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Date: September 8, 2005
Refer to: ER2005-0665

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

SUBJECT: SUBMITTAL OF THE INVESTIGATION REPORT FOR MATERIAL DISPOSAL AREA G CONSOLIDATED UNIT 54-013(b)-99 AT TECHNICAL AREA 54

Dear Mr. Bearzi:

Enclosed please find two hard copies with electronic files of the "Investigation Report for Material Disposal Area G, Consolidated Unit, 54-013(b)-99 at Technical Area 54."

The report describes the results of the investigation activities conducted to complete characterization of the nature and extent of contaminant releases at MDA G. The drilling and sampling of 1 of the 38 required boreholes (borehole 1) was not completed in July along with the other 37 boreholes. Borehole 1 was delayed approximately six weeks while nuclear safety requirements were resolved and implemented. Borehole 1 was completed on August 20th, 2005. The preliminary analytical results for borehole 1 are included in this report. Rather than request an extension to the submittal date, we will forward validated analytical results, chain-of-custody forms, and data packages for borehole 1 by October 7, 2005. Based on preliminary data, we do not anticipate that the calculated human health or ecological risks will change.

If you have questions, please contact John Hopkins at (505) 667-9551 (johnhopkins@lanl.gov) or Frank Bosiljevac at (505) 855-5746 (fbosiljevac@doeal.gov).

Sincerely,

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

Sincerely,

David Gregory, Federal Project Director
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LA-UR-05-6398
September 2005
ER2005-0626

Investigation Report for Material Disposal Area G, Consolidated Unit 54-013(b)-99, at Technical Area 54

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Prepared by
Environmental Stewardship Division–
Environmental Remediation and Surveillance Program

LA-UR-05-6398
ER2005-0626

Investigation Report for Material Disposal Area G, Consolidated Unit 54-013(b)-99, at Technical Area 54

September 2005

Responsible project leader:

John K. Hopkins		Project Leader	ENV-ECR	9/6/05
Printed Name	Signature	Title	Organization	Date

Responsible UC representative:

David McInroy		Deputy Program Director	ENV-ERS	9/7/05
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Responsible DOE representative:

David Gregory		Federal Project Director	DOE-LASO	9/7/05
Printed Name	Signature	Title	Organization	Date

EXECUTIVE SUMMARY

This investigation report describes the results of the 2005 field investigation proposed in the investigation work plan for Material Disposal Area (MDA) G and approved with modifications by the New Mexico Environment Department. This investigation report also presents an assessment of the nature and extent of contamination and the potential present-day risks to human health and the environment associated with MDA G based on the results of investigations conducted from 1986 through August 2005.

The objectives of the 2005 investigation were to complete the determination of the nature and extent of releases of hazardous waste constituents and/or radionuclides identified during the 1993 through 1995 Phase I Resource Conservation and Recovery Act facility investigation (RFI) and to collect additional information on the hydrogeologic properties and other physical characteristics of the vadose zone beneath MDA G.

In total, 39 boreholes were drilled alongside MDA G disposal units. Thirty-seven boreholes were drilled using a hollow-stem auger rig either to refusal or to the target depth specified in the approved work plan. Boreholes 38 and 39 were drilled to a depth of 556 and 700 ft, respectively, with an air-rotary rig to determine whether perched water was present. The 38th borehole was abandoned at 556 ft when drilling problems prevented the target depth of 700 ft from being reached, thus requiring a 39th borehole to be drilled at an adjacent location to a depth of 700 ft.

Continuous core was collected in the 37 shallow boreholes to characterize the stratigraphy beneath the site, and samples were collected and analyzed for target analyte list metals, cyanide, nitrates, explosive compounds, dioxins, furans, perchlorate, volatile organic compounds (VOCs), and radionuclides. The sampling also focused on fracture characterization. Samples of fracture fill and surrounding intact tuff were collected when substantial fractures were encountered. Finally, geotechnical and geochemical samples were collected from the deep boreholes to measure chloride-ion concentration, matric potential, and moisture content. Moisture content and matric potential samples were collected every 5 ft; samples for chloride analysis were collected every 10 ft from recovered core. Pore-gas samples for tritium and VOCs were collected to evaluate the nature and extent of vapor-phase VOCs and tritium in pore water beneath MDA G.

The results of soil and rock sample analyses detected a number of organic and inorganic chemicals at trace levels beneath the former disposal units and were generally consistent with the results obtained during the Phase I RFI. The only organic chemicals detected in core samples were trace levels of several dioxin and furan congeners. Inorganic chemicals detected above background levels did not show any discernable patterns or trends and did not indicate a release from any of the historical waste units at MDA G.

A number of naturally occurring and anthropogenic radionuclides were detected or detected above background values in soil and rock samples from beneath MDA G. Anthropogenic radionuclides detected included americium-241, plutonium-238, plutonium-239, and strontium-90. These detections were generally sporadic across the site. Naturally occurring radionuclides detected above background values included thorium isotopes, uranium-234, uranium-235, and uranium 238. Naturally occurring radionuclides were detected at concentrations within the natural variability of these chemicals in the subsurface.

The analytical results from pore-gas samples collected from 38 of the 39 boreholes in 2005 confirmed the presence of VOCs (consisting primarily of chlorinated VOCs) in the vadose zone beneath MDA G. Data collected during the Phase I RFI, quarterly monitoring, and the 2005 investigation indicate the highest VOC concentrations are beneath the eastern and south-central portions of MDA G and are limited at depth by the Cerros del Rio Basalt. The dominant subsurface vapor contaminant is 1,1,1-trichloroethane. Tritium was detected in pore-gas samples collected from 35 of the 38 boreholes sampled. The highest concentrations were detected in samples from locations in the eastern and south-central portions of MDA G, coinciding with the highest vapor concentrations of VOCs.

Subsurface samples collected to evaluate moisture content and geophysical logging did not identify perched water zones to a depth of 700 ft beneath MDA G. Gravimetric moisture analyses showed moisture levels ranging from 0.2% to 27.2% moisture by weight with all samples except one showing moisture levels less than, or equal to, 11.2%. Laboratory matric potential readings confirmed that all samples collected beneath MDA G contained moisture levels below saturation. Perched groundwater was not detected in any of the 39 boreholes, including the borehole completed to a depth of 700 ft.

Data gathered during the Phase I RFI, quarterly monitoring events, and the approved investigation work plan activities have characterized the nature and extent of contamination in surface and subsurface media. Results from the human health and ecological assessments show that MDA G poses no unacceptable present-day risk to human health and the environment.

Based on the results of the Phase I RFI, quarterly pore-gas monitoring, and the 2005 investigation sampling, no additional data are needed to characterize the nature and extent of contaminant releases at MDA G. The pore-gas sampling data indicate that the existing subsurface vapor-monitoring network is adequate, although several locations were identified for construction of additional vapor-monitoring wells. Therefore, the investigation report makes the following recommendations:

- complete a corrective measures evaluation to ensure that future releases from the site pose no unacceptable risks to human and ecological receptors, and
- monitor subsurface vapor beneath MDA G in accordance with a long-term monitoring plan to be approved by the New Mexico Environment Department.

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1.0 INTRODUCTION

Los Alamos National Laboratory (LANL or the Laboratory) is a multidisciplinary research facility owned by the U.S. Department of Energy (DOE) and managed by the University of California (UC). The Laboratory is located in north-central New Mexico, approximately 60 mi northeast of Albuquerque and 20 mi northwest of Santa Fe. The Laboratory site covers 40 mi^2 of the Pajarito Plateau, which consists of a series of finger-like mesas separated by deep canyons containing perennial and intermittent streams running from west to east. Mesa tops range in elevation from approximately 6200 ft to 7800 ft above sea level (asl).

The Laboratory's Environmental Stewardship Division–Environmental Remediation and Surveillance (ENV-ERS) Program is participating in a national effort by DOE to clean up sites and facilities formerly involved in weapons research and production. The goal of ENV-ERS is to ensure that past operations at the Laboratory do not threaten human or environmental health and safety in and around Los Alamos County, New Mexico. To achieve this goal, ENV-ERS is currently investigating sites potentially contaminated by past Laboratory operations. The sites under investigation are either solid waste management units (SWMUs) or areas of concern (AOCs). This report describes the investigation undertaken at Material Disposal Area (MDA) G to fulfill the requirements of Section IV.C.1.c of the March 1, 2005, Compliance Order on Consent (hereafter, the Consent Order) signed by the New Mexico Environment Department (NMED), DOE, and UC.

Historically, MDA G at Technical Area (TA) 54, also referred to as Consolidated Unit 54-013(b)-99, was used for the disposal of low-level radioactive waste (LLW), certain radioactively contaminated infectious waste, asbestos-contaminated material, and polychlorinated biphenyls (PCBs). It was also used for the retrievable storage of transuranic (TRU) waste. On November 5, 2004, NMED approved the MDA G investigation work plan (hereafter, the approved work plan) with modifications (NMED 2004, 89371) to finalize the environmental characterization of the site. The Laboratory incorporated NMED's comments and issued a revised work plan on December 1, 2004 (LANL 2004, 87833). Implementation of the approved work plan meets the requirements for investigating MDA G contained in Section IV.C.1.c of the Consent Order. Thirty-nine boreholes were drilled alongside subsurface pits, shafts, and trenches, and numerous subsurface samples were collected and analyzed for organic chemicals, inorganic chemicals, and radionuclides. The locations of the subsurface SWMUs were determined by analyzing data from two global positioning system (GPS) surveys, one conducted in 1994 by Johnson Controls, Inc., and another in 1998 by the Laboratory (LANL 2003, 75908), and by reviewing as-built drawings (LASL, LANL 1977–1989, 76099). The shafts and the corners of the disposal pits and trenches were surveyed in 1994.

This investigation report (IR) has been written according to the requirements described in the Consent Order, Appendix XI, Reporting Requirements. This IR assesses the nature and extent of contamination based upon a review of analytical laboratory results from samples collected at the site. It also assesses the potential present-day risks/doses to human health and the environment associated with MDA G based on the results of field investigations conducted from 1986 through August 2005.

Appendix A includes a list of acronyms and defines the terms and the data qualifiers used in this report. Appendix B summarizes the field methods used during the site investigations. Appendix C includes logs for the 39 boreholes drilled for this investigation, along with downhole geophysical survey results. Appendix D provides a description of the quality assurance (QA)/quality control (QC) program. Appendix E contains analytical results, the chain-of-custody forms, and the data validation reports. Appendix F is a review of the analytical data. Appendix G contains the ecological and human health risk assessments for MDA G. Appendix H includes the ecological scoping checklist and surface water assessment. Appendix I presents the long-term subsurface vapor monitoring plan for MDA G. Appendix J documents the management of investigation-derived waste (IDW). Appendix K presents a report evaluating sediment data from canyon reaches downgradient of MDA G.

2.0 BACKGROUND

MDA G is located in the east-central portion of the Laboratory at TA-54, Area G, on Mesita del Buey (Figure 2.0-1). MDA G consists of inactive subsurface units that include 32 pits, 194 shafts, and 4 trenches with depths ranging from 10 to 65 ft below the original ground surface (Figure 2.0-2). The pits, trenches, and shafts are constructed in unit 2 (caprock) and unit 1 (subsurface) of the Tshirege Member of the Bandelier Tuff (consolidated tuff units). The regional aquifer is estimated to be at an average depth of approximately 930 ft below ground surface (bgs) at MDA G, based on data from wells in the vicinity of the area and the predictions of the hydrogeologic conceptual model for the Pajarito Plateau (LANL 1998, 59599). The topography of Area G is relatively flat. Portions of the disposal units at MDA G are covered with concrete to house ongoing waste-management activities conducted at area G; surface runoff from the site is controlled and discharges into drainages to the north (towards Cañada del Buey) and the south (towards Pajarito Canyon). Storm water and sediment monitoring stations are distributed throughout the surface of Area G and in drainages leading to the canyons. The inactive subsurface disposal units and the existing surface structures used for current waste-management activities are shown in Figure 2.0-2.

The depth of the inactive disposal units, described in the approved Resource Conservation and Recovery Act (RCRA) facility investigation (RFI) work plan for Operable Unit (OU) 1148 (LANL 1992, 07669), is based on historical records. The subsequent placement of the cover material over the disposal units has increased elevations across the site. At the time of excavation, the elevation of the disposal units was estimated from the tuff/soil interface identified in the Phase I RFI borehole logs (LANL 1996, 54462).

MDA G is located in an industrial area within TA-54. The Laboratory does not anticipate land use at TA-54 will change from industrial in the foreseeable future. Public access to the site is restricted by fencing and locked gates, and entry onto Pajarito Road is restricted to Laboratory employees and authorized contractor personnel. Under present-day conditions, only Laboratory employees or contractors may enter Area G for site-management activities (e.g., installing best management practices, conducting waste-management operations, or performing environmental sampling).

2.1 Site History

During the 1950s, the Laboratory, with approval of the U.S. Atomic Energy Commission and upon the recommendation of the U.S. Geological Survey, selected Mesita del Buey within TA-54 for underground disposal of Laboratory-derived waste (Rogers 1977, 05707; Rogers 1977, 05708, p. G-1). Since then, the main waste storage and disposal facilities for the Laboratory have been located at TA-54. MDA G is one of four MDAs on Mesita del Buey between Pajarito Canyon (south) and Cañada del Buey (north) (Figure 2.1-1).

MDA G is a decommissioned (i.e., removed from service) subsurface site established for disposition of LLW, certain radioactively contaminated infectious waste, asbestos-contaminated material, and PCBs. It was also used for the retrievable storage of TRU waste. MDA G began operations in 1957. The operational history of MDA G is summarized in the approved RFI work plan for OU 1148 (LANL 1992, 07669, pp. 5-179 to 5-200) and in Appendix B, the historical investigation report (HIR), of the approved work plan for MDA G (LANL 2004, 87833). Furthermore, the performance assessment and composite analysis report (LANL 1997, 63131) and the safety analysis report for Area G (LANL 1995, 63300) present additional information on MDA G.

At MDA G, 32 pits, 194 shafts, and 4 trenches were excavated into the overlying soil in unit 2 (caprock) and unit 1 (subsurface) of the Tshirege Member of the Bandelier Tuff. The pits, shafts, and trenches were unlined. Summaries of operational periods and wastes received by each pit, trench, and shaft are presented in Tables 2.1-1 through 2.1-3. During operation (i.e., when waste was being received), the pits and trenches remained open to the atmosphere. When active the shafts remained covered and locked with steel lids for safety and security. When operations ceased the remaining capacity of the pits, shafts, and trenches was backfilled with clean, crushed, compacted tuff and closed. The disposal shafts were then capped with a concrete plug (LANL 1992, 07669, p. 5-179).

2.2 Results of Previous Investigations

2.2.1 Pre-RFI Investigations

On May 7, 1985, the Laboratory received a Compliance Order from the New Mexico Environmental Improvement Division (NMEID, now NMED) that addressed numerous waste management issues at the Laboratory (NMEID 1985, 75885). The 1985 Order specified the following six tasks involving site-investigation activities in and around Area G:

- Task 1: Measure the intrinsic permeability of the tuff
- Task 2: Determine the soil-moisture characteristic curves
- Task 3: Determine the unsaturated hydraulic conductivity of the Bandelier Tuff
- Task 4: Analyze the infiltration and redistribution of meteoric water into the tuff
- Task 5: Characterize core and pore gas in the vadose zone
- Task 6: Determine if perched water exists beneath MDA G

The results and outcomes of these six tasks are described in a hydrogeologic assessment of Areas G and L in TA-54 (LANL 1987, 76068, pp. 6-2–6-7), submitted to NMEID in 1987 in response to the 1985 Compliance Order Schedule.

2.2.2 Phase I RFI Investigations

In 1993, 1994, and 1995, ambient-air, channel-sediment, and subsurface-core samples were collected during a Phase I RFI. In addition, quarterly pore-gas samples have been collected since 1985. The results of these previous investigations, which were reported in the HIR of the approved work plan for MDA G (LANL 2004, 87833, pp. B-5–B-18), are summarized in the following sections.

Sampling and Analysis of 1994 Sediment Samples

Phase I RFI channel sediment sampling was conducted at MDA G in July 1994. A total of 113 channel sediment samples were collected from drainages leading from Area G (LANL 1996, 54462) from depths between 0 in. and 10 in. using stainless steel trowels. Sediment samples were collected from seven to ten locations in each of the Area G drainages (Figure 2.2-1). All samples were field-screened by the Laboratory's mobile radiological analysis laboratory. Screening was used to identify 59 samples to be submitted to an off-site contract laboratory for analysis, including 4 samples from each of the drainage channels. These samples were analyzed for inorganic chemicals (target analyte list [TAL] metals and cyanide), organic chemicals (PCBs and pesticides), radionuclides (by gamma spectroscopy), americium-241, tritium, isotopic thorium, strontium-90, isotopic uranium, and isotopic plutonium (LANL 1996, 54462).

Channel sediments contained low concentrations of methoxychlor. Americium-241, cesium-137, cobalt-60, plutonium-238, plutonium-239, and tritium were detected at concentrations greater than their respective background values (BVs) in channel sediments (Figures 2.2 -2 and 2.2-3; Table 2.2-1). Cobalt, selenium, and silver were not detected; however, the detection limits (DLs) for some samples were elevated above BVs (Table 2.2-2). Barium, cadmium, chromium, copper, mercury, and iron were detected above BVs. The extent of contamination in channel sediments was not defined.

Sampling and Analysis of Core Samples, 1993 through 1995

Between September 1993 and May 1995, 156 core samples were collected from 10 vertical and 10 angled boreholes drilled near MDA G disposal units (Figure 2.2-4) (LANL 2004, 87833, p. B-30) and submitted to an off-site contract laboratory for analysis. The depth intervals for sample collection and analytical suites varied by borehole and ranged from 38.5 ft to 153 ft bgs.

A review and an analysis of radionuclides in tuff beneath the pits, trenches, and shafts indicate infrequent detections of radionuclides below the disposal units. Radionuclides detected in tuff samples at MDA G include americium-241, cesium-137, cobalt-60, europium-152, plutonium-238, plutonium-239, strontium-90, thorium-230, uranium-234, uranium-235, and uranium-238 (Figure 2.2-5; Table 2.2-3). The Phase I RFI data do not indicate a release of radionuclides from the disposal units because no pattern of detections was observed from the borehole samples. However, the Phase I RFI coverage was insufficient to conclude no releases had occurred.

A review and an analysis of inorganic chemicals in tuff beneath the pits, trenches, and shafts indicate infrequent detections of inorganic chemicals above BVs below the disposal units. Inorganic chemicals detected include antimony, cadmium, cyanide, mercury, molybdenum, selenium, silver, thallium, and vanadium (Figure 2.2-6; Table 2.2-4). Phase I RFI data did not determine whether a release of inorganic chemicals occurred from the disposal units because of elevated DLs and insufficient spatial coverage.

Sampling and Analysis of Surface Flux

Volatile organic compound (VOC) surface flux was measured across Area G in two surveys conducted in August 1993 and August 1994 using a surface flux chamber and EMFLUX surface adsorbent cartridges. Details of the surface flux chamber investigations are reported in Eklund (1995, 56033). Details of the EMFLUX surface adsorbent cartridges investigations are presented in two Quadrel Services reports (Quadrel 1993, 63868; Quadrel 1994, 63869) and in Trujillo et al. (1998, 58242). During the summers of 1993 and 1994, tritium flux was measured at 142 locations on and near the surface of Area G (Eklund 1995, 56033).

Additionally, in 1994, 16 ambient-air samples were collected for 8 days at 2 sampling locations along the northern perimeter of Area G. Surface flux and ambient-air sampling results indicated VOCs and tritium were being released into the atmosphere from the subsurface.

Sampling and Analysis of Tritium in Pore Gas

In 2003, 13 subsurface pore-gas samples collected from boreholes (BHs) 54-01110 and 54-01111 (adjacent to the tritium disposal shafts) were analyzed for tritium.

A review and an analysis of the data indicate that tritium has been released into the tuff beneath the disposal units. The vertical extent of tritium contamination was not defined.

VOCs (primarily 1,1,1-trichloroethane [TCA]) were detected in subsurface pore gas, indicating a release. The vertical extent of contamination was not defined.

2.2.3 Quarterly Sampling of VOCs in Pore Gas, 1985 through 2004

Because methods and resulting data quality have changed significantly over the years, pore-gas data collected before 1996 were used only semiquantitatively in the MDA G HIR (LANL 2005, 87833). Data collected from 1997 to the present have been subjected to rigorous QA/QC procedures. The pore-gas monitoring data for MDA G indicate that TCA is the primary VOC detected.

Analyses of the pore-gas monitoring data indicated that the two subsurface vapor-phase VOC plumes present are closely associated with the earliest MDA G disposal pits: Pits 1 through 5 and Pits 25 and 26. The detectable VOC concentrations were known to extend to at least 153 ft bgs.

3.0 SCOPE OF ACTIVITIES

This section describes the field activities undertaken to implement the approved work plan for MDA G. The objectives of the investigation were to complete the determination of the nature and extent of hazardous waste constituent and/or radionuclide releases identified during the Phase I RFI and reported in the MDA G HIR (LANL 2005, 87833, pp. B-5–B-18).

The approved work plan for MDA G required conducting geophysical surveys, drilling 38 boreholes adjacent to or under the disposal units, and collecting samples to supplement the Phase I RFI data to determine the nature and extent of contamination. One borehole was drilled to 700 ft bgs to determine whether perched groundwater is present and to collect data on hydrogeologic properties. The first attempt to drill the 700-ft borehole was successful only to 556 ft bgs; a second borehole was drilled 10 ft away to a depth of 700 ft, resulting in a total of 39 boreholes. As part of the approved work plan, sediment samples were collected in Cañada del Buey and Pajarito Canyon, east of Area G.

The field investigation was specifically designed to determine the following:

- The nature and extent of contamination in subsurface tuff, including
    - the vertical extent of tritium in the subsurface along the southern fenceline near the high-activity tritium disposal shafts;
    - the vertical extent of the vapor-phase VOCs beneath Pits 1 through 5 at the eastern boundary of Area G and in the area of Pits 25 and 26;
    - the extent of radionuclides and inorganic chemicals beneath and adjacent to several disposal units; and
    - the presence of perchlorate, cyanide nitrate, dioxin, furan, and explosive-compound contamination in the tuff beneath MDA G.
- The presence of perched groundwater beneath MDA G.
- The hydrogeologic properties and fracture characteristics of the vadose zone beneath MDA G needed to perform contaminant-transport modeling.

Field activities at MDA G began on January 20, 2005, and were completed on August 20, 2005. All activities were conducted in accordance with applicable Environmental Stewardship–Environmental Characterization and Remediation (ENV-ECR) standard operating procedures (SOPs) (Appendix B), quality procedures (QPs), Laboratory Implementation Requirements (LIRs), Laboratory Implementation Guidance (LIGs), and Laboratory Performance Requirements (LPRs).

Deviations from the Approved MDA G Work Plan

The following were deviations from the approved work plan during the investigation.

- Because of uncertainties related to field-screening instrument readings, the boreholes were not advanced to total depths (TDs) based on photoionization detector (PID) readings. As noted in Section 6.2, the PID is susceptible to fluctuations resulting from water vapor. Samples of core contained in sealed bags for headspace measurements rapidly form condensation as water in the core evaporates, causing the PID to be unreliable for detecting low concentrations of organic vapors.
- Geotechnical and hydrogeological sampling in support of the identification of perched waters beneath MDA G was completed through the advancement of two boreholes. Samples over the depth interval of 0 ft to 556 ft were collected from BH 15-2 (54-24523). After drilling problems occurred in loose sediments and basalt debris at 556 ft bgs, BH 15-2 (54-24523) was not advanced further. BH 15-3 (54-24523) was drilled approximately 10 ft to the north of BH 15-2 (54-24523), allowing for casing to be advanced to greater depths. Sampling resumed once BH 15-3 (54-25423) reached 556 ft bgs and continued until the TD was reached at 700 ft bgs.
- Samples for moisture content, matric potential, anions, saturated and unsaturated hydraulic conductivity, and porosity were collected from the Cerro Toledo interval, Otowi Member, Guaje Pumice Bed, and Cerros del Rio basalts. Although these samples were not specified in the approved work plan, this information is important for evaluating the movement of air and water through the subsurface and may be useful in evaluating the potential for contaminant migration. In addition to sampling the individual geologic units, several contacts between these units were sampled, allowing for investigation of hydraulic conductivity across varying lithologies.

3.1 Health and Safety Monitoring

As part of the health and safety program, a site-specific health and safety plan (SSHASP) and integrated work document (IWD) (LANL 2005, 87833) were developed to delineate the scope of work of the project and to provide background information specific to the project, including relevant history and descriptions of the project sites, administrative and engineering controls, personal protective equipment (PPE), and task-specific exposure monitoring requirements. The SSHASP and IWD were prepared using a multidisciplinary team consisting of drillers, geologists, waste-management personnel, and subject-matter experts in industrial and radiological safety. During the preparation of these documents, the team identified the primary work activities and divided them into a discrete set of work steps. A detailed hazard analysis of the work steps was conducted, and a set of hazard controls was established and incorporated into the SSHASP and IWD, to which all personnel were required to be briefed as part of the project-specific training process.

As a result of the hazard assessment, real-time field health and safety monitoring was conducted for the following hazards: noise from drilling operations, dust and potential airborne inorganic chemical contaminants resulting from drilling operations and windblown material, and radioactive and volatile organic contaminants. Additionally, air sampling was conducted for the presence of silica and radiological samples were collected and analyzed for various potential contaminants.

Health and safety monitoring was conducted in accordance with applicable Occupational Safety and Health Administration (OSHA), Laboratory, American Conference of Governmental Industrial Hygienists (ACGIH), and National Institute for Occupational Safety and Health (NIOSH) protocols. The relevant regulations and documents are as follows:

- OSHA 29 Code of Federal Regulations 1926.52, Occupational Noise Exposure
- OSHA 29 Code of Federal Regulations 1926.65, Hazardous Waste Operations and Emergency Response
- OSHA 29 Code of Federal Regulations 1926.55, Gas, Vapors, Fumes, Dusts, and Mists
- Los Alamos National Laboratory Implementation Procedure (IMP) 300.2, Integrated Work Management for Work Activities
- LIR 402-700-01.2, Occupational Radiation Protection Requirements
- NIOSH, Manual of Analytical Methods
- ACGIH, Threshold Limit Values for Chemical Substances and Physical Agents and Biological Exposure Indices

Health and safety monitoring did not affect or limit completion of any task required in the approved work plan (LANL 2005, 87833).

3.2 Geophysical Survey

As part of the Laboratory's excavation permit process, subsurface utilities in the vicinity of each borehole were located using a Metrotech 810 pipe and cable locator. In addition, a ground-penetrating radar (GPR) survey was conducted in the vicinity of BH 15-1 (54-24360) to ensure the borehole was not located above any subsurface utilities or structures undetected with the Metrotech 810. The locations of subsurface anomalies were marked with paint on the asphalt as they were detected to ensure that the boreholes were properly sited.

3.3 Drilling Activities

A total of 39 boreholes were drilled alongside MDA G pits and shafts in 2005 at locations shown in Figure 3.3-1. The locations and sampling criteria for the boreholes were detailed in the approved work plan for MDA G (LANL 2005, 87833, pp. 24–26). Three different drill rigs were used to complete characterization drilling at the site. The drilling methods included both hollow-stem auger (HSA) and air-rotary drilling. Auger drilling was completed using two Central Mine Equipment 75 auger rigs, and air-rotary drilling was completed with a Boart Longyear Deltabase 540. Table 3.3-1 summarizes the drilling activities conducted at MDA G.

Surface casing was set at all the HSA MDA G boreholes to guide drilling and facilitate surface completions for long-term monitoring. Surface casing lengths ranged between 5 and 30 ft bgs depending on the depth to tuff, and each had a 9.5- or 10-in.-inside-diameter (I.D.).

BH 15-2 (54-24523) and BH 15-3 (54-25105) were drilled using casing-advance drilling methods. After drilling operations were completed, the casing was removed from BH 15-2 (54-24523). In BH 15-3 (54-25105), 4-in. schedule-80 polyvinyl chloride (PVC) was set to a depth of 508 ft once the steel casing was removed.

Hollow-stem auger drilling used 7 5/8-in.-outside-diameter (O.D.) auger flights and a continuous core sampling system. The continuous core sampling system consisted of a 3-in.-I.D. split barrel, retrieved with centering rods. Core recovery using this system averaged 95% per borehole.

Air-rotary drilling employed a variety of techniques, including open-hole coring and casing advancement using an underreaming hammer. Coring was completed with both 2.5-in.-I.D. and 1.75-in.-I.D. solid core barrels with wireline retrieval. Core recovery using this system averaged 60% in the Bandelier Tuff, 90% in the Cerros del Rio basalts, and nearly 100% in the Puye Formation. In addition, air-rotary drilling methods required the use of the Laboratory-owned total dust suppression system (TDSS) to contain drill cuttings and filter the air stream.

The core was visually inspected and field-screened for alpha and beta/gamma radioactivity and organic vapors in headspace. Core samples were collected and delivered to an off-site analytical laboratory for the analyses stipulated in the approved work plan (LANL 2005, 87833). The analytical data are provided in Appendix E and discussed in Section 6 and Appendix F. Field-data collection, including information from visual examination, headspace-vapor screening for VOCs, continuous screening for radiological contamination, selective screening for nitroaromatics, nitroamines, health and safety monitoring, and general daily activities, were recorded in field logbooks as required by the approved work plan (LANL 2005, 87833). The boreholes were surveyed using a differential GPS (DGPS) unit. Logs were prepared for each borehole and are included in Appendix C of this report. Once the shallow boreholes were drilled and core sampling completed, pore-gas samples were collected and delivered to an off-site analytical laboratory for the analyses stipulated in the approved work plan (LANL 2005, 87833).

3.4 Subsurface Vapor Sampling

Vapor samples for tritium and VOCs were collected to evaluate the nature and extent of the VOC vapor plume and tritium in pore gas beneath MDA G. After drilling activities concluded, pore-gas samples were collected for VOC and tritium analysis from each borehole. For all boreholes except BHs 15-2 (54-24523) and 15-3 (54-25105), a sample was collected at the depth of the nearest adjacent disposal unit and at TD. At BH-15-3 (54-25105), VOC and tritium samples were collected at the bottom of the casing (485 ft bgs).

Appendix I describes the proposed long-term subsurface monitoring plan for pore gas and identifies specific boreholes to be completed for vapor monitoring. A FLUTe soil-gas sampling positive-pressure membrane was installed in each identified borehole, and the boreholes will be incorporated into the Laboratory's pore-gas monitoring network. Figure 3.3-2 is a schematic of a FLUTe membrane installed in a borehole showing the ports and related instrumentation.

3.5 Canyon Sediment Sampling

Sediment samples were collected from canyon reaches downgradient of Area G (Figures 3.5-1 to 3.5-3b; Appendix K). The reaches are located immediately downgradient of the easternmost tributary drainages from Area G, designated reaches CDB-3 East (CDB-3E) in Cañada del Buey and PA-4 in Pajarito Canyon. Sediment deposits in these reaches potentially contain contaminants transported from Area G, including MDA G, and from other upstream locations. Thus, these two reaches were sampled to evaluate the nature and extent of contamination from MDA G and to achieve the sampling objectives specified in the "Work Plan for Sandia Canyon and Cañada del Buey" (LANL 1999, 64617) and the "Work Plan for Pajarito Canyon" (LANL 1998, 59577) to complete the Phase 1 investigations delineated in these two plans. A summary of the field investigations in reaches CDB-3E and PA-4 is presented in Reneau et al. (2005, 88716).

The sediment samples were collected according to ENV-ECR SOP-6.09, Rev. 1, Spade and Scoop Method for Collection of Soil Samples. Sediment samples were sent to an off-site contract laboratory for analysis of TAL metals, cyanide, VOCs, semivolatile organic compounds (SVOCs), pesticides/PCBs, nitrates, perchlorate, americium-241, isotopic plutonium, isotopic uranium, strontium-90, and tritium. A discussion of the sediment sampling activities and a summary of the results are presented in Appendix K.

3.6 Exploratory Boring Geophysical Logging

Geophysical surveys were completed on each new borehole. All boreholes drilled were caliper-logged, neutron-logged, and gamma-logged. In addition, BH 15-3 (54-25105) was camera logged from 490 ft to a TD of 698 ft. The results of neutron-, gamma-, and camera-logging are presented in the borehole logs (Appendix C).

3.7 Management of IDW

The waste streams generated and managed during the MDA G investigation included drill cuttings, PPE, and plastics. All wastes were managed as specified in Appendix H of the approved MDA G work plan (LANL 2005, 87833). The management of IDW is described in Appendix J.

3.8 Aquifer Testing

No site-specific aquifer testing was conducted at the site. However, as required by the approved work plan, an analysis of the groundwater samples collected from the regional wells surrounding TA-54 and the municipal wells in the vicinity of TA-54 is presented in a recent groundwater monitoring report submitted to NMED in July 2005 (LANL 2005, 89383).

4.0 FIELD INVESTIGATION RESULTS

Field investigations at MDA G began on January 20, 2005, and concluded on August 20, 2005. Borehole core samples and pore-gas samples were collected to determine the nature and extent of potential releases from the subsurface disposal units. Field-screening for radionuclides and organic chemicals was conducted during drilling to determine whether contamination was present at depth and thereby determine when drilling could cease.

4.1 Surface Conditions

Area G at TA-54 is located in the eastern area of Mesita del Buey, a 100- to 140-ft-high, finger-shaped mesa that trends southeast. The elevation of Mesita del Buey ranges from 6605 ft to 6748 ft asl at Area G and varies in width from 500 ft to 1000 ft. The mesa is bounded by Cañada del Buey (to the north) and Pajarito Canyon (to the south). The topography at Area G is relatively flat and narrow, with steep sides draining into Cañada del Buey to the north and Pajarito Canyon to the south. The north-facing slope of the mesa has a gentler gradient than the south-facing slope. The south-facing slope of Mesita del Buey is almost vertical near the rim and slopes more gently toward the canyon floor approximately 100 ft below.

The surface of Area G is regularly modified to accommodate ongoing waste storage and management operations. A very limited portion of the area can be considered undisturbed with respect to vegetation, erosional features, and soil formation. Most of Area G consists of asphalt-paved roads and storage areas, graded roads, buildings, utilities, storm water drainages, shaft caps, and vegetated pit and trench covers.

4.2 Exploratory Drilling Investigations

From January 2005 to August 2005, 39 boreholes were drilled at MDA G (Figure 3.3-1). Core was continuously collected using a 5-ft core barrel sampler in all the boreholes. Subsurface core samples were collected from the core barrel sampler following ENV-ECR SOP-6.26, Rev. 1, Core Barrel Samples for Subsurface Earth Materials, and all boreholes were logged to TD following ENV-ECR SOP-12.01, Rev. 4, Field Logging, Handling, and Documentation of Borehole Materials. Field documentation of samples collected from fractures includes detailed descriptions of the fracture-fill material and rock-matrix sampled, following ENV-ECR SOP-12.01, Rev. 4. The core was screened for organic vapors using a PID with an 11.7-eV lamp following ENV-ECR SOP-6.33, Rev. 0, Headspace Vapor Sampling with a Photoionization Detector. Gross alpha-beta radiation was measured using an Eberline E600 probe following the manufacturer's instructions. Two samples per borehole were analyzed for trinitrotoluene (TNT) and hexahydro-135-trinitro-1,3,5-triazine (RDX) using D-Tech explosives test kits. One sample each was collected from the base of the borehole and from a depth corresponding to the base of the nearest disposal unit, pit, or shaft. Tuff samples were analyzed using the instructions provided by the manufacturer.

Samples were analyzed using methods specified by contract requirements of the Laboratory's statement of work (SOW) for analytical services (LANL 2000, 71233). QA/QC samples included field duplicate samples to evaluate the reproducibility of the sampling technique and trip blanks to evaluate analytical laboratory contamination procedures. These samples were collected following ENV-ECR SOP-1.05, Rev. 1, Field Quality Control Samples. A field duplicate was collected from each borehole at the base elevation of the adjacent pit, trench, or shaft. At least one trip blank was submitted with each shipment of VOC samples. This level of QA/QC sampling complies with Section IX.B.2.e of the Consent Order. The sampling equipment was decontaminated using dry decontamination methods (i.e., using window cleaner, paper towels, and wire brushes). Equipment rinse blanks were not collected.

In accordance with the approved work plan, at least one sample was collected at the lowest base elevation of the closest disposal unit and at the TD of the borehole. Additional samples were collected based on visual and field indicators (i.e., fractures, staining, etc.) or elevated field-screening results. The analytical suite for all samples included isotopic uranium, isotopic plutonium, isotopic thorium, americium-241, strontium-90, gamma spectroscopy, TAL metals, boron, molybdenum, perchlorate, nitrates, and cyanide. Samples collected at the lowest base elevation of the adjacent disposal unit also included VOCs, technicium-99, dioxins, and furans. Samples collected from the bottom of the borehole included technecium-99 and VOCs; 20% of these samples were analyzed for explosive compounds. Samples from BH 15-2 (54-24523) and BH 15-3 (54-25105) were collected to assess geotechnical and hydrogeologic parameters, including saturated and unsaturated hydraulic conductivity, porosity, bulk density, moisture content, matric potential, and chloride anions.

A radiological laboratory performed gross alpha, beta, and gamma screening to meet federal transportation requirements.

Paired samples of fracture fill and surrounding intact tuff were collected when large fractures, or fracture zones, were encountered per the approved work plan (LANL 2005, 87833, p. 31). Paired fracture samples were collected when sufficient intact nonfractured core material was available. During the MDA G investigation, eight paired fracture samples were collected (Table 4.2-1).

In accordance with the approved work plan, samples were collected from BH 15-2 (54-24523) and BH 15-3 (54-25105) to measure the following parameters: saturated and unsaturated hydraulic conductivity, chloride ion concentration, porosity, bulk density, matric potential, and moisture content. Moisture-content and matric-potential samples were collected every 5 ft; samples for chloride analysis were collected every 10 ft. These sampling intervals increased to no less than 1 per 50 ft of depth once the borehole had been advanced into the Cerros de Rio basalts. Samples were collected for saturated and unsaturated hydraulic conductivity, porosity, and bulk-density analyses from the Cerro Toledo interval, Otowi Member, Guaje Pumice Bed, and Cerros del Rio basalts. These samples allowed for investigation of individual units as well as the contacts between these units. Analyses for saturated and unsaturated hydraulic conductivity, porosity, and bulk density were performed using the methods specified by contract requirements of the Laboratory's SOW for analytical laboratories (LANL 2000, 71233). One field duplicate sample was collected and analyzed for all the parameters listed above, except for chloride ion concentration. Samples were collected, handled, packaged, and analyzed according to applicable ENV-ECR SOPs.

Auger flights and split-spoon sampling equipment were dry-decontaminated using paper towels and brushes.

Appendix C summarizes field-screening, sample depths, types, and total number of samples collected from each borehole.

4.3 Exploratory Boring Geophysical Logging

Downhole geophysical methods were used to provide information important to evaluating subsurface physical properties. Each borehole was logged with caliper, camera, neutron, and natural gamma tools according to ENV-ECR SOP 5.07, Rev. 0, Operation of Borehole Logging Trailer. Caliper logging was used to continuously measure changes with depth in the borehole diameter. Camera logging provided a visual inspection of the condition of the borehole, and confirmation of features identified in core. Neutron probe readings were collected to provide information on moisture content. Gamma probe readings measured natural and potential anthropogenic sources of radionuclides. Because naturally occurring radionuclides are high in many minerals that form the fine-grained, high-clay-content deposits within the Bandelier Tuff and Cerros del Rio basalts, gamma logging may provide information on potential perching lithologies. The results of the geophysical logging are presented in the borehole logs in Appendix C and include the descriptions of soil and rock lithologies encountered.

4.4 Subsurface Conditions

A detailed description of the stratigraphy beneath MDA G was presented in the approved work plan (LANL 2005, 87833, pp. 16–19). The borehole logs confirm that the general stratigraphy beneath MDA G is consistent with what was encountered during previous drilling at MDA G and with the regional geology described by Broxton and Reneau (1995, 49726). The stratigraphy encountered is summarized in Sections 4.4.1 and 4.4.2. The locations of surface structures and subsurface utilities are shown in Figure 4.4-1.

4.4.1 Stratigraphy beneath Mesita del Buey

The boreholes drilled at MDA G as part of Phase I RFI activities and those drilled according to the approved work plan confirm the stratigraphy beneath Mesita del Buey as described by Broxton and Reneau (1995, 49726). The locations and depths of previously drilled regional wells (R-20, R-21, R-22, and R-32) were also used to infer the stratigraphy beneath MDA G, which includes the units of the Bandelier Tuff and the Cerros del Rio basalts (Figure 4.4-2). The regional aquifer is located within the Santa Fe Group, the Puye Formation, and the Cerros del Rio basalts.

With reference to the Bandelier Tuff, the term *welding* is used to distinguish between tuffs that are less compacted (or uncompacted) and porous (nonwelded) and those that are more compacted and dense (welded). In the field, the degree of welding in tuff is quantified by the degree of flattening of pumice fragments (a higher degree of flattening and elongation equals a higher degree of welding). Petrographically, welded tuffs show adhesion (welding) of grains, but nonwelded tuffs do not. The term *devitrified* is applied to tuff whose volcanic glass has crystallized.

Tshirege Member

The Tshirege Member of the Bandelier Tuff is a compound-cooling unit that resulted from several successive ash-flow deposits separated by periods of inactivity, which allowed for partial cooling of each unit. The properties related to water flow and contaminant migration (e.g., density, porosity, degree of welding, fracture content, and mineralogy) vary both vertically and laterally as a result of localized emplacement temperature, thickness, gas content, and composition.

Tshirege Member Unit 2

Unit 2 of the Tshirege Member of the Bandelier Tuff is a competent, resistant unit that forms the surface of Mesita del Buey. Its thickness varies from 36 ft (11 m) to 65 ft (19.8 m) at MDA G. Where it is exposed, unit 2 forms nearly vertical cliffs on the sides of the mesa. The rock is described as a moderately welded ash-flow tuff composed of crystal-rich, devitrified pumice fragments in a matrix of ash, shards, and phenocrysts (primarily potassium feldspar [sanidine] and quartz).

Unit 2 is extensively fractured as a result of contraction during postdepositional cooling. The cooling-joint fractures are visible on mesa edges and on the walls of pits. In general, the fractures dissipate at the bottom of unit 2. On average, fractures in unit 2 are nearly vertical. The mean spacing between fractures ranges from 1.9 ft to 2.6 ft (0.6 m and 8.8 m), and the fracture width ranges from less than 0.03 in. to 0.51 in. (1 mm and 13 mm), with a median width of 0.12 in. (3 mm). The fractures are typically filled with clays to a depth of about 9.9 ft (3 m); smectites are the dominant clay minerals present. Smectites are known for their tendency to swell when water is present and for their ability to strongly bind certain elements, both of which have implications for the transport of radionuclides in fractures. Opal and calcite may be found throughout the fractured length, usually in the presence of tree and plant roots (live and decomposed); the presence of both the minerals and the roots indicates some water at depth in fractures.

At the base of unit 2 is a series of thin, less-than-3.9-in.-thick (10-cm-thick), discontinuous, crystal-rich, fine- to coarse-grained surge deposits. Bedding structures are often observed in these deposits. The surge beds mark the base of unit 2.

Tshirege Member Unit 1v

Tshirege Member unit 1v is a vapor-phase-altered cooling unit underlying unit 2. This unit forms sloping outcrops, which contrast with the near-vertical cliffs of unit 2. Unit 1v is further subdivided into units 1v(u) and 1vl.

Unit 1v(u). The uppermost portion of unit 1v is devitrified and vapor-phase-altered ash-fall and ash-flow tuff; it has been designated unit 1v(u), where u signifies upper. Its thickness varies from 3 ft (0.9 m) to 35 ft (10.7 m) at MDA G. Unit 1v(u) is unconsolidated at its base and becomes moderately welded nearer the overlying unit 2. Only the more prominent cooling fractures originating in unit 2 continue into the more welded upper section of unit 1v(u) but die out in the lower, less consolidated section. More typically, fractures in unit 2 do not extend into unit 1v(u).

Unit 1v(c). Beneath unit 1v(u) is unit 1v(c), where c stands for colonnade, named for the columnar jointing visible in cliffs formed from this unit. 1v(c) is a poorly welded, devitrified ash-flow tuff at its base and top; it becomes more welded in its interior. Unit 1v(c) varies in thickness from 6 ft (1.8 m) to 32 ft (9.8 m) at MDA G.

Tshirege Member Unit 1g

The basal contact of unit 1v(c) is marked by a rapid change (within 0.7 ft [0.2 m] vertically) from devitrified (crystallized) matrix in unit 1v(c) to vitric (glassy) matrix in the underlying unit 1g. Vitric pumices in unit 1g stand out in relief on weathered outcrops, but devitrified pumices above this interval are weathered out. In outcrop, this devitrification interval forms a prominent erosional recess termed the *vapor-phase notch*. No depositional break is associated with the vapor-phase notch; the abrupt transition indicates this feature is the base of the devitrification that occurred in the hot interior of the cooling ash-flow sheet after emplacement.

Unit 1g is a vitric, pumiceous, nonwelded ash-flow tuff underlying the devitrified unit 1v(c). Unit 1g varies in thickness from 30 ft (9.1 m) to 88 ft (26.8 m) at MDA G. Few fractures are observed in the visible outcrops of this unit, and weathered cliff faces have a distinctive Swiss-cheese appearance because of the softness of the tuff. The uppermost 5 ft to 20 ft (1.5 m to 6.1 m) of unit 1g are iron-stained and slightly welded. This portion of unit 1g is resistant to erosion, helping to preserve the vapor-phase notch in the outcrops. A distinctive pumice-poor surge deposit forms the base of unit 1g.

Tsankawi Pumice Bed

The Tsankawi Pumice Bed is the basal air-fall deposit of the Tshirege Member of the Bandelier Tuff. It is a thin bed of gravel-sized vitric pumice. The maximum thickness of the Tsankawi Pumice Bed is 2 ft (0.6 m) at MDA G.

Cerro Toledo Interval

The Cerro Toledo interval consists of thin beds of tuffaceous sandstones, paleosols, siltstones, ash, and pumice falls; it separates the Tshirege and Otowi Members of the Bandelier Tuff. The Cerro Toledo interval also includes localized gravel- and cobble-rich fluvial deposits predominantly derived from intermediate composition lavas eroded from the Jemez Mountains west of the Pajarito Plateau. This interval varies in thickness from 0.5 ft (0.2 m) to 32 ft (9.8 m) at MDA G.

Otowi Member

The Otowi Member tuffs have a maximum penetrated thickness of 62 ft (18.9 m) at MDA G, although in some locations it was not encountered. The tuffs are massive, nonwelded, pumice-rich, and mostly vitric ash flows. The pumices are fully inflated, supporting tubular structures that have not collapsed as a result of welding. The matrix is an unsorted mix of glass shards, phenocrysts, perlite clasts, and minute, broken pumice fragments.

The Guaje Pumice Bed is the basal air-fall deposit of the Otowi Member of the Bandelier Tuff. The maximum thickness of the unit at MDA G is 5 ft (1.5 m). The pumice bed is nonwelded but brittle, and the pumice tubes are partially filled with silica cement.

Cerros del Rio Basalts (Tb 4)

In the vicinity of TA-54, the Cerros del Rio basalts lie directly beneath the Otowi Member of the Bandelier Tuff. In well R-32, the basalts are 636 ft (193.9 m) thick; in well R-22 they are 983 ft (299.6 m) thick. In both wells, the regional water table occurs within these basalts. Local borehole cores at MDA G show the basalts consist of both angular rubble and dense, fractured masses, with zones of moderately to very porous lavas. Deeper drilling at R-22 showed a wide variety of lithologies within the basalts, including massive flows, interflow rubble or scoria zones, sediments, and paleosols. One borehole (BH 15-3 [54-25105]) penetrated 282 ft (85.9 m) of the Cerros del Rio basalts.

Puye Formation (Tpf, Tpp) and Older Fanglomerate

The Puye Formation is a conglomerate deposit derived primarily from volcanic rocks to the west, with varying lithologies, including stream channel and overbank deposits, ash and pumice beds, debris flows and lahar deposits. Well tests on the plateau confirm the unit is very heterogeneous with both high- and low-permeability zones present (Nylander et al. 2003, 76059). The formation is poorly lithified, and as such is unlikely to sustain open fractures.

The Puye Formation thins from west to east beneath TA-54. At supply well PM-2, the Puye Formation (including fanglomerate, pumaceous units, and ancestral Rio Grande deposits) is approximately 800 ft (243.8 m) thick; at well R-23 it is completely absent. Drilling across the plateau indicates the Puye Formation is frequently underlain by alluvial fan deposits similar in lithology to the Puye, but considerably older. These deposits are of considerable thickness at PM-2, were penetrated at R-22 (and were approximately 80 ft [24.4 m] thick), and were absent at R-23. The Puye Formation was also encountered at R-16 (351 ft [106.9 m] thick) where the water table occurs within the Puye Formation.

Totavi Lentil Deposits (Tpt)

The Totavi Lentil is an ancestral Rio Grande deposit consisting of coarse gravels and sands with abundant quartzite. The deposit has been alternatively conceptualized as a series of distinct north-south trending ribbons as well as a continuous thin sheet at the base of the Puye Formation. Like the overlying Puye Formation it has both high- and low-permeability zones (Nylander et al. 2003, 76059).

Santa Fe Group (Tsf, Tf, and Ts) and Santa Fe-Age Basalts (Tb 1 and Tb 2)

The Santa Fe Group is an alluvial-fan deposit comprised of medium to fine sands and clays. Numerous north-south trending faults are present in the Santa Fe Group. Santa Fe Group rocks are deep below MDA G (1500 ft [457.2 m] bgs at PM-2) and were not penetrated by R-20, R-32, or R-22. Most water supply wells on the eastern edge of the Pajarito Plateau and elsewhere in the basin are completed in these rocks. The Santa Fe Group units have the lowest permeability of all the units in the regional aquifer.

Basaltic lava flows occurred when the Santa Fe Group was deposited; these basalts occur both within the Santa Fe Group and within the pre-Puye-Formation sands, gravels, and conglomerates penetrated by R-20 and R-22. These old basalts appear to have fewer open fractures than the younger Cerros del Rio basalts.

4.4.2 Stratigraphic Units Encountered During MDA G Drilling

The subsurface conditions encountered at MDA G showed little variation from north to south and a gradual decline in unit thicknesses from west to east. The uppermost units encountered were cooling unit 2 (Qbt 2), which ranged in thickness from 37 ft to 65 ft; followed in stratigraphy by Qbt 1v(u), which ranged in thickness from 3 ft to 35 ft; followed by the colonade member Qbt 1v(c), which ranged in thickness from 6 ft to 32 ft. Beneath these units were Qbt 1g, ranging in thickness from 30 ft to 88 ft; Tsankawi Pumice, ranging in thickness from 0 ft to 2 ft; and the Cerro Toledo interval having a thickness between 0.5 ft and 32 ft. The Otowi Member, ranging in thickness between 0 ft and 61.5 ft, and the Guaje Pumice Bed, with a thickness of 0 ft to 5 ft, were penetrated only by a smaller subset of boreholes. The Cerros del Rio basalts were penetrated beyond refusal only in BH 15-2 (54-24523) and BH 15-3 (54-25105).

4.5 Groundwater Conditions

Borehole 15-3 (54-25105) was drilled to 700 ft to determine if perched groundwater is present in the vadose zone beneath Mesita del Buey at MDA G. Perched groundwater was not encountered in this borehole. In addition, none of the other 38 boreholes encountered perched lenses. Groundwater monitoring was not required by the approved work plan unless perched groundwater was encountered. Therefore, groundwater monitoring was not performed as part of the MDA G investigation. The results of groundwater monitoring in the regional aquifer in the vicinity of MDA G are presented in a recent Laboratory report submitted to NMED in July 2005 (LANL 2005, 89383).

4.6 Surface Air and Subsurface Vapor Conditions

Following the completion of drilling, pore-gas samples were collected for VOC analysis, following ENV-ECR SOP-6.31, Rev. 1, Sampling of Subatmospheric Air. The samples were collected using a straddle packer to isolate discrete depths within the borehole after allowing for equilibration of pore gas. Each interval was purged before it was sampled until the measurements of carbon dioxide and oxygen were stable and representative of subsurface conditions. Subsurface pore-gas samples were collected in SUMMA canisters and submitted to an off-site contract laboratory for VOC analysis using U.S. Environmental Protection Agency (EPA) Method TO-15.

QA/QC samples for VOCs in pore gas consisted of three equipment blanks and three field duplicates for all 39 boreholes. After sampling and purge decontamination, the equipment blanks were collected by pulling zero gas (99.9% ultrahigh-purity nitrogen) through the packer sampling apparatus. These samples were used to evaluate the decontamination procedures. The field duplicate samples were collected to evaluate the reproducibility of the sampling technique. QA/QC samples were collected were collected once during each sampling event in accordance with ENV-ECR SOP-1.05, Rev. 1.

Pore-gas samples were also collected to determine the lateral and vertical extent of the subsurface tritium release at MDA G. Samples from boreholes were collected using an inflatable straddle packer system. Samples were collected as vapor by pulling pore gas through columns filled with absorbent silica gel in accordance with ENV-ECR SOP-6.31, Rev. 1. After allowing time for equilibration, the newly completed boreholes were sampled from the depth equal to the base depth of the adjacent disposal unit, and at TD. QA/QC samples were collected according to applicable SOPs and the approved work plan. Three tritium field duplicates were collected during vapor sampling at MDA G according to the approved work plan and ENV-ECR SOP-1.0.5, Rev. 1. Tritium was analyzed in water collected in silica gel columns from the pore-gas using EPA Method 906.0.

Air-permeability data were not collected during this investigation. However, the bulk permeability of the media may be inferred from data collected in boreholes at MDA L (SEA 1997, 87918). Anemometry measurements from MDA L location 54-01018 provide information on the bulk flow within the media. These data indicated that in the upper 300 ft of strata, surface-air flow is least restricted by the matrix within the Cerro Toledo interval. Subsequent discrete-point permeability measurements confirmed the Cerro Toledo interval has a higher permeability than the other stratigraphic layers (3–10 D compared to 0.2–0.9 D). Figure 4.6-1 shows both the anemometry and discrete-point permeability measurements from location 54-01018. The variability in the anemometry readings within the Qbt 1g unit was the result of measurement variability.

5.0 REGULATORY CRITERIA

This section describes the regulatory criteria used for screening sample results and for evaluating potential risk to ecological and human receptors. Regulatory criteria identified in Section XI.C.8 of the Consent Order include cleanup standards, risk-based screening levels, and risk-based cleanup goals established by medium. These criteria are discussed in the following subsections. Applicable criteria identified in this section are included in the data tables in Section 6, Appendix F, and Appendix G.

5.1 Screening Levels

Screening levels for chemicals in soil, sediment, and tuff are NMED soil screening levels (SSLs) as presented in the "Technical Background Document for Development of Soil Screening Levels" (NMED 2004, 85615). In accordance with this guidance, if an NMED SSL is not available for a chemical, the EPA Region 6 human health media-specific screening level is used as the SSL (adjusted to 10^{-5} for carcinogens) (EPA 2004, 87478). Both residential and industrial SSLs are presented in the chemical data tables in the risk assessment (Appendix G) for comparison with analytical results.

Screening levels for radionuclides in soil, sediment, and tuff are screening action levels (SALs) based on 15 mrem/yr exposure and are derived using RESRAD Version 6.21 (LANL 2005, 88493). SALs for both residential and industrial exposure are presented in radionuclide data tables in the risk assessment (Appendix G).

Screening levels for VOCs and tritium in pore gas have not been established for MDA G. These data were collected to determine the nature and extent of subsurface vapor plumes to use in evaluating contaminant transport and selecting possible corrective measures.

5.2 Cleanup Goals

The cleanup goals specified in Section VIII of the Consent Order are a target risk level of 10^{-5} for carcinogens or a hazard index (HI) of 1 for noncarcinogens. A cleanup goal of 15 mrem/yr incremental exposure for radioactively contaminated sites has been established by DOE. The screening levels referred to in Section 5.1 are based on these cleanup goals. As specified in Section VIII.B.1 of the Consent Order, the screening levels may be used as soil cleanup levels unless determined to be impracticable or unless SSLs do not exist for the current and reasonably foreseeable future land use. The soil cleanup levels to be used at MDA G will be determined during the corrective measures evaluation (CME).

6.0 SITE CONTAMINATION

The approved work plan was designed to provide data needed to complete an evaluation of the nature and extent of subsurface contamination related to historical waste disposal activities. This section presents the analytical results for soil, sediment, rock, and vapor sampling conducted under the approved work plan field activities.

6.1 Tuff and Sediment Sampling

Sediment Sampling

Sediment samples were collected from reaches in Pajarito Canyon and Cañada del Buey to evaluate potential contaminant transport into these canyons from MDA G. Sediment deposits in these reaches may potentially contain the combined effects of contaminants transported from Area G, including MDA G, and from other upstream locations. A discussion of the sediment sampling activities and a summary of the results are presented in Appendix K.

Subsurface Sampling

Subsurface samples were collected from 39 boreholes within and adjacent to MDA G. Samples were collected from 37 boreholes to determine the nature and extent of contamination, and geotechnical and hydrogeologic samples were collected from 2 boreholes. The samples were selected from predetermined depths and from intervals that showed unusual lithologies or fractures, visual indicators of contamination, or elevated field-screening results. The location of these boreholes and their identification numbers are presented in Figure 3.3-1.

Table 6.1-1 presents the depth interval, lithological unit, and analyte list for each sample, listed by borehole location. In addition, field-screening results and sample lithology descriptions can be found on the borehole logs (Appendix C).

6.2 Tuff and Sediment Sampling Field-Screening Results

The field team screened all recovered core samples for radioactivity and VOCs, and selected core samples were screened for high explosives (HE). The core was sampled and logged after field screening. In addition to the prescribed sampling intervals, eight samples were collected based upon visual examination of core (Table 4.2-1). Selection of these samples focused on the presence of fractures and on geologic lithologies with increased porosity.

Screening for gross alpha and beta radiation was performed using an Eberline E-600 portable radiation monitor, and an SHP-38AB scintillation detector. Heath, Safety, and Radiation Protection Division–Health Physics Operations Group (HSR-1) personnel conducted daily performance and operational checks. Screening was conducted in accordance with ENV-ECR SOP-10.07, Field Monitoring for Surface and Volume Radioactivity Levels, and the field team received hands-on training from HSR-1 personnel to use the instruments. The radiological screening results were recorded in the borehole logs (Appendix C). The results of radiological field screening should not be compared between boreholes because the background radiation values varied with geographic location across the site.

Organic vapor monitoring was performed using a Rae Systems, Inc. MiniRae 2000 Model PGM-7600 PID with an 11.7-eV bulb to monitor the core immediately after the core barrels were opened. Headspace screening was conducted on the core samples at 10-ft intervals according to ENV-ECR SOP-06.33. The workers' breathing zone was also monitored. PID readings were recorded in the borehole logs (Appendix C). While valuable for screening high concentrations of VOCs, the PID is susceptible to moisture, and the measurements can fluctuate greatly as the detectable concentration decreases. This fluctuation may be attributed to atmospheric moisture that will interfere with the detection instrumentation. Therefore, no biased samples were submitted for organic chemical analyses based on PID readings (Section 3.0).

Screening for HE using D-Tech test kits for the explosive compounds RDX and TNT was conducted at the base of the disposal units and at the TD of each borehole. The HE field-screening results are presented in the borehole logs (Appendix C).

6.3 Sediment and Tuff Sampling Analytical Results

The MDA G IR data set includes sediment samples from the canyons and soil, and rock samples from 37 boreholes. Field-related (QA/QC) samples include field duplicates and trip blanks. In addition, the analytical laboratory employed specific QA/QC procedures to ensure data quality. These procedures are described in Appendix D and the analytical results, the data validation reports, and the chain-of-custody forms are provided in Appendix E. This section summarizes the analytical results for the sediment and the subsurface core samples collected at MDA G in 2005.

6.3.1 Sediment Sampling

A discussion of the analytical results for reach samples from Cañada del Buey and Pajarito Canyon sampling events is presented in Appendix K. This section summarizes the results of post-Cerro Grande fire sampling data. Inorganic chemicals detected in reach CDB-3E in Cañada del Buey above the sediment BVs were aluminum, arsenic, barium, chromium, cobalt, copper, iron, lead, magnesium, manganese, potassium, selenium, vanadium, and zinc. Cadmium was not detected; however, the DLs were greater than the BV. Fluoride, nitrate, and perchlorate were detected but have no BVs. The inorganic chemicals detected in reach PA-4 in Pajarito Canyon above sediment BVs were aluminum, arsenic, barium, cadmium, calcium, chromium, cobalt, copper, cyanide, iron, lead, magnesium, manganese, nickel, potassium, selenium, silver, vanadium, and zinc. Nitrate was detected in PA-4 sediments but has no sediment BV for comparison.

Five organic chemicals (Aroclor-1254, Aroclor-1260, bis[2-ethylhexyl]phthalate, di-n-butylphthalate, and pyrene) were detected in at least one sample from reach CDB-3E. Four of the analytes were detected in only one sample, while Aroclor-1254 was detected in two samples. Twelve organic chemicals were detected in at least one postfire sediment sample from reach PA-4.

The radionuclides americium-241, plutonium-238, and plutonium-239 were detected above BVs in postfire CDB-3E samples. Americium-241, cesium-137, plutonium-239, and plutonium-240 were detected above BVs in postfire samples.

6.3.2 Subsurface Sampling

Core samples were collected from 37 boreholes and submitted to an off-site laboratory for analysis of VOCs, dioxins/furans, inorganic chemicals (including cyanide, nitrate and perchlorate), and radionuclides, as described in Table 6.1-1. Analytical results for subsurface samples are presented in Appendix E. To determine the chemicals of potential concern (COPCs) and to evaluate the nature and extent of contamination, subsurface data for inorganic chemicals and naturally occurring radionuclides were screened against BVs for individual stratigraphic units. The fallout radionuclides and organic chemicals detected in soil and rock samples are identified as COPCs.

Inorganic Chemicals Detected in Subsurface Samples

A number of inorganic chemicals were detected above BVs in samples collected during field-sampling activities. Table 6.3-1 shows the inorganic chemicals detected above BVs in subsurface soil and rock samples from each stratigraphic unit beneath MDA G. Included in the table are detected values for chemicals for which no BV has been established. Plate 6.3-1 shows the locations and depths of the detections of inorganic chemicals above BVs and the detections of inorganic chemicals without BVs.

Inorganic chemicals detected above BVs and nondetects with DLs exceeding BVs for units within the Bandelier Tuff are discussed below. Analytes without BVs detected in tuff samples are also presented below.

Inorganic Chemicals above BVs in Unit Qbt 2

Aluminum, arsenic, barium, chromium, cobalt, iron, lead, magnesium, nickel, potassium, vanadium, and zinc were detected above BVs infrequently (less than 5%) in the 65 samples analyzed from unit Qbt 2. In addition, cyanide (total) was detected above BV in 1 of 59 samples from Qbt 2, and beryllium, calcium, and copper were detected above BVs in 6 of 65 samples. Selenium was detected above BV in 5 of 65 samples, and 55 samples had DLs above the BVs. Inorganic chemicals detected in Qbt 2 with no BVs include boron, molybdenum, nitrate, and perchlorate. Boron was detected in 8 of 63 samples, molybdenum was detected in all 63 samples, nitrate was detected in 32 of 61 samples, and perchlorate was detected in 6 of 65 samples.

Inorganic Chemicals above BVs in Unit Qbt 1v

Barium, beryllium, and copper were detected at concentrations exceeding BVs in 1 of 12 samples analyzed from unit Qbt 1v (includes samples collected from Qbt 1v[u] and Qbt 1v[c]). Arsenic and selenium were detected above BVs in 4 of 12 samples. Cadmium, selenium, and thallium were reported as nondetects in several samples; however, the DLs for these metals are above their respective BVs. Molybdenum was detected in all 10 samples from unit Qbt 1v; however, no BV has been established.

Inorganic Chemicals above BVs in Unit Qbt 1g

Aluminum, arsenic, beryllium, calcium, iron, manganese, and nickel were detected at concentrations above BV in 2 of 10 samples analyzed from unit Qbt 1g. Barium was detected above BV in 4 of 10 samples from unit Qbt 1g. Arsenic, cadmium, and selenium were reported as nondetects in several samples; however, the DLs for these metals are above their respective BVs. Boron was detected in 5 samples, molybdenum was detected in all 10 samples, and perchlorate was detected in 1 sample, but these inorganic chemicals do not have BVs established.

Inorganic Chemicals above BVs in Unit Qct

Beryllium, calcium, lead, selenium, and zinc were detected at concentrations exceeding BVs in less than 4 of the 14 samples analyzed. Manganese and copper were detected above BVs in 8 of 14 samples. Arsenic, barium, and nickel were detected above BVs in 11 of 14 samples. Chromium, iron, and vanadium were detected above BVs in 12 of 14 samples. Aluminum was detected above BV in 13 of 14 samples. Magnesium was detected above BV in all 14 samples. Arsenic, cadmium, and selenium were reported as nondetects in several samples, but the DLs for these inorganic chemicals are above their respective BVs. Boron and nitrate were detected above BVs in 11 and 3 of 14 samples, respectively, from unit Qct. Boron and nitrate do not have BVs established.

Inorganic Chemicals above BVs in Unit Qbo

Aluminum, arsenic, calcium, chromium, copper, iron, nickel, and vanadium were detected at concentrations exceeding BVs in 1 to 4 of 25 samples from unit Qbo. Cyanide (total) was detected above its BV in 1 of 24 samples from Qbo. The concentrations of barium and magnesium exceeded BVs in 12 and 14 of 25 samples, respectively. Arsenic, cadmium, and selenium were reported as nondetects in several samples, but the DLs for these inorganic chemicals exceeded their respective BVs. Boron, perchlorate, and nitrate, were detected in 1, 2, and 3 samples, respectively. Molybdenum was detected in all the samples analyzed from Qbo. Boron, nitrate, perchlorate, and molybdenum do not have BVs established for unit Qbo.

Inorganic Chemicals above BVs in Unit Qbog

There are no established BVs for unit Qbog. Because Qbog is recognized as part of the Otowi Member of the Bandelier Tuff (Broxton and Reneau 1995, 49726), inorganic chemicals detected in unit Qbog are screened against the BVs for unit Qbo. Aluminum, cadmium, copper, iron, manganese, potassium, selenium, and vanadium were detected above BVs in 1 or 2 of 6 samples analyzed from unit Qbog. Arsenic, barium, calcium, chromium, iron, magnesium, and nickel were detected above BVs in 3 or 4 samples from Qbog. Antimony, arsenic, cadmium, and selenium were reported as nondetects in several samples; however, the DLs for these metals are above their respective Qbo BVs. Boron was detected in one sample, and molybdenum was detected in all six samples analyzed from Qbog. BVs have not been established for boron and molybdenum for unit Qbo.

Inorganic Chemicals above BVs in Soil

The results from samples collected from fractures and paleosols were compared to soil BVs. Beryllium, iron, selenium, and zinc were detected above BVs in one of six soil samples. Cobalt, copper, and nickel were detected above BVs in two or three of six soil samples. Cadmium and magnesium were detected above BVs in four of six soil samples. Calcium was detected above its BV in all six soil samples. Two sample results were reported as nondetects for selenium, but the DLs were above BV. Boron, molybdenum, and nitrate were detected in several soil samples; however, BVs have not been established for these chemicals.

Inorganic Chemicals above BVs in Unit Tcb

Chlorides were detected in all samples from Tcb. BVs have not been established for unit Tcb.

Organic Chemicals Detected in Subsurface Samples beneath MDA G

One sample from each borehole was collected for analysis of dioxins/furans at a depth that corresponds with the base of the closest waste disposal unit. Detected dioxin and furan congeners are presented in Table 6.3-2. Plate 6.3-2 shows the locations and depths of organic chemicals detected. Dioxin and furans were detected at parts per trillion concentrations in samples collected from eight boreholes drilled beneath MDA G. At least one dioxin or furan congener was detected in BHs 4 (54-24363), 11 (54-24371), BH 14 (54-24374), 21 (54-24381), 25 (54-24385), 28 (54-24388), 30 (54-24390), and 31 (54-24391). Octachlorodibenzodioxin[1,2,3,4,6,7,8,9-] was the most frequently detected congener (seven samples), with a maximum concentration of 0.00000897 mg/kg in BH 11 (54-24371) at 40–45 ft bgs.

No VOCs or explosive compounds were detected in core samples at MDA G.

Radionuclides Detected in Subsurface Samples beneath MDA G

Radionuclides detected above BVs, as well as detections of radionuclides without BVs, are presented in Table 6.3-3. Plate 6.3-3 shows the locations and depths of radionuclides detected above BVs and detections of radionuclides without BVs.

Radionuclides above BVs in Unit Qbt 2

Thorium-228, thorium-230, thorium 232, uranium-234, uranium-235, and uranium-238 were detected above BVs in 2 to 9 of 65 samples from unit Qbt 2. Amercium-241, plutonium-238, plutonium-239, and strontium-90, which do not have BVs for unit Qbt 2, were detected in up to 11 of 65 samples.

Radionuclides above BVs in Unit Qbt 1v

Thorium-238, thorium-230, thorium-232, uranium-235, and uranium-238 were detected at concentrations above BVs in 1 to 3 of 12 samples analyzed from unit Qbt 1v (including samples collected from Qbt 1v[u] and Qbt 1v[c]). Strontium-90 was detected in one sample and has no BV for unit Qbt 1v.

Radionuclides above BVs in Unit Qbt 1g

Thorium-230, uranium-234, uranium-235, and uranium-238 were detected at concentrations above BVs in 1 to 6 of 10 samples analyzed from unit Qbt 1g. Plutonium-239 was detected in one sample and has no BV for unit Qbt 1g.

Radionuclides above BVs in Unit Qct

Uranium-235 was detected at a concentration above BV in one of 14 samples analyzed from unit Qct. Americium-241, plutonium-239, and strontium-90 were detected in 1 or 2 of 14 samples from unit Qct; there are no BVs for these radionuclides.

Radionuclides above BVs in Unit Qbo

Uranium-235 and uranium-238 were detected at concentrations exceeding BVs in 1 and 3 of 25 samples, respectively, from unit Qbo. Plutonium-238 and strontium-90 were detected in 1 of 25 samples analyzed from unit Qbo. Americium-241 and plutonium-239 were detected in 4 of 25 samples. These radionuclides do not have BVs for unit Qbo.

Radionuclides above BVs in Unit Qbog

There are no established BVs for unit Qbog. Because Qbog is recognized as part of the Otowi Member of the Bandelier Tuff (Broxton and Reneau 1995, 49726), the radionuclides detected in unit Qbog are screened against BVs established for Qbo. Thorium-230, uranium-234, uranium-235, and uranium-238 were detected at concentrations above Qbo BVs in two or three of the six samples from unit Qbog. Plutonium-239 was detected in one of six samples and has no BV for unit Qbo.

Radionuclides above BVs in Soil

The naturally occurring radionuclide results from samples collected from fractures and paleosols were compared to soil BVs. Americium-241, plutonium-238, and plutonium-239 were detected in one of six such samples from MDA G. The soil BVs for the radionuclides are only for surface soil samples (0–6 in.) and were not used for comparison to the subsurface soil samples.

6.3.3 Results of Moisture Analyses

Sixty-two samples for laboratory analyses of moisture content and matric potential were collected at approximately 5-ft intervals to a depth of 595 ft from BH 54-25423. Three moisture and matric potential samples were collected at 5-ft intervals from 595.5 ft to 699.5 ft bgs in BH 15-3 (54-25105). The results of these analyses are presented in Table 6.3-4. Gravimetric moisture content results ranged from 0.2% to 27.2%, with all samples except the 27.2% result at or below 11.3% moisture by weight. The moisture content in Qbt 2 ranged from 2.1% to 6.4%, with a mean of 3.86%. Moisture content in Qbt 1v ranged from 5.3% to 10%, with a mean of 7.7%. Moisture content in Qbt 1g ranged from 4.0% to 10.8%, with a mean of 7.0%. Median values for all units were within 1.9% of the mean values. One sample, collected in BH 15-2 (54-25423) from the Guaje Pumice Bed overlying the basalt, showed a moisture content of 27.2%. One sample, collected from the basalt at a depth of 545.0 ft to 545.3 ft in BH 15-2 (54-25423), showed a moisture content of 11.3%. Matric potential measurements ranged from –0.6 bars to –335.0 bars, indicating that none of the samples submitted were saturated (negative matric potential readings are indicative of unsaturated conditions).

6.4 Subsurface Vapor Sampling

In each borehole, vapor samples for VOCs and tritium were collected at the base depth of the nearest adjacent disposal unit and at TD of the borehole. In addition to SUMMA canisters for VOC analyses and silica gel samples for tritium analysis, field-screening data were collected using a CES Landtec GEM 2000.

6.5 Subsurface Vapor Sampling Field-Screening Results

Following borehole completion, pore-gas samples were collected and analyzed in the field using a downhole straddle-packer system to isolate the desired sampling interval and a Landtec to monitor methane, carbon dioxide, and oxygen. Each sampling interval was purged before sampling until the measurements of carbon dioxide and oxygen were stable and representative of subsurface conditions. Field-screening results are presented in Table 6.5-1.

6.6 Subsurface Vapor Sampling Analytical Results

Pore-gas samples were sent to an off-site analytical laboratory for analysis of VOCs and tritium. Sample results from 38 boreholes (including deep BH 15-3 [54-25105]) installed during the investigation reported concentrations of multiple VOCs (Table 6.6-1) and tritium (Table 6.6-2).

Volatile organic compounds were detected in 38 boreholes at MDA G. In total, 30 VOCs were detected in some or all the pore-gas samples beneath MDA G. Table 6.6-1 lists the VOCs detected in pore gas by borehole. The primary VOC detected in 75 of 76 samples was TCA. Other VOCs detected included trichloroethene (TCE), tetrachloroethene (PCE), and trichloro-1,2,2-trifluoroethane[1,1,2-] (Freon-113). The concentrations of TCA ranged from 41 $\mu g/m^3$ to 709,000 $\mu g/m^3$. The highest VOC concentrations were detected in boreholes in the eastern portion of the site, in the vicinity of Pits 1, 2, 3, 4 and 5 and the nearby shaft field. The highest concentration of TCA was 709,000 $\mu g/m^3$collected from BH 54-24378 in the eastern portion of MDA G, near the disposal shafts, at a depth of 136 ft. Two additional areas of higher VOC concentrations occurred in the central portion of MDA G, near Pits 8, 9, 10, 12, 13, 15, 16, and 19, and in the western portion of the site, near Pits 29, 32, 33, 35 and 36. Plate 6.6-1 shows the VOCs detected in the subsurface vapor samples.

An analysis of the VOCs detected in pore-gas samples (Table 6.6-1) indicates that VOC contamination in the eastern, central, and western portions of the site may be the result of releases from different sources of VOCs from disposal units in these areas. The highest levels of TCA in the central and western portions of MDA G were detected in samples collected from BH 30 (54-24390) and BH 34 (54-24394), respectively. Although TCA is still the dominant contaminant in these areas, the relatively higher concentrations of other VOCs, including TCE and PCE, in these samples indicate releases from different sources. However, the levels of VOCs in the subsurface vapor in these portions of MDA G are an order of magnitude less than in the eastern portion.

Tritium samples collected from all 38 boreholes detected variable concentrations of tritium (Table 6.6-2). The concentrations ranged from 479 pCi/L (BH 24 [54-24384] at 65–67 ft bgs) to 6,960,000 pCi/L (BH 26 [54-24386] at 35–37 ft bgs). Plate 6.6-2 shows tritium in vapor samples collected beneath MDA G. The highest tritium readings were beneath the eastern and south-central portions of the facility. Tritium concentrations generally decrease with distance and depth from these two portions of MDA G. Tritium was detected at 5150 pCi/L in borehole BH 15-3 (54-25105) in a pore-gas sample from the Puye Formation, at a depth of 485–700 ft.

6.7 Preliminary Data for BH-1 (Location 54-24360)

Drilling for BH 1 (54-24360) began on August 16, 2005, and the surface casing set to a depth of 14 ft within unit 2 of the Tshirege Member. The overlying crushed tuff cover of Pits 1 and 3 was 9 ft thick. The following day, the borehole was advanced from 14 ft bgs to the target depth of 200 ft bgs. One analytical sample and field duplicate sample were collected at a depth corresponding with the base of the nearby pits (60 ft to 65 ft bgs) for the full analytical suite (TAL metals, boron, molybdenum, cyanide, nitrates, perchlorate, dioxins, furans, VOCs, and radionuclides [isotopic uranium, isotopic plutonium, americium-241, strontium-90, technetium-99, and those analyzed by gamma spectroscopy]). Additional samples were collected at 135 ft to 138 ft within the Cerro Toledo interval and at 195 ft to 200 ft bgs (TD) and analyzed for TAL metals, boron, molybdenum, cyanide, nitrates, perchlorate, and radionuclides (isotopic uranium, isotopic plutonium, americium-241, strontium-90, technetium-99, and those analyzed by gamma spectroscopy). Following completion of drilling on August 17, 2005, the borehole was completed with a flush mount wellhead. A summary of subsurface core samples collected from BH 1 (54-24360) is presented in Table 6.7-1.

Following the completion of drilling, pore-gas samples for tritium and VOCs were collected to evaluate the nature and extent of the VOC vapor plume and tritium in pore gas beneath MDA G. Pore-gas sampling was conducted in accordance with procedures described in Section 4.6. A summary of pore-gas samples is presented in Table 6.7-2.

Although the analytical data from BH 1 (54-24360) have not been validated, preliminary pore-gas data are presented in Tables 6.7-3 and 6.7-4. The preliminary core data for organic chemicals, inorganic chemicals, and radionuclides are presented in Tables 6.7-5 through 6.7-7. The preliminary results appear to be consistent with data for other boreholes sampled at MDA G. Once these data have been validated, the final results will be transmitted to NMED, along with a discussion of the impact, if any, on conclusions regarding the nature and extent of contamination at MDA G and the proposed monitoring program.

7.0 CONCLUSIONS

The MDA G field investigation was designed to provide data to complete an assessment of the nature and extent of contamination as a result of historical waste disposal activities at MDA G. These data complement data collected during 1994–1995 as part of the Phase I RFI and the quarterly pore-gas monitoring conducted from 1997 to the present.

7.1 Summary of RFI Investigation

The data collected during the Phase I RFI consisted of comparisons of site data with BVs in environmental media, an evaluation of correlations among environmental measurements, and an evaluation of spatial plots of contaminant concentrations in surface and subsurface environmental media. The following RFI COPCs were identified:

- Americium-241, cesium-137, cobalt-60, europium-152, plutonium-238, plutonium-239, strontium-90, thorium-230, tritium, uranium-234, uranium-235, and uranium-238 were detected in subsurface core beneath the pits, trenches, and shafts.
- Antimony, arsenic, cadmium, cyanide, molybdenum, selenium, silver, thallium, and vanadium had detected concentrations and/or DLs above background levels in subsurface core beneath the pits, trenches, and shafts.
- Twenty-two organic chemicals were detected in subsurface core beneath the pits, trenches, and shafts: one PCB, three pesticides, nine SVOCs, and nine VOC
- Tritium was detected in surface flux samples and pore gas.
- VOCs were detected in pore-gas samples collected from monitoring boreholes, surface flux, and ambient-air samples.
- Methoxychlor was detected in channel sediments.
- Americium-241, cesium-137, cobalt-60, plutonium-238, plutonium-239, and tritium were detected above BVs in channel sediments. Cobalt, mercury, selenium, and silver were not detected above BVs in sediment samples; however, the DLs for some samples were elevated above BVs. Barium, cadmium, chromium, and iron were detected above BVs in channel sediments.

7.2 Summary of Quarterly Pore-Gas Monitoring

Ongoing quarterly pore-gas monitoring conducted since 1997 indicates that the maximum vapor concentrations are located in the eastern portion of MDA G and are limited at depth by the Cerros del Rio basalt layer. The dominant subsurface vapor contaminant is TCA. A comparison of the results of the pore-gas samples collected during the 2005 field investigation with past quarterly pore-gas monitoring results indicate that the existing monitoring network is satisfactory for monitoring subsurface VOCs and tritium contamination. Several additional monitoring points were identified near potential source areas. Boreholes proposed for additional monitoring as part of the network are identified in Appendix I.

7.3 Results of the MDA G Work Plan Investigation

During the 2005 field investigation, 39 boreholes were drilled to collect soil, rock, and pore-gas samples to determine the nature and extent of contamination at MDA G. A number of organic and inorganic chemicals were detected at trace levels in soil and rock samples collected beneath the former disposal units. The findings were generally consistent with the Phase I RFI results. The only organic chemicals detected in core samples were trace levels of several dioxin and furan congeners.

Concentrations of inorganic chemicals detected beneath MDA G were indicative of natural variability within the various stratigraphic layers. All inorganic chemicals detected above BVs in the units adjacent to the base of the disposal pits, trenches, and shafts were generally less than five times the BV. In addition, all inorganic chemicals detected at levels greater than BVs were in samples from intervals containing clay-filled fractures. All detections within the fractures were less than the soil BV, a more representative metric for comparison.

A number of naturally occurring radionuclides and anthropogenic radionuclides were detected or detected above BVs in soil and rock samples from beneath MDA G. Naturally occurring radionuclides were detected at concentrations within the natural variability of these chemicals in the subsurface. All but three uranium and thorium isotope detects within Qbt2 (the unit adjacent the base of the disposal pits and trenches) were at concentrations less than two times the BV. Uranium-234, uranium-235, and uranium 238 each were detected once at 2.8, 3.4, and 2.6 times its BV, respectively. For uranium and thorium isotopes detected above BVs near the base of the disposal shafts (units Qbt 1v and Qbt 1g), all maximum values were less than two times BVs, with most values within 20% of the BV.

Anthropogenic radionuclides detected in subsurface samples were americium-241, plutonium-238, plutonium-239, and strontium-90. The detections of these anthropogenic radionuclides generally occurred sporadically across the site, with americium-241 detected in 10 of 38 boreholes, plutonium-238 in 3 of 38 boreholes, plutonium-239 in 8 of 38 boreholes, and strontium-90 in 6 of 38 boreholes. Plutonium-239 was detected in multiple samples from four boreholes at low levels ranging from 0.1 pCi/g to 0.3 pCi/g: BH 14 (location 54-24374 between Trenches B and C), BH 4 (an angled borehole extending beneath Pits 8, 9, and 10 at location 54-24363), BH 26 (location 54-24386 between Pits 5 and 6), and BH 37 (location 54-24397 at the southern edge of trenches B and C).

The results of quarterly monitoring show VOCs and tritium concentrations to be stable over time and do not indicate that the plume is expanding.

The analytical results from the pore-gas samples collected from 38 boreholes drilled in 2005 confirmed the presence of tritium and VOCs (consisting primarily of chlorinated hydrocarbons) in the vadose zone beneath MDA G. Data collected during the Phase I RFI, quarterly monitoring, and the 2005 investigation indicate that the highest VOC concentrations are beneath the eastern portion of the site, in the vicinity of the shaft field east of Pits 2 and 4.

Sampling results indicated that TCA is the dominant contaminant in pore gas beneath MDA G. The highest concentration of TCA was detected in BH 18 (location 54-24378). TCA concentrations in nearby locations at BHs 28 (54-24388), 19 (54-24379), 26 (54-24386), and 25 (54-24385) were also elevated compared to the rest of the site, indicating the greatest release of TCA is at the east end of MDA G. In addition, results from BH 18 (54-24378), BH 19 (54-24379), and BH 26 (54-24386) show an increase in TCA with depth. Two additional areas of elevated VOCs in pore gas were encountered in the central and western portions of MDA G. The highest levels of TCA in the central and western portions of MDA G were detected in samples collected from BH 30 (54-24390) and BH 34 (54-24394), respectively. Although TCA is still the dominant contaminant in these areas, the relatively higher concentrations of other VOCs, including TCE, Freon-113, and PCE, in these samples indicate releases from different sources. The levels of VOCs in the subsurface vapor in these portions of MDA G are an order of magnitude less than levels in the eastern portion.

No TCA was detected in the pore-gas sample collected at a depth interval of 485 ft to 700 ft from BH 15-3 (54-25105) in a Cerros del Rio basalt layer. An analysis of the chemicals detected in pore-gas samples indicates that the VOC contamination in the eastern, central, and western portions of MDA G may be the result of different sources of VOCs from the disposal units in these areas.

Tritium was detected in pore-gas samples in 35 of 38 boreholes, not including BH 1 (54-24360) for which the data are preliminary. The results from the 2005 field investigation confirm the presence of elevated tritium levels in the south-central portion of MDA G. The maximum tritium concentrations were detected in samples from locations BH 26 (54-24386) and BH 18 (54-24378), located in the eastern portion. Pore-gas monitoring results also confirmed the presence of high concentrations of tritium in the south-central portion of MDA G, beneath Trenches A, B, C and D. These findings appear to represent separate releases, because tritium concentrations decrease with distance and depth from these two portions of MDA G.

Perched groundwater was not encountered beneath MDA G during drilling. Subsurface samples were collected from BHs 15-2 (54-24523) and BHs (54-25105) to evaluate moisture properties and to determine the presence or absence of perched groundwater zones beneath MDA G. Detailed lithological logging of core did not identify visibly saturated zones to a depth of 700 ft. Sixty-two samples were submitted to an off-site contract laboratory for moisture content and matric potential analyses. The results of gravimetric moisture analyses showed moisture levels ranging from 0.2% to 27.2% moisture by weight. Only one sample, from BH 15-2 (54-24523), had a moisture level of 27.2%; all other remaining boreholes had moisture levels of 11.2% or less. Laboratory matric potential readings confirmed that all samples collected beneath MDA G contained moisture levels below saturation. Camera logging conducted in this borehole from approximately 480 ft to 700 ft bgs showed no signs of a perched zone within the Cerros del Rio basalts.

7.4 Summary of Risk Assessment Results

The present-day risk assessments for MDA G concluded that surface and subsurface contamination at the site does not pose a potential unacceptable risk to human health from exposure to ambient air or from inorganic, organic, or radionuclide COPCs in the surface.

Results of the human health risk assessment indicated that present-day noncarcinogenic and carcinogenic risks (0.07 and 1×10^{-8}, respectively) for an industrial site worker were less than NMED's target levels of an HI of 1.0 and cancer risk of 10^{-5} (NMED 2004, 85615). Potential dose for an industrial site worker at MDA G is approximately 1.5 mrem/yr, which is below the DOE's target dose of 15 mrem/yr (DOE 2000, 67489). The equivalent risk for the dose is 2×10^{-5} based on a comparison to EPA radiation preliminary remediation goals (PRGs) for an industrial outdoor worker (http://epa-prgs.ornl.gov/cgi-bin/epa-prgs). In addition, the tritium in ambient air indicates there is no potential unacceptable present day dose to site workers.

Contamination in channel sediment does not pose a potential risk to ecological receptors. Methoxychlor[4,4'-] was detected in 14 sediment samples and had an HQ less than 0.3. Americium-241, cesium-137, cobalt-60, plutonium-238, plutonium-239, and tritium were detected in multiple sediment samples but had HQs less than 0.3. Inorganic chemicals of potential ecological concern (COPECs) were either not detected in channel sediment or had detected concentrations similar to BVs. Potential exposure to the inorganic COPECs is similar to background.

The HI (0.09) from the inhalation ecological screening level comparison to pore-gas VOCs indicates no potential present-day risk to burrowing animals exists.

Based on the results of the Phase I RFI and the 2005 investigation sampling, no additional data are needed to characterize the nature and extent of contaminant releases beneath MDA G.

8.0 RECOMMENDATIONS

The objectives of the approved work plan activities were to

- complete the characterization of nature and extent of contaminant releases at MDA G,
- evaluate the potential ecological and human health risks posed by exposure to COPCs under present-day conditions, and
- recommend a path forward to reduce uncertainties associated with contaminant behavior and ensure that existing COPCs do not pose an unacceptable risk/dose to human and ecological receptors.

Data gathered during the Phase I RFI, data obtained from ongoing quarterly pore-gas monitoring, and data collected during the 2005 investigation under the approved work plan have characterized the nature and extent of contamination in surface and subsurface media at MDA G. The results from the human health and ecological assessments, presented in Appendix G, indicate that the site poses no potential present-day risk/dose to human health and the environment.

Therefore, based on the results of the field investigations, recommended actions are as follows:

- Complete a CME to ensure that future releases from the site pose no unacceptable risks to human and ecological receptors
- Monitor the subsurface vapor plume in accordance with a long-term monitoring plan (Appendix I) as approved by NMED

9.0 REFERENCES AND MAP DATA SOURCES

9.1 References

The following list includes all references cited in this document. Parenthetical information following each reference provides the author, publication date, and the ER identification (ID) number. This information also is included in the citations in the text. ER ID numbers are assigned by the Los Alamos National Laboratory's ENV-ERS Program to track records associated with the Program. These numbers can be used to locate copies of the actual documents at the ENV-ERS Program's Records Processing Facility and, where applicable, with the ENV-ERS Program's reference library titled "Reference Set for Material Disposal Areas, Technical Area 54."

Copies of the reference library are maintained at the NMED Hazardous Waste Bureau; the DOE Los Alamos Site Office; and EPA, Region 6. This library is a living collection of documents that was developed to ensure that the administrative authority has all the necessary material to review the decisions and actions proposed in this document. However, documents previously submitted to the administrative authority are not included.

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9.2 Map Data Sources

Spatial Data Sources

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Dirt Road Arcs; Los Alamos National Laboratory, KSL Site Support Services, Planning, Locating, and Mapping Section; Development Edition of 06 January 2005.

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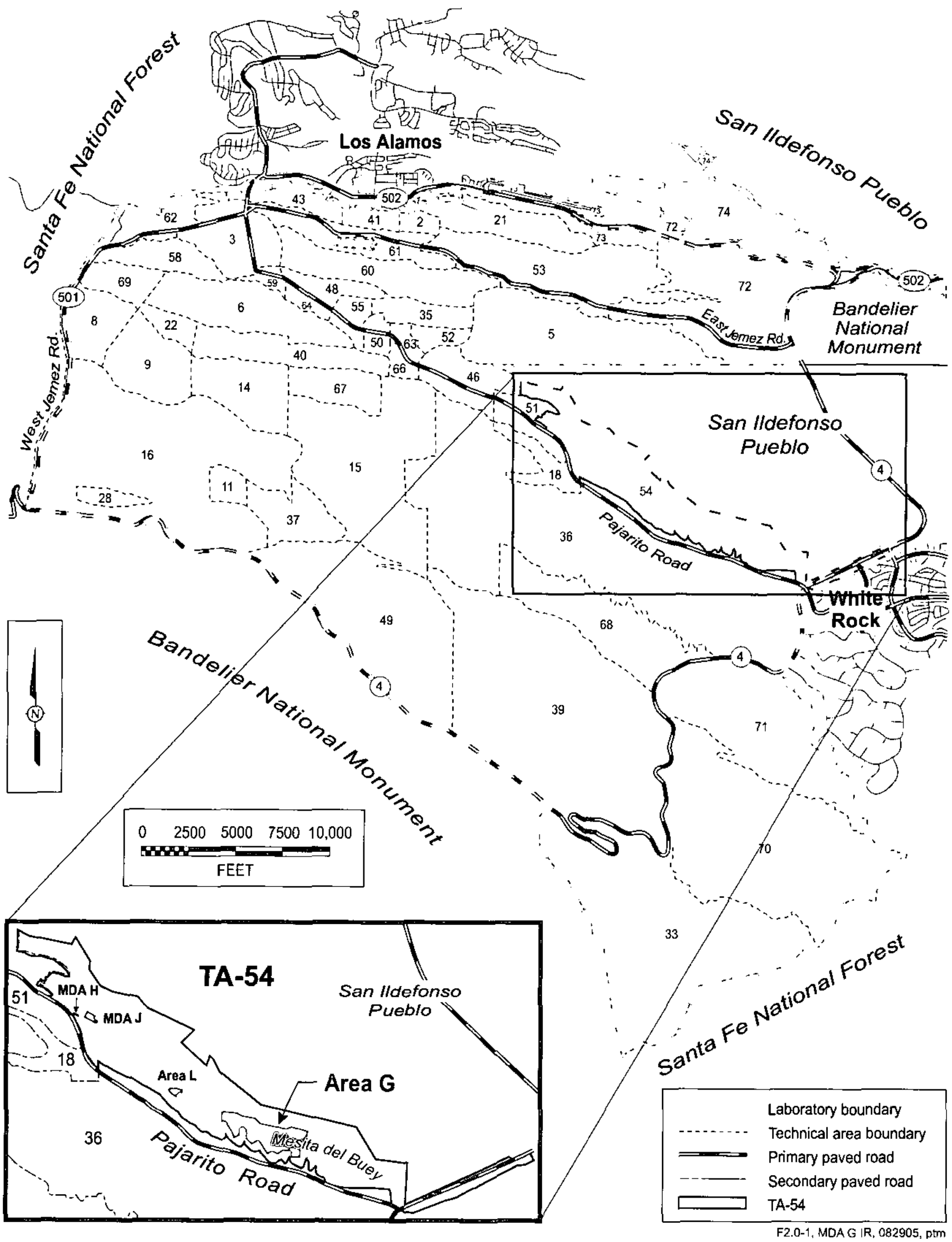

Figure 2.0-1. Location of Area G in TA-54 with respect to Laboratory technical areas and surrounding land holdings

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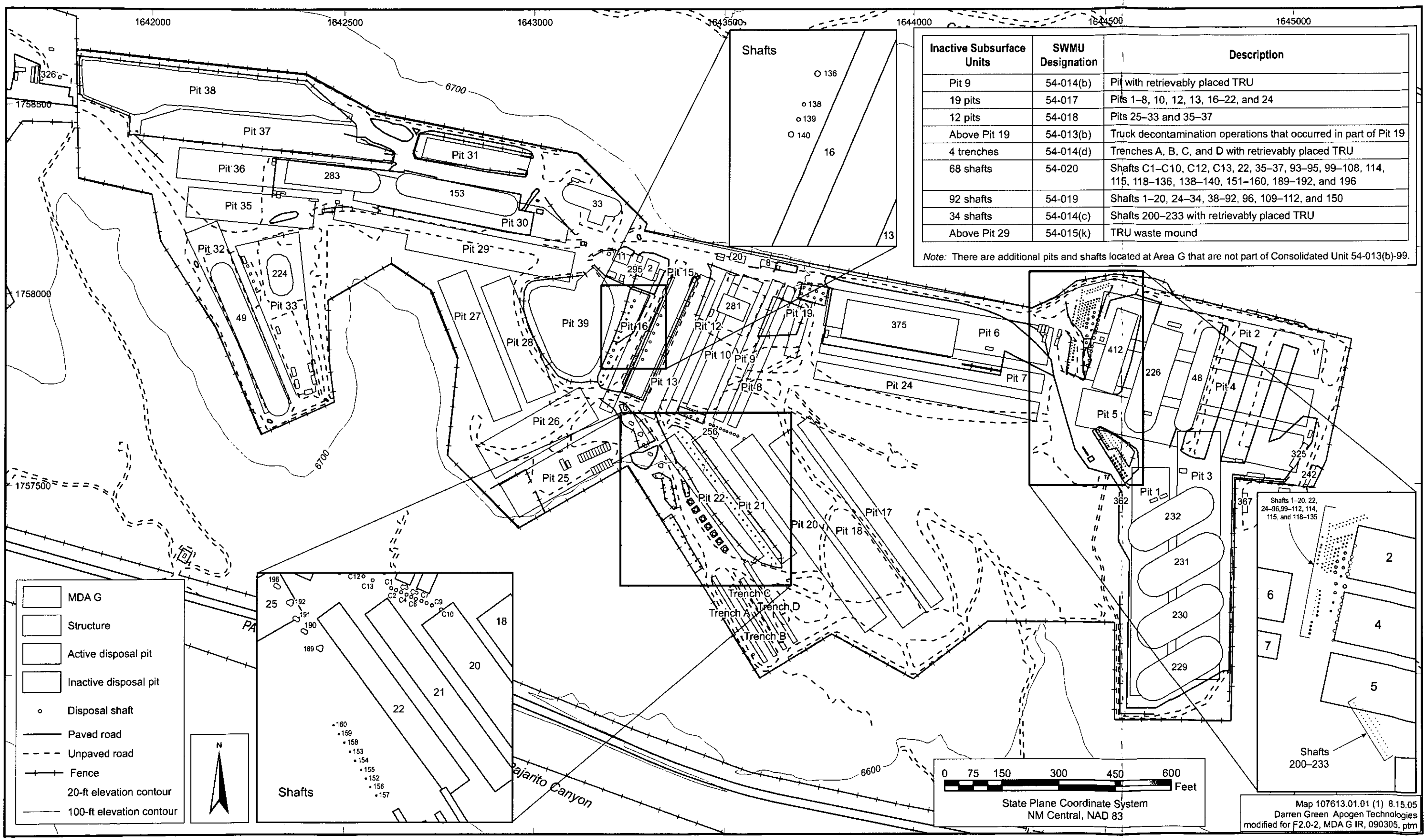
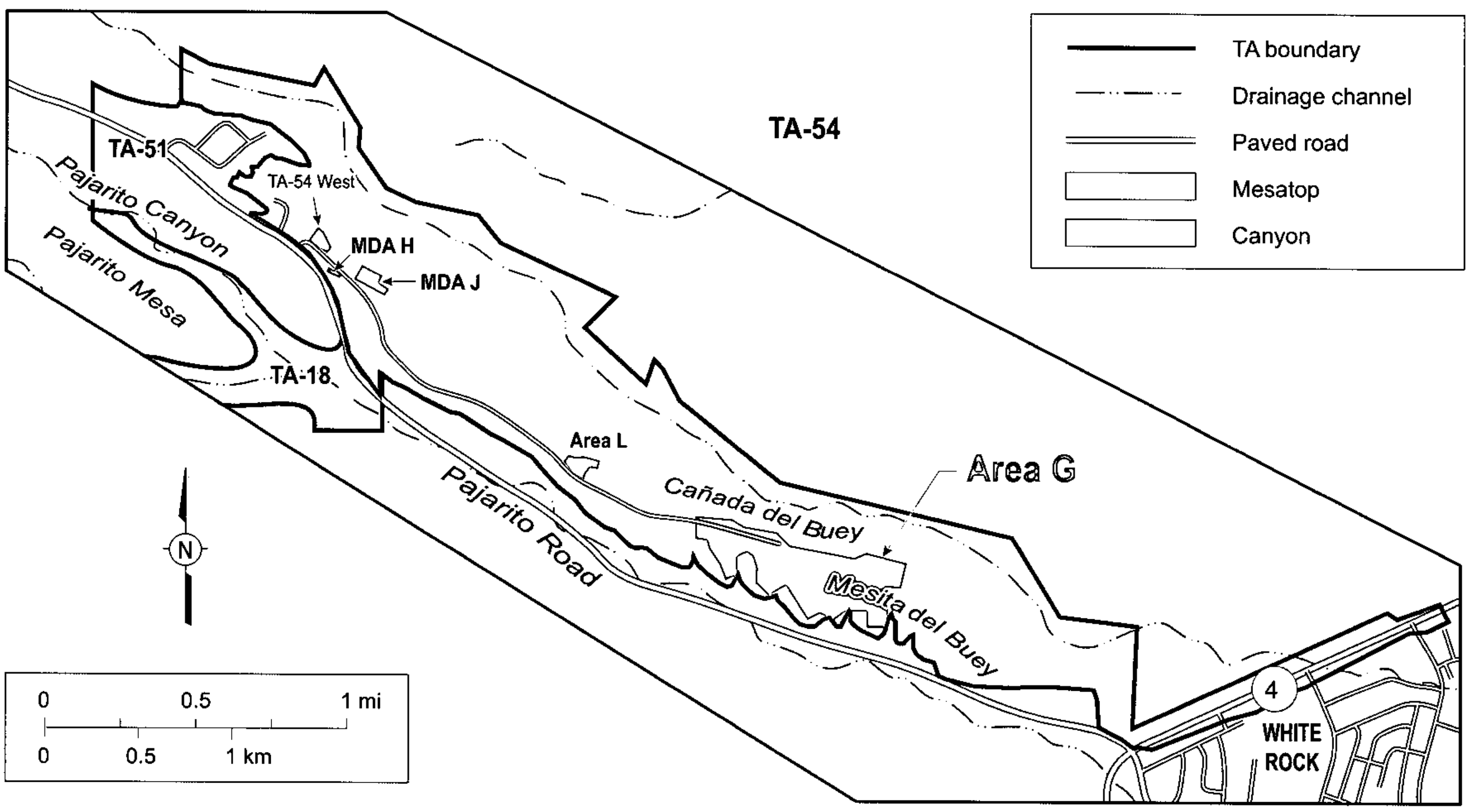


Inactive Subsurface Units	SWMU Designation	Description
Pit 9	54-014(b)	Pit with retrievably placed TRU
19 pits	54-017	Pits 1–8, 10, 12, 13, 16–22, and 24
12 pits	54-018	Pits 25–33 and 35–37
Above Pit 19	54-013(b)	Truck decontamination operations that occurred in part of Pit 19
4 trenches	54-014(d)	Trenches A, B, C, and D with retrievably placed TRU
68 shafts	54-020	Shafts C1–C10, C12, C13, 22, 35–37, 93–95, 99–108, 114, 115, 118–136, 138–140, 151–160, 189–192, and 196
92 shafts	54-019	Shafts 1–20, 24–34, 38–92, 96, 109–112, and 150
34 shafts	54-014(c)	Shafts 200–233 with retrievably placed TRU
Above Pit 29	54-015(k)	TRU waste mound

Note: There are additional pits and shafts located at Area G that are not part of Consolidated Unit 54-013(b)-99.

Figure 2.0-2. MDA G waste disposal units



Source: A. Kron_MDA L RFI Rpt., 120302, modified for F2.1-1, MDAG IR, 082605, ptm

Figure 2.1-1. Location of Area G in TA-54

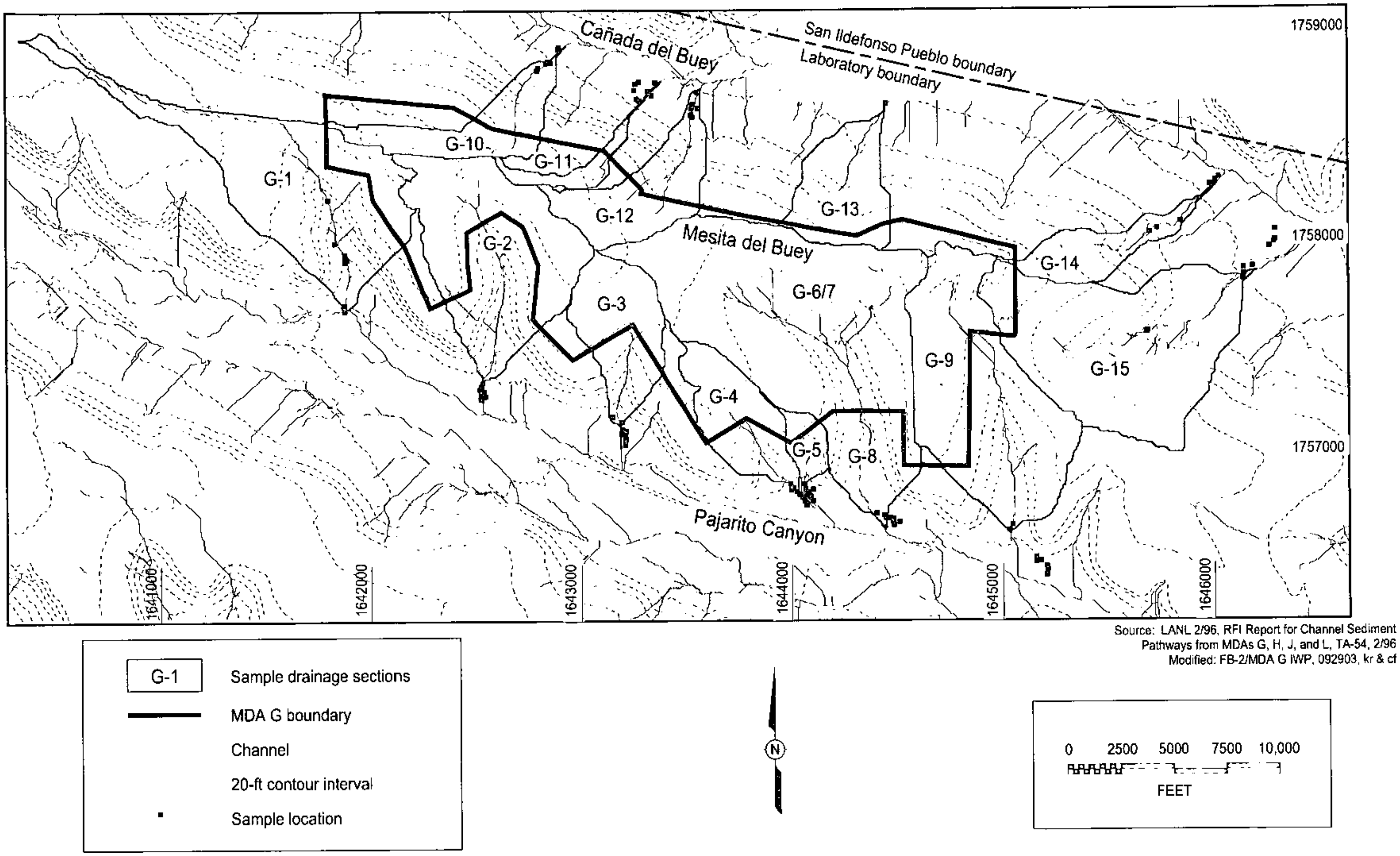


Figure 2.2-1. Locations and designations of Mesita del Buey drainage sections

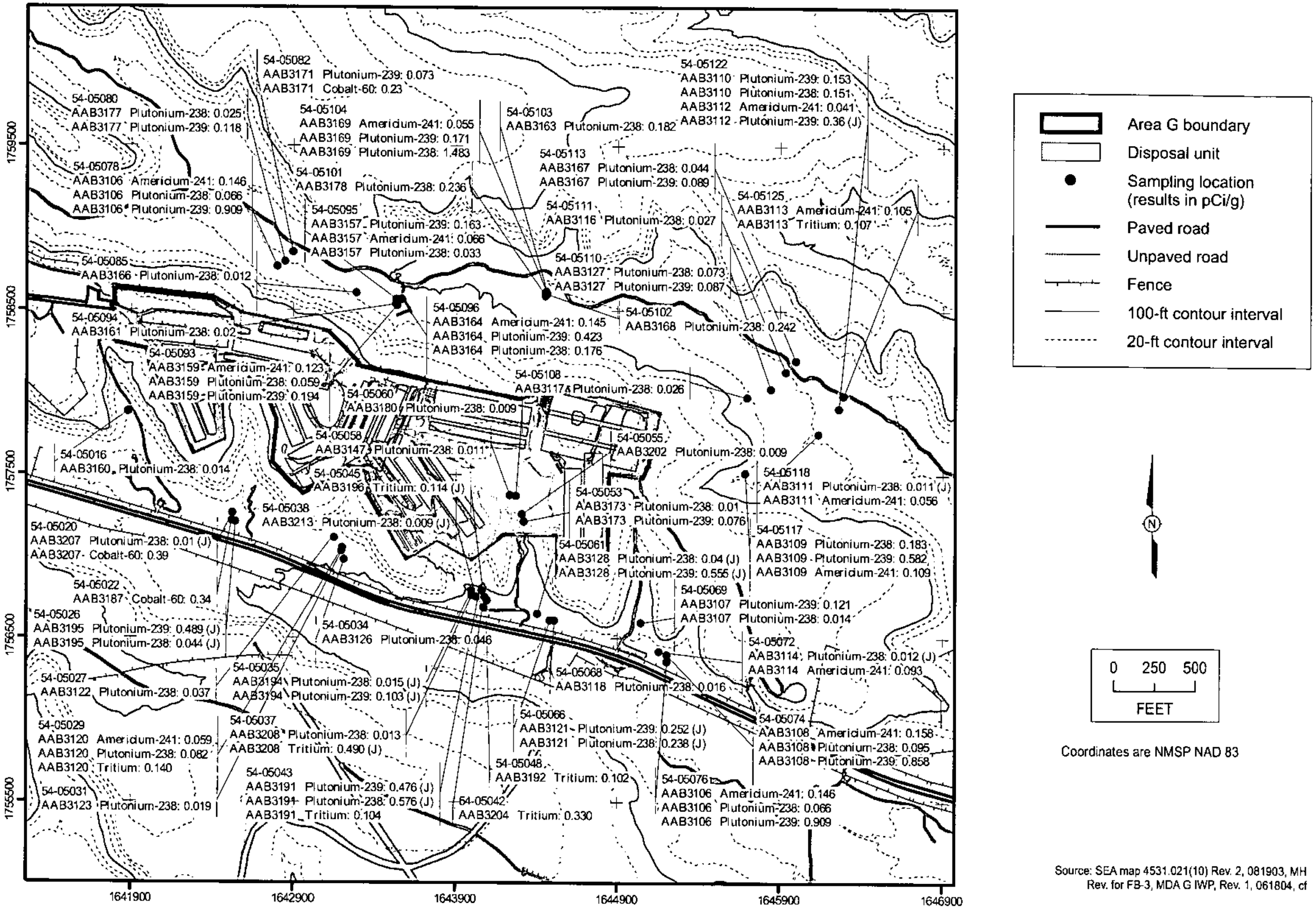


Figure 2.2-2. Radionuclides detected above background in MDA G channel sediments

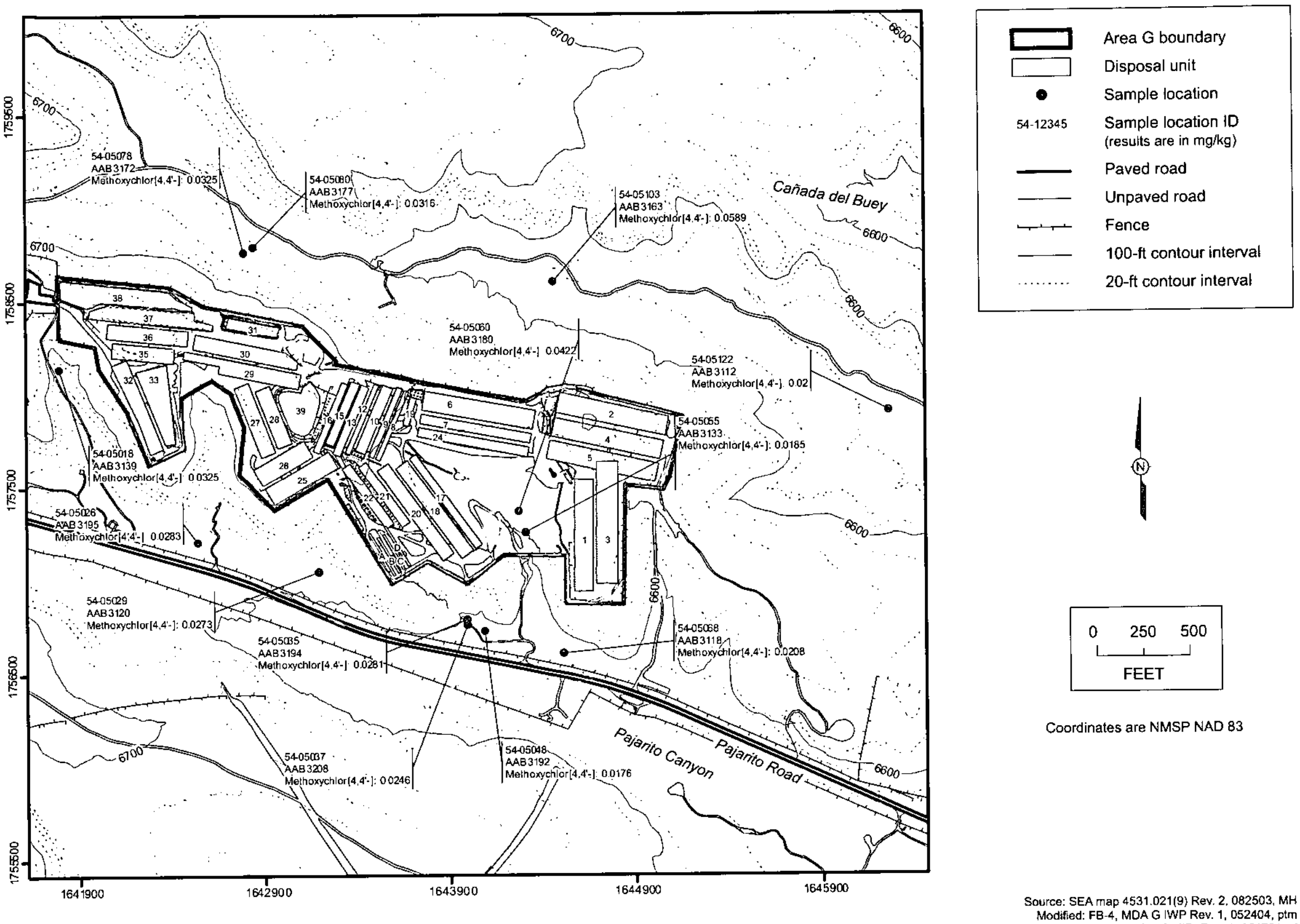


Figure 2.2-3. Organic chemicals detected in channel sediments at Area G

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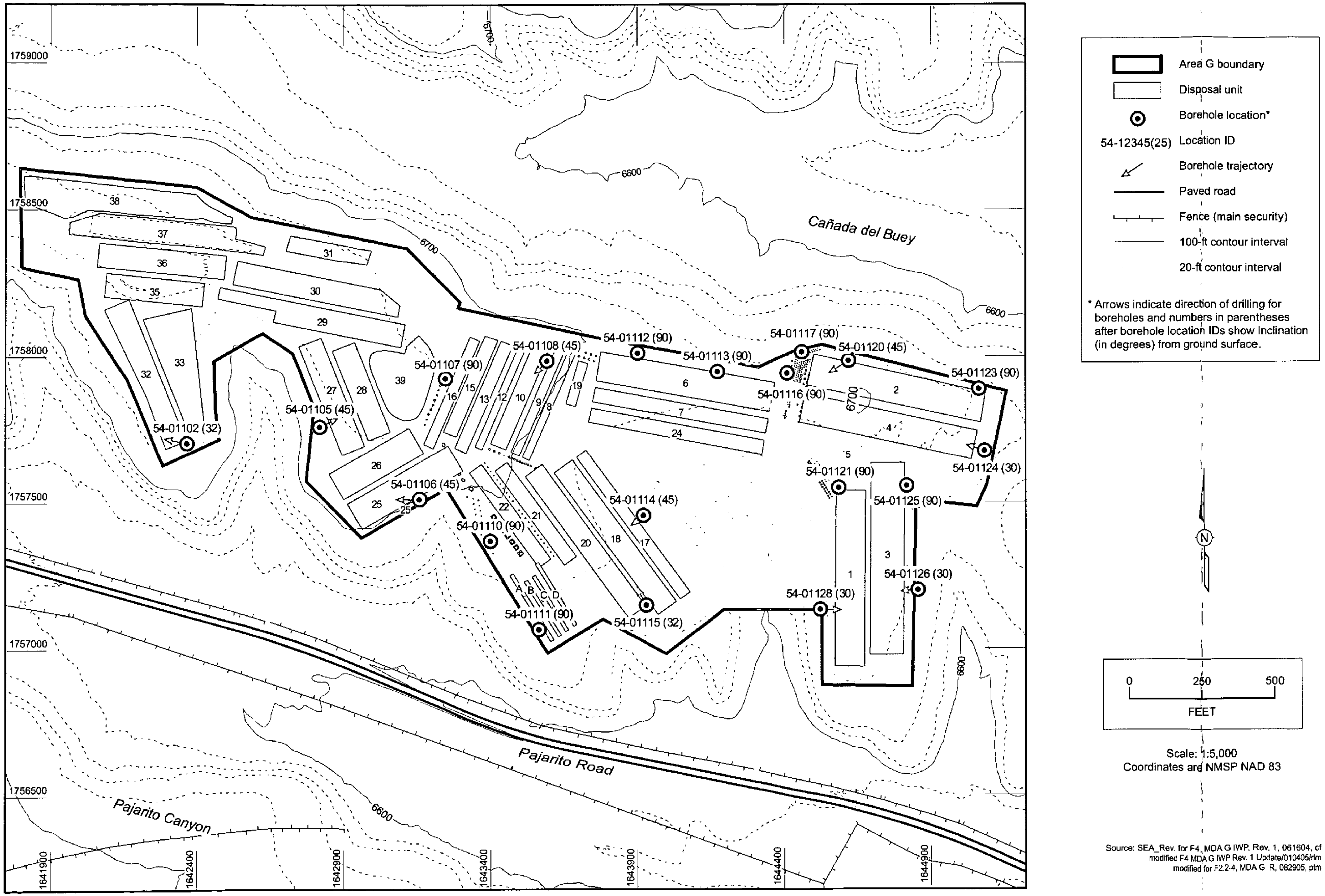

Figure 2.2-4. Locations of MDA G Phase I RFI boreholes

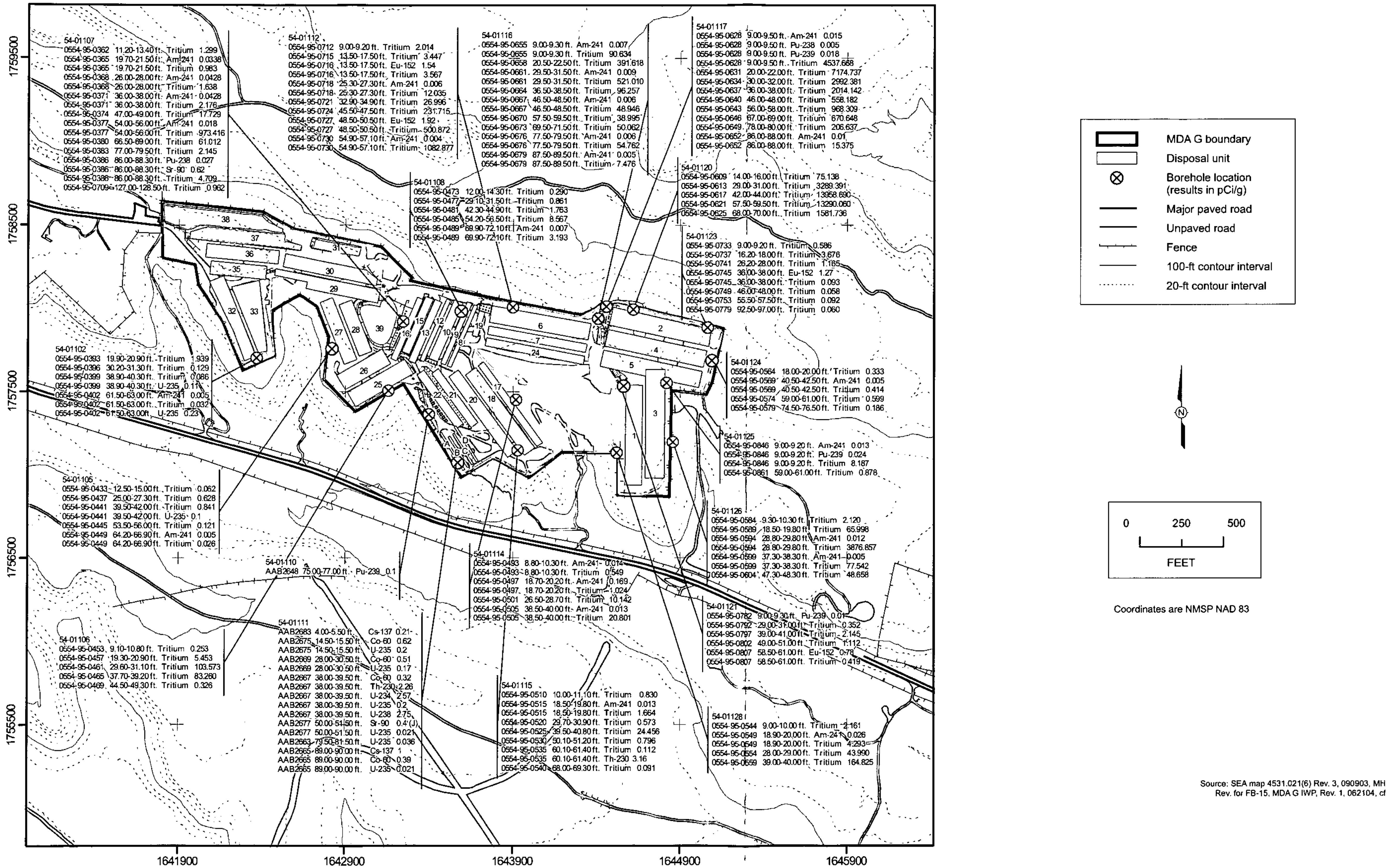

Figure 2.2-5. Radionuclides detected above background in MDA G subsurface tuff

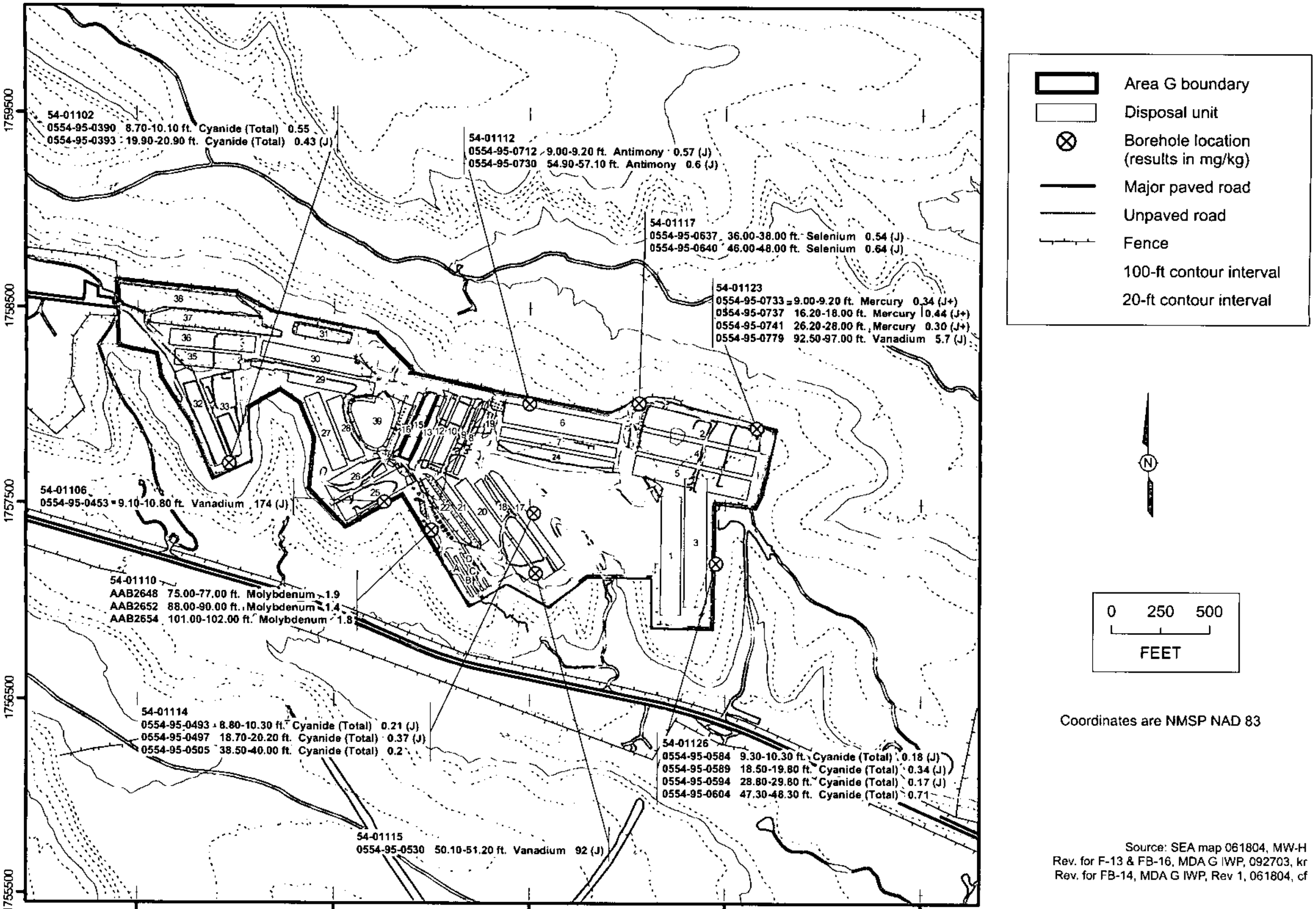

Figure 2.2-6. Inorganic chemicals detected in MDA G subsurface tuff

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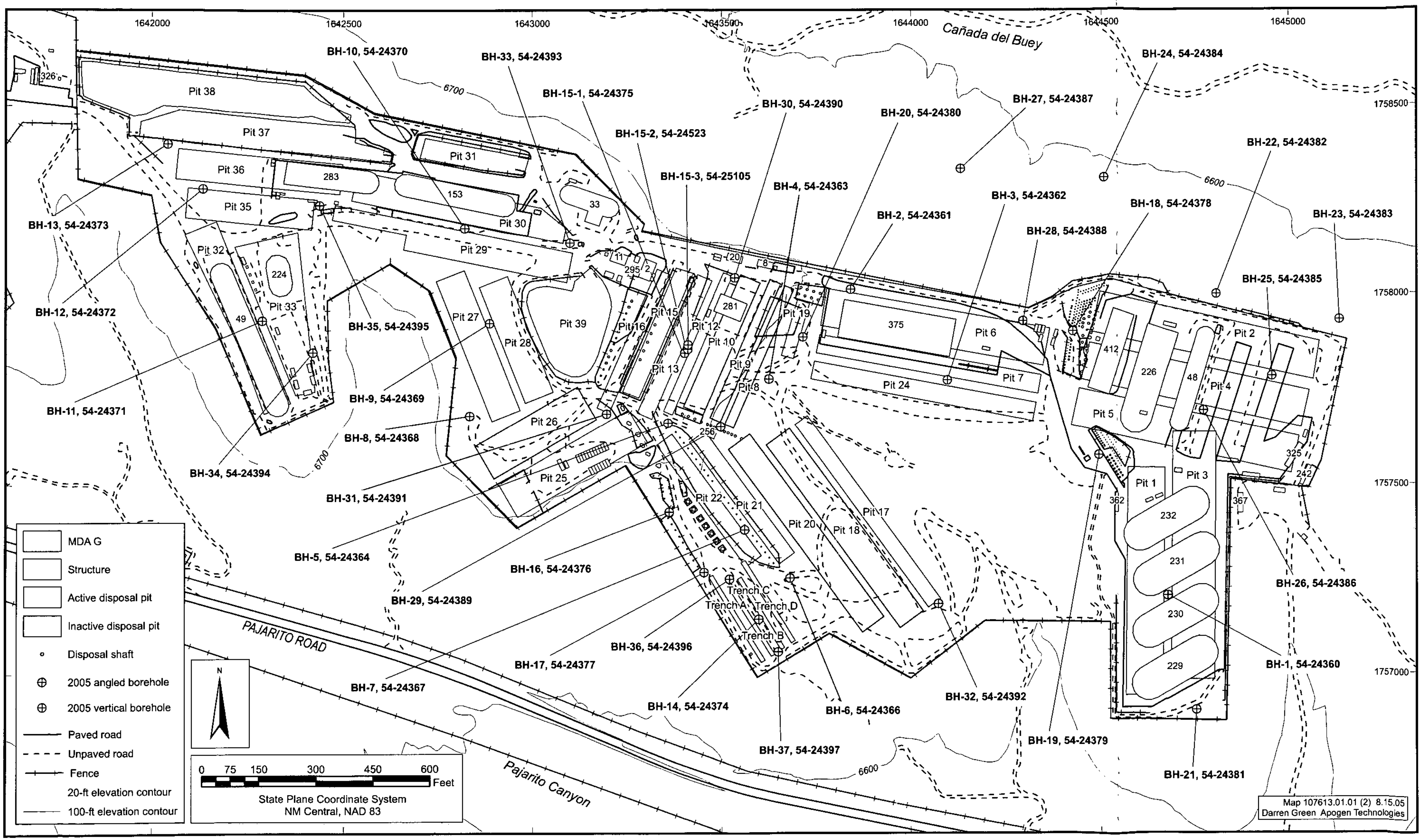

Figure 3.3-1. Locations of boreholes drilled during the MDA G investigation in 2005

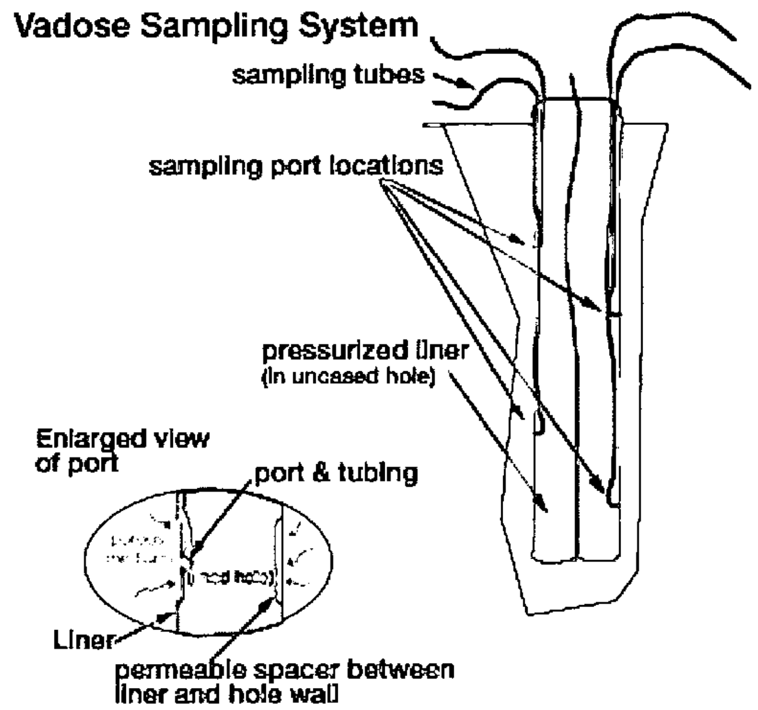

Figure 3.3-2. FLUTe™ membrane liner system for vadose zone pore gas sampling

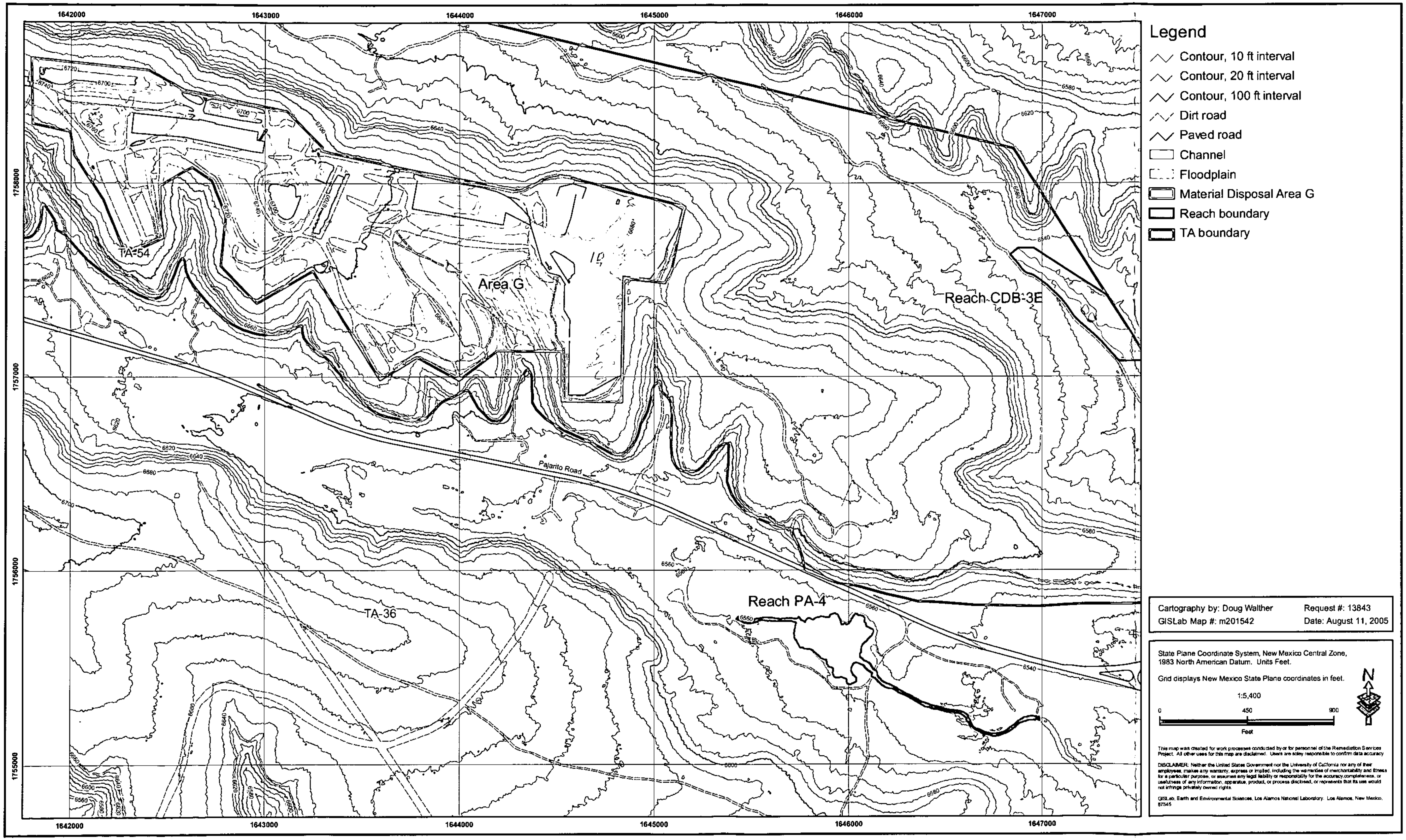

Figure 3.5-1. Locations of reaches CDB-3E and P-A4 in relation to MDA G

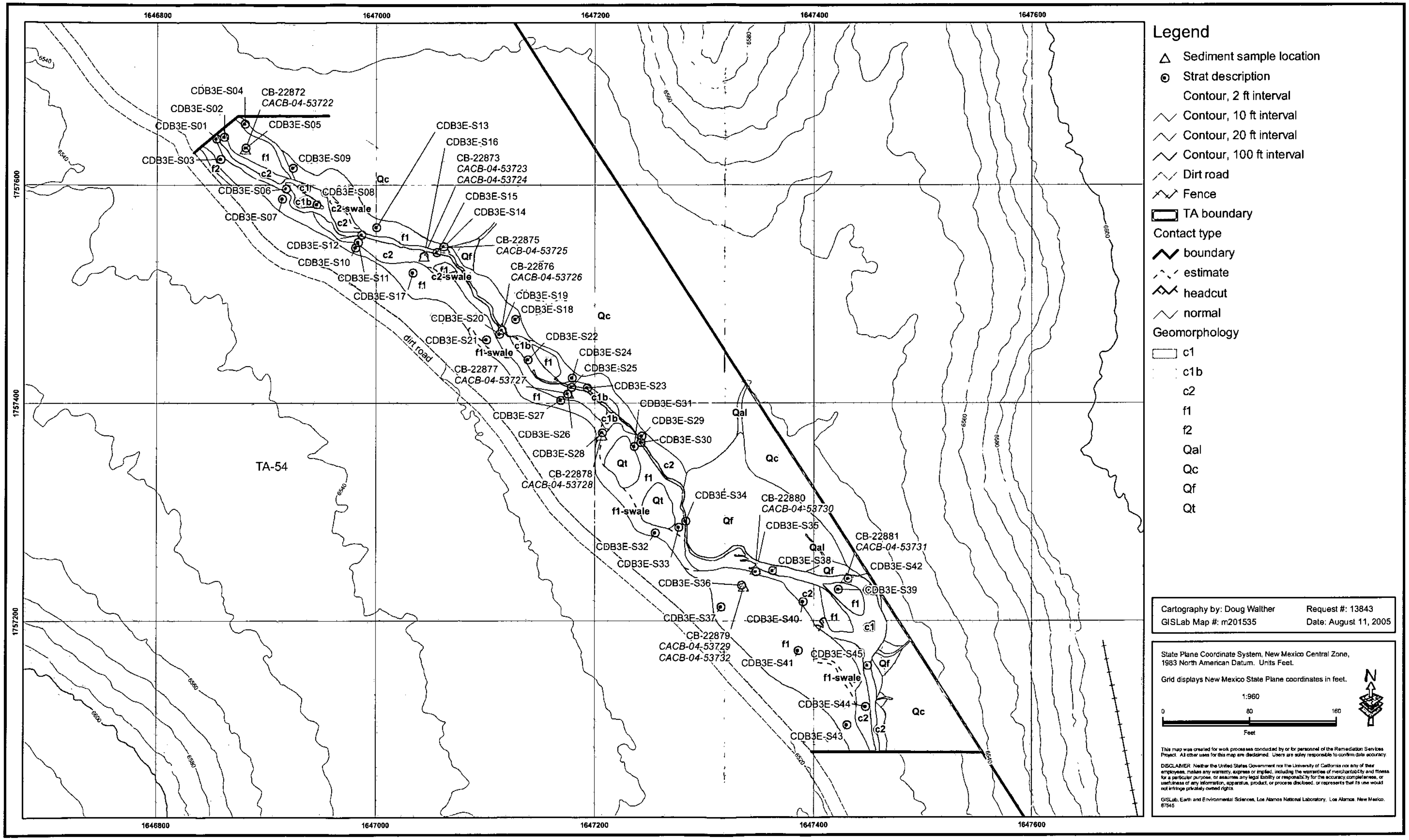

Figure 3.5-2. Cañada del Buey reach CDB-3E geomorphology and sampling locations

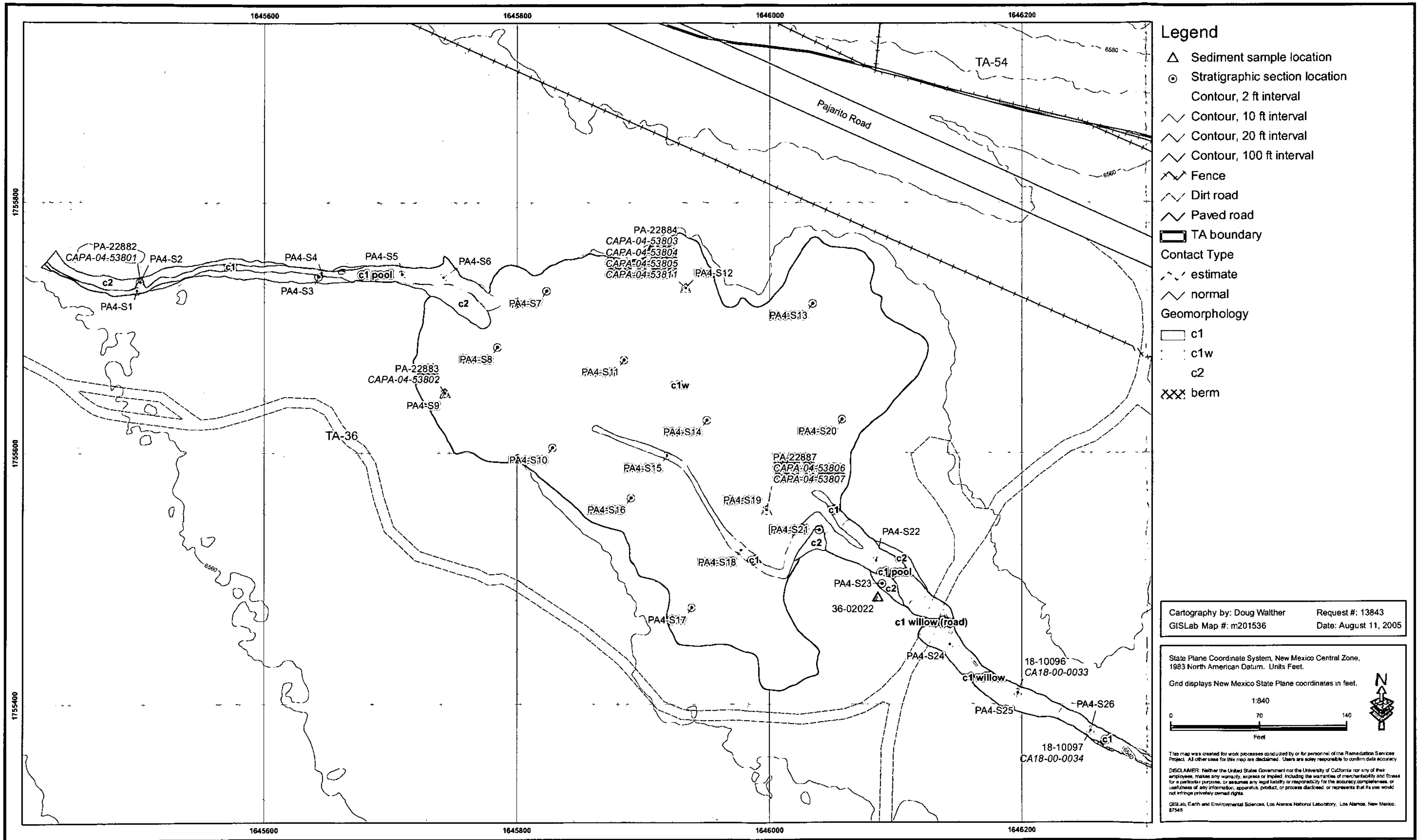

Figure 3.5-3a. Pajarito Canyon upper reach PA-4 geomorphology and sampling locations

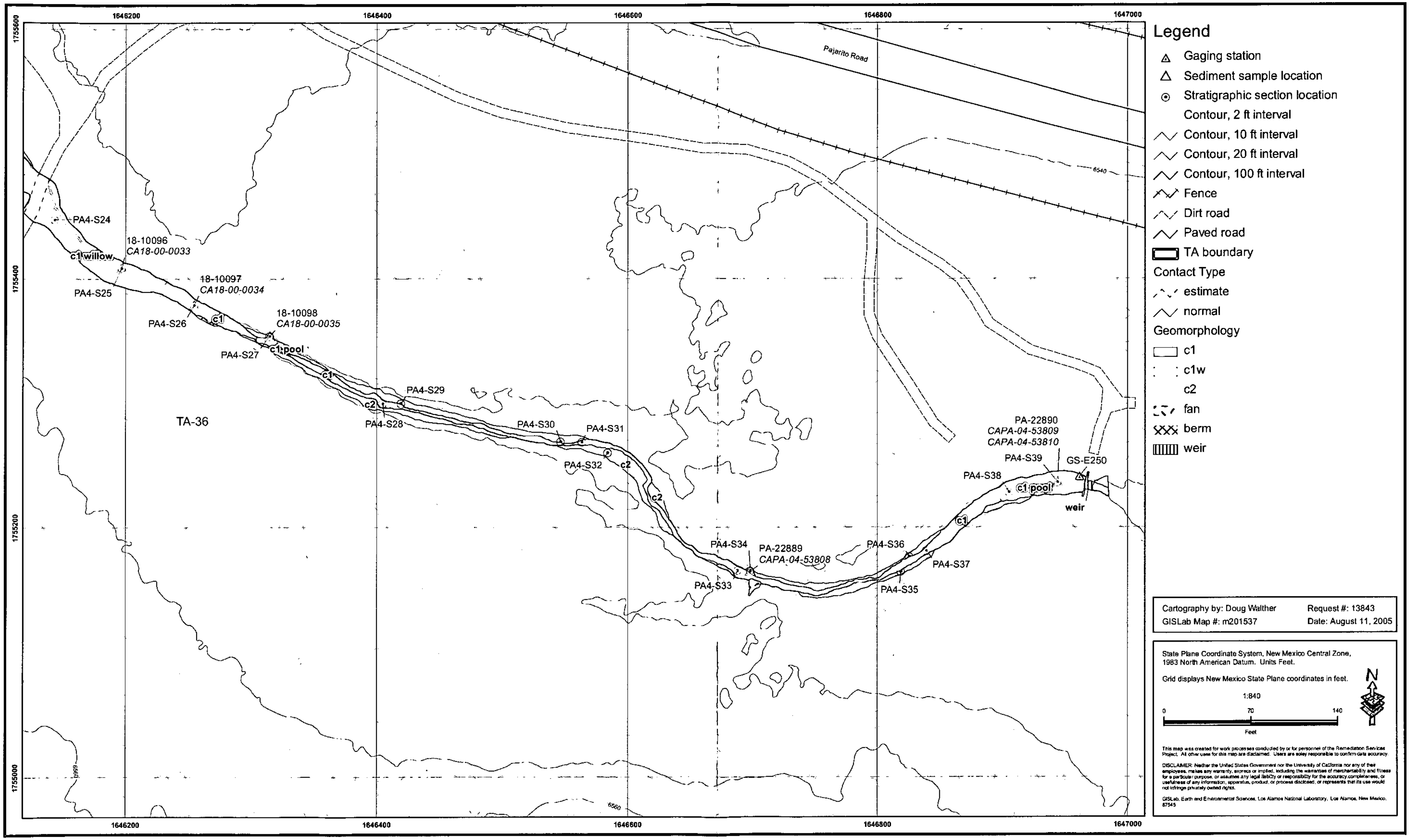

Figure 3.5-3b. Pajarito Canyon lower reach PA-4 geomorphology and sampling locations

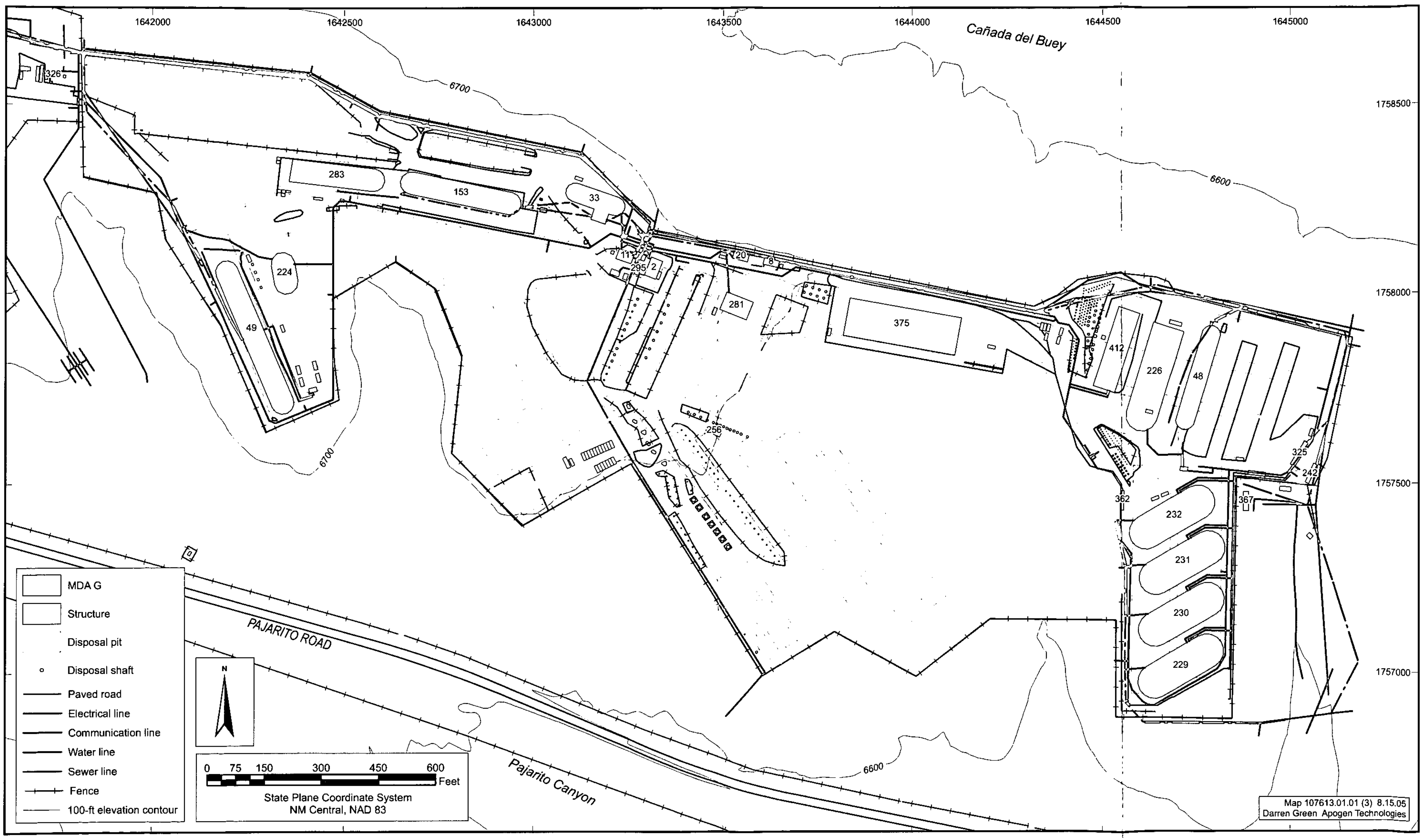

Figure 4.4-1. Utilities and subsurface structures at MDA G

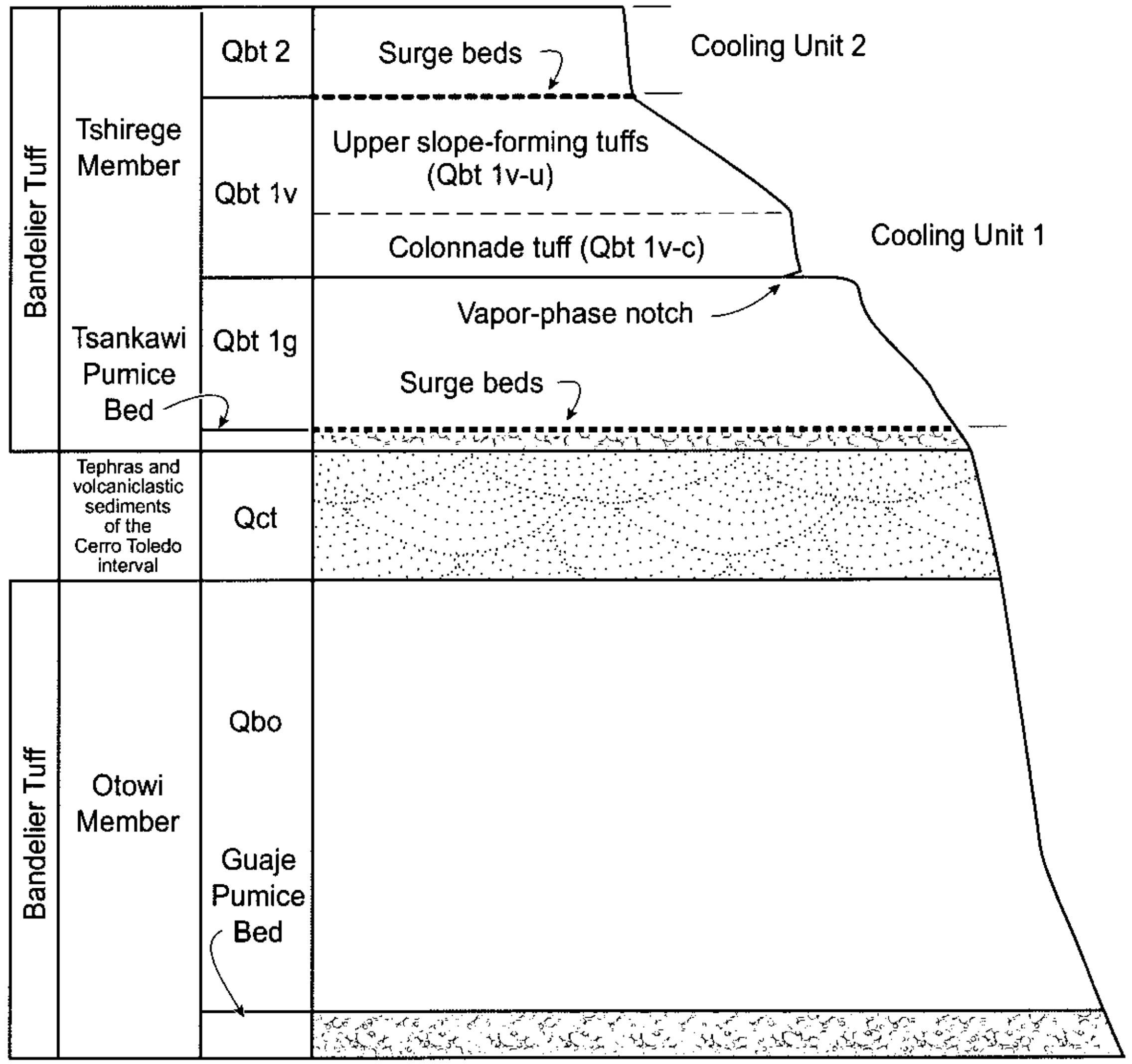

Figure 4.4-2. Generalized stratigraphy of Bandelier Tuff at TA-54

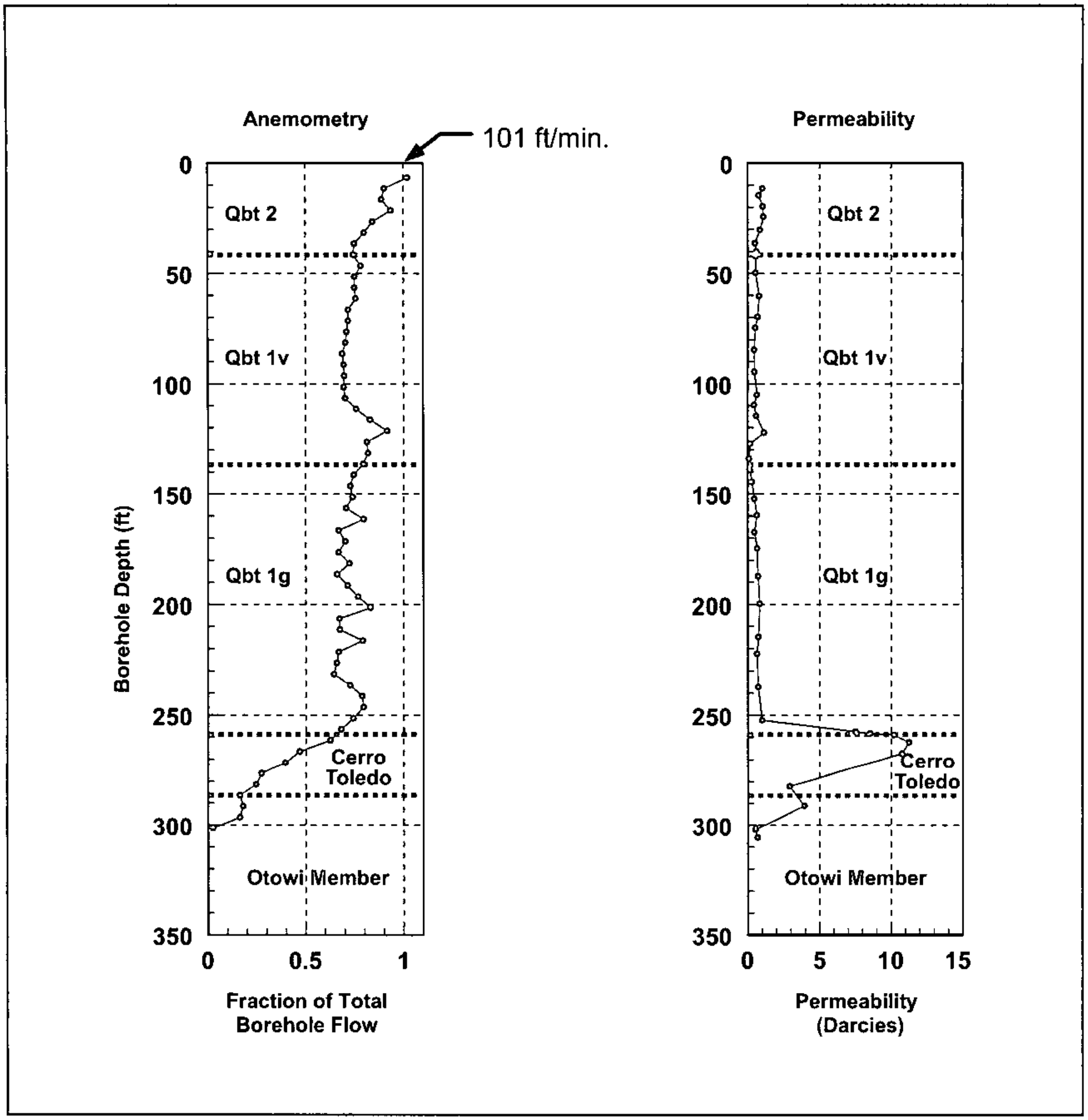

Figure 4.6-1. Borehole 54-01018 anemometry and permeability results

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Table 2.1-1
MDA G Disposal Unit Information for Pits

Pit No.	Operational Period	Dimensions (length x width x depth)	Field Meas. Pit Vol. (yd^3)	Vol. of Waste in Pit (yd^3)	Waste Description
1	Jan. 1959–April 1961	616 ft x 113 ft x 20 ft	37,080	5,529	Wing tanks from Kirtland AFB, Dry boxes, "normal trash." Pit used to burn combustibles
2	April 1961–July 1963	618 ft x 104 ft x 26 ft	42,911	6,407	Classified Bendix waste, 55-gal. drums, property numbers, D-38, hot dirt
3	June 1963–March 1966	655 ft x 115 ft x 33 ft	56,759	9,473	Misc. material, lumber, pipe, 55-gal. drums, D&D, D-38, Bendix classified waste, soil from TA-10 - Bayo Canyon
4	Jan. 1966–Dec. 1967	600 ft x 110 ft x 34 ft	44,950	8,212	D&D, graphite, wooden boxes, D-38, 55-gal. drums, classified Bendix waste, property numbers. Burning trench along south wall of pit
5	Jan. 1967–March 1974	600 ft x 100 ft x 29 ft	41,258	6,624	Scrap material, D&D, graphite hoppers, sludge drums (possibly aqueous solution from TA-50), property numbers
6	Jan. 1970–Aug. 1972	600 ft x 113 ft x 26 ft	43,933	6,696	Misc. scrap, wood, D&D. Covered with topsoil from TA-1 with up to 20 pCi/g Pu contamination
7	March 1974–Oct. 1975	600 ft x 50 ft x 30 ft	17,101	4,343	Low-level TRU waste. Replaced Pit 17 for LL TRU in 1974. Covered with topsoil from TA-1 with up to 20 pCi/g Pu contamination
8	Sept. 1971–May 1974	400 ft x 25 ft x 25 ft	6,528	2,311	55 gal. drums of sludge from H-7 and nonretrievable TRU waste also drums from TA-50 (aqueous and nonretrievable TRU)
9	Nov. 1974–Nov. 1979	400 ft x 30 ft x 20 ft	9,027	na*	Drums and fiberglassed crates containing retrievable TRU wastes (>10 nCi/g Pu-239 or U-233 or >100 nCi/g Pu-238) bottom of pit is paved
10	May 1979–March 1980	380 ft x 57 ft x 27 ft	15,549	4,016	Building debris, lab wastes, sludge drums (from TA-50 dewatering, possibly aqueous)
12	Sept. 1971–Dec. 1975	400 ft x 25 ft x 25 ft	7,303	2,363	Nonretrievable TRU waste. Originally contained retrievable TRU, but was transferred to Pit 9 (30 55-gal. drums)
13	Nov. 1976–Sept. 1977	400 ft x 42 ft x 28 ft	12,107	1,931	Uranium, mixed fission products, mixed activation products. Uranium fission products and induced activity wastes
16	Sept. 1971–Aug. 1975	400 ft x 25 ft x 25 ft	8,081	2,235	Crates and drums containing uranium contaminated wastes

Table 2.1-1 (continued)

Pit No.	Operational Period	Dimensions (length x width x depth)	Field Meas. Pit Vol. (yd^3)	Vol. of Waste in Pit (yd^3)	Waste Description
17	Aug. 1972–March 1974	600 ft x 46 ft x 24 ft	17,399	4,962	Low-level Pu TRU <10 mCi/g. Misc. scrap wastes, crates, filter plenums
18	Feb. 1978–Aug. 1979	600 ft x 75 ft x 40 ft	46,685	12,358	Contaminated dirt, lab wastes, noncompactible waste, D&D, drums
19	Nov. 1975–Aug. 1979	153 ft x 30 ft x 18 ft	1,371	na	Asbestos and carcinogens, plastic layer placed in bottom
20	Nov. 1975–Oct. 1977	600 ft x 71 ft x 36 ft	37,454	14,899	Lab waste, oil, sludge drums, trash, contaminated dirt
21	Aug. 1972–Dec. 1974	402 ft x 56 ft x 26 ft	13,328	3,607	U, classified material, boxes, drums, scrap metal
22	Sept. 1976–March 1978	413 ft x 56 ft x 33 ft	17,690	3,744	Filter plenum, sludge drums (possibly aqueous from TA-50), lab waste, graphite fuel rods, contaminated dirt
24	July 1975–Nov. 1976	600 ft x 58 ft x 30 ft	23,388	7,327	Graphite, lab wastes, 22 truck loads of soil. Uranium, tritium, mixed fission products, and mixed activation products
25	Jan. 1980–May 1981	395 ft x 103 ft x 39 ft	47,000	6,530	Reactor control rods, D&D, scrap drums, lab wastes, test drums, PCB-contaminated waste forms
26	Feb. 1984–Feb. 1985	310 ft x 100 ft x 36 ft	22,209	4,312	Building debris, TRU culverts, asbestos, alpha box soil, lumber, PCBs
27	May 1981–July 1982	400 ft x 80 ft x 46 ft	26,946	7,441	Lab waste, contaminated soil and pipe, D&D, PCBs, and unknown chemical waste
28	Dec. 1981–April 1983	330 ft x 83 ft x 40 ft	21,381	4,422	Ba nitrate, PCB soil, lab waste, property numbers, transformers, clay pipes, building debris, uranium graphite
29	Oct. 1984–Oct. 1986	658 ft x 80 ft x 50 ft	45,795	9,784	TRU cement paste (recoverable), D&D soil, glove boxes, plywood boxes (4'x4'x8'), asbestos, PCBs, and unknown chemical waste
30	Oct. 1988–June 1990	568 ft x 39 ft x 35 ft	42,843	13,464	Asbestos, PCBs, and unknown chemical waste
31	June 1990–March 2003	280 ft x 52 ft x 25 ft	na	2,702	Asbestos, mixed fission products, and mixed activation products. Currently operational
32	Nov. 1985–Aug. 1987	518 ft x 74 ft x 51 ft	36,364	5,367	PCB asphalt, transformers, contaminated soil, glove boxes, 4'x4'x8' plywood boxes, capacitors, building debris
33	Nov. 1982–July 1984	425 ft x 115 ft x 40 ft	59,930	7,776	Be in stainless steel, lab waste, building debris, asbestos, noncompactible trash, PCBs, and unknown chemical waste

Table 2.1-1 (continued)

Pit No.	Operational Period	Dimensions (length x width x depth)	Field Meas. Pit Vol. (yd^3)	Vol. of Waste in Pit (yd^3)	Waste Description
35	June 1987–Feb. 1988	363 ft x 83 ft x 40 ft	20,957	3,361	CP. Trash, 4'x4'x8' plywood boxes, asbestos, lab waste, PCBs, and unknown chemical waste
36	Jan. 1988–Dec. 1988	435 ft x 83 ft x 43 ft	28,057	4,491	4'x4'x8' plywood boxes, compactable N.N. trash, rubble, building waste, beryllium, and PCB soil (<200 ppm)
37	April 1990–April 1997	731 ft x 83 ft x 61 ft	57,213	24,299	UHTREX reactor vessel and stack, asbestos, PCBs, and unknown chemical waste

*na = No information available.

Table 2.1-2
MDA G Disposal Unit Information for Trenches

Trench No.	Operational Period	Dimensions (length x width x depth)	Waste Description
A	1974	262.5 ft x 12.75 ft x 8 ft	Heat source Pu-238 (80% Pu-238, 16% Pu-239, 3% Pu-239, 1% other) in casks from (1) radiolytic heating, (2) radiolytic gas formation, and (3) radiation emitting from waste. Average of 18 g Pu-238 per cask, with max 40 g Pu-238.
B	1974–1976	218.75 ft x 12.75 ft x 8 ft	
C	na*	218.75 ft x 12.75 ft x 10 ft (est.)	
D	na	250 ft x 12.75 ft x 10 ft (est.)	

*na = No information available.

Table 2.1-3
MDA G Disposal Unit Information for Shafts

Shaft No.	Operational Period	Diameter/ Depth (ft)	Lining	Shaft Volume (ft^3)	Waste Volume (ft^3)	Waste Description
1	1966–1967	2/25	N[a]	78.4	63	Cell trash, irradiated metal, animal tissue
2	1966–1967	2/25	N	78.4	42	DU[b] chips, animal tissue, irradiated Pu cell waste
3	1966–1967	2/25	N	78.4	35	Pu-contaminated Na and metal, neutron generators
4	1967–1968	2/25	N	78.4	44	U-contaminated metal, U-238 samples, DU
5	1967–1968	2/25	N	78.4	29	DU, tritium-contaminated materials, U-238 contaminated metal
6	1967–1968	2/25	N	78.4	21	Tritium-contaminated materials, U-235
7	1967–1968	2/25	N	78.4	52	Animal tissue, PTC waste, tritium DU
8	1968–1969	2/25	N	78.4	na[c]	Pu cell waste, animal tissue, end boxes
9	1968–1969	2/25	N	78.4	70	Hot cell waste, Pu cell waste, EBR-II waste, fuel elements
10	1969	2/25	N	78.4	54	Animal tissue, Pu-239 waste, U-contaminated chemicals
11	1967–1969	3/25	N	176.5	72	Pee Wee waste & trash, U-235 cell waste, graphite
12	1966–1970	3/25	N	176.5	83	Cell waste, rover waste, tritium
13	1966–1970	3/25	N	176.5	122	Animal tissue, EBR hardware, reactor parts
14	1966–1969	1/25	CMP[d]	19.7	na	U-235 vermiculite, neutralized solution HCL+U-235
15	1969–1970	1/25	CMP	19.7	8	Tritium in H_3PO_4, hot cell waste
16	1969	1/25	CMP	19.7	4	Tritium
17	1970–1974	1/25	CMP	19.7	1	Tritium pump, U-235 in Na
18	1970–1973	1/25	CMP	19.7	13	Neutralized NA, Cs-137 + Ba-140
19	1971–1974	1/25	CMP	19.7	3	Pu-239 solution, reacted Pu-239
20	1974–1975	1/25	CMP	19.7	8	Sorbed Pu-239 solution
22	1980–1993	1/25	CMP	19.7	7	Radioactive sources
24	1969–1970	2/25	N	78.4	44	Animal tissue, DU, unloaded fuel elements
25	1969–1971	2/25	N	78.4	45	DU, U-238 residue, U-238 contaminated metal
26	1969–1970	2/25	N	78.4	56	Hot cell trash, fuel elements, DU-contaminated metal
27	1970	2/25	N	78.4	13	Irradiated material, DU-contaminated material
28	1970	2/25	N	78.4	14	LA notebooks, U-235 residues
29	1970–1971	2/25	N	78.4	24	Thermocouple waste, U-235 residue
30	1970–1971	2/25	N	78.4	11	Animal tissue, Pu-239 hot cell waste
31	1970–1971	2/25	N	78.4	47	DU
32	1970–1971	2/25	N	78.4	33	LAMPRE-II lines and valves, animal tissue, irradiated stainless steel

Table 2.1-3 (continued)

Shaft No.	Operational Period	Diameter/ Depth (ft)	Lining	Shaft Volume (ft^3)	Waste Volume (ft^3)	Waste Description
33	1970–1971	2/25	N	78.4	15	Pu-239 hot cell waste
34	1970–1972	6/60	N	1709.2	932	U-contaminated oil
35	1971–1985	3/40	N	282.9	125	Hot cell wastes, animal tissues, herbicide containers, fission products
36	1970–1985	3/40	N	282.9	198	Hot cell wastes, spalation products
37	1970–1985	3/40	N	282.9	198	Animal and chemical wastes
38	1970–1974	3/40	N	282.9	69	Rover reactor parts, LAMPRE-II tank
39	1970–1973	6/60	N	1709.2	537	Tritium contaminated equipment
40	1971	2/25	N	78.4	28	Animal tissue
41	1971–1972	2/25	N	78.4	71	Animal tissue, graphite
42	1972	2/25	N	78.4	56	Animal tissue, U-contaminated metal
43	1971–1972	2/25	N	78.4	43	U-contaminated metal, DU
44	1971–1972	2/25	N	78.4	61	Animal tissue, Pu-239-contaminated vermiculite, DU with graphite
45	1971–1972	2/25	N	78.4	70	Pu-contaminated steel, U-235 residues
46	1972	2/25	N	78.4	38	Animal tissue, Pu-239-contaminated steel
47	1972	2/25	N	78.4	32	Animal tissue, contaminated metal, fuel waste (no vol.)
48	1972	2/25	N	78.4	19	Hot cell trash, fuel waste (no vol.)
49	1972	2/25	N	78.4	21	Animal tissue
50	1974–1976	6/60	N	1709.2	581	Tritium (1,110 Ci)
51	1975	2/25	N	78.4	52	Hot cell waste
52	1975–1976	2/25	N	78.4	6	Pu, U, mixed fission products, mixed activation products, hot cell wastes
53	1975–1976	2/25	N	78.4	3	Mixed fission products, cell wastes, Pu-239, U-235
54	1976	2/25	N	78.4	6	Mixed fission products, cell trash
55	1976–1977	2/25	N	78.4	20	Hot cell trash
56	1977	2/25	N	78.4	11	Cell waste, contaminated parts from Size Reduction Lab
57	1977	2/25	N	78.4	8	Hot cell waste
58	1972–1973	3/25	N	176.5	88	Hot cell waste, DU
59	1973–1974	6/60	N	1709.2	120	Tritium contaminated steel, tools, and waste
60	1972–1974	3/25	N	176.5	128	Oil contaminated with U-235, Pu-239
61	1973–1974	3/25	N	176.5	143	Be waste, U-238 contaminated metal, animal tissue
62	1976	3/25	N	176.5	141	Animal tissue, Pu-238, P-32
63	1976	3/25	N	176.5	28	DU, residues
64	1976–1977	3/25	N	176.5	32	Animal wastes, U-235
65	1976–1977	3/25	N	176.5	123	Classified U wastes, targets, animal tissue

Table 2.1-3 (continued)

Shaft No.	Operational Period	Diameter/ Depth (ft)	Lining	Shaft Volume (ft^3)	Waste Volume (ft^3)	Waste Description
66	1976–1979	3/25	N	176.5	25	Animal tissue
67	1977	2/25	N	78.4	48	Targets, cell trash
68	1977	2/25	N	78.4	23	Cell trash, classified notebooks
69	1977	2/25	N	78.4	20	AC parts from recovery
70	1975–1976	6/60	N	1709.2	917	Contaminated oil
71	1978	2/25	N	78.4	31	No description
72	1972–1973	2/25	N	78.4	61	Irradiated stainless steel, hot cell waste trash
73	1973	2/25	N	78.4	43	Hot cell trash
74	1973	2/25	N	78.4	69	Pu-239 waste
75	1973	2/25	N	78.4	61	Pu-238 waste, cell trash
76	1973–1974	2/25	N	78.4	75	Hot cell trash
77	1973–1974	2/25	N	78.4	33	Hot cell trash, Pu-239 hot cell trash
78	1974–1975	2/25	N	78.4	46	Cell wastes, reactor wastes, irradiated box ends
79	1974–1975	2/25	N	78.4	46	Hot cell waste, irradiated metal
80	1975–1976	2/25	N	78.4	25	Sodalime, Ta-182 chips, animal tissue
81	1976	2/25	N	78.4	na	Animal tissue (12 boxes)
82	1978	3/25	N	176.5	1	Trash, chemical wastes
83	1978	3/25	N	176.5	44	Animal tissue, DU
84	1978	3/25	N	176.5	17.3	Trash from Size Reduction Lab, cell trash
85	1978	3/25	N	176.5	12	Neutralized Na Dowanol, cell trash
86	1977	3/25	N	176.5	22	Spalation products, classified materials
87	1977	2/25	N	78.4	23	Cell wastes
88	1977	2/25	N	78.4	18	Cell wastes
89	1977–1978	2/25	N	78.4	12	Animal tissue (5 boxes), cell waste
90	1978	2/25	N	78.4	25	DU, hot cell trash
91	1977–1978	3/50	N	353.4	54	Spalation products, animal waste, cell trash, trash cans
92	1977–1978	3/50	N	353.4	60	Spalation products, uranyl-nitrate in HNO_3
93	1978–1984	3/50	N	353.4	139	Spalation products, fuel elements, cell waste, animal tissues
94	1978–1984	3/50	N	353.4	29	Hot cell waste, DU, control rods
95	1984	3/50	N	353.4	142	Cell wastes, animal tissues
96	1977–1979	6/50	N	1413.6	438	U-contaminated oil, nibbium, zirconium, chlorides, aluminum shell
99	1983–1984	3/60	N	424.1	189	Hot cell wastes, animal tissue, machine parts
100	1983	3/60	N	424.1	3	Hot cell waste, target and stinger
101	1980–1981	3/60	N	424.1	75	Spalation products, hot cell waste
102	1982–1983	3/60	N	424.1	184	No description

Table 2.1-3 (continued)

Shaft No.	Operational Period	Diameter/ Depth (ft)	Lining	Shaft Volume (ft³)	Waste Volume (ft³)	Waste Description
103	1981–1982	3/60	N	424.1	118	Hot cell waste, spent fuel elements
104	1982	3/60	N	424.1	10	U chips, scrap metal
105	1982–1983	3/60	N	424.1	2	Animal tissue
106	1980–1981	3/60	N	424.1	69	Spalation products, hot cell waste
107	1978–1981	3/60	N	424.1	27	Hot trash, animal tissue, chemical waste
108	1980–1982	3/60	N	424.1	230	Spalation products, solvent, animal tissue
109	1980	2/60	N	188.5	83	Spalation products, trash cans
110	1979	3/60	N	424.1	128	Spalation products, animal tissue, mixed combustible trash
111	1979–1980	2/60	N	188.5	134	Cell waste, spalation products, niobium and tantalum perchloride
112	1978–1979	3/60	N	424.1	149	Classified pieces, animal waste, cell waste, spalation products
114	1979–1982	6/60	N	1696.5	981	Shielding blocks, graphite design assembly
115	1979–1982	6/60	N	1696.5	539	Hot trash, tritium scrap
118	1983–1984	8/62	N	3267.3	461	Vials
119	1983	8/62	N	3116.5	549	DU chips, hydrocarbons, HF leach solids
120	1983–1984	8/63	N	3116.6	531	Shielding blocks, graphite design assembly
121	1984–1985	4/60	N	753.9	245	Animal tissue, cell trash
122	1984–1985	4/60	N	753.9	258	Hot cell waste, waste cans
123	1984	6/60	N	1696.5	516	DU chips and turnings, firing residue
124	1984–1991	6/65	N	1837.7	491	Vials, organics
125	1984	6/65	N	1837.7	597	DU chips and turnings
126	1985–1987	6/65	N	1837.7	781	Meson and hot cell waste
127	1985	6/65	N	1837.7	484	DU chips and turnings, U3 08 oil and wax
128	1985–1986	6/65	N	1837.7	417	Animal tissue, mustargem
129	1986	3/65	N	459.4	136	Mixed spalation products
130	1986–1987	6/65	N	1837.7	1110	DU chips, metal trash
131	1987–1995	6/65	N	1837.7	438	Activated shielding
132	1987–1993	6/65	N	1837.7	634	Classified material
133	1986–1987	4/65	N	816.8	96	Spalation products, hot cell waste
134	1986	3/65	N	459.4	239	Animal tissue
135	1986–1987	3/65	N	459.4	219	Animal tissue
136	1986–1995	6/65	N	1837.7	50	Low-level tritium
138	1987–1989	4/60	N	753.9	191	Animal tissue
139	1987–1988	4/60	N	753.9	308	Hot cell waste
140	1987–1991	6/61	N	1724.7	869	Animal tissue
150	1976–1979	6/60	CMPAC[e]	1696.5	86	Low-level tritium

Table 2.1-3 (continued)

Shaft No.	Operational Period	Diameter/ Depth (ft)	Lining	Shaft Volume (ft³)	Waste Volume (ft³)	Waste Description
151	1979–1986	3/60	CMPAC	424.1	131	Low-level tritium
152	1980–1983	3/60	CMPAC	424.1	147	Tritium scrap, tubing, hardware
153	1983–1984	3/60	CMPAC	424.1	12	Contaminated pump, property numbers
154	1984–1986	3/65	CMPAC	459.4	135	High-level tritium, molecular sieves
155	1988–1989	3/65	CMPAC	459.4	137	High-level tritium
156	1986–1987	3/45	CMPAC	318.2	59	Dry box trash, molecular sieves
157	1987–1988	3/45	CMPAC	318.2	88	Tritium
158	1989–1998	2/45	CMPAC	141.2	78	High-level tritium
159	1989	2/45	CMPAC	141.2	12	High-level tritium
160	1990–1993	2/45	CMPAC	141.2	89	High-level tritium
189	1987–1988	8/65	N	3267.3	1743	LAMPF activated shielding (triple shaft)
190	1983–1984	8/65	N	3267.3	1077	Scrap metal
191	1984–1986	8/65	N	3267.3	1470	LAMPF scrap metal, graphite target (double shaft)
192	1987–1989	8/65	N	3267.3	1537	LAMPF scrap metal (triple shaft)
196	1989–1993	6/53	N	2997.5	2050	LAMPF inerts
200	1980–1981	1/18	SPI[f]	56.5	44	Hot cell wastes
201	1978–1979	1/18	SPI	56.5	39	Hot cell wastes
202	1980	1/18	SPI	56.5	43	Hot cell wastes
203	1980	1/18	SPI	56.5	43	Hot cell wastes
204	1978–1979	1/18	SPI	56.5	38	Hot cell wastes, fuel cans
205	1980	1/18	SPI	56.5	45	Hot cell wastes, trash, fuel cans
206	1980–1981	1/18	SPI	56.5	67	Cell trash and fuel sample
207	1981	1/18	SPI	56.5	48	Cell trash, fuel cells
208	1981	1/18	SPI	56.5	48	Hot cell trash, waste
209	1981	1/18	SPI	56.5	48	Hot cell paint, trash
210	1981	1/18	SPI	56.5	48	Hot cell trash
211	1981	1/18	SPI	56.5	48	Hot cell trash
212	1980	1/18	SPI	56.5	75	LAMPF fuel vessel
213	1981	1/18	SPI	56.5	30	Hot cell wastes, trash
214	1982	1/18	SPI	56.5	30	Hot cell wastes
215	1982	1/18	SPI	56.5	30	Hot cell trash
216	1982	1/18	SPI	56.5	30	Hot cell wastes
217	1982	1/18	SPI	56.5	30	Hot cell wastes
218	1982	1/18	SPI	56.5	30	Hot cell wastes
219	1983	1/18	SPI	56.5	30	Hot cell wastes
220	1983	1/18	SPI	56.5	30	Hot cell wastes
221	1983	1/18	SPI	56.5	30	Hot cell wastes

Table 2.1-3 (continued)

Shaft No.	Operational Period	Diameter/ Depth (ft)	Lining	Shaft Volume (ft³)	Waste Volume (ft³)	Waste Description
222	1983	1/18	SPI	56.5	30	Hot cell wastes
223	1983	1/18	SPI	56.5	30	Hot cell wastes
224	1985	1/18	SPI	56.5	4	Hot cell wastes
225	1984	1/18	SPI	56.5	4	Hot cell wastes
226	1984	1/18	SPI	56.5	4	Hot cell wastes
227	1984	1/18	SPI	56.5	4	Hot cell wastes
228	1987	1/18	SPI	56.5	1	Hot cell wastes
229	1984	1/18	SPI	56.5	5	Hot cell wastes
230	1984	1/18	SPI	56.5	4	Hot cell wastes
231	1985	1/18	SPI	56.5	4	Hot cell wastes
232	1987	1/18	SPI	56.5	1	Hot cell wastes
233	na	1/18	SPI	56.5	na	Hot cell wastes
C1	na	6/60	N	1696.5	221	PCBs (no liquids)
C2	na	6/60	N	1696.5	357	PCBs (no liquids)
C3	na	6/60	N	1696.5	339	PCBs (no liquids)
C4	na	6/60	N	1696.5	385	PCBs (no liquids)
C5	na	6/60	N	1696.5	258	PCBs (no liquids)
C6	na	6/60	N	1696.5	449	PCBs (no liquids)
C7	na	6/60	N	1696.5	512	PCBs (no liquids)
C8	na	6/60	N	1696.5	498	PCBs (no liquids)
C9	na	6/60	N	1696.5	406	PCBs (no liquids)
C10	1984–1985	6/60	N	1696.5	534	PCBs (no liquids)
C12	1986–1990	6/65	N	1696.5	588	PCBs (no liquids)
C13	1987–1995	6/65	N	1696.5	1060	PCBs (no liquids)

[a] N = No.

[b] DU = Depleted uranium.

[c] na = No information available.

[d] CMP = Corrugated metal pipe.

[e] CMPAC = Corrugated metal pipe asphalt coated.

[f] SPI = Steel pipe insert.

Table 2.2-1
Radionuclides Detected above BVs in MDA G Phase I RFI Channel Sediment Samples

Sample ID	Location ID	Depth (ft)	Media	Americium-241	Cesium-137	Cobalt-60	Plutonium-238	Plutonium-239	Tritium
Sediment Background Value				**0.04**	**0.9**	**na[a]**	**0.006**	**0.068**	**0.093**
Industrial SAL (pCi/g)				**180**	**23**	**5.1**	**240**	**210**	**440000**
AAB3143	54-05015	0–0.5	Sediment	—[b]	—	—	—	—	—
AAB3160	54-05016	0–0.5	Sediment	—	—	—	0.014	—	—
AAB3150	54-05017	0–0.5	Sediment	—	—	—	—	—	—
AAB3139	54-05018	0–0.5	Sediment	—	0.99	—	—	—	—
AAB3190	54-05019	0–0.5	Sediment	—	—	—	—	—	—
AAB3207	54-05020	0–0.5	Sediment	—	—	0.39	0.01 (J)	—	—
AAB3187	54-05022	0–0.5	Sediment	—	—	0.34	—	—	—
AAB3195	54-05026	0–0.5	Sediment	—	—	—	0.044 (J)	0.489 (J)	—
AAB3122	54-05027	0–0.5	Sediment	—	—	—	0.037	—	—
AAB3120	54-05029	0–0.5	Sediment	0.059	—	—	0.082	—	0.1402735
AAB3123	54-05031	0–0.5	Sediment	—	—	—	0.019	—	—
AAB3126	54-05034	0–0.5	Sediment	—	—	—	0.046	—	—
AAB3194	54-05035	0–0.83	Sediment	—	—	—	0.015 (J)	0.103 (J)	—
AAB3208	54-05037	0–0.83	Sediment	—	—	—	0.013	—	0.4900508 (J)
AAB3213	54-05038	0–0.83	Sediment	—	—	—	0.009 (J)	—	—
AAB3204	54-05042	0–0.83	Sediment	—	—	—	—	—	0.3298158
AAB3191	54-05043	0–0.83	Sediment	—	—	—	0.576 (J)	0.476 (J)	0.1041099
AAB3196	54-05045	0–0.83	Sediment	—	—	—	—	—	0.1135484 (J)
AAB3192	54-05048	0–0.83	Sediment	—	—	—	—	—	0.1020202
AAB3132	54-05050	0–0.5	Sediment	—	—	—	—	—	—
AAB3173	54-05053	0–0.5	Sediment	—	—	—	0.01	0.076	—
AAB3133	54-05055	0–0.83	Sediment	—	—	—	—	—	—
AAB3202	54-05055	0–0.83	Sediment	—	—	—	0.009	—	—
AAB3147	54-05058	0–0.5	Sediment	—	—	—	0.011	—	—
AAB3180	54-05060	0–0.5	Sediment	—	—	—	0.009	—	—
AAB3128	54-05061	0–0.5	Sediment	—	—	—	0.04 (J)	0.555 (J)	—
AAB3124	54-05063	0–0.5	Sediment	—	—	—	—	—	—
AAB3121	54-05066	0–0.5	Sediment	—	—	—	0.238 (J)	0.252 (J)	—
AAB3118	54-05068	0–0.5	Sediment	—	—	—	0.016	—	—
AAB3107	54-05069	0–0.5	Sediment	—	—	—	0.014	0.121	—
AAB3114	54-05072	0–0.5	Sediment	0.093	—	—	0.012 (J)	—	—
AAB3108	54-05074	0–0.7	Sediment	0.158	—	—	0.095	0.858	—
AAB3106	54-05076	0–0.5	Sediment	0.146	—	—	0.066	0.909	—
AAB3170	54-05077	0–0.5	Sediment	—	—	—	—	—	—

Table 2.2-1 (continued)

Sample ID	Location ID	Depth (ft)	Media	Americium-241	Cesium-137	Cobalt-60	Plutonium-238	Plutonium-239	Tritium
Sediment Background Value				**0.04**	**0.9**	**na[a]**	**0.006**	**0.068**	**0.093**
Industrial SAL (pCi/g)				**180**	**23**	**5.1**	**240**	**210**	**440000**
AAB3172	54-05078	0–0.25	Sediment	—	—	—	—	—	—
AAB3177	54-05080	0–0.33	Sediment	—	—	—	0.025	0.118	—
AAB3171	54-05082	0–0.5	Sediment	—	1.24	0.23	—	0.073	—
AAB3158	54-05085	0–0.5	Sediment	—	—	—	—	—	—
AAB3166	54-05085	0–0.5	Sediment	—	—	—	0.012	—	—
AAB3155	54-05086	0–0.5	Sediment	—	—	—	—	—	—
AAB3156	54-05088	0–0.33	Sediment	—	—	—	—	—	—
AAB3154	54-05090	0–0.5	Sediment	—	—	—	—	—	—
AAB3159	54-05093	0–0.7	Sediment	0.123	—	—	0.059	0.194	—
AAB3161	54-05094	0–0.5	Sediment	—	—	—	0.02	—	—
AAB3157	54-05095	0–0.7	Sediment	0.066	—	—	0.033	0.163	—
AAB3164	54-05096	0–0.5	Sediment	0.145	—	—	0.176	0.423	—
AAB3178	54-05101	0–0.5	Sediment	—	—	—	0.236	—	—
AAB3168	54-05102	0–0.42	Sediment	—	—	—	0.242	—	—
AAB3163	54-05103	0–0.42	Sediment	—	—	—	0.182	—	—
AAB3169	54-05104	0–0.42	Sediment	0.055	—	—	1.483	0.171	—
AAB3117	54-05108	0–0.5	Sediment	—	—	—	0.026	—	—
AAB3127	54-05110	0–0.4	Sediment	—	—	—	0.073	0.087	—
AAB3116	54-05111	0–0.3	Sediment	—	—	—	0.027	—	—
AAB3167	54-05113	0–0.5	Sediment	—	1.12	—	0.044	0.089	—
AAB3109	54-05117	0–0.5	Sediment	0.109	—	—	0.183	0.582	—
AAB3111	54-05118	0–0.5	Sediment	0.056	—	—	0.011 (J)	—	—
AAB3110	54-05122	0–0.5	Sediment	—	—	—	0.151	0.153	—
AAB3112	54-05122	0–0.5	Sediment	0.041	—	—	—	0.36 (J)	—
AAB3113	54-05125	0–0.5	Sediment	0.105	1.3	—	—	—	0.1069729

Note: All values in pCi/g. See Appendix A for data qualifier definitions.

[a] na = No BV available.

[b] — = Not detected above BV.

Table 2.2-2
Inorganic Chemicals above BVs in MDA G Phase I RFI Channel Sediment Samples

Sample ID	Location ID	Depth (ft)	Media	Barium	Beryllium	Boron	Cadmium	Calcium	Chromium	Cobalt	Iron	Magnesium	Mercury	Molybdenum	Selenium	Silver
Sediment Background Value				**127**	**1.31**	**na[a]**	**0.4**	**4420**	**10.5**	**4.73**	**13800**	**2370**	**0.1**	**na**	**0.3**	**1**
Industrial Soil Screening Level (mg/kg)				**78300**	**2250**	**61600**	**1130[b]**	[c]	**5000**	**20500**	**100000**	[c]	**340**	**5680**	**5680**	**5680**
AAB3143	54-05015	0–0.5	Sediment	—[d]	—	1.6 (U)	—	—	—	—	—	—	—	5.2 (U)	—	—
AAB3160	54-05016	0–0.5	Sediment	—	—	1.6 (U)	—	—	—	—	—	—	—	5.2 (U)	—	—
AAB3150	54-05017	0–0.5	Sediment	—	—	1.6 (U)	0.61 (U)	—	—	—	—	—	—	5.3 (U)	—	—
AAB3139	54-05018	0–0.5	Sediment	—	—	1.8 (U)	0.49 (U)	—	—	—	—	—	—	5.7 (U)	—	—
AAB3190	54-05019	0–0.5	Sediment	—	—	—	—	—	—	—	—	—	—	—	0.6 (U)	2 (U)
AAB3207	54-05020	0–0.5	Sediment	—	—	—	—	—	—	—	—	—	—	—	0.6 (U)	2 (U)
AAB3187	54-05022	0–0.5	Sediment	—	—	—	0.46 (U)	—	—	—	—	—	—	—	0.6 (U)	2 (U)
AAB3195	54-05026	0–0.5	Sediment	—	—	—	—	—	—	—	—	—	—	—	0.61 (U)	2 (U)
AAB3122	54-05027	0–0.5	Sediment	—	—	1.6 (U)	—	—	—	—	—	—	—	5.2 (U)	—	—
AAB3120	54-05029	0–0.5	Sediment	—	—	1.6 (U)	0.63 (U)	—	—	—	—	—	—	5.3 (U)	—	1.5 (U)
AAB3123	54-05031	0–0.5	Sediment	—	—	1.6 (U)	—	—	—	—	—	—	—	5.2 (U)	—	—
AAB3126	54-05034	0–0.5	Sediment	—	—	1.6 (U)	0.41 (U)	—	—	—	—	—	—	5.3 (U)	—	1.4 (U)
AAB3194	54-05035	0–0.83	Sediment	—	—	—	—	6370	—	—	—	—	—	—	0.6 (U)	2 (U)
AAB3208	54-05037	0–0.83	Sediment	—	—	—	0.41 (U)	—	—	—	—	—	—	—	0.61 (U)	2 (U)
AAB3213	54-05038	0–0.83	Sediment	—	—	—	—	—	—	—	—	—	—	—	0.61 (U)	2 (U)
AAB3204	54-05042	0–0.83	Sediment	—	71 (U)	—	—	—	—	—	—	—	—	—	0.6 (U)	2 (U)
AAB3191	54-05043	0–0.83	Sediment	—	—	—	—	—	—	—	—	—	—	—	0.61 (U)	2 (U)
AAB3196	54-05045	0–0.83	Sediment	—	—	—	—	—	—	—	—	—	—	—	0.6 (U)	2 (U)
AAB3192	54-05048	0–0.83	Sediment	—	—	—	0.41 (U)	—	—	—	—	—	—	—	0.61 (U)	2 (U)
AAB3132	54-05050	0–0.5	Sediment	—	—	—	0.56 (U)	—	—	—	—	—	—	—	0.6 (U)	2 (U)
AAB3173	54-05053	0–0.5	Sediment	—	—	1.6 (U)	—	—	—	—	—	—	—	5.2 (U)	—	—
AAB3133	54-05055	0–0.83	Sediment	—	—	1.6 (U)	—	—	—	—	—	—	—	5.2 (U)	—	—
AAB3202	54-05055	0–0.83	Sediment	—	—	1.6 (U)	—	—	—	—	—	—	—	5.3 (U)	—	—

Table 2.2-2 (continued)

Sample ID	Location ID	Depth (ft)	Media	Barium	Beryllium	Boron	Cadmium	Calcium	Chromium	Cobalt	Iron	Magnesium	Mercury	Molybdenum	Selenium	Silver
Sediment Background Value				**127**	**1.31**	**na[a]**	**0.4**	**4420**	**10.5**	**4.73**	**13800**	**2370**	**0.1**	**na**	**0.3**	**1**
Industrial Soil Screening Level (mg/kg)				**78300**	**2250**	**61600**	**1130[b]**	c	**5000**	**20500**	**100000**	c	**340**	**5680**	**5680**	**5680**
AAB3147	54-05058	0–0.5	Sediment	—	—	1.6 (U)	0.53 (U)	—	—	—	—	—	—	5.2 (U)	—	—
AAB3180	54-05060	0–0.5	Sediment	—	—	1.6 (U)	—	—	—	—	—	—	—	5.3 (U)	—	—
AAB3128	54-05061	0–0.5	Sediment	—	—	—	—	—	—	—	—	—	—	—	0.6 (U)	2 (U)
AAB3124	54-05063	0–0.5	Sediment	—	—	—	0.47 (U)	—	—	—	—	—	—	—	0.6 (U)	2 (U)
AAB3121	54-05066	0–0.5	Sediment	—	—	—	0.57 (U)	—	—	—	—	—	—	—	0.61 (U)	2 (U)
AAB3118	54-05068	0–0.5	Sediment	—	—	—	—	—	—	—	—	—	—	—	0.61 (U)	2 (U)
AAB3107	54-05069	0–0.5	Sediment	—	—	—	—	—	—	—	—	—	—	—	0.6 (U)	2 (U)
AAB3114	54-05072	0–0.5	Sediment	—	—	—	—	—	—	—	—	—	—	—	0.61 (U)	2 (U)
AAB3108	54-05074	0–0.7	Sediment	—	—	—	0.48 (U)	—	—	—	—	—	—	—	0.61 (U)	2 (U)
AAB3106	54-05076	0–0.5	Sediment	—	—	—	0.41 (U)	—	—	—	—	—	—	—	0.61 (U)	2 (U)
AAB3170	54-05077	0–0.5	Sediment	—	—	1.6 (U)	—	—	—	—	—	—	—	5.2 (U)	—	—
AAB3172	54-05078	0–0.25	Sediment	—	—	1.6 (U)	0.58 (U)	—	—	—	—	—	0.2 (U)	5.2 (U)	—	—
AAB3177	54-05080	0–0.33	Sediment	—	—	1.6 (U)	0.81 (U)	—	—	—	—	—	—	5.2 (U)	—	—
AAB3171	54-05082	0–0.5	Sediment	—	—	1.6 (U)	0.55 (U)	—	—	—	—	—	—	5.3 (U)	—	—
AAB3158	54-05085	0–0.5	Sediment	—	—	1.6 (U)	—	—	—	—	—	—	—	5.3 (U)	—	—
AAB3166	54-05085	0–0.5	Sediment	—	—	1.6 (U)	0.69 (U)	—	—	—	—	—	—	5.2 (U)	—	—
AAB3155	54-05086	0–0.5	Sediment	—	—	1.6 (U)	0.58 (U)	—	—	—	—	—	—	5.3 (U)	—	—
AAB3156	54-05088	0–0.33	Sediment	—	—	1.6 (U)	—	—	—	—	—	—	—	5.2 (U)	—	—
AAB3154	54-05090	0–0.5	Sediment	—	—	1.6 (U)	—	—	—	—	—	—	—	5.3 (U)	—	—
AAB3159	54-05093	0–0.7	Sediment	—	—	1.6 (U)	—	—	17.9 (J)	—	—	—	—	5.3 (U)	—	—
AAB3161	54-05094	0–0.5	Sediment	—	—	1.6 (U)	0.61 (U)	—	—	—	—	—	—	5.2 (U)	—	—
AAB3157	54-05095	0–0.7	Sediment	—	—	1.6 (U)	0.52 (U)	—	—	—	—	—	—	5.2 (U)	—	—
AAB3164	54-05096	0–0.5	Sediment	—	—	1.6 (U)	0.88 (U)	—	—	—	—	—	—	5.3 (U)	—	—
AAB3178	54-05101	0–0.5	Sediment	—	—	1.6 (U)	0.67 (U)	—	—	—	—	—	—	5.2 (U)	—	—
AAB3168	54-05102	0–0.42	Sediment	—	—	1.6 (U)	0.55 (U)	—	—	—	—	—	—	5.2 (U)	—	—

Table 2.2-2 (continued)

Sample ID	Location ID	Depth (ft)	Media	Barium	Beryllium	Boron	Cadmium	Calcium	Chromium	Cobalt	Iron	Magnesium	Mercury	Molybdenum	Selenium	Silver
Sediment Background Value				**127**	**1.31**	**na**[a]	**0.4**	**4420**	**10.5**	**4.73**	**13800**	**2370**	**0.1**	**na**	**0.3**	**1**
Industrial Soil Screening Level (mg/kg)				**78300**	**2250**	**61600**	**1130**[b]	[c]	**5000**	**20500**	**100000**	[c]	**340**	**5680**	**5680**	**5680**
AAB3163	54-05103	0–0.42	Sediment	—	—	1.6 (U)	0.53 (U)	—	—	—	—	—	—	5.3 (U)	—	—
AAB3169	54-05104	0–0.42	Sediment	—	—	1.6 (U)	0.52 (U)	—	—	—	—	—	—	5.2 (U)	—	—
AAB3117	54-05108	0–0.5	Sediment	—	—	1.6 (U)	0.69 (U)	—	—	—	—	—	—	5.3 (U)	—	—
AAB3127	54-05110	0–0.4	Sediment	—	—	1.6 (U)	0.63 (U)	—	—	—	—	—	—	5.3 (U)	—	—
AAB3116	54-05111	0–0.3	Sediment	—	—	1.6 (U)	1.2	—	—	—	—	—	—	5.2 (U)	—	—
AAB3167	54-05113	0–0.5	Sediment	—	—	1.6 (U)	0.55 (U)	—	—	—	—	—	—	5.2 (U)	—	—
AAB3109	54-05117	0–0.5	Sediment	—	—	—	—	—	—	—	39000	—	—	—	0.6 (U)	2 (U)
AAB3111	54-05118	0–0.5	Sediment	—	—	—	0.65 (U)	—	—	—	—	—	—	—	0.61 (U)	2 (U)
AAB3110	54-05122	0–0.5	Sediment	141	—	—	0.52 (U)	—	—	5.6 (U)	—	—	—	—	0.62 (U)	2.1 (U)
AAB3112	54-05122	0–0.5	Sediment	144	—	—	0.65 (U)	—	—	5.1 (U)	—	—	—	—	0.62 (U)	2.1 (U)
AAB3113	54-05125	0–0.5	Sediment	180	—	—	1 (U)	—	—	5.5 (U)	—	2660	—	—	0.64 (U)	2.1 (U)

Note: All values in mg/kg. See Appendix A for data qualifier definitions.

[a] na = No BV available.

[b] Industrial SSL for cadmium calculated incorrectly in NMED 2004 85615, SSL recalculated using NMED parameters.

[c] Essential nutrient.

[d] — = Not detected above BV.

Table 2.2-3
Radionuclides Detected or Detected above BVs in MDA G Phase I RFI Subsurface Core Samples

Sample ID	Location ID	Depth (ft)	Media	Americium-241	Cesium-137	Cobalt-60	Europium-152	Plutonium-238	Plutonium-239
Qbt 2,3,4 Background Value				**na**[a]	**na**	**na**	**na**	**na**	**na**
Qbt 1v Background Value				**na**	**na**	**na**	**na**	**na**	**na**
Qbt 1g, Qct, Qbo Background Value				**na**	**na**	**na**	**na**	**na**	**na**
Industrial SAL (pCi/g)				**180**	**23**	**5.1**	**11**	**240**	**210**
0554-95-0393	54-01102	19.9–20.9	Qbt 2	—[b]	—	—	—	—	—
0554-95-0396	54-01102	30.2–31.3	Qbt 2	—	—	—	—	—	—
0554-95-0399	54-01102	38.9–40.3	Qbt 2	—	—	—	—	—	—
0554-95-0402	54-01102	61.5–63	Qbt 1v	0.005	—	—	—	—	—
0554-95-0433	54-01105	8.8–10.6	Qbt 2	—	—	—	—	—	—
0554-95-0437	54-01105	17.7–19.3	Qbt 2	—	—	—	—	—	—
0554-95-0441	54-01105	27.9–29.7	Qbt 2	—	—	—	—	—	—
0554-95-0445	54-01105	37.8–39.6	Qbt 2	—	—	—	—	—	—
0554-95-0449	54-01105	45.4–47.3	Qbt 2	0.005	—	—	—	—	—
0554-95-0453	54-01106	9.1–10.8	Qbt 2	—	—	—	—	—	—
0554-95-0457	54-01106	19.3–20.9	Qbt 2	—	—	—	—	—	—
0554-95-0461	54-01106	29.6–31.1	Qbt 2	—	—	—	—	—	—
0554-95-0465	54-01106	37.7–39.2	Qbt 2	—	—	—	—	—	—
0554-95-0469	54-01106	44.5–49.3	Qbt 1v	—	—	—	—	—	—
0554-95-0362	54-01107	11.2–13.4	Qbt 2	—	—	—	—	—	—
0554-95-0365	54-01107	19.7–21.5	Qbt 2	0.0338	—	—	—	—	—
0554-95-0368	54-01107	26–28	Qbt 2	0.0428	—	—	—	—	—
0554-95-0371	54-01107	36–38	Qbt 2	0.0428	—	—	—	—	—
0554-95-0374	54-01107	47–49	Qbt 2	—	—	—	—	—	—
0554-95-0377	54-01107	54–56	Qbt 2	0.018	—	—	—	—	—
0554-95-0380	54-01107	66.5–69	Qbt 1v	—	—	—	—	—	—
0554-95-0383	54-01107	77–79.5	Qbt 1v	—	—	—	—	—	—
0554-95-0386	54-01107	86–88.3	Qbt 1v	—	—	—	—	0.027	—
0554-95-0709	54-01107	127–128.5	Qbt 1g	—	—	—	—	—	—
0554-95-0473	54-01108	8.5–10.1	Qbt 2	—	—	—	—	—	—
0554-95-0477	54-01108	20.6–22.3	Qbt 2	—	—	—	—	—	—
0554-95-0481	54-01108	29.9–31.7	Qbt 2	—	—	—	—	—	—
0554-95-0485	54-01108	38.3–40	Qbt 2	—	—	—	—	—	—
0554-95-0489	54-01108	49.4–51	Qbt 1v	0.007	—	—	—	—	—
AAB2648	54-01110	75–77	Qbt 1v	—	—	—	—	—	0.1
AAB2683	54-01111	4–5.5	Qbt 2	—	0.21	—	—	—	—
AAB2675	54-01111	14.5–15.5	Qbt 2	—	—	0.62	—	—	—
AAB2685	54-01111	18.5–21	Qbt 2	—	—	—	—	—	—
AAB2669	54-01111	28–30.5	Qbt 2	—	—	0.51	—	—	—
AAB2667	54-01111	38–39.5	Qbt 2	—	—	0.32	—	—	—
AAB2677	54-01111	50–51.5	Qbt 1v	—	—	—	—	—	—

Table 2.2-3 (continued)

Sample ID	Location ID	Depth (ft)	Media	Americium-241	Cesium-137	Cobalt-60	Europium-152	Plutonium-238	Plutonium-239
Qbt 2,3,4 Background Value				na[a]	na	na	na	na	na
Qbt 1v Background Value				na	na	na	na	na	na
Qbt 1g, Qct, Qbo Background Value				na	na	na	na	na	na
Industrial SAL (pCi/g)				**180**	**23**	**5.1**	**11**	**240**	**210**
AAB2679	54-01111	60–61.5	Qbt 1v	—	—	—	—	—	—
AAB2671	54-01111	70.5–72.5	Qbt 1v	—	—	—	—	—	—
AAB2661	54-01111	79.5–81.5	Qbt 1v	—	—	—	—	—	—
AAB2663	54-01111	79.5–81.5	Qbt 1v	—	—	—	—	—	—
AAB2665	54-01111	89–90	Qbt 1g	—	1	0.39	—	—	—
0554-95-0712	54-01112	9–9.2	Qbt 2	—	—	—	—	—	—
0554-95-0715	54-01112	13.5–17.5	Qbt 2	—	—	—	—	—	—
0554-95-0716	54-01112	13.5–17.5	Qbt 2	—	—	—	1.54	—	—
0554-95-0718	54-01112	25.3–27.3	Qbt 2	0.006	—	—	—	—	—
0554-95-0721	54-01112	32.9–34.9	Qbt 2	—	—	—	—	—	—
0554-95-0724	54-01112	45.5–47.5	Qbt 1v	—	—	—	—	—	—
0554-95-0727	54-01112	48.5–50.5	Qbt 1v	—	—	—	1.92	—	—
0554-95-0730	54-01112	54.9–57.1	Qbt 1v	0.004	—	—	—	—	—
0554-95-0493	54-01114	8.8–10.3	Qbt 2	0.014	—	—	—	—	—
0554-95-0497	54-01114	18.7–20.2	Qbt 2	0.169	—	—	—	—	—
0554-95-0501	54-01114	26.5–28.7	Qbt 2	—	—	—	—	—	—
0554-95-0505	54-01114	38.5–40	Qbt 1v	0.013	—	—	—	—	—
0554-95-0510	54-01115	10–11.1	Qbt 2	—	—	—	—	—	—
0554-95-0515	54-01115	18.5–19.8	Qbt 2	0.013	—	—	—	—	—
0554-95-0520	54-01115	29.7–30.9	Qbt 2	—	—	—	—	—	—
0554-95-0525	54-01115	39.5–40.8	Qbt 1v	—	—	—	—	—	—
0554-95-0530	54-01115	50.1–51.2	Qbt 1v	—	—	—	—	—	—
0554-95-0535	54-01115	60.1–61.4	Qbt 1v	—	—	—	—	—	—
0554-95-0540	54-01115	68.0–69.3	Qbt 1v	—	—	—	—	—	—
0554-95-0655	54-01116	9–9.3	Qbt 2	0.007	—	—	—	—	—
0554-95-0658	54-01116	20.5–22.5	Qbt 2	—	—	—	—	—	—
0554-95-0661	54-01116	29.5–31.5	Qbt 2	0.009	—	—	—	—	—
0554-95-0664	54-01116	36.5–38.5	Qbt 2	—	—	—	—	—	—
0554-95-0667	54-01116	46.5–48.5	Qbt 1v	0.006	—	—	—	—	—
0554-95-0670	54-01116	57.5–59.5	Qbt 1v	—	—	—	—	—	—
0554-95-0673	54-01116	69.5–71.5	Qbt 1v	—	—	—	—	—	—
0554-95-0676	54-01116	77.5–79.5	Qbt 1v	0.006	—	—	—	—	—
0554-95-0679	54-01116	87.5–89.5	Qbt 1g	0.005	—	—	—	—	—
0554-95-0628	54-01117	9–9.5	Qbt 2	0.015	—	—	—	0.005	0.018
0554-95-0631	54-01117	20–22	Qbt 2	—	—	—	—	—	—
0554-95-0634	54-01117	30–32	Qbt 2	—	—	—	—	—	—
0554-95-0637	54-01117	36–38	Qbt 1v	—	—	—	—	—	—
0554-95-0640	54-01117	46–48	Qbt 1v	—	—	—	—	—	—
0554-95-0643	54-01117	56–58	Qbt 1v	—	—	—	—	—	—

Table 2.2-3 (continued)

Sample ID	Location ID	Depth (ft)	Media	Americium-241	Cesium-137	Cobalt-60	Europium-152	Plutonium-238	Plutonium-239
Qbt 2,3,4 Background Value				**na**[a]	**na**	**na**	**na**	**na**	**na**
Qbt 1v Background Value				**na**	**na**	**na**	**na**	**na**	**na**
Qbt 1g, Qct, Qbo Background Value				**na**	**na**	**na**	**na**	**na**	**na**
Industrial SAL (pCi/g)				**180**	**23**	**5.1**	**11**	**240**	**210**
0554-95-0646	54-01117	67–69	Qbt 1v	—	—	—	—	—	—
0554-95-0649	54-01117	78–80	Qbt 1v	—	—	—	—	—	—
0554-95-0652	54-01117	86–88	Qbt 1g	0.01	—	—	—	—	—
0554-95-0609	54-01120	9.9–11.3	Qbt 2	—	—	—	—	—	—
0554-95-0613	54-01120	20.5–21.9	Qbt 2	—	—	—	—	—	—
0554-95-0617	54-01120	29.7–31.1	Qbt 2	—	—	—	—	—	—
0554-95-0621	54-01120	40.7–42.1	Qbt 1v	—	—	—	—	—	—
0554-95-0625	54-01120	48.1–49.5	Qbt 1v	—	—	—	—	—	—
0554-95-0782	54-01121	9–9.3	Qbt 2	—	—	—	—	—	0.01
0554-95-0792	54-01121	29–31	Qbt 1v	—	—	—	—	—	—
0554-95-0797	54-01121	39–41	Qbt 1v	—	—	—	—	—	—
0554-95-0802	54-01121	49–51	Qbt 1v	—	—	—	—	—	—
0554-95-0807	54-01121	58.5–61	Qbt 1v	—	—	—	0.78	—	—
0554-95-0733	54-01123	9–9.2	Qbt 2	—	—	—	—	—	—
0554-95-0737	54-01123	16.2–18	Qbt 2	—	—	—	—	—	—
0554-95-0741	54-01123	26.2–28	Qbt 2	—	—	—	—	—	—
0554-95-0745	54-01123	36–38	Qbt 1v	—	—	—	1.27	—	—
0554-95-0749	54-01123	46–48	Qbt 1v	—	—	—	—	—	—
0554-95-0753	54-01123	55.5–57.5	Qbt 1v	—	—	—	—	—	—
0554-95-0779	54-01123	92.5–97	Qbt 1v	—	—	—	—	—	—
0554-95-0564	54-01124	9–10	Qbt 2	—	—	—	—	—	—
0554-95-0569	54-01124	20.3–21.3	Qbt 2	0.005	—	—	—	—	—
0554-95-0574	54-01124	29.5–30.5	Qbt 1v	—	—	—	—	—	—
0554-95-0579	54-01124	37.3–38.3	Qbt 1v	—	—	—	—	—	—
0554-95-0846	54-01125	9–9.2	Qbt 2	0.013	—	—	—	—	0.024
0554-95-0861	54-01125	59–61	Qbt 1v	—	—	—	—	—	—
0554-95-0584	54-01126	9.3–10.3	Qbt 2	—	—	—	—	—	—
0554-95-0589	54-01126	18.5–19.8	Qbt 2	—	—	—	—	—	—
0554-95-0594	54-01126	28.8–29.8	Qbt 1v	0.012	—	—	—	—	—
0554-95-0599	54-01126	37.3–38.3	Qbt 1v	0.005	—	—	—	—	—
0554-95-0604	54-01126	47.3–48.3	Qbt 1v	—	—	—	—	—	—
0554-95-0544	54-01128	9–10	Qbt 2	—	—	—	—	—	—
0554-95-0549	54-01128	18.9–20	Qbt 2	0.026	—	—	—	—	—
0554-95-0554	54-01128	28–29	Qbt 1v	—	—	—	—	—	—
0554-95-0559	54-01128	39–40	Qbt 1v	—	—	—	—	—	—

Table 2.2-3 (continued)

Sample ID	Location ID	Depth (ft)	Media	Strontium-90	Thorium-230	Tritium	Uranium-234	Uranium-235	Uranium-238
Qbt 2,3,4 Background Value				**na**	**1.98**	**na**	**1.98**	**0.09**	**1.93**
Qbt 1v Background Value				**na**	**3.12**	**na**	**3.12**	**0.14**	**3.05**
Qbt 1g, Qct, Qbo Background Value				**na**	**4**	**na**	**4**	**0.18**	**3.9**
Industrial SAL (pCi/g)				**1900**	**5**	**440000**	**1500**	**83**	**430**
0554-95-0393	54-01102	19.9–20.9	Qbt 2	—	—	1.938743	—	—	—
0554-95-0396	54-01102	30.2–31.3	Qbt 2	—	—	0.1294589	—	—	—
0554-95-0399	54-01102	38.9–40.3	Qbt 2	—	—	8.606438E-02	—	0.11	—
0554-95-0402	54-01102	61.5–63	Qbt 1v	—	—	3.236603E-02	—	0.23	—
0554-95-0433	54-01105	8.8–10.6	Qbt 2	—	—	6.203144E-02	—	—	—
0554-95-0437	54-01105	17.7–19.3	Qbt 2	—	—	0.628291	—	—	—
0554-95-0441	54-01105	27.9–29.7	Qbt 2	—	—	0.8405954	—	0.1	—
0554-95-0445	54-01105	37.8–39.6	Qbt 2	—	—	0.1209776	—	—	—
0554-95-0449	54-01105	45.4–47.3	Qbt 2	—	—	2.558376E-02	—	—	—
0554-95-0453	54-01106	9.1–10.8	Qbt 2	—	—	0.253097	—	—	—
0554-95-0457	54-01106	19.3–20.9	Qbt 2	—	—	5.452775	—	—	—
0554-95-0461	54-01106	29.6–31.1	Qbt 2	—	—	103.5729	—	—	—
0554-95-0465	54-01106	37.7–39.2	Qbt 2	—	—	83.26047	—	—	—
0554-95-0469	54-01106	44.5–49.3	Qbt 1v	—	—	0.325773	—	—	—
0554-95-0362	54-01107	11.2–13.4	Qbt 2	—	—	1.298701	—	—	—
0554-95-0365	54-01107	19.7–21.5	Qbt 2	—	—	0.9832879	—	—	—
0554-95-0368	54-01107	26–28	Qbt 2	—	—	1.637998	—	—	—
0554-95-0371	54-01107	36–38	Qbt 2	—	—	2.175816	—	—	—
0554-95-0374	54-01107	47–49	Qbt 2	—	—	17.72893	—	—	—
0554-95-0377	54-01107	54–56	Qbt 2	—	—	973.416	—	—	—
0554-95-0380	54-01107	66.5–69	Qbt 1v	—	—	61.01235	—	—	—
0554-95-0383	54-01107	77–79.5	Qbt 1v	—	—	2.145473	—	—	—
0554-95-0386	54-01107	86–88.3	Qbt 1v	0.62	—	4.709307	—	—	—
0554-95-0709	54-01107	127–128.5	Qbt 1g	—	—	0.962199	—	—	—
0554-95-0473	54-01108	8.5–10.1	Qbt 2	—	—	0.2901379	—	—	—
0554-95-0477	54-01108	20.6–22.3	Qbt 2	—	—	0.8613467	—	—	—
0554-95-0481	54-01108	29.9–31.7	Qbt 2	—	—	1.763495	—	—	—
0554-95-0485	54-01108	38.3–40	Qbt 2	—	—	8.566834	—	—	—
0554-95-0489	54-01108	49.4–51	Qbt 1v	—	—	3.192516	—	—	—
AAB2648	54-01110	75–77	Qbt 1v	—	—	—	—	—	—
AAB2683	54-01111	4–5.5	Qbt 2	—	—	—	—	—	—
AAB2675	54-01111	14.5–15.5	Qbt 2	—	—	—	—	0.2	—
AAB2685	54-01111	18.5–21	Qbt 2	—	—	—	—	—	—
AAB2669	54-01111	28–30.5	Qbt 2	—	—	—	—	0.17	—
AAB2667	54-01111	38–39.5	Qbt 2	—	2.26	—	2.57	0.2	2.75
AAB2677	54-01111	50–51.5	Qbt 1v	0.4 (J)	—	—	—	0.21	—
AAB2679	54-01111	60–61.5	Qbt 1v	—	—	—	—	—	—
AAB2671	54-01111	70.5–72.5	Qbt 1v	—	—	—	—	—	—
AAB2661	54-01111	79.5–81.5	Qbt 1v	—	—	—	—	—	—

Table 2.2-3 (continued)

Sample ID	Location ID	Depth (ft)	Media	Strontium-90	Thorium-230	Tritium	Uranium-234	Uranium-235	Uranium-238
Qbt 2,3,4 Background Value				**na**	**1.98**	**na**	**1.98**	**0.09**	**1.93**
Qbt 1v Background Value				**na**	**3.12**	**na**	**3.12**	**0.14**	**3.05**
Qbt 1g, Qct, Qbo Background Value				**na**	**4**	**na**	**4**	**0.18**	**3.9**
Industrial SAL (pCi/g)				**1900**	**5**	**440000**	**1500**	**83**	**430**
AAB2663	54-01111	79.5–81.5	Qbt 1v	—	—	—	—	0.36	—
AAB2665	54-01111	89–90	Qbt 1g	—	—	—	—	0.21	—
0554-95-0712	54-01112	9–9.2	Qbt 2	—	—	2.013757	—	—	—
0554-95-0715	54-01112	13.5–17.5	Qbt 2	—	—	3.447367	—	—	—
0554-95-0716	54-01112	13.5–17.5	Qbt 2	—	—	3.566815	—	—	—
0554-95-0718	54-01112	25.3–27.3	Qbt 2	—	—	12.03517	—	—	—
0554-95-0721	54-01112	32.9–34.9	Qbt 2	—	—	26.99579	—	—	—
0554-95-0724	54-01112	45.5–47.5	Qbt 1v	—	—	231.7149	—	—	—
0554-95-0727	54-01112	48.5–50.5	Qbt 1v	—	—	500.8719	—	—	—
0554-95-0730	54-01112	54.9–57.1	Qbt 1v	—	—	1082.877	—	—	—
0554-95-0493	54-01114	8.8–10.3	Qbt 2	—	—	0.5493319	—	—	—
0554-95-0497	54-01114	18.7–20.2	Qbt 2	—	—	1.024093	—	—	—
0554-95-0501	54-01114	26.5–28.7	Qbt 2	—	—	10.14241	—	—	—
0554-95-0505	54-01114	38.5–40	Qbt 1v	—	—	20.80119	—	—	—
0554-95-0510	54-01115	10–11.1	Qbt 2	—	—	0.830065	—	—	—
0554-95-0515	54-01115	18.5–19.8	Qbt 2	—	—	1.663689	—	—	—
0554-95-0520	54-01115	29.7–30.9	Qbt 2	—	—	0.572884	—	—	—
0554-95-0525	54-01115	39.5–40.8	Qbt 1v	—	—	24.4561	—	—	—
0554-95-0530	54-01115	50.1–51.2	Qbt 1v	—	—	0.7955704	—	—	—
0554-95-0535	54-01115	60.1–61.4	Qbt 1v	—	3.16	0.1120686	—	—	—
0554-95-0540	54-01115	68.0–69.3	Qbt 1v	—	—	0.0914083	—	—	—
0554-95-0655	54-01116	9–9.3	Qbt 2	—	—	90.63394	—	—	—
0554-95-0658	54-01116	20.5–22.5	Qbt 2	—	—	391.6178	—	—	—
0554-95-0661	54-01116	29.5–31.5	Qbt 2	—	—	521.0103	—	—	—
0554-95-0664	54-01116	36.5–38.5	Qbt 2	—	—	96.25675	—	—	—
0554-95-0667	54-01116	46.5–48.5	Qbt 1v	—	—	48.94558	—	—	—
0554-95-0670	54-01116	57.5–59.5	Qbt 1v	—	—	38.99498	—	—	—
0554-95-0673	54-01116	69.5–71.5	Qbt 1v	—	—	50.06168	—	—	—
0554-95-0676	54-01116	77.5–79.5	Qbt 1v	—	—	54.7623	—	—	—
0554-95-0679	54-01116	87.5–89.5	Qbt 1g	—	—	7.475635	—	—	—
0554-95-0628	54-01117	9–9.5	Qbt 2	—	—	4537.668	—	—	—
0554-95-0631	54-01117	20–22	Qbt 2	—	—	7174.737	—	—	—
0554-95-0634	54-01117	30–32	Qbt 2	—	—	2992.381	—	—	—
0554-95-0637	54-01117	36–38	Qbt 1v	—	—	2014.142	—	—	—
0554-95-0640	54-01117	46–48	Qbt 1v	—	—	558.1818	—	—	—
0554-95-0643	54-01117	56–58	Qbt 1v	—	—	968.309	—	—	—
0554-95-0646	54-01117	67–69	Qbt 1v	—	—	670.6476	—	—	—
0554-95-0649	54-01117	78–80	Qbt 1v	—	—	206.6366	—	—	—
0554-95-0652	54-01117	86–88	Qbt 1g	—	—	15.37481	—	—	—

Table 2.2-3 (continued)

Sample ID	Location ID	Depth (ft)	Media	Strontium-90	Thorium-230	Tritium	Uranium-234	Uranium-235	Uranium-238
Qbt 2,3,4 Background Value				**na**	**1.98**	**na**	**1.98**	**0.09**	**1.93**
Qbt 1v Background Value				**na**	**3.12**	**na**	**3.12**	**0.14**	**3.05**
Qbt 1g, Qct, Qbo Background Value				**na**	**4**	**na**	**4**	**0.18**	**3.9**
Industrial SAL (pCi/g)				**1900**	**5**	**440000**	**1500**	**83**	**430**
0554-95-0609	54-01120	9.9–11.3	Qbt 2	—	—	75.13757	—	—	—
0554-95-0613	54-01120	20.5–21.9	Qbt 2	—	—	3289.391	—	—	—
0554-95-0617	54-01120	29.7–31.1	Qbt 2	—	—	13958.69	—	—	—
0554-95-0621	54-01120	40.7–42.1	Qbt 1v	—	—	13290.06	—	—	—
0554-95-0625	54-01120	48.1–49.5	Qbt 1v	—	—	1581.736	—	—	—
0554-95-0782	54-01121	9–9.3	Qbt 2	—	—	—	—	—	—
0554-95-0792	54-01121	29–31	Qbt 1v	—	—	0.3517428	—	—	—
0554-95-0797	54-01121	39–41	Qbt 1v	—	—	2.144709	—	—	—
0554-95-0802	54-01121	49–51	Qbt 1v	—	—	1.111591	—	—	—
0554-95-0807	54-01121	58.5–61	Qbt 1v	—	—	0.4186273	—	—	—
0554-95-0733	54-01123	9–9.2	Qbt 2	—	—	0.5863512	—	—	—
0554-95-0737	54-01123	16.2–18	Qbt 2	—	—	3.676294	—	—	—
0554-95-0741	54-01123	26.2–28	Qbt 2	—	—	1.165195	—	—	—
0554-95-0745	54-01123	36–38	Qbt 1v	—	—	0.0933876	—	—	—
0554-95-0749	54-01123	46–48	Qbt 1v	—	—	5.771662E-02	—	—	—
0554-95-0753	54-01123	55.5–57.5	Qbt 1v	—	—	0.0921519	—	—	—
0554-95-0779	54-01123	92.5–97	Qbt 1v	—	—	6.021882E-02	—	—	—
0554-95-0564	54-01124	9–10	Qbt 2	—	—	0.3332415	—	—	—
0554-95-0569	54-01124	20.3–21.3	Qbt 2	—	—	0.4135135	—	—	—
0554-95-0574	54-01124	29.5–30.5	Qbt 1v	—	—	0.5989743	—	—	—
0554-95-0579	54-01124	37.3–38.3	Qbt 1v	—	—	0.1858207	—	—	—
0554-95-0846	54-01125	9–9.2	Qbt 2	—	—	8.187273	—	—	—
0554-95-0861	54-01125	59–61	Qbt 1v	—	—	0.8776417	—	—	—
0554-95-0584	54-01126	9.3–10.3	Qbt 2	—	—	2.11982	—	—	—
0554-95-0589	54-01126	18.5–19.8	Qbt 2	—	—	65.99837	—	—	—
0554-95-0594	54-01126	28.8–29.8	Qbt 1v	—	—	3876.857	—	—	—
0554-95-0599	54-01126	37.3–38.3	Qbt 1v	—	—	77.54217	—	—	—
0554-95-0604	54-01126	47.3–48.3	Qbt 1v	—	—	48.65787	—	—	—
0554-95-0544	54-01128	9–10	Qbt 2	—	—	2.160635	—	—	—
0554-95-0549	54-01128	18.9–20	Qbt 2	—	—	4.293469	—	—	—
0554-95-0554	54-01128	28–29	Qbt 1v	—	—	43.98966	—	—	—
0554-95-0559	54-01128	39–40	Qbt 1v	—	—	164.8245	—	—	—

Note: All values in pCi/g. See Appendix A for data qualifier definitions.

[a] na = No BV available.

[b] — = Not detected above BV.

Table 2.2-4
Inorganic Chemicals above BVs in MDA G Phase I RFI Subsurface Core Samples

Sample ID	Location ID	Depth (ft)	Media	Antimony	Arsenic	Barium	Beryllium	Boron	Cadmium	Calcium	Chromium	Cobalt	Copper
Qbt 2,3,4 Background Value				**0.5**	**2.79**	**46**	**1.21**	**na**[a]	**1.63**	**2200**	**7.14**	**3.14**	**4.66**
Qbt 1v Background Value				**0.5**	**1.81**	**26.5**	**1.7**	**na**	**0.4**	**3700**	**2.24**	**1.78**	**3.26**
Qbt 1g, Qct, Qbo Background Value				**0.5**	**0.56**	**25.7**	**1.44**	**na**	**0.4**	**1900**	**2.6**	**8.89**	**3.96**
Industrial Soil Screening Level (mg/kg)				**45400**	**17.7**	**78300**	**2250**	**61600**	**1130**[b]	[c]	**5000**	**20500**	**45400**
0554-95-0390	54-01102	8.7–10.1	Qbt 2	0.53 (U)	—[d]	—	—	—	—	—	—	—	—
0554-95-0393	54-01102	19.9–20.9	Qbt 2	0.52 (U)	—	—	—	—	—	—	—	—	—
0554-95-0396	54-01102	30.2–31.3	Qbt 2	3.3 (U)	—	—	—	—	—	—	—	—	—
0554-95-0399	54-01102	38.9–40.3	Qbt 2	3.2 (U)	—	—	—	—	—	—	—	—	—
0554-95-0402	54-01102	61.5–63	Qbt 1v	3.2 (U)	—	—	—	—	—	—	—	—	—
0554-95-0433	54-01105	8.8–10.6	Qbt 2	3.3 (U)	—	—	—	—	—	—	—	—	—
0554-95-0437	54-01105	17.7–19.3	Qbt 2	3.1 (U)	—	—	—	—	—	—	—	—	—
0554-95-0441	54-01105	27.9–29.7	Qbt 2	3.3 (U)	—	—	—	—	—	—	—	—	—
0554-95-0445	54-01105	37.8–39.6	Qbt 2	3.3 (U)	—	—	—	—	—	—	—	—	—
0554-95-0449	54-01105	45.4–47.3	Qbt 2	3.2 (U)	—	—	—	—	—	—	—	—	—
0554-95-0453	54-01106	9.1–10.8	Qbt 2	—	—	—	—	—	—	—	—	—	—
0554-95-0457	54-01106	19.3–20.9	Qbt 2	—	—	—	—	—	—	—	—	—	—
0554-95-0461	54-01106	29.6–31.1	Qbt 2	—	—	—	—	—	—	—	—	—	—
0554-95-0465	54-01106	37.7–39.2	Qbt 2	—	—	—	—	—	—	—	—	—	—
0554-95-0469	54-01106	44.5–49.3	Qbt 1v	—	—	—	—	—	—	—	—	—	—
0554-95-0362	54-01107	11.2–13.4	Qbt 2	5.3 (U)	—	—	—	—	—	—	—	—	—
0554-95-0365	54-01107	19.7–21.5	Qbt 2	5.1 (U)	—	—	—	—	—	—	—	—	—
0554-95-0368	54-01107	26–28	Qbt 2	5.3 (U)	—	—	—	—	—	—	—	—	—
0554-95-0371	54-01107	36–38	Qbt 2	5.2 (U)	—	—	—	—	—	—	—	—	—
0554-95-0374	54-01107	47–49	Qbt 2	5.2 (U)	—	—	—	—	—	—	—	—	—
0554-95-0377	54-01107	54–56	Qbt 2	5.3 (U)	—	—	1.6	—	—	—	—	—	6.8 (U)
0554-95-0380	54-01107	66.5–69	Qbt 1v	5 (U)	—	—	—	—	0.63 (U)	—	—	—	—
0554-95-0383	54-01107	77–79.5	Qbt 1v	5.1 (U)	—	—	—	—	0.64 (U)	—	—	—	—
0554-95-0386	54-01107	86–88.3	Qbt 1v	5.2 (U)	—	—	—	—	0.65 (U)	—	—	—	—

Table 2.2-4 (continued)

Sample ID	Location ID	Depth (ft)	Media	Antimony	Arsenic	Barium	Beryllium	Boron	Cadmium	Calcium	Chromium	Cobalt	Copper
Qbt 2,3,4 Background Value				**0.5**	**2.79**	**46**	**1.21**	**na**[a]	**1.63**	**2200**	**7.14**	**3.14**	**4.66**
Qbt 1v Background Value				**0.5**	**1.81**	**26.5**	**1.7**	**na**	**0.4**	**3700**	**2.24**	**1.78**	**3.26**
Qbt 1g, Qct, Qbo Background Value				**0.5**	**0.56**	**25.7**	**1.44**	**na**	**0.4**	**1900**	**2.6**	**8.89**	**3.96**
Industrial Soil Screening Level (mg/kg)				**45400**	**17.7**	**78300**	**2250**	**61600**	**1130**[b]	[c]	**5000**	**20500**	**45400**
0554-95-0709	54-01107	127–128.5	Qbt 1g	2.9 (UJ)	—	26.5	—	—	—	—	—	—	—
0554-95-0473	54-01108	8.5–10.1	Qbt 2	—	—	—	—	—	—	—	—	—	—
0554-95-0477	54-01108	20.6–22.3	Qbt 2	—	—	—	—	—	—	—	—	—	—
0554-95-0481	54-01108	29.9–31.7	Qbt 2	—	—	—	—	—	—	—	—	—	—
0554-95-0485	54-01108	38.3–40	Qbt 2	—	—	—	—	—	—	—	—	—	—
0554-95-0489	54-01108	49.4–51	Qbt 1v	—	—	—	—	—	—	—	—	—	—
AAB2638	54-01110	6–7.5	Qbt 2	—	—	—	—	—	—	—	—	—	—
AAB2640	54-01110	16.5–17.5	Qbt 2	—	—	—	—	—	—	—	—	—	—
AAB2634	54-01110	26–28	Qbt 2	—	—	—	—	—	—	—	—	—	—
AAB2656	54-01110	36.5–37.5	Qbt 2	—	—	—	—	—	—	—	—	—	—
AAB2642	54-01110	46–48	Qbt 2	—	—	—	—	1 (U)	—	—	—	—	—
AAB2636	54-01110	56–57	Qbt 1v	—	—	—	—	1 (U)	—	—	—	—	—
AAB2648	54-01110	75–77	Qbt 1v	—	—	—	—	1 (U)	—	—	2.6	3.3	—
AAB2652	54-01110	88–90	Qbt 1g	—	0.8	—	—	1 (U)	—	—	—	—	—
AAB2654	54-01110	101–102	Qbt 1g	—	—	—	—	1 (U)	—	—	4.2	—	—
AAB2683	54-01111	4–5.5	Qbt 2	4.3 (U)	—	—	—	—	—	2420	—	—	—
AAB2675	54-01111	14.5–15.5	Qbt 2	4.2 (U)	—	—	—	—	—	—	—	—	—
AAB2685	54-01111	18.5–21	Qbt 2	4.2 (U)	—	—	—	—	—	—	—	—	—
AAB2669	54-01111	28–30.5	Qbt 2	4.2 (U)	—	—	—	—	—	—	—	—	—
AAB2667	54-01111	38–39.5	Qbt 2	4.2 (U)	—	—	—	—	—	—	—	—	—
AAB2677	54-01111	50–51.5	Qbt 1v	—	—	—	—	—	—	—	—	—	—
AAB2679	54-01111	60–61.5	Qbt 1v	—	—	—	—	—	—	—	—	—	—
AAB2671	54-01111	70.5–72.5	Qbt 1v	—	—	—	—	—	—	—	—	—	—
AAB2661	54-01111	79.5–81.5	Qbt 1v	—	—	—	—	—	—	—	—	—	—
AAB2663	54-01111	79.5–81.5	Qbt 1v	—	2.2	—	—	—	—	—	—	—	—
AAB2665	54-01111	89–90	Qbt 1g	—	—	—	—	—	—	—	—	—	—

Table 2.2-4 (continued)

Sample ID	Location ID	Depth (ft)	Media	Antimony	Arsenic	Barium	Beryllium	Boron	Cadmium	Calcium	Chromium	Cobalt	Copper
Qbt 2,3,4 Background Value				**0.5**	**2.79**	**46**	**1.21**	**na[a]**	**1.63**	**2200**	**7.14**	**3.14**	**4.66**
Qbt 1v Background Value				**0.5**	**1.81**	**26.5**	**1.7**	**na**	**0.4**	**3700**	**2.24**	**1.78**	**3.26**
Qbt 1g, Qct, Qbo Background Value				**0.5**	**0.56**	**25.7**	**1.44**	**na**	**0.4**	**1900**	**2.6**	**8.89**	**3.96**
Industrial Soil Screening Level (mg/kg)				**45400**	**17.7**	**78300**	**2250**	**61600**	**1130[b]**	**[c]**	**5000**	**20500**	**45400**
AAB2722	54-01111	108–110	Qbt 1g	—	—	—	—	—	—	—	—	—	—
0554-95-0712	54-01112	9–9.2	Qbt 2	0.57 (J)	—	—	—	—	—	—	—	—	5 (J)
0554-95-0715	54-01112	13.5–17.5	Qbt 2	0.51 (U)	—	—	—	—	—	—	—	—	—
0554-95-0716	54-01112	13.5–17.5	Qbt 2	0.51 (U)	—	—	—	—	—	—	—	—	—
0554-95-0718	54-01112	25.3–27.3	Qbt 2	0.51 (U)	—	—	—	—	—	—	—	—	—
0554-95-0721	54-01112	32.9–34.9	Qbt 2	0.51 (U)	—	—	—	—	—	—	—	—	—
0554-95-0724	54-01112	45.5–47.5	Qbt 1v	0.52 (U)	—	—	—	—	—	—	—	—	—
0554-95-0727	54-01112	48.5–50.5	Qbt 1v	0.52 (U)	—	—	—	—	—	—	—	—	5.9
0554-95-0730	54-01112	54.9–57.1	Qbt 1v	0.6 (J)	—	—	—	—	—	—	—	—	—
0554-95-0493	54-01114	8.8–10.3	Qbt 2	—	—	—	—	—	—	—	—	—	—
0554-95-0497	54-01114	18.7–20.2	Qbt 2	—	—	—	—	—	—	—	—	—	—
0554-95-0501	54-01114	26.5–28.7	Qbt 2	0.51 (U)	—	—	—	—	—	—	—	—	—
0554-95-0505	54-01114	38.5–40	Qbt 1v	0.51 (U)	—	—	—	—	—	—	—	—	—
0554-95-0510	54-01115	10–11.1	Qbt 2	—	—	—	—	—	—	—	—	—	—
0554-95-0515	54-01115	18.5–19.8	Qbt 2	—	—	—	—	—	—	—	—	—	—
0554-95-0520	54-01115	29.7–30.9	Qbt 2	—	—	—	—	—	—	—	—	—	—
0554-95-0525	54-01115	39.5–40.8	Qbt 1v	—	—	—	—	—	—	—	—	—	—
0554-95-0530	54-01115	50.1–51.2	Qbt 1v	—	—	—	—	—	—	—	—	—	—
0554-95-0535	54-01115	60.1–61.4	Qbt 1v	—	—	—	—	—	—	—	—	—	—
0554-95-0540	54-01115	68.0–69.3	Qbt 1v	—	—	—	—	—	—	—	—	—	—
0554-95-0655	54-01116	9–9.3	Qbt 2	9.1 (U)	—	—	—	—	—	—	—	—	—
0554-95-0658	54-01116	20.5–22.5	Qbt 2	9 (U)	—	—	—	—	—	—	—	—	—
0554-95-0661	54-01116	29.5–31.5	Qbt 2	8.8 (U)	—	—	—	—	—	—	—	—	—
0554-95-0664	54-01116	36.5–38.5	Qbt 2	8.6 (U)	—	—	—	—	—	—	—	—	—
0554-95-0667	54-01116	46.5–48.5	Qbt 1v	8.3 (U)	—	—	—	—	0.66 (U)	—	—	—	—
0554-95-0670	54-01116	57.5–59.5	Qbt 1v	8.7 (U)	—	—	—	—	0.68 (U)	—	—	—	—

Table 2.2-4 (continued)

Sample ID	Location ID	Depth (ft)	Media	Antimony	Arsenic	Barium	Beryllium	Boron	Cadmium	Calcium	Chromium	Cobalt	Copper
Qbt 2,3,4 Background Value				**0.5**	**2.79**	**46**	**1.21**	**na[a]**	**1.63**	**2200**	**7.14**	**3.14**	**4.66**
Qbt 1v Background Value				**0.5**	**1.81**	**26.5**	**1.7**	**na**	**0.4**	**3700**	**2.24**	**1.78**	**3.26**
Qbt 1g, Qct, Qbo Background Value				**0.5**	**0.56**	**25.7**	**1.44**	**na**	**0.4**	**1900**	**2.6**	**8.89**	**3.96**
Industrial Soil Screening Level (mg/kg)				**45400**	**17.7**	**78300**	**2250**	**61600**	**1130[b]**	**[c]**	**5000**	**20500**	**45400**
0554-95-0673	54-01116	69.5–71.5	Qbt 1v	8.6 (U)	—	—	—	—	0.68 (U)	—	—	—	—
0554-95-0676	54-01116	77.5–79.5	Qbt 1v	8.6 (U)	—	—	—	—	0.68 (U)	—	—	—	—
0554-95-0679	54-01116	87.5–89.5	Qbt 1g	8.4 (U)	—	—	—	—	0.66 (U)	—	—	—	—
0554-95-0628	54-01117	9–9.5	Qbt 2	8.8 (U)	—	—	—	—	—	—	—	—	—
0554-95-0631	54-01117	20–22	Qbt 2	8.7 (U)	—	—	—	—	—	—	—	—	—
0554-95-0634	54-01117	30–32	Qbt 2	—	—	—	—	—	—	—	—	—	—
0554-95-0637	54-01117	36–38	Qbt 1v	—	—	—	—	—	—	—	—	—	—
0554-95-0640	54-01117	46–48	Qbt 1v	—	—	—	—	—	—	—	—	—	—
0554-95-0643	54-01117	56–58	Qbt 1v	—	—	—	—	—	—	—	—	—	—
0554-95-0646	54-01117	67–69	Qbt 1v	—	—	—	—	—	—	—	—	—	—
0554-95-0649	54-01117	78–80	Qbt 1v	0.51 (U)	2.2	—	—	—	—	—	—	—	—
0554-95-0652	54-01117	86–88	Qbt 1g	—	—	—	—	—	—	—	—	—	—
0554-95-0609	54-01120	9.9–11.3	Qbt 2	3.2 (UJ)	—	—	—	—	—	—	—	—	—
0554-95-0613	54-01120	20.5–21.9	Qbt 2	3.1 (UJ)	—	—	—	—	—	—	—	—	—
0554-95-0617	54-01120	29.7–31.1	Qbt 2	3.1 (UJ)	—	—	—	—	—	—	—	—	—
0554-95-0621	54-01120	40.7–42.1	Qbt 1v	3.1 (UJ)	—	—	—	—	—	—	—	—	5.8
0554-95-0625	54-01120	48.1–49.5	Qbt 1v	3.1 (UJ)	—	—	—	—	—	—	—	—	—
0554-95-0782	54-01121	9–9.3	Qbt 2	0.53 (U)	—	—	—	—	—	5580	—	—	—
0554-95-0787	54-01121	19–21	Qbt 2	0.51 (U)	—	—	—	—	—	—	—	—	—
0554-95-0792	54-01121	29–31	Qbt 1v	0.51 (U)	—	—	—	—	—	—	—	—	—
0554-95-0797	54-01121	39–41	Qbt 1v	0.51 (U)	—	—	—	—	—	—	—	—	—
0554-95-0802	54-01121	49–51	Qbt 1v	0.51 (U)	—	—	—	—	—	—	—	—	—
0554-95-0807	54-01121	58.5–61	Qbt 1v	—	—	—	—	—	—	—	—	—	—
0554-95-0733	54-01123	9–9.2	Qbt 2	—	—	—	—	—	—	—	—	—	—
0554-95-0737	54-01123	16.2–18	Qbt 2	—	—	—	—	—	—	—	—	—	—
0554-95-0741	54-01123	26.2–28	Qbt 2	—	—	—	—	—	—	—	—	—	—

Table 2.2-4 (continued)

Sample ID	Location ID	Depth (ft)	Media	Antimony	Arsenic	Barium	Beryllium	Boron	Cadmium	Calcium	Chromium	Cobalt	Copper
Qbt 2,3,4 Background Value				**0.5**	**2.79**	**46**	**1.21**	**na[a]**	**1.63**	**2200**	**7.14**	**3.14**	**4.66**
Qbt 1v Background Value				**0.5**	**1.81**	**26.5**	**1.7**	**na**	**0.4**	**3700**	**2.24**	**1.78**	**3.26**
Qbt 1g, Qct, Qbo Background Value				**0.5**	**0.56**	**25.7**	**1.44**	**na**	**0.4**	**1900**	**2.6**	**8.89**	**3.96**
Industrial Soil Screening Level (mg/kg)				**45400**	**17.7**	**78300**	**2250**	**61600**	**1130[b]**	**[c]**	**5000**	**20500**	**45400**
0554-95-0745	54-01123	36–38	Qbt 1v	—	—	—	—	—	—	—	—	—	—
0554-95-0749	54-01123	46–48	Qbt 1v	—	—	—	—	—	—	—	—	—	—
0554-95-0753	54-01123	55.5–57.5	Qbt 1v	—	—	—	—	—	—	—	—	—	—
0554-95-0779	54-01123	92.5–97	Qbt 1v	—	—	71.6	—	—	—	—	2.3 (U)	—	—
0554-95-0564	54-01124	9–10	Qbt 2	11 (U)	—	—	—	—	—	—	—	—	—
0554-95-0569	54-01124	20.3–21.3	Qbt 2	10 (U)	—	—	—	—	—	—	—	—	—
0554-95-0574	54-01124	29.5–30.5	Qbt 1v	11 (U)	—	—	—	—	0.56 (U)	—	5.6	—	—
0554-95-0579	54-01124	37.3–38.3	Qbt 1v	10 (U)	—	—	—	—	0.51 (U)	—	—	—	—
0554-95-0846	54-01125	9–9.2	Qbt 2	11 (UJ)	—	—	—	—	—	—	—	—	8.7 (J-)
0554-95-0849	54-01125	16–18	Qbt 2	11 (UJ)	—	—	—	—	—	—	—	—	—
0554-95-0852	54-01125	26–28	Qbt 2	11 (UJ)	—	—	—	—	—	—	—	—	—
0554-95-0855	54-01125	36–38	Qbt 2	11 (UJ)	—	—	—	—	—	—	—	—	—
0554-95-0858	54-01125	46–48	Qbt 1v	11 (UJ)	—	—	—	—	0.55 (U)	—	—	—	—
0554-95-0861	54-01125	59–61	Qbt 1v	11 (UJ)	—	—	—	—	0.57 (U)	—	—	—	—
0554-95-0584	54-01126	9.3–10.3	Qbt 2	3.2 (UJ)	—	—	—	—	—	—	—	—	—
0554-95-0589	54-01126	18.5–19.8	Qbt 2	3.1 (UJ)	—	—	—	—	—	—	—	—	—
0554-95-0594	54-01126	28.8–29.8	Qbt 1v	3.2 (UJ)	—	—	—	—	—	—	—	—	—
0554-95-0599	54-01126	37.3–38.3	Qbt 1v	—	—	—	—	—	—	—	—	—	—
0554-95-0604	54-01126	47.3–48.3	Qbt 1v	—	—	—	—	—	—	—	—	—	—
0554-95-0544	54-01128	9–10	Qbt 2	10 (U)	—	—	—	—	—	—	—	—	—
0554-95-0549	54-01128	18.9–20	Qbt 2	10 (U)	—	—	—	—	—	—	—	—	—
0554-95-0554	54-01128	28–29	Qbt 1v	11 (U)	—	—	—	—	0.53 (U)	—	—	—	4.3 (J+)
0554-95-0559	54-01128	39–40	Qbt 1v	11 (U)	—	—	—	—	0.53 (U)	—	—	—	—

Table 2.2-4 (continued)

Sample ID	Location ID	Depth (ft)	Media	Cyanide (Total)	Magnesium	Mercury	Molybdenum	Nickel	Selenium	Silver	Thallium	Vanadium	Zinc
Qbt 2,3,4 Background Value				**0.5**	**1690**	**0.1**	**na**	**6.58**	**0.3**	**1**	**1.1**	**17**	**63.5**
Qbt 1v Background Value				**0.5**	**780**	**0.1**	**na**	**2**	**0.3**	**1**	**1.24**	**4.48**	**87.6**
Qbt 1g, Qct, Qbo Background Value				**0.5**	**739**	**0.1**	**na**	**2**	**0.3**	**1**	**1.22**	**4.59**	**40**
Industrial Soil Screening Level (mg/kg)				**22700**	[b]	**340**	**5680**	**22500**	**5680**	**5680**	**74.9**	**7950**	**100000**
0554-95-0390	54-01102	8.7–10.1	Qbt 2	0.55	—	—	—	—	0.51 (U)	—	—	—	—
0554-95-0393	54-01102	19.9–20.9	Qbt 2	0.43 (J)	—	—	—	—	0.5 (U)	—	—	—	—
0554-95-0396	54-01102	30.2–31.3	Qbt 2	0.102 (U)	—	—	—	—	0.61 (UJ)	—	—	—	—
0554-95-0399	54-01102	38.9–40.3	Qbt 2	0.103 (U)	—	—	—	—	0.61 (UJ)	—	—	—	—
0554-95-0402	54-01102	61.5–63	Qbt 1v	0.101 (U)	—	—	—	—	0.6 (UJ)	—	—	—	—
0554-95-0433	54-01105	8.8–10.6	Qbt 2	0.1 (U)	—	—	—	—	0.62 (UJ)	—	—	—	—
0554-95-0437	54-01105	17.7–19.3	Qbt 2	0.102 (U)	—	—	—	—	0.59 (UJ)	—	—	—	—
0554-95-0441	54-01105	27.9–29.7	Qbt 2	0.102 (U)	—	—	—	—	0.63 (UJ)	—	—	—	—
0554-95-0445	54-01105	37.8–39.6	Qbt 2	0.101 (U)	—	—	—	—	0.62 (UJ)	—	—	—	—
0554-95-0449	54-01105	45.4–47.3	Qbt 2	0.101 (U)	—	—	—	—	0.6 (UJ)	—	—	—	—
0554-95-0453	54-01106	9.1–10.8	Qbt 2	0.15 (UJ)	—	—	—	—	0.31 (U)	—	—	174 (J)	—
0554-95-0457	54-01106	19.3–20.9	Qbt 2	0.16 (UJ)	—	—	—	—	0.31 (U)	—	—	—	—
0554-95-0461	54-01106	29.6–31.1	Qbt 2	0.15 (UJ)	—	—	—	—	0.31 (U)	—	—	—	—
0554-95-0465	54-01106	37.7–39.2	Qbt 2	0.16 (UJ)	—	—	—	—	0.31 (U)	—	—	—	—
0554-95-0469	54-01106	44.5–49.3	Qbt 1v	0.15 (UJ)	—	—	—	—	—	—	—	—	—
0554-95-0362	54-01107	11.2–13.4	Qbt 2	0.54 (U)	—	—	—	—	0.35 (U)	1.4 (U)	—	—	—
0554-95-0365	54-01107	19.7–21.5	Qbt 2	0.52 (U)	—	—	—	—	0.33 (U)	1.1 (U)	—	—	—
0554-95-0368	54-01107	26–28	Qbt 2	0.54 (U)	—	—	—	—	0.34 (U)	1.3 (U)	—	—	—
0554-95-0371	54-01107	36–38	Qbt 2	0.53 (U)	—	—	—	—	0.34 (U)	1.2 (U)	—	—	—
0554-95-0374	54-01107	47–49	Qbt 2	0.53 (U)	—	—	—	—	0.34 (U)	1.2 (U)	—	—	—
0554-95-0377	54-01107	54–56	Qbt 2	0.54 (U)	—	—	—	—	0.35 (U)	1.2 (U)	—	—	—
0554-95-0380	54-01107	66.5–69	Qbt 1v	0.51 (U)	—	—	—	—	0.33 (U)	1.1 (U)	—	—	—
0554-95-0383	54-01107	77–79.5	Qbt 1v	0.52 (U)	—	—	—	—	0.33 (U)	1.1 (U)	—	—	—
0554-95-0386	54-01107	86–88.3	Qbt 1v	0.53 (U)	—	—	—	—	0.34 (U)	1.2 (U)	—	—	—
0554-95-0709	54-01107	127–128.5	Qbt 1g	0.16 (U)	—	—	—	4.4	0.31 (U)	—	—	—	—
0554-95-0473	54-01108	8.5–10.1	Qbt 2	—	—	0.11 (U)	—	—	0.66 (U)	—	—	—	—

Table 2.2-4 (continued)

Sample ID	Location ID	Depth (ft)	Media	Cyanide (Total)	Magnesium	Mercury	Molybdenum	Nickel	Selenium	Silver	Thallium	Vanadium	Zinc
Qbt 2,3,4 Background Value				**0.5**	**1690**	**0.1**	**na**	**6.58**	**0.3**	**1**	**1.1**	**17**	**63.5**
Qbt 1v Background Value				**0.5**	**780**	**0.1**	**na**	**2**	**0.3**	**1**	**1.24**	**4.48**	**87.6**
Qbt 1g, Qct, Qbo Background Value				**0.5**	**739**	**0.1**	**na**	**2**	**0.3**	**1**	**1.22**	**4.59**	**40**
Industrial Soil Screening Level (mg/kg)				**22700**	[b]	**340**	**5680**	**22500**	**5680**	**5680**	**74.9**	**7950**	**100000**
0554-95-0477	54-01108	20.6–22.3	Qbt 2	—	—	0.11 (U)	—	—	0.66 (U)	—	—	—	—
0554-95-0481	54-01108	29.9–31.7	Qbt 2	—	—	—	—	—	0.65 (U)	—	—	—	—
0554-95-0485	54-01108	38.3–40	Qbt 2	—	—	0.11 (U)	—	—	0.64 (U)	—	—	—	—
0554-95-0489	54-01108	49.4–51	Qbt 1v	—	—	—	—	—	0.62 (U)	—	—	—	—
AAB2638	54-01110	6–7.5	Qbt 2	—	—	—	—	—	0.6 (U)	—	—	—	—
AAB2640	54-01110	16.5–17.5	Qbt 2	—	—	—	—	—	0.61 (U)	—	—	—	—
AAB2634	54-01110	26–28	Qbt 2	—	—	—	—	—	0.6 (U)	—	—	—	—
AAB2656	54-01110	36.5–37.5	Qbt 2	—	—	—	—	—	0.58 (U)	—	—	—	—
AAB2642	54-01110	46–48	Qbt 2	0.05 (U)	—	—	0.9 (U)	—	—	—	—	—	—
AAB2636	54-01110	56–57	Qbt 1v	0.05 (U)	—	—	0.9 (U)	—	—	—	—	—	—
AAB2648	54-01110	75–77	Qbt 1v	0.05 (U)	—	—	1.9	—	—	—	—	—	—
AAB2652	54-01110	88–90	Qbt 1g	0.05 (U)	—	—	1.4	—	—	—	—	—	—
AAB2654	54-01110	101–102	Qbt 1g	0.05 (U)	—	—	1.8	—	—	—	—	—	42
AAB2683	54-01111	4–5.5	Qbt 2	—	—	—	—	—	0.52 (U)	—	—	—	—
AAB2675	54-01111	14.5–15.5	Qbt 2	—	—	—	—	—	0.5 (U)	—	—	—	—
AAB2685	54-01111	18.5–21	Qbt 2	—	—	—	—	—	0.5 (U)	—	—	—	—
AAB2669	54-01111	28–30.5	Qbt 2	—	—	—	—	—	0.5 (U)	—	—	—	—
AAB2667	54-01111	38–39.5	Qbt 2	—	—	—	—	—	0.5 (U)	—	—	—	—
AAB2677	54-01111	50–51.5	Qbt 1v	—	—	—	—	—	0.58 (U)	—	—	—	—
AAB2679	54-01111	60–61.5	Qbt 1v	—	—	—	—	—	0.58 (U)	—	—	—	—
AAB2671	54-01111	70.5–72.5	Qbt 1v	—	—	—	—	—	0.58 (U)	—	—	—	—
AAB2661	54-01111	79.5–81.5	Qbt 1v	—	—	—	—	—	0.6 (U)	—	—	—	—
AAB2663	54-01111	79.5–81.5	Qbt 1v	—	—	—	—	—	0.6 (U)	—	—	—	—
AAB2665	54-01111	89–90	Qbt 1g	—	—	—	—	—	0.58 (U)	—	—	—	—
AAB2722	54-01111	108–110	Qbt 1g	—	—	—	—	—	0.6 (UJ)	—	—	—	—
0554-95-0712	54-01112	9–9.2	Qbt 2	0.2 (U)	—	—	—	—	0.49 (U)	—	—	—	—

Table 2.2-4 (continued)

Sample ID	Location ID	Depth (ft)	Media	Cyanide (Total)	Magnesium	Mercury	Molybdenum	Nickel	Selenium	Silver	Thallium	Vanadium	Zinc
Qbt 2,3,4 Background Value				**0.5**	**1690**	**0.1**	**na**	**6.58**	**0.3**	**1**	**1.1**	**17**	**63.5**
Qbt 1v Background Value				**0.5**	**780**	**0.1**	**na**	**2**	**0.3**	**1**	**1.24**	**4.48**	**87.6**
Qbt 1g, Qct, Qbo Background Value				**0.5**	**739**	**0.1**	**na**	**2**	**0.3**	**1**	**1.22**	**4.59**	**40**
Industrial Soil Screening Level (mg/kg)				**22700**	[b]	**340**	**5680**	**22500**	**5680**	**5680**	**74.9**	**7950**	**100000**
0554-95-0715	54-01112	13.5–17.5	Qbt 2	0.2 (U)	—	—	—	—	0.49 (U)	—	—	—	—
0554-95-0716	54-01112	13.5–17.5	Qbt 2	0.2 (U)	—	—	—	—	0.49 (U)	—	—	—	—
0554-95-0718	54-01112	25.3–27.3	Qbt 2	0.2 (U)	—	—	—	—	0.49 (U)	—	—	—	—
0554-95-0721	54-01112	32.9–34.9	Qbt 2	0.2 (U)	—	—	—	—	0.49 (U)	—	—	—	—
0554-95-0724	54-01112	45.5–47.5	Qbt 1v	0.21 (U)	—	—	—	—	0.5 (U)	—	—	—	—
0554-95-0727	54-01112	48.5–50.5	Qbt 1v	0.21 (U)	1040 (J)	—	—	2.3 (J)	0.5 (U)	—	—	—	—
0554-95-0730	54-01112	54.9–57.1	Qbt 1v	0.2 (U)	—	—	—	—	0.5 (U)	—	—	—	—
0554-95-0493	54-01114	8.8–10.3	Qbt 2	0.21 (J)	—	—	—	—	0.7 (U)	—	—	—	—
0554-95-0497	54-01114	18.7–20.2	Qbt 2	0.37 (J)	—	—	—	—	0.79 (U)	—	—	—	—
0554-95-0501	54-01114	26.5–28.7	Qbt 2	0.2 (U)	—	—	—	—	0.49 (U)	—	—	—	—
0554-95-0505	54-01114	38.5–40	Qbt 1v	0.2	—	—	—	—	0.49 (U)	—	—	—	—
0554-95-0510	54-01115	10–11.1	Qbt 2	0.108 (U)	—	—	—	—	0.66 (UJ)	—	—	—	—
0554-95-0515	54-01115	18.5–19.8	Qbt 2	0.106 (U)	—	0.11 (U)	—	—	0.64 (UJ)	—	—	—	—
0554-95-0520	54-01115	29.7–30.9	Qbt 2	0.105 (U)	—	0.11 (U)	—	—	0.65 (UJ)	—	—	—	—
0554-95-0525	54-01115	39.5–40.8	Qbt 1v	0.105 (U)	—	0.11 (U)	—	—	0.63 (UJ)	—	—	—	—
0554-95-0530	54-01115	50.1–51.2	Qbt 1v	0.103 (U)	—	—	—	—	0.64 (UJ)	—	—	92 (J)	—
0554-95-0535	54-01115	60.1–61.4	Qbt 1v	0.1 (U)	—	—	—	—	0.59 (UJ)	—	—	—	—
0554-95-0540	54-01115	68.0–69.3	Qbt 1v	0.101 (U)	—	—	—	—	0.6 (UJ)	—	—	—	—
0554-95-0655	54-01116	9–9.3	Qbt 2	0.53 (U)	—	—	—	—	0.34 (UJ)	—	—	—	—
0554-95-0658	54-01116	20.5–22.5	Qbt 2	0.52 (U)	—	—	—	—	0.34 (UJ)	—	—	—	—
0554-95-0661	54-01116	29.5–31.5	Qbt 2	0.52 (U)	—	—	—	—	0.33 (UJ)	—	—	—	—
0554-95-0664	54-01116	36.5–38.5	Qbt 2	0.5 (U)	—	—	—	—	0.31 (UJ)	—	—	—	—
0554-95-0667	54-01116	46.5–48.5	Qbt 1v	0.5 (U)	—	—	—	2.9 (U)	0.32 (UJ)	—	—	—	—
0554-95-0670	54-01116	57.5–59.5	Qbt 1v	0.5 (U)	—	—	—	3 (U)	0.32 (UJ)	—	—	—	—
0554-95-0673	54-01116	69.5–71.5	Qbt 1v	0.5 (U)	—	—	—	3 (U)	0.32 (UJ)	—	—	—	—
0554-95-0676	54-01116	77.5–79.5	Qbt 1v	0.51 (U)	—	—	—	3 (U)	0.32 (UJ)	—	—	—	—

Table 2.2-4 (continued)

Sample ID	Location ID	Depth (ft)	Media	Cyanide (Total)	Magnesium	Mercury	Molybdenum	Nickel	Selenium	Silver	Thallium	Vanadium	Zinc
Qbt 2,3,4 Background Value				**0.5**	**1690**	**0.1**	**na**	**6.58**	**0.3**	**1**	**1.1**	**17**	**63.5**
Qbt 1v Background Value				**0.5**	**780**	**0.1**	**na**	**2**	**0.3**	**1**	**1.24**	**4.48**	**87.6**
Qbt 1g, Qct, Qbo Background Value				**0.5**	**739**	**0.1**	**na**	**2**	**0.3**	**1**	**1.22**	**4.59**	**40**
Industrial Soil Screening Level (mg/kg)				**22700**	[b]	**340**	**5680**	**22500**	**5680**	**5680**	**74.9**	**7950**	**100000**
0554-95-0679	54-01116	87.5–89.5	Qbt 1g	0.5 (U)	—	—	—	2.9 (U)	0.32 (UJ)	—	—	—	—
0554-95-0628	54-01117	9–9.5	Qbt 2	0.51 (U)	—	—	—	—	0.33 (UJ)	—	—	—	—
0554-95-0631	54-01117	20–22	Qbt 2	0.51 (U)	—	—	—	—	0.33 (UJ)	—	—	—	—
0554-95-0634	54-01117	30–32	Qbt 2	0.19 (U)	—	—	—	—	0.47 (U)	—	—	—	—
0554-95-0637	54-01117	36–38	Qbt 1v	0.19 (U)	—	—	—	—	0.54 (J)	—	—	—	—
0554-95-0640	54-01117	46–48	Qbt 1v	0.19 (U)	—	—	—	—	0.64 (J)	—	—	—	—
0554-95-0643	54-01117	56–58	Qbt 1v	0.19 (U)	—	—	—	—	0.46 (U)	—	—	—	—
0554-95-0646	54-01117	67–69	Qbt 1v	0.97 (U)	—	—	—	—	0.47 (U)	—	—	—	—
0554-95-0649	54-01117	78–80	Qbt 1v	0.2 (U)	—	—	—	—	0.49 (U)	—	—	—	—
0554-95-0652	54-01117	86–88	Qbt 1g	0.19 (U)	—	—	—	—	0.47 (U)	—	—	—	—
0554-95-0609	54-01120	9.9–11.3	Qbt 2	0.39 (U)	—	—	—	—	0.42 (U)	—	—	—	—
0554-95-0613	54-01120	20.5–21.9	Qbt 2	0.35 (U)	—	—	—	—	0.41 (U)	—	—	—	—
0554-95-0617	54-01120	29.7–31.1	Qbt 2	0.15 (U)	—	—	—	—	0.41 (U)	—	—	—	—
0554-95-0621	54-01120	40.7–42.1	Qbt 1v	0.2 (U)	—	—	—	4.9	0.41 (U)	—	—	—	—
0554-95-0625	54-01120	48.1–49.5	Qbt 1v	0.16 (U)	—	—	—	—	0.42 (U)	—	—	—	—
0554-95-0782	54-01121	9–9.3	Qbt 2	0.21 (U)	—	—	—	—	0.51 (U)	—	—	—	—
0554-95-0787	54-01121	19–21	Qbt 2	0.2 (U)	—	—	—	—	0.49 (U)	—	—	—	—
0554-95-0792	54-01121	29–31	Qbt 1v	0.2 (U)	—	—	—	—	0.49 (U)	—	—	—	—
0554-95-0797	54-01121	39–41	Qbt 1v	0.2 (U)	—	—	—	—	0.48 (U)	—	—	—	—
0554-95-0802	54-01121	49–51	Qbt 1v	0.2 (U)	—	—	—	—	0.49 (U)	—	—	—	—
0554-95-0807	54-01121	58.5–61	Qbt 1v	0.2 (U)	—	—	—	—	0.48 (U)	—	—	—	—
0554-95-0733	54-01123	9–9.2	Qbt 2	0.525 (U)	—	0.34 (J+)	0.14 (U)	—	0.61 (U)	—	—	—	—
0554-95-0737	54-01123	16.2–18	Qbt 2	0.517 (U)	—	0.44 (J+)	0.27 (U)	—	0.64 (U)	—	—	—	—
0554-95-0741	54-01123	26.2–28	Qbt 2	0.512 (U)	—	0.3 (J+)	0.38 (U)	—	0.63 (U)	—	—	—	—
0554-95-0745	54-01123	36–38	Qbt 1v	0.505 (U)	—	—	0.18 (U)	—	0.62 (U)	—	—	—	—
0554-95-0749	54-01123	46–48	Qbt 1v	0.509 (U)	—	—	0.14 (U)	—	0.62 (U)	—	—	—	—

Table 2.2-4 (continued)

Sample ID	Location ID	Depth (ft)	Media	Cyanide (Total)	Magnesium	Mercury	Molybdenum	Nickel	Selenium	Silver	Thallium	Vanadium	Zinc
Qbt 2,3,4 Background Value				**0.5**	**1690**	**0.1**	**na**	**6.58**	**0.3**	**1**	**1.1**	**17**	**63.5**
Qbt 1v Background Value				**0.5**	**780**	**0.1**	**na**	**2**	**0.3**	**1**	**1.24**	**4.48**	**87.6**
Qbt 1g, Qct, Qbo Background Value				**0.5**	**739**	**0.1**	**na**	**2**	**0.3**	**1**	**1.22**	**4.59**	**40**
Industrial Soil Screening Level (mg/kg)				**22700**	[b]	**340**	**5680**	**22500**	**5680**	**5680**	**74.9**	**7950**	**100000**
0554-95-0753	54-01123	55.5–57.5	Qbt 1v	0.521 (U)	—	—	0.55 (U)	—	0.62 (U)	—	—	—	—
0554-95-0779	54-01123	92.5–97	Qbt 1v	0.554 (U)	1930 (J+)	0.11 (U)	0.15 (U)	—	0.65 (U)	—	—	5.7 (J)	—
0554-95-0564	54-01124	9–10	Qbt 2	0.55 (U)	—	0.11 (U)	—	—	1.1 (U)	2.2 (UJ)	—	—	—
0554-95-0569	54-01124	20.3–21.3	Qbt 2	0.52 (U)	—	—	—	—	1 (U)	2.1 (UJ)	—	—	—
0554-95-0574	54-01124	29.5–30.5	Qbt 1v	0.56 (U)	—	0.11 (U)	—	2.2 (U)	1.1 (U)	2.2 (UJ)	—	—	—
0554-95-0579	54-01124	37.3–38.3	Qbt 1v	0.51 (U)	—	—	—	—	1 (U)	2 (UJ)	—	—	—
0554-95-0846	54-01125	9–9.2	Qbt 2	0.54 (U)	—	0.11 (U)	—	—	1.1 (U)	2.2 (U)	1.4 (U)	—	—
0554-95-0849	54-01125	16–18	Qbt 2	0.56 (U)	—	0.11 (U)	—	—	1.1 (U)	2.2 (U)	1.4 (U)	—	—
0554-95-0852	54-01125	26–28	Qbt 2	0.54 (U)	—	0.11 (U)	—	—	1.1 (U)	2.2 (U)	1.4 (U)	—	—
0554-95-0855	54-01125	36–38	Qbt 2	0.54 (U)	—	0.11 (U)	—	—	1.1 (U)	2.2 (U)	1.3 (U)	—	—
0554-95-0858	54-01125	46–48	Qbt 1v	0.55 (U)	—	0.11 (U)	—	2.2 (U)	1.1 (U)	2.2 (U)	1.4 (U)	—	—
0554-95-0861	54-01125	59–61	Qbt 1v	0.57 (U)	—	0.11 (U)	—	2.3 (U)	1.1 (U)	2.3 (U)	1.4 (U)	—	—
0554-95-0584	54-01126	9.3–10.3	Qbt 2	0.18 (J)	—	—	—	—	0.43 (U)	—	—	—	—
0554-95-0589	54-01126	18.5–19.8	Qbt 2	0.34 (J)	—	—	—	—	0.41 (U)	—	—	—	—
0554-95-0594	54-01126	28.8–29.8	Qbt 1v	0.17 (J)	—	—	—	—	0.42 (U)	—	—	—	—
0554-95-0599	54-01126	37.3–38.3	Qbt 1v	0.2 (U)	—	—	—	—	0.48 (U)	—	—	—	—
0554-95-0604	54-01126	47.3–48.3	Qbt 1v	0.71	—	—	—	—	0.47 (U)	—	—	—	—
0554-95-0544	54-01128	9–10	Qbt 2	0.51 (U)	—	—	—	—	1 (U)	2 (UJ)	—	—	—
0554-95-0549	54-01128	18.9–20	Qbt 2	0.51 (U)	—	—	—	—	1 (U)	2 (UJ)	—	—	—
0554-95-0554	54-01128	28–29	Qbt 1v	0.53 (U)	—	0.11 (U)	—	2.1 (U)	1.1 (U)	2.1 (UJ)	—	—	—
0554-95-0559	54-01128	39–40	Qbt 1v	0.53 (U)	—	0.11 (U)	—	2.1 (U)	1.1 (U)	2.1 (UJ)	—	—	—

Note: All values in mg/kg. See Appendix A for data qualifier definitions.

[a] na = No BV available.

[b] Industrial SSL for cadmium calculated incorrectly in NMED 2004 85615, SSL recalculated using NMED parameters.

[c] Essential nutrient.

[d] — = Not detected above BV.

Table 3.3-1
MDA G Investigation Work Plan Drilling Summary

Borehole ID	Borehole Location	Target Depth (ft)	Drilled Depth (ft)	Length (ft)	Angle	Drill Method Used
BH 1	54-24360	200	200	200	90	HSA
BH 2	54-24361	200	170	170	90	HSA
BH 3	54-24362	200	189	189	90	HSA
BH 4	54-24363	250	176.8	250	45	HSA
BH 5	54-24364	200	200	200	90	HSA
BH 6	54-24366	300	176.8	250	45	HSA
BH 7	54-24367	200	200	200	90	HSA
BH 8	54-24368	300	201.5	285	45	HSA
BH 9	54-24369	250	250	250	90	HSA
BH 10	54-24370	225	225	225	90	HSA
BH 11	54-24371	200	200	200	90	HSA
BH 12	54-24372	250	250	250	90	HSA
BH 13	54-24373	250	250	250	90	HSA
BH 14	54-24374	200	200	200	90	HSA
BH 15	54-24375	200	200	200	90	HSA
BH 15-2	54-24523	700	556	556	90	Air-Rotary
BH 15-3	54-25105	700	700	700	90	Air-Rotary
BH 16	54-24376	200	200	200	90	HSA
BH 17	54-24377	200	200	200	90	HSA
BH 18	54-24378	200	182	182	90	HSA
BH 19	54-24379	200	200	200	90	HSA
BH 20	54-24380	200	196	196	90	HSA
BH 21	54-24381	200	200	200	90	HSA
BH 22	54-24382	200	147	147	90	HSA
BH 23	54-24383	200	147.5	147.5	90	HSA
BH 24	54-24384	200	68	68	90	HSA
BH 25	54-24385	200	177	177	90	HSA
BH 26	54-24386	200	186	186	90	HSA
BH 27	54-24387	200	81	81	90	HSA
BH 28	54-24388	200	180	180	90	HSA
BH 29	54-24389	200	200	200	90	HSA
BH 30	54-24390	200	186	186	90	HSA
BH 31	54-24391	200	200	200	90	HSA
BH 32	54-24392	200	200	200	90	HSA
BH 33	54-24393	225	206	206	90	HSA
BH 34	54-24394	200	200	200	90	HSA
BH 35	54-24395	200	200	200	90	HSA
BH 36	54-24396	200	200	200	90	HSA
BH 37	54-24397	200	200	200	90	HSA

Table 4.2-1
Fracture Sample Summary for Boreholes at MDA G

Borehole ID	Borehole Location	Sample ID	Media Code	Begin Depth (ft)	End Depth (ft)	Sample Description	Notes
BH 3	54-24362	MD54-05-57887	Qbt 2	35	40	Fracture (38–40 ft) filled with clay	Sample represents base of closest disposal unit
		MD54-05-57894					Duplicate of MD54-05-57887
BH 4	54-24363	MD54-05-57896	Qbt 2	42.8	45.2	Clay filled fracture	Did not collect a paired sample above fracture because a sample was collected at 31.8–35.4 ft
BH 9	54-24369	MD54-05-57960	Qbt 2	65	70	2–3 mm thick clay filled fracture	Sample represents base of closest disposal unit
		MD54-05-57967					Duplicate of MD54-05-57967
BH 15	54-24375	MD54-05-58014	Qbt 2	62	64	Tuff sample collected above fracture	**Paired fracture sample**
		MD54-05-58015		64	65	1–2 mm thick mud filled fracture	
BH 25	54-24385	MD54-05-58103	Qbt 2	30	35	Fracture (31.8–32.0 ft) filled with 0.1 mm clay coating	Sample represents base of closest disposal unit
		MD54-05-58110					Duplicate of MD54-05-58103
BH 26	54-24386	MD54-05-58117	Qbt 2	56	58	Tuff sample collected above fracture	**Paired fracture sample**
		MD54-05-58118		58	59	2-mm-thick silt filled fracture	
BH 30	54-24390	MD54-05-58149	Qbt 2	56	57	Fracture from 56–57 ft	Not enough material in core barrel to collect sample above the fracture
		MD54-05-58150	Qbt 1v	93	94	Tuff sample collected above fracture	**Paired fracture sample**
		MD54-05-58151		94	95	1–2 mm thick clay filled fracture	
BH 34	54-24394	MD54-05-58186	Qbt 2	50	55	Fracture (50–55 ft) filled with 3-mm-thick clay and organic material	Did not collect sample above fracture because a sample was collected at 40–45 ft
		MD54-05-58187	Qbt 1v	100	102	Tuff sample collected above fracture	**Paired fracture sample**
		MD54-05-58188		102	105	1.5–2 mm thick silt filled fracture	

Table 6.1-1
Summary of Subsurface Soil and Rock Sampling at MDA G

Borehole ID	Borehole Location	Actual Analytical Sample Depth (ft)	Matrix	Sample ID	Sample Type
BH 1	54-24360	60–65	QBT1v	MD54-05-57871	Metals+Cn+B+Mo, AM+GS+U+PU+TH+SR90+TC99, Nitrate & Perchlorate, dioxins/furans, VOCs
		60–65	QBT1v	MD54-05-57878	Field Dup (metals+Cn+B+Mo, AM+GS+U+PU+TH+SR90+TC99, Nitrate & Perchlorate, dioxins/furans, VOCs)
		135–138	QCT	MD54-05-57872	Metals+Cn+B+Mo, AM+GS+U+PU+TH+SR90+TC99, Nitrate & Perchlorate
		195–200	QBO	MD54-05-57873	Metals+Cn+B+Mo, AM+GS+U+PU+TH+SR90+TC99, Nitrate & Perchlorate, 8330
BH 2	54-24361	30–35	QBT2	MD54-05-57879	Netals+Cn+B+Mo, AM+GS+U+PU+TH+SR90+TC99, Nitrate & Perchlorate, dioxins/furans, VOCs
		30–35	QBT2	MD54-05-57886	Field Dup (metals+Cn+B+Mo, AM+GS+U+PU+TH+SR90+TC99, Nitrate & Perchlorate, dioxins/furans, VOCs)
		168–170	QBO	MD54-05-57885	Metals+Cn+B+Mo, AM+GS+U+PU+TH+SR90+TC99, Nitrate & Perchlorate, 8330
BH 3	54-24362	35–40	QBT2	MD54-05-57887	Metals+Cn+B+Mo, AM+GS+U+PU+TH+SR90+TC99, Nitrate & Perchlorate, dioxins/furans, VOCs
		35–40	QBT2	MD54-05-57894	Field Dup (metals+Cn+B+Mo, AM+GS+U+PU+TH+SR90+TC99, Nitrate & Perchlorate, dioxins/furans, VOCs)
		187–189	ALLH	MD54-05-57893	Metals+Cn+B+Mo, AM+GS+U+PU+TH+SR90+TC99, Nitrate & Perchlorate
BH 4	54-24363	31.8–35.4	QBT2	MD54-05-57895	Metals+Cn+B+Mo, AM+GS+U+PU+TH+SR90+TC99, Nitrate & Perchlorate, dioxins/furans, VOCs
		31.8–35.4	QBT2	MD54-05-57902	Field Dup (metals+Cn+B+Mo, AM+GS+U+PU+TH+SR90+TC99, Nitrate & Perchlorate, dioxins/furans, VOCs)
		42.8–45.2	QBT2	MD54-05-57896	Metals+Cn+B+Mo+B+Mo, AM+GS+U+PU+TH+SR90+TC99, Nitrate & Perchlorate
		113.1–114.5	QBT1g	MD54-05-57897	Metals+Cn+B+Mo, AM+GS+U+PU+TH+SR90+TC99, Nitrate & Perchlorate
		175.3–176.8	QBOg	MD54-05-57901	Metals+Cn+B+Mo, AM+GS+U+PU+TH+SR90+TC99, Nitrate & Perchlorate
BH 5	54-24364	65–70	QBT1v	MD54-05-57903	Metals+Cn+B+Mo, AM+GS+U+PU+TH+SR90+TC99, Nitrate & Perchlorate, dioxins/furans, VOCs
		65–70	QBT1v	MD54-05-57910	Field Dup (metals+Cn+B+Mo, AM+GS+U+PU+TH+SR90+TC99, Nitrate & Perchlorate, dioxins/furans, VOCs)
		195–200	QBO	MD54-05-57909	Metals+Cn+B+Mo, AM+GS+U+PU+TH+SR90+TC99, Nitrate & Perchlorate

Table 6.1-1 (continued)

Borehole ID	Borehole Location	Actual Analytical Sample Depth (ft)	Matrix	Sample ID	Sample Type
BH 6	54-24366	99–101	QBT1g	MD54-05-57936	Metals+Cn+B+Mo, AM+GS+U+PU+TH+SR90+TC99, Nitrate & Perchlorate, dioxins/furans, VOCs
		175.9–176.8	QBO	MD54-05-57942	Metals+Cn+B+Mo, AM+GS+U+PU+TH+SR90+TC99, Nitrate & Perchlorate
BH 7	54-24367	30–35	QBT2	MD54-05-57944	Metals+Cn+B+Mo, AM+GS+U+PU+TH+SR90+TC99, Nitrate & Perchlorate, dioxins/furans, VOCs
		30–35	QBT2	MD54-05-57951	Field Dup (metals+Cn+B+Mo, AM+GS+U+PU+TH+SR90+TC99, Nitrate & Perchlorate, dioxins/furans, VOCs)
		198–200	QBO	MD54-05-57950	Metals+Cn+B+Mo, AM+GS+U+PU+TH+SR90+TC99, Nitrate & Perchlorate
BH 8	54-24368	67–70	QBT1v	MD54-05-57952	Metals+Cn+B+Mo, AM+GS+U+PU+TH+SR90+TC99, Nitrate & Perchlorate, dioxins/furans, VOCs
		67–70	QBT1v	MD54-05-57959	Field Dup (metals+Cn+B+Mo, AM+GS+U+PU+TH+SR90+TC99, Nitrate & Perchlorate, dioxins/furans, VOCs)
		200.1–201.5	QBO	MD54-05-57958	Metals+Cn+B+Mo, AM+GS+U+PU+TH+SR90+TC99, Nitrate & Perchlorate
BH 9	54-24369	65–70	QBT2	MD54-05-57960	Metals+Cn+B+Mo, AM+GS+U+PU+TH+SR90+TC99, Nitrate & Perchlorate, dioxins/furans, VOCs
		65–70	QBT2	MD54-05-57967	Field Dup (metals+Cn+B+Mo, AM+GS+U+PU+TH+SR90+TC99, Nitrate & Perchlorate, dioxins/furans, VOCs)
		183–185	QCT	MD54-05-57966	Metals+Cn+B+Mo, AM+GS+U+PU+TH+SR90+TC99, Nitrate & Perchlorate
		248–250	QBOg	MD54-05-57961	Metals+Cn+B+Mo, AM+GS+U+PU+TH+SR90+TC99, Nitrate & Perchlorate
BH 10	54-24370	37–40	QBT2	MD54-05-57968	Metals+Cn+B+Mo, AM+GS+U+PU+TH+SR90+TC99, Nitrate & Perchlorate, dioxins/furans, VOCs
		223–225	QBOg	MD54-05-57974	Metals+Cn+B+Mo, AM+GS+U+PU+TH+SR90+TC99, Nitrate & Perchlorate, HE
BH 11	54-24371	40–45	QBT2	MD54-05-57981	Metals+Cn+B+Mo, AM+GS+U+PU+TH+SR90+TC99, Nitrate & Perchlorate, dioxins/furans, VOCs
		40–45	QBT2	MD54-05-57988	Field Dup (metals+Cn+B+Mo, AM+GS+U+PU+TH+SR90+TC99, Nitrate & Perchlorate, dioxins/furans, VOCs)
		198–200	QBO	MD54-05-57987	Metals+Cn+B+Mo, AM+GS+U+PU+TH+SR90+TC99, Nitrate & Perchlorate

Table 6.1-1 (continued)

Borehole ID	Borehole Location	Actual Analytical Sample Depth (ft)	Matrix	Sample ID	Sample Type
BH 12	54-24372	55–60	QBT2	MD54-05-57989	Metals+Cn+B+Mo, AM+GS+U+PU+TH+SR90+TC99, Nitrate & Perchlorate, dioxins/furans, VOCs
		55–60	QBT2	MD54-05-57996	Field Dup (metals+Cn+B+Mo, AM+GS+U+PU+TH+SR90+TC99, Nitrate & Perchlorate, dioxins/furans, VOCs)
		248–250	QBO	MD54-05-57995	Metals+Cn+B+Mo, AM+GS+U+PU+TH+SR90+TC99, Nitrate & Perchlorate
BH 13	54-24373	65–70	QBT1v	MD54-05-57997	Metals+Cn+B+Mo, AM+GS+U+PU+TH+SR90+TC99, Nitrate & Perchlorate, dioxins/furans, VOCs
		65–70	QBT1v	MD54-05-58004	Field Dup (metals+Cn+B+Mo, AM+GS+U+PU+TH+SR90+TC99, Nitrate & Perchlorate, dioxins/furans, VOCs)
		248–250	QBO	MD54-05-58003	Metals+Cn+B+Mo, AM+GS+U+PU+TH+SR90+TC99, Nitrate & Perchlorate
BH 14	54-24374	12–15 ft	QBT2	MD54-05-58005	Metals+Cn+B+Mo, AM+GS+U+PU+TH+SR90+TC99, Nitrate & Perchlorate, dioxins/furans, VOCs
		12–15 ft	QBT2	MD54-05-58012	Field Dup (metals+Cn+B+Mo, AM+GS+U+PU+TH+SR90+TC99, Nitrate & Perchlorate, dioxins/furans, VOCs)
		198–200	QBO	MD54-05-58011	Metals+Cn+B+Mo, AM+GS+U+PU+TH+SR90+TC99, Nitrate & Perchlorate,
BH 15	54-24375	30–35	QBT2	MD54-05-58013	Metals+Cn+B+Mo, AM+GS+U+PU+TH+SR90+TC99, Nitrate & Perchlorate, dioxins/furans, VOCs
		30–35	QBT2	MD54-05-58020	Field Dup (metals+Cn+B+Mo, AM+GS+U+PU+TH+SR90+TC99, Nitrate & Perchlorate, dioxins/furans, VOCs)
		62–64	QBT2	MD54-05-58014	Metals+Cn+B+Mo, AM+GS+U+PU+TH+SR90+TC99, Nitrate & Perchlorate
		64–65	QBT2	MD54-05-58015	Metals+Cn+B+Mo, AM+GS+U+PU+TH+SR90+TC99, Nitrate & Perchlorate
		195–200	QBO	MD54-05-58019	Metals+Cn+B+Mo, AM+GS+U+PU+TH+SR90+TC99, Nitrate & Perchlorate
BH 16	54-24376	35–40	QBT2	MD54-05-58026	Metals+Cn+B+Mo, AM+GS+U+PU+TH+SR90+TC99, Nitrate & Perchlorate, dioxins/furans, VOCs
		35–40	QBT2	MD54-05-58033	Field Dup (metals+Cn+B+Mo, AM+GS+U+PU+TH+SR90+TC99, Nitrate & Perchlorate, dioxins/furans, VOCs)
		198–200	QBO	MD54-05-58032	Metals+Cn+B+Mo, AM+GS+U+PU+TH+SR90+TC99, Nitrate & Perchlorate

Table 6.1-1 (continued)

Borehole ID	Borehole Location	Actual Analytical Sample Depth (ft)	Matrix	Sample ID	Sample Type
BH 17	54-24377	45–50	QBT1v	MD54-05-58034	Metals+Cn+B+Mo, AM+GS+U+PU+TH+SR90+TC99, Nitrate & Perchlorate, dioxins/furans, VOCs
		45–50	QBT1v	MD54-05-58041	Field Dup (metals+Cn+B+Mo, AM+GS+U+PU+TH+SR90+TC99, Nitrate & Perchlorate, dioxins/furans, VOCs)
		198–200	QBO	MD54-05-58040	Metals+Cn+B+Mo, AM+GS+U+PU+TH+SR90+TC99, Nitrate & Perchlorate
BH 18	54-24378	25–30	QBT2	MD54-05-58042	Metals+Cn+B+Mo, AM+GS+U+PU+TH+SR90+TC99, Nitrate & Perchlorate, dioxins/furans, VOCs
		25–30	QBT2	MD54-05-58049	Field Dup (metals+Cn+B+Mo, AM+GS+U+PU+TH+SR90+TC99, Nitrate & Perchlorate, dioxins/furans, VOCs)
		148.5–150	QCT	MD54-05-58043	Metals+Cn+B+Mo, AM+GS+U+PU+TH+SR90+TC99, Nitrate & Perchlorate
		180–182	QBO	MD54-05-58048	Metals+Cn+B+Mo, AM+GS+U+PU+TH+SR90+TC99, Nitrate & Perchlorate
BH 19	54-24379	20–25	QBT2	MD54-05-58050	Metals+Cn+B+Mo, AM+GS+U+PU+TH+SR90+TC99, Nitrate & Perchlorate, dioxins/furans, VOCs
		20–25	QBT2	MD54-05-58057	Field Dup (metals+Cn+B+Mo, AM+GS+U+PU+TH+SR90+TC99, Nitrate & Perchlorate, dioxins/furans, VOCs)
		117–119	QCT	MD54-05-58051	Metals+Cn+B+Mo, AM+GS+U+PU+TH+SR90+TC99, Nitrate & Perchlorate
		148–150	QBO	MD54-05-58052	Metals+Cn+B+Mo, AM+GS+U+PU+TH+SR90+TC99, Nitrate & Perchlorate
		198–200	QBOg	MD54-05-58056	Metals+Cn+B+Mo, AM+GS+U+PU+TH+SR90+TC99, Nitrate & Perchlorate
BH 20	54-24380	20–25	QBT2	MD54-05-58058	Metals+Cn+B+Mo, AM+GS+U+PU+TH+SR90+TC99, Nitrate & Perchlorate, dioxins/furans, VOCs
		20–25	QBT2	MD54-05-58065	Field Dup (metals+Cn+B+Mo, AM+GS+U+PU+TH+SR90+TC99, Nitrate & Perchlorate, dioxins/furans, VOCs)
		176–178	QCT	MD54-05-58059	Metals+Cn+B+Mo, AM+GS+U+PU+TH+SR90+TC99, Nitrate & Perchlorate
		195–196	QCT	MD54-05-58064	Metals+Cn+B+Mo, AM+GS+U+PU+TH+SR90+TC99, Nitrate & Perchlorate

Table 6.1-1 (continued)

Borehole ID	Borehole Location	Actual Analytical Sample Depth (ft)	Matrix	Sample ID	Sample Type
BH 21	54-24381	15–20	QBT2	MD54-05-58071	Metals+Cn+B+Mo, AM+GS+U+PU+TH+SR90+TC99, Nitrate & Perchlorate, dioxins/furans, VOCs
		15–20	QBT2	MD54-05-58078	Field Dup (metals+Cn+B+Mo, AM+GS+U+PU+TH+SR90+TC99, Nitrate & Perchlorate, dioxins/furans, VOCs)
		110–112	QBT1g	MD54-05-58072	Metals+Cn+B+Mo, AM+GS+U+PU+TH+SR90+TC99, Nitrate & Perchlorate
		148–150	QBO	MD54-05-58073	Metals+Cn+B+Mo, AM+GS+U+PU+TH+SR90+TC99, Nitrate & Perchlorate
		198–200	QBO	MD54-05-58077	Metals+Cn+B+Mo, AM+GS+U+PU+TH+SR90+TC99, Nitrate & Perchlorate, HE
BH 22	54-24382	30–35	QBT2	MD54-05-58079	Metals+Cn+B+Mo, AM+GS+U+PU+TH+SR90+TC99, Nitrate & Perchlorate, dioxins/furans, VOCs
		30–35	QBT2	MD54-05-58086	Field Dup (metals+Cn+B+Mo, AM+GS+U+PU+TH+SR90+TC99, Nitrate & Perchlorate, dioxins/furans, VOCs)
		103–105	QCT	MD54-05-58080	Metals+Cn+B+Mo, AM+GS+U+PU+TH+SR90+TC99, Nitrate & Perchlorate
		145–147	QBO	MD54-05-58085	Metals+Cn+B+Mo, AM+GS+U+PU+TH+SR90+TC99, Nitrate & Perchlorate
BH 23	54-24383	20–25	QBT2	MD54-05-58087	Metals+Cn+B+Mo, AM+GS+U+PU+TH+SR90+TC99, Nitrate & Perchlorate, dioxins/furans, VOCs
		20–25	QBT2	MD54-05-58094	Field Dup (metals+Cn+B+Mo, AM+GS+U+PU+TH+SR90+TC99, Nitrate & Perchlorate, dioxins/furans, VOCs)
		145–147.5	ALLH	MD54-05-58093	Metals+Cn+B+Mo, AM+GS+U+PU+TH+SR90+TC99, Nitrate & Perchlorate
BH 24	54-24384	25–30	QBT2	MD54-05-58095	Metals+Cn+B+Mo, AM+GS+U+PU+TH+SR90+TC99, Nitrate & Perchlorate, dioxins/furans, VOCs
		25–30	QBT2	MD54-05-58102	Field Dup (metals+Cn+B+Mo, AM+GS+U+PU+TH+SR90+TC99, Nitrate & Perchlorate, dioxins/furans, VOCs)
		66–68	ALLH	MD54-05-58101	Metals+Cn+B+Mo, AM+GS+U+PU+TH+SR90+TC99, Nitrate & Perchlorate
BH 25	54-24385	30–35	QBT2	MD54-05-58103	Metals+Cn+B+Mo, AM+GS+U+PU+TH+SR90+TC99, Nitrate & Perchlorate, dioxins/furans, VOCs
		30–35	QBT2	MD54-05-58110	Field Dup (metals+Cn+B+Mo, AM+GS+U+PU+TH+SR90+TC99, Nitrate & Perchlorate, dioxins/furans, VOCs)
		110.5–112.5	QCT	MD54-05-58104	Metals+Cn+B+Mo, AM+GS+U+PU+TH+SR90+TC99, Nitrate & Perchlorate
		175.5–177	ALLH	MD54-05-58109	Metals+Cn+B+Mo, AM+GS+U+PU+TH+SR90+TC99, Nitrate & Perchlorate

Table 6.1-1 (continued)

Borehole ID	Borehole Location	Actual Analytical Sample Depth (ft)	Matrix	Sample ID	Sample Type
BH 26	54-24386	35–40	QBT2	MD54-05-58116	Metals+Cn+B+Mo, AM+GS+U+PU+TH+SR90+TC99, Nitrate & Perchlorate, dioxins/furans, VOCs
		35–40	QBT2	MD54-05-58123	Field Dup (metals+Cn+B+Mo, AM+GS+U+PU+TH+SR90+TC99, Nitrate & Perchlorate, dioxins/furans, VOCs)
		56–58	QBT2	MD54-05-58117	Metals+Cn+B+Mo, AM+GS+U+PU+TH+SR90+TC99, Nitrate & Perchlorate
		58–59	QBT2	MD54-05-58118	Metals+Cn+B+Mo, AM+GS+U+PU+TH+SR90+TC99, Nitrate & Perchlorate
		110–112	QCT	MD54-05-58119	Metals+Cn+B+Mo, AM+GS+U+PU+TH+SR90+TC99, Nitrate & Perchlorate,
		185–186	ALLH	MD54-05-58122	Metals+Cn+B+Mo, AM+GS+U+PU+TH+SR90+TC99, Nitrate & Perchlorate
BH 27	54-24387	5–10 ft	QBT2	MD54-05-58124	Metals+Cn+B+Mo, AM+GS+U+PU+TH+SR90+TC99, Nitrate & Perchlorate, dioxins/furans, VOCs
		5–10 ft	QBT2	MD54-05-58131	Field Dup (metals+Cn+B+Mo, AM+GS+U+PU+TH+SR90+TC99, Nitrate & Perchlorate, dioxins/furans, VOCs)
		78–81	QBOG /ALLH	MD54-05-58130	Metals+Cn+B+Mo, AM+GS+U+PU+TH+SR90+TC99, Nitrate & Perchlorate
BH 28	54-24388	25–30	QBT2	MD54-05-58132	Metals+Cn+B+Mo, AM+GS+U+PU+TH+SR90+TC99, Nitrate & Perchlorate, dioxins/furans, VOCs
		25–30	QBT2	MD54-05-58139	Field Dup (metals+Cn+B+Mo, AM+GS+U+PU+TH+SR90+TC99, Nitrate & Perchlorate, dioxins/furans, VOCs)
		63–64.5	QBT2	MD54-05-58133	Metals+Cn+B+Mo, AM+GS+U+PU+TH+SR90+TC99, Nitrate & Perchlorate
		132.5–134.5	QBT1g	MD54-05-58134	Metals+Cn+B+Mo, AM+GS+U+PU+TH+SR90+TC99, Nitrate & Perchlorate
		155–157	QCT	MD54-05-58135	Metals+Cn+B+Mo, AM+GS+U+PU+TH+SR90+TC99, Nitrate & Perchlorate
		177–180	QCT	MD54-05-58138	Metals+Cn+B+Mo, AM+GS+U+PU+TH+SR90+TC99, Nitrate & Perchlorate, HE
BH 29	54-24389	20–25	QBT2	MD54-05-58140	Metals+Cn+B+Mo, AM+GS+U+PU+TH+SR90+TC99, Nitrate & Perchlorate, dioxins/furans, VOCs
		20–25	QBT2	MD54-05-58147	Field Dup (metals+Cn+B+Mo, AM+GS+U+PU+TH+SR90+TC99, Nitrate & Perchlorate, dioxins/furans, VOCs)
		173–175	QCT	MD54-05-58141	Metals+Cn+B+Mo, AM+GS+U+PU+TH+SR90+TC99, Nitrate & Perchlorate
		198–200	QBO	MD54-05-58146	Metals+Cn+B+Mo, AM+GS+U+PU+TH+SR90+TC99, Nitrate & Perchlorate

Table 6.1-1 (continued)

Borehole ID	Borehole Location	Actual Analytical Sample Depth (ft)	Matrix	Sample ID	Sample Type
BH 30	54-24390	30–35	QBT2	MD54-05-58148	Metals+Cn+B+Mo, AM+GS+U+PU+TH+SR90+TC99, Nitrate & Perchlorate, dioxins/furans, VOCs
		30–35	QBT2	MD54-05-58155	Field Dup (metals+Cn+B+Mo, AM+GS+U+PU+TH+SR90+TC99, Nitrate & Perchlorate, dioxins/furans, VOCs)
		56–57	QBT2	MD54-05-58149	Metals+Cn+B+Mo, AM+GS+U+PU+TH+SR90+TC99, Nitrate & Perchlorate
		93–94	QBT1v	MD54-05-58150	Metals+Cn+B+Mo, AM+GS+U+PU+TH+SR90+TC99, Nitrate & Perchlorate
		94–95	QBT1v	MD54-05-58151	Metals+Cn+B+Mo, AM+GS+U+PU+TH+SR90+TC99, Nitrate & Perchlorate
		185–186	ALLH	MD54-05-58154	Metals+Cn+B+Mo, AM+GS+U+PU+TH+SR90+TC99, Nitrate & Perchlorate
BH 31	54-24391	25–30	QBT2	MD54-05-58161	Metals+Cn+B+Mo, AM+GS+U+PU+TH+SR90+TC99, Nitrate & Perchlorate, dioxins/furans, VOCs
		25–30	QBT2	MD54-05-58168	Field Dup (metals+Cn+B+Mo, AM+GS+U+PU+TH+SR90+TC99, Nitrate & Perchlorate, dioxins/furans, VOCs)
		198–200	QBO	MD54-05-58167	Metals+Cn+B+Mo, AM+GS+U+PU+TH+SR90+TC99, Nitrate & Perchlorate, HE
BH 32	54-24392	25–30	QBT2	MD54-05-58169	Metals+Cn+B+Mo, AM+GS+U+PU+TH+SR90+TC99, Nitrate & Perchlorate, dioxins/furans, VOCs
		25–30	QBT2	MD54-05-58176	Field Dup (metals+Cn+B+Mo, AM+GS+U+PU+TH+SR90+TC99, Nitrate & Perchlorate, dioxins/furans, VOCs)
		198–200	QBO	MD54-05-58175	Metals+Cn+B+Mo, AM+GS+U+PU+TH+SR90+TC99, Nitrate & Perchlorate
BH 33	54-24393	35–40	QBT2	MD54-05-58177	Metals+Cn+B+Mo, AM+GS+U+PU+TH+SR90+TC99, Nitrate & Perchlorate, dioxins/furans, VOCs
		35–40	QBT2	MD54-05-58184	Field Dup (metals+Cn+B+Mo, AM+GS+U+PU+TH+SR90+TC99, Nitrate & Perchlorate, dioxins/furans, VOCs)
		158–160	QCT	MD54-05-58178	Metals+Cn+B+Mo, AM+GS+U+PU+TH+SR90+TC99, Nitrate & Perchlorate
		193–194	QBO	MD54-05-58179	Metals+Cn+B+Mo, AM+GS+U+PU+TH+SR90+TC99, Nitrate & Perchlorate
		204–206	QBOg	MD54-05-58183	Metals+Cn+B+Mo, AM+GS+U+PU+TH+SR90+TC99, Nitrate & Perchlorate

Table 6.1-1 (continued)

Borehole ID	Borehole Location	Actual Analytical Sample Depth (ft)	Matrix	Sample ID	Sample Type
BH 34	54-24394	40–45	QBT2	MD54-05-58185	Metals+Cn+B+Mo, AM+GS+U+PU+TH+SR90+TC99, Nitrate & Perchlorate, dioxins/furans, VOCs
		40–45	QBT2	MD54-05-58192	Field Dup (metals+Cn+B+Mo, AM+GS+U+PU+TH+SR90+TC99, Nitrate & Perchlorate, dioxins/furans, VOCs)
		50–55	QBT2	MD54-05-58186	Metals+Cn+B+Mo, AM+GS+U+PU+TH+SR90+TC99, Nitrate & Perchlorate
		100–102	QBT1v	MD54-05-58187	Metals+Cn+B+Mo, AM+GS+U+PU+TH+SR90+TC99, Nitrate & Perchlorate
		102–105	QBT1v	MD54-05-58188	Metals+Cn+B+Mo, AM+GS+U+PU+TH+SR90+TC99, Nitrate & Perchlorate
		198–200	QBO	MD54-05-58191	Metals+Cn+B+Mo, AM+GS+U+PU+TH+SR90+TC99, Nitrate & Perchlorate, HE
BH 35	54-24395	40–45	QBT2	MD54-05-58193	Metals+Cn+B+Mo, AM+GS+U+PU+TH+SR90+TC99, Nitrate & Perchlorate, dioxins/furans, VOCs
		40–45	QBT2	MD54-05-58200	Field Dup (metals+Cn+B+Mo, AM+GS+U+PU+TH+SR90+TC99, Nitrate & Perchlorate, dioxins/furans, VOCs)
		153–155	QBT1g	MD54-05-58194	Metals+Cn+B+Mo, AM+GS+U+PU+TH+SR90+TC99, Nitrate & Perchlorate
		188–190	QCT	MD54-05-58195	Metals+Cn+B+Mo, AM+GS+U+PU+TH+SR90+TC99, Nitrate & Perchlorate
		198–200	QBO	MD54-05-58199	Metals+Cn+B+Mo, AM+GS+U+PU+TH+SR90+TC99, Nitrate & Perchlorate
BH 36	54-24396	10–15 ft	QBT2	MD54-05-58206	Metals+Cn+B+Mo, AM+GS+U+PU+TH+SR90+TC99, Nitrate & Perchlorate, dioxins/furans, VOCs
		10–15 ft	QBT2	MD54-05-58213	Field Dup (metals+Cn+B+Mo, AM+GS+U+PU+TH+SR90+TC99, Nitrate & Perchlorate, dioxins/furans, VOCs)
		154–155	QCT	MD54-05-58207	Metals+Cn+B+Mo, AM+GS+U+PU+TH+SR90+TC99, Nitrate & Perchlorate
		198–200	QBO	MD54-05-58212	Metals+Cn+B+Mo, AM+GS+U+PU+TH+SR90+TC99, Nitrate & Perchlorate
BH 37	54-24397	15–20	QBT2	MD54-05-58214	Metals+Cn+B+Mo, AM+GS+U+PU+TH+SR90+TC99, Nitrate & Perchlorate, dioxins/furans, VOCs
		15–20	QBT2	MD54-05-58221	Field Dup (metals+Cn+B+Mo, AM+GS+U+PU+TH+SR90+TC99, Nitrate & Perchlorate, dioxins/furans, VOCs)
		159–160	QCT	MD54-05-58215	Metals+Cn+B+Mo, AM+GS+U+PU+TH+SR90+TC99, Nitrate & Perchlorate
		198–200	QBO	MD54-05-58220	Metals+Cn+B+Mo, AM+GS+U+PU+TH+SR90+TC99, Nitrate & Perchlorate

Table 6.3-1
Inorganic Chemicals Detected above BVs in Subsurface Samples from MDA G

Sample ID	Location ID	Depth (ft)	Media	Aluminum	Arsenic	Barium	Beryllium	Boron	Cadmium	Calcium	Chloride	Chromium	Cobalt	Copper	Cyanide (Total)	Iron	Lead	Magnesium
Soil Background Value				**29,200**	**8.17**	**295**	**1.83**	**na[a]**	**0.4**	**6120**	**na**	**19.3**	**8.64**	**14.7**	**0.5**	**21500**	**22.3**	**4610**
Qbt 2,3,4 Background Value				**7340**	**2.79**	**46**	**1.21**	**na**	**1.63**	**2200**	**na**	**7.14**	**3.14**	**4.66**	**0.5**	**14500**	**11.2**	**1690**
Qbt 1v Background Value				**8170**	**1.81**	**26.5**	**1.7**	**na**	**0.4**	**3700**	**na**	**2.24**	**1.78**	**3.26**	**0.5**	**9900**	**18.4**	**780**
Qbt 1g, Qct, Qbo, Qbog[b] Background Value				**3560**	**0.56**	**25.7**	**1.44**	**na**	**0.4**	**1900**	**na**	**2.6**	**8.89**	**3.96**	**0.5**	**3700**	**13.5**	**739**
Tcb Background Value				**na**	**na**	**na**	**na**	**na**	**na**	**na**	**na**	**na**	**na**	**na**	**na**	**na**	**na**	**na**
Industrial Soil Screening Levels				**100000**	**17.7**	**78300**	**2250**	**61600**	**1130[c]**	**na**	**na**	**5000[d]**	**20500**	**45400**	**22700**	**100000**	**750**	**na**
Residential Soil Screening Levels				**77800**	**3.9**	**5450**	**156**	**5500**	**74.1**	**na**	**na**	**2100[d]**	**1520**	**3130**	**1560**	**23500**	**400**	**na**
MD54-05-57879	54-24361	30.00–35.00	Qbt 2	—[e]	—	—	—	—	—	—	—	—	—	—	—	—	—	—
MD54-05-57885	54-24361	168.00–170.00	Qbo	—	—	—	—	—	0.532 (U)	—	—	—	—	—	—	—	—	—
MD54-05-57887	54-24362	35.00–40.00	Qbt 2	—	—	—	—	2.12 (J)	—	—	—	—	—	—	—	—	—	—
MD54-05-57893	54-24362	187.00–189.00	Soil	—	—	—	—	5.49 (J)	1.93	75500 (J+)	—	—	9.04	16.8	—	—	—	6680
MD54-05-57895	54-24363	31.80–35.40	Qbt 2	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
MD54-05-57896	54-24363	42.80–45.20	Qbt 2	28900 (J-)	4.94	140	3.41	16.8	—	4200 (J+)	—	13.2	5.69	20.7	—	16500 (J+)	16.5	6680
MD54-05-57897	54-24363	113.10–114.50	Qbt 1g	—	1.64 (U)	—	—	—	—	—	—	—	—	—	—	—	—	—
MD54-05-57901	54-24363	175.30–176.80	Qbog	4140 (J+)	0.727 (J)	—	—	—	—	2460 (J+)	—	10.2	—	4.32	—	5500	—	3050
MD54-05-57903	54-24364	65.00–70.00	Qbt 1v	—	—	—	—	—	0.503 (U)	—	—	—	—	—	—	—	—	—
MD54-05-57909	54-24364	195.00–200.00	Qbo	—	—	35	—	—	0.528 (U)	—	—	—	—	—	—	—	—	—
MD54-05-57936	54-24366	99.00–101.80	Qbt 1g	—	1.53 (U)	—	—	—	0.51 (U)	—	—	—	—	—	—	—	—	—
MD54-05-57942	54-24366	175.40–176.80	Qbo	—	1.58 (U)	26.3	—	—	0.526 (U)	—	—	—	—	—	—	—	—	—
MD54-05-57944	54-24367	30.00–35.00	Qbt 2	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
MD54-05-57950	54-24367	198.00–200.00	Qbo	—	1.53 (U)	44.3	—	—	0.51 (U)	—	—	—	—	—	2.38 (J)	—	—	861
MD54-05-57952	54-24368	67.00–70.00	Qbt 1v	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
MD54-05-57958	54-24368	200.10–201.50	Qbo	—	1.58 (U)	—	—	—	0.526 (U)	—	—	—	—	—	—	—	—	1070 (J+)
MD54-05-57960	54-24369	65.00–70.00	Qbt 2	9530	—	—	3.27 (J)	4.14 (J)	—	2840	—	—	—	9.27	—	—	—	2460
MD54-05-57961	54-24369	183.00–185.00	Qct	4790	1.62 (U)	—	—	1.76 (J)	—	—	—	—	—	—	—	—	32.6	877
MD54-05-57966	54-24369	248.00–250.00	Qbog	—	—	26.3	—	—	0.533 (J)	—	—	—	—	—	—	—	—	—
MD54-05-57968	54-24370	37.00–40.00	Qbt 2	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
MD54-05-57974	54-24370	223.00–225.00	Qbog	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
MD54-05-57981	54-24371	40.00–45.00	Qbt 2	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
MD54-05-57987	54-24371	198.00–200.00	Qbo	—	1.55 (U)	—	—	—	—	—	—	—	—	—	—	—	—	1160
MD54-05-57989	54-24372	55.00–60.00	Qbt 2	—	—	—	—	—	—	—	—	—	—	—	1.21	—	—	—
MD54-05-57995	54-24372	248.00–250.00	Qbo	—	1.57 (U)	—	—	—	0.523 (U)	—	—	—	—	—	—	—	—	—
MD54-05-57997	54-24373	65.00–70.00	Qbt 1v	—	—	—	—	—	0.502 (U)	—	—	—	—	—	—	—	—	—
MD54-05-58003	54-24373	248.00–250.00	Qbo	—	1.57 (U)	—	—	—	0.524 (U)	—	—	—	—	—	—	—	—	744
MD54-05-58005	54-24374	12.00–15.00	Qbt 2	—	—	—	—	1.04 (J)	—	—	—	—	—	—	—	—	—	—

Table 6.3-1 (continued)

Sample ID	Location ID	Depth (ft)	Media	Aluminum	Arsenic	Barium	Beryllium	Boron	Cadmium	Calcium	Chloride	Chromium	Cobalt	Copper	Cyanide (Total)	Iron	Lead	Magnesium
Soil Background Value				**29,200**	**8.17**	**295**	**1.83**	**na[a]**	**0.4**	**6120**	**na**	**19.3**	**8.64**	**14.7**	**0.5**	**21500**	**22.3**	**4610**
Qbt 2,3,4 Background Value				**7340**	**2.79**	**46**	**1.21**	**na**	**1.63**	**2200**	**na**	**7.14**	**3.14**	**4.66**	**0.5**	**14500**	**11.2**	**1690**
Qbt 1v Background Value				**8170**	**1.81**	**26.5**	**1.7**	**na**	**0.4**	**3700**	**na**	**2.24**	**1.78**	**3.26**	**0.5**	**9900**	**18.4**	**780**
Qbt 1g, Qct, Qbo, Qbog[b] Background Value				**3560**	**0.56**	**25.7**	**1.44**	**na**	**0.4**	**1900**	**na**	**2.6**	**8.89**	**3.96**	**0.5**	**3700**	**13.5**	**739**
Tcb Background Value				**na**	**na**	**na**	**na**	**na**	**na**	**na**	**na**	**na**	**na**	**na**	**na**	**na**	**na**	**na**
Industrial Soil Screening Levels				**100000**	**17.7**	**78300**	**2250**	**61600**	**1130[c]**	**na**	**na**	**5000[d]**	**20500**	**45400**	**22700**	**100000**	**750**	**na**
Residential Soil Screening Levels				**77800**	**3.9**	**5450**	**156**	**5500**	**74.1**	**na**	**na**	**2100[d]**	**1520**	**3130**	**1560**	**23500**	**400**	**na**
MD54-05-58011	54-24374	198.00–200.00	Qbo	—	1.62 (U)	29.6	—	—	0.538 (U)	—	—	—	—	—	—	—	—	747 (J+)
MD54-05-58013	54-24375	30.00–35.00	Qbt 2	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
MD54-05-58014	54-24375	62.00–64.00	Qbt 2	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
MD54-05-58015	54-24375	64.00–65.00	Qbt 2	—	—	—	1.5	—	—	—	—	—	—	5.72	—	—	—	—
MD54-05-58019	54-24375	195.00–200.00	Qbo	—	—	—	—	—	0.534 (U)	—	—	—	—	—	—	—	—	—
MD54-05-58026	54-24376	35.00–40.00	Qbt 2	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
MD54-05-58032	54-24376	198.00–200.00	Qbo	—	1.54 (U)	29.9	—	—	0.513 (U)	—	—	—	—	—	—	—	—	919
MD54-05-58034	54-24377	45.00–50.00	Qbt 1v	—	—	—	—	—	0.515 (U)	—	—	—	—	—	—	—	—	—
MD54-05-58040	54-24377	198.00–200.00	Qbo	—	1.54 (U)	34.4	—	—	0.514 (U)	—	—	—	—	—	—	—	—	—
MD54-05-58042	54-24378	25.00–30.00	Qbt 2	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
MD54-05-58043	54-24378	148.50–150.00	Qct	6550	0.702	—	—	—	—	—	—	2.79	—	7.45	—	3950	—	799
MD54-05-58048	54-24378	180.00–182.00	Qbo	17500	2.24	58.5	—	—	—	18700 (J)	—	14.5	—	12	—	17000	—	6190
MD54-05-58050	54-24379	20.00–25.00	Qbt 2	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
MD54-05-58051	54-24379	117.00–119.00	Qct	7020 (J+)	1.03	50.9	—	3.39 (J)	0.5 (U)	—	—	3.65	—	4.33	—	5070	—	1340
MD54-05-58052	54-24379	148.00–150.00	Qbo	—	—	—	—	—	0.503 (U)	—	—	—	—	—	—	—	—	794
MD54-05-58056	54-24379	198.00–200.00	Qbog	—	0.723	—	—	—	—	—	—	4.85	—	—	—	3940	—	1770
MD54-05-58058	54-24380	20.00–25.00	Qbt 2	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
MD54-05-58059	54-24380	176.00–178.00	Qct	7040	0.823	32.1	—	3.52 (J)	—	—	—	3.03	—	8.24 (J+)	—	4370	33.3	1050 (J-)
MD54-05-58064	54-24380	195.00–196.00	Qct	5820	0.872	49.5	—	1.62 (J)	—	—	—	4.59	—	—	—	6150	—	1620 (J-)
MD54-05-58071	54-24381	15.00–20.00	Qbt 2	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
MD54-05-58072	54-24381	110.00–112.00	Qbt 1g	—	—	34.5	—	—	0.515 (U)	—	—	—	—	—	—	—	—	—
MD54-05-58073	54-24381	148.00–150.00	Qbo	—	—	—	—	—	0.513 (U)	—	—	—	—	—	—	—	—	—
MD54-05-58077	54-24381	198.00–200.00	Qbo	—	—	—	—	—	0.539 (U)	—	—	—	—	—	—	—	—	869 (J)
MD54-05-58079	54-24382	30.00–35.00	Qbt 2	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
MD54-05-58080	54-24382	103.00–105.00	Qct	10300	1.28 (J)	42.7	—	4.85 (J)	0.53 (U)	2150	—	6.11	—	—	—	8570	—	2400 (J+)
MD54-05-58085	54-24382	145.00–147.00	Qbo	6360	1.79	61.1	—	1.38 (J)	0.547 (U)	1940	—	5.06	—	5.49	—	7220	—	1830 (J+)
MD54-05-58087	54-24383	20.00–25.00	Qbt 2	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
MD54-05-58093	54-24383	145.00–147.50	Soil	—	—	—	—	4.23 (J)	—	315000	—	—	—	—	—	—	—	5820 (J+)

Table 6.3-1 (continued)

Sample ID	Location ID	Depth (ft)	Media	Aluminum	Arsenic	Barium	Beryllium	Boron	Cadmium	Calcium	Chloride	Chromium	Cobalt	Copper	Cyanide (Total)	Iron	Lead	Magnesium
Soil Background Value				**29,200**	**8.17**	**295**	**1.83**	**na[a]**	**0.4**	**6120**	**na**	**19.3**	**8.64**	**14.7**	**0.5**	**21500**	**22.3**	**4610**
Qbt 2,3,4 Background Value				**7340**	**2.79**	**46**	**1.21**	**na**	**1.63**	**2200**	**na**	**7.14**	**3.14**	**4.66**	**0.5**	**14500**	**11.2**	**1690**
Qbt 1v Background Value				**8170**	**1.81**	**26.5**	**1.7**	**na**	**0.4**	**3700**	**na**	**2.24**	**1.78**	**3.26**	**0.5**	**9900**	**18.4**	**780**
Qbt 1g, Qct, Qbo, Qbog[b] Background Value				**3560**	**0.56**	**25.7**	**1.44**	**na**	**0.4**	**1900**	**na**	**2.6**	**8.89**	**3.96**	**0.5**	**3700**	**13.5**	**739**
Tcb Background Value				**na**	**na**	**na**	**na**	**na**	**na**	**na**	**na**	**na**	**na**	**na**	**na**	**na**	**na**	**na**
Industrial Soil Screening Levels				**100000**	**17.7**	**78300**	**2250**	**61600**	**1130[c]**	**na**	**na**	**5000[d]**	**20500**	**45400**	**22700**	**100000**	**750**	**na**
Residential Soil Screening Levels				**77800**	**3.9**	**5450**	**156**	**5500**	**74.1**	**na**	**na**	**2100[d]**	**1520**	**3130**	**1560**	**23500**	**400**	**na**
MD54-05-58095	54-24384	25.00–30.00	Qbt 1g	—	1.52 (U)	—	—	1.39 (J)	0.508 (U)	—	—	—	—	—	—	—	—	—
MD54-05-58101	54-24384	66.00–68.00	Soil	—	—	—	2.87	6.18	0.859	9730	—	—	12.2	21.2	—	22800	—	6470
MD54-05-58103	54-24385	30.00–35.00	Qbt 2	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
MD54-05-58104	54-24385	110.50–112.50	Qct	4650	0.985 (U)	52.5	—	1.71 (J)	—	—	—	3.03	—	—	—	—	—	848
MD54-05-58109	54-24385	175.50–177.00	Soil	—	—	—	—	2.93 (J)	—	193000 (J+)	—	—	—	—	—	—	—	—
MD54-05-58116	54-24386	35.00–40.00	Qbt 2	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
MD54-05-58117	54-24386	56.00–58.00	Qbt 2	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
MD54-05-58118	54-24386	58.00–59.00	Qbt 2	—	—	—	—	0.614 (J)	—	—	—	—	—	—	—	—	—	—
MD54-05-58119	54-24386	110.00–112.00	Qct	8100	1.59	78.5 (J)	—	3.69 (J)	—	2700 (J+)	—	4.26	—	4.96	—	5970	—	1910 (J+)
MD54-05-58122	54-24386	185.00–186.00	Soil	—	—	—	—	4.71 (J)	0.645	112000 (J+)	—	—	—	15.1	—	—	—	5870 (J+)
MD54-05-58124	54-24387	5.00–10.00	Qbt 1g	5520	2.52	105	1.59	2.16 (J)	—	3460	—	—	—	—	—	4890	—	—
MD54-05-58130	54-24387	78.00–81.00	Qbog	17700	3.94	120	—	5.52 (J)	1	44100	—	12	—	14.5	—	12300	—	4650
MD54-05-58132	54-24388	25.00–30.00	Qbt 2	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
MD54-05-58133	54-24388	63.00–64.50	Qbt 2	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
MD54-05-58134	54-24388	132.50–134.50	Qbt 1g	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
MD54-05-58135	54-24388	155.00–157.00	Qct	11500	1.33	46.7	2.45	2.59 (J)	—	—	—	3.52	—	7.54	—	6120	45.6	1360 (J)
MD54-05-58138	54-24388	177.00–180.00	Qct	—	—	—	—	0.7 (J)	—	—	—	—	—	—	—	4130	—	788 (J)
MD54-05-58140	54-24389	20.00–25.00	Qbt 2	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
MD54-05-58141	54-24389	173.00–175.00	Qct	9920 (J-)	1.67	34.7	—	—	—	—	—	6.53	—	4.37	—	8170 (J+)	—	2290
MD54-05-58146	54-24389	198.00–200.00	Qbo	—	—	28.5	—	—	0.525 (U)	—	—	—	—	—	—	—	—	858
MD54-05-58148	54-24390	30.00–35.00	Qbt 2	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
MD54-05-58149	54-24390	56.00–57.00	Qbt 2	11800	2.97	61.9	8.77	4.29 (J)	—	2690	—	—	—	14.5	—	—	—	3270 (J-)
MD54-05-58150	54-24390	93.00–94.00	Qbt 1v	—	2.44	—	—	—	0.533 (U)	—	—	—	—	—	—	—	—	—
MD54-05-58151	54-24390	94.00–95.00	Qbt 1v	—	2.77	—	2.21	—	0.544 (U)	—	—	—	—	3.49	—	—	—	—
MD54-05-58154	54-24390	185.00–186.00	Soil	—	—	—	—	—	0.858	71600	—	—	—	—	—	—	—	—
MD54-05-58161	54-24391	25.00–30.00	Qbt 2	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
MD54-05-58167	54-24391	198.00–200.00	Qbo	—	—	—	—	—	0.52 (U)	—	—	—	—	—	—	—	—	—
MD54-05-58169	54-24392	25.00–30.00	Qbt 2	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—

Table 6.3-1 (continued)

Sample ID	Location ID	Depth (ft)	Media	Aluminum	Arsenic	Barium	Beryllium	Boron	Cadmium	Calcium	Chloride	Chromium	Cobalt	Copper	Cyanide (Total)	Iron	Lead	Magnesium
Soil Background Value				**29,200**	**8.17**	**295**	**1.83**	**na[a]**	**0.4**	**6120**	**na**	**19.3**	**8.64**	**14.7**	**0.5**	**21500**	**22.3**	**4610**
Qbt 2,3,4 Background Value				**7340**	**2.79**	**46**	**1.21**	**na**	**1.63**	**2200**	**na**	**7.14**	**3.14**	**4.66**	**0.5**	**14500**	**11.2**	**1690**
Qbt 1v Background Value				**8170**	**1.81**	**26.5**	**1.7**	**na**	**0.4**	**3700**	**na**	**2.24**	**1.78**	**3.26**	**0.5**	**9900**	**18.4**	**780**
Qbt 1g, Qct, Qbo, Qbog[b] Background Value				**3560**	**0.56**	**25.7**	**1.44**	**na**	**0.4**	**1900**	**na**	**2.6**	**8.89**	**3.96**	**0.5**	**3700**	**13.5**	**739**
Tcb Background Value				**na**	**na**	**na**	**na**	**na**	**na**	**na**	**na**	**na**	**na**	**na**	**na**	**na**	**na**	**na**
Industrial Soil Screening Levels				**100000**	**17.7**	**78300**	**2250**	**61600**	**1130[c]**	**na**	**na**	**5000[d]**	**20500**	**45400**	**22700**	**100000**	**750**	**na**
Residential Soil Screening Levels				**77800**	**3.9**	**5450**	**156**	**5500**	**74.1**	**na**	**na**	**2100[d]**	**1520**	**3130**	**1560**	**23500**	**400**	**na**
MD54-05-58175	54-24392	198.00–200.00	Qbo	—	1.62 (U)	—	—	—	0.538 (U)	—	—	2.71	—	—	—	—	—	885
MD54-05-58177	54-24393	35.00–40.00	Qbt 2	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
MD54-05-58178	54-24393	158.00–160.00	Qct	8730	1.33 (J)	66.7	—	3.65 (J)	—	2370	—	6.07	—	4.54	—	7780	—	2840
MD54-05-58179	54-24393	193.00–194.40	Qbo	—	1.69 (U)	32.1	—	—	0.565 (U)	—	—	—	—	—	—	—	—	834
MD54-05-58183	54-24393	204.00–206.00	Qbog	—	0.731 (J)	36	—	—	—	35200	—	—	—	—	—	—	—	—
MD54-05-58185	54-24394	40.00–45.00	Qbt 2	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
MD54-05-58186	54-24394	50.00–55.00	Qbt 2	—	—	—	2.45	1.72 (J)	—	—	—	—	—	8.78	—	—	—	—
MD54-05-58187	54-24394	100.00–102.00	Qbt 1v	—	1.92	—	—	—	0.514 (U)	—	—	—	—	—	—	—	—	—
MD54-05-58188	54-24394	102.00–105.00	Qbt 1v	—	2.14	30.9	—	—	0.521 (U)	—	—	—	—	—	—	—	—	—
MD54-05-58191	54-24394	198.00–200.00	Qbo	—	1.53 (U)	—	—	—	0.511 (U)	—	—	2.98	—	—	—	—	—	—
MD54-05-58193	54-24395	40.00–45.00	Qbt 2	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
MD54-05-58194	54-24395	153.00–155.00	Qbt 1g	—	1.73 (U)	—	—	—	0.575 (U)	—	—	—	—	—	—	—	—	—
MD54-05-58195	54-24395	188.00–190.00	Qbt 1g	—	1.85 (U)	—	—	1.44 (J)	0.618 (U)	—	—	—	—	—	—	—	—	—
MD54-05-58199	54-24395	198.00–200.00	Qbo	—	1.67 (U)	27.6	—	—	—	—	—	—	—	—	—	—	—	—
MD54-05-58206	54-24396	10.00–15.00	Qbt 2	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
MD54-05-58207	54-24396	154.00–155.00	Qct	11500 (J-)	2.26	61.7	—	—	—	2430 (J+)	—	7.33	—	5.64	—	8700 (J+)	—	2850
MD54-05-58212	54-24396	198.00–200.00	Qbo	—	—	30.4	—	—	0.522 (U)	—	—	—	—	—	—	—	—	—
MD54-05-58214	54-24397	15.00–20.00	Qbt 2	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
MD54-05-58215	54-24397	159.00–160.00	Qct	7250 (J+)	1.11 (J)	34.2	—	2.67 (J)	0.547 (U)	—	—	4.45	—	—	—	6680 (J+)	—	1190 (J+)
MD54-05-58220	54-24397	198.00–200.00	Qbo	—	1.58 (U)	—	—	—	0.527 (U)	—	—	—	—	—	—	3860 (J+)	—	743 (J+)
MD54-05-59184	54-24523	199.80–200.00	Qbog	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
MD54-05-59186	54-24523	221.80–222.00	Tcb	—	—	—	—	—	—	—	0.558 (J)	—	—	—	—	—	—	—
MD54-05-59190	54-24523	262.60–265.80	Tcb	—	—	—	—	—	—	—	0.909 (J)	—	—	—	—	—	—	—
MD54-05-59202	54-24523	386.10–386.60	Tcb	—	—	—	—	—	—	—	0.433 (J)	—	—	—	—	—	—	—
MD54-05-59204	54-24523	404.30–407.30	Tcb	—	—	—	—	—	—	—	0.515 (J)	—	—	—	—	—	—	—
MD54-05-59212	54-24523	696.00–696.50	Tcb	—	—	—	—	—	—	—	1.44 (J+)	—	—	—	—	—	—	—

Table 6.3-1 (continued)

Sample ID	Location ID	Depth (ft)	Media	Manganese	Mercury	Molybdenum	Nickel	Nitrate	Perchlorate	Potassium	Selenium	Silver	Sodium	Thallium	Vanadium	Zinc
Soil Background Value				**671**	**0.1**	**na**	**15.4**	**na**	**na**	**3640**	**1.52**	**1**	**915**	**0.73**	**39.6**	**48.8**
Qbt 2,3,4 Background Value				**482**	**0.1**	**na**	**6.58**	**na**	**na**	**3500**	**0.3**	**1**	**2770**	**1.1**	**17**	**63.5**
Qbt 1v Background Value				**408**	**0.1**	**na**	**2**	**na**	**na**	**6670**	**0.3**	**1**	**6330**	**1.24**	**4.48**	**84.6**
Qbt 1g, Qct, Qbo, Qbog[b] Background Value				**189**	**0.1**	**na**	**2**	**na**	**na**	**2390**	**0.3**	**1**	**4350**	**1.22**	**4.59**	**40**
Tcb Background Value				**na**	**na**	**na**	**na**	**na**	**na**	**na**	**na**	**na**	**na**	**na**	**na**	**na**
Industrial Soil Screening Levels				**21800**	**340[d]**	**5680**	**22500**	**100000**	**110[d]**	**na**	**5680**	**5680**	**na**	**74.9**	**7950**	**100000**
Residential Soil Screening Levels				**1550**	**23[d]**	**391**	**1560**	**100000**	**7.8[d]**	**na**	**391**	**391**	**na**	**5.16**	**548**	**23500**
MD54-05-57879	54-24361	30.00–35.00	Qbt 2	—	—	0.576	—	1.13 (J-)	—	—	—	—	—	—	—	—
MD54-05-57885	54-24361	168.00–170.00	Qbo	—	—	0.0812 (J)	—	—	—	—	0.344 (U)	—	—	—	—	—
MD54-05-57887	54-24362	35.00–40.00	Qbt 2	—	—	0.453	—	0.359 (J)	—	—	1.56 (U)	—	—	—	—	—
MD54-05-57893	54-24362	187.00–189.00	Soil	—	—	0.236	18.6	—	—	—	2.85	—	—	—	—	—
MD54-05-57895	54-24363	31.80–35.40	Qbt 2	—	—	0.327	—	5.18	—	—	0.509 (U)	—	—	—	—	—
MD54-05-57896	54-24363	42.80–45.20	Qbt 2	—	—	1.32	11	1.64	—	4750	2.12	—	—	—	30.1	72.1
MD54-05-57897	54-24363	113.10–114.50	Qbt 1g	—	—	0.277	—	—	—	—	1.64 (U)	—	—	—	—	—
MD54-05-57901	54-24363	175.30–176.80	Qbog	—	—	0.22	4.68	—	—	—	—	—	—	—	8.63 (J)	—
MD54-05-57903	54-24364	65.00–70.00	Qbt 1v	—	—	0.501	—	—	—	—	1.07 (J)	—	—	—	—	—
MD54-05-57909	54-24364	195.00–200.00	Qbo	—	—	0.0617 (J)	—	0.949 (J)	—	—	0.528 (U)	—	—	—	—	—
MD54-05-57936	54-24366	99.00–101.80	Qbt 1g	—	—	0.25	—	—	—	—	1.53 (U)	—	—	—	—	—
MD54-05-57942	54-24366	175.40–176.80	Qbo	—	—	0.106	—	—	—	—	1.58 (U)	—	—	—	—	—
MD54-05-57944	54-24367	30.00–35.00	Qbt 2	—	—	0.407	—	—	0.151	—	1.54 (U)	—	—	—	—	—
MD54-05-57950	54-24367	198.00–200.00	Qbo	—	—	0.156	—	—	—	—	1.53 (U)	—	—	—	—	—
MD54-05-57952	54-24368	67.00–70.00	Qbt 1v	—	—	—	—	—	—	—	1.53 (U)	—	—	—	—	—
MD54-05-57958	54-24368	200.10–201.50	Qbo	—	—	0.0644 (J)	—	—	—	—	1.58 (U)	—	—	—	—	—
MD54-05-57960	54-24369	65.00–70.00	Qbt 2	—	—	0.494	—	—	—	—	1.6 (U)	—	—	—	—	—
MD54-05-57961	54-24369	183.00–185.00	Qct	319	—	0.768	—	0.413 (J)	—	—	0.957 (J)	—	—	—	—	166
MD54-05-57966	54-24369	248.00–250.00	Qbog	383	—	0.219	—	—	—	—	—	—	—	—	—	—
MD54-05-57968	54-24370	37.00–40.00	Qbt 2	—	—	0.566	—	—	—	—	1.56 (U)	—	—	—	—	—
MD54-05-57974	54-24370	223.00–225.00	Qbog	—	—	0.268	—	—	—	—	—	—	—	—	—	—
MD54-05-57981	54-24371	40.00–45.00	Qbt 2	—	—	0.734	—	—	—	—	1.61 (U)	—	—	—	—	—
MD54-05-57987	54-24371	198.00–200.00	Qbo	—	—	0.121	—	—	—	—	1.55 (U)	—	—	—	—	—
MD54-05-57989	54-24372	55.00–60.00	Qbt 2	—	—	0.402	—	—	—	—	1.51 (U)	—	—	—	—	—
MD54-05-57995	54-24372	248.00–250.00	Qbo	—	—	0.0863 (J)	—	—	—	—	1.57 (U)	—	—	—	—	—
MD54-05-57997	54-24373	65.00–70.00	Qbt 1v	—	—	0.558	—	—	—	—	1.51 (U)	—	—	5.04 (U)	—	—
MD54-05-58003	54-24373	248.00–250.00	Qbo	—	—	0.0921 (J)	—	—	—	—	1.57 (U)	—	—	—	—	—
MD54-05-58005	54-24374	12.00–15.00	Qbt 2	—	—	0.556	—	0.615 (J)	—	—	1.54 (U)	—	—	—	—	—
MD54-05-58011	54-24374	198.00–200.00	Qbo	—	—	0.0864 (J)	—	—	—	—	0.991 (U)	—	—	—	—	—

Table 6.3-1 (continued)

Sample ID	Location ID	Depth (ft)	Media	Manganese	Mercury	Molybdenum	Nickel	Nitrate	Perchlorate	Potassium	Selenium	Silver	Sodium	Thallium	Vanadium	Zinc
Soil Background Value				**671**	**0.1**	**na**	**15.4**	**na**	**na**	**3640**	**1.52**	**1**	**915**	**0.73**	**39.6**	**48.8**
Qbt 2,3,4 Background Value				**482**	**0.1**	**na**	**6.58**	**na**	**na**	**3500**	**0.3**	**1**	**2770**	**1.1**	**17**	**63.5**
Qbt 1v Background Value				**408**	**0.1**	**na**	**2**	**na**	**na**	**6670**	**0.3**	**1**	**6330**	**1.24**	**4.48**	**84.6**
Qbt 1g, Qct, Qbo, Qbog[b] Background Value				**189**	**0.1**	**na**	**2**	**na**	**na**	**2390**	**0.3**	**1**	**4350**	**1.22**	**4.59**	**40**
Tcb Background Value				**na**	**na**	**na**	**na**	**na**	**na**	**na**	**na**	**na**	**na**	**na**	**na**	**na**
Industrial Soil Screening Levels				**21800**	**340[d]**	**5680**	**22500**	**100000**	**110[d]**	**na**	**5680**	**5680**	**na**	**74.9**	**7950**	**100000**
Residential Soil Screening Levels				**1550**	**23[d]**	**391**	**1560**	**100000**	**7.8[d]**	**na**	**391**	**391**	**na**	**5.16**	**548**	**23500**
MD54-05-58013	54-24375	30.00–35.00	Qbt 2	—	—	0.346	—	2.05 (J-)	—	—	0.498 (U)	—	—	—	—	—
MD54-05-58014	54-24375	62.00–64.00	Qbt 2	—	—	0.423	—	—	—	—	2.49 (U)	—	—	—	—	—
MD54-05-58015	54-24375	64.00–65.00	Qbt 2	—	—	0.384	—	—	—	—	2.49 (U)	—	—	—	—	—
MD54-05-58019	54-24375	195.00–200.00	Qbo	—	—	0.268	—	1.38 (J-)	—	—	0.534 (U)	—	—	—	—	—
MD54-05-58026	54-24376	35.00–40.00	Qbt 2	—	—	0.468	—	—	—	—	1.55 (U)	—	—	—	—	—
MD54-05-58032	54-24376	198.00–200.00	Qbo	—	—	0.118	—	—	—	—	1.54 (U)	—	—	—	—	—
MD54-05-58034	54-24377	45.00–50.00	Qbt 1v	—	—	0.736	—	—	—	—	1.54 (U)	—	—	—	—	—
MD54-05-58040	54-24377	198.00–200.00	Qbo	—	—	0.112	—	—	—	—	1.54 (U)	—	—	—	—	—
MD54-05-58042	54-24378	25.00–30.00	Qbt 2	—	—	—	—	—	—	—	0.406 (J)	—	—	—	—	—
MD54-05-58043	54-24378	148.50–150.00	Qct	—	—	—	—	—	—	—	—	—	—	—	5.31	—
MD54-05-58048	54-24378	180.00–182.00	Qbo	—	—	—	8.38	—	—	—	1.16	—	—	—	24.6	—
MD54-05-58050	54-24379	20.00–25.00	Qbt 2	—	—	0.546	—	3.69 (J-)	—	—	0.5 (U)	—	—	—	—	—
MD54-05-58051	54-24379	117.00–119.00	Qct	—	—	0.228	3.15	—	—	—	0.5 (U)	—	—	—	7.71	—
MD54-05-58052	54-24379	148.00–150.00	Qbo	—	—	0.0652 (J)	—	—	—	—	0.503 (U)	—	—	—	—	—
MD54-05-58056	54-24379	198.00–200.00	Qbog	—	—	0.288	5.74	—	—	—	0.596	—	—	—	—	—
MD54-05-58058	54-24380	20.00–25.00	Qbt 2	—	—	0.861	—	—	—	—	0.517 (U)	—	—	—	—	—
MD54-05-58059	54-24380	176.00–178.00	Qct	440 (J)	—	0.501	2.53	—	—	—	0.533 (U)	—	—	—	5.06	51.1
MD54-05-58064	54-24380	195.00–196.00	Qct	—	—	0.297	4.5	—	—	—	0.672 (U)	—	—	—	7.99	—
MD54-05-58071	54-24381	15.00–20.00	Qbt 2	—	—	0.481	—	4.74 (J-)	0.123	—	—	—	—	—	—	—
MD54-05-58072	54-24381	110.00–112.00	Qbt 1g	—	—	0.646	—	—	0.126	—	0.515 (U)	—	—	—	—	—
MD54-05-58073	54-24381	148.00–150.00	Qbo	—	—	0.122	—	—	0.123	—	0.513 (U)	—	—	—	—	—
MD54-05-58077	54-24381	198.00–200.00	Qbo	—	—	0.147	—	—	0.13	—	—	—	—	—	—	—
MD54-05-58079	54-24382	30.00–35.00	Qbt 2	—	—	0.307	—	—	—	—	1.52 (U)	—	—	—	—	—
MD54-05-58080	54-24382	103.00–105.00	Qct	212	—	0.223	4.08 (J+)	—	—	—	1.59 (U)	—	—	—	10.4	—
MD54-05-58085	54-24382	145.00–147.00	Qbo	—	—	0.197	3.54 (J+)	—	—	—	1.64 (U)	—	—	—	12.5	—
MD54-05-58087	54-24383	20.00–25.00	Qbt 2	—	—	0.348	—	—	—	—	1.5 (U)	—	—	—	—	—
MD54-05-58093	54-24383	145.00–147.50	Soil	—	—	0.275	—	—	—	—	1.77 (U)	—	—	—	—	—
MD54-05-58095	54-24384	25.00–30.00	Qbt 1g	—	—	0.203	—	—	—	—	15.2 (U)	—	—	—	—	—
MD54-05-58101	54-24384	66.00–68.00	Soil	—	—	0.266	25.8	—	—	—	35.3 (U)	—	—	—	—	61.5

Table 6.3-1 (continued)

Sample ID	Location ID	Depth (ft)	Media	Manganese	Mercury	Molybdenum	Nickel	Nitrate	Perchlorate	Potassium	Selenium	Silver	Sodium	Thallium	Vanadium	Zinc
Soil Background Value				**671**	**0.1**	**na**	**15.4**	**na**	**na**	**3640**	**1.52**	**1**	**915**	**0.73**	**39.6**	**48.8**
Qbt 2,3,4 Background Value				**482**	**0.1**	**na**	**6.58**	**na**	**na**	**3500**	**0.3**	**1**	**2770**	**1.1**	**17**	**63.5**
Qbt 1v Background Value				**408**	**0.1**	**na**	**2**	**na**	**na**	**6670**	**0.3**	**1**	**6330**	**1.24**	**4.48**	**84.6**
Qbt 1g, Qct, Qbo, Qbog[b] Background Value				**189**	**0.1**	**na**	**2**	**na**	**na**	**2390**	**0.3**	**1**	**4350**	**1.22**	**4.59**	**40**
Tcb Background Value				**na**	**na**	**na**	**na**	**na**	**na**	**na**	**na**	**na**	**na**	**na**	**na**	**na**
Industrial Soil Screening Levels				**21800**	**340[d]**	**5680**	**22500**	**100000**	**110[d]**	**na**	**5680**	**5680**	**na**	**74.9**	**7950**	**100000**
Residential Soil Screening Levels				**1550**	**23[d]**	**391**	**1560**	**100000**	**7.8[d]**	**na**	**391**	**391**	**na**	**5.16**	**548**	**23500**
MD54-05-58103	54-24385	30.00–35.00	Qbt 2	—	—	0.754	—	1.23 (J-)	—	—	0.474 (J)	—	—	—	—	—
MD54-05-58104	54-24385	110.50–112.50	Qct	—	—	0.298	—	—	—	—	—	—	—	—	4.65	—
MD54-05-58109	54-24385	175.50–177.00	Soil	—	—	0.17	—	0.958 (J-)	—	—	—	—	—	—	—	—
MD54-05-58116	54-24386	35.00–40.00	Qbt 2	—	—	0.688	—	1.25 (J-)	—	—	0.519 (U)	—	—	—	—	—
MD54-05-58117	54-24386	56.00–58.00	Qbt 2	—	—	0.549	—	1.69 (J-)	0.0994 (J)	—	0.524 (U)	—	—	—	—	—
MD54-05-58118	54-24386	58.00–59.00	Qbt 2	—	—	0.658	—	1.19 (J-)	0.125 (J)	—	0.534 (U)	—	—	—	—	—
MD54-05-58119	54-24386	110.00–112.00	Qct	246 (J+)	—	0.388	3.82	—	—	—	0.591 (U)	—	—	—	9.22	—
MD54-05-58122	54-24386	185.00–186.00	Soil	—	—	0.285	25.2	0.946 (J-)	—	—	—	—	—	—	—	—
MD54-05-58124	54-24387	5.00–10.00	Qbt 1g	214	—	0.707	2.82	—	—	—	16 (U)	—	—	—	—	—
MD54-05-58130	54-24387	78.00–81.00	Qbog	227	—	0.318	14.4	—	—	2490	—	—	—	—	20.7	—
MD54-05-58132	54-24388	25.00–30.00	Qbt 2	—	—	1.04	—	—	—	—	0.492 (J)	—	—	—	—	—
MD54-05-58133	54-24388	63.00–64.50	Qbt 2	—	—	0.375	—	1.24 (J-)	—	—	0.518	—	—	—	—	—
MD54-05-58134	54-24388	132.50–134.50	Qbt 1g	—	—	0.179	—	—	—	—	—	—	—	—	—	—
MD54-05-58135	54-24388	155.00–157.00	Qct	606 (J+)	—	0.485	3.72	0.955 (J-)	—	—	0.44 (J)	—	—	—	6.18	154
MD54-05-58138	54-24388	177.00–180.00	Qct	—	—	0.185	5.12	—	—	—	0.406 (J)	—	—	—	—	—
MD54-05-58140	54-24389	20.00–25.00	Qbt 2	—	—	0.343	—	—	—	—	2.58 (U)	—	—	—	—	—
MD54-05-58141	54-24389	173.00–175.00	Qct	199 (J+)	—	0.234	4.52	—	—	—	0.751 (U)	—	—	—	12.9	—
MD54-05-58146	54-24389	198.00–200.00	Qbo	—	—	0.109	—	—	—	—	0.525 (U)	—	—	—	—	—
MD54-05-58148	54-24390	30.00–35.00	Qbt 2	—	—	0.766	—	0.984	—	—	0.512 (U)	—	—	—	—	—
MD54-05-58149	54-24390	56.00–57.00	Qbt 2	—	—	0.698	—	1.76	—	—	0.814 (U)	—	—	—	—	73.1
MD54-05-58150	54-24390	93.00–94.00	Qbt 1v	—	—	0.909	—	—	—	—	0.533 (U)	—	—	—	—	—
MD54-05-58151	54-24390	94.00–95.00	Qbt 1v	—	—	0.665	—	—	—	—	0.544 (U)	—	—	—	—	—
MD54-05-58154	54-24390	185.00–186.00	Soil	—	—	0.421	—	—	—	—	—	—	—	—	—	—
MD54-05-58161	54-24391	25.00–30.00	Qbt 2	—	—	0.33	—	1.04	—	—	0.513 (U)	—	—	—	—	—
MD54-05-58167	54-24391	198.00–200.00	Qbo	—	—	0.0957 (J)	—	0.904	—	—	0.52 (U)	—	—	—	—	—
MD54-05-58169	54-24392	25.00–30.00	Qbt 2	—	—	0.546	—	—	—	—	1.55 (U)	—	—	—	—	—
MD54-05-58175	54-24392	198.00–200.00	Qbo	—	—	0.375	2.22	—	—	—	1.62 (U)	—	—	—	—	—
MD54-05-58177	54-24393	35.00–40.00	Qbt 2	—	—	0.421	—	—	—	—	1.52 (U)	—	—	—	—	—
MD54-05-58178	54-24393	158.00–160.00	Qct	—	—	0.235	4.94	—	—	—	1.6 (U)	—	—	—	12.7	—

Table 6.3-1 (continued)

Sample ID	Location ID	Depth (ft)	Media	Manganese	Mercury	Molybdenum	Nickel	Nitrate	Perchlorate	Potassium	Selenium	Silver	Sodium	Thallium	Vanadium	Zinc
Soil Background Value				**671**	**0.1**	**na**	**15.4**	**na**	**na**	**3640**	**1.52**	**1**	**915**	**0.73**	**39.6**	**48.8**
Qbt 2,3,4 Background Value				**482**	**0.1**	**na**	**6.58**	**na**	**na**	**3500**	**0.3**	**1**	**2770**	**1.1**	**17**	**63.5**
Qbt 1v Background Value				**408**	**0.1**	**na**	**2**	**na**	**na**	**6670**	**0.3**	**1**	**6330**	**1.24**	**4.48**	**84.6**
Qbt 1g, Qct, Qbo, Qbog[b] Background Value				**189**	**0.1**	**na**	**2**	**na**	**na**	**2390**	**0.3**	**1**	**4350**	**1.22**	**4.59**	**40**
Tcb Background Value				**na**	**na**	**na**	**na**	**na**	**na**	**na**	**na**	**na**	**na**	**na**	**na**	**na**
Industrial Soil Screening Levels				**21800**	**340[d]**	**5680**	**22500**	**100000**	**110[d]**	**na**	**5680**	**5680**	**na**	**74.9**	**7950**	**100000**
Residential Soil Screening Levels				**1550**	**23[d]**	**391**	**1560**	**100000**	**7.8[d]**	**na**	**391**	**391**	**na**	**5.16**	**548**	**23500**
MD54-05-58179	54-24393	193.00–194.40	Qbo	—	—	0.108 (J)	—	—	—	—	1.69 (U)	—	—	—	—	—
MD54-05-58183	54-24393	204.00–206.00	Qbog	—	—	0.231	3.37	—	—	—	—	—	—	—	—	—
MD54-05-58185	54-24394	40.00–45.00	Qbt 2	—	—	0.695	—	—	—	—	1.65 (U)	—	—	—	—	—
MD54-05-58186	54-24394	50.00–55.00	Qbt 2	—	—	1.11	—	—	—	—	1.65 (U)	—	—	—	—	—
MD54-05-58187	54-24394	100.00–102.00	Qbt 1v	—	—	1.44	—	—	—	—	0.75 (J)	—	—	—	—	—
MD54-05-58188	54-24394	102.00–105.00	Qbt 1v	—	—	2.5	—	—	—	—	0.756 (J)	—	—	—	—	—
MD54-05-58191	54-24394	198.00–200.00	Qbo	—	—	0.17	—	—	—	—	1.53 (U)	—	—	—	—	—
MD54-05-58193	54-24395	40.00–45.00	Qbt 2	—	—	0.568	—	—	—	—	1.8 (U)	—	—	—	—	—
MD54-05-58194	54-24395	153.00–155.00	Qbt 1g	—	—	0.514	—	—	—	—	1.73 (U)	—	—	—	—	—
MD54-05-58195	54-24395	188.00–190.00	Qbt 1g	—	—	0.278	—	—	—	—	1.85 (U)	—	—	—	—	—
MD54-05-58199	54-24395	198.00–200.00	Qbo	—	—	0.205	—	—	—	—	1.67 (U)	—	—	—	—	—
MD54-05-58206	54-24396	10.00–15.00	Qbt 2	—	—	0.552	—	1.09 (J-)	—	—	—	—	—	—	—	—
MD54-05-58207	54-24396	154.00–155.00	Qct	220 (J+)	—	0.317	5.89	—	—	—	0.622 (U)	—	—	—	15.2	41.6
MD54-05-58212	54-24396	198.00–200.00	Qbo	—	—	0.134	—	—	—	—	0.522 (U)	—	—	—	—	—
MD54-05-58214	54-24397	15.00–20.00	Qbt 2	—	—	0.449	—	0.641 (J)	—	—	1.02 (U)	—	—	—	—	—
MD54-05-58215	54-24397	159.00–160.00	Qct	201	—	0.275	2.53	0.689 (J)	—	—	1.41 (U)	—	—	—	8.91	—
MD54-05-58220	54-24397	198.00–200.00	Qbo	—	—	0.0916 (J)	—	—	—	—	1.14 (U)	—	—	—	—	—
MD54-05-59184	54-24523	199.80–200.00	Qbog	—	—	—	—	—	—	—	—	—	—	—	—	—
MD54-05-59186	54-24523	221.80–222.00	Tcb	—	—	—	—	—	—	—	—	—	—	—	—	—
MD54-05-59190	54-24523	262.60–265.80	Tcb	—	—	—	—	—	—	—	—	—	—	—	—	—
MD54-05-59202	54-24523	386.10–386.60	Tcb	—	—	—	—	—	—	—	—	—	—	—	—	—
MD54-05-59204	54-24523	404.30–407.30	Tcb	—	—	—	—	—	—	—	—	—	—	—	—	—
MD54-05-59212	54-24523	696.00–696.50	Tcb	—	—	—	—	—	—	—	—	—	—	—	—	—

Note: All values in mg/kg. See Appendix A for data qualifier definitions.

[a] na = Not available.

[b] Qbo background values used for Qbog.

[c] Industrial SSL for cadmium calculated incorrectly in NMED 2004 85615, SSL recalculated using NMED parameters.

[d] SSLs obtained from EPA 2004, 87478.

[e] — = Analysis not requested, the reported value was less than the BV, or result not detected.

Table 6.3-2
Organic Chemicals Detected in Subsurface Samples from MDA G

Sample ID	Location ID	Depth (ft)	Media	Heptachlorodibenzodioxin[1,2,3,4,6,7,8-]	Heptachlorodibenzodioxins (Total)	Heptachlorodibenzofuran[1,2,3,4,6,7,8-]	Heptachlorodibenzofurans (Total)	Hexachlorodibenzodioxins (Total)	Hexachlorodibenzofuran[2,3,4,6,7,8-]	Hexachlorodibenzofurans (Total)	Octachlorodibenzodioxin[1,2,3,4,6,7,8,9-]	Pentachlorodibenzofurans (Totals)
Industrial Soil Screening Levels				**Soil screening levels are not available for the individual congeners, just for 2,3,7,8-TCDD.**								
Residential Soil Screening Levels				**Soil screening levels are not available for the individual congeners, just for 2,3,7,8-TCDD.**								
MD54-05-57895	54-24363	31.80–35.40	Qbt 2	0.0000001 (J)	0.0000001 (J)	—*	—	—	—	—	5.2E-07 (J)	—
MD54-05-57981	54-24371	40.00–45.00	Qbt 2	—	1.03E-06	—	—	—	—	—	8.97E-06	—
MD54-05-58005	54-24374	12.00–15.00	Qbt 2	1.6E-07 (J)	3.6E-07	—	—	—	—	—	—	—
MD54-05-58071	54-24381	15.00–20.00	Qbt 2	0.0000013 (J)	3.44E-06	9.9E-07 (J)	9.9E-07	3.9E-07	1.6E-07 (J)	1.01E-06	7.69E-06	1.3E-07
MD54-05-58103	54-24385	30.00–35.00	Qbt 2	2.4E-07 (J)	2.4E-07	—	—	—	—	—	7.6E-07 (J)	—
MD54-05-58132	54-24388	25.00–30.00	Qbt 2	3.2E-07 (J)	6.5E-07	—	—	—	—	—	1.41E-06 (J)	—
MD54-05-58148	54-24390	30.00–35.00	Qbt 2	—	—	—	—	—	—	—	3.8E-07 (J)	—
MD54-05-58161	54-24391	25.00–30.00	Qbt 2	—	—	—	—	—	—	—	4.7E-07 (J)	—

Note: All values in mg/kg. See Appendix A for data qualifier definitions.

*— = Not detected.

Table 6.3-3
Radionuclides Detected above BVs in Subsurface Samples from MDA G

Sample ID	Location ID	Depth (ft)	Media	Americium-241	Plutonium-238	Plutonium-239	Strontium-90	Thorium-228	Thorium-230	Thorium-232	Uranium-234	Uranium-235	Uranium-238
Soil Background Value				**0.013**	**0.023**	**0.054**	**1.31**	**2.28**	**2.29**	**2.33**	**2.59**	**0.2**	**2.29**
Qbt 2,3,4 Background Value				**na[a]**	**na**	**na**	**na**	**2.52**	**1.98**	**2.52**	**1.98**	**0.09**	**1.93**
Qbt 1v Background Value				**na**	**na**	**na**	**na**	**3.75**	**3.12**	**3.75**	**3.12**	**0.14**	**3.05**
Qbt 1g, Qct, Qbo, Qbog[b] Background Value				**na**	**na**	**na**	**na**	**4.90**	**4.00**	**4.90**	**4.00**	**0.18**	**3.90**
Industrial Screening Action Level				**180**	**240**	**210**	**1900**	**9.0**	**5[c]**	**5[c]**	**1500**	**87**	**430**
Residential Screening Action Level				**30**	**37**	**33**	**5.7**	**2.3**	**5[c]**	**5[c]**	**170**	**17**	**86**
MD54-05-57897	54-24363	113.10–114.50	Qbt 1g	—[d]	—	0.315	—	—	—	—	—	—	—
MD54-05-57901	54-24363	175.30–176.80	Qbog	—	—	0.176	—	—	6.75	—	—	—	—
MD54-05-57950	54-24367	198.00–200.00	Qbo	0.153	—	—	—	—	—	—	—	—	—
MD54-05-57958	54-24368	200.10–201.50	Qbo	—	—	—	3.81	—	—	—	—	—	—
MD54-05-57960	54-24369	65.00–70.00	Qbt 2	—	—	—	—	—	—	—	5.575 (J-)	—	4.959 (J-)
MD54-05-57966	54-24369	248.00–250.00	Qbog	—	—	—	—	—	6.121 (J+)	—	7.835	—	7.803
MD54-05-57974	54-24370	223.00–225.00	Qbog	—	—	—	—	—		—		—	—
MD54-05-57981	54-24371	40.00–45.00	Qbt 2	—	—	—	—	—	—	—	2.337	—	2.552
MD54-05-57987	54-24371	198.00–200.00	Qbo	—	—	—	—	—	—	—	—	—	4.152
MD54-05-57989	54-24372	55.00–60.00	Qbt 2	—	—	—	0.64	—	—	—	—	—	—
MD54-05-58005	54-24374	12.00–15.00	Qbt 2	—	—	0.072	—	—	—	—	—	—	—
MD54-05-58011	54-24374	198.00–200.00	Qbo	—	—	0.113	—	—	—	—	—	—	—
MD54-05-58013	54-24375	30.00–35.00	Qbt 2	—	—	—	—	—	—	—	2.576	0.139	2.744
MD54-05-58015	54-24375	64.00–65.00	Qbt 2	0.278	—	—	—	—	—	—	—	—	—
MD54-05-58032	54-24376	198.00–200.00	Qbo	—	0.053	0.088	—	—	—	—	—	—	—
MD54-05-58034	54-24377	45.00–50.00	Qbt 1v	—	—	—	—	—	3.263 (J-)	—	—	—	—
MD54-05-58042	54-24378	25.00–30.00	Qbt 2	0.111	—	—	—	—	—	—	—	—	—
MD54-05-58043	54-24378	148.50–150.00	Qct	—	—	—	—	—	—	—	—	0.745	—
MD54-05-58048	54-24378	180.00–182.00	Qbo	0.078	—	—	—	—	—	—	—	0.621	—
MD54-05-58056	54-24379	198.00–200.00	Qbog	—	—	—	—	—	5.68	—	5.03	0.241	5.5

Table 6.3-3 (continued)

Sample ID	Location ID	Depth (ft)	Media	Americium-241	Plutonium-238	Plutonium-239	Strontium-90	Thorium-228	Thorium-230	Thorium-232	Uranium-234	Uranium-235	Uranium-238
Soil Background Value				**0.013**	**0.023**	**0.054**	**1.31**	**2.28**	**2.29**	**2.33**	**2.59**	**0.2**	**2.29**
Qbt 2,3,4 Background Value				**na[a]**	**na**	**na**	**na**	**2.52**	**1.98**	**2.52**	**1.98**	**0.09**	**1.93**
Qbt 1v Background Value				**na**	**na**	**na**	**na**	**3.75**	**3.12**	**3.75**	**3.12**	**0.14**	**3.05**
Qbt 1g, Qct, Qbo, Qbog[b] Background Value				**na**	**na**	**na**	**na**	**4.90**	**4.00**	**4.90**	**4.00**	**0.18**	**3.90**
Industrial Screening Action Level				**180**	**240**	**210**	**1900**	**9.0**	**5[c]**	**5[c]**	**1500**	**87**	**430**
Residential Screening Action Level				**30**	**37**	**33**	**5.7**	**2.3**	**5[c]**	**5[c]**	**170**	**17**	**86**
MD54-05-58072	54-24381	110.00–112.00	Qbt 1g	—	—	—	—	—	4.11	—	4.33	0.287	4.35
MD54-05-58073	54-24381	148.00–150.00	Qbo	—	—	—	—	—	—	—	—	0.192	—
MD54-05-58079	54-24382	30.00–35.00	Qbt 2	—	—	—	—	—	—	—	—	0.127	—
MD54-05-58085	54-24382	145.00–147.00	Qbo	—	—	—	—	—	—	—	—	0.206	—
MD54-05-58087	54-24383	20.00–25.00	Qbt 2	—	—	—	—	—	—	—	—	0.134	—
MD54-05-58095	54-24384	25.00–30.00	Qbt 1g	—	—	—	—	—	4.12	—	—	0.28	—
MD54-05-58109	54-24385	175.50–177.00	Soil	0.278	0.031	—	—	—	—	—	—	—	—
MD54-05-58116	54-24386	35.00–40.00	Qbt 2	—	—	0.166	—	—	—	—	—	—	—
MD54-05-58117	54-24386	56.00–58.00	Qbt 2	—	—	0.183	—	—	—	—	—	—	—
MD54-05-58118	54-24386	58.00–59.00	Qbt 2	—	—	0.083	—	—	—	—	—	—	—
MD54-05-58119	54-24386	110.00–112.00	Qct	—	—	0.127	—	—	—	—	—	—	—
MD54-05-58122	54-24386	185.00–186.00	Soil	—	—	0.102	—	—	—	—	—	—	—
MD54-05-58124	54-24387	5.00–10.00	Qbt 1g	—	—	—	—	—	—	—	—	0.287	—
MD54-05-58130	54-24387	78.00–81.00	Qbog	—	—	—	—	—	—	—		0.221	—
MD54-05-58133	54-24388	63.00–64.50	Qbt 2	—	—	—	—	2.65	2.29	—	—	0.134	2.04
MD54-05-58134	54-24388	132.50–134.50	Qbt 1g	—	—	—	—	—	—	—	—	0.186	3.95
MD54-05-58141	54-24389	173.00–175.00	Qct	0.183	—	—	—	—	—	—	—	—	—
MD54-05-58148	54-24390	30.00–35.00	Qbt 2	—	—	—	—	—	—	2.58	—	0.102	—
MD54-05-58149	54-24390	56.00–57.00	Qbt 2	—	—	—	—	2.84	—	3.1	—	0.26	—
MD54-05-58150	54-24390	93.00–94.00	Qbt 1v	—	—	—	—	3.95	3.42	—	—	0.152	3.23
MD54-05-58151	54-24390	94.00–95.00	Qbt 1v	—	—	—	—	4.02	3.36	3.89	—	0.222	—

Table 6.3-3 (continued)

Sample ID	Location ID	Depth (ft)	Media	Americium-241	Plutonium-238	Plutonium-239	Strontium-90	Thorium-228	Thorium-230	Thorium-232	Uranium-234	Uranium-235	Uranium-238
Soil Background Value				**0.013**	**0.023**	**0.054**	**1.31**	**2.28**	**2.29**	**2.33**	**2.59**	**0.2**	**2.29**
Qbt 2,3,4 Background Value				**na[a]**	**na**	**na**	**na**	**2.52**	**1.98**	**2.52**	**1.98**	**0.09**	**1.93**
Qbt 1v Background Value				**na**	**na**	**na**	**na**	**3.75**	**3.12**	**3.75**	**3.12**	**0.14**	**3.05**
Qbt 1g, Qct, Qbo, Qbog[b] Background Value				**na**	**na**	**na**	**na**	**4.90**	**4.00**	**4.90**	**4.00**	**0.18**	**3.90**
Industrial Screening Action Level				**180**	**240**	**210**	**1900**	**9.0**	**5[c]**	**5[c]**	**1500**	**87**	**430**
Residential Screening Action Level				**30**	**37**	**33**	**5.7**	**2.3**	**5[c]**	**5[c]**	**170**	**17**	**86**
MD54-05-58161	54-24391	25.00–30.00	Qbt 2	—	—	—	2.778 (J-)	—	—	—	—	—	—
MD54-05-58169	54-24392	25.00–30.00	Qbt 2	0.305	—	—	—	—	2.545	—	—	—	—
MD54-05-58175	54-24392	198.00–200.00	Qbo	—	—	0.054 (J+)	—	—	—	—	—	—	—
MD54-05-58177	54-24393	35.00–40.00	Qbt 2	—	—	—	—	—	—	—	2.021	—	2.167
MD54-05-58178	54-24393	158.00–160.00	Qct	—	—	—	5.9	—	—	—	—	—	—
MD54-05-58179	54-24393	193.00–194.40	Qbo	0.151	—	—	—	—	—	—	—	—	—
MD54-05-58183	54-24393	204.00–206.00	Qbog	—	—	—	—	—	—	—		1.644	—
MD54-05-58185	54-24394	40.00–45.00	Qbt 2	0.274	—	—	—	—	—	—	—	—	—
MD54-05-58186	54-24394	50.00–55.00	Qbt 2	0.092 (J+)	—	—	—	—	—	—	—	—	—
MD54-05-58193	54-24395	40.00–45.00	Qbt 2	0.074 (J+)	—	—	—	—	—	—	—	—	1.948
MD54-05-58206	54-24396	10.00–15.00	Qbt 2	—	—	—	2.84	—	—	—	—	—	—
MD54-05-58212	54-24396	198.00–200.00	Qbo	0.265	—	—	—	—	—	—	—	—	—
MD54-05-58214	54-24397	15.00–20.00	Qbt 2	—	—	0.22	—	—	2.326	—	—	—	—
MD54-05-58215	54-24397	159.00–160.00	Qct	—	—	0.21	—	—	—	—	—	—	—
MD54-05-58220	54-24397	198.00–200.00	Qbo	—	—	0.218	—	—	—	—	—	—	—

Note: All values in pCi/g. See Appendix A for data qualifier definitions.

[a] na = Not available.

[b] Qbo background values used for Qbog.

[c] The Screening Action Level is the generic soil guideline for release of property published in Chapter 4 ("Residual Radioactive Material") DOE Order 5400.5. For the concentration averaged over the first 15 cm of soil below the surface, 5 pCi/g applies; for the subsequent 15 cm thick layers, the generic soil guideline is 15 pCi/g.

[d] — = Analysis not requested, the reported value was less than the BV, or result not detected.

Table 6.3-4
Gravimetric Moisture Content and Matric Potential at MDA G

Sample Number	Sample Depth	Matrix	Gravimetric Moisture Content (%, g/g)	Matric Potential (bars)
MD54-05-59235	11.5	Qbt 2	3.0	8.0
MD54-05-59237	22.0	Qbt 2	4.5	1.3
MD54-05-59239	32.0	Qbt 2	2.1	2.9
MD54-05-59241	42.0	Qbt 2	4.8	6.0
MD54-05-59243	52.0	Qbt 2	6.4	2.0
MD54-05-59245	62.0	Qbt 2	2.4	4.0
MD54-05-59248	82.0	Qbt 1v	5.3	3.4
MD54-05-59250	92.0	Qbt 1vc	10.0	2.7
MD54-05-59252	102.0	Qbt 1g	10.8	5.0
MD54-05-59253	107.0	Qbt 1g	5.7	2.8
MD54-05-59255	117.0	Qbt 1g	5.4	2.9
MD54-05-59256	122.0	Qbt 1g	4.0	3.3
MD54-05-59258	142.0	Qbt 1g	6.4	3.0
MD54-05-59260	157.0	Qbt 1g	8.3	2.9
MD54-05-59261	162.0	Qbt 1g	7.8	2.1
MD54-05-59262	167.0	Qbt 1g	7.6	1.5
MD54-05-59264	177.0	Qct	6.1	2.4
MD54-05-59265	182.0	Qct	9.3	1.4
MD54-05-59266	185.0	Qct	7.3	4.9
MD54-05-59268	197.0	Qbog	27.2	0.6
MD54-05-59270	207.0	Tcb	0.4	48.0
MD54-05-59310	210.0	Tcb	1.2	3.7
MD54-05-59272	217.0	Tcb	2.7	19.6
MD54-05-59273	222.0	Tcb	2.1	2.1
MD54-05-59274	227.0	Tcb	0.7	7.9
MD54-05-59275	232.0	Tcb	0.5	14.8
MD54-05-59276	237.0	Tcb	0.2	95.1
MD54-05-59277	242.0	Tcb	0.4	27.6
MD54-05-59278	247.0	Tcb	2.1	50.6
MD54-05-59279	254.5	Tcb	0.9	7.3
MD54-05-59281	265.0	Tcb	0.2	15.1
MD54-05-59282	271.5	Tcb	1.4	5.5
MD54-05-59283	276.2	Tcb	0.8	15.7
MD54-05-59284	281.3	Tcb	2.1	1.1
MD54-05-59285	286.4	Tcb	0.7	11.6
MD54-05-59286	291.3	Tcb	1.6	2.4
MD54-05-59287	296.1	Tcb	3.1	3.3

Table 6.3-4 (continued)

Sample Number	Sample Depth	Matrix	Gravimetric Moisture Content (%, g/g)	Matric Potential (bars)
MD54-05-59289	301.1	Tcb	3.0	5.0
MD54-05-59288	301.5	Tcb	0.8	4.9
MD54-05-59291	316.7	Tcb	5.2	4.4
MD54-05-59292	321.8	Tcb	5.2	1.5
MD54-05-59293	326.9	Tcb	0.8	4.9
MD54-05-59294	331.6	Tcb	1.8	2.4
MD54-05-59295	336.0	Tcb	0.7	4.3
MD54-05-59296	341.9	Tcb	1.0	3.5
MD54-05-59297	346.8	Tcb	0.7	3.1
MD54-05-59298	351.0	Tcb	0.6	2.3
MD54-05-59299	356.9	Tcb	0.7	6.0
MD54-05-59301	366.9	Tcb	0.8	8.8
MD54-05-59302	371.4	Tcb	0.7	8.2
MD54-05-59303	376.1	Tcb	0.6	12.2
MD54-05-59304	381.3	Tcb	0.8	21.7
MD54-05-59305	386.7	Tcb	0.5	12.6
MD54-05-59306	391.6	Tcb	1.0	3.5
MD54-05-59307	396.7	Tcb	0.6	32.7
MD54-05-59308	401.4	Tcb	0.6	8.3
MD54-05-59309	407.0	Tcb	0.6	6.9
MD54-05-59311	436.5	Tcb	0.6	6.3
MD54-05-59312	456.7	Tcb	0.6	8.7
MD54-05-59313	482.3	Tcb	5.4	335.0
MD54-05-59314	494.0	Tcb	7.5	22.7
MD54-05-59315	545.0	Tcb	11.3	3.2

Table 6.5-1
MDA G Subsurface Vapor Sampling Field-Screening Results

Borehole ID	Borehole Location	Depth (ft)	Date	Time	CH_4 (%)	CO_2 (%)	O_2 (%)
2	54-24361	Ambient	7.17.05	0822	0.1	0.0	17.3
		30	7.17.05	0833	0.0	1.1	16.2
		Ambient	7.16.05	1411	0.0	0.0	17.9
		138	7.16.05	1418	0.1	1.0	16.6
3	54-24362	Ambient	7.25.05	0950	0.0	0.0	16.8
		35	7.25.05	0944	0.0	1.6	15.5
		Ambient	7.24.05	1558	0.0	0.0	17.4
		135	7.24.05	1604	0.0	0.9	16.6
4 (angled)	54-24363	Ambient	8.4.05	1350	0.0	0.0	17.7
		12-Bottom	8.4.05	1355	0.0	0.1	17.5
5	54-24364	Ambient	6.15.05	1505	0.0	0.0	18.0
		65	6.15.05	1514	0.0	0.5	17.2
		Ambient	6.15.05	1227	0.0	0.0	17.0
		130	6.15.05	1241	0.0	0.8	16.3
		Ambient	7.30.05	1251	0.0	0.0	17.4
		130	7.30.05	1246	0.0	0.5	17.1
6 (angled)	54-24366	Ambient	8.4.05	1100	0.0	0.0	17.4
		12-bottom	8.4.05	1105	0.0	0.0	17.4
7	54-24367	Ambient	7.7.05	1002	0.0	0.0	17.5
		30	7.7.05	1129	0.0	0.0	12.1
		153	7.7.05	1014	0.0	1.4	16.1
		Ambient	7.31.05	0912	0.0	0.1	12.3
		153	7.31.05	0920	0.0	0.6	16.8
8 (angled)	54-24368	Ambient	8.1.05	1706	0.0	0.0	17.9
		95	8.1.05	1710	0.0	1.2	16.6
		192	8.2.05	0955	0.0	1.5	16.1
9	54-24369	Ambient	7.25.05	1313	0.0	0.0	17.1
		64	7.25.05	1608	0.0	2.3	14.9
		184	7.25.05	1306	0.0	1.0	15.8
10	54-24370	Ambient	7.08.05	1331	0.0	0.0	18.0
		37	7.08.05	1452	0.0	6.3	11.2
		148	7.08.05	1340	0.0	6.4	11.0
11	54-24371	Ambient	7.27.05	1115	0.0	0.0	16.7
		40	7.27.05	1421	0.0	0.3	17.0
		141	7.2705	1122	0.0	0.5	16.0

Table 6.5-1 (continued)

Borehole ID	Borehole Location	Depth (ft)	Date	Time	CH_4 (%)	CO_2 (%)	O_2 (%)
12	54-24372	Ambient	7.28.05	0925	0.0	0.0	17.3
		55	7.28.05	1300	0.0	0.2	17.3
		185	7.28.05	0935	0.0	0.1	17.0
13	54-24373	Ambient	6.10.05	1242	0.0	0.1	17.0
		65	6.10.05	1246	0.0	2.8	14.2
		Ambient	6.10.05	1521	0.0	0.0	17.9
		65	6.10.05	1526	0.0	1.9	15.8
		Ambient	6.13.05	1321	0.0	0.0	18.0
		187	6.13.05	1332	0.0	0.6	16.9
		Ambient	6.14.05	1212	0.0	0.0	17.4
		187	6.14.05	1222	0.0	0.6	16.7
14	54-24374	Ambient	6.17.05	1510	0.0	0.0	18.2
		10	6.17.05	1521	0.0	0.4	17.3
		Ambient	6.17.05	1425	0.0	0.0	18.0
		139	6.17.05	1433	0.0	0.4	17.3
15-1	54-24375	Ambient	7.14.05	0918	1.0	0.1	17.3
		30	7.14.05	1232	0.0	1.5	15.9
		157	7.14.05	0927	0.0	1.7	15.6
15-2	54-24523	Ambient	7.12.05	1512	0.0	0.0	17.5
		485-700	7.12.05	1521	0.0	0.0	17.3
16	54-24376	Ambient	7.07.05	1341	0.0	0.0	17.9
		35	7.0705	1500	0.0	0.2	17.5
		158	7.07.05	1352	0.0	0.1	17.5
17	54-24377	Ambient	7.06.05	1234	0.0	0.0	17.4
		45	7.06.05	1404	0.0	0.2	17.8
		150	7.06.06	1247	0.0	0.2	16.9
		Ambient	7.31.05	1414	0.0	0.0	17.8
		150	7.31.05	1420	0.0	0.1	17.4
18	54-24378	Ambient	7.19.05	1336	0.0	0.0	17.7
		30	7.19.05	1429	0.0	0.7	15.8
		136	7.19.05	1331	0.1	0.8	16.8
19	54-24379	Ambient	7.20.05	1145	0.0	0.0	17.5
		20	7.20.05	1429	0.0	0.3	16.7
		144	7.20.05	1200	0.0	1.2	16.0
20	54-24380	Ambient	7.21.05	1044	0.0	0.0	17.2
		20	7.21.05	1209	0.0	0.9	17.0
		155	7.21.05	1040	0.0	1.1	16.3

Table 6.5-1 (continued)

Borehole ID	Borehole Location	Depth (ft)	Date	Time	CH_4 (%)	CO_2 (%)	O_2 (%)
21	54-24381	Ambient	7.22.05	1053	0.0	0.0	17.1
		15	7.22.05	1344	0.0	0.5	16.8
		143	7.22.05	1100	0.0	0.7	16.3
22	54-24382	Ambient	n/a[a]	n/a	n/a	n/a	n/a
		28	7.31.05	[b]	[b]	[b]	[b]
		107	7.31.05	[b]	[b]	[b]	[b]
23	54-24383	Ambient	n/a	n/a	n/a	n/a	n/a
		10	7.31.05	[b]	[b]	[b]	[b]
		107	7.31.05	[b]	[b]	[b]	[b]
24	54-24384	Ambient	n/a	n/a	n/a	n/a	n/a
		10	7.31.05	[b]	[b]	[b]	[b]
		65	5.23.05	[c]	[c]	[c]	[c]
25	54-24385	Ambient	7.22.05	1630	0.0	0.0	17.4
		30	7.23.05	1036	0.0	1.2	16.0
		134	7.22.05	1640	0.0	0.9	16.3
26	54-24386	Ambient	7.23.05	1556	0.0	0.0	17.3
		35	7.24.05	1028	0.0	1.2	15.6
		156	7.24.05	1603	0.0	1.8	15.7
27	54-24387	Ambient	n/a	n/a	n/a	n/a	n/a
		10	7.30.05	[b]	[b]	[b]	[b]
		80	5.24.05	[c]	[c]	[c]	[c]
28	54-24388	Ambient	7.18.05	1441	0.0	0.0	17.6
		25	7.18.05	1503	0.0	0.9	16.6
		Ambient	7.17.05	1327	0.0	0.0	17.7
		129	7.17.05	1322	0.0	1.0	16.6
29	54-24389	Ambient	7.29.05	0953	0.0	0.0	17.2
		20	7.29.05	0946	0.0	0.1	17.1
		Ambient	7.28.05	1634	0.0	0.0	17.7
		147	7.28.05	1642	0.0	0.4	17.3
30	54-24390	Ambient	7.15.05	1500	0.0	0.0	17.7
		30	7.15.05	1029	0.0	0.7	17.7
		158	7.15.05	1514	0.0	1.0	16.7
31	54-24391	Ambient	7.08.05	1006	0.0	0.0	17.6
		25	7.08.05	1012	0.0	0.2	17.1
		Ambient	7.07.05	1618	0.0	0.0	18.2
		165	7.07.05	1626	0.0	0.4	17.2

Table 6.5-1 (continued)

Borehole ID	Borehole Location	Depth (ft)	Date	Time	CH_4 (%)	CO_2 (%)	O_2 (%)
32	54-24392	Ambient	7.29.05	1339	0.0	0.0	17.3
		25	7.29.05	1702	0.0	0.1	17.4
		144	7.29.05	1345	0.0	0.3	16.8
33	54-24393	Ambient	7.15.05	0850	0.1	0.0	17.5
		35	7.15.05	1129	0.0	0.5	17.2
		156	7.15.05	0901	0.0	1.2	16.2
34	54-24394	Ambient	7.26.05	0930	0.0	0.0	17.0
		50	7.26.05	1513	0.1	1.5	15.9
		163	7.26.05	0939	0.0	2.2	15.1
		163	7.26.05	1258	0.0	1.8	15.5
35	54-24395	Ambient	6.16.05	1529	0.0	0.0	17.8
		40	6.16.05	1534	0.0	2.5	14.9
		Ambient	6.16.05	1318	0.0	0.0	17.2
		170	6.16.05	1325	0.0	2.3	14.7
36	54-24396	Ambient	6.17.05	1226	0.0	0.0	17.7
		10	6.17.05	1231	0.0	0.2	17.2
		Ambient	6.17.05	1033	0.0	0.1	17.5
		131	6.17.05	1042	0.0	0.7	16.6
37	54-24397	Ambient	6.22.05	1600	0.1	0.0	18.0
		15	6.22.05	1645	0.1	0.2	17.5
		125	6.22.05	1605	0.1	0.4	17.5

[a] n/a = Not applicable.

[b] CES Landtec GEM2000 gas analyzer not functioning. Purge of sample interval confirmed by duration of water vapor collection and monitoring of packer pressure.

[c] Prior field-screening performed using single-packer system through hollow-stem auger.

Table 6.6-1
VOCs Detected in Pore-Gas Samples at MDA G

Borehole Location	Depth (ft)	Sample ID	Analyte	Result (µg/m³)
54-24361	30–32	MD54-05-60283	Chloroform	234
			Dichloroethane[1,1-]	688
			Dichloroethene[1,1-]	436
			Tetrachloroethene	9490
			Trichloro-1,2,2-trifluoroethane[1,1,2-]	3140 (J)
			Trichloroethane[1,1,1-]	14700
			Trichloroethene	53700
	138–140	MD54-05-60282	Chloroform	381
			Dichloroethane[1,1-]	1130
			Dichloroethene[1,1-]	832
			Tetrachloroethene	3320
			Toluene	267
			Trichloro-1,2,2-trifluoroethane[1,1,2-]	1460 (J)
			Trichloroethane[1,1,1-]	13600
			Trichloroethene	29000
54-24362	35–37	MD54-05-60285	Carbon Tetrachloride	32.0
			Chloroform	100
			Dichlorodifluoromethane	2400
			Dichloroethane[1,1-]	260
			Dichloroethene[1,1-]	330
			Styrene	45.0
			Tetrachloroethene	1100
			Toluene	400
			Trichloro-1,2,2-trifluoroethane[1,1,2-]	1200
			Trichloroethane[1,1,1-]	8200
			Trichloroethene	6500
			Trichlorofluoromethane	130
	135–137	MD54-05-60284	Acetone	64.1 (J)
			Chloroform	151
			Dichloroethane[1,1-]	526
			Dichloroethene[1,1-]	753
			Methylene Chloride	55.5
			Styrene	51.1
			Tetrachloroethene	1150
			Toluene	324
			Trichloro-1,2,2-trifluoroethane[1,1,2-]	3060 (J+)

Table 6.6-1 (continued)

Borehole Location	Depth (ft)	Sample ID	Analyte	Result (µg/m³)
54-24362 (continued)			Trichloroethane[1,1,1-]	10900
			Trichloroethene	5260
			Trichlorofluoromethane	286
54-24363	12–250	MD54-05-60286	Toluene	240
			Carbon Disulfide	2.9
			Chloroform	5.2
			Dichlorodifluoromethane	13
			Dichloroethane[1,1-]	11
			Dichloroethene[1,1-]	46
			Styrene	10
			Butanone[2-]	5
			Tetrachloroethene	96
			Acetone	70
			Trichloro-1,2,2-trifluoroethane[1,1,2-]	120
			Trichloroethane[1,1,1-]	900
			Trichloroethene	45
			Trichlorofluoromethane	6.6
			Xylene[1,3-]+Xylene[1,4-]	8.4
54-24364	65–67	MD54-05-60289	Dichloroethane[1,1-]	129
			Dichloroethene[1,1-]	384
			Dichloropropane[1,2-]	25.9
			Methylene Chloride	29.9
			Tetrachloroethene	1760
			Trichloro-1,2,2-trifluoroethane[1,1,2-]	1840 (J)
			Trichloroethane[1,1,1-]	5340
			Trichloroethene	2850
			Trichlorofluoromethane	225
	130–132	MD54-05-60288	Acetone	102
			Dichloroethane[1,1-]	105
			Dichloroethene[1,1-]	384
			Dichloropropane[1,2-]	42.0
			Methylene Chloride	45.1
			Tetrachloroethene	1290
			Trichloro-1,2,2-trifluoroethane[1,1,2-]	1300 (J)
			Trichloroethane[1,1,1-]	4040
			Trichloroethene	1830
			Trichlorofluoromethane	180

Table 6.6-1 (continued)

Borehole Location	Depth (ft)	Sample ID	Analyte	Result (µg/m³)
54-24366	12–250	MD54-05-60290	Trichloroethane[1,1,1-]	29
			Acetone	17
			Toluene	20
54-24367	30–32	MD54-05-60293	Dichloroethane[1,1-]	259
			Dichloroethene[1,1-]	396
			Styrene	63.9
			Tetrachloroethene	481
			Toluene	527
			Trichloro-1,2,2-trifluoroethane[1,1,2-]	2070 (J+)
			Trichloroethane[1,1,1-]	13100
			Trichloroethene	1290
			Trichlorofluoromethane	399
	153–155	MD54-05-60292	Dichloroethane[1,1-]	809
			Dichloroethene[1,1-]	2540
			Styrene	111
			Tetrachloroethene	881
			Toluene	1170
			Trichloro-1,2,2-trifluoroethane[1,1,2-]	6360 (J+)
			Trichloroethane[1,1,1-]	31600
			Trichloroethene	2420
			Trichlorofluoromethane	483
54-24368	95–97	MD54-05-60295	Dichlorodifluoromethane	310
			Dichloroethane[1,1-]	660
			Dichloroethene[1,1-]	1900
			Styrene	160
			Tetrachloroethene	290
			Trichloro-1,2,2-trifluoroethane[1,1,2-]	7100
			Trichloroethane[1,1,1-]	42000
			Trichloroethene	480
			Trichlorofluoromethane	770
	192–194	MD54-05-60294	Dichlorodifluoromethane	390
			Dichloroethane[1,1-]	430
			Dichloroethene[1,1-]	1600
			Propanol[2-]	210
			Styrene	500
			Tetrachloroethene	280
			Trichloro-1,2,2-trifluoroethane[1,1,2-]	4000
			Trichloroethane[1,1,1-]	22000

Table 6.6-1 (continued)

Borehole Location	Depth (ft)	Sample ID	Analyte	Result (µg/m³)
54-24368 (continued)			Trichloroethene	470
			Trichlorofluoromethane	820
54-24369	65–67	MD54-05-61743	Dichlorodifluoromethane	2800
			Dichloroethane[1,1-]	2800
			Dichloroethene[1,1-]	4800
			Tetrachloroethene	3600
			Trichloro-1,2,2-trifluoroethane[1,1,2-]	18000
			Trichloroethane[1,1,1-]	120000
			Trichloroethene	3200
			Trichlorofluoromethane	2500
	184–186	MD54-05-61742	Dichlorodifluoromethane	1000
			Dichloroethane[1,1-]	490
			Dichloroethene[1,1-]	1100
			Tetrachloroethene	500
			Toluene	140
			Trichloro-1,2,2-trifluoroethane[1,1,2-]	3800
			Trichloroethane[1,1,1-]	20000
			Trichloroethene	500
			Trichlorofluoromethane	780
54-24370	37–39	MD54-05-60299	Dichlorodifluoromethane	10400
			Dichloroethene[1,1-]	2730
			Dichloroethene[cis-1,2-]	388
			Tetrachloroethene	1020
			Toluene	791
			Trichloro-1,2,2-trifluoroethane[1,1,2-]	48300 (J+)
			Trichloroethane[1,1,1-]	92700
			Trichloroethene	12400
			Trichlorofluoromethane	10100
	148–150	MD54-05-60298	Dichlorodifluoromethane	12400
			Dichloroethane[1,1-]	6880
			Dichloroethene[1,1-]	3290
			Dichloroethene[cis-1,2-]	396
			Methylene Chloride	312
			Styrene	179
			Tetrachloroethene	624
			Toluene	1130
			Trichloro-1,2,2-trifluoroethane[1,1,2-]	33700 (J+)
			Trichloroethane[1,1,1-]	65400

Table 6.6-1 (continued)

Borehole Location	Depth (ft)	Sample ID	Analyte	Result (µg/m³)
54-24370 (continued)			Trichloroethene	6980
			Trichlorofluoromethane	7300
54-24371	40–42	MD54-05-61745	Butanone[2-]	72.0
			Chloroform	100
			Dichlorodifluoromethane	730
			Dichloroethane[1,1-]	760
			Dichloroethene[1,1-]	290
			Methyl-2-pentanone[4-]	29.0
			Styrene	120
			Tetrachloroethene	460
			Toluene	4400
			Trichloro-1,2,2-trifluoroethane[1,1,2-]	12000
			Trichloroethane[1,1,1-]	9100
			Trichloroethene	2400
			Trichlorofluoromethane	1300
	141–143	MD54-05-61744	Acetone	46.0
			Butanone[2-]	84.0
			Chloroform	92.0
			Dichlorodifluoromethane	690
			Dichloroethane[1,1-]	720
			Dichloroethene[1,1-]	330
			Methyl-2-pentanone[4-]	28.0
			Methylene Chloride	17.0
			Styrene	100
			Tetrachloroethene	410
			Toluene	4400
			Trichloro-1,2,2-trifluoroethane[1,1,2-]	5900
			Trichloroethane[1,1,1-]	7500
			Trichloroethene	2600
			Trichlorofluoromethane	1200
54-24372	55–57	MD54-05-61747	Acetone	30.0
			Butanone[2-]	28.0
			Dichlorodifluoromethane	180
			Dichloroethane[1,1-]	25.0
			Dichloroethene[1,1-]	38.0
			Methyl-2-pentanone[4-]	10.0
			Styrene	90.0
			Tetrachloroethene	190

Table 6.6-1 (continued)

Borehole Location	Depth (ft)	Sample ID	Analyte	Result (µg/m³)
54-24372 (continued)			Toluene	1800
			Trichloro-1,2,2-trifluoroethane[1,1,2-]	130
			Trichloroethane[1,1,1-]	970
			Trichloroethene	200
			Trichlorofluoromethane	360
	185–187	MD54-05-61746	Acetone	21.0
			Butanone[2-]	22.0
			Dichlorodifluoromethane	86.0
			Dichloroethane[1,1-]	25.0
			Dichloroethene[1,1-]	47.0
			Methyl-2-pentanone[4-]	10.0
			Methylene Chloride	57.0
			Styrene	95.0
			Tetrachloroethene	180
			Toluene	1400
			Trichloro-1,2,2-trifluoroethane[1,1,2-]	63.0
			Trichloroethane[1,1,1-]	750
			Trichloroethene	210
			Trichlorofluoromethane	150
			Xylene[1,3-]+Xylene[1,4-]	7.40
54-24373	65–67	MD54-05-60305	Acetone	128
			Butanone[2-]	3.83
			Chloroform	9.76
			Dichlorodifluoromethane	939
			Dichloroethane[1,1-]	13.8
			Dichloroethene[1,1-]	31.7
			Dichloropropane[1,2-]	55.4
			Methylene Chloride	149
			Tetrachloroethene	94.9
			Toluene	3.50
			Trichloro-1,2,2-trifluoroethane[1,1,2-]	605
			Trichloroethane[1,1,1-]	1200
			Trichloroethene	69.8
			Trichlorofluoromethane	1460
	187–189	MD54-05-60304	Acetone	28.5
			Dichlorodifluoromethane	203
			Dichloroethene[1,1-]	5.55
			Dichloropropane[1,2-]	9.24

Table 6.6-1 (continued)

Borehole Location	Depth (ft)	Sample ID	Analyte	Result (µg/m³)
54-24373 (continued)			Methylene Chloride	25.0
			Tetrachloroethene	18.3
			Toluene	4.90
			Trichloro-1,2,2-trifluoroethane[1,1,2-]	115
			Trichloroethane[1,1,1-]	229
			Trichloroethene	10.2
			Trichlorofluoromethane	270
54-24374	10–12	MD54-05-60306	Dichloroethane[1,1-]	117
			Methylene Chloride	41.7
			Tetrachloroethene	217
			Trichloro-1,2,2-trifluoroethane[1,1,2-]	4290 (J)
			Trichloroethane[1,1,1-]	8720
			Trichloroethene	193
			Trichlorofluoromethane	101
	139–141	MD54-05-60307	Acetone	228
			Dichloroethane[1,1-]	93.0
			Dichloroethene[1,1-]	365
			Dichloropropane[1,2-]	69.3
			Methylene Chloride	29.5
			Tetrachloroethene	183
			Toluene	32.0
			Trichloro-1,2,2-trifluoroethane[1,1,2-]	1990 (J)
			Trichloroethane[1,1,1-]	5180
			Trichloroethene	274
			Trichlorofluoromethane	101
54-24375	30–32	MD54-05-60309	Dichloroethane[1,1-]	485
			Dichloroethene[1,1-]	1470
			Tetrachloroethene	11500
			Toluene	181
			Trichloro-1,2,2-trifluoroethane[1,1,2-]	9190 (J)
			Trichloroethane[1,1,1-]	43100
			Trichloroethene	1130
			Trichlorofluoromethane	500
	157–159	MD54-05-60308	Dichloroethane[1,1-]	380
			Dichloroethene[1,1-]	1820
			Methylene Chloride	104
			Tetrachloroethene	11500
			Toluene	162

Table 6.6-1 (continued)

Borehole Location	Depth (ft)	Sample ID	Analyte	Result (µg/m³)
54-24375 (continued)			Trichloro-1,2,2-trifluoroethane[1,1,2-]	8420 (J)
			Trichloroethane[1,1,1-]	36000
			Trichloroethene	1400
			Trichlorofluoromethane	511
54-24376	35–37	MD54-05-60311	Dichloroethane[1,1-]	129
			Dichloroethene[1,1-]	246
			Styrene	93.7
			Tetrachloroethene	149
			Toluene	565
			Trichloro-1,2,2-trifluoroethane[1,1,2-]	1230 (J+)
			Trichloroethane[1,1,1-]	6000
			Trichloroethene	258
			Trichlorofluoromethane	78.6
	158–160	MD54-05-60310	Acetone	49.9
			Butanone[2-]	5.89
			Dichloroethane[1,1-]	64.7
			Dichloroethene[1,1-]	166
			Methyl-2-pentanone[4-]	16.4
			Styrene	119
			Tetrachloroethene	74.6
			Toluene	1020
			Trichloro-1,2,2-trifluoroethane[1,1,2-]	421 (J+)
			Trichloroethane[1,1,1-]	2340
			Trichloroethene	161
			Trichlorofluoromethane	33.7
54-24377	45–47	MD54-05-60313	Dichloroethane[1,1-]	76.9
			Dichloroethene[1,1-]	234
			Methylene Chloride	12.8
			Styrene	123
			Tetrachloroethene	122
			Toluene	603
			Trichloro-1,2,2-trifluoroethane[1,1,2-]	1380 (J+)
			Trichloroethane[1,1,1-]	3540
			Trichloroethene	215
			Trichlorofluoromethane	73.0
	150–152	MD54-05-60312	Acetone	57.0
			Butanone[2-]	9.43
			Dichloroethane[1,1-]	48.5

Table 6.6-1 (continued)

Borehole Location	Depth (ft)	Sample ID	Analyte	Result (µg/m³)
54-24377 (continued)			Dichloroethene[1,1-]	178
			Methyl-2-pentanone[4-]	19.2
			Methylene Chloride	8.33
			Styrene	145
			Tetrachloroethene	67.8
			Toluene	1280
			Trichloro-1,2,2-trifluoroethane[1,1,2-]	758 (J+)
			Trichloroethane[1,1,1-]	2020
			Trichloroethene	134
			Trichlorofluoromethane	43.2
			Xylene[1,3-]+Xylene[1,4-]	13.0
54-24378	30–32	MD54-05-60315	Dichloroethane[1,1-]	7280
			Dichloroethene[1,1-]	5550
			Trichloro-1,2,2-trifluoroethane[1,1,2-]	22200 (J)
			Trichloroethane[1,1,1-]	464000
			Trichloroethene	4080
	136–138	MD54-05-60314	Dichloroethane[1,1-]	12900
			Dichloroethene[1,1-]	13900
			Trichloro-1,2,2-trifluoroethane[1,1,2-]	28300 (J)
			Trichloroethane[1,1,1-]	709000
			Trichloroethene	7520
54-24379	20–22	MD54-05-60317	Dichloroethane[1,1-]	1460
			Dichloroethene[1,1-]	3650
			Tetrachloroethene	664
			Toluene	279
			Trichloro-1,2,2-trifluoroethane[1,1,2-]	375 (J)
			Trichloroethane[1,1,1-]	32700
			Trichloroethene	1240
	144–146	MD54-05-60316	Dichloroethane[1,1-]	6070
			Dichloroethene[1,1-]	15100
			Tetrachloroethene	2030
			Trichloro-1,2,2-trifluoroethane[1,1,2-]	1530 (J)
			Trichloroethane[1,1,1-]	98200
			Trichloroethene	4780
54-24380	20–22	MD54-05-60319	Chloroform	1850
			Dichloroethane[1,1-]	295
			Dichloroethene[1,1-]	396
			Tetrachloroethene	813

Table 6.6-1 (continued)

Borehole Location	Depth (ft)	Sample ID	Analyte	Result (µg/m³)
54-24380 (continued)			Toluene	128
			Trichloro-1,2,2-trifluoroethane[1,1,2-]	2990 (J+)
			Trichloroethane[1,1,1-]	14700
			Trichloroethene	3440
			Trichlorofluoromethane	163
	155–157	MD54-05-60318	Chloroform	683
			Dichloroethane[1,1-]	445
			Dichloroethene[1,1-]	753
			Methylene Chloride	79.8
			Styrene	76.6
			Tetrachloroethene	813
			Toluene	716
			Trichloro-1,2,2-trifluoroethane[1,1,2-]	2990 (J+)
			Trichloroethane[1,1,1-]	16900
			Trichloroethene	4030
			Trichlorofluoromethane	236
54-24381	15–17	MD54-05-60321	Dichloroethane[1,1-]	1660
			Dichloroethene[1,1-]	3800
			Tetrachloroethene	949
			Toluene	309
			Trichloroethane[1,1,1-]	54500
			Trichloroethene	462
	143–145	MD54-05-60320	Dichloroethane[1,1-]	1780
			Dichloroethene[1,1-]	5150
			Tetrachloroethene	746
			Toluene	377
			Trichloroethane[1,1,1-]	51300
			Trichloroethene	537
54-24382	28–29	MD54-05-60323	Chloroform	57.0
			Dichloroethane[1,1-]	950
			Dichloroethene[1,1-]	1100
			Ethanol	59.0 (J)
			Tetrachloroethene	310
			Trichloroethane[1,1,1-]	8400
			Trichloroethene	90.0
	107–109	MD54-05-60322	Acetone	83.0 (J)
			Butanone[2-]	8.50
			Chloroform	8.60

Table 6.6-1 (continued)

Borehole Location	Depth (ft)	Sample ID	Analyte	Result (µg/m³)
54-24382 (continued)			Dichloroethane[1,1-]	180
			Dichloroethane[1,2-]	9.00
			Dichloroethene[1,1-]	170
			Methylene Chloride	5.30
			n-Heptane	8.90
			Propanol[2-]	47.0
			Styrene	400
			Tetrachloroethene	37.0
			Toluene	44.0
			Trichloroethane[1,1,1-]	1100
			Trichloroethene	18.0
			Vinyl Chloride	2.90
			Xylene[1,3-]+Xylene[1,4-]	15.0
54-24383	10–11	MD54-05-60324	Acetone	23.0 (J)
			Butanol[1-]	13.0
			Butanone[2-]	4.30
			Dichloroethane[1,1-]	7.60
			Dichloroethene[1,1-]	13.0
			Ethyltoluene[4-]	13.0
			Styrene	8.10
			Trichloroethane[1,1,1-]	80.0
			Trimethylbenzene[1,2,4-]	10.0
			Xylene[1,3-]+Xylene[1,4-]	13.0
	107–109	MD54-05-60359	Acetone	27.0 (J)
			Butanone[2-]	2.80
			Dichloroethane[1,1-]	52.0
			Dichloroethene[1,1-]	95.0
			Propanol[2-]	8.90
			Styrene	220
			Tetrachloroethene	44.0
			Toluene	30.0
			Trichloroethane[1,1,1-]	440
			Trichloroethene	12.0
			Xylene[1,3-]+Xylene[1,4-]	8.40
54-24384	10–12	MD54-05-60327	Acetone	58.0 (J)
			Dichloroethane[1,1-]	4.40
			Dichloroethene[1,1-]	9.20
			Propanol[2-]	77.0

Table 6.6-1 (continued)

Borehole Location	Depth (ft)	Sample ID	Analyte	Result (µg/m³)
54-24384 (continued)			Styrene	130
			Toluene	32.0
			Trichloroethane[1,1,1-]	68.0
			Trichloroethene	47.0
			Xylene[1,3-]+Xylene[1,4-]	12.0
	65–67	MD54-05-60326	Acetone	112
			Dichloroethane[1,1-]	113
			Dichloroethene[1,1-]	285
			Hexane	5.64
			Methyl-2-pentanone[4-]	16.8
			Tetrachloroethene	42.0
			Toluene	10.2
			Trichloro-1,2,2-trifluoroethane[1,1,2-]	60.5
			Trichloroethane[1,1,1-]	1960
			Trichloroethene	41.9
			Xylene[1,3-]+Xylene[1,4-]	16.5
54-24385	30–32	MD54-05-60329	Dichloroethane[1,1-]	3880
			Dichloroethene[1,1-]	5550
			Tetrachloroethene	5630
			Toluene	162
			Trichloro-1,2,2-trifluoroethane[1,1,2-]	1070 (J+)
			Trichloroethane[1,1,1-]	65400
			Trichloroethene	859
	134–136	MD54-05-60328	Dichloroethane[1,1-]	5660
			Dichloroethene[1,1-]	8320
			Tetrachloroethene	4880
			Trichloro-1,2,2-trifluoroethane[1,1,2-]	1070 (J+)
			Trichloroethane[1,1,1-]	70900
			Trichloroethene	1130
54-24386	35–37	MD54-05-60331	Dichloroethane[1,1-]	4040
			Dichloroethene[1,1-]	4750
			Tetrachloroethene	1150
			Trichloro-1,2,2-trifluoroethane[1,1,2-]	996 (J+)
			Trichloroethane[1,1,1-]	98200
			Trichloroethene	1020
	156–158	MD54-05-60330	Dichloroethane[1,1-]	33200
			Dichloroethene[1,1-]	59400
			Tetrachloroethene	5490

Table 6.6-1 (continued)

Borehole Location	Depth (ft)	Sample ID	Analyte	Result (µg/m³)
54-24386 (continued)			Trichloro-1,2,2-trifluoroethane[1,1,2-]	5440 (J+)
			Trichloroethane[1,1,1-]	447000
			Trichloroethene	8590
54-24387	10–11	MD54-05-60333	Acetone	51.0 (J)
			Butanone[2-]	5.50
			Dichloroethene[1,1-]	5.00
			Ethyltoluene[4-]	13.0
			Styrene	16.0
			Toluene	7.80
			Trichloroethane[1,1,1-]	41.0
			Trichloroethene	20.0
			Trimethylbenzene[1,2,4-]	23.0
			Trimethylbenzene[1,3,5-]	5.50
			Xylene[1,2-]	5.80
			Xylene[1,3-]+Xylene[1,4-]	14.0
	80–82	MD54-05-60332	Acetone	123
			Butanone[2-]	9.43
			Dichloroethane[1,1-]	5.66
			Dichloroethene[1,1-]	7.53
			Ethanol	9.04
			Hexane	7.75
			Methyl-2-pentanone[4-]	9.83
			Toluene	13.9
			Trichloroethane[1,1,1-]	65.4
			Trichloroethene	29.0
			Trimethylbenzene[1,2,4-]	4.91
			Xylene[1,3-]+Xylene[1,4-]	20.8
54-24388	25–27	MD54-05-60335	Dichloroethane[1,1-]	2180
			Dichloroethene[1,1-]	2810
			Tetrachloroethene	2030
			Trichloro-1,2,2-trifluoroethane[1,1,2-]	5590 (J)
			Trichloroethane[1,1,1-]	125000
			Trichloroethene	2850
	129–131	MD54-05-60334	Dichloroethane[1,1-]	2670
			Dichloroethene[1,1-]	5150
			Tetrachloroethene	1970
			Trichloro-1,2,2-trifluoroethane[1,1,2-]	7350 (J)

Table 6.6-1 (continued)

Borehole Location	Depth (ft)	Sample ID	Analyte	Result (µg/m³)
54-24388 (continued)			Trichloroethane[1,1,1-]	125000
			Trichloroethene	4190
54-24389	20–22	MD54-05-60337	Acetone	13.0 (J)
			Butanone[2-]	15.0
			Carbon Tetrachloride	16.0
			Chloroform	21.0
			Dichlorodifluoromethane	22.0
			Dichloroethane[1,1-]	28.0
			Dichloroethene[1,1-]	82.0
			Methyl-2-pentanone[4-]	7.90
			Styrene	85.0
			Tetrachloroethene	630
			Toluene	1200
			Trichloro-1,2,2-trifluoroethane[1,1,2-]	320
			Trichloroethane[1,1,1-]	1700
			Trichloroethene	460
			Trichlorofluoromethane	12.0
			Xylene[1,3-]+Xylene[1,4-]	6.60
	147–149	MD54-05-60336	Acetone	35.0 (J)
			Butanone[2-]	28.0
			Carbon Tetrachloride	23.0
			Chloroform	42.0
			Dichlorodifluoromethane	110
			Dichloroethane[1,1-]	92.0
			Dichloroethene[1,1-]	310
			Methyl-2-pentanone[4-]	14.0
			Methylene Chloride	27.0
			Styrene	70.0
			Tetrachloroethene	920
			Toluene	2600
			Trichloro-1,2,2-trifluoroethane[1,1,2-]	590
			Trichloroethane[1,1,1-]	3700
			Trichloroethene	1100
			Trichlorofluoromethane	57.0
54-24390	30–32	MD54-05-60339	Dichloroethane[1,1-]	2180
			Dichloroethene[1,1-]	3250
			Tetrachloroethene	1360
			Toluene	365

Table 6.6-1 (continued)

Borehole Location	Depth (ft)	Sample ID	Analyte	Result (µg/m³)
54-24390 (continued)			Trichloro-1,2,2-trifluoroethane[1,1,2-]	21400 (J)
			Trichloroethane[1,1,1-]	142000
	158–160	MD54-05-60338	Dichloroethane[1,1-]	1420
			Dichloroethene[1,1-]	3680
			Tetrachloroethene	2370
			Toluene	678
			Trichloro-1,2,2-trifluoroethane[1,1,2-]	19100 (J)
			Trichloroethane[1,1,1-]	109000
			Trichloroethene	644
54-24391	25–27	MD54-05-60341	Dichloroethane[1,1-]	324
			Dichloroethene[1,1-]	325
			Styrene	97.9
			Tetrachloroethene	2780
			Toluene	377
			Trichloro-1,2,2-trifluoroethane[1,1,2-]	1530 (J+)
			Trichloroethane[1,1,1-]	22400
			Trichloroethene	140
			Trichlorofluoromethane	432
	165–167	MD54-05-60340	Dichloroethane[1,1-]	186
			Dichloroethene[1,1-]	475
			Styrene	72.4
			Tetrachloroethene	949
			Toluene	829
			Trichloro-1,2,2-trifluoroethane[1,1,2-]	1150 (J+)
			Trichloroethane[1,1,1-]	7630
			Trichloroethene	193
			Trichlorofluoromethane	376
54-24392	25–27	MD54-05-60343	Acetone	13.0 (J)
			Butanone[2-]	12.0
			Dichlorodifluoromethane	20.0
			Dichloroethane[1,1-]	14.0
			Dichloroethene[1,1-]	40.0
			Methyl-2-pentanone[4-]	6.40
			Styrene	60.0
			Tetrachloroethene	140
			Toluene	880
			Trichloro-1,2,2-trifluoroethane[1,1,2-]	31.0
			Trichloroethane[1,1,1-]	580

Table 6.6-1 (continued)

Borehole Location	Depth (ft)	Sample ID	Analyte	Result (µg/m³)
54-24392 (continued)			Trichloroethene	150
			Trichlorofluoromethane	12.0
			Xylene[1,3-]+Xylene[1,4-]	4.60
	144–146	MD54-05-60342	Acetone	36.0 (J)
			Butanone[2-]	18.0
			Carbon Disulfide	4.50
			Chloroform	10.0
			Dichlorodifluoromethane	100
			Dichloroethane[1,1-]	35.0
			Dichloroethene[1,1-]	170
			Methyl-2-pentanone[4-]	8.20
			Methylene Chloride	4.80
			Styrene	66.0
			Tetrachloroethene	210
			Toluene	970
			Trichloro-1,2,2-trifluoroethane[1,1,2-]	190
			Trichloroethane[1,1,1-]	1300
			Trichloroethene	220
			Trichlorofluoromethane	51.0
			Xylene[1,3-]+Xylene[1,4-]	14.0
54-24393	35–37	MD54-05-60345	Chlorodifluoromethane	3890
			Chloroform	29.3
			Dichlorodifluoromethane	1930
			Dichloroethane[1,1-]	190
			Dichloroethene[1,1-]	174
			Styrene	59.6
			Tetrachloroethene	305
			Toluene	414
			Trichloro-1,2,2-trifluoroethane[1,1,2-]	4370 (J)
			Trichloroethane[1,1,1-]	4420
			Trichloroethene	156
			Trichlorofluoromethane	1120
			Xylene[1,3-]+Xylene[1,4-]	60.8
	156–158	MD54-05-60344	Chlorodifluoromethane	2050
			Chloroform	18.1
			Dichlorodifluoromethane	2080
			Dichloroethane[1,1-]	194
			Dichloroethene[1,1-]	317

Table 6.6-1 (continued)

Borehole Location	Depth (ft)	Sample ID	Analyte	Result (µg/m³)
54-24393 (continued)			Methylene Chloride	13.9
			Styrene	15.8
			Tetrachloroethene	393
			Toluene	226
			Trichloro-1,2,2-trifluoroethane[1,1,2-]	4440 (J)
			Trichloroethane[1,1,1-]	4800
			Trichloroethene	193
			Trichlorofluoromethane	1240
54-24394	50–52	MD54-05-61749	Chloroform	150
			Dichlorodifluoromethane	1100
			Dichloroethane[1,1-]	1600
			Dichloroethene[1,1-]	930
			Tetrachloroethene	640
			Toluene	95.0
			Trichloro-1,2,2-trifluoroethane[1,1,2-]	21000
			Trichloroethane[1,1,1-]	18000
			Trichloroethene	32000
			Trichlorofluoromethane	2200
	163–165	MD54-05-61748	Chloroform	120
			Dichlorodifluoromethane	1900
			Dichloroethane[1,1-]	960
			Dichloroethene[1,1-]	740
			Methylene Chloride	46.0
			Tetrachloroethene	580
			Toluene	120
			Trichloro-1,2,2-trifluoroethane[1,1,2-]	9200
			Trichloroethane[1,1,1-]	13000
			Trichloroethene	12000
			Trichlorofluoromethane	2500
54-24395	40–42	MD54-05-60349	Bromodichloromethane	26.1
			Chloroform	73.2
			Dichlorodifluoromethane	1580
			Dichloroethane[1,1-]	48.5
			Methylene Chloride	11.8
			Tetrachloroethene	183
			Trichloro-1,2,2-trifluoroethane[1,1,2-]	5280 (J)
			Trichloroethane[1,1,1-]	4360
			Trichloroethene	134

Table 6.6-1 (continued)

Borehole Location	Depth (ft)	Sample ID	Analyte	Result (µg/m³)
54-24395 (continued)			Trichlorofluoromethane	3870
	170–172	MD54-05-60348	Acetone	112
			Bromodichloromethane	23.4
			Chloroform	48.8
			Dichlorodifluoromethane	1090
			Dichloroethane[1,1-]	34.4
			Dichloropropane[1,2-]	18.0
			Methanol	301
			Methylene Chloride	30.9
			Tetrachloroethene	149
			Trichloro-1,2,2-trifluoroethane[1,1,2-]	2680 (J)
			Trichloroethane[1,1,1-]	2560
			Trichloroethene	172
			Trichlorofluoromethane	2250
54-24396	10–12	MD54-05-60351	Acetone	126
			Dichloroethane[1,1-]	80.9
			Dichloroethene[1,1-]	242
			Dichloropropane[1,2-]	24.5
			Methylene Chloride	16.7
			Tetrachloroethene	156
			Trichloro-1,2,2-trifluoroethane[1,1,2-]	1530 (J)
			Trichloroethane[1,1,1-]	4470
			Trichloroethene	231
			Trichlorofluoromethane	61.8
	131–133	MD54-05-60350	Acetone	109
			Dichloroethane[1,1-]	166
			Dichloroethene[1,1-]	674
			Dichloropropane[1,2-]	32.3
			Methylene Chloride	34.7
			Tetrachloroethene	291
			Trichloro-1,2,2-trifluoroethane[1,1,2-]	2530 (J)
			Trichloroethane[1,1,1-]	7090
			Trichloroethene	537
			Trichlorofluoromethane	157
54-24397	15–17	MD54-05-60353	Acetone	209
			Butanone[2-]	7.37
			Dichloroethane[1,1-]	36.0
			Dichloroethene[1,1-]	119

Table 6.6-1 (continued)

Borehole Location	Depth (ft)	Sample ID	Analyte	Result (µg/m³)
54-24397 (continued)			Dichloropropane[1,2-]	17.1
			Methylene Chloride	10.1
			Tetrachloroethene	94.9
			Trichloro-1,2,2-trifluoroethane[1,1,2-]	1380 (J+)
			Trichloroethane[1,1,1-]	2290
			Trichloroethene	80.6
			Trichlorofluoromethane	44.4
	125–127	MD54-05-60352	Acetone	147
			Butanone[2-]	7.37
			Dichloroethane[1,1-]	44.5
			Dichloroethene[1,1-]	214
			Dichloropropane[1,2-]	20.3
			Methylene Chloride	11.1
			Tetrachloroethene	81.3
			Toluene	13.6
			Trichloro-1,2,2-trifluoroethane[1,1,2-]	1150 (J+)
			Trichloroethane[1,1,1-]	2400
			Trichloroethene	107
			Trichlorofluoromethane	67.4
54-24523	485–700	MD54-05-60366	Acetone	71.2
			Butanone[2-]	5.89
			Toluene	7.53

Note: See Appendix A for data qualifier definitions.

Table 6.6-2
Tritium Detected in Pore-Gas Samples at MDA G

Borehole Location	Depth (ft)	Sample ID	Result	Units
54-24361	30–32	MD54-05-61531	11890	pCi/L
	138–140	MD54-05-61530	3126	pCi/L
54-24362	35–37	MD54-05-61533	35630	pCi/L
	135–137	MD54-05-61532	24720	pCi/L
54-24363	12–14	MD54-05-61534	22510	pCi/L
54-24364	65–67	MD54-05-61537	5254	pCi/L
	130–132	MD54-05-61536	5846	pCi/L
54-24366	12–14	MD54-05-61538	37910	pCi/L
54-24367	30–31	MD54-05-61541	81190	pCi/L
	153–155	MD54-05-61540	7601	pCi/L
54-24368	95–97	MD54-05-61543	1886	pCi/L
	192–194	MD54-05-61542	3331	pCi/L
54-24369	65–67	MD54-05-61545	17310	pCi/L
	184–186	MD54-05-61544	3827	pCi/L
54-24371	40–42	MD54-05-61549	4515	pCi/L
	141–143	MD54-05-61548	8148	pCi/L
54-24372	55–57	MD54-05-61551	6210	pCi/L
	185–187	MD54-05-61550	6022	pCi/L
54-24373	65–67	MD54-05-60305	5700	pCi/L
	187–189	MD54-05-60304	1910	pCi/L
54-24374	10–12	MD54-05-61555	2659000	pCi/L
	139–141	MD54-05-61554	206800	pCi/L
54-24375	30–32	MD54-05-61557	6584	pCi/L
	157–159	MD54-05-61556	2135	pCi/L
54-24376	158–160	MD54-05-61558	26350	pCi/L
54-24377	150–152	MD54-05-61560	18810	pCi/L
54-24378	30–32	MD54-05-61563	3512000	pCi/L
	136–138	MD54-05-61562	1119000	pCi/L
54-24379	20–22	MD54-05-61565	3844	pCi/L
	144–146	MD54-05-61564	25410	pCi/L
54-24380	20–22	MD54-05-61567	2381	pCi/L
	155–157	MD54-05-61566	2131	pCi/L
54-24381	15–17	MD54-05-61569	4761	pCi/L
	143–145	MD54-05-61568	3614	pCi/L
54-24382	28–29	MD54-05-61571	2597	pCi/L
	107–109	MD54-05-61570	6406	pCi/L
54-24383	10–11	MD54-05-60325	1965	pCi/L

Table 6.6-2 (continued)

Borehole Location	Depth (ft)	Sample ID	Result	Units
54-24384	10–12	MD54-05-60327	7183	pCi/L
	65–67	MD54-05-60326	479	pCi/L
54-24385	30–32	MD54-05-61577	395300	pCi/L
	134–136	MD54-05-61576	13320	pCi/L
54-24386	35–37	MD54-05-61579	6963000	pCi/L
	156–158	MD54-05-61578	172100	pCi/L
54-24387	10–11	MD54-05-60333	2763	pCi/L
54-24388	25–27	MD54-05-61583	124200	pCi/L
54-24389	20–22	MD54-05-61584	6872	pCi/L
	147–149	MD54-05-61585	3953	pCi/L
54-24390	30–32	MD54-05-61587	5480	pCi/L
	158–160	MD54-05-61586	1888	pCi/L
54-24391	25–27	MD54-05-61589	4357	pCi/L
	165–167	MD54-05-61588	7632	pCi/L
54-24392	25–27	MD54-05-61591	7193	pCi/L
	144–146	MD54-05-61590	4837	pCi/L
54-24393	35–37	MD54-05-61593	1489	pCi/L
54-24394	163–165	MD54-05-61594	1458	pCi/L
54-24396	131–133	MD54-05-61598	17680	pCi/L
54-24397	15–17	MD54-05-61601	1257000	pCi/L
54-25105	485–700	MD54-05-61604	5150	pCi/L

Table 6.7-1
Summary of Subsurface Soil and Rock Samples from BH 1 (54-24360)

Actual Analytical Sample Depth (ft)	Matrix	Sample ID	Sample Type
60–65	QBT1v	MD54-05-57871	Metals+Cn+B+Mo, AM+GS+U+PU+TH+SR90+TC99, Nitrate & Perchlorate, dioxins/furans, VOCs
60–65	QBT1v	MD54-05-57878	Field Dup (metals+Cn+B+Mo, AM+GS+U+PU+TH+SR90+TC99, Nitrate & Perchlorate, dioxins/furans, VOCs)
135–138	QCT	MD54-05-57872	Metals+Cn+B+Mo, AM+GS+U+PU+TH+SR90+TC99, Nitrate & Perchlorate
195–200	QBO	MD54-05-57873	Metals+Cn+B+Mo, AM+GS+U+PU+TH+SR90+TC99, Nitrate & Perchlorate, HE

Table 6.7-2
Summary of Pore-Gas Samples from BH 1 (54-24360)

Actual Analytical Sample Depth (ft)	Matrix	Sample ID	Laboratory Analytical Sample Type	Field Screening
29–31	Qbt2	MD54-05-63415	SUMMA Canister: VOCs Silica Gel Column: Tritium	Landtec: CH_4, CO_2, O_2
		MD54-05-63416	Field Duplicate: SUMMA Canister: VOCs Silica Gel Column: Tritium	Landtec: CH_4, CO_2, O_2
155–157	Qbt 1g	MD54-05-63413	SUMMA Canister: VOCs Silica Gel Column: Tritium	Landtec: CH_4, CO_2, O_2
		MD54-05-63414	Field Duplicate: SUMMA Canister: VOCs Silica Gel Column: Tritium	Landtec: CH_4, CO_2, O_2
n/a	n/a	MD54-05-63417	Equipment Blank: SUMMA Canister: VOCs Silica Gel Column: Tritium	n/a
n/a	n/a	MD54-05-63418	Equipment Blank: SUMMA Canister: VOCs Silica Gel Column: Tritium	n/a

*n/a = Not applicable.

Table 6.7-3
Preliminary Tritium Detects in Pore Gas from BH 1 (54-24360)

Sample ID	Depth (ft)	Analyte	Result	Units
MD54-05-63415	29–31	Tritium	2484	pCi/L
MD54-05-63413	155–157	Tritium	2182	pCi/L

Note: Results have not been validated in accordance with Laboratory QA/QC procedures.

Table 6.7-4
Preliminary VOCs Detected in Pore Gas from BH 1 (54-24360)

Sample ID	Depth (ft)	Analyte Name	Result (μg/m³)
MD54-05-63415	29–31	1,1,1-Trichloroethane	24000
		1,1-Dichloroethene	1800
		1,1-Dichloroethane	1200
		Tetrachloroethene	950
		Trichloroethene	390
		Toluene	150
		m,p-Xylene	91
MD54-05-63413	155–157	1,1,1-Trichloroethane	9700
		1,1-Dichloroethene	1900
		1,1-Dichloroethane	880
		Toluene	670
		Tetrachloroethene	450
		m,p-Xylene	300
		Benzene	280
		Trichloroethene	260
		Hexane	240
		o-Xylene	120
		cis-1,2-Dichloroethene	110
		Heptane	100
		Ethyl Benzene	80
		Chloroform	75
		Methylene Chloride	36

Note: Results have not been validated in accordance with Laboratory QA/QC procedures.

Table 6.7-5
Preliminary VOCs Detected in
Subsurface Soil and Rock Samples from BH 1 (54-24360)

Sample ID	Depth (ft)	Media	Analyte	Result (mg/kg)
MD54-05-57871	60–65	Qbt 1v	Acetone	0.00815
			Methylene chloride	0.00551

Note: Results have not been validated in accordance with Laboratory QA/QC procedures.

Table 6.7-6
Preliminary Inorganic Chemicals above BVs
in Subsurface Soil and Rock Samples from BH 1 (54-24360)

Sample ID	Depth (ft)	Media	Analyte	BV (mg/kg)	Result (mg/kg)
MD54-05-57871	60–65	Qbt 1v	Molybdenum	na*	0.5
			Nitrate	na	1.14
MD54-05-57872	135–138	Qct	Aluminum	3,560	4960
			Arsenic	0.56	0.708
			Boron	na	1.91
			Chromium	2.6	2.89
			Copper	3.96	4.07
			Molybdenum	na	0.335
			Nitrate	na	0.863
MD54-05-57873	195–200	Qbo	Magnesium	739	812
			Molybdenum	na	0.381
			Nitrate	na	0.856

Note: Results have not been validated in accordance with Laboratory QA/QC procedures.
*na = Not available.

Table 6.7-7
Preliminary Radionuclides above BVs in
Subsurface Soil and Rock Samples from BH 1 (54-24360)

Sample ID	Depth (ft)	Media	Analyte	BV (pCi/g)	Result (pCi/g)
MD54-05-57871	60–65	Qbt 1v	Thorium-228	3.76	3.76
			Uranium-235	0.14	0.157
MD54-05-57872	135–138	Qct	Uranium-235	0.18	0.218
MD54-05-57873	195–200	Qbo	Uranium-235	0.18	0.232

Note: Results have not been validated in accordance with Laboratory QA/QC procedures.

Appendix A

Acronyms, Glossary, and
Metric Conversion and Data Qualifier Definition Tables

A-1.0 ACRONYMS

ACGIH	American Conference of Governmental Industrial Hygienists
AK	acceptable knowledge
AOC	area of concern
asl	above sea level
B&K	Brüel and Krajer
BCF	bioconcentration factor
bgs	below ground surface
BH	borehole
BHC	beta-benzene hexachloride
BV	background value
COPC	chemical of potential concern
COPEC	chemical of potential ecological concern
CME	corrective measures evaluation
CMI	corrective measures implementation
CVOC	chlorinated volatile organic compound
D&D	decontamination and decommissioning
DDD	dichlorodiphenyldichloroethane
DDE	dichlorophenyltrichloroethane
DDT	dichlorodiphenyltrichloroethane
DGPS	differential global-positioning system
DL	detection limit
DOE	U.S. Department of Energy
DOT	Department of Transportation
DU	depleted uranium
ENV-ECR	Environmental Stewardship Division–Environmental Remediation and Characterization
ENV-ERS	Environmental Stewardship Division–Environmental Remediation and Surveillance
EDL	estimated detection limit
EM	electromagnetic
EP	extraction procedure
EPA	U.S. Environmental Protection Agency
EPC	exposure point concentration
EQL	estimated quantitation limit
ER Project	Environmental Restoration Project

ESL	ecological screening level
EZ	exclusion zone
FV	fallout value
FWO	Facility Waste Operations
FY	fiscal year
GPR	ground-penetrating radar
GPS	global-positioning system
HAZWOPER	hazardous waste operations
HE	high explosive
HI	hazard index
HIR	historical investigation report
HQ	hazard quotient
HAS	hollow-stem auger
HSR	Health Safety and Radiation Protection
HSWA	Hazardous and Solid Waste Amendments of 1984
IA	Information Architecture
ICP	inductively coupled plasma
ICPMS	inductively coupled plasma/mass spectrometry
ID	identification
I.D.	inside diameter
IDW	investigation-derived waste
IMP	Implementation Procedure
IR	investigation report
IWD	Integrated Work Document
LANL	Los Alamos National Laboratory
LASL	Los Alamos Scientific Laboratory (designation of the Laboratory before January 1, 1981)
LCS	laboratory control sample
LIG	Laboratory Implementing Guidance
LIR	Laboratory Implementation Requirements
LLW	low-level waste
LPR	Laboratory Performance Requirements
MDA	material disposal area
NIOSH	National Institute of Occupational Safety and Health
NMED	New Mexico Environmental Department

NMEID	New Mexico Environmental Improvement Division (designation of NMED before January 1, 1991)
NMHWA	New Mexico Hazardous Waste Act
NOAEL	no observed adverse effect level
O.D.	outside diameter
OSHA	Occupational Safety and Health Administration
OU	operable unit
PCB	polychlorinated biphenyl
PCE	tetrachloroethene
PID	photoionization detector
PPE	personal protective equipment
PRG	preliminary remediation goal
PVC	polyvinyl chloride
QA	quality assurance
QC	quality control
QP	Quality Procedure
RCRA	Resource Conservation and Recovery Act
RDX	1,3,5-trinitro-1,3,5-triazacyclohexane
RfD	reference dose
RFI	RCRA facility investigation
RPD	relative percent difference
RPF	Records Processing Facility
SAL	screening action level
SAP	sampling and analysis plan
SF	slope factor
SMO	Sample Management Office
SOP	standard operating procedure
SOW	statement of work
SSHASP	site-specific health and safety plan
SSL	soil screening level
SVOC	semivolatile organic compound
SWMU	solid waste management unit
T&E	threatened and endangered
TA	technical area

TAL	target analyte list (EPA)
TCA	1,1,1-trichloroethane
TCE	trichloroethene
TD	total depth
TDSS	total dust suppression system
TNT	trinitrotoluene
TRU	transuranic
TRV	toxicity reference value
UC	University of California
UCL	upper confidence limit
USGS	United States Geological Survey
UTL	upper tolerance limit
VOC	volatile organic compound
WCSF	Waste Characterization Strategy Form
WP	Waste Profile

A-2.0 GLOSSARY

abandonment—The plugging of a well or *borehole* in a manner that precludes the *migration* of surface *runoff* or *groundwater* along the length of the well or borehole.

absorption—The uptake of water, other fluids, or dissolved *chemicals* by a cell or organism (e.g., tree roots absorb dissolved nutrients in *soil*).

accuracy—A measure of the closeness of measurements to the true value of the parameter being measured.

administrative authority—For Los Alamos National Laboratory, one or more regulatory agencies, such as the New Mexico Environment Department, the *U.S. Environmental Protection Agency*, or the *U.S. Department of Energy*, as appropriate.

administrative controls—Nonphysical or nonengineered mechanisms for managing *risks* to human health and the environment. (Also see *institutional controls.*)

adsorption—The surface retention of solid, liquid, or gas molecules, atoms, or ions by a solid.

adverse condition—An all-inclusive term used to reference failures, malfunctions, defective items, and *nonconformances*.

alluvial—Pertaining to geologic deposits or features formed by running water.

alluvium—*Soil* deposited by a river or other running water.

alpha radiation—A form of particle *radiation* that is highly ionizing and has low penetration. Alpha radiation consists of two protons and two neutrons bound together into a particle that is identical to a helium nucleus and can be written as He^{2+}.

analysis—A critical evaluation, usually made by breaking a subject (either material or intellectual) down into its constituent parts, then describing the parts and their relationship to the whole. Analyses may include physical analysis, *chemical analysis*, toxicological analysis, and knowledge-of-process determinations.

analyte—The element, nuclide, or ion a *chemical analysis* seeks to identify and/or quantify; the chemical constituent of interest.

analytical method—A procedure or technique for systematically performing an activity.

annular seal—The material (usually cement *grout* or *bentonite*) placed in the space between a *borehole* wall and a *well casing* for zone isolation. Annular seals are most often used to prevent surface contamination from entering a borehole.

annular space (annulus)—The space between a *borehole* wall and a *well casing*, or the space between a casing pipe and a liner pipe.

anomaly—Deviation or departure from the normal or common order, form, or rule.

anthropogenic—Of, relating to, or resulting from, the influence of human beings on nature.

aquifer—An underground geological formation (or group of formations) containing water that is the source of *groundwater* for wells and *springs*.

area count—An integrated area under a chromatographic peak. The area count is proportional to the amount of compound present in the *aliquot* that is injected into the chromatograph.

area of concern—(1) A *release* that warrants investigation or *remediation*, whether or not it is associated with a specific *solid waste management unit* (SWMU). (2) An area at Los Alamos National Laboratory[0] that may have had a release of a *hazardous waste* or a *hazardous constituent* but is not a SWMU. (Note: Generally, the acronym AOC is used for *area of contamination*.)

area use factor—The ratio of an organism's home range, breeding range, or feeding/foraging range to the *area of contamination* within a *site* under investigation.

artificial fill—A material that has been imported and typically consists of disturbed *soils* mixed with crushed Bandelier Tuff or other rock types.

ash-flow tuff—A *tuff* deposited by a hot, dense volcanic current. Ash-flow tuff can be either *welded tuff* or nonwelded tuff.

assessment—(1) The act of reviewing, inspecting, testing, checking, conducting surveillance, auditing, or otherwise determining and documenting whether items, processes, or services meet specified requirements. (2) An evaluation process used to measure the performance or effectiveness of a system and its elements. In this glossary, assessment is an all-inclusive term used to denote any one of the following: *audit*, *performance evaluation*, management system review, *peer review*, *inspection*, or surveillance.

assessment endpoint—In an ecological *risk assessment*, the expression of an environmental value considered to be at *risk* (e.g., fish *biomass* or reproduction of avian *populations*).

auger flights—Winding metal strips welded to auger sections that carry cuttings to the surface when an auger is rotated.

background concentration—Naturally occurring concentrations of an inorganic *chemical* or *radionuclide* in *soil*, *sediment*, or *tuff*.

background data—Data that represent naturally occurring concentrations of inorganic and *radionuclide* constituents in a geologic *medium*. Los Alamos National Laboratory's (the Laboratory's) background data are derived from *samples* collected at locations that are either within, or adjacent to, the Laboratory. These locations (1) are representative of geological media found within Laboratory boundaries, and (2) have not been affected by Laboratory operations.

background level—(1) The concentration of a substance in an environmental *medium* (air, water, or *soil*) that occurs naturally or is not the result of human activities. (2) In exposure *assessment*, the concentration of a substance in a defined control area over a fixed period of time before, during, or after a data-gathering operation.

background radiation—The amount of *radioactivity* naturally present in the environment, including cosmic rays from space and natural *radiation* from *soils* and rock.

background value (BV)—The *background concentration* of a *chemical* used to represent the background of statistically derived BV in the *upper tolerance limit* (UTL) of the distribution. If a UTL cannot be derived, either the *detection limit* or maximum reported value in the *background data* set is used.

basalt—A fine-grained, dark volcanic rock comprised chiefly of plagioclase, augite, olivine, and magnetite.

bentonite—An absorbent aluminum silicate clay formed from volcanic ash and used in various adhesives, cements, and ceramic fillers. Because bentonite can absorb large quantities of water and expand to several times its normal volume, it is a common drilling mud additive.

beta radiation—High-energy electrons emitted by certain types of radioactive nuclei, such as potassium-40. The beta particles emitted are a form of ionizing *radiation* also known as beta rays.

biomass—The dry weight of living matter (including stored food) that is present in a species *population*. Biomass is expressed in terms of a habitat's given area or volume.

blank—A *sample* that is expected to have a negligible or unmeasurable amount of an *analyte*. Results of blank sample analyses indicate whether *field samples* might have been contaminated during the sample collection, *transport*, storage, preparation, or *analysis* processes.

blind sample—See *single blind sample* and *double blind sample*.

borehole—(1) A hole drilled or bored into the ground, usually for exploratory or economic purposes. (2) A hole into which *casing*, screen, and other materials may be installed to construct a well.

borehole logging—The process of making remote measurements of physical, chemical, or other parameters at multiple depths in a *borehole*.

calibration—A process used to identify the relationship between the true *analyte* concentration or other variable and the response of a measurement instrument, *chemical analysis method*, or other measurement system.

calibration blank—A *calibration standard* prepared to contain negligible or unmeasurable amounts of *analytes*. A calibration blank is used to establish the zero concentration point for analytical measurement *calibrations*.

calibration standard—A *sample* prepared to contain known amounts of *analytes* of interest and other constituents required for an *analysis*.

canyon—A stream-cut chasm or gorge, the sides of which are composed of cliffs or a series of cliffs rising from the canyon's bed. Canyons are characteristic of arid or semiarid regions where downcutting by streams greatly exceeds weathering.

cap—A modern engineered landfill cover that is designed and constructed to minimize or eliminate the release of constituents into the environment.

casing—A solid piece of pipe, typically steel, stainless steel, or polyvinyl chloride (PVC) plastic, used to keep a well open in either unconsolidated material or unstable rock and as a means to contain zone-isolation materials, such as cement *grout* or *bentonite*.

chain of custody—An unbroken, documented trail of accountability that is designed to ensure the uncompromised physical integrity of *samples*, data, and *records*.

chemical—Any naturally occurring or human-made substance characterized by a definite molecular composition, including molecules that contain *radionuclides*.

chemical analysis—A process used to measure one or more attributes of a *sample* in a clearly defined, controlled, and systematic manner. Chemical analysis often requires treating a sample chemically or physically before measurement.

chemical interference—A *chemical* or physical entity whose influence results in a decrease or increase in the response of an *analytical method* or other measurement system relative to the response obtained in the absence of the entity.

chemical of concern—A *chemical* identified as a *risk* during a *site*-specific human-health or ecological *risk assessment*. (Also see *chemical of potential concern*.)

chemical of potential ecological concern—A detected *chemical* compound or element that has the potential to adversely affect ecological *receptors* as a result of its concentration, distribution, and toxicity. (Also see *chemical of potential concern*.)

cleanup levels—Media-specific *contaminant* concentration levels that must be met by a selected *corrective action*. Cleanup levels are established by using criteria such as the protection of human health and the environment; compliance with regulatory requirements; reduction of toxicity, mobility, or volume through *treatment*; long- and short-term effectiveness; implementability; and cost.

Code of Federal Regulations (CFR)—A *document* that codifies all rules of the executive departments and agencies of the federal government. The code is divided into 50 volumes, known as titles. Title 40 of the CFR (referenced as 40 CFR) covers environmental regulations.

cold vapor atomic absorption—An analytical technique used for measuring mercury which is described in *U.S. Environmental Protection Agency* Methods 7470A ("Mercury in Liquid Waste") and 7471A ("Mercury in Solid or Semisolid Waste"). The technique is based on the *absorption* of nonionizing *radiation* at 253.7 nanometers (nm) by mercury vapor. The mercury is reduced to the elemental state and aerated from solution in a closed system. The mercury vapor passes through a cell positioned in the light path of an atomic absorption spectrophotometer. Absorbance (peak height) is measured as a function of mercury concentration.

colluvium—A loose deposit of rock debris accumulated through the action of gravity at the base of a cliff or *slope*.

comparability—A qualitative measure of the degree to which one item or data set can be compared with another.

Compliance Order on Consent (Consent Order)—For the *Environmental Restoration Project*, an enforcement *document* signed by the New Mexico Environment Department, the *U.S. Department of Energy*, and the University of California on March 1, 2005, which prescribes the requirements for *corrective action* at Los Alamos National Laboratory. The purposes of the Consent Order are (1) to define the nature and extent of *releases* of *contaminants* at, or from, the *facility*; (2) to identify and evaluate, where needed, alternatives for *corrective measures* to clean up contaminants in the environment and prevent or mitigate the *migration* of contaminants at, or from, the facility; and (3) to implement such corrective measures. The Consent Order supersedes the corrective action requirements previously specified in Module VIII of the *Hazardous Waste Facility Permit*.

composite sample—A *sample* collected over a temporal or spatial range that typically consists of a series of discrete equal samples which have been combined or composited.

conceptual hydrogeologic model—An approximation of the occurrence, movement, and quality of *groundwater* in a given area and the relationship of that groundwater to the surface water, *soil water*, and geologic framework in that area.

conceptual model—See *site conceptual model*.

Consent Order—See *Compliance Order on Consent*.

construction worker scenario—A scenario that evaluates exposures to a human *receptor* throughout a construction project. The activities typically involve substantial short-term on-site exposures.

contaminant—(1) Any *chemical* (including *radionuclides*) present in environmental media or on structural debris above *background levels*. (2) According to the *Compliance Order on Consent*, any *hazardous waste* listed or identified as characteristic in 40 Code of Federal Regulations (CFR) 261 (incorporated by 20.4.1.200 New Mexico Administrative Code [NMAC]); any *hazardous constituent* listed in 40 CFR 261 Appendix VIII (incorporated by 20.4.1.200 NMAC) or 40 CFR 264 Appendix IX (incorporated by 20.4.1.500 NMAC); any *groundwater* contaminant listed in the Water Quality Control Commission (WQCC) Regulations at 20.6.3.3103 NMAC; any *toxic pollutant* listed in the WQCC Regulations at 20.6.2.7 NMAC; explosive compounds; nitrate; and perchlorate. (Note: Under the *Compliance Order on Consent*, the term "contaminant" does not include radionuclides or the radioactive portion of *mixed waste*.)

continuing calibration—A combination of *calibration blank* and check standards used to determine if an instrument's response to an analyte concentration is within acceptable bounds relative to its *initial calibration*. A continuing calibration is performed every 12 hr of operation or every 10 injections, depending on the analytical test method, thus verifying the satisfactory performance of an instrument on a day-to-day basis. The continuing-calibration 12-hr period assumes that the instrument has not been shut down since the initial calibration.

contract analytical laboratory—An analytical laboratory under contract to the University of California to analyze samples from work performed at Los Alamos National Laboratory.

controlled area—An indoor or outdoor Los Alamos National Laboratory area to which access is controlled for security reasons or for the protection of individuals from exposure to *radiation* and/or hazardous materials.

corrective action—(1) In the *Resource Conservation and Recovery Act*, an action taken to rectify conditions potentially adverse to human health or the environment. (2) In the *quality assurance* field, the process of rectifying and preventing *nonconformances*. (Also see *accelerated corrective action*.)

corrective measure—An action taken at a *solid waste management unit* or *area of concern* to protect human health or the environment in the event of a *release* of *contaminants* into the environment. (Also see *accelerated corrective measure*.)

corrective measure evaluation—An evaluation of potential remedial alternatives undertaken to identify a preferred remedy that will be protective of human health and the environment and that will attain appropriate *cleanup* goals.

Curie—A unit of *radioactivity* defined as the quantity of any radioactive nuclide that has an activity of 3.7×10^{10} disintegrations per second (dps).

daily calibration—The combination of a *calibration blank* and *calibration standard* used to determine if the instrument response to an *analyte* concentration is within acceptable bounds relative to the *initial calibration*. A daily *calibration* establishes the instrument response factors on which quantitations are based, thus verifying the satisfactory performance of an instrument on a day-to-day basis.

data package—The hard copy deliverable for each sample delivery group produced by a *contract analytical laboratory* in accordance with the statement of work for analytical services.

data quality assessment—The statistical and/or scientific evaluation of a data set that establishes whether the data set is adequate for its intended use.

data validation—A systematic process that applies a defined set of performance-based criteria to a body of data and that may result in the *qualification* of the data. The data-validation process is performed independently of the analytical laboratory that generates the data set and occurs before conclusions are drawn from the data. The process may comprise a standardized data review (*routine data validation*) and/or a problem-specific data review (*focused data validation*).

data verification—The process of evaluating the completeness, correctness, consistency, and compliance of a laboratory *data package* against a specified standard or contract.

- Completeness: All required information is present—in both hard copy and electronic forms.
- Correctness: The reported results are based on properly documented and correctly applied algorithms.
- Consistency: The values are the same when they appear in different reports or are transcribed from one report to another.
- Compliance: The data pass numerical *quality control* tests based on parameters or limits specified in a contract or in an auxiliary *document*.

decontamination—The removal of unwanted material from the surface of, or from within, another material.

detect (detection)—An analytical result, as reported by an analytical laboratory, that denotes a *chemical* or *radionuclide* to be present in a *sample* at a given concentration.

detection limit—The minimum concentration that can be determined by a single measurement of an instrument. A detection limit implies a specified statistical confidence that the analytical concentration is greater than zero.

disposal—The *discharge*, deposit, injection, dumping, spilling, leaking, or placing of any *solid waste* or *hazardous waste* into, or on, any land or water so that such solid waste or hazardous waste or any constituent thereof may enter the environment or be emitted into the air or discharged into any waters, including *groundwaters*. (40 Code of Federal Regulations [CFR] 260.10)

document—A written or pictorial compilation of information that describes, defines, specifies, reports, or certifies activities, requirements, procedures, or results (e.g., plan, report, proposal, regulatory response, *permit modification* request, document addendum or update, or procedure) and that must be submitted to the *administrative authority* or that has significance to the operations of the *Environmental Restoration Project*. Document types are shown in Quality Procedure 4.9, Document Development and Approval Process.

dose (dosage)—(1) The actual quantity of a *chemical* that is administered to an organism or to which it is exposed. (2) The amount of a substance that reaches a specific tissue (e.g., the liver). (3) The amount of a substance that is available for interaction with metabolic processes after it has crossed an organism's outer boundary.

drill bit—The cutting tool attached to the bottom of a drill stem.

drilling string—The string of pipe (extending from the bit to the driving mechanism) that serves to carry mud down a *borehole* and to rotate a bit.

drill rod (drill pipe)—Special pipe used to transmit rotation and energy from the drill rig to the bit. This conduit conveys circulation fluids such as air, water, or other mixtures to cool the bit and evacuate the *borehole* cuttings.

duplicate analysis—An *analysis* performed on one member of a pair of identically prepared *subsamples* taken from the same *sample*.

duplicate measurement—An additional measurement performed on a *prepared sample* under identical conditions to evaluate any variance in measurement.

ecological screening levels—*Soil*, sediment, or water concentrations that are used to screen for potential ecological effects. The concentrations are based on a *chemical*'s no-observed-adverse-effect level for a *receptor*, below which no *risk* is indicated.

Environmental Restoration (ER) Project—A Los Alamos National Laboratory project established in 1989 as part of a *U.S. Department of Energy* nationwide program. The ER Project's specific purposes are (1) to investigate hazardous and/or *radioactive materials* that may be present in the environment as a result of past Laboratory operations, (2) to determine if the materials currently pose an unacceptable *risk* to human health or the environment, and (3) to remediate (clean up, stabilize, or restore) those *sites* where contamination is still present.

environmental samples—Air, *soil*, water, or other media *samples* that have been collected from streams, wells, and soils, or other locations, and that are not expected to exhibit properties classified as hazardous by the U.S. Department of Transportation.

environmental surveillance—The collection and *analysis* of *samples* from air, water, *soil*, foodstuffs, biota, and other media to determine the environmental quality of an industry or *community*. Environmental surveillance is performed commonly at *sites* that contain nuclear facilities.

ephemeral—Pertaining to a stream or *spring* that flows only during, and immediately after, periods of rainfall or snowmelt.

equipment blank (rinsate blank)—A *sample* used to rinse sample-collection equipment and expected to have negligible or unmeasurable amounts of *analytes*. The equipment blank is collected after the equipment *decontamination* is completed but before the collection of another *field sample*.

ER data—Data derived from *samples* that have been collected and paid for through *Environmental Restoration Project* funding.

ER database (ERDB)—A database housing analytical and other programmatic information for the *Environmental Restoration Project*. The ERDB currently contains about 3 million analyses in 300 tables.

ER identification (ER ID) number—A unique identifier assigned by the *Environmental Restoration (ER) Project*'s Records Processing Facility to each *document* when it is submitted as a final *record*. The ER ID number signals the end of the document process.

error—The quantifiable difference between an observed value and the true value of a parameter being measured.

estimated detection limit—A *reporting limit* required by a Los Alamos National Laboratory statement of work for analytical services.

estimated quantitation limit (EQL)—The lowest concentration that can be reliably achieved within specified limits of *precision* and *accuracy* during routine analytical-laboratory operating conditions. The low point on a *calibration* curve should reflect this quantitation limit. The EQL is not used to establish detection status. Sample EQLs are highly matrix-dependent and the specified EQLs might not always be achievable.

exposure pathway—Any path from the sources of *contaminants* to humans and other species or settings via *soil*, water, or food.

external standard calibration—A comparison of instrument responses from a *sample* to the responses from target compounds in the *calibration standards*. The sample's peak areas (or peak heights) are compared to the standards' peak areas (or peak heights).

facility—All contiguous land (and structures, other appurtenances, and improvements on the land) used for treating, storing, or disposing of *hazardous waste*. A facility may consist of several *treatment*, storage, or *disposal* operational units. For the purpose of implementing a *corrective action*, a facility is all the contiguous property that is under the control of the owner or operator seeking a *permit* under Subtitle C of the Resource Conservation and Recovery Act (40 Code of Federal Regulations 260.10).

fallout radionuclides—*Radionuclides* that are present at globally elevated levels in the environment as a result of fallout from atomic weapons tests. The Los Alamos National Laboratory (the Laboratory) *background data* sets consist of *environmental surveillance samples* taken from marginal and regional locations for the following radionuclides associated with fallout: tritium, cesium-137, americium-241, plutonium-238, plutonium-239/240, and strontium-90. Samples were collected from regional and marginal locations in the Laboratory's vicinity that were (1) representative of geological media found within Laboratory boundaries, and (2) were not impacted by Laboratory operations.

fault—A fracture, or zone of fractures, in rock along which vertical or horizontal movement has taken place and adjacent rock layers or bodies have been displaced.

Federal Register—The official daily publication for Rules, Proposed Rules, and Notices from federal agencies and organizations, as well as Executive Orders and other presidential documents.

field blank (field reagent blank)—A *blank sample* prepared in the field or carried to the sampling *site*, exposed to sampling conditions (e.g., by removing bottle caps), and returned to a laboratory to be analyzed in the same manner in which *environmental samples* are being analyzed. Field blanks are used to identify the presence of any contamination that may have been added during the sampling and *analysis* process.

field duplicate (replicate) samples—Two separate, independent *samples* taken from the same source, which are collected as *collocated samples* (i.e., equally representative of a sample matrix at a given location and time).

field notebook—A *record* of activities performed in the field or a compilation of field data.

field reagent blank—See *field blank*.

field sample—See *sample*.

focused data validation—A technically based *analyte*-, *sample*-, and data-use-specific process that extends the *qualification* of data beyond method or contractual compliance and provides a higher level of confidence that an analyte is present or absent. If an analyte is present, the quality of the quantitation may be obtained through focused validation. (Also see *data validation.*)

gamma radiation—A form of electromagnetic, high-energy ionizing *radiation* emitted from a nucleus. Gamma rays are essentially the same as x-rays (though at higher energy) and require heavy shielding, such as concrete or steel, to be blocked.

geohydrology—The science that applies hydrologic methods to the understanding of geologic phenomena.

gravimetric moisture content—See *water content.*

ground cover—The covering of naturally occurring *soils* by either natural or human-made mechanisms (e.g., grasses, pine needles, asphalt, or concrete).

groundwater—Interstitial water that occurs in saturated earth material and is capable of entering a well in sufficient amounts to be used as a water supply.

half-life—(1) The time required for a pollutant to lose one-half of its original concentration (for example, the biochemical half-life of DDT [dichlorodiphenyltrichloroethane] in the environment is 15 yr). (2) The time required for one half of the atoms in a radioactive element to undergo self-transmutation or decay (the half-life of radium is 1620 yr). (3) The time required for the elimination of one half of a total dose from the body.

hazard index (HI)—The sum of *hazard quotients* (HQs) for multiple *contaminants* to which a *receptor* (j) is thought to have been exposed (i.e., $HI_j = \sum_i HQ_{ij}$).

Hazardous and Solid Waste Amendments (HSWA)—The HSWA of 1984 (Public Law No. 98-616, 98 Stat. 3221), which amended the Resource Conservation and Recovery Act of 1976 (42 United States Code § 6901 *et seq*).

hazardous constituent (hazardous waste constituent)—According to the *Compliance Order on Consent*, any constituent identified in Appendix VIII to 40 Code of Federal Regulations (CFR) 261 (incorporated by 20.4.1.200 New Mexico Administrative Code [NMAC]) or any constituent identified in 40 CFR 264, Appendix IX (incorporated by 20.4.1.500 NMAC).

hazardous waste—(1) *Solid waste* (as defined in 40 Code of Federal Regulations [CFR] 261.2) that is a listed *hazardous waste* (as provided in 40 CFR Subpart D), or a waste that exhibits any of the characteristics of hazardous waste (i.e., ignitability, corrosivity, reactivity, or toxicity, as provided in 40 CFR Subpart C). (2) According to *Compliance Order on Consent*, any solid waste or combination of solid wastes which, because of its quantity, concentration, or physical, chemical, or infectious characteristics, meets the description set forth in New Mexico Statutes Annotated 1978, § 74-4-3(K) and is listed as a hazardous waste or exhibits a hazardous waste characteristic under 40 CFR 261 (incorporated by 20.4.1.200 New Mexico Administrative Code).

Hazardous Waste Facility Permit[o]—The *permit* issued to Los Alamos National Laboratory (the Laboratory) by the New Mexico Environment Department that allows the Laboratory to operate as a *hazardous waste treatment*, storage, and *disposal facility.*

Hazardous Waste Bureau—The New Mexico Environment Department bureau charged with providing regulatory oversight and technical guidance to New Mexico *hazardous waste* generators and to *treatment, storage, and disposal facilities*, as required by the New Mexico Hazardous Waste Act and by regulations promulgated under the Act.

hazard quotient (HQ)—The ratio of the estimated *site*-specific exposure concentration of a single *chemical* from a site to the estimated daily exposure level at which no adverse health effects are likely to occur.

holding time—The maximum elapsed time a *sample* can be stored without unacceptable changes in *analyte* concentrations. Holding times apply under prescribed conditions, and deviations from these conditions may affect the holding times. Extraction holding time refers to the time lapsed between sample collection and sample preparation. Analytical holding time refers to the time lapsed between sample preparation and *analysis*.

HSWA module—Module VIII of the Los Alamos National Laboratory (the Laboratory) *Hazardous Waste Facility Permit*. This *permit* allows the Laboratory to operate as a *hazardous waste treatment, storage, and disposal facility*. Module VIII incorporates requirements from the *Hazardous and Solid Waste Amendments*, including the requirement of *corrective actions* for *releases* from *solid waste management units*.

hydraulic conductivity—(1) A coefficient of proportionality that describes the rate at which a fluid can move through a permeable *medium*. The rate is a function of both the medium and the fluid flowing through it. (2) The quantity of water that will flow through a unit of cross-sectional area of a porous material per unit time under a *hydraulic gradient* of 1.00 (measured at right angles to the direction of flow) at a specified temperature. (Also see *unsaturated hydraulic conductivity*.)

"Hydrogeologic Workplan"—The *document* that describes the activities planned by Los Alamos National Laboratory (the Laboratory) to characterize the hydrologic setting beneath the Laboratory and to enhance the Laboratory's *groundwater* monitoring program.

hydrogeology—The science dealing with the occurrence of surface water and *groundwater*, their utilizations, and their functions in modifying the Earth, primarily by erosion and deposition.

inductively coupled plasma emission spectroscopy—A method that detects trace elements (including metals) in solutions by measuring characteristic emission spectra via optical spectrometry. *Samples* are nebulized and the resulting aerosol is transported to a plasma torch. Element-specific emission spectra are produced by a radio-frequency, inductively coupled plasma. The spectra are dispersed by a grating spectrometer, and photosensitive devices are used to monitor the emission lines' intensities.

inductively coupled plasma mass spectrometry—A method that detects sub-µg/L concentrations of a large number of elements in water *samples* and in waste extracts or digests. When dissolved constituents are required, samples must be filtered and acid-preserved before *analysis*. No digestion is required before analysis for dissolved elements in water samples. The method measures ions produced by a radio-frequency, inductively coupled plasma. *Analyte* species originating in a liquid are nebulized and the resulting aerosol is transported by argon gas into a plasma torch. The ions produced in the plasma gas are introduced into a mass spectrometer by means of an interface. The ions produced in the plasma are sorted according to their mass-to-change ratios and quantified with a channel electron multiplier or Faraday cup.

industrial scenario—A land-use condition in which current Los Alamos National Laboratory operations or industrial/commercial operations within Los Alamos County are continued or planned. Any necessary *remediation* involves *cleanup* to standards designed to ensure a safe and healthy work environment for workers.

infiltration—(1) The penetration of water through the ground surface into subsurface *soil*. (2) The technique of applying large volumes of wastewater to land to penetrate the surface and percolate through the underlying soil.

initial calibration—The process used to establish the relationship between instrument response and *analyte* concentration at several analyte concentration values in order to demonstrate that an instrument is capable of acceptable analytical performance.

institutional controls—Controls that prohibit or limit access to contaminated media. Institutional controls may include use restrictions, permitting requirements, *standard operating procedures*, laboratory implementation requirements, laboratory implementation guidance, and laboratory performance requirements. (Also see *administrative controls.*)

instrument detection limit (IDL)—A measure of instrument *sensitivity* without any consideration for contributions to the signal from reagents. The IDL is calculated as follows: Three times the average of the standard deviations obtained on three nonconsecutive days from the *analysis* of a standard solution, with seven consecutive measurements of that solution per day. The standard solution must be prepared at a concentration of three to five times the instrument manufacturer's estimated IDL.

instrument performance check—The *analysis* of a *chemical* of known relative mass abundances to indicate how well a mass spectrometer is performing over a specified mass range.

intermittent stream—A stream that flows only in certain reaches as a result of the channel bed's losing and gaining characteristics.

internal standards—Compounds added to a *sample* after the sample has been prepared for qualitative and quantitative instrument *analysis*. The compounds serve as a standard of retention time and response which is invariant from run to run.

Investigation-derived waste—*Solid waste* or *hazardous waste* that was generated as a result of *corrective action* investigation or *remediation* field activities. Investigation-derived waste may include drilling muds, cuttings, and purge water from the installation of test pits or wells; purge water, *soil*, and other materials from the collection of *samples*; residues from the testing of *treatment* technologies and pump-and-treat systems; contaminated personal protective equipment; and solutions (aqueous or otherwise) used to decontaminate nondisposable protective clothing and equipment. (U.S. Environmental Protection Agency, January 1992. Publication 9345.3-03FS)

laboratory control sample (LCS)—A known matrix that has been spiked with compound(s) representative of *target analytes*. LCSs are used to document laboratory performance, and the acceptance criteria for LCSs are method-specific.

laboratory qualifier (laboratory flag)—Codes applied to data by a *contract analytical laboratory* to indicate, on a gross scale, a verifiable or potential data deficiency. These flags are applied according to the *U.S. Environmental Protection Agency* contract-laboratory program guidelines.

LANL (Los Alamos National Laboratory) data validation qualifiers—The Los Alamos National Laboratory data qualifiers which are defined by, and used, in the *Environmental Restoration (ER) Project* validation process. The qualifiers describe the general usability (or quality) of data. For a complete list of data qualifiers applicable to any particular analytical suite, consult the appropriate ER Project *standard operating procedure*.

LANL (Los Alamos National Laboratory) data validation reason codes—The Los Alamos National Laboratory designations applied to sample data by data validators who are independent of the contract laboratory that performed a given sample *analysis*. Reason codes provide an analysis-specific explanation for applying a qualifier, with some description of the qualifier's potential impact on data use. For a complete list of data qualifiers applicable to any particular analytical suite, consult the appropriate *Environmental Restoration Project standard operating procedure*.

leachate—Water that collects *contaminants* as it trickles through wastes, pesticides, or fertilizers. *Leaching* may occur in farming areas, feedlots, and landfills, and may result in *hazardous* substances entering surface water, *groundwater*, or *soil.*

leaching—The process by which soluble constituents are dissolved and filtered through the *soil* by a percolating fluid. (Also see *leachate.*)

log book—A notebook used to record tabulated data (e.g., the history of *calibrations*, *sample* tracking, numerical data, or other technical data).

logging run—A single data-collecting pass with a *logging tool* as the tool moves up or down in the *borehole* or a portion of the borehole. A logging operation generally consists of a main run and one or more *repeat runs* with each logging tool.

logging tool—A sonde or device that is run in a *borehole* to make *borehole logging* measurements.

long-term environmental stewardship—All the activities required to maintain an adequate level of protection for human health and the environment from *risks* posed by nuclear and/or chemical materials, waste, and contamination that remain after *cleanup* is complete.

Los Alamos unlimited release (LA-UR) number—A unique identification number required for all *documents* or presentations prepared for distribution outside Los Alamos National Laboratory (the Laboratory). LA-UR numbers are obtained by filling out a technical information release form (http://enterprise.lanl.gov/alpha.htm) and submitting the form together with 2 copies of the document to the Laboratory's Classification Group (S-7) for review.

lower acceptance limit (LAL)—The lowest limit that is acceptable according to *quality control* (QC) criteria for a specific QC *sample* and for a specific method. Any results lower than the LAL are qualified following the routine validation procedure.

material disposal area (MDA)—A subset of all the *solid waste management units* and *areas of concern* at Los Alamos National Laboratory (the Laboratory), including trenches, pits, and shafts, that were historically designated by the Laboratory as MDAs.

matrix—Relatively fine material in which coarser fragments or crystals are embedded; also called "ground mass" in the case of igneous rocks. (Also see *sample matrix.*)

matrix spike—An *aliquot* of a *sample* spiked with a known concentration of *target analyte(s).* Matrix spike samples are used to measure the ability to recover prescribed analytes from a native *sample matrix.* The spiking typically occurs before sample preparation and *analysis.* (Also see *matrix spike duplicate.*)

matrix spike duplicate—An intralaboratory duplicate *sample* spiked with a known amount of *target analyte(s).* Spiking typically occurs before sample preparation and *analysis.* (Also see *matrix spike.*)

measuring and test equipment—Devices or systems used to calibrate, measure, gauge, test, or inspect entities to control or acquire data and verify conformance to specified requirements.

medium (environmental)—Any medium capable of absorbing or transporting constituents. Examples of media include *tuffs*, *soils* and *sediments* derived from these tuffs, surface water, *soil water*, *groundwater*, air, structural surfaces, and debris.

method blank—An *analyte*-free matrix to which all reagents are added in the same volumes or proportions as those used in the *environmental sample* processing, and which is prepared and analyzed in the same manner as the corresponding environmental samples. The method blank is used to assess the potential for *sample* contamination during preparation and *analysis.*

method detection limit (MDL)—The minimum concentration of a substance that can be measured and reported with a known statistical confidence that the *analyte* concentration is greater than zero. After subjecting *samples* to the usual preparation, the MDL is determined by analyzing those samples of a given matrix type that contain the analyte. The MDL is used to establish detection status.

migration—The movement of inorganic and organic chemical species through unsaturated or saturated materials.

migration pathway—A route (e.g., a stream or subsurface flow path) for the potential movement of *contaminants* to environmental *receptors* (plants, humans, or other animals).

minimum detectable activity (MDA)—For the *analysis* of *radionuclides*, the lowest detectable *radioactivity* for a given analytical technique. The following equation is used to calculate the MDA unless otherwise noted or approved by Los Alamos National Laboratory. (Note: "MDA" here should not to be confused with *material disposal area)*:

$$MDA = \frac{4.65(BKG)^{0.5} + 2.71}{2.22 \times EFF \times V \times T_S \times Y},$$

where BKG = the total background counts,
EFF = the fraction detector efficiency,
V = the volume or unit weight,
T_s = the sample count duration, and
Y = the fractional chemical recovery obtained from the *tracer* recovery.

Depending on the type of analysis, other terms may also be required in the denominator (e.g., gamma abundance).

mixed waste—Waste containing both hazardous and source, special nuclear, or byproduct materials subject to the Atomic Energy Act of 1954. (Laboratory Implementation Requirement 404-00-03.1)

model—A schematic description of a physical, biological, or social system, theory, or phenomenon that accounts for its known or inferred properties and may be used for the further study of its characteristics.

monitoring well—(1) A well used to obtain water-quality *samples* or to measure *groundwater* levels. (2) A well drilled at a *hazardous waste* management facility or *Superfund site* to collect groundwater samples for the purpose of physical, chemical, or biological analysis and to determine the amounts, types, and distribution of *contaminants* in the groundwater beneath the site.

National Pollutant Discharge Elimination System—The national program for issuing, modifying, revoking and reissuing, terminating, monitoring, and enforcing *permits* to discharge wastewater or storm water, and for imposing and enforcing pretreatment requirements under the Clean Water Act.

nondetect—A result that is less than the *method detection limit.*

notices of approval, of approval with modification, or of disapproval—Notices issued by the New Mexico Environment Department (NMED). Upon receipt of a *work plan*, schedule, report, or other deliverable *document*, NMED reviews the document and approves the document as submitted, modifies the document and approves it as modified, or disapproves the document. A notice of approval means that the document is approved as submitted. A notice of approval with modifications means that the document is approved but with modifications specified by NMED. A notice of disapproval means that the document is disapproved and it states the deficiencies and other reasons for disapproval. If NMED issues a notice of disapproval for a document, it may include written instructions for modifying and resubmitting the document. (Note: Notices of disapproval have grown out of the *Compliance Order on Consent. Notices of deficiency* are used more broadly by NMED and have been in use for a longer time. Generally, the acronym NOD is used for a notice of deficiency.)

operable units (OUs)—At Los Alamos National Laboratory, 24 areas originally established for administering the *Environmental Restoration Project*. Set up as groups of *potential release sites*, the OUs were aggregated according to geographic proximity for the purposes of planning and conducting *Resource Conservation and Recovery Act (RCRA) facility assessments* and *RCRA facility investigations*. As the project matured, it became apparent that there were too many areas to allow efficient communication and to ensure consistency in approach. In 1994, the 24 OUs were reduced to 6 administrative field units.

peer review—See *decision peer review* and *document peer review*.

percent recovery (%R)—The amount of material detected in a *sample* (less any amount already in the sample) divided by the amount added to the sample, expressed as a percentage.

perched water—A zone of unpressurized water held above the *water table* by impermeable rock or *sediment*.

percolation—Gravity flow of *soil water* through the pore spaces in *soil* or rock below the ground surface.

perennial stream—Water in a channel or bed that flows continuously throughout the year.

performance evaluation—A type of *audit* in which quantitative data generated by a measurement system are obtained independently and then compared with routinely obtained data to evaluate the proficiency of an analyst or laboratory.

performance-evaluation sample—A *sample* of known composition with respect to selected *analytes*, which, upon *analysis*, is expected to yield results that fall within a prescribed range. Performance-evaluation samples are selected to mimic, as closely as possible, matrices that are representative of *environmental samples* from a particular location.

polychlorinated biphenyls (PCBs)—Any chemical substance that is limited to the biphenyl molecule which has been chlorinated to varying degrees, or any combination that contains such substances. PCBs are colorless, odorless compounds that are chemically, electrically, and thermally stable and have proven to be toxic to both humans and other animals.

population—(1) A group of interbreeding organisms occupying a particular space. (2) The number of humans or other living creatures in a designated area.

porosity—The degree to which *soil*, gravel, *sediment*, or rock is permeated with pores or cavities through which water or air can move.

precision—The degree of mutual agreement among a series of individual measurements, values, or results.

Quality Assurance Project Plan—A formal *document* that describes, in comprehensive detail, the necessary *quality assurance, quality control*, and other technical activities that must be implemented to ensure that results of work performed will satisfy stated *performance criteria*.

quality assurance/quality control—A system of procedures, checks, *audits*, and *corrective actions* set up to ensure that all *U.S. Environmental Protection Agency* research design and performance, environmental monitoring and sampling, and other technical and reporting activities are of the highest achievable quality.

quality control—See *quality assurance/quality control.*

quality management—The portion of an organization's overall management system that determines and implements the quality policy. Quality management includes strategic planning, allocation of resources, and other systematic activities (e.g., planning implementation and *assessment*) pertaining to an organization's quality standards.

Quaternary—The second period of the Cenozoic Era, following the Tertiary, and including the last two to three million years of Earth history.

radiation—A stream of particles or electromagnetic waves emitted by atoms and molecules of a radioactive substance as a result of nuclear decay. The particles or waves emitted can consist of neutrons, positrons, alpha particles, beta particles, or *gamma radiation.*

radioactive material—For purposes of complying with U.S. Department of Transportation regulations, any material having a specific activity (activity per unit mass of the material) greater than 2 nanocuries per gram (nCi/g) and in which the *radioactivity* is evenly distributed.

radioactive tracer—A *radionuclide* added to, or induced in, a *sample* for the purpose of monitoring chemical or physical losses of *target analytes*. The *tracer* is assumed to behave in the same manner as the target analytes.

radioactive waste—Waste that, by either monitoring and *analysis*, or acceptable knowledge, or both, has been determined to contain added (or concentrated and naturally occurring) *radioactive material* or activation products, or that does not meet radiological *release* criteria.

radioactivity (radioactive decay; radioactive disintegration)—The spontaneous change in an atom by the emission of charged particles and/or gamma rays.

radionuclide—Radioactive particle (human-made or natural) with a distinct atomic weight number; can have as long a life as *soil* or water pollutants.

RCRA facility investigation (RFI)—A *Resource Conservation and Recovery Act (RCRA)* investigation that determines if a *release* has occurred and characterizes the nature and extent of contamination at a *hazardous waste facility*. The RFI is generally equivalent to the remedial investigation portion of the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) process.

reach—A specific length of a *canyon* that is treated as a single unit for sampling and *analysis*. Reaches tend to be internally uniform with respect to geomorphic setting and land use.

reamer—A type of *drill bit* that is used specifically for enlarging a borehole.

receptor—A person, other animal, plant, or geographical location that is exposed to a chemical or physical agent released to the environment by human activities.

recharge—The process by which water is added to a zone of saturation, usually by *percolation* from the *soil* surface (e.g., the recharge of an *aquifer*).

record—Any book, paper, map, photograph, machine-readable material, or other documentary material, regardless of physical form or characteristics.

reference set—A hard-copy compilation of reference items cited in *Environmental Restoration Project documents.*

regional aquifer—Geologic material(s) or unit(s) of regional extent whose saturated portion yields significant quantities of water to wells, contains the regional zone of saturation, and is characterized by the regional *water table* or *potentiometric surface*. (Also see *aquifer*.)

regulatory standard—Media-specific *contaminant* concentration levels of potential concern which are mandated by federal or state legislation or regulation (e.g., the Safe Drinking Water Act, New Mexico Water Quality Control Commission regulations).

relative percent difference (RPD)—The measure used to assess the *precision* between parent results and their associated duplicate results. The RPD is calculated as follows:

$$|RPD| = \frac{S - R}{\left(\frac{S + R}{2}\right)100},$$

where RPD = relative percent difference,
S = parent sample result, and
R = duplicate sample result.

The *Environmental Restoration Project* criteria for the RPD are less than 20% for aqueous samples and less than 35% for *soil* samples when the sample concentrations are greater than, or equal to, five times the *method detection limit (MDL)*. For samples with concentrations less than five times the MDL, but greater than the MDL, the control is +/-MDL. No precision criterion applies to samples with concentrations less than the MDL.

release—Any spilling, leaking, pumping, pouring, emitting, emptying, discharging, injecting, escaping, *leaching*, dumping, or disposing of *hazardous waste* or *hazardous constituents* into the environment.

remediation—(1) The process of reducing the concentration of a *contaminant* (or contaminants) in air, water, or *soil* media to a level that poses an acceptable *risk* to human health and the environment. (2) The act of restoring a contaminated area to a usable condition based on specified standards.

remediation waste—All *solid wastes* and *hazardous wastes*, and all media (including *groundwater*, surface water, *soils*, and *sediments*) and debris, that are managed for implementing *cleanup*. (40 Code of Federal Regulations 260.10)

reporting limit (RL)—The numerical value that an analytical laboratory (in conjunction with its client) selects for determining if a *target analyte* has been detected. Results below the RL are considered to be undetected, whereas results above the RL are considered to be detected. The RLs are not necessarily based on instrument *sensitivity*. RLs can be established at the *instrument detection limit*, *method detection limit*, *estimated quantitation limit*, or *contract-required detection limit*.

representativeness—The degree to which data accurately and precisely represent a characteristic of a *population* or an environmental condition.

request number—An identifying number assigned by the *Environmental Restoration Project* to a group of *samples* submitted for *analysis*.

residential scenario—The land use under which individuals may be exposed to *contaminants* as a result of living on or near contaminated *sites*.

Resource Conservation and Recovery Act—The Solid Waste Disposal Act as amended by the Resource Conservation and Recovery Act of 1976. (Public Law [PL] 94-580, as amended by PL 95-609 and PL 96-482, United States Code 6901 *et seq.*)

restricted area—Any area to which access is controlled by a licensee to protect individuals from exposure to *radiation* and *radioactive materials*. The "restricted area" shall not include areas used as residential quarters, although a separate room or rooms in a residential building may be set apart as a restricted area. (10 Code of Federal Regulations 60.2) (Also see *unrestricted area*.)

retardation—An act or process that reduces the rate of movement of a chemical substance in water relative to the average velocity of the water. The movement of chemical substances in water can be retarded by *adsorption* and precipitation reactions, and by diffusion into pore water in a given sedimentary or rock *matrix*.

retention time window criteria—The x-axis on a chromatogram represents retention time. A retention time window is a specified time range on this axis. If a *target analyte* is detected within its retention time window, it is considered detected. The retention time window criteria are the exact time windows on the chromatogram defining a given target analyte and are method-specific. *Absolute retention times* are used for compound identification in all gas chromatograph and high-pressure liquid chromatography methods that do not employ *internal standard calibration*. Retention time windows are crucial to the identification of target compounds. The windows are established to compensate for minor shifts in absolute retention times as a result of sample loadings and normal chromatographic variability. The width of retention time windows should be carefully established to minimize the occurrence of both false positive and false negative results. Tight retention time windows may result in false negatives and/or may cause unnecessary reanalysis of samples when *surrogates* or spiked compounds erroneously remain unidentified. Overly wide retention time windows may result in false positive results that cannot be confirmed after further analysis.

rinsate blank—See *equipment blank.*

risk—A measure of the probability that damage to life, health, property, and/or the environment will occur as a result of a given hazard.

risk assessment—See *baseline risk assessment.*

routine analysis—The *analysis* categories of inorganic compounds, organic compounds, metals, radiochemistry, and high explosives, as defined in a contract laboratory's statement of work.

routine data—Data generated using *analytical methods* that are identified as routine methods in the current *Environmental Restoration Project* statement of work for analytical services.

routine data validation—The process of reviewing analytical data relative to quantitative routine acceptance criteria. The objective of routine *data validation* is two-fold:

- to estimate the technical quality of the data relative to minimum national standards adopted by the *Environmental Restoration Project*, and
- to indicate to data users the technical data quality at a gross level by assigning *laboratory qualifiers* to environmental data whose *quality indicators* do not meet acceptance criteria.

runoff—The portion of the precipitation on a drainage area that is discharged from the area either by sheet flow or adjacent stream channels.

sample—A portion of a material (e.g., rock, *soil*, water, or air), which, alone or in combination with other portions, is expected to be representative of the material or area from which it is taken. Samples are typically either sent to a laboratory for *analysis* or *inspection* or are analyzed in the field. When referring to samples of environmental media, the term *field sample* may be used.

sample matrix—In *chemical analysis*, that portion of a *sample* which is exclusive of the *analytes* of interest. Together, the matrix and the analytes of interest form the sample.

screening action level (SAL)—A *chemical's medium*-specific concentration level; it is calculated by using conservative criteria below which it is generally assumed that no potential for unacceptable *risk* to human health exists. The derivation of a SAL is based on conservative exposure and on land-use assumptions. However, if an applicable *regulatory standard* exists that is less than the value derived by risk-based computations, it will be used for the SAL.

screening risk assessment—A *risk assessment* which is performed with few data and many assumptions in order to identify exposures that should be evaluated more carefully for potential *risk*.

sediment—(1) A mass of fragmented inorganic solid that comes from the weathering of rock and is carried or dropped by air, water, gravity, or ice. (2) A mass that is accumulated by any other natural agent and that forms in layers on the Earth's surface (e.g., sand, gravel, silt, mud, fill, or loess). (3) A solid material that is not in solution and is either distributed through the liquid or has settled out of the liquid.

sensitivity—An indication of the lowest *analyte* concentration that can be measured with a specified degree of confidence.

serial dilution sample—A requirement of the *U.S. Environmental Protection Agency (EPA)* Method 6010B (Inductively Coupled Plasma-Atomic Emission Spectroscopy). Serial dilutions are made by performing a series of dilutions on an *aliquot* taken from a stock solution for a *target analyte*. The first dilution of the original stock solution serves as the stock solution for the second dilution, and the second dilution serves as the stock solution for the third dilution, and so on. To meet the requirement of EPA Method 6010B, one serial dilution *analysis* must be performed for each matrix in every sample batch, with a minimum of 1 serial dilution sample per 20 samples. The serial dilution analysis is accomplished by diluting the sample(s) by a factor of five and comparing the dilution-corrected results to those of the undiluted parent sample(s). The serial dilution results are required to agree within ±10% of the undiluted parent sample results, where the undiluted results are greater than, or equal to, the *method detection limit*.

site—An area or place that falls under the jurisdiction of the *U.S. Environmental Protection Agency* and/or a state for *corrective action*.

site characterization—Defining the pathways and methods of *migration* of *hazardous waste* or *constituents*, including the media affected; the extent, direction and speed of the *contaminants*; complicating factors influencing movement; or concentration profiles. (U.S. Environmental Protection Agency, May 1994. Publication EPA-520/R-94/004)

site conceptual model—A qualitative or quantitative description of sources of contamination, environmental *transport* pathways for contamination, and *receptors* that may be impacted by contamination and whose relationships describe qualitatively or quantitatively the *release* of contamination from the sources, the movement of contamination along the pathways to the exposure points, and the uptake of *contaminants* by the receptors.

Site-Specific Health and Safety Plan (SSHASP)—A health and safety plan that has been tailored to a *site* or to an *Environmental Restoration (ER) Project* field activity and that has been approved by an ER health and safety representative. A SSHASP contains information specific to the project, including the scope of work, relevant history, descriptions of hazards from activity associated with the project site(s), and techniques for exposure *mitigation* (e.g., personal protective equipment and hazard mitigation).

slope—A ratio of units of elevation change to units of horizontal change, usually expressed in degrees.

soil—A sample media group that includes soil and can include artificial fill materials. "Soil" refers to a material that overlies bedrock and has been subject to soil-forming processes. The sample media group of soil includes soils from all soil horizons.

soil gas—Gaseous elements and compounds in the small spaces between particles of the earth and *soil*. Such gases can be moved or driven out under pressure.

soil moisture—The water contained in the pore space of the *unsaturated zone*.

soil screening level (SSL)—The concentration of a *chemical* (inorganic or organic) below which no potential for unacceptable *risk* to human health exists. The derivation of an SSL is based on conservative exposure and land-use assumptions, and on target levels of either a *hazard quotient* of 1.0 for a noncarcinogenic chemical or a cancer risk of 10^{-5} for a carcinogenic chemical.

soil water—Water in the *unsaturated zone*, regardless of whether it occurs in *soil* or rock.

solid waste—Any garbage, refuse, or sludge from a waste *treatment* plant, water-supply treatment plant, or air-pollution control facility, and other discarded material, including solid, liquid, semisolid, or contained gaseous material resulting from industrial, commercial, mining, and agricultural operations and from *community* activities. Solid waste does not include solid or dissolved materials in domestic sewage; solid or dissolved materials in irrigation return flows; industrial *discharges* which are point sources subject to *permits* under section 402 of the Federal Water Pollution Control Act, as amended; or source, special nuclear, or byproduct material as defined by the Atomic Energy Act of 1954, as amended.

solid waste management unit (SWMU)—(1) Any discernible site at which *solid wastes* have been placed at any time, whether or not the site use was intended to be the management of solid or hazardous waste. SWMUs include any site at a *facility* at which solid wastes have been routinely and systematically released. This definition includes regulated sites (i.e., landfills, surface impoundments, waste piles, and land *treatment* sites), but does not include passive leakage or one-time spills from production areas and sites in which wastes have not been managed (e.g., product storage areas). (2) According to the *Compliance Order on Consent*, any discernible site at which solid waste has been placed at any time, and from which NMED determines there may be a *risk* of a release of *hazardous waste* or hazardous waste constituents (*hazardous constituents*), whether or not the site use was intended to be the management of solid or hazardous waste. Such sites include any area in Los Alamos National Laboratory at which solid wastes have been routinely and systematically released; they do not include one-time spills.

split sample—A *sample* that has been divided into two or more portions that are expected to be of the same composition; used to characterize within-sample heterogeneity, sample handling, and measurement variability.

split-spoon sampler—A hollow, tubular sampling device below a drill stem that is driven by a weight to retrieve *soil samples*. The core barrel can be opened to remove samples. This is a sampling method commonly used with auger drilling. The split-spoon sampler can be driven into the ground or can be advanced inside hollow-stem augers.

standard operating procedure—A *document* that details the officially approved method(s) for an operation, *analysis*, or action, with thoroughly prescribed techniques and steps.

stratigraphy—The study of the formation, composition, and sequence of *sediments*, whether consolidated or not.

subsample—See *aliquot*.

surface sample—A *sample* taken at a collection depth that is (or was) representative of the *medium*'s surface during the period of investigative interest. A typical depth interval for a surface sample is 0 to 6 in. for mesa-top locations, but may be up to several feet in *sediment*-deposition areas within *canyons*.

surrogate (surrogate compound)—An organic compound used in the analyses of organic *target analytes* which is similar in composition and behavior to the target analytes but is not normally found in *field samples*. Surrogates are added to every *blank* and spike *sample* to evaluate the efficiency with which *analytes* are being recovered during extraction and *analysis*.

target analyte—A *chemical* or parameter, the concentration, mass, or magnitude of which is designed to be quantified by a particular test method.

technical area (TA)—At Los Alamos National Laboratory, an administrative unit of operational organization (e.g., TA-21).

technical notebook—A *record* of the methodology, observations, and results of technical activity investigations.

topography—The physical or natural features of an object or entity and their structural relationships.

total propagated uncertainty (TPU)—The range of concentrations (expressed as ± the measured concentration) that includes the theoretical or true concentration of an *analyte* with a specific degree of confidence. Radiochemical results are required to be accompanied by *sample*-specific uncertainty bounds that reflect the 67% confidence level (1-sigma TPU). The TPU includes not only the measurement or counting *error* but the technique-specific error term that includes uncertainty values for each contributing measurement process and a sample-specific contribution reflecting the specific chemical recoveries or detectors used. All radiochemical result uncertainties incorporate terms for technique-related and sample-specific measurement errors.

transport (transportation)—(1) The movement of a *hazardous waste* by air, rail, highway, or water. (40 Code of Federal Regulations 260.10) (2) The movement of a *contaminant* from a source through a *medium* to a *receptor.*

treatment—Any method, technique, or process, including elementary neutralization, designed to change the physical, chemical, or biological character or composition of any *hazardous waste* so as to *neutralize* such waste, recover energy or material resources from the waste, or so as to render such waste nonhazardous or less hazardous; safer to transport, store, or dispose of; or amenable for recovery or storage; or reduced in volume. (40 Code of Federal Regulations 260.10)

treatment, storage, and disposal facility—An interim-status or permitted facility in which *hazardous waste* is treated, stored, or disposed.

tremie pipe—A small-diameter pipe used to carry sand pack, *bentonite*, or grouting materials to a borehole's bottom. Materials are pumped under pressure or poured to the hole bottom through the pipe. The pipe is retracted as the *annular space* is filled.

trend analysis—An analytical or graphical representation used to identify the changes in a variable as it is measured over a period of time.

trip blank—A *sample* of *analyte*-free medium taken from a sampling *site* and returned to an analytical laboratory unopened, along with samples taken in the field; used to monitor cross contamination of samples during handling and storage both in the field and in the analytical laboratory.

tuff—Consolidated volcanic ash, composed largely of fragments produced by volcanic eruptions.

unsaturated hydraulic conductivity—A coefficient that describes the rate at which a fluid can potentially move through a permeable, unsaturated *medium.* (Also see *hydraulic conductivity.*)

unsaturated zone—The area above the *water table* where *soil* pores are not fully saturated, although some water may be present.

upper acceptance limit (UAL)—The highest limit that is acceptable, based on the *quality control* (QC) criteria for a specific QC *sample* for a specific method. Any results greater than the UAL are qualified.

upper confidence limit—The statistic that represents the upper bound of the arithmetic mean (usually 95%) of the measured data and that is used in a *risk assessment* as the reasonable maximum exposure point concentration.

upper tolerance limit—A statistical measure of the upper end of a distribution. The 95th percentile upper tolerance limit, which is the 95% upper percentile of the 95th percentile of the data distribution, is the *background value* used to represent the *background data* distribution for an inorganic *chemical* or naturally occurring *radionuclide*.

U.S. Department of Energy—The federal agency that sponsors energy research and regulates nuclear materials for weapons production.

U.S. Environmental Protection Agency (EPA)—The federal agency responsible for enforcing environmental laws. Although state regulatory agencies may be authorized to administer some of this responsibility, EPA retains oversight authority to ensure the protection of human health and the environment.

vadose zone—The zone between the land surface and the *water table* within which the moisture content is less than saturation (except in the capillary fringe) and pressure is less than atmospheric. *Soil* pore space also typically contains air or other gases. The capillary fringe is included in the vadose zone. (Also see *unsaturated zone*.)

verification—A test or tests, generally performed before and after logging in lieu of a *calibration*, to ascertain whether the logging system is operating properly. Verification differs from calibration in that it does not provide updated system-calibration values.

water content—The amount of water in an unsaturated *medium*, expressed as the ratio of the weight of water in a *sample* to the weight of the oven-dried sample (often expressed as a percentage). (Also see *gravimetric moisture content*.)

watercourse—Any river, creek, arroyo, *canyon*, draw, wash, or other channel that has definite banks and beds and provides visual evidence of the occasional flow of water.

watershed—A region or basin drained by, or contributing waters to, a river, stream, lake, or other body of water and separated from adjacent drainage areas by a divide, such as a mesa, ridge, or other geologic feature.

water table—The top of the regional saturated zone; the *piezometric surface* associated with an *unconfined aquifer*.

welded tuff—A volcanic deposit hardened by the action of heat, pressures from overlying material, and hot gases.

well casing—A solid piece of pipe, typically steel or polyvinyl chloride (PVC) plastic, used to keep a well open in either unconsolidated materials or unstable rock and as a means to contain zone-isolation materials such as cement *grout* or *bentonite*.

work plan—A *document* that specifies the activities to be performed when implementing an investigation or remedy. At a minimum, the work plan should identify the scope of the work to be performed, specify the procedures to be used to perform the work, and present a schedule for performing the work. The work plan may also present the technical basis for performing the work.

A-3.0 METRIC CONVERSION TABLE

Multiply SI (Metric) Unit	by	To Obtain US 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-4.0 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.

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Appendix B

Field Investigation Methods

Method	Summary
Containers and Preservation of Samples	Specific requirements/processes for sample containers, preservation techniques, and holding times were based on U.S. Environmental Protection Agency (EPA) guidance for environmental sampling, preservation, and quality assurance. Specific requirements for each sample were printed on the sample collection logs provided by the Los Alamos National Laboratory's (the Laboratory's) Sample Management Office (SMO) (size and type of container, i.e., glass, amber glass, polyethylene, preservative, etc.). All samples were preserved by placing them in insulated containers with ice to maintain a temperature of 4°C.
Handling, Packaging, and Shipping of Samples	Field team members sealed and labeled the samples before packing and ensured that the sample and the transport containers were free of external contamination. Field team members packaged all samples to minimize breakage during transportation. After all environmental samples were collected, packaged, and preserved. A field team member transported them to either the SMO or an SMO-approved radiation screening laboratory under chain-of-custody protocol. The SMO arranged for shipping of samples to analytical laboratories. The field team member informed the SMO and/or the radiation screening laboratory coordinator if the levels of radioactivity were in the action-level or limited-quantity ranges.
Sample Control and Field Documentation	The collection, screening, and transport of samples were documented on standard forms generated by the SMO, including sample collection logs, chain-of-custody forms, and sample-container labels. Collection logs were completed at the time of sample collection and were signed by the sampler and a reviewer who verified the logs for completeness and accuracy. Corresponding labels were initialed and applied to each sample container, and custody seals were placed around container lids or openings. Chain-of-custody forms were completed and assigned to verify that the samples were not left unattended.
Field Quality-Control Samples	Field quality-control samples were collected as directed in the March 1, 2005, Compliance Order on Consent as follows: *Field Duplicate*: at a 10% frequency; collected at the same time as a regular sample and submitted for the same analyses. *Trip Blanks*: required for all field events that include the collection of samples for volatile organic compound (VOC) analysis. Trip blank containers of certified clean sand were opened and kept with the other sample containers during the sampling process.
Field Decontamination of Drilling and Sampling Equipment	Dry decontamination is the preferred method to minimize generating liquid waste. Dry decontamination included using a wire brush or other tool to remove soil or other material adhering to the sampling equipment, followed by using a commercial cleaning agent (nonacid, waxless cleaners) and paper wipes. No wet decontamination techniques were used at Material Disposal Area (MDA) G.
Coordinating and Evaluating Geodetic Surveys	Geodetic surveys focused on obtaining survey data of acceptable quality for use during project investigations. Geodetic surveys were conducted with a Trimble 5700 differential global positioning system (DGPS). The survey data conformed to Laboratory Information Architecture (IA) project standards IA-CB02, "GIS Horizontal Spatial Reference System," and IA-D802, "Geospatial Positioning Accuracy Standard for A/E/C/ and Facility Management." All coordinates are expressed as SPCS 83, NM Central, U.S. ft coordinates. All elevation data are reported relative to the National Geodetic Vertical Datum of 1929.

Method	Summary
Drilling Methods and Drill-Site Management	Various drilling methods were used to successfully retrieve suitable formation samples. These methods included solid-stem auger, hollow-stem auger, direct rotary, and casing advance (ODEX). A description of the drilling methods used at MDA G is included in Section 3.2. Access to the area surrounding the drill rig was controlled using barricades (orange traffic fence, caution tape, and cones) with signs containing site and contact information. The area within the barricades was designated as a HAZWOPER site and zoned by the proximity to potential hazards during drilling. An exclusion zone (EZ) was established, and only authorized personnel meeting all training and entry requirements were permitted access. The EZ is the area in which most activities took place (drilling operations, sampling, evaluation of retrieved material, and monitoring of the working environment, etc.).
Operation of LANL-Owned Borehole Logging Trailer	Laboratory-owned geophysical logging equipment was used for postdrilling characterization of the subsurface, including caliper, gamma, neutron, and 360-degree camera surveys. The boreholes were logged over the maximum available depth.
Spade and Scoop Collection of Soil Samples	This method was used to collect sediment samples. It involved digging a hole to the desired depth, as prescribed in the MDA G investigation work plan and collecting a discrete grab sample. The sample was then placed in a clean stainless-steel bowl for transfer into the proper sample container.
Split-Spoon Core-Barrel Sampling	A stainless-steel core barrel (varying in length and diameter depending on drilling method) was advanced using a powered drilling rig. The core barrel extracted a continuous length of soil and/or rock that was examined as a unit. The split-spoon core barrel is a cylindrical barrel split lengthwise so that the two halves can be separated to expose the core sample. Once extracted, the section of core was screened for radioactivity and organic vapors, photographed, and described in a geologic log. A portion of the core was then collected as a discrete sample from the desired depth.
Sampling of Sub-Atmospheric Air	Subsurface samples were collected from discrete zones within each borehole, selected based on investigation and field-screening results. During field measurements vapor samples were monitored for percent oxygen; carbon dioxide; water vapor; 1,1,1-trichloroethane; trichloroethene; tetrachloroethene; and Freon-11. These gasses were monitored during purging with a Brüel and Kjaer (B&K) multigas monitor (Type 1302), and a Landtec GEM2000. Analytical samples were collected only after the readings had stabilized. Vapor samples were collected using a SUMMA canister and analyzed by EPA Method TO-15. All instruments used during field-screening were calibrated daily following the manufacturer's specifications.
Headspace Vapor Screening with a Photoionization Detector	Immediately after the core barrel was opened, a representative sample was retrieved and placed in an air-tight bag. This bag was allowed to set for approximately 2 to 5 min. The bag was then open slightly, and the intake of a photoionization detector (PID) was inserted. The peak reading on the PID was noted in the field logs. A PID with an 11.7eV bulb was used for all field-screening conducted at MDA G. The instrument was field-checked and calibrated daily according to the operation manual supplied by the manufacturer.
Subsurface Moisture Measurements Using a Neutron Probe	Moisture measurements were collected with a CPN 503 DR run through the Laboratory-owned borehole logging system. Moisture measurements were taken on approximately 2-in. intervals for the entire open length of the borehole and the data recorded on a laptop computer connected to the probe. Calibration and operation of the neutron probe were conducted according to the manufacturer's specifications.
Field Logging, Handling, and Documentation of Borehole Materials	Upon reaching the surface, the core barrels were immediately opened for field screening, sampling, and logging. Logging of borehole materials included a run number, a core recovery percentage, the field-screening results, a lithological and structural description, and a photograph. Once the core material was logged, selected samples were taken from the core. All borehole material not sampled was then disposed of as waste. No material from the boreholes at MDA G was archived.

Appendix C

Borehole Logs and Geophysical Survey Results

Los Alamos National Laboratory
Environmental Characterization and Remediation
2004 - 2005 MDA G Environmental Characterization Drilling
Borehole Log

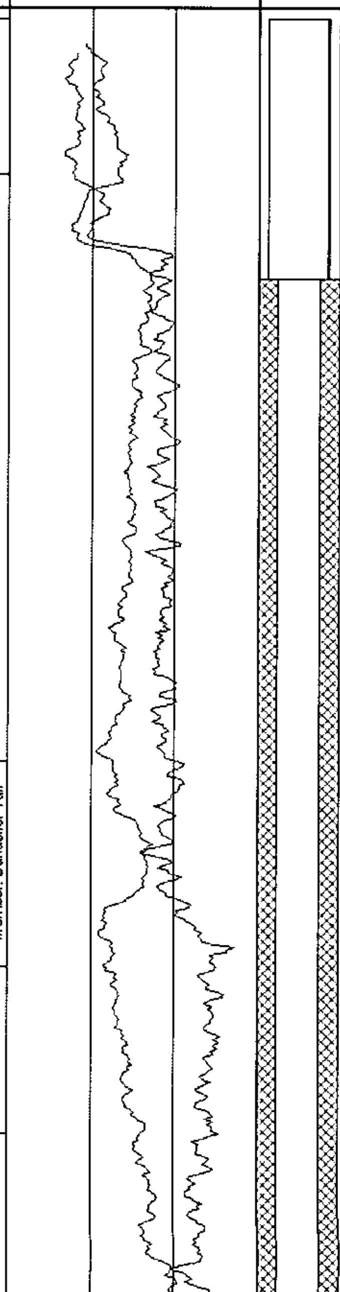
Borehole ID: 54-24360 **TA/OU:** 54/1148 **MDA:** G **Start Date / Time:** 8-16-05, 1125 **End Date / Time:** 8-18-05, 16:15

Drilling Co.: Enviro-Drill Inc. **Drilling Equip. / Method:** CME 75 / Hollow Stem Auger **Driller:** Matt Cain **Geologist:** Matt Hartmann, Apogen

Sampling Method: Continuous 5 ft core barrel **Declination:** 90 degrees **Bearing:** na **TD:** 200 ft

Depth	Core Run # / Core Recovery %	Field Screening Results	Analytical Sample Number	Lithology	Lithologic Unit	Notes
0.0 – 10.0	Crushed Tuff	3430 dpm Gross Alpha/Beta	No Samples	0.0 - 9.0 ft Fill	Fill	Gross Alpha/Beta Background = 2390 dpm.
10.0 – 15.0	3 / 100%	2920 dpm Gross Alpha/Beta		9.0 - 43.0 ft Tuff - Moderately welded, pinkish gray (5YR 6/2), dry. 10% quartz, 5% sanidine, 15 - 20% pumice. Pumice are large (up to 5 cm in diameter). A vertical caliche-lined fracture runs from 9.5 to 12.5 ft.	Unit 2 Tshirege Member, Bandelier Tuff	14 in. OD HSA to 10 ft bgs. Set 10 in. casing to depth of 15 ft.
15.0 – 20.0	4 / 100%	3310 dpm Gross Alpha/Beta				7 5/8 in OD HSA from 10 - 200 ft.
20.0 – 25.0	5 / 100%	2970 dpm Gross Alpha/Beta				
25.0 – 30.0	6 / 100%	4290 dpm Gross Alpha/Beta				
30.0 – 35.0	7 / 100%	4100 dpm Gross Alpha/Beta				
35.0 – 40.0	8 / 95%	4500 dpm Gross Alpha/Beta				
40.0 – 45.0	9 / 100%	4390 dpm Gross Alpha/Beta		43.0 - 55.0 ft Tuff - Poorly welded, pinkish grat (5 YR 6/2), dry. 15 -20% quartz, 5% sanidine, 10% pumice. Pumice are large and dark brown (up to 4 cm in diameter).	Unit 1v(u) Tshirege Member, Bandelier Tuff	
45.0 – 50.0	10 / 100%	4110 dpm Gross Alpha/Beta				
50.0 – 55.0	11 / 100%	4510 dpm Gross Alpha/Beta				
55.0 – 60.0	12 / 85%	4200 dpm Gross Alpha/Beta		55.0 - 65.0 ft Tuff - Poorly welded, softer than above, light gray (5YR 7/1), 15% quartz, <5% sanidine, 10% pumice.	Qbt 1v(c)	
60.0 – 65.0	13 / 90%	4430 dpm Gross Alpha/Beta	MD54-05-57871 MD54-05-57878(FD)			
65.0 – 70.0	14 / 100%	4490 dpm Gross Alpha/Beta		65.0 - 133.0 ft Tuff - Poorly welded, pink (5YR 7/3) to yellowish red (5YR 5/6) to white (7.5YR 8/1), dry. 15% quartz, 5% sanidine, 5-10 % lithics, 15% pumice. Pumice are round and large (up to 3cm)	Qbt 1g	
70.0 –	15 / 85%	3890 dpm Gross Alpha/Beta				

Neutron: 0 CPS 300 — Gamma: 0 CPS 300 — Construction: 7 7



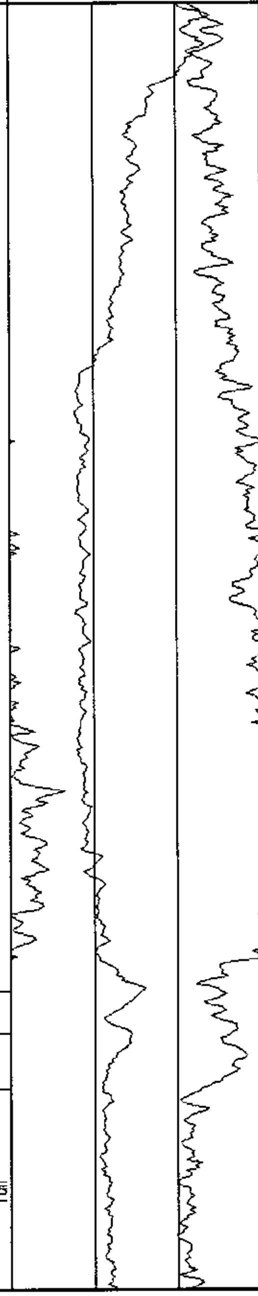
Los Alamos National Laboratory
Environmental Characterization and Remediation
2004 - 2005 MDA G Environmental Characterization Drilling
Borehole Log

Borehole ID: 54-24360 **TA/OU:** 54/1148 **MDA:** G **Start Date / Time:** 8-16-05, 1125 **End Date / Time:** 8-18-05, 16:15

Drilling Co.: Enviro-Drill Inc. **Drilling Equip. / Method:** CME 75 / Hollow Stem Auger **Driller:** Matt Cain **Geologist:** Matt Hartmann, Apogen

Sampling Method: Continuous 5 ft core barrel **Declination:** 90 degrees **Bearing:** na **TD:** 200 ft

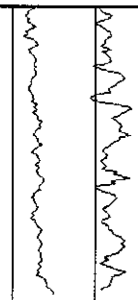
Depth	Core Run # / Core Recovery %	Field Screening Results	Analytical Sample Number	Lithology	Graphic Log	Lithologic Unit	Neutron (0 CPS 300) / Gamma (0 CPS 300)	Construction (? ?)	Notes
	16 / 95%	3200 dpm Gross Alpha/Beta	No Samples			Qbt 1g			
80.0	17 / 95%	3610 dpm Gross Alpha/Beta							
85.0	18 / 100%	3350 dpm Gross Alpha/Beta							
90.0	19 / 90%	3510 dpm Gross Alpha/Beta							
95.0	20 / 80%	3630 dpm Gross Alpha/Beta 0.0 ppm VOCs via PID Headspace							
100.0	21 / 70%	3120 dpm Gross Alpha/Beta							
105.0	22 / 60%	3100 dpm Gross Alpha/Beta 21 ppm VOCs via PID Headspace							
110.0	23 / 70%	2640 dpm Gross Alpha/Beta							
115.0	24 / 80%	2500 dpm Gross Alpha/Beta							
120.0	25 / 85%	3500 dpm Gross Alpha/Beta							
125.0	26 / 90%	2830 dpm Gross Alpha/Beta							
130.0	27 / 75%	3010 dpm Gross Alpha/Beta		133.0 - 134.0 ft Ash - reworked.		Qbtt			
135.0	28 / 60%	3630 dpm Gross Alpha/Beta 0.0 ppm VOCs via PID Headspace	MD54-05-57872	134.0 - 138.0 ft Sandy silt with ash.		Qct			
				138.0 - 200.0 ft Tuff - Nonwelded, white (5 YR 8/1), 10% quartz, 10% lithics, 10% pumice. Pumice are large and rounded (up to 4 cm in diameter). Lithics are mostly dacite fragments.		Otowi Member, Bandelier Tuff			
140.0	29 / 100%	2450 dpm Gross Alpha/Beta							
145.0	30 / 80%	2840 dpm Gross Alpha/Beta							



Borehole ID: 54-24360 **TA/OU:** 54/1148 **MDA:** G **Start Date / Time:** 8-16-05, 1125 **End Date / Time:** 8-18-05, 16:15

Drilling Co.: Enviro-Drill Inc. **Drilling Equip. / Method:** CME 75 / Hollow Stem Auger **Driller:** Matt Cain **Geologist:** Matt Hartmann, Apogen

Sampling Method: Continuous 5 ft core barrel **Declination:** 90 degrees **Bearing:** na **TD:** 200 ft

Depth	Core Run # / Core Recovery %	Field Screening Results	Analytical Sample Number	Lithology	Graphic Log	Lithologic Unit	Neutron 0 CPS 300 / Gamma 0 CPS 300	Construction 7 7	Notes
	31 / 70%	3900 dpm Gross Alpha/Beta	No Samples			Qbo			Slough in borehole from 167 - 200 ft prevents deeper geophysical measurements.
155.0	32 / 90%	3740 dpm Gross Alpha/Beta 0.0 ppm VOCs via PID Headspace							
160.0	33 / 80%	3540 dpm Gross Alpha/Beta							
165.0	34 / 90%	4130 dpm Gross Alpha/Beta							
170.0	35 / 80%	3320 dpm Gross Alpha/Beta							
175.0	36 / 90%	3380 dpm Gross Alpha/Beta							
180.0	37 / 90%	3300 dpm Gross Alpha/Beta							
185.0	38 / 85%	4200 dpm Gross Alpha/Beta							
190.0	39 / 95%	4100 dpm Gross Alpha/Beta							
195.0	40 / 95%	3230 dpm Gross Alpha/Beta 0.0 ppm VOCs via PID Headspace	MD54-05-57877						TD - 200 ft.
200.0									

Los Alamos National Laboratory
Environmental Characterization and Remediation
2004 - 2005 MDA G Environmental Characterization Drilling
Borehole Log

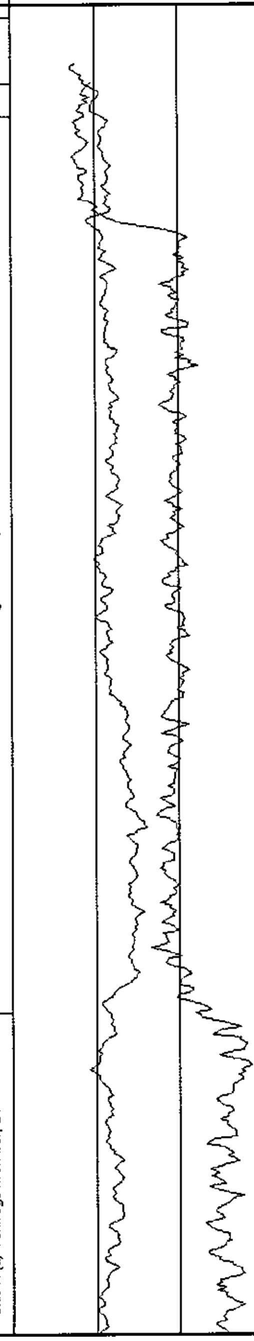
Borehole ID: 54-24361 **TA/OU:** 54/1148 **MDA:** G **Start Date / Time:** 3-4-05, 0733 **End Date / Time:** 3-5-05, 1200

Drilling Co.: Enviro-Drill Inc. **Drilling Equip. / Method:** CME 75 / Hollow Stem Auger **Driller:** Matt Cain **Geologist:** Pattie Baucom, Apogen

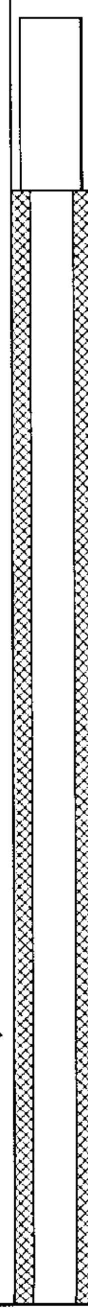
Sampling Method: Continuous 5 ft core barrel **Declination:** 90 degrees **Bearing:** N/A **TD:** 170 ft

Depth	Core Run # / Core Recovery %	Field Screening Results	Analytical Sample Number	Lithology	Lithologic Unit	Notes
0.0	1 / 40%	5650 dpm Gross Alpha/Beta	No Samples	0 - 0.35 ft Asphalt cap; 0.35 - 3.0 ft Mixed fill containing crushed tuff, sand, and silt, dry.	Asphalt; Fill	Gross Alpha/Beta Background = 6030 dpm; 14 in. OD HSA to 10 ft bgs. Set 10 in. casing to depth of 10 ft.
5.0	Core Logged from Cuttings	5790 dpm Gross Alpha/Beta	No Samples	3.0 - 50.0 ft Tuff - Densely welded, light gray (5YR7/1), dry. 15% quartz, 5% sanidine, 15% pumice. Pumice are small (2mm to 2 cm in diameter) and have a sugary texture.	Unit 2 Tshirege Member, Bandelier Tuff	7 5/8 in OD HSA from 10 - 170 ft.
10.0	2 / 80%	6800 dpm Gross Alpha/Beta 0.0 ppm VOCs via PID headspace	No Samples		Unit 2 Tshirege Member, Bandelier Tuff	
15.0	3 / 100%	6530 dpm Gross Alpha/Beta	No Samples		Unit 2 Tshirege Member, Bandelier Tuff	
20.0	4 / 100%	6910 dpm Gross Alpha/Beta	No Samples		Unit 2 Tshirege Member, Bandelier Tuff	
25.0	5 / 100%	6860 dpm Gross Alpha/Beta	No Samples		Unit 2 Tshirege Member, Bandelier Tuff	
30.0	6 / 100%	6270 dpm Gross Alpha/Beta TNT/RDX - Nondetect	MD54-05-57879 MD54-05-57886 (FD)		Unit 2 Tshirege Member, Bandelier Tuff	
35.0	7 / 100%	6350 dpm Gross Alpha/Beta 0.0 ppm VOCs via PID Headspace		35.0 - 56.0 ft Tuff - Densely welded, pale red (2.5YR 7/2), dry. 10% quartz, 5% sanidine, 15% pumice. Pumice are larger than above (up to 4 cm in diameter).	Unit 2 Tshirege Member, Bandelier Tuff	
40.0	8 / 100%	7340 dpm Gross Alpha/Beta			Unit 2 Tshirege Member, Bandelier Tuff	
45.0	9 / 100%	6880 dpm Gross Alpha/Beta			Unit 2 Tshirege Member, Bandelier Tuff	
50.0	10 / 100%	5860 dpm Gross Alpha/Beta			Unit 2 Tshirege Member, Bandelier Tuff	
55.0	11 / 100%	5850 dpm Gross Alpha/Beta		56.0 - 87.0 ft Tuff - Poorly welded to moderately welded, white (5YR 8/1), dry. 10% quartz, 5% sanidine, 20% pumice. Pumice are large, dark purple and brittle (.5 to 5 cm in diameter).	Unit 1v(u) Tshirege Member, Bandelier Tuff	
60.0	12 / 100%	6850 dpm Gross Alpha/Beta			Unit 1v(u) Tshirege Member, Bandelier Tuff	
65.0	13 / 100%	5470 dpm Gross Alpha/Beta			Unit 1v(u) Tshirege Member, Bandelier Tuff	
70.0	14 / 100%	6380 dpm Gross Alpha/Beta			Unit 1v(u) Tshirege Member, Bandelier Tuff	

Neutron: 0 CPS 300 / Gamma: 0 cps 300



Construction: 7 7

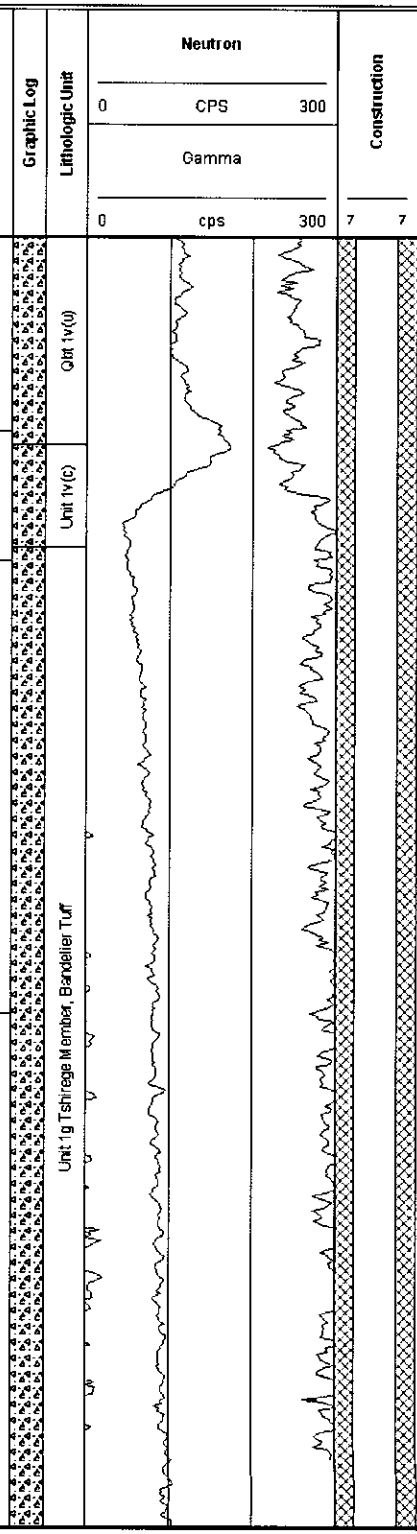


Borehole ID: 54-24361 **TA/OU:** 54/1148 **MDA:** G **Start Date / Time:** 3-4-05, 0733 **End Date / Time:** 3-5-05, 1200

Drilling Co.: Enviro-Drill Inc. **Drilling Equip. / Method:** CME 75 / Hollow Stem Auger **Driller:** Matt Cain **Geologist:** Pattie Baucom, Apogen

Sampling Method: Continuous 5 ft core barrel **Declination:** 90 degrees **Bearing:** N/A **TD:** 170 ft

Depth	Core Run # / Core Recovery %	Field Screening Results	Analytical Sample Number	Lithology	Lithologic Unit	Notes
	15 / 100%	6080 dpm Gross Alpha/Beta	No Samples		Qbt 1v(u)	
80.0	16 / 100%	5850 dpm Gross Alpha/Beta				
85.0	17 / 100%	5360 dpm Gross Alpha/Beta		87.0 - 93.0 ft Tuff- Densely welded, light reddish brown (2.5YR 7/4), dry. 10% quartz, 15% lithics (up to 3 cm in diameter), 5% pumice.	Unit 1v(c)	
90.0	18 / 100%	5790 dpm Gross Alpha/Beta				
95.0	19 / 100%	5250 dpm Gross Alpha/Beta		93.0 - 120.0 ft Tuff- Moderately welded to nonwelded, light reddish brown (2.5 YR7/3), dry. 10% quartz, 5-7% lithics, 15% pumice. Pumice are golden, crystalline, and fibrous (up to 4 cm in diameter).	Unit 1g Tshirege Member, Bandelier Tuff	
100.0	20 / 90%	6430 dpm Gross Alpha/Beta				
105.0	21 / 95%	6850 dpm Gross Alpha/Beta				
110.0	22 / 95%	6130 dpm Gross Alpha/Beta				
115.0	23 / 90%	5810 dpm Gross Alpha/Beta				
120.0	24 / 90%	4990 dpm Gross Alpha/Beta		120.0 - 159.0 ft Tuff- Nonwelded, pink (2.5YR 8/3) to white (2.5YR 8/1), dry. 10% quartz, <5% sanidine, 5% lithics , 15% pumice.		
125.0	25 / 95%	6530 dpm Gross Alpha/Beta				
130.0	26 / 95%	5650 dpm Gross Alpha/Beta				
135.0	27 / 95%	6270 dpm Gross Alpha/Beta				
140.0	28 / 95%	6210 dpm Gross Alpha/Beta				Slough in borehole from 151 - 170 ft prevents deeper geophysical measurements.
145.0	29 / 95%	6110 dpm Gross Alpha/Beta				



Los Alamos National Laboratory
Environmental Characterization and Remediation
2004 - 2005 MDA G Environmental Characterization Drilling
Borehole Log

Borehole ID: 54-24361 **TA/OU:** 54/1148 **MDA:** G **Start Date / Time:** 3-4-05, 0733 **End Date / Time:** 3-5-05, 1200

Drilling Co.: Enviro-Drill Inc. **Drilling Equip. / Method:** CME 75 / Hollow Stem Auger **Driller:** Matt Cain **Geologist:** Pattie Baucom, Apogen

Sampling Method: Continuous 5 ft core barrel **Declination:** 90 degrees **Bearing:** N/A **TD:** 170 ft

Depth	Core Run # / Core Recovery %	Field Screening Results	Analytical Sample Number	Lithology	Graphic Log	Lithologic Unit	Neutron 0 CPS 300 / Gamma 0 cps 300	Construction 7 7	Notes
	30 / 95%	5690 dpm Gross Alpha/Beta				Qbt 1g			
155.0	31 / 95%	5520 dpm Gross Alpha/Beta		159.0 - 161.0 ft Pumice - 50% coarse-grained quartz, 50% angular, gravel sized pumice.		Tsankawi Pumice			
160.0	32 / 95%	6260 dpm Gross Alpha/Beta		161.0 - 163.0 ft Silty sand with pebbles, reddish brown (5YR 5/4), dry.		Qct			
165.0	33 / 95%	5500 dpm Gross Alpha/Beta RDX/TNT - nondetect	MD54-05-57885	163.0 - 170.0 ft Tuff- Nonwelded, pinkish white (5YR 8/2), dry. 10% quartz, 5 % sanidine, 5% lithics, 12% pumice. Basalt cobbles in bottom of core barrel.		Qbo			Refusal at 170 ft.
170.0									

Los Alamos National Laboratory
Environmental Characterization and Remediation
2004 - 2005 MDA G Environmental Characterization Drilling
Borehole Log

Borehole ID: 54-24362 **TA/OU:** 54/1148 **MDA:** G **Start Date / Time:** 5-5-05, 1050 **End Date / Time:** 5-9-05, 1200

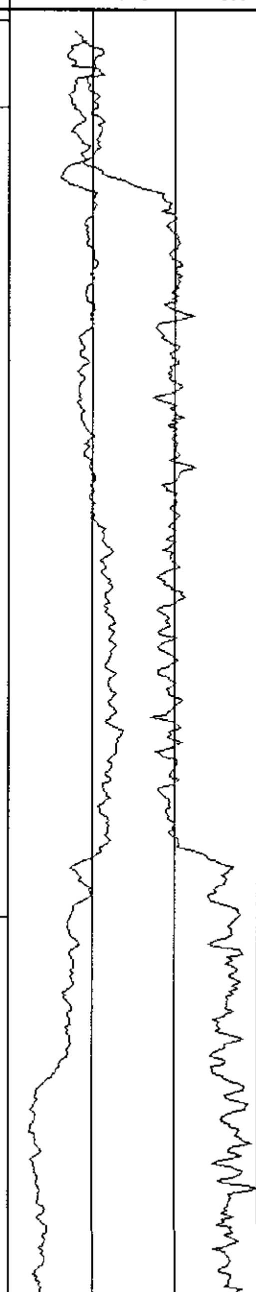
Drilling Co.: Enviro-Drill Inc. **Drilling Equip. / Method:** CME 75 / Hollow Stem Auger **Driller:** Matt Cain **Geologist:** Pattie Baucom, Apogen

Sampling Method: Continuous 5 ft core barrel **Declination:** 90 degrees **Bearing:** N/A **TD:** 189 ft

Depth	Core Run # / Core Recovery %	Field Screening Results	Analytical Sample Number	Lithology	Lithologic Unit	Notes
0.0	1 / 40%	4310 dpm Gross Alpha/Beta	No Samples	0.0 - 5.0 ft Fill - Crushed tuff with poorly developed soil horizons at 4.0 ft and 5.0 ft.	Fill	Net Alpha/Beta Background = 3010 dpm
5.0	2 / 90%	3670 dpm Gross Alpha/Beta		5.0 - 25.0 ft Tuff - Densely welded, fractured, light gray (5YR 7/1), damp. 12% quartz, 5% sanidine, 15% pumice.	Unit 2 Tshirege Member, Bandelier Tuff	14 in. OD HSA to 10 ft bgs. Set 10 in. casing to depth of 10 ft.
10.0	3 / 100%	4010 dpm Gross Alpha/Beta 0.0 ppm VOCs via PID headspace				7 5/8 in OD HSA from 10 - 189 ft.
15.0	4 / 90%	4590 dpm Gross Alpha/Beta				
20.0	5 / 95%	4710 dpm Gross Alpha/Beta				
25.0	6 / 95%	4920 dpm Gross Alpha/Beta		25.0 - 35.0 ft Tuff - Densely welded, fractured, pinkish gray (5YR 7/2), dry. 10% quartz, 5% sanidine, 15% pumice. Pumice are large (up to 3 cm in diameter).		
30.0	7 / 100%	4890 dpm Gross Alpha/Beta				
35.0	8 / 100%	4460 dpm Gross Alpha/Beta 0.0 ppm VOCs via PID Headspace TNT/RDX - Nondetect	MD54-05-57887 MD54-05-57894 (FD)	35.0 - 40.0 ft Tuff - SAA. Clay filled fracture from 38 - 40 ft.		
40.0	9 / 100%	4820 dpm Gross Alpha/Beta		40.0 - 52.0 ft Tuff - Moderately welded to densely welded, pinkish gray (5YR 7/2), dry. 10% quartz, 5% sanidine, 15% pumice. Pumice are large (up to 4 cm in diameter).		
45.0	10 / 100%	5160 dpm Gross Alpha/Beta				
50.0	11 / 100%	5010 dpm Gross Alpha/Beta		52.0 - 75.0 ft Tuff - Poorly welded to moderately welded, pinkish white (5YR 8/2) to white (5YR 8/1). 10% quartz, 15% pumice, 5% sanidine, 1% lithics. Pumice are dark purple, brittle, and large (up to 5 cm in diameter).	Unit 1v(u) Tshirege Member, Bandelier Tuff	
55.0	12 / 100%	5140 dpm Gross Alpha/Beta				
60.0	13 / 100%	5050 dpm Gross Alpha/Beta				
65.0	14 / 100%	5150 dpm Gross Alpha/Beta				
70.0	15 / 100%	5210 dpm Gross Alpha/Beta				

Graphic Log

Neutron
0 CPS 300
Gamma
0 CPS 300



Construction
7 7

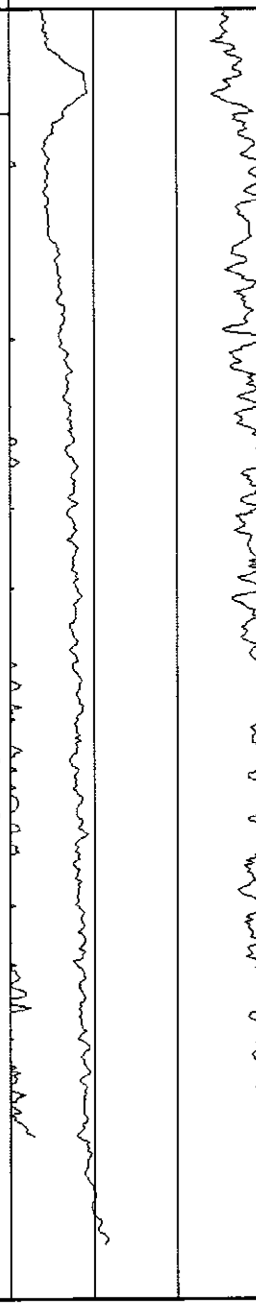
Los Alamos National Laboratory
Environmental Characterization and Remediation
2004 - 2005 MDA G Environmental Characterization Drilling
Borehole Log

Borehole ID: 54-24362 **TA/OU:** 54/1148 **MDA:** G **Start Date / Time:** 5-5-05, 1050 **End Date / Time:** 5-9-05, 1200

Drilling Co.: Enviro-Drill Inc. **Drilling Equip. / Method:** CME 75 / Hollow Stem Auger **Driller:** Matt Cain **Geologist:** Pattie Baucom, Apogen

Sampling Method: Continuous 5 ft core barrel **Declination:** 90 degrees **Bearing:** N/A **TD:** 189 ft

Depth	Core Run # / Core Recovery %	Field Screening Results	Analytical Sample Number	Lithology	Lithologic Unit	Notes
75.0–80.0	16 / 100%	4980 dpm Gross Alpha/Beta	No Samples	75.0 - 81.0 ft Tuff- Densely welded, pink (7.5 YR 8/3), dry. 10% quartz, 10% lithics, 5% sanidine, 15% pumice.	Unit 1v(c)	
80.0	17 / 100%	4480 dpm Gross Alpha/Beta		81.0 - 85.0 ft Tuff- Densely welded, pink (7.5YR 8/4), dry. 10% quartz, 7% lithics, 5% sanidine, 20% pumice. Pumice are golden, crystalline, and fibrous.	Unit 1g Tshirege Member, Bandelier Tuff	
85.0	18 / 100%	5120 dpm Gross Alpha/Beta		85.0 - 90.0 ft Tuff- SAA, welding decreases to nonwelded at 88 ft.		
90.0	19 / 100%	4740 dpm Gross Alpha/Beta		90.0 - 153.5 ft Tuff- Nonwelded, pink (7.5 YR 7/3) to white (7.5YR 8/1), dry. 10% quartz, 7% lithics, 20% pumice, 2% sanidine. Pumice range from .5 to 4 cm in diameter.		
95.0	20 / 100%	4930 dpm Gross Alpha/Beta				
100.0	21 / 100%	4770 dpm Gross Alpha/Beta				
105.0	22 / 100%	4120 dpm Gross Alpha/Beta				
110.0	23 / 100%	4720 dpm Gross Alpha/Beta				
115.0	24 / 100%	5240 dpm Gross Alpha/Beta				
120.0	25 / 90%	4790 dpm Gross Alpha/Beta				
125.0	26 / 90%	4950 dpm Gross Alpha/Beta				
130.0	27 / 90%	4980 dpm Gross Alpha/Beta				
135.0	28 / 90%	5070 dpm Gross Alpha/Beta				Net Alpha/Beta Background = 3200 dpm.
140.0	29 / 95%	3930 dpm Gross Alpha/Beta				Slough in borehole from 146 - 189 ft prevents deeper geophysical measurements.
145.0	30 / 95%	4410 dpm Gross Alpha/Beta				



Construction
7 7

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Environmental Characterization and Remediation
2004 - 2005 MDA G Environmental Characterization Drilling
Borehole Log

Borehole ID: 54-24362 **TA/OU:** 54/1148 **MDA:** G **Start Date / Time:** 5-5-05, 1050 **End Date / Time:** 5-9-05, 1200

Drilling Co.: Enviro-Drill Inc. **Drilling Equip. / Method:** CME 75 / Hollow Stem Auger **Driller:** Matt Cain **Geologist:** Pattie Baucom, Apogen

Sampling Method: Continuous 5 ft core barrel **Declination:** 90 degrees **Bearing:** N/A **TD:** 189 ft

Depth	Core Run # / Core Recovery %	Field Screening Results	Analytical Sample Number	Lithology	Graphic Log	Lithologic Unit	Neutron 0 CPS 300 / Gamma 0 CPS 300	Construction 7 7	Notes
	31 / 95%	3980 dpm Gross Alpha/Beta		153.5 - 155.0 ft Pumice - reworked. 60% angular, gravel sized pumice, 40% coarse-grained quartz.		Tsankawi Pumice			
155.0	32 / 85%	4270 dpm Gross Alpha/Beta		155.0 - 165.0 ft Interbedded silty fine-grained sand, well sorted fine to medium-grained sand, pumice layers (2.5 inches thick), and pebbley sand with dacite gravels.		Cerro Toledo Interval			
160.0	33 / 80%	3790 dpm Gross Alpha/Beta							
165.0	34 / 95%	4190 dpm Gross Alpha/Beta		165.0 - 183.0 ft Tuff- Nonwelded, pink (7.5YR 8/3), dry. 10% quartz, 5% lithics, 15% pumice.		Otowi Member, Bandelier Tuff			
170.0	35 / 95%	4250 dpm Gross Alpha/Beta							
175.0	36 / 100%	4420 dpm Gross Alpha/Beta							
180.0	37 / 95%	4180 dpm Gross Alpha/Beta							
185.0	38 / 70%	4010 dpm Gross Alpha/Beta RDX/TNT - Nondetect	MD54-05-57893	183.0 - 188.0 ft Pumice - reworked, gravel sized, angular, dry.		Qbog			Refusal at 189 ft.
				188.0 - 189.0 ft Paleosol, reddish brown (5YR 5/3), damp. Sandy silt with gravel sized basalt clasts, underlain by silty clay, pink (5YR 8/3), damp.		Paleosol			
190.0									

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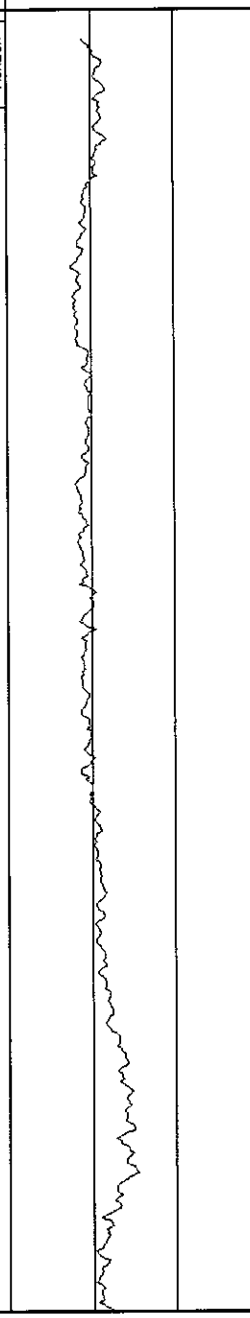
Environmental Characterization and Remediation
2004 - 2005 MDA G Environmental Characterization Drilling
Borehole Log

Borehole ID: 54-24363 **TA/OU:** 54/1148 **MDA:** G **Start Date / Time:** 3-9-05, 0933 **End Date / Time:** 3-25-05, 1020

Drilling Co.: Enviro-Drill Inc. **Drilling Equip. / Method:** CME 75 / Hollow Stem Auger **Driller:** Shad Betts **Geologist:** Kevin Reid, TerranearPMC

Sampling Method: Continuous 5 ft core barrel **Declination:** 45 degrees **Bearing:** N34W **TD:** 250 ft

LENGTH (45 degree angle depth)	Core Run # / Core Recovery %	Field Screening Results	Analytical Sample Number	Lithology	Lithologic Unit	Notes
0.0	Logged from cuttings	3860 dpm Gross Alpha/Beta		0.0 - 5.0 ft Soil - Sandy loam, slightly damp.	Soil Horizon	Gross Alpha/Beta Background = 2440 dpm
5.0		3980 dpm Gross Alpha/Beta		5.0 - 28.0 ft Tuff - Moderately welded to densely welded, light gray (7.5YR 7/1), dry. 10% quartz, 5% sanidine, 5% pumice. Pumice have a sugary texture.	Unit 2 Tshirege Member, Bandelier Tuff	14 in. OD HSA to 10 ft bgs. Set 10 in. casing to depth of 10 ft.
10.0	1 / 30%	2810 dpm Gross Alpha/Beta				7 5/8 in OD HSA from 10 - 250 ft.
15.0	2 / 30%	2940 dpm Gross Alpha/Beta				
20.0	3 / 30%	3440 dpm Gross Alpha/Beta	No Samples			
25.0	4 / 90%	3130 dpm Gross Alpha/Beta 0.0 ppm VOCs via PID Headspace		28.0 - 28.2 ft Surge Bed - 100% coarse-grained quartz crystals (1-2mm).		
30.0	5 / 95%	4120 dpm Gross Alpha/Beta		28.2 - 45.0 ft Tuff - SAA. Fractures from 32.3 - 32.8 ft, 36 - 37 ft, and 42 - 43 ft. Fractures are small (1-2 mm) and unfilled.		
35.0	6 / 100%	4090 dpm Gross Alpha/Beta 0.0 ppm VOCs via PID Headspace				
40.0	7 / 100%	3330 dpm Gross Alpha/Beta				
45.0	8 / 100%	4060 dpm Gross Alpha/Beta	MD54-05-57895 MD54-05-57902(FD)	45.0 - 80.0 ft Tuff - Densely welded, light gray (7.5YR 7/1), dry. 15% quartz, 5% sanidine, 5% pumice. Pumice are large (up to 5 cm in diameter) with a sugary texture. Clay filled fracture from 62 - 64 ft, light reddish brown (5YR 6/4), slightly moist.		
50.0	9 / 100%	4090 dpm Gross Alpha/Beta TNT/RDX - Nondetect	No Samples			
55.0	10 / 100%	4020 dpm Gross Alpha/Beta				
60.0	11 / 100%	3050 dpm Gross Alpha/Beta 0.0 ppm VOCs via PID Headspace	MD54-05-57896			
65.0	12 / 100%	4060 dpm Gross Alpha/Beta				
70.0	13 / 100%	3080 dpm Gross Alpha/Beta				

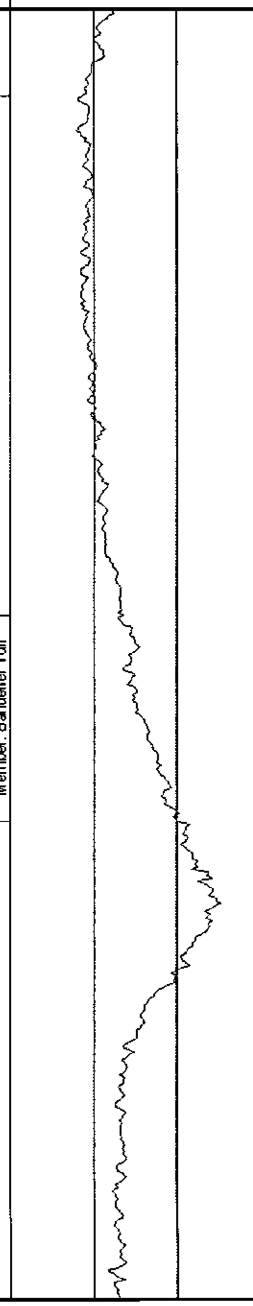
Neutron


Construction


Borehole ID: 54-24363 **TA/OU:** 54/1148 **MDA:** G **Start Date / Time:** 3-9-05, 0933 **End Date / Time:** 3-25-05, 1020

Drilling Co.: Enviro-Drill Inc. **Drilling Equip. / Method:** CME 75 / Hollow Stem Auger **Driller:** Shad Betts **Geologist:** Kevin Reid, TerranearPMC

Sampling Method: Continuous 5 ft core barrel **Declination:** 45 degrees **Bearing:** N34W **TD:** 250 ft

LENGTH (45 degree angle depth)	Core Run # / Core Recovery %	Field Screening Results	Analytical Sample Number	Lithology	Graphic Log	Lithologic Unit	Neutron (0 CPS 300)	Construction	Notes
	14 / 100%	3470 dpm Gross Alpha/Beta 0.0 ppm VOCs via PID Headspace	No Samples			Qbt 2			
80.0	15 / 100%	4630 dpm Gross Alpha/Beta		80.0 - 100.0 ft Tuff- Slightly welded to nonwelded, white (7.5 YR 8/1), dry. 10% quartz, 3% sanidine, 5% pumice, 1% lithics.		Unit 1v(u) Tshirege Member, Bandelier Tuff			
85.0	16 / 100%	4460 dpm Gross Alpha/Beta 0.0 ppm VOCs via PID Headspace							
90.0	17 / 100%	4120 dpm Gross Alpha/Beta							
95.0	18 / 100%	4350 dpm Gross Alpha/Beta							
100.0	19 / 100%	4000 dpm Gross Alpha/Beta		100.0 - 110.0 ft Tuff- Moderately welded, light gray (7.5 YR 7/1), dry. 15% quartz, 15% pumice, 3% sanidine. Pumice are up to 3 cm in diameter.					
105.0	20 / 100%	4600 dpm Gross Alpha/Beta							
110.0	21 / 100%	4490 dpm Gross Alpha/Beta 7.0 ppm VOCs via PID Headspace		110.0 - 122.0 ft Tuff- Moderately welded, dry. 15% quartz, 12% pumice, <5% sanidine, 5% lithics (up to 3 cm in diameter).		Unit 1v(c) Tshirege Member, Bandelier Tuff			
115.0	22 / 100%	4160 dpm Gross Alpha/Beta 0.0 ppm VOCs via PID Headspace							
120.0	23 / 100%	3620 dpm Gross Alpha/Beta 12.0 ppm VOCs via PID Headspace		122.0 - 130.0 ft Tuff- Densely welded, reddish brown (5YR 5/4), dry. 5% quartz, 5% sanidine, 15% pumice, 5% lithics.		Unit 1g Tshirege Member, Bandelier Tuff			
125.0	24 / 100%	4680 dpm Gross Alpha/Beta							
130.0	25 / 20%	3530 dpm Gross Alpha/Beta 2.3 ppm VOCs via PID Headspace		130.0 - 229.8 ft Tuff- Nonwelded, reddish brown (5YR 5/4) to white (5YR 8/1), dry. 10% quartz, 5% lithics, 2% sanidine, 15% pumice.					Gross Alpha/Beta Background = 3270 dpm.
135.0	26 / 100%	3590 dpm Gross Alpha/Beta							
140.0	27 / 100%	4210 dpm Gross Alpha/Beta 0.0 ppm VOCs via PID Headspace							
145.0	28 / 90%	4050 dpm Gross Alpha/Beta							

Borehole ID: 54-24363 **TA/OU:** 54/1148 **MDA:** G **Start Date / Time:** 3-9-05, 0933 **End Date / Time:** 3-25-05, 1020

Drilling Co.: Enviro-Drill Inc. **Drilling Equip. / Method:** CME 75 / Hollow Stem Auger **Driller:** Shad Betts **Geologist:** Kevin Reid, TerranearPMC

Sampling Method: Continuous 5 ft core barrel **Declination:** 45 degrees **Bearing:** N34W **TD:** 250 ft

LENGTH (45 degree angle depth)	Core Run # / Core Recovery %	Field Screening Results	Analytical Sample Number	Lithology	Graphic Log	Lithologic Unit	Neutron (0 CPS 300)	Construction	Notes
	29 / 100%	4550 dpm Gross Alpha/Beta 0.0 ppm VOCs via PID Headspace							
155.0	30 / 90%	4210 dpm Gross Alpha/Beta							
160.0	31 / 100%	4170 dpm Gross Alpha/Beta 0.0 ppm VOCs via PID Headspace	MD54-05-57897						
165.0	32 / 100%	3940 dpm Gross Alpha/Beta							
170.0	33 / 100%	3870 dpm Gross Alpha/Beta 0.0 ppm VOCs via PID Headspace							Gross Alpha/Beta Background = 2810 dpm.
175.0	34 / 90%	4680 dpm Gross Alpha/Beta 0.0 ppm VOCs via PID Headspace							
180.0	35 / 100%	3380 dpm Gross Alpha/Beta							
185.0	36 / 100%	3240 dpm Gross Alpha/Beta 0.0 ppm VOCs via PID Headspace				Qbt 1g			
190.0	37 / 100%	3050 dpm Gross Alpha/Beta							BH-04 could not be logged using the camera, caliper, or gamma tools. The neutron tool could not be advanced past 203 ft.
195.0	38 / 90%	4090 dpm Gross Alpha/Beta 0.0 ppm VOCs via PID Headspace							
200.0	39 / 100%	3030 dpm Gross Alpha/Beta							
205.0	40 / 100%	4150 dpm Gross Alpha/Beta 0.0 ppm VOCs via PID Headspace	No Samples						
210.0	41 / 100%	3380 dpm Gross Alpha/Beta							
215.0	42 / 100%	3630 dpm Gross Alpha/Beta 0.0 ppm VOCs via PID Headspace							
220.0	43 / 90%	4010 dpm Gross Alpha/Beta							

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2004 - 2005 MDA G Environmental Characterization Drilling
Borehole Log

Borehole ID: 54-24363 **TA/OU:** 54/1148 **MDA:** G **Start Date / Time:** 3-9-05, 0933 **End Date / Time:** 3-25-05, 1020

Drilling Co.: Enviro-Drill Inc. **Drilling Equip. / Method:** CME 75 / Hollow Stem Auger **Driller:** Shad Betts **Geologist:** Kevin Reid, TerranearPMC

Sampling Method: Continuous 5 ft core barrel **Declination:** 45 degrees **Bearing:** N34W **TD:** 250 ft

LENGTH (45 degree angle depth)	Core Run # / Core Recovery %	Field Screening Results	Analytical Sample Number	Lithology	Graphic Log	Lithologic Unit	Neutron (0 CPS 300)	Construction	Notes
	44 / 90%	3620 dpm Gross Alpha/Beta 0.0 ppm VOCs via PID Headspace				Qbt 1g			Gross Alpha/Beta Background = 2730 dpm.
230.0	45 / 70%	3010 dpm Gross Alpha/Beta		229.8 - 233.0 ft Pumice - Angular to subangular, well sorted pumice clasts (up to 1.5 cm in diameter).		Qbtt			
235.0	46 / 60%	3810 dpm Gross Alpha/Beta 0.0 ppm VOCs via PID Headspace		233.0 - 245.0 ft Interlayered sand with pumice clasts, coarse sand, and silt, very slightly damp.		Cerro Toledo Interval			
240.0	47 / 80%	3410 dpm Gross Alpha/Beta							
245.0	48 / 70%	3220 dpm Gross Alpha/Beta 0.0 ppm VOCs via PID Headspace TNT/RDX - Nondetect	MD54-05-57801	245.0 - 250.0 ft Pumice - Rounded to subrounded, well sorted, clasts up to 3 cm in diameter, very slightly damp.		Qbog			TD - 250 ft.
250.0									

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2004 - 2005 MDA G Environmental Characterization Drilling
Borehole Log

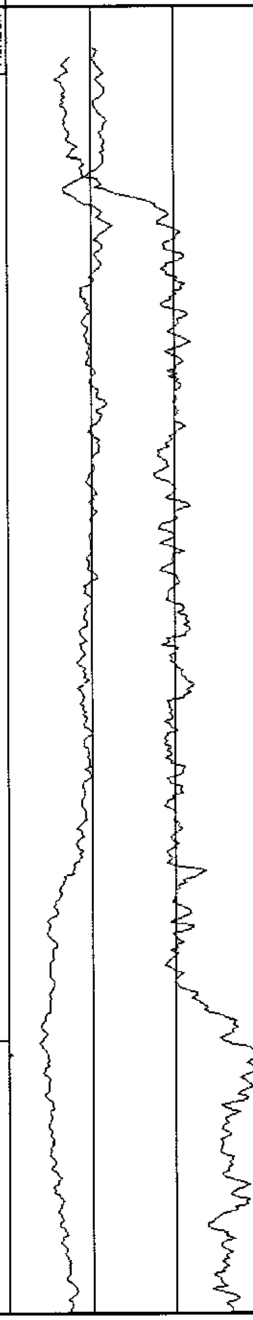
Borehole ID: 54-24364 **TA/OU:** 54/1148 **MDA:** G **Start Date / Time:** 2-28-05, 1450 **End Date / Time:** 3-2-05, 1645

Drilling Co.: Enviro-Drill Inc. **Drilling Equip. / Method:** CME 75 / Hollow Stem Auger **Driller:** Matt Cain **Geologist:** Kevin Reid, TerranearPMC

Sampling Method: Continuous 5 ft core barrel **Declination:** 90 degrees **Bearing:** na **TD:** 200 ft

Depth	Core Run # / Core Recovery %	Field Screening Results	Analytical Sample Number	Lithology	Lithologic Unit	Notes
0.0	Logged from cuttings	2870 dpm Gross Alpha/Beta 0.0 ppm VOCs via PID Headspace	No Samples	0.0 - 2.0 ft Soil - Sandy clay.	Soil Horizon	Gross Alpha/Beta Background = 1723 dpm
5.0				2.0 - 59.0 ft Tuff- Moderately welded to densely welded, gray (7.5YR 6/1), dry. 10% quartz, 5% sanidine, 5% pumice.	Unit 2 Tshirege Member, Bandelier Tuff	14 in. OD HSA to 10 ft bgs. Set 10 in. casing to depth of 10 ft.
10.0	1 / 100%	2040 dpm Gross Alpha/Beta				7 5/8 in OD HSA from 10 - 200 ft.
15.0	2 / 100%	2130 dpm Gross Alpha/Beta 0.0 ppm VOCs via PID Headspace				
20.0	3 / 100%	2170 dpm Gross Alpha/Beta				
25.0	4 / 100%	2810 dpm Gross Alpha/Beta 0.0 ppm VOCs via PID Headspace				
30.0	5 / 90%	2930 dpm Gross Alpha/Beta				
35.0	6 / 60%	2260 dpm Gross Alpha/Beta 0.0 ppm VOCs via PID Headspace				
40.0	7 / 80%	2370 dpm Gross Alpha/Beta				
45.0	8 / 100%	1841 dpm Gross Alpha/Beta				
50.0	9 / 100%	2390 dpm Gross Alpha/Beta				
55.0	10 / 100%	2260 dpm Gross Alpha/Beta		59.0 - 59.1 ft Surge bed - coarse grained quartz and sanidine crystals (1-2mm).		
60.0	11 / 100%	2880 dpm Gross Alpha/Beta 0.0 ppm VOCs via PID Headspace		59.3 - 82.0 ft Tuff- Moderately welded to poorly welded, light gray (7.5YR 7/1), dry. 10% quartz, 5% sanidine, 5% pumice. Pumice are dark purple and large (up to 5 cm in diameter).	Qbt 1v(u)	
65.0	12 / 100%	3350 dpm Gross Alpha/Beta TNT/RDX - Nondetect	MD54-05-57903 MD54-05-57910(FD)			
70.0	13 / 100%	3070 dpm Gross Alpha/Beta				

Neutron: 0 CPS 300
Gamma: 0 CPS 300
Construction: 7 7



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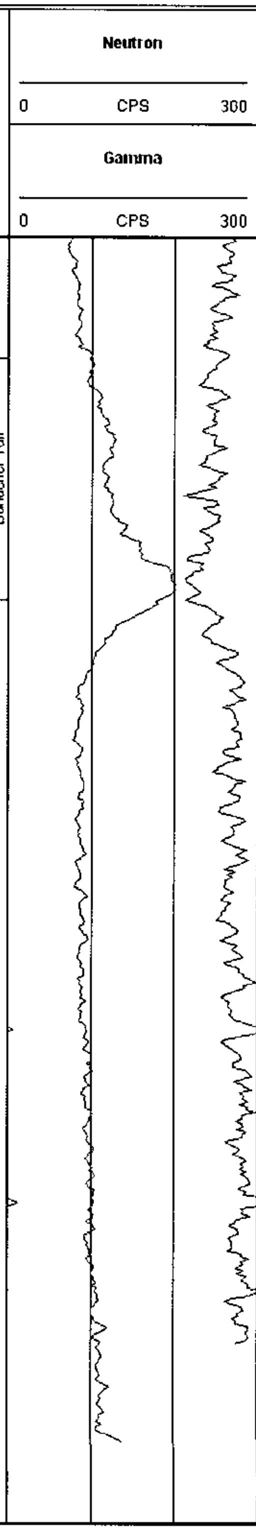
Environmental Characterization and Remediation
2004 - 2005 MDA G Environmental Characterization Drilling
Borehole Log

Borehole ID: 54-24364 **TA/OU:** 54/1148 **MDA:** G **Start Date / Time:** 2-28-05, 1450 **End Date / Time:** 3-2-05, 1645

Drilling Co.: Enviro-Drill Inc. **Drilling Equip. / Method:** CME 75 / Hollow Stem Auger **Driller:** Matt Cain **Geologist:** Kevin Reid, TerranearPMC

Sampling Method: Continuous 5 ft core barrel **Declination:** 90 degrees **Bearing:** na **TD:** 200 ft

Depth	Core Run # / Core Recovery %	Field Screening Results	Analytical Sample Number	Lithology	Lithologic Unit	Notes
	14 / 100%	2340 dpm Gross Alpha/Beta 0.0 ppm VOCs via PID Headspace			Qbt 1v(u)	
80.0	15 / 100%	2810 dpm Gross Alpha/Beta		82.0 - 96.0 ft Tuff - Moderately welded to densely welded, pinkish gray (7.5YR 7/2), dry. 15% quartz, 10% sanidine, 5% pumice, 3% lithics.	Unit 1v(c) Tshirege Member, Bandelier Tuff	
85.0	16 / 100%	2480 dpm Gross Alpha/Beta 0.0 ppm VOCs via PID Headspace				
90.0	17 / 100%	3100 dpm Gross Alpha/Beta				
95.0	18 / 100%	2310 dpm Gross Alpha/Beta		96.0 - 164.0 ft Tuff - Moderately welded to nonwelded, light reddish brown (5YR 6/4) to white (5YR 8/1), dry. 10% quartz, 5% sanidine, 5% lithics, 10% pumice.	Unit 1g Tshirege Member, Bandelier Tuff	
100.0	19 / 90%	2790 dpm Gross Alpha/Beta				
105.0	20 / 100%	3240 dpm Gross Alpha/Beta 0.0 ppm VOCs via PID Headspace				
110.0	21 / 100%	3087 dpm Gross Alpha/Beta				
115.0	22 / 100%	3170 dpm Gross Alpha/Beta 0.0 ppm VOCs via PID Headspace				Gross Alpha/Beta Background = 1695 dpm.
120.0	23 / 90%	2280 dpm Gross Alpha/Beta				
125.0	24 / 95%	2330 dpm Gross Alpha/Beta 0.0 ppm VOCs via PID Headspace				
130.0	25 / 90%	2860 dpm Gross Alpha/Beta	No Samples			
135.0	26 / 95%	2720 dpm Gross Alpha/Beta				
140.0	27 / 90%	2940 dpm Gross Alpha/Beta 0.0 ppm VOCs via PID Headspace				Slough in borehole from 146 - 200 ft prevents deeper geophysical measurements.
145.0	28 / 95%	2720 dpm Gross Alpha/Beta				



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Environmental Characterization and Remediation
2004 - 2005 MDA G Environmental Characterization Drilling
Borehole Log

Borehole ID: 54-24364 **TA/OU:** 54/1148 **MDA:** G **Start Date / Time:** 2-28-05, 1450 **End Date / Time:** 3-2-05, 1645

Drilling Co.: Enviro-Drill Inc. **Drilling Equip. / Method:** CME 75 / Hollow Stem Auger **Driller:** Matt Cain **Geologist:** Kevin Reid, TerranearPMC

Sampling Method: Continuous 5 ft core barrel **Declination:** 90 degrees **Bearing:** na **TD:** 200 ft

Depth	Core Run # / Core Recovery %	Field Screening Results	Analytical Sample Number	Lithology	Graphic Log	Lithologic Unit	Neutron (0 CPS 300) / Gamma (0 CPS 300)	Construction (7 7)	Notes
155.0	29 / 90%	2740 dpm Gross Alpha/Beta 0.0 ppm VOCs via PID Headspace							
160.0	30 / 95%	2500 dpm Gross Alpha/Beta							
165.0	31 / 95%	2620 dpm Gross Alpha/Beta 0.0 ppm VOCs via PID Headspace		164.0 - 165.5 ft Pumice - reworked, well sorted, angular to subangular, gravel-sized pumice.		Qbtt			
170.0	32 / 95%	2980 dpm Gross Alpha/Beta		165.5 - 178.0 ft Interlayered sand with pumice clasts and silt. Some organic material in silt.		Cerro Toledo Interval			
175.0	33 / 90%	2660 dpm Gross Alpha/Beta 0.0 ppm VOCs via PID Headspace							
180.0	34 / 100%	2630 dpm Gross Alpha/Beta 0.0 ppm VOCs via PID Headspace		178.0 - 200.0 ft Tuff - Nonwelded, very pale brown (10 YR 8/2), 10% quartz, 5% sanidine, 1% lithics, 5% pumice.		Otowi Member, Bandelier Tuff			
185.0	35 / 90%	2370 dpm Gross Alpha/Beta							
190.0	36 / 95%	2980 dpm Gross Alpha/Beta 0.0 ppm VOCs via PID Headspace							
195.0	37 / 95%	2720 dpm Gross Alpha/Beta							
200.0	38 / 95%	2480 dpm Gross Alpha/Beta 0.0 ppm VOCs via PID Headspace TNT/RDX - Nondetect	MD54-05-57909						TD - 200 ft.

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Environmental Characterization and Remediation
2004 - 2005 MDA G Environmental Characterization Drilling
Borehole Log

Borehole ID: 54-24366 **TA/OU:** 54/1148 **MDA:** G **Start Date / Time:** 3-28-05, 1330 **End Date / Time:** 4-5-05, 0840

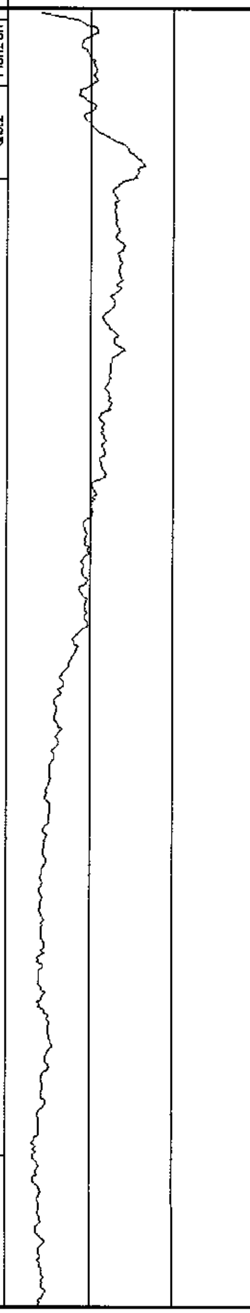
Drilling Co.: Enviro-Drill Inc. **Drilling Equip. / Method:** CME 75 / Hollow Stem Auger **Driller:** Shad Betts **Geologist:** Kevin Reid, TerranearPMC

Sampling Method: Continuous 5 ft core barrel **Declination:** 45 degrees **Bearing:** N51E **TD:** 250 ft

LENGTH (45 degree angle depth)	Core Run # / Core Recovery %	Field Screening Results	Analytical Sample Number	Lithology	Lithologic Unit	Notes
0.0	Logged from cuttings	3050 dpm Gross Alpha/Beta		0.0 - 4.0 ft Soil - Sandy clayey loam, very moist	Soil Horizon	Gross Alpha/Beta Background = 1869 dpm
				4.0 - 6.0 ft Tuff - Weathered Qbt2	Weathered Qbt2	
5.0		3840 dpm Gross Alpha/Beta		6.0 - 25.0 ft Tuff - Densely welded, pinkish gray (7.5YR 6/2), dry. 10% quartz, 5% sanidine, 15% pumice. Pumice have a sugary texture and are up to 3 cm.		14 in. OD HSA to 10 ft bgs. Set 10 in. casing to depth of 10 ft.
10.0	1 / 70%	2910 dpm Gross Alpha/Beta			Unit 2 Tshirege Member, Bandelier Tuff	7 5/8 in OD HSA from 10 - 250 ft.
15.0	2 / 80%	3010 dpm Gross Alpha/Beta				
20.0	3 / 70%	2950 dpm Gross Alpha/Beta				
25.0	4 / 80%	2840 dpm Gross Alpha/Beta 0.0 ppm VOCs via PID Headspace		25.0 - 39.3 ft Tuff - SAA. Small (2mm) clay and root filled fractures at 26.5 ft, 31.2 ft, and 35 ft.		
30.0	5 / 100%	3020 dpm Gross Alpha/Beta				
35.0	6 / 100%	2650 dpm Gross Alpha/Beta 0.0 ppm VOCs via PID Headspace				
40.0	7 / 100%	3070 dpm Gross Alpha/Beta		39.3 - 66.0 ft Tuff - Moderately welded, white (10YR 8/1), dry. 10% quartz, 5% sanidine, 30% pumice. small (5mm) clay filled fractures at 59.2 ft and 61.5 ft - 65 ft.		
45.0	8 / 100%	3100 dpm Gross Alpha/Beta 0.0 ppm VOCs via PID Headspace				
50.0	9 / 100%	3120 dpm Gross Alpha/Beta				
55.0	10 / 100%	3050 dpm Gross Alpha/Beta				
60.0	11 / 100%	2940 dpm Gross Alpha/Beta				
65.0	12 / 100%	2870 dpm Gross Alpha/Beta 0.0 ppm VOCs via PID Headspace	No Samples	66.0 - 85.0 ft Tuff - Nonwelded, white (10YR 8/1), dry. 5% quartz, 30% pumice, 3% sanidine. Pumice are large (up to 5 cm). Fractured from 82 - 84 ft.	Qbt 1v(u)	
70.0	13 / 100%	3010 dpm Gross Alpha/Beta				

Neutron

0 CPS 300



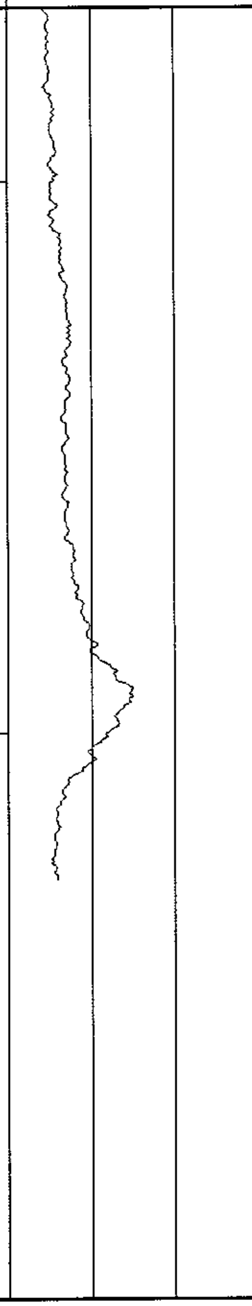
Construction: 7 7

Borehole ID: 54-24366 **TA/OU:** 54/1148 **MDA:** G **Start Date / Time:** 3-28-05, 1330 **End Date / Time:** 4-5-05, 0840

Drilling Co.: Enviro-Drill Inc. **Drilling Equip. / Method:** CME 75 / Hollow Stem Auger **Driller:** Shad Betts **Geologist:** Kevin Reid, TerranearPMC

Sampling Method: Continuous 5 ft core barrel **Declination:** 45 degrees **Bearing:** N51E **TD:** 250 ft

LENGTH (45 degree angle depth)	Core Run # / Core Recovery %	Field Screening Results	Analytical Sample Number	Lithology	Graphic Log	Lithologic Unit	Neutron (0 CPS 300)	Construction	Notes
	14 / 100%	2750 dpm Gross Alpha/Beta 0.0 ppm VOCs via PID Headspace				Qbt 1v(u)			
80.0	15 / 100%	3050 dpm Gross Alpha/Beta							Gross Alpha/Beta Background = 2650 dpm.
85.0	16 / 100%	3100 dpm Gross Alpha/Beta 0.0 ppm VOCs via PID Headspace		85.0 - 117.0 ft Tuff- Moderately welded, white (10YR 8/1), dry. 15% quartz, 20% pumice, 10% sanidine, 5% lithics. Some iron staining at grain boundaries. Pumice have a sugary texture and are up to 6 cm.		Unit 1v(c) Tshirege Member, Bandelier Tuff			
90.0	17 / 100%	3410 dpm Gross Alpha/Beta							
95.0	18 / 100%	3780 dpm Gross Alpha/Beta							
100.0	19 / 100%	3100 dpm Gross Alpha/Beta							
105.0	20 / 100%	2950 dpm Gross Alpha/Beta 0.0 ppm VOCs via PID Headspace							
110.0	21 / 100%	3050 dpm Gross Alpha/Beta							
115.0	22 / 100%	3100 dpm Gross Alpha/Beta 0.0 ppm VOCs via PID Headspace		117.0 - 228.0 ft Tuff- Moderately to nonwelded, pink (5YR 7/3) to white (7.5YR 8/1), dry. 15% quartz, 10% sanidine, 15 - 20% pumice, 5% lithics.		Unit 1g Tshirege Member, Bandelier Tuff			BH-06 could not be logged using the camera, caliper, or gamma tools. The neutron probe could not be advanced past 127 ft.
120.0	23 / 100%	3120 dpm Gross Alpha/Beta							
125.0	24 / 100%	3070 dpm Gross Alpha/Beta 0.0 ppm VOCs via PID Headspace							
130.0	25 / 100%	2850 dpm Gross Alpha/Beta 0.0 ppm VOCs via PID Headspace							
135.0	26 / 80%	3210 dpm Gross Alpha/Beta							Gross Alpha/Beta Background = 2500 dpm.
140.0	27 / 80%	2800 dpm Gross Alpha/Beta 0.0 ppm VOCs via PID Headspace TNT/RDX - Nondetect	MD54-05-57936						
145.0	28 / 90%	3200 dpm Gross Alpha/Beta							



Borehole ID: 54-24366 **TA/OU:** 54/1148 **MDA:** G **Start Date / Time:** 3-28-05, 1330 **End Date / Time:** 4-5-05, 0840

Drilling Co.: Enviro-Drill Inc. **Drilling Equip. / Method:** CME 75 / Hollow Stem Auger **Driller:** Shad Betts **Geologist:** Kevin Reid, TerranearPMC

Sampling Method: Continuous 5 ft core barrel **Declination:** 45 degrees **Bearing:** N51E **TD:** 250 ft

LENGTH (45 degree angle depth)	Core Run # / Core Recovery %	Field Screening Results	Analytical Sample Number	Lithology	Graphic Log	Lithologic Unit	Neutron (0 CPS 300)	Construction (7 7)	Notes
	29 / 90%	2370 dpm Gross Alpha/Beta 0.0 ppm VOCs via PID Headspace							
155.0	30 / 90%	2910 dpm Gross Alpha/Beta							
160.0	31 / 90%	3650 dpm Gross Alpha/Beta 0.0 ppm VOCs via PID Headspace							
165.0	32 / 90%	3140 dpm Gross Alpha/Beta							
170.0	33 / 90%	3060 dpm Gross Alpha/Beta 0.0 ppm VOCs via PID Headspace							Gross Alpha/Beta Background = 2070dpm.
175.0	34 / 95%	2700 dpm Gross Alpha/Beta							
180.0	35 / 100%	3150 dpm Gross Alpha/Beta 0.0 ppm VOCs via PID Headspace							
185.0	36 / 95%	3010 dpm Gross Alpha/Beta				Qbt 1g			
190.0	37 / 90%	2910 dpm Gross Alpha/Beta 0.0 ppm VOCs via PID Headspace							Gross Alpha/Beta Background = 2250 dpm.
195.0	38 / 95%	3040 dpm Gross Alpha/Beta	No Samples						
200.0	39 / 95%	3210 dpm Gross Alpha/Beta 0.0 ppm VOCs via PID Headspace							
205.0	40 / 100%	3550 dpm Gross Alpha/Beta							
210.0	41 / 90%	3260 dpm Gross Alpha/Beta							
215.0	42 / 100%	3620 dpm Gross Alpha/Beta 0.0 ppm VOCs via PID Headspace							
220.0	43 / 100%	3460 dpm Gross Alpha/Beta							

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Borehole ID: 54-24366 **TA/OU:** 54/1148 **MDA:** G **Start Date / Time:** 3-28-05, 1330 **End Date / Time:** 4-5-05, 0840

Drilling Co.: Enviro-Drill Inc. **Drilling Equip. / Method:** CME 75 / Hollow Stem Auger **Driller:** Shad Betts **Geologist:** Kevin Reid, TerranearPMC

Sampling Method: Continuous 5 ft core barrel **Declination:** 45 degrees **Bearing:** N51E **TD:** 250 ft

LENGTH (45 degree angle depth)	Core Run # / Core Recovery %	Field Screening Results	Analytical Sample Number	Lithology	Lithologic Unit	Neutron (0 CPS 300)	Construction	Notes
	44 / 90%	3250 dpm Gross Alpha/Beta		228.8 - 230.0 ft Pumice - Angular to subangular, well sorted, dry. 60% pumice, 30% quartz, 10% lithic fragments.	Qbt1g / Qbtt			
230.0	45 / 80%	2570 dpm Gross Alpha/Beta 0.0 ppm VOCs via PID Headspace		230.0 - 245.0 ft Interlayered coarse-grained sand, gravels with pumice clasts, and silt, dry.	Cerro Toledo Interval			
235.0	46 / 70%	3420 dpm Gross Alpha/Beta						
240.0	47 / 70%	3220 dpm Gross Alpha/Beta						Gross Alpha/Beta Background = 2460 dpm.
245.0	48 / 100%	3250 dpm Gross Alpha/Beta RDX/TNT - nondetect	MD54-05-57942	245.0 - 250.0 ft Tuff- Nonwelded, pink (5YR 7/3), dry. 10% quartz, 30% sanidine, 1% mafics, 3% lithics, 5% pumice.	Qbo			Gross Alpha/Beta Background = 2190 dpm. TD - 250 ft.
250.0								

Construction: 7 7

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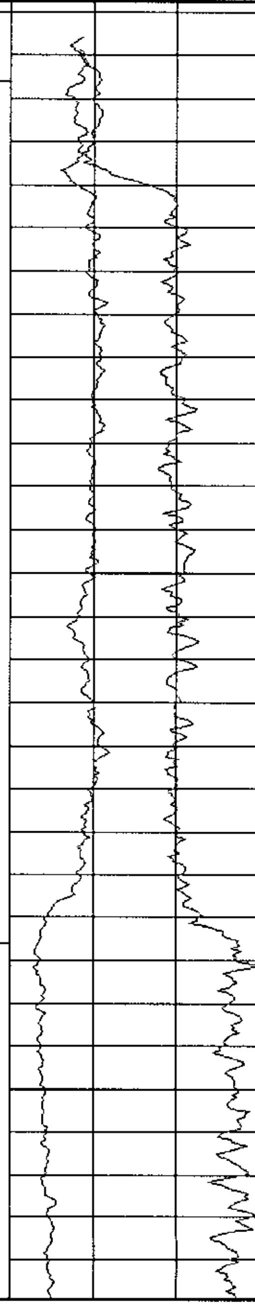
Borehole ID: 54-24367 **TA/OU:** 54/1148 **MDA:** G **Start Date / Time:** 4/4/05, 1340 **End Date / Time:** 4-6-05, 1105

Drilling Co.: Enviro-Drill Inc. **Drilling Equip. / Method:** CME 75 / Hollow Stem Auger **Driller:** Matt Cain **Geologist:** Pattie Baucom, Apogen

Sampling Method: Continuous 5 ft core barrel **Declination:** 90 degrees **Bearing:** na **TD:** 200 ft

Depth	Core Run # / Core Recovery %	Field Screening Results	Analytical Sample Number	Lithology	Graphic Log	Lithologic Unit	Neutron (0 CPS 300) / Gamma (0 CPS 300)	Construction (7 7)	Notes
0.0	1 / 10%	1869 dpm Gross Alpha/Beta	No Samples	0.0 - 5.0 ft Fill - Silty sand with crushed tuff, moist		Fill			Gross Alpha/Beta Background = 1869 dpm.
5.0	2 / 70%			5.0 - 45.0 ft Tuff - Moderately to densely welded, light gray (7.5YR 7/1), dry. 10% quartz, 5% sanidine, 15% pumice. Pumice have a sugary texture.		Unit 2 Tshirege Member, Bandelier Tuff			14 in. OD HSA to 10 ft bgs. Set 10 in. casing to depth of 10 ft.
10.0	3 / 100%	2780 dpm Gross Alpha/Beta							7 5/8 in OD HSA from 10 - 200 ft.
15.0	4 / 100%	3118 dpm Gross Alpha/Beta 0.0 ppm VOCs via PID Headspace							
20.0	5 / 100%	2800 dpm Gross Alpha/Beta							
25.0	6 / 100%	3080 dpm Gross Alpha/Beta 0.0 ppm VOCs via PID Headspace							
30.0	7 / 100%	3310 dpm Gross Alpha/Beta TNT/RDX - Nondetect	MD54-05-57944 MD54-05-57951(FD)						
35.0	8 / 100%	3070 dpm Gross Alpha/Beta 0.0 ppm VOCs via PID Headspace							
40.0	9 / 100%	2880 dpm Gross Alpha/Beta							
45.0	10 / 100%	3150 dpm Gross Alpha/Beta 0.0 ppm VOCs PID Headspace		45.0 - 54.1 ft Tuff - SAA. Color change to pinkish gray (5YR 7/2).					
50.0	11 / 100%	2950 dpm Gross Alpha/Beta							
55.0	12 / 100%	3260 dpm Gross Alpha/Beta		54.0 - 75.0 ft Tuff - Poorly welded, white (5YR 8/1), dry. 10% quartz, 5% sanidine, 15 - 20% pumice, 3% lithics. Pumice are dark purple, brittle, and large (1 to 4 cm).		Unit 1v(u) Tshirege Member, Bandelier Tuff			
60.0	13 / 100%	3290 dpm Gross Alpha/Beta							
65.0	14 / 100%	3290 dpm Gross Alpha/Beta 0.0 ppm VOCs via PID Headspace							
70.0	15 / 100%	3750 dpm Gross Alpha/Beta							



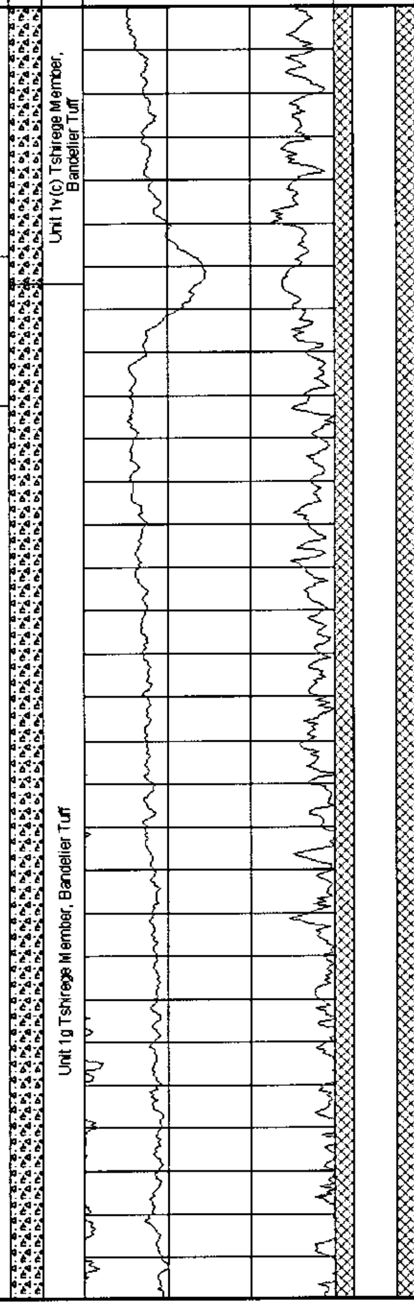
Borehole ID: 54-24367 **TA/OU:** 54/1148 **MDA:** G **Start Date / Time:** 4/4/05, 1340 **End Date / Time:** 4-6-05, 1105

Drilling Co.: Enviro-Drill Inc. **Drilling Equip. / Method:** CME 75 / Hollow Stem Auger **Driller:** Matt Cain **Geologist:** Pattie Baucom, Apogen

Sampling Method: Continuous 5 ft core barrel **Declination:** 90 degrees **Bearing:** na **TD:** 200 ft

Depth	Core Run # / Core Recovery %	Field Screening Results	Analytical Sample Number	Lithology	Notes
	16 / 100%	3660 dpm Gross Alpha/Beta 0.0 ppm VOCs via PID Headspace		75.0 - 91.0 ft Tuff - Moderately to densely welded, pinkish white (7.5YR 8/2) to pink (5YR 8/3), dry. 10% quartz, 5% sanidine, 15% pumice, 5% lithics.	
80.0	17 / 100%	3500 dpm Gross Alpha/Beta			
85.0	18 / 100%	2700 dpm Gross Alpha/Beta 0.0 ppm VOCs via PID Headspace			
90.0	19 / 90%	3240 dpm Gross Alpha/Beta		91.0 - 96.5 ft Tuff - Densely welded, pink (5YR 7/3 to 5YR 7/4), dry. 12% quartz, 5% sanidine, 7% lithics, 15% pumice. Pumice are golden, crystalline, and fibrous.	
95.0	20 / 100%	3250 dpm Gross Alpha/Beta 0.0 ppm VOCs via PID Headspace		96.5 - 167.5 ft Tuff - Nonwelded, pink (5YR 8/3) to white (5YR 8/1), dry. 15% quartz, pumice 15 - 17%, lithics 5%, sanidine 5%. Pumice are large and round (up to 6 cm). Lithics range in size from 2mm to 1 cm.	
100.0	21 / 100%	3330 dpm Gross Alpha/Beta			
105.0	22 / 100%	3580 dpm Gross Alpha/Beta 0.0 ppm VOCs via PID Headspace			
110.0	23 / 100%	2730 dpm Gross Alpha/Beta			
115.0	24 / 85%	2840 dpm Gross Alpha/Beta 0.0 ppm VOCs via PID Headspace	No Samples		
120.0	25 / 90%	2980 dpm Gross Alpha/Beta			
125.0	26 / 90%	3850 dpm Gross Alpha/Beta 0.0 ppm VOCs via PID Headspace			
130.0	27 / 95%	3630 dpm Gross Alpha/Beta			
135.0	28 / 95%	3480 dpm Gross Alpha/Beta			
140.0	29 / 95%	3190 dpm Gross Alpha/Beta 0.0 ppm VOCs via PID Headspace			Gross Alpha/Beta Background = 1982 dpm.
145.0	30 / 95%	2550 dpm Gross Alpha/Beta			

Graphic Log | Lithologic Unit | Neutron (0 CPS 300) / Gamma (0 CPS 300) | Construction (7 7)



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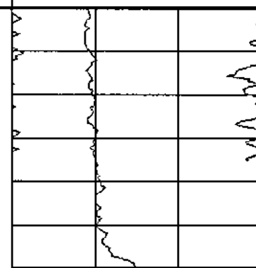
Borehole Log

Borehole ID: 54-24367 **TA/OU:** 54/1148 **MDA:** G **Start Date / Time:** 4/4/05, 1340 **End Date / Time:** 4-6-05, 1105

Drilling Co.: Enviro-Drill Inc. **Drilling Equip. / Method:** CME 75 / Hollow Stem Auger **Driller:** Matt Cain **Geologist:** Pattie Baucom, Apogen

Sampling Method: Continuous 5 ft core barrel **Declination:** 90 degrees **Bearing:** na **TD:** 200 ft

Depth	Core Run # / Core Recovery %	Field Screening Results	Analytical Sample Number	Lithology	Graphic Log	Lithologic Unit	Neutron 0 CPS 300 / Gamma 0 CPS 300	Construction 7 7	Notes
	31 / 95%	3090 dpm Gross Alpha/Beta							
155.0	32 / 95%	4150 dpm Gross Alpha/Beta							
160.0	33 / 95%	3540 dpm Gross Alpha/Beta							Slough in borehole from 165 - 200 ft prevents deeper geophysical measurements.
165.0	34 / 95%	3460 dpm Gross Alpha/Beta		167.5 - 169.5 ft Pumice - reworked, angular to subangular, 50 % coarse-grained quartz, 50 % pumice fragments.		Qtt			
170.0	35 / 95 %			169.5 - 189.5 ft Interlayered sands and silty sand, pumice clasts, silt, and gravels.		Cerro Toledo Interval			
175.0	36 / 80%								
180.0	37 / 80%								
185.0	38 / 95%	3260 dpm Gross Alpha/Beta							
190.0	39 / 95%	2780 dpm Gross Alpha/Beta		189.5 - 200.0 ft Tuff - Nonwelded, pinkish white (7.5YR 8/2), 7% quartz, 5% lithics, 5% mafics, 20% pumice.		Otowi Member, Bandelier Tuff			
195.0	40 / 95 %	2870 dpm Gross Alpha/Beta 0.0 ppm VOCs via PID Headspace TNT/RDX - Nondetect	MD54-05-57950						TD - 200 ft.
200.0									



Los Alamos National Laboratory
Environmental Characterization and Remediation
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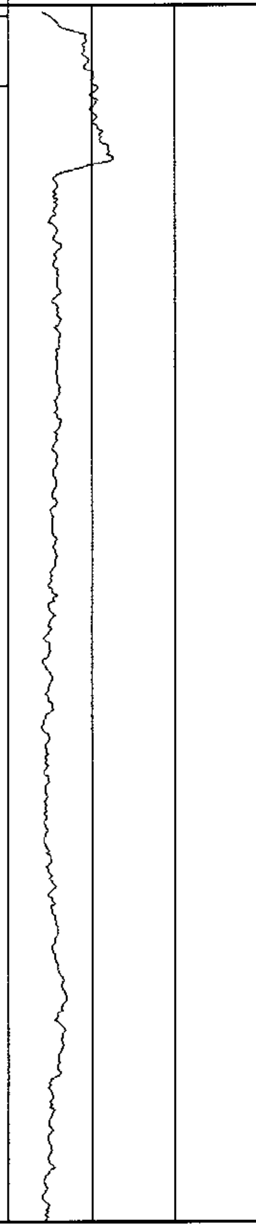
Borehole Log

Borehole ID: 54-24368 **TA/OU:** 54/1148 **MDA:** G **Start Date / Time:** 4-11-05, 1315 **End Date / Time:** 4-20-05, 1415

Drilling Co.: Enviro-Drill Inc. **Drilling Equip. / Method:** CME 75 / Hollow Stem Auger **Driller:** Shad Betts **Geologist:** Kevin Reid, TerranearPMC

Sampling Method: Continuous 5 ft core barrel **Declination:** 45 degrees **Bearing:** S54E **TD:** 285 ft

LENGTH (45 degree angle depth)	Core Run # / Core Recovery %	Field Screening Results	Analytical Sample Number	Lithology	Graphic Log	Lithologic Unit	Neutron (0 – CPS – 300)	Construction	Notes
0.0	Logged from cuttings	3080 dpm Gross Alpha/Beta	No Samples	0.0 - 4.0 ft Soil - Sandy clayey, damp.		Soil			Gross Alpha/Beta Background = 2080 dpm
5.0		2930 dpm Gross Alpha/Beta		4.0 - 73.0 ft Tuff - Densely welded, light gray (7.5YR 7/1), dry. 15% quartz, 5% sanidine, 15% pumice. Pumice have a sugary texture and are large (up to 5 cm in diameter).		Unit 2 Tshirege Member, Bandelier Tuff			14 in. OD HSA to 10 ft bgs. Set 10 in. casing to depth of 10 ft.
10.0	1 / 30%	3210 dpm Gross Alpha/Beta							7 5/8 in OD HSA from 10 - 285 ft.
15.0	2 / 30%	3170 dpm Gross Alpha/Beta							
20.0	3 / 50%	3040 dpm Gross Alpha/Beta							
25.0	4 / 90%	3770 dpm Gross Alpha/Beta 0.0 ppm VOCs via PID Headspace							
30.0	5 / 100%	4140 dpm Gross Alpha/Beta							
35.0	6 / 100%	3860 dpm Gross Alpha/Beta 0.0 ppm VOCs via PID Headspace							
40.0	7 / 100%	3330 dpm Gross Alpha/Beta							
45.0	8 / 100%	3570 dpm Gross Alpha/Beta 0.0 ppm VOCs via PID Headspace							
50.0	9 / 100%	4060 dpm Gross Alpha/Beta							
55.0	10 / 100%	3180 dpm Gross Alpha/Beta							
60.0	11 / 50%	4120 dpm Gross Alpha/Beta							
65.0	12 / 80%	3530 dpm Gross Alpha/Beta 0.0 ppm VOCs via PID Headspace							



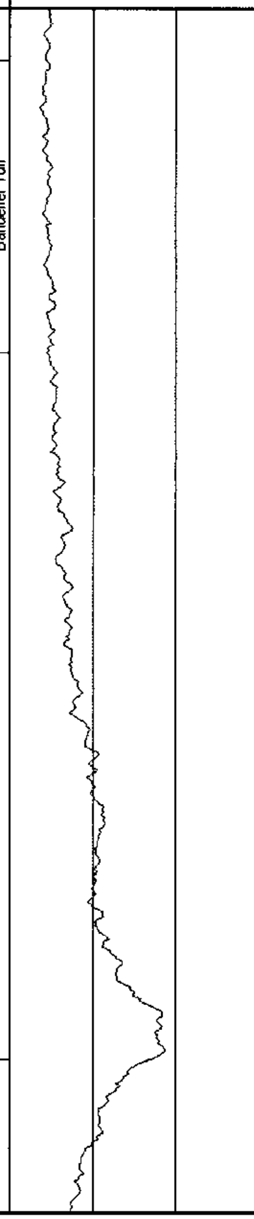
Borehole ID: 54-24368 **TA/OU:** 54/1148 **MDA:** G **Start Date / Time:** 4-11-05, 1315 **End Date / Time:** 4-20-05, 1415

Drilling Co.: Enviro-Drill Inc. **Drilling Equip. / Method:** CME 75 / Hollow Stem Auger **Driller:** Shad Betts **Geologist:** Kevin Reid, TerranearPMC

Sampling Method: Continuous 5 ft core barrel **Declination:** 45 degrees **Bearing:** S54E **TD:** 285 ft

LENGTH (45 degree angle depth)	Core Run # / Core Recovery %	Field Screening Results	Analytical Sample Number	Lithology	Lithologic Unit	Notes
	13 / 50%	3840 dpm Gross Alpha/Beta			Qbt2	
75.0	14 / 80%	3590 dpm Gross Alpha/Beta 0.0 ppm VOCs via PID Headspace		73.0 - 90.0 ft Tuff - Moderately welded to poorly welded, light gray (7.5YR 7/1), dry. 15% quartz, 15% pumice, 5% sanidine. Pumice are large (up to 8 cm in diameter).	Unit 1v(u) Tshirege Member, Bandelier Tuff	
80.0	15 / 90%	3310 dpm Gross Alpha/Beta				
85.0	16 / 100%	3440 dpm Gross Alpha/Beta 0.0 ppm VOCs via PID Headspace				
90.0	17 / 100%	3610 dpm Gross Alpha/Beta		90.0 - 131.0 ft Tuff - Moderately welded, pinkish gray (7.5YR 7/2) to white (7.5YR 8/1), dry. 15% quartz, 20% pumice, 5% sanidine, 5 - 10% lithics. Small fracture observed from 107 - 107.3 ft.	Unit 1v(c) Tshirege Member, Bandelier Tuff	
95.0	18 / 100%	4240 dpm Gross Alpha/Beta TNT/RDX - Nondetect	MD54-05-57952 MD54-05-57959(FD)			
100.0	19 / 100%	3740 dpm Gross Alpha/Beta				
105.0	20 / 100%	3840 dpm Gross Alpha/Beta 0.0 ppm VOCs via PID Headspace				
110.0	21 / 100%	4030 dpm Gross Alpha/Beta				
115.0	22 / 100%	3860 dpm Gross Alpha/Beta 0.0 ppm VOCs via PID Headspace				
120.0	23 / 100%	3870 dpm Gross Alpha/Beta				
125.0	24 / 100%	3810 dpm Gross Alpha/Beta 0.0 ppm VOCs via PID Headspace				
130.0	25 / 100%	4080 dpm Gross Alpha/Beta 0.0 ppm VOCs via PID Headspace		117.0 - 223.5 ft Tuff - Moderately to nonwelded, pink (7.5YR 7/3) to light gray (7.5YR 7/1), dry. 10% quartz, 5% sanidine, 15% pumice, 5% lithics.	Qbt 1g	
135.0	26 / 80%	4270 dpm Gross Alpha/Beta				Gross Alpha/Beta Background = 2860 dpm.

Neutron (0 – CPS – 300)



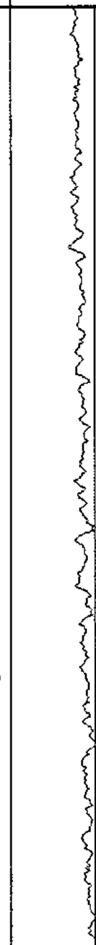
Construction: 7 7

Los Alamos National Laboratory
Environmental Characterization and Remediation
2004 - 2005 MDA G Environmental Characterization Drilling
Borehole Log

Borehole ID: 54-24368 **TA/OU:** 54/1148 **MDA:** G **Start Date / Time:** 4-11-05, 1315 **End Date / Time:** 4-20-05, 1415

Drilling Co.: Enviro-Drill Inc. **Drilling Equip. / Method:** CME 75 / Hollow Stem Auger **Driller:** Shad Betts **Geologist:** Kevin Reid, TerranearPMC

Sampling Method: Continuous 5 ft core barrel **Declination:** 45 degrees **Bearing:** S54E **TD:** 285 ft



LENGTH (45 degree angle depth)	Core Run # / Core Recovery %	Field Screening Results	Analytical Sample Number	Lithology	Graphic Log	Lithologic Unit	Neutron (0 CPS 300)	Construction (7 7)	Notes
	27 / 80%	3890 dpm Gross Alpha/Beta 0.0 ppm VOCs via PID Headspace							
145.0	28 / 85%	3850 dpm Gross Alpha/Beta							
150.0	29 / 90%	4310 dpm Gross Alpha/Beta 0.0 ppm VOCs via PID Headspace							
155.0	30 / 90%	3740 dpm Gross Alpha/Beta							
160.0	31 / 90%	4170 dpm Gross Alpha/Beta 0.0 ppm VOCs via PID Headspace							
165.0	32 / 90%	4140 dpm Gross Alpha/Beta							
170.0	33 / 90%	3910 dpm Gross Alpha/Beta 0.0 ppm VOCs via PID Headspace							Gross Alpha/Beta Background = 2990dpm.
175.0	34 / 95%	4310 dpm Gross Alpha/Beta							
180.0	35 / 95%	4190 dpm Gross Alpha/Beta 0.0 ppm VOCs via PID Headspace				Qbt 1g			
185.0	36 / 90%	3840 dpm Gross Alpha/Beta							BH-08 could not be logged using the camera, caliper, or gamma tools. The neutron probe could not be advanced past 195 feet.
190.0	37 / 90%	4190 dpm Gross Alpha/Beta 0.0 ppm VOCs via PID Headspace	No Samples						
195.0	38 / 90%	3540 dpm Gross Alpha/Beta							
200.0	39 / 85%	4060 dpm Gross Alpha/Beta 0.0 ppm VOCs via PID Headspace							
205.0	40 / 95%	4270 dpm Gross Alpha/Beta							
210.0	41 / 100%	3820 dpm Gross Alpha/Beta							
215.0	42 / 90%	4120 dpm Gross Alpha/Beta 0.0 ppm VOCs via PID Headspace							

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Environmental Characterization and Remediation
2004 - 2005 MDA G Environmental Characterization Drilling
Borehole Log

Borehole ID: 54-24368 **TA/OU:** 54/1148 **MDA:** G **Start Date / Time:** 4-11-05, 1315 **End Date / Time:** 4-20-05, 1415

Drilling Co.: Enviro-Drill Inc. **Drilling Equip. / Method:** CME 75 / Hollow Stem Auger **Driller:** Shad Betts **Geologist:** Kevin Reid, TerranearPMC

Sampling Method: Continuous 5 ft core barrel **Declination:** 45 degrees **Bearing:** S54E **TD:** 285 ft

LENGTH (45 degree angle depth)	Core Run # / Core Recovery %	Field Screening Results	Analytical Sample Number	Lithology	Graphic Log	Lithologic Unit	Neutron (0 CPS 300)	Construction (7 7)	Notes
	43 / 90%	4380 dpm Gross Alpha/Beta		223.5 - 227.5 ft Pumice - Angular to subangular, well sorted, dry. 80% pumice, 20% coarse-grained quartz sand.		Qbt1g			
225.0	44 / 60%	4840 dpm Gross Alpha/Beta				Qbtt			
						Qct			
230.0	45 / 90%	4360 dpm Gross Alpha/Beta 0.0 ppm VOCs via PID Headspace		227.5 - 228.0 ft Sand - Medium to coarse-grained sand with rounded dacite clasts.					
235.0	46 / 85%	3680 dpm Gross Alpha/Beta		228.0 - 285.0 ft Tuff - Nonwelded, pinkish white (7.5YR 8/2), dry. 10% quartz, 3% sanidine, 1% mafics, 5% lithics, 10% pumice.					
240.0	47 / 90%	4050 dpm Gross Alpha/Beta 0.0 ppm VOCs via PID Headspace							Gross Alpha/Beta Background = 3690 dpm.
245.0	48 / 90%	4110 dpm Gross Alpha/Beta							
250.0	49 / 95%	4430 dpm Gross Alpha/Beta 0.0 ppm VOCs via PID Headspace							
255.0	50 / 90%	3760 dpm Gross Alpha/Beta				Qbo			
260.0	54 / 95%	4340 dpm Gross Alpha/Beta 0.0 ppm VOCs via PID Headspace							
265.0	55 / 90%	4620 dpm Gross Alpha/Beta							
270.0	56 / 90%	4730 dpm Gross Alpha/Beta							
275.0	57 / 95%	4810 dpm Gross Alpha/Beta							
280.0		4390 dpm Gross Alpha/Beta 0.0 ppm VOCs via PID Headspace TNT/RDX - Nondetect	MD54-05-57958						Refusal at 285 ft.
285.0									

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Environmental Characterization and Remediation
2004 - 2005 MDA G Environmental Characterization Drilling
Borehole Log

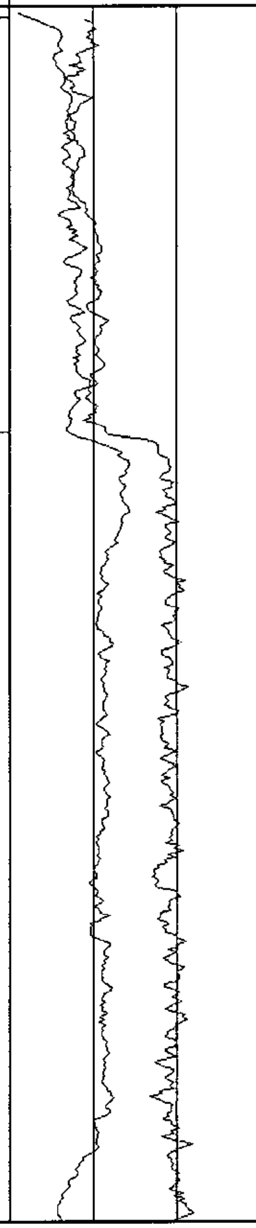
Borehole ID: 54-24369 **TA/OU:** 54/1148 **MDA:** G **Start Date / Time:** 4-20-05, 1525 **End Date / Time:** 4-25-05, 1442

Drilling Co.: Enviro-Drill Inc. **Drilling Equip. / Method:** CME 75 / Hollow Stem Auger **Driller:** Matt Cain **Geologist:** Pattie Baucom, Apogen

Sampling Method: Continuous 5 ft core barrel **Declination:** 90 degrees **Bearing:** na **TD:** 250 ft

Depth	Core Run # / Core Recovery %	Field Screening Results	Analytical Sample Number	Lithology	Lithologic Unit	Notes
0.0–5.0	1 / 50%	2070 dpm Gross Alpha/Beta	No Samples	0.0 - 24.0 ft Pit spoils - Crushed tuff with sandy silt layers at 8.5 ft, 10 ft, and 12 ft.	Pit spoils - crushed tuff	Gross Alpha/Beta Background = 2070 dpm.
5.0–10.0	2 / 50%	2910 dpm Gross Alpha/Beta				
10.0–15.0	3 / 60%	2630 dpm Gross Alpha/Beta				
15.0–20.0	4 / 50%	2860 dpm Gross Alpha/Beta 0.0 ppm VOCs via PID Headspace				
20.0–25.0	5 / 100%	2640 dpm Gross Alpha/Beta				14 in. OD HSA to 25 ft bgs. Set 10 in. casing to depth of 25 ft.
25.0–30.0	6 / 100%	3150 dpm Gross Alpha/Beta 0.0 ppm VOCs via PID Headspace		24.0 - 51.5 ft Tuff- Densely welded, light gray (5YR 7/1), fractured, dry. 10% quartz, 5% sanidine, 15% pumice. Some root material is present in fractures.	Unit 2 Tshirege Member, Bandelier Tuff	7 5/8 in OD HSA from 25 - 250 ft.
30.0–35.0	7 / 100%	2610 dpm Gross Alpha/Beta				
35.0–40.0	8 / 100%	2430 dpm Gross Alpha/Beta 0.0 ppm VOCs via PID Headspace				
40.0–45.0	9 / 100%	3270 dpm Gross Alpha/Beta				
45.0–50.0	10 / 100%	2580 dpm Gross Alpha/Beta 0.0 ppm VOCs PID Headspace				
50.0–55.0	11 / 100%	2720 dpm Gross Alpha/Beta		51.5 - 71.5 ft Tuff - SAA. Color change to pinkish gray (5YR 7/2). Clay filled fracture with organic material from 65.0 - 71.5 ft.		
55.0–60.0	12 / 100%	2970 dpm Gross Alpha/Beta				
60.0–65.0	13 / 100%	3050 dpm Gross Alpha/Beta				
65.0–	14 / 100%	2900 dpm Gross Alpha/Beta 0.0 ppm VOCs via PID Headspace TNT/RDX - Nondetect	MD54-05-57960 MD54-05-57967(FD)			

Graphic Log | Neutron 0 CPS 300 | Gamma 0 CPS 300 | Construction 7 7



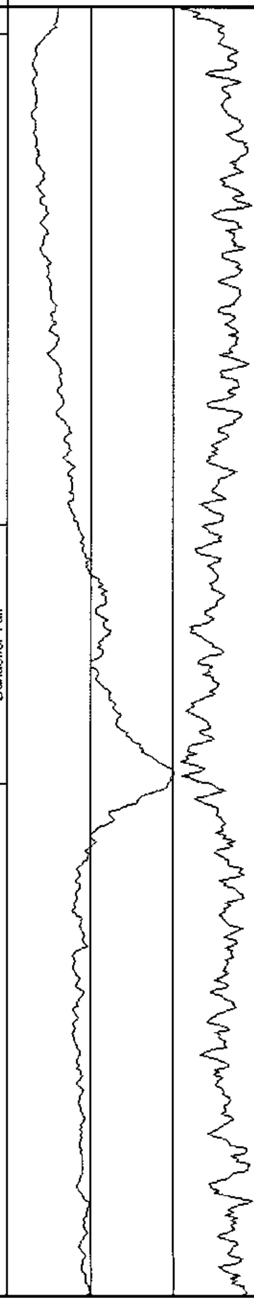
Los Alamos National Laboratory
Environmental Characterization and Remediation
2004 - 2005 MDA G Environmental Characterization Drilling
Borehole Log

Borehole ID: 54-24369 **TA/OU:** 54/1148 **MDA:** G **Start Date / Time:** 4-20-05, 1525 **End Date / Time:** 4-25-05, 1442

Drilling Co.: Enviro-Drill Inc. **Drilling Equip. / Method:** CME 75 / Hollow Stem Auger **Driller:** Matt Cain **Geologist:** Pattie Baucom, Apogen

Sampling Method: Continuous 5 ft core barrel **Declination:** 90 degrees **Bearing:** na **TD:** 250 ft

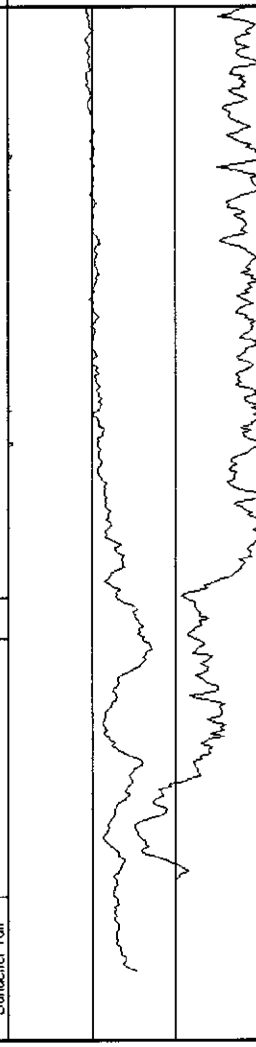
Depth	Core Run # / Core Recovery %	Field Screening Results	Analytical Sample Number	Lithology	Graphic Log	Lithologic Unit	Neutron 0 CPS 300 / Gamma 0 CPS 300	Construction 7 7	Notes
	15 / 100%	3220 dpm Gross Alpha/Beta		71.5 - 100.0 ft Tuff- Poorly welded, white (7.5YR 8/1), dry. 10% quartz, 5% sanidine, 10-15% pumice. Pumice are dark purple, brittle, and large (up to 2 cm in diameter).		Unit 1v(u) Tshirege Member, Bandelier Tuff			
75.0	16 / 100%	3590 dpm Gross Alpha/Beta 0.0 ppm VOCs via PID Headspace							
80.0	17 / 100%	3010 dpm Gross Alpha/Beta							
85.0	18 / 100%	2920 dpm Gross Alpha/Beta 0.0 ppm VOCs via PID Headspace							
90.0	19 / 100%	3040 dpm Gross Alpha/Beta							
95.0	20 / 100%	2970 dpm Gross Alpha/Beta 0.0 ppm VOCs via PID Headspace							
100.0	21 / 100%	2760 dpm Gross Alpha/Beta		100.0 - 115.0 ft Tuff- Moderately welded, pinkish white (5YR 8/2) to pink (5YR 7/4), dry. 10% quartz, 15 % pumice, 7% lithics.		Unit 1v(c) Tshirege Member, Bandelier Tuff			
105.0	22 / 100%	2860 dpm Gross Alpha/Beta 0.0 ppm VOCs via PID Headspace							
110.0	23 / 100%	2870 dpm Gross Alpha/Beta							
115.0	24 / 100%	2890 dpm Gross Alpha/Beta 0.0 ppm VOCs via PID Headspace		115.0 - 179.8 ft Tuff- Densely welded to nonwelded, reddish yellow (5YR 7/6) to white (5YR 8/1), dry. 5 - 10% quartz, 15 - 20% pumice, sanidine <5%, lithics 7%, mafics 5%. Pumice are large and round (up to 4 cm in diameter). Lithic fragments range from .5 to 6 cm in diameter.		Unit 1g Tshirege Member, Bandelier Tuff			
120.0	25 / 100%	2620 dpm Gross Alpha/Beta							
125.0	26 / 100%	3390 dpm Gross Alpha/Beta 0.0 ppm VOCs via PID Headspace	No Samples						
130.0	27 / 100%	2740 dpm Gross Alpha/Beta							
135.0	28 / 100%	2670 dpm Gross Alpha/Beta							
140.0	29 / 100%	3118 dpm Gross Alpha/Beta 0.0 ppm VOCs via PID Headspace							



Borehole ID: 54-24369 **TA/OU:** 54/1148 **MDA:** G **Start Date / Time:** 4-20-05, 1525 **End Date / Time:** 4-25-05, 1442

Drilling Co.: Enviro-Drill Inc. **Drilling Equip. / Method:** CME 75 / Hollow Stem Auger **Driller:** Matt Cain **Geologist:** Pattie Baucom, Apogen

Sampling Method: Continuous 5 ft core barrel **Declination:** 90 degrees **Bearing:** na **TD:** 250 ft

Depth	Core Run # / Core Recovery %	Field Screening Results	Analytical Sample Number	Lithology	Graphic Log	Lithologic Unit	Neutron (0 CPS 300) / Gamma (0 CPS 300)	Construction	Notes
145.0	30 / 100%	2560 dpm Gross Alpha/Beta				Qbt 1g			Gross Alpha/Beta Background = 2200 dpm.
150.0	31 / 90%	3670 dpm Gross Alpha/Beta 0.0 ppm VOCs via PID Headspace							
155.0	32 / 90%	3370 dpm Gross Alpha/Beta							
160.0	33 / 90%	3570 dpm Gross Alpha/Beta 0.0 ppm VOCs in PID Headspace							
165.0	34 / 90%	3120 dpm Gross Alpha/Beta							
170.0	35 / 90%	3060 dpm Gross Alpha/Beta							
175.0	36 / 90%	3540 dpm Gross Alpha/Beta 0.0 ppm VOCs in PID Headspace		179.8 - 181.0 ft Pumice, reworked. 50% angular to subangular pumice, 50% quartz crystals.		Qbtt			
180.0	37 / 90%	3250 dpm Gross Alpha/Beta	MD54-05-57961	181.0 - 196.5 ft Interlayered fine to coarse-grained sand, silt and silty sand with pumice and lithic fragments, and silty clay layers, damp.		Cerro Toledo Interval			
185.0	38 / 90%	3350 dpm Gross Alpha/Beta 0.0 ppm VOCs in PID Headspace							
190.0	39 / 60%	2990 dpm Gross Alpha/Beta							
195.0	40 / 60%	3410 dpm Gross Alpha/Beta 0.0 ppm VOCs via PID Headspace		196.5 - 244.0 ft Tuff - Nonwelded, pinkish white (5YR 8/2), dry. 10% quartz, 7 - 10% lithics (up to 5cm in diameter), 12 - 15% pumice (fragments up to 10 cm in diameter).		Otowi Member, Bandelier Tuff			Slough in borehole from 203 - 250 ft prevents further geophysical measurements.
200.0	41 / 90%	3480 dpm Gross Alpha/Beta							

Borehole ID: 54-24369 **TA/OU:** 54/1148 **MDA:** G **Start Date / Time:** 4-20-05, 1525 **End Date / Time:** 4-25-05, 1442

Drilling Co.: Enviro-Drill Inc. **Drilling Equip. / Method:** CME 75 / Hollow Stem Auger **Driller:** Matt Cain **Geologist:** Pattie Baucom, Apogen

Sampling Method: Continuous 5 ft core barrel **Declination:** 90 degrees **Bearing:** na **TD:** 250 ft

Depth	Core Run # / Core Recovery %	Field Screening Results	Analytical Sample Number	Lithology	Graphic Log	Lithologic Unit	Neutron 0 CPS 300 / Gamma 0 CPS 300	Construction ? ?	Notes
	42 / 90%	3200 dpm Gross Alpha/Beta 0.0 ppm VOCs via PID Headspace	No Samples			Otowi Member, Bandelier Tuff			
210.0	43 / 90%	3360 dpm Gross Alpha/Beta							
215.0	44 / 90%	3260 dpm Gross Alpha/Beta 0.0 ppm VOCs via PID Headspace							
220.0	45 / 90%	3850 dpm Gross Alpha/Beta							
225.0	46 / 90%	3570 dpm Gross Alpha/Beta 0.0 ppm VOCs via PID Headspace							
230.0	47 / 95%	3410 dpm Gross Alpha/Beta							
235.0	48 / 95%	3580 dpm Gross Alpha/Beta 0.0 ppm VOCs via PID Headspace							
240.0	49 / 95%	2860 dpm Gross Alpha/Beta							
245.0	50 / 85%	3260 dpm Gross Alpha/Beta 0.0 ppm VOCs via PID Headspace TNT/RDX - Nondetect	MD54-05-57966	244.0 - 250.0 ft Pumice - reworked. 75% angular to subangular pumice (up to 2 cm in diameter), 25% quartz and lithics fragments (mostly dacite).		Qbog			TD - 250 ft.
250.0									

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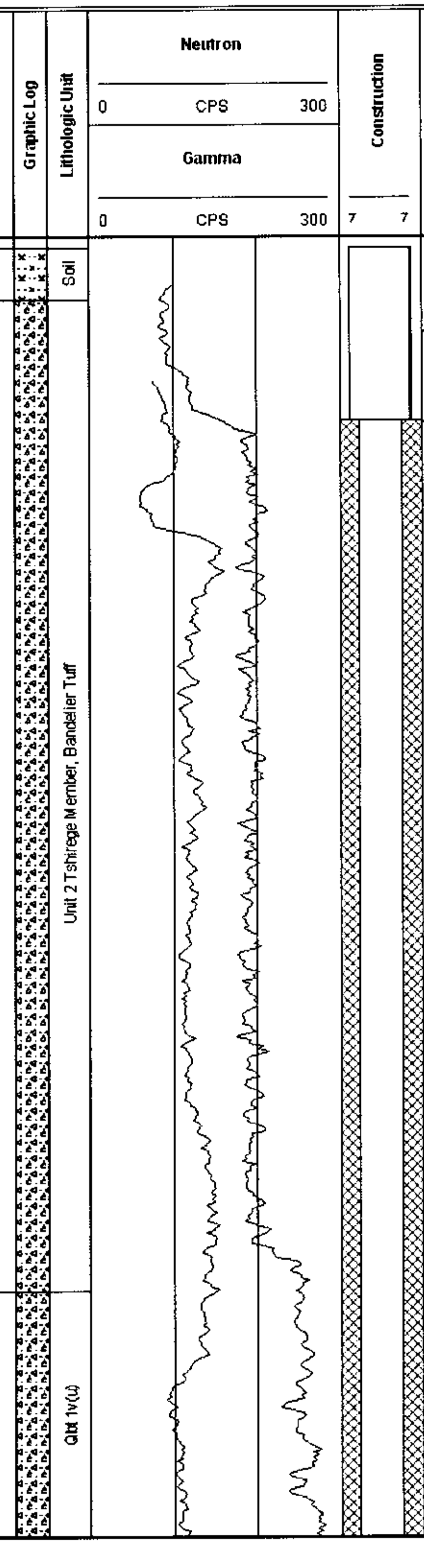
Borehole Log

Borehole ID: 54-24370 **TA/OU:** 54/1148 **MDA:** G **Start Date / Time:** 4/06/05, 1430 **End Date / Time:** 4-7-05, 1553

Drilling Co.: Enviro-Drill Inc. **Drilling Equip. / Method:** CME 75 / Hollow Stem Auger **Driller:** Matt Cain **Geologist:** Pattie Baucom, Apogen

Sampling Method: Continuous 5 ft core barrel **Declination:** 90 degrees **Bearing:** na **TD:** 225 ft

Depth	Core Run # / Core Recovery %	Field Screening Results	Analytical Sample Number	Lithology	Lithologic Unit	Notes
0.0	1 / 80%	3030 dpm Gross Alpha/Beta	No Samples	0.0 - 3.0 ft Soil - silty fine-grained sand, moist.	Soil	Gross Alpha/Beta Background = 3030 dpm.
5.0	2 / 0%			3.0 - 60.5 ft Tuff - Densely welded, light gray (7.5YR 7/1), dry. 12% quartz, 5% sanidine, 15% pumice.	Unit 2 Tshirege Member, Bandelier Tuff	14 in. OD HSA to 10 ft bgs. Set 10 in. casing to depth of 10 ft.
10.0	3 / 80%	3740 dpm Gross Alpha/Beta 0.8 ppm VOCs via PID Headspace				7 5/8 in OD HSA from 10 - 225 ft.
15.0	4 / 80%	3400 dpm Gross Alpha/Beta				
20.0	5 / 100%	3950 dpm Gross Alpha/Beta 0.8 ppm VOCs via PID Headspace				
25.0	6 / 100%	3810 dpm Gross Alpha/Beta				
30.0	7 / 100%	3750 dpm Gross Alpha/Beta 1.2 ppm VOCs via PID Headspace				
35.0	8 / 100%	3330 dpm Gross Alpha/Beta TNT/RDX - Nondetect	MD54-05-57968			
40.0	9 / 100%	3770 dpm Gross Alpha/Beta 0.4 ppm VOCs via PID Headspace				
45.0	10 / 100%	3320 dpm Gross Alpha/Beta				
50.0	11 / 100%	3890 dpm Gross Alpha/Beta 0.2 ppm VOCs via PID Headspace				
55.0	12 / 100%	3400 dpm Gross Alpha/Beta				
60.0	13 / 100%	3660 dpm Gross Alpha/Beta		60.5 - 85.0 ft Tuff - Poorly welded, white (7.5YR 8/1), dry. 10% quartz, 5% lithics, 15-20% pumice. Pumice are dark purple, brittle, and large (up to 4 cm in diameter).	Qbt 1v(u)	
65.0	14 / 100%	3340 dpm Gross Alpha/Beta				
70.0	15 / 100%	3520 dpm Gross Alpha/Beta				



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Environmental Characterization and Remediation
2004 - 2005 MDA G Environmental Characterization Drilling
Borehole Log

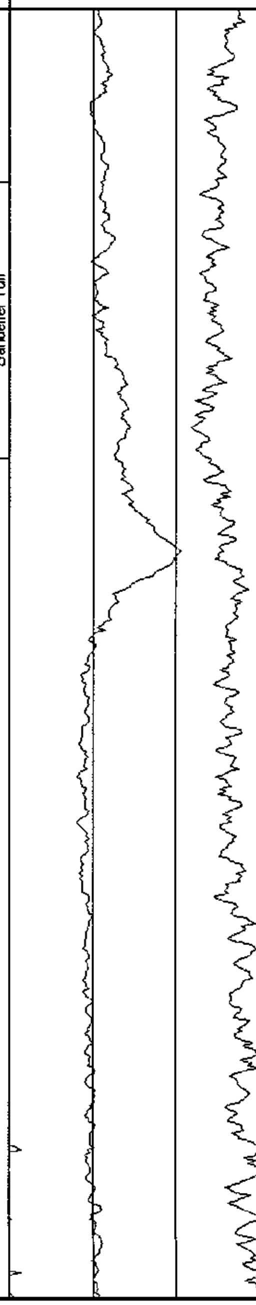
Borehole ID: 54-24370 **TA/OU:** 54/1148 **MDA:** G **Start Date / Time:** 4/06/05, 1430 **End Date / Time:** 4-7-05, 1553

Drilling Co.: Enviro-Drill Inc. **Drilling Equip. / Method:** CME 75 / Hollow Stem Auger **Driller:** Matt Cain **Geologist:** Pattie Baucom, Apogen

Sampling Method: Continuous 5 ft core barrel **Declination:** 90 degrees **Bearing:** na **TD:** 225 ft

Depth	Core Run # / Core Recovery %	Field Screening Results	Analytical Sample Number	Lithology	Lithologic Unit	Notes
	16 / 100%	3580 dpm Gross Alpha/Beta			Qbt 1v(u)	
80.0	17 / 100%	3620 dpm Gross Alpha/Beta				
85.0	18 / 100%	3670 dpm Gross Alpha/Beta		85.0 - 101.0 ft Tuff - Moderately welded, pinkish white (5YR 8/2) to pink (5YR 7/3), dry. 12% quartz, 15 % pumice, 7% lithics, 5% sanidine.	Unit 1v(c) Tshirege Member, Bandelier Tuff	
90.0	19 / 100%	2890 dpm Gross Alpha/Beta				
95.0	20 / 100%	2970 dpm Gross Alpha/Beta				
100.0	21 / 100%			101.0 - 105.0 ft Tuff - Densely welded, reddish yellow (5YR 7/4), dry. 10% quartz, 15-20% pumice, 5% sanidine, 5% lithics, 2% mafics. Pumice are large and round (up to 5 cm in diameter).	Unit 1g Tshirege Member, Bandelier Tuff	Alpha/Beta radiation instrument was not available for screening core samples.
105.0	22 / 100%			105.0 - 165.0 ft Tuff - SAA, nonwelded, reddish yellow (5YR 7/4) to white (5YR 8/1).		
110.0	23 / 100%					
115.0	24 / 100%					
120.0	25 / 100%					
125.0	26 / 100%					
130.0	27 / 100%		No Samples			
135.0	28 / 45%					
140.0	29 / 95%					
145.0	30 / 95%					

Neutron: 0 CPS 300
Gamma: 0 CPS 300



Construction: 7 7

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Environmental Characterization and Remediation
2004 - 2005 MDA G Environmental Characterization Drilling
Borehole Log

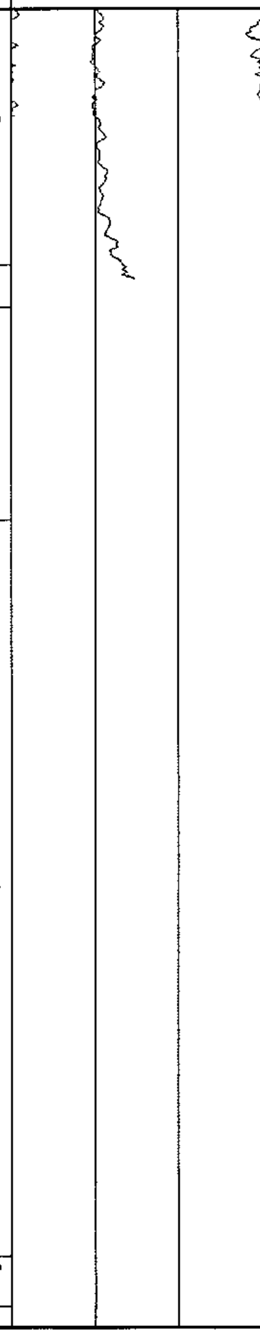
Borehole ID: 54-24370 **TA/OU:** 54/1148 **MDA:** G **Start Date / Time:** 4/06/05, 1430 **End Date / Time:** 4-7-05, 1553

Drilling Co.: Enviro-Drill Inc. **Drilling Equip. / Method:** CME 75 / Hollow Stem Auger **Driller:** Matt Cain **Geologist:** Pattie Baucom, Apogen

Sampling Method: Continuous 5 ft core barrel **Declination:** 90 degrees **Bearing:** na **TD:** 225 ft

Depth	Core Run # / Core Recovery %	Field Screening Results	Analytical Sample Number	Lithology	Lithologic Unit	Notes
155.0	31 / 95%				Qbt 1g	
160.0	32 / 95%				Qbt 1g	
165.0	33 / 95%			165.0 - 167.0 ft Pumice, reworked. 50% angular to subangular pumice, 50% quartz crystals.	Qbt 1g / Qbtt	Slough in borehole from 167 - 225 ft prevents further geophysical measurements.
170.0	34 / 90%			167.0 - 179.5 ft Interlayered silt, fine to medium-grained sand with silt laminations, and gravel (with dacite and pumice clasts).	Qbtt / Cerro Toledo Interval	
175.0	35 / 80%				Cerro Toledo Interval	
180.0	36 / 80%				Cerro Toledo Interval	
185.0	37 / 90%			179.5 - 222.5 ft Tuff- Nonwelded, pinkish white (7.5YR 8/2), dry. 10% quartz, 5% lithics, 17% pumice.	Otowi Member, Bandelier Tuff	
190.0	38 / 95%				Otowi Member, Bandelier Tuff	
195.0	39 / 95%				Otowi Member, Bandelier Tuff	
200.0	40 / 95%	2930 dpm Gross Alpha/Beta			Otowi Member, Bandelier Tuff	Gross Alpha/Beta Background = 2410 dpm.
205.0	41 / 100%	3460 dpm Gross Alpha/Beta			Otowi Member, Bandelier Tuff	
210.0	42 / 100%				Otowi Member, Bandelier Tuff	
215.0	43 / 100%				Otowi Member, Bandelier Tuff	
220.0	44 / 100%				Otowi Member, Bandelier Tuff	
225.0	45 / 90%	4780 dpm Gross Alpha/Beta RDX/TNT - Nondetect	MD54-05-57974	222.5 - 225.0 ft Pumice - reworked. 50% angular to subangular pumice, 40% quartz, 10% lithics.	Qbog	TD - 225 ft.

Neutron: 0 CPS 300 — Gamma: 0 CPS 300 — Construction: 7 7



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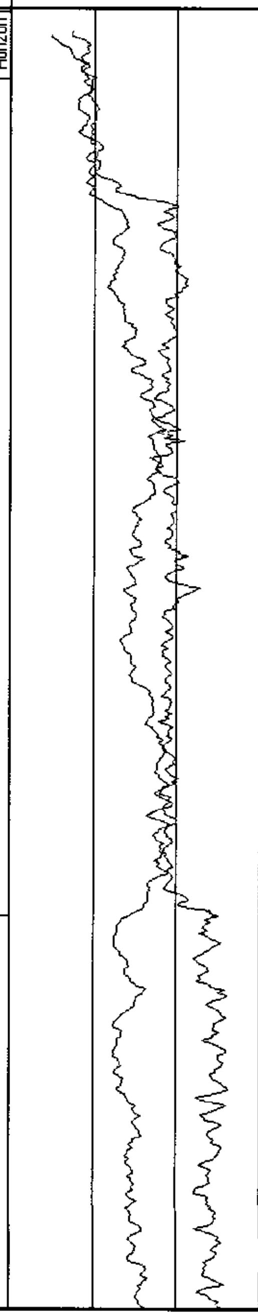
2004 - 2005 MDA G Environmental Characterization Drilling
Borehole Log

Borehole ID: 54-24371 **TA/OU:** 54/1148 **MDA:** G **Start Date / Time:** 4-11-05, 1352 **End Date / Time:** 4-13-05, 0914

Drilling Co.: Enviro-Drill Inc. **Drilling Equip. / Method:** CME 75 / Hollow Stem Auger **Driller:** Matt Cain **Geologist:** Kevin Reid, TerranearPMC

Sampling Method: Continuous 5 ft core barrel **Declination:** 90 degrees **Bearing:** na **TD:** 200 ft

Depth	Core Run # / Core Recovery %	Field Screening Results	Analytical Sample Number	Lithology	Graphic Log	Lithologic Unit	Neutron (0 CPS 300) / Gamma (0 CPS 300)	Construction (7 7)	Notes
0.0	Logged from cuttings	8050 dpm Gross Alpha/Beta	No Samples	0.0 - 3.0 ft Soil - Silty sand with gravel.		Soil Horizon			Gross Alpha/Beta Background = 8050 dpm.
5.0				3.0 - 52.0 ft Tuff - Densely welded, pinkish gray (5YR 7/2 to 5YR 6/2), dry. 10% quartz, 5% sanidne, 15% pumice. Pumice have a sugary texture and are large (up to 2 cm in diameter).		Unit 2 Tshirege Member, Bandelier Tuff			14 in. OD HSA to 10 ft bgs. Set 10 in. casing to depth of 10 ft.
10.0	1 / 90%	10,520 dpm Gross Alpha/Beta							7 5/8 in OD HSA from 10 - 200 ft.
15.0	2 / 100%	9880 dpm Gross Alpha/Beta							
20.0	3 / 100%	10,570 dpm Gross Alpha/Beta							
25.0	4 / 100%	11,130 dpm Gross Alpha/Beta							
30.0	5 / 100%	9780 dpm Gross Alpha/Beta							
35.0	6 / 100%	9560 dpm Gross Alpha/Beta							
40.0	7 / 100%	11,760 dpm Gross Alpha/Beta 0.5 ppm VOCs via PID Headspace TNT/RDX - Nondetect	MD54-05-57981 MD54-05-57988(FD)						
45.0	8 / 100%	9890 dpm Gross Alpha/Beta							
50.0	9 / 100%	10,280 dpm Gross Alpha/Beta 0.4 ppm VOCs vis PID Headspace		52.0 - 85.0 ft Tuff - Poorly welded to moderately welded, pinkish (5YR 7/2), dry. 10% quartz, 5% sanidine, 15 - 20% pumice. Pumice are dark purple to reddish brown.		Unit 1v(u) Tshirege Member, Bandelier Tuff			
55.0	10 / 100%	9860 dpm Gross Alpha/Beta							
60.0	11 / 100%	9280 dpm Gross Alpha/Beta 0.7 ppm VOCs via PID Headspace							
65.0	12 / 100%	10,300 dpm Gross Alpha/Beta							
70.0	13 / 100%	9220 dpm Gross Alpha/Beta 0.9 ppm VOCs via PID Headspace							



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Borehole Log

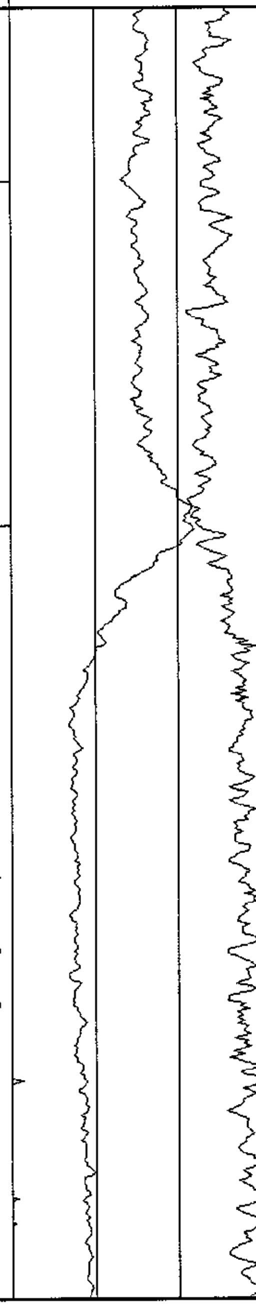
Borehole ID: 54-24371 **TA/OU:** 54/1148 **MDA:** G **Start Date / Time:** 4-11-05, 1352 **End Date / Time:** 4-13-05, 0914

Drilling Co.: Enviro-Drill Inc. **Drilling Equip. / Method:** CME 75 / Hollow Stem Auger **Driller:** Matt Cain **Geologist:** Kevin Reid, TerranearPMC

Sampling Method: Continuous 5 ft core barrel **Declination:** 90 degrees **Bearing:** na **TD:** 200 ft

Depth	Core Run # / Core Recovery %	Field Screening Results	Analytical Sample Number	Lithology	Lithologic Unit
	14 / 100%	11710 dpm Gross Alpha/Beta			Qbt 1v(u)
80.0	15 / 100%	10450 dpm Gross Alpha/Beta			Qbt 1v(u)
85.0	16 / 100%	10190 dpm Gross Alpha/Beta 0.0 ppm VOCs via PID Headspace		85.0 - 105.0 ft Tuff- Densely welded, pinkish white (5YR 8/2) to pink (5YR7/4), dry. 10% quartz, 15% pumice, 5% lithics, 2% sanidine. Basalt fragments are large (up to 3 cm in diameter).	Unit 1v(c) Tshirege Member, Bandelier Tuff
90.0	17 / 100%	9470 dpm Gross Alpha/Beta			
95.0	18 / 100%	8440 dpm Gross Alpha/Beta 0.2 ppm VOCs via PID Headspace			
100.0	19 / 100%	8290 dpm Gross Alpha/Beta			
105.0	20 / 100%	8690 dpm Gross Alpha/Beta 1.3 ppm VOCs via PID Headspace		105.0 - 110.0 ft Tuff- Densely welded, pink (5YR 7/4), dry. 10% quartz, 10% lithics, 15% pumice. Pumice are golden, crystalline, and fibrous.	Unit 1g Tshirege Member, Bandelier Tuff
110.0	21 / 100%	9100 dpm Gross Alpha/Beta		110.0 - 193.0 ft Tuff- Slightly welded to nonwelded, pink (5YR 7/4) to white (5YR8/1), dry. 10% quartz, 10% lithics 15 -20% pumice.	
115.0	22 / 100%	9490 dpm Gross Alpha/Beta 0.5 ppm VOCs via PID Headspace			
120.0	23 / 100%	9470 dpm Gross Alpha/Beta	No Samples		
125.0	24 / 100%	8320 dpm Gross Alpha/Beta 0.0 ppm VOCs via PID Headspace			
130.0	25 / 95%	8880 dpm Gross Alpha/Beta 0.0 ppm VOCs via PID Headspace			
135.0	26 / 95%	7080 dpm Gross Alpha/Beta			
140.0	27 / 95%	8440 dpm Gross Alpha/Beta 0.0 ppm VOCs via PID Headspace			
145.0	28 / 90%	6890 dpm Gross Alpha/Beta			

Graphic Log | Neutron: 0 CPS 300 | Gamma: 0 CPS 300 | Construction: 7 7 | Notes



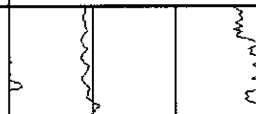
Los Alamos National Laboratory
Environmental Characterization and Remediation
2004 - 2005 MDA G Environmental Characterization Drilling
Borehole Log

Borehole ID: 54-24371 **TA/OU:** 54/1148 **MDA:** G **Start Date / Time:** 4-11-05, 1352 **End Date / Time:** 4-13-05, 0914

Drilling Co.: Enviro-Drill Inc. **Drilling Equip. / Method:** CME 75 / Hollow Stem Auger **Driller:** Matt Cain **Geologist:** Kevin Reid, TerranearPMC

Sampling Method: Continuous 5 ft core barrel **Declination:** 90 degrees **Bearing:** na **TD:** 200 ft

Neutron: 0 – CPS – 300; Gamma: 0 – CPS – 300; Construction: 7 7



Depth	Core Run # / Core Recovery %	Field Screening Results	Analytical Sample Number	Lithology	Lithologic Unit	Notes
	29 / 90%	6910 dpm Gross Alpha/Beta 0.0 ppm VOCs via PID Headspace			Qbt 1g	
155.0	30 / 90%	7200 dpm Gross Alpha/Beta			Qbt 1g	Slough in borehole from 156 - 200 ft prevents deeper geophysical measurements.
160.0	31 / 90%	8790 dpm Gross Alpha/Beta 0.0 ppm VOCs via PID Headspace			Qbt 1g	
165.0	32 / 90%	7500 dpm Gross Alpha/Beta			Qbt 1g	
170.0	33 / 90%	7670 dpm Gross Alpha/Beta 0.0 ppm VOCs via PID Headspace			Qbt 1g	
175.0	34 / 90%	7480 dpm Gross Alpha/Beta 0.0 ppm VOCs via PID Headspace			Qbt 1g	Gross Alpha/Beta Background = 6520 dpm.
180.0	35 / 95%	8910 dpm Gross Alpha/Beta			Qbt 1g	
185.0	36 / 95%	9770 dpm Gross Alpha/Beta 0.0 ppm VOCs via PID Headspace			Qbt 1g	
190.0	37 / 95%	10580 dpm Gross Alpha/Beta		193.0 - 195.0 ft Pumice - reworked. 50% pumice, 50% quartz crystals.	Qbt 1g / Qbtt	
195.0	38 / 90%	6960 dpm Gross Alpha/Beta 0.0 ppm VOCs via PID Headspace TNT/RDX - Nondetect	MD5405-57987	195.0 - 196.0 ft Silty sand with pumice clasts, brown. 196.0 - 200.0 ft Tuff - Nonwelded, pink (7.5 YR 8/3), dry. 5% quartz, 5% lithics, 10 - 12% pumice.	Qct / Qbo	TD - 200 ft.
200.0						

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Environmental Characterization and Remediation
2004 - 2005 MDA G Environmental Characterization Drilling
Borehole Log

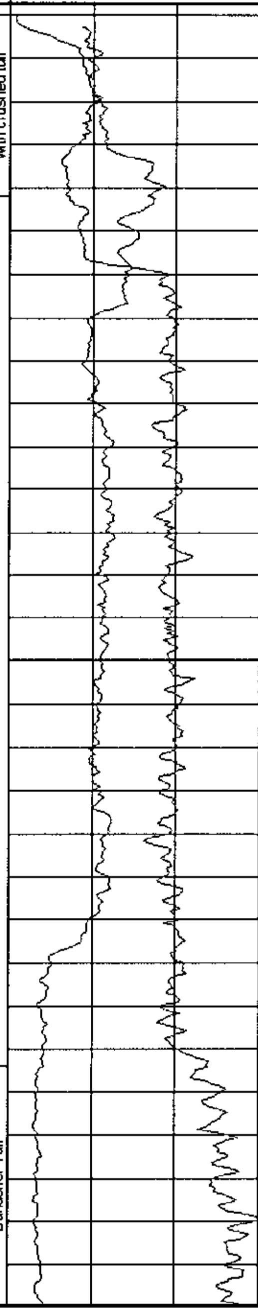
Borehole ID: 54-24372 **TA/OU:** 54/1148 **MDA:** G **Start Date / Time:** 4-29-05, 1330 **End Date / Time:** 5-04-05, 1439

Drilling Co.: Enviro-Drill Inc. **Drilling Equip. / Method:** CME 75 / Hollow Stem Auger **Driller:** Matt Cain **Geologist:** Pattie Baucom, Apogen

Sampling Method: Continuous 5 ft core barrel **Declination:** 90 degrees **Bearing:** na **TD:** 250 ft

Depth	Core Run # / Core Recovery %	Field Screening Results	Analytical Sample Number	Lithology	Lithologic Unit	Notes
0.0	1 / 50%	2920 dpm Gross Alpha/Beta		0.0 - 10.5 ft Pit spoils - Brown silty sand with crushed tuff, moist.	Pit spoils - silty sand with crushed tuff	Gross Alpha/Beta Background = 2280 dpm.
5.0	2 / 50%	3440 dpm Gross Alpha/Beta				
10.0	3 / 100%	3430 dpm Gross Alpha/Beta		10.5 - 25.0 ft Tuff - Densely welded, light gray (7.5YR 7/1), fractured, dry. 10% quartz, 5% sanidine, 15% pumice.	Unit 2 Tshirege Member, Bandelier Tuff	14 in. OD HSA to 25 ft bgs. Set 10 in. casing to depth of 15 ft.
15.0	4 / 50%	3280 dpm Gross Alpha/Beta 0.0 ppm VOCs via PID Headspace				7 5/8 in OD HSA from 15 - 250 ft.
20.0	5 / 100%	3370 dpm Gross Alpha/Beta				Gross Alpha/Beta Background = 2460 dpm.
25.0	6 / 100%	3260 dpm Gross Alpha/Beta 0.0 ppm VOCs via PID Headspace	No Samples	25.0 - 61.0 ft Tuff - SAA. Color change to pinkish gray (5YR 7/2). Pumice are large and have a sugary texture (up to 4 cm in diameter).		
30.0	7 / 100%	3230 dpm Gross Alpha/Beta				
35.0	8 / 100%	3170 dpm Gross Alpha/Beta 0.0 ppm VOCs via PID Headspace				
40.0	9 / 100%	3250 dpm Gross Alpha/Beta				
45.0	10 / 100%	3210 dpm Gross Alpha/Beta 0.0 ppm VOCs PID Headspace				
50.0	11 / 100%	3540 dpm Gross Alpha/Beta				
55.0	12 / 100%	3540 dpm Gross Alpha/Beta TNT/RDX - Nondetect	MD54-05-57989 MD54-05-57996(FD)			
60.0	13 / 100%	3560 dpm Gross Alpha/Beta		61.0 - 100.0 ft Tuff - Poorly welded, white (5YR 8/1) to pinkish white (5YR 8/2), dry. 10% quartz, 5% sanidine, 15-20% pumice. Pumice are dark purple, brittle, and large (up to 3 cm in diameter).	Unit 1v(u) Tshirege Member, Bandelier Tuff	
65.0	14 / 100%	3540 dpm Gross Alpha/Beta 0.0 ppm VOCs via PID Headspace				
70.0	15 / 100%	3790 dpm Gross Alpha/Beta				

Neutron 0 CPS 300 / Gamma 0 CPS 300 / Construction 7 7

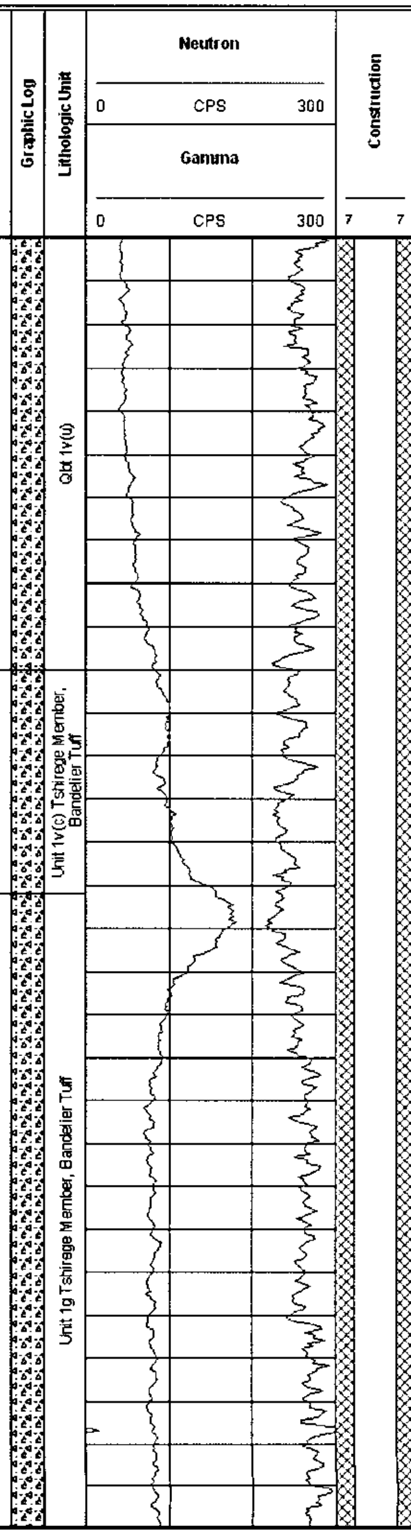


Borehole ID: 54-24372 **TA/OU:** 54/1148 **MDA:** G **Start Date / Time:** 4-29-05, 1330 **End Date / Time:** 5-04-05, 1439

Drilling Co.: Enviro-Drill Inc. **Drilling Equip. / Method:** CME 75 / Hollow Stem Auger **Driller:** Matt Cain **Geologist:** Pattie Baucom, Apogen

Sampling Method: Continuous 5 ft core barrel **Declination:** 90 degrees **Bearing:** na **TD:** 250 ft

Depth	Core Run # / Core Recovery %	Field Screening Results	Analytical Sample Number	Lithology	Lithologic Unit	Notes
	16 / 100%	3740 dpm Gross Alpha/Beta 0.0 ppm VOCs via PID Headspace			Qbt 1v(u)	
80.0	17 / 100%	3380 dpm Gross Alpha/Beta				
85.0	18 / 100%	3650 dpm Gross Alpha/Beta 0.0 ppm VOCs via PID Headspace				
90.0	19 / 100%	3810 dpm Gross Alpha/Beta				
95.0	20 / 100%	4030 dpm Gross Alpha/Beta 0.0 ppm VOCs via PID Headspace				
100.0	21 / 100%	3820 dpm Gross Alpha/Beta		100.0 - 113.0 ft Tuff - Moderately welded, pinkish white (5YR 8/2), dry. 10% quartz, 12% pumice, 5% lithics.	Unit 1v(c) Tshirege Member, Bandelier Tuff	
105.0	22 / 100%	3730 dpm Gross Alpha/Beta 0.0 ppm VOCs via PID Headspace				
110.0	23 / 100%	3320 dpm Gross Alpha/Beta		113.0 - 201.0 ft Tuff - Densely welded to nonwelded, pink (5YR 7/4) to white (5YR 8/1), dry. 10% quartz, 15-20% pumice, 5% sanidine, 7%, lithics. Pumice are large and round (up to 4 cm in diameter). Lithic fragments range from .5 to 6 cm in diameter.	Unit 1g Tshirege Member, Bandelier Tuff	
115.0	24 / 100%	3740 dpm Gross Alpha/Beta 0.0 ppm VOCs via PID Headspace				
120.0	25 / 100%	4040 dpm Gross Alpha/Beta				
125.0	26 / 100%	3610 dpm Gross Alpha/Beta 0.0 ppm VOCs via PID Headspace				
130.0	27 / 100%	3850 dpm Gross Alpha/Beta				
135.0	28 / 100%	3750 dpm Gross Alpha/Beta				
140.0	29 / 100%	4480 dpm Gross Alpha/Beta 0.0 ppm VOCs via PID Headspace				
145.0	30 / 100%	3990 dpm Gross Alpha/Beta				Gross Alpha/Beta Background = 2480 dpm.

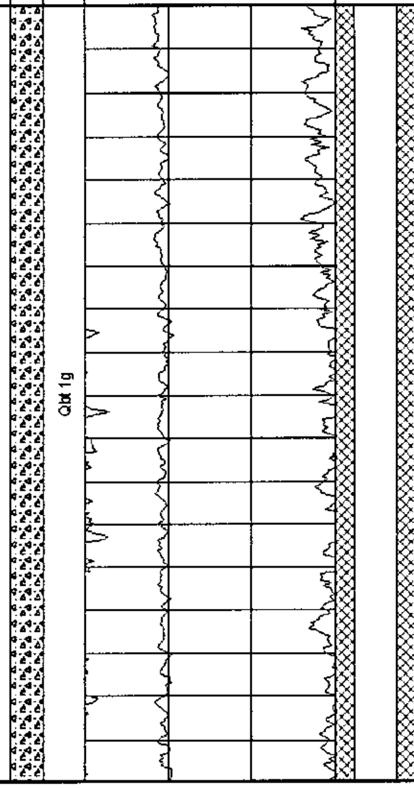


Borehole ID: 54-24372 **TA/OU:** 54/1148 **MDA:** G **Start Date / Time:** 4-29-05, 1330 **End Date / Time:** 5-04-05, 1439

Drilling Co.: Enviro-Drill Inc. **Drilling Equip. / Method:** CME 75 / Hollow Stem Auger **Driller:** Matt Cain **Geologist:** Pattie Baucom, Apogen

Sampling Method: Continuous 5 ft core barrel **Declination:** 90 degrees **Bearing:** na **TD:** 250 ft

Depth	Core Run # / Core Recovery %	Field Screening Results	Analytical Sample Number	Lithology	Graphic Log	Lithologic Unit	Neutron 0 CPS 300 / Gamma 0 CPS 300	Construction 7 7	Notes
	31 / 85%	3860 dpm Gross Alpha/Beta 0.0 ppm VOCs via PID Headspace	No Samples						
155.0	32 / 95%	3860 dpm Gross Alpha/Beta							
160.0	33 / 95%	4040 dpm Gross Alpha/Beta 0.0 ppm VOCs in PID Headspace							
165.0	34 / 90%	3960 dpm Gross Alpha/Beta							
170.0	35 / 90%	3580 dpm Gross Alpha/Beta				Qbt 1g			
175.0	36 / 90%	3790 dpm Gross Alpha/Beta 0.0 ppm VOCs in PID Headspace							
180.0	37 / 90%	3620 dpm Gross Alpha/Beta							
185.0	38 / 90%	3660 dpm Gross Alpha/Beta 0.0 ppm VOCs in PID Headspace							
190.0	39 / 80%	3480 dpm Gross Alpha/Beta							



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Environmental Characterization and Remediation
2004 - 2005 MDA G Environmental Characterization Drilling
Borehole Log

Borehole ID: 54-24372 **TA/OU:** 54/1148 **MDA:** G **Start Date / Time:** 4-29-05, 1330 **End Date / Time:** 5-04-05, 1439

Drilling Co.: Enviro-Drill Inc. **Drilling Equip. / Method:** CME 75 / Hollow Stem Auger **Driller:** Matt Cain **Geologist:** Pattie Baucom, Apogen

Sampling Method: Continuous 5 ft core barrel **Declination:** 90 degrees **Bearing:** na **TD:** 250 ft

Depth	Core Run # / Core Recovery %	Field Screening Results	Analytical Sample Number
195.0 - 200.0	40 / 90%	3930 dpm Gross Alpha/Beta 0.0 ppm VOCs via PID Headspace	
200.0 - 205.0	41 / 85%	3390 dpm Gross Alpha/Beta	
205.0 - 210.0	42 / 90%	3240 dpm Gross Alpha/Beta 0.0 ppm VOCs via PID Headspace	
210.0 - 215.0	43 / 90%	3480 dpm Gross Alpha/Beta	
215.0 - 220.0	44 / 90%	3220 dpm Gross Alpha/Beta 0.0 ppm VOCs via PID Headspace	
220.0 - 225.0	45 / 90%	3460 dpm Gross Alpha/Beta	
225.0 - 230.0	46 / 90%	3470 dpm Gross Alpha/Beta 0.0 ppm VOCs via PID Headspace	
230.0 - 235.0	47 / 90%	3690 dpm Gross Alpha/Beta	
235.0 - 240.0	48 / 90%	3580 dpm Gross Alpha/Beta 0.0 ppm VOCs via PID Headspace	
240.0 - 245.0	49 / 95%	3480 dpm Gross Alpha/Beta	
245.0 - 250.0	50 / 95%	3580 dpm Gross Alpha/Beta 0.0 ppm VOCs via PID Headspace TNT/RDX - Nondetect	MD54-05-57995

Lithology

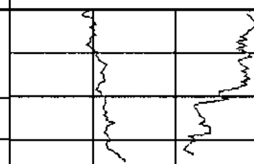
201.0 - 201.5 ft Pumice, reworked. 50% angular to subangular pumice, 50% medium-grained quartz sand.

201.5 - 202.5 ft Silty sand, dry

202.5 - 250.0 ft Tuff- Nonwelded, pinkish white (5YR 8/2), 10% quartz, 7 - 10% lithics (up to 3 cm in diameter), 12 - 15% pumice (clasts up to 3 cm in diameter).

Lithologic Unit: Qbt 1g; Qbtt; Qct; Otowi Member, Bandelier Tuff

Neutron 0 CPS 300 / **Gamma** 0 CPS 300



Construction

Notes: Slough in borehole from 204 - 250 ft prevents deeper geophysical measurements.

TD - 250 ft.

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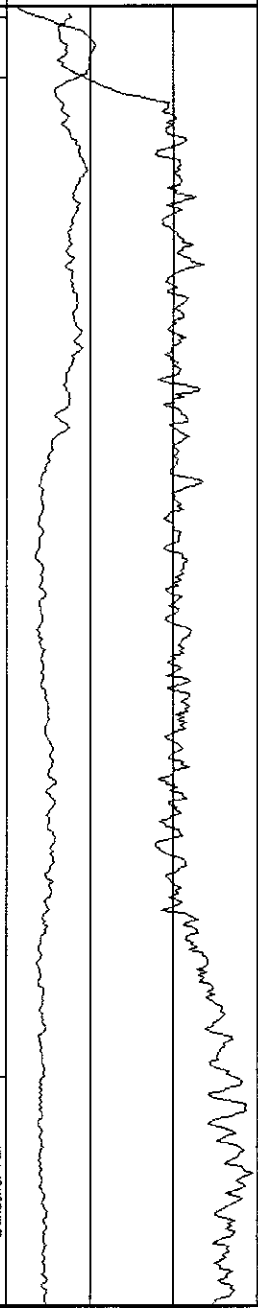
Borehole Log

Borehole ID: 54-24373 **TA/OU:** 54/1148 **MDA:** G **Start Date / Time:** 4-26-05, 1530 **End Date / Time:** 4-29-05, 1034

Drilling Co.: Enviro-Drill Inc. **Drilling Equip. / Method:** CME 75 / Hollow Stem Auger **Driller:** Matt Cain **Geologist:** Pattie Baucom, Apogen

Sampling Method: Continuous 5 ft core barrel **Declination:** 90 degrees **Bearing:** na **TD:** 250 ft

Depth	Core Run # / Core Recovery %	Field Screening Results	Analytical Sample Number	Lithology	Graphic Log	Lithologic Unit	Neutron 0 CPS 300 / Gamma 0 CPS 300	Construction	Notes
0.0	1 / 0%	2530 dpm Gross Alpha/Beta	No Samples	0.0 - 3.5 ft Soil - Silty sand, brown.		Soil			Gross Alpha/Beta Background = 2530 dpm.
5.0	2 / 90%	2840 dpm Gross Alpha/Beta		3.5 - 61.5 ft Tuff - Densely welded, pinkish gray (7.5YR 7/2 to 5YR 7/2), fractured from 29.5 - 30 ft, dry. 10% quartz, 5% sanidine, 15% pumice. Pumice are large (up to 3 cm in diameter).		Unit 2 Tshirege Member, Bandelier Tuff			14 in. OD HSA to 25 ft bgs. Set 10 in. casing to depth of 5 ft.
10.0	3 / 90%	2720 dpm Gross Alpha/Beta							7 5/8 in OD HSA from 5 - 250 ft.
15.0	4 / 100%	2560 dpm Gross Alpha/Beta							
20.0	5 / 100%	3110 dpm Gross Alpha/Beta 0.0 ppm VOCs via PID Headspace							
25.0	6 / 100%	2940 dpm Gross Alpha/Beta							
30.0	7 / 100%	3070 dpm Gross Alpha/Beta 0.0 ppm VOCs via PID Headspace							
35.0	8 / 100%	3260 dpm Gross Alpha/Beta							
40.0	9 / 100%	2920 dpm Gross Alpha/Beta 0.0 ppm VOCs via PID Headspace							
45.0	10 / 100%	2720 dpm Gross Alpha/Beta							Gross Alpha/Beta Background = 2170 dpm.
50.0	11 / 100%	3040 dpm Gross Alpha/Beta 0.0 ppm VOCs via PID Headspace							
55.0	12 / 100%	3160 dpm Gross Alpha/Beta							
60.0	13 / 100%	3230 dpm Gross Alpha/Beta		61.5 - 85.0 ft Tuff - Poorly welded, white (5YR 8/1) to pinkish white (5YR 8/2), dry. 10% quartz, 5% sanidine, 15% pumice.		Unit 1v (U) Tshirege Member, Bandelier Tuff			
65.0	14 / 100%	3160 dpm Gross Alpha/Beta 0.0 ppm VOCs via PID Headspace TNT/RDX - Nondetect	MD54-05-57997 MD54-05-58004(FD)						
70.0	15 / 100%	3180 dpm Gross Alpha/Beta							



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Environmental Characterization and Remediation
2004 - 2005 MDA G Environmental Characterization Drilling
Borehole Log

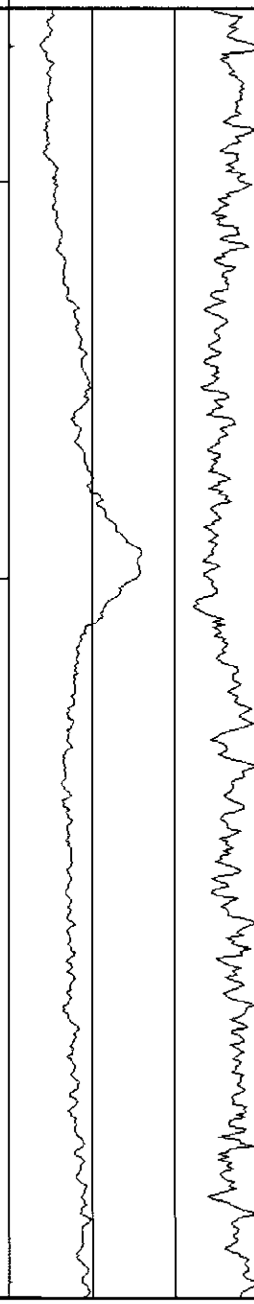
Borehole ID: 54-24373 **TA/OU:** 54/1148 **MDA:** G **Start Date / Time:** 4-26-05, 1530 **End Date / Time:** 4-29-05, 1034

Drilling Co.: Enviro-Drill Inc. **Drilling Equip. / Method:** CME 75 / Hollow Stem Auger **Driller:** Matt Cain **Geologist:** Pattie Baucom, Apogen

Sampling Method: Continuous 5 ft core barrel **Declination:** 90 degrees **Bearing:** na **TD:** 250 ft

Depth	Core Run # / Core Recovery %	Field Screening Results	Analytical Sample Number	Lithology	Lithologic Unit	Notes
	16 / 100%	3290 dpm Gross Alpha/Beta 0.0 ppm VOCs via PID Headspace			Qbt 1v(u)	
80.0	17 / 100%	3510 dpm Gross Alpha/Beta				
85.0	18 / 100%	3240 dpm Gross Alpha/Beta 0.0 ppm VOCs via PID Headspace		85.0 - 108.0 ft Tuff- Moderately welded, pinkish white (5YR 8/2) to pink (5YR 7/3), dry. 10% quartz, 15% pumice, 5% lithics.	Unit 1v(c) Tshirege Member, Bandelier Tuff	
90.0	19 / 100%	3410 dpm Gross Alpha/Beta				
95.0	20 / 100%	3250 dpm Gross Alpha/Beta 0.0 ppm VOCs via PID Headspace				
100.0	21 / 100%	3070 dpm Gross Alpha/Beta				
105.0	22 / 100%	3300 dpm Gross Alpha/Beta 0.0 ppm VOCs via PID Headspace		108.0 - 188.0 ft Tuff- Densely welded (108 - 112 ft) to nonwelded, reddish yellow (5YR 7/6) to white (5YR 8/1), dry. 10% quartz, 15-20% pumice, <5% sanidine, 7%, lithics, 5 % mafics.	Unit 1g Tshirege Member, Bandelier Tuff	
110.0	23 / 100%	3280 dpm Gross Alpha/Beta				
115.0	24 / 100%	3440 dpm Gross Alpha/Beta 0.0 ppm VOCs via PID Headspace				
120.0	25 / 100%	3370 dpm Gross Alpha/Beta				
125.0	26 / 100%	3370 dpm Gross Alpha/Beta 0.0 ppm VOCs via PID Headspace				
130.0	27 / 90%	3450 dpm Gross Alpha/Beta				
135.0	28 / 90%	3450 dpm Gross Alpha/Beta				
140.0	29 / 90%	3610 dpm Gross Alpha/Beta 0.0 ppm VOCs via PID Headspace				
145.0	30 / 90%	3630 dpm Gross Alpha/Beta				

Neutron: 0 CPS 300
Gamma: 0 CPS 300
Construction: 7 7



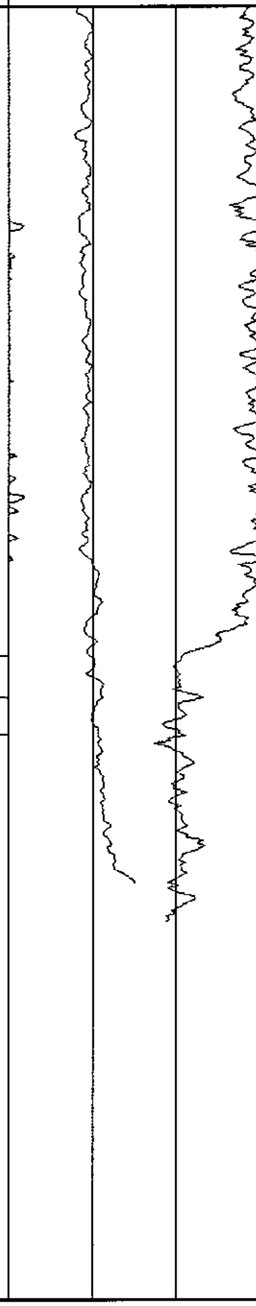
Borehole ID: 54-24373 **TA/OU:** 54/1148 **MDA:** G **Start Date / Time:** 4-26-05, 1530 **End Date / Time:** 4-29-05, 1034

Drilling Co.: Enviro-Drill Inc. **Drilling Equip. / Method:** CME 75 / Hollow Stem Auger **Driller:** Matt Cain **Geologist:** Pattie Baucom, Apogen

Sampling Method: Continuous 5 ft core barrel **Declination:** 90 degrees **Bearing:** na **TD:** 250 ft

Depth	Core Run # / Core Recovery %	Field Screening Results	Analytical Sample Number	Lithology	Lithologic Unit	Notes
155.0	31 / 90%	3530 dpm Gross Alpha/Beta 0.0 ppm VOCs via PID Headspace	No Samples		Qbt 1g	
160.0	32 / 90%	3530 dpm Gross Alpha/Beta				
165.0	33 / 90%	3460 dpm Gross Alpha/Beta 0.0 ppm VOCs in PID Headspace				
170.0	34 / 90%	3370 dpm Gross Alpha/Beta				
175.0	35 / 90%	3260 dpm Gross Alpha/Beta				
180.0	36 / 90%	3610 dpm Gross Alpha/Beta 0.0 ppm VOCs in PID Headspace				
185.0	37 / 90%	3070 dpm Gross Alpha/Beta				
190.0	38 / 90%	3210 dpm Gross Alpha/Beta 0.0 ppm VOCs in PID Headspace		188.0 - 189.5 ft Pumice, reworked. 50% angular to subangular pumice, 50% quartz sand.	Qbtt	
195.0	39 / 95%	3210 dpm Gross Alpha/Beta		189.5 - 190.0 ft Silty fine-grained sand, dry	Qct	Gross Alpha/Beta Background = 2420 dpm.
200.0	40 / 95%	3170 dpm Gross Alpha/Beta 0.0 ppm VOCs via PID Headspace		190.0 - 250.0 ft Tuff-Nonwelded, pinkish white (7.5YR 8/2), dry. 10 - 12% quartz, 10% lithics (up to 4 cm in diameter), 15% pumice. Pumice are round and large (up to 3 cm in diameter).	Otowi Member, Bandelier Tuff	Slough in borehole from 203 - 250 ft prevents deeper geophysical measurements.
205.0	41 / 95%	3320 dpm Gross Alpha/Beta				
210.0	42 / 95%	3150 dpm Gross Alpha/Beta 0.0 ppm VOCs via PID Headspace				
215.0	43 / 95%	3410 dpm Gross Alpha/Beta				
220.0	44 / 95%	3380 dpm Gross Alpha/Beta 0.0 ppm VOCs via PID Headspace				
	45 / 95%	3440 dpm Gross Alpha/Beta				

Neutron: 0 CPS 300
Gamma: 0 CPS 300



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Environmental Characterization and Remediation
2004 - 2005 MDA G Environmental Characterization Drilling
Borehole Log

Borehole ID: 54-24373 **TA/OU:** 54/1148 **MDA:** G **Start Date / Time:** 4-26-05, 1530 **End Date / Time:** 4-29-05, 1034

Drilling Co.: Enviro-Drill Inc. **Drilling Equip. / Method:** CME 75 / Hollow Stem Auger **Driller:** Matt Cain **Geologist:** Pattie Baucom, Apogen

Sampling Method: Continuous 5 ft core barrel **Declination:** 90 degrees **Bearing:** na **TD:** 250 ft

Depth	Core Run # / Core Recovery %	Field Screening Results	Analytical Sample Number	Lithology	Graphic Log	Lithologic Unit	Neutron 0 CPS 300 / Gamma 0 CPS 300	Construction ? ?	Notes
	46 / 95%	3310 dpm Gross Alpha/Beta 0.0 ppm VOCs via PID Headspace				Qbo			
230.0	47 / 95%	3430 dpm Gross Alpha/Beta							
235.0	48 / 95%	3280 dpm Gross Alpha/Beta 0.0 ppm VOCs via PID Headspace							
240.0	49 / 95%	3560 dpm Gross Alpha/Beta							
245.0	50 / 95%	3470 dpm Gross Alpha/Beta 0.0 ppm VOCs via PID Headspace TNT/RDX - Nondetect	MD54-05-58003						TD - 250 ft.
250.0									

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Environmental Characterization and Remediation
2004 - 2005 MDA G Environmental Characterization Drilling
Borehole Log

Borehole ID: 54-24374 **TA/OU:** 54/1148 **MDA:** G **Start Date / Time:** 3-16-05, 1300 **End Date / Time:** 3-21-05, 1050

Drilling Co.: Enviro-Drill Inc. **Drilling Equip. / Method:** CME 75 / Hollow Stem Auger **Driller:** Matt Cain **Geologist:** Kevin Reid, TerranearPMC

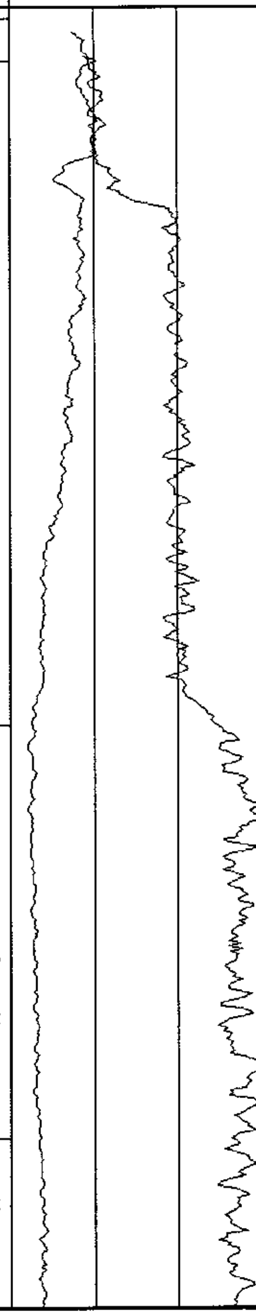
Sampling Method: Continuous 5 ft core barrel **Declination:** 90 degrees **Bearing:** na **TD:** 200 ft

Depth	Core Run # / Core Recovery %	Field Screening Results	Analytical Sample Number
0.0–10.0	Logged from cuttings	2190 dpm Gross Alpha/Beta	No Samples
10.0–15.0	1 / 100%	3090 dpm Gross Alpha/Beta 0.0 ppm VOCs via PID Headspace TNT/RDX - Nondetect	MD54-05-58005 MD54-05-58012(FD)
15.0–20.0	2 / 100%	2590 dpm Gross Alpha/Beta	
20.0–25.0	3 / 100%	2780 dpm Gross Alpha/Beta 0.0 ppm VOCs via PID Headspace	
25.0–30.0	4 / 100%	2350 dpm Gross Alpha/Beta	
30.0–35.0	5 / 100%	3870 dpm Gross Alpha/Beta 0.0 ppm VOCs via PID Headspace	
35.0–40.0	6 / 100%	2750 dpm Gross Alpha/Beta	
40.0–45.0	7 / 100%	4710 dpm Gross Alpha/Beta 0.0 ppm VOCs via PID Headspace	
45.0–50.0	8 / 100%	4450 dpm Gross Alpha/Beta	
50.0–55.0	9 / 100%	3280 dpm Gross Alpha/Beta 0.0 ppm VOCs via PID Headspace	
55.0–60.0	10 / 100%	4550 dpm Gross Alpha/Beta	
60.0–65.0	11 / 100%	3290 dpm Gross Alpha/Beta 0.0 ppm VOCs via PID Headspace	
65.0–70.0	12 / 100%	4260 dpm Gross Alpha/Beta	
70.0–75.0	13 / 100%	4460 dpm Gross Alpha/Beta	

Lithology

Lithology	Lithologic Unit
0.0 - 2.5 ft Fill - sandy silt with crushed tuff.	Fill
2.0 - 41.0 ft Tuff - Densely welded, white (5YR 8/1), dry. 10% quartz, 5% sanidine, 10% pumice. Pumice have a sugary texture and are large (up to 4 cm in diameter).	Unit 2 Tshirege Member, Bandelier Tuff
41.0 - 65.0 ft Tuff - Poorly welded, white (2.5YR 8/1), dry. 10% quartz, <5% sanidine, 15% pumice. Pumice are dark purple and large (up to 5 cm in diameter).	Unit 1v(u) Tshirege Member, Bandelier Tuff
65.0 - 82.0 ft Tuff - Moderately welded, pinkish white (5YR 8/2), dry. 12% quartz, 5% sanidine, 15% pumice, 7% lithics (dacite fragments are up to 2 cm in diameter).	Qbt 1v(c)

Neutron 0 CPS 300
Gamma 0 CPS 300



Construction 7 7

Notes

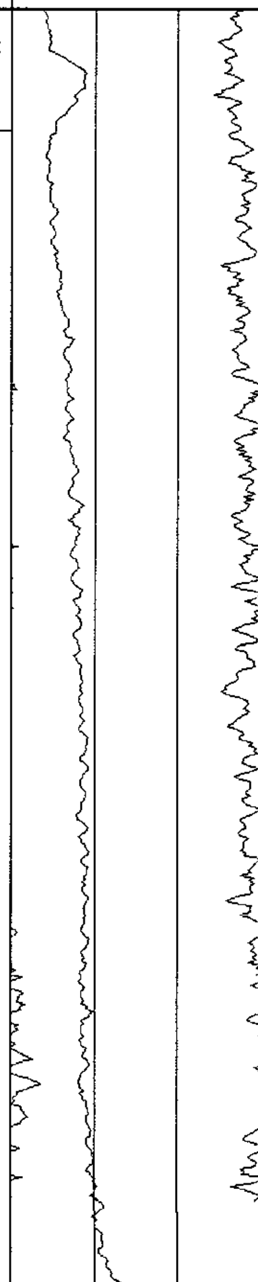
- Gross Alpha/Beta Background = 2190 dpm.
- 14 in. OD HSA to 10 ft bgs. Set 10 in. casing to depth of 10 ft.
- 7 5/8 in OD HSA from 10 - 200 ft.

Borehole ID: 54-24374 **TA/OU:** 54/1148 **MDA:** G **Start Date / Time:** 3-16-05, 1300 **End Date / Time:** 3-21-05, 1050

Drilling Co.: Enviro-Drill Inc. **Drilling Equip. / Method:** CME 75 / Hollow Stem Auger **Driller:** Matt Cain **Geologist:** Kevin Reid, TerranearPMC

Sampling Method: Continuous 5 ft core barrel **Declination:** 90 degrees **Bearing:** na **TD:** 200 ft

Depth	Core Run # / Core Recovery %	Field Screening Results	Analytical Sample Number	Lithology	Graphic Log	Lithologic Unit	Neutron 0 CPS 300 / Gamma 0 CPS 300	Construction	Notes
	14 / 100%	3430 dpm Gross Alpha/Beta 0.0 ppm VOCs via PID Headspace	No Samples			Qbt 1v(c)			
80.0	15 / 100%	3990 dpm Gross Alpha/Beta		82.0 - 152.0 ft Tuff - Poorly welded to nonwelded, pink (5YR 8/3) to white (5YR 8/1), dry. 10% quartz, 5% sanidine, 5% lithics, 15% pumice.		Unit 1g Tshirege Member, Bandelier Tuff			
85.0	16 / 100%	4270 dpm Gross Alpha/Beta 0.0 ppm VOCs via PID Headspace							
90.0	17 / 90%	4390 dpm Gross Alpha/Beta							
95.0	18 / 70%	4270 dpm Gross Alpha/Beta							
100.0	19 / 80%	3660 dpm Gross Alpha/Beta							
105.0	20 / 80%	4150 dpm Gross Alpha/Beta 0.0 ppm VOCs via PID Headspace							
110.0	21 / 80%	4770 dpm Gross Alpha/Beta							
115.0	22 / 80%	3840 dpm Gross Alpha/Beta 0.0 ppm VOCs via PID Headspace							
120.0	23 / 85%	4280 dpm Gross Alpha/Beta							
125.0	24 / 85%	3830 dpm Gross Alpha/Beta 0.0 ppm VOCs via PID Headspace							
130.0	25 / 85%	4770 dpm Gross Alpha/Beta							
135.0	26 / 85%	5030 dpm Gross Alpha/Beta							
140.0	27 / 85%	4200 dpm Gross Alpha/Beta 0.0 ppm VOCs via PID Headspace							
145.0	28 / 85%	4360 dpm Gross Alpha/Beta							



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Environmental Characterization and Remediation
2004 - 2005 MDA G Environmental Characterization Drilling
Borehole Log

Borehole ID: 54-24374 **TA/OU:** 54/1148 **MDA:** G **Start Date / Time:** 3-16-05, 1300 **End Date / Time:** 3-21-05, 1050

Drilling Co.: Enviro-Drill Inc. **Drilling Equip. / Method:** CME 75 / Hollow Stem Auger **Driller:** Matt Cain **Geologist:** Kevin Reid, TerranearPMC

Sampling Method: Continuous 5 ft core barrel **Declination:** 90 degrees **Bearing:** na **TD:** 200 ft

Neutron: 0 CPS 300; Gamma: 0 CPS 300

Depth	Core Run # / Core Recovery %	Field Screening Results	Analytical Sample Number	Lithology	Lithologic Unit	Notes
152.0–155.0	29 / 90%	4440 dpm Gross Alpha/Beta; 0.0 ppm VOCs via PID Headspace		152.0 - 153.0 ft Pumice - reworked. 50% angular to subangular pumice, 50 % quartz.	Qbt1g / Qbt1	Alpha/Beta Background = 2030 dpm.
155.0–160.0	30 / 90%	3870 dpm Gross Alpha/Beta		153.0 - 179.5 ft Interlayered silt, fine- to medium-grained silty sand with pebbles, and gravel layers.	Cerro Toledo Interval	Slough in borehole from 151 to 200 ft prevents deeper geophysical measurements.
160.0–165.0	31 / 90%	3530 dpm Gross Alpha/Beta; 0.0 ppm VOCs via PID Headspace			Cerro Toledo Interval	
165.0–170.0	32 / 85%	4240 dpm Gross Alpha/Beta			Cerro Toledo Interval	
170.0–175.0	33 / 85%	4280 dpm Gross Alpha/Beta; 0.0 ppm VOCs via PID Headspace			Cerro Toledo Interval	
175.0–180.0	34 / 85%	4190 dpm Gross Alpha/Beta; 0.0 ppm VOCs via PID Headspace			Cerro Toledo Interval	
180.0–185.0	35 / 95%	3690 dpm Gross Alpha/Beta		179.5 - 200.0 ft Tuff - Nonwelded, pink (7.5 YR 8/3), 10% quartz, 5% sanidine, 5% lithics, 5% mafics, 15% pumice.	Otowi Member, Bandelier Tuff	
185.0–190.0	36 / 95%	4660 dpm Gross Alpha/Beta; 0.0 ppm VOCs via PID Headspace			Otowi Member, Bandelier Tuff	
190.0–195.0	37 / 95%	3660 dpm Gross Alpha/Beta			Otowi Member, Bandelier Tuff	
195.0–200.0	38 / 95%	3650 dpm Gross Alpha/Beta; 0.0 ppm VOCs via PID Headspace; TNT/RDX - Nondetect	MD54-05-58011		Otowi Member, Bandelier Tuff	TD - 200 ft.

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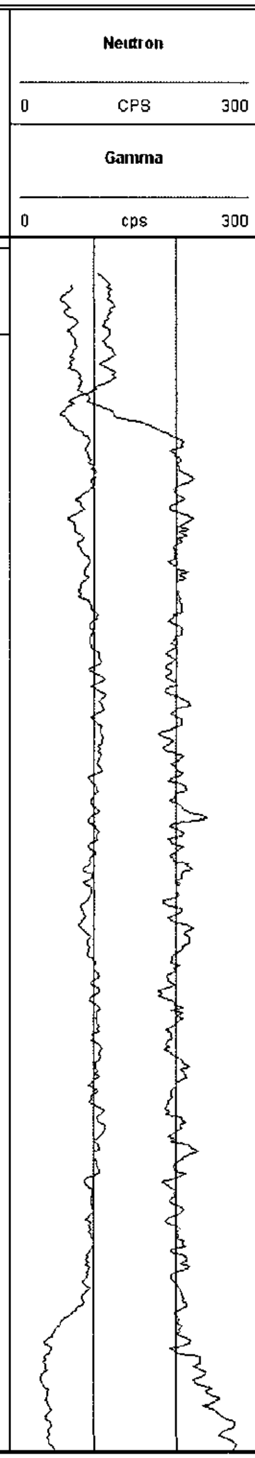
Borehole ID: 54-24375 **TA/OU:** 54/1148 **MDA:** G **Start Date / Time:** 3-01-05, 0930 **End Date / Time:** 3-3-05, 1107

Drilling Co.: Enviro-Drill Inc. **Drilling Equip. / Method:** CME 75 / Hollow Stem Auger **Driller:** Matt Cain **Geologist:** Pattie Baucom, Apogen

Sampling Method: Continuous 5 ft core barrel **Declination:** 90 degrees **Bearing:** na **TD:** 201 ft

Depth	Core Run # / Core Recovery %	Field Screening Results	Analytical Sample Number	Lithology	Lithologic Unit	Notes
0.0	Logged from cuttings	2210 dpm Gross Alpha/Beta	No Samples	0.0 - 5.0 ft Soil. Silty sand, slightly moist.	Soil	Gross Alpha/Beta Background = 2210 dpm.
5.0				5.0 - 64.0 ft Tuff - Densely welded, light gray (7.5YR 7/1), dry. 15% quartz, 5% sanidine, 10% pumice. Pumice have a sugary texture and are large (up to 3 cm in diameter).	Unit 2 Tshirege Member, Bandelier Tuff	14 in. OD HSA to 10 ft bgs. Set 10 in. casing to depth of 10 ft.
10.0	1 / 90%	3010 dpm Gross Alpha/Beta				7 5/8 in OD HSA from 10 - 201 ft.
15.0	2 / 90%	2850 dpm Gross Alpha/Beta				
20.0	3 / 100%	3420 dpm Gross Alpha/Beta				
25.0	4 / 100%	3090 dpm Gross Alpha/Beta				
30.0	5 / 100%	3850 dpm Gross Alpha/Beta TNT/RDX - Nondetect	MD54-05-58013 MD54-05-58020(FD)			
35.0	6 / 100%	3150 dpm Gross Alpha/Beta	No Samples			
40.0	7 / 100%	3060 dpm Gross Alpha/Beta				
45.0	8 / 100%	2980 dpm Gross Alpha/Beta				
50.0	9 / 100%	3250 dpm Gross Alpha/Beta				
55.0	10 / 100%	2810 dpm Gross Alpha/Beta				
60.0	11 / 100%	3050 dpm Gross Alpha/Beta	MD54-05-58014 MD54-05-58015	64.0 - 65.0 ft Tuff - SAA. Mud filled fracture from 64 - 65 ft, dry.		
65.0	12 / 100%	3250 dpm Gross Alpha/Beta		65.0 - 70.0 ft Tuff - SAA.		



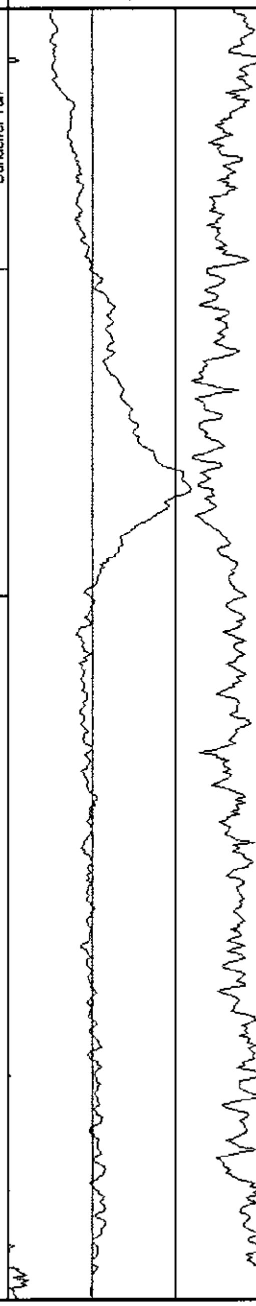
Los Alamos National Laboratory
Environmental Characterization and Remediation
2004 - 2005 MDA G Environmental Characterization Drilling
Borehole Log

Borehole ID: 54-24375 **TA/OU:** 54/1148 **MDA:** G **Start Date / Time:** 3-01-05, 0930 **End Date / Time:** 3-3-05, 1107

Drilling Co.: Enviro-Drill Inc. **Drilling Equip. / Method:** CME 75 / Hollow Stem Auger **Driller:** Matt Cain **Geologist:** Pattie Baucom, Apogen

Sampling Method: Continuous 5 ft core barrel **Declination:** 90 degrees **Bearing:** na **TD:** 201 ft

Depth	Core Run # / Core Recovery %	Field Screening Results	Analytical Sample Number	Lithology	Graphic Log	Lithologic Unit	Neutron (0 CPS 300) / Gamma (0 cps 300)	Construction (7 7)	Notes
	13 / 100%	3470 dpm Gross Alpha/Beta 0.0 ppm VOCs via PID Headspace		70.0 - 85.0 ft Tuff - Poorly welded to moderately welded, white (7.5YR 8/1) to pinkish white (2.5 YR 8/2), dry. 10% quartz, <5% sanidine, 15% pumice. Pumice are dark purple and large (up to 6 cm in diameter).		Unit 1v(u) Tshirege Member, Bandelier Tuff			
75.0	14 / 100%	3140 dpm Gross Alpha/Beta							
80.0	15 / 100%	3490 dpm Gross Alpha/Beta 0.0 ppm VOCs via PID Headspace							
85.0	16 / 100%	3240 dpm Gross Alpha/Beta		85.0 - 104.0 ft Tuff - Moderately welded, light reddish brown (2.5YR 7/3), dry. 15% quartz, 5% sanidine, 15% pumice, 5% lithics.		Unit 1v(c) Tshirege Member, Bandelier Tuff			
90.0	17 / 100%	2640 dpm Gross Alpha/Beta 0.0 ppm VOCs via PID Headspace							
95.0	18 / 100%	3540 dpm Gross Alpha/Beta							
100.0	19 / 100%	3250 dpm Gross Alpha/Beta							
105.0	20 / 100%	2810 dpm Gross Alpha/Beta		104.0 - 169.0 ft Tuff - Poorly welded to nonwelded, light reddish brown (2.5YR 6/4) to pinkish white (2.5YR 8/2), dry. 15% quartz, 5% sanidine, 5 - 10% lithics, 15% pumice. Pumice are round and large (up to 6 cm in diameter), lithics are angular and large (up to 4 cm in diameter).		Unit 1g Tshirege Member, Bandelier Tuff			
110.0	21 / 100%	3450 dpm Gross Alpha/Beta							
115.0	22 / 100%	3050 dpm Gross Alpha/Beta 0.0 ppm VOCs via PID Headspace							
120.0	23 / 95%	3110 dpm Gross Alpha/Beta							
125.0	24 / 0%	3910 dpm Gross Alpha/Beta							
130.0	25 / 95%	3200 dpm Gross Alpha/Beta	No Samples						
135.0	26 / 95%	3260 dpm Gross Alpha/Beta 0.0 ppm VOCs via PID Headspace							
140.0	27 / 95%	3840 dpm Gross Alpha/Beta							



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2004 - 2005 MDA G Environmental Characterization Drilling
Borehole Log

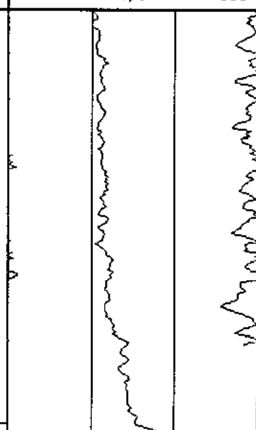
Borehole ID: 54-24375 **TA/OU:** 54/1148 **MDA:** G **Start Date / Time:** 3-01-05, 0930 **End Date / Time:** 3-3-05, 1107

Drilling Co.: Enviro-Drill Inc. **Drilling Equip. / Method:** CME 75 / Hollow Stem Auger **Driller:** Matt Cain **Geologist:** Pattie Baucom, Apogen

Sampling Method: Continuous 5 ft core barrel **Declination:** 90 degrees **Bearing:** na **TD:** 201 ft

Depth	Core Run # / Core Recovery %	Field Screening Results	Analytical Sample Number	Lithology	Lithologic Unit	Notes
	28 / 95%	3080 dpm Gross Alpha/Beta				
150.0	29 / 95%	3220 dpm Gross Alpha/Beta				
155.0	30 / 95%	3040 dpm Gross Alpha/Beta 0.0 ppm VOCs via PID Headspace			Qbt 1g	
160.0	31 / 95%	3510 dpm Gross Alpha/Beta				Slough in borehole from 169 - 201 ft prevents deeper geophysical measurements.
165.0	32 / 95%	3530 dpm Gross Alpha/Beta		169.0 - 171.0 ft Pumice - reworked. 80% poorly sorted, gravel sized pumice, 20% ash.		
170.0	33 / 95%	2830 dpm Gross Alpha/Beta			Qbtt	Gross Alpha/Beta Background = 1710 dpm.
175.0	34 / 95%	2650 dpm Gross Alpha/Beta		171.0 - 183.0 ft Interlayered massive silt and silty fine- to medium-grained sand with pumice and lithic clasts.	Cerro Toledo Interval	
180.0	35 / 95%	2660 dpm Gross Alpha/Beta				
185.0	36 / 95%	2670 dpm Gross Alpha/Beta 6.9 ppm VOCs via PID Headspace		183.0 - 198.0 ft Tuff - Nonwelded, pinkish white (7.5 YR 8/2), 10% quartz, 5% lithics, 5% mafics, 10% pumice (up to 3 cm in diameter).	Otowi Member, Bandelier Tuff	
190.0	37 / 95%	2800 dpm Gross Alpha/Beta 2.0 ppm VOCs via PID Headspace				
195.0	38 / 95%	2400 dpm Gross Alpha/Beta	MD54-58019	198.0 - 200.0 ft Pumice - reworked. 60% poorly sorted, angular pumice (up to 4 cm in diameter), 10% quartz crystals, and 30% ash.	Qbog	
200.0		2120 dpm Gross Alpha/Beta RDX/TNT - nondetect		200 - 201.0 ft Paleosol. Sandy clayey loam with angular basalt clasts underlain by pale pink silty clay, slightly damp, rust stained.	Paleosol	TD - 201 ft.
205.0						

Neutron: 0 CPS 300 — Gamma: 0 cps 300 — Construction: 7 7



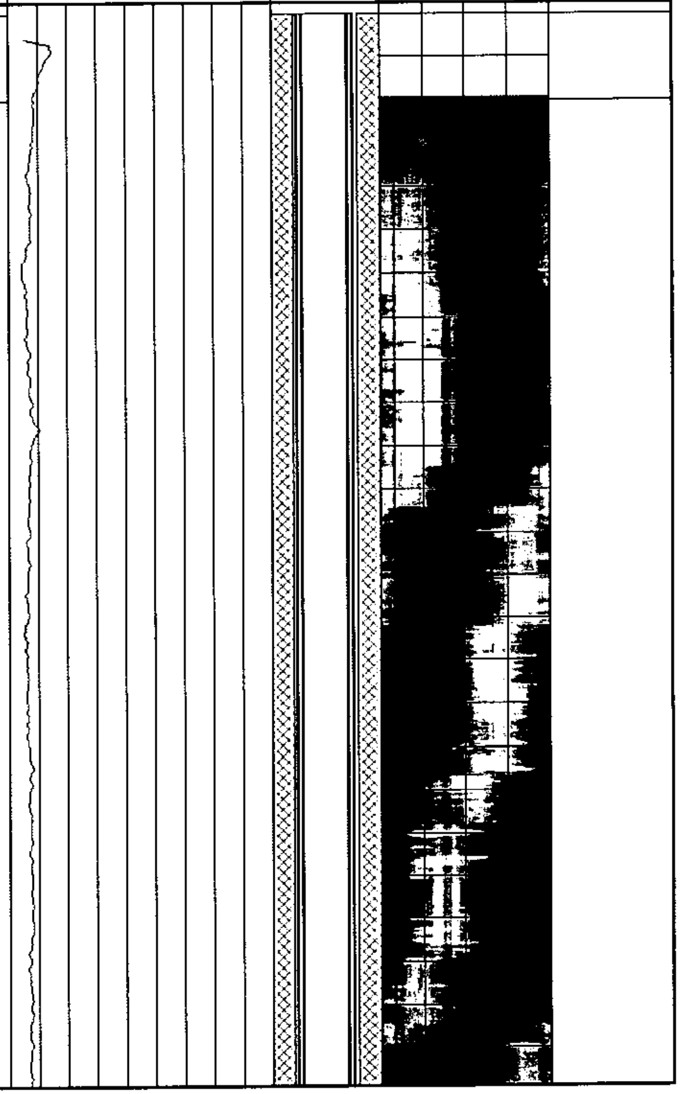
Los Alamos National Laboratory
Environmental Characterization and Remediation
2004 - 2005 MDA G Environmental Characterization Drilling
Borehole Log

Borehole ID: 54-24523 54-25105 **TA/OU:** 54/1148 **MDA:** G **Start Date / Time:** 5-18-05, 1500 **End Date / Time:** 6-30-05, 1047

Drilling Co.: Spectrum **Drilling Equip. / Method:** Boart Longyear Air Rotary DB540 **Driller:** S. Jager **Geologist:** K. Reid, S. White, TerranearPMC

Sampling Method: 5 ft core barrel **Declination:** 90 degrees **Bearing:** N/A **TD:** 701.3 ft

Depth	Core Run # / Core Recovery %	Field Screening Results	Lithology	Graphic Log	Lithologic Unit	Neutron (0 CPS 900) / Gamma (0 cps 100)	Construction (5 5)	Image (0° 90° 180° 270° 0°)	Notes
0.0	Logged from cuttings		0.0 - 5.0 ft Soil - silty sand, dry.		Soil				
5.0	1 / 100%		5.0 - 65.0 ft Tuff - Densely welded, light gray (10 YR 7/1), dry. 15% quartz, 10% pumice, 10% sanidine		Unit 2 Tshirege Member, Bandelier Tuff				
10.0	2 / 60%	4370 dpm Gross Alpha/Beta							
15.0	3 / 90%	4580 dpm Gross Alpha/Beta							
20.0	4 / 50%	3930 dpm Gross Alpha/Beta							
25.0	5 / 90%	3690 dpm Gross Alpha/Beta							
30.0	6 / 95%	4240 dpm Gross Alpha/Beta							
35.0	7 / 75%	4370 dpm Gross Alpha/Beta							
40.0	8 / 95%	3390 dpm Gross Alpha/Beta							
45.0	9 / 100%	4330 dpm Gross Alpha/Beta							
50.0	10 / 100%	4250 dpm Gross Alpha/Beta							
55.0	11 / 90%	4100 dpm Gross Alpha/Beta							
60.0	12 / 90%	4050 dpm Gross Alpha/Beta							



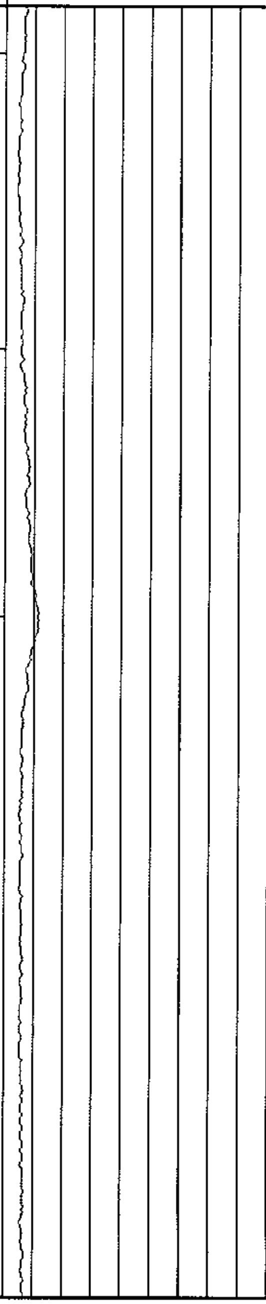
Los Alamos National Laboratory
Environmental Characterization and Remediation
2004 - 2005 MDA G Environmental Characterization Drilling
Borehole Log

Borehole ID: 54-24523 54-25105 **TA/OU:** 54/1148 **MDA:** G **Start Date / Time:** 5-18-05, 1500 **End Date / Time:** 6-30-05, 1047

Drilling Co.: Spectrum **Drilling Equip. / Method:** Boart Longyear Air Rotary DB540 **Driller:** S. Jager **Geologist:** K. Reid, S. White, TerranearPMC

Sampling Method: 5 ft core barrel **Declination:** 90 degrees **Bearing:** N/A **TD:** 701.3 ft

Depth	Core Run # / Core Recovery %	Field Screening Results	Lithology	Graphic Log	Lithologic Unit	Neutron 0 CPS 900 / Gamma 0 cps 100	Construction	Image 0° 90° 180° 270° 0°	Notes
65.0	13 / 85%	3930 dpm Gross Alpha/Beta□	65.0 - 82.3 ft Tuff- Moderately welded to nonwelded, white (10 YR 8/1), dry. 15% quartz, 10% sanidine, 10% pumice. Pumice are large (up to 3 cm in diameter).		Unit 1v(u) Tshirege Member, Bandelier Tuff				
70.0	14 / 0%								
75.0	15 / 95%	4540 dpm Gross Alpha/Beta							
80.0	16 / 90%	4080 dpm Gross Alpha/Beta							
85.0	17 / 95%	3580 dpm Gross Alpha/Beta	82.3 - 97.3 ft Tuff- Moderately welded to densely welded, pinkish gray (7.5 YR 7/2) to pink (7.5 YR 7/4), dry. 15% quartz, 10% sanidine, 10% pumice, 5% lithics. Iron staining at grain boundaries.		Unit 1v(c) Tshirege Member, Bandelier Tuff				
90.0	18 / 95%	3920 dpm Gross Alpha/Beta							
95.0	19 / 90%	3770 dpm Gross Alpha/Beta							
100.0	20 / 90%	4150 dpm Gross Alpha/Beta	97.3 - 171.3 ft Tuff- Moderately welded to nonwelded, pink (7.5 YR 7/4) to light gray (5 YR 7/1), dry. 15% quartz, 10% lithics, 10% pumice, 10% sanidine. Pumice are large (up to 3 cm in diameter).		Unit 1g Tshirege Member, Bandelier Tuff				
105.0	21 / 20%	3380 dpm Gross Alpha/Beta□							
110.0	22 / 25%	4110 dpm Gross Alpha/Beta							
115.0	23 / 25%	3310 dpm Gross Alpha/Beta							
120.0	24 / 30%	3640 dpm Gross Alpha/Beta							
125.0	25 / 0%								
130.0	26 / 50%	3210 dpm Gross Alpha/Beta							
135.0	27 / 0%								



Borehole ID: 54-24523 54-25105 **TA/OU:** 54/1148 **MDA:** G **Start Date / Time:** 5-18-05, 1500 **End Date / Time:** 6-30-05, 1047

Drilling Co.: Spectrum **Drilling Equip. / Method:** Boart Longyear Air Rotary DB540 **Driller:** S. Jager **Geologist:** K. Reid, S. White, TerranearPM(

Sampling Method: 5 ft core barrel **Declination:** 90 degrees **Bearing:** N/A **TD:** 701.3 ft

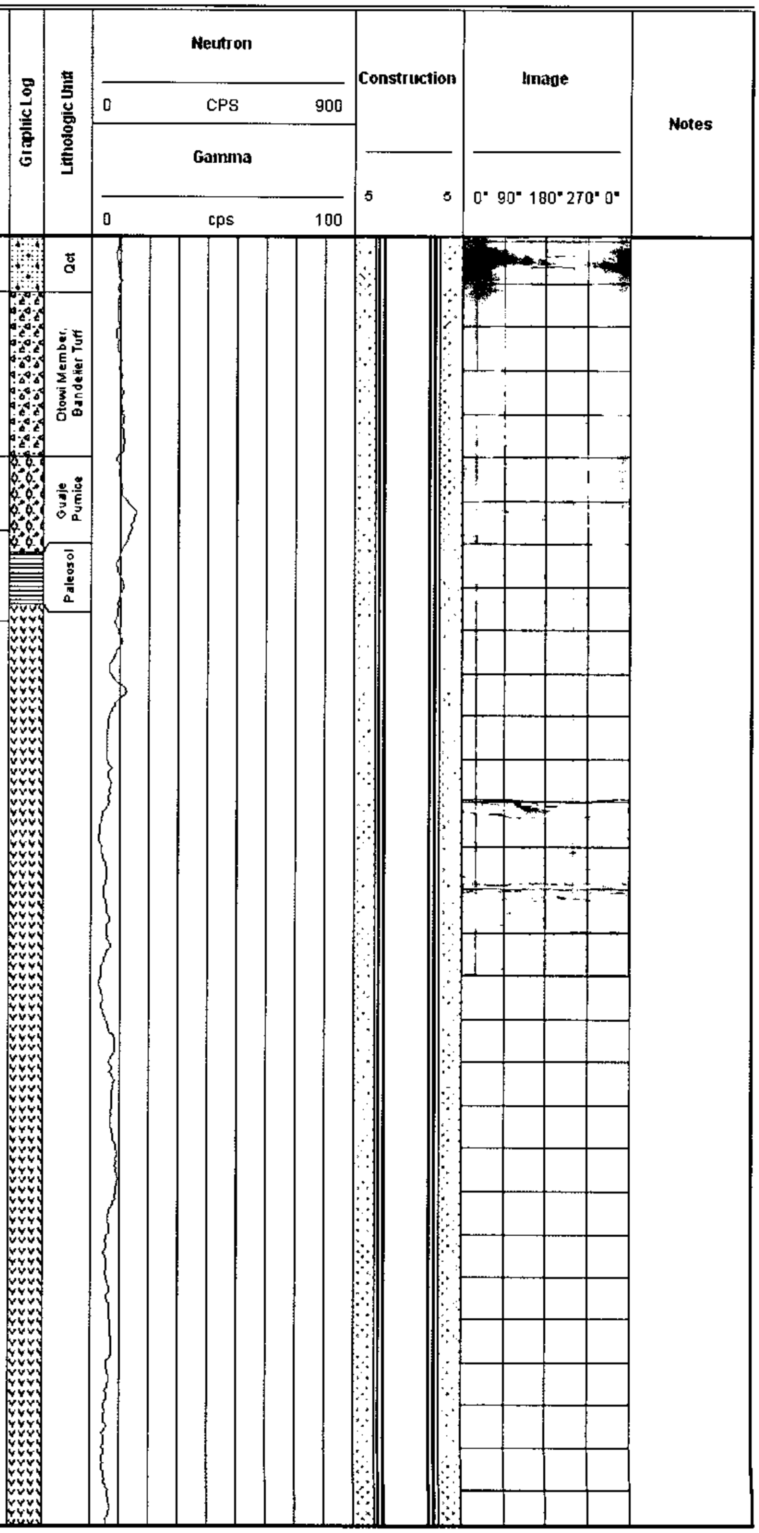
Depth	Core Run # / Core Recovery %	Field Screening Results	Lithology	Graphic Log	Lithologic Unit	Neutron (0 CPS 900) / Gamma (0 cps 100)	Construction (5 5)	Image (0° 90° 180° 270° 0°)	Notes
140.0	28 / 50%	2970 dpm Gross Alpha/Beta			Qbt 1g				
145.0	29 / 0%								
150.0	30 / 10%								
155.0	31 / 50%	2980 dpm Gross Alpha/Beta							
160.0	32 / 60%	2710 dpm Gross Alpha/Beta							
165.0	33 / 65%	3060 dpm Gross Alpha/Beta							
170.0	34 / 75%	2560 dpm Gross Alpha/Beta	171.3 - 172.3 ft Pumice - reworked. Pumice with quartz and ash deposits.		Tsankawi Pumice				
175.0	35 / 60%	2690 dpm Gross Alpha/Beta	172.3 - 185.5 ft Interlayered clayey sand and silt, pebbley sand, sand, and sand with cobbles.		Qct				
180.0	36 / 50%	2510 dpm Gross Alpha/BetaD							

Borehole ID: 54-24523 54-25105 **TA/OU:** 54/1148 **MDA:** G **Start Date / Time:** 5-18-05, 1500 **End Date / Time:** 6-30-05, 1047

Drilling Co.: Spectrum **Drilling Equip. / Method:** Boart Longyear Air Rotary DB540 **Driller:** S. Jager **Geologist:** K. Reid, S. White, TerranearPMC

Sampling Method: 5 ft core barrel **Declination:** 90 degrees **Bearing:** N/A **TD:** 701.3 ft

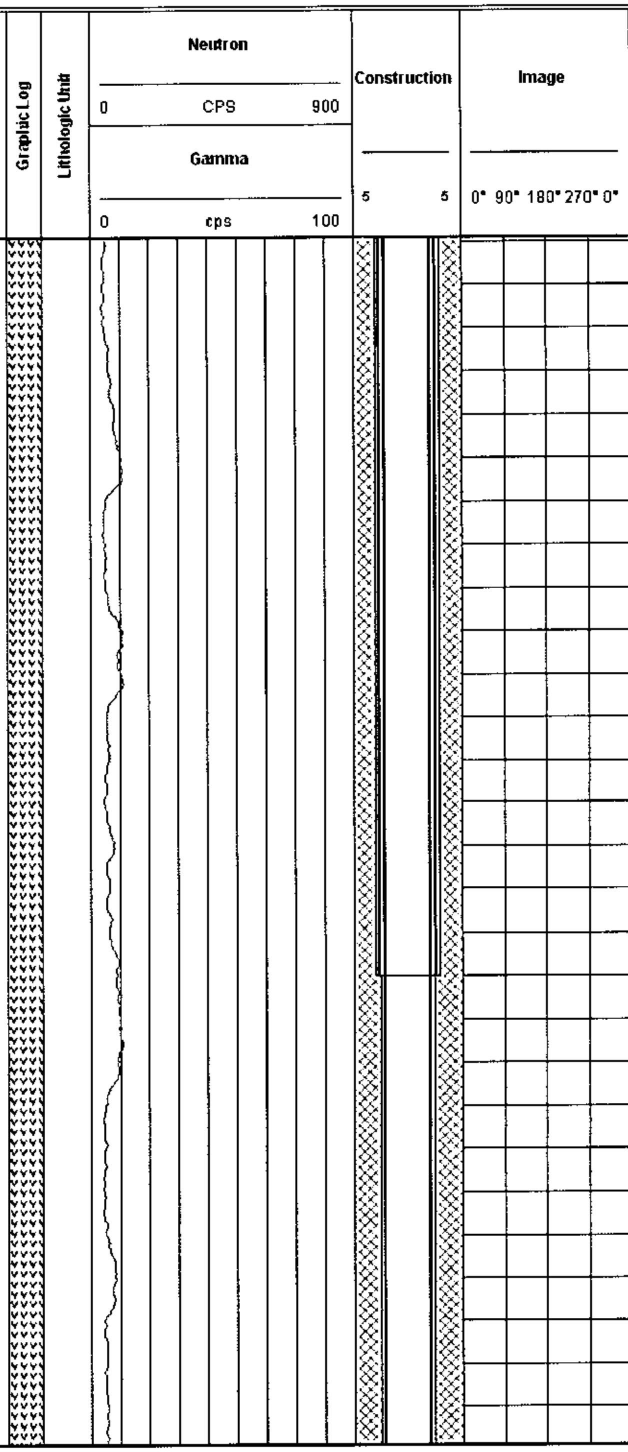
Depth	Core Run # / Core Recovery %	Field Screening Results	Lithology	Lithologic Unit
185.0	37 / 40%	2190 dpm Gross Alpha/Beta		Qct
190.0	38 / 40%	2560 dpm Gross Alpha/Beta	185.5 - 195.0 ft Tuff-Nonwelded, pink (5YR 7/3), dry. 15% quartz, 15 - 20% pumice, lithics 5-10 %. Pumice are large and fibrous (up to 4 cm in diameter).	Otowi Member, Bandelier Tuff
195.0	39 / 50%	2040 dpm Gross Alpha/Beta	195.0 - 200.5 ft Pumice - reworked. Pumice and ash with quartz crystals.	Guaje Pumice
200.0	40 / 50%	2130 dpm Gross Alpha/Beta	200.5 - 203.3 ft Palesol - Silty clayey sand with numerous basalt cobbles.	Paleosol
205.0	41 / 90%	2420 dpm Gross Alpha/Beta	203.3 - 477.3 ft Basalt - Slightly vesicular to highly vesicular, highly fractured, slightly damp on freshly broken surfaces. Iron staining and calcium carbonate precipitation is apparent along fractures and within vesicles. Basalt grades to more massive with depth. Basalt rubble zones are common.	
210.0	42 / 95%	2360 dpm Gross Alpha/Beta		
215.0	43 / 90%	2430 dpm Gross Alpha/Beta		
220.0	44 / 85%	3620 dpm Gross Alpha/Beta		
225.0	45 / 70%	3250 dpm Gross Alpha/Beta		
230.0	46 / 30%	3190 dpm Gross Alpha/Beta		
235.0	47 / 30%	3740 dpm Gross Alpha/Beta		
240.0	48 / 95%			
245.0	49 / 10%	3210 dpm Gross Alpha/BetaD		
250.0	50 / 20%	3115 dpm Gross Alpha/Beta		
255.0	51 / 85%	3170 dpm Gross Alpha/Beta		



Borehole ID: 54-24523 54-25105 **TA/OU:** 54/1148 **MDA:** G **Start Date / Time:** 5-18-05, 1500 **End Date / Time:** 6-30-05, 1047

Drilling Co.: Spectrum **Drilling Equip. / Method:** Boart Longyear Air Rotary DB540 **Driller:** S. Jager **Geologist:** K. Reid, S, White, TerranearPM(

Sampling Method: 5 ft core barrel **Declination:** 90 degrees **Bearing:** N/A **TD:** 701.3 ft



Depth	Core Run # / Core Recovery %	Field Screening Results	Lithology	Notes
260.0	52 / 85%	3100 dpm Gross Alpha/Beta		
265.0	53 / 100%	3120 dpm Gross Alpha/Beta		
270.0	54 / 90%	2330 dpm Gross Alpha/Beta		
275.0	55 / 100%	2870 dpm Gross Alpha/Beta		
280.0	56 / 90%	3230 dpm Gross Alpha/Beta		
285.0	57 / 90%	3180 dpm Gross Alpha/Beta		
290.0	58 / 80%	2730 dpm Gross Alpha/Beta		
295.0	59 / 90%	3350 dpm Gross Alpha/Beta		
300.0	60 / 40%	3550 dpm Gross Alpha/Beta		5.5 inch casing set from 0 - 300 ft bgs.
305.0	61 / 90%	2470 dpm Gross Alpha/Beta		
310.0	62 / 100%	2230 dpm Gross Alpha/Beta		
315.0	63 / 90%	2490 dpm Gross Alpha/Beta		
320.0	64 / 100%	2880 dpm Gross Alpha/Beta		
325.0	65 / 80%	3090 dpm Gross Alpha/Beta		

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Borehole Log

Borehole ID: 54-24523 54-25105 **TA/OU:** 54/1148 **MDA:** G **Start Date / Time:** 5-18-05, 1500 **End Date / Time:** 6-30-05, 1047

Drilling Co.: Spectrum **Drilling Equip. / Method:** Boart Longyear Air Rotary DB540 **Driller:** S. Jager **Geologist:** K. Reid, S. White, TerranearPMC

Sampling Method: 5 ft core barrel **Declination:** 90 degrees **Bearing:** N/A **TD:** 701.3 ft

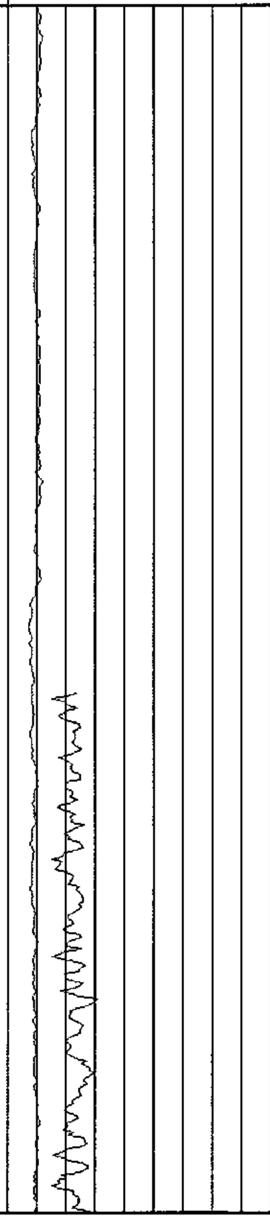
Depth	Core Run # / Core Recovery %	Field Screening Results	Lithology	Graphic Log	Lithologic Unit	Neutron 0 CPS 900 / Gamma 0 cps 100	Construction 5 5	Image 0° 90° 180° 270° 0°	Notes
330.0	66 / 80%	2710 dpm Gross Alpha/Beta			Cerros del Rio Volcanics				
335.0	67 / 70%	2400 dpm Gross Alpha/Beta							
340.0	68 / 95%	2640 dpm Gross Alpha/Beta							
345.0	69 / 100%	2010 dpm Gross Alpha/Beta							
350.0	70 / 95%	2130 dpm Gross Alpha/Beta							
355.0	71 / 100%	2070 dpm Gross Alpha/Beta							
360.0	72 / 100%□	2440 dpm Gross Alpha/Beta							
365.0	73 / 100%	2360 dpm Gross Alpha/Beta							
370.0	74 / 100%	2010 dpm Gross Alpha/Beta							
375.0	75 / 100%	2650 dpm Gross Alpha/Beta							
380.0	76 / 100%	1810 dpm Gross Alpha/Beta							
385.0	77 / 100%	1990 dpm Gross Alpha/Beta							
390.0	78 / 90%	2400 dpm Gross Alpha/Beta							
395.0	79 / 90%	2150 dpm Gross Alpha/Beta							
400.0	80 / 90%	2290 dpm Gross Alpha/Beta							

Borehole ID: 54-24523 54-25105 **TA/OU:** 54/1148 **MDA:** G **Start Date / Time:** 5-18-05, 1500 **End Date / Time:** 6-30-05, 1047

Drilling Co.: Spectrum **Drilling Equip. / Method:** Boart Longyear Air Rotary DB540 **Driller:** S. Jager **Geologist:** K. Reid, S. White, TerranearPMC

Sampling Method: 5 ft core barrel **Declination:** 90 degrees **Bearing:** N/A **TD:** 701.3 ft

Depth	Core Run # / Core Recovery %	Field Screening Results	Lithology	Graphic Log	Lithologic Unit	Neutron (0 CPS 800) / Gamma (0 cps 100)	Construction (5 5)	Image (0° 90° 180° 270° 0°)	Notes
405.0	81 / 100%	2140 dpm Gross Alpha/Beta							
410.0	82 / 85%	3130 dpm Gross Alpha/Beta							
415.0	83 / 90%	2940 dpm Gross Alpha/Beta							
420.0	84 / 80%	2810 dpm Gross Alpha/Beta							
425.0	85 / 100%	2690 dpm Gross Alpha/Beta							
430.0	86 / 100%	2860 dpm Gross Alpha/Beta							
435.0	87 / 100%	2630 dpm Gross Alpha/Beta							
440.0	88 / 100%	3170 dpm Gross Alpha/Beta							
445.0	89 / 100%	3180 dpm Gross Alpha/Beta							
450.0	90 / 100%	2960 dpm Gross Alpha/Beta							
455.0	91 / 100%	3050 dpm Gross Alpha/Beta							
460.0	92 / 100%	2530 dpm Gross Alpha/Beta							
465.0	93 / 100%	2210 dpm Gross Alpha/Beta							
470.0	94 / 100%	2150 dpm Gross Alpha/Beta							

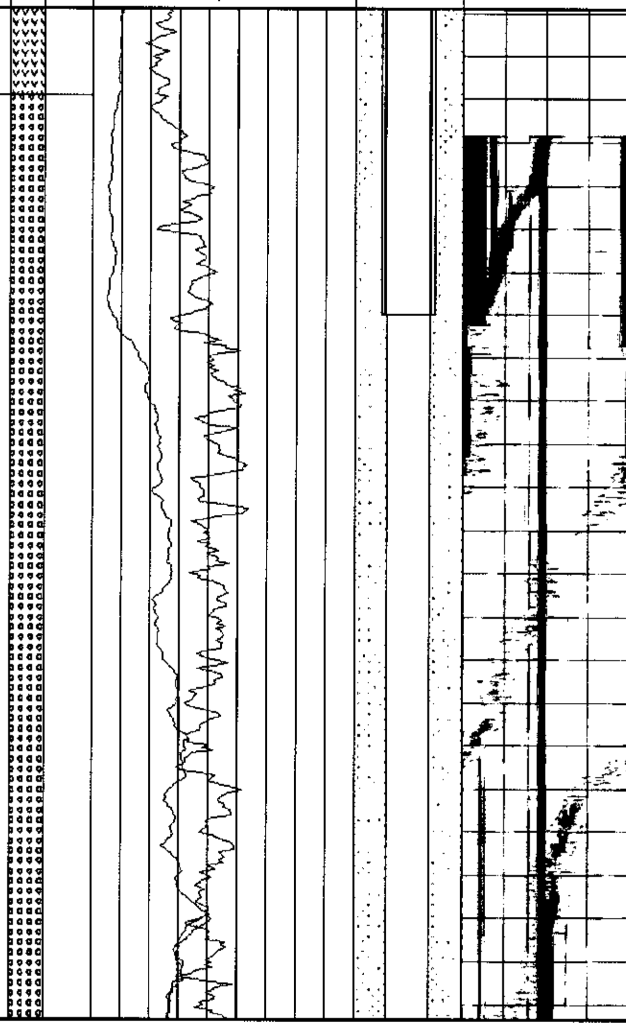


Borehole ID: 54-24523 54-25105 **TA/OU:** 54/1148 **MDA:** G **Start Date / Time:** 5-18-05, 1500 **End Date / Time:** 6-30-05, 1047

Drilling Co.: Spectrum **Drilling Equip. / Method:** Boart Longyear Air Rotary DB540 **Driller:** S. Jager **Geologist:** K. Reid, S. White, TerranearPM(

Sampling Method: 5 ft core barrel **Declination:** 90 degrees **Bearing:** N/A **TD:** 701.3 ft

Depth	Core Run # / Core Recovery %	Field Screening Results	Lithology	Graphic Log	Lithologic Unit	Neutron (0 CPS 900) / Gamma (0 cps 100)	Construction (5 5)	Image (0° 90° 180° 270° 0°)	Notes
475.0	95 / 30%								
480.0	96 / 0%		477.3 - 602.0 Conglomerate - coarse-grained volcaniclastic conglomerate, medium hard, slightly to moderately weathered, clast supported, very slightly damp. 95% subrounded basalt clasts ranging from 2 - 50 mm in diameter with some cobble sized pieces, some iron staining, possible calcium carbonate cement.						
485.0	97 / 10%	1950 dpm Gross Alpha/Beta							
490.0	98 / 10%	2120 dpm Gross Alpha/Beta							4.5 inch casing set from 0 - 490 ft bgs.
495.0	99 / 90%	3130 dpm Gross Alpha/Beta							3.5 inch open hole from 490 - 701.3 ft.
500.0	100 / 100%	2930 dpm Gross Alpha/Beta							
505.0	101 / 100%	3220 dpm Gross Alpha/Beta							
510.0	102 / 60%	2940 dpm Gross Alpha/Beta							
515.0	103 / 100%	3260 dpm Gross Alpha/Beta							
520.0	104 / 100%	3430 dpm Gross Alpha/Beta							
525.0	105 / 60%	3490 dpm Gross Alpha/Beta							
530.0	106 / 60%	3870 dpm Gross Alpha/Beta							



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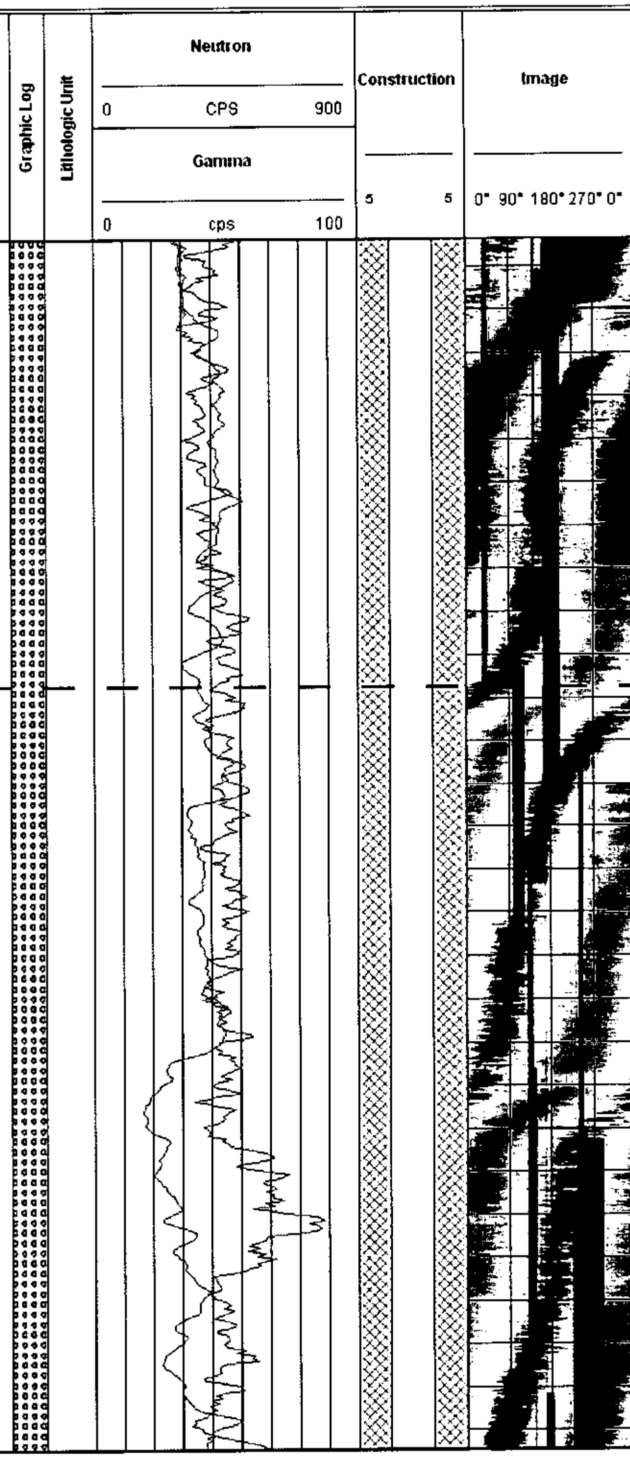
2004 - 2005 MDA G Environmental Characterization Drilling
Borehole Log

Borehole ID: 54-24523 54-25105	**TA/OU:** 54/1148	**MDA:** G	**Start Date / Time:** 5-18-05, 1500	**End Date / Time:** 6-30-05, 1047	
Drilling Co.: Spectrum	**Drilling Equip. / Method:** Boart Longyear Air Rotary DB540	**Driller:** S. Jager	**Geologist:** K. Reid, S. White, TerranearPMC		
Sampling Method: 5 ft core barrel	**Declination:** 90 degrees	**Bearing:** N/A	**TD:** 701.3 ft		

Depth	Core Run # / Core Recovery %	Field Screening Results	Lithology	Notes
535.0	107 / 80%	3490 dpm Gross Alpha/Beta		
540.0	108 / 100%	3040 dpm Gross Alpha/Beta		
545.0	109 / 100%	2850 dpm Gross Alpha/Beta		
550.0	110 / 100%	4020 dpm Gross Alpha/Beta		
555.0	111 / 100%	3240 dpm Gross Alpha/Beta		
560.0	112 / 100%	3210 dpm Gross Alpha/Beta		BH 54-25105 located 15 feet to the southwest of BH 54-24523 begins at 556.3 ft bgs.
565.0	113 / 100%	3370 dpm Gross Alpha/Beta		
570.0	114 / 100%	2680 dpm Gross Alpha/Beta		
575.0	115 / 100%	2730 dpm Gross Alpha/Beta		
580.0	116 / 100%	3060 dpm Gross Alpha/Beta		
585.0	117 / 40%	2790 dpm Gross Alpha/Beta		
590.0	118 / 80%	3150 dpm Gross Alpha/Beta		
595.0	119 / 100%	3270 dpm Gross Alpha/Beta		
600.0	120 / 40%	2730 dpm Gross Alpha/Beta		



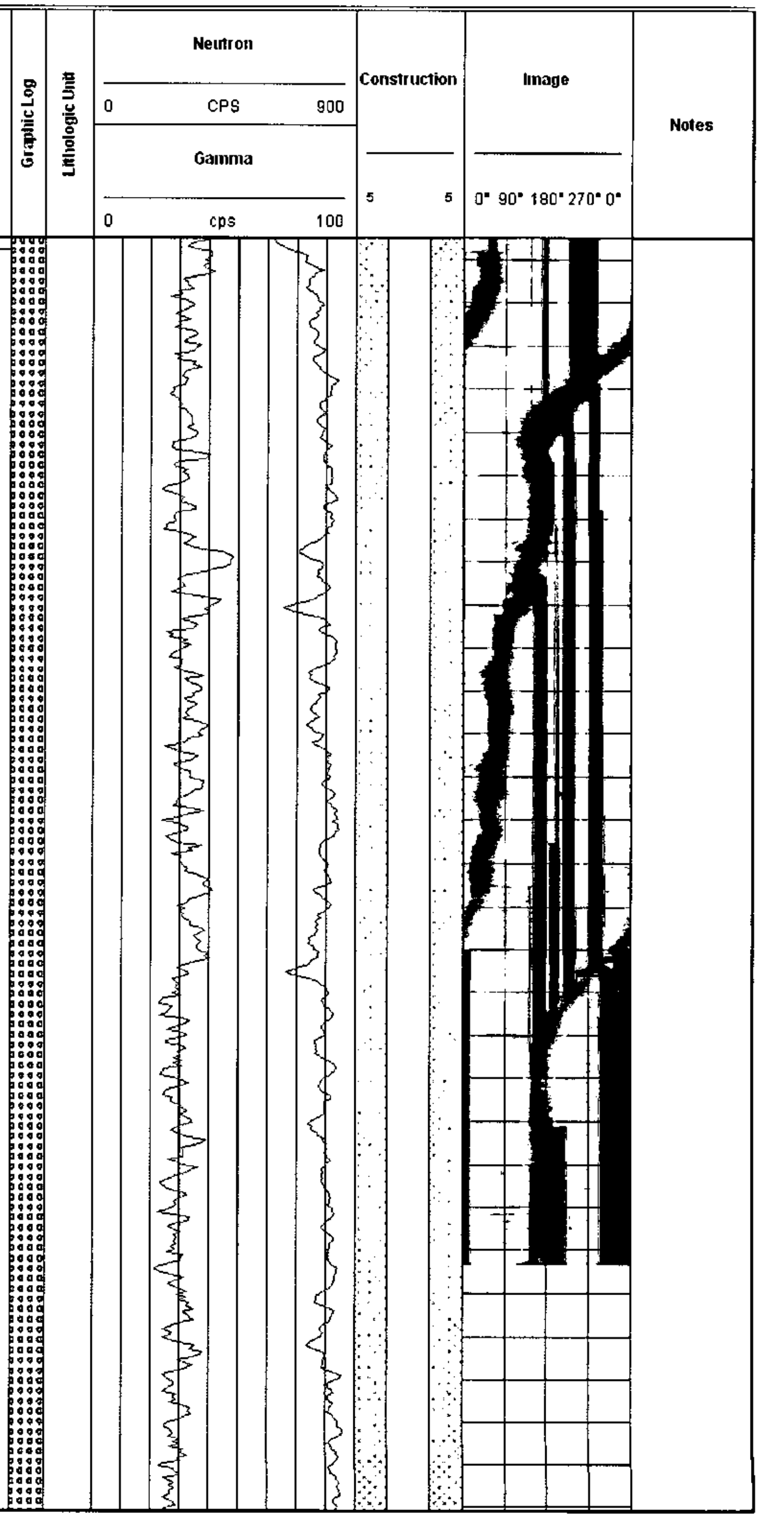
Los Alamos National Laboratory
Environmental Characterization and Remediation
2004 - 2005 MDA G Environmental Characterization Drilling
Borehole Log

Borehole ID: 54-24523 54-25105 **TA/OU:** 54/1148 **MDA:** G **Start Date / Time:** 5-18-05, 1500 **End Date / Time:** 6-30-05, 1047

Drilling Co.: Spectrum **Drilling Equip. / Method:** Boart Longyear Air Rotary DB540 **Driller:** S. Jager **Geologist:** K. Reid, S. White, TerranearPM(

Sampling Method: 5 ft core barrel **Declination:** 90 degrees **Bearing:** N/A **TD:** 701.3 ft

Depth	Core Run # / Core Recovery %	Field Screening Results	Lithology
605.0	121 / 100%	3340 dpm Gross Alpha/Beta	602.0 - 691.0 Conglomerate - fine- to coarse-grained volcaniclastic conglomerate, hard to very hard, slightly weathered, matrix supported, very slightly damp. Matrix may be recrystalized.
610.0	122 / 100%	3360 dpm Gross Alpha/Beta	
615.0	123 / 100%	3170 dpm Gross Alpha/Beta	
620.0	124 / 100%	3390 dpm Gross Alpha/Beta	
625.0	125 / 100%	3160 dpm Gross Alpha/Beta	
630.0	126 / 100%	2570 dpm Gross Alpha/Beta	
635.0	127 / 100%	3440 dpm Gross Alpha/Beta	
640.0	128 / 100%	2570 dpm Gross Alpha/Beta	
645.0	129 / 100%	2720 dpm Gross Alpha/Beta	
650.0	130 / 100%	3070 dpm Gross Alpha/Beta	
655.0	131 / 100%	2840 dpm Gross Alpha/Beta	
660.0	132 / 100%	2970 dpm Gross Alpha/Beta	
665.0	133 / 100%	2950 dpm Gross Alpha/Beta	
670.0	134 / 100%	3120 dpm Gross Alpha/Beta	
	135 / 100%	2850 dpm Gross Alpha/Beta	

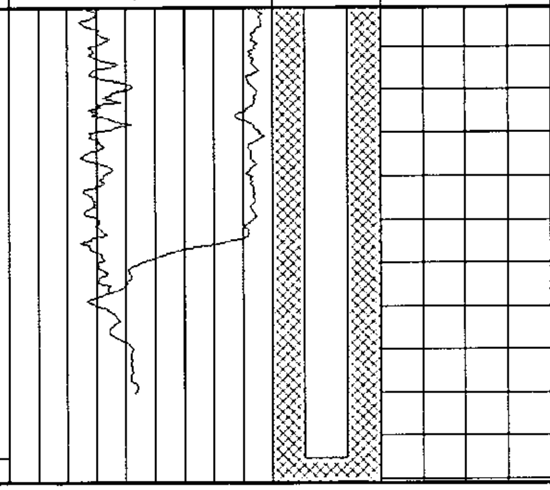


Borehole ID: 54-24523 54-25105 **TA/OU:** 54/1148 **MDA:** G **Start Date / Time:** 5-18-05, 1500 **End Date / Time:** 6-30-05, 1047

Drilling Co.: Spectrum **Drilling Equip. / Method:** Boart Longyear Air Rotary DB540 **Driller:** S. Jager **Geologist:** K. Reid, S, White, TerranearPMC

Sampling Method: 5 ft core barrel **Declination:** 90 degrees **Bearing:** N/A **TD:** 701.3 ft

Depth	Core Run # / Core Recovery %	Field Screening Results	Lithology	Graphic Log	Lithologic Unit	Neutron (0 CPS 900) / Gamma (0 cps 100)	Construction (5 5)	Image (0° 90° 180° 270° 0°)	Notes
	136 / 100%	3330 dpm Gross Alpha/Beta							
680.0	137 / 100%	3040 dpm Gross Alpha/Beta							
685.0	138 / 100%	2810 dpm Gross Alpha/Beta							
690.0	139 / 100%	2860 dpm Gross Alpha/Beta	691.0 - 701.3 Conglomerate - fine- to coarse-grained sandy conglomerate, clast supported, slightly weathered, moderately hard. Clasts consist mostly of basalt and dacite pebbles.						
695.0	140 / 80%	2870 dpm Gross Alpha/Beta							
700.0									



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Borehole Log

Borehole ID: 54-24376 **TA/OU:** 54/1148 **MDA:** G **Start Date / Time:** 3-28-05, 1700 **End Date / Time:** 3-30-05, 1132

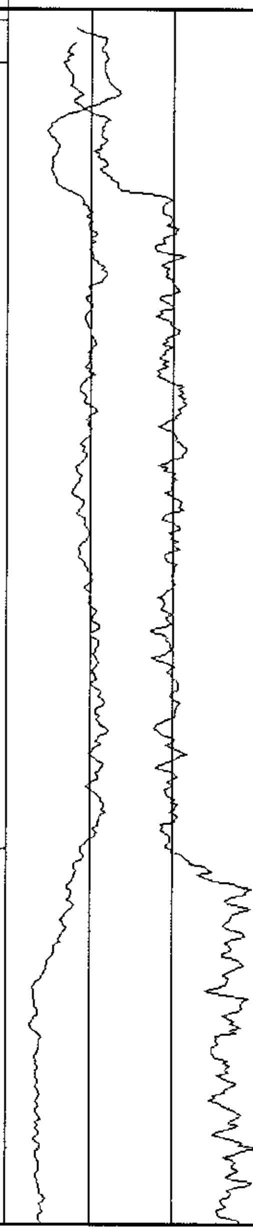
Drilling Co.: Enviro-Drill Inc. **Drilling Equip. / Method:** CME 75 / Hollow Stem Auger **Driller:** Matt Cain **Geologist:** Pattie Baucom, Apogen

Sampling Method: Continuous 5 ft core barrel **Declination:** 90 degrees **Bearing:** na **TD:** 200 ft

Depth	Core Run # / Core Recovery %	Field Screening Results	Analytical Sample Number	Lithology	Lithologic Unit	Notes
0.0	Logged from cuttings	1983 dpm Gross Alpha/Beta	No Samples	0.0 - 2.5 ft Fill - Sandy silt with crushed tuff.	Fill	Gross Alpha/Beta Background = 1983 dpm.
				2.5 - 48.0 ft Tuff - Densely welded, pinkish gray (7.5YR 7/2), dry. 15% quartz, 5% sanidne, 15% pumice. Pumice have a sugary texture and are large (up to 4 cm in diameter).	Unit 2 Tshirege Member, Bandelier Tuff	
5.0						14 in. OD HSA to 10 ft bgs. Set 10 in. casing to depth of 10 ft.
10.0	1 / 80%	3140 dpm Gross Alpha/Beta				7 5/8 in OD HSA from 10 - 200 ft.
15.0	2 / 100%	4290 dpm Gross Alpha/Beta				
20.0	3 / 100%	3320 dpm Gross Alpha/Beta 0.0 ppm VOCs via PID Headspace				
25.0	4 / 100%	2680 dpm Gross Alpha/Beta				
30.0	5 / 100%	4180 dpm Gross Alpha/Beta 0.0 ppm VOCs via PID Headspace				
35.0	6 / 100%	3150 dpm Gross Alpha/Beta TNT/RDX-Nondetect	MD54-05-58026 MD54-05-58033(FD)			
40.0	7 / 100%	3220 dpm Gross Alpha/Beta 0.0 ppm VOCs via PID Headspace				
45.0	8 / 100%	3260 dpm Gross Alpha/Beta		48.0 - 70.0 ft Tuff - Poorly welded, pinkish gray (5YR 7/2), dry. 10% quartz, <5% sanidine, 15% pumice. Pumice are dark purple and large (up to 5 cm in diameter).	Unit 1v(u) Tshirege Member, Bandelier Tuff	
50.0	9 / 100%	3680 dpm Gross Alpha/Beta 0.0 ppm VOCs via PID Headspace				
55.0	10 / 100%	3070 dpm Gross Alpha/Beta				
60.0	11 / 100%	3050 dpm Gross Alpha/Beta 0.0 ppm VOCs via PID Headspace				
65.0	12 / 100%	3910 dpm Gross Alpha/Beta				

Graphic Log

Neutron: 0 CPS 300
Gamma: 0 CPS 300



Construction: 7 7

Los Alamos National Laboratory
Environmental Characterization and Remediation
2004 - 2005 MDA G Environmental Characterization Drilling
Borehole Log

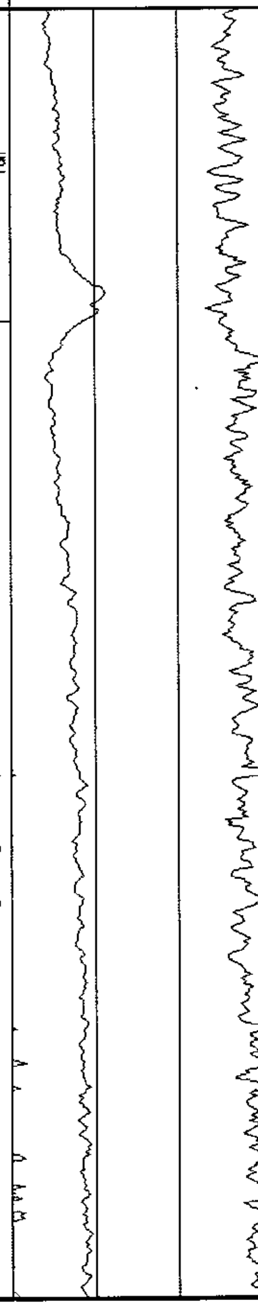
Borehole ID: 54-24376 **TA/OU:** 54/1148 **MDA:** G **Start Date / Time:** 3-28-05, 1700 **End Date / Time:** 3-30-05, 1132

Drilling Co.: Enviro-Drill Inc. **Drilling Equip. / Method:** CME 75 / Hollow Stem Auger **Driller:** Matt Cain **Geologist:** Pattie Baucom, Apogen

Sampling Method: Continuous 5 ft core barrel **Declination:** 90 degrees **Bearing:** na **TD:** 200 ft

Depth	Core Run # / Core Recovery %	Field Screening Results	Analytical Sample Number	Lithology	Lithologic Unit
	13 / 100%	4210 dpm Gross Alpha/Beta 0.0 ppm VOCs via PID		70.0 - 88.0 ft Tuff- Moderately welded, pinkish white (5YR 8/2 to 7.5 YR 8/2), dry. 10% quartz, 5% sanidine, 15% pumice, 5% lithics.	Unit 1v(c) Tshirege Member, Bandelier Tuff
75.0	14 / 100%	3500 dpm Gross Alpha/Beta			
80.0	15 / 100%	3600 dpm Gross Alpha/Beta 0.0 ppm VOCs via PID Headspace			
85.0	16 / 100%	3280 dpm Gross Alpha/Beta			
90.0	17 / 100%	2780 dom Gross Alpha/Beta 0.0 ppm VOCs via PID Headspace		88.0 - 156.0 ft Tuff- Moderately welded to nonwelded, pink (5YR 7/4 to white (5YR 8/1), dry. 10 - 15% quartz, <5% sanidine, 5% lithics, 15% pumice. Pumice are round and large (up to 7cm in diameter), lithics are angular and large (up to 5 cm in diameter).	Unit 1g Tshirege Member, Bandelier Tuff
95.0	18 / 100%	2710 dpm Gross Alpha/Beta			
100.0	19 / 95%	3740 dpm Gross Alpha/Beta 0.0 ppm VOCs via PID Headspace			
105.0	20 / 95%	3090 dpm Gross Alpha/Beta			
110.0	21 / 90%	3270 dpm Gross Alpha/Beta 0.0 ppm VOCs via PID Headspace			
115.0	22 / 90%	3530 dpm Gross Alpha/Beta	No Samples		
120.0	23 / 95%	4240 dpm Gross Alpha/Beta 0.0 ppm VOCs via PID Headspace			
125.0	24 / 90%	4010 dpm Gross Alpha/Beta			
130.0	25 / 85%	3650 dpm Gross Alpha/Beta 0.0 ppm VOCs via PID Headspace			
135.0	26 / 95%	3980 dpm Gross Alpha/Beta			
140.0	27 / 85%	2950 dpm Gross Alpha/Beta 0.0 ppm VOCs via PID Headspace			

Graphic Log | Neutron (0 CPS 300) / Gamma (0 CPS 300) | Construction (7 7) | Notes



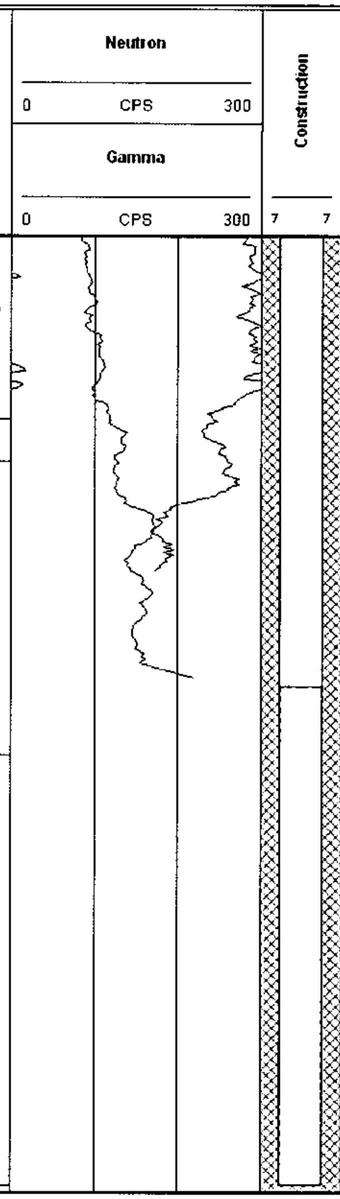
Los Alamos National Laboratory
Environmental Characterization and Remediation
2004 - 2005 MDA G Environmental Characterization Drilling
Borehole Log

Borehole ID: 54-24376 **TA/OU:** 54/1148 **MDA:** G **Start Date / Time:** 3-28-05, 1700 **End Date / Time:** 3-30-05, 1132

Drilling Co.: Enviro-Drill Inc. **Drilling Equip. / Method:** CME 75 / Hollow Stem Auger **Driller:** Matt Cain **Geologist:** Pattie Baucom, Apogen

Sampling Method: Continuous 5 ft core barrel **Declination:** 90 degrees **Bearing:** na **TD:** 200 ft

Depth	Core Run # / Core Recovery %	Field Screening Results	Analytical Sample Number	Lithology	Lithologic Unit	Notes
	28 / 95%	3740 dpm Gross Alpha/Beta			Qbt 1g	Gross Alpha/Beta Background = 2190 dpm.
150.0	29 / 95%	4260 dpm Gross Alpha/Beta 0.0 ppm VOCs via PID Headspace			Qbt 1g	
155.0	30 / 90%	2580 dpm Gross Alpha/Beta		156.0 - 157.5 ft Pumice - reworked. 50% poorly sorted angular pumice clasts, 50% coarse-grained quartz.	Qbt	
160.0	31 / 90%	3770 dpm Gross Alpha/Beta 0.0 ppm VOCs via PID Headspace		157.5 - 175.0 ft Interlayered massive silt and silty fine- to medium-grained sand with pumice and lithic clasts.	Cerro Toledo Interval	
165.0	32 / 95%	3390 dpm Gross Alpha/Beta			Cerro Toledo Interval	Slough in borehole from 171 - 200 ft prevents deeper geophysical measurements.
170.0	33 / 95%	3550 dpm Gross Alpha/Beta 0.0 ppm VOCs via PID Headspace			Cerro Toledo Interval	
175.0	34 / 95%	3370 dpm Gross Alpha/Beta		175.0 - 200.0 ft Tuff - Nonwelded, pinkish white (7.5 YR 8/2), 10% quartz, 7% lithics, 5% mafics, 15% pumice (up to 2 cm in diameter).	Otowi Member, Bandelier Tuff	
180.0	35 / 95%	3020 dpm Gross Alpha/Beta 0.0 ppm VOCs via PID Headspace			Otowi Member, Bandelier Tuff	
185.0	36 / 95%	2910 dpm Gross Alpha/Beta			Otowi Member, Bandelier Tuff	
190.0	37 / 95%	3160 dpm Gross Alpha/Beta 0.0 ppm VOCs via PID Headspace			Otowi Member, Bandelier Tuff	
195.0	38 / 95%	2580 dpm Gross Alpha/Beta RDX/TNT - nondetect	MD54-58032		Otowi Member, Bandelier Tuff	TD - 200 ft.
200.0						



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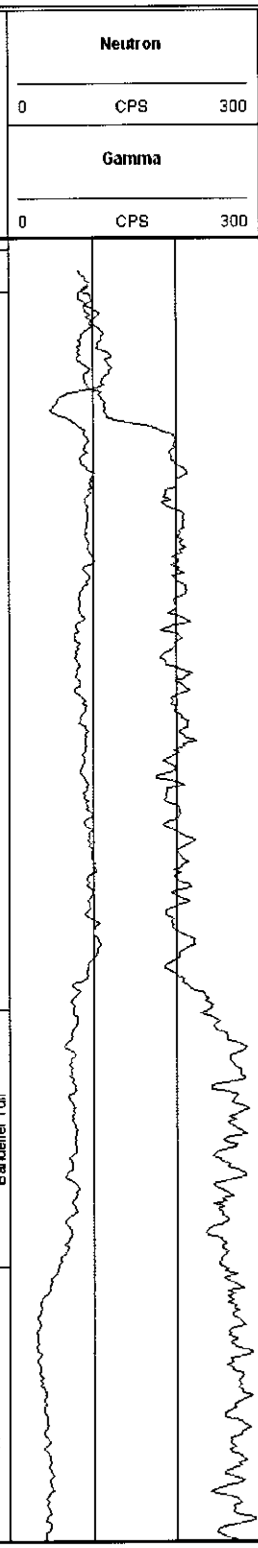
Environmental Characterization and Remediation
2004 - 2005 MDA G Environmental Characterization Drilling
Borehole Log

Borehole ID: 54-24377 **TA/OU:** 54/1148 **MDA:** G **Start Date / Time:** 3-23-05, 1500 **End Date / Time:** 3-28-05, 1207

Drilling Co.: Enviro-Drill Inc. **Drilling Equip. / Method:** CME 75 / Hollow Stem Auger **Driller:** Matt Cain **Geologist:** Pattie Baucom, Apogen

Sampling Method: Continuous 5 ft core barrel **Declination:** 90 degrees **Bearing:** na **TD:** 200 ft

Depth	Core Run # / Core Recovery %	Field Screening Results	Analytical Sample Number	Lithology	Lithologic Unit	Notes
0.0	Logged from cuttings	2070 dpm Gross Alpha/Beta	No Samples	0.0 - 2.5 ft Fill - Silty sand with pebbles.	Fill	Gross Alpha/Beta Background = 2070 dpm.
				2.5 - 44.0 ft Tuff - Densely to moderately welded, pinkish gray (7.5YR 7/2), dry. 10% quartz, 5% sanidine, 15% pumice.	Unit 2 Tshirege Member, Bandelier Tuff	
5.0						14 in. OD HSA to 10 ft bgs. Set 10 in. casing to depth of 10 ft.
10.0	1 / 80%	3000 dpm Gross Alpha/Beta				7 5/8 in OD HSA from 10 - 200ft.
15.0	2 / 100%	3040 dpm Gross Alpha/Beta 0.0 ppm VOCs via PID Headspace				
20.0	3 / 100%	2960 dpm Gross Alpha/Beta				
25.0	4 / 100%	3080 dpm Gross Alpha/Beta				
30.0	5 / 100%	3270 dpm Gross Alpha/Beta				
35.0	6 / 100%	3230 dpm Gross Alpha/Beta 0.0 ppm VOCs via PID Headspace				
40.0	7 / 100%	3080 dpm Gross Alpha/Beta				
45.0	8 / 100%	3480 dpm Gross Alpha/Beta 0.0 ppm VOCs via PID Headspace TNT/RDX - Nondetect	MD54-05-58034 MD54-05-58041(FD)	44.0 - 59.0 ft Tuff - Poorly welded to nonwelded, white (5YR8/1), dry. 10% quartz, 5% sanidine, 17% pumice. Pumice are large (up to 4 cm in diameter), dark purple, and brittle.	Unit 1v(u) Tshirege Member, Bandelier Tuff	
50.0	9 / 100%	3000 dpm Gross Alpha/Beta	No Samples			
55.0	10 / 95%	3450 dpm Gross Alpha/Beta 0.0 ppm VOCs via PID Headspace				
60.0	11 / 100%	3630 dpm Gross Alpha/Beta		59.0 - 82.0 ft Tuff - Moderately welded to densely welded, pinkish white (5YR 8/3), dry. 10% quartz, 5% sanidine, 17% pumice, 5% lithics, and 5% mafics.	Qbt 1v(c)	
65.0	12 / 100%	3130 dpm Gross Alpha/Beta				
70.0	13 / 100%	3560 dpm Gross Alpha/Beta				

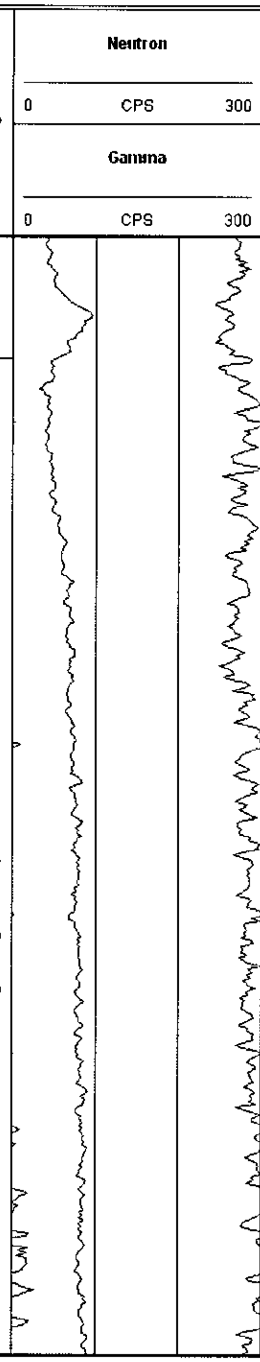


Borehole ID: 54-24377 **TA/OU:** 54/1148 **MDA:** G **Start Date / Time:** 3-23-05, 1500 **End Date / Time:** 3-28-05, 1207

Drilling Co.: Enviro-Drill Inc. **Drilling Equip. / Method:** CME 75 / Hollow Stem Auger **Driller:** Matt Cain **Geologist:** Pattie Baucom, Apogen

Sampling Method: Continuous 5 ft core barrel **Declination:** 90 degrees **Bearing:** na **TD:** 200 ft

Depth	Core Run # / Core Recovery %	Field Screening Results	Analytical Sample Number	Lithology	Lithologic Unit	Notes
	14 / 100%	3310 dpm Gross Alpha/Beta	No Samples			
80.0	15 / 100%	3900 dpm Gross Alpha/Beta 0.0 ppm VOCs via PID Headspace		82.0 - 145.5 ft Tuff- Moderately welded to nonwelded, pink (5YR 7/4) to white (7.5 YR 8/1), dry. 10% quartz, 5% sanidine, 5% lithics, 15% pumice. Pumice are round and large (up to 3 cm in diameter).	Unit 1g Tshirege Member, Bandelier Tuff	
85.0	16 / 100%	3480 dpm Gross Alpha/Beta				
90.0	17 / 95%	3550 dpm Gross Alpha/Beta 0.0 ppm VOCs via PID Headspace				
95.0	18 / 95%	4110 dpm Gross Alpha/Beta				
100.0	19 / 95%	4110 dpm Gross Alpha/Beta 0.0 ppm VOCs via PID Headspace				
105.0	20 / 95%	3290 dpm Gross Alpha/Beta				
110.0	21 / 95%	3640 dpm Gross Alpha/Beta				
115.0	22 / 95%	3740 dpm Gross Alpha/Beta 0.0 ppm VOCs via PID Headspace				
120.0	23 / 90%	3820 dpm Gross Alpha/Beta				
125.0	24 / 90%	3500 dpm Gross Alpha/Beta 0.0 ppm VOCs via PID Headspace				
130.0	25 / 95%	4580 dpm Gross Alpha/Beta				
135.0	26 / 95%	3790 dpm Gross Alpha/Beta 0.0 ppm VOCs via PID Headspace				



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Environmental Characterization and Remediation
2004 - 2005 MDA G Environmental Characterization Drilling
Borehole Log

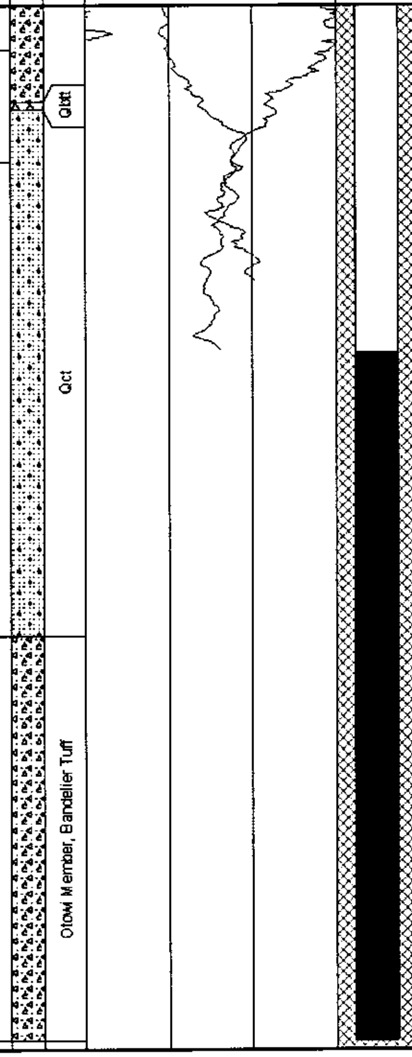
Borehole ID: 54-24377 **TA/OU:** 54/1148 **MDA:** G **Start Date / Time:** 3-23-05, 1500 **End Date / Time:** 3-28-05, 1207

Drilling Co.: Enviro-Drill Inc. **Drilling Equip. / Method:** CME 75 / Hollow Stem Auger **Driller:** Matt Cain **Geologist:** Pattie Baucom, Apogen

Sampling Method: Continuous 5 ft core barrel **Declination:** 90 degrees **Bearing:** na **TD:** 200 ft

Depth	Core Run # / Core Recovery %	Field Screening Results	Analytical Sample Number	Lithology	Lithologic Unit	Notes
	27 / 95%	3510 dpm Gross Alpha/Beta				
145.0	28 / 90%	3490 dpm Gross Alpha/Beta 0.0 ppm VOCs via PID Headspace		145.5 - 146.0 ft Pumice - reworked. 50% poorly sorted angular pumice clasts, 50% coarse-grained quartz.	Qbt1	Gross Alpha/Beta Background = 2010 dpm.
150.0	29 / 90%	3310 dpm Gross Alpha/Beta		146.0 - 176.5 ft Homogenous silty fine-grained sand with layers of coarse sand, pebbles, and silt.	Qct	Slough in borehole from 160 - 200 ft prevents deeper geophysical measurements.
155.0	30 / 85%	3950 dpm Gross Alpha/Beta 0.0 ppm VOCs via PID Headspace				
160.0	31 / 80%	3100 dpm Gross Alpha/Beta				
165.0	32 / 80%	2940 dpm Gross Alpha/Beta 0.0 ppm VOCs via PID Headspace				
170.0	33 / 80%	2880 dpm Gross Alpha/Beta				
175.0	34 / 80%	2870 dpm Gross Alpha/Beta 0.0 ppm VOCs via PID Headspace		176.5 - 200.0 ft Tuff - Nonwelded, pink (7.5 YR 8/3), dry. 10% quartz, 15% pumice, 5% lithics.	Otowi Member, Bandelier Tuff	
180.0	35 / 85%	3070 dpm Gross Alpha/Beta				
185.0	36 / 85%	3340 dpm Gross Alpha/Beta				
190.0	37 / 85%	2960 dpm Gross Alpha/Beta				
195.0	38 / 85%	2710 dpm Gross Alpha/Beta RDX/TNT - nondetect	MD54-05-58040			TD - 200 ft.
200.0						

Graphic Log | Neutron: 0 CPS 300 | Gamma: 0 CPS 300 | Construction: 7 7



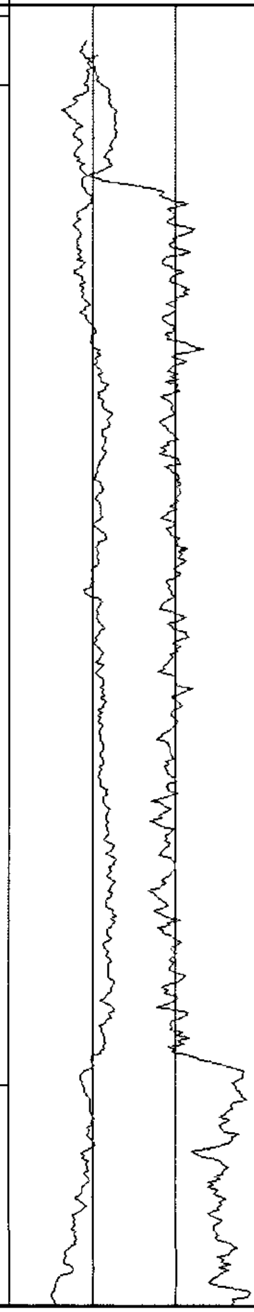
Los Alamos National Laboratory
Environmental Characterization and Remediation
2004 - 2005 MDA G Environmental Characterization Drilling
Borehole Log

Borehole ID: 54-24378 **TA/OU:** 54/1148 **MDA:** G **Start Date / Time:** 2/7/05, 0800 **End Date / Time:** 2/9/05, 1040

Drilling Co.: Enviro-Drill Inc. **Drilling Equip. / Method:** CME 75 / Hollow Stem Auger **Driller:** Matt Cain **Geologist:** Kevin Reid, TerranearPMC

Sampling Method: Continuous 5 ft core barrel **Declination:** 90 degrees **Bearing:** na **TD:** 182.5 ft

Depth	Core Run # / Core Recovery %	Field Screening Results	Analytical Sample Number	Lithology	Graphic Log	Lithologic Unit	Neutron (0 CPS 300) / Gamma (0 CPS 300)	Construction (7 7)	Notes
0.0	Logged from cuttings			0.0 - 4.0 ft Soil. Sandy clay, slightly moist.		Soil			
5.0				4.0 - 62.0 ft Tuff - Densely welded to moderately welded, light gray (7.5YR 7/1), dry. 15% quartz, 10% sanidine, 5% pumice.		Unit 2 Tshirege Member, Bandelier Tuff			14 in. OD HSA to 10 ft bgs. Set 10 in. casing to depth of 10 ft.
10.0	1 / 50%	2840 dpm Gross Alpha/Beta	No Samples						7 5/8 in OD HSA from 10 - 182.5 ft.
15.0	2 / 100%	2930 dpm Gross Alpha/Beta 0.0 ppm VOCs via PID Headspace							
20.0	3 / 100%	2660 dpm Gross Alpha/Beta							
25.0	4 / 100%	2750 dpm Gross Alpha/Beta TNT/RDX-Nondetect	MD54-05-58042 MD54-05-58049(FD)						
30.0	5 / 100%	2970 dpm Gross Alpha/Beta							
35.0	6 / 100%	3240 dpm Gross Alpha/Beta 1.7 ppm VOCs via PID Headspace							
40.0	7 / 100%	2600 dpm Gross Alpha/Beta							
45.0	8 / 100%	2890 dpm Gross Alpha/Beta							
50.0	9 / 100%	3110 dpm Gross Alpha/Beta							
55.0	10 / 100%	3330 dpm Gross Alpha/Beta 4.0 ppm VOCs via PID Headspace							
60.0	11 / 100%	3200 dpm Gross Alpha/Beta		62.0 - 80.0 ft Tuff - Slightly welded to moderately welded, white (7.5YR 8/1), dry. 10% quartz, 5% sanidine, 5% pumice, 3% lithics.		Qbt 1v(u)			
65.0	12 / 100%	2450 dpm Gross Alpha/Beta 4.0 ppm VOCs via PID Headspace							
70.0	13 / 100%	3600 dpm Gross Alpha/Beta							

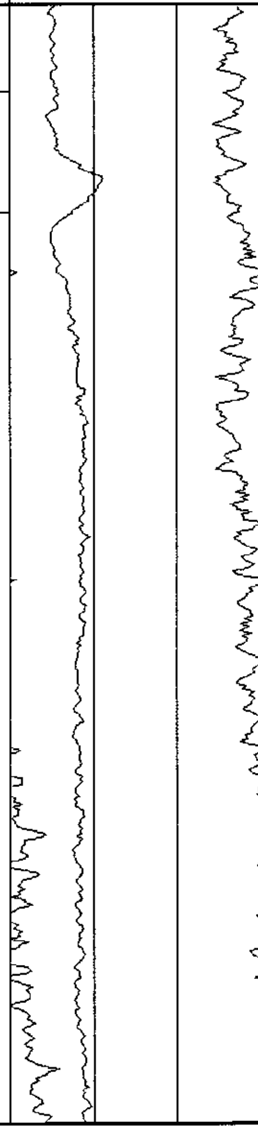


Borehole ID: 54-24378 **TA/OU:** 54/1148 **MDA:** G **Start Date / Time:** 2/7/05, 0800 **End Date / Time:** 2/9/05, 1040

Drilling Co.: Enviro-Drill Inc. **Drilling Equip. / Method:** CME 75 / Hollow Stem Auger **Driller:** Matt Cain **Geologist:** Kevin Reid, TerranearPMC

Sampling Method: Continuous 5 ft core barrel **Declination:** 90 degrees **Bearing:** na **TD:** 182.5 ft

Depth	Core Run # / Core Recovery %	Field Screening Results	Analytical Sample Number	Lithology	Graphic Log	Lithologic Unit	Neutron (0 CPS 300) / Gamma (0 CPS 300)	Construction (7 7)	Notes
	14 / 75%	3380 dpm Gross Alpha/Beta 2.2 ppm VOCs via PID Headspace	No Samples			Qbt 1v(u)			
80.0	15 / 100%	2700 dpm Gross Alpha/Beta		80.0 - 87.0 ft Tuff - SAA. Moderately welded to densely welded.		Qbt 1v(c)			
85.0	16 / 100%	3250 dpm Gross Alpha/Beta		87.0 - 147.5 ft Tuff - Slightly welded to nonwelded pink (2.5YR 7/4) to white (5 YR 8/1), dry. 10% quartz, 5% sanidine, 5% lithics, 15% pumice. Pumice are round and large (up to 2 cm in diameter).		Unit 1g Tshirege Member, Bandelier Tuff			
90.0	17 / 100%	3240 dpm Gross Alpha/Beta							
95.0	18 / 100%	3560 dpm Gross Alpha/Beta 8.5 ppm VOCs via PID Headspace							
100.0	19 / 100%	3550 dpm Gross Alpha/Beta							
105.0	20 / 100%	3830 dpm Gross Alpha/Beta 11.1 ppm VOCs via PID Headspace							
110.0	21 / 100%	3660 dpm Gross Alpha/Beta							
115.0	22 / 100%	3770 dpm Gross Alpha/Beta							
120.0	23 / 95%	3220 dpm Gross Alpha/Beta							
125.0	24 / 100%	3540 dpm Gross Alpha/Beta							
130.0	25 / 95%	3470 dpm Gross Alpha/Beta 2.5 ppm VOCs via PID Headspace							
135.0	26 / 95%	3260 dpm Gross Alpha/Beta 0.2 ppm VOCs via PID Headspace							



Los Alamos National Laboratory
Environmental Characterization and Remediation
2004 - 2005 MDA G Environmental Characterization Drilling
Borehole Log

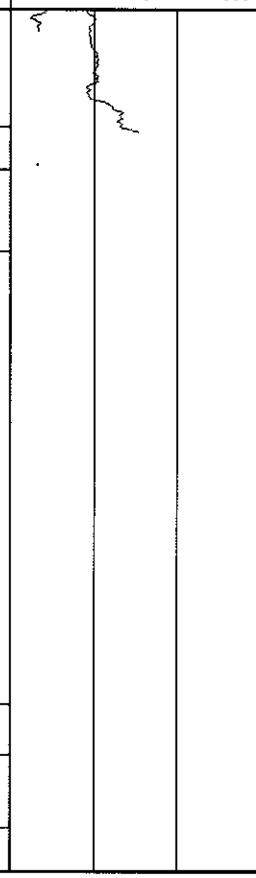
Borehole ID: 54-24378 **TA/OU:** 54/1148 **MDA:** G **Start Date / Time:** 2/7/05, 0800 **End Date / Time:** 2/9/05, 1040

Drilling Co.: Enviro-Drill Inc. **Drilling Equip. / Method:** CME 75 / Hollow Stem Auger **Driller:** Matt Cain **Geologist:** Kevin Reid, TerranearPMC

Sampling Method: Continuous 5 ft core barrel **Declination:** 90 degrees **Bearing:** na **TD:** 182.5 ft

Depth	Core Run # / Core Recovery %	Field Screening Results	Analytical Sample Number	Lithology	Lithologic Unit	Notes
	27 / 95%	3840 dpm Gross Alpha/Beta 0.3 ppm VOCs via PID Headspace			Qbt 1g	Slough in borehole from 147.0 - 182.5 ft prevents deeper geophysical measurements.
145.0	28 / 80%	3100 dpm Gross Alpha/Beta 0.0 ppm VOCs via PID Headspace	MD54-05-58043	147.5 - 148.5 ft Pumice - reworked. 50% poorly sorted angular pumice clasts, 50% coarse-grained quartz.	Qbtt	
150.0	29 / 100%	3280 dpm Gross Alpha/Beta		148.5 - 154.0 ft Homogenous silty fine-grained sand with pumice fragments.	Qct	
155.0	30 / 90%	3140 dpm Gross Alpha/Beta 0.0 ppm VOCs via PID Headspace	No Samples	154.0 - 181.5 ft Tuff-nonwelded, pinkish white (5 YR 8/2), dry. 10% quartz, 5% pumice, 1-3% lithics.	Otowi Member, Bandelier Tuff	
160.0	31 / 95%	3440 dpm Gross Alpha/Beta				
165.0	32 / 95%	3220 dpm Gross Alpha/Beta 2.0 ppm VOCs via PID Headspace				
170.0	33 / 95%	3250 dpm Gross Alpha/Beta				
175.0	34 / 95%	2940 dpm Gross Alpha/Beta 0.4 ppm VOCs via PID Headspace				
180.0	35 / 50%	2420 dpm Gross Alpha/Beta 0.0 ppm VOCs via PID Headspace TNT/RDX - Nondetect	MD54-05-58048	181.5 - 181.8 ft Pumice - reworked. 100% angular to subangular pumice clasts.	Qbog	Refusal at 182.5 ft.
				181.8 - 182.5 ft Silty clayey soil, dry.	Paleosol	
185.0				182.2 - 182.5 ft Basalt.	TCB	

Neutron: 0 CPS 300
Gamma: 0 CPS 300
Construction: 7 7



Los Alamos National Laboratory
Environmental Characterization and Remediation
2004 - 2005 MDA G Environmental Characterization Drilling
Borehole Log

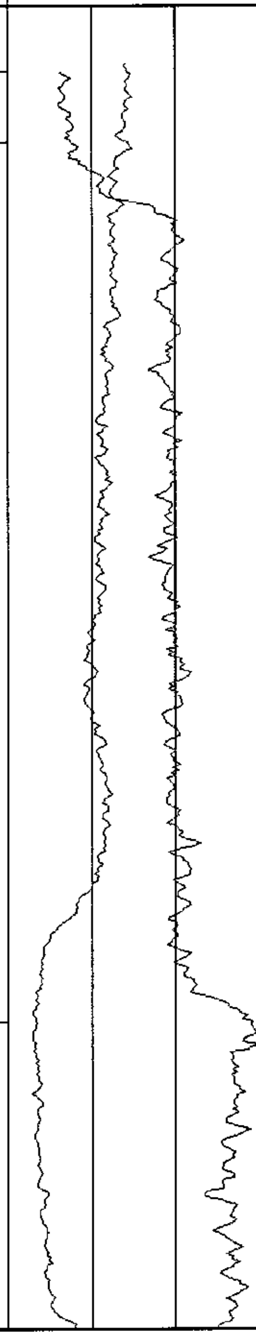
Borehole ID: 54-24379 **TA/OU:** 54/1148 **MDA:** G **Start Date / Time:** 1/28/05, 1415 **End Date / Time:** 2/04/05, 0835

Drilling Co.: Enviro-Drill Inc. **Drilling Equip. / Method:** CME 75 / Hollow Stem Auger **Driller:** Matt Cain **Geologist:** Kevin Reid, TerranearPMC

Sampling Method: Continuous 5 ft core barrel **Declination:** 90 degrees **Bearing:** na **TD:** 200.0 ft

Depth	Core Run # / Core Recovery %	Field Screening Results	Analytical Sample Number	Lithology	Lithologic Unit	Notes
0.0				Asphalt	Asphalt	
0.0–10.0	Logged from cuttings	2530 dpm Gross Alpha/Beta	No Samples	0.2 - 6.0 ft Fill - coarse sand and crushed tuff.	Fill	14 in. OD HSA to 10 ft bgs. Set 10 in. casing to depth of 10 ft.
10.0–15.0	1 / 100%	3070 dpm Gross Alpha/Beta		6.0 - 57.0 ft Tuff - Densely welded to moderately welded, light gray (7.5YR 7/1), dry. 15% quartz, 10% sanidine, 5% pumice. Pumice are large (up to 4 cm in diameter).	Unit 2 Tshirege Member, Bandelier Tuff	7 5/8 in OD HSA from 10 - 200 ft.
15.0–20.0	2 / 100%	3710 dpm Gross Alpha/Beta				
20.0–25.0	3 / 100%	2920 dpm Gross Alpha/Beta 0.0 ppm VOCs via PID Headspace TNT/RDX - Nondetect	MD54-05-58050 MD54-05-58057(FD)			
25.0–30.0	4 / 100%	2390 dpm Gross Alpha/Beta				
30.0–35.0	5 / 100%	2590 dpm Gross Alpha/Beta				
35.0–40.0	6 / 100%	2990 dpm Gross Alpha/Beta				
40.0–45.0	7 / 100%	3220 dpm Gross Alpha/Beta				
45.0–50.0	8 / 100%	3000 dpm Gross Alpha/Beta				
50.0–55.0	9 / 100%	2550 dpm Gross Alpha/Beta				
55.0–60.0	10 / 100%	2920 dpm Gross Alpha/Beta		57.0 - 78.0 ft Tuff - Slightly welded to moderately welded, pinkish gray (5YR 7/2), dry. 10% quartz, 5% sanidine, 5% pumice, 3% lithics.	Qbt 1v(u)	
60.0–65.0	11 / 100%	3090 dpm Gross Alpha/Beta				
65.0–70.0	12 / 100%	3090 dpm Gross Alpha/Beta				
70.0–75.0	13 / 80%	3690 dpm Gross Alpha/Beta	No Samples			

Neutron: 0 CPS 300
Gamma: 0 CPS 300
Construction: 7 7



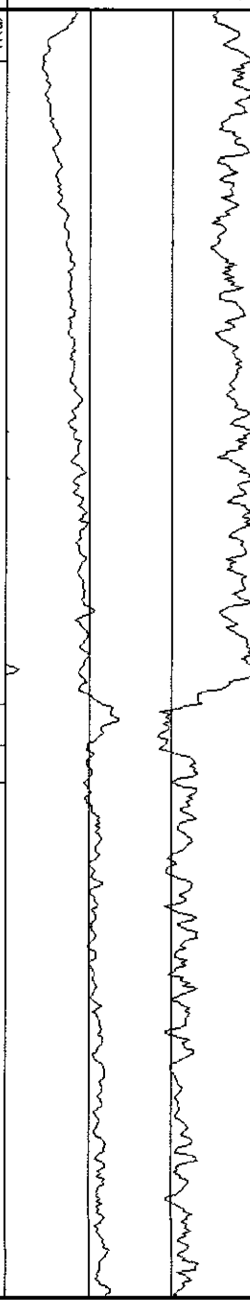
Los Alamos National Laboratory
Environmental Characterization and Remediation
2004 - 2005 MDA G Environmental Characterization Drilling
Borehole Log

Borehole ID: 54-24379 **TA/OU:** 54/1148 **MDA:** G **Start Date / Time:** 1/28/05, 1415 **End Date / Time:** 2/04/05, 0835

Drilling Co.: Enviro-Drill Inc. **Drilling Equip. / Method:** CME 75 / Hollow Stem Auger **Driller:** Matt Cain **Geologist:** Kevin Reid, TerranearPMC

Sampling Method: Continuous 5 ft core barrel **Declination:** 90 degrees **Bearing:** na **TD:** 200.0

Depth	Core Run # / Core Recovery %	Field Screening Results	Analytical Sample Number	Lithology	Graphic Log	Lithologic Unit	Neutron 0 CPS 300 / Gamma 0 CPS 300	Construction 7 7	Notes
	14 / 100%	3020 dpm Gross Alpha/Beta				Qbt 1v(u)			
80.0	15 / 80%	3140 dpm Gross Alpha/Beta		78.0 - 116.0 ft Tuff- Slightly welded to nonwelded, reddish yellow (5YR 7/6) to white (7.5YR 8/1), dry. 10% quartz, 5% sanidine, 5% lithics, 15% pumice. Pumice are round and large (up to 3 cm in diameter). Lithics are large (up to 4 cm in diameter).		Unit 1g Tshirege Member, Bandelier Tuff			
85.0	16 / 70%	3220 dpm Gross Alpha/Beta							
90.0	17 / 80%	2590 dpm Gross Alpha/Beta							
95.0	18 / 85%	2730 dpm Gross Alpha/Beta							
100.0	19 / 85%	3270 dpm Gross Alpha/Beta							
105.0	20 / 90%	2870 dpm Gross Alpha/Beta							
110.0	21 / 90%	3360 dpm Gross Alpha/Beta							
115.0	22 / 70%	3870 dpm Gross Alpha/Beta 0.0 ppm VOCs via PID Headspace	MD54-05-58051	116.0 - 117.0 ft Pumice - reworked. 50% poorly sorted angular pumice clasts, 50% coarse-grained quartz.		Qbtt			
				117.0 - 119.0 ft Homogenous silty fine-grained sand with pumice fragments.		Qct			
120.0	23 / 90%	2440 dpm Gross Alpha/Beta	No Samples						
125.0	24 / 95%	3200 dpm Gross Alpha/Beta		119 - 194.5 ft Tuff- nonwelded, pinkish white (5 YR 8/2), dry. 10% quartz, 5% pumice, 1-3% lithics. Pumice are large (up to 8 cm in diameter).		Otowi Member, Bandelier Tuff			
130.0	25 / 90%	2640 dpm Gross Alpha/Beta							
135.0	26 / 95%	2420 dpm Gross Alpha/Beta							
140.0	27 / 95%	3550 dpm Gross Alpha/Beta							
145.0	28 / 95%	2940 dpm Gross Alpha/Beta	MD54-05-58052						

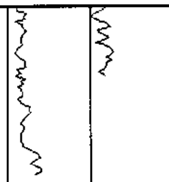


Los Alamos National Laboratory
Environmental Characterization and Remediation
2004 - 2005 MDA G Environmental Characterization Drilling
Borehole Log

Borehole ID: 54-24379 **TA/OU:** 54/1148 **MDA:** G **Start Date / Time:** 1/28/05, 1415 **End Date / Time:** 2/04/05, 0835

Drilling Co.: Enviro-Drill Inc. **Drilling Equip. / Method:** CME 75 / Hollow Stem Auger **Driller:** Matt Cain **Geologist:** Kevin Reid, TerranearPMC

Sampling Method: Continuous 5 ft core barrel **Declination:** 90 degrees **Bearing:** na **TD:** 200.0

Depth	Core Run # / Core Recovery %	Field Screening Results	Analytical Sample Number	Lithology	Graphic Log	Lithologic Unit	Neutron 0 CPS 300 / Gamma 0 CPS 300	Construction 7 7	Notes
	29 / 95%	2780 dpm Gross Alpha/Beta	No Samples			Qbo			Slough in borehole from 160 - 200 ft prevents deeper geophysical measurements.
155.0	30 / 100%	3030 dpm Gross Alpha/Beta							
160.0	31 / 100%	2770 dpm Gross Alpha/Beta							
165.0	32 / 100%	2520 dpm Gross Alpha/Beta							
170.0	33 / 100%	2600 dpm Gross Alpha/Beta							
175.0	34 / 100%	2830 dpm Gross Alpha/Beta							
180.0	35 / 100%	3000 dpm Gross Alpha/Beta							
185.0	36 / 100%	3220 dpm Gross Alpha/Beta 0.0 ppm VOCs via PID Headspace							
190.0	37 / 100%	3030 dpm Gross Alpha/Beta							
195.0	38 / 90%	3210 dpm Gross Alpha/Beta 0.0 ppm VOCs via PID Headspace TNT/RDX - Nondetect	MD54-05-58056	194.5 - 200 ft Pumice - reworked. 100% angular to subangular pumice clasts.		Qbog			TD - 200 ft
200.0									

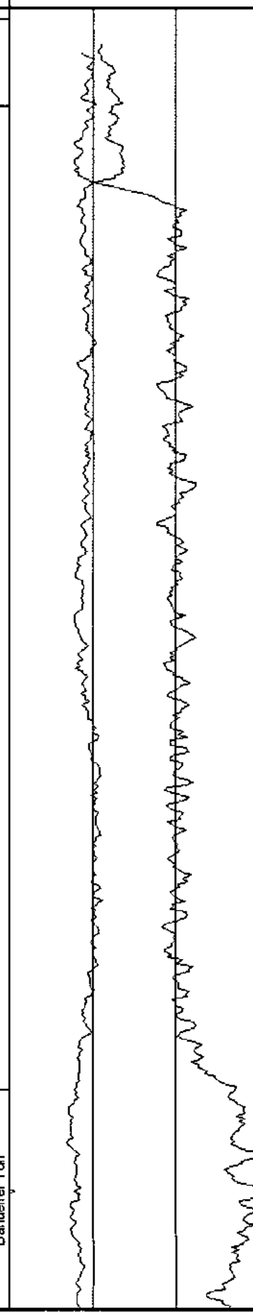
Borehole ID: 54-24380 **TA/OU:** 54/1148 **MDA:** G **Start Date / Time:** 3-8-05, 1500 **End Date / Time:** 2-11-05, 1450

Drilling Co.: Enviro-Drill Inc. **Drilling Equip. / Method:** CME 75 / Hollow Stem Auger **Driller:** Matt Cain **Geologist:** Pattie Baucom, Apogen

Sampling Method: Continuous 5 ft core barrel **Declination:** 90 degrees **Bearing:** na **TD:** 196 ft

Depth	Core Run # / Core Recovery %	Field Screening Results	Analytical Sample Number	Lithology	Lithologic Unit	Notes
0.0 – 10.0	Logged from cuttings	3500 dpm Gross Alpha/Beta	No Samples	0.0 - 5.0 ft Fill - Sand with gravel and crushed tuff.	Fill	Gross Alpha/Beta Background = 3500 dpm.
				5.0 - 62.0 ft Tuff - Slightly welded to densely welded, light gray (7.5YR 7/1), dry. 10% quartz, 5% sanidine, 5% pumice.	Unit 2 Tshirege Member, Bandelier Tuff	14 in. OD HSA to 10 ft bgs. Set 10 in. casing to depth of 10 ft.
10.0 – 15.0	1 / 50%	3120 dpm Gross Alpha/Beta				7 5/8 in OD HSA from 10 - 196 ft.
15.0 – 20.0	2 / 100%	3250 dpm Gross Alpha/Beta				
20.0 – 25.0	3 / 100%	3900 dpm Gross Alpha/Beta 0.0 ppm VOCs via PID Headspace TNT/RDX - Nondetect	MD54-05-58058 MD54-05-58065(FD)			
25.0 – 30.0	4 / 100%	3530 dpm Gross Alpha/Beta				
30.0 – 35.0	5 / 100%	3830 dpm Gross Alpha/Beta 0.0 ppm VOCs via PID Headspace				
35.0 – 40.0	6 / 100%	3420 dpm Gross Alpha/Beta				
40.0 – 45.0	7 / 100%	3780 dpm Gross Alpha/Beta 0.0 ppm VOCs via PID Headspace				
45.0 – 50.0	8 / 100%	3970 dpm Gross Alpha/Beta				
50.0 – 55.0	9 / 100%	3870 dpm Gross Alpha/Beta				
55.0 – 60.0	10 / 100%	3630 dpm Gross Alpha/Beta 0.0 ppm VOCs via PID Headspace				
60.0 – 65.0	11 / 100%	4330 dpm Gross Alpha/Beta 0.0 ppm VOCs via PID Headspace		62.0 - 80.0 ft Tuff - Poorly welded, pinkish gray (5YR 7/2) to white (7.5YR 7/1), dry. 10% quartz, 5% sanidine, 2% lithics, 5% pumice. Pumice are dark purple and large (up to 4 cm in diameter). Volcanic lithics are large (up to 4 cm in diameter).	Unit 1v(u) Tshirege Member, Bandelier Tuff	
65.0 – 70.0	12 / 100%	4560 dpm Gross Alpha/Beta				
70.0 –	13 / 100%	4350 dpm Gross Alpha/Beta 0.0 ppm VOCs via PID				

Neutron: 0 – CPS – 300; Gamma: 0 – CPS – 300; Construction: 7 7



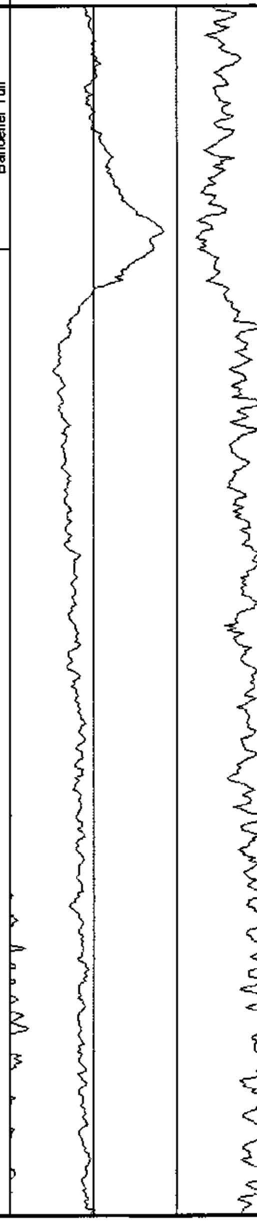
Borehole ID: 54-24380 **TA/OU:** 54/1148 **MDA:** G **Start Date / Time:** 3-8-05, 1500 **End Date / Time:** 2-11-05, 1450

Drilling Co.: Enviro-Drill Inc. **Drilling Equip. / Method:** CME 75 / Hollow Stem Auger **Driller:** Matt Cain **Geologist:** Pattie Baucom, Apogen

Sampling Method: Continuous 5 ft core barrel **Declination:** 90 degrees **Bearing:** na **TD:** 196 ft

Depth	Core Run # / Core Recovery %	Field Screening Results	Analytical Sample Number	Lithology	Lithologic Unit	Notes
	15 / 100%	3290 dpm Gross Alpha/Beta 0.0 ppm VOCs via PID Headspace	No Samples	80.0 - 94.0 ft Tuff- Moderately welded to densely welded, white (7.5 YR 8/1), dry. 15% quartz, 10% sanidine, 5% pumice, 5% lithics. Iron staining at grain boundaries.	Unit 1v(c) Tshirege Member, Bandelier Tuff	
85.0	16 / 100%	4360 dpm Gross Alpha/Beta				
90.0	17 / 100%	3530 dpm Gross Alpha/Beta 0.0 ppm VOCs via PID Headspace				
95.0	18 / 100%	4580 dpm Gross Alpha/Beta		94.0 - 174.0 ft Tuff- Moderately welded to nonwelded, pink (5YR 7/3) to white (5YR 8/1), dry. 10% quartz, 5% sanidine, 10% lithics, 5% pumice. Pumice are round and large (up to 3cm in diameter).	Unit 1g Tshirege Member, Bandelier Tuff	
100.0	19 / 95%	4340 dpm Gross Alpha/Beta 0.0 ppm VOCs via PID Headspace				
105.0	20 / 95%	4440 dpm Gross Alpha/Beta				
110.0	21 / 95%	3990 dpm Gross Alpha/Beta 0.0 ppm VOCs via PID Headspace				
115.0	22 / 95%	4120 dpm Gross Alpha/Beta				
120.0	23 / 95%	4350 dpm Gross Alpha/Beta				
125.0	24 / 95%	4180 dpm Gross Alpha/Beta				
130.0	25 / 95%	3690 dpm Gross Alpha/Beta 0.0 ppm VOCs via PID Headspace				
135.0	26 / 95%	3940 dpm Gross Alpha/Beta				
140.0	27 / 95%	3890 dpm Gross Alpha/Beta 0.0 ppm VOCs via PID Headspace				
145.0	28 / 95%	4260 dpm Gross Alpha/Beta				Gross Alpha/Beta Background = 2980 dpm.

Neutron: 0 CPS 300 — Gamma: 0 CPS 300 — Construction: 7 7



Los Alamos National Laboratory
Environmental Characterization and Remediation
2004 - 2005 MDA G Environmental Characterization Drilling
Borehole Log

Borehole ID: 54-24380 **TA/OU:** 54/1148 **MDA:** G **Start Date / Time:** 3-8-05, 1500 **End Date / Time:** 2-11-05, 1450

Drilling Co.: Enviro-Drill Inc. **Drilling Equip. / Method:** CME 75 / Hollow Stem Auger **Driller:** Matt Cain **Geologist:** Pattie Baucom, Apogen

Sampling Method: Continuous 5 ft core barrel **Declination:** 90 degrees **Bearing:** na **TD:** 196 ft

Neutron: 0 CPS 300; Gamma: 0 CPS 300; Construction: 7 7

Depth	Core Run # / Core Recovery %	Field Screening Results	Analytical Sample Number	Lithology	Lithologic Unit	Notes
	29 / 95%	4820 dpm Gross Alpha/Beta 0.0 ppm VOCs via PID Headspace				
155.0	30 / 95%	4540 dpm Gross Alpha/Beta				Slough in borehole from 162 - 196.0 ft prevents deeper geophysical measurements.
160.0	31 / 95%	4340 dpm Gross Alpha/Beta 0.0 ppm VOCs via PID Headspace				
165.0	32 / 95%	4190 dpm Gross Alpha/Beta				
170.0	33 / 95%	4220 dpm Gross Alpha/Beta 0.0 ppm VOCs via PID Headspace		174.0 - 176.0 ft Pumice - reworked. 50% poorly sorted, angular pumice clasts, 50% coarse-grained quartz.	Qbtt	
175.0	34 / 95%	4280 dpm Gross Alpha/Beta	MD54-05-58059			
180.0	35 / 90%	4000 dpm Gross Alpha/Beta		176.0 - 195.7 ft Interlayered fine to coarse-grained sand, pebble layers, gravel beds, pumice clasts, and massive silt.	Cerro Toledo Interval	
185.0	36 / 90%	4070 dpm Gross Alpha/Beta	No Samples			
190.0	37 / 90%	4020 dpm Gross Alpha/Beta				
195.0	38 / 10%	3570 dpm Gross Alpha/Beta RDX/TNT - nondetect	MD54-05-58064	195.7 - 196.0 ft Basalt	TCB	TD - Refusal at 196.0 ft.
200.0						

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Environmental Characterization and Remediation
2004 - 2005 MDA G Environmental Characterization Drilling
Borehole Log

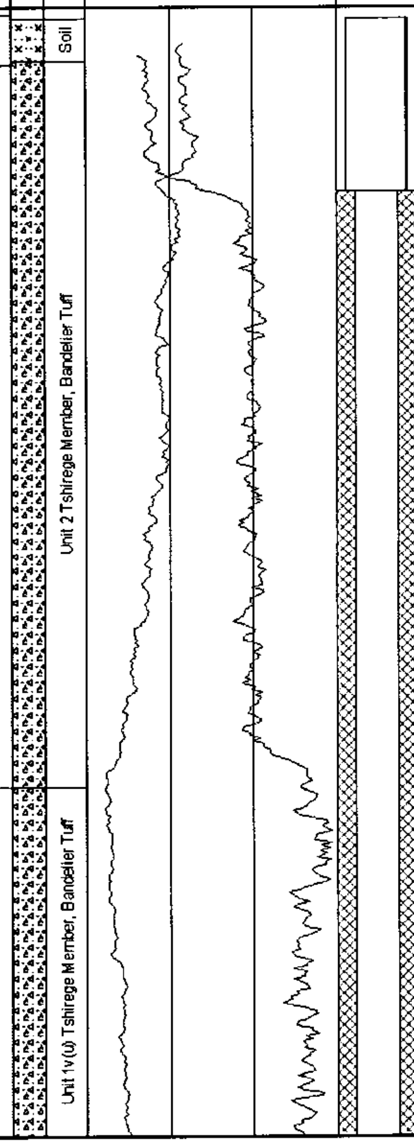
Borehole ID: 54-24381 **TA/OU:** 54/1148 **MDA:** G **Start Date / Time:** 01-24-05, 1500 **End Date / Time:** 1-26-05, 1510

Drilling Co.: Enviro-Drill Inc. **Drilling Equip. / Method:** CME 75 / Hollow Stem Auger **Driller:** Matt Cain **Geologist:** Kevin Reid, TerranearPMC

Sampling Method: Continuous 5 ft core barrel **Declination:** 90 degrees **Bearing:** na **TD:** 200 ft

Depth	Core Run # / Core Recovery %	Field Screening Results	Analytical Sample Number	Lithology	Lithologic Unit	Notes
0.0	Logged from cuttings	4210 dpm Gross Alpha/Beta	No Samples	0.0 - 2.5 ft Soil. Sandy clay, slightly moist.	Soil	Gross Alpha/Beta Background = 5030 dpm.
5.0				2.5 - 44.5 ft Tuff- Densely welded to moderately welded, light gray (7.5YR 7/1), dry. 15% quartz, 10% sanidine, 5% pumice. Pumice have a sugary texture.	Unit 2 Tshirege Member, Bandelier Tuff	14 in. OD HSA to 10 ft bgs. Set 10 in. casing to depth of 10 ft.
10.0	1 / 85%	3020 dpm Gross Alpha/Beta				7 5/8 in OD HSA from 10 - 200 ft.
15.0	2 / 90%	3190 dpm Gross Alpha/Beta 0.0 ppm VOCs via PID Headspace TNT/RDX - Nondetect	MD54-05-58071 MD54-05-58078(FD)			
20.0	3 / 95%	3090 dpm Gross Alpha/Beta	No Samples			
25.0	4 / 100%	2950 dpm Gross Alpha/Beta				
30.0	5 / 100%	3330 dpm Gross Alpha/Beta				
35.0	6 / 100%	3540 dpm Gross Alpha/Beta				
40.0	7 / 100%	3470 dpm Gross Alpha/Beta				
45.0	8 / 90%	3530 dpm Gross Alpha/Beta		44.5 - 68.0 ft Tuff- Moderately welded to slightly welded, pinkish white (7.5 YR 8/2), dry. 10% quartz, 5% sanidine, 5% pumice. Pumice are large (up to 3 cm in diameter). Some iron staining at grain boundaries.	Unit 1v(u) Tshirege Member, Bandelier Tuff	
50.0	9 / 100%	3740 dpm Gross Alpha/Beta				
55.0	10 / 90%	3540 dpm Gross Alpha/Beta				
60.0	11 / 100%	3340 dpm Gross Alpha/Beta				

Graphic Log | Neutron 0 CPS 300 | Gamma 0 CPS 300 | Construction 7 7



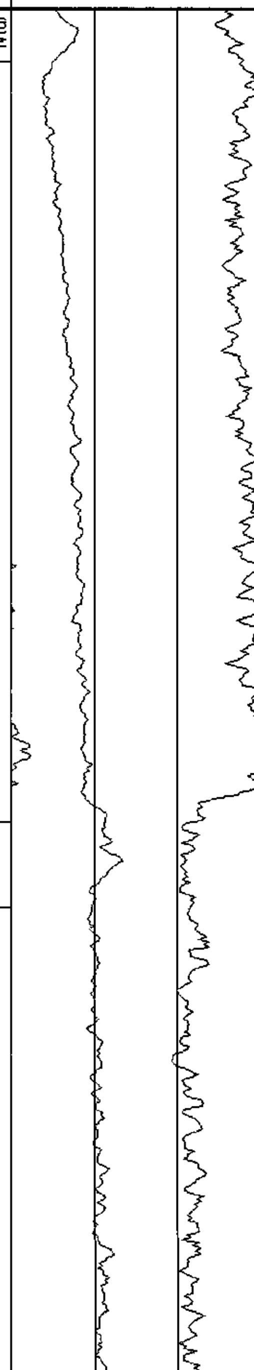
Borehole ID: 54-24381 **TA/OU:** 54/1148 **MDA:** G **Start Date / Time:** 01-24-05, 1500 **End Date / Time:** 1-26-05, 1510

Drilling Co.: Enviro-Drill Inc. **Drilling Equip. / Method:** CME 75 / Hollow Stem Auger **Driller:** Matt Cain **Geologist:** Kevin Reid, TerranearPMC

Sampling Method: Continuous 5 ft core barrel **Declination:** 90 degrees **Bearing:** na **TD:** 200 ft

Depth	Core Run # / Core Recovery %	Field Screening Results	Analytical Sample Number	Lithology	Lithologic Unit
	12 / 100%	3540 dpm Gross Alpha/Beta			Qbt 1v(u)
70.0	13 / 90%	3470 dpm Gross Alpha/Beta	No Samples	68.0 - 112.0 ft Tuff - Moderately welded to nonwelded, light reddish brown (2.5YR 7/3) to white (7.5YR 8/1), dry. 10% quartz, 5% sanidine, 5% lithics, 5% pumice. Pumice are round and large (up to 3 cm in diameter).	Unit 1g Tshirege Member, Bandelier Tuff
75.0	14 / 85%	3330 dpm Gross Alpha/Beta 0.0 ppm VOCs via PID Headspace			
80.0	15 / 90%	3520 dpm Gross Alpha/Beta			
85.0	16 / 80%	3820 dpm Gross Alpha/Beta			
90.0	17 / 80%	3400 dpm Gross Alpha/Beta			
95.0	18 / 85%	3570 dpm Gross Alpha/Beta 0.8 ppm VOCs via PID Headspace			
100.0	19 / 85%	3330 dpm Gross Alpha/Beta			
105.0	20 / 85%	3650 dpm Gross Alpha/Beta			
110.0	21 / 85%	2750 dpm Gross Alpha/Beta 0.0 ppm VOCs via PID Headspace	MD54-05-58072	112.0 - 117.0 ft Sandy silt with pumice fragments and reworked ash.	Qct
115.0	22 / 85%	3380 dpm Gross Alpha/Beta	No Samples	117.0 - 200.0 ft Tuff - Nonwelded, pinkish white (7.5 YR 8/2), 10% quartz, 5% lithics, 5% pumice. Pumice are large (up to 3 cm in diameter). Lithics are mostly dacite fragments and are large (up to 3.5 cm in diameter).	Otowi Member, Bandelier Tuff
120.0	23 / 90%	3180 dpm Gross Alpha/Beta			
125.0	24 / 90%	2830 dpm Gross Alpha/Beta			
130.0	25 / 95%	3590 dpm Gross Alpha/Beta			
135.0	26 / 90%	3350 dpm Gross Alpha/Beta 0.0 ppm VOCs via PID Headspace			
140.0	27 / 95%	3500 dpm Gross Alpha/Beta			

Graphic Log | Neutron: 0 CPS 300 | Gamma: 0 CPS 300 | Construction: 7 7 | Notes

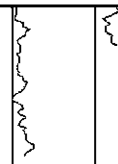


Los Alamos National Laboratory
Environmental Characterization and Remediation
2004 - 2005 MDA G Environmental Characterization Drilling
Borehole Log

Borehole ID: 54-24381 **TA/OU:** 54/1148 **MDA:** G **Start Date / Time:** 01-24-05, 1500 **End Date / Time:** 1-26-05, 1510

Drilling Co.: Enviro-Drill Inc. **Drilling Equip. / Method:** CME 75 / Hollow Stem Auger **Driller:** Matt Cain **Geologist:** Kevin Reid, TerranearPMC

Sampling Method: Continuous 5 ft core barrel **Declination:** 90 degrees **Bearing:** na **TD:** 200 ft

Depth	Core Run # / Core Recovery %	Field Screening Results	Analytical Sample Number	Lithology	Graphic Log	Lithologic Unit	Neutron 0 CPS 300 / Gamma 0 CPS 300	Construction 7 7	Notes
	28 / 95%	3830 dpm Gross Alpha/Beta	MD54-06-58073			Otowi Member, Bandelier Tuff			Slough in borehole from 153 - 200 ft prevents deeper geophysical measurements.
150.0	29 / 95%	2910 dpm Gross Alpha/Beta	No Samples						
155.0	30 / 80%	3430 dpm Gross Alpha/Beta 0.0 ppm VOCs via PID Headspace							
160.0	31 / 90%	3570 dpm Gross Alpha/Beta							
165.0	32 / 90%	3460 dpm Gross Alpha/Beta							
170.0	33 / 90%	3250 dpm Gross Alpha/Beta							
175.0	34 / 90%	3630 dpm Gross Alpha/Beta 0.0 ppm VOCs via PID Headspace							
180.0	35 / 90%	3570 dpm Gross Alpha/Beta							
185.0	36 / 95%	3020 dpm Gross Alpha/Beta							
190.0	37 / 95%	3460 dpm Gross Alpha/Beta							
195.0	38 / 90%	3030 dpm Gross Alpha/Beta 0.0 ppm VOCs via PID Headspace TNT/RDX - Nondetect	MD54-58077						TD - 200 ft.
200.0									

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Environmental Characterization and Remediation
2004 - 2005 MDA G Environmental Characterization Drilling
Borehole Log

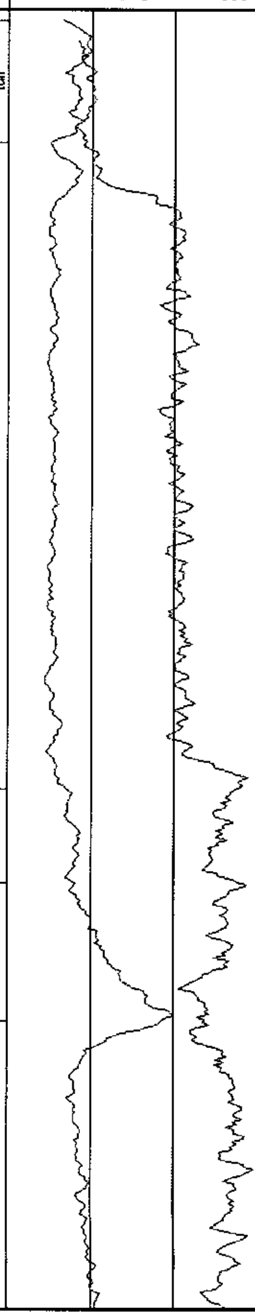
Borehole ID: 54-24382 **TA/OU:** 54/1148 **MDA:** G **Start Date / Time:** 5-17-05, 1356 **End Date / Time:** 5-18-05, 1304

Drilling Co.: Enviro-Drill Inc. **Drilling Equip. / Method:** CME 75 / Hollow Stem Auger **Driller:** Matt Cain **Geologist:** Pattie Baucom, Apogen

Sampling Method: Continuous 5 ft core barrel **Declination:** 90 degrees **Bearing:** na **TD:** 147 ft

Depth	Core Run # / Core Recovery %	Field Screening Results	Analytical Sample Number	Lithology	Lithologic Unit	Notes
0.0	Logged from cuttings	2040 dpm Gross Alpha/Beta	No Samples	0.0 - 7.0 ft Fill - Crushed tuff.	Fill - crushed tuff	Gross Alpha/Beta Background = 2040 dpm. 14 in. OD HSA to 10 ft bgs. Set 10 in. casing to depth of 10 ft.
10.0	1 / 50%	3140 dpm Gross Alpha/Beta		7.0 - 44.5 ft Tuff - Densely welded, light reddish brown (2.5YR 7/4), dry. 10% quartz, 5% sanidine, 15% pumice. Pumice have a sugary texture and are large (up to 2 cm in diameter).	Unit 2 Tshirege Member, Bandelier Tuff	7 5/8 in OD HSA from 10 - 147.0 ft.
15.0	2 / 100%	3950 dpm Gross Alpha/Beta				
20.0	3 / 100%	3900 dpm Gross Alpha/Beta				
25.0	4 / 100%	3170 dpm Gross Alpha/Beta				
30.0	5 / 100%	3370 dpm Gross Alpha/Beta 0.0 ppm VOCs via PID Headspace TNT/RDX - Nondetect	MD54-05-58079 MD54-05-58085(FD)			
35.0	6 / 100%	3310 dpm Gross Alpha/Beta	No Samples			
40.0	7 / 100%	3100 dpm Gross Alpha/Beta				
45.0	8 / 100%	2790 dpm Gross Alpha/Beta		44.5 - 50.0 ft Tuff - Nonwelded to moderately welded, white (5YR 8/1), dry. 10% quartz, 15% pumice, 5% lithics. Pumice are dark purple to reddish brown and large (up to 4 cm in diameter).	Qbt 1v(u)	
50.0	9 / 100%	3150 dpm Gross Alpha/Beta		50.0 - 58.0 ft Tuff - Densely welded, pink (2.5YR 8/3), dry. 10% quartz, 15% pumice, 5% lithics.	Qbt 1 v(c)	
55.0	10 / 100%	3350 dpm Gross Alpha/Beta				
60.0	11 / 100%	3020 dpm Gross Alpha/Beta 0.0 ppm VOCs via PID Headspace		58.0 - 94.0 ft Tuff - Moderately welded to nonwelded, pink (5YR 7/4) to white (7.5 YR 8/1), dry. 10% quartz, 5% lithics, 15 - 20% pumice. Pumice are rounded and large (up to 9 cm in diameter).	Qbt 1g	
65.0	12 / 100%	3250 dpm Gross Alpha/Beta				
70.0	13 / 100%	3420 dpm Gross Alpha/Beta 0.0 ppm VOCs via PID Headspace				

Neutron: 0 CPS 300 — Gamma: 0 CPS 300



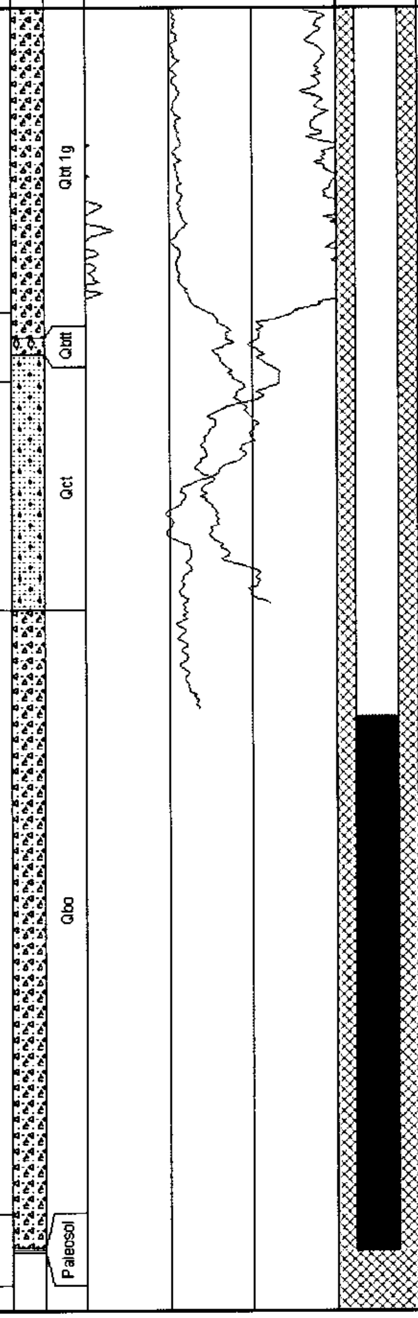
Borehole ID: 54-24382 **TA/OU:** 54/1148 **MDA:** G **Start Date / Time:** 5-17-05, 1356 **End Date / Time:** 5-18-05, 1304

Drilling Co.: Enviro-Drill Inc. **Drilling Equip. / Method:** CME 75 / Hollow Stem Auger **Driller:** Matt Cain **Geologist:** Pattie Baucom, Apogen

Sampling Method: Continuous 5 ft core barrel **Declination:** 90 degrees **Bearing:** na **TD:** 147 ft

Depth	Core Run # / Core Recovery %	Field Screening Results	Analytical Sample Number	Lithology	Lithologic Unit	Notes
75.0–80.0	14 / 100%	3860 dpm Gross Alpha/Beta			Qbt 1g	
80.0–85.0	15 / 100%	3040 dpm Gross Alpha/Beta			Qbt 1g	
85.0–90.0	16 / 100%	3070 dpm Gross Alpha/Beta 0.0 ppm VOCs via PID Headspace			Qbt 1g	
90.0–95.0	17 / 100%	2940 dpm Gross Alpha/Beta		94.0 - 95.0 ft Pumice - reworked. 50% pumice, 50% quartz crystals.	Qbt 1g / Qbtt	
95.0–100.0	18 / 95%	3180 dpm Gross Alpha/Beta 0.0 ppm VOCs via PID Headspace		95.0 - 109.8 ft Silty sand, medium-grained sand, and pebbley sand with pumice clasts, brown, slightly damp.	Qct	
100.0–105.0	19 / 90%	3440 dpm Gross Alpha/Beta	MD54-05-58080		Qct	
105.0–110.0	20 / 50%	3040 dpm Gross Alpha/Beta	No Samples		Qct	Slough in borehole from 116 - 147 ft prevents deeper geophysical measurements.
110.0–115.0	21 / 75%	3600 dpm Gross Alpha/Beta		109.8 - 146.8 ft Tuff- Nonwelded, pinkish white (5 YR 8/2), dry. 10% quartz, 5% lithics, 15 - 17% pumice.	Qbo	
115.0–120.0	22 / 75%	3730 dpm Gross Alpha/Beta			Qbo	
120.0–125.0	23 / 85%	2660 dpm Gross Alpha/Beta			Qbo	
125.0–130.0	24 / 95%	3540 dpm Gross Alpha/Beta 0.0 ppm VOCs via PID Headspace			Qbo	
130.0–135.0	25 / 95%	2940 dpm Gross Alpha/Beta 0.0 ppm VOCs via PID Headspace			Qbo	
135.0–140.0	26 / 95%	2830 dpm Gross Alpha/Beta			Qbo	
140.0–145.0	27 / 95%	3790 dpm Gross Alpha/Beta 0.0 ppm VOCs via PID Headspace			Qbo	
145.0–150.0	28 / 40%	2810 dpm Gross Alpha/Beta RDX/TNT - nondetect	MD54-05-58085	146.8 - 147.0 Paleosol - silty sand with basalt cobbles, brown, dry.	Paleosol	Refusal at 147 ft.

Graphic Log / Neutron (0 CPS 300) / Gamma (0 CPS 300) / Construction (7 7):



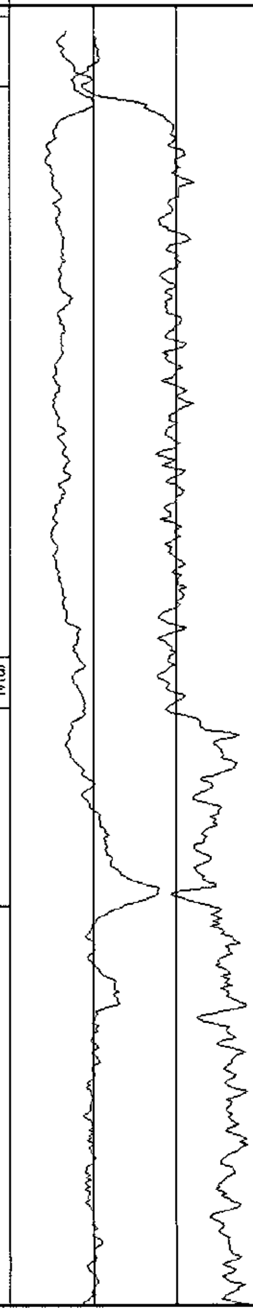
Los Alamos National Laboratory
Environmental Characterization and Remediation
2004 - 2005 MDA G Environmental Characterization Drilling
Borehole Log

Borehole ID: 54-24383 **TA/OU:** 54/1148 **MDA:** G **Start Date / Time:** 5-17-05, 1253 **End Date / Time:** 5-19-05, 1256

Drilling Co.: Enviro-Drill Inc. **Drilling Equip. / Method:** CME 75 / Hollow Stem Auger **Driller:** Matt Cain **Geologist:** Pattie Baucom, Apogen

Sampling Method: Continuous 5 ft core barrel **Declination:** 90 degrees **Bearing:** na **TD:** 147.5 ft

Depth	Core Run # / Core Recovery %	Field Screening Results	Analytical Sample Number	Lithology	Graphic Log	Lithologic Unit	Neutron (0 CPS 300) / Gamma (0 CPS 300)	Construction	Notes
0.0	Logged from cuttings	1921 dpm Gross Alpha/Beta	No Samples	0.0 - 4.0 ft Fill - Crushed tuff.		Fill			Gross Alpha/Beta Background = 1921 dpm.
5.0	1 / 80%	2740 dpm Gross Alpha/Beta		4.0 - 37.0 ft Tuff - Densely welded, pale red (2.5YR 7/2), dry. 10% quartz, 5% sanidine, 15% pumice.		Unit 2 Tshirege Member, Bandelier Tuff			14 in. OD HSA to 5 ft bgs. Set 10 in. casing to depth of 5 ft.
10.0	2 / 100%	3140 dpm Gross Alpha/Beta							7 5/8 in OD HSA from 5 - 147.5 ft.
15.0	3 / 100%	3160 dpm Gross Alpha/Beta							
20.0	4 / 100%	3000 dpm Gross Alpha/Beta 0.0 ppm VOCs via PID Headspace TNT/RDX - Nondetect	MD54-05-58087 MD54-05-58094(FD)						
25.0	5 / 100%	2730 dpm Gross Alpha/Beta							
30.0	6 / 100%	3230 dpm Gross Alpha/Beta							
35.0	7 / 100%	3760 dpm Gross Alpha/Beta		37.0 - 40.0 ft Tuff - Poorly welded, pink (5YR 8/3), dry. 10% quartz, 15% pumice, 5% sanidine. Pumice are dark purple to reddish brown and large (up to 4 cm in diameter).		Qbt 1v(u)			
40.0	8 / 100%	2970 dpm Gross Alpha/Beta		40.0 - 51.5 ft Tuff - Moderately welded, pink (5YR 8/3), dry. 10% quartz, 15% pumice, 5% lithics. Pumice are large (up to 5 cm in diameter).		Qbt 1 v(c)			
45.0	9 / 100%	2860 dpm Gross Alpha/Beta							
50.0	10 / 100%	3310 dpm Gross Alpha/Beta		51.5 - 78.0 ft Tuff - Moderately welded to nonwelded, pink (5YR 7/4) to white (5YR 8/1), dry. 10% quartz, 5% lithics, 5% sanidine, 20% pumice. Pumice are rounded and large (up to 6 cm in diameter).		Unit 1g Tshirege Member, Bandelier Tuff			
55.0	11 / 100%	2560 dpm Gross Alpha/Beta							
60.0	12 / 90%	3610 dpm Gross Alpha/Beta							
65.0	13 / 95%	2520 dpm Gross Alpha/Beta							
70.0	14 / 95%	3160 dpm Gross Alpha/Beta							



Los Alamos National Laboratory
Environmental Characterization and Remediation
2004 - 2005 MDA G Environmental Characterization Drilling
Borehole Log

Borehole ID: 54-24383 **TA/OU:** 54/1148 **MDA:** G **Start Date / Time:** 5-17-05, 1253 **End Date / Time:** 5-19-05, 1256

Drilling Co.: Enviro-Drill Inc. **Drilling Equip. / Method:** CME 75 / Hollow Stem Auger **Driller:** Matt Cain **Geologist:** Pattie Baucom, Apogen

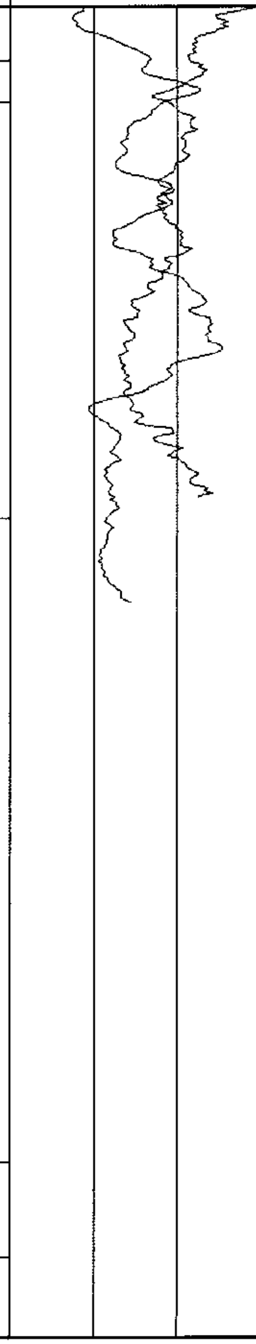
Sampling Method: Continuous 5 ft core barrel **Declination:** 90 degrees **Bearing:** na **TD:** 147.5 ft

Depth	Core Run # / Core Recovery %	Field Screening Results	Analytical Sample Number	Lithologic Unit	Notes
75.0–80.0	15 / 90%	3200 dpm Gross Alpha/Beta	No Samples	Qbt1g / Qbtt	
80.0–85.0	16 / 90%	3720 dpm Gross Alpha/Beta	No Samples	Qct	
85.0–90.0	17 / 80%	3800 dpm Gross Alpha/Beta	No Samples	Qct	
90.0–95.0	18 / 90%	3410 dpm Gross Alpha/Beta	No Samples	Qct	
95.0–100.0	19 / 85%	2600 dpm Gross Alpha/Beta	No Samples	Qct	
100.0–105.0	20 / 75%	3630 dpm Gross Alpha/Beta	No Samples	Qct	Slough in borehole from 110 - 147.5 ft prevents deeper geophysical measurements.
105.0–110.0	21 / 90%	3580 dpm Gross Alpha/Beta	No Samples	Qbo	
110.0–115.0	22 / 85%	2940 dpm Gross Alpha/Beta	No Samples	Qbo	
115.0–120.0	23 / 85%	4570 dpm Gross Alpha/Beta	No Samples	Qbo	
120.0–125.0	24 / 90%	2880 dpm Gross Alpha/Beta	No Samples	Qbo	
125.0–130.0	25 / 100%	3340 dpm Gross Alpha/Beta	No Samples	Qbo	
130.0–135.0	26 / 100%	2810 dpm Gross Alpha/Beta	No Samples	Qbo	
135.0–140.0	27 / 100%	3070 dpm Gross Alpha/Beta	No Samples	Qbo	
140.0–145.0	28 / 80%	3630 dpm Gross Alpha/Beta	No Samples	Qbo / Paleosol	
145.0–150.0	29 / 40%	2530 dpm Gross Alpha/Beta RDX/TNT - nondetect	MD54-05-58093	Paleosol	Refusal at 147.5 ft.

Lithology

- 78.0 - 79.0 ft Pumice - reworked. 50% pumice, 50% quartz crystals.
- 79.0 - 104.5 ft Interlayered sandy silt, silt, and coarse-grained sand with ash layers, pumice clasts, and muddy pumice layers.
- 104.5 - 142.0 ft Tuff - Nonwelded, pinkish white (5YR 8/2), dry. 10% quartz, 5% lithics, 5% mafics, 15% pumice. Pumice are large (up to 4 cm in diameter).
- 142.0 - 145.0 ft Pumice, reworked. 50% angular gravel-sized pumice, 50% quartz.
- 145.0 - 147.5 ft Paleosol - brown silty clay, moist, underlain by tan-colored silty clay (opaline/chert?), dry.

Neutron: 0 CPS 300
Gamma: 0 CPS 300



Construction: ? ?

Los Alamos National Laboratory
Environmental Characterization and Remediation
2004 - 2005 MDA G Environmental Characterization Drilling
Borehole Log

Borehole ID: 54-24384 **TA/OU:** 54/1148 **MDA:** G **Start Date / Time:** 5-20-05, 1400 **End Date / Time:** 5-23-05, 0900

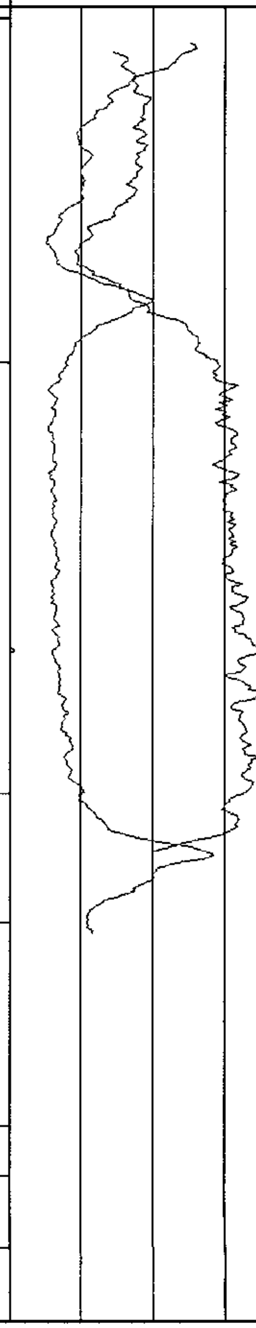
Drilling Co.: Enviro-Drill Inc. **Drilling Equip. / Method:** CME 75 / Hollow Stem Auger **Driller:** Matt Cain **Geologist:** Pattie Baucom, Apogen

Sampling Method: Continuous 5 ft core barrel **Declination:** 90 degrees **Bearing:** na **TD:** 68 ft

Depth	Core Run # / Core Recovery %	Field Screening Results	Analytical Sample Number	Lithology	Lithologic Unit	Notes
0.0 – 5.0	Logged from cuttings	1940 dpm Gross Alpha/Beta	No Samples	0.0 - 20.0 ft Colluvium - organic rich silty sand underlain by ashy silty sand and pebbley coarse-grained quartzose sand with dacite pebbles.	Colluvium	Gross Alpha/Beta Background = 1790 dpm.
5.0 – 10.0	1 / 50%	1190 dpm Gross Alpha/Beta				
10.0 – 15.0	2 / 30%	1870 dpm Gross Alpha/Beta				7 5/8 in OD HSA from 0 - 68.0 ft.
15.0 – 20.0	3 / 30%	2220 dpm Gross Alpha/Beta				
20.0 – 25.0	4 / 30%	2650 dpm Gross Alpha/Beta 0.0 ppm VOCs via PID Headspace		20.0 - 45.0 ft Tuff - nonwelded, pinkish white (5YR 8/2) to white (5YR 8/1), dry. 10% quartz, 5% lithics, 15% pumice. Pumice are round and large (up to 4 cm in diameter).	Qbt 1g	
25.0 – 30.0	5 / 50%	2580 dpm Gross Alpha/Beta TNT/RDX - Nondetect	MD54-05-58095 MD54-05-58102(FD)			
30.0 – 35.0	6 / 60%	3080 dpm Gross Alpha/Beta				
35.0 – 40.0	7 / 60%	3030 dpm Gross Alpha/Beta				
40.0 – 45.0	8 / 60%	2580 dpm Gross Alpha/Beta				
45.0 – 50.0	9 / 100%	3270 dpm Gross Alpha/Beta	No Samples	45.0 - 52.5 ft Interlayered coarse-grained sand, pumice layers, ash beds, and silt laminations.	Qct	Slough in borehole from 55 - 68 ft prevents deeper geophysical measurements.
50.0 – 55.0	10 / 100%	2570 dpm Gross Alpha/Beta		52.5 - 64.5 ft Tuff - Nonwelded, pinkish white (5YR 8/2), dry. 7% quartz, 5% lithics, 5% mafics, 15% pumice.	Qbo	
55.0 – 60.0	11 / 100%	3530 dpm Gross Alpha/Beta				
60.0 – 65.0	12 / 95%	2940 dpm Gross Alpha/Beta		64.5 - 67.0 ft Pumice, reworked with ash and clay material. 60% angular gravel-sized pumice, 30% ash and clay, 10% quartz.	Qbog	
65.0 – 70.0	13 / 80%	2450 dpm Gross Alpha/Beta RDX/TNT - nondetect	MD54-05-58101	67.0 - 68.0 ft Paleosol - Silt with large pieces of basalt, damp, underlain by light colored hard silt (opaline/chert?).	Paleosol	Refusal at 68.0 ft.
70.0 – 75.0						

Graphic Log / Construction

Neutron 0 CPS 350 — Gamma 0 CPS 350



Los Alamos National Laboratory
Environmental Characterization and Remediation
2004 - 2005 MDA G Environmental Characterization Drilling
Borehole Log

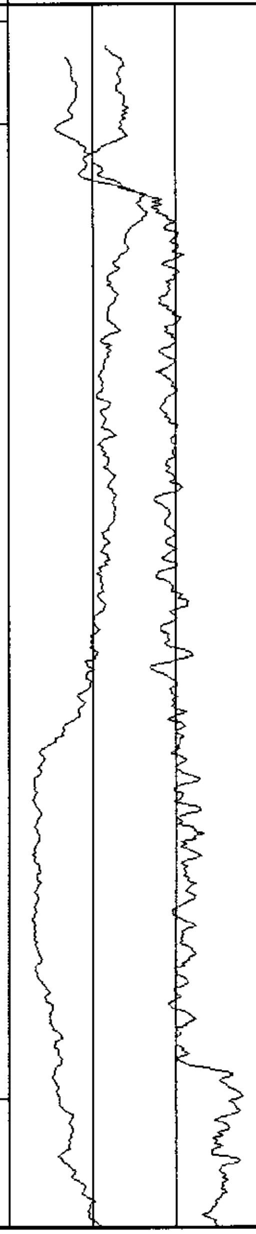
Borehole ID: 54-24385 **TA/OU:** 54/1148 **MDA:** G **Start Date / Time:** 2-16-05, 1500 **End Date / Time:** 2-18-05, 0931

Drilling Co.: Enviro-Drill Inc. **Drilling Equip. / Method:** CME 75 / Hollow Stem Auger **Driller:** Matt Cain **Geologist:** Kevin Reid, TerranearPMC

Sampling Method: Continuous 5 ft core barrel **Declination:** 90 degrees **Bearing:** na **TD:** 177 ft

Depth	Core Run # / Core Recovery %	Field Screening Results	Analytical Sample Number	Lithology	Lithologic Unit	Notes
0.0	1 / 90%	2350 dpm Gross Alpha/Beta	No Samples	0.0 - 0.3 ft Asphalt cap 0.0 - 6.0 ft Fill - Silty sand with some clay and crushed tuff, slightly moist.	Fill	Gross Alpha/Beta Background = 2010 dpm.
5.0	2 / 100%	2770 dpm Gross Alpha/Beta 0.0 ppm VOCs via PID Headspace		6.0 - 62.5 ft Tuff - Moderately to densely welded, light reddish brown (2.5YR 6/4), slight damp to dry. 15% quartz, 10% sanidne, 5% pumice. Pumice have a sugary texture and are large (up to 3 cm in diameter). Clay, root and calcium carbonate filled fractures present at 7.5 - 8.5 ft and 17.5 - 18 ft.	Unit 2 Tshirege Member, Bandelier Tuff	14 in. OD HSA to 10 ft bgs. Set 10 in. casing to depth of 10 ft.
10.0	3 / 100%	2940 dpm Gross Alpha/Beta				7 5/8 in OD HSA from 10 - 177.0 ft.
15.0	4 / 100%	2500 dpm Gross Alpha/Beta 0.0 ppm VOCs via PID Headspace				
20.0	5 / 100%	3100 dpm Gross Alpha/Beta 148.0 ppm VOCs via PID Headspace				
25.0	6 / 100%	2760 dpm Gross Alpha/Beta 2.5 ppm VOCs via PID Headspace				
30.0	7 / 100%	2450 dpm Gross Alpha/Beta 77.6 ppm VOCs via PID Headspace TNT/RDX - Nondetect	MD54-05-58103 MD54-05-58110(FD)			
35.0	8 / 100%	2970 dpm Gross Alpha/Beta 0.0 ppm VOCs via PID Headspace				
40.0	9 / 100%	3340 dpm Gross Alpha/Beta				
45.0	10 / 100%	2890 dpm Gross Alpha/Beta 0.3 ppm VOCs PID Headspace				
50.0	11 / 100%	2730 dpm Gross Alpha/Beta				
55.0	12 / 100%	2900 dpm Gross Alpha/Beta 0.6 ppm VOCs via PID Headspace				
60.0	13 / 100%	2870 dpm Gross Alpha/Beta		62.5 - 75.0 ft Tuff - Moderately welded to poorly welded, white (7.5YR 8/1), dry. 15% quartz, 10% sanidine, 5% pumice, 3% lithics.	Qbt 1v(u)	
65.0	14 / 100%	3450 dpm Gross Alpha/Beta 0.0 ppm VOCs via PID Headspace				

Neutron: 0 CPS 300
Gamma: 0 CPS 300



Construction: ? ?

Borehole ID: 54-24385 **TA/OU:** 54/1148 **MDA:** G **Start Date / Time:** 2-16-05, 1500 **End Date / Time:** 2-18-05, 0931

Drilling Co.: Enviro-Drill Inc. **Drilling Equip. / Method:** CME 75 / Hollow Stem Auger **Driller:** Matt Cain **Geologist:** Kevin Reid, TerranearPMC

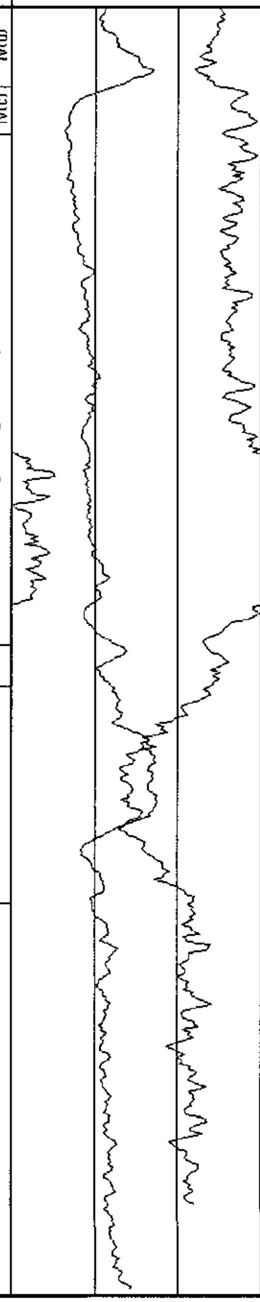
Sampling Method: Continuous 5 ft core barrel **Declination:** 90 degrees **Bearing:** na **TD:** 177 ft

Depth	Core Run # / Core Recovery %	Field Screening Results	Analytical Sample Number
	15 / 100%	2730 dpm Gross Alpha/Beta	No Samples
75.0	16 / 85%	3250 dpm Gross Alpha/Beta 0.0 ppm VOCs via PID Headspace	
80.0	17 / 85%	3530 dpm Gross Alpha/Beta	
85.0	18 / 80%	2780 dpm Gross Alpha/Beta 0.0 ppm VOCs via PID Headspace	
90.0	19 / 90%	3280 dpm Gross Alpha/Beta	
95.0	20 / 90%	3360 dpm Gross Alpha/Beta 0.0 ppm VOCs via PID Headspace	
100.0	21 / 95%	2930 dpm Gross Alpha/Beta	
105.0	22 / 80%	3070 dpm Gross Alpha/Beta 0.0 ppm VOCs via PID Headspace	
110.0	23 / 90%	2290 dpm Gross Alpha/Beta	MD54-05-58104
115.0	24 / 90%	2290 dpm Gross Alpha/Beta 0.0 ppm VOCs via PID Headspace	
120.0	25 / 85%	2850 dpm Gross Alpha/Beta	
125.0	26 / 95%	3080 dpm Gross Alpha/Beta 0.0 ppm VOCs via PID Headspace	
130.0	27 / 90%	2850 dpm Gross Alpha/Beta	
135.0	28 / 95%	2780 dpm Gross Alpha/Beta 0.0 ppm VOCs via PID Headspace	
140.0	29 / 95%	3480 dpm Gross Alpha/Beta	No Samples

Lithology

Lithology	Lithologic Unit
75.0 - 77.0 ft Tuff - Densely welded, white (7.5YR 8/1), dry. 15% quartz, 10% sanidine, 5% pumice, 3% lithics.	Qbt 1v(u) / Qbt 1v(c)
77.0 - 107.0 ft Tuff - Poorly welded, reddish yellow (5YR 7/6) to white (7.5YR 8/1), dry. 10% quartz, 5% sanidine, 5% pumice. Pumice are golden, crystalline, and fibrous.	Unit 1g Tshirege Member, Bandelier Tuff
107 - 107.5 ft Surge bed - coarse-grained quartz sand and sanidine crystals.	Qbtt
107.5 - 109.0 ft Pumice - reworked, angular to subangular, 50% coarse-grained quartz, 50% pumice fragments.	Cerro Toledo Interval
109.0 - 122.0 ft Interlayered coarse sand and silt with pumice clasts and pebbles.	Cerro Toledo Interval
122.0 - 176.0 ft Tuff - Nonwelded, pinkish white (2.5YR 8/2), dry. 5% quartz, 2% lithics, 5% pumice, 3% sanidine.	Otowi Member, Bandelier Tuff

Neutron: 0 CPS 300
Gamma: 0 CPS 300



Construction: ? ?

Notes: Slough in borehole from 144 - 177 ft prevents deeper geophysical measurements.

Borehole ID: 54-24385 **TA/OU:** 54/1148 **MDA:** G **Start Date / Time:** 2-16-05, 1500 **End Date / Time:** 2-18-05, 0931

Drilling Co.: Enviro-Drill Inc. **Drilling Equip. / Method:** CME 75 / Hollow Stem Auger **Driller:** Matt Cain **Geologist:** Kevin Reid, TerranearPMC

Sampling Method: Continuous 5 ft core barrel **Declination:** 90 degrees **Bearing:** na **TD:** 177 ft

Depth	Core Run # / Core Recovery %	Field Screening Results	Analytical Sample Number	Lithology	Graphic Log	Lithologic Unit	Neutron 0 CPS 300 / Gamma 0 CPS 300	Construction 7 7	Notes
	30 / 95%	3070 dpm Gross Alpha/Beta 0.8 ppm VOCs via PID Headspace				Otowi Member, Bandelier Tuff			
150.0	31 / 95%	2890 dpm Gross Alpha/Beta							
155.0	32 / 95%	3030 dpm Gross Alpha/Beta 1.1 ppm VOCs via PID Headspace							
160.0	33 / 95%	3030 dpm Gross Alpha/Beta							
165.0	34 / 95%	3580 dpm Gross Alpha/Beta							
170.0	35 / 90%	2920 dpm Gross Alpha/Beta							
175.0	36 / 60%	3790 dpm Gross Alpha/Beta 0.0 ppm VOCs via PID Headspace TNT/RDX - Nondetect	MD54-05-58109	176.0 - 177.0 ft Paleosol. Sandy clayey soil with reworked ash and basalt pebbles.		Paleosol			Refusal at 177 ft.
180.0									

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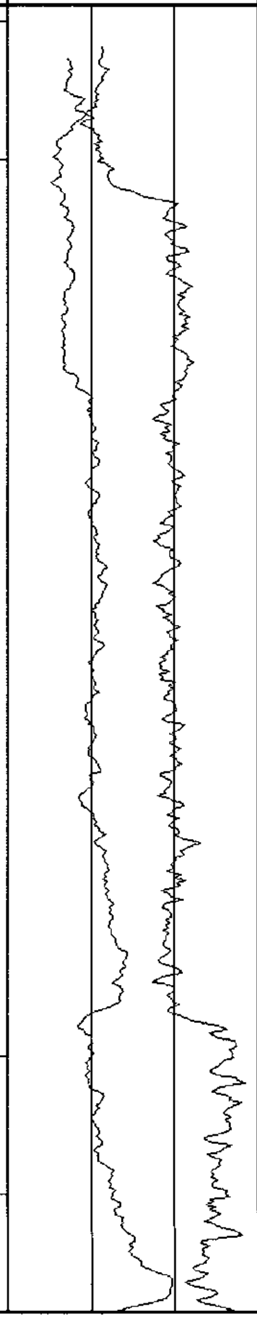
Environmental Characterization and Remediation
2004 - 2005 MDA G Environmental Characterization Drilling
Borehole Log

Borehole ID: 54-24386 **TA/OU:** 54/1148 **MDA:** G **Start Date / Time:** 2-18-05, 1425 **End Date / Time:** 2-23-05, 0955

Drilling Co.: Enviro-Drill Inc. **Drilling Equip. / Method:** CME 75 / Hollow Stem Auger **Driller:** Matt Cain **Geologist:** Pattie Baucom, Apogen

Sampling Method: Continuous 5 ft core barrel **Declination:** 90 degrees **Bearing:** na **TD:** 186 ft

Depth	Core Run # / Core Recovery %	Field Screening Results	Analytical Sample Number	Lithology	Lithologic Unit	Construction	Notes
0.0	1 / 20%	9020 dpm Gross Alpha/Beta	No Samples	Asphalt Cap 0.0 - 8.0 ft Fill - Sand, gravel, and crushed tuff, slightly moist.	Fill		Gross Alpha/Beta Background = 7570 dpm.
5.0	2 / 50%	8010 dpm Gross Alpha/Beta					14 in. OD HSA to 10 ft bgs. Set 10 in. casing to depth of 10 ft.
10.0	3 / 100%	9760 dpm Gross Alpha/Beta		8.0 - 59.0 ft Tuff - Moderately to densely welded, pinkish gray (5YR 7/2), dry. 15% quartz, 5% sanidine, 10% pumice. Pumice have a sugary texture and are large (up to 6 cm in diameter). Vertical fracture filled with fine-grained ash from 25 - 27 ft.	Unit 2 Tshirege Member, Bandelier Tuff		7 5/8 in OD HSA from 10 - 186.0 ft.
15.0	4 / 100%	9230 dpm Gross Alpha/Beta 385 ppm VOCs via PID Headspace					
20.0	5 / 100%	9580 dpm Gross Alpha/Beta					
25.0	6 / 95%	7780 dpm Gross Alpha/Beta 3.5 ppm VOCs via PID Headspace					
30.0	7 / 100%	7460 dpm Gross Alpha/Beta					
35.0	8 / 100%	8420 dpm Gross Alpha/Beta TNT/RDX - Nondetect	MD54-05-58116 MD54-05-58123(FD)				
40.0	9 / 100%	7820 dpm Gross Alpha/Beta	No Samples				
45.0	10 / 100%	7420 dpm Gross Alpha/Beta 1.7 ppm VOCs PID Headspace					
50.0	11 / 100%	7870 dpm Gross Alpha/Beta					
55.0	12 / 100%	8650 dpm Gross Alpha/Beta 0.0 ppm VOCs via PID Headspace	MD54-05-58117 MD54-05-58118	58.0 - 59.0 ft Vertical fracture filled with silt. 59.0 - 60.0 ft Surge bed - pumice rich, pinkish gray (7.5YR 7/2).			
60.0	13 / 100%	8860 dpm Gross Alpha/Beta		60.0 - 68.0 ft Tuff - Poorly welded, white (7.5YR 8/1) to pink (2.5YR 8/3), dry. 10% quartz, 15% pumice, 5% sanidine.	Qbt 1v(u)		
65.0	14 / 100%	7420 dpm Gross Alpha/Beta 5.0 ppm VOCs via PID Headspace					
70.0	15 / 100%	8720 dpm Gross Alpha/Beta		68 - 76.5 ft Tuff - Densely welded, light red (2.5YR 7/6), dry. 10% quartz, 5% lithics, 5% pumice.	Qbt 1v(c)		



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2004 - 2005 MDA G Environmental Characterization Drilling
Borehole Log

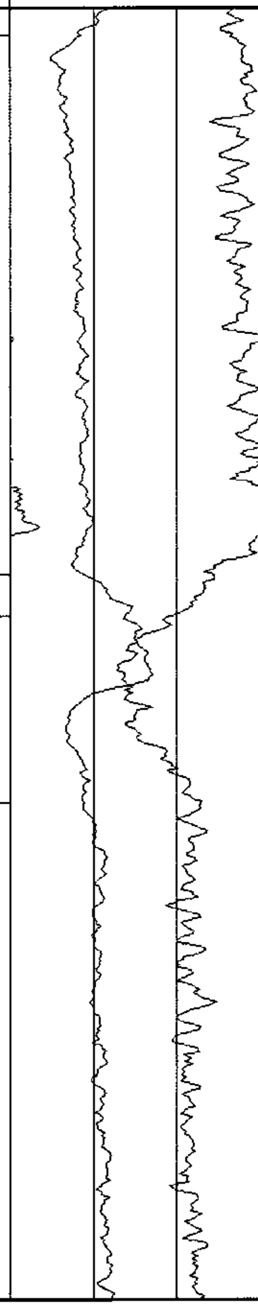
Borehole ID: 54-24386 **TA/OU:** 54/1148 **MDA:** G **Start Date / Time:** 2-18-05, 1425 **End Date / Time:** 2-23-05, 0955

Drilling Co.: Enviro-Drill Inc. **Drilling Equip. / Method:** CME 75 / Hollow Stem Auger **Driller:** Matt Cain **Geologist:** Pattie Baucom, Apogen

Sampling Method: Continuous 5 ft core barrel **Declination:** 90 degrees **Bearing:** na **TD:** 186 ft

Depth	Core Run # / Core Recovery %	Field Screening Results	Analytical Sample Number	Lithology	Lithologic Unit	Notes
	16 / 100%	8530 dpm Gross Alpha/Beta	No Samples	76.5 - 108.0 ft Tuff - Nonwelded, light reddish brown (2.5YR 7/4), pink (2.5YR 8/4) and pinkish white (7.5 YR 7/2), dry. 15% quartz, 5 % lithics, 5% mafic minerals, <5% sanidine, 10 - 15% pumice. Pumice are large (up to 5cm in diameter). Lithics are angular and range from 2 mm to 1 cm in diameter.	Unit 1g Tshirege Member, Bandelier Tuff	
80.0	17 / 100%	9930 dpm Gross Alpha/Beta				
85.0	18 / 80%	7550 dpm Gross Alpha/Beta 20.9 ppm VOCs via PID Headspace				
90.0	19 / 90%	10270 dpm Gross Alpha/Beta				
95.0	20 / 90%	8580 dpm Gross Alpha/Beta				
100.0	21 / 90%	8150 dpm Gross Alpha/Beta				
105.0	22 / 90%	7550 dpm Gross Alpha/Beta 3.3 ppm VOCs via PID Headspace		108.0 - 110.0 ft Pumice - reworked pumice and ash. 50% angular pumice, 30% ash, 15% quartz, 5% lithics.	Qbtt	
110.0	23 / 95%	11510 dpm Gross Alpha/Beta	MD54-05-58119	110.0 - 121.0 ft Interlayered silty sand, pebbly sand, and massive silt with pumice clasts.	Cerro Toledo Interval	
115.0	24 / 80%	7320 dpm Gross Alpha/Beta 0.0 ppm VOCs via PID Headspace	No Samples			
120.0	25 / 90%	9410 dpm Gross Alpha/Beta		121.0 - 182.5 ft Tuff - Nonwelded, pinkish white (7.5YR 8/2), dry. 10% quartz, 5% lithics, 5% mafic minerals, 10% pumice, 5% sanidine.	Otowi Member, Bandelier Tuff	
125.0	26 / 90%	9720 dpm Gross Alpha/Beta 0.0 ppm VOCs via PID Headspace				
130.0	27 / 95%	9440 dpm Gross Alpha/Beta				
135.0	28 / 95%	9680 dpm Gross Alpha/Beta 0.0 ppm VOCs via PID Headspace				
140.0	29 / 95%	9290 dpm Gross Alpha/Beta				Gross Alpha/Beta Background = 8490 dpm.
145.0	30 / 95%	8790 dpm Gross Alpha/Beta 1.5 ppm VOCs via PID Headspace	No Samples			

Neutron: 0 CPS 300 / Gamma: 0 CPS 300 — Construction: 7 7



Los Alamos National Laboratory
Environmental Characterization and Remediation
2004 - 2005 MDA G Environmental Characterization Drilling
Borehole Log

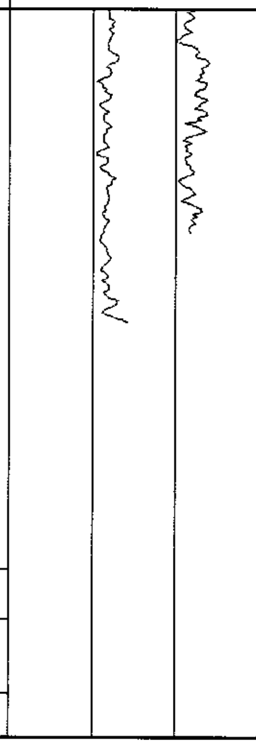
Borehole ID: 54-24386 **TA/OU:** 54/1148 **MDA:** G **Start Date / Time:** 2-18-05, 1425 **End Date / Time:** 2-23-05, 0955

Drilling Co.: Enviro-Drill Inc. **Drilling Equip. / Method:** CME 75 / Hollow Stem Auger **Driller:** Matt Cain **Geologist:** Pattie Baucom, Apogen

Sampling Method: Continuous 5 ft core barrel **Declination:** 90 degrees **Bearing:** na **TD:** 186 ft

Depth	Core Run # / Core Recovery %	Field Screening Results	Analytical Sample Number	Lithology	Lithologic Unit	Notes
155.0	31 / 95%	9590 dpm Gross Alpha/Beta			Otowi Member, Bandelier Tuff	
160.0	32 / 95%	9160 dpm Gross Alpha/Beta				
165.0	33 / 95%	9100 dpm Gross Alpha/Beta				Slough in borehole from 168 - 186 ft prevents deeper geophysical measurements.
170.0	34 / 90%	9050 dpm Gross Alpha/Beta 0.0 ppm VOCs via PID Headspace				
175.0	35 / 95%	9610 dpm Gross Alpha/Beta				
180.0	36 / 95%	8730 dpm Gross Alpha/Beta 0.0 ppm VOCs via PID Headspace				
185.0	37 / 90%	9330 dpm Gross Alpha/Beta		182.5 - 185.0 ft Pumice - angular to subangular, moderately well sorted, gravel-sized pumice.	Qbog	Refusal at 186 ft.
190.0	38 / 20%	9740 dpm Gross Alpha/Beta RDX/TNT - nondetect	MD54-05-58122	185.0 - 186.0 ft Paleosol - sandy clay with basalt clasts underlain by hard silty clay (siltstone?), dry.	Paleosol	

Graphic Log | Neutron (0 CPS 300) / Gamma (0 CPS 300) | Construction (? ?)



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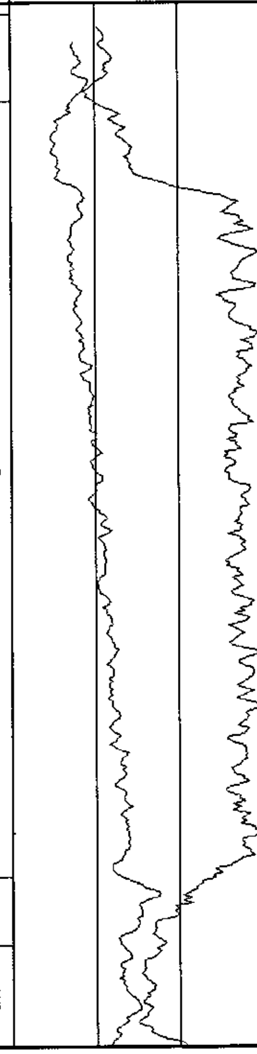
Environmental Characterization and Remediation
2004 - 2005 MDA G Environmental Characterization Drilling
Borehole Log

Borehole ID: 54-24387 **TA/OU:** 54/1148 **MDA:** G **Start Date / Time:** 5-23-05, 1035 **End Date / Time:** 5-24-05, 0954

Drilling Co.: Enviro-Drill Inc. **Drilling Equip. / Method:** CME 75 / Hollow Stem Auger **Driller:** Matt Cain **Geologist:** Pattie Baucom, Apogen

Sampling Method: Continuous 5 ft core barrel **Declination:** 90 degrees **Bearing:** na **TD:** 81.0 ft

Depth	Core Run # / Core Recovery %	Field Screening Results	Analytical Sample Number	Lithology	Graphic Log	Lithologic Unit	Neutron (0 CPS 300) / Gamma (0 CPS 300)	Construction (7 7)	Notes
0.0	Logged from cuttings	2730 dpm Gross Alpha/Beta	No Samples	0.0 - 5.0 ft Soil - organic rich silty sand with tuff clasts (Qbt 1v(c)), slightly damp.		Soil			Gross Alpha/Beta Background = 2090 dpm.
5.0	1 / 80%	3120 dpm Gross Alpha/Beta TNT/RDX - Nondetect	MD54-05-58124 MD54-05-58131(FD)	5.0 - 50.0 ft Tuff - Densely welded to nonwelded, pink (5YR 7/4) to white (5YR 8/1), dry. 10% quartz, 5 - 7% lithics, 20% pumice. Pumice are round and large (up to 3 cm in diameter). Lithics are large (up to 2.5 cm in diameter).		Qbt 1g			14 in OD HSA to 10 ft bgs. Set 10 in.casing to depth of 10 ft.
10.0	2 / 30%	2860 dpm Gross Alpha/Beta	No Samples						7 5/8 in OD HSA from 10 - 81.0 ft.
15.0	3 / 60%	3370 dpm Gross Alpha/Beta							
20.0	4 / 60%	2940 dpm Gross Alpha/Beta							
25.0	5 / 70%	3680 dpm Gross Alpha/Beta							
30.0	6 / 80%	3550 dpm Gross Alpha/Beta							
35.0	7 / 80%	3710 dpm Gross Alpha/Beta							
40.0	8 / 100%	3460 dpm Gross Alpha/Beta							
45.0	9 / 100%	3620 dpm Gross Alpha/Beta							
50.0	10 / 60%	3630 dpm Gross Alpha/Beta		50.0 - 54.0 ft Pumice, reworked. 50% pebble-sized pumice, 40% quartz, 10% volcanic lithics.		Qbtt			
55.0	11 / 50%	2440 dpm Gross Alpha/Beta		45.0 - 52.5 ft Interlayered silty sand, pumice layers, and poorly sorted pebbley silty sand, dry		Qct			



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Environmental Characterization and Remediation
2004 - 2005 MDA G Environmental Characterization Drilling
Borehole Log

Borehole ID: 54-24387 **TA/OU:** 54/1148 **MDA:** G **Start Date / Time:** 5-23-05, 1035 **End Date / Time:** 5-24-05, 0954

Drilling Co.: Enviro-Drill Inc. **Drilling Equip. / Method:** CME 75 / Hollow Stem Auger **Driller:** Matt Cain **Geologist:** Pattie Baucom, Apogen

Sampling Method: Continuous 5 ft core barrel **Declination:** 90 degrees **Bearing:** na **TD:** 81.0 ft

Depth	Core Run # / Core Recovery %	Field Screening Results	Analytical Sample Number	Lithology	Graphic Log	Lithologic Unit	Neutron (0 CPS 300) / Gamma (0 CPS 300)	Construction (7 7)	Notes
	12 / 90%	2880 dpm Gross Alpha/Beta		60.5 - 73.0 ft Tuff- Nonwelded, pinkish white (7.5YR 8/2), dry. 10% quartz, 5% lithics, 5% mafics, 15% pumice.		Qbo			Slough in borehole from 70 - 81 ft prevents deeper geophysical measurements.
65.0	13 / 95%	2800 dpm Gross Alpha/Beta							
70.0	14 / 95%	3150 dpm Gross Alpha/Beta							
75.0	15 / 95%	2780 dpm Gross Alpha/Beta		73.0 - 80.0 ft Pumice, reworked. 80% angular gravel-sized pumice, 10% ash and clay, 10% ash.		Qbog			
80.0	16 / 30%	2437 dpm Gross Alpha/Beta TNT/RDX - Nondetect	MD54-05-58130	80.0 - 81.0 ft Paleosol - brown silt with large pieces of basalt, damp, underlain by light tan silty clay, slightly damp.		Paleosol			Refusal at 81 ft.

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Environmental Characterization and Remediation
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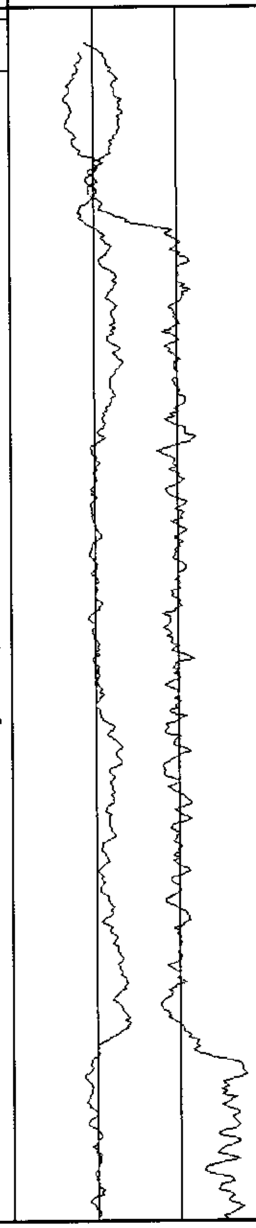
Borehole Log

Borehole ID: 54-24388 **TA/OU:** 54/1148 **MDA:** G **Start Date / Time:** 2-14-05, 1420 **End Date / Time:** 2-16-05, 1100

Drilling Co.: Enviro-Drill Inc. **Drilling Equip. / Method:** CME 75 / Hollow Stem Auger **Driller:** Matt Cain **Geologist:** Kevin Reid, TerranearPMC

Sampling Method: Continuous 5 ft core barrel **Declination:** 90 degrees **Bearing:** na **TD:** 181.0 ft

Depth	Core Run # / Core Recovery %	Field Screening Results	Analytical Sample Number	Lithology	Graphic Log	Lithologic Unit	Neutron (0 CPS 300) / Gamma (0 CPS 300)	Construction (7 7)	Notes
0.0	Logged from cuttings			0.0 - 3.0 ft Fill. Muddy sand with gravel.		Fill			
5.0				3.0 - 73.8 ft Tuff - Densely to moderately welded, light gray (7.5YR 7/1), dry. 10% quartz, 5% sanidine, 5% pumice. Pumice are large (up to 5cm in diameter).		Unit 2 Tshirege Member, Bandelier Tuff			14 in. OD HSA to 10 ft bgs. Set 10 in. casing to depth of 10 ft.
10.0	1 / 30%	3070 dpm Gross Alpha/Beta	No Samples						7 5/8 in OD HSA from 10 - 181 ft.
15.0	2 / 100%	3660 dpm Gross Alpha/Beta							
20.0	3 / 100%	3228 dpm Gross Alpha/Beta 0.0 ppm VOCs via PID Headspace							
25.0	4 / 100%	2850 dpm Gross Alpha/Beta TNT/RDX - Nondetect	MD54-05-58132 MD54-05-58139(FD)						
30.0	5 / 100%	2750 dpm Gross Alpha/Beta 0.0 ppm VOCs via PID Headspace							
35.0	6 / 100%	3150 dpm Gross Alpha/Beta							
40.0	7 / 100%	3310 dpm Gross Alpha/Beta 0.0 ppm VOCs via PID Headspace							
45.0	8 / 100%	3600 dpm Gross Alpha/Beta	No Samples						
50.0	9 / 100%	3380 dpm Gross Alpha/Beta 0.0 ppm VOCs via PID Headspace							
55.0	10 / 100%	3010 dpm Gross Alpha/Beta							
60.0	11 / 100%	2800 dpm Gross Alpha/Beta 0.0 ppm VOCs via PID Headspace	MD54-05-58133						
65.0	12 / 100%	3650 dpm Gross Alpha/Beta							



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2004 - 2005 MDA G Environmental Characterization Drilling
Borehole Log

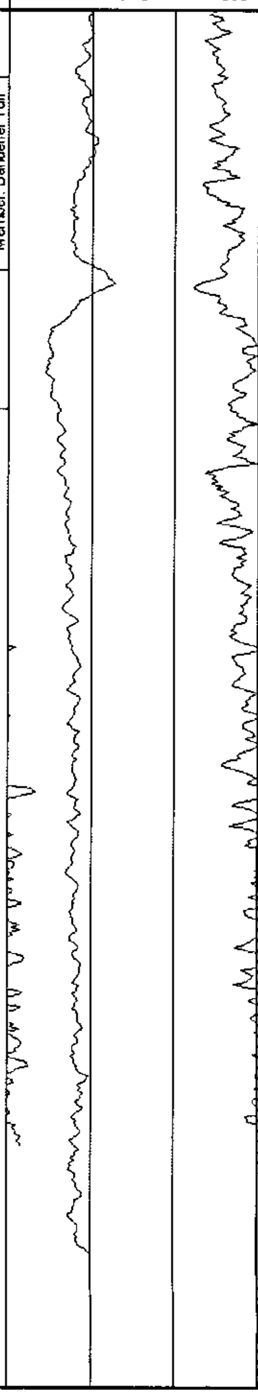
Borehole ID: 54-24388 **TA/OU:** 54/1148 **MDA:** G **Start Date / Time:** 2-14-05, 1420 **End Date / Time:** 2-16-05, 1100

Drilling Co.: Enviro-Drill Inc. **Drilling Equip. / Method:** CME 75 / Hollow Stem Auger **Driller:** Matt Cain **Geologist:** Kevin Reid, TerranearPMC

Sampling Method: Continuous 5 ft core barrel **Declination:** 90 degrees **Bearing:** na **TD:** 181.0 ft

Depth	Core Run # / Core Recovery %	Field Screening Results	Analytical Sample Number	Lithology	Lithologic Unit
	13 / 100%	2850 dpm Gross Alpha/Beta 0.0 ppm VOCs via PID Headspace	No Samples		
75.0	14 / 75%	3300 dpm Gross Alpha/Beta		73.8 - 85.0 ft Tuff- Moderately welded, pinkish white (2.5YR 8/2) to white (2.5YR 8/1), dry. 15% quartz, 10% sanidine, 5% pumice, 3% lithics.	Unit 1v(u) Tshirege Member, Bandelier Tuff
80.0	15 / 100%	3250 dpm Gross Alpha/Beta 0.0 ppm VOCs via PID Headspace			
85.0	16 / 100%	3360 dpm Gross Alpha/Beta		85.0 - 93.0 ft Tuff- Moderately welded to densely welded, white (2.5 YR 8/1), dry. 15% quartz, 10% sanidine, 5% pumice, 5% lithics.	Qbt 1v(c)
90.0	17 / 100%	2980 dpm Gross Alpha/Beta 0.0 ppm VOCs via PID Headspace			
95.0	18 / 90%	3280 dpm Gross Alpha/Beta		93.0 - 154.0 ft Tuff- nonwelded, light reddish brown (2.5 YR 6/4) to white (7.5 YR 7/1), dry. 10% quartz, 5% sanidine, 5% pumice, 3% lithics Pumice are large (up to 6 cm in diameter).	Unit 1g Tshirege Member, Bandelier Tuff
100.0	19 / 85%	3360 dpm Gross Alpha/Beta 0.0 ppm VOCs via PID Headspace			
105.0	20 / 80%	2380 dpm Gross Alpha/Beta			
110.0	21 / 85%	3290 dpm Gross Alpha/Beta			
115.0	22 / 80%	3010 dpm Gross Alpha/Beta			
120.0	23 / 95%	3440 dpm Gross Alpha/Beta 0.0 ppm VOCs via PID Headspace			
125.0	24 / 90%	3220 dpm Gross Alpha/Beta			
130.0	25 / 95%	3250 dpm Gross Alpha/Beta 85.0 ppm VOCs via PID Headspace	MD54-05-58134		
135.0	26 / 90%	3780 dpm Gross Alpha/Beta 0.0 ppm VOCs via PID Headspace	No Samples		
140.0	27 / 95%	3840 dpm Gross Alpha/Beta 0.0 ppm VOCs via PID Headspace			
145.0	28 / 95%	3230 dpm Gross Alpha/Beta 0.0 ppm VOCs via PID Headspace			

Neutron: 0 CPS 300 · Gamma: 0 CPS 300 · Construction: 7 7 · Notes



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Environmental Characterization and Remediation
2004 - 2005 MDA G Environmental Characterization Drilling
Borehole Log

Borehole ID: 54-24388 **TA/OU:** 54/1148 **MDA:** G **Start Date / Time:** 2-14-05, 1420 **End Date / Time:** 2-16-05, 1100

Drilling Co.: Enviro-Drill Inc. **Drilling Equip. / Method:** CME 75 / Hollow Stem Auger **Driller:** Matt Cain **Geologist:** Kevin Reid, TerranearPMC

Sampling Method: Continuous 5 ft core barrel **Declination:** 90 degrees **Bearing:** na **TD:** 181.0 ft

Depth	Core Run # / Core Recovery %	Field Screening Results	Analytical Sample Number	Lithology	Graphic Log	Lithologic Unit	Neutron 0 CPS 300 / Gamma 0 CPS 300	Construction 7 7	Notes
	29 / 95%	2890 dpm Gross Alpha/Beta 0.0 ppm VOCs via PID Headspace							Slough in borehole from 142 - 181 ft prevents deeper geophysical measurements.
155.0	30 / 95%	2980 dpm Gross Alpha/Beta	MD54-05-58135	154.0 - 180.0 ft Interlayered coarse-grained sand and sandy clay with pumice layers and lithic clasts.		Cerro Toledo			
160.0	31 / 85%	2750 dpm Gross Alpha/Beta 0.0 ppm VOCs via PID Headspace	No Samples						
165.0	32 / 100%	3020 dpm Gross Alpha/Beta							
170.0	33 / 90%	3560 dpm Gross Alpha/Beta 0.0 ppm VOCs via PID Headspace							
175.0	34 / 90%	3010 dpm Gross Alpha/Beta	MD54-05-58138	180.0 - 181.0 ft Paleosol. Sandy clay with basalt fragments and basalt cobbles.		Paleosol			
180.0	35 /20%	2180 dpm Gross Alpha/Beta 0.0 ppm VOCs via PID Headspace TNT/RDX - Nondetect							Refusal at 181 ft.

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Environmental Characterization and Remediation
2004 - 2005 MDA G Environmental Characterization Drilling
Borehole Log

Borehole ID: 54-24389 **TA/OU:** 54/1148 **MDA:** G **Start Date / Time:** 3-8-05, 1500 **End Date / Time:** 3-10-05, 1140

Drilling Co.: Enviro-Drill Inc. **Drilling Equip. / Method:** CME 75 / Hollow Stem Auger **Driller:** Matt Cain **Geologist:** Pattie Baucom, Apogen

Sampling Method: Continuous 5 ft core barrel **Declination:** 90 degrees **Bearing:** na **TD:** 200 ft

Depth	Core Run # / Core Recovery %	Field Screening Results	Analytical Sample Number
0.0	Logged from cuttings	2860 dpm Gross Alpha/Beta	No Samples
10.0	1 / 100%	3040 dpm Gross Alpha/Beta	No Samples
15.0	2 / 100%	3130 dpm Gross Alpha/Beta	No Samples
20.0	3 / 100%	3530 dpm Gross Alpha/Beta; 0.0 ppm VOCs via PID Headspace; TNT/RDX - Nondetect	MD54-05-58140; MD54-05-58147(FD)
25.0	4 / 100%	2840 dpm Gross Alpha/Beta	
30.0	5 / 100%	2980 dpm Gross Alpha/Beta; 0.0 ppm VOCs via PID Headspace	
35.0	6 / 100%	3070 dpm Gross Alpha/Beta	
40.0	7 / 100%	2800 dpm Gross Alpha/Beta; 0.0 ppm VOCs via PID Headspace	
45.0	8 / 100%	2880 dpm Gross Alpha/Beta	
50.0	9 / 100%	2730 dpm Gross Alpha/Beta	
55.0	10 / 100%	2870 dpm Gross Alpha/Beta; 0.0 ppm VOCs via PID Headspace	
60.0	11 / 100%	2810 dpm Gross Alpha/Beta; 0.0 ppm VOCs via PID Headspace	
65.0	12 / 100%	3040 dpm Gross Alpha/Beta	
70.0	13 / 100%	3200 dpm Gross Alpha/Beta; 0.0 ppm VOCs via PID	

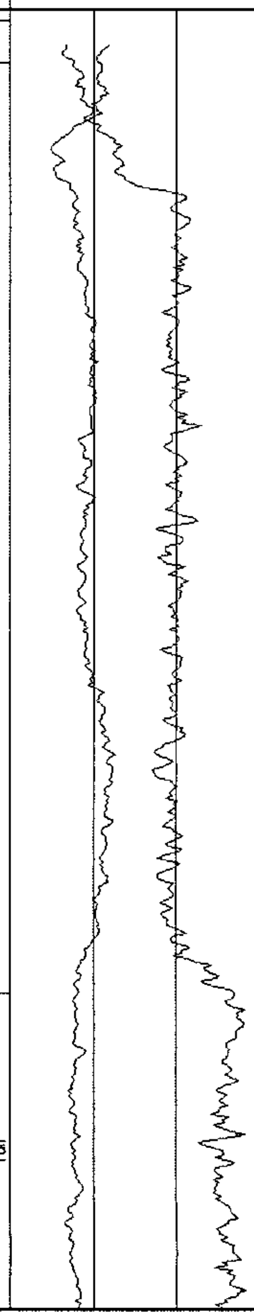
Lithology

Interval	Lithology	Lithologic Unit
0.0 - 2.5 ft	Soil - Sandy soil with roots.	Soil
5.0 - 56.5 ft	Tuff - Densely welded, pinkish gray (7.5YR 7/2), dry. 15% quartz, 5% sanidine, 15% pumice.	Unit 2 Tshirege Member, Bandelier Tuff
56.5 - 80.0 ft	Tuff - Poorly welded, white (7.5YR 8/1), dry. 10% quartz, 5% sanidine, 15-20% pumice. Pumice are dark purple and brittle.	Unit 1v(U) Tshirege Member, Bandelier Tuff

Graphic Log

Neutron: 0 CPS 300

Gamma: 0 CPS 300



Construction: 7 7

Notes

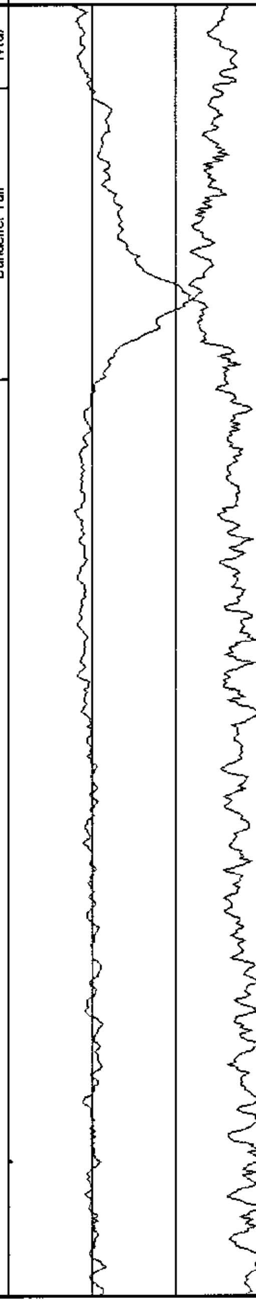
- Gross Alpha/Beta Background = 2860 dpm.
- 14 in. OD HSA to 10 ft bgs. Set 10 in. casing to depth of 10 ft.
- 7 5/8 in OD HSA from 10 - 200 ft.

Borehole ID: 54-24389 **TA/OU:** 54/1148 **MDA:** G **Start Date / Time:** 3-8-05, 1500 **End Date / Time:** 3-10-05, 1140

Drilling Co.: Enviro-Drill Inc. **Drilling Equip. / Method:** CME 75 / Hollow Stem Auger **Driller:** Matt Cain **Geologist:** Pattie Baucom, Apogen

Sampling Method: Continuous 5 ft core barrel **Declination:** 90 degrees **Bearing:** na **TD:** 200 ft

Depth	Core Run # / Core Recovery %	Field Screening Results	Analytical Sample Number	Lithology	Graphic Log	Lithologic Unit	Neutron (0 CPS 300) / Gamma (0 CPS 300)	Construction	Notes
	14 / 100%	3370 dpm Gross Alpha/Beta	No Samples			Qbt 1v(u)			
80.0	15 / 100%	2840 dpm Gross Alpha/Beta 0.0 ppm VOCs via PID Headspace		80.0 - 96.5 ft Tuff - Densely welded, pink (5YR 7/4 to 5YR 7/3), dry. 10% quartz, 5% sanidine, 10% pumice, 5% lithics.		Unit 1v(c) Tshirege Member, Bandelier Tuff			
85.0	16 / 100%	2790 dpm Gross Alpha/Beta							
90.0	17 / 100%	2770 dpm Gross Alpha/Beta 0.0 ppm VOCs via PID Headspace							
95.0	18 / 100%	2610 dpm Gross Alpha/Beta		96.5 - 168.0 ft Tuff - Poorly welded to nonwelded, pink (5YR 7/3) to white (5YR 8/1), dry. 15% quartz, 7% sanidine, 5% lithics, 15% pumice. Pumice are round and large (up to 7 cm in diameter). Lithics (mostly dacite clasts) are angular and large (up to 5 cm in diameter).		Unit 1g Tshirege Member, Bandelier Tuff			
100.0	19 / 95%	2880 dpm Gross Alpha/Beta 0.0 ppm VOCs via PID Headspace							
105.0	20 / 95%	3660 dpm Gross Alpha/Beta							
110.0	21 / 95%	3120 dpm Gross Alpha/Beta 0.0 ppm VOCs via PID Headspace							
115.0	22 / 95%	2670 dpm Gross Alpha/Beta							
120.0	23 / 95%	3560 dpm Gross Alpha/Beta							
125.0	24 / 95%	3780 dpm Gross Alpha/Beta							
130.0	25 / 95%	2860 dpm Gross Alpha/Beta 0.0 ppm VOCs via PID Headspace							
135.0	26 / 95%	3040 dpm Gross Alpha/Beta							
140.0	27 / 95%	3530 dpm Gross Alpha/Beta 0.0 ppm VOCs via PID Headspace							
145.0	28 / 95%	2650 dpm Gross Alpha/Beta							Gross Alpha/Beta Background = 2940 dpm.



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Environmental Characterization and Remediation
2004 - 2005 MDA G Environmental Characterization Drilling
Borehole Log

Borehole ID: 54-24389 **TA/OU:** 54/1148 **MDA:** G **Start Date / Time:** 3-8-05, 1500 **End Date / Time:** 3-10-05, 1140

Drilling Co.: Enviro-Drill Inc. **Drilling Equip. / Method:** CME 75 / Hollow Stem Auger **Driller:** Matt Cain **Geologist:** Pattie Baucom, Apogen

Sampling Method: Continuous 5 ft core barrel **Declination:** 90 degrees **Bearing:** na **TD:** 200 ft

Depth	Core Run # / Core Recovery %	Field Screening Results	Analytical Sample Number	Lithology	Graphic Log	Lithologic Unit	Neutron 0 CPS 300 / Gamma 0 CPS 300	Construction 7 7	Notes
	29 / 95%	3110 dpm Gross Alpha/Beta 0.0 ppm VOCs via PID Headspace							
155.0	30 / 95%	2890 dpm Gross Alpha/Beta							Slough in borehole from 182 - 200 ft prevents deeper geophysical measurements.
160.0	31 / 95%	3060 dpm Gross Alpha/Beta 0.0 ppm VOCs via PID Headspace							
165.0	32 / 95%	3390 dpm Gross Alpha/Beta		168.0 - 169.5 ft Pumice - reworked. 50% poorly sorted, angular pumice clasts, 40% coarse-grained quartz sand, 10% ash.		Qbtt			
170.0	33 / 95%	2820 dpm Gross Alpha/Beta 0.0 ppm VOCs via PID Headspace	MD54-05-58141	169.5 - 189.0 ft Interlayered fine to coarse-grained silty sand, pebble layers, gravel beds, and well sorted very fine-grained sand, slightly damp. Large basalt cobble (8cm in diameter) at 189.0 ft.		Cerro Toledo Interval			
175.0	34 / 95%	2750 dpm Gross Alpha/Beta	No Samples						
180.0	35 / 95%	2530 dpm Gross Alpha/Beta							
185.0	36 / 90%	2700 dpm Gross Alpha/Beta 0.0 ppm VOCs via PID Headspace							
190.0	37 / 95%	2860 dpm Gross Alpha/Beta		189.0 - 200.0 ft Tuff - Nonwelded, pink (5YR 8/3), dry. 10% quartz, 10% lithics, 5% mafics, 15% pumice.		Otowi Member, Bandelier Tuff			
195.0	38 / 95%	2770 dpm Gross Alpha/Beta 0.0 ppm VOCs via PID Headspace TNT/RDX - Nondetect	MD54-05-58146						TD - 200.0 ft.
200.0									

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Borehole Log

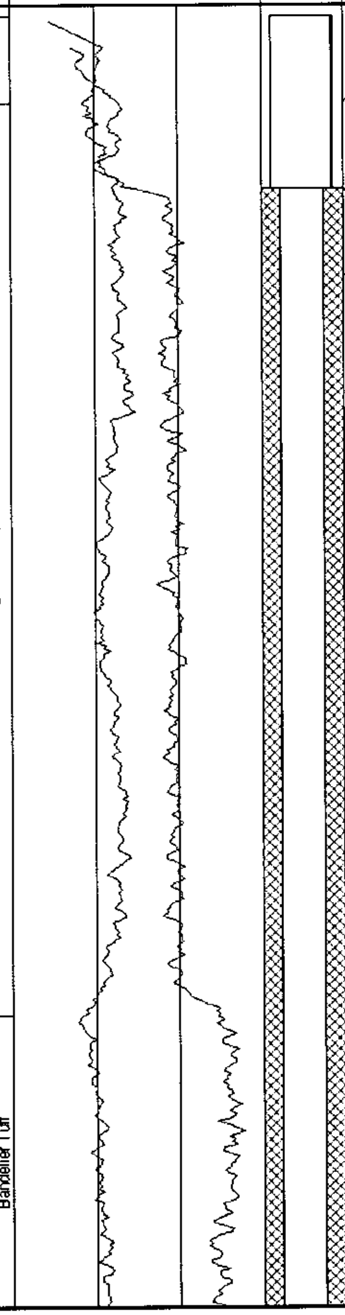
Borehole ID: 54-24390 **TA/OU:** 54/1148 **MDA:** G **Start Date / Time:** 2-23-05, 1426 **End Date / Time:** 2-25-05, 1355

Drilling Co.: Enviro-Drill Inc. **Drilling Equip. / Method:** CME 75 / Hollow Stem Auger **Driller:** Matt Cain **Geologist:** Pattie Baucom, Apogen

Sampling Method: Continuous 5 ft core barrel **Declination:** 90 degrees **Bearing:** na **TD:** 186 ft

Depth	Core Run # / Core Recovery %	Field Screening Results	Analytical Sample Number	Lithology	Lithologic Unit	Notes
0.0	Logged from cuttings	1786 dpm Gross Alpha/Beta	No Samples	0.0 - 5.0 ft Fill - Silty sand with pebbles.	Fill	Gross Alpha/Beta Background = 1786 dpm.
5.0				5.0 - 30.0 ft Tuff - Densely welded, light gray (7.5YR 7/1), dry. 15% quartz, 5% sanidine, 15% pumice. Pumice are large (up to 4 cm in diameter).	Unit 2 Tshirege Member, Bandelier Tuff	14 in. OD HSA to 10 ft bgs. Set 10 in. casing to depth of 10 ft.
10.0	1 / 80%	2630 dpm Gross Alpha/Beta				7 5/8 in OD HSA from 10 - 186 ft.
15.0	2 / 100%	2780 dpm Gross Alpha/Beta 0.0 ppm VOCs via PID Headspace				
20.0	3 / 100%	2745 dpm Gross Alpha/Beta				
25.0	4 / 100%	3850 dpm Gross Alpha/Beta				
30.0	5 / 100%	2570 dpm Gross Alpha/Beta TNT/RDX - Nondetect	MD54-05-58148 MD54-05-58155(FD)	30.0 - 58.0 ft Tuff - SAA. Color change to pale red (2.5 YR 7/2). Clay and root filled fracture from 56 - 57 ft.		
35.0	6 / 100%	3040 dpm Gross Alpha/Beta 0.0 ppm VOCs via PID Headspace	No Samples			
40.0	7 / 100%	2860 dpm Gross Alpha/Beta				
45.0	8 / 100%	2790 dpm Gross Alpha/Beta 0.0 ppm VOCs via PID Headspace				
50.0	9 / 100%	2730 dpm Gross Alpha/Beta				
55.0	10 / 95%	3130 dpm Gross Alpha/Beta 0.0 ppm VOCs via PID Headspace	MD54-05-58149			
58.0			No Samples	58.0 - 90.0 ft Tuff - Poorly welded to moderately welded, light reddish gray (2.5 YR 7/1), dry. 15% quartz, 5% sanidine, 15-20% pumice, lithics 5%.	Unit 1v(u) Tshirege Member, Bandelier Tuff	
60.0	11 / 100%	3960 dpm Gross Alpha/Beta				
65.0	12 / 100%	3990 dpm Gross Alpha/Beta 0.2 ppm VOCs via PID Headspace				
70.0	13 / 100%	3510 dpm Gross Alpha/Beta				

Neutron: 0 CPS 300
Gamma: 0 CPS 300



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Environmental Characterization and Remediation
2004 - 2005 MDA G Environmental Characterization Drilling
Borehole Log

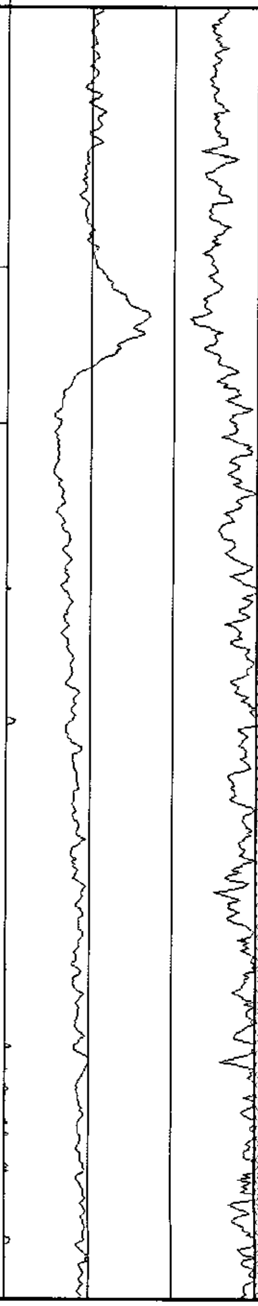
Borehole ID: 54-24390 **TA/OU:** 54/1148 **MDA:** G **Start Date / Time:** 2-23-05, 1426 **End Date / Time:** 2-25-05, 1355

Drilling Co.: Enviro-Drill Inc. **Drilling Equip. / Method:** CME 75 / Hollow Stem Auger **Driller:** Matt Cain **Geologist:** Pattie Baucom, Apogen

Sampling Method: Continuous 5 ft core barrel **Declination:** 90 degrees **Bearing:** na **TD:** 200 ft

Depth	Core Run # / Core Recovery %	Field Screening Results	Analytical Sample Number	Lithology	Lithologic Unit	Notes
	14 / 100%	3630 dpm Gross Alpha/Beta 0.1 ppm VOCs vis PID Headspace	No Samples		Qbt 1v(u)	
80.0	15 / 100%	2810 dpm Gross Alpha/Beta				
85.0	16 / 100%	3220 dpm Gross Alpha/Beta 0.0 ppm VOCs via PID Headspace				
90.0	17 / 100%	4550 dpm Gross Alpha/Beta	MD54-05-58150	90.0 - 99.0 ft Tuff- Densely welded, pink (5YR 7/4 to 5YR 7/3), dry. 15% quartz, 5% sanidine, 10% pumice, 5% lithics. Clay filled fracture from 94 - 95 ft.	Qbt 1v(c)	
95.0	18 / 100%	5430 dpm Gross Alpha/Beta 0.0 ppm VOCs via PID Headspace	MD54-05-58151			Gross Alpha/Beta Background = 1970 dpm.
100.0	19 / 100%	3150 dpm Gross Alpha/Beta		99.0 - 177.0 ft Tuff- Moderately welded to poorly welded, pink (5YR 7/3) and light reddish brown (2.5 YR 7/3) to white (5YR 8/1), dry. 10% quartz, 5% sanidine, 7 -10% lithics, 15% pumice. Pumice are round and large (up to 3 cm in diameter). Lithics (mostly dacite clasts) are angular and range in diameter from 2 mm to 1 cm.	Unit 1g Tshirege Member, Bandelier Tuff	
105.0	20 / 85%	3290 dpm Gross Alpha/Beta				
110.0	21 / 85%	3030 dpm Gross Alpha/Beta				
115.0	22 / 85%	3250 dpm Gross Alpha/Beta				
120.0	23 / 80%	3750 dpm Gross Alpha/Beta				
125.0	24 / 85%	3040 dpm Gross Alpha/Beta 0.0 ppm VOCs via PID Headspace				
130.0	25 / 85%	3370 dpm Gross Alpha/Beta				
135.0	26 / 85%	3130 dpm Gross Alpha/Beta 0.0 ppm VOCs via PID Headspace				
140.0	27 / 90%	3350 dpm Gross Alpha/Beta	No Samples			
145.0	28 / 85%	3100 dpm Gross Alpha/Beta				

Neutron: 0 CPS 300
Gamma: 0 CPS 300
Construction: 7 7



Los Alamos National Laboratory
Environmental Characterization and Remediation
2004 - 2005 MDA G Environmental Characterization Drilling
Borehole Log

Borehole ID: 54-24390 **TA/OU:** 54/1148 **MDA:** G **Start Date / Time:** 2-23-05, 1426 **End Date / Time:** 2-25-05, 1355

Drilling Co.: Enviro-Drill Inc. **Drilling Equip. / Method:** CME 75 / Hollow Stem Auger **Driller:** Matt Cain **Geologist:** Pattie Baucom, Apogen

Sampling Method: Continuous 5 ft core barrel **Declination:** 90 degrees **Bearing:** na **TD:** 200 ft

Depth	Core Run # / Core Recovery %	Field Screening Results	Analytical Sample Number	Lithology	Graphic Log	Lithologic Unit	Neutron 0 CPS 300 / Gamma 0 CPS 300	Construction ? ?	Notes
	29 / 85%	3070 dpm Gross Alpha/Beta							
155.0	30 / 90%	2970 dpm Gross Alpha/Beta							
160.0	31 / 90%	3570 dpm Gross Alpha/Beta							
165.0	32 / 100%	3380 dpm Gross Alpha/Beta							Slough in borehole from 175 - 186 ft prevents deeper geophysical measurements.
170.0	33 / 100%	3150 dpm Gross Alpha/Beta		177.0 - 178.0 ft Pumice - reworked. 50% poorly sorted, angular pumice clasts, 40% coarse-grained quartz sand, 10% ash.		Qbtt			
175.0	34 / 100%	3090 dpm Gross Alpha/Beta		178.0 - 185.0 ft Interlayered fine to coarse-grained silty sand and massive silt with pumice clasts.		Qct			
180.0	35 / 100%	3560 dpm Gross Alpha/Beta							TD - Refusal at 186 ft.
185.0	36 / 10%	2700 dpm Gross Alpha/Beta 0.0 ppm VOCs via PID Headspace TNT/RDX - Nondetect	MD54-05-58154	185.0 - 186.0 ft Paleosol. Silty sandy with fragments of basalt (up to 8 cm) underlain by white to tan colored silty clay (chert ?).		Paleosol			
190.0									

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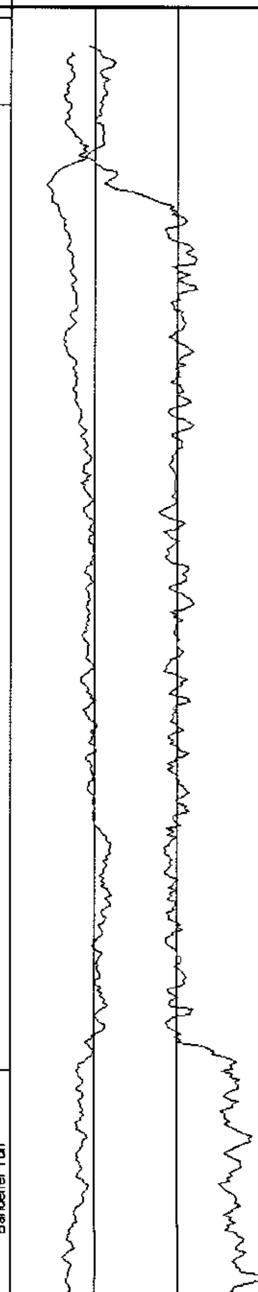
Borehole Log

Borehole ID: 54-24391	**TA/OU:** 54/1148	**MDA:** G	**Start Date / Time:** 3-3-05, 1526
End Date / Time: 3-8-05, 0919	**Drilling Co.:** Enviro-Drill Inc.	**Drilling Equip. / Method:** CME 75 / Hollow Stem Auger	**Driller:** Matt Cain
Geologist: Pattie Baucom, Apogen	**Sampling Method:** Continuous 5 ft core barrel	**Declination:** 90 degrees	**Bearing:** na
TD: 200 ft			

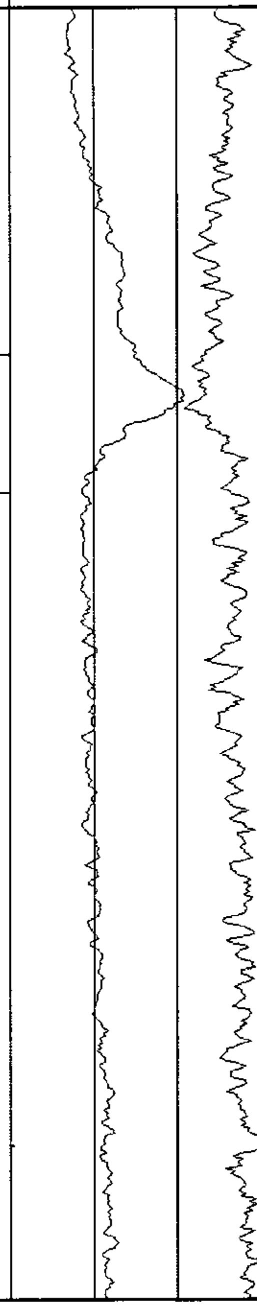
Depth	Core Run # / Core Recovery %	Field Screening Results	Analytical Sample Number	Lithology	Graphic Log	Lithologic Unit	Neutron 0 CPS 300 / Gamma 0 CPS 300	Construction 7 7	Notes
0.0	Core Logged from Cuttings	2850 dpm Gross Alpha/Beta	No Samples	0.0 - 5.0 ft Soil - Sand with pebbles, moist.		Soil			Gross Alpha/Beta Background = 2850 dpm.
5.0				5.0 - 61.0 ft Tuff - Densely welded, white (7.5YR 8/1), dry. 15% quartz, 5% sanidine, 15% pumice.		Unit 2 Tshirege Member, Bandelier Tuff			14 in. OD HSA to 10 ft bgs. Set 10 in. casing to depth of 10 ft.
10.0	1 / 100%	2010 dpm Gross Alpha/Beta							7 5/8 in OD HSA from 10 - 200 ft.
15.0	2 / 100%	2690 dpm Gross Alpha/Beta 316 ppm VOCs via PID Headspace							
20.0	3 / 100%	2790 dpm Gross Alpha/Beta							
25.0	4 / 100%	2840 dpm Gross Alpha/Beta TNT/RDX - Nondetect	MD54-05-58161 MD54-05-58168(FD)						
30.0	5 / 100%	2310 dpm Gross Alpha/Beta 28.7 ppm VOCs via PID Headspace							
35.0	6 / 100%	2260 dpm Gross Alpha/Beta							
40.0	7 / 100%	2360 dpm Gross Alpha/Beta 25.7 ppm VOCs via PID Headspace							
45.0	8 / 100%	2900 dpm Gross Alpha/Beta 8.0 ppm VOCs via PID Headspace							
50.0	9 / 100%	2790 dpm Gross Alpha/Beta							
55.0	10 / 100%	2450 dpm Gross Alpha/Beta 4.6 ppm VOCs via PID Headspace							
60.0	11 / 100%	2930 dpm Gross Alpha/Beta		61.0 - 95.0 ft Tuff - Poorly welded, white (7.5YR 7/1), dry. 15% quartz, 5% sanidine, 15% pumice. Pumice are dark purple, brittle, and large (up to 6 cm in diameter).		Unit 1v(u) Tshirege Member, Bandelier Tuff			
65.0	12 / 100%	2640 dpm Gross Alpha/Beta 1.4 ppm VOCs via PID Headspace							
70.0	13 / 100%	2520 dpm Gross Alpha/Beta							

Borehole ID: 54-24391 **TA/OU:** 54/1148 **MDA:** G **Start Date / Time:** 3-3-05, 1526 **End Date / Time:** 3-8-05, 0919

Drilling Co.: Enviro-Drill Inc. **Drilling Equip. / Method:** CME 75 / Hollow Stem Auger **Driller:** Matt Cain **Geologist:** Pattie Baucom, Apogen

Sampling Method: Continuous 5 ft core barrel **Declination:** 90 degrees **Bearing:** na **TD:** 200 ft

Depth	Core Run # / Core Recovery %	Field Screening Results	Analytical Sample Number	Lithology	Graphic Log	Lithologic Unit	Neutron (0 CPS 300) / Gamma (0 CPS 300)	Construction	Notes
	14 / 100%	2910 dpm Gross Alpha/Beta 0.0 ppm VOCs via PID Headspace				Qbt 1v(u)			
80.0	15 / 100%	2370 dpm Gross Alpha/Beta							
85.0	16 / 100%	2510 dpm Gross Alpha/Beta 0.0 ppm VOCs via PID Headspace							
90.0	17 / 100%	2940 dpm Gross Alpha/Beta							
95.0	18 / 100%	2950 dpm Gross Alpha/Beta 0.0 ppm VOCs via PID Headspace		95.0 - 103.0 ft Tuff- Densely welded, pinkish white (2.5YR 8/2), dry. 10% quartz, 15% pumice, 5% lithics, 5% sanidine.		Qbt 1v(c)			
100.0	19 / 100%	2510 dpm Gross Alpha/Beta							
105.0	20 / 100%	2890 dpm Gross Alpha/Beta 0.0 ppm VOCs via PID Headspace		103.0 - 158.5 ft Tuff- Poorly welded, light red (2.5YR 7/6) to white (2.5YR 8/1), dry. 15% quartz, 15% pumice, 5% sanidine, 5% lithics. Pumice are large (up to 4 cm in diameter).		Unit 1g Tshirege Member, Bandelier Tuff			
110.0	21 / 95%	3590 dpm Gross Alpha/Beta							
115.0	22 / 95%	2790 dpm Gross Alpha/Beta 0.0 ppm VOCs via PID Headspace	No Samples						
120.0	23 / 90%	2930 dpm Gross Alpha/Beta							
125.0	24 / 90%	2850 dpm Gross Alpha/Beta 0.0 ppm VOCs via PID Headspace							
130.0	25 / 95%	2650 dpm Gross Alpha/Beta							
135.0	26 / 95%	2700 dpm Gross Alpha/Beta 0.0 ppm VOCs via PID Headspace							
140.0	27 / 95%	2880 dpm Gross Alpha/Beta							
145.0	28 / 95%	2850 dpm Gross Alpha/Beta 0.0 ppm VOCs via PID Headspace							



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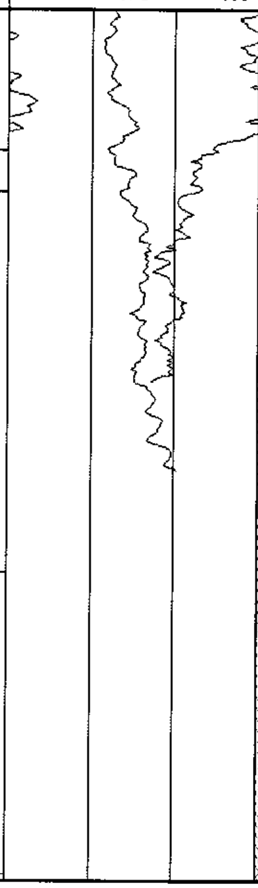
Borehole Log

Borehole ID: 54-24391 **TA/OU:** 54/1148 **MDA:** G **Start Date / Time:** 3-3-05, 1526 **End Date / Time:** 3-8-05, 0919

Drilling Co.: Enviro-Drill Inc. **Drilling Equip. / Method:** CME 75 / Hollow Stem Auger **Driller:** Matt Cain **Geologist:** Pattie Baucom, Apogen

Sampling Method: Continuous 5 ft core barrel **Declination:** 90 degrees **Bearing:** na **TD:** 200 ft

Depth	Core Run # / Core Recovery %	Field Screening Results	Analytical Sample Number	Lithology	Graphic Log	Lithologic Unit	Neutron 0 CPS 300 / Gamma 0 CPS 300	Construction 7 7	Notes
	29 / 95%	3030 dpm Gross Alpha/Beta				Qbt 1g			
155.0	30 / 95%	3190 dpm Gross Alpha/Beta 0.8 ppm VOC via PID Heaspace		158.5 - 160.0 ft Pumice, reworked. 50% angular to subangular pumice, 50% quartz crystals.		Qbtt			
160.0	31 / 95%	2950 dpm Gross Alpha/Beta		160.0 - 182.5 ft Interlayered fine to medium-grained sand and coarse sand. Pumice fragments are present throughout.		Cerro Toledo Interval			
165.0	32 / 95%	2490 dpm Gross Alpha/Beta 0.4 ppm VOCs via PID Headspace							Slough in borehole from 176 - 206 ft prevents deeper geophysical measurements.
170.0	33 / 95%	3060 dpm Gross Alpha/Beta							Gross Alpha/Beta Background = 2640 dpm.
175.0	34 / 95%	2780 dpm Gross Alpha/Beta 0.4 ppm VOCs via PID Headspace							
180.0	35 / 90%	2710 dpm Gross Alpha/Beta		182.5 - 200.0 ft Tuff-Nonwelded, pink (5YR 8/3), dry. 8% quartz, 5% sanidine, 3% lithics, 15% pumice.		Otowi Member, Bandelier Tuff			
185.0	36 / 90%	2870 dpm Gross Alpha/Beta							
190.0	37 / 90%	3090 dpm Gross Alpha/Beta							
195.0	38 / 90%	3050 dpm Gross Alpha/Beta RDX/TNT - nondetect	MD54-05-58167						TD - 200 ft.
200.0									



Los Alamos National Laboratory
Environmental Characterization and Remediation
2004 - 2005 MDA G Environmental Characterization Drilling
Borehole Log

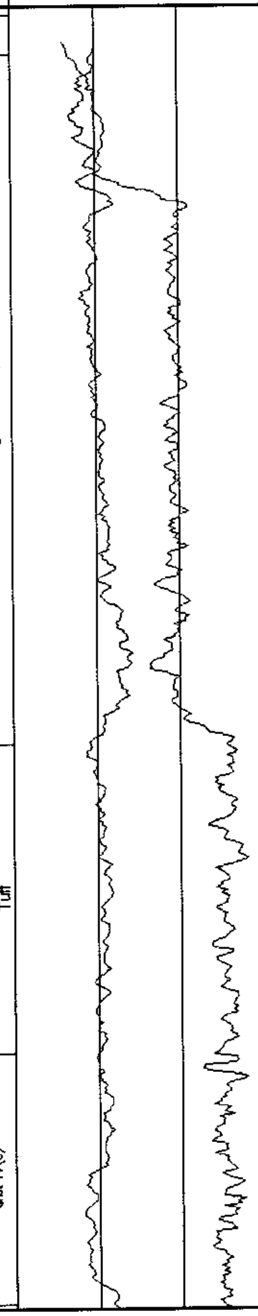
Borehole ID: 54-24392 **TA/OU:** 54/1148 **MDA:** G **Start Date / Time:** 3-30-05, 1710 **End Date / Time:** 4-01-05, 0941

Drilling Co.: Enviro-Drill Inc. **Drilling Equip. / Method:** CME 75 / Hollow Stem Auger **Driller:** Matt Cain **Geologist:** Pattie Baucom, Apogen

Sampling Method: Continuous 5 ft core barrel **Declination:** 90 degrees **Bearing:** na **TD:** 200 ft

Depth	Core Run # / Core Recovery %	Field Screening Results	Analytical Sample Number	Lithology	Lithologic Unit	Notes
0.0	Core Logged from Cuttings	3110 dpm Gross Alpha/Beta	No Samples	0.0 - 2.0 ft Soil - silty sand with pebbles, moist.	Soil	Gross Alpha/Beta Background = 3110 dpm.
5.0				2.0 - 42.0 ft Tuff - Densely welded, pale red (2.5 YR 7/2) to white (7.5YR 8/1), dry. 10% quartz, 5% sanidine, 15% pumice. Pumice are large (up to 4 cm in diameter).	Unit 2 Tshirege Member, Bandelier Tuff	14 in. OD HSA to 10 ft bgs. Set 10 in. casing to depth of 10 ft.
10.0	1 / 95%	3330 dpm Gross Alpha/Beta				7 5/8 in OD HSA from 10 - 200 ft.
15.0	2 / 100%	3040 dpm Gross Alpha/Beta				
20.0	3 / 100%	3450 dpm Gross Alpha/Beta				
25.0	4 / 100%	3170 dpm Gross Alpha/Beta TNT/RDX - Nondetect	MD54-05-58169 MD54-05-58176(FD)			
30.0	5 / 100%	2080 dpm Gross Alpha/Beta				
35.0	6 / 100%	3240 dpm Gross Alpha/Beta				
40.0	7 / 100%	3120 dpm Gross Alpha/Beta		42.0 - 60.0 ft Tuff - Poorly welded, pinkish gray white (5YR 7/2), dry. 10% quartz, 5% sanidine, 15% pumice, 3% lithics. Pumice are dark purple and brittle.	Unit 1v(u) Tshirege Member, Bandelier Tuff	
45.0	8 / 100%	2950 dpm Gross Alpha/Beta				
50.0	9 / 100%	3040 dpm Gross Alpha/Beta				
55.0	10 / 100%	3280 dpm Gross Alpha/Beta				
60.0	11 / 100%	2870 dpm Gross Alpha/Beta		60.0 - 77.0 ft Tuff - Moderately welded, pinkish white (2.5YR 8/2), dry. 10% quartz, 10% pumice, 5% lithics, <5% sanidine.	Qbt 1v(c)	
65.0	12 / 100%	2490 dpm Gross Alpha/Beta				
70.0	13 / 100%	3180 dpm Gross Alpha/Beta				

Neutron: 0 CPS 300
Gamma: 0 CPS 300



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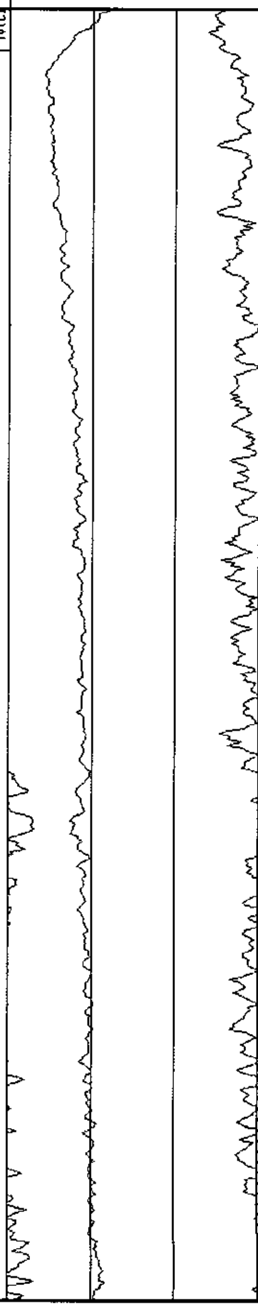
Drilling Co.: Enviro-Drill Inc. **Drilling Equip. / Method:** CME 75 / Hollow Stem Auger **Driller:** Matt Cain **Geologist:** Pattie Baucom, Apogen

Sampling Method: Continuous 5 ft core barrel **Declination:** 90 degrees **Bearing:** na **TD:** 200 ft

Depth	Core Run # / Core Recovery %	Field Screening Results	Analytical Sample Number	Lithology	Graphic Log	Lithologic Unit	Neutron 0 CPS 300 / Gamma 0 CPS 300	Construction 7 7	Notes
	14 / 100%	3230 dpm Gross Alpha/Beta				Qbt 1v(c)			
80.0	15 / 100%	3690 dpm Gross Alpha/Beta		77.0 - 159.0 ft Tuff- Densely welded to poorly welded, pink (5YR 8/3) to white (5YR 8/1), dry. 10% quartz, 15 - 20% pumice, <5% sanidine, 7% lithics. Pumice are large (up to 4 cm in diameter). Lithics are large (up to 2 cm in diameter).		Unit 1g Tshirege Member, Bandelier Tuff			
85.0	16 / 100%	3490 dpm Gross Alpha/Beta							
90.0	17 / 95%	3270 dpm Gross Alpha/Beta							
95.0	18 / 95%	3750 dpm Gross Alpha/Beta							
100.0	19 / 95%	3640 dpm Gross Alpha/Beta							
105.0	20 / 95%	3050 dpm Gross Alpha/Beta							
110.0	21 / 95%	3080 dpm Gross Alpha/Beta	No Samples						
115.0	22 / 95%	2630 dpm Gross Alpha/Beta							
120.0	23 / 95%	3830 dpm Gross Alpha/Beta							
125.0	24 / 95%	4810 dpm Gross Alpha/Beta							
130.0	25 / 95%	3920 dpm Gross Alpha/Beta							
135.0	26 / 95%	4340 dpm Gross Alpha/Beta							
140.0	27 / 95%	4240 dpm Gross Alpha/Beta							
145.0	28 / 95%	4700 dpm Gross Alpha/Beta							



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Sampling Method: Continuous 5 ft core barrel **Declination:** 90 degrees **Bearing:** na **TD:** 200 ft

Depth	Core Run # / Core Recovery %	Field Screening Results	Analytical Sample Number	Lithology	Graphic Log	Lithologic Unit	Neutron (0 CPS 300) / Gamma (0 CPS 300)	Construction (7 7)	Notes
	29 / 95%					Qbt 1g			E600 Gross Alpha/Beta radiation instrument was not available.
155.0	30 / 95%			159.0 - 161.0 ft Pumice, reworked. 50% angular to subangular pumice, 50% quartz crystals.		Qctt			Slough in borehole from 160 - 200 ft prevents deeper geophysical measurements.
160.0	31 / 95%			161.0 - 187.0 ft Interlayered fine to medium-grained sand, silt and pebbles with pumice fragments and basalt clasts.		Cerro Toledo Interval			
165.0	32 / 95%								
170.0	33 / 95%								
175.0	34 / 95%								
180.0	35 / 70%								
185.0	36 / 95%			187.0 - 200.0 ft Tuff - Nonwelded, pink (5YR 7/3), dry. 10% quartz, 5% sanidine, 3% lithics, 20% pumice.		Otowi Member, Bandelier Tuff			
190.0	37 / 100%								
195.0	38 / 100%	2870 dpm Gross Alpha/Beta RDX/TNT - nondetect	MD54-05-58175						TD - 200 ft.
200.0									

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Environmental Characterization and Remediation
2004 - 2005 MDA G Environmental Characterization Drilling
Borehole Log

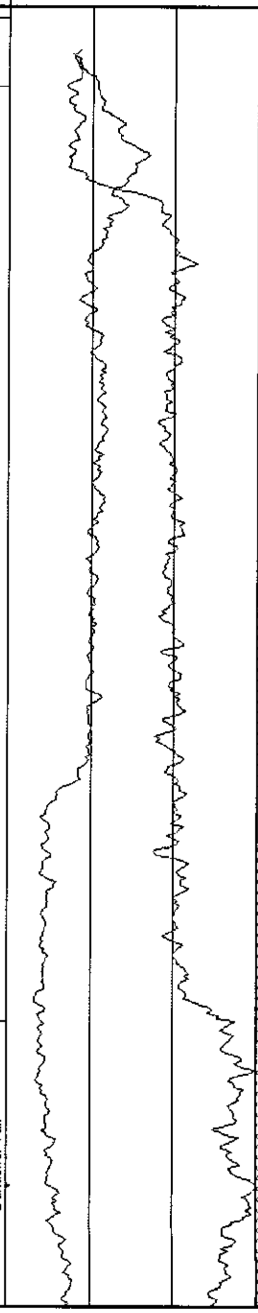
Borehole ID: 54-24393 **TA/OU:** 54/1148 **MDA:** G **Start Date / Time:** 4-06-05, 1000 **End Date / Time:** 4-08-05, 1026

Drilling Co.: Enviro-Drill Inc. **Drilling Equip. / Method:** CME 75 / Hollow Stem Auger **Driller:** Matt Cain **Geologist:** Kevin Reid, TerranearPMC

Sampling Method: Continuous 5 ft core barrel **Declination:** 90 degrees **Bearing:** na **TD:** 206 ft

Depth	Core Run # / Core Recovery %	Field Screening Results	Analytical Sample Number	Lithology	Lithologic Unit	Notes
0.0	Core Logged from Cuttings	2930 dpm Gross Alpha/Beta	No Samples	0.0 - 4.0 ft Soil - Sandy clay, moist	Soil	Gross Alpha/Beta Background = 2410 dpm.
5.0		2600 dpm Gross Alpha/Beta		4.0 - 58.0 ft Tuff - Densely welded, gray (7.5YR 6/1), slightly damp. 15% quartz, 10% sanidine, 15% pumice.	Unit 2 Tshirege Member, Bandelier Tuff	14 in. OD HSA to 10 ft bgs. Set 10 in. casing to depth of 10 ft.
10.0	1 / 100%	2400 dpm Gross Alpha/Beta				7 5/8 in OD HSA from 10 - 206 ft.
15.0	2 / 100%	2320 dpm Gross Alpha/Beta				
20.0	3 / 100%	2750 dpm Gross Alpha/Beta				
25.0	4 / 100%	2640 dpm Gross Alpha/Beta 0.0 ppm VOCs via PID Headspace				
30.0	5 / 100%	2990 dpm Gross Alpha/Beta				
35.0	6 / 100%	2960 dpm Gross Alpha/Beta TNT/RDX - Nondetect	MD54-05-58177 MD54-05-58184(FD)			
40.0	7 / 100%	3050 dpm Gross Alpha/Beta				
45.0	8 / 100%	3380 dpm Gross Alpha/Beta				
50.0	9 / 100%	3140 dpm Gross Alpha/Beta				
55.0	10 / 100%	2910 dpm Gross Alpha/Beta		58.0 - 58.4 ft Tuff - SAA. Surge bed composed of coarse-grained quartz and ash.		
60.0	11 / 100%	3230 dpm Gross Alpha/Beta		58.4 - 80.0 ft Tuff - Moderately welded to poorly welded, white (10YR 8/1), dry. 10% quartz, 5% sanidine, 5% lithics 15-20% pumice. Pumice are dark purple, brittle, and large (up to 5 cm).	Unit 1Y(u) Tshirege Member, Bandelier Tuff	
65.0	12 / 100%	3070 dpm Gross Alpha/Beta 0.0 ppm VOCs via PID Headspace				
70.0	13 / 100%	2820 dpm Gross Alpha/Beta				

Neutron: 0 CPS 300
Gamma: 0 CPS 300



Construction: 7 7

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2004 - 2005 MDA G Environmental Characterization Drilling
Borehole Log

Borehole ID: 54-24393 **TA/OU:** 54/1148 **MDA:** G **Start Date / Time:** 4-06-05, 1000 **End Date / Time:** 4-08-05, 1026

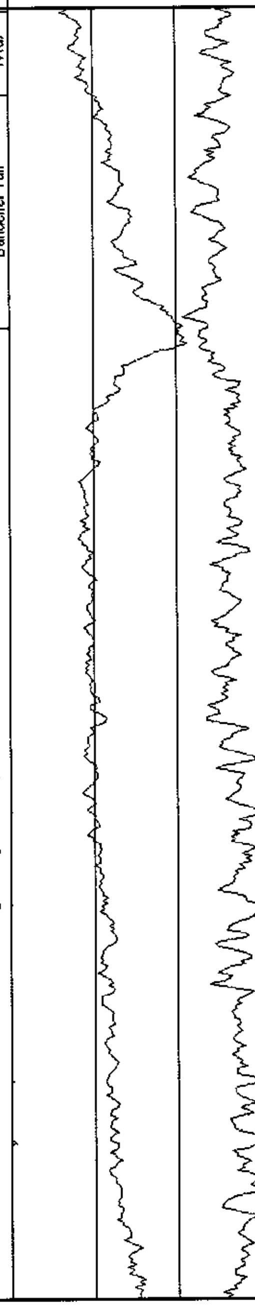
Drilling Co.: Enviro-Drill Inc. **Drilling Equip. / Method:** CME 75 / Hollow Stem Auger **Driller:** Matt Cain **Geologist:** Kevin Reid, TerranearPMC

Sampling Method: Continuous 5 ft core barrel **Declination:** 90 degrees **Bearing:** na **TD:** 206 ft

Depth	Core Run # / Core Recovery %	Field Screening Results	Analytical Sample Number	Lithology	Lithologic Unit	Notes
	14 / 100%	2730 dpm Gross Alpha/Beta 0.0 ppm VOCs via PID Headspace	No Samples		Qbt 1v(u)	
80.0	15 / 100%	2910 dpm Gross Alpha/Beta		80.0 - 93.5 ft Tuff- Moderately welded to densely welded, light gray (7.5YR 7/1) to pinkish gray (7.5YR 8/2), dry. 15% quartz, 15% pumice, 5% lithics, 10% sanidine. Iron staining at grain boudaries.	Unit 1v(c) Tshirege Member, Bandelier Tuff	
85.0	16 / 100%	3160 dpm Gross Alpha/Beta 0.0 ppm VOCs via PID Headspace				
90.0	17 / 100%	3160 dpm Gross Alpha/Beta				
95.0	18 / 100%	2860 dpm Gross Alpha/Beta 0.0 ppm VOCs via PID Headspace		93.5 - 153.0 ft Tuff- Densely welded to nonwelded, reddish yellow (5YR 6/6) to white (7.5YR 7/1), dry. 15% quartz, 15% pumice, 5% sanidine, 5% lithic.	Unit 1g Tshirege Member, Bandelier Tuff	
100.0	19 / 100%	3120 dpm Gross Alpha/Beta				
105.0	20 / 100%	3050 dpm Gross Alpha/Beta 0.0 ppm VOCs via PID Headspace				
110.0	21 / 95%	2960 dpm Gross Alpha/Beta				
115.0	22 / 100%	3130 dpm Gross Alpha/Beta 0.0 ppm VOCs via PID Headspace				
120.0	23 / 90%	3120 dpm Gross Alpha/Beta				
125.0	24 / 100%	3350 dpm Gross Alpha/Beta 0.0 ppm VOCs via PID Headspace				
130.0	25 / 100%	3190 dpm Gross Alpha/Beta				
135.0	26 / 45%	2980 dpm Gross Alpha/Beta 0.0 ppm VOCs via PID Headspace				
140.0	27 / 95%	3310 dpm Gross Alpha/Beta				
145.0	28 / 90%	3420 dpm Gross Alpha/Beta 0.0 ppm VOCs via PID Headspace				

Graphic Log

Neutron 0 CPS 300 / Gamma 0 CPS 300



Construction ? ?

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Borehole Log

Borehole ID: 54-24393 **TA/OU:** 54/1148 **MDA:** G **Start Date / Time:** 4-06-05, 1000 **End Date / Time:** 4-08-05, 1026

Drilling Co.: Enviro-Drill Inc. **Drilling Equip. / Method:** CME 75 / Hollow Stem Auger **Driller:** Matt Cain **Geologist:** Kevin Reid, TerranearPMC

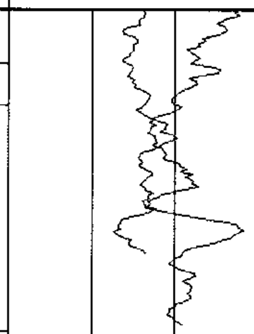
Sampling Method: Continuous 5 ft core barrel **Declination:** 90 degrees **Bearing:** na **TD:** 206 ft

Depth	Core Run # / Core Recovery %	Field Screening Results	Analytical Sample Number	Lithology	Lithologic Unit	Notes
153.0–155.0	29 / 85%	3370 dpm Gross Alpha/Beta		153.0 - 154.0 ft Pumice, reworked. 50% angular to subangular pumice, 50% quartz and sanidine crystals.	Qbt1g	
155.0–160.0	30 / 80%	2490 dpm Gross Alpha/Beta	MD54-05-58178	154.0 - 168.5 ft Fine sand and clayey sand with pumice clasts, slightly damp.	Qbt / Cerro Toledo Interval	
160.0–165.0	31 / 80%	2740 dpm Gross Alpha/Beta			Cerro Toledo Interval	Slough in borehole from 168 - 206 ft prevents deeper geophysical measurements.
165.0–170.0	32 / 100%	2630 dpm Gross Alpha/Beta 0.0 ppm VOCs via PID Headspace			Cerro Toledo Interval	
170.0–175.0	33 / 100%	2470 dpm Gross Alpha/Beta		168.5 - 194.4 ft Tuff-Nonwelded, pinkish white (7.5YR 7/2), dry, 15% quartz, 5% sanidine, 3% lithics, 15% pumice.	Otowi Member, Bandelier Tuff	Gross Alpha/Beta Background = 2720 dpm.
175.0–180.0	34 / 100%	2930 dpm Gross Alpha/Beta	No Samples		Otowi Member, Bandelier Tuff	
180.0–185.0	35 / 100%	3290 dpm Gross Alpha/Beta 0.0 ppm VOCs via PID Headspace			Otowi Member, Bandelier Tuff	
185.0–190.0	36 / 100%	3260 dpm Gross Alpha/Beta 0.0 ppm VOCs via PID Headspace			Otowi Member, Bandelier Tuff	
190.0–195.0	37 / 100%	3130 dpm Gross Alpha/Beta	MD54-05-58183		Otowi Member, Bandelier Tuff	
195.0–200.0	38 / 80%	3020 dpm Gross Alpha/Beta 0.0 ppm VOCs via PID Headspace	No Samples	194.4 - 205.0 ft Pumice - reworked, slightly damp. 50% angular to subangular pumice, 40% quartz, and 10% sanidine crystals.	Qbog	
200.0–205.0	39 / 85%	3030 dpm Gross Alpha/Beta	MD54-05-58183		Qbog	
205.0–210.0	40 / 100%	3530 dpm Gross Alpha/Beta 0.0 ppm VOCs via PID Headspace TNT/RDX - Nondetect		205.0 - 206.0 ft Ash layer with calcite cement (?) and basalt fragments.	Ash layer/basalt	Refusal at 206 ft.

Neutron 0 CPS 300

Gamma 0 CPS 300

Construction 7 7



Los Alamos National Laboratory
Environmental Characterization and Remediation
2004 - 2005 MDA G Environmental Characterization Drilling
Borehole Log

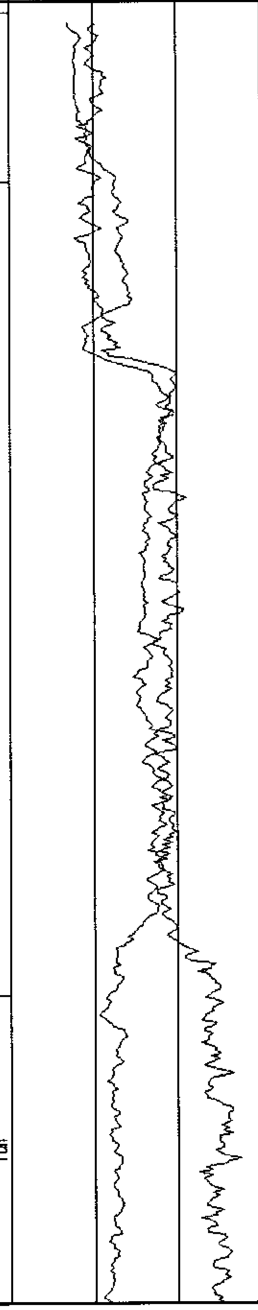
Borehole ID: 54-24394 **TA/OU:** 54/1148 **MDA:** G **Start Date / Time:** 4-15-05, 1315 **End Date / Time:** 4-19-05, 0938

Drilling Co.: Enviro-Drill Inc. **Drilling Equip. / Method:** CME 75 / Hollow Stem Auger **Driller:** Matt Cain **Geologist:** Pattie Baucom, Apogen

Sampling Method: Continuous 5 ft core barrel **Declination:** 90 degrees **Bearing:** na **TD:** 200 ft

Depth	Core Run # / Core Recovery %	Field Screening Results	Analytical Sample Number	Lithology	Lithologic Unit	Notes
0.0	1 / 40%	2980 dpm Gross Alpha/Beta	No Samples	0.0 - 9.8 ft Pit Spoils - crushed tuff.	Fill	Gross Alpha/Beta Background = 2980 dpm.
5.0	2 / 60%					14 in. OD HSA to 20 ft bgs. Set 10 in. casing to depth of 20 ft.
10.0	3 / 90%	3210 dpm Gross Alpha/Beta		9.8 - 57.0 ft Tuff - Densely welded, light gray (7.5YR 7/1) to pinkish gray (5YR 6/2), dry. 10% quartz, 5% sanidine, 15% pumice.	Unit 2 Tshirege Member, Bandelier Tuff	7 5/8 in OD HSA from 20 - 200 ft.
15.0	4 / 0%	2480 dpm Gross Alpha/Beta				Gross Alpha/Beta Background = 2480 dpm.
20.0	5 / 80%	3080 dpm Gross Alpha/Beta				
25.0	6 / 100%	3690 dpm Gross Alpha/Beta				
30.0	7 / 100%	3920 dpm Gross Alpha/Beta 0.0 ppm VOCs via PID Headspace				
35.0	8 / 100%	3440 dpm Gross Alpha/Beta				
40.0	9 / 100%	3410 dpm Gross Alpha/Beta 0.0 ppm VOCs via PID Headspace TNT/RDX - Nondetect	MD54-05-58185 MD54-05-58192(FD)			
45.0	10 / 100%	2770 dpm Gross Alpha/Beta	No Samples			
50.0	11 / 100%	3060 dpm Gross Alpha/Beta 0.0 ppm VOCs via PID Headspace	MD54-05-57186	49.5 - 57.0 ft Tuff - SAA. 3 mm thick clay and root filled vertical fracture from 49.5 to 57.0 ft.		
55.0	12 / 100%	3680 dpm Gross Alpha/Beta		57.0 - 87.0 ft Tuff - Poorly welded, white (7.5YR 8/1), dry. 10% quartz, 5% lithics, 15-17% pumice. Pumice are dark purple, brittle, and large (up to 5 cm in diameter). Lithics are large (up to 2 cm in diameter).	Unit 1v(u) Tshirege Member, Bandelier Tuff	
60.0	13 / 100%	3790 dpm Gross Alpha/Beta				
65.0	14 / 100%	2980 dpm Gross Alpha/Beta 0.0 ppm VOCs via PID Headspace				
70.0	15 / 100%	4190 dpm Gross Alpha/Beta				

Neutron: 0 CPS 300 — Gamma: 0 CPS 300 — Construction: 7 7



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2004 - 2005 MDA G Environmental Characterization Drilling
Borehole Log

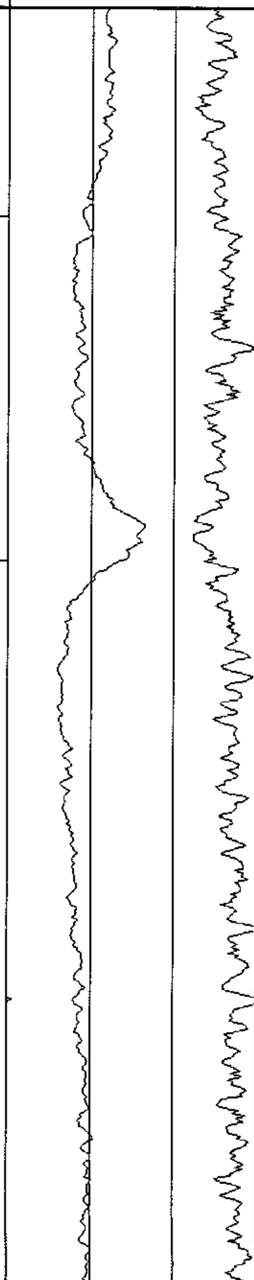
Borehole ID: 54-24394 **TA/OU:** 54/1148 **MDA:** G **Start Date / Time:** 4-15-05, 1315 **End Date / Time:** 4-19-05, 0938

Drilling Co.: Enviro-Drill Inc. **Drilling Equip. / Method:** CME 75 / Hollow Stem Auger **Driller:** Matt Cain **Geologist:** Pattie Baucom, Apogen

Sampling Method: Continuous 5 ft core barrel **Declination:** 90 degrees **Bearing:** na **TD:** 200 ft

Depth	Core Run # / Core Recovery %	Field Screening Results	Analytical Sample Number	Lithology	Lithologic Unit
	16 / 100%	4660 dpm Gross Alpha/Beta 0.0 ppm VOCs via PID Headspace	No Samples		Qbt 1v(u)
80.0	17 / 100%	4150 dpm Gross Alpha/Beta			
85.0	18 / 100%	3900 dpm Gross Alpha/Beta 0.0 ppm VOCs via PID Headspace		87.0 - 107.0 ft Tuff- Densely welded, pinkish white (5YR 8/2) to pink (5YR 7/4), dry. 10% quartz, 17% pumice, 7% lithics. Iron staining at grain boundaries. Silt filled vertical fracture from 102 - 105 ft.	Unit 1v(c) Tshirege Member, Bandelier Tuff
90.0	19 / 100%	4740 dpm Gross Alpha/Beta			
95.0	20 / 100%	3160 dpm Gross Alpha/Beta 0.0 ppm VOCs via PID Headspace			
100.0	21 / 100%	3090 dpm Gross Alpha/Beta	MD54-05-58187 MD54-05-58188		
105.0	22 / 100%	4200 dpm Gross Alpha/Beta 0.0 ppm VOCs via PID Headspace		107.0 - 188.0 ft Tuff- Densely welded to nonwelded, reddish yellow (5YR 7/4) to white (5YR 8/1), dry. 10% quartz, 15-17% pumice, <5% sanidine, 7% lithics.	Unit 1g Tshirege Member, Bandelier Tuff
110.0	23 / 100%	3240 dpm Gross Alpha/Beta			
115.0	24 / 100%	3840 dpm Gross Alpha/Beta 0.0 ppm VOCs via PID Headspace			
120.0	25 / 90%	5240 dpm Gross Alpha/Beta 0.0 ppm VOCs via PID Headspace			
125.0	26 / 90%	3260 dpm Gross Alpha/Beta			
130.0	27 / 90%	3120 dpm Gross Alpha/Beta 0.0 ppm VOCs via PID Headspace			
135.0	28 / 90%	3820 dpm Gross Alpha/Beta			
140.0	29 / 95%	3520 dpm Gross Alpha/Beta 0.0 ppm VOCs via PID Headspace			
145.0	30 / 95%	3510 dpm Gross Alpha/Beta			

Neutron 0 CPS 300 / Gamma 0 CPS 300



Construction: 7 7

Notes

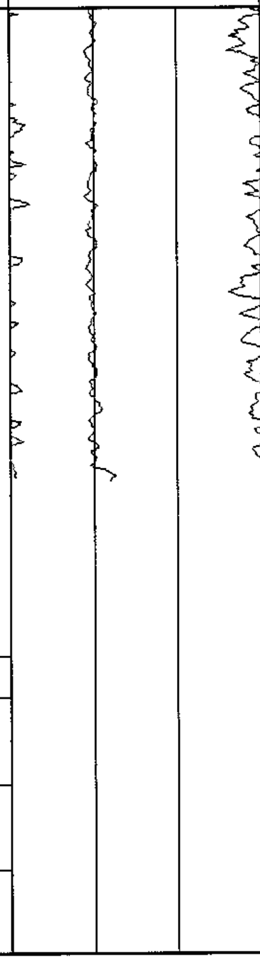
Los Alamos National Laboratory
Environmental Characterization and Remediation
2004 - 2005 MDA G Environmental Characterization Drilling
Borehole Log

Borehole ID: 54-24394 **TA/OU:** 54/1148 **MDA:** G **Start Date / Time:** 4-15-05, 1315 **End Date / Time:** 4-19-05, 0938

Drilling Co.: Enviro-Drill Inc. **Drilling Equip. / Method:** CME 75 / Hollow Stem Auger **Driller:** Matt Cain **Geologist:** Pattie Baucom, Apogen

Sampling Method: Continuous 5 ft core barrel **Declination:** 90 degrees **Bearing:** na **TD:** 200 ft

Depth	Core Run # / Core Recovery %	Field Screening Results	Analytical Sample Number	Lithology	Graphic Log	Lithologic Unit	Neutron 0 CPS 300 / Gamma 0 CPS 300	Construction 7 7	Notes
	31 / 95%	2870 dpm Gross Alpha/Beta 0.0 ppm VOCs via PID Headspace	No Samples						
155.0	32 / 95%	4680 dpm Gross Alpha/Beta							
160.0	33 / 95%	4290 dpm Gross Alpha/Beta 0.0 ppm VOCs via PID Headspace							
165.0	34 / 95%	3110 dpm Gross Alpha/Beta				Qbt 1g			
170.0	35 / 95%	4090 dpm Gross Alpha/Beta 0.0 ppm VOCs via PID Headspace							Slough in borehole from 177.0 - 200 ft prevents further geophysical measurements.
175.0	36 / 95%	3250 dpm Gross Alpha/Beta							
180.0	37 / 95%	4620 dpm Gross Alpha/Beta							
185.0	38 / 95%	3920 dpm Gross Alpha/Beta 0.0 ppm VOCs via PID Headspace		188.0 - 189.5 ft Pumice, reworked. 50% angular to subangular pumice, 50% quartz crystals.		Qbtt			
190.0	39 / 90%	3970 dpm Gross Alpha/Beta		189.5 - 195.0 ft Interlayered silty sand and sand with pebbles and pumice fragments.		Qct			
195.0	40 / 95%	3520 dpm Gross Alpha/Beta 0.0 ppm VOCs via PID Headspace TNT/RDX - Nondetect	MD54-05-58191	195.0 - 200.0 ft Tuff- Nonwelded, pinkish white (7.5YR 8/2), dry, 7% quartz, 5% lithics, 10 - 15% pumice. Pumice are large (up to 15 cm in diameter).		Qbo			TD - 200.0 ft.
200.0									



Los Alamos National Laboratory
Environmental Characterization and Remediation
2004 - 2005 MDA G Environmental Characterization Drilling
Borehole Log

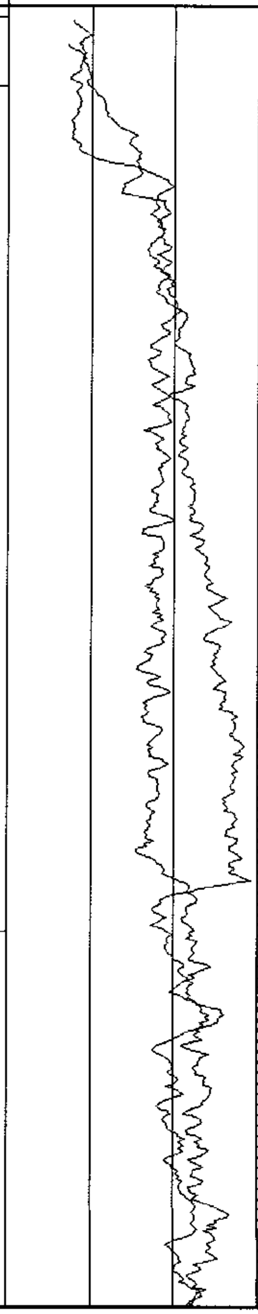
Borehole ID: 54-24395 **TA/OU:** 54/1148 **MDA:** G **Start Date / Time:** 4-13-05, 1450 **End Date / Time:** 4-14-05, 1617

Drilling Co.: Enviro-Drill Inc. **Drilling Equip. / Method:** CME 75 / Hollow Stem Auger **Driller:** Matt Cain **Geologist:** Pattie Baucom, Apogen

Sampling Method: Continuous 5 ft core barrel **Declination:** 90 degrees **Bearing:** na **TD:** 200 ft

Depth	Core Run # / Core Recovery %	Field Screening Results	Analytical Sample Number	Lithology	Lithologic Unit	Notes
0.0	1 / 80%	7800 dpm Gross Alpha/Beta		0.0 - 4.0 ft Soil - Silty sand, moist.	Soil	Gross Alpha/Beta Background = 7800 dpm.
5.0	2 / 0%			4.0 - 53.0 ft Tuff - Densely welded, light gray (7.5YR 7/1) to pale red (2.5YR 6/2) to light brown (7.5YR 6/3), slightly moist. 15% quartz, 5% sanidine, 15% pumice.	Unit 2 Tshirege Member, Bandelier Tuff	14 in. OD HSA to 10 ft bgs. Set 10 in. casing to depth of 10 ft.
10.0	3 / 60%	8220 dpm Gross Alpha/Beta				7 5/8 in OD HSA from 10 - 200 ft.
15.0	4 /100%	9870 dpm Gross Alpha/Beta 0.0 ppm VOCs via PID Headspace				Gross Alpha/Beta Background = 8590 dpm.
20.0	5 / 100%	8990 dpm Gross Alpha/Beta	No Samples			
25.0	6 / 100%	8600 dpm Gross Alpha/Beta 0.0 ppm VOCs via PID Headspace				
30.0	7 / 100%	7470 dpm Gross Alpha/Beta				
35.0	8 / 100%	8500 dpm Gross Alpha/Beta 0.0 ppm VOCs via PID Headspace				
40.0	9 / 100%	8640 dpm Gross Alpha/Beta TNT/RDX - Nondetect	MD54-05-58193 MD54-05-58200(FD)			
45.0	10 / 100%	8530 dpm Gross Alpha/Beta 0.0 ppm VOCs via PID Headspace				
50.0	11 / 100%	9570 dpm Gross Alpha/Beta		53.0 - 80.0 ft Tuff - Moderately welded to poorly welded, pinkish gray (5YR 7/2), slightly moist. 10% quartz, 5% lithics, 15% pumice. Pumice are dark purple, brittle, and large (up to 4 cm in diameter).	Unit 1v(u) Tshirege Member, Bandelier Tuff	
55.0	12 / 100%	9780 dpm Gross Alpha/Beta 0.0 ppm VOCs via PID Headspace				
60.0	13 / 100%	8970 dpm Gross Alpha/Beta				
65.0	14 / 100%	8620 dpm Gross Alpha/Beta 0.0 ppm VOCs via PID Headspace				
70.0	15 / 100%	7920 dpm Gross Alpha/Beta				

Neutron: 0 CPS 300
Gamma: 0 CPS 300



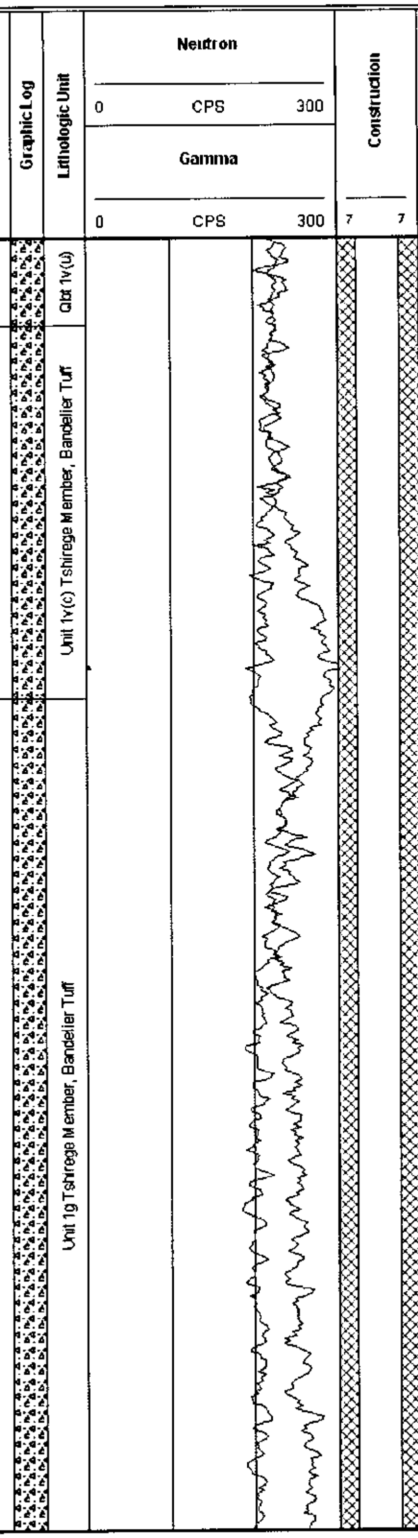
Los Alamos National Laboratory
Environmental Characterization and Remediation
2004 - 2005 MDA G Environmental Characterization Drilling
Borehole Log

Borehole ID: 54-24395 **TA/OU:** 54/1148 **MDA:** G **Start Date / Time:** 4-13-05, 1450 **End Date / Time:** 4-14-05, 1617

Drilling Co.: Enviro-Drill Inc. **Drilling Equip. / Method:** CME 75 / Hollow Stem Auger **Driller:** Matt Cain **Geologist:** Pattie Baucom, Apogen

Sampling Method: Continuous 5 ft core barrel **Declination:** 90 degrees **Bearing:** na **TD:** 200 ft

Depth	Core Run # / Core Recovery %	Field Screening Results	Analytical Sample Number	Lithology	Lithologic Unit	Notes
	16 / 100%	8650 dpm Gross Alpha/Beta; 0.0 ppm VOCs via PID Headspace	No Samples		Qbt 1v(u)	
80.0	17 / 100%	8330 dpm Gross Alpha/Beta		80.0 - 101.5 ft Tuff- Moderately welded to densely welded, pinkish gray (7.5YR 7/2) to pink (5YR 7/4), slightly moist. 12% quartz, 12% pumice, 5% lithics. Iron staining at grain boundaries.	Unit 1v(c) Tshirege Member, Bandelier Tuff	
85.0	18 / 100%	8740 dpm Gross Alpha/Beta; 0.0 ppm VOCs via PID Headspace				
90.0	19 / 100%	9410 dpm Gross Alpha/Beta				
95.0	20 / 100%	7790 dpm Gross Alpha/Beta; 0.0 ppm VOCs via PID Headspace				
100.0	21 / 100%	8520 dpm Gross Alpha/Beta; 0.0 ppm VOCs via PID Headspace		101.5 - 188.0 ft Tuff- Densely welded to nonwelded, reddish yellow (5YR 6/6) to white (7.5YR 8/1), slightly moist. 10% quartz, 15-20% pumice, <5% sanidine, 10% lithics. Lithics are large (up to 5 cm in diameter).	Unit 1g Tshirege Member, Bandelier Tuff	
105.0	22 / 100%	8950 dpm Gross Alpha/Beta				
110.0	23 / 100%	9870 dpm Gross Alpha/Beta				
115.0	24 / 100%	7380 dpm Gross Alpha/Beta; 0.0 ppm VOCs via PID Headspace				
120.0	25 / 90%	7520 dpm Gross Alpha/Beta; 0.0 ppm VOCs via PID Headspace				
125.0	26 / 90%	7220 dpm Gross Alpha/Beta				
130.0	27 / 90%	7880 dpm Gross Alpha/Beta				
135.0	28 / 90%	8890 dpm Gross Alpha/Beta				
140.0	29 / 95%	8770 dpm Gross Alpha/Beta				
145.0	30 / 95%	8110 dpm Gross Alpha/Beta				

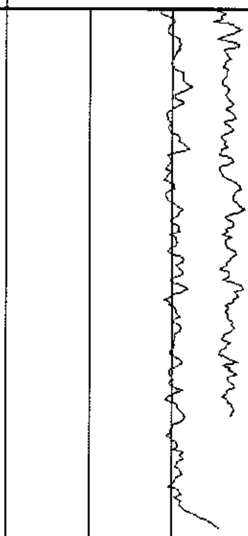


Borehole ID: 54-24395 **TA/OU:** 54/1148 **MDA:** G **Start Date / Time:** 4-13-05, 1450 **End Date / Time:** 4-14-05, 1617

Drilling Co.: Enviro-Drill Inc. **Drilling Equip. / Method:** CME 75 / Hollow Stem Auger **Driller:** Matt Cain **Geologist:** Pattie Baucom, Apogen

Sampling Method: Continuous 5 ft core barrel **Declination:** 90 degrees **Bearing:** na **TD:** 200 ft

Depth	Core Run # / Core Recovery %	Field Screening Results	Analytical Sample Number	Lithology	Graphic Log	Lithologic Unit	Neutron (0 CPS 300) / Gamma (0 CPS 300)	Construction	Notes
150.0–155.0	31 / 95%	7970 dpm Gross Alpha/Beta	MD54-05-58194			Qbt 1g			
155.0–160.0	32 / 95%	9240 dpm Gross Alpha/Beta	No Samples			Qbt 1g			
160.0–165.0	33 / 95%	9300 dpm Gross Alpha/Beta	No Samples			Qbt 1g			
165.0–170.0	34 / 95%	9370 dpm Gross Alpha/Beta	No Samples			Qbt 1g			
170.0–175.0	35 / 95%	9650 dpm Gross Alpha/Beta	No Samples			Qbt 1g			
175.0–180.0	36 / 95%	10190 dpm Gross Alpha/Beta	No Samples			Qbt 1g			Slough in borehole from 179.0 - 200 ft prevents further geophysical measurements.
180.0–185.0	37 / 95%	8660 dpm Gross Alpha/Beta	No Samples			Qbt 1g			
185.0–190.0	38 / 95%	7870 dpm Gross Alpha/Beta	MD54-05-58195	188.0 - 189.5 ft Pumice, reworked. 50% angular to subangular pumice, 50% quartz crystals.		Qbtt			
190.0–195.0	39 / 90%	7770 dpm Gross Alpha/Beta	No Samples	189.5 - 198.0 ft Interlayered silty sand and sand with pebbles and pumice fragments, slightly moist to moderately moist.		Qct			
195.0–200.0	40 / 95%	9870 dpm Gross Alpha/Beta RDX/TNT - nondetect	MD54-05-58199	198.0 - 200.0 ft Tuff - Nonwelded, pink (7.5YR 7/3), slightly moist. 10% quartz, 5% lithics, 15% pumice.		Qbo			TD - 200.0 ft.



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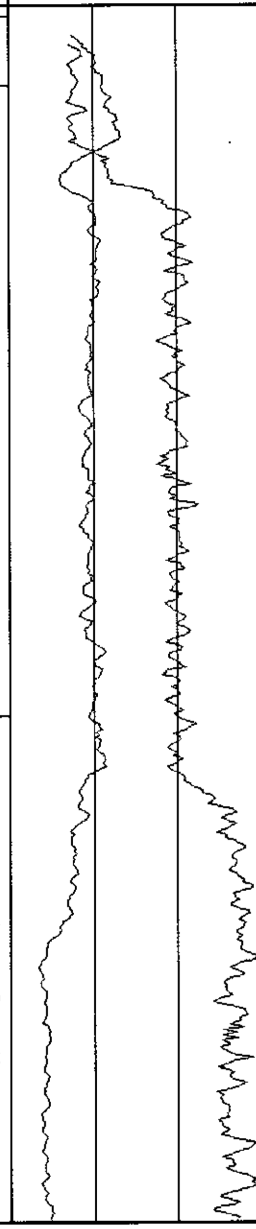
Environmental Characterization and Remediation
2004 - 2005 MDA G Environmental Characterization Drilling
Borehole Log

Borehole ID: 54-24396 **TA/OU:** 54/1148 **MDA:** G **Start Date / Time:** 3-3-05, 1620 **End Date / Time:** 3-8-05, 1548

Drilling Co.: Enviro-Drill Inc. **Drilling Equip. / Method:** CME 75 / Hollow Stem Auger **Driller:** Matt Cain **Geologist:** Pattie Baucom, Apogen

Sampling Method: Continuous 5 ft core barrel **Declination:** 90 degrees **Bearing:** na **TD:** 200 ft

Depth	Core Run # / Core Recovery %	Field Screening Results	Analytical Sample Number	Lithology	Graphic Log	Lithologic Unit	Neutron (0 CPS 300) / Gamma (0 CPS 300)	Construction (7 7)	Notes
0.0	Core Logged from Cuttings	2090 dpm Gross Alpha/Beta	No Samples	0.0 - 4.0 ft Soil - Silty sand with pebbles.		Soil			Gross Alpha/Beta Background = 2090 dpm.
5.0				4.0 - 40.5 ft Tuff - Poorly welded to moderately welded, light gray (5YR 7/1) to pinkish gray (5YR 6/2), dry. 15% quartz, 5% sanidine, 15% pumice.		Unit 2 Tshirege Member, Bandelier Tuff			14 in. OD HSA to 10 ft bgs. Set 10 in. casing to depth of 10 ft.
10.0	1 / 100%	2550 dpm Gross Alpha/Beta TNT/RDX - Nondetect	MD54-05-58206 MD54-05-58213						7 5/8 in OD HSA from 10 - 200 ft.
15.0	2 /100%	2950 dpm Gross Alpha/Beta 0.0 ppm VOCs via PID Headspace							
20.0	3 / 100%	2840 dpm Gross Alpha/Beta							
25.0	4 / 95%	2540 dpm Gross Alpha/Beta 0.0 ppm VOCs via PID Headspace							
30.0	5 / 100%	3160 dpm Gross Alpha/Beta							
35.0	6 / 100%	2917 dpm Gross Alpha/Beta 0.0 ppm VOCs via PID Headspace							
40.0	7 / 100%	3060 dpm Gross Alpha/Beta		40.5 - 70.0 ft Tuff - Slightly welded to nonwelded, pink (5YR 7/3) to pinkish white (5YR 8/2), dry. 10% quartz, 5% lithics, 15% pumice. Pumice are dark purple, brittle, and large (up to 4 cm in diameter).		Unit 1v(u) Tshirege Member, Bandelier Tuff			
45.0	8 / 100%	3400 dpm Gross Alpha/Beta 0.0 ppm VOCs via PID Headspace							
50.0	9 / 100%	3130 dpm Gross Alpha/Beta							
55.0	10 / 100%	2960 dpm Gross Alpha/Beta 0.0 ppm VOCs via PID Headspace							
60.0	11 / 100%	2850 dpm Gross Alpha/Beta							
65.0	12 / 100%	3090 dpm Gross Alpha/Beta 0.0 ppm VOCs via PID Headspace							



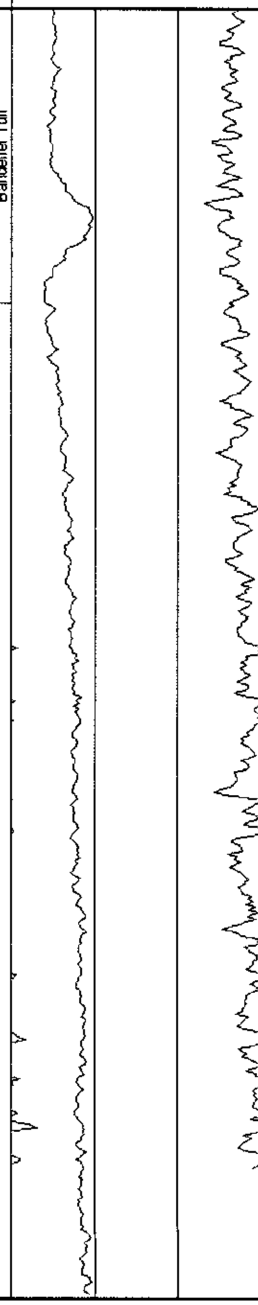
Los Alamos National Laboratory
Environmental Characterization and Remediation
2004 - 2005 MDA G Environmental Characterization Drilling
Borehole Log

Borehole ID: 54-24396 **TA/OU:** 54/1148 **MDA:** G **Start Date / Time:** 3-3-05, 1620 **End Date / Time:** 3-8-05, 1548

Drilling Co.: Enviro-Drill Inc. **Drilling Equip. / Method:** CME 75 / Hollow Stem Auger **Driller:** Matt Cain **Geologist:** Pattie Baucom, Apogen

Sampling Method: Continuous 5 ft core barrel **Declination:** 90 degrees **Bearing:** na **TD:** 200 ft

Depth	Core Run # / Core Recovery %	Field Screening Results	Analytical Sample Number	Lithology	Graphic Log	Lithologic Unit	Neutron 0 CPS 300 / Gamma 0 CPS 300	Construction	Notes
	13 / 100%	3060 dpm Gross Alpha/Beta	No Samples	70.0 - 87.0 ft Tuff- Moderately welded to densely welded, light reddish brown (2.5YR 6/4), dry. 10% quartz, 15% pumice, 7% lithics, sanidine <5%. Iron staining at grain boundaries. Pumice and lithics are large (up to 3 cm in diameter).		Unit 1v(c) Tshirege Member, Bandelier Tuff			
75.0	14 / 100%	2530 dpm Gross Alpha/Beta 0.0 ppm VOCs via PID Headspace							
80.0	15 / 100%	2920 dpm Gross Alpha/Beta							
85.0	16 / 100%	2580 dpm Gross Alpha/Beta 0.0 ppm VOCs via PID Headspace		87.0 - 150.5 ft Tuff- Nonwelded, light reddish brown (2.5YR 7/4) to white (7.5YR 8/1), dry. 10% quartz, 15-20% pumice, <5% sanidine, 2-10% lithics. Lithics are large (up to 2 cm in diameter).		Unit 1g Tshirege Member, Bandelier Tuff			
90.0	17 / 95%	3120 dpm Gross Alpha/Beta							
95.0	18 / 80%	3020 dpm Gross Alpha/Beta							
100.0	19 / 80%	2960 dpm Gross Alpha/Beta							
105.0	20 / 85%								
110.0	21 / 90%								Gross Alpha/Beta Background = 2320 dpm.
115.0	22 / 80%	2930 dpm Gross Alpha/Beta							
120.0	23 / 90%	3480 dpm Gross Alpha/Beta							
125.0	24 / 90%	2610 dpm Gross Alpha/Beta							
130.0	25 / 100%	3470 dpm Gross Alpha/Beta 4.8 ppm VOCs via PID Headspace							
135.0	26 / 95%	2530 dpm Gross Alpha/Beta 1.2 ppm VOCs via PID Headspace							
140.0	27 / 90%	3250 dpm Gross Alpha/Beta 2.5 ppm VOCs via PID Headspace							



Borehole ID: 54-24396 **TA/OU:** 54/1148 **MDA:** G **Start Date / Time:** 3-3-05, 1620 **End Date / Time:** 3-8-05, 1548

Drilling Co.: Enviro-Drill Inc. **Drilling Equip. / Method:** CME 75 / Hollow Stem Auger **Driller:** Matt Cain **Geologist:** Pattie Baucom, Apogen

Sampling Method: Continuous 5 ft core barrel **Declination:** 90 degrees **Bearing:** na **TD:** 200 ft

Neutron: 0 – CPS – 300; Gamma: 0 – CPS – 300; Construction: 7 – 7

Depth	Core Run # / Core Recovery %	Field Screening Results	Analytical Sample Number	Lithology	Lithologic Unit	Notes
(to 150.0)	28 / 90%	3840 dpm Gross Alpha/Beta			Qbt 1g	Slough in borehole from 147.0 - 200 ft prevents deeper geophysical measurements.
150.0 – 155.0	29 / 95%	2220 dpm Gross Alpha/Beta 0.0 ppm VOCs via PID Headspace	MD54-05-58207	150.5 - 150.8 ft Pumice, reworked. Well sorted pumice, biotite, and quartz. 150.8 - 183.0 ft Interlayered silty sand and sand with pebbles and pumice fragments, slightly moist.	Qbtt / Cerro Toledo Interval	
155.0 – 160.0	30 / 95%	2840 dpm Gross Alpha/Beta	No Samples		Cerro Toledo Interval	
160.0 – 165.0	31 / 90%	2870 dpm Gross Alpha/Beta 45.2 ppm VOCs via PID Headspace (?)				
165.0 – 170.0	32 / 85%	3440 dpm Gross Alpha/Beta				
170.0 – 175.0	33 / 80%	2370 dpm Gross Alpha/Beta 0.0 ppm VOCs via PID Headspace				
175.0 – 180.0	34 / 90%	2810 dpm Gross Alpha/Beta				
180.0 – 185.0	35 / 90%	2860 dpm Gross Alpha/Beta 3.8 ppm VOCs via PID Headspace		183.0 - 200.0 ft Tuff-Nonwelded, pinkish gray (7.5YR 7/2), dry. 8% quartz, 5% lithics, 3% sanidine, 15% pumice.	Otowi Member, Bandelier Tuff	
185.0 – 190.0	36 / 95%	2970 dpm Gross Alpha/Beta				
190.0 – 195.0	37 / 100%	2830 dpm Gross Alpha/Beta 0.0 ppm VOCs via PID Headspace				
195.0 – 200.0	38 / 95%	3130 dpm Gross Alpha/Beta 0.0 ppm VOCs via PID Headspace TNT/RDX - Nondetect	MD54-05-58212			TD - 200.0 ft.

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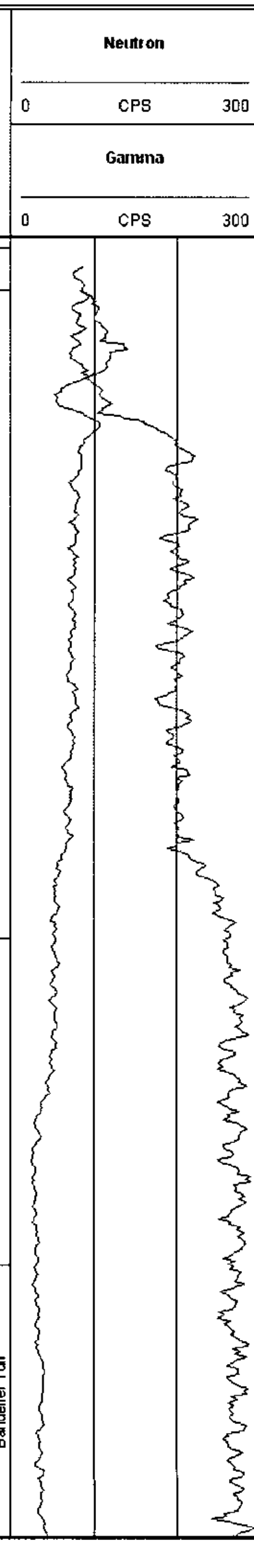
Borehole ID: 54-24397 **TA/OU:** 54/1148 **MDA:** G **Start Date / Time:** 3-21-05, 1352 **End Date / Time:** 3-8-05, 1548

Drilling Co.: Enviro-Drill Inc. **Drilling Equip. / Method:** CME 75 / Hollow Stem Auger **Driller:** Matt Cain **Geologist:** Pattie Baucom, Apogen

Sampling Method: Continuous 5 ft core barrel **Declination:** 90 degrees **Bearing:** na **TD:** 200 ft

Depth	Core Run # / Core Recovery %	Field Screening Results	Analytical Sample Number	Lithology	Lithologic Unit	Notes
0.0	Core Logged from Cuttings	2240 dpm Gross Alpha/Beta	No Samples	0.0 - 2.5 ft Soil - Silty sand with pebbles.	Soil	Gross Alpha/Beta Background = 2240 dpm.
				2.5 - 40 ft Tuff - Moderately welded to densely welded, pinkish gray (5YR 7/2), dry. 15% quartz, 5% sanidine, 15% pumice. Pumice are large (up to 3 cm in diameter).	Unit 2 Tshirege Member, Bandelier Tuff	14 in. OD HSA to 10 ft bgs. Set 10 in. casing to depth of 10 ft.
10.0	1 / 80%	4080 dpm Gross Alpha/Beta				7 5/8 in OD HSA from 10 - 200 ft.
15.0	2 /100%	4660 dpm Gross Alpha/Beta TNT/RDX - Nondetect	MD54-05-58214 MD54-05-58221(FD)			
20.0	3 / 100%	2570 dpm Gross Alpha/Beta				
25.0	4 / 100%	3570 dpm Gross Alpha/Beta				
30.0	5 / 100%	3670 dpm Gross Alpha/Beta				
35.0	6 / 100%	3850 dpm Gross Alpha/Beta				
40.0	7 / 100%	4640 dpm Gross Alpha/Beta		40.5 - 59.0 ft Tuff - Slightly welded to nonwelded, white (7.5YR 8/1), dry. 10 - 15% quartz, 5% sanidine 15 - 20% pumice. Pumice are dark purple, brittle, and fibrous.	Unit 1v(u) Tshirege Member, Bandelier Tuff	
45.0	8 / 100%	4770 dpm Gross Alpha/Beta				
50.0	9 / 100%	3660 dpm Gross Alpha/Beta				
55.0	10 / 100%	4300 dpm Gross Alpha/Beta				
60.0	11 / 100%	4750 dpm Gross Alpha/Beta		59.0 - 78.5 ft Tuff - Moderately welded to densely welded, pinkish white (5YR 8/2), dry. 15% quartz, 15% pumice, 5% lithics, sanidine <5%. Iron staining at grain boundaries. Lithic clasts are angular and large (up to 2 cm in diameter).	Unit 1v(c) Tshirege Member, Bandelier Tuff	
65.0	12 / 100%	3920 dpm Gross Alpha/Beta				
70.0	13 / 100%	3880 dpm Gross Alpha/Beta				

Construction: 7 7



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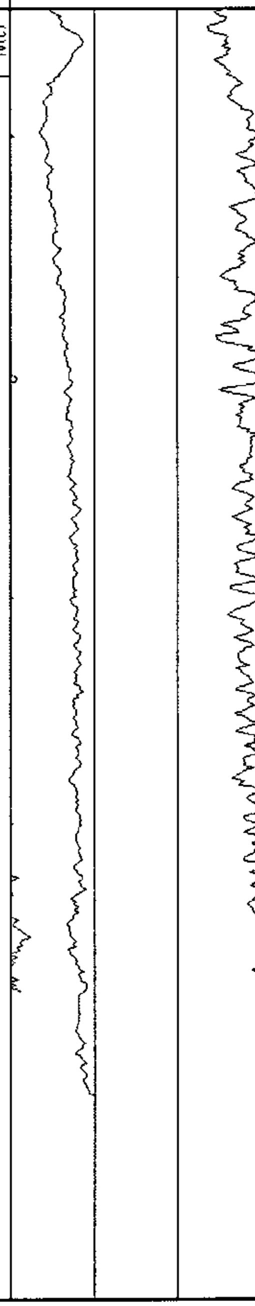
Environmental Characterization and Remediation
2004 - 2005 MDA G Environmental Characterization Drilling
Borehole Log

Borehole ID: 54-24397 **TA/OU:** 54/1148 **MDA:** G **Start Date / Time:** 3-21-05, 1352 **End Date / Time:** 3-8-05, 1548

Drilling Co.: Enviro-Drill Inc. **Drilling Equip. / Method:** CME 75 / Hollow Stem Auger **Driller:** Matt Cain **Geologist:** Pattie Baucom, Apogen

Sampling Method: Continuous 5 ft core barrel **Declination:** 90 degrees **Bearing:** na **TD:** 200 ft

Depth	Core Run # / Core Recovery %	Field Screening Results	Analytical Sample Number	Lithology	Graphic Log	Lithologic Unit	Neutron (0 CPS 300) / Gamma (0 CPS 300)	Construction	Notes
	14 / 95%	3530 dpm Gross Alpha/Beta	No Samples			Qbt 1v(c)			
80.0	15 / 95%	3770 dpm Gross Alpha/Beta		78.5 - 155.0 ft Tuff - Nonwelded, pink (5YR 7/4) to white (5YR 8/1), dry. 10% quartz, 15% pumice, <5% sanidine, 5% lithics, 5% mafic minerals. Pumice are large (up to 7 cm in diameter).		Unit 1g Tshirege Member, Bandelier Tuff			
85.0	16 / 95%	3620 dpm Gross Alpha/Beta 0.8 ppm VOCs via PID Headspace							
90.0	17 / 95%	3740 dpm Gross Alpha/Beta							
95.0	18 / 95%	3600 dpm Gross Alpha/Beta							
100.0	19 / 95%	3100 dpm Gross Alpha/Beta 0.1 ppm VOCs via PID Headspace							
105.0	20 / 95%	3570 dpm Gross Alpha/Beta							
110.0	21 / 95%	3390 dpm Gross Alpha/Beta 0.1 ppm VOCs via PID Headspace							Gross Alpha/Beta Background = 2070 dpm.
115.0	22 / 90%	4740 dpm Gross Alpha/Beta							
120.0	23 / 85%	3820 dpm Gross Alpha/Beta 0.0 ppm VOCs via PID Headspace							
125.0	24 / 85%	2940 dpm Gross Alpha/Beta							
130.0	25 / 85%	2920 dpm Gross Alpha/Beta 0.0 ppm VOCs via PID Headspace							Slough in borehole from 139.0 - 200 ft prevents further geophysical measurements.
135.0	26 / 85%	3600 dpm Gross Alpha/Beta							
140.0	27 / 90%	4540 dpm Gross Alpha/Beta							
145.0	28 / 90%	3230 dpm Gross Alpha/Beta 0.0 ppm VOCs via PID Headspace							



Los Alamos National Laboratory
Environmental Characterization and Remediation
2004 - 2005 MDA G Environmental Characterization Drilling
Borehole Log

Borehole ID: 54-24397 **TA/OU:** 54/1148 **MDA:** G **Start Date / Time:** 3-21-05, 1352 **End Date / Time:** 3-8-05, 1548

Drilling Co.: Enviro-Drill Inc. **Drilling Equip. / Method:** CME 75 / Hollow Stem Auger **Driller:** Matt Cain **Geologist:** Pattie Baucom, Apogen

Sampling Method: Continuous 5 ft core barrel **Declination:** 90 degrees **Bearing:** na **TD:** 200 ft

Depth	Core Run # / Core Recovery %	Field Screening Results	Analytical Sample Number	Lithology	Graphic Log	Lithologic Unit	Neutron 0 CPS 300 / Gamma 0 CPS 300	Construction 7 7	Notes
	29 / 95%	4310 dpm Gross Alpha/Beta		150.5 - 150.8 ft Pumice, reworked. 50% coarse-grained quartz, 50% angular gravel-sized pumice.		Qbt 1g			
155.0	30 / 95%	4020 dpm Gross Alpha/Beta	MD54-05-58215			Qbtt			
160.0	31 / 95%	4090 dpm Gross Alpha/Beta		156.5 - 174.0 ft Interlayered poorly sorted silty sands, sand with pebbles and silt laminations, and pumice fragments, slightly moist.		Cerro Toledo Interval			
165.0	32 / 85%	3250 dpm Gross Alpha/Beta							
170.0	33 / 90%	4720 dpm Gross Alpha/Beta							
175.0	34 / 95%	4280 dpm Gross Alpha/Beta	No Samples	174.0 - 200.0 ft Tuff - Nonwelded, pink (7.5YR 8/3), dry. 10% quartz, 5% lithics, 5% mafic minerals, 15 - 17% pumice.		Otowi Member, Bandelier Tuff			
180.0	35 / 95%	4240 dpm Gross Alpha/Beta							
185.0	36 / 95%	4600 dpm Gross Alpha/Beta							
190.0	37 / 95%	3050 dpm Gross Alpha/Beta							
195.0	38 / 95%	3830 dpm Gross Alpha/Beta TNT/RDX - Nondetect	MD54-05-58220						TD - 200.0 ft.
200.0									

Appendix D

Quality Assurance/Quality Control Program

D-1.0 INTRODUCTION

This appendix discusses analytical methods, data quality objectives, and data quality review. Additionally, this appendix summarizes the effects of data quality exceptions on the acceptability of the field and analytical laboratory and their data impacts on the investigation and site status.

Quality assurance (QA), quality control (QC), and data validation procedures were implemented in accordance with the "Quality Assurance Project Plan Requirements for Sampling and Analysis" (LANL 1996, 54609), and the Los Alamos National Laboratory's (the Laboratory's of LANL's) statement of work (SOW) for analytical laboratories (LANL 2000, 71233). 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, blank spikes, matrix spikes, laboratory-control samples (LCSs), internal standards, initial and continuing calibrations, surrogates, and tracers.

The type and frequency of QC analyses are described in the analytical laboratories SOW (LANL 2000, 71233). Other QC factors, such as sample preservation and holding times, were also assessed in accordance with the requirements outlined in the standard operating procedure (SOP) Environmental Stewardship Division–Environmental Characterization and Remediation Group (ENV-ECR) SOP-1.02, Rev. 1, INC1, Sample Containers and Preservation. A focused data validation was also performed for each data package (also referred to as request numbers). The SOPs used for data validation are provided in Table D-1.0-1. The focused validation included a more detailed review of the data generated by the analytical laboratory. The analytical data and instrument printouts used during focused validation are provided in Appendix E.

Analytical data were reviewed and evaluated based on Environmental Protection Agency (EPA) National Functional Guidelines for inorganic and organic chemical data review, where applicable (EPA 1999, 66649; EPA 1994, 48639). Data have also been assessed using guidelines established in SW-846 (EPA 1996, 57589). As a result of the data validation and assessment efforts, qualifiers are assigned to the analytical records as appropriate. The explanation of data qualifiers used in data validation procedures is provided in Table D-1.0-2.

D-2.0 ANALYSIS SUMMARY

From May 23, 2005, to August 2, 2005, 69 pore-gas samples and 1 field duplicate were collected at Material Disposal Area (MDA) G at Technical Area (TA) 54 for analysis of volatile organic compounds (VOCs) using EPA Method TO-15. All QC procedures were followed as required by the analytical laboratories SOW (LANL 2000, 71233). Table D-2.0-1 lists the analytical methods used for organic chemical analyses

From May 23, 2005, to August 4, 2005, 70 pore-gas samples and 1 field duplicate were collected for tritium analysis using EPA Method 9063 (NESHAP Part 61, Appendix B). All QC procedures were followed as required by the analytical laboratories SOW (LANL 2000, 71233). Table D-2.0-2 lists the analytical methods used for radionuclide analyses.

From January 25, 2005, to May 23, 2005, 41 core samples and 34 field duplicates were collected for analysis of VOCs, dioxins/furans, and explosives using EPA Methods 8260B, 8290, and 8330, respectively. All QC procedures were followed as required by the analytical services SOW (LANL 2000, 71233). Table D-2.0-1 gives the analytical methods used for organic chemical analyses.

From January 25, 2005, to May 24, 2005, 104 core samples and 34 field duplicate were collected for analyses of gamma spectroscopy suite isotopes; gas-flow proportional counting of strontium-90 and technetium-99; alpha spectroscopy of americium, plutonium, thorium, and uranium isotopes; and liquid scintillation analysis of technetium-99. HASL-300 Methods and EPA Methods 901.1 and 905.0 were used. All QC procedures were followed as required by the analytical laboratories SOW (LANL 2000, 71233). Table D-2.0-3 gives the analytical methods used for radionuclide analyses.

From January 25, 2005, to June 7, 2005,147 core samples and 36 field duplicate samples were collected for inductively coupled plasma (ICP) analysis of metals, ICP mass spectroscopy (ICPMS) analysis of metals, cold-vapor atomic absorption analysis of mercury, colorimetric analysis of cyanide, and ion chromatographic analysis of anions. EPA Methods 6010B, 6020, 7471A, 9012A, 300.0, and 314.0 were used. All QC procedures were followed as required by the analytical laboratories SOW (LANL 2000, 71233). Table D-2.0-3 gives the analytical methods used for inorganic chemical analyses.

The analytical methods for organic and inorganic chemicals and radionuclides are summarized in the following sections. The required estimated detection limit (EDL) or estimated quantitation limit (EQL) for each analyte is prescribed in the analytical laboratories SOW (LANL 2000, 71233).

D-3.0 ORGANIC CHEMICAL ANALYSES

The summaries for these analyses are presented in the sections below. All QC procedures were followed as required by the analytical laboratories SOW (LANL 2000, 71233).

D-3.1 Maintenance of Chain of Custody

Chain of custody was properly maintained for all samples.

D-3.2 Sample Documentation and Dilutions

Samples were properly documented in the field.

D-3.3 Sample Preservation

Preservation criteria were met for all samples.

D-3.4 Holding Times

Holding times were met for all but one sample analyzed for explosive compounds. No explosives analytes were detected in this sample. The reported values for these 14 nondetected results have been qualified with UJ and are an estimate of the sample-specific quantitation limits or detection limits (DLs).

D-3.5 Initial and Continuing Calibrations

Initial and continuing calibrations were met for all but 132 VOC samples analyzed by SW-846 Method 8260B and 151 VOC samples analyzed by EPA Method TO-15. Initial calibration percent relative standard deviation or continuing calibration percent difference criteria were not met. The reported values for each of the affected core results and 129 air results have been qualified with UJ and are an estimate of the sample-specific quantitation limits or DLs. Twenty-two detection results in air analyses are qualified with J and are estimated.

D-3.6 Analyte Identification

Analyte identification criteria were met for all the organic chemical samples from core. Sixty-nine VOC samples from air did not meet the mass spectral criteria. These samples are qualified with U as not detected.

D-3.7 Analyte Quantitation

Analyte quantitation criteria were met for all organic chemical analytical results.

D-3.8 Method Blanks

The method blank results for organic chemical analyses were within acceptable limits for 6125 analyses. Target analyte was detected in method blanks and in associated soil samples at less than or equal to 5 times (10 times for common laboratory contaminants) the value in the method blank affecting 35 dioxin/furan sample analyses. The results are qualified but not detected with U in the samples impacted by method blank contamination.

D-3.9 Matrix Spike Recoveries

Matrix spike recoveries for organic chemical analyses were within acceptable limits for all the analyses.

D-3.10 Surrogate Recoveries and Internal Standard Responses

Surrogate recoveries for organic chemical analyses were within acceptable limits for all the analyses. Internal standard responses for organic chemical analyses were within acceptable limits for all analyses.

D-3.11 Laboratory Control Sample (LCS) Recoveries

The LCS recoveries were within acceptance limits for all but 16 analytical results from soil analyses and 112 air analyses. Six nondetected VOC soil analyses using SW-846 Method 8260B are qualified with UJ, 92 nondetected VOC air analyses using EPA Method TO-15 are qualified with UJ, and 1 detected VOC air analysis using EPA Method TO-15 was qualified with J- because they were associated with LCS recoveries greater than or equal to 10% but less than 70%. The reported results for the detected samples are estimated and biased low. The reported values for these nondetected results are an estimate of the sample-specific quantitation limits or DLs.

Nineteen detected VOC air analyses using EPA Method TO-15 are qualified with J+ because they were associated with LCS recoveries greater than upper acceptance limits. The reported results for the detected samples are estimated and biased high.

D-3.12 Laboratory and Field Duplicates

Laboratory duplicate precision is not evaluated for organic chemicals.

Field duplicates collected for VOC and explosives analyses indicate acceptable precision. Field duplicate precision was poor for dioxin/furan analyses raising questions about the reliability of low-level dioxin/furan analyses. Of the 850 dioxin/furan field duplicate samples analyzed, 37 contained detected results in either the associated sample or field duplicate. Seventeen of 37 were nondetected in the field duplicate but were detected in the sample, 13 of 37 were nondetected in the sample but were detected in the field duplicate, while the remaining seven of 37 were detected in both the sample and field duplicate. Field duplicate to sample relative percent difference (RPD) was greater than 35% in two of the seven detected pairs or 5% of the total. Generally, low-level dioxin/furan detects were not reproducible in 86% of analyses. No qualification was performed based on this observation; the dioxin/furan results may be estimates, given the poor precision.

D-3.13 Trip, Field, and Rinsate Blanks

No trip or field blanks were collected for VOC air analyses. No rinsate blank samples were collected for organic chemical analyses. Thirty-six trip blanks were collected for VOC core analyses. Acetone contamination was detected in every trip blank. Methylene chloride was detected in 20 trip blanks, indicating it may be present in samples because of contamination. Acetone was detected at concentrations in samples below levels found in the trip blanks, indicating that any acetone detect could be the result of contamination. Other field blank analyses showed negligible contamination or were not associated with detected sample results.

D-4.0 INORGANIC CHEMICAL ANALYSES

D-4.1 Maintenance of Chain of Custody

Chain of custody was properly maintained for all samples.

D-4.2 Sample Documentation and Dilutions

Samples were properly documented in the field.

D-4.3 Sample Preservation

Preservation criteria were met for all samples.

D-4.4 Holding Times

Holding times were met for all but 14 cyanide, 6 perchlorate, and 17 nitrate soil sample analyses. Nitrate was not detected in 16 samples and is qualified with UJ; nitrate was detected in one of these out-of-hold analyses and is qualified with J-; cyanide was not detected in 14 out-of-hold analyses and is qualified with UJ; and perchlorate was not detected in 6 out-of-hold samples and is qualified with UJ. The reported values for these nondetected results are an estimate of the sample-specific quantitation limits or DLs. The reported results for the detected samples are estimated and biased low.

D-4.5 Initial and Continuing Calibrations

Initial and continuing calibrations are acceptable for all inorganic chemical analyses except for 15 detected ICP analyses. Initial calibration verification or continuing calibration verification standard recoveries associated with these samples analyzed by ICP were greater than or equal to 110% but less than 125%. The reported results for the detected samples are qualified with J+ and are estimated and biased high.

D-4.6 Analyte Identification

Analyte identification criteria were met for all inorganic chemical analyses.

D-4.7 Analyte quantitation

Analyte quantitation criteria were met for all inorganic chemical analyses.

D-4.8 Method Blanks

The method blank results for inorganic chemical analyses were within acceptable limits for 3793 analyses. For an analyte to be qualified as nondetected based on method blank contamination, the target analyte must be detected in both the method blank and in the associated soil sample, and the concentration of analyte in the sample must be less than or equal to 5 times the value of the analyte in the method blank. Fifty-six ICP analyses are qualified with U; 15 ICPMS analyses were qualified with U, 3 mercury analyses are qualified with U; and 12 cyanide analyses are qualified with U as a result of method blank contamination.

D-4.9 Matrix Spike Recoveries

Matrix spike recoveries for inorganic chemical analyses were within acceptable limits for 3533 analyses. These recoveries were greater than or equal to 30% but less than 75%, affecting 6 nondetected cyanide analyses qualified with UJ; 38 detected ICP soil analyses qualified with J-; 8 detected ICPMS analyses qualified with J-; and 39 nondetected ICPMS soil analyses qualified with UJ. The reported results for the detected samples are estimated and biased low. The reported values for these nondetected results are estimates of the sample-specific quantitation limits or DLs.

Matrix spike recoveries were greater than 125% but less than or equal to 150%, affecting 121 detected ICP soil analyses qualified with J+ and 7 ICPMS soil analyses qualified with J+. The reported results for the detected results are estimated and biased high.

Recoveries of inorganic chemicals were greater than 150%, affecting 118 detected ICP soil analyses qualified with J+; 2 detected ICPMS soil analyses also qualified with J+; and 5 nondetected cyanide soil analyses qualified with UJ. The reported results for the detected samples are estimated and biased high. The reported values for these nondetected results are estimates of the sample-specific quantitation limits or DLs.

Finally, two nondetected cyanide soil analyses were analyzed without an associated sample matrix spike and are qualified with UJ. The reported values for these nondetected results are estimates of the sample-specific quantitation limits or DLs.

D-4.10 Internal Standard responses

Internal standard responses for ICPMS analyses were within acceptable limits for all analyses.

D-4.11 LCS Recoveries

The LCS recoveries for inorganic chemical analyses were within acceptable limits for 3844 samples. The recoveries were greater than 125%, affecting 19 detected samples from ICP soil analyses qualified with J+, and 10 detections from cyanide soil analyses also qualified with J+. The reported results for the detected records are estimated and biased high.

Recoveries were greater than or equal to 30% but less than 75%, affecting 3 detected nitrate samples qualified with J- and 2 nondetected nitrate results qualified with UJ from anion soil. Six nondetected results from cyanide analyses are qualified with UJ. The reported results for the detected record are estimated and biased low. The reported values for these nondetected results are an estimate of the sample-specific quantitation limits or DLs.

D-4.12 Laboratory and Field Duplicates

Laboratory duplicates collected for inorganic chemical analyses indicate acceptable precision for all but 72 results. Sixty detected samples are qualified with J, 3 nondetected ICP soil analyses are qualified with UJ, and 6 detected ICPMS soil analyses were qualified with J because laboratory duplicate pairs did not meet 35% RPD criteria. One detected cyanide result is qualified with J, and two nondetected cyanide soil analyses are qualified with UJ because the laboratory duplicate pair results were less than five times the reporting limit, but their difference was greater than two times the reporting limit.

Three ICP soil analyses and one ICPMS soil analysis did not meet serial dilution sample criteria. The undiluted ICP sample results were greater than 50 times their reporting limits or the ICPMS sample results were greater than 100 times their reporting limits, but the RPD between the samples and their serial dilution was greater than 10. The affected results are qualified with J and are estimated.

Field duplicates collected for most inorganic chemical analyses indicate acceptable precision. The field duplicate and associated sample analysis was not detected for 308 analyses. A total of 636 inorganic chemical samples were detected in either the sample or the field duplicate. Of these 636 samples, 51 had an RPD greater than or equal to 35%, and 38 were not detected in both the sample and field duplicate. In total, 89 of inorganic chemical analyses were not reproducible. No qualifications are necessary based on this performance.

D-4.13 Trip, Field, and Rinsate Blanks

Field blanks were not collected for inorganic chemical analyses.

D-5.0 RADIONUCLIDE ANALYSES

D-5.1 Maintenance of Chain of Custody

Chain of custody was properly maintained for all samples.

D-5.2 Sample Documentation and Dilutions

Samples were properly documented in the field.

D-5.3 Sample Preservation

Preservation criteria were met for all samples.

D-5.4 Holding Times

Holding times were met for all inorganic chemical digestions and analyses.

D-5.5 Initial and Continuing Calibrations

Initial and continuing calibrations are acceptable for all radionuclide analyses.

D-5.6 Analyte Identification

Analyte identification criteria were met for all radionuclide analyses.

D-5.7 Analyte Quantitation

Analyte quantitation criteria were met for all but four radionuclide analyses. Technetium-99 was detected in results for two samples, MD54-05-58122 and MD54-05-58123, from request number 2943S. The technetium-99 analyses were performed using a gas-flow method that does not discriminate between different beta emitters. The method relies on complete ion-resin separation of technetium-99 from the sample. However, while beta emitters are separated from the sample by the sample preparation steps, beta emitter interferers will begin ingrowth immediately after chemical separation. Signal detected at the instrument and assumed to be technetium-99 will increase, depending on the time between chemical separation and analysis.

A third detected result of technetium-99, sample ID MD54-05-58199, was analyzed by liquid scintillation. The quench of this sample was twice that of any other sample analyzed in the batch. Such a large difference is not expected between samples of similar matrix. A quench calibration was provided in the package but there was no evidence the quench curve was used to calculate the reported results. It appears the laboratory used a constant quench method of calculation. When this method of calculation is used, the sample quench should be within 5% of the standard quench

Sample ID MD54-05-58146 was reported to contain trace amounts of cesium-137. Analytical results from the laboratory show that cesium-137 was not identified and as such is not usable.

D-5.8 Method Blanks

The method blank results for radionuclide analyses were within acceptable limits for 2155 core and 65 air analyses. For a radionuclide to be qualified as nondetected based on method blank contamination, the target analyte must be detected in both the method blank and in the associated sample, and the concentration of analyte in the sample must be less than or equal to the concentration of the analyte in the method blank. Three isotopic thorium analyses are qualified with U and seven tritium analyses are qualified with U as a result of method blank contamination. The results are qualified as analyzed but not detected.

D-5.9 Matrix Spike Recoveries

Matrix spike recoveries for radionuclide analyses were within acceptable limits for all the analyses.

D-5.10 Carrier and Tracer Recoveries

Tracer and carrier recoveries for radionuclide analyses were within acceptable limits for 2133 core and 72 air analyses. Tracer or carrier recoveries were greater than upper acceptance limits affecting two detected results qualified with J+ from isotopic americium soil analyses. The reported results for the detected records are estimated and biased high.

Tracer or carrier recoveries were greater than or equal to 10% but less than 30%, affecting 15 nondetected results qualified with UJ from isotopic americium analyses; 12 nondetected results qualified with UJ from isotopic plutonium analyses; 11 detected results qualified with J- and 5 nondetected results qualified with UJ from isotopic thorium analyses; and 17 detected results qualified with J- and 15 nondetected results qualified with UJ from isotopic uranium analyses. The reported results for the detected record are estimated and biased low. The reported values for these nondetected results are estimates of the sample-specific quantitation limits or DLs.

D-5.11 LCS Recoveries

Recoveries of LCSs for radionuclide analyses were within acceptable limits for 2090 core and 72 air analyses. The recoveries were greater than 120%, affecting eight detected results qualified with J+ from isotopic thorium analysis. The reported results for the detected records are estimated and biased high.

The recoveries were greater than or equal to 10% but less than 80%, affecting 2 detected results qualified with J- from strontium-90 analyses; 4 nondetected results qualified with UJ from isotopic americium analysis; 4 nondetected results qualified with UJ from isotopic plutonium analysis; 4 nondetected results qualified with UJ from isotopic thorium analysis; and 8 nondetected results qualified with UJ from technetium-99 analysis.

D-5.12 Laboratory and Field Duplicates

Field duplicates collected for most radionuclide analyses indicate acceptable precision. The field duplicate and associated sample analysis was not detected for 371 core analyses. A total of 167 radionuclide results were detected in either the core sample or field duplicates. Of these 167 results, 7 showed an RPD of greater than or equal to 35% and a duplicate error ratio greater than 4. Forty-seven results were not detected in both the sample and field duplicate. In total, 53 of radionuclide field duplicate analyses did not reproduce sample results. No qualifications are necessary based on this performance.

D-5.13 Trip, Field, and Rinsate Blanks

Field blanks samples were not collected for radionuclide analyses.

D-6.0 REFERENCES

The following list includes all references cited in this appendix. Parenthetical information following each reference provides the author, publication date, and the ER identification (ID) number. This information also is included in the citations in the text. ER ID numbers are assigned by the Los Alamos National Laboratory's ENV-ERS Program to track records associated with the Program. These numbers can be used to locate copies of the actual documents at the ENV-ERS Program's Records Processing Facility and, where applicable, with the ENV-ERS Program's reference library titled "Reference Set for Material Disposal Areas, Technical Area 54."

Copies of the reference library are maintained at the NMED Hazardous Waste Bureau; the DOE Los Alamos Site Office; and EPA, Region 6. This library is a living collection of documents that was developed to ensure that the administrative authority has all the necessary material to review the decisions and actions proposed in this document. However, documents previously submitted to the administrative authority are not included.

EPA (U.S. Environmental Protection Agency), May 1996. "Test Methods for Evaluating Solid Waste, Laboratory Manual, Physical/Chemical Methods," SW-846, 3rd ed., Update III, Washington, D.C. (EPA 1987, 57589)

EPA (U.S. Environmental Protection Agency), February 1, 1994. "USEPA Contract Laboratory Program National Functional Guidelines for Inorganic Data Review," OSWER 9240.1-35, EPA540/R-94-013, Washington, D.C. (EPA 1994, 48639)

EPA (U.S. Environmental Protection Agency), October 1, 1999. "USEPA Contract Laboratory Program National Functional Guidelines for Organic Data Review," OSWER 9240.1-05A-P, PB99-963506, EPA540/R-99-008, Washington, D.C. (EPA 1999, 66649)

LANL (Los Alamos National Laboratory), March 1996. "Quality Assurance Project Plan Requirements for Sampling and Analysis," Los Alamos National Laboratory document LA-UR-96-441, Los Alamos, New Mexico. (LANL 1996, 54609)

LANL (Los Alamos National Laboratory), December 2000. "Statement of Work for Analytical Laboratories, Rev. 1," Los Alamos National Laboratory contract number I8980SOW0-8s, Los Alamos, New Mexico. (LANL 2000, 71233)

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Table D-1.0-1
Data Analysis and Assessment Procedures

Procedure Identifier	Title	Effective Date
SOP-15.01, Rev. 1	Routine Validation of Volatile Organic Data	4/20/2004
SOP-15.02, Rev. 1	Routine Validation of Semivolatile Organic Data	04/20/2004
SOP-15.04, Rev. 1	Routine Validation of High Explosives Data	04/20/2004
SOP-15.05, Rev. 1, ICN 1	Routine Validation of Inorganic Data	04/30/2004
SOP-15.06, R1, ICN1	Routine Validation of Gamma Spectroscopy Data	04/20/2004
SOP-15.07, R1, ICN1	Routine Validation of Chemical Separation Alpha Spectrometry, Gas Proportional Counting, and Liquid Scintillation Data	04/20/2004

Table D-1.0-2
Explanation of Data Qualifiers Used in the Data Validation Procedure

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.

Table D-2.0-1
Analytical Methods Used for Organic Chemical Analyses

Analytical Method	Analytical Description	Target Compound List
EPATO-15 – Sampling and Analysis	VOCs in air	Analytical services SOW (LANL 2000, 71233)
EPA SW-846 method 8260B	VOCs	Analytical services SOW (LANL 2000, 71233)
EPA SW-846 method 8290	Dioxins/furans	Analytical services SOW (LANL 2000, 71233)
EPA SW-846 method 8321A	Explosives	Analytical services SOW (LANL 2000, 71233)

Table D-2.0-2
Analytical Methods Used for Radionuclide Analyses

Analytical Method	Analytical Technique	Radionuclides
EPA Method 114 – Sampling EPA Method 114 – Extraction EPA Method 906.0 – Analysis	Liquid scintillation in air	Tritium
EPA Method 901.1	Gamma spectroscopy	Gamma-emitting isotopes
EPA Method 905.0	Gas-flow proportional counting	Strontium-90
HASL-300 Method	Alpha spectroscopy	Isotopic americium
HASL-300 Method	Alpha spectroscopy	Isotopic plutonium
HASL-300 Method	Alpha spectroscopy	Isotopic uranium
HASL-300 Method	Alpha spectroscopy	Isotopic thorium
HASL-300 Method	Liquid scintillation	Technetium-99

Table D-2.0-3
Analytical Methods Used for Inorganic Chemical Analyses

Analytical Method	Analytical Description	Target Analyte List
EPA Method 300.0	Anion	Nitrate
EPA Method 314.0	Anion	Perchlorate
EPA SW-846 Method 6010B	ICP metals	Analytical laboratories SOW (LANL 2000, 71233)
EPA SW-846 Method 6020	ICPMS metals	Analytical laboratories SOW (LANL 2000, 71233)
EPA SW-846 Method 7471A	Mercury	Mercury
EPA SW-846 Method 9012A	Cyanide	Cyanide

Appendix E

Analytical Data, Analytical Reports,
Data Validation Reports, and Chain-of-Custody Forms
(CDs included with this document)

One of the CDs included with this appendix contains the analytical data in the form of data tables. This CD is labeled "Appendix E, Analytical Data."

All available reports from the contract laboratories are included in this appendix. These reports are provided as a four-part CD set labeled "Appendix E, Analytical Reports, Data Validation Reports, and Chain-of-Custody Forms."

Preliminary analytical data for Borehole 1 (54-24360) are attached for the following:

- subsurface core
  - inorganic chemicals
  - organic chemicals
  - gamma spectroscopy
  - isotopic plutonium
  - isotopic uranium
  - isotopic thorium
  - strontium-90
- pore gas
  - volatile organic chemicals
  - tritium

Missing data for Borehole 1 include the following:

- subsurface core
  - technetium-90
  - dioxin/furan

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Certificate of Analysis

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Los Alamos, New Mexico 87545
Contact: Joylene Valdez
Project: **LANL ER Project**

Report Date: August 30, 2005

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Client Sample ID: MD54-05-57871
Sample ID: 143791001
Matrix: Soil
Collect Date: 18-AUG-05 10:23
Receive Date: 23-AUG-05
Collector: Client
Moisture: 8.76%

Project: LANL00600
Client ID: LANL006

Parameter	Qualifier	Result	DL	RL	Units	DF	Analyst	Date	Time	Batch	Method
Flow Injection Analysis Federal											
SW9012A Cyanide, Total Federal											
Cyanide, Total	U	ND	133	266	ug/kg	1	ADF	08/29/05	1708	456292	1
Ion Chromatography Federal											
EPA 300.0 Nitrate in Soil											
Nitrate-N	Hh	1.14	0.219	1.10	mg/kg	1	VH1	08/30/05	0714	456516	2
EPA 314.0 DOE-AL Perchlorate by IC											
Perchlorate	U	ND	43.8	132	ug/kg	1	AXM1	08/29/05	2201	456104	3
Mercury Analysis-CVAA											
7471 Cold Vapor Hg in Solid											
Mercury	U	ND	2.74	10.9	ug/kg	1	NOR1	08/30/05	1100	457608	4
Metals Analysis-ICP											
3050/6010 Aluminum Federal											
Aluminum		679000	7380	21700	ug/kg	1	HSC	08/30/05	0818	457543	5
Arsenic	J	1560	651	1630	ug/kg	1					
Barium		4260	109	543	ug/kg	1					
Boron	U	ND	1090	5430	ug/kg	1					
Cadmium	U	ND	109	543	ug/kg	1					
Calcium		1400000	3910	10900	ug/kg	1					
Chromium		901	109	543	ug/kg	1					
Cobalt	U	ND	217	543	ug/kg	1					
Copper		1560	326	1090	ug/kg	1					
Iron		5100000	1950	10900	ug/kg	1					
Lead		1090	271	1090	ug/kg	1					
Magnesium		165000	9220	32600	ug/kg	1					
Manganese		381000	217	1090	ug/kg	1					
Potassium		475000	5430	16300	ug/kg	1					
Selenium	U	ND	651	1630	ug/kg	1					
Sodium		402000	4880	16300	ug/kg	1					
Vanadium		855	109	543	ug/kg	1					
Zinc		69800	217	1090	ug/kg	1					
Metals Analysis-ICP-MS											
3050/6020 Silver Federal											
Antimony	U	ND	108	431	ug/kg	2	BAJ	08/30/05	1156	457536	6
Molybdenum		500	21.5	108	ug/kg	2					
Nickel		470	108	431	ug/kg	2					

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Client Sample ID: MD54-05-57871 Project: LANL00600
Sample ID: 143791001 Client ID: LANL006

Parameter	Qualifier	Result	DL	RL	Units	DF	Analyst	Date	Time	Batch	Method
Metals Analysis-ICP-MS											
3050/6020 Silver Federal											
Silver	U	ND	43.1	215	ug/kg	2					
Thallium	U	ND	86.1	215	ug/kg	2					
Beryllium		439	21.5	108	ug/kg	2	BAJ	08/30/05	1504	457536	7

The following Prep Methods were performed

Method	Description	Analyst	Date	Time	Prep Batch
EPA 300.0 PREP	EPA 300.0 Total Anions in Soil	VH1	08/29/05	1717	456514
EPA 314.0	EPA 314.0 Prep Perchlorate by IC	AXM1	08/29/05	1600	456103
SW846 3050B	846 3050BS PREP	SXL2	08/29/05	1730	457541
SW846 3050B	ICP-MS 3050BS PREP	SXL2	08/29/05	1730	457534
SW846 7471A Prep	EPA 7471A Mercury Prep Soil	ETL	08/29/05	1600	457607
SW846 9010B Prep	SW846 9010B Prep	GXA2	08/26/05	1435	456291

The following Analytical Methods were performed

Method	Description	Analyst Comments
1	SW846 9012A	
2	EPA 300.0	
3	EPA 314.0 DOE-AL	
4	SW846 7471A	
5	SW846 3050B/6010B	
6	SW846 3050B/6020	
7	SW846 3050B/6020	

Notes:
The Qualifiers in this report are defined as follows :

** Indicates the analyte is a surrogate compound.
< Result is less than amount reported.
> Result is greater than amount reported.
B Target analyte was detected in the sample as well as the associated blank.
BD Results below the MDC or low tracer recovery.
E Concentration of the target analyte exceeds the instrument calibration range.
H Analytical holding time exceeded.
J Indicates an estimated value.
U Target analyte was analyzed for but not detected above the MDL or LOD.
UI Uncertain identification for gamma spectroscopy.
X Lab-specific qualifier-please see case narrative, data summary package or contact your project manager for details.

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Client Sample ID: MD54-05-57871 Project: LANL00600
Sample ID: 143791001 Client ID: LANL006

Parameter	Qualifier	Result	DL	RL	Units	DF	AnalystDate	Time	Batch	Method

Z Paint Filter qualifier: Particulates passed through the filter. No free liquids were observed.
d The 2:1 depletion requirement was not met for this sample
h Sample preparation or preservation holding time exceeded.

The above sample is reported on a dry weight basis except where prohibited by the analytical procedure.
Where the analytical method has been performed under NELAP certification, the analysis has met all of the requirements of the NELAC standard unless qualified on the Certificate of Analysis.

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Certificate of Analysis

Company : Los Alamos National Laboratories
Address : PO Box 1663
TA-3, Bldg. 1237, Drop Pt. 03U
Los Alamos, New Mexico 87545
Contact: Joylene Valdez
Project: **LANL ER Project**

Report Date: August 30, 2005

Page 1 of 3

Client Sample ID: MD54-05-57872
Sample ID: 143791002
Matrix: Soil.
Collect Date: 18-AUG-05 13:10
Receive Date: 23-AUG-05
Collector: Client
Moisture: 3.85%

Project: LANL00600
Client ID: LANL006

Parameter	Qualifier	Result	DL	RL	Units	DF	Analyst	Date	Time	Batch	Method
Flow Injection Analysis Federal											
SW9012A Cyanide, Total Federal											
Cyanide, Total	U	ND	125	250	ug/kg	1	ADF	08/29/05	1709	456292	1
Ion Chromatography Federal											
EPA 300.0 Nitrate in Soil											
Nitrate-N	HJh	0.863	0.208	1.04	mg/kg	1	VH1	08/30/05	0812	456516	2
EPA 314.0 DOE-AL Perchlorate by IC											
Perchlorate	U	ND	41.6	125	ug/kg	1	AXM1	08/29/05	2302	456104	3
Mercury Analysis-CVAA											
7471 Cold Vapor Hg in Solid											
Mercury	U	ND	2.56	10.2	ug/kg	1	NOR1	08/30/05	1110	457608	4
Metals Analysis-ICP											
3050/6010 Aluminum Federal											
Aluminum		4960000	7000	20600	ug/kg	1	HSC	08/30/05	0848	457543	5
Arsenic	J	708	618	1540	ug/kg	1					
Barium		16000	103	515	ug/kg	1					
Boron	J	1910	1030	5150	ug/kg	1					
Cadmium	U	ND	103	515	ug/kg	1					
Calcium		1480000	3710	10300	ug/kg	1					
Chromium		2890	103	515	ug/kg	1					
Cobalt		722	206	515	ug/kg	1					
Copper		4070	309	1030	ug/kg	1					
Iron		3490000	1850	10300	ug/kg	1					
Lead		4480	257	1030	ug/kg	1					
Magnesium		699000	8750	30900	ug/kg	1					
Manganese		172000	206	1030	ug/kg	1					
Potassium		701000	5150	15400	ug/kg	1					
Selenium	U	ND	618	1540	ug/kg	1					
Sodium		543000	4630	15400	ug/kg	1					
Vanadium		4050	103	515	ug/kg	1					
Zinc		18700	206	1030	ug/kg	1					
Metals Analysis-ICP-MS											
3050/6020 Silver Federal											
Antimony	U	ND	103	412	ug/kg	2	BAJ	08/30/05	1222	457536	6
Molybdenum		335	20.6	103	ug/kg	2					
Nickel		1440	103	412	ug/kg	2					

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Project: **LANL ER Project**

Report Date: August 30, 2005

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Client Sample ID: MD54-05-57872 Project: LANL00600
Sample ID: 143791002 Client ID: LANL006

Parameter	Qualifier	Result	DL	RL	Units	DF	Analyst	Date	Time	Batch	Method
Metals Analysis-ICP-MS											
3050/6020 Silver Federal											
Silver	J	48.6	41.2	206	ug/kg	2					
Thallium	U	ND	82.4	206	ug/kg	2					
Beryllium		627	20.6	103	ug/kg	2	BAJ	08/30/05	1516	457536	7

The following Prep Methods were performed

Method	Description	Analyst	Date	Time	Prep Batch
EPA 300.0 PREP	EPA 300.0 Total Anions in Soil	VH1	08/29/05	1717	456514
EPA 314.0	EPA 314.0 Prep Perchlorate by IC	AXM1	08/29/05	1600	456103
SW846 3050B	846 3050BS PREP	SXL2	08/29/05	1730	457541
SW846 3050B	ICP-MS 3050BS PREP	SXL2	08/29/05	1730	457534
SW846 7471A Prep	EPA 7471A Mercury Prep Soil	ETL	08/29/05	1600	457607
SW846 9010B Prep	SW846 9010B Prep	GXA2	08/26/05	1435	456291

The following Analytical Methods were performed

Method	Description	Analyst Comments
1	SW846 9012A	
2	EPA 300.0	
3	EPA 314.0 DOE-AL	
4	SW846 7471A	
5	SW846 3050B/6010B	
6	SW846 3050B/6020	
7	SW846 3050B/6020	

Notes:
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< Result is less than amount reported.
> Result is greater than amount reported.
B Target analyte was detected in the sample as well as the associated blank.
BD Results below the MDC or low tracer recovery.
E Concentration of the target analyte exceeds the instrument calibration range.
H Analytical holding time exceeded.
J Indicates an estimated value.
U Target analyte was analyzed for but not detected above the MDL or LOD.
UI Uncertain identification for gamma spectroscopy.
X Lab-specific qualifier-please see case narrative, data summary package or contact your project manager for details.

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Project: **LANL ER Project**

Report Date: August 30, 2005

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	Client Sample ID:	MD54-05-57872				Project:	LANL00600				
	Sample ID:	143791002				Client ID:	LANL006				
Parameter	**Qualifier**	**Result**	**DL**	**RL**	**Units**	**DF**	**AnalystDate**	**Time**	**Batch**	**Method**	

Z Paint Filter qualifier: Particulates passed through the filter. No free liquids were observed.
d The 2:1 depletion requirement was not met for this sample
h Sample preparation or preservation holding time exceeded.

The above sample is reported on a dry weight basis except where prohibited by the analytical procedure.
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Project: **LANL ER Project**

Report Date: August 30, 2005

Page 1 of 3

Client Sample ID:	MD54-05-57873	Project:	LANL00600
Sample ID:	143791003	Client ID:	LANL006
Matrix:	Soil		
Collect Date:	18-AUG-05 16:15		
Receive Date:	23-AUG-05		
Collector:	Client		
Moisture:	5.34%		

Parameter	Qualifier	Result	DL	RL	Units	DF	Analyst	Date	Time	Batch	Method
Flow Injection Analysis Federal											
SW9012A Cyanide, Total Federal											
Cyanide, Total	U	ND	121	242	ug/kg	1	ADF	08/29/05	1710	456292	1
Ion Chromatography Federal											
EPA 300.0 Nitrate in Soil											
Nitrate-N	HJh	0.856	0.211	1.06	mg/kg	1	VH1	08/30/05	0831	456516	2
EPA 314.0 DOE-AL Perchlorate by IC											
Perchlorate	U	ND	42.3	127	ug/kg	1	AXM1	08/29/05	2317	456104	3
Mercury Analysis-CVAA											
7471 Cold Vapor Hg in Solid											
Mercury	U	ND	2.58	10.3	ug/kg	1	NOR1	08/30/05	1112	457608	4
Metals Analysis-ICP											
3050/6010 Aluminum Federal											
Aluminum		2800000	7180	21100	ug/kg	1	HSC	08/30/05	0853	457543	5
Arsenic	U	ND	634	1580	ug/kg	1					
Barium		18400	106	528	ug/kg	1					
Boron	U	ND	1060	5280	ug/kg	1					
Cadmium	U	ND	106	528	ug/kg	1					
Calcium		1060000	3800	10600	ug/kg	1					
Chromium		1250	106	528	ug/kg	1					
Cobalt	J	386	211	528	ug/kg	1					
Copper		2030	317	1060	ug/kg	1					
Iron		1830000	1900	10600	ug/kg	1					
Lead		4440	264	1060	ug/kg	1					
Magnesium		812000	8980	31700	ug/kg	1					
Manganese		92200	211	1060	ug/kg	1					
Potassium		416000	5280	15800	ug/kg	1					
Selenium	U	ND	634	1580	ug/kg	1					
Sodium		783000	4750	15800	ug/kg	1					
Vanadium		2030	106	528	ug/kg	1					
Zinc		6980	211	1060	ug/kg	1					
Metals Analysis-ICP-MS											
3050/6020 Silver Federal											
Antimony	U	ND	104	417	ug/kg	2	BAJ	08/30/05	1227	457536	6
Molybdenum		381	20.8	104	ug/kg	2					
Nickel		1170	104	417	ug/kg	2					

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Report Date: August 30, 2005

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Client Sample ID: MD54-05-57873 Project: LANL00600
Sample ID: 143791003 Client ID: LANL006

Parameter	Qualifier	Result	DL	RL	Units	DF	Analyst	Date	Time	Batch	Method
Metals Analysis-ICP-MS											
3050/6020 Silver Federal											
Silver	U	ND	41.7	208	ug/kg	2					
Thallium	U	ND	83.3	208	ug/kg	2					
Beryllium		206	20.8	104	ug/kg	2	BAJ	08/30/05	1518	457536	7

The following Prep Methods were performed

Method	Description	Analyst	Date	Time	Prep Batch
EPA 300.0 PREP	EPA 300.0 Total Anions in Soil	VH1	08/29/05	1717	456514
EPA 314.0	EPA 314.0 Prep Perchlorate by IC	AXM1	08/29/05	1600	456103
SW846 3050B	846 3050BS PREP	SXL2	08/29/05	1730	457541
SW846 3050B	ICP-MS 3050BS PREP	SXL2	08/29/05	1730	457534
SW846 7471A Prep	EPA 7471A Mercury Prep Soil	ETL	08/29/05	1600	457607
SW846 9010B Prep	SW846 9010B Prep	GXA2	08/26/05	1435	456291

The following Analytical Methods were performed

Method	Description	Analyst Comments
1	SW846 9012A	
2	EPA 300.0	
3	EPA 314.0 DOE-AL	
4	SW846 7471A	
5	SW846 3050B/6010B	
6	SW846 3050B/6020	
7	SW846 3050B/6020	

Notes:
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BD Results below the MDC or low tracer recovery.
E Concentration of the target analyte exceeds the instrument calibration range.
H Analytical holding time exceeded.
J Indicates an estimated value.
U Target analyte was analyzed for but not detected above the MDL or LOD.
UI Uncertain identification for gamma spectroscopy.
X Lab-specific qualifier-please see case narrative, data summary package or contact your project manager for details.

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Page 3 of 3

Client Sample ID: MD54-05-57873 Project: LANL00600
Sample ID: 143791003 Client ID: LANL006

Parameter	Qualifier	Result	DL	RL	Units	DF	AnalystDate	Time	Batch	Method

Z Paint Filter qualifier: Particulates passed through the filter. No free liquids were observed.
d The 2:1 depletion requirement was not met for this sample
h Sample preparation or preservation holding time exceeded.

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Los Alamos, New Mexico 87545
Contact: Joylene Valdez
Project: **LANL ER Project**

Report Date: September 2, 2005

Client Sample ID: MD54-05-57871
Sample ID: 143792001
Matrix: Soil
Collect Date: 18-AUG-05 10:23
Receive Date: 23-AUG-05
Collector: Client
Moisture: 8.76%

Project: LANL00600
Client ID: LANL006

Parameter	Qualifier	Result	DL	RL	Units	DF	Analyst	Date	Time	Batch	Method
Volatile Organics Federal											
GEL 8260B Method List Soil Fed											
1,1,1,2-Tetrachloroethane	U	ND	0.288	1.44	ug/kg	1	YS1	08/29/05	1941	457329	1
1,1,1-Trichloroethane	U	ND	0.433	1.44	ug/kg	1					
1,1,2,2-Tetrachloroethane	U	ND	0.361	1.44	ug/kg	1					
1,1,2-Trichloroethane	U	ND	0.433	1.44	ug/kg	1					
1,1-Dichloroethane	U	ND	0.433	1.44	ug/kg	1					
1,1-Dichloroethylene	U	ND	0.433	1.44	ug/kg	1					
1,1-Dichloropropene	U	ND	0.361	1.44	ug/kg	1					
1,2,3-Trichloropropane	U	ND	0.721	1.44	ug/kg	1					
1,2,4-Trimethylbenzene	U	ND	0.288	1.44	ug/kg	1					
1,2-Dibromo-3-chloropropane	U	ND	0.721	1.44	ug/kg	1					
1,2-Dibromoethane	U	ND	0.288	1.44	ug/kg	1					
1,2-Dichlorobenzene	U	ND	0.288	1.44	ug/kg	1					
1,2-Dichloroethane	U	ND	0.361	1.44	ug/kg	1					
1,2-Dichloropropane	U	ND	0.433	1.44	ug/kg	1					
1,3,5-Trimethylbenzene	U	ND	0.288	1.44	ug/kg	1					
1,3-Dichlorobenzene	U	ND	0.288	1.44	ug/kg	1					
1,3-Dichloropropane	U	ND	0.433	1.44	ug/kg	1					
1,4-Dichlorobenzene	U	ND	0.288	1.44	ug/kg	1					
2,2-Dichloropropane	U	ND	0.433	1.44	ug/kg	1					
2-Butanone	U	ND	2.45	7.21	ug/kg	1					
2-Chlorotoluene	U	ND	0.288	1.44	ug/kg	1					
2-Hexanone	U	ND	2.19	7.21	ug/kg	1					
4-Chlorotoluene	U	ND	0.346	1.44	ug/kg	1					
4-Isopropyltoluene	U	ND	0.361	1.44	ug/kg	1					
4-Methyl-2-pentanone	U	ND	1.57	7.21	ug/kg	1					
Acetone		8.15	3.72	7.21	ug/kg	1					
Benzene	U	ND	0.476	1.44	ug/kg	1					
Bromobenzene	U	ND	0.288	1.44	ug/kg	1					
Bromochloromethane	U	ND	0.721	1.44	ug/kg	1					
Bromodichloromethane	U	ND	0.288	1.44	ug/kg	1					
Bromoform	U	ND	0.433	1.44	ug/kg	1					
Bromomethane	U	ND	0.721	1.44	ug/kg	1					
Carbon disulfide	U	ND	1.80	7.21	ug/kg	1					
Carbon tetrachloride	U	ND	0.288	1.44	ug/kg	1					
Chlorobenzene	U	ND	0.288	1.44	ug/kg	1					
Chloroethane	U	ND	0.721	1.44	ug/kg	1					
Chloroform	U	ND	0.288	1.44	ug/kg	1					

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Report Date: September 2, 2005

Page 2 of 3

Client Sample ID: MD54-05-57871
Sample ID: 143792001
Project: LANL00600
Client ID: LANL006

Parameter	Qualifier	Result	DL	RL	Units	DF	AnalystDate	Time	Batch	Method
Volatile Organics Federal										
GEL 8260B Method List Soil Fed										
Chloromethane	U	ND	0.721	1.44	ug/kg	1				
Dibromochloromethane	U	ND	0.433	1.44	ug/kg	1				
Dibromomethane	U	ND	0.433	1.44	ug/kg	1				
Dichlorodifluoromethane	U	ND	0.721	1.44	ug/kg	1				
Ethylbenzene	U	ND	0.288	1.44	ug/kg	1				
Iodomethane	U	ND	2.41	7.21	ug/kg	1				
Isopropylbenzene	U	ND	0.288	1.44	ug/kg	1				
Methylene chloride	BJ	5.51	2.88	7.21	ug/kg	1				
Styrene	U	ND	0.288	1.44	ug/kg	1				
Tetrachloroethylene	U	ND	0.288	1.44	ug/kg	1				
Toluene	U	ND	0.418	1.44	ug/kg	1				
Trichloroethylene	U	ND	0.361	1.44	ug/kg	1				
Trichlorofluoromethane	U	ND	0.721	1.44	ug/kg	1				
1,1,2-Trichloro-1,2,2-Trifluoroethane	U	ND	1.44	7.21	ug/kg	1				
Vinyl chloride	U	ND	0.721	1.44	ug/kg	1				
cis-1,2-Dichloroethylene	U	ND	0.433	1.44	ug/kg	1				
cis-1,3-Dichloropropylene	U	ND	0.288	1.44	ug/kg	1				
m,p-Xylenes	U	ND	0.361	2.88	ug/kg	1				
n-Butylbenzene	U	ND	0.288	1.44	ug/kg	1				
n-Propylbenzene	U	ND	0.288	1.44	ug/kg	1				
o-Xylene	U	ND	0.288	1.44	ug/kg	1				
sec-Butylbenzene	U	ND	0.288	1.44	ug/kg	1				
tert-Butylbenzene	U	ND	0.288	1.44	ug/kg	1				
trans-1,2-Dichloroethylene	U	ND	0.433	1.44	ug/kg	1				
trans-1,3-Dichloropropylene	U	ND	0.433	1.44	ug/kg	1				

The following Prep Methods were performed

Method	Description	Analyst	Date	Time	Prep Batch
SW846 5030	Volatile 5030 Solid Prep	PS	08/29/05	1503	457328

The following Analytical Methods were performed

Method	Description	Analyst Comments
1	SW846 8260B	

Surrogate/Tracer recovery	Test	Recovery%	Acceptable Limits
Bromofluorobenzene	GEL 8260B Method List Soil Fed	109	(62%-124%)
Dibromofluoromethane	GEL 8260B Method List Soil Fed	114	(74%-121%)
Toluene-d8	GEL 8260B Method List Soil Fed	101	(76%-121%)

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Project: **LANL ER Project**

Report Date: September 2, 2005

Client Sample ID: MD54-05-57871 Project: LANL00600
Sample ID: 143792001 Client ID: LANL006

Parameter	Qualifier	Result	DL	RL	Units	DF	AnalystDate	Time	Batch	Method

Notes:
The Qualifiers in this report are defined as follows :

** Indicates the analyte is a surrogate compound.
B Target analyte was detected in the sample as well as the associated blank.
BD Results below the MDC or low tracer recovery.
E Concentration of the target analyte exceeds the instrument calibration range.
H Analytical holding time exceeded.
J Indicates an estimated value.
P The response between the confirmation and the primary columns is >40% Different.
R Sample results are rejected.
U Target analyte was analyzed for but not detected above the MDL or LOD.
UI Uncertain identification for gamma spectroscopy.
X Lab-specific qualifier-please see case narrative, data summary package or contact your project manager for details.
Y QC Samples were not spiked with this compound.
d The 2:1 depletion requirement was not met for this sample
h Sample preparation or preservation holding time exceeded.

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Contact: Joylene Valdez
Project: **LANL ER Project**

Report Date: September 6, 2005

Page 1 of 3

Client Sample ID: MD54-05-57871
Sample ID: 143790001
Matrix: Soil
Collect Date: 18-AUG-05 10:23
Receive Date: 23-AUG-05
Collector: Client

Project: LANL00600
Client ID: LANL006

Parameter	Qualifier	Result	Uncertainty	DL	RL	Units	DF	AnalystDate	Time	Batch	Method
Rad Alpha Spec Analysis											
AM241											
ISOPU											
ISOTH											
ISOU											
Rad Gamma Spec Analysis											
GAMMA SPEC											
Americium-241	U	-0.125	+/-0.261	0.383	0.200	pCi/g		MJH1 09/03/05	1251	459262	5
Bismuth-211	UI	7.03	+/-0.745	0.318		pCi/g					
Bismuth-214		2.04	+/-0.263	0.119	0.200	pCi/g					
Cadmium-109	UI	6.99	+/-1.48	1.48		pCi/g					
Cerium-139	U	-0.00271	+/-0.0319	0.0547	0.050	pCi/g					
Cesium-134	UI	0.142	+/-0.0583	0.0913	0.100	pCi/g					
Cesium-137	U	0.0243	+/-0.0403	0.0636	0.100	pCi/g					
Cobalt-60	U	0.00125	+/-0.0382	0.0664	0.100	pCi/g					
Europium-152	U	-0.0226	+/-0.0959	0.168	0.200	pCi/g					
Lanthanum-140	UI	1.97	+/-30.8	0.00		pCi/g					
Lead-212		2.68	+/-0.248	0.104	0.100	pCi/g					
Lead-214		2.45	+/-0.289	0.111	0.100	pCi/g					
Mercury-203	UI	0.089	+/-0.0586	0.0783	0.100	pCi/g					
Potassium-40		38.5	+/-3.65	0.585	1.00	pCi/g					
Radium-223	U	-0.169	+/-0.816	1.18		pCi/g					
Radium-224	UI	7.65	+/-1.45	1.18		pCi/g					
Radium-226		2.04	+/-0.263	0.119		pCi/g					
Radium-228		2.75	+/-0.522	0.234	0.500	pCi/g					
Ruthenium-106	U	0.0385	+/-0.290	0.503	0.800	pCi/g					
Sodium-22	U	-0.0116	+/-0.0491	0.0707	0.080	pCi/g					
Strontium-85	U	0.0329	+/-0.0423	0.0677		pCi/g					
Thallium-208		0.831	+/-0.104	0.0625	0.080	pCi/g					
Thorium-227	U	0.171	+/-0.419	0.714		pCi/g					
Thorium-231	UI	0.936	+/-0.296	0.417		pCi/g					
Thorium-234		4.42	+/-3.23	2.92	2.00	pCi/g					
Tin-113	U	0.0158	+/-0.0448	0.0802	0.100	pCi/g					
Uranium-235	U	0.323	+/-0.414	0.434	0.500	pCi/g					
Yttrium-88	U	-0.00293	+/-0.0327	0.0591	0.100	pCi/g					
Rad Gas Flow Proportional Counting											
SR90											
Rad Liquid Scintillation Analysis											

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Certificate of Analysis

Company : Los Alamos National Laboratories
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Los Alamos, New Mexico 87545
Contact: Joylene Valdez
Project: **LANL ER Project**

Report Date: September 6, 2005

Page 2 of 3

Client Sample ID: MD54-05-57871 Project: LANL00600
Sample ID: 143790001 Client ID: LANL006

Parameter	Qualifier	Result	Uncertainty	DL	RL	Units	DF	AnalystDate	Time	Batch	Method

Rad Liquid Scintillation Analysis

TC99

The following Prep Methods were performed

Method	Description	Analyst	Date	Time	Prep Batch
Ash Soil Prep	Ash Soil Prep, GL-RAD-A-021B	TC1	08/30/05	1205	456425
Dry Soil Prep	Dry Soil Prep GL-RAD-A-021	TC1	08/29/05	1046	456423

The following Analytical Methods were performed

Method	Description	Analyst Comments
1	DOE EML HASL-300, Am-05-RC Modified	
2	DOE EML HASL-300, Pu-11-RC Modified	
3	DOE EML HASL-300, Th-01-RC Modified	
4	DOE EML HASL-300, U-02-RC Modified	
5	EML HASL 300, 4.5.2.3	
6	EPA 905.0 Modified	
7	DOE EML HASL-300, Tc-02-RC Modified	

Notes:
The Qualifiers in this report are defined as follows :

** Indicates the analyte is a surrogate compound.
B Target analyte was detected in the sample as well as the associated blank.
BD Results below the MDC or low tracer recovery.
E Concentration of the target analyte exceeds the instrument calibration range.
H Analytical holding time exceeded.
J Indicates an estimated value.
U Target analyte was analyzed for but not detected above the MDL or LOD.
UI Uncertain identification for gamma spectroscopy.
X Lab-specific qualifier-please see case narrative, data summary package or contact your project manager for details.
d The 2:1 depletion requirement was not met for this sample
h Sample preparation or preservation holding time exceeded.

The above sample is reported on a dry weight basis except where prohibited by the analytical procedure.

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Project: **LANL ER Project**

Report Date: September 6, 2005

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Client Sample ID: MD54-05-57871 Project: LANL00600
Sample ID: 143790001 Client ID: LANL006

Parameter	Qualifier	Result	Uncertainty	DL	RL	Units	DF	AnalystDate	Time	Batch	Method

Where the analytical method has been performed under NELAP certification, the analysis has met all of the requirements of the NELAC standard unless qualified on the Certificate of Analysis.

This data report has been prepared and reviewed in accordance with General Engineering Laboratories, LLC standard operating procedures. Please direct any questions to your Project Manager, Valerie Davis.

Reviewed by

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Project: **LANL ER Project**

Report Date: September 6, 2005

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Client Sample ID: MD54-05-57872
Sample ID: 143790004
Matrix: Soil
Collect Date: 18-AUG-05 13:10
Receive Date: 23-AUG-05
Collector: Client

Project: LANL00600
Client ID: LANL006

Parameter	Qualifier	Result	Uncertainty	DL	RL	Units	DF	AnalystDate	Time	Batch	Method
Rad Alpha Spec Analysis											
AM241											
ISOPU											
ISOTH											
ISOU											
Rad Gamma Spec Analysis											
GAMMA SPEC											
Americium-241	U	-0.0318	+/-0.075	0.126	0.200	pCi/g		MJH1 09/03/05	1252	459262	5
Bismuth-211	UI	7.48	+/-0.768	0.445		pCi/g					
Bismuth-214		2.33	+/-0.346	0.163	0.200	pCi/g					
Cadmium-109	UI	7.20	+/-1.21	1.18		pCi/g					
Cerium-139	U	0.0318	+/-0.0386	0.0625	0.050	pCi/g					
Cesium-134	UI	0.128	+/-0.0903	0.120	0.100	pCi/g					
Cesium-137	U	0.0559	+/-0.0571	0.0929	0.100	pCi/g					
Cobalt-60	U	-0.0154	+/-0.0586	0.101	0.100	pCi/g					
Europium-152	U	-0.0886	+/-0.129	0.213	0.200	pCi/g					
Lanthanum-140	U	-15.3	+/-42.0	0.00		pCi/g					
Lead-212		2.75	+/-0.281	0.121	0.100	pCi/g					
Lead-214		2.60	+/-0.300	0.152	0.100	pCi/g					
Mercury-203	U	0.0165	+/-0.0606	0.0928	0.100	pCi/g					
Potassium-40		28.6	+/-2.63	0.860	1.00	pCi/g					
Radium-223	U	0.622	+/-0.993	1.53		pCi/g					
Radium-224	UI	8.87	+/-1.85	1.33		pCi/g					
Radium-226		2.33	+/-0.346	0.163		pCi/g					
Radium-228		2.74	+/-0.507	0.320	0.500	pCi/g					
Ruthenium-106	U	-0.00777	+/-0.462	0.804	0.800	pCi/g					
Sodium-22	U	-0.0289	+/-0.0631	0.107	0.080	pCi/g					
Strontium-85	U	0.0787	+/-0.0576	0.0915		pCi/g					
Thallium-208		0.904	+/-0.163	0.0913	0.080	pCi/g					
Thorium-227	U	-0.343	+/-0.489	0.815		pCi/g					
Thorium-231	UI	0.989	+/-0.409	0.497		pCi/g					
Thorium-234		2.97	+/-1.36	1.23	2.00	pCi/g					
Tin-113	U	-0.0167	+/-0.0633	0.105	0.100	pCi/g					
Uranium-235	U	0.073	+/-0.334	0.435	0.500	pCi/g					
Yttrium-88	U	0.00706	+/-0.040	0.0722	0.100	pCi/g					
Rad Gas Flow Proportional Counting											
SR90											

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Contact:	Joylene Valdez
Project:	**LANL ER Project**

Report Date: September 6, 2005

Page 2 of 2

Client Sample ID:	MD54-05-57872	Project:	LANL00600
Sample ID:	143790004	Client ID:	LANL006

Parameter	Qualifier	Result	Uncertainty	DL	RL	Units	DF	AnalystDate	Time	Batch	Method

The following Prep Methods were performed

Method	Description	Analyst	Date	Time	Prep Batch
Ash Soil Prep	Ash Soil Prep, GL-RAD-A-021B	TC1	08/30/05	1205	456425
Dry Soil Prep	Dry Soil Prep GL-RAD-A-021	TC1	08/29/05	1046	456423

The following Analytical Methods were performed

Method	Description	Analyst Comments
1	DOE EML HASL-300, Am-05-RC Modified	
2	DOE EML HASL-300, Pu-11-RC Modified	
3	DOE EML HASL-300, Th-01-RC Modified	
4	DOE EML HASL-300, U-02-RC Modified	
5	EML HASL 300, 4.5.2.3	
6	EPA 905.0 Modified	

Notes:
The Qualifiers in this report are defined as follows :

** Indicates the analyte is a surrogate compound.
B Target analyte was detected in the sample as well as the associated blank.
BD Results below the MDC or low tracer recovery.
E Concentration of the target analyte exceeds the instrument calibration range.
H Analytical holding time exceeded.
J Indicates an estimated value.
U Target analyte was analyzed for but not detected above the MDL or LOD.
UI Uncertain identification for gamma spectroscopy.
X Lab-specific qualifier-please see case narrative, data summary package or contact your project manager for details.
d The 2:1 depletion requirement was not met for this sample
h Sample preparation or preservation holding time exceeded.

The above sample is reported on a dry weight basis except where prohibited by the analytical procedure.
Where the analytical method has been performed under NELAP certification, the analysis has met all of the requirements of the NELAC standard unless qualified on the Certificate of Analysis.

This data report has been prepared and reviewed in accordance with General Engineering Laboratories, LLC standard operating procedures. Please direct any questions to your Project Manager, Valerie Davis.

Reviewed by

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Los Alamos, New Mexico 87545
Contact: Joylene Valdez
Project: **LANL ER Project**

Report Date: September 6, 2005

Page 1 of 3

Client Sample ID: MD54-05-57873
Sample ID: 143790002
Matrix: Soil
Collect Date: 18-AUG-05 16:15
Receive Date: 23-AUG-05
Collector: Client

Project: LANL00600
Client ID: LANL006

Parameter	Qualifier	Result	Uncertainty	DL	RL	Units	DF	AnalystDate	Time	Batch	Method
Rad Alpha Spec Analysis											
AM241											
ISOPU											
ISOTH											
ISOU											
Rad Gamma Spec Analysis											
GAMMA SPEC											
Americium-241	U	-0.0525	+/-0.117	0.207	0.200	pCi/g		MJH1 09/03/05	1252	459262	5
Bismuth-211	UI	6.26	+/-0.657	0.301		pCi/g					
Bismuth-214		1.95	+/-0.266	0.103	0.200	pCi/g					
Cadmium-109	UI	5.60	+/-1.21	1.10		pCi/g					
Cerium-139	U	-0.00209	+/-0.028	0.0469	0.050	pCi/g					
Cesium-134	UI	0.133	+/-0.0479	0.0762	0.100	pCi/g					
Cesium-137	U	-0.0156	+/-0.0336	0.0566	0.100	pCi/g					
Cobalt-60	U	-0.013	+/-0.0339	0.0569	0.100	pCi/g					
Europium-152	U	-0.0549	+/-0.0852	0.142	0.200	pCi/g					
Lanthanum-140	U	-6.38	+/-24.6	0.00		pCi/g					
Lead-212		2.16	+/-0.211	0.0888	0.100	pCi/g					
Lead-214		2.18	+/-0.255	0.103	0.100	pCi/g					
Mercury-203	U	0.0455	+/-0.0534	0.0581	0.100	pCi/g					
Potassium-40		34.7	+/-2.65	0.526	1.00	pCi/g					
Radium-223	U	-0.0851	+/-0.655	0.987		pCi/g					
Radium-224	UI	7.04	+/-1.38	1.01		pCi/g					
Radium-226		1.95	+/-0.266	0.103		pCi/g					
Radium-228		2.12	+/-0.394	0.193	0.500	pCi/g					
Ruthenium-106	U	0.129	+/-0.270	0.486	0.800	pCi/g					
Sodium-22	U	-0.0261	+/-0.0379	0.0619	0.080	pCi/g					
Strontium-85	UI	0.117	+/-0.0401	0.0708		pCi/g					
Thallium-208		0.680	+/-0.100	0.0525	0.080	pCi/g					
Thorium-227	U	0.357	+/-0.246	0.578		pCi/g					
Thorium-231	UI	0.349	+/-0.304	0.266		pCi/g					
Thorium-234		1.97	+/-1.49	1.72	2.00	pCi/g					
Tin-113	U	-0.0122	+/-0.0403	0.0677	0.100	pCi/g					
Uranium-235	U	0.262	+/-0.208	0.360	0.500	pCi/g					
Yttrium-88	U	-0.00477	+/-0.0292	0.0519	0.100	pCi/g					
Rad Gas Flow Proportional Counting											
SR90											
Rad Liquid Scintillation Analysis											

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Contact: Joylene Valdez
Project: **LANL ER Project**

Report Date: September 6, 2005

Page 2 of 3

Client Sample ID: MD54-05-57873
Sample ID: 143790002
Project: LANL00600
Client ID: LANL006

Parameter	Qualifier	Result	Uncertainty	DL	RL	Units	DF	AnalystDate	Time	Batch	Method
Rad Liquid Scintillation Analysis											
TC99											

The following Prep Methods were performed

Method	Description	Analyst	Date	Time	Prep Batch
Ash Soil Prep	Ash Soil Prep, GL-RAD-A-021B	TC1	08/30/05	1205	456425
Dry Soil Prep	Dry Soil Prep GL-RAD-A-021	TC1	08/29/05	1046	456423

The following Analytical Methods were performed

Method	Description	Analyst Comments
1	DOE EML HASL-300, Am-05-RC Modified	
2	DOE EML HASL-300, Pu-11-RC Modified	
3	DOE EML HASL-300, Th-01-RC Modified	
4	DOE EML HASL-300, U-02-RC Modified	
5	EML HASL 300, 4.5.2.3	
6	EPA 905.0 Modified	
7	DOE EML HASL-300, Tc-02-RC Modified	

Notes:
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BD Results below the MDC or low tracer recovery.
E Concentration of the target analyte exceeds the instrument calibration range.
H Analytical holding time exceeded.
J Indicates an estimated value.
U Target analyte was analyzed for but not detected above the MDL or LOD.
UI Uncertain identification for gamma spectroscopy.
X Lab-specific qualifier-please see case narrative, data summary package or contact your project manager for details.
d The 2:1 depletion requirement was not met for this sample
h Sample preparation or preservation holding time exceeded.

The above sample is reported on a dry weight basis except where prohibited by the analytical procedure.

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Contact: Joylene Valdez
Project: **LANL ER Project**

Report Date: September 6, 2005

Client Sample ID: MD54-05-57873
Sample ID: 143790002
Project: LANL00600
Client ID: LANL006

Parameter	Qualifier	Result	Uncertainty	DL	RL	Units	DF	AnalystDate	Time	Batch	Method

Where the analytical method has been performed under NELAP certification, the analysis has met all of the requirements of the NELAC standard unless qualified on the Certificate of Analysis.

This data report has been prepared and reviewed in accordance with General Engineering Laboratories, LLC standard operating procedures. Please direct any questions to your Project Manager, Valerie Davis.

Reviewed by

AIR TOXICS LTD.

Client Sample ID: MD54-05-63413

Lab ID#: 0508494-01A

MODIFIED EPA METHOD TO-15 GC/MS FULL SCAN

File Name:	1082416	Date of Collection: 8/20/05
Dil. Factor:	16.8	Date of Analysis: 8/24/05 11:52 PM

Compound	Rpt. Limit (ppbv)	Amount (ppbv)	Rpt. Limit (uG/m3)	Amount (uG/m3)
Freon 12	8.4	Not Detected	42	Not Detected
Freon 114	8.4	Not Detected	59	Not Detected
Chloromethane	34	Not Detected	69	Not Detected
Vinyl Chloride	8.4	Not Detected	21	Not Detected
1,3-Butadiene	8.4	Not Detected	18	Not Detected
Bromomethane	8.4	Not Detected	33	Not Detected
Chloroethane	8.4	Not Detected	22	Not Detected
Freon 11	8.4	Not Detected	47	Not Detected
Ethanol	34	Not Detected	63	Not Detected
Freon 113	8.4	Not Detected	64	Not Detected
1,1-Dichloroethene	8.4	480	33	1900
Acetone	34	Not Detected	80	Not Detected
2-Propanol	34	Not Detected	82	Not Detected
Carbon Disulfide	8.4	Not Detected	26	Not Detected
Methylene Chloride	8.4	10	29	36
Methyl tert-butyl ether	8.4	Not Detected	30	Not Detected
trans-1,2-Dichloroethene	8.4	Not Detected	33	Not Detected
Hexane	8.4	67	30	240
1,1-Dichloroethane	8.4	220	34	880
2-Butanone (Methyl Ethyl Ketone)	8.4	Not Detected	25	Not Detected
cis-1,2-Dichloroethene	8.4	29	33	110
Tetrahydrofuran	8.4	Not Detected	25	Not Detected
Chloroform	8.4	15	41	75
1,1,1-Trichloroethane	8.4	1800	46	9700
Cyclohexane	8.4	Not Detected	29	Not Detected
Carbon Tetrachloride	8.4	Not Detected	53	Not Detected
Benzene	8.4	87	27	280
1,2-Dichloroethane	8.4	Not Detected	34	Not Detected
Heptane	8.4	25	34	100
Trichloroethene	8.4	48	45	260
1,2-Dichloropropane	8.4	Not Detected	39	Not Detected
1,4-Dioxane	34	Not Detected	120	Not Detected
Bromodichloromethane	8.4	Not Detected	56	Not Detected
cis-1,3-Dichloropropene	8.4	Not Detected	38	Not Detected
4-Methyl-2-pentanone	8.4	Not Detected	34	Not Detected
Toluene	8.4	180	32	670
trans-1,3-Dichloropropene	8.4	Not Detected	38	Not Detected
1,1,2-Trichloroethane	8.4	Not Detected	46	Not Detected
Tetrachloroethene	8.4	66	57	450
2-Hexanone	34	Not Detected	140	Not Detected
Dibromochloromethane	8.4	Not Detected	72	Not Detected
1,2-Dibromoethane (EDB)	8.4	Not Detected	64	Not Detected

AIR TOXICS LTD.

Client Sample ID: MD54-05-63413

Lab ID#: 0508494-01A

MODIFIED EPA METHOD TO-15 GC/MS FULL SCAN

File Name:	1082416	Date of Collection: 8/20/05
Dil. Factor:	16.8	Date of Analysis: 8/24/05 11:52 PM

Compound	Rpt. Limit (ppbv)	Amount (ppbv)	Rpt. Limit (uG/m3)	Amount (uG/m3)
Chlorobenzene	8.4	Not Detected	39	Not Detected
Ethyl Benzene	8.4	18	36	80
m,p-Xylene	8.4	70	36	300
o-Xylene	8.4	28	36	120
Styrene	8.4	Not Detected	36	Not Detected
Bromoform	8.4	Not Detected	87	Not Detected
1,1,2,2-Tetrachloroethane	8.4	Not Detected	58	Not Detected
4-Ethyltoluene	8.4	Not Detected	41	Not Detected
1,3,5-Trimethylbenzene	8.4	Not Detected	41	Not Detected
1,2,4-Trimethylbenzene	8.4	Not Detected	41	Not Detected
1,3-Dichlorobenzene	8.4	Not Detected	50	Not Detected
1,4-Dichlorobenzene	8.4	Not Detected	50	Not Detected
alpha-Chlorotoluene	8.4	Not Detected	43	Not Detected
1,2-Dichlorobenzene	8.4	Not Detected	50	Not Detected
1,2,4-Trichlorobenzene	34	Not Detected	250	Not Detected
Hexachlorobutadiene	34	Not Detected	360	Not Detected
Chlorodifluoromethane	34	Not Detected	120	Not Detected
Methanol	840	Not Detected	1100	Not Detected
n-Butanol	34	Not Detected	100	Not Detected
Propylene	34	Not Detected	58	Not Detected

Container Type: 6 Liter Summa Canister

Surrogates	%Recovery	Method Limits
Toluene-d8	95	70-130
1,2-Dichloroethane-d4	98	70-130
4-Bromofluorobenzene	98	70-130

AIR TOXICS LTD.

Client Sample ID: MD54-05-63415

Lab ID#: 0508494-03A

MODIFIED EPA METHOD TO-15 GC/MS FULL SCAN

File Name:	1082418	Date of Collection: 8/20/05
Dil. Factor:	35.0	Date of Analysis: 8/25/05 01:35 AM

Compound	Rpt. Limit (ppbv)	Amount (ppbv)	Rpt. Limit (uG/m3)	Amount (uG/m3)
Freon 12	18	Not Detected	86	Not Detected
Freon 114	18	Not Detected	120	Not Detected
Chloromethane	70	Not Detected	140	Not Detected
Vinyl Chloride	18	Not Detected	45	Not Detected
1,3-Butadiene	18	Not Detected	39	Not Detected
Bromomethane	18	Not Detected	68	Not Detected
Chloroethane	18	Not Detected	46	Not Detected
Freon 11	18	Not Detected	98	Not Detected
Ethanol	70	Not Detected	130	Not Detected
Freon 113	18	Not Detected	130	Not Detected
1,1-Dichloroethene	18	460	69	1800
Acetone	70	Not Detected	170	Not Detected
2-Propanol	70	Not Detected	170	Not Detected
Carbon Disulfide	18	Not Detected	54	Not Detected
Methylene Chloride	18	Not Detected	61	Not Detected
Methyl tert-butyl ether	18	Not Detected	63	Not Detected
trans-1,2-Dichloroethene	18	Not Detected	69	Not Detected
Hexane	18	Not Detected	62	Not Detected
1,1-Dichloroethane	18	300	71	1200
2-Butanone (Methyl Ethyl Ketone)	18	Not Detected	52	Not Detected
cis-1,2-Dichloroethene	18	Not Detected	69	Not Detected
Tetrahydrofuran	18	Not Detected	52	Not Detected
Chloroform	18	Not Detected	85	Not Detected
1,1,1-Trichloroethane	18	4400	95	24000
Cyclohexane	18	Not Detected	60	Not Detected
Carbon Tetrachloride	18	Not Detected	110	Not Detected
Benzene	18	Not Detected	56	Not Detected
1,2-Dichloroethane	18	Not Detected	71	Not Detected
Heptane	18	Not Detected	72	Not Detected
Trichloroethene	18	72	94	390
1,2-Dichloropropane	18	Not Detected	81	Not Detected
1,4-Dioxane	70	Not Detected	250	Not Detected
Bromodichloromethane	18	Not Detected	120	Not Detected
cis-1,3-Dichloropropene	18	Not Detected	79	Not Detected
4-Methyl-2-pentanone	18	Not Detected	72	Not Detected
Toluene	18	40	66	150
trans-1,3-Dichloropropene	18	Not Detected	79	Not Detected
1,1,2-Trichloroethane	18	Not Detected	95	Not Detected
Tetrachloroethene	18	140	120	950
2-Hexanone	70	Not Detected	290	Not Detected
Dibromochloromethane	18	Not Detected	150	Not Detected
1,2-Dibromoethane (EDB)	18	Not Detected	130	Not Detected

AIR TOXICS LTD.

Client Sample ID: MD54-05-63415

Lab ID#: 0508494-03A

MODIFIED EPA METHOD TO-15 GC/MS FULL SCAN

File Name:	1082418	Date of Collection:	8/20/05
Dil. Factor:	35.0	Date of Analysis:	8/25/05 01:35 AM

Compound	Rpt. Limit (ppbv)	Amount (ppbv)	Rpt. Limit (uG/m3)	Amount (uG/m3)
Chlorobenzene	18	Not Detected	80	Not Detected
Ethyl Benzene	18	Not Detected	76	Not Detected
m,p-Xylene	18	21	76	91
o-Xylene	18	Not Detected	76	Not Detected
Styrene	18	Not Detected	74	Not Detected
Bromoform	18	Not Detected	180	Not Detected
1,1,2,2-Tetrachloroethane	18	Not Detected	120	Not Detected
4-Ethyltoluene	18	Not Detected	86	Not Detected
1,3,5-Trimethylbenzene	18	Not Detected	86	Not Detected
1,2,4-Trimethylbenzene	18	Not Detected	86	Not Detected
1,3-Dichlorobenzene	18	Not Detected	100	Not Detected
1,4-Dichlorobenzene	18	Not Detected	100	Not Detected
alpha-Chlorotoluene	18	Not Detected	90	Not Detected
1,2-Dichlorobenzene	18	Not Detected	100	Not Detected
1,2,4-Trichlorobenzene	70	Not Detected	520	Not Detected
Hexachlorobutadiene	70	Not Detected	750	Not Detected
Chlorodifluoromethane	70	Not Detected	250	Not Detected
Methanol	1800	Not Detected	2300	Not Detected
n-Butanol	70	Not Detected	210	Not Detected
Propylene	70	Not Detected	120	Not Detected

Container Type: 6 Liter Summa Canister

Surrogates	%Recovery	Method Limits
Toluene-d8	96	70-130
1,2-Dichloroethane-d4	98	70-130
4-Bromofluorobenzene	100	70-130

AMERICAN RADIATION SERVICES, INC.

2609 North River Road, Port Allen, Louisiana 70767

1 (800) 401-4277 FAX (225) 381-2996

ARS Sample Delivery Group: ARS1-05-00449
Client Sample ID: MD54-05-63413
Sample Collection Date: 08/20/05 11:15
Sample Matrix: Soil/Solid

Request or PO Number: 37585
ARS Sample ID: ARS1-05-00449-003
Date Received: 8/23/05
Report Date: 08/26/05 15:26

Analysis Description	Analysis Results	Analysis Error +/- 1 s	MDC	DLC	Qual	Analysis Units	Analysis Test Method	Analysis Date/Time	Analysis Technician	Tracer/Chem Recovery
H-3	2182.3258	167.3722	203.7985	NA		pCi/L	EPA : 906.0	8/25/06 22:00	BS	NA

Quality Assurance Review

Notes: American Radiation Services, Inc. assumes no liability for the use or interpretation of any analytical results provided other than the cost of the analysis itself. Reproduction of this report in less than full requires the written consent of the client.

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AMERICAN RADIATION SERVICES, INC.

2609 North River Road, Port Allen, Louisiana 70767

1 (800) 401-4277 FAX (225) 381-2996

ARS Sample Delivery Group:	ARS1-05-00449	**Request or PO Number:**	37585
Client Sample ID:	MD54-05-63415	**ARS Sample ID:**	ARS1-05-00449-002
Sample Collection Date:	08/20/05 15:25	**Date Received:**	8/23/05
Sample Matrix:	Soil/Solid	**Report Date:**	08/26/05 15:26

Analysis Description	Analysis Results	Analysis Error +/- 1 s	MDC	DLC	Qual	Analysis Units	Analysis Test Method	Analysis Date/Time	Analysis Technician	Tracer/Chem Recovery
H-3	5165.8938	227.1745	201.0872	NA		pCi/L	EPA : 906.0	8/25/06 22:00	BS	NA

Quality Assurance Review

Notes: American Radiation Services, Inc. assumes no liability for the use or interpretation of any analytical results provided other than the cost of the analysis itself. Reproduction of this report in less than full requires the written consent of the client.

LELAP Certificate# 30658 NELAP Certificate # E87558

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GENERAL ENGINEERING LABORATORIES, LLC

2040 Savage Road Charleston SC 29407 - (843) 556-8171 - www.gel.com

Certificate of Analysis

Company : Los Alamos National Laboratories
Address : PO Box 1663
TA-3, Bldg. 1237, Drop Pt. 03U
Los Alamos, New Mexico 87545
Contact: Joylene Valdez
Project: **LANL ER Project**

Report Date: September 6, 2005

Page 1 of 3

Client Sample ID: MD54-05-57871
Sample ID: 143790001
Matrix: Soil
Collect Date: 18-AUG-05 10:23
Receive Date: 23-AUG-05
Collector: Client

Project: LANL00600
Client ID: LANL006

Parameter	Qualifier	Result	Uncertainty	DL	RL	Units	DF	Analyst	Date	Time	Batch	Method
Rad Alpha Spec Analysis												
AM241												
Americium-241	U	-0.00529	+/-0.0132	0.044	0.050	pCi/g		SCP	09/03/05	2252	457994	1
ISOPU												
Plutonium-238	U	-0.00336	+/-0.00713	0.026	0.050	pCi/g		SCP	09/03/05	2252	457995	2
Plutonium-239/240	U	0.00504	+/-0.00504	0.028	0.050	pCi/g						
ISOTH												
Thorium-228		3.76	+/-0.164	0.182	0.100	pCi/g		SCP	09/03/05	2251	457996	3
Thorium-230		3.01	+/-0.138	0.494	0.100	pCi/g						
Thorium-232		3.38	+/-0.146	0.145	0.100	pCi/g						
ISOU												
Uranium-233/234		2.67	+/-0.125	0.136	0.100	pCi/g		SCP	09/03/05	2251	457997	4
Uranium-235/236		0.157	+/-0.035	0.144	0.100	pCi/g						
Uranium-238		2.78	+/-0.127	0.122	0.100	pCi/g						
Rad Gamma Spec Analysis												
GAMMA SPEC												
Americium-241	U	-0.125	+/-0.261	0.383	0.200	pCi/g		MJH1	09/03/05	1251	459262	5
Bismuth-211	UI	7.03	+/-0.745	0.318		pCi/g						
Bismuth-214		2.04	+/-0.263	0.119	0.200	pCi/g						
Cadmium-109	UI	6.99	+/-1.48	1.48		pCi/g						
Cerium-139	U	-0.00271	+/-0.0319	0.0547	0.050	pCi/g						
Cesium-134	UI	0.142	+/-0.0583	0.0913	0.100	pCi/g						
Cesium-137	U	0.0243	+/-0.0403	0.0636	0.100	pCi/g						
Cobalt-60	U	0.00125	+/-0.0382	0.0664	0.100	pCi/g						
Europium-152	U	-0.0226	+/-0.0959	0.168	0.200	pCi/g						
Lanthanum-140	UI	1.97	+/-30.8	0.00		pCi/g						
Lead-212		2.68	+/-0.248	0.104	0.100	pCi/g						
Lead-214		2.45	+/-0.289	0.111	0.100	pCi/g						
Mercury-203	UI	0.089	+/-0.0586	0.0783	0.100	pCi/g						
Potassium-40		38.5	+/-3.65	0.585	1.00	pCi/g						
Radium-223	U	-0.169	+/-0.816	1.18		pCi/g						
Radium-224	UI	7.65	+/-1.45	1.18		pCi/g						
Radium-226		2.04	+/-0.263	0.119		pCi/g						
Radium-228		2.75	+/-0.522	0.234	0.500	pCi/g						
Ruthenium-106	U	0.0385	+/-0.290	0.503	0.800	pCi/g						
Sodium-22	U	-0.0116	+/-0.0491	0.0707	0.080	pCi/g						
Strontium-85	U	0.0329	+/-0.0423	0.0677		pCi/g						
Thallium-208		0.831	+/-0.104	0.0625	0.080	pCi/g						
Thorium-227	U	0.171	+/-0.419	0.714		pCi/g						

GENERAL ENGINEERING LABORATORIES, LLC

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Los Alamos, New Mexico 87545
Contact: Joylene Valdez
Project: **LANL ER Project**

Report Date: September 6, 2005

Page 2 of 3

Client Sample ID: MD54-05-57871
Sample ID: 143790001
Project: LANL00600
Client ID: LANL006

Parameter	Qualifier	Result	Uncertainty	DL	RL	Units	DF	AnalystDate	Time	Batch	Method
Rad Gamma Spec Analysis											
GAMMA SPEC											
Thorium-231	UI	0.936	+/-0.296	0.417		pCi/g					
Thorium-234		4.42	+/-3.23	2.92	2.00	pCi/g					
Tin-113	U	0.0158	+/-0.0448	0.0802	0.100	pCi/g					
Uranium-235	U	0.323	+/-0.414	0.434	0.500	pCi/g					
Yttrium-88	U	-0.00293	+/-0.0327	0.0591	0.100	pCi/g					
Rad Gas Flow Proportional Counting											
SR90											
Strontium-90	U	0.113	+/-0.069	0.294	0.500	pCi/g		EXW1 09/02/05	2052	458269	6
Rad Liquid Scintillation Analysis											
TC99											

The following Prep Methods were performed

Method	Description	Analyst	Date	Time	Prep Batch
Ash Soil Prep	Ash Soil Prep, GL-RAD-A-021B	TC1	08/30/05	1205	456425
Dry Soil Prep	Dry Soil Prep GL-RAD-A-021	TC1	08/29/05	1046	456423

The following Analytical Methods were performed

Method	Description	Analyst Comments
1	DOE EML HASL-300, Am-05-RC Modified	
2	DOE EML HASL-300, Pu-11-RC Modified	
3	DOE EML HASL-300, Th-01-RC Modified	
4	DOE EML HASL-300, U-02-RC Modified	
5	EML HASL 300, 4.5.2.3	
6	EPA 905.0 Modified	
7	DOE EML HASL-300, Tc-02-RC Modified	

Surrogate/Tracer recovery	Test	Recovery%	Acceptable Limits
-0.00529	AM241	53	(15%-125%)
-0.00336	ISOPU	98	(15%-125%)
0.00504	ISOPU	98	(15%-125%)
3.01	ISOTH	88	(15%-125%)
3.38	ISOTH	88	(15%-125%)
3.76	ISOTH	88	(15%-125%)
0.157	ISOU	88	(25%-125%)
2.67	ISOU	88	(25%-125%)
2.78	ISOU	88	(25%-125%)

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Project: **LANL ER Project**

Report Date: September 6, 2005

Page 3 of 3

Client Sample ID: MD54-05-57871
Sample ID: 143790001

Project: LANL00600
Client ID: LANL006

Parameter	Qualifier	Result	Uncertainty	DL	RL	Units	DF	AnalystDate	Time	Batch	Method
0.113	SR90							65	(25%-125%)		
Strontium-90	SR90							65	(25%-125%)		

Notes:
The Qualifiers in this report are defined as follows :

** Indicates the analyte is a surrogate compound.
B Target analyte was detected in the sample as well as the associated blank.
BD Results below the MDC or low tracer recovery.
E Concentration of the target analyte exceeds the instrument calibration range.
H Analytical holding time exceeded.
J Indicates an estimated value.
U Target analyte was analyzed for but not detected above the MDL or LOD.
UI Uncertain identification for gamma spectroscopy.
X Lab-specific qualifier-please see case narrative, data summary package or contact your project manager for details.
d The 2:1 depletion requirement was not met for this sample
h Sample preparation or preservation holding time exceeded.

The above sample is reported on a dry weight basis except where prohibited by the analytical procedure.
Where the analytical method has been performed under NELAP certification, the analysis has met all of the requirements of the NELAC standard unless qualified on the Certificate of Analysis.

This data report has been prepared and reviewed in accordance with General Engineering Laboratories, LLC standard operating procedures. Please direct any questions to your Project Manager, Valerie Davis.

Reviewed by

GENERAL ENGINEERING LABORATORIES, LLC

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Certificate of Analysis

Company : Los Alamos National Laboratories
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Los Alamos, New Mexico 87545
Contact: Joylene Valdez
Project: **LANL ER Project**

Report Date: September 6, 2005

Page 1 of 3

Client Sample ID: MD54-05-57872
Sample ID: 143790004
Matrix: Soil
Collect Date: 18-AUG-05 13:10
Receive Date: 23-AUG-05
Collector: Client

Project: LANL00600
Client ID: LANL006

Parameter	Qualifier	Result	Uncertainty	DL	RL	Units	DF	Analyst	Date	Time	Batch	Method
Rad Alpha Spec Analysis												
AM241												
Americium-241	U	-0.00223	+/-0.00373	0.021	0.050	pCi/g		SCP	09/03/05	2252	457994	1
ISOPU												
Plutonium-238	U	0.00279	+/-0.00342	0.021	0.050	pCi/g		SCP	09/03/05	2252	457995	2
Plutonium-239/240	U	0.00557	+/-0.00341	0.023	0.050	pCi/g						
ISOTH												
Thorium-228		3.48	+/-0.154	0.184	0.100	pCi/g		SCP	09/03/05	2251	457996	3
Thorium-230		2.83	+/-0.134	0.497	0.100	pCi/g						
Thorium-232		3.26	+/-0.144	0.146	0.100	pCi/g						
ISOU												
Uranium-233/234		2.84	+/-0.137	0.154	0.100	pCi/g		SCP	09/03/05	2251	457997	4
Uranium-235/236		0.218	+/-0.0435	0.163	0.100	pCi/g						
Uranium-238		2.93	+/-0.139	0.137	0.100	pCi/g						
Rad Gamma Spec Analysis												
GAMMA SPEC												
Americium-241	U	-0.0318	+/-0.075	0.126	0.200	pCi/g		MJH1	09/03/05	1252	459262	5
Bismuth-211	UI	7.48	+/-0.768	0.445		pCi/g						
Bismuth-214		2.33	+/-0.346	0.163	0.200	pCi/g						
Cadmium-109	UI	7.20	+/-1.21	1.18		pCi/g						
Cerium-139	U	0.0318	+/-0.0386	0.0625	0.050	pCi/g						
Cesium-134	UI	0.128	+/-0.0903	0.120	0.100	pCi/g						
Cesium-137	U	0.0559	+/-0.0571	0.0929	0.100	pCi/g						
Cobalt-60	U	-0.0154	+/-0.0586	0.101	0.100	pCi/g						
Europium-152	U	-0.0886	+/-0.129	0.213	0.200	pCi/g						
Lanthanum-140	U	-15.3	+/-42.0	0.00		pCi/g						
Lead-212		2.75	+/-0.281	0.121	0.100	pCi/g						
Lead-214		2.60	+/-0.300	0.152	0.100	pCi/g						
Mercury-203	U	0.0165	+/-0.0606	0.0928	0.100	pCi/g						
Potassium-40		28.6	+/-2.63	0.860	1.00	pCi/g						
Radium-223	U	0.622	+/-0.993	1.53		pCi/g						
Radium-224	UI	8.87	+/-1.85	1.33		pCi/g						
Radium-226		2.33	+/-0.346	0.163		pCi/g						
Radium-228		2.74	+/-0.507	0.320	0.500	pCi/g						
Ruthenium-106	U	-0.00777	+/-0.462	0.804	0.800	pCi/g						
Sodium-22	U	-0.0289	+/-0.0631	0.107	0.080	pCi/g						
Strontium-85	U	0.0787	+/-0.0576	0.0915		pCi/g						
Thallium-208		0.904	+/-0.163	0.0913	0.080	pCi/g						
Thorium-227	U	-0.343	+/-0.489	0.815		pCi/g						

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Los Alamos, New Mexico 87545
Contact: Joylene Valdez
Project: **LANL ER Project**

Report Date: September 6, 2005

Page 2 of 3

Client Sample ID: MD54-05-57872
Sample ID: 143790004
Project: LANL00600
Client ID: LANL006

Parameter	Qualifier	Result	Uncertainty	DL	RL	Units	DF	AnalystDate	Time	Batch	Method
Rad Gamma Spec Analysis											
GAMMA SPEC											
Thorium-231	UI	0.989	+/-0.409	0.497		pCi/g					
Thorium-234		2.97	+/-1.36	1.23	2.00	pCi/g					
Tin-113	U	-0.0167	+/-0.0633	0.105	0.100	pCi/g					
Uranium-235	U	0.073	+/-0.334	0.435	0.500	pCi/g					
Yttrium-88	U	0.00706	+/-0.040	0.0722	0.100	pCi/g					
Rad Gas Flow Proportional Counting											
SR90											
Strontium-90	U	0.0179	+/-0.0477	0.221	0.500	pCi/g		EXW1 09/02/05	2053	458269	6

The following Prep Methods were performed

Method	Description	Analyst	Date	Time	Prep Batch
Ash Soil Prep	Ash Soil Prep, GL-RAD-A-021B	TC1	08/30/05	1205	456425
Dry Soil Prep	Dry Soil Prep GL-RAD-A-021	TC1	08/29/05	1046	456423

The following Analytical Methods were performed

Method	Description	Analyst Comments
1	DOE EML HASL-300, Am-05-RC Modified	
2	DOE EML HASL-300, Pu-11-RC Modified	
3	DOE EML HASL-300, Th-01-RC Modified	
4	DOE EML HASL-300, U-02-RC Modified	
5	EML HASL 300, 4.5.2.3	
6	EPA 905.0 Modified	

Surrogate/Tracer recovery	Test	Recovery%	Acceptable Limits
-0.00223	AM241	88	(15%-125%)
0.00279	ISOPU	93	(15%-125%)
0.00557	ISOPU	93	(15%-125%)
2.83	ISOTH	87	(15%-125%)
3.26	ISOTH	87	(15%-125%)
3.48	ISOTH	87	(15%-125%)
0.218	ISOU	87	(25%-125%)
2.84	ISOU	87	(25%-125%)
2.93	ISOU	87	(25%-125%)
0.0179	SR90	84	(25%-125%)
Strontium-90	SR90	84	(25%-125%)

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Contact: Joylene Valdez
Project: **LANL ER Project**

Report Date: September 6, 2005

Page 3 of 3

Client Sample ID: MD54-05-57872   Project: LANL00600
Sample ID: 143790004   Client ID: LANL006

Parameter	Qualifier	Result	Uncertainty	DL	RL	Units	DF	AnalystDate	Time	Batch	Method

Notes:
The Qualifiers in this report are defined as follows :

** Indicates the analyte is a surrogate compound.
B Target analyte was detected in the sample as well as the associated blank.
BD Results below the MDC or low tracer recovery.
E Concentration of the target analyte exceeds the instrument calibration range.
H Analytical holding time exceeded.
J Indicates an estimated value.
U Target analyte was analyzed for but not detected above the MDL or LOD.
UI Uncertain identification for gamma spectroscopy.
X Lab-specific qualifier-please see case narrative, data summary package or contact your project manager for details.
d The 2:1 depletion requirement was not met for this sample
h Sample preparation or preservation holding time exceeded.

The above sample is reported on a dry weight basis except where prohibited by the analytical procedure.
Where the analytical method has been performed under NELAP certification, the analysis has met all of the requirements of the NELAC standard unless qualified on the Certificate of Analysis.

This data report has been prepared and reviewed in accordance with General Engineering Laboratories, LLC standard operating procedures. Please direct any questions to your Project Manager, Valerie Davis.

Reviewed by

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Certificate of Analysis

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Los Alamos, New Mexico 87545
Contact: Joylene Valdez
Project: **LANL ER Project**

Report Date: September 6, 2005

Page 1 of 3

Client Sample ID: MD54-05-57873
Sample ID: 143790002
Matrix: Soil
Collect Date: 18-AUG-05 16:15
Receive Date: 23-AUG-05
Collector: Client

Project: LANL00600
Client ID: LANL006

Parameter	Qualifier	Result	Uncertainty	DL	RL	Units	DF	Analyst	Date	Time	Batch	Method
Rad Alpha Spec Analysis												
AM241												
Americium-241	U	-0.0159	+/-0.00748	0.022	0.050	pCi/g		SCP	09/03/05	2252	457994	1
ISOPU												
Plutonium-238	U	0.00403	+/-0.00672	0.021	0.050	pCi/g		SCP	09/03/05	2252	457995	2
Plutonium-239/240	U	-0.00269	+/-0.0071	0.022	0.050	pCi/g						
ISOTH												
Thorium-228		2.65	+/-0.170	0.255	0.100	pCi/g		SCP	09/03/05	2251	457996	3
Thorium-230		2.51	+/-0.150	0.690	0.100	pCi/g						
Thorium-232		2.47	+/-0.152	0.203	0.100	pCi/g						
ISOU												
Uranium-233/234		2.18	+/-0.125	0.163	0.100	pCi/g		SCP	09/05/05	1505	457997	4
Uranium-235/236		0.232	+/-0.0463	0.173	0.100	pCi/g						
Uranium-238		2.38	+/-0.129	0.146	0.100	pCi/g						
Rad Gamma Spec Analysis												
GAMMA SPEC												
Americium-241	U	-0.0525	+/-0.117	0.207	0.200	pCi/g		MJH1	09/03/05	1252	459262	5
Bismuth-211	UI	6.26	+/-0.657	0.301		pCi/g						
Bismuth-214		1.95	+/-0.266	0.103	0.200	pCi/g						
Cadmium-109	UI	5.60	+/-1.21	1.10		pCi/g						
Cerium-139	U	-0.00209	+/-0.028	0.0469	0.050	pCi/g						
Cesium-134	UI	0.133	+/-0.0479	0.0762	0.100	pCi/g						
Cesium-137	U	-0.0156	+/-0.0336	0.0566	0.100	pCi/g						
Cobalt-60	U	-0.013	+/-0.0339	0.0569	0.100	pCi/g						
Europium-152	U	-0.0549	+/-0.0852	0.142	0.200	pCi/g						
Lanthanum-140	U	-6.38	+/-24.6	0.00		pCi/g						
Lead-212		2.16	+/-0.211	0.0888	0.100	pCi/g						
Lead-214		2.18	+/-0.255	0.103	0.100	pCi/g						
Mercury-203	U	0.0455	+/-0.0534	0.0581	0.100	pCi/g						
Potassium-40		34.7	+/-2.65	0.526	1.00	pCi/g						
Radium-223	U	-0.0851	+/-0.655	0.987		pCi/g						
Radium-224	UI	7.04	+/-1.38	1.01		pCi/g						
Radium-226		1.95	+/-0.266	0.103		pCi/g						
Radium-228		2.12	+/-0.394	0.193	0.500	pCi/g						
Ruthenium-106	U	0.129	+/-0.270	0.486	0.800	pCi/g						
Sodium-22	U	-0.0261	+/-0.0379	0.0619	0.080	pCi/g						
Strontium-85	UI	0.117	+/-0.0401	0.0708		pCi/g						
Thallium-208		0.680	+/-0.100	0.0525	0.080	pCi/g						
Thorium-227	U	0.357	+/-0.246	0.578		pCi/g						

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Contact: Joylene Valdez
Project: **LANL ER Project**

Report Date: September 6, 2005

Page 2 of 3

Client Sample ID: MD54-05-57873 Project: LANL00600
Sample ID: 143790002 Client ID: LANL006

Parameter	Qualifier	Result	Uncertainty	DL	RL	Units	DF	AnalystDate	Time	Batch	Method
Rad Gamma Spec Analysis											
GAMMA SPEC											
Thorium-231	UI	0.349	+/-0.304	0.266		pCi/g					
Thorium-234		1.97	+/-1.49	1.72	2.00	pCi/g					
Tin-113	U	-0.0122	+/-0.0403	0.0677	0.100	pCi/g					
Uranium-235	U	0.262	+/-0.208	0.360	0.500	pCi/g					
Yttrium-88	U	-0.00477	+/-0.0292	0.0519	0.100	pCi/g					
Rad Gas Flow Proportional Counting											
SR90											
Strontium-90	U	-0.0264	+/-0.0533	0.262	0.500	pCi/g		EXW1 09/02/05	2052	458269	6
Rad Liquid Scintillation Analysis											
TC99											

The following Prep Methods were performed

Method	Description	Analyst	Date	Time	Prep Batch
Ash Soil Prep	Ash Soil Prep, GL-RAD-A-021B	TC1	08/30/05	1205	456425
Dry Soil Prep	Dry Soil Prep GL-RAD-A-021	TC1	08/29/05	1046	456423

The following Analytical Methods were performed

Method	Description	Analyst Comments
1	DOE EML HASL-300, Am-05-RC Modified	
2	DOE EML HASL-300, Pu-11-RC Modified	
3	DOE EML HASL-300, Th-01-RC Modified	
4	DOE EML HASL-300, U-02-RC Modified	
5	EML HASL 300, 4.5.2.3	
6	EPA 905.0 Modified	
7	DOE EML HASL-300, Tc-02-RC Modified	

Surrogate/Tracer recovery	Test	Recovery%	Acceptable Limits
-0.0159	AM241	92	(15%-125%)
-0.00269	ISOPU	100	(15%-125%)
0.00403	ISOPU	100	(15%-125%)
2.47	ISOTH	59	(15%-125%)
2.51	ISOTH	59	(15%-125%)
2.65	ISOTH	59	(15%-125%)
0.232	ISOU	76	(25%-125%)
2.18	ISOU	76	(25%-125%)
2.38	ISOU	76	(25%-125%)

GENERAL ENGINEERING LABORATORIES, LLC

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Certificate of Analysis

Company : Los Alamos National Laboratories
Address : PO Box 1663
TA-3, Bldg. 1237, Drop Pt. 03U
Los Alamos, New Mexico 87545
Contact: Joylene Valdez
Project: **LANL ER Project**

Report Date: September 6, 2005

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Client Sample ID: MD54-05-57873
Sample ID: 143790002

Project: LANL00600
Client ID: LANL006

Parameter	Qualifier	Result	Uncertainty	DL	RL	Units	DF	AnalystDate	Time	Batch	Method
-0.0264	SR90							83	(25%-125%)		
Strontium-90	SR90							83	(25%-125%)		

Notes:
The Qualifiers in this report are defined as follows :

** Indicates the analyte is a surrogate compound.
B Target analyte was detected in the sample as well as the associated blank.
BD Results below the MDC or low tracer recovery.
E Concentration of the target analyte exceeds the instrument calibration range.
H Analytical holding time exceeded.
J Indicates an estimated value.
U Target analyte was analyzed for but not detected above the MDL or LOD.
UI Uncertain identification for gamma spectroscopy.
X Lab-specific qualifier-please see case narrative, data summary package or contact your project manager for details.
d The 2:1 depletion requirement was not met for this sample
h Sample preparation or preservation holding time exceeded.

The above sample is reported on a dry weight basis except where prohibited by the analytical procedure.
Where the analytical method has been performed under NELAP certification, the analysis has met all of the requirements of the NELAC standard unless qualified on the Certificate of Analysis.

This data report has been prepared and reviewed in accordance with General Engineering Laboratories, LLC standard operating procedures. Please direct any questions to your Project Manager, Valerie Davis.

Reviewed by

Appendix F

Review of Analytical Data

F-1.0 INTRODUCTION

This appendix describes the review process used for data discussed in the Material Disposal Area (MDA) G investigation report. The data analysis for the ecological and human health risk assessment is presented in Appendix G of this report. Sediment samples, subsurface soil and rock samples, and pore gas samples are discussed separately.

F-2.0 SUMMARY OF SAMPLES COLLECTED

F-2.1 Sediment Sampling

Sediment samples were collected from canyon reaches in the vicinity of MDA G (Figures 3.5-1, 3.5-3a, and 3.5-3b). The reaches are located immediately downgradient of the easternmost tributary drainages from Area G and are designated as reaches CDB-3 East (CDB-3E) in Cañada del Buey and PA-4 in Pajarito Canyon. Sediment deposits in these reaches potentially contain contaminants transported from Area G, including MDA G, and from other upstream locations. Thus, these two reaches were sampled to evaluate the nature and extent of contamination from MDA G and to achieve the sampling objectives specified in the "Work Plan for Sandia Canyon and Cañada del Buey" (LANL 1999, 64617) and the "Work Plan for Pajarito Canyon" (LANL 1998, 59577) to complete Phase I investigations in these two plans. A summary of the field investigations in CDB-3E and PA-4 is presented in Reneau et al. (2005, 88716).

The sediment samples were collected according to Environmental Stewardship Division–Environmental Characterization and Remediation Group (ENV-ECR) Standard Operating Procedure (SOP) 6.09, Rev. 1, Spade and Scoop Method for Collection of Soil Samples. Sediment samples were sent to an off-site contract laboratory for analysis of target analyte list (TAL) metals, cyanide, volatile organic compounds (VOCs), semivolatile organic compounds (SVOCs), pesticides/PCBs, nitrates, perchlorate, americium-241, isotopic plutonium, isotopic uranium, strontium-90, and tritium.

The drainage channel sediment sampling activities and a summary of the results are discussed in Appendix K of this report.

F-2.2 Subsurface Soil and Rock Sampling

From January 2005 to August 2005, 39 boreholes were drilled at MDA G (Figure 3.3-1). Core was continuously collected using a 5-ft core barrel sampler in all boreholes. Subsurface core samples were collected from the core barrel sampler following ENV-ECR SOP-6.26, Rev. 1, Core Barrel Samples for Subsurface Earth Materials, and all boreholes were logged to total depth (TD) following ENV-ECR SOP-12.01, Rev. 4, Field Logging, Handling, and Documentation of Borehole Materials. Field documentation of samples collected from fractures includes detailed descriptions of the fracture-fill material and the rock-matrix sampled, following ENV-ECR SOP-12.01, Rev. 4. The core was screened for organic vapors using a photoionization detector (PID) with an 11.7-eV lamp following ENV-ECR SOP-6.33, Rev. 0, Headspace Vapor Sampling with a Photoionization Detector. Gross alpha-beta radiation was measured using an Eberline E600 probe following the manufacturer's instructions. Two samples per borehole were analyzed for trinitrotoluene (TNT) and hexahydro-135-trinitro-1,3,5-triazine (RDX) using D-Tech explosives test kits. One sample each was collected from the base of the borehole and from a depth corresponding to the base of the nearest disposal unit, pit, or shaft. Tuff samples were analyzed using the instructions provided by the manufacturer.

Analytical samples for the determination of the nature and extent of contamination were collected from 38 of the boreholes. Samples were analyzed using methods specified by contract requirements of the Laboratory's statement of work (SOW) for analytical services (LANL 2000, 71233).

Table F-2.2-1 presents the depth interval, lithological unit, and analyte list for each sample, listed by borehole location. In addition, field-screening results and sample lithology descriptions can be found on the borehole logs (Appendix C).

F-2.3 Subsurface Vapor Sampling Summary

After drilling was completed, pore-gas samples were collected for VOC analysis from 38 boreholes, following ENV-ECR SOP-6.31, Rev. 1, Sampling of Subatmospheric Air, and using a straddle packer to isolate discrete depths within the borehole after allowing for equilibration of pore gas. Each interval was purged before sampling, until measurements of carbon dioxide and oxygen were stable and representative of subsurface conditions. Subsurface pore-gas samples were collected in SUMMA canisters and submitted to a contract laboratory for VOC analysis using Environmental Protection Agency (EPA) Method TO-15.

Quality assurance/ quality control (QA/QC) samples for VOCs in pore-gas consisted of an equipment blank and field duplicate for each sampling round. After sampling and purge decontamination, the equipment blank was collected by pulling zero gas (99.9% ultrahigh-purity nitrogen) through the packer-sampling apparatus. The sample collected was used to evaluate decontamination procedures. Field duplicate samples were collected to evaluate the reproducibility of the sampling technique. QA/QC samples were collected once during each sampling event in accordance with ENV-ECR SOP-1.05, Rev. 1, Field Quality Control Samples.

Pore-gas samples were also collected to determine the lateral and vertical extent of the subsurface tritium release at MDA G. Samples from noninstrumented boreholes were collected using an inflatable straddle packer system. Samples were collected as water vapor by pulling pore gas through columns filled with absorbent silica gel in accordance with ECR-SOP-6.31, Rev. 1. After allowing for equilibration, the newly completed boreholes were sampled from the depth equal to the base depth of the adjacent disposal unit, and at TD. A field duplicate sample was also collected for tritium analysis. Tritium samples were analyzed from the pore-gas samples using EPA Method 906.0.

F-3.0 OVERVIEW OF DATA REVIEW

For inorganic chemicals and naturally occurring radionuclides, the results were compared with Los Alamos National Laboratory (the Laboratory) background values (BVs) (LANL 1998, 59730). The BVs are represented by the upper tolerance limit (UTL) of the background data set collected specifically for the purpose of differentiating between uncontaminated and contaminated media. Specifically, the UTLs are calculated as the 95% upper confidence bound on the 95th quantile of the data set. BVs for inorganic chemicals are presented by media type in Table F-3.1-1. BVs by media for naturally occurring radionuclides are presented in Table F-3.1-2. For sediment and surface soils within 0–6 in., fallout values (FVs) are used to screen radionuclides associated with atmospheric fallout resulting from nuclear weapons testing. FVs are presented for americium-241, cesium-137, plutionium-238, plutonium 239/240, strontium-90, and tritium in Table F-3.1-2. Fallout radionuclides at depth or in tuff are evaluated based on detection status.

Organic compounds (VOCs, SVOCs, PCBs, pesticides, herbicides, high explosives [HE], and dioxin and furan congeners) are chemicals of potential concern (COPCs) if they were detected.

F-4.0 MDA G DATA REVIEW

F-4.1 Sediment Analytical Data

A detailed discussion of the analytical results for the Cañada del Buey and Pajarito Canyon sampling events are presented in Appendix K. This section presents a brief summary of the results of postfire sampling data. Inorganic chemicals detected in CDB-3E above the sediment BVs were aluminum, arsenic, barium, chromium, cobalt, copper, iron, lead, magnesium, manganese, potassium, selenium, vanadium, and zinc. Cadmium was not detected; however, detection limits were greater than the BV. Fluoride, nitrate, and perchlorate were detected, but have no BVs. Inorganic chemicals detected in PA-4 above sediment BVs were aluminum, arsenic, barium, cadmium, calcium, chromium, cobalt, copper, cyanide, iron, lead, magnesium, manganese, nickel, potassium, selenium, silver, vanadium, and zinc. Nitrate was detected in PA-4 sediments but has no sediment BV for comparison.

Radionuclides detected above BVs in post-Cerro Grande fire CDB-3E samples were americium-241, plutonium-238, and plutonium-239. Radionuclides detected above BV in postfire PA-4 samples were americium-241, cesium-137, and plutonium-239/240.

Five organic chemicals (Aroclor-1254, Aroclor-1260, bis[2-ethylhexyl]phthalate, di-n-butylphthalate, and pyrene) were detected in at least one sample from reach CDB-3E. Four of the organic chemicals were only detected in one sample, while Aroclor-1254 was detected in two samples. There were 12 organic chemicals detected in at least one postfire sediment sample from reach PA-4.

F-4.2 Subsurface Soil and Rock Analytical Data

Core samples were collected from 37 boreholes and submitted to an off-site laboratory for analyses of VOCs, dioxin/furans, inorganic chemicals (including cyanide, nitrate and perchlorate), and radionuclides. Analytical results for subsurface samples are presented in Appendix E. Subsurface data for inorganic chemicals and naturally occurring radionuclides were screened against BVs for individual stratigraphic units to determine the COPCs. Organic chemicals and fallout radionuclides detected in soil and rock samples are identified as COPCs.

A total of 104 core samples and 34 field duplicate samples were collected and submitted to an off-site analytical laboratory for analysis. The analytical suite for all samples included isotopic uranium, isotopic plutonium, isotopic thorium, americium-241, strontium-90, gamma spectroscopy, TAL metals, boron, molybdenum, perchlorate, nitrates, cyanide, and VOCs. Samples collected at the lowest base elevation of the adjacent disposal unit also included technicium-99, dioxins, and furans. In addition, 20% of TD samples were analyzed for explosive compounds.

Table F-4.2-1 summarizes the frequency of inorganic chemicals above BVs in subsurface soil and rock samples detected above media-specific BVs. Table F-4.2-2 presents the results of inorganic chemicals above BVs by borehole and depth. Table F-4.2-3 summarizes the frequency of organic chemicals. Table F-4.2-4 lists organic chemicals detected in subsurface samples. Table F-4.2-5 presents the frequency of detects for radionuclides detected in core samples above BVs. Table F-4.2-6 presents radionuclides detected above BVs by borehole and depth.

Inorganic Chemicals Detected above BVs in Qbt 2

Aluminum, arsenic, barium, chromium, cobalt, iron, lead, magnesium, nickel, potassium, vanadium, and zinc were detected above BV (less than 5%) in the 65 samples analyzed from unit Qbt 2. In addition, cyanide (total) was detected above background levels in 1 of 59 samples from Qbt 2. Beryllium, calcium, and copper were detected above BV in 6 of 65 samples. Selenium was detected above BV in 5 of 65 samples and 55 of these samples had a detection limit (DL) above the BV. Inorganic chemicals detected in Qbt 2 that do not have BVs include boron, molybdenum, nitrate, and perchlorate. Boron was detected in 8 of 63 samples, molybdenum was detected in all 63 samples, nitrate was detected in 32 of 61 samples, and perchlorate was detected in 6 of 65 samples.

Inorganic Chemicals Detected above BVs in Qbt 1v

Barium, beryllium, and copper were detected at concentrations exceeding BV in 1 of 12 samples analyzed from unit Qbt 1v (includes samples collected from Qbt 1v(u) and Qbt 1v(c)). Arsenic and selenium were detected above BV in 4 of 12 samples. Cadmium, selenium, and thallium were reported as nondetects in several samples, but the DLs for these metals are above the respective BVs. Molybdenum was detected in all 10 samples from unit Qbt 1v; however, no BV has been established.

Inorganic Chemicals Detected above BVs in Qbt 1g

Aluminum, arsenic, beryllium, calcium, iron, manganese, and nickel were detected at concentrations above BV in 2 of 10 samples analyzed from unit Qbt 1g. Barium was detected above BV in 4 of 10 samples from unit Qbt 1g. Arsenic, cadmium, and selenium were reported as nondetects in several samples, but the DLs for these metals are above the respective BVs. Boron was detected in 5 samples, molybdenum was detected in all 10 samples, and perchlorate was detected in 1 sample; however, there are no corresponding BVs for these chemicals.

Inorganic Chemicals Detected above BVs in Qct

Beryllium, calcium, lead, selenium, and zinc were detected at concentrations exceeding BVs in fewer than 4 of the 14 samples analyzed from unit Qct. Manganese and copper were detected above BVs in 8 of 14 samples. Arsenic, barium, and nickel were detected above BVs in 11 of 14 samples. Chromium, iron, and vanadium were detected above BVs in 12 of 14 samples. Aluminum was detected above BV in 13 of 14 samples, and magnesium was detected above BV in all 14 samples. Arsenic, cadmium, and selenium were reported as nondetects in several samples, but the DLs for these inorganic chemicals are above their respective BVs. Boron and nitrate were detected in 11 and 3 of 14 samples, respectively, from unit Qct. Boron and nitrate do not have BVs established.

Inorganic Chemicals Detected above BVs in Qbo

Aluminum, arsenic, calcium, chromium, copper, iron, nickel, and vanadium were detected at concentrations exceeding BVs in 1 to 4 of 25 samples from unit Qbo. Cyanide (total) was detected above BV in 1 of 24 samples from Qbo. Concentrations of barium and magnesium exceeded BV in 12 and 14 of 25 samples, respectively. Arsenic, cadmium, and selenium were reported as nondetects in several samples, but the DLs for these inorganic chemicals exceed the respective BVs. Boron, perchlorate, and nitrate were detected in 1, 2, and 3 of 25 samples, respectively. Molybdenum was detected in all the samples analyzed from Qbo. Boron, nitrate, perchlorate, and molybdenum do not have established BVs for unit Qbo.

Inorganic Chemicals Detected above BVs in Qbog

There are no established BVs for unit Qbog. Because Qbog is recognized as part of the Otowi Member of the Bandelier Tuff (Broxton and Reneau 1995, 49726), inorganic chemicals detected in unit Qbog are screened against the BVs for unit Qbo. Aluminum, cadmium, copper, iron, manganese, potassium, selenium, and vanadium were detected above BV in 1 or 2 of 6 samples analyzed from unit Qbog. Arsenic, barium, calcium, chromium, iron, magnesium, and nickel were detected above BV in 3 or 4 samples from Qbog. Antimony, arsenic, cadmium, and selenium were reported as nondetects in several samples, but the DLs for these metals are above their respective Qbo BVs. Boron was detected in one sample and molybdenum was detected in all 6 samples analyzed from Qbog. BVs have not been established for boron and molybdenum for unit Qbo.

Inorganic Chemicals above BV in Soil

The results from samples collected from fractures and paleosols were compared to soil BVs. Beryllium, iron, selenium, and zinc were detected above BVs in 1 of 6 soil samples. Cobalt, copper, and nickel were detected above BVs in 2 or 3 of 6 soil samples. Cadmium and magnesium were detected above BVs in 4 of 6 soil samples. Calcium was detected above BV in all six soil samples collected. Two samples reported as nondetects for selenium but the DLs were above BV. Boron, molybdenum, and nitrate were detected in several soil samples; however, BVs have not been established for these chemicals.

Inorganic Chemicals above BV in Unit Tcb

Chlorides were detected in samples from unit Tcb but BVs for chloride have not been established in this unit.

Inorganic Chemical Trends at MDA G

Concentrations of inorganic chemicals detected beneath MDA G were indicative of natural variability within the various stratigraphic layers. With a few exceptions, all inorganic chemicals detected above BVs in Qbt2, which is the unit adjacent the base of the disposal pits and trenches, were generally less than 5 times the BV. In addition, all inorganic chemicals detected at levels greater than BVs were detected in samples from intervals containing clay-filled fractures. All of the detected chemicals were less than the soil BV, a more representative metric for comparison. For inorganic chemicals detected above BVs near the base of the disposal shafts (units Qbt 1v and Qbt 1g), all maximum values were less than 5 times the BVs except for one barium value, which was approximately 4 times the BV.

Organic Chemicals Detected in Soil and Rock Samples beneath MDA G

One sample from each borehole was collected at a depth that corresponds with the base of the closest waste disposal unit for analysis of dioxins/furans. Twenty percent of the TD samples were submitted for analysis of explosive compounds. Plate 6.3-2 shows the locations and depths of organic chemicals detected.

Dioxin and furan congeners were detected at parts per trillion concentrations in samples collected from 8 boreholes drilled beneath MDA G. At least one dioxin/furan congener was detected in boreholes 54-24363, 54-24371, 54-24374, 54-24381, 54-24385, 54-24388, 54-24390, and 54-24391. Octachlorodibenzodioxin[1,2,3,4,6,7,8,9-] was the most frequently detected congener (7 samples), with a maximum concentration of 0.00000897 mg/kg in borehole 54-24371 at 40–45 ft bgs.

No VOCs or explosive compounds were detected in core samples at MDA G.

Radionuclides above BV in Unit Qbt 2

Thorium-228, thorium-230, thorium 232, uranium-234, uranium-235, and uranium-238 were detected above BVs in 2 to 9 of 65 samples from unit Qbt 2.

Amercium-241, plutonium-238, plutonium-239, and strontium-90 were detected in up to 11 of 65 samples from unit Qbt 2. These radionuclides do not have BVs for unit Qbt 2.

Radionuclides above BV in Unit Qbt 1v

Thorium-238, thorium-230, thorium-232, uranium-235, and uranium-238 were detected at concentrations above BVs in 1 to 3 of 12 samples analyzed from unit Qbt 1v (includes samples collected from Qbt 1v(u) and Qbt 1v(c)). Strontium-90 was detected in one sample: however, strontium-90 has no BV for unit Qbt 1v.

Radionuclides above BV in Unit Qbt 1g

Thorium-230, uranium-234, uranium-235, and uranium-238 were detected at concentrations above BV in 1 to 6 of 10 samples analyzed from unit Qbt 1g. Plutonium-239 was detected in one sample; however, there is no BV for plutonium-239 for unit Qbt 1g.

Radionuclides above BV in Unit Qct

Uranium-235 was detected at a concentration above BV in one of 14 samples analyzed from unit Qct. Americium-241, plutonium-239, and strontium-90 were detected in 1 or 2 of 14 samples from unit Qct; however, there are no BVs for these radionuclides.

Radionuclides above BV in Unit Qbo

Uranium-235 and uranium-238 were detected at concentrations exceeding BVs in 1 and 3 of 25 samples, respectively, from unit Qbo. Plutonium-238 and strontium-90 were detected in 1 of 25 samples analyzed from unit Qbo. Americium-241 and plutonium-239 were detected in 4 of 25 samples. These radionuclides do not have BVs for unit Qbo.

Radionuclides above BV in Unit Qbog

There are no established BVs for unit Qbog. Because Qbog is recognized as part of the Otowi Member of the Bandelier Tuff (Broxton and Reneau 1995, 49726), radionuclides detected in unit Qbog are screened against BVs established for Qbo. Thorium-230, uranium-234, uranium-235, and uranium-238 were detected at concentrations above Qbo BVs in 2 or 3 of the samples from unit Qbog. Plutonium-239 was detected in 1 of 6 samples. There is no BV for plutonium-239 for unit Qbo.

Radionuclides above BV in Soil

The results for naturally occurring radionuclides from samples collected from fractures and paleosols were compared to soil BVs. Americium-241, plutonium-238, and plutonium-239 were detected in 1 of 6 such samples from MDA G. The soil BVs for these radionuclides are only for surface soil samples (0–6 in.) and were not used for comparison to the subsurface soil samples.

Radionuclide Trends at MDA G

A number of naturally occurring and anthropogenic radionuclides were detected above BVs in soil and rock samples beneath MDA G. Naturally occurring radionuclides were detected at concentrations within the natural variability of these chemicals in the subsurface. All but three uranium isotope detects within Qbt2 (the unit adjacent the base of the disposal pits and trenches) were at concentrations less than 2 times the BV. One detect each of uranium-234, uranium-235, and uranium 238 were detected at 2.8 times, 3.4 times, and 2.6 times BV, respectively. For uranium and thorium isotopes detected above BVs near the base of the disposal shafts (units Qbt 1v and Qbt 1g), all maximum values were less than 2 times BVs, with most values within 20% of the BV.

Anthropogenic radionuclides detected beneath MDA G included americium-241, plutonium-238, plutonium-239, and strontium-90. These detects were generally sporadic across the site; however, four boreholes, 54-24374 (located between trenches B and C) 54-24363 (an angle borehole that extends beneath pits 8, 9, and 10), 54-24386 (located between pits 5 and 6) and 54-24397 (located at the southern edge of trenches B and C), had multiple detects of plutonium-239 at concentrations between 0.1 and 0.3 pCi/g.

Field QA/QC Sample Data Summary

Samples for QA/QC included field duplicates to evaluate the reproducibility of the sampling technique and trip blanks to evaluate analytical laboratory procedures. These samples were collected following ENV-ECR SOP-1.05, Rev. 1. A field duplicate was collected from each borehole at the base elevation of the adjacent pit, trench, or shaft. At least one trip blank was submitted with each shipment of VOC samples. This level of QA/QC sampling complies with Section IX.B.2.e of the March 1, 2005, Compliance Order on Consent. The sampling equipment was decontaminated using dry decontamination methods (i.e., using window cleaner, paper towels, and wire brushes); thus, rinsate blanks were not collected. Appendix D describes the QA/QC of analytical results from MDA G.

F-4.3 Subsurface Vapor Analytical Data

Subsurface Vapor VOC Data

VOCs were detected in 38 boreholes at MDA G. In total, 30 VOCs were detected in all of the pore-gas samples beneath MDA G. Table F-4.3-1 shows the frequency of VOCs detected in pore gas. Table F-4.3-2 presents the detected pore-gas VOCs by borehole and sample depth. Table F-4.3-3 shows the frequency of detects for tritium in pore gas. Table F-4.3-4 shows tritium pore-gas results for the boreholes.

Trichloroethane[1,1,1] (TCA) is the primary VOC detected in 75 of 76 samples collected. Other VOCs included trichloroethene (TCE), tetrachloroethene (PCE), and trichloro-1,2,2-trifluoroethane[1,1,2-] (Freon-113). TCA concentrations ranged from 41 $\mu g/m^3$ to 709,000 $\mu g/m^3$. The highest VOC concentrations were detected in boreholes in the eastern portion of the site (those in the vicinity of Pits 1, 2, 3, 4 and 5, and the nearby shaft field). The highest concentration of TCA was 709,000 $\mu g/m^3$ collected from borehole location 54-24378, in the eastern portion of MDA G, near the disposal shafts, at a depth of 136 ft. TCA concentrations in nearby locations 54-24388, 54-24379, 54-24386, and 54-24385 are also elevated. In addition, results from locations 54-24378, 19 54-24379, and 54-24386 show an increase in TCA with depth. Two additional areas of higher VOC concentrations occurred in the central portion of MDA G, near Pits 8, 9, 10, 12, 13, 15, 16, and 19, and in the western portion of the site, near Pits 29, 32, 33, 35 and 36. A pore-gas sample collected from location 54-25105 in the Cerros del Rio basalt layer, at a depth interval of 485 ft to 700 ft did not detect TCA. Plate 6.6-1 is a map showing VOCs detected in the subsurface vapor samples.

Analysis of the VOCs detected in pore-gas samples indicates that VOC contamination is present in the eastern, central, and western portions of MDA G. The highest levels of TCA in the central and western portions of MDA G were detected in samples collected from locations 54-24390 and 54-24394, respectively. Although TCA is still the dominant pore-gas contaminant in these areas, the relatively higher concentrations of other VOCs including TCE and PCE in these samples indicate releases from different sources. However, levels of VOCs in the subsurface vapor in these portions of MDA G are an order of magnitude less than in the eastern portion.

Subsurface Vapor Tritium Data

Tritium was detected in samples collected from all 35 of 38 boreholes (not including borehole 1, which only has preliminary data) at concentrations ranging from 479 pCi/L (location 54-24384 at 65–67 ft bgs) to 6,960,000 pCi/L (location 54-24386 at 35–37 ft bgs). Plate 6.6-3 is a detect map showing tritium in vapor samples collected beneath MDA G. The highest tritium readings were beneath the eastern portion of the facility. Tritium concentrations generally decrease with distance and depth from these two portions of MDA G. Tritium was also detected in boreholes in the south-central portion of the site in the vicinity of trenches A, B, C, and D. Tritium concentrations generally decrease with distance and depth from these two portions of MDA G. Tritium was detected in pore gas beneath the western portion of MDA G; however, concentrations were significantly lower than the other portions of the site. Tritium was detected at 5150 pCi/L in borehole 54-25105 in a pore-gas sample from the Puye Formation, at a depth of 485–700 ft.

Subsurface Vapor Duplicate Sample Summary

Pore gas field duplicates collected for VOCs and tritium indicated acceptable precision.

Subsurface Vapor Contamination Summary for MDA G

Analytical results from the pore-gas samples collected from 38 boreholes drilled in 2005 confirmed the presence tritium and VOCs (consisting primarily of chlorinated hydrocarbons) in the subsurface beneath MDA G. Sampling results indicated that TCA is the dominant contaminant in pore gas beneath MDA G. The highest concentration of TCA was detected at location 54-24378. Two additional areas of elevated VOCs in pore gas were encountered in the central and western portions of MDA G. The highest levels of TCA in the central and western portions of MDA G were detected in samples collected from locations 54-24390 and 54-24394, respectively. Although TCA is still the dominant contaminant in these areas the relatively higher concentrations of other VOCs including TCE, Freon-113, and PCE in these areas indicate releases from different sources. However, levels of VOCs in the subsurface vapor in the south-central and western portions of MDA G are an order of magnitude less than in the eastern portion.
A pore-gas sample collected from location 54-25105 in the Cerros del Rio basalt layer, at a depth interval of 485 ft to 700 ft, did not detect TCA.

Tritium was detected in pore-gas samples in 35 of 38 boreholes (not including borehole 1, which only has preliminary data). The results from the 2005 field investigation showed the highest tritium concentrations were from locations 54-24386 and 54-24378 located in the eastern portion of the site. Pore-gas results also confirm the presence of high concentrations of tritium in the south-central portion of MDA G, beneath trenches A, B, C, and D. These appear to represent separate releases, as tritium concentrations generally decrease with distance and depth from these two portions of MDA G.

F-5.0 REFERENCES

The following list includes all references cited in this appendix. Parenthetical information following each reference provides the author, publication date, and the ER identification (ID) number. This information also is included in the citations in the text. ER ID numbers are assigned by the Los Alamos National Laboratory's ENV-ERS Program to track records associated with the Program. These numbers can be used to locate copies of the actual documents at the ENV-ERS Program's Records Processing Facility and, where applicable, with the ENV-ERS Program's reference library titled "Reference Set for Material Disposal Areas, Technical Area 54."

Copies of the reference library are maintained at the NMED Hazardous Waste Bureau; the DOE Los Alamos Site Office; and EPA, Region 6. This library is a living collection of documents that was developed to ensure that the administrative authority has all the necessary material to review the decisions and actions proposed in this document. However, documents previously submitted to the administrative authority are not included.

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LANL (Los Alamos National Laboratory), September 1999. "Inorganic and Radionuclide Background Data Soils, Canyon Sediment, and Bandelier Tuff at Los Alamos National Laboratory," Los Alamos National Laboratory document LA-UR-98-4847, Los Alamos, New Mexico. (LANL 1998, 59730)

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Table F-2.2-1
MDA G Subsurface Vapor Sampling Field-Screening Results

Borehole ID	Borehole Location	Depth (ft)	Date	Time	CH_4 (%)	CO_2 (%)	O_2 (%)
2	54-24361	Ambient	7.17.05	0822	0.1	0.0	17.3
		30	7.17.05	0833	0.0	1.1	16.2
		Ambient	7.16.05	1411	0.0	0.0	17.9
		138	7.16.05	1418	0.1	1.0	16.6
3	54-24362	Ambient	7.25.05	0950	0.0	0.0	16.8
		35	7.25.05	0944	0.0	1.6	15.5
		Ambient	7.24.05	1558	0.0	0.0	17.4
		135	7.24.05	1604	0.0	0.9	16.6
4 (angled)	54-24363	Ambient	8.4.05	1350	0.0	0.0	17.7
		12-Bottom	8.4.05	1355	0.0	0.1	17.5
5	54-24364	Ambient	6.15.05	1505	0.0	0.0	18.0
		65	6.15.05	1514	0.0	0.5	17.2
		Ambient	6.15.05	1227	0.0	0.0	17.0
		130	6.15.05	1241	0.0	0.8	16.3
		Ambient	7.30.05	1251	0.0	0.0	17.4
		130	7.30.05	1246	0.0	0.5	17.1
6 (angled)	54-24366	Ambient	8.4.05	1100	0.0	0.0	17.4
		12-bottom	8.4.05	1105	0.0	0.0	17.4
7	54-24367	Ambient	7.7.05	1002	0.0	0.0	17.5
		30	7.7.05	1129	0.0	0.0	12.1
		153	7.7.05	1014	0.0	1.4	16.1
		Ambient	7.31.05	0912	0.0	0.1	12.3
		153	7.31.05	0920	0.0	0.6	16.8
8 (angled)	54-24368	Ambient	8.1.05	1706	0.0	0.0	17.9
		95	8.1.05	1710	0.0	1.2	16.6
		192	8.2.05	0955	0.0	1.5	16.1
9	54-24369	Ambient	7.25.05	1313	0.0	0.0	17.1
		64	7.25.05	1608	0.0	2.3	14.9
		184	7.25.05	1306	0.0	1.0	15.8
10	54-24370	Ambient	7.08.05	1331	0.0	0.0	18.0
		37	7.08.05	1452	0.0	6.3	11.2
		148	7.08.05	1340	0.0	6.4	11.0
11	54-24371	Ambient	7.27.05	1115	0.0	0.0	16.7
		40	7.27.05	1421	0.0	0.3	17.0
		141	7.2705	1122	0.0	0.5	16.0

Table F-2.2-1 (continued)

Borehole ID	Borehole Location	Depth (ft)	Date	Time	CH_4 (%)	CO_2 (%)	O_2 (%)
12	54-24372	Ambient	7.28.05	0925	0.0	0.0	17.3
		55	7.28.05	1300	0.0	0.2	17.3
		185	7.28.05	0935	0.0	0.1	17.0
13	54-24373	Ambient	6.10.05	1242	0.0	0.1	17.0
		65	6.10.05	1246	0.0	2.8	14.2
		Ambient	6.10.05	1521	0.0	0.0	17.9
		65	6.10.05	1526	0.0	1.9	15.8
		Ambient	6.13.05	1321	0.0	0.0	18.0
		187	6.13.05	1332	0.0	0.6	16.9
		Ambient	6.14.05	1212	0.0	0.0	17.4
		187	6.14.05	1222	0.0	0.6	16.7
14	54-24374	Ambient	6.17.05	1510	0.0	0.0	18.2
		10	6.17.05	1521	0.0	0.4	17.3
		Ambient	6.17.05	1425	0.0	0.0	18.0
		139	6.17.05	1433	0.0	0.4	17.3
15-1	54-24375	Ambient	7.14.05	0918	1.0	0.1	17.3
		30	7.14.05	1232	0.0	1.5	15.9
		157	7.14.05	0927	0.0	1.7	15.6
15-2	54-24523	Ambient	7.12.05	1512	0.0	0.0	17.5
		485-700	7.12.05	1521	0.0	0.0	17.3
16	54-24376	Ambient	7.07.05	1341	0.0	0.0	17.9
		35	7.0705	1500	0.0	0.2	17.5
		158	7.07.05	1352	0.0	0.1	17.5
17	54-24377	Ambient	7.06.05	1234	0.0	0.0	17.4
		45	7.06.05	1404	0.0	0.2	17.8
		150	7.06.06	1247	0.0	0.2	16.9
		Ambient	7.31.05	1414	0.0	0.0	17.8
		150	7.31.05	1420	0.0	0.1	17.4
18	54-24378	Ambient	7.19.05	1336	0.0	0.0	17.7
		30	7.19.05	1429	0.0	0.7	15.8
		136	7.19.05	1331	0.1	0.8	16.8
19	54-24379	Ambient	7.20.05	1145	0.0	0.0	17.5
		20	7.20.05	1429	0.0	0.3	16.7
		144	7.20.05	1200	0.0	1.2	16.0
20	54-24380	Ambient	7.21.05	1044	0.0	0.0	17.2
		20	7.21.05	1209	0.0	0.9	17.0
		155	7.21.05	1040	0.0	1.1	16.3

Table F-2.2-1 (continued)

Borehole ID	Borehole Location	Depth (ft)	Date	Time	CH_4 (%)	CO_2 (%)	O_2 (%)
21	54-24381	Ambient	7.22.05	1053	0.0	0.0	17.1
		15	7.22.05	1344	0.0	0.5	16.8
		143	7.22.05	1100	0.0	0.7	16.3
22	54-24382	Ambient	n/a[a]	n/a	n/a	n/a	n/a
		28	7.31.05	[b]	[b]	[b]	[b]
		107	7.31.05	[b]	[b]	[b]	[b]
23	54-24383	Ambient	n/a	n/a	n/a	n/a	n/a
		10	7.31.05	[b]	[b]	[b]	[b]
		107	7.31.05	[b]	[b]	[b]	[b]
24	54-24384	Ambient	n/a	n/a	n/a	n/a	n/a
		10	7.31.05	[b]	[b]	[b]	[b]
		65	5.23.05	[c]	[c]	[c]	[c]
25	54-24385	Ambient	7.22.05	1630	0.0	0.0	17.4
		30	7.23.05	1036	0.0	1.2	16.0
		134	7.22.05	1640	0.0	0.9	16.3
26	54-24386	Ambient	7.23.05	1556	0.0	0.0	17.3
		35	7.24.05	1028	0.0	1.2	15.6
		156	7.24.05	1603	0.0	1.8	15.7
27	54-24387	Ambient	n/a	n/a	n/a	n/a	n/a
		10	7.30.05	[b]	[b]	[b]	[b]
		80	5.24.05	[c]	[c]	[c]	[c]
28	54-24388	Ambient	7.18.05	1441	0.0	0.0	17.6
		25	7.18.05	1503	0.0	0.9	16.6
		Ambient	7.17.05	1327	0.0	0.0	17.7
		129	7.17.05	1322	0.0	1.0	16.6
29	54-24389	Ambient	7.29.05	0953	0.0	0.0	17.2
		20	7.29.05	0946	0.0	0.1	17.1
		Ambient	7.28.05	1634	0.0	0.0	17.7
		147	7.28.05	1642	0.0	0.4	17.3
30	54-24390	Ambient	7.15.05	1500	0.0	0.0	17.7
		30	7.15.05	1029	0.0	0.7	17.7
		158	7.15.05	1514	0.0	1.0	16.7
31	54-24391	Ambient	7.08.05	1006	0.0	0.0	17.6
		25	7.08.05	1012	0.0	0.2	17.1
		Ambient	7.07.05	1618	0.0	0.0	18.2
		165	7.07.05	1626	0.0	0.4	17.2

Table F-2.2-1 (continued)

Borehole ID	Borehole Location	Depth (ft)	Date	Time	CH_4 (%)	CO_2 (%)	O_2 (%)
32	54-24392	Ambient	7.29.05	1339	0.0	0.0	17.3
		25	7.29.05	1702	0.0	0.1	17.4
		144	7.29.05	1345	0.0	0.3	16.8
33	54-24393	Ambient	7.15.05	0850	0.1	0.0	17.5
		35	7.15.05	1129	0.0	0.5	17.2
		156	7.15.05	0901	0.0	1.2	16.2
34	54-24394	Ambient	7.26.05	0930	0.0	0.0	17.0
		50	7.26.05	1513	0.1	1.5	15.9
		163	7.26.05	0939	0.0	2.2	15.1
		163	7.26.05	1258	0.0	1.8	15.5
35	54-24395	Ambient	6.16.05	1529	0.0	0.0	17.8
		40	6.16.05	1534	0.0	2.5	14.9
		Ambient	6.16.05	1318	0.0	0.0	17.2
		170	6.16.05	1325	0.0	2.3	14.7
36	54-24396	Ambient	6.17.05	1226	0.0	0.0	17.7
		10	6.17.05	1231	0.0	0.2	17.2
		Ambient	6.17.05	1033	0.0	0.1	17.5
		131	6.17.05	1042	0.0	0.7	16.6
37	54-24397	Ambient	6.22.05	1600	0.1	0.0	18.0
		15	6.22.05	1645	0.1	0.2	17.5
		125	6.22.05	1605	0.1	0.4	17.5

[a] n/a = Not applicable.

[b] CES Landtec GEM2000 gas analyzer not functioning. Purge of sample interval confirmed by duration of water vapor collection and monitoring of packer pressure.

[c] Prior field-screening performed using single-packer system through hollow-stem auger.

Table F-3.1-1
Background Values for Inorganic Chemicals

Analyte	Soil	Canyon Sediment	Qbt 2, 3, 4[a]	Qbt 1v[a]	Qbt 1g, Qct, Qbo[a]
Aluminum	29,200	15,400	7,340	8,170	3,560
Antimony	0.83	0.83	0.5	0.5	0.5
Arsenic	8.17	3.98	2.79	1.81	0.56
Barium	295	127	46	26.5	25.7
Beryllium	1.83	1.31	1.21	1.70	1.44
Cadmium	0.4	0.4	1.63	0.4	0.4
Calcium	6,120	4,420	2,200	3,700	1,900
Chloride	231	17.1	94.6	446	474
Chromium	19.3	10.5	7.14	2.24	2.60
Cobalt[b]	8.64	4.73	3.14	1.78	8.89
Copper	14.7	11.2	4.66	3.26	3.96
Cyanide	0.5	0.82	0.5	0.5	0.5
Iron	21,500	13,800	14,500	9,900	3,700
Lead	22.3	19.7	11.2	18.4	13.5
Magnesium	4,610	2,370	1,690	780	739
Manganese	671	543	482	408	189
Mercury	0.1	0.1	0.1	0.1	0.1
Nickel	15.4	9.38	6.58	2	2
Potassium	3,460	2,690	3,500	6,670	2,390
Selenium	1.52	0.3	0.3	0.3	0.3
Silver	1	1	1	1	1
Sodium	915	1,470	2,770	6,330	4,350
Sulfate	293	58.2	157	142	1,120
Tantalum	0.3	0.3	1.16	0.86	0.95
Thallium	0.73	0.73	1.10	1.24	1.22
Thorium	14.6	14.6	10.8	22.5	4.51
Uranium	1.82	2.22	2.40	6.22	0.72
Vanadium	39.6	19.7	17	4.48	4.59
Zinc	48.8	60.2	63.5	84.6	40.0

Note: Units are mg/kg.

[a] Value represents background for unweathered tuff.

[b] Maximum value from neutron activation analysis is reported for rock background.

Table F-3.1-2
Background Values and Fallout Values for Radionuclides

Analyte	Soil	Canyon Sediment	Qbt 2, 3, 4[a]	Qbt 1v[a]	Qbt 1g, Qct, Qbo[a]
Background Values					
Thorium-228	2.28	2.28	2.52	3.75	4.90
Thorium--230	2.29	2.29	1.98	3.12	4.00
Thorium-232	2.33	2.33	2.52	3.75	4.90
Uranium-234	2.59	2.59	1.98	3.12	4.00
Uranium-235	0.20	0.20	0.09	0.14	0.18
Uranium-238	2.29	2.29	1.93	3.05	3.90
Fallout Values					
Americium-241	0.013[b]	0.040	na[c]	na	na
Cesium-137	1.65[b]	0.90	na	na	na
Plutonium-238	0.023[b]	0.006	na	na	na
Plutonium-239, 240	0.054[b]	0.068	na	na	na
Strontium-90	1.31[b]	1.04	na	na	na
Tritium (pCi/L)	0.766[b,d]	0.093	na	na	na

Note: Units are pCi/g, unless otherwise noted.

[a] Represents background for unweathered tuff.

[b] Value applies to samples collected from 0–6 in. only.

[c] na = Not available.

[d] Units are pCi/mL soil moisture. To convert to pCi/g, use the following equation:
BV (per unit mass) = BV (per unit moisture) x m/(100-m)
Where m = percent soil moisture of sample.

Table F-4.2-1
Frequency of Inorganic Chemicals Detected above BVs in Soil and Rock Samples at MDA G

Analyte	Media	Number of Analyses	Frequency of Detects	Detected Concentration Range (mg/kg)	Background Value (mg/kg)	Frequency of Detects Above Background Value	Frequency of Nondetects	Nondetected Concentration Range (mg/kg)	Frequency of Nondetects Above Background Value
Aluminum	QBO	25	25/25	1970 to 17500	3560	2/25	0/25	na*	0/25
Barium	QBO	25	25/25	12.1 to 61.1	25.7	12/25	0/25	na	0/25
Beryllium	QBO	25	25/25	0.146 to 0.631	1.44	0/25	0/25	na	0/25
Calcium	QBO	25	25/25	656 to 18700	1900	2/25	0/25	na	0/25
Chromium	QBO	25	25/25	0.928 to 14.5	2.6	4/25	0/25	na	0/25
Cobalt	QBO	25	25/25	0.386 to 7.66	8.89	0/25	0/25	na	0/25
Copper	QBO	25	25/25	1.28 to 12	3.96	2/25	0/25	na	0/25
Iron	QBO	25	25/25	1510 to 17000	3700	3/25	0/25	na	0/25
Lead	QBO	25	25/25	3.14 to 7.97	13.5	0/25	0/25	na	0/25
Magnesium	QBO	25	25/25	455 to 6190	739	14/25	0/25	na	0/25
Nickel	QBO	25	25/25	0.751 to 8.38	2	3/25	0/25	na	0/25
Potassium	QBO	25	25/25	360 to 1890	2390	0/25	0/25	na	0/25
Sodium	QBO	25	25/25	523 to 870	4350	0/25	0/25	na	0/25
Vanadium	QBO	25	25/25	1.79 to 24.6	4.59	2/25	0/25	na	0/25
Zinc	QBO	25	25/25	5.35 to 34.7	40	0/25	0/25	na	0/25
Manganese	QBO	24	24/24	42.2 to 155	189	0/24	0/24	na	0/24
Molybdenum	QBO	24	24/24	0.0617 to 0.375	na	24/24	0/24	na	0/24
Silver	QBO	25	6/25	0.0129 to 0.0691	1	0/25	19/25	0.0155 to 0.226	0/25
Arsenic	QBO	25	5/25	0.232 to 2.24	0.56	2/25	20/25	0.503 to 1.69	14/25
Cadmium	QBO	25	3/25	0.0864 to 0.197	0.4	0/25	22/25	0.503 to 0.565	22/25
Mercury	QBO	25	3/25	0.0026 to 0.01	0.1	0/25	22/25	0.0025 to 0.011	0/25
Nitrate	QBO	24	3/24	0.904 to 1.38	na	3/24	21/24	0.895 to 1.15	21/24
Thallium	QBO	25	3/25	0.0227 to 0.0915	1.22	0/25	22/25	0.102 to 0.226	0/25

Table F-4.2-1 (continued)

Analyte	Media	Number of Analyses	Frequency of Detects	Detected Concentration Range (mg/kg)	Background Value (mg/kg)	Frequency of Detects Above Background Value	Frequency of Nondetects	Nondetected Concentration Range (mg/kg)	Frequency of Nondetects Above Background Value
Perchlorate	QBO	25	2/25	0.123 to 0.13	na	2/25	23/25	0.112 to 0.138	23/25
Selenium	QBO	25	2/25	0.2 to 1.16	0.3	1/25	23/25	0.344 to 1.69	23/25
Antimony	QBO	25	1/25	0.119 to 0.119	0.5	0/25	24/25	0.406 to 0.452	0/25
Boron	QBO	24	1/24	1.38 to 1.38	na	1/24	23/24	0.64 to 5.65	23/24
Chloride	QBO	1	1/1	12.1	474	0/1	0/1	na	0/1
Cyanide (Total)	QBO	24	1/24	2.38 to 2.38	0.5	1/24	23/24	0.239 to 0.285	0/24
Aluminum	QBOG	6	6/6	664 to 17700	3560	2/6	0/6	na	0/6
Barium	QBOG	6	6/6	4.78 to 120	25.7	3/6	0/6	na	0/6
Beryllium	QBOG	6	6/6	0.108 to 1.04	1.44	0/6	0/6	na	0/6
Calcium	QBOG	6	6/6	336 to 44100	1900	3/6	0/6	na	0/6
Chromium	QBOG	6	6/6	1.84 to 12	2.6	3/6	0/6	na	0/6
Cobalt	QBOG	6	6/6	0.324 to 6.24	8.89	0/6	0/6	na	0/6
Copper	QBOG	6	6/6	0.737 to 14.5	3.96	2/6	0/6	na	0/6
Iron	QBOG	6	6/6	1060 to 12300	3700	3/6	0/6	na	0/6
Magnesium	QBOG	6	6/6	242 to 4650	739	3/6	0/6	na	0/6
Manganese	QBOG	6	6/6	27.2 to 383	189	2/6	0/6	na	0/6
Molybdenum	QBOG	6	6/6	0.219 to 0.318	na	6/6	0/6	na	0/6
Nickel	QBOG	6	6/6	0.735 to 14.4	2	4/6	0/6	na	0/6
Potassium	QBOG	6	6/6	174 to 2490	2390	1/6	0/6	na	0/6
Sodium	QBOG	6	6/6	463 to 724	4350	0/6	0/6	na	0/6
Vanadium	QBOG	6	6/6	1.21 to 20.7	4.59	2/6	0/6	na	0/6
Zinc	QBOG	6	6/6	5.8 to 37.5	40	0/6	0/6	na	0/6
Lead	QBOG	6	5/6	0.911 to 6.99	13.5	0/6	1/6	1.76 to 1.76	0/6
Arsenic	QBOG	6	4/6	0.723 to 3.94	0.56	4/6	2/6	1.64 to 1.7	2/6
Mercury	QBOG	6	3/6	0.003 to 0.005	0.1	0/6	3/6	0.0109 to 0.0114	0/6

Table F-4.2-1 (continued)

Analyte	Media	Number of Analyses	Frequency of Detects	Detected Concentration Range (mg/kg)	Background Value (mg/kg)	Frequency of Detects Above Background Value	Frequency of Nondetects	Nondetected Concentration Range (mg/kg)	Frequency of Nondetects Above Background Value
Cadmium	QBOG	6	2/6	0.533 to 1	0.4	2/6	4/6	0.537 to 0.59	4/6
Thallium	QBOG	6	2/6	0.0308 to 0.256	1.22	0/6	4/6	0.218 to 1.12	0/6
Boron	QBOG	6	1/6	5.52	na	1/6	5/6	0.809 to 5.9	5/6
Chloride	QBOG	1	1/1	65.4	474	0/1	0/1	na	0/1
Selenium	QBOG	6	1/6	0.596	0.3	1/6	5/6	1.64 to 19.4	5/6
Silver	QBOG	6	1/6	0.129	1	0/6	5/6	0.212 to 0.237	0/6
Aluminum	QBT1G	8	8/8	461 to 5520	3560	1/8	0/8	na	0/8
Barium	QBT1G	8	8/8	14.4 to 105	25.7	2/8	0/8	na	0/8
Beryllium	QBT1G	8	8/8	0.146 to 1.59	1.44	1/8	0/8	na	0/8
Calcium	QBT1G	8	8/8	227 to 3460	1900	1/8	0/8	na	0/8
Chromium	QBT1G	8	8/8	0.446 to 1.96	2.6	0/8	0/8	na	0/8
Copper	QBT1G	8	8/8	0.503 to 2.33	3.96	0/8	0/8	na	0/8
Iron	QBT1G	8	8/8	1680 to 4890	3700	1/8	0/8	na	0/8
Lead	QBT1G	8	8/8	2.71 to 13.1	13.5	0/8	0/8	na	0/8
Magnesium	QBT1G	8	8/8	95.4 to 620	739	0/8	0/8	na	0/8
Manganese	QBT1G	8	8/8	81 to 214	189	1/8	0/8	na	0/8
Molybdenum	QBT1G	8	8/8	0.179 to 0.707	na	8/8	0/8	na	0/8
Nickel	QBT1G	8	8/8	0.216 to 2.82	2	1/8	0/8	na	0/8
Potassium	QBT1G	8	8/8	213 to 937	2390	0/8	0/8	na	0/8
Sodium	QBT1G	8	8/8	498 to 1080	4350	0/8	0/8	na	0/8
Vanadium	QBT1G	8	8/8	0.765 to 4.15	4.59	0/8	0/8	na	0/8
Zinc	QBT1G	8	8/8	9.08 to 36.9	40	0/8	0/8	na	0/8
Chloride	QBT1G	8	7/8	0.54 to 3.2	474	0/8	1/8	2.04	0/8
Cobalt	QBT1G	8	4/8	0.212 to 0.483	8.89	0/8	4/8	0.508 to 0.575	0/8
Arsenic	QBT1G	8	3/8	0.329 to 2.52	0.56	1/8	5/8	1.52 to 1.85	5/8

Table F-4.2-1 (continued)

Analyte	Media	Number of Analyses	Frequency of Detects	Detected Concentration Range (mg/kg)	Background Value (mg/kg)	Frequency of Detects Above Background Value	Frequency of Nondetects	Nondetected Concentration Range (mg/kg)	Frequency of Nondetects Above Background Value
Boron	QBT1G	8	3/8	1.39 to 2.16	na	3/8	5/8	0.49 to 5.75	5/8
Silver	QBT1G	8	3/8	0.0124 to 0.0891	1	0/8	5/8	0.203 to 0.248	0/8
Cadmium	QBT1G	8	2/8	0.112 to 0.123	0.4	0/8	6/8	0.049 to 0.618	5/8
Thallium	QBT1G	8	2/8	0.0235 to 0.338	1.22	0/8	6/8	0.103 to 0.248	0/8
Mercury	QBT1G	8	1/8	0.0078	0.1	0/8	7/8	0.00103 to 0.0121	0/8
Perchlorate	QBT1G	8	1/8	0.126	na	1/8	7/8	0.121 to 0.151	7/8
Aluminum	QBT1V	8	8/8	421 to 3090	8170	0/8	0/8	na	0/8
Arsenic	QBT1V	8	8/8	1.03 to 2.77	1.81	4/8	0/8	na	0/8
Barium	QBT1V	8	8/8	3.47 to 30.9	26.5	1/8	0/8	na	0/8
Beryllium	QBT1V	8	8/8	0.292 to 2.21	1.7	1/8	0/8	na	0/8
Calcium	QBT1V	8	8/8	1120 to 2550	3700	0/8	0/8	na	0/8
Chromium	QBT1V	8	8/8	0.258 to 1.96	2.24	0/8	0/8	na	0/8
Copper	QBT1V	8	8/8	1.37 to 3.49	3.26	1/8	0/8	na	0/8
Iron	QBT1V	8	8/8	4850 to 7110	9900	0/8	0/8	na	0/8
Magnesium	QBT1V	8	8/8	137 to 334	780	0/8	0/8	na	0/8
Manganese	QBT1V	8	8/8	210 to 345	408	0/8	0/8	na	0/8
Nickel	QBT1V	8	8/8	0.224 to 0.684	2	0/8	0/8	na	0/8
Potassium	QBT1V	8	8/8	245 to 1060	6670	0/8	0/8	na	0/8
Sodium	QBT1V	8	8/8	321 to 678	6330	0/8	0/8	na	0/8
Vanadium	QBT1V	8	8/8	0.672 to 2.47	4.48	0/8	0/8	na	0/8
Zinc	QBT1V	8	8/8	47.7 to 67.3	84.6	0/8	0/8	na	0/8
Lead	QBT1V	8	7/8	2.11 to 11.9	18.4	0/8	1/8	1.03	0/8
Molybdenum	QBT1V	7	7/7	0.501 to 2.5	na	7/7	0/7	na	0/7
Silver	QBT1V	8	4/8	0.0217 to 0.0752	1	0/8	4/8	0.202 to 0.211	0/8
Antimony	QBT1V	8	3/8	0.0982 to 0.113	0.5	0/8	5/8	0.403 to 0.423	0/8

Table F-4.2-1 (continued)

Analyte	Media	Number of Analyses	Frequency of Detects	Detected Concentration Range (mg/kg)	Background Value (mg/kg)	Frequency of Detects Above Background Value	Frequency of Nondetects	Nondetected Concentration Range (mg/kg)	Frequency of Nondetects Above Background Value
Selenium	QBT1V	8	3/8	0.75 to 1.07	0.3	3/8	5/8	0.533 to 1.54	5/8
Cobalt	QBT1V	8	2/8	0.111 to 0.183	1.78	0/8	6/8	0.502 to 0.521	0/8
Thallium	QBT1V	8	2/8	0.0286 to 0.0497	1.24	0/8	6/8	0.101 to 5.04	1/8
Cadmium	QBT1V	8	1/8	0.105	0.4	0/8	7/8	0.502 to 0.544	7/8
Chloride	QBT1V	3	1/3	1.47	446	0/3	2/3	2.03 to 2.14	0/3
Cyanide (Total)	QBT1V	8	1/8	0.162	0.5	0/8	7/8	0.236 to 0.271	0/8
Mercury	QBT1V	8	1/8	0.0011	0.1	0/8	7/8	0.00965 to 0.0106	0/8
Aluminum	QBT2	37	37/37	158 to 28900	7340	3/37	0/37	na	0/37
Barium	QBT2	37	37/37	2.2 to 140	46	2/37	0/37	na	0/37
Beryllium	QBT2	37	37/37	0.171 to 8.77	1.21	5/37	0/37	na	0/37
Calcium	QBT2	37	37/37	186 to 4200	2200	3/37	0/37	na	0/37
Chromium	QBT2	37	37/37	0.25 to 13.2	7.14	1/37	0/37	na	0/37
Copper	QBT2	37	37/37	0.547 to 20.7	4.66	5/37	0/37	na	0/37
Iron	QBT2	37	37/37	1400 to 16500	14500	1/37	0/37	na	0/37
Magnesium	QBT2	37	37/37	48.3 to 6680	1690	3/37	0/37	na	0/37
Potassium	QBT2	37	37/37	107 to 4750	3500	1/37	0/37	na	0/37
Sodium	QBT2	37	37/37	117 to 1450	2770	0/37	0/37	na	0/37
Vanadium	QBT2	37	37/37	0.362 to 30.1	17	1/37	0/37	na	0/37
Zinc	QBT2	37	37/37	18.1 to 73.1	63.5	2/37	0/37	na	0/37
Arsenic	QBT2	37	36/37	0.762 to 4.94	2.79	2/37	1/37	0.922	0/37
Manganese	QBT2	36	36/36	69.6 to 385	482	0/36	0/36	na	0/36
Molybdenum	QBT2	36	36/36	0.307 to 1.32	na	36/36	0/36	na	0/36
Nickel	QBT2	37	36/37	0.198 to 11	6.58	1/37	1/37	0.315	0/37
Lead	QBT2	37	22/37	0.47 to 16.5	11.2	1/37	15/37	0.291 to 2.6	0/37
Nitrate	QBT2	35	18/35	0.359 to 5.18	na	18/35	17/35	0.766 to 1.07	17/35

Table F-4.2-1 (continued)

Analyte	Media	Number of Analyses	Frequency of Detects	Detected Concentration Range (mg/kg)	Background Value (mg/kg)	Frequency of Detects Above Background Value	Frequency of Nondetects	Nondetected Concentration Range (mg/kg)	Frequency of Nondetects Above Background Value
Cobalt	QBT2	37	17/37	0.082 to 5.69	3.14	1/37	20/37	0.0817 to 0.599	0/37
Silver	QBT2	37	15/37	0.0166 to 0.204	1	0/37	22/37	0.0151 to 0.236	0/37
Cadmium	QBT2	37	10/37	0.0514 to 0.351	1.63	0/37	27/37	0.049 to 0.599	0/37
Thallium	QBT2	37	9/37	0.024 to 0.334	1.1	0/37	28/37	0.099 to 1.08	0/37
Boron	QBT2	36	7/36	0.614 to 16.8	na	7/36	29/36	0.49 to 5.99	29/36
Chloride	QBT2	6	6/6	0.621 to 7.22	94.6	0/6	0/6	na	0/6
Selenium	QBT2	37	6/37	0.265 to 2.12	0.3	5/37	31/37	0.178 to 2.58	29/37
Cyanide (Total)	QBT2	34	5/34	0.0592 to 1.21	0.5	1/34	29/34	0.0849 to 0.294	0/34
Mercury	QBT2	37	4/37	0.0015 to 0.0099	0.1	0/37	33/37	0.000973 to 0.012	0/37
Perchlorate	QBT2	37	4/37	0.0994 to 0.151	na	4/37	33/37	0.0919 to 0.143	33/37
Aluminum	QCT	14	14/14	3200 to 11500	3560	13/14	0/14	na	0/14
Barium	QCT	14	14/14	14.3 to 78.5	25.7	11/14	0/14	na	0/14
Beryllium	QCT	14	14/14	0.431 to 2.45	1.44	1/14	0/14	na	0/14
Calcium	QCT	14	14/14	921 to 2700	1900	4/14	0/14	na	0/14
Chromium	QCT	14	14/14	1.96 to 7.33	2.6	12/14	0/14	na	0/14
Cobalt	QCT	14	14/14	0.724 to 3.01	8.89	0/14	0/14	na	0/14
Copper	QCT	14	14/14	1.9 to 8.24	3.96	8/14	0/14	na	0/14
Iron	QCT	14	14/14	2930 to 8700	3700	12/14	0/14	na	0/14
Lead	QCT	14	14/14	3.04 to 45.6	13.5	3/14	0/14	na	0/14
Magnesium	QCT	14	14/14	788 to 2850	739	14/14	0/14	na	0/14
Nickel	QCT	14	14/14	1.56 to 5.89	2	11/14	0/14	na	0/14
Potassium	QCT	14	14/14	519 to 2170	2390	0/14	0/14	na	0/14
Sodium	QCT	14	14/14	206 to 664	4350	0/14	0/14	na	0/14
Vanadium	QCT	14	14/14	3.73 to 15.2	4.59	12/14	0/14	na	0/14
Zinc	QCT	14	14/14	12.9 to 166	40	4/14	0/14	na	0/14

Table F-4.2-1 (continued)

Analyte	Media	Number of Analyses	Frequency of Detects	Detected Concentration Range (mg/kg)	Background Value (mg/kg)	Frequency of Detects Above Background Value	Frequency of Nondetects	Nondetected Concentration Range (mg/kg)	Frequency of Nondetects Above Background Value
Manganese	QCT	13	13/13	93.4 to 606	189	8/13	0/13	na	0/13
Molybdenum	QCT	13	13/13	0.185 to 0.768	na	13/13	0/13	na	0/13
Arsenic	QCT	14	12/14	0.499 to 2.26	0.56	11/14	2/14	0.985 to 1.62	2/14
Thallium	QCT	14	12/14	0.0357 to 0.58	1.22	0/14	2/14	0.22 to 1.07	0/14
Boron	QCT	13	11/13	0.7 to 4.85	na	11/13	2/13	5.76 to 8.49	2/13
Silver	QCT	14	10/14	0.0338 to 0.12	1	0/14	4/14	0.0388 to 0.214	0/14
Cadmium	QCT	14	8/14	0.0557 to 0.384	0.4	0/14	6/14	0.0503 to 0.547	3/14
Mercury	QCT	14	5/14	0.001 to 0.0029	0.1	0/14	9/14	0.001 to 0.0107	0/14
Selenium	QCT	14	4/14	0.229 to 0.957	0.3	3/14	10/14	0.171 to 1.6	9/14
Nitrate	QCT	13	3/13	0.413 to 0.955	na	3/13	10/13	0.891 to 1.07	10/13
Cyanide (Total)	QCT	14	2/14	0.0588 to 0.157	0.5	0/14	12/14	0.0791 to 0.273	0/14
Chloride	QCT	1	1/1	2.88	474	0/1	0/1	na	0/1
Aluminum	SOIL	6	6/6	5510 to 28200	29200	0/6	0/6	na	0/6
Arsenic	SOIL	6	6/6	1.53 to 3.48	8.17	0/6	0/6	na	0/6
Barium	SOIL	6	6/6	57.8 to 213	295	0/6	0/6	na	0/6
Beryllium	SOIL	6	6/6	0.359 to 2.87	1.83	1/6	0/6	na	0/6
Cadmium	SOIL	6	6/6	0.113 to 1.93	0.4	4/6	0/6	na	0/6
Calcium	SOIL	6	6/6	9730 to 315000	6120	6/6	0/6	na	0/6
Chromium	SOIL	6	6/6	5.42 to 18.8	19.3	0/6	0/6	na	0/6
Cobalt	SOIL	6	6/6	2.97 to 12.2	8.64	2/6	0/6	na	0/6
Copper	SOIL	6	6/6	6.74 to 21.2	14.7	3/6	0/6	na	0/6
Iron	SOIL	6	6/6	4650 to 22800	21500	1/6	0/6	na	0/6
Magnesium	SOIL	6	6/6	3580 to 6680	4610	4/6	0/6	na	0/6
Manganese	SOIL	6	6/6	77.3 to 511	671	0/6	0/6	na	0/6
Mercury	SOIL	6	6/6	0.0049 to 0.0172	0.1	0/6	0/6	na	0/6

Table F-4.2-1 (continued)

Analyte	Media	Number of Analyses	Frequency of Detects	Detected Concentration Range (mg/kg)	Background Value (mg/kg)	Frequency of Detects Above Background Value	Frequency of Nondetects	Nondetected Concentration Range (mg/kg)	Frequency of Nondetects Above Background Value
Molybdenum	SOIL	6	6/6	0.17 to 0.421	na	6/6	0/6	na	0/6
Nickel	SOIL	6	6/6	8.68 to 25.8	15.4	3/6	0/6	na	0/6
Potassium	SOIL	6	6/6	954 to 3110	3460	0/6	0/6	na	0/6
Silver	SOIL	6	6/6	0.0663 to 0.178	1	0/6	0/6	na	0/6
Sodium	SOIL	6	6/6	143 to 761	915	0/6	0/6	na	0/6
Vanadium	SOIL	6	6/6	9.34 to 34.4	39.6	0/6	0/6	na	0/6
Zinc	SOIL	6	6/6	13.9 to 61.5	48.8	1/6	0/6	na	0/6
Boron	SOIL	6	5/6	2.93 to 6.18	na	5/6	1/6	3.43 to 3.43	1/6
Lead	SOIL	6	5/6	3.53 to 13.7	22.3	0/6	1/6	2.27 to 2.27	0/6
Thallium	SOIL	6	5/6	0.0983 to 0.342	0.73	0/6	1/6	0.236 to 0.236	0/6
Nitrate	SOIL	5	2/5	0.946 to 0.958	na	2/5	3/5	1 to 1.16	3/5
Antimony	SOIL	6	1/6	0.0594 to 0.0594	0.83	0/6	5/6	0.439 to 0.481	0/6
Cyanide (Total)	SOIL	6	1/6	0.0997 to 0.0997	0.5	0/6	5/6	0.0754 to 0.29	0/6
Selenium	SOIL	6	1/6	2.85 to 2.85	1.52	1/6	5/6	0.559 to 35.3	2/6
Chloride	TCB	28	5/28	0.433 to 1.44	na	5/28	23/28	1.39 to 2.11	23/28

*na = Background data not available.

Table F-4.2-2
Inorganic Chemicals Detected above BVs in Subsurface Samples from MDA G

Sample ID	Location ID	Depth (ft)	Media	Aluminum	Arsenic	Barium	Beryllium	Boron	Cadmium	Calcium	Chloride	Chromium	Cobalt	Copper	Cyanide (Total)	Iron	Lead	Magnesium
Soil Background Value				**29,200**	**8.17**	**295**	**1.83**	**na[a]**	**0.4**	**6120**	**na**	**19.3**	**8.64**	**14.7**	**0.5**	**21500**	**22.3**	**4610**
Qbt 2,3,4 Background Value				**7340**	**2.79**	**46**	**1.21**	**na**	**1.63**	**2200**	**na**	**7.14**	**3.14**	**4.66**	**0.5**	**14500**	**11.2**	**1690**
Qbt 1v Background Value				**8170**	**1.81**	**26.5**	**1.7**	**na**	**0.4**	**3700**	**na**	**2.24**	**1.78**	**3.26**	**0.5**	**9900**	**18.4**	**780**
Qbt 1g, Qct, Qbo, Qbog[b] Background Value				**3560**	**0.56**	**25.7**	**1.44**	**na**	**0.4**	**1900**	**na**	**2.6**	**8.89**	**3.96**	**0.5**	**3700**	**13.5**	**739**
Tcb Background Value				**na**	**na**	**na**	**na**	**na**	**na**	**na**	**na**	**na**	**na**	**na**	**na**	**na**	**na**	**na**
Industrial Soil Screening Levels				**100000**	**17.7**	**78300**	**2250**	**61600**	**1130[c]**	**na**	**na**	**5000[d]**	**20500**	**45400**	**22700**	**100000**	**750**	**na**
Residential Soil Screening Levels				**77800**	**3.9**	**5450**	**156**	**5500**	**74.1**	**na**	**na**	**2100[d]**	**1520**	**3130**	**1560**	**23500**	**400**	**na**
MD54-05-57879	54-24361	30.00–35.00	Qbt 2	—[e]	—	—	—	—	—	—	—	—	—	—	—	—	—	—
MD54-05-57885	54-24361	168.00–170.00	Qbo	—	—	—	—	—	0.532 (U)	—	—	—	—	—	—	—	—	—
MD54-05-57887	54-24362	35.00–40.00	Qbt 2	—	—	—	—	2.12 (J)	—	—	—	—	—	—	—	—	—	—
MD54-05-57893	54-24362	187.00–189.00	Soil	—	—	—	—	5.49 (J)	1.93	75500 (J+)	—	—	9.04	16.8	—	—	—	6680
MD54-05-57895	54-24363	31.80–35.40	Qbt 2	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
MD54-05-57896	54-24363	42.80–45.20	Qbt 2	28900 (J-)	4.94	140	3.41	16.8	—	4200 (J+)	—	13.2	5.69	20.7	—	16500 (J+)	16.5	6680
MD54-05-57897	54-24363	113.10–114.50	Qbt 1g	—	1.64 (U)	—	—	—	—	—	—	—	—	—	—	—	—	—
MD54-05-57901	54-24363	175.30–176.80	Qbog	4140 (J+)	0.727 (J)	—	—	—	—	2460 (J+)	—	10.2	—	4.32	—	5500	—	3050
MD54-05-57903	54-24364	65.00–70.00	Qbt 1v	—	—	—	—	—	0.503 (U)	—	—	—	—	—	—	—	—	—
MD54-05-57909	54-24364	195.00–200.00	Qbo	—	—	35	—	—	0.528 (U)	—	—	—	—	—	—	—	—	—
MD54-05-57936	54-24366	99.00–101.80	Qbt 1g	—	1.53 (U)	—	—	—	0.51 (U)	—	—	—	—	—	—	—	—	—
MD54-05-57942	54-24366	175.40–176.80	Qbo	—	1.58 (U)	26.3	—	—	0.526 (U)	—	—	—	—	—	—	—	—	—
MD54-05-57944	54-24367	30.00–35.00	Qbt 2	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
MD54-05-57950	54-24367	198.00–200.00	Qbo	—	1.53 (U)	44.3	—	—	0.51 (U)	—	—	—	—	—	2.38 (J)	—	—	861
MD54-05-57952	54-24368	67.00–70.00	Qbt 1v	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
MD54-05-57958	54-24368	200.10–201.50	Qbo	—	1.58 (U)	—	—	—	0.526 (U)	—	—	—	—	—	—	—	—	1070 (J+)
MD54-05-57960	54-24369	65.00–70.00	Qbt 2	9530	—	—	3.27 (J)	4.14 (J)	—	2840	—	—	—	9.27	—	—	—	2460
MD54-05-57961	54-24369	183.00–185.00	Qct	4790	1.62 (U)	—	—	1.76 (J)	—	—	—	—	—	—	—	—	32.6	877
MD54-05-57966	54-24369	248.00–250.00	Qbog	—	—	26.3	—	—	0.533 (J)	—	—	—	—	—	—	—	—	—
MD54-05-57968	54-24370	37.00–40.00	Qbt 2	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
MD54-05-57974	54-24370	223.00–225.00	Qbog	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
MD54-05-57981	54-24371	40.00–45.00	Qbt 2	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
MD54-05-57987	54-24371	198.00–200.00	Qbo	—	1.55 (U)	—	—	—	—	—	—	—	—	—	—	—	—	1160
MD54-05-57989	54-24372	55.00–60.00	Qbt 2	—	—	—	—	—	—	—	—	—	—	—	1.21	—	—	—
MD54-05-57995	54-24372	248.00–250.00	Qbo	—	1.57 (U)	—	—	—	0.523 (U)	—	—	—	—	—	—	—	—	—
MD54-05-57997	54-24373	65.00–70.00	Qbt 1v	—	—	—	—	—	0.502 (U)	—	—	—	—	—	—	—	—	—
MD54-05-58003	54-24373	248.00–250.00	Qbo	—	1.57 (U)	—	—	—	0.524 (U)	—	—	—	—	—	—	—	—	744
MD54-05-58005	54-24374	12.00–15.00	Qbt 2	—	—	—	—	1.04 (J)	—	—	—	—	—	—	—	—	—	—

Table F-4.2-2 (continued)

Sample ID	Location ID	Depth (ft)	Media	Aluminum	Arsenic	Barium	Beryllium	Boron	Cadmium	Calcium	Chloride	Chromium	Cobalt	Copper	Cyanide (Total)	Iron	Lead	Magnesium
Soil Background Value				**29,200**	**8.17**	**295**	**1.83**	**na[a]**	**0.4**	**6120**	**na**	**19.3**	**8.64**	**14.7**	**0.5**	**21500**	**22.3**	**4610**
Qbt 2,3,4 Background Value				**7340**	**2.79**	**46**	**1.21**	**na**	**1.63**	**2200**	**na**	**7.14**	**3.14**	**4.66**	**0.5**	**14500**	**11.2**	**1690**
Qbt 1v Background Value				**8170**	**1.81**	**26.5**	**1.7**	**na**	**0.4**	**3700**	**na**	**2.24**	**1.78**	**3.26**	**0.5**	**9900**	**18.4**	**780**
Qbt 1g, Qct, Qbo, Qbog[b] Background Value				**3560**	**0.56**	**25.7**	**1.44**	**na**	**0.4**	**1900**	**na**	**2.6**	**8.89**	**3.96**	**0.5**	**3700**	**13.5**	**739**
Tcb Background Value				**na**	**na**	**na**	**na**	**na**	**na**	**na**	**na**	**na**	**na**	**na**	**na**	**na**	**na**	**na**
Industrial Soil Screening Levels				**100000**	**17.7**	**78300**	**2250**	**61600**	**1130[c]**	**na**	**na**	**5000[d]**	**20500**	**45400**	**22700**	**100000**	**750**	**na**
Residential Soil Screening Levels				**77800**	**3.9**	**5450**	**156**	**5500**	**74.1**	**na**	**na**	**2100[d]**	**1520**	**3130**	**1560**	**23500**	**400**	**na**
MD54-05-58011	54-24374	198.00–200.00	Qbo	—	1.62 (U)	29.6	—	—	0.538 (U)	—	—	—	—	—	—	—	—	747 (J+)
MD54-05-58013	54-24375	30.00–35.00	Qbt 2	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
MD54-05-58014	54-24375	62.00–64.00	Qbt 2	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
MD54-05-58015	54-24375	64.00–65.00	Qbt 2	—	—	—	1.5	—	—	—	—	—	—	5.72	—	—	—	—
MD54-05-58019	54-24375	195.00–200.00	Qbo	—	—	—	—	—	0.534 (U)	—	—	—	—	—	—	—	—	—
MD54-05-58026	54-24376	35.00–40.00	Qbt 2	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
MD54-05-58032	54-24376	198.00–200.00	Qbo	—	1.54 (U)	29.9	—	—	0.513 (U)	—	—	—	—	—	—	—	—	919
MD54-05-58034	54-24377	45.00–50.00	Qbt 1v	—	—	—	—	—	0.515 (U)	—	—	—	—	—	—	—	—	—
MD54-05-58040	54-24377	198.00–200.00	Qbo	—	1.54 (U)	34.4	—	—	0.514 (U)	—	—	—	—	—	—	—	—	—
MD54-05-58042	54-24378	25.00–30.00	Qbt 2	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
MD54-05-58043	54-24378	148.50–150.00	Qct	6550	0.702	—	—	—	—	—	—	2.79	—	7.45	—	3950	—	799
MD54-05-58048	54-24378	180.00–182.00	Qbo	17500	2.24	58.5	—	—	—	18700 (J)	—	14.5	—	12	—	17000	—	6190
MD54-05-58050	54-24379	20.00–25.00	Qbt 2	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
MD54-05-58051	54-24379	117.00–119.00	Qct	7020 (J+)	1.03	50.9	—	3.39 (J)	0.5 (U)	—	—	3.65	—	4.33	—	5070	—	1340
MD54-05-58052	54-24379	148.00–150.00	Qbo	—	—	—	—	—	0.503 (U)	—	—	—	—	—	—	—	—	794
MD54-05-58056	54-24379	198.00–200.00	Qbog	—	0.723	—	—	—	—	—	—	4.85	—	—	—	3940	—	1770
MD54-05-58058	54-24380	20.00–25.00	Qbt 2	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
MD54-05-58059	54-24380	176.00–178.00	Qct	7040	0.823	32.1	—	3.52 (J)	—	—	—	3.03	—	8.24 (J+)	—	4370	33.3	1050 (J-)
MD54-05-58064	54-24380	195.00–196.00	Qct	5820	0.872	49.5	—	1.62 (J)	—	—	—	4.59	—	—	—	6150	—	1620 (J-)
MD54-05-58071	54-24381	15.00–20.00	Qbt 2	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
MD54-05-58072	54-24381	110.00–112.00	Qbt 1g	—	—	34.5	—	—	0.515 (U)	—	—	—	—	—	—	—	—	—
MD54-05-58073	54-24381	148.00–150.00	Qbo	—	—	—	—	—	0.513 (U)	—	—	—	—	—	—	—	—	—
MD54-05-58077	54-24381	198.00–200.00	Qbo	—	—	—	—	—	0.539 (U)	—	—	—	—	—	—	—	—	869 (J)
MD54-05-58079	54-24382	30.00–35.00	Qbt 2	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
MD54-05-58080	54-24382	103.00–105.00	Qct	10300	1.28 (J)	42.7	—	4.85 (J)	0.53 (U)	2150	—	6.11	—	—	—	8570	—	2400 (J+)
MD54-05-58085	54-24382	145.00–147.00	Qbo	6360	1.79	61.1	—	1.38 (J)	0.547 (U)	1940	—	5.06	—	5.49	—	7220	—	1830 (J+)
MD54-05-58087	54-24383	20.00–25.00	Qbt 2	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
MD54-05-58093	54-24383	145.00–147.50	Soil	—	—	—	—	4.23 (J)	—	315000	—	—	—	—	—	—	—	5820 (J+)

Table F-4.2-2 (continued)

Sample ID	Location ID	Depth (ft)	Media	Aluminum	Arsenic	Barium	Beryllium	Boron	Cadmium	Calcium	Chloride	Chromium	Cobalt	Copper	Cyanide (Total)	Iron	Lead	Magnesium
Soil Background Value				**29,200**	**8.17**	**295**	**1.83**	**na[a]**	**0.4**	**6120**	**na**	**19.3**	**8.64**	**14.7**	**0.5**	**21500**	**22.3**	**4610**
Qbt 2,3,4 Background Value				**7340**	**2.79**	**46**	**1.21**	**na**	**1.63**	**2200**	**na**	**7.14**	**3.14**	**4.66**	**0.5**	**14500**	**11.2**	**1690**
Qbt 1v Background Value				**8170**	**1.81**	**26.5**	**1.7**	**na**	**0.4**	**3700**	**na**	**2.24**	**1.78**	**3.26**	**0.5**	**9900**	**18.4**	**780**
Qbt 1g, Qct, Qbo, Qbog[b] Background Value				**3560**	**0.56**	**25.7**	**1.44**	**na**	**0.4**	**1900**	**na**	**2.6**	**8.89**	**3.96**	**0.5**	**3700**	**13.5**	**739**
Tcb Background Value				**na**	**na**	**na**	**na**	**na**	**na**	**na**	**na**	**na**	**na**	**na**	**na**	**na**	**na**	**na**
Industrial Soil Screening Levels				**100000**	**17.7**	**78300**	**2250**	**61600**	**1130[c]**	**na**	**na**	**5000[d]**	**20500**	**45400**	**22700**	**100000**	**750**	**na**
Residential Soil Screening Levels				**77800**	**3.9**	**5450**	**156**	**5500**	**74.1**	**na**	**na**	**2100[d]**	**1520**	**3130**	**1560**	**23500**	**400**	**na**
MD54-05-58095	54-24384	25.00–30.00	Qbt 1g	—	1.52 (U)	—	—	1.39 (J)	0.508 (U)	—	—	—	—	—	—	—	—	—
MD54-05-58101	54-24384	66.00–68.00	Soil	—	—	—	2.87	6.18	0.859	9730	—	—	12.2	21.2	—	22800	—	6470
MD54-05-58103	54-24385	30.00–35.00	Qbt 2	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
MD54-05-58104	54-24385	110.50–112.50	Qct	4650	0.985 (U)	52.5	—	1.71 (J)	—	—	—	3.03	—	—	—	—	—	848
MD54-05-58109	54-24385	175.50–177.00	Soil	—	—	—	—	2.93 (J)	—	193000 (J+)	—	—	—	—	—	—	—	—
MD54-05-58116	54-24386	35.00–40.00	Qbt 2	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
MD54-05-58117	54-24386	56.00–58.00	Qbt 2	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
MD54-05-58118	54-24386	58.00–59.00	Qbt 2	—	—	—	—	0.614 (J)	—	—	—	—	—	—	—	—	—	—
MD54-05-58119	54-24386	110.00–112.00	Qct	8100	1.59	78.5 (J)	—	3.69 (J)	—	2700 (J+)	—	4.26	—	4.96	—	5970	—	1910 (J+)
MD54-05-58122	54-24386	185.00–186.00	Soil	—	—	—	—	4.71 (J)	0.645	112000 (J+)	—	—	—	15.1	—	—	—	5870 (J+)
MD54-05-58124	54-24387	5.00–10.00	Qbt 1g	5520	2.52	105	1.59	2.16 (J)	—	3460	—	—	—	—	—	4890	—	—
MD54-05-58130	54-24387	78.00–81.00	Qbog	17700	3.94	120	—	5.52 (J)	1	44100	—	12	—	14.5	—	12300	—	4650
MD54-05-58132	54-24388	25.00–30.00	Qbt 2	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
MD54-05-58133	54-24388	63.00–64.50	Qbt 2	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
MD54-05-58134	54-24388	132.50–134.50	Qbt 1g	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
MD54-05-58135	54-24388	155.00–157.00	Qct	11500	1.33	46.7	2.45	2.59 (J)	—	—	—	3.52	—	7.54	—	6120	45.6	1360 (J)
MD54-05-58138	54-24388	177.00–180.00	Qct	—	—	—	—	0.7 (J)	—	—	—	—	—	—	—	4130	—	788 (J)
MD54-05-58140	54-24389	20.00–25.00	Qbt 2	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
MD54-05-58141	54-24389	173.00–175.00	Qct	9920 (J-)	1.67	34.7	—	—	—	—	—	6.53	—	4.37	—	8170 (J+)	—	2290
MD54-05-58146	54-24389	198.00–200.00	Qbo	—	—	28.5	—	—	0.525 (U)	—	—	—	—	—	—	—	—	858
MD54-05-58148	54-24390	30.00–35.00	Qbt 2	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
MD54-05-58149	54-24390	56.00–57.00	Qbt 2	11800	2.97	61.9	8.77	4.29 (J)	—	2690	—	—	—	14.5	—	—	—	3270 (J-)
MD54-05-58150	54-24390	93.00–94.00	Qbt 1v	—	2.44	—	—	—	0.533 (U)	—	—	—	—	—	—	—	—	—
MD54-05-58151	54-24390	94.00–95.00	Qbt 1v	—	2.77	—	2.21	—	0.544 (U)	—	—	—	—	3.49	—	—	—	—
MD54-05-58154	54-24390	185.00–186.00	Soil	—	—	—	—	—	0.858	71600	—	—	—	—	—	—	—	—
MD54-05-58161	54-24391	25.00–30.00	Qbt 2	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
MD54-05-58167	54-24391	198.00–200.00	Qbo	—	—	—	—	—	0.52 (U)	—	—	—	—	—	—	—	—	—
MD54-05-58169	54-24392	25.00–30.00	Qbt 2	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—

Table F-4.2-2 (continued)

Sample ID	Location ID	Depth (ft)	Media	Aluminum	Arsenic	Barium	Beryllium	Boron	Cadmium	Calcium	Chloride	Chromium	Cobalt	Copper	Cyanide (Total)	Iron	Lead	Magnesium
Soil Background Value				**29,200**	**8.17**	**295**	**1.83**	**na[a]**	**0.4**	**6120**	**na**	**19.3**	**8.64**	**14.7**	**0.5**	**21500**	**22.3**	**4610**
Qbt 2,3,4 Background Value				**7340**	**2.79**	**46**	**1.21**	**na**	**1.63**	**2200**	**na**	**7.14**	**3.14**	**4.66**	**0.5**	**14500**	**11.2**	**1690**
Qbt 1v Background Value				**8170**	**1.81**	**26.5**	**1.7**	**na**	**0.4**	**3700**	**na**	**2.24**	**1.78**	**3.26**	**0.5**	**9900**	**18.4**	**780**
Qbt 1g, Qct, Qbo, Qbog[b] Background Value				**3560**	**0.56**	**25.7**	**1.44**	**na**	**0.4**	**1900**	**na**	**2.6**	**8.89**	**3.96**	**0.5**	**3700**	**13.5**	**739**
Tcb Background Value				**na**	**na**	**na**	**na**	**na**	**na**	**na**	**na**	**na**	**na**	**na**	**na**	**na**	**na**	**na**
Industrial Soil Screening Levels				**100000**	**17.7**	**78300**	**2250**	**61600**	**1130[c]**	**na**	**na**	**5000[d]**	**20500**	**45400**	**22700**	**100000**	**750**	**na**
Residential Soil Screening Levels				**77800**	**3.9**	**5450**	**156**	**5500**	**74.1**	**na**	**na**	**2100[d]**	**1520**	**3130**	**1560**	**23500**	**400**	**na**
MD54-05-58175	54-24392	198.00–200.00	Qbo	—	1.62 (U)	—	—	—	0.538 (U)	—	—	2.71	—	—	—	—	—	885
MD54-05-58177	54-24393	35.00–40.00	Qbt 2	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
MD54-05-58178	54-24393	158.00–160.00	Qct	8730	1.33 (J)	66.7	—	3.65 (J)	—	2370	—	6.07	—	4.54	—	7780	—	2840
MD54-05-58179	54-24393	193.00–194.40	Qbo	—	1.69 (U)	32.1	—	—	0.565 (U)	—	—	—	—	—	—	—	—	834
MD54-05-58183	54-24393	204.00–206.00	Qbog	—	0.731 (J)	36	—	—	—	35200	—	—	—	—	—	—	—	—
MD54-05-58185	54-24394	40.00–45.00	Qbt 2	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
MD54-05-58186	54-24394	50.00–55.00	Qbt 2	—	—	—	2.45	1.72 (J)	—	—	—	—	—	8.78	—	—	—	—
MD54-05-58187	54-24394	100.00–102.00	Qbt 1v	—	1.92	—	—	—	0.514 (U)	—	—	—	—	—	—	—	—	—
MD54-05-58188	54-24394	102.00–105.00	Qbt 1v	—	2.14	30.9	—	—	0.521 (U)	—	—	—	—	—	—	—	—	—
MD54-05-58191	54-24394	198.00–200.00	Qbo	—	1.53 (U)	—	—	—	0.511 (U)	—	—	2.98	—	—	—	—	—	—
MD54-05-58193	54-24395	40.00–45.00	Qbt 2	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
MD54-05-58194	54-24395	153.00–155.00	Qbt 1g	—	1.73 (U)	—	—	—	0.575 (U)	—	—	—	—	—	—	—	—	—
MD54-05-58195	54-24395	188.00–190.00	Qbt 1g	—	1.85 (U)	—	—	1.44 (J)	0.618 (U)	—	—	—	—	—	—	—	—	—
MD54-05-58199	54-24395	198.00–200.00	Qbo	—	1.67 (U)	27.6	—	—	—	—	—	—	—	—	—	—	—	—
MD54-05-58206	54-24396	10.00–15.00	Qbt 2	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
MD54-05-58207	54-24396	154.00–155.00	Qct	11500 (J-)	2.26	61.7	—	—	—	2430 (J+)	—	7.33	—	5.64	—	8700 (J+)	—	2850
MD54-05-58212	54-24396	198.00–200.00	Qbo	—	—	30.4	—	—	0.522 (U)	—	—	—	—	—	—	—	—	—
MD54-05-58214	54-24397	15.00–20.00	Qbt 2	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
MD54-05-58215	54-24397	159.00–160.00	Qct	7250 (J+)	1.11 (J)	34.2	—	2.67 (J)	0.547 (U)	—	—	4.45	—	—	—	6680 (J+)	—	1190 (J+)
MD54-05-58220	54-24397	198.00–200.00	Qbo	—	1.58 (U)	—	—	—	0.527 (U)	—	—	—	—	—	—	3860 (J+)	—	743 (J+)
MD54-05-59184	54-24523	199.80–200.00	Qbog	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
MD54-05-59186	54-24523	221.80–222.00	Tcb	—	—	—	—	—	—	—	0.558 (J)	—	—	—	—	—	—	—
MD54-05-59190	54-24523	262.60–265.80	Tcb	—	—	—	—	—	—	—	0.909 (J)	—	—	—	—	—	—	—
MD54-05-59202	54-24523	386.10–386.60	Tcb	—	—	—	—	—	—	—	0.433 (J)	—	—	—	—	—	—	—
MD54-05-59204	54-24523	404.30–407.30	Tcb	—	—	—	—	—	—	—	0.515 (J)	—	—	—	—	—	—	—
MD54-05-59212	54-24523	696.00–696.50	Tcb	—	—	—	—	—	—	—	1.44 (J+)	—	—	—	—	—	—	—

Table F-4.2-2 (continued)

Sample ID	Location ID	Depth (ft)	Media	Manganese	Mercury	Molybdenum	Nickel	Nitrate	Perchlorate	Potassium	Selenium	Silver	Sodium	Thallium	Vanadium	Zinc
Soil Background Value				**671**	**0.1**	**na**	**15.4**	**na**	**na**	**3640**	**1.52**	**1**	**915**	**0.73**	**39.6**	**48.8**
Qbt 2,3,4 Background Value				**482**	**0.1**	**na**	**6.58**	**na**	**na**	**3500**	**0.3**	**1**	**2770**	**1.1**	**17**	**63.5**
Qbt 1v Background Value				**408**	**0.1**	**na**	**2**	**na**	**na**	**6670**	**0.3**	**1**	**6330**	**1.24**	**4.48**	**84.6**
Qbt 1g, Qct, Qbo, Qbog[b] Background Value				**189**	**0.1**	**na**	**2**	**na**	**na**	**2390**	**0.3**	**1**	**4350**	**1.22**	**4.59**	**40**
Tcb Background Value				**na**	**na**	**na**	**na**	**na**	**na**	**na**	**na**	**na**	**na**	**na**	**na**	**na**
Industrial Soil Screening Levels				**21800**	**340[d]**	**5680**	**22500**	**100000**	**110[d]**	**na**	**5680**	**5680**	**na**	**74.9**	**7950**	**100000**
Residential Soil Screening Levels				**1550**	**23[d]**	**391**	**1560**	**100000**	**7.8[d]**	**na**	**391**	**391**	**na**	**5.16**	**548**	**23500**
MD54-05-57879	54-24361	30.00–35.00	Qbt 2	—	—	0.576	—	1.13 (J-)	—	—	—	—	—	—	—	—
MD54-05-57885	54-24361	168.00–170.00	Qbo	—	—	0.0812 (J)	—	—	—	—	0.344 (U)	—	—	—	—	—
MD54-05-57887	54-24362	35.00–40.00	Qbt 2	—	—	0.453	—	0.359 (J)	—	—	1.56 (U)	—	—	—	—	—
MD54-05-57893	54-24362	187.00–189.00	Soil	—	—	0.236	18.6	—	—	—	2.85	—	—	—	—	—
MD54-05-57895	54-24363	31.80–35.40	Qbt 2	—	—	0.327	—	5.18	—	—	0.509 (U)	—	—	—	—	—
MD54-05-57896	54-24363	42.80–45.20	Qbt 2	—	—	1.32	11	1.64	—	4750	2.12	—	—	—	30.1	72.1
MD54-05-57897	54-24363	113.10–114.50	Qbt 1g	—	—	0.277	—	—	—	—	1.64 (U)	—	—	—	—	—
MD54-05-57901	54-24363	175.30–176.80	Qbog	—	—	0.22	4.68	—	—	—	—	—	—	—	8.63 (J)	—
MD54-05-57903	54-24364	65.00–70.00	Qbt 1v	—	—	0.501	—	—	—	—	1.07 (J)	—	—	—	—	—
MD54-05-57909	54-24364	195.00–200.00	Qbo	—	—	0.0617 (J)	—	0.949 (J)	—	—	0.528 (U)	—	—	—	—	—
MD54-05-57936	54-24366	99.00–101.80	Qbt 1g	—	—	0.25	—	—	—	—	1.53 (U)	—	—	—	—	—
MD54-05-57942	54-24366	175.40–176.80	Qbo	—	—	0.106	—	—	—	—	1.58 (U)	—	—	—	—	—
MD54-05-57944	54-24367	30.00–35.00	Qbt 2	—	—	0.407	—	—	0.151	—	1.54 (U)	—	—	—	—	—
MD54-05-57950	54-24367	198.00–200.00	Qbo	—	—	0.156	—	—	—	—	1.53 (U)	—	—	—	—	—
MD54-05-57952	54-24368	67.00–70.00	Qbt 1v	—	—	—	—	—	—	—	1.53 (U)	—	—	—	—	—
MD54-05-57958	54-24368	200.10–201.50	Qbo	—	—	0.0644 (J)	—	—	—	—	1.58 (U)	—	—	—	—	—
MD54-05-57960	54-24369	65.00–70.00	Qbt 2	—	—	0.494	—	—	—	—	1.6 (U)	—	—	—	—	—
MD54-05-57961	54-24369	183.00–185.00	Qct	319	—	0.768	—	0.413 (J)	—	—	0.957 (J)	—	—	—	—	166
MD54-05-57966	54-24369	248.00–250.00	Qbog	383	—	0.219	—	—	—	—	—	—	—	—	—	—
MD54-05-57968	54-24370	37.00–40.00	Qbt 2	—	—	0.566	—	—	—	—	1.56 (U)	—	—	—	—	—
MD54-05-57974	54-24370	223.00–225.00	Qbog	—	—	0.268	—	—	—	—	—	—	—	—	—	—
MD54-05-57981	54-24371	40.00–45.00	Qbt 2	—	—	0.734	—	—	—	—	1.61 (U)	—	—	—	—	—
MD54-05-57987	54-24371	198.00–200.00	Qbo	—	—	0.121	—	—	—	—	1.55 (U)	—	—	—	—	—
MD54-05-57989	54-24372	55.00–60.00	Qbt 2	—	—	0.402	—	—	—	—	1.51 (U)	—	—	—	—	—
MD54-05-57995	54-24372	248.00–250.00	Qbo	—	—	0.0863 (J)	—	—	—	—	1.57 (U)	—	—	—	—	—
MD54-05-57997	54-24373	65.00–70.00	Qbt 1v	—	—	0.558	—	—	—	—	1.51 (U)	—	—	5.04 (U)	—	—
MD54-05-58003	54-24373	248.00–250.00	Qbo	—	—	0.0921 (J)	—	—	—	—	1.57 (U)	—	—	—	—	—
MD54-05-58005	54-24374	12.00–15.00	Qbt 2	—	—	0.556	—	0.615 (J)	—	—	1.54 (U)	—	—	—	—	—
MD54-05-58011	54-24374	198.00–200.00	Qbo	—	—	0.0864 (J)	—	—	—	—	0.991 (U)	—	—	—	—	—

Table F-4.2-2 (continued)

Sample ID	Location ID	Depth (ft)	Media	Manganese	Mercury	Molybdenum	Nickel	Nitrate	Perchlorate	Potassium	Selenium	Silver	Sodium	Thallium	Vanadium	Zinc
Soil Background Value				**671**	**0.1**	**na**	**15.4**	**na**	**na**	**3640**	**1.52**	**1**	**915**	**0.73**	**39.6**	**48.8**
Qbt 2,3,4 Background Value				**482**	**0.1**	**na**	**6.58**	**na**	**na**	**3500**	**0.3**	**1**	**2770**	**1.1**	**17**	**63.5**
Qbt 1v Background Value				**408**	**0.1**	**na**	**2**	**na**	**na**	**6670**	**0.3**	**1**	**6330**	**1.24**	**4.48**	**84.6**
Qbt 1g, Qct, Qbo, Qbog[b] Background Value				**189**	**0.1**	**na**	**2**	**na**	**na**	**2390**	**0.3**	**1**	**4350**	**1.22**	**4.59**	**40**
Tcb Background Value				**na**	**na**	**na**	**na**	**na**	**na**	**na**	**na**	**na**	**na**	**na**	**na**	**na**
Industrial Soil Screening Levels				**21800**	**340[d]**	**5680**	**22500**	**100000**	**110[d]**	**na**	**5680**	**5680**	**na**	**74.9**	**7950**	**100000**
Residential Soil Screening Levels				**1550**	**23[d]**	**391**	**1560**	**100000**	**7.8[d]**	**na**	**391**	**391**	**na**	**5.16**	**548**	**23500**
MD54-05-58013	54-24375	30.00–35.00	Qbt 2	—	—	0.346	—	2.05 (J-)	—	—	0.498 (U)	—	—	—	—	—
MD54-05-58014	54-24375	62.00–64.00	Qbt 2	—	—	0.423	—	—	—	—	2.49 (U)	—	—	—	—	—
MD54-05-58015	54-24375	64.00–65.00	Qbt 2	—	—	0.384	—	—	—	—	2.49 (U)	—	—	—	—	—
MD54-05-58019	54-24375	195.00–200.00	Qbo	—	—	0.268	—	1.38 (J-)	—	—	0.534 (U)	—	—	—	—	—
MD54-05-58026	54-24376	35.00–40.00	Qbt 2	—	—	0.468	—	—	—	—	1.55 (U)	—	—	—	—	—
MD54-05-58032	54-24376	198.00–200.00	Qbo	—	—	0.118	—	—	—	—	1.54 (U)	—	—	—	—	—
MD54-05-58034	54-24377	45.00–50.00	Qbt 1v	—	—	0.736	—	—	—	—	1.54 (U)	—	—	—	—	—
MD54-05-58040	54-24377	198.00–200.00	Qbo	—	—	0.112	—	—	—	—	1.54 (U)	—	—	—	—	—
MD54-05-58042	54-24378	25.00–30.00	Qbt 2	—	—	—	—	—	—	—	0.406 (J)	—	—	—	—	—
MD54-05-58043	54-24378	148.50–150.00	Qct	—	—	—	—	—	—	—	—	—	—	—	5.31	—
MD54-05-58048	54-24378	180.00–182.00	Qbo	—	—	—	8.38	—	—	—	1.16	—	—	—	24.6	—
MD54-05-58050	54-24379	20.00–25.00	Qbt 2	—	—	0.546	—	3.69 (J-)	—	—	0.5 (U)	—	—	—	—	—
MD54-05-58051	54-24379	117.00–119.00	Qct	—	—	0.228	3.15	—	—	—	0.5 (U)	—	—	—	7.71	—
MD54-05-58052	54-24379	148.00–150.00	Qbo	—	—	0.0652 (J)	—	—	—	—	0.503 (U)	—	—	—	—	—
MD54-05-58056	54-24379	198.00–200.00	Qbog	—	—	0.288	5.74	—	—	—	0.596	—	—	—	—	—
MD54-05-58058	54-24380	20.00–25.00	Qbt 2	—	—	0.861	—	—	—	—	0.517 (U)	—	—	—	—	—
MD54-05-58059	54-24380	176.00–178.00	Qct	440 (J)	—	0.501	2.53	—	—	—	0.533 (U)	—	—	—	5.06	51.1
MD54-05-58064	54-24380	195.00–196.00	Qct	—	—	0.297	4.5	—	—	—	0.672 (U)	—	—	—	7.99	—
MD54-05-58071	54-24381	15.00–20.00	Qbt 2	—	—	0.481	—	4.74 (J-)	0.123	—	—	—	—	—	—	—
MD54-05-58072	54-24381	110.00–112.00	Qbt 1g	—	—	0.646	—	—	0.126	—	0.515 (U)	—	—	—	—	—
MD54-05-58073	54-24381	148.00–150.00	Qbo	—	—	0.122	—	—	0.123	—	0.513 (U)	—	—	—	—	—
MD54-05-58077	54-24381	198.00–200.00	Qbo	—	—	0.147	—	—	0.13	—	—	—	—	—	—	—
MD54-05-58079	54-24382	30.00–35.00	Qbt 2	—	—	0.307	—	—	—	—	1.52 (U)	—	—	—	—	—
MD54-05-58080	54-24382	103.00–105.00	Qct	212	—	0.223	4.08 (J+)	—	—	—	1.59 (U)	—	—	—	10.4	—
MD54-05-58085	54-24382	145.00–147.00	Qbo	—	—	0.197	3.54 (J+)	—	—	—	1.64 (U)	—	—	—	12.5	—
MD54-05-58087	54-24383	20.00–25.00	Qbt 2	—	—	0.348	—	—	—	—	1.5 (U)	—	—	—	—	—
MD54-05-58093	54-24383	145.00–147.50	Soil	—	—	0.275	—	—	—	—	1.77 (U)	—	—	—	—	—
MD54-05-58095	54-24384	25.00–30.00	Qbt 1g	—	—	0.203	—	—	—	—	15.2 (U)	—	—	—	—	—
MD54-05-58101	54-24384	66.00–68.00	Soil	—	—	0.266	25.8	—	—	—	35.3 (U)	—	—	—	—	61.5

Table F-4.2-2 (continued)

Sample ID	Location ID	Depth (ft)	Media	Manganese	Mercury	Molybdenum	Nickel	Nitrate	Perchlorate	Potassium	Selenium	Silver	Sodium	Thallium	Vanadium	Zinc
Soil Background Value				**671**	**0.1**	**na**	**15.4**	**na**	**na**	**3640**	**1.52**	**1**	**915**	**0.73**	**39.6**	**48.8**
Qbt 2,3,4 Background Value				**482**	**0.1**	**na**	**6.58**	**na**	**na**	**3500**	**0.3**	**1**	**2770**	**1.1**	**17**	**63.5**
Qbt 1v Background Value				**408**	**0.1**	**na**	**2**	**na**	**na**	**6670**	**0.3**	**1**	**6330**	**1.24**	**4.48**	**84.6**
Qbt 1g, Qct, Qbo, Qbog[b] Background Value				**189**	**0.1**	**na**	**2**	**na**	**na**	**2390**	**0.3**	**1**	**4350**	**1.22**	**4.59**	**40**
Tcb Background Value				**na**	**na**	**na**	**na**	**na**	**na**	**na**	**na**	**na**	**na**	**na**	**na**	**na**
Industrial Soil Screening Levels				**21800**	**340[d]**	**5680**	**22500**	**100000**	**110[d]**	**na**	**5680**	**5680**	**na**	**74.9**	**7950**	**100000**
Residential Soil Screening Levels				**1550**	**23[d]**	**391**	**1560**	**100000**	**7.8[d]**	**na**	**391**	**391**	**na**	**5.16**	**548**	**23500**
MD54-05-58103	54-24385	30.00–35.00	Qbt 2	—	—	0.754	—	1.23 (J-)	—	—	0.474 (J)	—	—	—	—	—
MD54-05-58104	54-24385	110.50–112.50	Qct	—	—	0.298	—	—	—	—	—	—	—	—	4.65	—
MD54-05-58109	54-24385	175.50–177.00	Soil	—	—	0.17	—	0.958 (J-)	—	—	—	—	—	—	—	—
MD54-05-58116	54-24386	35.00–40.00	Qbt 2	—	—	0.688	—	1.25 (J-)	—	—	0.519 (U)	—	—	—	—	—
MD54-05-58117	54-24386	56.00–58.00	Qbt 2	—	—	0.549	—	1.69 (J-)	0.0994 (J)	—	0.524 (U)	—	—	—	—	—
MD54-05-58118	54-24386	58.00–59.00	Qbt 2	—	—	0.658	—	1.19 (J-)	0.125 (J)	—	0.534 (U)	—	—	—	—	—
MD54-05-58119	54-24386	110.00–112.00	Qct	246 (J+)	—	0.388	3.82	—	—	—	0.591 (U)	—	—	—	9.22	—
MD54-05-58122	54-24386	185.00–186.00	Soil	—	—	0.285	25.2	0.946 (J-)	—	—	—	—	—	—	—	—
MD54-05-58124	54-24387	5.00–10.00	Qbt 1g	214	—	0.707	2.82	—	—	—	16 (U)	—	—	—	—	—
MD54-05-58130	54-24387	78.00–81.00	Qbog	227	—	0.318	14.4	—	—	2490	—	—	—	—	20.7	—
MD54-05-58132	54-24388	25.00–30.00	Qbt 2	—	—	1.04	—	—	—	—	0.492 (J)	—	—	—	—	—
MD54-05-58133	54-24388	63.00–64.50	Qbt 2	—	—	0.375	—	1.24 (J-)	—	—	0.518	—	—	—	—	—
MD54-05-58134	54-24388	132.50–134.50	Qbt 1g	—	—	0.179	—	—	—	—	—	—	—	—	—	—
MD54-05-58135	54-24388	155.00–157.00	Qct	606 (J+)	—	0.485	3.72	0.955 (J-)	—	—	0.44 (J)	—	—	—	6.18	154
MD54-05-58138	54-24388	177.00–180.00	Qct	—	—	0.185	5.12	—	—	—	0.406 (J)	—	—	—	—	—
MD54-05-58140	54-24389	20.00–25.00	Qbt 2	—	—	0.343	—	—	—	—	2.58 (U)	—	—	—	—	—
MD54-05-58141	54-24389	173.00–175.00	Qct	199 (J+)	—	0.234	4.52	—	—	—	0.751 (U)	—	—	—	12.9	—
MD54-05-58146	54-24389	198.00–200.00	Qbo	—	—	0.109	—	—	—	—	0.525 (U)	—	—	—	—	—
MD54-05-58148	54-24390	30.00–35.00	Qbt 2	—	—	0.766	—	0.984	—	—	0.512 (U)	—	—	—	—	—
MD54-05-58149	54-24390	56.00–57.00	Qbt 2	—	—	0.698	—	1.76	—	—	0.814 (U)	—	—	—	—	73.1
MD54-05-58150	54-24390	93.00–94.00	Qbt 1v	—	—	0.909	—	—	—	—	0.533 (U)	—	—	—	—	—
MD54-05-58151	54-24390	94.00–95.00	Qbt 1v	—	—	0.665	—	—	—	—	0.544 (U)	—	—	—	—	—
MD54-05-58154	54-24390	185.00–186.00	Soil	—	—	0.421	—	—	—	—	—	—	—	—	—	—
MD54-05-58161	54-24391	25.00–30.00	Qbt 2	—	—	0.33	—	1.04	—	—	0.513 (U)	—	—	—	—	—
MD54-05-58167	54-24391	198.00–200.00	Qbo	—	—	0.0957 (J)	—	0.904	—	—	0.52 (U)	—	—	—	—	—
MD54-05-58169	54-24392	25.00–30.00	Qbt 2	—	—	0.546	—	—	—	—	1.55 (U)	—	—	—	—	—
MD54-05-58175	54-24392	198.00–200.00	Qbo	—	—	0.375	2.22	—	—	—	1.62 (U)	—	—	—	—	—
MD54-05-58177	54-24393	35.00–40.00	Qbt 2	—	—	0.421	—	—	—	—	1.52 (U)	—	—	—	—	—
MD54-05-58178	54-24393	158.00–160.00	Qct	—	—	0.235	4.94	—	—	—	1.6 (U)	—	—	—	12.7	—

Table F-4.2-2 (continued)

Sample ID	Location ID	Depth (ft)	Media	Manganese	Mercury	Molybdenum	Nickel	Nitrate	Perchlorate	Potassium	Selenium	Silver	Sodium	Thallium	Vanadium	Zinc
Soil Background Value				**671**	**0.1**	**na**	**15.4**	**na**	**na**	**3640**	**1.52**	**1**	**915**	**0.73**	**39.6**	**48.8**
Qbt 2,3,4 Background Value				**482**	**0.1**	**na**	**6.58**	**na**	**na**	**3500**	**0.3**	**1**	**2770**	**1.1**	**17**	**63.5**
Qbt 1v Background Value				**408**	**0.1**	**na**	**2**	**na**	**na**	**6670**	**0.3**	**1**	**6330**	**1.24**	**4.48**	**84.6**
Qbt 1g, Qct, Qbo, Qbog[b] Background Value				**189**	**0.1**	**na**	**2**	**na**	**na**	**2390**	**0.3**	**1**	**4350**	**1.22**	**4.59**	**40**
Tcb Background Value				**na**	**na**	**na**	**na**	**na**	**na**	**na**	**na**	**na**	**na**	**na**	**na**	**na**
Industrial Soil Screening Levels				**21800**	**340[d]**	**5680**	**22500**	**100000**	**110[d]**	**na**	**5680**	**5680**	**na**	**74.9**	**7950**	**100000**
Residential Soil Screening Levels				**1550**	**23[d]**	**391**	**1560**	**100000**	**7.8[d]**	**na**	**391**	**391**	**na**	**5.16**	**548**	**23500**
MD54-05-58179	54-24393	193.00–194.40	Qbo	—	—	0.108 (J)	—	—	—	—	1.69 (U)	—	—	—	—	—
MD54-05-58183	54-24393	204.00–206.00	Qbog	—	—	0.231	3.37	—	—	—	—	—	—	—	—	—
MD54-05-58185	54-24394	40.00–45.00	Qbt 2	—	—	0.695	—	—	—	—	1.65 (U)	—	—	—	—	—
MD54-05-58186	54-24394	50.00–55.00	Qbt 2	—	—	1.11	—	—	—	—	1.65 (U)	—	—	—	—	—
MD54-05-58187	54-24394	100.00–102.00	Qbt 1v	—	—	1.44	—	—	—	—	0.75 (J)	—	—	—	—	—
MD54-05-58188	54-24394	102.00–105.00	Qbt 1v	—	—	2.5	—	—	—	—	0.756 (J)	—	—	—	—	—
MD54-05-58191	54-24394	198.00–200.00	Qbo	—	—	0.17	—	—	—	—	1.53 (U)	—	—	—	—	—
MD54-05-58193	54-24395	40.00–45.00	Qbt 2	—	—	0.568	—	—	—	—	1.8 (U)	—	—	—	—	—
MD54-05-58194	54-24395	153.00–155.00	Qbt 1g	—	—	0.514	—	—	—	—	1.73 (U)	—	—	—	—	—
MD54-05-58195	54-24395	188.00–190.00	Qbt 1g	—	—	0.278	—	—	—	—	1.85 (U)	—	—	—	—	—
MD54-05-58199	54-24395	198.00–200.00	Qbo	—	—	0.205	—	—	—	—	1.67 (U)	—	—	—	—	—
MD54-05-58206	54-24396	10.00–15.00	Qbt 2	—	—	0.552	—	1.09 (J-)	—	—	—	—	—	—	—	—
MD54-05-58207	54-24396	154.00–155.00	Qct	220 (J+)	—	0.317	5.89	—	—	—	0.622 (U)	—	—	—	15.2	41.6
MD54-05-58212	54-24396	198.00–200.00	Qbo	—	—	0.134	—	—	—	—	0.522 (U)	—	—	—	—	—
MD54-05-58214	54-24397	15.00–20.00	Qbt 2	—	—	0.449	—	0.641 (J)	—	—	1.02 (U)	—	—	—	—	—
MD54-05-58215	54-24397	159.00–160.00	Qct	201	—	0.275	2.53	0.689 (J)	—	—	1.41 (U)	—	—	—	8.91	—
MD54-05-58220	54-24397	198.00–200.00	Qbo	—	—	0.0916 (J)	—	—	—	—	1.14 (U)	—	—	—	—	—
MD54-05-59184	54-24523	199.80–200.00	Qbog	—	—	—	—	—	—	—	—	—	—	—	—	—
MD54-05-59186	54-24523	221.80–222.00	Tcb	—	—	—	—	—	—	—	—	—	—	—	—	—
MD54-05-59190	54-24523	262.60–265.80	Tcb	—	—	—	—	—	—	—	—	—	—	—	—	—
MD54-05-59202	54-24523	386.10–386.60	Tcb	—	—	—	—	—	—	—	—	—	—	—	—	—
MD54-05-59204	54-24523	404.30–407.30	Tcb	—	—	—	—	—	—	—	—	—	—	—	—	—
MD54-05-59212	54-24523	696.00–696.50	Tcb	—	—	—	—	—	—	—	—	—	—	—	—	—

Note: All values in mg/kg. See Appendix A for data qualifier definitions.

[a] na = Not available.

[b] Qbo background values used for Qbog.

[c] Industrial SSL for cadmium calculated incorrectly in NMED 2004 85615, SSL recalculated using NMED parameters.

[d] SSLs obtained from EPA 2004, 87478.

[e] — = Analysis not requested, the reported value was less than the BV, or result not detected.

Table F-4.2-3
Frequency of Organic Chemicals Detected in Subsurface Soil and Rock Samples at MDA G

Analyte	Media	Number of Analyses	Frequency of Detects	Detected Concentration Range (mg/kg)	Frequency of Nondetects	Nondetected Concentration Range (mg/kg)
Octachlorodibenzodioxin[1,2,3,4,6,7,8,9-]	QBT2	29	7/29	3.8E-07 to 8.97E-06	22/29	2.2E-07 to 1.36E-06
Heptachlorodibenzodioxins (Total)	QBT2	29	6/29	0.0000001 to 3.44E-06	23/29	6E-08 to 3.8E-07
Heptachlorodibenzodioxin[1,2,3,4,6,7,8-]	QBT2	29	5/29	0.0000001 to 1.3E-06	24/29	6E-08 to 1.17E-06
Heptachlorodibenzofuran[1,2,3,4,6,7,8-]	QBT2	29	1/29	9.9E-07	28/29	4E-08 to 5.1E-07
Heptachlorodibenzofurans (Total)	QBT2	29	1/29	9.9E-07	28/29	4E-08 to 5.1E-07
Hexachlorodibenzodioxins (Total)	QBT2	29	1/29	0.0000004	28/29	6E-08 to 3.8E-07
Hexachlorodibenzofuran[2,3,4,6,7,8-]	QBT2	29	1/29	1.6E-07	28/29	2E-08 to 1.1E-07
Hexachlorodibenzofurans (Total)	QBT2	29	1/29	1.01E-06	28/29	3E-08 to 4.7E-07
Pentachlorodibenzofurans (Totals)	QBT2	29	1/29	1.3E-07	28/29	6E-08 to 3.4E-07

Table F-4.2-4
Organic Chemicals Detected in Subsurface Samples from MDA G

Sample ID	Location ID	Depth (ft)	Media	Heptachlorodibenzodioxin[1,2,3,4,6,7,8-]	Heptachlorodibenzodioxins (Total)	Heptachlorodibenzofuran[1,2,3,4,6,7,8-]	Heptachlorodibenzofurans (Total)	Hexachlorodibenzodioxins (Total)	Hexachlorodibenzofuran[2,3,4,6,7,8-]	Hexachlorodibenzofurans (Total)	Octachlorodibenzodioxin[1,2,3,4,6,7,8,9-]	Pentachlorodibenzofurans (Totals)
Industrial Soil Screening Levels				**Soil screening levels are not available for the individual congeners, just for 2,3,7,8-TCDD.**								
Residential Soil Screening Levels				**Soil screening levels are not available for the individual congeners, just for 2,3,7,8-TCDD.**								
MD54-05-57895	54-24363	31.80–35.40	Qbt 2	0.0000001 (J)	0.0000001 (J)	—*	—	—	—	—	5.2E-07 (J)	—
MD54-05-57981	54-24371	40.00–45.00	Qbt 2	—	1.03E-06	—	—	—	—	—	8.97E-06	—
MD54-05-58005	54-24374	12.00–15.00	Qbt 2	1.6E-07 (J)	3.6E-07	—	—	—	—	—	—	—
MD54-05-58071	54-24381	15.00–20.00	Qbt 2	0.0000013 (J)	3.44E-06	9.9E-07 (J)	9.9E-07	3.9E-07	1.6E-07 (J)	1.01E-06	7.69E-06	1.3E-07
MD54-05-58103	54-24385	30.00–35.00	Qbt 2	2.4E-07 (J)	2.4E-07	—	—	—	—	—	7.6E-07 (J)	—
MD54-05-58132	54-24388	25.00–30.00	Qbt 2	3.2E-07 (J)	6.5E-07	—	—	—	—	—	1.41E-06 (J)	—
MD54-05-58148	54-24390	30.00–35.00	Qbt 2	—	—	—	—	—	—	—	3.8E-07 (J)	—
MD54-05-58161	54-24391	25.00–30.00	Qbt 2	—	—	—	—	—	—	—	4.7E-07 (J)	—

Note: All values in mg/kg. See Appendix A for data qualifier definitions.

*— = Not detected.

Table F-4.2-5
Frequency of Radionuclides Detected above BVs in Subsurface Soil and Rock Samples at MDA G

Analyte	Media	Number of Analyses	Frequency of Detects	Detected Concentration Range (pCi/g)	Background Value (pCi/g)	Frequency of Detects Above Background Value	Frequency of Nondetects	Nondetected Concentration Range (pCi/g)
Uranium-234	QBO	25	22/25	0.457 to 3.859	4	0/25	3/25	-0.021 to 0.167
Uranium-238	QBO	25	20/25	0.43 to 4.152	3.9	1/25	5/25	-0.014 to 0.643
Thorium-230	QBO	25	18/25	0.11 to 3.047	4	0/25	7/25	0.046 to 9.249
Thorium-232	QBO	25	18/25	0.039 to 2.913	4.9	0/25	7/25	-3.047 to 0.264
Thorium-228	QBO	25	15/25	0.195 to 2.73	4.9	0/25	10/25	-31.164 to 0.2071
Americium-241	QBO	25	4/25	0.078 to 0.265	na*	4/25	21/25	-5.573 to 0.085
Plutonium-239	QBO	25	4/25	0.054 to 0.218	na	4/25	21/25	-0.38 to 0.035
Uranium-235	QBO	25	3/25	0.192 to 0.621	0.18	3/25	22/25	-0.031 to 0.464
Plutonium-238	QBO	25	1/25	0.053	na	1/25	24/25	-0.145 to 0.0238
Strontium-90	QBO	25	1/25	3.81	na	1/25	24/25	-1.57 to 0.9
Thorium-228	QBOG	6	6/6	0.3125 to 4.7	4.9	0/6	0/6	na
Uranium-234	QBOG	6	6/6	1.707 to 7.835	4	2/6	0/6	na
Thorium-230	QBOG	6	5/6	1.725 to 6.75	4	3/6	1/6	0.219
Thorium-232	QBOG	6	5/6	2.001 to 4.819	4.9	0/6	1/6	0.198
Uranium-238	QBOG	6	5/6	1.938 to 7.803	3.9	2/6	1/6	0.09
Uranium-235	QBOG	6	3/6	0.221 to 1.644	0.18	3/6	3/6	0.118 to 0.279
Plutonium-239	QBOG	6	1/6	0.176	na	1/6	5/6	-0.0644 to 0.006
Uranium-234	QBT1G	8	7/8	1.289 to 4.33	4	1/8	1/8	0.4
Uranium-238	QBT1G	8	7/8	1.585 to 4.35	3.9	2/8	1/8	0.507
Thorium-230	QBT1G	8	6/8	0.371 to 4.12	4	2/8	2/8	0.111 to 0.171
Thorium-232	QBT1G	8	6/8	0.311 to 3.81	4.9	0/8	2/8	-0.059 to 0.173
Thorium-228	QBT1G	8	5/8	0.328 to 3.93	4.9	0/8	3/8	-0.192 to 0.658
Uranium-235	QBT1G	8	4/8	0.186 to 0.287	0.18	4/8	4/8	-0.03 to 0.06
Plutonium-239	QBT1G	8	1/8	0.315	na	1/8	7/8	-0.227 to 0.00824

Table F-4.2-5 (continued)

Analyte	Media	Number of Analyses	Frequency of Detects	Detected Concentration Range (pCi/g)	Background Value (pCi/g)	Frequency of Detects Above Background Value	Frequency of Nondetects	Nondetected Concentration Range (pCi/g)
Uranium-234	QBT1V	8	8/8	0.387 to 2.91	3.12	0/8	0/8	na
Uranium-238	QBT1V	8	7/8	1.163 to 3.23	3.05	1/8	1/8	0.319
Thorium-232	QBT1V	8	6/8	0.667 to 3.89	3.75	1/8	2/8	0.027 to 0.134
Thorium-228	QBT1V	8	5/8	0.637 to 4.02	3.75	2/8	3/8	0.002 to 0.124
Thorium-230	QBT1V	8	4/8	2.9 to 3.42	3.12	3/8	4/8	-0.031 to 0.369
Uranium-235	QBT1V	8	3/8	0.0867 to 0.222	0.14	2/8	5/8	0.016 to 0.259
Uranium-234	QBT2	37	35/37	0.105 to 5.575	1.98	4/37	2/37	-0.283 to 0.154
Uranium-238	QBT2	37	30/37	0.208 to 4.959	1.93	6/37	7/37	-0.128 to 1.341
Thorium-232	QBT2	37	25/37	0.248 to 3.1	2.52	2/37	12/37	0 to 0.252
Thorium-228	QBT2	37	20/37	0.208 to 2.84	2.52	2/37	17/37	-0.308 to 0.684
Thorium-230	QBT2	37	18/37	0.291 to 2.545	1.98	3/37	19/37	-0.05 to 0.946
Uranium-235	QBT2	37	9/37	0.0514 to 0.26	0.09	6/37	28/37	-0.071 to 0.31
Americium-241	QBT2	37	6/37	0.074 to 0.305	na	6/37	31/37	-0.313 to 0.0361
Plutonium-239	QBT2	37	5/37	0.072 to 0.22	na	5/37	32/37	-0.271 to 0.076
Strontium-90	QBT2	37	3/37	0.64 to 2.84	na	3/37	34/37	-6.41 to 1.13
Uranium-234	QCT	14	13/14	0.447 to 2.58	4	0/14	1/14	-3.396
Uranium-238	QCT	14	12/14	0.644 to 2.67	3.9	0/14	2/14	-2.64 to 0.191
Thorium-232	QCT	14	11/14	0.179 to 3.08	4.9	0/14	3/14	0.0282 to 0.069
Thorium-230	QCT	14	10/14	0.569 to 2.62	4	0/14	4/14	-0.022 to 0.114
Thorium-228	QCT	14	8/14	1.469 to 3.18	4.9	0/14	6/14	-0.299 to 0.124
Uranium-235	QCT	14	6/14	0.0778 to 0.745	0.18	1/14	8/14	-0.846 to 0.0751
Plutonium-239	QCT	14	2/14	0.127 to 0.21	na	2/14	12/14	-2.997 to 0.037
Americium-241	QCT	14	1/14	0.183	na	1/14	13/14	-0.269 to 0.147
Strontium-90	QCT	14	1/14	5.9	na	1/14	13/14	-0.35 to 0.14
Uranium-234	SOIL	6	6/6	0.321 to 1.35	2.59	0/6	0/6	na
Uranium-238	SOIL	6	6/6	0.702 to 1.64	2.29	0/6	0/6	na

Table F-4.2-5 (continued)

Analyte	Media	Number of Analyses	Frequency of Detects	Detected Concentration Range (pCi/g)	Background Value (pCi/g)	Frequency of Detects Above Background Value	Frequency of Nondetects	Nondetected Concentration Range (pCi/g)
Thorium-230	SOIL	6	5/6	1.18 to 1.48	2.29	0/6	1/6	0.079 to 0.079
Thorium-228	SOIL	6	4/6	0.624 to 2.15	2.28	0/6	2/6	0.0343 to 0.0362
Thorium-232	SOIL	6	4/6	0.544 to 2.05	2.33	0/6	2/6	0.036 to 0.042
Uranium-235	SOIL	6	3/6	0.0546 to 0.131	0.2	0/6	3/6	0.006 to 0.029
Americium-241	SOIL	6	1/6	0.278	0.013	1/6	5/6	-0.0142 to 0.105
Plutonium-238	SOIL	6	1/6	0.031	0.023	1/6	5/6	-0.018 to 0.00375
Plutonium-239	SOIL	6	1/6	0.102	0.054	1/6	5/6	-0.022 to 0.021

*na = Background data not available.

Table F-4.2-6
Radionuclides Detected above BVs in Subsurface Samples from MDA G

Sample ID	Location ID	Depth (ft)	Media	Americium-241	Plutonium-238	Plutonium-239	Strontium-90	Thorium-228	Thorium-230	Thorium-232	Uranium-234	Uranium-235	Uranium-238
Soil Background Value				**0.013**	**0.023**	**0.054**	**1.31**	**2.28**	**2.29**	**2.33**	**2.59**	**0.2**	**2.29**
Qbt 2,3,4 Background Value				**na**[a]	**na**	**na**	**na**	**2.52**	**1.98**	**2.52**	**1.98**	**0.09**	**1.93**
Qbt 1v Background Value				**na**	**na**	**na**	**na**	**3.75**	**3.12**	**3.75**	**3.12**	**0.14**	**3.05**
Qbt 1g, Qct, Qbo, Qbog[b] **Background Value**				**na**	**na**	**na**	**na**	**4.90**	**4.00**	**4.90**	**4.00**	**0.18**	**3.90**
Industrial Screening Action Level				**180**	**240**	**210**	**1900**	**9.0**	**5**[c]	**5**[c]	**1500**	**87**	**430**
Residential Screening Action Level				**30**	**37**	**33**	**5.7**	**2.3**	**5**[c]	**5**[c]	**170**	**17**	**86**
MD54-05-57897	54-24363	113.10–114.50	Qbt 1g	—[d]	—	0.315	—	—	—	—	—	—	—
MD54-05-57901	54-24363	175.30–176.80	Qbog	—	—	0.176	—	—	6.75	—	—	—	—
MD54-05-57950	54-24367	198.00–200.00	Qbo	0.153	—	—	—	—	—	—	—	—	—
MD54-05-57958	54-24368	200.10–201.50	Qbo	—	—	—	3.81	—	—	—	—	—	—
MD54-05-57960	54-24369	65.00–70.00	Qbt 2	—	—	—	—	—	—	—	5.575 (J-)	—	4.959 (J-)
MD54-05-57966	54-24369	248.00–250.00	Qbog	—	—	—	—	—	6.121 (J+)	—	7.835	—	7.803
MD54-05-57974	54-24370	223.00–225.00	Qbog	—	—	—	—	—		—		—	—
MD54-05-57981	54-24371	40.00–45.00	Qbt 2	—	—	—	—	—	—	—	2.337	—	2.552
MD54-05-57987	54-24371	198.00–200.00	Qbo	—	—	—	—	—	—	—	—	—	4.152
MD54-05-57989	54-24372	55.00–60.00	Qbt 2	—	—	—	0.64	—	—	—	—	—	—
MD54-05-58005	54-24374	12.00–15.00	Qbt 2	—	—	0.072	—	—	—	—	—	—	—
MD54-05-58011	54-24374	198.00–200.00	Qbo	—	—	0.113	—	—	—	—	—	—	—
MD54-05-58013	54-24375	30.00–35.00	Qbt 2	—	—	—	—	—	—	—	2.576	0.139	2.744
MD54-05-58015	54-24375	64.00–65.00	Qbt 2	0.278	—	—	—	—	—	—	—	—	—
MD54-05-58032	54-24376	198.00–200.00	Qbo	—	0.053	0.088	—	—	—	—	—	—	—
MD54-05-58034	54-24377	45.00–50.00	Qbt 1v	—	—	—	—	—	3.263 (J-)	—	—	—	—
MD54-05-58042	54-24378	25.00–30.00	Qbt 2	0.111	—	—	—	—	—	—	—	—	—
MD54-05-58043	54-24378	148.50–150.00	Qct	—	—	—	—	—	—	—	—	0.745	—
MD54-05-58048	54-24378	180.00–182.00	Qbo	0.078	—	—	—	—	—	—	—	0.621	—
MD54-05-58056	54-24379	198.00–200.00	Qbog	—	—	—	—	—	5.68	—	5.03	0.241	5.5

Table F-4.2-6 (continued)

Sample ID	Location ID	Depth (ft)	Media	Americium-241	Plutonium-238	Plutonium-239	Strontium-90	Thorium-228	Thorium-230	Thorium-232	Uranium-234	Uranium-235	Uranium-238
Soil Background Value				**0.013**	**0.023**	**0.054**	**1.31**	**2.28**	**2.29**	**2.33**	**2.59**	**0.2**	**2.29**
Qbt 2,3,4 Background Value				**na[a]**	**na**	**na**	**na**	**2.52**	**1.98**	**2.52**	**1.98**	**0.09**	**1.93**
Qbt 1v Background Value				**na**	**na**	**na**	**na**	**3.75**	**3.12**	**3.75**	**3.12**	**0.14**	**3.05**
Qbt 1g, Qct, Qbo, Qbog[b] Background Value				**na**	**na**	**na**	**na**	**4.90**	**4.00**	**4.90**	**4.00**	**0.18**	**3.90**
Industrial Screening Action Level				**180**	**240**	**210**	**1900**	**9.0**	**5[c]**	**5[c]**	**1500**	**87**	**430**
Residential Screening Action Level				**30**	**37**	**33**	**5.7**	**2.3**	**5[c]**	**5[c]**	**170**	**17**	**86**
MD54-05-58072	54-24381	110.00–112.00	Qbt 1g	—	—	—	—	—	4.11	—	4.33	0.287	4.35
MD54-05-58073	54-24381	148.00–150.00	Qbo	—	—	—	—	—	—	—	—	0.192	—
MD54-05-58079	54-24382	30.00–35.00	Qbt 2	—	—	—	—	—	—	—	—	0.127	—
MD54-05-58085	54-24382	145.00–147.00	Qbo	—	—	—	—	—	—	—	—	0.206	—
MD54-05-58087	54-24383	20.00–25.00	Qbt 2	—	—	—	—	—	—	—	—	0.134	—
MD54-05-58095	54-24384	25.00–30.00	Qbt 1g	—	—	—	—	—	4.12	—	—	0.28	—
MD54-05-58109	54-24385	175.50–177.00	Soil	0.278	0.031	—	—	—	—	—	—	—	—
MD54-05-58116	54-24386	35.00–40.00	Qbt 2	—	—	0.166	—	—	—	—	—	—	—
MD54-05-58117	54-24386	56.00–58.00	Qbt 2	—	—	0.183	—	—	—	—	—	—	—
MD54-05-58118	54-24386	58.00–59.00	Qbt 2	—	—	0.083	—	—	—	—	—	—	—
MD54-05-58119	54-24386	110.00–112.00	Qct	—	—	0.127	—	—	—	—	—	—	—
MD54-05-58122	54-24386	185.00–186.00	Soil	—	—	0.102	—	—	—	—	—	—	—
MD54-05-58124	54-24387	5.00–10.00	Qbt 1g	—	—	—	—	—	—	—	—	0.287	—
MD54-05-58130	54-24387	78.00–81.00	Qbog	—	—	—	—	—	—	—		0.221	—
MD54-05-58133	54-24388	63.00–64.50	Qbt 2	—	—	—	—	2.65	2.29	—	—	0.134	2.04
MD54-05-58134	54-24388	132.50–134.50	Qbt 1g	—	—	—	—	—	—	—	—	0.186	3.95
MD54-05-58141	54-24389	173.00–175.00	Qct	0.183	—	—	—	—	—	—	—	—	—
MD54-05-58148	54-24390	30.00–35.00	Qbt 2	—	—	—	—	—	—	2.58	—	0.102	—
MD54-05-58149	54-24390	56.00–57.00	Qbt 2	—	—	—	—	2.84	—	3.1	—	0.26	—
MD54-05-58150	54-24390	93.00–94.00	Qbt 1v	—	—	—	—	3.95	3.42	—	—	0.152	3.23
MD54-05-58151	54-24390	94.00–95.00	Qbt 1v	—	—	—	—	4.02	3.36	3.89	—	0.222	—

Table F-4.2-6 (continued)

Sample ID	Location ID	Depth (ft)	Media	Americium-241	Plutonium-238	Plutonium-239	Strontium-90	Thorium-228	Thorium-230	Thorium-232	Uranium-234	Uranium-235	Uranium-238
Soil Background Value				**0.013**	**0.023**	**0.054**	**1.31**	**2.28**	**2.29**	**2.33**	**2.59**	**0.2**	**2.29**
Qbt 2,3,4 Background Value				**na[a]**	**na**	**na**	**na**	**2.52**	**1.98**	**2.52**	**1.98**	**0.09**	**1.93**
Qbt 1v Background Value				**na**	**na**	**na**	**na**	**3.75**	**3.12**	**3.75**	**3.12**	**0.14**	**3.05**
Qbt 1g, Qct, Qbo, Qbog[b] Background Value				**na**	**na**	**na**	**na**	**4.90**	**4.00**	**4.90**	**4.00**	**0.18**	**3.90**
Industrial Screening Action Level				**180**	**240**	**210**	**1900**	**9.0**	**5[c]**	**5[c]**	**1500**	**87**	**430**
Residential Screening Action Level				**30**	**37**	**33**	**5.7**	**2.3**	**5[c]**	**5[c]**	**170**	**17**	**86**
MD54-05-58161	54-24391	25.00–30.00	Qbt 2	—	—	—	2.778 (J-)	—	—	—	—	—	—
MD54-05-58169	54-24392	25.00–30.00	Qbt 2	0.305	—	—	—	—	2.545	—	—	—	—
MD54-05-58175	54-24392	198.00–200.00	Qbo	—	—	0.054 (J+)	—	—	—	—	—	—	—
MD54-05-58177	54-24393	35.00–40.00	Qbt 2	—	—	—	—	—	—	—	2.021	—	2.167
MD54-05-58178	54-24393	158.00–160.00	Qct	—	—	—	5.9	—	—	—	—	—	—
MD54-05-58179	54-24393	193.00–194.40	Qbo	0.151	—	—	—	—	—	—	—	—	—
MD54-05-58183	54-24393	204.00–206.00	Qbog	—	—	—	—	—	—	—		1.644	—
MD54-05-58185	54-24394	40.00–45.00	Qbt 2	0.274	—	—	—	—	—	—	—	—	—
MD54-05-58186	54-24394	50.00–55.00	Qbt 2	0.092 (J+)	—	—	—	—	—	—	—	—	—
MD54-05-58193	54-24395	40.00–45.00	Qbt 2	0.074 (J+)	—	—	—	—	—	—	—	—	1.948
MD54-05-58206	54-24396	10.00–15.00	Qbt 2	—	—	—	2.84	—	—	—	—	—	—
MD54-05-58212	54-24396	198.00–200.00	Qbo	0.265	—	—	—	—	—	—	—	—	—
MD54-05-58214	54-24397	15.00–20.00	Qbt 2	—	—	0.22	—	—	2.326	—	—	—	—
MD54-05-58215	54-24397	159.00–160.00	Qct	—	—	0.21	—	—	—	—	—	—	—
MD54-05-58220	54-24397	198.00–200.00	Qbo	—	—	0.218	—	—	—	—	—	—	—

Note: All values in pCi/g. See Appendix A for data qualifier definitions.

[a] na = Not available.

[b] Qbo background values used for Qbog.

[c] The Screening Action Level is the generic soil guideline for release of property published in Chapter 4 ("Residual Radioactive Material") DOE Order 5400.5. For the concentration averaged over the first 15 cm of soil below the surface, 5 pCi/g applies; for the subsequent 15 cm thick layers, the generic soil guideline is 15 pCi/g.

[d] — = Analysis not requested, the reported value was less than the BV, or result not detected.

Table F-4.3-1
Frequency of VOCs Detected in Pore-Gas Samples at MDA G

Analyte	Number of Analyses	Frequency of Detects	Detected Concentration Range (µg/m³)	Frequency of Nondetects	Nondetected Concentration Range (µg/m³)
Trichloroethane[1,1,1-]	69	68/69	41 to 709000	1/69	5.13
Trichloroethene	69	66/69	10.2 to 53700	3/69	5 to 505
Dichloroethane[1,1-]	69	65/69	4.4 to 33200	4/69	3.64 to 9300
Dichloroethene[1,1-]	69	65/69	5 to 59400	4/69	3.72 to 305
Tetrachloroethene	69	62/69	18.3 to 11500	7/69	6.37 to 3120
Trichloro-1,2,2-trifluoroethane[1,1,2-]	69	59/69	31 to 48300	10/69	6.7 to 276
Toluene	69	47/69	3.5 to 4400	22/69	3.5 to 1730
Trichlorofluoromethane	69	44/69	12 to 10100	25/69	4.9 to 2580
Styrene	69	29/69	8.1 to 500	40/69	3.75 to 1960
Acetone	69	27/69	13 to 228	42/69	28.5 to 4270
Methylene Chloride	69	25/69	4.8 to 312	44/69	3 to 1600
Dichlorodifluoromethane	69	23/69	20 to 12400	46/69	4.3 to 2270
Chloroform	69	20/69	8.6 to 1850	49/69	4.3 to 2240
Butanone[2-]	69	19/69	2.8 to 84	50/69	2.65 to 1360
Xylene[1,3-]+Xylene[1,4-]	69	13/69	4.6 to 60.8	56/69	7.64 to 3990
Methyl-2-pentanone[4-]	69	12/69	6.4 to 29	57/69	3.6 to 1880
Dichloropropane[1,2-]	69	10/69	9.24 to 69.3	59/69	4 to 2120
Propanol[2-]	69	4/69	8.9 to 210	65/69	7.37 to 4420
Carbon Tetrachloride	69	3/69	16 to 32	66/69	5.5 to 2890
Trimethylbenzene[1,2,4-]	69	3/69	4.91 to 23	66/69	4.3 to 2260
Bromodichloromethane	69	2/69	23.4 to 26.1	67/69	5.89 to 3080
Chlorodifluoromethane	69	2/69	2050 to 3890	67/69	10.6 to 6360
Dichloroethene[cis-1,2-]	69	2/69	388 to 396	67/69	3.49 to 1820
Ethanol	69	2/69	9.04 to 59	67/69	5.65 to 3390
Ethyltoluene[4-]	69	2/69	13 to 13	67/69	4.3 to 2260
Hexane	69	2/69	5.64 to 7.75	67/69	3.1 to 1620
Butanol[1-]	69	1/69	13	68/69	9.09 to 5450
Carbon Disulfide	69	1/69	4.5	68/69	2.7 to 1430
Dichloroethane[1,2-]	69	1/69	9	68/69	3.5 to 1860
Methanol	69	1/69	301	68/69	110 to 60200
n-Heptane	69	1/69	8.9	68/69	3.6 to 1880
Trimethylbenzene[1,3,5-]	69	1/69	5.5	68/69	4.3 to 2260
Vinyl Chloride	69	1/69	2.9	68/69	2.2 to 1180
Xylene[1,2-]	69	1/69	5.8	68/69	3.8 to 2000

Table F-4.3-2
VOCs Detected in Pore-Gas Samples at MDA G

Borehole Location	Depth (ft)	Sample ID	Analyte	Result (µg/m³)
54-24361	30–32	MD54-05-60283	Chloroform	234
			Dichloroethane[1,1-]	688
			Dichloroethene[1,1-]	436
			Tetrachloroethene	9490
			Trichloro-1,2,2-trifluoroethane[1,1,2-]	3140 (J)
			Trichloroethane[1,1,1-]	14700
			Trichloroethene	53700
	138–140	MD54-05-60282	Chloroform	381
			Dichloroethane[1,1-]	1130
			Dichloroethene[1,1-]	832
			Tetrachloroethene	3320
			Toluene	267
			Trichloro-1,2,2-trifluoroethane[1,1,2-]	1460 (J)
			Trichloroethane[1,1,1-]	13600
			Trichloroethene	29000
54-24362	35–37	MD54-05-60285	Carbon Tetrachloride	32.0
			Chloroform	100
			Dichlorodifluoromethane	2400
			Dichloroethane[1,1-]	260
			Dichloroethene[1,1-]	330
			Styrene	45.0
			Tetrachloroethene	1100
			Toluene	400
			Trichloro-1,2,2-trifluoroethane[1,1,2-]	1200
			Trichloroethane[1,1,1-]	8200
			Trichloroethene	6500
			Trichlorofluoromethane	130
	135–137	MD54-05-60284	Acetone	64.1 (J)
			Chloroform	151
			Dichloroethane[1,1-]	526
			Dichloroethene[1,1-]	753
			Methylene Chloride	55.5
			Styrene	51.1
			Tetrachloroethene	1150
			Toluene	324
			Trichloro-1,2,2-trifluoroethane[1,1,2-]	3060 (J+)

Table F4.3-2 (continued)

Borehole Location	Depth (ft)	Sample ID	Analyte	Result (µg/m³)
54-24362 (continued)			Trichloroethane[1,1,1-]	10900
			Trichloroethene	5260
			Trichlorofluoromethane	286
54-24363	12–250	MD54-05-60286	Toluene	240
			Carbon Disulfide	2.9
			Chloroform	5.2
			Dichlorodifluoromethane	13
			Dichloroethane[1,1-]	11
			Dichloroethene[1,1-]	46
			Styrene	10
			Butanone[2-]	5
			Tetrachloroethene	96
			Acetone	70
			Trichloro-1,2,2-trifluoroethane[1,1,2-]	120
			Trichloroethane[1,1,1-]	900
			Trichloroethene	45
			Trichlorofluoromethane	6.6
			Xylene[1,3-]+Xylene[1,4-]	8.4
54-24364	65–67	MD54-05-60289	Dichloroethane[1,1-]	129
			Dichloroethene[1,1-]	384
			Dichloropropane[1,2-]	25.9
			Methylene Chloride	29.9
			Tetrachloroethene	1760
			Trichloro-1,2,2-trifluoroethane[1,1,2-]	1840 (J)
			Trichloroethane[1,1,1-]	5340
			Trichloroethene	2850
			Trichlorofluoromethane	225
	130–132	MD54-05-60288	Acetone	102
			Dichloroethane[1,1-]	105
			Dichloroethene[1,1-]	384
			Dichloropropane[1,2-]	42.0
			Methylene Chloride	45.1
			Tetrachloroethene	1290
			Trichloro-1,2,2-trifluoroethane[1,1,2-]	1300 (J)
			Trichloroethane[1,1,1-]	4040
			Trichloroethene	1830
			Trichlorofluoromethane	180

Table F4.3-2 (continued)

Borehole Location	Depth (ft)	Sample ID	Analyte	Result (µg/m³)
54-24366	12–250	MD54-05-60290	Trichloroethane[1,1,1-]	29
			Acetone	17
			Toluene	20
54-24367	30–32	MD54-05-60293	Dichloroethane[1,1-]	259
			Dichloroethene[1,1-]	396
			Styrene	63.9
			Tetrachloroethene	481
			Toluene	527
			Trichloro-1,2,2-trifluoroethane[1,1,2-]	2070 (J+)
			Trichloroethane[1,1,1-]	13100
			Trichloroethene	1290
			Trichlorofluoromethane	399
	153–155	MD54-05-60292	Dichloroethane[1,1-]	809
			Dichloroethene[1,1-]	2540
			Styrene	111
			Tetrachloroethene	881
			Toluene	1170
			Trichloro-1,2,2-trifluoroethane[1,1,2-]	6360 (J+)
			Trichloroethane[1,1,1-]	31600
			Trichloroethene	2420
			Trichlorofluoromethane	483
54-24368	95–97	MD54-05-60295	Dichlorodifluoromethane	310
			Dichloroethane[1,1-]	660
			Dichloroethene[1,1-]	1900
			Styrene	160
			Tetrachloroethene	290
			Trichloro-1,2,2-trifluoroethane[1,1,2-]	7100
			Trichloroethane[1,1,1-]	42000
			Trichloroethene	480
			Trichlorofluoromethane	770
	192–194	MD54-05-60294	Dichlorodifluoromethane	390
			Dichloroethane[1,1-]	430
			Dichloroethene[1,1-]	1600
			Propanol[2-]	210
			Styrene	500
			Tetrachloroethene	280
			Trichloro-1,2,2-trifluoroethane[1,1,2-]	4000
			Trichloroethane[1,1,1-]	22000

Table F4.3-2 (continued)

Borehole Location	Depth (ft)	Sample ID	Analyte	Result (μg/m³)
54-24368 (continued)			Trichloroethene	470
			Trichlorofluoromethane	820
54-24369	65–67	MD54-05-61743	Dichlorodifluoromethane	2800
			Dichloroethane[1,1-]	2800
			Dichloroethene[1,1-]	4800
			Tetrachloroethene	3600
			Trichloro-1,2,2-trifluoroethane[1,1,2-]	18000
			Trichloroethane[1,1,1-]	120000
			Trichloroethene	3200
			Trichlorofluoromethane	2500
	184–186	MD54-05-61742	Dichlorodifluoromethane	1000
			Dichloroethane[1,1-]	490
			Dichloroethene[1,1-]	1100
			Tetrachloroethene	500
			Toluene	140
			Trichloro-1,2,2-trifluoroethane[1,1,2-]	3800
			Trichloroethane[1,1,1-]	20000
			Trichloroethene	500
			Trichlorofluoromethane	780
54-24370	37–39	MD54-05-60299	Dichlorodifluoromethane	10400
			Dichloroethene[1,1-]	2730
			Dichloroethene[cis-1,2-]	388
			Tetrachloroethene	1020
			Toluene	791
			Trichloro-1,2,2-trifluoroethane[1,1,2-]	48300 (J+)
			Trichloroethane[1,1,1-]	92700
			Trichloroethene	12400
			Trichlorofluoromethane	10100
	148–150	MD54-05-60298	Dichlorodifluoromethane	12400
			Dichloroethane[1,1-]	6880
			Dichloroethene[1,1-]	3290
			Dichloroethene[cis-1,2-]	396
			Methylene Chloride	312
			Styrene	179
			Tetrachloroethene	624
			Toluene	1130
			Trichloro-1,2,2-trifluoroethane[1,1,2-]	33700 (J+)
			Trichloroethane[1,1,1-]	65400

Table F4.3-2 (continued)

Borehole Location	Depth (ft)	Sample ID	Analyte	Result (µg/m³)
54-24370 (continued)			Trichloroethene	6980
			Trichlorofluoromethane	7300
54-24371	40–42	MD54-05-61745	Butanone[2-]	72.0
			Chloroform	100
			Dichlorodifluoromethane	730
			Dichloroethane[1,1-]	760
			Dichloroethene[1,1-]	290
			Methyl-2-pentanone[4-]	29.0
			Styrene	120
			Tetrachloroethene	460
			Toluene	4400
			Trichloro-1,2,2-trifluoroethane[1,1,2-]	12000
			Trichloroethane[1,1,1-]	9100
			Trichloroethene	2400
			Trichlorofluoromethane	1300
	141–143	MD54-05-61744	Acetone	46.0
			Butanone[2-]	84.0
			Chloroform	92.0
			Dichlorodifluoromethane	690
			Dichloroethane[1,1-]	720
			Dichloroethene[1,1-]	330
			Methyl-2-pentanone[4-]	28.0
			Methylene Chloride	17.0
			Styrene	100
			Tetrachloroethene	410
			Toluene	4400
			Trichloro-1,2,2-trifluoroethane[1,1,2-]	5900
			Trichloroethane[1,1,1-]	7500
			Trichloroethene	2600
			Trichlorofluoromethane	1200
54-24372	55–57	MD54-05-61747	Acetone	30.0
			Butanone[2-]	28.0
			Dichlorodifluoromethane	180
			Dichloroethane[1,1-]	25.0
			Dichloroethene[1,1-]	38.0
			Methyl-2-pentanone[4-]	10.0
			Styrene	90.0
			Tetrachloroethene	190

Table F4.3-2 (continued)

Borehole Location	Depth (ft)	Sample ID	Analyte	Result (µg/m³)
54-24372 (continued)			Toluene	1800
			Trichloro-1,2,2-trifluoroethane[1,1,2-]	130
			Trichloroethane[1,1,1-]	970
			Trichloroethene	200
			Trichlorofluoromethane	360
	185–187	MD54-05-61746	Acetone	21.0
			Butanone[2-]	22.0
			Dichlorodifluoromethane	86.0
			Dichloroethane[1,1-]	25.0
			Dichloroethene[1,1-]	47.0
			Methyl-2-pentanone[4-]	10.0
			Methylene Chloride	57.0
			Styrene	95.0
			Tetrachloroethene	180
			Toluene	1400
			Trichloro-1,2,2-trifluoroethane[1,1,2-]	63.0
			Trichloroethane[1,1,1-]	750
			Trichloroethene	210
			Trichlorofluoromethane	150
			Xylene[1,3-]+Xylene[1,4-]	7.40
54-24373	65–67	MD54-05-60305	Acetone	128
			Butanone[2-]	3.83
			Chloroform	9.76
			Dichlorodifluoromethane	939
			Dichloroethane[1,1-]	13.8
			Dichloroethene[1,1-]	31.7
			Dichloropropane[1,2-]	55.4
			Methylene Chloride	149
			Tetrachloroethene	94.9
			Toluene	3.50
			Trichloro-1,2,2-trifluoroethane[1,1,2-]	605
			Trichloroethane[1,1,1-]	1200
			Trichloroethene	69.8
			Trichlorofluoromethane	1460
	187–189	MD54-05-60304	Acetone	28.5
			Dichlorodifluoromethane	203
			Dichloroethene[1,1-]	5.55
			Dichloropropane[1,2-]	9.24

Table F4.3-2 (continued)

Borehole Location	Depth (ft)	Sample ID	Analyte	Result (µg/m³)
54-24373 (continued)			Methylene Chloride	25.0
			Tetrachloroethene	18.3
			Toluene	4.90
			Trichloro-1,2,2-trifluoroethane[1,1,2-]	115
			Trichloroethane[1,1,1-]	229
			Trichloroethene	10.2
			Trichlorofluoromethane	270
54-24374	10–12	MD54-05-60306	Dichloroethane[1,1-]	117
			Methylene Chloride	41.7
			Tetrachloroethene	217
			Trichloro-1,2,2-trifluoroethane[1,1,2-]	4290 (J)
			Trichloroethane[1,1,1-]	8720
			Trichloroethene	193
			Trichlorofluoromethane	101
	139–141	MD54-05-60307	Acetone	228
			Dichloroethane[1,1-]	93.0
			Dichloroethene[1,1-]	365
			Dichloropropane[1,2-]	69.3
			Methylene Chloride	29.5
			Tetrachloroethene	183
			Toluene	32.0
			Trichloro-1,2,2-trifluoroethane[1,1,2-]	1990 (J)
			Trichloroethane[1,1,1-]	5180
			Trichloroethene	274
			Trichlorofluoromethane	101
54-24375	30–32	MD54-05-60309	Dichloroethane[1,1-]	485
			Dichloroethene[1,1-]	1470
			Tetrachloroethene	11500
			Toluene	181
			Trichloro-1,2,2-trifluoroethane[1,1,2-]	9190 (J)
			Trichloroethane[1,1,1-]	43100
			Trichloroethene	1130
			Trichlorofluoromethane	500
	157–159	MD54-05-60308	Dichloroethane[1,1-]	380
			Dichloroethene[1,1-]	1820
			Methylene Chloride	104
			Tetrachloroethene	11500
			Toluene	162

Table F4.3-2 (continued)

Borehole Location	Depth (ft)	Sample ID	Analyte	Result (µg/m³)
54-24375 (continued)			Trichloro-1,2,2-trifluoroethane[1,1,2-]	8420 (J)
			Trichloroethane[1,1,1-]	36000
			Trichloroethene	1400
			Trichlorofluoromethane	511
54-24376	35–37	MD54-05-60311	Dichloroethane[1,1-]	129
			Dichloroethene[1,1-]	246
			Styrene	93.7
			Tetrachloroethene	149
			Toluene	565
			Trichloro-1,2,2-trifluoroethane[1,1,2-]	1230 (J+)
			Trichloroethane[1,1,1-]	6000
			Trichloroethene	258
			Trichlorofluoromethane	78.6
	158–160	MD54-05-60310	Acetone	49.9
			Butanone[2-]	5.89
			Dichloroethane[1,1-]	64.7
			Dichloroethene[1,1-]	166
			Methyl-2-pentanone[4-]	16.4
			Styrene	119
			Tetrachloroethene	74.6
			Toluene	1020
			Trichloro-1,2,2-trifluoroethane[1,1,2-]	421 (J+)
			Trichloroethane[1,1,1-]	2340
			Trichloroethene	161
			Trichlorofluoromethane	33.7
54-24377	45–47	MD54-05-60313	Dichloroethane[1,1-]	76.9
			Dichloroethene[1,1-]	234
			Methylene Chloride	12.8
			Styrene	123
			Tetrachloroethene	122
			Toluene	603
			Trichloro-1,2,2-trifluoroethane[1,1,2-]	1380 (J+)
			Trichloroethane[1,1,1-]	3540
			Trichloroethene	215
			Trichlorofluoromethane	73.0
	150–152	MD54-05-60312	Acetone	57.0
			Butanone[2-]	9.43
			Dichloroethane[1,1-]	48.5

Table F4.3-2 (continued)

Borehole Location	Depth (ft)	Sample ID	Analyte	Result (µg/m³)
54-24377 (continued)			Dichloroethene[1,1-]	178
			Methyl-2-pentanone[4-]	19.2
			Methylene Chloride	8.33
			Styrene	145
			Tetrachloroethene	67.8
			Toluene	1280
			Trichloro-1,2,2-trifluoroethane[1,1,2-]	758 (J+)
			Trichloroethane[1,1,1-]	2020
			Trichloroethene	134
			Trichlorofluoromethane	43.2
			Xylene[1,3-]+Xylene[1,4-]	13.0
54-24378	30–32	MD54-05-60315	Dichloroethane[1,1-]	7280
			Dichloroethene[1,1-]	5550
			Trichloro-1,2,2-trifluoroethane[1,1,2-]	22200 (J)
			Trichloroethane[1,1,1-]	464000
			Trichloroethene	4080
	136–138	MD54-05-60314	Dichloroethane[1,1-]	12900
			Dichloroethene[1,1-]	13900
			Trichloro-1,2,2-trifluoroethane[1,1,2-]	28300 (J)
			Trichloroethane[1,1,1-]	709000
			Trichloroethene	7520
54-24379	20–22	MD54-05-60317	Dichloroethane[1,1-]	1460
			Dichloroethene[1,1-]	3650
			Tetrachloroethene	664
			Toluene	279
			Trichloro-1,2,2-trifluoroethane[1,1,2-]	375 (J)
			Trichloroethane[1,1,1-]	32700
			Trichloroethene	1240
	144–146	MD54-05-60316	Dichloroethane[1,1-]	6070
			Dichloroethene[1,1-]	15100
			Tetrachloroethene	2030
			Trichloro-1,2,2-trifluoroethane[1,1,2-]	1530 (J)
			Trichloroethane[1,1,1-]	98200
			Trichloroethene	4780
54-24380	20–22	MD54-05-60319	Chloroform	1850
			Dichloroethane[1,1-]	295
			Dichloroethene[1,1-]	396
			Tetrachloroethene	813

Table F4.3-2 (continued)

Borehole Location	Depth (ft)	Sample ID	Analyte	Result (µg/m³)
54-24380 (continued)			Toluene	128
			Trichloro-1,2,2-trifluoroethane[1,1,2-]	2990 (J+)
			Trichloroethane[1,1,1-]	14700
			Trichloroethene	3440
			Trichlorofluoromethane	163
	155–157	MD54-05-60318	Chloroform	683
			Dichloroethane[1,1-]	445
			Dichloroethene[1,1-]	753
			Methylene Chloride	79.8
			Styrene	76.6
			Tetrachloroethene	813
			Toluene	716
			Trichloro-1,2,2-trifluoroethane[1,1,2-]	2990 (J+)
			Trichloroethane[1,1,1-]	16900
			Trichloroethene	4030
			Trichlorofluoromethane	236
54-24381	15–17	MD54-05-60321	Dichloroethane[1,1-]	1660
			Dichloroethene[1,1-]	3800
			Tetrachloroethene	949
			Toluene	309
			Trichloroethane[1,1,1-]	54500
			Trichloroethene	462
	143–145	MD54-05-60320	Dichloroethane[1,1-]	1780
			Dichloroethene[1,1-]	5150
			Tetrachloroethene	746
			Toluene	377
			Trichloroethane[1,1,1-]	51300
			Trichloroethene	537
54-24382	28–29	MD54-05-60323	Chloroform	57.0
			Dichloroethane[1,1-]	950
			Dichloroethene[1,1-]	1100
			Ethanol	59.0 (J)
			Tetrachloroethene	310
			Trichloroethane[1,1,1-]	8400
			Trichloroethene	90.0
	107–109	MD54-05-60322	Acetone	83.0 (J)
			Butanone[2-]	8.50
			Chloroform	8.60

Table F4.3-2 (continued)

Borehole Location	Depth (ft)	Sample ID	Analyte	Result (µg/m³)
54-24382 (continued)			Dichloroethane[1,1-]	180
			Dichloroethane[1,2-]	9.00
			Dichloroethene[1,1-]	170
			Methylene Chloride	5.30
			n-Heptane	8.90
			Propanol[2-]	47.0
			Styrene	400
			Tetrachloroethene	37.0
			Toluene	44.0
			Trichloroethane[1,1,1-]	1100
			Trichloroethene	18.0
			Vinyl Chloride	2.90
			Xylene[1,3-]+Xylene[1,4-]	15.0
54-24383	10–11	MD54-05-60324	Acetone	23.0 (J)
			Butanol[1-]	13.0
			Butanone[2-]	4.30
			Dichloroethane[1,1-]	7.60
			Dichloroethene[1,1-]	13.0
			Ethyltoluene[4-]	13.0
			Styrene	8.10
			Trichloroethane[1,1,1-]	80.0
			Trimethylbenzene[1,2,4-]	10.0
			Xylene[1,3-]+Xylene[1,4-]	13.0
	107–109	MD54-05-60359	Acetone	27.0 (J)
			Butanone[2-]	2.80
			Dichloroethane[1,1-]	52.0
			Dichloroethene[1,1-]	95.0
			Propanol[2-]	8.90
			Styrene	220
			Tetrachloroethene	44.0
			Toluene	30.0
			Trichloroethane[1,1,1-]	440
			Trichloroethene	12.0
			Xylene[1,3-]+Xylene[1,4-]	8.40
54-24384	10–12	MD54-05-60327	Acetone	58.0 (J)
			Dichloroethane[1,1-]	4.40
			Dichloroethene[1,1-]	9.20
			Propanol[2-]	77.0

Table F4.3-2 (continued)

Borehole Location	Depth (ft)	Sample ID	Analyte	Result (μg/m³)
54-24384 (continued)			Styrene	130
			Toluene	32.0
			Trichloroethane[1,1,1-]	68.0
			Trichloroethene	47.0
			Xylene[1,3-]+Xylene[1,4-]	12.0
	65–67	MD54-05-60326	Acetone	112
			Dichloroethane[1,1-]	113
			Dichloroethene[1,1-]	285
			Hexane	5.64
			Methyl-2-pentanone[4-]	16.8
			Tetrachloroethene	42.0
			Toluene	10.2
			Trichloro-1,2,2-trifluoroethane[1,1,2-]	60.5
			Trichloroethane[1,1,1-]	1960
			Trichloroethene	41.9
			Xylene[1,3-]+Xylene[1,4-]	16.5
54-24385	30–32	MD54-05-60329	Dichloroethane[1,1-]	3880
			Dichloroethene[1,1-]	5550
			Tetrachloroethene	5630
			Toluene	162
			Trichloro-1,2,2-trifluoroethane[1,1,2-]	1070 (J+)
			Trichloroethane[1,1,1-]	65400
			Trichloroethene	859
	134–136	MD54-05-60328	Dichloroethane[1,1-]	5660
			Dichloroethene[1,1-]	8320
			Tetrachloroethene	4880
			Trichloro-1,2,2-trifluoroethane[1,1,2-]	1070 (J+)
			Trichloroethane[1,1,1-]	70900
			Trichloroethene	1130
54-24386	35–37	MD54-05-60331	Dichloroethane[1,1-]	4040
			Dichloroethene[1,1-]	4750
			Tetrachloroethene	1150
			Trichloro-1,2,2-trifluoroethane[1,1,2-]	996 (J+)
			Trichloroethane[1,1,1-]	98200
			Trichloroethene	1020
	156–158	MD54-05-60330	Dichloroethane[1,1-]	33200
			Dichloroethene[1,1-]	59400
			Tetrachloroethene	5490

Table F4.3-2 (continued)

Borehole Location	Depth (ft)	Sample ID	Analyte	Result ($\mu g/m^3$)
54-24386 (continued)			Trichloro-1,2,2-trifluoroethane[1,1,2-]	5440 (J+)
			Trichloroethane[1,1,1-]	447000
			Trichloroethene	8590
54-24387	10–11	MD54-05-60333	Acetone	51.0 (J)
			Butanone[2-]	5.50
			Dichloroethene[1,1-]	5.00
			Ethyltoluene[4-]	13.0
			Styrene	16.0
			Toluene	7.80
			Trichloroethane[1,1,1-]	41.0
			Trichloroethene	20.0
			Trimethylbenzene[1,2,4-]	23.0
			Trimethylbenzene[1,3,5-]	5.50
			Xylene[1,2-]	5.80
			Xylene[1,3-]+Xylene[1,4-]	14.0
	80–82	MD54-05-60332	Acetone	123
			Butanone[2-]	9.43
			Dichloroethane[1,1-]	5.66
			Dichloroethene[1,1-]	7.53
			Ethanol	9.04
			Hexane	7.75
			Methyl-2-pentanone[4-]	9.83
			Toluene	13.9
			Trichloroethane[1,1,1-]	65.4
			Trichloroethene	29.0
			Trimethylbenzene[1,2,4-]	4.91
			Xylene[1,3-]+Xylene[1,4-]	20.8
54-24388	25–27	MD54-05-60335	Dichloroethane[1,1-]	2180
			Dichloroethene[1,1-]	2810
			Tetrachloroethene	2030
			Trichloro-1,2,2-trifluoroethane[1,1,2-]	5590 (J)
			Trichloroethane[1,1,1-]	125000
			Trichloroethene	2850
	129–131	MD54-05-60334	Dichloroethane[1,1-]	2670
			Dichloroethene[1,1-]	5150
			Tetrachloroethene	1970
			Trichloro-1,2,2-trifluoroethane[1,1,2-]	7350 (J)

Table F4.3-2 (continued)

Borehole Location	Depth (ft)	Sample ID	Analyte	Result (µg/m³)
54-24388 (continued)			Trichloroethane[1,1,1-]	125000
			Trichloroethene	4190
54-24389	20–22	MD54-05-60337	Acetone	13.0 (J)
			Butanone[2-]	15.0
			Carbon Tetrachloride	16.0
			Chloroform	21.0
			Dichlorodifluoromethane	22.0
			Dichloroethane[1,1-]	28.0
			Dichloroethene[1,1-]	82.0
			Methyl-2-pentanone[4-]	7.90
			Styrene	85.0
			Tetrachloroethene	630
			Toluene	1200
			Trichloro-1,2,2-trifluoroethane[1,1,2-]	320
			Trichloroethane[1,1,1-]	1700
			Trichloroethene	460
			Trichlorofluoromethane	12.0
			Xylene[1,3-]+Xylene[1,4-]	6.60
	147–149	MD54-05-60336	Acetone	35.0 (J)
			Butanone[2-]	28.0
			Carbon Tetrachloride	23.0
			Chloroform	42.0
			Dichlorodifluoromethane	110
			Dichloroethane[1,1-]	92.0
			Dichloroethene[1,1-]	310
			Methyl-2-pentanone[4-]	14.0
			Methylene Chloride	27.0
			Styrene	70.0
			Tetrachloroethene	920
			Toluene	2600
			Trichloro-1,2,2-trifluoroethane[1,1,2-]	590
			Trichloroethane[1,1,1-]	3700
			Trichloroethene	1100
			Trichlorofluoromethane	57.0
54-24390	30–32	MD54-05-60339	Dichloroethane[1,1-]	2180
			Dichloroethene[1,1-]	3250
			Tetrachloroethene	1360
			Toluene	365

Table F4.3-2 (continued)

Borehole Location	Depth (ft)	Sample ID	Analyte	Result (µg/m³)
54-24390 (continued)			Trichloro-1,2,2-trifluoroethane[1,1,2-]	21400 (J)
			Trichloroethane[1,1,1-]	142000
	158–160	MD54-05-60338	Dichloroethane[1,1-]	1420
			Dichloroethene[1,1-]	3680
			Tetrachloroethene	2370
			Toluene	678
			Trichloro-1,2,2-trifluoroethane[1,1,2-]	19100 (J)
			Trichloroethane[1,1,1-]	109000
			Trichloroethene	644
54-24391	25–27	MD54-05-60341	Dichloroethane[1,1-]	324
			Dichloroethene[1,1-]	325
			Styrene	97.9
			Tetrachloroethene	2780
			Toluene	377
			Trichloro-1,2,2-trifluoroethane[1,1,2-]	1530 (J+)
			Trichloroethane[1,1,1-]	22400
			Trichloroethene	140
			Trichlorofluoromethane	432
	165–167	MD54-05-60340	Dichloroethane[1,1-]	186
			Dichloroethene[1,1-]	475
			Styrene	72.4
			Tetrachloroethene	949
			Toluene	829
			Trichloro-1,2,2-trifluoroethane[1,1,2-]	1150 (J+)
			Trichloroethane[1,1,1-]	7630
			Trichloroethene	193
			Trichlorofluoromethane	376
54-24392	25–27	MD54-05-60343	Acetone	13.0 (J)
			Butanone[2-]	12.0
			Dichlorodifluoromethane	20.0
			Dichloroethane[1,1-]	14.0
			Dichloroethene[1,1-]	40.0
			Methyl-2-pentanone[4-]	6.40
			Styrene	60.0
			Tetrachloroethene	140
			Toluene	880
			Trichloro-1,2,2-trifluoroethane[1,1,2-]	31.0
			Trichloroethane[1,1,1-]	580

Table F4.3-2 (continued)

Borehole Location	Depth (ft)	Sample ID	Analyte	Result (µg/m³)
54-24392 (continued)			Trichloroethene	150
			Trichlorofluoromethane	12.0
			Xylene[1,3-]+Xylene[1,4-]	4.60
	144–146	MD54-05-60342	Acetone	36.0 (J)
			Butanone[2-]	18.0
			Carbon Disulfide	4.50
			Chloroform	10.0
			Dichlorodifluoromethane	100
			Dichloroethane[1,1-]	35.0
			Dichloroethene[1,1-]	170
			Methyl-2-pentanone[4-]	8.20
			Methylene Chloride	4.80
			Styrene	66.0
			Tetrachloroethene	210
			Toluene	970
			Trichloro-1,2,2-trifluoroethane[1,1,2-]	190
			Trichloroethane[1,1,1-]	1300
			Trichloroethene	220
			Trichlorofluoromethane	51.0
			Xylene[1,3-]+Xylene[1,4-]	14.0
54-24393	35–37	MD54-05-60345	Chlorodifluoromethane	3890
			Chloroform	29.3
			Dichlorodifluoromethane	1930
			Dichloroethane[1,1-]	190
			Dichloroethene[1,1-]	174
			Styrene	59.6
			Tetrachloroethene	305
			Toluene	414
			Trichloro-1,2,2-trifluoroethane[1,1,2-]	4370 (J)
			Trichloroethane[1,1,1-]	4420
			Trichloroethene	156
			Trichlorofluoromethane	1120
			Xylene[1,3-]+Xylene[1,4-]	60.8
	156–158	MD54-05-60344	Chlorodifluoromethane	2050
			Chloroform	18.1
			Dichlorodifluoromethane	2080
			Dichloroethane[1,1-]	194
			Dichloroethene[1,1-]	317

Table F4.3-2 (continued)

Borehole Location	Depth (ft)	Sample ID	Analyte	Result (µg/m³)
54-24393 (continued)			Methylene Chloride	13.9
			Styrene	15.8
			Tetrachloroethene	393
			Toluene	226
			Trichloro-1,2,2-trifluoroethane[1,1,2-]	4440 (J)
			Trichloroethane[1,1,1-]	4800
			Trichloroethene	193
			Trichlorofluoromethane	1240
54-24394	50–52	MD54-05-61749	Chloroform	150
			Dichlorodifluoromethane	1100
			Dichloroethane[1,1-]	1600
			Dichloroethene[1,1-]	930
			Tetrachloroethene	640
			Toluene	95.0
			Trichloro-1,2,2-trifluoroethane[1,1,2-]	21000
			Trichloroethane[1,1,1-]	18000
			Trichloroethene	32000
			Trichlorofluoromethane	2200
	163–165	MD54-05-61748	Chloroform	120
			Dichlorodifluoromethane	1900
			Dichloroethane[1,1-]	960
			Dichloroethene[1,1-]	740
			Methylene Chloride	46.0
			Tetrachloroethene	580
			Toluene	120
			Trichloro-1,2,2-trifluoroethane[1,1,2-]	9200
			Trichloroethane[1,1,1-]	13000
			Trichloroethene	12000
			Trichlorofluoromethane	2500
54-24395	40–42	MD54-05-60349	Bromodichloromethane	26.1
			Chloroform	73.2
			Dichlorodifluoromethane	1580
			Dichloroethane[1,1-]	48.5
			Methylene Chloride	11.8
			Tetrachloroethene	183
			Trichloro-1,2,2-trifluoroethane[1,1,2-]	5280 (J)
			Trichloroethane[1,1,1-]	4360
			Trichloroethene	134

Table F4.3-2 (continued)

Borehole Location	Depth (ft)	Sample ID	Analyte	Result (µg/m³)
54-24395 (continued)			Trichlorofluoromethane	3870
	170–172	MD54-05-60348	Acetone	112
			Bromodichloromethane	23.4
			Chloroform	48.8
			Dichlorodifluoromethane	1090
			Dichloroethane[1,1-]	34.4
			Dichloropropane[1,2-]	18.0
			Methanol	301
			Methylene Chloride	30.9
			Tetrachloroethene	149
			Trichloro-1,2,2-trifluoroethane[1,1,2-]	2680 (J)
			Trichloroethane[1,1,1-]	2560
			Trichloroethene	172
			Trichlorofluoromethane	2250
54-24396	10–12	MD54-05-60351	Acetone	126
			Dichloroethane[1,1-]	80.9
			Dichloroethene[1,1-]	242
			Dichloropropane[1,2-]	24.5
			Methylene Chloride	16.7
			Tetrachloroethene	156
			Trichloro-1,2,2-trifluoroethane[1,1,2-]	1530 (J)
			Trichloroethane[1,1,1-]	4470
			Trichloroethene	231
			Trichlorofluoromethane	61.8
	131–133	MD54-05-60350	Acetone	109
			Dichloroethane[1,1-]	166
			Dichloroethene[1,1-]	674
			Dichloropropane[1,2-]	32.3
			Methylene Chloride	34.7
			Tetrachloroethene	291
			Trichloro-1,2,2-trifluoroethane[1,1,2-]	2530 (J)
			Trichloroethane[1,1,1-]	7090
			Trichloroethene	537
			Trichlorofluoromethane	157
54-24397	15–17	MD54-05-60353	Acetone	209
			Butanone[2-]	7.37
			Dichloroethane[1,1-]	36.0
			Dichloroethene[1,1-]	119

Table F4.3-2 (continued)

Borehole Location	Depth (ft)	Sample ID	Analyte	Result (μg/m^3)
54-24397 (continued)			Dichloropropane[1,2-]	17.1
			Methylene Chloride	10.1
			Tetrachloroethene	94.9
			Trichloro-1,2,2-trifluoroethane[1,1,2-]	1380 (J+)
			Trichloroethane[1,1,1-]	2290
			Trichloroethene	80.6
			Trichlorofluoromethane	44.4
	125–127	MD54-05-60352	Acetone	147
			Butanone[2-]	7.37
			Dichloroethane[1,1-]	44.5
			Dichloroethene[1,1-]	214
			Dichloropropane[1,2-]	20.3
			Methylene Chloride	11.1
			Tetrachloroethene	81.3
			Toluene	13.6
			Trichloro-1,2,2-trifluoroethane[1,1,2-]	1150 (J+)
			Trichloroethane[1,1,1-]	2400
			Trichloroethene	107
			Trichlorofluoromethane	67.4
54-24523	485–700	MD54-05-60366	Acetone	71.2
			Butanone[2-]	5.89
			Toluene	7.53

Note: See Appendix A for data qualifier definitions.

Table F-4.3-3
Frequency of Tritium Detected in Pore-Gas Samples at MDA G

Analyte	Number of Analyses	Frequency of Detects	Detected Concentration Range (pCi/L)	Frequency of Nondetects	Nondetected Concentration Range (pCi/L)
Tritium	70	58/70	479 to 6963000	12/70	256 to 1047

Table F-4.3-4
Tritium Detected in Pore-Gas Samples at MDA G

Borehole Location	Depth (ft)	Sample ID	Result	Units
54-24361	30–32	MD54-05-61531	11890	pCi/L
	138–140	MD54-05-61530	3126	pCi/L
54-24362	35–37	MD54-05-61533	35630	pCi/L
	135–137	MD54-05-61532	24720	pCi/L
54-24363	12–14	MD54-05-61534	22510	pCi/L
54-24364	65–67	MD54-05-61537	5254	pCi/L
	130–132	MD54-05-61536	5846	pCi/L
54-24366	12–14	MD54-05-61538	37910	pCi/L
54-24367	30–31	MD54-05-61541	81190	pCi/L
	153–155	MD54-05-61540	7601	pCi/L
54-24368	95–97	MD54-05-61543	1886	pCi/L
	192–194	MD54-05-61542	3331	pCi/L
54-24369	65–67	MD54-05-61545	17310	pCi/L
	184–186	MD54-05-61544	3827	pCi/L
54-24371	40–42	MD54-05-61549	4515	pCi/L
	141–143	MD54-05-61548	8148	pCi/L
54-24372	55–57	MD54-05-61551	6210	pCi/L
	185–187	MD54-05-61550	6022	pCi/L
54-24373	65–67	MD54-05-60305	5700	pCi/L
	187–189	MD54-05-60304	1910	pCi/L
54-24374	10–12	MD54-05-61555	2659000	pCi/L
	139–141	MD54-05-61554	206800	pCi/L
54-24375	30–32	MD54-05-61557	6584	pCi/L
	157–159	MD54-05-61556	2135	pCi/L
54-24376	158–160	MD54-05-61558	26350	pCi/L
54-24377	150–152	MD54-05-61560	18810	pCi/L
54-24378	30–32	MD54-05-61563	3512000	pCi/L
	136–138	MD54-05-61562	1119000	pCi/L
54-24379	20–22	MD54-05-61565	3844	pCi/L
	144–146	MD54-05-61564	25410	pCi/L
54-24380	20–22	MD54-05-61567	2381	pCi/L
	155–157	MD54-05-61566	2131	pCi/L
54-24381	15–17	MD54-05-61569	4761	pCi/L
	143–145	MD54-05-61568	3614	pCi/L
54-24382	28–29	MD54-05-61571	2597	pCi/L
	107–109	MD54-05-61570	6406	pCi/L
54-24383	10–11	MD54-05-60325	1965	pCi/L

Table F-4.3-4 (continued)

Borehole Location	Depth (ft)	Sample ID	Result	Units
54-24384	10–12	MD54-05-60327	7183	pCi/L
	65–67	MD54-05-60326	479	pCi/L
54-24385	30–32	MD54-05-61577	395300	pCi/L
	134–136	MD54-05-61576	13320	pCi/L
54-24386	35–37	MD54-05-61579	6963000	pCi/L
	156–158	MD54-05-61578	172100	pCi/L
54-24387	10–11	MD54-05-60333	2763	pCi/L
54-24388	25–27	MD54-05-61583	124200	pCi/L
54-24389	20–22	MD54-05-61584	6872	pCi/L
	147–149	MD54-05-61585	3953	pCi/L
54-24390	30–32	MD54-05-61587	5480	pCi/L
	158–160	MD54-05-61586	1888	pCi/L
54-24391	25–27	MD54-05-61589	4357	pCi/L
	165–167	MD54-05-61588	7632	pCi/L
54-24392	25–27	MD54-05-61591	7193	pCi/L
	144–146	MD54-05-61590	4837	pCi/L
54-24393	35–37	MD54-05-61593	1489	pCi/L
54-24394	163–165	MD54-05-61594	1458	pCi/L
54-24396	131–133	MD54-05-61598	17680	pCi/L
54-24397	15–17	MD54-05-61601	1257000	pCi/L
54-25105	485–700	MD54-05-61604	5150	pCi/L

Appendix G

Risk Assessment

G-1.0 INTRODUCTION

Los Alamos National Laboratory (LANL or the Laboratory) is a multidisciplinary research facility owned by the U.S. Department of Energy (DOE) and managed by the University of California (UC). The Laboratory is located in north-central New Mexico, approximately 60 mi northeast of Albuquerque and 20 mi northwest of Santa Fe. The Laboratory site covers 40 mi^2 of the Pajarito Plateau, which consists of a series of finger-like mesas separated by deep canyons containing perennial and intermittent streams running from west to east. Mesa tops range in elevation from approximately 6200 to 7800 ft above sea level (asl).

Material Disposal Area (MDA) G [Consolidated Unit 54-013(b)-99] is located in the southeastern portion of the Laboratory at Technical Area (TA) 54 (Figure 2.0-1 of the investigation report [IR]). MDA G is located within a 100-acre fenced industrial area, known as Area G, that consists of a number of units currently used for Resource Conservation and Recovery Act- (RCRA-) regulated storage of mixed wastes. MDA G consists of inactive subsurface disposal units (32 pits, 4 trenches, and 194 shafts) located beneath the active units comprising Area G (Figure G-1.0-1).

This risk assessment appendix has been developed in accordance with reporting requirements defined in the March 1, 2005 Compliance Order on Consent, Appendix XI, Reporting Requirements, and presents an evaluation of the potential present-day risks to human health and the environment. The MDA G IR also presents an assessment of nature and extent associated with MDA G based on the results of field investigations from 1993 through July 2005. This appendix presents the conceptual site model and assesses the relevant data necessary to assess potential human health and ecological risks.

G-2.0 BACKGROUND

MDA G began operations in 1957. DOE initially authorized MDA G for disposal of low-level waste (LLW), certain radioactively contaminated infectious waste, asbestos-contaminated material, and polychlorinated biphenyls (PCBs), and for the temporary placement of transuranic (TRU) waste. Operational periods for MDA G shafts vary, but the full range is from about 1966 until 1993. However, most shafts were operational for only one to two years during this time period. Most of the pits were operational between 1959 and 1980 and received radioactive, mixed, and TRU wastes. Trenches began receiving TRU and mixed LLW in 1974. MDA G is a decommissioned (i.e., removed from service) subsurface disposal area.

In general, disposal areas were excavated, filled, and covered sequentially from the east end of the mesa, progressing westward. Thus, the oldest portion of the inventory exists at the east end and the newest at the west end.

An estimate of the types, activities, and quantities of waste disposed of at MDA G was compiled in the Operable Unit (OU) 1148 data report (LANL 1992, 23247) and in the approved RCRA facility investigation (RFI) work plan for OU 1148 (LANL 1992, 07669). Inventory before 1971 includes waste defined as mixed TRU. Inventory disposed of after 1971 but before 1987 includes waste defined as mixed LLW. Complete records were not kept on the types or amounts of hazardous constituents contained in waste disposed of until 1986 or the types or amounts of radioactive constituents of TRU waste disposed of before 1971. Existing records describe the radioactive constituents of TRU waste generated and retrievably placed at MDA G since 1971 and the hazardous and radioactive constituents of mixed LLW and mixed TRU waste retrievably placed since 1986 (LANL 2004, 87833).

G-2.1 Site Description

MDA G is located in an industrial area within TA-54, which is currently the primary site for waste-management activities at the Laboratory. TA-54 is located in the east-central portion of the Laboratory on Mesita del Buey between Pajarito Canyon on the south and Cañada del Buey on the north. The Laboratory does not anticipate that land use at TA-54 will change from industrial use in the foreseeable future. Public access to the site is restricted by fencing, locked gates, and restricted entry onto Pajarito Road and TA-54. Under present-day conditions, only Laboratory employees or contractors may enter the site for site management activities (e.g., installing best management practices, waste-management operations, or collecting environmental samples).

The pits, trenches, and shafts are constructed in the Tshirege Member of the Bandelier Tuff, a consolidated tuff unit. The regional aquifer is estimated to be at a depth of approximately 930 ft bgs, which corresponds to an elevation of 5850 ft asl, based on data from the Site-Wide Geologic Model 3-dimensional stratigraphic model (Stone et al. 2001, 69830). Regional well R-22, located immediately east of MDA G on Mesita del Buey, encountered the regional aquifer within the Cerros del Rio basalts at a depth of 895 ft (273 m), which correlates to an elevation of approximately 5745 ft (1751 m) asl. No perched zones of saturation were encountered above the regional aquifer. The topography of Area G is relatively flat. Surface water runoff from this area is primarily discharged to drainages into Pajarito Canyon (to the south). Runoff to the north is primarily sheet flow to minor drainages. Erosion controls are used to divert water away from waste management areas and disposal units. A surface water assessment of MDA G was conducted from July 30, 2001, to September 21, 2001, for each of the solid waste management units (SWMUs) individually (Appendix H). Based on this assessment, the consolidated unit that comprises MDA G has a score of 37.5 out of a possible 100, indicating a low erosion potential. The assessment found no debris in the watercourses to the north. Surface water conditions at MDA G have not changed substantially since the 2001 assessments.

Site-specific aspects of the environmental setting of MDA G include

- a semiarid climate with low precipitation and a high evapotranspiration rate, which limits the amount of moisture percolating into the disposal units, subsequently limiting the amount of water available to leach radionuclides and/or hazardous waste constituents;
- a very thick, relatively dry unsaturated zone, which greatly restricts or prevents downward migration of contaminants in the liquid phase through the vadose zone to the regional aquifer; and
- canyon-mesa terrain, which affects atmospheric conditions and ecological habitats (e.g., channeling of winds through Cañada del Buey and Pajarito Canyon creating the potential for resuspension of dusts).

No threatened and endangered (T&E) species habitat exists at MDA G. However, potential T&E habitat for two species is found on the mesa top or hillsides of Mesita del Buey outside of MDA G. Further information is contained in "Biological Assessment of Environmental Restoration Program, Operable Unit 1148, TA-54" (Banar 1996, 58192). The site has little vegetative cover and is partially paved. Vegetative cover for the entire mesa top is estimated at less than 20%. No surface water bodies or wetlands are present on Mesita del Buey, but wetlands and floodplains occur in Cañada del Buey and Pajarito Canyon. The ecological scoping checklist (Appendix H) states that ground-dwelling organisms (e.g., burrowing rodents) and deeply rooted plants potentially may intrude into buried waste. Soil-based contamination and volatile organic compound (VOC) vapors in rodent burrows are potential sources of exposure.

G-2.2 Sampling Results

This section summarizes analytical results for soil, tuff, and sediment samples used for evaluating risk to human health and the environment. The concentrations used in this assessment were obtained from environmental samples collected in 1994 and 1995. Only sample results to a maximum depth of 1 ft below ground surface (bgs) were used to assess the present-day human-health assessment for industrial exposure based on an assumption of no intrusive activities for a site worker. Any potential exposure associated with intrusive activities, whether related to construction, remediation, or other site activities that may occur in the future, will be assessed separately, as necessary, to protect and inform the workers and the facility of any potential risks. Therefore, data for the industrial site worker assessment are limited to sediment data from the drainages because no data from 0 to 1 ft bgs were collected from the mesa top. Data from 0 to 12 ft bgs were used to assess residential exposure, which includes mesa-top tuff and drainage sediment data. The data from 0 to 5 ft bgs were used for the ecological assessment, which also limits the data to that collected from the drainages.

Background values (BV) for inorganic chemicals and radionuclides are provided in Tables F-3.3-1 and F-3.3-2 in Appendix F of this IR. BVs are obtained from "Inorganic and Radionuclide Background Data for Soils, Canyon Sediments, and Bandelier Tuff at Los Alamos National Laboratory" (LANL 1998, 59730). Data used in the human health and ecological screening assessments are summarized in this appendix and shown in Tables G-2.2-1 through G-2.2-6. The data summaries in these tables present the following information for each analyte in each medium (tuff and sediment): (1) numbers of sample, (2) numbers of detects and nondetects, (3) detected and nondetected concentrations, and (4) the exposure point concentration (EPC) for each inorganic chemical, organic chemical, and radionuclide evaluated in the screening assessment. Tables G-2.2-1, G-2.2-3, and G-2.2-5 present the inorganic, organic, and radionuclide chemicals of potential concern (COPCs) from 0 to 1 ft bgs used in the industrial screening assessment (drainage sediment only). Tables G-2.2-2, G-2.2-4, and G-2.2-6 present the inorganic, organic, and radionuclide COPCs from 0 to 12 ft bgs used in the residential screening assessment (drainage sediment and tuff).

The exposure concentration used for the screening assessments was either the 95% upper confidence level (UCL) of the mean or the maximum detected concentration (for several inorganic COPCs the maximum detection limit as used because there are no detected concentrations). The 95% UCLs were not calculated for some COPCs because the numbers of detected concentrations were too small to calculate representative values. Tables G-2.2-1 through G-2.2-6 present the exposure concentrations for the inorganic, organic, and radionuclide COPCs in drainage sediment and tuff, as appropriate.

The COPCs identified by the data review (Appendix F) differ for the assessments performed and are listed in Table G-2.2-7 and summarized as follows:

- for human health industrial scenario: 8 inorganic chemicals, 1 organic chemical, and 6 radionuclides
- for human health residential scenario: 9 inorganic chemicals, 12 organic chemicals, and 6 radionuclides
- for ecological assessment: 8 inorganic chemicals, 1 organic chemical, and 6 radionuclides

G-3.0 CONCEPTUAL SITE MODEL

The known sources of environmental contamination are as follows:

- vapor-phase releases of tritium and VOCs from subsurface SWMUs
- inorganic chemicals, radionuclides, and organic chemicals in drainage channel sediment
- releases of metals and radionuclides dissolved in liquid solvents into tuff below the subsurface SWMUs

G-3.1 Environmental Fate and Transport

This section evaluates the data for MDA G in the context of the conceptual site model (Figure G-3.1-1). The data are used to estimate potential present-day risks and doses associated with contamination in potentially accessible environmental media at MDA G.

G-3.1.1 Contaminant Release Mechanisms

The conceptual site model of contaminant release from belowground sources includes the following processes:

- diffusion of volatile and vapor-phase contaminants
- uptake of bioavailable contaminants by plants rooting into the waste
- excavation of particulate contaminants by animals burrowing into the waste
- erosion of the cover placed over the waste
- dissolution of soluble contaminants in water percolating through the waste or infiltrating from the surface through the covers and into the waste volume
- resuspension and dispersion in air and sediment transport in surface water for surface contamination

Release rates depend upon the rate at which gaseous species are generated and how quickly the contaminants move through the waste matrix, backfill, and rock matrix. The maximum inventory of tritium has been reduced by both diffusion out of the waste and by radioactive decay. The remaining inventory of tritium will be reduced by a factor of 2 every 12.3 yr and will continue to diffuse at slower and slower rates.

G-3.1.2 Contaminant Transport Pathways

The inventory of wastes disposed at MDA G includes radionuclides, inorganic chemicals, and organic chemicals. The relevant release and transport processes associated with these wastes are a function of chemical-specific properties, the physical form and/or container associated with a waste, and the nature of the transport process. The pathways by which contaminants released from MDA G could be transported in environmental media include the following:

- unsaturated transport by pore water through the vadose zone beneath the waste
- solute or sediment transport of surface contamination by surface water into Cañada del Buey and Pajarito Canyon

- biotic uptake and redistribution of contamination
- diffusion of volatile or vapor-phase contaminants from the ground surface into the ambient air, followed by dispersion in air
- atmospheric transport of vapor-phase volatile contaminants and contaminated surface soils to off-site locations

In addition to the processes described above in the context of buried wastes, contaminants may also have impacted environmental media at MDA G from releases that occurred during the operation of MDA G. Dissolution of contaminants in infiltrating water, for example, may have been more prevalent during site operations when pits, trenches, and shafts were open for disposal. Contaminants may also have been released to surface soil and the canyon drainages during the period when wastes were actively disposed of at MDA G.

Tritium in water vapor in the subsurface will condense into the liquid phase if liquid water is present in sufficient amounts. This process is not physically possible at the generally low ambient moisture contents measured at MDA G. If the moisture content in and around the disposal units at MDA G were to increase to 20% or 25%, the tritium could be transported vertically downward with water percolating through Mesita del Buey. Tritium could then reach the regional aquifer and be transported to downgradient locations east of Mesita del Buey in 120 to 240 yr (10 to 20 half-lives).

Diffusion of vapor-phase and volatile contaminants is a natural extension of the gas-phase release mechanism. VOCs in the vapor phase move from higher to lower concentrations. The surface and the underlying Cerros del Rio basalts serve as "zero concentration" boundaries or infinite sinks for VOCs. Transport through the media may result strictly from diffusion or may include an advective component as well. For example, barometric conditions (involving alternating periods of high and low pressure) may affect the rate of subsurface VOC migration to the surface or basalt (measurements in the Cerros del Rio basalts underlying the site indicate close communication with the atmosphere). Contaminants transported to the surface will diffuse directly into the atmosphere and may diffuse into buildings constructed over the site.

No perched groundwater has been encountered beneath Mesita del Buey at MDA G. No saturation was observed in borehole (BH) 15-3 (location 54-25105), which was drilled to a depth of 700 ft (6007 ft asl) in the center of MDA G. Therefore, the potential for exposure of receptors through a water-mediated pathway is unlikely.

Data from other wells at the Laboratory and predictions of the hydrogeologic conceptual model for the Pajarito Plateau place the regional aquifer at approximately 850 to 950 ft bgs beneath MDA G (LANL 1998, 59599). Because of the depth to the regional aquifer and the low moisture content (less than 12% by volume) in the upper 100 ft of the vadose zone in areas that are undisturbed by disposal pits, trenches, shafts, and asphalt cover (LANL 1997, 56834), it is unlikely that contamination at MDA G could reach the regional aquifer in the foreseeable future. However, contaminants from MDA G have the potential to reach groundwater.

G-3.1.3 Chemical-Specific Fate and Transport

The evaluation of environmental fate addresses the chemical processes affecting the persistence of a chemical in the environment, and the evaluation of transport addresses processes affecting mobility. Migration into soil and tuff depends on properties such as rate of precipitation or snowmelt, soil moisture content, depth of soil, and soil hydraulic properties. Migration into and through tuff also depends on the unsaturated flow properties of the tuff, and the presence of joints and fractures.

Organic Chemicals

Physicochemical properties are the best indicators of fate and transport of organic chemicals. These properties include water solubility, vapor pressure, and octanol-water partition coefficient. The higher the water solubility of a chemical, the more likely it is to be mobile and the less likely it is to accumulate, bioaccumulate, volatilize, or persist in the environment. A highly soluble chemical (water solubility greater than 1000 mg/L) is prone to biodegradation and metabolic breakdown that may detoxify the parent chemical. With lower water solubility (especially lower than 10 mg/L), the organic chemical is more likely to be immobilized by adsorption onto particles of organic or inorganic matter. Lower solubility compounds are more likely to bioaccumulate and persist in the environment.

Vapor pressure indicates the tendency of an organic chemical to volatilize. Chemicals with vapor pressure greater than 0.01 mm of mercury (Hg), are more likely to volatilize and diffuse through the soil or tuff pores, potentially increasing release to the atmosphere. Chemicals with vapor pressures less than 0.000001 mm Hg are less likely to volatilize and, therefore, tend to be immobile.

The octanol-water partition coefficient (K_{ow}) is an indicator of a chemical's potential to bioaccumulate or bioconcentrate in the fatty tissues of living organisms. K_{ow} values above 1000 indicate that the chemical has an increased potential of bioaccumulation/bioconcentration in the food chain. A Kow of less than 500 indicates high water solubility, mobility, and low potential for bioaccumulation.

The octanol-carbon adsorption coefficient indicates the extent to which an organic chemical partitions between a solid and a liquid phase. Chemicals with a high K_{oc} (greater than 10,000) will adsorb to organic matter readily. Those with a low K_{oc} (1,000 or less) will have a decreased tendency to adsorb to organic matter.

Numerical values for these parameters are provided in Table G-3.1-1 and chemical-specific implications are discussed following the table.

The following chemicals have relatively high water solubility, vapor pressure, low K_{ow}, and low K_{oc}: acetone, benzene, ethylbenzene, methylene chloride, tetrachloroethene (PCE), and xylene. These organic chemicals should have a high tendency to biodegrade and volatilize and a low tendency to bioconcentrate and bind to organic matter.

Toluene, trimethylbenzene, and xylene have moderate water solubilities and vapor pressures. The K_{ow} and K_{oc} values cover a wide range. Therefore, their tendency to bioaccumulate and bind to organic matter ranges widely.

Aroclor-1254, methoxychlor[4,4'], naphthalene, and bis(2-ethyl)hexyl)phthalate have low water solubilities and vapor pressures, indicating they tend to bioaccumulate and persist in the environment. They have very low tendencies for mobility. The K_{ow} and K_{oc} values are high, indicating high potential for bioaccumulation.

Inorganic Chemicals

Eight inorganic chemicals were retained as COPCs for the industrial scenario, and ten COPCs were retained for the residential scenario. In general, and particularly in a semiarid climate, inorganic chemicals are not highly soluble or mobile in the environment, although there are some exceptions. Information about the fate and transport properties of some inorganic chemicals was obtained from individual chemical profiles published by the Agency for Toxic Substances and Disease Registry. The information for these inorganic chemicals is available at the agency's web site: http://www.atsdr.cdc.gov/toxprofiles.

Antimony

Affinity of antimony for soil, water, and air. Antimony is carried in particulates from wind-blown dust and most commonly from coal combustion and metal processing. Antimony is a natural constituent of soil and is transported into streams and waterways in runoff either from natural weathering or soil disturbance. Much of this antimony is associated with particulate matter, as antimony attaches strongly to particles containing iron, manganese, or aluminum. The solubility of antimony in water is highly dependent on the oxidation state and chemical form of the metalloid. Adsorption to soils should be greatest under weakly acidic conditions where iron, manganese, and aluminum are also present.

Potential for uptake. The speciation and physicochemical state of antimony are important to its behavior in the environment and availability to biota. For example, the antimony incorporated in mineral lattices is inert and unlikely to be bioavailable. Because most analytical methods for antimony do not distinguish the form of antimony, the total amount of antimony may be known, but the nature of the antimony compounds and whether they are adsorbed to other material may not. This information, which is critical in determining antimony's lability and availability, is usually site-specific. In contaminated sites studied, antimony did not bioaccumulate in plants, small mammals, or fish.

Barium

Affinity of barium for soil, water, and air. Barium reacts with metal oxides and hydroxides in soil and is subsequently adsorbed onto soil particulates. Barium is also adsorbed onto soil and subsoil through electrostatic interactions. The cation exchange capacity of the sorbent largely controls the retention of barium in soil. Barium is strongly adsorbed by clay minerals. In general, the solubility of barium compounds increases with decreasing pH. Barium does not hydrolyze appreciably, except in highly alkaline environments (i.e., at pH levels greater than or equal to 10). To a limited extent, barium also forms complexes with natural organic chemicals in water. Elemental barium is oxidized readily in moist air. The residence time of barium in the atmosphere may be several days, depending on the size of the particulate formed, the chemical nature of the particulate, and environmental factors such as rainfall.

Potential for uptake. Barium added to soils (e.g., from the land farming of waste drilling muds) may either be taken up by vegetation or transported through soil with precipitation. Relative to the amount of barium found in soils, little is bioconcentrated by plants. However, this transport pathway has not been studied comprehensively.

Cadmium

Affinity of cadmium for soil, water, and air. The principal chemical species in air is cadmium oxide, although some cadmium salts may also occur. These compounds are stable and do not undergo significant chemical transformation. The primary fate of airborne cadmium is to be dispersed by the wind and subsequently deposited by wet or dry processes. In surface water and groundwater, cadmium exists as the hydrated ion or as ionic complexes with other inorganic or organic substances. Cadmium is more mobile in aquatic environments than most other heavy metals, such as lead. In natural waters, most cadmium will exist as the hydrated ion. Cadmium concentration in water is inversely related to the pH and the concentration of organic material in the water. Because cadmium exists only in the +2 oxidation state, aqueous cadmium is not strongly influenced by the oxidizing or reducing potential of the water. However, under reducing conditions, cadmium may form cadmium sulfide, which is poorly soluble and tends to precipitate. While soluble forms may migrate in water, cadmium in insoluble complexes or adsorbed to sediments is relatively nonmobile. Cadmium is not known to form volatile compounds, so partitioning from water to the atmosphere does not occur. Cadmium in soil may exist in soluble form or in insoluble complexes with inorganic and organic soil constituents. Cadmium in soil tends to be more available and may leach into waters when the soil pH is low. Transformation processes for cadmium in soil are mediated by sorption from and desorption to water, and include precipitation, dissolution, complexation, and ion exchange. However, since cadmium accumulates largely in the liver and kidneys of vertebrates and not in the muscle tissue, and intestinal absorption of cadmium is low, biomagnification through the food chain may not be significant.

Potential for uptake. Cadmium is taken up and retained by aquatic and terrestrial plants and is concentrated in the liver and kidney of animals that eat the plants. The data indicate that cadmium bioaccumulates in all levels of the food chain. Cadmium accumulation has been reported in grasses and food crops and in earthworms, poultry, cattle, horses, and wildlife.

Chromium

Affinity of chromium for soil, water, and air. Most chromium (III) in soil is immobilized because of adsorption and complexation with soil materials. Chromium in the aquatic phase occurs in the soluble state or as suspended solids adsorbed onto clay materials, organic matter, or iron oxides. Most of the soluble chromium is present as chromium (VI) or as soluble chromium (III) complexes and generally accounts for a small percentage of the total. Soluble chromium (VI) may persist in some bodies of water for a long time, but will eventually be reduced to chromium (III) by organic matter or other reducing agents in water. Chromium compounds do not volatilize from water.

Potential for uptake. Chromium has a low mobility for translocation from roots to the aboveground parts of plants.

Cobalt

Affinity of cobalt for soil, water, and air. Cobalt compounds are nonvolatile and will be emitted to the atmosphere only in particulate form. In soils, cobalt generally has low mobility and strong adsorption. However, its mobility increases in moist, acidic soils. In water, cobalt largely partitions to sediment and to suspended solids in the water column; however, the amount adsorbed to suspended solids is highly variable and correlates most strongly with pH and with exchangeable calcium, water content, and cation exchange capacity. Cobalt will be more mobile in soils as it forms organic complexes. In water, more dissolved cobalt will be present as pH decreases since the H^+ ion competes for metal binding sites.

Potential for uptake. Cobalt is found in small quantities in plants and animals. Cobalt is an essential nutrient found in vitamin B-12 that does not biomagnify up the food chain.

Iron

Affinity of iron for soil, water, and air. Iron is the fourth most common element in the earth's crust making up approximately 5% of its mass. Ionic iron compounds may exist in the particulate phase in air, and these compounds may be removed from the air by wet and dry deposition. Hydrous iron(II) oxides (FeO(OH)) are generally red-brown gels and are the major constituents of soils. Iron(II) is unstable with respect to iron(III) in the presence of air and other oxidizing agents and iron ions are expected to exist as iron(III) under most environmental conditions. In general, metal cations in solution are attracted to the negatively charged surfaces of soil particles. Iron(III) ions have been shown to be strongly retained by humic and fulvic acid fractions separated from soils. Iron(II) and (III) ions form strong complexes with fulvic acid. Adsorption of iron depends on soil organic matter and pH: an increase in either of these factors will usually increase adsorption. The mobility of iron ions in soils is influenced also by redox potential, with iron being more mobile under reducing than under oxidizing conditions. Iron is expected to be dissolved in water only with pH less than 2. Above pH 2, it begins to form colloidal gels and complexes with ligands containing halide, nitrogen, oxygen, and sulfur donor groups.

Potential for uptake. Iron is essential for all life. Normal uptake is 1 mg/day in the adult male and 1.4 mg/day in the adult female.

Mercury

Affinity of mercury for soil, water, and air. Mercury occurs naturally in the environment and exists in several forms: metallic mercury (also known as elemental mercury), inorganic mercury, and organic mercury. Metallic mercury is a shiny, silver-white metal that is a liquid at room temperature. Metallic mercury is the elemental or pure form of mercury. Inorganic mercury compounds occur when mercury combines with elements such as chlorine, sulfur, or oxygen. When mercury combines with carbon, the compounds formed are called "organic" mercury compounds or organomercurials. Potentially, a large number of organic mercury compounds may occur; however, the most common organic mercury compound in the environment by far is methylmercury (also known as monomethylmercury).

At room temperature, metallic mercury will evaporate and form mercury vapor. Mercury vapor is colorless and odorless. The higher the temperature, the more vapor will be released from liquid metallic mercury. Once vaporized metallic mercury has a half-life in the atmosphere measured from 6 days to 2 yr and is the main form of mercury involved in global transport of the element. Mercury may be removed from the atmosphere by sorption of the vapor to soil or water surfaces and by wet and dry deposition processes.

In soil and water, mercury can exist as Hg^{+2} and Hg^{+1} as a number of complex ions with varying water solubilities. Sorption of Hg^{+2} to soil and sediment particles predominates in waters with little resuspension of inorganic mercury from the sediments back into the water. Organic mercury is soluble, mobile, and quickly enters the aquatic food chain where it is biomagnified on the order of 10,000–100,000 times the concentrations found in ambient waters. Inorganic mercury can be methylated in sediments in both aerobic and anaerobic conditions by bacteria and microbes most effectively under low pH and high mercury concentration conditions.

Potential for uptake. Metallic and inorganic mercury are absorbed into the body readily through inhalation but are poorly absorbed through the skin or intestines and do not bioaccumulate. Once inhaled, inorganic and metallic mercury reside in the liver and, to a lesser extent, in the brain. Organic mercury is absorbed into the body through food where it has been biomagnified in the food chain or as dimethylmercury which is also readily absorbed through the skin. Organic mercury, like inorganic mercury, concentrates in the kidney and in the brain and by crossing the placental barrier will concentrate in an unborn baby's blood at concentrations higher than in the mother's.

Selenium

Affinity of selenium for soil, water, and air. In general, elemental selenium is stable in soils and is found at low levels in water because of its ability to coprecipitate with sediments. The form of selenium expected to be found in surface water and the water contained in soils is as a salt in selenic and selenious acids. Sodium selenate is one of the most mobile selenium compounds in the environment because of its high solubility and inability to adsorb onto soil particles. Selenious acid is a weak acid, and the diselenite ion predominates in waters between pH 3.5 and 9. Most selenites are less soluble in water than the corresponding selenates. The volatile selenium compounds that partition into the atmosphere include the inorganic compounds selenium dioxide and hydrogen selenide and the organic compounds dimethyl selenide and dimethyl diselenide. Hydrogen selenide is highly reactive in air and is rapidly oxidized to elemental selenium and water, but the other compounds can persist in air (ATSDR 1995, 56531).

Potential for uptake. The soluble selenates are readily taken up by plants and converted to organic compounds, such as selenomethionine, selenocysteine, dimethyl selenide, and dimethyl diselenide. Selenium is bioaccumulated by aquatic organisms and may also biomagnify in aquatic organisms.

Silver

Affinity of silver for soil, water, and air. Silver and silver compounds have negligible vapor pressures. Therefore, volatilization of silver into the air is not expected to be a pathway of concern. In fresh water, silver may form complex ions with chlorides, ammonium (in areas of maximum biological activity), and sulfates; form soluble organic compounds such as the acetate and the tartrate; become adsorbed onto humic complexes and suspended particulates; and become incorporated into, or adsorbed onto, aquatic biota. Silver tends to form complexes with other inorganic chemicals and humic substances in soils.

Potential for uptake. Silver accumulation in marine algae appears to result from adsorption rather than uptake; bioconcentration factors of 13,000–66,000 have been reported.

Radionuclides

Americium-241

Americium-241 preferentially binds to fine soil or sediment particles under oxidizing conditions. Under these conditions, it is likely to be transported and deposited with sediments or to remain relatively immobile in the subsurface when bound to organic matter with high surface-to-volume ratios (Whicker and Schultz 1982, 58209).

Cesium-137

Cesium behaves in the environment like nutrient elements such as potassium. Soils and sediments with high clay content effectively immobilize cesium by chemical binding. In such systems, very little of the nuclides is available for biological incorporation (Whicker and Schultz 1982, 58209).

Cobalt-60

Cobalt is considered a heavy metal. It occurs as a micronutrient in plants and animals and is involved in certain biochemical reactions. Cobalt-60 is readily accumulated from the environment by aquatic and terrestrial organisms and may be taken up from soil by plants (Whicker and Schultz 1982, 58209). Cobalt-60 binds poorly to clay minerals but binds to a greater degree to organic materials.

Plutonium-238

Plutonium-238 is a minor constituent of fallout and is produced for radioisotope thermal generators. Its half-life is 87.7 yr. General forms of plutonium-238 are insoluble fluorides, hydroxides, and oxides. Solubility in water is dependent on water parameters, including redox, pH, and the presence of organic ligands. In the body, plutonium-238 is sequestered on bone surfaces and in the liver (Eisenbud and Gesell 1997, 70130).

Plutonium-239

Plutonium-239 is a component of fallout and is produced in fission reactions by neutron irradiation of uranium-238. Its half-life is 24,100 yr. Lungs, bones, and the liver tissues receive the highest portions of inhaled plutonium-239.

The extent to which plants absorb radionuclides from soil depends on the chemical form of the nuclides, its distribution coefficient, the metabolic requirements of the plant, and physicochemical factors in the soils. Plutonium is one of the least absorbed radioelements in soil and it does not move readily in soil or the food chain (Eisenbud and Gesell 1997, 70130).

Tritium

Tritium is produced continually in the atmosphere by cosmic rays and also by nuclear reactors and nuclear detonations. Tritium's half-life is 12.3 yr. Upon release to the environment, tritium generally follows the hydrologic cycle, but its behavior is determined by the source term. If released in liquid form, the tritiated water is diluted in surface waters and subject to physical dispersion, percolation, and evaporation (Whicker and Schultz 1982, 58209). Tritium enters plants through the roots, leaves, and stems. It enters animals through ingestion, inhalation, and direct absorption through skin. Although tritium forms "heavy" water, it behaves nearly identically to normal water with respect to transport in the environment.

G-3.1.4 Nature and Extent

The analytical results from pore-gas samples collected during the most current sampling confirmed the presence of vapor plumes consisting primarily of chlorinated VOCs. The maximum vapor concentrations are located in the eastern portion of MDA G and the plumes are limited at depth by the Cerros del Rio basalt.

The results of soil and rock sample analyses beneath the former disposal units were generally consistent with the results obtained during the Phase I RFI and indicate the presence of a number of organic chemicals and inorganic chemicals at trace levels. A number of naturally occurring radionuclides and anthropogenic radionuclides were detected above BVs in soil and rock samples collected beneath MDA G. Anthropogenic radionuclides detected included americium-241, plutonium-238, plutonium-239, and strontium-90. These detects were generally sporadic across the site. Naturally occurring radionuclides detected above BVs included thorium isotopes, uranium-234, uranium-235, and uranium-238. Naturally occurring radionuclides were detected at concentrations within the natural variability of these chemicals in the subsurface.

Concentrations of inorganic chemicals and radionuclides in the drainages are low, but some exceed BV. It is likely that runoff from MDA G has contributed to these levels. In addition, the low-level detected concentrations of methoxychlor[4,4'] in the drainages probably are related in part to surface runoff.

G-3.1.5 Exposure Pathways

Receptors potentially exposed to contamination from MDA G include site workers at Area G and TA-54 and biota at the site. Potentially, site workers may be exposed to contaminants by inadvertent soil ingestion, inhalation of suspended soil (dust), dermal absorption from soil on the skin, and external irradiation. Inhalation of gas-phase contaminants, such as tritium and/or VOCs emanating from the site into the atmosphere, is also a potential means of exposure. No evaluation of a construction worker is included in this assessment because no intrusive activity is anticipated at MDA G. Should such work occur, an evaluation will be performed to address this scenario, and those performing the evaluation will work with facility management to ensure safety of workers and limit their exposure.

Potential pathways from covered areas would be complete only if the covers were removed and soil and buried material were excavated and brought to the surface. In such a case, the potential contaminant migration pathways and potential exposure pathways would be the same as those of a surface soil release. A conceptual site model diagram for both human health and ecological receptors is shown in Figure G-3.1-1.

Ecological receptors may be exposed through soil ingestion, inhalation of suspended soil (dust), dermal absorption from soil on the skin, and external irradiation as well as through plant-root uptake and the food web. In addition, the receptors may be exposed to concentrations of gas-phase contaminants in subsurface burrows. The ecological pathways conceptual exposure model for MDA G identifies the primary exposure pathways to animals as being dietary uptake of contaminated channel sediment and respiratory uptake of vapor-phase contaminants. The primary exposure pathway to plants is root uptake.

G-4.0 RISK SCREENING LEVELS

G-4.1 Human Health Screening Assessment

The human health and ecological screening assessments for MDA G are presented in Section G-5. The human health screening assessment was performed according to the process outlined in a New Mexico Environment Department (NMED) technical document (NMED 2004, 85615) and Environmental Protection Agency (EPA) Region 6 guidance (EPA 2004, 87478).

The current land use for this site is industrial, and the most likely exposed individuals are site workers. The site has restricted access (i.e., fenced and locked) and is located within the boundaries of an operational facility. The future land use is anticipated to remain industrial, under Laboratory control, for the reasonably foreseeable future. Because of the restricted access, only site workers are subjected to exposures throughout the assumed operational period. Although other human health exposure scenarios could be envisioned, including trespassers and observers located outside the controlled areas, the duration and frequency of such exposures would be less than those experienced by on-site workers. Therefore, the assessment of risk to on-site workers (industrial scenario) is used to indicate whether there are potential present day risks. Pertinent site features are shown in Figure G-4.1-1.

A total of 16 COPCs for the industrial scenario and 22 COPCs for the residential scenario were identified based on the data review (Appendix F). The EPCs were derived using the EPA-recommended statistical package ProUCL (http://www.epa.gov/nerlesd1/tsc/software.htm). This software checks the data set for a constituent for distribution (e.g., normal, lognormal, gamma), then checks for statistical difference from the background data set. Based on these tests, the software recommends the 95% UCL that is most robust for this application. In some cases, the number of detected results in a data set was too low to allow for use of ProUCL. In these cases, the maximum detected concentration was used as the EPC. The industrial COPCs are evaluated by comparing the EPCs from the 0–1-ft depth interval to the soil screening level (SSL) for each chemical or the screening action level (SAL) for radionuclides. The essential nutrients calcium, magnesium, potassium, and sodium have low toxicity, have limited quantitative toxicity information, and are not evaluated in this screening assessment.

The SSLs are from NMED's "Technical Background Document for Development of Soil Screening Levels, Revision 2" (NMED 2004, 85615). The SSLs are based on parameters presented in NMED's guidance

(Table G-4.1-1). If a chemical does not have an NMED SSL, EPA Region 6 medium-specific screening levels are used as the SSL (EPA 2004, 87478). The SSLs for carcinogens are based on the NMED target risk level of 10^{-5}, and SSLs for noncarcinogens are based on a hazard quotient (HQ) of 1.0. The SSLs and results of these comparisons are presented in Tables G-4.1-2 through G-4.1-7. Residential values are presented for comparison purposes only. The SALs for radionuclides are derived using RESRAD Version 6.21 according to "Derivation and Use of Radionuclide Screening Action Levels, Revision 1" (LANL 2005, 88493). The SALs are derived based on an annual dose limit of 15 mrem/yr. The key parameters used in RESRAD for industrial and residential SALs are provided in Tables G-4.1-8 and G-4.1-9. The SALs are listed in Table G-4.1-10, and the results of the comparison are listed in Tables G-4.1-11 and G-4.1-12.

Based upon a site worker, the present-day human-health risk assessment estimates the potential risks associated with residual sediment contamination in drainages. The only organic COPC identified in sediment in the 0–1-ft interval was methoxychlor[4,4'-]. Americium-241, cesium-137, cobalt-60, plutonium-238, plutonium-239, and tritium were identified as radionuclide COPCs in sediment. Eight inorganic chemicals were identified as COPCs in sediment: barium, cadmium, chromium, cobalt, iron, mercury, selenium, and silver. No samples were collected in the 0–1-ft interval in tuff.

For residential exposure, potential risks were evaluated for COPCs in the 0–12-ft interval for tuff and sediment. For tuff and sediment in this depth interval, nine inorganic chemicals were identified as COPCs: antimony, barium, cadmium, chromium, cobalt, iron, mercury, selenium, and silver. Eleven organic chemicals were identified as COPCs in this depth interval in tuff: acetone, Aroclor-1254, benzene, bis(2-ethylhexyl)phthalate, ethylbenzene, methylene chloride, naphthalene, tetrachloroethene, toluene, trimethylbenzene[1,2,4-], and total xylene. Methoxychlor[4,4'] was the only organic COPC in sediment. Radionuclide COPCs (all in sediment) are the same as those listed above: americium-241, cesium-137, cobalt-60, plutonium-238, plutonium-239, and tritium.

The screening assessment for tritium is based on data presented in an Environmental Surveillance Program report for 2003 (LANL 2004, 88421). The mean airborne tritium level for 2003 at Area G was 163 pCi/m^3 and the maximum annual concentration was 1200 pCi/m^3. EPA has calculated that a tritium concentration in air of 1500 pCi/m^3 is equivalent to an annual radiation dose of 10 mrem/yr from inhalation assuming the receptor is on site 24 hr/day, unshielded. The 10 mrem/yr standard for inhalation is set forth in 40 CFR 61.102 and compliance with the tritium standard is defined in 40 CFR 61.103 (Table 2 of Appendix E).

G-4.2 Ecological Screening

Potential ecological risk from chemicals of potential ecological concern (COPECs) was limited to terrestrial pathways because no perennial surface-water bodies occur on the mesa. The primary pathways of concern for terrestrial animals include ingestion (incidental ingestion of soils) of contaminated soil (including radiological contamination) and food-web transport of contaminants in sediment. Inhalation of VOCs and dermal exposure for ground-dwelling animals such as small rodents are secondary pathways. The primary pathway of concern for plants is root uptake. A topographical map with habitat types and boundaries is presented in Figure G-4.2-1.

The chemicals and radionuclides included in the present-day ecological risk evaluation of MDA G are identified in this section. Data in the 0–5-ft interval were used in the evaluation (LANL 2004, 87630). All contaminants in accessible environmental media were evaluated in the present-day assessment without regard to source. These include eight inorganic chemicals, six radionuclides, and methoxychlor[4,4'-], all in sediment.

G-4.3 Ecological Scoping Evaluation

The scoping evaluation includes the problem formulation that forms the conceptual basis for exposure and identifies the pathways of contaminant exposure to ecological receptors. The ecological scoping checklist, which contains this basic information, is provided in Appendix H. The checklist includes all of TA-54 because the area contains similar habitat and receptors. Information from this checklist is summarized below. The scoping checklist addresses five major areas of concern for evaluating ecological risk at a site: (1) biotic associations, (2) suspected contaminant and physical effects on biotic media, (3) aggregation of sites (e.g., neighboring SWMUs), (4) data evaluation, and (5) development of the ecological pathways conceptual exposure model.

G-4.3.1 Biotic Associations

The top of Mesita del Buey is developed with some intrusion from grasses (e.g., *Bouteloua spp.*) and sage (*Artemesia spp.*). Predominant hillside tree and shrub species include ponderosa pine (*Pinus ponderosa*), piñon pine (*Pinus edulis*), one-seed juniper (*Juniperus monosperma*), Rocky Mountain juniper (*Juniperus scropulorum*), Gambel oak (*Quercus gambelii*), wavyleaf oak (*Quercus undulata*), mockorange (*Philadelphus microphyllus*), mountain mahogany (*Cercocarpus montanus*), New Mexico hops (*Ptelae trifoliata*), sumac (*Rhus spp.*), and sage. Predominant hillside ground cover includes various grasses and some forbs as well as mosses and lichens in rocky areas. MDA G resides in a single biotic unit: piñon-juniper woodland. A detailed account of the species present in and around MDA G can be found in Banar (1996, 58192). Scoping activities revealed abundant invertebrates, reptiles, mammals, birds, and plant life on the hillsides. The hillside areas of Mesita del Buey have fully intact terrestrial biotic communities and therefore include a full suite of potential terrestrial receptors.

MDA G is managed in a way that limits ecological receptors to invasive plants, small mammals, birds, and invertebrates. The mesa top is fenced off from the surrounding hillsides and is managed intensively to limit access to the area by large animals (e.g., deer, elk, and mountain lions); some limitations may also apply to foxes, coyotes, raccoons, bobcat, or other medium-size mammals. Although the mesa top and hillsides differ in community composition and character, the terrestrial functional feeding groups expected on the Pajarito Plateau are not likely to be found in and around MDA G because it is highly industrialized and part of it is paved.

Potential habitat for T&E species is found on the mesa top and/or hillsides of Mesita del Buey for a number of species (Banar 1996, 58192, Chapter 6). However, habitat of only one T&E species is found with high frequency in the area: that of the spotted bat (*Euderma maculatum*). Habitat for the peregrine falcon (*Falco peregrinus*) also occurs frequently but this species has been delisted as a T&E species. These species have not been observed to roost or nest in the area.

G-4.3.2 Suspected Contaminant and Physical Effects on Biotic Media

To evaluate the impacts of potential contamination from subsurface SWMUs, efforts were made to distinguish between effects that may be contaminant-related and those that are related to natural physical processes or anthropogenic disturbances (i.e., operational activities). Contaminants are known to have reached biotic populations of vegetation (Fresquez et al. 1997, 62346), small mammals (Bennett et al. 1997, 62342), and invertebrates (Haarmann and Fresquez 1998, 62351). However, no population-wide or individual toxicological effects have been demonstrated.

The only obvious ecological effects from MDA G operations are from the physical disturbance of the area. Sheet flow from rainstorm events has a high potential for run-on from the mesa top to the hillsides.

Erosion potential of the mesa top is generally low because of the low gradient of the surface and because the surface water release is controlled from the site as a condition of the operating permit. In the downslope areas, runoff creates progressively deeper and wider channels, until the water reaches the canyon bottoms where potential energy is dissipated and the water spreads across the canyon bottoms.

G-4.3.3 Assessment Endpoints

An assessment endpoint is an explicit expression of the environmental value to be protected. These endpoints should be ecologically relevant and should help sustain the natural structure, function, and biodiversity of an ecosystem or its components (EPA 1998, 62809). In a screening-level assessment, assessment endpoints are any adverse effects on ecological receptors, where receptors are populations and communities (EPA 1997, 59370).

The ecological screening assessment is designed to protect populations and communities of biota rather than individual organisms, except for listed or candidate T&E species or treaty-protected species (EPA 1999, 70086). The individuals within these designated protected species can also be protected at the population level; the populations of these species tend to be small, and the loss of an individual adversely affects the species.

In accordance with this guidance, the Laboratory developed generic assessment endpoints (LANL 1999, 64137) to ensure that values at all levels of ecological organization are considered in the ecological screening process. These general assessment endpoints can be measured using impacts on reproduction, growth, and survival to represent categories of effects that may adversely impact populations. In addition, specific receptor species were chosen to represent each functional group. The receptor species were chosen based on their presence at the site, their sensitivity to the COPCs, and their potential for exposure to those COPCs. These categories of effects and the chosen receptor species were used to select the types of effects seen in toxicity studies considered in the development of the toxicity reference values (TRVs). Toxicity studies used in the development of TRVs included only studies in which the adverse effect evaluated impacted reproduction, survival, and/or growth.

The selection of receptors and assessment endpoints are designed to be protective of both the representative species used as screening receptors and the other species within their feeding guilds and the overall food web for the terrestrial and aquatic ecosystems. Focusing assessment endpoints on these general characteristics of species that affect populations (versus biochemical and behavior changes that may affect only the studied species) also ensures applicability of the estimated impact on the ecosystems of concern.

G-4.3.4 Screening Analysis

Ten terrestrial receptors are appropriate for numerical screening against contaminant concentrations in soil or channel sediment. These terrestrial receptors cover 11 trophic categories identified for the Pajarito Plateau (LANL 2004, 87630) and include the following:

- plant
- an earthworm (soil-dwelling invertebrate)
- American robin (avian invertebrate eater, avian omnivore, and avian herbivore)
- American kestrel (avian invertebrate/flesh eater and avian flesh eater [serving as a surrogate for the Mexican spotted owl])
- deer mouse (mammalian omnivore)

- montane shrew (mammalian invertebrate eater)
- desert cottontail (mammalian herbivore)
- red fox (mammalian flesh eater)
- little brown Myotis bat (avian invertebrate eater [serving as a surrogate for the spotted bat])
- Botta's pocket gopher (burrowing animal)

The screening assessment compared medium-specific ecological screening levels (ESLs) to concentrations of COPCs found at the site (Table G-4.3-1). ESLs for wildlife are derived based on the approach presented Laboratory guidance (LANL 2004, 87630), and the information contained within the ECORISK Database, Version 2.1 (LANL 2004, 87386). These sources include all relevant information necessary to calculate HQs and hazard indexes (HIs), including concentration equations, dose equations, bioconcentration factors, transfer factors, and toxicity reference values. Chemical ESLs are determined on a toxicological dose basis (LANL 2004, 87630). For wildlife, toxicological studies were used to determine the maximum contaminant exposure at which no adverse effect was observed (LANL 2004, 87630). This critical exposure level may vary greatly because of population-based variations in individual weight, diet, reproductive status, and phenology. In the case of terrestrial organisms, ESLs were developed to reflect an adverse effect on an average, nongravid adult individual of a particular species (EPA 1993, 59384, p. 7). ESLs are designed to be protective of specific organisms and may only be used to infer a potential for risk to receptors. The ESLs used in the screening evaluation at MDA G were obtained from the ECORISK Database, version 2.1 (LANL 2004, 87386).

The number of samples collected from the 0–5-ft depth was generally sufficient to calculate a representative 95% UCL of the mean for the COPCs. In cases where the 95% UCL could not be calculated (one detection in 59 samples), the maximum detected concentration was used for the EPC. For some COPCs, no detected concentrations were reported so the maximum detection limit was used as the EPC.

The minimum ESL for each COPC was compared with the EPC (Table G-4.3-2). The HQ was calculated by dividing the EPC by the ESL. An HQ of 0.3 was used to identify COPECs and to determine which chemicals should be evaluated further (LANL 2004, 87630). This further evaluation of COPECs against all terrestrial receptors on the Pajarito Plateau is shown in Table G-4.3-3.

Because animal burrows have been observed at MDA G, exposure to burrowing animals from VOCs in subsurface soil was assessed. The VOC pore-gas data from 5 shallowest boreholes (10–12 ft bgs) were used for this assessment. These boreholes are BH 14 (54-24374), BH 23 (54-24383), BH 24 (54-24384), BH 27 (54-23487), and BH 36 (54-24396). The data are presented in Section 6, Table 6.6-2. The ESLs for the inhalation pathway were obtained from the ECORISK Database, Version 2.1 (LANL 2004, 87386) and are based on Botta's pocket gopher as the burrowing receptor. However, ESLs for some of the pore-gas VOCs detected are not available. The maximum detected pore-gas concentrations were assumed to be in equilibrium within an animal burrow and used as the EPC for those VOCs having ESLs. The results of this comparison are shown in Table G-4.3-4.

G-5.0 RISK ASSESSMENT RESULTS

The EPCs for noncarcinogenic COPCs were all less than their industrial SSLs (HI=0.07). The HI is less than the NMED's noncarcinogenic target of 1.0 (NMED 2004, 85615). The residential SSLs yielded an HI=0.9. These results are shown in Tables G-4.1-4 and G-4.1-5.

The EPCs for carcinogenic COPCs were all less then their SSLs. The total potential excess cancer risk for an industrial scenario is approximately 1 x 10^{-8}. The cancer risk is less than the NMED target risk of 1 x 10^{-5} (NMED 2004, 85615).The potential excess cancer risk for the residential scenario is approximately 1 x 10^{-6}. These results are shown in Tables G-4.1-6 and G-4.1-7.

Radiological dose was estimated by comparing EPCs of radiological COPCs to industrial SALs. The estimated annual industrial dose is approximately 1.5 mrem/yr. The estimated dose is less than DOE's target dose limit of 15 mrem/yr (DOE 2000, 67489). The comparison to residential SALs resulted in an estimated dose of 6.3 mrem/yr. These results are shown in Tables G-4.1-10 and G-4.1-11.

The highest detected annual tritium concentration of 1200 pCi/m^3 is equivalent to a dose of 8 mrem/yr. The dose based on the annual mean tritium concentration is 1.1 mrem/yr. These estimated doses are below the EPA target dose of 10 mrem/year.

Initial ecological screening assessment was performed for 16 COPCs. The EPCs were compared to the final ESL for each COPC. Six inorganic COPCs had ratios higher than 0.3 and were retained as COPECs. Mercury, methoxychlor, and all radionuclide COPCs were eliminated because their ratios were less than 0.3. These results are shown in Tables G-4.3-2. The HIs for each receptor were generally low (0.01 to 4) with the exception of the plant which had an HI of 52. The HIs for the T&E species are 0.01 for the Mexican spotted owl and 2.4 for the spotted bat. These COPECs are discussed in the uncertainty analysis.

Assessment of potential risks to burrowing animals from VOCs in subsurface soils indicated no unacceptable risk to these animals. When the maximum concentrations in five boreholes were compared to inhalation ESLs, the HQs ranged from 0.04 to 0.00003 and the HI was 0.09.

Uncertainty Analysis

Human Health Assessment

Exposure Assessment

The industrial site worker exposure to COPCs in the drainage sediments is likely to be less than the exposure assumptions used to derive the SSLs. The SSLs assume that the potentially exposed individual is on-site and spends all or most of their workday outdoors (NMED 2004, 85615). It is unlikely that a Laboratory worker is on-site in the drainages for 8 hr/day, 225 days/yr. As a result, the assessment overestimates risk, hazard, and dose. The actual site conditions of structures and partial asphalt cover over MDA G either limits or prevents exposure to subsurface contaminants. The use of the highest annual concentration of tritium overestimates the potential dose to a site worker from ambient-air exposure; the annual mean is more representative of the annual dose. In either case, the dose is less than EPA's limit of 10 mrem/yr.

The assumptions underlying the exposure pathways for parameter, route of exposure, amount of contaminated media available for exposure, and intake rates for routes of exposure are consistent with NMED/EPA parameters and default values (NMED 2004, 85615; EPA 2004, 87478). In the absence of site-specific data, several upper-bound values for the assumptions may be combined to estimate exposure for any one pathway, and the resulting risk estimate can exceed the 99th percentile. Therefore, uncertainties in the assumptions underlying the exposure pathways may contribute to risk assessments that exceed the range that would be reasonably expected. The data used in the tritium evaluation were collected and averaged over 1 yr and were less than the EPA dose limit of 10 mrem/yr.

Toxicity Assessment

The primary uncertainty associated with the screening values relates to the derivation of screening values from EPA toxicity values (reference doses [RfDs] and slope factors [SFs]) (EPA 2001, 70109; EPA 1997, 58968). Uncertainties were identified in three areas with respect to the toxicity values: (1) extrapolation from animals to humans, (2) extrapolation from one route of exposure to another route of exposure, and (3) interindividual variability in the human population.

The SFs and RfDs are often determined by extrapolation from animal data to humans, which may result in uncertainties in toxicity values because differences exist in chemical absorption, metabolism, excretion, and toxic response between animals and humans. EPA takes into account differences in body weight, surface area, and pharmacokinetic relationships between animals and humans to minimize the potential to underestimate the dose-response relationship.

The SFs and RfDs can often contain extrapolations from one route of exposure to another. The extrapolation from the oral route to the inhalation and/or the dermal route is used in the derivation of some screening values. Differences in chemical absorption and/or toxicity between two exposure routes could result in an overestimation or underestimation of risk or hazard.

For noncarcinogenic effects, the amount of human variability in physical characteristics is important in determining the risks that can be expected at low exposures and in determining the no observed adverse effect level (NOAEL). The NOAEL/uncertainty factor approach incorporates a factor of 10 to reflect the possible interindividual variability in the human population; it is generally considered a conservative estimate.

Another uncertainty related to toxicity assessment is the assumption of additivity, which may result in an overestimate or underestimate of risk. For noncarcinogens, the effects of a mixture of chemicals are generally unknown, and possible interactions could be synergistic or antagonistic. Additionally, the RfDs for different chemicals are not based on the same severity, effect, or target organ. Therefore, the potential for occurrence of noncarcinogenic effects can be overestimated for chemicals that are addressed additively but that act by different mechanisms and on different target organs.

Ecological Screening Assessment

The chemical form of the individual COPCs was not determined as part of this investigation, largely because of a limitation on analytical quantitation of individual chemical species. Toxicological data are typically based on the most toxic and bioavailable chemical species, which probably are not found in the environment. The inorganic and organic COPECs are not generally 100% bioavailable to receptors in the natural environment because the adsorption of chemical constituents to matrix surfaces (e.g., soils) or rapid oxidation or reduction changes that render harmful chemical forms unavailable to biotic processes. The ESLs were calculated to ensure a conservative indication of potential risk (LANL 2004, 87630), and the values were biased toward overestimating the potential risk to receptors.

The screening evaluation for ecological receptors was based on 59 sediment samples. The samples were collected downgradient from MDA G and provide an indication of what chemicals might leave the mesa top by surface runoff. Because much of the surface of MDA G is covered with structures or is paved, surface samples cannot provide information about any potential release beneath the pavement. The structures and pavement are an effective barrier to humans and most ecological receptors.

The COPC concentrations used in the calculations of HQs for cobalt, selenium, and silver were the maximum detection limits reported in the drainage sediment samples to a depth of 5 ft, thereby conservatively estimating the EPCs of these COPCs. For barium, cadmium, chromium, and iron, the number of detected concentrations above BV (and for mercury the number of detected concentrations) was infrequent (1 to 3 samples). As a result, the exposure of individuals within a population was evaluated using EPCs assumed to be constant throughout the exposure area. This assumption results in an overestimation of the potential risk because concentrations of COPCs varied across the site and were infrequently detected, particularly in the case of cadmium, iron, and mercury, which were detected in one sample each out of 59 samples.

Cobalt, selenium, and silver were not detected in any of the sediment samples used in this assessment. The maximum detection limits used in the ESL comparisons are similar to the sediment BVs for each inorganic chemical (4.73 mg/kg for cobalt, 0.3 mg/kg for selenium, and 1.0 mg/kg for silver) (LANL 1998, 59730). The detection limits are a factor of two or less above the sediment BVs. Therefore, exposure to these COPECs at or below the detection limits is similar to background. In addition, the barium, chromium, and iron 95% UCLs are less than the sediment BVs (127 mg/kg, 10.5 mg/kg, and 13800 mg/kg, respectively) (LANL 1998, 59730) so exposure is similar to background levels across the site. Cadmium and mercury were detected in one sample each at a concentration slightly above BV for cadmium and below the BV for mercury (1.2 mg/kg and 0.02 mg/kg, respectively) (Table G-4.3-2). Therefore, exposure to these COPECs is also similar to background levels. Based on this evaluation, no COPECs in sediment are retained because detected concentrations are infrequent and EPCs are similar to background.

Although data from only five boreholes were used in the inhalation screening assessment, the data were from the shallowest depths (10–12 ft) and therefore are more likely to represent the concentrations within a burrow. In addition, the maximum concentrations of VOCs at these depths were used in the inhalation screening assessment, so the potential exposure to burrowing animals is not underestimated.

Several of the VOCs (butanol[1-], butanone[2-], ethyltoluene, propanol[2-], styrene, trichloro-1,2,2-trifluoroethane[1,1,2-], trimethylbenzene[1,2,4-], and trimethylbenzene[1,3,5-]) detected in the pore gas do not have inhalation ESLs. These VOCs are not as volatile as those for which ESLs are available and are, therefore, less likely to volatilize into animal burrows. In addition, they are relatively less toxic than the more prevalent VOCs evaluated (tetrachloroethene and trichloroethene) based on human health SSLs (NMED 2004, 85615). Therefore, it is unlikely that excluding these VOCs from the screening assessment would substantially underestimate the potential risk.

G-6.0 CONCLUSIONS AND RECOMMENDATIONS

The present-day risk assessments for MDA G concluded that surface and subsurface contamination at the site do not pose a potential unacceptable risk to human health from exposure to ambient air or from inorganic, organic, or radionuclide COPCs in the surface.

Results of the human health risk assessment indicated that present-day noncarcinogenic and carcinogenic risks (HI=0.07 and cancer risk=1 x 10^{-8}) for an industrial site worker were less than NMED's target levels of an HI of 1.0 and cancer risk of 10^{-5} (NMED 2004, 85615). Potential dose for an industrial site worker at MDA G is approximately 1.5 mrem/yr, which is below the DOE's target dose of 15 mrem/yr (DOE 2000, 67489). The equivalent risk for the dose is 2 x 10^{-5} based on a comparison to EPA radiation preliminary remediation goals (PRGs) for an industrial outdoor worker scenario (http://epa-prgs.ornl.gov/cgi-bin/epa-prgs). In addition, exposure to tritium in ambient air does not pose a potential unacceptable present-day dose to site workers.

Therefore, no corrective actions are necessary to address present-day exposure of site workers to COPCs MDA G.

Contamination in channel sediment does not pose a potential risk to ecological receptors. Methoxychlor[4,4'-], detected in 14 sediment samples, had an HQ less than 0.3. Americium-241, cesium-137, cobalt-60, plutonium-238, plutonium-239, and tritium were detected in multiple sediment samples but had HQs less than 0.3. Inorganic COPECs were either not detected in channel sediment or had detected concentrations similar to BVs. Potential exposure to the inorganic COPECs is similar to background levels.

The HI (0.09) from the inhalation ESL comparison to pore-gas VOCs indicates no potential present-day risk to burrowing animals exists.

Based on the results of the ecological screening at MDA G, no corrective actions are necessary to address present-day risks to ecological receptors.

G-7.0 REFERENCES

The following list includes all references cited in this appendix. Parenthetical information following each reference provides the author, publication date, and the ER identification (ID) number. This information also is included in the citations in the text. ER ID numbers are assigned by the Los Alamos National Laboratory's ENV-ERS Program to track records associated with the Program. These numbers can be used to locate copies of the actual documents at the ENV-ERS Program's Records Processing Facility and, where applicable, with the ENV-ERS Program's reference library titled "Reference Set for Material Disposal Areas, Technical Area 54."

Copies of the reference library are maintained at the NMED Hazardous Waste Bureau; the DOE Los Alamos Site Office; and EPA, Region 6. This library is a living collection of documents that was developed to ensure that the administrative authority has all the necessary material to review the decisions and actions proposed in this document. However, documents previously submitted to the administrative authority are not included.

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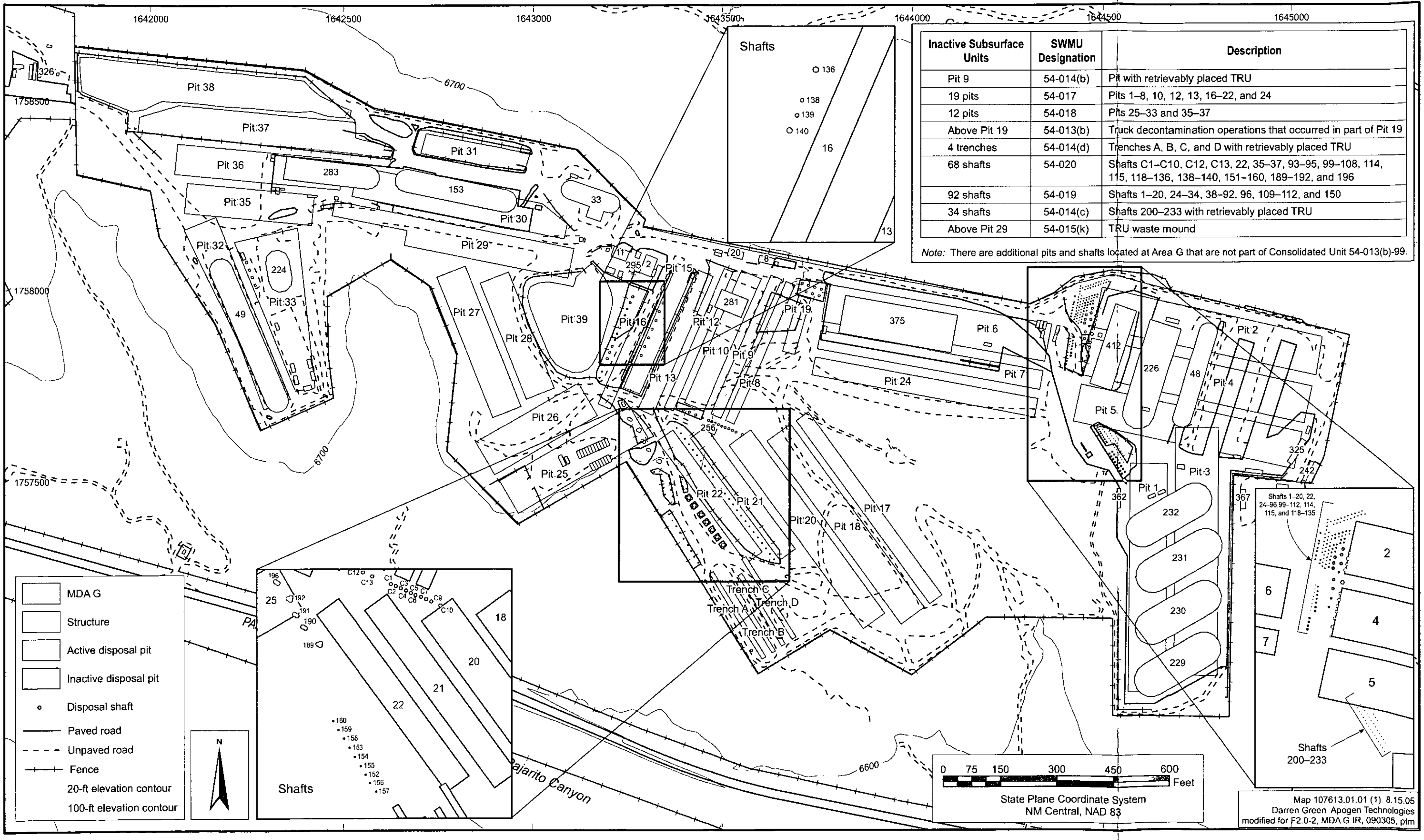

Inactive Subsurface Units	SWMU Designation	Description
Pit 9	54-014(b)	Pit with retrievably placed TRU
19 pits	54-017	Pits 1–8, 10, 12, 13, 16–22, and 24
12 pits	54-018	Pits 25–33 and 35–37
Above Pit 19	54-013(b)	Truck decontamination operations that occurred in part of Pit 19
4 trenches	54-014(d)	Trenches A, B, C, and D with retrievably placed TRU
68 shafts	54-020	Shafts C1–C10, C12, C13, 22, 35–37, 93–95, 99–108, 114, 115, 118–136, 138–140, 151–160, 189–192, and 196
92 shafts	54-019	Shafts 1–20, 24–34, 38–92, 96, 109–112, and 150
34 shafts	54-014(c)	Shafts 200–233 with retrievably placed TRU
Above Pit 29	54-015(k)	TRU waste mound

Note: There are additional pits and shafts located at Area G that are not part of Consolidated Unit 54-013(b)-99.

Figure G-1.0-1. MDA G waste disposal units

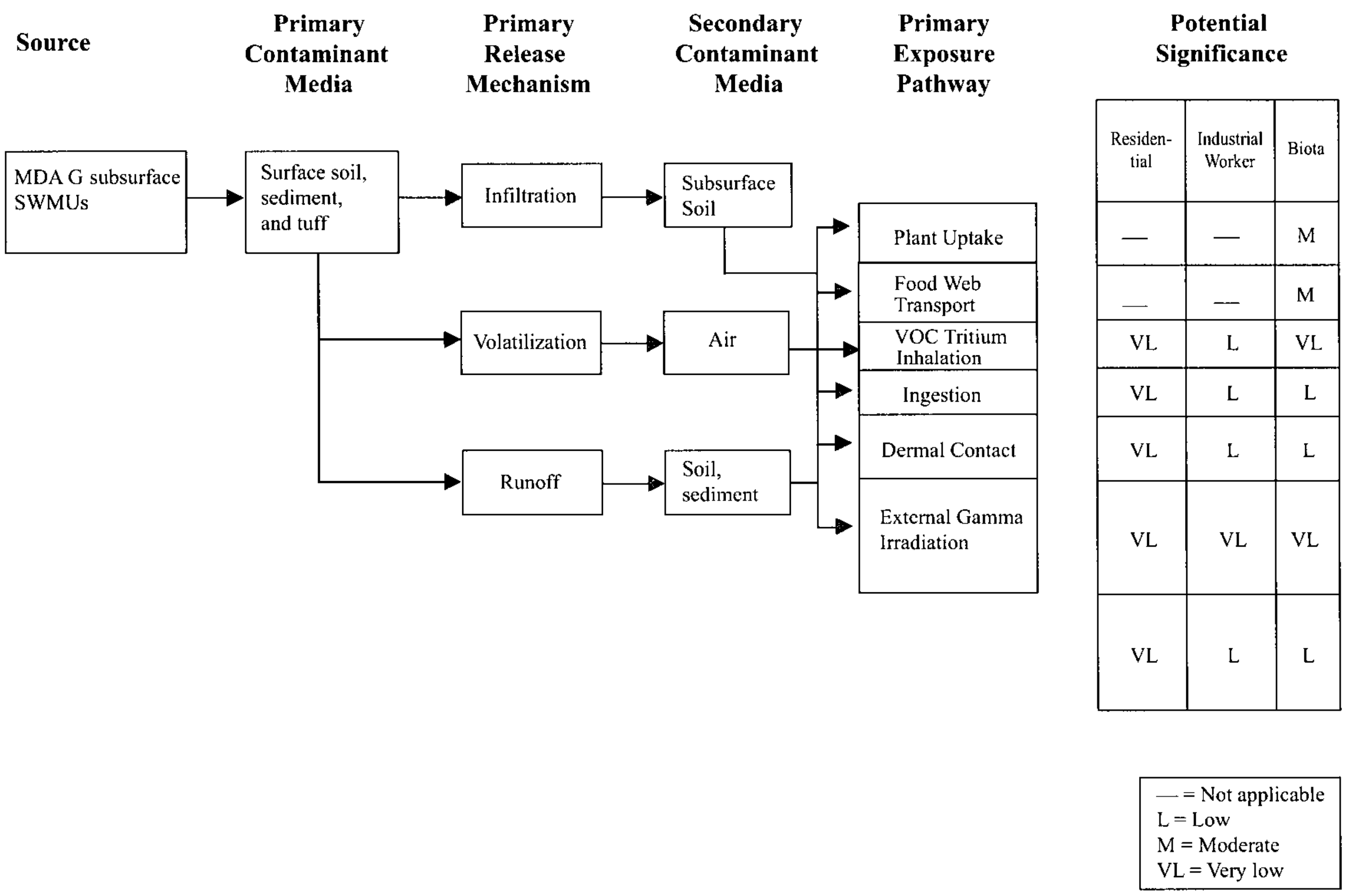

Figure G-3.1-1. Conceptual site model of contaminant transport and exposure for human health and ecological receptors at MDA G

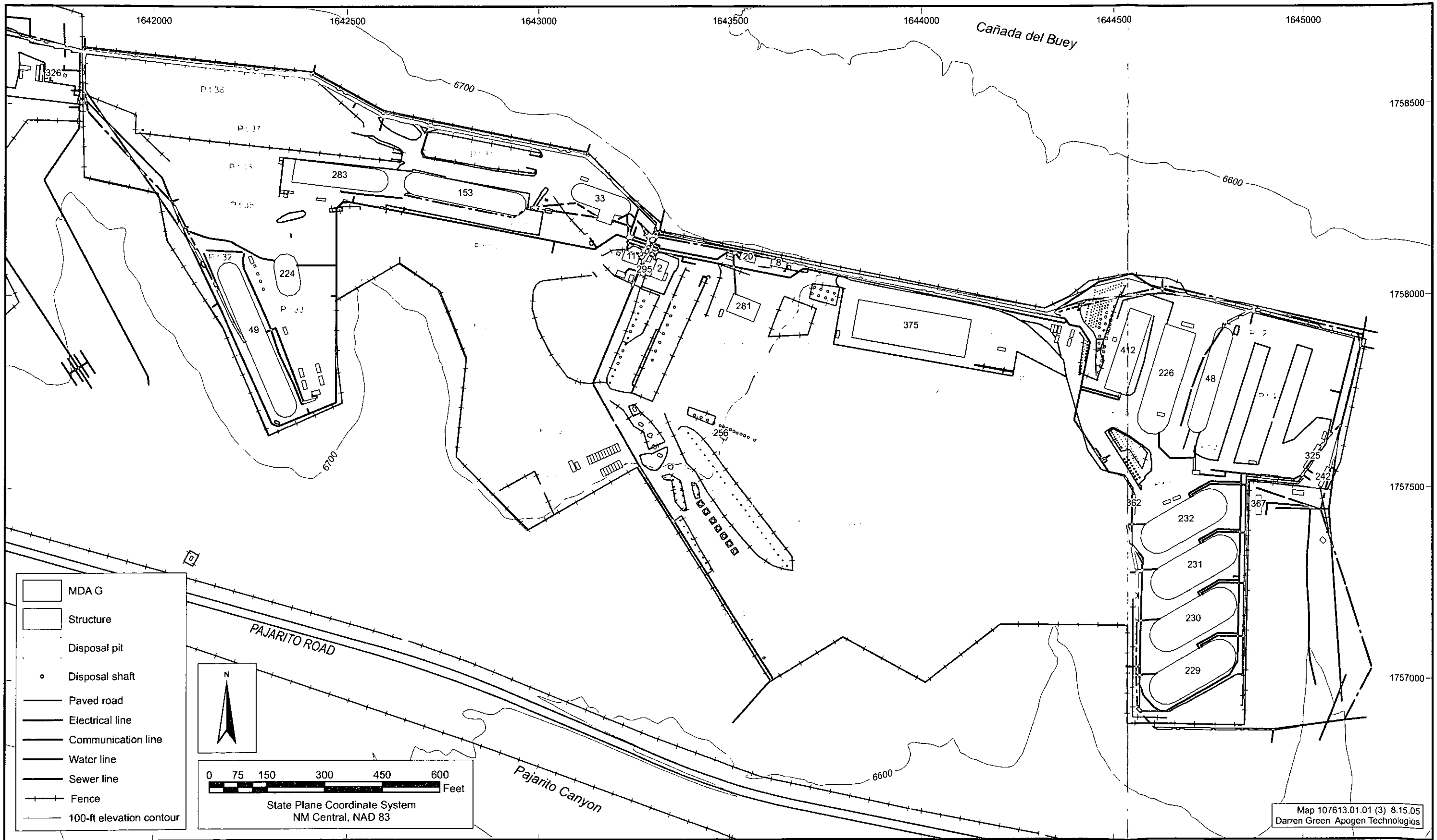

Figure G-4.1-1. Utilities and subsurface structures at MDA G

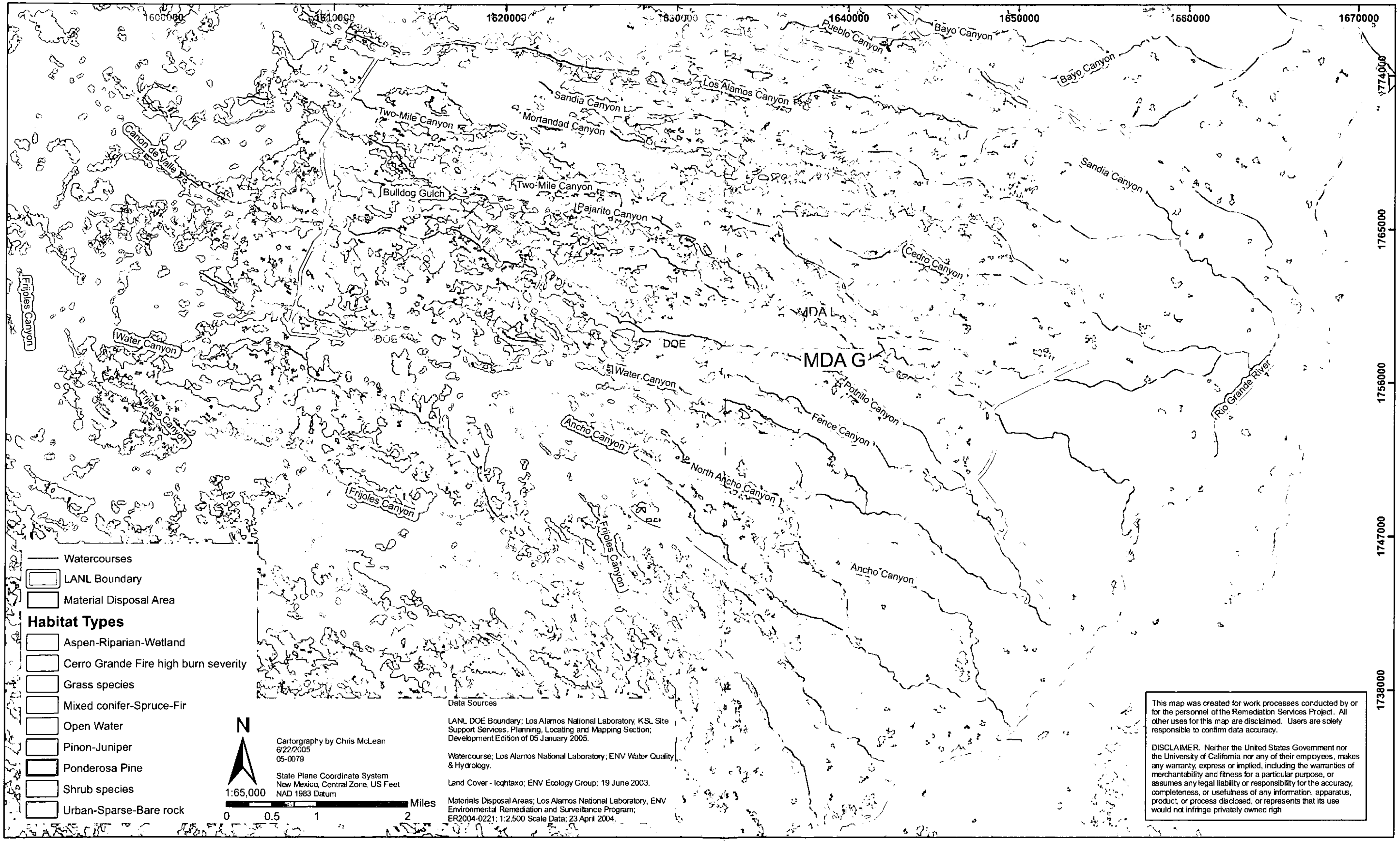

Figure G-4.2-1. Ecological habitat types, boundaries, and surface water features in the vicinity of MDA G

Table G-2.2-1
Summary of Sampling Results for Inorganic Chemicals in Sediment from 0 to 1 ft at MDA G

Analyte	Number of Analyses	Number of Detects	Detected Concentration Range (mg/kg)	Number of Detects above BV	Number of Nondetects	Nondetected Concentration Range (mg/kg)	Exposure Point Concentration (mg/kg)	Statistical Distributions
Barium	59	44	41.8 to 180	3	15	16 to 39.9	80.2	Non-parametric
Cadmium	59	1	1.2	1	58	0.2 to 1	1.2[a]	n/a[b]
Chromium	59	45	2.2 to 17.9	1	14	0.6 to 3.3	5.4	Non-parametric
Cobalt	59	0	n/a	0	59	0.8 to 5.6	5.6[c]	n/a
Iron	59	59	1270 to 39000	1	0	n/a	6945	Lognormal
Mercury	59	1	0.02	0	58	0.02 to 0.2	0.02[a]	n/a
Selenium	25	0	n/a	0	25	0.6 to 0.64	0.64[c]	n/a
Silver	59	0	n/a	0	59	0.6 to 2.1	2.1[c]	n/a

[a] Maximum detected concentration used because too few detected values available to calculate a representative 95% UCL.

[b] n/a = Not applicable.

[c] Not detected but detection limits above BV; maximum detection limit used as exposure concentration.

Table G-2.2-2
Summary of Sampling Results for Inorganic Chemicals from 0 to 12 ft at MDA G

Analyte	Number of Analyses	Number of Detects	Detected Concentration Range (mg/kg)	Number of Detects above BV	Number of Nondetects	Nondetected Concentration Range (mg/kg)	Exposure Point Concentration (mg/kg)	Statistical Distributions
Antimony	76	1	0.57	1	75	0.1 to 11	0.57[a]	n/a[b]
Barium	76	61	3 to 180	3	15	16 to 39.9	67.4	Non-parametric
Cadmium	76	3	0.12 to 1.2	1	73	0.04 to 1	1.2[a]	n/a
Chromium	76	51	0.59 to 17.9	1	25	0.12 to 3.3	4.6	Non-parametric
Cobalt	76	3	0.6 to 0.93	0	73	0.12 to 5.6	0.93[a]	n/a
Iron	76	76	529 to 39000	1	0	n/a	6061	Gamma
Mercury	76	2	0.02 to 0.34	2	74	0.02 to 0.2	0.34[a]	n/a
Selenium	42	0	n/a	0	42	0.31 to 1.1	1.1[a]	n/a
Silver	76	1	0.28	0	75	0.11 to 2.2	0.28[a]	n/a

[a] Maximum detected concentration used because too few detected values available to calculate a representative 95% UCL.

[b] n/a = Not applicable.

Table G-2.2-3
Summary of Sampling Results for Organic Chemicals in Sediment from 0 to 1 ft at MDA G

Analyte	Number of Analyses	Number of Detects	Detected Concentration Range (mg/kg)	Number of Nondetects	Nondetected Concentration Range (mg/kg)	Exposure Point Concentration (mg/kg)
Methoxychlor[4,4'-]	59	14	0.0176 to 0.945	45	0.017 to 0.0177	0.10*

*Maximum detected concentration used because too few detected values available to calculate a representative 95% UCL.

Table G-2.2-4
Summary of Sampling Results for Organic Chemicals from 0 to 12 ft at MDA G

Analyte	Number of Analyses	Number of Detects	Detected Concentration Range (mg/kg)	Number of Nondetects	Nondetected Concentration Range (mg/kg)	Exposure Point Concentrations[a] (mg/kg)
Acetone	17	2	0.028 to 0.03	15	0.005 to 0.022	0.03
Aroclor-1254	76	1	0.31	75	0.033 to 0.073	0.31
Benzene	17	1	0.003	16	0.005 to 0.006	0.003
Bis(2-ethylhexyl)phthalate	17	4	0.061 to 0.21	13	0.068 to 1.3	0.21
Ethylbenzene	17	1	0.002 to 0.002	16	0.005 to 0.006	0.002
Methoxychlor[4,4'-]	76	14	0.0176 to 0.945	62	0.017 to 0.036	0.945[b]
Methylene Chloride	17	2	0.001 to 0.0012	15	0.003 to 0.01	0.01
Naphthalene	21	2	0.002 to 0.003	19	0.005 to 0.37	0.003
Tetrachloroethene	17	2	0.0012 to 0.003	15	0.005 to 0.006	0.003
Toluene	17	1	0.013	16	0.005 to 0.006	0.013
Trimethylbenzene[1,2,4-]	17	1	0.003	16	0.005 to 0.006	0.003
Xylene (Total)	15	1	0.008	14	0.005 to 0.006	0.008

[a] Maximum detected concentrations used unless otherwise indicated because too few detected values available to calculate a representative 95% UCL.

[b] 95% UCL calculated with a non-parametric distribution.

Table G-2.2-5
Summary of Sampling Results for Radionuclides in Sediment in 0 to 1 ft at MDA G

Analyte	Number of Analyses	Number of Detects	Detected Concentration Range (pCi/g)	Number of Detects above BV	Number of Nondetects	Nondetected Concentration Range (pCi/g)	Exposure Point Concentration (pCi/g)	Statistical Distributions
Americium-241	59	51	0.007 to 0.158	12	8	0.005 to 0.01	0.05	Lognormal
Cesium-137	59	31	0.25 to 1.3	4	28	0.03 to 0.27	0.51	Non-parametric
Cobalt-60	59	3	0.23 to 0.39	3	56	0.01 to 0.11	0.39[a]	n/a[b]
Plutonium-238	59	39	0.009 to 1.483	39	20	0.001 to 0.013	0.13	Lognormal
Plutonium-239	59	54	0.007 to 0.909	20	5	0.004 to 0.01	0.22	Lognormal
Tritium	59	59	0.0031 to 0.49	7	0	n/a	0.07	Lognormal

[a] Maximum detected concentration used because too few detected values available to calculate a representative 95% UCL.
[b] n/a = Not applicable.

Table G-2.2-6
Summary of Sampling Results for Radionuclides from 0 to 12 ft at MDA G

Analyte	Number of Analyses	Number of Detects	Detected Concentration Range (pCi/g)	Number of Detects above BV	Number of Nondetects	Nondetected Concentration Range (pCi/g)	Exposure Point Concentration (pCi/g)	Statistical Distributions
Americium-241	76	56	0.007 to 0.158	12	20	0.002 to 0.011	0.04	Lognormal
Cesium-137	59	31	0.25 to 1.3	4	28	0.03 to 0.27	0.51	Non-parametric
Cobalt-60	59	3	0.23 to 0.39	3	56	0.01 to 0.11	0.39[a]	n/a[b]
Plutonium-238	76	41	0.005 to 1.483	39	35	0.001 to 0.013	0.15	Non-parametric
Plutonium-239	75	58	0.007 to 0.909	20	17	0 to 0.01	0.19	Non-parametric
Tritium	76	76	0.0031 to 4537.7	7	0	n/a	13.6	Non-parametric

[a] Maximum detected concentration used because too few detected values available to calculate a representative 95% UCL.
[b] n/a = Not applicable.

Table G-2.2-7
COPCs for MDA G Assessments

Analyte	COPC		
	Human Health Industrial	Human Health Residential[a]	Ecological[b]
Antimony	No	**Yes**[c]	No
Barium	**Yes**	**Yes**	**Yes**
Cadmium	**Yes**[b]	**Yes**[b]	**Yes**
Chromium	**Yes**	**Yes**	**Yes**
Cobalt	**Yes**[c]	**Yes**[c]	**Yes**[c]
Iron	**Yes**	**Yes**	**Yes**
Mercury	**Yes**	**Yes**	**Yes**
Selenium	**Yes**[b,c]	**Yes**[c]	**Yes**[c]
Silver	**Yes**[b,c]	**Yes**[b,c]	**Yes**[c]
Acetone	No	**Yes**	No
Aroclor-1254	No	**Yes**	**No**
Benzene	No	**Yes**	No
Bis(2-ethylhexyl)phthalate	No	**Yes**	No
Ethylbenzene	No	**Yes**	No
Methoxychlor[4,4'-]	**Yes**[b]	**Yes**[b]	**Yes**
Methylene Chloride	No	**Yes**	No
Naphthalene	No	**Yes**	No
Tetrachloroethene	No	**Yes**	No
Toluene	No	**Yes**	No
Trimethylbenzene[1,2,4-]	No	**Yes**	No
Xylene (total)	No	**Yes**	No
Americium-241	**Yes**	**Yes**	**Yes**
Cesium-137	**Yes**	**Yes**	**Yes**
Cobalt-60	**Yes**	**Yes**	**Yes**
Plutonium-238	**Yes**[b]	**Yes**	**Yes**
Plutonium-239	**Yes**	**Yes**	**Yes**
Tritium	**Yes**	**Yes**	**Yes**

[a] COPCs identified in Qbt 2 unless otherwise noted.

[b] COPC identified in sediment.

[c] Based on detection limit exceeding BV.

Table G-3.1-1
Physicochemical Properties of Organic COPCs

Analyte	Water Solubility (mg/L)	Vapor Pressure (mm Hg at 25°C)	K_{ow}	K_{oc} (L/kg)
Acetone	6.0E+05	2.3E+02	6.0E-01	2.0E+00
Aroclor-1254	3.4E-03	6.5E-06	6.2E+06	7.6E+04
Benzene	179E+02	9.5E+01	1.35E+02	1.65E+02
Bis(2-ethylhexyl)phthalate	2.7E-01	1.42E-07	4.0E+07	1.62E+05
Ethylbenzene	1.69E+02	9.6E+00	1.4E+03	5.18E+02
Methylene chloride	1.3E+04	4.3E+02	1.8E+01	2.4E+01
Methoxychlor[4,4']	1.0E-01	4.2E-05	4.7E+04	8.0E+04
Naphthalene	3.1E+01	8.5E-02	2.0E+03	1.84E+03
Tetrachloroethene	2.1E+02	1.8E+01	2.5E+03	1.1E+02
Toluene	5.26E+02	2.8E+01	5.4E+02	2.68E+02
Trimethylbenzene[1,2,4-]	5.7E+01	2.1E+00	4.3E+03	7.2E+02
Xylene (total)	1.1E+02	8.0E+00	1.3E+03	1.8E+03

Note: Source Risk Assessment Information System (http://risk/lsd/ornl.gov/cgi-bin/tox).

Table G-4.1-1
Parameters Used in the SSL Equations

Parameters	Residential Values	Industrial Worker Values
Target hazard quotient	1	1
Target cancer risk	10^{-5}	10^{-5}
Averaging time (carcinogen)	70 yr x 365 days	70 yr x 365 days
Averaging time (noncarcinogen)	ED x 365 days	ED x 365 days
Skin absorption factor	Semivolatile organic compounds = 0.1 Chemical-specific for some compounds	Semivolatile organic compounds = 0.1 Chemical-specific for some compounds
Adherence factor–child	0.2 mg/cm^2	n/a[a]
Body weight–child	15 kg (0–6 years of age)	n/a
Cancer slope factor–oral	Chemical-specific	Chemical-specific
Cancer slope factor–inhalation	Chemical-specific	Chemical-specific
Exposure frequency	350 day/yr	225 day/yr
Exposure duration–child	6 yr (0–6 years of age)	n/a
Age-adjusted ingestion factor	114 mg-yr/kg-day	n/a
Age-adjusted inhalation factor	11 m^3-yr/kg-day	n/a
Inhalation rate–child	10 m^3/day	n/a
Soil ingestion rate–child	200 mg/day	n/a
Particulate emission factor	6.61×10^9 m^3/kg	6.61×10^9 m^3/kg
Reference dose–oral	Chemical-specific	Chemical-specific
Reference dose–inhalation	Chemical-specific	Chemical-specific
Exposed surface area–child	2800 cm^2/day (head, hands, forearms, lower legs, feet)	n/a
Age-adjusted skin contact factor for carcinogens	361 mg-yr/kg-day	n/a
Volatilization factor for soil	Chemical-specific	Chemical-specific
Body weight–adult	70 kg	70 kg
Exposure duration	30 yr[b]	25
Adherence factor–adult	0.07 mg/cm^2	0.2 mg/cm^2
Soil ingestion rate–adult	100 mg/day	100 mg/day
Exposed surface area–adult	5700 cm^2/day (head, hands, forearms, lower legs)	3300 cm^2/day (head, hands, forearms)
Inhalation rate–adult	20 m^3/day	20 m^3/day

[a] n/a = Not applicable.

[b] Exposure duration for lifetime resident is 30 years. For carcinogens, the exposures are combined for child (6 yr) and adult (24 yr).

Table G-4.1-2
Noncarcinogenic Soil Screening Levels

Analyte	Industrial SSLs (mg/kg)	Residential SSLs (mg/kg
Antimony	454[a]	31.1
Barium	78300	5450
Cadmium	1130[b]	74.1
Cobalt	20500	1520
Iron	100000	23500
Mercury	340[b]	23[b]
Selenium	5680	391
Silver	5680	391
Acetone	100000[b]	70400
Aroclor-1254	12[a,c]	1.11
Methoxychlor[4,4'-]	3400[c]	310[b]
Naphthalene	98.3[a]	71.9
Toluene	248[a]	248
Trimethylbenzene[1,2,4-]	191[a]	52.2
Xylene (total)	132[a]	132

Note: SSLs obtained from NMED 2004, 85615, unless otherwise noted.

[a] SSL not used in industrial screening because not a COPC from 0–1 ft bgs.

[b] Industrial SSL for cadmium calculated incorrectly in NMED 2004, 85615; recalculated using NMED parameters.

[c] SSL from EPA Region 6 (EPA 2004, 87478).

Table G-4.1-3
Carcinogenic Soil Screening Levels

Analyte	Industrial SSLs[a] (mg/kg)	Residential SSLs (mg/kg)
Chromium	5000[b]	2100[b]
Aroclor-1254	8.26	2.22
Benzene	73.6	27
Bis(2-ethylhexyl)phthalate	1370	347
Ethylbenzene	25400	10600
Methylene Chloride	440	165
Tetrachloroethene	24.6	9.83

Note: SSL obtained from NMED 2004, 85615, unless otherwise noted.

[a] SSL not used in industrial screening because not a COPC from 0–1 ft bgs.

[b] SSLs from EPA Region 6 (EPA 2004, 87478)

Table G-4.1-4
Screening Evaluation for MDA G Noncarcinogenic COPCs Industrial Scenario

Analyte	Exposure Point Concentration (mg/kg)	Industrial SSL (mg/kg)	HQ
Barium	80.2	78300	0.001
Cadmium	1.2	1130[a]	0.001
Cobalt	5.6	20500	0.00005
Iron	6945	100000	0.061
Mercury	0.02	340[b]	0.001
Selenium	0.64 (U)	5680	0.0001
Silver	2.1 (U)	5680	0.0001
Methoxychlor[4,4']	0.10	3400[b]	0.0003
		HI	**0.07**

[a] Industrial SSL for cadmium calculated incorrectly in NMED 2004, 85615; recalculated using NMED parameters.

[b] SSL from EPA Region 6 (EPA 2004, 87478).

Table G-4-1-5
Screening Evaluation for MDA G Noncarcinogenic COPCs Residential Scenario

Analyte	Exposure Point Concentration (mg/kg)	Residential SSL[a] (mg/kg)	HQ
Antimony	11.0 (U)	31.1	0.35
Barium	67.4	5450	0.012
Cadmium	1.2	74.1	0.016
Cobalt	0.93	1520	0.0006
Iron	6061	23500	0.26
Mercury	0.34	23[b]	0.014
Selenium	1.1 (U)	391	0.003
Silver	0.28 (U)	391	0.0007
Acetone	0.03	70400	<0.00001
Aroclor-1254	0.31	1.11	0.28
Methoxychlor[4,4']	0.10	310[b]	0.003
Naphthalene	0.003	71.9	0.00004
Toluene	0.013	248	0.00005
Trimethylbenzene[1,2,4-]	0.003	52.2	0.00006
Xylene (total)	0.008	1320	0.00006
		HI	**0.9**

[a] SSL obtained from NMED 2004, 85615.

[b] SSL from EPA Region 6 (EPA 2004, 87478).

Table G-4.1-6
Screening Evaluation for MDA G Carcinogenic COPCs Industrial Scenario

Analyte	Exposure Point Concentration (mg/kg)	Industrial SSL (mg/kg)	Cancer Risk
Chromium	5.4	5000*	1×10^{-8}
		Total Excess Cancer Risk	**1×10^{-8}**

*SSL from EPA Region 6 (EPA 2004, 87478).

Table G-4.1-7
Screening Evaluation for MDA G Carcinogenic COPCs Residential Scenario

Analyte	Exposure Point Concentration (mg/kg)	Residential SSL[a] (mg/kg)	Cancer Risk
Chromium	4.6	2100[b]	2×10^{-8}
Aroclor-1254	0.31	2.22	1×10^{-6}
Benzene	0.003	27	1×10^{-9}
Bis(2-ethylhexyl)phthalate	0.21	347	6×10^{-9}
Ethylbenzene	0.002	10600	2×10^{-12}
Methylene chloride	0.01	165	6×10^{-10}
Tetrachloroethene	0.003	9.83	2×10^{-9}
		Total Excess Cancer Risk	**1×10^{-6}**

[a] SSLs obtained from NMED 2004, 85615.

[b] SSL from EPA Region 6 (EPA 2004, 87478).

Table G-4.1-8
Residential Scenario Exposure Parameters for RESRAD

Parameters	Residential, Child	Residential, Adult
Inhalation rate (m^3/year)	3,652.5[a]	7,305[b]
Mass loading (g/m^3)	1.5×10^{-7} [c]	1.5×10^{-7} [c]
Outdoor time fraction	0.2236[d]	0.0599[e]
Indoor time fraction	0.7347[f]	0.8984[g]
Soil ingestion (g/year)	73[h]	36.5[i]

[a] The inhalation rate compensates for the time-based occupancy factor applied by RESRAD in calculating exposure from the inhalation pathway. Calculated as [10 m^3/day x 350 day/yr] / [indoor + outdoor time fractions]; where 10 m^3/day is the daily inhalation rate of a child used in NMED (2004, 85615).

[b] The inhalation rate compensates for the time-based occupancy factor applied by RESRAD in calculating exposure from the inhalation pathway. Calculated as [20 m^3/day x 350 day/yr] / [indoor + outdoor time fractions]; where 20 m^3/day is the daily inhalation rate of an adult used in NMED (2004, 85615).

[c] Calculated as (1 / 6.6 x 10^{+9} m^3/kg) x 1000 g/kg; where 6.6 x 10^{+9} m^3/kg is particulate emission factor from NMED (2004, 85615)

[d] Calculated as (5.6 hr/day x 350 day/yr) / 8766 hr/yr, where 5.6 hr/day is an estimate of time spent outdoors for a 3–11 year old child (EPA 1997, 66598: Section 15.4.1).

[e] Calculated as (1.5 hr/day x 350 day/yr) / 8766 hr/yr, where 1.5 hr/day is an estimate of time spent outdoors for an adult 12 years and older (EPA 1997, 66598: Section 15.4.1).

[f] Calculated as [24 – 5.6 hr/day) x 350 day/yr] / 8766 hr/yr.

[g] Calculated as [24 – 1.5 hr/day) x 350 day/yr] / 8766 hr/yr.

[h] The soil ingestion rate compensates for the time-based occupancy factor applied by RESRAD in calculating exposure from the soil ingestion pathway. Calculated as [0.2 g/day x 350 day/yr] / [indoor + outdoor time fractions]; where 0.2 g/day is the child soil ingestion rate used in NMED (2004, 85615).

[i] The soil ingestion rate compensates for the time-based occupancy factor applied by RESRAD in calculating exposure from the soil ingestion pathway. Calculated as [0.1 g/day x 350 day/yr] / [indoor + outdoor time fractions]; where 0.1 g/day is the adult soil ingestion rate used in NMED (2004, 85615).

Table G-4.1-9
Industrial Scenario Exposure Parameters for RESRAD

Parameters	Industrial, Adult
Inhalation rate (m^3/year)	19,481[a]
Mass loading (g/m^3)	1.5 x 10^{-7} [b]
Outdoor time fraction	0.2053[c]
Indoor time fraction	0[d]
Soil ingestion (g/year)	97.4[e]

[a] The inhalation rate compensates for the time-based occupancy factor applied by RESRAD in calculating exposure from the inhalation pathway. Per NMED calculation, the (daily) inhalation rate is not modified by any assumed daily time fraction on-site. Calculated as [20 m^3/day x 225 day/yr] / [indoor + outdoor time fractions]; where 20 m^3/day is the daily inhalation rate of an adult and 225 days/yr is the exposure frequency used in NMED (2004, 85615).

[b] Calculated as (1 / 6.6 x 10^{+9} m^3/kg) x 1000 g/kg; where 6.6 x 10^{+9} m^3/kg is particulate emission factor from NMED (2004, 85615).

[c] Calculated as (8 hr/day x 225 day/yr) / 8766 hr/yr, where 8 hr/day is an estimate of the average length of the workday.

[d] The industrial worker is defined as someone who, "...spends most of the work day conducting maintenance or manual labor activities outdoors" (NMED 2004, 85615).

[e] The soil ingestion rate compensates for the time-based occupancy factor applied by RESRAD in calculating exposure from the soil ingestion pathway. Calculated as [0.1 g/day x 225 day/yr] / [indoor + outdoor time fractions]; where 0.1 g/day is the adult soil ingestion rate used in NMED (2004, 85615).

Table G-4.1-10
Radionuclide Screening Action Levels

Analyte	Industrial SALs (pCi/g)	Residential SALs (pCi/g)
Americium-241	180	30
Cesium-137	23	5.6
Cobalt-60	5.1	1.3
Plutonium-238	240	37
Plutonium-239	210	33
Tritium	4.40E+05	750

Note: Radionuclide screening action levels from LANL (2005, 88493).

Table G-4.1-11
Screening Evaluation for MDA G Radionuclide COPCs Industrial Scenario

Radionuclide	Exposure Point Concentration (pCi/g)	Industrial SAL[a] (pCi/g)	Dose (mrem/yr)
Americium-241	0.05	180	0.003
Cesium-137	0.51	23	0.33
Cobalt-60	0.39[b]	5.1	1.15
Plutonium-238	0.14	240	0.009
Plutonium-239	0.22	210	0.014
Tritium	0.07	4.4xE+5	0.0005
		Total Dose	**1.5**

[a] From LANL (2005, 88493).

[b] Maximum detected concentration used because too few detected values available to calculate a representative 95% UCL.

Table G-4.1-12
Screening Evaluation for MDA G Radionuclide COPCs Residential Scenario

Radionuclide	Exposure Point Concentration (pCi/g)	Residential SSL[a] (pCi/g)	Dose (mrem/yr)
Americium-241	0.04	30	0.02
Cesium-137	0.51	5.6	1.37
Cobalt-60	0.39[b]	1.3	4.50
Plutonium-238	0.15	37	0.06
Plutonium-239	0.19	33	0.09
Tritium	13.6	750	0.27
		Total Dose	**6.3**

[a] From LANL (2005, 88493).

[b] Maximum detected concentration used because too few detected values available to calculate a representative 95% UCL.

Table G-4.3-1
Ecological Screening Levels

Analyte	Plant ESL	Earthworm ESL	Deer Mouse ESL	Montane Shrew ESL	Cottontail ESL	Red Fox ESL	Robin Insectivore ESL	Robin Omnivore ESL	Robin Herbivore ESL	Kestrel Top ESL	Kestrel Intermediate ESL	Little Brown Bat ESL
Barium	100	330	440	230	3300	41000	190	300	820	36000	1400	320
Cadmium	29	150	1.2	0.67	22	570	0.83	1.5	10	770	5.9	0.84
Chromium	2.4	1.4	2100	700	8000	18000	1300	1500	1900	38000	15000	2300
Cobalt	13	3	69	33	1800	3900	19	35	170	2300	140	45
Mercury	34	0.05	44	20	250	450	0.22	0.15	0.38	3.1	1.1	36
Selenium	0.1	7.7	1.9	200.91	55	110	1.1	2.0	10	140	8.4	1.2
Silver	0.05	na*	130	86	490	14000	14	19	30	2400	100	110
Methoxychlor[4,4'-]	na	na	15	8.4	170	140	54	30	220	420	170	10
Americium-241	21000	44	32000	31000	32000	26000	4000	4000	13000	62000	35000	260
Cesium-137	2300	1700	2400	2400	2300	680	3700	3800	4200	2900	3700	3200
Cobalt-60	750	550	760	760	760	700	1500	1500	1500	1500	1500	960
Plutonium-238	1.1E+05	44	110000	92000	120000	30000	2100	2000	8300	130000	32000	120
Plutonium-239	1.6E+05	47	150000	110000	130000	33000	2100	2100	8600	160000	34000	120
Tritium	36000	48000	330000	340000	230000	190000	440000	600000	300000	580000	630000	1.3E+09

Note: Ecological screening levels from ECORISK database version 2.1 (LANL 2004, 87386).

*na = Not available.

Table G-4.3-2
Exposure Point Concentration of COPCs Compared with Final ESL at MDA G

Analyte	Exposure Point Concentration[a] (mg/kg)	Minimum ESL (mg/kg)	Receptor	HQ (unitless)
Barium	80.2	100	Plant	0.8
Cadmium	1.2[b]	0.67	Montane shrew	1.8
Chromium	5.4	1.4	Earthworm	3.8
Cobalt	5.6(U)[c]	13	Plant	0.4
Iron	6945	na[d]	na	na
Mercury	0.02[b]	0.15	Robin insectivore	0.13
Selenium	0.64(U)[c]	0.1	Plant	6.4
Silver	2.1(U)[c]	0.05	Plant	42
Methoxychlor[4,4']	0.10	8.4	Montane shrew	0.12
Americium-241	0.05 pCi/g	44 pCi/g	Earthworm	0.001
Cesium-137	0.51 pCi/g	680 pCi/g	Red Fox	0.001
Cobalt-60	0.39 pCi/g[b]	700 pCi/g	Red Fox	0.001
Plutonium-238	0.13 pCi/g	44 pCi/g	Earthworm	0.003
Plutonium-239	0.22 pCi/g	47 pCi/g	Earthworm	0.005
Tritium	0.07 pCi/g	36,000 pCi/g	Plant	2E-6

[a] Exposure concentration is the 95% UCL, unless otherwise indicated.

[b] Maximum detected concentration used because there are too few detected values to calculate a representative 95% UCL.

[c] Not detected but detection limits above BV; maximum detection limit used as exposure concentration.

[d] na = Not available.

Table G-4.3-3
Hazard Index Analysis of COPECs at MDA G

Analyte	Exposure Point Concentration (mg/kg)	Plant HQ	Earthworm HQ	Deer Mouse HQ	Montane Shrew HQ	Cottontail HQ	Red Fox HQ	Robin Insectivore HQ	Robin Omnivore HQ	Robin Herbivore HQ	Kestrel Top HQ	Kestrel Intermediate HQ	Little Brown Bat HQ
Barium	80.2	0.8	0.24	0.18	0.35	0.024	0.002	0.42	0.27	0.098	0.0022	0.057	0.25
Cadmium	1.2	0.04	0.008	1.0	1.79	0.055	0.0021	1.45	0.8	0.12	0.0016	0.2	1.43
Chromium	5.4	2.25	3.86	0.0026	0.008	0.0007	0.0003	0.0042	0.0036	0.0028	0.0001	0.0004	0.0023
Cobalt	5.6 (U)	0.43	0.17	0.081	0.17	0.0031	0.0014	0.29	0.16	0.033	0.0024	0.04	0.12
Selenium	0.64 (U)	6.4	0.083	0.34	0.003	0.012	0.0058	0.58	0.32	0.064	0.0046	0.076	0.53
Silver	2.1 (U)	42	—*	0.016	0.024	0.0043	0.0002	0.15	0.11	0.07	0.0009	0.021	0.019
Hazard Index		**51.9**	**4.4**	**1.6**	**2.3**	**0.1**	**0.01**	**2.9**	**1.7**	**0.4**	**0.01**	**0.4**	**2.4**

*— = No ESL available so HQ not calculated.

Table G-4.3-4
Comparison of VOC Pore Gas Concentrations with Inhalation ESLs

Analyte	Exposure Point Concentration* (µg/m³)	Inhalation ESL (µg/m³)	Hazard Quotient
Acetone	126	530000	2.4E-04
Dichloroethane[1,1-]	117	5600000	2.1E-05
Dichloroethene[1,1-]	242	5700	4.2E-02
Methylene chloride	41.7	1300000	3.2E-05
Tetrachloroethene	217	73000	3.0E-03
Toluene	32	60000	5.3E-04
Trichloroethane[1,1,1-]	8720	240000	3.6E-02
Trichloroethene	231	19000	1.2E-02
Trichlorofluoromethane	101	820000	1.2E-04
Xylene (total)	19.8	87000	2.3E-04
		Hazard Index	**9.4E-02**

Note: Inhalation ESLs obtained from ECORISK Database, version 2.1 (LANL 2004, 87386).

*Maximum detected concentrations from 10–12 ft.

Appendix H

Ecological Scoping Checklist and
Surface Water Site Assessments

H-1.0 ECOLOGICAL SCOPING CHECKLIST

The ecological screening assessment was performed in 1999 as part of the Material Disposal Area (MDA) G Resource Conservation and Recovery Act (RCRA) facility investigation (RFI). This assessment included MDAs G, H, and L. The Los Alamos National Laboratory reviewed this assessment and determined that because site conditions have not changed at MDA G, the results are still relevant to this investigation report.

Part A—Scoping Meeting Documentation

Site ID	TA-54, including MDAs G, H, L and development area	
Form of Site Releases (solid, liquid, vapor) Describe all relevant known or suspected *mechanisms* of release (spills, dumping, material disposal, outfall, explosive testing, etc.) and describe potential *areas* of release. Reference locations on a map, as appropriate.	Solid, liquid, and vapor-phase contaminants have been released from the radioactive and toxic waste disposal areas at Technical Area (TA) 54. Since 1957, various types of waste have been placed in pits and shafts underground and covered with 1 to 3 m of clean dirt. Contaminated soils from the TA-01 1974–1976 Ahlquist remedial activities were spread on the surface of the north central area (Pits 6 and 7) and southeastern area (Pits 1 and 3). Liquids and solids have been placed in direct contact with subsurface and surface media without the protection of containers or liners. A number of vapor-phase organics and tritium are known to diffuse from the top surface and hillsides of Mesita del Buey.	
List of Primary Impacted Media Indicate all that apply.	Surface soil	XXX
	Groundwater	Not applicable
	Surface sediment	XXX
	Subsurface	XXX
	Groundwater	Not applicable
	Other, explain	Air
Facility for Information Management, Analysis, and Display (FIMAD) Vegetation Class Based on Arcview Vegetation Coverage Indicate all that apply.	Water	Not applicable
	Bare ground/unvegetated	Not applicable
	Spruce/fir/aspen/mixed conifer	Not applicable
	Ponderosa pine	XXX (mix on hillsides)
	Piñon juniper/juniper savannah	XXX (mix on hillsides)
	Grassland/shrubland	XXX (limited on mesa top)
	Developed	XXX (mesa top)
Is threatened and endangered (T&E) species' habitat present? If applicable, list species known or suspected that use the site for breeding or foraging.	Potential T&E habitat is found on the mesa top or hillsides of Mesita del Buey for a number of species (for a detailed list and rationale, see Banar 1996, Chapter 6, 58192). However, habitats for only the spotted bat *(Euderma maculatum)* occur readily. These species have not been observed to roost or nest in the area. Nevertheless, Banar (1996, 58192) cautions that future disturbances to cliff tops and faces could have negative impacts on these species. Additionally, disturbances (physical, chemical) to the areas surrounding TA-54 may have negative impacts on the habitat for other species of potential concern. Banar (1996, 58192) presents further details and mitigation recommendations.	

Provide a list, of neighboring/ contiguous/ upgradient sites; include a brief summary of chemicals of potential concern (COPCs) and the form of releases for relevant sites, and reference a map, as appropriate. Use this information to evaluate the need to aggregate sites for screening.	The mesa top of Mesita del Buey including MDAs G, L, and H all share a geographic proximity. These areas share the same biotic character. No other sites are present.
Surface Water Erosion Potential Information Summarize information from the standard operating procedure (SOP) 2.01, including the runoff subscore (maximum of 46), terminal point of surface water transport, slope, and surface water run-on sources.	There are a limited number of solid waste management units (SWMUs) that have undergone SOP 2.01, (Rev. 0, "Surface Water Site Assessments") evaluation of TA-54. Nine individual SWMUs consolidated into Consolidated Unit 54-013(b)-99 were evaluated at MDA G, and the erosion matrix scores range from 3.6 to 66.5. In general, from scoping investigations of the areas of concern, the factors contributing the largest fraction to the erosion potential (according to SOP 2.01 criteria) are the percentage of ground cover and the slope of the exposed area. Additionally, structures and current operations increase the erosion potential of the hillsides, as there is regular disturbance from operations to many areas that lay barren. Terminal points of surface water transport are, most proximally, Cañada del Buey on the northern side of TA-54 and Pajarito Canyon on the southern side. In most areas, direct discharge pathways to the bottoms of these canyons does not occur because often intervening benches, rocks, roads, and vegetation are obstructions; especially for the southern side of Mesita del Buey where runoff approaches Pajarito Canyon. On the northern side of MDA G, a few direct discharge pathways to the bottom of Cañada del Buey occur from the mesa top.
Other Scoping Meeting Notes	The mesa-top areas of TA-54 are not all active for waste disposal at one time; therefore, much of the area is covered with structures, roads, parking areas, industrial storage areas, and groundcover vegetation (primarily grasses). The mesa top is fenced off from the surrounding hillsides and is managed intensively to limit access to the area by large ground-dwelling animals (e.g., deer, elk, mountain lions; some limitations may apply to foxes, coyotes, raccoons, bobcat, or other medium-size mammals). The hillsides represent an intact biotic community. Although more limited in terms of species present, the mesa top is probably occupied by a biotic community with a diverse trophic structure.

Part B—Site Visit Documentation

Site ID	TA-54
Date of Site Visit	Mesa top: April 13, 1999. Hillsides: June 10, 1999
Site Visit Conducted by	Mark Hooten and Randy Ryti

Receptor Information

Estimate Cover	Relative vegetative cover (high, medium, low, none): Mesa top: low (<20%); hillsides: medium (10–40%) Relative wetland cover (high, medium, low, none): Mesa top and hillsides: none (0%) Relative structures/asphalt cover (high, medium, low, none): Mesa top: medium (~20–30%); hillsides: none (0%)
Field Notes on the FIMAD Vegetation Class to Assist in Ground-Truthing the Arcview Information	The mesa top is developed with some intrusion from grasses (e.g., *Bouteloua spp.*) and sage (*Artemesia spp.*); the hillsides are piñon-juniper and ponderosa pine woodlands. Predominant tree and shrub species include ponderosa pine (*Pinus ponderosa*), piñon (*Pinus edulis*), one-seed juniper (*Juniperus monosperma*), Rocky Mountain juniper (*Juniperus scropulorum*), Gambel oak (*Quercus gambelii*), wavyleaf oak (*Quercus undulata*), mockorange (*Philadelphus microphyllus*), mountain mahogany (*Cercocarpus montanus*), New Mexico hops (*Ptelae trifoliata*), sumac (*Rhus spp.*), and sage. Predominant ground cover includes various grasses (e.g., *Bouteloua spp.*) and some forbs as well as mosses and lichens in rocky areas.
Field Notes on T&E Habitat (if applicable) Consider the need for a site visit by a T&E subject matter expert to support the use of the site by T&E receptors.	Scoping investigation confirms that cliffside areas are largely intact on the southern side of Mesita del Buey. These areas are close to the TA-54 operations and may be impacted by noise, vibration, exhausts, or fumes, erosion, and accelerated runoff from barren mesa-top areas.
Are ecological receptors present at the site? (yes/no/uncertain) Describe the general types of receptors present at the site (terrestrial and aquatic), and make notes on the quality of habitat present at the site.	Yes. The mesa-top areas are managed in a way that limits ecological receptors to invasive plants, small mammals, birds, and invertebrates but may retain trophic integrity. The hillsides areas appear to have intact biotic communities and therefore comprise a full suite of potential biotic receptors. Scoping activities revealed abundant invertebrates, reptiles, mammals, birds, and plant life on the hillsides.

Contaminant Transport Information

Surface Water Transport Field notes should summarize the erosion potential, including a discussion of the terminal point of surface water transport, if applicable.	Erosion potential of the mesa top is generally low because of the low gradient of most surfaces. However, sheet flow from rainstorm events has a high potential for run on from the mesa top to the hillsides, thus fostering erosion of the hillsides. (There appear to be few best management practices on the mesa edge that limit the potential for water to organize into small rill-conduits that can further organize into larger flows [i.e., rivulets] on the hillside areas.) The mesa top and mesa edge, especially areas of the MDAs bordering the fenceline, are generally barren and have had much of the vegetation cut for fire control. This practice increases the potential for erosion from the mesa top and mesa edge, as well as increases the potential for hillside erosion. In the downslope areas, runoff clearly funneled into deeper and wider channels, until water reaches the canyon bottoms where potential energy is dissipated and water spreads across the canyon bottoms. Thicker deposits of erosive sediments typify downslope areas toward the surrounding canyon bottoms, where these sediments are widely distributed.
Are there any off-site transport pathways (surface water, air, or groundwater)? (yes/no/uncertain)	Yes. Surface water and air provide ample opportunity for transport of soil-borne contaminants off the mesa top and into the neighboring canyons. Air currents carry volatile organic compounds (VOCs) and tritium exhaled from Mesita del Buey.
Is an interim action (IA) needed to limit off-site transport? (yes/no/uncertain) Provide explanation/ recommendation for IA to project lead.	A conflict exists between fire suppression and natural attenuation of erosion from the mesa edge (i.e., plants providing ample root-based soil support). Additionally, the perimeter of the MDAs, as defined by the fenceline, should be completely lined with permanent barriers to water flowing from the mesa top. A stormwater collection system should be designed such that deep runoff channels are not incised in the hillsides (as presently found). Slowing the flow of runoff from the mesa top would limit the potential for off-site transport of surface contamination (or eventually contamination at depth) and would lessen the impact of erosion to mesa-top and hillside biotic communities.

Ecological Effects Information

Physical Disturbance Provide list of major types of disturbances, including erosion and construction activities; review historical aerial photos where appropriate.	Much of the woodland areas typical of the hillsides show signs of erosion disturbance. In particular, the wooded areas bordering TA-54 on the northeastern and eastern edges of Mesita del Buey show signs of accelerated erosion from past conditions. In these areas, surface water movement accelerated by clearing the mesa-top vegetation and a fire break around MDA G has destroyed the biotic crust (cryptogamic crust) that is typical of wooded area soils of the Pajarito Plateau. Also, increasingly thicker deposits of erosive sediments typify downslope areas toward the surrounding canyon bottoms. In the canyon bottoms, erosional sediments are widely distributed. Such sediments (as well as the channelization of water) have negative effects on the understory flora and ground-dwelling fauna.
Are there obvious ecological effects? (yes/no/uncertain) Provide an explanation and apparent cause (e.g., contamination, physical disturbance, other).	The only obvious ecological effects from TA-54 operations are from physical disturbance of the area. There are no overt signs of contamination having ecological effects. Contaminants are known to have reached biotic populations, e.g., vegetation (Fresquez et al. 1997, 62346), small mammals (Bennett et al. 1997, 62342), and invertebrates (Haarmann and Fresquez 1998, 62351); however, there have been no demonstrated population-wide or individual toxicological effects.

IA needed to limit apparent ecological effects? (yes/no/uncertain) Provide explanation and recommendations for IA to mitigate apparent exposure pathways to project lead.	Uncertain. Some contaminants may be entering the biota and are possibly being carried through the food chain (although there is no indication of effects from biomagnification). However, because there have been no measurable or observable effects on the biota, either to individuals or populations, recommendation of any interim action (IA) to ameliorate the current rate of transfer into the biota would be premature. Still, any actions that may decelerate the acquisition of contaminants by biotic organisms (e.g., the control of erosion) would be prudent for limiting exposure, thus limiting potential adverse effects associated with contaminant uptake or exposure.

No Exposure/Transport Pathways

If there are no complete exposure pathways to ecological receptors on site and no transport pathways to off-site receptors, the remainder of the checklist should not be completed. Stop here and provide additional explanation/justification for proposing an ecological no further action recommendation (if needed). At a minimum, the potential for future transport should include likelihood that future construction activities could make contamination more available for exposure or transport. There is the potential for some ground-dwelling organisms (e.g., fossorial rodents), including deeply rooted plants, to intrude into buried waste. Additionally, future construction, grading, or digging activities pose the potential for mobilizing contaminants buried at depth, thus making them accessible to ecological receptors. Soil-based contamination and VOC vapors in rodent burrows pose the most significant threats to biota on in the current day.

Adequacy of Site Characterization

Do existing or proposed data provide information on the nature, rate, and extent of contamination? (yes/no/uncertain) Provide explanation (consider if the maximum value was captured by existing sample data).	It appears that existing data characterize the current conditions of contamination, including its nature and distribution, on TA-54. Rate of contaminants availed to ecological receptors that are being added to the inventory of TA-54 is unclear. However, current waste-handling operations are conducted such that wastes added to the TA-54 inventory are projected to have zero availability to ecological receptors of current day; this practice includes new protocols for depth of burial (3 m) and containment as well as and institutional controls.
Do existing or proposed data for the site address potential transport pathways of site contamination? (yes/no/uncertain) Provide explanation (consider if other sites should be aggregated to characterize potential ecological risk).	Yes. Existing data are adequate for characterizing models that describe the mass transport of soils and contaminants from the area of TA-54 to the far reaches of Cañada del Buey and Pajarito Canyon.

Additional Field Notes

Provide additional field notes on the site setting and potential ecological receptors. In summary, the area of TA-54, including MDA G and the development area, is a controlled waste-handling operation that largely contains the waste inventory, thus limiting its accessibility to ecological receptors. Legacy contamination released to the surface or near subsurface, however, may be reaching biotic receptors, primarily because of erosive forces exposing and mobilizing contaminants. To date, however, no apparent negative effects are found on the biota because of exposure to contamination. This state, however, may reflect a limitation of knowledge with regard to the reproductive, demographic, and genetic dynamics of receptor populations. Future potential for contaminant exposure (e.g., by mass wasting events, biotic activity on the site) is only obviated by the large inventory of buried waste at TA-54. The availability of such wastes to biotic receptors will depend on the mechanism of exposure, rate of exposure, and the natural geochemical processes that preclude or foster biotic uptake.

Part C—Ecological Pathways Conceptual Exposure Model

Question A

Could soil contaminants reach receptors by way of vapors?

- **Volatility of the hazardous substance (volatile chemicals generally have Henry's Law constant >10-5 atm-me/mol and molecular weight <200 g/mol).**

Answer (likely/unlikely/uncertain): Likely

Provide explanation: The following are VOCs at TA-54 and are measured for their flux off of the mesa.

MDA G. The primary VOC being emitted to the atmosphere is 1,1,1-trichloroethane (TCA). Next are perchloroethylene (PCE, tetrachloroethene), trichloroethylene (TCE, trichloroethene), and toluene.

MDA L. The primary VOCs being emitted to the atmosphere include TCA, followed by TCE and PCE. Secondary VOCs are Freon 113, acetone, and 1,1-dichloroethene.

MDA H. There is no measurable VOC plume at this site. Tritium, although not a VOC, is known to be in flux from the ground to the atmosphere.

General. The effects of the above VOCs and tritium on ecological receptors are poorly understood. Furthermore, the natural environment processes that may cause exposure of VOCs to organisms are not well understood. For example, the amount of such vapors reaching receptors depends on atmospheric dispersion processes such as temperature, airborne moisture, wind speed and direction, convective dynamics, as well as atmospheric dilution. Confounding factors in the biota, such as anatomical and physiological characteristics and behavioral and reproductive phenologies, require direct experimental field observations in order to evaluate the degree of exposure to VOCs under natural conditions. Among all potential receptors, ground-dwelling organisms are probably the most vulnerable. In particular, ground-burrowing rodents will likely encounter vapors in the soil at higher concentrations than most other receptors. It is likely that the period of time when these animals are most vulnerable is when they are in burrows rearing young.

Question B

Could the soil contaminants reach receptors through fugitive dust carried in air?

- **Soil contamination would have to be on the actual surface of the soil to become available for dust.**
- **In the case of dust exposures to burrowing animals, the contamination would have to occur in the depth interval where these burrows occur.**

Answer (likely/unlikely/uncertain): Likely

Provide explanation: Given current operations at TA-54 and erosional characteristics of the periphery of Mesita del Buey, there is a strong likelihood for fugitive dust reaching receptors in the area. The quantity of this exposure is not known and is a large uncertainty for evaluating ecological risk.

Question C

Can contaminated soil be transported to aquatic ecological communities? (Use SOP 2.01 run-off score and terminal point of surface water runoff to help answer this question)?

- **If the SOP 2.01 run-off score* for each PRS included in the site is equal to zero, this suggests that erosion at the site is not a transport pathway. (* note that the runoff score is not the entire erosion potential score, rather it is a subtotal of this score with a maximum value of 46 points).**
- **If erosion is a transport pathway, evaluate the terminal point to see if aquatic receptors could be affected by contamination from this site.**

Answer (likely/unlikely/uncertain): Unlikely

Provide explanation: There is some probability that water-borne constituents may reach aquatic communities at some time in the distant future. However, given the relatively flat terrain that surrounds the cliffs of Mesita del Buey, this does not appear to be a current exposure pathway to biota.

Question D

Is contaminated groundwater potentially available to biological receptors through seeps or springs or shallow groundwater?

- **Known or suspected presence of contaminants in groundwater.**

The potential for contaminants to migrate by way of groundwater and discharge into habitats and/or surface waters

Contaminants may be taken up by terrestrial and rooted aquatic plants whose roots are in contact with groundwater present within the root zone (~1 m depth).

Terrestrial wildlife receptors generally will not contact groundwater unless it is discharged to the surface.

Answer (likely/unlikely/uncertain): Unlikely

Provide explanation: Depth to groundwater from the top of Mesita del Buey is over 900 vertical ft. It is not probable that biota will ever be receptive of contaminants by way of a groundwater pathway.

Question E

Is infiltration/percolation from contaminated subsurface material a viable transport and exposure pathway?

- **Suspected ability of contaminants to migrate to groundwater.**
- **The potential for contaminants to migrate by way of groundwater and discharge into habitats and/or surface waters.**
- **Contaminants may be taken up by terrestrial and rooted aquatic plants whose roots are in contact with groundwater present within the root zone (~1 m depth).**
- **Terrestrial wildlife receptors generally will not contact groundwater unless it is discharged to the surface.**

Answer (likely/unlikely/uncertain): Unlikely

Provide explanation: See response to Question D.

Question F

Might erosion or mass wasting events be a potential release mechanism for contaminants from subsurface materials or perched aquifers to the surface?

- **This question is only applicable to release sites located on or near the mesa edge.**
- **Consider the erodability of surficial material and the geologic processes of canyon/mesa edges.**

Answer (likely/unlikely/uncertain): Unlikely

Provide explanation: Mass-wasting events are rare events on an ecological time scale. (Many of the Anasazi Indian cliff dwellings in the area, each 800–1200 yr old, are still intact despite being in soft tuffaceous material at the edge of cliffs. Ecological time scales are measured by generation (a species-specific measure) and biogeographic changes in populations. The former are relatively short, 10–15 yr for a long-lived organism like an elk, while the latter are often multigenerational but often less than 1000 yr for even the longest-lived organisms, e.g., ponderosa pine. Thus, mass-wasting events of significant proportion occur on a frequency of less than what is observed for biogeographic changes in some of the longest-lived organisms.

Question G

Could airborne contaminants interact with receptors through respiration of vapors?

- **Contaminants must be present as volatiles in the air.**
- **Consider the importance of inhalation of vapors for burrowing animals.**
- **Foliar uptake of organic vapors is typically not a significant exposure pathway.**

Provide quantification of exposure pathway (0 = no pathway, 1 = unlikely pathway, 2 = minor pathway, 3 = major pathway).

Terrestrial Plants: 2

Terrestrial Animals: 2

Provide explanation: See answer to Question A.

<u>Question H</u>

Could airborne contaminants interact with plants through deposition of particulates or with animals through inhalation of fugitive dust?

- **Contaminants must be present as particulates in the air or as dust for this exposure pathway to be complete.**
- **Exposure by way of inhalation of fugitive dust is particularly applicable to ground-dwelling species that would be exposed to dust disturbed by their foraging or burrowing activities or by wind movement.**

Provide quantification of exposure pathway (0 = no pathway, 1 = unlikely pathway, 2 = minor pathway, 3 = major pathway).

Terrestrial Plants: 2

Terrestrial Animals: 2

Provide explanation: See answer to Question B.

<u>Question I</u>

Could contaminants interact with plants through root uptake or rain splash from surficial soils?

- **Contaminants in bulk soil may partition into soil solution, making them available to roots.**
- **Exposure of terrestrial plants to contaminants present in particulates deposited on leaf and stem surfaces by rain striking contaminated soils (i.e., rain splash).**

Provide quantification of exposure pathway (0 = no pathway, 1 = unlikely pathway, 2 = minor pathway, 3 = major pathway).

Terrestrial Plants: 3

Provide explanation: Root uptake is likely to have a large influence on the contaminants acquired by plants. Deeply rooted plants, such as junipers, may penetrate waste cells where capping soils are less than 3 m deep. Any contamination on the surface may reach plants by way of root uptake and/or rain splash.

<u>Question J</u>

Could contaminants interact with receptors through food web transport from surficial soils?

- **The chemicals may bioaccumulate in animals.**
- **Animals may ingest contaminated food items.**

Provide quantification of exposure pathway (0 = no pathway, 1 = unlikely pathway, 2 = minor pathway, 3 = major pathway).

Terrestrial Animals: 3

Provide explanation: Aroclor-1254 is considered a persistent bioaccumulator.

Question K

Could contaminants interact with receptors by way of incidental ingestion of surficial soils?

- **Incidental ingestion of contaminated soil could occur while animals grub for food resident in the soil, feed on plant matter covered with contaminated soil, or while grooming themselves clean of soil.**

Provide quantification of exposure pathway (0 = no pathway, 1 = unlikely pathway, 2 = minor pathway, 3 = major pathway).

Terrestrial Animals: 3

Provide explanation: The dietary fraction of surface soils in a receptor's diet is species-specific. At TA-54, surface soil contamination is present, and fossorial animals will come into contact with subsurface contaminants that may then be transported to the surface during burrowing activities.

Question L

Could contaminants interact with receptors through dermal contact with surficial soils?

- **Significant exposure by way of dermal contact would generally be limited to organic contaminants that are lipophilic and can cross epidermal barriers.**

Provide quantification of exposure pathway (0 = no pathway, 1 = unlikely pathway, 2 = minor pathway, 3 = major pathway):

Terrestrial Animals: 2

Provide explanation: Because contaminants are known from the surface soils at TA-54, terrestrial animals will make some dermal contact. However, this pathway is far less important than dietary uptake, as the pelage of mammals, the scales of reptiles, the exoskeletons/exoderms of invertebrates, and the feathers of birds offer substantial protection from dust and water penetration to the skin.

Question M

Could contaminants interact with plants or animals through external irradiation?

- **External irradiation effects are most relevant for gamma emitting radionuclides.**
- **Burial of contamination attenuates radiological exposure.**

Provide quantification of exposure pathway (0 = no pathway, 1 = unlikely pathway, 2 = minor pathway, 3 = major pathway).

Terrestrial Plants: 2–3

Terrestrial Animals: 2–3

Provide explanation: Depending on the level of radiological contamination, this pathway may be minor to major. The known radiological COPCs identified at MDA G are americium-241, cesium-137, plutonium-238, plutonium-239, strontium-90, technetium-99, thorium-228, thorium-230, thorium-232, uranium-234, uranium-235, and uranium-238. Gamma-emitting radionuclides include americium-241, cesium-137, plutonium-239, technetium-99, thorium-228, thorium-230, thorium-232, uranium-234, uranium-235, and uranium-238.

Question N

Could contaminants interact with plants through direct uptake from water and sediment or sediment rain splash?

- **Contaminants may be taken-up by terrestrial plants whose roots are in contact with surface waters.**
- **Terrestrial plants may be exposed to particulates deposited on leaf and stem surfaces by rain striking contaminated sediments (i.e., rain splash) in an area that is only periodically inundated with water.**
- **Contaminants in sediment may partition into soil solution, making them available to roots.**

Provide quantification of exposure pathway (0 = no pathway, 1 = unlikely pathway, 2 = minor pathway, 3 = major pathway).

Terrestrial Plants: 0

Provide explanation: There are no aquatic environs that influence terrestrial vegetation on TA-54.

Question O

Could contaminants interact with receptors through food web transport from water and sediment?

- **The chemicals may bioconcentrate in food items.**
- **Animals may ingest contaminated food items.**

Provide quantification of exposure pathway (0 = no pathway, 1 = unlikely pathway, 2 = minor pathway, 3 = major pathway):

Terrestrial Animals: 0

Provide explanation: There are no aquatic environs that influence terrestrial vegetation on TA-54.

Question P

Could contaminants interact with receptors by way of ingestion of water and suspended sediments?

- **If sediments are present in an area that is only periodically inundated with water, terrestrial receptors may incidentally ingest sediments.**
- **Terrestrial receptors may ingest water-borne contaminants if contaminated surface waters are used as a drinking water source.**

Provide quantification of exposure pathway (0 = no pathway, 1 = unlikely pathway, 2 = minor pathway, 3 = major pathway).

Terrestrial Animals: 0

Provide explanation: There are no aquatic environs that influence terrestrial vegetation on TA-54.

Question Q

Could contaminants interact with receptors through dermal contact with water and sediment?

- **If sediments are present in an area that is only periodically inundated with water, terrestrial species may be dermally exposed during dry periods.**
- **Terrestrial organisms may be dermally exposed to water-borne contaminants as a result of wading or swimming in contaminated waters.**

Provide quantification of exposure pathway (0 = no pathway, 1 = unlikely pathway, 2 = minor pathway, 3 =major pathway):

Terrestrial Animals: 0

Provide explanation: There are no aquatic environs that influence terrestrial vegetation on TA-54.

Question R

Could contaminants interact with plants or animals through external irradiation?

- **External irradiation effects are most relevant for gamma-emitting radionuclides.**
- **Burial of contamination attenuates radiological exposure.**

Provide quantification of exposure pathway (0 = no pathway, 1 = unlikely pathway, 2 = minor pathway, 3 = major pathway):

Terrestrial Plants: 0

Terrestrial Animals: 0

Provide explanation: There are no aquatic environs that influence terrestrial vegetation on TA-54.

Question S

Could contaminants bioconcentrate in free-floating aquatic, attached aquatic plants, or emergent vegetation?

- **Aquatic plants are in direct contact with water.**
- **Contaminants in sediment may partition into pore water, making them available to submerged roots.**

Provide quantification of exposure pathway (0 = no pathway, 1 = unlikely pathway, 2 = minor pathway, 3 = major pathway).

Aquatic Plants/Emergent Vegetation: 0

Provide explanation: There are no aquatic environs on TA-54.

Question T

Could contaminants bioconcentrate in sedimentary or water column organisms?

- **Aquatic receptors may actively or incidentally ingest sediment while foraging.**
- **Aquatic receptors may be directly exposed to contaminated sediments or may be exposed to contaminants through osmotic exchange, respiration, or ventilation of sediment pore waters.**
- **Aquatic receptors may be exposed through osmotic exchange, respiration, or ventilation of surface waters.**

Provide quantification of exposure pathway (0 = no pathway, 1 = unlikely pathway, 2 = minor pathway, 3 = major pathway):

Aquatic Animals: 0

Provide explanation: There are no aquatic environs on TA-54.

Question U

Could contaminants bioaccumulate in sedimentary or water column organisms?

- **Lipophilic organic contaminants and some metals may concentrate in an organism's tissues.**
- **Ingestion of contaminated food items may result in contaminant bioaccumulation through the food web.**

Provide quantification of exposure pathway (0 = no pathway, 1 = unlikely pathway, 2 = minor pathway, 3 = major pathway).

Aquatic Animals: 0

Provide explanation: There are no aquatic environs on TA-54.

Question V

Could contaminants interact with aquatic plants or animals through external irradiation?

- **External irradiation effects are most relevant for gamma-emitting radionuclides.**
- **The water column acts to absorb radiation, thus external irradiation is typically more important for sediment dwelling organisms.**

Provide quantification of exposure pathway (0 = no pathway, 1 = unlikely pathway, 2 = minor pathway, 3 = major pathway):

Aquatic Plants: 0

Aquatic Animals: 0

Provide explanation: There are no aquatic environs on TA-54.

H-2.0 REFERENCES

The following list includes all references cited in this appendix. Parenthetical information following each reference provides the author, publication date, and the ER identification (ID) number. This information also is included in the citations in the text. ER ID numbers are assigned by the Los Alamos National Laboratory's ENV-ERS Program to track records associated with the Program. These numbers can be used to locate copies of the actual documents at the ENV-ERS Program's Records Processing Facility and, where applicable, with the ENV-ERS Program's reference library titled "Reference Set for Material Disposal Areas, Technical Area 54."

Copies of the reference library are maintained at the NMED Hazardous Waste Bureau; the DOE Los Alamos Site Office; and EPA, Region 6. This library is a living collection of documents that was developed to ensure that the administrative authority has all the necessary material to review the decisions and actions proposed in this document. However, documents previously submitted to the administrative authority are not included.

Banar, A., February 1996. "Biological Assessment for Environmental Restoration Program, Operable Unit 1148, TA-54 and TA-51," Los Alamos National Laboratory document LA-UR-93-1054, Los Alamos, New Mexico. (Banar 1996, 58192)

Bennett, K., J. Biggs, and P. Fresquez, January 1997. "Radionuclide Contaminant Analysis of Small Mammals at Area G, TA-54, Los Alamos National Laboratory, 1995," Los Alamos National Laboratory report LA-13242-MS, Los Alamos, New Mexico. (Bennett et al. 1997, 62342)

Fresquez, P., E. Vold, and L. Naranjo, Jr., July 1997. "Radionuclide Concentrations in Soils and Vegetation at Radioactive-Waste Disposal Area G during the 1996 Growing Season," Los Alamos National Laboratory report LA-13332-PR, Los Alamos, New Mexico. (Fresquez et al. 1997, 62346)

Haarman, T., and P. Fresquez, July 1998. "Radionuclide Concentrations in Honey Bees from Area G at TA-54 during 1997," Los Alamos National Laboratory report LA-13480-PR, Los Alamos, New Mexico. (Haarmann and Fresquez 1998, 62351)

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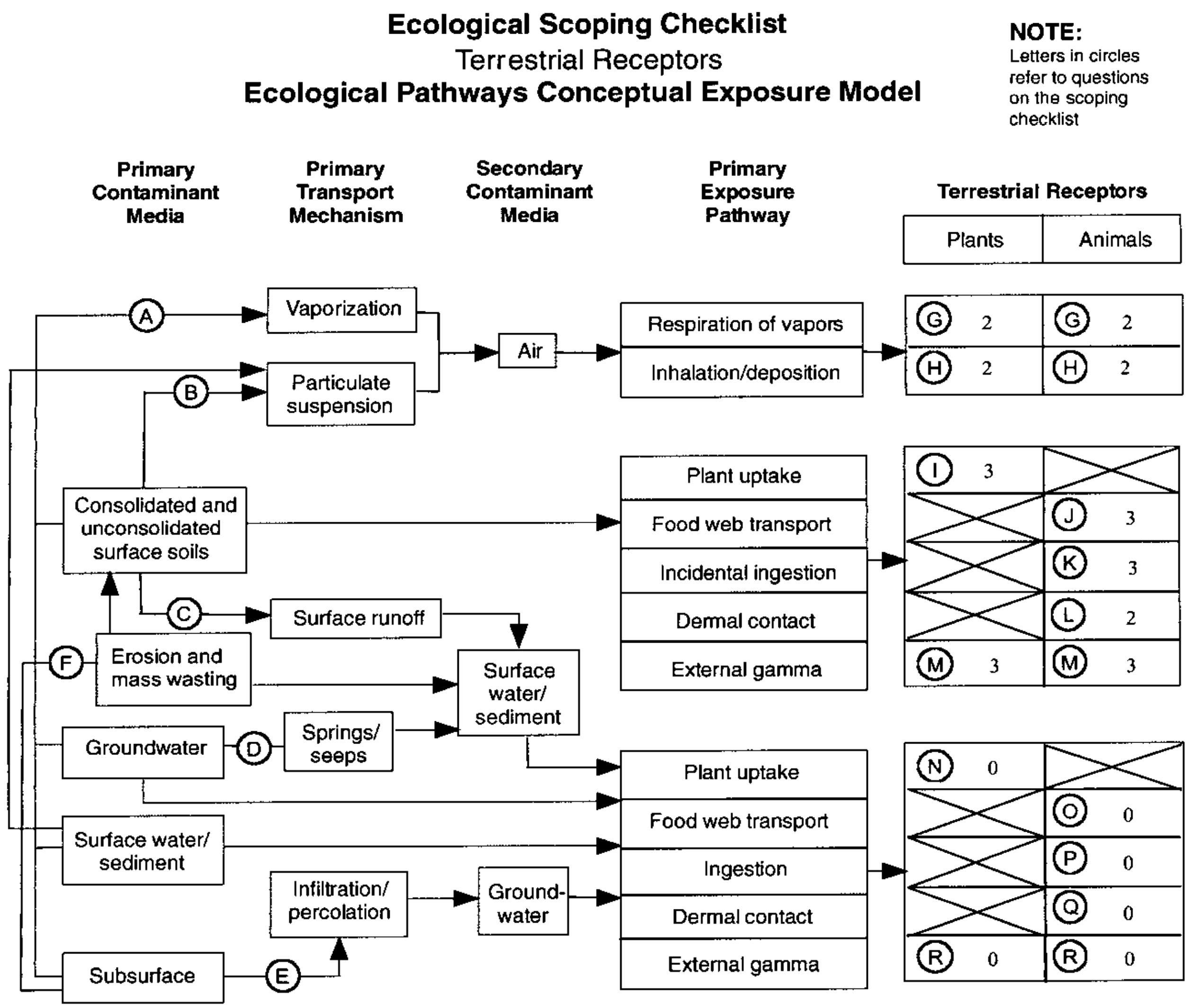


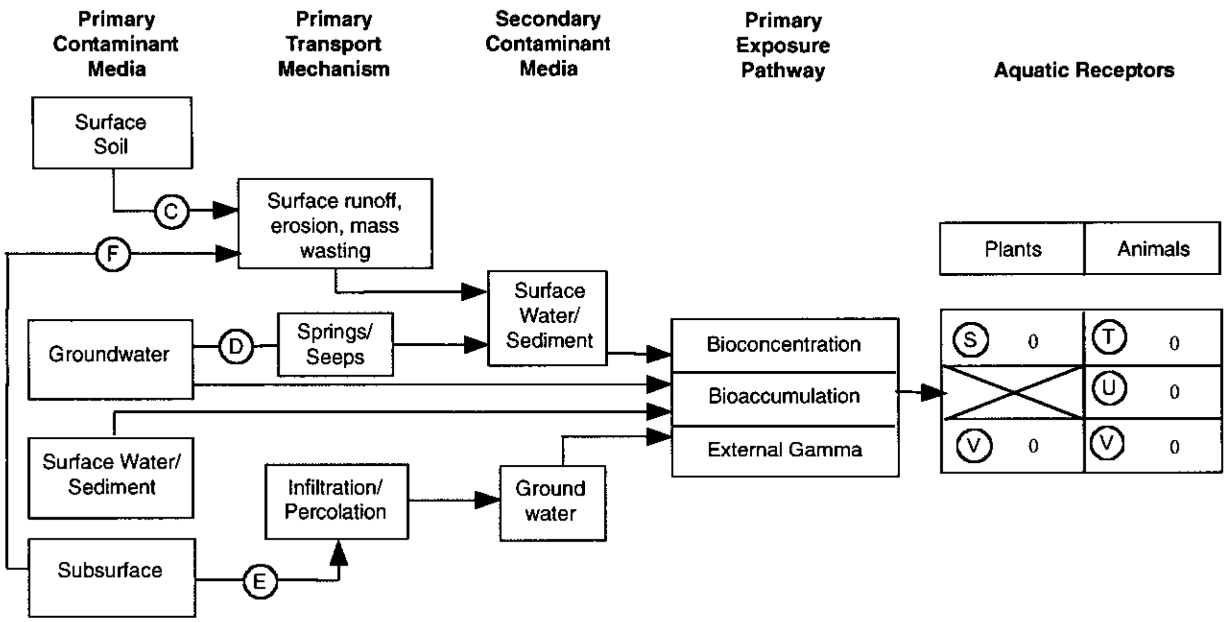
Ecological Scoping Checklist
Terrestrial Receptors
Ecological Pathways Conceptual Exposure Model
NOTE:
Letters in circles refer to questions on the scoping checklist
Primary Contaminant Media
Primary Transport Mechanism
Secondary Contaminant Media
Primary Exposure Pathway
Terrestrial Receptors
Plants
Animals
A
Vaporization
B
Particulate suspension
Air
Respiration of vapors
Inhalation/deposition
G 2
G 2
H 2
H 2
Consolidated and unconsolidated surface soils
C
Surface runoff
F
Erosion and mass wasting
Surface water/ sediment
Groundwater
D
Springs/ seeps
Surface water/ sediment
Infiltration/ percolation
Ground-water
Subsurface
E
Plant uptake
Food web transport
Incidental ingestion
Dermal contact
External gamma
I 3
J 3
K 3
L 2
M 3
M 3
Plant uptake
Food web transport
Ingestion
Dermal contact
External gamma
N 0
O 0
P 0
Q 0
R 0
R 0

Ecological Scoping Checklist

Aquatic Receptors

Ecological Pathways Conceptual Exposure Model

NOTE:
Letters in circles refer to questions on the Scoping Checklist



H-3.0 SURFACE WATER SITE ASSESSMENTS

Los Alamos National Laboratory

Page 1 of 5 **Surface Water Site Assessment**

Site Information

Site ID:	PRS ID:	Nearest Struct:
1698	54-013(b)	

Setting

Topography

On Mesa Top: Yes **On Bench In Canyon:** No **On Canyon Floor, Not Channel:** No **In Channel In Canyon Floor:** No

Topography Explanation:
54-013(b) is a consolidation PRS, that encompasses all the different PRSs w ithin TA-54 Area G. All the PRSs w ithin Area G w ere assessed individually, due to the size and the complexity of the area.

Ground/Canopy Cover

Sparse (<25%): No **Medium (25-75%):** No **Thick (>75%):** No

Ground/Canopy Cover Explanation:
All Assessment w ere done individually.

Slope at Area Impacted

Flat (<10%): No **Gradual (10-30%):** No **Steep (>30%):** No

Slope Explanation:
All Assessment w ere done individually.

Run-off

Is There Visible Evidence of Run-off Discharging from Site:
No

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Surface Water Site Assessment

PRS ID: 54-013(b)

Run-off (Continued)

Is Run-off Channelized:	Channel Type:
No	

Channelization Explanation:
All Assessment w ere done individually.

Where Does Evidence of Runoff Terminate:

Terminus Explanation

Has Run-off Caused Visible Erosion:	Erosion Type:
No	

Erosion Explanation:

Run-on

Structural Run On. Are Structures Creating Run-on to the Site:
No

Structural Run-on Explanation:
All Assessment w ere done individually.

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Surface Water Site Assessment

PRS ID: 54-013(b)

Run-on (Continued)

Natural Run-on. Is Natural Drainage Creating Run-on to the Site: No
Natural Run-on Explanation: All Assessment w ere done individually.

Current Operations Run-on. Are Current Operations Creating Run-on to the Site: No
Current Operations Run-on Explanation: All Assessment w ere done individually.

Assessment Finding

Based on the Above Criteria and the Assessment of this Site, Does Soil Erosion Potential Exist: No

Sign Off

Site Not Found: No	**Revision of Earlier Assessment:** No	
Name of Assessment Author:		**Assessment Date:** 09/21/2001

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Surface Water Site Assessment

PRS ID: 54-013(b)

Additional Information

Trash and Debris Notes

Is there Visible Trash and Debris on the Site:	Is there Visible Trash and Debris in a Watercourse:
No	No

Trash and Debris Explanation:

General Notes

Assessment Comments:

54-013(b) is a consolidation PRS, that encompasses all the different PRSs w ithin TA-54 Area G. All the PRSs w ithin Area G w ere assessed individually, due to the size and the complexity of the area. ** 54-013(b) w as not a specific PRS, nor did it consist of an individual site. It w as a consolidation number that encompassed all the PRSs in Area G.

Best Management Practice Notes

Are Permanent BMPs in Place:	Permanent BMPs in Place:
No	

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Surface Water Site Assessment

PRS ID: 54-013(b)

Erosion Matrix

Erosion/Sediment Transport Potential Scoring Criteria	Max Score Poss	Score Modifers for Transport Potential			Resulting Score
		Low (max * 0.1)	Med (max * 0.5)	High (max * 1.0)	
Setting Group (Max Total 43)					
Topography - On Mesa Top:	1	For these four criteria, use the single highest score from the criteria that received a "Yes" answer.			1.0
Topography - On Bench in Canyon:	4				
Topography - On Canyon Floor, Not in Channel:	13				
Topography - In Channel in Canyon Floor:	17				
Ground/Canopy Cover (Percent):	13	>75%	25-75%	<25%	1.3
Slope at Area Impacted:	13	<10%	10-30%	>30%	1.3
Run-off Group (Max Total 46)					
Visible Evidence of Run-off:	5	"Yes" = 5. "No" = 0 here and for two scores below.			0.0
Where Run-off Terminates:	19	"Other"	"Bench"	"Drainage/Canyon"	0.0
Visible Erosion:		"No" = 0. If "Yes", score by Erosion Type.			0.0
Erosion Type:	22	"Sheet"	"Rill"	"Gully"	
Run-on Group (Max Total 11)					
Structural Run-on:	7	"No" = 0. "Yes" = 7.			0.0
Natural Run-on:	7	"No" = 0. "Yes" = 7.			0.0
Current Operations Run-on:	4	"No" = 0. "Yes" = 4.			0.0
Maximum Possible Total Score:	**100**			*** Actual Total Score:**	**3.6**

Revision of Earlier Assessment: No

*** No permanent BMPs are in place. Score could be lower with them.**

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Surface Water Site Assessment

Site Information

Site ID:	PRS ID:	Nearest Struct:
1700	54-014(b)	54-8

Setting

Topography

On Mesa Top: Yes **On Bench In Canyon:** No **On Canyon Floor, Not Channel:** No **In Channel In Canyon Floor:** No

Topography Explanation:

PRS is located south of building 54-8. The area is divided into tw o levels, a small slope separates the levels. Both levels are flat, storage barrels are located in both areas.

Ground/Canopy Cover

Sparse (<25%): No **Medium (25-75%):** Yes **Thick (>75%):** No

Ground/Canopy Cover Explanation:

Vegetative coverage is approximately 35%, consisting mainly of forbs. The area is being disturbed by heavy machinery, soil is loose throughout the site.

Slope at Area Impacted

Flat (<10%): Yes **Gradual (10-30%):** Yes **Steep (>30%):** No

Slope Explanation:

PRS is divided into tw o levels by a slope. The slope of the tw o levels is less than 10%, the slope joining the tw o levels is approximately 20-25%.

Run-off

Is There Visible Evidence of Run-off Discharging from Site:

No

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Surface Water Site Assessment

PRS ID: 54-014(b)

Run-off (Continued)

Is Run-off Channelized:	**Channel Type:**
No	

Channelization Explanation:
There is no visible evidence of runoff discharging from the site.

Where Does Evidence of Runoff Terminate:

Terminus Explanation

Has Run-off Caused Visible Erosion:	**Erosion Type:**
No	

Erosion Explanation:

Run-on

Structural Run On. Are Structures Creating Run-on to the Site:
No

Structural Run-on Explanation:

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Surface Water Site Assessment

PRS ID: 54-014(b)

Run-on (Continued)

Natural Run-on. Is Natural Drainage Creating Run-on to the Site: No
Natural Run-on Explanation: There are no natural drainage patterns.

Current Operations Run-on. Are Current Operations Creating Run-on to the Site: No
Current Operations Run-on Explanation: Equipment activity (forklift) is disturbing soil on the slope and causing soil displacement.

Assessment Finding

Based on the Above Criteria and the Assessment of this Site, Does Soil Erosion Potential Exist: Yes

Sign Off

Site Not Found: No	**Revision of Earlier Assessment:** No	
Name of Assessment Author:		**Assessment Date:** 07/30/2001

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Los Alamos National Laboratory

Surface Water Site Assessment

PRS ID: 54-014(b)

Additional Information

Trash and Debris Notes

Is there Visible Trash and Debris on the Site:	Is there Visible Trash and Debris in a Watercourse:
No	No

Trash and Debris Explanation:

General Notes

Assessment Comments:

A minor erosion potential exists. Geo textile matting is deteriorating and being displaced by heavy equipment. Site is an active storage area.

Best Management Practice Notes

Are Permanent BMPs in Place:	Permanent BMPs in Place:
No	

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Surface Water Site Assessment

PRS ID: 54-014(b)

Erosion Matrix

Erosion/Sediment Transport Potential Scoring Criteria	Max Score Poss	Score Modifers for Transport Potential			Resulting Score
		Low (max * 0.1)	Med (max * 0.5)	High (max * 1.0)	
Setting Group (Max Total 43)					
Topography - On Mesa Top:	1	For these four criteria, use the single highest score from the criteria that received a "Yes" answer.			1.0
Topography - On Bench in Canyon:	4				
Topography - On Canyon Floor, Not in Channel:	13				
Topography - In Channel in Canyon Floor:	17				
Ground/Canopy Cover (Percent):	13	>75%	25-75%	<25%	6.5
Slope at Area Impacted:	13	<10%	10-30%	>30%	6.5
Run-off Group (Max Total 46)					
Visible Evidence of Run-off:	5	"Yes" = 5. "No" = 0 here and for two scores below.			0.0
Where Run-off Terminates:	19	"Other"	"Bench"	"Drainage/Canyon"	0.0
Visible Erosion:		"No" = 0. If "Yes", score by Erosion Type.			0.0
Erosion Type:	22	"Sheet"	"Rill"	"Gully"	
Run-on Group (Max Total 11)					
Structural Run-on:	7	"No" = 0. "Yes" = 7.			0.0
Natural Run-on:	7	"No" = 0. "Yes" = 7.			0.0
Current Operations Run-on:	4	"No" = 0. "Yes" = 4.			0.0
Maximum Possible Total Score:	**100**			*** Actual Total Score:**	**14.0**

Revision of Earlier Assessment: No

*** No permanent BMPs are in place. Score could be lower with them.**

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Los Alamos National Laboratory

Surface Water Site Assessment

Site Information

Site ID:	PRS ID:	Nearest Struct:
1701	54-014(c)	

Setting

Topography

On Mesa Top: Yes **On Bench In Canyon:** No **On Canyon Floor, Not Channel:** No **In Channel In Canyon Floor:** No

Topography Explanation:
Site is level, multiple concrete caps are visible. Area is located betw een asphalt roadw ays and surrounded by concrete barriers.

Ground/Canopy Cover

Sparse (<25%): No **Medium (25-75%):** Yes **Thick (>75%):** Yes

Ground/Canopy Cover Explanation:
Vegetation consists of native grasses and forbs at a rate on 25-30%. Shafts are covered w ith concrete and steel covers.

Slope at Area Impacted

Flat (<10%): Yes **Gradual (10-30%):** No **Steep (>30%):** No

Slope Explanation:
Site is located on level ground.

Run-off

Is There Visible Evidence of Run-off Discharging from Site:
Yes

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Los Alamos National Laboratory

Surface Water Site Assessment

PRS ID: 54-014(c)

Run-off (Continued)

Is Run-off Channelized:	Channel Type:
Yes	Man-Made

Channelization Explanation:
Run-off is collected in a drainage inlet.

Where Does Evidence of Runoff Terminate:
Drainage/Canyon

Terminus Explanation
Run-off terminates in Pajarito Canyon, but enters through a tributary of that canyon.

Has Run-off Caused Visible Erosion:	Erosion Type:
No	

Erosion Explanation:
No visible erosion resulting from run-off.

Run-on

Structural Run On. Are Structures Creating Run-on to the Site:
Yes

Structural Run-on Explanation:
Parking lot and buildings contribute minor run on to site.

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Surface Water Site Assessment

PRS ID: 54-014(c)

Run-on (Continued)

Natural Run-on. Is Natural Drainage Creating Run-on to the Site:
No
Natural Run-on Explanation:
No visible drainage patterns from stormw ater run-on.

Current Operations Run-on. Are Current Operations Creating Run-on to the Site:
No
Current Operations Run-on Explanation:
Current operations are not adversely impacting run-on to site.

Assessment Finding

Based on the Above Criteria and the Assessment of this Site, Does Soil Erosion Potential Exist:
No

Sign Off

Site Not Found:	**Revision of Earlier Assessment:**	
No	No	
Name of Assessment Author:		**Assessment Date:**
		08/02/2001

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Surface Water Site Assessment

PRS ID: 54-014(c)

Additional Information

Trash and Debris Notes

Is there Visible Trash and Debris on the Site:	Is there Visible Trash and Debris in a Watercourse:
No	No

Trash and Debris Explanation:

General Notes

Assessment Comments:
Site is stable.

Best Management Practice Notes

Are Permanent BMPs in Place:	Permanent BMPs in Place:
No	

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Surface Water Site Assessment

PRS ID: 54-014(c)

Erosion Matrix

Erosion/Sediment Transport Potential Scoring Criteria	Max Score Poss	Score Modifers for Transport Potential			Resulting Score
		Low (max * 0.1)	Med (max * 0.5)	High (max * 1.0)	
Setting Group (Max Total 43)					
Topography - On Mesa Top:	1	For these four criteria, use the single highest score from the criteria that received a "Yes" answer.			1.0
Topography - On Bench in Canyon:	4				
Topography - On Canyon Floor, Not in Channel:	13				
Topography - In Channel in Canyon Floor:	17				
Ground/Canopy Cover (Percent):	13	>75%	25-75%	<25%	6.5
Slope at Area Impacted:	13	<10%	10-30%	>30%	1.3
Run-off Group (Max Total 46)					
Visible Evidence of Run-off:	5	"Yes" = 5. "No" = 0 here and for two scores below.			5.0
Where Run-off Terminates:	19	"Other"	"Bench"	"Drainage/Canyon"	19.0
Visible Erosion:		"No" = 0. If "Yes", score by Erosion Type.			0.0
Erosion Type:	22	"Sheet"	"Rill"	"Gully"	
Run-on Group (Max Total 11)					
Structural Run-on:	7	"No" = 0. "Yes" = 7.			7.0
Natural Run-on:	7	"No" = 0. "Yes" = 7.			0.0
Current Operations Run-on:	4	"No" = 0. "Yes" = 4.			0.0
Maximum Possible Total Score:	**100**	*** Actual Total Score:**			**39.8**

Revision of Earlier Assessment: No

*** No permanent BMPs are in place. Score could be lower with them.**

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Surface Water Site Assessment

Site Information

Site ID:	PRS ID:	Nearest Struct:
1702	54-014(d)	

Setting

Topography

On Mesa Top: Yes **On Bench in Canyon:** No **On Canyon Floor, Not Channel:** No **In Channel in Canyon Floor:** No

Topography Explanation:
PRS is located on the north rim of Pajarito Canyon. Area slopes from the w est to the east. Site consists of mounds of dirt that cover trenches and a denuded roadw ay.

Ground/Canopy Cover

Sparse (<25%): No **Medium (25-75%):** Yes **Thick (>75%):** No

Ground/Canopy Cover Explanation:
PRS vegetation coverage at 35-40%, consisting of forbs and sage brush. Some native grasses and approximately 5-10% coverage, most of the grasses are dead. Roadw ay is denuded of vegetation.

Slope at Area Impacted

Flat (<10%): No **Gradual (10-30%):** Yes **Steep (>30%):** Yes

Slope Explanation:
The PRS slopes to the east at approximately 15-20%. Pajarito Canyon is located at the end of the PRS, the canyon slopes are greater than 30%.

Run-off

Is There Visible Evidence of Run-off Discharging from Site:
Yes

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Surface Water Site Assessment

PRS ID: 54-014(d)

Run-off (Continued)

Is Run-off Channelized:	Channel Type:
Yes	Natural

Channelization Explanation:
A natural channel drains from the south to the north along the fence line into Pajarito Canyon. This cannel collects run-off and transports it into Pajarito Canyon. Channeling is minor to moderate in places.

Where Does Evidence of Runoff Terminate:
Drainage/Canyon

Terminus Explanation

Has Run-off Caused Visible Erosion:	Erosion Type:
Yes	Rill

Erosion Explanation:
Some rill erosion has occurred. Sheet flow on road betw een trench B-L.

Run-on

Structural Run On. Are Structures Creating Run-on to the Site:
Yes

Structural Run-on Explanation:
Roadw ay to the w est is contributing run-on to the site.

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Surface Water Site Assessment

PRS ID: 54-014(d)

Run-on (Continued)

Natural Run-on. Is Natural Drainage Creating Run-on to the Site:
No
Natural Run-on Explanation:
Natural drainage patterns are not directing stormw ater onto the site.

Current Operations Run-on. Are Current Operations Creating Run-on to the Site:
Yes
Current Operations Run-on Explanation:
Heavy equipment operating to the w est of the PRS are having a minor impact on site.

Assessment Finding

Based on the Above Criteria and the Assessment of this Site, Does Soil Erosion Potential Exist:
Yes

Sign Off

Site Not Found:	Revision of Earlier Assessment:	
No	No	
Name of Assessment Author:		Assessment Date: 07/30/2001

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Surface Water Site Assessment

PRS ID: 54-014(d)

Additional Information

Trash and Debris Notes

Is there Visible Trash and Debris on the Site:	Is there Visible Trash and Debris In a Watercourse:
No	No

Trash and Debris Explanation:

General Notes

Assessment Comments:

PRS consists of four trenches running w est to east, the area is w ell vegetated but heavy equipment operations w ill impact site run-on and runoff.

Best Management Practice Notes

Are Permanent BMPs In Place:	Permanent BMPs In Place:
No	

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Surface Water Site Assessment

PRS ID: 54-014(d)

Erosion Matrix

Erosion/Sediment Transport Potential Scoring Criteria	Max Score Poss	Score Modifers for Transport Potential			Resulting Score
		Low (max * 0.1)	Med (max * 0.5)	High (max * 1.0)	
Setting Group (Max Total 43)					
Topography - On Mesa Top:	1	For these four criteria, use the single highest score from the criteria that received a "Yes" answer.			1.0
Topography - On Bench in Canyon:	4				
Topography - On Canyon Floor, Not in Channel:	13				
Topography - In Channel in Canyon Floor:	17				
Ground/Canopy Cover (Percent):	13	>75%	25-75%	<25%	6.5
Slope at Area Impacted:	13	<10%	10-30%	>30%	13.0
Run-off Group (Max Total 46)					
Visible Evidence of Run-off:	5	"Yes" = 5. "No" = 0 here and for two scores below.			5.0
Where Run-off Terminates:	19	"Other"	"Bench"	"Drainage/Canyon"	19.0
Visible Erosion:		"No" = 0. If "Yes", score by Erosion Type.			11.0
Erosion Type:	22	"Sheet"	"Rill"	"Gully"	
Run-on Group (Max Total 11)					
Structural Run-on:	7	"No" = 0. "Yes" = 7.			7.0
Natural Run-on:	7	"No" = 0. "Yes" = 7.			0.0
Current Operations Run-on:	4	"No" = 0. "Yes" = 4.			4.0
Maximum Possible Total Score:	**100**			*** Actual Total Score:**	**66.5**

Revision of Earlier Assessment: No

*** No permanent BMPs are in place. Score could be lower with them.**

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Surface Water Site Assessment

Site Information

Site ID:	PRS ID:	Nearest Struct:
1713	54-015(k)	

Setting

Topography

On Mesa Top: Yes **On Bench in Canyon:** No **On Canyon Floor, Not Channel:** No **In Channel in Canyon Floor:** No

Topography Explanation:
PRS is bi-level; the low er area is an active roadw ay, the upper area is a disturbed area used by heavy equipment to move backfill material.

Ground/Canopy Cover

Sparse (<25%): No **Medium (25-75%):** Yes **Thick (>75%):** Yes

Ground/Canopy Cover Explanation:
The low er roadw ay consists of basecoarse covered w ith a dust prevention solution. The slope in betw een the levels has a vegetative coverage of 25-30% consisting of forbs. The upper area has a denuded area w ith a basecoarse roadw ay.

Slope at Area Impacted

Flat (<10%): Yes **Gradual (10-30%):** Yes **Steep (>30%):** No

Slope Explanation:
The slope of the low er roadw ay is less than 10%. The slope of the upper level is approximately 10-15% w ith the roads entering and exiting at slopes of 15-20%. The area joining the upper and low er levels has a slope of 25-30%.

Run-off

Is There Visible Evidence of Run-off Discharging from Site:
No

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Surface Water Site Assessment

PRS ID: 54-015(k)

Run-off (Continued)

Is Run-off Channelized:	Channel Type:
No	

Channelization Explanation:
There is no visible evidence of runoff.

Where Does Evidence of Runoff Terminate:

Terminus Explanation

Has Run-off Caused Visible Erosion:	Erosion Type:
Yes	Rill

Erosion Explanation:
Sheet flow is probable on roadw ays, some minor rill erosion is present along slope betw een the upper and low er levels.

Run-on

Structural Run On. Are Structures Creating Run-on to the Site:
No

Structural Run-on Explanation:

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Surface Water Site Assessment

PRS ID: 54-015(k)

Run-on (Continued)

Natural Run-on. Is Natural Drainage Creating Run-on to the Site: No
Natural Run-on Explanation: There are no natural drainage patterns.

Current Operations Run-on. Are Current Operations Creating Run-on to the Site: Yes
Current Operations Run-on Explanation: Area is used to store backfill material, site is active and being disturbed.

Assessment Finding

Based on the Above Criteria and the Assessment of this Site, Does Soil Erosion Potential Exist: No

Sign Off

Site Not Found: No	**Revision of Earlier Assessment:** No	
Name of Assessment Author:		**Assessment Date:** 07/30/2001

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Surface Water Site Assessment

PRS ID: 54-015(k)

Additional Information

Trash and Debris Notes

Is there Visible Trash and Debris on the Site:	Is there Visible Trash and Debris in a Watercourse:
No	No

Trash and Debris Explanation:

General Notes

Assessment Comments:
PRS is an active earth moving site.

Best Management Practice Notes

Are Permanent BMPs in Place:	Permanent BMPs in Place:
No	

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Surface Water Site Assessment

PRS ID: 54-015(k)

Erosion Matrix

Erosion/Sediment Transport Potential Scoring Criteria	Max Score Poss	Score Modifers for Transport Potential			Resulting Score
		Low (max * 0.1)	Med (max * 0.5)	High (max * 1.0)	
Setting Group (Max Total 43)					
Topography - On Mesa Top:	1	For these four criteria, use the single highest score from the criteria that received a "Yes" answ er.			1.0
Topography - On Bench in Canyon:	4				
Topography - On Canyon Floor, Not in Channel:	13				
Topography - In Channel in Canyon Floor:	17				
Ground/Canopy Cover (Percent):	13	>75%	25-75%	<25%	6.5
Slope at Area Impacted:	13	<10%	10-30%	>30%	6.5
Run-off Group (Max Total 46)					
Visible Evidence of Run-off:	5	"Yes" = 5. "No" = 0 here and for tw o scores below.			0.0
Where Run-off Terminates:	19	"Other"	"Bench"	"Drainage/Canyon"	0.0
Visible Erosion:		"No" = 0. If "Yes", score by Erosion Type.			0.0
Erosion Type:	22	"Sheet"	"Rill"	"Gully"	
Run-on Group (Max Total 11)					
Structural Run-on:	7	"No" = 0. "Yes" = 7.			0.0
Natural Run-on:	7	"No" = 0. "Yes" = 7.			0.0
Current Operations Run-on:	4	"No" = 0. "Yes" = 4.			4.0
Maximum Possible Total Score:	**100**	*** Actual Total Score:**			**18.0**

Revision of Earlier Assessment: No

*** No permanent BMPs are in place. Score could be lower with them.**

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Surface Water Site Assessment

Site Information

Site ID:	PRS ID:	Nearest Struct:
1716	54-017	

Setting

Topography

On Mesa Top: Yes **On Bench In Canyon:** No **On Canyon Floor, Not Channel:** No **In Channel In Canyon Floor:** No

Topography Explanation:

PRS is within Area G of TA-54. Area is complex and spans from Canada del Buey to Pajarito Canyon. Sites range from level asphalt covered areas with dome structures built upon them to revegetated areas with slopes approximately 10%. Multiple areas within the PRS are active and are being disturbed by everyday operations, such as the "TWIST Project".

Ground/Canopy Cover

Sparse (<25%): Yes **Medium (25-75%):** Yes **Thick (>75%):** Yes

Ground/Canopy Cover Explanation:

Ground cover varies throughout PRS. There are asphalt covered areas, basecoarse roadways, and vegetated areas. Vegetation consists of forbs with coverage from 25-35%. There are denuded areas in between sites.

Slope at Area Impacted

Flat (<10%): Yes **Gradual (10-30%):** Yes **Steep (>30%):** Yes

Slope Explanation:

Asphalt covered areas containing buildings are located on slopes less than 10%. Areas in between domes have slopes of 10-15%. Some pits are located on slopes of 10-20%. The north and south slopes of canyon rims have slopes >30%.

Run-off

Is There Visible Evidence of Run-off Discharging from Site:

Yes

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Surface Water Site Assessment

PRS ID: 54-017

Run-off (Continued)

Is Run-off Channelized:	**Channel Type:**
Yes	Man-Made

Channelization Explanation:
Manmade channels betw een domes direct run-off into Pajarito Canyon. Minor run-off on the north side of PRS flow s into Canada del Buey.

Where Does Evidence of Runoff Terminate:
Drainage/Canyon

Terminus Explanation
Run-off flow s into Canada Del Buey and Pajarito Canyon. Run-off into Canada Del Buey is minor. Most of the run-off flow s to the south into Pajarito Canyon.

Has Run-off Caused Visible Erosion:	**Erosion Type:**
No	

Erosion Explanation:
No visible erosion from runoff.

Run-on

Structural Run On. Are Structures Creating Run-on to the Site:
Yes

Structural Run-on Explanation:
Buildings, roof drains, parking lots, storm drains, and roadw ays contribute run on to sites.

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Surface Water Site Assessment

PRS ID: 54-017

Run-on (Continued)

Natural Run-on. Is Natural Drainage Creating Run-on to the Site:
No

Natural Run-on Explanation:
No visible drainage patterns directing stormw ater onto sites.

Current Operations Run-on. Are Current Operations Creating Run-on to the Site:
Yes

Current Operations Run-on Explanation:
TWIST Project is displacing soil during removal operations. Heavy machinery operations throughout Area G is disturbing soil.

Assessment Finding

Based on the Above Criteria and the Assessment of this Site, Does Soil Erosion Potential Exist:
No

Sign Off

Site Not Found:	Revision of Earlier Assessment:	
No	No	
Name of Assessment Author:		Assessment Date: 07/30/2001

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Surface Water Site Assessment

PRS ID: 54-017

Additional Information

Trash and Debris Notes

Is there Visible Trash and Debris on the Site:	Is there Visible Trash and Debris in a Watercourse:
No	No

Trash and Debris Explanation:

General Notes

Assessment Comments:

Operations are ongoing throughout Area G. The Twist project is disturbing the soil of pad 3 on pits 2,4,5 and is displacing soil. PRS has operational BMPs in place surrounding the area. Heavy machinery operations are disturbing some sites within PRS, however these sites are in good to fair condition and seem to be stable.

Best Management Practice Notes

Are Permanent BMPs in Place:	Permanent BMPs in Place:
No	

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Surface Water Site Assessment

PRS ID: 54-017

Erosion Matrix

Erosion/Sediment Transport Potential Scoring Criteria	Max Score Poss	Score Modifers for Transport Potential			Resulting Score
		Low (max * 0.1)	Med (max * 0.5)	High (max * 1.0)	
Setting Group (Max Total 43)					
Topography - On Mesa Top:	1	For these four criteria, use the single highest score from the criteria that received a "Yes" answer.			1.0
Topography - On Bench in Canyon:	4				
Topography - On Canyon Floor, Not in Channel:	13				
Topography - In Channel in Canyon Floor:	17				
Ground/Canopy Cover (Percent):	13	>75%	25-75%	<25%	13.0
Slope at Area Impacted:	13	<10%	10-30%	>30%	13.0
Run-off Group (Max Total 46)					
Visible Evidence of Run-off:	5	"Yes" = 5. "No" = 0 here and for two scores below.			5.0
Where Run-off Terminates:	19	"Other"	"Bench"	"Drainage/Canyon"	19.0
Visible Erosion:		"No" = 0. If "Yes", score by Erosion Type.			0.0
Erosion Type:	22	"Sheet"	"Rill"	"Gully"	
Run-on Group (Max Total 11)					
Structural Run-on:	7	"No" = 0. "Yes" = 7.			7.0
Natural Run-on:	7	"No" = 0. "Yes" = 7.			0.0
Current Operations Run-on:	4	"No" = 0. "Yes" = 4.			4.0
Maximum Possible Total Score:	**100**	*** Actual Total Score:**			**62.0**

Revision of Earlier Assessment: No

*** No permanent BMPs are in place. Score could be lower with them.**

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Surface Water Site Assessment

Site Information

Site ID:	PRS ID:	Nearest Struct:
1717	54-018	

Setting

Topography

On Mesa Top: Yes **On Bench in Canyon:** No **On Canyon Floor, Not Channel:** Yes **In Channel in Canyon Floor:** No

Topography Explanation:
PRS consists of inactive pits scattered between Canada Del Buey and Pajarito Canyon. Some are covered up and others have been built upon. The topography consists of rolling hills and level areas. Earth moving and construction activities are ongoing in this area.

Ground/Canopy Cover

Sparse (<25%): No **Medium (25-75%):** Yes **Thick (>75%):** Yes

Ground/Canopy Cover Explanation:
Denuded areas are common due to heavy equipment operations. Areas between pits and along roadways are vegetated with forbs at approximately 25-30% coverage. Several areas are built upon and covered with asphalt or concrete.

Slope at Area Impacted

Flat (<10%): Yes **Gradual (10-30%):** Yes **Steep (>30%):** Yes

Slope Explanation:
Building sites are level, slopes of roadways vary from level to approximately 25%. Canyons are located to the north and south of the PRS, the slopes of the canyon walls are greater than 30%.

Run-off

Is There Visible Evidence of Run-off Discharging from Site:
Yes

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Surface Water Site Assessment

PRS ID: 54-018

Run-off (Continued)

Is Run-off Channelized:	**Channel Type:**
Yes	Man-Made

Channelization Explanation:
There is minor soil displacement on PRS slope. A manmade channel on the north side of PRS diverts run-on away from site and directs run-off from PRS slope.

Where Does Evidence of Runoff Terminate:

Terminus Explanation
Runoff terminates in Canada del Buey and Pajarito Canyon.

Has Run-off Caused Visible Erosion:	**Erosion Type:**
Yes	Sheet Flow

Erosion Explanation:
There is evidence of sheet flow from the dirt stock piles.

Run-on

Structural Run On. Are Structures Creating Run-on to the Site:
Yes

Structural Run-on Explanation:
Buildings, roof drains and the fill dirt area are contributing run-on to site.

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Surface Water Site Assessment

PRS ID: 54-018

Run-on (Continued)

Natural Run-on. Is Natural Drainage Creating Run-on to the Site: No
Natural Run-on Explanation: There are no natural drainage patterns at this site.

Current Operations Run-on. Are Current Operations Creating Run-on to the Site: Yes
Current Operations Run-on Explanation: Heavy equipment operations are currently disturbing the soil and run-on patterns.

Assessment Finding

Based on the Above Criteria and the Assessment of this Site, Does Soil Erosion Potential Exist: Yes

Sign Off

Site Not Found: No	**Revision of Earlier Assessment:** No	
Name of Assessment Author:		**Assessment Date:** 08/02/2001

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Surface Water Site Assessment

PRS ID: 54-018

Additional Information

Trash and Debris Notes

Is there Visible Trash and Debris on the Site:	Is there Visible Trash and Debris in a Watercourse:
No	No

Trash and Debris Explanation:

General Notes

Assessment Comments:
This area is large and complex relative to a surface water assessment. Everyday operations impact surface water run-on and runoff. Pits are not in use.

Best Management Practice Notes

Are Permanent BMPs in Place:	Permanent BMPs in Place:
No	

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Surface Water Site Assessment

PRS ID: 54-018

Erosion Matrix

Erosion/Sediment Transport Potential Scoring Criteria	Max Score Poss	Score Modifers for Transport Potential			Resulting Score
		Low (max * 0.1)	Med (max * 0.5)	High (max * 1.0)	
Setting Group (Max Total 43)					
Topography - On Mesa Top:	1	For these four criteria, use the single highest score from the criteria that received a "Yes" answer.			13.0
Topography - On Bench in Canyon:	4				
Topography - On Canyon Floor, Not in Channel:	13				
Topography - In Channel in Canyon Floor:	17				
Ground/Canopy Cover (Percent):	13	>75%	25-75%	<25%	6.5
Slope at Area Impacted:	13	<10%	10-30%	>30%	13.0
Run-off Group (Max Total 46)					
Visible Evidence of Run-off:	5	"Yes" = 5. "No" = 0 here and for two scores below.			5.0
Where Run-off Terminates:	19	"Other"	"Bench"	"Drainage/Canyon"	1.9
Visible Erosion:		"No" = 0. If "Yes", score by Erosion Type.			2.2
Erosion Type:	22	"Sheet"	"Rill"	"Gully"	
Run-on Group (Max Total 11)					
Structural Run-on:	7	"No" = 0. "Yes" = 7.			7.0
Natural Run-on:	7	"No" = 0. "Yes" = 7.			0.0
Current Operations Run-on:	4	"No" = 0. "Yes" = 4.			4.0
Maximum Possible Total Score:	**100**	*** Actual Total Score:**			**52.6**

Revision of Earlier Assessment: No

*** No permanent BMPs are in place. Score could be lower with them.**

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Surface Water Site Assessment

Site Information

Site ID:	PRS ID:	Nearest Struct:
1718	54-019	

Setting

Topography

On Mesa Top: Yes **On Bench in Canyon:** No **On Canyon Floor, Not Channel:** No **In Channel in Canyon Floor:** No

Topography Explanation:

This PRS consists of shafts scattered throughout TA-54 Area G. The shafts are located in level areas and are covered w ith concrete caps.

Ground/Canopy Cover

Sparse (<25%): No **Medium (25-75%):** Yes **Thick (>75%):** Yes

Ground/Canopy Cover Explanation:

Shafts are covered concrete caps or mounds, the vegetative coverage betw een the mounds is at approximately 25% and consists of forbs.

Slope at Area Impacted

Flat (<10%): Yes **Gradual (10-30%):** Yes **Steep (>30%):** Yes

Slope Explanation:

PRS sites are located on a less than 10% slope. Some sites have adjacent slopes that are approximately 10-20%. Tw o of the pits are located near the canyon rim, the w alls of w hich have slopes greater than 30%.

Run-off

Is There Visible Evidence of Run-off Discharging from Site:

No

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Surface Water Site Assessment

PRS ID: 54-019

Run-off (Continued)

Is Run-off Channelized: No	**Channel Type:**
Channelization Explanation: There is not visible evidence of runoff at the site.	

Where Does Evidence of Runoff Terminate:
Terminus Explanation

Has Run-off Caused Visible Erosion: No	**Erosion Type:**
Erosion Explanation:	

Run-on

Structural Run On. Are Structures Creating Run-on to the Site: Yes
Structural Run-on Explanation: Buildings and roof drains contribute minor run-on to the site.

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Surface Water Site Assessment

PRS ID: 54-019

Run-on (Continued)

Natural Run-on. Is Natural Drainage Creating Run-on to the Site:
No
Natural Run-on Explanation:
There are no natural drainage patterns directing flow towards the site.

Current Operations Run-on. Are Current Operations Creating Run-on to the Site:
No
Current Operations Run-on Explanation:
Current operations are not adversely impacting the site.

Assessment Finding

Based on the Above Criteria and the Assessment of this Site, Does Soil Erosion Potential Exist:
No

Sign Off

Site Not Found:	Revision of Earlier Assessment:	
No	No	
Name of Assessment Author:		**Assessment Date:**
		08/02/2001

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Surface Water Site Assessment

PRS ID: 54-019

Additional Information

Trash and Debris Notes

Is there Visible Trash and Debris on the Site:	Is there Visible Trash and Debris in a Watercourse:
No	No

Trash and Debris Explanation:

General Notes

Assessment Comments:
Shafts are encased in concrete.

Best Management Practice Notes

Are Permanent BMPs in Place:	Permanent BMPs in Place:
No	

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Surface Water Site Assessment

PRS ID: 54-019

Erosion Matrix

Erosion/Sediment Transport Potential Scoring Criteria	Max Score Poss	Score Modifers for Transport Potential			Resulting Score
		Low (max * 0.1)	Med (max * 0.5)	High (max * 1.0)	
Setting Group (Max Total 43)					
Topography - On Mesa Top:	1	For these four criteria, use the single highest score from the criteria that received a "Yes" answ er.			1.0
Topography - On Bench in Canyon:	4				
Topography - On Canyon Floor, Not in Channel:	13				
Topography - In Channel in Canyon Floor:	17				
Ground/Canopy Cover (Percent):	13	>75%	25-75%	<25%	6.5
Slope at Area Impacted:	13	<10%	10-30%	>30%	13.0
Run-off Group (Max Total 46)					
Visible Evidence of Run-off:	5	"Yes" = 5. "No" = 0 here and for tw o scores below.			0.0
Where Run-off Terminates:	19	"Other"	"Bench"	"Drainage/Canyon"	0.0
Visible Erosion:		"No" = 0. If "Yes", score by Erosion Type.			0.0
Erosion Type:	22	"Sheet"	"Rill"	"Gully"	
Run-on Group (Max Total 11)					
Structural Run-on:	7	"No" = 0. "Yes" = 7.			7.0
Natural Run-on:	7	"No" = 0. "Yes" = 7.			0.0
Current Operations Run-on:	4	"No" = 0. "Yes" = 4.			0.0
Maximum Possible Total Score:	**100**	*** Actual Total Score:**			**27.5**

Revision of Earlier Assessment: No

*** No permanent BMPs are in place. Score could be lower with them.**

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Surface Water Site Assessment

Site Information

Site ID:	PRS ID:	Nearest Struct:
1719	54-020	

Setting

Topography

On Mesa Top: Yes **On Bench In Canyon:** No **On Canyon Floor, Not Channel:** No **In Channel in Canyon Floor:** No

Topography Explanation:

The PRS consists of shafts scattered throughout TA-54 Area G betw een Canada del Buey and Pajarito Canyon. The majority of the shafts have visible concrete mounds or flat concrete caps covering the shaft outlet. The terrain and slope varies throughout the site.

Ground/Canopy Cover

Sparse (<25%): No **Medium (25-75%):** Yes **Thick (>75%):** Yes

Ground/Canopy Cover Explanation:

The majority of the sites w ithin the PRS are covered w ith concrete, others have been buried and covered w ith vegetation. Vegetative coverage on and betw een shafts consists of native grasses and forbs at a rate of approximately 30-35%.

Slope at Area Impacted

Flat (<10%): Yes **Gradual (10-30%):** Yes **Steep (>30%):** Yes

Slope Explanation:

The majority of the shafts are located on slopes of less than 10%. Other sites are on slopes ranging from 10-30%, a few sites are located near the canyon rim, the w alls of w hich are have slopes greater than 30%.

Run-off

Is There Visible Evidence of Run-off Discharging from Site:

Yes

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Surface Water Site Assessment

PRS ID: 54-020

Run-off (Continued)

Is Run-off Channelized:	Channel Type:
No	

Channelization Explanation:
Minor soil displacement provides evidence of sheet flow .

Where Does Evidence of Runoff Terminate:
Drainage/Canyon

Terminus Explanation
PRS is located on both Canada del Buey and Pajarito Canyon rims, all run-off enters through tributaries leading into these canyons.

Has Run-off Caused Visible Erosion:	Erosion Type:
Yes	Sheet Flow

Erosion Explanation:
Minor soil displacement provides evidence of sheet flow .

Run-on

Structural Run On. Are Structures Creating Run-on to the Site:
Yes

Structural Run-on Explanation:
Roadways and buildings are contributing run on to the site.

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Surface Water Site Assessment

PRS ID: 54-020

Run-on (Continued)

Natural Run-on. Is Natural Drainage Creating Run-on to the Site:
No
Natural Run-on Explanation:
Natural drainage patterns are not directing stormw ater onto the site.

Current Operations Run-on. Are Current Operations Creating Run-on to the Site:
No
Current Operations Run-on Explanation:
Current operations are not adversely impacting the site.

Assessment Finding

Based on the Above Criteria and the Assessment of this Site, Does Soil Erosion Potential Exist:
No

Sign Off

Site Not Found:	**Revision of Earlier Assessment:**	
No	No	
Name of Assessment Author:		**Assessment Date:** 08/02/2001

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Surface Water Site Assessment

PRS ID: 54-020

Additional Information

Trash and Debris Notes

Is there Visible Trash and Debris on the Site:	Is there Visible Trash and Debris in a Watercourse:
No	No

Trash and Debris Explanation:

General Notes

Assessment Comments:
BMPs are operational but are being impacted by heavy equipment operations. Sites are stable.

Best Management Practice Notes

Are Permanent BMPs in Place:	Permanent BMPs in Place:
No	

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Surface Water Site Assessment

PRS ID: 54-020

Erosion Matrix

Erosion/Sediment Transport Potential Scoring Criteria	Max Score Poss	Score Modifers for Transport Potential			Resulting Score
		Low (max * 0.1)	Med (max * 0.5)	High (max * 1.0)	
Setting Group (Max Total 43)					
Topography - On Mesa Top:	1	For these four criteria, use the single highest score from the criteria that received a "Yes" answer.			1.0
Topography - On Bench in Canyon:	4				
Topography - On Canyon Floor, Not in Channel:	13				
Topography - In Channel in Canyon Floor:	17				
Ground/Canopy Cover (Percent):	13	>75%	25-75%	<25%	6.5
Slope at Area Impacted:	13	<10%	10-30%	>30%	13.0
Run-off Group (Max Total 46)					
Visible Evidence of Run-off:	5	"Yes" = 5. "No" = 0 here and for two scores below.			5.0
Where Run-off Terminates:	19	"Other"	"Bench"	"Drainage/Canyon"	19.0
Visible Erosion:		"No" = 0. If "Yes", score by Erosion Type.			2.2
Erosion Type:	22	"Sheet"	"Rill"	"Gully"	
Run-on Group (Max Total 11)					
Structural Run-on:	7	"No" = 0. "Yes" = 7.			7.0
Natural Run-on:	7	"No" = 0. "Yes" = 7.			0.0
Current Operations Run-on:	4	"No" = 0. "Yes" = 4.			0.0
Maximum Possible Total Score:	**100**	*** Actual Total Score:**			**53.7**

Revision of Earlier Assessment: No

*** No permanent BMPs are in place. Score could be lower with them.**

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Appendix I

Long-Term Subsurface Vapor Monitoring Plan

I-1.0 INTRODUCTION

The following plan describes proposed subsurface vapor monitoring activities and the frequencies at which they will continue to be conducted within the vadose zone beneath Material Disposal Area (MDA) G. The objective of the monitoring is to evaluate trends in volatile organic compound (VOC) and tritium concentrations over time.

I-2.0 HISTORICAL DATA REVIEW

Routine monitoring of VOCs in subsurface pore-gas has been ongoing at Area G from 1992 to the present. Data were last reported in Appendix C of the "Quarterly Technical Report, July–September 2004" (LANL 2004, 89304). Monitoring was conducted on up to 12 boreholes equipped with downhole ports for subsurface pore-gas monitoring, including four boreholes drilled for the MDA G Phase I Resource Conservation and Recovery Act facility investigation (RFI) and nine boreholes installed by Facility Waste Operations (FWO) at Area G. Each monitoring event consisted of collecting two pore-gas samples using SUMMA canisters and screening all ports for VOCs in pore gas using the Brüel and Kjaer (B&K) multigas monitor.

Results from routine monitoring indicated that trichloroethane[1,1,1-] (TCA) is the dominant contaminant present as a vapor beneath MDA G. Maximum concentrations are closely associated with the location of the earliest MDA G disposal in the eastern portion of the area. The detectable VOC concentrations extended to at least 153 ft below ground surface (bgs).

Following completion of drilling the 2005 investigation boreholes pore gas samples were collected from each borehole at the base depth of the nearest adjacent disposal unit and at total depth of the borehole. Samples were collected using a downhole straddle-packer system to isolate the desired sampling interval. Samples were collected in SUMMA canisters for VOC analyses and silica gel columns for tritium analysis. Purge gas was screened during the sampling process for percent oxygen and carbon dioxide.

Results from the 2005 investigation confirm the presence of VOCs in subsurface pore gas at MDA G. Thirty VOCs were detected with the dominant contaminant being TCA. Concentrations of TCA generally decreased from east to west across the site. The highest concentration of TCA was detected at location 54-24378. TCA concentrations in nearby locations 54-24388, 54-24379, 54-24386, and 54-24385 are also elevated compared to the rest of the site indicating the greatest release of TCA is at the east end of MDA G near pits 1 through 5 and adjacent shaft fields (Plate 6.6-2).

The highest levels of TCA in the central and western portions of MDA G were detected in samples collected from locations 54-24390 and 54-24394, respectively. Although TCA is still the dominant contaminant in these areas the relatively higher concentrations of other VOCs, including trichloroethene (TCE) and tetrachloroethene (PCE), in these samples indicate releases from different sources. However, levels of VOCs in the subsurface vapor in these portions of MDA G are an order of magnitude less than in the eastern portion.

Boreholes 54-01110 and 54-01111 are located adjacent to the active and inactive tritium disposal shafts in the south-central portion of MDA G. Core, subsurface vapor, and flux samples collected at MDA G all indicate this as the region with the highest levels of tritium (LANL 2004, 89304). Analysis of vapor samples collected in 2003 from locations 54-01110 and 54-01111 indicated that tritium levels increase with depth. The results from the 2005 field investigation confirm elevated tritium exists in the south-central portion; however, the maximum tritium concentrations were detected in samples from locations 54-24386 and 54-24378 located in the eastern portion. Tritium concentrations generally decrease with distance and depth from these two portions of MDA G.

I-3.0 MONITORING METHODS

Monitoring methods were selected to provide both precise and accurate data on the concentrations of tritium and VOCs in subsurface vapor beneath MDA G to determine trends through time. The method for monitoring pore gas at MDA G includes purging the sampling port and field-screening purge gas, followed by collecting samples in SUMMA canisters and silica gel columns from prescribed locations for off-site laboratory analysis. The proposed frequency of sampling and locations to be sampled are defined in Section I-4.0, Proposed Monitoring Distribution and Frequency. Field-screening of subsurface vapor at MDA G will include measuring the percent carbon dioxide, percent oxygen, static subsurface pressure, and organic vapors. Vapor samples for laboratory analysis will be collected using SUMMA canisters and silica gel columns. SUMMA canister samples will be analyzed for VOC concentrations by the Environmental Protection Agency (EPA) Method TO-15. Silica gel column samples will be analyzed for tritium by EPA Method 906.0.

Monitoring of pore gas at MDA G will be conducted in accordance with the current version of Environmental Stewardship–Environmental Characterization and Remediation Standard Operating Procedure 6.31, Sampling Sub-Atmospheric Air. According to this procedure, field-screening will be performed before analytical samples are collected. Each port will be purged and monitored with a Landtec GEM2000 instrument or equivalent, until the percent carbon dioxide and oxygen levels have stabilized at values representative of subsurface pore-gas conditions and are consistent with previously recorded measurements. The vapor will then be screened for VOCs using a B&K multigas analyzer, Type 1302, which measures four VOCs: TCA, TCE, PCE, and Freon-11. The B&K analyzer also measures percent carbon dioxide to 0.01%. Once purge and field-screening are completed, vapor samples will be collected using SUMMA canisters and silica gel columns as prescribed in Section I-4.0.

During each sampling event, three types of field quality assurance (QA) samples will be collected and analyzed for VOCs using SUMMA canisters: a field duplicate sample, an equipment blank of zero-grade air (a common term for air certified to be free from VOC contamination) or nitrogen drawn through the sampling apparatus in the working area, and a performance evaluation sample/calibration gas sample taken from a tank of a certified gas mixture. Analytical laboratory QA for EPA Method TO-15 includes internal standards, surrogates, replicates, blanks, laboratory control samples, and reference standards. A field duplicate sample will be collected for QA and analyzed for tritium using silica gel column.

I-4.0 PROPOSED MONITORING DISTRIBUTION AND FREQUENCY

Pore-gas monitoring locations are shown in Figure I-4.0-1 and listed in Table I-4.0-1. Four boreholes drilled in 2005 will be equipped with sampling membranes for continued monitoring. The twelve existing monitoring locations and four new 2005 investigation locations will allow monitoring within and adjacent to areas of maximum VOC and tritium concentrations at MDA G. Locations 54-24378, 54-24390, and 54-24394 will monitor the location of maximum VOC levels for the eastern, central, and western portions, respectively. Location 54-24378 will be one of the monitoring locations surrounding the eastern portion of MDA G where the maximum levels of tritium and VOC exist. The planned port depths for these boreholes will include ports at the base depth of the nearest adjacent disposal unit and every 25 ft along the length of the borehole down to the total depth of the borehole. A schematic of a vapor sampling membrane is shown in Figure I-4.0-2. The remainder of the boreholes drilled during 2005 will be abandoned, except for the deep borehole at location 54-25105.

Location 54-25105, the open borehole within the Puye Formation, will remain available for packer-sampling from the end of the casing at 485 ft to the total depth at 701ft. Because of the instability and irregular diameter of the open portion of borehole, installing the membrane or deploying a straddle packer below the casing is not feasible. This location will allow for continued monitoring at depth beneath MDA G.

Every port in the pore-gas monitoring locations listed in Table I-4.0-1 will be monitored quarterly for two years by field measurement of percent carbon dioxide, percent oxygen, static subsurface pressure, and organic vapors using the methods described in Section I-3.0. These data will be compared to the historic record to evaluate spatial extent and trends of the dominant VOCs released from MDA G.

Vapor samples will be collected quarterly for one year using SUMMA canisters and silica gel columns from the port nearest the lowest base elevation of the adjacent disposal unit, and at the total depth of the locations listed in Table I-4.0-1 with two exceptions; location 54-25105 will be sampled across the open portion using a straddle packer, and location 54-22116 will be sampled from the two ports containing the highest level of TCA, as measured by the B&K analyzer. Quarterly subsurface vapor monitoring will include collection of a minimum of 32 vapor samples from subsurface monitoring locations at MDA G. Additionally two duplicates, two equipment blanks, and one performance evaluation sample will be collected during each event using SUMMA canisters. One duplicate sample will be collected during each event using a silica gel column. During the second year, vapor samples will be collected semiannually.

After two years, vapor screening of all ports and SUMMA-canister sampling of selected ports will be performed annually. This annual monitoring will be continued until a final remedy for MDA G is selected. Final long-term monitoring requirements will be determined as part of the corrective measures implementation (CMI) process based on the remedy selected.

Pore-gas monitoring data will be reported every six months for the first two years and annually thereafter until the CMI. Monitoring data will be reported in a periodic monitoring report according to the requirements of the Compliance Order on Consent, Section XI.D. This report may include recommendations for future monitoring and remedial actions based on data results and trends.

I-5.0 REFERENCES

The following list includes all references cited in this appendix. Parenthetical information following each reference provides the author, publication date, and the ER identification (ID) number. This information also is included in the citations in the text. ER ID numbers are assigned by the Los Alamos National Laboratory's ENV-ERS Program to track records associated with the Program. These numbers can be used to locate copies of the actual documents at the ENV-ERS Program's Records Processing Facility and, where applicable, with the ENV-ERS Program's reference library titled "Reference Set for Material Disposal Areas, Technical Area 54."

Copies of the reference library are maintained at the NMED Hazardous Waste Bureau; the DOE Los Alamos Site Office; and EPA, Region 6. This library is a living collection of documents that was developed to ensure that the administrative authority has all the necessary material to review the decisions and actions proposed in this document. However, documents previously submitted to the administrative authority are not included.

LANL (Los Alamos National Laboratory), November 2004. "Quarterly Technical Report July–September 2004," Los Alamos National Laboratory document LA-UR-04-7387, Los Alamos, New Mexico. (LANL 2004, 89304)

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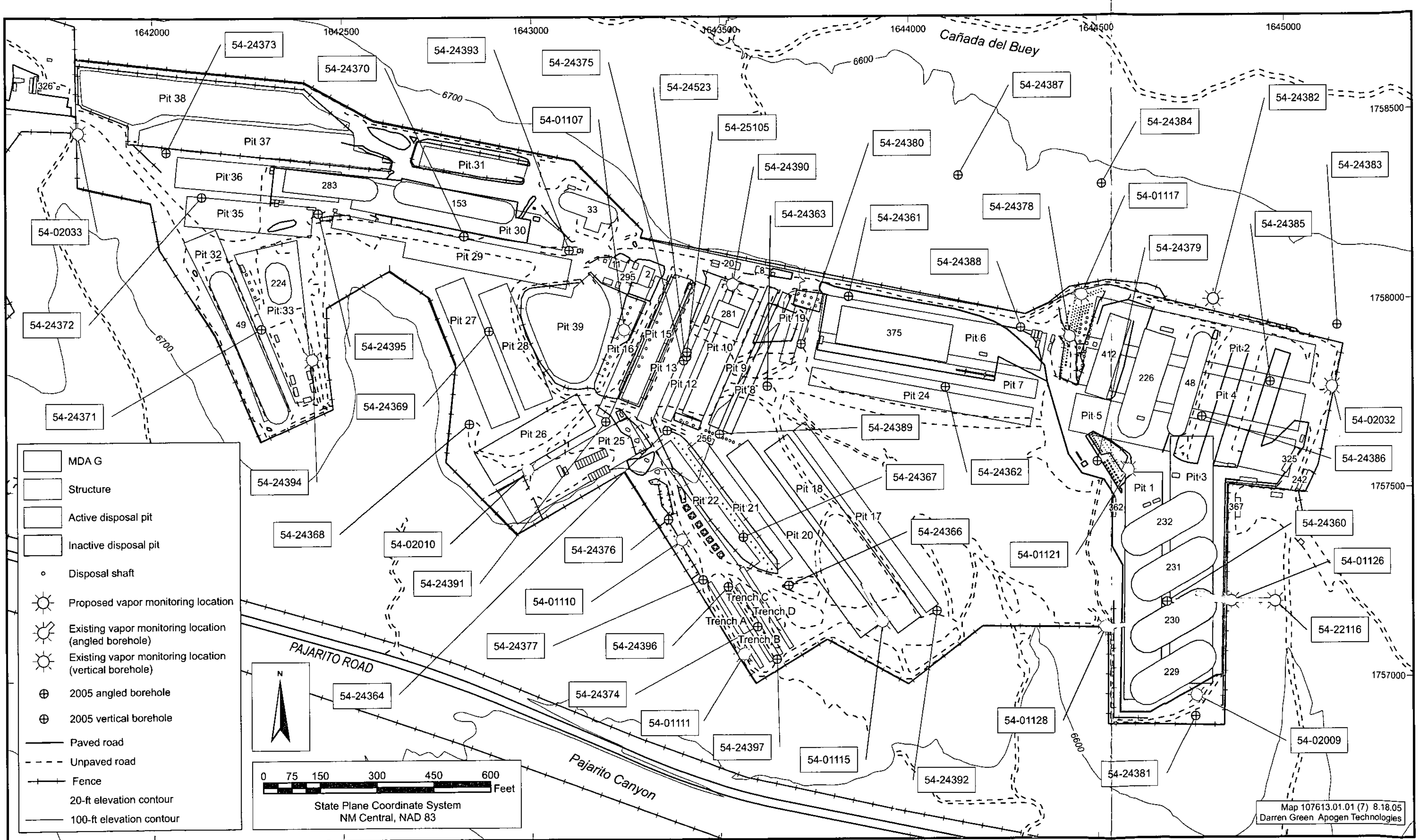
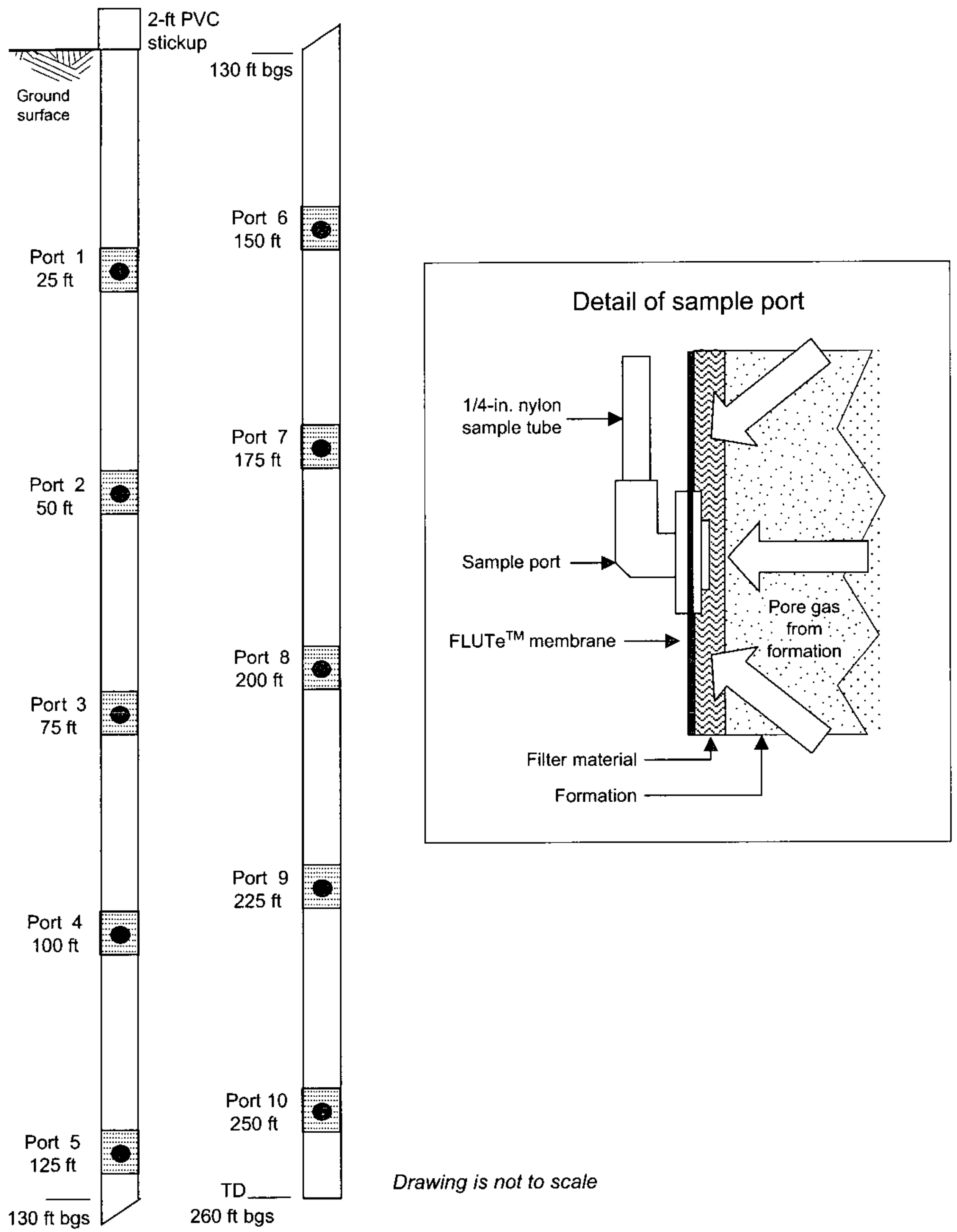


Figure I-4.0-1. Existing and proposed vapor monitoring locations at MDA G



F30, MDA L IWP Rev. 1, 121503, PTM, 121903, cf
Rev. for F46, MDA G IWP, Rev. 1, 061704, cf

Figure I-4.0-2. General diagram for construction of a vapor monitoring borehole

Table I-4.0-1
MDA G Subsurface Vapor Monitoring Locations

Location ID	Depths of Screened Ports (ft)
54-24382	28, 50, 75, 108
54-24388	26, 50, 75, 100, 130
54-24390	15, 31, 50, 75, 100, 125, 159
54-24394	25, 51, 75, 100, 125, 164
54-25105	485–701[a]
54-01107	20, 44.5, 56.5, 74, 91, 100
54-01110	20, 48, 60, 70, 85, 90
54-01111	20, 39.5, 50, 70, 78, 100, 139
54-01115	7.9, 26.5, 40.8, 53, 63.6, 68.9
54-01117	20, 31.5, 55, 73, 82, 85
54-01121	20, 26, 61.5, 70, 76, 98, 121
54-01126	7.5, 17.5, 28.5, 35, 42.5, 49.5
54-01128	7.5, 15, 20, 30, 39
54-02009	37, 62, 92
54-02010	30, 53, 95
54-02032	20, 60, 100, 130, 156
54-02033	20, 60, 100, 160, 200, 220, 260, 277
54-22116[b]	28, 46, 64, 82, 100, 118, 136, 154, 172, 190, 208, 226, 244, 262, 280

[a] Open borehole.

[b] Distance from well head, horizontal well.

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Appendix J

Investigation-Derived Waste Management

J-1.0 INVESTIGATION-DERIVED WASTE MANAGEMENT

This appendix describes the management of waste generated during the investigation of Material Disposal Area (MDA) G at Technical Area (TA) 54, Los Alamos National Laboratory (LANL or the Laboratory). Investigation-derived waste (IDW) is solid waste generated during field investigations and may include, but is not limited to, drill cuttings, contaminated personal protective equipment (PPE), sampling supplies and plastic, fluids from the decontamination of PPE and sampling equipment, and all other wastes that may potentially come in contact with contaminants.

All IDW generated during the 2004–2005 MDA G field investigation was managed in accordance with applicable Environmental Stewardship Division–Environmental Characterization and Remediation (ENV-ECR) standard operating procedures (SOPs). These SOPs incorporate the requirements of all applicable U.S. Environmental Protection Agency (EPA) and New Mexico Environment Department (NMED) regulations, U.S. Department of Energy (DOE) orders, and Laboratory Implementation Requirements (LIRs).

SOPs applicable to the characterization and management of IDW are

- ENV-ECR SOP-1.06, Management of Environmental Restoration Project Waste and
- ENV-ECR SOP-1.10, Revision 1, Waste Characterization.

These SOPs may be found at the following URL: http://erproject.lanl.gov/documents/procedures.html.

The 2004 Pollution Prevention Roadmap (LANL 2004, 88465) was implemented during field investigations at MDA G to minimize waste generation. This plan is updated annually as a requirement of Module VIII of the Laboratory's Hazardous Waste Facility Permit.

The IDW waste streams associated with the investigation of MDA G are identified in Table J-1.0-1 and are briefly described below. Table J-1.0-1 also summarizes the waste types, volumes, characterization methods, methods of on-site management, and disposition path for each of the following waste streams.

Drill cuttings: The drill cuttings waste stream consists of cuttings from boreholes drilled at MDA G. Drill cuttings were collected and containerized at the point of generation (i.e., at the drill rig). The drill cutting waste stream is being characterized with analytical results from core samples augmented by direct sampling of the containerized waste. Contaminants of concern are metals and radionuclides. The maximum detected concentrations of radionuclides are compared with background/fallout values. If the maximum concentrations are above background/fallout values, the waste cuttings will be designated as low-level radioactive waste (LLW). The waste was sampled and analyzed using the toxicity characteristic leaching procedure to confirm that it is characteristically nonhazardous, as was anticipated based on acceptable knowledge (AK) from existing data/documentation and site characterization. The waste analysis data are currently in review. At present, this waste is being managed on-site at TA-54, Area G, pending profiling.

Spent PPE: The spent PPE waste stream consisted of PPE that "contacted" contaminated environmental media (i.e., core and/or drill cuttings) and that cannot be decontaminated. The bulk of this waste stream consisted of protective clothing, such as coveralls, gloves, and shoe covers. Spent PPE was collected in containers at personnel decontamination stations. Characterization of this waste stream was performed through AK of the waste materials, the methods of generation, and the levels of contamination observed in the environmental media. At present, this waste is being managed on-site at TA-54, Area G, pending profiling.

Disposable sampling supplies: The disposable sampling supplies waste stream consisted of all equipment and materials required for collecting samples that came into direct contact with contaminated environmental media and that could not be decontaminated. This waste stream also included wastes associated with dry decontamination activities, primarily paper and plastic items collected in bags at the sampling location and transferred to accumulation drums. Characterization of this waste stream was performed through AK of the waste materials, the methods of generation, and the levels of contamination observed in the environmental media. At present, this waste is being managed on-site at TA-54, Area G, pending profiling.

Spent acetone (high explosives test kit waste): The spent acetone waste stream consisted of high explosives test kit waste in the form of spent solvent. As a spent solvent, acetone is listed as a hazardous waste (EPA Hazardous Waste Number F003 and D001) because of its ignitability. This waste stream was characterized using AK of the process and the materials used to generate the waste. This waste stream is stored in a sealed secondary container at a registered Satellite Accumulation Area on-site and will be disposed under existing Waste Profile (WP) 38181 when a Consolidated Remote Waste Storage Site disposal request is approved. The activities associated with this project generated less than 4 L of spent acetone.

Empty sodium azide container: The D-Tech test kits include buffer solution bottles containing sodium azide. The solution was used up during the screening process and exists only as residual material in the bottles; however, the empty containers from the transfer of the sodium azide buffer solution are considered nonhazardous solid waste because they are transfer vessels that once contained dilute sodium azide, a product used for its intended purpose according to the field analytical method. This waste stream was characterized using AK of the process and the materials used to generate the waste. This waste stream is stored in a sealed secondary container on-site and will be disposed under WP 38132 at the Waste Management landfill in Rio Rancho, New Mexico, or at another permitted, off-site disposal facility. The activities associated with this project generated less than 5 gal. of empty sodium azide containers.

Decontamination fluids: Decontamination fluids were not generated during this investigation because dry decontamination methods were used successfully.

Before the start of field investigation activities, a Waste Characterization Strategy Form (WCSF) was prepared and approved per the requirements of the ENV-ECR SOP-01.10, Revision 1. The WCSF provided information on IDW characterization, management, containerization, and estimated volumes. The IDW characterization was completed by reviewing existing data and documentation and analytical data from samples collected from the media being investigated (subsurface soil/tuff). The approved WCSF is provided as Attachment J-1 to this appendix.

The selection of waste containers was based on appropriate U.S. Department of Transportation requirements, waste types, and estimated volumes of IDW to be generated. Immediately following containerization, each waste container was individually labeled with a unique identification number and with information regarding waste classification, item(s), radioactivity (if applicable), and date generated. The wastes were staged in clearly marked and appropriately constructed waste accumulation areas. Waste accumulation area postings, regulated storage duration, and inspection requirements were based on the type of IDW and its classification. Container and storage requirements were detailed in the WCSF and approved before the waste was generated.

J-2.0 REFERENCE

The following list includes all references cited in this appendix. Parenthetical information following each reference provides the author, publication date, and the ER identification (ID) number. This information also is included in the citations in the text. ER ID numbers are assigned by the Los Alamos National Laboratory's ENV-Environmental Remediation and Surveillance (ERS) Program to track records associated with the Program. These numbers can be used to locate copies of the actual documents at the ENV-ERS Program's Records Processing Facility and, where applicable, with the ENV-ERS Program's reference library titled "Reference Set for Material Disposal Areas, Technical Area 54."

Copies of the reference library are maintained at the NMED Hazardous Waste Bureau; the DOE Los Alamos Site Office; and EPA, Region 6. This library is a living collection of documents that was developed to ensure that the administrative authority has all the necessary material to review the decisions and actions proposed in this document. However, documents previously submitted to the administrative authority are not included.

LANL (Los Alamos National Laboratory), December 2004. "2004 Pollution Prevention Roadmap," Los Alamos National Laboratory document LA-UR-04-8973, Los Alamos, New Mexico. (LANL 2004, 88465)

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Table J-1.0-1
Summary of IDW Generation and Management

Waste Stream	Expected Waste Type	Volume	Characterization Method	On-Site Management	Expected Disposition
Drill cuttings	Nonhazardous, LLW	140 yd^3	Analytical results from waste samples	55-gal. drums, soft sided strong tight containers, 5-gal. bucket	Disposal at TA-54, Area G
Spent PPE and disposable sampling supplies	Nonhazardous LLW	0.25 yd^3	AK	Accumulation in 55-gal. drum	Disposal at TA-54, Area G
Spent PPE and disposable sampling supplies	Nonhazardous, non-radioactive	0.25 yd^3	AK	Accumulation in 55-gal. drum	Disposal at an approved off-site facility as "Green is Clean"
Spent acetone	Hazardous	<4 L	AK	5-gal. bucket	Off-site disposal under a Consolidated Remote Waste Storage Site disposal request approval
Empty sodium azide containers	Nonhazardous, non-radioactive	<5 gal.	AK	5-gal. bucket	Disposal at the Waste Management solid waste landfill in Rio Rancho, New Mexico

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Attachment J-1

Waste Characterization Strategy Form

Waste Characterization Strategy Form

For instructions regarding this form, see section 8 of ER-SOP-01.10, R1.

Project Title	**Drilling and Sampling Activities at TA-54 MDA G**
Operating Unit #	**OU 1148**
PRS #	**SWMU 54-013(b)-99**
Activity Type	**Site Characterization Sampling**
Field Team Leader	**John Hopkins**
Waste Management Coordinator	**Paula Bertino**
Completed by	**Victor Garde**
Date	**January 20, 2005**

Description of activities:

The objectives of the investigation activities at TA-54 MDA G are to complete the determination of the nature and extent of the contamination identified during past investigations, including the MDA G Phase I RFI fieldwork, and to collect additional information on the hydrogeologic properties and other physical characteristics of the vadose zone beneath the MDA G disposal units.

The proposed activities include drilling thirty-four vertical and three angled boreholes adjacent to or under the disposal units and collecting samples to supplement the Phase I RFI data for determining the nature and extent of contamination.

Acceptable Knowledge

Site history and description:
MDA G is located in TA-54 at Los Alamos National Laboratory (LANL). MDA G is a decommissioned subsurface material disposal area established for disposing of low-level radioactive waste, low-level asbestos-contaminated material, and low-level PCB-contaminated wastes. It was also utilized for retrievable storage of TRU waste. The SWMU addressed in this activity is 54-013(b)-99, which is a consolidation of SWMUs 54-013(b), 54-014(b-d), 54-015(k), 54-017, 54-018, 54-019, and 54-020

At MDA G, 32 pits, 194 shafts, and 4 trenches were excavated into the overlying soil, unit 2, and unit 1 of the Tshirege Member of the Bandelier Tuff. During operation, the pits and trenches remained open to the atmosphere. When active, most of the shafts remained covered and locked with steel lids for safety and security. The remaining excavated volume of the pits, shafts, and trenches were then backfilled with crushed tuff. The shafts were then capped with a concrete plug and marked with a brass monument.

Previous Investigation Activities

The results of previous investigations of MDA G are summarized in the MDA G Historical Information Report, which is presented as Appendix B to the MDA G Investigation Work Plan (LANL 2004, 87440). The most recent previous investigation is the Phase I RFI, which was conducted over the period 1993 to 2001. Phase I RFI activities included sampling of ambient air, channel sediments, subsurface core, and pore gas.

VOC surface flux was measured across MDA G by both a surface flux chamber and EMFLUX® surface adsorbent cartridges in surveys conducted in August 1993 and August 1994. Details of the surface flux chamber investigations are reported in Eklund (1995, 56033). Details of the EMFLUX® surface adsorbent cartridges investigations are reported in Quadrel Services reports (1993, 63868; 1994, 63869) and in Trujillo et al. (1998, 58242).

During the summers of 1993 and 1994, tritium flux was measured at 142 locations on and near the surface of MDA G (Eklund 1995, 56033).

Between September 1993 and May 1995, 156 core samples were collected from 10 vertical and 10 angled boreholes drilled at MDA G and submitted to an off-site contract laboratory for analysis. Depth intervals for sample collection and analytical suites varied by borehole. The depths of these boreholes ranged from 38.5 to 153 ft bgs. A total of 20 boreholes were drilled during the Phase I RFI. Borehole 54-01113 was inadvertently advanced into a disposal unit and was abandoned at 17.5 ft bgs. The two samples collected and analyzed for this borehole were not used in the data review.

In 1994, 113 sediment samples were collected from drainages leading from MDA G (Figure B-2; LANL 1996, 54462) from depths between 0 in. and 10 in. using stainless steel trowels. Sixteen field-duplicate samples were also collected from the drainages; local background samples were collected from 10 locations in two channels that drain portions of Mesita del Buey not used for waste management. Sediment samples were collected from seven to ten locations in each of the MDA G drainages. All samples were field-screened by the Laboratory's mobile radiological analysis laboratory. Screening was used to identify 59 samples to be submitted to an off-site contract laboratory for analysis, including four samples from each of the drainage channels. These samples were analyzed for inorganic chemicals (metals and cyanide), organic chemicals (PCBs and pesticides), gamma spectroscopy, americium-241, tritium, isotopic thorium, strontium-90, isotopic uranium, and isotopic plutonium (LANL 1996, 54462).

In 1994, ambient air samples were collected for eight days at two sampling locations along the northern perimeter of MDA G. The samples were analyzed for VOCs.

Tables 1 through 6 provide frequency of detects for inorganics, organics, and radionuclides in subsurface tuff, maximum VOC concentrations in pore gas, and tritium concentrations in pore gas at locations 54-01110 and 54-01111.

Evaluation of environmental data generated during the Phase I RFI consisted of comparisons of site data with background values in environmental media, evaluation of correlations among environmental measurements, and evaluation of spatial plots of contaminant concentrations in surface and subsurface environmental media. The following contaminants were identified as being associated with MDA G:

- Americium-241, cesium-137, cobalt-60, europium-152, plutonium-238, plutonium-239, strontium-90, thorium-230, tritium, uranium-234, uranium-235, and uranium-238 were detected in subsurface core beneath the pits, trenches, and shafts.
- Antimony, cadmium, cyanide, mercury, molybdenum, selenium, silver, thallium, and vanadium had detected concentrations and/or detection limits above background in subsurface core beneath the pits, trenches, and shafts.
- Tritium was detected in surface flux samples and pore gas.
- VOCs were detected in pore gas samples collected from monitoring boreholes, surface flux, and ambient-air samples.
- Methoxychlor was detected in channel sediments.
- Americium-241, cobalt-60, plutonium-238, plutonium-239, and tritium were elevated with respect to background values in channel sediments. Beryllium, cobalt, mercury, selenium, and silver were not detected above background values in sediment samples; however, the detection limits for some samples were elevated above background values. Cadmium was statistically different from background.

Additional data are required to determine the following:

- The vertical extent of tritium in subsurface along the southern fence line near the high-activity tritium disposal shafts;

- The vertical extent of the vapor-phase VOCs beneath the pits at the eastern boundary of Area G and in the area of Pits 25 and 26;
- The extent of radionuclides and inorganic chemicals beneath and adjacent to several disposal units;
- The presence of perchlorate, nitrate, and high-explosives contamination in borehole samples; and
- The presence or absence of perched groundwater beneath MDA G.

Additional samples from Cañada del Buey and Pajarito Canyon are also needed to further characterize sediment downgradient from Area G.

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Characterization Strategy:

Five separate waste streams are expected to be generated during characterization activities: investigation-derived waste (IDW), municipal solid waste (MSW), borehole cuttings, High Explosives (HE) screening test kit waste including spent acetone, and empty sodium azide containers. In addition, three other waste streams may potentially be generated: petroleum contaminated soil (PCS), absorbent material, and decontamination liquids.

Waste # 1: Investigation Derived Waste

Waste type: IDW includes spent PPE, contaminated sampling supplies (including paper towels and sampling jars).

Anticipated Regulatory Status: Low Level Waste (LLW)

Characterization Approach: LLW will be characterized based on previous analytical data gathered during previous and current RFI activities and direct sampling of the borehole cuttings. Contact waste will be segregated from cuttings and will be managed appropriately.

Storage and Disposal Method: All IDW will be stored in appropriate LLRW containers, staged at a LLR waste staging area at MDA G, and disposed of at Area G at TA-54.

Waste # 2: Municipal Solid Waste

Waste type: MSW will consist of non-contact trash and debris.

Anticipated Regulatory Status: Non-hazardous, non-radioactive municipal solid waste.

Characterization Approach: MSW will be characterized based on acceptable knowledge (i.e., no contact of the wastes with environmental media). MSW will be segregated from all other waste streams.

Storage and Disposal Method: It is anticipated that the waste will be stored in plastic-lined trashcans, and then disposed of at the County of Los Alamos Landfill.

Waste # 3 : Borehole Cuttings

Waste Type: Soil and tuff cuttings from boreholes. Borehole cuttings will be managed as LLW for final disposal at Area G at TA-54.

Anticipated Regulatory Status: Low Level Waste

Characterization Approach: LLW will be characterized based upon direct sampling of the borehole cuttings to ensure correct assignment of waste type. The maximum detected concentrations of radionuclides will be compared with background/fallout values. If maximum concentrations are above background/fallout values, the waste cuttings will be designated as low-level radioactive waste. Maximum concentrations of toxicity characteristic leaching procedure (TCLP) constituents will be compared with 20 times the TCLP regulatory limit. If concentrations are less than 20 times the regulatory limit, the waste cuttings will be designated nonhazardous by characteristic. If concentrations exceed 20 times the regulatory limit, the waste will be sampled and analyzed using the TCLP to determine if it is hazardous by characteristic. If listed waste constituents are detected in tuff samples, the maximum concentrations will be compared to NMED soil screening levels (SSLs). If concentrations are less than SSLs, a "no longer contained in" determination will be requested from NMED. If concentrations exceed SSLs, the wastes will be designated as listed hazardous waste.

Storage and Disposal Method: All borehole cuttings will be stored in soft-sided, strong-tight containers, staged at a LLRW staging area at MDA G, and disposed of at Area G at TA-54.

Waste #4 : Spent Acetone (HE test kit waste)

Waste Type: Spent solvent. Soil screening will include an extraction step using acetone as a solvent.

Anticipated Regulatory Status: Acetone, as a spent solvent, is a listed hazardous waste (EPA Hazardous Waste Number F003 and D001) based on ignitability.

Characterization Approach: This waste stream will be characterized using acceptable knowledge (AK) of the process generating the waste and the materials used in this process.

Storage and Disposal Method: This waste stream will be stored in a sealed secondary container at a registered Satellite Accumulation Area (SAA) on-site and disposed under existing Waste Profile (WP) 38181 when a Consolidated Remote Waste Storage Site (CRWSS) disposal request is approved. The activities associated with this project will generate less than 4 Liters of spent acetone.

Waste #5 : Empty Sodium Azide Containers:

Waste Type: The D-Tech test kits have buffer solution bottles containing sodium azide, however, these components are typically used up during the screening process and will likely only exist as residual material inside the bottles.

Anticipated Regulatory Status: The empty containers from the transfer of the sodium azide buffer solution are considered to be non-hazardous solid waste since they are transfer vessels containing dilute sodium azide that is a product used for its intended purpose per the field analytical method.

Characterization Approach: This waste stream will be characterized using AK of the process generating the waste and the materials used in this process.

Storage and Disposal Method: This waste stream will be stored in a sealed secondary container on-site and disposed under WP 38132 at the Waste Management landfill in Rio Rancho, NM. The activities associated with this project will generate less than 5 gallons of empty sodium azide containers.

Waste # 6: Petroleum-Contaminated Soil (PCS) (Potential)

Waste Type: PCS from the release of commercial products such as hydraulic fluid, motor oil, or diesel fuel. This waste stream would only be generated in the event of an accidental release, such as the rupture of a hydraulic hose.

Anticipated Regulatory Status: New Mexico Special Waste (NMSW) based on the MSDS for the released product.

Characterization Approach: The PCS will be characterized based on the Material Safety Data Sheets (MSDS) for the product and direct waste characterization sampling. LANL RCTs will conduct radiological surveys on all PCS.

Storage and Disposal Method: It is anticipated that the waste will be stored in 55-gallon drums, staged in a designated NMSW storage area, and disposed of offsite at an NMSW-permitted facility.

Waste # 7: Absorbent Material (Potential) and PPE

Waste Type: Absorbent material includes pads, paper towels, or other material used to contain released commercial products considered to be NMSW. This waste stream would only be generated in the event of an accidental release, such as the rupture of a hydraulic hose.

Anticipated Regulatory Status: NMSW based on the MSDS for the released product.

Characterization Approach: The absorbent material will be characterized based on the MSDS for the released product and direct waste characterization sampling. LANL RCTs will conduct radiological surveys on all absorbent material.

Storage and Disposal Method: It is anticipated that the waste will be stored in 55-gallon drums in a designated NMSW storage area, and disposed of offsite at a NMSW-permitted facility.

Waste # 8: Decontamination Liquid (Potential)

Waste Type: To the extent possible, sampling equipment will be decontaminated using the dry techniques described in ER-SOP-01.08, "Field Decontamination of Drilling and Sampling Equipment." If the dry techniques are not applicable or prove to be ineffective, decontamination water/liquids will be utilized to achieve complete decontamination. It is anticipated that less than six gallons of decontamination water/liquid per day will be generated.

Anticipated Regulatory Status: Nonhazardous.

Characterization Approach: In accordance with ER-SOP-01.06, Management of Environmental Restoration Project Waste," up to six gallons per day of decontamination liquids may be discharged to the ground provided they are not hazardous or mixed waste. The decontamination liquid will be characterized based on acceptable knowledge, including field screening results and past analytical results for media in contact with the equipment being decontaminated.

Storage and Disposal Method: The decontamination water will be discharged on-site in accordance with ER-SOP-01.06, "Management of Environmental Restoration Project Waste."

Table 1
Frequency of Inorganic Chemicals Above BVs in Subsurface Core Samples at MDA G

Analyte	Geologic Unit	Number of Analyses	Number of Detects	Concentration Range[a] (mg/kg)[a]	BV[b] (mg/kg)	Frequency of Detects Above BV	Frequency of Nondetects Above BV
Aluminum	Qbt 1g	7	6	[359]–720	3560	0/7	0/7
Aluminum	Qbt 1v	49	48	186–5610	8170	0/49	0/49
Aluminum	Qbt 2	69	65	116–3510	7340	0/69	0/69
Antimony	Qbt 1g	7	0	[0.2–8.4]	0.5	0/7	2/7
Antimony	Qbt 1v	49	1	[0.1–11]	0.5	1/49	24/49
Antimony	Qbt 2	69	1	[0.1–11]	0.5	1/69	46/69
Arsenic	Qbt 1g	7	2	[0.3]–0.8	0.56	1/7	0/7
Arsenic	Qbt 1v	49	15	0.3–2.2	1.81	2/49	0/49
Arsenic	Qbt 2	69	13	[0.29–2.1]	2.79	0/69	0/69
Barium	Qbt 1g	7	5	8.3–26.5	25.7	1/7	0/7
Barium	Qbt 1v	49	43	2.2–71.6	26.5	1/49	0/49
Barium	Qbt 2	69	59	[1.4]–41	46	0/69	0/69
Beryllium	Qbt 1g	7	5	0.28–0.54	1.44	0/7	0/7
Beryllium	Qbt 1v	49	22	[0.05]–1.7	1.7	0/49	0/49
Beryllium	Qbt 2	69	20	[0.04]–1.6	1.21	1/69	0/69
Boron	Qbt 1g	2	0	[1–1]	n/a[c]	0/2	n/a
Boron	Qbt 1v	2	0	[1–1]	n/a	0/2	n/a
Boron	Qbt 2	1	0	[1–1]	n/a	0/1	n/a
Cadmium	Qbt 1g	7	0	[0.04–0.66]	0.4	0/7	1/7
Cadmium	Qbt 1v	49	3	[0.04–0.68]	0.4	0/49	13/49
Cadmium	Qbt 2	69	3	[0.04–0.72]	1.63	0/69	0/69
Calcium	Qbt 1g	7	5	653–1100	1900	0/7	0/7
Calcium	Qbt 1v	49	48	590–2460	3700	0/49	0/49
Calcium	Qbt 2	69	63	187–5580	2200	2/69	0/69
Chromium	Qbt 1g	7	4	[0.39]–4.2	2.6	1/7	0/7
Chromium	Qbt 1v	49	23	[0.12]–5.6	2.24	2/49	1/49
Chromium	Qbt 2	69	21	[0.12–6.2]	7.14	0/69	0/69
Cobalt	Qbt 1g	7	3	[0.08]–3.2	8.89	0/7	0/7
Cobalt	Qbt 1v	49	13	[0.15]–3.3	1.78	1/49	0/49
Cobalt	Qbt 2	69	8	[0.1]–2.6	3.14	0/69	0/69
Copper	Qbt 1g	7	3	[0.5]–3.7	3.96	0/7	0/7
Copper	Qbt 1v	49	23	[0.39]–5.9	3.26	3/49	0/49
Copper	Qbt 2	69	24	[0.24]–8.7	4.66	2/69	1/69
Cyanide (Total)	Qbt 1g	5	0	[0.05–0.5]	n/a	0/5	n/a

Table 1 (continued)

Analyte	Geologic Unit	Number of Analyses	Number of Detects	Concentration Range[a] (mg/kg)[a]	BV[b] (mg/kg)	Frequency of Detects Above BV	Frequency of Nondetects Above BV
Cyanide (Total)	Qbt 1v	43	3	[0.05–0.97]	n/a	3/43	n/a
Cyanide (Total)	Qbt 2	56	6	[0.05–0.56]	n/a	6/56	n/a
Iron	Qbt 1g	7	7	2200–3650	3700	0/7	0/7
Iron	Qbt 1v	49	49	1350–7600	9900	0/49	0/49
Iron	Qbt 2	69	69	529–5840	14500	0/69	0/69
Lead	Qbt 1g	7	6	2.7–10	13.5	0/7	0/7
Lead	Qbt 1v	49	45	0.81–13	18.4	0/49	0/49
Lead	Qbt 2	69	63	[0.45]–10.4	11.2	0/69	0/69
Magnesium	Qbt 1g	7	5	74.8–150	739	0/7	0/7
Magnesium	Qbt 1v	49	39	[25]–1930	780	2/49	0/49
Magnesium	Qbt 2	69	51	[26]–965	1690	0/69	0/69
Manganese	Qbt 1g	7	7	76.9–154	189	0/7	0/7
Manganese	Qbt 1v	49	49	92–340	408	0/49	0/49
Manganese	Qbt 2	69	69	56.7–251	482	0/69	0/69
Mercury	Qbt 1g	5	0	[0.02–0.1]	0.1	0/5	0/5
Mercury	Qbt 1v	44	0	[0.02–0.11]	0.1	0/44	7/44
Mercury	Qbt 2	60	3	[0.02]–0.44	0.1	3/60	10/60
Molybdenum	Qbt 1g	2	2	1.4–1.8	n/a	2/2	n/a
Molybdenum	Qbt 1v	6	1	[0.14]–1.9	n/a	1/6	n/a
Molybdenum	Qbt 2	4	0	[0.14–0.9]	n/a	0/4	n/a
Nickel	Qbt 1g	7	2	[0.26]–4.4	2	1/7	1/7
Nickel	Qbt 1v	49	11	[0.1]–4.9	2	2/49	9/49
Nickel	Qbt 2	69	14	[0.13–3.2]	6.58	0/69	0/69
Potassium	Qbt 1g	7	5	[198]–1300	2390	0/7	0/7
Potassium	Qbt 1v	49	40	110–1170	6670	0/49	0/49
Potassium	Qbt 2	69	49	[78]–1220	3500	0/69	0/69
Selenium	Qbt 1g	7	0	[0.3–0.6]	0.3	0/7	5/7
Selenium	Qbt 1v	49	2	[0.3–1.1]	0.3	2/49	44/49
Selenium	Qbt 2	69	0	[0.3–1.1]	0.3	0/69	68/69
Silver	Qbt 1g	7	1	[0.06–1]	1	0/7	0/7
Silver	Qbt 1v	49	1	[0.06–2.3]	1	0/49	9/49
Silver	Qbt 2	69	1	[0.06–2.2]	1	0/69	14/69
Sodium	Qbt 1g	7	5	219–2420	4350	0/7	0/7
Sodium	Qbt 1v	49	44	86.2–690	6330	0/49	0/49
Sodium	Qbt 2	69	55	78.8–525	2770	0/69	0/69
Thallium	Qbt 1g	7	0	[0.1–0.58]	1.22	0/7	0/7
Thallium	Qbt 1v	45	0	[0.1–1.4]	1.24	0/45	2/45
Thallium	Qbt 2	65	0	[0.1–1.4]	1.1	0/65	4/65

Table 1 (continued)

Analyte	Geologic Unit	Number of Analyses	Number of Detects	Concentration Range[a] (mg/kg)[c]	BV[b] (mg/kg)	Frequency of Detects Above BV	Frequency of Nondetects Above BV
Vanadium	Qbt 1g	7	4	[0.5]–1.2	4.59	0/7	0/7
Vanadium	Qbt 1v	49	37	0.31–92	4.48	2/49	0/49
Vanadium	Qbt 2	69	52	0.57–174	17	1/69	0/69
Zinc	Qbt 1g	7	7	9.4–42	40	1/7	0/7
Zinc	Qbt 1v	49	49	15.7–64	84.6	0/49	0/49
Zinc	Qbt 2	69	69	9.5–58	63.5	0/69	0/69

[a] Square brackets indicate detection limits for nondetected results.

[b] Source of BVs: LANL 1998, 59730.

[c] n/a = Not applicable.

Table 2
Frequency of Radionuclides Above BVs or Detected in Subsurface Tuff Samples at MDA G

Analyte	Geologic Unit	Number of Analyses	Number of Detects	Concentration Range[a] (pCi/g)	BV[b] (pCi/g)	Frequency of Detects Above BV
Americium-241	Qbt 1g	7	2	[-0.073–0.027]	n/a[c]	2/7
Americium-241	Qbt 1v	49	8	[-0.023–0.0248]	n/a	8/49
Americium-241	Qbt 2	69	15	[-0.085]–0.169	n/a	15/69
Cesium-134	Qbt 1g	3	0	[0.07–0.23]	n/a	0/3
Cesium-134	Qbt 1v	42	0	[-0.014–0.43]	n/a	0/42
Cesium-134	Qbt 2	59	0	[-0.034–0.12]	n/a	0/59
Cesium-137	Qbt 1g	7	1	[-0.014]–1	n/a	1/7
Cesium-137	Qbt 1v	49	0	[-0.028–0.38]	n/a	0/49
Cesium-137	Qbt 2	69	1	[-0.031]–0.21	n/a	1/69
Cobalt-60	Qbt 1g	7	1	[-0.011]–0.39	n/a	1/7
Cobalt-60	Qbt 1v	49	0	[-0.006–0.28]	n/a	0/49
Cobalt-60	Qbt 2	69	3	[-0.009]–0.62	n/a	3/69
Europium-152	Qbt 1g	3	0	[0.27–0.73]	n/a	0/3
Europium-152	Qbt 1v	41	3	[-0.0823]–1.92	n/a	3/41
Europium-152	Qbt 2	50	1	[-0.033]–1.54	n/a	1/50
Plutonium-238	Qbt 1g	7	0	[0–0.01]	n/a	0/7
Plutonium-238	Qbt 1v	49	1	[-0.007]–0.027	n/a	1/49
Plutonium-238	Qbt 2	69	1	[-0.02–0.014]	n/a	1/69
Plutonium-239	Qbt 1g	7	0	[0–0.001]	n/a	0/7
Plutonium-239	Qbt 1v	49	1	[0]–0.1	n/a	1/49
Plutonium-239	Qbt 2	69	3	[-0.002]–0.024	n/a	3/69
Ruthenium-106	Qbt 1g	3	0	[0.45–0.86]	n/a	0/3
Ruthenium-106	Qbt 1v	42	0	[0.059–1.33]	n/a	0/42
Ruthenium-106	Qbt 2	59	0	[-0.272–1.21]	n/a	0/59
Sodium-22	Qbt 1g	3	0	[0.06–0.14]	n/a	0/3
Sodium-22	Qbt 1v	42	0	[-0.0062–0.15]	n/a	0/42
Sodium-22	Qbt 2	59	0	[-0.034–0.18]	n/a	0/59
Strontium-90	Qbt 1g	7	0	[-0.59–0.26]	n/a	0/7
Strontium-90	Qbt 1v	49	2	[-0.34]–0.62	n/a	2/49
Strontium-90	Qbt 2	69	0	[-0.29–0.38]	n/a	0/69
Thorium-228	Qbt 1g	7	7	1.83–3.14	4.9	0/7
Thorium-228	Qbt 1v	49	49	1.58–3.25	3.75	0/49
Thorium-228	Qbt 2	69	69	1.23–2.32	2.52	0/69
Thorium-230	Qbt 1g	7	7	1.8–3.17	4	0/7
Thorium-230	Qbt 1v	49	46	1.48–3.16	3.12	1/49
Thorium-230	Qbt 2	69	57	1.11–2.26	1.98	1/69

Table 2 (continued)

Analyte	Geologic Unit	Number of Analyses	Number of Detects	Concentration Range[a] (pCi/g)	BV[b] (pCi/g)	Frequency of Detects Above BV
Thorium-232	Qbt 1g	7	7	1.71–3.19	4.9	0/7
Thorium-232	Qbt 1v	49	49	1.64–3.23	3.75	0/49
Thorium-232	Qbt 2	69	69	1.33–2.31	2.52	0/69
Tritium	Qbt 1g	21	21	0.55–474	n/a	21/21
Tritium	Qbt 1v	55	54	3.24E-02–34301	n/a	54/55
Tritium	Qbt 2	73	67	2.56E-02–80435	n/a	67/73
Uranium-234	Qbt 1g	4	4	2.04–3.02	4	0/4
Uranium-234	Qbt 1v	11	11	1.61–2.74	3.12	0/11
Uranium-234	Qbt 2	25	25	0.92–2.57	1.98	1/25
Uranium-235	Qbt 1g	6	4	0.07–0.21	0.18	1/6
Uranium-235	Qbt 1v	49	10	0.0541–[0.82]	0.14	3/49
Uranium-235	Qbt 2	69	15	0.02–[0.66]	0.09	5/69
Uranium-238	Qbt 1g	4	4	2.35–2.99	3.9	0/4
Uranium-238	Qbt 1v	11	11	1.51–2.89	3.05	0/11
Uranium-238	Qbt 2	25	25	0.84–2.75	1.93	1/25

[a] Square brackets indicate minimum detectable activity (i.e., detection limits) for nondetected results.

[b] Source of BVs: LANL 1998, 59730.

[c] n/a = Not applicable.

Waste Characterization Strategy Form

Table 3
Frequency of Detected Organic Chemicals in Subsurface Tuff Samples

Analyte	Geologic Unit	Number of Analyses	Number of Detects	Concentration Range* (mg/kg)	EQLs (mg/kg)	Frequency of Detects
Acetone	Qbt 2	68	6	[0.005 to 1.3]	0.01	6/68
Acetone	Qbt 1g	7	1	[0.008] to 0.039	0.01	1/7
Acetone	Qbt 1v	49	10	[0.003] to 0.059	0.01	10/49
Aldrin	Qbt 2	63	1	[0.0017 to 0.0036]	0.0017	1/63
Aroclor-1254	Qbt 1v	49	1	[0.031] to 0.12	0.033	1/49
Benzene	Qbt 2	68	1	0.003 to [0.007]	0.005	1/68
Benzo(a)pyrene	Qbt 1v	48	1	[0.16 to 0.67]	0.33	1/48
Benzo(g,h,i)perylene	Qbt 1v	48	2	[0.16] to 1.2	0.33	2/48
Bis(2-ethylhexyl)phthalate	Qbt 2	68	5	0.046 to [1.9]	0.33	5/68
Bis(2-ethylhexyl)phthalate	Qbt 1g	7	1	0.041 to [0.35]	0.33	1/7
Bis(2-ethylhexyl)phthalate	Qbt 1v	48	1	[0.079] to 4	0.33	1/48
Butanone[2-]	Qbt 2	68	2	[0.003] to 7.2	0.33	2/68
Butylbenzylphthalate	Qbt 1v	48	1	6.5E-02 to [0.69]	0.33	1/48
Chlordane[gamma-]	Qbt 2	63	1	[0.0017 to 0.0036]	0.0017	1/63
Di-n-butylphthalate	Qbt 1g	7	1	0.035 to [0.35]	0.33	1/7
Di-n-octylphthalate	Qbt 1v	48	1	0.081 to [0.69]	0.33	1/48
Ethylbenzene	Qbt 2	68	1	0.002 to [0.007]	0.005	1/68
Heptachlor Epoxide	Qbt 2	63	1	[0.0017 to 0.0036]	0.0017	1/63
Methylene Chloride	Qbt 2	68	4	0.001 to [0.011]	0.01	4/68
Methylnaphthalene[2-]	Qbt 2	68	1	0.049 to [0.46]	0.33	1/68
Naphthalene	Qbt 2	80	3	0.002 to [0.46]	0.33	3/80
Naphthalene	Qbt 1v	63	2	0.002 to [0.69]	0.33	2/63
Pyrene	Qbt 1v	48	1	0.15 to [0.67]	0.33	1/48
Tetrachloroethene	Qbt 2	68	2	0.0012 to [0.007]	0.005	2/68
Tetrachloroethene	Qbt 1v	49	1	0.0024 to [0.006]	0.005	1/49
Toluene	Qbt 2	68	1	[0.005] to 0.013	0.005	1/68
Toluene	Qbt 1v	49	1	0.001 to [0.006]	0.005	1/49
Trimethylbenzene[1,2,4-]	Qbt 2	68	1	0.003 to [0.007]	0.005	1/68
Xylene (Total)	Qbt 2	64	1	[0.005] to 0.008	0.005	1/64

*Square brackets indicate detection limits for nondetects.

Table 4
Maximum Pore-Gas VOC Concentrations, Fourth Quarter of FY1999 (TO-14 Method) at MDA G

Compound	Well Number	Depth (ft)	Concentration (ppmv)
Methylene Chloride	54-02032	156	48
Methanol	54-02010	95	20
TCA	54-02010	95	17
Acetone	54-02010	95	9.8
Dichloroethene[1,1-]	54-02032	156	2.3
Acetonitrile	54-02010	95	2
Freon 113	54-02010	95	1.6
Dichloroethane[1,1-]	54-02030	156	1
PCE	54-02032	156	0.97
Freon 11	54-02010	95	0.79

Table 5
Maximum Pore-Gas VOC Concentrations, First Quarter of Fiscal Year 2002 (TO-14 Method) at MDA G

Compound	Well Number	Depth (ft)	Concentration (ppmv)
TCA	54-02009	62	97
Methanol	54-02009	62	35
Propanol[2-]	54-01117	55	4.5
Dichloroethene[1,1-]	54-02009	62	4.4
Dichloroethane[1,1-]	54-02009	62	3.9
Butanol[1-]	54-02009	62	3.4
Ethanol	54-02009	62	2.3
TCE	54-01117	55	1.6
Freon 113	54-01117	55	1.4
PCE	54-02009	62	0.84
Freon 11	54-02010	53	0.59
Methylene Chloride	54-00117	55	0.49

Table 6
2003 Pore-Gas Tritium Results for 54-01110 and 54-01111

Borehole	Sample ID	Depth (ft bgs)	Tritium (pCi/L)	Qualifier
54-01110	MD54-03-50390	20	5.85E+06	J+
54-01110	MD54-03-50391	48	6.83E+06	J+
54-01110	MD54-03-50392	60	1.63E+05	J+
54-01110	MD54-03-50393	70	2.67E+05	J+
54-01110	MD54-03-50394	85	3.38E+07	J+

Waste Characterization Strategy Form

Borehole	Sample ID	Depth (ft bgs)	Tritium (pCi/L)	Qualifier
54-01110	MD54-03-50395	90	5.27E+07	J+
54-01111	MD54-03-50396	20	8.82E+07	J+
54-01111	MD54-03-50397	39.5	1.24E+07	J+
54-01111	MD54-03-50398	50	3.01E+07	J+
54-01111	MD54-03-50399	70	1.50E+09	J+
54-01111	MD54-03-50403	70	1.43E+08	J+
54-01111	MD54-03-50400	78	3.83E+09	J+
54-01111	MD54-03-50402	100	1.65E+09	J+
54-01111	MD54-03-50401	139	1.58E+08	J+

Waste Characterization Strategy Form

CHARACTERIZATION TABLE

WASTE DESCRIPTION	Waste #1 – IDW	Waste #2 – MSW	Waste #3 - Borehole Cuttings	Waste #4 - Spent Acetone	Waste #5 – Empty Sodium Azide Containers
Volume (estimate)	2 cubic yard (cy)	2 cy	140 cy	< 4 liters	< 5 gallons
Packaging	55-gal drum (8)	Plastic-lined trash cans	1 cy soft sided strong tight container	Poly bottles in plastic 5-gallon bucket	Poly bottles in plastic 5-gallon bucket
Regulatory classification					
Solid	LLW	X	LLW		X
RCRA				X	
TSCA					
New Mexico Special					
CHARACTERIZATION METHOD					
AK: Existing Data/Documentation	X	X	X	X	X
AK: from Site Characterization			X		
Direct Sampling of Containerized Waste			X		
ANALYTICAL TESTING					
Volatile Organic Constituents EPA 8260-B					
Semivolatiles EPA 8270-C					
Organic Pesticides EPA 8081-A					
Organic Herbicides EPA 8151-A					
PCBs EPA 8082					
Total Metals EPA 6010-B					
Total Cyanide EPA 9012-A					
High Explosives Constituents EPA 8330					
Asbestos					
TPH EPA 8015					
TCLP Metals (EPA 1311/6010-B)			X		
TCLP Organics (EPA 1311/8260 & 1311/8270)			X		
TCLP Pest. & Herb. (EPA 1311/8081/1311/8151-A)					
Gross Alpha (alpha counting)			X		
Gross Beta (beta counting)			X		
Gross Gamma (gamma counting)			X		
Tritium (liquid scintillation)			X		
Gamma spectroscopy			X		
Isotopic plutonium (chem. Separation/alpha spec.)			X		

Isotopic uranium (chem. Separation/alpha spec.)			X		
Total uranium (6020 ICPMS)			X		
Strontium-90 (beta proportional counting)			X		
Americium-241 (chem. separation/alpha spec.)			X		
Waste Profile Form #	TBD	TBD	TBD	38131	38132

CHARACTERIZATION TABLE (CONTINUED)

WASTE DESCRIPTION	Waste #6 - PCS	Waste #7 – Absorbent Material	Waste #8 – Decon. Liquid
Volume (estimate)	0.25 cy	0.25 cy	< 6 gal./day
Packaging	55-gal drum (1)	55-gal drum (1)	Discharge on Site
Regulatory classification			
Solid			X
RCRA			
TSCA			
New Mexico Special	X	X	
CHARACTERIZATION METHOD			
AK: Existing Data/Documentation	X	X	X
AK: from Site Characterization			
Direct Sampling of Containerized Waste	X	X	
ANALYTICAL TESTING			
Volatile Organic Constituents EPA 8260-B	X	X	
Semivolatiles EPA 8270-C			
Organic Pesticides EPA 8081-A			
Organic Herbicides EPA 8151-A			
PCBs EPA 8082			
Total Metals EPA 6010-B			
Total Cyanide EPA 9012-A			
High Explosives Constituents EPA 8330			
Asbestos			
TPH EPA 8015	X	X	
TCLP Metals (EPA 1311/6010-B)			
TCLP Organics (EPA 1311/8260 & 1311/8270)			
TCLP Pest. & Herb. (EPA 1311/8081/1311/8151-A)			
Gross Alpha (alpha counting)			
Gross Beta (beta counting)			
Gross Gamma (gamma counting)			
Tritium (liquid scintillation)			
Gamma spectroscopy			
Isotopic plutonium (chem. Separation/alpha spec.)			
Isotopic uranium (chem. Separation/alpha spec.)			
Total uranium (6020 ICPMS)			
Strontium-90 (beta proportional counting)			
Americium-241 (chem. separation/alpha			

spec.)			
Waste Profile Form #	TBD	TBD	TBD

SIGNATURES	DATE
Team Leader (Print name and then sign below.) John Hopkins [signature]	1/20/05
Regulatory Compliance Focus Area representative (Print name and then sign below.) Joe English [signature]	1/20/05
ER Waste Management Coordinator (Print name and then sign below.) Paula Bertino [signature]	1/21/05
Waste Services representative (Print name and then sign below.) Michelle Coriz [signature]	1/21/05

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Waste Characterization Strategy Form

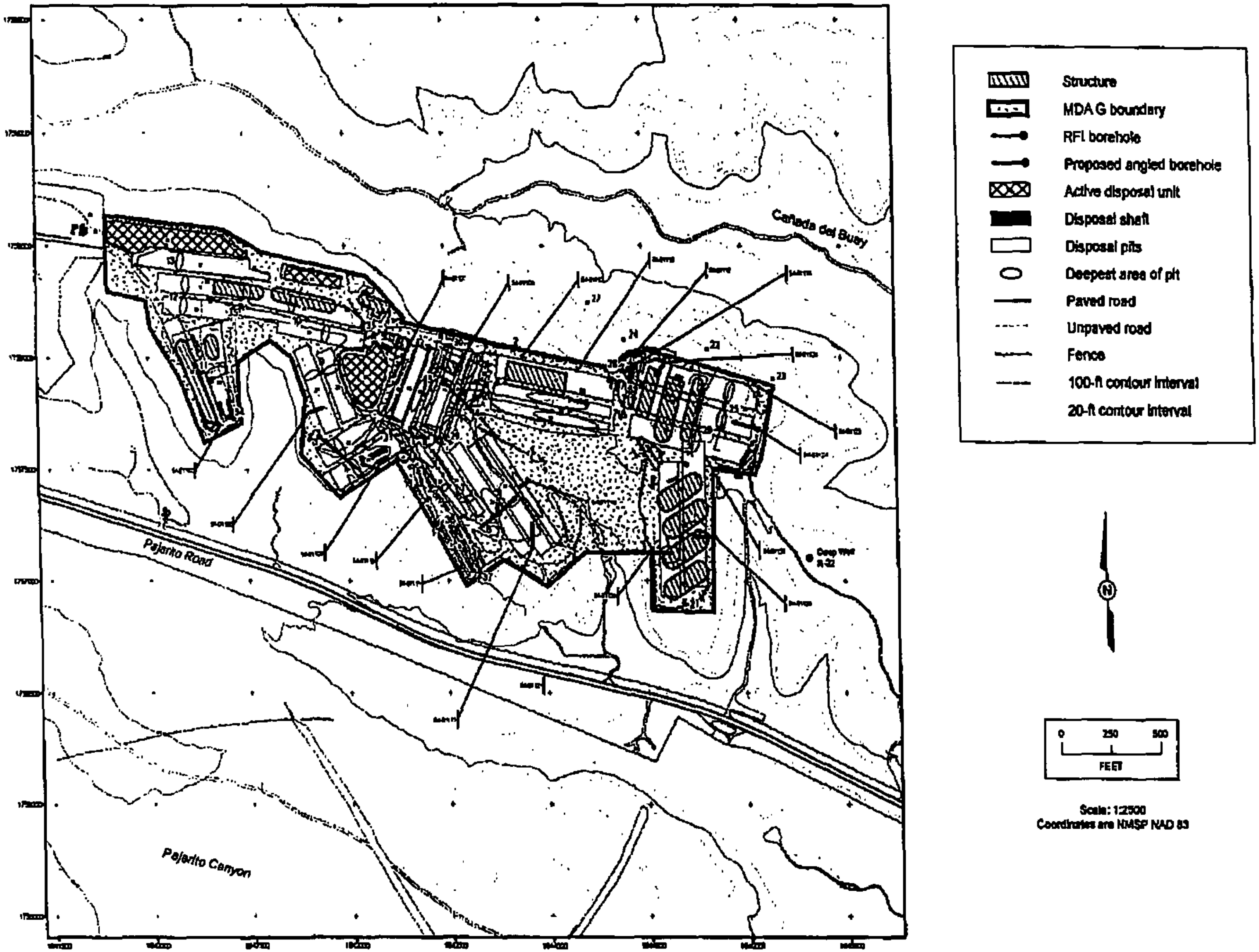

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Figure 14. Locations and cross sections of the proposed boreholes in relation to the disposal units and the existing boreholes at MDA G

Appendix K

Evaluation of Sediment Data from Reaches CDB-3E and PA-4, Cañada del Buey and Pajarito Canyon, Downgradient of MDA G

K-1.0 INTRODUCTION

Sediment sampling and associated geomorphic characterization were conducted in 2000 and 2004 in Cañada del Buey and Pajarito Canyon in support of an evaluation of potential contaminant transport into these canyons from Material Disposal Area (MDA) G, Technical Area (TA) 54, Los Alamos National Laboratory (LANL or the Laboratory). MDA G consists of subsurface disposal units at Area G, and the latter also includes surface storage areas. The sediment sampling areas are located immediately downgradient of the easternmost tributary drainages from Area G and are designated reaches CDB-3 East (CDB-3E) in Cañada del Buey and PA-4 in Pajarito Canyon (Figure K-1.0-1). Sediment deposits in these reaches potentially contain contaminants transported from Area G, including MDA G, and from other upstream locations. This work was in partial fulfillment of the "Investigation Work Plan for Material Disposal Area G at Technical Area 54" (LANL 2003, 81174, pp. 20 and 22). These two reaches were also specified in the "Work Plan for Sandia Canyon and Cañada del Buey" (LANL 1999, 64617) and the "Work Plan for Pajarito Canyon" (LANL 1998, 59577), and this work contributes to the completion of Phase 1 investigations in these plans. A summary of the field investigations in CDB-3E and PA-4 is presented in Reneau et al. (2005, 88716). This appendix presents an evaluation of the analytical results from CDB-3E and PA-4 sediment samples with the goal of identifying possible contaminants resulting from transport from Area G or from other Laboratory sites.

K-2.0 BACKGROUND

Reach CDB-3E extends for 275 m (900 ft) downstream from the easternmost point where runoff enters Cañada del Buey from Area G (Figure K-2.0-1). Previous sampling of drainages from Area G into Cañada del Buey had identified some inorganic chemicals and radionuclides above sediment background values (BVs), including barium, chromium, iron, magnesium, americium-241, cesium-137, plutonium-238, plutonium-239, strontium-90, and tritium (LANL 1996, 54462; sediment BVs from LANL 1998, 59730). The analytes with sample results from the Area G Cañada del Buey drainages above Laboratory sediment BVs are presented in Table K-2.0-1 (inorganic chemicals) and Table K-2.0-2 (radionuclides). Analytes with detected sample results for organic chemicals from the Area G Cañada del Buey drainages are presented in Table K-2.0-3. In addition to potentially receiving contaminants from Area G, CDB-3E is also downgradient of solid waste management units (SWMUs) or areas of concern (AOCs) at former TA-04 and at TA-46, -51, -52, and -54 (LANL 1999, 64617). CDB-3E is in a part of Cañada del Buey where surface water flow is ephemeral, known only to occur in response to storm water runoff. No previous sediment sampling has occurred in CDB-3E, although a detailed sediment investigation has been completed in reach CDB-4, which starts about 0.8 km downstream from CDB-3E and extends to State Highway 4 (Drakos et al. 2000, 68739). No contaminants were identified in CDB-4 sediments, although a number of metals had elevated local sediment background levels as compared to the Laboratory-wide background data set that had been obtained from other parts of the Pajarito Plateau (LANL 1998, 59730; McDonald et al. 2003, 76084). It was hypothesized that erosion of old eolian-derived soils near CDB-4 was the likely source of elevated local sediment background levels for several metals. The local background data set obtained in the vicinity of CDB-4 (Drakos et al. 2000, 68739) is used in evaluating data from CDB-3E in this appendix.

Reach PA-4 extends for 550 m (1800 ft) downstream from the easternmost point where runoff enters Pajarito Canyon from Area G to just downstream of the E250 stream gaging station (Figures K-2.0-2a and K-2.0-2b). Previous sampling of drainages from Area G into Pajarito Canyon had identified some inorganic chemicals and radionuclides above sediment BVs, including calcium, americium-241, cesium-137, plutonium-238, plutonium-239, and tritium (LANL 1996, 54462; sediment BVs from LANL 1998, 59730 and McDonald et al. 2003, 76084). The analytes with sample results from the Area G

Pajarito drainages above Laboratory sediment BVs are presented in Table K-2.0-4 (inorganic chemicals) and Table K-2.0-5 (radionuclides). Analytes with detected sample results for organic chemicals from the Area G Pajarito drainages are presented in Table K-2.0-6.

In addition to potentially receiving contaminants from Area G, PA-4 is also downgradient of SWMUs or AOCs at former TA-12 and TA-03, -06, -07, -08, -09, -15, -18, -22, -36, -40, -48, -54, -55, -59, -64, and -69 (LANL 1998, 59577). PA-4 is in a part of Pajarito Canyon with an intermittent stream and extensive wetlands. The stream can flow for up to two months or more in response to snowmelt runoff, such as occurred in spring 2001 (stream gage E250) (Shaull et al. 2002, 85499, p. 67). The wetlands are mostly in large borrow pits that were created before 1954 and therefore predate initial activities at Area G in 1957 (they are visible on aerial photographs taken in 1954) (Reneau et al. 2005, 88716). Some sediment sampling had been conducted in PA-4 and downstream near State Highway 4 in the summer of 2000 as part of an effort to characterize contaminant levels in sediment deposits that predated the May 2000 Cerro Grande fire and that could potentially be eroded by postfire floods. A sample of postfire sediment was also collected near State Highway 4 in the summer of 2000. Sediment samples have also been collected from PA-4, at the E250 gaging station, and downstream at State Highway 4 by the Environmental Surveillance Program since 1977, including both prefire and postfire sediment (ESP 2004, 83635). Pajarito Canyon has experienced multiple postfire floods, and postfire sediment deposits contain components of ash transported from the burned areas. This ash has elevated levels of many inorganic chemicals and radionuclides relative to sediment BVs, and evaluations of potential contamination in postfire deposits in this appendix include a comparison with data obtained from sediment in baseline areas within and downstream from the burned areas and not affected by runoff or discharges from SWMUs or AOCs. A presentation of data from postfire baseline samples, including samples collected in the Pajarito Canyon watershed, is contained in the "Los Alamos and Pueblo Canyons Investigation Report" (LANL 2004, 87390).

K-3.0 OVERVIEW OF METHODS

The data for reaches CDB-3E and PA-4 are presented in the following sections. Data from postfire sediment samples in PA-4 are evaluated separately from data from sediment deposits that predate the Cerro Grande fire because of the strong influence that Cerro Grande ash can have on analytical results. All inorganic chemicals with at least one result above the sediment BV in either CDB-3E or PA-4 are chemicals of potential concern (COPCs) in that reach. All radionuclides with at least one detected result above the sediment BV and all detected organic chemicals (for which there are no BVs) are also COPCs. Subsequent analyses were used to help evaluate sources for these COPCs, for example whether the available data indicate a source from Area G, ash from the Cerro Grande burn area, an elevated local background level, or other unidentified sources.

Two types of analyses were used to evaluate the concentrations of inorganic chemicals and radionuclides in these reaches to compare the data with Laboratory sediment background data (LANL 1998, 59730; McDonald et al. 2003, 76084) and either local sediment background data from reach CDB-4 (Drakos et al. 2000, 68739) or postfire baseline data (LANL 2004, 87390). First, graphical comparisons of reach and background sample results are presented. Second, the results of formal statistical testing are presented. Each of these methods is discussed below. The data from CDB-3E and PA-4 are also compared to data from sediment samples collected from drainages leaving Area G (LANL 1996, 54462), the latter divided into drainages tributary to Cañada del Buey and drainages tributary to Pajarito Canyon.

K-4.0 COMPARISONS OF INORGANIC CHEMICAL AND RADIONUCLIDE DATA BY REACH

These comparisons use graphical displays called "box plots" that show the results for each analyte with at least one result above the Laboratory sediment BV. Box plots summarize information about the shape and spread of the distribution of results from a data set. Box plots consist of a box, a horizontal line across the box, whiskers (dashed lines that extend vertically beyond the box), and points outside the whiskers (outliers). The y-axis displays the observed results of the data in the appropriate units. The area enclosed by the box shows the range containing the middle half of the data; that is, the lower box edge is at the first or lower quartile of the data (Q1, also called the 25th percentile; i.e., 25% of the data fall below Q1), and the upper box edge is at the third or upper quartile of the data (Q3, the 75th percentile; i.e., 25% of the results fall above Q3). The height of the box (the interquartile range, Q3–Q1) is a measure of the spread of the results. The horizontal line across the box represents the median (50th percentile or second quartile) of the data, a measure of the center of the results distribution. If the median line divides the box into two approximately equal parts, the shape of the distribution of results is symmetric; if not, the distribution is skewed or nonsymmetric.

These plots also show the full set of results that are plotted as points overlaying the box plot. When a data set contains results for both detects (detected chemical concentrations) and nondetects (nondetected chemicals reported as less than a sample-specific detection limit) different plotting symbols were used for the detects and nondetects (the detected concentrations were plotted with an "x" and the detection limits of nondetects with an "o"). The dotted line across the box plot represents the Laboratory sediment BV. The BV for the specific analyte is presented at the upper right hand corner of the box plot.

These box plots each include up to four sets of data for visual comparison. The data from CDB-3E are presented with the data from the Area G sediment samples in the Cañada del Buey watershed, the local background data, and the Laboratory background sediment data. The PA-4 prefire data are presented with the data from the Area G sediment samples in the Pajarito watershed, the local background data, and the Laboratory background sediment data. The PA-4 postfire data are presented with the data from the Area G sediment samples in the Pajarito watershed, the postfire baseline data, and the Laboratory background sediment data.

The differences between data groups depicted in box plots are evaluated with the statistical tests discussed below.

K-4.1 Statistical Testing

Because the data for these analytes do not appear typically to satisfy conditions of statistical normality, nonparametric statistical tests are preferred for background level comparisons. The tests include the Gehan or Wilcoxon rank sum test, the quantile test, and the slippage test. These tests are discussed below and more discussion of these tests is provided in "Statistical Methods for Background Comparisons (draft)" (LANL 1998, 59596).

The Wilcoxon rank sum test was used for testing differences in the entire distribution of sample results. The purpose of this test is to detect whether the reach data show evidence of a release of any analyte through a systematic increase in concentration over that observed in the background or baseline data. The Wilcoxon test is recommended when nondetects are relatively infrequent (less than 10%) and all have the same detection limit. The nondetects are treated as tied at a value less than the smallest detected concentration. The Wilcoxon rank sum test will have about the same or more power than the t-test for most distributions. As is frequently the case for environmental data, when some of the data are "censored" or reported as below a detection limit and especially when not all the detection limits are identical, the Gehan modification to the Wilcoxon test is useful. The Gehan test uses a modified ranking of sample results to accommodate nondetected chemicals together with detected values, and then applies the Wilcoxon rank sum test. The Gehan test is recommended when nondetects are relatively frequent (greater than 10% and less than 50%). It handles data sets with nondetects reported at multiple detection limits in a statistically robust manner. The Gehan test is not recommended if either of the two data sets has more than 50% nondetects. It is identical to the Wilcoxon rank sum test when applied to results containing no nondetects. The Gehan test is the preferred test because of its applicability to a majority of environmental data sets, and its recognition and recommendation in U.S. Environmental Protection Agency (EPA) sponsored workshops and publications.

The quantile test determines whether more of the observations in the top 20% of the combined data set come from the reach data set than would be expected by chance, given the relative sizes of the reach and background data sets. If the relative proportion of the two populations being tested is different in the top 20% of the data than in the remainder of the data, the distributions may be partially shifted because of a subset of site data. This test is capable of detecting a statistical difference when only a small number of site concentrations are elevated. The quantile test is the most useful distribution shift test for reaches at which samples from a release represent a small fraction of the overall data collected. The quantile test is applied at a prespecified threshold, usually the 80th percentile. The test cannot be performed if more than 80% (or, in general, more than the chosen percentile) of the combined data are nondetected values. It can be used when the frequency of nondetects is approximately the same as the quantile being tested. For example, in a case with 75% nondetects in the combined background and reach data set, application of a quantile test comparing 80th percentiles is appropriate. The threshold percentage may be adjusted to accommodate the detection rate of an analyte or to look for differences further into the distribution tails. The quantile test is more powerful than the Wilcoxon (or Gehan) test for detecting differences when only a small percentage of the reach concentrations is elevated.

The slippage test is based on the maximum observed concentration in the background data set and the number ("s") of reach concentrations exceeding the maximum concentration in the background set. The result (p-value) of the slippage test is the probability that "s" reach samples (or more) exceed the maximum background concentration by chance alone. The test accounts for the number of samples in each data set (number of samples from the reach and number of samples from background) and determines the probability of "s" (or more) exceedances if the two data sets came from identical distributions. This test is similar to a BV comparison (a test against an upper tolerance limit or other threshold) in that it evaluates the largest reach measurements. However, it is more useful than the BV comparison because it is based on a statistical hypothesis test, not simply on a statistic calculated from the background distribution.

The metrics used to determine if a statistically significant difference between reach data and site data exists are the calculated significance levels (p-values) for the tests. A low p-value (near zero) indicates that the reach data are greater than background data, whereas a p-value approaching 1 indicates no difference between reach data and background data. If a p-value is less than some small probability (0.05), then there is some reason to suspect that the reach statistical distribution may be elevated above the background distribution; otherwise, no difference is indicated.

K-4.2 Overall Data Quality

In the CDB-3E data, the antimony results were rejected in all ten samples because the associated spike sample recovered less than 30%. Seven sample results for cesium-134, one sample result for sodium-22, and two sample results for cesium-137 were rejected because spectral interference prevented a positive identification of the analytes. All semivolatile organic compound (SVOC) results were rejected for sample CACB-04-53726 because of quality deficiencies.

The CDB-4 local background data set did not have any rejected results reported.

In the PA-4 prefire data, seven results for cesium-134 were rejected because spectral interference prevented the positive identification of the analyte. No results for inorganic chemicals or organic chemicals were rejected.

In the PA-4 postfire data, two results for cesium-134 were rejected because spectral interference prevented the positive identification of the analyte. No results for inorganic chemicals or organic chemicals were rejected.

In the postfire baseline data, some samples did not have results reported for antimony, americium-241, or uranium-235. The data source for the samples did not include a summary of rejected data or reasons for not including these data.

The Area G Pajarito drainage data set had 12 selenium results rejected because they were analyzed after a period equal to or greater than twice the holding time for these inorganic chemicals.

The Area G Cañada del Buey drainage data set had 20 selenium results rejected because they were analyzed after a period equal to or greater than twice the holding time for these inorganic chemicals.

K-4.3 Results of CDB-3E Data

Samples collected from reach CDB-3E were analyzed for various inorganic chemicals, organic chemicals and radionuclides. The samples, analyte suites, and request numbers are presented in Table K-4.3-1.

Inorganic Chemicals

The maximum result reported for each inorganic chemical in CDB-3E was compared to the appropriate Laboratory sediment BV to determine which analytes had at least one result above the BV and were therefore COPCs. The inorganic chemicals with maximum results above the sediment BV were aluminum, arsenic, barium, cadmium (detection limits only), chromium, cobalt, copper, iron, lead, magnesium, manganese, potassium, selenium, vanadium, and zinc. Fluoride, nitrate, and perchlorate were detected in nine, eight, and one sample(s), respectively, but have no BV for comparison. Inorganic chemical analyses from CDB-3E samples that exceed sediment BVs and detected inorganic chemicals that did not have a BV for comparison are presented in Table K-4.3-2. For the 15 analytes with a maximum result above the BV, graphical displays were used to further evaluate the data and are presented in Figure K-4.3-1.

The Gehan, quantile, and slippage tests were run for the inorganic chemicals with at least one sample result above the sediment BV. The results of the statistical tests are presented in Table K-4.3-3. The analytes with at least one p-value less than 0.05 may be statistically greater than the Laboratory sediment background level. These analytes are aluminum, barium, chromium, cobalt, copper, iron, magnesium, potassium, selenium, and vanadium. In contrast, arsenic, cadmium, lead, manganese, and zinc have distributions that are not statistically different from background levels.

Further statistical tests were performed for the ten analytes that are statistically different from the Laboratory sediment background data set, comparing data for these ten analytes with the local background data set from reach CDB-4. The results from these statistical tests are presented in Table K-4.3-4. Based on the statistical tests and review of the associated box plots for the inorganic chemicals, aluminum, magnesium, and potassium differ statistically from both the Laboratory sediment background data set and the local background data set. Fluoride, nitrate, and perchlorate were detected in CDB-3E samples but do not have background data available for comparison.

Organic Chemicals

Five organic chemicals (Aroclor-1254, Aroclor-1260, bis[2-ethylhexyl]phthalate, di-n-butylphthalate, and pyrene) were detected in at least one sample from reach CDB-3E. Detected organic chemical analyses from CDB-3E samples are presented in Table K-4.3-5. Four of the analytes were detected in only one out of ten samples, and one analyte (Aroclor-1254) was detected in two samples. Aroclor-1254 and Aroclor-1260 were also analyzed in the Area G Cañada del Buey drainage data set. These analytes were not detected in the Area G Cañada del Buey drainage samples, although detection limits for these samples are greater than the detected concentrations in the CDB-3E data set. Box plots are presented in Figure K-4.3-1 for these organic chemicals for comparison to Area G Cañada del Buey drainage data.

Radionuclides

The maximum detected result reported for each radionuclide in CDB-3E was compared to the appropriate Laboratory sediment BV to determine which analytes had at least one result above the BV. Americium-241, plutonium-238, and plutonium-239 had at least one detected value above the BV. Radionuclide analyses from CDB-3E samples that exceed sediment BVs are presented in Table K-4.3-6. The data for these three radionuclides are presented in the box plots in Figure K-4.3-1.

The Wilcoxon, quantile, and slippage tests were run for the three radionuclides that had at least one detected sample result above the sediment BV. The results of the statistical tests are presented in Table K-4.3-7. The analytes with at least one p-value less than 0.05 may be statistically greater than the Laboratory sediment background level. Plutonium-238 was the only radionuclide statistically greater than background levels. In contrast, americium-241 and plutonium-239 have distributions that are not statistically different from background levels.

Further statistical tests were performed for plutonium-238 because the data were statistically different from the Laboratory sediment background data set. The plutonium-238 data were compared to the local background data set from reach CDB-4. The results from these statistical tests are presented in Table K-4.3-8. Based on the statistical tests and review of the associated box plots for the radionuclides, plutonium-238 is statistically different from both the Laboratory sediment background data set and the local background data set.

Summary

Twenty-six analytes from reach CDB-3E were identified as COPCs based on comparisons to BVs, detection limits, or detection status (for organic chemicals). These include 18 inorganic chemicals, 3 radionuclides, and 5 organic chemicals, as summarized in Table K-4.3-9.

Fifteen of the inorganic COPCs were compared to background data sets, and 12 of these are not statistically different than background levels. The three COPCs that are statistically different from background levels (aluminum, manganese, and potassium) had no results above sediment BVs in the Area G drainages (Figure K-4.3-1), and the sources for these chemicals are unknown. Three additional inorganic chemicals (fluoride, nitrate, and perchlorate) have no BVs and were retained as COPCs based on detections in at least one sample. Fluoride and nitrate had high detection frequencies, but perchlorate was detected in only one sample.

The three radionuclide COPCs may be compared to background data sets, and two of these analytes are not statistically different from background levels. The one radionuclide COPC that is statistically different from background levels, plutonium-238, was detected at higher concentrations in the Area G Cañada del Buey drainages than in the CDB-3E data set (Figure K-4.3-1), indicating that runoff from Area G is one possible source for these COPCs in reach CDB-3E.

The five organic COPCs in CDB-3E had relatively low detection frequencies (1 of 10 or 2 of 10). Only two of these COPCs were analyzed for in the Area G Cañada del Buey drainage samples. The detection limits for the PCBs in the Area G Cañada del Buey drainage data set were greater than the detected concentrations of PCBs in the CDB-3E samples. Therefore, the source of these COPCs is unknown.

K-4.4 Results of Reach PA-4 Prefire Data

Samples collected from reach PA-4 and associated with prefire sediment deposits were analyzed for various inorganic chemicals, organic chemicals, and radionuclides. The samples, analyte suites, and request numbers are presented in Table K-4.4-1.

Inorganic Chemicals

The maximum result reported for each inorganic chemical in PA-4 prefire samples was compared to the appropriate Laboratory sediment BV to determine which analytes had at least one result above the BV. The inorganic chemicals above the BV were aluminum, antimony, arsenic, barium, beryllium, cadmium (detection limits only), calcium, chromium, cobalt, copper, cyanide, iron, lead, magnesium, manganese, nickel, potassium, selenium, silver, thallium (detection limits only), vanadium, and zinc. Nitrate was detected in four samples but has no BV for comparison. Inorganic chemical analyses from PA-4 prefire samples that exceed sediment BVs and detected inorganic chemicals that did not have a BV for comparison are presented in Table K-4.4-2. For the 22 analytes with a maximum result above the sediment BV, the graphical displays used to further evaluate the data are presented in Figure K-4.4-1.

The Gehan, quantile, and slippage tests were run for 20 analytes with at least one sample result above the sediment BV. Antimony and thallium do not have a background data set because the BV is a surrogate from the soil data; therefore, statistical tests were not run for these two inorganic chemicals. The results of the statistical tests are presented in Table K-4.4-3. The analytes with at least one p-value less than 0.05 may be statistically greater than the Laboratory sediment background level. These 17 analytes are aluminum, arsenic, barium, beryllium, calcium, chromium, cobalt, copper, iron, lead, magnesium, manganese, nickel, selenium, silver, vanadium, and zinc. In contrast, cadmium, cyanide, and potassium have distributions statistically not different from background levels.

Further statistical tests were performed for the 17 analytes that are statistically different from the Laboratory sediment background data set, comparing data for these analytes with the local background data set from reach CDB-4. The results from these statistical tests are presented in Table K-4.4-4. Based on the statistical tests and a review of the associated box plots for the inorganic chemicals, aluminum, magnesium, silver, and zinc are statistically different from both the Laboratory sediment background data set and the local background data set. Nitrate was detected in PA-4 prefire sediment samples but does not have background data available for comparison.

Organic Chemicals

Twenty organic chemicals were detected in at least one prefire sample from reach PA-4. Detected organic chemical analyses from PA-4 prefire samples are presented in Table K-4.4-5. Aroclor-1260, beta-benzene hexachloride (BHC), dichlorodiphenyldichloroethane (4,4'-DDD), dichlorophenyltrichloroethane (4,4'-DDE), dichlorodiphenyltrichloroethane (4,4'-DDT), and dieldrin were the only analytes also analyzed in the Area G Pajarito drainage data set. None of these chemicals were detected in the Area G drainages into Pajarito Canyon.

Radionuclides

The maximum detected result reported for each radionuclide in reach PA-4 prefire sediment samples was compared to the appropriate Laboratory sediment BV to determine which analytes had at least one result above the BV. Plutonium-238, plutonium-239, and thorium-228 all had at least one detected value above the sediment BV. Radionuclide analyses from PA-4 prefire samples that exceed sediment BVs are presented in Table K-4.4-6. The data for these three radionuclides are presented in the box plots in Figure K-4.4-1.

The Wilcoxon, quantile, and slippage tests were run for the three analytes with at least one detected sample result above the sediment BV. The results of the statistical tests are presented in Table K-4.4-7. The analytes with at least one p-value less than 0.05 may be statistically greater than the Laboratory sediment background level. Plutonium-238 is the only radionuclide that is statistically greater than background levels. In contrast, plutonium-239 and thorium-228 have distributions statistically not different from background levels.

Further statistical tests were performed for plutonium-238 because the data were statistically different from the Laboratory sediment background data set. The plutonium-238 data were compared to the local background data set from reach CDB-4. The results from these statistical tests are presented in Table K-4.4-8. Based on the statistical tests and a review of the associated box plots for the radionuclides, plutonium-238 is statistically different from the Laboratory sediment background data set but statistically not different from the local background data set.

Summary

Forty-six analytes from prefire sediment deposits in reach PA-4 were identified as COPCs based on comparisons to BVs, detection limits, or detection status. These include 23 inorganic chemicals, 3 radionuclides, and 20 organic chemicals, as summarized in Table K-4.4-9.

Twenty of the inorganic COPCs were compared to background data sets, and 16 of these are not different statistically from background levels. The four chemicals that are statistically different from background levels (aluminum, magnesium, silver, and zinc) had no detected results above sediment BVs in the Area G drainages (although silver had nondetected results with detection limits greater than the BV [Figure K-4.4-1]), and the source(s) for these inorganic chemicals is unknown. One additional inorganic chemical, nitrate, has no BV and was retained as a COPC based on detections in at least one sample.

The three radionuclide COPCs were compared to background data sets, and none of these chemicals are statistically different than background levels.

The 20 organic COPCs in PA-4 prefire sediment samples had varying frequencies of detection, ranging from 1 in 15 to 10 in 15. Six of these analytes were also analyzed in the Area G data set but none were detected in the Area G samples. Therefore, the source of these COPCs is not known.

K-4.5 Results of Reach PA-4 Postfire Data

Samples collected from reach PA-4 and associated with postfire sediment deposits were analyzed for various inorganic chemicals, organic chemicals, and radionuclides. The samples, analyte suites, and request numbers are presented in Table K-4.5-1.

Inorganic Chemicals

The maximum result reported for each inorganic chemical in postfire samples from reach PA-4 was compared to the appropriate Laboratory sediment BV to determine which analytes had at least one result above the BV. The inorganic chemicals above the BV were aluminum, arsenic, barium, cadmium, calcium, chromium, cobalt, copper, cyanide, iron, lead, magnesium, manganese, nickel, potassium, selenium, silver, vanadium, and zinc. Inorganic chemical analyses from PA-4 postfire samples that exceed sediment BVs are presented in Table K-4.5-2. Nitrate was detected in one of three samples, but has no BV for comparison. For the 19 analytes that had a maximum result above the sediment BV, graphical displays were used to further evaluate the data, and are presented in Figure K-4.5-1.

The PA-4 postfire data set contains only three samples, which is insufficient to run further statistical tests. However, a comparison of the box plots in Figure K-4.5-1 indicates that 13 of the inorganic COPCs have maximum sample results greater than those in the postfire baseline data set, which indicates possible releases of the following chemicals into the watershed: arsenic, barium, cadmium, chromium, cobalt, copper, iron, magnesium, manganese, nickel, potassium, vanadium, and zinc. However, only two of these chemicals were also statistically different from background data in the prefire PA-4 samples (magnesium and zinc). None of these COPCs had maximum values greater than sediment BVs in the Area G Pajarito drainage data set. Therefore, the source(s) for these chemicals is unknown.

Organic Chemicals

Twelve organic chemicals were detected in at least one postfire sediment sample from reach PA-4. Detected organic chemical analyses from PA-4 postfire samples are presented in Table K-4.5-3. All of these detected organic chemicals were also analyzed in the postfire baseline samples. 4,4'-DDE and 4,4'-DDT were the only two analytes also analyzed in the Area G Pajarito drainage data set. Box plots are presented in Figure K-4.5-1 for these organic chemicals for comparison to postfire baseline data. Maximum detected values for chrysene and pyrene are greater in the PA-4 postfire samples than in the postfire baseline data set, although these analytes both had elevated detection limits in the baseline data set, as shown in Figure K-4.5-1.

Radionuclides

The maximum result reported for each radionuclide in postfire PA-4 sediment samples was compared to the appropriate Laboratory sediment BV to determine which analytes had at least one result above the BV. Americium-241, cesium-137, and plutonium-239 all had at least one detected value above the BV. Radionuclide analyses from PA-4 postfire samples exceeding sediment BVs are presented in Table K-4.5-4. The data for these three radionuclides are presented in the box plots in Figure K-4.5-1. The maximum postfire PA-4 result for all three is less than the maximum value in the postfire baseline data set, indicating that concentrations in these samples are dominated by the effects of Cerro Grande ash.

Summary

Thirty-five analytes from postfire sediment deposits in reach PA-4 were identified as COPCs based on comparisons to BVs, detection limits, or detection status. These include 20 inorganic chemicals, 3 radionuclides, and 12 organic chemicals, as summarized in Table K-4.5-5.

Thirteen of the inorganic COPCs have higher maximum values in the PA-4 postfire data set than in the postfire baseline data set, indicating possible releases into the watershed. However, only two of these (magnesium and zinc) were also elevated in prefire sediment deposits in PA-4 relative to background levels, and none of them had detected results above sediment BVs in the Area G drainages into Pajarito Canyon.

The three radionuclide COPCs in the PA-4 postfire data set (americium-241, cesium-137, and plutonium-239) were detected at higher concentrations in the postfire baseline data set (Figure K-4.5-1), indicating that the concentrations of these analytes at this site are dominated by ash transported from the Cerro Grande burn area.

Of the 12 organic COPCs in PA-4 postfire sediment samples, 10 had higher maximum detected concentrations in the postfire baseline data set, indicating that concentrations are dominated by ash transported from the Cerro Grande burn area. The other two, chrysene and pyrene, had elevated detection limits in the postfire baseline data set, and these values may also reflect concentrations in ash.

K-5.0 CONCLUSIONS

Analytes identified as COPCs in sediment samples collected from reaches CDB-3E and PA-4, based on comparison of maximum values in a reach to BVs, were further compared to background and baseline data sets and to data from drainages at Area G to evaluate possible sources for these COPCs. Statistical and graphical evaluations show that many of these COPCs do not differ from relevant background or baseline data sets, indicating their concentrations are consistent with either background levels or concentrations associated with ash transported from the Cerro Grande burn area. Analytes identified as COPCs in CDB-3E and PA-4 and statistically elevated in relation to relevant background or baseline data sets are summarized in Table K-5.0-1, which shows maximum values for these data sets. Table K-5.0-1 also presents maximum values from the Area G Cañada del Buey and Pajarito Canyon drainage data sets. Only two analytes, magnesium and plutonium-238 in CDB-3E, were both statistically different from background data sets and elevated in the Area G data set, indicating that runoff from Area G was a possible source of these COPCs to Cañada del Buey. However, the maximum value for magnesium is higher in CDB-3E than in the Area G data set, indicating that magnesium may be attributed to other sources in Cañada del Buey. In addition, the data set from Area G is incomplete for some analytes identified as COPCs in CDB-3E and PA-4, particularly for some organic chemicals, and the possibility of runoff from Area G as the source for other COPCs identified in these reaches cannot be ruled out.

SWMUs or AOCs upcanyon from Area G in the Cañada del Buey or Pajarito Canyon watersheds may be sources for the COPCs shown in Table K-5.0-1 that are statistically or graphically different from background or baseline data sets. Possible sources for these COPCs will be further evaluated as part of canyons investigations in these watersheds (LANL 1998, 59577; LANL 1999, 64617). Potential human health or ecological risk associated with COPCs in canyon-bottom sediment deposits will also be evaluated as part of these canyons investigations.

K-6.0 REFERENCES

The following list includes all references cited in this appendix. Parenthetical information following each reference provides the author, publication date, and the ER identification (ID) number. This information also is included in the citations in the text. ER ID numbers are assigned by the Los Alamos National Laboratory's ENV-ERS Program to track records associated with the Program. These numbers can be used to locate copies of the actual documents at the ENV-ERS Program's Records Processing Facility and, where applicable, with the ENV-ERS Program's reference library titled "Reference Set for Material Disposal Areas, Technical Area 54."

Copies of the reference library are maintained at the NMED Hazardous Waste Bureau; the DOE Los Alamos Site Office; and EPA, Region 6. This library is a living collection of documents that was developed to ensure that the administrative authority has all the necessary material to review the decisions and actions proposed in this document. However, documents previously submitted to the administrative authority are not included.

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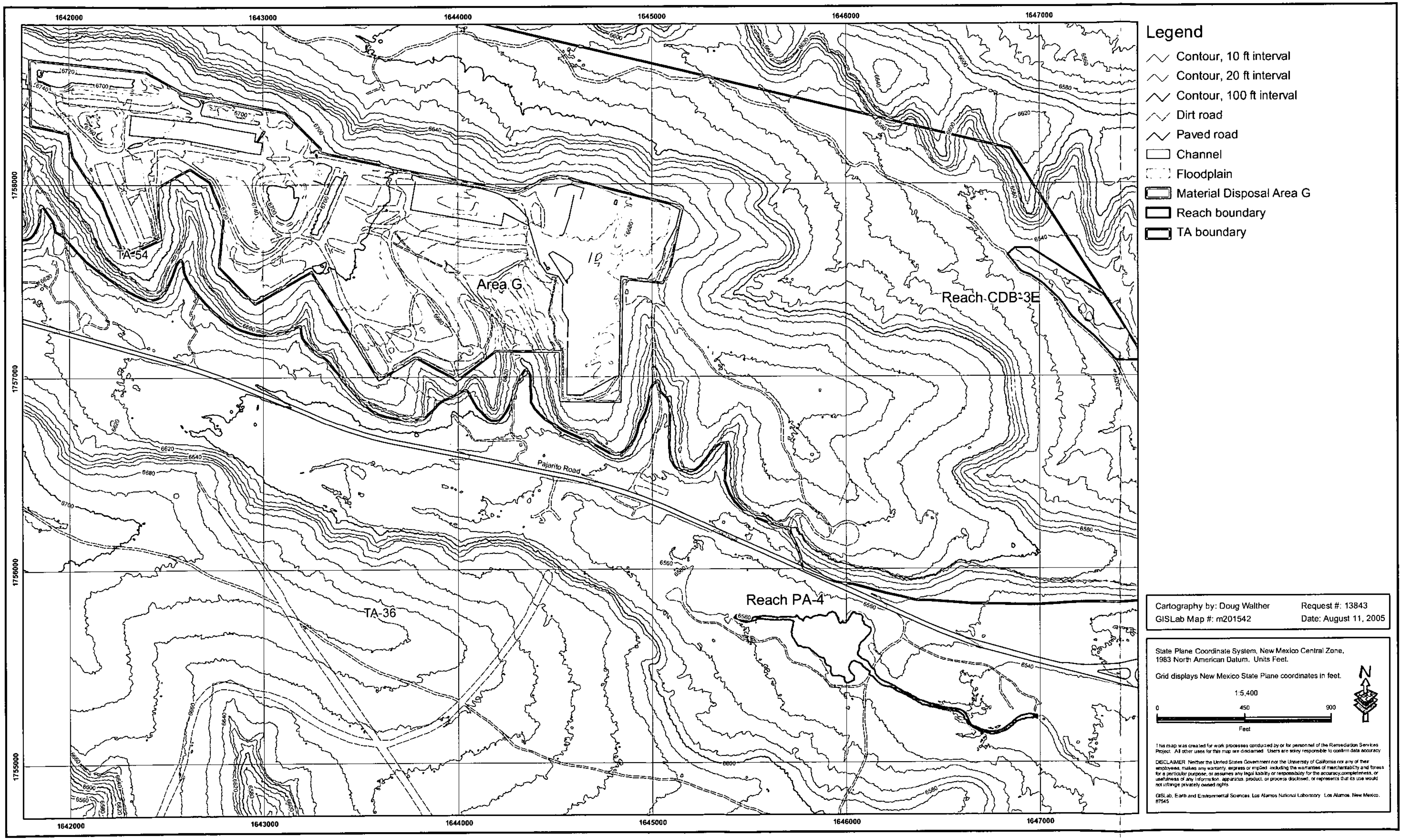


Figure K-1.0-1. Locations of reaches CDB-3E and P-A4 in relation to MDA G

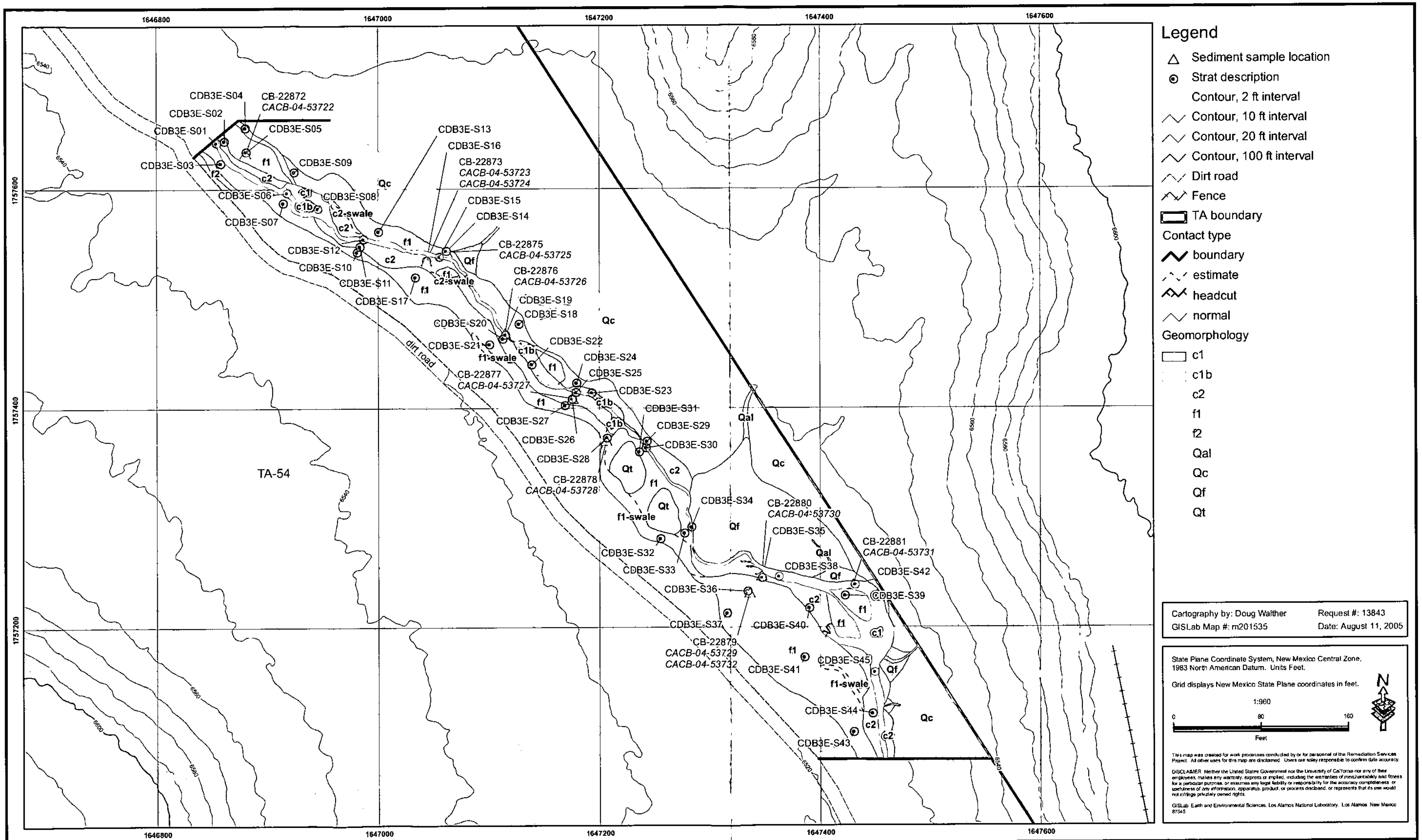


Figure K-2.0-1. Cañada del Buey reach CDB-3E geomorphology and sampling locations

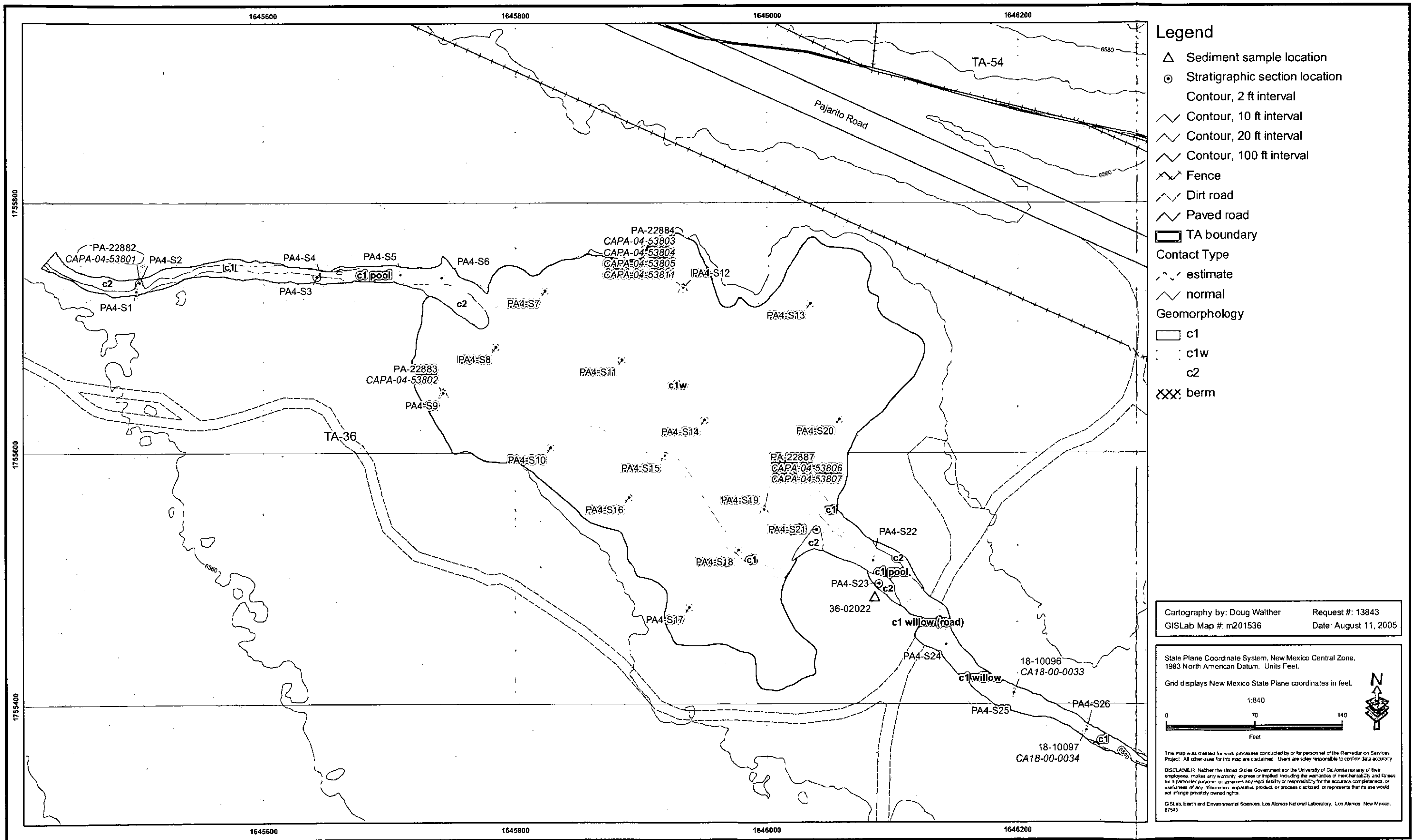


Figure K-2.0-2a. Pajarito Canyon upper reach PA-4 geomorphology and sampling locations

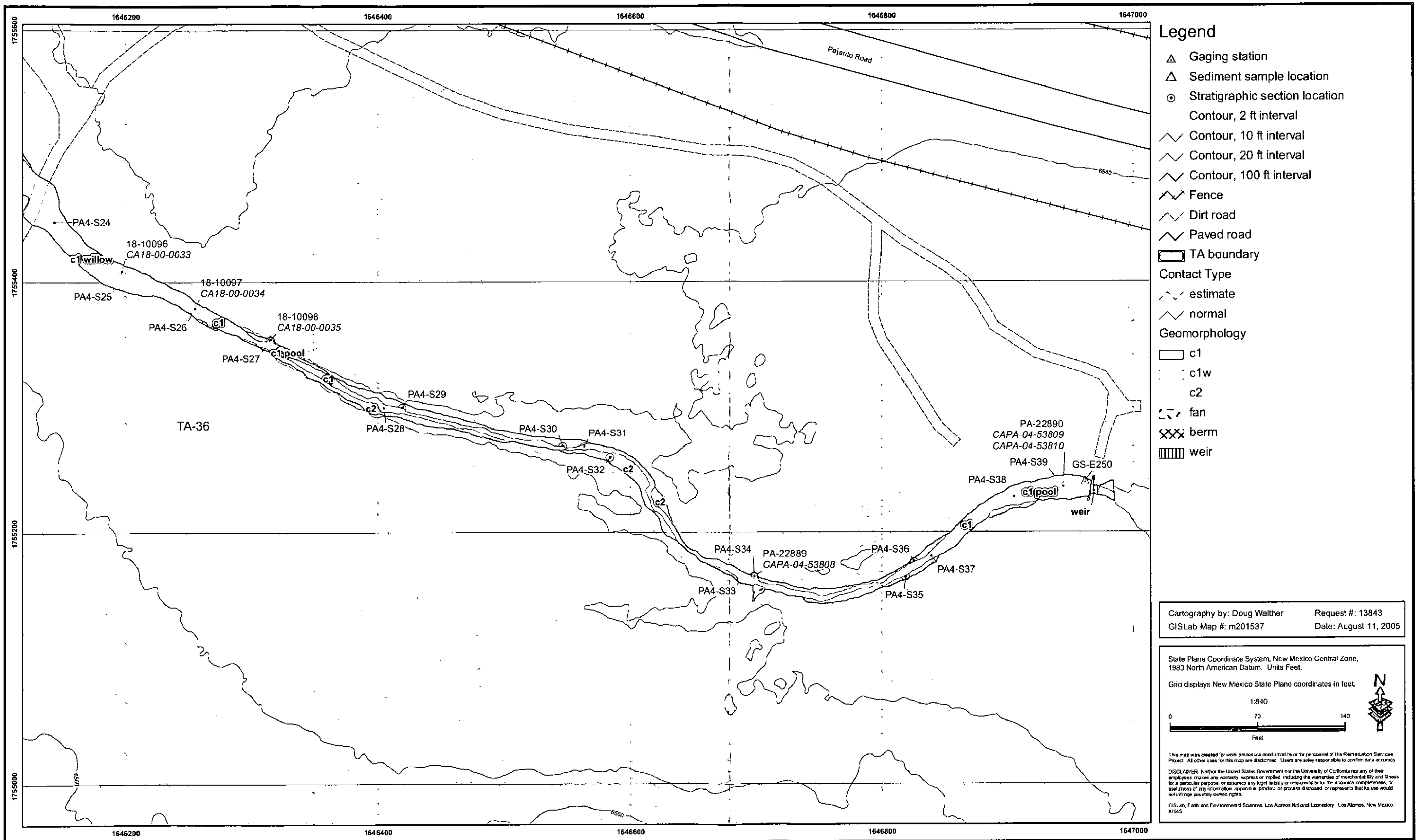


Figure K-2.0-2b. Pajarito Canyon lower reach PA-4 geomorphology and sampling locations

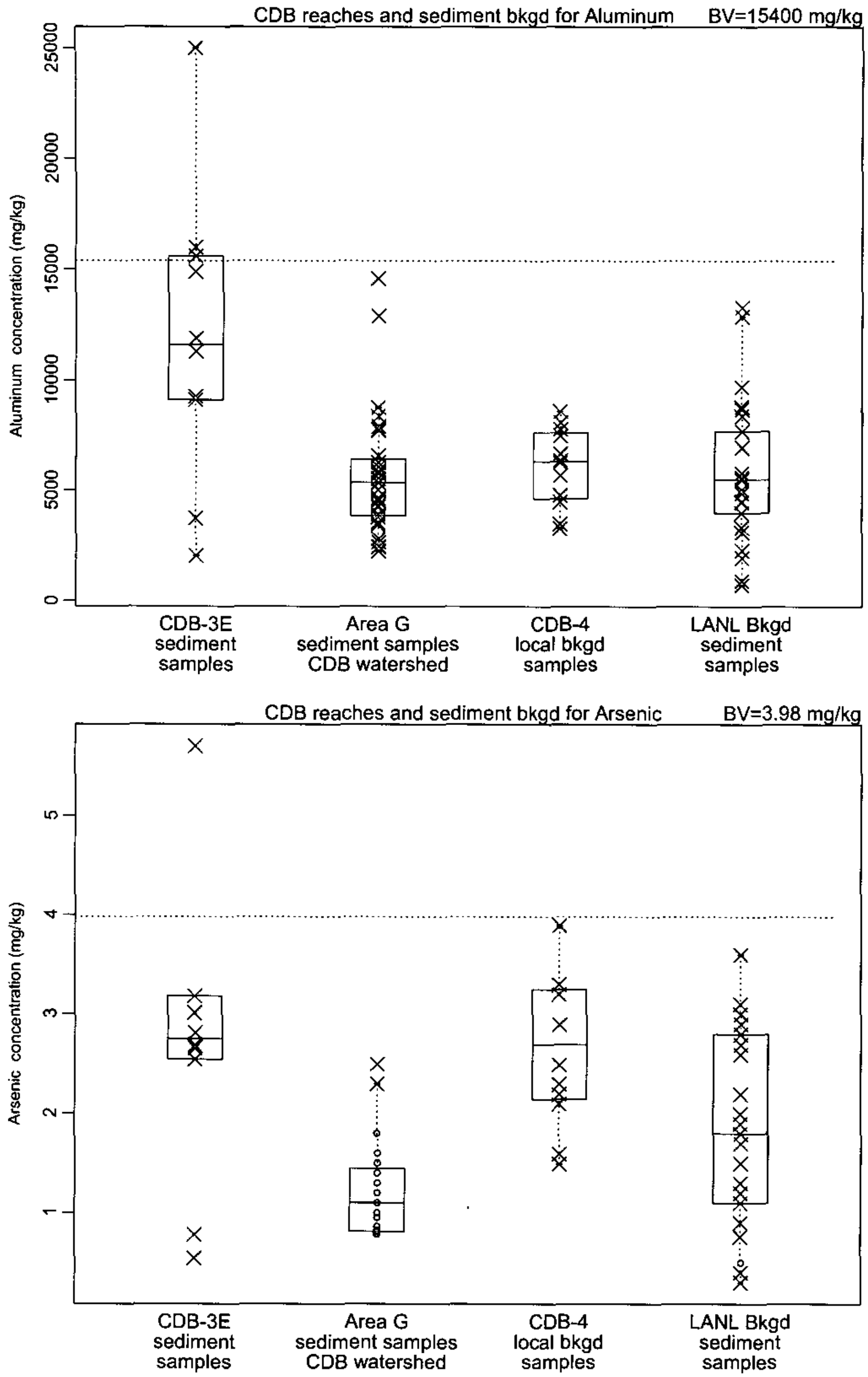


Figure K-4.3-1. Box plots for Reach CDB-3E COPCs compared to data from Area G sediment samples, local background samples, and the LANL sediment data set

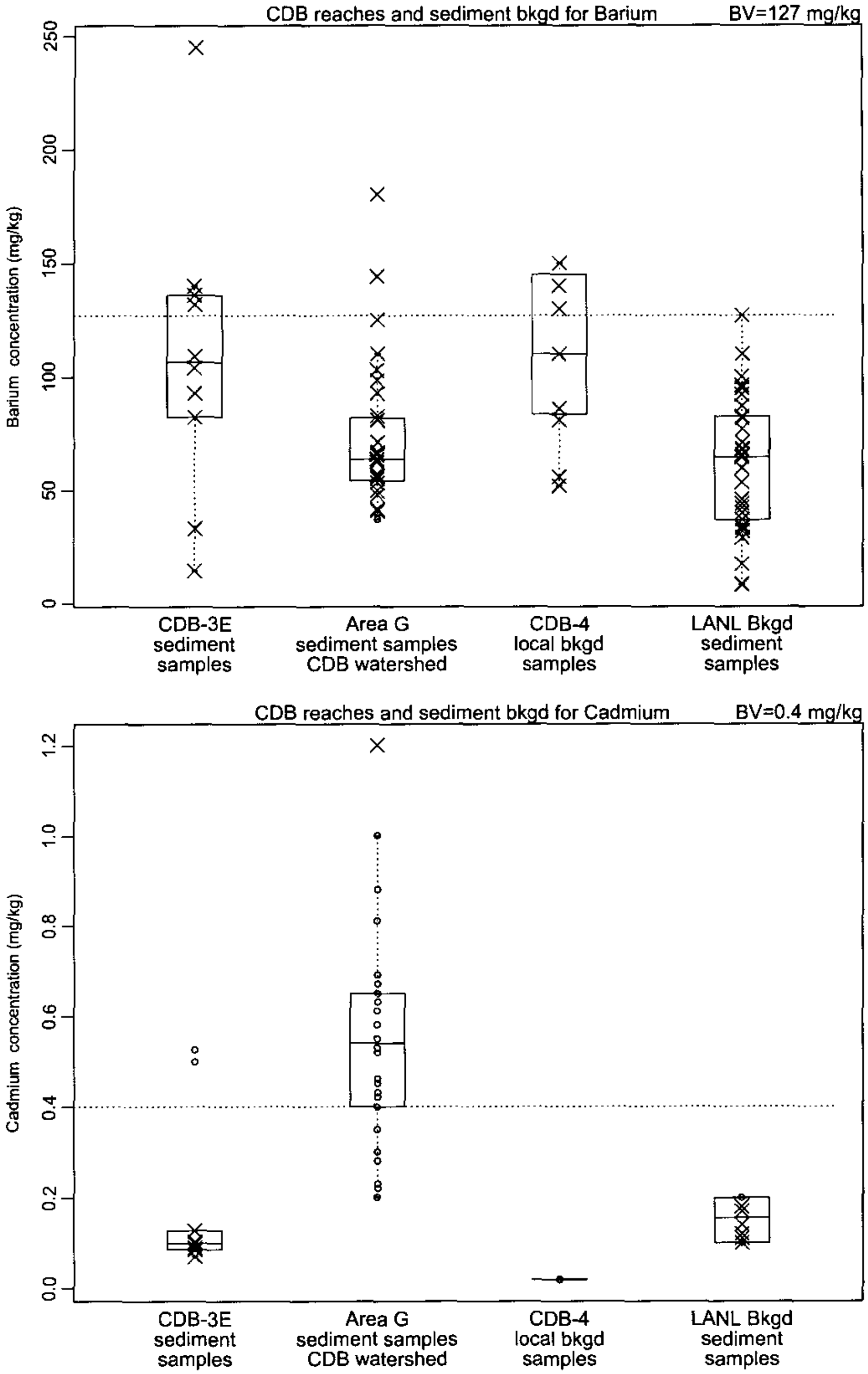
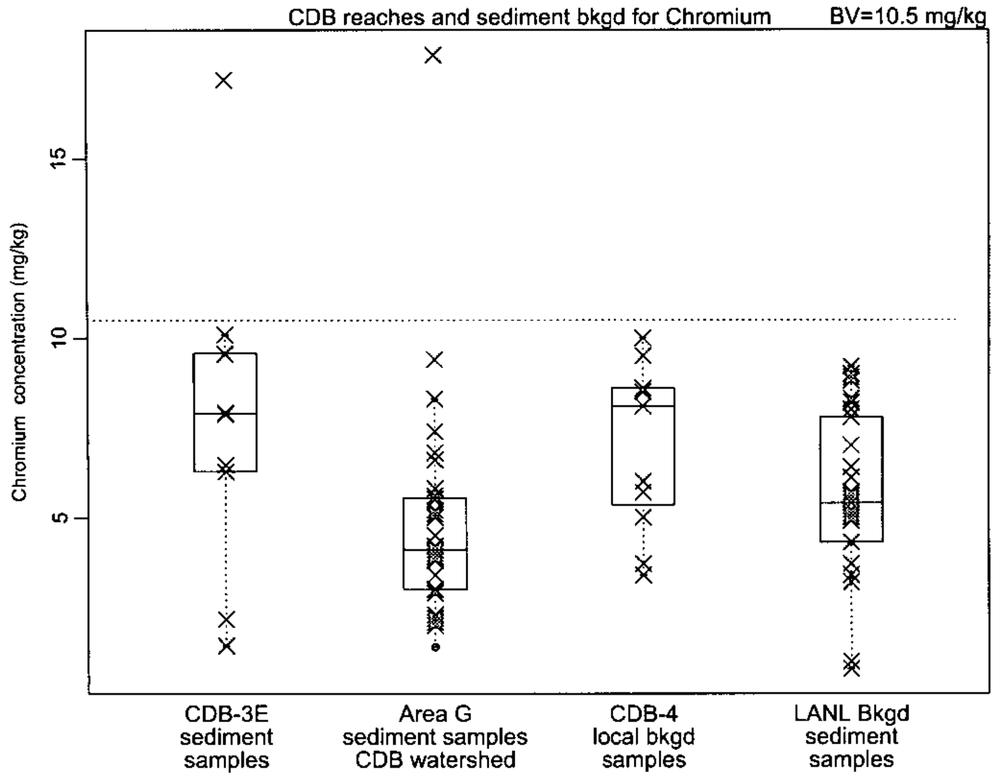


Figure K-4.3-1 (continued). Box plots for Reach CDB-3E COPCs compared to data from Area G sediment samples, local background samples, and the LANL sediment data set



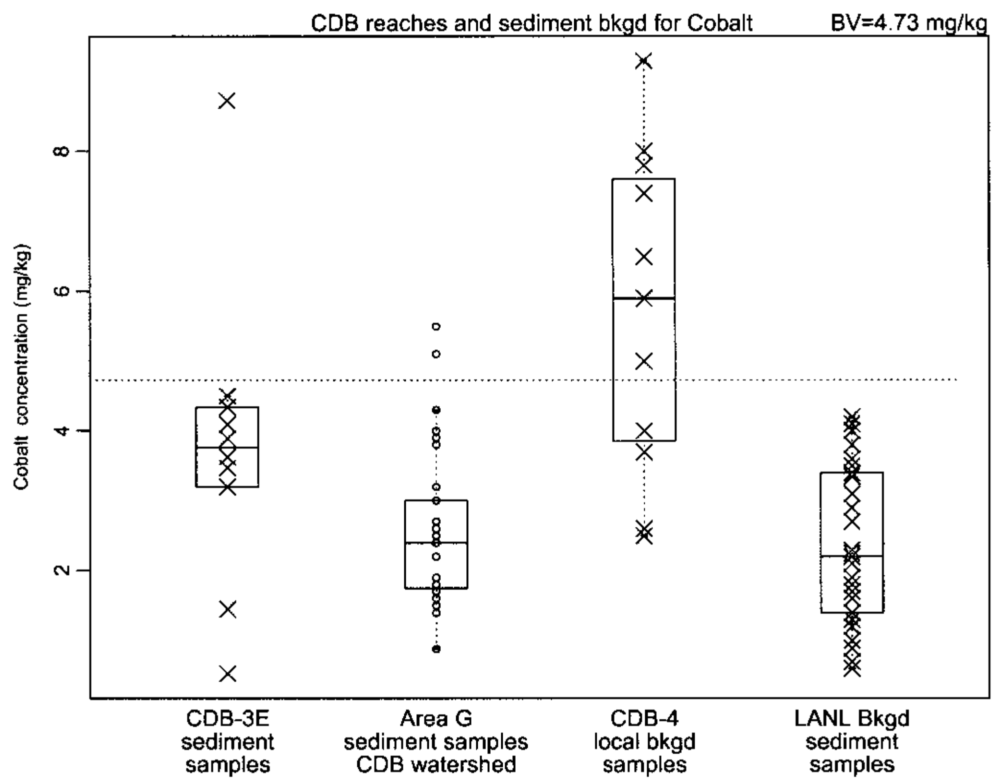


Figure K-4.3-1 (continued). Box plots for Reach CDB-3E COPCs compared to data from Area G sediment samples, local background samples, and the LANL sediment data set

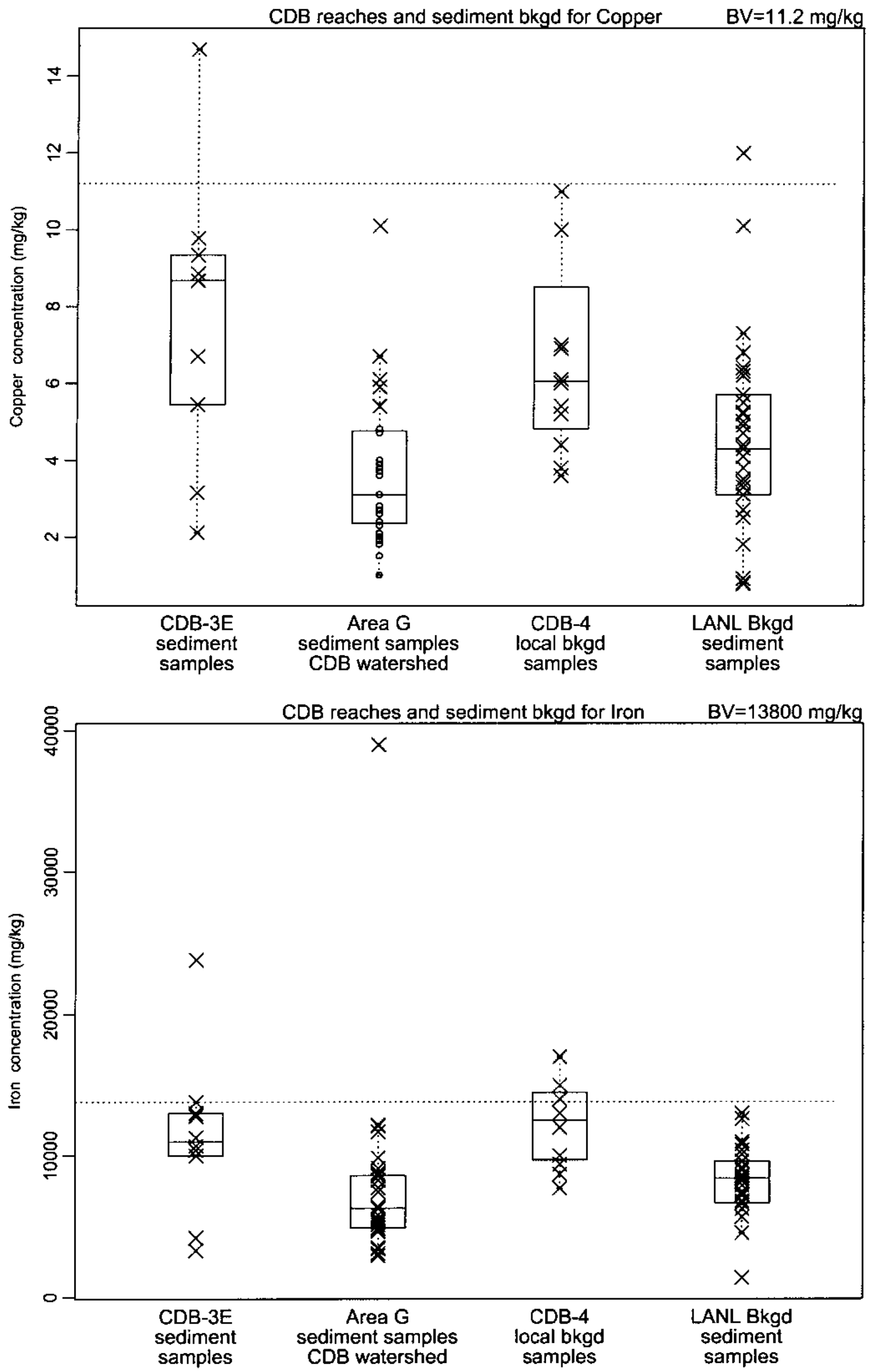
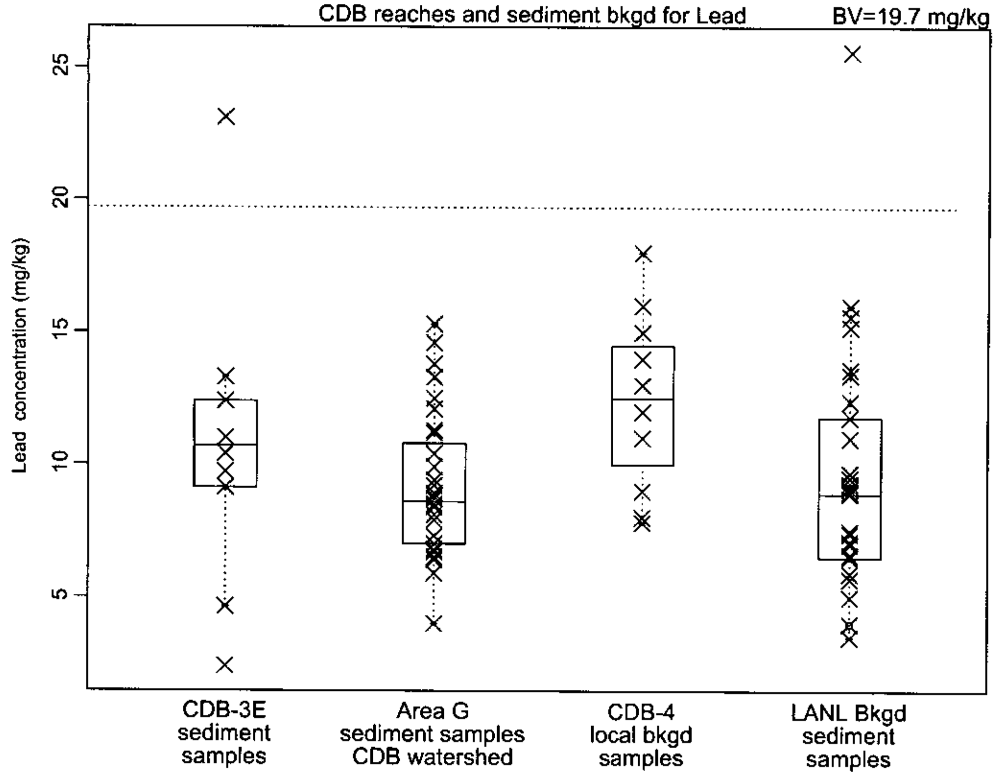


Figure K-4.3-1 (continued). Box plots for reach CDB-3E COPCs compared to data from Area G sediment samples, local background samples, and the LANL sediment data set



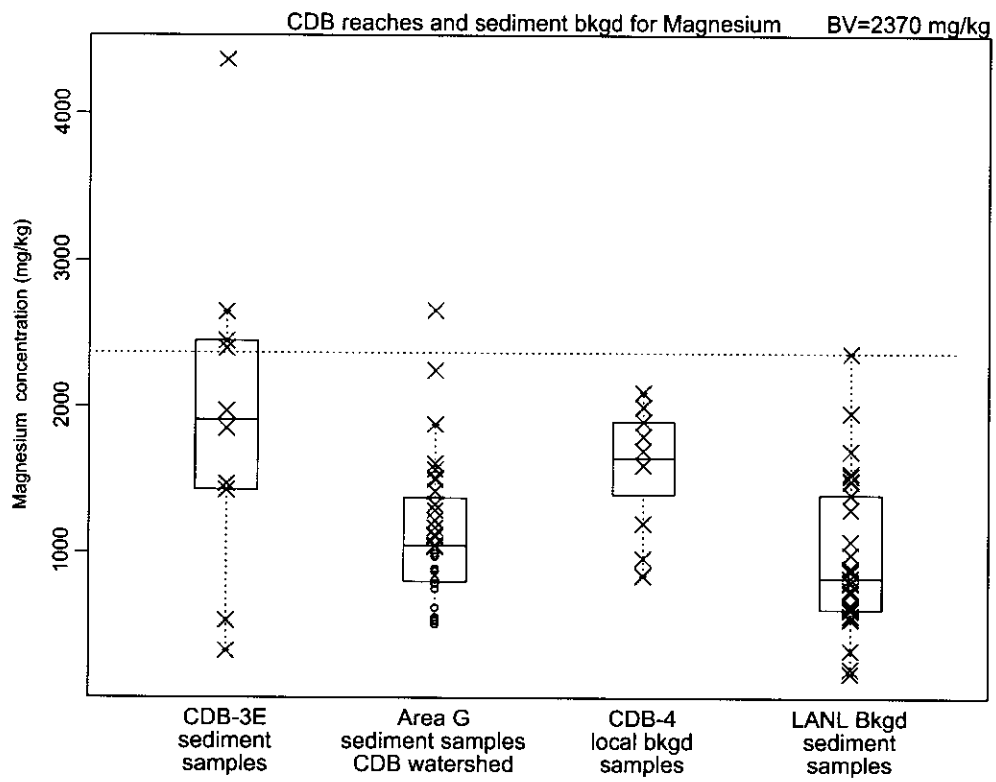
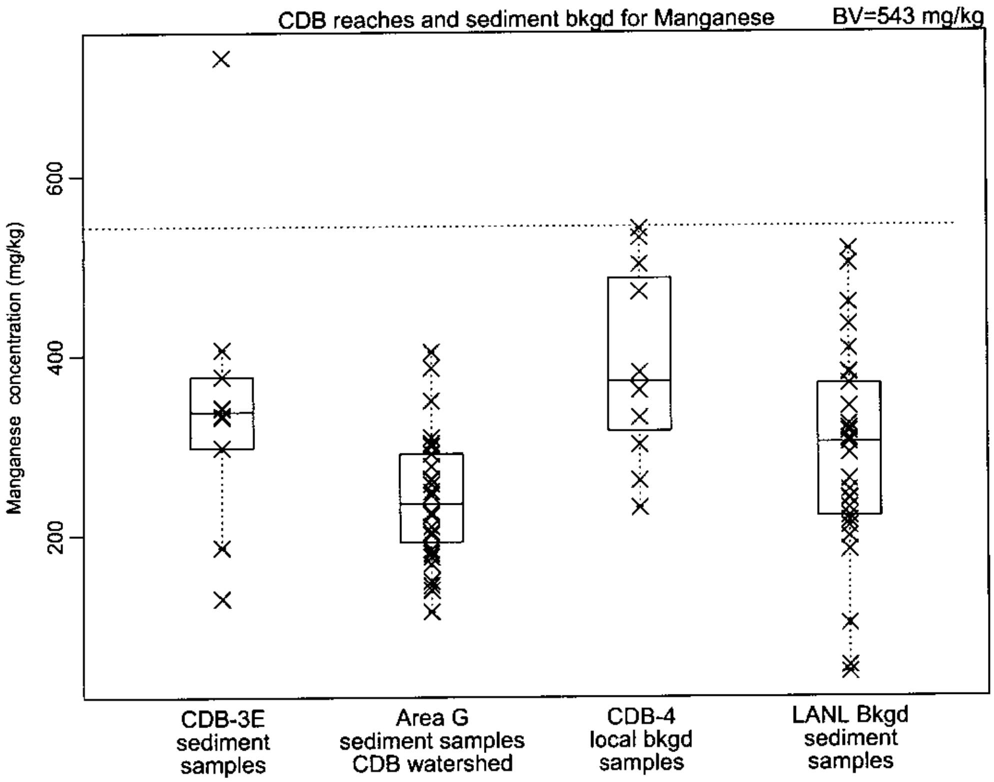


Figure K-4.3-1 (continued). Box plots for reach CDB-3E COPCs compared to data from Area G sediment samples, local background samples, and the LANL sediment data set



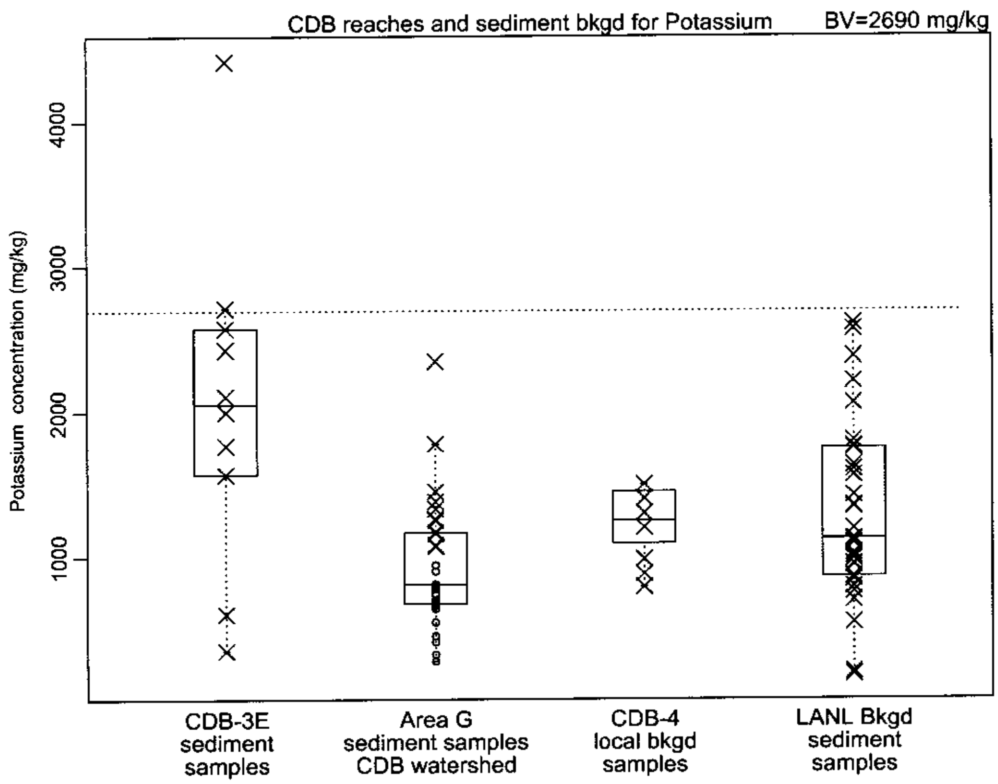
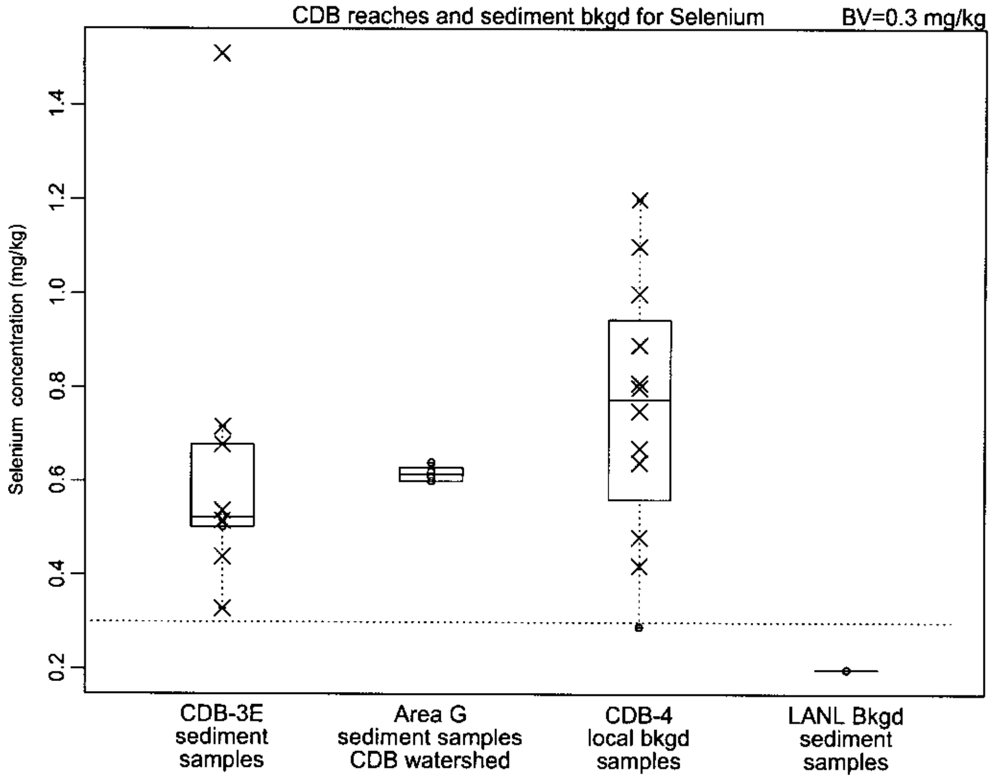


Figure K-4.3-1 (continued). Box plots for reach CDB-3E COPCs compared to data from Area G sediment samples, local background samples, and the LANL sediment data set



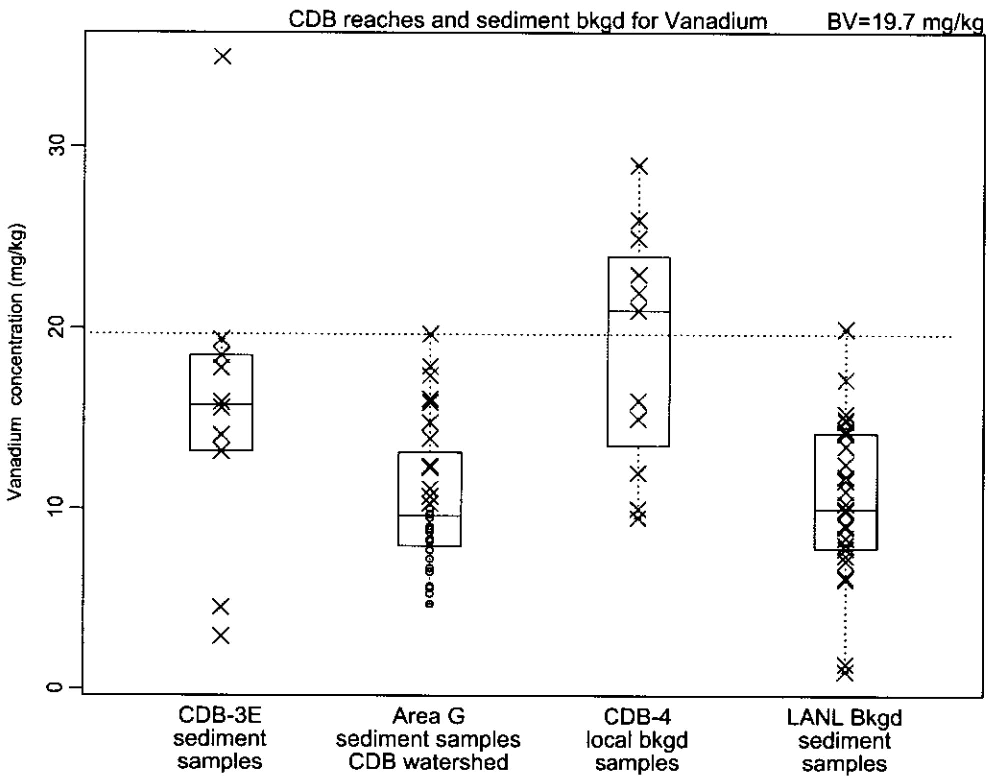
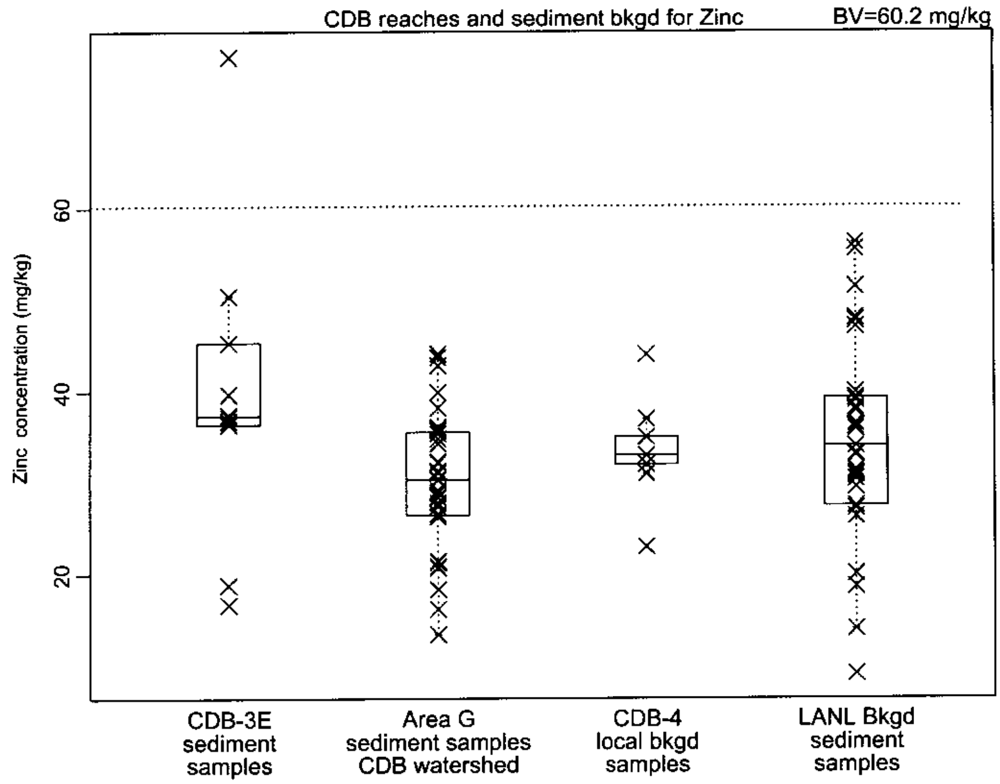


Figure K-4.3-1 (continued). Box plots for reach CDB-3E COPCs compared to data from Area G sediment samples, local background samples, and the LANL sediment data set



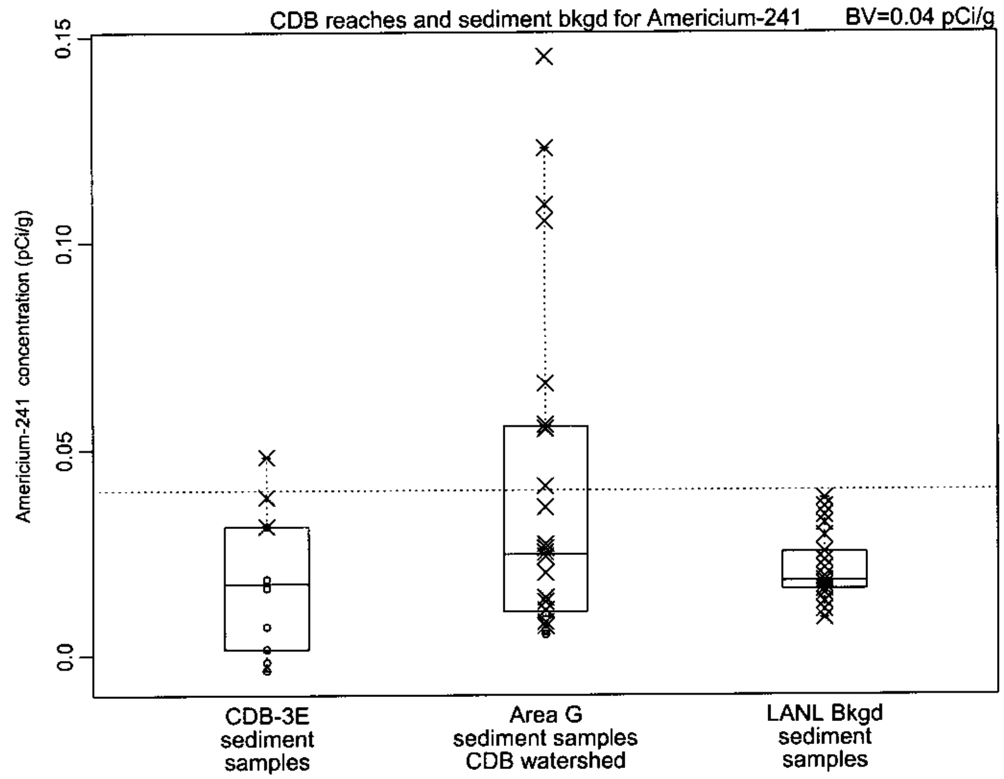
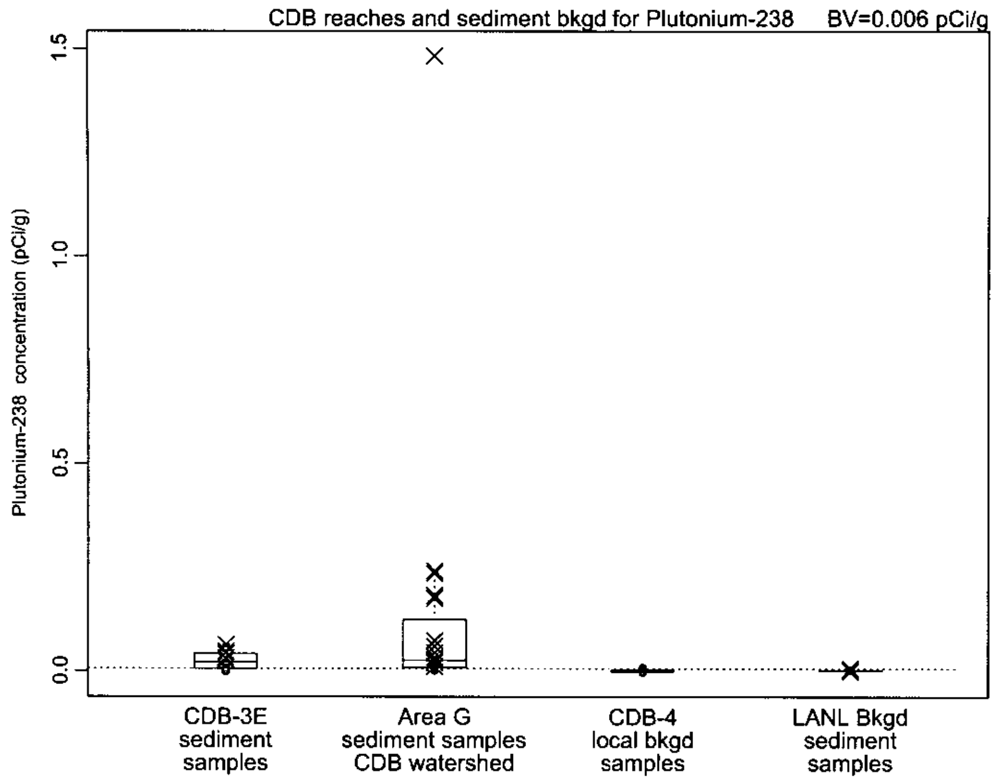


Figure K-4.3-1 (continued). Box plots for reach CDB-3E COPCs compared to data from Area G sediment samples, local background samples, and the LANL sediment data set



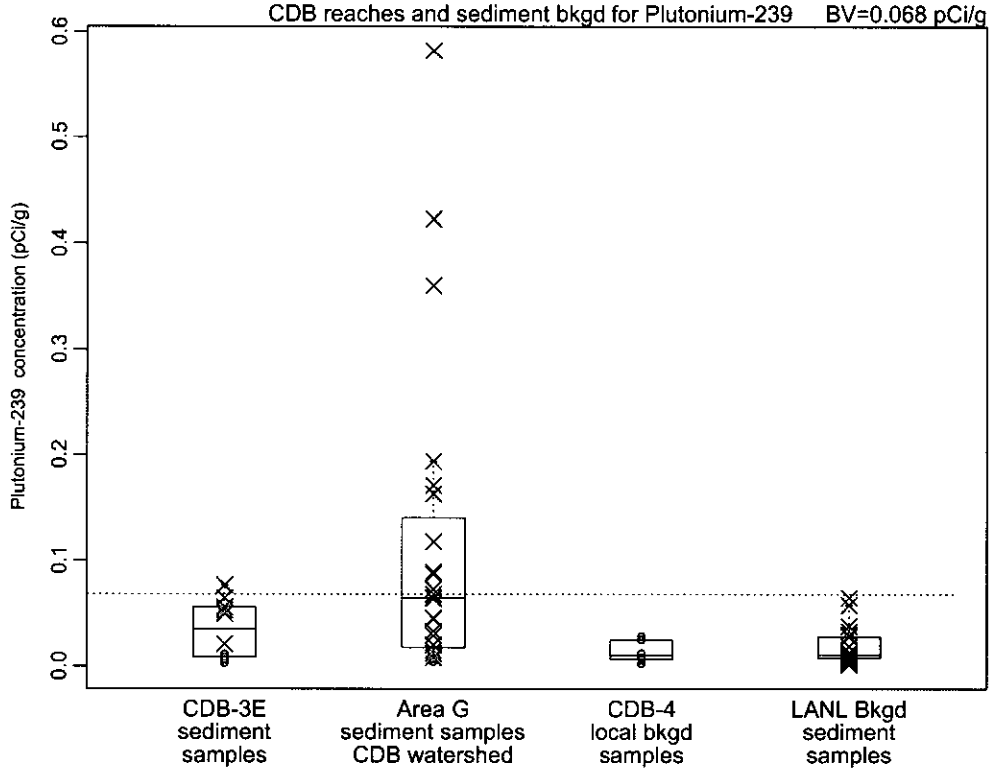


Figure K-4.3-1 (continued). Box plots for reach CDB-3E COPCs compared to data from Area G sediment samples, local background samples, and the LANL sediment data set

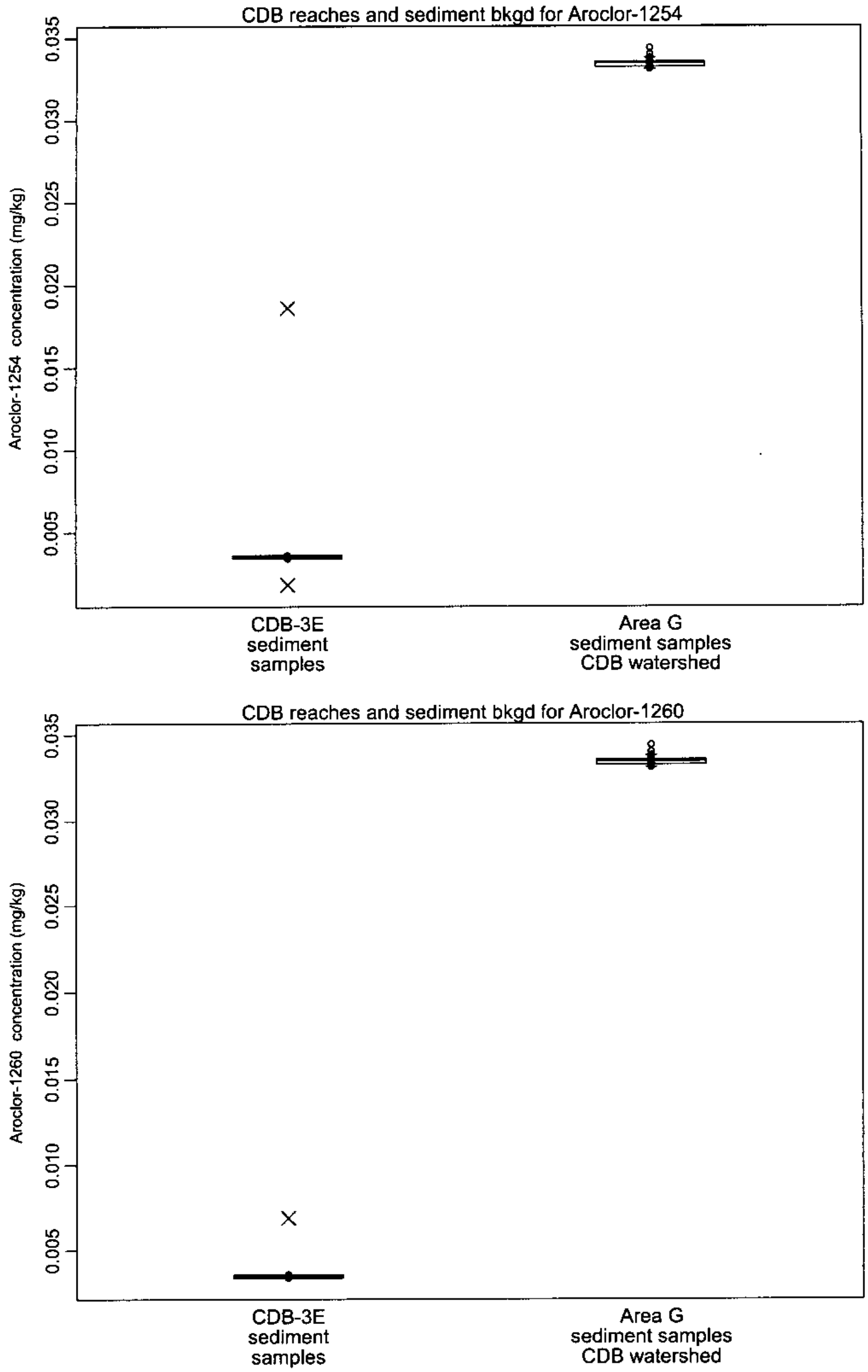


Figure K-4.3-1 (continued). Box plots for reach CDB-3E COPCs compared to data from Area G sediment samples, local background samples, and the LANL sediment data set

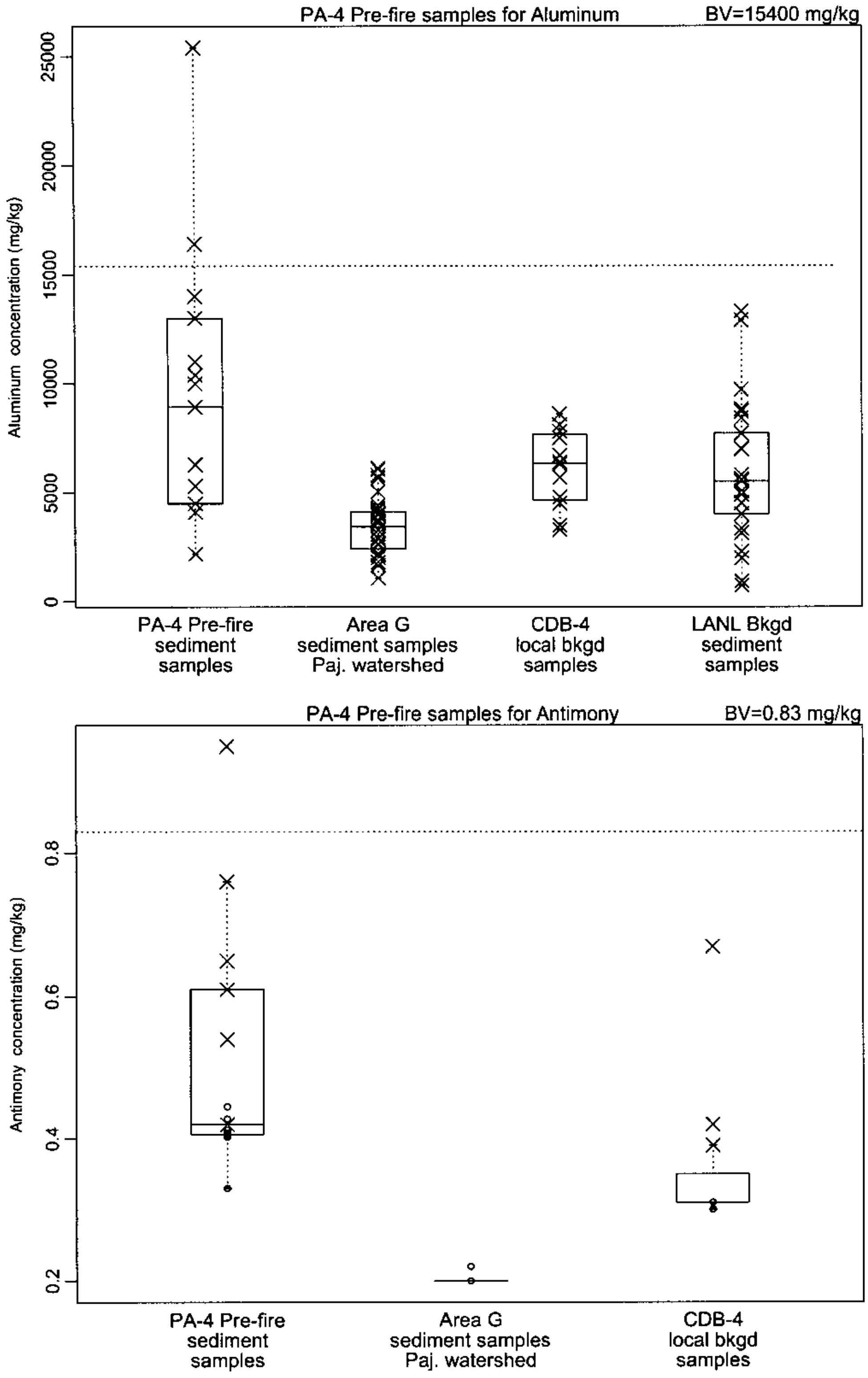
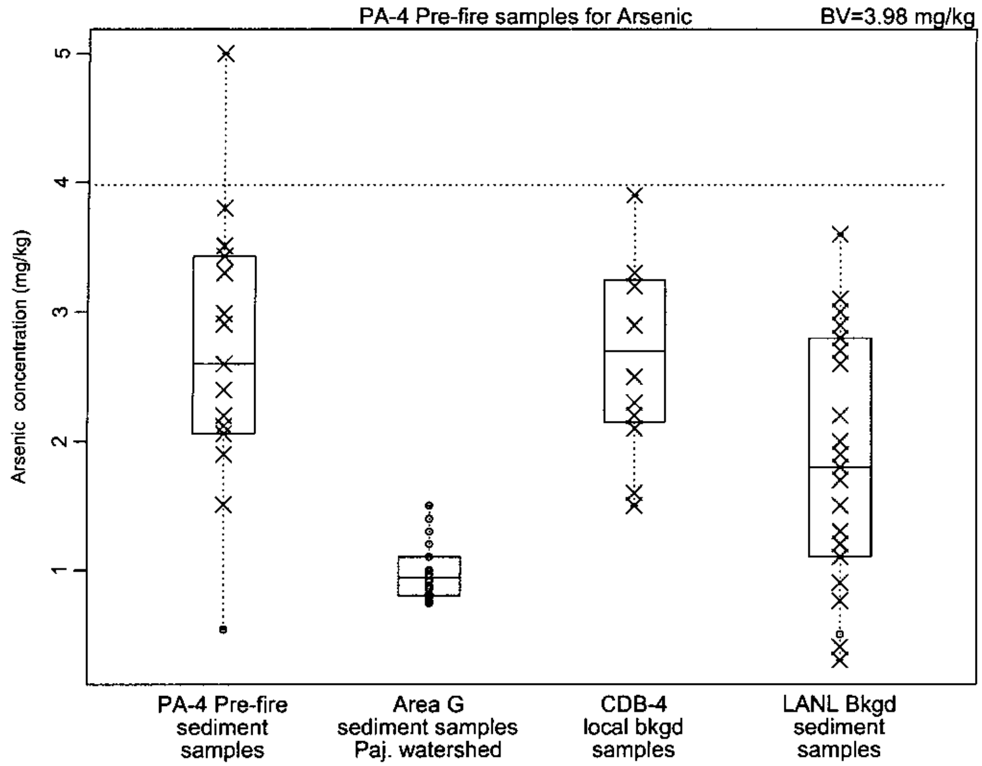


Figure K-4.4-1. Box plots for reach PA-4 COPCs in prefire sediment deposits compared to data from Area G sediment samples, local background samples, and the LANL sediment data set



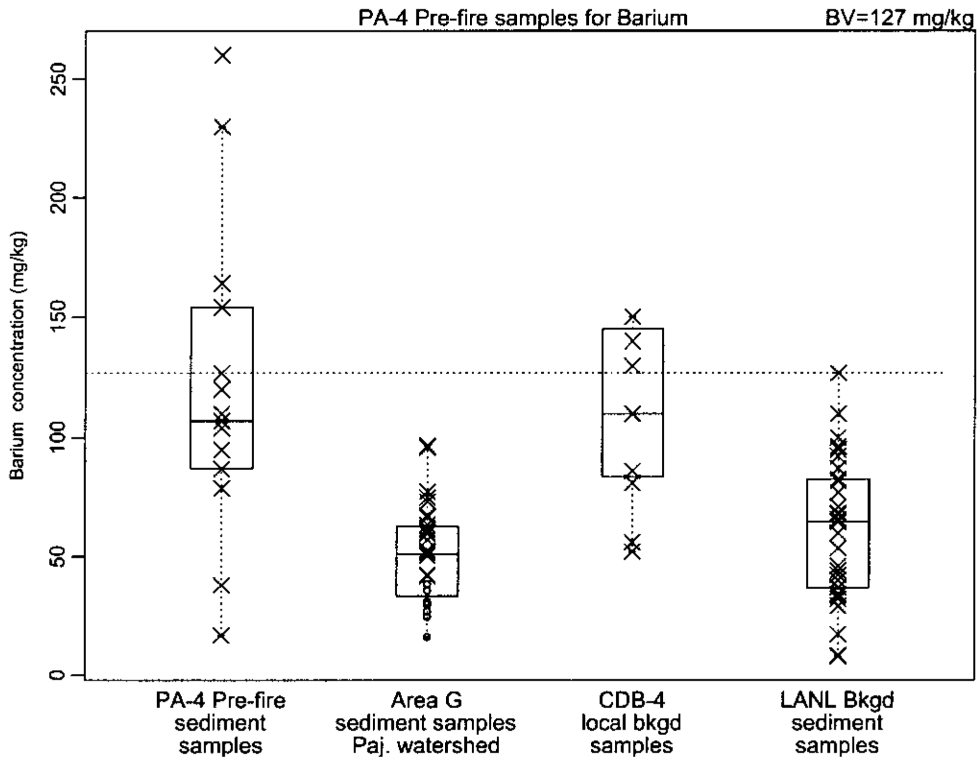
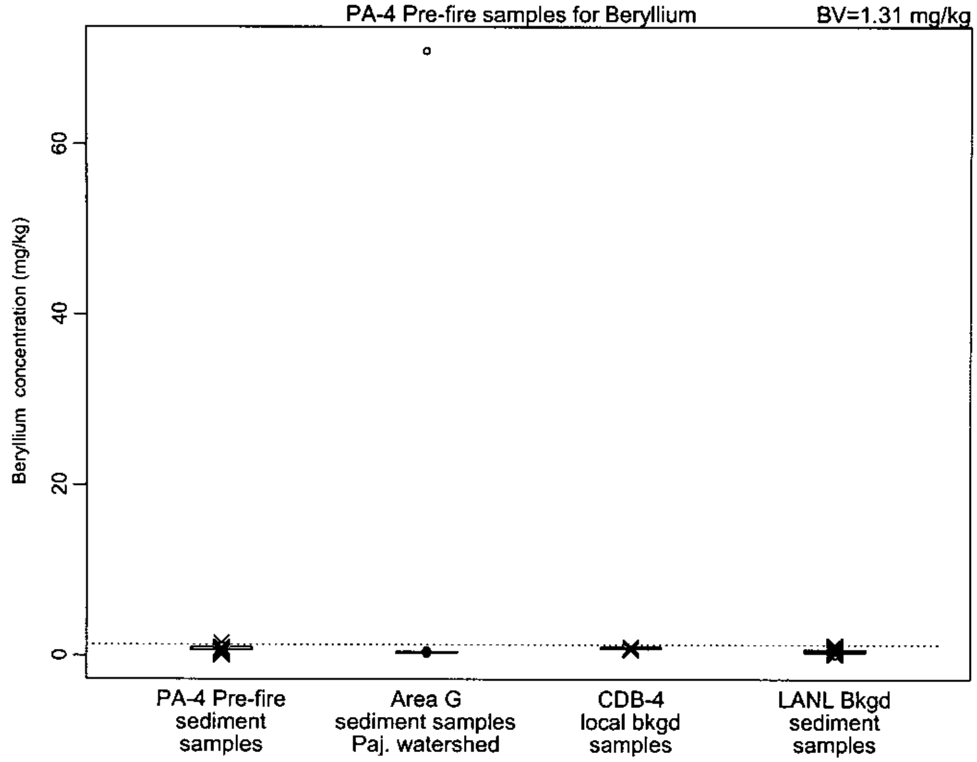


Figure K-4.4-1 (continued). Box plots for reach PA-4 COPCs in prefire sediment deposits compared to data from Area G sediment samples, local background samples, and the LANL sediment data set



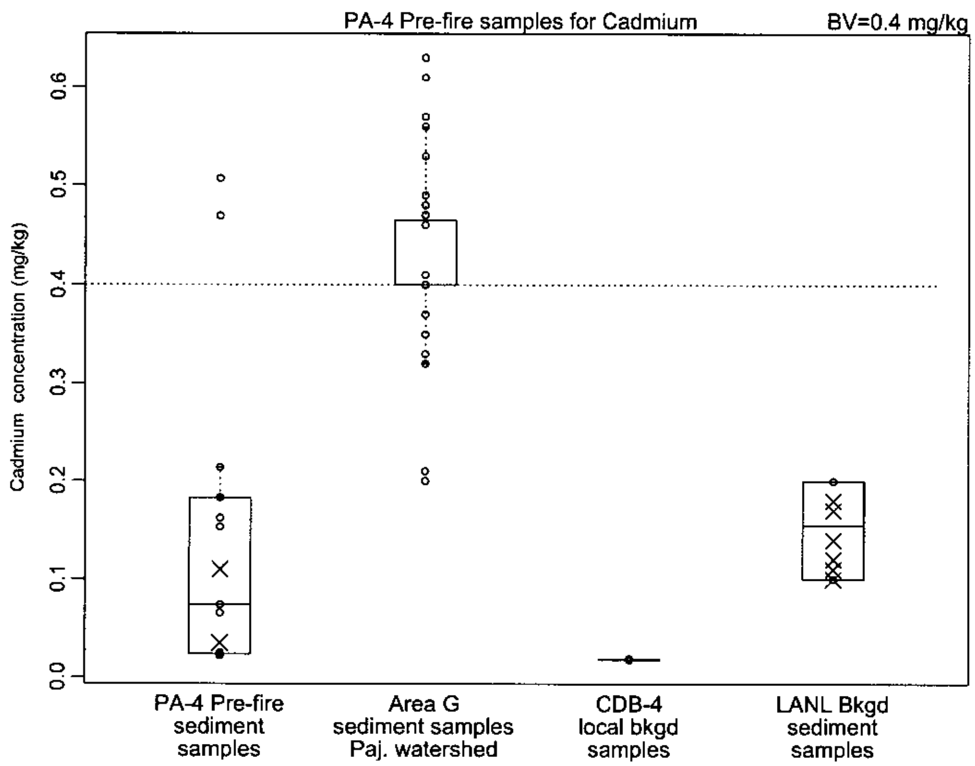
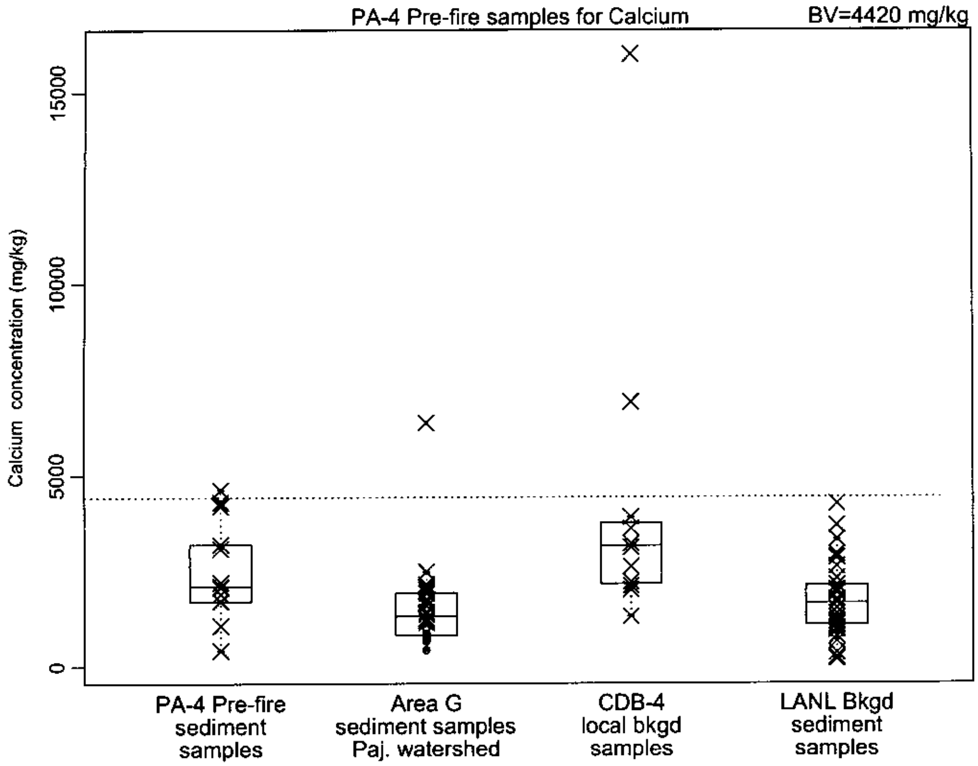


Figure K-4.4-1 (continued). Box plots for reach PA-4 COPCs in prefire sediment deposits compared to data from Area G sediment samples, local background samples, and the LANL sediment data set



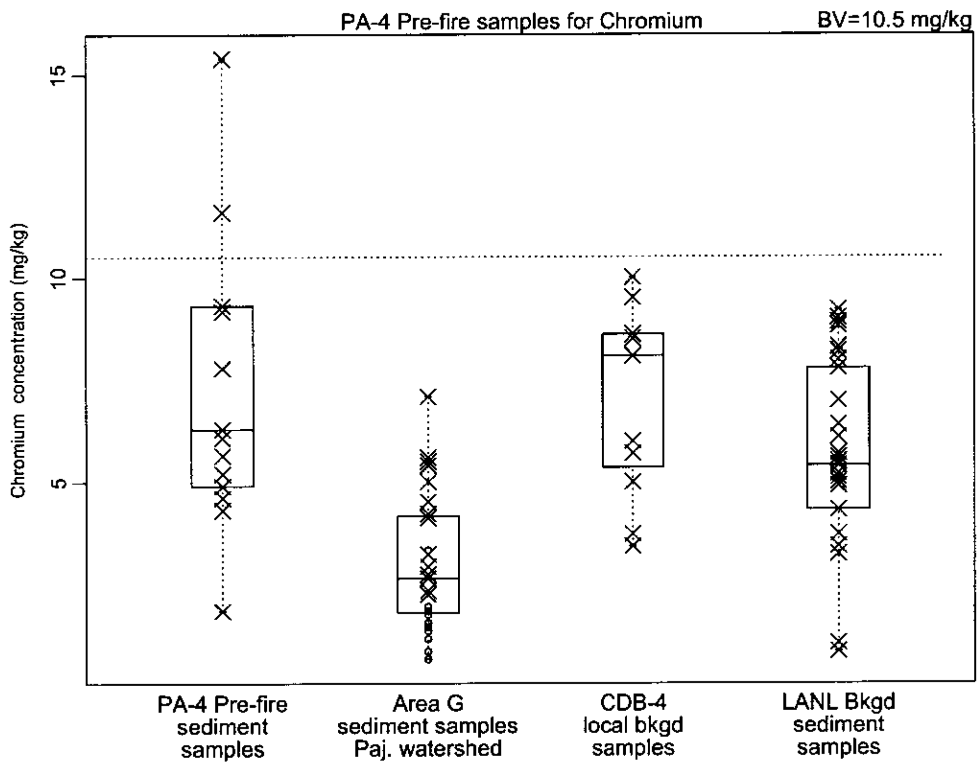
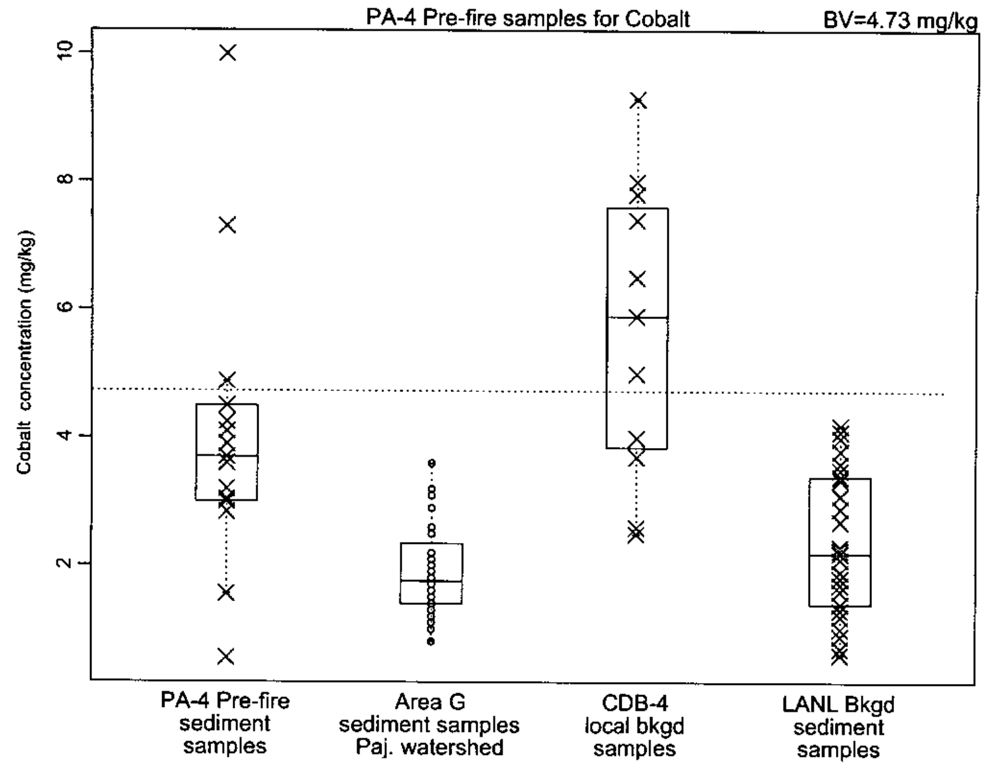
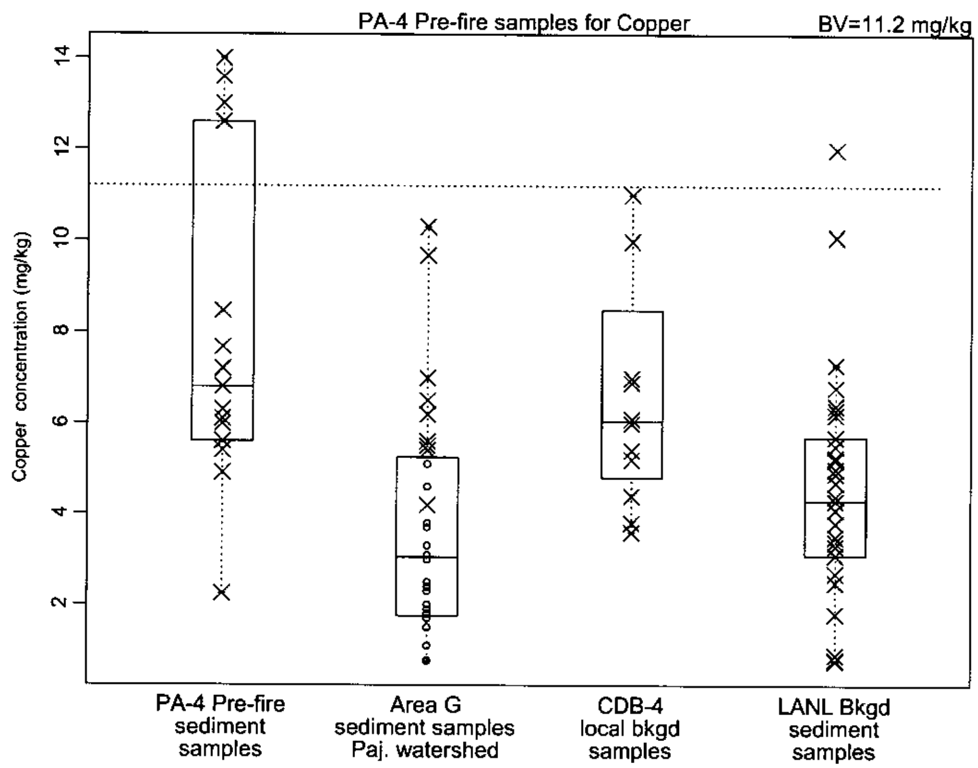


Figure K-4.4-1 (continued). Box plots for reach PA-4 COPCs in prefire sediment deposits compared to data from Area G sediment samples, local background samples, and the LANL sediment data set





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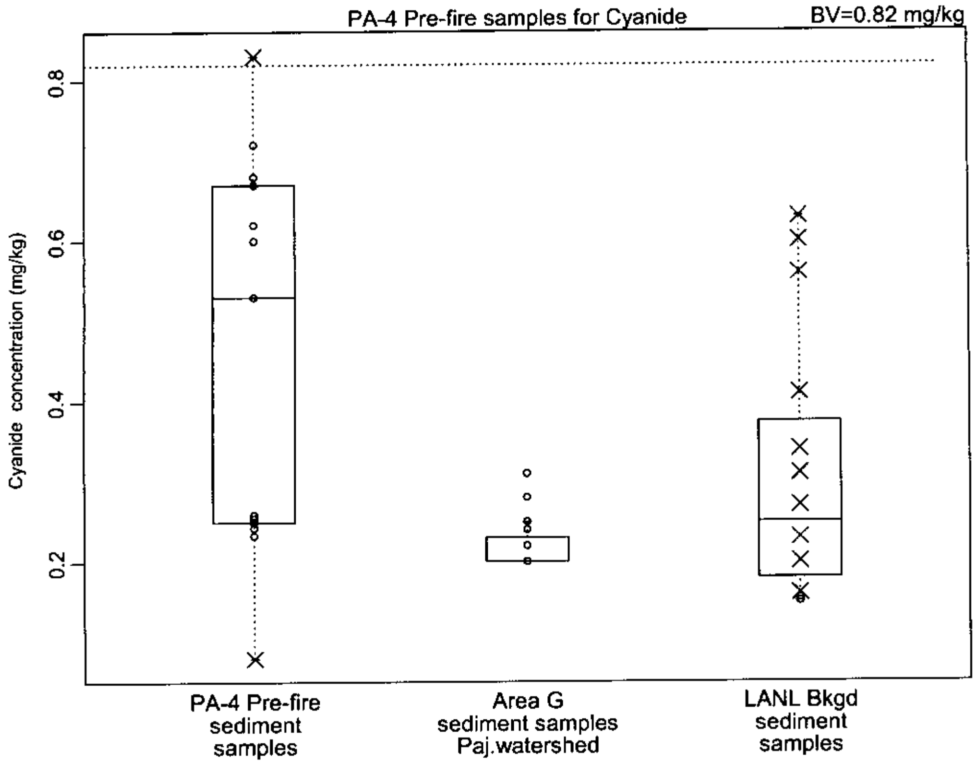

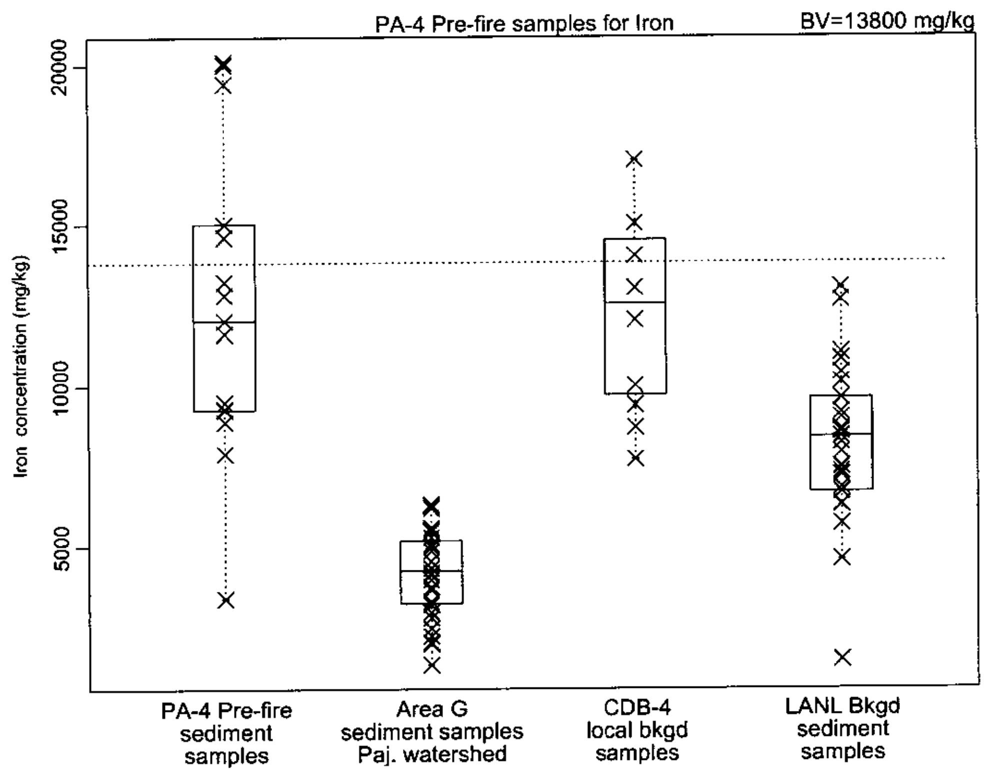

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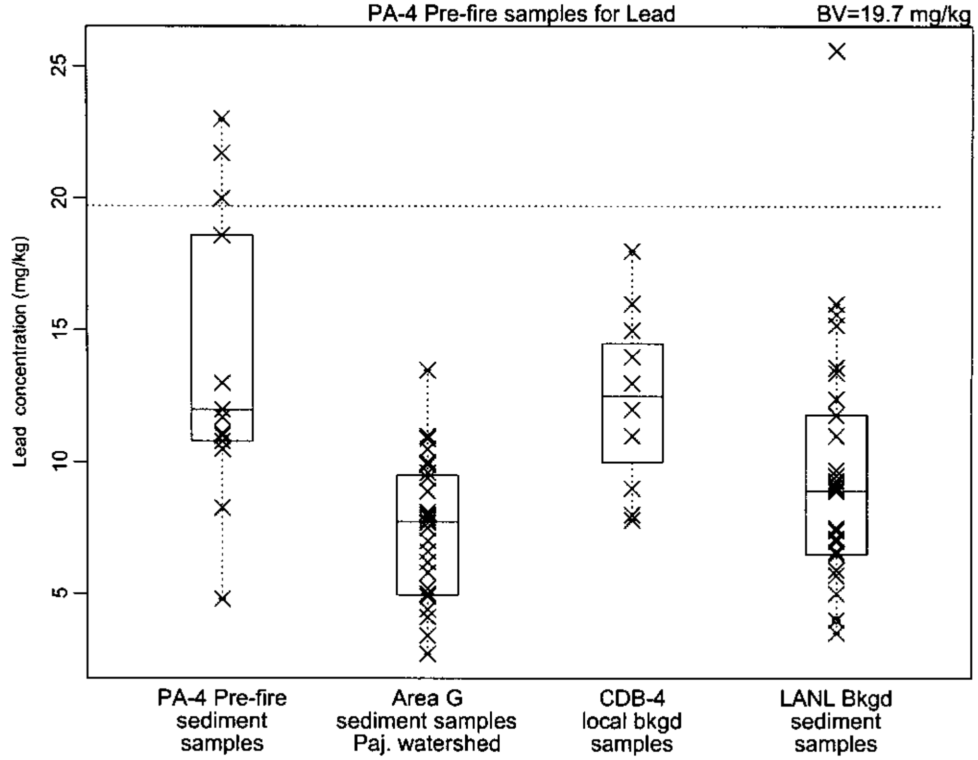

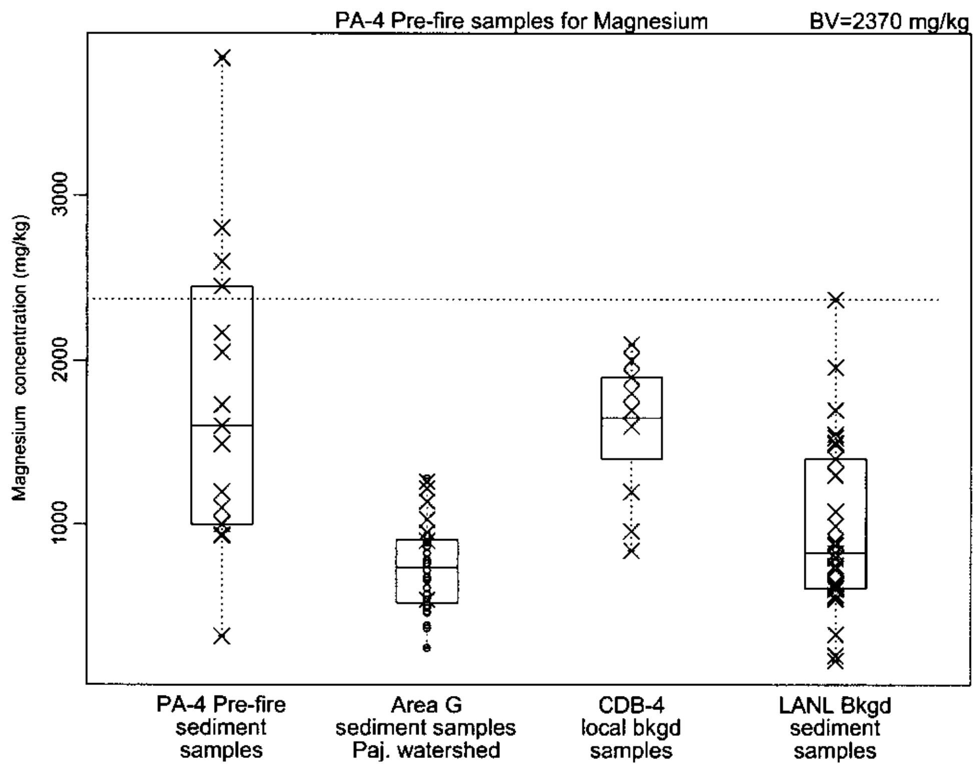

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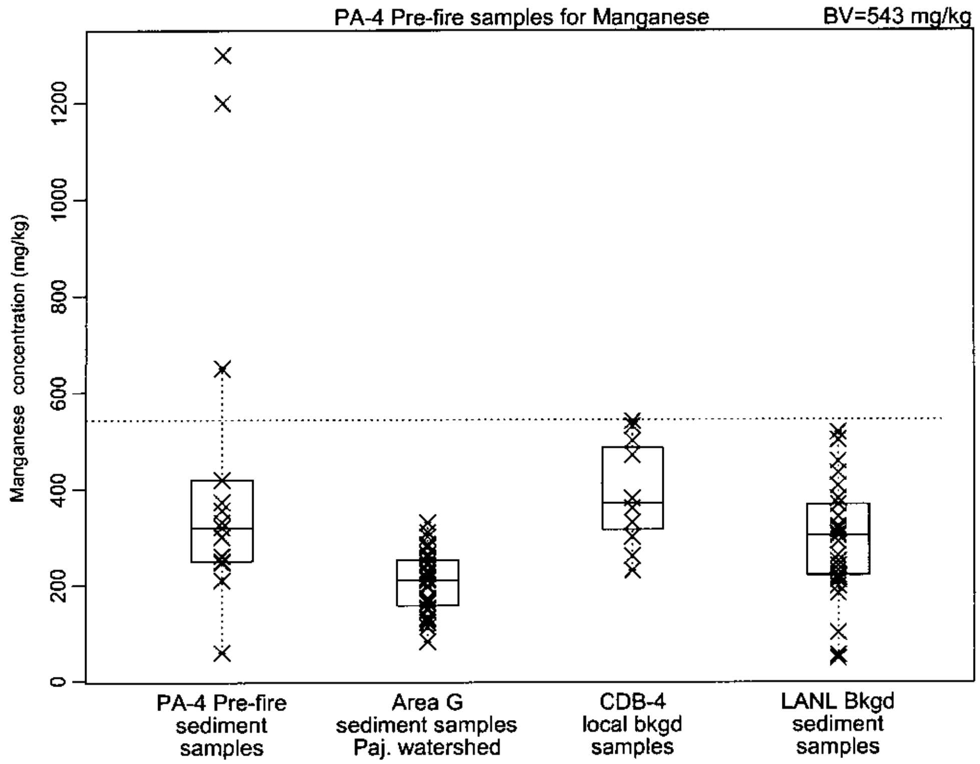


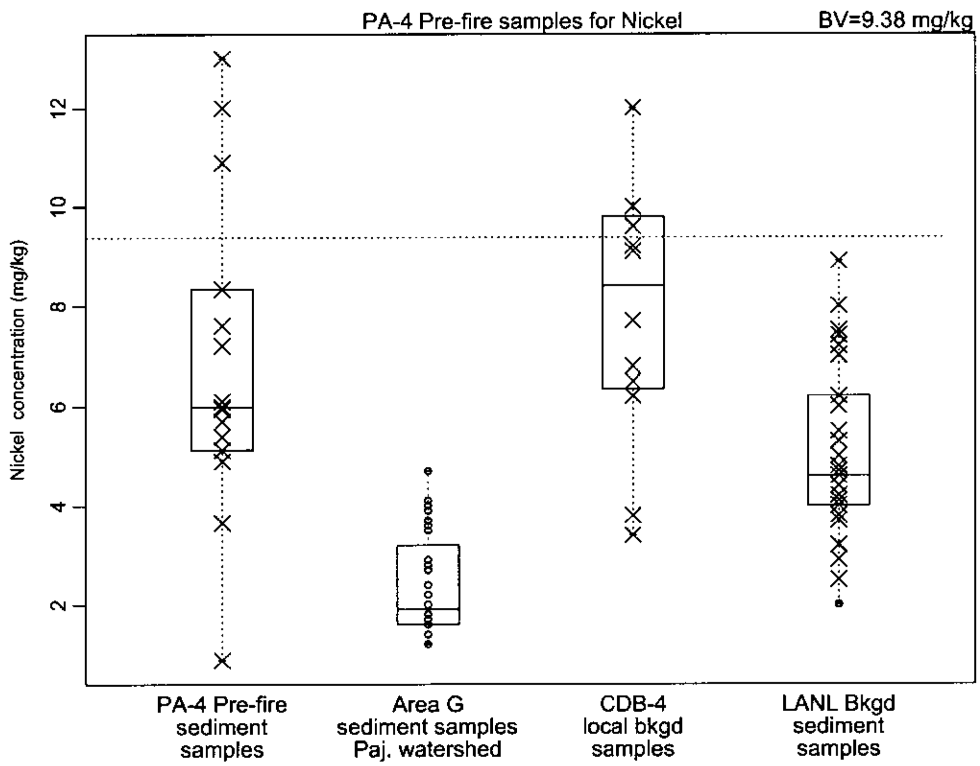
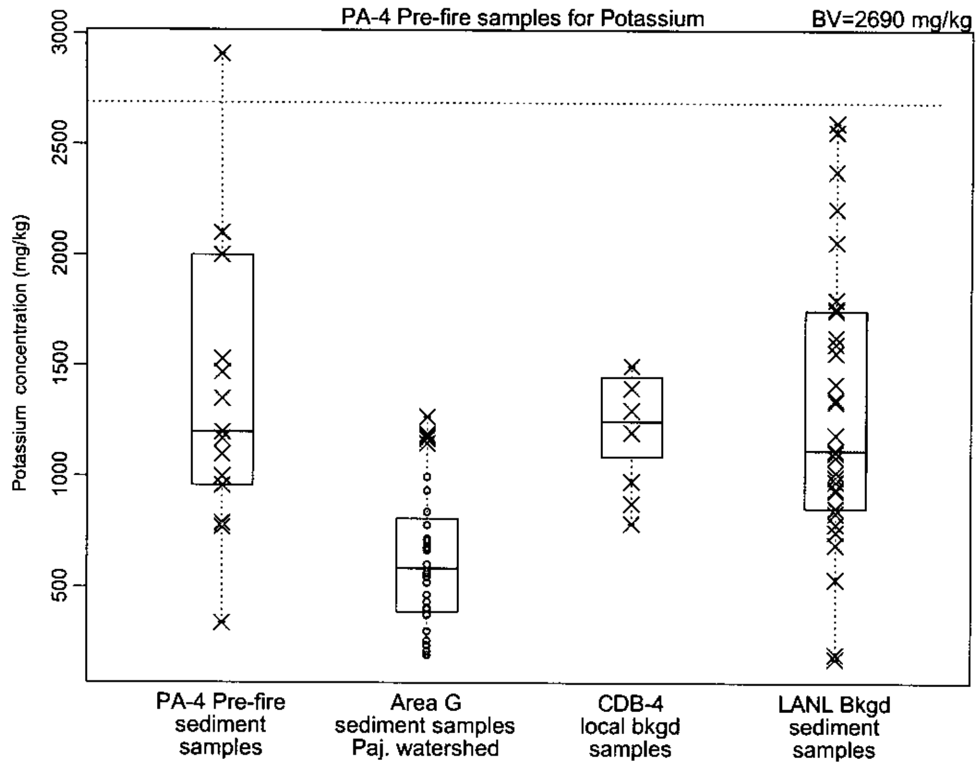


Figure K-4.4-1 (continued). Box plots for reach PA-4 COPCs in prefire sediment deposits compared to data from Area G sediment samples, local background samples, and the LANL sediment data set



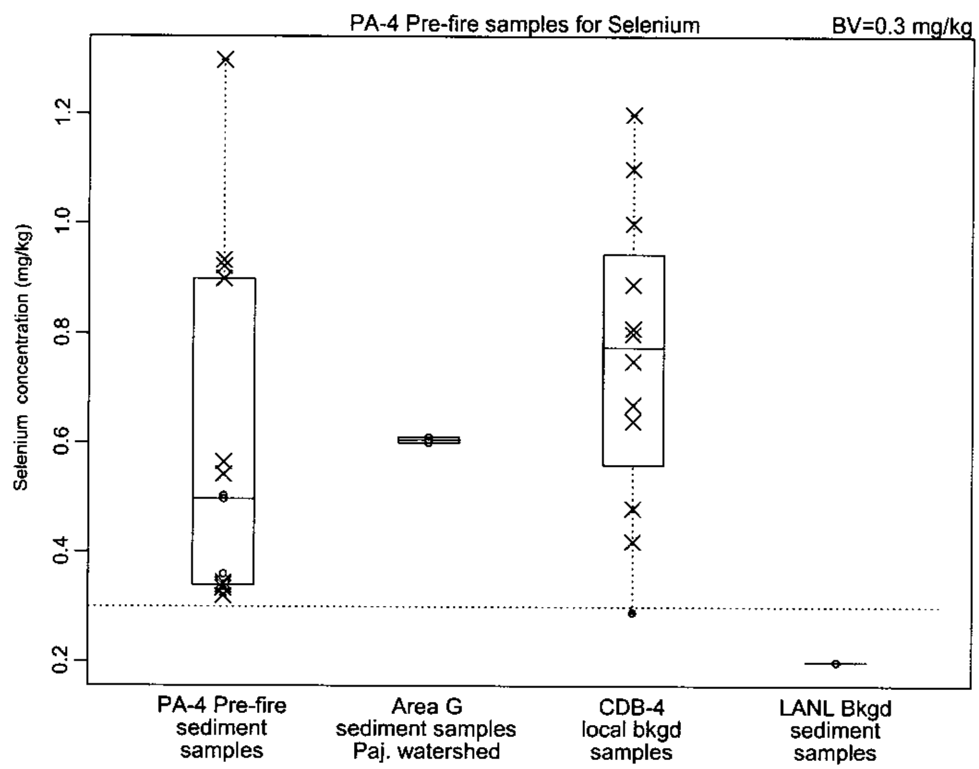
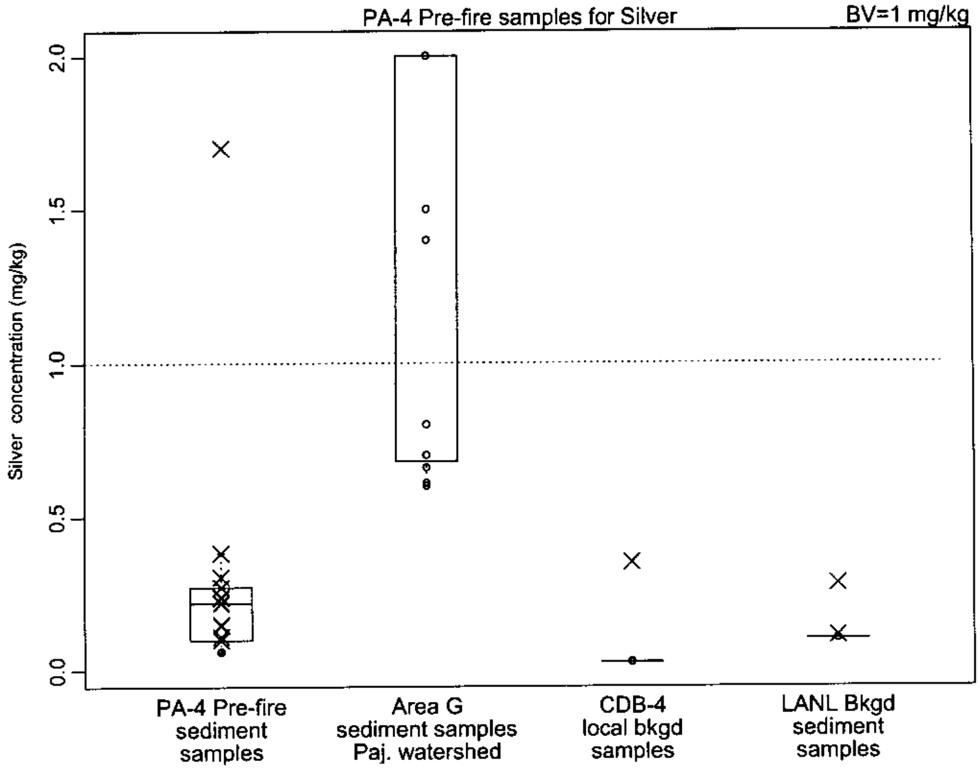
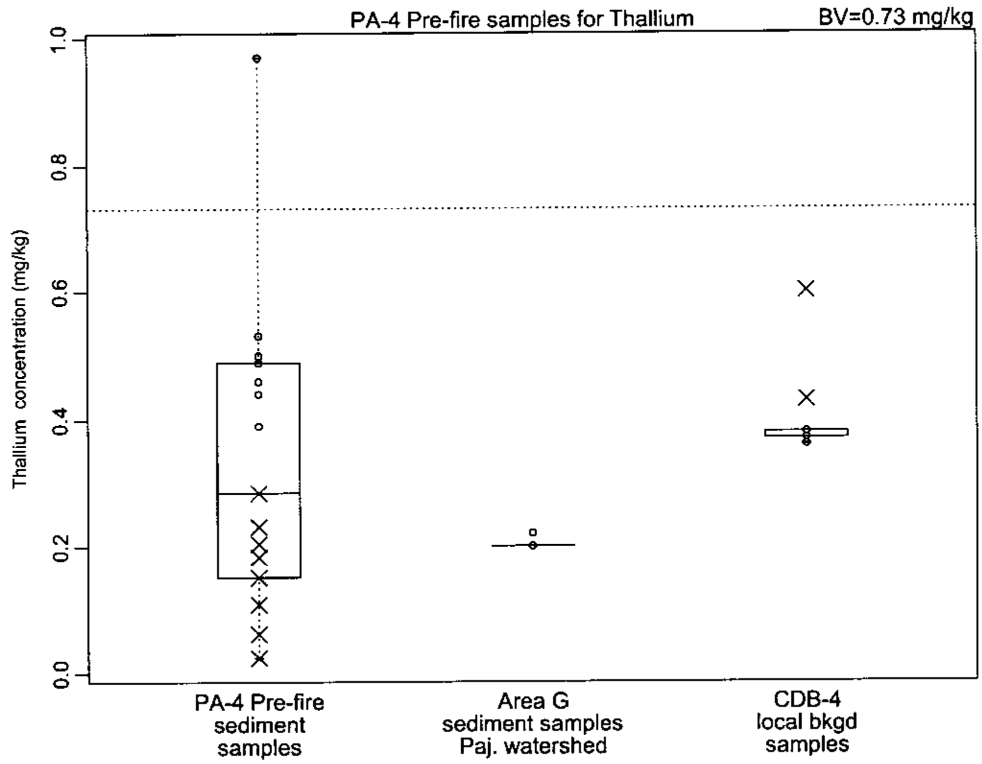


Figure K-4.4-1 (continued). Box plots for reach PA-4 COPCs in prefire sediment deposits compared to data from Area G sediment samples, local background samples, and the LANL sediment data set





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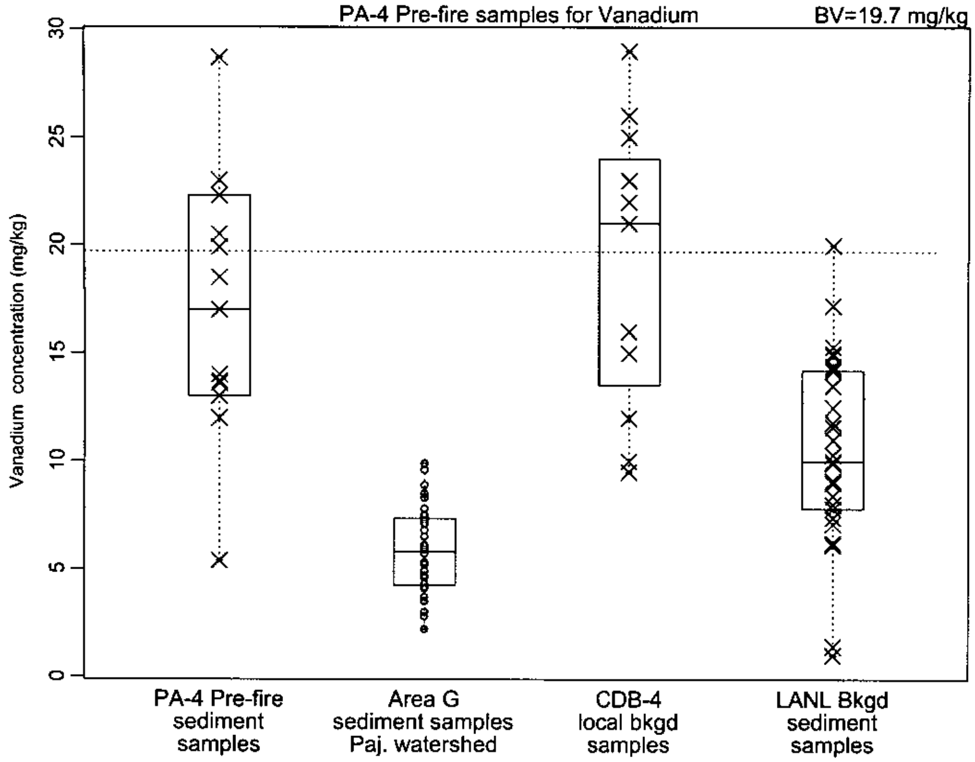

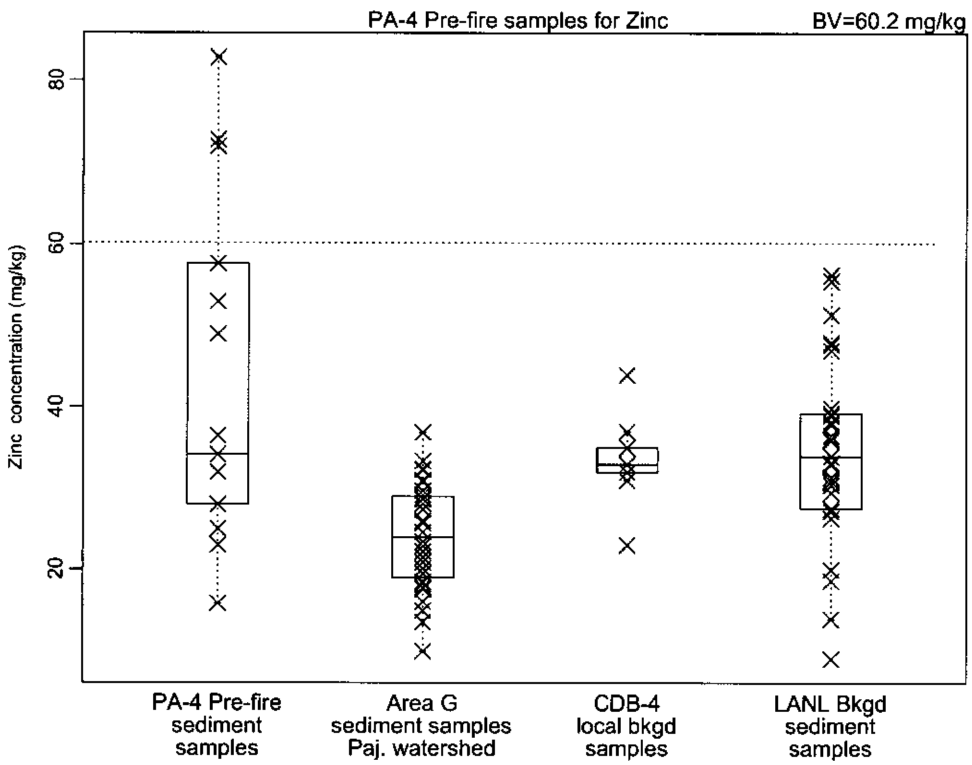

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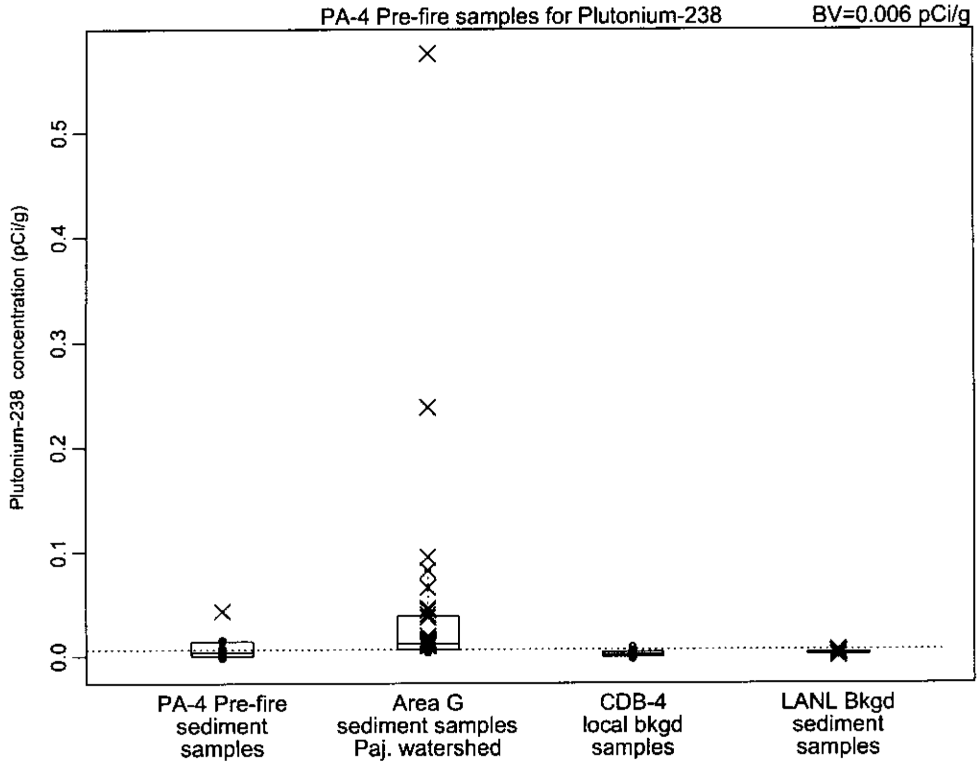


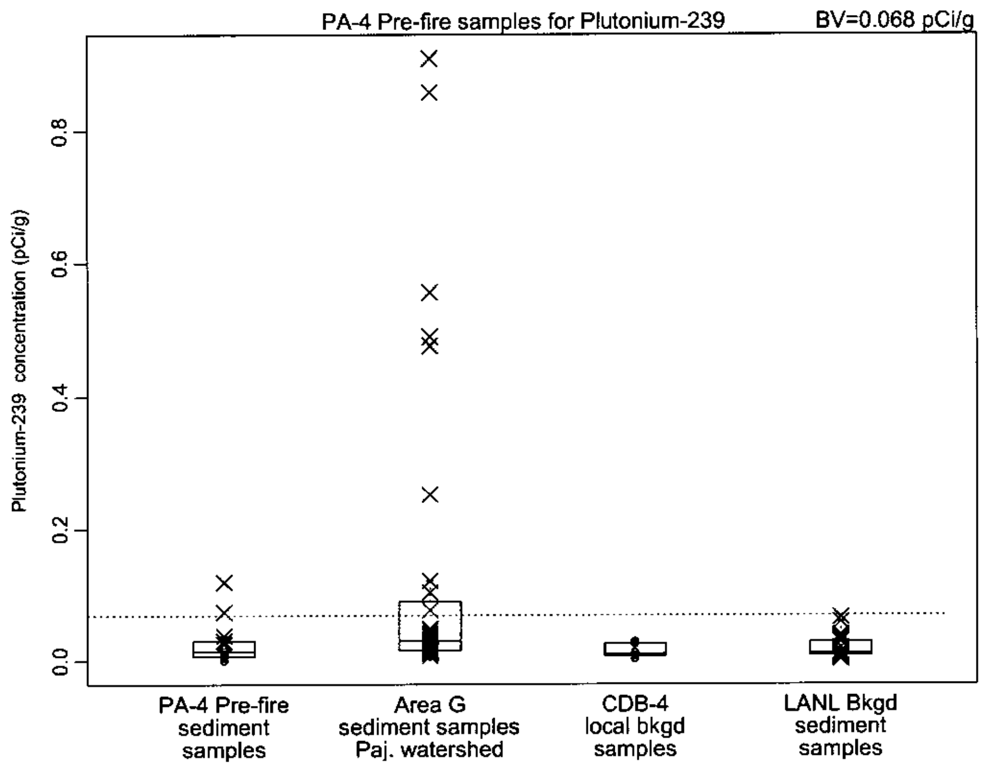
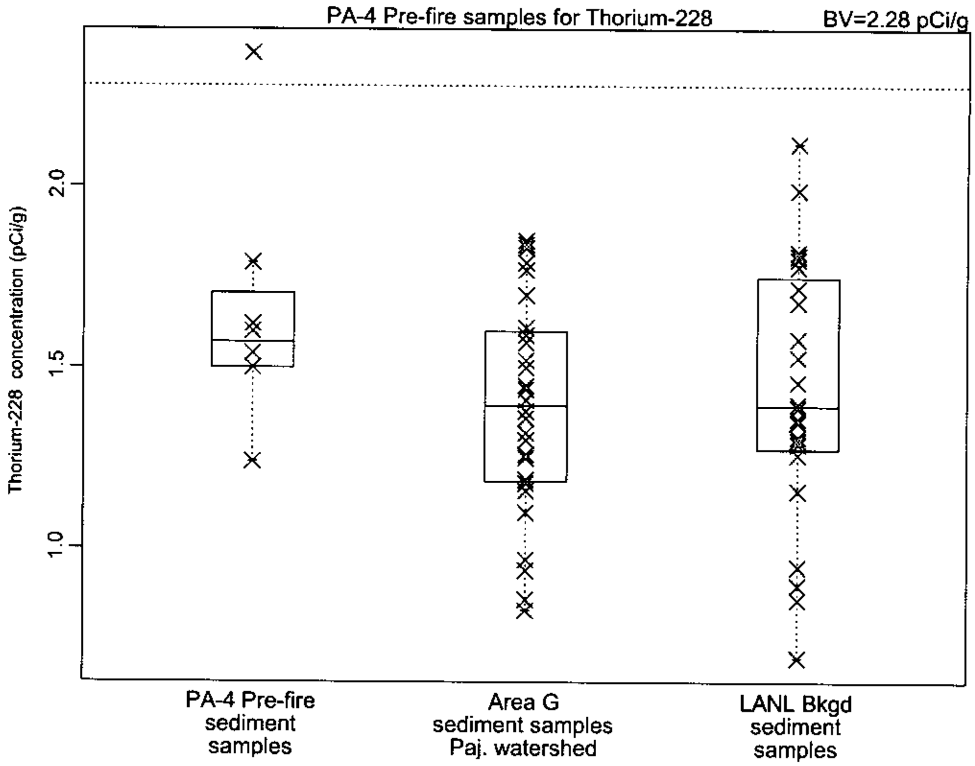


Figure K-4.4-1 (continued). Box plots for reach PA-4 COPCs in prefire sediment deposits compared to data from Area G sediment samples, local background samples, and the LANL sediment data set



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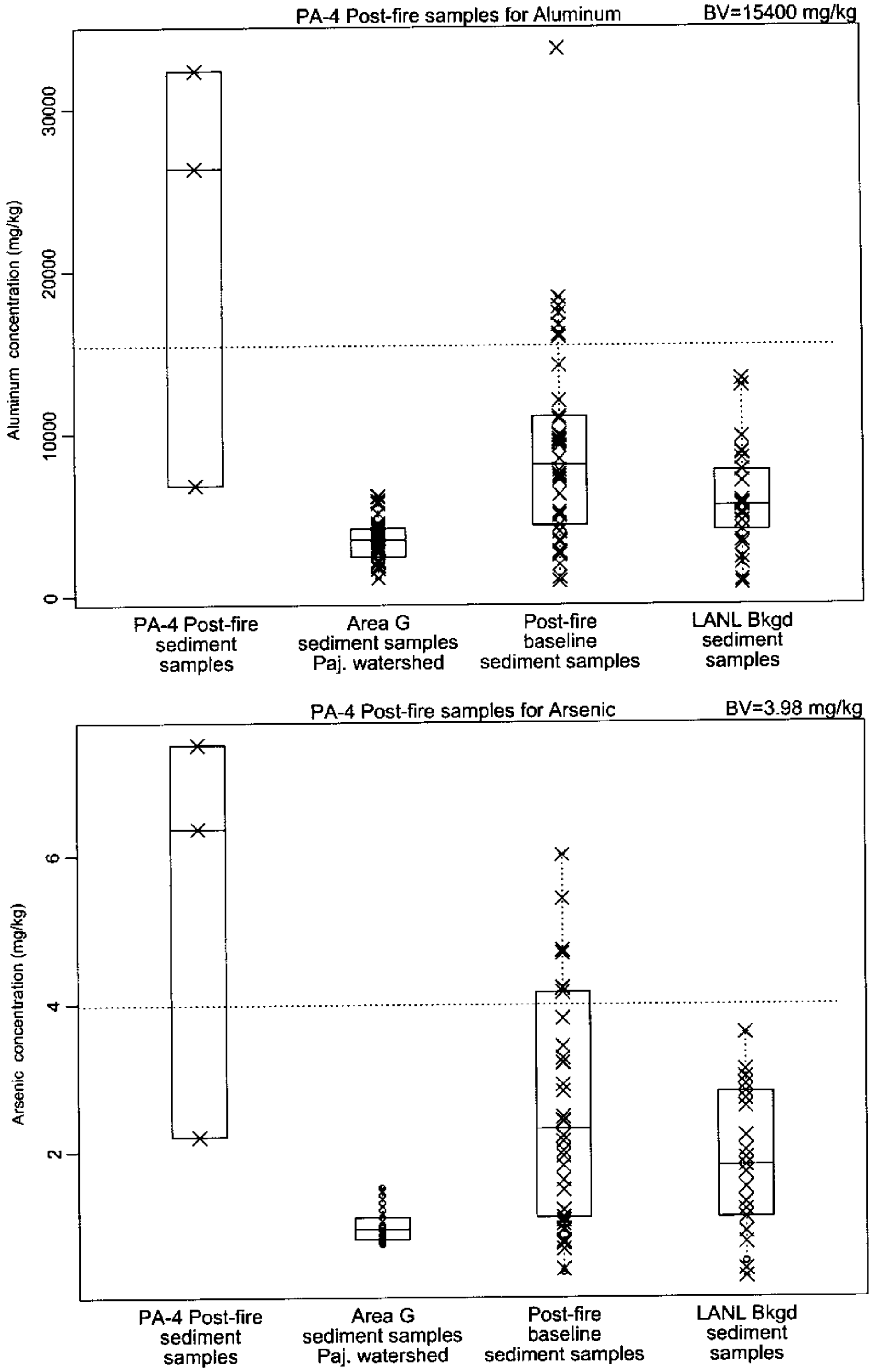
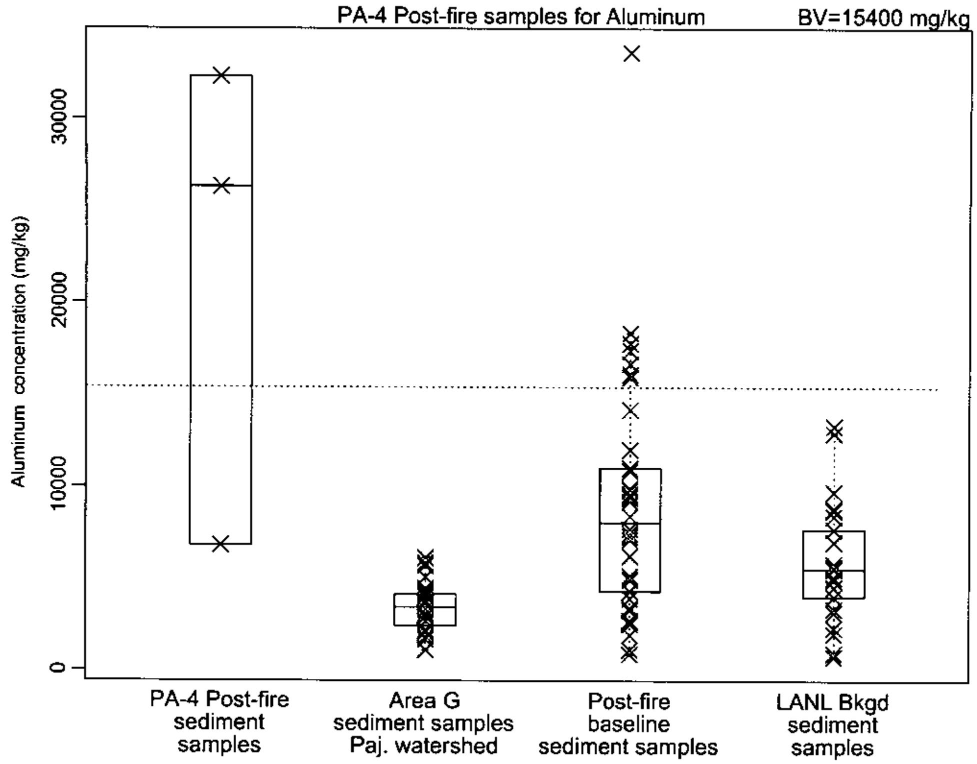


Figure K-4.5-1. Box plots for reach PA-4 COPCs in postfire sediment deposits compared to data from Area G sediment samples, local background samples, and the LANL sediment data set



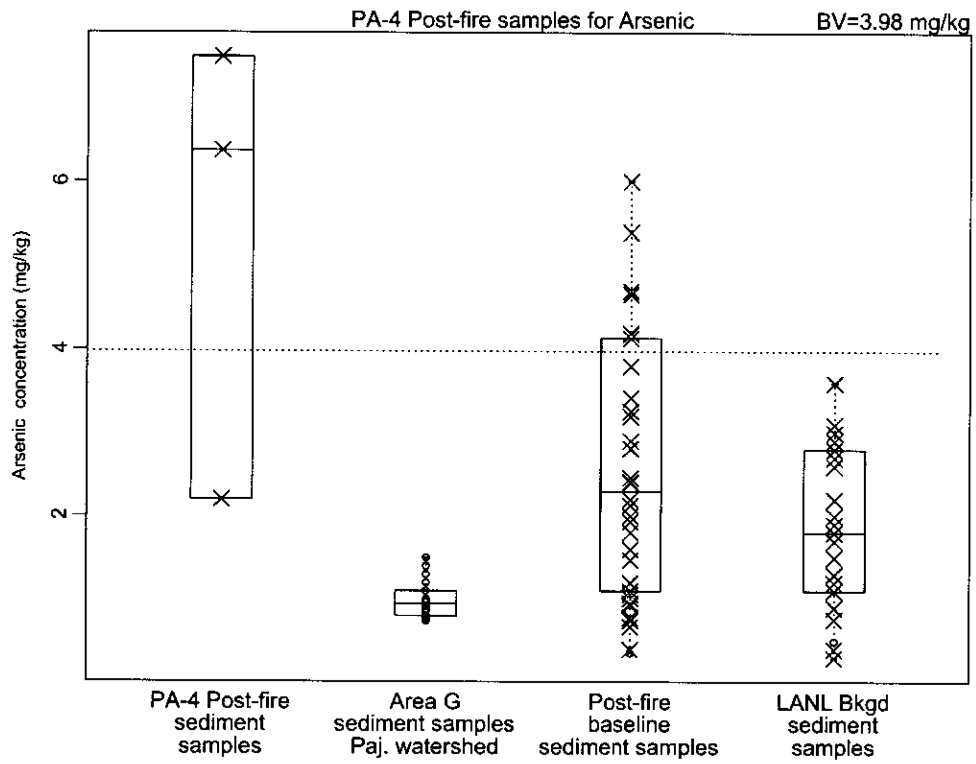
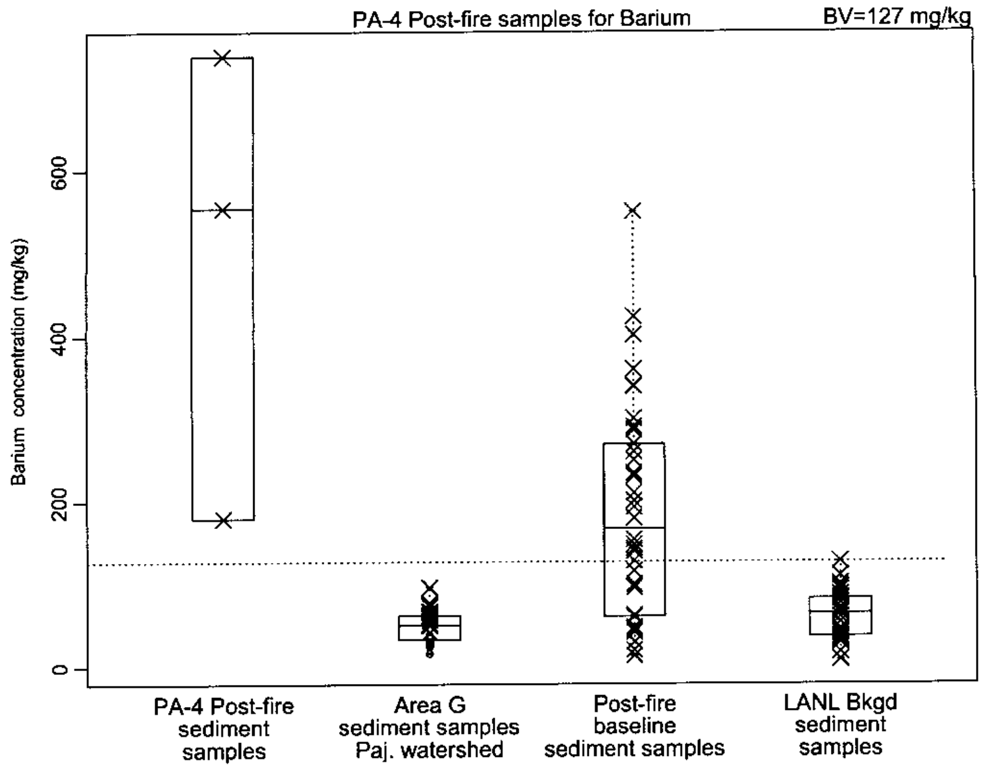


Figure K-4.5-1 (continued). Box plots for reach PA-4 COPCs in postfire sediment deposits compared to data from Area G sediment samples, local background samples, and the LANL sediment data set



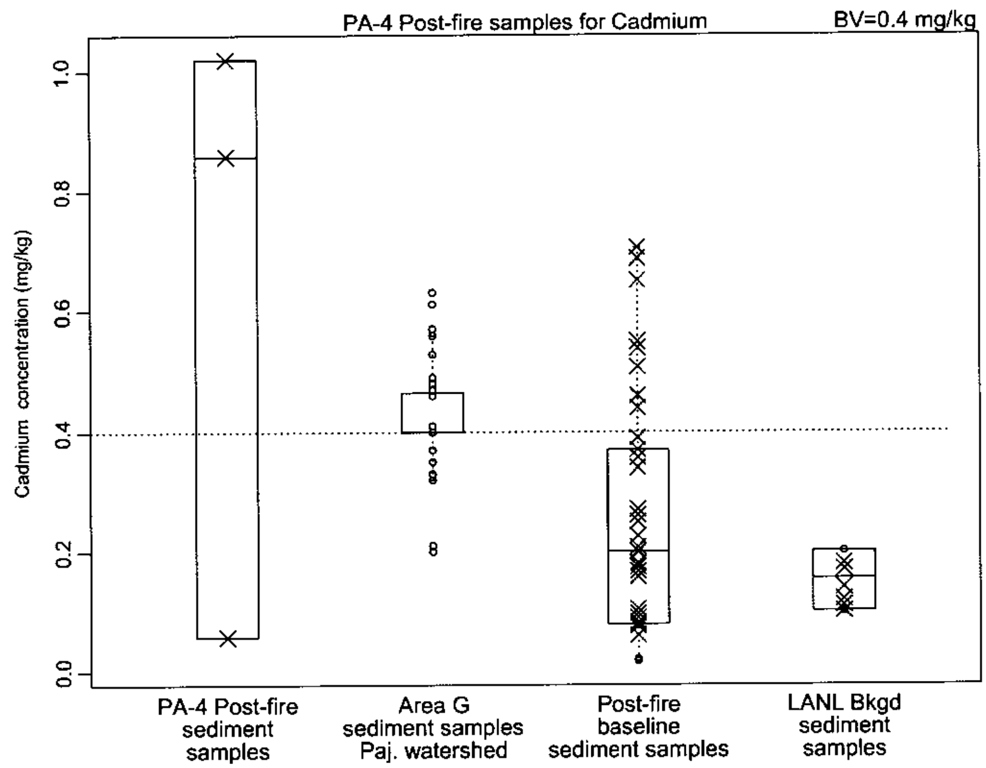
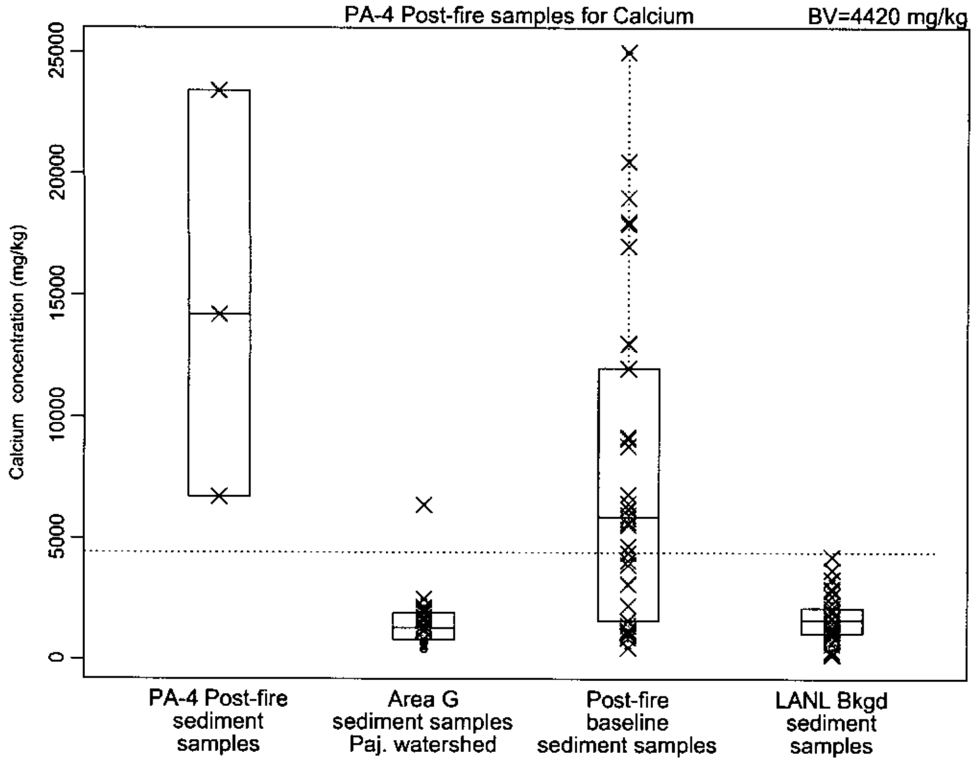


Figure K-4.5-1 (continued). Box plots for reach PA-4 COPCs in postfire sediment deposits compared to data from Area G sediment samples, local background samples, and the LANL sediment data set



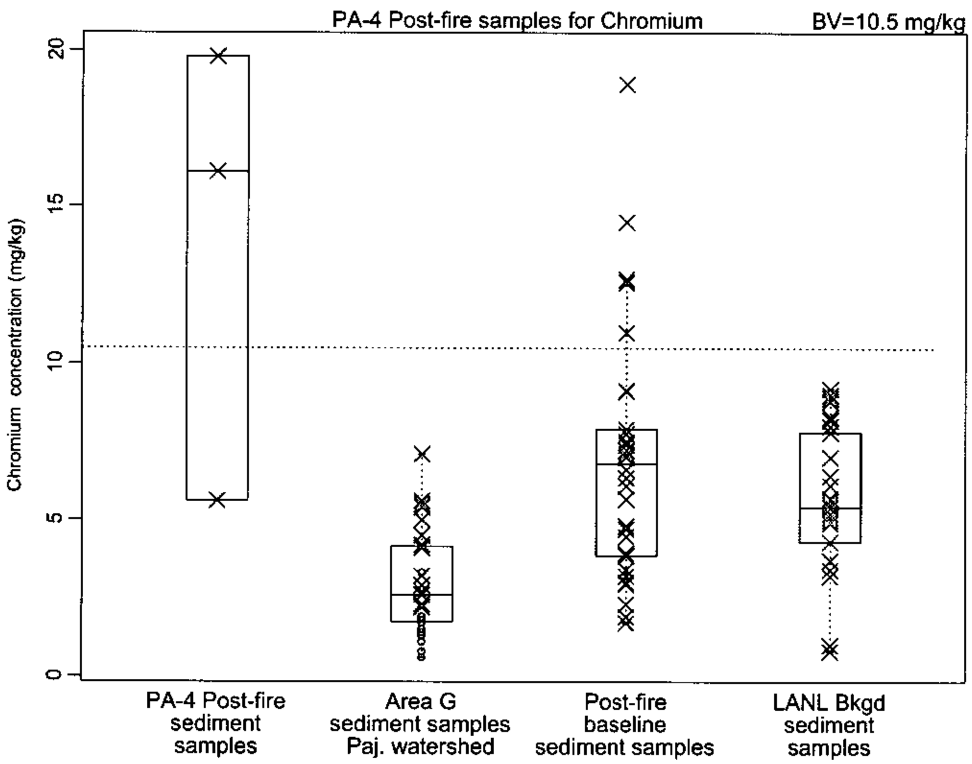
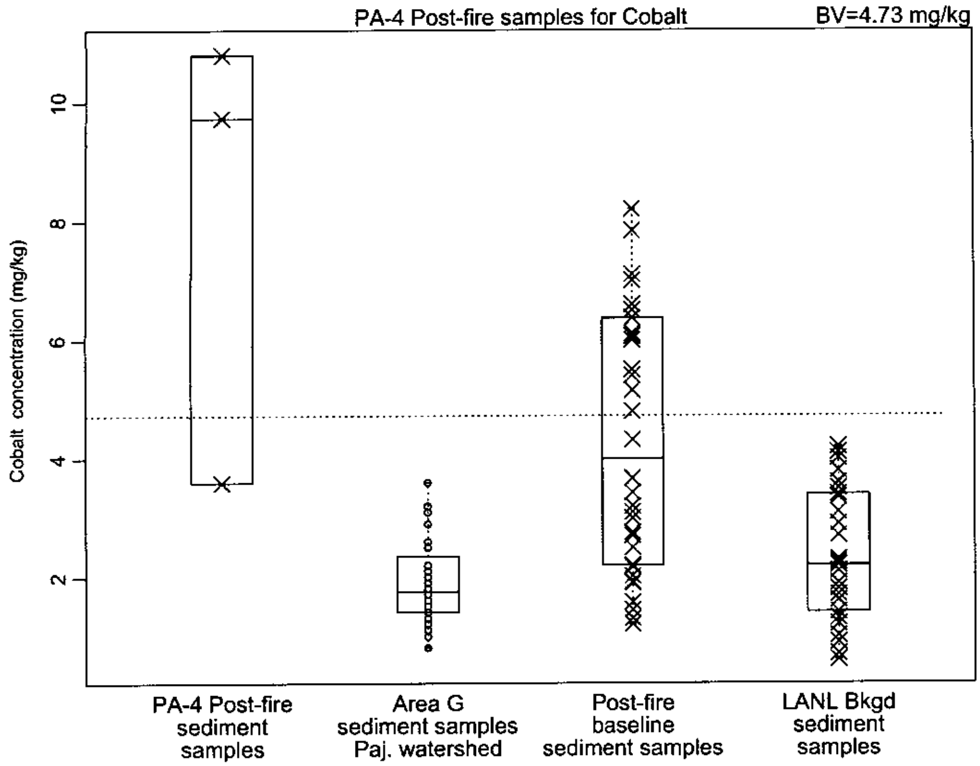


Figure K-4.5-1 (continued). Box plots for reach PA-4 COPCs in postfire sediment deposits compared to data from Area G sediment samples, local background samples, and the LANL sediment data set



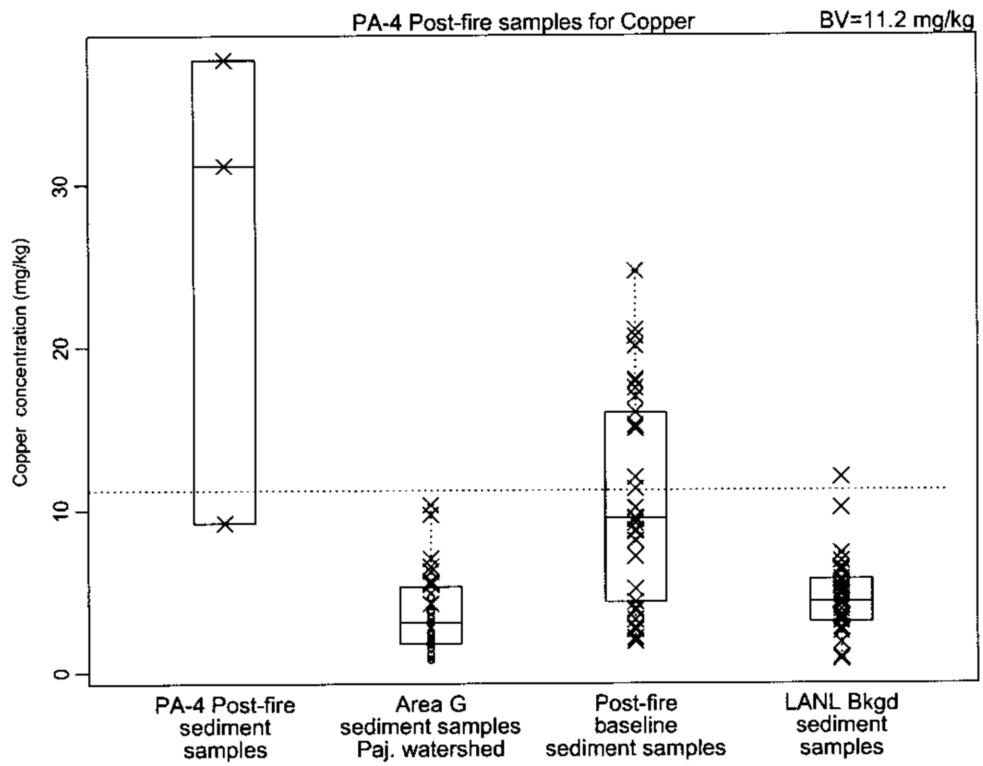
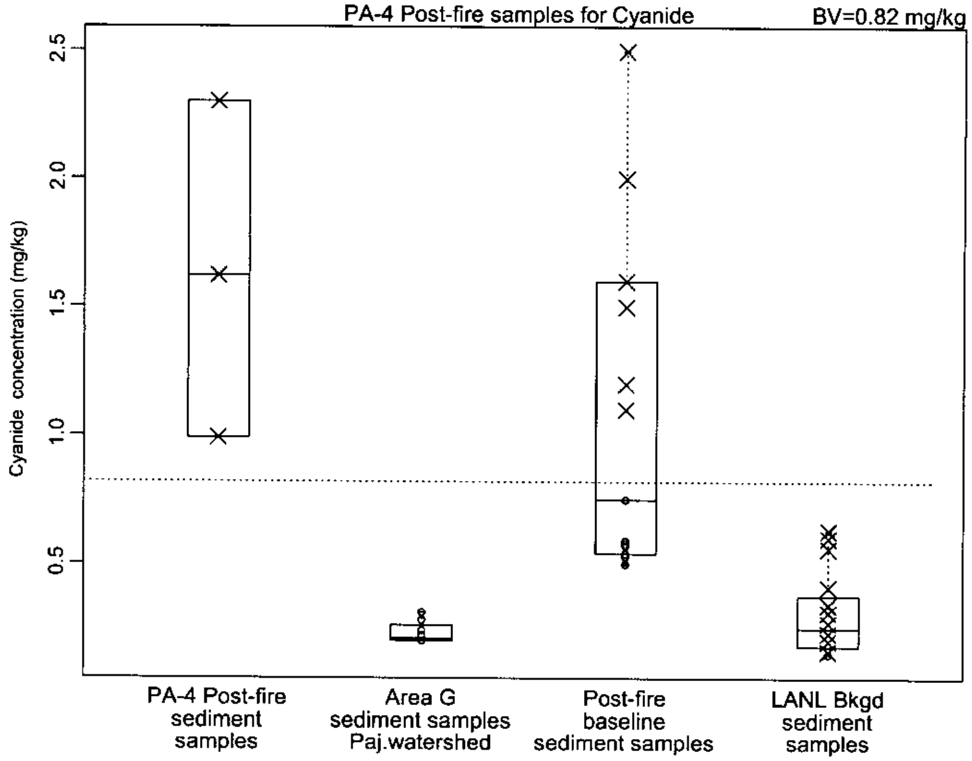


Figure K-4.5-1 (continued). Box plots for reach PA-4 COPCs in postfire sediment deposits compared to data from Area G sediment samples, local background samples, and the LANL sediment data set



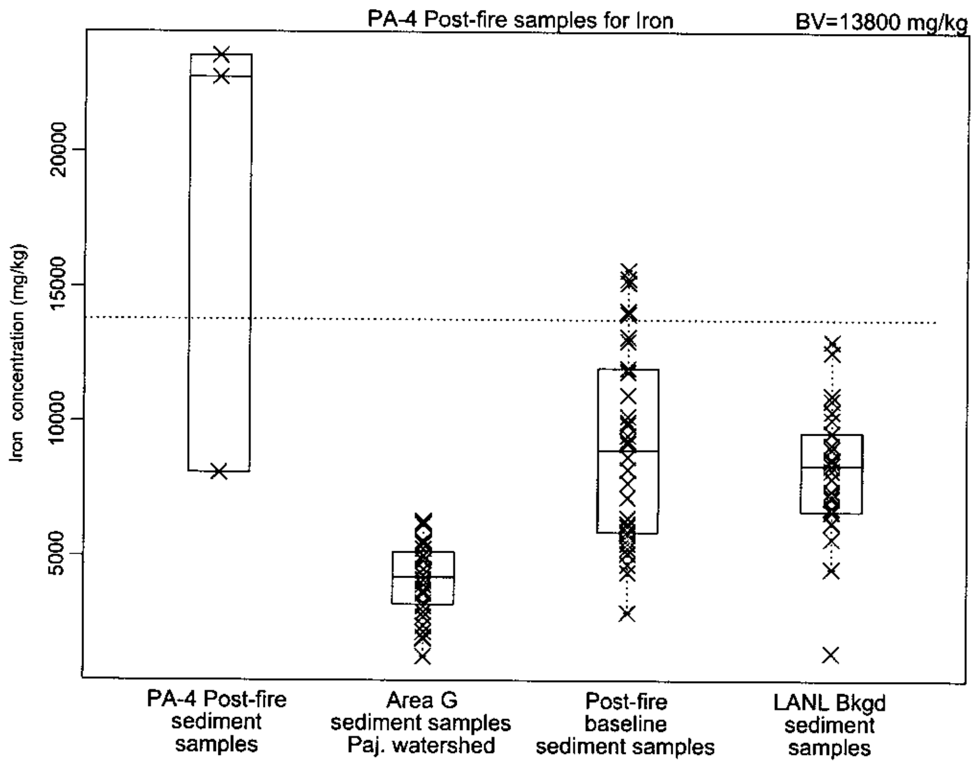
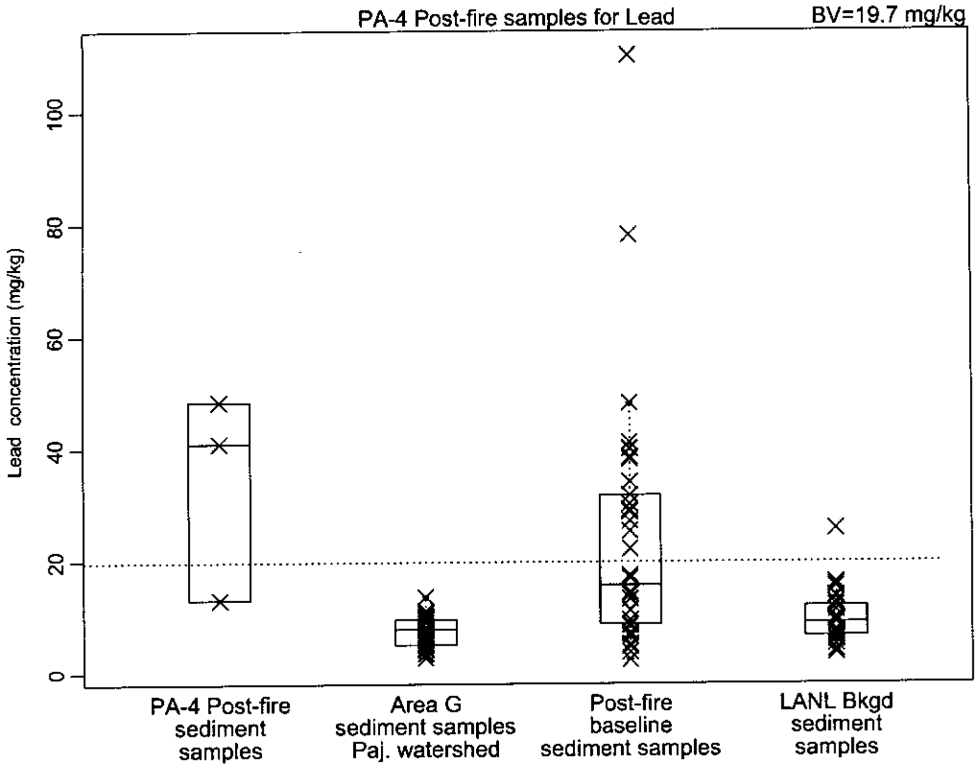


Figure K-4.5-1 (continued). Box plots for reach PA-4 COPCs in postfire sediment deposits compared to data from Area G sediment samples, local background samples, and the LANL sediment data set



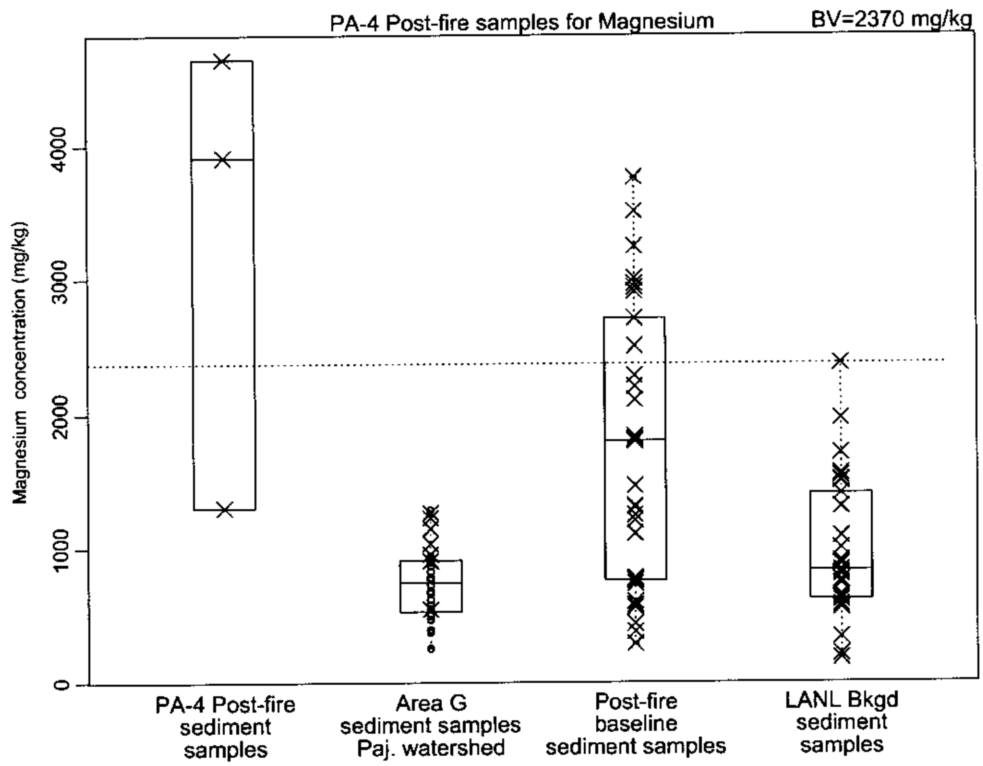
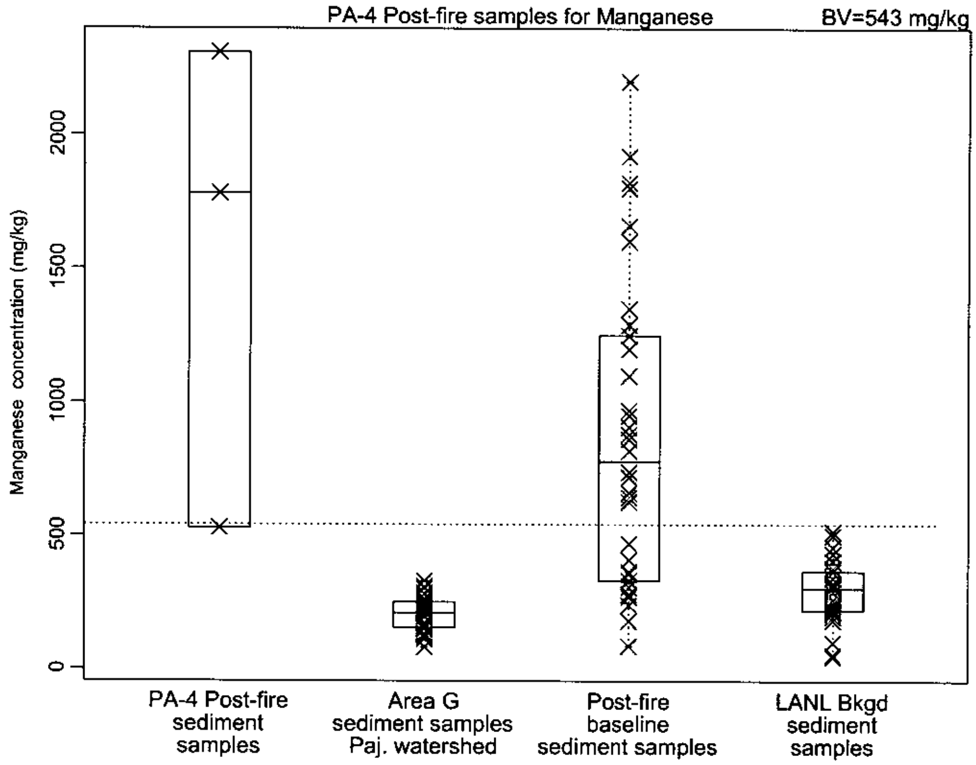


Figure K-4.5-1 (continued). Box plots for reach PA-4 COPCs in postfire sediment deposits compared to data from Area G sediment samples, local background samples, and the LANL sediment data set



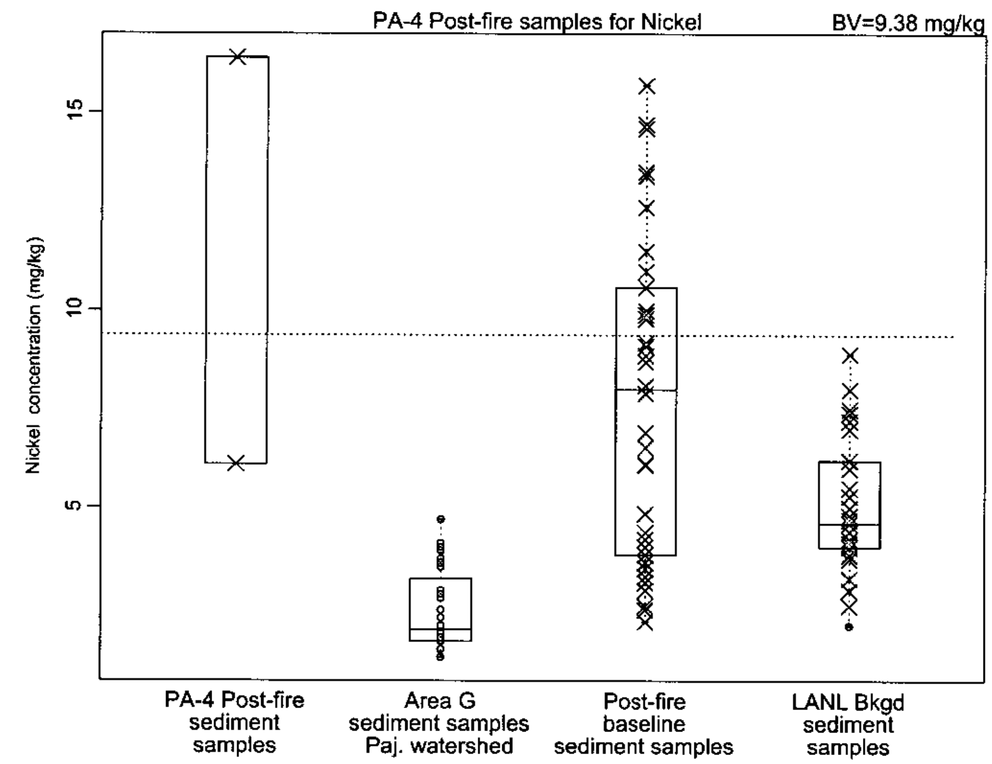
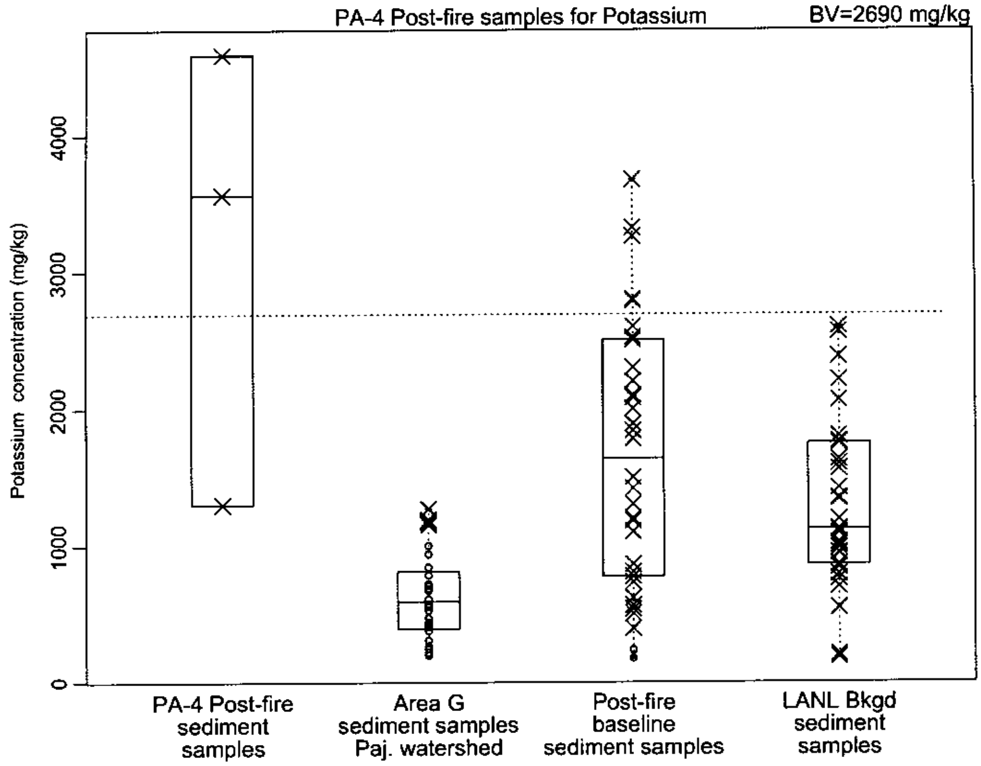


Figure K-4.5-1 (continued). Box plots for reach PA-4 COPCs in postfire sediment deposits compared to data from Area G sediment samples, local background samples, and the LANL sediment data set



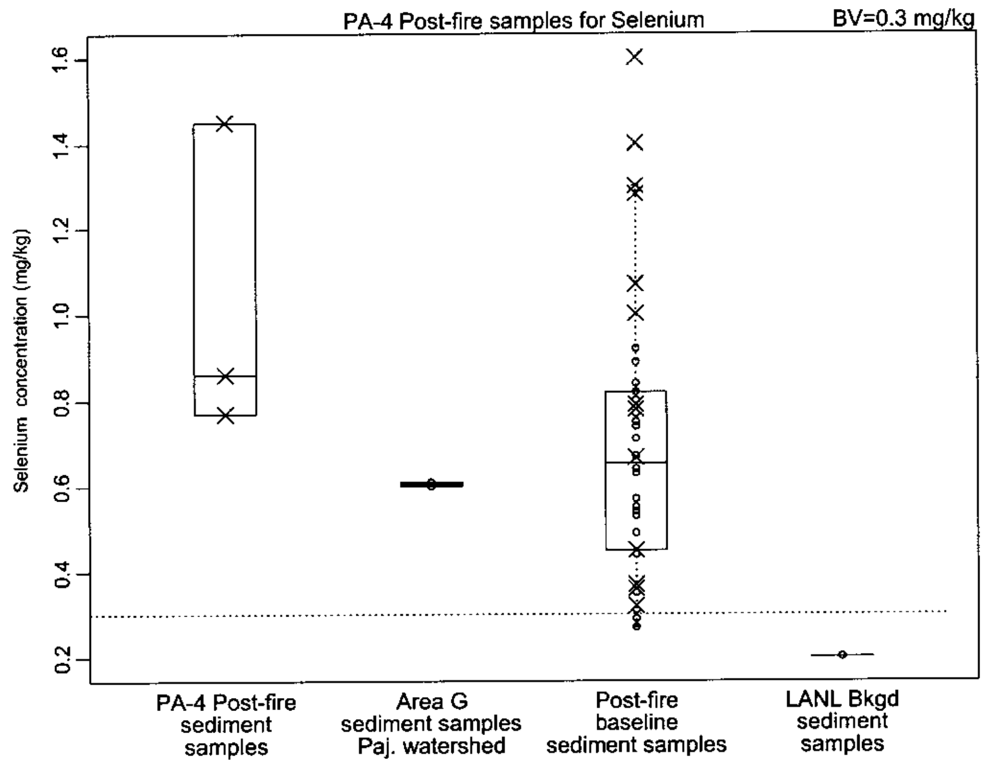
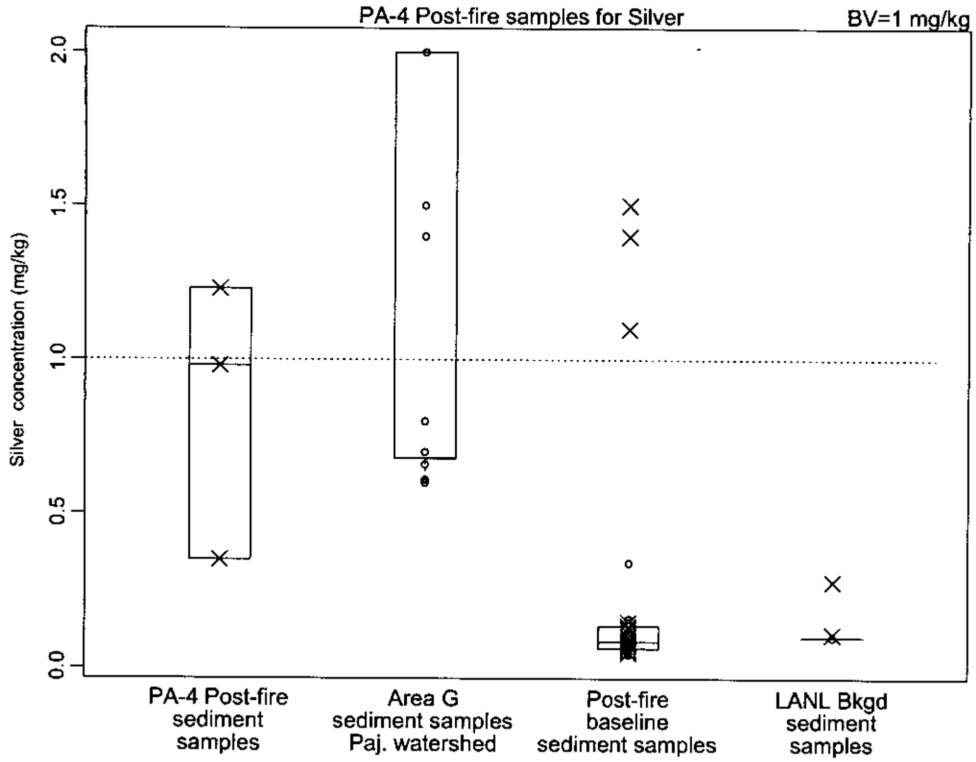


Figure K-4.5-1 (continued). Box plots for reach PA-4 COPCs in postfire sediment deposits compared to data from Area G sediment samples, local background samples, and the LANL sediment data set



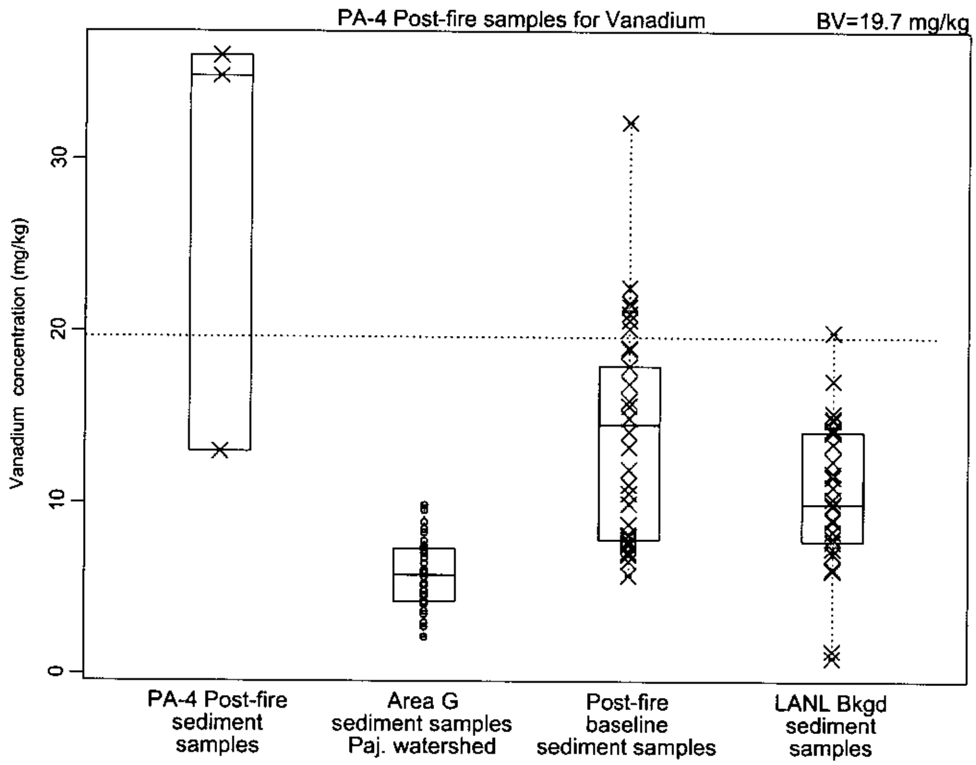
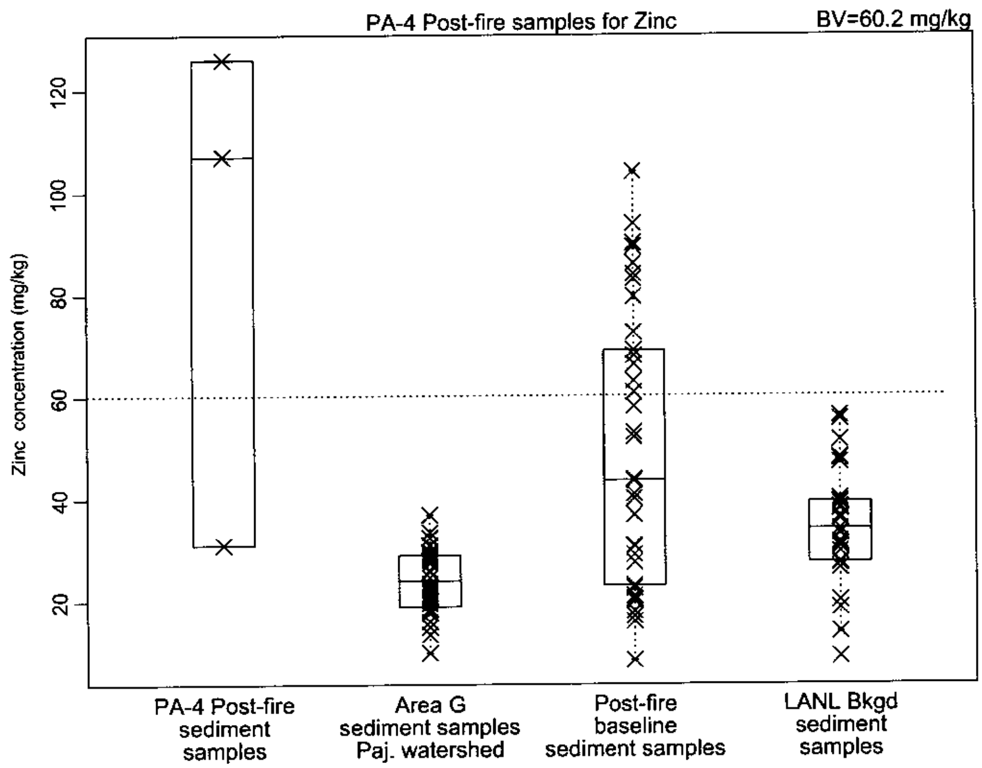
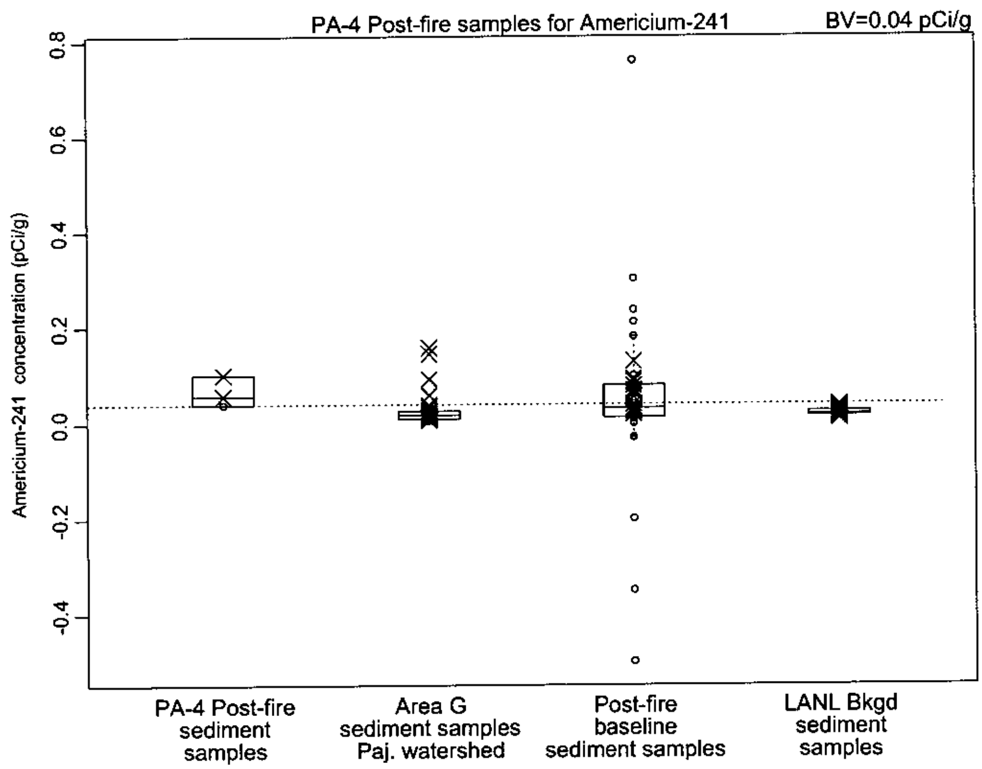


Figure K-4.5-1 (continued). Box plots for reach PA-4 COPCs in postfire sediment deposits compared to data from Area G sediment samples, local background samples, and the LANL sediment data set





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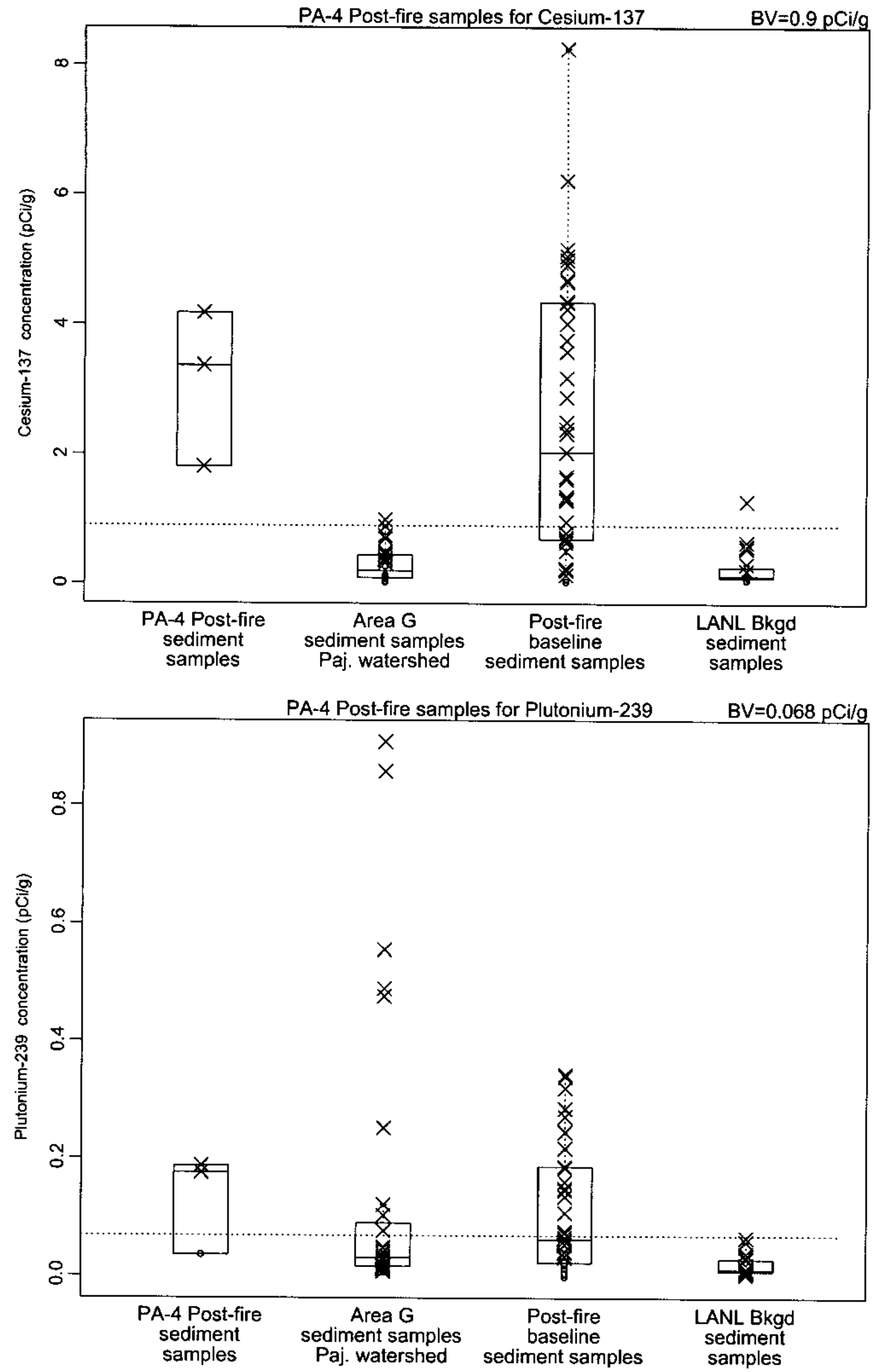
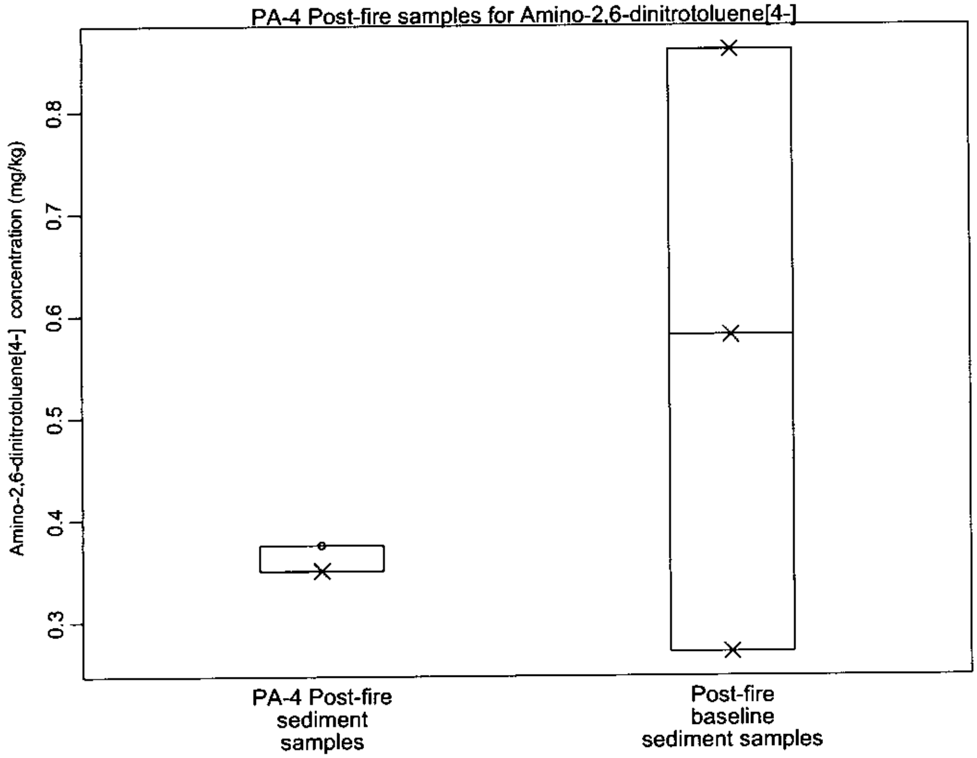


Figure K-4.5-1 (continued). Box plots for reach PA-4 COPCs in postfire sediment deposits compared to data from Area G sediment samples, local background samples, and the LANL sediment data set



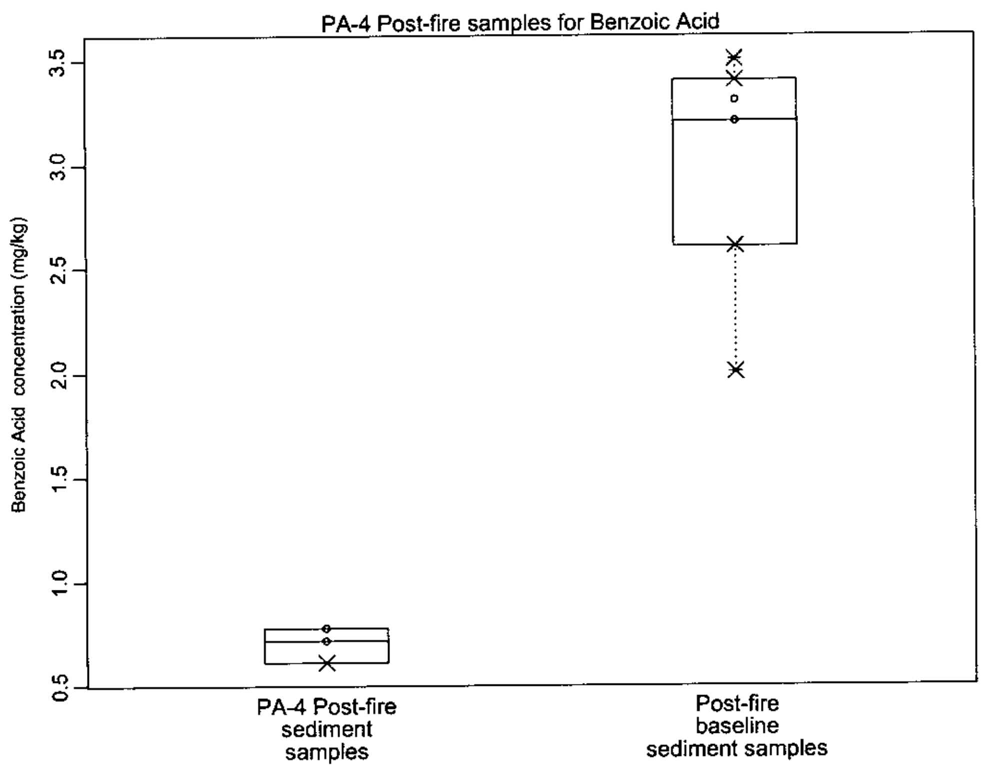
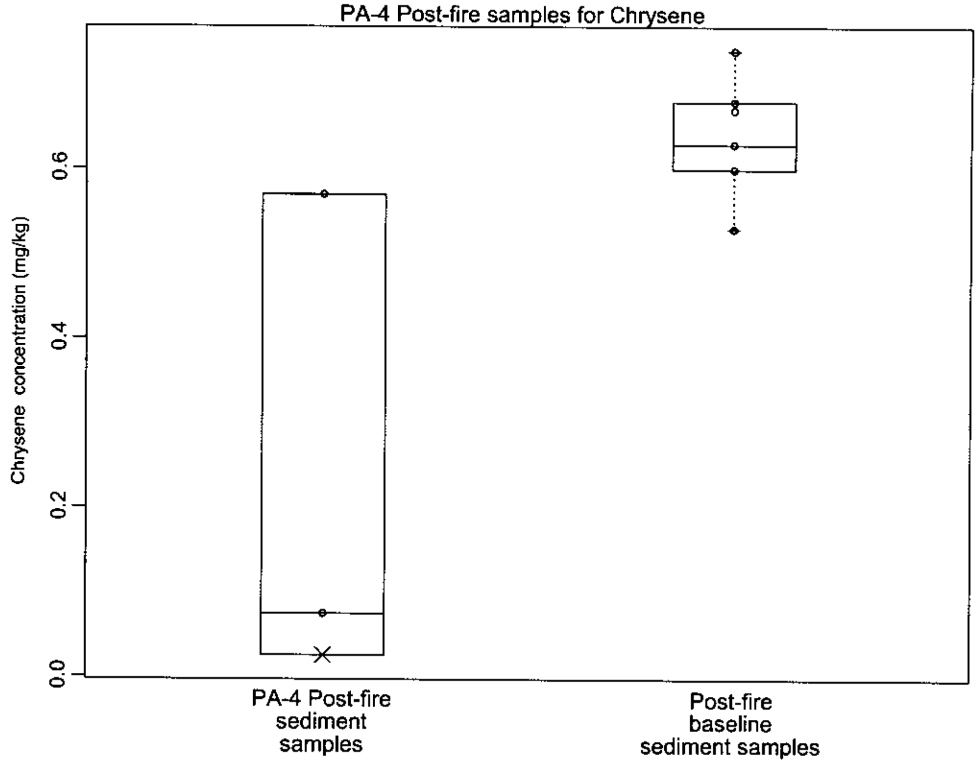


Figure K-4.5-1 (continued). Box plots for reach PA-4 COPCs in postfire sediment deposits compared to data from Area G sediment samples, local background samples, and the LANL sediment data set



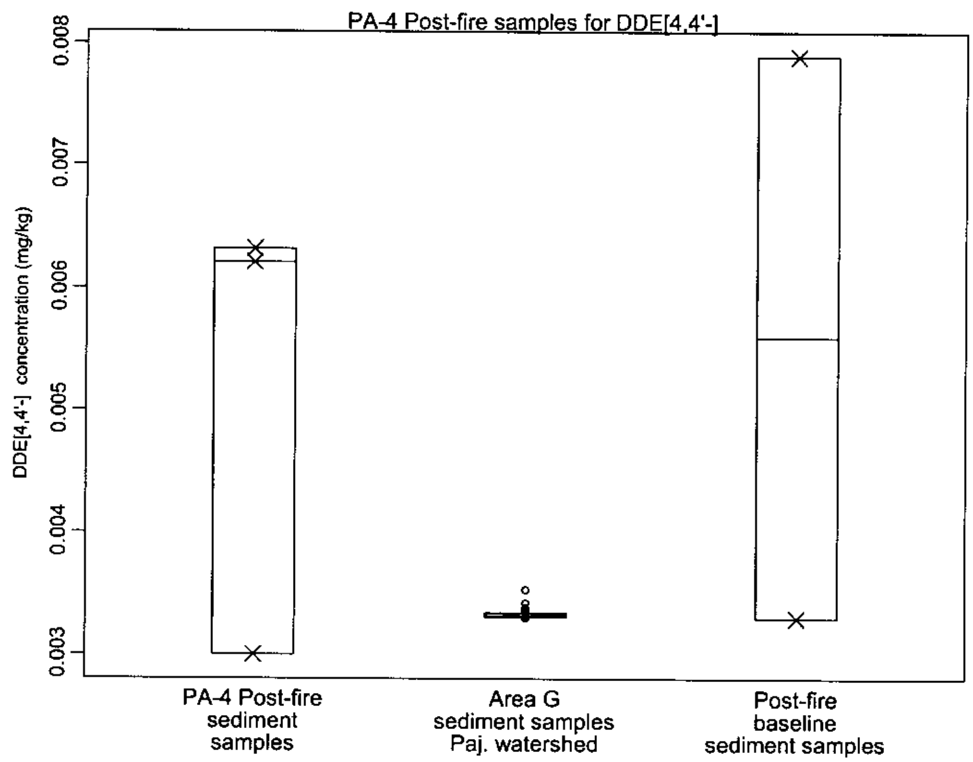
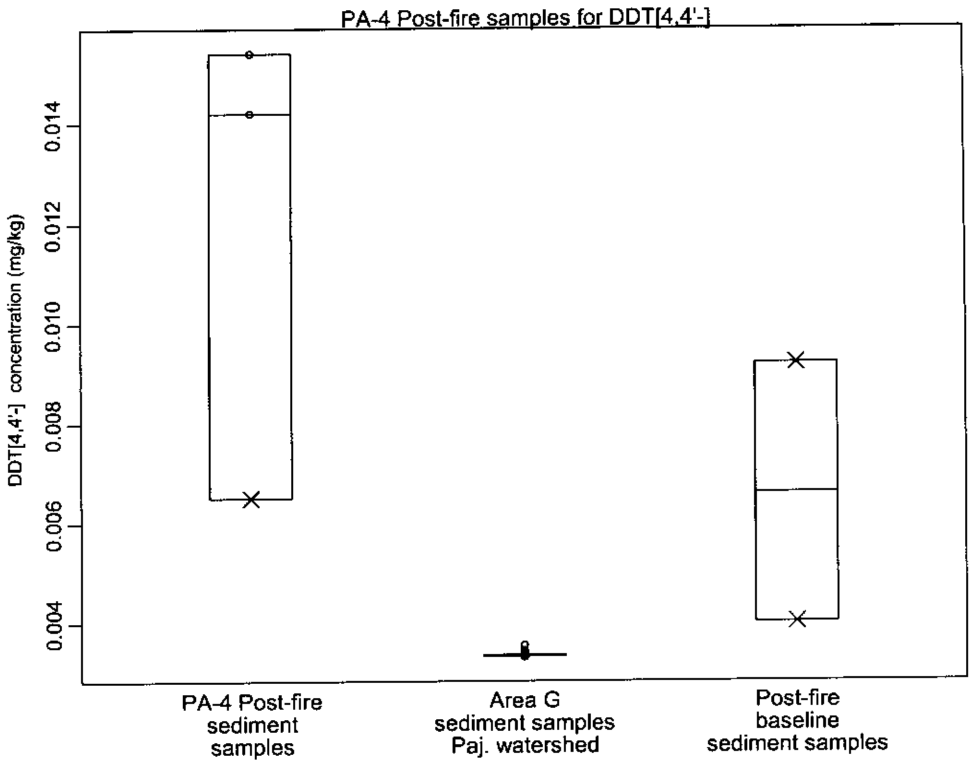


Figure K-4.5-1 (continued). Box plots for reach PA-4 COPCs in postfire sediment deposits compared to data from Area G sediment samples, local background samples, and the LANL sediment data set



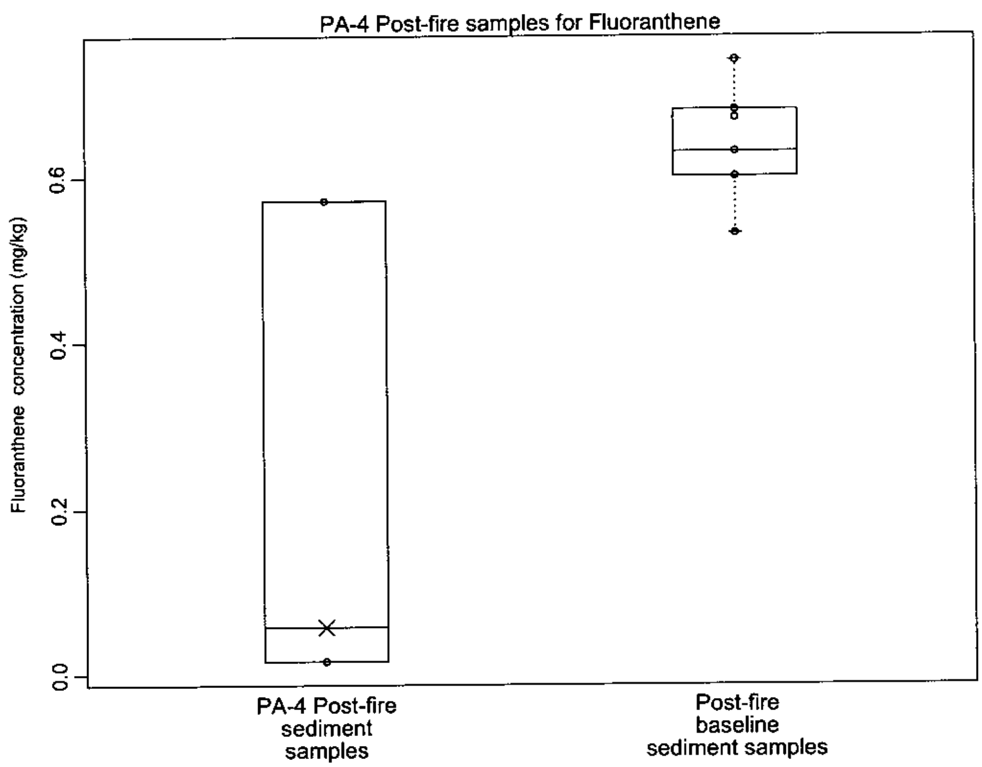
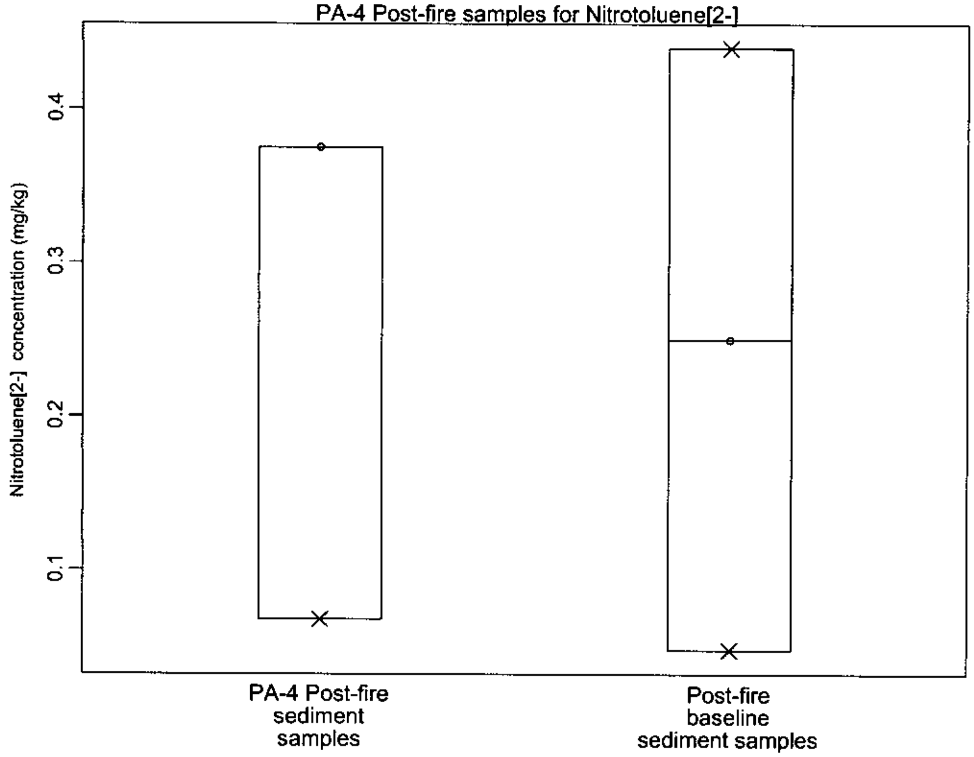


Figure K-4.5-1 (continued). Box plots for reach PA-4 COPCs in postfire sediment deposits compared to data from Area G sediment samples, local background samples, and the LANL sediment data set



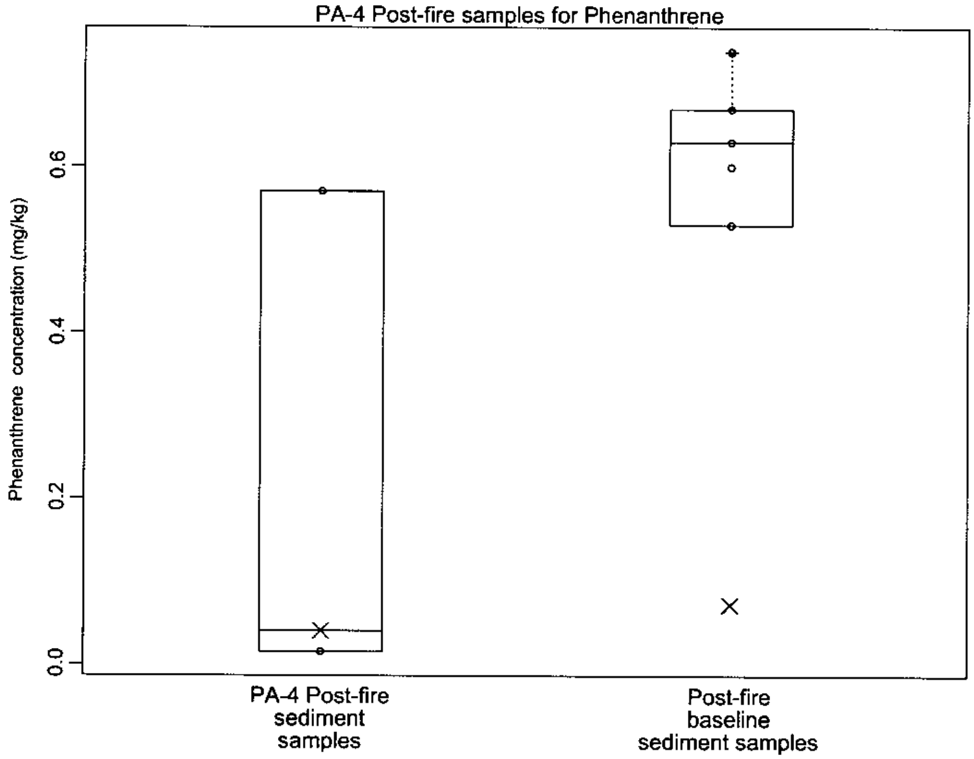
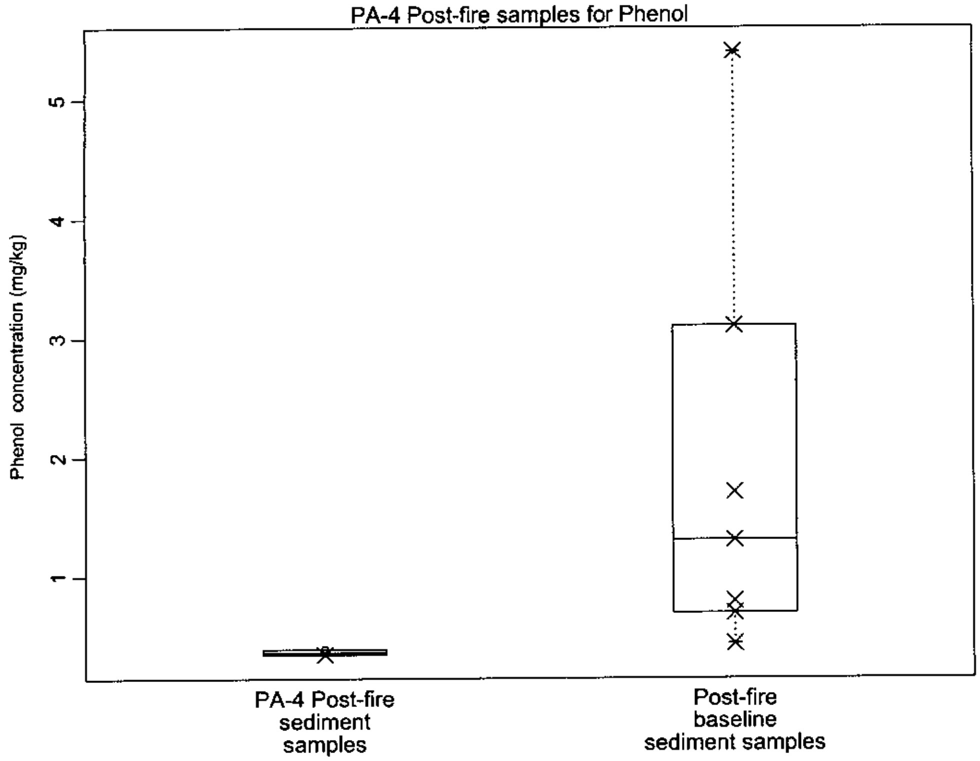


Figure K-4.5-1 (continued). Box plots for reach PA-4 COPCs in postfire sediment deposits compared to data from Area G sediment samples, local background samples, and the LANL sediment data set



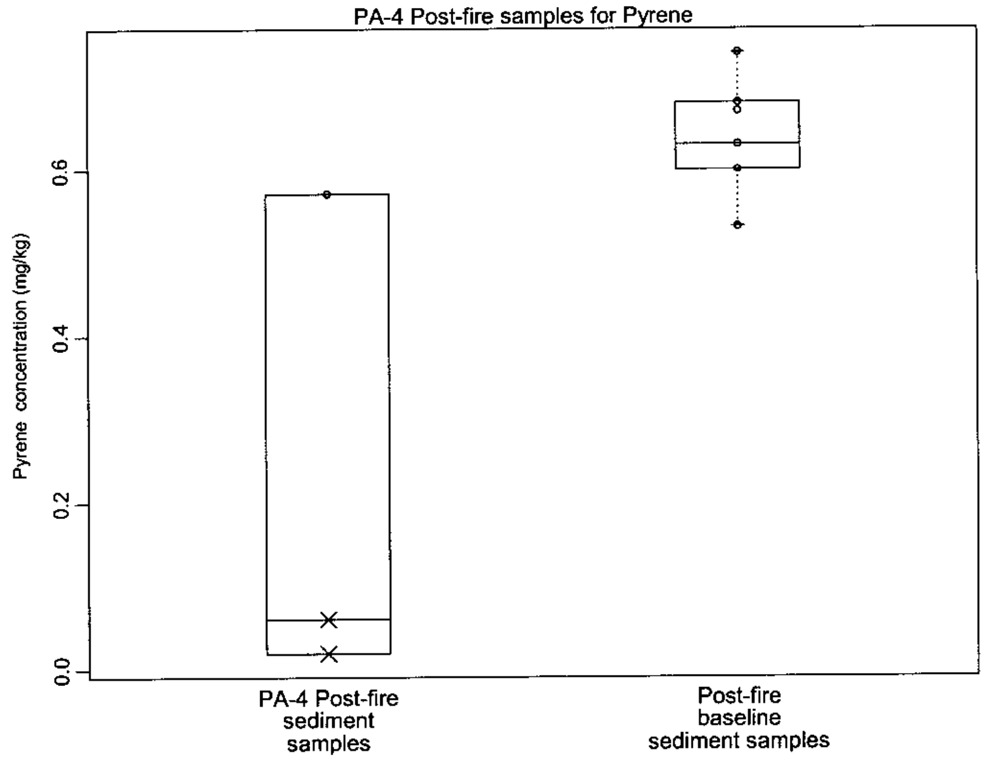
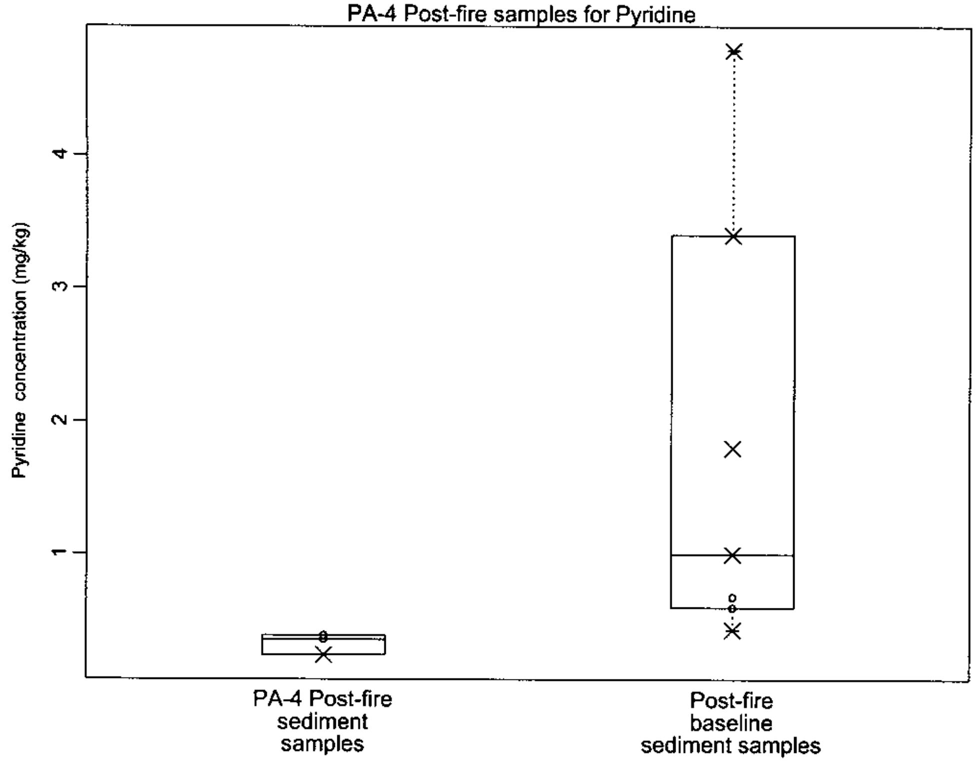


Figure K-4.5-1 (continued). **Box plots for reach PA-4 COPCs in postfire sediment deposits compared to data from Area G sediment samples, local background samples, and the LANL sediment data set**



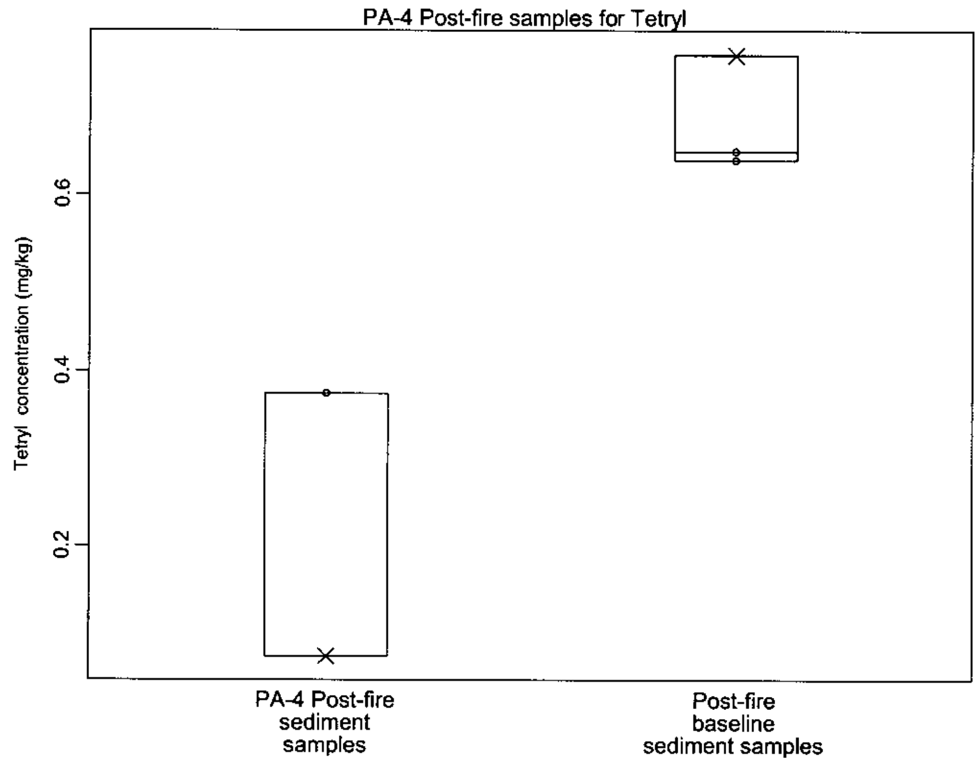


Figure K-4.5-1 (continued). Box plots for reach PA-4 COPCs in postfire sediment deposits compared to data from Area G sediment samples, local background samples, and the LANL sediment data set

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Table K-2.0-1
Inorganic Chemical Results from
MDA G Cañada del Buey Drainage Sediment Samples that are Above BVs

Location ID	Depth (cm)	Sample ID	Collection Date	Barium	Cadmium	Chromium	Cobalt	Iron	Magnesium	Selenium	Silver
LANL sediment BV				**127**	**0.4**	**10.5**	**4.73**	**13800**	**2370**	**0.3**	**1**
54-05078	0–8	AAB3172	7/6/94	—*	0.58 (U)	—	—	—	—	—	—
54-05080	0–10	AAB3177	7/6/94	—	0.81 (U)	—	—	—	—	—	—
54-05082	0–15	AAB3171	7/6/94	—	0.55 (U)	—	—	—	—	—	—
54-05086	0–15	AAB3155	7/6/94	—	0.58 (U)	—	—	—	—	—	—
54-05093	0–21	AAB3159	7/6/94	—	—	17.9 (J)	—	—	—	—	—
54-05094	0–15	AAB3161	7/6/94	—	0.61 (U)	—	—	—	—	—	—
54-05095	0–21	AAB3157	7/6/94	—	0.52 (U)	—	—	—	—	—	—
54-05096	0–15	AAB3164	7/6/94	—	0.88 (U)	—	—	—	—	—	—
54-05101	0–15	AAB3178	7/6/94	—	0.67 (U)	—	—	—	—	—	—
54-05102	0–13	AAB3168	7/6/94	—	0.55 (U)	—	—	—	—	—	—
54-05103	0–13	AAB3163	7/6/94	—	0.53 (U)	—	—	—	—	—	—
54-05104	0–13	AAB3169	7/6/94	—	0.52 (U)	—	—	—	—	—	—
54-05108	0–15	AAB3117	7/6/94	—	0.69 (U)	—	—	—	—	—	—
54-05110	0–12	AAB3127	7/6/94	—	0.63 (U)	—	—	—	—	—	—
54-05111	0–9	AAB3116	7/6/94	—	1.2	—	—	—	—	—	—
54-05113	0–15	AAB3167	7/6/94	—	0.55 (U)	—	—	—	—	—	—
54-05117	0–15	AAB3109	7/7/94	—	—	—	—	39000	—	0.6 (U)	2 (U)
54-05118	0–15	AAB3111	7/7/94	—	0.65 (U)	—	—	—	—	0.61 (U)	2 (U)
54-05122	0–15	AAB3112	7/7/94	144	0.65 (U)	—	5.1 (U)	—	—	0.62 (U)	2.1 (U)
54-05125	0–15	AAB3113	7/7/94	180	1 (U)	—	5.5 (U)	—	2660	0.64 (U)	2.1 (U)

Note: All values in mg/kg. See Appendix A for data qualifier definitions.

*— = Analysis not requested or the reported value was less than the BV (or result not detected if no BV available).

Table K-2.0-2
Radionuclide Results from
MDA G Cañada del Buey Drainage Sediment Samples that are Above BVs

Location ID	Depth (cm)	Sample ID	Collection Date	Americium-241	Cesium-137	Cobalt-60	Plutonium-238	Plutonium-239	Tritium
LANL sediment BV				**0.04**	**0.9**	**na[a,b]**	**0.006**	**0.068**	**0.093**
54-05080	0–10	AAB3177	7/6/94	—[c]	—	—	0.025	0.118	—
54-05082	0–15	AAB3171	7/6/94	—	1.24	0.23	—	0.073	—
54-05093	0–21	AAB3159	7/6/94	0.123	—	—	0.059	0.194	—
54-05094	0–15	AAB3161	7/6/94	—	—	—	0.02	—	—
54-05095	0–21	AAB3157	7/6/94	0.066	—	—	0.033	0.163	—
54-05096	0–15	AAB3164	7/6/94	0.145	—	—	0.176	0.423	—
54-05101	0–15	AAB3178	7/6/94	—	—	—	0.236	—	—
54-05102	0–13	AAB3168	7/6/94	—	—	—	0.242	—	—
54-05103	0–13	AAB3163	7/6/94	—	—	—	0.182	—	—
54-05104	0–13	AAB3169	7/6/94	0.055	—	—	1.483	0.171	—
54-05108	0–15	AAB3117	7/6/94	—	—	—	0.026	—	—
54-05110	0–12	AAB3127	7/6/94	—	—	—	0.073	0.087	—
54-05111	0–9	AAB3116	7/6/94	—	—	—	0.027	—	—
54-05113	0–15	AAB3167	7/6/94	—	1.12	—	0.044	0.089	—
54-05117	0–15	AAB3109	7/7/94	0.109	—	—	0.183	0.582	—
54-05118	0–15	AAB3111	7/7/94	0.056	—	—	0.011	—	—
54-05122	0–15	AAB3112	7/7/94	0.041	—	—	—	0.36	—
54-05125	0–15	AAB3113	7/7/94	0.105	1.3	—	—	—	0.107

Note: All values in pCi/g unless otherwise noted.

[a] For analytes without a BV, all detects are listed.

[b] na = Not available.

[c] — = Analysis not requested or the reported value was less than the BV (or result not detected if no BV available).

Table K-2.0-3
Detected Organic Chemical Results from MDA G Canada del Buey Drainage Sediment Samples

Location ID	Depth (cm)	Sample ID	Collection Date	Methoxychlor[4,4'-]
54-05122	0–15	AAB3112	7/7/1994	0.02
54-05103	0–13	AAB3163	7/6/1994	0.0589
54-05080	0–10	AAB3177	7/6/1994	0.0316
54-05078	0–8	AAB3172	7/6/1994	0.0325

Note: All values in mg/kg.

Table K-2.0-4
Inorganic Chemical Results from MDA G Pajarito Drainage Sediment Samples that are Above BVs

Location ID	Depth (cm)	Sample ID	Collection Date	Beryllium	Cadmium	Calcium	Selenium	Silver
LANL sediment BV				**1.31**	**0.4**	**4420**	**0.3**	**1**
54-05017	0–15	AAB3150	7/8/94	—*	0.61 (U)	—	—	—
54-05018	0–15	AAB3139	7/8/94	—	0.49 (U)	—	—	—
54-05019	0–15	AAB3190	7/7/94	—	—	—	0.6 (U)	2 (U)
54-05020	0–15	AAB3207	7/7/94	—	—	—	0.6 (U)	2 (U)
54-05022	0–15	AAB3187	7/7/94	—	0.46 (U)	—	0.6 (U)	2 (U)
54-05026	0–15	AAB3195	7/7/94	—	—	—	0.61 (U)	2 (U)
54-05029	0–15	AAB3120	7/8/94	—	0.63 (U)	—	—	1.5 (U)
54-05034	0–15	AAB3126	7/8/94	—	0.41 (U)	—	—	1.4 (U)
54-05035	0–25	AAB3194	7/7/94	—	—	6370	0.6 (U)	2 (U)
54-05037	0–25	AAB3208	7/7/94	—	0.41 (U)	—	0.61 (U)	2 (U)
54-05038	0–25	AAB3213	7/7/94	—	—	—	0.61 (U)	2 (U)
54-05042	0–25	AAB3204	7/7/94	71 (U)	—	—	0.6 (U)	2 (U)
54-05043	0–25	AAB3191	7/7/94	—	—	—	0.61 (U)	2 (U)
54-05045	0–25	AAB3196	7/7/94	—	—	—	0.6 (U)	2 (U)
54-05048	0–25	AAB3192	7/7/94	—	0.41 (U)	—	0.61 (U)	2 (U)
54-05050	0–15	AAB3132	7/7/94	—	0.56 (U)	—	0.6 (U)	2 (U)
54-05058	0–15	AAB3147	7/8/94	—	0.53 (U)	—	—	—
54-05061	0–15	AAB3128	7/7/94	—	—	—	0.6 (U)	2 (U)
54-05063	0–15	AAB3124	7/7/94	—	0.47 (U)	—	0.6 (U)	2 (U)
54-05066	0–15	AAB3121	7/7/94	—	0.57 (U)	—	0.61 (U)	2 (U)
54-05068	0–15	AAB3118	7/7/94	—	—	—	0.61 (U)	2 (U)
54-05069	0–15	AAB3107	7/7/94	—	—	—	0.6 (U)	2 (U)
54-05072	0–15	AAB3114	7/7/94	—	—	—	0.61 (U)	2 (U)
54-05074	0–21	AAB3108	7/7/94	—	0.48 (U)	—	0.61 (U)	2 (U)
54-05076	0–15	AAB3106	7/7/94	—	0.41 (U)	—	0.61 (U)	2 (U)

Note: All values in mg/kg. See Appendix A for data qualifier definitions.

*— = Analysis not requested or the reported value was less than the BV (or result not detected if no BV available).

Table K-2.0-5
Radionuclide Results from MDA G Pajarito Drainage Sediment Samples that are Above BVs

Location ID	Depth (cm)	Sample ID	Collection Date	Americium-241	Cesium-137	Cobalt-60	Plutonium-238	Plutonium-239	Tritium
LANL sediment BV				**0.04**	**0.9**	na[a,b]	**0.006**	**0.068**	**0.093**
54-05016	0–15	AAB3160	7/8/94	—[c]	—	—	0.014	—	—
54-05018	0–15	AAB3139	7/8/94	—	0.99	—	—	—	—
54-05020	0–15	AAB3207	7/7/94	—	—	0.39	0.01	—	—
54-05022	0–15	AAB3187	7/7/94	—	—	0.34	—	—	—
54-05026	0–15	AAB3195	7/7/94	—	—	—	0.044	0.489	—
54-05027	0–15	AAB3122	7/8/94	—	—	—	0.037	—	—
54-05029	0–15	AAB3120	7/8/94	0.059	—	—	0.082	—	0.140
54-05031	0–15	AAB3123	7/8/94	—	—	—	0.019	—	—
54-05034	0–15	AAB3126	7/8/94	—	—	—	0.046	—	—
54-05035	0–25	AAB3194	7/7/94	—	—	—	0.015	0.103	—
54-05037	0–25	AAB3208	7/7/94	—	—	—	0.013	—	0.490
54-05038	0–25	AAB3213	7/7/94	—	—	—	0.009	—	—
54-05042	0–25	AAB3204	7/7/94	—	—	—	—	—	0.330
54-05043	0–25	AAB3191	7/7/94	—	—	—	0.576	0.476	0.104
54-05045	0–25	AAB3196	7/7/94	—	—	—	—	—	0.114
54-05048	0–25	AAB3192	7/7/94	—	—	—	—	—	0.102
54-05050	0–15	AAB3132	7/7/94	—	—	—	—	—	—
54-05053	0–15	AAB3173	7/8/94	—	—	—	0.01	0.076	—
54-05058	0–15	AAB3147	7/8/94	—	—	—	0.011	—	—
54-05060	0–15	AAB3180	7/8/94	—	—	—	0.009	—	—
54-05061	0–15	AAB3128	7/7/94	—	—	—	0.04	0.555	—
54-05066	0–15	AAB3121	7/7/94	—	—	—	0.238	0.252	—
54-05068	0–15	AAB3118	7/7/94	—	—	—	0.016	—	—
54-05069	0–15	AAB3107	7/7/94	—	—	—	0.014	0.121	—
54-05072	0–15	AAB3114	7/7/94	0.093	—	—	0.012	—	—
54-05074	0–21	AAB3108	7/7/94	0.158	—	—	0.095	0.858	—
54-05076	0–15	AAB3106	7/7/94	0.146	—	—	0.066	0.909	—

Note: All values in pCi/g.

[a] For analytes without a BV, all detects are listed.

[b] na = Not available.

[c] — = Analysis not requested or the reported value was less than the BV (or result not detected if no BV available).

Table K-2.0-6
Detected Organic Chemical Results from
MDA G Pajarito Drainage Sediment Samples

Location ID	Depth (cm)	Sample ID	Collection Date	Methoxychlor[4,4'-]
54-05018	0–15	AAB3139	7/8/94	0.0325
54-05029	0–15	AAB3120	7/8/94	0.0273
54-05055	0–25	AAB3133	7/8/94	0.0185
54-05060	0–15	AAB3180	7/8/94	0.0422
54-05035	0–25	AAB3194	7/7/94	0.0281
'54-05037	0–25	AAB3208	7/7/94	0.0246
'54-05068	0–15	AAB3118	7/7/94	0.0208
54-05048	0–25	AAB3192	7/7/94	0.0176
54-05026	0–15	AAB3195	7/7/94	0.0283

Note: All values in mg/kg.

Table K-4.3-1
Reach CDB-3E Sediment Samples Taken

Part 1

Location ID	Depth (cm)	Sample ID	Geomorphic Unit	Facies	Collection Date	Americium-241	Anion*	Cyanide	Gamma Spec	Tritium	High Explosives	Isotopic Plutonium	Isotopic Thorium
CB-22872	5–16	CACB-04-53722	f1	fine	9/1/04	2249S	2247S	2247S	2249S	2249S	2246S	2249S	2249S
CB-22873	4–18	CACB-04-53723	c2	fine	9/1/04	2249S	2247S	2247S	2249S	2249S	2246S	2249S	2249S
CB-22873	21–40	CACB-04-53724	c2	fine	9/1/04	2249S	2247S	2247S	2249S	2249S	2246S	2249S	2249S
CB-22875	0–9	CACB-04-53725	f1	fine	9/1/04	2249S	2247S	2247S	2249S	2249S	2246S	2249S	2249S
CB-22876	0–15	CACB-04-53726	c1	fine	9/1/04	2249S	2247S	2247S	2249S	2249S	2246S	2249S	2249S
CB-22877	0–20	CACB-04-53727	c2	fine	9/1/04	2249S	2247S	2247S	2249S	2249S	2246S	2249S	2249S
CB-22878	0–16	CACB-04-53728	f1	fine	9/1/04	2249S	2247S	2247S	2249S	2249S	2246S	2249S	2249S
CB-22879	0–28	CACB-04-53729	f1	fine	9/1/04	2249S	2247S	2247S	2249S	2249S	2246S	2249S	2249S
CB-22880	14–42	CACB-04-53730	c2	coarse	9/1/04	2249S	2247S	2247S	2249S	2249S	2246S	2249S	2249S
CB-22881	0–40	CACB-04-53731	c1	coarse	9/1/04	2249S	2247S	2247S	2249S	2249S	2246S	2249S	2249S

Part 2

Location ID	Depth (cm)	Sample ID	Geomorphic Unit	Facies	Collection Date	Isotopic Uranium	Metals	PAH	PCB	Perchlorate	Pesticides	Strontium-90	SVOC
CB-22872	5–16	CACB-04-53722	f1	fine	9/1/04	2249S	2247S	2246S	2246S	2247S	2246S	2249S	2246S
CB-22873	4–18	CACB-04-53723	c2	fine	9/1/04	2249S	2247S	2246S	2246S	2247S	2246S	2249S	2246S
CB-22873	21–40	CACB-04-53724	c2	fine	9/1/04	2249S	2247S	2246S	2246S	2247S	2246S	2249S	2246S
CB-22875	0–9	CACB-04-53725	f1	fine	9/1/04	2249S	2247S	2246S	2246S	2247S	2246S	2249S	2246S
CB-22876	0–15	CACB-04-53726	c1	fine	9/1/04	2249S	2247S	2246S	2246S	2247S	2246S	2249S	2246S
CB-22877	0–20	CACB-04-53727	c2	fine	9/1/04	2249S	2247S	2246S	2246S	2247S	2246S	2249S	2246S
CB-22878	0–16	CACB-04-53728	f1	fine	9/1/04	2249S	2247S	2246S	2246S	2247S	2246S	2249S	2246S
CB-22879	0–28	CACB-04-53729	f1	fine	9/1/04	2249S	2247S	2246S	2246S	2247S	2246S	2249S	2246S
CB-22880	14–42	CACB-04-53730	c2	coarse	9/1/04	2249S	2247S	2246S	2246S	2247S	2246S	2249S	2246S
CB-22881	0–40	CACB-04-53731	c1	coarse	9/1/04	2249S	2247S	2246S	2246S	2247S	2246S	2249S	2246S

Note: Request numbers are shown for each analyte suite.

*The anion analytical suite includes nitrate analysis.

Table K-4.3-2
Inorganic Chemical Results from Reach CDB-3E Sediment Samples that are Above BVs

Location ID	Depth (cm)	Sample ID	Geomorphic Unit	Facies	Collection Date	Aluminum	Arsenic	Barium	Cadmium	Chromium	Cobalt	Copper	Fluoride	Iron
LANL sediment BV						**15400**	**3.98**	**127**	**0.4**	**10.5**	**4.73**	**11.2**	**na[a,b]**	**13800**
CB-22872	5–16	CACB-04-53722	f1	fine	9/1/2004	—[c]	—	—	—	—	—	—	0.743 (J)	—
CB-22873	4–18	CACB-04-53723	c2	fine	9/1/2004	—	—	—	—	—	—	—	0.86 (J)	—
CB-22873	21–40	CACB-04-53724	c2	fine	9/1/2004	25000	5.71	245	—	17.2	8.73	14.7	1.93	23800
CB-22875	0–9	CACB-04-53725	f1	fine	9/1/2004	15600	—	132	—	—	—	—	0.954 (J)	—
CB-22876	0–15	CACB-04-53726	c1	fine	9/1/2004	16000	—	140	0.526 (U)	—	—	—	0.803 (J)	—
CB-22877	0–20	CACB-04-53727	c2	fine	9/1/2004	—	—	136	—	—	—	—	1.11	—
CB-22878	0–16	CACB-04-53728	f1	fine	9/1/2004	—	—	—	—	—	—	—	0.887 (J)	—
CB-22879	0–28	CACB-04-53729	f1	fine	9/1/2004	—	—	—	—	—	—	—	1.18	—
CB-22880	14–42	CACB-04-53730	c2	coarse	9/1/2004	—	—	—	0.499 (U)	—	—	—	0.855 (J)	—
CB-22881	0–40	CACB-04-53731	c1	coarse	9/1/2004	—	—	—	—	—	—	—	—	—

Table K-4.3-2 (continued)

Location ID	Depth (cm)	Sample ID	Geomorphic Unit	Facies	Collection Date	Lead	Magnesium	Manganese	Nitrate	Perchlorate	Potassium	Selenium	Vanadium	Zinc
LANL sediment BV						**19.7**	**2370**	**543**	**na**	**na**	**2690**	**0.3**	**19.7**	**60.2**
CB-22872	5–16	CACB-04-53722	f1	fine	9/1/2004	—	—	—	1.35 (J-)	—	—	0.678 (J)	—	—
CB-22873	4–18	CACB-04-53723	c2	fine	9/1/2004	—	—	—	5.59 (J-)	—	—	0.716 (J)	—	—
CB-22873	21–40	CACB-04-53724	c2	fine	9/1/2004	23.1	4370 (J+)	732	0.466 (J-)	—	4420 (J+)	0.515 (J)	35	76.5
CB-22875	0–9	CACB-04-53725	f1	fine	9/1/2004	—	2450 (J+)	—	2.36 (J-)	—	—	1.51 (J)	—	—
CB-22876	0–15	CACB-04-53726	c1	fine	9/1/2004	—	2650 (J+)	—	3.45 (J-)	—	2710 (J+)	0.537 (J)	—	—
CB-22877	0–20	CACB-04-53727	c2	fine	9/1/2004	—	2400 (J+)	—	1.05 (J-)	—	—	0.328 (J)	—	—
CB-22878	0–16	CACB-04-53728	f1	fine	9/1/2004	—	—	—	0.741 (J-)	—	—	0.52 (UJ)	—	—
CB-22879	0–28	CACB-04-53729	f1	fine	9/1/2004	—	—	—	1.23 (J-)	—	—	0.525 (UJ)	—	—
CB-22880	14–42	CACB-04-53730	c2	coarse	9/1/2004	—	—	—	—	—	—	0.439 (J)	—	—
CB-22881	0–40	CACB-04-53731	c1	coarse	9/1/2004	—	—	—	—	0.0151 (J)	—	0.502 (UJ)	—	—

Note: All values in pCi/g. See Appendix A for data qualifier definitions.

[a] If no BV exists, all detects are listed.

[b] na = Not available.

[c] — = Analysis not requested or the reported value was less than the BV (or result not detected if no BV available).

Table K-4.3-3
Statistical Tests for Reach CDB-3E Sediment Data and LANL Background Sediment Data for Inorganic Chemicals

Analyte	Gehan p-value	Quantile p-value	Slippage p-value	Number of Reach Sample Results	Number of LANL Background Sample Results	Maximum Reach Concentration (mg/kg)	Maximum LANL Sediment Background Concentration (mg/kg)
Aluminum	0.004	0.012	0.004	10	25	25000	13300
Arsenic	0.035	0.082	0.244	10	31	5.71	3.6
Barium	0.006	0.001	0.002	10	31	245	127
Cadmium	0.954	0.685	0.080	10	24	0.526[a]	0.2
Chromium	0.027	0.082	0.002	10	31	17.2	9.2
Cobalt	0.010	0.013	0.011	10	31	8.73	4.2
Copper	0.007	0.001	0.244	10	31	14.7	12
Iron	0.009	0.013	0.055	10	31	23800	13000
Lead	0.140	0.642	>0.999	10	31	23.1	25.6
Magnesium	0.007	0.001	0.002	10	31	4370	2370
Manganese	0.162	0.642	0.244	10	31	732	517
Potassium	0.017	0.082	0.055	10	31	4420	2600
Selenium	<0.001	<0.001	n/a[b]	10	24	1.51	0.2[a]
Vanadium	0.014	0.001	0.244	10	31	35	20
Zinc	0.147	0.642	0.244	10	31	76.5	56.2

Note: Analytes with at least one p-value less than 0.05 are bolded.

[a] Maximum value reported is a detection limit.

[b] n/a = Not applicable.

Table K-4.3-4
Statistical Tests for Reach CDB-3E Sediment Data and Local Background Data for Inorganic Chemicals

Analyte	Gehan p-value	Quantile p-value	Slippage p-value	Number of Reach Sample Results	Number of Local Background Sample Results	Maximum Reach Concentration (mg/kg)	Maximum Local Sediment Background Concentration (mg/kg)
Aluminum	0.007	0.029	<0.001	10	12	25000	8600
Barium	0.724	0.932	0.455	10	12	245	150
Chromium	0.358	0.226	0.195	10	12	17.2	10
Cobalt	0.970	0.932	>0.999	10	12	8.73	9.3
Copper	0.287	0.932	0.455	10	12	14.7	11
Iron	0.795	0.932	0.455	10	12	23800	17000
Magnesium	0.224	0.029	0.029	10	12	4370	2100
Potassium	0.009	0.029	<0.001	10	12	4420	1500
Selenium	0.950	0.932	0.455	10	12	1.51	1.2
Vanadium	0.901	0.932	0.455	10	12	35	29

Note: Analytes with at least one p-value less than 0.05 are bolded.

Table K-4.3-5
Detected Organic Chemical Results from Reach CDB-3E Sediment Samples

Location ID	Depth (cm)	Sample ID	Geomorphic Unit	Facies	Collection Date	Aroclor-1254	Aroclor-1260	Bis(2-ethylhexyl)phthalate	Di-n-butylphthalate	Pyrene
CB-22872	5–16	CACB-04-53722	f1	fine	9/1/2004	—*	—	0.0317 (J)	—	—
CB-22873	21–40	CACB-04-53724	c2	fine	9/1/2004	0.0018 (J)	—	—	—	—
CB-22878	0–16	CACB-04-53728	f1	fine	9/1/2004	—	—	—	—	0.0106
CB-22880	14–42	CACB-04-53730	c2	coarse	9/1/2004	0.0186	0.0069 (J)	—	—	—
CB-22881	0–40	CACB-04-53731	c1	coarse	9/1/2004	—	—	—	0.0263 (J)	—

Note: All values in mg/kg. See Appendix A for data qualifier definitions.

*— = Analysis not requested or the reported value was less than the BV (or result not detected if no BV available).

Table K-4.3-6
Radionuclide Results from Reach CDB-3E Sediment Samples that are Above BVs

Location ID	Depth (cm)	Sample ID	Geomorphic Unit	Facies	Collection Date	Americium-241	Plutonium-238	Plutonium-239
LANL sediment BV						**0.04**	**0.006**	**0.068**
CB-22873	4–18	CACB-04-53723	c2	fine	9/1/2004	—*	0.0253	—
CB-22873	21–40	CACB-04-53724	c2	fine	9/1/2004	—	0.0313	—
CB-22875	0–9	CACB-04-53725	f1	fine	9/1/2004	0.0482	0.0412	—
CB-22876	0–15	CACB-04-53726	c1	fine	9/1/2004	—	0.0628	0.0767
CB-22877	0–20	CACB-04-53727	c2	fine	9/1/2004	—	0.0462	—

Note: All values in pCi/g.
*— = Analysis not requested or the reported value was less than the BV (or result not detected if no BV available).

Table K-4.3-7
Statistical Tests for Reach CDB-3E Sediment Data and LANL Background Sediment Data for Radionuclides

Analyte	Wilcoxon p-value	Quantile p-value	Slippage p-value	Number of Reach Sample Results	Number of LANL Background Sample Results	Maximum Reach Concentration (pCi/g)	Maximum LANL Sediment Background Concentration (pCi/g)
Americium-241	0.652	0.605	0.085	10	23	0.0482	0.038
Plutonium-238	0.006	0.000	0.000	10	24	0.0628	0.006
Plutonium-239	0.189	0.053	0.303	10	23	0.0767	0.065

Note: Analytes with at least one p-value less than 0.05 are bolded.

Table K-4.3-8
Statistical Tests for Reach CDB-3E Sediment Data and Local Background Sediment Data for Radionuclides

Analyte	Wilcoxon p-value	Quantile p-value	Slippage p-value	Number of Reach Sample Results	Number of Local Background Sample Results	Maximum Reach Concentration (pCi/g)	Maximum Local Sediment Background Concentration (pCi/g)
Plutonium-238	0.022	0.214	0.010	10	6	0.0628	0.0081

Note: Analytes with at least one p-value less than 0.05 are bolded.

Table K-4.3-9
COPC Summary Table for Reach CDB-3E

Analyte Category	Analyte Name	Maximum Detected Sample Result	Units	Number of Detects/ Number of Samples	Background Test Results
Inorganic Chemicals	Aluminum	25000	mg/kg	10/10	>LANL and >local
	Arsenic	5.71	mg/kg	10/10	Not different
	Barium	245	mg/kg	10/10	>LANL, not different from local
	Cadmium	0.127	mg/kg	8/10	Not different
	Chromium	17.2	mg/kg	10/10	>LANL, not different from local
	Cobalt	8.73	mg/kg	10/10	>LANL, not different from local
	Copper	14.7	mg/kg	10/10	>LANL, not different from local
	Iron	23800	mg/kg	10/10	>LANL, not different from local
	Lead	23.1	mg/kg	10/10	Not different
	Magnesium	4370	mg/kg	10/10	>LANL and >local
	Manganese	732	mg/kg	10/10	Not different
	Potassium	4420	mg/kg	10/10	>LANL and >local
	Selenium	1.51	mg/kg	7/10	>LANL, not different from local
	Vanadium	35	mg/kg	10/10	>LANL, not different from local
	Zinc	76.5	mg/kg	10/10	Not different
	Fluoride	1.93	mg/kg	9/10	Not applicable
	Nitrate	5.59	mg/kg	8/8	Not applicable
	Perchlorate	0.0151	mg/kg	1/10	Not applicable
Radionuclides	Americium-241	0.0482	pCi/g	3/10	Not different
	Plutonium-238	0.0628	pCi/g	5/10	>LANL and >local
	Plutonium-239	0.0767	pCi/g	6/10	Not different
Organic Chemicals	Aroclor-1254	0.0186	mg/kg	2/10	Not applicable
	Aroclor-1260	0.0069	mg/kg	1/10	Not applicable
	Bis(2-ethylhexyl)phthalate	0.0317	mg/kg	1/10	Not applicable
	Di-n-butylphthalate	0.0263	mg/kg	1/10	Not applicable
	Pyrene	0.0106	mg/kg	1/10	Not applicable

Table K-4.4-1
Reach PA-4 Prefire Sediment Samples Taken

Location ID	Depth (cm)	Sample ID	Geomorphic Unit	Facies	Collection Date	Americium-241	Anion	Cyanide	Gamma Spec	Tritium	High Explosives	Isotopic Plutonium	Isotopic Thorium
PA-22882	9–39	CAPA-04-53801	c2	coarse	9/15/2004	2330S	2328S	2328S	2330S	2330S	2327S	2330S	2330S
PA-22884	14–24	CAPA-04-53803	c1w	fine	9/15/2004	2330S	2328S	2328S	2330S	2330S	2327S	2330S	2330S
PA-22884	24–32	CAPA-04-53804	c1w	coarse	9/15/2004	2330S	2328S	2328S	2330S	2330S	2327S	2330S	2330S
PA-22884	32–56	CAPA-04-53805	c1w	fine	9/15/2004	2330S	2328S	2328S	2330S	2330S	2327S	2330S	2330S
PA-22887	2–19	CAPA-04-53806	c1w	fine	9/15/2004	2330S	2328S	2328S	2330S	2330S	2327S	2330S	2330S
PA-22887	19–27	CAPA-04-53807	c1w	fine	9/15/2004	2330S	2328S	2328S	2330S	2330S	2327S	2330S	2330S
18-10096	0–9	CA18-00-0033	c1 willow	fine	7/5/00	7038R	—[a]	7037R	7038R	—	7036R	7038R	—
18-10097	1–15	CA18-00-0034	c1	fine	7/5/00	7038R	—	7037R	7038R	—	7036R	7038R	—
18-10098	8–20	CA18-00-0035	c2	fine	7/5/00	7038R	—	7037R	7038R	—	7036R	7038R	—
PA-22889	4–18	CAPA-04-53808	c2	fine	9/15/2004	2330S	2328S	2328S	2330S	2330S	2327S	2330S	2330S
PA-22890	26–35	CAPA-04-53810	c1 pool	fine	9/15/2004	2330S	2328S	2328S	2330S	2330S	2327S	2330S	2330S
18-10099	0–36	CA18-00-0036	c1 willow? [b]	fine	7/5/00	7038R	—	7037R	7038R	—	7036R	7038R	—
18-10100	4–21	CA18-00-0037	c1 willow? [b]	fine	7/5/00	7038R	—	7037R	7038R	—	7036R	7038R	—
18-10100	30–63	CA18-00-0038	c1 willow? [b]	fine	7/5/00	7038R	—	7037R	7038R	—	7036R	7038R	—
18-10101	5–32	CA18-00-0039	c2? *	fine	7/5/00	7038R	—	7037R	7038R	—	7036R	7038R	—

Table K-4.4-1 (continued)

Location ID	Depth (cm)	Sample ID	Geomorphic Unit	Facies	Collection Date	Isotopic Uranium	Metals	PAH	PCB	Pesticides	Strontium-90	SVOC
PA-22882	9–39	CAPA-04-53801	c2	coarse	9/15/2004	2330S	2328S	2327S	2327S	2327S	2330S	2327S
PA-22884	14–24	CAPA-04-53803	c1w	fine	9/15/2004	2330S	2328S	2327S	2327S	2327S	2330S	2327S
PA-22884	24–32	CAPA-04-53804	c1w	coarse	9/15/2004	2330S	2328S	2327S	2327S	2327S	2330S	2327S
PA-22884	32–56	CAPA-04-53805	c1w	fine	9/15/2004	2330S	2328S	2327S	2327S	2327S	2330S	2327S
PA-22887	2–19	CAPA-04-53806	c1w	fine	9/15/2004	2330S	2328S	2327S	2327S	2327S	2330S	2327S
PA-22887	19–27	CAPA-04-53807	c1w	fine	9/15/2004	2330S	2328S	2327S	2327S	2327S	2330S	2327S
18-10096	0–9	CA18-00-0033	c1 willow	fine	7/5/00	7038R	7037R	—	7035R	7035R	—	7035R
18-10097	1–15	CA18-00-0034	c1	fine	7/5/00	7038R	7037R	—	7035R	7035R	—	7035R
18-10098	8–20	CA18-00-0035	c2	fine	7/5/00	7038R	7037R	—	7035R	7035R	—	7035R
PA-22889	4–18	CAPA-04-53808	c2	fine	9/15/2004	2330S	2328S	2327S	2327S	2327S	2330S	2327S
PA-22890	26–35	CAPA-04-53810	c1 pool	fine	9/15/2004	2330S	2328S	2327S	2327S	2327S	2330S	2327S
18-10099	0–36	CA18-00-0036	c1 willow? [b]	fine	7/5/00	7038R	7037R	—	7035R	7035R	—	7035R
18-10100	4–21	CA18-00-0037	c1 willow? [b]	fine	7/5/00	7038R	7037R	—	7035R	7035R	—	7035R
18-10100	30–63	CA18-00-0038	c1 willow? [b]	fine	7/5/00	7038R	7037R	—	7035R	7035R	—	7035R
18-10101	5–32	CA18-00-0039	c2? *	fine	7/5/00	7038R	7037R	—	7035R	7035R	—	7035R

Note: Request numbers are shown for each analyte suite.

[a] — = Analysis not requested for this suite.

[b] Area not mapped, and geomorphic unit inferred from field descriptions.

Table K-4.4-2
Inorganic Chemical Results from Reach PA-4 Prefire Sediment Samples that are Above BVs

Location ID	Depth (cm)	Sample ID	Geomorphic Unit	Facies	Collection Date	Aluminum	Antimony	Arsenic	Barium	Beryllium	Cadmium	Calcium	Chromium
LANL sediment BV						**15400**	**0.83**	**3.98**	**127**	**1.31**	**0.4**	**4420**	**10.5**
PA-22882	9–39	CAPA-04-53801	c2	coarse	9/15/04	—[a]	—	—	—	—	0.507 (U)	—	—
PA-22884	14–24	CAPA-04-53803	c1w	fine	9/15/04	16400	—	—	154	—	0.469 (U)	—	11.6 (J)
PA-22884	24–32	CAPA-04-53804	c1w	coarse	9/15/04	—	—	—	—	—	—	—	—
PA-22884	32–56	CAPA-04-53805	c1w	fine	9/15/04	—	—	—	—	—	—	—	—
PA-22887	2–19	CAPA-04-53806	c1w	fine	9/15/04	—	—	—	—	—	—	—	—
PA-22887	19–27	CAPA-04-53807	c1w	fine	9/15/04	—	—	—	—	—	—	—	—
18-10096	0–9	CA18-00-0033	c1 willow	fine	7/5/00	—	—	—	230	1.5	—	—	—
18-10097	1–15	CA18-00-0034	c1	fine	7/5/00	—	0.95 (J-)	5	260	1.5	—	—	—
18-10098	8–20	CA18-00-0035	c2	fine	7/5/00	—	—	—	—	—	—	—	—
PA-22889	4–18	CAPA-04-53808	c2	fine	9/15/04	—	—	—	—	—	—	—	—
PA-22890	26–35	CAPA-04-53810	c1 pool	fine	9/15/04	25400	—	—	164	1.51 (J)	—	4620	15.4 (J)
18-10099	0–36	CA18-00-0036	c1 willow? [b]	fine	7/5/00	—	—	—	—	—	—	—	—
18-10100	4–21	CA18-00-0037	c1 willow? [b]	fine	7/5/00	—	—	—	—	—	—	—	—
18-10100	30–63	CA18-00-0038	c1 willow? [b]	fine	7/5/00	—	—	—	—	—	—	—	—
18-10101	5–32	CA18-00-0039	c2? **	fine	7/5/00	—	—	—	—	—	—	—	—

Table K-4.4-2 (continued)

Location ID	Depth (cm)	Sample ID	Geomorphic Unit	Facies	Collection Date	Cobalt	Copper	Cyanide (Total)	Iron	Lead	Magnesium	Manganese	Nickel
LANL sediment BV						**4.73**	**11.2**	**0.82**	**13800**	**19.7**	**2370**	**543**	**9.38**
PA-22882	9–39	CAPA-04-53801	c2	coarse	9/15/04	—	—	—	14600	—	—	—	—
PA-22884	14–24	CAPA-04-53803	c1w	fine	9/15/04	—	12.6 (J)	—	—	21.7 (J)	2450	—	—
PA-22884	24–32	CAPA-04-53804	c1w	coarse	9/15/04	—	—	—	—	—	—	—	—
PA-22884	32–56	CAPA-04-53805	c1w	fine	9/15/04	—	—	—	—	—	—	—	—
PA-22887	2–19	CAPA-04-53806	c1w	fine	9/15/04	—	—	—	—	—	—	—	—
PA-22887	19–27	CAPA-04-53807	c1w	fine	9/15/04	—	—	—	—	—	—	—	—
18-10096	0–9	CA18-00-0033	c1 willow	fine	7/5/00	7.3	14	—	15000	20	2800 (J—)	1200	13
18-10097	1–15	CA18-00-0034	c1	fine	7/5/00	10	13	—	20000	23	2600 (J—)	1300	12
18-10098	8–20	CA18-00-0035	c2	fine	7/5/00	—	—	—	—	—	—	—	—
PA-22889	4–18	CAPA-04-53808	c2	fine	9/15/04	—	—	0.831	19400	—	—	650	—
PA-22890	26–35	CAPA-04-53810	c1 pool	fine	9/15/04	4.88 (J)	13.6 (J)	—	20100	—	3840	—	10.9 (J)
18-10099	0–36	CA18-00-0036	c1 willow? [b]	fine	7/5/00	—	—	—	—	—	—	—	—
18-10100	4–21	CA18-00-0037	c1 willow? [b]	fine	7/5/00	—	—	—	—	—	—	—	—
18-10100	30–63	CA18-00-0038	c1 willow? [b]	fine	7/5/00	—	—	—	—	—	—	—	—
18-10101	5–32	CA18-00-0039	c2? **	fine	7/5/00	—	—	—	—	—	—	—	—

Table K-4.4-2 (continued)

Location ID	Depth (cm)	Sample ID	Geomorphic Unit	Facies	Collection Date	Nitrate	Potassium	Selenium	Silver	Thallium	Vanadium	Zinc
LANL sediment BV						**na**[c]	**2690**	**0.3**	**1**	**0.73**	**19.7**	**60.2**
PA-22882	9–39	CAPA-04-53801	c2	coarse	9/15/04	0.629 (J-)	—	0.934 (J)	—	—	—	72.7
PA-22884	14–24	CAPA-04-53803	c1w	fine	9/15/04	—	—	0.565 (J)	1.7 (J)	—	22.3 (J)	—
PA-22884	24–32	CAPA-04-53804	c1w	coarse	9/15/04	—	—	0.497 (U)	—	—	—	—
PA-22884	32–56	CAPA-04-53805	c1w	fine	9/15/04	—	—	0.334 (J)	—	—	—	—
PA-22887	2–19	CAPA-04-53806	c1w	fine	9/15/04	0.559 (J-)	—	0.503 (U)	—	—	—	—
PA-22887	19–27	CAPA-04-53807	c1w	fine	9/15/04	0.4 (J-)	—	0.345 (J)	—	—	20.5 (J)	—
18-10096	0–9	CA18-00-0033	c1 willow	fine	7/5/00	—	—	0.9	—	0.97 (U)	23	—
18-10097	1–15	CA18-00-0034	c1	fine	7/5/00	—	—	1.3	—	—	23	—
18-10098	8–20	CA18-00-0035	c2	fine	7/5/00	—	—	0.36 (U)	—	—	—	—
PA-22889	4–18	CAPA-04-53808	c2	fine	9/15/04	—	—	0.542 (J)	—	—	19.9 (J)	82.9
PA-22890	26–35	CAPA-04-53810	c1 pool	fine	9/15/04	2.96 (J-)	2910	0.923 (J)	—	—	28.7	71.9
18-10099	0–36	CA18-00-0036	c1 willow? [b]	fine	7/5/00	—	—	0.32 (J)	—	—	—	—
18-10100	4–21	CA18-00-0037	c1 willow? [b]	fine	7/5/00	—	—	0.34 (J)	—	—	—	—
18-10100	30–63	CA18-00-0038	c1 willow? [b]	fine	7/5/00	—	—	0.36 (U)	—	—	—	—
18-10101	5–32	CA18-00-0039	c2? **	fine	7/5/00	—	—	0.33 (U)	—	—	—	—

Note: All values in mg/kg. See Appendix A for data qualifier definitions.

[a] — = Analysis not requested or the reported value was less than the BV (or result not detected if no BV available).

[b] Area not mapped, and geomorphic unit inferred from field descriptions.

[c] na = Not available.

Table K-4.4-3
Statistical Tests for Reach PA-4 Prefire Sediment Data and LANL Background Sediment Data for Inorganic Chemicals

Analyte	Gehan p-value	Quantile p-value	Slippage p-value	Number of Reach Sample Results	Number of LANL Background Sample Results	Maximum Reach Concentration (mg/kg)	Maximum LANL Sediment Background Concentration (mg/kg)
Aluminum	0.022	0.022	0.046	15	25	25400	13300
Arsenic	0.006	0.023	0.101	15	31	5	3.6
Barium	<0.001	0.003	0.008	15	31	260	127
Beryllium	0.019	0.109	0.030	15	31	1.51	1.3
Cadmium	0.963	0.674	0.050	15	24	0.507[a]	0.2
Calcium	0.016	0.109	0.101	15	31	4620	4240
Chromium	0.039	0.023	0.002	15	31	15.4	9.2
Cobalt	0.002	0.023	0.002	15	31	10	4.2
Copper	<0.001	0.023	0.008	15	31	14	12
Cyanide	0.880	0.988	0.314	15	24	0.831	0.63
Iron	<0.001	0.003	<0.001	15	31	20100	13000
Lead	0.004	0.320	>0.999	15	31	23	25.6
Magnesium	<0.001	0.003	0.008	15	31	3840	2370
Manganese	0.128	0.320	0.030	15	31	1300	517
Nickel	0.016	0.109	0.030	15	31	13	8.9
Potassium	0.337	0.320	0.326	15	31	2910	2600
Selenium	<0.001	<0.001	n/a[b]	15	24	1.3	0.2[a]
Silver	0.019	0.053	0.083	15	18	1.7	0.28
Vanadium	<0.001	0.003	0.002	15	31	28.7	20
Zinc	0.223	0.023	0.008	15	31	82.9	56.2

Note: Analytes with at least one p-value less than 0.05 are bolded.

[a] Maximum value reported is a detection limit.

[b] n/a = Not applicable.

Table K-4.4-4
Statistical Tests for
Reach PA-4 Prefire Sediment Data and Local Background Data for Inorganic Chemicals

Analyte	Gehan p-value	Quantile p-value	Slippage p-value	Number of Reach Sample Results	Number of Local Background Sample Results	Maximum Reach Concentration (mg/kg)	Maximum Local Sediment Background Concentration (mg/kg)
Aluminum	0.094	0.037	0.003	15	12	25400	8600
Arsenic	0.442	0.240	0.556	15	12	5	3.9
Barium	0.520	0.240	0.078	15	12	260	150
Beryllium	0.938	0.612	0.156	15	12	1.51	1.1
Calcium	0.956	0.612	>0.999	15	12	4620	16000
Chromium	0.490	0.612	0.299	15	12	15.4	10
Cobalt	0.972	0.990	0.556	15	12	10	9.3
Copper	0.136	0.240	0.078	15	12	14	11
Iron	0.558	0.612	0.156	15	12	20100	17000
Lead	0.451	0.240	0.078	15	12	23	18
Magnesium	0.432	0.037	0.037	15	12	3840	2100
Manganese	0.829	0.612	0.156	15	12	1300	540
Nickel	0.889	0.612	0.556	15	12	13	12
Selenium	0.944	0.898	0.556	15	12	1.3	1.2
Silver	<0.001	0.240	0.299	15	12	1.7	0.35
Vanadium	0.804	0.898	>0.999	15	12	28.7	29
Zinc	0.385	0.037	0.017	15	12	82.9	44

Note: Analytes with at least one p-value less than 0.05 are bolded.

Table K-4.4-5
Detected Organic Chemical Results from Reach PA-4 Prefire Sediment Samples

Location ID	Depth (cm)	Sample ID	Geomorphic Unit	Facies	Collection Date	Acenaphthene	Anthracene	Aroclor-1260	Benzo(a)anthracene	Benzo(a)pyrene	Benzo(b)fluoranthene	Benzo(g,h,i)perylene
PA-22882	9–39	CAPA-04-53801	c2	coarse	9/15/04	—[a]	—	0.0042 (J)	—	—	—	—
PA-22884	14–24	CAPA-04-53803	c1w	fine	9/15/04	—	—	0.0324 (J)	0.0425 (J-)	0.0442 (J-)	0.0513 (J-)	0.0308 (J-)
PA-22884	32–56	CAPA-04-53805	c1w	fine	9/15/04	0.0806	0.0821	0.0357 (J)	0.169	0.138	0.219	0.0865
PA-22887	2–19	CAPA-04-53806	c1w	fine	9/15/04	0.059 (J-)	0.058 (J-)	—	0.139 (J-)	0.104 (J-)	0.169 (J-)	0.0696 (J-)
PA-22887	19–27	CAPA-04-53807	c1w	fine	9/15/04	—	—	—	—	—	—	—
PA-22889	4–18	CAPA-04-53808	c2	fine	9/15/04	—	—	—	—	—	—	—
PA-22890	26–35	CAPA-04-53810	c1 pool	fine	9/15/04	—	—	—	—	—	—	—
18-10099	0–36	CA18-00-0036	c1 willow? [b]	fine	7/5/00	—	—	—	—	—	—	—
18-10100	4–21	CA18-00-0037	c1 willow? [b]	fine	7/5/00	—	—	—	—	—	—	—
18-10100	30–63	CA18-00-0038	c1 willow? [b]	fine	7/5/00	—	—	—	—	—	—	—

Table K-4.4-5 (continued)

Location ID	Depth (cm)	Sample ID	Geomorphic Unit	Facies	Collection Date	BHC[beta-]	Bis(2-ethylhexyl)phthalate	Chrysene	DDD[4,4'-]	DDE[4,4'-]	DDT[4,4'-]	Dieldrin
PA-22882	9–39	CAPA-04-53801	c2	coarse	9/15/04	—	—	0.00421	—	0.00174 (J)	—	—
PA-22884	14–24	CAPA-04-53803	c1w	fine	9/15/04	—	—	0.0422 (J-)	0.003 (J)	0.00433 (J)	—	0.00157 (J)
PA-22884	32–56	CAPA-04-53805	c1w	fine	9/15/04	—	—	0.128	—	—	—	—
PA-22887	2–19	CAPA-04-53806	c1w	fine	9/15/04	—	0.0399 (J)	0.0987 (J-)	—	—	—	—
PA-22887	19–27	CAPA-04-53807	c1w	fine	9/15/04	—	—	—	—	—	—	—
PA-22889	4–18	CAPA-04-53808	c2	fine	9/15/04	—	—	—	—	—	—	—
PA-22890	26–35	CAPA-04-53810	c1 pool	fine	9/15/04	—	—	—	—	—	—	—
18-10099	0–36	CA18-00-0036	c1 willow? [b]	fine	7/5/00	—	—	—	—	—	—	—
18-10100	4–21	CA18-00-0037	c1 willow? [b]	fine	7/5/00	0.0016 (J)	—	—	—	—	0.0015 (J)	—
18-10100	30–63	CA18-00-0038	c1 willow? [b]	fine	7/5/00	—	—	—	—	—	—	—

Table K-4.4-5 (continued)

Location ID	Depth (cm)	Sample ID	Geomorphic Unit	Facies	Collection Date	Di-n-butylphthalate	Fluoranthene	Fluorene	Indeno(1,2,3-cd)pyrene	Phenanthrene	Pyrene
PA-22882	9–39	CAPA-04-53801	c2	coarse	9/15/04	—	0.00803	—	—	0.00554 (J)	0.00796
PA-22884	14–24	CAPA-04-53803	c1w	fine	9/15/04	—	0.101 (J-)	—	—	0.0739 (J-)	0.111 (J-)
PA-22884	32–56	CAPA-04-53805	c1w	fine	9/15/04	0.06 (J)	0.35	0.0726	0.0834	0.359	0.33
PA-22887	2–19	CAPA-04-53806	c1w	fine	9/15/04	0.104 (J)	0.279 (J-)	0.0445 (J-)	0.068 (J-)	0.262 (J-)	0.261 (J-)
PA-22887	19–27	CAPA-04-53807	c1w	fine	9/15/04	—	0.0143	—	—	0.0131 (J)	0.0148
PA-22889	4–18	CAPA-04-53808	c2	fine	9/15/04	—	0.0148	—	—	-	0.0114
PA-22890	26–35	CAPA-04-53810	c1 pool	fine	9/15/04	—	0.0146	—	—	0.00978 (J)	0.015
18-10099	0–36	CA18-00-0036	c1 willow? [b]	fine	7/5/00	—	0.19 (J)	—	—	0.16 (J)	0.24 (J)
18-10100	4–21	CA18-00-0037	c1 willow? [b]	fine	7/5/00	—	0.17 (J)	—	—	0.16 (J)	0.24 (J)
18-10100	30–63	CA18-00-0038	c1 willow? [b]	fine	7/5/00	—	0.34 (J)	—	—	0.29 (J)	0.46 (J)

Note: All values in mg/kg. See Appendix A for data qualifier definitions.

[a] — = Analysis not requested or the reported value was less than the BV (or result not detected if no BV available).

[b] Area not mapped, and geomorphic unit inferred from field descriptions.

Table K-4.4-6
Radionuclide Results from Reach PA-4 Prefire Sediment Samples that are Above BVs

Location ID	Depth (cm)	Sample ID	Geomorphic Unit	Facies	Collection Date	Plutonium-238	Plutonium-239	Thorium-228
LANL sediment BV						**0.006**	**0.068**	**2.28**
PA-22884	14–24	CAPA-04-53803	c1w	fine	9/15/04	—	0.0735	—
PA-22884	32–56	CAPA-04-53805	c1w	fine	9/15/04	0.0432	0.119	—
PA-22890	26–35	CAPA-04-53810	c1 pool	fine	9/15/04	—	—	2.37

Note: All values in pCi/g.

*— = Analysis not requested or the reported value was less than the BV (or result not detected if no BV available).

Table K-4.4-7
Statistical Tests for Reach PA-4 Prefire Sediment Data and LANL Background Sediment Data for Radionuclides

Analyte	Wilcoxon p-value	Quantile p-value	Slippage p-value	Number of Reach Sample Results	Number of LANL Background Sample Results	Maximum Reach Concentration (pCi/g)	Maximum LANL Sediment Background Concentration (pCi/g)
Plutonium-238	0.581	0.025	0.005	15	24	0.0432	0.006
Plutonium-239	0.686	0.581	0.149	15	23	0.119	0.065
Thorium-228	0.249	0.851	0.250	8	24	2.37	2.12

Note: Analytes with at least one p-value less than 0.05 are bolded.

Table K-4.4-8
Statistical Tests for Reach PA-4 Prefire Sediment Data and Local Background Sediment Data for Radionuclides

Analyte	Wilcoxon p-value	Quantile p-value	Slippage p-value	Number of Reach Sample Results	Number of LANL Background Sample Results	Maximum Reach Concentration (pCi/g)	Maximum LANL Sediment Background Concentration (pCi/g)
Plutonium-238	0.302	0.228	0.228	15	6	0.0432	0.0081

Note: Analytes with at least one p-value less than 0.05 are bolded.

Table K-4.4-9
COPC Summary Table for Reach PA-4 Prefire Data

Analyte Category	Analyte Name	Maximum Detected Sample Result	Units	Number of Detects/ Number of Samples	Background Test Results
Inorganic Chemicals	Aluminum	25400	mg/kg	15/15	>LANL and >local
	Arsenic	5	mg/kg	14/15	>LANL, not different from local
	Barium	260	mg/kg	15/15	>LANL, not different from local
	Beryllium	1.51	mg/kg	15/15	>LANL, not different from local
	Cadmium	0.11	mg/kg	2/15	Not different
	Calcium	4620	mg/kg	15/15	>LANL, not different from local
	Chromium	15.4	mg/kg	15/15	>LANL, not different from local
	Cobalt	10	mg/kg	15/15	>LANL, not different from local
	Copper	14	mg/kg	15/15	>LANL, not different from local
	Cyanide (Total)	0.831	mg/kg	2/15	Not different
	Iron	20100	mg/kg	15/15	>LANL, not different from local
	Lead	23	mg/kg	15/15	>LANL, not different from local
	Magnesium	3840	mg/kg	15/15	>LANL and >local
	Manganese	1300	mg/kg	15/15	>LANL, not different from local
	Nickel	13	mg/kg	15/15	>LANL, not different from local
	Potassium	2910	mg/kg	15/15	Not different
	Selenium	1.3	mg/kg	10/15	>LANL, not different from local
	Silver	1.7	mg/kg	12/15	>LANL and >local
	Thallium	0.284	mg/kg	8/15	Not different
	Vanadium	28.7	mg/kg	15/15	>LANL, not different from local
	Zinc	82.9	mg/kg	15/15	>LANL and >local
	Nitrate	2.96	mg/kg	4/8	Not applicable
Radionuclides	Plutonium-238	0.0432	pCi/g	1/15	>LANL, not different from local
	Plutonium-239	0.119	pCi/g	5/15	Not different
	Thorium-228	2.37	pCi/g	8/8	Not different
Organic Chemicals	Acenaphthene	0.0806	mg/kg	2/15	Not applicable
	Anthracene	0.0821	mg/kg	2/15	Not applicable
	Aroclor-1260	0.0357	mg/kg	3/15	Not applicable
	Benzo(a)anthracene	0.169	mg/kg	3/15	Not applicable
	Benzo(a)pyrene	0.138	mg/kg	3/15	Not applicable
	Benzo(b)fluoranthene	0.219	mg/kg	3/15	Not applicable
	Benzo(g,h,i)perylene	0.0865	mg/kg	3/15	Not applicable
	BHC[beta-]	0.0016	mg/kg	1/15	Not applicable
	Bis(2-ethylhexyl)phthalate	0.0399	mg/kg	1/15	Not applicable
	Chrysene	0.128	mg/kg	4/15	Not applicable

Table K-4.4-9 (continued)

Analyte Category	Analyte Name	Maximum Detected Sample Result	Units	Number of Detects/ Number of Samples	Background Test Results
Organic Chemicals (continued)	DDD[4,4'-]	0.003	mg/kg	1/15	Not applicable
	DDE[4,4'-]	0.00433	mg/kg	2/15	Not applicable
	DDT[4,4'-]	0.0015	mg/kg	1/15	Not applicable
	Dieldrin	0.00157	mg/kg	1/15	Not applicable
	Di-n-butylphthalate	0.104	mg/kg	2/15	Not applicable
	Fluoranthene	0.35	mg/kg	10/15	Not applicable
	Fluorene	0.0726	mg/kg	2/15	Not applicable
	Indeno(1,2,3-cd)pyrene	0.0834	mg/kg	2/15	Not applicable
	Phenanthrene	0.359	mg/kg	9/15	Not applicable
	Pyrene	0.46	mg/kg	10/15	Not applicable

Table K-4.5-1
Reach PA-4 Postfire Sediment Samples Taken

Part 1

Location ID	Depth (cm)	Sample ID	Geomorphic Unit	Facies	Collection Date	Americium-241	Anion	Cyanide	Gamma Spec	Tritium	High Explosives	Isotopic Plutonium	Isotopic Thorium
PA-22883	0–14	CAPA-04-53802	c1w	fine	9/15/2004	2330S	2328S	2328S	2330S	2330S	2327S	2330S	2330S
PA-22890	0–26	CAPA-04-53809	c1 pool	fine	9/15/2004	2330S	2328S	2328S	2330S	2330S	2327S	2330S	2330S
18-10102	0–15	CA18-00-0041	c1	fine	6/29/2000	7023R	—*	7022R	7023R	—	7021R	7023R	—

Part 2

Location ID	Depth (cm)	Sample ID	Geomorphic Unit	Facies	Collection Date	Isotopic Uranium	Metals	PAH	PCB	Pesticides	Strontium-90	SVOC
PA-22883	0–14	CAPA-04-53802	c1w	fine	9/15/2004	2330S	2328S	2327S	2327S	2327S	2330S	2327S
PA-22890	0–26	CAPA-04-53809	c1 pool	fine	9/15/2004	2330S	2328S	2327S	2327S	2327S	2330S	2327S
18-10102	0–15	CA18-00-0041	c1	fine	6/29/2000	7023R	7022R	—	7020R	7020R	—	7020R

Note: Request numbers are shown for each analyte suite.

*— = Analysis not requested for this suite.

Table K-4.5-2
Inorganic Chemical Results from Reach PA-4 Postfire Sediment Samples that are Above BVs

Part 1

Location ID	Depth (cm)	Sample ID	Geomorphic Unit	Facies	Collection Date	Aluminum	Arsenic	Barium	Cadmium	Calcium	Chromium	Cobalt	Copper	Cyanide (Total)	Iron
LANL sediment BV						**15400**	**3.98**	**127**	**0.4**	**4420**	**10.5**	**4.73**	**11.2**	**0.82**	**13800**
PA-22883	0–14	CAPA-04-53802	c1w	fine	9/15/2004	26300	7.5 (J)	554	0.859 (J)	14200	16.1 (J)	10.8 (J)	31.2	1.62	23600
PA-22890	0–26	CAPA-04-53809	c1 pool	fine	9/15/2004	32300	6.37 (J)	738	1.02 (J)	23400	19.8 (J)	9.73 (J)	37.7	2.3	22800
18-10102	0–15	CA18-00-0041	c1	fine	6/29/2000	—[a]	—	180 (J-)	—	6700 (J)	—	—	—	0.99	—

Part 2

Location ID	Depth (cm)	Sample ID	Geomorphic Unit	Facies	Collection Date	Lead	Magnesium	Manganese	Nickel	Nitrate	Potassium	Selenium	Silver	Vanadium	Zinc
LANL sediment BV						**19.7**	**2370**	**543**	**9.38**	**na[b]**	**2690**	**0.3**	**1**	**19.7**	**60.2**
PA-22883	0–14	CAPA-04-53802	c1w	fine	9/15/2004	40.9	3910	1780	16.4 (J)	—	3560	0.862 (J)	1.23 (J)	34.9	107
PA-22890	0–26	CAPA-04-53809	c1 pool	fine	9/15/2004	48.3	4650	2310	16.4 (J)	51.2 (J-)	4590	1.45 (J)	—	36.1	126 (J)
18-10102	0–15	CA18-00-0041	c1	fine	6/29/2000	—	—	—	—	—	—	0.77 (J)	—	—	—

Note: All values in mg/kg. See Appendix A for data qualifier definitions.

[a] — = Analysis not requested or the reported value was less than the BV (or result not detected if no BV available).

[b] na = Not available.

Table K-4.5-3
Detected Organic Chemical Results from Reach PA-4 Postfire Sediment Samples

Location ID	Depth (Cm)	Sample ID	Geomorphic Unit	Facies	Collection Date	Amino-2,6-dinitrotoluene[4-]	Benzoic Acid	Chrysene	DDE[4,4'-]	DDT[4,4'-]	Fluoranthene	Nitrotoluene[2-]	Phenanthrene	Phenol	Pyrene	Pyridine	Tetryl
PA-22883	0–14	CAPA-04-53802	c1w	fine	9/15/2004	—*	—	0.0255	0.00632 (J)	—	0.0567	—	0.0403	—	0.0603	—	—
PA-22890	0–26	CAPA-04-53809	c1 pool	fine	9/15/2004	—	—	—	0.00621 (J)	—	—	—	—	—	0.0192	—	—
18-10102	0–15	CA18-00-0041	c1	fine	6/29/2000	0.35	0.61 (J)	—	0.003 (J)	0.0065 (J)	—	0.068 (J)	—	0.34 (J)	—	0.24 (J)	0.075 (J)

Note: All values in mg/kg. See Appendix A for data qualifier definitions.

*— = Analysis not requested or the reported value was less than the BV (or result not detected if no BV available).

Table K-4.5-4
Radionuclide Results from Reach PA-4 Postfire Sediment Samples that are Above BVs

Location ID	Depth (cm)	Sample ID	Geomorphic Unit	Facies	Collection Date	Americium-241	Cesium-137	Plutonium-239
LANL sediment BV						**0.04**	**0.9**	**0.068**
PA-22883	0–14	CAPA-04-53802	c1w	fine	9/15/2004	0.102	3.37	0.175
PA-22890	0–26	CAPA-04-53809	c1 pool	fine	9/15/2004	0.0578	4.18	0.187
18-10102	0–15	CA18-00-0041	c1	fine	6/29/2000	—*	1.81	—

Note: All values in pCi/g.

*— = Analysis not requested or the reported value was less than the BV (or result not detected if no BV available).

Table K-4.5-5
COPC Summary Table for Reach PA-4 Postfire Data

Analyte Category	Analyte Name	Maximum Detected Sample Result	Units	Number of Detects/ Number of Samples
Inorganic Chemicals	Aluminum	32300	mg/kg	3/3
	Arsenic	7.5	mg/kg	3/3
	Barium	738	mg/kg	3/3
	Cadmium	1.02	mg/kg	3/3
	Calcium	23400	mg/kg	3/3
	Chromium	19.8	mg/kg	3/3
	Cobalt	10.8	mg/kg	3/3
	Copper	37.7	mg/kg	3/3
	Cyanide (Total)	2.3	mg/kg	3/3
	Iron	23600	mg/kg	3/3
	Lead	48.3	mg/kg	3/3
	Magnesium	4650	mg/kg	3/3
	Manganese	2310	mg/kg	3/3
	Nickel	16.4	mg/kg	3/3
	Potassium	4590	mg/kg	3/3
	Selenium	1.45	mg/kg	3/3
	Silver	1.23	mg/kg	3/3
	Vanadium	36.1	mg/kg	3/3
	Zinc	126	mg/kg	3/3
	Nitrate	51.2	mg/kg	1/2
Radionuclides	Americium-241	0.102	pCi/g	2/3
	Cesium-137	4.18	pCi/g	3/3
	Plutonium-239	0.187	pCi/g	2/3
Organic Chemicals	Amino-2,6-dinitrotoluene[4-]	0.35	mg/kg	1/3
	Benzoic Acid	0.61	mg/kg	1/3
	Chrysene	0.0255	mg/kg	1/3
	DDE[4,4'-]	0.00632	mg/kg	3/3
	DDT[4,4'-]	0.0065	mg/kg	1/3
	Fluoranthene	0.0567	mg/kg	1/3
	Nitrotoluene[2-]	0.068	mg/kg	1/3
	Phenanthrene	0.0403	mg/kg	1/3
	Phenol	0.34	mg/kg	1/3
	Pyrene	0.0603	mg/kg	2/3
	Pyridine	0.24	mg/kg	1/3
	Tetryl	0.075	mg/kg	1/3

Table K-5.0-1
COPC Summary Table for CDB-3E, PA-4, and Area G Data

Analyte	Area G Cañada del Buey Drainages	Reach CDB-3E	Area G Pajarito Canyon Drainages	Reach PA-4 Prefire	Reach PA-4 Postfire
Aluminum	—[a]	25000	—	25400	NGD[b]
Antimony	—	R[c]	—	NSD	—
Arsenic	—	NSD[d]	—	NSD	7.5 (J)
Barium	180	NSD	—	NSD	738
Beryllium	—	—	ND[e] >BV[f]	NSD	—
Cadmium	1.2	ND>BV	ND>BV	ND>BV	1.02 (J)
Calcium	—	—	6370	NSD	NGD
Chromium	17.9 (J)	NSD	—	NSD	19.8 (J)
Cobalt	ND>BV	NSD	—	NSD	10.8 (J)
Copper	—	NSD	—	NSD	37.7
Cyanide (Total)	ND	—	ND	NSD	NGD
Fluoride	NA[g]	1.93	NA	NA	NA
Iron	39000	NSD	—	NSD	23600
Lead	—	NSD	—	NSD	NGD
Magnesium	2660	4370 (J+)	—	3840	4650
Manganese	—	NSD	—	NSD	2310
Nickel	—	—	—	NSD	16.4 (J)
Nitrate	NA	5.59 (J-)	NA	2.96 (J-)	51.2 (J-)
Perchlorate	NA	0.0151 (J)	NA	—	—
Potassium	—	4420 (J+)	—	NSD	4590
Selenium	ND>BV	NSD	ND>BV	NSD	NGD
Silver	ND>BV	—	ND>BV	1.7 (J)	NGD
Thallium	—	—	—	ND>BV	—
Vanadium	—	NSD	—	NSD	36.1
Zinc	—	NSD	—	82.9	126 (J)
Americium-241	0.145	NSD	0.158	—	NGD
Cesium-137	1.3	—	0.99	—	NGD
Cobalt-60	0.23	—	0.39	—	—
Plutonium-238	1.483	0.0628	0.576	NSD	—
Plutonium-239	0.582	NSD	0.909	NSD	NGD
Thorium-228	—	—	—	NSD	—
Tritium	0.107	—	0.490	—	—
Acenaphthene	NA	—	NA	0.0806	—
Amino-2,6-dinitrotoluene[4-]	NA	—	NA	—	NGD
Anthracene	NA	—	NA	0.0821	—
Aroclor-1254	ND	0.0186	—	—	—

Table K-5.0-1 (continued)

Analyte	Area G Cañada del Buey Drainages	Reach CDB-3E	Area G Pajarito Canyon Drainages	Reach PA-4 Prefire	Reach PA-4 Postfire
Aroclor-1260	ND	0.0069 (J)	—	0.0357 (J)	—
Benzo(a)anthracene	NA	—	NA	0.169	—
Benzo(a)pyrene	NA	—	NA	0.138	—
Benzo(b)fluoranthene	NA	—	NA	0.219	—
Benzo(g,h,i)perylene	NA	—	NA	0.0865	—
Benzoic Acid	NA	—	NA	—	NGD
BHC[beta-]	ND	—	—	0.0016 (J)	—
Bis(2-ethylhexyl)phthalate	NA	0.0317 (J)	NA	0.0399 (J)	—
Chrysene	NA	—	NA	0.128	0.0255
DDD[4,4'-]	ND	—	—	0.003 (J)	—
DDE[4,4'-]	ND	—	—	0.00433 (J)	NGD
DDT[4,4'-]	ND	—	—	0.0015 (J)	NGD
Dieldrin	ND	—	—	0.00157 (J)	—
Di-n-butylphthalate	NA	0.0263 (J)	NA	0.104 (J)	—
Fluoranthene	NA	—	NA	0.35	NGD
Fluorene	NA	—	NA	0.0726	—
Indeno(1,2,3-cd)pyrene	NA	—	NA	0.0834	—
Methoxychlor[4,4'-]	0.0589	—	0.0422	—	—
Nitrotoluene[2-]	NA	—	NA	—	NGD
Phenanthrene	NA	—	NA	0.359	NGD
Phenol	NA	—	NA	—	NGD
Pyrene	NA	0.0106	NA	0.46 (J)	0.0603
Pyridine	NA	—	NA	—	NGD
Tetryl	NA	—	NA	—	NGD

[a] — = Not identified as a COPC.

[b] NGD = Not graphically different from baseline data set (maximum less than baseline maximum).

[c] R = All results rejected.

[d] NSD = Not statistically different from background data sets.

[e] ND = Non-detects.

[f] BV = Background value.

[g] NA = Not analyzed.

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