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Investigation Report for Direct-Push Sampling Material Disposal Area B, Solid Waste Management Unit 21-015, at Technical Area 21

Los Alamos
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EXECUTIVE SUMMARY

The Los Alamos National Laboratory (the Laboratory) Environmental Programs Directorate has completed direct-push technology core sampling of Material Disposal Area (MDA) B, Solid Waste Management Unit 21-015, at Technical Area 21. Core sampling was conducted between August and September 2009 and is the first intrusive investigation of MDA B conducted to date. The results of direct-push core sampling will assist in determining the scope of follow-on investigation.

This was a scoping investigation and this report covers only the objectives, methods, and results of this direct-push core sampling campaign. This is not a comprehensive investigation report.

MDA B direct-push core sampling was conducted in accordance with the "Sampling and Analysis Plan for Direct-Push Technology at Material Disposal Area B," which is an addendum to the "Investigation/Remediation Work Plan for Material Disposal Area B, Solid Waste Management Unit 21-015, at TA-21, Revision 1, prepared by the Laboratory in October 2006.

The objectives of direct-push technology core sampling are to provide operational data for (1) safely performing waste-retrieval and sorting activities by establishing correlations between field instrument readings and laboratory analysis before actual excavation begins, (2) revising the estimated quantity and distribution of radioactive material at risk (the quantity of radioactive material at risk is measured in units of plutonium-239 equivalent curies or grams), (3) analyzing waste samples for hazardous materials before excavation to aid in initial waste-sorting activities and (4) indicate the configuration of the trenches. The systematic sampling data using direct-push technology are intended to supplement, not to replace, any sampling performed during waste excavation, as described in the approved work plan.

Geophysical surveys have been conducted to determine the probable lateral and vertical extents of the subsurface waste units. These surveys resulted in the establishment of a boundary for the waste units and thus a defined footprint on the site where buried waste is expected. Distributed over this footprint, 45 direct-push locations were systematically selected at certain nodes on a sitewide grid for sampling.

At each location, a direct-push coring tube was driven through the waste zone to obtain a core or set of cores containing at least 80% recovery in one to four attempts around a 2-ft radius. In the event that refusal in tuff was met, the field crew continued to collect core samples until 80% core volume had been collected and relocated to a different grid cell. Each acetate core collection sleeve was surveyed for volatile organic compounds (VOCs) and gross radioactivity and assayed by gamma spectroscopy in the field.

Samples were submitted for the following laboratory definitive analyses for radioactive and hazardous constituents: gamma spectroscopy, alpha spectroscopy, strontium-90, tritium, VOCs, semivolatile organic compounds, target analyte list metals + uranium, mercury, toxicity characteristic leaching procedure, and dioxins/furans (for apparent burnt material).

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1.0 INTRODUCTION

This investigation report presents data obtained during the 2009 direct-push core sampling investigation of Material Disposal Area (MDA) B in Technical Area 21 (TA-21) at Los Alamos National Laboratory (LANL or the Laboratory). The investigation reported here is a scoping investigation and may lead to follow-on core sampling or other intrusive investigations of MDA B.

1.1 Investigation Overview

The purpose of the 2009 direct-push technology (DPT) core sampling investigation was to conduct preliminary characterization of the nature of the contamination in the MDA B waste and provide data to support future characterization and remediation at the site. The "Sampling and Analysis Plan for Direct-Push Technology at Material Disposal Area B" (LANL 2009, 106154), which is an addendum to the "Investigation/Remediation Work Plan for Material Disposal Area B, Solid Waste Management Unit 21-015, at TA-21, Revision 1" (LANL 2006, 095499), identified the following objectives for the investigation:

- provide operational data for
    - ❖ safely performing waste-retrieval and sorting activities by establishing correlations between field instrument readings and laboratory analysis before actual excavation begins
    - ❖ revising the estimated quantity and distribution of radioactive material at risk ([MAR]; the quantity of radioactive MAR is measured in units of plutonium-239 equivalent curies or grams)
    - ❖ analyzing waste samples for hazardous materials before excavation to aid in initial waste-sorting activities
- indicate the configuration of the trenches

2.0 SCOPE OF ACTIVITIES

The scope of activities for the 2009 MDA B direct-push core sampling and analysis included determining sample locations on the site map; surveying and marking sampling locations in the field; obtaining cores in the MDA B waste zone; performing field decontamination, field surveys, and gamma assay of the cores; obtain sampling from the cores; and analyzing off-site samples.

2.1 Determining Sample Locations

Sample locations are shown on Plate 1 and were determined with the interpreted waste zone boundary taken from geophysical survey maps. Geophysical surveys were conducted over the surface of MDA B to determine potential waste trench locations. The survey results of each campaign were color-mapped to show differences in the geophysical nature of the subsurface, and both showed an apparent signature of the location(s) of the waste zone. This outline of the apparent waste zone became the interpreted boundary within which to conduct DPT core sampling.

Using geographical information system (GIS) software, a 10-ft × 10-ft grid was projected over the MDA B area to provide a grid cell location system to support characterization of MDA B, excavation planning, and waste tracking from grid cell of origin. The grid has an alphanumeric coordinate system, with alpha values on the x-axis and numeric values on the y-axis.

Forty-five core sample locations were initially selected over the surface on the interpreted waste zone using visual sampling plan software. These locations were adjusted to match the center of the nearest grid cell, and some locations were further adjusted to target the strongest geophysical survey responses.

The locations were mapped in GIS. The alphanumeric grid cell location identification (ID), northing, and easting of each location were generated and exported to a spreadsheet file.

2.2 Surveying and Marking Locations in the Field

The locations are defined by northing and easting in the New Mexico State Plane map datum system. Locations were surveyed in the field using a Trimble global positioning system (GPS) survey system referenced to a nearby Laboratory survey marker and using a Laboratory land-based GPS reference tower. Each location was marked with a red marker and the location ID written on the marker.

2.3 Core Sampling

A direct-push core sampling rig was used to push coring tube and core collection sleeve into the subsurface, one section at a time, rather than a rotating bit to core and extract small volume samples. Sections were 5 ft in length. After pushing one section to the 5-ft length, the core sample collection sleeve was collected and removed, a new sample collection tube and acetate liner were installed, and then a core section was collected and removed from the next 5-ft depth interval. This proceeded until refusal was met either in waste or at the interface between soil and underlying tuff.

The method of direct-push sampling used was the tube-in-tube arrangement that involves an outer push tube with a conical cutting shoe at the end and an inner sample sheath tube that carries the acetate core liner. After pushing a 5-ft section of tube into the ground, the outer push tube remains in place, while the inner sample sheath tube is removed to collect the acetate liner, including the core sample. The tube-in-tube system is designed to eliminate cross-contamination that would be caused by completely removing the outer tube after each interval and then redriving it through upper media to mix with media below.

If refusal was encountered in what appeared to be waste, the DPT rig was relocated within a 2-ft radius at the initial location, and the DPT core attempted again until either (1) coring was successful down to refusal in tuff or (2) four attempts around the 2-ft radius had been completed without reaching refusal in tuff. If refusal in tuff was not reached after four additional attempts, then additional push attempts were made as required to obtain sufficient core sample volume and the rig was moved to the next primary sampling location. Where core recovery at a particular depth interval was less than 80% core volume, the DPT rig was relocated on the 2-ft radius and another core was taken to obtain more sample volume.

After a 5-ft core section was collected or if refusal was met, the acetate liner and core sample were removed from the sample sheath carrier tube. The core was surveyed with chemical and radiological instruments, examined for evidence of reaction, labeled, placed in a plastic bag for contamination control, and placed in a polyvinyl chloride (PVC) handling tube for protection of the core sample. These readings were recorded in a logbook. The PVC tube containing the core was then transported to the field gamma assay station.

During the process of collecting core sections around each primary sampling location, information was recorded in field data packets. Field data packets were prepared for each location so that location information was already populated on core collection log sheets. The field technician would record the time, type of refusal encountered (if any), percent of recovery of core material in the acetate liner, and the radiological and chemical screening readings of the cores as they emerged from the sample sheath. A diagram, showing a 2-ft radius circle around the primary location, was provided and was used to record the approximate location of each relocation attempt around the primary location.

2.4 Decontamination Methods

Decontamination methods consisted of dry and damp wipe-down decontamination using industrial absorbent wipes and an Alconox and deionized water solution in a spray bottle for damp wipe-down.

The application of these two methods was dictated by the sampling equipment and by the sample collection sequence and was performed in accordance with EP-ERSS-SOP-5061, Field Decontamination.

Using this system, four pieces of sampling equipment were potentially subject to contamination:

- the conical cutting shoe at the end of the outer push tube
- the sections of outer push tube
- the sample sheath carrying the acetate core sleeve
- the acetate sleeve itself

The cutting shoe shears a core that is 1.8-in. in diameter, which is collected in the acetate liner. As the core material passes through the cutting shoe, a small inner lip of the inner carrier tube is exposed to the core material before it passes into the acetate core collection sleeve. Unless free liquids were encountered, only the cutting shoe, the outer surfaces of the outer push tube, the lower end of the inner carrier tube, and the inside of the acetate liner will contact core material. These areas were a primary focus for decontamination activities.

Decontamination was applied to these pieces of equipment in the order that they were removed after a core was collected. This order included the inner steel sample sheath that was raised in 1-ft increments, dry-wiped, surveyed for radiological contamination, and monitored for volatile organic compounds (VOCs) with a photoionization detector (PID) for indication of chemical contamination. If any contamination was detected, the tube was further damp-wiped with a light spray of decontamination solution and resurveyed. The inner sample sheath was then placed in a vise, and the sheath drive head was unscrewed to allow removal of the acetate liner and core sample. Each of these steps was preceded by dry wipe-down, chemical and radiological survey, and damp wipe-down decontamination until no contamination was observed above established limits. The limit for radiological contamination was established by radiological work permit, and the limit for monitoring by PID was to decontaminate until no VOC reading was detected.

Once a maximum sampling depth was reached and the sample sheath had been removed, the outer push tube was withdrawn in sections. As it was withdrawn, the process was repeated with dry wipe-down, surveyed, and damp wipe-down until contamination was removed to below established limits. When the last section emerged, it was placed in a plastic bag and put into a vise to remove and decontaminate the cutting shoe. The cutting shoe and the threaded end of the push tube that mates with the shoe were the only decontamination challenges encountered, and spares were used to proceed to the next sample location when more time was required to adequately decontaminate them. In one instance, a shoe could not be adequately decontaminated and it was placed in a bag and disposed of as low-level radioactive waste.

2.5 Field-Screening Surveys and Field Gamma Assay of Cores

The 5-ft sample liners were not opened in the field, but rather kept as contained as possible and monitored to ensure no contaminants were released. The following field-screening techniques were used during the sampling effort as a means to monitor safe working conditions as well as to support core transport off-site:

- gross field radioactivity levels using a variety of detectors (e.g., sodium iodide, alpha/beta scintillation, dose rate meters, and/or scalers for removable activity)
- VOCs using a PID on open ends of sample liners
- gamma-emitting isotopes using a high-purity germanium (HPGe) detector

A radiological control technician conducted surveys within the exclusion zone so that core samples, sample tubes, and push tubes could be surveyed as they emerged and so any contamination could be controlled. A health and safety representative was also inside the exclusion zone to screen the sample tube as it emerged from the ground and the sample core sleeve as it was removed from the sample sheath. The health and safety representative also monitored the general area. Portable multigas PIDs were used at the point of sampling, as well as upwind and downwind of the direct-push rig to monitor for presence of any VOCs.

As a further field survey step of the cores, each core was subjected to field gamma assay using an HPGe detector. The results were immediately screened for indication of gamma emitters and approximate overall activity. Each field assay was later analyzed for estimation of isotopic composition. These steps were used to support sample transport off-site, confirm the field screening results from the other field instruments, and inform further characterization of MDA B. Before excavation, field gamma assay results will be evaluated against laboratory analytical data to determine if they can be correlated. It is expected that field gamma assay will be an important screening tool during excavation.

2.6 Sampling from the Cores

The Laboratory contracted with the American Radiation Services (ARS) to pick up sample cores, transport them to an off-site field laboratory, and prepare actual sample sets for analysis (2006, 094164). A set of samples was prepared for each 5-ft depth interval where cores were obtained at each location. If the final depth-to-tuff for a particular location was 4.5 ft, then only one sample set was prepared for that location. However if the final depth-to-tuff for a location was 14 ft, then three sample sets were prepared: the 0- to 5-ft interval, the 5- to 10-ft interval, and the 10- to 15-ft interval in which tuff were met.

All cores for a particular depth interval and location were removed from the shipping tubes, surveyed, placed in a fume hood, and removed from the plastic bag. Once all the cores for a location and depth interval were in the hood, the following process was used to obtain a sample set.

1. Take photos and record observations.
2. Using a jig, perforate each core at 1-ft intervals along its length and take PID reading at each 1-ft interval.
3. Record values and repeat the process for each core.
4. Determine hot spot (if any) for VOCs, and bias for VOC sampling.
5. Cut open the core with the highest reading or best percent recovery.
6. Immediately fill the VOC sample jar from the target area.

7. Open the remaining cores.
8. Take photographs and observations of soil type, color, layering, debris, staining, etc.
9. Conduct radiological screening of open cores and record counts.
10. Conduct metals screening of open cores using x-ray fluorescence (XRF) and record concentrations.
11. If staining is visible, then take a semivolatile organic compound (SVOC) sample from the stained area.
12. If there is no staining, then collect an SVOC sample from the bottom of the most complete core.
13. Composite the remaining material.
14. If debris is found that looks like possible transite or asbestos, obtain an asbestos sample.
15. Obtain a radiological sample from the remaining material.
16. Obtain a metals sample from the remaining material.
17. Obtain a reactives sample from the remaining material.
18. If sufficient material remains, obtain a dioxins/furans sample from the remaining material.
19. Initiate a chain of custody for the sample set.
20. Store samples at 4°C until ready for transport to the Sample Management Office (SMO).
21. Transport samples to the SMO, for shipment to off-site laboratories.

For each sample set, a log of cores, observations, and readings was recorded. This log information and core photographs were then uploaded into an environmental sample data base under the location ID and sample number. All analytical data received from Laboratory contract laboratories were uploaded into the Laboratory data base as well as the contractor data base under the location ID and sample ID, for example, location ID AS153 and sample ID MDAB-00-04-09-173.

2.7 Off-Site Sample Analysis

In accordance with the “Sampling and Analysis Plan for Direct-Push Technology at Material Disposal Area B” (LANL 2009, 106154), definitive laboratory analysis was subcontracted to meet the analytical requirements outlined in Tables 2.7-1 and 2.7-2.

Analyses were performed by the following analytical laboratories:

- ALS Laboratory Group and ARS International for radiological analyses
- Test America and GEL Laboratories, LLC, for chemical analyses

3.0 FIELD INVESTIGATION RESULTS

3.1 Current Site Conditions

Since the release of the “Investigation/Remediation Work Plan for Material Disposal Area B, Solid Waste Management Unit 21-015, at TA-21, Revision 1” (LANL 2006, 095499), several activities have changed site conditions at MDA B.

- Trees were removed and mulched in place on the south side of MDA B (2007).
- A haul road and a stormwater retention pond system were installed on the south side of MDA B (2007)
- New perimeter fencing was installed around the designated MDA B area of contamination (2007).
- Legacy lighting poles and overhead wire were removed from the north side of MDA B (2009).
- Weed and shrub vegetation was mowed to allow direct-push sampling (2009).
- Forty-five locations within MDA B were core-sampled to depths between 1 and 20ft, using direct-push sampling.

The site configuration remains paved from the west end—three-fourths of the length of MDA B going east—and remains capped on the eastern unpaved portion. The entire area remains free of surface contamination, with the exception of a small area with fixed contamination around sample location AI209 (marked).

3.2 Investigation Results

Results are referenced to the direct-push location IDs (AG153, AI221, etc.) and mapped on Plate 1. Results are further broken down by sample numbers (e.g., MDAB-00-04-09-177), which include indicators of the depth interval of the sample. Sample numbers that begin “MDAB-00-04-” are for the first 5-ft depth interval, those that begin “MDAB-04-08-” are for the second or 5- to 10-ft depth interval, those that begin “MDAB-08-12-” are samples taken at the 10- to 15-ft depth interval, and so on.

Location IDs (associated sample IDs) and core collection field observations are summarized in Table 3.2 1.

3.3 Analytical Data

Tables that present the analytical results are provided in Appendix B on CD with the Microsoft Access data base file for all the data and with Microsoft Excel files in separate folders for radionuclides, inorganics, and organics. Within each folder, tables are provided for summary of detections, frequency of detections, and all analyses. The summary of detections and all analyses tables are organized to present the location ID, sample ID, depth interval in the left three columns, analytes across the top row, and results in the body of the table. Locations IDs are mapped on Plate 1, an aerial photograph of the site, so the reviewer is able to crosswalk the data to the coring locations on MDA B.

Quality assurance/quality control (QA/QC) and data validation procedures were implemented in accordance with the requirements of the Laboratory’s “Quality Assurance Project Plan Requirements for Sampling and Analysis” (LANL 1996, 054609) and the Laboratory’s analytical services statement of work (SOW) for contract laboratories (LANL 1995, 049738; LANL 2000, 071233). The results of the QA/QC procedures were used to estimate the accuracy, bias, and precision of the analytical measurements. Samples for QC include method blanks, matrix spikes, laboratory control samples, internal standards, initial and continuing calibrations, surrogates, and tracers.

The type and frequency of laboratory QC analyses are described in the analytical laboratories SOWs (LANL 1995, 049738; LANL 2000, 071233). Other QC factors, such as sample preservation and holding times, were also assessed in accordance with the requirements outlined in SOP EP-ERSS-SOP-5056, Sample Containers and Preservation. A routine data validation was performed for each data package.

4.0 CONCLUSIONS

The DPT core sampling has provided valuable information on the legacy trenches at MDA B.

The resulting analytical data from DPT have been received, verified, and validated in parallel with preparation of this report; therefore, this report describes the sampling and reports the data. Progress was made toward the objectives of DPT, as follows.

- Analytical data have been obtained to be evaluated against field gamma assay data. This evaluation will occur before excavation.
- Analytical data have been obtained that will contribute to a reevaluation of estimated MAR quantities and distribution in the landfill. The original estimate of MAR is based on a handful of data points, none of which are from samples of actual MDA B landfill material. Before excavation, these analytical data will be reviewed and a decision made to reevaluate estimated MAR or to continue with the current estimate.
- Analytical hazardous materials data are now available to aid in waste excavation planning and initial waste sorting activities. Analytical data on hazardous materials will be evaluated to determine areas that require additional precautions and controls during excavation, as well as areas in which little or no contamination was found and reduced controls are required.
- The depth at which the coring tube struck the underlying tuff rock has provided an indication of the configuration of the trenches and, in certain areas, indication that no trench is present.

Because the historical waste trenches were cut into the underlying tuff to provide trenches of adequate depth, the use of DPT core sampling provided improved indication of waste trench location, depth, and width by virtue of the depth at which the coring tube was stopped by the underlying tuff at each location.

Direct-push core sampling has provided a strong indication at several areas that a waste trench is not present; however, these areas will be further examined to determine the contamination present and possibly identify areas of low or no contamination. These are areas, such as the area referred to as Pit 10, where depth-to-tuff was very shallow for all coring in the area.

In summary, the project has now obtained significantly more data to guide determination of MAR, the excavation plan, and excavation controls.

5.0 REFERENCES

The following list includes all documents cited in this report. Parenthetical information following each reference provides the author(s), publication date, and ER ID. This information is also included in text citations. ER IDs are assigned by the Environmental Programs Directorate's Records Processing Facility (RPF) and are used to locate the document at the RPF and, where applicable, in the master reference set.

Copies of the master reference set are maintained at the NMED Hazardous Waste Bureau and the Directorate. The set was developed to ensure that the administrative authority has all material needed to review this document, and it is updated with every document submitted to the administrative authority. Documents previously submitted to the administrative authority are not included.

ARM (ARM Group, Inc.), May 1, 2006. “Geophysical Investigation of Material Disposal Area C, Los Alamos National Laboratory, Los Alamos, New Mexico,” ARM Project No. 06195, Hershey, Pennsylvania. (ARM 2006, 094164)

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LANL (Los Alamos National Laboratory), April 2009. “Sampling and Analysis Plan for Direct-Push Technology at Material Disposal Area B,” Los Alamos National Laboratory document LA-UR-09-2338, Los Alamos, New Mexico. (LANL 2009, 106154)

Table 2.7-1
Summary of Analytical Requirements for MDA B Radioactive Constituents

Analyte	Method	Approach
Gamma Spectroscopy	Health and Safety Laboratory (HASL)-300	10% of total to verify field HPGe
Alpha Spectrometry	HASL-300	100% of samples above screening level identified by HPGe results
Strontium-90	U.S. Environmental Protection Agency (EPA) 905.0	100% of total
Tritium	EPA 906.0	Maximum 20% of total, visual liquid (random)

Table 2.7-2
Summary of Analytical Requirements for MDA B Hazardous Constituents

Analyte	Method	Approach
VOC target compound list	EPA 8260b	100% of total
SVOC list	EPA 3545/8270d	100% of total
Target analyte list metals + uranium	EPA 3050b/6020a	100% of total
Mercury	EPA 7471b	100% of total
Toxicity characteristic leaching procedure	EPA 1311	100% of total
Dioxins/furans	EPA 8280/90	If polycyclic aromatic hydrocarbons >2 ppm (fire + chlorinated aromatics = mechanism for tetrachlorodibenzo-*p*-dioxin formation)

Table 3.2-1
Core Collection Field Observations by Location ID and Sample ID

Location ID	Sample ID	# Cores	Depth to Tuff (ft.)	Field Screening		Core Collection and Sampling Observations
				PID ppm	Infrared (°F)	
AS153	MDAB-00-04-09-173	2	5	0.3	85	Sandy soil mixed with 1-2 in. chunks of weathered, Qbt 3 tuff; color change of reddish brown to light gray 1 ft below ground surface (bgs)
AU152	MDAB-00-04-09-178	2	6.5	0.3	94	Soil
	MDAB-04-08-09-177	1		0	97	Medium brown sandy soil mixed with weathered, light/medium gray, weathered Qbt 3 tuff
AU154	MDAB-00-04-09-181	2	5	0	82	Soil with apparent blue tarp material 2 in. in diameter observed in fill material 0–1 ft bgs
AW152	MDAB-00-04-09-185	3	6.5	0	86	Medium brown sandy soil mixed with a few pebbles
	MDAB-04-08-09-186	2		0	96	Medium brown sandy soil and weathered light/medium gray Qbt 3 tuff
BB153	MDAB-00-04-09-189	2	5	0	93	Soil with blue tarp material at top of sample
	MDAB-04-08-09-190	1		0	93	Partial core collected ,but too small to sample
AI155	MDAB-00-04-09-193	2	10	0	87	Dark brown staining in upper 2–3 ft of core
	MDAB-04-08-09-194	3		0	80	Moist dark brown clay in upper section; crushed tuff soil at depth of 8–10 ft
AI157	MDAB-00-04-09-197	4	9	0	90	Dark brown to light brown soils followed by light gray tuff
	MDAB-04-08-09-198	4		0	91	Brown soil below a layer of rocks; pink bands/layers in the soil; pink debris has the texture of latex
AJ158	MDAB-00-04-09-201	2	9	0	80	Soil from dark brown, to light brown, to gray
	MDAB-04-08-09-202	2		0.3	79	Soil with some chunks of tuff and rocks throughout; rubbery material found; small scrap of metal in Core B
AG167	MDAB-00-04-09-205	3	4	0	92	Soil with heavy clay content (dark brown to reddish); stained area with white crumbly material (possibly drywall)
AH167	MDAB-00-04-09-209	3	2	0.1	96	Soil with heavy clay content, with a rocky layer (dark brown to reddish); stained area with white crumbly material on all cores
AI176	MDAB-00-04-09-213	1	9	0	78	Dark to medium brown soil with a rocky layer at the bottom of the core; dark staining near the chip seal
	MDAB-04-08-09-214	4		0	78	Medium brown soil with some rocky areas; yellow clay at the bottom of Core C, containing uranium

Table 3.2-1 (continued)

Location ID	Sample ID	# Cores	Depth to Tuff (ft.)	Field Screening		Core Collection and Sampling Observations
				PID ppm	Infrared (°F)	
AJ183	MDAB-00-04-09-217	2	9	0	82.6	Soil
	MDAB-04-08-09-218	2		0	79.1	Medium brown clay soil, with some areas of dark brown staining; Core B had a sodium iodide measurement of 24,135 cpm
AI180	MDAB-00-04-09-221	1	10	0	85	Soil
	MDAB-04-08-09-222	3		0.3	85	Medium brown soil, some plant material at the top; dark asphalt layer near the bottom; some white material in the middle (Core B), sampled for asbestos
AI185	MDAB-00-04-09-225	2	7	0	87	Soil under chip seal
	MDAB-04-08-09-226	2		0	85	Soil and a small area of chip seal
AI191	MDAB-00-04-09-229	2	4.5	0	89	Chip seal, light brown soil, reddish rocks
AI200	MDAB-00-04-09-233	1	11	0	75	Chip seal , soil, crushed tuff
	MDAB-04-08-09-234	1		0	72	Soil containing broken glass and pieces of rubber material recovered from Core 235
	MDAB-08-12-09-235	1		0	72	No sample: less than 6-in. core combined with 234
AI209	MDAB-00-04-09-237	1	12	0	77	Brown heavy clay soil with gray tuff at the base; a small piece of glass was found
	MDAB-04-08-09-238	1		0	78	Soil, whitish roots, and possible drywall material found
	MDAB-04-08-09-239	1		0.2	75	No sample: less than 6-in. core combined with 238
	MDAB-12-16-09-240	0		X	X	Tuff plug from cutting shoe after collecting core; MDA B-08-12-09-239 exhibited high activity
AI213	MDAB-00-04-09-241	2	11	0	75	Soil and crushed tuff below chip seal
	MDAB-04-08-09-242	2		0	71	Soil and rocks
	MDAB-08-12-09-243	1		0	69	No sample: less than 6-in. core combined with 242
AH215	MDAB-00-04-09-245	3	7	3.7	81	Tuff very shallow (2 ft) for the easternmost sample; this appears to a trench edge; liquid oily substance in one of the cores; soil and crushed tuff below chip seal
	MDAB-04-08-09-246	2		23	88	Soil and crushed tuff; potential debris, rock or bricklike material containing Lead, as recorded during the XRF scan (129 ppm)

Table 3.2-1 (continued)

Location ID	Sample ID	# Cores	Depth to Tuff (ft.)	Field Screening		Core Collection and Sampling Observations
				PID ppm	Infrared (°F)	
AI217	MDAB-00-04-09-249	2	7	0	78	Dark brown soil, medium brown soil, and crushed gray tuff; Core B had some pinkish staining
	MDAB-04-08-09-250	2		0	79	Medium brown heavy clay soil and crushed tuff
AI224	MDAB-00-04-09-253	3	2	0.5	97.3	Soil with tuff; orange bricklike material that is potentially waste
AI229	MDAB-00-04-09-398	2	11	0	78	Chip seal at the top, darker to medium brown heavy clay soil; an area (8 in.) of concrete in Core A; orange-stained, sandy soil at the base of Core B
	MDAB-04-08-09-399	2		0	78	Brown soil, crushed tuff, crushed reddish bricklike material in both cores
	MDAB-08-12-09-400	1		0	73	No sample: less than 6-in. core combined with 399
AI234	MDAB-00-04-09-257	2	13	0	79	Soil and crushed tuff below chip seal cap and about 5% concrete chunks; hit refusal in debris & relocated
	MDAB-04-08-09-258	1		0	78	Soil and crushed tuff; potential debris, rock or bricklike material containing Lead, as recorded during the XRF scan (12 ppm)
	MDAB-08-12-09-259	1		0	77	95% soil, 5% debris; debris includes a piece of latex glove and broken glass
AI245	MDAB-00-04-09-261	2	12	0	78	Chip seal, soil, chunks of concrete, crushed tuff, and sandy soil at the bottom
	MDAB-04-08-09-262	2		0	75	Soil, rocks and some paper material
	MDAB-08-12-09-264	1		0	75	No sample: less than 6-in. core combined with 262
AI251	MDAB-00-04-09-265	2	9	0	80	Soil, rocks, and crushed tuff below the chip seal cap
	MDAB-04-08-09-266	2		0	77	soil and crushed tuff
AI256	MDAB-00-04-09-269	2	9	0	84	95% rocky soil and crushed tuff below the chip seal , and 5% concrete; potential sieve of transite asbestos panel
	MDAB-04-08-09-270	2		0	83	Soil and crushed tuff; potential debris, rock or bricklike material containing lead, as recorded during the XRF scan (12 ppm)
AL256	MDAB-00-04-09-273	2	5.5	0	83	Heavy clay soil, rocks, and reddish crushed tuff; dark staining near the base of the cores
	MDAB-04-08-09-274	1		0	82	No sample: combined with 273
AN226	MDAB-00-04-09-277	1	3	0	84	Soil below the chip seal; some small pinkish areas were observed that may be crushed brick

Table 3.2-1 (continued)

Location ID	Sample ID	# Cores	Depth to Tuff (ft.)	Field Screening		Core Collection and Sampling Observations
				PID ppm	Infrared (°F)	
AM228	MDAB-00-04-09-281	1	4	0	84	Soil and crushed tuff under the chip seal
AM232	MDAB-00-04-09-285	1	4	0	84	Soil and crushed tuff under the chip seal; pink paperclip recovered from the core during compositing of the sample material
NH27	MDAB-00-04-09-289	3	11	1.1	78	Tuff hit at 2 ft for the initial push; drop-off in depth-to-tuff to 11 ft on south push; chip seal, soil, rocks and crushed tuff, with an area of white, crumbly material; white, crumbly material sampled for asbestos
	MDAB-04-08-09-290	2		0	75	Soil and tuff with chip seal at the top
	MDAB-08-12-09-291	1		0	75	No sample: less than 6-in. core combined with 290
NJ30	MDAB-00-04-09-293	1	9	0	82	Soil, concrete and sand under chip seal
	MDAB-04-08-09-294	1		0	82	100% sand; stained areas near the middle of the core
NJ35	MDAB-00-04-09-297	2	5	0	93	Heavy clay soil and sand below the chip seal
NI48	MDAB-00-04-09-301	2	5	0	80	Soil and some grey tuff at the base
	MDAB-04-08-09-302	1		0	75	No sample: combined with 301
NH33	MDAB-00-04-09-305	2	2.5	0	89	Chip seal, rocks, and tuff
NI43	MDAB-00-04-09-309	2	7	0	80	The core taken south of the original found tuff at 4 ft; heavy clay soil below the chip seal cap
	MDAB-04-08-09-310	1		0	80	Crushed tuff
NI38	MDAB-00-04-09-313	3	3	0	79	First push hit refusal at 1-ft depth, second at 2 ft. and third at 3 ft, such that this may be refusal in debris; heavy clay soil, rocky soil, medium brown-to-reddish crushed tuff; a small amount of concrete in Cores B and C, below the chip seal.
NG56	MDAB-00-04-09-317	2	20	0	72	Original push hit refusal in tuff at 2-ft depth; upon relocating 2 ft south, pushed to 20-ft depth; soil and crushed tuff
	MDAB-04-08-09-318	1		0	68	Soil and tuff
	MDAB-08-12-09-319	1		0	63	Crushed grey tuff
	MDAB-12-16-09-320	1		0	63	Crushed tuff; found a small amount of debris, including latexlike material and plastic
NH59	MDAB-00-04-09-321	2	16	0.1	81	Depth of tuff increases sharply here; original push had a depth of 2 ft; soil and tuff
	MDAB-04-08-09-322	2		0	76	Soil and tuff
	MDAB-08-12-09-323	2		0	73	Crushed tuff
	MDAB-12-16-09-324	1		0	68	Crushed grey tuff

Table 3.2-1 (continued)

Location ID	Sample ID	# Cores	Depth to Tuff (ft.)	Field Screening		Core Collection and Sampling Observations
				PID ppm	Infrared (°F)	
NG61	MDAB-00-04-09-325	1	16	0	71	Rocky soil and crushed tuff
	MDAB-04-08-09-326	1		0	70	To the east of the original sample, the depth of tuff decreases to 10 ft; rocky soil and crushed tuff.
	MDAB-08-12-09-327	2		0	65	Crushed grey tuff
	MDAB-12-16-09-328	1		0	64	Crushed grey tuff
NG75	MDAB-00-04-09-329	1	20	0	79	Soil, rocks, and crushed tuff
	MDAB-04-08-09-330	1		0.2	82	Reddish and grey crushed tuff
	MDAB-08-12-09-331	1		0	82	Crushed grey tuff
	MDAB-12-16-09-332	1		0	71	No sample: less than 6-in. core combined with 331.
NG77	MDAB-00-04-09-382	1	16	0	80	Crushed tuff with some plant material
	MDAB-04-08-09-383	1		0	76	To the east of the original sample, the depth of tuff decreases to 10 ft; reddish and grey crushed tuff
	MDAB-08-12-09-385	3		0	75	Crushed tuff; found a small amount of debris, including latexlike material and plastic
	MDAB-12-16-09-384	1		0	71	Grey crushed tuff
NI85	MDAB-00-04-09-389	2	4	0	81	Soil, tuff, small amount of plant matter
NF95	MDAB-00-04-09-390	1	8	0	82	Soil, rocks, and crushed tuff; a small piece of red tape, that appears recent was found at the top of the core
	MDAB-04-08-09-391	1		0	82	Refusal at 1-ft depth to the north and south of original sampling location; crushed grey tuff.
NG103	MDAB-00-04-09-394	1	11	0	73	Rocky soil and rocks at the bottom
	MDAB-04-08-09-395	1		0	71	Soil and crushed tuff
	MDAB-08-12-09-396	1		0	73	Crushed grey tuff

Appendix A

Acronyms and Abbreviations, Metric Conversion Table, and Data Qualifier Definitions

A-1.0 ACRONYMS AND ABBREVIATIONS

ARS	American Radiation Services
bgs	below ground surface
DPT	direct-push technology
EPA	Environmental Protection Agency
GIS	geographic information system
GPS	global positioning system
HASL	health and safety laboratory
HPGe	high purity germanium (detector)
ID	identification
LANL	Los Alamos National Laboratory
MAR	material at risk
MDA	material disposal area
NMED	New Mexico Environment Department
PID	photoionization detector
PVC	polyvinyl chloride
QA/QC	quality assurance/quality control
SMO	Sample Management Office
SOW	statement of work
SVOC	semivolatile organic compound
SWMU	solid waste management unit
TA	technical area
VOC	volatile organic compound
XRF	x-ray fluorescence

A-2.0 METRIC CONVERSION TABLE

Multiply SI (Metric) Unit	by	To Obtain U.S. Customary Unit
kilometers (km)	0.622	miles (mi)
kilometers (km)	3281	feet (ft)
meters (m)	3.281	feet (ft)
meters (m)	39.37	inches (in.)
centimeters (cm)	0.03281	feet (ft)
centimeters (cm)	0.394	inches (in.)
millimeters (mm)	0.0394	inches (in.)
micrometers or microns (µm)	0.0000394	inches (in.)
square kilometers (km^2)	0.3861	square miles (mi^2)
hectares (ha)	2.5	acres
square meters (m^2)	10.764	square feet (ft^2)
cubic meters (m^3)	35.31	cubic feet (ft^3)
kilograms (kg)	2.2046	pounds (lb)
grams (g)	0.0353	ounces (oz)
grams per cubic centimeter (g/cm^3)	62.422	pounds per cubic foot (lb/ft^3)
milligrams per kilogram (mg/kg)	1	parts per million (ppm)
micrograms per gram (µg/g)	1	parts per million (ppm)
liters (L)	0.26	gallons (gal.)
milligrams per liter (mg/L)	1	parts per million (ppm)
degrees Celsius (°C)	9/5 + 32	degrees Fahrenheit (°F)

A-3.0 DATA QUALIFIER DEFINITIONS

Data Qualifier	Definition
U	The analyte was analyzed for but not detected.
J	The analyte was positively identified, and the associated numerical value is estimated to be more uncertain than would normally be expected for that analysis.
J+	The analyte was positively identified, and the result is likely to be biased high.
J-	The analyte was positively identified, and the result is likely to be biased low.
UJ	The analyte was not positively identified in the sample, and the associated value is an estimate of the sample-specific detection or quantitation limit.
R	The data are rejected as a result of major problems with quality assurance/quality control (QA/QC) parameters.

Appendix B

Analytical Preliminary Results Summary of Data Tables
(on CD included with this report)

Appendix C

Analytical Preliminary Results Complete Data Files
(on CD included with this document)

Plate 1. MDA B DPT Locations

Portage Inc.; Date: 09.14.2009
Map #: MDAB_DPTLocsPIOnlyRep_v1.rv0

Disclaimer: This map was created for work processes associated with the MDA B DPT Phase I Investigation Report. All other uses for this map should be confirmed with the LANL Enviromental Programs Directorate.