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Date Received: 10/7/2004 *Processor:* DSV *Page Count:* 34

Privileged: (Y/N N *Record Category:* P *Administrative Record:* (Y/N Y

FileFolder: N/A

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1	FIELD SUMMARY REPORT	12/1/1998	Field Summary Report, MDA U, PRS 21-017 a, b, c, RCRA Facility Investigation, December 1998 N/A N/A N/A		



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FIELD SUMMARY REPORT

**MDA U
PRS 21-017 a, b, c
RCRA FACILITY INVESTIGATION**

December 1998

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- Exhibit A Survey Instrument Performance Test Logs
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- Exhibit C Sample Collection Logs and Chain of Custody Forms
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1.0 INTRODUCTION

An initial Resource Conservation and Recovery Act (RCRA) Facility Investigation (RFI) of surface contamination and the associated drainage of Material Disposal Area (MDA) U, Potential Release Sites (PRSs) 21-017 (a, b and c) at Technical Area (TA) 21 was conducted in 1994. This RFI investigation, conducted in September and October 1998, was an investigation of subsurface contamination beneath MDA U and surface contamination to fill in data gaps from the 1994 RFI investigation. This field summary report presents a description and history of the site and the planned and actual field activities.

1.1 Site Description and History

MDA U [PRSs 21-017 (a, b, and c)] is an inactive disposal site located north of Buildings 152 and 153 on DP Mesa (Figure 1); the MDA is fenced on all sides. MDA U covers an area of approximately 0.2 acres (1200 M2) and contains two absorption beds [PRSs 21-017(a) and (b)]. The TA-21 work plan states that the absorption beds were used for subsurface disposal of radioactively contaminated liquid wastes from 1948 to 1968, and as constructed, the two absorption beds had a surface area of approximately 1800 square feet with an estimated volume of about 18,000 cubic feet (LANL 1991, 7529, p. 16-198). An associated distribution box, TA-21 164 [PRS 21-017(c)], was located between the two beds. The distribution box [PRS 21-017(c)] and associated distribution lines in PRSs 21-017(a and b) were removed in 1985.

Operational History

The following information was published in the TA-21 RFI work plan (LANL 1991, 07529, pp. 16-198 through 16-199).

The DP East area began operation in 1945 at Buildings TA-21-151, -152, and -153. These facilities were used to process polonium and actinium and to produce weapon components. Process waste produced in the various research and production activities consisted of solid and liquid physical form waste. In the late 1940s and early 1950s, it was found that the natural soils and clays at TA-21 were effective in separating radioactive contaminants from waste liquids. Therefore, absorption beds were used, and process effluent was emptied into trenches filled with absorption material consisting of cobble, gravel, and fine sand (LASL 1945, 1093). One of the areas at which the absorption beds were located was MDA U.

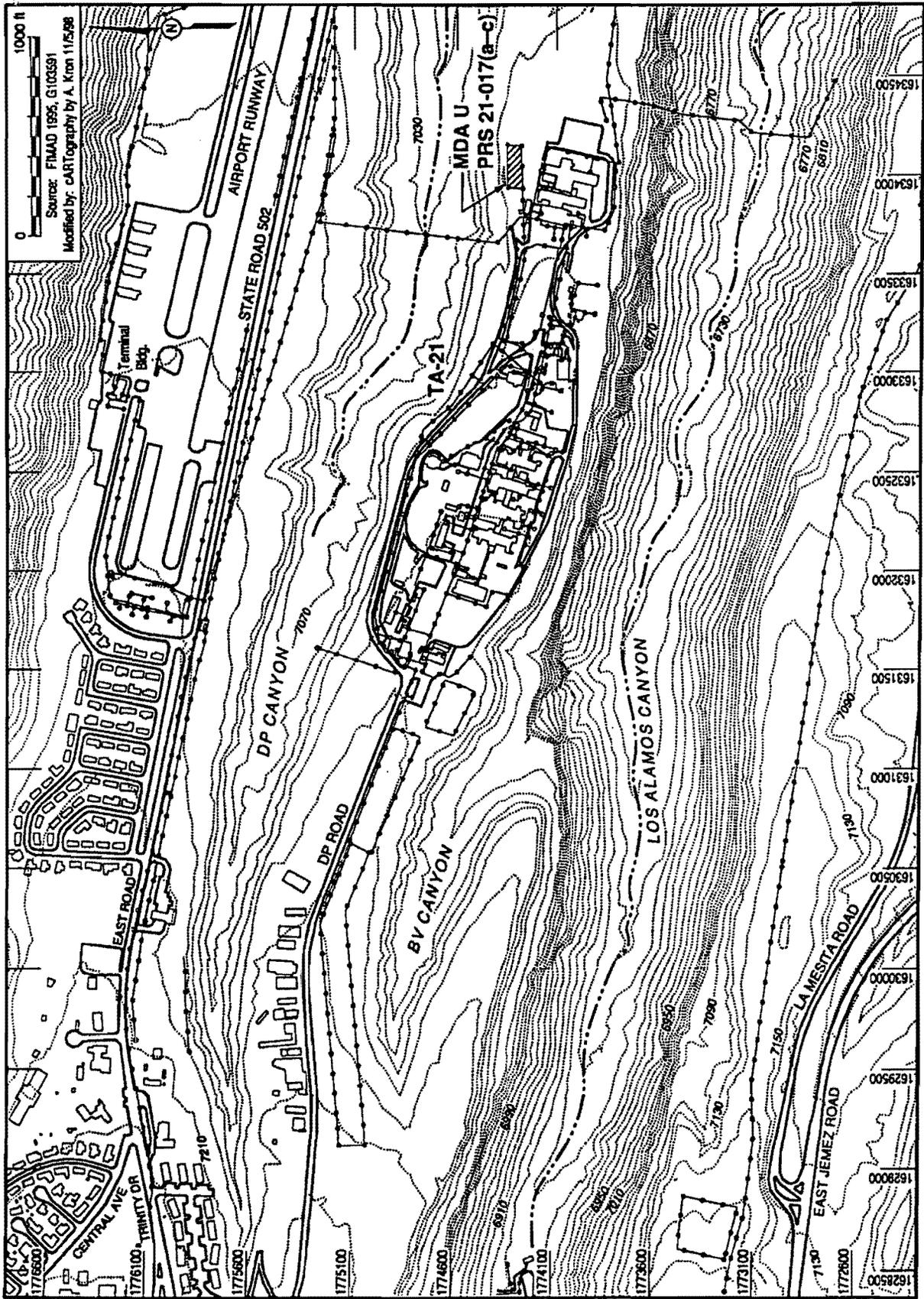


Figure 1. Location and topography of MDA U at TA-21.

The TA-21 work plan (LANL 1991, 7529) references a 1945 memorandum (Veltman 1945,1305) that described in some detail what are believed to be the design requirements for the MDA U absorption beds. The memorandum stated the requirements as follows:

" ... provision would be made to handle the so-called process sewage from Buildings 2, 3, 4, 5 and 52 in the following manner. A pit will be dug on the north side of the mesa approximately 64 feet deep and 10 x 50 feet in area for Building 52¹. A graded gravel bed will fill this pit with relatively large stones in the bottom and ordinary soil on top. This arrangement will allow satisfactory draining of process sewage."

Liquid effluents from Buildings 21-152 and 21-153 and from the TSTA were drained to the MDA U absorption beds. In addition, oil from precipitrons was disposed of at MDA U (Drager 1946, 1562). Historical records for MDA U state that the primary contaminant released to MDA U was polonium-210 (Christenson 1973, 0940), which has a half-life of 138.4 days and would have since decayed to undetectable levels. A 1946 memorandum (Tribby 1946, 1540) indicates that plutonium, as well as polonium, was measured in effluent. Records also indicate that about 2.5 Ci of actinium-227 was discharged into the MDA U absorption beds in 1953 (Christenson 1973, 0940). The actinium came primarily from the effluents of Building 21-153, a filter building where actinium-227 was scrubbed out of the air from several process buildings at TA-21 (DOE 1979, 8610). A drain line from the TSTA cooling tower was found in the west absorption bed [PRS 21 - 017(a)] (Mayfield 1985, 1172).

In 1968, disposal of liquid effluents at MDA U from Buildings 21-152 and 21-153 ceased (Hakonson 1987, 7422). The absorption beds continued to receive cooling water effluent from the TSTA cooling tower until some time after 1976 (Purtymun 1976, 1107). Site stabilization efforts began in 1985. The distribution box and pipelines within the beds and a portion of the line from the cooling tower were excavated and taken to MDA G at TA-54. The material above the pipelines was excavated, stockpiled, and used to backfill the pipeline trench. The area between the top of the beds and the embankments surrounding the beds was backfilled with uncontaminated tuff. A plastic lining was placed in the beds to indicate the boundary between clean and contaminated material; the area was covered with 6 in. of topsoil, regraded to address several drainage problems, and revegetated.

In 1987, additional site stabilization was completed including the construction of ditches along the south fence of MDA U to prevent run-on, the placement of topsoil and mulch, and reseeding inside the fence. Four brass markers were placed at the corners of the MDA. In 1990, additional

¹ Building 52 and 53 were renumbered to 152 and 153. This quote is referring to what is called Building 152 in this section

run-on controls were constructed to prevent runoff from the surrounding area from flowing across MDA U.

Waste Characteristics

This section addresses the potential contaminants that may be present at this PRS, based on the information contained in Section 1.1, Site Description, and Operational History. The following information was published in the TA-21 RFI work plan (LANL 1991, 7529, p. 16-199).

"Existing information on waste discharge is scant. It is known that the primary contaminant of waste discharged to the two beds was ^{210}Po (Christenson 1973). Although the amount of ^{210}Po discharged is unknown, its half-life of 138.4 days indicates that it has decayed to undetectable levels. Christenson (1973) also stated that these beds received 2.5 Ci of ^{227}Ac in 1953. ^{227}Ac came principally from the effluents of filter building 153, which scrubbed ^{227}Ac out of the air in several process buildings at TA-21 (Department of Energy 1979). Identification of other wastes at MDA U must come from sampling data. ^{227}Ac has a half-life of about 21.8 years. A rough decay correction of two half-lives indicates the 1953 release to MDA U would have decayed to about 0.63 Ci of ^{227}Ac by 1996.

A Purtymun (1976) memo stated that on December 18, 1975, water from a cooling process was being released into the west pit from a nearby building. At that time, there appeared to be permanent water in the west pit, although no overflow into the adjacent drainage was observed." In addition, the operational history indicates the presence of tritium, plutonium, uranium-235, gamma radiation, and contaminated oils from precipitrons. The 1998 sampling investigation included analysis for PCBs in case PCBs were present in oils.

2.0 OBJECTIVES AND APPROACH

2.1 Objectives

The objective of the 1998 investigation was to collect and analyze data to support/allow cleanup decisions at this site. This was accomplished by

- Collecting sufficient data to determine the nature and extent of contamination beneath MDA U,
- Collecting sufficient data to determine the volume of contaminated material in the absorption beds,

- Collecting sufficient data to investigate the potential presence and effect of a paleochannel in the vicinity,
- Collecting sufficient data to update the MDA U conceptual model, and
- Collecting sufficient data to screen alternative remedies for corrective actions at MDA U.

2.2 Approach

The 1998 field investigation of the tuff/soil beneath the absorption beds included vertical borehole drilling to determine the nature and extent of the subsurface contamination (Figure 2). Vertical borehole drilling was also used to obtain core samples that were evaluated for fractures under the absorption beds. The core samples from the boreholes were screened for radionuclides and organics, logged, and analyzed for metals, radionuclides, semivolatile organic compounds (SVOCs), polychlorinated biphenyls (PCBs), and volatile organic compounds (VOCs).

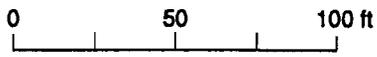
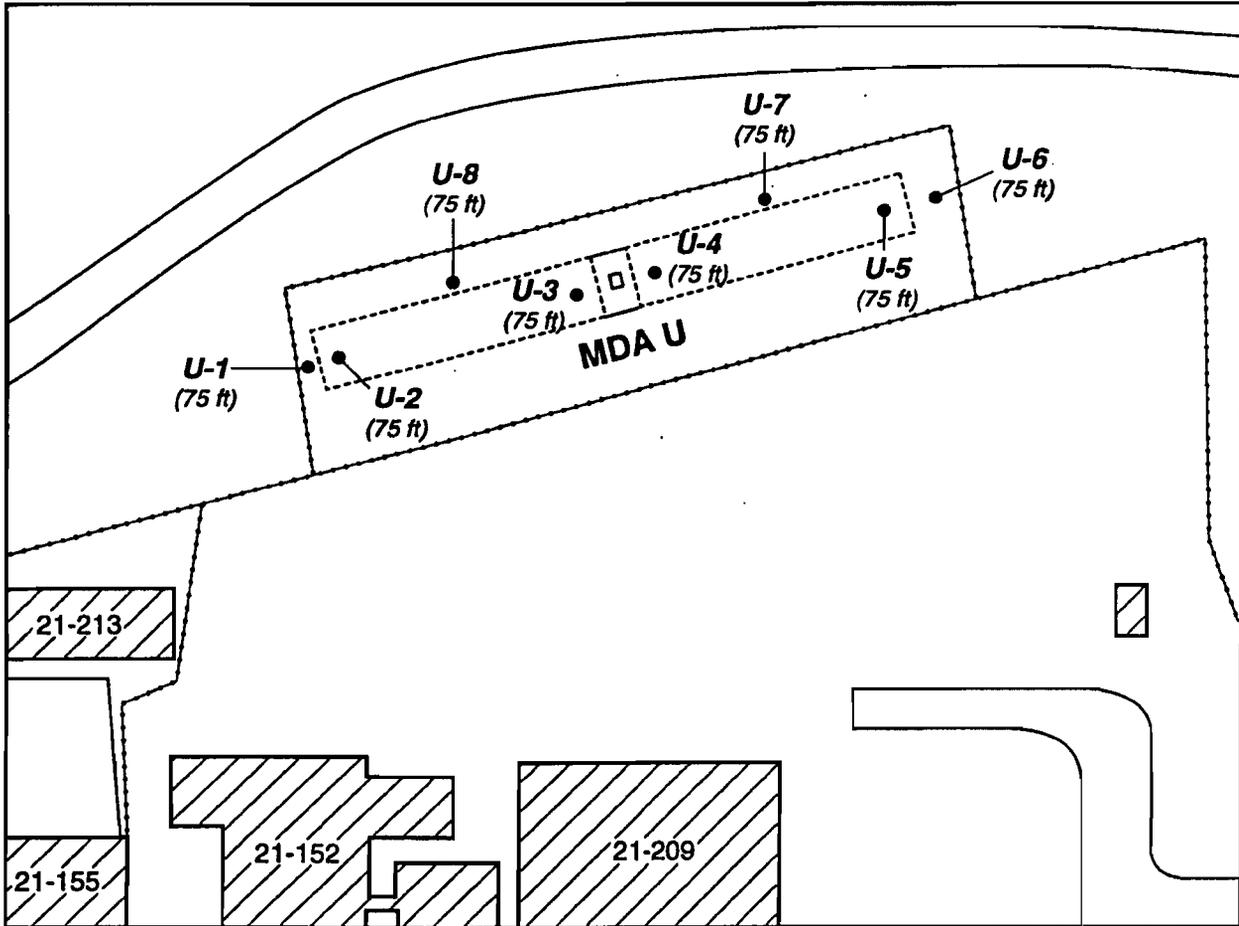
A review of data in Geomorphic Studies at DP Mesa and Vicinity (Broxton and Eller 1995, 58207, pp. 68 and 69) indicated the potential presence of paleochannels across the plateau. A large paleochannel, approximately 30 feet deep by 35 feet wide, that may intersect the MDA U absorption bed was identified during the 1996-97 field work conducted at MDA T. During the MDA U field investigation, core from boreholes along the eastern boundary of MDA U were investigated for the presence of rounded alluvial material (sand to cobbles) that would indicate the presence of the paleochannel.

Additional surface soil sampling was also part of the 1998 field investigation. Surface soils were collected and analyzed for actinium daughter products, which were not quantified in the Phase I surface soil investigation. These sampling data will be used to determine whether or not contaminants were released to the surface from the MDA and the extent of potential overflows from the MDA.

3.0 FIELD INVESTIGATION

A readiness review meeting was conducted on August 28, 1998 in preparation for fieldwork. The following documents were prepared by the field team and were subsequently approved by the MDA Field Project Leader or designee:

- Site-Specific Health and Safety Plan (SSHASP),
- Sampling and Analysis Plan (SAP), and
- Waste Characterization Strategy Form (WCSF)



.cARTography by A. Kron 12/8/98
 Source:
 LANL 5/91 TA-21 Operable Unit RFI Work Plan



-  Building/structure
-  Absorption bed
-  Paved road
-  Fence
- U-1** • Vertical borehole
(75 ft)

Figure 2. Locations of vertical boreholes at MDA U.

3.1 General Field Activities

Field activities were conducted from September 1998 through October 1998. All activities were conducted in accordance with all applicable Los Alamos National Laboratory (LANL) Environmental Restoration (ER) Program Standard Operation Procedures (SOPs).

3.1.1 Site Survey

Site survey activities included interviewing LANL personnel, reviewing historic aerial photographs, maps, and engineering drawings and performing a site inspection. A detailed site map was not prepared because it was not required for planning borehole locations.

3.1.2 Geodetic Survey

On October 26 through 28, 1998, borehole and surface sampling locations were surveyed at MDA U to determine their northing and easting coordinates and elevations. Survey points were recorded in the New Mexico state planar coordinate system. Facility for Information Mapping, Analysis and Display (FIMAD) identification numbers were assigned to each borehole and sampling location (Table 1). Land surveying was conducted in accordance with LANL-ER-SOP-03.01, Land Surveying Procedures (LANL, 1994c).

Table 1. Borehole and Surface Sample Location

Field borehole Designation	FIMAD Location I.D.	Northing	Easting	Elevation (feet a.m.s.l.)	Total Borehole Depth (feet bgs)
U-1	21-10838	1774309.5950	1633945.7997	7118.81	75
U-2	21-10839	1774306.5457	1633979.7929	7120.16	75
U-3	21-10840	1774310.9415	1634008.9534	7120.87	75
U-4	21-10841	1774310.4638	1634066.8723	7120.80	75
U-5	21-10842	1774315.4076	1634104.5300	7119.59	75
U-6	21-10843	1774323.4492	1634135.3935	7117.65	75
U-7	21-10844	1774332.4254	1634089.1591	7118.77	75
U-8	21-10845	1774329.4491	1633999.3434	7119.85	75

Surface Sample Designation	FIMAD Location I.D.	Northing	Easting	Elevation (feet a.m.s.l.)
482	21-10846	1774366.8683	1634002.1759	7112.11
481	21-10847	1774366.3081	1634036.4620	7111.33
479	21-10848	1774362.0173	1634069.6583	7111.66
478	21-10849	1774343.6831	1634166.9411	7113.79
480	21-10850	1774409.6822	1634165.6453	7109.10
486	21-10851	1774410.1639	1634133.9738	7108.52
487	21-10852	1774409.5599	1634067.7252	7104.19
489	21-10853	1774396.5986	1634091.1046	7106.92
483	21-10854	1774442.6600	1634100.3412	7103.33
492	21-10855	1774442.8628	1634132.8545	7104.40
488	21-10856	1774443.7694	1634067.3627	7102.58
484	21-10857	1774440.8418	1634034.9912	7101.75
485	21-10858	1774388.9875	1633930.3325	7106.44
491	21-10859	1774409.6552	1633935.9429	7096.29
493	21-10860	1774441.5765	1633935.8496	7096.06
490	21-10861	1774442.3184	1633903.7320	7095.46
495	21-10862	1774344.2198	1633936.1030	7114.44
494	21-10863	1774411.2168	1634003.6509	7101.30
497	21-2570	1774628.9108	1633945.6763	7031.87
496	21-2571	177464.5427	1633948.6588	7030.45
504	21-10899	1774044.9360	1634932.5904	7074.14
505	21-10900	1774051.7431	1634930.4191	7073.00

3.1.3 Hand Augering and Drilling Activities

Hand augering activities were initiated on September 22, 1998 by the MK/PMC field team. The boreholes were advanced using a stainless steel 3-inch outer diameter (O.D.) hand auger. Hand augering surface samples were collected in the drainage north of MDA U and in the paleochannel outcrop at TA-21.

Drilling operations were initiated on September 22, 1998. Drilling and subsurface sampling services were provided by LANL subcontractor, ICF Kaiser for boreholes 1 through 5 and by Stewart Brothers Drilling Company for boreholes 6 through 8. Boreholes 1 through 5 were advanced using an Acker AD II drill rig with 8.25 inch O.D., 3.25 inch inside diameter (I.D.) hollow stem augers. Boreholes 6 through 8 were advanced using a CME-750 drill rig with 8.25 inch O.D., 4-inch I.D. hollow stem augers. Continuous subsurface core samples were collected using 3.125-inch O.D., 5-foot long, stainless steel, split barrel samplers that were retrieved on a wireline system. The drill rig and associated equipment were inspected prior to being brought on site. Daily drilling equipment inspections were also performed by the drillers prior to beginning operations each day. After drilling operations were completed, equipment and personnel demobilized from the site.

3.1.4 Field Screening

The field team screened recovered drill augered samples and core for radioactivity and organic vapors immediately after the sample was removed from the auger or after the core barrel was opened. The core was sampled and logged after field screening. The top of the boreholes and the workers' breathing zone were also screened.

Screening for beta/gamma radiation was performed using an Eberline ESP-1 rate meter with a HP260 pancake probe. Screening for alpha radiation was performed using a Ludlum Model 139 survey meter equipped with an air proportional alpha detector. Screening was conducted in accordance with the LANL-ER-SOP-06.23, Measurement of Gamma-Ray Fields Using a Sodium Iodide Detector (LANL, 1993b), and LANL-ER-SOP-1 0.07, Field Monitoring for Surface and Volume Radioactivity Levels (LANL, 1994a). Daily performance checks were performed for both the beta/gamma and alpha survey meters following ESH-1 -07-85, Rev. 0, Operational Checks of Beta/Gamma Survey Instruments (LANL, 1994h), and ESH-1-07-86, Rev. 0, Operational Checks of Alpha Survey Instruments (LANL, 1994g). The results of these performance checks were recorded each day on Survey Instrument Performance Test Logs (Exhibit A). Daily background readings were performed outdoors in uncontaminated areas for each meter following ESH-1 -

0702, Rev. 0, Operating the Ludlum 139 With Air Proportional Probe (LANL, 19940, and ESH-1-0704, Rev. 0, Operating the ESP/HP260 (LANL, 1994e).

Radiological screening results are recorded on survey forms (Exhibit B) and individual sample collection logs (Exhibit C) and are summarized in Table 2. Site specific field screening results are discussed below.

Organic vapor monitoring was performed using a photoionization detector (PID) to monitor the hand auger samples and the core immediately after opening the core barrels. The workers' breathing zone was also monitored. PID readings were recorded on individual sample collection logs (Exhibit C), and on PID field data forms (Exhibit D).

3.1.5 Borehole Logging

Borehole core extracted from each borehole was lithologically logged by a MK/PMC geologist. Borehole sample logs (Exhibit E) were completed to describe the core for each run which were typically 2.5 feet (ft) or 5 ft in length. Drill cuttings and excess core were temporarily placed in labeled drum liners. After reaching total depth of a borehole and all core logging and sample collection tasks have been completed, the recovered cuttings were returned to the borehole at the approximate depth from which they originated. Any excess cuttings and core were placed in lined Department of Transportation (DOT) approved, open top 55-gallon drums for temporary storage on site until disposal could be arranged. Table 3 presents a summary of each borehole drilled and sampled.

Table 2. Summary of Field Screening Results for MDA U PRS 21-017 a,b,c Hand Augering, Drilling and Sampling Activities

Date	FIMAD Location ID	Sample No.	Sample Depth (feet bgs)	Photoionization Detector Readings		Radiation Screening					
				Breathing Zone (ppm)	Core/Cuttings (ppm)	Direct Alpha		Direct Beta/Gamma		Tritium	
						Results (cpm)	Background (cpm)	Results (cpm)	Background (cpm)	Results (uCi/m3)	Background (uCi/m3)
9/22/98	21-10838		0-2.5	NR	0.0	NDA	1.4	NDA	0.0	0.0	0.0
9/24/98	21-10838	MD21-98-0394	2.5-5.0	NR	0.0	NDA	1.4	NDA	0.0	0.0	0.0
9/24/98	21-10838		5.0-7.5	NR	0.0	NDA	1.4	NDA	0.0	0.0	0.0
9/24/98	21-10838		7.5-10	NR	0.0	NDA	1.4	NDA	0.0	0.0	0.0
9/24/98	21-10838		10-12.5	NR	0.0	NDA	1.4	NDA	0.0	0.0	0.0
9/24/98	21-10838	MD21-98-0392	12.5-15	NR	0.0	NDA	1.4	NDA	0.0	0.0	0.0
9/24/98	21-10838		15-17.5	0.0	0.0	NDA	1.4	NDA	0.0	0.0	0.0
9/24/98	21-10838		17.5-20	NR	0.0	NDA	1.4	NDA	0.0	0.0	0.0
9/24/98	21-10838		20-22.5	NR	0.0	NDA	1.4	NDA	0.0	0.0	0.0
9/24/98	21-10838	MD21-98-0395	22.5-25	NR	0.0	NDA	1.4	NDA	0.0	0.0	0.0
9/24/98	21-10838		25-27.5	NR	0.0	NDA	1.4	NDA	0.0	0.0	0.0
9/24/98	21-10838		27.5-30	NR	0.0	NDA	1.4	NDA	0.0	0.0	0.0
9/24/98	21-10838		30-32.5	NR	0.0	NDA	1.4	NDA	0.0	0.0	0.0
9/24/98	21-10838	MD21-98-0393	32.5-35	NR	0.0	NDA	1.4	NDA	0.0	0.0	0.0
9/24/98	21-10838		35-37.5	NR	0.0	NDA	1.4	NDA	0.0	0.0	0.0
9/24/98	21-10838		37.5-40	NR	0.0	NDA	1.4	NDA	0.0	0.0	0.0
9/24/98	21-10838		40-42.5	NR	0.0	NDA	1.4	NDA	0.0	0.0	0.0
9/24/98	21-10838	MD21-98-0397	42.5-45	NR	0.0	NDA	1.4	NDA	0.0	0.0	0.0
9/24/98	21-10838		45-47.5	0.0	0.0	NDA	1.4	NDA	0.0	0.0	0.0

Date	FIMAD Location ID	Sample No.	Sample Depth (feet bgs)	Photoionization Detector Readings		Radiation Screening					
				Breathing Zone (ppm)	Core/Cuttings (ppm)	Direct Alpha		Direct Beta/Gamma		Tritium	
						Results	Background	Results	Background	Results	Background
9/24/98	21-10838		47.5-50	NR	0.0	NDA	1.4	NDA	0.0	0.0	0.0
9/24/98	21-10838		50-52.5	NR	0.0	NDA	1.4	NDA	0.0	0.0	0.0
9/24/98	21-10838	MD21-98-0507	52.5-55	NR	0.0	NDA	1.4	NDA	0.0	0.0	0.0
9/25/98	21-10838		55-57.5	NR	0.0	NDA	0.0	NDA	0.0	0.0	0.0
9/25/98	21-10838		57.5-60	NR	0.0	NDA	0.0	NDA	0.0	0.0	0.0
9/25/98	21-10838		60-62.5	NR	0.0	NDA	0.0	NDA	0.0	0.0	0.0
9/25/98	21-10838	MD21-98-0396	62.5-65	NR	0.0	NDA	0.0	NDA	0.0	0.0	0.0
9/25/98	21-10838		65-67.5	NR	0.0	NDA	0.0	NDA	0.0	0.0	0.0
9/25/98	21-10838		67.5-70	NR	0.0	NDA	0.0	NDA	0.0	0.0	0.0
9/25/98	21-10838		70-72.5	NR	0.0	NDA	0.0	NDA	0.0	0.0	0.0
9/25/98	21-10838	MD21-98-0506	72.5-75	NR	0.0	NDA	0.0	NDA	0.0	0.0	0.0
9/28/98	21-10839	MD21-98-0508	0-2.5	NR	0.0	NDA	0.4	193.66	198	0.0	0.0
9/28/98	21-10839		2.5-5	NR	0.0	NDA	0.4	NDA	198	0.0	0.0
9/28/98	21-10839		5-7.5	NR	0.0	NDA	0.4	NDA	198	0.0	0.0
9/28/98	21-10839		7.5-10	NR	0.0	NDA	0.4	NDA	198	0.0	0.0
9/28/98	21-10839		10-12.5	NR	0.0	NDA	0.4	NDA	198	0.0	0.0
9/28/98	21-10839	MD21-98-0402	12.5-15	NR	0.0	NDA	0.4	NDA	198	0.0	0.0
9/28/98	21-10839		16-17.5	NR	0.0	NDA	0.4	NDA	198	0.0	0.0
9/29/98	21-10839		17.5-20	NR	0.0	NDA	2.02	72.55	210.4	0.0	0.0
9/29/98	21-10839		20-22.5	NR	0.0	NDA	2.02	134.55	210.4	0.0	0.0
9/29/98	21-10839	MD1-98-0403	22.5-25	NR	0.0	NDA	2.02	51.55	210.4	0.0	0.0
9/29/98	21-10839		25-27.5	NR	0.0	NDA	2.02	NDA	210.4	0.0	0.0
9/29/98	21-10839		27.5-30	NR	0.0	NDA	2.02	NDA	210.4	0.0	0.0

Date	FIMAD Location ID	Sample No.	Sample Depth (feet bgs)	Photoionization Detector Readings		Radiation Screening					
				Breathing Zone (ppm)	Core/Cuttings (ppm)	Direct Alpha		Direct Beta/Gamma		Tritium	
						Results	Background	Results	Background	Results	Background
9/29/98	21-10839		30-32.5	NR	0.0	NDA	2.02	108.55	210.4	0.0	0.0
9/29/98	21-10839	MD21-98-0405	32.5-35	NR	0.0	NDA	2.02	NDA	210.4	0.0	0.0
9/29/98	21-10839		35-37.5	NR	0.0	NDA	2.02	NDA	210.4	0.0	0.0
9/29/98	21-10839		37.5-40	NR	0.0	NDA	2.02	NDA	210.4	0.0	0.0
9/29/98	21-10839		40-42.5	NR	0.0	NDA	2.02	NDA	210.4	0.0	0.0
9/29/98	21-10839	MD21-98-0406	42.5-45	NR	0.0	NDA	2.02	NDA	210.4	0.0	0.0
9/29/98	21-10839		45-47.5	NR	0.0	NDA	2.02	NDA	210.4	0.0	0.0
9/29/98	21-10839		47.5-50	NR	0.0	NDA	2.02	NDA	210.4	0.0	0.0
9/29/98	21-10839	MD21-98-0509	50-52.5	NR	0.0	NDA	2.02	23.55	210.4	0.0	0.0
9/29/98	21-10839		52.5-55	NR	0.0	NDA	2.02	NDA	210.4	0.0	0.0
9/29/98	21-10839		55-57.5	NR	0.0	NDA	2.02	75.55	210.4	0.0	0.0
9/29/98	21-10839	MD21-98-0404	57.5-60	NR	0.0	NDA	2.02	178.55	210.4	0.0	0.0
9/30/98	21-10839		60-62.5	NR	0.0	NDA	0.4	NDA	192.8	0.0	0.0
9/30/98	21-10839		62.5-65	NR	0.0	NDA	0.4	NDA	192.8	0.0	0.0
9/30/98	21-10839		65-67.5	NR	0.0	NDA	0.4	NDA	192.8	0.0	0.0
9/30/98	21-10839		67.5-70	NR	0.0	NDA	0.4	NDA	192.8	0.0	0.0
9/30/98	21-10839		70-72.5	NR	0.0	NDA	0.4	NDA	192.8	0.0	0.0
9/30/98	21-10839	MD21-98-0407	72.5-75	NR	0.0	NDA	0.4	NDA	192.8	0.0	0.0
9/30/98	21-10840		0-2.5	NR	0.0	NDA	0.4	NDA	192.8	0.0	0.0
9/30/98	21-10840	MD21-98-0412	2.5-5	NR	0.0	NDA	0.4	113.5	192.8	0.0	0.0
9/30/98	21-10840		5-7.5	NR	0.0	NDA	0.4	NDA	192.8	0.0	0.0
9/30/98	21-10840		7.5-7.8	NR	0.0	NDA	0.4	NDA	192.8	0.0	0.0
10/1/98	21-10840	MD21-98-0414	10-12.5	NR	0.0	NDA	1.7	NDA	198	0.0	0.0

Date	FIMAD Location ID	Sample No.	Sample Depth (feet bgs)	Photoionization Detection Readings		Radiation Screening					
				Breathing Zone (ppm)	Core/Cuttings (ppm)	Direct Alpha		Direct Beta/Gamma		Tritium	
						Results	Background	Results	Background	Results	Background
10/1/98	21-10840		12.5-15	NR	0.0	NDA	1.7	NDA	198	0.0	0.0
10/1/98	21-10840		15-17.5	NR	0.0	NDA	1.7	NDA	198	0.0	0.0
10/1/98	21-10840		17.5-20	NR	0.0	NDA	1.7	NDA	198	0.0	0.0
10/1/98	21-10840	MD21-98-0413	20-22.5	NR	0.0	NDA	1.7	127	198	0.0	0.0
10/1/98	21-10840		22.5-25	NR	0.0	NDA	1.7	NDA	198	0.0	0.0
10/2/98	21-10840		25-27.5	NR	0.0	NDA	0.4	NDA	209.4	0.0	0.0
10/2/98	21-10840		25-27.5	NR	0.0	NDA	0.4	NDA	209.4	0.0	0.0
10/2/98	21-10840		27.5-30	NR	0.0	NDA	0.4	NDA	209.4	0.0	0.0
10/2/98	21-10840		30-32.5	NR	0.0	NDA	0.4	NDA	209.4	0.0	0.0
10/2/98	21-10840	MD21-98-0415	32.5-35	NR	0.0	NDA	0.4	24.23	209.4	0.0	0.0
10/2/98	21-10840		35-37.5	NR	0.0	NDA	0.4	NDA	209.4	0.0	0.0
10/2/98	21-10840		37.5-40	NR	0.0	NDA	0.4	NDA	209.4	0.0	0.0
10/2/98	21-10840		40-42.5	NR	0.0	NDA	0.4	NDA	209.4	0.0	0.0
10/2/98	21-10840	MD21-98-0417	42.5-45	NR	0.0	NDA	0.4	NDA	209.4	0.0	0.0
10/2/98	21-10840	MD21-98-0416	45-47.5	NR	0.0	NDA	0.4	NDA	209.4	0.0	0.0
10/2/98	21-10840		47.5-50	NR	0.0	NDA	0.4	NDA	209.4	0.0	0.0
10/2/98	21-10840		50-52.5	NR	0.0	NDA	0.4	NDA	209.4	0.0	0.0
10/2/98	21-10840		52.5-55	NR	0.0	NDA	0.4	NDA	209.4	0.0	0.0
10/2/98	21-10840		55-57.5	NR	0.0	NDA	0.4	NDA	209.4	0.0	0.0
10/2/98	21-10840		57.5-60	NR	0.0	NDA	0.4	NDA	209.4	0.0	0.0
10/2/98	21-10840		60-62.5	NR	0.0	NDA	0.4	NDA	209.4	0.0	0.0
10/2/98	21-10840	MD21-98-0422	62.5-65	NR	0.0	NDA	0.4	NDA	209.4	0.0	0.0
10/2/98	21-10840		65-67.5	NR	0.0	NDA	0.4	59.23	209.4	0.0	0.0

Date	FIMAD Location ID	Sample No.	Sample Depth (feet bgs)	Photoionization Detector Readings		Radiation Screening					
				Breathing Zone (ppm)	Core/Cuttings (ppm)	Direct Alpha		Direct Beta/Gamma		Tritium	
						Results	Background	Results	Background	Results	Background
10/2/98	21-10840		67.5-70	NR	0.0	NDA	0.4	NDA	209.4	0.0	0.0
10/2/98	21-10840		70-72.5	NR	0.0	NDA	0.4	NDA	209.4	0.0	0.0
10/2/98	21-10840	MD21-98-0511	72.5-75	NR	0.0	NDA	0.4	29.23	209.4	0.0	0.0
10/5/98	21-10841		0-2.5	NR	0.0	NDA	0.4	NDA	183.6	0.0	0.0
10/5/98	21-10841	MD21-98-0423	2.5-5	NR	0.0	NDA	0.4	NDA	183.6	0.0	0.0
10/5/98	21-10841		5-7.5	NR	0.0	NDA	0.4	NDA	183.6	0.0	0.0
10/5/98	21-10841		7.5-8	NR	0.0	NDA	0.4	NDA	183.6	0.0	0.0
10/5/98	21-10841	MD21-98-0425	10-12.5	NR	0.0	0.98	0.4	NDA	183.6	0.0	0.0
10/5/98	21-10841		12.5-15	NR	0.0	NDA	0.4	NDA	183.6	0.0	0.0
10/5/98	21-10841		15-17.5	NR	0.0	NDA	0.4	NDA	183.6	0.0	0.0
10/5/98	21-10841		17.5-20	NR	0.0	NDA	0.4	NDA	183.6	0.0	0.0
10/5/98	21-10841		20-22.5	NR	0.0	NDA	0.4	NDA	183.6	0.0	0.0
10/5/98	21-10841	MD21-98-0424	22.5-25	NR	0.0	NDA	0.4	NDA	183.6	0.0	0.0
10/5/98	21-10841		25-27.5	NR	0.0	NDA	0.4	NDA	183.6	0.0	0.0
10/5/98	21-10841		27.5-30	NR	0.0	NDA	0.4	NDA	183.6	0.0	0.0
10/5/98	21-10841		30-32.5	NR	0.0	NDA	0.4	NDA	183.6	0.0	0.0
10/5/98	21-10841	MD21-98-0426	32.5-35	NR	0.0	NDA	0.4	NDA	183.6	0.0	0.0
10/5/98	21-10841		35-37.5	NR	0.0	NDA	0.4	NDA	183.6	0.0	0.0
10/5/98	21-10841		37.5-40	NR	0.0	NDA	0.4	NDA	183.6	0.0	0.0
10/5/98	21-10841		40-42.5	NR	0.0	NDA	0.4	NDA	183.6	0.0	0.0
10/5/98	21-10841	MD21-98-0428	42.5-45	NR	0.0	NDA	0.4	NDA	183.6	0.0	0.0
10/5/98	21-10841		45-47.5	NR	0.0	NDA	0.4	NDA	183.6	0.0	0.0
10/5/98	21-10841		47.5-50	NR	0.0	NDA	0.4	NDA	183.6	0.0	0.0

Date	FIMAD Location ID	Sample No.	Sample Depth (feet bgs)	Photoionization Detection Readings		Radiation Screening					
				Breathing Zone (ppm)	Core/Cuttings (ppm)	Direct Alpha		Direct Beta/Gamma		Tritium	
						Results	Background	Results	Background	Results	Background
10/5/98	21-10841		50-52.5	NR	0.0	NDA	0.4	NDA	183.6	0.0	0.0
10/5/98	21-10841	MD21-98-0513	52.5-55	NR	0.0	NDA	0.4	NDA	183.6	0.0	0.0
10/5/98	21-10841	MD21-98-0427	55-57.5	NR	0.0	NDA	0.4	44.73	183.6	0.0	0.0
10/5/98	21-10841		57.5-60	NR	0.0	NDA	0.4	NDA	183.6	0.0	0.0
10/5/98	21-10841		60-62.5	NR	0.0	NDA	0.4	NDA	183.6	0.0	0.0
10/5/98	21-10841		62.5-65	NR	0.0	NDA	0.4	NDA	183.6	0.0	0.0
10/5/98	21-10841		65-67.5	NR	0.0	NDA	0.4	NDA	183.6	0.0	0.0
10/5/98	21-10841		67.5-70	NR	0.0	NDA	0.4	NDA	183.6	0.0	0.0
10/5/98	21-10841		70-72.5	NR	0.0	NDA	0.4	NDA	183.6	0.0	0.0
10/5/98	21-10841	MD21-98-0512	72.5-75	NR	0.0	NDA	0.4	NDA	183.6	0.0	0.0
10/6/98	21-10842		0-2.5	NR	0.0	NDA	0.2	NDA	167.8	0.0	0.0
10/6/98	21-10842	MD21-98-0433	2.5-5	NR	0.0	NDA	0.2	18.37	167.8	0.0	0.0
10/6/98	21-10842		5-7.5	NR	0.0	NDA	0.2	NDA	167.8	0.0	0.0
10/6/98	21-10842		10-12.5	NR	0.0	NDA	0.2	41.37	167.8	0.0	0.0
10/6/98	21-10842	MD21-98-0435	12.5-15	NR	0.0	NDA	0.2	17.37	167.8	0.0	0.0
10/6/98	21-10842		15-17.5	NR	0.0	NDA	0.2	77.37	167.8	0.0	0.0
10/6/98	21-10842		17.5-20	NR	0.0	NDA	0.2	NDA	167.8	0.0	0.0
10/7/98	21-10842		20-22.5	NR	0.0	NDA	0.2	NDA	187.6	0.0	0.0
10/7/98	21-10842	MD21-98-0434	22.5-25	NR	0.0	NDA	0.2	NDA	187.6	0.0	0.0
10/7/98	21-10842	MD21-98-0438	25-27.5	NR	0.0	NDA	0.2	24.52	187.6	0.0	0.0
10/7/98	21-10842		27.5-30	NR	0.0	NDA	0.2	NDA	187.6	0.0	0.0
10/7/98	21-10842		30-32.5	NR	0.0	NDA	0.2	NDA	187.6	0.0	0.0
10/7/98	21-10842		32.5-35	NR	0.0	NDA	0.2	NDA	187.6	0.0	0.0

Date	FIMAD Location ID	Sample No.	Sample Depth (feet bgs)	Photoionization Detector Readings		Radiation Screening					
				Breathing Zone (ppm)	Core/Cuttings (ppm)	Direct Alpha		Direct Beta/Gamma		Tritium	
						Results	Background	Results	Background	Results	Background
10/7/98	21-10842		35-37.5	NR	0.0	NDA	0.2	NDA	187.6	0.0	0.0
10/7/98	21-10842		37.5-40	NR	0.0	NDA	0.2	NDA	187.6	0.0	0.0
10/7/98	21-10842		40-42.5	NR	0.0	NDA	0.2	NDA	187.6	0.0	0.0
10/7/98	21-10842	MD21-98-0436	42.5-45	NR	0.0	NDA	0.2	NDA	187.6	0.0	0.0
10/7/98	21-10842		45-47.5	NR	0.0	NDA	0.2	NDA	187.6	0.0	0.0
10/7/98	21-10842	MD21-98-0437	47.5-50	NR	0.0	NDA	0.2	58.52	187.6	0.0	0.0
10/7/98	21-10842		50-52.5	NR	0.0	NDA	0.2	43.52	187.6	0.0	0.0
10/7/98	21-10842		52.5-55	NR	0.0	NDA	0.2	18.52	187.6	0.0	0.0
10/7/98	21-10842		61.5-65	NR	0.0	NDA	0.2	NDA	187.6	0.0	0.0
10/7/98	21-10842		65-67.5	NR	0.0	NDA	0.2	NDA	187.6	0.0	0.0
10/7/98	21-10842		67.5-70	NR	0.0	NDA	0.2	NDA	187.6	0.0	0.0
10/7/98	21-10842	MD21-98-0515	70-72.5	NR	0.0	NDA	0.2	96.52	187.6	0.0	0.0
10/7/98	21-10842		72.5-75	NR	0.0	NDA	0.2	57.52	187.6	0.0	0.0
10/13/98	21-10843		0-2.5	NR	0.0	NDA	1.4	NDA	186	0.0	0.0
10/13/98	21-10843	MD21-98-0443	2.5-5	NR	0.0	NDA	1.4	NDA	186	0.0	0.0
10/13/98	21-10843		5-7.5	NR	0.0	NDA	1.4	NDA	186	0.0	0.0
10/13/98	21-10843		7.5-10	NR	0.0	NDA	1.4	NDA	186	0.0	0.0
10/13/98	21-10843		10-12.5	NR	0.0	NDA	1.4	NDA	186	0.0	0.0
10/13/98	21-10843	MD21-98-0445	12.5-15	NR	0.0	NDA	1.4	NDA	186	0.0	0.0
10/13/98	21-10843		15-17.5	NR	0.0	NDA	1.4	NDA	186	0.0	0.0
10/13/98	21-10843		17.5-20	NR	0.0	NDA	1.4	NDA	186	0.0	0.0
10/13/98	21-10843		20-22.5	NR	0.0	NDA	1.4	NDA	186	0.0	0.0
10/13/98	21-10843	MD21-98-0444	22.5-25	NR	0.0	NDA	1.4	NDA	186	0.0	0.0

Date	FIMAD Location ID	Sample No.	Sample Depth (feet bgs)	Photoionization Detector Readings		Radiation Screening					
				Breathing Zone (ppm)	Core/Cuttings (ppm)	Direct Alpha		Direct Beta/Gamma		Tritium	
						Results	Background	Results	Background	Results	Background
10/13/98	21-10843		25-27.5	NR	0.0	NDA	1.4	NDA	186	0.0	0.0
10/13/98	21-10843		27.5-30	NR	0.0	NDA	1.4	NDA	186	0.0	0.0
10/13/98	21-10843		30-32.5	NR	0.0	NDA	1.4	NDA	186	0.0	0.0
10/13/98	21-10843	MD21-98-0446	32.5-35	NR	0.0	NDA	1.4	NDA	186	0.0	0.0
10/13/98	21-10843		35-37.5	NR	0.0	NDA	1.4	NDA	186	0.0	0.0
10/13/98	21-10843		37.5-40	NR	0.0	NDA	1.4	NDA	186	0.0	0.0
10/13/98	21-10843		40-42.5	NR	0.0	NDA	1.4	NDA	186	0.0	0.0
10/13/98	21-10843	MD21-98-0447	42.5-45	NR	0.0	NDA	1.4	NDA	186	0.0	0.0
10/13/98	21-10843		45-47.5	NR	0.0	NDA	1.4	NDA	186	0.0	0.0
10/13/98	21-10843		47.5-50	NR	0.0	NDA	1.4	NDA	186	0.0	0.0
10/13/98	21-10843		50-52.5	NR	0.0	NDA	1.4	NDA	186	0.0	0.0
10/13/98	21-10843	MD21-98-0448	52.5-55	NR	0.0	NDA	1.4	NDA	186	0.0	0.0
10/14/98	21-10843		55-57.5	NR	0.0	NDA	1.7	NDA	202	0.0	0.0
10/14/98	21-10843		57.5-60	NR	0.0	NDA	1.7	NDA	202	0.0	0.0
10/14/98	21-10843		60-62.5	NR	0.0	NDA	1.7	NDA	202	0.0	0.0
10/14/98	21-10843	MD21-98-0453	62.5-65	NR	0.0	NDA	1.7	NDA	202	0.0	0.0
10/14/98	21-10843		65-67.5	NR	0.0	NDA	1.7	NDA	202	0.0	0.0
10/14/98	21-10843		67.5-70	NR	0.0	NDA	1.7	NDA	202	0.0	0.0
10/14/98	21-10843		70-72.5	NR	0.0	NDA	1.7	NDA	202	0.0	0.0
10/14/98	21-10843	MD21-98-0516 MD21-98-0517	72.5-75	NR	0.0	NDA	1.7	NDA	202	0.0	0.0
10/14/98	21-10844		0-2.5	NR	0.0	NDA	1.7	NDA	202	0.0	0.0
10/14/98	21-10844	MD21-98-0454	2.5-5	NR	0.0	NDA	1.7	NDA	202	0.0	0.0
10/14/98	21-10844		5-7.5	NR	0.0	NDA	1.7	NDA	202	0.0	0.0

Date	FIMAD Location ID	Sample No.	Sample Depth (feet bgs)	Photoionization Detector Readings		Radiation Screening					
				Breathing Zone (ppm)	Core/Cuttings (ppm)	Direct Alpha		Direct Beta/Gamma		Tritium	
						Results	Background	Results	Background	Results	Background
10/14/98	21-10844		7.5-10	NR	0.0	NDA	1.7	NDA	202	0.0	0.0
10/14/98	21-10844		10-12.5	NR	0.0	NDA	1.7	NDA	202	0.0	0.0
10/14/98	21-10844	MD21-98-0456	12.5-15	NR	0.0	NDA	1.7	NDA	202	0.0	0.0
10/15/98	21-10844		15-17.5	NR	0.0	NDA	1.1	NDA	194	0.0	0.0
10/15/98	21-10844		17.5-20	NR	0.0	NDA	1.1	NDA	194	0.0	0.0
10/15/98	21-10844		20-22.5	NR	0.0	NDA	1.1	NDA	194	0.0	0.0
10/15/98	21-10844	MD21-98-0455	22.5-25	NR	0.0	NDA	1.1	NDA	194	0.0	0.0
10/15/98	21-10844		25-27.5	NR	0.0	NDA	1.1	NDA	194	0.0	0.0
10/15/98	21-10844		27.5-30	NR	0.0	NDA	1.1	NDA	194	0.0	0.0
10/15/98	21-10844		30-32.5	NR	0.0	NDA	1.1	NDA	194	0.0	0.0
10/15/98	21-10844	MD21-98-0457	32.5-35	NR	0.0	NDA	1.1	NDA	194	0.0	0.0
10/15/98	21-10844		35-37.5	NR	0.0	NDA	1.1	NDA	194	0.0	0.0
10/15/98	21-10844		37.5-40	NR	0.0	NDA	1.1	NDA	194	0.0	0.0
10/15/98	21-10844		40-42.5	NR	0.0	NDA	1.1	NDA	194	0.0	0.0
10/15/98	21-10844	MD21-98-0458	42.5-45	NR	0.0	NDA	1.1	NDA	194	0.0	0.0
10/15/98	21-10844		45-47.5	NR	0.0	NDA	1.1	NDA	194	0.0	0.0
10/15/98	21-10844		47.5-50	NR	0.0	NDA	1.1	NDA	194	0.0	0.0
10/15/98	21-10844		50-52.5	NR	0.0	NDA	1.1	NDA	194	0.0	0.0
10/15/98	21-10844	MD21-98-0459	52.5-55	NR	0.0	NDA	1.1	NDA	194	0.0	0.0
10/15/98	21-10844		55-57.5	NR	0.0	NDA	1.1	NDA	194	0.0	0.0
10/15/98	21-10844		57.5-60	NR	0.0	NDA	1.1	NDA	194	0.0	0.0
10/15/98	21-10844		60-62.5	NR	0.0	NDA	1.1	NDA	194	0.0	0.0
10/15/98	21-10844	MD21-98-0464	62.5-65	NR	0.0	NDA	1.1	NDA	194	0.0	0.0

Date	FIMAD Location ID	Sample No.	Sample Depth (feet bgs)	Photoionization Detector Readings		Radiation Screening					
				Breathing Zone (ppm)	Core/Cuttings (ppm)	Direct Alpha		Direct Beta/Gamma		Tritium	
						Results	Background	Results	Background	Results	Background
10/15/98	21-10844		65-67.5	NR	0.0	NDA	1.1	NDA	194	0.0	0.0
10/15/98	21-10844		67.5-70	NR	0.0	NDA	1.1	NDA	194	0.0	0.0
10/15/98	21-10844		70-72.5	NR	0.0	NDA	1.1	NDA	194	0.0	0.0
10/15/98	21-10844	MD21-98-0519 MD21-98-0465	72.5-75	NR	0.0	NDA	1.1	NDA	194	0.0	0.0
10/19/98	21-10845		0-2.5	NR	0.0	NDA	1.3	NDA	212	0.0	0.0
10/19/98	21-10845	MD21098-0468	2.5-5	NR	0.0	NDA	1.3	NDA	212	0.0	0.0
10/19/98	21-10845		5-7.5	NR	0.0	NDA	1.3	NDA	212	0.0	0.0
10/19/98	21-10845		7.5-10	NR	0.0	NDA	1.3	NDA	212	0.0	0.0
10/19/98	21-10845		10-12.5	NR	0.0	NDA	1.3	NDA	212	0.0	0.0
10/19/98	21-10845	MD21-980470	12.5-15	NR	0.0	NDA	1.3	NDA	212	0.0	0.0
10/19/98	21-10845		15-17.5	NR	0.0	NDA	1.3	NDA	212	0.0	0.0
10/19/98	21-10845		17.5-20	NR	0.0	NDA	1.3	NDA	212	0.0	0.0
10/19/98	21-10845		20-22.5	NR	0.0	NDA	1.3	NDA	212	0.0	0.0
10/19/98	21-10845	MD21-98-0469	22.5-25	NR	0.0	NDA	1.3	NDA	212	0.0	0.0
10/19/98	21-10845		25-27.5	NR	0.0	NDA	1.3	NDA	212	0.0	0.0
10/19/98	21-10845		27.5-30	NR	0.0	NDA	1.3	NDA	212	0.0	0.0
10/19/98	21-10845		30-32.5	NR	0.0	NDA	1.3	NDA	212	0.0	0.0
10/19/98	21-10845	MD21-98-0471	32.5-35	NR	0.0	NDA	1.3	NDA	212	0.0	0.0
10/19/98	21-10845		35-37.5	NR	0.0	NDA	1.3	NDA	212	0.0	0.0
10/19/98	21-10845		37.5-40	NR	0.0	NDA	1.3	NDA	212	0.0	0.0
10/19/98	21-10845		40-42.5	NR	0.0	NDA	1.3	NDA	212	0.0	0.0
10/19/98	21-10845	MD21-98-0472	42.5-45	NR	0.0	NDA	1.3	NDA	212	0.0	0.0
10/19/98	21-10845		45-47.5	NR	0.0	NDA	1.3	NDA	212	0.0	0.0

Date	FIMAD Location ID	Sample No.	Sample Depth (feet bgs)	Photoionization Detector Readings		Radiation Screening					
				Breathing Zone (ppm)	Core/Cuttings (ppm)	Direct Alpha		Direct Beta/Gamma		Tritium	
						Results	Background	Results	Background	Results	Background
10/19/98	21-10845		47.5-50	NR	0.0	NDA	1.3	NDA	212	0.0	0.0
10/19/98	21-10845		50-52.5	NR	0.0	NDA	1.3	NDA	212	0.0	0.0
10/19/98	21-10845	MD21-98-0473	52.5-55	NR	0.0	NDA	1.3	NDA	212	0.0	0.0
10/19/98	21-10845		55-57.5	NR	0.0	NDA	1.3	NDA	212	0.0	0.0
10/19/98	21-10845		57.5-60	NR	0.0	NDA	1.3	NDA	212	0.0	0.0
10/19/98	21-10845		60-62.5	NR	0.0	NDA	1.3	NDA	212	0.0	0.0
10/19/98	21-10845	MD21-98-0520	62.5-65	NR	0.0	NDA	1.3	NDA	212	0.0	0.0
10/19/98	21-10845		65-67.5	NR	0.0	NDA	1.3	NDA	212	0.0	0.0
10/19/98	21-10845		67.5-70	NR	0.0	NDA	1.3	NDA	212	0.0	0.0
10/19/98	21-10845		70-72.5	NR	0.0	NDA	1.3	NDA	212	0.0	0.0
10/19/98	21-10845	MD21-98-0521	72.5-75	NR	0.0	NDA	1.3	NDA	212	0.0	0.0

bgs = below ground surface
 ppm = parts per million
 NR = reading not recorded
 NDA = no detectable activity

Table 3. MDA U Borehole Summary Information

Location Description	FIMAD Location I.D.	Sample Number	Sample Interval		Borehole Diameter (Inches)	Total Depth (feet bgs)	Comments	
			From(feet bgs)	To (feet bgs)				
MDA U-1	21-10838	MD21-98-0394	4	5	8.25	5	CORE	
		MD21-98-0392	14	15	8.25	15	CORE	
		MD21-98-0395	24	25	8.25	25	CORE	
		MD21-98-0398	25	25	8.25	25	SOIL GAS	
		MD21-98-0393	34	35	8.25	35	CORE	
		MD21-98-0397	44	45	8.25	45	CORE	
		MD21-98-0507	54	55	8.25	55	CORE	
		MD21-98-0399	55	55	8.25	55	SOIL GAS	
		MD21-98-0396	64	65	8.25	65	CORE	
		MD21-98-0506	74	75	8.25	75	CORE	
		MD21-98-0400	75	75	8.25	75	SOIL GAS	
		MDA U-2	21-10839	MD21-98-0508	2	3	8.25	3
MD21-98-0402	14			15	8.25	15	CORE	
MD21-98-0403	24			25	8.25	25	CORE	
MD21-98-0408	25			25	8.25	25	SOIL GAS	
MD21-98-0405	34			35	8.25	35	CORE	
MD21-98-0406	44			45	8.25	45	CORE	
MD21-98-0509	51.5			52.5	8.25	52.5	CORE	

Location Description	FIMAD Location I.D.	Sample Number	Sample Interval		Borehole Diameter (Inches)	Total Depth (feet bgs)	Comments
			From(feet bgs)	To (feet bgs)			
		MD21-98-0409	55	55	8.25	55	SOIL GAS
		MD21-98-0404	59	60	8.25	60	CORE
		MD21-98-0407	74	75	8.25	75	CORE
		MD21-98-0410	75	75	8.25	75	SOIL GAS
MDA U-3	21-10840	MD21-98-0412	4	5	8.25	5	CORE
		MD21-98-0414	11.5	12.5	8.25	12.5	CORE
		MD21-98-0413	21.5	22.5	8.25	22.5	CORE
		MD21-98-0418	25	25	8.25	25	SOIL GAS
		MD21-98-0415	34	35	8.25	35	CORE
		MD21-98-0417	44	45	8.25	45	CORE
		MD21-98-0416	46.5	47.5	8.25	47.5	CORE
		MD21-98-0419	55	55	8.25	55	SOIL GAS
		MD21-98-0422	64	65	8.25	65	CORE
		MD21-98-0511	74	75	8.25	75	CORE
		MD21-98-0420	75	75	8.25	75	SOIL GAS
MDA U-4	21-10841	MD21-98-0423	4	5	8.25	5	CORE
		MD21-98-0425	11.5	12.5	8.25	12.5	CORE
		MD21-98-0424	24	25	8.25	25	CORE
		MD21-98-0429	25	25	8.25	25	SOIL GAS
		MD21-98-0426	34	35	8.25	35	CORE
		MD21-98-0428	44	45	8.25	45	CORE
		MD21-98-0513	54	55	8.25	55	CORE

Location Description	FIMAD Location I.D.	Sample Number	Sample Interval		Borehole Diameter (Inches)	Total Depth (feet bgs)	Comments
			From(feet bgs)	To (feet bgs)			
		MD21-98-0430	55	55	8.25	55	SOIL GAS
		MD21-98-0427	56.5	57.5	8.25	57.5	CORE
		MD21-98-0512	74	75	8.25	75	CORE
		MD21-98-0431	75	75	8.25	75	SOIL GAS
MDA U-5	21-10842	MD21-98-0433	4	5	8.25	5	CORE
		MD21-98-0435	14	15	8.25	15	CORE
		MD21-98-0434	24	25	8.25	25	CORE
		MD21-98-0439	25	25	8.25	25	SOIL GAS
		MD21-98-0438	26.5	27.5	8.25	27.5	CORE
		MD21-98-0436	44	45	8.25	45	CORE
		MD21-98-0437	49	50	8.25	50	CORE
		MD21-98-0440	55	55	8.25	55	SOIL GAS
		MD21-98-0515	71.5	72.5	8.25	72.5	CORE
		MD21-98-0441	75	75	8.25	75	SOIL GAS
MDA U-6	21-10843	MD21-98-0443	4	5	8.25	5	CORE
		MD21-98-0445	14	15	8.25	15	CORE
		MD21-98-0444	24	25	8.25	25	CORE
		MD21-98-0449	25	25	8.25	25	SOIL GAS
		MD21-98-0446	34	35	8.25	35	CORE
		MD21-98-0447	44	45	8.25	45	CORE
		MD21-98-0448	54	55	8.25	55	CORE
		MD21-98-0450	55	55	8.25	55	SOIL GAS

Location Description	FIMAD Location I.D.	Sample Number	Sample Interval		Borehole Diameter (Inches)	Total Depth (feet bgs)	Comments
			From(feet bgs)	To (feet bgs)			
		MD21-98-0453	64	65	8.25	65	CORE
		MD21-98-0516	72.5	75	8.25	75	CORE
		MD21-98-0517	72.5	75	8.25	75	CORE
		MD21-98-0451	75	75	8.25	75	SOIL GAS
MDA U-7	21-10844	MD21-98-0454	2.5	5	8.25	5	CORE
		MD21-98-0456	12.5	15	8.25	15	CORE
		MD21-98-0455	24	25	8.25	25	CORE
		MD21-98-0460	25	25	8.25	25	SOIL GAS
		MD21-98-0457	34	35	8.25	35	CORE
		MD21-98-0458	44	45	8.25	45	CORE
		MD21-98-0459	54	55	8.25	55	CORE
		MD21-98-0461	55	55	8.25	55	SOIL GAS
		MD21-98-0464	64	65	8.25	65	CORE
		MD21-98-0465	74	75	8.25	75	CORE
		MD21-98-0519	74	75	8.25	75	CORE
		MD21-98-0462	75	75	8.25	75	SOIL GAS
MDA U-8	21-10845	MD21-98-0468	4	5	8.25	5	CORE
		MD21-98-0470	14	15	8.25	15	CORE
		MD21-98-0469	24	25	8.25	25	CORE
		MD21-98-0474	25	25	8.25	25	SOIL GAS
		MD21-98-0471	34	35	8.25	35	CORE
		MD21-98-0472	44	45	8.25	45	CORE

Location Description	FIMAD Location I.D.	Sample Number	Sample Interval		Borehole Diameter (Inches)	Total Depth (feet bgs)	Comments
			From(feet bgs)	To (feet bgs)			
		MD21-98-0473	54	55	8.25	55	CORE
		MD21-98-0475	55	55	8.25	55	SOIL GAS
		MD21-98-0520	64	65	8.25	65	CORE
		MD21-98-0521	74	75	8.25	75	CORE
		MD21-98-0476	75	75	8.25	75	SOIL GAS
		MD21-98-0477	75	75	8.25	75	SOIL GAS

bgs = below ground surface

3.1.6 Subsurface Sampling

Sample containers, sample labels, and quality assurance/quality control samples were prepared in accordance with LANL-ER-SOP-01.05, Field Quality Control Samples (LANL, 1992a) and LANL-ER-SOP-01.02, Sample Containers and Preservation (LANL, 1992d). Samples were documented, handled, and shipped in accordance with LANL-ER-SOP-01.03, Handling, Packaging, and Shipping of Samples (LANL, 1994b), and LANL-ER-SOP-01.04, Sample Control and Field Documentation (LANL, 1994d). Samples were collected and submitted to the LANL Sample Management Office (SMO) for laboratory analysis of VOCs by EPA SW-846 Method 8260, SVOCs by EPA SW-846 Method 8270, TAL Metals by EPA SW-846 Method 601 0, pesticides/PCBs by EPA SW-846 Method 8080, gamma spectrometry, gross alpha, gross beta and tritium. The radiological screening lab at TA-21 was used for gross alpha, beta, gamma, moisture, and tritium screening for sample transportation requirements.

The subsurface sampling protocol used during this field investigation generally followed that stated in the Sampling and Analysis Plan. Eight samples were collected in each boring from 0 to 75 feet. One sample was collected from 0 to 5 feet, then one sample per 10-foot interval to a total depth of 75 feet. Sampling details are presented in individual sample collection logs (Exhibit C), and individual core logs are presented in Exhibit E.

3.1.7 Pore Gas Sampling

Three soil pore gas samples were collected per borehole for VOCs. Samples were collected based on field screening results or at 25 ft, 55 ft, and 75 ft. Samples were collected by running an extraction tube down the inside of the augers to the bottom of the hole and sealing it off with an inflatable packer. The line was purged and then the sample was contained into a SUMMA canister in accordance with LANL-ER-SOP-06.22,RO ,EPA Method TO-14.

3.1.8 Absorption Bed Sampling

On October 28, 1998 samples were collected from the two absorption beds, PRS 21-017 a, and b. S.G. Western was subcontracted to provide and operate a backhoe to excavate a trench at each absorption bed for sampling the bed materials.

The eastern absorption bed trench was excavated and exposed a plastic liner at approximately 6 feet deep. The material above the liner was crushed tuff, below the liner were cobbles (2" to 18") and crushed tuff. Two samples were collected from 6 to 8 feet.

The western absorption bed trench was excavated and exposed a plastic liner at approximately 5 feet deep. The material above the liner was crushed tuff, below the liner were cobbles (2" to 18") and crushed tuff. Two samples were collected from 5 to 8 feet.

3.1.9 Surface Sampling

Sample containers, sample labels, and quality assurance/quality control samples were prepared in accordance with LANL-ER-SOP-01.05, Field Quality Control Samples (LANL, 1992a) and LANL-ER-SOP-01.02, Sample Containers and Preservation (LANL, 1992d). Samples were documented, handled, and shipped in accordance with LANL-ER-SOP-01.03, Handling, Packaging, and Shipping of Samples (LANL, 1994b), and LANL-ER-SOP-01.04, Sample Control and Field Documentation (LANL, 1994d). Samples were collected and submitted to the LANL Sample Management Office (SMO) for laboratory analysis of VOCs by EPA SW-846 Method 8260, SVOCs by EPA SW-846 Method 8270, TAL Metals by EPA SW-846 Method 601 0, pesticides/PCBs by EPA SW-846 Method 8080, gamma spectrometry, gross alpha, gross beta and tritium. The radiological screening lab at TA-21 was used for gross alpha, beta, gamma, moisture, and tritium screening for sample transportation requirements. Sample collection logs (Exhibit C) were completed for each sample. Results of the fixed laboratory analyses are the subject of a pending RFI Report.

The surface sampling protocol used during this field investigation generally followed that stated in the Sampling and Analysis Plan. Samples were collected from 0 to 6 inches. Sampling details are presented in individual sample collection logs (Exhibit C).

3.1.10 Equipment Decontamination Procedures

The drill rig, augers, and core barrels were decontaminated by steam cleaning prior to mobilizing for the project. Each auger flight was decontaminated after each use and prior to being used in a new borehole. The augers were scrubbed with an Alconox/potable water wash to remove any soil adhered to the equipment, then rinsed with deionized water. All decontamination fluids were captured in plastic buckets then disposed of on site according to the site specific Spill Prevention Plan. Each core barrel was decontaminated between samples. After dry decontamination using Fantastic spray cleaner and deionized water rinse, the core barrels were assembled and stored on racks away from the drilling and decontamination activities. All downhole drilling equipment was also decontaminated before final demobilization from each site. A temporary decontamination pad was constructed in an area designated for equipment decontamination.

The sampling equipment used during hand augering activities were decontaminated between samples using the dry decontamination method.

3.1.11 Borehole Abandonment

In accordance with LANL-ER-AP-05.3, Management of Environmental Restoration Program Wastes (LANL, 1994i), each borehole was abandoned by backfilling with cuttings. Cuttings and core temporarily stored in plastic drum liners were returned to the borehole in the reverse order from which there were displaced. The upper two feet of the borehole was capped with bentonite and hydrated with potable water. Any cuttings which could not be returned to the boreholes were placed in 55-gallon drums for temporary storage.

The upper three feet of each borehole outside the absorption beds was capped with Quikrete cement. In boreholes in the absorption beds, bentonite chips were placed from 10 feet to 3 feet and hydrated with potable water, then Quikrete was placed from 3 feet to the surface.

3.1.12 Quality Assurance/Quality Control Sample Collection

Out of the 65 borehole samples collected, 2 were collected for quality assurance/quality control. These samples were field duplicates collected during drilling activities at MDA U. The samples were submitted, along with the associated soil samples, to the SMO for fixed laboratory analyses.

The purpose of a field duplicate is to document variability at the point of sample collection and as a quality control check on the analytical laboratory. A field duplicate is a separate, independent sample collected from the same source and collected to represent the same matrix as a soil sample collected at a given location and time (LANL 1992a).

3.1.13 Demobilization

All drilling activities at MDA U were concluded on October 21, 1998. All equipment and personnel were demobilized from the site on that date. Twenty-two solid waste drums containing drill cuttings, plastic, sampling debris, and PPE and 1 liquid waste drum containing decon liquids were left on site. The drums were roped off with yellow caution tape inside the MDA U fence for a temporary drum staging area.

4.0 DEVIATIONS FROM WORK PLAN

There were no deviations from the planned approach stated in the Sampling and Analysis Plan.

5.0 WASTE MANAGEMENT

Solid waste generated during the investigation of MDA U, included drill cuttings and core, disposable sampling equipment, plastic sheeting, empty plastic cuttings bags, and personal protective equipment (PPE), was placed in open-top 55-gallon drums. Liquid waste produced during decon activities was placed in a closed-top 55-gallon drum. Waste drums are temporarily stored in a small temporary waste staging area until the waste can be profiled and disposal can be arranged.

6.0 DATA ASSESSMENT

Subsurface soil samples were collected from 8 boreholes, surface soil samples were collected from 22 locations, and absorption bed samples were collected from 2 locations. Samples were submitted to the Field Support Facility for radiochemical screening and the SMP for radionuclide, organic and inorganic laboratory analyses. Validated fixed laboratory analytical results are not currently available and this data will be assessed in a pending RFI report.

7.0 REFERENCES

- TA-21 Work Plan (LANL 1991, 07529, pp. 16-198 through 16-199).
- Geomorphic Studies at DP Mesa and Vicinity (Broxton and Eller 1995, 58207, pp. 68 and 69)
- LANL-ER-SOP-03.01, Land Surveying Procedures (LANL, 1994).
- LANL-ER-SOP-06.23, Measurement of Gamma-Ray Fields Using a Sodium Iodide Detector (LANL, 1993)
- LANL-ER-SOP-1 0.07, Field Monitoring for Surface and Volume Radioactivity Levels (LANL, 1994)
- ESH-1 -07-85, Rev. 0, Operational Checks of Beta/Gamma Survey Instruments (LANL, 1994),
- ESH-1-07-86, Rev. 0, Operational Checks of Alpha Survey Instruments (LANL, 1994).
- ESH-1 -0702, Rev. 0, Operating the Ludlum 139 With Air Proportional Probe (LANL, 1994), and
- ESH-1-0704, Rev. 0, Operating the ESP/HP260 (LANL, 1994).
- LANL-ER-SOP-01.05, Field Quality Control Samples (LANL, 1992)
- LANL-ER-SOP-01.02, Sample Containers and Preservation (LANL, 1992)
- LANL-ER-SOP-01.03, Handling, Packaging, and Shipping of Samples (LANL, 1994)
- LANL-ER-SOP-01.04, Sample Control and Field Documentation (LANL, 1994)
- LANL-ER-SOP-06.22, RO, EPA Method TO-14.