1564 General

Multiyear Work Element Plan

AL 3.5.4 JM Shallow-Land Burial Technology

(LS-2010A)

National Low-Level Waste Program

University of California

Los Alamos Scientific Laboratory

Life Sciences Division

Environmental Sciences Group, LS-6

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September, 1979

Prepared for

Department of Energy

Idaho Operations Office

Lead Field Office for Low-Level Waste Management

Under Contract W-7405-ENG-36

12150

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1. SUMMARY

Present shallow-land burial practices will probably have to be improved for continued operations. This task will identify improved barriers for use in an arid environment, evaluate the impact of initial waste properties on the performance of the barriers, and determine the cost-benefit of improved engineered barriers as a method to increase the containment capability of burial grounds.

2. INTRODUCTION

Existing shallow land burial practices for solid low-level waste are coming under increasing attack with the probable outcome that many changes will be required. At the same time, existing disposal facilities are approaching capacity or throughput limits. Recent attempts to increase disposal capacity have not been successful and this situation is quickly approaching a crisis. This situation leads to the conclusion that shallow land burial methods and technology must show improved capability. Studies recently released by NRC and EPA seem to be leading in this direction - to an eventual requirement that greater protection must be afforded to disposed low-level wastes, but the basis for specifying the amount of increased protection required is lacking.

3. GOALS AND OBJECTIVES

The goal of this activity is to specify practical improvements to the retention capability of shallow land burial facilities.

The major objectives are to: (1) identify and evaluate engineered barriers, (2) estimate the impact of different waste forms, (3) determine methods to evaluate performance, (4) demonstrate the validity of the engineering in the field, and (5) identify the additional cost incurred for additional time of containment.

4. SUB TASKS

a. Work Breakdown Structure (Table I).

b. Description of Subtasks

1. Improved Barriers

Natural barriers in an arid environment will be evaluated. Engineered barriers will be surveyed, evaluated, priced, and several of the most promising methods will be selected for further study.

2. Impacting Factors

Waste properties (pH, gas evolution rate, etc.) and natural phenomena (ultraviolet radiation, erosion, etc.) degrade the performance of the engineered barriers. A literature survey will be conducted to determine the results of past experiments and supplemental laboratory experiments will be performed where needed.

3. Migration Mechanisms

Physical, chemical, and hydrologic contaminant transport mechanisms are being evaluated under conditions of saturated and unsaturated water flow. This will be necessary for an understanding of how certain engineered and natural barriers are effective and how to develop monitoring techniques.

4. Monitoring Methods

Measurement of transport through unsaturated engineered barriers is difficult and uncertain. Instrumentation and techniques will have to be developed to measure barrier performance, especially if accurate long-range predictions are to be made.

5. Field Testing

An improved shallow land demonstration facility will be designed and the engineering designs will be field tested. Criteria for arid site disposal facilities will be developed.

Table I

Work Breakdown Structure

1. Improved Barriers
2. Impacting Factors
3. Migration Mechanisms
4. Monitoring Methods
5. Field Testing

Table II. Milestone Schedule

Work Activity	FY-79 1 2 3 4	FY-80 1 2 3 4	FY-81 1 2 3 4	FY-82	FY-83	FY-84	FY-85
1. Improved Barriers			1	2			
2. Impacting Factors			3	4			
3. Migration Mechanisms		5 6	7	8, 9 10		11	
4. Monitoring Methods			12	13			
5. Field Testing				14	15		

Table III

Milestone Number	Explanation of Milestones	Date
1.	Evaluation of manmade barriers by University of Texas subcontract and Los Alamos Engineer	(Oct., 1980)
2.	Further evaluation of engineered barriers and workshop on barriers and monitoring techniques	(Mar., 1982)
3.	Literature survey on the influence of waste materials and environmental factors on engineered barriers by University of Texas subcontract	(Oct., 1980)
4.	Experiments on barrier performance	(Mar., 1982)
5.	Counting facility and hyperpure germanium - lithium drifted germanium system on line	(Oct., 1979)
6.	Analysis of 1000 tuff samples collected under a previously-used liquid radioactive waste disposal bed	(Jun., 1980)
7.	Technology and modeling of water flow through unsaturated materials accomplished by University of Texas subcontract and Los Alamos hydrologist	(Mar., 1981)
8.	Completion of Los Alamos Laboratory studies on saturated and unsaturated flow of radioactive waste solutions in tuff	(Oct., 1981)
9.	Report on New Mexico States's laboratory studies on stable element solute retention by Los Alamos soils and tuff	(Oct., 1981)
10.	Models developed for radionuclide and stable element transport in soils and tuff with help of University of Texas and New Mexico State	(Mar., 1982)
11.	Field validation of transport models at Los Alamos	(Oct., 1983)
12.	Development of neutron activation tracers and field equipment for monitoring tracer migration	(Oct., 1980)
13.	Performance evaluation of neutron activation tracers and naturally-occurring elements as indicators of elemental transport in the field at Los Alamos	(Oct., 1981)
14.	Planning phase for setting up a shallow land burial demonstration facility with Los Alamos engineer and subcontract information	(Mar., 1982)
15.	Construction phase for demonstration facility	(Oct., 1982)
16.	Field evaluation of an experimentation with improved waste burial techniques	(Oct., 1985)

Table IV. Program Manpower Requirements

Research Activity	Fiscal Year (Manyears)													
	1979		1980		1981		1982		1983		1984		1985	
	S	O	S	O	S	O	S	O	S	O	S	O	S	O
1. Improved Barriers	0.1		0.1		0.1		0.1							
2. Impacting Factors	0.1		0.1		0.1		0.1							
3. Migration Mechanisms	1.0	2.6	0.8	2.1	0.7	2.1	0.4	1.1	1.0	1.1	1.0			
4. Monitoring Methods	1.2	1.0	1.0		1.1		1.0							
5. Field Testing	—	—	0.4	0.5	0.4	0.5	0.8	1.5	1.4	1.5	1.4	1.5	1.4	1.5
	2.4	3.6	2.4	2.6	2.4	2.6	2.4	2.6	2.4	2.6	2.4	1.5	1.4	1.5
	6.0		5.0		5.0		5.0		5.0		3.9		2.9	

Table V. Program Costs According to Work Breakdown Structure

Research Activity	Fiscal Year ($ 000)						
	1979	1980	1981	1982	1983	1984	1985
1. Improved Barriers	170	40	35	35			
2. Impacting Factors	100	40	45	45			
3. Migration Mechanisms	135	120	94	118	180	70	
4. Monitoring Methods	200	100	140	60			
5. Field Testing		100	114	200	310	200	200
	605	400	428	458	490	270	200

Table VI. Capital Equipment Requirements

Work Breakdown Sturcture Number	Equipment Item	Equipment Cost ($,000)
	FY 1979	
3, 4, 5	GeLi Detector	20
3, 4, 5	Intrinsic GeLi Detector	20
3, 4, 5	Automatic sample changer	10
	FY 1979 Subtotal	50
	FY 1980	
2, 3, 4, 5	Automated neutron moisture probe	50
3, 4, 5	Computer-based pulse height analyzer with associated electronics equipment	50
	FY 1980 Subtotal	100
	FY 1981	
2, 3, 4, 5	Automated neutron moisture probe	50
2, 3, 4, 5	Portable sonde (neutron activator-detector downhole monitoring system) with associated shielding and field wenching equipment	75
	FY 1981 Subtotal	125
	FY 1982	
2, 3, 4, 5	Portable field data acquisition system (Digital preprocessor, microcomputer, casette drive and associated software)	50
2, 3, 4, 5	Demonstration Facility Instrumentation (Pit covers and liners with associated water and neutron activation field detection equipment)	50
	FY 1982 Subtotal	100

Table VII

Subcontracts

Work Breakdown Structure Number	Purpose	Cost ($,000)
	FY-1979	
1.2.3.5	Univ. of Texas. Improvements to Shallow Land Burial	95
2.3.5	NM State, Solute Transport	62
		157
	FY-1980	
1.2.3.5	Univ. of Texas. Improvements to Shallow Land Burial	60
2.3.5	NM State, Solute Transport	50
		110
	FY-1981	
1.2.3.5	Univ. of Texas. Improvements to Shallow Land Burial	65
2.3.5	NM State, Solute Transport	54
		119
	FY-1982	
1.2.3.5	Univ. of Texas. Improvements to Shallow Land Burial	69
2.3.5	NM State, Solute Transport	58
		127

Table VIII

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TASK REQUIREMENTS FOR OPERATING EQUIPMENT COSTS AND OBLIGATIONS

CONTRACTOR NAME: Los Alamos Scientific Laboratory

BIN NUMBER	TASK NO.	REV. NO.	DATE PREPARED	CONTRACTOR NUMBER
			9/79	

	BY-2	BY-1 PRESIDENT'S	BY-1 REVISED	AUTHORIZED	BY-FY 1981
20. STAFFING *(in staff years)*					
a. SCIENTIFIC	2.4		2.4		2.6
b. OTHER DIRECT	3.6		2.6		3.5
c. TOTAL DIRECT	6.0		5.0		6.1
21. OBLIGATIONS AND COSTS *(in Thousands)*					
a. TOTAL COSTS	605		400		458
b. TOTAL OBLIGATIONS	605		400		458
22. EQUIPMENT *(in Thousands)*					
a. EQUIPMENT COSTS	50		100		125
b. EQUIPMENT OBLIGATIONS	50		100		125
23. OTHER COSTS *(specify)*					
a. GPP					350
b.					
c.					
d.					

24. OPTIONAL FIVE-YEAR PLAN *(in Thousands)* Constant BY dollars	BY +1	BY +2	BY +3	BY +4
a. TOTAL OPERATING COSTS	458	490	270	200
b. TOTAL OPERATING OBLIGATIONS	458	490	270	200
c. TOTAL EQUIPMENT COSTS	100	50		
d. TOTAL EQUIPMENT OBLIGATIONS	100	50		

25. MILESTONE SCHEDULE	PROPOSED SCHEDULE	AUTHORIZED SCHEDULE

ZBB Impact Statement

Minimum Level

At the minimum level, evaluation of improved barriers and evaluation of neutron activation tracers as indicators of transport will be delayed six months.

Current Level

At the current level, the evaluation of improved barriers and completion of the field testing will be delayed six months.

Table IX

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TASK REQUIREMENTS FOR OPERATING/EQUIPMENT COSTS AND OBLIGATIONS

CONTRACTOR NAME: Los Alamos Scientific Laboratory

BIN NUMBER	TASK NO.	REV. NO.	DATE PREPARED	CONTRACTOR NUMBER
			9/79	

20. STAFFING (in staff years)	BY-2 FY 1979	BY-1 BY 1980 PRESIDENT'S	BY-1 BY 1980 REVISED	BY FY 1981 Minimum	BY FY 1981 Current	BY FY 1981 Enhanced
a. SCIENTIFIC	2.4		2.4	2.4	2.5	2.6
b. OTHER DIRECT	3.6		2.6	3.6	3.3	3.5
c. TOTAL DIRECT	6.0		5.4	5.0	5.8	6.1
21. OBLIGATIONS AND COSTS (in Thousands)						
a. TOTAL COSTS	605		400	428	440	458
b. TOTAL OBLIGATIONS	605		400	428	440	458
22. EQUIPMENT (in Thousands)						
a. EQUIPMENT COSTS	50		100	125	125	125
b. EQUIPMENT OBLIGATIONS	50		100	125	125	125
23. OTHER COSTS (specify)						
a. GPP				350	350	350
b.						
c.						
d.						

24. OPTIONAL FIVE-YEAR PLAN (in Thousands) Constant BY dollars	BY +1	BY +2	BY +3	BY +4
a. TOTAL OPERATING COSTS	458	490	270	200
b. TOTAL OPERATING OBLIGATIONS	458	490	270	200
c. TOTAL EQUIPMENT COSTS	100	50		
d. TOTAL EQUIPMENT OBLIGATIONS	100	50		

25. MILESTONE SCHEDULE	PROPOSED SCHEDULE	AUTHORIZED SCHEDUL

Table X. Milestone Schedule (ZBB)

Work Activity	FY-79 1 2 3 4	FY-80 1 2 3 4	FY-81 1 2 3 4	FY-82	FY-83	FY-84	FY-85
1. Improved Barriers			1	2	M & C		
2. Impacting Factors			3	4	M & C		
3. Migration Mechanisms		5 6	7	8,9 10		11	
4. Monitoring Methods			12	13 M			
5. Field Testing				14	15		