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APR 2008
NMED Hazardous Waste Bureau

Date: April 18, 2008
Refer To: EP2008-0194

James P. Bearzi, Bureau Chief
Hazardous Waste Bureau
New Mexico Environment Department
2905 Rodeo Park Drive East, Building 1
Santa Fe, NM 87505-6303

Subject: Response to the Review of Periodic Monitoring Report for Vapor Sampling Activities at Material Disposal Area G, Technical Area 54, For Fiscal Year 2007 and Submittal of Pilot Test Work Plan for Evaluating Type 4 Vapor-Sampling Systems at Material Disposal Area G

Dear Mr. Bearzi:

On March 14, 2008, Los Alamos National Laboratory (LANL) received a request from the New Mexico Environment Department (NMED) to develop either a work plan or addendum to the Periodic Monitoring Report for Vapor-Sampling Activities at Material Disposal Area G, Technical Area 54, for Fiscal Year 2007. The work plan or addendum is to assess the sampling methods that have been used for collecting vapor samples described in the periodic monitoring report.

NMED requested clarification and/or action on several comments:

- Comment 1—An apparent discrepancy between the data collection activities summarized in the periodic monitoring report and information presented in Appendix D of the corrective measures evaluation (CME) plan describing the proposed interim subsurface vapor-monitoring plan for Material Disposal Area (MDA) G.
- Comment 2—Boreholes in the MDA G monitoring network containing membrane sampling systems listed in the report as SEAmist™.
- Comment 3—Concern about potential short-circuiting in Group (or Type) 4 boreholes.

Response to Comment 1

Appendix D, "Interim Subsurface Vapor-Monitoring Plan for Material Disposal Area G at Technical Area 54," of the MDA G CME plan is the implementing document for vapor monitoring at Area G. Sections D-3.0 and D-4.0 of this appendix describe the monitoring methods and the specific boreholes to be monitored during MDA G pore-gas sampling events. Both sections describe the screening and sampling of "ports," and specifically, the first paragraph of section D-4.0 describes several boreholes constructed with sampling ports, indicating dedicated sampling

equipment. Additionally, the only borehole described as requiring the use of a packer is 54-25105; an explanation is provided in Appendix D of the CME plan.

Based on this information, LANL does not believe a deviation to the work plan occurred; however, LANL recognizes that not all boreholes listed in Table D-1 of Appendix D of the CME plan have sufficient detail describing pore-gas sampling construction type. LANL proposes (1) revising Table D-1 to include an additional column showing pore-gas monitoring construction type and (2) including figures to present generalized construction diagrams for each construction type. LANL proposes submitting revision 3 of the CME plan (the implementing document) 10 days following NMED's approval to move forward with this approach.

Response to Comment 2

Table 2.0-1, MDA G Subsurface Vapor-Monitoring Locations, of the periodic monitoring report presents nine locations with construction types as SEAmist™. SEAmist™ was the trademark name used for the flexible liner instrumentation systems. In 1996, Flexible Liner Underground Technologies, LLC (FLUTe™) acquired the technology and obtained the new trademark name of FLUTe™. The membranes used in Area G were purchased in 1998 and 1999 to collect data for the low-level waste facility performance assessment. The name SEAmist™ was inaccurately used and carried forward in some LANL reports, including the 2007 periodic monitoring report for MDA G. Attachment 1 is a letter from Carl Keller of FLUTe™ confirming that the name of the product changed to FLUTe™ in 1996. Also, Attachment 2 provides revised pages to the periodic monitoring report with the correct terminology for the construction type for vapor-monitoring locations at Area G.

NMED has raised concerns regarding the potential for absorption of contaminants by the nylon membrane and tubing used in the FLUTe™ sampling systems. A pilot test is being conducted in coordination with investigation work at MDA C to evaluate and compare volatile organic compounds (VOCs) collected from boreholes using three different vapor-monitoring systems: the packer system, the FLUTe™ system, and a stainless-steel tubing system. All three systems have been used at LANL for collecting vapor-phase samples. In addition, at NMED's direction, LANL is conducting a comparison of packer and FLUTe™ sampling systems at MDA H during the second and third quarters of this fiscal year.

Because of the breadth of the tests being conducted at MDAs C and H (i.e., multiple tests comparing all three sampling systems in low-, medium-, and high-concentration zones of the subsurface) and because contaminants of concern at MDA C are similar to those at MDA G (approximately 95% of the VOCs detected at MDA G were also detected at MDA C), LANL believes these ongoing studies will adequately evaluate the comparability of each sampling system used at LANL. Attachment 3 presents a table comparing detected VOCs at MDAs G and C.

Response to Comment 3

Type 4 boreholes were constructed during Phase I Resource Conservation and Recovery Act facility investigation activities completed in mid- to late-1980s. Based on our understanding of the construction of Type 4 boreholes (i.e., sand between ports with no documentation of bentonite or other impermeable layer between ports), LANL agrees with NMED's concerns regarding the

potential for short-circuiting between ports. During the next round of field screening and sampling of Type 4 boreholes 54-02032 and 54-02033, LANL will conduct a field test to determine whether or not short-circuiting is occurring. Attachment 4 is the work plan describing additional data that will be collected to evaluate this potential effect. If the data show that short-circuiting may be occurring, LANL will evaluate the effects and propose possible corrective actions.

If you have any questions, please contact Steve Paris at (505) 606-0915 (smparis@lanl.gov) or Ed Worth at (505) 606-0398 (eworth@doeal.gov).

Sincerely,

for Susan G. Stiger, Associate Director
Environmental Programs
Los Alamos National Laboratory

Sincerely,

for David R. Gregory, Project Director
Environmental Operations
Los Alamos Site Office

SS/DG/DM/SP:sm

Attachments: 1) Letter from Carl Keller: "What Is the Difference between SEAmist® and FLUTe®"
2) Replacement pages for Periodic Monitoring Report for Vapor-Sampling Activities at Material Disposal Area G, Technical Area 54, for Fiscal Year 2007 (on CD)
3) Table of "Comparison of Detected VOCs for MDA G and MDA C Results in $\mu g/m^3$"
4) Pilot Test Work Plan for Evaluating Type 4 Vapor-Sampling Systems at Material Disposal Area G (on CD)

Cy: (w/enc.)
Steve Paris, EP-CAP, MS M992
RPF, MS M707 (with two CDs)
Public Reading Room, MS M992

Cy: (Letter and CD only)
Laurie King, EPA Region 6, Dallas, TX
Steve Yanicak, NMED-OB, White Rock, NM
Ed Worth, DOE-LASO, MS A316
Tom Anderson, SEA
Peggy Reneau, WES-DO, MS M992
EP-CAP File, MS M992

Cy: (w/o enc.)
Tom Skibitski, NMED-OB, Santa Fe, NM
Melanie Skeet, DOE-LASO (date-stamped letter emailed)
Susan G. Stiger, ADEP, MS M991
Dave McInroy, EP-CAP, MS M992
Alison M. Dorries, WES-DO, MS M992
IRM-RMMSO, MS A150

Attachment 1

Letter from Carl Keller:
"What Is the Difference between SEAmist® and FLUTe®"

FLUTe™ Flexible Liner Underground Technologies, Ltd. L.C.
For a medley of innovative designs
6 Easy St., Santa Fe, NM 87506
505-455-1300, www.flut.com

Subject: What is the difference between Seamist® and FLUTe®

To whom it may concern:

The trademarked name "SEAmist" was coined by Carl Keller who invented the technology while an employee of Science and Engineering Associates in 1990. It was an acronym for *SEA membrane instrumentation and sampling technique*. In 1993, the trademark was sold to Eastman Cherrington who also employed Carl Keller at that time. The trademark continued to be used as the generic name for flexible liner instrumentation systems. In 1995, Eastman Cherrington quit the environmental/flexible liner/drilling business, although they still hold the trademark. However, the name SEAmist was still commonly used for the flexible liner systems. In 1996, Carl Keller started his own company with many additional patents on flexible liner methods. The name SEAmist was not available to his company *Flexible Liner Underground Technologies* now known as *FLUTe®*. The FLUTe technologies have grown far beyond the original SEAmist system. However Apogen, formerly SEA, still commonly referred to flexible liners as SEAmist systems.

FLUTe has never used the name SEAmist, but has sold flexible liner systems to LANL and SEA/Apogen which they referred to as SEAmist systems.

The vadose systems sold to LANL by FLUTe are not covered by the original SEAmist patent, but they are the same systems referenced in 1995-1996 as SEAmist systems. The current flexible liner vadose sampling systems are technical evolutions well beyond the original SEAmist systems. The term SEAmist is rarely heard anymore. FLUTe is the only supplier of flexible liner systems in the United States. A copy of the FLUTe design is built in Germany.

Sincerely,

Carl Keller
Principal Scientist

Attachment 2

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

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Plate 2 Organic chemicals ($\mu g/m^3$) detected in subsurface pore gas at MDA G during 4QFY07

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 FLUTe 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 (CO_2) and oxygen (O_2). 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 CO_2 and water vapor (H_2O).
- 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.

$C_{water} = C_{air}$/Henry's Law constant (H') **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, H_2O, percent CO_2, and O_2. 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 CO_2 and O_2 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 CO_2 and O_2 measured during the FY2007 ranged from 0.0% to 12.9% and 4.9% to 20.9%, respectively. Low O_2 and high CO_2 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 CO_2 or O_2 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 FLUTe 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 µg/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

$$H' = \frac{C_{air}}{C_{water}} \qquad \textbf{Equation 5-1}$$

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):

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

where C_{air} is the concentration of VOC in the pore-gas sample (µg/m^3), H' is the dimensionless Henry's Law constant, SL is the screening level (µg/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,

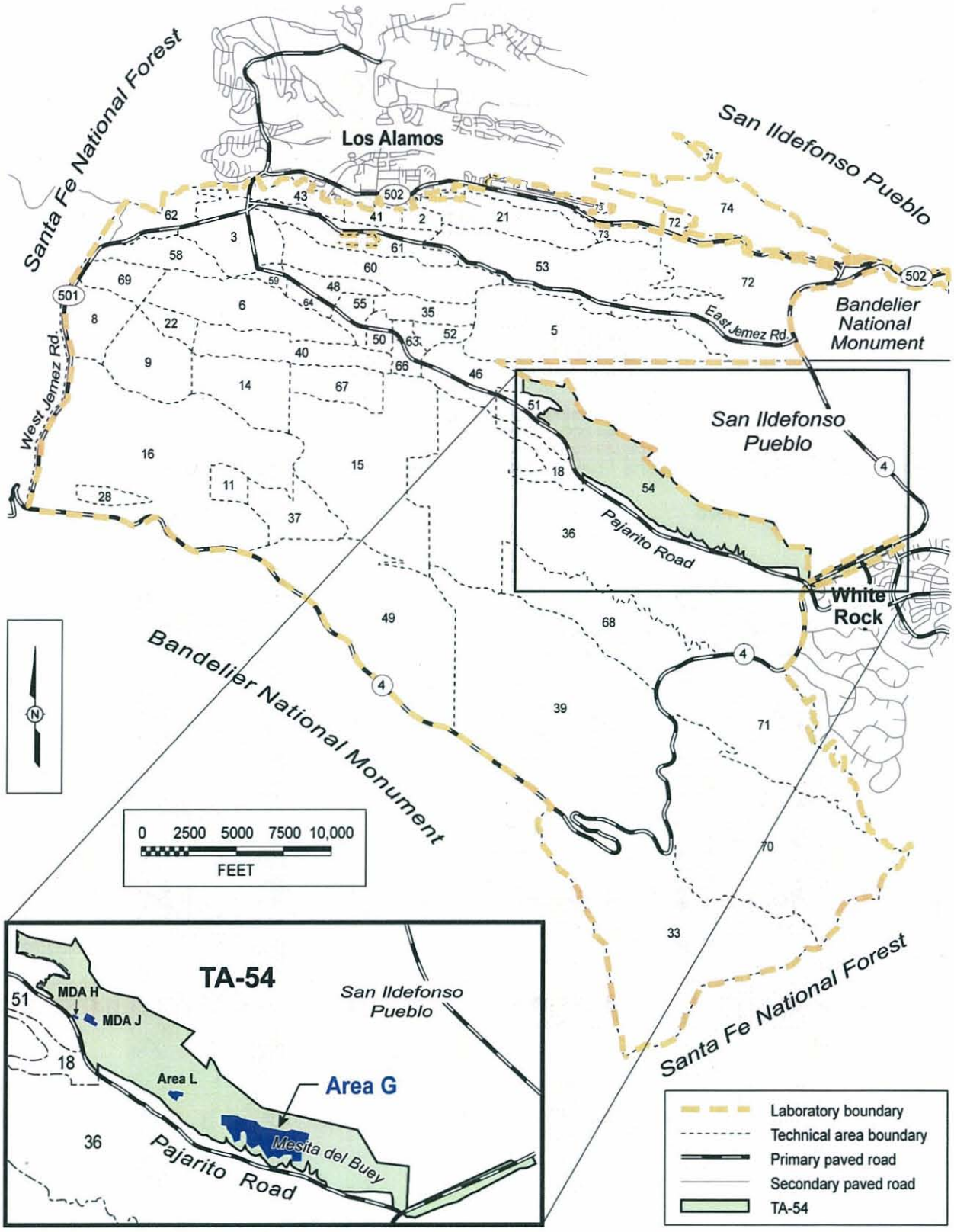


Figure 1.0-1 Location of Area G in TA-54 with respect to Laboratory technical areas and surrounding land holdings

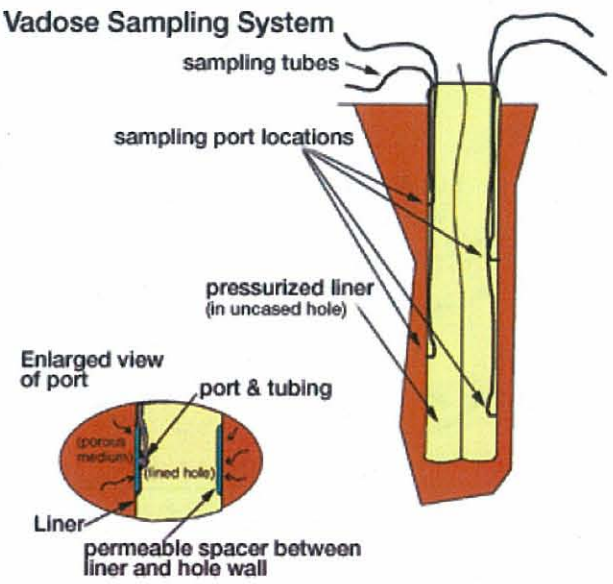


Figure 2.0-1 FLUTe membrane liner system for vadose zone pore-gas sampling

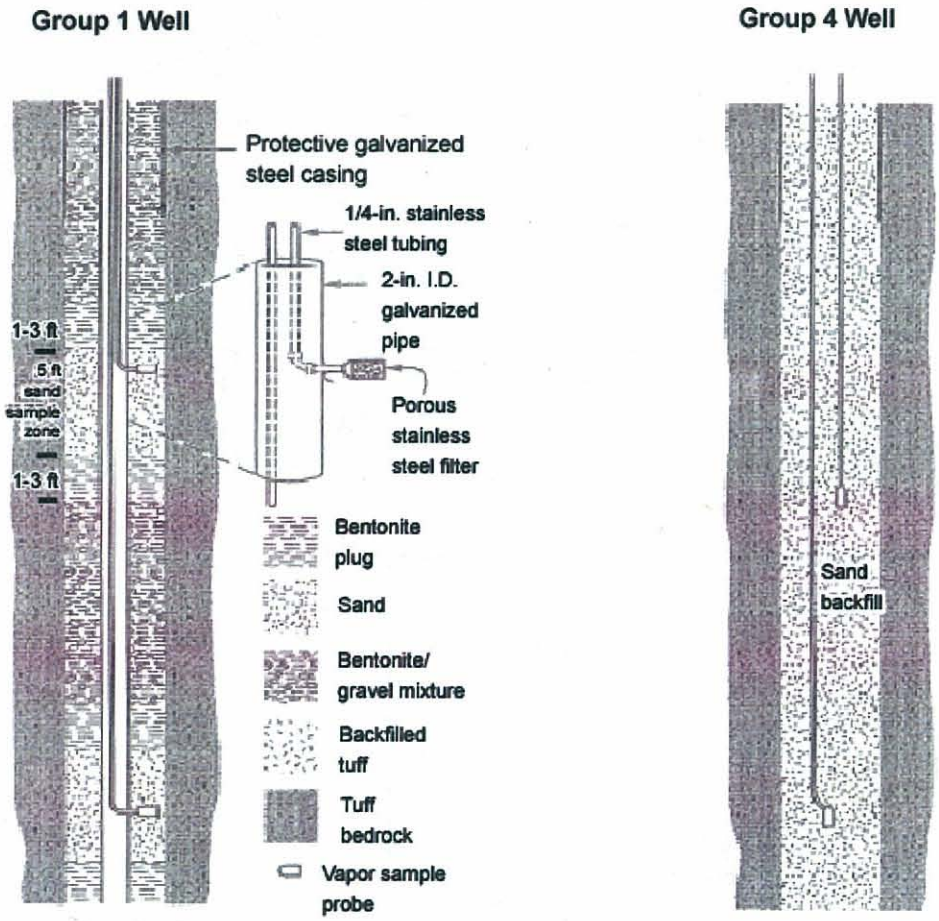


Figure 2.0-2 Construction details of instrumented boreholes for vadose zone pore-gas sampling

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	FLUTe	—[a]	2Q07	20, 44.5, 56.5, 74, 91, 100
54-01110	FLUTe	—	2Q07	20, 48, 60, 70, 85, 90
54-01111	FLUTe	—	2Q07	20, 39.5, 50, 70, 78, 100, 139
54-01115[b]	FLUTe	—	2Q07	7.9 (15), 26.5 (50), 40.8 (77), 53 (100), 63.6 (120), 68.9 (130)
54-01117	FLUTe	—	2Q07	20, 31.5, 55, 73, 82, 85
54-01121	FLUTe	—	2Q07	20, 26, 61.5, 70, 76, 98, 121
54-01126[b]	FLUTe	—	2Q07	7.5 (15), 17.5 (35), 28.5 (57), 35 (70), 42.5 (85), 49.5 (99)
54-01128[b]	FLUTe	—	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	FLUTe	—	—	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
CO_2 Screening Results Using a Landtec GEM-500 PID

Location ID	Depth (ft bgs) [Length (ft)]	Q2 FY2007 Result ($\mu g/m^3$)	Q4FY2007 Result ($\mu g/m^3$)
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	—

Attachment 3

Table of "Comparison of Detected VOCs for MDA G and MDA C Results in µ/m^3"

Comparison of Detected VOCs for MDA G and MDA C Results in $\mu g/m^3$

Analyte	MDA C			MDA G		
	Count of Detected Samples	Min Value of Detected Results	Max Value of Detected Results	Count of Detected Samples	Min Value of Detected Results	Max Value of Detected Results
Acetone	172	9.9	390	8	19	140000
Benzene	40	0.68	1300	–*	–	–
Butadiene[1,3-]	21	1.8	230	–	–	–
Butanol[1-]	6	13	65	–	–	–
Butanone[2-]	39	3	160	4	4.6	8000
Carbon Disulfide	23	3.1	89	12	3.9	3700
Carbon Tetrachloride	330	1.5	7200	–	–	–
Chlorodibromomethane	1	110	110	–	–	–
Chlorodifluoromethane	2	20	61	5	14	140
Chloroethane	–	–	–	1	93	93
Chloroform	395	1.8	4600	26	4.5	760
Chloromethane	24	0.82	2.3	–	–	–
Cyclohexane	7	2.9	30	6	15	340
Dichloro-1,1,2,2-tetrafluoroethane[1,2-]	41	2.2	500	–	–	–
Dichlorobenzene[1,2-]	1	5.7	5.7	–	–	–
Dichlorodifluoromethane	392	3.6	3900	34	8	23000
Dichloroethane[1,1-]	24	0.81	120	48	9.7	36000
Dichloroethane[1,2-]	91	0.88	430	–	–	–
Dichloroethene[1,1-]	22	0.91	400	49	11	66000
Dichloroethene[cis-1,2-]	328	1	840	11	15	700
Dichloropropane[1,2-]	199	1	860	–	–	–
Dioxane[1,4-]	2	980	2300	–	–	–
Ethanol	1	7.2	7.2	–	–	–
Ethylbenzene	37	0.96	240	–	–	–
Ethyltoluene[4-]	16	2	25	–	–	–
Hexane	19	3.1	170	1	6000	6000
Hexanone[2-]	7	1.7	18	–	–	–
Methanol	1	130	130	1	71000	71000
Methyl-2-pentanone[4-]	6	7.6	26	–	–	–
Methylene Chloride	313	0.76	2200	26	3.3	9300
n-Heptane	13	3.6	220	–	–	–
Propylene	20	12	760	–	–	–
Styrene	5	2.2	76	–	–	–
Tetrachloroethene	395	2.4	24000	48	25	11000
Toluene	100	1.7	750	6	6.7	4700
Trichloro-1,2,2-trifluoroethane[1,1,2-]	262	6.7	2900	47	18	120000
Trichloroethane[1,1,1-]	190	1.3	530	49	180	790000
Trichloroethane[1,1,2-]	27	1.5	190	–	–	–
Trichloroethene	400	6.9	77000	48	62	190000
Trichlorofluoromethane	74	2.4	190	30	5.7	16000
Trimethylbenzene[1,2,4-]	17	2	30	–	–	–
Trimethylbenzene[1,3,5-]	7	2.3	16	–	–	–
Xylene (Total)	52	2.7	1100	–	–	–
Xylene[1,2-]	42	0.91	39	–	–	–
Xylene[1,3-]+Xylene[1,4-]	25	3.8	160	–	–	–

Note: Shading indicates that VOCs are detected at both sites.

*– = Not detected.

Attachment 4

Pilot Test Work Plan for Evaluating Type 4 Vapor-Sampling Systems at Material Disposal Area G

Work Plan for Evaluating Potential Short-Circuiting between Ports in Type 4 Boreholes at Technical Area 54

Purpose of Test	Type 4 boreholes were installed at Technical Area (TA) 54 during the 1980s to evaluate the extent of vapor contamination beneath disposal areas. According to historical records, the interval between the ports within the borehole is backfilled with sand and contains no impermeable separation layer (e.g. bentonite). The New Mexico Environment Department (NMED) has requested that Los Alamos National Laboratory (LANL) conduct a test to determine whether or not short-circuiting is occurring between ports during pore-gas sampling.
Type 4 Boreholes	Two Type 4 boreholes will be sampled in conjunction with Material Disposal Area (MDA) G investigation activities: 54-02032 and 54-02033. Both boreholes will be tested during the next round of pore-gas sampling for MDA G.
Sampling Protocol	All vapor sampling activities will be performed following Standard Operating Procedure 5074. During this test, two adjacent ports (with the exception of the uppermost and lowermost ports, which have only one adjacent port) will be monitored using a handheld manometer with a differential pressure range of 0 to 40 in.-water column (WC). Differential pressure readings will be recorded with a Model 475-2-FM Dwyer Series 475 Mark III digital manometer having an accuracy of ± 0.5% full scale. This instrument has been used at TA-54 for the last 2 yr to measure differential pressure (i.e., atmospheric pressure versus subsurface pressure) during pore-gas sampling events. Background differential pressure readings will be collected in adjacent ports at 1-min intervals for a minimum of 10 min before the port is purged. Differential pressure readings will continue to be collected at 1-min intervals during purging before pore-gas sampling and will be recorded in field logbooks.
Evaluation of Results and Decision Process	The evaluation will compare the readings collected while purging with prepurge background readings. Results will be compared graphically, and, if necessary, statistical methods will be used to evaluate the effect of purging on differential pressure in adjacent ports.
Schedule	MDA G pore-gas sampling activities are schedule to occur during June 2008. A letter will be submitted to NMED with the results of the test no later than August 15, 2008.