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TA 00

Date: July 15, 2005
Refer to: ER2005-0442

Mr. James Bearzi
NMED – Hazardous Waste Bureau
2905 Rodeo Park Drive East, Building 1
Santa Fe, NM 87505-6303

RECEIVED
JUL 2005
NMED Hazardous Waste Bureau

SUBJECT: SUPPLEMENTAL RESPONSE TO THE NOTICE OF DEFICIENCY FOR THE COMPLETION REPORT FOR THE VOLUNTARY CORRECTIVE ACTION AT SOLID WASTE MANAGEMENT UNITS 0-030(l), 0-033(a), AND 0-030(a) AND AREA OF CONCERN 0-004, 0-010(b), 0-033(b), AND 0-029(a, b, c) LOS ALAMOS NATIONAL LABORATORY, EPA ID #NM0890010515 HWB-LANL-03-013

Dear Mr. Bearzi:

Attached are two hard copies with electronic files of the "Supplemental Response to the Notice of Deficiency for the Completion Report for the Voluntary Corrective Action at Solid Waste Management Units 0-030(l), 0-033(a), and 0-030(a) and Areas of Concern 0-004, 0-010(b), 0-033(b), and 0-029(a, b, c)." This attachment completes the documentation for all work performed in support of the above-named voluntary corrective action.

The work reported in this attachment was proposed in the initial notice of deficiency response (LA-UR-04-2783) dated April 28, 2004. The proposal was agreed to in a conversation with Darlene Goering of your staff in May 2004 and ultimately approved with an approval with modifications letter dated June 21, 2004.

If you have questions, please contact Terry Rust at (505) 665-8843 (trust@lanl.gov) or Bob Enz at (505) 667-7640 (renz@doeal.gov).

Sincerely,

for
David McInroy, Deputy Program Director
Environmental Remediation & Surveillance
Los Alamos National Laboratory

Sincerely,

for
David Gregory, Federal Project Director
Department of Energy
Los Alamos Site Office

TR/jk

Enclosures: 1) Supplemental Response to the Notice of Deficiency for the Completion Report for the Voluntary Corrective Action at Solid Waste Management Units 0-030(L), 0-033(A), and 0-030(a) and Area of Concern 0-004, 0-010(b), 0-033(b), and 0-029(a, b, c) (two copies) (ER2005-0175)
2) Certification by the ENV–ERS Program Technical Representatives

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T. Rust, ENV-ECR, MS M992
D. Gregory, DOE LASO, MS A316
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S-7, MS F674

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B. Criswell, ENV-ERS, MS M992
B. Enz, DOE-LASO, MS A316
B. Rich, ADO, MS A104
D. Pepe, NMED-OB

CERTIFICATION

CERTIFICATION BY THE ENVIRONMENTAL STEWARDSHIP– ENVIRONMENTAL REMEDIATION & SURVEILLANCE PROGRAM TECHNICAL REPRESENTATIVES

Document Title: **SUPPLEMENTAL RESPONSE TO THE NOTICE OF DEFICIENCY FOR THE COMPLETION REPORT FOR THE VOLUNTARY CORRECTIVE ACTION AT SOLID WASTE MANAGEMENT UNITS 0-030(l), 0-033(a), AND 0-030(a) AND AREA OF CONCERN 0-004, 0-010(b), 0-033(b), AND 0-029(a, b, c) LOS ALAMOS NATIONAL LABORATORY, EPA ID #NM0890010515 HWB-LANL-03-013**

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 ensure that qualified personnel properly gathered and evaluated 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.

Name: Gabriela Y. [illegible] for Date: 7/14/05
David McInroy, Deputy Program Director
Environmental Remediation & Surveillance Program
Los Alamos National Laboratory

or

_____ Date: _____
Ken Hargis, Division Leader
Environmental Stewardship Division
Los Alamos National Laboratory

[illegible] for D. Gregory Date: 7/15/05
David Gregory, Federal Project Director
Environmental Restoration Program
Department of Energy/Los Alamos Site Office

or

_____ Date: _____
John Ordaz,
Assistant Area Manager of Environmental Projects
Department of Energy/Los Alamos Site Office

Supplemental Response to the
Notice of Deficiency [NOD] for the "Completion Report for the Voluntary Corrective Action at SWMUs 0-030(l), 0-033(a), and 0-030(a) and AOCs 0-004, 0-010(b), 0-033(b), and 0-029(a,b,c), Los Alamos National Laboratory, EPA ID# NM0890010515, NMED Task # LANL-03-013"

INTRODUCTION

The information provided herein summarizes the additional fieldwork performed in response to the New Mexico Environment Department (NMED) NOD for the "*Completion Report for the VCA* [Voluntary Corrective Action] *at* [Solid Waste Management Units] *SWMUs 0-030(a), 0-030(b)-00, and 0-033(a) and* [Areas of Concern] *AOCs 0-029(a,b,c) and 0-010(a,b) and for the* [Interim Action] *IA at SWMU 21-021-99"* (September 2003, ER2003-0445, LA-UR-03-4326). The NOD was dated March 19, 2004. Los Alamos National Laboratory (LANL or the Laboratory) responded on April 27, 2004 (ER2004-0164, LA-UR-04-2783). NMED sent an associated "Approval with Modifications" letter dated June 21, 2004.

For each NMED comment that required additional or revised information, the relevant chronology, the applicable text of NMED comments, and any LANL previous responses are provided below. Comments have been separated by shading.

This response contains data on radioactive materials, including source, special nuclear, and by-product material. The management of these materials is regulated under the Atomic Energy Act and is specifically excluded from regulation under the Resource Conservation and Recovery Act and the New Mexico Hazardous Waste Act. Information on radioactive materials and radionuclides, including the results of sampling and analysis of radioactive constituents, is voluntarily provided to NMED in accordance with U.S. Department of Energy policy.

SPECIFIC COMMENTS

LANL completion report, dated September 2003

NMED NOD, dated March 19, 2004

LANL NOD response, dated April 27, 2004:

> *LANL response to Comment #1*
>
> *. . . Sample locations 00-04223 and 00-04224 have the highest detected concentrations of DDT and DDE within the aggregate of AOC 0-003* [0-004]*, AOC 0-033(b), and SWMU 0-030(l) and will be removed during the 2004 field season. Confirmatory samples will be collected, analyzed for pesticides, and reported to NMED in a subsequent communication.*
>
> *. . .Sample location 00-04423 will be sampled at depth at the same time as the soil removal and confirmatory sampling described above. The additional sampling will address the mercury concentration detected at 5-6 ft at this location (0.21 mg/kg) as well as other COPCs detected in this sample.*
>
> *Following receipt of the sample results, the data will be evaluated to determine whether the ecological screening should be redone. The results and any assessment of the data will be reported to NMED in a subsequent communication.*

NMED approval-with-modifications letter, dated June 21, 2004:

Bullet #1

The Permittees acknowledge that additional samples will be collected at AOC 0-004 at sample location 00-04423. However, the Permittees incorrectly identified the sample location. NMED's original comment refers to sample location 00-04223 at the southeast corner of the site (see Figure 2.4-4 of the VCA Completion Report). This location has the highest DDT detection. The Permittees shall resample at location 00-04223.

LANL supplemental response:

Table 1 shows the locations and samples that were excavated while conducting the additional fieldwork in 2004 and 2005.

Table 1
Locations Sampled and Excavated
from AOCs 0-004 and 0-033(b) and SWMU 0-030(l)

Sample ID	Location ID	Depth (ft)	Action
0100-96-1765	00-05761	0–0.5	Excavated
0100-96-1766	00-05762	0–0.5	Excavated
RE00-04-53719	00-22869	0–0.5	Excavated
RE00-05-56938	00-22869	6–6.5	Excavated
RE00-04-56939	00-22869	7–7.5	Excavated

(a) The coordinates for the two sample locations (00-04223 and 00-04224) where NMED requested that the soil be resampled due to the DDT detected (at location 00-04223, 1.8 mg/kg was detected in the sample; at location 00-04224, 0.36 mg/kg was detected in the sample) were located by licensed surveyors. The marked locations were at the mesa edge, immediately adjacent to a near-vertical precipice and, upon inspection, it was discovered that there was no soil remaining to be sampled at these locations (see Figure 1). It is likely that the material was removed by sampling during the previous sampling event. Therefore, no samples were collected at these locations.

Figure 1. Locations 00-04223 and 00-04224

Location 00-05761, sample 0100-96-1765, had 1.3 mg/kg of DDT within the sample; location 00-05762, sample 0100-96-1766, had 1.2 mg/kg of DDT within the sample. An area that encompassed previous sample locations 00-05761 and 00-05762 within AOC 0-033(b) was selected for soil removal in order to further reduce the amount of DDT remaining on these sites. On August 25, 2004, soil was removed in a 10-ft by 3-ft area to a depth of 1 ft (approximately 1 yd^3). Two confirmatory samples were collected, one from each of two locations, following removal of the soil. The samples (RE00-04-53719 at location 00-22869, and RE00-04-53720 at location 00-22870) were collected at a depth of 0-0.5 ft (1–1.5 ft below original ground surface) within the footprint of the soil removal area (location 00-22869 was 2 ft from the north end of the excavated area and approximately 15 in. south of former location 00-05762; location 00-22870 was 2 ft from the south end and approximately 13 in. north of former location 00-05761). The samples were submitted to an off-site fixed laboratory for analysis of pesticides. The detected pesticides are listed in Table 2.

Table 2
Detected Concentrations of Pesticides at AOCs 0-004 and 0-033(b), August 2004

Sample ID	Location ID	Depth (ft)	Media	Chlordane-[alpha-]	Chlordane-[gamma-]	DDD[4,4'-]	DDE[4,4'-]	DDT[4,4'-]	Heptachlor
Residential SSL[a]				**1.6**	**1.6**	**2.4**	**1.7**	**1.7**	**0.11**
RE00-04-53719	00-22869	0–0.5	Soil	—[b]	—	0.427	1.15	5.42	—
RE00-04-53720	00-22870	0–0.5	Soil	0.0139	0.0059(J)[c]	0.0192	0.0887	0.3	—

Note: All results in mg/kg.

[a] NMED 2000, 68554.

[b] — = Not detected.

[c] J = Result is estimated.

The confirmation sample results revealed that additional material needed to be removed from location 00-22869. The confirmation sample results from location 00-22870 indicated that no further sampling was necessary at that location because detected concentrations were approximately two orders of magnitude lower than those in the sample from location 00-05761. Because location 00-22869 had 5.42 mg/kg of DDT detected, it was further excavated to remove the contaminated fill material. An area approximately 3 ft by 3 ft, centered on location 00-22869, was excavated to a depth of 6 ft below ground surface (bgs) (approximately 2 yd^3) on November 16, 2004.

Confirmation samples were collected at depths of 6–6.5 ft and 7–7.5 ft bgs after excavation and submitted for analysis of pesticides. Results of the pesticide analyses of the confirmation samples indicated that DDT and DDE were still present at concentrations similar to the 0- to 0.5-ft sample, so the decision was made to remove additional material (fill and tuff).

On January 27, 2005, the location (00-22869) was excavated, removing all fill material and the upper portion (approximately 0.5 ft) of the tuff. Confirmation samples were collected at depths of 12–12.5 ft and 13–13.5 ft bgs, both from tuff. The samples were submitted to an off-site fixed laboratory for the analyses of pesticides. The results of the analyses are listed in Table 3, with only the detected analytes included.

Table 3
Pesticides Detected in Confirmation Samples at Location 00-22869, January 2005

Sample ID	Location ID	Depth (ft)	Media	DDE[4,4'-]	DDT[4,4'-]
Residential SSL[a]				**1.7**	**1.7**
RE00-05-57653	00-22869	12–12.5	Qbt 3	0.135	0.322
RE00-05-58296	00-22869	13–13.5	Qbt 3	0.00276(J)[b]	0.0061(J)

Note: All results in mg/kg.

[a] NMED 2000, 68554.

[b] J = Result is estimated.

DDT and DDE were detected at low concentrations in both samples, with the upper sample depth concentrations approximately one order of magnitude lower than the previous sample results

(Table 2). The DDT and DDE concentrations in the lower sample depth (RE00-05-58296) (0.0061 mg/kg and 0.00276 mg/kg, respectively) are approximately 50 times lower than the concentrations at the sample depth above (0.322 mg/kg and 0.135 mg/kg, respectively). Both confirmation samples represent a decreasing trend with depth relative to the previously collected samples. The decreasing trend and the low concentrations in the deepest sample indicate that the extent of contamination is defined. The remaining concentrations of both DDE and DDT are well below their residential soil screening levels (SSLs) (NMED 2000, 68554), and do not contribute to any potential unacceptable human health risk. In addition, they do not pose a potential unacceptable ecological risk because there is no complete pathway.

The samples collected at location 00-22869 prior to January 2005 were in material that had been excavated and removed from the site (approximately 4 yd^3 of soil and fill were removed and replaced with crushed tuff and soil fill); therefore, those samples no longer represent site conditions.

(b) As agreed to in the April 2004 NOD response, LANL resampled previous location 00-04423 to determine the extent of mercury. The samples were collected on August 25, 2004, at depths of 6–6.5 ft and 6.5–7 ft bgs. The previous 1995 sample (0100-95-0627) was collected at a depth of 5–6 ft. Samples RE00-04-53549 (6–6.5 ft) and RE00-04-53598 (6.5–7 ft) were submitted to an off-site fixed laboratory for the analyses of pesticides, semivolatile organic compounds, and target analyte list (TAL) metals. The results of inorganic chemical analyses for location 00-04423 are listed in Table 4.

Table 4
Inorganic Chemicals Detected Above BVs at Location 00-04423

Sample ID	Location ID	Depth (ft)	Media	Antimony	Arsenic	Barium	Chromium	Copper	Lead	Mercury	Nickel	Selenium	Thallium	Zinc
			Qbt 3 BV	**0.5**	**2.79**	**46**	**7.14**	**4.66**	**11.2**	**0.1**	**6.58**	**0.3**	**1.1**	**63.5**
			Residential SSL[a]	**30[b]**	**0.39**	**5200**	**2100**	**2800**	**400**	**23[b]**	**1500**	**380**	**6.1**	**23,000**
0100-95-0627	00-04423	5–6	Qbt 3	0.75(U)[c]	3.4	88.4	—[d]	21.5	28	0.21	—	0.82(U)	1.4(U)	92.8
RE00-04-53549	00-04423	6–6.5	Qbt 3	—	3.02	—	63.5(J-)[e]	—	—	—	—	0.502(U)	—	—
RE00-04-53598	00-04423	6.5–7	Qbt 3	—	2.81	—	55.3(J-)	—	—	—	7.48	0.61	—	—

Note: All results in mg/kg; shaded rows are 2004 samples, unshaded row is 1995 sample.

[a] NMED 2000, 68554.

[b] EPA Region 6 Residential Soil Screening Level (EPA 2002, 73691).

[c] U = Undetected result.

[d] — = Not detected or detected below BV.

[e] J- = Result is estimated, with possible low bias.

Mercury, the primary reason for resampling location 00-04423, was not detected in the deeper (2004) samples. Several other inorganic chemicals that were detected above their background values (BVs) (or with elevated detection limits) in the 1995 sample (5- to 6-ft depth) were also not detected in the deeper samples (antimony, barium, copper, lead, thallium, and zinc). Arsenic and selenium concentrations decreased with depth relative to the 1995 sample. Chromium and nickel were not detected above their BVs in the 1995 sample, but were detected above their BVs in the 2004 samples. The reported concentration of nickel (7.48 mg/kg) is only slightly above the maximum concentration of nickel (7 mg/kg) in the background data set (LANL 1998, 59730) and simply reflects the natural variability of nickel in tuff. The two chromium results at depth are above the chromium BV, but are well below the NMED residential SSLs (NMED 2000, 68554) for both chromium III (1.00E+05 mg/kg) and chromium VI (230 mg/kg), and below the EPA Region 6 residential SSL for total chromium (2100 mg/kg). Given the lack of detected chromium in the overlying tuff it is not believed that these detects are indicative of a site release. Coupled with the depth at which the detects occurred, and the concentration detected, chromium is not considered a contributor to human health or ecological risk at this site. All reported concentrations of inorganic chemicals are less than their respective residential SSLs.

The pesticides and other organic chemicals detected in the 2004 samples are listed in Table 5, together with the 1995 sample for comparison.

Both DDE and DDT decreased with depth as compared to the 1995 sample. All detected organic chemicals are at low concentrations (four orders of magnitude) below their residential SSLs (NMED 2000, 68554) and were detected below the estimated quantitation limits.

The depths of the 2004 samples (6–6.5 and 6.5–7 ft bgs) are below the depth available to ecological receptors and are both within tuff, so they do not pose a potential unacceptable ecological risk.

Table 5
Detected Concentrations of Organic Chemicals at Location 00-04423

Sample ID	Location ID	Depth (ft)	Media	Benzoic Acid	BHC[alpha-]	BHC[gamma-]	Chlordane-[gamma-]	DDD[4,4'-]	DDE[4,4'-]	DDT[4,4'-]	Dieldrin	Heptachlor	Nitroso-di-n-propylamine[N-]
Residential SSL[a]				**100,000[b]**	**0.09**	**.44**	**1.6**	**2.4**	**1.7**	**1.7**	**0.03**	**0.11**	**0.70[b]**
0100-95-0668	00-04423	5–6	Qbt 3	—[c]	—	—	—	—	0.00616	0.0136	—	—	—
RE00-04-53549	00-04423	6–6.5	Qbt 3	0.229(J)[d]	0.000222(J)	0.0002(J)	0.000197(J)	—	0.00286	0.00401	0.000457(J)	0.000261(J)	0.219(J)
RE00-04-53598	00-04423	6.5–7	Qbt 3	—	—	—	0.000189(J)	0.000244(J)	0.00295	0.00525	0.000628(J)	—	—

Notes: All results in mg/kg; shaded rows are 2004 samples, unshaded row is 1995 sample.

[a] NMED 2000, 68554.

[b] EPA Region 6 Residential Soil Screening Level (EPA 2002, 73691).

[c] — = Not detected.

[d] J = Result is estimated.

LANL completion report, dated September 2003

NMED NOD, dated March 19, 2004

LANL NOD response, dated April 27, 2004

NMED approval-with-modifications letter, dated June 21, 2004:

Bullet #2

The Permittees assert [see LANL response to Comment #5] *that NMED agreed that SWMU 0-033(a) was "complete" and that the site did not need to be included in the ecological risk screening assessment for the nearby sites. NMED did not agree to this. NMED agreed that the site had been cleaned up under another authority and that no further action is necessary. The Permittees must revise their response accordingly.*

LANL revised response:

SWMU 0-033(a) was remediated in 1995 and determined not to pose a public health or environmental threat by the NMED Underground Storage Tank (UST) Bureau (now the NMED Petroleum Storage Tank Bureau). The removal of the tank and the contaminated tuff beneath the tank, and the subsequent sampling of the area, under the auspices of the UST Bureau, were enough to adequately define extent and obtain approval for no further action from the NMED UST Bureau. The remediation included removing the UST and the underlying tuff to a depth of 11 ft bgs (see LANL 1996, 55203, and the **"**Forty-Five-Day Report"). Any residual contamination remaining is at a depth (11 ft bgs) that does not pose a potential risk to ecological receptors because there are no complete pathways for exposure. A copy of the Forty-Five-Day Report is provided as Attachment 1 to this document.

The SWMU is between two buildings in a developed industrial area which provides limited habitat for ecological receptors and does not contain any sensitive habitats, or threatened and endangered species. There are no complete exposure pathways to receptors, given the depth of the residual contamination. For these reasons, this SWMU does not warrant inclusion with the surrounding sites for the evaluation of potential ecological risk.

LANL completion report, dated September 2003

NMED NOD, dated March 19, 2004

LANL NOD response, dated April 27, 2004:

Comment #2

. . . LANL agrees to collect additional samples from this area [locations 00-02-19622 to 00-02-19627] *at depth and analyze them for metals to address NMED's concerns regarding extent.*

. . . These two sample locations [00-05756 and 00-05756] *will be sampled for pesticides at depth to delineate the extent of the chlordane.*

NMED approval-with-modifications letter, dated June 21, 2004:

NMED cannot approve the Permittees' request for NFA for AOC 0-033(b) at this time because the extent of contamination at the site has not been determined and the ecological risk screening assessment was biased. The 2002 VCA plan states that contamination is not expected above 2 feet or below 5 feet. However, all of the samples were collected from 1-1.5 feet. To properly

investigate the site, the Permittees must collect samples between 2 and 5 feet, the depth at which the contaminants are likely to be found. The Permittees must also consider soil removal in the area of elevated concentrations of contaminants in the central portion of the site (in the vicinity of sample locations 00-02-19623 through 00-02-19627) as a corrective action for the site.

LANL supplemental response

On August 26, 2004, two additional samples were collected to define the extent of alpha- and gamma-chlordane. At location 00-05756, one sample (RE00-04-53548) was collected at a depth of 5.5–6 ft bgs. At location 00-05757, one sample (RE00-04-53547) was collected at a depth of 4.5–4.7 ft bgs. The samples were submitted to an off-site fixed laboratory for the analyses of pesticides. The results of the chlordane analysis are shown in Table 6, compared to the previous samples at the same locations.

Table 6
Detected Concentrations of Alpha- and Gamma-Chlordane at AOC 0-033(b)

Sample ID	Location ID	Depth (ft)	Media	Alpha-chlordane (mg/kg)	Gamma-chlordane (mg/kg)
			Residential SSL*	**1.6**	**1.6**
0100-96-1756	00-05756	5–5.5	Soil	0.38	0.41
RE00-04-53547	00-05756	5.5–6	Soil	0.148	0.145
0100-96-1761	00-05757	4–4.5	Soil	1.9	2.6
RE00-04-53548	00-05757	4.5–4.7	Soil	0.0998	0.0994

Notes: All results in mg/kg; shaded rows are 2004 samples, unshaded rows are 1996 samples.
*NMED 2000, 68554.

Both alpha- and gamma-chlordane were detected in the new samples. At both locations, however, the deeper (2004) sample had much lower reported concentrations of both alpha-chlordane and gamma-chlordane than was reported in the shallower (1996) sample. The low concentrations and decreasing trend with depth indicate that the extent of chlordane contamination is bounded. These results change the 95% UCL (already well below their SSLs) to 0.48 for alpha-chlordane and 0.64 for gamma-chlordane, for human health. The ecological 95% UCL changes to 0.63 for alpha-chlordane and 0.85 for gamma-chlordane. The chlordanes are only minor contributors (1% each) to the calculated risk for the site (note that sample RE00-04-53547 does not contribute to ecological risk because of its depth).

Four samples were collected at four locations to better determine vertical extent of metals. The samples were collected on August 26 and 27, 2004. Samples were collected at depths greater than the corresponding samples collected in 2002. The samples were submitted for the analyses of TAL metals. The results of those analyses that are greater than the BVs are presented in Table 7, with corresponding 2002 results for comparison.

Table 7
Inorganic Chemicals Detected Above BVs at AOC 0-033(b)

Sample ID	Location ID	Depth (ft)	Media	Cadmium	Calcium	Chromium	Copper	Lead	Mercury	Zinc
			Soil BV	**0.4**	**6120**	**19.3**	**14.7**	**22.3**	**0.1**	**48.8**
			Residential SSL[a]	**70**	**—**	**2100[b]**	**2800**	**400**	**23**	**23,000**
RE00-04-53541	00-02-19622	1.50–2.00	Soil	—[c]	—	—	—	23.3	—	—
RE00-02-45448	00-02-19623	1.00–1.50	Soil	—	11300	—	—	34.2	0.35	81.6
RE00-04-53542	00-02-19623	1.50–1.80	Soil	—	6330	—	—	31.4	0.182	57
RE00-02-45451	00-02-19626	1.00–1.50	Soil	0.54	—	—	—	27.6	0.2	68.1
RE00-04-53545	00-02-19626	1.50–2.00	Soil	0.967	—	—	24.8	53.3	0.146	75.6
RE00-02-45452	00-02-19627	1.00–1.50	Soil	0.85	—	—	—	34.6	0.25	79.9
RE00-04-53546	00-02-19627	1.50–1.80	Soil	—	—	28.7(J-)	—	—	—	—

Notes: All results in mg/kg.; shaded rows are 2004 samples, unshaded rows are 2002 samples.

[a] NMED 2000, 68554.

[b] EPA Region 6 Residential Soil Screening Level (EPA 2002, 73691).

[c] — = Not detected or detected below BV.

In most cases, the reported concentration decreased with depth relative to the 2002 sample at the same location. Cadmium increased slightly with depth at location 00-02-19626, but the reported concentration (0.967 mg/kg) is still below the maximum soil background concentration in the dataset (2.6 mg/kg) of cadmium (0.2 to 2.6 mg/kg) (LANL 1998, 59730). Chromium (total) was only detected above its BV in the deeper sample at location 00-02-19627 but, again, that concentration (28.7 mg/kg) is less than the maximum soil background concentration in the dataset (36.5 mg/kg) (LANL 1998, 59730). Lead increased with depth at one location (00-02-19626). However, lead detected in deeper samples (greater than 4 ft) at locations 00-04423 and 00-0575 within 25-50 ft of location 00-02-19626 had lower concentrations of lead approaching the BV. Mercury decreased with depth at all locations. Zinc increased with depth at one location (00-02-19626), but is equivalent to the maximum soil background concentration in the dataset (75.5 mg/kg) (LANL 1998, 59730). Extent has been defined for the 6th Street Warehouse SWMUs and AOCs.

The revised hazard index (HI) is approximately 1.0, which is equivalent to NMED's target level of 1.0. The revised cancer risk was approximately 3E-05, but the concentration of the 95% UCL for arsenic is similar to background. When arsenic is removed from the cancer risk value, it decreases to 2E-05. In addition, dibenz(a,h)anthracene was only detected in one sample; Aroclor-1242 and Aroclor-1254 were detected in one and two samples, respectively. As a result, the potential cancer risk is overestimated by the analytes that were detected infrequently in the soil and does not pose an unacceptable risk.

It should also be noted that the risk calculations presented were performed using the 2000 NMED SSLs (NMED 2000, 68554) in order to be consistent with the rest of the VCA Report. However, if the current (revised) NMED SSLs are used (NMED 2004, 85615), the HI is less than 1 and the cancer risk is less than 1E-05.

LANL completion report, dated September 2003

NMED comment from letter to DOE LASO, dated February 2004:

Comment #3

The Permittees must determine the vertical and lateral extent of contamination at this site [SWMU 21-021] *before drawing conclusions about risk to human and ecological receptors at this site. Many inorganic constituents were detected above their respective background levels. The deepest sample collected was 6 inches below the ground surface in an area that has been recontoured and regraded in the past. NMED questions whether the samples represent the highest levels of contamination at the site and disagrees that the extent of contamination has been determined. The Permittees shall resample the locations in the VCA Report at depth to determine the extent of contamination.*

LANL response, dated February 20, 2004:

Comment #3

. . . the Permittees propose collecting a subset of the 2002 locations that would include 20% of the locations (16) biased for site coverage and, insofar as possible, towards locations of highest concentrations.

LANL supplemental response:

The eastern portion of the site was not significantly disturbed by the various developments undertaken in the western portion of tract A8. The primary source of contaminants for SWMU 21-021 is fallout (from TA-21 stack emissions and from global atmospheric sources), so contaminants are expected to be at, or slightly below, the surface in this area.

Samples were collected at 16 locations on August 23 and 24, 2004. All samples were collected at a depth of 0.5–1 ft bgs, with the exception of location 00-22854. At that location, one sample was collected from 0–0.5 ft and one was collected from 0.5–1 ft bgs because this location was not sampled in 2002. This location was chosen based on the sampling data from the early 1990s.

All samples were submitted to an off-site fixed laboratory for analysis of TAL metals, isotopic plutonium, strontium-90, tritium, and gamma-emitting radionuclides. The results of the 2004 sample radionuclide analyses are presented in Table 8, with results of previous samples from all SWMU 21-021 locations included in VCA report.

Table 8
Detected Activities of Radionuclides at SWMU 21-021-99

Sample ID	Location ID	Depth (ft)	Media	Cesium-137	Plutonium-238	Plutonium-239	Strontium-90	Tritium (pCi/mL)	Uranium-235
Soil BV or Fallout Value[a]				**1.65**	**0.023**	**0.054**	**1.31**	**0.766**	**0.2**
Residential Screening Action Level				**5.3**	**49**	**44**	**5.7**	**890 (pCi/g)**	**17**
RE00-02-45636	00-02-19713	0.00–0.08	Soil	—[b]	—	0.142	—	—	—
RE00-04-53550	00-02-19713	0.50–1.00	Soil	—	—	0.0371	—	—	—
RE00-02-45639	00-02-19716	0.00–0.08	Soil	—	—	—	—	—[c]	—
RE00-04-53551	00-02-19716	0.50–1.00	Soil	0.0617	—	0.205	—	0.6552	—
RE00-05-57572	00-02-19716	1.00–1.50	Soil	—	0.008	0.018	—	—	—
RE00-05-57573	00-02-19716	2.50–3.00	Soil	—	0.023	0.023	—	—	—
RE00-02-45644	00-02-19721	0.00–0.08	Soil	—	—	5.79	—	—	—
RE00-04-53552	00-02-19721	0.50–1.00	Soil	0.0521	—	2.18	—	—	—
RE00-02-45649	00-02-19726	0.00–0.08	Soil	—	—	0.107	—	—[c]	—
RE00-04-53553	00-02-19726	0.50–1.00	Soil	0.0649	—	0.0266	—	0.8412	—
RE00-02-45653	00-02-19730	0.00–0.08	Soil	—	—	0.0656	—	—	—
RE00-04-53554	00-02-19730	0.50–1.00	Soil	—	—	—	—	0.671	—
RE00-02-45655	00-02-19732	0.00–0.08	Soil	—	—	—	—	—[c]	—
RE00-02-45705	00-02-19732	0.08–0.50	Soil	—	—	0.0644	—	—[c]	—
RE00-04-53555	00-02-19732	0.50–1.00	Soil	—	—	0.0457	—	0.7524	—
RE00-02-45662	00-02-19739	0.00–0.08	Soil	—	—	0.32	—	—	—
RE00-02-45702	00-02-19739	0.08–0.50	Soil	—	—	0.342	—	—	—
RE00-04-53556	00-02-19739	0.50–1.00	Soil	0.0742	—	0.0571	—	0.7883	—
RE00-02-45663	00-02-19740	0.00–0.08	Soil	2.81	—	1.01	—	—	—
RE00-04-53557	00-02-19740	0.50–1.00	Qbt 3	0.0573	—	0.0424	—	—	—
RE00-02-45666	00-02-19743	0.00–0.08	Soil	2.13	0.0471	0.569	—	—	0.343
RE00-04-53558	00-02-19743	0.50–1.00	Qbt 3	—	—	0.041	—	—	—
RE00-02-45670	00-02-19747	0.00–0.08	Soil	—	—	—	—	—	—
RE00-02-45707	00-02-19747	0.08–0.50	Soil	—	0.0638	1.5	—	—	—
RE00-04-53559	00-02-19747	0.50–1.00	Soil	—	—	—	—	0.6625	—
RE00-02-45674	00-02-19751	0.00–0.08	Soil	2.94	—	—	—	—	—
RE00-04-53560	00-02-19751	0.50–1.00	Soil	0.069	—	—	—	—	—
RE00-02-45677	00-02-19754	0.00–0.08	Soil	—	—	0.0573	—	—[c]	—
RE00-02-45708	00-02-19754	0.08–0.50	Soil	—	—	0.295	—	—[c]	—
RE00-04-53604	00-02-19754	0.50–1.00	Soil	—	—	—	—	0.8848	—
RE00-02-45721	00-02-19759	0.08–0.50	Soil	—	—	—	—	—	—
RE00-04-53562	00-02-19759	0.50–1.00	Soil	—	—	—	—	0.5408	—
RE00-02-45685	00-02-19762	0.00–0.08	Soil	6.03	0.0622	4.12	1.65	—	
RE00-02-45718	00-02-19762	0.08–0.50	Soil	—	—	0.321	—	—	—

Table 8 (continued)

Sample ID	Location ID	Depth (ft)	Media	Cesium-137	Plutonium-238	Plutonium-239	Strontium-90	Tritium (pCi/mL)	Uranium-235
Soil BV or Fallout Value[a]				**1.65**	**0.023**	**0.054**	**1.31**	**0.766**	**0.2**
Residential Screening Action Level				**5.3**	**49**	**44**	**5.7**	**890 (pCi/g)**	**17**
RE00-04-53563	00-02-19762	0.50–1.00	Soil	—	—	—	—	1.2277	—
RE00-02-45695	00-02-19772	0.00–0.08	Soil	2.56	0.0285	0.736	—	—	
RE00-04-53564	00-02-19772	0.50–1.00	Qbt 3	0.0615	—	0.0284	—	1.39	—
RE00-04-53565	00-22854	0.00–0.50	Soil	—	—	0.0662	—	0.7103	—
RE00-04-53566	00-22854	0.50–1.00	Qbt 3	—	—	—	—	0.5387	—

Notes: All results in pCi/g, except where noted; shaded rows are 2004 samples, unshaded rows are 2002 samples.

[a] Soil BVs from LANL 1998, 59730; soil BVs apply only to samples between 0- and 0.5-ft depth.

[b] — = Not detected above BV or fallout value.

[c] Surface sample results for tritium were below fallout value but greater than the deeper sample.

Four radionuclides were detected in the 2004 subsurface samples: cesium-137 (7 of 16 samples), plutonium-238 (2 of 16 samples), plutonium-239 (9 of 16 samples), and tritium (11 of 16 samples). Five radionuclides (cesium-137, plutonium-238, plutonium-239, strontium-90, and uranium-235) had been detected in the surface samples collected in 2002.

At 5 of the 16 locations sampled, cesium-137 was detected above its fallout value (1.65 pCi/g) in the corresponding surface sample. At each of those 5 locations, the deeper sample had a much lower activity (almost 100 times lower) of cesium-137. The 95% UCL for cesium-137 is decreased from 1.28 to 0.92 pCi/g by including the 2004 sample results.

Plutonium-238 was detected in 6 of the samples collected at 5 locations. At 4 of those locations, the activity of plutonium-238 decreased or was not detected in the deeper sample. At the fifth location, the activity of plutonium-238 increased from 0.008 pCi/g (1–1.5 ft) to 0.023 pCi/g (2.5–3 ft). Although the activity of plutonium-238 increased slightly with depth, this sample location is within the western section of SWMU 21-021-99 that was graded for the trailer park and therefore has been disturbed and may not reflect original conditions. The value of 0.023 pCi/g is equivalent to the soil BV. The 95% UCL for plutonium-238 is 0.0075 pCi/g (no 95% UCL was calculated in the 2003 VCA report).

Plutonium-239 was detected in 16 of the surface samples at 13 locations where subsurface samples were collected. At all 13 of those locations, the activity of plutonium-239 decreased or was not detected in the deeper sample. At 3 locations, plutonium-239 was detected in the surface sample but not in the subsurface sample. The 95% UCL for plutonium-239 is decreased from 0.87 to 0.74 pCi/g by including the 2004 sample results.

Tritium was detected in the surface sample at location 00-22854 at a concentration less than the fallout value (Table 8). Tritium also was detected in 11 subsurface samples. The activity of tritium ranged from 0.1020 pCi/ml to 1.39 pCi/ml in the subsurface samples; the one surface sample (location 00-22854) where tritium was detected had a tritium activity of 0.7103 pCi/ml. Overall, tritium shows a decreasing trend with depth. The value used for the tritium 95% UCL in the 2003 VCA report was the maximum value of 1.75 pCi/g; the maximum value in the 2004 samples is 1.39 pCi/ml = 0.0695 pCi/g, so the maximum value has not changed as a result of the additional sampling.

Because the 95% UCLs for the 4 radionuclides detected in 2004 samples either decreased or did not change, the total dose for the site is estimated to be 4.1 mrem/yr, which is the same as the total dose calculated in the VCA completion report.

The results of inorganic chemical analyses of those 2004 samples where inorganic chemicals were detected above background are presented in Table 9. Also included, for comparison, are the results from the corresponding surface samples collected in 2002.

Several metals were detected above their respective BVs or had detection limits above the BV at several locations. Aluminum, beryllium, cadmium, chromium, iron, magnesium, manganese, and nickel concentrations were all within the range of values in the background data set (Table 10) for the appropriate medium (LANL 1998, 59730).

Overall, the HI for noncarcinogens at SWMU 21-021-99 decreased slightly from 0.26 to 0.23 when the 2004 sample data were incorporated. At this site there is no risk from carcinogens. The HI (0.23) is less than NMED's target level of 1.0; therefore, the conclusions reached in the VCA report are still appropriate, and there is no potential unacceptable risk from metals at this SWMU.

The ecological risk is affected by the 1 copper value of 3430 mg/kg at location 00-02-19713, which increases the 95% UCL from 13.9 to 150.6 mg/kg. The concentration of copper decreases immediately to approximately 8 mg/kg (2–2.5 ft bgs), more than 2 orders of magnitude below the value of 3430 mg/kg. The extent of copper is bounded by samples within 50 ft. In addition, to the north of this sample location is DP Road. Given the limited occurrence of elevated copper, the conclusions from the ecological screening in Section 6.5.1.2(d) of the VCA completion report remain the same (i.e., no potential adverse effects to the population). The remainder of the HIs and hazard quotients were not affected by the additional data.

Table 9
Inorganic Chemicals Detected Above BVs at SWMU 21-021-99

Sample ID	Location ID	Depth (ft)	Media	Aluminum	Barium	Beryllium	Cadmium	Calcium	Chromium	Copper	Iron	Lead	Magnesium	Manganese	Mercury	Nickel	Selenium	Silver	Zinc
			Soil BV	**29,200**	**295**	**1.83**	**0.4**	**6120**	**19.3**	**14.7**	**21,500**	**22.3**	**4610**	**671**	**0.1**	**15.4**	**1.52**	**1**	**48.8**
			Qbt 2,3,4 BV	**7340**	**46**	**1.21**	**1.63**	**2200**	**7.14**	**4.66**	**14,500**	**11.2**	**1690**	**482**	**0.1**	**6.58**	**0.3**	**1**	**63.5**
			Residential SSL[a]	**74,000**	**5200**	**150**	**70**	**na**	**2100[e]**	**28,000**	**23,000**	**400**	**na**	**7800**	**23[e]**	**1500**	**380**	**380**	**23,000**
RE00-02-45636	00-02-19713	0.00-0.08	Soil	—[b]	—	—	0.555	—	—	63.3	—	80.3	—	—	—	—	—	—	177
RE00-04-53550	00-02-19713	0.50-1.00	Soil	—	—	—	0.454	—	—	3430	—	—	—	—	—	—	—	1.14	655
RE00-05-57570	00-02-19713	2.00-2.50	Soil	—	—	—	0.553	—	—	—	—	—	—	—	—	—	—	0.109	—
RE00-05-57571	0-02-19713	3.50-4.00	Soil	—	—	—	0.542	—	—	—	—	—	—	—	—	—	—	—	—
RE00-02-45639	00-02-19716	0.00-0.08	Soil	—	—	—	—	—	—	16.6	—	65.3	—	—	0.275	—	—	—	149
RE00-02-45714	00-02-19716	0.08-0.50	Soil	—	379	—	—	—	—	18.1	—	83.4	—	—	0.236	—	—	—	263
RE00-04-53551	00-02-19716	0.50-1.00	Soil	—	—	—	—	—	—	42.1	—	—	—	—	0.387	—	—	—	133
RE00-05-57572	00-02-19716	1.00-1.50	Soil	—	—	—	0.578	—	—	—	—	25.7	—	—	0.172	—	—	—	58.4
RE00-05-57573	00-02-19716	2.50-3.00	Soil	—	—	—	0.547	—	—	—	—	27.1	—	—	0.215	—	—	—	86.8
RE00-02-45653	00-02-19730	0.00-0.08	Soil	—	—	—	0.475 (U)[c]	—	—	—	—	—	—	—	—	—	—	—	—
RE00-02-45712	00-02-19730	0.08-0.50	Soil	29,230	—	2.2	0.498 (U)	—	—	—	—	—	—	—	—	—	—	—	—
RE00-04-53554	00-02-19730	0.50-1.00	Soil	29,500	—	2.67	—	—	—	—	—	—	—	—	—	15.5	—	—	—
RE00-02-45655	00-02-19732	0.00-0.08	Soil	—	—	—	0.457(U)	—	—	—	—	—	—	—	—	—	—	—	—
RE00-02-45705	00-02-19732	0.08-0.50	Soil	—	—	—	0.48(U)	—	—	—	—	—	—	—	—	—	—	—	—
RE00-04-53555	00-02-19732	0.50-1.00	Soil	—	—	—	0.53(U)	—	—	—	—	—	—	—	—	—	—	—	53
RE00-02-45663	00-02-19740	0.00-0.08	Soil	—	(172)[d]	—	0.568	7610	—	—	—	59.5	—	820	—	—	—	—	74.2
RE00-04-53557	00-02-19740	0.50-1.00	Qbt 3	—	57.8	—	—	3060	—	—	—	—	—	—	—	—	0.493(U)	—	—
RE00-02-45666	00-02-19743	0.00-0.08	Soil	—	—	—	—	—	—	—	—	42.1	—	—	—	—	—	—	51.1
RE00-04-53558	00-02-19743	0.50-1.00	Qbt 3	—	—	—	—	—	9.14	—	—	—	—	—	—	—	0.544(U)	—	—
RE00-04-53559	00-02-19747	0.50-1.00	Soil	—	—	—	0.582(U)	—	—	—	—	—	—	—	—	—	—	—	—
RE00-02-45708	00-02-19754	0.08-0.50	Soil	36,730	—	2.1	0.418	—	—	—	29090	—	4920	—	—	—	—	—	58.9

Table 9 (continued)

Sample ID	Location ID	Depth (ft)	Media	Aluminum	Barium	Beryllium	Cadmium	Calcium	Chromium	Copper	Iron	Lead	Magnesium	Manganese	Mercury	Nickel	Selenium	Silver	Zinc
			Soil BV	**29,200**	**295**	**1.83**	**0.4**	**6120**	**19.3**	**14.7**	**21,500**	**22.3**	**4610**	**671**	**0.1**	**15.4**	**1.52**	**1**	**48.8**
			Qbt 2,3,4 BV	**7340**	**46**	**1.21**	**1.63**	**2200**	**7.14**	**4.66**	**14,500**	**11.2**	**1690**	**482**	**0.1**	**6.58**	**0.3**	**1**	**63.5**
			Residential SSL	**74,000**	**5200**	**150**	**70**	**na**	**2100[e]**	**28,000**	**23,000**	**400**	**na**	**7800**	**23[e]**	**1500**	**380**	**380**	**23,000**
RE00-04-53561	00-02-19754	0.50-1.00	Soil	—	—	—	0.549(U)	—	—	—	—	—	—	—	—	—	—	—	—
RE00-02-45695	00-02-19772	0.00-0.08	Soil	—	—	—	—	—	—	—	—	25.7	—	—	—	—	—	—	—
RE00-04-53564	00-02-19772	0.50-1.00	Qbt 3	7360	—	—	—	—	11.3	—	—	—	—	—	—	—	0.609(U)	—	—
RE00-04-53565	00-22854	0.00-0.50	Soil	—	—	—	0.541(U)	—	—	—	—	—	—	—	—	—	—	—	—
RE00-04-53566	00-22854	0.50-1.00	Qbt 3	—	—	—	—	—	—	—	—	—	—	—	—	—	0.515(U)	—	—

Note: All results in mg/kg; shaded rows are 2004 samples, unshaded rows are 2002 samples.

[a] NMED 2000, 68554.

[b] — Indicates not detected or detected below BV.

[c] (U) = undetected, detection limit greater than BV.

[d] Values in parentheses are detected but below BV, included for comparison to 2004 (deeper) samples at same location.

[e] EPA Region 6 Residential Screening Level (EPA 2002, 73691).

Table 10
BV Ranges

	Aluminum (mg/kg)	Beryllium (mg/kg)	Cadmium (mg/kg)	Chromium (mg/kg)	Iron (mg/kg)	Magnesium (mg/kg)	Manganese (mg/kg)	Nickel (mg/kg)
Soil BV range	900–61500	0.04–3.95	0.2–2.6	1.9–36.5	3300–36,000	420–10,000	76–1100	1–29
Maximum value detected above soil BV	36,730	2.67	0.582(U)[a]	—[b]	29,090	4920	820	15.5
Qbt 3 BV range	350–8370	0.04–1.8	0.1–1.5	0.25–13	190–19,500	39–2820	22–752	0.5–7
Maximum value detected above Qbt 3 BV	7360	—	—	11.3	—	—	—	—

[a] (U) = undetected, detection limit greater than BV.

[b] — Indicates not detected or detected below BV.

LANL completion report, dated September 2003

NMED NOD, dated March 19, 2004

LANL NOD response, dated April 27, 2004

NMED approval-with-modifications letter, dated June 21, 2004:

Bullet #3

For AOC 0-029(c), the Permittees admit that there were QA/QC problems with the PCB data in 1992. The data were deemed questionable for this reason yet the Permittees are concluding there is no evidence of a release based on these data. In addition, the Permittees' claim that the northern portion of the AOC is upgradient of the transformer and, therefore, probably was not subject to a release is not supported by the topographic map (Figure 4.4-3). The Permittees must provide the 1992 data and an explanation of the QA/QC problems so that NMED can properly evaluate the Permittees' conclusions. The Permittees may provide this information along with the results of the additional investigation.

LANL supplemental response:

NMED's comment of June 21, 2004, is incorrect regarding the Permittees' claim of no evidence of release being based on 1992 data. As stated on page 4-6 (last paragraph) of the VCA completion report, the 1992 data were not used for the characterization of AOC 0-029(c). It was specifically because the 1992 data lacked proper QA/QC documentation that the samples collected in 2002 replaced the earlier data in the data review and screening assessment for this AOC. In 2002, 44 samples (including 2 field duplicate samples) were collected from 21 locations; the sample locations are shown on Figure 4.4-3 and listed in Table 4.4-7.

Regarding the slope of the site; the location of the former transformer is at an elevation of approximately 5972 ft, according to the topographic base map in Figure 4.4-3 [see revised Figure 4.4-3 submitted with the April 2004 response to the NOD (ER2004-0164; LA-UR-04-2783)]. The northern and western corners of the AOC boundary are at elevations between 5976 and 5978 ft according to the same topographic map, making the northern portion of the AOC upgradient (upslope) from the transformer location. It is unlikely, therefore, that any potential releases from the transformer would result in contamination of that portion of the AOC. Nevertheless, several samples were collected in 2002 at locations to the north and northwest of the former transformer location and the former pump house location. Sample locations 00-02-20107, 00-02-20100, and 00-02-20099 are north of the former pump house and the former transformer. Sample locations 00-02-20106 and 00-02-20105 are directly west of the former pump house. Sample location 00-02-20098 is directly north of the former transformer and south of the former pump house. These samples had very low concentrations of pesticides and PCBs (maximum value of 0.0441 mg/kg).

As requested in the VCA completion report, this site is recommended for NFA.

LANL completion report, dated September 2003

NMED NOD, dated March 19, 2004

LANL NOD response, dated April 27, 2004

NMED approval-with-modifications letter, dated June 21, 2004:

Bullet #4

At SWMU 0-030(m), the Permittees claim that there is no evidence of a release. NMED does not concur with this conclusion. Mercury and silver were detected above the background values at one sampling location. The NMED does concur that the levels (8.4 and 21.1 ppm, respectively) and the depth at which they were detected does not represent an unacceptable risk.

LANL supplemental response:

Noted.

REFERENCES

EPA (U.S. Environmental Protection Agency), November 2002. "EPA Region 6 Human Health Medium-Specific Screening Levels," U.S. EPA Region 6, Dallas, Texas. (EPA 2002, 73691)

LANL (Los Alamos National Laboratory), August 1996. "Voluntary Corrective Action Completion Report for PRSs 0-030(l), 0-030(m), and 0-033(a), 6th Street Warehouses," Los Alamos National Laboratory report LA-UR-96-2901, Los Alamos, New Mexico. (LANL 1996, 55203)

LANL (Los Alamos National Laboratory), September 1998. "Inorganic and Radionuclide Background Data for Soils, Sediments, and Bandelier Tuff at Los Alamos National Laboratory," Los Alamos National Laboratory document LA-UR-98-4847, Los Alamos, New Mexico. (LANL 1998, 59730)

LANL (Los Alamos National Laboratory), December 1999. "Screening Level Ecological Risk Assessment Methods," Revision 1, Los Alamos National Laboratory report LA-UR-99-1405, Los Alamos, New Mexico. (LANL 1999, 64783)

NMED (New Mexico Environment Department), December 2000. "Technical Background Document for Development of Soil Screening Levels," New Mexico Environment Department, Ground Water Quality Bureau, and Voluntary Remediation Program, Santa Fe, New Mexico. (NMED 2000, 68554)

NMED (New Mexico Environment Department), February 2004. "Technical Background Document for Development of Soil Screening Levels," Revision 2.0, New Mexico Environment Department, Ground Water Quality Bureau, and Voluntary Remediation Program, Santa Fe, New Mexico. (NMED 2004, 85615)

Attachment 1

Forty-Five-Day Report

Los Alamos
NATIONAL LABORATORY

Hazardous & Solid Waste Group
Los Alamos National Laboratory
Los Alamos, New Mexico 87545

Date: January 11, 1996
In Reply Refer To: ESH-19:96-0015
Mail Stop: K498
Telephone: (505) 665-2505

Anthony Moreland, Geologist
Remedial Action Section
Underground Storage Tank Bureau
New Mexico Environment Department
1190 St. Francis Drive
Harold Runnels Building
Santa Fe, New Mexico 87502

Dear Mr. Moreland:

SUBJECT: FORTY-FIVE DAY REPORT FOR FUEL OIL UST RELEASE AT TECHNICAL AREA 0, 6TH STREET

This letter transmits a forty-five day investigation report involving petroleum soil contamination associated with an underground storage tank (UST) located at Technical Area (TA) 0, 6th Street, near Warehouse Number Three. On November 13, 1995, the New Mexico Environment Department was notified that heating fuel oil contamination was discovered in the soil beneath the UST during a routine UST removal. The UST is owned by the Department of Energy.

The enclosed forty-five day investigation report and its associated enclosures will show that Los Alamos National Laboratory has determined the extent of the fuel oil contaminated soil at the TA-0, 6th Street UST site. If you have questions concerning this report, please contact me at (505) 665-2505.

The foregoing report was prepared under my supervision by qualified staff who are personally familiar with the information submitted in the report and the enclosed documents.

Sincerely,

Jeff Carmichael
Hazardous & Solid Waste

JAC:es

Enclosure: UST TA-0, 6th, Street Forty-Five Day Report

Cy: T. Grieggs, ESH-19, MS K498, w/o enc.
L. Hartman, EM/ER, MS E525, w/enc.
T. Taylor, LAAO, MS A316, w/enc.
RPF, EM/ER, MS M707, w/enc.
ESH-19 Circ File
C. Fesmire, LAAO, MS A316, w/enc.
J. Vozella, LAAO, MS A316, w/enc.
S. Calhoun, ERM/Golder, MS M327, w/enc.
CIC-10, MS A150

Los Alamos
NATIONAL LABORATORY

Hazardous & Solid Waste Group
Los Alamos National Laboratory
Los Alamos, New Mexico 87545

UNDERGROUND STORAGE TANK

TA-0, 6TH STREET

FORTY-FIVE DAY REPORT

1.0 INTRODUCTION

The purpose of this report is to fulfill the forty-five day reporting requirements of Part XII, Section 1206 B., of the New Mexico Underground Storage Tank Regulations (USTR). Under this regulation, the forty-five day report was due on January 4, 1995. However, an extension of time was granted to January 11, 1996.

On November 13, 1995, Los Alamos National Laboratory (LANL) notified the New Mexico Environment Department (NMED) of a confirmed petroleum release. The release was discovered during a scheduled underground storage tank (UST) removal located at LANL's Technical Area (TA) 0. See *Enclosure One* for maps of LANL's property boundary, Technical Areas, and of the UST site. The UST is owned by the Department of Energy and was taken out of operation in the late 1960's. This UST was discovered by LANL's Environmental Management/Environmental Restoration Project. Listed below is a data summary regarding this UST and its removal:

UST DATA

• Name of UST	TA-0, 6th Street
• Physical Location of UST:	TA-0, North West Side of Warehouse # 3
• Age of UST:	Unknown
• UST Capacity:	5,000 Gallons
• Contents of UST:	Heating Fuel Oil
• Date Removed:	11-13-95
• NMED Inspector Present:	None

A visual inspection of the UST revealed one hole, approximately 2 inches in diameter, in the lower west end of the tank. The soil surrounding and beneath the UST was contaminated with fuel oil, but not highly contaminated. Soil samples collected beneath the UST have total petroleum hydrocarbons (TPH) concentrations ranging from approximately 3,000 to 10,800 mg/kg (ppm).

The excavation was backfilled with clean fill material to avoid structural damage to the adjacent warehouse foundation. Pursuant to Part XII, Section 1206 (B.), of the USTR, five boreholes were drilled and sampled. Analytical data from these boreholes was sufficient to define both the horizontal and vertical extent of the TPH affected area.

2.0 UST REMOVAL DETAILS

Excavation support during the UST removal was provided by Keers Environmental of Albuquerque, New Mexico. Oversight of the operations was provided by the Morrison Knudsen Corporation of Los Alamos, New Mexico, ERM/Golder Los Alamos Project Team, and LANL's Hazardous and Solid Waste Group (ESH-19).

An initial inspection found the UST to contain approximately 3,500 gallons of water and fuel oil, with approximately one foot of fuel oil floating on top of the water. These liquids were pumped out of the tank prior to commencing excavation activities and transported to Mesa Oil, Inc. for recycling *(See Manifest in Enclosure Two).*

A visual inspection of the UST revealed one hole, approximately 2 inches in diameter, in the lower west end of the tank. The piping associated with this tank, rose straight up from the tank approximately 18 inches, then made a 90 degree turn south, and penetrated the wall of the adjacent warehouse. The total length of pipe was approximately 15 feet. The UST's piping condition was only slightly corroded except for where the fill pipe attached to the UST. This area had significant corrosion. Furthermore, the fill pipe was found loose where it connected to the tank. It is speculated that surface water from rain events collected on the ground above the UST and over time penetrated into the UST through the loose fill pipe connection filling the tank.

A sufficient amount of tank pit backfill material was excavated to remove the tank and piping. The backfill material was obviously contaminated with fuel oil. Therefore, the remaining backfill material and concrete cradles on which the tank was resting were removed, and the tuff below the tank was excavated to a depth of approximately 11 feet. This tuff removal was voluntary because the tuff was not highly contaminated. The excavation was eventually stopped because of potential structural damage to the warehouse foundation to the south and the concrete utility corridor to the west. The final excavation was approximately 15 feet wide, 30 feet long, and 11 feet deep.

The UST and the concrete cradles were transported off-site by Keers. The UST was shipped to Eidson Steel Products, Inc. for recycling. The concrete cradles were disposed of by Keers. The excavated soil, totaling 55 cubic yards, was transported to Keers Solid Waste Management Facility located in Mountainair, New Mexico, for hydrocarbon soil farming. See *Enclosure Two* for copies of the disposal manifests.

During removal, an underground power line, was encountered above the UST and was temporarily rerouted during construction activities. An underground electric line also runs east-west about 15 feet north of the UST location at a depth of approximately 4 feet. Also, a north-south running sewer line is located about 6 feet west of the UST excavation at a depth of approximately five feet. A concrete encased utility corridor runs north-south immediately west of the UST excavation. No other utilities lines are located near the UST site. Utility corridor investigations revealed that they were not impacted by the TPH soil contamination.

3.0 EXCAVATION SAMPLING

Following removal of the UST, the contaminated fill material was removed and the tuff below the tank was removed to a depth of approximately 11 feet. Four samples of tuff from below the tank were then collected and submitted to LANL's mobile chemical analytical laboratory (MCAL) for TPH analysis using EPA SW-846, Method 418.1. Table 1 provides information regarding the sample IDs, depths, and analytical results.

TABLE 1
Excavation Bottom TPH Results

Sample ID	Sample Location/Depth	Analytical Data
0100-95-0736	West end / 11 feet	5,163 ppm
0100-95-0737	Southeast Corner / 11 feet	2,989 ppm
0100-95-0738	Northeast Corner / 11 feet	8,215 ppm
0100-95-0739	Southwest Corner / 11 feet	10,822 ppm

All samples were field screened for radioactivity and none was detected.

4.0 ON-SITE INVESTIGATION HORIZONTAL AND VERTICAL EXTENT OF CONTAMINATION

On December 4 through 13, 1995, five boreholes were advanced to a total depth of 40 feet to determine the extent of vertical and horizontal TPH contamination. Chain of custody forms and analytical data sheets are enclosed for all five soil borings as discussed in Tables 2-6 of this report *(See Enclosure Three). Enclosure Four* contains a map showing the location of each borehole and *Enclosure Five* contains each corehole sample log.

Borehole 01

Borehole #01 was completed on December 4 and 5, 1995, near the center of the UST excavation. The fill material used to backfill the excavation was encountered from 0 to 10 feet. Gray and brown tuff was encountered from 10 to 40 feet. From 10 to 30 feet, the recovered core samples had a fuel oil odor and varied in moisture content. The core was particularly moist with water, although not exhibiting saturated conditions, within the zone from 30 to 35 feet. Samples were collected at approximately five-foot intervals and submitted for analysis of TPH using EPA SW-846, Method 418.1. This analytical method was used for evaluating all subsequent corehole samples. Analytical results showed elevated TPH concentrations from 11 feet to between 30 and 35 feet, with concentrations ranging from 148 to 5818 ppm (Table 2). Samples collected at 35 and 40 feet showed no detectable TPH concentrations.

TABLE 2
Borehole #01 TPH Results

Sample ID	Sample Depth (ft)	PID Value (ppm)	Analytical Data
0100-95-0916	11.0	0	4,237 ppm
0100-95-0917	16.0	89	4,541 ppm
0100-95-0918	20.0	24	1,119 ppm

0100-95-0919	25.0	49	5,818 ppm
0100-95-0920	30.0	0	148 ppm
0100-95-0921	35.0	0	ND
0100-95-0922	40.0	0	ND

Borehole 02

Borehole #02 was completed on December 11, 1995, approximately 15 feet east of the UST excavation. Reddish brown to gray, moderately welded tuff was encountered from near the surface to a depth of 40 feet. Occasional brown stains, believed to be iron oxide, were noticed on the recovered core. However, based on the analytical results these stains proved not to be related to TPH contamination. The recovered core did not have a fuel oil odor and moisture contents were low. Samples were collected at approximately five-foot intervals and where stains or other possible signs of TPH contamination were observed. Sample results showed no detectable TPH concentrations (Table 3).

TABLE 3
Borehole #02 TPH Results

Sample ID	Sample Depth (ft)	PID Value (ppm)	Analytical Data
0100-95-0923	3.0	0	ND
0100-95-0924	8.0	0	ND
0100-95-0925	12.0	0	ND
0100-95-0926	13.0	0	ND
0100-95-0927	17.0	0	ND
0100-95-0928	19.0	0	ND
0100-95-0929	23.5	0	ND
0100-95-0930	28.0	0	ND
0100-95-0931	33.0	0	ND
0100-95-0932	36.0	0	ND
0100-95-0933	38.5	0	ND

Borehole 03

Borehole #03 was completed on December 12, 1995, approximately 20 feet west of the UST excavation. Reddish brown to gray, moderately welded tuff with occasional brown clay lined fractures were encountered from near the surface to a depth of 40 feet. The recovered core had no fuel oil odor and moisture contents were low. Samples were collected at approximately every five-foot interval and where stains or other possible signs of contamination were observed. Sample results showed no detectable TPH concentrations (Table 4).

TABLE 4

Borehole #03 TPH Results

Sample ID	Sample Depth (ft)	PID Value (ppm)	Analytical Data
0100-95-0934	3.0	0	ND
0100-95-0935	8.0	0	ND
0100-95-0936	14.0	0	ND
0100-95-0937	19.0	0	ND
0100-95-0938	24.0	0	ND
0100-95-0939	29.0	0	ND
0100-95-0940	34.5	0	ND
0100-95-0941	39.0	0	ND

Borehole 04

Borehole #04 was completed on December 12, 1995, approximately 10 feet north of the UST excavation. Reddish brown to gray and dusky red, moderately welded tuff was encountered from near the surface to a depth of 40 feet. Reddish clay lined fractures were occasionally noted. Recovered core did not have a fuel oil odor and moisture contents were low. Samples were collected at approximately five-foot intervals and where stains or other possible signs of contamination were observed. Sample results showed no detectable TPH concentrations (Table 5).

TABLE 5

Borehole #04 TPH Results

Sample ID	Sample Depth (ft)	PID Value (ppm)	Analytical Data
0100-95-0942	8.0	0	ND
0100-95-0943	12.0	0	ND
0100-95-0944	14.0	0	ND
0100-95-0945	19.0	0	ND
0100-95-0946	23.5	0	ND
0100-95-0947	27.0	0	ND
0100-95-0948	28.5	0	ND
0100-95-0949	31.5	0	ND
0100-95-0950	38.0	0	ND

Borehole 05

Borehole #05 was completed on December 13, 1995, approximately 70 feet south of the UST excavation. Since 6th Street Warehouses #3 and #4 are adjacent to the south side of the UST excavation, it was necessary to locate borehole #05 on the south side of the building. Dark and light gray, moderately welded tuff was encountered from near the surface to a depth of 40 feet during drilling. Again samples were collected at approximately five-foot intervals. Recovered core had no fuel oil odor and moisture contents were low. Sample results showed no detectable TPH concentrations (Table 6).

TABLE 6

Borehole #05 TPH Results

Sample ID	Sample Depth (ft)	PID Value (ppm)	Analytical Data
0100-95-0951	4.0	0	ND
0100-95-0952	8.5	0	ND
0100-95-0953	14.5	0	ND
0100-95-0954	19.0	0	ND

0100-95-0955	23.0	0	ND
0100-95-0956	27.0	0	ND
0100-95-0959	34.0	0	ND
0100-95-0960	37.0	0	ND

4.1 Corehole Investigation Summary

Based on the analytical data, both the horizontal and vertical extent of TPH affected tuff have been defined, and at depth, the TPH concentrations do not exceed 5,818 ppm. Borehole #01 provides evidence that the TPH plume extends vertically to no deeper than 30 to 35 feet. The four surrounding boreholes indicate that there has been little if any horizontal movement of the TPH plume. There appears to be three primary reasons for this apparent lack of significant migration of the fuel oil: first, the moderately welded tuff lacks sufficient permeability for significant migration, second, the observed fractures in the tuff were mostly clay filled, thus inhibiting migration, and third, the moisture zone at a depth of 30 to 35 feet in borehole #01 has acted as a barrier to vertical migration.

5.0 UST REQUIRED INFORMATION

Depth to groundwater beneath TA-0 is approximately 1,000 feet. There are no private water supply wells within a 1000 foot radius or municipal water wells within an one mile radius of this UST removal site. Additionally, there are no surface water courses within 500 feet of this UST removal site. LANL has determined that the surrounding utility corridors were not impacted by the petroleum soil contamination. No potentially explosive fuel oil or harmful vapors have been detected in these corridors or in the vicinity of the release. This report also contains information that is required in Part XII, §1206 B., of the USTR *(See Enclosures 6 and 7).*

6.0 CONCLUSIONS

LANL has determined that there is no threat to human health and the environment from the fuel oil soil contamination. The extent of the contamination has now been defined. No highly contaminated soil was encountered during this investigation. Because the UST was abandoned in the late 1960's, LANL has no tank tightness or repair data on this UST. If you should require any additional information, please contact me at 665-2505.

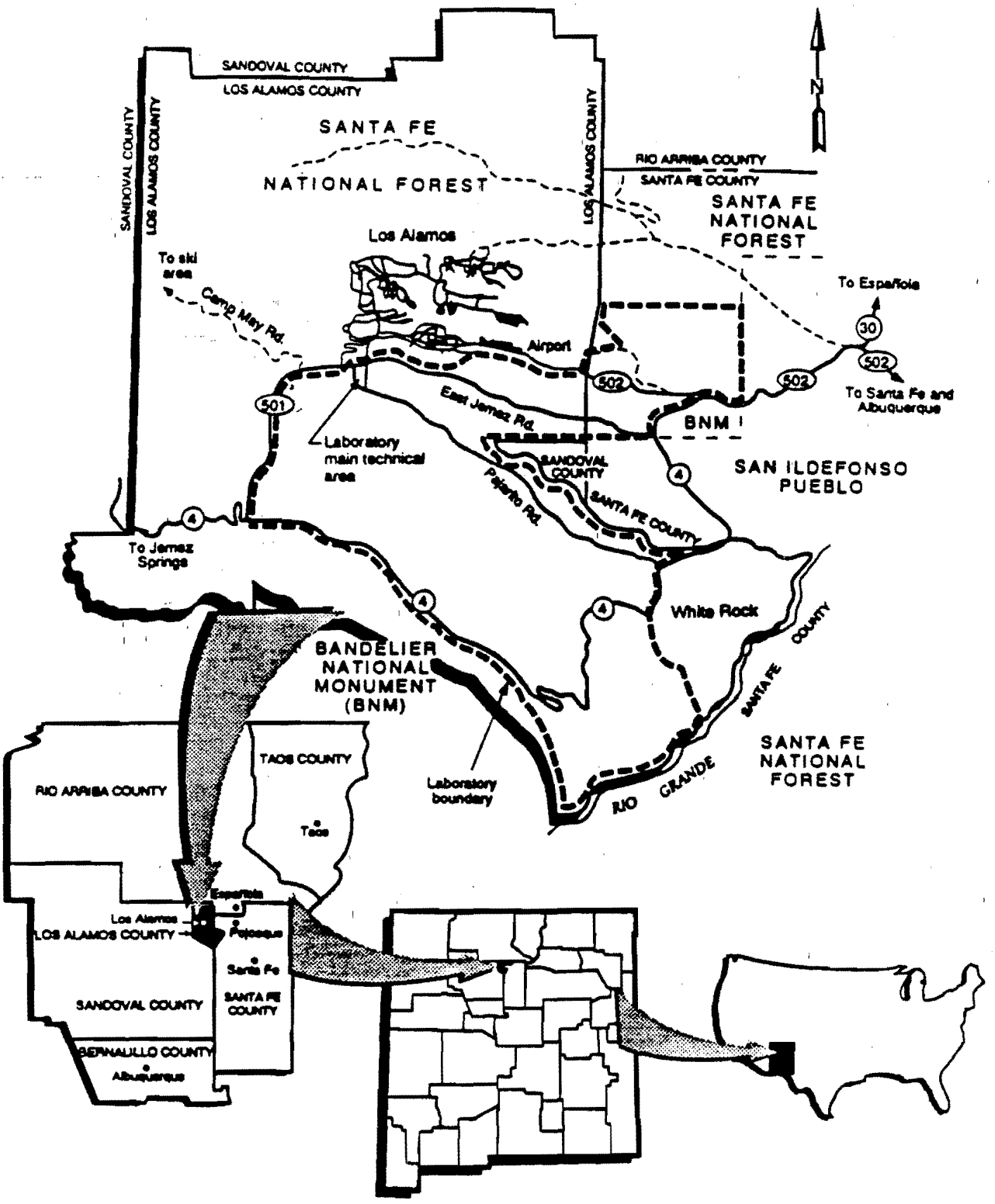
Enclosures:

1. Maps of LANL's Property Boundary, Technical Areas, and of the UST Site
2. Disposal Manifests
3. Chain of Custody and Corehole Sample Analytical Data Sheets
4. Corehole Locations
5. Corehole Sample Logs
6. LANL General Geology and Hydrology Information
7. Groundwater Wells and Other Penetrations and Drawings

ENCLOSURE ONE

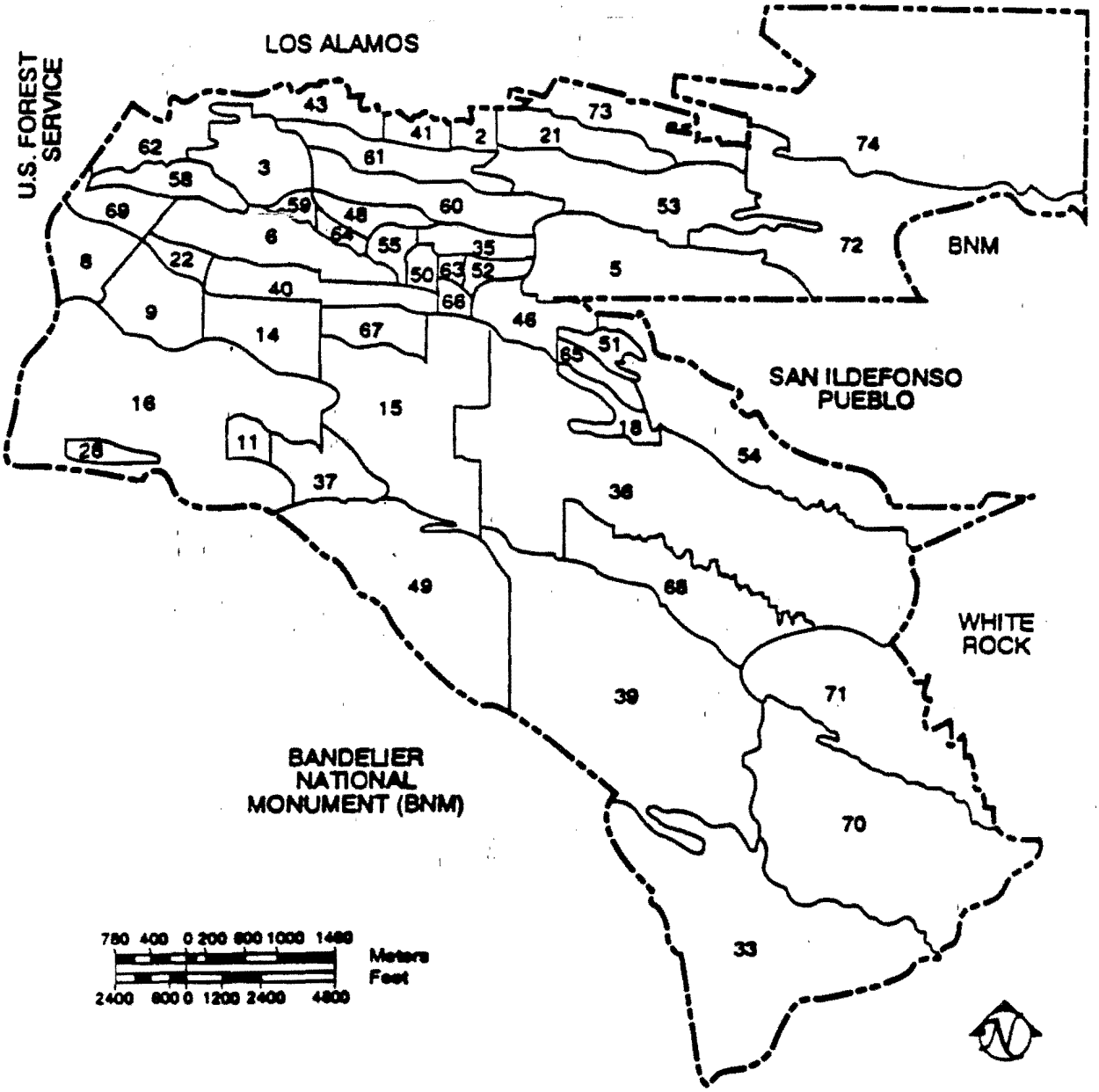
MAPS OF LANL'S PROPERTY BOUNDARY, TECHNICAL AREAS, AND UST SITE

Note: No surface impoundments or pit areas reside in the vicinity of this former UST.

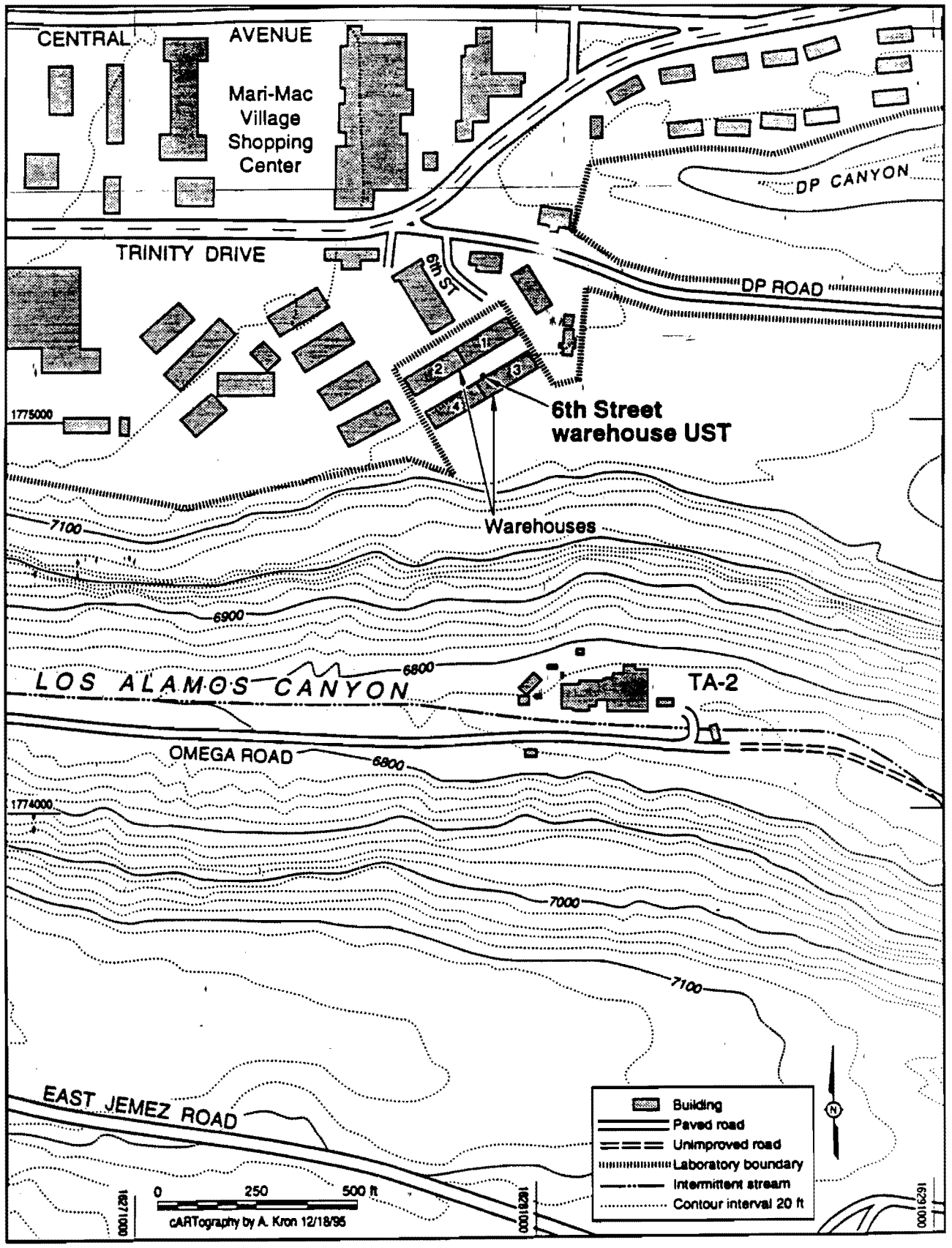


Regional location of Los Alamos National Laboratory.

TA-0 Is Located In The Town Site.



Technical areas (TAs) of Los Alamos National Laboratory in relation to surrounding landholdings.



Location of the 6th Street warehouse area (SWMU Group 0-1) in Los Alamos.

ENCLOSURE TWO

DISPOSAL MANIFESTS

KEERS ENVIRONMENTAL

NMED GROUND WATER DISCHARGE PERM

5904 FLORENCE AVE. NE
ALBUQUERQUE, NM 87113
(505) 823-9006
1-800-327-2766
FAX (505) 823-2766

KEERS HYDROCARBON SOIL LAND FARM
14 MILES SOUTH ON HWY 55 FROM
MOUNTAINAIR, NEW MEXICO

GROUND WATER DISCHARGE PERMIT
MANIFEST 00218

HYDROCARBON CONTAMINATED SOIL MANIFEST

PART I

GENERATOR NAME Los Alamos National Laboratory

GENERATOR ADDRESS P.O. Box 1663 MS J593

CITY/STATE/ZIP Los Alamos / NM / 87545

TELEPHONE 505-667-7579 FAX

TECHNICAL FIRM Keers

TECHNICAL CONTACT Dan Gray

TELEPHONE 823-9006 FAX 823-2766

KEERS HYDROCARBON CONTAMINATED SOIL PROFILE SHEET NUMBER 00168

QUANTITY 20 CUBIC YARDS X DRUMS _____ OTHER Bulk

GENERATORS CERTIFICATION: I HEREBY CERTIFY THAT THE ABOVE DESCRIBED MATERIAL IS NOT A HAZARDOUS WASTE AS DEFINED B US EPA AND/OR STATE AND LOCAL REGULATIONS, DOES NOT CONTAIN REGULATED RADIOACTIVE MATERIALS OR REGULATED CONCE. TIONS OF PCB'S (POLYCHLORINATED BIPHENYLS), AND THIS MATERIAL DOES NOT CONTAIN FREE LIQUIDS. I ALSO CERTIFY THAT ...E MATERIAL BEING REPRESENTED IN THIS MANIFEST CORRESPONDS WITH AND IS THE SAME AS THE MATERIAL REFERENCED IN THE HYDROCARBON CONTAMINATED SOIL PROFILE SHEET SHOWN ABOVE.

NAME OF GENERATOR OR AUTHORIZED AGENT (PRINT) Henry Paul Nunes

SIGNATURE OF GENERATOR OR AUTHORIZED AGENT Henry Paul Nunes

RECEIPT DATE 11-22-95

PART II

TRANSPORTER CERTIFICATION: I HEREBY CERTIFY THAT NO OTHER MATERIAL HAS BEEN PLACED IN THIS TRUCK SINCE ACCEPTANCE C THE MATERIAL AS DESCRIBED IN PART I OF THIS DOCUMENT.

NAME OF TRANSPORTER (PRINT) _____

SIGNATURE OF TRANSPORTER _____

RECEIPT DATE _____

PART III

THIS IS TO CERTIFY THAT KEERS HYDROCARBON CONTAMINATED SOIL LAND FARM, OPERATING UNDER N.M.E.D GROUND WATER DISCHARGE PERMIT #DP-1012 HAS ACCEPTED THE ABOVE MATERIAL.

NAME OF AUTHORIZED AGENT (PRINT) _____

SIGNATURE OF AUTHORIZED AGENT _____

RECEIPT DATE _____

MATERIAL DEPOSITED IN CELL # _____ LOCATION _____

KEERS ENVIRONMENTAL

NMED GROUND WATER DISCHARGE PERMIT

5904 FLORENCE AVE. NE
ALBUQUERQUE, NM 87113
(505) 823-9006
1-800-327-2766
FAX (505) 823-2766

KEERS HYDROCARBON SOIL LAND FARM
14 MILES SOUTH ON HWY 55 FROM
MOUNTAINAIR, NEW MEXICO

GROUND WATER DISCHARGE PERMIT
MANIFEST 00222

HYDROCARBON CONTAMINATED SOIL MANIFEST

PART I

GENERATOR NAME: Los Alamos National Laboratory
GENERATOR ADDRESS: P.O. Box 1663 MS J593
CITY/STATE/ZIP: Los Alamos / NM / 87545
TELEPHONE: 505-667-7577 FAX:
TECHNICAL FIRM: Keers
TECHNICAL CONTACT: Dan Gay
TELEPHONE: 823-9006 FAX: 823-2766
KEERS HYDROCARBON CONTAMINATED SOIL PROFILE SHEET NUMBER: 00168

QUANTITY: 35 CUBIC YARDS: ____ DRUMS: ____ OTHER: Bulk

GENERATORS CERTIFICATION: I HEREBY CERTIFY THAT THE ABOVE DESCRIBED MATERIAL IS NOT A HAZARDOUS WASTE AS DEFINED BY U.S. EPA AND/OR STATE AND LOCAL REGULATIONS, DOES NOT CONTAIN REGULATED RADIOACTIVE MATERIALS OR REGULATED CONCENTRATIONS OF PCB'S (POLYCHLORINATED BIPHENYLS), AND THIS MATERIAL DOES NOT CONTAIN FREE LIQUIDS. I ALSO CERTIFY THAT THE MATERIAL BEING REPRESENTED IN THIS MANIFEST CORRESPONDS WITH AND IS THE SAME AS THE MATERIAL REFERENCED IN THE HYDROCARBON CONTAMINATED SOIL PROFILE SHEET SHOWN ABOVE.

NAME OF GENERATOR OR AUTHORIZED AGENT (PRINT): Henry Paul Nunes
SIGNATURE OF GENERATOR OR AUTHORIZED AGENT: Henry Paul Nunes
RECEIPT DATE: 11-14-95

PART II

TRANSPORTER CERTIFICATION: I HEREBY CERTIFY THAT NO OTHER MATERIAL HAS BEEN PLACED IN THIS TRUCK SINCE ACCEPTANCE OF THE MATERIAL AS DESCRIBED IN PART I OF THIS DOCUMENT.

NAME OF TRANSPORTER (PRINT): Cl Paul M Chavez Chavez Soil Trucking
SIGNATURE OF TRANSPORTER: Paul M Chavez KEERS
RECEIPT DATE: 11/21/95

PART III

THIS IS TO CERTIFY THAT KEERS HYDROCARBON CONTAMINATED SOIL LAND FARM, OPERATING UNDER N.M.E.D GROUND WATER DISCHARGE PERMIT #DP-1012 HAS ACCEPTED THE ABOVE MATERIAL.

NAME OF AUTHORIZED AGENT (PRINT): Shannon Kayser
SIGNATURE OF AUTHORIZED AGENT: [signature]
RECEIPT DATE: 11-21-95
MATERIAL DEPOSITED IN CELL #: 5 LOCATION: Middle - South side

Eidson
STEEL PRODUCTS, INC.
8301 BROADWAY, S.E., ALBUQUERQUE, NM 87105
TELEPHONE (505) 873-0160 FAX (505) 873-0167

T A N K D I S P O S A L

DATE: 11/14/95

TO WHOM IT MAY CONCERN:

PLEASE BE ADVISED THAT THE FOLLOWING TANK(S) WILL BE PROPERLY DISPOSED OF AND/OR RECYCLED BY EIDSON STEEL PRODUCTS, INC. IN ACCORDANCE WITH APPLICABLE RULES AND REGULATIONS:

TANK SIZE: GALLONS 3500 DIMENSIONS 8 X 25 LABEL # UNKNOWN

PREVIOUS LOCATION OF TANK(S) 6TH STREET WAREHOUSE, LOS ALAMOS, NM

OWNER KEERS ENVIRONMENTAL

DISPOSAL REQUESTED BY KEERS ENVIRONMENTAL

RESPECTFULLY,

Mike Moro

EIDSON STEEL PRODUCTS, INC.

MESA ENVIRONMENTAL

A DIVISION OF MESA OIL, INC.

RECYCLING MANIFEST / RECEIPT

Service Order # 085265

82

Mailing Address
Keers Environmental Inc
5904 Florence Ave NE
Accts Payable - Emily Sanchez
Albq NM 87113

(505) 823-9006 Ext. 0000

Service Address
Keers Environmental Inc
600 6th St
Robbi
Los Alamos NM 87544

(505) 288-0079 Ext. 0000
Contact: Sterling Johnson

Account Number	P.O. Number	Order Date	Terms
KEERS01		11/08/95	Net 30 days

Description	Ordered	Unit	Price	Quantity	Total
Used Oil Removal	1	Gal-Tank	0.2000		
Oily Water Removal	1	Gal-Tank	0.7200	2,500	2,500
Meet Robbi Across The Street From The Hilltop In In Los Alamos At 7:30 Am.					

APPROVAL:
JOB #:
CAT:
CLASS:

SPECIAL INSTRUCTIONS

SALES TAX

TOTAL DUE MESA OIL $

FORM OF PAYMENT

CASH:
CHECK:
CREDIT APP.#
APPROVED BY
MC / VISA
P.O.#

Shipping manifest only

GENERATORS CERTIFICATION: This material is described to the best of my ability. This material has not been mixed with PCB's or hazardous waste listed in 40 C.F.R. part 262. I acknowledge the accuracy of the total due on this receipt. If to be charged on account I understand that an invoice will follow with terms of NET 30 DAYS.

Robbi Hilo — Printed / Typed Name
Signature
11/7/95 — Date

TRANSPORTER, STORER AND RECYCLER

MESA OIL, INC. - PLANT
Belen, NM
EPA# NMD 0000096024
TEXAS TWC ID# 40849

MESA OIL, INC. - PLANT
Golden, CO
EPA# COD 983772955

Mailing Address:
Mesa Oil, Inc.
7239 Bradburn Blvd.
Westminster, CO 80030
(303) 426-4777

MESA01

IN CASE OF SPILL CONTACT: MESA OIL, INC. 1-800-USED-OIL

D.O.T. REQUIREMENT - MAXIMUM LOAD 7000 GALLONS
OIL N.O.S. COMBUSTIBLE LIQUID

TRANSPORTER ACKNOWLEDGMENT OF RECEIPT OF MATERIALS:
I certify materials have been tested and are below 1,000 PPM halogens.

Bob Williams — Printed / Typed Name
Bob Williams — Signature
11-9-95 — Date

TREATMENT FACILITY OPERATOR:
The described materials were handled by me, the treatment facility named above, and were accepted.

Printed / Typed Name
Signature
Date

White - Return to Generator Green - Records Pink - Office Goldenrod - Generator Copy

ENCLOSURE THREE

CHAIN OF CUSTODY AND COREHOLE SAMPLE ANALYTICAL DATA SHEETS

Los Alamos National Laboratory Environmental Restoration (Los Alamos, NM 87545)

CHAIN OF CUSTODY/REQUEST FOR ANALYSIS

Technical Area	00	Send Lab Report to	Janet Brewer	Field Unit Leader	Garry Allen
Operable Unit	1071		E525		(505)667-3394
Date	12/05/95	LANL Destination	Chem Van	Turnaround	45 days
OU Contact	Rebecca C. Eaton	LANL Contact	John Miglio	Lab Report Required	01/19/96
Contact Phone No	(505) 662-1358	LANL Mail Stop		Charge Code	MA1CB0400000

Relinquished by: ~~Dave Frank~~ ALEX MCCA (Signature): Affiliation: ERM/Golder	Date: 120995	Relinquished by: CST-12 (Signature): Laura Kelly Affiliation:	Date: 12/4/95	Relinquished by: (Signature): Affiliation:	Date:
Received by: CST-12 (Signature): Laura Kelly Affiliation:	Time: 1145 TO 1515	Received by: ALEX MCCA (Signature): Affiliation: ERM	Time: 1530	Received by: (Signature): Affiliation:	Time:

POSSIBLE HAZARD IDENTIFICATION: (please indicate if sample(s) are hazardous materials and/or suspected to contain high levels of hazardous substances): Radiological___ Highly Toxic___ Flammable___ Skin Irritant___ Non-Hazard X Other___

SCREENING METHOD: Rad Van/Chem Van

SAMPLE DISPOSAL: Return to Client

Comments: BH 01

Field Unique Sample #/ID	Cont ID	Date & Time Collected	Sample Container Volume/Material	Matrix	Preserv	ANALYSIS REQUESTED: (SMO Order Codes)	REMARKS (Conditions of receipt, etc.)
0100-95-0916	01	12/04/95 1145	125 ml Septum Amber G	Soil	Ice	CVTPH	
0100-95-0917	01	12/04/95 1320	125 ml Septum Amber G	Soil	Ice	CVTPH	
0100-95-0918	01	12/04/95 1520	125 ml Septum Amber G	Soil	Ice	CVTPH	
0100-95-0919	01	12/05/95 1040	125 ml Septum Amber G	Soil	Ice	CVTPH	
0100-95-0920	01	12/05/95 1150	125 ml Septum Amber G	Soil	Ice	CVTPH	
0100-95-0921	01	12/05/95 1420	125 ml Septum Amber G	Soil	Ice	CVTPH	
0100-95-0922	01	12/05/95 1515	125 ml Septum Amber G	Soil	Ice	CVTPH	

tal Petroleum Hydrocarbons in Soil.

CST-12 Mobile Analytical Laboratory

Analytical Results

Analyst: LAK

Date: 12/4/95

Sample #	Weight(g)	Dilution	ABS	Soil oncentration (mg/kg)
Daily Std.	10	1	0.268	58
0100-95-0916	10.2	100	0.201	4237
0100-95-0917	10.7	100	0.226	4541
0100-95-0918	9.8	100	0.051	1119

ily Std. Recovery: 105%

Total Petroleum Hydrocarbons in Soil.

CST-12 Mobile Analytical Laboratory

Analytical Results

Analyst: LAK

Date: 12/5/95

Sample #	Weight(g)	Dilution	ABS	Soil Concentration (mg/kg)
Daily Std.	10	1	0.045	10
0100-95-0919	10.2	100	0.276	5818
0100-95-0920	10.4	1	0.714	148
0100-95-0921	10.8	1	-0.008	<1
0100-95-0922	10.6	1	-0.001	<1

Daily Std. Recovery: 88%

Los Alamos National Laboratory Environmental Restoration (Los Alamos, NM 87545)

CHAIN OF CUSTODY/REQUEST FOR ANALYSIS

Technical Area	00	Send Lab Report to	Janet Brewer E525	Field Unit Leader	Garry Allen (505)667-3394
Operable Unit	1071				
Date	12/11/95	LANL Destination	Chem Van	Turnaround	45 days
OU Contact	Rebecca C. Eaton	LANL Contact	John Miglio	Lab Report Required	01/25/96
Contact Phone No	(505) 662-1358	LANL Mail Stop		Charge Code	MA1CB0400000

Relinquished by: ~~Dave Frank~~ ALEX MORA (Signature): [signature] Affiliation: ERM/Golder	Date: 12-11-95	Relinquished by: CST-12 (Signature): Laura Kelly Affiliation: [signature]	Date: 12/11/95	Relinquished by: (Signature): Affiliation:	Date:
Received by: CST-12 (Signature): Laura Kelly Affiliation: [signature]	Time: 1630 to 1445	Received by: ALEX MORA (Signature): [signature] Affiliation: ERM	Time: 1500	Received by: (Signature): Affiliation:	Time:

POSSIBLE HAZARD IDENTIFICATION: (please indicate if sample(s) are hazardous materials and/or suspected to contain high levels of hazardous substances): Radiological___ Highly Toxic___ Flammable___ Skin Irritant___ Non-Hazard X Other___

SCREENING METHOD: Rad Van/Chem Van

SAMPLE DISPOSAL: Return to Client

Comments: BH02

Field Unique Sample #/ID	Cont ID	Date & Time Collected	Sample Container Volume/Material	Matrix	Preserv	ANALYSIS REQUESTED: (SMO Order Codes)	REMARKS (Conditions of receipt, etc.)
0100-95-0923	01	12/11/95 1030	125 ml Septum Amber G	Soil	Ice	CVTPH	
0100-95-0924	01	12/11/95 1100	125 ml Septum Amber G	Soil	Ice	CVTPH	
0100-95-0925	01	12/11/95 1120	125 ml Septum Amber G	Soil	Ice	CVTPH	
0100-95-0926	01	12/11/95 1305	125 ml Septum Amber G	Soil	Ice	CVTPH	
0100-95-0927	01	12/11/95 1315	125 ml Septum Amber G	Soil	Ice	CVTPH	
0100-95-0928	01	12/11/95 1340	125 ml Septum Amber G	Soil	Ice	CVTPH	
0100-95-0929	01	12/11/95 1350	125 ml Septum Amber G	Soil	Ice	CVTPH	
0100-95-0930	01	12/11/95 1415	125 ml Septum Amber G	Soil	Ice	CVTPH	
0100-95-0931	01	12/11/95 1430	125 ml Septum Amber G	Soil	Ice	CVTPH	
0100-95-0932	01	12/11/95 1440	125 ml Septum Amber G	Soil	Ice	CVTPH	
0100-95-0933	01	12/11/95 1445	125 ml Septum Amber G	Soil	Ice	CVTPH	

Total Petroleum Hydrocarbons in Soil.

CST-12 Mobile Analytical Laboratory

Analytical Results

Analyst: LAK

Date: 12/11/95

Sample #	Weight(g)	Dilution	ABS	Soil Concentration (mg/kg)
Daily Std.	10	1	0.053	11
0100-95-0923	10.4	1	-0.01	<1
0100-95-0924	9.7	1	-0.004	<1
0100-95-0925	10	1	-0.007	<1
0100-95-0926	9.9	1	-0.006	<1
0100-95-0927	10.4	1	0.001	<1
0100-95-0928	10.3	1	-0.002	<1
0100-95-0929	10.3	1	-0.03	<1
0100-95-0930	10	1	-0.008	<1
0100-95-0931	10.6	1	-0.009	<1
0100-95-0932	10.7	1	-0.007	<1
0100-95-0933	10.5	1	-0.011	<1

Daily Std. Recovery: 104%

Los Alamos National Laboratory Environmental Restoration (Los Alamos, NM 87545)

CHAIN OF CUSTODY/REQUEST FOR ANALYSIS

Technical Area	00	Send Lab Report to	Janet Brewer	Field Unit Leader	Garry Allen
Operable Unit	1071		E525		(505)667-3394
Date	12/12/95	LANL Destination	Chem Van	Turnaround	45 days
OU Contact	Rebecca C. Eaton	LANL Contact	John Miglio	Lab Report Required	01/26/96
Contact Phone No	(505) 662-1358	LANL Mail Stop		Charge Code	MA1CB0400000

Relinquished by: ~~Dave Frank~~ ALEX MORA (Signature): Affiliation: ERM/Golder	Date: 12-12-95	Relinquished by: CST-12 (Signature): Laura Kelly Affiliation: Laura Kelly	Date: 12/12/95	Relinquished by: (Signature): Affiliation:	Date:
Received by: CST-12 (Signature): Laura Kelly Affiliation: Laura Kelly	Time: 0900 TO 1130.	Received by: ALEX MORA (Signature): Affiliation: ERM	Time: 1130	Received by: (Signature): Affiliation:	Time:

POSSIBLE HAZARD IDENTIFICATION: (please indicate if sample(s) are hazardous materials and/or suspected to contain high levels of hazardous substances): Radiological___ Highly Toxic___ Flammable___ Skin Irritant___ Non-Hazard X Other___

SCREENING METHOD: Rad Van/Chem Van

SAMPLE DISPOSAL: Return to Client

Comments: BH 03

Field Unique Sample #/ID	Cont ID	Date & Time Collected	Sample Container Volume/Material	Matrix	Preserv	ANALYSIS REQUESTED: (SMO Order Codes)	REMARKS (Conditions of receipt, etc.)
0100-95-0934	01	12/12/95 0900	125 ml Septum Amber G	Soil	Ice	CVTPH	
0100-95-0935	01	12/12/95 0915	125 ml Septum Amber G	Soil	Ice	CVTPH	
0100-95-0936	01	12/12/95 0930	125 ml Septum Amber G	Soil	Ice	CVTPH	
0100-95-0937	01	12/12/95 1007	125 ml Septum Amber G	Soil	Ice	CVTPH	
0100-95-0938	01	12/12/95 1018	125 ml Septum Amber G	Soil	Ice	CVTPH	
0100-95-0939	01	12/12/95 1100	125 ml Septum Amber G	Soil	Ice	CVTPH	
0100-95-0940	01	12/12/95 1116	125 ml Septum Amber G	Soil	Ice	CVTPH	
0100-95-0941	01	12/12/95 1130	125 ml Septum Amber G	Soil	Ice	CVTPH	

Los Alamos National Laboratory Environmental Restoration (Los Alamos, NM 87545)

CHAIN OF CUSTODY/REQUEST FOR ANALYSIS

Technical Area	00	**Send Lab Report to**	Janet Brewer	**Field Unit Leader**	Garry Allen
Operable Unit	1071		E525		(505)667-3394
Date	12/12/95	**LANL Destination**	Chem Van	**Turnaround**	45 days
OU Contact	Rebecca C. Eaton	**LANL Contact**	John Miglio	**Lab Report Required**	01/26/96
Contact Phone No	(505) 662-1358	**LANL Mail Stop**		**Charge Code**	MA1CB0400000

Relinquished by: ~~Dave Frank~~ ALEX MORA **(Signature):** **Affiliation:** ERM/Golder	**Date:** 12-12-95	**Relinquished by:** CST-12 **(Signature):** Laura Kelly **Affiliation:**	**Date:** 12/12/95	**Relinquished by:** **(Signature):** **Affiliation:**	**Date:**
Received by: CST-12 **(Signature):** Laura Kelly **Affiliation:**	**Time:** 1400 TC	**Received by:** ALEX MORA **(Signature):** **Affiliation:** ERM	**Time:** 1500	**Received by:** **(Signature):** **Affiliation:**	**Time:**

POSSIBLE HAZARD IDENTIFICATION: (please indicate if sample(s) are hazardous materials and/or suspected to contain high levels of hazardous substances): Radiological___ Highly Toxic___ Flammable___ Skin Irritant___ Non-Hazard X Other___

SCREENING METHOD: Rad Van/Chem Van

SAMPLE DISPOSAL: Return to Client

Comments: BH 04

Field Unique Sample #/ID	Cont ID	Date & Time Collected	Sample Container Volume/Material	Matrix	Preserv	ANALYSIS REQUESTED: (SMO Order Codes)	REMARKS (Conditions of receipt, etc.)
0100-95-0942	01	12/12/95 1400	125 ml Septum Amber G	Soil	Ice	CVTPH	
0100-95-0943	01	12/12/95 1420	125 ml Septum Amber G	Soil	Ice	CVTPH	
0100-95-0944	01	12/12/95 1420	125 ml Septum Amber G	Soil	Ice	CVTPH	
0100-95-0945	01	12/12/95 0000	125 ml Septum Amber G	Soil	Ice	CVTPH	
0100-95-0946	01	12/12/95 1500	125 ml Septum Amber G	Soil	Ice	CVTPH	
0100-95-0947	01	12/12/95 1520	125 ml Septum Amber G	Soil	Ice	CVTPH	
0100-95-0948	01	12/12/95 1520	125 ml Septum Amber G	Soil	Ice	CVTPH	
0100-95-0949	01	12/12/95 0000 1540	125 ml Septum Amber G	Soil	Ice	CVTPH	
0100-95-0950	01	12/12/95 0000 1550	125 ml Septum Amber G	Soil	Ice	CVTPH	

Original - LANL Destination Yellow - RPF Pink - FTL Copy

Los Alamos National Laboratory Environmental Restoration (Los Alamos, NM 87545)

CHAIN OF CUSTODY/REQUEST FOR ANALYSIS

Technical Area	00	Send Lab Report to	Janet Brewer	Field Unit Leader	Garry Allen
Operable Unit	1071		E525		(505)667-3394
Date	12/13/95	LANL Destination	Chem Van	Turnaround	45 days
OU Contact	Rebecca C. Eaton	LANL Contact	John Miglio	Lab Report Required	01/27/96
Contact Phone No	(505) 662-1358	LANL Mail Stop		Charge Code	MA1CB0400000

Relinquished by: ~~Dave Frank~~ ALEX MORA (Signature): Affiliation: ERM/Golder	Date: 12-13-95	Relinquished by: CST-12 (Signature): Laura Kelly Affiliation:	Date: 12-13-95	Relinquished by: (Signature): Affiliation:	Date:
Received by: CST-12 (Signature): Laura Kelly Affiliation:	Time: 1000 to 1145	Received by: ALEX MORA (Signature): Affiliation: ERM	Time: 1145	Received by: (Signature): Affiliation:	Time:

POSSIBLE HAZARD IDENTIFICATION: (please indicate if sample(s) are hazardous materials and/or suspected to contain high levels of hazardous substances): Radiological___ Highly Toxic___ Flammable___ Skin Irritant___ Non-Hazard X Other___

SCREENING METHOD: Rad Van/Chem Van

SAMPLE DISPOSAL: Return to Client

Comments: BH 05

Field Unique Sample #/ID	Cont ID	Date & Time Collected	Sample Container Volume/Material	Matrix	Preserv	ANALYSIS REQUESTED: (SMO Order Codes)	REMARKS (Conditions of receipt, etc.)
0100-95-0951	01	12/13/95 1000	125 ml Septum Amber G	Soil	Ice	CVTPH	
0100-95-0952	01	12/13/95 1015	125 ml Septum Amber G	Soil	Ice	CVTPH	
0100-95-0953	01	12/13/95 1033	125 ml Septum Amber G	Soil	Ice	CVTPH	
0100-95-0954	01	12/13/95 1100	125 ml Septum Amber G	Soil	Ice	CVTPH	
0100-95-0955	01	12/13/95 1100	125 ml Septum Amber G	Soil	Ice	CVTPH	
0100-95-0956	01	12/13/95 1120	125 ml Septum Amber G	Soil	Ice	CVTPH	
0100-95-0959	01	12/13/95 1140	125 ml Septum Amber G	Soil	Ice	CVTPH	
0100-95-0960	01	12/13/95 1145	125 ml Septum Amber G	Soil	Ice	CVTPH	

Total Petroleum Hydrocarbons in Soil.

CST-12 Mobile Analytical Laboratory

Analytical Results

Analyst: LAK

Date: 12/12/95

Sample #	Weight(g)	Dilution	ABS	Soil Concentration (mg/kg)
Daily Std.	10	1	0.052	11
0100-95-0934	10.2	1	-0.002	<1
0100-95-0935	10	1	-0.008	<1
0100-95-0936	9.7	1	-0.005	<1
0100-95-0937	10.2	1	-0.007	<1
0100-95-0938	9.8	1	-0.005	<1
0100-95-0939	10.4	1	0	<1
0100-95-0940	10.3	1	-0.003	<1
0100-95-0941	10.2	1	-0.002	<1
0100-95-0942	10.4	1	0.002	<1
0100-95-0943	10.2	1	-0.002	<1
0100-95-0944	10.5	1	0.003	<1
0100-95-0945	10.2	1	0	<1
0100-95-0946	9.5	1	0.003	<1
0100-95-0947	10.6	1	-0.001	<1
0100-95-0948	10.6	1	-0.002	<1
0100-95-0949	9.6	1	-0.003	<1
0100-95-0950	10.2	1	0	<1

Daily Std. Recovery: 102%

Total Petroleum Hydrocarbons in Soil.

CST-12 Mobile Analytical Laboratory

Analytical Results

Analyst: jbr

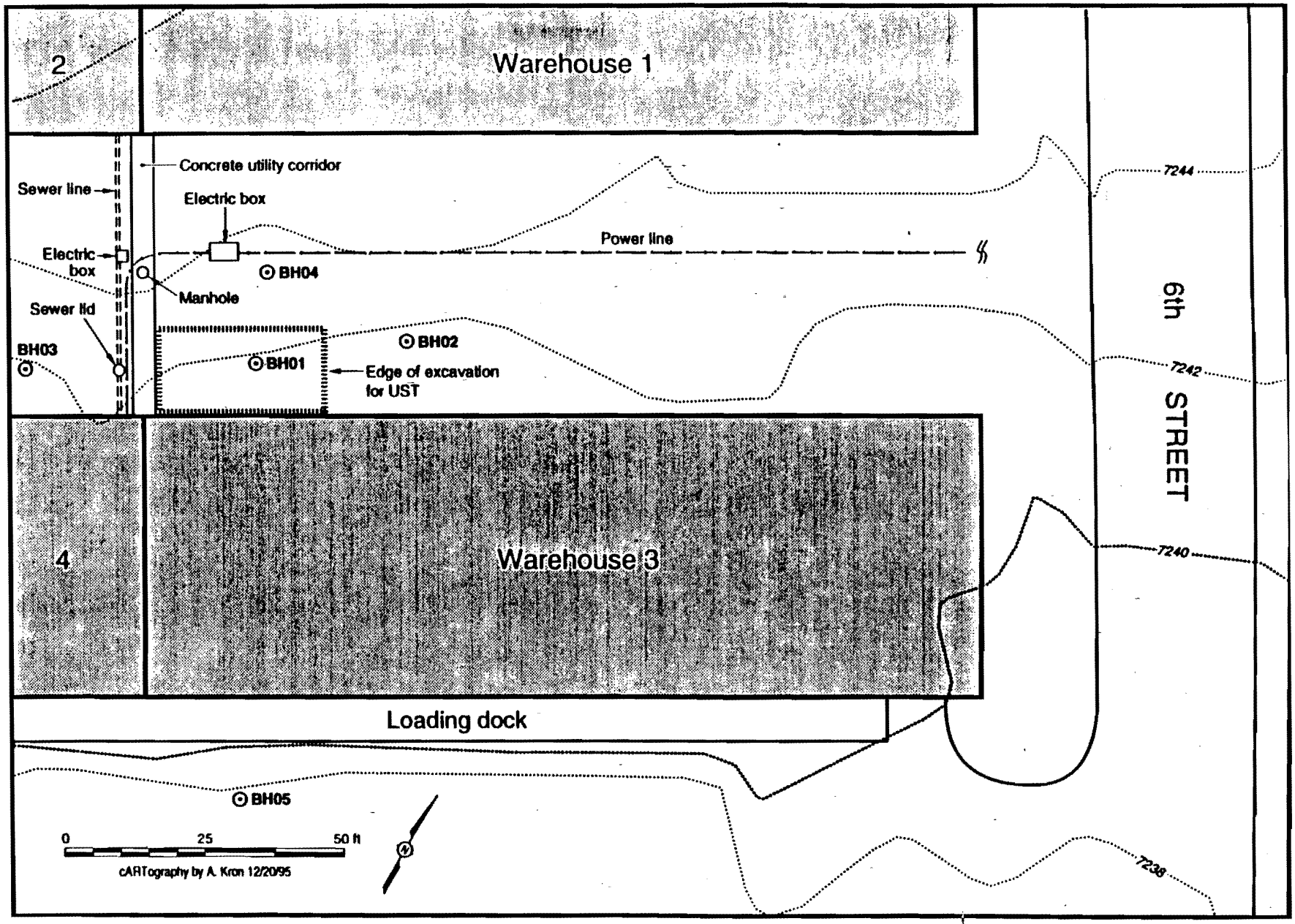
Date: 12/13/95

Sample #	Weight(g)	Dilution	ABS	Soil Concentration (mg/kg)
Daily Std.	10	1	0.052	11
0100-95-0951	10.3	1	0.013	3
0100-95-0952	10.6	1	-0.001	<1
0100-95-0953	10.2	1	-0.002	<1
0100-95-0954	10.1	1	-0.003	<1
0100-95-0955	10.2	1	-0.001	<1
0100-95-0956	10.4	1	-0.002	<1
0100-95-0959	10	1	-0.001	<1
0100-95-0960	10.1	1	-0.001	<1

Daily Std. Recovery: 102%

ENCLOSURE FOUR

COREHOLE LOCATIONS



Locations of boreholes at the underground storage tank, 6th Street warehouse.

ENCLOSURE FIVE

COREHOLE SAMPLE LOGS

LOS ALAMOS NATIONAL LABORATORY ENVIRONMENTAL RESTORATION PROGRAM

SAMPLE MANAGEMENT FACILITY

CORE SAMPLE LOG

Borehole ID [illegible] TA/OU [illegible] Drill Depth From [illegible] To 35 Page [illegible] of 2

Driller [illegible] Box #(s) 1A Start Date/Time [illegible] End Date/Time [illegible]

Drilling Equip./Method [illegible] Sampling Equip./Method [illegible]

ALL SAMPLES FROM THE [illegible] RE FILLED TO # [illegible]

Depth (feet)	Recovery (feet per feet / %)	Field Analytical Sample Number	Field Screening Results	Top/Bottom of Core in Box	Lithology-Petrology - Soil	Graphic Log	Lithologic Unit	Notes
5					FILL MATERIAL FROM 3-033 TANK EXCAVATION. THIS MATERIAL WAS NOT SAMPLED			
10	2.0/2.0 100%	3100-95-3916	OVM=0.0 α=ND β/γ=ND	NA	RUN #1, 10.3-11.2, 11 45, SAMPLE TAKEN FROM 11.0 FT. LOOSE TO CONSOLIDATED, VERY LT. GRAY TO WHITE TUFF STRONG SOIL, WET TO DRY, POWDERY APPEARANCE.			SAMPLE FOR TPH ONLY VIA CHEM VAN METHOD 418.1
12	2.0/2.0 100%	3100-95-3917	OVM=59 α=NDA β/γ=	NA	RUN #2, 14.7-16.7, 13 20, SAMPLE COLLECTED FROM THE 15 FT MARK. CORE IS LOOSE TO CONSOLIDATED, LOOSE GRADING TO CONSOLIDATED LIGHT GRAY TO DARK GRAY TUFF NO PUMICE VISIBLE. FRESHLY CORE IS WET GRADING TO DRY.			TPH VIA CHEM VAN.
15								
	2.0/2.0 100%	3100-95-3918	OVM=24 α=NDA β/γ=NDA	NA	RUN #3, 18.0-20.4, 1520, SAMPLE COLLECTED FROM THE 20 FT MARK, SAME LITHOLOGY AS THE PAST TWO SAMPLES. S. [illegible] 12 [illegible] 95			
20	2.0/2.0 100%	3100-95-3919	OVM=49 α=NDA β/γ=NDA	NA	RUN #4, 23.0-25.0, 1040, SAMPLE WAS COLLECTED AT THE 25 FT MARK. COHESIVE CONSOLIDATED DARK GREY TO LIGHT GRAY PUMICE POOR ASH FLOW TUFF, HYDROCARBON ODOR, DAMP.			WEATHER FOR [illegible] IS [illegible] SLIGHT BREEZE SOME HIGH CLOUDS, NO PRECIPITATION.
25	2.0/2.0 100%	3100-95-3920	OVM=14 α=ND β/γ ND	NA	RUN #5, 29-31 FT. 1150 SAMPLED FROM THE 30 FT. INTERVAL. CORE IS CONSOLIDATED COHESIVE PUMICE POOR WELDED TUFF GRAY TO LIGHT BROWN WET. FEW CRYSTALS TO 2MM SLIGHT HYDROCARBON ODOR.			BREAK FOR LUNCH 12 [illegible]
30								
	2.0/2.0 100%	3100-95-3921	OVM=ND α=ND β/γ=ND	NA	RUN #6, [illegible] 1420 SAMPLE FROM THE 35 FT INTERVAL. COHESIVE CONSOLIDATED. BROWN (LAYER) TUFF, PLATY STRUCTURE, LITTLE VISIBLE PUMICE, NO FEEL ODOR, WET.			[illegible] DRILLING FOR THE DAY
35								

WEATHER [illegible] SOME HIGH CLOUDS, NO PRECIP. (NOON)

BEGINNING 3001 DRILLED THROUGH CENTER OF THE CONCRETE WHERE THE TANK USED TO BE

Prepared by [illegible] Date [illegible] Checked By MEX MORP Date [illegible]

LOS ALAMOS NATIONAL LABORATORY ENVIRONMENTAL RESTORATION PROGRAM

SAMPLE MANAGEMENT FACILITY

CORE SAMPLE LOG

Borehole ID [illegible] TA/OU [illegible] Drill Depth From [illegible] To [illegible] Page [illegible] of [illegible]

Driller M. HENKE Box #(s) 1A Start Date/Time [illegible] End Date/Time [illegible]

Drilling Equip./Method [illegible] Sampling Equip./Method [illegible]

Depth (feet)	Recovery (feet per feet / %)	Field Anaytical Sample Number	Field Screening Results	Top/Bottom of Core in Box	Lithology-Petrology - Soil	Graphic Log	Lithologic Unit	Notes
35	2.0/2.0 100%	0100-0422	VOH ND α=ND β/γ=ND	NA	RUN #7, 35-40, 1550, SAMPLED AT 40' CONSOLIDATED, COHESIVE AT BRIM TO LI GRAY TUFF, SOMEWHAT FLAKY STRUCTURE NO VISIBLE CLASTS OR PUMICE, MOIST.			
					FINISH DRILLING FOR THE DAY			
40								
45								
50								

Prepared by D. FRANK Date 12-4-95 Checked By [illegible] MORA Date [illegible]

LOS ALAMOS NATIONAL LABORATORY ENVIRONMENTAL RESTORATION PROGRAM

SAMPLE MANAGEMENT FACILITY

CORE SAMPLE LOG

Borehole ID 02 TA/OU 0, FU-1 Drill Depth From 0 To 10 Page 1 of 4

Driller STEWART DOOSS Box #(s) NA Start Date/Time 12-11-95/1000 End Date/Time 12-11-95/1100

Drilling Equip./Method 6" HOLLOW STEM AUGER Sampling Equip./Method CONTINUOUS CORE BARREL

Depth (feet)	Recovery (feet per feet / %)	Field Analytical Sample Number	Field Screening Results	Top/Bottom of Core in Box	Lithology-Petrology - Soil	Graphic Log	Lithologic Unit	Notes
0	3.5/5.0 RUN 1	0100-95 0933 @ 3'	PID-0	NA	0-6" TOPSOIL [illegible] 6"-1.5' [illegible] TUFF, REDDISH YELLOW (7.5YR 7/6) 1.5-2.0' STRONG BROWN (5YR 7.5YR) CLAY, DRY, LOW PLASTICITY. 2.0-2.4' LIGHT BROWN (5YR 7.5YR), WEATHERED CLAYEY TUFF, DRY. 2.4-3.5 GRAY (5Y) TUFF CRUMBLED SLIGHT / MOIST 3.5-5.0' NO. PACKED FLOODED WITH CLAY.			1000
5								
6	5.0/5.0 RUN 2	0100-95 0924 @ 9'	PID-0		5.0-10.0 MODERATELY WELDED IGNIMBRITE TO VITRIC AND DEVITRIFIED PUMICE, AND MODERATE TO RICH IN PHENOCRYSTS SLIGHTLY TO WELL INDURATED. - 20% PUMICE LAPILLI VITRIFIED AND DEVITRIFIED, BROWN (5YR, 7.5YR), RANGING FROM 0.3 TO 2.5 CM, AVERAGING 2.0 CM. - 80% PHENOCRYST, QUARTZ (90%), FELDSPARS (5%), SANIDINE (2%), OTHER (3%). SIZE IS ANGULAR, CLEAR, RANGING FROM 0.1 TO 0.3 mm, AND AVERAGING 0.2 mm IN SIZE. - LITHICS NOT VISIBLE. - MATRIX IS LIGHT REDDISH BROWN (5YR6/3) ash, MODERATELY CONSOLIDATED.			1010
7								
8								
9								
10								

Prepared by ALEX MORA Date 12-18-95 Checked By [signature] Date 12/21/95

LOS ALAMOS NATIONAL LABORATORY ENVIRONMENTAL RESTORATION PROGRAM

SAMPLE MANAGEMENT FACILITY

CORE SAMPLE LOG

Borehole ID 02 TA/OU O. FU-1 Drill Depth From 10 To 20 Page 2 of 4

Driller STUART BROSS Box #(s) NA Start Date/Time 12-11-95/1150 End Date/Time 12-11-95/1630

Drilling Equip./Method 6" HOLLOW STEM AUGER Sampling Equip./Method CONTINUOUS CORE BARREL

Depth (feet)	Recovery (feet per feet / %)	Field Analytical Sample Number	Field Screening Results	Top/Bottom of Core in Box	Lithology-Petrology - Soil	Graphic Log	Lithologic Unit	Notes
10	5.0/5.0	0125-95 0925 @ 12'	PID: 0	NA	10-15 MODERATELY WELDED IGNIMBRITE [illegible] PUMICE, AND RICH IN PHENOCRYST. WELL INDURATED.			1100
11	RUN 3	0125-95 0926 @ 13'			- 5% [illegible] LIGHT GRAY (7/N) RANGING FROM 2 TO 3 cm [illegible]			
12		0			- 25% PHENOCRYSTS QUARTZ (75%) SEMI-BROKEN CLEAR, 1 TO 3 mm AND 2 mm AVERAGE IN SIZE. OTHER NOT IDENTIFIED MINERALS (10%)			
13		0			- LITHICS NOT OBSERVED			
14					- MATRIX GRAY [illegible] SLIGHTLY TO MODERATELY COHESIVE.			
15								
16	5.0/5.0 RUN 4	0125-95 0927 @ 17' 0125-95 0928 @ 19'	PID: 0	NA	15-20 SLIGHTLY WELDED IGNIMBRITE [illegible] PUMICE AND MODERATELY RICH IN PHENOCRYSTS. SLIGHTLY INDURATED.			1300
17		0			- 10% PUMICE, [illegible] (7/N), RANGING FROM 4 mm / 1 cm AND AVERAGING 3 cm IN SIZE.			
18					- 15% PHENOCRYSTS, QUARTZ (80%), CLEAR AVERAGING 1 mm IN SIZE. SANIDINE (5%) BLACK, AVERAGING 1 mm IN SIZE. OTHER UNIDENTIFIED (15%)			
19					- LITHICS NOT OBSERVED			
20					- MATRIX LIGHT RED (2.5 YR 6/8), SLIGHTLY MODERATELY COHESIVE.			

Prepared by ALEX MORA Date 12-18-95 Checked By [signature] Date 12/21/95

LOS ALAMOS NATIONAL LABORATORY ENVIRONMENTAL RESTORATION PROGRAM

SAMPLE MANAGEMENT FACILITY

CORE SAMPLE LOG

Borehole ID 02 TA/OU 0-FU-1 Drill Depth From 20 To 30' Page 3 of 4

Driller STEWART BROS Box #(s) NA Start Date/Time 12-11-95/1400 End Date/Time 12-11-95/1430

Drilling Equip./Method 6" HOLLOW STEM AUGER Sampling Equip./Method CONTINUOUS CORE BARREL

Depth (feet)	Recovery (feet per feet / %)	Field Analytical Sample Number	Field Screening Results	Top/Bottom of Core in Box	Lithology-Petrology - Soil	Graphic Log	Lithologic Unit	Notes
20	50/5.0	0100-95 0929	PID:0		20-25 SILTY. EXHIBITS BOWING AND STRESS.			1400
21	RUN 5	@ 23.5'						
22								
23								
	0	0						
24								
25								
	50/5.0	0100-95 0930	PID:0		25-30 SLIGHTLY TO MODERATELY WELDED IGNIMBRITE WITH VITRIFIED PUMICE AND MODERATE PHENOCRYST CONTENT. WELL INDURATED.			1420 28' [illegible] 45° STRUCTURE.
26	RUN 6	@ 28'			- 10% PUMICE LAPILLI, VITRIFIED, BROWN (7.5YR 5/2) RANGING FROM 1-4 CM AND AVERAGING 3 CM IN SIZE.			
27					- 20% PHENOCRYSTS, QUARTZ (80%) CLEAR, 1-4 mm and AVERAGING 2mm IN SIZE			
28					- LITHICS NOT OBSERVED.			
29					- MATRIX IS REDDISH GRAY (5YR 5/2), ASH, MODERATELY CONSOLID.			
30								

Prepared by ALEX MORA Date 12-18-95 Checked By [signature] Date 12/20/95

LOS ALAMOS NATIONAL LABORATORY ENVIRONMENTAL RESTORATION PROGRAM

SAMPLE MANAGEMENT FACILITY

CORE SAMPLE LOG

Borehole ID 02 TA/OU 0, FU-1 Drill Depth From 30' To 40' Page 4 of 4

Driller [illegible] Box #(s) NA Start Date/Time 12-11-95/1430 End Date/Time 12-11-95/1440

Drilling Equip./Method 6" HOLLOW STEM AUGER Sampling Equip./Method CONTINUOUS CORE BARREL

Depth (feet)	Recovery (feet per feet / %)	Field Analytical Sample Number	Field Screening Results	Top/Bottom of Core in Box	Lithology-Petrology - Soil	Graphic Log	Lithologic Unit	Notes
30	5.0/50	[illegible]-95 0931 at 33'	BKG	NA	[illegible]			1430
31	RUN 7							
32								
33								
34								
35								
36	5.0/50 RUN 8	[illegible]-95 0932 at 36 [illegible] at 38.5'	BKG	NA	35-40 [illegible] TO MODERATELY WELDED [illegible] WITH VITRIC [illegible] AND [illegible] PUMICES AND MONOMINERAL IN PREDOMINANT [illegible] MATRIX. [illegible] INDURATED. - 5-[illegible]% [illegible] VITRIC AND [illegible] RANGING FROM 1 TO 4 CM AND [illegible] 2 CM IN SIZE. - 20% PRE-[illegible] GRANITE (30%) [illegible] TRANSLUCENT [illegible] 2 mm IN SIZE. - LITHICS NOT [illegible] - MATRIX IS [illegible]			1440 [illegible]
37								
38								
39								
40					BOTTOM OF BOREHOLE AT 40'			

Prepared by ALEX MORA Date 12-18-95 Checked By [signature] Date 12/20/95

LOS ALAMOS NATIONAL LABORATORY ENVIRONMENTAL RESTORATION PROGRAM

SAMPLE MANAGEMENT FACILITY

CORE SAMPLE LOG

Borehole ID 03 TA/OU 0-FU-1 Drill Depth From 0 To 10 Page 1 of 4

Driller STEWART BROS Box #(s) NA Start Date/Time 12-12-95/0900 End Date/Time 12-12-95/0930

Drilling Equip./Method 6" HOLLOW STEM AUGER Sampling Equip./Method CONTINUOUS CORE BARREL

Depth (feet)	Recovery (feet per feet / %)	Field Analytical Sample Number	Field Screening Results	Top/Bottom of Core in Box	Lithology-Petrology - Soil	Graphic Log	Lithologic Unit	Notes
0	5.0/5.0 RUN 1	0900-95 0934 at 3'	PID = 0	NA	0-3.0 REDDISH BROWN SILTY CLAY TO SILTY CLAY INCREASING TO BOTTOM. 3.0-5.0 NE.			0900
5	5.0/5.0 RUN 2	0900-95 0935 at 8'	PID = 0	NA	5.0-10.0 MODERATELY WELDED KNIGHTBRIDGE WITH DEVITRIFIED PUMICE AND MODERATE TO RICH IN PHENOCRYSTS. SLIGHTLY INDURATED. - 5% PUMICE LAPILLI, DEVITRIFIED REDDISH BROWN (5YR 4/3) RANGING FROM 2 TO 5 CM. AND AVERAGING 3 CM IN SIZE. - 20% PHENOCRYSTS: QUARTZ (90%) FANDISPE TRANSPARENT, 3 mm IN SIZE. - LITHICS NOT OBSERVED. - MATRIX IS REDDISH BROWN (5YR 4/3) ASH. TOUGHLY TO MODERATELY COHESIVE.			0915
10								

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LOS ALAMOS NATIONAL LABORATORY ENVIRONMENTAL RESTORATION PROGRAM

SAMPLE MANAGEMENT FACILITY

CORE SAMPLE LOG

Borehole ID 03 TA/OU 0, FU-1 Drill Depth From 10 To 20 Page 2 of 4

Driller [illegible] Box #(s) [illegible] Start Date/Time 12-12-95/0930 End Date/Time 12-12-95/1010

Drilling Equip./Method 6" HOLLOW STEM AUGER Sampling Equip./Method CONTINUOUS CORE BARREL

Depth (feet)	Recovery (feet per feet / %)	Field Anaytical Sample Number	Field Screening Results	Top/Bottom of Core in Box	Lithology-Petrology - Soil	Graphic Log	Lithologic Unit	Notes
10	50/5.0 RUN 3	0936	PID = 0	NA	10-15 I.A.A. EXCEPT MATRIX IS GRAY (5YR.5/1)			0930 14' FRAGMENTS, METAL FRAGMENTS FOUND. 12-14 REDUCED FRAGMENT STRINGS.
11								
12								
13								
14								
15	50/50 RUN 4	0937	PID = 0	NA	15-20 [illegible] - 20% [illegible] SUBROUNDED, FINGER 1 TO 4mm [illegible] - NO VISIBLE [illegible] - MATRIX IS GRAY (5/N), DRY, SLIGHTLY COHESIVE.			1000
16								
17								
18								
19								
20								

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LOS ALAMOS NATIONAL LABORATORY ENVIRONMENTAL RESTORATION PROGRAM

SAMPLE MANAGEMENT FACILITY

CORE SAMPLE LOG

Borehole ID 53 TA/OU C-EU-1 Drill Depth From 20 To 30 Page 3 of 4

Driller STEWART GROSS Box #(s) NA Start Date/Time 12-12-95/1010 End Date/Time 12-12-95/1100

Drilling Equip./Method 4" HOLLOW STEM AUGER Sampling Equip./Method CONTINUOUS CORE BARREL

Depth (feet)	Recovery (feet per feet / %)	Field Analytical Sample Number	Field Screening Results	Top/Bottom of Core in Box	Lithology-Petrology - Soil	Graphic Log	Lithologic Unit	Notes
20	5.0/5.0	0100-95 0939	PID = 0	NA	20-25 S.A.A - PUMICE UP TO 5CM IN SIZE.			1010
21	RUN 5	at 24'						23 FRACTURE, XZTAL SILICA STAINS
22								22.5 FRACTURE HEAVY OLIVE STAINS.
23								
24								
25								
26	5.0/5.0	0100-95 0939	PID = 0	NA	25-30 S.A.A - SANIDINE PRESENT (5% OF TOTAL PHENOCRYST CONTENT).			1100
27	RUN 6	at 29'						
28								
29								
30								

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LOS ALAMOS NATIONAL LABORATORY ENVIRONMENTAL RESTORATION PROGRAM

SAMPLE MANAGEMENT FACILITY

CORE SAMPLE LOG

Borehole ID 03 TA/OU [illegible] Drill Depth From 30 To 40 Page 4 of 4

Driller [illegible] Box #(s) NA Start Date/Time [illegible] End Date/Time [illegible]

Drilling Equip./Method [illegible] Sampling Equip./Method [illegible]

Depth (feet)	Recovery (feet per feet / %)	Field Analytical Sample Number	Field Screening Results	Top/Bottom of Core in Box	Lithology-Petrology - Soil	Graphic Log	Lithologic Unit	Notes
30	E2/50	[illegible] 0940	PID=0	NA	30-35 S.A.A.			1110
31	RUN 7	[illegible]						34.5' FRACTURE, 45° EDGE WITH CLAY LINING.
32								
33								
34								
35								
	50/50	0100-95 0941.	PID=0		35'-40' S.A.A. [illegible]			1130
36	RUN 8				37.3 [illegible]			36.5' FRACTURE, METAL [illegible]
37								39' FRACTURE 45° BROWN STAINED. [illegible] CLAY LINING.
38								
39								
40					BOTTOM OF BOREHOLE.			

Prepared by ALEX MORA Date [illegible] Checked By [illegible] Date 12

LOS ALAMOS NATIONAL LABORATORY ENVIRONMENTAL RESTORATION PROGRAM

SAMPLE MANAGEMENT FACILITY

CORE SAMPLE LOG

Borehole ID 04 TA/OU [illegible] Drill Depth From 0 To 10 Page [illegible] of 4

Driller [illegible] Box #(s) [illegible] Start Date/Time 12-12-95/1345 End Date/Time 12-12-95/1400

Drilling Equip./Method 6" HOLLOW STEM AUGER Sampling Equip./Method CONTINUOUS CORE BARREL

Depth (feet)	Recovery (feet per feet / %)	Field Analytical Sample Number	Field Screening Results	Top/Bottom of Core In Box	Lithology-Petrology - Soil	Graphic Log	Lithologic Unit	Notes
0	2.5/5.0 RUN 1	NA	PID 0	NA	0 2.5 REDDISH BROWN SANDY SILT. DRY OBSERVED WATER. 2.5-5.0 NR.			1345
5	5.0/5.0 RUN 2	[illegible] 094d at 9'	PID 0	NA	5.0 TO 6.5 REDDISH BROWN SANDY SILT. 6.5 TO 10 MODERATELY WELDED IGNIMBRITE WITH DEVITRIFIED PUMICE AND MODERATE PHENOCRYST CONTENT. MODERATELY INDURATED. - 5% PUMICE [illegible] PINK RED (2.5YR 4/2) RANGING FROM 1 [illegible] CM TO [illegible] AVERAGING 1 CM. - 30% PHENOCRYSTS: QUARTZ (90%) ANGULAR TRANSPARENT 1 TO 4 MM IN SIZE AND AVERAGING 2 MM. - LITHICS NOT OBSERVED - MATRIX IS PINK WHITE (5YR 8/1) SLIGHTLY COARSE.			1400
10								

Prepared by ALEX MORA Date [illegible] Checked By [illegible] Date 12/20/95

LOS ALAMOS NATIONAL LABORATORY ENVIRONMENTAL RESTORATION PROGRAM

SAMPLE MANAGEMENT FACILITY

CORE SAMPLE LOG

Borehole ID 04 TA/OU O. FU-1 Drill Depth From 10 To 20 Page 2 of 4

Driller STEWART CROSS Box #(s) NA Start Date/Time [illegible] End Date/Time [illegible]

Drilling Equip./Method [illegible] Sampling Equip./Method CONTINUOUS CORE BARREL

Depth (feet)	Recovery (feet per feet / %)	Field Analytical Sample Number	Field Screening Results	Top/Bottom of Core In Box	Lithology-Petrology - Soil	Graphic Log	Lithologic Unit	Notes
10	50/5.0 RUN 3	0105-95-0943 at 12' 0105-95-0944 at 14'	PID 0.0	NA	10-15 S.A.A EXCEPT [illegible] AT [illegible]			1405 11-12 FRACTURED, 45° FILLED W/ TAN BROWN CLAY SLIGHTLY PLASTIC AND MOIST. 12-13 FRACTURED 45° S.A.A. FRACTURE.
15	50/5.0 RUN 4	0105-95-0945 at 19'	PID 0.0	NA	15-20 S.A.A			1445
20								

Prepared by ALEX MOZA Date 12-19-95 Checked By [illegible] Date 12/20/95

LOS ALAMOS NATIONAL LABORATORY ENVIRONMENTAL RESTORATION PROGRAM

SAMPLE MANAGEMENT FACILITY

CORE SAMPLE LOG

Borehole ID 04 TA/OU 0 [illegible] Drill Depth From 20 To 30 Page 3 of 4

Driller STEWART BROS Box #(s) NA Start Date/Time [illegible] End Date/Time [illegible]

Drilling Equip./Method 6" HOLLOW STEM AUGER Sampling Equip./Method CONTINUOUS CORE BARREL

Depth (feet)	Recovery (feet per feet / %)	Field Analytical Sample Number	Field Screening Results	Top/Bottom of Core In Box	Lithology-Petrology - Soll	Graphic Log	Lithologic Unit	Notes
20	50/5.0	[illegible] 0946 at 23.5'	PID=0	NA	20-25 SAA MATRIX DARK PEACH GRAY (5YR 4/2).			1500
21	RUN 5							
22								
23								
24								
25	50/5.0	[illegible] 0947 at 27.0 [illegible] 0948 at 28.5'	PID=0	NA	25-27 MODERATELY WELDED IGNIMBRITE WITH DEVITRIFIED PUMICE AND MODERATE IN HANDSPECIMENS. POORLY TO MODERATELY INDURATED. - 8% PUMICE LAPILLI, DEVITRIFIED DARK PEACH GRAY (10R 7/1) RANGING FROM 1 TO 3 cm. FAIR PROTRUDING 2cm IN SIZE. - 10% IGNIMBRITE (90%) TEUFFUSIFIED, CLEAR 1 TO 3mm IN SIZE FAIR PROTRUDING 2 mm IN SIZE. - LITHICS NOT OBSERVED - MATRIX IS DUSKY RED (2.5YR 3/2) 27-30 SAA BUT LEFT PUMICE DARKENED (5YR 4/4) AND MATRIX DARKENED TO [illegible] (5YR 4/4).			1500
26	RUN 6							
27								
28								
29								
30								

Prepared by ALEX MORA Date [illegible] Checked By [signature] Date 12/20/95

LOS ALAMOS NATIONAL LABORATORY ENVIRONMENTAL RESTORATION PROGRAM

SAMPLE MANAGEMENT FACILITY

CORE SAMPLE LOG

Borehole ID 34 TA/OU [illegible] Drill Depth From 30 To 40 Page 4 of 4

Driller [illegible] Box #(s) NA Start Date/Time [illegible] End Date/Time [illegible]

Drilling Equip./Method [illegible] Sampling Equip./Method [illegible]

Depth (feet)	Recovery (feet per feet / %)	Field Analytical Sample Number	Field Screening Results	Top/Bottom of Core in Box	Lithology-Petrology - Soil	Graphic Log	Lithologic Unit	Notes
30	5.0/5.0 RUN 7	0100-95 0949	PID=0	NA	30-35 SAA EXCEPT MATRIX IS DARK REDDISH GRAY (5YR 4/2).			1545
31								
32								
33								
34								
35	5.0/5.0 RUN 8	0100-95 0950	PID=0	NA	35-40 SAA			1600
36								
37								
38								
39								
40					BOTTOM OF BOREHOLE AT 40'			

Prepared by ALEX MORA Date 12-19-95 Checked By [illegible] Date 12/20/95

LOS ALAMOS NATIONAL LABORATORY ENVIRONMENTAL RESTORATION PROGRAM

SAMPLE MANAGEMENT FACILITY

CORE SAMPLE LOG

Borehole ID 05 TA/OU 0 FU-1 Drill Depth From 0 To 10 Page 1 of 4

Driller STEWART BROSS. Box #(s) NA Start Date/Time 12-13-95/1000 End Date/Time 12-13-95/1030

Drilling Equip./Method 6" HOLLOW STEM AUGER Sampling Equip./Method CONTINUOUS CORE BARREL

Depth (feet)	Recovery (feet per feet / %)	Field Analytical Sample Number	Field Screening Results	Top/Bottom of Core in Box	Lithology-Petrology - Soil	Graphic Log	Lithologic Unit	Notes
0	3.5/5.0 RUN 1	0100-95-0951 at 4'	PID: 0	NA	0-1.5' ASPHALT 1.5-3.0 NR 3.0-5.0 BROWN CLAY WITH YELLOWISH SAND. DRY LOW PLASTICITY.			1000
1								
2								
3								
4								
5	5.0/5.0 RUN 2	0100-95-0952 at 8.5'	PID: 0	NA	5'-6' BROWN CLAY WITH YELLOWISH SAND 6'-10 SLIGHTLY TO MODERATELY WELDED IGNIMBRITE WITH VITRIC PUMICE AND POOR TO MODERATE IN PHENOCRYSTS. SLIGHTLY INDURATED. – 5% PUMICE LAPILLI, VITRIC, LIGHT BLUISH GRAY (7/.), RANGING FROM 1 TO 3 CM, AND AVERAGING 1.5 CM IN SIZE. – 5% PHENOCRYST, QUARTZ (90%) SEMI-ANGULAR TRANSLUCID, RANGING FROM 1 TO 3 mm IN SIZE. OTHERS (10%). – LITHICS NOT OBSERVED. – MATRIX IS BLUISH GRAY (6/.), ASH. SLIGHTLY COHESIVE, AND BECOMING GRAY (5YR 6/.) TOWARD BOTTOM.			1015. FRACTURE AT 7', 30° CLAY LINNED. BROWN CLAY WITH WHITE CALICHE.
6								
7								
8								
9								
10								

Prepared by ALEX MOZH Date 12-18-95 Checked By [signature] Date 12/20/95

LOS ALAMOS NATIONAL LABORATORY ENVIRONMENTAL RESTORATION PROGRAM

SAMPLE MANAGEMENT FACILITY

CORE SAMPLE LOG

Borehole ID 05 TA/OU 0. FU-1 Drill Depth From 10 To 20 Page 2 of 4

Driller STEWART GROSS. Box #(s) NA Start Date/Time 12-13-95/1025 End Date/Time 12-13-95 /1100

Drilling Equip./Method 6" HOLLOW STEM AUGER Sampling Equip./Method CONTINUOUS CORE BARREL

Depth (feet)	Recovery (feet per feet / %)	Field Anaytical Sample Number	Field Screening Results	Top/Bottom of Core In Box	Lithology-Petrology - Soil	Graphic Log	Lithologic Unit	Notes
10	5.0/6.0 RUN 3	0100-95-0953. at 14.5'	PID=0	NA	10-15' S.A.A EXCEPT: -MATRIX IS GRAY (7.5YR 6/1) AND - PHENOCRYSTS AVERAGE 4MM IN SIZE.			1025
11								
12								
13								
14								
15								
16	5.0/5.0 RUN 4	0100-95 0954 at 19'	PID=0	NA	15-20' S.A.A. EXCEPT: - PUMICE LAPILLI BROWN (7.5YR 4/2).			1030
17								
18								
19								
20								

NO ENTRIES. SEE NEXT PAGE

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LOS ALAMOS NATIONAL LABORATORY ENVIRONMENTAL RESTORATION PROGRAM

SAMPLE MANAGEMENT FACILITY | CORE SAMPLE LOG

Borehole ID 05 TA/OU 0 FU-1 Drill Depth From 20 To 30 Page 3 of 4

Driller STEWART GROSS. Box #(s) NA Start Date/Time 12-13-95/1100 End Date/Time 12-13-95/1130

Drilling Equip./Method 6 HOLLOW STEM AUGER Sampling Equip./Method SOP 06.24 - CONTINUOUS CORE BARREL

Depth (feet)	Recovery (feet per feet / %)	Field Analytical Sample Number	Field Screening Results	Top/Bottom of Core in Box	Lithology-Petrology - Soil	Graphic Log	Lithologic Unit	Notes
20	5.0/5.0 RUN 5	0100-95-0955 at 23'	PID = 0	NA	20'-25' S.A.A. EXCEPT: - MATRIX IS GRAY (5/N).			1100 FRACTURE. FROM 22 TO 23' 50°, SLIGHTLY STAINED BROWN.
21								
22								
23								
24								
25								
26	5.0/5.0 RUN 6	0100-95 0956 at 27'	PID = 0	NA.	25-30' - SLIGHTLY WELDED IGNIMBRITE, WITH VITRIC AND DEVITRIFIED PUMICE, AND MODERATE IN PHENOCRYSTS. SLIGHTLY INDURATED. - 5% PUMICE LAPILLI, VITRIC AND DEVITRIFIED, GRAY (5YR 6/1) RANGING FROM 1 TO 3 cm, AND AVERAGING 2 CM IN SIZE. ALSO DARK GRAY (5YR 4/1) PUMICES. - 10% PHENOCRYSTS, QUARTZ (40%), ANGULAR TO SEMI-ANGULAR, TRANSPARENT, AVERAGING 2 MM IN SIZE. - LITHICS NOT OBSERVED. - MATRIX IS GRAY (5YR 6/1) ASH, SLIGHTLY COHESIVE.			1120
27								
28								
29								
30								

Prepared by ALEX MORA Date 12-18-95 Checked By [signature] Date 12/20/95

LOS ALAMOS NATIONAL LABORATORY ENVIRONMENTAL RESTORATION PROGRAM

SAMPLE MANAGEMENT FACILITY

CORE SAMPLE LOG

Borehole ID 55 TA/OU O.50-1 Drill Depth From 30 To 40 Page 4 of 4

Driller STEWART BROS Box #(s) NA Start Date/Time 12-13-95/1130 End Date/Time 12-13-95/1200

Drilling Equip./Method GEOPROBE 5100A DIESEL Sampling Equip./Method CONTINUOUS CORE BARREL

Depth (feet)	Recovery (feet per feet / %)	Field Analytical Sample Number	Field Screening Results	Top/Bottom of Core in Box	Lithology-Petrology - Soil	Graphic Log	Lithologic Unit	Notes
30	5.0/5.0 RUN 7	0100-95 0959 at 34'	PID=0	NA	30-35 S.A.A 31.5-32.5 POORLY INDURATED			1130
31								
32								
33								
34								
35								
36	3.0/5.0 RUN 8	0100-95 0960 at 37'	PID=0	NA	35-37' NR. 37-40 SAA. POORLY TO NON INDURATED GRAY (5Y) SAND-LIKE IGNIMBRITE			1140
37								
38								
39								
40								
					BOTTOM OF BOREHOLE AT 40'.			1200

Prepared by ALEX MOZA Date 12-18-95 Checked By [signature] Date 12/20/95

LANL ENCLOSURE SIX

LANL GENERAL GEOLOGY AND HYDROLOGY INFORMATION

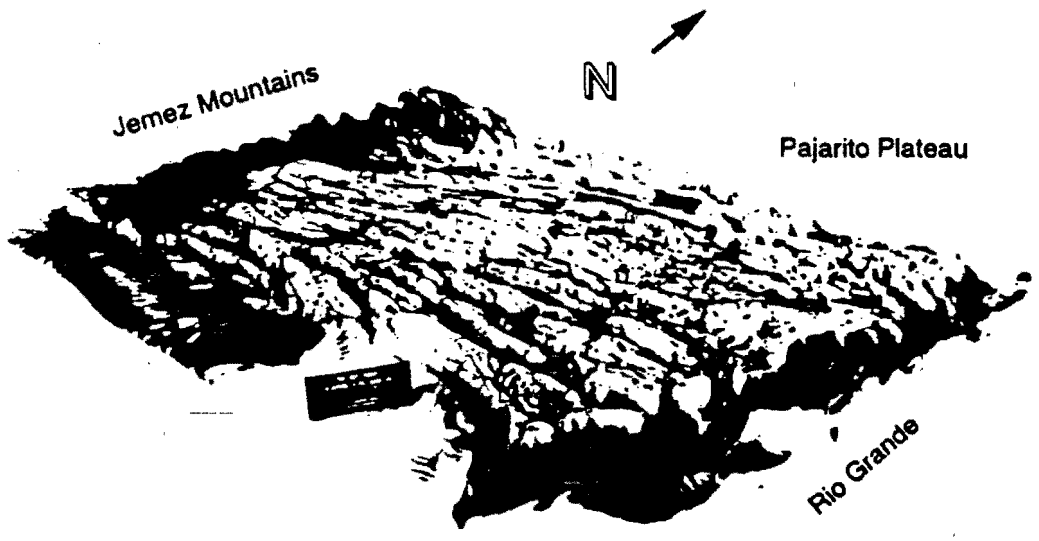


Figure II-3. Topography of the Los Alamos area.

The report provided environmental input for decisions regarding continuing activities at the Laboratory. It also provided more detailed information on the environment in and around Los Alamos. DOE is planning to prepare a new site-wide EIS for the Laboratory within the next several years.

C. Geology and Hydrology

Most of the finger-like mesas in the Los Alamos area are Bandelier Tuff, ash fall, ash fall pumice, and rhyolite tuff (Figure II-6). The tuff, ranging from nonwelded to welded, is over 300 m (1,000 ft) thick in the western part of the plateau and thins to about 80 m (260 ft) eastward above the Rio Grande. It was deposited as a result of a major eruption of a volcano in the Jemez Mountains about 1.1 to 1.4 million years ago.

The tuff overlaps onto the Tschicoma Formation, which consists of older volcanics that form the Jemez Mountains. The tuff is underlain by the conglomerate of the Puye Formation (Figure II-6) in the central and eastern edge along the Rio Grande. Chino Mesa basalts interfinger with the conglomerate along the river. These formations overlay the sediments of the Santa Fe Group, which extends across the Rio Grande Valley and is more than 1,000 m (3,300 ft) thick. The Laboratory is bordered on the east by the Rio Grande, within the Rio Grande Rift. Because the rift is slowly widening, the area experiences frequent but minor seismic disturbances.

Surface water in the Los Alamos area occurs primarily as ephemeral or intermittent reaches of streams. Perennial springs on the flanks of the Jemez Mountains supply base flow into upper reaches of some canyons, but the volume is insufficient to maintain surface flows across the Laboratory site before they are depleted by evaporation, transpiration, and infiltration. Run-off from heavy thunderstorms or heavy snowmelt reaches the Rio Grande several times a year in some drainages. Effluents from sanitary sewage, industrial waste treatment plants, and cooling-tower blowdown enter some canyons at rates sufficient to maintain surface flows for varying distances.

Groundwater in the Los Alamos area occurs in three modes: (1) water in shallow alluvium in canyons, (2) perched water (a body of groundwater above an impermeable layer that separates it from the underlying main body of groundwater), and (3) the main aquifer of the Los Alamos area.

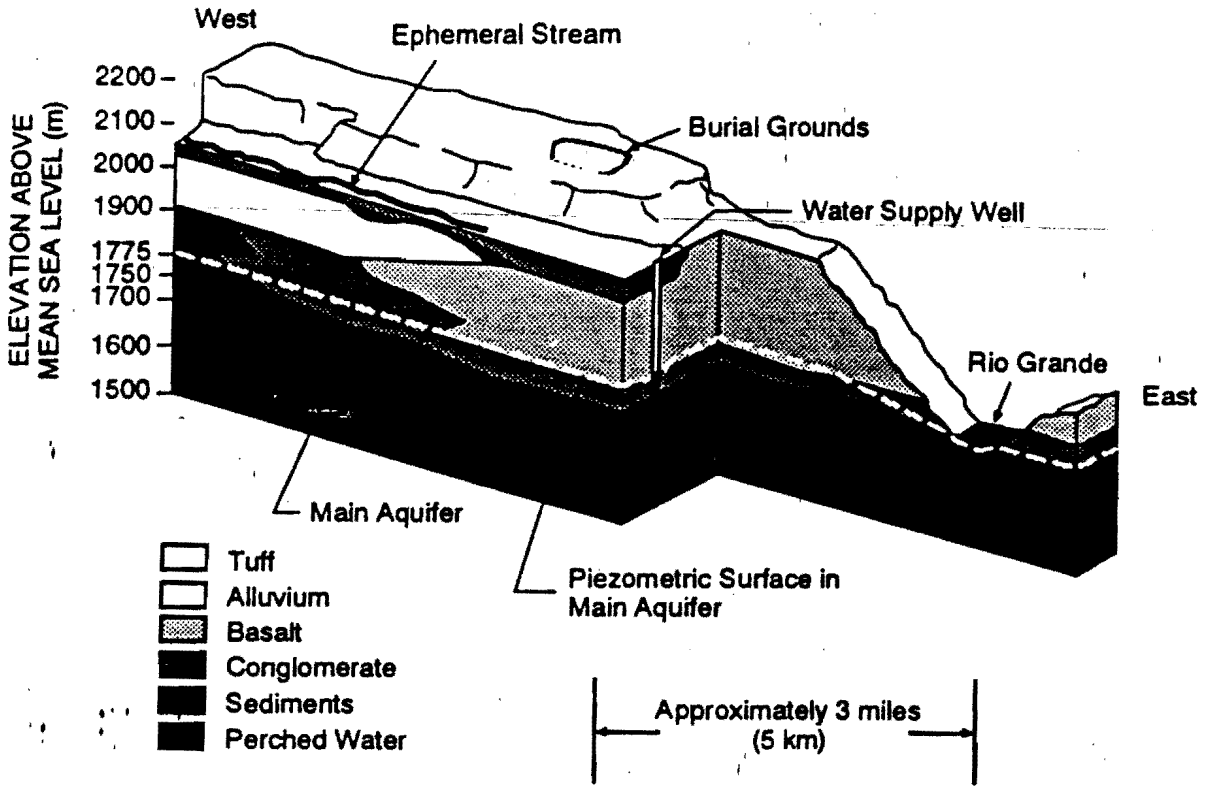


Figure II-6. Conceptual illustration of geologic and hydrologic relationship in Los Alamos area.

Ephemeral and interrupted streams have deposited alluvium that ranges from less than 1 m (3 ft) to as much as 30 m (100 ft) in thickness. Run-off in canyons infiltrates the alluvium until its downward movement is impeded by layers of weathered tuff and volcanic sediment that are less permeable than the alluvium. This creates shallow bodies of perched groundwater that move down gradient within the alluvium. As water in the alluvium moves down gradient, it is depleted by evapotranspiration and movement into underlying volcanics (Purtymun 1977). The perched alluvial groundwaters show the effects of discharges from the Laboratory.

Perched groundwater occurs at intermediate depths in conglomerates and basalts beneath the alluvium in portions of Pueblo, Los Alamos, and Sandia canyons. It has been found at depths of about 37 m (120 ft) in the midreach of Pueblo Canyon, about 45 to 60 m (150 to 200 ft) beneath the surface in lower Pueblo and Los Alamos canyons near their confluence in basalts in Los Alamos Canyon at 61 to 76 m (200 to 250 ft) (Figure II-6), and in Sandia Canyon near the eastern Laboratory boundary at a depth of about 137 m (450 ft). This intermediate depth perched water has one known discharge point at Basalt Spring in Los Alamos Canyon. The intermediate depth groundwaters communicate with the overlying perched alluvial groundwaters and show the effects of radioactive and inorganic contamination from Laboratory operations.

The main aquifer of the Los Alamos area is the only aquifer in the area capable of serving as a municipal water supply. The surface of the aquifer rises westward from the Rio Grande within the Tesuque Formation into the lower part of the Puye Formation beneath the central and western part of the plateau. Depth to the main aquifer is about 300 m (1,000 ft) beneath the mesa tops in the central part of the plateau. The main aquifer is separated from alluvial and perched waters by about 110 to 190 m (350 to 620 ft) of tuff and volcanic sediments with low (<10%) moisture content.

Water in the main aquifer is under artesian conditions in the eastern part and along the Rio Grande (Purtymun 1974b). Continuously recorded data on water levels collected in test wells since fall 1992 indicate that the main

aquifer exhibits confined aquifer response to barometric and earth tide effects throughout the Plateau. Major recharge to the main aquifer is probably from the west because the piezometric surface slopes downward to the east. The main aquifer discharges into the Rio Grande through springs in White Rock Canyon. The 18.5 km (11.5 mi) reach of the river in White Rock Canyon between Otowi Bridge and the mouth of Rito de Frijoles receives an estimated 5.3 to 6.8 × 10^6 m^3 (4,300 to 5,500 ac-ft) annually from the aquifer.

D. Climatology

Climatological averages for atmospheric state variables (temperature, pressure, and moisture) and precipitation are based on observations made at the official Los Alamos weather station from 1961 to 1991. Extremes are based on the 1911 to 1991 period. Although the location of the official weather station has changed over the years, all locations are within 30 m (100 ft) of each other in elevation and 5 km (3 mi) in distance. The meteorological conditions described here are representative of conditions on the Pajarito Plateau at an elevation of approximately 2,250 m (7,400 ft) above sea level.

Statistics on wind do not vary significantly from year to year; it may be helpful to refer to the wind roses for 1992 (Figures II-7 and II-8) along with the following text. In these diagrams, the length of each spoke is proportional to the amount of time that the wind blew from the indicated direction; circles of a probability of 6% and 12% are shown for reference. The spoke representing each wind direction sector is partitioned into segments, and the length of each segment is proportional to percentage of time the wind speed fell within the indicated range. Unless otherwise noted, the following discussion is based on winds observed at 11 m (36 ft) above the ground. The average time for wind gusts is approximately 1 s.

Los Alamos winds are generally light, averaging 2.8 m/s (6.3 mi/h). Strong winds are most frequent during the spring when sustained winds exceeding 11 m/s (25 mi/h) with peak gusts exceeding 22 m/s (50 mi/h) are common. The highest wind gust in the record is 34.4 m/s (77 mi/h).

Winds over the plateau show considerable spatial structure and temporal variability. The semiarid climate promotes strong surface heating by day and strong radiative cooling by night. Because the terrain is very complex, heating and cooling rates are uneven over the Los Alamos area, and this results in diurnal thermally generated local flows. However, it is often difficult to explain observed winds completely in terms of the simple conceptual models of slope and valley flows.

During sunny, light-wind days, an upslope flow often develops over the plateau in the morning hours. This flow is more pronounced along the western edge of the plateau, where it is 200 to 500 m (650 to 1650 ft) deep. By noon, southerly flow usually prevails over the entire plateau.

At measurement sites closer to the eastern edge of the plateau, wind roses show a weak secondary peak in the daytime wind direction in the northeast sector. These northeasterlies also show up in the wind roses for observations made at 92 m (300 ft) and 510 m (1,670 ft) above the ground. They are thought to result from cold air drainage down the Rio Grande Valley that persists into the early morning hours.

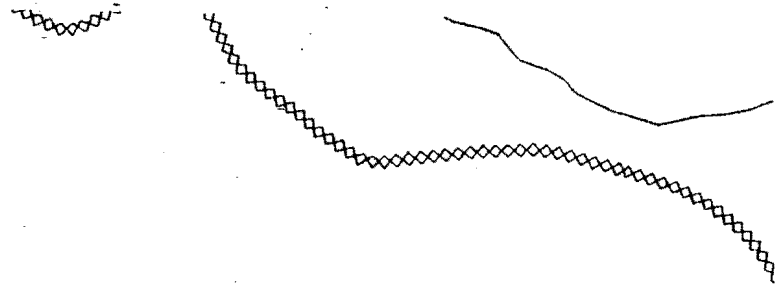
The prevailing nighttime flow along the western edge of the plateau is west-southwesterly to northwesterly. These nighttime westerlies result from cold air drainage off the Jemez Mountains and the Pajarito Plateau; the drainage layer is typically 50 m (165 ft) deep in the vicinity of TA-3. At sites farther from the mountains, the nighttime direction is more variable but usually has a relatively strong westerly component. Just above the drainage layer, the prevailing nighttime flow is southwesterly, with minor peaks in the distribution around northwest and northeast. At 510 m (1,673 ft) above the ground, the wind direction distribution exhibits a broad, flat peak covering the whole western half of the compass.

Atmospheric flow in the canyons is quite different than over the plateau. Data collected from Los Alamos Canyon suggest that at night a cold air drainage fills the lower portion of the canyon. The flow is steady and continues for about an hour after sunrise when it ceases abruptly and is followed by an unsteady up-canyon flow for a couple of hours. This up-canyon flow often gives way to the development of a rotor that fills the canyon when the wind over the plateau has a strong cross-canyon component. When the rotor occurs, southwesterly (or southeasterly) flow over the plateau results in northwesterly (or northeasterly) flow at the canyon bottom. Down-canyon flow begins again around sunset, but the onset time appears to be more variable than cessation time in the morning.

ENCLOSURE SEVEN

GROUNDWATER WELLS AND OTHER PENETRATIONS AND DRAWINGS

Note: The nearest public supply well is PM-5 which is approximately 8,800 feet southeast of former UST TA-0, 6th Street.



LEGEND

1748

PERCHED ALLUVIAL MONITORING WELLS
(Old wells are pre-1990; new wells installed since 1990 according to EPA guidelines)

○ New Dry Well

⊖ Old Dry Well

● New Saturated Well

◓ Old Saturated Well