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Voluntary Corrective Action Completion Report for a

Solid Waste Management Unit at TA-46

46-003(h) Outfall

Field Unit 3

Environmental Restoration Project

September 1996

A Department of Energy Environmental Cleanup Program

Los Alamos
NATIONAL LABORATORY

VOLUNTARY CORRECTIVE ACTION REPORT

SWMU 46-003(h)

1.0 INTRODUCTION

Solid waste management unit (SWMU) 46-003(h) is the outfall of a drain pipe that once served a sink in Building TA-46-77, located at the eastern end of Technical Area (TA) 46. During Phase I investigation of the SWMU, cadmium, copper, and lead were detected above screening action levels (SALs) and retained as chemicals of potential concern (COPCs).

Concentrations of contaminants were below industrial cleanup levels. However, a cleanup was considered best management practice and was pursued as a voluntary corrective action (VCA) for the following reasons.

- At this very small SWMU, cleanup costs were considered more reasonable than the Phase II RFI process, and this VCA was considered a final remedy.
- A picnic table, barbecue grill, and horseshoe pit are located in the vicinity of this SWMU and are available to area workers. The increased potential for worker exposure was an important concern.
- The original sample depth (0.5 ft) under the outfall did not follow depth guidance (1.5 to 2 ft) outlined in the Environmental Protection Agency (EPA) notice of deficiency for the RFI work plan for TA-46 (EPA 1994, 11-255)

SWMU 46-003(h) is listed in Table A of the Los Alamos National Laboratory's (LANL's) Hazardous and Solid Waste Amendments (HSWA) permit. This report serves as a formal request for Department of Energy (DOE) and New Mexico Environment Department (NMED) concurrence that no further action is necessary at this SWMU.

2.0 SITE CHARACTERIZATION PRIOR TO REMOVAL

2.1 History

Solid waste management unit (SWMU) 46-003(h) is an inactive outfall that once served a sink in TA-46-77. SWMU 46-003(h) is discussed in a VCA plan (LANL 1996, 11-263) and in the RFI work

plan, Subsections 5.3.1.1 and 5.3.4.2.2 (LANL 1993, 1093). TA-46-77 was constructed in the 1960s as a warehouse for general storage. The building now serves as a welding and machine shop facility. The outfall was plugged in 1994.

The objective of Phase I RFI sampling was to determine if contaminants were present at levels of concern in soil beneath the outfall. The RFI sampling indicated that concentrations of several inorganics were above SALs but below accepted industrial cleanup levels. However, because the SWMU is near an area that has a horseshoe pit, barbecue grill, and picnic table, a voluntary corrective action (VCA) cleanup for SWMU 46-003(h) was performed as a best management practice. Soil removal was an obvious and final remedy requiring less than a week to accomplish.

Archival information indicates that waste from the sink in TA-46-77 was discharged without treatment (Dunne 1976, 11-081). Volatile organic compounds (VOCs), semivolatile organic compounds (SVOCs), and metals may have been discarded in the sink. There is no indication that uranium was ever brought into the building.

2.2 Description

TA-46-77 is a 30 ft x 40 ft metal building on a concrete foundation. SWMU 46-003(h) is a small area of soil beneath the outfall of a 1-in. diameter pipe. The pipe once protruded about 1 ft above ground and about 6-in. beyond the east wall of the building. Effluent was discharged directly on a chunk of concrete beneath the pipe. No erosion channel formed on the level ground. The area is unpaved and sparsely covered with weeds (LANL 1993, 1093). In 1994 the pipe was cut flush with the building and plugged. A large tree is near the building, and the site workers use the area for some informal picnic use.

2.3 Previous Investigation

Phase I RFI sampling at TA-46 was conducted between August and November of 1994. Sampling at SWMU 46-003(h) was designed to detect maximum contamination using reconnaissance sampling.

2.4 Field Investigation

During the 1994 sampling, three biased soil samples were taken at the outfall (Fig. 2.4-1). All samples were analyzed for inorganics and semivolatile organic compounds (SVOCs). Two samples were analyzed for volatile organic compounds (VOCs),(Table 2.4-1).

TABLE 2.4-1

SUMMARY OF SAMPLES COLLECTED FOR SWMU 46-003(h)

SAMPLE ID	SITE ID	DEPTH (ft)	MEDIUM	INORGANICS	VOCs[a]	SVOCs[b]
AAA9508	46-1146	1	Soil	19881[c]	19416	19416
AAA9509	46-1147	0.5	Soil	19881	NA[d]	19416
AAA9510	46-1148	1	Soil	19881	19416	19416

[a] VOCs = Volatile organic compounds.
[b] SVOCs = Semivolatile organic compounds.
[c] ER analytical request number.
[d] NA = Not analyzed.

Fig. 2.4-1. TA-46-77, showing the SWMU 46-003(h) cleanup area.

2.5 Evaluation of Inorganic and Organic Chemicals

Cadmium, copper, and lead were detected above SALs. Chromium, mercury, nickel, silver, and zinc were detected above the LANL background upper tolerance limit (UTL). (Table 2.5-1). Mercury is qualified as estimated (J) because mercury recovery in the control sample exceeded 120%, indicating that mercury results may be biased high.

TABLE 2.5-1

INORGANICS DETECTED ABOVE BACKGROUND UTLs AT SWMU 46-003(h)

SAMPLE ID	DEPTH (ft)	CADMIUM (mg/kg)	CHROMIUM (mg/kg)	COPPER (mg/kg)	LEAD (mg/kg)	MERCURY (mg/kg)	NICKEL (mg/kg)	SILVER (mg/kg)	ZINC (mg/kg)
SAL[a]	N/A	38	210	2 800	400	23	1 500	380	23 000
LANL UTL[c]	N/A	2.7	19.3	15.5	23.3	0.1	15.2	ND[d]	50.8
AAA9508	1	**62.8**[e]	*149*[f]	7 640	902	*12.2 (J)*	*70.3*	*62.5*	*1 130*
AAA9509	0.5	<0.66	5.7	*37*	17.3	*0.75 (J)*	<4.6	<1.7	*114*
AAA9510	1	<0.83	4.4	*18.2*	*24.2*	*0.57 (J)*	<3.6	<0.55	*186*

[a] SAL = Screening action level.
[b] N/A = Not applicable.
[c] UTL = Upper tolerance limit.
[d] ND = Not determined.
[e] Bold = Result above SAL.
[f] Italics = Result above background UTL.

2.6 Evaluation of Organic Chemicals

A common plasticizer, bis(2-ethylhexyl)phthalate), was found in samples AAA9508 and AAA9509. A trace amount of toluene was found in sample AAA9508 (Table 2.6-1). These contaminants are well below SALs for the respective compounds.

TABLE 2.6-1

SOIL CONCENTRATIONS FOR
ORGANIC ANALYTES WITH VALUES GREATER
THAN THE REPORTING LIMIT

SAMPLE ID	DEPTH (ft)	SEMIVOLATILE AND VOLATILE ORGANICS	RESULT (mg/kg)	SAL (mg/kg)
AAA9508	1	Bis(2-ethylhexyl)phthalate	1.1	32
AAA9508	1	Toluene	0.005	1 900
AAA9509	0.5	Bis(2-ethylhexyl)phthalate	0.41	32

2.7 Human Health Assessment

2.7.1 Screening Assessment

Cadmium, copper, and lead were found above SAL in sample AAA9508 collected at the outfall (Table 2.4-1). Therefore, these three contaminants were identified as COPCs.

TABLE 2.7-1

INORGANICS DETECTED ABOVE SALs AT SWMU 46-003(h)

SAMPLE ID	DEPTH (ft)	CADMIUM (mg/kg)	COPPER (mg/kg)	LEAD (mg/kg)
SAL	*N/A*[a]	*38*	*2 800*	*400*
PRG	*N/A*	*850*	*63 000*	*1 000*
AAA9508	1	62.8	7 640	902

[a] N/A = Not applicable.

Remaining inorganic contaminants greater than LANL background UTLs were submitted for multiple chemical evaluation (MCE) for noncarcinogenic effects. The sum of the maxima for the noncarcinogenic group is 0.8, below the target value of 1, indicating a low potential for adverse effects due to exposure to this grouping (Table 2.7-2). Therefore, these contaminants were not identified as chemicals of potential concern (COPCs).

Chromium was the only carcinogen detected above UTLs, therefore, no MCE was performed for this grouping. No radionuclide analyses were performed for SWMU 46-003(h), however, field screening for radioactivity was performed at each sample location. None was found.

TABLE 2.7-2

MULTIPLE CHEMICAL EVALUATION NONCARCINOGENIC EFFECTS
AT SWMU 46-003(h)

CHEMICAL	SAMPLE ID	MAXIMUM SAMPLE VALUE (mg/kg)	SOIL SAL (mg/kg)	NORMALIZED VALUE
Mercury	AAA9508	12.2	23	0.53

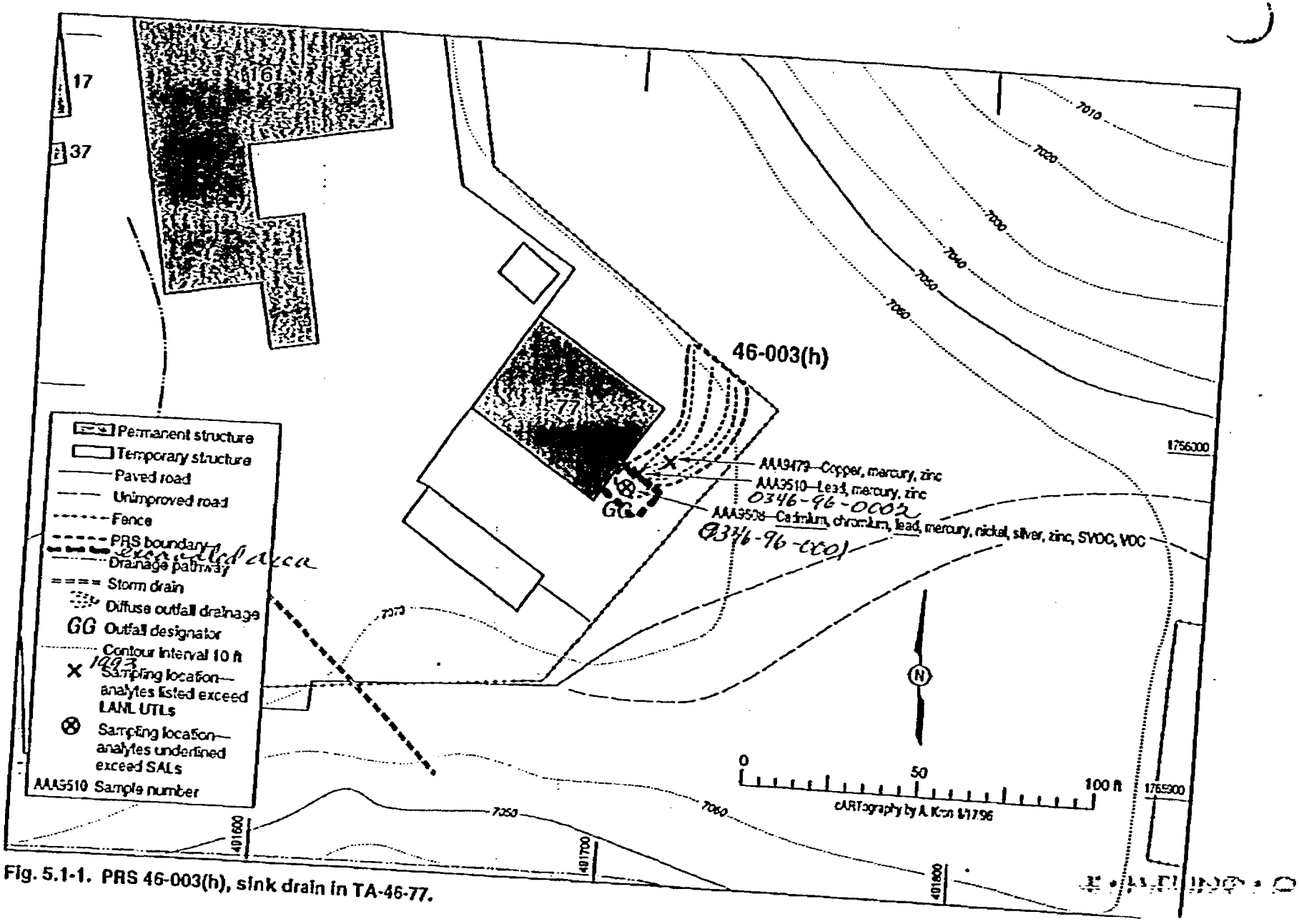

Fig. 5.1-1. PRS 46-003(h), sink drain in TA-46-77.

Nickel	AAA9508	70.3	1 500	0.05
Silver	AAA9508	62.5	380	0.16
Zinc	AAA9508	1 130	23 000	0.05
			TOTAL	0.8

2.7.2 Risk Assessment

No risk assessment was performed for this SWMU

2.8 Preliminary Ecological Assessment

In cooperation with the New Mexico Environment Department and EPA Region 6, the Laboratory Environmental Restoration Project is developing an approach for ecological risk assessment. Further ecological risk assessment at this site will be deferred until the site can be assessed as part of the ecological exposure unit methodology currently being developed. Because of the small size of this SWMU, no environmental impacts are expected.

2.9 Extent of Contamination

Contamination appeared to be confined to the immediate area of the outfall and had not migrated beyond that point.

2.10 Conclusions and Recommendations

SWMU 46-003(h) consisted of a small area of soil that had received effluent from a sink drain outfall. Cadmium, copper, and lead were detected above SALs in the soil. EPA Region 9 generic industrial soil cleanup levels are 850 mg/kg for cadmium, 1 000 mg/kg for lead, and 63 000 mg/kg for copper. Although contaminant concentrations are below these levels, a cleanup was considered best management practice and a VCA was performed by removing contaminated soil in the area of the former outfall.

In the VCA plan for SWMU 46-003(h), EPA Region 9 industrial cleanup levels were used to determine acceptable risk of remaining contaminants (LANL 1996, 11-263). Two confirmatory samples were collected following removal of the soil. No contaminant was found above cleanup levels. Results of confirmatory sampling are discussed in Section 3.3 of this VCA report.

Five criteria have been agreed upon under which a SWMU may be proposed for no further action (NFA) (New Mexico Environment Department et al. 1995, 1328). The appropriate NFA criterion for SWMU 46-003(h) is Criterion 5: the SWMU has been characterized or remediated in accordance

with current applicable state or federal regulations, and the available data indicate that contaminants of concern are either not present or are present in concentrations that would pose an acceptable level of risk under the projected future land use.

Based on NFA Criterion 5, SWMU 46-003(h) is recommended for no further action.

3.0 REMEDIAL ACTIVITIES AND RESULTS OF CONFIRMATORY SAMPLING

3.1 Risk Calculations and/or Cleanup Level Derivation

SWMU 46-003(h) is located in an active industrial area that is designated for continued Laboratory operations. A picnic table, barbecue grill, and horseshoe pit are located in the vicinity of this SWMU and are available to area workers. The COPCs considered for this VCA were identified by comparisons of SWMU 46-003(h) RFI analytical results to background and SAL concentrations. As presented in Section 2.5 of this VCA report, analytical results from the Phase I RFI sampling indicate that three inorganics, cadmium, copper, and lead, are the primary COPCs for soil contamination at the site.

LANL has adopted a lead cleanup level for industrial soils of 1 000 mg/kg recommended by EPA Region 6. This cleanup threshold was calculated by EPA Region 6 using the Integrated Exposure Uptake Biokinetic Model (EPA 1994, 1178) adjusted for default industrial exposure parameters. The proposed soil cleanup level for cadmium of 850 mg/kg and of 63 000 mg/kg for copper has been adopted from the Region 9 preliminary remediation goals (PRGs) for industrial soil. This threshold combines current EPA toxicity values with default industrial exposure factors to estimate a concentration in soil which is protective of human health, including sensitive groups, over a lifetime.

3.2 Remedial Implementation

Soil was removed from a 3.5 x 4 ft area beneath the outfall (Fig. 3.2-1). The contaminated soil was generally removed to a depth of 0.5 ft. Soil was vacuumed into 55-gal drums using a high-power, high-volume vacuum system. Field screening by x-ray fluorescence (XRF) was performed after the first 0.5 ft of contaminated soil was removed to determine if deeper soil excavation was necessary. At the location of the 1994 sampling point under the outfall, a confirmatory sample was collected at a depth of 1 ft. Intensive field screening at that point with XRF for inorganics and the photoionization detector for volatile organics indicated that no contamination remained.

Verification samples were collected to confirm that cleanup goals have been achieved, as shown in Section 3.3 of this VCA report. The site has been filled with clean soil and regraded. Soil stabilization consisted of planting the site with a native plant seed mixture and covered with a biodegradable jute matting. The site will be inspected monthly for six months to determine if further site protection is necessary.

3.3 Confirmatory Sampling

Two confirmatory samples were collected from 46-003(h) (Table 3.3-1). The first sample (46-96-0001) was located 1 ft east of TA-46-77, at a depth of 0–6 in. within the excavated area (approximately 1 ft. below the original surface). The point is approximately 4–6 in. from the 1994 RFI sample AAA9508. This sample was collected following remediation but before site restoration to verify that sufficient material had been removed from the remediated area. Sample 46-96-0002 was collected from undisturbed soil immediately adjacent to the remediated area. This sample, located downgradient from the remediated area, was collected to verify that the extent of remediation was sufficient. Both samples were analyzed for inorganics and VOCs.

Copper, mercury, and zinc detected in the two confirmatory soil samples were above LANL background UTLs, but far below industrial cleanup levels (Table 3.3-2). Although SALs are not cleanup levels, results were also below SALs. A trace of methylene chloride, a common laboratory contaminant was detected. Methylene chloride is not considered a remaining COPC because it was not found in the excavated soil removed from the SWMU, indicating that methylene chloride was not widespread.

TABLE 3.3-1

SUMMARY OF CONFIRMATORY SAMPLES COLLECTED FOR SWMU 46-003(h))

SAMPLE ID	SITE ID	MATRIX	DEPTH (ft)	INORGANICS	VOCs
46-96-0001	?	Soil	0 -0.5 [a]	2564 [b]	2563
46-96-0002	?	Soil	0-0.5	2564	2563

[a] Below excavated surface.
[b] ER analytical request number.

TABLE 3.3-2

INORGANICS AND ORGANICS DETECTED ABOVE BACKGROUND UTLs AT SWMU 46-003(h)

SAMPLE ID	DEPTH (ft)	COPPER mg/kg	MERCURY mg/kg	ZINC mg/kg	METHYLENE CHLORIDE mg/kg
SAL	N/A [a]	2800	23	23,000	11

UTL	N/A	15.5	0.1	50.8	Not determined
46-96-0001	0-0.5 [b]	*36* [c]	*0.21*	*160*	*0.0095*
46-96-0002	0-0.5	12	*0.22*	*70*	Not detected

[a] N/A = Not applicable.
[b] Below excavated surface.
[c] Italics indicates above background UTL.

4.0 WASTE MANAGEMENT

4.1 Waste Minimization, Recycling, and Waste Avoidance

Field screening by XRF was used to ensure that no more soil was excavated than was necessary. Aggressive waste minimization strategies were used to keep volume of investigation-derived waste low. No recycling was possible at this SWMU.

4.2 Comparisons with VCA Plan

Table 4.2-1 compares the actual volumes of generated VCA waste with volumes estimated in the VCA Plan (LANL 1996, 11-263). Discrepancies are due to the initially conservative estimates of waste because the vertical extent of contamination was not defined during phase I sampling. To avoid removing excess volumes during cleanup, soil was screened by x-ray fluorescence for inorganics of concern. Because of waste minimization techniques resulting in lower waste volumes, lower volumes of personal protective equipment and decontamination water were generated.

TABLE 4.2-1

ESTIMATED ACTUAL VOLUMES COMPARED WITH PROJECTED WASTE VOLUMES AT SWMU 46-003(h)

ITEM	WASTE TYPE	PROJECTED BULK VOLUME	ESTIMATED ACTUAL VOLUME
Investigation waste/ Personal protective equipment	Municipal refuse	1 yd^3	0.1 yd^3
Contaminated soils	Nonhazardous, nonradioactive waste	10 yd^3	1 yd^3
Decontamination water	Nonhazardous, nonradioactive waste	50 gal.	5 gal.

4.3. Type of Waste and Waste Characterization Methods

Contaminated soil was vacuumed into 55-gal. steel drums and managed in accordance with RCRA requirements. Confirmatory sample 46-96-0003 was a composite consisting of one grab sample from each of three waste drums(Table 4.0-1). It was analyzed for inorganics and VOCs. Cadmium, chromium, copper, mercury, nickel, lead, and zinc were found above background UTLs but below SALs and cleanup levels (Table 4.0-2). No VOCs were detected.

TABLE 4.3-1

SUMMARY OF WASTE SAMPLE COLLECTED FOR SWMU 46-003(h)

SAMPLE ID	MATRIX	INORGANIC	VOCs
46-96-0003	Waste	2564 [a]	2563

[a] ER analytical request number.

TABLE 4.3-2

INORGANICS DETECTED IN WASTE COMPOSITE SAMPLE AT SWMU 46-003(h)

SAMPLE ID	CADMIUM (mg/kg)	CHROMIUM (mg/kg)	COPPER (mg/kg)	MERCURY (mg/kg)	NICKEL (mg/kg)	LEAD (mg/kg)	ZINC (mg/kg)
SAL	38	15.5	2800	23	1500	400	23,000
UTL	2.7	19.3	15.5	0.1	15.2	23.3	50.8
46-96-0003	*6.2*[a]	*72*	*300*	*2.8*	*40*	*79*	*410*

[a] Italics = above LANL background UTL.

Drummed soil was characterized by fixed laboratory analysis. Decontamination liquid was characterized based on the results of soil characterization.

4.4 Disposal Locations And Schedules

Drummed soil will be disposed of as nonhazardous chemical waste at an industrial landfill. It is expected that this activity will be completed in calendar year 1996.

5.0 REFERENCES

Dunne, W. M., December 7, 1976. "Rerouting Waste from Building 46-77 to Sewage Lagoons," Los Alamos Scientific Laboratory Memorandum H7-76-494 to J. G. Parsons (ENG-4) from W. M. Dunne (H-7), Los Alamos, New Mexico. (Dunne 1978,11-081)

EPA (US Environmental Protection Agency), February 1994. "Guidance Manual for the Integrated Exposure Uptake Biokinetic Model for Lead in Children," EPA 540-R-93-081, Office of Emergency and Remedial Response, Washington, DC. (EPA 1994, 1178)

EPA (US Environmental Protection Agency), July 15, 1994. "Notice of Deficiency, RFI Work Plan OU 1140" Letter from William Honker (EPA) to Joseph Vozella (LAAO), EPA Region VI, Hazardous Waste Management Division, Dallas, Texas. **(EPA 1994, 11-255)**

LANL (Los Alamos National Laboratory), August 1993. "RFI Work Plan for Operable Unit 1140," Los Alamos National Laboratory Report LA-UR-93-1940, Los Alamos, New Mexico. **(LANL 1993, 1093)**

LANL (Los Alamos National Laboratory). "Los Alamos National Laboratory Environmental Restoration Program Standard Operating Procedures," Los Alamos National Laboratory report, Los Alamos, New Mexico. **(LANL, 0875)**

LANL (Los Alamos National Laboratory), August 1996. "Voluntary Corrective Action Plan for a Solid Waste Management Unit at TA-46," Los Alamos, New Mexico. **(LANL 1996, 11-263)**

New Mexico Environment Department, US Environmental Protection Agency, Los Alamos National Laboratory, Sandia National Laboratory, November 16, 1995. "Environmental Restoration Document of Understanding," Santa Fe, New Mexico. **(New Mexico Environment Department et al. 1995, 1328)**

APPENDIX A RAW RFI CHARACTERIZATION DATA

1. Screening Data. Decisions for this SWMU were based on laboratory data. No screening data were used in final decisions.

2. Confirmatory Sampling Data. Confirmatory sampling data are shown in Appendix D of this VCA report.

3. Waste Characterization Data. Waste characterization data are shown in Appendix D of this VCA report.

Chemicals that are reported by analytical laboratories that are nonhazardous, below Laboratory background levels, or as undetected have not been included in the tables of this VCA report. Nonetheless, these analytes are part of the decision-making process and it is important to note that these chemicals were analyzed for. Analytes included in the inorganic analytical suite for this VCA report are listed below.

Aluminum	Beryllium	Cobalt	Magnesium	Potassium	Thallium
Antimony	Cadmium	Copper	Manganese	Selenium	Vanadium
Arsenic	Calcium	Iron	Mercury	Silver	Zinc

Barium	Chromium	Lead	Nickel	Sodium

Analytes included in the VOC analytical suite for this VCA report are listed below.

Acetone	1,2-Dibromo-3-chloropropane	Isopropylbenzene
Benzene	1,2-Dibromoethane	p-Isopropyltoluene
Bromobenzene	Dibromomethane	4-Methyl-2-pentanone
Bromochloromethane	1,2-Dichlorobenzene	Methylene chloride
Bromodichloromethane	1,3-Dichlorobenzene	n-Propylbenzene
Bromoform	1,4-Dichlorobenzene	Styrene
Bromomethane	Dichlorodifluoromethane	1,1,1,2-Tetrachloroethane
2-Butanone	1,1-Dichloroethane	1,1,2,2,-Tetrachloroethane
n-Butylbenzene	1,2-Dichloroethane	Tetrachloroethene
sec-Butylbenzene	1,1-Dichloroethene	Toluene
tert-Butylbenzene	1,2-Dichloroethene (total)	Trichlorotrifluoroethane
Carbon disulfide	1,2-Dichloropropane	1,1,1-Trichloroethane
Carbon tetrachloride	1,3-Dichloropropane	1,1,2-Trichloroethane
Chlorobenzene	2,2-Dichloropropane	Trichloroethene
Chlorodibromomethane	1,1-Dichloropropene	Trichlorofluoromethane
Chloroethane	cis-1,3-Dichloropropene	1,2,3-Trichloropropane
Chloroform	trans-1,3-Dichloropropene	1,2,4-Trimethylbenzene
Chloromethane	Ethylbenzene	1,3,5-Trimethylbenzene
2-Chlorotoluene	2-Hexanone	Vinyl chloride
4-Chlorotoluene	Iodomethane	o,m,p-Xylene (mixed)

APPENDIX B QUALITY ASSURANCE/QUALITY CONTROL (QA/QC)

Validated data are available in Facility for Information, Management, Analysis, and Display (FIMAD) or upon request.

Samples are submitted to analytical laboratories in batches identified by a request number. Request numbers for each sampling campaign at SWMU 46-003(h) are referenced in Tables 2.4-1 and 3.3-1 of this VCA report. Table B-1 summarizes the results of quality assurance/quality control (QA/QC) data validation for all inorganic and radiological analytical results used to support recommendations in this VCA report.

TABLE B-1

DATA QUALITY EVALUATION FOR INORGANIC ANALYSES
AT SWMU 46-003(h)

SUITE	REQUEST NUMBER	COMMENTS
Inorganics	2564	Recoveries of the initial and continuing calibration and post-digestion spike were in control. Spike sample recoveries for antimony were below control limits. Recoveries for aluminum and iron were very high (679& and 397% respectively. These analytes were not considered in formulating decisions for this SWMU. Eight duplicate analyses were beyond control limits. These are considered due to inhomogeneity of the samples. Antimony was out of control in the laboratory control sample. Because all QC samples were in control for the analytes of concern in this confirmatory samples, the data are accepted as valid.
	19881	Holding times for mercury were slightly exceeded. Because holding times are established only for water matrices, and the times were not grossly exceeded, mercury results were not qualified. Mercury recovery in the laboratory control sample exceeded 120%. Mercury results were qualified as estimates (J). QC spike results for aluminum, potassium, sodium, and vanadium were outside control limits. These analytes were not considered contaminants of concern. Spiking levels of selenium and thallium were below instrument detection levels. The analytes were not found in the samples.
Volatile organic compounds	2563	Sample 46-96-0003 exhibited sample matrix interference with surrogate standards. This interference was confirmed by the matrix spike/matrix spike duplicate analyses. No target compounds were detected in the sample. A tentatively identified compound, 5-methyl-tetrazole, was detected in the Blank and laboratory control sample recoveries were in control except for 1,2,3-trichloropropane at the 200 µg/kg level (73%).
	19416	An unknown tentatively identified compound was reported in the blank but not in the samples. Recovery of one surrogate was out of control in sample AAA9508. Results were not qualified because recovery was high. No other anomalies were noted and results were accepted as valid.
Semivolatile organic compounds	19416	Toluene and 1,1,2,2-tetrachloroethane were detected in the blank but were not found in the samples. Recovery of pyrene did not meet control limits. Recoveries of 18 compounds in the blind QC sample did not meet control limits. None was found in the samples. No other anomalies were noted and results were accepted as valid.

APPENDIX C BEFORE AND AFTER COST COMPARISON

Table C-1 shows cost comparisons for the life cycle of remediation, including waste management.

APPENDIX C

COST COMPARISON

ACTIVITY	PROJECTED COSTS	ACTUAL COSTS
Pre-field activities (field preparation and plan development)	$8 000	Cathy
Cleanup	$25 000	?
Waste management disposal	$2 000	?
Sampling/analytical	$2 000	?
Post-field activities and report	$8 000	?
Total estimated cost	$53 000	?

APPENDIX D CONFIRMATORY SAMPLING RESULTS TABLE

All contaminants detected above LANL background UTLs in confirmatory sampling are listed in Table 3.3-2 of this VCA report.

APPENDIX E CERTIFICATION OF COMPLETION

The ER Field Unit 3 certification of completion follows this page.

Los Alamos Environmental Restoration Records Processing Facility

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