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YUCCA MOUNTAIN PROJECT

ESF TITLE I DESIGN CONTROL PROCESS REVIEW REPORT

January 19, 1989

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Edwin L. Wilmot, Deputy Project Manager

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I. EXECUTIVE SUMMARY

The Exploratory Shaft Facility (ESF) Title I Design Control Process Review was initiated in response to direction from the Office of Civilian Radioactive Waste Management (OCRWM) (letter: Kale to Gertz, NRC Concerns on Title I Design Control Process, November 17, 1988). The direction was to identify the existing documentation that described "... the design control process and the quality assurance that governed ..." (a) the development of the requirements documents for the ESF design, (b) the various interfaces between activities, (c) analyses and definitions leading to additional requirements in the System Design Requirements Documents and, (d) completion of Title I design.

A plan (Appendix A) for accomplishing the task was developed, and the task was initiated in an orientation meeting with participant representatives on November 4, 1988.

This report provides historical information for general use in determining the extent of the quality assurance program in existence during the ESF Title I Design.

Unless specifically noted otherwise, the report cannot be used as a basis for representing the quality assurance standards implemented during the preparation of specific project documents.

It is the responsibility of the user to this report to verify that the quality assurance program stated to be in existence at the specific dates indicated in this report was implemented in the preparation of specific reports and/or data.

The information provided by the participants is summarized in the following.

Figure 1 in this section presents ESF-related requirement flow through three related document hierarchies. The flow of ESF design criteria and design requirements from 10 CFR 60 to Title I design, is presented in the central horizontal hierarchy, based on the requirements flow specified in the OGR and Project Systems Engineering Management Plans. The hierarchy of documents containing the controlling systems engineering is presented across the upper flow, while the hierarchy of quality assurance requirements documents is shown along the lower sequence. It should be noted that this figure indicates functional organizational relationships implied by the levels of documents in effect during part or all of the reported activities; the April 1988 OCRWM reorganization is not depicted. Figure 2 presents the general organizational framework within which ESF activities were accomplished.

Generic requirements for the ESF were approved in November 1986, and issued in March 1987, as Appendix E (Change BCP 115) to

DOE/RW 090:OGR/B-2, Generic Requirements for a Mined Geologic Disposal System. Site-specific ESF design requirements were initially approved by the Nevada Nuclear Waste Site Investigations (NNWSI) Project (now the Yucca Mountain Project) and issued as the ESF Subsystem Design Requirements Document (SDRD) in July 1986. Revision 1 of the ESF SDRD (NVO-309) was issued in December 1987. Preparation of Design Basis documents by the architect/engineers Fenix & Scisson, Inc. (F&S); and Holmes & Narver, Inc. (H&N), was authorized in May 1987. The design basis documents were approved by the Waste Management Project Office (WMPO) in December 1987, and the start of Title I design was directed by WMPO in January 1988.

Management systems defined within the following documents specify how activities such as identification of generic requirements were supposed to be accomplished: DOE Order 5700.4A, Project Management System, November 17, 1983 (superseded in 1987 by DOE Order 4700.1); DOE/RW-0068, OGR/B-1, OGR Program Baseline Procedures Notebook, October 24, 1984; and OGR/B-7, System Engineering Management Plan, January 10, 1985. In addition, quality assurance requirements were specified in DOE/RW-0095:OGR/B-3, OGR Quality Assurance Plan for High-Level Radioactive Waste Repositories, October 24, 1984, and DOE/RW-0032, OCRWM Quality Assurance Management Policies and Requirements, October 1985.

The NNWSI Project issued Revision 0 of NVO-196-17, NNWSI Project Quality Assurance Plan, in August 1980. At that time the QA program was based on industry consensus standard NQA-1-1979 Basic Requirements. Subsequent revisions incorporated requirements of 10 CFR 60 Subpart G (and, therefore, 10 CFR 50, Appendix B) and of the NQA-1 "Supplements". ESF design activities were assigned Quality Assurance level II August 28, 1986.

Project Participants' design control procedures had been issued prior to the start of Title I design, except for H&N's NNWSI-015, Design Inputs Control, and NNWSI-038, QA Drawing and Specification Review; however, note that H&N Procedure NNWSI-007, Work Initiation, Criteria Gathering and Reporting, April 1987, provided full controls on design inputs and addressed QA review. As noted in Section III, "Approach", this review did not assess the adequacy of the procedures that had been issued nor the degree to which procedural provisions were observed in performance of ESF Title I design activities.

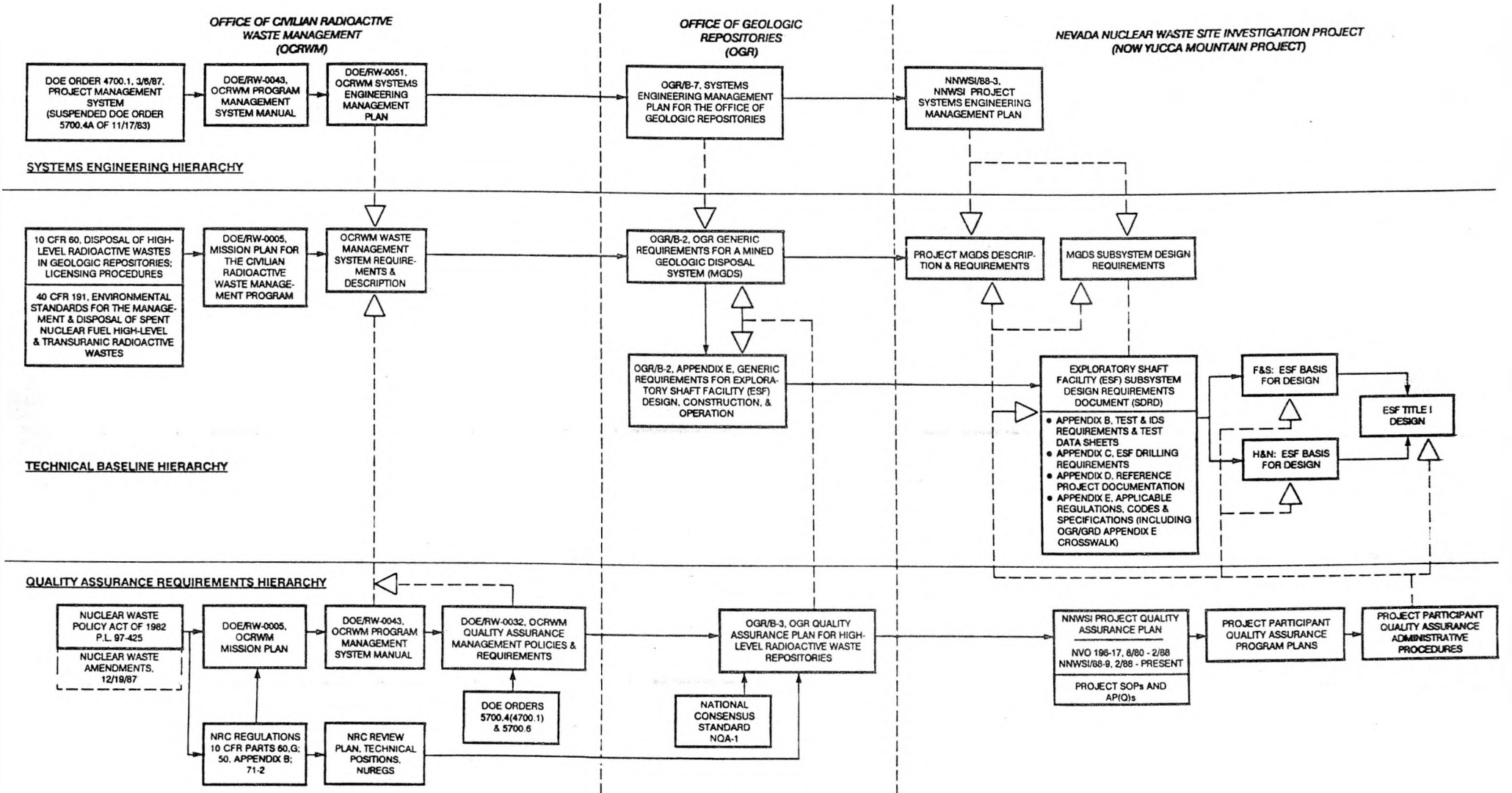

FIGURE 1. REQUIREMENTS HIERARCHY FOR THE EXPLORATORY SHAFT FACILITY (ESF)

ESFREQHL004/1-13-89

NOTE: CHANGES THAT AFFECT A TECHNICAL BASELINE REQUIRE APPROVAL BY THE CHANGE CONTROL BOARD RESPONSIBLE FOR THE AFFECTED BASELINE.

LEGEND:

——————> DIRECT FLOW OF REQUIREMENTS

- - - - - - - > APPLICATION OF MANAGEMENT CONTROLS

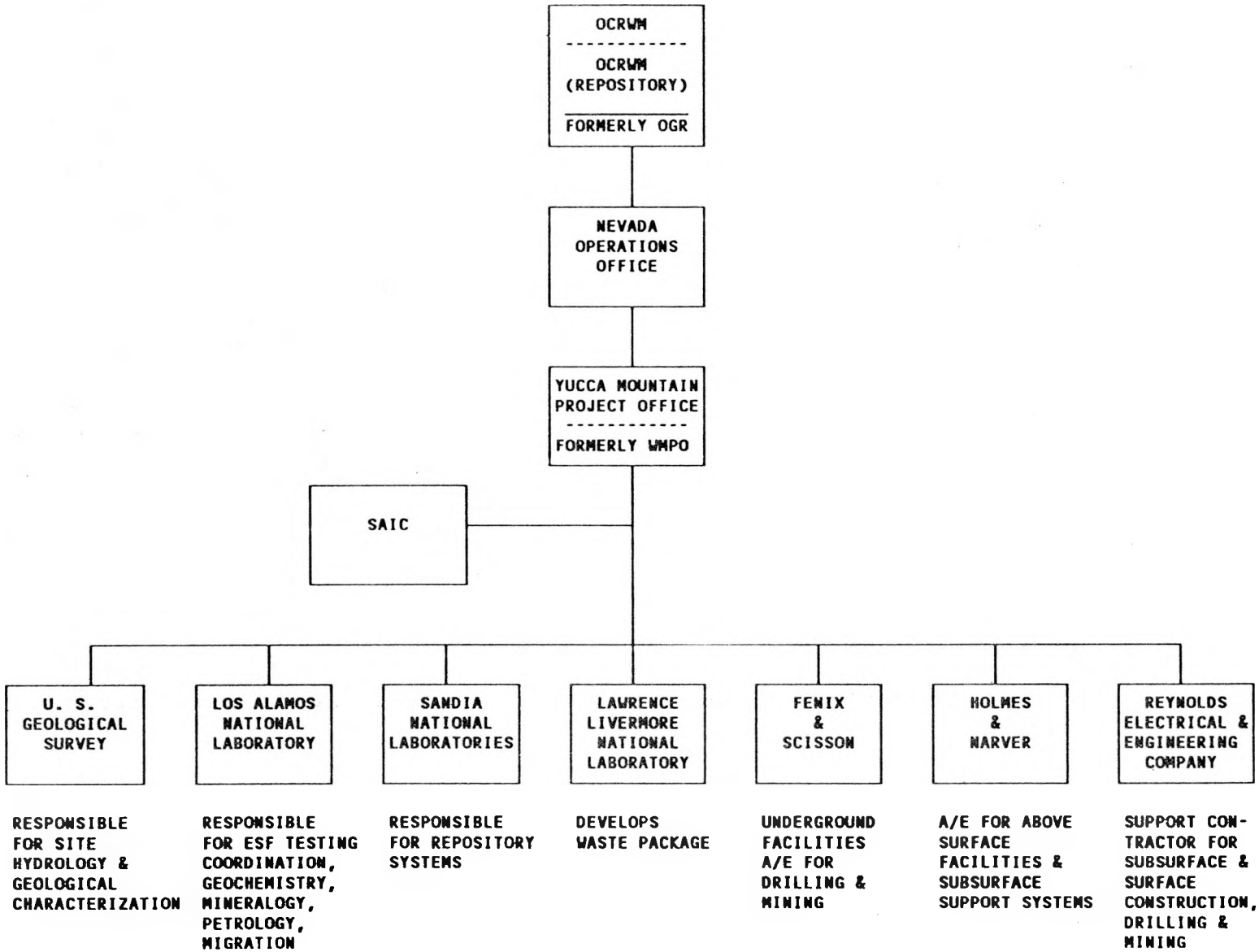

FIGURE 2: ORGANIZATIONAL FRAMEWORK FOR REPORTED EXPLORATORY SHAFT FACILITY ACTIVITIES

II. BACKGROUND

The activity covered by this investigation was initiated by direction from the Office of Civilian Radioactive Waste Management (OCRWM) requesting documentation as described in a November 17, 1988, memorandum from Stephen Kale (Acting Associate Director for Facilities Siting and Development) to Carl Gertz, Yucca Mountain Project: NRC Concerns on Title I Design Control Process.

This report responds to Step 1 of that letter, as quoted below:

> The Project Office should document, (described in Step 2)*, the design control process and quality assurance that were in place and governed (1) the development of the hierarchy of requirement documents, specifically the incorporation of 10 CFR 60 requirements, for the ESF, into GR Appendix E, SDRD, and Design Basis, (2) the identification of interfaces between the ESF design, construction, and operation, and the repository and between siting, design, testing, and performance

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* Included as the second paragraph of the quoted material.

assessment aspects of the program, (3) the analyses and definitions which led to additional requirements in the SDRD, consisting of shaft location, shaft diameter, second shaft, shaft separation, testing interferences, and testing needs, and (4) the completion of Title I design and review of the process to ensure that 10 CFR 60 requirements were incorporated into the design.

The documentation should include the responsible organizations and individuals who performed, reviewed and approved the work, the plans and procedures which governed the performance and review of the work, the quality assurance program the work was performed under, the qualifications of the responsible individuals, results of any management and/or technical assessments performed related to the work, and reports documenting the work.

This report provides historical information for general use in determining the extent of the quality assurance program in existence during the ESF Title I Design.

Unless specifically noted otherwise, the report cannot be used as a basis for representing the quality assurance standards implemented during the preparation of specific project documents.

It is the responsibility of the user to this report to verify that the quality assurance program stated to be in existence at the specific dates indicated in this report was implemented in the preparation of specific reports and/or data.

NOTE: This section briefly summarizes the document hierarchy within which requirements get from the point of origin to the point of application. Processes for controlling transmittal and change are addressed at appropriate locations in Section IV, Control Systems.

A. HIERARCHY OF CONTROLLING DOCUMENTS

Design requirements flow down from applicable government regulations to the Generic Requirements Document, from there to the Subsystem Design Requirements Document (SDRD) and finally to the design basis documents (DBDs). The Title I Design Report and the DBDs will be used to proceed with Title II Design.

The hierarchy of the controlling documents in the exploratory shaft facility design process is described in this section.

1. Generic Requirements

In order to ensure that the Project's efforts are consistent with Office of Geologic Repository program objectives and are documented and presented on a comparable basis, a document entitled Generic Requirements for a Mined Geologic Disposal System (OGR/B-2) was developed. This document gives a functional description of the generic structure of a mined geologic disposal system (MGDS) to convey to the Project a minimum set of requirements that must be satisfied without unduly constraining individual design efforts. These requirements come from the Nuclear Waste Policy Act of 1982 (Public Law 97-425, signed January 7, 1983); the Environmental Protection Agency's Environmental Standards for the Management and Disposal of Spent Nuclear Fuel, High-Level and Transuranic Radioactive Wastes (40 CFR 191, September 19, 1985); the U.S. Nuclear Regulatory Commission's Final Rule for the Disposal of High-Level Radioactive Wastes in Geologic Repositories (10 CFR 60, June 21, 1983); General Guidelines for the Recommendation of Sites for Nuclear Waste Repositories (10 CFR 960, December 6, 1984); and the Office of Civilian Radioactive Waste Management Mission Plan (DOE/RW-0005, June 1985). The generic requirements of OGR/B-2 were stated in that document not to be intended as a substitute for upper tier requirements and regulations, but to provide the guidance necessary to ensure that the designers of the MGDS address certain minimum requirements.

The Yucca Mountain Project used the GRMGDS document:

1. As the generic basis for site-specific design requirements,

2. As the starting point for a site-specific subsystem requirements document,

3. As a basis for evaluating the adequacy of the Project designs, and

4. To assist in Project control of the site-specific design.

2. Subsystem Design Requirements Document (SDRD)

The OGR System Engineering Management Plan (SEMP), OGR/B-7, requires the Project to prepare a site-specific MGDS description, site-specific MGDS requirements, and site-specific subsystem design requirements. The MGDS description and requirements are in preparation; the ESF SDRD provides the site-specific design requirements (i.e., functional requirements and performance criteria) for the ESF subsystem, and incorporates the applicable requirements and criteria from OGR/B-2, Appendix E, "Generic

Requirements For Exploratory Shaft Facility (ESF) Design, Construction, and Operations".

(See discussion of OCRWM and Waste Management Project Office/Science Applications International Corporation SDRD reviews in Section IV B.1.b and IV B.2.b.)

The NNWSI Project Systems Engineering Management Plan (SEMP) defines systems engineering documentation to be used by the Project to support and document technical decisions and to provide a traceable record for use in MGDS acquisition and licensing. As the SEMP was not issued for use until July 1988, its chief effect on Title I design was on the 100% ESF Title I Design Technical Assessment Review of August 1988.

The ESF SDRD (NVO-309, Revision 1) provides functional requirements and performance criteria. The most stringent of the applicable regulations, codes, and standards furnish other basic design criteria.

3. Design Basis Documents (DBDs)

The purpose of the ESF DBDs is to provide documents, developed in response to the requirements given in the SDRD, that contain the specific design criteria for the proposed surface and subsurface

portions of Yucca Mountain Project ESF. The two DBDs prepared by Holmes & Narver, Inc. (H&N) and Fenix & Scisson, Inc. (F&S) and approved by Project Office are the basis for design and engineering efforts to develop specifications and drawings for a specific type and quality of facility that will make up the ESF. The two DBDs were approved and were used by H&N and F&S to develop the Title I design.

III. APPROACH

A. INTRODUCTION

The Exploratory Shaft Facility (ESF) Title I Design Process Review Plan (Appendix A to this report) was developed to describe and control the activities of the responsible participants in identifying and collecting the required documentation. Each of the participants appointed a representative to work with the Process Review team. The organizations participating and their representatives are listed below:

Charles Brooks	U.S. Department of Energy (DOE), Office of Civilian Radioactive Waste Management (OCRWM)
John Robson	DOE Yucca Mountain Project Office (Project Office)
Richard Bahorich	Science Applications International Corporation (SAIC)
Hemi Kalia	Los Alamos National Laboratory (LANL)
William Wilson	United States Geological Survey (USGS)

Thomas Blejwas	Sandia National Laboratories (SNL)
Charles Ward	Holmes & Narver, Inc. (H&N)
James Grenia	Fenix & Scisson, Inc. (F&S)

B. QUESTIONNAIRE

A questionnaire (see Appendix A) was designed to obtain the specific data requested by OCRWM direction, (see Section II, Background) from personnel having personal knowledge of the affected work. The questions were divided into five sections covering the following subjects:

Section 1	Preparation of OGR/B-2, Appendix E, ESF Generic Requirements
Section 2	Preparation of the ESF Subsystem Design Requirements Document (SDRD)
Section 3	Preparation of Design Basis Documents (DBDs)
Section 4	Key Decisions/Analyses and ESF Title I Design

Section 5 Quality Assurance (QA) Program/Design Controls

The criteria used to develop the questions were derived from the reference letter identified in Section II, Background. The questions in Sections 1, 2, and 3 of the Questionnaire were designed to provide the following information regarding the documentation:

1. Participating organizations,
2. Role of the participant,
3. Participating individuals and their qualifications,
4. Identification of subcontractors used and instructions given to them,
5. Time span of participation,
6. Processes actually used,
7. Meetings and correspondence, and
8. Instructions and planning documents.

In addition, Section 2, covering the SDRD, asked for identification of analyses and studies performed, as well as other methods of specifying ESF design criteria, if used.

Section 4 was designed to determine which of the affected organizations had participated in the identification of interfaces between a) ESF design, construction and operation and

the repository, and b) siting, design, testing and performance assessment aspects of the ESF program. In addition, Section 4 was intended to determine participant roles in interface identification or evaluation and in efforts to integrate these aspects during planning and ESF Title I design. Specific information was requested regarding ESF design input analyses for the following items: shaft location, shaft diameter, need for a second shaft, shaft separation, tests required, and testing interferences.

Section 5 was prepared to provide specific information about the initiation and chronological evolution of the design control processes and the quality-related procedures "... that were in place and governed ..." the various activities.

Verification of compliance with the procedures that had been issued for use prior to, or during, ESF Title I activities was outside the scope of this information-gathering task. However, Participants have identified the audits and surveillances that addressed design controls (see Appendix F). Similarly, this review identified the family of design control procedures in effect during the period of interest but did not attempt to matrix individual procedures or procedural provisions against discrete decisions or Title I design elements.

The participants were directed to ensure documentation was available to support the data submitted in response to the questions.

An orientation meeting was held with the team and the representatives of the participants on November 4, 1988. The questions were modified as appropriate to accommodate understandings resulting from the discussions. A revised questionnaire was delivered to each of the participants and incorporated into Revision 0, November 17, 1988, of the plan.

To respond to formal direction from the OCRWM, Revision 1 to Questionnaire Section 4, Question 1, was incorporated and transmitted to the participants.

C. RESPONSES

The responses to the questionnaire are included in Appendix F and summarized in tabular form in Appendix B. Responses to the questionnaire are presented by questionnaire section, participant, and nature of response. These summaries provide an overall view of ESF Title I design activities and of interactions among the participants.

A time-line chart for each of the participants is included in Appendix C. These charts show the chronological relationship between events reported by participants and issuance of key management and design control documents.

D. PERSONNEL

Individuals who participated in the activities addressed in the survey, as well as their fields of expertise and the nature of their participation, are shown in Appendix B, Table 5.

E. TASK INSTRUCTIONS

The ESF Design Control Program Review Plan provides instructions for performing the activities it describes. The process contained herein provides the procedural controls of this work effort.

IV. CONTROL SYSTEMS

A. INTRODUCTION

The chronological record of activities of each participant and the design control process and quality assurance (QA) program that were in place is presented for the following five key elements:

1. Development of Generic Requirements for Mined Geologic Disposal System (OGR/B-2), Appendix E, Exploratory Shaft Facility

2. System Design Requirement Document

3. Design Basis Documents

4. Key Analyses and Decisions

5. QA Program and Design Controls

A brief written summary for each participant is included in this section of the report and a graphical illustration is shown in the time-line charts in Appendix C. These charts are designed to show the time relationship of the activities with the design control processes and the QA program.

The design control processes and the QA program and implementing procedures are shown above the date line and the activities/ events/analyses/reports are shown below the date line. This arrangement displays, graphically, the existence of the management and design controls that existed during the period covered by the activities and events that are shown. The following written discussions supplement the graphical presentation.

The personnel who participated in the activities for each of the participating organizations and their fields of expertise are included in Appendix B Figure 5. Documentation of personnel qualifications is required to be retained as Project QA records.

B. PARTICIPANTS

1. Participation by the Office of Civilian Radioactive Waste Management (OCRWM), Office of Geologic Repositories (OGR)

a. Generic Requirements for a Mined Geologic Disposal System (OGR/B-2:DOE/RW 090), Revision 5, Appendix E, Generic Requirements for Exploratory Shaft Facility (ESF) Design, Construction, and Operations

At the time that Appendix E for the mined geologic disposal system (MGDS) generic requirements document was prepared the work was under the direction of the OGR, which existed within the OCRWM until April 1988. OGR/B-2 was originally issued in October 1984. The change draft (which became BCP 115) was prepared in early 1986. OCRWM and Weston personnel conducted workshops with the four project offices and then solicited final comments from the Waste Management Project Office (WMPO) on August 26, 1986[1]. Appendix E (prepared by Weston) was approved as BCP 115 by the OGR Change Control Board (CCB) November 30, 1986. Revision 3 of OGR/B-2 was issued on March 5, 1987. Note: Membership in the CCB included the project managers from the four projects, the OGR division directors, and the associate director for the OGR.

b. Development of the Exploratory Shaft Facility Subsystem Design Requirements Document (ESF SDRD)

OCRWM OGR/B-7, System Engineering Management Plan, dated October 1985, requires the Project Office to prepare subsystem design requirements. The ESF SDRD accomplished that function for the ESF subsystem. Input requirements for the SDRD were provided in OGR/B-2, Revision 3, issued March 5, 1987. Los Alamos National Laboratory (LANL) documented

applicable requirements from resource data contained or referenced in OGR/B-2 Appendix E, and Science Applications International Corporation (SAIC), with WMPO guidance, compiled and formatted them.[2,3] OCRWM OGR/B-7 requires SDRD approval by the associate director for the OGR prior to SDRD issuance or design of the subsystem. OCRWM personnel reviewed the SDRD and approved it conditionally in December 1987.[4]

The initial work by the OCRWM (i.e., OGR and Weston personnel) on the SDRD was in April 1986, with a final review meeting with the Project in August 1987.[5]

c. Design Basis Documents

The OCRWM did not participate in preparation or review of the Basis for Design documents.[6]

d. Key Decisions/Analyses and Title I Design

The OGR approved the shaft location and shaft diameters. They further directed in May 1985 that a second shaft be included in the ESF design.[7] The OGR also began a review of the ESF SDRD in August 1987.[8]

e. QA Program/Design Controls

The OCRWM Systems Engineering Management Plan (SEMP; DOE/RW-0051) and the OGR SEMP (OGR/B-7) were issued in October 1985. Generic Requirements for a Mined Geologic Disposal System (OGR/B-2) was issued in June 1986. Revision 3 was issued March 5, 1987.

The OCRWM initially issued the OGR Quality Assurance Plan (OGR/B-3) in September 1984. Revision 1 was issued in August 1986 and included QA procedures (i.e., audits, surveillances, etc.). Revision 1.1, issued on August 21, 1987, incorporated procedures for design review, peer review, technical review, and document control.

The chronological order of release of the various management controls is shown in Appendix C.

f. References

(1) SAIC response to Questionnaire Section 1, Question 10.

(2) Los Alamos response to Questionnaire Section 2, Question 7.

(3) SAIC response to Questionnaire Section 2, Question 7.

(4) Letter, Frei to Skousen, NNWSI Site-Specific Subsystem Design Requirements Document (SDRD) for the Exploratory Shaft Facility (ESF), August 20, 1987.

(5) OCRWM response to Questionnaire Section 2, Questions 2 and 8.

(6) OCRWM response to Questionnaire Section 3, Question 1.

(7) Memorandum, J. W. Bennett to L. Olson, J. Neff, and D. Vieth, subject: Second Exploratory Shaft Directive, May 10, 1984.

(8) OCRWM response to Questionnaire Section 2, Question 8.

2. Participation by the Waste Management Project Office (WMPO) and Science Applications International Corporation (SAIC)

a. **OGR/B-2; DOE/RW-0090, Revision 5, Appendix E, Generic Requirements for Exploratory Shaft Facility (ESF) Design, Construction, and Operations**

SAIC did not participate in the development of OGR/B-2 Appendix E, but did participate in the workshops in March and June 1986 at the Project level and provided comments.(1) These open comments were included with the Project comments and were transmitted to the OCRWM from the WMPO (now the Yucca Mountain Project) in September 1986.(2) The documents reviewed included OGR/B-2, Appendix E, Draft 1a, dated February 27, 1986, OGR/B-2, Appendix E, dated April 1, 1986; and OGR/B-2, Appendix E dated August 14, 1986.

b. **Development of the Exploratory Shaft Facility (ESF) Subsystem Design Requirements Document (SDRD)**

Los Alamos developed the requirements for the SDRD from the existing data, which were then formatted, compiled and reviewed by SAIC.(3) SAIC personnel participated in major SDRD comment resolution meetings as follows:

1. The NNWSI/SDRD comment resolution meeting in December 1986,

2. The NNWSI/SDRD comment resolution meeting in April 1987,

3. The DOE-HQ/SDRD comment resolution meeting in August 1987.[4]

The SDRD had been identified in July 1986 as one of the documents making up the Project Baseline technical element (i.e., "baselined"). The Project administrative procedure (SOP-03-05, later replaced by AP-5.6Q) establishing the Interface Control Working Group (ICWG) as the controlling body for requests for changes to the ESF technical element and/or to ESF baseline documents was issued for use in January 1987. Under that procedure, proposed changes to the SDRD are submitted to the ICWG by the participants. The changes are considered by the ICWG and approved or rejected for interface adequacy by the DOE chairman of the ICWG. ICWG-approved Engineering Change Requests (ECRs) affecting the Baseline technical element were then processed through the Project Change Control Board in accordance with AP-3.3, Change Control.

NOTE: The changes recommended through the ICWG during the current ESF Title I design effort, January 1988 through September 1988, were taken under consideration by the CCB and approved in December 1988.

c. **Design Basis Document**

SAIC personnel did not participate in the development of the A/E developed Basis for Design Documents. However, in reviewing this report, DOE's Dennis Irby indicates that SAIC reviewed them prior to WMPO approval. Records of this approval were provided by the architect/engineers.[5,6]

d. **Key Decisions/Analyses and Title I Design**

SAIC participated in the ESF Title I design by conducting the 50% and 100% Technical Assessment Reviews.[7] SAIC was a task force member in the recommendation of shaft location, second-shaft diameter, and shaft separation and participated on the Exploratory Shaft Test Plan (ESTP) committee beginning in 1984.[8] During ESTP committee meetings the required tests and test interferences were evaluated and became the basis for design input analyses. SAIC also prepared the Vieth position paper on the shaft

diameter, the need for two shafts, and shaft location, which was presented to and accepted by the NRC and the State of Nevada on April 15, 1987.[9,10]

e. QA Program/Design Controls

The Nevada Nuclear Waste Storage Investigations (NNWSI) Project (now the Yucca Mountain Project) adopted the requirements of ANSI/ASME NQA-1 with the issuance of the NNWSI Project Quality Assurance Plan, NVO-196-17, Revision 0 in August 1980. The plan was based on NQA-1-1979. The WMPO published its Quality Assurance Program Plan (QAPP) NVO-196-18 in August 1980 in compliance with requirements of NVO-196-17 and ANSI/ASME NQA-1-1979.

Design control measures were specified in Section 3.0 of the QA Plan (NVO-196-17, Rev. 0). WMPO internal procedures covering peer review and document review/acceptance/ approval were initially issued in December 1984. NNWSI Project Standard Operating Procedures (SOPs) applicable to all participants were issued prescribing QAPP requirements (January 1985), Acceptance of Data not developed under the QA Plan (SOP-03-03, January 1986), Software Quality Assurance (February 1986), and ESF Interface Control (SOP-03-05, January 1987).

Audits and surveillances were initially specified in the August 1980 Project QAPP. Audits were performed for the WMPO by Sandia National Laboratories (SNL), which was the QA Support Contractor for the WMPO until 1983. The Project issued their audit procedure in December 1984; audits were subsequently conducted by WMPO beginning in 1985.

f. References

(1) SAIC response to Questionnaire Section 1, Question 8.

(2) Letter DOE/NV, D. L. Vieth to Roy F. Weston, Inc., Hanson, dated September 30, 1986.

(3) SAIC response to Questionnaire Section 2, Question 12.

(4) SAIC response to Questionnaire Section 2, Question 8.

(5) Approval of the Fenix & Scisson, Inc., Basis for Design document, WMPO:DHI-789, January 13, 1988.

(6) Approval of the Holmes & Narver, Inc., Design Basis Document, Revision 1, December 22, 1987.

(7) SAIC response to Questionnaire Section 4, Question 6.

(8) SAIC response to Questionnaire Section 4, Question 2.

(9) SAIC response to Questionnaire Section 4, Question 3.

(10) Summary of Meeting on Proposed Changes to the Nevada Nuclear Waste Storage Investigations Exploratory Shaft Facility, April 14-15, 1987, concurrence signed by J. Linehan, NRC; D. Vieth, DOE-NNWSI; M. Frei, DOE-OGR; C. Johnson, State of Nevada.

3. Participation by LANL

a. OGR/B-2:DOE/RW-0090, Revision 5, Appendix E, Generic Requirements for Exploratory Shaft Facility (ESF) Design, Construction, and Operations

LANL reports that they did not participate in the development of OGR/B-2 Appendix E.(1)

b. Development of the Exploratory Shaft Facility (ESF) Subsystem Design Requirements Document (SDRD)

LANL participated in the preparation and updating of the SDRD by reviewing draft requirements submitted as

Engineering Change Requests (ECRs) to the Interface Control Working Group (ICWG). LANL also collects testing-related requirements from the Principal Investigators (PIs), reviews them for technical consistency, then prepares and submits the ECRs to the ICWG for the PIs. If the architect/ engineers need any test-related requirements, LANL obtains the needed information from the PIs and ensures that an ECR is submitted to the ICWG.(2) These test requirements are shown in the Test and Integrated Data System (IDS) Section, Appendix B and C of the SDRD, which was started in approximately November 1986, and for which LANL has responsibility.(3)

The DOE Chairman of the ICWG approves changes to the ESF SDRD prior to their submittal (when required) to the CCB.(4) Documentation of SDRD ECRs and of Interface Control Working Group (ICWG) meetings is available in the project records center.

With respect to basis for design, LANL reports that all of the tests that were in ESTP Revision 2 were included in Chapter 8 of the SCP, and as such had been reviewed and approved by the Project Office and the OCRWM. On that basis, the SCP test descriptions were being used in the most recent update of ESF SDRD Appendix B.(5)

LANL had issued management and design control procedures by September 1984.[6] The current ESF SDRD, which was initiated in 1986 by the Project Office, was subject to requirements of NNWSI Project Operating Procedures (SOPs), which also covered the activities of the ICWG. Documentation and records of LANL activities on the ESF are maintained as Project records at LANL.

c. Design Basis Documents

Los Alamos did not directly participate in the F&S or H&N Basis for Design Documents except with regard to ECRs to the SDRD, which when approved were supplied to the architect/engineers.

d. Key Decisions/Analysis and Title I Design

The Los Alamos response notes that the current ESF design is the second Title I ESF design produced by the Project. Los Alamos had lead responsibility for the original ESF design, but requested and was granted relief from that responsibility in 1986, prior to the start of the current design.[7,8]

Los Alamos participated in the current (i.e., 1988) ESF Title I design in a consulting and review function and as a member of the Ad Hoc Technical Overview Committee in the evaluation work.[9] However, some aspects of earlier iterations of the design carried over. For example, the ES-2 shaft diameter is the same as was planned for the original ESF.

e. QA Program/Design Controls

LANL has been involved in the waste program since 1977. At that time NQA-1 and the ANSI/ASME N45.2 standards were used as QA guidance. In 1978 LANL issued their program document TWS-QP-1, Revision 0, which provided guidance for work on the Nevada Test Site as a Supplement to NQA-1.[10]

LANL issued procedures covering design review, design control and surveillance in September 1984. The procedures were amended and updated as revisions of the Project QA Plan were issued. In May 1987, LANL issued the LANL-NNWSI QAPP to comply with revision 5 of the Project QA Plan.

The chronology of LANL participation in ESF activities and QA program controls is presented in Appendix C.

f. References

(1) LANL response to Questionnaire Section 1, Question 1.

(2) LANL response to Questionnaire Section 2, Question 2.

(3) LANL response to Questionnaire Section 2, Questions 6 and 7.

(4) LANL response to Questionnaire Section 3, Question 2, and Project administrative procedure AP-5.6Q.

(5) LANL response to Questionnaire Section 3, Question 3. (NOTE: Although Section 3 of the questionnaire was directed at participation in development of the architect/engineers' Basis for Design documents, the LANL response properly addressed design inputs upon which those Basis for Design documents depend.)

(6) LANL response to Questionnaire Section 5, Question 2.

(7) Letter, LANL file no. ESD-WX-4-6/86-13, Oakley to Vieth, dated June 4, 1986.

(8) Letter, LANL file no. ESD-WX-4-11, Vieth to Oakley, dated November 5, 1986.

(9) Letter, S. Bertram, SAND84-10/3/1984.

(10) LANL response to Questionnaire Section 5, Question 1.

4. Participation by Sandia National Laboratory (SNL)

a. **OGR/B-2:DOE/RW-090, Revision 5, Appendix E, Generic Requirements for Exploratory Shaft Facility (ESF) Design, Construction, and Operations**

SNL did not participate in the development of OGR/B-2 Appendix E, but did participate in review workshop meetings at the project level.(1) These meetings are documented by meeting minutes.

b. **SDRD Development**

SNL participated in the preparation of the SDRD beginning in October 1985. Participation by SNL consisted of preparation of draft designs and criteria for the main test level; the location, extent, and sizing of the lateral drifts driven to investigate the geological features of the site; and the layouts of the upper and lower breakout levels and the seismic criteria (which Sandia, as a participant in the

Interface Control Working Group (ICWG), presented as ECR's for review and incorporation into the SDRD).[2] In addition, SNL developed the Reference Information Base (RIB) which was initially released as Version 01.001 in April 1986.[3] This document has been revised, updated, released, and controlled by SNL through their RIB change control process. Sandia also has participated in the ESTP Committee. Portions of ESF SDRD Appendix B developed by Los Alamos were derived from Detail Test Plans prepared in part by SNL PIs. In addition, SNL conducts performance assessments and developed the conceptual design for the SCP. The documentation of the work performed and the processes followed by SNL and its principal design contractor are on file in the SNL Project records. Copies of SNL reports were submitted as Project records.[3]

c. **Preparation of Design Basis Documents**

SNL did not participate in developing the Design Basis documents by the architect/engineers.[4]

d. Key Decisions/Analyses and Title I Design

SNL participated as consultants and reviewers on the ESF Design beginning in October 1985[5] and are responsible for the design of the repository and conducting performance assessments.

They provided recommendations on the ESF shafts beginning in April 1982. SNL personnel and their contractor personnel participated in the shaft sizing determinations that were developed in April 1986 by a WMPO selected working group. SNL provided recommendations on the sizing of the second shaft. Sandia also participated in the shaft determination that separation was adequate to assure there would not be shaft to shaft interferences.[6] SNL has proposed experiments and tests for the ESF to obtain site information and engineering criteria for the repository. They also participated in the development of the strategy and criteria for test/experiment spacing to ensure that there will be no interferences between tests, which was documented in the SCP Section 8.4.2.3. SNL personnel and SNL contractor personnel also performed reviews of the ESF Title I design, as it would affect the repository design and the ability to conduct performance assessments.[7] The records and papers supporting this effort are identified and are on file in the Project records system.

e. QA Program/Design Control

SNL has had procedures covering certain design activities since 1983, and procedures providing overall design process control system had been issued by November 1986.[8] Sandia states that they used NQA-1 Basic Requirements to structure their QA program since their initial involvement in the NNWSI project. Sandia's QA program was upgraded to comply with the project QA Plan (NVO-196-17, Rev. 4), as well as and NQA-1 and supplements, which was invoked by the WMPO in December 1986.[8] The chronology of SNL's participation and QA program controls is presented in Appendix C.

f. References

(1) SNL response to Questionnaire Section 1, Questions 1 and 2.

(2) SNL response to Questionnaire, Section 2, Questions 1, 2, and 7.

(3) SNL response to Questionnaire Section 2, Question 9.

(4) SNL response to Questionnaire Section 3, Question 1.

(5) SNL response to Questionnaire, Section 4, Question 6.

(6) SNL response to Questionnaire Section 4, Questions 1 and 2.

(7) SNL response to Questionnaire Section 4, Questions 3, 4 and 7.

(8) SNL response to Questionnaire Section 5, Questions 1 and 2.

5. Participation by the United States Geological Survey (USGS)

a. OGR/B-2:DOE/RW-090, Revision 5, Appendix E, Generic Requirements for Exploratory Shaft Facility Design, Construction, and Operations

The USGS did not participate in the development of OGR/B-2 Appendix E.

b. Development of the Exploratory Shaft Facility (ESF) Subsystem Design Requirements Document (SDRD)

The USGS involvement in the SDRD has been principally indirect, through participation in the ESTP Committee (established in 1982) and as a participant of the Interface Control Working Group (ICWG) to review changes for the SDRD. Portions of SDRD Appendix B developed by Los Alamos were derived from Detail Test Plans and the ESTP, prepared in part by USGS PIs.(1) Copies of pertinent reports and correspondence are available in files at USGS as well as in the Project files.

The U.S. Bureau of Reclamation (USBR) provided similar review input for the SDRD and performed selected reviews in their field of expertise. Copies of these reports are in the Project files.

c. Preparation of Design Basis Documents

The USGS and the USBR did not participate in developing the architect/engineers' Design Basis documents.

d. Key Decisions/Analyses and Title I Design

The USGS and the USBR participated as consultants on the repository and site subsystems, and the test and performance assessment activities. As members of the ESTP Committee, they have provided input for the ESF since 1981. They participated as consultants regarding ESF shaft location, shaft diameter, the need for a second shaft, and shaft separation. In addition, they have prepared and reviewed test descriptions and test requirements since 1981.(2)

With regard to ESF Title I Design, the USGS and the USBR provided consultation as well as reviewing the documents. This consultation and review activity has been ongoing by the USGS and the USBR since 1981. The records and papers supporting this effort are identified and are on file in USGS NNWSI Project files.(3)

e. QA Program/Design Controls

"The USGS does not perform design and does not have a design control program..."(4) However, they performed reviews of some Title I design and served as members of the ESTP Committee and the ICWG.(2,3) Submittal of changes to ESF Title I design requirements, as well as review and approval,

were controlled by Project SOP-03-05 (now AP-5.6Q) starting January 27, 1987. LANL worked with the USGS to develop QA Plan NWM-USGS-QAPP-01, Revision 0, in compliance with ANSI/ASME NQA-1, which was first issued in November 1980.[4] This plan was revised and reissued in July 1983. LANL also prepared the Unit Test Procedures (UTPs) and multiple test procedures (MTPs) which provided basic descriptions of USGS technical work to be performed under each task area, and listed technical procedures to provide more detailed instructions for performing tasks.

The USGS revised and reissued their QA Plan as Revision 2, effective August 1985. LANL continued to assist the USGS in establishing their audit and surveillance program. Both the USGS and the USBR are now performing their own audits and surveillances. The USGS prepared Quality Management Procedures to implement the QAPP and detailed technical procedures, which superseded the UTPs and MTPs.[4]

Revision 3 of the QAPP, effective October 1986, was the first QAPP in full compliance with the Project QA Plan (NVO-196-17, Revision 4). Revision 4 of the USGS QAPP, effective January 1988, was likewise in compliance with the subsequent revision of the QA Plan (NVO-196-17, Revision 5).[4]

The chronology of USGS and participation and QA program controls is presented in Appendix C.

f. **References**

(1) USGS response to Questionnaire Section 2, Questions 2, 6, 7, 8, 9, and 12.

(2) USGS response to Questionnaire Section 4, Questions 1 and 2.

(3) USGS response to Questionnaire Section 4, Questions 4 and 5.

(4) USGS response to Questionnaire Section 5, Questions 2, 3, and 6.

6. Participation by Fenix & Scisson, Inc. (F&S)

a. **OGR/B-2; DOE/RW-090, Revision 5, Appendix E, Generic Requirements for Exploratory Shaft Facility (ESF) Design, Construction, and Operations**

F&S did not participate in the development of OGR/B-2, Appendix E; however, predating the MGDS, F&S participated in reviews and provided comments on the ESF.

b. Development of the Exploratory Shaft Facility (ESF) Subsystem Design Requirements Document (SDRD)

F&S did not participate in the preparation of the current ESF SDRD, but did review and comment. Copies of these comments are available in the Project files.[1,2,3,4]

c. Design Basis Documents

F&S used the DOE Basis for Design letter, dated May 19, 1987,[5] and Revision 1 of the ESF SDRD (NVO-309) and elaborated on the requirements based upon F&S design experience to develop their Design Basis Document.

The F&S Basis for Design Document was submitted to the Project Office for review; it was approved on December 31, 1987 (reference WMPO:DMI-789) after internal release as Issue 0 December 16, 1987.[6]

d. Key Decisions/Analyses and Title I Design

F&S Design and Project Groups are responsible for the underground design of the ESF. In this function F&S participated in the identification and/or evaluation of the ESF repository design interfaces, as documented in ICWG and ESTP meeting minutes and in the ICWG drawings, which were reviewed and concurred with by F&S. The records are available in the project records center. F&S Title I design was initiated on January 13, 1988.

F&S provided proposed locations for the Shaft locations in July 1986. The YM Project Office made the final decision on location in January 1987. F&S initially reviewed the shaft diameter and criteria in November 1982. The need for a second shaft was identified on the Basalt project as a necessary safety measure in late 1983. OCRWM and the project office subsequently directed that a second shaft be incorporated in the NNWSI ESF in May, 1984.(7)

F&S reviewed and recommended shaft spacing in June 1986. In January 1987 the Yucca Mountain Project Office directed the shaft location and F&S accepted this location in the ESF design in January 1987. F&S reviewed the SDRD, Rev. 0, Appendices B and C on the Engineering aspects of the tests described in Appendix B. No comments were provided on the

site characterization tests or on the testing interferences.[8]

e. QA Program/Design Controls

F&S has complied with the Yucca Mountain Project QA Program document YMP/88-9 since its original issue as NVO-196-17. F&S prepared procedures covering the scope of its work beginning as early as March 1982, with the design control procedures issued beginning in 1986.[9] The chronological relationship of the various design and QA procedures is shown in Figure Appendix C.

f. References

(1) F&S memo dated 8/8/86, subject: Review and Comments on the Draft SDR, dated 7/18/86.

(2) F&S memo, dated 6/22/87, comments on SDRD, preliminary, March, 1987.

(3) F&S letter, dated 8/14/88, Murphy to DOE/NV, D. Irby, subject: Comments on ESF Subsystem Design Requirement.

(4) F&S letter NWTUL-88-013, dated 1/19/88, Acceptance of SDRD NVO-309, Rev. 1.

(5) DOE/NV, Vieth to F&S, Bullock, dated 5/19/87, Basis for Design.

(6) DOE/NV letter, WMPO:HDI-787, dated 12/31/87 to F&S, Bullock, Approval of F&S Basis for Design Document.

(7) DOE memorandum, J. W. Bennett to L. Olson, J. Neff, and D. Vieth, subject: Second Exploratory Shaft Directive, May 10, 1984.

(8) F&S response to Questionnaire Section 4, Questions 1 and 2.

(9) F&S response to Questionnaire Section 5, Questions 1 and 2.

7. Participation by Holmes & Narver, Inc. (H&N)

a. OGR/B-2; DOE/RW 090, Revision 5, Appendix E, Generic Requirements for Exploratory Shaft Facility (ESF) Design, Construction, and Operations

H&N did not participate in the development of OGR/B-2, Generic Requirements for a Mined Geologic Disposal System - Appendix E[1] but did review it and provide comments in the form of mark-ups and marginal notes in the document.[2]

b. **SDRD Development**

H&N did participate in the preparation of the SDRD beginning in 1986. H&N's role was to review and provide comments to the Yucca Mountain Project Office as a member of the Interface Control Working Group (ICWG). (H&N had no approval authority.)[3]

H&N personnel provided comments (in the form of document mark-ups and marginal notes) to the project office and also attended the SDRD review meetings with OCRWM personnel. H&N did not retain copies of the draft documents.

c. **Design Basis Documents**

H&N used the SDRD as the basis for design and elaborated upon the contents based on their experience as designers to develop Basis for Design document.[4]

H&N notes that no procedural requirement existed for the retention of H&N internal review documents. The formal review was conducted by the Yucca Mountain Project Office for the Basis for Design Document.(5)

d. Key Decisions/Analyses and Title I Design

Holmes and Narver, Inc. is the ESF A-E responsible for the design of the underground support systems and the above-ground facilities. Responsibilities include field surveillance and inspection of facilities construction. Additionally, they provide Material Test Laboratory support, nondestructive examination services, and field surveying services, microfilming, and archival storage of NNWSI Project records.(6)

H&N did not participate in establishing the Shaft locations, the shaft diameter, the need for a second shaft, shaft separation, establishing required tests or in establishing Test Interferences.

e. QA Program/Design Control

Holmes & Narver, Inc./Energy Support Division (H&N/ESD) has committed to comply with the Yucca Mountain Project Office (YMPO) Project Quality Assurance Plan (QAP) (NVO-196-17 and its successor 88-9) since the inception of the project. The YMPO QAP indicates that NQA-1 is one of the documents which forms the basis for the development of the Project QAP. In summary, H&N/ESD has committed to NQA-1 to the extent prescribed by the Department of Energy/Nevada Operations Office (DOE/NV) 5700.6 series Orders. The first YMPO approval of the H&N/ESD QA Program specifically developed for the Yucca Mountain Project was in May 1986.(8)

Annual audits and surveillances of H&N QA program activities have been conducted since 1986. H&N developed specific procedures for the Yucca Mountain Project beginning in 1986.(9) The chronological relationship of the various design and QA procedures to the ESF design process is shown in Appendix C.

f. References

(1) H&N response to Questionnaire Section 1, Question 1.

(2) DOE/NV, D. L. Vieth to Roy F. Weston, Inc., Hanson, dated 9/30/86.

(3) H&N response to Questionnaire Section 2, Questions 1 and 2.

(4) H&N response to Questionnaire Section 3, Question 2.

(5) H&N response to Questionnaire Section 3, Questions 7 and 8.

(6) NNWSI/88-9, Yucca Mountain Project Quality Assurance Plan, Introduction, p. xxxi.

(7) H&N response to Questionnaire Section 4, Question 1 and 2.

(8) H&N response to Questionnaire Section 5, Question 1.

(9) H&N response to Questionnaire Section 5, Questions 3, 4, and 5.

C. SPECIFIC INTERFACES AND ANALYSES

1. Exploratory Shaft Location

Initial NNWSI Project exploratory shaft site selection was accomplished by the NNWSI Project Technical Integration Group, June 14-15, 1982. The group's recommendation was communicated to D. L. Vieth, Director, Waste Management Project Office, June 25, 1982.(1) The recommendation included, as an attachment, the committee's report, which identified committee membership, objectives, evaluation process, overall evaluation criteria, results of the screening process, ranking criteria, and supplemental data for performance comparison.

Exploratory shaft design task force activities in the early spring of 1986 led to further analyses.(2) In July 1986 F&S transmitted a new shaft location recommendation, with supporting rationale, for DOE/WMPO approval.(3)

The Project Office response stated that SNL and LANL review and concurrence would be required prior to final approval, but directed F&S and H&N to develop conceptual layouts and general arrangements based on the recommended locations, as aids in the decision process.(4) In January 1987 the Project Office announced the selection of the shaft location for ES-1 in a

letter addressed to SNL, LANL, F&S, H&N, and Reynolds Electrical and Engineering Company, Inc. (REECo).[5]

The Project presented proposed changes to the ESF at an April 14-15, 1987, meeting with the NRC and the State of Nevada. One of the proposed changes was to move the shafts 440 feet northeast so the shaft collars could be emplaced in rock rather than fill. Results of the meeting, including action items, were documented in the meeting summary.[6]

(1) Letter, R. C. Lincoln to D. L. Vieth, presenting recommendations developed during the June 14, 15, 1982 meeting of the NNWSI Technical Integration Group, letter dated June 25, 1982.

(2) SAIC response to ESF Title I Design Control Review Questionnaire, November 1988.

(3) F&S letter, NW-86-142, J. A. Cross to R. M. Nelson, Jr., attn. D. L. Vieth, subject: Location of Shafts for the Exploratory Shaft Facility (ESF), dated July 29, 1986.

(4) DOE letter, D. L. Vieth to J. A. Cross, subject: Location of Shaft for the Exploratory Shaft Facility (ESF), dated August 21, 1986.

(5) DOE letter, D. H. Irby to T. E. Blejwas, J. P. Pedalino, D. L. Koss, T. J. Merson, and S. D. Murphy, subject: Proposed Final Shaft Locations and Conceptual Site Surface Layout for the Exploratory Shaft Facility (ESF)..., dated January 7, 1987.

(6) Summary of Meeting on Proposed Changes to the Nevada Nuclear Waste Storage Investigations Exploratory Shaft Facility, April 14-15, 1987, concurrence signed by J. Linehan, NRC; D. Vieth, DOE-NNWSI; M. Frei, DOE-OGR; C. Johnson, State of Nevada.

2. Shaft Diameter (ES-1)

The 12-foot diameter of the primary exploratory shaft was established during the first design effort (1982 and earlier), at which time LANL had lead responsibility for ESF design. LANL transmitted specifications to the architect/engineer (i.e., F&S) by letter approved by the Project Office on November 12, 1982.(1)

The shaft diameter determination "appears to have carried over" into the second round of ESF Title I design.(2) [Note that the Los Alamos response emphasizes the fact that the current ESF design is "... the second Title I ESF design produced by the Project."(3) LANL had lead responsibility for the original ESF

design but requested and was granted relief from that responsibility in 1986, prior to the start of the current design.[4,5]] No information has surfaced during this review with regard to reevaluation of ES-1 diameter.

(1) LANL letter, D. C. Nelson to J. H. Dryden, subject: Exploratory Shaft Design Criteria Letter DCL-4, dated November 8, 1982.

(2) LANL response to Title I Design Control Review questionnaire (Section 4, question 2), November 8, 1988.

(3) "Qualifications on Responses to Questions in the ESF Design Control Program Review Plan", Los Alamos response to Questionnaire (see Appendix F).

(4) Letter, Oakley to Vieth, LANL File No. ESD-WX-4-6/86-13, dated June 4, 1986.

(5) Letter, Vieth to Oakley, LANL File No. PRC:ESD-WX-4-11/86-7.

3. Second Shaft

The Basalt Waste Isolation Project (BWIP) requested approval in 1983 for a second exploratory shaft as a personnel safety measure. The OCRWM extended evaluation of the safety issues raised by the BWIP request to address the tuff and salt projects. In May 1984 the OCRWM directed that the NNWSI Project plan for a second shaft to provide an alternative egress for personnel.(1) That direction indicated that "... until HQ has made a final determination on the policy to use in sizing the second shaft, exploratory shaft detailed design efforts currently underway should not be redirected to a second shaft size in excess of that needed to meet safety requirements ..."

SNL and its underground design support contractor, Parsons-Brinkerhoff, performed the necessary shaft sizing analysis for the second shaft.(2) LANL processed a request through the Project Office for F&S and H&N to proceed with Title I and Title II design of the second shaft. Project guidance was cited as the source of the requirement for a nominal inside diameter of six feet, but the letter acknowledged that some other size might prove better in the light of "... safety, equipment availability, or cost or schedule considerations ..."(3)

The LANL letter included a requirement for the second shaft to be separated from the main shaft by 100 to 500 feet, referring to the 100-foot minimum specified by California Mine Orders.

In the same time frame, SNL reviewed proposed shaft separation and shaft construction methods.(4)

Later recommendations and decisions concerning second shaft sizing included a meeting of Project participant representatives April 9-11, 1986, and continued communication among affected participants. Results were summarized in a July 1986 letter from T. Blejwas (SNL) to D. Vieth (WMPO).(5) In 1987, a decision was made to increase the diameter of the second shaft from 6 to 12 feet; the proposed increase was discussed (with other changes) at the April 14-15, 1987, Las Vegas meeting with representatives of the NRC and the State of Nevada.(6)

(1) Memorandum, J. W. Bennett to L. Olson, J. Neff, and D. Vieth, subject: Second Exploratory Shaft Directive, May 10, 1984.

(2) SNL Report SAND84-1261, Recommendation for a Second Access for the Yucca Mountain Exploratory Shaft Facility.

(3) Letter, D. C. Nelson to J. H. Dryden, Request for Title I and Title II Engineering Design for a Second Shaft for the Exploratory Shaft Facility (ESF)-DCL-10, dated August 1, 1984.

(4) SNL Report SAND84-1003, NNWSI Exploratory Shaft Site and Construction Recommendation Report.

(5) Letter, T. Blejwas to D. Vieth, subject: Shaft sizes and configuration for the ES2 shaft of the Exploratory Shaft Facility.

(6) Summary of Meeting on Proposed Changes to the Nevada Nuclear Waste Storage Investigations Exploratory Shaft Facility, April 14-15, 1987, concurrence signed by J. Linehan, NRC; D. Vieth, DOE-NNWSI; M. Frei, DOE-OGR; C. Johnson, State of Nevada.

4. Shaft Separation

Although it had originally been assumed that each shaft would be serviced by its own hoist house, initial layouts indicated space problems, and discussions between Project Office and F&S engineers led to a decision to explore the feasibility of using a single hoist house. Accordingly, in July 1986 F&S recommended a

N65° E approximate centerline bearing, ES-1 to ES-2, and shaft separation of 180 to 240 feet.(1) Shaft separation calculations, transmitted with the recommendation, were based on engineering and construction considerations, and assuming the common hoist house. The Project Office authorized F&S and H&N to proceed with conceptual layouts based on the recommendation, recognizing that a need for changes might arise out of SNL and LANL review of potential impact of construction in one shaft on testing in the other.(2)

SNL and LANL analyses of the recommended shaft separation for testing interference potential indicated that a 300 foot separation would be adequate to prevent interference.(3)

The Project Office issued an ESF Site Surface Conceptual Layout drawing to Project participants, stating that it superseded any previous information and should be utilized as the input for the ESF design studies.(4,5)

(1) F&S letter, J. A. Cross to R. M. Nelson, Jr., attn. D. L. Vieth, subject: Location of Shafts for the Exploratory Shaft Facility (ESF), NW-86-142, dated July 29, 1986.

(2) DOE letter, D. L. Vieth to J. A. Cross, subject: Location of Shaft for the Exploratory Shaft Facility (ESF), dated August 21, 1986.

(3) Analyses presented in Site Characterization Plan (SCP) Section 8.4.3.2.

(4) Drawing, ESF Site Surface Conceptual Layout, Dennis H. Irby, December 12, 1986.

(5) DOE letter, D. H. Irby to T. E. Blejwas (SNL), J. P. Pedalino (H&N), D. L. Koss (REECo), T. J. Merson (LANL), and S. D. Murphy (F&S), subject: Proposed Final Shaft Locations and Conceptual Site Surface Layout for the Exploratory Shaft Facility (ESF), dated January 7, 1987.

5. Testing Interferences

The direction from OCRWM regarding this ESF Title I design process review requested documentation concerning the analyses and definitions that led to additional requirements in the SDRD (see Section II, Background, in this report). Specific information regarding testing interferences was requested.

The analyses of testing interferences was accomplished by the ESTP Committee. All members of the ESTP Committee contributed to analyses that established test locations to avoid testing interferences. Results are reported and supporting analyses are referenced in Section 8.4.2.3 of the SCP. In addition, the minutes of the monthly ESTP Committee meetings document interchange among participants with respect to test planning coordination and actions undertaken to evaluate or resolve potential interferences.

6. Testing Needs

LANL has lead responsibility for exploratory shaft test planning and coordination. The Laboratory approach was a standing committee of scientists and engineers representing LANL, SNL, Lawrence Livermore National Laboratory (LLNL) and the USGS. Within the committee, the following organizational responsibility existed:[1]

LANL	Management of Exploratory Shaft Testing and Test Plan Development; Geochemistry; Mineralogy/ Petrology
SNL	Geomechanics; Boring Machine Development

LLNL	Waste Package; Engineered Barrier
USGS	Geology; Hydrology; In Situ Stress (with SNL); Vertical Seismic Profiling (with the Lawrence Berkeley Laboratory)

For the period 1983 through 1988, LANL lists 239 documents in the record dealing directly with ESTP meetings and drafts of the plan.(2) The LANL listing of reports, memoranda, letters, etc., pertaining to topics such as ESF design, proposed tests, status meetings, and personnel certifications, covering the period 1980 to 1988, contains 1370 entries.(3)

(1) LANL letter, Aamodt to Davis, No. TWS-ESS-1-2/87-3, dated February 9, 1987 [Copy of letter furnished with LANL response to Questionnaire Section 3, Question 4, as an example of instructions and background information furnished to external reviewers of the ESTP.]

(2) LANL response to Title I Design Process Review questionnaire, Attachment 2, List of ESTP-related documents relevant to the ESF design questionnaire.

(3) LANL response to Title I Design Process Review questionnaire, Attachment 3, General listing of ESF design and testing references relevant to the ESF design questionnaire.

APPENDIX A

ESF TITLE I DESIGN PROCESS REVIEW PLAN

DOE/NV

YUCCA MOUNTAIN PROJECT

ESF TITLE I DESIGN CONTROL PROCESS REVIEW PLAN

REVISION 1
11-30-88

Approvals:

OK ESF
11/30/88

Edwin L. Wilmot, Deputy Project Manager — Date: 1/19/89

J. Blaylock — Date: 1/19/89

J. Blaylock, Project QA Manager

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NOTE: Rev. 0 was never issued by letter. Changes to original issue were provided informally to project participants, to provide for initiation of the work.

ESF TITLE I DESIGN CONTROL PROCESS REVIEW PLAN

1.0 PURPOSE

The purpose of the review is to document the design control process and quality assurance that were in place and governed (1) the development of the hierarchy of requirement documents, specifically the incorporation of 10CFR60 requirements, for the ESF, into Mined Geologic Disposal System (MGDS), Appendix E, Subsystem Design Requirements Document (SDRD), and Design Basis, (2) the identification of interfaces between the ESF design, construction, and operation, and the repository and between siting, design, testing, and performance assessment aspects of the program, (3) the analyses and definitions which led to additional requirements in the SDRD, consisting of shaft location, shaft diameter, second shaft, shaft separation, testing interferences, and testing needs, and (4) the performance of Title I design and review of the process to ensure that 10CFR60 requirements were incorporated into the design.

2.0 APPLICABILITY

This plan controls the identification of the documentation of the design control process and the quality assurance controls used to perform the Exploratory Shaft Facility programs and activities performed by the following organizations in the

preparation and issuance of the Generic Requirements for a Mined Geologic Repository System, Appendix E (DOE/RW-090; OGR/B-2); the Subsystem Design Requirements Document (NVO-309); Holmes & Narver, Inc. Design Basis Document; and Fenix & Scisson, Inc. Basis for Design Document; and the ESF Title I Design Documents.

2.1 Department of Energy, Office of Civilian Radioactive Waste Management (OCRWM)

2.2 Nevada Operations Office, Yucca Mountain Project Office

2.3 Science Applications International Corporation (SAIC)

2.4 Holmes & Narver, Inc. (H&N)

2.5 Los Alamos National Laboratory (LANL)

2.6 United States Geological Survey (USGS)

2.7 Sandia National Laboratory (SNL)

2.8 Fenix & Scisson, Inc. (F&S)

3.0 REFERENCES AND DEFINITIONS

3.1 10CFR60 Disposal of High-Level Radioactive Wastes in Geological Repositories, Subpart G

3.2 YMP/88-9, (NVO 196-17) Yucca Mountain Project Quality Assurance Plan

3.3 ESF Title I Design Control Process Review Plan is - "A program review to document the design and quality assurance controls that were in place during the establishment of the requirements documents and preparing and reviewing of the ESF Title I Design Documents."

3.4 Quality Levels - The activity described by the plan has been assigned Quality Assurance Level III, reference QALA YMP-EHP-1, Rev. 0. Work-specific requirements of the following QA program criteria of YMP/88-9 have been selected by management for application to this activity as deemed appropriate.

Criterion I Organization

Criterion II Application of graded quality assurance

Criterion V	Written instructions, procedures, and drawings
Criterion XVI	Corrective Action
Criterion XVII	QA Records
Criterion XVIII	Audit

4.0 RESPONSIBILITIES

The questionnaire included as part of this plan shall be completed by each organization to facilitate the submittal of the OCRWM requested information. (Note that the YMPO completes this activity by review of the documentation submitted by the other participants.)

4.1 Each organization listed in Section 2.0 shall identify their role in the preparation, review and/or implementation of the identified documents in Section 2.0. Work on the ESF Title I Design Control Process Plan is under the Management of Pre-title II Design Activities, DOE/YMP letter NNI-881026.0048, dated 10/26/88.

4.2 Each organization shall indicate when the requirements (e.g., reference 3.2) were incorporated in program plans, procedures or instructions that have been used on the YMP.

4.3 Each organization shall indicate the documentation interfaces that controlled their activities between the repository and site subsystems and the test and performance assessment activities.

4.4 Each organization shall indicate their participant role in the design input and/or analysis of the ESF Title I Design for:

4.4.1 Shaft location

4.4.2 Shaft diameter

4.4.3 Determination of need for second shaft

4.4.4 Determination of shaft separation

4.4.5 Determination of required tests

4.4.6 Analysis of potential test interferences

4.5 Each organization shall indicate their role in the ESF Title I design process and the design and quality assurance controls that were utilized.

4.6 Each organization shall indicate their role in the ESF Title I design review process or technical assessment and the design and quality assurance controls that were utilized.

4.7 Each organization management shall appoint a representative as required to document their plans, procedures, instructions, and records, conduct the necessary interviews and complete the questionnaire (Attachment 1). The documentation should include the responsible organizations and individuals who performed, reviewed and approved the work, the plans and procedures which governed the performance and review of the work, the quality assurance program the work was performed under, the qualifications of the responsible individuals, results of any management assessments performed related to the work, and reports documenting the work.

4.7.1 One representative from each organization shall be given orientation by the Yucca Mountain Project Office with regard to this Plan.

4.7.2 Additional organization personnel who implement this plan will receive orientation from the representative who received project office orientation.

4.7.3 Each organization shall submit the completed questionnaire to the Project Office.

4.8 The YMPO Systems Branch Chief shall be responsible for directing the efforts of the Team in implementing this Review Plan.

4.8.1 The team leader shall review for completeness the results documented in the questionnaire and issue the Final Report.

4.8.2 Project Participants shall provide selected individuals to perform the work.

5.0 OBJECTIVE

The objective of this ESF Design Control Process Review is to document the design control process and the quality assurance program that were in place and governed the development of the hierarchy of requirements documents and the performance of the ESF Title I design.

It is the responsibility of the user of any data or reports generated in accordance with this plan to verify that any information referenced as a result of using such data or reports meets the appropriate quality assurance requirements.

6.0 EVALUATION

The Team Leader will be responsible for evaluation with respect to completeness of the results of this Design Control Process Review and will submit the Final Report to Ed Wilmot, Deputy Director, for approval.

Review Team

Lead -	A. L. Baca	Phone:	794-7960	(FTS:	544-7960)
Member -	G. S. Braun	Phone:	794-7845	(FTS:	544-7845)
Member -	L. E. Zwissler	Phone:	794-7845	(FTS:	544-7845)
Member -	J. H. Rusk	Phone:	794-7845	(FTS:	544-7845)
Member -	B. M. Gregory	Phone:	794-7130	(FTS:	544-7130)

Any additional members added will be identified in the final report.

7.0 PLAN

The ESF Title I Design Control Process Review will be conducted in phases.

7.1 Phase 1 will encompass the preparation of the Review Plan and orientation of the participating organizations representatives, the completion of the questionnaire and providing this information to the Review Team.

7.2 Phase 2 will encompass the completion of the information submitted and summarize the results.

7.3 Phase 3 will encompass the preparation of the Draft Report, as well as preparation of materials and participation in any meetings with the NRC to review the results.

7.4 Phase 4 will include preparing and issuing the Final Report.

8.0 SCHEDULE

11/4/88 Hold kickoff meeting with review team and participating organizations.

11/14/88 Completion of Phase 1.

11/18/88 Completion of Phase 2.

12/5/88 Completion of Phase 3.

12/16/88 Completion of Phase 4.

9.0 RECORDS

Quality records will be generated by application of this plan.

The following documents generated by application of this procedure shall be transmitted to the Project Control Records Facility as quality records.

1. The ESF Title I Design Control Process Review Plan and any approved revisions,

2. QALA's for Task,

3. Completed questionnaires (or equivalent), and supporting documents as deemed appropriate,

4. The final report,

These records shall be submitted to the Project Central Records Facility by the Team Leader in accordance with requirements of Project Procedure AP-1.7Q.

SECTION 1: GENERIC REQUIREMENTS FOR A MINED GEOLOGIC DISPOSAL SYSTEM

1. Did your organization participate in the identification of ESF criteria/requirements for inclusion in OGR/B-2, Appendix E?

   Yes _____ No _____

   NOTE: If the response to Question 1 is negative, no further questions in this section need to be answered.

2. What was your organization's role in the preparation of Appendix E (e.g., inputs, participate in analyses, participate in review, etc.)?

   _____

   _____

   _____

3. Identify the individuals who participated for your organization and summarize (briefly) the relevant qualifications of each. Make your response a separate attachment if necessary.

   _____

   _____

   _____

   _____

4. Did your organization subcontract any part of that activity to experts outside the program?

   Yes _____ No _____

5. If the response to Question 4 is affirmative, list the persons, indicate their roles and affiliations, and identify the documents by which your organization defined their tasks and deliverables.

6. When did your participation in that activity start?

7. Briefly describe the process by which Appendix E content and format were established, as seen from your organization's perspective.

8. What meetings on ESF generic requirements were attended by personnel from your organization, or by personnel under contract to your organization?

9. Did your organization participate in incorporation of 10CFR60 requirements in this document? If so, in what role (e.g., responsible, review, etc.)?

_____

_____

_____

10. What planning document(s) and/or other instructions did your organization issue or receive (as applicable) prior to and/or during your participation in the Appendix E activity? (Provide document number(s), revision(s), and date(s).)

_____

_____

_____

_____

SECTION 2: ESF SUBSYSTEMS DESIGN REQUIREMENTS DOCUMENT (SDRD)

1. Did/does your organization participate in the establishment or criteria/requirements contained in the SDRD?

   Yes _____ No _____

   NOTE: If your response to Question 1 is negative, no further questions in this section need to be answered.

2. What was/is your organization's role in the preparation/ updating of the SDRD (e.g., generate, interpret, draft requirements; review, approve, etc.)

   _____

   _____

   _____

3. Identify the individuals who participated for your organization and summarize (briefly) the relevant qualifications of each. Make your response a separate attachment if necessary.

   _____

   _____

   _____

   _____

   _____

4. Did your organization subcontract any part of the definition or review of SDRD criteria/requirements to experts outside the program?

   Yes _____ No _____

5. If the response to Question 4 is affirmative, list the persons, indicate their roles and affiliations, and identify the documents by which your organization defined their tasks and deliverables.

_____

_____

_____

_____

_____

6. When did your SDRD participation start?

_____

7. Briefly describe the process by which SDRD criteria/ requirements were established, as seen from your organization's perspective?

_____

_____

_____

_____

_____

8 What meetings on SDRD criteria/requirements were attended by personnel from your organization, or by personnel under contract to your organization, during preparation of the SDRD? (If a list of formal meetings is appropriate, reference this section and question, and make the list an attachment to your response.)

_____

_____

_____

9. What analyses, studies, etc., did your organization perform to arrive at your inputs to the SDRD? List reports or formal correspondence generated as a result of such analyses, studies, etc.

_____

_____

_____

10. Did/does your organization specify ESF design criteria/ requirements to an Architect/Engineer other than via the SDRD or SDRD changes?

Yes _____ No _____

11. If the response to Question 9 is affirmative, briefly describe the process for generating and transmitting such criteria/requirements.

_____

_____

_____

_____

_____

12. What planning document(s) and/or written instructions did your organization issue or receive prior to or during your participation in establishment of SDRD criteria/ requirements? (Provide document numbers, revisions, and dates.)

_____

_____

_____

SECTION 3: DESIGN BASIS DOCUMENTS

1. When did your organization start preparation of your ESF Design Basis document?

2. How did/does your organization establish the criteria/ requirements that are specified in your ESF Design Basis document?

3. Identify the individuals who were/are responsible for approving requirements for incorporation in your organization's ESF Design Basis document?

4. How did/does your organization document qualifications of these personnel, and where can such documentation be retrieved?

5. Did/does your organization employ the services of subcontractors or consultants in the establishment of criteria/requirements for your ESF Design Basis document?

   Yes _____ No _____

6. If the response to Question 5 is affirmative, list the documents that defined the task, deliverables, and control requirements for the activity.

   _____

   _____

   _____

   _____

7. For internal review/approval of initial entries and changes to your ESF Design Basis document, provide the identifying information necessary to retrieve review documentation from your organization's files or from the project record center.

   _____

   _____

   _____

   _____

8. Did/do other Project participants review or approve your organization's Design Basis document? If so, identify the organizations and their roles - i.e., review, approve, or both.

   _____

   _____

   _____

   _____

   _____

SECTION 4: SPECIFIC INTERFACES AND ANALYSES

1. (Part one of two parts.) During the ESF design did your organization participate in the identification and/or evaluation of interfaces (i.e., potential for interactions) between ESF, design, construction, and operation, and the repository, and/or in minimizing or preventing such interactions through ESF design, selection of construction methods, etc.?

   Yes _____ No _____

   (Identify applicable documentation if not already identified in earlier information packages.)

   (Part two of two parts.) In what role did your organization participate in identifying the interfaces between the siting, design, testing, and performance assessment aspects of the ESF program and ensuring that ESF planning and design integrated those aspects? (Identify applicable documentation if not already done so.)

2. Did your organization perform or otherwise participate (e.g., consult, review, approve, etc.) in any of the following ESF design input analyses?

Shaft location:	_____	Role:	_____	When:	_____
Shaft diameter:	_____	Role:	_____	When:	_____
Need for second shaft:	_____	Role:	_____	When:	_____
Shaft separation:	_____	Role:	_____	When:	_____
Tests required:	_____	Role:	_____	When:	_____
Testing interferences:	_____	Role:	_____	When:	_____

Note: "Required Tests" is interpreted to mean tests for which provisions must be made in the ESF design.

3. For each of the activities in Question 2 in which your organization had a role, list the reports, correspondence, meeting minutes, etc., that can be used to establish a documented record of the decision making process. Identify such documentation in sufficient detail for rapid retrieval from records storage, and/or indicate where copies can be obtained. (Make list an attachment to your response; reference the attachment here: _____.)

4. Did your organization perform or otherwise participate directly in Title I design?

   Yes _____ No _____

5. If the response to Question 4 is affirmative, what was/were your organization's role(s)?

   Directly responsible _____

   Provided consultation _____

   Review _____

   Approval _____

6. When did your organization's Title I design activity start?

   _____

7. Identify the responsible individuals from your organization who participated in the activities addressed by questions 2 and 5. State where documentation of their relevant qualifications is maintained.

   _____

   _____

   _____

   _____

SECTION 5: QA PROGRAM/DESIGN CONTROLS

1. When did your organization adopt the requirements of NQA-1 and its Supplements as the basis for its Yucca Mountain (formerly NNWSI) Project QA program?

   _____

2. Show the chronological evolution of your organization's design control and/or R&D policies, procedures, or other instructions applicable to activities your organization conducted relative to development of MGDS Appendix E, the SDRD, and/or the H&N and F&S Design Basis documents. Cover the period since the earliest date you entered in Section 1 through 3 of this questionnaire. Include the following data:

   Procedure identifying number
   Title
   Subject (if the title does not clearly indicate what the procedure covered)
   Revision number
   From and to dates for the revision
   Procedure and revision this procedure or revision replaced or superseded

   NOTE: The information for Question 2 should make it possible to trace the coverage of a major control from earliest participation in any of the indicated activities to the present.

3. As the OCRWM and YMP QA programs evolved, the wording and/or applicability of some design control requirements have changed. Use Table 1 of this questionnaire to identify major design control changes in your organization's QA program and to flag any that should be considered in terms of reanalysis or reverification during Title II design. The table makes it possible to distinguish between changes in how work or controls were actually accomplished and those that affected the nature or amount of documentation without affecting the underlying work or controls.

4. Attach a chronological list of the procedures (including revisions and effective or issue dates) that covered your organization's audit and/or surveillance activities over the period of your organization's participation in the activities addressed in this questionnaire.

5. List audits and surveillances that included any of the activities addressed by this questionnaire. Identify by dates and report numbers. Use Table 1.

_____

_____

_____

_____

_____

6. Provide a list summarizing each of the findings and observations resulting from the audits/surveillances identified in response to Question 5, and the resolution and close-out date for each. Reference the list to Question 6 of Section 5.

7. How and where are the professional qualifications of personnel who represented your organization in the activities covered in Section 1 through 4 (as applicable) documented?

_____

_____

_____

_____

TABLE 1: *RESPONSE TO QUESTION 3 OF SECTION 5*

Element of design/ R&D control	Approx. Time	Procedure Wording*	Actual Practice*	Nature/amount * of documentation
Control/evaluation of inputs upon which requirements or criteria were based				
Documentation of rationale for selection of specific criteria and requirements				
Documentation and review of analyses and/or calculations				
Inclusion of reviewers who did not directly participate in the work being reviewed				
Identification and control of internal and external interfaces				

* Indicate the affected column(s) with an "X" or a checkmark. If no effect, enter "NONE".

Team members are required to meet the requirements of a college degree plus one year experience in nuclear power and/or waste disposal experience as controlled by 10CFR50 QA programs. The team member qualifications are included in this section.

ESF DESIGN CONTROL REVIEW

TEAM MEMBER EXPERIENCE

NAME	EDUCATION	YEARS EXPERIENCE	YEARS EXPERIENCE 10CFR50 QA PROGRAMS	YEARS EXPERIENCE ENGINEERING/ MANAGEMENT	YEARS EXPERIENCE QA AUDITING
G.S. Braun	B.S. ME	31	20	31	0
J.H. Rusk	B.A., M.S.	36	14	13	14
L.E. Zwissler	BSCE, M.S.	48	8	30	20
B.M. Gregory	B.S. ME	38	16	38	14
A. L. Baca	B.S. ME	3	1	3	1

QUALITY LEVEL ASSIGNMENT JUSTIFICATION

The ESF Title I Design Control Review Process and Plan have been determined not to be QA Level 1 as the activities that will be performed will not produce data needed for performance assessments nor to demonstrate that performance objectives will be met. The data collection technique utilized does not need to comply with QA Level I, as it does not have an impact on site characterization; and does not affect the final design and waste package performance.

It is the responsibility of the user of any data or reports generated in accordance with this plan to verify that any information referenced as a result of using such data or reports meets the appropriate quality assurance requirements.

The only use of this data is to provide background information on the design control process that was in place during the development of the ESF requirements documents and the Title I design report; as well as the Quality Assurance measures that were complied with during these design activities by the Participants and OCRWM.

This Plan and the final report do not meet any of the attributes for QA Level I or Level II. Reference QALA, YMP-EHP-1, Rev. 0, November 15, 1988.

Examination of the QA Level Assignment Checklist from QMP-02-06 indicates that steps one through eleven responses are all negative, as shown in the attached checklist, and therefore the quality level assignment is QA Level III.

**QA LEVEL ASSIGNMENT CHECKLIST FOR
ESF TITLE I DESIGN CONTROL PROCESS REVIEW, YMP-EHP-1, REV. 0
SUPPORTING DOCUMENTATION**

1. The activity does not involve or affect public radiological health or safety.

2. The activity does not affect long term waste containment and waste isolation.

3. The activity does not provide data for a license application (reference Regulation and Site Evaluation Division verbal response to R. Bahorich inquiry, 11/14/88).

4. The failure of this activity cannot cause a failure of a QA Level I item or irretrievable loss of QA Level I data.

5. The activity does not involve a design phase which is to be constructed immediately prior to application for a NRC license, procurement, or construction.

6. The activity does not involve or affect retrievability of waste.

7. The activity cannot have a major impact on non-radiological or occupational health and safety of the public and repository workers.

8. The activity cannot cause exposure to radioactive contamination.

9. The activity has no impact on non-radiological operation, reliability or maintainability.

10. The activity does not involve a design phase for which the principal purpose is to conduct a comparative technical analysis of alternatives.

11. The activity cannot cause a major cost overrun or schedule slippage.

12. The activity shall be assigned QA Level III.

Prepared by _____
B. M. Gregory, November 15, 1988

APPENDIX B

TABULAR SUMMARIES

TABLE 1: PREPARATION OF ESF GENERIC REQUIREMENTS

	OCRWM	YMP	SAIC	SNL	LANL	USGS	H&N	F&S
PARTICIPATED?	YES	YES	YES	NO	NO	NO	NO	NO
PREPARED	YES	NO	NO	NO	NO	NO	NO	NO
REVIEWED	YES	YES	YES	YES	YES	NO	NO	NO
APPROVED	YES	YES	NO	NO	NO	NO	NO	NO
START DATE	12/85	1/86	1/86	NO	NO	NO	NO	NO
HAD WRITTEN PLAN OR DIRECTION				NO	NO	NO	NO	NO
SUBCONTRACTED ALL OR SOME OF EFFORT	NO*	NO*	NO	NO	NO	NO	NO	NO
HAS RECORD OF DIRECTION/INSTRUCTIONS PROVIDED TO SUBCONTRACTOR(S)	NO	NO	NO	NO	NO	NO	NO	NO
RESPONSIBLE PERSONNEL IDENTIFIED	YES	YES	YES	NO	NO	NO	NO	NO
RECORDS OF QUALIFICATIONS OF PERSONNEL AVAILABLE	YES	YES	YES	NO	NO	NO	NO	NO
WRITTEN POLICIES/PROCEDURES IN PLACE DURING ACTIVITY	YES	YES	YES	NO	NO	NO	NO	NO
MEETINGS IDENTIFIED	YES	YES	YES	NO	NO	NO	NO	NO

* SUPPORT SERVICES CONTRACTOR NOT CLASSIFIED AS "SUBCONTRACTOR"

TABLE 2: PREPARATION OF ESF SUBSYSTEMS DESIGN REQUIREMENTS DOCUMENT

	OCRWM	YMP	SAIC	SNL	LANL	USGS	H&N	F&S
?TICIPATED?	YES	YES	YES	YES	YES	YES	YES	YES
PREPARED SOME OR ALL	NO	NO	YES	YES	YES**	YES*	NO	NO
REVIEWED	YES	YES	YES	YES	YES	YES	YES	YES
APPROVED	YES	YES	NO	NO	NO	NO	NO	NO
START DATE	4/86	6/86	6/86	10/85	11/86	1/82	1986	1986
SUBCONTRACTED SOME OR ALL OF EFFORT	NO	NO	NO	YES	NO	NO	NO	NO
HAS RECORD OF DIRECTION/INSTRUCTIONS PROVIDED TO SUBCONTRACTOR	NO	NO	NO	YES	NO	NO	NO	NO
RESPONSIBLE PERSONNEL IDENTIFIED	YES	YES	YES	YES	YES	YES	NO	NO
RECORDS OF QUALIFICATIONS OF PERSONNEL AVAILABLE	YES	YES	YES	YES	YES	YES	NO	NO
PROCESS DOCUMENTATION AVAILABLE	NO	YES	YES	YES	YES	YES	NO	NO
RECORDS OF MEETINGS AVAILABLE	YES	YES	YES	YES	YES	YES	YES	NO
RECORDS OF ANALYSES, STUDIES, AND CORRESPONDENCE AVAILABLE	YES	YES	YES	YES	YES	YES	NO	NO

* SOME OF SDRD APPENDIX B INPUTS

** SDRD APPENDIX B

TABLE 3: PREPARATION OF DESIGN BASIS DOCUMENTS

	OCRWM	YMP	SAIC	SNL	LANL	USGS	H&N	F&S
PARTICIPATE?	NO	YES	YES	NO	NO	NO	YES	YES
PREPARED	NO	NO	NO	NO	NO	NO	YES	YES
REVIEWED	NO	YES	YES	NO	NO	NO	YES	YES
APPROVED	NO	YES	NO	NO	NO	NO	YES	YES
START DATE	NO	10/87	10/87	N/A	N/A	N/A	5/87	5/87
HAD WRITTEN PLAN OR DIRECTION	NO	YES	YES	NO	NO	NO	YES	YES
SUBCONTRACTED SOME OR ALL OF EFFORT	NO	NO	NO	NO	NO	NO	NO	NO
HAS RECORD OF DIRECTIONS/INSTRUCTIONS PROVIDED TO SUBCONTRACTOR(S)	NO	NO	NO	NO	NO	NO	NO	NO
RESPONSIBLE PERSONNEL IDENTIFIED	NO	YES	YES	NO	NO	NO	YES	YES
RECORDS OF QUALIFICATIONS OF RESPONSIBLE PERSONNEL AVAILABLE	NO	YES	YES	NO	NO	NO	YES	YES

TABLE 4: KEY DECISIONS/ANALYSES AND TITLE I DESIGN

	OCRWM	YMP	SAIC	SNL	LANL	USGS	H&N	F&S
PARTICIPATED IN IDENT/ANALYSIS OF INTERFACES BETWEEN ESF AND REPOSITORY	NO	YES**	YES	YES	YES	YES	NO	YES
PARTICIPATION IN IDENTIFICATION OF INTERFACES AMONG THE DIFFERENT ASPECTS OF ESF PROGRAM+++	NO	YES	YES	YES	YES	YES	NO	YES
PARTICIPATED IN ESF DESIGN INPUT ANALYSES	NO	NO	YES	YES	YES	YES	NO	YES
SHAFT LOCATION (PARTICIPATION)	YES	YES	YES	YES	NO	YES	NO	YES
ANALYZE/RECOMMEND	NO	NO	YES	YES	NO	NO	NO	YES
CONSULT	NO	NO	NO	NO	NO	YES	NO	NO
REVIEW	YES	YES	YES	NO	NO	NO	NO	NO
APPROVE	YES	YES	NO	NO	NO	NO	NO	NO
SHAFT DIAMETER (PARTICIPATION)	YES	YES	YES	YES	NO	YES	NO	YES
ANALYZE/RECOMMEND	NO	NO	YES	YES	NO	YES	NO	YES
CONSULT	NO	NO	NO	NO	NO	NO	NO	YES
REVIEW	YES	YES	YES	YES	NO	THRU.ESTP	NO	NO
APPROVE	YES	YES	NO	NO	NO	NO	NO	NO
NEED FOR SECOND SHAFT (PARTICIPATION)	YES	YES	NO	NO	NO	YES	NO	YES
ANALYZE/RECOMMEND	YES	YES	NO	NO	NO	YES	NO	NO
REVIEW	NO	YES	NO	NO	NO	NO	NO	YES
DIRECTED	YES	NO	NO	NO	NO	NO	NO	NO
SHAFT SEPARATION (PARTICIPATION)	NO	YES	YES	YES	YES	YES	NO	YES
ANALYZE/RECOMMEND	NO	NO	YES	NO	NO	NO	NO	YES
CONSULT	NO	NO	NO	YES	NO	NO	NO	YES
REVIEW	NO	YES	YES	YES	YES	YES	NO	YES
APPROVE	NO	YES	NO	NO	NO	NO	NO	NO
TESTS REQUIRED (PARTICIPATION)	NO	YES	YES	YES	YES	YES	NO	YES
ANALYZE/RECOMMEND	NO	NO	NO	YES	YES	YES	NO	NO
CONSULT	NO	NO	NO	NO	YES	NO	NO	NO
REVIEW	YES	YES	YES	YES	YES	YES	NO	YES
APPROVE	YES	YES	NO	NO	NO	NO	NO	NO
TESTING INTERFERENCES (PARTICIPATION)	NO	YES	YES	YES	YES	YES	NO	NO
ANALYZE	NO	NO	YES	YES	YES	YES	NO	NO
REVIEW	NO	YES	YES	YES	YES	YES	NO	NO
APPROVE	NO	YES	NO	NO	NO	NO	NO	NO
DOCUMENTATION OF ANALYSES AND DECISION-MAKING AVAILABLE	YES	YES	YES	YES	YES	YES	YES	YES
PARTICIPATION IN TITLE I DESIGN	YES	YES	YES	YES	YES	YES	YES	YES
DIRECTLY RESPONSIBLE	NO	NO	NO	NO	NO	NO	YES	YES
PROVIDED CONSULTATION	NO	NO	NO	NO	YES	YES	NO	NO
PERFORMED REVIEW	YES	YES	YES	YES	YES	YES	YES	YES
APPROVAL RESPONSIBILITY	YES	YES	NO	NO	NO	NO	YES	YES
START DATE	8/87		5/88	~10/85	1986	1981	2/88	1/88
RESPONSIBLE INDIVIDUALS IDENTIFIED	YES	YES	YES	YES	YES	YES	YES*	YES
RECORD OF QUALIFICATIONS OF RESPONSIBLE PERSONNEL AVAILABLE	YES	YES	YES	YES	YES	YES	YES	YES

* ORG. CHARTS
** CHAIRING ICWG
\+ ES&P PARTICIPANT
++ TASK FORCE PARTICIPANT
+++ I.E., THE SITING, DESIGN, TESTING, AND PERFORMANCE ASSESSMENT ASPECTS

TABLE 5: PARTICIPATING PERSONNEL

GENERI REQMTS APP. E	SDRD	DESIGN BASIS DOC'S	ES LOC & DIAM	TEST REQMTS	SECOND SHAFT NEED	SHAFT SEPAR	IDENT ES/REP INTFCS	IDENT ES ASP INTFCS	TITLE I DESIGN	RESPONSIBLE INDIVIDUALS	DISCIPLINE	ORGANIZATION
P R A	P R A	P R A	P R A	P R A	P R A	P R A	P R A	P R A	P R A			
					X					W. BENNETT	NUC ENG/ASSOC DIRECTOR	OCRWM
X			X							M. FREI	NUCLEAR ENGINEER	OCRWM
X X									X	C. BROOKS	SYSTEMS ENG. & MGMT	OCRWM
X X	X								X	D. STUCKER	MINING ENGINEER	OCRWM
X X										M. HANSON	NUCLEAR ENGINEER	HQ (WESTON)
X X	X								X	J. MONTGOMERY	MINING ENGINEER	HQ (WESTON)
X X										E. SWENSON	SYSTEMS ENGINEER	HQ (WESTON)
X X										H. BERMONIS	NUC/LICEN. ENGINEER	HQ (WESTON)
X	X	X								D. IRBY	MINING ENG/ICWG CHG DES	YMP
X	X									D. VIETH	PROJECT DIRECTOR	YMP
	X									J. OWENS	MINING ENGINEER	YMP
		X								L. SKOUSEN	BUSINESS MANAGER	YMP
X									X	G. BEALL	MINING ENGINEERING	SAIC
									X	M. BRAKE	CIVIL ENG/SYS. ENGINEER	SAIC
									X	E. CIKANEK	GEOTECH ENGINEER	SAIC
									X	I. COTTLE	CIVIL ENG/ESF INTEGR	SAIC
									X	J. DAVENPORT	ENGINEERING GEOLOGIST	SAIC
X										D. DAWSON	NUC REG COMPLIANCE MGMT	SAIC
X										J. JARDINE	MFG ENGINEER	SAIC
									X	P. KARNOSKI	NUC DESIGN, NUC QA	SAIC
									X	W. KAZOR	NUC QA AUDIT MGMT	SAIC
									X	R. KLEMENS	QA ENG, ELECTRICAL ENG	SAIC
									X	A. LANGSTAFF	SR. MINING ENGINEER	SAIC
X	X		X X			X X			X	K. MACDONALD	SR. MINING ENGINEER	SAIC
									X	J. MCCONVILLE	DES ANALYST, TEST ENG	SAIC
	X								X	W. NARROWS	CHEMICAL ENGINEER	SAIC
X										C. PFLUM	NUC REG INTEG (FM NRC)	SAIC
									X	S. PHILLIPS	IND SAFETY/HYGIENE	SAIC
									X	T. PYSTO	WILDLIFE BIOLOGY	SAIC
									X	J. REISER	SYS ENG & DESIGN	SAIC
X	X									R. REUST	SR CHEMICAL ENGINEER	SAIC
									X	D. ROSS-BROWN	GEOTECH ENGINEER	SAIC
X										J. SHALER	CIVIL ENGINEER	SAIC
									X	S. SMITH	ESF INTEGR MINING ENG	SAIC

* NOTE: P = PERFORM OR PREPARE, R = REVIEW, A = APPROVE

TABLE 5: PERSONNEL AND QUALIFICATIONS

GENERI REQMTS APP. E	SDRD	DESIGN BASIS DOC'S	ES LOC & DIAM	TEST REQMTS	SECOND SHAFT NEED	SHAFT SEPAR	IDENT ES/REP INTFCS	IDENT ES ASP INTFCS	TITLE I DESIGN	RESPONSIBLE INDIVIDUALS	DISCIPLINE	ORGANIZATION
P R A*	P R A	P R A	P R A	P R A	P R A	P R A	P R A	P R A	P R A			
	X								X	P. STENECK	MECH ENG, PROJ ENGINEER	SAIC
										R. TOME	REMOTE SYS ENGINEER	SAIC
	X X					X	X	X X	X	P. AAMODT	GEOLOGIST	LANL
	X X					X	X	X X	X	T. MERSON	MECHANICAL ENGINEER	LANL
						X	X	X	X	R. CROWLEY	ELECTRICAL ENGINEER	LANL
	X					X	X	X	X	S. FRANCIS	MINING ENGINEER	LANL
						X	X	X	X	J. RAY	GEOLOGIST	LANL
						X	X	X	X	D. YORK	MECHANICAL ENGINEER	LANL
	X X		X			X		X	X	T. BLEJWAS (Ph.D)	GEOTECH PROJ	SNL
	X X		X		+					R. STINEBAUGH	GEOTECH ENGINEER	SNL
	X				+					B. BOHLKE (Ph.D)	GEOTECH ENGINEER	P-B,Q,&D (SNL)
	X				+					W. STREETER	MINING ENGINEER	P-B,Q,&D (SNL)
			X							S. BERTRAM	MATHEMATICIAN	SNL
			X		+					R. HARIG	CIVIL ENGINEER	P-B,Q,&D (SNL)
			X		+					J. GRENIA	GEOL., MINING	P-B,Q,&D (SNL)
					+					G. BEALL	CIVIL ENGINEER	SNL
					+					L. SKULLY	MECHANICAL ENGINEER	SNL
					+					M. COMAR	MINING, PETROLEUM	P-B,Q,&D (SNL)
					+					B. LAWRENCE	MINING ENGINEER	P-B,Q,&D (SNL)
					+					P. SPERRY	CIVIL ENGINEER	P-B,Q,&D (SNL)
					+					R. ROBB	MINING ENGINEER	++
						X X		X X		J. TILLERSON (Ph.D)	MECHANICAL ENGINEER	SNL
						X X		X X		L. COSTIN (Ph.D)	MECHANICAL ENGINEER	SNL
						X X		X X		J. FERNANDEZ	GEOTECH ENGINEER	SNL
						X X		X X		B. EHGARTNER (Ph.D)	GEOMECHANICAL ENGINEER	SNL
						X X		X X		E. KLAVETTER (Ph.D)	CHEMICAL ENGINEER	SNL
						X X		X X		R. PETERS	MECHANICAL ENGINEER	SNL

\+ ANALYSES AND CONSULTATION

++ LOS ALAMOS TECH. ASSOCIATION (FOR SNL)

* NOTE: P = PERFORM OR PREPARE, R = REVIEW, A = APPROVE

TABLE 5: PARTICIPATING PERSONNEL

GENERI REQMTS APP. E	SDRD	DESIGN BASIS DOC'S	ES LOC & DIAM	TEST REQMTS	SECOND SHAFT NEED	SHAFT SEPAR	IDENT ES/REP INTFCS	IDENT ES ASP INTFCS	TITLE I DESIGN	RESPONSIBLE INDIVIDUALS	DISCIPLINE	ORGANIZATION
P R A*	P R A	P R A	P R A	P R A	P R A	P R A	P R A	P R A	P R A			
					X					D. SNOW (Ph.D)	HYDRO,GEOL, GEOTECH ENG	SAIC(FOR USGS)
	X			X				X		M. WHITFIELD	HYDROLOGIST	USGS
	X			X X				X		W. WILSON (Ph.D)	HYDROLOGIST	USGS
				X						A. YANG (Ph.D)	GEOCHEMIST	USGS
											HYDROLOGIST	
				X						P. HARROLD	HYDROLOGIST	USGS
	X			X						B. LEWIS	HYDROLOGIST	USGS
	X			X X			X	X	X	P. MONTAZER (Ph.D)	HYDROLOGIST	USGS
	X			X						R. CRAIG	HYDROLOGIST	USGS
	X			X						R. SCOTT (Ph.D)	GEOLOGIST	USGS
				X						R. SPENGLER	GEOLOGIST	USGS
				X						G. DIXON	GEOLOGIST	USGS
				X						W. DUDLEY,JR (Ph.D)	HYDROLOGIST	USGS
				X					X	L. HAYES	GEOLOGIST	USGS
				X						G. BODVARSSON(Ph.D)	STAFF SCI:CIV & GEOL ENG	LBL (FOR USGS)
				X						C. BARTON (Ph.D)		USGS
		X	X	X	X	X			X X	L. WEYAND	DESIGN MANAGER	F&S
		X		X						R. BULLOCK	PROJECT MANAGER	F&S
			X	X						S. MURPHY	PROJECT MANAGER	F&S
						X	X	X		J. MCKENZIE	MINING ENGINEER	F&S
							X	X		R. MUDD	STRUCTURAL ENGINEER	F&S
			X	X	X				X	B. CHYTROWSKI	DESIGN MANAGER	F&S
			X			X			X	B. SMITH	LEAD DESIGN ENGINEER	F&S
									X	J. GRENIA	LEAD DESIGN ENGINEER	F&S
			X			X			X	A. HOLBROOK	QA ENGINEER	F&S
			X			X			X	P. HALE	QA ENGINEER	F&S
					X	X			X	R. COPPAGE	MINING ENGINEER	F&S

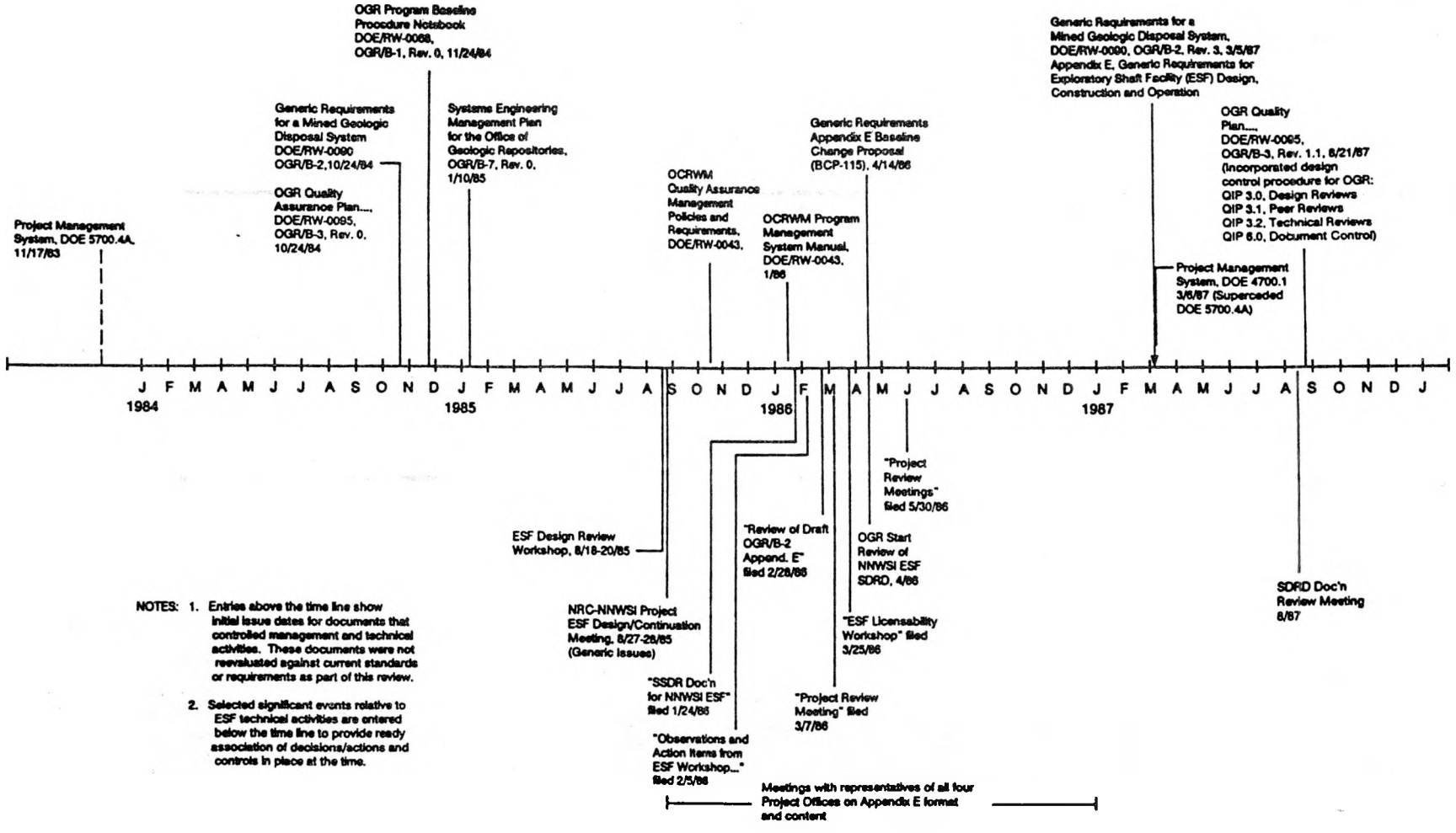
* NOTE: P = PERFORM OR PREPARE, R = REVIEW, A = APPROVE

APPENDIX C

TIME LINE CHARTS FOR PARTICIPANT ACTIVITIES AND QA PROGRAMS

OCRWM

CHRONOLOGY OF ESF TITLE I EVENTS AND MANAGEMENT CONTROLS



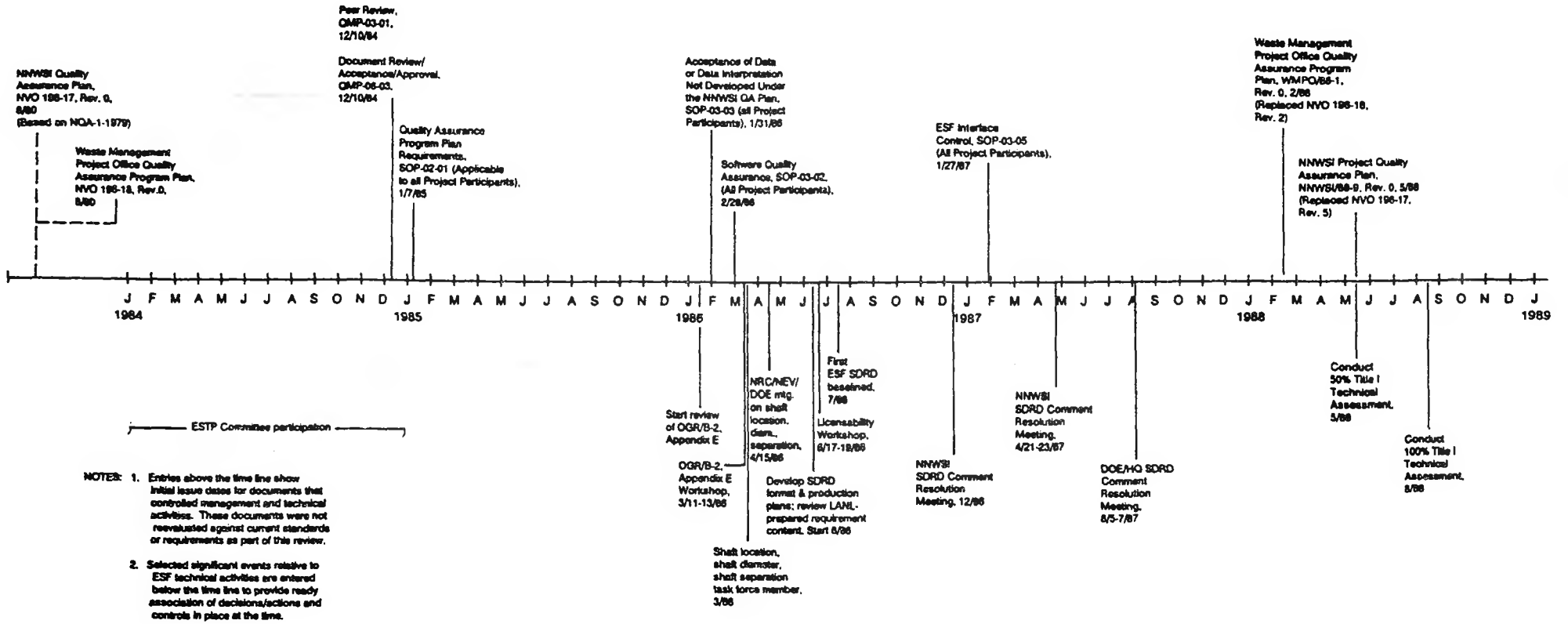
NOTES:

1. Entries above the time line show initial issue dates for documents that controlled management and technical activities. These documents were not reevaluated against current standards or requirements as part of this review.
2. Selected significant events relative to ESF technical activities are entered below the time line to provide ready association of decisions/actions and controls in place at the time.

RPTDOC1.003/12-13-88

YMP/SAIC

CHRONOLOGY OF ESF TITLE I EVENTS AND DESIGN CONTROLS



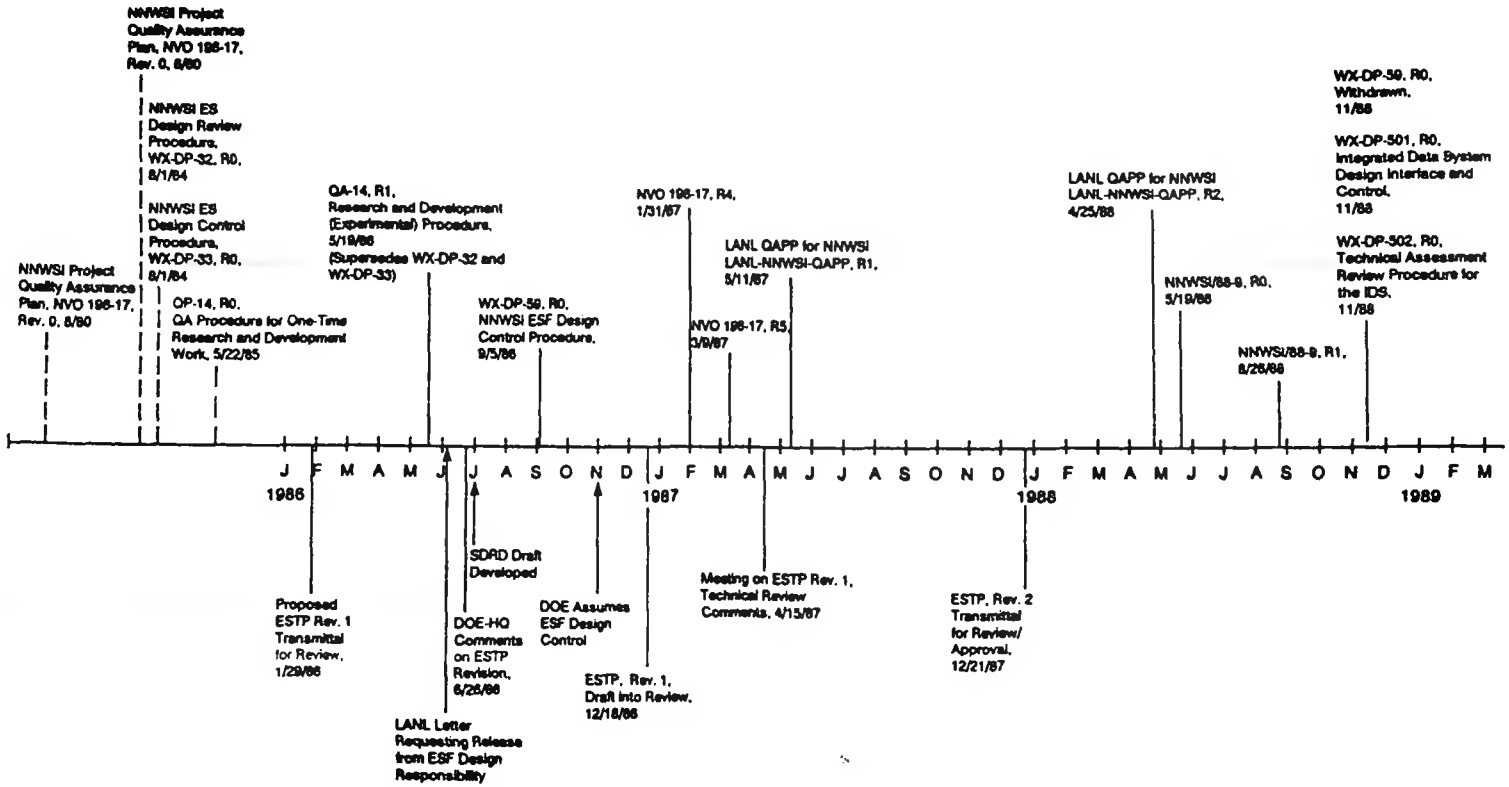
NOTES: 1. Entries above the time line show initial issue dates for documents that controlled management and technical activities. These documents were not reevaluated against current standards or requirements as part of this review.

2. Selected significant events relative to ESF technical activities are entered below the time line to provide ready association of decisions/actions and controls in place at the time.

RPTDOC6.003/1-3-89

LANL

CHRONOLOGY OF ESF TITLE I EVENTS AND DESIGN CONTROLS



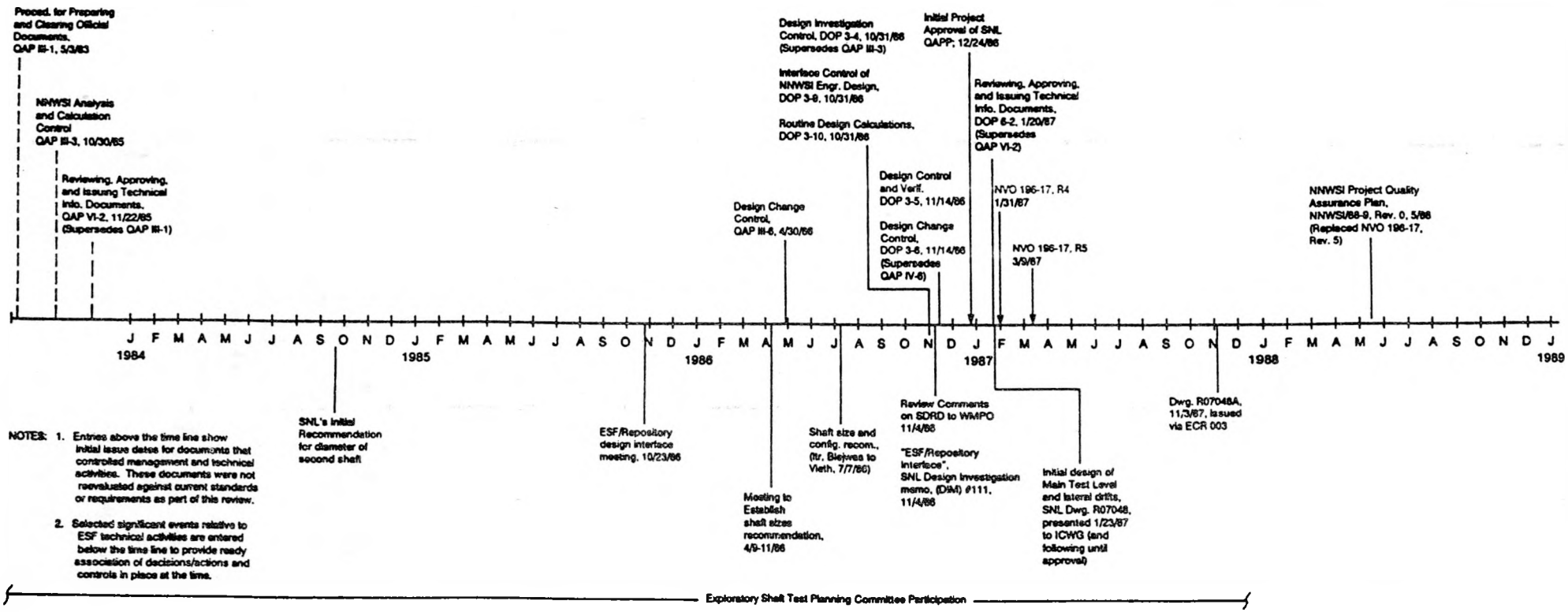
NOTES:

1. Entries above the time line show initial issue dates for documents that controlled management and technical activities. These documents were not reevaluated against current standards or requirements as part of this review.
2. Selected significant events relative to ESF technical activities are entered below the time line to provide ready association of decisions/actions and controls in place at the time.

RPTDOC7.003/12-13-88

SNL

CHRONOLOGY OF ESF TITLE I EVENTS AND DESIGN CONTROLS



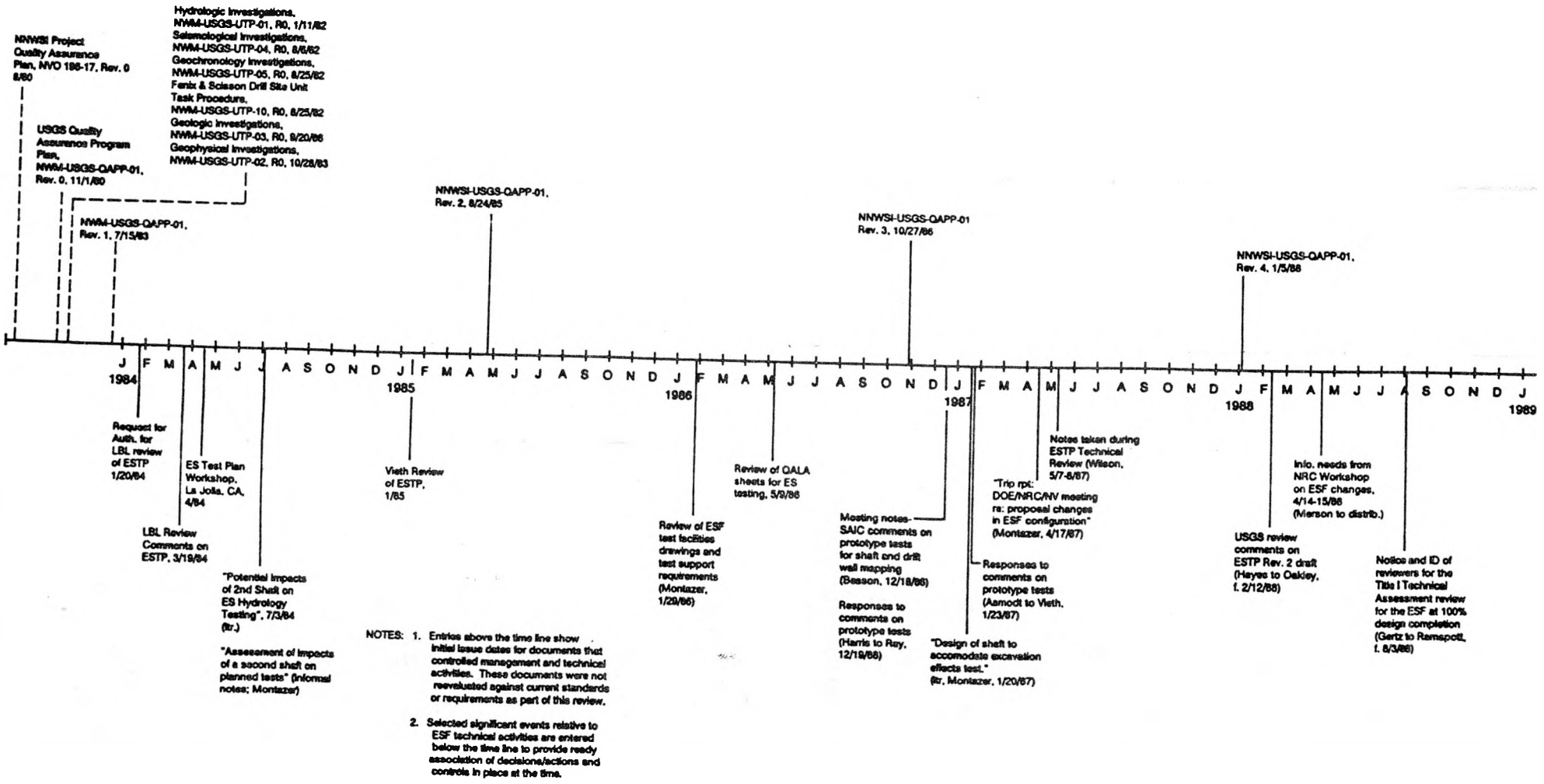
NOTES:

1. Entries above the time line show initial issue dates for documents that controlled management and technical activities. These documents were not reevaluated against current standards or requirements as part of this review.
2. Selected significant events relative to ESF technical activities are entered below the time line to provide ready association of decisions/actions and controls in place at the time.

RPTDOC4.003/12-13-88

USGS

CHRONOLOGY OF ESF TITLE I EVENTS AND R/D CONTROLS

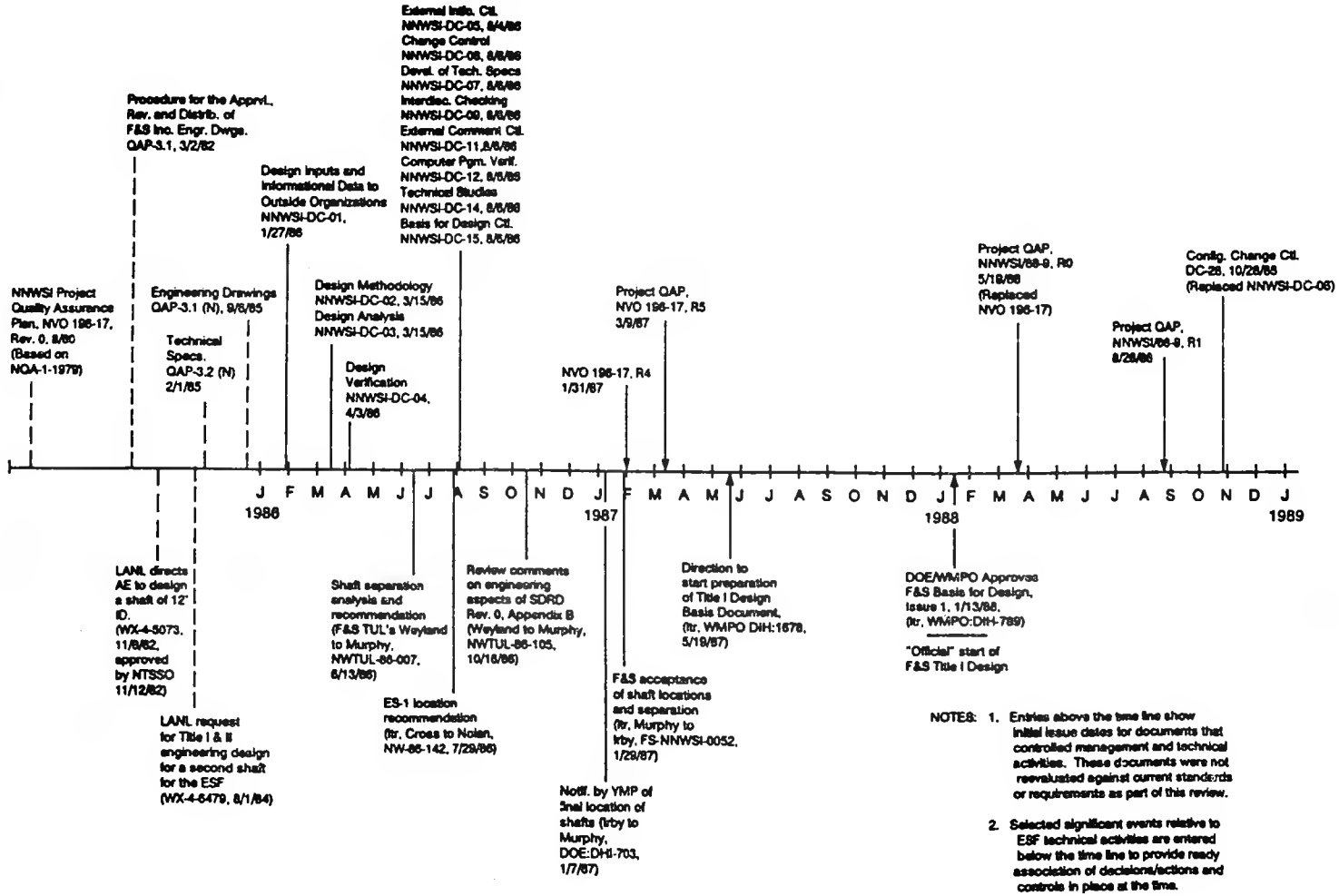


NOTES:
1. Entries above the time line show initial issue dates for documents that controlled management and technical activities. These documents were not reevaluated against current standards or requirements as part of this review.
2. Selected significant events relative to ESF technical activities are entered below the time line to provide ready association of decisions/actions and controls in place at the time.

RPTDOC5.003/12-13-88

F&S

CHRONOLOGY OF ESF TITLE I EVENTS AND DESIGN CONTROLS

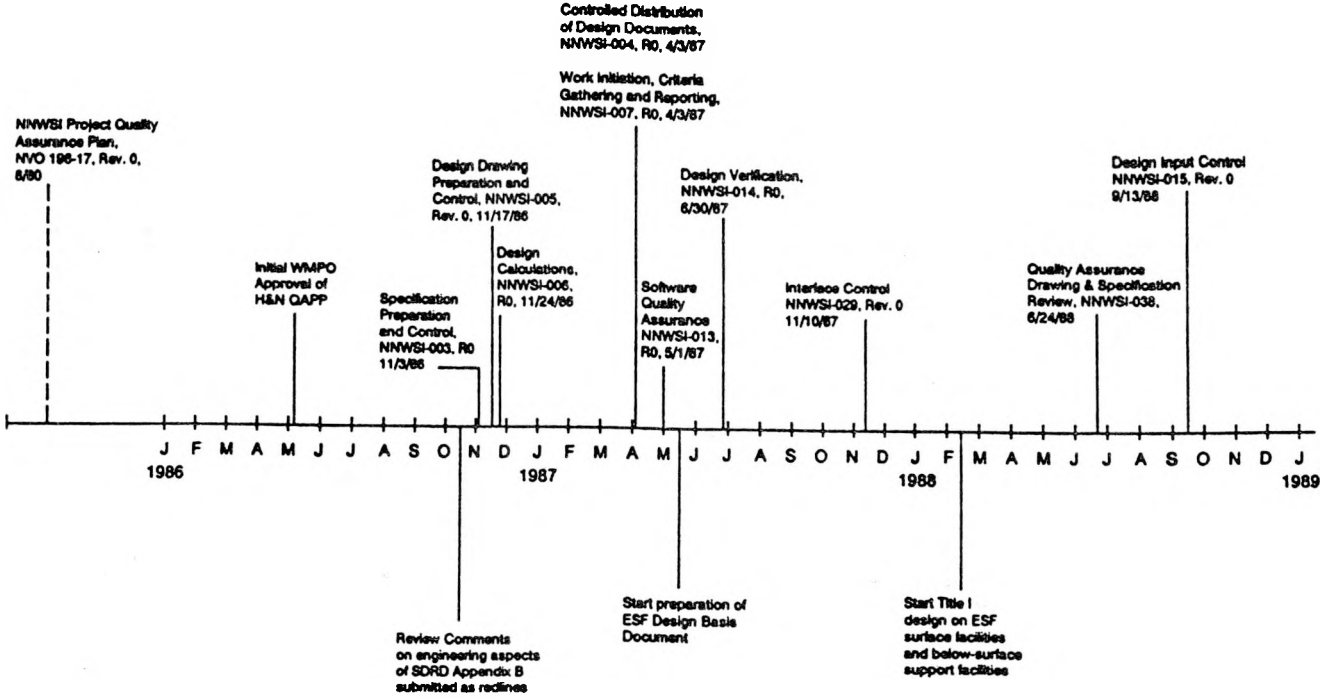


NOTES:
1. Entries above the time line show initial issue dates for documents that controlled management and technical activities. These documents were not reevaluated against current standards or requirements as part of this review.
2. Selected significant events relative to ESF technical activities are entered below the time line to provide ready association of decisions/actions and controls in place at the time.

RPTDOC2.003/12-6-88

H&N

CHRONOLOGY OF ESF TITLE I EVENTS AND DESIGN CONTROLS



NOTES: 1. Entries above the time line show initial issue dates for documents that controlled management and technical activities. These documents were not reevaluated against current standards or requirements as part of this review.

2. Selected significant events relative to ESF technical activities are entered below the time line to provide ready association of decisions/actions and controls in place at the time.

APPENDIX D

MANAGEMENT/TECHNICAL ASSESSMENTS

MANAGEMENT/TECHNICAL ASSESSMENTS

	ES Design Review Meeting, minutes dated 2-27-84
	ESF Project Status Meeting, minutes dated 9-5-84
	ESF Title I and Title II Design Review, minutes dated 9-12-88
	ESF Project Status Meeting, minutes dated 1-9-85
2-13-85	ESF Project Status Meeting, minutes dated 3-1-85
3-13-85	ESF Project Status Meeting, minutes dated 4-2-85
4-11-85	ESF Project Status Meeting, minutes dated 5-2-85
6-3-85	ESF Project Status Meeting, minutes dated 6-3-85
7-9-85	ESF Project Status Meeting, minutes dated 8-5-85
8-6-85	ESF Project Meeting, minutes dated 8-23-85
	ESF Subsurface Design Review Meeting, minutes dated 8-19-85
11-26-85	ESF Project Status Meeting, minutes dated 12-11-85
	Project Review Meeting (OCRWM), files 3-7-86
3-24 - 3-25-86	NNWSI Project Manager - Technical Project Officers (TPOs) Meeting, minutes dated 4-3-86
7-2-86	Vieth - Programmatic and Policy Review of Technical Report
7-10 - 7-11-86	TPO Meeting, summary dated 7-15-86
8-6 - 8-8-86	TPO Meeting, minutes dated 8-11-86
9-3 - 9-4-86	TPO Meeting, minutes dated 9-12-86
9-30 - 10-2-86	TPO Meeting, minutes dated 10-14-86
11-5 - 11-6-86	TPO Meeting, notes dated 11-12-86
12-9 - 12-10-86	TPO Meeting, notes dated 12-12-86

1-20 - 1-21-87	TPO Meeting, notes dated 1-26-87
2-18 - 2-19-87	TPO Meeting, notes dated 2-20-87
3-10-87	Norton, Policy Review
3-10-87	Norton, Corporate Overview
3-25 - 3-26-87	TPO Meeting, notes dated 3/27/87
4-20-87	Oakley to Vieth, Management Assessment of QA Effectiveness
4-22 - 4-23-87	TPO Meeting, notes dated 4-27-87, minutes dated 5-12-87
5-20 - 5-21-87	TPO Meeting, minutes dated 6-3-87
9-24 - 9-25-87	TPO Meeting, notes dated 9-28-87
1-5 - 1-6-88	TPO Meeting, notes dated 1-7-88
5-88	Title I Design 50% Complete Technical Assessment
6-2-88	Vieth, Programmatic and Policy Review of Technical Report
7-14-88	Skousen, Design Requirements Review Meeting
8-88	Title I Design 100% Complete Technical Assessment

APPENDIX E

REFERENCES

APPENDIX E

REFERENCES

1. Letter: NRC Concerns on Title I Design Control Process; Stephen Kale, acting Associate Director for Facilities Siting and Development to Carl Gertz, YMP Project Manager, November 17, 1988.

2. GRMGDS (DOE/RW-090:OGR/B-2), Appendix E, Generic Requirements for Exploratory Shaft Facility (ESF) Design, Constructions, and Operations.

3. Systems Engineering Management Plan for the Office of Geologic Repositories (DOE/RW-0051:OGR/B-7).

4. NNWSI Project Systems Engineering Management Plan NNWSI/88-3.

5. ESF Subsystems Design Requirements Document (SDRD), (NVO-309).

6. Holmes & Narver, NNWSI/ESF Title I Design Basis Documents, September, 1987, and subsequent revisions.

7. Fenix & Scisson, Inc., NNWSI Exploratory Shaft Facility Basis for Design, April 11, 1988, and subsequent revisions.

8. DOE 4700.1 Project Management System, March 6, 1987.

9. Quality Assurance Plan OGR/B-3, DOE/RW-0095.

10. Quality Assurance Policies and Requirements DOE/RW-0032.

11. NNWSI Quality Assurance Plan NVO-196-17, Rev. 0, August, 1980.

12. ANSI/ASME NQA-1 Quality Assurance Program Requirements for Nuclear Facilities.

APPENDIX F

PARTICIPANT RESPONSES TO QUESTIONNAIRE
RAW DATA

(Each Participant response set off by separate tab)

INTRODUCTION - APPENDIX F

Appendix F consists of the answers to the questionnaire included in the ESF Title I Design Control Process Review Plan (Appendix A). This material is included for information only.

The responses summarize or refer to information officially recorded elsewhere; they do not contain previously undocumented facts, conclusions, or rationale. The responses are, therefore, not primary records of quality-affecting activities.

The factual material in the Report has been checked for accuracy by reference to actual documents, information provided by multiple participants, oral confirmations and resolutions, and explanatory information obtained from active participants. Specific references to participants responses are incorporated in the body of the report.

The reader is cautioned to utilize the material in the report, itself. Any apparent anomalies contained in the responses to the questionnaire in this Appendix F should be referred to the participant for resolution. The participants, in some cases furnished additional information, such as computer printouts of reference material, documents, events, etc.; copies of documents; and other material. This material will be included in the records for this task; however, it is suggested that information of this nature be obtained from the participant as the most expeditious method.

OFFICE OF CIVILIAN RADIOACTIVE WASTE MANAGEMENT

(OCRWM)

SECTION 1: GENERIC REQUIREMENTS FOR A MINED GEOLOGIC DISPOSAL SYSTEM

1. Did your organization participate in the identification of ESF criteria/requirements for inclusion in OGR/B-2, Appendix E?

   Yes X No _____

   NOTE: If the response to Question 1 is negative, no further questions in this section need to be answered.

2. What was your organization's role in the preparation of Appendix E (e.g., inputs, participate in analyses, participate in review, etc.)?

   Develope and Baseline, then Review and Controll. DOE/OGR developed the Generic Requirements for the RSF (App. E) with help from portions of the four project Offices.

3. Identify the individuals who participated for your organization and summarize (briefly) the relevant qualifications of each. Make your response a separate attachment if necessary.

   Dean Stucker, Mark Fuller, C. Brooks, Tim Montgomery
   Eric Sellgren, Marty Hanson, Hank Benmanis

4. Did your organization subcontract any part of that activity to experts outside the program?

   Yes _____ No X

   We utilized Weston, our support contractor, but did not subcontract

5. If the response to Question 3 is affirmative, list the persons, indicate their roles and affiliations, and identify the documents by which your organization defined their tasks and deliverables.

Approval: M. Frei

Reviewers: All others.

Affiliations: DOE (Frei & Stucker); others Westa

See attached list of correspondence.

6. When did your participation in that activity start?

late 1985

7. Briefly describe the process by which Appendix E content and format were established, as seen from your organization's perspective.

Meetings with the project participants Representing all 4 project offices agreed on WBS as Served, and the GR as guidline for content

8. What meetings on ESF generic requirements were attended by personnel from your organization, or by personnel under contract to your organization?

numerous meetings from 1985 through baseline in 1987, The exact meeting are only available if an extensive file review were conducted

9. Did your organization participate in incorporation of 10CFR60 requirements in this document? If so, in what role (e.g., responsible, review, etc.)?

Yes, we reviewed the GRD To assure The 10 CFR 60 requirements in GRD Cleared down To This App. E.

10. What planning document(s) and/or other instructions did your organization issue or receive (as applicable) prior to and/or during your participation in the Appendix E activity? (Provide document number(s), revision(s), and date(s).)

SEMP. (CODE 6.7), DOE ORDER 4700, (5700) AT That time, MGDS GR

SECTION 2: ESF SUBSYSTEMS DESIGN REQUIREMENTS DOCUMENT (SDRD)

1. Did/does your organization participate in the establishment or criteria/requirements contained in the SDRD?

Yes _____ No X we did not establish! only Review!

NOTE: If your response to Question 1 is negative, no further questions in this section need to be answered.

2. What was/is your organization's role in the preparation/ updating of the SDRD (e.g., generate, interpret, draft requirements; review, approve, etc.)

Review, & Approve

3. Identify the individuals who participated for your organization and summarize (briefly) the relevant qualifications of each. Make your response a separate attachment if necessary.

Dean Stucker DOR/OGR (DOE/OPSD)
Jim MacTaggart, Weston
Both Mining Engr's

4. Did your organization subcontract any part of the definition or review of SDRD criteria/requirements to experts outside the program?

Yes _____ No X

5. If the response to Question 3 is affirmative, list the persons, indicate their roles and affiliations, and identify the documents by which your organization defined their tasks and deliverables.

N.A.

6. When did your SDRD participation start?

April 1986

7. Briefly describe the process by which SDRD criteria/ requirements were established, as seen from your organization's perspective?

Project office responsibility

8 What meetings on SDRD criteria/requirements were attended by personnel from your organization, or by personnel under contract to your organization, during preparation of the SDRD? (If a list of formal meetings is appropriate, reference this section and question, and make the list an attachment to your response.)

Document Review Mtg. August '87

9. What analyses, studies, etc., did your organization perform to arrive at your inputs to the SDRD? List reports or formal correspondence generated as a result of such analyses, studies, etc.

N.A.

10. Did/does your organization specify ESF design criteria/ requirements to an Architect/Engineer other than via the SDRD or SDRD changes?

Yes _____ No X

11. If the response to Question 9 is affirmative, briefly describe the process for generating and transmitting such criteria/requirements.

N.A.

12. What planning document(s) and/or written instructions did your organization issue or receive prior to or during your participation in establishment of SDRD criteria/ requirements? (Provide document numbers, revisions, and dates.)

~~N.A.~~ MCDS Appendix E, OGR/B-3 Rev.1 8/1/86
HQ Requirements in OGR/B-2 Rev.3 3/5/87
OGR/B-1 Rev.3 6/25/85

SECTION 3: DESIGN BASIS DOCUMENTS

1. When did your organization start preparation of your ESF Design Basis document?

   N.A.

2. How did/does your organization establish the criteria/ requirements that are specified in your ESF Design Basis document?

3. Identify the individuals who were/are responsible for approving requirements for incorporation in your organization's ESF Design Basis document?

4. How did/does your organization document qualifications of these personnel, and where can such documentation be retrieved?

5. Did/does your organization employ the services of subcontractors or consultants in the establishment of criteria/requirements for your ESF Design Basis document?

Yes _____ No _____

6. If the response to Question 3 is affirmative, list the documents that defined the task, deliverables, and control requirements for the activity.

_____

_____

_____

_____

7. For internal review/approval of initial entries and changes to your ESF Design Basis document, provide the identifying information necessary to retrieve review documentation from your organization's files or from the project record center.

_____

_____

_____

_____

8. Did/do other Project participants review or approve your organization's Design Basis document? If so, identify the organizations and their roles - i.e., review, approve, or both.

_____

_____

_____

_____

_____

SECTION 4: SPECIFIC INTERFACES AND ANALYSES

1. Did your organization participate in the identification of any of the interfaces between:

   Repository and site subsystems? _____

   Test and performance assessment activities? _____

2. Did your organization perform or otherwise participate (e.g., consult, review, approve, etc.) in any of the following ESF design input analyses?

Shaft location:	_____	Role:	Approval	When:	NOT SURE
Shaft diameter:	_____	Role:	Approval	When:	_____
Need for second shaft:	_____	Role:	DIRECTED	When:	1985 (MEMO) RW-23 To PRJ
Shaft separation:	_____	Role:	_____	When:	_____
Tests required:	_____	Role:	_____	When:	_____
Testing interferences:	_____	Role:	_____	When:	_____

   Note: "Required Tests" is interpreted to mean tests for which provisions must be made in the ESF design.

3. For each of the activities in Question 2 in which your organization had a role, list the reports, correspondence, meeting minutes, etc., that can be used to establish a documented record of the decision making process. Identify such documentation in sufficient detail for rapid retrieval from records storage, and/or indicate where copies can be obtained. (Make list an attachment to your response; reference the attachment here: MEMO S/NE. RW23-To project.)

4. Did your organization perform or otherwise participate directly in Title I design?

   Yes _____ No X ONLY AS A REVIEW.

5. If the response to Question 4 is affirmative, what was/were your organization's role(s)?

Directly responsible _____

Provided consultation _____

Review REVIEW - NOTE ADDITIONAL FINAL REVIEW UNDERWAY AT PRESENT.

Approval (WILL APPROVE PRIOR TO START OF TITLE II DESIGN

6. When did your organization's Title I design activity start?

Aug 87

7. Identify the responsible individuals from your organization who participated in the activities addressed by questions 2 and 5. State where documentation of their relevant qualifications is maintained.

J. MONTGOMERY - WESTON

D. STRUCK - OGR

C. BROOKS OGR

SECTION 5: QA PROGRAM/DESIGN CONTROLS

1. When did your organization adopt the requirements of NQA-1 and its Supplements as the basis for its Yucca Mountain (formerly NNWSI) Project QA program?

   DOE/RW-0595 Rev. 0 Sept. 1984.

2. Show the chronological evolution of your organization's design control and/or R&D policies, procedures, or other instructions applicable to activities your organization conducted relative to development of MGDS Appendix E, the SDRD, and/or the H&N and F&S Design Basis documents. Cover the period since the earliest date you entered in Section 1 through 3 of this questionnaire. Include the following data:

   Procedure identifying number
   Title
   Subject (if the title does not clearly indicate what the procedure covered)
   Revision number
   From and to dates for the revision
   Procedure and revision this procedure or revision replaced or superseded

   NOTE: The information for Question 2 should make it possible to trace the coverage of a major control from earliest participation in any of the indicated activities to the present.

3. As the OCRWM and YMP QA programs evolved, the wording and/or applicability of some design control requirements have changed. Use Table 1 of this questionnaire to identify major design control changes in your organization's QA program and to flag any that should be considered in terms of reanalysis or reverification during Title II design. The table makes it possible to distinguish between changes in how work or controls were actually accomplished and those that affected the nature or amount of documentation without affecting the underlying work or controls.

4. Attach a chronological list of the procedures (including revisions and effective or issue dates) that covered your organization's audit and/or surveillance activities over the period of your organization's participation in the activities addressed in this questionnaire.

TABLE 1: RESPONSE TO QUESTION 3 OF SECTION 5

Element of design/ R&D control	Approx. Time	Procedure Wording*	Actual Practice*	Nature/amount * of documentatic
Control/evaluation of inputs upon which requirements or criteria were based	1984 (CONT) 1986 11/20/86	APPROVED	DEVELOPED STRAWMAN - THEN REVISED WITH PROJECT OFFICES BEFORE CONCURRENCE AND CONCEPT BOARD REVIEW 8/5/87 FORMALLY	BCP-115
Documentation of rationale for selection of specific criteria and requirements				
Documentation and review of analyses and/or calculations	N/A			
Inclusion of reviewers who did not directly participate in the work being reviewed	1986			ESF WORKSCOPE AND REVIEWS W/PROJECTS W/NRC
Identification and control of internal and external interfaces				DOCUMENT BASELINE

* Indicate the affected column(s) with an "X" or a checkmark. If no effect, enter "NONE".

02K8

5. List audits and surveillances that included any of the activities addressed by this questionnaire. Identify by dates and report numbers. Use Table 1.

6. Provide a list summarizing each of the findings and observations resulting from the audits/surveillances identified in response to Question 5, and the resolution and close-out date for each. Reference the list to Question 6 of Section 5.

7. How and where are the professional qualifications of personnel who represented your organization in the activities covered in Section 1 through 4 (as applicable) documented?

In personnel Records of DOE and Weston.

OFFICE OF GEOLOGIC REPOSITORIES PROGRAM REVISION/CHANGE RECORD

S3R/B-1 OGR Program Baseline Procedures Notebook Rev.0 11/27/87

DOCUMENT NUMBER: DOE/RW-0068
DOCUMENT TITLE: OGR Program Baseline Procedure Notebook (OGR/B-1)

DATE/ REVISION NUMBER	CCBD/BCP NUMBER	REVISION/CHANGE DESCRIPTION	PAGES AFFECTED
2/1/85 1	B-102	Revise Appendices F and G to list name of new CCB Secretary. Other changes	44,46,48 48
3/9/85 2	B-103 (B-4)	Revise Baseline Register, Appendix B, to include "Annotated Outline for Site Characterization Plans"	29
6/19/85 3	B-5	Revise Baseline Register, Appendix B, to include "Annotated Outline for SCP Conceptual Design Report"	29
6/11/86 4	B-116 B-6 B-117	Revised Appendix C examples. Addition of exemption procedure and discussion in new Appendix F. All forms revised including addition of Controlled Document Transmittal forms and BCP Log. Revised Baseline Register, Appendix B, to include "Systems Engienering Management Plan". Revised procedure and Appendices G and H for organization changes and distribution changes. All additions and revisions marked with vertical lines in right margin except Appendix C, Appendix E, Appendix F and new forms.	All pages replaced with new pages; Slip In Cover, Inside Cover, page i, pages 1 to 74
10/20/86 5	B-119 B-9	Revise Baseline Register, Appendix B, to include "OGR Quality Assurance Plan for High-Level Radioactive Waste Repositories" and "OGR Issues Hierarchy for a Mind Geologic Disposal System"	ii, 41
7/20/87 6	B-7 B-8 B-10 B-11 B-12 B-106 B-107 B-120	Revise Baseline Register, Appendix B, to include updates of documents OGR/B-1, OGR/B-2, OGR/B-5, OGR/B-6, OGR/B-8, OGR/B-9, OGR/B-11, OGR/B-12, and OGR/B-13.	ii, 41 41A

OFFICE OF GEOLOGIC REPOSITORIES
PROGRAM
REVISION/CHANGE RECORD

DOCUMENT NUMBER: DOE/RW-0095
DOCUMENT TITLE: Quality Assurance Plan for High-Level Radioactive Waste Repositories (OGR/B-3)

DATE/ REVISION NUMBER	CCBD/BCP NUMBER	REVISION/CHANGE DESCRIPTION	PAGES AFFECTED
8/1/86 1	B-119	Major re-write, update organizational changes and add NRC QA Review Plan to requirements.	i thru viii 1 thru 24
7/86 0	B-119	Add supplemental QA requirements (QAR), Specific QAR's added are listed to the right.	App B QAR 1, 2, 3,4,5,7,8,9
8/1/86 1	B-126	Clarity and update Quality Implementing Procedures (QIP). Add QIP's to OGR Baseline. Specific QIP's revised listed to the right.	App A QIP 2.0, 2.1, 5.0, 6.0, 16.0, 17.0, 18.0, 18.1, 18.2, 18.3, 18.4
8/21/87 1.1	B-128	OGR Program Revision/Change Record. QIP Table of Contents & Revision Control Sheet. Issue Quality Implementing Procedures (QIP). This revision is identified as Revision 1.1, since the QA Plan itself is unchanged. The additional and revised QIPs are applicable only to OGR Headquarters.	viii 1 of 1 QIP REV 3.0 0 3.1 1 3.2 0 4.0 0 5.0 2 6.0 2 7.0 0
9/9/87	B.	chg'd NQA-1 '83 to '86	Pg 2 Pg 5 Pg 17 Append A QIP 2.0, 2.1, 16.0 17.0, 18.0, Supp 3 Supp 4 7 8

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OMB CONTROL NO: 1910-0900

OFFICE OF GEOLOGIC REPOSITORIES PROGRAM REVISION/CHANGE RECORD

DOCUMENT NUMBER: DOE/RW-0068
DOCUMENT TITLE: OGR Program Baseline Procedure Notebook (OGR/B-1)

DATE/ REVISION NUMBER	CCBD/BCP NUMBER	REVISION/CHANGE DESCRIPTION	PAGES AFFECTED
1/25/88 7	B-146	Change Control Flow Chart & Text Revisions	All
2/23/88 7.1	B-16	Update to include Quality Assurance Requirements for High-Level Waste Form Production (OGR/B-14) baseline document.	vi, viii A-2, A-3 E-16

8222-00128C 4/1/86

OGR BASELINED DOCUMENTS

Table A-1

OGR PROGRAM BASELINE REGISTER
(DOE/RW-**** = no DOE publication no. at present)

DOE PUBLICATION NUMBER	DOCUMENT EFFECTIVE DATE	TITLE	REV	REVISION EFFECTIVE DATE
DOE/RW-0068	11/27/84	Office of Geologic Repositories Program Baseline Procedures Notebook (OGR/B-1)	7.1	02/23/88
DOE/RW-0090	10/24/84	Generic Requirements for a Mined Geologic Disposal System (OGR/B-2)	3	03/05/87
DOE/RW-0095	10/24/84	OGR Quality Assurance Plan for High-Level Radioactive Waste Repositories (OGR/B-3)	1.1	08/27/87
DOE/RW-****	11/19/84	OGR Work Breakdown Structure and Dictionary - Development and Evaluation Phase (OGR/B-4)	0	11/19/84
DOE/RW-0142	02/21/85	Annotated Outline for Site Characterization Plans (OGR/B-5)	2	08/27/87
DOE/RW-0147	05/14/85	Annotated Outline for SCP Conceptual Design Report (OGR/B-6)	1	06/05/87
DOE/RW-****	01/10/85	Systems Engineering Management Plan for the Office of Geologic Repositories (OGR/B-7)	1	04/28/86
DOE/RW-0125	12/05/86	Waste Acceptance Preliminary Specifications for the Defense Waste Processing Facility High-Level Waste Form (OGR/B-8)	0	12/05/86
DOE/RW-0136	03/25/87	Waste Acceptance Preliminary Specifications for the West Valley Demonstration Project High-Level Waste Form (OGR/B-9)	0	03/25/87
DOE/RW-0101	09/01/86	OGR Issues Hierarchy for a Mined Geologic Disposal System (OGR/B-10)	1	08/27/87

Table A-1 (Continued)

OGR PROGRAM BASELINE REGISTER
(DOE/RW-**** = no DOE publication no. at present)

DOE PUBLICATION NUMBER	DOCUMENT EFFECTIVE DATE	TITLE	REV	REVISION EFFECTIVE DATE
DOE/RW-****	06/15/87	Project Charter for the Basalt Waste Isolation Project (OGR/B-11)	0	06/15/87
DOE/RW-****	06/15/87	Project Charter for the Nevada Nuclear Waste Storage Investigations Project (OGR/B-12)	0	06/15/87
DOE/RW-****	06/15/87	Project Charter for the Salt Repository Project (OGR/B-13)	0	06/15/87
DOE/RW-****	02/23/88	Quality Assurance Requirements for High-Level Waste Form Production	0	02/23/88

YUCCA MOUNTAIN PROJECT OFFICE

SCIENCE APPLICATIONS INTERNATIONAL CORP.

(YMPO/SAIC)

SECTION 1: GENERIC REQUIREMENTS FOR A MINED GEOLOGIC DISPOSAL SYSTEM

1. Did your organization participate in the identification of ESF criteria/requirements for inclusion in OGR/B-2, Appendix E?

   Yes xx No _____

   NOTE: If the response to Question 1 is negative, no further questions in this section need to be answered.

2. What was your organization's role in the preparation of Appendix E (e.g., inputs, participate in analyses, participate in review, etc.)?

   Participation in Review of Document.

3. Identify the individuals who participated for your organization and summarize (briefly) the relevant qualifications of each. Make your response a separate attachment if necessary.

   Rex Reust, Kenneth A. MacDonald, John A. Jardine, John F. Shaler, David M. Dawson and Chris G. Pflum. (WMPO Proficiency Review Reports are attached).

4. Did your organization subcontract any part of that activity to experts outside the program?

   Yes _____ No xx

5. If the response to Question 3 is affirmative, list the persons, indicate their roles and affiliations, and identify the documents by which your organization defined their tasks and deliverables.

6. When did your participation in that activity start?

January 1986.

7. Briefly describe the process by which Appendix E content and format were established, as seen from your organization's perspective.

The content and format for OGR/B-2 Appendix E was developed by DOE/HQ and provided to the participants.

8. What meetings on ESF generic requirements were attended by personnel from your organization, or by personnel under contract to your organization?

March 11 - 13, 1986 Appendix E Workshop

June 17 - 19, 1986 Licensability Workshop

9. Did your organization participate in incorporation of 10CFR60 requirements in this document? If so, in what role (e.g., responsible, review, etc.)?

Review.

10. What planning document(s) and/or other instructions did your organization issue or receive (as applicable) prior to and/or during your participation in the Appendix E activity? (Provide document number(s), revision(s), and date(s).)

OGR/B2 Appendix E Draft 1a February 27, 1986

OGR/B2 Appendix E - April 1, 1986

OGR/B2 Appendix E - August 14, 1986

SECTION 2: ESF SUBSYSTEMS DESIGN REQUIREMENTS DOCUMENT (SDRD)

1. Did/does your organization participate in the establishment or criteria/requirements contained in the SDRD?

   Yes xx No _____

   NOTE: If your response to Question 1 is negative, no further questions in this section need to be answered.

2. What was/is your organization's role in the preparation/ updating of the SDRD (e.g., generate, interpret, draft requirements; review, approve, etc.)

   Generate the document, drafted requirements and reviewed requirements.

3. Identify the individuals who participated for your organization and summarize (briefly) the relevant qualifications of each. Make your response a separate attachment if necessary.

   Rex R. Reust, Paul D. Steneck, Kenneth A. MacDonald, William E. Narrows,

   WMPO Proficiency Review Reports are enclosed.

4. Did your organization subcontract any part of the definition or review of SDRD criteria/requirements to experts outside the program?

   Yes _____ No x

5. If the response to Question 3 is affirmative, list the persons, indicate their roles and affiliations, and identify the documents by which your organization defined their tasks and deliverables.

6. When did your SDRD participation start?

June 1986

7. Briefly describe the process by which SDRD criteria/ requirements were established, as seen from your organization's perspective?

Los Alamos generated the requirements from existing data, which was reviewed and approved by the Waste Management Project Office. This information was issued as the first SDRD, which was baselined July, 1986.

8 What meetings on SDRD criteria/requirements were attended by personnel from your organization, or by personnel under contract to your organization, during preparation of the SDRD? (If a list of formal meetings is appropriate, reference this section and question, and make the list an attachment to your response.)

NNWSI/SDRD Comment Resolution Meeting, December, 1986.

NNWSI/SDRD Comment Resolution Meeting, April 21-23, 1987.

DOE/HQ/SDRD Comment Resolution Meeting, August 5-7, 1987.

9. What analyses, studies, etc., did your organization perform to arrive at your inputs to the SDRD? List reports or formal correspondence generated as a result of such analyses, studies, etc.

SAIC/T&MSS inputs to the SDRD were in the nature of development of format and document production.

10. Did/does your organization specify ESF design criteria/ requirements to an Architect/Engineer other than via the SDRD or SDRD changes?

Yes _____ No ___xx___

11. If the response to Question 9 is affirmative, briefly describe the process for generating and transmitting such criteria/requirements.

12. What planning document(s) and/or written instructions did your organization issue or receive prior to or during your participation in establishment of SDRD criteria/ requirements? (Provide document numbers, revisions, and dates.)

The July 1986 baselined ESF SDRD.

SECTION 3: DESIGN BASIS DOCUMENTS

1. When did your organization start preparation of your ESF Design Basis document?

   SAIC/T&MSS did not prepare a Design Basis Document.

2. How did/does your organization establish the criteria/ requirements that are specified in your ESF Design Basis document?

3. Identify the individuals who were/are responsible for approving requirements for incorporation in your organization's ESF Design Basis document?

4. How did/does your organization document qualifications of these personnel, and where can such documentation be retrieved?

5. Did/does your organization employ the services of subcontractors or consultants in the establishment of criteria/requirements for your ESF Design Basis document?

Yes _____ No _____

6. If the response to Question 3 is affirmative, list the documents that defined the task, deliverables, and control requirements for the activity.

_____

_____

_____

_____

7. For internal review/approval of initial entries and changes to your ESF Design Basis document, provide the identifying information necessary to retrieve review documentation from your organization's files or from the project record center.

_____

_____

_____

_____

8. Did/do other Project participants review or approve your organization's Design Basis document? If so, identify the organizations and their roles - i.e., review, approve, or both.

_____

_____

_____

_____

_____

SECTION 4: SPECIFIC INTERFACES AND ANALYSES

1. Did your organization participate in the identification of any of the interfaces between:

   Repository and site subsystems? Yes

   Test and performance assessment activities? Yes

2. Did your organization perform or otherwise participate (e.g., consult, review, approve, etc.) in any of the following ESF design input analyses?

Shaft location:	Yes	Role:	Task Force Member	When:	March 1986
Shaft diameter:	"	Role:	"	When:	"
Need for second shaft:	No	Role:	--	When:	--
Shaft separation:	Yes	Role:	"	When:	"
Tests required:	Yes	Role:	ES&P Membership	When:	1984
Testing interferences:	Yes	Role:	"	When:	"

   Note: "Required Tests" is interpreted to mean tests for which provisions must be made in the ESF design.

3. For each of the activities in Question 2 in which your organization had a role, list the reports, correspondence, meeting minutes, etc., that can be used to establish a documented record of the decision making process. Identify such documentation in sufficient detail for rapid retrieval from records storage, and/or indicate where copies can be obtained. (Make list an attachment to your response; reference the attachment here: _____.)
   Position paper on suggested changes to the ESF developed for and presented at the April 15, 1987 NRC and State Meeting.

4. Did your organization perform or otherwise participate directly in Title I design?

   Yes _____ No xx

5. If the response to Question 4 is affirmative, what was/were your organization's role(s)?

Directly responsible _____

Provided consultation _____

Although T&MSS did not participate directly in the Title I Design effort, we had the responsibility for conducting the 50% and 100% Technical Assessment Reviews.

Review _____

Approval _____

6. When did your organization's Title I design activity start?

May 1988 for the 50% Title I Review.
August 1988 for the 100% Title I Review.

7. Identify the responsible individuals from your organization who participated in the activities addressed by questions 2 and 5. State where documentation of their relevant qualifications is maintained.

George K. Beall, Ivan Cottle, Ronald L. Tome, J. Marshall Davenport, Edward M. Cikanek, Margret C. Brake, Alvin Langstaff, James McConville, Dermot Ross-Brown, Robert H. Klemens, Steven Smith, Walter Kazor, Thomas H. Pysto, Peter J. Karnoski, John Jardine, Stanleigh Phillips, Joseph G. Reiser, William E. Narrows. The qualification sheets for these personnel are attached. Kenneth MacDonald participated in the Task Force for Item #2. (WMPO Proficiency Review Reports are enclosed).

SECTION 5: QA PROGRAM/DESIGN CONTROLS

1. When did your organization adopt the requirements of NQA-1 and its Supplements as the basis for its Yucca Mountain (formerly NNWSI) Project QA program?

   _____

2. Show the chronological evolution of your organization's design control and/or R&D policies, procedures, or other instructions applicable to activities your organization conducted relative to development of MGDS Appendix E, the SDRD, and/or the H&N and F&S Design Basis documents. Cover the period since the earliest date you entered in Section 1 through 3 of this questionnaire. Include the following data:

   Procedure identifying number
   Title
   Subject (if the title does not clearly indicate what the procedure covered)
   Revision number
   From and to dates for the revision
   Procedure and revision this procedure or revision replaced or superseded

   NOTE: The information for Question 2 should make it possible to trace the coverage of a major control from earliest participation in any of the indicated activities to the present.

3. As the OCRWM and YMP QA programs evolved, the wording and/or applicability of some design control requirements have changed. Use Table 1 of this questionnaire to identify major design control changes in your organization's QA program and to flag any that should be considered in terms of reanalysis or reverification during Title II design. The table makes it possible to distinguish between changes in how work or controls were actually accomplished and those that affected the nature or amount of documentation without affecting the underlying work or controls.

4. Attach a chronological list of the procedures (including revisions and effective or issue dates) that covered your organization's audit and/or surveillance activities over the period of your organization's participation in the activities addressed in this questionnaire.

5. List audits and surveillances that included any of the activities addressed by this questionnaire. Identify by dates and report numbers. Use Table 1.

_____

_____

_____

_____

_____

6. Provide a list summarizing each of the findings and observations resulting from the audits/surveillances identified in response to Question 5, and the resolution and close-out date for each. Reference the list to Question 6 of Section 5.

7. How and where are the professional qualifications of personnel who represented your organization in the activities covered in Section 1 through 4 (as applicable) documented?

_____

_____

_____

_____

SAIC

RESPONSES TO SECTION 5 OF ESF TITLE I DESIGN CONTROL PROCESS REVIEW PLAN

1.0 The NNWSI Project adopted the requirements of NQA-1 with the issuance of the NNWSI Quality Assurance Plan, NVO-196-17, Rev. 0 in August 1980. The Plan was based upon ANSI/ASME NQA-1-1979. The Waste Management Project Office (WMPO, now YMPO) published its Quality Assurance Program Plan, NVO-196-18 in August 1980 also, stating in the Introduction "These activities are intended to conform with the applicable portions of ANSI/ASME NQA-1-1979."

Both Plans underwent revisions and ultimately received new alpha-numeric designations; 196-17 Rev.5 incorporating the eight supplements of NQA-1 became NNWSI/88-9 in ~~January 1987~~ May 1988, and 196-18 Rev.2 became NNWSI/88-1 in February 1988.

2.0 Chronological evolution of design control policies, procedures or instructions relative to development of the ESF-SDRD, and the Design Basis Documents of F&S and H&N.

Design Control was prescribed in Section 3.0 of NVO-196-17, Rev.0 which was issued in August 1980. Subsequent revisions of 196-17 brought in the concept of three levels of quality, clarified design and site investigation control activities by devoting separate sub-sections of Section 3.0 to Scientific Investigation Control and Design Control.

The following Procedures relating to Design Control were issued:

QMP-03-01	"Peer Review" 12/10/84
QMP-06-03	"Document Review/Acceptance/Approval" 12/10/84
SOP-02-01	"Quality Assurance Program Plan Requirements" 1/7/85
SOP-03-03	"Acceptance of Data or Data Interpretation Not Developed Under the NNWSI QA Plan" 1/31/86
SOP-03-02	"Software Quality Assurance" 2/28/86
SOP-03-05	"ESF Interface Control" 1/27/87

4.0 Chronological list of procedures covering audit and/or surveillance activities:

QMP-18-01	"Audits" Rev.0,12/10/84, Rev. 1 - 3/27/87; Rev. 2 - 2/22/88; REV.3 - 10/3/88
QMP-18-02	"Surveillances" Rev.0 - 5/11/87; Rev. 1 - 5/27/88

Audits and surveillances were covered Section 18.0 of NNWSI-SOP-02-01 which was issued on 1/7/85 and revised on 1/31/86. SOP-02-01 was absorbed into the Project QAP, NVO-196-17 Rev.4 in January 1986.

5
1/5/89

TABLE 1: RESPONSE TO QUESTION 3 OF SECTION 5

Element of design/ R&D control	Approx. Time	Procedure Wording*	Actual Practice*	Nature/amount * of documentation
Control/evaluation of inputs upon which requirements or criteria were based	8/80	NONE		
	4/81	NONE		
	4/84	NONE		
	1/85	X		
	1/86	X		
Documentation of rationale for selection of specific criteria and requirements	8/80	NONE		
	4/81	NONE		
	4/84	NONE		
	1/85	X		
	1/86	X		
Documentation and review of analyses and/or calculations	8/80	NONE		
	4/81	NONE		
	4/84	NONE		
	1/85	X		
	1/86	X		
Inclusion of reviewers who did not directly participate in the work being reviewed	8/80	NONE		
	4/81	NONE		
	4/84	NONE		
	1/85	X		
	1/86	X		
Identification and control of internal and external interfaces	8/80	NONE		
	4/81	X		
	4/84	X		
	1/85	X		
	1/86	X		

* Indicate the affected column with an "X" or a checkmark. If no effect, enter "NONE".

02K8

Pete Karwowski 7736

YMP/SAIC

SECTION V of ESF Title I Design Control Process Review Plan

Question 5 and 6

See Attachment 1 for a list of Audits and Surveillances with summarized findings and close-out dates. (3 pages) (Note: SAIC subsequently replaced handwritten list with 4 pp. typed. JBlack 1/20/89)

Question 7

Personnel qualifications are documented in accordance with the requirements of QMP-02-01. These documents are maintained in the Project Training Center.

AUDIT NO.	ORGAN.	DATE	SDR #	SUMMARY OF FINDING	CLOSEOUT DATE
87-5	SNL	6/87	028	Design ctrl procedures & interface control procedures do not address processing & approval within SNL	4/28/88
87-8	F&S	7/87	062	Corrections made to design calculations without being initiated and dated by person making correction	1/13/88
	F&S	7/87	063	Design verification record for F&S study #4 was not in project file	1/13/88
	F&S	7/87	064	Comments not included on design verification records	1/13/88
	F&S	7/87	065	Lead discipline engineers have not approved the eleven design studies. Study #4 was not signed by the QA Rep	2/17/88
88-01	F&S	2/88	104	Design review not performed as required by procedure	6/7/88
88-02	H&N	4/88	120	Interdiscipline reviews not addressed in procedures	9/16/88
88-03	USGS	4/88	140	Using data generated by software that has not been validated or verified	
88-04	USGS	6/88	146	Data documents and computer codes are not identified by Quality Levels	
	USGS	6/88	147	Publications generated by computer program without appropriate updated SCIF	
	USGS	6/88	149	Technical reviewers not certified	
	USGS	6/88	153	Scientific notebooks and Field notebooks are not adequate	
	USGS	6/88	155	Data not rev ed & cosigned by a peer or supervisor	

AUDIT NO.	ORGAN.	DATE	SDR #	SUMMARY OF FINDING	CLOSEOUT DATE
88-06	SNL	8/88	170	QA has not reviewed or approved design inputs	
	SNL	8/88	172	Design requirements for QA Level II are less restrictive than for QA Level I	

AUDIT NO.	ORGAN.	DATE	SDR #	SUMMARY OF FINDING	CLOSEOUT DATE
88-06	SNL	8/88	175	Design files do not contain all required information	
	SNL	8/88	176	Non-approved data is being used in design activities w/o justification	
	SNL	8/88	179	Calculations are being performed with the incorrect procedure	
88-05	LLNL	11/88	230	Peer review not done to YMP procedure	
	YMP	11/88	231	Peer review not done to YMP procedure	
	LLNL	11/88	242	QA Software records missing	
	LLNL	11/88	247	Software QA Documentation inconsistent with NUREG 0856	
S89-01	H&N	11/88	252	Insufficient detail in electrical and civil calculations	
S80-02	F&S	12/88	263	Interdiscipline checkprint comments not verified by engineers	
	F&S	12/88	267	Commercial software used during Title I Design Activities has not been verified or documented by F&S	
S89-03	YMP	12/88	272	The review plan controlling the design acceptability analysis has not undergone formal review and approval	
				nor has the plan been subjected to formal document control requirements	
	YMP	12/88	273	Design acceptability analysis was initiated prior to the approval of the QALAs for the activity	

SURVEILLANCE NO.	ORGAN.	DATE	SDR #	SUMMARY OF FINDING	CLOSEOUT DATE
88-011	SAIC	8/88	183	Not implementing AP-1.3Q and AP-06.03	
YMP-SR-88-021	LANL	10/88	197	Lack of assignment of QA levels to Design Phases	
	LANL	10/88	201	No pre-award evaluation and bid evaluation of IDS Design suppliers	

LOS ALAMOS NATIONAL LABORATORIES

(LANL)

SECTION 1: GENERIC REQUIREMENTS FOR A MINED GEOLOGIC DISPOSAL SYSTEM
GRD - APPENDIX E

1. No, this was a DOE/HQ-produced document.

Ref. (1) for Respt. Sect. IV.B.3

2-10. Not applicable.

SECTION 2: ESF SUBSYSTEMS DESIGN REQUIREMENTS DOCUMENT (SDRD)

1. Yes

2. Los Alamos has participated in the preparation and updating of the SDRD by reviewing draft requirements submitted as Engineering Change Requests (ECRs). The ECRs can be submitted directly to the Interface Control Working Group (ICWG) by any participating organization. Los Alamos normally collects the testing-related requirements from the Principal Investigators (PIs), reviews them for technical consistency, then prepares and submits the ECR(s) on behalf of the PI(s). When the Architect Engineers (AEs) request test-related requirements, Los Alamos is responsible for obtaining the needed information from the PIs, if available, and assuring that an ECR is submitted with that information as soon as it is available.

3. **T. Merson**, ICWG Member, Mechanical Engineer/Eng. Physicist, 31 years relevant experience, 8 years on Yucca Mountain Project
   P. Aamodt, alternate, geologist, 16 years relevant experience, 5.5 years on Project

4. No

5. Not applicable

6. At the time the SDRD Appendix B was started, approximately November 1986.

7. The SDRD ESF requirements were initially established based on existing ESF design documents including the higher level requirements in the GRD and 10 CFR 60. The DOE/WMPO position paper outlining an ESF with two 12-ft shafts and long exploratory drifts (Vieth, 1987) provided the basic design concepts for the SDRD. Testing-related requirements, including the long exploratory drifts, were developed by the Principal Investigators. The test requirements that formed the basis for the first draft (Revision 0) of the SDRD were obtained from the PIs using a standard form developed by SAIC for that purpose (see Attachment 4). It is conceivable that the information acquired using the SAIC form was supplemented with test design requirements documented in the Exploratory Shaft Test Plan Revision 1 draft (August 1985).

   Subsequent revisions to the SDRD Appendix B (Test Support Requirements) or Appendix C (Test Drilling/Coring Requirements) were, we believe, introduced following a procedurally-controlled process that required submittal of Engineering Change Requests (ECRs). The ECRs, prepared by the testing organizations, were introduced to the Interface Control Working Group (ICWG) for review. Following review by all ICWG members and group discussion, the DOE ICWG Chairman could either accept, reject, or return the ECR for modification.

   Since 1986, when the SDRD process was implemented, Los Alamos has been responsible for collecting ESF requirements related to testing. Only the ICWG Chairman, however, has authority to approve ESF design requirements including those that are testing-related.

8. ICWG meetings, usually held monthly, were attended by a Los Alamos ICWG member (or alternate). The meeting minutes were prepared by Marge Brake, SAIC, and should be available from the Project Records Center.

9. Los Alamos solicited ESF test requirements from the PIs at Los Alamos, SNL, USGS/USBR, and LLNL. Special studies included ESF power requirements (for testing), ESF population requirements (testing only), surface space requirements, and (possibly) the fluids and materials study by K. West.

10. No, the SDRD procedure does not allow design criteria to go to the AE organizations from any organization but DOE. (Special Note: the above answer is correct for all of the input to the current ESF Title I design. In years prior to the SDRD, when Los Alamos had primary responsibility for ESF design, it was permissible for Los Alamos to transmit criteria directly to the AE organizations--DOE did, however, have to approve all such criteria.)

11. Not applicable.

12. This is a question that we will assume refers only to the current ESF Title I design--that controlled by the SDRD. If the "written instructions" question refers to instructions to the AEs, the answer is none. If the "written instructions" question refers to other organizations or the DOE, we would ask for clarification of the question before we attempt an answer.

    The assumption that we must make is that the current ESF Title I design was prepared in its entirety using the SDRD process following approved administrative and QA procedures. We can provide information on the previous design (pre-SDRD) process if requested, but it does not now appear relevant to the current ESF Title I design.

    For pre-SDRD information on the ESF see Attachment 1, "Los Alamos National Laboratory Document Accountability Log." Those documents dated about January 1986 relate to the original (pre-SDRD) Title I and Title II designs, not the present Title I ESF design.

SECTION 3: DESIGN BASIS DOCUMENTS

1. Los Alamos has had the responsibility for coordinating the development of ESF test plans since 1982, when the ESTP Committee was established to develop the ESTP Revision 0 document. The test planning process continued with ESTP updates (Revision 1, August 1985, and Revision 2, December 1987). At the time that the SDRD was first drafted, test requirements were consolidated mainly in the ESTP Revision 1 draft document.

2. Los Alamos only established criteria for Los Alamos tests, and for certain common-to requirements such as office space, power, IDS services, etc. In all cases, the PIs develop and provide their requirements/criteria for their own tests. Los Alamos then integrates those requirements and after final review by the PIs, incorporates them into an ECR (or ECRs) for submittal to the ICWG. Following review by the ICWG, DOE makes the final determination as to whether or not to accept them. If the DOE (ICWG Chairman) accepts an ECR, the requirements are made part of the SDRD (Appendices B or C) and the Chairman notifies the AEs to incorporate the new requirements into the ESF design. Although Los Alamos can question PI test or common-to requirements and request documented justification, it is the ICWG Chairman alone who has authority to accept or reject PI criteria or requirements.

3. The DOE ICWG Chairman is solely authorized to accept or reject criteria/requirements for ESF design.

   With respect to the design information and requirements in the ESTP (Revisions 0 to 2) the DOE has never "approved" the test plans or the document. There is documentation (Attachment 4) to the effect that the PIs can continue to develop their test plans; it was received following a detailed review by D. L. Vieth (then WMPO Project Director). Nevertheless, the ESTP or parts therein have never been formally approved per se. It should also be noted, however, that all of the tests in the ESTP Revision 2 were included in Chapter 8 of the SCP and, since all activities described in the SCP were formally reviewed and approved at both the Project and DOE/HQ levels, the ESF tests are apparently all "approved" as written in the SCP. Recognition of this situation caused Los Alamos to use the SCP test descriptions for the most recent update of the SDRD Appendix B. These descriptions with respect to criteria and requirements, were generally inadequate for Title II design, thus the PIs have been requested to formally supplement the SCP information. This work is still ongoing and should be completed in December 1988.

4. All Los Alamos personnel qualifications are on record with the Los Alamos Quality Assurance Manager. Each of the PI organizations is responsible for documenting their own employees' qualifications per Project-approved procedures. Either the DOE Project QA Manager, or the individual participant QA managers should be able to provide documentation on employee qualifications.

5. Los Alamos has used consultants to review the test plans as they were developed in the ESTP Rev. 1 document. A specific request made to the reviewers was to provide a judgement as to whether or not each test could be successfully performed as it was planned (designed). The request letter from Los Alamos and the technical (peer) review comments are available either from the Project Records Center

or upon request to the Los Alamos TPO. (This information also is available in the ESTP Revision 2 document in an appendix.) Consultants have also been used to assist with developing the Integrated Data System interface requirements, and to provide technical support related to validation of air-coring technology.

6. Available documentation related to the employment of consultants is included as Attachment 5.

7. The SDRD entries/changes are controlled and documented by the DOE Project Office.

   The ESTP is not an officially recognized Project document. (A list of ESTP-related documents is provided as Attachment 2).

8. Each of the test organizations (Los Alamos, SNL, USGS/USBR, and LLNL) have representatives on the ICWG. They are able to review all ECRs, but only the DOE ICWG Chairman can reject or approve ESF criteria/requirements. Each organization has been asked to review the ESTP revisions as they became available. The DOE has not approved the ESTP.

SECTION 4: SPECIFIC INTERFACES AND ANALYSES

1. a) Yes - Review function only
   b) Yes - Review function only

2. a) No - The DOE selected the current locations for ES-1 and ES-2.
   b) No - However, the shaft diameter appears to be a carryover design feature from the original ESF design.
   c) No - The need for a second shaft was a DOE/HQ requirement [see references ESD-WX-4-5/84-31, Bennet to Vieth; and ESD-WX-4-5/84-30, Vieth to R. Nelson, both enclosed (Attachment 4)]
   d) Yes - Review (It should be noted that way back when, the USGS hydrologists were asked to judge how far away from USW G-4 the ES-1 should be located in order to reduce the likelihood of adverse influence of drill water on the unsaturated-zone hydrology tests in the ESF. They recommended a separation of "about 300 ft." This informal requirement somehow became a formalized requirement that was carried along with the 2-shaft design even after the shafts were relocated several hundred feet farther away from USW G-4. Perhaps it was serendipity, but the required fleet angle to the hoist ropes using a single hoist house between the two shafts also turned out to give a 300 ft separation.)
   e) Yes - Consult, review, and compile into the ESTP documents. Los Alamos PIs also developed the plans for their geochemistry and mineralogy/petrology ESF tests. 1982 to present.
   f) Yes - consult, review, and compile into the SDRD Appendix B original and subsequent updates. 1986 to present.

3. See attached lists (Attachments 1, 2, and 3).

4. Yes

5. Provided Consultation
   Review

6. With commencement of the SDRD in 1986
   (Note: There was an earlier Title I design for which the Los Alamos role was direct responsibility. That design was dropped from further consideration in 1987 when D. L. Vieth presented the new ESF conceptual design having two 12-ft shafts and ~4500 ft of drifts at the same level as a prospective repository. The NRC and State of Nevada agreed to the new expanded ESF design at that time (March 1987).

7. R. Crowley
   J. M. Ray
   S. D. Francis
   T. J. Merson
   P. L. Aamodt
   D. A. York

   Personnel qualifications are maintained with the Los Alamos QA Manager.

SECTION 4: SPECIFIC INTERFACES AND ANALYSES

1. (Part one of two parts.) During the ESF design did your organization participate in the identification and/or evaluation of interfaces (i.e., potential for interactions) between ESF, design, construction, and operation, and the repository, and/or in minimizing or preventing such interactions through ESF design, selection of construction methods, etc.?

   Yes X No _____

   (Identify applicable documentation if not already identified in earlier information packages.)

   Los Alamos did participate in the identification and evaluation of interfaces between ESF design, construction, and operation. We did not provide any formal input into the interfaces, but did perform reviews and advice on a consultative basis.

   (Part two of two parts.) In what role did your organization participate in identifying the interfaces between the siting, design, testing, and performance assessment aspects of the ESF program and ensuring that ESF planning and design integrated those aspects? (Identify applicable documentation if not already done so.)

   Los Alamos is represented on the ICWG, and meetings are generally held on a monthly basis. Los Alamos participation is documented in the monthly meeting minutes, and can be obtained from the Project Records Center.

SECTION 5: QA PROGRAM/DESIGN CONTROLS

1. Los Alamos has been involved in the waste program since 1977. At that time, NQA-1 and ANSI/ASME requirements were used as QA guidance. In 1978 Los Alamos had in place TWS-QP-1, R0, which provided QA guidance for work on the Nevada Test Site (as a supplement to NQA-1).

2. The chronological evolution of Los Alamos' design control procedures, plus significant events related to ESF design responsibility are shown on the attached figure. We have focused on the period since mid 1986 when the SDRD and DOE design responsibility were established. This is the period of time that is most relevant to the present Title I ESF design and the NRC concerns.

3. Refer to Figure 1, attached. The attached Table 1 is probably not applicable. However, the phrasing of guidance in question 3 and the table don't seem to be consistent, so we may need to readdress the question once we understand what is being asked.

4. See Figure 1. If more detailed information is needed, please contact the Los Alamos QA Manager or TPO.

5. See Figure 1. If additional detail is needed, please contact the Los Alamos QA Manager or TPO.

6. We would request that you direct this question to Jim Blaylock, DOE Project QA Manager. Jim maintains all of the official records and resolution status for all Los Alamos audits.

7. The Los Alamos QA Manager maintains records of all personnel qualifications. Relevant procedures are TWS-QAS-QP-02.1, R0 and TWS-MST-QA-QP-08, R2.

Note: Follow-up action by LANL resulted in transmittal of their list of audits and surveillances, which is included here with their response.
J Rusk

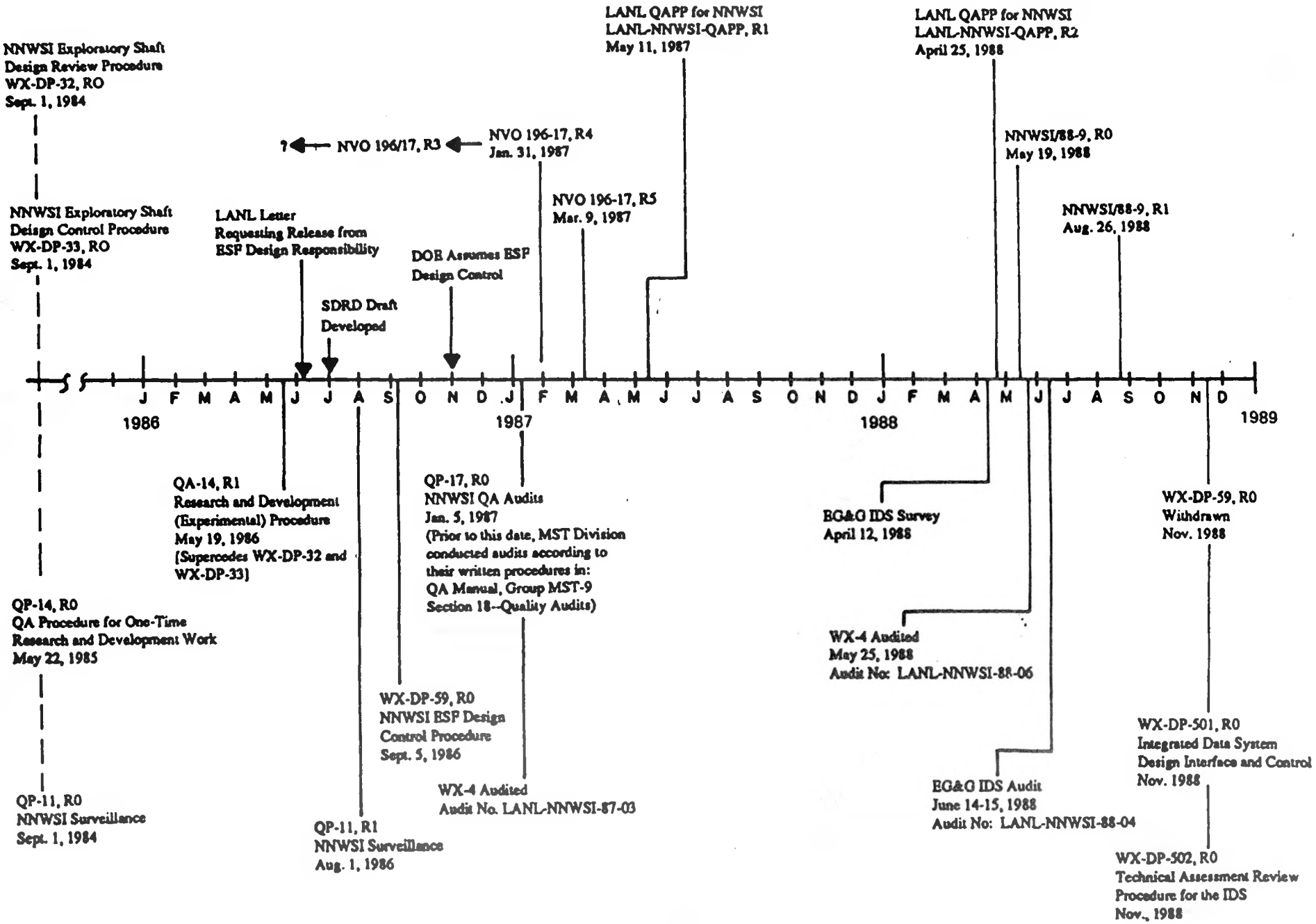

Fig. 1. ESF Design QA History, 1986-1988.

LOS ALAMOS NATIONAL LABORATORY
SURVEILLANCE REPORT LOG

SR No	SR DATE	TWS#	SURVEILLANCE ACTIVITY	ORGANIZATION	PROCEDURE
-0001	2/12/87	TWS-N-S-04-87-53	M&TE Surveillance	ESS-1	QP-15
-0002	2/12/87	TWS-N-S-04-87-54	M&TE Surveillance	INC-11	QP-15
-0003	2/27/87	TWS N-S-04-87-55	M&TE Surveillance	NSE-5	QP-15
-0004	2/27/87	TWS-N-S-04-87-56	M&TE Surveillance	NSE-12	QP-15
-0005	3/11/87	TWS-N-S-04-87-57	M&TE Surveillance	LS-1	QP-15
-0006	4/19/86	N/A	Audit response follow up	ESS-1	QP-11
-0007	1/27/87	~~N/A~~ PJ TWS-ESS-1-3-87-66	Purchase Request QA requirement follow up	ESS-1	QP-12
-008	5/11/87		DP-61 RD IMPLEMENTATION	INC-7/11	DP-61 & QP-14

LOS ALAMOS NATIONAL LABORATORY
SURVEILLANCE REPORT LOG

SR No	SR DATE	TWS#	SURVEILLANCE ACTIVITY	ORGANIZATION	PROCEDURE
-0009	~~6~~ 7/7/87	TWS-N-5-87-28	TWS - HSTQA - QP 17, R2	ESS - 5	
-0010	6/24		Implementing QA program	ESS - 4	
-0011	6/26		LS-3 M&TE Survey	LS-3	QP-15
-0012	6/29	TWS-N-5-87-109	HSE-5 M&TE Survey	HSE-5	QP-15
-0013	6/29	TWS-N-5-86-111	HSE-12 M&TE Survey	HSE-12	QP-15
-0014	7/8		INC 7/11 Follow-up to Corrective actions on Finding # 1, Audit No. LANL-1AWS1-87-02	INC 7/1	QP-17
-0015	7/10/87	VOIDED	Number never issued (Dr. Nunes, ORS, 9/15/87		
-0016	7/8/87		EG&G - Initial Survey to establish IDS project scope	EG&G	~~QADP~~
-0017	8/17/87		Audit 87-04 / Closeout on Finding # 2 - Notebooks	ESS-1	QP-03 QP-14
-0018	8/17-18/87	N-S-08-87-69	Survey activities of LBL	INC 7/11	SIP NO. 8614.1.1.4, R0
-0019	9/29 & 10/1 1987		Notebook survey for closeout of Audit ESS-1, 87-04	ESS-1	QP-14 & QP-03

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SR No	SR DATE	TWS#	SURVEILLANCE ACTIVITY	ORGANIZATION	PROCEDURE
0020	10-16-87	TWS-NS-87-57	Close out audit TWS-NS-87-06	HSE-12	QP-05 QP-14
0021	10-26-87	TWS-NS-87-58	Data files and modeling Traceability	UTEP, Sub to HSE-12	QAPP QP-03 QP-14 QP-55
0022	11-16-87	TWS-NS-11-87-27	Survey Compliance with	CLS-1 for HSE-12	QAPP QP-03 QP-12
0023	12/2/87	TWS-NS-12-87-11	Loading air particulate sample cassettes	HSE-5	OP-HSES-211
0024	1/26/88	TWS-NS/02-88-61	RPC files	N-5,	QP-09, R2 (draft) (QP-17.1)
0025	1/21/88	TWS-NS/02-88-71	Notebooks Resident files	CSS-5	QP-03
0026			CANCEL	LS-2	
0027	2/25/88	TWS-NS/03-88-18	Resident file	HSE-12	QP-09, R0 QP-02.1 QP-07
0028	1/27/88	TWS-NS/02-88-73	Notebooks Resident file	ESS-4	QP-03, R1 QP-09, R0 QP-14
0029	2/9/88	TWS-NS/02-88-102	Loading filters	HSE-5	OP-211
0030	3/11/88	TWS-NS/03-88-66 TWS-NS/04-88-61	Robot gamma Counting	INC 7/11	OP-64 (draft)
0031	3/1/88	TWS-NS/03-88-49	Resident file	HSE-5	QP-09 QP-08 QP-06 QP-15 QP-07 QP-20
X	X	X			

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SR No	SR DATE	TWS#	SURVEILLANCE ACTIVITY	ORGANIZATION	PROCEDURE
0032	2/8/88	TWS-NS/ 02-88-05	Review and design control of Table I and II drawings	LWX-4	DP-57, R0
0033			CANCEL		
0034	4/7/88	TWS-NS/ 04-88-62	Resident file Notebook	LS-2	QP-03 QP-14
0035	4/14/88	TWS-NS/ 04-88-63	Point count mineral analysis	ESS-1	DP-102, R0
0036	4/19/88	TWS-NS/ 04-88-70	Calibration of balance	MEC-9	MEC-
0037	4/21/88	TWS-NS/ 04-88-68	Reactive Tracer Testing M&TE	HSE-12	QP-12.1
0038	4/19/88	TWS-NS/ 04-88-67	Mineral analysis	ESS-1	DP-07
0039	4/12/88	TWS-NS/ 05-88-52	EG&G Records Review	EG&G	N/A
0040	5/5/88	TWS-NS/ 05-88-19	Mettler Balance	ESS-1	DP-51 (Draft)
0041	5/17/88	TWS-NS/ 05-88-44	SEM Procedures	HSE-5	~~DP-201~~ DP-202
0042	5/19/88	TWS-NS/ 05-88-49	Sample preparation DP-201 Fiber Examination DP-205	HSE-5	DP-201 DP-205
0043	5/26/88	TWS-NS/ 06-88-05	Check notebook TWS-HSE-12 8/87-14 to close out UTEP audit	HSE-12	QP-03
0044	6/2/89	TWS-NS/ 06-88-10	Brown-Brann Thin Section Prep.	ESS-1	ESS-DP-04, R4

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SR No	SR DATE	TWS#	SURVEILLANCE ACTIVITY	ORGANIZATION	PROCEDURE
0045	5/10/88	TWS-NS/ 06-88-26	Clark notebook TWC-ESS-1-7/86-43 To close out Audit 88-03	ESS-1	QP-03, R7
0046	6/13/88	TWS-NS/ 06-88-29	Sample identification and control	ESS-1	ESS-DP-10, R0
0047	6/13/88	TWS-NS/ 06-88-30	Prototype work for ESHaft	ESS-1	—
0048	6/24/88	TWS-NS/ 06-88-68	Clay Sample	HSE-12	ESS-DP-25 HSE-12-DP-307 -318 -311
0049	8/8 & 9/88	TWS-NS/08- ~~88-09~~ Inv	LBL full scope survey	LBL-INC-11	
0050	7/1?/88	TWS-NS/08-88-09	Resident file records Sample Management	LS-2	QP-02.1, 03 04.1, 07, 18.1, 17.1
0051	7/27/88	TWS-NS/08-88-01	Survey notebooks for correct documentation and disposition	NSE-12	QP-14, QP-05 (QA) in notebooks
0052	8/1/88	TWS-NS/ 09-88-038	Computer software control for RALPH, sample identification, review of PRs, review of technical publication issues	INC 8/11	QP-04.1 QP-07 04AD.
0053	8/17/88	TWS-NS/ 09-88-038	Martin CAS notebook QP 7RS & Personnel files	INC 7/11	QP-03 QP-14 QP-02.1
0054	9/8/88	TWS-NS/09-88-04	Hobart/Palmer notebook	INC-11	
0055	9/21/88 ~~9/19/90~~	TWS-NS/21 088 ~~20 094~~	WX-4 Close out audit	WX-4	Audit Close 880831-88-06
0056	9/9/88		EGG Closeout survey	EG&G	
0057	11/17/88	TWS-NS-CP-88-005	LS-2 Close out CAR 042		

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SURVEILLANCE REPORT LOG

SR No.	SR DATE	TWS #	SURVEILLANCE ACTIVITY	ORGANIZATION	PROCEDURE
0058	12/17/88	TWS-NS-12-88-0[illegible]	Trainings for O,APP	DESK Survey	

TWS # is written in after it has been sent (just in case the report is lost - new # issued - whatever)

thanks

AUDIT NUMBER LOG

AUDIT NUMBER	AUDIT DATE	ORGANIZATION AUDITED	CORRESPONDENCE TO ORGANIZATION
LANL-NNWSE-88-01	NOV. 23-24, 1987	Inc 7/11	Sched Memo 11/13/87 Audit Rpt 12/22/87 Audit Closed 5/16/88
LANL-NNWSE-88-02	Feb 16-17, 1988	UTEP	Sched Memo Feb 5, 1988 Audit Rpt 2/26/88 Audit Closed 6/7/88
LANL-NNWSE-88-03	Feb 10-11, 1988	ESS-1	Sched Memo 1/4/88 Audit Rpt 3/4/88 Audit Closed 6/14/88
LANL-NNWSE-88-04	JUNE 14-15, 1988	EG&G	Sched Memo 3/2/88 telecon Audit Rpt 7/20/88 Audit Closed
LANL-NNWSE-88-05	MAY 3,4,5, 1988	HSE-12 CLS-1	Sched Memo 4/4/88 Audit Rpt 5/20/88 Audit Closed 9/13/88
LANL-NNWSE 88-06	MAY 25, 1988	WX-4	Sched Memo 5/2/88 Audit Rpt 6/10/88 Audit Closed Oct 13 '88
LANL-NNWSE-88-07	AUG 4, 1988 audit rescheduled Sept 15, 1988	LS-2	Sched Memo 7/8/88 Audit Rpt 9/13/88 Received Audit Closed
LANL-NNWSE-88-08	JUNE 30, 1988	HSE-5	Sched Memo 5/24/88 Audit Rpt 7/25/88 Audit Closed Indefinate Hold 10/31/88
LANL-NNWSE-88-09	July 28, 1988	ESS-5	Sched Memo 6/24/88 Audit Rpt 8/11/88 Audit Closed
LANL-NNWSE-88-10	July 26, 1988	ESS-4	Cancled 6/88 Sched Memo 7/7/88 Audit Rpt 8/10/88 Audit Closed

SANDIA NATIONAL LABORATORY

(SNL)

VERSION TO BE USED

SECTION 1: GENERIC REQUIREMENTS FOR A MINED GEOLOGIC DISPOSAL SYSTEM

1. Did your organization participate in the identification of ESF criteria/requirements for inclusion in ORR/B-2, Appendix E?

   Yes _____ No X

   NOTE: If the response to Question 1 is negative, no further questions in this section need to be answered.

2. What was your organization's role in the preparation of Appendix E (e.g., inputs, participate in analyses, participate in review, etc.)?

   Full Scale Division

3. Identify the individuals who participated for your organization and summarize (briefly) the relevant qualifications of each. Make your response a separate attachment if necessary.

   Full Scale Division

4. Did your organization subcontract any part of that activity to experts outside the program?

   Yes _____ No _____

   From - Sandia
   R. E. Stinebaugh

5. If the response to Question 3 is affirmative list the persons, indicate their roles and affiliations, and identify the documents by which your organization defined their tasks and deliverables.

6. When did your participation in that activity start?

7. Briefly describe the process by which Appendix E content and format were established, as seen from your organization's perspective.

8. What meetings on ESF generic requirements were attended by personnel from your organization, or by personnel under contract to your organization?

9. Did your organization participate in incorporation of 10CFR60 requirements in this document? If so, in what role (e.g., responsible, review, etc.)?

_____

_____

_____

10. What planning document(s) and/or other instructions did your organization issue or receive (as applicable) prior to and/or during your participation in the Appendix E activity? (Provide document number(s), revision(s), and date(s).)

_____

_____

_____

_____

SECTION 2: ESF SUBSYSTEMS DESIGN REQUIREMENTS DOCUMENT (SDRD)

1. Did/does your organization participate in the establishment or criteria/requirements contained in the SDRD?

   Yes X No _____

   NOTE: If your response to Question 1 is negative, no further questions in this section need to be answered.

2. What was/is your organization's role in the preparation/ updating of the SDRD (e.g., generate, interpret, draft requirements; review, approve, etc.)

   GENERATE CRITERIA & REVIEW

3. Identify the individuals who participated for your organization and summarize (briefly) the relevant qualifications of each. Make your response a separate attachment if necessary.

   SEE ATTACHED

4. Did your organization subcontract any part of the definition or review of SDRD criteria/requirements to experts outside the program?

   Yes X No _____

5. If the response to Question 3 is affirmative, list the persons, indicate their roles and affiliations, and identify the documents by which your organization defined their tasks and deliverables.

SEE ATTACHED

6. When did your SDRD participation start?

SEE ATTACHED

7. Briefly describe the process by which SDRD criteria/ requirements were established, as seen from your organization's perspective?

SEE ATTACHED

8 What meetings on SDRD criteria/requirements were attended by personnel from your organization, or by personnel under contract to your organization, during preparation of the SDRD? (If a list of formal meetings is appropriate, reference this section and question, and make the list an attachment to your response.)

SEE ATTACHED

9. What analyses, studies, etc., did your organization perform to arrive at your inputs to the SDRD? List reports or formal correspondence generated as a result of such analyses, studies, etc.

SEE ATTACHED

10. Did/does your organization specify ESF design criteria/ requirements to an Architect/Engineer other than via the SDRD or SDRD changes?

Yes _____ No X

11. If the response to Question 9 is affirmative, briefly describe the process for generating and transmitting such criteria/requirements.

N/A

12. What planning document(s) and/or written instructions did your organization issue or receive prior to or during your participation in establishment of SDRD criteria/ requirements? (Provide document numbers, revisions, and dates.)

SEE ATTACHED

Section 2 ESF Subsystems Design Requirements Document

---------- Question 3 ----------

T. E. Blejwas, Supervisor, Geotechnical Projects Division, Sandia Laboratories PHD University of Colorado 1978, 3 years supervising rock mechanics testing, 4 years R & D in reactor safety

R. E. Stinebaugh, Member of Technical Staff, Geotechnical Design Division, Sandia Laboratories. BSME, New Mexico State University, 1959. Previous positions at SNL included the responsiblity for the conceptual design of the underground facilities for the Waste Isolation Pilot Plant, the conceptual design of the underground waste handling systems for both the WIPP and the NNWSI repository. Since 1984 has been responsible for the design of the underground facilities for the repository at Yucca Mountain

Qualification certification records for the above persons are in the SNL Records Management System under file code 90/1293/CRT/Q?

---------- Question 5 ----------

B. M. Bohlke and Wilfred Streeter of Parsons-Brinckerhoff Quade and Douglas served as reviewers for the ESF SDRD. Their participation was authorized by SNL Design Investigation Memo (DIM) # 111 which is titled "ESF/Repository Interface". Review comments by these reviewers were forwarded to WMPO by SNL on 11/4/86. (Reference letter Tillerson to Skousen dtd 11/4/86)

---------- Question 6 ----------

Approximately 10/85 based on minutes of the ESF/Repository design interface meeting held 10/23/85. At this meeting, alternatives for the drifting to

investigate the geological features (Ghost Dance, Drill Hole Wash, and the suspected imbricate faults) and the main test level layouts were discussed. This meeting set charter for further work by SNL to develop inputs for the ESF SDRD.

---------- Question 7 ----------

To answer this question, three items reflected in the SDRD, that were basically initiated by SNL are discussed. These items are: 1) the location, extent, and sizing of the lateral drifts driven to investigate the geological features of the site, 2) the initial layout of the main test level (MTL), the Upper Breakout Demonstration Room (UBDR) and the Calico Hills Drill Room (CHDR) including breakout levels, 3) Seismic design criteria, and 4) the Reference Information Base (RIB).

For Items 1&2...the designs for the MTL and the lateral exploration drifts was developed by an iterative process involving: 1) development of a draft designs, review by program participants, and incorporation of the designs into the SDRD using the SNL and WMPO change procedures. The design of the MTL and the lateral drifts was first presented to the ICWG on SNL dwg R07048 at the 1/23/87 meeting of the ICWG. At the request of the WMPO, the design presented at the 1/23/87 meeting was revised and represented to the ICWG at the meeting held on 2/10/87. Based on additional changes suggested at this meeting the drawing was again revised for presentation at the ICWG meeting scheduled for 4/28/87. Review and revision of this drawing continued until it was approved. Note: review was done by all ICWG participating members and review comments are recorded as a part of the meeting minutes for this group. The issue of drawing R07048A dated 11/3/87 was issued for use by program participants by WMPO ECR 003.

Drawing R07048A was revised in December of 1987 per the request of the WMPO (Ref Ltr Skousen to Hunter dated 12/16/87). This revised drawing was transmitted to

WMPO for approval on 12/30/87 (Ref Ltr Stinebaugh to Irby dtd 12/30/87). This new drawing was approved and implemented into the system for use as design critria by WMPO ECR 004 (ref ltr Skousen to distribution, dtd 1/21/88, subj: Engineering change request 004). The drawing was changed one additional time to incorporate changes to correct erorrs in the presentation of the stratigraphy on sheets 11,12,13,14, and 15 and to reflect changes in the design of the test facility on the main test level. This last change was submitted to the WMPO by letter on 2/26/88. Accompanying this letter was an SNL Design Change Request (DCR 012) and an ECR as required by NNWSI SOP 03-05.

It should be noted that drawing RO7048A reflects the results of other efforts that were carried on simoultaneously with the development of the drawing that were also directed at the development of criteria for the ESF; namely:

- Efforts to determine the sizes for the lateral exploratory drifts. This effort culminated in a report (SNL SLTR88-4001) prepared by SNL. The report has been reviewed by WMPO and by DOE headquarters. Comments from both agencies have been incorporated. The document is awaiting final approval from DOE HQ.

- Determination of the elevations for the UDBR, the MTL and the CHDR. The elevations for the main test level and other breakouts from ES-1 were established over a period of time by the following process:

  . The process of establishing the breakout levels for the UDBR, the MTL, and the CHDR in ES-1 was initiated by a letter from Tom Blejwas to Dennis Irby dtd 5/27/87, subject: Breakout elevations for the Exploratory Shaft Facility (ESF) and the depth of the shaft. This letter presented the proper breakout levels and indicated the references used to derive these

elevations. The references cited were: 1) Letter from T. E. Blejwas to D. H. Irby dated 2/2/87, 2) Memo from R. Spengler to B. Scott dated 5/1/87, 3) Memo From F. B. Nimick and R. H. Price to T. E. Blejwas dated 5/19/87, and 4) Letter from R. B. Scott to P. L. Aamodt dated 5/13/87

. Subsequent to the letter referenced above an ECR was initiated by SNL requesting that the ESF SDRD be revised to reflect these elevations for the ES-1 breakouts. The ECR was accompanied by an SNL drawing (SNL CAL0200)

For Item 3... regarding the seismic design criteria for use in the design of the ESF. The criteria was developed by the Seismic Design Subgroup sponsored by the ICWG and was documented in a report prepared by this group. The WMPO was requested to incorporate this report as design criteria for the design of the ESF by submission of an ECR that was an attachment to a letter sent to the WMPO (ltr dtd 6/14/88, Stinebaugh to Irby subj: Incorporation of the Working Group report "Exploratory Shaft Seismic Design Basis" as design guideance for the Exploratory Shaft Facility). This ECR (ECR 012) was approved after copies of this document were submitted to the ICWG membership for review and comment. Approval was on 7/8/88.

The chronology and history for the development of the RIB, Item 4 from above, is summarized as follows:

See Insert "A" (PAGES 8&9

~~JOE SCHELLING WILL HAVE THIS BY THIS AFTERNOON, i.e. 11/10/88~~

These are specific examples of the process by which SDRD criteria/Requirements were established as seen from the perspective of SNL. In summary, as we have

witnessed this process over the last couple of years, the process involves: 1) the establishment of the need for the required SDRD change or addition, 2) preparation of a draft description of the change as text or drawing, 3) presentation of the draft description to the ICWG for review and comment, 4) comment resolution, 5) preparation of an ECR to implement the change to the SDRD, and 6) approval of the ECR.

---------- Question 8 ----------

All meeting of the ICWG have been attended by members of the SNL staff and in some cases personnel from Parsons-Brinckerhoff who are under contract to SNL. Meeting relating to the development of the SDRD other that the ICWG meetings were not attended by SNL.

The comment resolution meeting for resolution of comments on the SDRD were attended by personnel from Parsons-Brinckerhoff. These meeting were held in Las Vegas On _____. The P-B personnel attending were _____

---------- Question 9 ----------

- Study to determine the size for the lateral drifts driven to intersect the Ghost Dance Fault, the Drillhole Wash structures and the suspected Imbricate Faults. The results of this study are reported in Sandia report SLTR 87-4001. This report looked at the economics and operational feasibility of various sizes for the lateral exploration drifts.

- Study to develop the methods to be used for designing the shafts of the ESF and the repository. The results of this study are documented in a draft SNL report SAND 88-4060 titled "Preliminary Drift design Criteria and Methodology Guide" This report is scheduled for final release in December of this year. The report includes sample calculations for the design of the shaft liner, and in a preliminary fashion verifies that

a thickness of 12 inches is adequate for the ESF shafts. The report also summarizes the basic criteria for all shafts as agreed to by the ICWG at its 8/25/87 meeting.

- SNL chaired a subgroup sponsored by the ICWG to develope the Seismic design basis for the ESF. The work of this group will be reported in final by SNL report SAND 88-1203 titled "Exploratory Shaft Seismic Design Basis Working Group Report". The report is currently at the YMPO for policy and technical review.

- The elevations of the breakout levels for the UBDR, the MTL, and the CHDR were set by SNL. THe process of selecting these elevations is documented the following correspondence:

  - Ltr T. E. Blejwas (SNL) to L. Skousen (WMPO) dtd 6/11/87 subj: elevations and designations for the breakout levels in the ES This letter included an ECR requesting that the subject elevations be used to modify the ES/SDRD
  - Ltr from T. E. Blejwas (SNL) to D. Irby (WMPO) dtd 5/27/87
  - Memo from F. B. Nimick & R. H. Price to T. E. Blejwas dtd 5/19/87
  - Ltr from R. B. Scott (USGS) to P. L> Aamodt (LANL) dtd 5/13/87
  - Memo from R. Spengler (USGS) to B. Scott (USGS) dtd 5/1/87
  - Letter from T. E. Blejwas to D. H. Irby dtd 2/2/87

- The sizing for the drifts in the Main Test level and the lateral drifts driven to investigate the various geological structures is supported by 14 differenct reports that have published by SNL over the last 5 years. These results of these studies on drift sizing, shaft design, thermal effects and etc. are summarized in SNL report SAND88-2294 titled "A Synopsis of Analyses (1981-87) Perfromed to Assess the Stability of

Underground Excavations at Yucca Mountain"

---------- Question 12 ----------

Specific documents were not received; however, compliance with the Program Quality Assurance Documents was recognized as mandatory. The appropriate NNWSI quality documents or the SNL equivalent documents were available to support the development of any criteria by SNL

INSERT "A" Sheet 1 of 2

D DEVELOPMENT OF RIB

Version 01.001 of the Reference Information Base (RIB) was released in April, 1986 (Milestone R081) as a draft document intended to serve as an example of the proposed structure and format.

Version 02.001 (May, 1987) (Milestone M765), and the update package 02.002 (August, 1987), which are identified as SLTR87-6001, were distributed to the Project also in a draft form as more extensive example of not only proposed structure and format, but also as an illustration of how the RIB will be regularly updated. Submittal of Version 02.001 to the Project Office was accompanied by a request that it undergo Project review and baselining. The content of Version 02.001 used the Site Characterization Plan Conceptual Design Report as a reference source for most of the information, and was distributed to prompt comment and the submission of better or more recent information, e.g. to increase participant involvement in the change control process. It was not intended to represent official, Project-endorsed information.

A December 1, 1987 letter from Skousen to Hunter (Request for changes to the Nevada Nuclear Waste Storage Investigations (NNWSI) Project Reference Information Base (RIB) (WMPO Action Item #88-5(5)) directed the removal of all data in the RIB not required for ESF design. F&S and H&N were asked on September 14, 1987 to identify the necessary data (WMPO:DHI-2671 Skousen to Bullock and Pedalino). Responses are documented by a September 14, 1987 letter from Pedalino of H&N (NNWSI:TPO:87-162) and a September 16, 1987 letter from Bullock of F&S (FS-NNWSI-0346). A letter on December 4, 1987 from Gertz to Hunter (Waste Management Project Office (WMPO) comments on the Reference Information Base (RIB) Milestone M764 (WMPO Action Item #88-532)) requested that SNL replace all draft RIB copies with a draft which addresses only initial ESF design needs.

Also on December 4, 1987, SNL responded in a letter from Hunter to Gertz (Transmittal of Draft of Version 03.001 of the NNWSI Project Reference Information Base (WMPO Action Item #88-505), which transmitted Version 03.001 of the RIB for Project review.

Review comments from WMPO and SAIC were supplied on December 14, 1987 and resolved on December 15, 1987. Comment resolution is documented by Project document review sheets. It was understood that the content of Version 03.001 would be based on the information from Version 02.002 as modified in response to review comments. Simultaneous with the release of Version 03.001, an effort was initiated to develop replacement information which would better document information traceability and quality assurance, expand descriptive summaries, and be oriented toward ESF design needs, as appropriate. The results of this effort are expected to be available for Project use prior to the start of Title II ESF design.

A December 18, 1987 letter from Hunter to Gertz (Transmittal of Version 03.001 of the NNWSI Project Reference Information Base for Publication (WMPO Action Item #88-505; Milestone M763) submitted Version 03.001 for publication and distribution by the T&MSS contractor.

A December 30, 1987 letter from Skousen to Hunter (Approval of the Reference Information Base (RIB), Version 03.001, Waste Management Project Office (WMPO) documents WMPO approval of Version 03.001 and completion of Milestones M764, M763, and R092. (Milestone P634 was cancelled in April,

8

INSERT "A" Sheet 2 of 2

1988, as the RIB was baselined before it had been submitted for baselining.) A letter from Hunter to Gertz on January 25, 1988 (Response to WMPO Action Item #88-532) notified WMPO on action taken to replace Version 02.002 with the new Version 03.001.

Annual summary reports of the status of the RIB have been submitted to the Project Office, including Milestones R081 (March 15, 1986), P632 (July, 1987), and R094 (July 19, 1988)

Until Project administrative procedures are implemented for baselining and RIB change control, review and approval of RIB changes are being processed (beginning with Version 02.001) through DOP 3-8, "RIB Change Control" (Rev. 0 April 24, 1987 and Rev. A dated March 4, 1988). Through Version 02.002, the RIB was issued as an SNL controlled document.

Documentation of the preparation and review of RIB information is maintained in the 45 series of SNL's Local Records Center. General correspondence is filed as 45/12133/COR/Q1 and change control documentation under 45/12133/CCD/Q1. Of particular interest may be the December 8, 1987 and April 4, 1988 memos from Schelling to Tang submitting sets of completed change documentation and the May 7, 1987 memo from Schelling to Hunter and Pope regarding the review process for Version 02.001 (in the CCD series).

SECTION 3: DESIGN BASIS DOCUMENTS

1. When did your organization start preparation of your ESF Design Basis document?

N/A

2. How did/does your organization establish the criteria/ requirements that are specified in your ESF Design Basis document?

3. Identify the individuals who were/are responsible for approving requirements for incorporation in your organization's ESF Design Basis document?

4. How did/does your organization document qualifications of these personnel, and where can such documentation be retrieved?

5. Did/does your organization employ the services of subcontractors or consultants in the establishment of criteria/requirements for your ESF Design Basis document?

Yes _____ No _____

6. If the response to Question 3 is affirmative, list the documents that defined the task, deliverables, and control requirements for the activity.

_____

_____

_____

_____

7. For internal review/approval of initial entries and changes to your ESF Design Basis document, provide the identifying information necessary to retrieve review documentation from your organization's files or from the project record center.

_____

_____

_____

_____

8. Did/do other Project participants review or approve your organization's Design Basis document? If so, identify the organizations and their roles - i.e., review, approve, or both.

_____

_____

_____

_____

_____

SECTION 4: SPECIFIC INTERFACES AND ANALYSES

1. Did your organization participate in the identification of any of the interfaces between:

   Repository and site subsystems? NO

   Test and performance assessment activities? NO

2. Did your organization perform or otherwise participate (e.g., consult, review, approve, etc.) in any of the following ESF design input analyses?

   SEE ATTACHED

Shaft location:	_____	Role:	_____	When:	_____
Shaft diameter:	_____	Role:	_____	When:	_____
Need for second shaft:	_____	Role:	_____	When:	_____
Shaft separation:	_____	Role:	_____	When:	_____
Tests required:	_____	Role:	_____	When:	_____
Testing interferences:	_____	Role:	_____	When:	_____

   Note: "Required Tests" is interpreted to mean tests for which provisions must be made in the ESF design.

3. For each of the activities in Question 2 in which your organization had a role, list the reports, correspondence, meeting minutes, etc., that can be used to establish a documented record of the decision making process. Identify such documentation in sufficient detail for rapid retrieval from records storage, and/or indicate where copies can be obtained. (Make list an attachment to your response; reference the attachment here: _____.)

   SEE ATTACHED

4. Did your organization perform or otherwise participate directly in Title I design?

   Yes X No _____

5. If the response to Question 4 is affirmative what was/were your organization's role(s)?

Directly responsible _____

Provided consultation _____

Review ✓

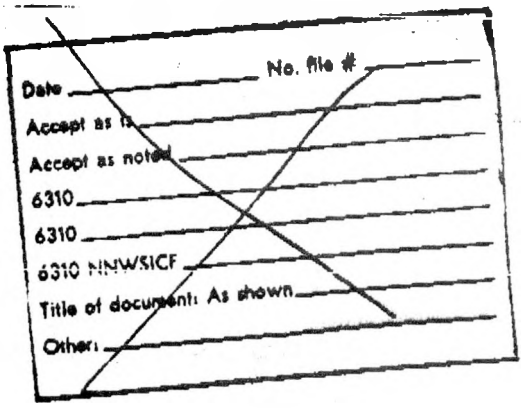
Approval _____

6. When did your organization's Title I design activity start?

~ 10/85

7. Identify the responsible individuals from your organization who participated in the activities addressed by questions 2 and 5. State where documentation of their relevant qualifications is maintained.

SEE ATTACHED



SECTION 4: SPECIFIC INTERFACES AND ANALYSES

QUESTION 1....REVISED

PART ONE

THE ANSWER IS NOW.....YES

PART TWO

SNL DID PARTICIPATE IN IDENTIFICATION OF DESIGN INTERFACES. THE MAJOR INTERFACES IDENTIFIED AND DEFINED BY SNL WERE THE PHYSICAL INTERFACES BETWEEN THE ESF AND THE REPOSITORY. THESE PHYSICAL INTERFACES WERE IDENTIFIED ON SNL DRAWING NO. R07048A, THEY INCLUDED: 1) THE LOCATION AND SIZING OF LATERAL DRIFTS THAT ARE USED TO ACCESS CERTAIN GEOLOGICAL FEATURES WITHIN THE PLANE OF THE REPOSITORY (THESE WERE LOCATED COINCIDENT WITH FUTURE REPOSITORY DRIFTING SO THAT THEY COULD BE CONVERTED TO SUPPORT REPOSITORY OPERATIONS), 2) DEFINITION OF THE ENCOMPASSING AREA FOR THE ESF (THIS REPRESENTS THE AREA WITHIN THE REPOSITORY PLANE WITHIN WHICH THE ESF COULD BE DEVELOPED WITHOUT INFRINGEMENT UPON THE AREAS THAT ARE PLANNED FOR EVENTUAL REPOSITORY USE), AND 3) THE REQUIREMENTS EMPOSED ON THE LAYOUT OF THE ESF TO INSURE THAT IF WATER WERE TO ENTER THE ESF THAT IT WOULD NOT FLOW INTO THE REPOSITORY. THE DEVELOPMENT OF THIS DRAWING IS CHRONICLED IN THE RESPONSE TO QUESTIONS 6 & 7 OF SECTION 2.

DRAWING R07048A ALSO DEPICTED THE LAYOUT OF THE UPPER DEMONSTRATION BREAKOUT ROOM, THE MAIN TEST LEVEL, AND THE CALICO HILLS DRILL ROOM. THE LAYOUTS OF THESE PARTS OF THE ESF IDENTIFIED THE LOCATION AND SIZING OF THE ALCOVES NEEDED FOR EXPERIMENT INSTALLATION AND FOR SUPPORTING THE INSTRUMENTATION SYSTEMS. THESE ELEMENTS OF THE DRAWING WERE REVIEWED AS A PART OF THE TOTAL DRAWING REVIEW PROCESS AS EXPLAINED IN THE RESPONSE TO QUESTION 7 OF SECTION 2.

Section 4 Specific Interfaces and Analyses

---------- Question 2 ----------

o Shaft Location

. SNL did participate in the location of the ESF shafts

. The SNL role was to prepare recommendation for the shaft location

. This activity occurred during April, May and June of 1982

o Shaft Diameter

. Yes, SNL did participate in the process to determine the size of the ESF shafts

. SNL personnel and SNL Contractor personnel from Parsons-Brinckerhoff Participated in the shaft sizing process as a part of a working group selected by the WMPO

. The meeting in which the recommendation for size of the shafts was determined was held in Las Vegas on 4/9 through 4/11, 1986

o Need for Second Shaft

. No, the decision for a second shaft was recommended by DOE (DOE: "Second Exploratory Shaft Directive," memo to Lee Olson, RL; Donald Veith, NV; Jeff Neff, SRPO; May 10, 1984d.

. Sandia's role was to provide a recommendation for the size of the second shaft

. SNL involvement in the sizing recommendation was in the last half of 1984

o Shaft Separation

- SNL did participate in a retroactive role
- SNL role was to substantiate that the spacing chosen was adequate to assure that there would be not shaft to shaft interference

o Tests required

- Yes, SNL has proposed experiments for the ESF.
- Design of the test proposed to obtain site info and engineering criteria
- SNL involvement in the selection of tests for the ESF covers a period from 1984 to the present

o Testing interferences

- Yes, SNL has participated in the development of the strategy and criteria for test/experiment spacing to assure that there will be no interference between tests
- SNL has performed analysis to support spacing recommendations for tests in the ESF
- 1984 to present

---------- Question 3 ----------

Shaft Location

o Major role of SNL in the location of the ESF shafts is documented in SNL report SAND84-1003 titled "NNWSI Exploratory Shaft Site and Construction Recommendation Report"

Shaft Diameter

o The work of SNL and its contractors in the recommending of the diameters for the ESF shafts is summarized in a letter to Don veith. reference: ltr Thomas E. Blejwas (SNL) to D. L. Veith (WMPO), dtd 7/7/86, subj:

Shaft sizes and configurations for the ES2 shaft of the Exploratory Shaft Facility

Need for Second Shaft

- The effort of SNL and its underground design support contract (Parsons-Brinckerhoff) in the sizing of the second shaft shaft for the ESF is documented in SNL report SAND84-1261 titled "Recommendation for a Second Access for the Yucca Mountain Exploratory Shaft Facility"

Shaft Separation

- The analyses done by SNL and others that was used to assess the adequacy of the 300 feet spacing between the ESF shafts is summarized in the SCP Section 8.4.3.2. These analyses support a conclusion that the 300 feet spacing is adequate to prevent the construction effects in one shaft from impacting experiments in the other shaft.

Test Required

- SNL has defined and designed numerous tests to be conducted in the ESF. The tests planned by SNL are documented in the SCP in Section 8.4.2.3.1.

Testing Interference

- The work done by SNL and others to set the criteria for the locating of ESF experiments to insured that there would be no interference between tests is documented in Section 8.4.2.3. of the Site Characterization Plan.

---------- Question 7 ----------

- Shaft Location
  - report is listed above

. author of the report was Sharla G. Bertram

o Shaft Diameter

. Report was not issued. The work that SNL participated in was documented in the letter referenced above in response to question 3. The conclusion reached on sizing for the second ESF shaft was presented to the NRC, the State of Nevada and NNWSI participants on April 14-15, 1987. The minutes of this meeting reflect that the participants agreed with the 12 foot diameter recommended by the working group. The minutes of this meeting were transmitted by letter: Veith to Knight, WMPO: JSS-1520, dated 4/27/87.

. Participants in the shaft sizing working group were:

From SNL	From Parsons-Brinckerhoff
... T. E. Blejwas	... R. F. Harig
... R. E. Stinebaugh	... J. Grenia

. Qualifications for the SNL personnel are maintained in the SNL records management system under file code 90/1293/CRT/Q?

The qualification certification sheets for the Parsons-Brinckerhoff personnel are maintanined in the Task files at their Offices in San Francisco located at 1625 Van Ness Avenue, ZIP 94109-3678. The QA manager at P-B is Chuck Holman, his phone number is 415-474-4500

o Need for Second Shaft

. The SNL activity relating to the second egress for the ESF involved only the selection of the method of egress and the sizing of the method selected. The results of this work were reported in SAND84-1251.

. Participants in this activity included:

From SNL	From Parsons-Brinckerhoff	From F & S
... G. K. Beall	... M. Comar	... R. D. Coppage
... L. W. Scully	... J. D. Grenia	
... R. E. Stinebaugh	... R. F. Harig	
	... B. W. Lawrence	
	... P. E. Sperry	

From Los Alamos Technical Assoc

... R. M. Robb

. Certifications of qualification for the personnel involved with this exercise are not in existance except for those still in the program. At the time this study was performed the requirements regarding personnel qualifications were not in existence.

o Shaft Separation

. See the SCP for reports that are used to answer the adequacy of the currently planned shaft separation distance.

. Sandia Personnel that have had input to this topic in the form of report preparation, analyses, or development of rationale for addressing this question include:

J. R. Tillerson	L. S. Costin	B. L. Ehgartner	R. R. Peters
T. E. Blejwas	J. A. Fernandez	E. A. Klavetter	

- Certifications of qualification for these personnel are maintained in the SNL records management system under file code 90/1293/CRT/Q?

o Tests required

Tests required are defined in the SCP Section 8.4.2.3.1.

o Testing interference

- See the SCP (section 8.4.2.3) for reports that are referenced as a basis for the conclusions regarding experiment to experiment interference
- Personnel involved in preparing reports, analyses, or rationale that were used to address this question are the same as those listed above under shaft seperation

SANDIA

Section 5 QA Program / Design Controls
(See disclaimer)

1 The basic structure of a nuclear QA program, as specified in NQA-1, has been the framework for the SNL NNWSI QA Program from SNL's initial involvement in the Project. However, SNL first received approval of a Project-approved QA Program Plan based on the NNWSI QA Plan, (which is, in part, based on NQA-1 and supplements) on Dec. 24, 1986.

4. No audits or surveillances of activities covered by this questionnaire were conducted prior to May 1987 by SNL.

SNL NNWSI QA Procedure 18-1, "QA Auditing Procedures", Rev. 0, effective 10/17/86. Still current.
SNL NNWSI QA Procedure 10-1, "Surveillance Requirements," Rev. 0, effective 7/28/87. Still current

5. Audits:

YMPO Audit 88-06, 7/25 - 8/3/88
SNL Audit SNL-88, 6/6-13/88
SNL Audit PB-88-1, 5/9-10/88
SNL Audit PB-87-1, 6/17-19/87
SNL Audit SNL-8701, 5/18-22/87
WHPO Audit 87-5, 6/1-5/87
WHPO Audit 85-8, 10/16-18/85

1

Surveillances:

SNL DOP 3-4-88-1, 2/15-16/88

6. The short-deadline nature of this response does not permit time to tabulate the requested information. The requested information is available at the Project Office, either in the hands of other TTMSS QA or Project Records.

7. Records of personnel qualifications are found in the SNL Records Management System and the SNL Personnel Dept. Records or in the records of the subcontractor organizations involved in the work.

2. Procedure Chronology:
Topic - Control of Review, Approval and Issuance of Technical Reports

- QAP III-1, "Procedure for Preparing, Clearing, and Printing Official Documents."
  Rev. A
  From 5/3/83 to 11/22/85
- QAP VI-2, "Reviewing, Approving, and Issuing Tech. Information Documents."
  Rev. 0
  From 11/22/85 to 1/20/87 (over)

(Superseded QAP III-1, above)

- DOP 6-2, "Reviewing, Approving, and Issuing Tech. Info. Documents"

Rev. 0

From 1/20/87 to present

(Superseded QAP VI-2, above.)

Topic — Control of Design Analyses and Investigations

- QAP III-3, "NNECSI Analysis and Calculation Control."

Rev A

From 10/30/85 to 10/31/86

- DOP 3-4, "Design Investigation Control"

Rev 0

From 10/31/86 to 11/9/87

(superseded QAP III-3, above)

Rev A

From 11/9/87 to 5/17/88

(superseded Rev 0.)

Rev B

from 5/17/88 to present

(superseded Rev A)

Topic - Overall Design Process Control

- DOP 3-5, "Design Control and Verification"

Rev 0. from 11/14/86 to present.

Topic – Engineering Drawing Control

- DOP 3-1, "Preparing, Reviewing, Approving and Issuing Engineering Drawings"
  Rev. 0, from 3/9/87 to 2/2/88
  Rev A, from 2/2/88 to 7/1/88 (supersedes Rev. 0)
  Rev B, from 7/1/88 to present (supersedes Rev. A)

Topic – Design Change Control

- QAP III-6, "Design Change Control"
  Rev. 0, from 4/30/86 to 11/14/86
- DOP 3-6, " (same as above)
  Rev. 0. from 11/14/86 – 2/5/88 (supersedes QAP III-6)
  Rev A. from 2/5/88 to present (supersedes Rev 0.

Topic – Interface Control in Design

- DOP 3-9, "Interface Control of NNEGSI Engineering Design"
  Rev. 0, from 10/31/86 to 2/5/88
  Rev. A, from 2/5/88 to present (supersedes Rev. 0)

Topic – Control of Calculation Documentation

- DOP 3-10, "Routine Design Calculations"
  Rev. 0, from 10/31/86 to present.

TABLE 1: RESPONSE TO QUESTION 3 OF SECTION 5

Element of design/ R&D control	Approx. Time	Procedure Wording*	Actual Practice*	Nature/amount of documentation
Control/evaluation of inputs upon which requirements or criteria were based	Not yet incorpd when effective	X	X	X
Documentation of rationale for selection of specific criteria and requirements	Not yet incorporated	X	X	X
Documentation and review of analyses and/or calculations	10/85	None	None	None
Inclusion of reviewers who did not directly participate in the work being reviewed	Has been SOP at SNL all along	None	None	None
Identification and control of internal and external interfaces	10/86	X	X	X

* Indicate the affected column(s) with an "X" or a checkmark. If no effect, enter "NONE".

02K8

11/08/1988 12:04 MAC TEC 702 794 7125 P.14

6

U.S. GEOLOGICAL SURVEY

(USGS)

USGS Encl 2

SECTION 1: GENERIC REQUIREMENTS FOR A MINED GEOLOGIC DISPOSAL SYSTEM

1. Did your organization participate in the identification of ESF criteria/requirements for inclusion in OGR/B-2, Appendix E?

   Yes _____ No ___XX___

   NOTE: If the response to Question 1 is negative, no further questions in this section need to be answered.

2. What was your organization's role in the preparation of Appendix E (e.g., inputs, participate in analyses, participate in review, etc.)?

   _____

   _____

   _____

Add ⇨ 3. Identify the individuals who participated for your organization and summarize (briefly) the relevant qualifications of each. Make your response a separate attachment if necessary.

   _____

   _____

   _____

   _____

4. Did your organization subcontract any part of that activity to experts outside the program?

   Yes _____ No _____

5. If the response to Question 3 is affirmative, list the persons, indicate their roles and affiliations, and identify the documents by which your organization defined their tasks and deliverables.

6. When did your participation in that activity start?

7. Briefly describe the process by which Appendix E content and format were established, as seen from your organization's perspective.

8. What meetings on ESF generic requirements were attended by personnel from your organization, or by personnel under contract to your organization?

9. Did your organization participate in incorporation of 10CFR60 requirements in this document? If so, in what role (e.g., responsible, review, etc.)?

_____

_____

_____

10. What planning document(s) and/or other instructions did your organization issue or receive (as applicable) prior to and/or during your participation in the Appendix E activity? (Provide document number(s), revision(s), and date(s).)

_____

_____

_____

_____

SECTION 2: ESF SUBSYSTEMS DESIGN REQUIREMENTS DOCUMENT (SDRD)

1. Did/does your organization participate in the establishment or criteria/requirements contained in the SDRD?

   Yes XX **No** _____

   NOTE: If your response to Question 1 is negative, no further questions in this section need to be answered.

2. What was/is your organization's role in the preparation/ updating of the SDRD (e.g., generate, interpret, draft requirements; review, approve, etc.)

   See attached response.

ADDED ⇨ 3. Identify the individuals who participated for your organization and summarize (briefly) the relevant qualifications of each. Make your response a separate attachment if necessary.

   See attachment

4. Did your organization subcontract any part of the definition or review of SDRD criteria/requirements to experts outside the program?

   Yes _____ **No** XX

5. If the response to Question 3 is affirmative, list the persons, indicate their roles and affiliations, and identify the documents by which your organization defined their tasks and deliverables.

N/A

6. When did your SDRD participation start?

See response to #2

7. Briefly describe the process by which SDRD criteria/ requirements were established, as seen from your organization's perspective?

See response to #2

8 What meetings on SDRD criteria/requirements were attended by personnel from your organization, or by personnel under contract to your organization, during preparation of the SDRD? (If a list of formal meetings is appropriate, reference this section and question, and make the list an attachment to your response.)

See response to #2

9. What analyses, studies, etc., did your organization perform to arrive at your inputs to the SDRD? List reports or formal correspondence generated as a result of such analyses, studies, etc.

See response to #2

10. Did/does your organization specify ESF design criteria/ requirements to an Architect/Engineer other than via the SDRD or SDRD changes?

Yes _____ No XX

11. If the response to Question 9 is affirmative, briefly describe the process for generating and transmitting such criteria/requirements.

N/A

12. What planning document(s) and/or written instructions did your organization issue or receive prior to or during your participation in establishment of SDRD criteria/ requirements? (Provide document numbers, revisions, and dates.)

See response to #2

Encl. 2, Att. 1

Response to Section 2, Question 2 DRAFT

The USGS involvement in the SDRD has been principally indirect, through participation in the ESTP Committee. Portions of Appendix B were derived from Detailed Test Plans and the Exploratory Shaft Test Plan, prepared in part by USGS Principal Investigators. These test plans were developed through numerous discussions and activities in the ESTP Committee, beginning in January 1982 and continuing today. The USGS currently is reviewing the ES-SDRD, including a draft of Appendix B (Test and Integrated Data System Requirements).

SECTION 3: DESIGN BASIS DOCUMENTS

1. When did your organization start preparation of your ESF Design Basis document?

N/A

2. How did/does your organization establish the criteria/ requirements that are specified in your ESF Design Basis document?

N/A

3. Identify the individuals who were/are responsible for approving requirements for incorporation in your organization's ESF Design Basis document?

N/A

4. How did/does your organization document qualifications of these personnel, and where can such documentation be retrieved?

N/A

5. Did/does your organization employ the services of subcontractors or consultants in the establishment of criteria/requirements for your ESF Design Basis document?

N/A

Yes _____ No _____ N/A

6. If the response to Question 5 is affirmative, list the documents that defined the task, deliverables, and control requirements for the activity.

N/A

7. For internal review/approval of initial entries and changes to your ESF Design Basis document, provide the identifying information necessary to retrieve review documentation from your organization's files or from the project record center.

N/A

8. Did/do other Project participants review or approve your organization's Design Basis document? If so, identify the organizations and their roles - i.e., review, approve, or both.

N/A

SECTION 4: SPECIFIC INTERFACES AND ANALYSES

1. Did your organization participate in the identification of any of the interfaces between:

   Repository and site subsystems? Yes

   Test and performance assessment activities? Yes

2. Did your organization perform or otherwise participate (e.g., consult, review, approve, etc.) in any of the following ESF design input analyses?

Shaft location:	Yes	Role:	Consultation	When:	Periodically
Shaft diameter:	Yes	Role:	through ESTP	When:	Since 1981
Need for second shaft:	Yes	Role:	Committee	When:	
Shaft separation:	Yes	Role:		When:	
Tests required:	Yes	Role:	Preparation and review of test descriptions & requirements	When:	Since 1981
Testing interferences:		Role:		When:	

   Note: "Required Tests" is interpreted to mean tests for which provisions must be made in the ESF design.

3. For each of the activities in Question 2 in which your organization had a role, list the reports, correspondence, meeting minutes, etc., that can be used to establish a documented record of the decision making process. Identify such documentation in sufficient detail for rapid retrieval from records storage, and/or indicate where copies can be obtained. (Make list an attachment to your response; reference the attachment here: See attachments.)

4. Did your organization perform or otherwise participate directly in Title I design?

   Yes XX No

5. If the response to Question 4 is affirmative, what was/were your organization's role(s)?

Directly responsible _____

Provided consultation XX

Review XX

Approval _____

6. When did your organization's Title I design activity start?

1981

7. Identify the responsible individuals from your organization who participated in the activities addressed by questions 2 and 5. State where documentation of their relevant qualifications is maintained.

See attachment

SEE ENCLOSED REVISION TO THIS RESPONSE. JR 1/7/89

SECTION 5: QA PROGRAM/DESIGN CONTROLS

1. **When did your organization commit to the requirements of NQA-1 and its Supplements as the basis for its Yucca Mountain (formerly NNWSI) Project QA program?**

   November 1, 1980

2. **Show the chronological evolution of your organization's design control and/or R&D policies, procedures, or other instructions applicable to activities your organization conducted relative to development of the GRD, SDRD, and/or Design Basis documents. Cover the period since the earliest date you entered in Section 1 through 3 of this questionnaire. Include the following data:** The USGS does not perform design control & has no design control QA requirements

   Procedure identifying number
   Title
   Subject (if the title does not clearly indicate what the procedure covered)
   Revision number
   From and to dates for the revision
   Procedure and revision this procedure or revision replaced or superseded

   NOTE: The information for Question 2 should make it possible to trace the coverage of a major control from earliest participation in any of the indicated activities to the present.

3. **As the OCRWM and YMP QA programs evolved, the wording and/or applicability of some design control requirements have changed. Use Table 1 of this questionnaire to identify major design control changes in your organization's QA program and to flag any that should be considered in terms of reanalysis or reverification during Title II design. The table makes it possible to distinguish between changes in how work or controls were actually accomplished and those that affected the nature or amount of documentation without affecting the underlying work or controls.**

   See #2

4. **Attach a chronological list of the procedures (including revisions and effective or issue dates) that covered your organization's audit and/or surveillance activities over the period of your organization's participation in the activities addressed in this questionnaire.**

Plan	Effective Date
NWM-USGS-QAPP-01, R0	11/01/80
NWM-USGS-QAPP-01, R1	7/15/83
NNWSI-USGS-QAPP-01, R2	8/24/85
NNWSI-USGS-QAPP-01, R3	10/27/86
NNWSI-USGS-QAPP-01, R4	01/05/88

5. **List audits and surveillances that included any of the activities addressed by this questionnaire. Identify by dates and report numbers. Use Table 1.**

N/A. The USGS does not perform design control activities and has therefore not audited any.

6. **Provide a list summarizing each of the findings and observations resulting from the audits/surveillances identified in response to Question 5, and the resolution and close-out date for each. Reference the list to Question 6 of Section 5.** N/A

7. **How and where are the professional qualifications of personnel who represented your organization in the activities covered in Section 1 through 4 (as applicable) documented?**

USGS Local Records Center

TABLE 1: RESPONSE TO QUESTION 3 OF SECTION 5

Element of design/ R&D control	Approx. Time	Procedure Wording*	Actual Practice*	Nature/amount of documentati
Control/evaluation of inputs upon which requirements or criteria were based				
Documentation of rationale for selection of specific criteria and requirements				
Documentation and review of analyses and/or calculations				
Inclusion of reviewers who did not directly participate in the work being reviewed				
Identification and control of internal and external interfaces				

* Ir ate the affected column(s) with an "X" c- ı checkmark. If no effect, enter "NONE".

United States Department of the Interior
GEOLOGICAL SURVEY
BOX 25046 M.S. 421
DENVER FEDERAL CENTER
DENVER, COLORADO 80225

TAKE PRIDE IN AMERICA

IN REPLY REFER TO:

WBS#: 1.2.9.1
QA :"QA"
December 1, 1988

Mr. Lew Zwissler
MACTEC
Phase 2, Suite 113
101 Convention Center Drive
Las Vegas, NV 89109

REVISED USGS RESPONSE TO DESIGN CONTROL QUESTIONNAIRE

Enclosed is the revised USGS response to Section 5, Question 2, of subject questionnaire. We may have additional document titles to add to the list that is provided in part 1; I will forward the titles if and when they become available.

Please feel free to call me if you have any questions or comments regarding this material.

Bill Wilson

William E. Wilson
Science Advisor for
Program Coordination
Branch of Yucca Mountain Project

cc wo/encl:

Larry Hayes
Joe Willmon

WEW/pnb
DCQ.WEW

REVISED USGS RESPONSE TO SECTION 5, QUESTION 2,
ESF DESIGN CONTROL PROCESS REVIEW QUESTIONNAIRE

Part 1. Existing Agency Policies and Procedures

The U. S. Geological Survey, including both the Geologic Division and Water Resources Division, has issued various documents describing policies, procedures, or other instructions that pertain to the technical work of the USGS. These documents provided guidance and control over USGS technical work performed as part of NNWSI prior to the adoption of a formal NNWSI QA Program, and they continue to serve those functions for the project, supplemental to the QA program. A sampling of these documents is listed below, and additional information is contained in the attachments.

1. Water Resources Division Publication Guide (see Attachment 1, Article 1.01.1, which describes references on report policy.)
2. Techniques of Water Resources Investigations -- a series of manuals describing procedures for planning and conducting specialized work in water-resources investigations (see Attachment 2, a listing of these manuals).
3. Supplement to U. S. Geological Survey Manual, Geologic Mapping Standards.
4. Memoranda stating Water Resources Division (WRD) policies:
   - o Statement No. 1 -- Publications
   - o Statement No. 2 -- Development of careers in WRD
   - o Statement No. 3 -- Policy guides for programs and plans
5. Geologic Division Supplement to USGS Manual 501.1, "Responsibilities for Preparation of Reports and Maps"
6. Ground-water Notes -- A series of technical notes on conducting and analyzing results of ground-water investigations
7. Various Division and Branch Memoranda related to QA procedures and policies for water-quality analyses, including the following:
   - o WRD Memorandum No. 79.15: Quality-assurance Program for Direct-service and contractor laboratories (11-3-78)
   - o WRD Memorandum No. 79.69: Quality assurance of water-quality field measurements (3-28-79)

- WRD Memorandum No. 77-68: Data handling -- policy on review of water quality data (3-11-77)
- Quality of Water Branch Technical Memorandum No. 79.16: Quality assurance of temperature measurements (9-28-79)
- WRD Memorandum No. 78-01: Quality-assurance procedures for water-quality analytical work performed by state, local, or private contract laboratories (10-5-77). (Updated by WRD Memorandum No. 81.79, 5-28-81)
- WRD Memorandum No. 82.16: Policy on water quality analytical services for other agencies (11-12-81)
- WRD Memorandum No. 82.28: Acceptability and use of water-quality analytical methods (1-21-82).

8. USGS standards for classification as Geologist and Hydrologist (supplements those standards established by Office of Personnel Management)
9. Various formal training programs and manuals for personnel of both Divisions

ESF DESIGN CONTROL PROCESS REVIEW QUESTIONNAIRE

Part 2. Development of Quality Assurance Program

Los Alamos National Laboratories developed the USGS Quality Assurance Program Plans (QAPP) NWM-USGS-QAPP-01, R0 (effective 11/1/80) and NWM-USGS-QAPP-01, R1 (effective 7/15/83) based upon the requirements of NQA-1. Additionally LANL prepared the Unit Task Procedures (UTP) which provided basic descriptions of technical work to be performed under each task area and listed technical procedures describing in more detail the work to be done in that area.

After the USGS prepared its own NNWSI-USGS QAPP-01, R2 (effective 8/24/85) LANL provided further support to the USGS in the development of the USGS audit and surveillance program. The USGS prepared Quality Management Procedures (QMP) to implement the QAPP and continued to write detailed technical procedures. The UTP and Multidiscipline Procedures (MDP) documents were superseded by detailed technical procedures at this time.

NNWSI-USGS-QAPP-01, R3 (effective 10/27/86) was the first QAPP in full compliance with NVO-196-17, R4. QMPs were rewritten to meet policy changes in Revision 3 and are currently being rewritten again to meet the new requirements of NNWSI-USGS-QAPP-01, R4 (effective 1-5-88). Detailed technical procedures continue to be written and revised.

The attached lists show the progression of documents cited. A complete list of current approved technical procedures is available but is not included.

June 16, 1983

USGS-NNWSI QUALITY ASSURANCE DOCUMENT INDEX

Volume I

PROGRAM PLANS (QAPP)

NWM-USGS-QAPP-01, R0	Quality Assurance Program Plan for Nevada Nuclear Waste Storage Investigations

QUALITY ASSURANCE PROCEDURES (QP)

NWM-USGS-QP-01, R0	Document Control
NWM-USGS-QP-02, R0	Control of Quality Assurance Records
NWM-USGS-QP-03, R0	Control of Nonconforming Materials, Components, & Processes
NWM-USGS-QP-04, R0	Control for Corrective Action
NWM-USGS-QP-05, R1	Auditing
NWM-USGS-QP-06, R1	Instrument Calibration
-07, R0 6/15/84	Procurement

UNIT TASK PROCEDURES (UTP)

NWM-USGS-UTP-01, R0	Hydrologic Investigations
NWM-USGS-UTP-03, R0	Geologic Investigations
NWM-USGS-UTP-04, R0	Seismological Investigations
NWM-USGS-UTP-05, R0	Geochronology Investigations
NWM-USGS-UTP-10, R0	Fenix & Scisson Drill Site Unit Task Procedure

HYDROLOGY PROCEDURES (HP)

NWM-USGS-HP-01, R0	Methods for Determining Water Level
NWM-USGS-HP-03, R0	Hydrologic Tracejector Test
NWM-USGS-HP-04, R0	Hydrologic Surging
NWM-USGS-HP-05, R0	Hydrologic Swabbing
NWM-USGS-HP-06, R0	Hydrologic Pumping Test
NWM-USGS-HP-08, R0	Methods for Determination of Inorganic Substances in Water
NWM-USGS-HP-10, R0	Hydrologic Packer Test
NWM-USGS-HP-11, R0	Methods for Determination of Radioactive Substances in Water
NWM-USGS-HP-12, R0	Procedures for Handling and Field Testing of the Core from Unsaturated Bore Holes

GEOLOGY PROCEDURES (GP)

NWM-USGS-GP-01, R0	Geologic Mapping
NWM-USGS-GP-02, R0	Subsurface Investigations
NWM-USGS-GP-03, R0	Stratigraphic Studies
NWM-USGS-GP-04, R0	Structural Studies
NWM-USGS-GP-05, R0	Geologic Support Activities
NWM-USGS-GP-06, R0	Geodetic, Leveling, and Trilateration Surveys

USGS QUALITY ASSURANCE DOCUMENT INDEX

Volume I

PROGRAM PLANS (QAPP)

NWM-USGS-QAPP-01, R1	Quality Assurance Program Plan for Nevada Nuclear Waste Storage Investigations

QUALITY ASSURANCE PROCEDURES (QP)

NWM-USGS-QP-01, R1 4/1/84	Document Control
NWM-USGS-QP-02, R1 4/30/84	Control of Quality Assurance Records
NWM-USGS-QP-03, R1 4/1/84	Control of Nonconforming Materials, Components, & Processes
NWM-USGS-QP-04, R1 4/01/84	Control for Corrective Action
NWM-USGS-QP-05, R1 ? ←	~~Auditing~~ — R2 ⇒ 6/15/84
NWM-USGS-QP-06, R2 4/01/84	Instrument Calibration
NWM-USGS-QP-09, R0 11/25/83	Surveillance

UNIT TASK PROCEDURES (UTP)

NWM-USGS-UTP-01, R0 1/11/82 (D)	Hydrologic Investigations
NWM-USGS-UTP-02, R0 10/28/83	Geophysical Investigations
NWM-USGS-UTP-03, R0 9/20/82	Geologic Investigations
NWM-USGS-UTP-04, R0 8/06/82	Seismological Investigations
NWM-USGS-UTP-05, R0 8/25/82	Geochronology Investigations
NWM-USGS-UTP-10, R0 8/25/82 (V)	Fenix & Scisson Drill Site Unit Task Procedure

HYDROLOGY PROCEDURES (HP)

NWM-USGS-HP-01, R0	Methods for Determining Water Level
NWM-USGS-HP-03, R0	Hydrologic Tracejector Test
NWM-USGS-HP-04, R0	Hydrologic Surging
NWM-USGS-HP-05, R0	Hydrologic Swabbing
NWM-USGS-HP-06, R0	Hydrologic Pumping Test
NWM-USGS-HP-08, R0	Methods for Determination of Inorganic Substances in Water
NWM-USGS-HP-10, R0	Hydrologic Packer Test
NWM-USGS-HP-11, R0	Methods for Determination of Radioactive Substances in Water
NWM-USGS-HP-12, R0	Procedures for Handling and Field Testing of the Core from Unsaturated Bore Holes
NWM-USGS-HP-13, R0	Collection and Field Analysis of Unsaturated Zone Ground Water Samples
NWM-USGS-HP-14, R0	Method for Calibrating Thermocouple Psychrometers for Measuring the Water Potential of Partially Saturated Media
NWM-USGS-HP-16, R0	Collection and Preservation of Atmospheric Precipitation Samples for Isotope Analysis
NWM-USGS-HP-23, R0	Collection and Field Analysis of Saturated Zone Ground Water Samples

Volume I (Cont'd).

GEOLOGY PROCEDURES (GP)

NWM-USGS-GP-01, R0	Geologic Mapping
NWM-USGS-GP-02, R0	Subsurface Investigations
NWM-USGS-GP-03, R0	Stratigraphic Studies
NWM-USGS-GP-04, R0	Structural Studies
NWM-USGS-GP-05, R0	Geologic Support Activities
NWM-USGS-GP-06, R0	Geodetic, Leveling, and Trilateration Surveys

Volume II

SEISMOLOGY PROCEDURES (SP)

NWM-USGS-SP-01, R2	Earthquake Location Procedures
NWM-USGS-SP-02, R0	Procedure for Calculating Frequency of Recurrence Curves
NWM-USGS-SP-03, R0	Seismic Zoning Procedure
NWM-USGS-SP-04, R0	Earthquake Magnitude Determination Procedure
NWM-USGS-SP-05, R0	Procedure For The Determination of Earthquake Source Parameters
NWM-USGS-SP-06, R0	Procedure For The Determination of Earthquake Focal Mechanism
NWM-USGS-SP-07, R0	Geophysics: Teleseismic P-residual Study of the Tectonic Environment
NWM-USGS-SP-08, R0	Seismic Study of the Tectonic Environment

GEOCHRONOLOGY PROCEDURES (GCP)

NWM-USGS-GCP-01, R0	Radiometric-Age Data Bank
NWM-USGS-GCP-02, R0	Labeling, Identification and Control of Geochronology Samples and Separates
NWM-USGS-GCP-03, R0	Uranium - Series Dating
NWM-USGS-GCP-04, R0	Uranium - Trend Dating
NWM-USGS-GCP-05, R0	Radium - Equivalent Uranium, Thorium, and Potassium Analysis by Gamma-Ray Spectrometry
NWM-USGS-GCP-06, R0	Potassium-Argon Dating
NWM-USGS-GCP-07, R0	Geochemical Mineral Separation
NWM-USGS-GCP-08, R0	Fission Track Dating
NWM-USGS-GCP-09, R0	Spike Calibration

Volume II (Cont'd).

GEOPHYSICS PROCEDURE (GPP)

NWM-USGS-GPP-01, R0	Gravity Measurement and Data Reduction
NWM-USGS-GPP-02, R0	Heat Flow Studies Related to Nuclear Waste Storage Investigations
NWM-USGS-GPP-04, R0	In-Situ Stress Investigations

MULTIDISCIPLINE PROCEDURES (MDP)

NWM-USGS-MDP-01, R0	Identification, Handling, Storage, and Disposition of Drill-Hole Core and Samples
NWM-USGS-MDP-02, R0	Documentation of Communications, Decisions, and Independent Actions

FENIX & SCISSON PROCEDURES (FS)

NWM-USGS-FS-02, R0	Certification of Fenix & Scisson Geologists

USGS-NNWSI QUALITY ASSURANCE DOCUMENT INDEX (CONT'D).

Volume II

SEISMOLOGY PROCEDURES (SP)

NWM-USGS-SP-01, R2	Earthquake Location Procedures
NWM-USGS-SP-02, R0	Procedure for Calculating Frequency of Recurrence Curves
NWM-USGS-SP-03, R0	Seismic Zoning Procedure
NWM-USGS-SP-04, R0	Earthquake Magnitude Determination Procedure
NWM-USGS-SP-05, R0	Procedure For The Determination of Earthquake Source Parameters
NWM-USGS-SP-06, R0	Procedure For The Determination of Earthquake Focal Mechanism
NWM-USGS-SP-07, R0	Geophysics: Teleseismic P-residual Study of the Tectonic Environment
NWM-USGS-SP-08, R0	Seismic Study of the Tectonic Environment

GEOCHRONOLOGY PROCEDURES (GCP)

NWM-USGS-GCP-01, R0	Radiometric-Age Data Bank
NWM-USGS-GCP-02, R0	Labeling, Identification and Control of Geochronology Samples and Separates
NWM-USGS-GCP-03, R0	Uranium - Series Dating
NWM-USGS-GCP-04, R0	Uranium - Trend Dating
NWM-USGS-GCP-05, R0	Radium - Equivalent Uranium, Thorium, and Potassium Analysis by Gamma-Ray Spectrometry
NWM-USGS-GCP-06, R0	Potassium-Argon Dating
NWM-USGS-GCP-07, R0	Geochemical Mineral Separation
NWM-USGS-GCP-08, R0	Fission Track Dating
NWM-USGS-GCP-09, R0	Spike Calibration

GEOPHYSICS PROCEDURE (GPP)

NWM-USGS-GPP-01, R0	Gravity Measurement and Data Reduction
NWM-USGS-GPP-02, R0	Heat Flow Studies Related to Nuclear Waste Storage Investigations
NWM-USGS-GPP-04, R0	In-Situ Stress Investigations

MULTIDISCIPLINE PROCEDURES (MDP)

NWM-USGS-MDP-01, R0	Identification, Handling, Storage, and Disposition of Drill-Hole Core and Samples
NWM-USGS-MDP-02, R0	Documentation of Communications, Decisions and Independent Actions

FENIX & SCISSON PROCEDURES (FS)

NWM-USGS-FS-02, R0	Certification of Fenix & Scisson Geologist

MANAGEMENT PROCEDURES MANUAL

REVISION RECORD

Record for Quality Assurance Program Plan (QAPP)

QAPP Number	Effective Date
NWM-USGS-QAPP-01, R0	11/01/80
NWM-USGS-QAPP-01, R1	07/15/83
NNWSI-USGS-QAPP-01, R2	08/24/85
NNWSI-USGS-QAPP-01, R3	10/27/86
NNWSI-USGS-QAPP-01, R4	01/05/88

Record for Quality Management Procedures (QMP)

QMP Document Number	Effective Date(s) Rev.0	Rev.1	Rev.2	Deleted	Amendment No.	Amendment Date
NNWSI-USGS-QMP-1.01	08/24/85	10/27/86				
NNWSI-USGS-QMP-1.02	10/27/86					
NNWSI-USGS-QMP-2.01	08/24/85	10/27/86				
NNWSI-USGS-QMP-2.02	08/24/85	10/27/86				
NNWSI-USGS-QMP-2.03	08/24/85	10/27/86				
NNWSI-USGS-QMP-2.04	08/24/85			10/27/86		
NNWSI-USGS-QMP-2.05	08/24/85	10/27/86				
NNWSI-USGS-QMP-3.01	08/24/85	10/27/86				
NNWSI-USGS-QMP-3.02	08/24/85	10/27/86				
NNWSI-USGS-QMP-3.03	10/27/86					
NNWSI-USGS-QMP-3.04	08/24/85	10/27/86				
NNWSI-USGS-QMP-3.05	08/24/85	10/27/86				
NNWSI-USGS-QMP-3.06	10/27/86					
NNWSI-USGS-QMP-3.07	10/27/86					
NNWSI-USGS-QMP-4.01	08/24/85	10/27/86			01	7/28/87
NNWSI-USGS-QMP-5.01	08/24/85	10/27/86				
NNWSI-USGS-QMP-5.02	10/27/86					
NNWSI-USGS-QMP-5.03	10/27/86	02/17/88				
NNWSI-USGS-QMP-6.01	08/24/85	10/27/86				
NNWSI-USGS-QMP-7.01	10/27/86					
NNWSI-USGS-QMP-7.02	10/27/86					
NNWSI-USGS-QMP-7.03	10/27/86					
NNWSI-USGS-QMP-8.01	08/24/85	10/27/86	02/19/88			
NNWSI-USGS-QMP-9.01	10/27/86					
NNWSI-USGS-QMP-10.01	08/24/85	10/27/86				
NNWSI-USGS-QMP-11.01	08/24/85	10/27/86				
NNWSI-USGS-QMP-12.01	08/24/85	10/27/86				
NNWSI-USGS-QMP-13.01	10/27/86					
NNWSI-USGS-QMP-15.01	08/24/85	10/27/86				
NNWSI-USGS-QMP-15.02	10/27/86					
NNWSI-USGS-QMP-16.01	08/24/85	10/27/86				
NNWSI-USGS-QMP-17.01	08/24/85	10/27/86				
NNWSI-USGS-QMP-17.02	10/27/86					
NNWSI-USGS-QMP-18.01	08/24/85	10/27/86				

Attachment 1

WATER RESOURCES DIVISION PUBLICATIONS GUIDE

Article 1.01.1

Subject: U.S. GEOLOGICAL SURVEY POLICY--Written Reports

1.01.1 References on report policy

Widespread respect for the U.S. Geological Survey is the result of its integrity and impartiality and its ability to release results of its investigations in a manner that serves the whole public rather than the interest of any special group or individual. For this purpose, the Geological Survey has devoted itself to the publication of reports that archive and disseminate its findings.

The following is a list of references that have affected the policy of the Geological Survey regarding written reports. They should be read in their entirety by all authors.

The Act of Congress (Organic Act) that created the Geological Survey in March 1979 established the Survey's obligation to make public the results of its investigations and research and to conduct, on a continuing, systematic, and scientific basis, the investigation of the geologic structure, mineral resources and products of the National domain."

Water Resources Division Policy Statement No. 1, June 4, 1959, by Luna B. Leopold, Chief Hydraulic Engineer (1957-66) lists report goals and author responsibility. (See article 1.01.2.)

Water Resources Division Memorandum No. 79.43, "Policy of Water Resources Division Regarding Written Reports," December 22, 1978, by Joseph S. Cragwall, Jr., Chief Hydrologist (1974-79) updates but does not change Policy Statement No. 1. (See article 1.01.3.)

Geological Survey Manual, No. 500.14, January 28, 1980, "Safeguard and Release of Geological Survey Information," enumerates general policy and requirements regarding release of Geological Survey information. (See article 1.02.1.)

Geological Survey Manual, No. 500.9, July 15, 1976, "Outside Publication and Oral Presentation - Clearance from the Director," states that all writings in which the Geological Survey has proprietary interest and all writings in which the author's Survey affiliation is shown should be submitted to the Director for approval prior to release for outside publication. (See article 1.02.5.)

Government Printing Office Style Manual, (March 1984), hereinafter referred to as "Style Manual."

ggestions To Authors of the Reports of the United States Geological Survey
th ed., 1958; 6th ed., 1978), hereinafter referred to as "Suggestions to Authors," describes Geological Survey publications policy and author responsibility.

TECHNIQUES OF WATER-RESOURCES
INVESTIGATIONS OF
THE U.S. GEOLOGICAL SURVEY

The U.S. Geological Survey publishes a series of manuals describing procedures for planning and conducting specialized work in water-resources investigations. The manuals published to date are listed below and may be ordered by mail from the U.S. Geological Survey, Books and Open-File Reports Section, Federal Center, Box 25425, Denver, Colorado 80225 (an authorized agent of the Superintendent of Documents, Government Printing Office).

Prepayment is required. Remittance should be sent by check or money order payable to U.S. Geological Survey. Prices are not included in the listing below as they are subject to change. Current prices can be obtained by writing to the USGS address shown above. Prices include cost of domestic surface transportation. For transmittal outside the U.S.A. (except to Canada and Mexico) a surcharge of 25 percent of the net bill should be included to cover surface transportation. When ordering any of these publications, please give the title, book number, chapter number, and "U.S. Geological Survey Techniques of Water-Resources Investigations."

TWI 1-D1. Water temperature--influential factors, field measurement, and data presentation, by H.H. Stevens, Jr., J.F. Ficke, and G.F. Smoot. 1975. 65 pages.

TWI 1-D2. Guidelines for collection and field analysis of ground-water samples for selected unstable constituents, by W.W. Wood. 1976. 24 pages.

TWI 2-D1. Application of surface geophysics to ground-water investigations, by A.A.R. Zohdy, G.P. Eaton, and D.R. Mabey. 1974. 116 pages.

TWI 2-E1. Application of borehole geophysics to water-resources investigations, by W.S. Keys and L.M. MacCary. 1971. 126 pages.

TWI 3-A1. General field and office procedures for indirect discharge measurements, by M.A. Benson and Tate Dalrymple. 1967. 30 pages.

TWI 3-A2. Measurement of peak discharge by the slope-area method, by Tate Dalrymple and M.A. Benson. 1967. 12 pages.

TWI 3-A3. Measurement of peak discharge at culverts by indirect methods, by G.L. Bodhaine. 1968. 60 pages.

TWI 3-A4. Measurement of peak discharge at width contractions by indirect methods, by H.F. Matthai. 1967. 44 pages.

TWI 3-A5. Measurement of peak discharge at dams by indirect methods, by Harry Hulsing. 1967. 29 pages.

TWI 3-A6. General procedure for gaging streams, by R.W. Carter and Jacob Davidian. 1968. 13 pages.

TWI 3-A7. Stage measurements at gaging stations, by T.J. Buchanan and W.P. Somers. 1968. 28 pages.

TWI 3-A8. Discharge measurements at gaging stations, by T.J. Buchanan and W.P. Somers. 1969. 65 pages.

TWI 3-A9. Measurement of time of travel and dispersion in streams by by E.F. Hubbard, F.A. Kilpatrick, L.A. Martens, and J.F. Wilson, Jr. 1982. 44 pages.

TWI 3-A10. Discharge ratings at gaging stations, by E.J. Kennedy. 1984. 59 pages.

TWI 3-A11. Measurement of discharge by moving-boat method, by G.F. Smoot and C.E. Novak. 1969. 22 pages.

TWI 3-A12 Fluorometric procedures for dye tracing, by J.F. Wilson, Jr., E.D. Cobb, and F.A. Kilpatrick

TWI 3-A13. Computation of continuous records of streamflow, by E.J. Kennedy. 1983. 53 pages.

TWI 3-A14. Use of flumes in measuring discharge, by F.A. Kilpatrick and V.R. Schneider. 1983. 46 pages.

TWI 3-A15. Computation of water-surface profiles in open channels, by Jacob Davidian. 1984. 48 pages.

TWI 3-A16. Measurement of discharge using tracers, by F.A. Kilpatrick and E.D. Cobb. 1985. 52 pages.

TWI 3-A17. Acoustic velocity meter systems, by Antonius Laenen. 1985. 38 pages.

TWI 3-B1. Aquifer-test design, observation, and data analysis, by R.W. Stallman. 1971. 26 pages.

1/ TWI 3-B2. Introduction to ground-water hydraulics, a programmed text for self-instruction, by G.D. Bennett. 1976. 172 pages.

TWI 3-B3. Type curves for selected problems of flow to wells in confined aquifers, by J.E. Reed. 1980. 106 pages.

TWI 3-B6 The principle of superposition and its application in ground-water hydraulics, by T.E. Reilly, O.L. Franke, and G.D. Bennett

TWI 3-C1. Fluvial sediment concepts, by H.P. Guy. 1970. 55 pages.

TWI 3-C2. Field methods of measurement of fluvial sediment, by H.P. Guy and V.W. Norman. 1970. 59 pages.

TWI 3-C3. Computation of fluvial-sediment discharge, by George Porterfield. 1972. 66 pages.

TWI 4-A1. Some statistical tools in hydrology, by H.C. Riggs. 1968. 39 pages.

TWI 4-A2. Frequency curves, by H.C. Riggs. 1968. 15 pages.

TWI 4-B1. Low-flow investigations, by H.C. Riggs. 1972. 18 pages.

TWI 4-B2. Storage analyses for water supply, by H.C. Riggs and C.H. Hardison. 1973. 20 pages.

TWI 4-B3. Regional analyses of streamflow characteristics, by H.C. Riggs. 1973. 15 pages.

TWI 4-D1. Computation of rate and volume of stream depletion by wells, by C.T. Jenkins. 1970. 17 pages.

TWI 5-A1. Methods for determination of inorganic substances in water and fluvial sediments, by M.W. Skougstad and others, editors. 1979. 626 pages.

TWI 5-A2. Determination of minor elements in water by emission spectroscopy, by P.R. Barnett and E.C. Mallory, Jr. 1971. 31 pages.

2/ TWI 5-A3. ~~Methods for analysis of organic substances in water, by D.F. Goerlitz and Eugene Brown. 1972. 40 pages.~~

TWI 5-A4. Methods for collection and analysis of aquatic biological and microbiological samples, edited by P.E. Greeson, T.A. Ehlke, G.A. Irwin, B.W. Lium, and K.V. Slack. 1977. 332 pages.

1/ Spanish translation also available.

2/ Methods for the determination of organic substances in waters and fluvial sediments, edited by R.L. Wershaw and

TWI 5-A5. Methods for determination of radioactive substances in water and fluvial sediments, by L.L. Thatcher, V.J. Janzer, and K.W. Edwards. 1977. 95 pages.

TWI 5-A6. Quality assurance practices for the chemical and biological analyses of water and fluvial sediments, by L.C. Friedman and D.E. Erdmann. 1982. 181 pages.

TWI 5-C1. Laboratory theory and methods for sediment analysis, by H.P. Guy. 1969. 58 pages.

TWI 7-C1. Finite difference model for aquifer simulation in two dimensions with results of numerical experiments, by P.C. Trescott, G.F. Pinder, and S.P. Larson. 1976. 116 pages.

TWI 7-C2. Computer model of two-dimensional solute transport and dispersion in ground water, by L.F. Konikow and J.D. Bredehoeft. 1978. 90 pages.

TWI 7-C3. A model for simulation of flow in singular and interconnected channels, by R.W. Schaffranek, R.A. Baltzer, and D.E. Goldberg. 1981. 110 pages.

TWI 8-A1. Methods of measuring water levels in deep wells, by M.S. Garber and F.C. Koopman. 1968. 23 pages.

TWI 8-A2. Installation and service manual for U.S. Geological Survey monometers, by J.D. Craig. 1983. 57 pages.

TWI 8-B2. Calibration and maintenance of vertical-axis type current meters, by G.F. Smoot and C.E. Novak. 1968. 15 pages.

FENIX & SCISSON, INC.

(F&S)

F&S

SECTION 1: GENERIC REQUIREMENTS FOR A MINED GEOLOGIC DISPOSAL SYSTEM

1. Did your organization participate in the identification of ESF criteria/requirements for inclusion in OGR/B-2, Appendix E?

   Yes _____ No __X__

   NOTE: If the response to Question 1 is negative, no further questions in this section need to be answered.

2. What was your organization's role in the preparation of Appendix E (e.g., inputs, participate in analyses, participate in review, etc.)?

   N/A

3. Identify the individuals who participated for your organization and summarize (briefly) the relevant qualifications of each. Make your response a separate attachment if necessary.

   N/A

4. Did your organization subcontract any part of that activity to experts outside the program?

   Yes _____ No __X__

5. If the response to Question 3 is affirmative, list the persons, indicate their roles and affiliations, and identify the documents by which your organization defined their tasks and deliverables.

N/A

6. When did your participation in that activity start?

N/A

7. Briefly describe the process by which Appendix E content and format were established, as seen from your organization's perspective.

N/A

8. What meetings on ESF generic requirements were attended by personnel from your organization, or by personnel under contract to your organization?

N/A

9. Did your organization participate in incorporation of 10CFR60 requirements in this document? If so, in what role (e.g., responsible, review, etc.)?

N/A

10. What planning document(s) and/or other instructions did your organization issue or receive (as applicable) prior to and/or during your participation in the Appendix E activity? (Provide document number(s), revision(s), and date(s).)

N/A

SECTION 2: ESF SUBSYSTEMS DESIGN REQUIREMENTS DOCUMENT (SDRD)

1. Did/does your organization participate in the establishment or criteria/requirements contained in the SDRD?

   Yes _____ No __X__

   NOTE: If your response to Question 1 is negative, no further questions in this section need to be answered.

2. What was/is your organization's role in the preparation/ updating of the SDRD (e.g., generate, interpret, draft requirements; review, approve, etc.)

   N/A

3. Identify the individuals who participated for your organization and summarize (briefly) the relevant qualifications of each. Make your response a separate attachment if necessary.

   N/A

4. Did your organization subcontract any part of the definition or review of SDRD criteria/requirements to experts outside the program?

   Yes _____ No __X__

5. If the response to Question 3 is affirmative, list the persons, indicate their roles and affiliations, and identify the documents by which your organization defined their tasks and deliverables.

N/A

6. When did your SDRD participation start?

N/A

7. Briefly describe the process by which SDRD criteria/ requirements were established, as seen from your organization's perspective?

N/A

8 What meetings on SDRD criteria/requirements were attended by personnel from your organization, or by personnel under contract to your organization, during preparation of the SDRD? (If a list of formal meetings is appropriate, reference this section and question, and make the list an attachment to your response.)

N/A

9. What analyses, studies, etc., did your organization perform to arrive at your inputs to the SDRD? List reports or formal correspondence generated as a result of such analyses, studies, etc.

N/A

10. Did/does your organization specify ESF design criteria/ requirements to an Architect/Engineer other than via the SDRD or SDRD changes?

Yes _____ No X

11. If the response to Question 10 is affirmative, briefly describe the process for generating and transmitting such criteria/requirements.

N/A

12. What planning document(s) and/or written instructions did your organization issue or receive prior to or during your participation in establishment of SDRD criteria/ requirements? (Provide document numbers, revisions, and dates.)

N/A

SECTION 3: DESIGN BASIS DOCUMENTS

1. When did your organization start preparation of your ESF Design Basis document?

THE LETTER OFFICIALLY DIRECTING THE START OF THE DESIGN BASIS DOCUMENT IS WMPO DHI:1678 DATED 5-19-87

2. How did/does your organization establish the criteria/ requirements that are specified in your ESF Design Basis document?

F&S FOLLOWED THE DOE INSTRUCTIONS GIVEN IN WMPO DHI:1678 PAR. 2 "BASIS FOR DESIGN DOCUMENT" (SEE ATTACHED) FOR THE ESTABLISHMENT OF THE CRITERIA/ REQUIREMENTS SPECIFIED IN THE DESIGN BASIS DOCUMENT.

3. Identify the individuals who were/are responsible for approving requirements for incorporation in your organization's ESF Design Basis document?

LOREN WEYAND - NNWSI ESF PROJECT DESIGN MANAGER

RICHARD L. BULLOCK - NNWSI ESF PROJECT MANAGER

4. How did/does your organization document qualifications of these personnel, and where can such documentation be retrieved?

PERSONNEL QUALIFICATIONS ARE DOCUMENTED IN ACCORDANCE WITH THE F&S NNWSI ESF PROJECT CONTROL MANUAL PART I SEC. 3 EXHIBIT 3-1 PERSONNEL QUALIFICATION EVALUATION. THESE DOCUMENTS MAY BE RETRIEVED FROM THE PROJECT CONTROL ROOM

5. Did/does your organization employ the services of subcontractors or consultants in the establishment of criteria/requirements for your ESF Design Basis document?

Yes _____ No X

6. If the response to Question 3 is affirmative, list the documents that defined the task, deliverables, and control requirements for the activity.

7. For internal review/approval of initial entries and changes to your ESF Design Basis document, provide the identifying information necessary to retrieve review documentation from your organization's files or from the project record center.

THESE RECORDS DO NOT EXIST.

8. Did/do other Project participants review or approve your organization's Design Basis document? If so, identify the organizations and their roles - i.e., review, approve, or both.

APPROVAL OF THE F&S BASIS FOR DESIGN ISSUE NO. 1 WAS OBTAINED FROM

DOE/WMPO 1-13-88 (REF. WMPO:DHI-789)

Department of Energy
Post Office Box 98518
Las Vegas, NV 89193-8518

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NNWSI
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DEC 3 1 1987

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JAN 1 3 1988
Fenix & Scisson, Inc.

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Richard L. Bullock
Technical Project Officer
for NNWSI
Fenix & Scisson, Inc.
M/S 514, P.O. Box 93265
Las Vegas, NV 89193-3265

APPROVAL OF THE FENIX AND SCISSON, INC. TITLE I BASIS FOR DESIGN AND THE DESIGN SCOPE AND PLANNING DOCUMENTS

Approved copies of the subject documents are enclosed. Please provide controlled copies of these documents to the following people/organizations.

L. P. Skousen	WMPO, NV
D. H. Irby	WMPO, NV
L. J. Owens	WMPO, NV
R. S. Waters	WMPO, NV
James Blaylock	WMPO, NV
V. F. Witherill	NTSO, NV
S. R. Elliott	SHD, NV
V. J. Cassella	HQ (RW-222) FORS
R. R. Reust (2)	SAIC, Las Vegas, NV
W. E. Narrows	SAIC, Las Vegas, NV
M. S. Bozarth	SAIC, Las Vegas, NV
R. B. Graham	SAIC, Las Vegas, NV
D. L. Koss	REECo, Mercury, NV
J. C. Calovini (3)	H&N, Las Vegas, NV

BFD APPROVAL CJB

If you need any additional information regarding this matter, please contact Dennis Irby at 295-8932.

Lester P. Skousen, Chief
Technology Development and
Engineering Branch
Waste Management Project Office

WMPO:DHI-789

Enclosures:
F&S BFD and Design Scope
and Planning Documents

DEC 31 1987

cc w/encls:
V. J. Cassella, HQ (RW-222) FORS
R. R. Reust, SAIC, Las Vegas, NV
W. E. Narrows, SAIC, Las Vegas, NV
M. S. Bozarth, SAIC, Las Vegas, NV
R. B. Graham, SAIC, Las Vegas, NV
S. H. Klein, SAIC, Las Vegas, NV
P. J. Karnoski, SAIC, Las Vegas, NV
J. C. Calovini, H&N, Las Vegas, NV
D. L. Koss, REECo, Mercury, NV
V. F. Witherill, NTSO, NV
S. R. Elliott, SHD, NV
C. P. Gertz, WMPO, NV
D. H. Irby, WMPO, NV
L. J. Owens, WMPO, NV
R. S. Waters, WMPO, NV
James Blaylock, WMPO, NV

F | S
engineering
construction
management

NNWSI
EXPLORATORY SHAFT FACILITY

BASIS FOR DESIGN

ISSUE 0

DECEMBER 16, 1987

APPROVED: _____ DATE: 12-16-87
Project Design Manager

APPROVED: _____ DATE: 12-18-87
Project Manager

APPROVED: _____ DATE: 12-22-87
Waste Management Project Office

FENIX & SCISSON, INC.
Tulsa, Oklahoma

F S

engineering
construction
management

NNWSI
EXPLORATORY SHAFT FACILITY

BASIS FOR DESIGN

ISSUE 1

APRIL 11, 1988

APPROVED: _____ DATE: 4-13-88
Project Design Manager

APPROVED: _____ DATE: 4-19-88
Project Manager

APPROVED: _____ DATE: 5-4-88
WMPO

FENIX & SCISSON, INC.
Tulsa, Oklahoma

Department of Energy
Nevada Operations Office
P. O. Box 14100
Las Vegas, NV 89114-4100

F & S
NNWSI
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MAY 19 1987

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Richard L. Bullock
Technical Project Officer
for NNWSI
Fenix & Scisson, Inc.
1050 East Flamingo
Suite 220
Las Vegas, NV 89114

EXPLORATORY SHAFT FACILITY (ESF) PRE-TITLE I DESIGN EFFORT (WMPO ACTION ITEM #87-1604)

The Waste Management Project Office (WMPO) requests your organization to initiate the scope definition and planning effort associated with the Title I design of the ESF. The efforts that are requested by this letter are limited to the development of the Fenix & Scisson (F&S) ESF Design Basis, and the required scoping and planning documentation that will ensure the successful and orderly completion of the preliminary design(s). All pre-Title I planning documentation must coordinate and include the technical interfaces that have been and/or will be developed during the design process, both within the F&S organization as well as with other Nevada Nuclear Waste Storage Investigations (NNWSI) Project participants. This effort shall produce two documents, namely, F&S's Basis for Design and the Title I Scope and Planning Basis.

Basis for Design document

The Basis for Design document should be compatible and structured similar to the NNWSI ESF Subsystem Design Requirements Document (SDRD), March 1987 proposed revision. This should be developed with the intent of a one-to-one relationship in accordance with the requirements and scope of F&S's responsibilities. For the design of the applicable systems and subsystems as contained in the ESF SDRD, this document shall be explicit in stating the criteria, requirements, and the specific basis that F&S will adhere to. The document shall be developed for the review and approval by this office. The WMPO approval must be obtained prior to the start of the applicable Title I design packages.

Scope and Planning Basis document

The Title I design will be comprised of individual design packages that will be brought together as part of the Title I design report. The content of each package should be structured, as much as practicable, to the construction packages that will be generated at the end of the Title II design effort. The intent of this effort is to develop the plans for the content of the design packages, prior to the start of Title I, to minimize the replanning effort associated with the subsequent pre-Title II and Title II phases.

Each package, as submitted, shall address the technical scope, the technical approach, the interrelationships, the technical input requirements (needs), a cost estimate for the package (man-hours and dollars), a scheduled date for completion, and the list of deliverables. In addition, a master schedule for the Title I effort shall be prepared that delineates kick-off meeting(s), design package plan review and approval hold points as required for WMPO review, design basis review and concurrence, timing of input requirements, interim milestones, design interrelationships (required interfaces within and external to F&S), review, comment and approval period by F&S and WMPO, and estimated completion dates.

General

The Basis for Design and the design package plans associated with the Scope and Planning Basis Document must be reviewed and approved by WMPO prior to the start of any technical activities associated with the Title I effort. F&S is requested to submit ten copies of the applicable document to WMPO to initiate the review and approval process.

It is the intent for the Title I results to be used to enhance and upgrade the ESF SDRD currently in revision, from a document that supports the Title I design phase to a document that will support the detail design (Title II) phase.

All design activities shall be conducted at a quality level commensurate with the quality assurance level assignments that have been approved for the specific design items and/or activities.

WMPO encourages F&S to review the requirements for these two documents as contained in this letter and schedule meetings as required to clarify these activities to eliminate any potential misunderstandings. The preliminary meeting should be held at your earliest possible convenience either in Las Vegas, or at the Tulsa office.

If you have any questions regarding this matter, please call Dennis H. Irby at 295-1696.

Donald L. Vieth, Director
Waste Management Project Office

WMPO:DHI-1678

SECTION 4: SPECIFIC INTERFACES AND ANALYSES

1. (Part one of two parts.) During the ESF design did your organization participate in the identification and/or evaluation of interfaces (i.e., potential for interactions) between ESF, design, construction, and operation, and the repository, and/or in minimizing or preventing such interactions through ESF design, selection of construction methods, etc.?

   Yes X No _____ (See attached sheet marked "Section 4: Parts 1A &

   (Identify applicable documentation if not already identified in earlier information packages.) - Identified in the previously submitted questionaire package of 11-14-88 FS-YMP-0086

   (Part two of two parts.) In what role did your organization participate in identifying the interfaces between the siting, design, testing, and performance assessment aspects of the ESF program and ensuring that ESF planning and design integrated those aspects? (Identify applicable documentation if not already done so.)

2. Did your organization perform or otherwise participate (e.g., consult, review, approve, etc.) in any of the following ESF design input analyses?

Shaft location:	Yes	Role:	Proposed Location	When:	7-29-86
Shaft diameter:	Yes	Role:	Reviewed Criteria	When:	11-8-82
Need for second shaft:	Yes	Role:	Reviewed/Concurred	When:	1-8-84
Shaft separation:	Yes	Role:	Reviewed WMPO D&I-703	When:	1-12-87
Tests required:	Yes	Role:	Reviewed/Comment	When:	10-16-86
Testing interferences:	No	Role:		When:	

TYPO

Note: "Required Tests" is interpreted to mean tests for which provisions must be made in the ESF design.

3. For each of the activities in Question 2 in which your organization had a role, list the reports, correspondence, meeting minutes, etc., that can be used to establish a documented record of the decision making process. Identify such documentation in sufficient detail for rapid retrieval from records storage, and/or indicate where copies can be obtained. (Make list an attachment to your response; reference the attachment here: SEE ATTACHED .)

4. Did your organization perform or otherwise participate directly in Title I design?

   Yes X No _____

5. If the response to Question 4 is affirmative, what was/were your organization's role(s)?

   Directly responsible X

   Provided consultation _____

   Review _____

   Approval _____

6. When did your organization's Title I design activity start?

   January 13, 1988

7. Identify the responsible individuals from your organization who participated in the activities addressed by questions 2 and 5. State where documentation of their relevant qualifications is maintained.

   Shaft Location - Sheldon D. Murphy F&S ESF Project Manager

   Shaft Diameter - F.D. Waltman F&S Mining Manager (Deceased)

   Need for Second Shaft - Richard L. Coppage Sr. Mining Engineer

   Shaft Separation - Richard L. Bullock F&S ESF Project Manager

   Tests Required - Richard L. Bullock F&S ESF Project Manager

   Documentation of the relevent qualifications for the individuals with the exception of F.D. Waltman are maintained in the F&S project control room, 101 Convention Center Drive Suite P-250 Las Vegas, NV 89109.

SECTION 4: Parts 1A & 1B

1.A The applicable Documents which indicate the participation of the F&S ESF Design Organization in the identification and/or evaluation of the ESF Design Interface with the Repository Design, are the ICWG and ESTP Meeting Minutes and the ICWG drawings which were reviewed and concurred with by F&S from time to time.

1.B The SDRD with its appendices, F&S Basis of Design, and the subsequent Engineering change request (ECR's) contain Design input which has considered the aspects of siting, design, testing and performance assessment. Therefore, review and use of these documents in the ESF Design indicates that the specific aspects of siting, design, testing and performance assessment were integrated into the ESF Design.

REFERENCE SECTION 4, PART 3 DATA SUPPORTING DESIGN DECISIONS

1. SHAFT LOCATION

   7-29-88 Fenix & Scisson Letter NW-86-142 Cross to Nelson - Proposing a location for ES-1 based on topography & DOE location guidelines

   1-07-87 DOE:DHI-703 Irby to Murphy - Final location of shafts
   1-29-87 FS-NNWSI-0052 Murphy to Irby - Acceptance of shaft location

2. SHAFT DIAMETER

   11-8-82 Los Alamos WX-4-5073 - Approved for compliance NTSSO 11-12-82 directs AE to design a 12 feet diameter shaft

3. NEED FOR A SECOND SHAFT

   8-1-84 Los Alamos WX-4-6479 - Request for Title I & Title II Engineering design for a second shaft for the ESF

4. SHAFT SEPARATION

   6-13-86 NWTUL-86-007 Weyand to Murphy - Contains an analysis recommending a shaft spacing

   1-07-87 WMPO:DHI-703 Irby to Murphy - Directing the location of ES-1 and ES-2 & requesting comments

   1-29-87 FS-NNWSI-0052 Murphy to Irby - Acceptance of shaft location

5. TESTS REQUIRED

   10-16-86 NWTUL-86-105 Weyand to Murphy - Comments on SDRD Rev. 0 Appendices B and C. F&S did not offer comments on the site characterization tests content. F&S commented only on the Engineering aspects of the tests described in the Appendix B.

:CTION 5

#1

F&S did not commit to the requirements of ANSI/ASME NQA-1 and its Supplements as the basis for its Yucca Mountain Project QA Program. F&S has complied with the project Quality Assurance Program document NNWSI/88-9 (formerly NVO-196-17) since the original issue.

#2

CHRONOLOGICAL EVOLUTION OF PROCEDURES

	PROCEDURE NUMBER	TITLE	REVISION	EFFECTIVE DATE
1.	DC-01	Design Inputs and informational Data	6	10/31/88 to present
		Data to outside Organizations		
	NNWSI-DC-01		5	7/8/88 - 10/31/88
			4	11/2/87 - 7/8/88
			3	3/16/87 - 11/2/87
			2	11/11/86 - 3/16/87
			1	8/4/86 - 11/11/86
			0	1/27/86 - 8/4/86
2.	DC-02	Design Methodology	6	10/31/88 to present
	NNWSI-DC-02		5	7/8/88 - 10/31/88
			4	11/2/87 - 7/8/88
			3	3/16/87 - 11/2/87
			2	11/11/86 - 3/16/87
			1	8/4/86 - 11/11/8
			0	3/15/86 - 8/4/86
3.	DC-03	Design Analysis	6	10/31/88 to present
	NNWSI-DC-03		5	7/8/88 - 10/31/88
			4	11/2/87 - 7/8/88
			3	3/16/87 - 11/2/87
			2	11/11/86 - 3/16/87
			1	8/4/86 - 11/11/86
			0	3/15/86 - 8/4/86
4.	DC-04	Design Verification	6	10/31/88 to present
	NNWSI-DC-04		5	7/8/88 - 10/31/88
			4	11/2/87 - 7/8/88
			3	3/16/87 - 11/2/87
			2	11/11/86 - 3/16/87
			1	8/4/86 - 11/11/86
			0	4/3/86 - 8/4/86
5.	DC-05	Design Interface Control	5	10/31/88 to present
	NNWSI-DC-05		4	7/8/88 - 10/31/88
		External Interface Control	3	11/2/87 - 7/8/88
			2	3/16/87 - 11/2/87
			1	11/11/86 - 3/16/87
			0	8/4/86 - 11/11/86

	PROCEDURE NUMBER	TITLE	REVISION	EFFECTIVE DATE
6.	DC-06	Change Control	Deleted	10/31/88
			3	7/8/88 - 10/31/88
			2	11/2/87 - 7/8/88
			1	3/16/87 - 11/2/87
			0	8/4/86 - 3/16/87
7.	DC-07	Development of Technical Specifications	5	10/31/88 to present
	NNWSI-DC-07		4	7/8/88 - 10/31/88
			3	11/2/87 - 7/8/88
			2	3/16/87 - 11/2/87
			1	11/11/86 - 3/16/87
			0	8/6/86 - 11/11/86
8.	DC-08	Preparation of Design Control Procedures	5	10/31/88 to present
	NNWSI-DC-08		4	7/8/88 - 10/31/88
		Preparation of Procedures	3	11/2/87 - 7/8/88
			2	3/16/87 - 11/2/87
			1	11/11/86 - 3/16/87
			0	8/6/86 - 11/11/86
9.	DC-09	Interdiscipline Review	6	10/31/88 to present
	NNWSI-DC-09	Interdiscipline Checking	5	7/8/88 - 10/31/88
			4	11/2/87 - 7/8/88
			3	5/15/87 - 11/2/87
			2	3/16/87 - 5/15/87
			1	11/11/86 - 3/16/87
			0	8/6/86 - 11/11/86
10.	NNWSI-DC-10	Intradiscipline Checking	Deleted	3/16/87
			1	11/11/86 - 3/16/87
			0	8/6/86 - 11/11/86
11.	DC-11	External Comment Control	5	10/31/88 to present
	NNWSI-DC-11		4	7/8/88 - 10/31/88
			3	11/2/87 - 7/8/88
			2	3/16/87 - 11/2/87
			1	11/11/86 - 3/16/87
			0	8/6/86 - 11/11/86
12.	DC-12	Computer Program Verification	4	10/31/88 to present
	NNWSI-DC-12		3	7/8/88 - 10/31/88
			2	12/11/87 - 7/8/88
			1	3/16/87 - 12/11/87
			0	8/7/86 - 3/16/87

	PROCEDURE NUMBER	TITLE	REVISION	EFFECTIVE DATE
13.	DC-13	Drafting Procedures and Standards	5	10/31/88 to present
	NNWSI-DC-13		4	7/8/88 - 10/31/88
			3	2/24/88 - 7/8/88
			2	12/11/87 - 2/24/88
			1	3/16/87 - 12/11/87
		Drafting Procedures, Standards and CAD	0	8/7/86 - 3/16/87
14.	DC-14	Technical Studies	5	10/31/88 to present
	NNWSI-DC-14		4	7/8/88 - 10/31/88
			3	12/11/87 - 7/8/88
			2	3/16/87 - 12/11/87
			1	11/11/86 - 3/16/87
			0	8/6/86 - 11/11/86
15.	DC-15	Basis for Design	5	10/31/88 to present
	NNWSI-DC-15	Basis for Design Control	4	7/8/88 - 10/31/88
			3	11/2/87 - 7/8/88
			2	3/16/87 - 11/2/87
			1	11/11/86 - 3/16/87
			0	8/6/86 - 11/11/86
16.	DC-16	Document Control	4	10/31/88 to present
	NNWSI-DC-16		3	11/2/87 - 10/31/88
			2	3/16/87 - 11/2/87
			1	11/11/86 - 3/16/87
			0	8/6/86 - 11/11/86
17.	NNWSI-DC-17	Quality Assurance Records	3	Replaced by PP-50-01 7/8/88
				1/22/88 - 7/8/88
			2	3/16/87 - 1/22/88
			1	11/11/86 - 3/16/87
			0	8/7/86 - 11/11/86
18.	DC-18	Training on Design Control Procedures	2	10/31/88 to present
	NNWSI-DC-18		1	7/8/88 - 10/31/88
		Training on Tulsa Design Control Procedures	0	7/24/87 - 7/8/88
19.	NNWSI-DC-22	Purchasing Procedure	0	1/22/88 - 7/8/88 superceded by PP-60-02

	PROCEDURE NUMBER	TITLE	REVISION	EFFECTIVE DATE
20.	NNWSI-DC-23	Authorized Signature	2	11/2/87 - 7/8/88
			1	3/16/87 - 11/2/87
			0	8/6/86 - 3/16/87
21.	DC-25	Configuration Management	0	10/31/88 to present
22.	DC-26	Configuration Identification and Documentation	0	10/31/88 to present
23.	DC-27	Configuration Status Reporting	0	10/31/88 to present
24.	DC-28	Configuration Change Control	0	10/31/88 to present Replaces NNWSI-DC-06
25.	PP-50-01	YMP Records Management	2	10/31/88 to present
		NNWSI Records Management	1	9/1/88 - 10/31/88
			0	9/18/87 - 9/1/88
26.	PP-60-01	Personnel Selection and Indoctrination	1	7/25/88 to present
			0	8/20/87 - 7/25/88
27.	PP-60-02	Purchasing	1	10/31/88 to present
			0	6/3/88 - 10/31/88
28.	QAP-3.1(N)	Engineering Drawings	3	11/15/88 to present
			2	6/1/88 - 11/15/88
			1	9/6/85 - 6/1/88
	QAP-3.1	Procedure for the Approval, Revision and Distribution of F&S Inc. Engineering Drawings	0	3/2/82 - 9/6/85
29.	QAP-3.2(N)	Technical Specifications	3	8/2/88 to present
			2	12/4/85 - 8/2/88
			1	2/1/85 - 12/4/85
30.	QAP-3.3(N)	Design Analyses	0	7/27/88 to present

#4

AUDITS & SURVEILLANCES

PROCEDURE NUMBER	TITLE	REVISION	EFFECTIVE DATE
QAP-2.3(N)	Qualification of Audits	3	9/15/88 to present
		2	1/15/88
	Procedure changed # & name		
QAP-18.2(N)	Qualification and Certification of Auditors	1	3/3/86
		0	11/1/85
QAP-18.1(N)	Audits	3	4/25/88 to present
		2	3/3/86
		1	8/21/85
		0	
QAP-18.3(N)	Surveillance	0	4/25/88 to present

TABLE 1: RESPONSE TO QUESTION 3 OF SECTION 5

Element of design/ R&D control	Approx. Time	Procedure Wording*	Actual Practice*	Nature/amount * of documentation
Control/evaluation of inputs upon which requirements or criteria were based	In effect since 3/15/86 Procedure DC-02 Rev. 0	None	None	None
Documentation of rationale for selection of specific criteria and requirements	Not applicable	Not applicable	Not applicable	Not applicable
Documentation and review of analyses and/or calculations	In effect since 3/15/86 DC-03 Rev. 0	None	None	None
Inclusion of reviewers who did not directly participate in the work being reviewed	In effect since 4/3/86 DC-04 Rev. 0	None	None	None
Identification and control of internal and external interfaces	In effect since DC-05 Rev. 0 8/4/86 DC-09 Rev. 0	None	None	None

* Indicate the affected column(s) with an "X" or a checkmark. If no effect, enter "NONE".

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#5

SURVEILLANCES	DATE	REPORT NO.
SR(N)-88-005	8/24/88	FS-YMP-1498
SR(N)-88-004	7/14/88	FS-NNWSI-0890
SR(N)-88-003	4/20/88	FS-NNWSI-1120
SR(N)-88-002	2/2/88	QA-88-015
SR(N)-88-001	1/21/88	FS-NNWSI-1085
SR(N)-87-06	10/28/87	FS-NNWSI-1066
SR(N)-87-05	8/26/87	FS-NNWSI-1049
SR(N)-87-04	3/25/87	FS-NNWSI-1022
SR(N)-87-03	5/28/87	FS-NNWSI-1027
SR(N)-87-02	3/26/87	FS-NNWSI-1020
SR(N)-87-01	1/13/87	FS-NNWSI-1005
SR(N)-86-003	10/22/86	ADM-QA-3846
SR(N)-86-002	9/10/86	ADM-QA-3803
SR(N)-86-001	7/15/86	ADM-QA-3719

#5

AUDITS & SURVEILLANCES

AUDITS	DATE	REPORT NO.
QA(N)-88-01	5/16/88	FS-NNWSI-1130
QA(N)-88-02	10/12/88	No report issued yet
QA(N)-87-02	6/16/87	FS-NNWSI-1032
QA(N)-87-01	6/10/87	FS-NNWSI-1030
QA(N)-86-03	11/19/86	ADM-QA-3876
QA(N)-86-02	10/29/86	ADM-QA-3856
QA(N)-86-01	5/19/86	ADM-QA-3645

#6

AUDIT QA(N)-86-03

	DEFICIENCY	RESOLUTION	CLOSE OUT DATE
1.	Design interfaces not identified in log	Interfaces determined not to be significant	12/23/86

SR(N)-87-02

	CONCERN	RESOLUTION	CLOSE OUT DATE
1.	Lacking procedure to described program and organizational interface	Developed procedure	9/18/87

CR(N)-87-02

	CONCERN	RESOLUTION	CLOSE OUT DATE
1.	No Tulsa interface review for PP-50-01	Have Tulsa Review	9/19/99

SECTION 5
#7

The professional qualifications of F&S personnel are documented by the Human Resources Department using procedure PP-60-01, Personnel Selection and Indoctrination. Education and experience of F&S personnel is verified and the documentation is kept in the personnel file.

HOLMES & NARVER, INC.

(H&N)

SECTION 1: **GENERIC REQUIREMENTS FOR A MINED GEOLOGIC DISPOSAL SYSTEM**

1. Did your organization participate in the identification of ESF criteria/requirements for inclusion in OGR/B-2, Appendix E?

   Yes _____ No _X_____

   NOTE: If the response to Question 1 is negative, no further questions in this section need to be answered.

2. What was your organization's role in the preparation of Appendix E (e.g., inputs, participate in analyses, participate in review, etc.)?

   _____

   _____

   _____

3. Identify the individuals who participated for your organization and summarize (briefly) the relevant qualifications of each. Make your response a separate attachment if necessary.

   _____

   _____

   _____

   _____

4. Did your organization subcontract any part of that activity to experts outside the program?

   Yes _____ No _____

5. If the response to Question 3 is affirmative, list the persons, indicate their roles and affiliations, and identify the documents by which your organization defined their tasks and deliverables.

6. When did your participation in that activity start?

7. Briefly describe the process by which Appendix E content and format were established, as seen from your organization's perspective.

8. What meetings on ESF generic requirements were attended by personnel from your organization, or by personnel under contract to your organization?

9. Did your organization participate in incorporation of 10CFR60 requirements in this document? If so, in what role (e.g., responsible, review, etc.)?

_____

_____

_____

10. What planning document(s) and/or other instructions did your organization issue or receive (as applicable) prior to and/or during your participation in the Appendix E activity? (Provide document number(s), revision(s), and date(s).)

_____

_____

_____

_____

SECTION 2: ESF SUBSYSTEMS DESIGN REQUIREMENTS DOCUMENT (SDRD)

1. Did/does your organization participate in the establishment or criteria/requirements contained in the SDRD?

   Yes __X__ No _____

   NOTE: If your response to Question 1 is negative, no further questions in this section need to be answered.

2. What was/is your organization's role in the preparation/ updating of the SDRD (e.g., generate, interpret, draft requirements; review, approve, etc.)

   Participated in review and comment phase. Comments were red lines to documents, and were not retained in H&N files.

3. Identify the individuals who participated for your organization and summarize (briefly) the relevant qualifications of each. Make your response a separate attachment if necessary.

   Work was done at an early time, no documentation exists as to participants. Current staff had no input.

4. Did your organization subcontract any part of the definition or review of SDRD criteria/requirements to experts outside the program?

   Yes _____ No __X__

5. If the response to Question 3 is affirmative, list the persons, indicate their roles and affiliations, and identify the documents by which your organization defined their tasks and deliverables.

6. When did your SDRD participation start?

Earliest letter found is 1986, when SDRD was ESF Design Requirements.

7. Briefly describe the process by which SDRD criteria/ requirements were established, as seen from your organization's perspective?

Comments were red-lined into documents and were not saved within H&N.

8 What meetings on SDRD criteria/requirements were attended by personnel from your organization, or by personnel under contract to your organization, during preparation of the SDRD? (If a list of formal meetings is appropriate, reference this section and question, and make the list an attachment to your response.)

Staff was present during Headquarters review. No comments or answers solicited from H&N.

9. What analyses, studies, etc., did your organization perform to arrive at your inputs to the SDRD? List reports or formal correspondence generated as a result of such analyses, studies, etc.

No H&N analyses, studies, etc... were in file as input.

10. Did/does your organization specify ESF design criteria/ requirements to an Architect/Engineer other than via the SDRD or SDRD changes?

Yes _____ No X

11. If the response to Question ~~9~~ 10 is affirmative, briefly describe the process for generating and transmitting such criteria/requirements.

12. What planning document(s) and/or written instructions did your organization issue or receive prior to or during your participation in establishment of SDRD criteria/ requirements? (Provide document numbers, revisions, and dates.)

No inputs solicited, comments were made on draft document.

SECTION 3: DESIGN BASIS DOCUMENTS

1. When did your organization start preparation of your ESF Design Basis document?

   May 1987.

2. How did/does your organization establish the criteria/ requirements that are specified in your ESF Design Basis document?

   Used SDRD as basis and elaborated on contents from experience.

3. Identify the individuals who were/are responsible for approving requirements for incorporation in your organization's ESF Design Basis document?

   Eugene Garnett Richard Greenwold

   Mark Happ

   Bert Anzai

   Joe Dumas

4. How did/does your organization document qualifications of these personnel, and where can such documentation be retrieved?

   Qualification of personnel part of H&N YMP support office files.

5. Did/does your organization employ the services of subcontractors or consultants in the establishment of criteria/requirements for your ESF Design Basis document?

Yes _____ No X

6. If the response to Question 5 is affirmative, list the documents that defined the task, deliverables, and control requirements for the activity.

7. For internal review/approval of initial entries and changes to your ESF Design Basis document, provide the identifying information necessary to retrieve review documentation from your organization's files or from the project record center.

No formal request for internal review documentation not available.

8. Did/do other Project participants review or approve your organization's Design Basis document? If so, identify the organizations and their roles - i.e., review, approve, or both.

Copies of original documents provided to WMPO (Yucca Mountain Project Office). Review handled through them.

SECTION 4: SPECIFIC INTERFACES AND ANALYSES

1. (Part one of two parts.) During the ESF design did your organization participate in the identification and/or evaluation of interfaces (i.e., potential for interactions) between ESF, design, construction, and operation, and the repository, and/or in minimizing or preventing such interactions through ESF design, selection of construction methods, etc.?

   Yes _____ No ___X___

   (Identify applicable documentation if not already identified in earlier information packages.)

   (Part two of two parts.) In what role did your organization participate in identifying the interfaces between the siting, design, testing, and performance assessment aspects of the ESF program and ensuring that ESF planning and design integrated those aspects? (Identify applicable documentation if not already done so.)

2. Did your organization perform or otherwise participate (e.g., consult, review, approve, etc.) in any of the following ESF design input analyses?

Shaft location:	No	Role:		When:	
Shaft diameter:	No	Role:		When:	
Need for second shaft:	No	Role:		When:	
Shaft separation:	No	Role:		When:	
Tests required:	No	Role:		When:	
Testing interferences:	No	Role:		When:	

Note: "Required Tests" is interpreted to mean tests for which provisions must be made in the ESF design.

3. For each of the activities in Question 2 in which your organization had a role, list the reports, correspondence, meeting minutes, etc., that can be used to establish a documented record of the decision making process. Identify such documentation in sufficient detail for rapid retrieval from records storage, and/or indicate where copies can be obtained. (Make list an attachment to your response; reference the attachment here: _____.)

4. Did your organization perform or otherwise participate directly in Title I design?

   Yes ___X___ No _____

5. If the response to Question 4 is affirmative, what was/were your organization's role(s)?

   Directly responsible _____X_____

   Provided consultation _____

   Review _____

   Approval _____

6. When did your organization's Title I design activity start?

   February 1988

7. Identify the responsible individuals from your organization who participated in the activities addressed by questions 2 and 5. State where documentation of their relevant qualifications is maintained.

   H&N Design and Project Groups were directly responsible for the Title I Design. (Org. Chart). Personnel qualifications available in the H&N YMP office files.

NOTE: Org charts furnished; filed with records pkg. J Rusk

SECTION 5: QA PROGRAM/DESIGN CONTROLS

1. When did your organization commit to the requirements of NQA-1 and its Supplements as the basis for its Yucca Mountain (formerly NNWSI) Project QA program?

   Holmes & Narver, Inc./Energy Support Division (H&N/ESD) has committed to comply with the Waste Management Project Office (WMPO) Project Quality Assurance Plan (QAP) (NVO-196-17 and its predecessor 88-9) since the inception of the project. The WMPO QAP indicates that NQA-1 is one of the documents which forms the basis for the development of the Project QAP. In summary, H&N/ESD has committed to NQA-1 to the extent prescribed by the Department of Energy/Nevada Operations Office (DOE/NV) 5700.6 series Orders. The first WMPO approval of the H&N/ESD QA Program specifically developed for the NNWSI Project was in May 1986.

2. Show the chronological evolution of your organization's design control and/or R&D policies, procedures, or other instructions applicable to activities your organization conducted relative to development of the GRD, SDRD, and/or Design Basis documents. Cover the period since the earliest date you entered in Section 1 through 3 of this questionnaire. Include the following data:

   Procedure identifying number
   Title
   Subject (if the title does not clearly indicate what the procedure covered)
   Revision number
   From and to dates for the revision
   Procedure and revision this procedure or revision replaced or superseded

   NOTE: The information for Question 2 should make it possible to trace the coverage of a major control from earliest participation in any of the indicated activities to the present.

3. As the OCRWM and YMP QA programs evolved, the wording and/or applicability of some design control requirements have changed. Use Table 1 of this questionnaire to identify major design control changes in your organization's QA program and to flag any that should be considered in terms of reanalysis or reverification during Title II design. The table makes it possible to distinguish between changes in how work or controls were actually accomplished and those that affected the nature or amount of documentation without affecting the underlying work or controls.

QUESTION #2

PROCEDURE NUMBER	PROCEDURE TITLE	EFFECTIVE DATE
NNWSI-001, REV. 0	GENERATION AND CONTROL OF NNWSI PROCEDURES	09/19/86
ICN-001		05/15/87
ICN-002		05/05/88
NNWSI-001, REV. 1	GENERATION AND CONTROL OF NNWSI PROCEDURES	06/02/88
ICN-001		09/26/88
NNWSI-002, REV. 0	INDOCTRINATION, TRAINING, CERTIFICATION, AND QUALIFICATION	11/03/86
ICN-001		03/25/88
ICN-002		04/01/88
NNWSI-003, REV. 0	SPECIFICATION PREPARATION AND CONTROL	11/03/86
ICN-001		08/29/88
ICN-002		09/26/88
ICN-003		11/30/88
NNWSI-004, REV. 0	CONTROLLED DISTRIBUTION OF DESIGN DOCUMENTS	04/03/87
NNWSI-004, REV. 1	CONTROLLED DISTRIBUTION OF DESIGN DOCUMENTS	03/25/88
ICN-001		09/26/88
ICN-002		11/30/88
NNWSI-005, REV. 0	DESIGN DRAWING PREPARATION AND CONTROL	11/17/86
NNWSI-005, REV. 1	DESIGN DRAWING PREPARATION AND CONTROL	05/19/88
ICN-001		09/26/88
NNWSI-006, REV. 0	DESIGN CALCULATIONS	11/24/86
NNWSI-006, REV. 1	DESIGN ANALYSIS	05/19/88
ICN-001		09/26/88

QUESTION #2

PROCEDURE NUMBER	PROCEDURE TITLE	EFFECTIVE DATE
NNWSI-007, REV. 0	WORK INITIATION, CRITERIA GATHERING, AND REPORTING	04/03/87
ICN-001		07/30/87
NNWSI-007, REV. 1	WORK INITIATION	08/11/88
NNWSI-008, REV. 0	NO AVAILABLE DATA	
NNWSI-008, REV. 1	QUALITY ASSURANCE RECORDS MANAGEMENT	08/28/87
NNWSI-008, REV. 2	QUALITY ASSURANCE RECORDS MANAGEMENT	07/25/88
YMP-008, REV. 3	QUALITY ASSURANCE RECORDS MANAGEMENT	11/30/88
NNWSI-009, REV. 0	STOP WORK ORDER	04/03/87
ICN-001		04/26/88
NNWSI-010, REV. 0	CONTROL OF MEASURING AND TEST EQUIPMENT	06/05/87
NNWSI-010, REV. 1	CONTROL OF MEASURING AND TEST EQUIPMENT	05/27/88
ICN-001		11/30/88
NNWSI-011, REV. 0	NNWSI NONCONFORMANCE CONTROL	05/15/87
ICN-001		04/26/88
ICN-002		09/26/88
NNWSI-012, REV. 0	CORRECTIVE ACTION	10/30/87
ICN-001		04/13/88
NNWSI-013, REV. 0	SOFTWARE QUALITY ASSURANCE	05/01/87
NNWSI-014, REV. 0	DESIGN VERIFICATION	06/30/87
ICN-001		05/06/88
ICN-002		09/26/88

QUESTION #2

PROCEDURE NUMBER	PROCEDURE TITLE	EFFECTIVE DATE
NNWSI-015, REV. 0	DESIGN INPUT CONTROL	09/13/88
NNWSI-016, REV. 0	SURVEY DEPARTMENT DOCUMENT CONTROL AND DISTRIBUTION	06/05/87
ICN-001		02/05/88
NNWSI-017, REV. 0	SURVEY DEPART WORK FUNCTIONS	04/27/87
ICN-001		05/15/87
NNWSI-017, REV. 1	SURVEY DEPARTMENT WORK FUNCTIONS	05/27/88
NNWSI-019, REV. 0	GENERAL TESTING PROCEDURE FOR THE MATERIALS TESTING LABORATORY	10/30/87
NNWSI-019, REV. 1	GENERAL TESTING PROCEDURE FOR THE MATERIALS TESTING LABORATORY	07/01/88
NNWSI-022, REV. 0	NDT PERSONNEL CERTIFICATION	06/30/88
NNWSI-026, REV. 0	MICROFILMING AND ARCHIVAL STORAGE SERVICES FACILITY (MASSF)	08/07/87
NNWSI-027, REV. 0	DEPARTMENT FILING SYSTEM PROCEDURE	08/07/87
NNWSI-027, REV. 1	DEPARTMENT FILING SYSTEM PROCEDURE	05/31/88
NNWSI-028, REV. 0	MAGNETIC PARTICLE TESTING PROCEDURE	10/30/87
NNWSI-029, REV. 0	INTERFACE CONTROL	11/10/87
NNWSI-029, REV. 1	INTERFACE CONTROL	04/15/88
ICN-001		06/17/88
NNWSI-031, REV. 0	AUDITS	10/30/87
ICN-001		04/26/88
ICN-002		09/26/88

QUESTION #2

PROCEDURE NUMBER	PROCEDURE TITLE	EFFECTIVE DATE
NNWSI-032, REV. 0	QUALIFICATION OF AUDIT PERSONNEL	10/30/87
ICN-001		04/26/88
NNWSI-033, REV. 0	SURVEILLANCE ACTIVITIES	10/30/87
ICN-001		04/26/88
ICN-002		09/26/88
NNWSI-037, REV. 0	CONTROL OF QUALITY ASSURANCE PROGRAM PLAN	06/24/88
ICN-001		09/26/88
NNWSI-038, REV. 0	QUALITY ASSURANCE DRAWING AND SPECIFICATION REVIEW	06/24/88
NNWSI-043, REV. 0	LITIGATION DISCOVERY PROCESS OF NNWSI PROJECTS RECORDS	08/05/88
NNWSI-055, REV. 0	REQUEST FOR ESTIMATE AND COST ESTIMATE	08/11/88

4. Attach a chronological list of the procedures (including revisions and effective or issue dates) that covered your organization's audit and/or surveillance activities over the period of your organization's participation in the activities addressed in this questionnaire.

Audit	QAGL 18.0 Rev. 2	-	)Insignificant
	QAGL 18.0 Rev. 3	06/18/86	)change to
	NNWSI-031 Rev. 0	10/30/87	)program
Audit QAL	QAGL 18.1 Rev. 0	-	)Insignificant
	QAGL 18.1 Rev. 1	06/18/86	)change to
	NNWSI-032 Rev. 0	10/30/87	)program
Surveillance	QAGL 19.0 Rev. 1	-	)Insignificant
	QAGL 18.2 Rev. 0	06/18/86	)change to
	NNWSI-033 Rev. 0	10/30/87	)program

5. List audits and surveillances that included any of the activities addressed by this questionnaire. Identify by dates and report numbers. Use Table 1.

Audits	
Audit 87-02	ESD:QA:87-42 dated 04/01/87
Audit 87-10	ESD:QA:88-01 dated 01/07/88
Audit N88-001	Audit report not issued as of this date
Surveillances	
88-S-008	MEM:QA:88-004 dated 06/27/88
N88-S-011	MEM:QA:N88-013 dated 09/06/88

6. Provide a list summarizing each of the findings and observations resulting from the audits/surveillances identified in response to Question 5, and the resolution and close-out date for each. Reference the list to Question 6 of Section 5.

Source	Observation/CAR #	Table 1 Ref.
Audit 87-02	OBS #9	Item 2

OBS- Criteria not being controlled. Reference: NNWSI Procedure 007, effective date of 04/03/87, will be utilized to control criteria input.

*Audit N88-001 CAR N88-007 Item 2

CAR N88-007- Design input not being reviewed and approved by Quality Assurance.

*Audit N88-001 CAR N88-008 Item 3

CAR N88-008- Design Analysis- NNWSI-006 does not require QA review/approval as required by QAPP.

*Audit N88-001 OBS #___ Item 5

OBS #7- H&N procedures do not address passing on the QALA Level requirements in their design output documents.

Source	Observation/CAR #	Table 1 Ref.
Audit N88-001	OBS #	Item 2

OBS (17/18)- Design Input Control not being accomplished as prescribed by NNWSI-015.

Surveillance 88-S-008	CAR N88-S-001	Item 2

CAR N88-S-001- Existing procedures do not provide for the control of internally-generated design inputs.

Resolution: NNWSI-015 issued 09/13/88. CAR remains open until verification of satisfactory implementation of the requirements imposed by 015.

Surveillance 88-S-008	OBS #1	Item 2

OBS #1- WMPO SDR NO. 119 identified QA not reviewing and signing-off on Work Initiations.

Resolution: Requirements deleted from NNWSI-007. SDR No. 119 closed by WMPO.

Surveillance N88-S-0011	CAR N88-S-002	Item 3

CAR N88-S-002- Requirements of H&N Procedure 006, Design Analysis, are not being complied with.

Response: All Design Analyses packages will be reevaluated prior to commencement of Title II activities.

Training of design personnel will be conducted to assure understanding and compliance to the requirements of 006.

* Reflect CARs/OBSs not issued as of 11/10/88

7. How and where are the professional qualifications of personnel who represented your organization in the activities covered in Section 1 through 4 (as applicable) documented?

The qualifications for all personnel involved with the Yucca Mountain Project are maintained in the training files at the H&N/YMP office at the Valley Bank Center.

TABLE 1: RESPONSE TO QUESTION 3 OF SECTION 5

Element of design/ R&D control	Approx. Time	Procedure Wording*	Actual Practice*	Nature/amount * of documentation
Control/evaluation of inputs upon which requirements or criteria were based		X	X	X
	H&N's design process has provisions for a design verification as the final design function prior to the release for construction.			
Documentation of rationale for selection of specific criteria and requirements		None	None	None
Documentation and review of analyses and/or calculations		None	None	None
Inclusion of reviewers who did not directly participate in the work being reviewed		None	None - This was considered at the outset and provisions were made to include this requirement.	X
Identification and control of internal and external interfaces	Significant - time allowed is 3 FTE's for external interface control. Also portion of all design engineers' time.	X	X	X

* Indicate the affected column(s) with an "X" or a checkmark. If no effect, enter "NONE".

02K8

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