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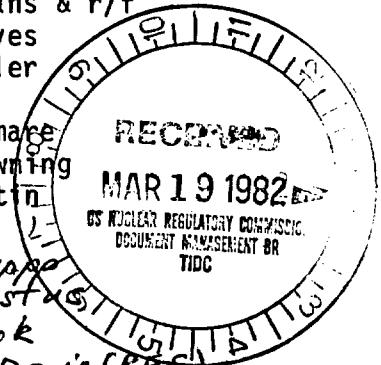
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R. Cook
J. J. Davis (RES)
WMHT
PDR



MEMORANDUM FOR:

Hubert J. Miller, Chief
High-Level Waste Technical
Development Branch
Division of Waste Management

FROM:

John T. Greeves, Section Leader
High-Level Waste Technical
Development Branch
Division of Waste Management

SUBJECT:

NMSS PROGRAM MILESTONE NO. 312313D

Attached is the status report on WMHT (Design Section) program objectives, present status, future plans, and integration with other sections. Emphasis is on technical assistance contracting efforts.

The attached technical status report on repository design fulfills PPSAS number 312313D.

John T. Greeves, Section Leader
High-Level Waste Technical
Development Branch
Division of Waste Management

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TECHNICAL STATUS REPORT

REPOSITORY DESIGN

INTRODUCTION

This report provides the Technical Status Report for the Design Section of the High-Level Waste Technical Development Branch (WMHT). WMHT (Design Section) program objectives, present status, future plans, and integration with other sections will be covered. Emphasis is on technical assistance and research contracting efforts.

The overall objective of the Design Section is to critically review repository designs and test methods proposed by the Department of Energy (DOE). In performing this review the Design Section evaluates the DOE design against the requirements of 10 CFR Part 60. This involves making independent assessments of the short-term repository stability and the long-term waste isolation capability as related to the repository design. In addition, the Design Section is responsible for developing staff licensing capability in the design area.

The WMHT Design Section is presently assisting in the completion of the final version of 10 CFR Part 60 (technical rule), performing prelicensing activities for specific repository sites, and generating regulatory guidance in the form of technical positions. For specific repository sites, DOE will submit Site Characterization Reports (SCR) describing planned activities during site characterization, to NRC as follows:

<u>Site</u>	<u>SCR Submittal Date</u>
Hanford (Basalt)	September 1982
Nevada Test Site (Tuff)	June 1983
Salt Site	July 1983

The Design Section is presently preparing for review of the Hanford SCR and preparation of the Director's Opinion.

Technical positions will be prepared in the following areas by the Design Section:

- ° Quality Assurance

- ° In - Situ Testing
- ° Thermal and Thermomechanical effects
- ° Engineered Barriers

Long-term activities will involve developing licensing capabilities for construction authorization, operation, and decommissioning of the repository. The Design Section is continuously coordinating with the High-Level Waste Licensing Management Branch (WMHL) in areas such as performance assessment and waste package design. Coordination with the Office of Research is also part of the Design Sections standing responsibilities on a number of contracting efforts.

Status of Contracting Efforts

Contracting efforts in the WMHT Design Section address two main areas; review and assessment of repository designs, and evaluations of specific technical areas.

Contract efforts involved with assessing repository designs are:

- ° B-6934 Technical Support for Design Review (BOM)
- ° B-7328 Technical Assistance for Design Reviews (UNDES)

Contract efforts involved with evaluating specific technical areas are:

- ° B-6983 Technical Assistance for Development of Repository
Design Criteria (GAI)
- ° B-6986 Performance of Engineered Barriers in a Geologic
Repository (GAI)
- ° B-6995 Borehole and Shaft Sealing Performance Criteria
(UNDES)
- ° B-7327 Assessment of Waste Retrieval Alternatives (E.I.)

Attachment A is a summary of both technical assistance and research contracts which support repository design activities.

Four design contracts are presently in operation and are producing scheduled deliverables. Technical Support For Design Reviews (B-6934) with the Bureau of Mines provides the Design Section with assistance from

experts in rock mechanics and underground construction. Within limited levels of effort, the Bureau can review and comment on technical documents and accompany the NRC staff on site visits and technical meetings. Since initiation of the contract in December 1980, the Bureau has provided NRC with assessments of both a preconcept-level design and various technical documents concerned with specific areas of design. In addition, Bureau representatives accompanied NRC staff on five technical meetings providing expert assistance during the meetings and comprehensive trip reports. The Bureau's technical assistance is used by the Design Section to assist in various prelicensing activities and interactions with the Department of Energy.

NRC's participation in the activities of the U.S. National Committee on Rock Mechanics (B6932) assures the Design Section has close contact with the one national organization having the responsibility of advancing the science of rock mechanics. Through quarterly reports, annual reports, conference proceedings, and informal interactions, the Design Section is fully aware of all activities in the field of rock mechanics which may be of importance in the repository development.

Technical Assistance for Development of Repository Design Criteria (B6983) involves six tasks addressing specific aspects of the repository

design. Task 1 will determine how various geologic, hydrologic, and rock mechanics factors influence the design and construction of a repository in dome salt and tuff media. Draft reports for both media have been received. Task 2 will identify large scale in-situ testing of the rock mass and groundwater system needed to analyze and design a repository in various geologic media. A draft report for this task has been received. Under Task 3 the contractor will assess various shaft designs and shaft sinking techniques with regard to performance requirements of the repository in various geologic media. Task 4 will evaluate the relationship between the construction and operation of both the at-depth test facility and the final repository. Task 5 involves the evaluation of the engineering aspects of particular backfill materials with respect to material preparation, placement, compaction and testing. Task 6 provides for contractor assistance in the form of attending technical meetings and reviewing specific technical documents at the request of NRC. The products from this contract will be utilized by the Design Section during the preparation of technical positions, in prelicensing activities such as reviews of Site Characterization Reports, and in various technical interactions with DOE.

Performance of Engineered Barriers In a Geologic Repository (B-6986) involves six tasks addressing specific areas of the repository design. Task 1 will identify reference repositories, for various geologic media, for use in subsequent tasks which assess repository performance. Under

Task 2 the contractor reviews and summarizes the state-of-the-art on how engineered portions of the repository design will affect performance of the underground facility. Task 3 indentifies various engineered barriers which will enhance the long-term isolation capability of the repository. Task 4 provides for in-depth assessments of how engineered portions of the repository design will affect performance of the underground facility. Task 5 indentifies and evaluates regulatory criteria needed to control performance of the underground facility. Task 6 provides for contractor assistance in the 10 CFR Part 60 rulemaking. The products from this contract will be utilized by the Design Section during the preparation of technical positions, in prelicensing activities, and in various technical interactions with DOE.

Assessment of Waste Retrieval Alternatives (B-7327) has recently been executed and the contract is composed of two tasks which address specific aspects of the repository design related to waste retrievability. Task 1 assesses to what extent state-of-the-art applications in ventilation, waste handling and backfill/excavation can be relied upon to meet 10 CFR

Part 60 retrieval requirements. Task 2 provides for contractor assistance by reviewing documents and participating in technical meetings. This effort will assist the Design Section in prelicensing activities to reach agreement on what methods of meeting the 10 CFR Part 60 retrievability requirements would be acceptable to NRC.

Two Design Section contracts will be executed within the next few months. Borehole and Shaft Sealing Performance Criteria (B-6995) is comprised of four tasks focusing on specific aspects of the repository design. Task 1 involves a review and summarization of the state-of-art in borehole and shaft sealing technology. Task 2 provides for a technical assessment of various seal materials and designs. Task 3 will provide a recommended test program for verification of seal performance. Task 4 provides for general contractor assistance by reviewing technical documents and participating in technical meetings. The products from this contract will assist the Design Section in preparation of a technical position and in various prelicensing activities such as the evaluation of Site Characterization Reports.

Technical Assistance for Design Reviews (B-7328) has two tasks involving the assessment of repository designs. Task 1 provides for the assessment of various repository designs focusing on underground structures, systems, and components important to safety. Task 2 requires the contractor to

participate in technical meetings at NRC's request. The results of this contract will be used by the Design Section during review of Site Characterization Reports and in other prelicensing interactions with DOE.

Coordination with the the WMHT Siting Section

The Design Section is continually coordinating with the Siting Section to insure that both Siting and Design contracting activities are interfaced. This is necessary for all Siting and Design contracts since many siting activities such as exploration and testing provide direct input to design analyses. Also, all of the Design contracts which address a specific technical concern are directly tied to the hydrologic, geologic, and rock mechanics aspects of the site.

Coordination with The High-Level Waste Licensing Management Branch (WMHL)

The Design Section is interacting with the High-Level Waste Licensing Management Branch (WMHL) regarding contract coordination and product development in a number of areas. WMHL contract Benchmarking of Computer Codes and Licensing Assistance (B6985) provides for the complete assessment of repository related computer models and for the overall assessment of repository performance. The Design Section is assisting WMHL in developing plans for reviewing design related codes (e.g. thermal and thermomechanical

codes). In addition, this WMHL contract is being coordinated with the Design contract Performance of Engineered Barriers in a Geologic Repository (B6986) with respect to assessing the performance of engineered barriers.

WMHL contract Effect of Repository Environment on Waste Package (B8069) will be executed within a few months. The Design Section is coordinating with WMHL to insure that the work is integrated and no duplication of effort occurs with the Design contract B6986.

The Design contract Borehole and Shaft Sealing Performance Criteria (B6995) is being coordinated with WMHL regarding their performance assessment activities.

Coordination with the Office of Research

The Design Section is working with the Office of Research on a number of research contracts addressing various aspects of the repository design. The Research contract Evaluation of Geotechnical Surveillance Techniques for Monitoring High-Level Waste Repository Performance (B1099) determined phenomena to be monitored, monitoring instrument technology needed, and recommended an appropriate monitoring philosophy. This contract has been completed and the results will be incorporated into appropriate Design technical positions.

The Research contract Recommended Standard Testing Procedures for Rock Mechanics (B7115) will provide the Design Section with standard testing procedures for obtaining a number of rock parameters. This work will address the specific concerns of designing a repository and will be incorporated into appropriate Design technical positions.

The Research contract Geologic Site Investigations for Tunnels (B7591) will review case histories and assess the entire design process from site explorations and design through actual performance after construction. This effort will assist the Design Section in determining where regulatory guidance such as technical positions will be required.

The Research contract Sealing of Rock Masses (B-6627) will assess state-of-the-art technology in sealing boreholes and shafts in various geologic media. Laboratory and field tests on various seals will be performed. The results from both this effort and Design contract B-6995 will be incorporated into a Design technical position.

Summary

The Design Section is presently in a prelicensing mode. The primary objective of both the staff's and contracting activities is to insure that the Department of Energy submits to NRC a repository design which is adequate so that NRC can perform a construction authorization review. This will be accomplished through present interactions with DOE, issuance of

Directors Opinions on DOE's Site Characterization Reports, and subsequent interactions with DOE. Present DOE plans call for completion of exploratory shafts in three geologic media by 1985, exploration and testing in the shafts through 1987, and filing a license application for one site in 1988.

ATTACHMENT A
CONTRACT SUMMARY

HIGH-LEVEL WASTE CONTRACT LISTING

BY

TECHNOLOGY ISSUE AREA AND ACTIVITY

HIGH-LEVEL WASTE CONTRACT SUMMARY

Technical Issue Areas

- 1.0 Waste Form and Packaging
 - 1.1 Container components performance
 - 1.2 Waste form components performance
 - 1.3 Backfill components performance
 - 1.4 Repository environment determination
 - 1.5 QA/QC of waste package
- 2.0 Repository Siting
 - 2.1 Hydrology
 - 2.2 Geochemistry
 - 2.3 Geologic stability
 - 2.4 Test methods
- 3.0 Repository Design/Construction/Operation
 - 3.1 Rock mechanics (incl. thermomechanical)
 - 3.2 Retrieval (eval. procedures)
 - 3.3 Repository design
 - 3.4 Engineered barriers
 - 3.5 Borehole and shaft seal
 - 3.6 Quality assurance
- 4.0 Performance Assessment
 - 4.1 Model development
 - 4.2 Model evaluation and improvements
 - 4.3 Model application

HLW FORM AND PACKAGING CONTRACT SUMMARY

<u>NRC Activities Technical Issues</u>	<u>Develop Licensing Capability</u>	<u>Licensing Review- DOE Programs</u>	<u>RESEARCH Understand Basic Phenomena- Limitations & Uncertainties with Data & Test Methods</u>	<u>Develop Generic Technical Positions</u>
Container Components Performance	A 3163	A 3164 A 3167	A 3237 B 6764 A 2230	A 3168 Task 1.1
Waste Form Components Performance	A 3163	A 3164 A 3167	A 2230 B 6764	A 3168 Task 1.1
Back Fill Components Performance	A 3163	A 3164 A 3167	A 2230 TBE	A 3168 Task 1.1
Repository Environmental Determination	A 3163	TBE	A 2230	TBE A 3168 Task 1.2
QA/QC Waste Package	A 3163	A 3164 A 3167	A 2230 B 6764 A 3237 B 7278	A 3168 Task 1.3 A 3168 Task 1.2

HLW REPOSITORY SITING CONTRACT SUMMARY

<u>NRC Activities Technical Issues</u>	<u>Develop Licensing Capability</u>	<u>Licensing Review- DOE Programs</u>	<u>RESEARCH Understand Basic Phenomena- Limitations & Uncertainties with Data & Test Methods</u>	<u>Develop Generic Technical Positions</u>
Hydrogeology		B 3109 T1,4,6 LBL B 5753 UAZ B 7291 UAZ B 7330, T1 BOA	A 2230 LBL B 3040, T2,3 LBL B 3110, T2 LBL B 5753 UAZ B 7291, T1,3 UAZ B 6628 UA B 6661 AAEC	B 5753 UAZ B 7291 UAZ B 7330, T2 BOA
Geochemistry	B 0462 ORNL B 3040, T4, LBL B 3109, T3 LBL	UNDES (TA Geochem) B 3109 T1-4 LBL	A 2230 ANL B 0462, T2,3 ORNL B 3040, T1-3 LBL B 6661 AAEC B 7057 LMNT	
Geologic Stability		B 7121, T4 NSF B 6935 COE	A 2230 ANL B 0462 ORNL B 3040, T5 LBL B 6628 UAZ B 6661 AAEC B 7057 LMNT G 1010, T1-3 Schumm	G 1010 Schumm
Test Methods		B 3110, T2 LBL A 0367, TB, D, LLNL B 6337, T5 UAZ	B 3110, T1-2 LBL A 0367, TA,B,D LLNL B 6337, T1-4, UAZ B 7291, T2, UAZ B 0462, T1 ORNL B 3040, T1-3 LBL B 6628 UAZ B 7057 LMNT B 7121 T1-3 NSF G 1010 Schumm	A 0367 TA,B,D LLNL B 6337, T5 UAZ

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HLW REPOSITORY DESIGN/CONSTRUCTION/OPERATION CONTRACT SUMMARY

<u>NRC Activities Technical Issues</u>	<u>Develop Licensing Capability</u>	<u>Licensing Review- DOE Programs</u>	<u>RESEARCH Understand Basic Phenomena- Limitations & Uncertainties with Data & Test Methods</u>	<u>Develop Generic Technical Positions</u>
Rock Mechanics	B 6985 B 3109 T5	B 6932 B 7328 B 6934 B 6935 B 3109 T4,5 B 6983 T2,4,6 B 7327	B 1099 B 7115 A 0371 B-3110	B 1099 B 7115
Retrieval (Evaluation Procedures)		B 7328 B 7327		
Repository Design (Mining Problems including Vent., Hoist, and Excavation)	GAI B 6985	B 7328 B 6934 B 6983 T1,6 B 7327	B 6673	
Engineered Barriers		B 6986 B 6995 B 3109 T3 B 6983 T5	B 6627 B 8069 A 2230	B 6986 B 3109 T3 B 6995 B 6983 T5
Borehole and Shaft Seal		B 6995 B 6986 B 6983 T3	B 6627 B 7284	B 6995 B 6986 B 6983 T3
Quality Assurance		B 7328	B 7278	

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HLW PERFORMANCE ASSESSMENT CONTRACT SUMMARY

<u>NRC Activities Technical Issues</u>	<u>Develop Licensing Capability</u>	<u>Licensing Review- DOE Programs</u>	<u>RESEARCH Understand Basic Phenomena- Limitations & Uncertainties with Data & Test Methods</u>	<u>Develop Generic Technical Positions</u>
Model Development	A 1158 T1		A 1192 A 1225 B 5753 B 7291 A 1266 B 6661	
Model Evaluation and Improvement	A 1158 T2 A 1166 A 1168 A 1165 T1 B 6985 T1-5	A 1165 T2 B 6985 T1-5	B 6694 A 9041 T1-4 A 1192 A 1266	
Model Application	A 1326 B 6985 T6,8 A 9041 T3,5	A 1165 T3 B 6985 T7,9		

HLW CONTRACT (TASK)

OBJECTIVES

By

Technical Issue Area and Activity

82/02/05

HLW CONTRACT (TASK) OBJECTIVES

Technical/NRC Issues /Activities	Develop Licensing Capabilities	Review -DOE/EPA Programs	Understand Basic Phenomena- Limitation and Uncertainties in Data and Test Methods	Develop Generic Technical Positions
Rock Mechanics	<p>B3109 (Task 5), LBL Establish general guide- lines for optimal surface cooling periods, density of waste emplacement, and repository loading sequence.</p> <p>B3109 (Task 4), LBL Assessment of alternative geologic environments with respect to tradeoffs between favorable and unfavorable characteris- tics</p> <p>B6985, Tekneron For selected design codes provide a general description of code, operating character- istics and a review of the support theory.</p>	<p>B7328, RFP Provide multi- disciplinary reviews of repository designs with emphasis on underground construction of structures, systems, and components important to safety.</p> <p>B6934, BOM Provide reviews of repository designs in areas of rock mechanics and under ground construction.</p> <p>B6935, COE Provide reviews of site investigations, research and develop- ment programs, and repository designs.</p>	<p>B1099 (Task 1), Agapito Recommend what process should be monitored during repository development.</p> <p>B1099 (Task 2), Agapito Recommend what instruments to use in repository monitoring.</p> <p>B1099 (Task 3), Agapito Recommend overall monitoring program,</p> <p>B7115, ASTM Recommend standard testing procedures for the following items: Task 1: in-situ measure- ment of elastic properties of rock Task 2: thermal conduct- ivity of rock</p>	

HLW CONTRACT (TASK) OBJECTIVES

Technical/NRC Issues /Activities	Develop Licensing Capabilities	Review -DOE/EPA Programs	Understand Basic Phenomena- Limitation and Uncertainties in Data and Test Methods	Develop Generic Technical Positions
Rock Mechanics (Con't)	B6932, NAS Provide NRC with information on latest developments in rock mechanics research and application.	B6983 (Task 2), Golder Identify large scale testing of ROCK necessary to analyze and design a geologic repository. B6983 (Task 4), Golder Investigate relationship between underground test facility (construction and testing) and the final repository. B6983 (Task 6), Golder Review of DOE design documents provided by NRC B7327, EI Consider rock mechanics aspects in conjunction with in depth evaluation of ventilation, waste handling, and backfilling studies to meet removal requirements.	B7115, Con't Thermal expansion of rock B7115, Task 4, ASTM Time dependent deformation of rocks. B7115, Task 5, ASTM Testing procedures for rock bolts for use in repositories B7062, UNDES assess and test methods for monitoring and recording the long-term effects of thermal loading	B1099 (Task 3), Agapito provide input for T.P. on requirements of rock mechanics. B7115, ASTM Recommend standard testing procedures for 5 particular areas in rock mechanics.

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HLW CONTRACT (TASK) OBJECTIVES

Technical/NRC Issues /Activities	Develop Licensing Capabilities	Review -DOE/EPA Programs	Understand Basic Phenomena- Limitation and Uncertainties in Data and Test Methods	Develop Generic Technical Positions
Retrieval		<p>B7328, RFP Provide multi disciplinary reviews of repository designs with emphasis on underground construction of structures, systems, and components important to safety.</p> <p>B7327, EI Provide in-depth evaluations of ventilation, waste handling, and backfill aspects necessary to meet retrieval requirements.</p>	<p>A0371, UNDES Determine the adequacy and reliability of in-situ tests, laboratory experiments, and numerical structural models which DOE will use to design the repository.</p>	<p>B7327, EI Provide input for T.P. on ventilation, waste handling and backfill aspects to meet retrieval requirements</p>

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HLW CONTRACT (TASK) OBJECTIVES

Technical/NRC Issues /Activities	Develop Licensing Capabilities	Review -DOE/EPA Programs	Understand Basic Phenomena- Limitation and Uncertainties in Data and Test Methods	Develop Generic Technical Positions
Repository Design	<p>B6985 (Task 1) Review models which deal with repository design.</p> <p>B6985 (Task 2) Identify codes which relate to design and should be benchmarked.</p> <p>B6985 (Task 3) Provide NRC with an independent method to compare model results for design and identify design benchmark problems.</p>	<p>B6934 (Task 1), BOM Review DOE Repository Design submittals and assess DOE design programs.</p> <p>B6934 (Task 3), BOM Assess DOE site testing and development of repository design.</p> <p>B6983 (Task 1), Golder Identification of factors that influence design. Specifically Domed salt and tuff</p> <p>B6983 (Task 6), Golder Provide letter reports on reviews of DOE repository designs and make visits to DOE sites proposed for characterization.</p>	<p>B6773, UNDES Assess effects produced by static and dynamic loads on media surrounding a repository. Evaluate impact of loading effects on design parameters.</p>	

HLW CONTRACT (TASK) OBJECTIVES

Technical/NRC Issues /Activities	Develop Licensing Capabilities	Review -DOE/EPA Programs	Understand Basic Phenomena- Limitation and Uncertainties in Data and Test Methods	Develop Generic Technical Positions
Repository Design (Con't)		B7327 (Task 1), EI Design parameters affecting design <ul style="list-style-type: none">• thermal loading• shape and SIZE OF ROOMS• type of rock• waste package design B7327 (Task 2), EI Participate in meetings and work shops to review technical reports related to design for retrievability B7328 (Task 1), RFP Review selected portions of DOE designs and reports related to design B7328 (Task 2), RFP Reviews, site visits and meetings to provide technical assistance on design.		

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HLW CONTRACT (TASK) OBJECTIVES

Technical/NRC Issues /Activities	Develop Licensing Capabilities	Review -DOE/EPA Programs	Understand Basic Phenomena- Limitation and Uncertainties in Data and Test Methods	Develop Generic Technical Positions
Engineered Barriers		<p>B6995 Task 1,RFP Review of International and National Programs on Sealing including placement techniques and seal test methods</p> <p>B6986 Task 1 Identified of Reference Repository</p> <p>B6986 Task 2 Lit. review of effects of repository design on performance of the underground facility and effects of one engineered barrier on another.</p> <p>B6986 Task 3 Identification of system of engineered barriers to be used in a modeling effort</p>	<p>B6627, UAZ Field studies, laboratory studies, comparison of field to laboratory results in sealing fractures in rock and boreholes, data analysis</p> <p>B8069 Performance of backfill materials</p>	<p>B6986, Task 4, Golder Input for T.P. on criteria for engineered barriers</p> <p>B6983, Task 5, Golder Input for T.P. on criteria for backfills</p> <p>B3109, LBL Provide input for T.P. on in-situ testing, geochemistry, engineered barriers, thermal and thermochemical aspects of repository design.</p>

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HLW CONTRACT (TASK) OBJECTIVES

Technical/NRC Issues /Activities	Develop Licensing Capabilities	Review -DOE/EPA Programs	Understand Basic Phenomena- Limitation and Uncertainties in Data and Test Methods	Develop Generic Technical Positions
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B6986 Task 4 and 5, Golden
Evaluation of results from
modeling of engineering barrier
system developed in Task 3

82/02/05

HLW CONTRACT (TASK) OBJECTIVES

Technical/NRC Issues /Activities	Develop Licensing Capabilities	Review -DOE/EPA Programs	Understand Basic Phenomena- Limitation and Uncertainties in Data and Test Methods	Develop Generic Technical Positions
Borehole and Shaft Seal		B6995 Task 1, RFD Lit. Review of International and National Programs on Sealing including placement techniques and seal test methods	B6627, UAZ Field studies, laboratory studies, comparison of field laboratory results in sealing fractures in rock and boreholes data analysis	B6995 Tasks 2,3,4, RFP provide input for T.P. on verification of borehole and shaft seals
		B6986 Task 2, Golden Lit review of effects of repository design on performance of the underground, and effects of one engineered barrier on another.	B7284 Performance assessment of seal performance and effects on repository integrity of seal failure.	B6986, Task 4, Golden Scenarios on engineered seals are one endpoint Provides input on T.P. for borehole and shaft seal criteria
		B6986 Task 3, Golden Identification of system of engineered barriers to be used in a modeling effort.		B6983, Task 3, Golden Provides input on T.P. for borehole and shaft seal criteria.
		B6983 Task 3, Golden Evaluation of shaft sinking techniques, Information will be used in determining the effects of shaft sinking on seals designs.		
		B6995 Task 4, RFP Review of DOE documents involving progression of repository sealing program		

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HLW CONTRACT (TASK) OBJECTIVES

Technical/NRC Issues /Activities	Develop Licensing Capabilities	Review -DOE/EPA Programs	Understand Basic Phenomena- Limitation and Uncertainties in Data and Test Methods	Develop Generic Technical Positions
Quality Assurance		B7328, RFP Review of quality assurance program for repository design	B7278 QA/QC of waste form and container. Control of design, research and development, construction, and reliability.	

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LISTING OF CONTRACT
DELIVERABLES

<u>CONTRACTOR FIN/TASK</u>	<u>DELIVERABLES</u>	<u>DUE DATE</u>
BOM B6932	Quarterly Reports } Annual Reports } Special study reports	Due by 30th of following month As Available
BOM B6934	Quarterly Reports Technical Reports Trip Reports	Due by 25th of following month As Available As Available
UNDES B7328	Task Orders	1982-1984
UNDES B6995/Task 1	Technical Evaluation of Reports and Studies Related to Borehole/ Shaft Sealing, Draft Rpt.	9/27/82
UNDES B6995/Task 1	Final Report on above topic	12/06/82
UNDES B6995/Task 2	Seal Performance Evaluation of DOE material and designs for sealing , Draft Rpt.	2/04/83
UNDES B6995/Task 2	Final Report on above topic	4/15/83
UNDES B6995/Task 3	Seal Performance Verification Program Report, Draft Rpt.	7/04/83
UNDES B6995/Task 3	Final Report on above topic	9/12/83
UNDES B6995/Task 4	Review of DOE sealing reports	As Requested
B6627	Quarterly Progress Reports	Sept. - Nov. Dec. - Feb. Mar. - May June - Aug.
	Annual Progress Reports	May
	Topical Reports	As Completed

<u>CONTRACTOR FIN/TASK</u>	<u>DELIVERABLES</u>	<u>DUE DATE</u>
Engrs. Int. B-7327/Task 1	Letter report recommending DOE conceptual designs for further evaluation under Task 1	3/26/82
	Draft Task 1 Report evaluating retrieval feasibility in DOE conceptual designs	1/26/83
	Final Task 1 Report	6/26/83
ASTM B-7115/Task 1	Report on in-situ measurement of rock elastic properties	Sept. 1982
ASTM B-7115/Task 2	Report on determining thermal conductivity of rock -	Sept. 1982
ASTM B-7115/Task 3	Report on tests for rock thermal expansion	Sept. 1982
ASTM B-7115/Task 4	Report on tests for rock time dependent deformation	Sept. 1982
ASTM B-7115/Task 5	Report on tests for rock bolts	Sept. 1982
AGAPITO B-1099/Tasks 1,2,3	Final Report on Monitoring	Delivered 12/81
GAI B-6986/Task 1	Draft report on reference repositories	7/13/82
	Final Task 1 Report	6/15/83
GAI B-6986/Task 2	Draft report on effect of repository design on performance of barriers	7/13/82
	Final Task 2 Report	6/15/83

<u>CONTRACTOR FIN/TASK</u>	<u>DELIVERABLES</u>	<u>DUE DATE</u>
GAI B-6986/Task 3	Draft report on system of engineered barriers	9/13/82
	Final Task 3 Report	6/15/83
GAI B-6986/Task 4	Draft report on evaluation of de- sign for barriers	4/13/83
	Final Task 4 Report	6/15/83
GAI B-6986/Task 5	Draft report on position evaluation and criteria develop- ment	4/83
	Final Task 5 Report	9/83
NAS B-7591	Final report on results of case studies	11/83
GAI B-6983/Task 1	Draft report on factors influencing design	2/82
	Final Report	3/82
GAI B-6983/Task 2	Draft report on large scale testing	2/82
	Final Report	3/82
GAI B-6983/Task 3	Draft report on shaft sinking	4/82
	Final Report	6/82
GAI B-6983/Task 4	Draft report on at-depth test facility	5/82
	Final Report	7/82
GAI B-6983/Task 5	Draft report on backfill placement	7/82
	Final Report	9/82
GAI B-6983/Task 6	Reports of technical reviews and trips	As Requested

CONTRACTOR
FIN/TASKDELIVERABLESDUE DATEUNDES
A-0371UNDES
B-6673UNDES
B-7062Contracts Have Not
Been AwardedUNDES
B-7284UNDES
B-8069