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Los Alamos National Laboratory

ENVIRONMENTAL RESTORATION

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Date: April 21, 1995
Refer to: EM/ER:95-160

Mr. William Honker
RCRA Permits Branch
Hazardous Waste Management Division
U.S. Environmental Protection Agency
1445Ross Avenue, Suite 1200
Dallas, TX 75202-2733

Dear Mr. Honker:

SUBJECT: REQUEST FOR PERMIT MODIFICATION

Los Alamos National Laboratory (Laboratory) is requesting a Class III permit modification per 40 CFR 270.42(c). This request, if approved, will allow the Laboratory to implement expedited cleanups (ECs) for four solid waste management units (SWMUs) that will constitute a final remedy for the SWMUs. This EC process was developed and discussed within the Accelerated Cleanup Process Policy Paper previously sent to your office.

The cleanup remedy identified for these SWMUs is apparent and readily implementable. Therefore, the Laboratory wishes to proceed with a proactive approach for the cleanup of the sites in the near future rather than delaying the cleanup due to the lengthy corrective action process. Upon completion of the expedited cleanup, the Laboratory will submit a summarization of data and verification statements assuring that the plan has been implemented and the SWMUs have been cleaned up. The SWMUs can then be removed from Module VIII.

Enclosed please find three EC plans addressing these four SWMUs. Barbara Driscoll, of your staff, has reviewed these EC plans in draft. Her comments have been addressed.

Public notice of this activity is anticipated to be published on April 24, 1995, and the public meeting is scheduled for May 9, 1995. Notices will be sent to all persons on the facility mailing list, which will contain at a minimum, all information as prescribed in 40 CFR 270.42. Comments received from the public meetings and other comments received as a result of public review of these plans will be forwarded to your office. When our public notices are published, copies of the articles will also be provided to your office. Upon addressing any potential concerns or problems received from public input, it is understood that your office will grant Temporary Authorization to proceed with the field work.

Received by ER-RPF
APR 27 1995

Should you have any questions pertaining to this request, please contact David McInroy or Court Pesmire of our staffs. They can be reached at 505-667-0819 and 505-665-4718, respectively.

Sincerely,

Jorg Jansen, Project Manager
Environmental Restoration

Sincerely,

Theodore J. Taylor, Program Manager
Los Alamos Area Office

JJ/TT/rfr

Enclosures: Three EC Plans

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N. Weber, Bureau Chief, AIP, NMED

CERTIFICATION

I certify under penalty of law that these documents and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violation.

Document Title:

Class III Permit Modification for Expedited Cleanup Plans for SWMUs 8-003(a); 18-001(b); 48-002(a); 48-002(b)

Name: _____ Date: April 25, 1995

Dennis J. Erickson, Director
Environmental, Safety, and Health Division
Los Alamos National Laboratory

Name: _____ Date: April 25, 1995

Joseph Vozella,
Acting Assistant Area Manager of
Environment Projects
Environment, Safety, and Health Branch
DOE-Los Alamos Area Office

or

Theodore J. Taylor
Program Manager
Environment Restoration Program
DOE-Los Alamos Area Office

Los Alamos

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INTERNAL/EXTERNAL DOCUMENT APPROVAL

NOTE: Please furnish CRMO with two copies of this form. An approved copy will be returned to the originating office.

Please contact Arlene Merayo immediately after signature for pick up at 5-4557

Document Date: April 21, 1995

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Document Identification: EM/ER:95-160

	MAIL STOP	AUTHORIZING OFFICIAL	SIGNATURE	APPROVE YES	APPROVE NO	DATE SENT
1	M992	Dave McInroy		✓		4/21/95
2	M992	Jorg Jansen, Project Manager		✓		4/21/95
3	K498	Other: Pat Shanley		✓		4/21/95
4	A183	Legal Counsel: Joe Rochelle		✓		4/21/95
5	J591	EM Program Director: Tom Baca		✓		4/25/95
6	K491	ESH Division Director: Dennis Erickson		✓		4/24/95
7	A316	LAAO: Court Fearmire		✓		4/25/95
8	A316	LAAO: Ted Taylor		✓		4/25/95

*Reason(s) for disapproval

Recommendation: Please approve and sign letter.

Form Number CRM-35 (9/93)
ST-2042

4/EFM form

Los Alamos National Laboratory

Environmental Restoration Project

EXPEDITED CLEANUP PLAN

for

SOLID WASTE MANAGEMENT UNIT 18-001(b)

April 1995
Revision 1

Environmental
Restoration

Approvals and Reviews

This document is based on the most current information available at the time of preparation. In the event changes or modifications are required from those proposed, modifications will be made to incorporate any and all revisions. Subsequent reviews and approvals, consistent with those provided for in this revision, will be required. This document has been reviewed for content and approved as reflected by the signatures below:

Document Approved By:

Gene Gold, Field Project Leader

4/24/95
Date

ACRONYMS

AOC	area of concern
AP	Administrative Procedure
CEARP	Comprehensive Environmental Assessment and Response Program
COC	contaminant of concern
CST	Chemical Science and Technology (Division)
CST-3	Analytical Services (Group)
DOE	U.S. Department of Energy
DU	depleted uranium
EC	expedited cleanup
EPA	U.S. Environmental Protection Agency
ER	Environmental Restoration
FPL	Field Project Leader
FTL	Field Team Leader
HSWA	Hazardous and Solid Waste Amendments
LANL, the Laboratory	Los Alamos National Laboratory
PCOC	potential contaminant of concern
PPE	personal protective equipment
PRS	potential release site
RCRA	Resource Conservation and Recovery Act
RFI	RCRA Facility Investigation
SAL	screening action level
SOP	Standard Operating Procedure
SSHASP	Site-Specific Health and Safety Plan
SVOC	semivolatile organic compound
SWMU	solid waste management unit
TA	Technical Area
VOC	volatile organic compound

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1.0 INTRODUCTION

This Expedited Cleanup (EC) Plan is for Solid Waste Management Unit (SWMU) 18-001 (b), located within the central portion of the Los Alamos National Laboratory (the Laboratory), Los Alamos, New Mexico (Figure 1-1). This EC Plan is being proposed as a part of the Resource Conservation and Recovery Act (RCRA) Facility Investigation (RFI) process described in the Operable Unit 1093 RFI Work Plan (LANL 1993, 1065) and the subsequent RFI Report for Operable Unit 1093, Potential Release Sites 18-001 (a), (b), (c); 18-007, 27-001, 27-003 (LANL 1995).

SWMU 18-001 (b) is included in Table A of the Hazardous and Solid Waste Amendments (HSWA) permit.

SWMU 18-001(b) consists of an inactive sewer line and eleven manholes. Associated with this waste line are two septic lagoons [SWMU 18-001(a)] and a single effluent outfall. The sanitary sewer line, lagoons and outfall constitute a single septic system which was in use from 1969 to 1992. Analytical results from the 1994 RFI sampling effort of the septic system were compared to conservative residential use screening action levels (SAL) to assess the potential risk posed by SWMU 18-001(a) and (b) to human health and the environment. These results indicate constituents detected within the associated lagoons were below SALs while analytes detected in the manholes were slightly above SALs. This EC plan proposes the decommissioning in place of SWMU 18-001(b), stabilization of the remaining manhole sediments to eliminate the potential risk. Because of potential for mixed waste exists, demolition and removal of the manholes and associated drain lines would prove a complex and costly option, without providing significant additional reduction in risk to human health and the environment.

SWMU 18-001(a), the lagoons and associated outfall, are addressed in the RFI report referenced above.

This EC Plan identifies the level of effort required from initial transmittal of the plan to EPA for review, through implementation, to the completion of the final project report. In the development of this EC Plan, the following assumptions are made:

Future land use at the location of this SWMU will continue to be for industrial purposes.

Minimal delays to EC operations will be experienced as a result of inclement weather and site access delays. Delays that result from the acquisition and scheduling of heavy equipment and from accepting waste at permitted disposal facilities cannot be anticipated and therefore are not considered within this plan.

The Health and Safety Plan will be developed specifically to address COCs in this EC Plan. Deviations from these anticipated concentrations of contaminants of concern may necessitate adjustments to both plans.

Any comments generated by agencies for public review may necessitate adjustments to the scope of this EC plan.

2.0 SITE BACKGROUND AND ENVIRONMENTAL SETTING

2.1 Detailed Description of SWMU 18-001(b)

2.1.1 Operational History and System Description

SWMU 18-001(a) and (b) constitute a single sanitary waste system. SWMU 18-001(a) is comprised of two sanitary sewage lagoons. SWMU 18-001(b) consists of the associated sewer line and manholes (Figure 2-1). The system was placed in service in 1969 and remained active through the fall of 1992. During this period, the sanitary sewer system served Technical Area (TA)-18, excluding Kivas 1, 2, and 3, which are served by individual septic systems.

SWMU 18-001(b), the inactive sewer line, runs parallel to Pajarito Road. The line is buried approximately 5 ft to 6 ft below ground surface (bgs) and is constructed of vitrified clay pipe. The pipe is broken and cracked in places, allowing shallow alluvial groundwater to infiltrate the sewer line between the source buildings and the lagoons. Eleven manholes (TA 18-160,-161, and -169 through -177[1]) are associated with the inactive portion of the sewer line. The manholes consist of a 3-ft diameter concrete culvert pipe positioned vertically so that the manhole opening is approximately 1 ft above ground while the base extends to approximately 5 to 6 ft below ground surface. The base of each manhole is lined with concrete. Inlet and outlet ports from the clay sewer pipe are located at the invert elevation (bottom) of each manhole. SWMU 18-001(b) emptied into the two adjoining lagoons.

2.1.2 Physical Setting

The former sanitary sewer system lies entirely on U.S. Department of Energy (DOE)-owned land on the relatively flat Pajarito Canyon floor. The residential community of White Rock lies to the east. Pajarito Road (a public-access road) is immediately adjacent to SWMU 18-001 (b).

The prevalent soil type in the canyon bottom is the well-drained, alluvial-derived soils of the Totavi series. Alluvial channel-fill deposits consist of sandy clays, clayey sands, and cobbles. These deposits are approximately 35 ft thick in the eastern portion of TA-18 where the lagoons are located. Pleistocene ash flows of the Bandelier tuff directly underlie the soil and alluvial channel-fill deposits.

Stream flow in the eastern section of Pajarito Canyon is ephemeral. A significant volume of surface flow in the form of stream and surface water runoff recharges an unconfined, perched groundwater body in the channel-fill alluvium. The shallow groundwater is confined to the canyon alluvium extending from the top of the Bandelier tuff to near ground surface. Thickness of the saturated zone varies seasonally. The perched aquifer is believed to not be hydraulically connected with the regional groundwater system. The main aquifer is located approximately 300 ft below the perched alluvial groundwater.

[1] Note, as shown in Figure 2-1, the manhole numbers jump from MH-161 to MH-169.

2.2 Summary of Previous Investigations

2.2.1 Investigations Prior to RFI

A review of past operations in buildings served by the sanitary sewer system led to the development of a list of potential contaminants of concern (PCOC), including uranium, undifferentiated solvents, beryllium and other metals, and undifferentiated semivolatile organics. No information is available regarding any sampling efforts of SWMU 18-001(b) prior to the RFI. However, on April 13 and 14, 1988, SWMU 18-001(a), the associated sanitary lagoons, were sampled and analyzed for volatile organic compounds (VOC) and semi-volatile organic compounds(SVOC). Twelve lagoon samples of each category were taken; only the liquid was sampled, not the sludge. The results of the analysis indicate that all constituents were below detection limits (30 ppb for VOCs and 20 ppb for SVOCs) (Sutcliffe 1988,16-0031).

2.2.2 RFI Investigation

During September and October 1993, multimedia samples were collected from SWMU 18-001(b), to ascertain the potential effect of the inactive sewer system on public health and the environment. The results of the investigation were presented in the RFI Report for Operable Unit 1093 (LANL 1995). A summary of the sampling effort for SWMU 18-001 (b) is described below. An evaluation of the results follows the sampling discussion.

SWMU 18-001(b), the inactive sewer line, includes 11 manholes, which serve as catchments for sediments and fluids moving through the sewer line. These manholes provided ease of access to the sewer line for sampling purposes. Samples collected from the manholes are believed to be indicative of the entire sewer line.

Either sediment or water samples were collected from Manholes 160, 169, 170, 173, 175, 176, and 177 (Figure 2-1). There was no manhole in which both water and sediment samples were present in sufficient quantities to allow sampling of both media. Furthermore, collection of sediment samples generally required the removal of nearly all the sediment in a manhole. No more than 0.5l of sediment remain in any manhole.

Water was flowing in small quantities in some manholes. This water is the result of infiltration of shallow groundwater into the manholes or connecting sewer line. The outflow from Manhole 177, which is immediately upstream of the lagoon, was plugged when the line was taken out of service to prevent this water from entering the lagoons. Thus, at the time of sample collection, Manhole 177 had accumulated water to a depth of approximately 30 in. In Manholes 161, 171, 172, and 174, neither sediment nor water was present in sufficient quantities to allow sample collection, so swipes were collected at four locations from the interior surface of each manhole and analyzed for gross alpha, beta, and gamma.

2.2.3 Evaluation of the Results

Appendix A presents a summary of the analytical data for all samples collected at SWMU 18-001(b). The contract-required quantification limit, the conservative residential land use SAL, and the upper tolerance limit (UTL) for background concentrations in soil and water are also presented in Appendix A. A discussion of screening assessment tools (SALs and UTL background values) is found in Section 2.4.3. The UTL background water concentrations are based on measured

detected in one of the two water samples. This result is considered to be biased high because of incorrect recovery of surrogates in a related QC sample.

Filter swipes from the 11 manholes identified removable beta contamination on only one swipe from Manhole 176. The reported value was 35.4 pCi/100 cm^2, well below the DOE release limit for removable beta contamination of 450 pCi/100 cm^2.

2.2.4 Conclusions

The results of the RFI sampling effort indicate very low volumes of materials remain in SWMU 18-001(b). These materials include infiltrating groundwater and residual sediments. The remaining sediments, no more than 0.5 liter in any manhole, contain elevated levels of metals (primarily barium and lead) such that the maximum values for the TCLP for RCRA hazardous wastes may be exceeded. Sediment in one manhole exhibited low concentrations of total uranium and plutonium isotopes were also detected which exceeded background levels but were below SALs. Nonetheless, these slightly elevated levels of radioactive and potentially hazardous constituents may cause the manhole residuals to be classified as mixed waste.

Sample results collected from infiltrating groundwater indicate measured concentrations of all analytes were one or more orders of magnitude below SALs with the exception of one sample where laboratory error occurred. To the extent that water in the manholes is representative of groundwater infiltrating the sewer line, these values indicate that no unacceptable groundwater contamination has occurred.

Analytical results of sediment samples indicate radioactive or hazardous constituents are present in sufficiently low concentrations and volumes, such that following the proposed insitu immobilization of the sewer line, the risk posed by the sediments will be eliminated.

2.3 Types and Volumes of Waste Present

EC activities proposed for SWMU 18-001(b) consist of decommissioning in place of the sewer line. This plan is designed to further reduce any potential risk to human health and the environment while minimizing waste generation.

As indicated in Section 2.2.3, organic or inorganic constituents detected at concentrations approaching or somewhat in excess of SALs were present in nearly every manhole from which a sample could be collected. The risk associated with this material, based on a residential land use, is in the range of 10^{-4} to 10^{-5}. However, less than 0.5 liters of sediment remains within any one manhole and the land at this site is anticipated to remain under industrial use. We propose that the manholes be decommissioned in place without removing the bottom of the manhole or any residual material. As described in Section 3.3, the decommissioning will include plugging the 11 manholes with concrete to above the inlet/outlet ports and removing the upper portion of each manhole. The remaining excavations will then be backfilled with clean soil. Therefore, the anticipated waste associated with this EC plan is limited to the upper portion of each manhole, which is not contaminated, and nonhazardous administrative waste (used caution tape, etc.). However, to effectively apply the concrete to the manholes, it may be necessary to remove any accumulated water from the base of the structure. Should conditions warrant removal of any water, this waste will be pumped into drums and sampled for PCOCs. The material will be handled in accordance with the task-specific waste management plan and treated as potentially hazardous/radioactive waste pending field screening and/or analytical results.

As discussed in Section 2.2.3, analytical results from the RFI sampling effort indicate that concentrations of PCOCs for the SWMU was generally below the SALs, with the exception of the sediment samples obtained from the manholes. As described above, the SALs for hazardous and radioactive constituents are calculated values, based on a conservative residential scenario, that represent a concentration at which exposure would produce a risk of 10^{-6} to human health. Since the future land use for this site is industrial, these are conservative criteria. The risk posed by the sediments in the manholes at SWMU 18-001(b) is in the range of 10^{-5} to 10^{-6} (LANL 1995) using these criteria. Based on the RFI sampling effort, the volume of remaining sediments is small, and the risk will be further reduced following the proposed EC activities (Section 3.3).

be replaced, and the concrete allowed to cure. The manholes will be inspected to ensure that the level of concrete is adequately maintained to provide complete plugging of the sewer line ports. The upper portion of each manhole will then be removed, and the remaining excavation backfilled with clean soil. This mode of final decommissioning is preferred by the LANL facilities engineering group, independent of any risk reduction associated with the closure.

Manhole 177, next to the lagoons, may contain sufficient water to impede the application of concrete to the base of the structure. If encountered, the water will be removed and placed in drums for storage and analysis, prior to the application of concrete.

3.4 Waste Management Issues

All wastes will be handled in accordance with the task-specific waste management plan (Annex 6.6). Any potentially contaminated wastes generated by this EC will be temporarily placed in a designated storage facility pending analytical characterization and/or field screening results.

3.4.1 Characterization of Materials for Disposal

Field screening for radioactivity and organic vapors will be performed.

No additional sampling is proposed; therefore, nominal wastes for disposal will be generated. Should removal of accumulated water in manhole 177 be necessary for application of concrete, the waste water will be removed, drummed and sampled for all PCOCs according to requirements of the task-specific waste management plan.

A nominal quantity of decontamination water and PPE may be generated under this EC effort. These wastes will be containerized and handled in accordance with the task-specific waste management plan.

The upper portion of each manhole which will be removed from the ground has not come in contact with waste materials. Further, swipe tests (Section 2.2.3) indicate this waste will not be contaminated.

3.5 Verification Plan

Verification sampling of this EC effort is not proposed. Based on sample results obtained during the RFI, the detected concentrations of hazardous or radioactive constituents are very low. Furthermore, it is believed that the water samples collected from the manholes, which represent groundwater infiltration, indicate that no significant releases have occurred to the surrounding media. Therefore, further sampling of the groundwater and adjacent soils is not warranted.

3.6 Site Restoration Plan

3.6.1 Return of Materials to Site

Minimal field activities are necessary for this EC. Surface soils adjacent to each manhole may be excavated or disturbed during removal of the surface portions of the manhole. Every attempt will be made to return the site to its pre-investigation condition.

4.0 PROJECT MANAGEMENT

4.1 Staffing Requirements

Overall implementation of this expedited cleanup will be managed by Gene Gould (Field Project Leader). Catherine Goetz of ICF Kaiser Engineers will serve as Field Team Leader (FTL) for general EC activities. The Site Safety Officer will be provided by Morrison Knudsen.

4.2 Resource Requirements

Total anticipated costs to the ER Project for this EC are $25,200, as detailed below. The cost for removal of surface portions of the manholes is not included here, as that cost will be covered by the LANL Facilities Engineering Division.

Pre-Field Activities	
Preparation of Site Health and Safety Plan	2,800
Site Preparation/Subcontractor Scheduling	2,800
Subtotal	$5,600
Decommissioning of Manholes	
Concrete Fill in Manholes	$3,000
Backfill Material/Reseeding in disturbed area	600
Mobilization/Demobilization	500
Contractors General Expense	1,000
Subtotal	$5,100
Supervisory Support Personnel	
Site Safety Officer x 1 weeks @ $70/hr	$2,800
ICF KE FTL/Geologist x 2 weeks @ $70/hr	5,600
Subtotal	$8,400
Post-Field Activities	
Acceptance Inspection	500
Final report	5,600
Subtotal	6,100
TOTAL ESTIMATED COST	**$25,200**

4.3 Schedule

The proposed EC schedule is shown in Table 4-1. The submittal of this EC Plan to EPA in mid-April 1995 will initiate the 60-day public review/comment period. No sooner than 15 days after the start of that period, a public meeting will be held. Pre-field activities will be conducted concurrent to the public review period. Field work will be initiated with 10 days of agency and public approval or receipt of EPA temporary authorization to proceed. The final report will be submitted to EPA within 14 days of receipt of the Acceptance Inspection certification.

4.4 Stakeholder Notifications

Stakeholder notifications are an integral part of the procedure for conducting ECs. The ER Project will identify and notify government agencies, external and internal stakeholders, and individuals on the EC project mailing list of the availability of the EC plan. The EC plan will be available to the stakeholders in the Community Reading Room in Los Alamos, at the document repositories in Los Alamos, Española, and Santa Fe public libraries and at the San Ildefonso Pueblo Governor's Office.

The submission of the EC plan to EPA will trigger publication of a public notice indicating the start of the 30-day public comment period.

6.0 Annexes

6.1 Implementation SOPs

See Environmental Restoration Standard Operating Procedures, Volumes I and II, November 17, 1993, Los Alamos National Laboratory.

6.2 Quality Assurance Plan

Quality Program Plan And Quality Assurance Project Plan For Environmental Restoration, last revision January 1993, May 1991, Los Alamos National Laboratory, Los Alamos, New Mexico.

6.3 Site-Specific Health and Safety Plan

See Los Alamos National Laboratory (LANL) Environmental Restoration (ER) Project Health and Safety Plan (HASP) (LANL, February 11, 1995).

6.4 Records Management Plan

See Installation Work Plan for Environmental Restoration, Revision 4, Chapter IV, Records Management Program Plan.

6.5 Public Involvement Plan

See Installation Work Plan for Environmental Restoration, Revision 4, Chapter V, Public Involvement Program Plan.

6.6 Waste Management Plan

6.7 Field Work Approval Form

6.8 Proposed Outline for Expedited Cleanup Report

6.9 RFI Analytical Reports

ANNEX 6.8
PROPOSED OUTLINE FOR EXPEDITED CLEANUP REPORTS

1.0 Summary of Expedited Cleanup

- 1.1 Overview
- 1.2 Expedited Cleanup

2.0 Site Restoration

3.0 Modifications to the EC Plan

4.0 Quantities and Types of Waste Generated

5.0 Outstanding Items from the Acceptance Inspection

6.0 Problems Encountered and Lessons Learned

APPENDICES

- A Analytical Data
- B Acceptance Inspection Checklist
- C Warehouse Inventory
- D Photographs
- E Certification of Completion

ANNEX 6.8
RI ANALYTICAL RESULTS FOR SWMU 18-001(b)

Sample Location	Sample Number	Sample Type	Units	Metals	Radionuclides	SVOCs	VOCs	SALs	CRQLs	Background
[illegible] (2 Samples)	[illegible]	Water	[illegible]	[illegible]	[illegible]			2000	200	130
			[illegible]					50	3	1.1
			[illegible]		[illegible]			20 (MCL)	NA	0.0012
			pci/l		0.01 Pu-239			15	NA	0.051
			pci/l		0.01 Pu-239			15	NA	0.083
			[illegible]				5.2 1,2 Dichloroethane	5	10	
	AAA5719	Water	[illegible]	100 Barium				2000	200	130
			[illegible]					50	3	1.1
			[illegible]		[illegible]			20 (MCL)	NA	0.0012
			pci/l		0.008 Pu-239			15	NA	0.051
			pci/l		0.011 Pu-239			15	NA	0.083
			[illegible]			10 Di-n-butyl phthalate		3,500	10	
[illegible]-178 (1 Sample)	AAA[illegible]	Sediment	mg/kg	[illegible]				5600	40	1140
			mg/kg	[illegible]				NC	1	3.31
			mg/kg					80	1	2.7
			mg/kg					400	2	34.2
			mg/kg					400	0.6	39
			mg/kg					24	0.04	0.1
			mg/kg					1600	8	26.7
			mg/kg	15 Silver				400	2	NA
			mg/kg					24,000	4	101
			pci/g		[illegible]			20	NA	0.014
			pci/g		[illegible]			18	NA	0.052
			mg/kg		[illegible]			160	NA	2.09
			mg/kg			0.430 Benzo(a)pyrene		0.1	0.33	
			mg/kg			0.750 Benzo(b)fluoranthene		0.7	0.33	
			mg/kg			18.80 Bis(2-ethylhexyl)phthalate		50	0.33	
			mg/kg			0.480 Chrysene		22	0.33	
			mg/kg			0.550 Fluoranthene		3,200	0.33	
			mg/kg			0.600 Pyrene		2400	0.33	
			mg/kg				0.019 Chloroform	0.21	0.01	

Maximum concentration in boldface
Shaded values: measured values above background UTL
(J): Estimated Value NA: Not Available
NC: SALs for beryllium set at background

ANNEX 6.9
SPI ANALYTICAL RESULTS FOR SWMU 19-001(b)

Sample Location	Sample Number	Sample Type	Units	Metals	Radionuclides	SVOCs	VOCs	SALs	CRQLs	Background
MH-169 (2 Samples)	AAA5781	Sediment	mg/kg	36 Barium				5600	40	1140
			mg/kg	0.12 Beryllium				NC	1	3.31
			mg/kg	1.3 Cadmium				80	1	2.7
			mg/kg	[illegible]				400	2	34.2
			mg/kg	[illegible]				400	0.6	39
			mg/kg	[illegible]				24	0.04	0.1
			mg/kg	3.3 Nickel				1600	8	26.7
			mg/kg	21 Silver				400	2	NA
			mg/kg	[illegible]				24,000	4	101
			mg/kg		0.99 U(total)			160	NA	2.09
			mg/kg			0.760 Bis(2-ethylhexyl)phthalate		50	0.33	
			mg/kg			0.47 Butyl benzyl phthalate		16,000	0.33	
			mg/kg			0.460 Fluoranthene		3,200	0.33	
			mg/kg			0.460 2-Methylphenol		4,000	0.33	
			mg/kg			0.550 Pyrene		2,400	0.33	
			mg/kg			[illegible]		0.1	0.33	
			mg/kg				0.000 Acetone	8000	0.01	
			mg/kg				0.200 2-Butanone	4000	0.01	
	AAA5791	Sediment	mg/kg	49 Barium				5600	40	1140
			mg/kg	0.18 Beryllium				NC	1	3.31
			mg/kg	1.8 Cadmium				80	1	2.7
			mg/kg	22 Chromium				400	2	34.2
			mg/kg	[illegible]				400	0.6	39
			mg/kg	[illegible]				24	0.04	0.1
			mg/kg	10.5 Nickel				1600	8	26.7
			mg/kg	48 Silver				400	2	NA
			mg/kg	[illegible]				24,000	4	101
			mg/kg		[illegible]			160	NA	2.09
			mg/kg			0.470 Benzo(b)fluoranthene		0.7	0.33	
			mg/kg			0.740 Bis(2-ethylhexyl)phthalate		50	0.33	
			mg/kg			[illegible]		0.1	0.33	
			mg/kg			0.530 Fluoranthene		3,200	0.33	
			mg/kg			0.000 2-Methylphenol		4,000	0.33	
			mg/kg			0.470 Fluoranthene			0.33	
			mg/kg			0.000 Pyrene		2,400	0.33	
			mg/kg				0.300 Acetone	8000	0.01	
			mg/kg				0.110 2-Butanone	4000	0.01	
			mg/kg				0.012 Carbon disulfide	7.4	0.01	

Maximum concentration in boldface
Shaded values: measured values above background UTL
(J): Estimated Value NA: Not Available
NC: SALs for beryllium set at background

Los Alamos National Laboratory

Environmental Restoration Project

EXPEDITED CLEANUP PLAN

for

SOLID WASTE MANAGEMENT UNIT 8-003(a)

April 1995
Revision 1

Environmental
Restoration

Approvals and Reviews

This document is based on the most current information available at the time of preparation. In the event changes or modifications are required from those proposed, modifications will be made to incorporate any and all revisions. Subsequent reviews and approvals, consistent with those provided for this revision, will be required. This document has been reviewed for content and approved as reflected by the signatures below:

Document Approved By:

Cheryl Rofer, Field Project Leader

4/24/95
Date

ACRONYMS

AP	Administrative Procedure
COC	contaminant of concern
CST	Chemical Science and Technology
DOE	U. S. Department of Energy
EC	expedited cleanup
EPA	U. S. Environmental Protection Agency
ER	Environmental Restoration
FPL	Field Project Leader
FTL	Field Team Leader
HSWA	Hazardous and Solid Waste Amendments
LANL	Los Alamos National Laboratory
PCOC	potential contaminant of concern
PRS	potential release site
RCRA	Resource Conservation and Recovery Act
RFI	RCRA Facility Investigation
SAL	screening action level
SOP	Standard Operating Procedure
SSHASP	Site-Specific Health and Safety Plan
SVOC	semivolatile organic compound
SWMU	solid waste management unit
TA	Technical Area
TCLP	Toxicity Characteristic Leaching Procedure
VOC	volatile organic compound

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1.0 INTRODUCTION

This Expedited Cleanup (EC) Plan addresses Solid Waste Management Unit (SWMU) 8-003(a), located within the western portion of the Los Alamos National Laboratory (the Laboratory), Los Alamos, New Mexico (Figure 1-1). This EC plan is being proposed as a part of the Resource Conservation and Recovery Act (RCRA) Facility Investigation (RFI) process described in the Operable Unit 1157 RFI Work Plan (LANL 1993, 1230).

SWMU 8-003(a) is included in Table A of the Hazardous and Solid Waste Amendments (HSWA) permit.

SWMU 8-003(a) consists of an inactive septic tank. The outfall is designated as another SWMU. The system was in use from 1943 to 1968. Photochemical wastes and other laboratory wastes (as well as sanitary wastes) were routinely discharged to the system. Preliminary results from the RFI sampling effort indicate the sludge in the septic tank contains elevated levels of volatile organic compounds (VOCs). These data indicate that the contents of the tank should be classified as RCRA hazardous waste and should be removed from the tank for proper disposal.

Activities comprising this EC Plan include verification sampling outside the tank to ensure contamination is confined to the interior of the septic tank. The contents of the septic tank will then be removed, the interior of the tank cleaned, the tank stabilized (by filling with sand and/or pea gravel and leaving it in place), the sludge disposed of at a permitted facility, and the site restored to its previous condition.

This EC Plan identifies the level of effort required from initial transmittal of the plan to EPA for review, through implementation, to the completion of the final project report. In the development of this EC Plan, the following assumptions were made:

- The levels of contaminants of concern (COC) and volumes of anticipated waste are consistent with preliminary RFI data;
- Future land use at the location of this SWMU will continue to be for industrial purposes;
- Minimal delays in EC operations will be experienced as a result of inclement weather, site access problems, and firing schedule delays. Delays that result from the acquisition and scheduling of heavy equipment and from the acceptance of waste at permitted disposal facilities cannot be anticipated and therefore are not considered within this plan;
- A Site-Specific Health and Safety Plan (SSHASP) and Waste Management Plan will be developed specifically to address COCs identified in this EC Plan. Deviations from the anticipated concentrations and locations of contaminants of concern may necessitate adjustments to both plans; and
- Any comments generated by agencies for public review may necessitate adjustments to the scope of this EC Plan.

2.0 SITE BACKGROUND AND ENVIRONMENTAL SETTING

2.1 Detailed Description of SWMU 8-003(a)

SWMU 8-003(a), an inactive septic tank, is located in Technical Area (TA)-8 in the western part of the Laboratory (Figure 2-1). The septic tank includes one manhole affiliated with the inlet line from TA-8-1 (Figure 2-2). The site is situated approximately 35 ft northeast of the northeast corner of TA-8-1. The septic tank, which is approximately 10 ft by 4 ft by 4 ft, with a 1,197-gal capacity is located in a small valley on the west side of Anchor Ranch Road.

The tank is constructed of precast reinforced concrete and is approximately 90% full of a liquid and sludge mixture. The liquid phase is approximately six inches thick and overlies a sludge phase described by samplers as having a "pudding-like" consistency. A steel plate covering an access hole to the tank is readily identifiable. The septic tank and associated line are buried approximately 1.5 ft below ground surface. Drainage from the valley has been impeded by fill material used in constructing Anchor Ranch Road, and the original storm drain serving the site has been partially blocked by sediment. Shallow sediment deposits over the steel plate suggests that water occasionally ponds over the tank and may drain into it.

2.1.1 Operational History

SWMU 8-003(a) was installed in 1943 and served Buildings TA-8-1 and -3. Both buildings were also constructed in 1943. Building TA-8-1 served as a control center for the adjacent gun firing site, and after World War II was used for explosives development and crystal growth experiments. Building TA-8-3 may have discharged explosives wastes and sanitary wastes to the tank; the system has been inactive since 1968.

2.1.2 Physical Setting

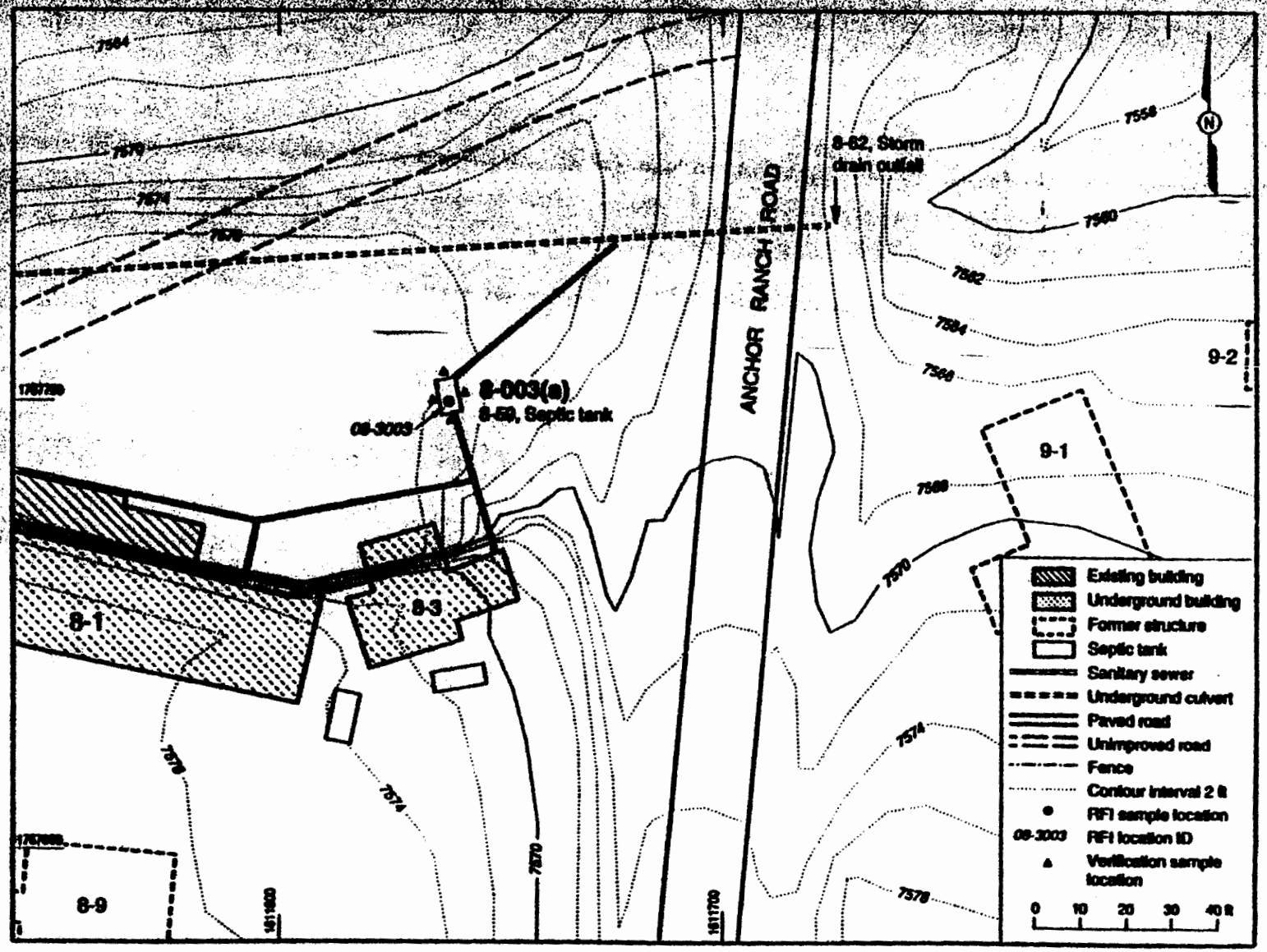
SWMU 8-003(a) lies entirely on US Department of Energy (DOE)-owned land on a mesa top south of Two Mile Mesa. The area is removed from any public access roads. In the foreseeable future, the land is anticipated to be used exclusively for Laboratory operations.

The prevalent soil type on the mesa top is the moderately deep (20 to 40 in.) and well-drained Nyjack Loam. Pleistocene ash flows of the Bandelier Tuff directly underlie the soil. The tuff is moderately welded to nonwelded in the area of the septic system. Because the site is situated on a mesa, the existence of shallow aquifers in the area is unlikely. The depth to the main aquifer is estimated at 875 to 1,100 ft below ground surface.

2.2 Summary of Investigations

2.2.1 Investigations Prior to the RFI

In 1971, liquid samples were collected from SWMU 8-003(a) and, although background counts of gross alpha and gross beta indicated that the tank contents were free of radioactive contamination, the contents were found to contain volatile hydrocarbons and oil and the tank contents were considered to have probable explosives and chemical contamination.



Source: LASL 1987 (12-6652); FWAD 4/6/95, G103/91
Modified by: cARTography by A. Kron 4/13/95

Figure 2-2. Septic system SWMU 8-003(a) site sketch.

Exposed Cesspool at SWMU 8-003(a)

April 1995
ECPLN83a

The tank liquid and sludge samples revealed elevated levels of VOCs. As described in Section 3.3, the contents of the tank will be pumped directly into a tanker truck for transport and disposal by an approved waste facility. Treatment or stabilization of the residuals by the waste facility may be necessary before its disposal. The specific nature of this stabilization will be determined by the disposal facility.

In addition to the existing material in the tank, potentially contaminated water will be generated during the washing of the interior of the tank following the removal of the existing sludge. The wastewater will be disposed along with the tank contents as hazardous waste.

Verification sampling will be performed as described in Section 3.5. A small volume of solid and liquid wastes will be generated by this activity. Waste associated with this effort may include disposable sampling equipment, personal protective equipment, and decontamination water. These materials will be handled in accordance with the site-specific Waste Management Plan and treated as potentially hazardous waste pending characterization.

TABLE 2-1
ANTICIPATED WASTE VOLUMES

Item	Type	Anticipated Volume
Sampling waste/PPE	solid - potential hazardous	1 cu. ft.
Decontamination waste	water- potential hazardous	300 gal.
Tank contents	sludge/liquid - hazardous	1100 gal.

2.4 Potential Impacts on Public Health and the Environment

Receptors of possible contaminants include animals and humans. Potential exposure routes of receptors, if a release from the tank were to occur, include the following:

- Inhalation (especially if the SWMU is disturbed);
- Ingestion; and
- Skin contact with contaminated soils or sediments.

2.4.1 Potential Pathways

2.4.1.1 SWMU - In Place

The only source from which potential contaminants may migrate is the septic tank. Available analytical results from the outfall indicate that soils from this area do not serve as a potential source area for contaminant migration. Therefore, the primary source area for PCOC migration is via residuals within the septic tank. Although a significant release of contaminants from the septic system was not detected during the RFI effort, possible future releases of the PCOCs to the environment via septic tank leaks or movement of residuals through the outfall may occur if the contents remain in place.

Should releases occur, the primary mode for PCOC migration is via subsurface soils. Because the tuff is less permeable than the overlying soil, the interface serves as a preferential subsurface pathway. Thus, the most likely subsurface migration scenario has PCOCs moving along the soil/tuff interface toward the Canyon de Valle floor. Release to the surface could also occur along this pathway where the Bandelier Tuff is exposed along the steep canyon walls. Minor migration pathways through surface-water runoff and wind mechanisms could then develop.

3.0 EXPEDITED CLEANUP

3.1 Overview And Rationale

Preliminary RFI analytical results indicate that the septic tank contents are classified as hazardous waste. Any fractures in the tank or inadequate joints between the tank and the inflow and outflow lines may result in contamination to the surrounding soils. Should the contents of the tank remain in place, the potential remains for contaminant release to the environment. Therefore, the proposed EC Plan (described in Section 3.3) will be implemented to remove the potential risk of the remaining contents of the tank. Verification sampling will be performed to confirm that the site has been remediated in accordance with this plan.

3.2 Permitting, Approval, and Notification Requirements

An excavation permit will be prepared and submitted for approval before execution of this plan.

Documentation will be prepared in accordance with Laboratory Environmental Restoration (ER) Administrative Procedure (AP) LANL-ER-AP-05.1, Rev. 0, Readiness Review for Environmental Restoration Program Field Activities. Key documents to be prepared include a Site-Specific Health and Safety Plan (SSHASP) and a site-specific Waste Management Plan. Personnel training requirements will be specified and will require completion prior to implementation of this EC Plan. Site workers must have received all training for this project as specified in the SSHASP.

3.2.1 DOE Approval

Implementation of this EC will proceed only after DOE approval is documented through receipt of the signed Field Work Approval Form (Annex 6.7).

3.2.2 Regulatory Notification/Permit Modifications

SWMU 8-003(a) is included in Table A of the Hazardous and Solid Waste Amendments (HSWA) permit. Implementation of this EC will require a Class III modification to the Laboratory's RCRA Permit. EPA and the New Mexico Environment Department will be notified of this project, and a request for a permit modification will be submitted.

3.3 Cleanup Activities

SWMU 8-003(a) is located within a secured area of TA-8; therefore, site preparation activities will include scheduling site access and establishing work zones. Initially, the overburden from the tank will be removed to expose the tank's lid and central portal. Once the tank walls are delineated, four boreholes will be installed around the periphery of the tank using hand-operated augers (Figure 2-2). Installation of the boreholes will provide information regarding the integrity of the septic tank prior to its decommissioning. The verification sampling (Table 3-1) is being performed first to ensure the receipt of analytical results to allow for a timely remediation decision. Should field screening and/or analytical results from the verification sampling indicate elevated contaminant levels in the soils surrounding the tank, a separate sampling plan will be submitted. During the verification sampling effort, a sample of the sludge may be collected and analyzed to confirm the current waste characterization profile.

EC activities shall decommissioning the tank in place. The tank will be vacuum-pumped from the central portal, if possible, otherwise the activities will proceed to the removal of the tank's concrete lid and subsequent removal of the sludge. Once the tank contents have been removed and pumped directly to the bulk tanker, the interior of the tank will be washed using a pressure wash. The wash

3.6 Site Restoration Plan

3.6.1 Return of Materials to Site

Every attempt will be made to return the excavation and its adjacent area to the pre-investigation condition. If verification sample results confirm that the tank has not been breached, the lid and overburden will be replaced and the area reseeded with native grasses.

3.7 Acceptance Inspection

The Laboratory proposes an Acceptance Inspection as the mechanism for DOE and EPA to assess that the Laboratory has implemented this EC Plan effectively. A minimum of 14 days' notification will be provided to the agencies before the start of field activities. At this time, a tentative date for the inspection will be agreed upon.

An inspection checklist will be used to document the scope of the inspection and will become part of the EC Final Report. The checklist and the timing of the inspection will be developed by the Laboratory and agreed to by the other agencies. This inspection checklist will contain specific items, criteria, and requirements agreed upon by all parties to be inspected that will constitute acceptance of remediation activities. Possible checkpoints at which the inspection is conducted are: at completion of verification sampling, after removal of waste and rinsing of the tank, or after final site restoration. The inspection could address items such as compliance with proposed verification sampling, conduct of the EC, waste removal, waste management, and site restoration.

The acceptance inspection will be conducted by an independent professional skilled in the appropriate technical discipline. During the final inspection, written resolution and anticipated schedule for completion will be identified for any outstanding items and documented on the inspection checklist. The Laboratory Field Project Leader (FPL) or designee will be responsible for addressing outstanding inspection items and documenting their resolution in the EC Final Report.

Upon completion of remediation activities, the Laboratory will submit a written certification to EPA Region VI, stating that the remedy has been completed in accordance with the EC Plan and Acceptance Inspection checklist. The certification will be signed by the permitee (LANL) and the independent professional conducting the inspection. The certification will accompany the final EC Report.

3.8 Final Report

Following the return of analytical data from the verification sampling and completion of all field activities, a final report will be prepared. A proposed outline for this report is presented as Annex 6.8.

4.0 PROJECT MANAGEMENT

Overall implementation of this expedited cleanup will be managed by Cheryl Rofer, the Field Project Leader (FPL). Luan Walker will serve as Field Team Leader (FTL) for the EC activities.

4.1 Staff and Resource Requirements

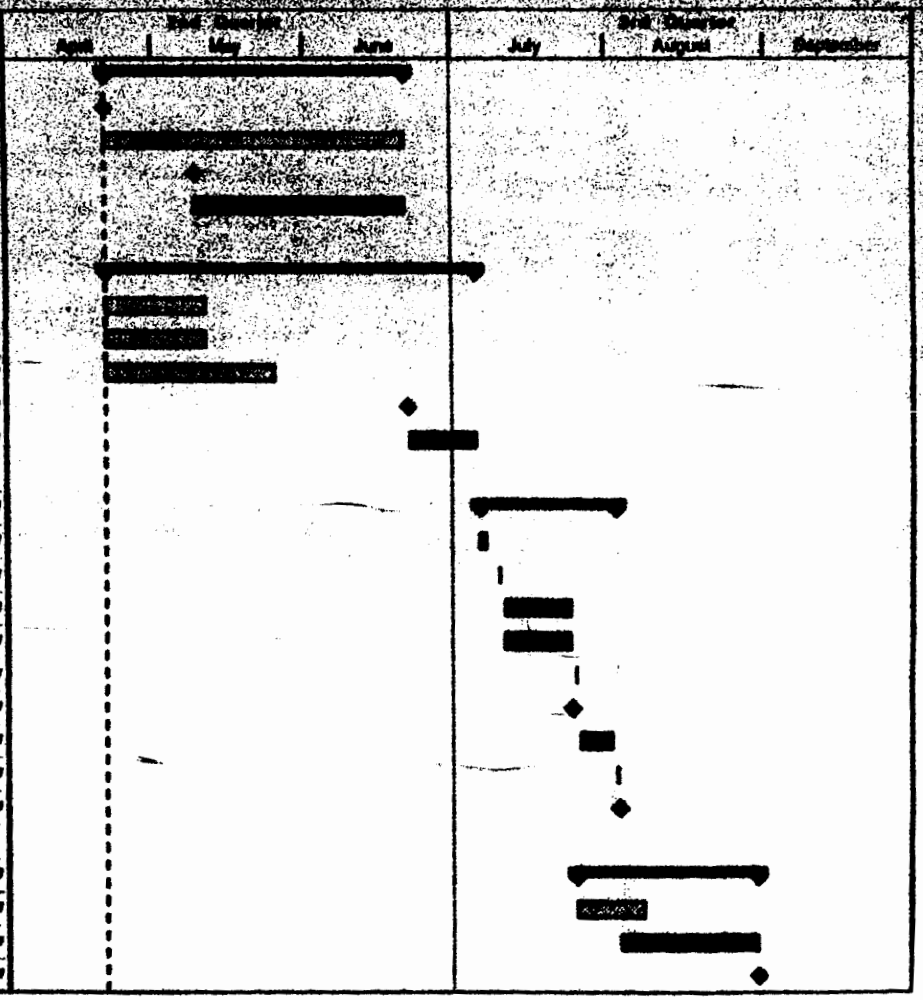
Total anticipated costs for the EC is $40,095, as detailed below.

Prefield Activities	
Preparation of Waste Management Plan	$1,000
Preparation of Site Health and Safety Plan	2,500
Field Work Preparation	3,000
Subtotal	$6,500
Field Activities	
Tank lid excavation @ $175/day	$175
Hand Auger samples (4)	500
Subcontractor (removal, transportation, and disposal of waste)	20,000
Filling of tank with sand	1,000
Site restoration/reseeding	2,000
Subtotal	$23,675
Personnel Costs	
FTL: $70/hr x 5 days	$2,800
Site Health and Safety Officer: $70/hr x 3 days	1,680
Sample Technician: $60/hr x 1 days	480
Backhoe Operator: $60/hr x 2 days	960
Subtotal	$5,920
Analytical Costs	
6 samples x $500	$3,000
Waste disposal characterization (1 sample)	500
Subtotal	$3,500
Post-Field Activities	
Acceptance Inspection (including preparation of checklist)	$2,500
Final report	5,000
Subtotal	$7,500
TOTAL ESTIMATED COST	$40,095

4.2 Schedule

The proposed EC schedule is shown in Table 4-1. The submittal of this EC Plan to EPA in April 1995 will initiate the 60-day public review/comment period. No sooner than 15 days after the start of this period, a public meeting will be held. Preparation for field work will be conducted concurrent to the public review period. Field work will be initiated within 10 days of agency and public approval or receipt of EPA temporary authorization to proceed. The final report will be submitted to EPA within 14 days of receipt of verification sample results.

ID	Name	Duration
1	1.0 PUBLIC ACCEPTANCE	8.77ew
2	1.1 SUBMIT EC PLAN TO EPA	0w
3	1.2 PUBLIC COMMENTS	44d
4	1.3 PUBLIC MEETING	0w
5	1.4 REVISED TO PUBLIC COMMENT	6.4w
6		
7	2.0 PLANNING	10.77ew
8	2.1 PREPARE/REVIEW HEALTH AND SAFETY PLAN	3w
9	2.2 PREPARE/REVIEW WASTE MANAGEMENT PLAN	3w
10	2.3 FIELD WORK PLANNING	5w
11	2.4 FIELD WORK APPROVAL FORM SIGNED	0w
12	2.5 14-DAY NOTIFICATION OF FIELD WORK	2w
13		
14	3.0 IMPLEMENT EXPEDITED CLEANUP	3.91ew
15	3.1 MOBILIZATION	0.4w
16	3.2 VERIFICATION SAMPLING	0.2w
17	3.3 VERIFICATION ANALYSIS	2w
18	3.4 PERFORM CLEANUP	2w
19	3.5 ACCEPTANCE INSPECTION	0.2w
20	3.6 ANALYSIS COMPLETE	0w
21	3.7 SITE RESTORATION	1w
22	3.8 DEMOBILIZATION	0.2w
23	3.9 COMPLETE EC	0w
24		
25	4.0 REPORT PREPARATION	5.2ew
26	4.1 VALIDATE SAMPLE DATA	2w
27	4.2 PREPARE FINAL REPORT	4w
28	4.3 SUBMIT REPORT	0w



Project: EXPEDITED CLEANUP
Date: 4/21/95

Critical
Noncritical
Progress
Milestone
Summary

Los Alamos National Laboratory

9.0 ANNEXES

9.1 Implementation SOPs

See Environmental Restoration Standard Operating Procedures, Volumes I and II, November 17, 1993, Los Alamos National Laboratory.

9.2 Quality Assurance Plan

See Quality Program Plan And Quality Assurance Project Plan For Environmental Restoration, February 1995 revision, Los Alamos National Laboratory, Los Alamos, New Mexico.

9.3 Site-Specific Health and Safety Plan

See Los Alamos National Laboratory (LANL) Environmental Restoration (ER) Project Health and Safety Plan (HASP) (LANL, February 11,1995).

9.4 Records Management Plan

See Installation Work Plan for Environmental Restoration, Revision 4, Chapter IV, Records Management Program Plan.

9.5 Public Involvement Plan

See Installation Work Plan for Environmental Restoration, Revision 4, Chapter V, Public Involvement Program Plan.

9.6 Waste Management Plan

9.7 Field Work Approval Form

9.8 Proposed Outline for Expedited Cleanup Final Report

9.9 RFI Analytical Results

ATTACHMENT 3
FIELD WORK APPROVAL FORM

This form must be completed prior to starting remediation field work in accordance with Voluntary Corrective Action Plans.

I, _____, DOE-LAAO, Approve the field work as proposed in the accompanying Voluntary Corrective Action Plan for Potential Release Site _____, TA-___.

I, _____, DOE-LAAO, DO NOT APPROVE the field work as proposed in the accompanying voluntary correction plan for Potential Release Site _____, TA-___.

The following reasons reflect the decision for disapproval:

Signed:_____ Date:_____

ANNEX 6.3

ANALYTICAL RESULTS

6-003(a) Detects
Water samples

Location ID	Depth of sample	Sample ID	Analyte	Results	Units	SAL
08-3003	3.17 - 3.70 ft.	AAB0762	Alpha	2.25	PCI/L	n/a
			Aluminium	403	UG/L	n/a
			Barium	337	UG/L	2000
			Beta	9.34 (J)	PCI/L	n/a
			Calcium	98200	UG/L	n/a
			Chloroform	7	UG/L	100
			Dichloroethane [1,1-]	140	UG/L	3500
			Dichloroethane [1,2-]	33	UG/L	5
			Dichloroethene [1,1-]	17	UG/L	7
			Dichloroethene [1,2-]	3200	UG/L	n/a
			Iron	6480	UG/L	n/a
			Magnesium	12500	UG/L	n/a
			Manganese	3680	UG/L	180
			Potassium	6200	UG/L	n/a
			Sodium	16000	UG/L	n/a
			Trichloroethane [1,1,1-]	29	UG/L	200
08-3003	3.17 - 3.70 ft.	AAB0763	Alpha	2.93	PCI/L	n/a
			Aluminium	225	UG/L	n/a
			Barium	343	UG/L	2000
			Beta	9.6 (J)	PCI/L	n/a
			Bis(2-ethylhexyl)phthalate	43 (J)	UG/L	6
			Calcium	99500	UG/L	n/a
			Chloroform	7 (J)	UG/L	100
			Dichloroethane [1,1-]	150	UG/L	3500
			Dichloroethane [1,2-]	34 (J)	UG/L	5
			Dichloroethene [1,1-]	17 (J)	UG/L	7
			Dichloroethene [1,2-]	3600	UG/L	n/a
			Iron	6210	UG/L	n/a
			Magnesium	12500	UG/L	n/a
			Manganese	3860	UG/L	180
			Potassium	6050	UG/L	n/a
			Sodium	16200	UG/L	n/a
			Trichloroethane [1,1,1-]	30 (J)	UG/L	200

Los Alamos National Laboratory
Environmental Restoration Project

EXPEDITED CLEANUP PLAN

for

SOLID WASTE MANAGEMENT UNITS 48-002(a) and 48-002(b)

April 1995
Revision 1

Environmental
Restoration

Comments and Remarks

This document is based on the most current information available at the time of preparation. In the event changes or modifications are ordered from those proposed, modifications will be made to subsequent revisions and appendix consistent with those provided [illegible]. This document has been reviewed for content and approved as [illegible]

[illegible]

24 April 85
Date

ACRONYMS

AR	administrative requirement
CEARP	Comprehensive Environmental Assessment and Response Program
CFR	Code of Federal Regulations
Chem van	mobile chemical analytical laboratory
COC	contaminant of concern
CST	Chemical Science and Technology (Division)
EC	expedited cleanup
EPA	US Environmental Protection Agency
ER	Environmental Restoration
ES&H	environment, safety, and health
HASP	health and safety plan
H&S	health and safety
Laboratory	Los Alamos National Laboratory
ORNL	Oak Ridge National Laboratory
PPE	Personal Protective Equipment
Rad van	mobile radiological analytical laboratory
RCRA	Resource Conservation and Recovery Act
RFI	Resource Conservation and Recovery Act facility investigation
SAL	screening action level
SOP	standard operating procedure
SSHASP	Site-Specific Health and Safety Plan
SVOC	semivolatile organic compound
SWMU	solid waste management unit
TA	technical area
TCLP	toxicity characteristic leaching procedure
TSD	treatment, storage, and disposal
USGS	United States Geological Survey
VOC	volatile organic compound
UTL	upper tolerance limit
XRF	x-ray fluorescence

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2.2 Summary [illegible] 6
2.2.1 [illegible] to the RFI 6
2.2.2 [illegible] Investigation 6
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1.0 INTRODUCTION

This Expedited Cleanup (EC) Plan addresses Solid Waste Management Units (SWMUs) 48-002 (a) and 48-002(b), located in the northwest portion of Los Alamos National Laboratory (the Laboratory), in Los Alamos, New Mexico (Figure 1-1). This EC Plan is being proposed as part of the Resource Conservation and Recovery Act (RCRA) Facility Investigation (RFI) process described in the Operable Unit (OU) 1129 RFI Work Plan (LANL 1992, 7666).

SWMUs 48-002(a) and 48-002(b) are included in Table A of the Hazardous and Solid Waste Amendments (HSWA) permit.

SWMUs 48-002(a) and 48-002(b) are former container storage areas located at Technical Area (TA) - 48. Preliminary results from the Phase I RFI sampling efforts indicate that soils within the SWMU boundaries contain elevated levels of metallic mercury and semivolatile organic compounds (SVOCs). These data indicate that this contamination may pose an immediate threat to the environment and possibly to worker safety and may be classified as RCRA hazardous waste.

Activities comprising this EC include the removal of mercury-contaminated soil at the SWMUs. The level of effort required from initial transmittal of the plan to EPA for review, through implementation, to the completion of the final project report is identified in this EC Plan. In the development of this EC Plan, the following assumptions were made:

- The levels of contaminants of concern (COCs) and volumes anticipated are consistent with preliminary data.
- Future land use at the location of these SWMUs will continue to be for industrial purposes.
- Minimal delays in EC operations will be experienced as a result of inclement weather and site access problems. Delays that result from the acquisition and scheduling of heavy equipment and from accepting waste at permitted disposal facilities cannot be anticipated and therefore are not considered within this plan.
- A Site-Specific Health and Safety Plan (SSHASP) and Waste Management Plan will be developed specifically to address COCs identified in this EC Plan. Deviations from the anticipated concentrations and locations of contaminants of concern may necessitate adjustments to both plans.
- Any comments generated by agencies for public review may necessitate adjustments to the scope of this EC Plan. Activities will be performed on a continuous basis during regular business hours, weather permitting, until verification samples indicate that all cleanup levels were met.
- Cost estimates are based on completing the proposed cleanup by removing contaminated soil to a depth of one foot.

2.0 SITE BACKGROUND AND ENVIRONMENTAL SETTING

2.1 Detailed Description of SWMUs 48-002(a) and 48-002(b)

SWMUs 48-002(a) and 48-002(b) are former container storage areas located adjacent to the south side of the Radiochemistry Laboratory, building TA-48-1 (Figure 2-1). The SWMUs have been addressed together during Phase I characterization due to their physical proximity and because preliminary site characterization data indicate the presence of the same suite of COCs. This EC plan continues to address the SWMUs together for these reasons.

Beginning as early as 1976, approximately 200 2-qt. metal flasks, each containing 76 lb. of triple-distilled high-purity mercury, were stored among other "junk" at SWMU 48-002(a) (Garvey 1986, 827; LANL 1990, 7511). The flasks were removed from this location in 1989 (LANL 1990, 7511). Records do not reflect any known releases of hazardous materials, but the flasks were described as "rusting" and sitting in decayed and broken wooden-framed holders (Garvey 1986, 827). No records were found indicating that the site was managed as an active storage area.

SWMU 48-002(b) consisted of an unpaved storage area located at the south end of TA-48-1 where labeled and unlabeled drums were periodically stored (LANL 1990, 7511; DOE 1987, 8663). No records have been located indicating that the area was managed as a formal container storage area. In 1986, a field observation report noted signs of spills at this SWMU, which the observer postulated were due to leaky drums (Perkins 1986, 808; DOE 1987, 8663). In 1989, an internal Laboratory environmental audit report noted only the presence of a long, unlabeled cylinder but omitted any discussion of drums or contamination (LANL 1990, 7511). In 1991, a field activity data log noted that the drums and cylinders previously observed had been removed (Roberson 1991, 884).

The boundaries of SWMUs 48-002(a) and 48-002(b) are generally defined by the physical barriers surrounding the proposed cleanup area. This area is bounded on the north by the wall of building TA-48-1, the east by the concrete retaining wall surrounding the exhaust stack FES-45, and the south by an asphalt road. The western extent of the proposed site, determined from Phase I RFI characterization, is approximately 20 ft. west of the concrete retaining wall. The site measures approximately 220 square ft. and is illustrated in Figure 2-2. The south end of building TA-48-1, where SWMUs 48-002(a) and 48-002(b) are located, is reported to have a basement and perhaps a sub-basement. This feature may be important with regard to potential pathways for contaminant migration (see Section 2.4.1).

2.1.1 Operational History

TA-48 was established in 1957 and is the site of former and current operational structures built to house research work for radiochemistry and nuclear medicine (LANL 1992, 7666). Building TA-48-1 was initially completed in 1957, and in 1963 the alpha wing was added. The alpha wing, located in the northwest end of the building, is used to process high-level alpha and/or beta-gamma emitters. The hot cell facility, which formerly handled irradiated fuel elements from the Rover Program (a nuclear rocket reactor program), is currently used for radiochemical analysis on spallation products from the Clinton P. Anderson Meson Physics Facility. The Nevada Operations Facility is also located within building TA-48-1. Personnel at this facility dissolve samples retrieved from underground shot cavities at the Nevada Test Site and perform radiochemical studies on them.

It is likely that SWMUs 48-002(a) and 48-002(b) were used informally as container storage areas throughout the operational history of the TA-48 facility. No Laboratory records were located to document the intended use of the mercury or the potential source of the SVOCs. Anecdotal information from a former employee indicates that surplus liquid mercury was shipped from Oak Ridge National Laboratory (ORNL) for possible use as shielding for gamma-ray detectors. However, most of the mercury was never used (Balagna, 1995).

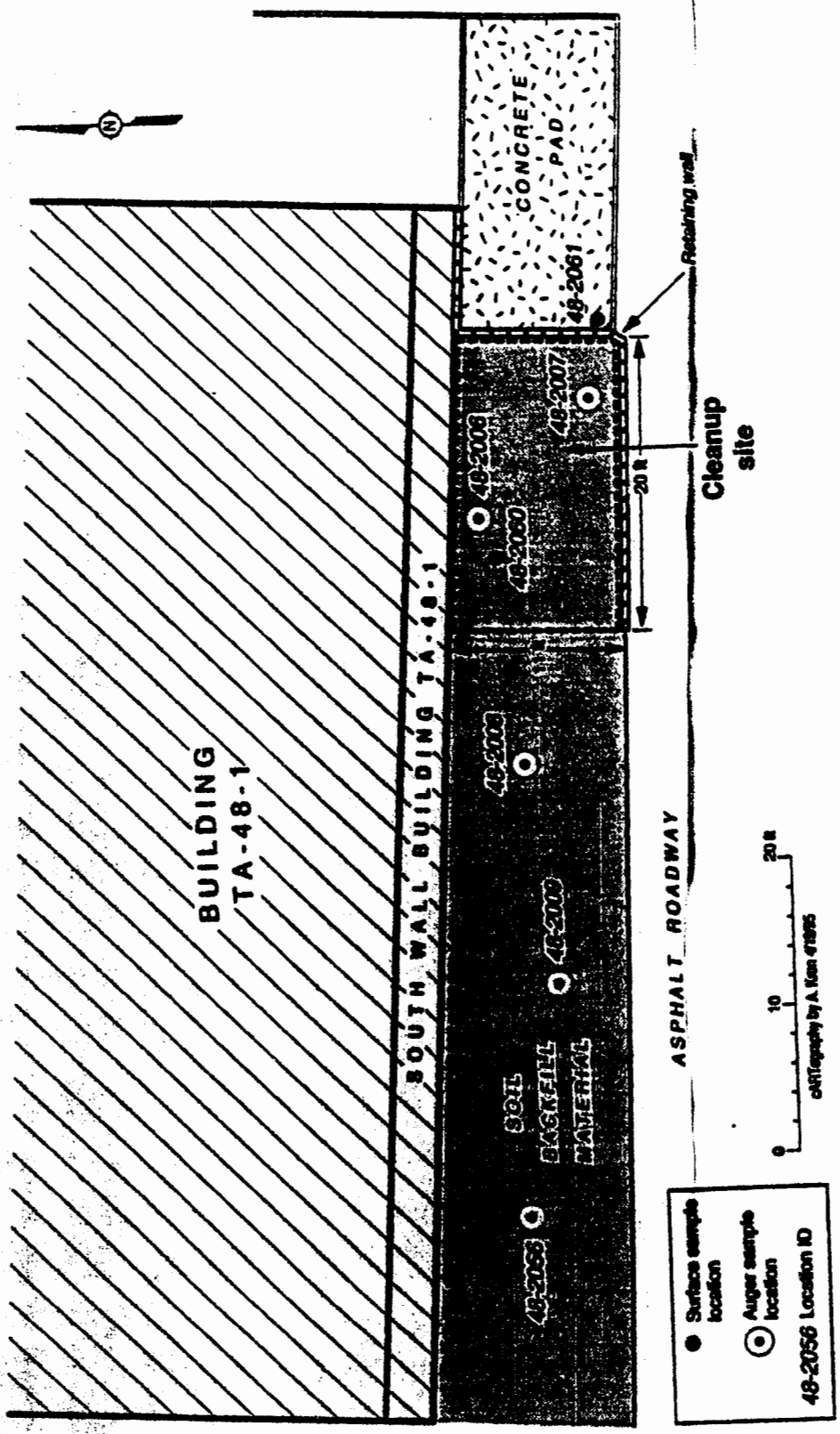


Figure 2-2. Site sketch for SWMUs 48-002(a) and 48-002(b).

All of the samples were submitted for analysis of volatile organic compounds (VOCs), SVOCs, metals, and radionuclides; additional samples were collected and field-analyzed for metals using an x-ray fluorescence (XRF) analyzer. A Jerome (Model 431-X) mercury vapor analyzer ("sniffer") was used to monitor the breathing zone and the sampling locations before and during sampling. Readings ranged from barely detectable in the breathing zone to near the Laboratory-imposed H&S action limit at the soil surface at sample location 48-2060.

In October 1993, six additional surface soil samples were collected to evaluate possible mercury migration from the SWMUs. One sample (48-2061) consisted of sediment that had accumulated from wind and/or runoff on a concrete pad associated with TA-48-1. The other five samples (48-2062 through 48-2066) were collected in areas downgradient of the site. All of these soil samples were submitted for mercury analysis.

2.2.3 Summary and Evaluation of Results

Annex 6.9 presents a summary of the RFI analytical sampling results reported above detection limits for all RFI samples collected at the site. The detected concentrations, screening action levels (SALs), and upper tolerance limits (UTLs) for background concentrations in soil are also presented for comparison. Based on preliminary review of the monitoring and sampling data, the results are summarized as follows:

- The highest concentration of mercury (62 ppm) in soil was observed near the east end of the south wall of TA-48-1 at a depth of 0.5 ft. (sample number 48-2006). Mercury was detected near the Laboratory SAL (24 ppm) in one sample collected from windblown and/or runoff sediments accumulated on a concrete pad. No mercury was detected in surface soil samples collected from areas downgradient of the SWMUs.

- SVOC concentrations were detected above Laboratory SALs with maximum values provided for benzo(a)anthrac-ene (23.2 ppm); benzo(a)pyrene (22.6 ppm); benzo(b) fluoanth-ene (25.8 ppm); benzo(k)fluoranth-ene (10.7 ppm); dibenzo(a,h)anthrac-ene (2.7 ppm); and ideno(1,2,3-(d)) pyrene (13.7 ppm).

- Thorium-228 was detected at levels slightly above the Laboratory SAL (1.5 pCi/g). The highest values for Thorium-228 (2.27 pCi/g and 2.03 pCi/g) were detected near the east end of the south wall of TA-48-1 at depths of 1 ft to 1.5 ft. Thorium concentrations are within Bandelier Tuff background range of 1.7 pCi/g to 4.0 pCi/g (Crowe, et al., 1978). The values obtained from other locations near the building are relatively consistent throughout the soils. Thorium-228 levels detected during Phase I characterization are well below the levels established to trigger remedial action under 40 CFR 192 (EPA 1994), and well below applicable values for unrestricted release found in DOE Order 5400.5, Radiation Protection of the Public and the Environment.

No identifiable compounds were detected in the VOC analysis. Based on these results, the following assumptions have been made:

- The mercury and SVOC contamination is likely limited to a rectangular area that extends from the east corner of building TA-48-1 for approximately 20 ft along the south wall of the building, and from the wall to approximately 11 ft out toward the asphalt, (Figure 2-2).

- Mercury and SVOC contamination in the soil was generally limited to a depth of approximately 1 foot. Some elemental mercury may have migrated downward between the soil/building interface.

- The reported thorium activity, while slightly above the SAL, is within the range of Laboratory background activity and will not require remediation.

likelihood that mercury has migrated down the interface between the soil and the wall of building TA-48-1. This is inferred from the mercury vapor screening results which showed elevated concentrations of mercury at the soil immediately adjacent to the wall and on the wall.

- Some of the inorganic elemental mercury may attach itself to silt- or clay-sized particles, which can then be mobilized by precipitation and/or wind. While the downward pathway is likely to be very small because of capillary action and soil drying during dry periods, one surface sample (48-2061) indicates that lateral movement via water and/or wind is possible.

2.4.1.2 SWMU Remediation

Potential pathways for contaminant migration during excavation of the soils are generally the same as those described above in Section 2.4.1.1. Some potential exists for sideward migration and airborne transport because of physical agitation of the soils during remediation. Appropriate dust suppression techniques will be followed to minimized this pathway. Little or no potential exists for aqueous transport during remediation because the excavated soils will be placed in 55-gallon drums and covered to prohibit contact with water. Further, the excavated area will be covered with plastic sheeting to prohibit water from entering the excavation.

2.4.2 Future Land Use

SWMUs 48-002(a) and 48-002(b) lie entirely on US Department of Energy (DOE)-owned land on Mesita del Buey. In the foreseeable future, the land is anticipated to be used exclusively for Laboratory (industrial) operations.

2.4.3 Cleanup Levels

Results from the previous investigations indicate mercury and carcinogenic PAH are contaminants of concern for this EC, and therefore, cleanup levels have been calculated for these compounds. For mercury, the soil cleanup level was set at a concentration that would result in an estimated noncarcinogenic hazard index of one or less for the occupational exposure scenario. The cleanup level for mercury has been calculated at 280 mg/kg (ppm). For carcinogenic PAH, the cleanup level has been calculated for an excess cancer risk due to occupational exposure of 1E-04 (one excess case of cancer in 10,000). This cleanup level is calculated at 80 mg/kg, based on the carcinogenic slope factor for benzo[a]pyrene (BaP). The equation and assumptions used for the calculation of cleanup levels is provided in Annex 6.10. In this case, LANL will adopt a conservative approach of summing all the carcinogenic PAH detected during verification sampling to compare to this level. It should be noted that typically, LANL will start with a cleanup level based on an excess cancer risk of 1E-06. However, this approach was not practical because the calculated cleanup level for BaP (0.75 mg/kg) is well below background at this level of risk (background UTL approximately 12 mg/kg, LANL 1995). However, the cleanup level presented is still within the EPA acceptable risk range of 1E-04 to 1E-06, and remains conservative given that exposure is highly unlikely due to the restricted access of this area. In addition, the maximum observed concentration of PAH (approximately 20 mg/kg) was observed in the first foot of soil, and it is anticipated that PAH contamination will be removed with the mercury-contaminated soil.

Attainment of these cleanup levels will be considered achieved when the upper 95% confidence level of the mean concentration of the constituent remaining in the excavated area, as demonstrated by verification sampling, is equal to or less than the established cleanup levels.

a HEPA filter, and activated charcoal filter. Waste from the vacuum process will be placed in a 55-gallon drum, located adjacent to the cleanup site.

An initial 1-foot lift of soil will be removed in the proposed cleanup area using either shovels or a backhoe, as required by site conditions. After this lift of soil is removed, the excavated area will inspected for any visible surface contamination that will be removed by vacuum, as outlined above. Confirmatory cleanup samples will be collected on the nodes of a 3 ft. by 3 ft. grid within the excavated area; these samples will be submitted for on-site field laboratory analysis. A mobile Chem van using XRF and gas chromatography will analyze for mercury and SVOC analysis, respectively. The area for subsequent excavation will be determined based on the comparison of the results of the verification sampling to the cleanup criteria.

If necessary, additional excavation in areas that do not meet the cleanup criteria will be performed in 1-foot lifts until field laboratory analytical results indicate that mercury and SVOC concentrations in the soil at the site are below cleanup levels. Excavation equipment will be decontaminated between lifts. This phased cleanup process will continue until the entire site meets the cleanup criteria.

All vacuumed and excavated materials will be managed in 55-gallon drums. Material collected using the vacuum will be segregated from the excavated soil. The soil will be placed in 55-gallon drums to be located at the western boundary of the remediation site. Waste materials will be analyzed for mercury and SVOCs for waste characterization to verify the waste acceptance criteria (WAC) as required by the disposal facility, in accordance with appropriate waste handling and QA/QC procedures.

3.4 Waste Management Issues

The laboratory results from Phase I RFI sampling indicate that the contaminated soils may be classified as RCRA hazardous waste. Based on the projected extent of contamination, the maximum total volume of soil to be excavated and removed is estimated to be between 200 and 300 cu. ft.

Other wastes will include personal protective equipment (PPE), sampling wastes, and waste water from equipment decontamination. The volume of PPE is expected to be about one 55-gallon drum. Sampling wastes are expected to be no more than 2 cu. ft., and the decontamination water is expected to have a volume of about 150 gal. These volume estimates are based on past experience with Phase I RFI investigations.

3.4.1 Characterization of Materials for Disposal

Field laboratory analytical results from the confirmatory cleanup samples collected after each lift will be used to determine the gross contamination in the waste soils. After cleanup activities are completed, samples from a representative percentage of the waste containers will be collected and sent to a laboratory and analyzed in accordance with the disposer's WAC and 40 CFR 261 requirements. Waste water generated during equipment decontamination will be sampled and analyzed for mercury and SVOCs.

3.4.2 Treatment, Storage, and Disposal Plans for Waste

The majority of the waste materials generated in this EC will be in the form of mercury and/or SVOC-contaminated soils. These soils, sampling wastes, and PPE wastes will be transported to a permitted treatment, storage, and disposal (TSD) facility for final disposal. Several TSD facilities have Laboratory contracts to treat mercury-contaminated wastes. Laboratory disposal facilities that might be used during this EC include TA-54, Area L for the disposal of nonhazardous and hazardous wastes. Depending on the concentrations of COCs found in the decontamination water, the liquid waste may be sent to the TA-50, Liquid Waste Treatment Plant or to a permitted TSD facility for

Table 3-1
SUMMARY OF VERIFICATION SAMPLES AND ANALYSES
FOR SWMUs 48-002(a) and 48-002(b)

Description	Samples						Field Screening				Laboratory Analyses					
	Structure		Surface		Subsurface											
	Primary	duplicate	primary	duplicate	primary	duplicate	Beta-gamma	Alpha	Organic Vapor	Radiological Smear and Swipe Techniques	Total Uranium	Isotopic plutonium	Metals (SW 6010/7000)*	Mercury	VOCs (SW 8260)*	SVOCs (SW8270)*
Soil Samples			2	1			x	x	x					x		x
Equipment Rinsate	1						x	x	x					x		x

x: All samples
Note: Additional samples may be taken based on field surveys and observations.
*: Applicable EPA SW 846 methods.

4.0 PROJECT MANAGEMENT

Overall implementation of this expedited cleanup will be managed by Allyn Pratt, the Field Project Leader (FPL). Leslie Sontag will serve as Field Team Leader (FTL) for the EC activities.

4.1 Staff and Resource Requirements

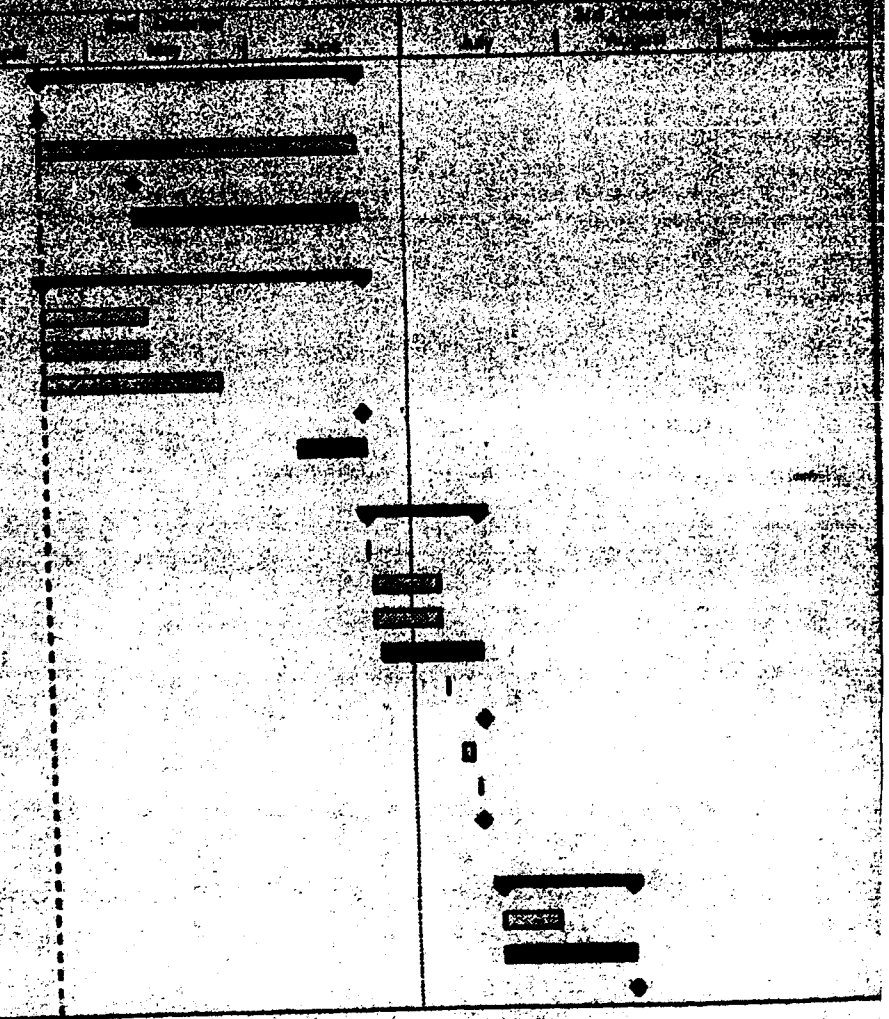
Total anticipated costs for the EC is $76,700 as detailed below.

Pre-Field Activities	
Preparation of Waste Management Plan	$1,000
Preparation of Site Health and Safety Plan	2,500
Field Work Preparation	2,500
Subtotal	$6,000
Field Activities	
Geodetic/"mark out" surveys	$3,500
Mercury vapor/combustible meter	2,000
Subcontractor (excavation)	2,500
Subcontractor (transportation and disposal of waste)	14,400
Site restoration	600
Subtotal	$23,000
Personnel Costs	
Field Team (FTL, SSO, 2 technicians) : $6,600/week x 2	$13,200
Backhoe Operator : $30/hr x 10 days	2,500
Subtotal	$15,700
Analytical Costs	
Red van (assume shared cost): $1,000/day x 10 days	$10,000
Chem van (assume shared cost): $1,000/day x 10 days	10,000
Verification sampling: 4 samples x $750	3,000
Waste disposal characterization: 3 samples x $1,000	3,000
Subtotal	$26,000
Post-Field Activities	
Acceptance inspection (including preparation of checklist)	$4,000
Final report	2,000
Subtotal	$6,000
TOTAL ESTIMATED COST	**$76,700**

4.2 Schedule

The proposed EC schedule is shown in Table 4-1. The submittal of this EC Plan to EPA in April 1995 will initiate the 30-day public review/comment period. No sooner than 15 days after the start of the period, a public meeting will be held. Preparation for field work will be conducted concurrent to the public review period. Field work will be initiated within 10 days of agency and public approval or receipt of EPA temporary authorization to proceed. The final report will be submitted to EPA within 14 days of receipt of verification sample results.

ID	Name	Duration
1	1.0 PUBLIC ACCEPTANCE	0.17w
2	1.1 SUBMIT ECPL AN TO EPA	0w
3	1.2 [illegible]	[illegible]
4	1.3 [illegible]	[illegible]
5	1.4 [illegible] TO PUBLIC COMMENT	[illegible]
6		
7	2.0 PLANNING	[illegible]
8	2.1 PREPARE SITE HEALTH AND SAFETY PLAN	3w
9	2.2 [illegible]	2w
10	2.3 FIELD WORK PLANNING	6w
11	2.4 FIELD WORK APPROVAL FORM SIGNED	0w
12	2.5 14-DAY NOTIFICATION OF FIELD WORK	2w
13		
14	3.0 IMPLEMENT EXPEDITED CLEANUP	3.5w
15	3.1 MOBILIZATION	0.5w
16	3.2 [illegible]	3w
17	3.3 [illegible]	0w
18	3.4 [illegible]	0w
19	3.5 [illegible] INSPECTION	0.2w
20	3.6 ANALYSIS COMPLETE	0w
21	3.7 SITE RESTORATION	0.8w
22	3.8 DEMOBILIZATION	0.2w
23	3.9 COMPLETE EC	0w
24		
25	4.0 REPORT PREPARATION	3.5w
26	4.1 VALIDATE SAMPLE DATA	2w
27	4.2 PREPARE FINAL REPORT	4w
28	4.3 SUBMIT REPORT	0w



Project: EXPEDITED CLEANUP
Date: 4/21/95

Critical
Noncritical
Progress
Milestone
Summary

Los Alamos National Laboratory

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Stellavato, S., July 27, 1993. "Technical Area 48, Operable Unit 1129, Site Work Plan Aggregate L," Daily Activity Log, Los Alamos National Laboratory, Los Alamos, New Mexico. (Stellavato 1993, ER ID Number 45353)

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Stellavato, S., October 27, 1993. "Technical Area 48, Operable Unit 1129, Site Work Plan Aggregate L," Daily Activity Log, Los Alamos National Laboratory, Los Alamos, New Mexico. (Stellavato 1993, ER ID Number 45356)

USEPA (US Environmental Protection Agency), April 10, 1990. Module VIII of RCRA Permit No. NM0890010515, EPA Region VI, issued to Los Alamos National Laboratory, Los Alamos, New Mexico, effective May 23, 1990, EPA Region VI, Hazardous Waste Management Division, Dallas, Texas. (USEPA 1990, ER ID Number 1585)

USEPA (US Environmental Protection Agency), 1994. "Health and Environmental Protection Standards for Uranium and Thorium Mill Tailings," 40 CFR 192, Washington DC. (USEPA, 1994)

USEPA (US Environmental Protection Agency), February 1989. "Methods for Evaluating the Attainment of Cleanup Standards," Volume 1: Soils and Solid Media, EPA 230/02-89-042, National Technical Information Service, Springfield, Virginia. (EPA 1989, 0794)

USGS, 1984. Topographic Map, Frijoles Quadrangle, New Mexico, Map No. 35106-G3-TF-024, Denver, Colorado. (USGS 1984, ER ID Number 21588)

ANNEX E.1

FIELD WORK APPROVAL FORM

ANNEX 6.8

PROPOSED OUTLINE FOR EXPEDITED CLEANUP REPORT

1.0 SUMMARY OF EXPEDITED CLEANUP

- 1.1 Overview
- 1.2 Expedited Cleanup

2.0 DISCUSSION OF SAMPLING AND ANALYSIS

- 2.1 Verification Sampling and Analysis
  - 2.1.1 Sampling Objectives
  - 2.1.2 QA/QC
  - 2.1.3 Sampling Activities
- 2.2 Site Restoration

3.0 MODIFICATIONS TO THE EC PLAN

4.0 QUANTITIES AND TYPES OF WASTES GENERATED

5.0 OUTSTANDING ITEMS FROM THE ACCEPTANCE INSPECTION

6.0 PROBLEMS ENCOUNTERED AND LESSONS LEARNED

APPENDICES

- A ANALYTICAL DATA
- B ACCEPTANCE INSPECTION CHECKLIST
- C WASTE STREAM INVENTORY
- D PHOTOGRAPHS
- E CERTIFICATION OF COMPLETION

Location ID	Depth of sample	Sample ID	Analyte	Results	Units	SAL	UTL
48-2006	0.0 - 0.5 ft	AAA3753	Aluminium	12000	MG/KG	n/a	123000
			Arsenic	2.5	MG/KG	n/a	11.6
			Barium	120	MG/KG	5600	1143
			Beryllium	0.81	MG/KG	n/a	3.31
			Calcium	2000	MG/KG	n/a	54362
			Chromium	8	MG/KG	n/a	34.2
			Cobalt	4	MG/KG	n/a	51.1
			Copper	4.2	MG/KG	3000	15.7
			Iron	11000	MG/KG	n/a	35586
			Lead	10	MG/KG	400	39
			Lithium	14	MG/KG	n/a	n/a
			Magnesium	1900	MG/KG	n/a	16147
			Manganese	330	MG/KG	11000	1030
			Mercury	25	MG/KG	24	0.1
			Mercury	28.8	MG/KG	24	0.1
			Mercury	36	MG/KG	24	0.1
			Mercury	40	MG/KG	24	0.1
			Mercury	41	MG/KG	24	0.1
			Nickel	7	MG/KG	1600	26.7
			Potassium	1400	MG/KG	n/a	6179
			Sodium	110	MG/KG	n/a	1884
			Strontium	20	MG/KG	48000	n/a
			Vanadium	16	MG/KG	560	66
			Zinc	58	MG/KG	24000	101
48-2006	0.0 - 0.5 ft	AAA4494	Acenaphthene	1.1	MG/KG	4800	3.4
			Aluminium	11000	MG/KG	n/a	123000
			Anthracene	2.3	MG/KG	24000	4.29 *
			Arsenic	2.6	MG/KG	n/a	11.6
			Barium	100	MG/KG	5600	1143
			Benzo[a]anthracene	12.5	MG/KG	1	12.4 *
			Benzo[a]pyrene	12	MG/KG	0.1	12.1 *
			Benzo[b]fluoranthene	13.8	MG/KG	1	12.2 *
			Benzo[g,h,i]perylene	4.2	MG/KG	n/a	5.9 *
			Benzo[k]fluoranthene	3.2	MG/KG	1	19.4 *
			Beryllium	0.72	MG/KG	n/a	3.31
			Calcium	1800	MG/KG	n/a	54362
			Chromium	7	MG/KG	n/a	34.2
			Chrysene	13.6	MG/KG	96	19.5
			Cobalt	3.4	MG/KG	n/a	51.1
			Copper	3.5	MG/KG	3000	15.7
			Dibenzo[a,h]anthracene	1.6	MG/KG	0.1	2.9 *
			Fluoranthene	20.5	MG/KG	3200	32.5 *
			Fluorene	0.72	MG/KG	3200	3.3 *
			Indeno[1,2,3-cd]pyrene	5.5	MG/KG	1	6 *
			Iron	11000	MG/KG	n/a	35586
			Lead	9	MG/KG	400	39
			Lithium	13	MG/KG	n/a	n/a
			Magnesium	1700	MG/KG	n/a	16147
			Manganese	270	MG/KG	11000	1030
			Mercury	35	MG/KG	24	0.1
			Mercury	38.1	MG/KG	24	0.1
			Mercury	47	MG/KG	24	0.1

Location ID	Depth of sample	Sample ID	Analyte	Results	Units	SAL	UTL
			Pyrene	11.7	MG/KG	2400	12.8 *
			Radvan Ruthenium-106	0.14	PCI/G	14	n/a
			Thorium-228	1.28	PCI/G	1.5	n/a
			Thorium-230	4.19	PCI/G	5	n/a
			Thorium-232	1.38	PCI/G	5	2.68
			Uranium-234	1.1	PCI/G	86	2.03
			Uranium-238	0.892	PCI/G	59	1.9
48-2006	3.0 - 4.0 ft	AAA3769	Fluoranthene	0.44	MG/KG	3200	32.5 *
			Plutonium-238	0.115	PCI/G	20	0.014
			Plutonium-239	0.0775	PCI/G	18	0.052
			Pyrene	0.39	MG/KG	2400	12.8 *
			Radvan Americium-241	0.28	PCI/G	17	n/a
			Radvan Ruthenium-106	4.83	PCI/G	14	n/a
			Thorium-228	1.45	PCI/G	1.5	n/a
			Thorium-230	1.05	PCI/G	5	n/a
			Thorium-232	0.487	PCI/G	5	2.68
			Uranium-234	0.73	PCI/G	86	2.03
			Uranium-235	0.181	PCI/G	18	0.088
			Uranium-238	0.807	PCI/G	59	1.9
48-2006	4.0 - 5.0 ft	AAA3770	Benzo[a]anthracene	0.49	MG/KG	1	12.4 *
			Benzo[a]pyrene	0.51	MG/KG	0.1	12.1 *
			Benzo[b]fluoranthene	0.54	MG/KG	1	12.2 *
			Chrysene	0.5	MG/KG	96	19.5 *
			Fluoranthene	1.2	MG/KG	3200	32.5 *
			Phenanthrene	1.1	MG/KG	n/a	24.2 *
			Plutonium-239	0.121	PCI/G	18	0.052
			Pyrene	1.1	MG/KG	2400	12.8 *
			Radvan Americium-241	0.6	PCI/G	17	n/a
			Radvan Ruthenium-106	1.35	PCI/G	14	n/a
			Thorium-228	1.12	PCI/G	1.5	n/a
			Thorium-230	3.89	PCI/G	5	n/a
			Thorium-232	1.1	PCI/G	5	2.68
			Uranium-234	0.453	PCI/G	86	2.03
			Uranium-238	0.829	PCI/G	59	1.9
48-2006	5.0 - 6.0 ft	AAA3771	Benzo[a]anthracene	0.47	MG/KG	1	12.4 *
			Benzo[a]pyrene	0.6	MG/KG	0.1	12.1 *
			Benzo[b]fluoranthene	0.68	MG/KG	1	12.2 *
			Chrysene	0.51	MG/KG	96	19.5 *
			Fluoranthene	1.5	MG/KG	3200	32.5 *
			Phenanthrene	1.3	MG/KG	n/a	24.2 *
			Plutonium-238	0.0009	PCI/G	20	0.014
			Pyrene	1.3	MG/KG	2400	12.8 *
			Radvan Americium-241	0.25	PCI/G	17	n/a
			Thorium-228	0.911	PCI/G	1.5	n/a
			Thorium-228	1.44	PCI/G	1.5	n/a
			Thorium-230	1.49	PCI/G	5	n/a
			Thorium-230	2.64	PCI/G	5	n/a
			Thorium-232	0.629	PCI/G	5	2.68
			Thorium-232	0.896	PCI/G	5	2.68
			Uranium-234	0.837	PCI/G	86	2.03
			Uranium-234	1.14	PCI/G	86	2.03
			Uranium-235	0.184	PCI/G	18	0.088

48-002(a/b) Detects

Location ID	Depth of sample	Sample ID	Analyte	Results	Units	SAL	UTL
			Anthracene	5.1	MG/KG	24000	4 29 *
			Arsenic	2.2	MG/KG	n/a	11.6
			Barium	76	MG/KG	5600	1143
			Benzo[a]anthracene	23.3	MG/KG	1	12.4 *
			Benzo[a]pyrene	22.6	MG/KG	0.1	12.1 *
			Benzo[b]fluoranthene	25.8	MG/KG	1	12.2 *
			Benzo[g,h,i]perylene	13.3	MG/KG	n/a	5.9 *
			Benzo[k]fluoranthene	10.7	MG/KG	1	19.4 *
			Beryllium	0.66	MG/KG	n/a	3.31
			Calcium	1700	MG/KG	n/a	54362
			Carbon disulfide	0.0058	MG/KG	7.4	n/a
			Chromium	13	MG/KG	n/a	34.2
			Chrysene	26	MG/KG	96	19.5 *
			Cobalt	3	MG/KG	n/a	51.1
			Copper	4.1	MG/KG	3000	15.7
			Dibenzofuran	0.94	MG/KG	n/a	n/a
			Dibenzo[a,h]anthracene	2.7	MG/KG	0.1	2.9 *
			Fluoranthene	0.36	MG/KG	3200	32.5 *
			Fluorene	2.1	MG/KG	3200	3.3 *
			Indeno[1,2,3-cd]pyrene	13.7	MG/KG	1	6 *
			Iron	8000	MG/KG	n/a	35586
			Lead	25	MG/KG	400	39
			Lithium	7.1	MG/KG	n/a	n/a
			Magnesium	1300	MG/KG	n/a	16147
			Manganese	250	MG/KG	11000	1030
			Naphthalene	0.61	MG/KG	3200	0.66 *
			Nickel	10	MG/KG	1600	26.7
			Phenanthrene	26.2	MG/KG	n/a	24.2 *
			Plutonium-238	0.051	PCI/G	20	0.014
			Plutonium-239	0.718	PCI/G	18	0.052
			Potassium	860	MG/KG	n/a	6179
			Pyrene	44.4	MG/KG	2400	12.8 *
			Radvan Americium-241	0.16	PCI/G	17	n/a
			Radvan Ruthenium-106	0.24	PCI/G	14	n/a
			Sodium	64	MG/KG	n/a	1884
			Strontium	15	MG/KG	48000	n/a
			Thorium-228	1.718	PCI/G	1.5	n/a
			Thorium-230	1.477	PCI/G	5	n/a
			Thorium-232	2.082	PCI/G	5	2.68
			Uranium-234	0.801	PCI/G	86	2.03
			Uranium-235	0.024	PCI/G	18	0.088
			Uranium-238	0.823	PCI/G	59	1.9
			Vanadium	11	MG/KG	560	66
			Zinc	40	MG/KG	24000	101
48-2007	0.5 - 1.0 ft	AAA4497	Americium-241	0	PCI/G	17	n/a
			Benzo[a]anthracene	12.3	MG/KG	1	12.4 *
			Benzo[a]pyrene	12.9	MG/KG	0.1	12.1 *
			Benzo[b]fluoranthene	15.9	MG/KG	1	12.2 *
			Benzo[g,h,i]perylene	5.2	MG/KG	n/a	5.9 *
			Benzo[k]fluoranthene	4.3	MG/KG	1	19.4 *
			Cerium-144	0.514	PCI/G	64	n/a
			Cesium-137	0.06	PCI/G	4	1.4

48-002(a/b) Detects

Location ID	Depth of sample	Sample ID	Analyte	Results	Units	SAL	UTL
			Fluoranthene	2.7	MG/KG	3200	32.5 *
			Indeno[1,2,3-cd]pyrene	0.88	MG/KG	1	6 *
			Phenanthrene	1.7	MG/KG	n/a	24.2 *
			Plutonium-238	0.055	PCI/G	20	0.014
			Plutonium-239	0.826	PCI/G	18	0.052
			Pyrene	2.7	MG/KG	2400	12.8 *
			Radvan Cobalt-60	0.07	PCI/G	0.9	n/a
			Radvan Ruthenium-106	0.87	PCI/G	14	n/a
			Thorium-228	1.754	PCI/G	1.5	n/a
			Thorium-230	1.29	PCI/G	5	n/a
			Thorium-232	2.064	PCI/G	5	2.68
			Uranium-234	0.627	PCI/G	86	2.03
			Uranium-235	0.024	PCI/G	18	0.088
			Uranium-238	0.638	PCI/G	59	1.9
48-2008	1.5 - 3.0 ft	AAA3749	Americium-241	0.099	PCI/G	17	n/a
			Benzo[a]anthracene	0.45	MG/KG	1	12.4 *
			Benzo[a]pyrene	0.47	MG/KG	0.1	12.1 *
			Benzo[b]fluoranthene	0.58	MG/KG	1	12.2 *
			Chrysene	0.55	MG/KG	96	19.5
			Fluoranthene	0.86	MG/KG	3200	32.5 *
			Phenanthrene	0.53	MG/KG	n/a	24.2 *
			Plutonium-238	0.053	PCI/G	20	0.014
			Plutonium-239	0.436	PCI/G	18	0.052
			Pyrene	0.89	MG/KG	2400	12.8 *
			Radvan Americium-241	0.04	PCI/G	17	n/a
			Radvan Cobalt-60	0.19	PCI/G	0.9	n/a
			Radvan Ruthenium-106	1.4	PCI/G	14	n/a
			Thorium-228	1.622	PCI/G	1.5	n/a
			Thorium-230	1.159	PCI/G	5	n/a
			Thorium-232	1.902	PCI/G	5	2.68
			Uranium-234	0.599	PCI/G	86	2.03
			Uranium-235	0.017	PCI/G	18	0.088
			Uranium-238	0.625	PCI/G	59	1.9
48-2009	0.0 - 0.5 ft	AAA3750	Aluminium	11000	MG/KG	n/a	123000
			Americium-241	0.003	PCI/G	17	n/a
			Arsenic	2.6	MG/KG	n/a	11.6
			Barium	100	MG/KG	5600	1143
			Benzo[b]fluoranthene	0.4	MG/KG	1	12.2 *
			Beryllium	0.77	MG/KG	n/a	3.31
			Bis(2-ethylhexyl)phthalate	0.7	MG/KG	50	n/a
			Calcium	2200	MG/KG	n/a	54362
			Chromium	7.3	MG/KG	n/a	34.2
			Cobalt	4.6	MG/KG	n/a	51.1
			Copper	3.1	MG/KG	3000	15.7
			Fluoranthene	0.56	MG/KG	3200	32.5 *
			Iron	11000	MG/KG	n/a	35586
			Lead	12	MG/KG	400	39
			Lithium	12	MG/KG	n/a	n/a
			Magnesium	1800	MG/KG	n/a	16147
			Manganese	310	MG/KG	11000	1030
			Nickel	8	MG/KG	1600	26.7
			Plutonium-238	0.005	PCI/G	20	0.014

48-002(a/b) Detects

Location ID	Depth of sample	Sample ID	Analyte	Results	Units	SAL	UTL
			Thorium-232	1.675	PCI/G	5	2.68
			Uranium-234	0.461	PCI/G	86	2.03
			Uranium-235	0.016	PCI/G	18	0.088
			Uranium-238	0.473	PCI/G	59	1.9
48-2056	0.0 - 0.5 ft	AAA3765	Aluminium	6000	MG/KG	n/a	123000
			Americium-241	0.003	PCI/G	17	n/a
			Arsenic	1.7	MG/KG	n/a	11.6
			Barium	62	MG/KG	5600	1143
			Benzo[a]anthracene	0.41	MG/KG	1	12.4 *
			Benzo[a]pyrene	0.45	MG/KG	0.1	12.1 *
			Benzo[b]fluoranthene	0.52	MG/KG	1	12.2 *
			Beryllium	0.62	MG/KG	n/a	3.31
			Bis(2-ethylhexyl)phthalate	0.37	MG/KG	50	n/a
			Calcium	1300	MG/KG	n/a	54362
			Cerium-144	0.238	PCI/G	64	n/a
			Cesium-137	0.0645	PCI/G	4	1.4
			Chromium	5.1	MG/KG	n/a	34.2
			Chrysene	0.44	MG/KG	96	19.5
			Cobalt	2.4	MG/KG	n/a	51.1
			Cobalt-60	0.0454	PCI/G	0.9	n/a
			Copper	1.1	MG/KG	3000	15.7
			Fluoranthene	1.2	MG/KG	3200	32.5 *
			Iron	8000	MG/KG	n/a	35586
			Lead	6.1	MG/KG	400	39
			Lithium	10	MG/KG	n/a	n/a
			Magnesium	1200	MG/KG	n/a	16147
			Manganese	270	MG/KG	11000	1030
			Nickel	5.4	MG/KG	1600	26.7
			Phenanthrene	1.1	MG/KG	n/a	24.2 *
			Plutonium-238	0.005	PCI/G	20	0.014
			Plutonium-239	0.014	PCI/G	18	0.052
			Potassium	760	MG/KG	n/a	6179
			Pyrene	1.1	MG/KG	2400	12.8 *
			Radvan Cobalt-60	0.88	PCI/G	0.9	n/a
			Radvan Ruthenium-106	1.11	PCI/G	14	n/a
			Sodium	79	MG/KG	n/a	1884
			Strontium	11	MG/KG	48000	n/a
			Thorium-228	1.579	PCI/G	1.5	n/a
			Thorium-230	1.163	PCI/G	5	n/a
			Thorium-232	1.86	PCI/G	5	2.68
			Uranium-234	0.66	PCI/G	86	2.03
			Uranium-235	0.027	PCI/G	18	0.088
			Uranium-238	0.671	PCI/G	59	1.9
			Vanadium	9.6	MG/KG	560	66
			Zinc	34	MG/KG	24000	101
48-2056	0.5 - 1.5 ft	AAA3766	Americium-241	0.008	PCI/G	17	n/a
			Benzo[a]anthracene	0.39	MG/KG	1	12.4 *
			Benzo[a]pyrene	0.49	MG/KG	0.1	12.1 *
			Benzo[b]fluoranthene	0.57	MG/KG	1	12.2 *
			Cerium-144	0.114	PCI/G	64	n/a
			Cesium-137	0.0788	PCI/G	4	1.4
			Chrysene	0.5	MG/KG	96	19.5

48-002(a/b) Detects

Location ID	Depth of sample	Sample ID	Analyte	Results	Units	SAL	UTL
			Uranium-238	0.608	PCI/G	59	1.9
48-2081		AAA3787	Mercury	23	MG/KG	24	0.1
			Mercury	24	MG/KG	24	0.1
			Mercury	27	MG/KG	24	0.1
XRF Results							
48-2006	0.0 - 0.5 ft	AAA4494	Barium	514	PPM	5600	1143
			Calcium	0.59	%	n/a	54362
			Chromium	15	PPM	n/a	34.2
			Copper	12	PPM	3000	15.7
			Iron	1.8	%	n/a	35586
			Lead	25	PPM	400	39
			Manganese	440	PPM	11000	1030
			Mercury	32	PPM	24	0.1
			Potassium	2.67	%	n/a	6179
			Thorium	20	PPM	n/a	n/a
			Titanium	2239	PPM	n/a	n/a
			Zinc	53	PPM	24000	101
48-2006	0.5 - 1.5 ft	AAA4493	Barium	393	PPM	5600	1143
			Barium	445	PPM	5600	1143
			Calcium	0.58	%	n/a	54362
			Calcium	0.58	%	n/a	54362
			Chromium	11	PPM	n/a	34.2
			Chromium	12	PPM	n/a	34.2
			Copper	12	PPM	3000	15.7
			Iron	1.81	%	n/a	35586
			Iron	1.87	%	n/a	35586
			Lead	22	PPM	400	39
			Lead	29	PPM	400	39
			Manganese	401	PPM	11000	1030
			Manganese	424	PPM	11000	1030
			Mercury	10	PPM	24	0.1
			Nickel	16	PPM	1600	26.7
			Potassium	2.83	%	n/a	6179
			Potassium	2.87	%	n/a	6179
			Thorium	15	PPM	n/a	n/a
			Thorium	17	PPM	n/a	n/a
			Titanium	2211	PPM	n/a	n/a
			Titanium	2212	PPM	n/a	n/a
			Zinc	44	PPM	24000	101
			Zinc	46	PPM	24000	101
48-2006	1.5 - 3.0 ft	AAA4495	Barium	331	PPM	5600	1143
			Calcium	0.48	%	n/a	54362
			Chromium	12	PPM	n/a	34.2
			Iron	1.57	%	n/a	35586
			Lead	28	PPM	400	39
			Manganese	362	PPM	11000	1030
			Mercury	190	PPM	24	0.1
			Potassium	3.13	%	n/a	6179
			Thorium	20	PPM	n/a	n/a

48-002(a/b) Detects

Location ID	Depth of sample	Sample ID	Analyte	Results	Units	SAL	UTL
			Chromium	14	PPM	n/a	34.2
			Copper	18	PPM	3000	15.7
			Iron	1.83	%	n/a	35586
			Lead	40	PPM	400	39
			Manganese	533	PPM	11000	1030
			Potassium	2.97	%	n/a	6179
			Thorium	15	PPM	n/a	n/a
			Titanium	2134	PPM	n/a	n/a
			Zinc	59	PPM	24000	101
48-2007	0.5 - 1.0 ft	AAA4497	Barium	409	PPM	5600	1143
			Calcium	0.53	%	n/a	54362
			Iron	1.62	%	n/a	35586
			Lead	30	PPM	400	39
			Manganese	429	PPM	11000	1030
			Potassium	2.88	%	n/a	6179
			Thorium	16	PPM	n/a	n/a
			Titanium	1662	PPM	n/a	n/a
			Zinc	45	PPM	24000	101
48-2008	0.0 - 0.5 ft	AAA4499	Barium	417	PPM	5600	1143
			Barium	421	PPM	5600	1143
			Calcium	0.59	%	n/a	54362
			Calcium	0.59	%	n/a	54362
			Copper	10	PPM	3000	15.7
			Iron	1.66	%	n/a	35586
			Iron	1.67	%	n/a	35586
			Lead	29	PPM	400	39
			Lead	33	PPM	400	39
			Manganese	354	PPM	11000	1030
			Manganese	372	PPM	11000	1030
			Potassium	2.92	%	n/a	6179
			Potassium	2.97	%	n/a	6179
			Thorium	12	PPM	n/a	n/a
			Thorium	12	PPM	n/a	n/a
			Titanium	1856	PPM	n/a	n/a
			Titanium	1859	PPM	n/a	n/a
			Zinc	41	PPM	24000	101
			Zinc	43	PPM	24000	101
48-2008	0.5 - 1.5 ft	AAA4500	Barium	445	PPM	5600	1143
			Calcium	0.62	%	n/a	54362
			Chromium	11	PPM	n/a	34.2
			Iron	1.81	%	n/a	35586
			Lead	27	PPM	400	39
			Manganese	385	PPM	11000	1030
			Potassium	2.86	%	n/a	6179
			Thorium	18	PPM	n/a	n/a
			Titanium	2183	PPM	n/a	n/a
			Zinc	46	PPM	24000	101
48-2008	1.5 - 3.0 ft	AAA3749	Barium	351	PPM	5600	1143
			Calcium	0.48	%	n/a	54362
			Chromium	10	PPM	n/a	34.2
			Iron	1.46	%	n/a	35586
			Lead	24	PPM	400	39

48-002(a/b) Detects

Location ID	Depth of sample	Sample ID	Analyte	Results	Units	SAL	UTL
			Titanium	1662	PPM	n/a	n/a
			Zinc	43	PPM	24000	101
48-2056	0.5 - 1.5 ft	AAA3766	Barium	308	PPM	5600	1143
			Calcium	0.41	%	n/a	54362
			Iron	1.4	%	n/a	35586
			Lead	19	PPM	400	39
			Manganese	344	PPM	11000	1030
			Mercury	12	PPM	24	0.1
			Potassium	3.03	%	n/a	6179
			Thorium	12	PPM	n/a	n/a
			Titanium	1361	PPM	n/a	n/a
			Zinc	40	PPM	24000	101
48-2056	1.5 - 2.0 ft	AAA3767	Barium	353	PPM	5600	1143
			Calcium	0.51	%	n/a	54362
			Chromium	12	PPM	n/a	34.2
			Copper	15	PPM	3000	15.7
			Iron	1.53	%	n/a	35586
			Lead	21	PPM	400	39
			Manganese	371	PPM	11000	1030
			Potassium	3.06	%	n/a	6179
			Thorium	14	PPM	n/a	n/a
			Titanium	1504	PPM	n/a	n/a
			Zinc	40	PPM	24000	101
48-2060	0.0 - 0.5 ft	AAA3775	Arsenic	36	PPM	n/a	11.6
			Barium	135	PPM	5600	1143
			Calcium	0.57	%	n/a	54362
			Chromium	17	PPM	n/a	34.2
			Copper	31	PPM	3000	15.7
			Iron	1.48	%	n/a	35586
			Lead	18	PPM	400	39
			Manganese	352	PPM	11000	1030
			Mercury	50110	PPM	24	0.1
			Potassium	2.48	%	n/a	6179
			Thorium	57	PPM	n/a	n/a
			Titanium	2080	PPM	n/a	n/a

* UTL value is taken from the Assessments Council position paper "Interim Guidance for Evaluating PAHs in Soil"

48-002(a/b) Detects above SAL and/or UTL

Location ID	Depth of sample	Sample ID	Analyte	Results	Units	SAL	UTL
			Benzo[b]fluoranthene	5.4	MG/KG	1	12.2 *
			Benzo[k]fluoranthene	2	MG/KG	1	19.4 *
			Dibenzo[a,h]anthracene	0.63	MG/KG	0.1	2.9 *
			Indeno[1,2,3-cd]pyrene	2.4	MG/KG	1	6 *
			Plutonium-239	0.231	PCI/G	18	0.052
48-2008	0.5 - 1.5 ft	AAA4500	Thorium-228	1.54	PCI/G	1.5	n/a
			Benzo[a]anthracene	1.3	MG/KG	1	12.4 *
			Benzo[a]pyrene	1.5	MG/KG	0.1	12.1 *
			Benzo[b]fluoranthene	1.6	MG/KG	1	12.2 *
			Plutonium-238	0.055	PCI/G	20	0.014
			Plutonium-239	0.826	PCI/G	18	0.052
48-2008	1.5 - 3.0 ft	AAA3749	Thorium-228	1.754	PCI/G	1.5	n/a
			Benzo[a]pyrene	0.47	MG/KG	0.1	12.1 *
			Plutonium-238	0.053	PCI/G	20	0.014
			Plutonium-239	0.436	PCI/G	18	0.052
48-2009	0.0 - 0.5 ft	AAA3750	Thorium-228	1.622	PCI/G	1.5	n/a
			Plutonium-239	0.34	PCI/G	18	0.052
48-2009	0.0 - 0.5 ft	AAA3758	Thorium-228	1.661	PCI/G	1.5	n/a
48-2009	0.5 - 1.5 ft	AAA3751	Benzo[a]pyrene	0.37	MG/KG	0.1	12.1 *
			Benzo[a]pyrene	0.43	MG/KG	0.1	12.1 *
48-2009	1.5 - 3.0 ft	AAA3752	Thorium-228	1.656	PCI/G	1.5	n/a
			Plutonium-239	0.388	PCI/G	18	0.052
48-2056	0.0 - 0.5 ft	AAA3765	Thorium-228	1.619	PCI/G	1.5	n/a
			Benzo[a]pyrene	0.45	MG/KG	0.1	12.1 *
48-2056	0.5 - 1.5 ft	AAA3766	Thorium-228	1.579	PCI/G	1.5	n/a
			Benzo[a]pyrene	0.49	MG/KG	0.1	12.1 *
			Plutonium-238	0.016	PCI/G	20	0.014
48-2056	1.5 - 2.0 ft	AAA3767	Thorium-228	1.836	PCI/G	1.5	n/a
			Plutonium-238	0.078	PCI/G	20	0.014
48-2060	0.0 - 0.5 ft	AAA3775	Plutonium-239	0.084	PCI/G	18	0.052
			Benzo[a]anthracene	14.2	MG/KG	1	12.4 *
			Benzo[a]pyrene	14.5	MG/KG	0.1	12.1 *
			Benzo[b]fluoranthene	18.5	MG/KG	1	12.2 *
			Benzo[k]fluoranthene	5	MG/KG	1	19.4 *
			Indeno[1,2,3-cd]pyrene	5.7	MG/KG	1	6 *
48-2061		AAA3787	Thorium-228	1.617	PCI/G	1.5	n/a
			Mercury	27	MG/KG	24	0.1
XRF Results							
48-2006	0.0 - 0.5 ft	AAA4494	Mercury	32	PPM	24	0.1
48-2006	0.5 - 1.5 ft	AAA4493	Mercury	10	PPM	24	0.1
48-2006	1.5 - 3.0 ft	AAA4495	Mercury	190	PPM	24	0.1
48-2007	0.0 - 0.5 ft	AAA4496	Copper	18	PPM	3000	15.7
			Lead	40	PPM	400	39
48-2009	0.0 - 0.5 ft	AAA3750	Mercury	31	PPM	24	0.1
48-2056	0.5 - 1.5 ft	AAA3766	Mercury	12	PPM	24	0.1
48-2060	0.0 - 0.5 ft	AAA3775	Arsenic	36	PPM	n/a	11.6
			Copper	31	PPM	3000	15.7
			Mercury	50110	PPM	24	0.1

* UTL value is taken from the Assessments Council position paper "Interim Guidance for Evaluating PAHs in Soil"

Chemical	EPA Cancer Class	Risk Range		Cleanup Level mg/kg Occupational Scenario Carcinogenic Range			Noncarc.
Arsenic	A	1.00E-04 -	1.00E-06	250	-	2	613
Beryl	D						7,530
Cadmium	B1	1.00E-04 -	1.00E-06	2,523	-	25	2,044
Chromium VI	A	1.00E-04 -	1.00E-06	378	-	4	10,220
Copper							75,628
Manganese							793
Mercury	D						279
Nickel	A						40,880
Silver	D						10,220
Thallium							164
Vanadium							14,308
Zinc	D						613,200
Benzene	A	1.00E-04 -	1.00E-06	277	-	3	
cis-1,2-Dichloroethene							20,440
Methylene Chloride	B2	1.00E-04 -	1.00E-06	2,508	-	25	11,545
Tetrachloroethene	B-C	1.00E-04 -	1.00E-06	3,088	-	31	20,440
1,1,1-Trichloroethane	D						7,259
Trichloroethene	B-C	1.00E-04 -	1.00E-06	1,347	-	13	
Benzo(a)pyrene	B2	1.00E-04 -	1.00E-06	78	-	1	
PCBs	B2	1.00E-04 -	1.00E-06	74	-	1	
2,4-DNT	B2	1.00E-04 -	1.00E-06	842	-	8	4,088
2,6-DNT	B2	1.00E-04 -	1.00E-06	842	-	8	2,044
HMX							102,200
PETN							40,880
RDX	C	1.00E-04 -	1.00E-06	5,203	-	52	6,132
TNT	C	1.00E-04 -	1.00E-06	19,077	-	191	1,022

Chemical	EPA Cancer Class	Carcinogenic Slope Factors (kg-day/mg) Oral	Carcinogenic Slope Factors (kg-day/mg) Inhalation	Chronic RfDs (mg/kg-day) Oral	Chronic RfDs (mg/kg-day) Inhalation	VF m^3/kg
Arsenic	A	1.75	15	0.0003		
Barium	D			0.07	0.00014	
Cadmium	B1		6.3	0.001		
Chromium VI	A		42	0.005		
Copper				0.037		
Manganese				0.14	0.000014	
Mercury	D			0.0003	0.00009	
Nickel	A			0.02		
Silver	D			0.005		
Thallium				0.00008		
Vanadium				0.007		
Zinc	D			0.3		
Benzene	A	0.029	0.029			6700
cis-1,2-Dichloroethene				0.01		4600
Methylene Chloride	B2	0.0075	0.0016	0.06	0.86	2900
Tetrachloroethene	B-C	0.052	0.002	0.01		6000
1,1,1-Trichloroethane	D			0.09	0.29	5100
Trichloroethene	B-C	0.011	0.006			5800
Benzo(a)pyrene	B2	7.3				
PCBs	B2	7.7				
2,4-DNT	B2	0.68		0.002		
2,6-DNT	B2	0.68		0.001		
HMX				0.05		
PETN				0.02		
RDX	C	0.11		0.003		
TNT	C	0.03		0.0005		

[illegible]

[illegible]CATION PLAN CALCULATIONS

Verification Plan

The number of samples to be taken to determine whether a confirmation unit (in this case the 20 by 11 foot area of contamination) has achieved the cleanup standard due to excavation is dictated by the sampling frequency needed to achieve statistically defensible data. *Methods for Evaluating the Attainment of Cleanup Standards, Volume 1, Solid Media (EPA 1988)* provides the formulae for calculating the number of random samples needed to determine if the mean concentration remaining in the area after excavation is less than the cleanup goal at a specified level of confidence. The required number of samples is computed using the following equation:

$$n_d = \frac{\left(z_{1-\beta} + z_{1-\alpha}\right)^2}{\tau^2} \quad where \quad \tau = \frac{(C_s - \mu_1)}{\sigma}$$

The required number of samples is computed using the following parameters and assumptions:

Parameter	Assumption	Value
α	alpha - the desired false positive rate	0.05
β	beta - the desired false negative rate	0.2
τ	tau - an expression of relative difference	calculated
C_s	cleanup standard for the sample area	for Hg = 280 mg/kg for PAH = 80 mg/kg
μ_1	the mean concentration where the site should be declared clean with a high probability	assume 50% of C_s
σ	the estimate of the standard deviation of the individual contaminant concentrations within the CU	assume a coefficient of variation of 50% which is 50% of μ_1 or 25% of C_s

Application of this approach with assumptions as outlined results in a confirmatory sample size of 2 soil samples for laboratory analysis. The confirmatory sampling approach will include the evaluation of screening data after each cleanup excavation lift is accomplished. If screening data indicate that contaminant concentrations are 50% or less of the cleanup standard with a standard deviation of 25% of the C_s, the 2 confirmatory

laboratory samples will be obtained. Given the small size of this SWMU, if screening data do not achieve these results, additional soil will be removed until the screening requirements are met. An approach for larger remediated sites would consider the benefit from additional sampling to verify cleanup (i.e., the larger number of samples, the closer the UCL is to the mean) versus the cost of removing additional soil (i.e., reduce the average contaminant concentration).

Results from the 2 laboratory confirmatory samples will be used to calculate the 95% UCL to compare to the cleanup level established for each contaminant. The site cleanup objectives will be obtained when the calculated UCL is less than the established cleanup levels.

REFERENCE

0794 EPA (US Environmental Protection Agency), February 1989. "Methods for Evaluating the Attainment of Cleanup Standards," Volume 1: Soils and Solid Media, EPA 230/02-89-042, National Technical Information Service, Springfield, Virginia. (EPA 1989, 0794) Verified