

SANDIA NATIONAL LABORATORIES
DEPARTMENT 6310
YUCCA MOUNTAIN PROJECT

YUCCA MOUNTAIN PROJECT
EXPLORATORY SHAFT FACILITY ALTERNATIVES STUDY
IMPLEMENTATION PLAN
REV 0
NOVEMBER 30, 1989

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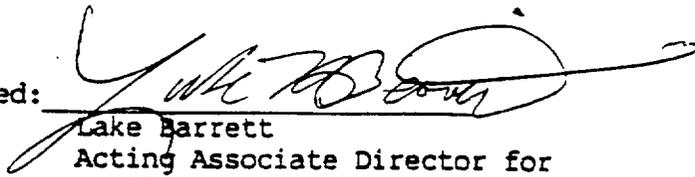
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SANDIA NATIONAL LABORATORIES
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EXPLORATORY SHAFT FACILITY ALTERNATIVES STUDY
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Accepted:



Lake Barrett
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30-Nov-1989

YUCCA MOUNTAIN PROJECT
EXPLORATORY SHAFT FACILITY ALTERNATIVES STUDY
IMPLEMENTATION PLAN - REV. 0

NOVEMBER 30, 1989

EXECUTIVE SUMMARY

The Yucca Mountain Project will perform an evaluation, conducted under a quality assurance program that meets the requirements of NWSI/88-9 to identify various Exploratory Shaft Facility configuration and construction method options, to evaluate those options, and to select a preferred option to be used as the basis for subsequent design efforts.

The Project Office has assigned the lead technical and coordination responsibility for the evaluation to Sandia National Laboratories (SNL). Other Project participants will be assigned by the Project Office, at the request of SNL, to perform individual tasks within this evaluation.

The evaluation will be performed by conducting several individual tasks as follows:

A survey will be made of existing design requirements, identifying those which may impact the selection of the preferred repository access configuration and construction methods and the repository/ESF interfaces. Similarly, those requirements which may impact the selection of the preferred ESF configuration and construction methods will also be identified. To the extent possible, these requirements will be quantified and traceability of the design inputs established.

A literature survey will be made of existing Yucca Mountain Project documents, and the repository and ESF options that were considered in the past will be identified. Additionally, all comments, concerns and issues raised by the NRC, NWTRB, the State of Nevada, the DOE, and others, which may impact the selection of the preferred repository option or the preferred ESF configuration and construction option, will be identified.

Using the results from the bibliographic surveys described above, specific repository access and ESF options will be identified and will undergo an initial screening process in order to select viable options for further evaluation.

A methodology will be developed for use in the final evaluation of the viable repository access and ESF options. This methodology will consider both regulatory and non-regulatory evaluation criteria.

The evaluation of the repository access options will be conducted first, and the preferred repository option will be identified. Next, an evaluation of the viable ESF configurations and construction methods will be conducted using the preferred repository access option as part of the evaluation criteria.

Finally, a preferred ESF configuration and construction method will be identified and will be presented to DOE in a final report. This report will consolidate all the information used in the evaluation and will present the conclusions and recommendations pertaining to the preferred ESF configuration and construction method.

EXPLORATORY SHAFT FACILITY (ESF) ALTERNATIVES STUDY

IMPLEMENTATION PLAN

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1.0 INTRODUCTION

1.1 Scope of Alternative Studies

These alternative studies are being undertaken to evaluate and identify a basis for the design and construction of an Exploratory Shaft Facility (ESF) at the Yucca Mountain site. The scope of these studies will be limited to the identification of the preferred repository options (accesses, construction methods, the identification of a preferred location or locations for the ESF accesses and underground facilities based on repository-ESF interface considerations) and the selection of the preferred ESF configuration and construction method(s). The repository options will be developed to the extent necessary to perform this evaluation of the ESF.

For the purposes of this evaluation, "configuration" includes the orientation, geometry, layout, and depth of the exploratory shaft facility; the location and means of access to the exploratory shaft facility; and the design of any engineered elements of the exploratory shaft facility. It also includes the strategy for and the sequencing of testing to be conducted in the exploratory shaft facility during site characterization.

1.2 Purpose of Implementation Plan

The purpose of this implementation plan is to identify (1) the Yucca Mountain Project (YMP) participant organization responsible for management of these studies, (2) the responsibilities of, and organizational interfaces between the YMP participant organizations conducting these studies, (3) the quality assurance requirements applicable to these studies, (4) the proposed schedule for initiation and completion of these studies, (5) the methodology proposed for use in conducting these studies, (6) the work to be performed as part of these studies, and (7) the final product for these studies.

2.0 PLAN MANAGEMENT AND IMPLEMENTATION

This section describes the overall management, coordination, and implementation process for performing the tasks identified in this plan.

2.1 Management

The Project Office has assigned the lead technical and coordination responsibility for this plan and its implementation to Sandia National Laboratories (SNL). The Project Office will maintain administrative control of this task. This administrative control will include approval of resource allocations and activity schedules. At the request of SNL, project participants will be assigned, at Project Office direction, to the individual tasks in accordance with their WBS responsibilities.

2.2 Organization

The Project participants will be organized according to the responsibility matrix plan contained in Exhibit A. This matrix identifies the technical lead and support roles for each task. The matrix organization will allow interactive participant coverage of the activities required by each of the tasks described in this plan.

2.2.1 Responsibilities

The responsibilities of the participants are as follows:

The Project Office is responsible for work authorization, budget allocation, review and acceptance of the implementation plan, review and acceptance of the task deliverables, acceptance of the final report, and for management and direction of SNL, the lead organization for the ESF alternatives study.

T&MSS, under the direction of the Project Office Engineering and Development (E&D) Division will assist the Project Office in the guidance, management and monitoring of the progress of this evaluation. Additionally, T&MSS will provide technical support, as required, to SNL during the performance of the tasks outlined in this plan.

Sandia National Laboratories (SNL) is responsible for managing, monitoring, controlling, and coordinating the activities of the Project participants involved in the ESF alternatives evaluation study. SNL will monitor and report the progress of the tasks to the Project Office at monthly meetings.

On a technical level, SNL is responsible for: certification of performance assessment computer codes; identification and quantification of design and construction requirements; verification of design inputs; identification of alternative repository options; development of evaluation criteria and methodology; selection of the preferred repository option and selection of the preferred ESF configuration and construction Methods. SNL will use Parsons-Brinckerhoff (PB), the repository underground facilities designer, to assist in the identification of alternative repository options, and support the selection of the preferred ESF option.

Los Alamos National Laboratory (LANL) is responsible for testing strategies including their application and location within the ESF, and will also support the selection of the preferred ESF option. Another major area of responsibility is verification that the preferred ESF configuration and construction methods are suitable for the intended use of this facility. The LANL Test Manager's Office (TMO) at Las Vegas will coordinate development of all test related material with respect to content and schedule, and will participate in the monthly meetings.

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Holmes and Narver (H&N) and Fenix Scisson of Nevada (FSN), the ESF Architect Engineer(s) (A/Es), are responsible for the identification of the ESF configuration options and construction methods. The A/Es will also support the selection of the preferred ESF option. This task will involve identification of ESF options for the underground access, connecting drifts and openings, operational support functions, layout of surface facilities, and schedules and cost estimates. Additionally, the A/Es will provide support in their respective areas of expertise as needed, and will participate in the monthly meetings.

Reynolds Electrical and Engineering Company (REECo) will provide expertise in construction and installation techniques and will support the selection of the preferred ESF option, as required. This support will include identification of construction options, schedules, and cost estimates; construction related input to proposed layout configurations; and review and comments on proposed configurations. REECo will also participate in the monthly meetings.

The DOE/HQ Office of Facilities Siting and Development (RW-20) will have the option of (1) attending the monthly meetings as observers, (2) hosting the quarterly status meetings, and (3) participating in reviews. RW-20 will cooperate with the Project Office in the arrangement of any discussions of these studies with the Nuclear Regulatory Commission (NRC) or the Nuclear Waste Technical Review Board (NWTB).

2.2.2 Organizational Interfaces

SNL will interface with the responsible project participants. During the performance of the assigned tasks, the participating Project organizations will interface with each other as required. Project organizations will interface with each other in accordance with AP-5.19Q, "Interface Control" which has been adopted by SNL as a controlling procedure.

Repository and ESF configurations will be coordinated, where appropriate, with surface based testing requirements and license application strategies.

2.3 Quality Assurance

The work described in this document will be conducted under a 10 CFR 60 Subpart G Quality Assurance Program, as implemented by the Yucca Mountain Project Quality Assurance plan, NNWSI/88-9, Rev. 2. Each participant will define that program as applied to their work by applying AP-5.4Q and AP-5.17Q. The appropriate portions of NNWSI/88-9, determined by the individual participants to be applicable to their work, will apply.

Any quality-affecting software used in the conduct of this work will be developed and controlled under a YMPO approved software QA plan.

Personnel from those participants that do not yet have a qualified QA program will be trained and conduct their activities under the Sandia National Laboratories QA program.

2.4 Task Plans

The participants assigned as technical leads may develop task plans for each task. These plans may include:

1. Purpose and scope.
2. Description of work to be performed.
3. Methods and procedures to be used.
4. Personnel assigned by activity or task.
5. Reports, products and reviews planned.
6. Quality Assurance.
7. Schedule.
8. Resource Requirements

Prior to initiation of technical activities, the task plans shall undergo an independent technical review and a QA review for inclusion of appropriate technical and QA requirements. Approval of the task plans shall be by the Technical Project Officer (TPO) of each organization proposing the work under their own QA program and by the SNL TPO.

2.5 Documentation

Work performed during the implementation of each of the tasks will be documented. The documentation shall provide sufficient detail to permit independent reviewers to comprehend the original determinations.

Documentation shall include the following completed items and sections as applicable:

1. Name of the task for which the work is performed.
2. Objective of the analysis, evaluation, or calculation.
3. Special directions given and by whom.
4. Method of analysis, evaluation, review, or calculation used.
5. Listing of information sources and specific data used.

6. Qualitative statement regarding the degree of uncertainty or maturity of the information sources.
7. Assumptions and their basis (rationale).
8. References (title [including accession number], revision number, author, and date), or other unique identifiers.
9. Special terms used.
10. Constants used.
11. Conclusions.
12. An orderly statement of analysis logic.
13. Authentication by the preparing parties.

2.6 Deliverables

The deliverables to be produced for each specific task will be identified in the task plans.

2.7 Schedule

The preliminary schedule for implementing this plan is contained in Exhibit B. The final schedule shall be developed by SNL before December 1, 1989. The final selection of the preferred ESF option will be available by December 30, 1990.

2.8 Records Management

Records Management will be in accordance with the procedure(s) identified as applicable by SNL.

2.9 Reviews

Independent reviews will be performed as Technical Reviews or Peer Reviews as applicable. Appropriate interim reviews may also be conducted. DOE/HQ will have the option of participating in these reviews.

3.0 DEVELOPMENT OF EVALUATION METHODOLOGY

This task will address the development of the methodology required for the evaluation of the repository and ESF options.

3.1 Evaluation Criteria

This section describes the methods and resources to be used for the development of the evaluation criteria.

3.1.1 Repository Evaluation Criteria

The repository system is divided into subsystems as described in the Repository Design Requirements document. Criteria will be developed for evaluation of the surface to underground access configurations and the repository/ESF interface subsystems. The requirements will be organized according to their hierarchy such that higher-level requirements are satisfied if it can be shown that each individual subordinate requirement is satisfied.

Evaluation criteria for determining whether the individual lower-level requirements are met will be developed for each physical subsystem to which a requirement applies. These criteria will be developed from the performance allocation tables in the SCP, appropriate design requirements documents, and qualitative professional judgment.

In addition to the regulatory criteria, non-regulatory criteria will be developed from the requirements identified in Section 4.0. These criteria will be based on such factors as industrial safety, cost, schedule, constructability, ventilation requirements, long-term drift maintenance, rock disturbance, water minimization, construction methods, and opening stability. These criteria will take into account comments and concerns raised by the NRC, the NWTRB, the State of Nevada, internal DOE reviews, and other sources.

3.1.2 ESF Evaluation Criteria

The development of evaluation criteria for the ESF will proceed in a manner similar to that described above for the repository configuration. A list of relevant ESF requirements will be developed. Comments from the NRC's Site Characterization Analysis (SCA) and testing related criteria will be included in the ESF evaluation criteria.

Additional criteria will be developed, as necessary, based on comments and concerns raised by the NRC, the NWTRB, the State of Nevada, internal DOE reviews, and other sources.

As a minimum, the following factors will be addressed by the ESF evaluation criteria:

1. Potential impacts of an ESF configuration and construction options on the ability of the site to isolate waste following permanent closure of the repository.
2. Potential impacts of an ESF configuration and construction options on radiological and nonradiological health and safety during repository construction, operation, decommissioning, and closure.

3. Ability of an ESF configuration to obtain data needed to design the repository and conduct performance assessments including, the ability to satisfy the requirements of the testing strategies outlined in the SCP, and the ability to obtain sufficient data representative of repository conditions.
4. Flexibility of an ESF configuration to allow performance of new testing not previously identified or described in the SCP (i.e., performance confirmation).
5. Flexibility of an ESF configuration to support modification of the configuration or construction methods during construction in response to conditions encountered, new or modified testing, or other requirements.
6. An ESF configuration's potential for construction-to-testing interference, operations-to-testing interference, and testing-to-testing interference.
7. Compatibility of an ESF configuration and construction options with repository design requirements and the preferred repository configuration.
8. Necessity for prototype testing or surface-based testing prior to design or construction of the ESF.
9. The technical and engineering considerations associated with the configuration and construction methods, including the risks associated with using state-of-the-art or prototype technology; water-usage; penetration rates; requirement for temporary versus permanent ground support; shaft or drift face accessibility; and power requirements.
10. Ability to conduct routine operations (e.g., transporting personnel, muck haulage, ventilation, hoisting, and sampling.)
11. Impacts on cost and schedule related to ESF configurations and construction methods, and to the repository configurations.

3.2 Application of Criteria

Detailed instructions for performing the evaluations of the configurations and construction options will be developed in accordance with the Task Plans and approved by the SNL TPO.

Instructions will be developed for application of the selection criteria to the viable repository and ESF options. The procedures for application of the evaluation criteria to these options will address the following:

1. Selection of the major areas of consideration and identification of their expected percentage of influence.
2. Identification of quantitative and qualitative criteria for each major area of consideration.
3. Development of criteria weighting.

3.3 Deliverables

The proposed deliverables resulting from this task are Chapter 2.0 of the final report and its supporting appendices, as indicated below:

2.0 Evaluation Methodology

2.1 Technical Approach

2.2 Assumptions

2.3 Evaluation Criteria

2.3.1 Repository Evaluation Criteria

2.3.2 ESF Evaluation Criteria

2.4 Acceptable Method(s) for Application of Evaluation Criteria

2.5 Acceptable Method(s) for Documentation of Results

4.0 EVALUATION OF REPOSITORY AND ESF DESIGN AND CONSTRUCTION REQUIREMENTS

The first part of this evaluation will be a review of existing program requirements documents and all comments and concerns relating to the repository and ESF design and construction. The purpose of this review is to identify those requirements which may impact the selection of the preferred repository access configuration and the ESF configuration and construction methods. Comments and concerns will include, but are not limited to, those raised by the Nuclear Regulatory Commission (NRC), the Nuclear Waste Technical Review Board (NWTB), the State of Nevada, and the Department of Energy (DOE). This review will culminate in the preparation of two lists of requirements. The first list will contain those requirements impacting the selection of the preferred Yucca Mountain repository option. The second list will contain those requirements impacting the selection of the preferred ESF configuration and construction methods.

The applicable requirements will be reviewed to identify those which shall be quantified or be made site specific. Specific values, based on performance and design-related calculations, evaluations, and trade-off studies, will be established.

The resulting repository and ESF requirements lists will be used to support the evaluation of alternatives for the configuration and construction method. Additional requirements, identified as a result of tasks outlined above, will be incorporated into the existing project requirements documents as part of this ESF evaluations study prior to commencement of design leading to construction. In parallel with the quantification efforts, SNL will provide traceability (verification) of design inputs.

4.1 Survey of Requirements

This section describes the general process for reviewing existing regulatory requirements and additional comments and concerns to produce a comprehensive list of requirements which are applicable to the repository and ESF design and construction.

4.1.1 Repository Requirements

SNL will perform a detailed review of Title 10 Chapter I Part 60 of the Code of Federal Regulations (10 CFR 60), the Generic Requirements for a Mined Geologic Disposal System -OGR/B2 (GR) and the draft Repository Design Requirements Document (RDR) (which is consistent with the GR) to ensure that the requirements which apply to the selection of the preferred repository access configuration and construction methods and repository/ESF interfaces have been adequately interpreted and translated into requirements. In addition, SNL will review all comments and concerns raised by the NRC, NWTRB, the State of Nevada, the DOE, and others, to ascertain if any of the comments or concerns may affect the repository access and interface requirements. Sources of such comments and concerns may include the NRC's Site Characterization Analysis (SCA), written correspondence received from the NWTRB and the State of Nevada public meetings and hearings, and publicly released reports.

As a result of these reviews, SNL will identify and list the requirements which impact the selection of the preferred repository option. A summary of relevant comments and concerns will also be prepared.

4.1.2 ESF Requirements

SNL, supported by LANL, will perform a document review to ensure that all requirements which the ESF must satisfy are incorporated into the ESF SDRD. Documents to be reviewed will include upper-tier documents such as Appendix E of the GR and the draft RDR. Other documents, as identified in the work plans, will be reviewed for additional requirements which may potentially impact the ESF. The documents to be reviewed will be the latest versions available at the initiation of this task.

DOE will provide guidance as to which 10 CFR 60 requirements may impact the selection of the preferred ESF configuration. These requirements will be identified in an updated GR Appendix E or by guidance letter identifying those additional requirements not contained in the current version of GR Appendix E. The updated GR Appendix E will be approved prior to approval of the final report of this study. A review of comments and concerns raised by the NRC, NWTRB, the State of Nevada, the DOE, and others, will be performed to ascertain if any of the comments or concerns may affect the design and construction of the ESF.

As a result of this review, SNL will identify and list the requirements which impact the selection of the preferred ESF configuration and construction method. A summary of relevant comments and concerns will also be prepared.

4.1.3 Testing Requirements

LANL will assume the lead in performing a document review to identify ESF test requirements, identified in the Site Characterization Plan (SCP) and study plans, which will impact the selection of the preferred ESF configuration and construction method. Specific requirements identified as a result of this effort will be incorporated into the ESF requirements list. Documentation to be reviewed will be identified in the work plans. In addition, LANL will review all comments and concerns raised by the NRC, NWTRB, the State of Nevada and the DOE with respect to testing to ascertain if any of the comments or concerns are applicable to the design and construction of the ESF.

As a result of this review, LANL will identify and list the testing requirements which impact the selection of the preferred ESF configuration and construction method. A summary of relevant comments and concerns will also be prepared. These requirements will be incorporated into the ESF requirements lists identified in Section 4.1.2.

4.2 Quantification of Requirements

Requirements identified in Section 4.1, which are expressed in a qualitative manner, will be reviewed to identify those which shall be assigned specific values. Based on analyses and trade-off studies identified in the work plans, values will be assigned to the identified requirements as necessary.

4.2.1 Repository and ESF Requirements

The requirements applicable to the selection of the preferred repository option and ESF configuration and construction methods will be reviewed by SNL and, where appropriate, be grouped into analysis categories such as thermomechanical, hydrological, geochemical, geotechnical and geological. Each of the categories will be segregated into analysis packages which will address one or more requirement.

Analyses will be performed for each analysis package to quantify the requirement it addresses over a range of alternate conditions that will cover the configurations identified in Section 5.1 and 5.2 and allow trade-off studies to be performed. The range of the input parameters and scope for each analysis will be established to assure that the requirements are adequately investigated.

4.2.2 Testing Requirements

LANL will be the technical lead responsible for quantifying the testing requirements identified in the SDRD. The requirements to be met by the ESF in support of the Integrated Data System (IDS) will also be identified. The requirements developed and quantified by LANL will be verified by the participating test organizations prior to incorporation into the appropriate requirements list.

4.3 Traceability of Repository and ESF Design Input Data

As part of the incorporation of the results of this study into the existing project requirements documents, the traceability of the repository and ESF design input data will be established and documented by SNL.

4.4 Revision of Requirements

As a result of the requirements surveys outlined in Section 4.1, requirements lists to be used in the selection of the preferred repository option and ESF configuration and construction methods will be developed. The RDR and the ESF SDRD will be updated to incorporate additional regulatory requirements as determined by these studies. These documents will then be reviewed, approved, and placed under change control.

4.5 Deliverables

The proposed deliverables resulting from this task are Chapter 3.0 of the final report and its supporting appendices, as indicated below:

3.0 Repository and ESF Design and Construction Requirements

3.1 Requirements impacting selection of the preferred repository option.

3.2 Requirements impacting the selection of the preferred ESF configuration and construction method(s).

Appendices

1. An appendix documenting the methods and procedures used to identify the requirements and comments and concerns which may impact the selection of the preferred repository option. A list of the requirements will be part of this appendix.
2. An appendix documenting the methods and procedures used to identify the requirements and the comments and concerns which may impact the selection of the preferred ESF configuration and construction method. A list of the requirements will be part of this appendix.
3. An appendix documenting the methods and procedures used to compile a list of quantified requirements which may impact the selection of the preferred repository option.
4. An appendix documenting the methods and procedures used to compile a list of quantified requirements which may impact the selection of the preferred ESF configuration and construction methods.
5. An appendix documenting the methods and procedures used to verify the design inputs which will be used in the evaluation of the preferred options.
6. An appendix identifying the computer codes to be used in the evaluation of the preferred options. The appendix will also identify the steps which were taken to use these codes.

Additional deliverables for this task are the revisions to the project requirements documents as outlined in Section 4.5.

5.0 IDENTIFICATION OF REPOSITORY ACCESS AND ESF OPTIONS

This task will identify repository access options and ESF configuration options and construction methods.

5.1 Repository Access and ESF Options

This section deals with the process of identification of the repository access options and the ESF configuration options and construction methods. This process will involve a literature survey for identification of existing concepts, identification and consideration of comments and concerns, and identification of new concepts.

5.1.1 Literature Survey

A survey of project documents will be conducted to identify those repository options and ESF configuration options and construction methods that have been considered in the past. The Yucca Mountain project documents to be considered may include reports, presentations, white papers, and letters. Document sources may include the project central records facility and the local record facility of the project participants involved with past design efforts.

The Literature Survey documentation will cover previous evaluations of repository layouts and ESF configuration options and construction methods. This will include the scope of the evaluations that were conducted, the methodologies that were used for the evaluations, and the results of the evaluations including recommendations. The QA controls under which the evaluations were conducted will also be reviewed. Guidelines will be developed to determine the quality of the concepts identified in the literature survey. A bibliographic summary of the relevant literature will be provided.

Additionally, the literature survey will identify the repository and ESF related comments, concerns, and issues raised by the NRC, NWTRB, the State of Nevada, and the DOE. This information will also be part of the bibliographic summary.

5.1.2 Identification of New Options

From the literature survey described in Section 5.1.1, specific repository and ESF options may be identified that require refinements. New options may also be identified which will address the more recent comments and concerns expressed by the NRC, NWTRB, the State of Nevada and DOE. The identification of these new options will be documented. Such documentation may include the development of sketches to describe the configuration and construction methods.

5.2 Deliverables

The proposed deliverables resulting from this task are Chapter 4.0 and 5.0 of the final report and their supporting appendices, as indicated below:

4.0 Identification of Alternative Repository Configurations

4.1 Repository Options Previously Considered

4.2 Repository Related Comments and Concerns

4.3 New Configurations and Construction Methods Identified

- 5.0 Identification of Alternative ESF Configurations and Construction Methods
 - 5.1 ESF Configuration Options and Construction Methods Previously Considered
 - 5.2 ESF Related Comments and Concerns
 - 5.3 New Configurations and Construction Methods Identified

6.0 SELECTION OF PREFERRED CONFIGURATION AND CONSTRUCTION METHODS

This section defines the process for applying the evaluation methodology identified in Section 3.0 to the repository access options and ESF configuration options and construction methods listed in Section 5.0. The evaluation will be performed in two parts: (1) the ranking of the repository options and the selection of the preferred option, and (2) the ranking of ESF configurations and construction methods options and selection of the preferred configuration and construction method. The preferred repository option will then be used as part of the criteria for evaluating ESF configuration options and construction methods.

An evaluation group will be formed to evaluate the repository and ESF options developed in Section 5.0 in accordance with the evaluation methodology developed in Section 3.0. The detail of each of the option packages will be further developed to a level necessary for adequate evaluation. Each option will be depicted by sketches with brief descriptions of the functions and rationale for location of major features in the layout.

The members of the evaluation group shall perform the calculations and screenings necessary to obtain individual ranking component values for the options. The component values will be accumulated and an overall ranking developed for each option. Because this is a somewhat subjective process, each member of the evaluation group will be required to maintain a comprehensive record of all information relevant to the options evaluations, and the evaluation groups will be required to maintain detailed minutes of all meetings. All individual and group records must be made a part of the final record and must be available for independent review subsequent to the completion of these studies.

6.1 Performance Assessment

The performance assessment analysis of the repository and ESF options will at a minimum address the following areas:

1. Waste isolation.
2. Radiological safety.
3. Chemical and fluid transport.
4. Stress fields.
5. Temperature fields.
6. Zones of disturbance.
7. Closure of openings.

Appropriate models for the options will be used. Each model will be analyzed by the appropriate performance assessment techniques and a ranking developed based on the results obtained.

Documentation of performance assessment analyses will include the following:

1. Identification of performance assessment codes if any are used in the analysis.
2. Identification of configuration models to be used.
3. Identification of configuration-related functional design criteria to be used.
4. Development of assumptions for use with the performance codes.

Validation of the performance assessment codes used in the evaluation activities described in this plan will not have been completed when the final reports are prepared. The following paragraphs briefly describe the process applicable to software life cycles for codes that will be used.

Computer codes may be used in many of the analyses performed in evaluating alternative configurations. To ensure that the results of these analyses can be used with confidence, careful attention will be paid to the status of verification and validation of the codes. The procedures that currently govern analyses and software life cycle provide for this attention by calling for certification of codes; the procedures specify in detail how certification is to be achieved. Because all the analyses will follow those procedures, the required attention will be paid to verification and validation.

Briefly stated, the analysis and software procedures require that each analysis be accompanied by a Statement of Software Certification for each piece of Scientific and Engineering Software (SES) used in the analysis. The statement includes a description and review of the status of verification and validation of the piece of software. It explains why the current status is appropriate for the analysis, and it outlines the additional efforts, if any, that must be made to bring the status to a more appropriate level. The statement is reviewed and becomes a part of the analysis records, allowing future reviews and critiques of the analysis to have access to the thinking by which the use of the software was justified.

The procedures require that certification be done in this way because they recognize that verification and validation must be interpreted separately for each problem to which a code is applied. (Validation is the process by which a model is shown to represent correctly the processes it is intended to represent.) Validation of these codes requires data which is not yet available, but will be collected during Site Characterization. Therefore, validation cannot take place until such time as the actual data is available. Each analysis must be accompanied by an assessment of the validity of its models for the intended purposes. The assessment of validity will be a Statement of Analysis-Specific Software Certification, to be prepared for each code for its intended use. The certification will include the following information:

1. The name, version, release number, and qualification status of each piece of Scientific and Engineering Software (SES) to be used in the analysis.
2. An identifying number associated with the analysis (e.g., Problem Definition Memo (PDM) number, Design Investigation Memo (DIM) number), the Work Breakdown Structure (WBS) number, and the extent to which the software is subjected to QA requirements (i.e., Q or Non-Q).
3. Identification of all non-SES calculations, non-calculational software, and auxiliary software used in conjunction with an SES code for the analysis. Such software is included in the certification by reference.
4. A summary of the verification and validation analyses that have been completed and a statement of conclusions drawn from them concerning the adequacy of the code for meeting the objective of the analysis.
5. A summary of additional application-verification and validation activities, if any are needed, including references to current plans for evaluating the adequacy of the code for meeting the objective of the analysis.

6. Tentative plans for efforts to ensure that the results of the analysis will be controlled in such a way that the results of future application-verification and validation work will be compared with the results of this analysis and previous analyses. The intent of such control is to ensure that all analyses are evaluated for the effect of limitations or faults found in subsequent application-verification testing.
7. The basis supporting the certification of the software for the specific physical problem, including reasons why the code, in its present state of development and documentation, is appropriate for the analysis.

6.2 Preferred Repository Option

The evaluation group will review each of the viable repository options and will select the preferred repository access configuration and construction method.

6.3 Preferred ESF Configuration and Construction Methods

The preferred repository option identified in Section 6.2 above shall become part of the evaluation criteria used in the ranking process of the viable ESF configuration options and construction methods. The evaluation group will review each of the viable ESF configuration options and construction methods and list them in order of their ranking. The preferred ESF option will be selected.

6.4 Deliverables

The proposed deliverables resulting from this task are Chapter 6.0 of the final report and its supporting appendices, as indicated below:

6.0 Selection of Preferred Configuration and Construction Method

6.1 Preferred Repository Access Configuration and Construction Method

6.2 Preferred ESF Configuration and Construction Method

Appendices

1. Repository Selection Process Documentation

- a. Repository evaluation group selection process and qualifications.
- b. Report on the performance and results of the repository layouts ranking process and identification of the preferred repository option.
- c. Description of the selected repository access configuration and construction method.

2. ESF Selection Process and Documentation
 - a. ESF evaluation group selection process and qualifications.
 - b. Report on the performance and results of the ESF layouts and construction options ranking process and identification of the preferred ESF configuration and construction options.
 - c. Description of the selected ESF configuration and construction methods.

7.0 REPORTS

The results of the ESF alternative evaluations will be presented in three documents. These documents are: the revised editions of the RDR and the SDRD, and the Alternative Studies Report.

7.1 Revised RDR and SDRD

The revisions for Project requirements documents as identified in Section 4.6 will be incorporated into the RDR and SDRD and the revised documents will be issued in accordance with approved Project procedures.

7.2 Alternatives Study Report Organization, Format and Content

This section outlines the organization, format and content in the final report to be presented to DOE.

7.2.1 Organization and Format

The organization and format of the final report should be in accordance with SNL editorial policies.

7.2.2 Contents of Final Report

The body of the report should consolidate the information, conclusions and recommendations provided by the deliverables that are identified in Sections 3.0, 4.0, 5.0 and 6.0 of the implementation plan. The suggested table of contents for the final report is as follows:

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- 5.2 ESF Related Comments and Concerns
- 5.3 New Configurations and Construction Methods Identified
- 6.0 **SELECTION OF PREFERRED CONFIGURATIONS AND CONSTRUCTION METHODS**
- 6.1 Preferred Repository Access Configuration and Construction Method
- 6.2 Preferred ESF Configuration and Construction Method
- 7.0 **APPENDICES**

Appendices shall include, but not be limited to, those identified in Sections 3.0, 4.0, 5.0, and 6.0 of this plan, and this implementation plan.

PLAN ASSIGNMENTS RESPONSIBILITY MATRIX

<u>SECTION</u>	<u>PROJECT MANAGEMENT</u>		<u>MANAGEMENT</u>		<u>TECHNICAL</u>		<u>SUPPORT</u>	<u>WBS NO.</u>
	<u>DIRECTION & INTEGRATION</u>	<u>LEAD</u>	<u>LEAD</u>	<u>LEAD</u>	<u>INPUT</u>			
2.0 PLAN MANAGEMENT AND IMPLEMENTATION	P.O./TJHSS	SANDIA						
2.1 Management	.....	.....	SANDIA	(T)	1.2.6.1			
2.2 Organization	.....	.....	SANDIA	(T,IA,H,F,R)	1.2.6.1			
2.2.1 Responsibilities	.....	.....	SANDIA	(P,T)	1.2.6.1			
2.2.2 Organizational Interfaces	.....	.....	SANDIA	(T,IA,H,F,R)	1.2.6.1			
2.3 Quality Assurance	.....	.....	SANDIA	(TED)	1.2.6.1			
2.4 Work Plans	.....	.....	SANDIA	(TED)	1.2.6.1			
2.5 Documentation	.....	.....	SANDIA	(T,IA,H,F,R)	1.2.6.1			
2.6 Deliverables	.....	.....	SANDIA	(TED)	1.2.6.1			
2.7 Schedule	.....	.....	SANDIA	(T,IA,H,F,R)	1.2.6.1			
2.8 Records Management	.....	.....	SANDIA	(T,IA,H,F,R)	1.2.6.1			
3.0 DEVELOPMENT OF EVALUATION METHODOLOGY	P.O./TJHSS	SANDIA						
3.1 Evaluation Criteria								
3.1.1 Repository Evaluation Criteria	.....	.....	SANDIA	(F,IA,PB)	1.2.1.4			
3.1.2 ESF Evaluation Criteria	.....	.....	SANDIA	(F,IA,R)	1.2.6.1			
3.2 Application of Criteria								
3.2.1 Quantitative and Qualitative Criteria	.....	.....	SANDIA	(TED)	1.2.1.4			
3.2.2 Performance Assessment	.....	.....	SANDIA	(TED)	1.2.6.1/1.2.1.4			
3.3 Deliverables	.....	.....	SANDIA	(TED)	1.2.6.1/1.2.1.4			

NOTE: 1) P-Project Office T-TJHSS S-SANDIA LA-LOS ALAMOS P-PSN R-RHEN R-REXO PB-Parsons Brinckerhoff
 2) 1.2.1.4 Systems Performance assessment, 1.2.4.3 Repository Facilities, 1.2.4.7 Repository Design Basis, 1.2.6.1 ESF Management and Integration
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PLAN ASSIGNMENTS RESPONSIBILITY MATRIX

SECTION	PROJECT MANAGEMENT		MANAGEMENT		TECHNICAL		SUPPORT		WBS NO.
	DIRECTION & INTEGRATION	LEAD	LEAD		LEAD		INPUT		
4.0 EVALUATION OF REPOSITORY AND ESF DESIGN AND CONSTRUCTION REQUIREMENTS									
4.1 Survey of Requirements									
4.1.1	Repository Requirements				SANDIA		(T, LA, PB)		1.2.4.7
4.1.2	ESF Requirements				SANDIA		(T, LA)		1.2.6.1
4.1.3	Testing Requirements				LOS ALAMOS		(TED)		1.2.6.1
4.2 Quantification of Requirements									
4.2.1	Repository and ESF Requirements				SANDIA		(LA, F, R, PB)		1.2.4.7
4.2.2	Testing Requirements				LOS ALAMOS		(TED)		1.2.6.1
4.3	Traceability of ESF and Repository Design Input Data				SANDIA		(LA, F, R, PB)		1.2.1.4/1.2.6.1
4.4	Revision of Requirements				SANDIA		(T, LA, PB)		1.2.6.1
4.5	Deliverables				SANDIA		(T, LA, F, R, PB)		1.2.6.1
5.0 IDENTIFICATION OF REPOSITORY ACCESS AND ESF OPTIONS									
5.1 Repository Access and ESF Options									
5.1.1	Literature Survey				SANDIA		(F, R, LA, PB)		1.2.4.3
5.1.2	Identification of New Options				SANDIA		(F, R, LA, PB)		1.2.4.3
5.2	Deliverables				SANDIA		(LA, R, R, S, F, PB)		1.2.6.1

NOTE: 1) P-Project Office T-TRUSS S-SANDIA LA-LOS ALAMOS F-FSN R-RUN R-REDCO PB-Parsons Brinckerhoff
 2) 1.2.1.4 Systems Performance assessment, 1.2.4.3 Repository Facilities, 1.2.4.7 Repository Design Basis, 1.2.6.1 ESF Management and Integration
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6.0 SELECTION OF PREFERRED CONFIGURATION AND CONSTRUCTION METHODS	P.O./TAMSS	LEAD	LEAD	INPUT	1.2.1.4
6.1 Performance Assessment					1.2.1.4
6.2 Preferred Repository Option					1.2.1.4/1.2.1.3
6.3 Preferred ESR Configuration and Construction Methods					1.2.6.1
6.4 Deliverables					1.2.6.1
7.0 REPORT	P.O./TAMSS				1.2.6.1
7.1 Revised RFR and SFRD	SANDIA				1.2.1.4/1.2.6.1
7.2 Alternative Studies Report					1.2.6.1
7.2.1 Organization and Format					1.2.6.1
7.2.2 Contents of Final Report					1.2.6.1
EXHIBITS					
A. Responsibility Matrix for Plan					1.2.6.1
B. Implementation Plan Schedule					1.2.6.1

NOTE: 1) P-Project Office T-TAMSS S-SANDIA LA-LOS ALAMOS P-FSN R-RSN P-RZOO PB-Parsons Brinckerhoff
 2) 1.2.1.4 Systems Performance Assessment, 1.2.4.3 Repository Facilities, 1.2.4.7 Repository Design Basis, 1.2.6.1 ESR Management and Integration

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