTS	6.0	01/07/88	02/18/88	02/18/88		0.0	26MGRC

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27470	27475	WBS 124232	PREPARE DRAFT REPORT	14.2	02/18/88	05/27/88	05/27/88		0.0	26MGRC
27475	27480	WBS 124232	INTERNAL SNLA REVIEW	18.0	05/27/88	10/05/88	10/05/88		0.0	266310
27480	27485	WBS 124232	DOE REVIEW	4.0	10/05/88	11/02/88	11/02/88		0.0	26DOE
27485	27490	WBS 124232	FINAL REVIEW & APPROVAL	2.0	11/02/88	11/16/88	11/16/88		0.0	266310
27490	27495	WBS 124232	PRINT REPORT	6.0	11/16/88	01/09/89	01/09/89		0.0	26SNLA
27495M	27495M	WBS 124232	REPORT SEAL MATL/TOP COMP	0.0	01/09/89	01/09/89	01/09/89		0.0	26MS-3
27495	27499E	WBS 124232	UNSCHEDULED END	0.0	01/09/89	01/09/89	01/09/89		0.0	26
27500	27505	WBS 243	PROCURE MATL'S FOR TSTS	4.0	01/15/87	02/12/87	02/12/87		0.0	26MGRC
27505	31000	WBS 124232	PREPARE SAMPLES	8.0	02/12/87	04/09/87	04/09/87		0.0	26MGRC
27520	27425	WBS 124232	RESTRAINT	0.0	03/18/88	03/18/88	06/29/88		14.4	26
27520M	27520M	WBS 124232	LAB LONG TST COMP (II)	0.0	03/18/88	03/18/88	03/18/88		0.0	26MS-4
27520	27525	WBS 124232	EVALUATE TEST RESULTS	6.0	03/18/88	04/29/88	04/29/88		0.0	26MGRC
27525	26400	WBS 243	RESTRAINT	0.0	04/29/88	04/29/88	09/19/88		19.6	26
27525	27530	WBS 124232	PREPARE DRAFT REPORT	10.0	04/29/88	07/12/88	07/12/88		0.0	26MGRC
27530	26010	WBS 243	RESTRAINT	0.0	07/12/88	07/12/88	05/11/89		41.6	26
27530	26100	WBS 243	RESTRAINT	0.0	07/12/88	07/12/88	04/07/89		36.8	26
27530	26120	WBS 243	RESTRAINT	0.0	07/12/88	07/12/88	04/07/89		36.8	26
27530	26150	WBS 243	RESTRAINT	0.0	07/12/88	07/12/88	04/07/89		36.8	26
27530	27535	WBS 124232	INTERNAL SNLA REVIEW	20.0	07/12/88	12/02/88	12/02/88		0.0	266310
27535	27540	WBS 124232	DOE REVIEW	4.0	12/02/88	01/09/89	01/09/89		0.0	26DOE
27540	27545	WBS 124232	FINAL REVIEW & APPROVAL	2.0	01/09/89	01/23/89	01/23/89		0.0	266310
27545	27550	WBS 124232	PRINT REPORT	8.0	01/23/89	03/20/89	03/20/89		0.0	26SNLA
27550M	27550M	WBS 124232	RPT COMPAT SEAL MATL/CALC	0.0	03/20/89	03/20/89	03/20/89		0.0	26MS-3
27550	27559E	WBS 124232	UNSCHEDULED END	0.0	03/20/89	03/20/89	03/20/89		0.0	26
28000	28020	WBS 243	RESTRAINT					*11/15/84		26
28005	28020	WBS 243	RESTRAINT					*11/01/84		26
28010	28020	WBS 243	RESTRAINT					*11/15/84		26
28015	28020	WBS 243	RESTRAINT					*12/04/84		26
28020	28025	WBS 243	LEAD TIME	8.0	12/04/84	02/06/85	04/05/85		8.4	26
28020	28030	WBS 243	LEAD TIME	8.0	12/04/84	02/06/85	04/05/85		8.4	26
28020	28040	WBS 243	LEAD TIME	8.0	12/04/84	02/06/85	04/05/85		8.4	26
28020	28055	WBS 243	LEAD TIME	5.0	12/04/84	01/16/85	03/01/85		6.4	26
28020	28060	WBS 243	LEAD TIME	15.0	12/04/84	03/27/85	06/10/85		10.4	26
28020	28065	WBS 124231	REVW ENHANCMNT PERMEABIL	8.0	12/04/84	02/06/85	03/22/85		6.4	26ITC
28020	28075	WBS 124231	DEF PLAN F/POSITION PAPER	5.0	12/04/84	01/16/85	02/25/85		5.6	26LANL
28020	28085	WBS 124231	DEF PLAN F/POSITION PAPER	5.0	12/04/84	01/16/85	02/25/85		5.6	26MES
28020	28095	WBS 124231	DEF PLAN F/POSITION PAPER	5.0	12/04/84	01/16/85	02/25/85		5.6	266311
28025	28035	WBS 124231	REVW GEO DATA OBTAIN DATA	2.0	02/06/85	02/20/85	04/19/85		8.4	26ITC
28030	28035	WBS 124231	DEFINE WATERSHEDS	2.0	02/06/85	02/20/85	04/19/85		8.4	26ITC
28035	28050	WBS 124231	COMP MAX SURF RUNOFF	2.0	02/20/85	03/06/85	05/03/85		8.4	26ITC
28040	28045	WBS 124231	UPDATE INFO ON ALLUV SOIL	2.0	02/06/85	02/20/85	04/19/85		8.4	26ITC
28045	28050	WBS 124231	SELCT CHAR CURVES F/MATL	2.0	02/20/85	03/06/85	05/03/85		8.4	26ITC
28050	26290	WBS 124231	PERF HYDRO CALCULATIONS	8.0	03/06/85	05/01/85	07/01/85		8.4	26ITC
28055	28065	WBS 124231	DEV HYDRO GEO MOD F/ANAL	3.0	01/16/85	02/06/85	03/22/85		6.4	26ITC

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28060	26290	WBS 124231	PERF SUP CALC DET GROUT	3.0	03/27/85	04/17/85	07/01/85		10.4	26ITC
28065	26290	WBS 124231	PERF HYDRO CALCULATIONS	6.0	02/06/85	03/20/85	07/01/85		14.4	26ITC
28065	28070	WBS 243	LEAD TIME	4.0	02/06/85	03/06/85	06/17/85		14.4	26
28065	28105	WBS 124231	PERF HYDRO CALCULATIONS	6.0	02/06/85	03/20/85	05/03/85		6.4	26ITC
28070	26290	WBS 124231	PRFM BOREHOLE ANALYSIS	2.0	03/06/85	03/20/85	07/01/85		14.4	26TBD
28075	28080	WBS 124231	REVIEW & APPROVE	2.8	01/16/85	02/05/85	03/15/85		5.6	266313
28080	28105	WBS 124231	PREP POS PAPER REPR POTEN	7.0	02/05/85	03/26/85	05/03/85		5.6	26LANL
28085	28090	WBS 124231	REVIEW & APPROVE	2.8	01/16/85	02/05/85	03/15/85		5.6	266313
28090	28105	WBS 124231	PREP POS PAPER SLTNG POTN	7.0	02/05/85	03/26/85	05/03/85		5.6	26WES
28095	28100	WBS 124231	REVIEW & APPROVE	2.8	01/16/85	02/05/85	03/15/85		5.6	266313
28100	28105	WBS 124231	PREP POS PAPER BIOFOULING	7.0	02/05/85	03/26/85	05/03/85		5.6	266311
28105	26290	WBS 124231	CONTINUE ANALYSIS	8.0	03/26/85	05/21/85	07/01/85		5.6	26ITC
30000	30005	WBS 124232	CURE SAMPLES AT 38 C	2.0	01/08/87	01/22/87	01/22/87		0.0	26MGRC
30005	30010	WBS 124232	CONDUCT STRENGTH DIFF TST	2.0	01/22/87	02/05/87	02/05/87		0.0	26MGRC
30005	30015	WBS 124232	CONT SPL CURE AT 38 C	2.0	01/22/87	02/05/87	02/05/87		0.0	26MGRC
30010	30015	WBS 243	RESTRAINT	0.0	02/05/87	02/05/87	02/05/87		0.0	26
30015	30020	WBS 124232	CONDUCT STRENGTH DIFF TST	2.0	02/05/87	02/19/87	03/05/87		2.0	26MGRC
30015	30025	WBS 124232	CONT SPL CURE AT 38 C	4.0	02/05/87	03/05/87	03/05/87		0.0	26MGRC
30020	30025	WBS 243	RESTRAINT	0.0	02/19/87	02/19/87	03/05/87		2.0	26
30025	30030	WBS 124232	CONDUCT X-RAY DIFF TEST	2.0	03/05/87	03/19/87	04/02/87		2.0	26MGRC
30025	30035	WBS 124232	CONT SPL CURE AT 38 C	4.0	03/05/87	04/02/87	04/02/87		0.0	26MGRC
30030	30035	WBS 243	RESTRAINT	0.0	03/19/87	03/19/87	04/02/87		2.0	26
30035	27465	WBS 124232	CONDUCT BASELNE CHAR SAMP	3.0	04/02/87	04/23/87	01/07/88		34.8	26MGRC
30035	30040	WBS 124232	SHIP SPLS TO SNLA & TBD	1.0	04/02/87	04/09/87	12/09/87		33.8	26MGRC
30035	30045	WBS 124232	EQUIL TEST SPLS (ABC)	3.0	04/02/87	04/23/87	06/11/87		6.8	26MGRC
30035	30085	WBS 124232	CONDCT X-RAY DIFF TST	2.0	04/02/87	04/16/87	10/26/87		26.8	26MGRC
30035	30090	WBS 124232	CONT SAMPLE CURE AT 38 C	6.0	04/02/87	05/14/87	10/26/87		22.8	26MGRC
30035	30105	WBS 243	LEAD TIME	2.0	04/02/87	04/16/87	04/16/87		0.0	26
30040	27465	WBS 124232	PERFORM UPT	3.0	04/09/87	04/30/87	01/07/88		33.8	26SNLA
30045	27465	WBS 124232	CHAR SAMPLE(C) SAT PERMEA	6.0	04/23/87	06/05/87	01/07/88		28.8	26MGRC
30045	30050	WBS 124232	SHP SPLS (C) TO SNLA	1.0	04/23/87	04/30/87	12/09/87		30.8	26MGRC
30045	30055	WBS 124232	EQUIL TEST SPLS (ABC)PSU	3.0	04/23/87	05/14/87	07/02/87		6.8	26MGRC
30050	27465	WBS 124232	PERFORM UPT	3.0	04/30/87	05/21/87	01/07/88		30.8	26SNLA
30055	27465	WBS 124232	CHARACT SPLS (ABC)	6.0	05/14/87	06/26/87	01/07/88		25.8	26MGRC
30055	30060	WBS 124232	SHP SPLS (ABC) TO SNL&TBD	1.0	05/14/87	05/21/87	10/26/87		21.8	26MGRC
30055	30065	WBS 124232	EQUIL TEST SAMPLES	6.0	05/14/87	06/26/87	08/14/87		6.8	26MGRC
30060	27465	WBS 124232	PERFORM UPT	9.0	05/21/87	07/27/87	01/07/88		21.8	26SNLA
30065	27465	WBS 124232	CHARACT SAMPLES (ABC)	6.0	06/26/87	08/10/87	01/07/88		19.8	26MGRC
30065	30070	WBS 124232	EQUIL TEST SPLS (ABC)	12.0	06/26/87	09/22/87	11/09/87		6.8	26MGRC
30065	30080	WBS 124232	SHP SPLS (ABC) TO SNLA	1.0	06/26/87	07/06/87	10/26/87		15.8	26MGRC
30070	27465	WBS 124232	CHARACTERIZE SAMPLES	6.0	09/22/87	11/03/87	01/07/88		7.8	26MGRC
30070	30075	WBS 124232	SHP SPLS (AB) TO SNLA	1.0	09/22/87	09/29/87	11/16/87		6.8	26MGRC
30075	27465	WBS 124232	PERFORM UPT	6.0	09/29/87	11/10/87	01/07/88		6.8	26SNLA
30080	27465	WBS 124232	PERFORM UPT	9.0	07/06/87	09/08/87	01/07/88		15.8	26SNLA

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30085	30090	WBS 243	RESTRAINT	0.0	04/16/87	04/16/87	10/26/87		26.8	26
30090	30095	WBS 124232	COND X-RAY DIFF TEST	2.0	05/14/87	05/29/87	12/16/87		27.8	26MGRC
30090	30100	WBS 124232	CONT SAMPLE CURE AT 38 C	7.0	05/14/87	07/06/87	12/16/87		22.8	26MGRC
30095	30100	WBS 243	RESTRAINT	0.0	05/29/87	05/29/87	12/16/87		27.8	26
30100	27465	WBS 124232	CONDUCT X-RAY DIFF TSTS	2.0	07/06/87	07/20/87	01/07/88		22.8	26MGRC
30105	27465	WBS 124232	COND BASELN PERM TST MINI	4.0	04/16/87	05/14/87	01/07/88		31.8	26MGRC
30105	30110	WBS 124232	EQUILIBRATE SAMPLES	3.0	04/16/87	05/07/87	10/26/87		23.8	26MGRC
30105	30115	WBS 124232	EQUILIBRATE SAMPLES	6.0	04/16/87	05/29/87	05/29/87		0.0	26MGRC
30110	27465	WBS 124232	PERF PERM MEASUREMENT	9.0	05/07/87	07/13/87	01/07/88		23.8	26MGRC
30115	27465	WBS 124232	PERF PERM MEASUREMENT	9.0	05/29/87	08/03/87	01/07/88		20.8	26MGRC
30115	30120	WBS 124232	EQUILIBRATE SAMPLES	6.0	05/29/87	07/13/87	07/13/87		0.0	26MGRC
30120	27465	WBS 124232	PERF PERM MEASUREMENT	9.0	07/13/87	09/15/87	01/07/88		14.8	26MGRC
30120	30125	WBS 124232	EQUILIBRATE SAMPLES	12.0	07/13/87	10/06/87	10/06/87		0.0	26MGRC
30125	27465	WBS 124232	PERF PERM MEASUREMENT	11.8	10/06/87	01/07/88	01/07/88		0.0	26MGRC
31000	31005	WBS 124232	CURE SAMPLES AT 38 C	2.0	04/09/87	04/23/87	04/23/87		0.0	26MGRC
31005	31010	WBS 124232	COND X-RAY DIFF TEST	2.0	04/23/87	05/07/87	05/07/87		0.0	26MGRC
31005	31015	WBS 124232	CONT SAMPLE CURE AT 38 C	2.0	04/23/87	05/07/87	05/07/87		0.0	26MGRC
31010	31015	WBS 243	RESTRAINT	0.0	05/07/87	05/07/87	05/07/87		0.0	26
31015	31020	WBS 124232	COND X-RAY DIFF TEST	2.0	05/07/87	05/21/87	06/05/87		2.0	26MGRC
31015	31025	WBS 124232	CONT SAMPLE CURE AT 38 C	4.0	05/07/87	06/05/87	06/05/87		0.0	26MGRC
31020	31025	WBS 243	RESTRAINT	0.0	05/21/87	05/21/87	06/05/87		2.0	26
31025	31030	WBS 124232	COND X-RAY DIFF TEST	2.0	06/05/87	06/19/87	07/06/87		2.0	26MGRC
31025	31035	WBS 124232	CONT SAMPLE CURE AT 38 C	4.0	06/05/87	07/06/87	07/06/87		0.0	26MGRC
31030	31035	WBS 243	RESTRAINT	0.0	06/19/87	06/19/87	07/06/87		2.0	26
31035	27520	WBS 124232	COND BASELN CHAR SAMPLES	3.0	07/06/87	07/27/87	03/18/88		32.0	26MGRC
31035	31040	WBS 124232	SHIP SAMPLES TO SNL & TBD	1.0	07/06/87	07/13/87	02/26/88		31.0	26MGRC
31035	31045	WBS 124232	EQUIL TEST SAMPLES (ABC)	3.0	07/06/87	07/27/87	08/24/87		4.0	26MGRC
31035	31085	WBS 124232	COND X-RAY DIFF TEST	2.0	07/06/87	07/20/87	01/15/88		24.0	26MGRC
31035	31090	WBS 124232	CONT SAMPLE CURE AT 38 C	6.0	07/06/87	08/17/87	01/15/88		20.0	26MGRC
31035	31105	WBS 243	LEAD TIME	2.0	07/06/87	07/20/87	07/20/87		0.0	26
31040	27520	WBS 124232	PERFORM UPT	3.0	07/13/87	08/03/87	03/18/88		31.0	26SNLA
31045	27520	WBS 124232	CHAR SAMPLE(C) SAT PERMEA	6.0	07/27/87	09/08/87	03/18/88		26.0	26PSU
31045	31050	WBS 124232	SHIP SPLS (C) TO SNL TBD	1.0	07/27/87	08/03/87	02/26/88		28.0	26MGRC
31045	31055	WBS 124232	EQUIL TEST SPLS (ABC)	3.0	07/27/87	08/17/87	09/15/87		4.0	26MGRC
31050	27520	WBS 124232	PERFORM UPT	3.0	08/03/87	08/24/87	03/18/88		28.0	26MGRC
31055	27520	WBS 124232	CHARACTERIZE SAMPLES(ABC)	6.0	08/17/87	09/29/87	03/18/88		23.0	26MGRC
31055	31060	WBS 124232	SHIP SPLS (ABC) TO SNLA	1.0	08/17/87	08/24/87	01/15/88		19.0	26MGRC
31055	31065	WBS 124232	EQUIL TEST SAMPLES	6.0	08/17/87	09/29/87	10/27/87		4.0	26MGRC
31060	27520	WBS 124232	PERFORM UPT	9.0	08/24/87	10/27/87	03/18/88		19.0	26SNLA
31065	27520	WBS 124232	CHARACTERIZE SPLS (ABC)	6.0	09/29/87	11/10/87	03/18/88		17.0	26MGRC
31065	31070	WBS 124232	EQUIL TEST SAMPLES (ABC)	12.0	09/29/87	12/24/87	01/29/88		4.0	26MGRC
31065	31080	WBS 124232	SHIP SPLS (ABC) TO SNLA	1.0	09/29/87	10/06/87	01/15/88		13.0	26MGRC
31070	27520	WBS 124232	CHARACTERIZE SAMPLES	6.0	12/24/87	02/12/88	03/18/88		5.0	26MGRC
31070	31075	WBS 124232	SHIP SPLS (AB) TO SNLA	1.0	12/24/87	01/08/88	02/05/88		4.0	26MGRC

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31075	27520	WBS 124232	PERFORM UPT	6.0	01/08/88	02/19/88	03/18/88		4.0	26SNLA
31080	27520	WBS 124232	PERFORM UPT	9.0	10/06/87	12/10/87	03/18/88		13.0	26SNLA
31085	31090	WBS 243	RESTRAINT	0.0	07/20/87	07/20/87	01/15/88		24.0	26
31090	31095	WBS 124232	COND X-RAY DIFF TEST	2.0	08/17/87	08/31/87	03/04/88		25.0	26MGRC
31090	31100	WBS 124232	CONT SAMPLE CURE AT 38 C	7.0	08/17/87	10/06/87	03/04/88		20.0	26MGRC
31095	31100	WBS 243	RESTRAINT	0.0	08/31/87	08/31/87	03/04/88		25.0	26
31100	27520	WBS 124232	COND BASELINE PERM TEST	2.0	10/06/87	10/20/87	03/18/88		20.0	26PSU
31105	27520	WBS 124232	COND X-RAY DIFF TEST	4.0	07/20/87	08/17/87	03/18/88		29.0	26MGRC
31105	31110	WBS 124232	EQUILIBRATE SAMPLES	3.0	07/20/87	08/10/87	01/15/88		21.0	26MGRC
31105	31115	WBS 124232	EQUILIBRATE SAMPLES	6.0	07/20/87	08/31/87	08/31/87		0.0	26MGRC
31110	27520	WBS 124232	PERF PERM MEASUREMENT	9.0	08/10/87	10/13/87	03/18/88		21.0	26MGRC
31115	27520	WBS 124232	PERF PERM MEASUREMENT	9.0	08/31/87	11/03/87	03/18/88		18.0	26MGRC
31115	31120	WBS 124232	EQUILIBRATE SAMPLES	6.0	08/31/87	10/13/87	10/13/87		0.0	26MGRC
31120	27520	WBS 124232	PERF PERM MEASUREMENT	9.0	10/13/87	12/17/87	03/18/88		12.0	26MGRC
31120	31125	WBS 124232	EQUILIBRATE SAMPLES	12.0	10/13/87	01/15/88	01/15/88		0.0	26MGRC
31125	27520	WBS 124232	PERF PERM MEASUREMENT	9.0	01/15/88	03/18/88	03/18/88		0.0	26MGRC

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0001S	26000	WBS 243	START					*10/03/83		26
26000	26430	WBS 243	LEAD TIME					*11/01/83		26
26000	26225	WBS 124231	DEFINE SEAL COND/DRFT RPT					*12/23/83		266313
26000	26255	WBS 243	LEAD TIME					*12/23/83		26
26225	26200	WBS 243	RESTRAINT					*12/23/83		26
26225M	26225M	WBS 124231	DEFINE SEAL CONC/RPT COMP					*12/23/83		26MS-2
26225	26435	WBS 243	RESTRAINT					*12/23/83		26
0002S	26200	WBS 243	START					*03/12/84		26
26255	26260	WBS 124231	DEFINE SEAL ISS/DRFT PLAN					*03/30/84		266313
26260	26200	WBS 243	RESTRAINT					*03/30/84		26
26260M	26260M	WBS 124231	DEFINE SEAL ISS/PLAN COMP					*03/30/84		26MS-2
26000	26035	WBS 243	LEAD TIME					*05/15/84		26
26225	26230	WBS 124231	CONDUCT PEER RVW & REVISE					*05/29/84		26SNLA
26230	26235	WBS 124231	REVIEW REPORT					*06/26/84		26DOE
26200	26205	WBS 124231	EVAL LITERATURE/FRE SURF					*07/16/84		26PNL
26200	26215	WBS 124231	EVAL NEAR SURF SOIL PROP					*07/16/84		26PNL
26200	26220	WBS 124231	RE-EVAL CURR FRACT DATA					*07/16/84		26PNL
26205	26435	WBS 243	RESTRAINT					*07/16/84		26
26215	26205	WBS 243	RESTRAINT					*07/16/84		26
26220	26205	WBS 243	RESTRAINT					*07/16/84		26
26430	26435	WBS 124233	PRE&NEGOT CONC DSN/SEAL					*07/23/84		266313
26435M	26435M	WBS 124233	CONT PLACED/CONC DSN SEAL					*07/23/84		26MS-4
26000	27300	WBS 243	LEAD TIME					*08/08/84		26
26235	26240	WBS 124231	CONDUCT LINE REVIEW					*08/08/84		266310
26240	26245	WBS 124231	MODIFY REPORT					*09/06/84		266313
26000	27210	WBS 124232	PREP CON-14 RPT (GEOCH)					*09/14/84		26PSU
26000	27270	WBS 124232	PREP RPT ATHENAN CODE					*10/01/84		26PSU
26000	27040	WBS 124232	MEAS PROP&PREP DRFT RPT					*10/05/84		26PSU
27040	27305	WBS 243	RESTRAINT					*10/05/84		26
26205	28020	WBS 124231	PERF ANAL RATE LOW SHAFT					*10/15/84		26ITC
26260	26265	WBS 124231	CONDUCT PEER RVW & REVISE					*10/15/84		266313
26265M	26265M	WBS 124231	DRFT PROG PLAN RPT COMP					*10/15/84		26MS-1
26205	28005	WBS 124231	PER ANAL FLOW SHFT COLLAR					*11/01/84		26ITC
26245	26250	WBS 124231	PUBLISH REPORT					*11/01/84		26SNLA
26250M	26250M	WBS 124231	FINAL SEAL CONC RPT COMP					*11/01/84		26MS-2
26250	26259E	WBS 124231	UNSCHEDULED END					*11/01/84		26
28005	28020	WBS 243	RESTRAINT					*11/01/84		26
26205	28000	WBS 124231	PFRM ANALYSIS/FLOW THRU					*11/15/84		26ITC
26205	28010	WBS 124231	PERF ANAL INFLW/SHFT INFW					*11/15/84		26ITC
28000	28020	WBS 243	RESTRAINT					*11/15/84		26
28010	28020	WBS 243	RESTRAINT					*11/15/84		26
00035	27310	WBS 243	START					*11/26/84		26
26265	26270	WBS 124231	REVIEW REPORT					*12/03/84		26DOE
26205	28015	WBS 124231	EVAL INFLWS F/FAULT ZONES					*12/04/84		26ITC

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28015	28020	WBS 243	RESTRAINT					*12/04/84		26
27040	27045	WBS 124232	REVIEW REPORT					*12/05/84		266313
26270	26275	WBS 124231	CONDUCT LINE REVIEW					*12/12/84		266310
26000	26185	WBS 243	LEAD TIME	63.0	10/03/83	01/11/85	01/11/85		0.0	26
26000	27240	WBS 124232	PREP RPT MORTAR/GROUT	63.2	10/03/83	01/14/85	01/14/85		0.0	26PSU
27045	27050	WBS 124232	REVISE REPORT	4.4	12/05/84	01/14/85	01/14/85		0.0	26PSU
0006S	26475	WBS 124233	START	0.0	01/15/85	01/15/85	01/15/85	S01/15/85	0.0	26
27210	27215	WBS 124232	RVW CON-14 RPT	15.8	09/14/84	01/15/85	01/15/85		0.0	26LANL
27300	27305	WBS 124232	IDENTIFY LOW TEMP MINERLS	21.0	08/08/84	01/15/85	04/30/85		15.0	26PSU
28020	28055	WBS 243	LEAD TIME	5.0	12/04/84	01/16/85	03/01/85		6.4	26
28020	28075	WBS 124231	DEF PLAN F/POSITION PAPER	5.0	12/04/84	01/16/85	02/25/85		5.6	26LANL
28020	28085	WBS 124231	DEF PLAN F/POSITION PAPER	5.0	12/04/84	01/16/85	02/25/85		-5.6	26WES
28020	28095	WBS 124231	DEF PLAN F/POSITION PAPER	5.0	12/04/84	01/16/85	02/25/85		5.6	266311
26275	26280	WBS 124231	MODIFY REPORT	4.0	12/12/84	01/17/85	01/17/85		0.0	266313
27270	27275	WBS 124232	REVIEW CODE REPORT	16.2	10/01/84	02/01/85	02/01/85		0.0	26SNLA
28075	28080	WBS 124231	REVIEW & APPROVE	2.8	01/16/85	02/05/85	03/15/85		5.6	266313
28085	28090	WBS 124231	REVIEW & APPROVE	2.8	01/16/85	02/05/85	03/15/85		5.6	266313
28095	28100	WBS 124231	REVIEW & APPROVE	2.8	01/16/85	02/05/85	03/15/85		5.6	266313
28020	28025	WBS 243	LEAD TIME	8.0	12/04/84	02/06/85	04/05/85		8.4	26
28020	28030	WBS 243	LEAD TIME	8.0	12/04/84	02/06/85	04/05/85		8.4	26
28020	28040	WBS 243	LEAD TIME	8.0	12/04/84	02/06/85	04/05/85		8.4	26
28020	28065	WBS 124231	REVW ENHANCMNT PERMEABIL	8.0	12/04/84	02/06/85	03/22/85		6.4	26ITC
28055	28065	WBS 124231	DEV HYDRO GEO MOD F/ANAL	3.0	01/16/85	02/06/85	03/22/85		6.4	26ITC
26435	26440	WBS 124233	PREP PREL DRFT RPT/DSN RQ	27.2	07/23/84	02/11/85	02/11/85		0.0	26SNLA
26185	26190	WBS 243	DEFINE PLAN F/POSIT PAPER	4.4	01/11/85	02/12/85	02/12/85		0.0	26PSU
26280	26289E	WBS 124231	PUBLISH REPORT	4.2	01/17/85	02/15/85	02/15/85		0.0	26SNLA
27215	27220	WBS 124232	REVISE REPORT	4.6	01/15/85	02/15/85	02/15/85		0.0	26PSU
27305	27315	WBS 124232	DEFINE POSS REACTIONS	5.0	01/15/85	02/19/85	06/05/85		15.0	26PSU
27305	27320	WBS 124232	SEARCH LITERATURE F/DATA	5.0	01/15/85	02/19/85	06/05/85		15.0	26PSU
27305	27325	WBS 124232	DEFINE TESTS/EXPERMNTATN	5.0	01/15/85	02/19/85	06/05/85		15.0	26PSU
27310	27325	WBS 124232	SELECT PROCEDURES/ESTS	11.0	11/26/84	02/19/85	06/05/85		15.0	26PSU
27315	27325	WBS 124232	RESTRAINT	0.0	02/19/85	02/19/85	06/05/85		15.0	26
27320	27325	WBS 243	RESTRAINT	0.0	02/19/85	02/19/85	06/05/85		15.0	26
28025	28035	WBS 124231	REVW GEO DATA OBTAIN DATA	2.0	02/06/85	02/20/85	04/19/85		8.4	26ITC
28030	28035	WBS 124231	DEFINE WATERSHEDS	2.0	02/06/85	02/20/85	04/19/85		8.4	26ITC
28040	28045	WBS 124231	UPDATE INFO ON ALLUV SOIL	2.0	02/06/85	02/20/85	04/19/85		8.4	26ITC
27240	27245	WBS 124232	REVIEW REPORT	5.8	01/14/85	02/22/85	02/22/85		0.0	26LANL
27050	27055	WBS 124232	REVIEW & MODIFY RPT	6.0	01/14/85	02/25/85	02/25/85		0.0	26SNLA
26000	27000	WBS 124232	MEAS PROP/TEST SEALS&PREP	70.0	10/03/83	03/01/85	03/01/85		0.0	26WES
26475	26480	WBS 124233	MOD CURR INPUT/ES TST	6.6	01/15/85	03/01/85	03/01/85		0.0	266313
26480M	26480M	WBS 124233	PREL INPUT TST COMPLETE	0.0	03/01/85	03/01/85	03/01/85		0.0	26MS-4
28035	28050	WBS 124231	COMP MAX SURF RUNOFF	2.0	02/20/85	03/06/85	05/03/85		8.4	26ITC
28045	28050	WBS 124231	SELCT CHAR CURVES F/MATL	2.0	02/20/85	03/06/85	05/03/85		8.4	26ITC
28065	28070	WBS 243	LEAD TIME	4.0	02/06/85	03/06/85	06/17/85		14.4	26

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26190	26195	WBS 243	REVIEW & APPROVE	4.0	02/12/85	03/12/85	03/12/85		0.0	266313
27220	27225	WBS 124232	REVIEW REPORT	4.0	02/15/85	03/15/85	03/15/85		0.0	26DOE
28065	26290	WBS 124231	PERF HYDRO CALCULATIONS	6.0	02/06/85	03/20/85	07/01/85		14.4	26ITC
28065	28105	WBS 124231	PERF HYDRO CALCULATIONS	6.0	02/06/85	03/20/85	05/03/85		6.4	26ITC
28070	26290	WBS 124231	PRFM BOREHOLE ANALYSIS	2.0	03/06/85	03/20/85	07/01/85		14.4	26TBD
27245	27250	WBS 124232	REVISE REPORT	4.0	02/22/85	03/22/85	03/22/85		0.0	26PSU
27320	27330	WBS 124232	CONT SEARCH LIT/THERMDATA	5.0	02/19/85	03/26/85	07/11/85		15.0	26PSU
27325	27330	WBS 124232	APPROVE PLAN & MODIFY	5.0	02/19/85	03/26/85	07/11/85		15.0	26SNLA
28080	28105	WBS 124231	PREP POS PAPER REPR POTEN	7.0	02/05/85	03/26/85	05/03/85		5.6	26LANL
28090	28105	WBS 124231	PREP POS PAPER SLTNG POTN	7.0	02/05/85	03/26/85	05/03/85		5.6	26WES
28100	28105	WBS 124231	PREP POS PAPER BIOFOULING	7.0	02/05/85	03/26/85	05/03/85		5.6	266311
28020	28060	WBS 243	LEAD TIME	15.0	12/04/84	03/27/85	06/10/85		10.4	26
27275	27280	WBS 124232	REVISE ATHENAN CODE RPT	8.2	02/01/85	04/01/85	04/01/85		0.0	26PSU
26440	26445	WBS 124233	CONDUCT INTERNAL REVIEW	8.0	02/11/85	04/08/85	04/08/85		0.0	26SNLA
26445M	26445M	WBS 124233	PREL DRFT DSN/MR COMPLETE	0.0	04/08/85	04/08/85	04/08/85		0.0	26MS-3
26445	26485	WBS 243	RESTRAINT	0.0	04/08/85	04/08/85	11/14/85		31.0	26
27055	27060	WBS 124232	PERFORM LINE REVIEW	6.0	02/25/85	04/08/85	04/08/85		0.0	266300
27225	27230	WBS 124232	PRFM FNL REVISION CON-14	4.2	03/15/85	04/15/85	04/15/85		0.0	26PSU
28060	26290	WBS 124231	PERF SUP CALC DET GROUT	3.0	03/27/85	04/17/85	07/01/85		10.4	26ITC
26475	26865	WBS 124233	PREP FNL INPUT/ES PLAN	13.8	01/15/85	04/22/85	04/22/85		0.0	266313
26865M	26865M	WBS 124233	FINAL INPUT/ES TEST COMP	0.0	04/22/85	04/22/85	04/22/85		0.0	26MS-4
26865	26889E	WBS 124233	UNSCHEDULED END	0.0	04/22/85	04/22/85	04/22/85		0.0	26
27250	27255	WBS 124232	REVIEW REPORT	4.2	03/22/85	04/22/85	04/22/85		0.0	26DOE
27060	27065	WBS 124232	MODIFY RPT	3.0	04/08/85	04/29/85	04/29/85		0.0	26PSU
27280	27282	WBS 124232	REVIEW REPORT	4.0	04/01/85	04/29/85	04/29/85		0.0	26DOE
27000	27005	WBS 124232	CONT MEAS SEALS/PREP RPT	8.6	03/01/85	05/01/85	05/01/85		0.0	26WES
27005M	27005M	WBS 124232	DRAFT WEAP SEAL STDY COMP	0.0	05/01/85	05/01/85	05/01/85		0.0	26MS-3
28050	26290	WBS 124231	PERF HYDRO CALCULATIONS	8.0	03/06/85	05/01/85	07/01/85		8.4	26ITC
27230	27235	WBS 124232	PUBLISH REPORT	4.4	04/15/85	05/15/85	05/15/85		0.0	26LANL
27235M	27235M	WBS 124232	CON-14 RPT PUBLISHED	0.0	05/15/85	05/15/85	05/15/85		0.0	26MS-3
27235	27239E	WBS 124232	UNSCHEDULED END	0.0	05/15/85	05/15/85	05/15/85		0.0	26
28105	26290	WBS 124231	CONTINUE ANALYSIS	8.0	03/26/85	05/21/85	07/01/85		5.6	26ITC
27255	27260	WBS 124232	PERFORM FINAL REVISION	4.4	04/22/85	05/22/85	05/22/85		0.0	26PSU
27065	27066	WBS 124232	REVIEW REPORT	4.0	04/29/85	05/28/85	05/28/85		0.0	26DOE
27005	27010	WBS 124232	PERFORM PEER REVIEW	4.0	05/01/85	05/30/85	05/30/85		0.0	26SNLA
27282	27284	WBS 124232	PERFORM LINE REVIEW	4.8	04/29/85	06/03/85	06/03/85		0.0	266300
27330	27335	WBS 124232	THERMODYN PROP ESTIMATN	10.0	03/26/85	06/05/85	04/02/86		41.0	26MGRC
27335	27355	WBS 243	RESTRAINT	0.0	06/05/85	06/05/85	04/02/86		41.0	26
27330	27345	WBS 124232	SYNTHESIZE/CHAR/MATERIALS	12.0	03/26/85	06/19/85	10/04/85		15.0	26MGRC
27010	27015	WBS 124232	INCORPORATE COMMENTS	4.0	05/30/85	06/27/85	06/27/85		0.0	266313
26000	26290	WBS 124231	ESTAB POSIT/GASEOUS MIGRN	87.0	10/03/83	07/01/85	07/01/85		0.0	26LLNL
26195	26290	WBS 243	PREP POS PAPER/CONCR LINR	15.6	03/12/85	07/01/85	07/01/85		0.0	26PSU
26290	26299E	WBS 243	SCHEDULED END	0.0	07/01/85	07/01/85	07/01/85	07/01/85	0.0	26
27284	27285	WBS 124232	REVISE REPORT	4.0	06/03/85	07/01/85	07/01/85		0.0	26PSU

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27066	27070	WBS 124232	RESUBMIT LINE RVW/MOD	5.2	05/28/85	07/03/85	07/03/85		0.0	266313
0011S	27105	WBS 243	START	0.0	07/15/85	07/15/85	07/15/85	S07/15/85	.8	26
27260	27265	WBS 124232	PUBLISH RPT	8.2	05/22/85	07/22/85	07/22/85		0.0	26LANL
27265M	27265M	WBS 124232	MORTAR/GROUT RPT PUBLHD	0.0	07/22/85	07/22/85	07/22/85		0.0	26MS-3
27265	27269E	WBS 124232	UNSHCEDULED END	0.0	07/22/85	07/22/85	07/22/85		0.0	26
27015	27020	WBS 124232	REVIEW REPORT	4.0	06/27/85	07/26/85	07/26/85		0.0	26SNLA
26445	26450	WBS 124233	PREP FINAL DRAFT REPORT	16.2	04/08/85	08/01/85	08/01/85		0.0	26SNLA
27020	27025	WBS 124232	PERFORM LINE REVIEW	1.0	07/26/85	08/02/85	08/02/85		0.0	26SNLA
27105	27110	WBS 124232	PREP PLAN F/FRZ-THW TESTS	4.0	07/15/85	08/12/85	08/16/85		.8	26MMRC
27025	27030	WBS 124232	INCORPORATE COMMENTS	1.6	08/02/85	08/14/85	08/14/85		0.0	266313
27070	27075	WBS 124232	PUBLISH REPORT	6.0	07/03/85	08/15/85	08/15/85		0.0	26SNLA
27075M	27075M	WBS 124232	MECHANICAL PROP RPT COMP	0.0	08/15/85	08/15/85	08/15/85		0.0	26MS-3
27075	27079E	WBS 124232	UNSCHEDULED END	0.0	08/15/85	08/15/85	08/15/85		0.0	26
0005S	26535	WBS 243	START	0.0	08/22/85	08/22/85	08/22/85	S08/22/85	15.2	26
27285	27290	WBS 124232	PUBLISH REPORT	8.8	07/01/85	09/03/85	09/03/85		0.0	26SNLA
27290M	27290M	WBS 124232	ATHENAN CODE RPT PUBLD	0.0	09/03/85	09/03/85	09/03/85		0.0	26MS-3
27290	27299E	WBS 124232	UNSCHEDULED END	0.0	09/03/85	09/03/85	09/03/85		0.0	26
27110	27115	WBS 124232	REVIEW & APPROVE PLAN	4.0	08/12/85	09/10/85	09/16/85		.8	266313
27030	27035	WBS 124232	PUBLISH REPORT	4.0	08/14/85	09/12/85	09/12/85		0.0	26SNLA
27035M	27035M	WBS 124232	INTERFACE STUDY COMPLETE	0.0	09/12/85	09/12/85	09/12/85		0.0	26MS-3
27035	27039E	WBS 124232	UNSCHEDULED END	0.0	09/12/85	09/12/85	09/12/85		0.0	26
26535	26540	WBS 124233	PREP LTRS CRIT/G-TUN TSTS	3.0	08/22/85	09/13/85	01/09/86		15.2	266313
27330	27340	WBS 124232	SELE COMP CODE/MAKE OPER	24.0	03/26/85	09/13/85	04/02/86		27.0	26MGRC
27340	27355	WBS 243	RESTRAINT	0.0	09/13/85	09/13/85	04/02/86		27.0	26
27345	27350	WBS 124232	CONDUCT HYDRO/TH EXPM	12.0	06/19/85	09/13/85	01/08/86		15.0	26MGRC
27115	27125	WBS 124232	LIT SEARCH/ENVIRN CONDTN	1.0	09/10/85	09/17/85	10/21/85		4.8	26MMRC
26035	26040	WBS 243	PREP CDR OUTLINE	69.0	05/15/84	09/30/85	01/16/86		14.0	266311
26040M	26040M	WBS 243	START CONCEPT DESIGN	0.0	09/30/85	09/30/85	01/16/86		14.0	26MS-1
27125	27130	WBS 124232	PROCURE MATERIAL & REVIEW	3.0	09/17/85	10/08/85	11/11/85		4.8	26MMRC
27115	27120	WBS 124232	OBTAIN ALLUV&MATLS F/TSTG	8.0	09/10/85	11/05/85	11/11/85		.8	26MMRC
27120	27130	WBS 243	RESTRAINT	0.0	11/05/85	11/05/85	11/11/85		.8	26
26480	26485	WBS 124233	PREP FLD TST PLAN	36.2	03/01/85	11/14/85	11/14/85		0.0	266313
26485M	26485M	WBS 124233	DRFT FLD TST PLANS COMP	0.0	11/14/85	11/14/85	11/14/85		0.0	26MS-3
26000	26940	WBS 243	LEAD TIME	107.4	10/03/83	11/22/85	12/10/86		52.0	26
26290	26295	WBS 124231	PREP DRFT RPT RESOL ISSUS	21.0	07/01/85	11/27/85	11/27/85		0.0	266313
26450	26470	WBS 243	COMP FINAL DRFT RPT	16.6	08/01/85	11/27/85	11/27/85		0.0	26SNLA
26470	26295	WBS 243	RESTRAINT	0.0	11/27/85	11/27/85	11/27/85		0.0	26
26470M	26470M	WBS 243	PREP DSN REQ & MATL RPT	0.0	11/27/85	11/27/85	11/27/85		0.0	26MS-2
26485	26490	WBS 124233	SEND FLD TST PLANS F/REVW	2.0	11/14/85	12/02/85	10/06/86		42.2	266313
27120	27135	WBS 124232	CHAR CONSTIT USED/CONCRE	4.0	11/05/85	12/05/85	12/11/85		.8	26MMRC
27130	27135	WBS 124232	PRFM SOIL/SURF WTR ANALYS	4.0	11/05/85	12/05/85	12/11/85		.8	26MMRC
26490	26495	WBS 124233	PRETEST VERF MTG/MAN RESO	1.0	12/02/85	12/09/85	10/13/86		42.2	266313
27350	27355	WBS 124232	CONDUCT POST TST CHAR	12.0	09/13/85	12/10/85	04/02/86		15.0	26MGRC
27135	27140	WBS 124232	PREPARE SAMPLES F/TESTING	1.0	12/05/85	12/12/85	12/18/85		.8	26MMRC

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26495	26500	WBS 124233	PREP PR'S F/DATA & MONIT	1.0	12/09/85	12/16/85	12/17/86		50.2	26SNLA
26485	26530	WBS 243	LEAD TIME	4.4	11/14/85	12/18/85	12/18/85		0.0	26
26295	26300	WBS 124231	CONDUCT PEER REVIEW	4.0	11/27/85	01/06/86	01/06/86		0.0	26SNLA
0010S	27080	WBS 243	START	0.0	01/09/86	01/09/86	01/09/86	S01/09/86	0.0	26
26530	26540	WBS 124233	SELECT TST LOC IN G-TUNEL	2.0	12/18/85	01/09/86	01/09/86		0.0	266313
27140	27145	WBS 124232	CURE SAMPLES FOR 28 DAYS	4.0	12/12/85	01/17/86	01/23/86		.8	26MMRC
26495	26515	WBS 124233	PREP CONT FLD TST SUPPORT	5.0	12/09/85	01/21/86	11/17/86		42.2	266313
26485	26520	WBS 243	LEAD TIME	8.4	11/14/85	01/23/86	11/17/86		41.8	26
27355	27360	WBS 124232	COMP RESULTS EXP W/THEORY	6.0	12/10/85	01/29/86	05/14/86		15.0	26MGRC
27355	27365	WBS 124232	CALC STABLE PHASES	6.0	12/10/85	01/29/86	05/14/86		15.0	26MGRC
27360	27365	WBS 124232	RESTRAINT	0.0	01/29/86	01/29/86	05/14/86		15.0	26
26000	27440	WBS 243	LEAD TIME	116.6	10/03/83	02/06/86	09/08/86		29.8	26
26540	26545	WBS 124233	MAP DRIFT	4.0	01/09/86	02/06/86	02/06/86		0.0	26F&S
27080	27085	WBS 124232	PREP PLAN/RESIST PIPE TST	4.0	01/09/86	02/06/86	02/06/86		0.0	26MMRC
27365	27370	WBS 124232	SELECT MINERAL ASSEMBY	2.0	01/29/86	02/12/86	05/29/86		15.0	26MGRC
26545	26550	WBS 124233	DRILL MONITORING BOREHOLE	2.0	02/06/86	02/20/86	02/20/86		0.0	26REEC
26485	26870	WBS 124233	REVW RVSE PUBL FLD TST(S)	13.0	11/14/85	02/25/86	02/25/86		0.0	266313
26870M	26870M	WBS 124233	SEAL FLD TST RQMTS COMP	0.0	02/25/86	02/25/86	02/25/86		0.0	26MS-2
26870	26879E	WBS 124233	UNSCHEDULED END	0.0	02/25/86	02/25/86	02/25/86		0.0	26
27085	27090	WBS 124232	REVIEW & APPROVE PLAN	4.0	02/06/86	03/06/86	03/06/86		0.0	266313
27090	27095	WBS 243	RESTRAINT	0.0	03/06/86	03/06/86	03/20/86		2.0	26
27440	27445	WBS 124232	DEFINE QTY ROCK SAMP&SEAL	4.0	02/06/86	03/06/86	10/06/86		29.8	26MGRC
26485	26880	WBS 243	LEAD TIME	16.2	11/14/85	03/19/86	03/20/87		50.2	26
26550	26559E	WBS 124233	CONT TO DRILL MONIT BORHL	4.0	02/20/86	03/20/86	03/20/86		0.0	26REEC
27095	27100	WBS 124232	TST & DETRMN HEAT HYDRATN	3.0	03/06/86	03/27/86	04/10/86		2.0	26MMRC
26550	26555	WBS 124233	MAP FRACTURE PATT/BORHOLE	6.0	02/20/86	04/03/86	07/13/87		63.8	26TBD
27090	27100	WBS 124232	DETERM RESTRAINT VALUES	5.0	03/06/86	04/10/86	04/10/86		0.0	26MMRC
27145	27155	WBS 124232	CONDUCT FRZE THAW TST 666	12.0	01/17/86	04/11/86	01/23/87		38.8	26MMRC
27155	27175	WBS 243	RESTRAINT	0.0	04/11/86	04/11/86	01/23/87		38.8	26
26500	26505	WBS 124233	PROC DATA REQ SNSRS&MONT	16.0	12/16/85	04/15/86	04/16/87		50.2	26SNLA
26300	26305	WBS 124231	MODIFY & ISSUE REPORT	16.0	01/06/86	04/28/86	04/28/86		0.0	266313
26305M	26305M	WBS 124231	UPDATE PLAN & STATUS RPT	0.0	04/28/86	04/28/86	04/28/86		0.0	26MS-2
27100	27160	WBS 124232	PRFM CALC DETMN TEMP/PLUG	3.0	04/10/86	05/01/86	05/01/86		0.0	26MMRC
27370	27375	WBS 124232	PREP DETAILED TEST PLAN	12.0	02/12/86	05/07/86	08/22/86		15.0	26MGRC
26505	26510	WBS 124233	DELIVER&ASSEM TST HDWARE	4.0	04/15/86	05/13/86	05/14/87		50.2	26TBD
26515	26525	WBS 124233	SELECT CONTS SPT FLD TST	16.0	01/21/86	05/13/86	03/19/87		42.2	266313
26520	26525	WBS 124233	PROC COMP CODE OR DVLP MD	16.0	01/23/86	05/15/86	03/19/87		41.8	266313
0004S	26625	WBS 243	START	0.0	05/16/86	05/16/86	05/16/86	S05/16/86	0.0	26
26305	26310	WBS 124231	REVIEW REPORT	3.2	04/28/86	05/20/86	05/20/86		0.0	26DOE
26450	26455	WBS 243	PREP DRFT SEAL CDR	41.0	08/01/85	05/29/86	05/29/86		0.0	26ITC
26455M	26455M	WBS 124233	DRAFT SEALING CDR COMPLT	0.0	05/29/86	05/29/86	05/29/86		0.0	26MS-3
27375	27380	WBS 124232	REVIEW & APPROVE PLAN	4.0	05/07/86	06/05/86	09/22/86		15.0	266313
27380	27385	WBS 243	RESTRAINT	0.0	06/05/86	06/05/86	09/22/86		15.0	26
27380	27450	WBS 124232	RESTRAINT	0.0	06/05/86	06/05/86	11/03/86		21.0	26

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26310	26315	WBS 124231	CONDUCT LINE REVIEW	3.0	05/20/86	06/11/86	06/11/86		0.0	266310
26040	26045	WBS 243	PREP CONC DSN RPT DRFT	36.0	09/30/85	06/20/86	09/30/86		14.0	266310
26315	26320	WBS 124231	MODIFY REPORT	3.0	06/11/86	07/02/86	07/02/86		0.0	266313
26510	26555	WBS 124233	DTRM PERM/DISC FRACT-ZONS	8.0	05/13/86	07/10/86	07/13/87		50.2	26TBD
26880	26885	WBS 124233	UPDATE FIELD TEST PLANS	16.0	03/19/86	07/11/86	07/14/87		50.2	266313
26305	26330	WBS 124231	PREP PLAN/PERF ASSES ACTY	14.0	04/28/86	08/06/86	08/12/86		.8	266313
26320	26325	WBS 124231	PUBLISH REPORT	5.0	07/02/86	08/07/86	08/07/86		0.0	26SNLA
26325M	26325M	WBS 243	PROGRAM PLAN UPDATE COMP	0.0	08/07/86	08/07/86	08/07/86		0.0	26MS-1
26325	26329E	WBS 243	UNSCHEDUED END	0.0	08/07/86	08/07/86	08/07/86		0.0	26
0009S	26070	WBS 243	START	0.0	08/15/86	08/15/86	08/15/86	S08/15/86	.8	26
26070M	26070M	WBS 243	EST BOARD/TITLE I AE	0.0	08/15/86	08/15/86	08/21/86		.8	26MS-2
27160	27165	WBS 124232	PRFM EXPAN BAR&PIPE TESTS	16.0	05/01/86	08/25/86	08/25/86		0.0	26MMRC
26330	26335	WBS 124231	REVIEW & APPROVE PLAN	4.0	08/06/86	09/04/86	09/10/86		.8	266310
26335	26345	WBS 243	RESTRAINT	0.0	09/04/86	09/04/86	09/10/86		.8	26
26625	26630	WBS 124233	DRILL EXPLORATORY SHAFT	15.6	05/16/86	09/08/86	09/08/86		0.0	26TBD
26630	26940	WBS 243	RESTRAINT	0.0	09/08/86	09/08/86	12/10/86		13.0	26
26525	26555	WBS 124233	EXER CODE TO GAIN EXPERCE	16.0	05/15/86	09/09/86	07/13/87		41.8	26TBD
27165	27170	WBS 124232	CORRELATE DATA/MAKE PREDN	2.0	08/25/86	09/09/86	11/04/86		8.0	26MMRC
26455	26460	WBS 124233	MODIFY DRFT SEAL/CDR DOE	17.2	05/29/86	09/30/86	09/30/86		0.0	26SNLA
26460	26045	WBS 243	RESTRAINT	0.0	09/30/86	09/30/86	09/30/86		0.0	26
26460M	26460M	WBS 243	PREL RPT SEAL SUB COMP	0.0	09/30/86	09/30/86	09/30/86		0.0	26MS-2
26630	26635	WBS 124233	DRILL EXPLORATORY SHAFT	4.0	09/08/86	10/06/86	10/06/86		0.0	26REEC
26635	27445	WBS 243	RESTRAINT	0.0	10/06/86	10/06/86	10/06/86		0.0	26
26940	26945	WBS 124232	PROC MATL FROM EXPL SHAFT	4.0	09/08/86	10/06/86	01/15/87		13.0	26MMRC
26885	26890	WBS 124233	PROC EQPT&MATLS BASE SHFT	12.8	07/11/86	10/10/86	10/13/87		50.2	26SNLA
0014S	26600	WBS 243	START	0.0	10/29/86	10/29/86	10/29/86	S10/29/86	15.0	26
27385	27390	WBS 243	LEAD TIME	20.4	06/05/86	10/29/86	02/23/87		15.0	26
27445	27450	WBS 124232	PROC MATLS FOR LAB TESTS	4.0	10/06/86	11/03/86	11/03/86		0.0	26MGRC
26555	26560	WBS 124233	CONDUCT PRETST PRED CALCS	8.0	09/09/86	11/04/86	09/08/87		41.8	26TBD
27170	27175	WBS 124232	RUN FE ANALY/STRESS CONDT	10.0	09/09/86	11/18/86	01/23/87		8.0	26MMRC
26335	26340	WBS 124231	GAIN FAMLR W/COMPTR CODE	12.0	09/04/86	12/01/86	12/05/86		.8	26TBD
26335	26355	WBS 124231	SURVEY CURR HYDROGLG INFO	12.0	09/04/86	12/01/86	12/05/86		.8	266313
26340	26355	WBS 243	RESTRAINT	0.0	12/01/86	12/01/86	12/05/86		.8	26
26345	26350	WBS 124231	PREP CONC MODL/SEAL SUSYS	12.0	09/04/86	12/01/86	12/05/86		.8	266313
26350	26355	WBS 243	RESTRAINT	0.0	12/01/86	12/01/86	12/05/86		.8	26
0013S	26360	WBS 243	START	0.0	12/16/86	12/16/86	12/16/86	S12/16/86	4.6	26
26560	26565	WBS 124233	SELECT LOC/MON EQ & INSTL	6.0	11/04/86	12/18/86	10/20/87		41.8	266313
27450	30000	WBS 124232	PREPARE SAMPLES	8.0	11/03/86	01/08/87	01/08/87		0.0	26MGRC
26600	26605	WBS 124231	DEF SEAL CRIT/TITLE I DSN	9.0	10/29/86	01/12/87	04/27/87		15.0	266313
26635	26640	WBS 124233	DRILL EXPLORATORY SHAFT	13.0	10/06/86	01/15/87	01/15/87		0.0	26REEC
26640	26945	WBS 243	RESTRAINT	0.0	01/15/87	01/15/87	01/15/87		0.0	26
26640	27500	WBS 124233	RESTRAINT	0.0	01/15/87	01/15/87	01/15/87		0.0	26
27145	27150	WBS 124232	CONDUCT MORTAR BAR TESTS	50.0	01/17/86	01/19/87	01/23/87		.8	26MMRC
27145	27175	WBS 124232	CONDUCT FRZE THAW TST 671	50.0	01/17/86	01/19/87	01/23/87		.8	26MMRC

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27150	27175	WBS 243	RESTRAINT	0.0	01/19/87	01/19/87	01/23/87		.8	26
30000	30005	WBS 124232	CURE SAMPLES AT 38 C	2.0	01/08/87	01/22/87	01/22/87		0.0	26MGRC
27165	27175	WBS 124232	CONTINUE TESTING	20.0	08/25/86	01/23/87	01/23/87		0.0	26MMRC
27390	27395	WBS 124232	PREP MATL RECOMMDS REPORT	12.0	10/29/86	02/02/87	05/18/87		15.0	26MGRC
27395	26365	WBS 243	RESTRAINT	0.0	02/02/87	02/02/87	05/18/87		15.0	26
30005	30010	WBS 124232	CONDUCT STRENGTH DIFF TST	2.0	01/22/87	02/05/87	02/05/87		0.0	26MGRC
30005	30015	WBS 124232	CONT SPL CURE AT 38 C	2.0	01/22/87	02/05/87	02/05/87		0.0	26MGRC
30010	30015	WBS 243	RESTRAINT	0.0	02/05/87	02/05/87	02/05/87		0.0	26
27500	27505	WBS 243	PROCURE MATL'S FOR TSTS	4.0	01/15/87	02/12/87	02/12/87		0.0	26MGRC
30015	30020	WBS 124232	CONDUCT STRENGTH DIFF TST	2.0	02/05/87	02/19/87	03/05/87		2.0	26MGRC
30020	30025	WBS 243	RESTRAINT	0.0	02/19/87	02/19/87	03/05/87		2.0	26
26045	26050	WBS 243	CONT PREP CDR DRFT	20.2	09/30/86	03/02/87	03/02/87		0.0	266310
26050M	26050M	WBS 243	DRFT CDR AVAIL F/INT REVW	0.0	03/02/87	03/02/87	03/02/87		0.0	26MS-3
27395	27400	WBS 124232	RVW MATL RECOMMDN REPORT	4.0	02/02/87	03/02/87	07/17/87		19.4	266313
30015	30025	WBS 124232	CONT SPL CURE AT 38 C	4.0	02/05/87	03/05/87	03/05/87		0.0	26MGRC
27175	27180	WBS 124232	EVALUATE TEST RESULTS	6.0	01/23/87	03/06/87	03/06/87		0.0	26MMRC
26945	26950	WBS 124232	PROCURE ADDTL MINED SAMP	8.6	01/15/87	03/17/87	03/17/87		0.0	26MMRC
26945	26955	WBS 124232	CONDUCT CONS TSTNG/SHFT	8.6	01/15/87	03/17/87	03/17/87		0.0	26MMRC
26950	26955	WBS 243	RESTRAINT	0.0	03/17/87	03/17/87	03/17/87		0.0	26
30025	30030	WBS 124232	CONDUCT X-RAY DIFF TEST	2.0	03/05/87	03/19/87	04/02/87		2.0	26MGRC
30030	30035	WBS 243	RESTRAINT	0.0	03/19/87	03/19/87	04/02/87		2.0	26
26565	26570	WBS 124233	COND VERIF TSTG IN G-TUNL	12.0	12/18/86	03/20/87	01/22/88		41.8	266313
26460	26465	WBS 243	MODIFY REPORT	24.4	09/30/86	03/31/87	03/31/87		0.0	26SNLA
26465M	26465M	WBS 124233	SEALING CDR SENT DOE/NVO	0.0	03/31/87	03/31/87	03/31/87		0.0	26MS-2
30025	30035	WBS 124232	CONT SPL CURE AT 38 C	4.0	03/05/87	04/02/87	04/02/87		0.0	26MGRC
27505	31000	WBS 124232	PREPARE SAMPLES	8.0	02/12/87	04/09/87	04/09/87		0.0	26MGRC
30035	30040	WBS 124232	SHIP SPLS TO SNLA & TBD	1.0	04/02/87	04/09/87	12/09/87		33.8	26MGRC
26360	26365	WBS 124231	COMP SEAL SUBSYS FAIL AYS	16.0	12/16/86	04/15/87	05/18/87		4.6	266313
26485	26815	WBS 243	LEAD TIME	70.0	11/14/85	04/15/87	04/15/87		0.0	26
30035	30085	WBS 124232	CONDCT X-RAY DIFF TST	2.0	04/02/87	04/16/87	10/26/87		26.8	26MGRC
30035	30105	WBS 243	LEAD TIME	2.0	04/02/87	04/16/87	04/16/87		0.0	26
30085	30090	WBS 243	RESTRAINT	0.0	04/16/87	04/16/87	10/26/87		26.8	26
30035	27465	WBS 124232	CONDUCT BASELNE CHAR SAMP	3.0	04/02/87	04/23/87	01/07/88		34.8	26MGRC
30035	30045	WBS 124232	EQUIL TEST SPLS (ABC)	3.0	04/02/87	04/23/87	06/11/87		6.8	26MGRC
31000	31005	WBS 124232	CURE SAMPLES AT 38 C	2.0	04/09/87	04/23/87	04/23/87		0.0	26MGRC
30040	27465	WBS 124232	PERFORM UPT	3.0	04/09/87	04/30/87	01/07/88		33.8	26SNLA
30045	30050	WBS 124232	SHP SPLS (C) TO SNLA	1.0	04/23/87	04/30/87	12/09/87		30.8	26MGRC
26570	26575	WBS 124233	EVAL TST RSLTS W/PERFORM	6.0	03/20/87	05/01/87	03/04/88		41.8	266313
26575	26675	WBS 243	RESTRAINT	0.0	05/01/87	05/01/87	03/04/88		41.8	26
27400	27405	WBS 124232	RVW & INCORP COMMENTS	8.8	03/02/87	05/01/87	09/18/87		19.4	26MGRC
26605	26610	WBS 124231	DEF SEAL CRIT/TITLE I DSN	16.2	01/12/87	05/05/87	08/20/87		15.0	266313
30105	30110	WBS 124232	EQUILIBRATE SAMPLES	3.0	04/16/87	05/07/87	10/26/87		23.8	26MGRC
31005	31010	WBS 124232	COND X-RAY DIFF TEST	2.0	04/23/87	05/07/87	05/07/87		0.0	26MGRC
31005	31015	WBS 124232	CONT SAMPLE CURE AT 38 C	2.0	04/23/87	05/07/87	05/07/87		0.0	26MGRC

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31010	31015	WBS 243	RESTRAINT	0.0	05/07/87	05/07/87	05/07/87		0.0	26
26355	26365	WBS 124231	CALC EFFECT SEAL SUBSYS	22.0	12/01/86	05/12/87	05/18/87		.8	266313
30035	30090	WBS 124232	CONT SAMPLE CURE AT 38 C	6.0	04/02/87	05/14/87	10/26/87		22.8	26MGRC
30045	30055	WBS 124232	EQUIL TEST SPLS (ABC)PSU	3.0	04/23/87	05/14/87	07/02/87		6.8	26MGRC
30105	27465	WBS 124232	COND BASELN PERM TST MINI	4.0	04/16/87	05/14/87	01/07/88		31.8	26MGRC
30050	27465	WBS 124232	PERFORM UPT	3.0	04/30/87	05/21/87	01/07/88		30.8	26SNLA
30055	30060	WBS 124232	SHP SPLS (ABC) TO SNL&TBD	1.0	05/14/87	05/21/87	10/26/87		21.8	26MGRC
31015	31020	WBS 124232	COND X-RAY DIFF TEST	2.0	05/07/87	05/21/87	06/05/87		2.0	26MGRC
31020	31025	WBS 243	RESTRAINT	0.0	05/21/87	05/21/87	06/05/87		2.0	26
30090	30095	WBS 124232	COND X-RAY DIFF TEST	2.0	05/14/87	05/29/87	12/16/87		27.8	26MGRC
30095	30100	WBS 243	RESTRAINT	0.0	05/29/87	05/29/87	12/16/87		27.8	26
30105	30115	WBS 124232	EQUILIBRATE SAMPLES	6.0	04/16/87	05/29/87	05/29/87		0.0	26MGRC
26950	26960	WBS 124232	PROC ADDTL MINED SAMPLES	10.6	03/17/87	06/01/87	06/01/87		0.0	26MMRC
26955	26960	WBS 124232	CONTINUE CONSOLID TESTING	10.6	03/17/87	06/01/87	06/01/87		0.0	26MMRC
27180	27185	WBS 124232	PREPARE DRAFT REPORTS	12.0	03/06/87	06/01/87	06/01/87		0.0	26MMRC
27405	27410	WBS 124232	REVIEW & APPROVE	4.0	05/01/87	06/01/87	10/16/87		19.4	266313
27410	26615	WBS 243	RESTRAINT	0.0	06/01/87	06/01/87	10/16/87		19.4	26
27410M	27410M	WBS 124232	RECOMM SEAL MATL RPT DSN	0.0	06/01/87	06/01/87	10/16/87		19.4	26MS-3
27410	27415	WBS 243	RESTRAINT	0.0	06/01/87	06/01/87	02/26/88		36.8	26
26640	26645	WBS 124233	COMP DRILL OF EXPLOR SHFT	19.6	01/15/87	06/03/87	06/22/87		2.6	26REEC
26645	26649E	WBS 243	SCHEDULED END	0.0	06/03/87	06/03/87	07/10/87	07/10/87	5.2	26
30045	27465	WBS 124232	CHAR SAMPLE(C) SAT PERMEA	6.0	04/23/87	06/05/87	01/07/88		28.8	26MGRC
31015	31025	WBS 124232	CONT SAMPLE CURE AT 38 C	4.0	05/07/87	06/05/87	06/05/87		0.0	26MGRC
31025	31030	WBS 124232	COND X-RAY DIFF TEST	2.0	06/05/87	06/19/87	07/06/87		2.0	26MGRC
31030	31035	WBS 243	RESTRAINT	0.0	06/19/87	06/19/87	07/06/87		2.0	26
30055	27465	WBS 124232	CHARACT SPLS (ABC)	6.0	05/14/87	06/26/87	01/07/88		25.8	26MGRC
30055	30065	WBS 124232	EQUIL TEST SAMPLES	6.0	05/14/87	06/26/87	08/14/87		6.8	26MGRC
26070	26080	WBS 243	PREP RFQ/EVAL SELECT AE	43.4	08/15/86	06/30/87	07/07/87		.8	266310
26080M	26080M	WBS 243	SELECT TITLE I AE	0.0	06/30/87	06/30/87	07/07/87		.8	26MS-1
26610	26615	WBS 124231	DEF SEAL CRIT/TITLE I DSN	8.0	05/05/87	07/01/87	10/16/87		15.0	266313
30065	30080	WBS 124232	SHP SPLS (ABC) TO SNLA	1.0	06/26/87	07/06/87	10/26/87		15.8	26MGRC
30090	30100	WBS 124232	CONT SAMPLE CURE AT 38 C	7.0	05/14/87	07/06/87	12/16/87		22.8	26MGRC
31025	31035	WBS 124232	CONT SAMPLE CURE AT 38 C	4.0	06/05/87	07/06/87	07/06/87		0.0	26MGRC
30110	27465	WBS 124232	PERF PERM MEASUREMENT	9.0	05/07/87	07/13/87	01/07/88		23.8	26MGRC
30115	30120	WBS 124232	EQUILIBRATE SAMPLES	6.0	05/29/87	07/13/87	07/13/87		0.0	26MGRC
31035	31040	WBS 124232	SHIP SAMPLES TO SNL & TBD	1.0	07/06/87	07/13/87	02/26/88		31.0	26MGRC
26960	26965	WBS 124232	CONTINUE CONSOLIDTN TSTNG	6.4	06/01/87	07/16/87	07/16/87		0.0	26MMRC
30100	27465	WBS 124232	CONDUCT X-RAY DIFF TSTS	2.0	07/06/87	07/20/87	01/07/88		22.8	26MGRC
31035	31085	WBS 124232	COND X-RAY DIFF TEST	2.0	07/06/87	07/20/87	01/15/88		24.0	26MGRC
31035	31105	WBS 243	LEAD TIME	2.0	07/06/87	07/20/87	07/20/87		0.0	26
31085	31090	WBS 243	RESTRAINT	0.0	07/20/87	07/20/87	01/15/88		24.0	26
30060	27465	WBS 124232	PERFORM UPT	9.0	05/21/87	07/27/87	01/07/88		21.8	26SNLA
31035	27520	WBS 124232	COND BASELN CHAR SAMPLES	3.0	07/06/87	07/27/87	03/18/88		32.0	26MGRC
31035	31045	WBS 124232	EQUIL TEST SAMPLES (ABC)	3.0	07/06/87	07/27/87	08/24/87		4.0	26MGRC

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26050	26055	WBS 243	PREP CDR F/SUB DOE	21.4	03/02/87	07/31/87	07/31/87		0.0	26SNLA
26055M	26055M	WBS 243	SUBMIT CDR TO DOE/NVO	0.0	07/31/87	07/31/87	07/31/87		0.0	26MS-1
30115	27465	WBS 124232	PERF PERM MEASUREMENT	9.0	05/29/87	08/03/87	01/07/88		20.8	26MGRC
31040	27520	WBS 124232	PERFORM UPT	3.0	07/13/87	08/03/87	03/18/88		31.0	26SNLA
31045	31050	WBS 124232	SHIP SPLS (C) TO SNL TBD	1.0	07/27/87	08/03/87	02/26/88		28.0	26MGRC
26365	26370	WBS 124231	DVLP SCENARIOS F/TRANSPRT	12.0	05/12/87	08/06/87	08/12/87		.8	266313
30065	27465	WBS 124232	CHARACT SAMPLES (ABC)	6.0	06/26/87	08/10/87	01/07/88		19.8	26MGRC
31105	31110	WBS 124232	EQUILIBRATE SAMPLES	3.0	07/20/87	08/10/87	01/15/88		21.0	26MGRC
26615	26375	WBS 124231	RESTRAINT	0.0	08/13/87	08/13/87	11/05/87		11.8	26
26965	26970	WBS 124232	EVAL TSTNG RSLTS/EST CRIT	4.0	07/16/87	08/13/87	10/16/87		9.0	266313
26970	26615	WBS 243	RESTRAINT	0.0	08/13/87	08/13/87	10/16/87		9.0	26
26815	26820	WBS 124233	ESTAB ADDL RQMNTS TST PLN	17.2	04/15/87	08/17/87	08/17/87		0.0	266313
31035	31090	WBS 124232	CONT SAMPLE CURE AT 38 C	6.0	07/06/87	08/17/87	01/15/88		20.0	26MGRC
31045	31055	WBS 124232	EQUIL TEST SPLS (ABC)	3.0	07/27/87	08/17/87	09/15/87		4.0	26MGRC
31105	27520	WBS 124232	COND X-RAY DIFF TEST	4.0	07/20/87	08/17/87	03/18/88		29.0	26MGRC
26575	26580	WBS 124233	PREP RPT G-TUNN VERIF TST	15.2	05/01/87	08/19/87	08/02/88		47.6	266313
26580M	26580M	WBS 124233	PREL DRFT G-TUNN TST COMP	0.0	08/19/87	08/19/87	08/02/88		47.6	26MS-3
26465	26469E	WBS 124233	PREP REVISE PUB CDR	20.0	03/31/87	08/20/87	08/20/87		0.0	266310
31050	27520	WBS 124232	PERFORM UPT	3.0	08/03/87	08/24/87	03/18/88		28.0	26MGRC
31055	31060	WBS 124232	SHIP SPLS (ABC) TO SNLA	1.0	08/17/87	08/24/87	01/15/88		19.0	26MGRC
31090	31095	WBS 124232	COND X-RAY DIFF TEST	2.0	08/17/87	08/31/87	03/04/88		25.0	26MGRC
31095	31100	WBS 243	RESTRAINT	0.0	08/31/87	08/31/87	03/04/88		25.0	26
31105	31115	WBS 124232	EQUILIBRATE SAMPLES	6.0	07/20/87	08/31/87	08/31/87		0.0	26MGRC
30080	27465	WBS 124232	PERFORM UPT	9.0	07/06/87	09/08/87	01/07/88		15.8	26SNLA
31045	27520	WBS 124232	CHAR SAMPLE(C) SAT PERMEA	6.0	07/27/87	09/08/87	03/18/88		26.0	26PSU
0007S	26650	WBS 243	START	0.0	09/15/87	09/15/87	09/15/87	S09/15/87	0.0	26
30120	27465	WBS 124232	PERF PERM MEASUREMENT	9.0	07/13/87	09/15/87	01/07/88		14.8	26MGRC
26580	26585	WBS 124233	REVIEW & COMMENT	4.0	08/19/87	09/17/87	08/30/88		47.6	266310
30065	30070	WBS 124232	EQUIL TEST SPLS (ABC)	12.0	06/26/87	09/22/87	11/09/87		6.8	26MGRC
26645	26655	WBS 243	MINE DRIFTS	15.8	06/03/87	09/24/87	10/13/87		2.6	26CONT
30070	30075	WBS 124232	SHP SPLS (AB) TO SNLA	1.0	09/22/87	09/29/87	11/16/87		6.8	26MGRC
31055	27520	WBS 124232	CHARACTERIZE SAMPLES(ABC)	6.0	08/17/87	09/29/87	03/18/88		23.0	26MGRC
31055	31065	WBS 124232	EQUIL TEST SAMPLES	6.0	08/17/87	09/29/87	10/27/87		4.0	26MGRC
26615	26620	WBS 124231	CONT TO DEFINE SEAL CRIT	6.6	08/13/87	09/30/87	12/04/87		9.0	266313
26620	26075	WBS 243	RESTRAINT	0.0	09/30/87	09/30/87	12/04/87		9.0	26
26620M	26620M	WBS 124231	TITLE I SEAL CRIT COMPETE	0.0	09/30/87	09/30/87	12/04/87		9.0	26MS-2
27185	27190	WBS 124232	INTERNAL SNLA REVIEW	17.0	06/01/87	09/30/87	09/30/87		0.0	266310
30120	30125	WBS 124232	EQUILIBRATE SAMPLES	12.0	07/13/87	10/06/87	10/06/87		0.0	26MGRC
31065	31080	WBS 124232	SHIP SPLS (ABC) TO SNLA	1.0	09/29/87	10/06/87	01/15/88		13.0	26MGRC
31090	31100	WBS 124232	CONT SAMPLE CURE AT 38 C	7.0	08/17/87	10/06/87	03/04/88		20.0	26MGRC
26965	26975	WBS 124232	PREP RPT CONS SHFT FILL	12.0	07/16/87	10/09/87	10/09/87		0.0	26MGRC
26650	26655	WBS 124233	PREP LTRS CRIT/EXPL BRHLS	4.0	09/15/87	10/13/87	10/13/87		0.0	266313
26655	26890	WBS 124233	RESTRAINT	0.0	10/13/87	10/13/87	10/13/87		0.0	26
31110	27520	WBS 124232	PERF PERM MEASUREMENT	9.0	08/10/87	10/13/87	03/18/88		21.0	26MGRC

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31115	31120	WBS 124232	EQUILIBRATE SAMPLES	6.0	08/31/87	10/13/87	10/13/87		0.0	26MGRC
31100	27520	WBS 124232	COND BASELINE PERM TEST	2.0	10/06/87	10/20/87	03/18/88		20.0	26PSU
31060	27520	WBS 124232	PERFORM UPT	9.0	08/24/87	10/27/87	03/18/88		19.0	26SNLA
27190	27195	WBS 124232	DOE REVIEW	4.0	09/30/87	10/28/87	10/28/87		0.0	26DOE
26370	26375	WBS 124231	DVLP DEGRAD SEAL SUB MODL	12.0	08/06/87	10/30/87	11/05/87		.8	266313
26585	26590	WBS 124233	REVISE & INCORP COMMENTS	6.2	09/17/87	10/30/87	10/13/88		47.6	266313
30070	27465	WBS 124232	CHARACTERIZE SAMPLES	6.0	09/22/87	11/03/87	01/07/88		7.8	26MGRC
31115	27520	WBS 124232	PERF PERM MEASUREMENT	9.0	08/31/87	11/03/87	03/18/88		18.0	26MGRC
26975	26980	WBS 124232	REVIEW REPORT	4.2	10/09/87	11/09/87	11/09/87		0.0	266313
30075	27465	WBS 124232	PERFORM UPT	6.0	09/29/87	11/10/87	01/07/88		6.8	26SNLA
31065	27520	WBS 124232	CHARACTERIZE SPLS (ABC)	6.0	09/29/87	11/10/87	03/18/88		17.0	26MGRC
27195	27200	WBS 124232	FINAL REVIEW & APPROVAL	2.0	10/28/87	11/11/87	11/11/87		0.0	266310
0008S	26660	WBS 243	START	0.0	11/17/87	11/17/87	11/17/87	S11/17/87	0.0	26
26045	26075	WBS 243	PREPARE TITLE I DSN CRITA	58.2	09/30/86	11/30/87	12/04/87		.8	266310
26075M	26075M	WBS 243	COMP TITLE I DSN CRITERIA	0.0	11/30/87	11/30/87	12/04/87		.8	26MS-1
26980	26985	WBS 124232	REVISE&INCORPORATE COMNTS	4.0	11/09/87	12/09/87	12/09/87		0.0	266313
26655	26665	WBS 124233	DRILL EXPL BRHOL/SEL DRFT	8.0	10/13/87	12/10/87	01/08/88		3.0	26REEC
31080	27520	WBS 124232	PERFORM UPT	9.0	10/06/87	12/10/87	03/18/88		13.0	26SNLA
26890	26895	WBS 124233	SET SEALS&CURE 4 LOCATNS	8.6	10/13/87	12/15/87	12/15/87		0.0	26SNLA
31120	27520	WBS 124232	PERF PERM MEASUREMENT	9.0	10/13/87	12/17/87	03/18/88		12.0	26MGRC
26590	26595	WBS 124233	FINAL APPROVAL	6.8	10/30/87	12/21/87	12/02/88		47.6	266310
26595M	26595M	WBS 124233	G-TUNN DRAIN TST RPT COMP	0.0	12/21/87	12/21/87	12/02/88		47.6	26MS-3
26595	26695	WBS 243	RESTRAINT	0.0	12/21/87	12/21/87	12/02/88		47.6	26
26055	26060	WBS 243	PREP REVISED CDR & PUBLSH	20.2	07/31/87	12/24/87	12/24/87		0.0	266310
26060	26069E	WBS 243	UNSCHEDULED END	0.0	12/24/87	12/24/87	12/24/87		0.0	26
31065	31070	WBS 124232	EQUIL TEST SAMPLES (ABC)	12.0	09/29/87	12/24/87	01/29/88		4.0	26MGRC
27200	27205	WBS 124232	PRINT REPORTS	6.0	11/11/87	01/04/88	01/04/88		0.0	26SNLA
27205	26380	WBS 243	RESTRAINT	0.0	01/04/88	01/04/88	01/20/88		2.4	26
27205M	27205M	WBS 124232	RPTS SUSCEPT/RST TST COMP	0.0	01/04/88	01/04/88	01/04/88		0.0	26MS-3
27465	26385	WBS 243	RESTRAINT	0.0	01/07/88	01/07/88	05/03/88		16.6	26
27465	27415	WBS 243	RESTRAINT	0.0	01/07/88	01/07/88	02/26/88		7.2	26
27465M	27465M	WBS 124232	LAB LONG TST COMPLTE (I)	0.0	01/07/88	01/07/88	01/07/88		0.0	26MS-4
30125	27465	WBS 124232	PERF PERM MEASUREMENT	11.8	10/06/87	01/07/88	01/07/88		0.0	26MGRC
26660	26665	WBS 124233	PREP LTRS ACTIV F/FLD TST	6.0	11/17/87	01/08/88	01/08/88		0.0	266313
31070	31075	WBS 124232	SHIP SPLS (AB) TO SNLA	1.0	12/24/87	01/08/88	02/05/88		4.0	26MGRC
26375	26380	WBS 124231	CALC EFFECT DEGRDED MODEL	9.2	10/30/87	01/14/88	01/20/88		.8	266313
31120	31125	WBS 124232	EQUILIBRATE SAMPLES	12.0	10/13/87	01/15/88	01/15/88		0.0	26MGRC
26985	26990	WBS 124232	REVIEW & APPROVAL	4.4	12/09/87	01/18/88	01/18/88		0.0	266310
26990M	26990M	WBS 124232	CONSOLID BEHAVR RPT COMP	0.0	01/18/88	01/18/88	01/18/88		0.0	26MS-3
26990	26999E	WBS 124232	UNSCHEDULED END	0.0	01/18/88	01/18/88	01/18/88		0.0	26
26820	26825	WBS 124233	PROC&FAB PARTS TST EQPT	20.4	08/17/87	01/19/88	01/19/88		0.0	26MMRC
26895	26900	WBS 124233	OVERCORE SEAL	4.2	12/15/87	01/21/88	01/21/88		0.0	26REEC
26665	26670	WBS 124233	MINE DRIFT	4.0	01/08/88	02/05/88	02/05/88		0.0	26REEC
31070	27520	WBS 124232	CHARACTERIZE SAMPLES	6.0	12/24/87	02/12/88	03/18/88		5.0	26MGRC

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27465	27470	WBS 124232	EVALUATE TEST RESULTS	6.0	01/07/88	02/18/88	02/18/88		0.0	26MGRC
31075	27520	WBS 124232	PERFORM UPT	6.0	01/08/88	02/19/88	03/18/88		4.0	26SNLA
26075	26085	WBS 243	INTERNAL RVW&APPROVAL	11.6	11/30/87	02/26/88	03/03/88		.8	266310
26080	26085	WBS 243	PLACE CONTRACT WITH AE	32.6	06/30/87	02/26/88	03/03/88		.8	266310
26085M	26085M	WBS 243	BEGIN TITLE I DESIGN	0.0	02/26/88	02/26/88	03/03/88		.8	26MS-1
27205	27415	WBS 243	RESTRAINT	7.8	01/04/88	02/26/88	02/26/88		0.0	26
26670	26675	WBS 124233	MAP DRIFT IN EXPLOR SHAFT	4.0	02/05/88	03/04/88	03/04/88		0.0	26F&S
26820	26830	WBS 124233	PROC MATLS FLT SEAL&BRHOL	28.8	08/17/87	03/17/88	03/17/88		0.0	26MMRC
26825	26830	WBS 124233	FIELD TEST EQUIPMENT	8.4	01/19/88	03/17/88	03/17/88		0.0	26MMRC
27520	27425	WBS 124232	RESTRAINT	0.0	03/18/88	03/18/88	06/29/88		14.4	26
27520M	27520M	WBS 124232	LAB LONG TST COMP (II)	0.0	03/18/88	03/18/88	03/18/88		0.0	26MS-4
31125	27520	WBS 124232	PERF PERM MEASUREMENT	9.0	01/15/88	03/18/88	03/18/88		0.0	26MGRC
26900	26905	WBS 124233	CHARACTERIZE CORE	8.4	01/21/88	03/21/88	03/21/88		0.0	26MGRC
0012S	26140	WBS 243	START	0.0	03/31/88	03/31/88	03/31/88	S03/31/88	.8	26
26675	26715	WBS 124233	SELECT BRHLE&TST SECT LOC	4.0	03/04/88	04/01/88	04/01/88		0.0	266313
26715	26720	WBS 124233	DRILL MONITORING BOREHLS	2.0	04/01/88	04/15/88	04/15/88		0.0	26REEC
26085	26090	WBS 243	DEVELP TITLE I DESIGN	8.4	02/26/88	04/26/88	11/08/88		27.4	266310
26380	26385	WBS 124231	CALC EFFECT DEGRAD MODEL	14.8	01/14/88	04/27/88	05/03/88		.8	266313
27520	27525	WBS 124232	EVALUATE TEST RESULTS	6.0	03/18/88	04/29/88	04/29/88		0.0	26MGRC
27525	26400	WBS 243	RESTRAINT	0.0	04/29/88	04/29/88	09/19/88		19.6	26
26830	26835	WBS 124233	CONDUCT FLD TST/EMPL SEAL	8.4	03/17/88	05/16/88	05/16/88		0.0	266313
26720	26735	WBS 124233	VERIFY FINAL EFCT MONSYS	6.0	04/15/88	05/27/88	09/07/88		14.0	266313
26720	26740	WBS 124233	CONTINUE TO DRILL BOREHOL	6.0	04/15/88	05/27/88	09/07/88		14.0	26REEC
26735	26740	WBS 243	RESTRAINT	0.0	05/27/88	05/27/88	09/07/88		14.0	26
26740	26745	WBS 243	RESTRAINT	0.0	05/27/88	05/27/88	09/07/88		14.0	26
27415	27420	WBS 124232	PREP UPDATE MATL RECM RPT	13.0	02/26/88	05/27/88	05/27/88		0.0	266313
27420	26390	WBS 243	RESTRAINT	0.0	05/27/88	05/27/88	06/22/88		3.4	26
27470	27475	WBS 124232	PREPARE DRAFT REPORT	14.2	02/18/88	05/27/88	05/27/88		0.0	26MGRC
26720	26730	WBS 124233	MAP FRACTURE PATTN/BRHOLS	8.0	04/15/88	06/13/88	06/27/88		2.0	26TBD
26730	26725	WBS 243	RESTRAINT	0.0	06/13/88	06/13/88	06/27/88		2.0	26
26385	26390	WBS 124231	PREP RPT SEAL SYS PERFORM	7.0	04/27/88	06/16/88	06/22/88		.8	266313
26675	26680	WBS 124233	INIT PRETST PRED WTR FLOW	16.0	03/04/88	06/27/88	06/27/88		0.0	26TBD
26720	26725	WBS 124233	DETMN PERM/FRACT OR ZONES	10.0	04/15/88	06/27/88	06/27/88		0.0	266313
26725	26680	WBS 243	RESTRAINT	0.0	06/27/88	06/27/88	06/27/88		0.0	26
27420	27425	WBS 124232	REVIEW REPORT	4.4	05/27/88	06/29/88	06/29/88		0.0	266310
26730	26695	WBS 124233	PREP DRFT RPT/FRACT PATTN	4.0	06/13/88	07/12/88	12/02/88		20.0	266313
27525	27530	WBS 124232	PREPARE DRAFT REPORT	10.0	04/29/88	07/12/88	07/12/88		0.0	26MGRC
27530	26010	WBS 243	RESTRAINT	0.0	07/12/88	07/12/88	05/11/89		41.6	26
27530	26100	WBS 243	RESTRAINT	0.0	07/12/88	07/12/88	04/07/89		36.8	26
27530	26120	WBS 243	RESTRAINT	0.0	07/12/88	07/12/88	04/07/89		36.8	26
27530	26150	WBS 243	RESTRAINT	0.0	07/12/88	07/12/88	04/07/89		36.8	26
26390	26395	WBS 124231	COMP RPT SEAL SYS PRF RPT	6.2	06/16/88	08/01/88	08/05/88		.8	266313
26680	26685	WBS 124233	CONTINUE PRETEST CALCULTS	8.0	06/27/88	08/23/88	08/23/88		0.0	26TBD
27425	27430	WBS 124232	REVISE&INCORPOR COMMENTS	9.4	06/29/88	09/06/88	09/06/88		0.0	266313

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27430	26090	WBS 243	RESTRAINT	0.0	09/06/88	09/06/88	11/08/88		9.0	26
26685	26745	WBS 124233	ESTAB FINAL LOC/EQP&BRHOL	2.0	08/23/88	09/07/88	09/07/88		0.0	266313
26395	26400	WBS 124231	REVIEW REPORT	6.0	08/01/88	09/13/88	09/19/88		.8	266310
26835	26840	WBS 124233	CONDUCT FLD TST/SEAL TST	17.2	05/16/88	09/16/88	09/16/88		0.0	266313
27475	27480	WBS 124232	INTERNAL SNLA REVIEW	18.0	05/27/88	10/05/88	10/05/88		0.0	266310
26685	26690	WBS 124233	PRFM HYDRO CALCS/FR DRAIN	8.6	08/23/88	10/24/88	12/02/88		5.4	26TBD
26690	26695	WBS 243	RESTRAINT	0.0	10/24/88	10/24/88	12/02/88		5.4	26
26400	26405	WBS 124231	INCORP COMMENTS/RVSE RPT	6.0	09/13/88	10/25/88	10/31/88		.8	266313
27430	27435	WBS 124232	RVW&APPVL/MATL RECMM RPT	8.0	09/06/88	11/01/88	11/01/88		0.0	266310
27435M	27435M	WBS 124232	FINAL RECOMM/TITLE I COMP	0.0	11/01/88	11/01/88	11/01/88		0.0	26MS-3
27435	27439E	WBS 124232	UNSCHEDULED END	0.0	11/01/88	11/01/88	11/01/88		0.0	26
26745	26750	WBS 124233	INSTALL MONITORING EQPT	8.0	09/07/88	11/02/88	11/02/88		0.0	26SNLA
27480	27485	WBS 124232	DOE REVIEW	4.0	10/05/88	11/02/88	11/02/88		0.0	26DOE
26405	26410	WBS 124231	FINAL REVIEW & APPROVAL	2.2	10/25/88	11/09/88	11/15/88		.8	266310
27485	27490	WBS 124232	FINAL REVIEW & APPROVAL	2.0	11/02/88	11/16/88	11/16/88		0.0	266310
26690	26765	WBS 124233	PREPARE LETTER OF CRITERA	4.0	10/24/88	11/21/88	02/20/89		11.4	266313
26750	26755	WBS 124233	CONDUCT FLOW EXPERIMENT	4.0	11/02/88	12/02/88	12/02/88		0.0	266313
26755	26695	WBS 243	RESTRAINT	0.0	12/02/88	12/02/88	12/02/88		0.0	26
27530	27535	WBS 124232	INTERNAL SNLA REVIEW	20.0	07/12/88	12/02/88	12/02/88		0.0	266310
26410	26415	WBS 124231	REVIEW BY DOE/NVO	4.0	11/09/88	12/09/88	12/15/88		.8	26DOE
26840	26845	WBS 124233	PREP DRFT RPT/FLT SEAL	11.6	09/16/88	12/09/88	12/09/88		0.0	266313
26845	26010	WBS 243	RESTRAINT	0.0	12/09/88	12/09/88	05/11/89		20.6	26
26845	26125	WBS 243	RESTRAINT	0.0	12/09/88	12/09/88	06/05/89		23.8	26
26845	26155	WBS 243	RESTRAINT	0.0	12/09/88	12/09/88	06/05/89		23.8	26
26905	26910	WBS 124233	FIELD CURE TIME	37.8	03/21/88	12/16/88	12/16/88		0.0	26MGRC
27490	27495	WBS 124232	PRINT REPORT	6.0	11/16/88	01/09/89	01/09/89		0.0	26SNLA
27495M	27495M	WBS 124232	REPORT SEAL MATL/TOP COMP	0.0	01/09/89	01/09/89	01/09/89		0.0	26MS-3
27495	27499E	WBS 124232	UNSCHEDULED END	0.0	01/09/89	01/09/89	01/09/89		0.0	26
27535	27540	WBS 124232	DOE REVIEW	4.0	12/02/88	01/09/89	01/09/89		0.0	26DOE
26845	26850	WBS 124233	REVIEW & COMMENT	4.6	12/09/88	01/19/89	01/19/89		0.0	266310
26755	26760	WBS 124233	DRILL&GROUT HOLES INZONE	6.0	12/02/88	01/23/89	01/23/89		0.0	26REEC
27540	27545	WBS 124232	FINAL REVIEW & APPROVAL	2.0	01/09/89	01/23/89	01/23/89		0.0	266310
26910	26915	WBS 124233	OVERCORE SEAL	4.2	12/16/88	01/24/89	01/24/89		0.0	26REEC
26090	26100	WBS 243	DEVELP TITLE I DESIGN	20.0	09/06/88	02/03/89	04/07/89		9.0	266310
26415	26420	WBS 124231	INCORP DOE REVIEW COMMNTS	7.0	12/09/88	02/06/89	02/10/89		.8	266313
26850	26855	WBS 124233	REVISE&INCORPORATE COMNTS	4.0	01/19/89	02/16/89	02/16/89		0.0	266313
26695	26700	WBS 124233	INIT PREP DRFT RPT FAULT	10.0	12/02/88	02/20/89	02/20/89		0.0	266313
26760	26765	WBS 124233	CONDUCT FLOW EXPERIMENTS	4.0	01/23/89	02/20/89	02/20/89		0.0	266313
26765	26700	WBS 243	RESTRAINT	0.0	02/20/89	02/20/89	02/20/89		0.0	26
26765	26770	WBS 124233	CONSTRUCT FR DRAINS/SPOT	4.0	02/20/89	03/20/89	03/20/89		0.0	26REEC
27545	27550	WBS 124232	PRINT REPORT	8.0	01/23/89	03/20/89	03/20/89		0.0	26SNLA
27550M	27550M	WBS 124232	RPT COMPAT SEAL MATL/CALC	0.0	03/20/89	03/20/89	03/20/89		0.0	26MS-3
27550	27559E	WBS 124232	UNSCHEDULED END	0.0	03/20/89	03/20/89	03/20/89		0.0	26
26915	26920	WBS 124233	CHARACTERIZE CORE	8.4	01/24/89	03/23/89	03/23/89		0.0	26MGRC

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26855	26860	WBS 124233	FINAL APPROVAL	6.0	02/16/89	03/30/89	03/30/89		0.0	266310
26860M	26860M	WBS 124233	FAULT SEAL TEST RPT COMP	0.0	03/30/89	03/30/89	03/30/89		0.0	26MS-3
26860	26869E	WBS 124233	UNSCHEDULED END	0.0	03/30/89	03/30/89	03/30/89		0.0	26
26085	26120	WBS 243	DVLP TITLE I DSN/COMPONTS	55.0	02/26/88	04/03/89	04/07/89		.8	266310
26140	26150	WBS 243	ORGANIZE INPUT/DRFT PSAR	50.2	03/31/88	04/03/89	04/07/89		.8	266312
26420	26425	WBS 124231	FINAL REVIEW,APPRVL&PUBLH	8.0	02/06/89	04/03/89	04/07/89		.8	26SNLA
26425	26010	WBS 243	RESTRAINT	0.0	04/03/89	04/03/89	05/11/89		5.6	26
26425	26100	WBS 243	RESTRAINT	0.0	04/03/89	04/03/89	04/07/89		.8	26
26425	26120	WBS 243	RESTRAINT	0.0	04/03/89	04/03/89	04/07/89		.8	26
26425	26150	WBS 243	RESTRAINT	0.0	04/03/89	04/03/89	04/07/89		.8	26
26425M	26425M	WBS 243	RPT SEAL SUBSYS PFM COMP	0.0	04/03/89	04/03/89	04/07/89		.8	26MS-2
26700	26705	WBS 124233	CONTINUE DRFT RPT PREPATN	8.0	02/20/89	04/17/89	04/17/89		0.0	266313
26770	26775	WBS 124233	CONDUCT FLOW EXPERIMENT	4.0	03/20/89	04/17/89	04/17/89		0.0	266313
26775	26705	WBS 243	RESTRAINT	0.0	04/17/89	04/17/89	04/17/89		0.0	26
26000	26010	WBS 243	PREP&UPDATE SCP/DEIS	280.0	10/03/83	05/11/89	05/11/89		0.0	266312
26775	26780	WBS 124233	OBTAIN CORE FROM GROUT ZN	4.0	04/17/89	05/15/89	05/15/89		0.0	26REEC
26120	26125	WBS 243	CONTINUE TITLE I DESIGN	8.0	04/03/89	05/30/89	06/05/89		.8	266310
26150	26155	WBS 243	CONTINUE INPUT/DRFT PSAR	8.0	04/03/89	05/30/89	06/05/89		.8	266312
26705	26710	WBS 124233	CONTINUE DRFT RPT PREPATN	12.0	04/17/89	07/12/89	07/12/89		0.0	266313
26775	26785	WBS 124233	PRFORM POST-TEST EVALUTON	12.0	04/17/89	07/12/89	07/12/89		0.0	266313
26780	26785	WBS 124233	CHARACTERIZE GROUTED ZONE	8.0	05/15/89	07/12/89	07/12/89		0.0	26MGRC
26785	26710	WBS 243	RESTRAINT	0.0	07/12/89	07/12/89	07/12/89		0.0	26
26710	26790	WBS 124233	CONT DRFT RPT PREPARATION	4.0	07/12/89	08/09/89	08/09/89		0.0	266313
26785	26790	WBS 124233	COMPLETE POST-TST EVALUAT	4.0	07/12/89	08/09/89	08/09/89		0.0	266313
26010	26015	WBS 243	CONTINUE PREP OF DEIS	15.8	05/11/89	09/01/89	09/01/89		0.0	266312
26015M	26015M	WBS 243	DRAFT DEIS COMPLETE	0.0	09/01/89	09/01/89	09/01/89		0.0	26MS-1
26015	26020	WBS 243	CONDUCT PUBLIC HEARINGS	5.0	09/01/89	10/09/89	10/09/89		0.0	26DOE
26020M	26020M	WBS 243	DEIS HEARINGS COMPLETE	0.0	10/09/89	10/09/89	10/09/89		0.0	26MS-1
26100	26105	WBS 243	DEVELOP TITLE I DESIGN	28.2	04/03/89	10/20/89	10/26/89		.8	266310
26125	26130	WBS 243	CONT TIT I DSN CEIL CMP	20.2	05/30/89	10/20/89	10/26/89		.8	266310
26155	26165	WBS 243	CONT INPUT&BEGN PREP PSAR	20.2	05/30/89	10/20/89	10/26/89		.8	266312
26790	26795	WBS 124233	COMPLETE DRAFT REPORT	11.0	08/09/89	10/26/89	10/26/89		0.0	266313
26795	26105	WBS 243	RESTRAINT	0.0	10/26/89	10/26/89	10/26/89		0.0	26
26795	26130	WBS 243	RESTRAINT	0.0	10/26/89	10/26/89	10/26/89		0.0	26
26795	26165	WBS 243	RESTRAINT	0.0	10/26/89	10/26/89	10/26/89		0.0	26
26795	26800	WBS 124233	RVW&COMNT FULT SEAL TST	3.4	10/26/89	11/20/89	11/20/89		0.0	266310
26920	26925	WBS 124233	FIELD CURE TIME	37.6	03/23/89	12/19/89	12/19/89		0.0	26MGRC
26105	26110	WBS 243	DVLP TIT I DSN	8.0	10/26/89	01/02/90	01/02/90		0.0	266310
26130	26135	WBS 243	CONT TIT I DSN CEIL CMP	8.0	10/26/89	01/02/90	01/02/90		0.0	266310
26135	26110	WBS 243	RESTRAINT	0.0	01/02/90	01/02/90	01/02/90		0.0	26
26135M	26135M	WBS 243	TITLE I SEAL DSN COMPLETE	0.0	01/02/90	01/02/90	01/02/90		0.0	26MS-2
26135	26170	WBS 243	RESTRAINT	0.0	01/02/90	01/02/90	02/01/90		4.4	26
26800	26805	WBS 124233	REVISE&INCORPORATE COMNTS	6.2	11/20/89	01/12/90	01/12/90		0.0	266313
26925	26930	WBS 124233	OVERCORE SEAL	4.0	12/19/89	01/24/90	01/24/90		0.0	26REEC

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BY EXPECTED DATE AND PREDECESSOR EVENT NUMBER
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EVENT PRED	EVENT SUCC	NETWORK OR INTERFACE	ACTIVITY DESCRIPTION	TIME EST	EXPECTED START	EXPECTED FINISH	LATEST ALLOWED	*ACT/SCHD DATE	SLACK	ORG/ AGEN
26110	26112	WBS 243	DEVELOP TITLE I DESIGN	4.4	01/02/90	02/01/90	02/01/90		0.0	266310
26112M	26112M	WBS 243	TITLE I DESIGN COMPLETE	0.0	02/01/90	02/01/90	02/01/90		0.0	26MS-1
26112	26170	WBS 243	RESTRAINT	0.0	02/01/90	02/01/90	02/01/90		0.0	26
26165	26170	WBS 243	CONT PREP PSAR	12.4	10/26/89	02/01/90	02/01/90		0.0	266311
26805	26810	WBS 124233	FINAL APPROVAL	4.0	01/12/90	02/09/90	02/09/90		0.0	266310
26810M	26810M	WBS 124233	FLT SEAL DRN TST RPT COMP	0.0	02/09/90	02/09/90	02/09/90		0.0	26MS-3
26810	26819E	WBS 243	UNSCHEDULED END	0.0	02/09/90	02/09/90	02/09/90		0.0	26
26020	26030	WBS 243	UPDATE DEIS	19.0	10/09/89	03/01/90	03/01/90		0.0	266312
26030M	26030M	WBS 243	FEIS PUBLISHED	0.0	03/01/90	03/01/90	03/01/90		0.0	26MS-1
26930	26939E	WBS 124233	CHARACTERIZE SEAL	8.6	01/24/90	03/26/90	03/26/90		0.0	26MGRC
26030	26180	WBS 243	LEAD TIME	21.4	03/01/90	08/01/90	08/01/90		0.0	26
26170	26175	WBS 243	COMPLETE PSAR DRAFT	25.4	02/01/90	08/01/90	08/01/90		0.0	266311
26175M	26175M	WBS 243	PSAR DRAFT COMPLETE	0.0	08/01/90	08/01/90	08/01/90		0.0	26MS-1
26175	26180	WBS 243	RESTRAINT	0.0	08/01/90	08/01/90	08/01/90		0.0	26
26180M	26180M	WBS 243	CAA SUBMITTED TO NRC	0.0	08/01/90	08/01/90	08/01/90		0.0	26MS-1
26180	26189E	WBS 243	UNSCHEDULED END	0.0	08/01/90	08/01/90	08/01/90		0.0	26

APPENDIX D

Sealing Activities and Completion Dates--Net 50

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EVENT PRED	EVENT SUCC	NETWORK OR INTERFACE	ACTIVITY DESCRIPTION	TIME EST	EXPECTED START	EXPECTED FINISH	LATEST ALLOWED	*ACT/SCHD DATE	SLACK	ORG/ AGEN
0001S	50001	SCDFTP	START					*10/03/83		50
0002S	50000	SCDFTP	START					*07/23/84		50
0003S	50100	SCDFTP	START					*10/03/84		50
0004S	50110	SCDFTP	START					*11/08/84		50
0005S	50420	SCDFTP	START	0.0	01/15/85	01/15/85	01/15/85	S01/15/85	1.0	50
50000	50005	SCDFTP	PREP&PRES SITE&SEAL T/ITC					*07/25/84		506313
50001	50002	SCDFTP	EXAM&CHAR ANCIENT CONCRET					*10/01/84		50PSU
50001	50003	SCDFTP	LEAD TIME					*07/18/84		50
50001	50004	SCDFTP	MEASURE PROP TUFF CON&RPT	70.0	10/03/83	03/01/85	03/01/85		0.0	50WES
50001	50022	SCDFTP	LEAD TIME					*03/02/84		50
50001	50075	SCDFTP	COLLECT GEOCHEMICAL INFO					*11/01/84		50LANL
50002	50033	SCDFTP	REV ANCIENT CONCRETES RPT	16.2	10/01/84	02/01/85	02/01/85		0.0	50LANL
50002	50075	SCDFTP	RESTRAINT					*10/01/84		50
50003	50004	SCDFTP	ESTAB GRADATION CURVES					*08/01/84		50WES
50004M	50004M	SCDFTP	DRAFT TUFF CON STDY COMP	0.0	03/01/85	03/01/85	03/01/85		0.0	50MS-3
50004	50006	SCDFTP	PERFORM PEER REVIEW	2.0	03/01/85	03/15/85	03/15/85		0.0	50SNLA
50004	50155	SCDFTP	RESTRAINT	0.0	03/01/85	03/01/85	03/11/85		1.2	50
50005	50010	SCDFTP	COMPILE&SEND BKGD INFO					*07/30/84		506313
50005	50015	SCDFTP	CONTR PREP INIT WBS&ANALY					*08/06/84		506313
50006	50008	SCDFTP	INCORPORATE COMMENTS	2.0	03/15/85	03/29/85	03/29/85		0.0	506313
50008	50012	SCDFTP	PERFORM LINE REVIEW	4.0	03/29/85	04/26/85	04/26/85		0.0	506310
50010	50015	SCDFTP	REVIEW SITE & SEALNG INFO					*08/06/84		50ITC
50012	50014	SCDFTP	INCORPORATE COMMENTS	2.0	04/26/85	05/10/85	05/10/85		0.0	506313
50014	50016	SCDFTP	REVIEW REPORT	4.0	05/10/85	06/10/85	06/10/85		0.0	50DOE
50015	50025	SCDFTP	PREP QA PLAN F/TASK 1					*10/16/84		50ITC
50015	50030	SCDFTP	PREPARE QA PLAN F/TASK 2					*11/12/84		50ITC
50015	50035	SCDFTP	PREP PREL RECOM FLD TEST	21.0	08/06/84	01/11/85	04/08/85		12.2	50ITC
50015	50040	SCDFTP	REVIEW WBS & NETWORKS					*08/09/84		50ITC
50015	50045	SCDFTP	REVW SITE&SEALNG INFO					*08/20/84		50ITC
50016	50017	SCDFTP	PERFORM LINE RVW&COMMENT	4.0	06/10/85	07/09/85	07/09/85		0.0	506300
50017	50019E	SCDFTP	PUBLISH REPORT	4.0	07/09/85	08/06/85	08/06/85		0.0	50SNLA
50020	50080	SCDFTP	DESIGNATE RESP PREP RPT					*11/16/84		506313
50022	50024	SCDFTP	DVLP MOD/DISSOLUT OF GRT					*07/02/84		50PSU
50024	50075	SCDFTP	RVW DISSOLUTION MODEL					*10/12/84		50LANL
50025M	50025M	SCDFTP	QA PLAN COMPLETE					*10/16/84		50MS-4
50025	50029E	SCDFTP	UNSCHEDULED END					*10/16/84		50
50030M	50030M	SCDFTP	QA PLAN F/TASK 2 COMPLETE					*11/12/84		50MS-4
50030	50465	SCDFTP	RESTRAINT					*11/12/84		50
50033	50034	SCDFTP	REVISE REPORT	6.0	02/01/85	03/15/85	03/15/85		0.0	50PSU
50034	50036	SCDFTP	PERFM FINAL REV OF REPORT	4.2	03/15/85	04/15/85	04/15/85		0.0	50LANL
50035	50465	SCDFTP	RESTRAINT	0.0	01/11/85	01/11/85	04/08/85		12.2	50
50036	50037	SCDFTP	PERFM FINAL REVISION	4.4	04/15/85	05/15/85	05/15/85		0.0	50PSU
50037	50038	SCDFTP	PUBLISH REPORT	8.2	05/15/85	07/15/85	07/15/85		0.0	50LANL
50038M	50038M	SCDFTP	ANCIENT CONCRETES RPT PUB	0.0	07/15/85	07/15/85	07/15/85		0.0	50MS-3

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50025M	50025M	SCDFTP	QA PLAN COMPLETE					*10/16/84		50MS-4
50030M	50030M	SCDFTP	QA PLAN F/TASK 2 COMPLETE					*11/12/84		50MS-4
50135M	50135M	SCDFTP	RESPND LANL/QA LEV/E-SHFT	0.0	01/18/85	01/18/85	01/18/85	01/15/85	0.0	50MS-2
50004M	50004M	SCDFTP	DRAFT TUFF CON STDY COMP	0.0	03/01/85	03/01/85	03/01/85		0.0	50MS-3
50440M	50440M	SCDFTP	PRELIM INPUT TST PLN COMP	0.0	03/01/85	03/01/85	04/08/85	03/01/85	5.2	50MS-4
50160M	50160M	SCDFTP	PRELIM DSN/MATRL RPT COMP	0.0	04/08/85	04/08/85	04/08/85	04/01/85	0.0	50MS-3
50435M	50435M	SCDFTP	FINAL INPUT TST PLN COMP	0.0	04/22/85	04/22/85	04/29/85	04/22/85	1.0	50MS-4
50038M	50038M	SCDFTP	ANCIENT CONCRETES RPT PUB	0.0	07/15/85	07/15/85	07/15/85		0.0	50MS-3
50265M	50265M	SCDFTP	PREP DSN REQ/MTL REC RPT	0.0	10/31/85	10/31/85	10/31/85	11/29/85	0.0	50MS-2
50545M	50545M	SCDFTP	DRAFT FLD TEST PLAN COMP	0.0	10/31/85	10/31/85	10/31/85		0.0	50MS-3
50565M	50565M	SCDFTP	SEALING F/TST REQMTS COMP	0.0	02/11/86	02/11/86	02/11/86	02/25/86	0.0	50MS-2
50375M	50375M	SCDFTP	DRAFT SEALING CDR COMP	0.0	05/06/86	05/06/86	05/06/86	05/29/86	0.0	50MS-3
50385M	50385M	SCDFTP	PRELIM RPT CONCPT DSN	0.0	09/08/86	09/08/86	09/08/86	09/30/86	0.0	50MS-2
50395M	50395M	SCDFTP	SEALING CDR SENT TO DOE	0.0	03/09/87	03/09/87	03/09/87	03/31/87	0.0	50MS-2

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50038	50039E	SCDFTP	UNSCHEDULED END	0.0	07/15/85	07/15/85	07/15/85		0.0	50
50040	50045	SCDFTP	FNLZE WBS & NETWORK ANALY					*08/16/84		50ITC
50045	50050	SCDFTP	DVLP PREL CONCEPT MODELS					*10/25/84		50ITC
50050	50055	SCDFTP	PERF PREL THERMAL ANALYS					*11/01/84		50ITC
50050	50060	SCDFTP	PERF PREL HYDRO ANALYSES					*11/01/84		50ITC
50050	50065	SCDFTP	PERF PREL STRUCTURAL ANAL					*11/01/84		50ITC
50055	50065	SCDFTP	RESTRAINT					*11/01/84		50
50060	50065	SCDFTP	RESTRAINT					*11/01/84		50
50065	50020	SCDFTP	PREP ANNOTATED OUTLINE					*11/12/84		506313
50065	50070	SCDFTP	EVALUATE ANALYSES					*11/02/84		50ITC
50065	50155	SCDFTP	CONT ANAL TO DEV DSN RQMT	13.8	11/01/84	02/18/85	03/11/85		3.0	50ITC
50065	50445	SCDFTP	CONT ANAL TO DEV DSN RQMT	13.8	11/01/84	02/18/85	03/18/85		4.0	50ITC
50070	50075	SCDFTP	ESTB PREL DSN RQMTS SEAL					*11/12/84		50ITC
50075	50076	SCDFTP	HOLD 1ST DSN RQMTS/MTL WS					*11/15/84		50ITC
50075	50080	SCDFTP	RESTRAINT					*11/12/84		50
50076	50077	SCDFTP	PREP OUTLINE F/DEGRD MOD					*12/05/84		50PSU
50076	50082	SCDFTP	REVISE DISSOLUTION MODEL	4.2	11/15/84	12/18/84	01/08/85		1.8	50PSU
50076	50185	SCDFTP	RESTRAINT					*11/15/84		50
50077	50078	SCDFTP	PREP DEGRD MODEL REPORT	4.2	12/05/84	01/11/85	01/18/85		1.0	50PSU
50078	50081	SCDFTP	REVIEW REPORT	3.0	01/11/85	02/01/85	02/11/85		1.2	50LANL
50078	50140	SCDFTP	RESTRAINT	0.0	01/11/85	01/11/85	01/18/85		1.0	50
50080	50090	SCDFTP	PREP INPUT FOR REPORT					*12/14/84		50PSU
50080	50095	SCDFTP	PREP INPUT FOR REPORT					*12/03/84		506313
50081	50155	SCDFTP	FINAL REVSN/DEG MOD RPT	4.0	02/01/85	03/01/85	03/11/85		1.2	50PSU
50082	50083	SCDFTP	REVIEW DISSOLUTION MODEL	1.6	12/18/84	01/07/85	01/18/85		1.8	50LANL
50083	50140	SCDFTP	RESTRAINT	0.0	01/07/85	01/07/85	01/18/85		1.8	50
50083	50155	SCDFTP	FINAL REVSN OF DISSOL MOD	4.0	01/07/85	02/04/85	03/11/85		5.0	50PSU
50090	50095	SCDFTP	RESTRAINT					*12/14/84		50
50095	50140	SCDFTP	COMPILE INPUT FOR REPORT	3.8	12/14/84	01/18/85	01/18/85		0.0	506313
50100	50105	SCDFTP	PREP LTR REQUESTING INFO					*10/10/84		50SNL
50105	50155	SCDFTP	PREP LTR RPT AIRBORN REL	18.2	10/10/84	02/26/85	03/11/85		1.8	50LLNL
50110	50115	SCDFTP	PREP STRATEGY/INTL CALCTN					*12/10/84		50ITC
50115	50120	SCDFTP	PREP STRATEGY/OBTN APPRVL					*12/11/84		506313
50120	50125	SCDFTP	CONT CAL/SUBMIT REPORT					*12/21/84		50ITC
50125	50127	SCDFTP	REVIEW NUMERICAL CALCULNS					*01/02/85		506313
50127	50130	SCDFTP	PRESENT STRATEGY/RESPONSE					*01/09/85		506313
50130	50135	SCDFTP	MOD RESP/PERFM ADDL CALCN	1.4	01/09/85	01/18/85	01/18/85		0.0	506313
50135M	50135M	SCDFTP	RESPND LANL/QA LEV/E-SHFT	0.0	01/18/85	01/18/85	01/18/85	01/15/85	0.0	50MS-2
50135	50140	SCDFTP	RESTRAINT	0.0	01/18/85	01/18/85	01/18/85		0.0	50
50140	50143	SCDFTP	COMPILE/EDIT MTRL/DSN REQ	5.2	01/18/85	02/25/85	02/25/85		0.0	506313
50143	50145	SCDFTP	REVIEW REPORT	2.0	02/25/85	03/11/85	03/11/85		0.0	50LANL
50143	50150	SCDFTP	REVIEW REPORT	2.0	02/25/85	03/11/85	03/11/85		0.0	50PSU
50143	50155	SCDFTP	REVIEW REPORT	2.0	02/25/85	03/11/85	03/11/85		0.0	50MES
50145	50155	SCDFTP	RESTRAINT	0.0	03/11/85	03/11/85	03/11/85		0.0	50

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50150	50155	SCDFTP	RESTRAINT	0.0	03/11/85	03/11/85	03/11/85		0.0	50
50155	50160	SCDFTP	INCORPORATE COMMENTS	4.0	03/11/85	04/08/85	04/08/85		0.0	506313
50160M	50160M	SCDFTP	PRELIM DSN/MATRL RPT COMP	0.0	04/08/85	04/08/85	04/08/85	04/01/85	0.0	50MS-3
50160	50165	SCDFTP	CONT ANAL TO DEV DSN REQ	4.0	04/08/85	05/06/85	05/06/85		0.0	50ITC
50160	50175	SCDFTP	PERFM PEER/MGMT REVIEW	4.0	04/08/85	05/06/85	05/06/85		0.0	506313
50160	50185	SCDFTP	HOLD SECOND WORKSHOP	1.0	04/08/85	04/15/85	04/15/85		0.0	50ITC
50160	50470	SCDFTP	RESTRAINT	0.0	04/08/85	04/08/85	04/08/85		0.0	50
50165	50170	SCDFTP	CONT ANAL TO DEV DSN REQ	4.0	05/06/85	06/04/85	06/04/85		0.0	50ITC
50165	50175	SCDFTP	RESTRAINT	0.0	05/06/85	05/06/85	05/06/85		0.0	50
50170	50235	SCDFTP	RESTRAINT	0.0	06/04/85	06/04/85	06/04/85		0.0	50
50170	50240	SCDFTP	COMP ANAL TO DEV DSN REQ	4.0	06/04/85	07/02/85	07/02/85		0.0	50ITC
50175	50235	SCDFTP	INCORPORATE COMMENTS	4.0	05/06/85	06/04/85	06/04/85		0.0	506313
50185	50190	SCDFTP	PREP SEALING MATERIALS	1.0	04/15/85	04/22/85	04/22/85		0.0	50WES
50185	50210	SCDFTP	PREP SEALING MATERIALS	1.0	04/15/85	04/22/85	04/22/85		0.0	50PSU
50190	50200	SCDFTP	SEND SAMPLES TO TBD	1.0	04/22/85	04/29/85	05/06/85		1.0	50WES
50190	50205	SCDFTP	DETRM MTL PROPERTIES	4.0	04/22/85	05/20/85	05/20/85		0.0	50WES
50200	50230	SCDFTP	MEASURE UNSAT PERM CONCRT	2.0	04/29/85	05/13/85	05/20/85		1.0	50PNL
50205	50235	SCDFTP	PREP/SUBMIT LTR RPT SNL	2.0	05/20/85	06/04/85	06/04/85		0.0	50WES
50210	50215	SCDFTP	SEND SAMPLES TO TBD	1.0	04/22/85	04/29/85	05/06/85		1.0	50PSU
50210	50220	SCDFTP	DETRM MTL PROPERTIES	4.0	04/22/85	05/20/85	05/20/85		0.0	50PSU
50215	50230	SCDFTP	MEASURE UNSAT PERM GROUT	2.0	04/29/85	05/13/85	05/20/85		1.0	50PNL
50220	50235	SCDFTP	PREP/SUBMIT LTR RPT SNL	2.0	05/20/85	06/04/85	06/04/85		0.0	50PSU
50230	50235	SCDFTP	PREP/SUBMIT LTR RPT SNL	2.0	05/13/85	05/28/85	06/04/85		1.0	50PNL
50235	50240	SCDFTP	INC LAB/NUM ANAL DSN RPT	4.0	06/04/85	07/02/85	07/02/85		0.0	506313
50240	50245	SCDFTP	PERFM FINAL EDIT/COMP RPT	4.0	07/02/85	07/31/85	07/31/85		0.0	506313
50245	50250	SCDFTP	PERFM PEER/MGMT REVIEW	4.0	07/31/85	08/28/85	08/28/85		0.0	506313
50245	50290	SCDFTP	RESTRAINT	0.0	07/31/85	07/31/85	07/31/85		0.0	50
50250	50255	SCDFTP	INCORPORATE COMMENTS	4.0	08/28/85	09/26/85	09/26/85		0.0	506313
50255	50260	SCDFTP	PERFM LINE REVIEW	3.0	09/26/85	10/17/85	10/17/85		0.0	506310
50260	50265	SCDFTP	INCORPORATE COMMENTS	2.0	10/17/85	10/31/85	10/31/85		0.0	506313
50265M	50265M	SCDFTP	PREP DSN REQ/MTL REC RPT	0.0	10/31/85	10/31/85	10/31/85	11/29/85	0.0	50MS-2
50265	50270	SCDFTP	REVIEW REPORT	4.0	10/31/85	12/02/85	12/02/85		0.0	50DOE
50270	50275	SCDFTP	PERFM LINE REVIEW	2.0	12/02/85	12/16/85	12/16/85		0.0	506300
50275	50280	SCDFTP	INCORPORATE COMMENTS	3.0	12/16/85	01/14/86	01/14/86		0.0	506313
50280	50289E	SCDFTP	PUBLISH REPORT	6.0	01/14/86	02/25/86	02/25/86		0.0	50SNL
50290	50295	SCDFTP	IDNTFY QA REQ SLNG COPNTS	4.0	07/31/85	08/28/85	08/28/85		0.0	50ITC
50290	50300	SCDFTP	QUANTIFY PRELIM CONST REQ	4.0	07/31/85	08/28/85	08/28/85		0.0	50ITC
50290	50305	SCDFTP	IDNTFY HEALTH/SFTY ISSUES	4.0	07/31/85	08/28/85	08/28/85		0.0	50ITC
50290	50310	SCDFTP	IDENTIFY R&D ACTIVITIES	4.0	07/31/85	08/28/85	08/28/85		0.0	50ITC
50295	50310	SCDFTP	RESTRAINT	0.0	08/28/85	08/28/85	08/28/85		0.0	50
50300	50310	SCDFTP	RESTRAINT	0.0	08/28/85	08/28/85	08/28/85		0.0	50
50305	50310	SCDFTP	RESTRAINT	0.0	08/28/85	08/28/85	08/28/85		0.0	50
50310	50315	SCDFTP	PERFM TR/OFF & PERFM ANAL	12.0	08/28/85	11/21/85	11/21/85		0.0	50ITC
50315	50320	SCDFTP	SELECT SEALING COMP DSN	2.0	11/21/85	12/09/85	12/09/85		0.0	50ITC

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50320	50325	SCDFTP	DETRM QA REQUIREMENTS	3.0	12/09/85	01/07/86	01/07/86		0.0	50ITC
50320	50330	SCDFTP	DETRM SPEC CONST REQMTS	3.0	12/09/85	01/07/86	01/07/86		0.0	50ITC
50320	50335	SCDFTP	DETRM ISSUES SEALNG COMPD	3.0	12/09/85	01/07/86	01/07/86		0.0	50ITC
50320	50340	SCDFTP	DETRM R/D ACT SEALNG COMP	3.0	12/09/85	01/07/86	01/07/86		0.0	50ITC
50320	50345	SCDFTP	DETRM E CONSPTN/UTLTY REQ	3.0	12/09/85	01/07/86	01/07/86		0.0	50ITC
50325	50345	SCDFTP	RESTRAINT	0.0	01/07/86	01/07/86	01/07/86		0.0	50
50330	50345	SCDFTP	RESTRAINT	0.0	01/07/86	01/07/86	01/07/86		0.0	50
50335	50345	SCDFTP	RESTRAINT	0.0	01/07/86	01/07/86	01/07/86		0.0	50
50340	50345	SCDFTP	RESTRAINT	0.0	01/07/86	01/07/86	01/07/86		0.0	50
50345	50350	SCDFTP	DEFINE MONITORNG ACTIVITS	4.0	01/07/86	02/04/86	02/04/86		0.0	50ITC
50345	50355	SCDFTP	DEVELOP PLANS F/EMP COMPS	4.0	01/07/86	02/04/86	02/04/86		0.0	50ITC
50350	50355	SCDFTP	RESTRAINT	0.0	02/04/86	02/04/86	02/04/86		0.0	50
50355	50360	SCDFTP	CONTINUE PLAN/SCH DEV	3.0	02/04/86	02/25/86	02/25/86		0.0	50ITC
50355	50365	SCDFTP	DEVELOP CST EST EMPL COMP	3.0	02/04/86	02/25/86	02/25/86		0.0	50ITC
50360	50365	SCDFTP	RESTRAINT	0.0	02/25/86	02/25/86	02/25/86		0.0	50
50365	50370	SCDFTP	COMP CST EST F/EMPL COMPS	4.0	02/25/86	03/25/86	03/25/86		0.0	50ITC
50370	50375	SCDFTP	COMPLETE PREP OF CDR	6.0	03/25/86	05/06/86	05/06/86		0.0	50ITC
50375M	50375M	SCDFTP	DRAFT SEALING CDR COMP	0.0	05/06/86	05/06/86	05/06/86	05/29/86	0.0	50MS-3
50375	50380	SCDFTP	PERFM PEER/MGMT REVIEW	8.0	05/06/86	07/02/86	07/02/86		0.0	506313
50380	50385	SCDFTP	INCORPORATE COMMENTS	9.2	07/02/86	09/08/86	09/08/86		0.0	50ITC
50385M	50385M	SCDFTP	PRELIM RPT CONCPT DSN	0.0	09/08/86	09/08/86	09/08/86	09/30/86	0.0	50MS-2
50385	50390	SCDFTP	PERFM LINE REVIEW	6.0	09/08/86	10/20/86	10/20/86		0.0	506310
50390	50395	SCDFTP	INCORPORATE COMMENTS	18.4	10/20/86	03/09/87	03/09/87		0.0	506313
50395M	50395M	SCDFTP	SEALING CDR SENT TO DOE	0.0	03/09/87	03/09/87	03/09/87	03/31/87	0.0	50MS-2
50395	50400	SCDFTP	REVIEW REPORT	4.0	03/09/87	04/06/87	04/06/87		0.0	50DOE
50400	50405	SCDFTP	PERFM LINE REVIEW	3.0	04/06/87	04/27/87	04/27/87		0.0	506300
50405	50410	SCDFTP	INCORPORATE COMMENTS	5.0	04/27/87	06/02/87	06/02/87		0.0	506313
50410	50419E	SCDFTP	PUBLISH REPORT	8.0	06/02/87	07/29/87	07/29/87		0.0	50SNL
50420	50425	SCDFTP	PERFM SUP CAL DRAIN TEST	5.0	01/15/85	02/19/85	02/26/85		1.0	50ITC
50420	50440	SCDFTP	MOD CURNT INPT/SHFT T-PLN	6.6	01/15/85	03/01/85	04/08/85		5.2	506313
50425	50430	SCDFTP	DETRM INSTRUMENTATN NEEDS	3.0	02/19/85	03/12/85	03/19/85		1.0	50ITC
50430	50435	SCDFTP	PREP LETTER REPORT	5.8	03/12/85	04/22/85	04/29/85		1.0	506313
50435M	50435M	SCDFTP	FINAL INPUT TST PLN COMP	0.0	04/22/85	04/22/85	04/29/85	04/22/85	1.0	50MS-4
50435	50495	SCDFTP	RESTRAINT	0.0	04/22/85	04/22/85	04/29/85		1.0	50
50440M	50440M	SCDFTP	PRELIM INPUT TST PLN COMP	0.0	03/01/85	03/01/85	04/08/85	03/01/85	5.2	50MS-4
50440	50465	SCDFTP	RESTRAINT	0.0	03/01/85	03/01/85	04/08/85		5.2	50
50445	50450	SCDFTP	IDENTIFY ADDTNL ACTIVITES	3.0	02/18/85	03/11/85	04/08/85		4.0	50ITC
50445	50455	SCDFTP	IDENTIFY QA REQ F/SEALING	3.0	02/18/85	03/11/85	04/08/85		4.0	50ITC
50445	50460	SCDFTP	QUANTIFY PRELIM CONST REQ	3.0	02/18/85	03/11/85	04/08/85		4.0	50ITC
50445	50465	SCDFTP	IDENTIFY ENVIRMTL ISSUES	3.0	02/18/85	03/11/85	04/08/85		4.0	50ITC
50450	50465	SCDFTP	RESTRAINT	0.0	03/11/85	03/11/85	04/08/85		4.0	50
50455	50465	SCDFTP	RESTRAINT	0.0	03/11/85	03/11/85	04/08/85		4.0	50
50460	50465	SCDFTP	RESTRAINT	0.0	03/11/85	03/11/85	04/08/85		4.0	50
50465	50495	SCDFTP	PREP RVSD RECOM/FLD TEST	3.0	03/11/85	04/01/85	04/29/85		4.0	50ITC

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50470	50480	SCDFTP	DETRM QA REQUIREMENTS	3.0	04/08/85	04/29/85	04/29/85		0.0	50ITC
50470	50485	SCDFTP	DETRM SPEC CONST REQMTS	3.0	04/08/85	04/29/85	04/29/85		0.0	50ITC
50470	50490	SCDFTP	DETRM ISSUES SEALNG COMPD	3.0	04/08/85	04/29/85	04/29/85		0.0	50ITC
50470	50495	SCDFTP	DETEM R/D ACT SEALNG COMP	3.0	04/08/85	04/29/85	04/29/85		0.0	50ITC
50480	50495	SCDFTP	RESTRAINT	0.0	04/29/85	04/29/85	04/29/85		0.0	50
50485	50495	SCDFTP	RESTRAINT	0.0	04/29/85	04/29/85	04/29/85		0.0	50
50490	50495	SCDFTP	RESTRAINT	0.0	04/29/85	04/29/85	04/29/85		0.0	50
50495	50500	SCDFTP	PREP FNL RECOMM/PLAN	4.0	04/29/85	05/28/85	05/28/85		0.0	50ITC
50495	50510	SCDFTP	SELECT COMPTR CODES	5.0	04/29/85	06/04/85	06/04/85		0.0	50ITC
50500	50505	SCDFTP	DEVELOP CONCPT MODELS	1.0	05/28/85	06/04/85	06/04/85		0.0	50ITC
50500	50510	SCDFTP	DEFINE PARAM TO BE MEASRD	1.0	05/28/85	06/04/85	06/04/85		0.0	50ITC
50505	50510	SCDFTP	RESTRAINT	0.0	06/04/85	06/04/85	06/04/85		0.0	50
50510	50515	SCDFTP	CONDUCT PRETST PRED CALTN	8.0	06/04/85	07/31/85	07/31/85		0.0	50ITC
50510	50520	SCDFTP	DEFINE HARDWARE REQMENTS	3.0	06/04/85	06/25/85	08/07/85		6.0	50ITC
50515	50520	SCDFTP	SELECT LOCTN MONT EQUIPT	1.0	07/31/85	08/07/85	08/07/85		0.0	50ITC
50520	50525	SCDFTP	FINALIZE HARDWARE REQMNTS	1.0	08/07/85	08/14/85	08/21/85		1.0	50ITC
50520	50530	SCDFTP	IDNTFY QA REQUIREMENTS	2.0	08/07/85	08/21/85	09/05/85		2.0	50ITC
50520	50535	SCDFTP	DEVELOP CST EST F/FLD TST	4.0	08/07/85	09/05/85	09/05/85		0.0	50ITC
50520	50540	SCDFTP	DEVELOP PRELIM TEST SCH	4.0	08/07/85	09/05/85	09/05/85		0.0	50ITC
50525	50540	SCDFTP	SELECT APPROPRIATE HWDR	2.0	08/14/85	08/28/85	09/05/85		1.0	50ITC
50530	50540	SCDFTP	RESTRAINT	0.0	08/21/85	08/21/85	09/05/85		2.0	50
50535	50540	SCDFTP	RESTRAINT	0.0	09/05/85	09/05/85	09/05/85		0.0	50
50540	50545	SCDFTP	PREP FIELD TEST PLANS	8.0	09/05/85	10/31/85	10/31/85		0.0	50SNL
50545M	50545M	SCDFTP	DRAFT FLD TEST PLAN COMP	0.0	10/31/85	10/31/85	10/31/85		0.0	50MS-3
50545	50550	SCDFTP	PERFM PEER/MGMT REVIEW	4.0	10/31/85	12/02/85	12/02/85		0.0	50SNL
50550	50555	SCDFTP	INCORPORATE COMMENTS	4.0	12/02/85	01/07/86	01/07/86		0.0	506313
50555	50560	SCDFTP	PERFM LINE REVIEW	3.0	01/07/86	01/28/86	01/28/86		0.0	506310
50560	50565	SCDFTP	INCORPORATE COMMENTS	2.0	01/28/86	02/11/86	02/11/86		0.0	506313
50565M	50565M	SCDFTP	SEALING F/TST REQMTS COMP	0.0	02/11/86	02/11/86	02/11/86	02/25/86	0.0	50MS-2
50565	50570	SCDFTP	REVIEW REPORT	4.0	02/11/86	03/11/86	03/11/86		0.0	50DOE
50570	50575	SCDFTP	PERFM LINE REVIEW	3.0	03/11/86	04/01/86	04/01/86		0.0	506300
50575	50580	SCDFTP	INCORPORATE COMMENTS	2.0	04/01/86	04/15/86	04/15/86		0.0	506313
50580	50589E	SCDFTP	PUBLISH REPORT	6.0	04/15/86	05/28/86	05/28/86		0.0	50SNL

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0001S	50001	SCDFTP	START					*10/03/83		50
50001	50022	SCDFTP	LEAD TIME					*03/02/84		50
50022	50024	SCDFTP	DVLP MOD/DISSOLUT OF GRT					*07/02/84		50PSU
50001	50003	SCDFTP	LEAD TIME					*07/18/84		50
0002S	50000	SCDFTP	START					*07/23/84		50
50000	50005	SCDFTP	PREP&PRES SITE&SEAL T/ITC					*07/25/84		506313
50005	50010	SCDFTP	COMPILE&SEND BKGD INFO					*07/30/84		506313
50003	50004	SCDFTP	ESTAB GRADATION CURVES					*08/01/84		50MES
50005	50015	SCDFTP	CONTR PREP INIT WBS&ANALY					*08/06/84		506313
50010	50015	SCDFTP	REVIEW SITE & SEALNG INFO					*08/06/84		50ITC
50015	50040	SCDFTP	REVIEW WBS & NETWORKS					*08/09/84		50ITC
50040	50045	SCDFTP	FNLZE WBS & NETWORK ANALY					*08/16/84		50ITC
50015	50045	SCDFTP	REVW SITE&SEALNG INFO					*08/20/84		50ITC
50001	50002	SCDFTP	EXAM&CHAR ANCIENT CONCRET					*10/01/84		50PSU
50002	50075	SCDFTP	RESTRAINT					*10/01/84		50
0003S	50100	SCDFTP	START					*10/03/84		50
50100	50105	SCDFTP	PREP LTR REQUESTING INFO					*10/10/84		50SNL
50024	50075	SCDFTP	RVW DISSOLUTION MODEL					*10/12/84		50LANL
50015	50025	SCDFTP	PREP QA PLAN F/TASK 1					*10/16/84		50ITC
50025M	50025M	SCDFTP	QA PLAN COMPLETE					*10/16/84		50MS-4
50025	50029E	SCDFTP	UNSCHEDULED END					*10/16/84		50
50045	50050	SCDFTP	DVLP PREL CONCEPT MODELS					*10/25/84		50ITC
50001	50075	SCDFTP	COLLECT GEOCHEMICAL INFO					*11/01/84		50LANL
50050	50055	SCDFTP	PERF PREL THERMAL ANALYS					*11/01/84		50ITC
50050	50060	SCDFTP	PERF PREL HYDRO ANALYSES					*11/01/84		50ITC
50050	50065	SCDFTP	PERF PREL STRUCTURAL ANAL					*11/01/84		50ITC
50055	50065	SCDFTP	RESTRAINT					*11/01/84		50
50060	50065	SCDFTP	RESTRAINT					*11/01/84		50
50065	50070	SCDFTP	EVALUATE ANALYSES					*11/02/84		50ITC
0004S	50110	SCDFTP	START					*11/08/84		50
50015	50030	SCDFTP	PREPARE QA PLAN F/TASK 2					*11/12/84		50ITC
50030M	50030M	SCDFTP	QA PLAN F/TASK 2 COMPLETE					*11/12/84		50MS-4
50030	50465	SCDFTP	RESTRAINT					*11/12/84		50
50065	50020	SCDFTP	PREP ANNOTATED OUTLINE					*11/12/84		506313
50070	50075	SCDFTP	ESTB PREL DSN RQMTS SEAL					*11/12/84		50ITC
50075	50080	SCDFTP	RESTRAINT					*11/12/84		50
50075	50076	SCDFTP	HOLD 1ST DSN RQMTS/MTL WS					*11/15/84		50ITC
50076	50185	SCDFTP	RESTRAINT					*11/15/84		50
50020	50080	SCDFTP	DESIGNATE RESP PREP RPT					*11/16/84		506313
50080	50095	SCDFTP	PREP INPUT FOR REPORT					*12/03/84		506313
50076	50077	SCDFTP	PREP OUTLINE F/DEGRD MOD					*12/05/84		50PSU
50110	50115	SCDFTP	PREP STRATEGY/INTL CALCTN					*12/10/84		50ITC
50115	50120	SCDFTP	PREP STRATEGY/OBTN APPRVL					*12/11/84		506313
50080	50090	SCDFTP	PREP INPUT FOR REPORT					*12/14/84		50PSU

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50090	50095	SCDFTP	RESTRAINT					*12/14/84		50
50076	50082	SCDFTP	REVISE DISSOLUTION MODEL	4.2	11/15/84	12/18/84	01/08/85		1.8	50PSU
50120	50125	SCDFTP	CONT CAL/SUBMIT REPORT					*12/21/84		50ITC
50125	50127	SCDFTP	REVIEW NUMERICAL CALCULNS					*01/02/85		506313
50082	50083	SCDFTP	REVIEW DISSOLUTION MODEL	1.6	12/18/84	01/07/85	01/18/85		1.8	50LANL
50083	50140	SCDFTP	RESTRAINT	0.0	01/07/85	01/07/85	01/18/85		1.8	50
50127	50130	SCDFTP	PRESENT STRATEGY/RESPONSE					*01/09/85		506313
50015	50035	SCDFTP	PREP PREL RECOM FLD TEST	21.0	08/06/84	01/11/85	04/08/85		12.2	50ITC
50035	50465	SCDFTP	RESTRAINT	0.0	01/11/85	01/11/85	04/08/85		12.2	50
50077	50078	SCDFTP	PREP DEGRD MODEL REPORT	4.2	12/05/84	01/11/85	01/18/85		1.0	50PSU
50078	50140	SCDFTP	RESTRAINT	0.0	01/11/85	01/11/85	01/18/85		1.0	50
0005S	50420	SCDFTP	START	0.0	01/15/85	01/15/85	01/15/85	S01/15/85	1.0	50
50095	50140	SCDFTP	COMPILE INPUT FOR REPORT	3.8	12/14/84	01/18/85	01/18/85		0.0	506313
50130	50135	SCDFTP	MOD RESP/PERFM ADDL CALCN	1.4	01/09/85	01/18/85	01/18/85		0.0	506313
50135M	50135M	SCDFTP	RESPND LANL/QA LEV/E-SHFT	0.0	01/18/85	01/18/85	01/18/85	01/15/85	0.0	50MS-2
50135	50140	SCDFTP	RESTRAINT	0.0	01/18/85	01/18/85	01/18/85		0.0	50
50002	50033	SCDFTP	REV ANCIENT CONCRETES RPT	16.2	10/01/84	02/01/85	02/01/85		0.0	50LANL
50078	50081	SCDFTP	REVIEW REPORT	3.0	01/11/85	02/01/85	02/11/85		1.2	50LANL
50083	50155	SCDFTP	FINAL REVSN OF DISSOL MOD	4.0	01/07/85	02/04/85	03/11/85		5.0	50PSU
50065	50155	SCDFTP	CONT ANAL TO DEV DSN RQMT	13.8	11/01/84	02/18/85	03/11/85		3.0	50ITC
50065	50445	SCDFTP	CONT ANAL TO DEV DSN RQMT	13.8	11/01/84	02/18/85	03/18/85		4.0	50ITC
50420	50425	SCDFTP	PERFM SUP CAL DRAIN TEST	5.0	01/15/85	02/19/85	02/26/85		1.0	50ITC
50140	50143	SCDFTP	COMPILE/EDIT MTRL/DSN REQ	5.2	01/18/85	02/25/85	02/25/85		0.0	506313
50105	50155	SCDFTP	PREP LTR RPT AIRBORN REL	18.2	10/10/84	02/26/85	03/11/85		1.8	50LLNL
50001	50004	SCDFTP	MEASURE PROP TUFF CON&RPT	70.0	10/03/83	03/01/85	03/01/85		0.0	50WES
50004M	50004M	SCDFTP	DRAFT TUFF CON STDY COMP	0.0	03/01/85	03/01/85	03/01/85		0.0	50MS-3
50004	50155	SCDFTP	RESTRAINT	0.0	03/01/85	03/01/85	03/11/85		1.2	50
50081	50155	SCDFTP	FINAL REVSN/DEG MOD RPT	4.0	02/01/85	03/01/85	03/11/85		1.2	50PSU
50420	50440	SCDFTP	MOD CURNT INPT/SHFT T-PLN	6.6	01/15/85	03/01/85	04/08/85		5.2	506313
50440M	50440M	SCDFTP	PRELIM INPUT TST PLN COMP	0.0	03/01/85	03/01/85	04/08/85	03/01/85	5.2	50MS-4
50440	50465	SCDFTP	RESTRAINT	0.0	03/01/85	03/01/85	04/08/85		5.2	50
50143	50145	SCDFTP	REVIEW REPORT	2.0	02/25/85	03/11/85	03/11/85		0.0	50LANL
50143	50150	SCDFTP	REVIEW REPORT	2.0	02/25/85	03/11/85	03/11/85		0.0	50PSU
50143	50155	SCDFTP	REVIEW REPORT	2.0	02/25/85	03/11/85	03/11/85		0.0	50WES
50145	50155	SCDFTP	RESTRAINT	0.0	03/11/85	03/11/85	03/11/85		0.0	50
50150	50155	SCDFTP	RESTRAINT	0.0	03/11/85	03/11/85	03/11/85		0.0	50
50445	50450	SCDFTP	IDENTIFY ADDTNL ACTIVITES	3.0	02/18/85	03/11/85	04/08/85		4.0	50ITC
50445	50455	SCDFTP	IDENTIFY QA REQ F/SEALING	3.0	02/18/85	03/11/85	04/08/85		4.0	50ITC
50445	50460	SCDFTP	QUANTIFY PRELIM CONST REQ	3.0	02/18/85	03/11/85	04/08/85		4.0	50ITC
50445	50465	SCDFTP	IDENTIFY ENVIRMTL ISSUES	3.0	02/18/85	03/11/85	04/08/85		4.0	50ITC
50450	50465	SCDFTP	RESTRAINT	0.0	03/11/85	03/11/85	04/08/85		4.0	50
50455	50465	SCDFTP	RESTRAINT	0.0	03/11/85	03/11/85	04/08/85		4.0	50
50460	50465	SCDFTP	RESTRAINT	0.0	03/11/85	03/11/85	04/08/85		4.0	50
50425	50430	SCDFTP	DETRM INSTRUMENTATN NEEDS	3.0	02/19/85	03/12/85	03/19/85		1.0	50ITC

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50004	50006	SCDFTP	PERFORM PEER REVIEW	2.0	03/01/85	03/15/85	03/15/85		0.0	50SNLA
50033	50034	SCDFTP	REVISE REPORT	6.0	02/01/85	03/15/85	03/15/85		0.0	50PSU
50006	50008	SCDFTP	INCORPORATE COMMENTS	2.0	03/15/85	03/29/85	03/29/85		0.0	506313
50465	50495	SCDFTP	PREP RVSD RECOM/FLD TEST	3.0	03/11/85	04/01/85	04/29/85		4.0	50ITC
50155	50160	SCDFTP	INCORPORATE COMMENTS	4.0	03/11/85	04/08/85	04/08/85		0.0	506313
50160M	50160M	SCDFTP	PRELIM DSN/MATRL RPT COMP	0.0	04/08/85	04/08/85	04/08/85	04/01/85	0.0	50MS-3
50160	50470	SCDFTP	RESTRAINT	0.0	04/08/85	04/08/85	04/08/85		0.0	50
50034	50036	SCDFTP	PERFM FINAL REV OF REPORT	4.2	03/15/85	04/15/85	04/15/85		0.0	50LANL
50160	50185	SCDFTP	HOLD SECOND WORKSHOP	1.0	04/08/85	04/15/85	04/15/85		0.0	50ITC
50185	50190	SCDFTP	PREP SEALING MATERIALS	1.0	04/15/85	04/22/85	04/22/85		0.0	50WES
50185	50210	SCDFTP	PREP SEALING MATERIALS	1.0	04/15/85	04/22/85	04/22/85		0.0	50PSU
50430	50435	SCDFTP	PREP LETTER REPORT	5.8	03/12/85	04/22/85	04/29/85		1.0	506313
50435M	50435M	SCDFTP	FINAL INPUT TST PLN COMP	0.0	04/22/85	04/22/85	04/29/85	04/22/85	1.0	50MS-4
50435	50495	SCDFTP	RESTRAINT	0.0	04/22/85	04/22/85	04/29/85		1.0	50
50008	50012	SCDFTP	PERFORM LINE REVIEW	4.0	03/29/85	04/26/85	04/26/85		0.0	506310
50190	50200	SCDFTP	SEND SAMPLES TO TBD	1.0	04/22/85	04/29/85	05/06/85		1.0	50WES
50210	50215	SCDFTP	SEND SAMPLES TO TBD	1.0	04/22/85	04/29/85	05/06/85		1.0	50PSU
50470	50480	SCDFTP	DETRM QA REQUIREMENTS	3.0	04/08/85	04/29/85	04/29/85		0.0	50ITC
50470	50485	SCDFTP	DETRM SPEC CONST REQMTS	3.0	04/08/85	04/29/85	04/29/85		0.0	50ITC
50470	50490	SCDFTP	DETRM ISSUES SEALNG COMPD	3.0	04/08/85	04/29/85	04/29/85		0.0	50ITC
50470	50495	SCDFTP	DETEN R/D ACT SEALNG COMP	3.0	04/08/85	04/29/85	04/29/85		0.0	50ITC
50480	50495	SCDFTP	RESTRAINT	0.0	04/29/85	04/29/85	04/29/85		0.0	50
50485	50495	SCDFTP	RESTRAINT	0.0	04/29/85	04/29/85	04/29/85		0.0	50
50490	50495	SCDFTP	RESTRAINT	0.0	04/29/85	04/29/85	04/29/85		0.0	50
50160	50165	SCDFTP	CONT ANAL TO DEV DSN REQ	4.0	04/08/85	05/06/85	05/06/85		0.0	50ITC
50160	50175	SCDFTP	PERFM PEER/MGMT REVIEW	4.0	04/08/85	05/06/85	05/06/85		0.0	506313
50165	50175	SCDFTP	RESTRAINT	0.0	05/06/85	05/06/85	05/06/85		0.0	50
50012	50014	SCDFTP	INCORPORATE COMMENTS	2.0	04/26/85	05/10/85	05/10/85		0.0	506313
50200	50230	SCDFTP	MEASURE UNSAT PERM CONCRT	2.0	04/29/85	05/13/85	05/20/85		1.0	50PNL
50215	50230	SCDFTP	MEASURE UNSAT PERM GROUT	2.0	04/29/85	05/13/85	05/20/85		1.0	50PNL
50036	50037	SCDFTP	PERFM FINAL REVISION	4.4	04/15/85	05/15/85	05/15/85		0.0	50PSU
50190	50205	SCDFTP	DETRM MTL PROPERTIES	4.0	04/22/85	05/20/85	05/20/85		0.0	50WES
50210	50220	SCDFTP	DETRM MTL PROPERTIES	4.0	04/22/85	05/20/85	05/20/85		0.0	50PSU
50230	50235	SCDFTP	PREP/SUBMIT LTR RPT SNL	2.0	05/13/85	05/28/85	06/04/85		1.0	50PNL
50495	50500	SCDFTP	PREP FNL RECOMM/PLAN	4.0	04/29/85	05/28/85	05/28/85		0.0	50ITC
50165	50170	SCDFTP	CONT ANAL TO DEV DSN REQ	4.0	05/06/85	06/04/85	06/04/85		0.0	50ITC
50170	50235	SCDFTP	RESTRAINT	0.0	06/04/85	06/04/85	06/04/85		0.0	50
50175	50235	SCDFTP	INCORPORATE COMMENTS	4.0	05/06/85	06/04/85	06/04/85		0.0	506313
50205	50235	SCDFTP	PREP/SUBMIT LTR RPT SNL	2.0	05/20/85	06/04/85	06/04/85		0.0	50WES
50220	50235	SCDFTP	PREP/SUBMIT LTR RPT SNL	2.0	05/20/85	06/04/85	06/04/85		0.0	50PSU
50495	50510	SCDFTP	SELECT COMPTR CODES	5.0	04/29/85	06/04/85	06/04/85		0.0	50ITC
50500	50505	SCDFTP	DEVELOP CONCPT MODELS	1.0	05/28/85	06/04/85	06/04/85		0.0	50ITC
50500	50510	SCDFTP	DEFINE PARAM TO BE MEASRD	1.0	05/28/85	06/04/85	06/04/85		0.0	50ITC
50505	50510	SCDFTP	RESTRAINT	0.0	06/04/85	06/04/85	06/04/85		0.0	50

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50014	50016	SCDFTP	REVIEW REPORT	4.0	05/10/85	06/10/85	06/10/85		0.0	50DOE
50510	50520	SCDFTP	DEFINE HARDWARE REQMENTS	3.0	06/04/85	06/25/85	08/07/85		6.0	50ITC
50170	50240	SCDFTP	COMP ANAL TO DEV DSN REQ	4.0	06/04/85	07/02/85	07/02/85		0.0	50ITC
50235	50240	SCDFTP	INC LAB/NUM ANAL DSN RPT	4.0	06/04/85	07/02/85	07/02/85		0.0	506313
50016	50017	SCDFTP	PERFORM LINE RVW&COMMENT	4.0	06/10/85	07/09/85	07/09/85		0.0	506300
50037	50038	SCDFTP	PUBLISH REPORT	8.2	05/15/85	07/15/85	07/15/85		0.0	50LANL
50038M	50038M	SCDFTP	ANCIENT CONCRETES RPT PUB	0.0	07/15/85	07/15/85	07/15/85		0.0	50MS-3
50038	50039E	SCDFTP	UNSCHEDULED END	0.0	07/15/85	07/15/85	07/15/85		0.0	50
50240	50245	SCDFTP	PERFM FINAL EDIT/COMP RPT	4.0	07/02/85	07/31/85	07/31/85		0.0	506313
50245	50290	SCDFTP	RESTRAINT	0.0	07/31/85	07/31/85	07/31/85		0.0	50
50510	50515	SCDFTP	CONDUCT PRETST PRED CALTN	8.0	06/04/85	07/31/85	07/31/85		0.0	50ITC
50017	50019E	SCDFTP	PUBLISH REPORT	4.0	07/09/85	08/06/85	08/06/85		0.0	50SNLA
50515	50520	SCDFTP	SELECT LOCTN MONT EQUIPT	1.0	07/31/85	08/07/85	08/07/85		0.0	50ITC
50520	50525	SCDFTP	FINALIZE HARDWARE REQMNTS	1.0	08/07/85	08/14/85	08/21/85		1.0	50ITC
50520	50530	SCDFTP	IDNTFY QA REQUIREMENTS	2.0	08/07/85	08/21/85	09/05/85		2.0	50ITC
50530	50540	SCDFTP	RESTRAINT	0.0	08/21/85	08/21/85	09/05/85		2.0	50
50245	50250	SCDFTP	PERFM PEER/MGMT REVIEW	4.0	07/31/85	08/28/85	08/28/85		0.0	506313
50290	50295	SCDFTP	IDNTFY QA REQ SLNG COPNTS	4.0	07/31/85	08/28/85	08/28/85		0.0	50ITC
50290	50300	SCDFTP	QUANTIFY PRELIM CONST REQ	4.0	07/31/85	08/28/85	08/28/85		0.0	50ITC
50290	50305	SCDFTP	IDNTFY HEALTH/SFTY ISSUES	4.0	07/31/85	08/28/85	08/28/85		0.0	50ITC
50290	50310	SCDFTP	IDENTIFY R&D ACTIVITIES	4.0	07/31/85	08/28/85	08/28/85		0.0	50ITC
50295	50310	SCDFTP	RESTRAINT	0.0	08/28/85	08/28/85	08/28/85		0.0	50
50300	50310	SCDFTP	RESTRAINT	0.0	08/28/85	08/28/85	08/28/85		0.0	50
50305	50310	SCDFTP	RESTRAINT	0.0	08/28/85	08/28/85	08/28/85		0.0	50
50525	50540	SCDFTP	SELECT APPROPRIATE HWDR	2.0	08/14/85	08/28/85	09/05/85		1.0	50ITC
50520	50535	SCDFTP	DEVELOP CST EST F/FLD TST	4.0	08/07/85	09/05/85	09/05/85		0.0	50ITC
50520	50540	SCDFTP	DEVELOP PRELIM TEST SCH	4.0	08/07/85	09/05/85	09/05/85		0.0	50ITC
50535	50540	SCDFTP	RESTRAINT	0.0	09/05/85	09/05/85	09/05/85		0.0	50
50250	50255	SCDFTP	INCORPORATE COMMENTS	4.0	08/28/85	09/26/85	09/26/85		0.0	506313
50255	50260	SCDFTP	PERFM LINE REVIEW	3.0	09/26/85	10/17/85	10/17/85		0.0	506310
50260	50265	SCDFTP	INCORPORATE COMMENTS	2.0	10/17/85	10/31/85	10/31/85		0.0	506313
50265M	50265M	SCDFTP	PREP DSN REQ/MTL REC RPT	0.0	10/31/85	10/31/85	10/31/85	11/29/85	0.0	50MS-2
50540	50545	SCDFTP	PREP FIELD TEST PLANS	8.0	09/05/85	10/31/85	10/31/85		0.0	50SNL
50545M	50545M	SCDFTP	DRAFT FLD TEST PLAN COMP	0.0	10/31/85	10/31/85	10/31/85		0.0	50MS-3
50310	50315	SCDFTP	PERFM TR/OFF & PERFM ANAL	12.0	08/28/85	11/21/85	11/21/85		0.0	50ITC
50265	50270	SCDFTP	REVIEW REPORT	4.0	10/31/85	12/02/85	12/02/85		0.0	50DOE
50545	50550	SCDFTP	PERFM PEER/MGMT REVIEW	4.0	10/31/85	12/02/85	12/02/85		0.0	50SNL
50315	50320	SCDFTP	SELECT SEALING COMP DSN	2.0	11/21/85	12/09/85	12/09/85		0.0	50ITC
50270	50275	SCDFTP	PERFM LINE REVIEW	2.0	12/02/85	12/16/85	12/16/85		0.0	506300
50320	50325	SCDFTP	DETRM QA REQUIREMENTS	3.0	12/09/85	01/07/86	01/07/86		0.0	50ITC
50320	50330	SCDFTP	DETRM SPEC CONST REQMTS	3.0	12/09/85	01/07/86	01/07/86		0.0	50ITC
50320	50335	SCDFTP	DETRM ISSUES SEALNG COMPD	3.0	12/09/85	01/07/86	01/07/86		0.0	50ITC
50320	50340	SCDFTP	DETRM R/D ACT SEALNG COMP	3.0	12/09/85	01/07/86	01/07/86		0.0	50ITC
50320	50345	SCDFTP	DETRM E CONSPTN/UTLTY REQ	3.0	12/09/85	01/07/86	01/07/86		0.0	50ITC

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50325	50345	SCDFTP	RESTRAINT	0.0	01/07/86	01/07/86	01/07/86		0.0	50
50330	50345	SCDFTP	RESTRAINT	0.0	01/07/86	01/07/86	01/07/86		0.0	50
50335	50345	SCDFTP	RESTRAINT	0.0	01/07/86	01/07/86	01/07/86		0.0	50
50340	50345	SCDFTP	RESTRAINT	0.0	01/07/86	01/07/86	01/07/86		0.0	50
50550	50555	SCDFTP	INCORPORATE COMMENTS	4.0	12/02/85	01/07/86	01/07/86		0.0	506313
50275	50280	SCDFTP	INCORPORATE COMMENTS	3.0	12/16/85	01/14/86	01/14/86		0.0	506313
50555	50560	SCDFTP	PERFM LINE REVIEW	3.0	01/07/86	01/28/86	01/28/86		0.0	506310
50345	50350	SCDFTP	DEFINE MONITORNG ACTIVITS	4.0	01/07/86	02/04/86	02/04/86		0.0	50ITC
50345	50355	SCDFTP	DEVELOP PLANS F/EMP COMPS	4.0	01/07/86	02/04/86	02/04/86		0.0	50ITC
50350	50355	SCDFTP	RESTRAINT	0.0	02/04/86	02/04/86	02/04/86		0.0	50
50560	50565	SCDFTP	INCORPORATE COMMENTS	2.0	01/28/86	02/11/86	02/11/86		0.0	506313
50565M	50565M	SCDFTP	SEALING F/TST REQMTS COMP	0.0	02/11/86	02/11/86	02/11/86	02/25/86	0.0	50MS-2
50280	50289E	SCDFTP	PUBLISH REPORT	6.0	01/14/86	02/25/86	02/25/86		0.0	50SNL
50355	50360	SCDFTP	CONTINUE PLAN/SCH DEV	3.0	02/04/86	02/25/86	02/25/86		0.0	50ITC
50355	50365	SCDFTP	DEVELOP CST EST EMPL COMP	3.0	02/04/86	02/25/86	02/25/86		0.0	50ITC
50360	50365	SCDFTP	RESTRAINT	0.0	02/25/86	02/25/86	02/25/86		0.0	50
50565	50570	SCDFTP	REVIEW REPORT	4.0	02/11/86	03/11/86	03/11/86		0.0	50DOE
50365	50370	SCDFTP	COMP CST EST F/EMPL COMPS	4.0	02/25/86	03/25/86	03/25/86		0.0	50ITC
50570	50575	SCDFTP	PERFM LINE REVIEW	3.0	03/11/86	04/01/86	04/01/86		0.0	506300
50575	50580	SCDFTP	INCORPORATE COMMENTS	2.0	04/01/86	04/15/86	04/15/86		0.0	506313
50370	50375	SCDFTP	COMPLETE PREP OF CDR	6.0	03/25/86	05/06/86	05/06/86		0.0	50ITC
50375M	50375M	SCDFTP	DRAFT SEALING CDR COMP	0.0	05/06/86	05/06/86	05/06/86	05/29/86	0.0	50MS-3
50580	50589E	SCDFTP	PUBLISH REPORT	6.0	04/15/86	05/28/86	05/28/86		0.0	50SNL
50375	50380	SCDFTP	PERFM PEER/MGMT REVIEW	8.0	05/06/86	07/02/86	07/02/86		0.0	506313
50380	50385	SCDFTP	INCORPORATE COMMENTS	9.2	07/02/86	09/08/86	09/08/86		0.0	50ITC
50385M	50385M	SCDFTP	PRELIM RPT CONCPT DSN	0.0	09/08/86	09/08/86	09/08/86	09/30/86	0.0	50MS-2
50385	50390	SCDFTP	PERFM LINE REVIEW	6.0	09/08/86	10/20/86	10/20/86		0.0	506310
50390	50395	SCDFTP	INCORPORATE COMMENTS	18.4	10/20/86	03/09/87	03/09/87		0.0	506313
50395M	50395M	SCDFTP	SEALING CDR SENT TO DOE	0.0	03/09/87	03/09/87	03/09/87	03/31/87	0.0	50MS-2
50395	50400	SCDFTP	REVIEW REPORT	4.0	03/09/87	04/06/87	04/06/87		0.0	50DOE
50400	50405	SCDFTP	PERFM LINE REVIEW	3.0	04/06/87	04/27/87	04/27/87		0.0	506300
50405	50410	SCDFTP	INCORPORATE COMMENTS	5.0	04/27/87	06/02/87	06/02/87		0.0	506313
50410	50419E	SCDFTP	PUBLISH REPORT	8.0	06/02/87	07/29/87	07/29/87		0.0	50SNL

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