

1/1/1978

January 1978 Monthly Report

for

LS-1418A  
Evaluation of TRU Contaminated Waste Burial Sites

LS-1518A  
LASL Radioactive Solid Waste Disposal Site Studies

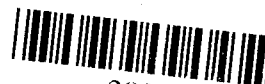
LS-2018A  
Radioactive Waste Burial Technology

A draft copy of the "Documentation of the Biological Transport Models" has been completed. The draft will be circulated for staff review, and if acceptable, published as a LA-MS series report. The model is written in a general form. With the appropriate weather, soils, and biological data base the model can be applied to other burial sites for investigation of the invasion of burial sites by plants and subsequent movement of radioactivity to the surface.

In the LASL waste burial areas the major plant invasions are expected to follow a succession of grasses to shrubs to pinyon-juniper or grasses to shrubs to ponderosa pine. The succession is illustrated in Figure 1 and predicted by the model. Grasses invade the covered waste pits early along with wild weeds, Russian thistle being the most abundant. Shrubs follow with a predicted maximum density after about 20 years. Pinyon-juniper invade slowly with the biomass finally exceeding the shrub biomass after approximately 20 years. As the pinyon-juniper biomass increases, the increased competition causes the grasses and shrub biomass to decrease with time. After 150 years the pinyon-juniper biomass has started to level and constitutes the major biomass present for cycling radionuclides out of the burial trenches back to the soil by dead biological materials.

A material inventory of Area C disposal shafts was completed. Shafts were inventoried and contents verified by cross checking Area C Shaft. Disposals compiled by burial ground operators with Laboratory Notebooks from Area C during the time in which the shafts were being used. All discrepancies between the operators compilation and the Notebooks were checked out by contacting persons directly involved with the disposal operation and/or persons with whom the wastes originated. When the discrepancies could not be resolved by this means the notebook entry was taken to be correct. This compilation will be published as Appendix H to LA-6848-MS, "History and Environmental Setting of LASL Near-Surface Land Disposal Facilities for Radioactive Wastes."

Gross- $\alpha$ , gross- $\beta$ , Cs-137, and total uranium results for surface soils at Area F are complete. Sources referenced in "History and Environmental



2892

0703  
TA-016

Setting of LASL Near-Surface Land Disposal Facilities for Radioactive Wastes" by Margaret Anne Rogers conflict in that some state that Area F has no radioactive waste while others claim the opposite. Gross- $\alpha$ , Cs-137, and total uranium results are all comparable to fallout levels for LASL on-site soils (see Figs. 2, 3, 4). However, gross- $\beta$  results from four soil samples were greater than background level plus three standard deviations; the values for these samples ranged from 9.2 to 22 pCi/g (Fig. 5). This seems to support the report of beta-emitters at Area F.

A paper titled "A Germanium Detector System for the Detection of Transuranics at Low-Activity Concentrations in Soil" was presented by L. West at the "Eleventh Midyear Topical Symposium of the Health Physics Society" on the subject of "Radiation Instrumentation," held in San Diego, California, during January 16-19. A copy of this paper (LA-UR-78-87) is attached. The most significant aspect of the paper is Table 1 where the detection limits for Pu and  $^{241}\text{Am}$  are listed for two different sample holders. The petri-dish sample holder (examined during recent weeks) allows a detection limit for plutonium of 3.6 pCi/g in a 4-hour counting time at the  $3\text{-}\sigma$  level. Another important aspect covered in the paper is how an increase in the detector Be window size leads to a cost-effective increase in the sensitivity of the detector.

A second paper, titled "Two New Portable Survey Instruments: The Field Phoswich Detector and the Wee Pee Wee" (LA-UR-78-48) was presented by J. Umbarger. The field phoswich detector described is the detector that H-8 has put to so much use during the past six months. The paper details the performance of the phoswich and compares it to a field FIDLER.

During January, plans were continued for an informal meeting of DOE contractors and staff to discuss Waste Burial Technology. The meeting is to be held during March 14 and 15 at the Hilton Inn at Santa Fe, New Mexico. Some of the topics to be discussed are burial practices, pathway analysis, design of monitoring systems, and design of a shallow land burial demonstration facility. The number of attendees is expected to be from 40 to 50 persons.

*M.A. Rogers*



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0818 TA-06

In reply refer to: LS6-79-141  
Mail stop: 495

December 19, 1979

Mr. John Peel  
Idaho Operations Office  
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Idaho Falls, ID 83404

Dear John:

Enclosed are the November 1979 Monthly Reports on those projects under your low-level waste program.

Sincerely,

*Jim*  
James G. Steger  
LS-6 Alternate Group Leader  
Environmental Science Group

JGS:tj

Enc: Monthly Report  
Distribution List

MONTHLY PROGRAMS REPORT

November 1979

AL 3.5.1  
Solid Radioactive Waste Disposal Studies

AL 3.5.4.  
Shallow Land Burial Technology

AL 3.10.1  
Alternative Systems Study

LOS ALAMOS SCIENTIFIC LABORATORY  
ENVIRONMENTAL SCIENCE GROUP LS-6

Work performed for

DIVISION OF WASTE MANAGEMENT  
US DEPARTMENT OF ENERGY

University of California



LOS ALAMOS SCIENTIFIC LABORATORY

## PROGRAM STATUS REPORT

Title Solid Radioactive Waste Disposal Studies BR&C NO.: AR-05-15-15

FO/Contractor: AL/LASL WEP NO.: AL 3.5.1

Manager: James G. Steger Annual Budget: \$300k

Principal Investigator: M. A. Rogers Date: December 19, 1979

Month Covered: November 1979

### Task Description:

The purpose of this task is to develop methods for environmental monitoring and surveillance of low-level waste disposal facilities. The approach taken will be to assess the migration of radionuclides from wastes buried during the last 35 years at LASL in order to determine waste/soil interactions and radionuclide movement in a semi-arid environment. Potentially significant pathways will be identified and modeled. A method of monitoring radionuclide movement along these pathways will be developed along with identifying the constraints that must be imposed upon disposal site operating practices and waste forms.

### Highlights and Significant Accomplishments

As a result of our assessment of the geological suitability of the new disposal pit (Pit 25) in Area G for the Waste Management Group (H-7), it has been decided that a committee should be formed and the Guidelines for Construction and Use of Solid Waste Disposal Facilities be rewritten. The present guidelines in some areas are too indefinite to be used for decision making.

We assisted H-7 in an experiment to use a bentonite slurry to seal cracks in the sidewalls of the disposal pits. The results were negative as the bentonite shrunk upon drying and fell out of the cracks.

An analysis of the Th/U ratios from outcrops across the plateau and from nine core samples taken from beneath Pit 3, Area G, suggest that there may be a slight redistribution of these elements. This may be due, in part, to water movement through the tuff over geologic time. The occurrence of El Cajete pumice in some

of the canyons indicates that we may be talking about 40,000 to 50,000 years. We must emphasize that any movement indicated is very slow and concerns only natural constituents in the tuff. It seems probable from the data that there is some redistribution of U and Th but how much, how fast, or even what direction cannot be resolved with the data at hand. More data are needed for verification. Additional samples can be obtained from drilling programs already underway.

A moisture distribution study, aimed at quantifying the net downward movement of water from the surface in the partially saturated zone, was begun to complete the hydrological characterization of the disposal sites.

Two moisture access holes were drilled this month in support of the planned study, one at Area F, near TA-6, and the other along Pajarito Road, west of TA-51. The former hole bottomed at 70 feet on a hard, presumably welded tuff zone; the latter bottomed at 182 feet due principally to depth limitations on the drill rig. Samples from the holes were analyzed for moisture content, and made available to Barry Burton for trace element analysis. More holes are planned for December.

Access holes around shaft #150, Area G, were logged for moisture. Values varied from a low of 2.3 at depths in excess of 50 feet, to high values of 12.5 near the surface, with an overall average of about 4%. These data will be used, in conjunction with measurements of tritium concentrations, to evaluate the effectiveness of modified packaging procedures applied to the waste disposed to the shaft. Preliminary analysis suggests that no substantial improvement was obtained over containment provided by previous procedures.

#### Budget Variance Analysis

None

#### Milestone Variance Analysis

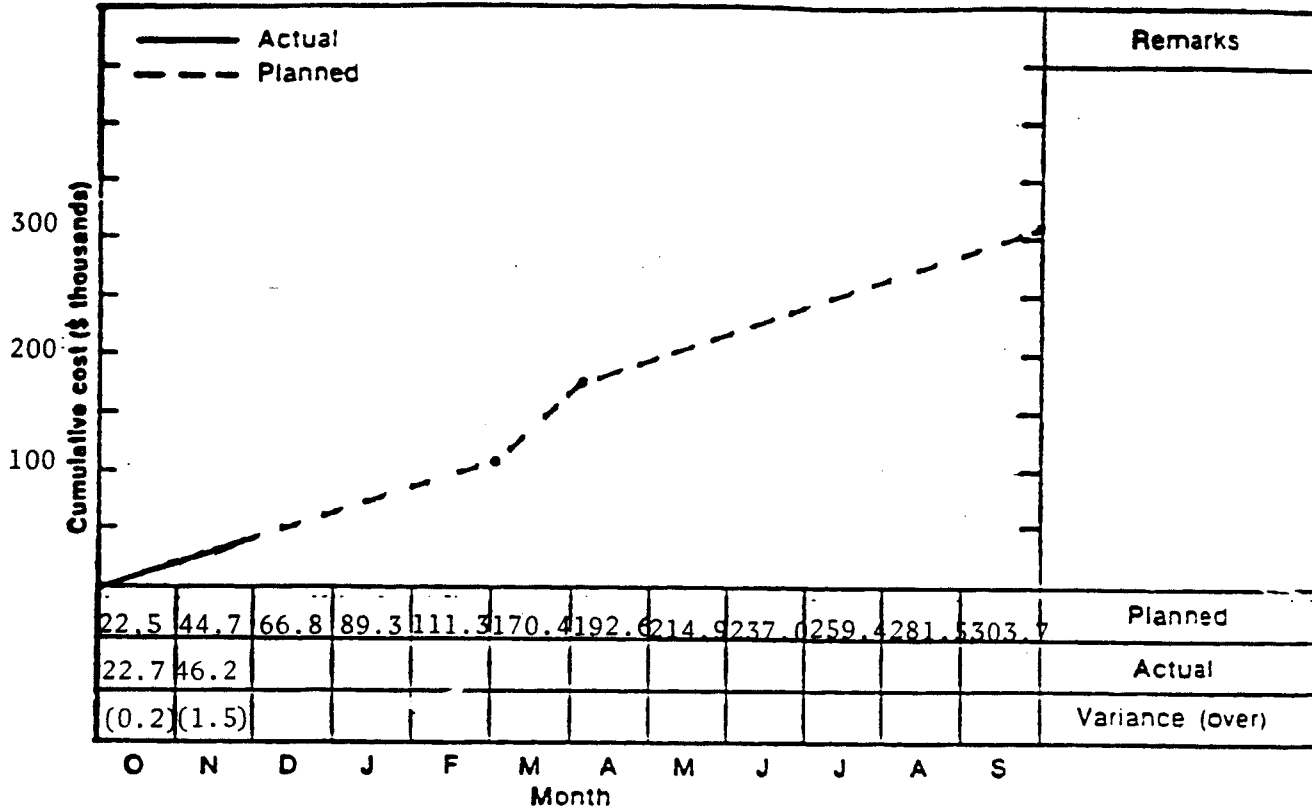
None

#### Problems and Issues

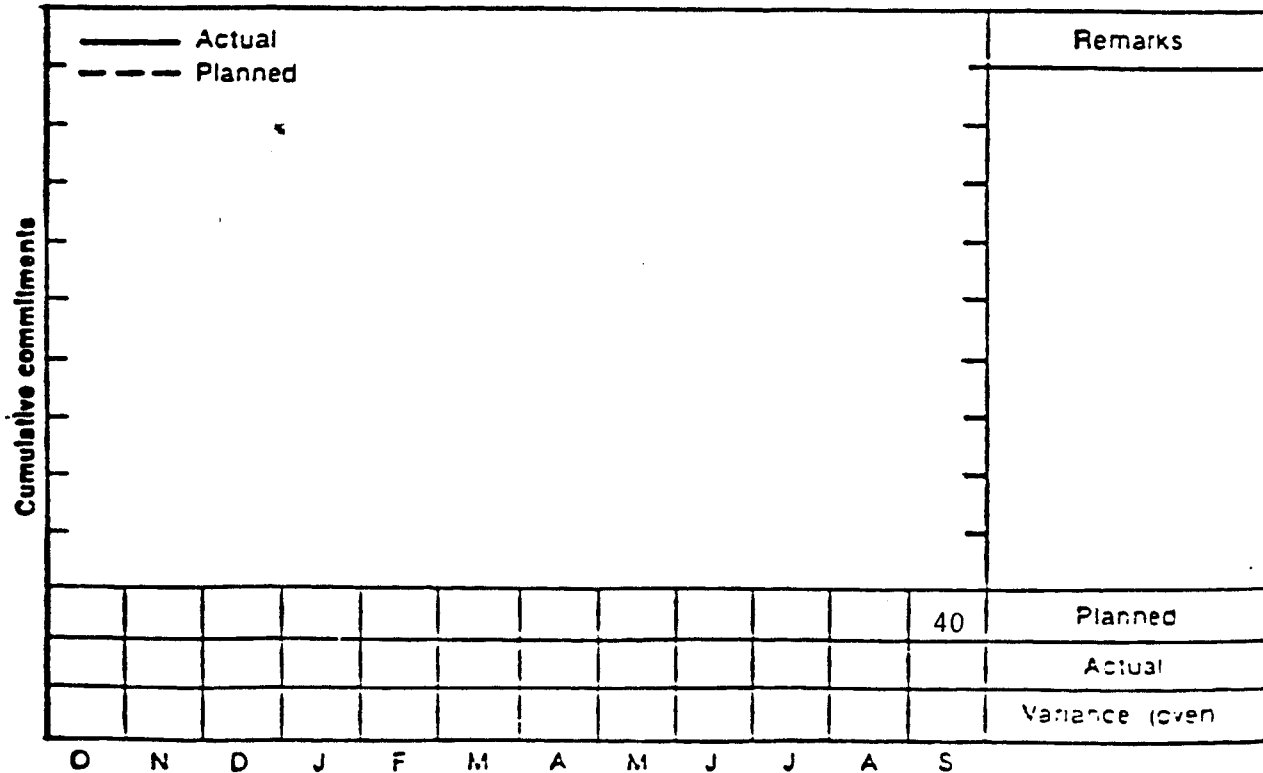
None

Title Solid Radioactive Waste Disposal Studies B&RC No. AR-05-15-15  
 FO/Contractor: AL/LASL FY 80 WEP No. AL-3.5.1

Operating Dollars in Thousands (BO)



Capital Equipment Dollars in Thousands (BA)



### Milestone Schedule

Level	Milestone No.	Milestone	FY. 80												FY. 81				
			O	N	D	J	F	M	A	M	J	J	A	S	10	20	30	40	
3	1.1	Summary Report on Source Term			+														
3	1.2	Field Sampling Completed																	
3	2.1A	Summary Report on Hydrology																	
3	2.1B	Summary Report on Geology																	
3	2.2A	Feasibility of Coupling PNL/LASL Surface Models Determined																	
3	2.2B	PNL/LASL Surface Models for TRU Adopted to LLW																	

Solid Radioactive Waste Disposal Studies

BCRC No. AR-05-15-15  
WEP No. 3.5.1

- Level 0 - Department-Controlled Milestone
- Level 1 - E1W - Controlled Milestone
- Level 2 - E1W P - Controlled Milestone
- △ Level 3 - Lead Field Office - Controlled Milestone
- ▽ Level 4 - Other Milestones and/or Intermediate Event

- ◇ Scheduled Deviation for ☆ or △
- Activity Line
- ↓ Time Now



## PROGRAM STATUS REPORT

Title Shallow Land Burial Technology BR&C NO.: AR-05-15-15  
FO/Contractor: AL/LASL WEP NO.: AL 3.5.4  
Manager: James G. Steger Annual Budget: \$400k  
Principal Investigator: John W. Nyhan Date: December 19, 1979  
Month Covered: November 1979

### Task Description:

To improve the technology related to the shallow land burial of radioactive waste by examining radionuclide mobilization and migration mechanisms, by developing monitoring techniques around burial sites, by developing engineering methods to improve waste containment, and by the construction of a waste burial demonstration facility.

### Highlights/Significant Accomplishments:

We have continued to process a group of 800 tuff samples collected under an old liquid waste disposal pit at LASL in an effort to examine radionuclide mobilization/migration mechanisms. About 200 of these samples are currently ready to be assayed for transuranics and fission products previously added to these pits using TASS, the automated radionuclide assay system, we have developed during FY78 and FY79.

Several significant accomplishments were made in the area of instrumentation development supporting potential monitoring capabilities. The computer software for automatic multisample soil assay was found to contain two "bugs" which did not become apparent until actual runs of unknown samples were made. These had to do with apparent negative amounts of Pu and negative background counts resulting from the background subtraction algorithm used on spectra with low count rates. It has also been decided to relax the original approximation of uniform sample weight and to modify the software to require the user to enter the weight of each sample on the computer terminal. Prolonged real-time use of the sample changer portion of

the assay system demonstrated that there was enough backlash in the drive motor's gear box to permit an error in sample changing if the sample wheel was out-of-balance; fortunately, this problem was circumvented by a change in the timing of the electronic signals controlling the changer. The calibration of the system for <sup>239</sup>Pu exhibited the same anomalies described in the August, 1979, report. The problem may be a.) inhomogeneity of the radionuclide in the calibration standards, b.) involve the solubility of the Pu salt in the solutions used to make the standards, or c.) both; tests of these hypotheses are currently in progress.

A Request for Proposal (RFP) has been written for the down-hole plutonium mimic experiments described in the October monthly report. This RFP was submitted to LASL Purchasing for distribution to several commercial vendors that perform in situ measurements down-hole for selected elements. Vanadium will be used as the nonradioactive soil "spike" to simulate plutonium migration through tuff at LASL. A copy of the RFP description is attached.

LASL personnel were also involved in trying to set up and evaluate university contracts, writing a publication describing the new automated radionuclide assay system, and trying to fill the engineer position in the project.

Budget Variance Analysis:

None

Milestone Variance Analysis:

None

Problems and Issues:

Delays (from outside of LASL) in finding out what funding levels this project would receive in FY80 have (1) caused a delay in hiring the engineer to be used in designing the waste burial demonstration facility, and (2) resulted in a temporary termination of our university subcontract research.

## REQUEST FOR PROPOSAL: IN-SITU PLUTONIUM MIMIC MEASUREMENTS

As part of LASL studies involving migration of selected transuranic (TRU) nuclides through soils and rock (primarily Pu), an in-situ measurement system is desired to quantify TRU migration values. For the initial studies, appropriate TRU mimics, or non-radioactive "act-alikes" as far as migration values are concerned, will be used in soil test beds at Los Alamos. The beds will be large enough to provide for several vertical drill holes from the surface to allow for in-situ downhole measurements. The beds will be artificially weathered, as appropriate, to simulate accelerated L.A. weather conditions. Sufficient mimic materials will be used at the start of the experiment to assure, hopefully, positive counting results by the end of the experimental period (1-2 years).

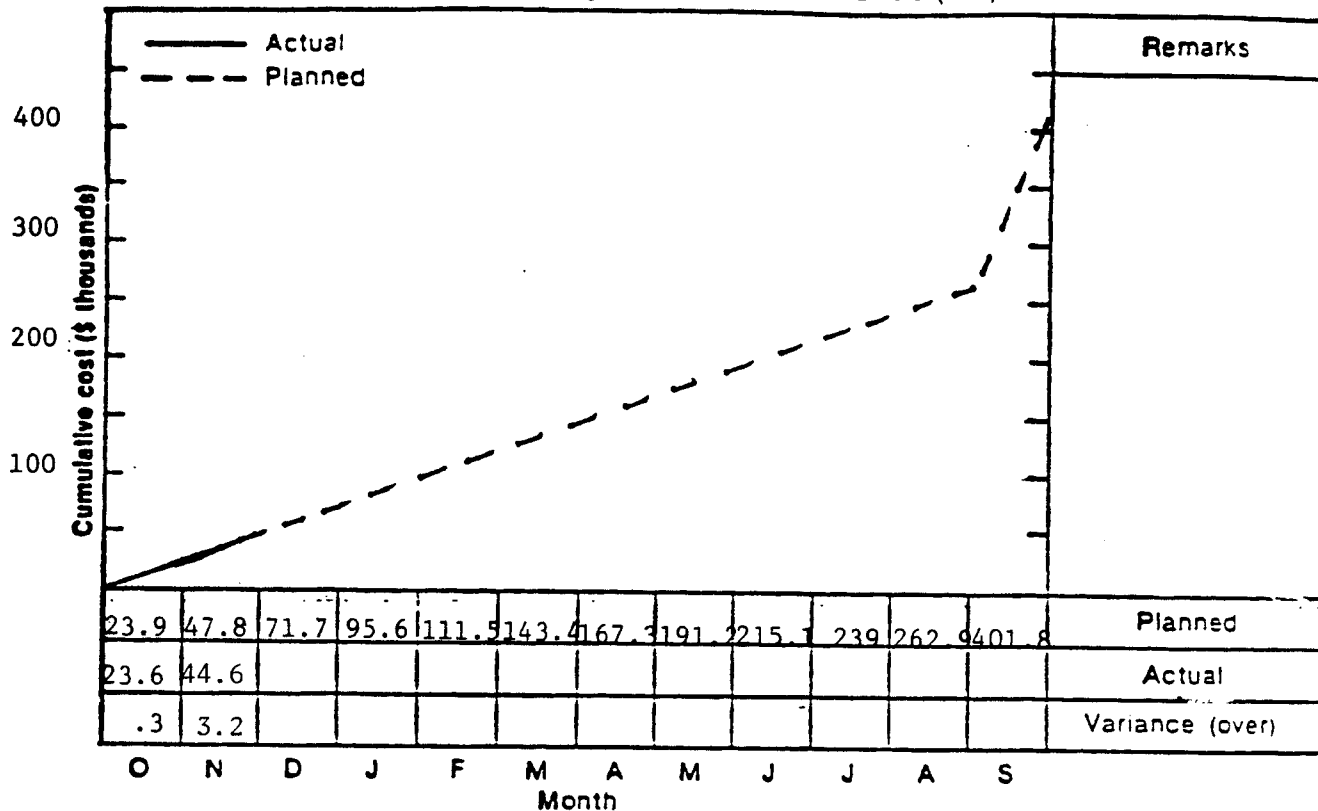
Rather than purchase or build such in-situ monitoring equipment, LASL proposes to lease the necessary equipment and staff from a vendor on an "as used" basis. Initial measurement for background purposes will be made by the vendor prior to the addition of the mimics and accelerated weather conditions. Thereafter, on a periodic basis (approximately every 3 months), the equipment would be brought back to LASL by the vendor for several days of downhole measurements. This schedule would continue for the next 1-1/2 - 2 years as appropriate.

The plutonium mimic of choice would be Vanadium (V) which has a good neutron activation cross section, short half-life, and high intensity, high energy gamma rays. Any proposal from a vendor would include their experience in this or similar measurements and their sensitivity for reliable V measurements in soils (in-situ). Lease costs would be calculated on a per use basis. All analysis would be performed by the vendor and provided to LASL within two weeks of each measurement session.

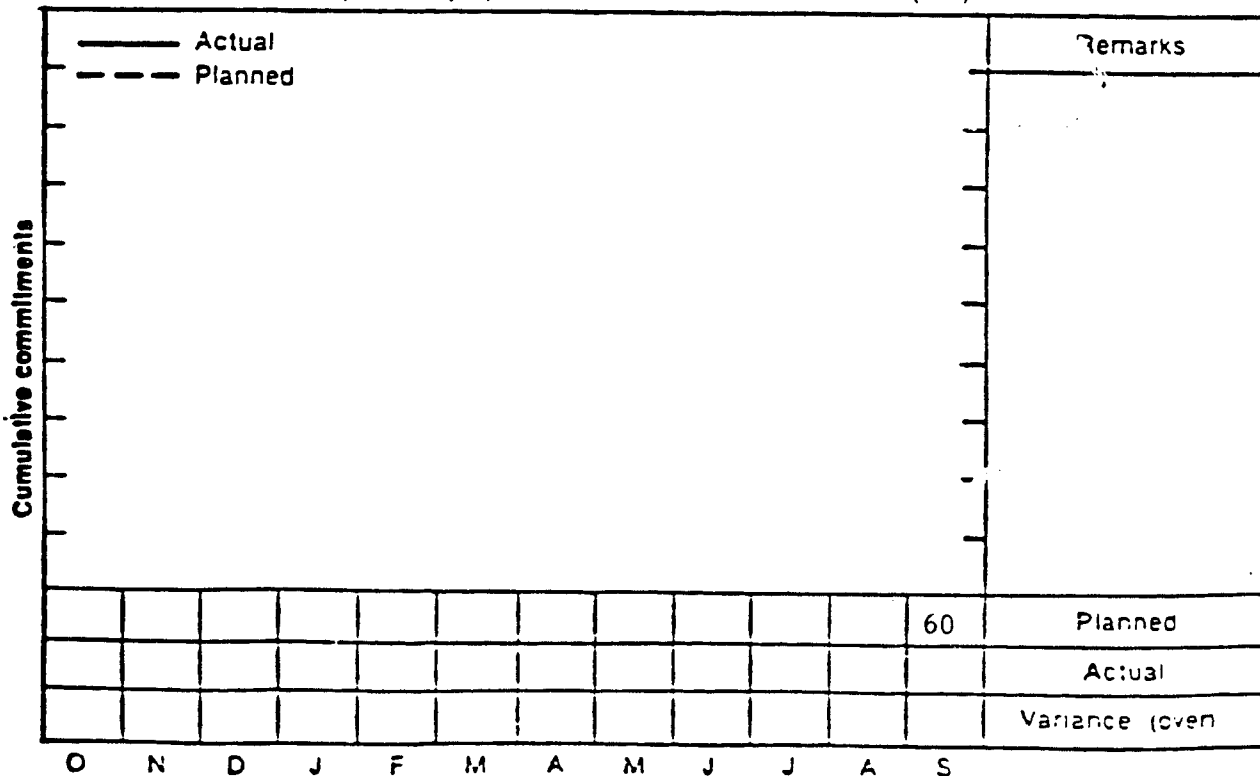
Any suggestions by the vendor on measurement technique and interpretation considerations are welcome. The vendors will be carefully considered on the basis of capability, availability of equipment for the scheduled measurements, previous experience in such measurements, and cost.

Title Shallow Land Burial Technology B&RC No. AR-05-15-15  
 FO/Contractor: AL/LASL FY 80 WEP No. AL 3.5.4

**Operating Dollars in Thousands (BO)**



**Capital Equipment Dollars in Thousands (BA)**



### Milestone Schedule

Level	Milestone No.	Milestone	FY. 80												FY. 81			
			O	N	D	J	F	M	A	M	J	J	A	S	1Q	2Q	3Q	4Q
	1	Evaluation of manmade barriers.			↓									△				
	3	Literature survey on influence of waste materials & environmental factors on engineered barriers.													△			
	6	Analysis of tuff samples collected under a previously-used liquid radioactive waste disposal bed.												△				
	7	Technology & modeling of water flow through unsaturated materials.																△
	8	Completion of LASL lab studies on saturated and unsaturated flow of radioactive waste solutions in tuff.																△
	9	Report on NMSU lab studies on stable element solute retention by soils & tuff.																△
	12	Development of neutron activation tracers & field equipment for monitoring tracer migration.													△			

- ☆ Level 0 - Department-Controlled Milestone
- ☆ Level 1 - ETW - Controlled Milestone
- ☆ Level 2 - ETW P - Controlled Milestone
- △ Level 3 - Lead Field Office - Controlled Milestone
- ▽ Level 4 - Other Milestones and/or Intermediate Event

- ◇— Scheduled Deviation for ☆ or △
- Activity Line
- ↓ Time Now

WEP No. \_\_\_\_\_  
 Shallow Land Burial Technology  
 B&RC No. \_\_\_\_\_  
 WEP No. AL 3.5.4  
 05-15-15

PROGRAM STATUS REPORT

Title Alternative Systems Study BR&C NO.: AR-05-15-15  
FO/Contractor: AL/LASL WEP NO.: AL 3.10.1  
Manager: James G. Steger Annual Budget: \$300k  
Principal Investigator: Merlin Wheeler Date: December 19, 1979  
Month Covered: November 1979

Task Description:

The overall goals of the proposed work are to gather information pertinent to analyzing Alternative Disposal Methods and to generate a management plan for a program to evaluate selected alternatives to shallow land burial for the disposal of low level radioactive waste. The work will be structured so as to take maximum advantage of all applicable ongoing and proposed work within DOE and other organizations. In particular, close cooperation will be sought between this work and the High Level Waste disposal work coordinated by ONWI.

Highlights/Significant Accomplishments:

The fundamentals of a contract with the University of Arizona were established, detailing the work that will be done this fiscal year. The work began by selecting the generic alternatives to shallow land burial that will be dealt with; intermediate depth burial, engineered structures above or below grade, mined cavity disposal, injection to wells or shafts, and ocean disposal<sup>1</sup>. The University is assembling information from existing literature to develop generic descriptions for some of these; others are being covered by LASL.

A portion of the contract with U of A involves interaction with ONWI to establish the applicability of work in high level disposal to the alternatives project. Discussions were held with researchers from U of A and officials from ONWI on two separate occasions during the month. An initial list of pertinent literature was provided by ONWI, and the details of further information flow were established.

Budget Variance Analysis:

None

Milestone Variance Analysis:

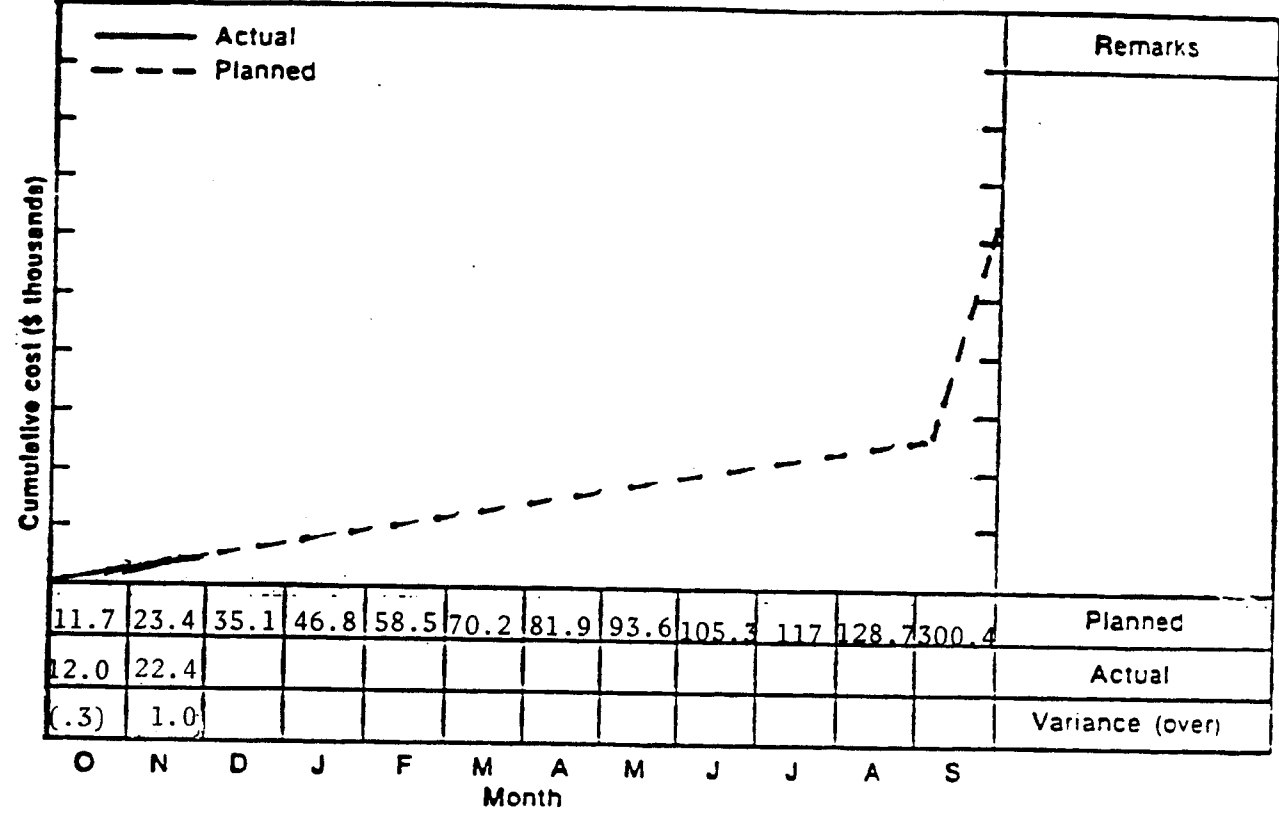
None

Problems and Issues:

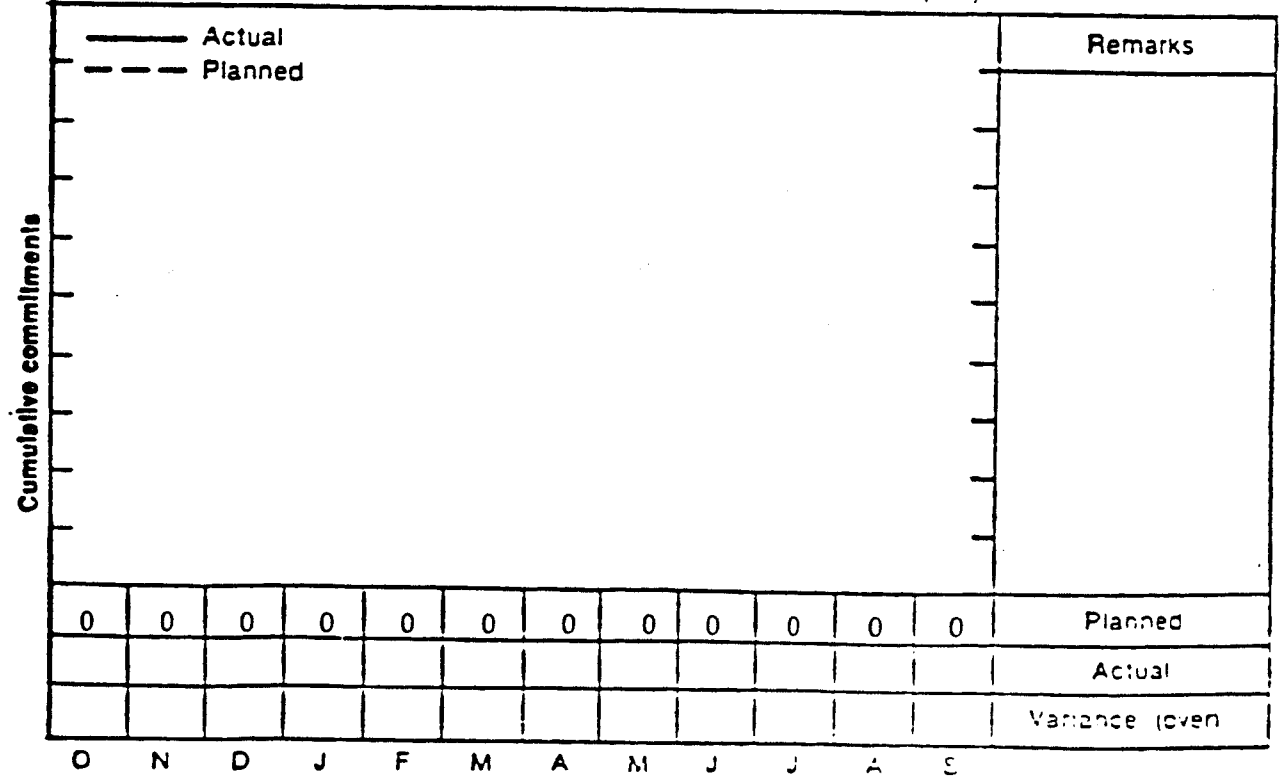
None

Title Alternative Systems Study E&RC No. AR-05-15-15  
 FO/Contractor: AL/LASL FY 80 WEP No. AL 3.10.1

Operating Dollars in Thousands (BO)



Capital Equipment Dollars in Thousands (BA)



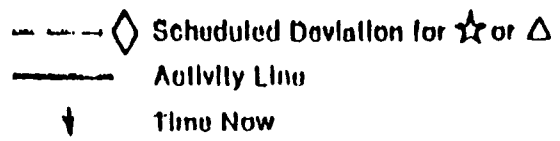


# Milestone Schedule

WEP Line:            Alternative System:            July             
 EFC No.:            05-15-15  
 WEP No.:            AL 3.10.1

Level	Milestone No.	Milestone	FY. 80												FY. 81				
			O	N	D	J	F	M	A	M	J	J	A	S	1Q	2Q	3Q	4Q	
3	1.	Input waste characterized			↓				△										
3	2.	Alternative Options Catalogued								▲									
3	3.	Report on assessment of technical issues												▲					
3	4.	Issue Development Plan															△		

- Level 0 - Department Controlled Milestone
- Level 1 - ETW - Controlled Milestone
- Level 2 - ETW P - Controlled Milestone
- △ Level 3 - Lead Field Office - Controlled Milestone
- ▽ Level 4 - Other Milestones and/or Intermediate Event



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