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Periodic Monitoring Report for Vapor-Sampling Activities at Material Disposal Area G, Technical Area 54, for Fiscal Year 2007


Prepared by the Environmental Programs Directorate

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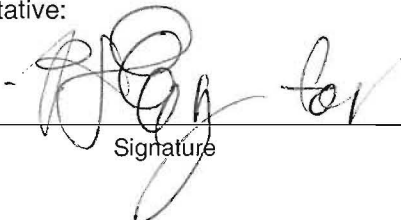
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EXECUTIVE SUMMARY

This periodic monitoring report summarizes the fiscal year (FY) 2007 monitoring and sampling activities conducted at Material Disposal Area (MDA) G, located in Technical Area 54 at Los Alamos National Laboratory (the Laboratory). The purpose of sampling is to implement the proposed long-term subsurface vapor-monitoring plan described in Appendix I of the MDA G investigation report. The objective of the monitoring activities is to evaluate trends in volatile organic compounds (VOCs) and tritium concentrations in subsurface vapor at MDA G over time.

Monitoring conducted in FY2007 included field screening of every port in 18 existing boreholes at MDA G, collecting pore-gas samples for laboratory analysis of VOCs and tritium from selected boreholes, and monitoring moisture. Validated analytical results confirm the presence of VOCs and tritium in vapor samples. Concentrations of VOCs from pore-gas analyses at four locations sampled periodically since 1997 show stable or decreasing VOC concentrations.

Concentrations of some VOCs in the central portion of the plume exceeded screening levels based on groundwater cleanup levels. Concentrations of all VOCs in the deepest pore-gas sample (i.e., the sample closest to the regional aquifer), however, are below screening levels. These results show no immediate threat to groundwater from the VOC plume but do indicate the need for continued monitoring of pore gas at a reduced frequency.

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1.0 INTRODUCTION

This report discusses quarterly subsurface pore-gas monitoring and sampling activities at Los Alamos National Laboratory (LANL or the Laboratory), Material Disposal Area (MDA) G at Technical Area (TA) 54. MDA G is located in the east-central portion of the Laboratory at TA-54, Area G, on Mesita del Buey (Figure 1.0-1). 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. 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 at MDA G, based on data from wells near the area and the predictions of the hydrogeologic conceptual model for the Pajarito Plateau (LANL 1998, 059599). Area G is relatively flat. Portions of the disposal units at MDA G are covered with concrete and asphalt to house ongoing waste-management activities conducted at Area G. Surface runoff from the site is controlled and discharges into drainages to the north (toward Cañada del Buey) and the south (toward Pajarito Canyon). Stormwater and sediment monitoring stations are distributed throughout the surface of Area G and in drainages leading to the canyons.

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, 005707; Rogers 1977, 005708, 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). MDA G is a decommissioned (i.e., removed from service) subsurface site for disposition of low-level waste, certain radioactively contaminated infectious waste, asbestos-contaminated material, and polychlorinated biphenyls. It was also used for the retrievable storage of transuranic waste. MDA G began operations in 1957. Information on radioactive materials and radionuclides, including the results of sampling and analysis of radioactive constituents, is voluntarily provided to the New Mexico Environment Department (NMED) in accordance with U.S. Department of Energy policy.

Pore-gas monitoring at MDA G has been required since 1985. A summary of pore-gas monitoring at MDA G follows.

- In 1985, the Laboratory received a compliance order from NMED that required, among other things, characterization of pore gas at Areas G and L. The Laboratory installed seven vapor-monitoring wells to characterize pore gas.
- From 1986 to 1990, the Laboratory voluntarily installed 22 additional vapor-monitoring wells to characterize the volatile organic compound (VOC) plume at Areas G and L.
- In 1990, the U.S. Environmental Protection Agency (EPA) issued Module VIII of the Laboratory's Hazardous Waste Facility Permit. Module VIII included requirements for quarterly pore-gas sampling at MDAs G and L as input into the Resource Conservation and Recovery Act (RCRA) facility investigation (RFI).
- In 2005, the Compliance Order on Consent (hereafter, the Consent Order) required pore-gas monitoring during the site investigations for all MDAs and submittal of a long-term pore-gas monitoring plan for each MDA. The Consent Order stated that drilling must continue to at least 25 ft below the deepest detected contamination based on headspace field screening for VOCs.
- In September 2005, the Laboratory submitted a long-term monitoring plan for pore gas in the MDA G investigation report (LANL 2005, 090513).

- In October 2007, the Laboratory submitted a revised long-term monitoring plan for pore gas in the MDA G corrective measures evaluation plan (LANL 2007, 098608).

Subsurface vapor monitoring and sampling are being performed by the Laboratory's Environmental Programs–Corrective Actions Project to characterize trends of VOCs and tritium in subsurface vapor. Field-screening data, analytical laboratory results, and monitoring data for fiscal year (FY) 2007 are presented in this report.

2.0 SCOPE OF ACTIVITIES

During FY2007, the following sampling activities were completed at MDA G.

- During the second quarter FY2007, pore-gas screening at MDA G was performed, and pore-gas samples were collected from sampling ports in 17 vapor monitoring boreholes and from the 485- to 700-ft interval using an inflatable packer sampling system at one borehole.
- Each sampling interval was purged to ensure that formation air was sampled in accordance with Environmental–Programs Directorate's Standard Operating Procedure (SOP) 06.31, Rev. 2, Sampling of Subatmospheric Air. Table 2.0-1 describes whether each borehole sampled is open or instrumented. Vapor monitoring wells at MDA G are instrumented with SEAMIST flexible liners, as shown in Figure 2.0-1, or with constructed ports as described in Figure 2.0-2.
- Samples from each interval as listed in Table 2.0-1 received field-screening analyses using a Landtec GEM-500 photoionization detector (PID) equipped with an 11.7-eV lamp for percent carbon dioxide (CO₂) and oxygen (O₂). Figure 2.0-3 presents locations of each borehole at MDA G producing vapor samples for field screening or laboratory analyses in the past year.
- The vapor from each interval was then screened for VOCs using a Brüel and Kræjer (B&K) multigas instrument, Type 1302, which measures four VOCs: (1) trichloroethane[1,1,1-] (TCA); (2) trichloroethene (TCE); (3) tetrachloroethene (PCE); and (4) trichlorofluoromethane (Freon 11). The B&K instrument also measures CO₂ and water vapor (H₂O).
- During the second quarter of FY2007, vapor samples were collected from selected screened ports in 10 vapor-monitoring boreholes (listed in Table 2.0-1) in SUMMA canisters for laboratory analysis of VOCs using EPA Method TO-15 and in silica gel cartridges for analysis of tritium using EPA Method 114 (National Emissions Standards for Hazardous Air Pollutants [NESHAP] Part 61, Appendix B).
- During the second quarter of FY2007, vapor samples were collected using a packer sampling system from location 54-25105 in SUMMA canisters for laboratory analysis of VOCs using EPA Method TO-15. A packer system for vapor sampling is shown in Figure 2.0-4.
- During the fourth quarter of FY2007, vapor samples were collected from selected screened ports in five vapor monitoring boreholes as listed in Table 2.0-1 in SUMMA canisters for laboratory analysis of VOCs using EPA Method TO-15 and in silica gel cartridges for analysis of tritium using EPA Method 114 (NESHAP, Part 61, Appendix B).
- During the first and second quarter of FY2007 moisture monitoring was conducted at Area G as described in Appendix C.

No investigation-derived waste was generated during FY2007 monitoring.

3.0 REGULATORY CRITERIA

The March 1, 2005, Consent Order does not identify any cleanup standards, risk-based screening levels, risk-based cleanup goals, or other regulatory criteria for pore gas at MDA H. Therefore, an analysis was conducted to evaluate the potential for contamination of groundwater by VOCs in pore gas using screening levels (SLs) based on groundwater cleanup levels contained in the Consent Order. The analysis evaluated the water concentration that will be in equilibrium with the maximum concentrations of VOCs detected at MDA H during the most recent round of monitoring.

$$C_{\text{water}} = C_{\text{air}} / \text{Henry's Law constant (H')} \quad \text{Equation 3-1}$$

If the concentration of the VOC in water is less than the SL, then no potential exists for exceedances of groundwater cleanup levels. The analysis for MDA H data is presented in section 5.0.

4.0 MONITORING RESULTS

Monitoring activities were performed at MDA G from February 14 to March 26, 2007 (second quarter FY2007) and from July 31 to August 1, 2007 (fourth quarter FY2007). Monitoring at MDA G included field screening of subsurface vapor for VOCs, H₂O, percent CO₂, and O₂. Moisture monitoring was conducted from December 14, 2006, to January 10, 2007. Moisture monitoring included camera logging of neutron access ports and determining moisture content through the length of each access port.

FY2007 subsurface vapor monitoring was conducted at the locations and depths described in section 2 of this report. Each monitoring depth was first purged to ensure that formation air was being collected. During the purge, the subsurface vapor was monitored for percent CO₂ and O₂ using a Landtec GEM-500 PID. The stabilized values from FY2007 monitoring events at each sampling location are listed in Tables 4.0-1 and 4.0-2. Percent CO₂ and O₂ measured during the FY2007 ranged from 0.0% to 12.9% and 4.9% to 20.9%, respectively. Low O₂ and high CO₂ concentrations are correlated in samples and are indicative of anaerobic degradation of chlorinated compounds. After purge and stabilization, VOC field-screening results were collected in the field using the B&K multigas instrument. Stabilized values from FY2007 monitoring events at each sampling location are listed separately for each organic chemical measured in Tables 4.0-3 through 4.0-6 for TCA, PCE, TCE, and Freon 11, respectively.

Not all sampling ports were able to produce adequate airflow to allow Landtec or B&K field-screening measurements. Location 54-01128 at the 30-ft sampling port could not be sampled by the B&K instrument on February 16, 2007. Location 54-02009 at the 79-ft sampling port could not be sampled by the B&K instrument on February 16, 2007. Location 54-02010 at the 53-ft sampling port could not be sampled by the B&K instrument on February 16, 2007. The Landtec was not available to make CO₂ or O₂ measurements on February 27, February 28, or March 2, 2007, affecting locations 54-01126, 54-27436, and 54-24394. Because the solar-powered air pumping systems failed, the flexible SEAMIST liner deflated, and the location 54-22116 could not be sampled.

5.0 ANALYTICAL DATA RESULTS

Subsurface vapor samples were collected from MDA G from February 15 to March 27, 2007 (second quarter FY2007) and from July 31 to August 2, 2007 (fourth quarter FY2007) in SUMMA canisters for laboratory analysis of VOCs using EPA Method TO-15 and in silica gel cartridges for analysis of tritium using EPA Method 114 (NESHAP Part 61, Appendix B). Analytical data from these sampling events are presented in Tables 5.0-1 and 5.0-2. The quality assurance/quality control program used to review the

data is presented in Appendix A, and the data packages and chain-of-custody forms resulting from FY2007 sampling and analyses are included in Appendix B (on CD included with this document).

Twenty-one different VOCs were detected in vapor samples collected in SUMMA canisters from MDA G during FY2007. Plates 1 and 2 present borehole locations and analytical data for pore-gas VOC analyses in second and fourth quarters of FY2007, respectively. TCA was the most frequently detected analyte and was the analyte detected with the greatest concentrations. TCA was detected in 61 of 61 samples collected; it reached a maximum of 790,000 $\mu\text{g}/\text{m}^3$ in borehole 54-24386 at the 37.5-ft sampling port.

Maximum tritium concentrations were detected from borehole 54-24397 at the 45-55 ft interval. Figures 5.0-1 and 5.0-2 presents the location and analytical data for pore-gas tritium analyses conducted during the second and fourth quarter of FY2007. Results for tritium concentrations ranged from 8,550,000 pCi/L to not detected above 1750 pCi/L.

Four instrumented boreholes at MDA G have been sampled for VOCs more than five times since 1997. Location 54-02009 at the 62-ft sampling port has been sampled 20 times since 1997. Location 54-02010 at the 95-ft sampling port has been sampled seven times since 1997. Location 54-02032 at the 156-ft sampling port has been sampled 11 times since 1997. Location 54-02033 at the 100-ft sampling port has been sampled nine times since 1997. Six organic chemicals—TCA, Freon 11, TCE, PCE, 1,1-dichloroethane (DCA), and 1,1-dichloroethene (DCE)—have been detected in more than half the samples collected at MDA G since 1997. Figures 5.0-3 through 5.0-8 illustrate concentrations over time for these six organic chemicals at the four locations with periodic monitoring since 1997. The sample with the largest VOC concentrations at MDA G, 54-24386 at the 40-ft sampling depth, has been sampled twice since the borehole was instrumented, so no trend analysis can be conducted.

The VOC results from the most recent round of monitoring were screened to evaluate whether the concentrations of VOCs in the plume would be of concern as a potential source of groundwater contamination. Because there are no SLs for pore gas that address the potential for groundwater contamination, the screening evaluation was based on groundwater cleanup levels contained in the Consent Order and Henry's Law constants that describe the equilibrium relationship between vapor and water concentrations. The source of the Henry's Law constants was the NMED soil screening level technical background document (NMED 2006, 092513). The following dimensionless form of Henry's Law constant was used

$$H' = \frac{C_{air}}{C_{water}} \quad \text{Equation 5-1}$$

where C_{air} is the volumetric concentration of contaminant in air and C_{water} is the volumetric concentration of contaminant in water. Equation 5-1 can be used to calculate the following screening value (SV):

$$SV = \frac{C_{air}}{1,000 \times H' \times SL} \quad \text{Equation 5-2}$$

where C_{air} is the concentration of VOC in the pore-gas sample ($\mu\text{g}/\text{m}^3$), H' is the dimensionless Henry's Law constant, SL is the screening level ($\mu\text{g}/\text{L}$), and 1000 is a conversion factor from L to m^3 . The SLs are groundwater cleanup levels specified in the Consent Order. These levels are the EPA maximum contaminant level (MCL) or New Mexico Water Quality Control Commission (NMWQCC) groundwater standard, whichever is lower. As specified in the Consent Order, if there is no MCL or NMWQCC standard, the EPA Region 6 human health medium-specific screening level for tap water is used adjusted to 10^{-5} risk for carcinogens. The numerator in Equation 5-2 is the actual concentration of VOC in pore gas, and the denominator represents the concentration in pore gas needed to exceed the SL. Therefore,

if SV is less than 1, the concentration of VOC in pore gas would not be sufficiently high to cause the water-screening level to be exceeded, even if the VOC plume were in contact with groundwater.

Equation 5-2 was used to screen the maximum concentrations of VOCs detected in pore-gas samples at MDA G during FY2007 sampling. The evaluation considered the 21 VOCs detected for which there are MCLs, NMWQCC standards, or human health screening levels. As shown in Table 5.0-3 the maximum concentrations of nine VOCs resulted in SVs greater than 1. These VOCs are acetone, 2-butanone, 1,1-DCA, 1,1-DCE, methanol, methylene chloride, PCE, TCA, and TCE, with TCE having the highest SV (90). Because some SVs exceeded 1, further screening was performed using the data from the deepest pore-gas samples (i.e., the samples collected closest to the regional aquifer). The deepest sample was collected from borehole location 54-25105 at a depth interval of 485 to 700 ft and had 11 detected VOCs. The results of this screening are presented in Table 5.0-4 and show that all maximum concentrations from the deep sample resulted in SVs below 1; the maximum SV was 0.0341 for TCE. Based on this evaluation, the concentrations of VOCs in pore gas at MDA G do not pose an immediate threat of groundwater contamination. Because SVs for maximum concentrations from samples collected near potential VOC source areas exceeded 1, additional sampling in these areas may be required.

6.0 SUMMARY

The purpose of monitoring and sampling activities at MDA G is to identify changes in contaminant concentrations at the perimeter of the relatively well-characterized plume at MDA G as an indicator of outward plume expansion (i.e., extent); to monitor for changes in contaminant concentration distributions within the plume at MDA G as an indicator of changes warranting further attention (i.e., nature); and to monitor boreholes for data-gap needs for future modeling and trend analyses.

All analytes shown in Figures 5.0-3 through 5.0-8 show concentrations that decrease over time. At all locations and depths sampled periodically since 1997, analytes show slightly decreasing or stable trends in concentration.

In summary,

- VOCs are present at variable concentrations in subsurface vapor at levels similar to or below concentrations observed during 1997,
- concentrations of VOCs in pore gas in the boreholes sampled are not high enough to pose an immediate threat of groundwater contamination by the VOC plume,
- pore-gas monitoring proposed in the long-term monitoring plan should be suspended until the need for additional sampling near potential VOC source areas has been determined, and
- tritium is present in subsurface vapor at concentrations decreases as sampling depth below the ground surface increases. The concentration of tritium in the deepest sample is approximately 10% of the MCL.

7.0 REFERENCES AND MAP DATA SOURCES

7.1 References

The following list includes all documents cited in this report. Parenthetical information following each reference provides the author(s), publication date, and ER ID number. This information is also included in text citations. ER ID numbers are assigned by the Environmental Programs Directorate's Records

Processing Facility (RPF) and are used to locate the document at the RPF and, where applicable, in the master reference set.

Copies of the master reference set are maintained at the NMED Hazardous Waste Bureau; the U.S. Department of Energy–Los Alamos Site Office; the U.S. Environmental Protection Agency, Region 6; and the Directorate. The set was developed to ensure that the administrative authority has all material needed to review this document, and it is updated with every document submitted to the administrative authority. Documents previously submitted to the administrative authority are not included.

LANL (Los Alamos National Laboratory), May 22, 1998. “Hydrogeologic Workplan,” Los Alamos National Laboratory document LA-UR-01-6511, Los Alamos, New Mexico. (LANL 1998, 059599)

LANL (Los Alamos National Laboratory), September 2005. “Investigation Report for Material Disposal Area G, Consolidated Unit 54-013(b)-99, at Technical Area 54,” Los Alamos National Laboratory document LA-UR-05-6398, Los Alamos, New Mexico. (LANL 2005, 090513)

LANL (Los Alamos National Laboratory), October 2007. “Corrective Measures Evaluation Plan for Material Disposal Area G at Technical Area 54, Revision 2,” Los Alamos National Laboratory document LA-UR-07-6882, Los Alamos, New Mexico. (LANL 2007, 098608)

NMED (New Mexico Environment Department), June 2006. “Technical Background Document for Development of Soil Screening Levels, Revision 4.0, Volume 1, Tier 1: Soil Screening Guidance Technical Background Document,” New Mexico Environment Department, Hazardous Waste Bureau and Ground Water Quality Bureau Voluntary Remediation Program, Santa Fe, New Mexico. (NMED 2006, 092513)

Rogers, M.A., June 1977. “History and Environmental Setting of LASL Near-Surface Land Disposal Facilities for Radioactive Wastes (Areas A, B, C, D, E, F, G, and T),” Vol. I, Los Alamos Scientific Laboratory report LA-6848-MS, Los Alamos, New Mexico. (Rogers 1977, 005707)

Rogers, M.A., June 1977. “History and Environmental Setting of LASL Near-Surface Land Disposal Facilities for Radioactive Wastes (Areas A, B, C, D, E, F, G, and T),” Vol. II, Los Alamos Scientific Laboratory report LA-6848-MS, Los Alamos, New Mexico. (Rogers 1977, 005708)

7.2 Map Data Sources

Data sources used in original figures created for this report are described below and identified by legend title.

Legend Item	Data Source
Disposal pit	Waste Storage Features; Los Alamos National Laboratory, Environment and Remediation Support Services Division, GIS/Geotechnical Services Group, EP2007-0032; 1:2,500 Scale Data; 13 April 2007.
Disposal shaft	Waste Storage Features; Los Alamos National Laboratory, Environment and Remediation Support Services Division, GIS/Geotechnical Services Group, EP2007-0032; 1:2,500 Scale Data; 13 April 2007.
Elevation contour	Hypsography, 10, 20, & 100 Foot Contour Intervals; Los Alamos National Laboratory, ENV Environmental Remediation and Surveillance Program; 1991.

Legend Item	Data Source
Fence	Security and Industrial Fences and Gates; Los Alamos National Laboratory, KSL Site Support Services, Planning, Locating and Mapping Section; 06 January 2004; as published 10 September 2007.
LANL boundary	LANL Areas Used and Occupied; Los Alamos National Laboratory, Site Planning & Project Initiation Group, Infrastructure Planning Division; 19 September 2007.
Material disposal area	Materials Disposal Areas; Los Alamos National Laboratory, ENV Environmental Remediation and Surveillance Program; ER2004-0221; 1:2,500 Scale Data; 23 April 2004.
Paved road	Paved Road Arcs; Los Alamos National Laboratory, KSL Site Support Services, Planning, Locating and Mapping Section; 06 January 2004; as published 10 September 2007.
Structure	Structures; Los Alamos National Laboratory, KSL Site Support Services, Planning, Locating and Mapping Section; 06 January 2004; as published 10 September 2007.
TA boundary	Technical Area Boundaries; Los Alamos National Laboratory, Site Planning & Project Initiation Group, Infrastructure Planning Division; 19 September 2007.
Unpaved road	Dirt Road Arcs; Los Alamos National Laboratory, KSL Site Support Services, Planning, Locating and Mapping Section; 06 January 2004; as published 10 September 2007.
Vapor monitoring well	Point Feature Locations of the Environmental Restoration Project Database; Los Alamos National Laboratory, Environment and Remediation Support Services Division, EP2007-0754; 30 November 2007.

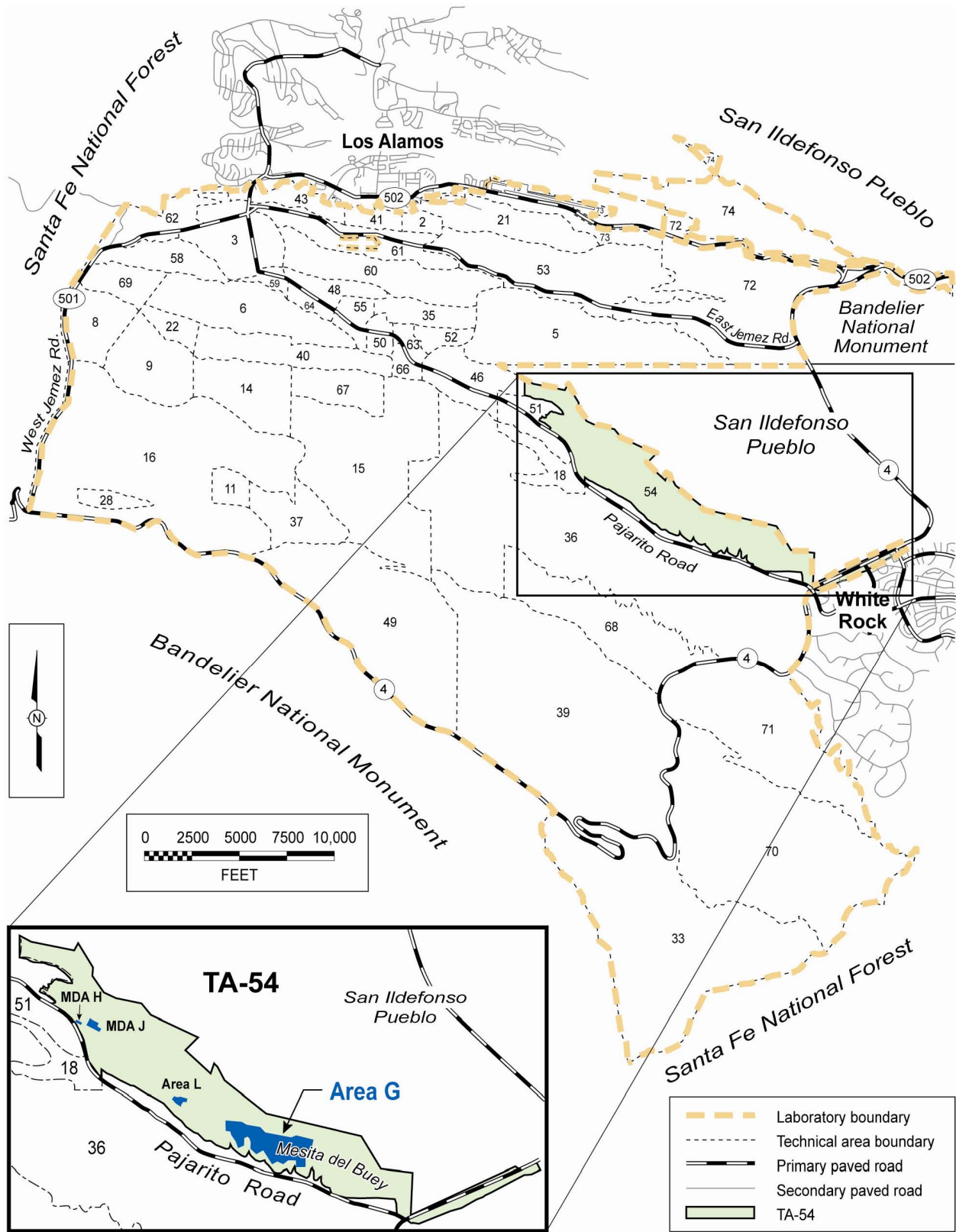


Figure 1.0-1 Location of Area G in TA-54 with respect to Laboratory technical areas and surrounding land holdings

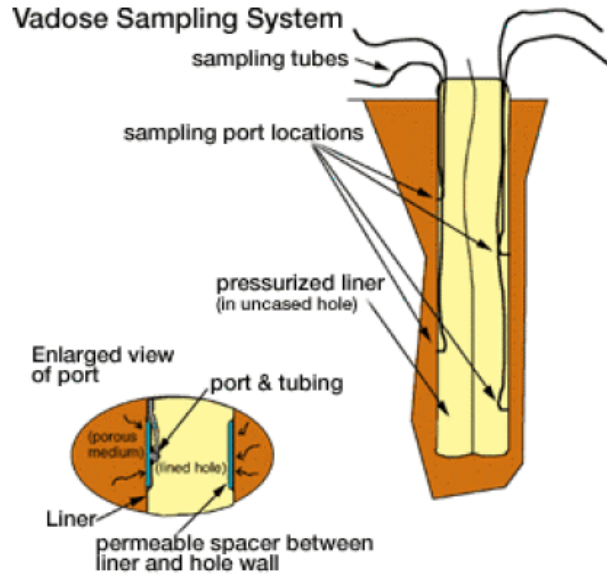


Figure 2.0-1 SEAMIST membrane liner system for vadose zone pore-gas sampling

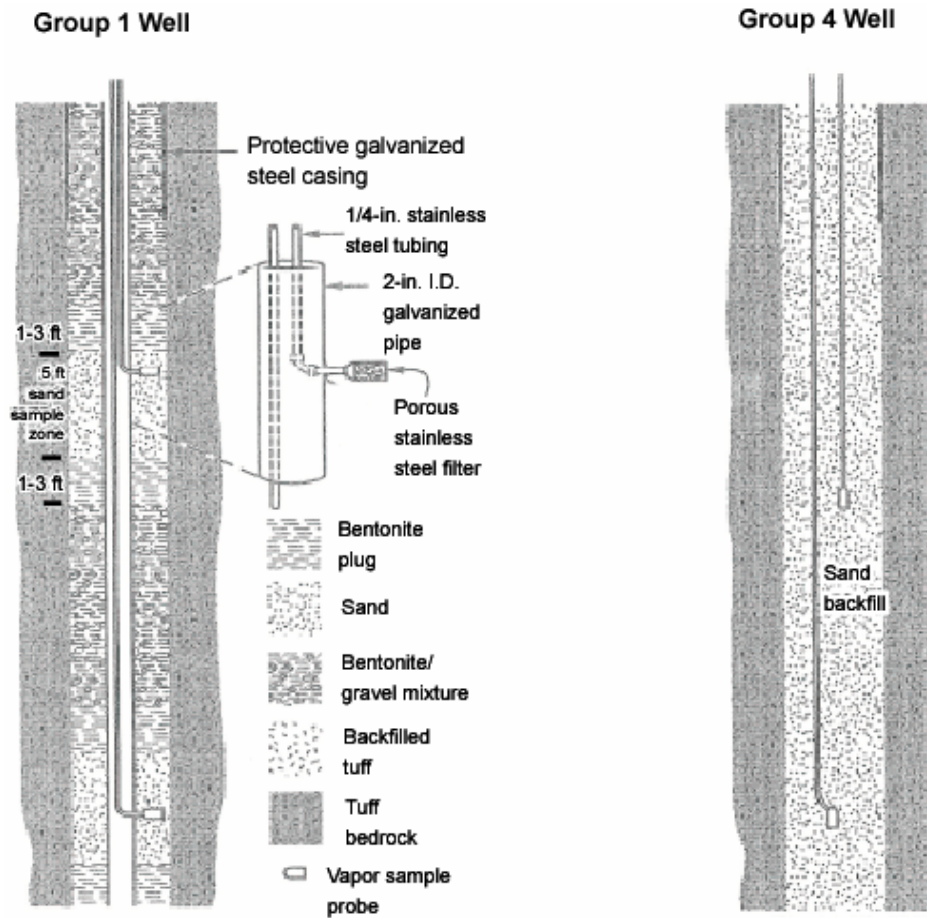


Figure 2.0-2 Construction details of instrumented boreholes for vadose zone pore-gas sampling

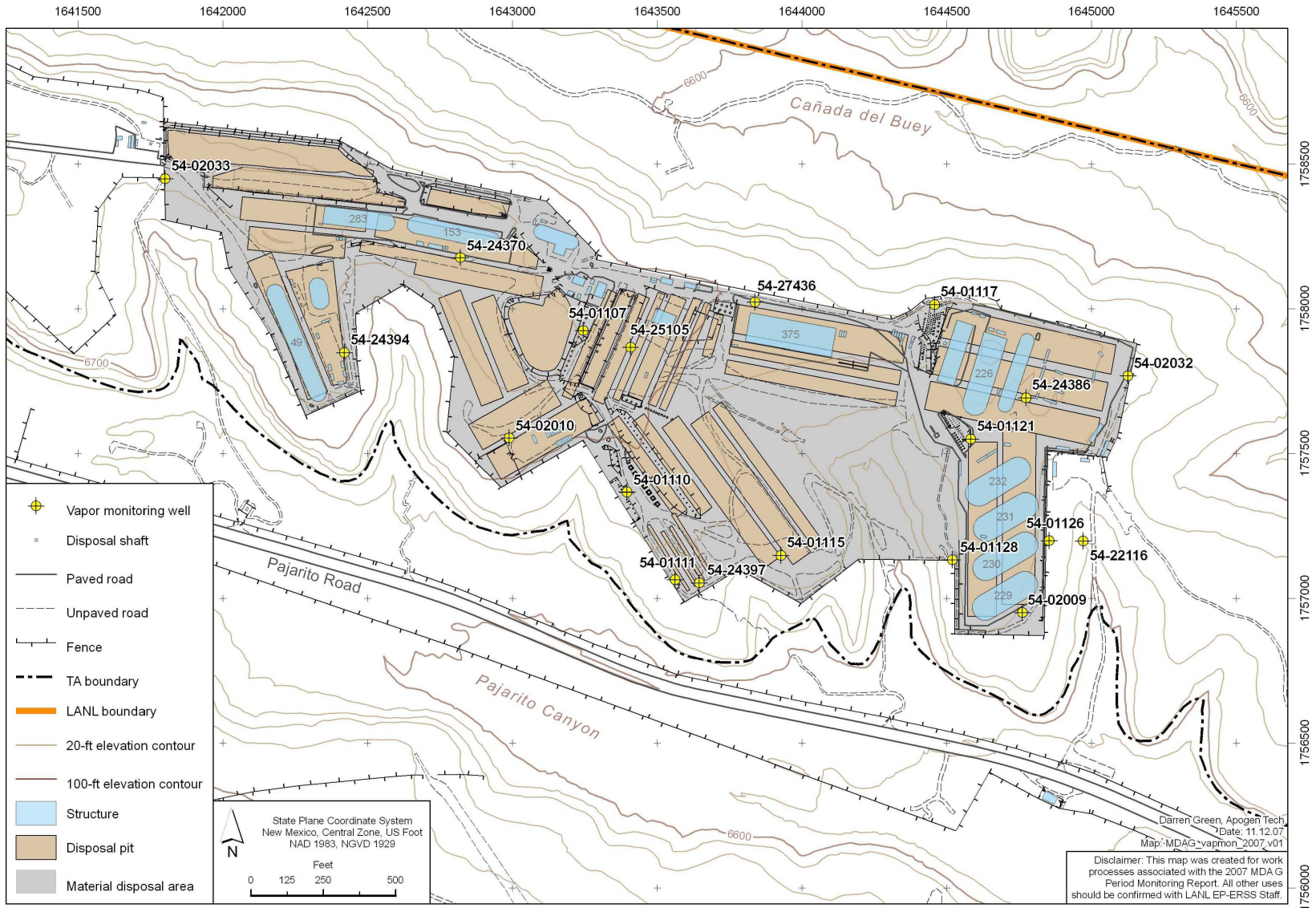


Figure 2.0-3 Locations of MDA G boreholes for pore-gas sampling

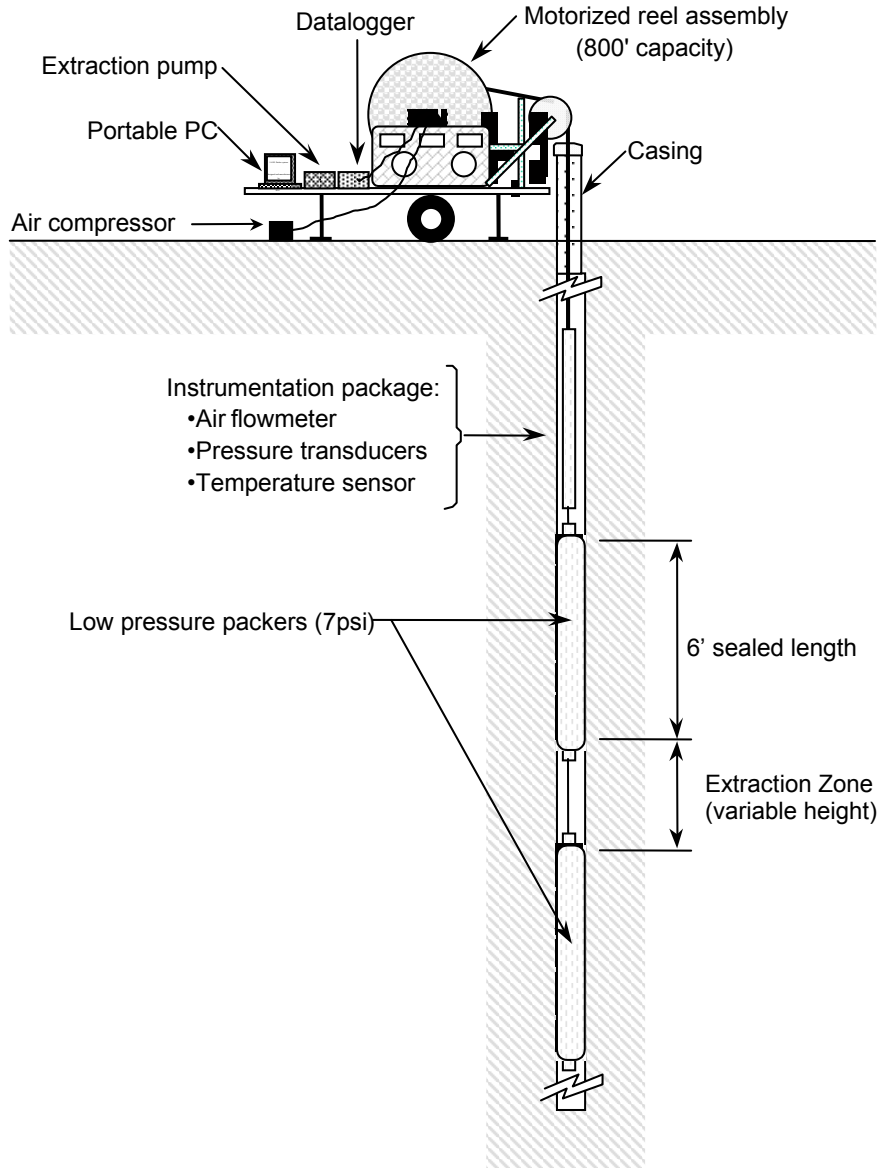


Figure 2.0-4 Packer system for vadose zone pore-gas sampling

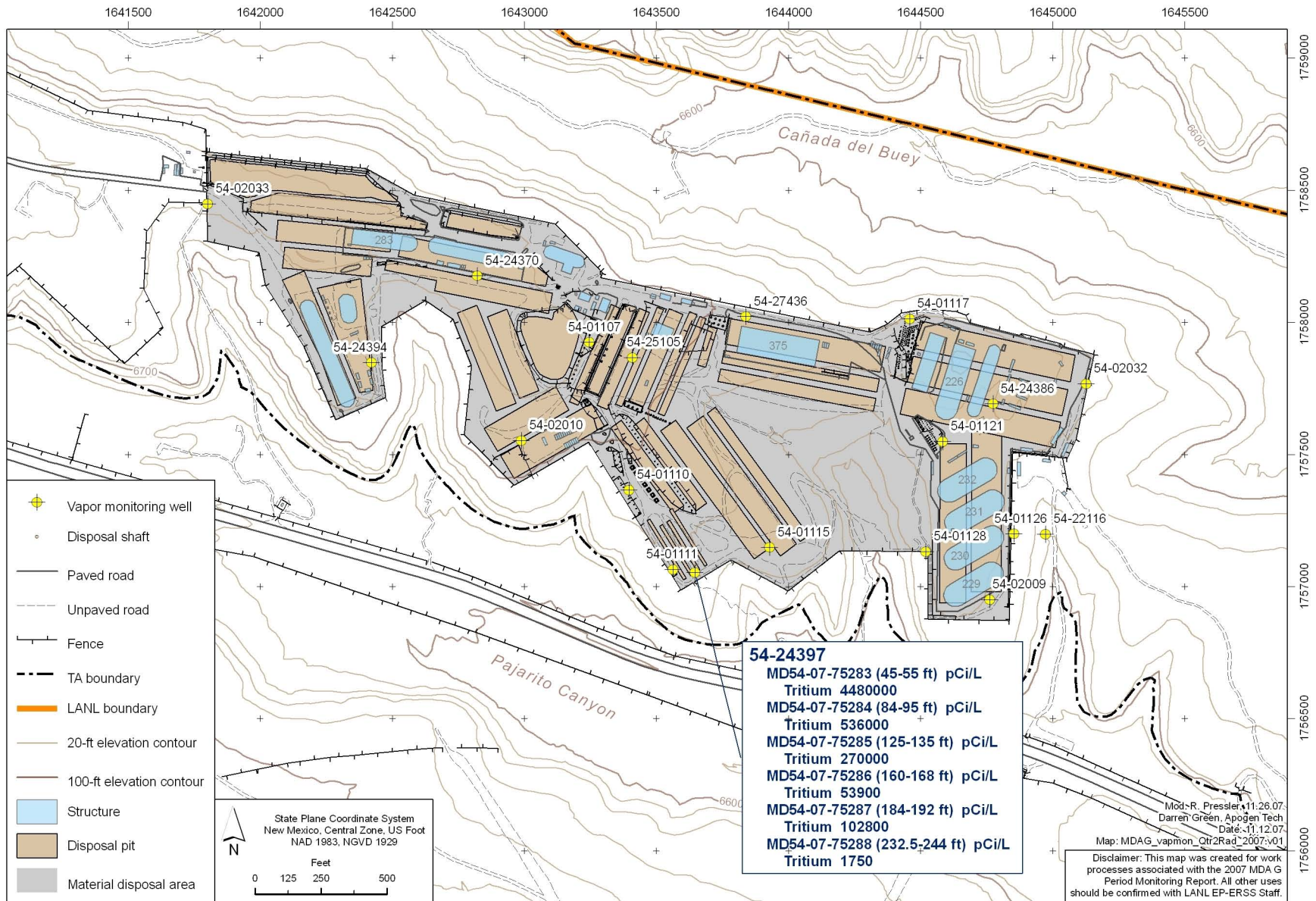


Figure 5.0-1 Tritium (pCi/L) detected in subsurface pore gas at MDA G during second quarter FY2007

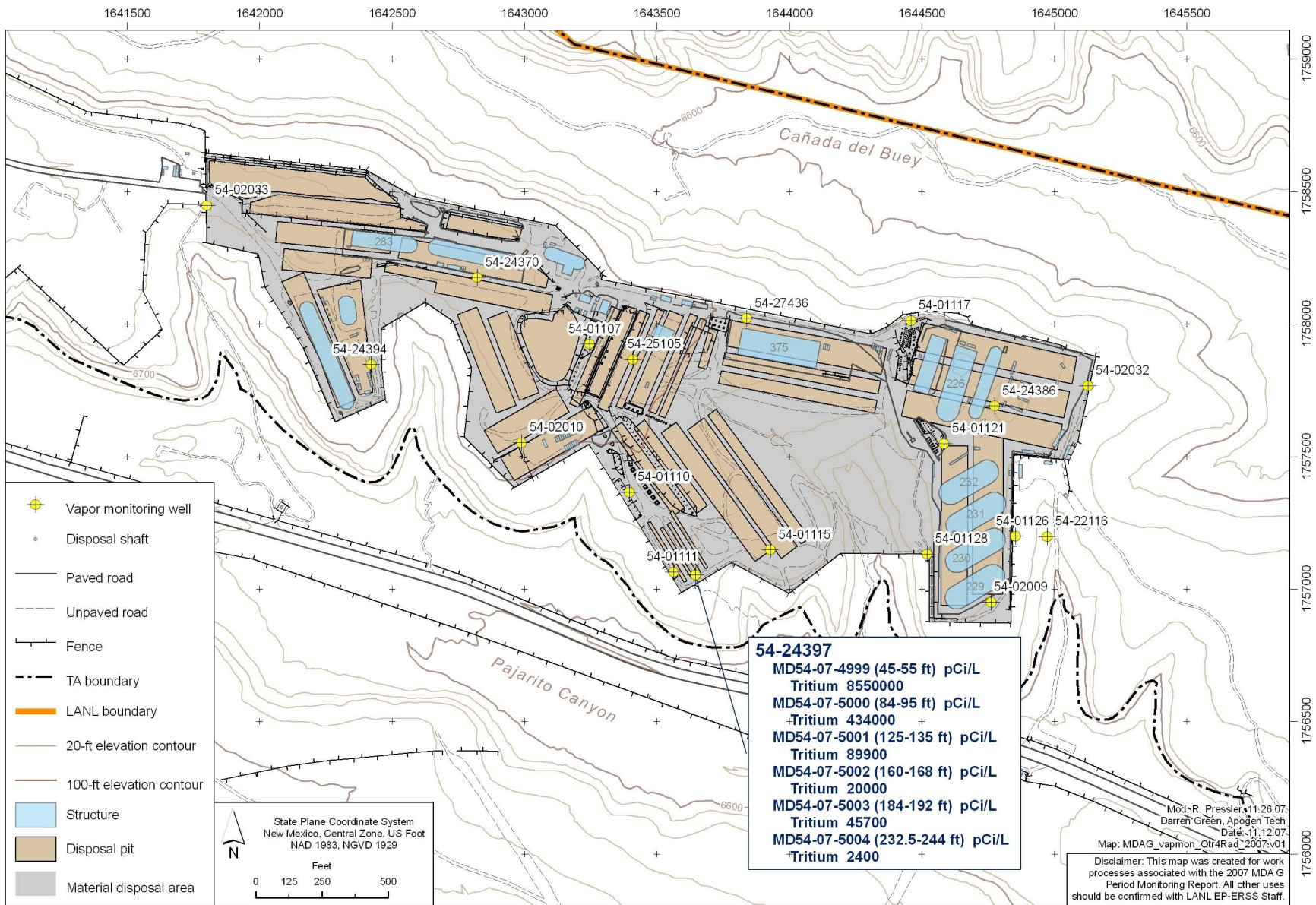


Figure 5.0-2 Tritium (pCi/L) detected in subsurface pore gas at MDA G during fourth quarter FY2007

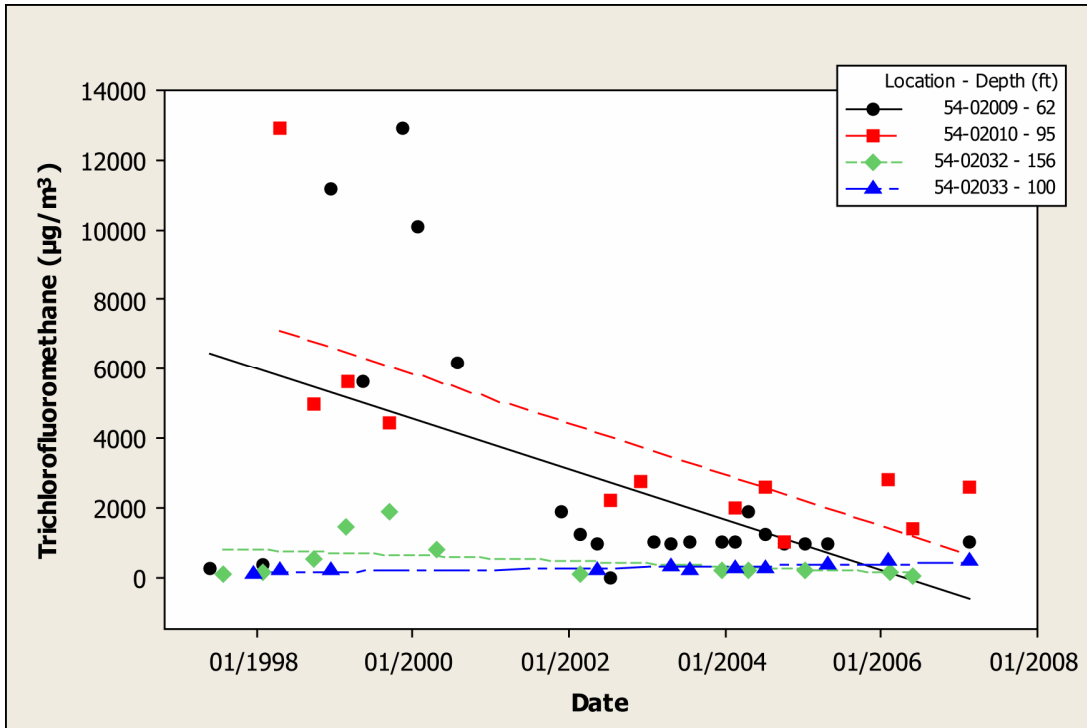


Figure 5.0-3 Trends in concentration of Freon 11 at MDA G from SUMMA analyses

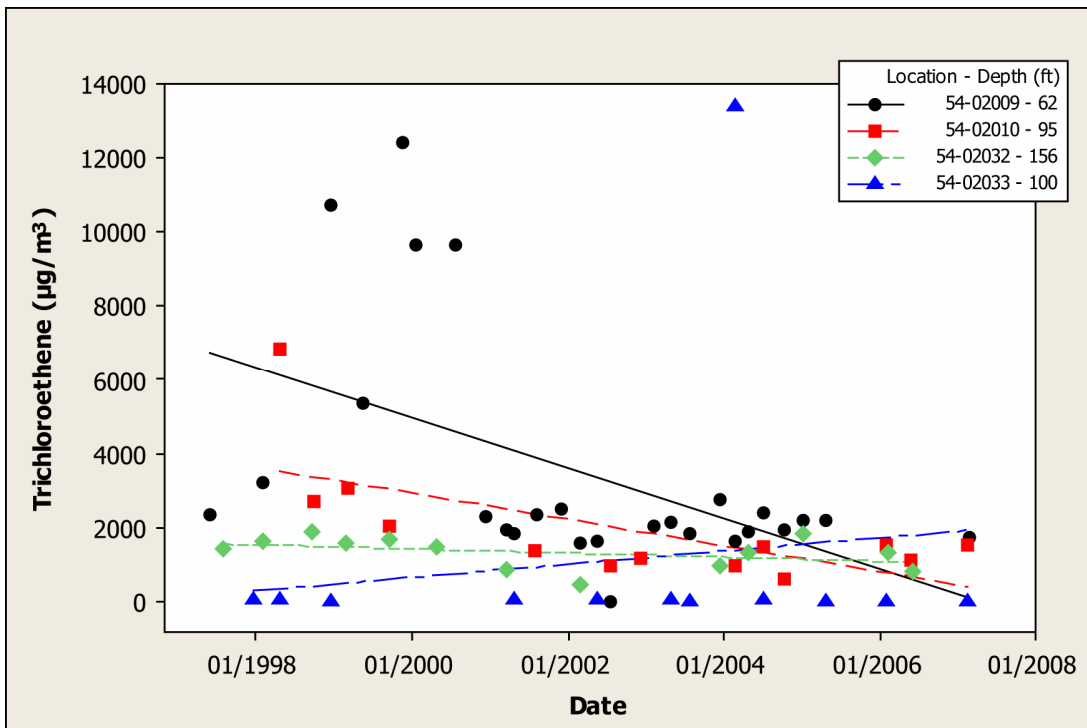


Figure 5.0-4 Trends in concentration of TCE at MDA G from SUMMA analyses

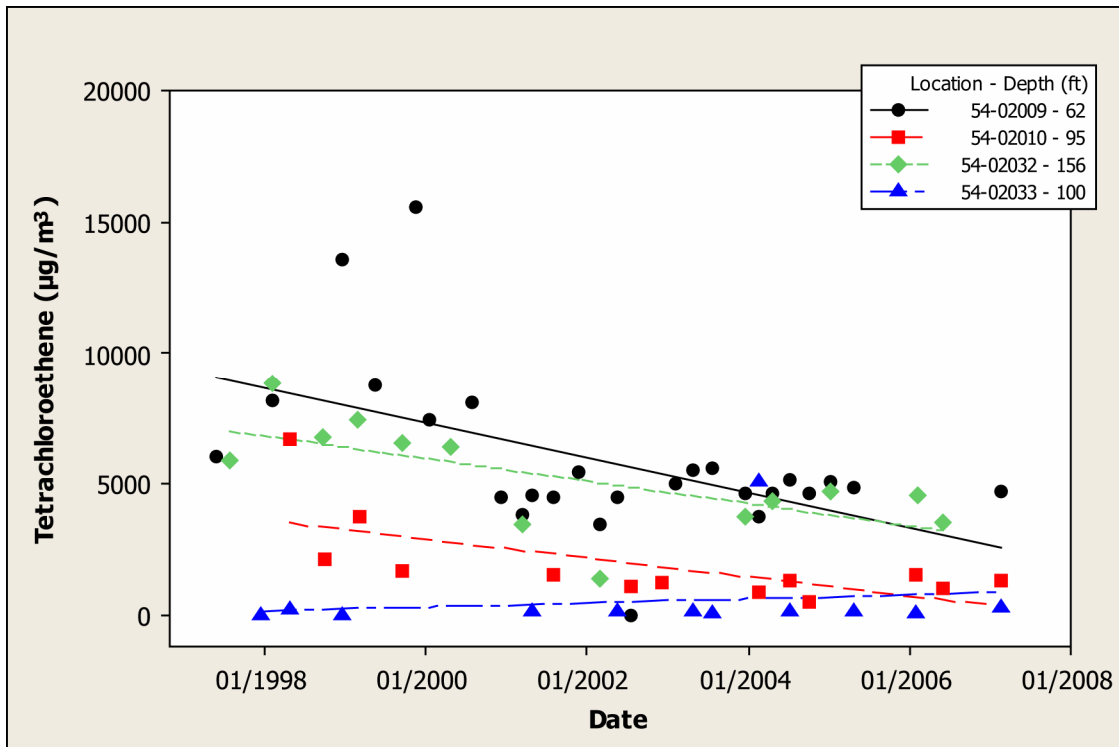


Figure 5.0-5 Trends in concentration of PCE at MDA G from SUMMA analyses

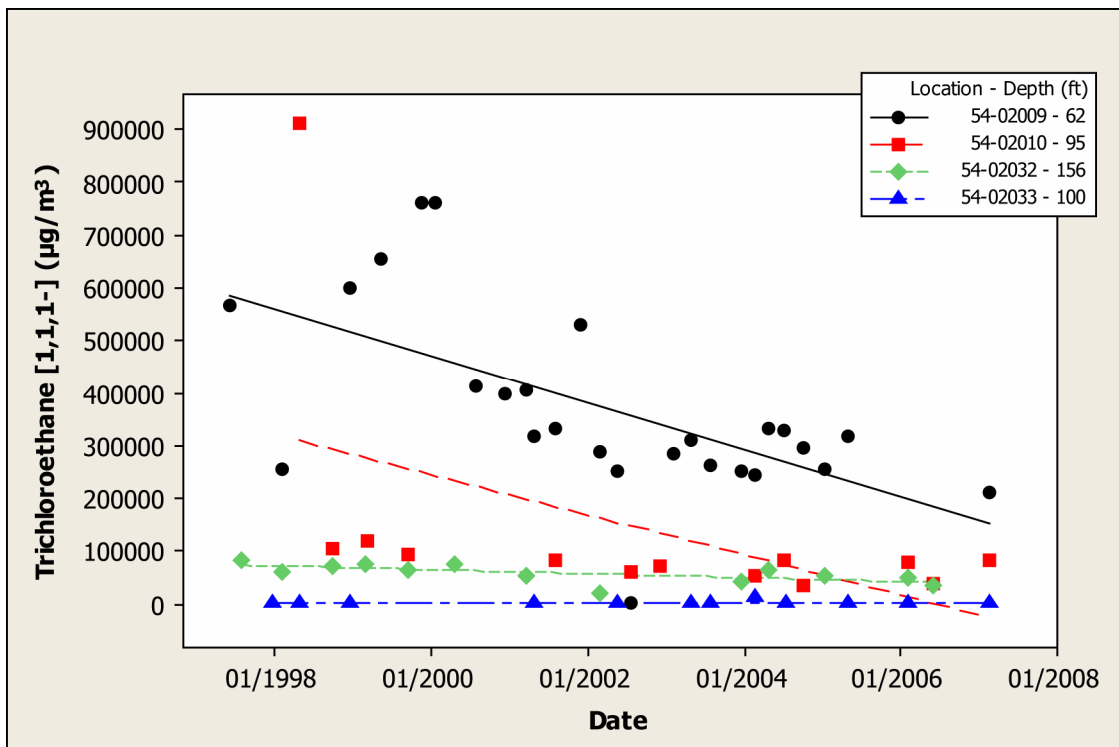


Figure 5.0-6 Trends in concentration of TCA at MDA G from SUMMA analyses

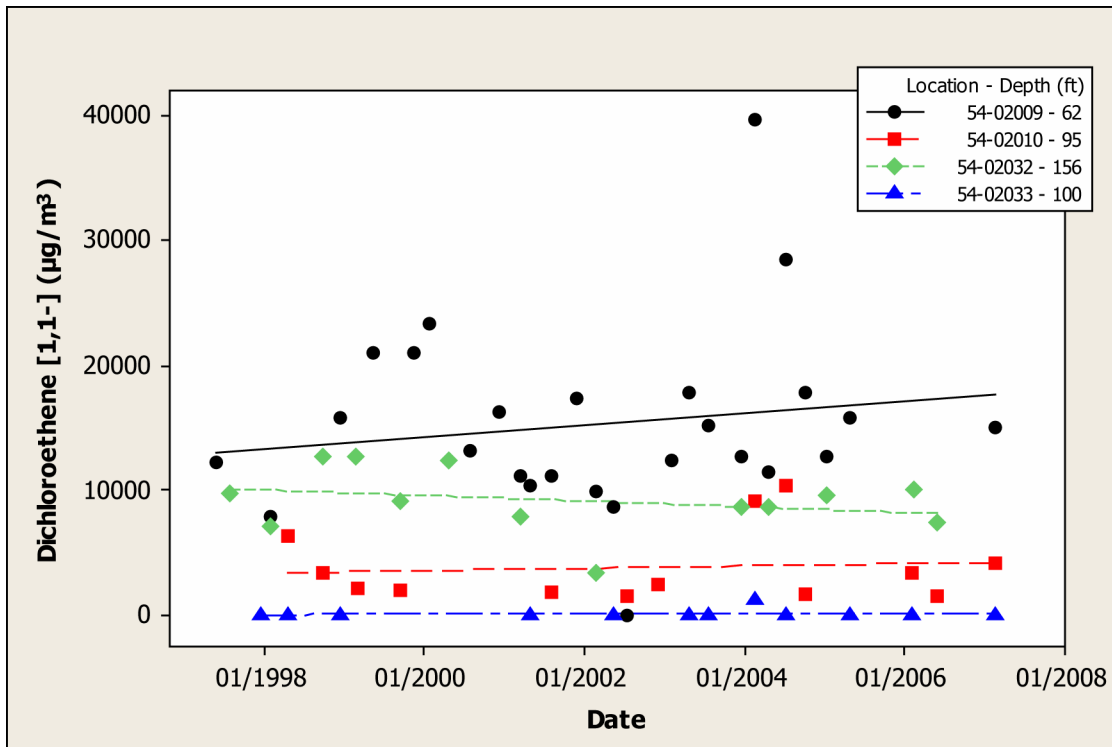


Figure 5.0-7 Trends in concentration of dichloroethene[1,1-] at MDA G from SUMMA analyses

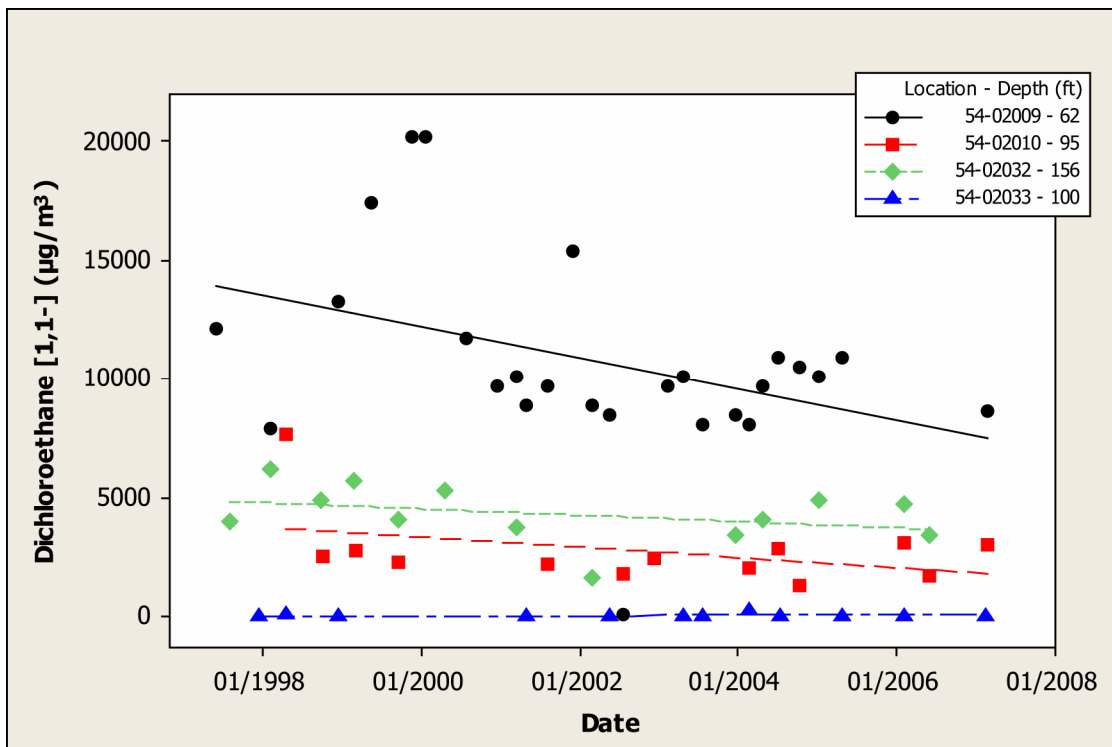


Figure 5.0-8 Trends in concentration of dichloroethane[1,1-] at MDA G from SUMMA analyses

**Table 2.0-1
MDA G Subsurface Vapor-Monitoring Locations**

Location ID	Borehole Construction Type	SUMMA/Tritium Sampling Period	Screening Sampling Period	Depth Below Surface (Borehole Length) of Instrumented Sampling Ports (ft)
54-01107	SEAMIST	— ^a	2Q07	20, 44.5, 56.5, 74, 91, 100
54-01110	SEAMIST	—	2Q07	20, 48, 60, 70, 85, 90
54-01111	SEAMIST	—	2Q07	20, 39.5, 50, 70, 78, 100, 139
54-01115 ^b	SEAMIST	—	2Q07	7.9 (15), 26.5 (50), 40.8 (77), 53 (100), 63.6 (120), 68.9 (130)
54-01117	SEAMIST	—	2Q07	20, 31.5, 55, 73, 82, 85
54-01121	SEAMIST	—	2Q07	20, 26, 61.5, 70, 76, 98, 121
54-01126 ^b	SEAMIST	—	2Q07	7.5 (15), 17.5 (35), 28.5 (57), 35 (70), 42.5 (85), 49.5 (99)
54-01128 ^b	SEAMIST	—	2Q07	7.5 (15), 15 (30), 20 (40), 30 (60), 39 (78)
54-02009	Group 1	2Q07	2Q07	37, 62 , 92
54-02010	Group 1	2Q07	2Q07	30, 53, 95
54-02032	Group 4	2Q07	2Q07	20, 60, 100, 130 , 156
54-02033	Group 4	2Q07	2Q07	20, 60, 100 , 160, 200, 220, 260, 277
54-22116	SEAMIST	—	—	28, 46, 64, 82, 100, 118, 136, 154, 172, 190, 208, 226, 244, 262, 280
54-27436	Group 1	2Q07/4Q07	2Q07/4Q07	40, 80, 120, 160, 168, 178
54-24370	Group 1	2Q07/4Q07	2Q07/4Q07	40, 80, 120, 173, 200, 233
54-24386	Group 1	2Q07/4Q07	2Q07/4Q07	40, 83, 117, 135, 195
54-24394	Group 1	2Q07/4Q07	2Q07/4Q07	50, 100, 150, 192, 245, 300
54-24397	Group 1	2Q07/4Q07	2Q07/4Q07	50, 90, 130, 165, 188, 239
54-25105 ^c	Open	2Q07	2Q07	485–701

Note: Bolded depths denote locations of SUMMA sample collection in FY2007.

^a — = Monitoring not requested.

^b Angled borehole: depth below surface borehole length (in parentheses).

^c Open borehole.

**Table 4.0-1
CO₂ Screening Results Using a Landtec GEM-500 PID**

Location ID	Depth (ft bgs) [Length (ft)]	Q2 FY2007 Result (µg/m ³)	Q4FY2007 Result (µg/m ³)
54-01107	20	2.7	— ^a
54-01107	44.5	3	—
54-01107	56.5	2.9	—
54-01107	74	2.8	—
54-01107	91	2	—
54-01107	100	2.4	—
54-01110	20	0.4	—
54-01110	48	0.6	—
54-01110	60	0.6	—
54-01110	70	0.7	—
54-01110	85	0.7	—
54-01110	90	0.7	—
54-01111	20	0.3	—
54-01111	39.5	0.4	—
54-01111	50	0.4	—
54-01111	70	0.4	—
54-01111	78	0.4	—
54-01111	100	0.5	—
54-01111	139	0.5	—
54-01115	7.9 [15]	1	—
54-01115	26.5 [50]	2.5	—
54-01115	40.8 [77]	3.2	—
54-01115	53 [100]	3.5	—
54-01115	63.6 [120]	3.6	—
54-01115	68.9 [130]	3.6	—
54-01117	20	0.5	—
54-01117	31.5	0.6	—
54-01117	55	0.8	—
54-01117	73	0.9	—
54-01117	82	0.9	—
54-01117	85	0.9	—
54-01121	20	2	—
54-01121	26	2.1	—
54-01121	61.5	2.6	—
54-01121	70	2.6	—
54-01121	76	2.6	—
54-01121	98	2.8	—

Table 4.0-1 (continued)

Location ID	Depth (ft bgs) [Length (ft)]	Q2 FY2007 Result ($\mu\text{g}/\text{m}^3$)	Q4FY2007 Result ($\mu\text{g}/\text{m}^3$)
54-01121	121	2.9	—
54-01126	7.5 [15]	ba	—
54-01126	17.5 [35]	b	—
54-01126	28.5 [57]	b	—
54-01126	35 [70]	b	—
54-01126	42.5 [85]	b	—
54-01126	49.5 [99]	b	—
54-01128	7.5 [15]	1	—
54-01128	15 [30]	1.8	—
54-01128	20 [40]	2.5	—
54-01128	30 [60]	3.1	—
54-01128	39 [78]	3.4	—
54-02009	37	1.4	—
54-02009	62	1.4	—
54-02009	79	1.3	—
54-02009	92	1.2	—
54-02010	30	2.9	—
54-02010	53	3.7	—
54-02010	95	3.3	—
54-02032	20	0.8	—
54-02032	60	1	—
54-02032	100	1.2	—
54-02032	130	1	—
54-02032	156	0.8	—
54-02033	20	0.5	—
54-02033	60	0.7	—
54-02033	100	0.8	—
54-02033	160	0.6	—
54-02033	200	0.2	—
54-02033	220	0.2	—
54-02033	260	0	—
54-02033	277	0	—
54-24370	40	11.8	12.9
54-24370	80	11.6	12.8
54-24370	120	8.1	9.1
54-24370	173	4.5	6.8
54-24370	200	3.8	6.3
54-24370	233	0.3	0.7

Table 4.0-1 (continued)

Location ID	Depth (ft bgs) [Length (ft)]	Q2 FY2007 Result ($\mu\text{g}/\text{m}^3$)	Q4FY2007 Result ($\mu\text{g}/\text{m}^3$)
54-24386	40	6.9	8
54-24386	83	4.3	5
54-24386	117	2.4	4
54-24386	135	2.9	3.6
54-24386	195	0.2	0.2
54-24394	50	b	3
54-24394	100	b	2.9
54-24394	150	b	2.6
54-24394	192	b	1.9
54-24394	245	b	1.7
54-24394	300	b	0.2
54-25105	485	0	—
54-27436	45	b	1.4
54-27436	70	b	1.3
54-27436	115	b	1.1
54-27436	163	b	0.8
54-27436	185	b	0.3

Note: For angled boreholes, the depth below surface borehole length is given in brackets.

^a — = Monitoring not requested.

^b Landtec not available for field measurements or instrumented borehole not functioning for pore-gas sample collection.

**Table 4.0-2
O₂ Screening Results Using a Landtec GEM-500 PID**

Location ID	Depth (ft bgs) [Length (ft)]	Q2 FY2007 Result ($\mu\text{g}/\text{m}^3$)	Q4FY2007 Result ($\mu\text{g}/\text{m}^3$)
54-01107	20	18	— ^a
54-01107	44.5	17.6	—
54-01107	56.5	17.8	—
54-01107	74	17.9	—
54-01107	91	18.6	—
54-01107	100	18.3	—
54-01110	20	20.3	—
54-01110	48	20.2	—
54-01110	60	20.1	—
54-01110	70	20.1	—
54-01110	85	20.1	—
54-01110	90	20.1	—
54-01111	20	20	—
54-01111	39.5	20	—
54-01111	50	20	—
54-01111	70	20	—
54-01111	78	20	—
54-01111	100	20	—
54-01111	139	20	—
54-01115	7.9 [15]	20.1	—
54-01115	26.5 [50]	18.9	—
54-01115	40.8 [77]	18.2	—
54-01115	53 [100]	17.8	—
54-01115	63.6 [120]	17.5	—
54-01115	68.9 [130]	17.9	—
54-01117	20	20.2	—
54-01117	31.5	20	—
54-01117	55	19.8	—
54-01117	73	18.8	—
54-01117	82	19.8	—
54-01117	85	19.8	—
54-01121	20	18.4	—
54-01121	26	18.1	—
54-01121	61.5	17.4	—
54-01121	70	17.2	—
54-01121	76	17.3	—
54-01121	98	17.1	—

Table 4.0-2 (continued)

Location ID	Depth (ft bgs) [Length (ft)]	Q2 FY2007 Result ($\mu\text{g}/\text{m}^3$)	Q4FY2007 Result ($\mu\text{g}/\text{m}^3$)
54-01121	121	17	—
54-01126	7.5 [15]	b	—
54-01126	17.5 [35]	b	—
54-01126	28.5 [57]	b	—
54-01126	35 [70]	b	—
54-01126	42.5 [85]	b	—
54-01126	49.5 [99]	b	—
54-01128	7.5 [15]	19.2	—
54-01128	15 [30]	18.5	—
54-01128	20 [40]	17.3	—
54-01128	30 [60]	16.6	—
54-01128	39 [78]	16.3	—
54-02009	37	18.9	—
54-02009	62	18.8	—
54-02009	79	18.9	—
54-02009	92	18.8	—
54-02010	30	17.3	—
54-02010	53	16.1	—
54-02010	95	16.9	—
54-02032	20	20.3	—
54-02032	60	20.1	—
54-02032	100	19.9	—
54-02032	130	20.2	—
54-02032	156	20.4	—
54-02033	20	20.5	—
54-02033	60	20.1	—
54-02033	100	20	—
54-02033	160	20.1	—
54-02033	200	20.5	—
54-02033	220	20.6	—
54-02033	260	20.9	—
54-02033	277	20.9	—
54-24370	40	7.7	4.9
54-24370	80	7.5	4.9
54-24370	120	11.4	7.7
54-24370	173	14.8	12.8
54-24370	200	8.4	13.4
54-24370	233	20.4	19.6

Table 4.0-2 (continued)

Location ID	Depth (ft bgs) [Length (ft)]	Q2 FY2007 Result ($\mu\text{g}/\text{m}^3$)	Q4FY2007 Result ($\mu\text{g}/\text{m}^3$)
54-24386	40	10.4	7.2
54-24386	83	14.4	13.3
54-24386	117	16.8	15
54-24386	135	16.8	15.6
54-24386	195	20.2	20.1
54-24394	50	b	17.5
54-24394	100	b	17.6
54-24394	150	b	17.6
54-24394	192	b	18.5
54-24394	245	b	18.8
54-24394	300	b	20.1
54-25105	485	20.6	—
54-27436	45	b	19.1
54-27436	70	b	19.2
54-27436	115	b	19.5
54-27436	163	b	19.7
54-27436	185	b	20.1

Note: For angled boreholes, the depth below surface borehole length is given in brackets.

^a — = Monitoring not requested.

^b Landtec not available for field measurements or instrumented borehole not functioning for pore-gas sample collection.

**Table 4.0-3
TCA Screening Results Using a B&K Multigas Instrument**

Location ID	Depth (ft bgs) [Length (ft)]	Q2 FY2007 Result ($\mu\text{g}/\text{m}^3$)	Q4FY2007 Result ($\mu\text{g}/\text{m}^3$)
54-01107	20	-19100 ^a	— ^b
54-01107	44.5	15800	—
54-01107	56.5	12100	—
54-01107	74	10900	—
54-01107	91	4250	—
54-01107	100	1030	—
54-01110	20	18300	—
54-01110	48	33100	—
54-01110	60	39900	—
54-01110	70	41200	—
54-01110	85	41700	—
54-01110	90	41800	—
54-01111	20	26600	—
54-01111	39.5	42800	—
54-01111	50	48600	—
54-01111	70	50800	—
54-01111	78	44000	—
54-01111	100	36400	—
54-01111	139	30300	—
54-01115	7.9 [15]	16600	—
54-01115	26.5 [50]	30300	—
54-01115	40.8 [77]	30900	—
54-01115	53 [100]	29400	—
54-01115	63.6 [120]	34800	—
54-01115	68.9 [130]	37400	—
54-01117	20	130000	—
54-01117	31.5	237000	—
54-01117	55	376000	—
54-01117	73	429000	—
54-01117	82	451000	—
54-01117	85	472000	—
54-01121	20	217000	—
54-01121	26	258000	—
54-01121	61.5	264000	—
54-01121	70	333000	—
54-01121	76	350000	—
54-01121	98	378000	—

Table 4.0-3 (continued)

Location ID	Depth (ft bgs) [Length (ft)]	Q2 FY2007 Result ($\mu\text{g}/\text{m}^3$)	Q4FY2007 Result ($\mu\text{g}/\text{m}^3$)
54-01121	121	396000	—
54-01126	7.5 [15]	105000	—
54-01126	17.5 [35]	198000	—
54-01126	28.5 [57]	376000	—
54-01126	35 [70]	436000	—
54-01126	42.5 [85]	448000	—
54-01126	49.5 [99]	531000	—
54-01128	7.5 [15]	105000	—
54-01128	15 [30]	168000	—
54-01128	20 [40]	231000	—
54-01128	30 [60]	^c	—
54-01128	39 [78]	368000	—
54-02009	37	260000	—
54-02009	62	292000	—
54-02009	79	^c	—
54-02009	92	300000	—
54-02010	30	107000	—
54-02010	53	^c	—
54-02010	95	131000	—
54-02032	20	38900	—
54-02032	60	57800	—
54-02032	100	47200	—
54-02032	130	77400	—
54-02032	156	58300	—
54-02033	20	3580	—
54-02033	60	6650	—
54-02033	100	9870	—
54-02033	160	5780	—
54-02033	200	7740	—
54-02033	220	4700	—
54-02033	260	3090	—
54-02033	277	2100	—
54-24370	40	-633000 ^a	155000
54-24370	80	-409000 ^a	91100
54-24370	120	-191000 ^a	-98200 ^a
54-24370	173	-27300 ^a	-180000 ^a
54-24370	200	-33800 ^a	-229000 ^a
54-24370	233	25500	-49600 ^a

Table 4.0-3 (continued)

Location ID	Depth (ft bgs) [Length (ft)]	Q2 FY2007 Result ($\mu\text{g}/\text{m}^3$)	Q4FY2007 Result ($\mu\text{g}/\text{m}^3$)
54-24386	40	470000	693000
54-24386	83	578000	310000
54-24386	117	267000	397000
54-24386	135	430000	393000
54-24386	195	26700	28900
54-24394	50	-21300 ^a	-174000 ^a
54-24394	100	32200	-131000 ^a
54-24394	150	24400	-98200 ^a
54-24394	192	18300	-17400 ^a
54-24394	245	11800	-19600 ^a
54-24394	300	-3230	-14700 ^a
54-25105	485	1510	—
54-27436	45	25200	-76300 ^a
54-27436	70	29000	-60000 ^a
54-27436	115	23400	-53400 ^a
54-27436	163	18100	-37600 ^a
54-27436	185	4040	-20700 ^a

Note: For angled boreholes, the depth below surface borehole length is given in brackets.

^a Interference observed in field measurement.

^b — = Monitoring not requested.

^c Instrumented borehole not functioning for pore-gas sample collection.

**Table 4.0-4
PCE Screening Results Using a B&K Multigas Instrument**

Location ID	Depth (ft bgs) [Length (ft)]	Q2 FY2007 Result ($\mu\text{g}/\text{m}^3$)	Q4FY2007 Result ($\mu\text{g}/\text{m}^3$)
54-01107	20	12600	— ^a
54-01107	44.5	10300	—
54-01107	56.5	11800	—
54-01107	74	12500	—
54-01107	91	6710	—
54-01107	100	12700	—
54-01110	20	1080	—
54-01110	48	4010	—
54-01110	60	4480	—
54-01110	70	4750	—
54-01110	85	4940	—
54-01110	90	4920	—
54-01111	20	7660	—
54-01111	39.5	10800	—
54-01111	50	11200	—
54-01111	70	9490	—
54-01111	78	8540	—
54-01111	100	6280	—
54-01111	139	6780	—
54-01115	7.9 [15]	1950	—
54-01115	26.5 [50]	7660	—
54-01115	40.8 [77]	16800	—
54-01115	53 [100]	18500	—
54-01115	63.6 [120]	19900	—
54-01115	68.9 [130]	21800	—
54-01117	20	6430	—
54-01117	31.5	11600	—
54-01117	55	12900	—
54-01117	73	16700	—
54-01117	82	17600	—
54-01117	85	18200	—
54-01121	20	8270	—
54-01121	26	12300	—
54-01121	61.5	14400	—
54-01121	70	19300	—
54-01121	76	21600	—
54-01121	98	25700	—

Table 4.0-4 (continued)

Location ID	Depth (ft bgs) [Length (ft)]	Q2 FY2007 Result ($\mu\text{g}/\text{m}^3$)	Q4FY2007 Result ($\mu\text{g}/\text{m}^3$)
54-01121	121	27200	—
54-01126	7.5 [15]	4170	—
54-01126	17.5 [35]	8470	—
54-01126	28.5 [57]	18000	—
54-01126	35 [70]	23600	—
54-01126	42.5 [85]	27700	—
54-01126	49.5 [99]	33100	—
54-01128	7.5 [15]	2700	—
54-01128	15 [30]	3330	—
54-01128	20 [40]	5610	—
54-01128	30 [60]	b	—
54-01128	39 [78]	11300	—
54-02009	37	6250	—
54-02009	62	7320	—
54-02009	79	b	—
54-02009	92	10100	—
54-02010	30	6780	—
54-02010	53	b	—
54-02010	95	15900	—
54-02032	20	3360	—
54-02032	60	2550	—
54-02032	100	4450	—
54-02032	130	8610	—
54-02032	156	3970	—
54-02033	20	1060	—
54-02033	60	1310	—
54-02033	100	840	—
54-02033	160	1540	—
54-02033	200	299	—
54-02033	220	500	—
54-02033	260	350	—
54-02033	277	415	—
54-24370	40	99600	82000
54-24370	80	83400	102000
54-24370	120	80000	99600
54-24370	173	57200	90100
54-24370	200	71800	86100
54-24370	233	13400	9560

Table 4.0-4 (continued)

Location ID	Depth (ft bgs) [Length (ft)]	Q2 FY2007 Result ($\mu\text{g}/\text{m}^3$)	Q4FY2007 Result ($\mu\text{g}/\text{m}^3$)
54-24386	40	22400	30900
54-24386	83	24100	22600
54-24386	117	15900	33900
54-24386	135	26400	35800
54-24386	195	613	3200
54-24394	50	107000	125000
54-24394	100	43800	61700
54-24394	150	24400	28900
54-24394	192	18800	17500
54-24394	245	14000	9290
54-24394	300	1650	2110
54-25105	485	346	—
54-27436	45	18200	14600
54-27436	70	14500	12700
54-27436	115	8400	7590
54-27436	163	3480	4130
54-27436	185	315	2620

Note: For angled boreholes, the depth below surface borehole length is given in brackets.

^a — = Monitoring not requested.

^b Instrumented borehole not functioning for pore-gas sample collection.

**Table 4.0-5
TCE Screening Results Using a B&K Multigas Instrument**

Location ID	Depth (ft bgs) [Length (ft)]	Q2 FY2007 Result ($\mu\text{g}/\text{m}^3$)	Q4FY2007 Result ($\mu\text{g}/\text{m}^3$)
54-01107	20	2060	— ^a
54-01107	44.5	1500	—
54-01107	56.5	585	—
54-01107	74	2290	—
54-01107	91	1830	—
54-01107	100	3090	—
54-01110	20	2960	—
54-01110	48	2500	—
54-01110	60	2320	—
54-01110	70	2860	—
54-01110	85	3180	—
54-01110	90	2840	—
54-01111	20	-166	—
54-01111	39.5	1570	—
54-01111	50	779	—
54-01111	70	2290	—
54-01111	78	1610	—
54-01111	100	1790	—
54-01111	139	2400	—
54-01115	7.9 [15]	2880	—
54-01115	26.5 [50]	3890	—
54-01115	40.8 [77]	2920	—
54-01115	53 [100]	5590	—
54-01115	63.6 [120]	4890	—
54-01115	68.9 [130]	3370	—
54-01117	20	7410	—
54-01117	31.5	9080	—
54-01117	55	13300	—
54-01117	73	11500	—
54-01117	82	11800	—
54-01117	85	11200	—
54-01121	20	6870	—
54-01121	26	9080	—
54-01121	61.5	8110	—
54-01121	70	11200	—
54-01121	76	11600	—
54-01121	98	12000	—

Table 4.0-5 (continued)

Location ID	Depth (ft bgs) [Length (ft)]	Q2 FY2007 Result ($\mu\text{g}/\text{m}^3$)	Q4FY2007 Result ($\mu\text{g}/\text{m}^3$)
54-01121	121	14000	—
54-01126	7.5 [15]	5640	—
54-01126	17.5 [35]	8380	—
54-01126	28.5 [57]	13500	—
54-01126	35 [70]	16500	—
54-01126	42.5 [85]	15400	—
54-01126	49.5 [99]	17600	—
54-01128	7.5 [15]	2500	—
54-01128	15 [30]	3700	—
54-01128	20 [40]	4100	—
54-01128	30 [60]	b	—
54-01128	39 [78]	4500	—
54-02009	37	4380	—
54-02009	62	4950	—
54-02009	79	b	—
54-02009	92	5340	—
54-02010	30	5530	—
54-02010	53	b	—
54-02010	95	4070	—
54-02032	20	3250	—
54-02032	60	4610	—
54-02032	100	2450	—
54-02032	130	4090	—
54-02032	156	2580	—
54-02033	20	2080	—
54-02033	60	2620	—
54-02033	100	3150	—
54-02033	160	2050	—
54-02033	200	2980	—
54-02033	220	2590	—
54-02033	260	1740	—
54-02033	277	2790	—
54-24370	40	22300	35800
54-24370	80	19900	38100
54-24370	120	16500	29100
54-24370	173	11900	21000
54-24370	200	11900	16800
54-24370	233	7200	3540

Table 4.0-5 (continued)

Location ID	Depth (ft bgs) [Length (ft)]	Q2 FY2007 Result ($\mu\text{g}/\text{m}^3$)	Q4FY2007 Result ($\mu\text{g}/\text{m}^3$)
54-24386	40	8380	15800
54-24386	83	9130	7630
54-24386	117	7090	11100
54-24386	135	9990	10800
54-24386	195	2580	838
54-24394	50	75700	84900
54-24394	100	30100	41700
54-24394	150	18900	22800
54-24394	192	14200	15100
54-24394	245	9830	8750
54-24394	300	2060	3670
54-25105	485	3110	—
54-27436	45	197000	158000
54-27436	70	142000	132000
54-27436	115	70400	67100
54-27436	163	27200	28000
54-27436	185	3710	4170

Note: For angled boreholes, the depth below surface borehole length is given in brackets.

^a — = Monitoring not requested.

^b Instrumented borehole not functioning for pore-gas sample collection.

**Table 4.0-6
Freon 11 Screening Results Using a B&K Multigas Instrument**

Location ID	Depth (ft bgs) [Length (ft)]	Q2 FY2007 Result ($\mu\text{g}/\text{m}^3$)	Q4FY2007 Result ($\mu\text{g}/\text{m}^3$)
54-01107	20	1370	— ^a
54-01107	44.5	971	—
54-01107	56.5	1500	—
54-01107	74	1360	—
54-01107	91	977	—
54-01107	100	1170	—
54-01110	20	10.7	—
54-01110	48	136	—
54-01110	60	335	—
54-01110	70	421	—
54-01110	85	494	—
54-01110	90	454	—
54-01111	20	668	—
54-01111	39.5	769	—
54-01111	50	842	—
54-01111	70	561	—
54-01111	78	468	—
54-01111	100	491	—
54-01111	139	377	—
54-01115	7.9 [15]	163	—
54-01115	26.5 [50]	707	—
54-01115	40.8 [77]	1330	—
54-01115	53 [100]	1360	—
54-01115	63.6 [120]	1750	—
54-01115	68.9 [130]	1840	—
54-01117	20	640	—
54-01117	31.5	1140	—
54-01117	55	1770	—
54-01117	73	2120	—
54-01117	82	2290	—
54-01117	85	2490	—
54-01121	20	1480	—
54-01121	26	2160	—
54-01121	61.5	2490	—
54-01121	70	3350	—
54-01121	76	3770	—

Table 4.0-6 (continued)

Location ID	Depth (ft bgs) [Length (ft)]	Q2 FY2007 Result ($\mu\text{g}/\text{m}^3$)	Q4FY2007 Result ($\mu\text{g}/\text{m}^3$)
54-01121	98	5140	—
54-01121	121	5780	—
54-01126	7.5 [15]	180	—
54-01126	17.5 [35]	5460	—
54-01126	28.5 [57]	1940	—
54-01126	35 [70]	2360	—
54-01126	42.5 [85]	3060	—
54-01126	49.5 [99]	3610	—
54-01128	7.5 [15]	194	—
54-01128	15 [30]	294	—
54-01128	20 [40]	668	—
54-01128	30 [60]	b	—
54-01128	39 [78]	1380	—
54-02009	37	893	—
54-02009	62	1220	—
54-02009	79	b	—
54-02009	92	1740	—
54-02010	30	983	—
54-02010	53	b	—
54-02010	95	2390	—
54-02032	20	-73	—
54-02032	60	182	—
54-02032	100	369	—
54-02032	130	741	—
54-02032	156	730	—
54-02033	20	-61.8	—
54-02033	60	125	—
54-02033	100	155	—
54-02033	160	94.3	—
54-02033	200	138	—
54-02033	220	-6.74	—
54-02033	260	8.98	—
54-02033	277	-213	—
54-24370	40	13900	19300
54-24370	80	10600	20000
54-24370	120	9150	17200
54-24370	173	6120	14900
54-24370	200	8200	14500

Table 4.0-6 (continued)

Location ID	Depth (ft bgs) [Length (ft)]	Q2 FY2007 Result ($\mu\text{g}/\text{m}^3$)	Q4FY2007 Result ($\mu\text{g}/\text{m}^3$)
54-24370	233	1210	1370
54-24386	40	3810	5120
54-24386	83	4410	5010
54-24386	117	3500	7970
54-24386	135	5900	8480
54-24386	195	245	758
54-24394	50	10300	21300
54-24394	100	4560	11200
54-24394	150	3020	5840
54-24394	192	2590	3570
54-24394	245	2090	2360
54-24394	300	28.3	-230
54-25105	485	29.4	—
54-27436	45	-56.1	977
54-27436	70	95.5	5460
54-27436	115	63.4	5400
54-27436	163	-112	1540
54-27436	185	-2130	43.2

Note: For angled boreholes, the depth below surface borehole length is given in brackets.

^a — = Monitoring not requested.

^b Instrumented borehole not functioning for pore-gas sample collection.

**Table 4.0-7
CO₂ Screening Results Using a B&K Multigas Instrument**

Location ID	Depth (ft bgs) [Length (ft)]	Q2 FY2007 Result (µg/m ³)	Q4FY2007 Result (µg/m ³)
54-01107	20	22200	— ^a
54-01107	44.5	21900	—
54-01107	56.5	24700	—
54-01107	74	23400	—
54-01107	91	18700	—
54-01107	100	20300	—
54-01110	20	4140	—
54-01110	48	5910	—
54-01110	60	6490	—
54-01110	70	6940	—
54-01110	85	7340	—
54-01110	90	7490	—
54-01111	20	3740	—
54-01111	39.5	4470	—
54-01111	50	4720	—
54-01111	70	5190	—
54-01111	78	5160	—
54-01111	100	5590	—
54-01111	139	6120	—
54-01115	7.9 [15]	9340	—
54-01115	26.5 [50]	23700	—
54-01115	40.8 [77]	29600	—
54-01115	53 [100]	32800	—
54-01115	63.6 [120]	33500	—
54-01115	68.9 [130]	33900	—
54-01117	20	4980	—
54-01117	31.5	6830	—
54-01117	55	8630	—
54-01117	73	8920	—
54-01117	82	8920	—
54-01117	85	9210	—
54-01121	20	20400	—
54-01121	26	20700	—
54-01121	61.5	21500	—
54-01121	70	28000	—
54-01121	76	28500	—
54-01121	98	29800	—

Table 4.0-7 (continued)

Location ID	Depth (ft bgs) [Length (ft)]	Q2 FY2007 Result ($\mu\text{g}/\text{m}^3$)	Q4FY2007 Result ($\mu\text{g}/\text{m}^3$)
54-01121	121	30200	—
54-01126	7.5 [15]	6350	—
54-01126	17.5 [35]	11200	—
54-01126	28.5 [57]	23900	—
54-01126	35 [70]	28100	—
54-01126	42.5 [85]	28900	—
54-01126	49.5 [99]	34500	—
54-01128	7.5 [15]	11100	—
54-01128	15 [30]	19400	—
54-01128	20 [40]	26600	—
54-01128	30 [60]	b	—
54-01128	39 [78]	36400	—
54-02009	37	15900	—
54-02009	62	15700	—
54-02009	79	b	—
54-02009	92	14100	—
54-02010	30	31300	—
54-02010	53	b	—
54-02010	95	35600	—
54-02032	20	7680	—
54-02032	60	9420	—
54-02032	100	5810	—
54-02032	130	9350	—
54-02032	156	7410	—
54-02033	20	5200	—
54-02033	60	7380	—
54-02033	100	7550	—
54-02033	160	6310	—
54-02033	200	5450	—
54-02033	220	5130	—
54-02033	260	3070	—
54-02033	277	2500	—
54-24370	40	123000	78000
54-24370	80	85700	74700
54-24370	120	64600	60200
54-24370	173	41300	48300
54-24370	200	43500	44300
54-24370	233	8980	5080

Table 4.0-7 (continued)

Location ID	Depth (ft bgs) [Length (ft)]	Q2 FY2007 Result ($\mu\text{g}/\text{m}^3$)	Q4FY2007 Result ($\mu\text{g}/\text{m}^3$)
54-24386	40	73500	61300
54-24386	83	45200	31500
54-24386	117	24700	35100
54-24386	135	29700	32700
54-24386	195	3850	4650
54-24394	50	22100	22400
54-24394	100	19100	20000
54-24394	150	18500	18200
54-24394	192	17000	15100
54-24394	245	15200	12000
54-24394	300	2480	2510
54-25105	485	695	—
54-27436	45	11900	11500
54-27436	70	11700	11000
54-27436	115	11400	10500
54-27436	163	8320	8910
54-27436	185	2610	3370

Note: For angled boreholes, the depth below surface borehole length is given in brackets.

^a — = Monitoring not requested.

^b Instrumented borehole not functioning for pore-gas sample collection.

**Table 4.0-8
Moisture (H₂O) Screening Results Using a B&K Multigas Instrument**

Location ID	Depth (ft bgs) [Length (ft)]	Q2 FY2007 Result ($\mu\text{g}/\text{m}^3$)	Q4FY2007 Result ($\mu\text{g}/\text{m}^3$)
54-01107	20	11700	— ^a
54-01107	44.5	10900	—
54-01107	56.5	11700	—
54-01107	74	11600	—
54-01107	91	11800	—
54-01107	100	11900	—
54-01110	20	7030	—
54-01110	48	7140	—
54-01110	60	7030	—
54-01110	70	7070	—
54-01110	85	7210	—
54-01110	90	7350	—
54-01111	20	10200	—
54-01111	39.5	10700	—
54-01111	50	10300	—
54-01111	70	11300	—
54-01111	78	11200	—
54-01111	100	10400	—
54-01111	139	11200	—
54-01115	7.9 [15]	10700	—
54-01115	26.5 [50]	8690	—
54-01115	40.8 [77]	8990	—
54-01115	53 [100]	8.02	—
54-01115	63.6 [120]	7550	—
54-01115	68.9 [130]	7530	—
54-01117	20	7990	—
54-01117	31.5	8030	—
54-01117	55	8390	—
54-01117	73	8200	—
54-01117	82	8330	—
54-01117	85	8240	—
54-01121	20	8380	—
54-01121	26	8950	—
54-01121	61.5	8690	—
54-01121	70	8910	—
54-01121	76	8920	—
54-01121	98	9160	—

Table 4.0-8 (continued)

Location ID	Depth (ft bgs) [Length (ft)]	Q2 FY2007 Result ($\mu\text{g}/\text{m}^3$)	Q4FY2007 Result ($\mu\text{g}/\text{m}^3$)
54-01121	121	9330	—
54-01126	7.5 [15]	11700	—
54-01126	17.5 [35]	11800	—
54-01126	28.5 [57]	12200	—
54-01126	35 [70]	11300	—
54-01126	42.5 [85]	10900	—
54-01126	49.5 [99]	11400	—
54-01128	7.5 [15]	12600	—
54-01128	15 [30]	8360	—
54-01128	20 [40]	8400	—
54-01128	30 [60]	b	—
54-01128	39 [78]	8820	—
54-02009	37	16800	—
54-02009	62	16600	—
54-02009	79	b	—
54-02009	92	12700	—
54-02010	30	11300	—
54-02010	53	b	—
54-02010	95	12300	—
54-02032	20	5850	—
54-02032	60	5580	—
54-02032	100	5620	—
54-02032	130	5140	—
54-02032	156	5060	—
54-02033	20	8140	—
54-02033	60	8450	—
54-02033	100	8020	—
54-02033	160	7890	—
54-02033	200	7970	—
54-02033	220	7720	—
54-02033	260	7240	—
54-02033	277	7140	—
54-24370	40	12200	25900
54-24370	80	9080	29800
54-24370	120	9030	28500
54-24370	173	8610	26500
54-24370	200	8360	27000
54-24370	233	12400	27800

Table 4.0-8 (continued)

Location ID	Depth (ft bgs) [Length (ft)]	Q2 FY2007 Result ($\mu\text{g}/\text{m}^3$)	Q4FY2007 Result ($\mu\text{g}/\text{m}^3$)
54-24386	40	10200	29400
54-24386	83	10600	26200
54-24386	117	11000	29200
54-24386	135	10700	29300
54-24386	195	10500	28500
54-24394	50	12000	26100
54-24394	100	12000	28400
54-24394	150	11800	29000
54-24394	192	11900	27800
54-24394	245	12000	24600
54-24394	300	11700	28500
54-25105	485	12700	—
54-27436	45	11600	22100
54-27436	70	11200	20800
54-27436	115	7.56	22400
54-27436	163	8810	25900
54-27436	185	8400	29600

Note: For angled boreholes, the depth below surface borehole length is given in brackets.

^a — = Monitoring not requested.

^b Instrumented borehole not functioning for pore-gas sample collection.

**Table 5.0-1
Detected Pore Gas VOC Results for Samples Collected During Monitoring Activities at MDA G**

Location ID	Depth Interval (ft bgs)	Analyte	Result ($\mu\text{g}/\text{m}^3$)	Collection Date
54-02009	62	Dichloroethane[1,1-]	8600	2/21/2007
54-02009	62	Dichloroethene[1,1-]	15000	2/21/2007
54-02009	62	Tetrachloroethene	4700	2/21/2007
54-02009	62	Trichloroethane[1,1,1-]	210000	2/21/2007
54-02009	62	Trichloroethene	1700	2/21/2007
54-02010	95	Dichlorodifluoromethane	990	2/20/2007
54-02010	95	Dichloroethane[1,1-]	3000	2/20/2007
54-02010	95	Dichloroethene[1,1-]	4100	2/20/2007
54-02010	95	Tetrachloroethene	1300	2/20/2007
54-02010	95	Trichloro-1,2,2-trifluoroethane[1,1,2-]	8800	2/20/2007
54-02010	95	Trichloroethane[1,1,1-]	81000	2/20/2007
54-02010	95	Trichloroethene	1500	2/20/2007
54-02010	95	Trichlorofluoromethane	2600	2/20/2007
54-02032	130	Chloroform	61	2/21/2007
54-02032	130	Dichlorodifluoromethane	110	2/21/2007
54-02032	130	Dichloroethane[1,1-]	2300	2/21/2007
54-02032	130	Dichloroethene[1,1-]	6100	2/21/2007
54-02032	130	Tetrachloroethene	1000	2/21/2007
54-02032	130	Trichloro-1,2,2-trifluoroethane[1,1,2-]	230	2/21/2007
54-02032	130	Trichloroethane[1,1,1-]	25000	2/21/2007
54-02032	130	Trichloroethene	500	2/21/2007
54-02033	100	Chlorodifluoromethane	51	2/15/2007
54-02033	100	Chloroform	6.8	2/15/2007
54-02033	100	Dichlorodifluoromethane	250	2/15/2007
54-02033	100	Dichloroethene[1,1-]	11	2/15/2007
54-02033	100	Methylene Chloride	7.4	2/15/2007
54-02033	100	Tetrachloroethene	280	2/15/2007
54-02033	100	Trichloro-1,2,2-trifluoroethane[1,1,2-]	300	2/15/2007
54-02033	100	Trichloroethane[1,1,1-]	280	2/15/2007
54-02033	100	Trichlorofluoromethane	470	2/15/2007
54-24370	35-45	Chloroform	660	2/22/2007
54-24370	35-45	Dichlorodifluoromethane	13000	2/22/2007
54-24370	35-45	Dichloroethane[1,1-]	15000	2/22/2007
54-24370	35-45	Dichloroethene[1,1-]	5100	2/22/2007
54-24370	35-45	Dichloroethene[cis-1,2-]	470	2/22/2007
54-24370	35-45	Tetrachloroethene	1900	2/22/2007

Table 5.0-1 (continued)

Location ID	Depth Interval (ft bgs)	Analyte	Result ($\mu\text{g}/\text{m}^3$)	Collection Date
54-24370	35-45	Trichloro-1,2,2-trifluoroethane[1,1,2-]	44000	2/22/2007
54-24370	35-45	Trichloroethane[1,1,1-]	170000	2/22/2007
54-24370	35-45	Trichloroethene	21000	2/22/2007
54-24370	35-45	Trichlorofluoromethane	14000	2/22/2007
54-24370	67.5-77.5	Chloroform	740	2/22/2007
54-24370	67.5-77.5	Dichlorodifluoromethane	17000	2/22/2007
54-24370	67.5-77.5	Dichloroethane[1,1-]	18000	2/22/2007
54-24370	67.5-77.5	Dichloroethene[1,1-]	7000	2/22/2007
54-24370	67.5-77.5	Dichloroethene[cis-1,2-]	700	2/22/2007
54-24370	67.5-77.5	Tetrachloroethene	2100	2/22/2007
54-24370	67.5-77.5	Trichloro-1,2,2-trifluoroethane[1,1,2-]	50000	2/22/2007
54-24370	67.5-77.5	Trichloroethane[1,1,1-]	190000	2/22/2007
54-24370	67.5-77.5	Trichloroethene	26000	2/22/2007
54-24370	67.5-77.5	Trichlorofluoromethane	15000	2/22/2007
54-24370	115-125	Chloroform	510	2/22/2007
54-24370	115-125	Dichlorodifluoromethane	19000	2/22/2007
54-24370	115-125	Dichloroethane[1,1-]	12000	2/22/2007
54-24370	115-125	Dichloroethene[1,1-]	6400	2/22/2007
54-24370	115-125	Dichloroethene[cis-1,2-]	620	2/22/2007
54-24370	115-125	Methylene Chloride	420	2/22/2007
54-24370	115-125	Tetrachloroethene	1500	2/22/2007
54-24370	115-125	Trichloro-1,2,2-trifluoroethane[1,1,2-]	39000	2/22/2007
54-24370	115-125	Trichloroethane[1,1,1-]	120000	2/22/2007
54-24370	115-125	Trichloroethene	16000	2/22/2007
54-24370	115-125	Trichlorofluoromethane	12000	2/22/2007
54-24370	169.5-180	Carbon Disulfide	120	2/22/2007
54-24370	169.5-180	Chloroethane	93	2/22/2007
54-24370	169.5-180	Chloroform	160	2/22/2007
54-24370	169.5-180	Dichlorodifluoromethane	13000	2/22/2007
54-24370	169.5-180	Dichloroethane[1,1-]	4000	2/22/2007
54-24370	169.5-180	Dichloroethene[1,1-]	4300	2/22/2007
54-24370	169.5-180	Dichloroethene[cis-1,2-]	270	2/22/2007
54-24370	169.5-180	Methylene Chloride	430	2/22/2007
54-24370	169.5-180	Tetrachloroethene	690	2/22/2007
54-24370	169.5-180	Trichloro-1,2,2-trifluoroethane[1,1,2-]	22000	2/22/2007
54-24370	169.5-180	Trichloroethane[1,1,1-]	53000	2/22/2007
54-24370	169.5-180	Trichloroethene	6000	2/22/2007
54-24370	169.5-180	Trichlorofluoromethane	7100	2/22/2007

Table 5.0-1 (continued)

Location ID	Depth Interval (ft bgs)	Analyte	Result ($\mu\text{g}/\text{m}^3$)	Collection Date
54-24370	195–205	Dichlorodifluoromethane	15000	2/22/2007
54-24370	195–205	Dichloroethane[1,1-]	3400	2/22/2007
54-24370	195–205	Dichloroethene[1,1-]	4900	2/22/2007
54-24370	195–205	Dichloroethene[cis-1,2-]	280	2/22/2007
54-24370	195–205	Methylene Chloride	460	2/22/2007
54-24370	195–205	Tetrachloroethene	740	2/22/2007
54-24370	195–205	Trichloro-1,2,2-trifluoroethane[1,1,2-]	23000	2/22/2007
54-24370	195–205	Trichloroethane[1,1,1-]	54000	2/22/2007
54-24370	195–205	Trichloroethene	6300	2/22/2007
54-24370	195–205	Trichlorofluoromethane	7900	2/22/2007
54-24370	237.5–249.5	Dichlorodifluoromethane	1500	2/22/2007
54-24370	237.5–249.5	Dichloroethane[1,1-]	240	2/22/2007
54-24370	237.5–249.5	Dichloroethene[1,1-]	630	2/22/2007
54-24370	237.5–249.5	Dichloroethene[cis-1,2-]	15	2/22/2007
54-24370	237.5–249.5	Methylene Chloride	37	2/22/2007
54-24370	237.5–249.5	Tetrachloroethene	120	2/22/2007
54-24370	237.5–249.5	Toluene	170	2/22/2007
54-24370	237.5–249.5	Trichloro-1,2,2-trifluoroethane[1,1,2-]	2400	2/22/2007
54-24370	237.5–249.5	Trichloroethane[1,1,1-]	4900	2/22/2007
54-24370	237.5–249.5	Trichloroethene	560	2/22/2007
54-24370	237.5–249.5	Trichlorofluoromethane	800	2/22/2007
54-24386	37.5–42.5	Carbon Disulfide	2100	2/15/2007
54-24386	37.5–42.5	Dichloroethane[1,1-]	36000	2/15/2007
54-24386	37.5–42.5	Dichloroethene[1,1-]	41000	2/15/2007
54-24386	37.5–42.5	Tetrachloroethene	6500	2/15/2007
54-24386	37.5–42.5	Trichloro-1,2,2-trifluoroethane[1,1,2-]	4700	2/15/2007
54-24386	37.5–42.5	Trichloroethane[1,1,1-]	790000	2/15/2007
54-24386	37.5–42.5	Trichloroethene	6400	2/15/2007
54-24386	80.5–86	Carbon Disulfide	1200	2/15/2007
54-24386	80.5–86	Dichloroethane[1,1-]	32000	2/15/2007
54-24386	80.5–86	Dichloroethene[1,1-]	46000	2/15/2007
54-24386	80.5–86	Tetrachloroethene	6100	2/15/2007
54-24386	80.5–86	Toluene	1200 (J)*	2/15/2007
54-24386	80.5–86	Trichloro-1,2,2-trifluoroethane[1,1,2-]	4000	2/15/2007
54-24386	80.5–86	Trichloroethane[1,1,1-]	640000	2/15/2007
54-24386	80.5–86	Trichloroethene	7900	2/15/2007
54-24386	115–120	Acetone	2600	2/15/2007
54-24386	115–120	Carbon Disulfide	1300	2/15/2007

Table 5.0-1 (continued)

Location ID	Depth Interval (ft bgs)	Analyte	Result ($\mu\text{g}/\text{m}^3$)	Collection Date
54-24386	115–120	Dichloroethane[1,1-]	32000	2/15/2007
54-24386	115–120	Dichloroethene[1,1-]	56000	2/15/2007
54-24386	115–120	Tetrachloroethene	5900	2/15/2007
54-24386	115–120	Toluene	4700	2/15/2007
54-24386	115–120	Trichloro-1,2,2-trifluoroethane[1,1,2-]	2800	2/15/2007
54-24386	115–120	Trichloroethane[1,1,1-]	400000	2/15/2007
54-24386	115–120	Trichloroethene	8300	2/15/2007
54-24386	130–136	Carbon Disulfide	620	2/15/2007
54-24386	130–136	Dichloroethane[1,1-]	17000	2/15/2007
54-24386	130–136	Dichloroethene[1,1-]	33000	2/15/2007
54-24386	130–136	Tetrachloroethene	3400	2/15/2007
54-24386	130–136	Trichloro-1,2,2-trifluoroethane[1,1,2-]	1600	2/15/2007
54-24386	130–136	Trichloroethane[1,1,1-]	240000	2/15/2007
54-24386	130–136	Trichloroethene	4800	2/15/2007
54-24386	191–201	Dichloroethane[1,1-]	1900	2/15/2007
54-24386	191–201	Dichloroethene[1,1-]	3400	2/15/2007
54-24386	191–201	Tetrachloroethene	440	2/15/2007
54-24386	191–201	Trichloro-1,2,2-trifluoroethane[1,1,2-]	200	2/15/2007
54-24386	191–201	Trichloroethane[1,1,1-]	23000	2/15/2007
54-24386	191–201	Trichloroethene	600	2/15/2007
54-24394	45–55	Carbon Disulfide	190	2/27/2007
54-24394	45–55	Dichlorodifluoromethane	1400	2/27/2007
54-24394	45–55	Dichloroethane[1,1-]	2300	2/27/2007
54-24394	45–55	Dichloroethene[1,1-]	1100	2/27/2007
54-24394	45–55	Methylene Chloride	280	2/27/2007
54-24394	45–55	Tetrachloroethene	540	2/27/2007
54-24394	45–55	Trichloro-1,2,2-trifluoroethane[1,1,2-]	73000	2/27/2007
54-24394	45–55	Trichloroethane[1,1,1-]	32000	2/27/2007
54-24394	45–55	Trichloroethene	83000	2/27/2007
54-24394	45–55	Trichlorofluoromethane	3300	2/27/2007
54-24394	95–105	Chloroform	140	2/27/2007
54-24394	95–105	Cyclohexane	340	2/27/2007
54-24394	95–105	Dichlorodifluoromethane	1500	2/27/2007
54-24394	95–105	Dichloroethane[1,1-]	1700	2/27/2007
54-24394	95–105	Dichloroethene[1,1-]	1100	2/27/2007
54-24394	95–105	Tetrachloroethene	450	2/27/2007
54-24394	95–105	Trichloro-1,2,2-trifluoroethane[1,1,2-]	28000	2/27/2007
54-24394	95–105	Trichloroethane[1,1,1-]	22000	2/27/2007

Table 5.0-1 (continued)

Location ID	Depth Interval (ft bgs)	Analyte	Result ($\mu\text{g}/\text{m}^3$)	Collection Date
54-24394	95–105	Trichloroethene	30000	2/27/2007
54-24394	95–105	Trichlorofluoromethane	2600	2/27/2007
54-24394	145–154.8	Chloroform	130	2/27/2007
54-24394	145–154.8	Cyclohexane	270	2/27/2007
54-24394	145–154.8	Dichlorodifluoromethane	1900	2/27/2007
54-24394	145–154.8	Dichloroethane[1,1-]	1200	2/27/2007
54-24394	145–154.8	Dichloroethene[1,1-]	1100	2/27/2007
54-24394	145–154.8	Methylene Chloride	74	2/27/2007
54-24394	145–154.8	Tetrachloroethene	470	2/27/2007
54-24394	145–154.8	Trichloro-1,2,2-trifluoroethane[1,1,2-]	13000	2/27/2007
54-24394	145–154.8	Trichloroethane[1,1,1-]	16000	2/27/2007
54-24394	145–154.8	Trichloroethene	17000	2/27/2007
54-24394	145–154.8	Trichlorofluoromethane	2800	2/27/2007
54-24394	190–195	Chlorodifluoromethane	130	2/27/2007
54-24394	190–195	Chloroform	110	2/27/2007
54-24394	190–195	Cyclohexane	210	2/27/2007
54-24394	190–195	Dichlorodifluoromethane	2200	2/27/2007
54-24394	190–195	Dichloroethane[1,1-]	760	2/27/2007
54-24394	190–195	Dichloroethene[1,1-]	990	2/27/2007
54-24394	190–195	Methylene Chloride	60	2/27/2007
54-24394	190–195	Tetrachloroethene	480	2/27/2007
54-24394	190–195	Trichloro-1,2,2-trifluoroethane[1,1,2-]	9000	2/27/2007
54-24394	190–195	Trichloroethane[1,1,1-]	13000	2/27/2007
54-24394	190–195	Trichloroethene	9400	2/27/2007
54-24394	190–195	Trichlorofluoromethane	3100	2/27/2007
54-24394	240–250	Chlorodifluoromethane	140	2/27/2007
54-24394	240–250	Chloroform	71	2/27/2007
54-24394	240–250	Cyclohexane	150	2/27/2007
54-24394	240–250	Dichlorodifluoromethane	2200	2/27/2007
54-24394	240–250	Dichloroethane[1,1-]	390	2/27/2007
54-24394	240–250	Dichloroethene[1,1-]	980	2/27/2007
54-24394	240–250	Methylene Chloride	58	2/27/2007
54-24394	240–250	Tetrachloroethene	380	2/27/2007
54-24394	240–250	Trichloro-1,2,2-trifluoroethane[1,1,2-]	6000	2/27/2007
54-24394	240–250	Trichloroethane[1,1,1-]	9100	2/27/2007
54-24394	240–250	Trichloroethene	4200	2/27/2007
54-24394	240–250	Trichlorofluoromethane	3000	2/27/2007
54-24394	296.5–306.5	Carbon Disulfide	3.9	2/27/2007

Table 5.0-1 (continued)

Location ID	Depth Interval (ft bgs)	Analyte	Result ($\mu\text{g}/\text{m}^3$)	Collection Date
54-24394	296.5–306.5	Chlorodifluoromethane	14	2/27/2007
54-24394	296.5–306.5	Chloroform	4.5	2/27/2007
54-24394	296.5–306.5	Cyclohexane	15	2/27/2007
54-24394	296.5–306.5	Dichlorodifluoromethane	220	2/27/2007
54-24394	296.5–306.5	Dichloroethane[1,1-]	39	2/27/2007
54-24394	296.5–306.5	Dichloroethene[1,1-]	180	2/27/2007
54-24394	296.5–306.5	Tetrachloroethene	45	2/27/2007
54-24394	296.5–306.5	Trichloro-1,2,2-trifluoroethane[1,1,2-]	470	2/27/2007
54-24394	296.5–306.5	Trichloroethane[1,1,1-]	880	2/27/2007
54-24394	296.5–306.5	Trichloroethene	290	2/27/2007
54-24394	296.5–306.5	Trichlorofluoromethane	250	2/27/2007
54-25105	485–700	Acetone	170	3/26/2007
54-25105	485–700	Dichlorodifluoromethane	8	3/26/2007
54-25105	485–700	Dichloroethane[1,1-]	9.7	3/26/2007
54-25105	485–700	Dichloroethene[1,1-]	39	3/26/2007
54-25105	485–700	Methylene Chloride	3.3	3/26/2007
54-25105	485–700	Tetrachloroethene	25	3/26/2007
54-25105	485–700	Toluene	6.7	3/26/2007
54-25105	485–700	Trichloro-1,2,2-trifluoroethane[1,1,2-]	18	3/26/2007
54-25105	485–700	Trichloroethane[1,1,1-]	180	3/26/2007
54-25105	485–700	Trichloroethene	72	3/26/2007
54-25105	485–700	Trichlorofluoromethane	5.7	3/26/2007
54-27436	40–50	Dichloroethane[1,1-]	1100	2/28/2007
54-27436	40–50	Dichloroethene[1,1-]	860	2/28/2007
54-27436	40–50	Tetrachloroethene	10000	2/28/2007
54-27436	40–50	Trichloro-1,2,2-trifluoroethane[1,1,2-]	1500	2/28/2007
54-27436	40–50	Trichloroethane[1,1,1-]	21000	2/28/2007
54-27436	40–50	Trichloroethene	190000	2/28/2007
54-27436	65–75	Dichloroethane[1,1-]	1100	2/28/2007
54-27436	65–75	Dichloroethene[1,1-]	910	2/28/2007
54-27436	65–75	Tetrachloroethene	7300	2/28/2007
54-27436	65–75	Trichloro-1,2,2-trifluoroethane[1,1,2-]	1400	2/28/2007
54-27436	65–75	Trichloroethane[1,1,1-]	20000	2/28/2007
54-27436	65–75	Trichloroethene	130000	2/28/2007
54-27436	110–120	Chloroform	360	2/28/2007
54-27436	110–120	Dichlorodifluoromethane	400	2/28/2007
54-27436	110–120	Dichloroethane[1,1-]	1200	2/28/2007
54-27436	110–120	Dichloroethene[1,1-]	730	2/28/2007

Table 5.0-1 (continued)

Location ID	Depth Interval (ft bgs)	Analyte	Result ($\mu\text{g}/\text{m}^3$)	Collection Date
54-27436	110–120	Methylene Chloride	230	2/28/2007
54-27436	110–120	Tetrachloroethene	3900	2/28/2007
54-27436	110–120	Trichloro-1,2,2-trifluoroethane[1,1,2-]	910	2/28/2007
54-27436	110–120	Trichloroethane[1,1,1-]	16000	2/28/2007
54-27436	110–120	Trichloroethene	56000	2/28/2007
54-27436	160–166	Chloroform	330	3/1/2007
54-27436	160–166	Dichlorodifluoromethane	290	3/1/2007
54-27436	160–166	Dichloroethane[1,1-]	940	3/1/2007
54-27436	160–166	Dichloroethene[1,1-]	680	3/1/2007
54-27436	160–166	Methylene Chloride	100	3/1/2007
54-27436	160–166	Tetrachloroethene	1300	3/1/2007
54-27436	160–166	Trichloro-1,2,2-trifluoroethane[1,1,2-]	440	3/1/2007
54-27436	160–166	Trichloroethane[1,1,1-]	10000	3/1/2007
54-27436	160–166	Trichloroethene	21000	3/1/2007
54-27436	180–191.5	Acetone	20	3/1/2007
54-27436	180–191.5	Butanone[2-]	4.6	3/1/2007
54-27436	180–191.5	Chloroform	34	3/1/2007
54-27436	180–191.5	Cyclohexane	27	3/1/2007
54-27436	180–191.5	Dichlorodifluoromethane	64	3/1/2007
54-27436	180–191.5	Dichloroethane[1,1-]	130	3/1/2007
54-27436	180–191.5	Dichloroethene[1,1-]	230	3/1/2007
54-27436	180–191.5	Methylene Chloride	10	3/1/2007
54-27436	180–191.5	Tetrachloroethene	160	3/1/2007
54-27436	180–191.5	Trichloro-1,2,2-trifluoroethane[1,1,2-]	120	3/1/2007
54-27436	180–191.5	Trichloroethane[1,1,1-]	1700	3/1/2007
54-27436	180–191.5	Trichloroethene	1800	3/1/2007
54-27436	180–191.5	Trichlorofluoromethane	31	3/1/2007
54-24370	35–45	Chloroform	760	7/31/2007
54-24370	35–45	Dichlorodifluoromethane	9200	7/31/2007
54-24370	35–45	Dichloroethane[1,1-]	16000	7/31/2007
54-24370	35–45	Dichloroethene[1,1-]	8300 (J+)	7/31/2007
54-24370	35–45	Tetrachloroethene	1800	7/31/2007
54-24370	35–45	Trichloro-1,2,2-trifluoroethane[1,1,2-]	49000	7/31/2007
54-24370	35–45	Trichloroethane[1,1,1-]	180000	7/31/2007
54-24370	35–45	Trichloroethene	19000	7/31/2007
54-24370	35–45	Trichlorofluoromethane	16000	7/31/2007
54-24370	67.5–77.5	Chloroform	700	7/31/2007
54-24370	67.5–77.5	Dichlorodifluoromethane	13000	7/31/2007

Table 5.0-1 (continued)

Location ID	Depth Interval (ft bgs)	Analyte	Result ($\mu\text{g}/\text{m}^3$)	Collection Date
54-24370	67.5–77.5	Dichloroethane[1,1-]	17000	7/31/2007
54-24370	67.5–77.5	Dichloroethene[1,1-]	6800	7/31/2007
54-24370	67.5–77.5	Dichloroethene[cis-1,2-]	600	7/31/2007
54-24370	67.5–77.5	Tetrachloroethene	1900	7/31/2007
54-24370	67.5–77.5	Trichloro-1,2,2-trifluoroethane[1,1,2-]	59000	7/31/2007
54-24370	67.5–77.5	Trichloroethane[1,1,1-]	190000	7/31/2007
54-24370	67.5–77.5	Trichloroethene	22000	7/31/2007
54-24370	67.5–77.5	Trichlorofluoromethane	15000	7/31/2007
54-24370	115–125	Chloroform	500	7/31/2007
54-24370	115–125	Dichlorodifluoromethane	23000	7/31/2007
54-24370	115–125	Dichloroethane[1,1-]	11000	7/31/2007
54-24370	115–125	Dichloroethene[1,1-]	8400 (J+)	7/31/2007
54-24370	115–125	Dichloroethene[cis-1,2-]	630	7/31/2007
54-24370	115–125	Methylene Chloride	550	7/31/2007
54-24370	115–125	Tetrachloroethene	1800	7/31/2007
54-24370	115–125	Trichloro-1,2,2-trifluoroethane[1,1,2-]	52000	7/31/2007
54-24370	115–125	Trichloroethane[1,1,1-]	140000	7/31/2007
54-24370	115–125	Trichloroethene	15000	7/31/2007
54-24370	115–125	Trichlorofluoromethane	15000	7/31/2007
54-24370	169.5–180	Dichlorodifluoromethane	18000	7/31/2007
54-24370	169.5–180	Dichloroethane[1,1-]	6400	7/31/2007
54-24370	169.5–180	Dichloroethene[1,1-]	7800 (J+)	7/31/2007
54-24370	169.5–180	Dichloroethene[cis-1,2-]	380	7/31/2007
54-24370	169.5–180	Methylene Chloride	360	7/31/2007
54-24370	169.5–180	Tetrachloroethene	1200	7/31/2007
54-24370	169.5–180	Trichloro-1,2,2-trifluoroethane[1,1,2-]	41000	7/31/2007
54-24370	169.5–180	Trichloroethane[1,1,1-]	85000	7/31/2007
54-24370	169.5–180	Trichloroethene	9000	7/31/2007
54-24370	169.5–180	Trichlorofluoromethane	12000	7/31/2007
54-24370	195–205	Chloroform	190	7/31/2007
54-24370	195–205	Dichlorodifluoromethane	18000	7/31/2007
54-24370	195–205	Dichloroethane[1,1-]	4400	7/31/2007
54-24370	195–205	Dichloroethene[1,1-]	7300 (J+)	7/31/2007
54-24370	195–205	Dichloroethene[cis-1,2-]	300	7/31/2007
54-24370	195–205	Methylene Chloride	600	7/31/2007
54-24370	195–205	Tetrachloroethene	1200	7/31/2007
54-24370	195–205	Trichloro-1,2,2-trifluoroethane[1,1,2-]	36000	7/31/2007
54-24370	195–205	Trichloroethane[1,1,1-]	71000	7/31/2007

Table 5.0-1 (continued)

Location ID	Depth Interval (ft bgs)	Analyte	Result ($\mu\text{g}/\text{m}^3$)	Collection Date
54-24370	195–205	Trichloroethene	7600	7/31/2007
54-24370	195–205	Trichlorofluoromethane	11000	7/31/2007
54-24370	237.5–249.5	Chlorodifluoromethane	60	7/31/2007
54-24370	237.5–249.5	Dichlorodifluoromethane	1600	7/31/2007
54-24370	237.5–249.5	Dichloroethane[1,1-]	310	7/31/2007
54-24370	237.5–249.5	Dichloroethene[1,1-]	790	7/31/2007
54-24370	237.5–249.5	Dichloroethene[cis-1,2-]	20	7/31/2007
54-24370	237.5–249.5	Methylene Chloride	47	7/31/2007
54-24370	237.5–249.5	Tetrachloroethene	140	7/31/2007
54-24370	237.5–249.5	Toluene	20	7/31/2007
54-24370	237.5–249.5	Trichloro-1,2,2-trifluoroethane[1,1,2-]	3700	7/31/2007
54-24370	237.5–249.5	Trichloroethane[1,1,1-]	6400	7/31/2007
54-24370	237.5–249.5	Trichloroethene	660	7/31/2007
54-24370	237.5–249.5	Trichlorofluoromethane	1000	7/31/2007
54-24386	37.5–42.5	Acetone	140000	7/31/2007
54-24386	37.5–42.5	Butanone[2-]	8000	7/31/2007
54-24386	37.5–42.5	Carbon Disulfide	3700	7/31/2007
54-24386	37.5–42.5	Dichloroethane[1,1-]	34000	7/31/2007
54-24386	37.5–42.5	Dichloroethene[1,1-]	38000 (J+)	7/31/2007
54-24386	37.5–42.5	Hexane	6000	7/31/2007
54-24386	37.5–42.5	Methylene Chloride	9300	7/31/2007
54-24386	37.5–42.5	Trichloroethane[1,1,1-]	770000	7/31/2007
54-24386	37.5–42.5	Trichloroethene	4400	7/31/2007
54-24386	80.5–86	Acetone	64000	7/31/2007
54-24386	80.5–86	Butanone[2-]	4600	7/31/2007
54-24386	80.5–86	Carbon Disulfide	1700	7/31/2007
54-24386	80.5–86	Dichloroethane[1,1-]	25000	7/31/2007
54-24386	80.5–86	Dichloroethene[1,1-]	38000	7/31/2007
54-24386	80.5–86	Methylene Chloride	1800	7/31/2007
54-24386	80.5–86	Tetrachloroethene	2900	7/31/2007
54-24386	80.5–86	Trichloro-1,2,2-trifluoroethane[1,1,2-]	3200	7/31/2007
54-24386	80.5–86	Trichloroethane[1,1,1-]	380000	7/31/2007
54-24386	80.5–86	Trichloroethene	4200	7/31/2007
54-24386	115–120	Acetone	69000	7/31/2007
54-24386	115–120	Butanone[2-]	3500	7/31/2007
54-24386	115–120	Carbon Disulfide	1900	7/31/2007
54-24386	115–120	Dichloroethane[1,1-]	32000	7/31/2007
54-24386	115–120	Dichloroethene[1,1-]	66000 (J+)	7/31/2007

Table 5.0-1 (continued)

Location ID	Depth Interval (ft bgs)	Analyte	Result ($\mu\text{g}/\text{m}^3$)	Collection Date
54-24386	115–120	Methanol	71000	7/31/2007
54-24386	115–120	Methylene Chloride	3200	7/31/2007
54-24386	115–120	Tetrachloroethene	3000	7/31/2007
54-24386	115–120	Trichloro-1,2,2-trifluoroethane[1,1,2-]	4100	7/31/2007
54-24386	115–120	Trichloroethane[1,1,1-]	420000	7/31/2007
54-24386	115–120	Trichloroethene	5600	7/31/2007
54-24386	130–136	Acetone	120	7/31/2007
54-24386	130–136	Carbon Disulfide	12	7/31/2007
54-24386	130–136	Dichloroethane[1,1-]	330	7/31/2007
54-24386	130–136	Dichloroethene[1,1-]	650 (J+)	7/31/2007
54-24386	130–136	Tetrachloroethene	34	7/31/2007
54-24386	130–136	Toluene	16	7/31/2007
54-24386	130–136	Trichloro-1,2,2-trifluoroethane[1,1,2-]	38	7/31/2007
54-24386	130–136	Trichloroethane[1,1,1-]	4400	7/31/2007
54-24386	130–136	Trichloroethene	62	7/31/2007
54-24386	191–201	Dichloroethane[1,1-]	3600	7/31/2007
54-24386	191–201	Dichloroethene[1,1-]	7000	7/31/2007
54-24386	191–201	Tetrachloroethene	990	7/31/2007
54-24386	191–201	Trichloro-1,2,2-trifluoroethane[1,1,2-]	460	7/31/2007
54-24386	191–201	Trichloroethane[1,1,1-]	45000	7/31/2007
54-24386	191–201	Trichloroethene	1000	7/31/2007
54-24394	45–55	Dichlorodifluoromethane	1400	7/30/2007
54-24394	45–55	Dichloroethane[1,1-]	3000	7/30/2007
54-24394	45–55	Dichloroethene[1,1-]	1600	7/30/2007
54-24394	45–55	Tetrachloroethene	840	7/30/2007
54-24394	45–55	Trichloro-1,2,2-trifluoroethane[1,1,2-]	120000	7/30/2007
54-24394	45–55	Trichloroethane[1,1,1-]	41000	7/30/2007
54-24394	45–55	Trichloroethene	110000	7/30/2007
54-24394	45–55	Trichlorofluoromethane	4400	7/30/2007
54-24394	95–105	Chloroform	220	7/30/2007
54-24394	95–105	Dichlorodifluoromethane	1700	7/30/2007
54-24394	95–105	Dichloroethane[1,1-]	2700	7/30/2007
54-24394	95–105	Dichloroethene[1,1-]	1500 (J+)	7/30/2007
54-24394	95–105	Tetrachloroethene	730	7/30/2007
54-24394	95–105	Trichloro-1,2,2-trifluoroethane[1,1,2-]	54000	7/30/2007
54-24394	95–105	Trichloroethane[1,1,1-]	32000	7/30/2007
54-24394	95–105	Trichloroethene	51000	7/30/2007
54-24394	95–105	Trichlorofluoromethane	3800	7/30/2007

Table 5.0-1 (continued)

Location ID	Depth Interval (ft bgs)	Analyte	Result (µg/m ³)	Collection Date
54-24394	145–154.8	Chloroform	180	7/30/2007
54-24394	145–154.8	Dichlorodifluoromethane	2300	7/30/2007
54-24394	145–154.8	Dichloroethane[1,1-]	1700	7/30/2007
54-24394	145–154.8	Dichloroethene[1,1-]	1600	7/30/2007
54-24394	145–154.8	Methylene Chloride	80	7/30/2007
54-24394	145–154.8	Tetrachloroethene	710	7/30/2007
54-24394	145–154.8	Trichloro-1,2,2-trifluoroethane[1,1,2-]	25000	7/30/2007
54-24394	145–154.8	Trichloroethane[1,1,1-]	24000	7/30/2007
54-24394	145–154.8	Trichloroethene	22000	7/30/2007
54-24394	145–154.8	Trichlorofluoromethane	4300	7/30/2007
54-24394	190–195	Chloroform	130	7/30/2007
54-24394	190–195	Dichlorodifluoromethane	2300	7/30/2007
54-24394	190–195	Dichloroethane[1,1-]	1000	7/30/2007
54-24394	190–195	Dichloroethene[1,1-]	1400 (J+)	7/30/2007
54-24394	190–195	Methylene Chloride	73	7/30/2007
54-24394	190–195	Tetrachloroethene	590	7/30/2007
54-24394	190–195	Trichloro-1,2,2-trifluoroethane[1,1,2-]	14000	7/30/2007
54-24394	190–195	Trichloroethane[1,1,1-]	17000	7/30/2007
54-24394	190–195	Trichloroethene	12000	7/30/2007
54-24394	190–195	Trichlorofluoromethane	4000	7/30/2007
54-24394	240–250	Carbon Disulfide	61	7/30/2007
54-24394	240–250	Chloroform	73	7/30/2007
54-24394	240–250	Dichlorodifluoromethane	1900	7/30/2007
54-24394	240–250	Dichloroethane[1,1-]	440	7/30/2007
54-24394	240–250	Dichloroethene[1,1-]	1200 (J+)	7/30/2007
54-24394	240–250	Methylene Chloride	57	7/30/2007
54-24394	240–250	Tetrachloroethene	440	7/30/2007
54-24394	240–250	Trichloro-1,2,2-trifluoroethane[1,1,2-]	7500	7/30/2007
54-24394	240–250	Trichloroethane[1,1,1-]	9900	7/30/2007
54-24394	240–250	Trichloroethene	4600	7/30/2007
54-24394	240–250	Trichlorofluoromethane	3200	7/30/2007
54-24394	296.5–306.5	Acetone	19	7/30/2007
54-24394	296.5–306.5	Chloroform	4.9	7/30/2007
54-24394	296.5–306.5	Dichlorodifluoromethane	210	7/30/2007
54-24394	296.5–306.5	Dichloroethane[1,1-]	49	7/30/2007
54-24394	296.5–306.5	Dichloroethene[1,1-]	260 (J+)	7/30/2007
54-24394	296.5–306.5	Methylene Chloride	4.3	7/30/2007
54-24394	296.5–306.5	Tetrachloroethene	51	7/30/2007

Table 5.0-1 (continued)

Location ID	Depth Interval (ft bgs)	Analyte	Result ($\mu\text{g}/\text{m}^3$)	Collection Date
54-24394	296.5–306.5	Trichloro-1,2,2-trifluoroethane[1,1,2-]	600	7/30/2007
54-24394	296.5–306.5	Trichloroethane[1,1,1-]	1000	7/30/2007
54-24394	296.5–306.5	Trichloroethene	230	7/30/2007
54-24394	296.5–306.5	Trichlorofluoromethane	300	7/30/2007
54-27436	40–50	Dichloroethane[1,1-]	1200	8/2/2007
54-27436	40–50	Dichloroethene[1,1-]	830 (J+)	8/2/2007
54-27436	40–50	Tetrachloroethene	11000	8/2/2007
54-27436	40–50	Trichloro-1,2,2-trifluoroethane[1,1,2-]	2700	8/2/2007
54-27436	40–50	Trichloroethane[1,1,1-]	19000	8/2/2007
54-27436	40–50	Trichloroethene	160000	8/2/2007
54-27436	65–75	Dichloroethane[1,1-]	1300	8/2/2007
54-27436	65–75	Dichloroethene[1,1-]	880 (J+)	8/2/2007
54-27436	65–75	Tetrachloroethene	9500	8/2/2007
54-27436	65–75	Trichloro-1,2,2-trifluoroethane[1,1,2-]	2000	8/2/2007
54-27436	65–75	Trichloroethane[1,1,1-]	22000	8/2/2007
54-27436	65–75	Trichloroethene	150000	8/2/2007
54-27436	110–120	Chloroform	450	8/2/2007
54-27436	110–120	Dichlorodifluoromethane	380	8/2/2007
54-27436	110–120	Dichloroethane[1,1-]	1300	8/2/2007
54-27436	110–120	Dichloroethene[1,1-]	970	8/2/2007
54-27436	110–120	Tetrachloroethene	4600	8/2/2007
54-27436	110–120	Trichloro-1,2,2-trifluoroethane[1,1,2-]	1200	8/2/2007
54-27436	110–120	Trichloroethane[1,1,1-]	18000	8/2/2007
54-27436	110–120	Trichloroethene	66000	8/2/2007
54-27436	160–166	Chloroform	440	8/2/2007
54-27436	160–166	Dichlorodifluoromethane	360	8/2/2007
54-27436	160–166	Dichloroethane[1,1-]	1300	8/2/2007
54-27436	160–166	Dichloroethene[1,1-]	910	8/2/2007
54-27436	160–166	Methylene Chloride	120	8/2/2007
54-27436	160–166	Tetrachloroethene	2100	8/2/2007
54-27436	160–166	Trichloro-1,2,2-trifluoroethane[1,1,2-]	810	8/2/2007
54-27436	160–166	Trichloroethane[1,1,1-]	15000	8/2/2007
54-27436	160–166	Trichloroethene	30000	8/2/2007
54-27436	160–166	Trichlorofluoromethane	120	8/2/2007
54-27436	180–191.5	Chloroform	77	8/2/2007
54-27436	180–191.5	Dichlorodifluoromethane	80	8/2/2007
54-27436	180–191.5	Dichloroethane[1,1-]	250	8/2/2007
54-27436	180–191.5	Dichloroethene[1,1-]	340 (J+)	8/2/2007

Table 5.0-1 (continued)

Location ID	Depth Interval (ft bgs)	Analyte	Result (µg/m ³)	Collection Date
54-27436	180–191.5	Methylene Chloride	22	8/2/2007
54-27436	180–191.5	Tetrachloroethene	320	8/2/2007
54-27436	180–191.5	Trichloro-1,2,2-trifluoroethane[1,1,2-]	170	8/2/2007
54-27436	180–191.5	Trichloroethane[1,1,1-]	3000	8/2/2007
54-27436	180–191.5	Trichloroethene	4000	8/2/2007
54-27436	180–191.5	Trichlorofluoromethane	39	8/2/2007

* (J) and other data qualifiers are defined in Table A-1.0-2.

**Table 5.0-2
Detected Pore Gas Tritium Results for
Samples Collected During Monitoring Activities at MDA G**

Location ID	Depth Interval (ft bgs)	Result (pCi/L)	Collection Date
54-24397	45–55	4480000	2/21/2007
54-24397	84–95	536000	2/23/2007
54-24397	125–135	270000	2/21/2007
54-24397	160–168	53900	2/21/2007
54-24397	184–192	103000	2/23/2007
54-24397	232.5–244	1750	2/21/2007
54-24397	45–55	8550000	7/31/2007
54-24397	84–95	434000	7/31/2007
54-24397	125–135	89900	7/31/2007
54-24397	160–168	20000	7/31/2007
54-24397	184–192	45700	7/31/2007
54-24397	232.5–244	2400	7/31/2007

**Table 5.0-3
Screening of VOCs Detected in Pore Gas at MDA G**

Chemical	Maximum Pore-Gas Concentration, ($\mu\text{g}/\text{m}^3$)	Dimensionless Henry's Constant (H')	Screening Level ($\mu\text{g}/\text{L}$)	Screen Value Max. Concentration/ ($1000 \times H' \times \text{SL}$)
Acetone	140000	0.0016	5500 ^a	16
Butanone[2-]	8000	0.0011	7100 ^a	1.0
Carbon Disulfide	3700	1.2	1040 ^a	0.0031
Chlorodifluoromethane	140	4.1	85000 ^a	0.00000040
Chloroethane	93	0.45	1 ^b	0.21
Chloroform	760	0.15	100 ^b	0.051
Cyclohexane	340	na ^c	na	na
Dichlorodifluoromethane	23000	4.1	390 ^a	0.014
Dichloroethane[1,1-]	36000	0.23	25 ^b	6.3
Dichloroethene[1,1-]	66000	1.1	5 ^b	12
Dichloroethene[cis-1,2-]	700	1.67	70 ^b	0.0060
Hexane	6000	5	416 ^a	0.0029
Methanol	7100	0.00011	18000 ^a	3.6
Methylene Chloride	9300	0.09	5 ^d	21
Tetrachloroethene	11000	0.754	5 ^d	2.9
Toluene	4700	0.272	750 ^b	0.023
Trichloro-1,2,2-trifluoroethane[1,1,2-]	120000	21.4	59000 ^a	0.000095
Trichloroethane[1,1,1-]	790000	0.705	60 ^b	19
Trichloroethene	190000	0.422	5 ^d	90
Trichlorofluoromethane	16000	4	1300 ^a	0.0031

^a EPA Region 6 human health media-specific screening level for tap water.

^b NMWQCC groundwater standard (20.6.2.3103 New Mexico Administrative Code).

^c na = Not available.

^d EPA MCL (40 CFR 141.61).

**Table 5.0-4
Screening of Volatile Organic Compounds Detected at 54-25105 (485–700 ft)**

Chemical	Pore-Gas Concentration (µg/m ³)	Dimensionless Henry's Constant (H')	Screening Level (µg/L)	Screen Value Conc/ (1000 × H' × SL)
Acetone	170	0.0016	5500 ^a	0.0193
Dichlorodifluoromethane	8	4.1	390 ^a	0.000005
Dichloroethane[1,1-]	9.7	0.23	25 ^b	0.000169
Dichloroethene[1,1-]	39	1.1	5 ^b	0.00709
Methylene Chloride	3.8	0.09	5 ^c	0.00844
Tetrachloroethene	27	0.754	5 ^c	0.00716
Toluene	6.7	0.272	750 ^b	0.0000328
Trichloro-1,2,2-trifluoroethane[1,1,2-]	18	21.4	59000 ^a	0.000000143
Trichloroethane[1,1,1-]	180	0.705	60 ^b	0.00426
Trichloroethene	72	0.422	5 ^c	0.0341
Trichlorofluoromethane	5.7	4	1300 ^a	0.00000110

^a EPA Region 6 human health media-specific screening level for tap water.

^b New Mexico WQCC groundwater standard (20.6.2.3103 NMAC).

^c EPA MCL (40 CFR 141.61).

Appendix A

Quality Assurance/Quality Control Program

A-1.0 INTRODUCTION

In accordance with Section XI.D.13.b of the Compliance Order on Consent, 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 laboratory analytical data as they impact the investigation and site status.

Quality assurance (QA), quality control (QC), and data validation procedures were implemented in accordance with the Los Alamos National Laboratory (LANL or the Laboratory) "Quality Assurance Project Plan Requirements for Sampling and Analysis" (LANL 1996, 054609) and the Laboratory's statement of work for analytical services (LANL 2000, 071233). The results of the QA/QC activities were used to estimate the accuracy, bias, and precision of the analytical measurements. QC samples, including method blanks, blank spikes, matrix spikes, laboratory control samples (LCSs), internal standards, initial and continuing calibrations, surrogates, and tracers, were used to assess laboratory accuracy and bias.

The type and frequency of QC analyses are described in the analytical services contract. Other QC factors, such as sample preservation and holding times, were also assessed. The requirements for sample preservation and holding times are given in the Environmental Programs Directorate Standard Operating Procedure (SOP) 01.02 (Rev. 1, ICN 1), Sample Containers and Preservation. Evaluating these QC indicators allows estimates to be made of the accuracy, bias, and precision of the analytical suites. A focused data validation was also performed for all the data packages (identified by request number). The procedures used for data validation are given in Table A-1.0-1. The focused validation followed the same procedure discussed above and included a more detailed review of the raw data results generated by the analytical laboratory. Copies of the raw analytical data, laboratory logbooks, and instrument printouts used during focused validation are provided in data packages as part of Appendix B (on CD included with this document).

Analytical data were reviewed and evaluated based on U.S. Environmental Protection Agency (EPA) National Functional Guidelines for inorganic and organic chemical data review, where applicable (EPA 1994, 048639; EPA 1999, 066649). Data have also been assessed using guidelines established in EPA Method SW-846 (EPA 1997, 057589). As a result of the data validation and assessment efforts, qualifiers have been assigned to each analytical record. Definitions for the data qualifiers used in data validation are given in Table A-1.0-2. Data validators and reviewers made judgments about the following industry-accepted QA/QC analytical quality functions.

Maintenance of Chain of Custody

To maintain chain of custody (COC) is to document or demonstrate the possession of an item by only authorized individuals. The COC process provides confidence in, and documentation of, analytical data integrity by establishing the traceability of the sample from the time of collection through processing to final maintenance as a record.

Sample Documentation

Establishing sample documentation acceptability is the first step toward verifying that an analytical system has produced data of known quality. Documentation is dependent upon the accessibility of review items that accurately and completely describe the work performed. In the absence of adequate sample documentation, data quality cannot be independently verified.

Sample Preservation

Sample preservation is the use of specific types of sample containers and preservation techniques. Sample preservation is mandatory for hazardous site investigations because the integrity of any sample decreases over time. Physical factors (light, pressure, temperature, etc.), chemical factors (changes in pH, volatilization, etc.), and biological factors may alter the original quality of a sample. Because the various target parameters are uniquely altered at varying rates, distinct sample containers, preservation techniques, and holding times have been established to maintain sample integrity for a reasonable and acceptable period of time.

Holding Time

Holding time is the maximum amount of time a sample can be stored without unacceptable changes in analyte concentrations. Holding times apply under prescribed conditions; deviations from these conditions may affect the holding time. Extraction holding time refers to the time that lapses between sample collection and sample preparation; analytical holding time refers to the time that lapses between sample preparation and analysis.

Initial and Continuing Calibration Verification (including interference-check standards)

Calibration verification is the establishment of a quantitative relationship between the response of the analytical procedure and the concentration of the target analyte. There are two aspects of calibration verification: initial and continuing. The initial calibration verifies the accuracy of the calibration curve as well as the individual calibration standards being used to perform the calibration. The continuing calibration ensures that the initial calibration is still holding and correct as the instrument is used to process samples. Interference-check samples are used to determine if a high concentration of a single analyte in a sample interferes with the accurate quantitation of other analytes.

Analyte Identification (including spectra review and thermal ionization cavity review)

Analyte identification is the process of associating an instrument signal with a compound or analyte of interest. Evaluation of signal retention times, spectral overlap, multipeak pattern matching, and mass spectral library searches are tools for making analyte identification determinations.

Analyte Quantitation

Analyte quantitation is the association of an instrument signal with a concentration, and the determination that a recorded signal is detected or not detected. Detection limits, instrument calibration linear ranges, internal standards, and carrier recoveries are tools for making analyte quantitation evaluations.

Organic and inorganic chemical results are considered to be not detected if the reported results are less than or equal to the method detection limit adjusted by sample-specific dilution or concentration factors.

Radiochemical results reported with values less than the minimum detectable activity are considered to be not detected (U). Each radiochemical result is also compared to the corresponding 1-sigma total propagated uncertainty (TPU). If the result is not greater than 3 times the TPU, it is also qualified as not detected.

Method Blank

A method blank is 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 extracted and analyzed in the same manner as the corresponding environmental samples. Method blanks are used to assess the potential for sample contamination during extraction and analysis. All target analytes should be below the contract-required detection limit in the method blank (LANL 2000, 071233).

Matrix Spike Recoveries

A matrix spike is an aliquot of sample spiked with a known concentration of the target analyte(s). Matrix spike samples are used to measure the ability to recover prescribed analytes from a native sample matrix. Spiking typically occurs before sample preparation and analysis. Acceptable percentage recoveries for matrix spikes vary by method but should generally be greater than 10% for an analytical result to be usable (LANL 2000, 071233).

Surrogate and Tracer Recoveries

A surrogate (an organic chemical compound) and a tracer (a radiochemical isotope) are similar in composition and behavior to target analytes but are not typically found in environmental samples. Surrogates and tracers are added to every blank, sample, and spike to evaluate the efficiency with which target analytes are recovered during extraction and analysis. The recovery percentages of the surrogates and tracers vary by method but should generally be greater than 10% for an analytical result to be usable (LANL 2000, 071233).

Internal standard responses and carrier recoveries

Internal standards and carriers are chemical compounds that are added to blank, sample, and standard extracts at known concentrations. They are used to compensate for (1) analyte concentration changes that might occur during storage of the extract, and (2) quantitation variations that can occur during analysis. Internal standard responses and carrier recoveries are used to adjust the reported concentrations for the quantitation of target analytes. The response factors for internal standards vary by method but should generally be within the range of $\geq 50\%$ to $\leq 200\%$. The recoveries for carriers vary by method but should generally be greater than 10% for an analytical result to be usable (LANL 2000, 071233).

LCS Recoveries

An LCS is a known matrix that has been spiked with compound(s) which are representative of the target analytes. The LCS is used to document laboratory performance. The acceptance criteria for LCSs are method-specific but should generally be greater than 10% for an analytical result to be usable (LANL 2000, 071233).

Laboratory and Field Duplicates (including serial dilutions)

Laboratory duplicates are two portions of a sample taken from the same sample container (prepared for analysis and analyzed independently but under identical conditions) that are used to assess or demonstrate acceptable laboratory-method precision at the time of analysis. Each duplicate sample is equally representative of the original material. Duplicate analyses are also performed to generate data and to determine the long-term precision of an analytical method on various matrices. All relative percent

differences (RPDs) between samples and field duplicates should be $\pm 35\%$ (LANL 2000, 071233). RPD is defined by the equation $RPD = \frac{|D1 - D2|}{(D1 + D2)} \times 100\%$, where $D1$ and $D2$ represent analytical measurements on duplicate samples.

For radionuclides, the duplicate error ratio (DER) may also be used to quantify precision. DER is defined by the equation $DER = \frac{|S-D|}{\sqrt{2\sigma S^2 + 2\sigma D^2}}$, where S represents the original sample value, D represents the duplicate value, and $2\sigma S$ and $2\sigma D$ represent the 2-sigma uncertainties surrounding the original and duplicate samples, respectively. A DER below 3 indicates sample-to-field-duplicate precision that is in control.

Field duplicates are independent samples that are collected as closely as possible to the same point in space and time. They are two separate samples taken from the same source, stored in separate containers, and analyzed independently.

Serial dilution checks are performed for certain inorganic analyses to determine if dilutions have been prepared correctly, and to identify any effects that may arise from characteristics of the sample matrix.

Trip Blanks, Field Blanks, and Rinsate Blanks

Trip blanks, field blanks, and rinsate blanks are all collected and analyzed to establish whether concentration values assigned to an analyte or compound are attributable to contamination of the analytical system or to the presence of the analyte in the samples collected.

Trip blank—a sample of analyte-free medium that is taken to the sampling site and returned unopened to an analytical laboratory. Trip blanks are used to identify contamination attributable to shipping or field handling procedures. Trip blanks are required for all field events that include the collection of volatile samples.

Field blank—a sample of analyte-free medium that is taken to the sampling site and exposed to the atmosphere during sample-collection activities. Field blanks are used to measure contamination introduced during sample collection.

Equipment rinsate blank—a sample of analyte-free medium that has been used to rinse the sampling equipment. It is collected after completion of decontamination and before sampling. Equipment rinsate blanks are used to assess the cleanliness of sampling equipment.

A-2.0 LABORATORY ANALYSIS SUMMARY

During the FY2007, 61 pore-gas samples, seven field blank samples, and 11 field duplicate samples were collected at Material Disposal Area (MDA) G. Analysis of pore gas was conducted for volatile organic compounds (VOCs) using EPA Method TO-15 or for tritium using EPA Method 906.0. All QC procedures were followed as required by the analytical services contract. Table A-2.0-1 lists the analytical method used for inorganic and organic chemical analyses.

Sampling locations, sampling ports, and validated analytical results are given in Appendix B of the monitoring report. The data, including the qualified data, are usable for evaluation and interpretive purposes. The entire data set meets the standards set for use in this report.

The analytical methods used for radionuclides and organic chemicals are summarized in the following sections. The required estimated detection limit (EDL) or estimated quantitation limit (EQL) for each analyte is defined in the analytical services contract.

A-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 services contract.

Maintenance of COC

COC was properly maintained for all samples.

Sample Documentation and Dilutions

Samples were properly documented in the field.

Sample Preservation

Preservation criteria were met for all samples.

Holding Time

Holding times were met for all samples.

Initial and Continuing Calibration Verification

Initial calibration acceptance criteria were met for all sample analyses. Continuing calibration percent differences (%D) were greater than 25% affecting EPA Method TO-15 analyses of 91 organic chemical records. Affected records were qualified as being an estimate of their sample-specific quantitation limit or detection limit.

Analyte Identification (including internal standards, spectra review, and thermal ionization cavity review)

Analyte identification criteria were met for all but eight sample analyses. The mass spectrum did not meet method specifications and associated records were qualified as not detected.

Analyte Quantitation

Analyte quantitation criteria were met for all sample analyses.

Method Blank

Method blank results for organic chemical analyses were within acceptable limits for all sample analyses.

Matrix Spike Recoveries

All matrix spike recoveries for organic chemical analyses were within acceptable limits.

Surrogate Recoveries

All surrogate recoveries for organic chemical analyses were within acceptable limits.

Internal Standard Responses

All internal standard responses for organic chemical analyses were within acceptable limits.

LCS Recoveries

LCS recoveries were within acceptable limits for all but 30 EPA Method TO-15 analytical records. LCS recoveries were greater than the upper acceptance limit, affecting 16 detected analytical records. Affected records were qualified as estimated and biased high. LCS recoveries were less than the lower acceptance limit but greater than 10%, affecting 14 detected analytical records. Each of the affected detected records was qualified being an estimate of their sample-specific quantitation limit or detection limit.

Laboratory and Field Duplicates

Laboratory duplicate analyses indicate acceptable precision for all organic chemicals.

Most field duplicates collected for organic chemical analyses indicate acceptable precision. During fiscal year (FY) 2007, field duplicate precision was greater than 35% for eight analyses conducted from pore-gas samples. The sample records potentially affected by larger-than-expected field duplicate RPDs are listed in Table A-3.0-1. Sample results are not qualified based on field duplicate precision.

Trip Blanks, Field Blanks, and Rinsate Blanks

Trip blank and rinsate blank samples are not collected during VOC SUMMA sampling.

The field blank collected on February 15, 2007, for EPA Method TO-15 analysis was contaminated with $4.5 \mu\text{g}/\text{m}^3$ of 1,1-dichloroethene. This concentration of 1,1-dichloroethene is within 5 times the concentration of one sample analyzed to contain detected concentrations of 1,1-dichloroethene, indicating that 1,1-dichloroethene detected in this sample may be the result of field contamination. Detected field blank results do not impact the investigation or site status. This second quarter FY2007 sample record potentially affected by field blank contamination is listed in Table A-3.0-2. The sampling results are not qualified based on field blank contamination.

A-4.0 RADIONUCLIDE ANALYSES

Maintenance of Chain of Custody

Chain of custody was properly maintained for all samples.

Sample Documentation and Dilutions

Samples were properly documented in the field.

Sample Preservation

Preservation criteria were met for all samples.

Holding Times

Holding times were met for all inorganic chemical digestions and analyses.

Initial and Continuing Calibration Verification

Initial and continuing calibrations are acceptable for all radionuclide analyses.

Analyte Identification

Analyte identification criteria were met for all radionuclide analyses.

Analyte Quantitation

Analyte quantitation criteria were met for all radionuclide analyses.

Method Blanks

The method blank results for radionuclide analyses were within acceptable limits all sample results.

Matrix Spike Recoveries

The matrix spike recoveries for radionuclide analyses were within acceptable limits for all the analyses.

Carrier and Tracer Recoveries

Tracer and carrier recoveries for radionuclide analyses were within acceptable limits for all core and air analyses.

LCS Recoveries

The LCS recoveries for radionuclide analyses were within acceptable limits for all core and air analyses.

Laboratory and Field Duplicates

Laboratory duplicate analyses indicate acceptable precision for all radionuclides.

Field duplicates collected for radionuclide analyses indicate acceptable precision for all but two sample results. Detected tritium and associated field duplicate results had RPDs greater than 35%. The sample records potentially affected by larger than expected field duplicate RPDs are listed in Table A-3.0-1. Sample results are not qualified based on field duplicate precision.

Trip, Field, and Rinsate Blanks

Trip blank and rinsate blank samples are not collected during tritium pore gas sampling.

The field blank collected on July 31, 2007, for EPA Method 906.0 analysis, was contaminated with detectable amounts of tritium. This fourth quarter FY2007 tritium field blank activity of 226,000 pCi/L is within 5 times the concentration of each of the samples collected for tritium analyses on this date.

Sampling records potentially affected by field blank contamination are listed in Table A-3.0-2. Sampling results are not qualified based on field blank contamination.

A-5.0 FIELD-MONITORING SUMMARY

Field-monitoring data are less costly to generate than laboratory data and are immediately available to guide field decisions. Field-monitoring results are generated by rapid methods of analysis that provide less precision than laboratory analyses. Field-monitoring data provide analyte (or at least chemical class) identification and quantification, although the quantification may be relatively imprecise.

Field monitoring of subsurface vapor monitoring at MDA G is conducted using guidance provided in SOP-06.31, Rev. 2, Sampling of Subatmospheric Air. This procedure covers the use of the Brüel and Kjær (B&K) Type 1302 multigas analyzer and Landtec GEM-500 photoionization detector (PID).

The B&K is calibrated annually by a certified calibration laboratory. The B&K is adjusted before each day's use to compensate for ambient pressure and temperature. Calibration is confirmed before each day's use by analyzing triplicate readings of ambient air and duplicate readings of known quantities of mixed organic analytes in nitrogen. These calibration verification check analyses confirm analytical stability, confirm that the instrument zero point for each analyte is correctly set, and confirm that the stored calibration curve remains applicable to current instrument response to the presence of organic analytes. Concentrations of calibration standards analyzed prior to each day's use are expected to be within $\pm 20\%$ of their known values. Additionally, during each sample analysis a low sample flow condition triggers an alarm on the B&K and VOC measurement is then not completed.

The presence of nontarget organic chemicals bias B&K target analyte results if they have an acoustic response to infrared light that is similar to the target analyte. Trichlorofluoromethane (Freon 11) generates a measurable acoustic signal in response to light with a wavelength of 11.6 μm that is proportional to its concentration. Other VOCs generating an acoustic signal to light at this wavelength include Freon 114 (CAS 76-14-2; 1,2-dichloro-1,1,2,2-tetrafluoroethane) and Freon 21 (CAS 75-43-4), which is not reported by EPA Method TO-15. Tetrachloroethene (PCE) generates an acoustic signal in response to light with a wavelength of 11.1 μm . Other VOCs responding to light at this wavelength include styrene (CAS 100-42-5); Freon 113 (CAS 76-13-1), which is not reported by EPA Method TO-15; Freon 12 (CAS 75-71-8, dichlorodifluoromethane); ethanol (CAS 64-17-5); and 1,1-dichloroethene (CAS 75-35-4). EPA Method TO-15 analytical results indicate that 1,1-dichloroethene and Freon 113 are present in most samples at MDA L at detectable concentrations which would be included in the signal interpreted as PCE. Table A-4.0-1 presents VOCs that interfere with each of the four B&K target analytes.

Analytical data generated using the B&K Type 1302 are supported by annual calibration records that bracket the periods of analyses. Calibration information is reported below for each of the two B&K photoacoustic analyzers used to generate results presented in this periodic monitoring report.

- The B&K with serial number 1692083 was calibrated on July 3, 2007. The zero point was set for 1,1,1-trichloroethane (TCA), trichloroethene (TCE), Freon 11, PCE, carbon dioxide (CO_2), and water (H_2O). Span concentrations of TCA at 61.4 ppm, TCE at 8.1 ppm, Freon 11 at 53 ppm, PCE at 19.24 ppm, and CO_2 at 1265 ppm were used to generate calibration response curves.
- The B&K with serial number 1692083 was calibrated on May 17, 2006. The zero point was set for TCA, TCE, Freon 11, PCE, CO_2 , and H_2O . Span concentrations of TCA at 61.4 ppm, TCE at 61.6 ppm, Freon 11 at 110 ppm, PCE at 63 ppm, and CO_2 at 4.99% were used to generate calibration response curves.

- The B&K with serial number 1732805 was calibrated on May 17, 2006. The zero point was set for TCA, TCE, Freon 11, PCE, CO₂, and H₂O. Span concentrations of TCA at 61.4 ppm, TCE at 61.6 ppm, Freon 11 at 110 ppm, PCE at 63 ppm, and CO₂ at 4.99% were used to generate calibration response curves.

The Landtec GEM 500 PID is calibrated annually by a certified calibration laboratory. During calibration, methane (CH₄), oxygen (O₂), and CO₂ zero points are set, and each analyte's calibration response curves is developed. The CH₄ reading is filtered to an infrared absorption frequency of 3.41 mm (nominal), the frequency specific to hydrocarbon bonds. Landtec instruments are calibrated using certified CH₄ mixtures and will give correct readings provided there are no other hydrocarbon gasses present within the sample (e.g., ethane, propane, butane, etc.). If there are other hydrocarbons present, the CH₄ reading will be higher (never lower) than the actual CH₄ concentration being monitored. The extent to which the CH₄ reading is affected depends upon the concentration of the CH₄ in the sample and the concentration of the other hydrocarbons. The effect of other hydrocarbons is nonlinear and difficult to predict. The CO₂ reading is filtered to an infrared absorption frequency of 4.29 μm (nominal), the frequency specific to CO₂. Therefore, any other gases usually found on landfill sites will not affect the CO₂ reading. The O₂ sensor is a galvanic cell type and is not affected by CO₂, CO₂, hydrogen sulfide, nitrate, sulfide, or hydrogen.

Calibration is confirmed prior to each day's use by analyzing multiple readings of ambient air. Zero readings of CH₄ and CO₂ are expected. Oxygen is expected to read 20.9%. Oxygen readings within ± 25% of 20.9% are considered acceptable.

Analytical data generated using the Landtec GEM-500 PID is supported by annual calibration records that bracket the periods of analyses. Calibration is performed by Geotech's Colorado Service Center in Denver, Colorado. Calibration information is reported below for the four Landtec PIDs used to generate results presented in this periodic monitoring report.

- Unit 1503 was calibrated on December 4, 2006. The zero point was set for CH₄, CO₂, and O₂. Calibration was performed so that CH₄ and CO₂ reached ±15% of a known concentration, and O₂ was set to read ambient air at 20.9%. Pump flow was confirmed to be 525 cc per min.
- Unit 279 was calibrated on January 26, 2007. The zero point was set for CH₄, CO₂, and O₂. Calibration was performed so that CH₄ and CO₂ reached ±15% of a known concentration, and O₂ was set to read ambient air at 20.9%. Pump flow was confirmed to be 500 cc per min.
- Unit 916 was calibrated on March 2, 2007. The zero point was set for CH₄, CO₂, and O₂. Calibration was performed so that CH₄ and CO₂ reached ±15% of a known concentration, and O₂ was set to read ambient air at 20.9%. Pump flow was confirmed to be 550 cc per min.
- Unit 916 was calibrated on May 1, 2007. The zero point was set for CH₄, CO₂, and O₂. Calibration was performed so that CH₄ and CO₂ reached ±15% of a known concentration, and O₂ was set to read ambient air at 20.9%. Pump flow was confirmed to be 525 cc per min.
- Unit 913 was calibrated on May 23, 2007. The zero point was set for CH₄, CO₂, and O₂. Calibration was performed so that CH₄ and CO₂ reached ±15% of a known concentration, and O₂ was set to read ambient air at 20.9%. Pump flow was confirmed to be 350 cc per min.
- Unit 913 was calibrated on July 19, 2007. The zero point was set for CH₄, CO₂, and O₂. Calibration was performed so that CH₄ and CO₂ reached ±15% of a known concentration, and O₂ was set to read ambient air at 20.9%. Pump flow was confirmed to be 375 cc per min.

A-6.0 REFERENCES

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

Copies of the master reference set are maintained at the NMED Hazardous Waste Bureau; the U.S. Department of Energy—Los Alamos Site Office; the U.S. Environmental Protection Agency, Region 6; and the Directorate. The set was developed to ensure that the administrative authority has all material needed to review this document, and it is updated with every document submitted to the administrative authority. Documents previously submitted to the administrative authority are not included.

EPA (U.S. Environmental Protection Agency), February 1994. "USEPA Contract Laboratory Program National Functional Guidelines for Inorganic Data Review," EPA-540/R-94/013, Office of Emergency and Remedial Response, Washington, D.C. (EPA 1994, 048639)

EPA (U.S. Environmental Protection Agency), 1997. "Test Methods for Evaluating Solid Waste, Laboratory Manual, Physical/Chemical Methods," SW-846, 3rd ed., Update III, Office of Solid Waste and Emergency Response, Washington, D.C. (EPA 1997, 057589)

EPA (U.S. Environmental Protection Agency), October 1999. "USEPA Contract Laboratory Program National Functional Guidelines for Organic Data Review," EPA540/R-99/008, Office of Emergency and Remedial Response, Washington, D.C. (EPA 1999, 066649)

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, 054609)

LANL (Los Alamos National Laboratory), December 2000. "University of California, Los Alamos National Laboratory (LANL), I8980SOW0-8S, Statement of Work for Analytical Laboratories," Rev. 1, Los Alamos National Laboratory, Los Alamos, New Mexico. (LANL 2000, 071233)

**Table A-1.0-1
Data Analysis and Assessment Procedures**

Procedure	Title	Effective Date
SOP-15.01, Rev. 1	Routine Validation of Volatile Organic Data	4/20/2004
SOP-15.07, Rev. 1	Routine Validation of Chemical Separation Alpha Spectrometry, Gas Proportional Counting, and Liquid Scintillation Data	4/20/2004

**Table A-1.0-2
Definition of Data Qualifiers Used in Data Validation**

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 A-2.0-1
Analytical Method Used for Organic Chemical Analyses**

Analytical Method	Analytical Description	Target Compound List
EPA Method TO-15— Sampling and Analysis	VOCs in air	See analytical services statement of work (LANL 2000, 071233)
EPA Method 906.0	Tritium analysis	See analytical services statement of work (LANL 2000, 071233)

**Table A-3.0-1
Sample Records with Large Duplicate RPDs**

Location ID	Depth (ft)	Analyte Name	Units	FD ^a Quantitation Limit	FD Result (qualifier)	Sample Quantitation Limit	Sample Result	RPD (%)
54-24397	239	Tritium	pCi/L	300	4470	160	1750	43.7
54-24397	239	Tritium	pCi/L	2320	44200	149	2400	89.7
54-24386	195	Trichloro-1,2,2-trifluoroethane[1,1,2-]	µg/m ³	210	430	95	200	36.5
54-27436	185	Dichloroethane[1,1-]	µg/m ³	11	280	4.6	130	36.6
54-27436	185	Trichloroethene	µg/m ³	14	4000	6.1	1800	37.9
54-27436	185	Chloroform	µg/m ³	13	78	5.6	34	39.3
54-27436	185	Methylene Chloride	µg/m ³	9.1	25	4	10	42.9
54-25105	485-700	Acetone	µg/m ³	8.3	59	8.3	170	48.5
54-27436	185	Cyclohexane	µg/m ³	9	9 (U) ^b	3.9	27	50.0
54-24394	300	Cyclohexane	µg/m ³	3.1	3.1 (U)	3.1	15	65.7

^a FD = Field duplicate.

^b See Table A-1.0-2 for definitions of data qualifiers.

**Table A-3.0-2
Sample Records Potentially Affected by Field Blank Contamination**

Analyte Name	Location ID	Sample ID	Depth (ft)	Sample Value	Reporting Units	Collection Date
Dichloroethene[1,1-]	54-02033	MD54-07-76262	100	11	µg/m ³	2/15/2007
Tritium	54-24397	MD54-07-5000	84	433617	pCi/L	7/31/2007
Tritium	54-24397	MD54-07-5001	125	89900	pCi/L	7/31/2007
Tritium	54-24397	MD54-07-5002	160	20000	pCi/L	7/31/2007
Tritium	54-24397	MD54-07-5003	184	45700	pCi/L	7/31/2007
Tritium	54-24397	MD54-07-5004	232.5	2400	pCi/L	7/31/2007

**Table A-4.0-1
B&K Target Analytes
and Potential Interfering Analytes**

Target	Potential Interfering Analyte
PCE	Styrene
PCE	Freon 113
PCE	Freon 12
PCE	1,1-Dichloroethene
PCE	Ethylene oxide
PCE	Ethanol
PCE	Dipropylnitrosamine
PCE	1,1-Dimethylhydrazine
PCE	1,4-Diethylene dioxide
PCE	Cyclohexene
PCE	tert-Butyl alcohol
PCE	m-Vinyltoluene
PCE	Vinyl chloride
PCE	Tetrahydrofurane
PCE	Silicium tetrafluoride
PCE	Nitromethane
PCE	Nitrogen trifluoride
PCE	α -Methylstyrene
PCE	Monomethyl hydrazine
PCE	Methyl iodide
PCE	n-Hexane
PCE	Acetic anhydride
PCE	1,3-Butadiene
Freon 11	Freon 114
Freon 11	Freon 21
Freon 11	Carbonyl sulphide
Freon 11	Methyl acetate
Freon 11	Chloropicrine
Freon 11	Cyclohexane
Freon 11	Dimethylnitrosamine
Freon 11	Epichlorohydrine
Freon 11	Ethane
Freon 11	Ethylene oxide
Freon 11	Ethyl formate
Freon 11	2-Nitropropane
Freon 11	Phosgene

Table A-4.0-1 (continued)

Target	Potential Interfering Analyte
Freon 11	Vinyl acetate
TCA	Fluorobenzene
TCA	Ethyl benzene
TCA	Dimethyl formamide
TCA	Dichloromethane
TCA	1,2-Dichloroethane
TCA	o-Dichlorobenzene
TCA	Dibutyl phthalate
TCA	Chloromethane
TCA	m-Xylene
TCA	1,1,2-Trichloroethane
TCA	o-Toluidine
TCA	Toluene
TCA	Phenol
TCA	Chlorobenzene
TCA	Carbon dioxide
TCA	Boron trifluoride
TCA	Aniline
TCA	Acetophenone
TCA	Hydrogen cyanide
TCA	n-Heptane
TCE	Arsine
TCE	Butanone
TCE	Freon 152
TCE	Diethyl ketone
TCE	Dinitrogen difluoride
TCE	2-Pentanone
TCE	2-Propanol
TCE	Sulfur hexafluoride
TCE	Vinyl chloride

Appendix B

*Data Packages and Chain-of-Custody Forms
(on CD included with this document)*

Appendix C

*Moisture Monitoring Investigation
at Technical Area 54, Area G*

C-1.0 INTRODUCTION

This report presents the data from the moisture monitoring event conducted during the first half of fiscal year (FY) 2007 at Area G, located within Technical Area (TA) 54 at the Los Alamos National Laboratory (the Laboratory). Previous moisture monitoring events are also discussed for comparison purposes.

Moisture monitoring has been performed at Area G since the 1980s to monitor subsurface moisture in and around operational and nonoperational waste disposal units, including subsurface moisture beneath permeable and impermeable surfaces, and to monitor the movement of moisture in both disturbed near-surface soils/crushed tuff and deeper undisturbed rock. Figure C-1.0-1 presents all of the available moisture monitoring locations at Area G.

During FY2007, a neutron access port construction assessment, neutron logging, and geodetic survey were performed in several solid waste disposal pits of TA-54 at Area G. The investigation was performed on preexisting neutron ports emplaced in the pits at the time of waste fill or abandonment. Neutron ports investigated were located in Pits 30, 31, 37, and 39 as well as two horizontal ports beneath the asphalt pad at Dome 375 (Figure C-1.0-1). Each port was initially camera logged to ensure a clear passage throughout the extent of the port. Each port was then neutron logged to obtain a neutron count for the surrounding waste/fill. The neutron counts were used to calculate the volumetric moisture content for the surrounding waste/fill. In total, 28 ports were camera logged. Twenty-four ports were determined to be clear, while 18 ports were neutron logged. Neutron logging was performed with a CPN 503DR Hydroprobe moisture gauge.

C-2.0 PURPOSE

Soil moisture is the primary constituent monitored within the vadose (unsaturated) zone and is the primary parameter used for monitoring the performance of disposal units within Area G. Soil moisture data are ultimately incorporated into the associated transport modeling for the Area G Performance Assessment (Hollis et al. 1997, 063131). Vertical probe access tubes are installed in many Area G disposal pits to monitor moisture behavior within waste or fill. In the newer disposal pits, access tubes are installed horizontally at the base of the pit before disposal operations are conducted, allowing for moisture logging below the waste.

There are two objectives for continued monitoring of soil moisture content at Area G: (1) to quantify the moisture content within the different geological units of the vadose zone to incorporate these data into the performance assessment transport modeling, and (2) to identify any trends in moisture content over time. Trend analysis is used to identify the presence or absence of increasing or decreasing moisture content trends that could be the result of natural processes or impacts from disposal operations. Significant trends in moisture behavior may warrant additional modeling and possibly sampling as well as possible best management practices such as water diversion.

C-3.0 SITE CONDITIONS

Area G is a 65-acre fenced area consisting of asphalt-paved roads and storage areas, graded roads, buildings, utilities, storm-water drainages, shaft caps, and vegetated pit and trench covers. Material Disposal Area (MDA) G is located within Area G. Historically, MDA G was used for the disposal of low-level and transuranic (TRU) radioactive waste and certain radioactively contaminated infectious waste, asbestos-contaminated material, and polychlorinated biphenyls (PCBs) and for temporary placement of

TRU waste. TRU Waste disposal no longer occurs at MDA G. However, disposal of low-level radioactive waste continues at Area G. The pits, trenches, and shafts in MDA G are constructed in unit 2 (caprock) and unit 1 (subsurface) of the Tshirege Member of the Bandelier Tuff, a consolidated tuff unit. The regional aquifer is estimated to be at an average depth of approximately 900 ft below ground surface (bgs) at Area G, based on data from wells at the Laboratory and the predictions of the hydrogeologic conceptual model for the Pajarito Plateau (LANL 1998, 059599).

The source of moisture in the vadose zone beneath TA-54 is infiltrating precipitation, but most of the precipitation is removed as runoff or evaporation and transpiration in the upper region of the vadose zone (Hollis et al. 1997, 063131). Subsurface movement of the remaining water is predominantly vertical and is influenced by the physical properties and conditions of the vadose zone.

Two geologic properties of the Bandelier Tuff that influence fluid flow in the vadose zone are the degree of welding and devitrification, both of which were determined by the presence of residual gases and high temperatures when the rock was deposited. Because different tuff units were deposited at different temperatures and because individual units were laid out in variable thicknesses over different landscapes, cooling was nonuniform. Consequently, welding varies spatially both between and within separate depositional layers. Welded tuffs tend to be more fractured than nonwelded tuffs. A more detailed description of the stratigraphy below MDA G is presented in the investigation report for MDA G (LANL 2005, 090513).

Several competing effects determine moisture content and fluid flux in welded, devitrified tuff. While water moves slowly through the unsaturated tuff matrix, it can move relatively rapidly through fractures if nearly saturated conditions exist (Hollis et al. 1997, 063131). Generally, field moisture content in the upper 100 ft of tuff at MDA G is less than 2% by volume in areas undisturbed by disposal pits, trenches, and shafts and, most notably, the asphalt cover. Around some disturbed settings caused by disposal activities, near-surface moisture content increases up to 25% because of the absence of plant evapotranspiration and suppression of atmospheric venting by installation of large asphalt surfaces (International Technology Corporation 1987, 008998). Even at these saturation levels, most of the deeper fractures beneath MDA G are completely dry, and the water can be found only in the tuff matrix. Only in situations when substantial infiltration occurs from the ground surface do the fractures become wet and conduct water. However, modeling studies at MDA G predict that when fractures disappear at contacts between stratigraphic subunits such as the Cerro Toledo interval, fracture moisture is absorbed into the tuff matrix if fracture fills are encountered and when the water source stops (Hollis et al. 1997, 063131).

In summary, the pore-water flow and contaminant transport in the vadose zone is difficult to characterize. The flow rates and transport velocities/directions are variable in both time and space. Between the ground surface and regional aquifer, the flow is predominantly vertical. Nevertheless, the pore-water transport velocities through the vadose zone in the region of TA-54 are slow, probably less than 1 cm/yr (Birdsell et al. 1995, 070012; Birdsell et al. 1999, 069792).

C-4.0 PREVIOUS MOISTURE MONITORING

Since 1987, moisture-monitoring assessments have been performed at MDA G. Moisture data have been collected from 55 boreholes and from within 4 waste disposal pits. In situ volumetric moisture monitoring was conducted between 1996 and 2001 and in 2005. Core samples for gravimetric moisture content were collected in 1987, 1995, and 2005. The types of moisture data collected at MDA G include the following.

Volumetric moisture content:

- determines volume of liquid water per volume of soil,
- is determined from in-situ field monitoring using gamma-ray attenuation, neutron-ray attenuation, or time-domain reflectometry (TDR), and
- provides for repeated measurements and trend evaluation

Gravimetric moisture content:

- determines mass of water per mass of dry soil,
- is determined by laboratory measurements (weighing) and by estimating mass and volume, and
- provides analytical laboratory benchmark for validation and calibration of field-screening methods.

C-4.1 Hydrologic Assessment

In 1986, a hydrologic assessment was performed using five boreholes at TA-54, two located at MDA G and three at MDA L. Volumetric moisture content ranged from 2% to 4% with isolated intervals ranging from 10% to 28%. Gravimetric analysis results from 20 core samples collected from the subsurface tuff reported moisture contents ranging between 2% and 10% and occasionally up to 28% (Kearl et al. 1986, 008414).

C-4.2 Volumetric Moisture Monitoring

From June 1996 to August 2001, 22 individual boreholes and neutron access ports located within four pits were neutron-logged monthly at 1-ft intervals providing 5 yr of volumetric moisture-content data for MDA G. Moisture levels observed ranged from 0.13% to 25% for all pits and boreholes. Table C-4.2-1 presents the minimum, maximum, and mean volumetric moisture results for each waste disposal pit collected during the 5 yr of monitoring.

A challenge associated with this previously collected neutron logging data is that the surface elevation was not recorded for each monitoring event, and total depths measured sometimes vary per monitoring event. As waste disposal operations progressed, lengths were added to neutron access pipes and occasionally pipe lengths were decreased. Further, pipes could be damaged or filled with soil or waste, causing a change in the total available length for neutron logging. For future neutron logging events, surveying and recording the base-surface elevation before each monitoring event within the pits would ensure that depth measurements can be compared to future data sets.

C-4.3 Performance Assessment Moisture Studies

As reported by Newman et al. (2005, 099163), two studies were undertaken in 1999 and 2002 as part of the Laboratory Performance Assessment Maintenance Program. One objective of the 1999 study was to examine the hydrologic effects of asphalt paving at MDA G. Since the initial performance assessment was completed, substantial areas of the mesa top have been paved with asphalt. To determine how the paving affects near-surface hydrologic behavior, an effort was made to compare gravimetric moisture content data from core samples taken in the unpaved areas to core samples from three paved locations. Four additional cores from paved areas were collected in 2002 to supplement the 1999 data.

Volumetric moisture content profiles for pit cover boreholes collected in 1999 ranged from approximately 2% to 14%. Profiles from Pits 17 and 24 were consistently below 10%, with Pit 2 having average values in

the low teens (Newman et al. 2005, 099163). Volumetric moisture content profiles for unexcavated areas adjacent to pits collected in 1999 ranged from 2% to 24%. Volumetric moisture content data collected from locations below asphalt indicates a lower range in moisture values compared with the unpaved locations. Because plants do not grow through the asphalt, transpiration in paved areas is minimal, except perhaps along the margins of the pads. Additionally, precipitation events will not have the same effects on subsurface moisture levels of paved areas when compared with unpaved areas because the asphalt appears to prevent the infiltration of moisture into the soil as well as the evaporation of moisture from the soil. The substantially lower level of evaporation and transpiration at the paved locations is an important hydrological difference that appears to be reflected in the water content data (Newman 1996, 059118).

C-4.4 2005 Investigation Work Plan Activities

In 2005, 39 boreholes were drilled within MDA G as part of the 2005 investigation work plan activities for MDA G (LANL 2005, 090513). All boreholes were neutron logged for volumetric moisture content data. Sixty-two core samples were collected for laboratory analyses of gravimetric moisture content and matric potential at approximately 5-ft intervals to a depth of 595 ft from borehole 54-25423. Three moisture and matric potential samples were collected at 5-ft intervals from depths of 595.5 ft to 699.5 ft in borehole 54-25105. Gravimetric moisture content results for each borehole ranged from 0.2% to 10.8% in the tuff units and 27.2% in the Guaje Pumice Bed. One sample, collected from the basalt at a depth of 545.0 ft to 545.3 ft in borehole 54-25423, had 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).

C-4.5 Summary of Previous Moisture Monitoring

Previous moisture data collected from Area G indicate that moisture content around and within disposal units behaves as expected for a semiarid climate with the seasonal precipitation being removed from the shallow subsurface depths by evapotranspiration. Generally, on the tops of mesas at Los Alamos, moisture from rainfall and snowmelt infiltrates a few meters into undisturbed tuff. Moisture content of undisturbed tuff deeper than a few meters is largely unaffected by surface moisture; however, seasonal variability of moisture content has been observed at depths of 100 ft. Soil moisture content is affected by asphalt and other impermeable surfaces, which reduce evapotranspiration and significantly increase moisture content in the vadose zone. A preliminary review of the volumetric moisture data collected from pits in MDA G indicate that moisture levels have remained consistent during the monitoring periods, and may possibly be decreasing over time. For example, neutron logging performed at Pit 37 C from November 1996 to June 2001 showed an overall decrease in maximum volumetric moisture levels as seen in Table C-4.2-1. Because of the data collection issues described in section 4.2, a detailed review of the historical volumetric moisture data provides limited information but does indicate a general stability of soil moisture below Area G. A summary of average moisture measurements collected during previous moisture monitoring events is summarized in Table C-4.5-1.

C-5.0 CAMERA LOGGING

Camera logging of neutron access ports was conducted to assess their condition and to determine whether there was clear access throughout the extent of each port. Neutron ports investigated were located in Pits 30, 31, 37, and 39 (Figure C-1.0-1). In total, 28 access ports were camera logged in FY2007. Twenty-four ports were determined to be clear. Table C-5.0-1 summarizes the locations of the camera logging activities, and status of each port.

C-6.0 NEUTRON LOGGING

A total of 18 neutron access ports were logged from December 14, 2006, to January 10, 2007, according to Standard Operating Procedure 07.05, Subsurface Moisture Measurements Using a Neutron Probe. Neutron logging was performed with a site-dedicated CPN 503DR Hydroprobe moisture gauge. The neutron counts from each of the neutron access locations were recorded into a spreadsheet, and the corresponding volumetric moisture content was calculated. Neutron probe calibration is dependent on borehole construction and is specific to the media being measured. Standard calculations for Bandelier Tuff used in this report were drawn from a report entitled "Subsurface Measurements Using Neutron Probes" (LANL 1999, 090803). Neutron logging was not performed at Pit 15 because waste disposal operations continue at the site. Borehole 54-22116 was also not neutron logged. Plots of volumetric moisture content for each neutron access location are shown in Figures C-6.0-1 through C-6.0-5.

C-7.0 NEUTRON LOGGING RESULTS

Neutron logging was performed beneath the Dome 375 asphalt pad on December 18 and 19, 2006, and in Pits 30, 31, 37, and 39 from December 14, 2006, through January 10, 2007.

C-7.1 Dome 375 Asphalt Pad

Two locations at the Dome 375 asphalt pad, Asphalt Pad West (W) and Asphalt Pad Central (C), were neutron logged along trenches that allow for horizontal measurement beneath the pad surface. Beginning at the south end of each trench, Asphalt Pad W extends 144 ft to the north, while Asphalt Pad C extends 138 ft to the north (Figure C-1.0-1). Moisture levels beneath each pad location were generally elevated (greater than 6%) from approximately 20 ft to 40 ft from the south. The highest moisture contents for Asphalt Pad W (9% and 9.1%) were observed at 36 ft and 126 ft, respectively, from the south. Moisture levels for Asphalt Pad W were generally observed to be between 5% and 7% beneath the majority of the pad.

Asphalt Pad C demonstrated similar moisture conditions with a peak moisture content of 10.3% at 19 ft from the south. Moisture levels were generally observed to be above 8% through 44 ft, where they then dropped to 6%. The last 3 ft of the trench had an increase in moisture content to above 7%.

The minimum, maximum and average moisture values for each asphalt pad neutron access location are summarized in Table C-7.1-1. Figure C-7.1-1 presents the minimum and maximum concentrations observed at location Asphalt Pad C over five monitoring events between March 1999 and September 2000. Figure C-7.1-2 presents the minimum and maximum concentrations observed at location Asphalt Pad W over five monitoring events between April 1999 and September 2000. Figure C-6.0-1 presents the moisture measurements at both pad locations for the FY2007 monitoring event.

In general, moisture values recorded for both pad locations during the 1999 and 2000 monitoring events demonstrated slightly higher values than the 2006 monitoring event. The average moisture content for the pad locations during 1999 and 2000 was 7.4% (Table C-4.2-1), while the average moisture content for Asphalt Pad C and Asphalt Pad W during 2006 was 6.8% and 6.9%, respectively (Table C-7.1-1).

C-7.2 Waste Disposal Pits

Sixteen neutron access ports were logged within waste Pits 30, 31, 37, and 39. The average volumetric soil-moisture values observed for all disposal pits ranged from 4.5% to 9.9% (see Table C-5.0-1), which

were significantly less than half the value considered necessary for saturation of tuff soils. The minimum, maximum, and average moisture values for each pit location are summarized in Table C-7.1-1.

Elevated moisture values of 25% and 24% were observed at the bottom of the logging ports for Pit 37 W2 and Pit 39 C2, respectively (Figures C-6.0-4 and C-6.0-5). Both values were likely the result of condensate build-up at the bottom of the ports.

Pit 30

Five neutron access ports were monitored in Pit 30. Four of the access ports are installed at depths ranging from 20 ft to 25 ft, while the fifth port is installed at a depth of 65 ft. Moisture values for Pit 30 were the most varied of the four pits (Figure C-6.0-2 and Table C-7.1-1). Moisture levels in the shallower neutron access ports (ports 1–4) were generally more elevated than the deeper access port ranging from 1.9% to 14.1% with an average value of approximately 7%. The 65-ft port had moisture levels ranging from 2.8% (48 ft) to 10.3% (2 ft) with an average value of 4.5%.

Pit 31

Two locations were neutron logged at Pit 31. Moisture levels ranged from 0.7% (4 ft) to 10.7% (5 ft) and averaged approximately 7% (Table C-7.1-1). Moisture levels for Pit 39 were greater in the near surface at depths between 5 ft and 17 ft. Figure C-6.0-3 presents a summary of all moisture measurements collected for Pit 31 in FY2007.

Pit 37

Six locations were neutron logged at Pit 37. Moisture levels ranged from 2.5% to 10.2%, with an average value of approximately 6% (Table C-7.1-1). Pit 37 W2 had an elevated moisture reading of 25.4% at 63 ft, probably the result of condensate build-up at the bottom of the access port. Figure C-6.0-4 presents a summary of all moisture measurements collected for Pit 37 in FY2007.

Pit 39

Three locations were neutron logged at Pit 39. Moisture levels ranged from 1% to 9.3% with an average value of approximately 8%. The deepest measurement from Pit 39 C2 at a depth of 53 ft had an elevated moisture reading of 24%, probably the result of condensate build-up at the bottom of the access port. Figure C-6.0-5 presents a summary of all moisture measurements collected for Pit 39 in FY2007.

C-8.0 CONCLUSIONS

Moisture data collected from Area G during previous (March 1999 to September 2000) and current (December 2006 and January 2007) monitoring events indicate that soil moisture content appears to be stable in soil/tuff and fill material within and adjacent to several Area G waste disposal units. The average moisture content in these materials has generally ranged from 6% to 8%, well below saturation levels. Within waste disposal Pits 30, 31, 37, and 39, moisture content was only slightly variable with increasing depth, indicating that the moisture content of undisturbed tuff deeper than a few meters is generally unaffected by surface moisture. As observed in the boreholes drilled during 2005, elevated moisture levels are sometimes seen at the interfaces of geologic units (LANL 2005, 090513).

A comparison of historical moisture values beneath the Dome 375 asphalt pad with values measured in December 2006 demonstrate a similar trend in that moisture content appears elevated in the 20- to 40-ft interval (as measured from the south-end of each monitoring location). The reasons for the increase in soil moisture at these horizontal distances from the pad margins are unclear at this time. Compared to other locations at the Laboratory where saturated soil moisture conditions developed beneath asphalt, the soil moisture beneath the asphalt at Area G is relatively dry (Newman et al. 2005, 099163). If the asphalt were to become cracked or perforated, the potential for increasing soil moisture conditions could develop.

Moisture data collected during the FY2007 monitoring event are suitable for the Area G performance assessment transport modeling. However, additional moisture monitoring data are needed to identify and evaluate soil moisture trends within and adjacent to Area G waste disposal units that are not reflected in the limited data set presented in this report.

C-9.0 REFERENCES

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

Copies of the master reference set are maintained at the NMED Hazardous Waste Bureau; the U.S. Department of Energy—Los Alamos Site Office; the U.S. Environmental Protection Agency, Region 6; and the Directorate. The set was developed to ensure that the administrative authority has all material needed to review this document, and it is updated with every document submitted to the administrative authority. Documents previously submitted to the administrative authority are not included.

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Figure C-1.0-1 Moisture monitoring locations at Area G

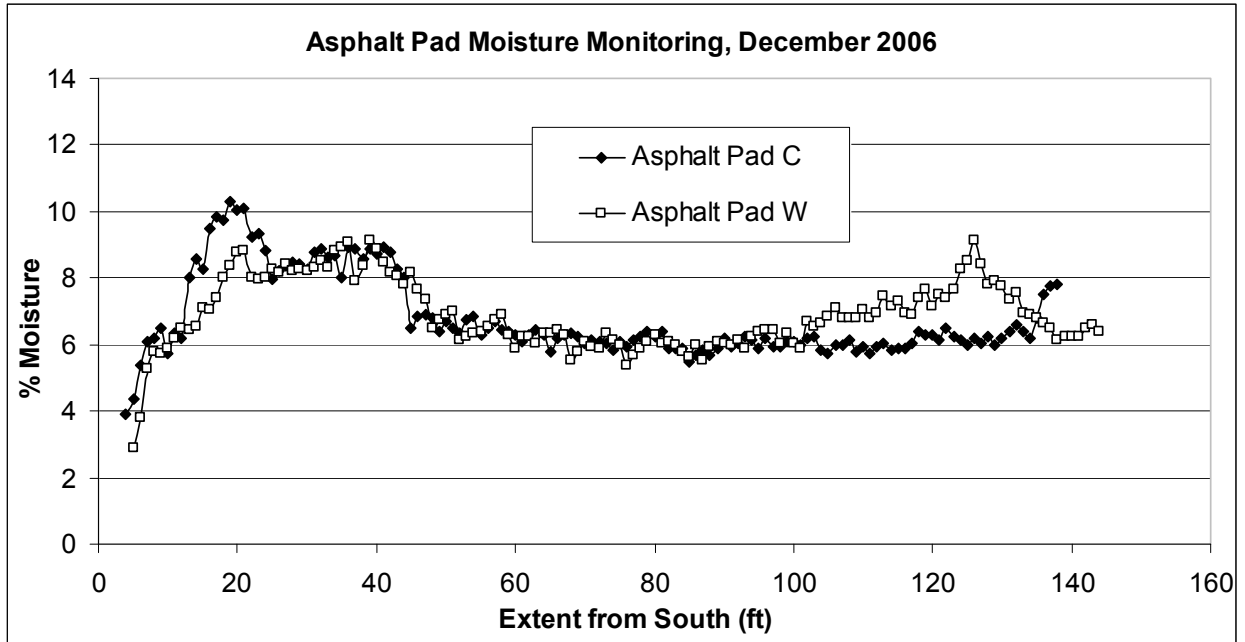


Figure C-6.0-1 Asphalt pad moisture measurements for FY2007

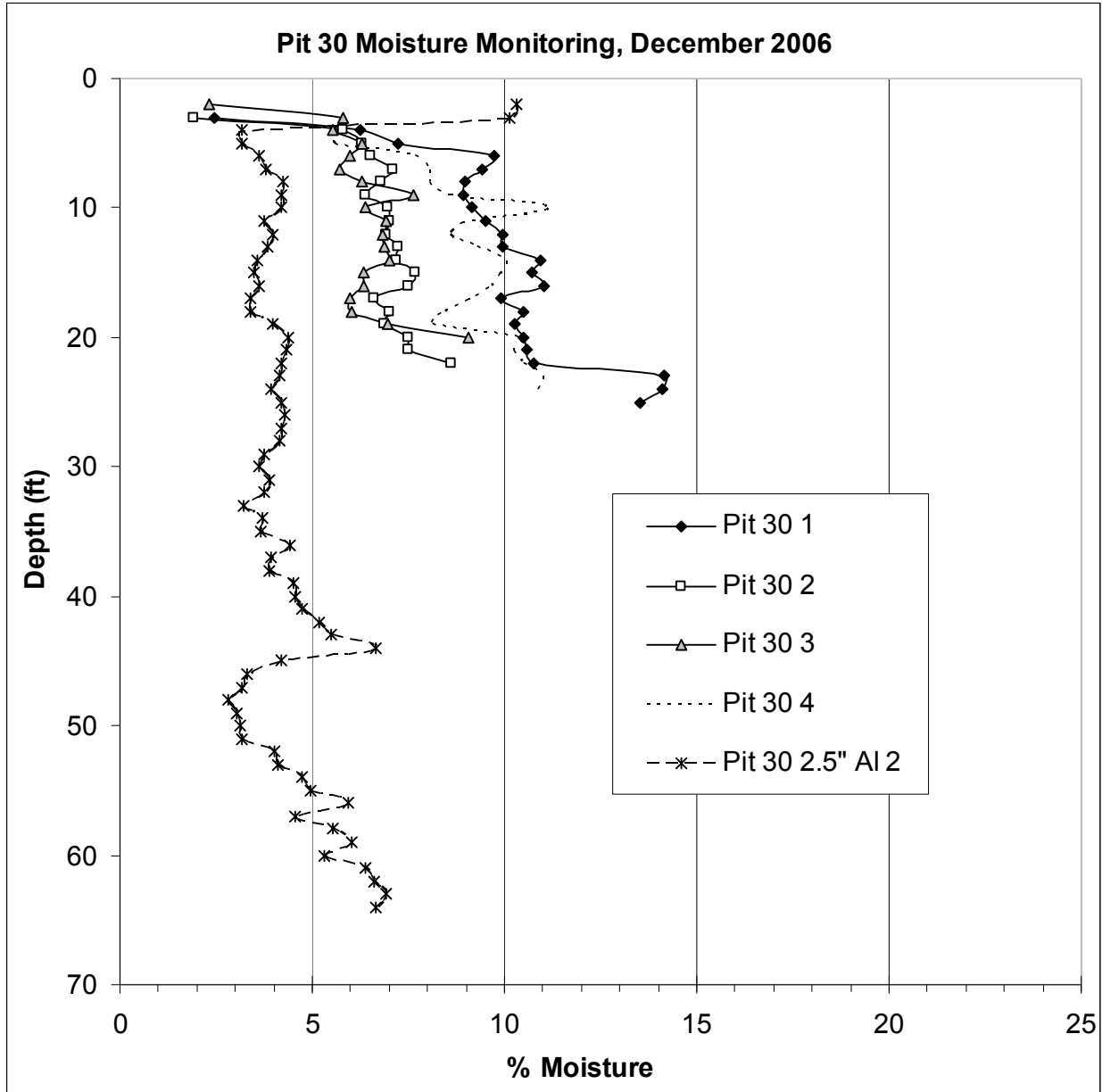


Figure C-6.0-2 Moisture measurements at Pit 30 for FY2007

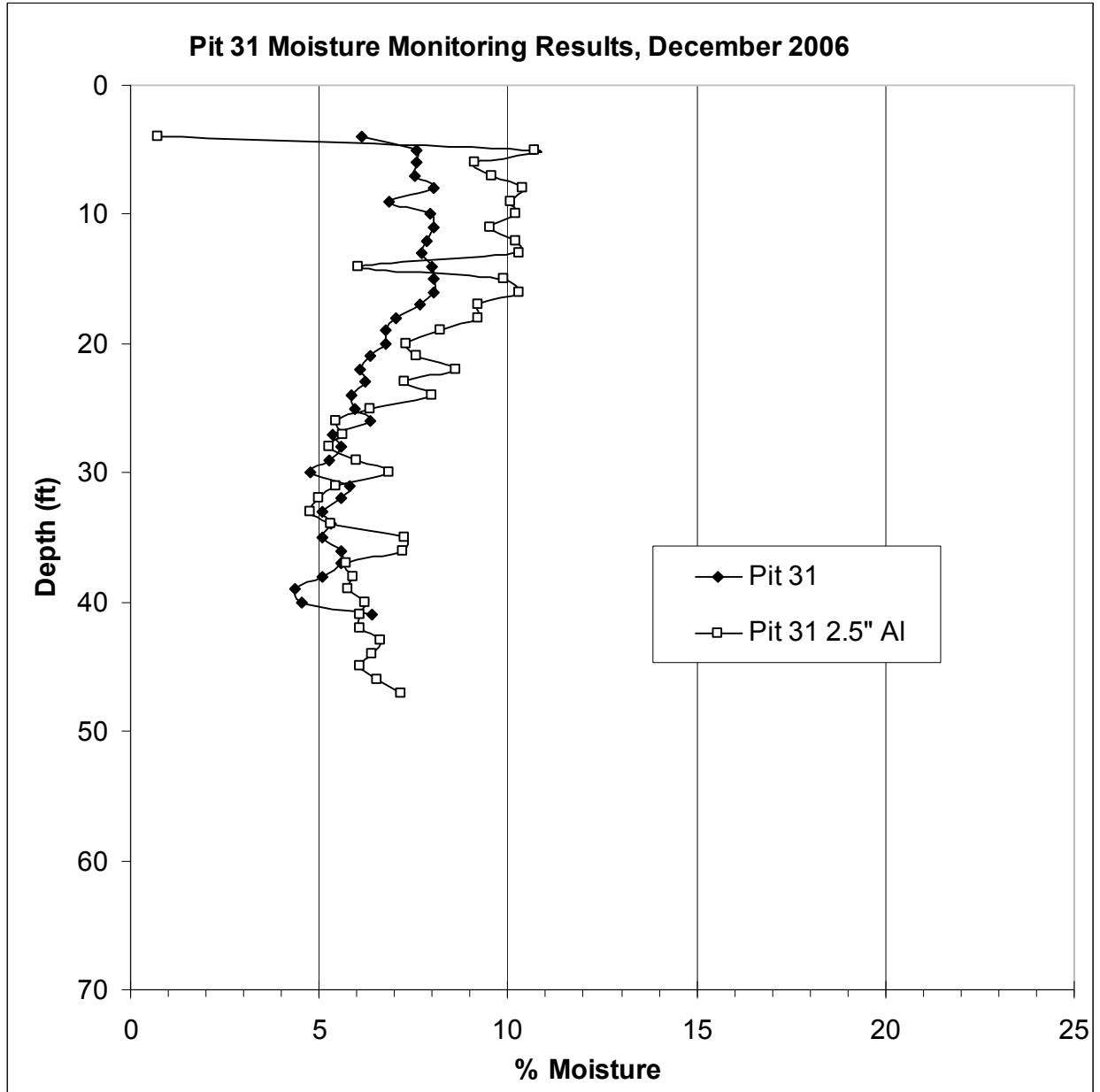
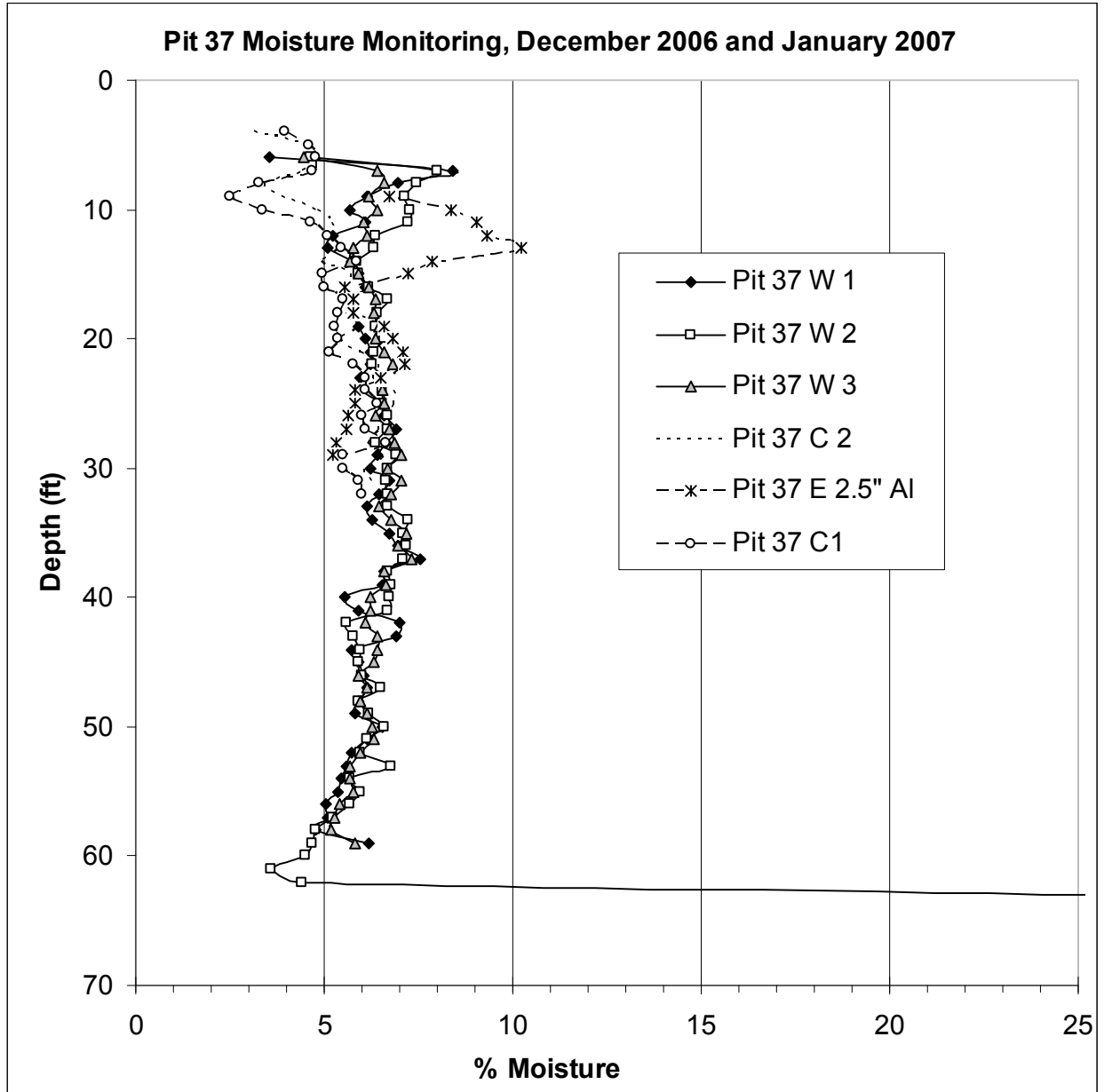
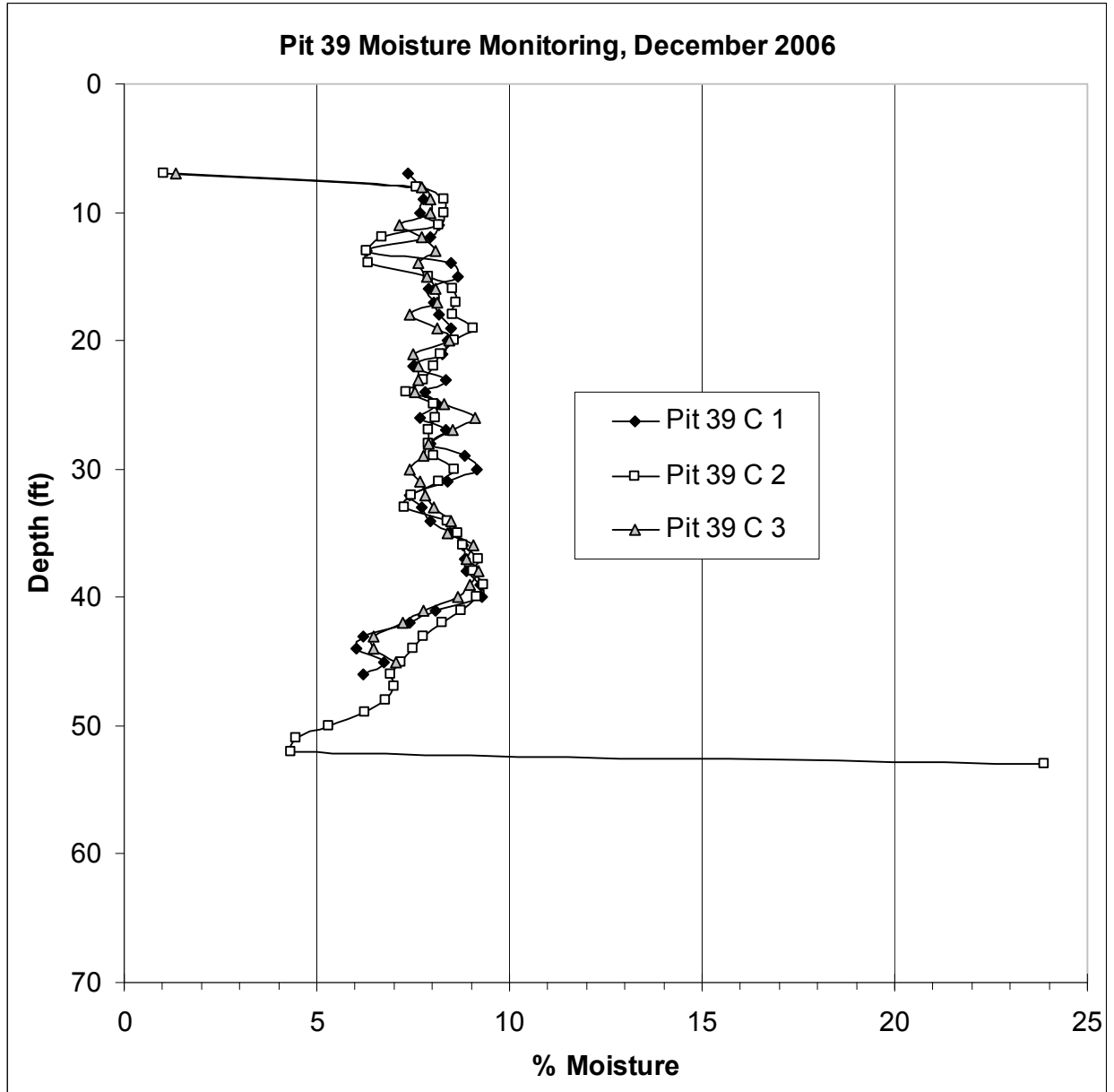


Figure C-6.0-3 Moisture measurements at Pit 31 for FY2007



Note: A moisture value of 25.4% was recorded at the greatest depth (63 ft) in Pit 37 W 2, likely due to the presence of condensate at the bottom of the monitoring port.

Figure C-6.0-4 Moisture measurements at Pit 37 for FY2007



Note: A moisture value of 23.9% was recorded at the greatest depth (53 ft) in Pit 39 C 2, probably from the presence of condensate at the bottom of the monitoring port.

Figure C-6.0-5 Moisture measurements at Pit 39 for FY2007

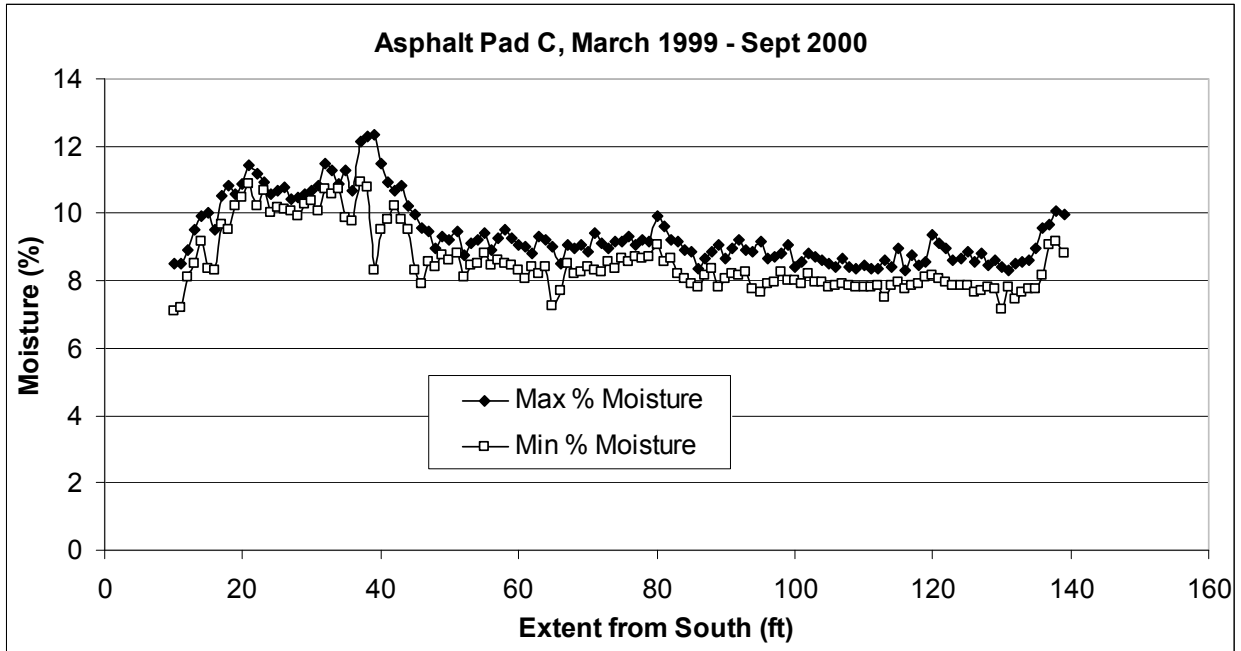


Figure C-7.1-1 Minimum and maximum moisture measurements at Asphalt Pad C 1999–2000

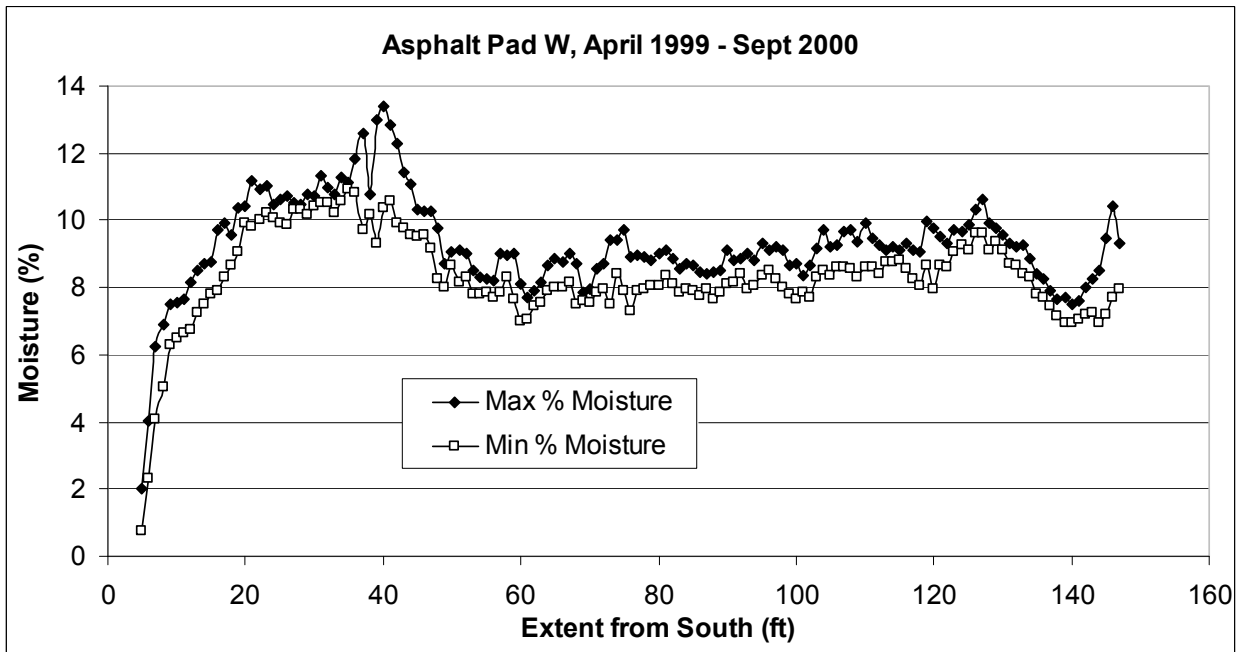


Figure C-7.1-2 Minimum and maximum moisture measurements at Asphalt Pad W 1999–2000

Table C-4.2-1
Minimum, Maximum, and Mean Results for Previously Collected Pit Moisture

Location	Date	Minimum Volumetric Soil Moisture (%)	Maximum Volumetric Soil Moisture (%)	Mean Volumetric Soil Moisture (%)	Depth of Minimum Result (ft)	Depth of Maximum Result (ft)	Total Depth Measured During Event (ft)
Pit 15 S	4/18/1999	4.65	11.7	7.12	1	12	12
Pit 15 S	6/4/1999	6.81	11.74	8.38	7	12	12
Pit 15 C	6/4/1999	5.51	7.97	6.72	12	10	12
Pit 15 C	8/18/1999	6.93	11.28	8.44	8	12	12
Pit 30	6/15/1999	1.48	14.75	3.18	34	2	68
Pit 37 C	11/7/1996	5.33	12.82	9.13	47	8	47
Pit 37 C	11/19/1996	5.34	12.82	9.26	47	8	47
Pit 37 C	12/23/1996	5.34	12.94	9.26	47	8	47
Pit 37 C	1/24/1997	5.45	12.78	9.16	47	8	47
Pit 37 C	2/21/1997	5.41	12.75	9.12	46	26	47
Pit 37 C	3/20/1997	5.31	12.58	9.23	47	8	47
Pit 37 C	5/5/1997	5.56	13.18	9.22	47	8	47
Pit 37 C	7/2/1997	5.57	13.61	9.33	47	8	47
Pit 37 C	8/5/1997	5.44	13.3	9.28	47	8	47
Pit 37 C	9/12/1997	0.45	13.6	9.19	1	8	12
Pit 37 C	10/17/1997	0.13	13.55	9.20	1	8	29
Pit 37 C	11/20/1997	0.61	13.09	9.13	1	8	29
Pit 37 C	12/23/1997	6.76	9.09	7.93	12	24	29
Pit 37 C	2/26/1998	4.19	9.23	7.88	1	25	29
Pit 37 C	4/23/1998	4.33	9.23	7.88	1	25	29
Pit 37 C	6/23/1998	2.59	9.28	7.84	1	24	29
Pit 37 C	9/3/1998	3.51	9.48	7.75	1	9	29
Pit 37 C	11/23/1998	6.95	9.17	8.04	11	24	29
Pit 37 C	2/1/1999	5.87	9.4	8.05	1	29	29
Pit 37 C	5/21/1999	5.92	9.43	8.05	1	8	29
Pit 37 C	8/19/1999	6.7	9.6	8.19	11	28	28
Pit 37 C	1/28/2000	5.26	9.18	7.79	1	22	27
Pit 37 C	4/18/2000	5.54	8.78	7.63	1	23	28
Pit 37 C	7/18/2000	1.92	8.95	6.96	1	29	29
Pit 37 C	9/27/2000	2.71	8.72	6.71	2	23	28
Pit 37 C	12/19/2000	3.23	8.73	7.16	5	23	29
Pit 37 C	5/15/2001	5.23	8.42	7.30	6	27	29
Pit 37 C	6/21/2001	3.24	8.64	7.28	2	23	29
Pit 37 C	8/21/2001	1.92	8.76	6.78	2	29	29
Pit 37 W	1/24/1997	7.98	11.63	9.97	33	27	39
Pit 37 W	2/21/1997	8.16	16.41	10.77	33	9	39

Table C-4.2-1 (continued)

Location	Date	Minimum Volumetric Soil Moisture (%)	Maximum Volumetric Soil Moisture (%)	Mean Volumetric Soil Moisture (%)	Depth of Minimum Result (ft)	Depth of Maximum Result (ft)	Total Depth Measured During Event (ft)
Pit 37 W	3/20/1997	8.29	14.81	11.44	33	9	39
Pit 37 W	5/5/1997	8.62	13.82	11.37	33	15	39
Pit 37 W	7/2/1997	4.82	13.74	10.86	4	15	39
Pit 37 W	8/1/1997	6.49	13.42	10.75	4	15	39
Pit 37 W	9/12/1997	2.68	13.5	10.74	1	16	35
Pit 37 W	10/17/1997	2.8	13.41	10.58	1	27	35
Pit 37 W	11/20/1997	6.44	13.1	10.64	1	27	35
Pit 37 W	12/22/1997	7.76	13.27	10.63	4	27	35
Pit 37 W	2/26/1998	7.16	13.17	10.50	4	27	35
Pit 37 W	4/23/1998	3.24	13.03	10.31	1	27	35
Pit 37 W	6/23/1998	0.69	13.51	10.10	1	27	35
Pit 37 W	9/3/1998	1.43	12.49	9.41	1	26	35
Pit 37 W	11/23/1998	4.71	13.12	9.92	4	26	36
Pit 37 W	2/1/1999	5.62	13.23	9.93	3	26	36
Pit 37 W	5/21/1999	7.3	13.05	9.94	4	27	35
Pit 37 W	8/19/1999	7.93	13.13	9.96	7	26	31
Pit 37 W	1/28/2000	6.09	11.72	9.67	1	27	36
Pit 37 W	4/18/2000	7.71	13.25	9.82	3	27	35
Pit 37 W	7/18/2000	3.63	13.31	9.62	1	27	35
Pit 37 W	9/27/2000	1.18	13.2	9.42	1	27	35
Pit 37 W	12/19/2000	1.6	13.93	9.34	1	27	35
Pit 37 W	5/14/2001	7.38	26	10.24	2	26	27
Pit 37 W	6/21/2001	7.23	13.63	9.95	1	26	28
Pit 37 W	8/21/2001	5.19	13.67	9.91	1	26	28
Pit 39	6/15/1999	5.45	12.11	6.01	23	9	34
Pit 39	8/19/1999	5.7	16.44	7.09	23	20	32
Pit 39	4/18/2000	1.34	15.39	6.22	1	20	27
Pit 39	7/20/2000	4.44	15.58	6.56	1	20	29

Table C-4.5-1
Average Historical Moisture Measurements Collected at Area G

Location	Average Minimum Moisture Content (%)	Average Maximum Moisture Content (%)	Average Moisture Content (%)
Boreholes	0.083	37	8.7
Pits	0.13	25.4	7.3
Beneath Asphalt	0.75	13.41	7.4

Table C-5.0-1
Neutron Port Access Status at Area G for FY2007

Location	Total Depth (ft)	Construction	Status of Neutron Access Port Based on Results of Camera Logging	Date Neutron Logged
Pit 15 NW	ND ^a	8-in. PVC ^b	Not determined, waste disposal in progress	Not Logged
Pit 15 NE	ND	8-in. PVC	Not determined, waste disposal in progress	Not Logged
Pit 15 N, 1	ND	4-in. PVC	Not determined, waste disposal in progress	Not Logged
Pit 15 N, 2	ND	4-in. PVC	Not determined, waste disposal in progress	Not Logged
Pit 15 S, 1	ND	4-in. PVC	Not determined, waste disposal in progress	Not Logged
Pit 15 S, 2	ND	4-in. PVC	Not determined, waste disposal in progress	Not Logged
Pit 30 1	25.0	4-in. PVC	Slight curve east, clear	12/14/2006
Pit 30 2	23.0	4-in. PVC	Clear to TD ^c	12/14/2006
Pit 30 3	20.0	4-in. PVC	Clear to TD	12/14/2006
Pit 30 4	25.0	4-in. PVC	Slight casing damage just below ground surface/clear	12/14/2006
Pit 30 2.5-in. Al, 1	6.0	2.5-in. Al ^d	Clear to TD	Not Logged
Pit 30 2.5-in. Al, 2	65.0	2.5-in. Al	Clear to TD	12/18/2006
Pit 31	42.0	4-in. PVC	Clear to TD	12/14/2006
Pit 31 2.5-in. Al	47.0	2.5-in. Al	Clear to TD	12/18/2006
Pit 37 W, 1	59.0	4-in. PVC	Clear to TD	12/14/2006
Pit 37 W, 2	63.5	4-in. PVC	Clear to TD	12/14/2006
Pit 37 W, 3	59.0	4-in. PVC	Clear to TD	12/14/2006
Pit 37 W, 2.5-in. Al	9.8	2.5-in. Al	Clear to TD	Not Logged
Pit 37 C, 1	33.0	4-in. PVC	Clear to TD	1/10/2007
Pit 37 C, 2	31.5	4-in. PVC	Clear to TD	12/14/2006
Pit 37 C, 2.5-in. Al	8.8	2.5-in. Al	Clear to TD	Not Logged
Pit 37 E, 1	9.0	4-in. PVC	Clear to TD	Not Logged
Pit 37 E, 2	6.0	4-in. PVC	Clear to TD	Not Logged
Pit 37 E, 2.5-in. Al	30.0	2.5-in. Al	Clear to TD	12/18/2006
Pit 39 NW, 1	85.0	4-in. PVC	Turn horizontal at 85 ft	Not Logged
Pit 39 NW, 2	41.5	4-in. PVC	Turn horizontal at 41.5 ft	Not Logged

Table C-5.0-1 (continued)

Location	TD (ft)	Construction	Status of Neutron Access Port Based on Results of Camera Logging	Date Neutron Logged
Pit 39, Gate W	9.0	8-in. PVC	Turn horizontal at 9 ft	Not Logged
Pit 39, Gate E	6.0	8-in. PVC	Major obstruction at 9 ft	Not Logged
Pit 39 C, 1	46.0	8-in. PVC	Clear to TD	12/14/2006
Pit 39 C, 2	53.5	8-in. PVC	Clear to TD	12/15/2006
Pit 39 C, 3	46.0	8-in. PVC	Clear to TD	12/14/2006
Pit 39 C, 2.5-in. Al	30.2	2.5-in. Al	Clear to TD	Not Logged
Asphalt Pad, W	144.0	4-in. PVC	Horizontal, clear to total length	12/18/2006
Asphalt Pad, C	138.0	4-in. PVC	Horizontal, clear to total length	12/19/2006
Asphalt Pad, E	ND	4-in. PVC	Horizontal, confined space not logged	Not Logged

^a ND = Not determined.

^b PVC = Polyvinyl chloride (pipe).

^c TD = Total depth.

^d Al = Aluminum (pipe).

**Table C-7.1-1
Moisture Measurements Collected at Area G for FY2007**

Location	Minimum Moisture (%)	Corresponding Minimum Depth (ft)	Maximum Moisture (%)	Corresponding Maximum Depth (ft)	Average Moisture Content (%)
Pit 30 1	2.5	3	14.1	23	9.9
Pit 30 2	1.9	3	8.6	22	6.8
Pit 30 3	2.3	2	9.1	20	6.3
Pit 30 4	5.6	5	11.1	10	9.0
Pit 30 2.5-in. Al 2	2.8	48	10.3	2	4.5
Pit 31	4.4	39	8.0	11	6.4
Pit 31 2.5-in. Al	0.7	4	10.7	5	7.3
Pit 37 W 1	3.5	6	8.4	7	6.1
Pit 37 W 2	3.6	61	25.4	63	6.6
Pit 37 W 3	4.4	6	7.3	37	6.3
Pit 37 C 1	2.5	9	6.6	28	5.2
Pit 37 C 2	3.1	4	6.8	25	5.5
Pit 37 E 2.5-in. Al	5.2	29	10.2	13	6.8
Pit 39 C 1	6.0	44	9.3	40	8.0
Pit 39 C 2	1.0	7	23.9	53	8.0
Pit 39 C 3	1.3	7	9.2	38	7.8
Asphalt Pad C*	3.9	4	10.3	19	6.8
Asphalt Pad W*	2.9	5	9.1	126	6.9

*Depths for locations Asphalt Pad C and W reflect horizontal distances measured from the south end of the monitoring locations.