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MODIFIED WORK PLAN TO SUPPORT

QUALITY ASSURANCE LEVEL ASSIGNMENTS

for

Sandia National Laboratories

NNWSI WBS ELEMENT 1.2.4.2.3.1.S

SEAL PERFORMANCE REQUIREMENTS

Approvals (signature and date):

B.1

B.2

8702120398 860714

PDR

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PDR

WM-11

PI Thomas & that he him 1/25/51 RTillen 1/25/84 Supervisor 7/24/80 WHPO (PQA)

FQA _	Connie Chocas 7/25/86
TPO _	Thomas 0, Hinty 7/25/81
WMPO	(Tech) 1/29/86

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List of Activities and Tasks

Design Requirements

A.1 Design Requirements in Support of Advanced Conceptual Design A.2 Design Requirements in Support of License Applications Design

Performance Evaluation

Performance Evaluation in Support of Advanced Conceptual Design

Performance Evaluation in Support of License Application Design

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WBS 1.2.4.2.3.1.S SEAL PERFORMANCE REQUIREMENTS

1. Objective and Issues Addressed

A. Objective

The objective of this portion of the NNWSI repository sealing program is the development of goals and design requirements for sealing system elements. An additional objective is to assess the performance of these sealing elements.

B. Issues Addressed

The Issues and Information Needs addressed are based on the Issues Hierarchy dated 4/15/86.

- 1. This WBS element will directly address the following Issues and Information Needs:
- <u>Issue 1.13</u> Have the characteristics and configurations of the shaft and borehole seals been adequately established to (a) show compliance with the postclosure design criteria of 10 CFR 60.134, and (b) provide information to support resolution of the performance issues?
 - 1.13.1 Site, waste package, and underground facility information needed for design of seals and their placement methods.
 - 1.13.2 Materials and characteristics for seals for shafts, drifts, and boreholes.
 - 1.13.3 Placement methods for seals for shafts, drifts, and boreholes.
 - 1.13.4 Reference design of seals for shafts, drifts, and boreholes.
- 2. The information obtained in this WBS element will contribute to the resolution of the following Issues and Information Needs:
 - 1.1.5 Determination of the radionuclide release rates to the accessible environment.
 - 1.1.6 Probabilistic estimates of the radionuclide releases to the accessible environment considering anticipated and unanticipated scenarios.
 - 1.5.5 Determination of the release rates for the engineered barrier system assuming both anticipated and unanticipated processes and events.

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C. Regulations and Requirements Addressed

Regulations and requirements addressed by the issues referenced in this WBS are cited in the NNWSI Systems Requirements Document. In particular, this WBS addresses 10 CFR 60.134, 10 CFR 60.112, 10 CFR 60.113, and 10 CFR 60.133.

D. Related Project Plans

The relationship between this WBS element and other work in the project is addressed in the NNWSI Site Characterization Plan (SCP), Chapter 8 (Sections 8.3.3 and Section 8.3.5.6). The data and reference values obtained under this WBS will be controlled as specified in the NNWSI Systems Engineering Management Plan (SEMP) and the NNWSI Configuration Management Plan.

- 2. Principal Investigator
 - J. A. Fernandez, Sandia National Laboratories (SNL), Albuquerque, NM
- 3. Statement of Work
 - A. Design Requirements

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A.1 Design Requirements in Support of Advanced Conceptual Design

- a. Purpose: Goals, design requirements, and materials recommendations for the NNWSI Repository Sealing program will be developed as part of this ACD activity. This will also include definition and resolution of issues associated with the development, performance, design, and emplacement of sealing components.
- b. Information Needs: 1.13.1, 1.13.2, 1.13.3, 1.13.4
- c. Hethods, Techniques, and Equipment: Analytical solutions to standard hydrologic models plus empirical results are used to establish initial goals, design requirements, and performance requirements for sealing components.

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Technical Procedures:

Available Procedures - None

Needed Procedures - None

e. Computer Codes:

Available Computer Codes - None Needed Computer Codes - None

- f. Documentation of Results: A SAND report will be written and results summarized in the Subsystem Design Requirements (SDR).
- g. Quality Assurance Level: II
- h. Remarks: QA Level II is assigned because the principal purpose of this task is to support ACD analysis of alternatives.

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A.2 Design Requirements in Support of License Application Design

- Purpose: Goals, design requirements, and materials recommendations for the NNWSI Repository Sealing program will be developed as part of this LAD activity. This will also include definition and resolution of issues associated with the development, performance, design, and emplacement of sealing components.
- Information Needs: 1.13.1, 1.13.2, 1.13.3, 1.13.4 ъ.
- c. Methods, Techniques, and Equipment: Analytical solutions to standard hydrologic models plus empirical results are used to establish initial goals, design requirements, and performance requirements for sealing components.

Technical Procedures: Available Procedures - None Needed Procedures - None

- Computer Codes:
 - Available Computer Codes None
- Needed Computer Codes None
- Documentation of Results: A SAND report will be written and results summarized in the Subsystem Design Requirements (SDR).
- Quality Assurance Level: I g.
- Remarks: QA Level I is assigned because the principal ħ. purpose of this task is to support LAD analysis of alternatives.
- В. Performance Evaluation

B.1 Performance Evaluation in Support of Advanced Conceptual Design

- Purpose: The purpose of this activity is to assess the performance of the sealing components in support of the Advanced Conceptual Design.
- Information Needs: 1.13.1, 1.13.2, 1.13.3, 1.13.4. ъ.
- c. Methods, Techniques, and Equipment: Analytical solutions plus numerical models and fault-tree analyses will be used to assess the performance of seal components.

Technical Procedures:

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- Available Procedures None
- Needed Procedures None_
- Computer Codes:

Available Computer Codes - SAGUARO (Sandia National Laboratories): This code may be used to assess the hydrologic performance of seals. Verification and validation of this code is being performed as part of WBS 1.2.1.4.4. Additional validation may be required to demonstrate applicability to seal analysis. UNSAT2 (U. of Arizona): This code may be used to assess the hydrologic performance of seals. Verification and validation of this code is being performed as part of WBS 1.2.1.4.4. Additional validation may be required to demonstrate applicability to sealanalysis. TRUST (PML): This code may be used to assess the hydrologic performance of seals. Verification and

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validiation of this code is being performed as part of WBS 1.2.1.4.4. Additional validation may be required to demonstrate applicability to seal analysis. ATHENAN (PSU): This code may be used to determine the thermal mechanical response to the heat of hydration of a curing cementitious seal. Additional verification and validation may be required. Needed Computer Codes - None

- f. Documentation of Results: A report will be written as required by Milestones R276 and M449.
- g. Quality Assurance Level: II
- h. Remarks: QA Level II is assigned since the principal purpose of this task is the evaluation of advanced conceptual design sealing alternatives.

B.2 Performance Evaluation in Support of License Application Design

- a. Purpose: The purpose of this activity is to assess the performance of the sealing components in support of the License Application Design.
- b. Information Needs: 1.13.1, 1.13.2, 1.13.3, 1.13.4.
- c. Methods, Techniques, and Equipment: Analytical solutions plus numerical models and fault-tree analyses
 - will be used to assess the performance of seal components.
- d. Technical Procedures:
 - Available Procedures None
 - Needed Procedures None
- e. Computer Codes:

Available Computer Codes - SAGUARO (Sandia National Laboratories): This code may be used to assess the hydrologic performance of seals. Verification and validation of this code is being performed as part of WBS 1.2.1.4.4. Additional validation may be required to demonstrate applicability to . seal analysis. UNSAT2 (U. of Arizona): This code may be used to assess the hydrologic performance of seals. Verification and validation of this code is being performed as part of WBS 1.2.1.4.4. Additional validation may be required to demonstrate applicability to seal analysis. TRUST (PML): This code may be used to assess the hydrologic performance of seals. Verification and validiation of this code is being performed as part of WBS 1.2.1.4.4. Additional validation may be required to demonstrate applicability to seal analysis. ATHENAN (PSU): This code may be used to determine the thermal mechanical response to the heat of hydration of a curing cementitious seal. Additional verification and validation may be required.

- Needed Computer Codes None
- f. Documentation of Results: A report will be written.

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g. Quality Assurance Level: I

h. Remarks: QA Level I is assigned since the principal purpose of this task is the evaluation of the performance of sealing designs for license application.

4. Data and Materials Needed

Tasks A.1 and A.2

Data Need - Sealing materials properties Source of Material - Data will be obtained from the Reference Information Base (RIB) Quality of Data - As defined in the RIB

Materials Needed - N/A Source of Materials - N/A Quality of Material - N/A

Tasks B.1 and B.2

Data Needed - Sealing materials properties, tuff and alluvium materials properties and water flow rates and sources. Source of Data - Data will be obtained from the RIB Quality of Data - As defined in the RIB

Materials Needed - N/A Source of Materials - N/A Quality of Materials - N/A

- 5. Non-Standard Methods or Techniques None
- 6. Location of Work Performance

Sandia National Laboratories, Albuquerque, NM

Contractors: International Technology Corporation, Albuquerque, NM (Task A).

7. Quality Assurance Requirements

Quality Assurance Level Assignments

The following Quality Assurance levels have been assigned to the tasks described in this WBS:

Quality Assurance Level I: Tasks A.2 and B.2 Quality Assurance Level II: Tasks A.1 and B.1 Quality Assurance Level III: None

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Application of Results

The results from the sealing activity will be used to support the development of sealing design (WBS 1.2.4.2.3.3), the SCP, the RCD/SC, the SDR, the EIS, the SAR, the License Application Design (LAD).

Schedule

Starting date: 1983; anticipated ending date: 1991

Past and Expected Achievements

A. Past Achievements

The NNWSI repository sealing concepts that provide the basis for the conceptual design activities have been completed and published. A detailed program plan has also been prepared that describes an approach to resolve specific performance-related questions and identifies tasks to be performed as part of the repository sealing program. Two additional reports that investigated flow of water in the unsaturated zone have also been prepared. These reports describe water flow in the vicinity of drifts and shafts.

During FY86 initial analyses were completed that evaluated the influence of the exploratory shaft on the performance of the repository. These results were discussed with the Nuclear

Regulatory Commission and the Department of Energy and their subcontractors. Further, work continued on the development of the initial goals, design requirements, and materials recommendations for the sealing program.

Input was also prepared for incorporation into the SCP (Chapters 6 and 8), and the SCP-CDR (Chapter 5).

3. Expected Achievements

FY86

Define the initial goals, design requirements, and materials recommendation for the sealing activity.

Perform additional analyses to evaluate the influence of the exploratory shaft on the performance of the repository.

Prepare input for the SCP, Chapter 6 and 8.

<u>FY87</u>

Publish the report on the goals, design requirements, and the materials recommendation for the sealing program.

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APPROVALS	(Signature and Date)
PI_Them	as la sputation 7/2:1315
Supervisor	See Rtilleren 7/25/86
WMPO (PQM)	Jamo Blaybork 7/24/80
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PQA Connie Cho an 7/25/86 TPO Thomas U. Hytin 1 7/25/86 rh WMPO (Tech) Pric-

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Activity: <u>A. Design Requirements</u>

Ta	sk Description	OA Level	QA Criteria	Level Justification
A.1	Design Requirements in Support of Advanced Conceptual Design	II	1-7, 15-18	QA Level II is assigned because this task involves comparative ACD technical analysis of alternatives (Step 10).
A.2	Design Requirements in Support of License Application Design	I	1-7, 15-18	QA Level I is assigned because this task involves comparative ACD technical analysis of alternatives (Step 6).
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QUALITY LEVEL ASSIGNMENT CRITERIA SHEET

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WP No. 12	4231-86		QALAS NO Rev.	. <u>043</u>
Kev	<u> </u>			· ·
Activity:	A. Design Requirem	ents	<u> </u>	
Task: <u>A,1</u>	Design Requirement of Advanced Concep	<u>s in Support</u> tual Design	PI	A, Fernandez
	 ^l		Does Not	======================================
Cri	terion	Applies	<u>Apply</u>	Comments
<u>1. 0A Or</u>	ganization	x	<u> </u>	
2. OA Pr	ogram	x		
Desig 	n & Scientific tigation Control	x		Scientific Investiga- tion Requirements Apply.
Pro <u>4, Docum</u>	curement ent Control	x		·
In <u>5. Proce</u>	structions dures & Drawings	x		
6. Docum	ent Control	x 1		
Contr Mater 7. and S	ol of Purchased ial, Equipment, ervices	X		
ID an Mater <u>8. Compo</u>	d Control of ials, Parts, nents and Samples		X	 No manufacturing or samples involved,
9. Contr	ol of Processes		X	 No_special_processes
10. Inspe	ction		X	No inspection or surveillance involved.
Test <u>11. Resea</u>	and Experiment/ rch Control		<u>x</u>	 No_tests/experiments
Contr 12. and T	ol of Measuring est Equipment		<u>x</u>	 No manufacturing or tests involved
Handl	ing, Shipping, torage		x	No instruments, hard- ware or samples linvolved.
Inspe <u>14. Opera</u> Con	ction, Test, and <u>ting Status</u> trol of		x	No inspection or tests involved.
15. Nonco	nformances	<u> </u>		l
16. Corre	ctive Action	x		
<u>17. OA Re</u>	cords	x		· · · · · · · · · · · · · · · · · · ·
<u>18. OA Au</u>	dits	· x		

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WP No. 124231-86		QALAS NO	043
RevB		Rev.	B
Activity: <u>A. Design Requirem</u>	ents		
Task: <u>A,2 Design Requirement</u> of License Applica	s in Support tion Design	PIJ.	A. Fernandez
QA		Does Not	
	 VDDTT62		Comments
<u>1. OA Organization</u>	ix	<u> </u>	<u> </u>
2. OA Program	x		
Design & Scientific 3. Investigation Control	x	 	Scientific Investiga- tion Requirements
Procurement			
4. Document control		1	
Instructions 5. Procedures & Drawings	<u>x</u>	[
	1		1
6. Document Control Control of Purchased	IX		<u> </u>
Material, Equipment, 7. and Services	x		
ID and Control of Materials, Parts,			No manufacturing or
8. Components and Samples		×	I samples involved.
9. Control of Processes	ļ	<u> </u>	No special processes.
10, Inspection		x	NO inspection or surveillance involved.
Test and Experiment/			 No tests/evneriments.
· · · · · · · · · · · · · · · · · · ·	 	1	
Control of Measuring 12. and Test Equipment		x	No manufacturing or tests involved.
Handling, Shipping, 13. and Storage		x	No instruments, hard- ware or samples involved.
Inspection, Test, and 14. Operating Status		x	 No inspection or tests involved.
Control of	x		
10. Corrective Action	<u> </u>	I	
17. OA Records	<u> </u>	ļ	<u> </u>
18. OA Audits	· x	Į	<u> </u>

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APPROVALS (Signature and Dat	te)
PI Thomas E. Andeleen	7/25/36
Supervisor Jo. Stillerow	1/25/82
WMPO (POM) James Blanbort	7/29/86

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PQA	Connie Chocas	7/26/86
TPO	Thomas . Hinter 1	7125/86
WMPO	(Tech)	- Thele

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Activity: B. Performance Evaluation

Task Description	OA Level	QA Criteria	Level Justification
B.1. Performance eval- uation in support of Advanced Conceptual Design	II	1-7, 15-18	In this activity analyti- cal solutions plus numer- ical models and a fault tree analysis will be used to assess the per- formance of seal com- ponents. QA Level II is , assigned since the prin- pal purpose of this task is the evaluation of Advanced Conceptual Design alternatives (Step 10).
B.2. Performance eval- uation in support of License Application Design	I	1-7, 15-18	In this activity analyti- cal solutions plus numer- ical models and a fault tree analysis will be used to assess the per- formance of seal com- ponents for License Application Design (Step 6).

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Activity: <u>B. Performance Eval</u>	luation		
Task: <u>B.1 Performance Evalua</u> of Advanced Concept	tion in Supp tual Design	<u>ort</u> PIJ.	A. Fernandez
Criterion	Applies	Apply	Comments
1. OA Organization	x		<u> </u>
2. OA Program	x		
Design & Scientific 3. Investigation Control	x		Scientific Investiga- tion Requirements
Procurement 4. Document Control	X	 	
Instructions 5. Procedures & Drawings	x	 	· · · · · · · · · · · · · · · · · · ·
6. Document Control Control of Purchased Material, Equipment, 7. and Services	X	 	
ID and Control of Materials, Parts, 8. Components and Samples	A	X	No manufacturing or samples involved.
9. Control of Processes	1		 No special processes.
10. Inspection	1	x ·	No inspection or surveillance involved.
Test and Experiment/ 11. Research Control	 	x	 No_tests/experiments
Control of Measuring 12. and Test Equipment		x	No manufacturing or tests involved.
Handling, Shipping, 13. and Storage		x	No instruments, hard- ware or samples involved.
Inspection, Test, and 14. Operating Status		x	No inspection or tests involved.
Control of 15. Nonconformances	x	 	
16. Corrective Action	· x		
17. OA Records	x		· · · · · · · · · · · · · · · · · · ·
18. OA Audits	x	[[

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WP NO. 124231-86	_	QALAS NO	045
RevB	-	Rev.	<u> </u>
Activity: <u>B.</u> Performance Ev	valuation		
Task: <u>B.2 Performance Evalu</u> of License Applic	ation in Suppo Cation Design	<u>ort</u> PI_ <u>J.</u>	A. Fernandez
~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~			
QA Critorion	 Annlies	Does Not	
<u>1. OA Organization</u>	X	<u> </u>]
2. OA Program	x	l	
Design & Scientific 3. Investigation Control	x		Scientific Investiga- tion Requirements
Procurement	Y		
4, Document Control	^	<u> </u>	
Instructions 5. Procedures & Drawings	X	 	
		ļ	
<u>6. Document Control</u> Control of Purchased Material, Equipment,	X		<u> </u>
ID and Control of Materials, Parts,			No manufacturing or
Components and Sampres	<u> </u>	LQ	
9. Control of Processes		<u> </u>	INO special processes.
10. Inspection		x	Isurveillance involved.
Test and Experiment/ 11. Research Control			 No tests/experiments.
Control of Measuring 12. and Test Equipment		x	No manufacturing or tests involved.
Handling, Shipping, 13. and Storage			No instruments, hard- ware or samples involved.
Inspection, Test, and 14. Operating Status		x	No inspection or tests involved.
Control of _15,Nonconformances	x	1	1
16. Corrective Action	X		
17. OA Records	X		
18. OA Audits	. x		