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Periodic Monitoring Report for Vapor-Sampling Activities at Material Disposal Area V, Consolidated Unit 21-018(a)-99, at Technical Area 21, February 2010

Los Alamos
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EXECUTIVE SUMMARY

This periodic monitoring report summarizes the latest results of the vapor-monitoring activities conducted during February 2010 at Material Disposal Area (MDA) V, Consolidated Unit 21-018(a)-99, within Technical Area 21 at Los Alamos National Laboratory (the Laboratory). The objectives of vapor monitoring at MDA V are (1) to collect additional samples from vapor-monitoring wells at MDA V and (2) to compare the results with previously detected tritium activities in pore gas beneath MDA V.

To define the vertical extent of tritium and to measure tritium activity over time, two new vapor-monitoring wells were installed in 2009 within 10 ft of the location of 21-24524, which was plugged and abandoned in June 2006. These new wells retained the location identification number of 21-24524, with an additional designation of west (21-24524W) and south (21-24524S) to indicate their locations relative to former location 21-24524.

To date, vapor-monitoring wells 21-24524W and 21-24524S have been sampled for three quarters. The first quarterly sampling was completed June–October 2009 for one sampling event. The second quarterly sampling at MDA V consisted of samples collected during the November 2009 event. The third quarterly sampling at MDA V consisted of samples collected during the February 2010 event. This report presents sampling data collected during the third quarter.

Vapor data collected from third quarter samples are presented and compared in this report. Pore-gas data from the previous quarters of vapor sampling at MDA V (June–October 2009 and November 2009) are also presented and compared with the current quarter data, as appropriate, for assessing trends over time.

Tritium activities measured from third quarter samples collected from vapor-monitoring wells 21-24524W and 21-24524S are similar to those reported during the first and second quarters, with two peak occurrences of tritium activity followed by decreases in activity with increased depth. All quarterly sampling activities are lower than samples measured during the 2005 to 2006 investigation.

Data collected during the fourth quarter (April 2010) will be presented in the fourth quarter monitoring report, as required by the New Mexico Environment Department's September 3, 2009, letter to the Laboratory.

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1.0 INTRODUCTION

This report presents the results of vapor-monitoring activities conducted during February 2010 at Material Disposal Area (MDA) V, Consolidated Unit 21-018(a)-99, located on Delta Prime (DP) Mesa in Technical Area 21 (TA-21) at Los Alamos National Laboratory (LANL or the Laboratory) (Figure 1.0-1). These activities are conducted per the requirements outlined in the approved MDA V well installation work plan (LANL 2007, 098944; NMED 2007, 098946). 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.

The objectives of the MDA V vapor-monitoring activities are (1) to collect additional vapor samples from vapor-monitoring wells at MDA V and (2) to compare the results with previously detected tritium activities beneath MDA V.

MDA V has been sampled previously for subsurface pore gas in 2005 and 2006. During these sampling events, location 21-24524 reported the maximum detected tritium activity of 271,192 pCi/L at total depth (TD) of 380 ft below the location of the former absorption beds. In June 2006, this borehole was plugged and abandoned in accordance with the approved MDA V investigation work plan.

To define the vertical extent of tritium and to measure tritium activity over time, new vapor-monitoring wells were installed in 2009 within 10 ft of the location of 21-24524, which was plugged and abandoned in June 2006. These wells retained the location identification number of 21-24524, but with an additional designation of west (21-24524W) and south (21-24524S) to indicate their locations relative to former location 21-24524 (Figure 1.0-2). Monitoring well 21-24524W has seven ports from depths of 45 ft below ground surface (bgs) to 380 ft bgs, and monitoring well 21-24524S has two ports located at depths of 680 ft bgs and 715 ft bgs. Figure 1.0-3 shows a schematic design of the vapor-monitoring wells. Data collected from these two well locations are presented as a single well system in this report.

To date, vapor-monitoring wells 21-24524W and 21-24524S have been sampled for three quarters. The first quarterly sampling during fiscal year (FY) 2010 was completed from June–October 2009 (LANL 2009, 108134) and consisted of one sampling event. The second quarterly sampling at MDA V was completed in November 2009 and consisted of one sampling event (LANL 2010, 109094). The third quarterly sampling at MDA V was completed in February 2010 and consisted of one sampling event. This report presents sampling data collected during the third quarter. First and second quarter vapor data are also included in section 5.0 of this report, as appropriate, for comparison with previously collected data and for assessing trends over time. Table 1.0-1 summarizes and clarifies vapor-monitoring sampling quarters, events, and dates.

All pore-gas samples collected from the MDA V vapor-monitoring wells were submitted for off-site analysis of tritium.

1.1 Site Location and Description

MDA V is located within TA-21 on DP Mesa (Figure 1.0-1). This MDA included three cobble- and gravel-filled absorption beds measuring 25 ft × 220 ft × 5–6 ft deep that were removed in 2005 and replaced by soil covered with aggregate-based graveled pavement and native grasses. The entire MDA V site measures approximately 0.88 acres. A haul road for MDA B runs along the northwest perimeter.

The edge of BV Canyon, which is a tributary to Los Alamos Canyon, is approximately 75 ft south of the location of the former absorption beds. The entire site was regraded following sampling and removal activities in 2005 and best management practices have been installed, including straw wattles and revegetation with native grass seed. The top of the regional aquifer is approximately 1300 ft bgs at MDA V, based on nearby water-level information from regional wells R-6, R-7, Otowi-4, and R-8 (LANL 2004, 087358; Kleinfelder 2005, 091693).

The MDA V investigation report (LANL 2007, 098942) presents further details regarding historical operations and past investigation activities.

2.0 SCOPE OF ACTIVITIES

As directed by the approved MDA V well installation work plan (LANL 2009, 106760; NMED 2009, 107304), three quarterly pore-gas field-screening and sampling activities have been completed at vapor-monitoring wells 21-24524W and 21-24524S (Figure 1.0-2 and Table 2.0-1).

During February 2010, 10 pore-gas samples (9 characterization and 1 quality assurance [QA]/quality control [QC]) were collected for tritium analysis from seven of seven ports in well 21-24524W, and two of two ports in well 21-24524S. Field duplicate (FD) samples were collected at a minimum frequency of 1 for every 10 samples. Table 2.0-1 summarizes the February 2010 pore-gas sampling depths and sample collection dates by well location. Table 2.0-2 summarizes the February 2010 samples collected at MDA V vapor-monitoring wells 21-24524W and 21-24524S and their respective analyses.

All samples were collected in accordance with the current version of standard operating procedure (SOP) EP-ERSS-SOP-5074, Sampling for Sub-Atmospheric Air, and submitted to an off-site analytical laboratory for tritium analysis using EPA Method 906.0. Further discussion of the field methods used for pore-gas field-screening and sample collection are presented in Appendix B. Field chain-of-custody (COC) forms and sample collection logs (SCLs) are provided in Appendix D (on CD). No investigation-derived waste was generated during execution of vapor-monitoring activities at MDA V.

The February 2010 pore-gas field-screening results are presented in section 4, and the pore-gas analytical results are presented in section 5. Any deviations from the scope of activities in the approved MDA V well-installation work plan (LANL 2009, 106760; NMED 2009, 107304) are presented in the following section.

2.1 Deviations

There were no deviations from the approved MDA V well-installation work plan (LANL 2009, 106760; NMED 2009, 107304).

3.0 REGULATORY CRITERIA

There are no applicable standards for tritium extracted from pore vapor.

4.0 FIELD-SCREENING RESULTS

Before each sampling event, field screening was performed in each vapor monitoring well and targeted sampling interval to ensure percent carbon dioxide ($\%CO_2$) and oxygen ($\%O_2$) levels at each sampling port had stabilized at values representative of subsurface pore-gas conditions. Further details are provided in

Appendix B. Table 4.0-1 presents a summary of all field-screening results obtained during the February 2010 sampling events at vapor-monitoring wells 21-24524W and 21-24524S by sampling depth.

Atmospheric information was obtained from http://www.srh.noaa.gov/data/obhistory/KLAM.html for the day of sampling using the closest Laboratory weather station to MDA V (KLAM Weather Station, Los Alamos Airport, latitude 35.83°, longitude 106.22). Table 4.0-2 summarizes the barometric pressure, temperature, and relative humidity for the sampling date.

5.0 ANALYTICAL DATA RESULTS

Analytical results for tritium were produced from laboratory analysis of vapor collected in silica gel columns and analyzed using EPA Method 906.0. All analytical data were subject to extensive QA/QC and data validation reviews in accordance with Laboratory guidance and procedures. The QA/QC and data validation review for February 2010 MDA V pore-gas data are presented in Appendix C. All validated analytical results from pore-gas sampling during this sampling period are presented on a CD in Appendix D.

Vapor analytical sampling data are also available at the Risk Analysis, Communication, Evaluation, and Reduction (RACER) website http://www.racernm.com.

5.1 Pore-Vapor Tritium Results

The results of all tritium data collected at vapor-monitoring well location 21-24524 are summarized in Table 5.1-1. For clarity, data in Figure 5.1-1 are presented as one monitoring-well system rather than separately for 21-24524W and 21-24524S. Certain activity trends observed during the February 2010 sampling period in wells 21-24524W and 21-24524S (Figure 5.1-1) are similar to those reported in June–October 2009 (LANL 2009, 108134) and November 2009 (LANL 2010, 109094).

First quarter (June–October 2009) and second quarter (November 2009) results were similar. Third quarter (February 2010) results were also similar to those of the first and second quarters and were as follows:

- Vapor-port samples collected between the 42.5 and 305 ft bgs (ports 1–5) indicated two peaks in tritium activity. The first peak of 35,063 pCi/L was detected at 42.5 to 47.5 ft bgs (port 1), and the second peak of 69,612 pCi/L was detected at 300 to 305 ft bgs (port 5).
- Tritium activity decreased to 13,546 pCi/L at 122.5 to 127.5 ft bgs (port 2), increased to 69,612 pCi/L at 300 to 305 ft bgs (port 5), and decreased to nondetect in the bottom two ports sampled at 677.5 to 682.5 ft bgs (port 10) and 712.5 to 717.5 ft bgs (port 11).

Comparisons among the first quarter (June–October 2009), second quarter (November 2009), and third quarter (February 2010) vapor-port monitoring results are presented below.

- Third quarter tritium results indicate a trend similar to those detected during the first and second quarters: a peak of tritium activity (18,980 pCi/L in June–October 2009; 44,020 pCi/L in November 2009; and 35,063 pCi/L in February 2010) at 42.5 to 47.5 ft bgs (port 1). A higher peak of tritium activity (46,830 pCi/L in June–October 2009; 67,924 pCi/L in November 2009; and 69,612 pCi/L in February 2010) occurred at 300 to 305 ft bgs (port 5). Below port 5, tritium activities decreased to TD.

- Two samples collected during third quarter sampling, one from each of the deepest vapor ports 10 and 11 (677.5 to 682.5 ft bgs and 712.5 to 717.5 ft bgs, respectively), had nondetect activities during February 2010 monitoring event. The June–October 2009 samples from ports 10 and 11 had measured tritium activities of 495 pCi/L and 1,713 pCi/L, respectively, while the November 2009 samples from ports 10 and 11 had tritium activities of 349 pCi/L and 464 pCi/L, respectively.
- The third quarter tritium activities are higher than the first quarter results and lower than the second quarter results from 42.5 to 177.5 ft bgs (ports 1–3). The third quarter tritium activities are higher than the first and second quarter results from 257.5 to 332.5 ft bgs; however, they are lower in the bottom three depths sampled (377.5 to 717.5 ft bgs, ports 7, 10, and 11, respectively. The largest change observed occurred at the depth of 257.5–262.5 ft bgs (port 4), which had a tritium activity of 1324 pCi/L in June–October 2009; 16,664 pCi/L in November 2010; and 24,174 pCi/L in February 2010.
- The first, second, and third quarter tritium activities continue to be lower than activities in samples collected during the 2005 and 2006 investigations at the original location of vapor-monitoring well 21-24524 (LANL 2006, 094361; LANL 2007, 098942). The maximum tritium activity during the 2005 and 2006 investigations measured 271,192 pCi/L at a depth of 379 to 380 ft bgs. In comparison, tritium activities from first, second, and third quarter data from 377.5 to 382.5 ft bgs were 9808 pCi/L, 10,458 pCi/L, and 8866 pCi/L, respectively.

6.0 SUMMARY

Vapor-monitoring wells 21-24524W and 21-24524S were sampled in February 2010, and the results of the third quarter monitoring activities indicate trends similar to those reported during first and second quarter monitoring activities (LANL 2009, 108134; LANL 2009, 109094).

Consistent with previous results, the highest tritium activities were detected at a depth of 300 to 305 ft bgs (port 5), at activities of 46,830 pCi/L in August–October 2009; 67,924 pCi/L in November 2009; and 69,612 in February 2010. Below port 6, tritium activities decreased to TD.

Quarterly vapor-monitoring activities will continue at MDA V per the requirements outlined in the approved MDA V well installation work plan (LANL 2009, 106760; NMED 2009, 107304). Data collected in April 2010 will be presented in the fourth quarter periodic monitoring report, as required by NMED's September 3, 2009, letter to the Laboratory.

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. This information is also included in text citations. ER IDs are assigned by the Environmental Programs Directorate's Records Processing Facility (RPF) and are used to locate the document at the RPF and, where applicable, in the master reference set.

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

Kleinfelder, April 2005. "Final Completion Report, Characterization Wells R-6/R-6i," report prepared for Los Alamos National Laboratory, Project No. 37151, Albuquerque, New Mexico. (Kleinfelder 2005, 091693)

LANL (Los Alamos National Laboratory), June 2004. "Investigation Work Plan for Consolidated Unit 21-018(a)-99, Material Disposal Area V, at Technical Area 21," Los Alamos National Laboratory document LA-UR-04-3699, Los Alamos, New Mexico. (LANL 2004, 087358)

LANL (Los Alamos National Laboratory), July 2007. "Investigation Report for Consolidated Unit 21-018(a)-99, Material Disposal Area V, at Technical Area 21, Revision 1," Los Alamos National Laboratory document LA-UR-07-4390, Los Alamos, New Mexico. (LANL 2007, 098942)

LANL (Los Alamos National Laboratory), October 2007. "Subsurface Vapor-Monitoring Plan for Material Disposal Area T at Technical Area 21," Los Alamos National Laboratory document LA-UR-07-7037, Los Alamos, New Mexico. (LANL 2007, 098944)

LANL (Los Alamos National Laboratory), December 2009. "Periodic Monitoring Report for Vapor-Sampling Activities at Material Disposal Area V, Consolidated Unit 21-018(a)-99, at Technical Area 21, June to October 2009," Los Alamos National Laboratory document LA-UR-09-8123, Los Alamos, New Mexico. (LANL 2009, 108134)

LANL (Los Alamos National Laboratory), April 2010. "Periodic Monitoring Report for Vapor-Sampling Activities at Material Disposal Area V, Consolidated Unit 21-018(a)-99, at Technical Area 21, November 2009," Los Alamos National Laboratory document LA-UR-10-1758, Los Alamos, New Mexico. (LANL 2010, 109094)

NMED (New Mexico Environment Department), October 31, 2007. "Approval with Modifications, Subsurface Vapor-Monitoring Plan for MDA T," New Mexico Environment Department letter to D. Gregory (DOE LASO) and D. McInroy (LANL) from J.P. Bearzi (NMED HWB), Santa Fe, New Mexico. (NMED 2007, 098946)

7.2 Map Data Sources

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

Data sources of existing figures used in this report are identified below:

Drainage; County of Los Alamos, Information Services; as published 16 May 2006.

Former Structures of the Los Alamos Site; Los Alamos National Laboratory, Waste and Environmental Services Division, EP2008-0441; 1:2,500 Scale Data; 08 August 2008.

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 Arcs; Los Alamos National Laboratory, KSL Site Support Services, Planning, Locating and Mapping Section; 06 January 2004; as published 15 January 2009.

Point Feature Locations of the Environmental Restoration Project Database; Los Alamos National Laboratory, Waste and Environmental Services Division, EP2008-0592; 04 November 2008.

Potential Release Sites; Los Alamos National Laboratory, Waste and Environmental Services Division, Environmental Data and Analysis Group, EP2008-0623; 1:2,500 Scale Data; 10 December 2008.

Security and Industrial Fences and Gates; Los Alamos National Laboratory, KSL Site Support Services, Planning, Locating and Mapping Section; 06 January 2004; as published 15 January 2009.

Structures; Los Alamos National Laboratory, KSL Site Support Services, Planning, Locating and Mapping Section; 06 January 2004; as published 15 January 2009.

Technical Area Boundaries; Los Alamos National Laboratory, Site Planning & Project Initiation Group, Infrastructure Planning Office; September 2007; as published 04 December 2008.

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.

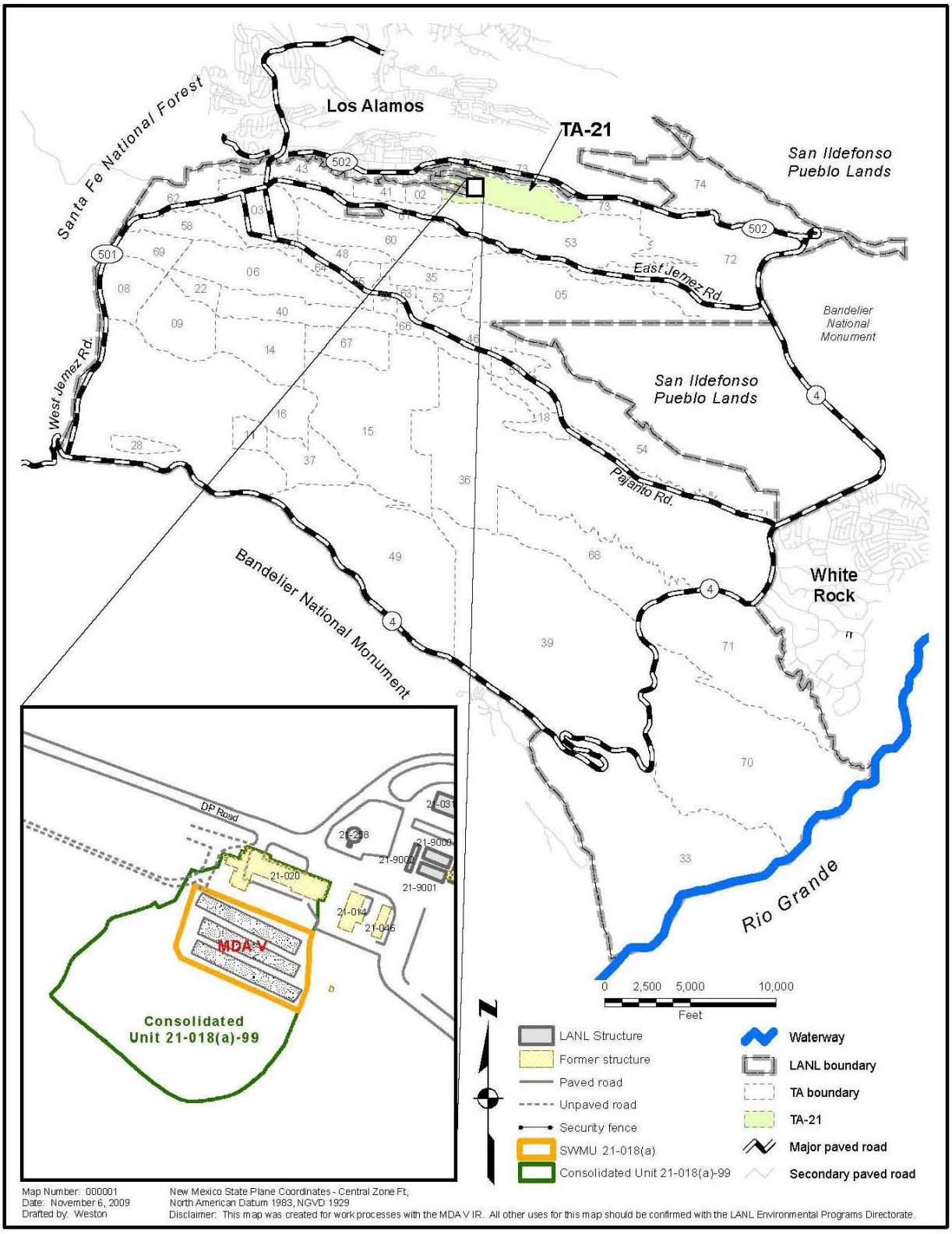

Figure 1.0-1 Location of MDA V at TA-21

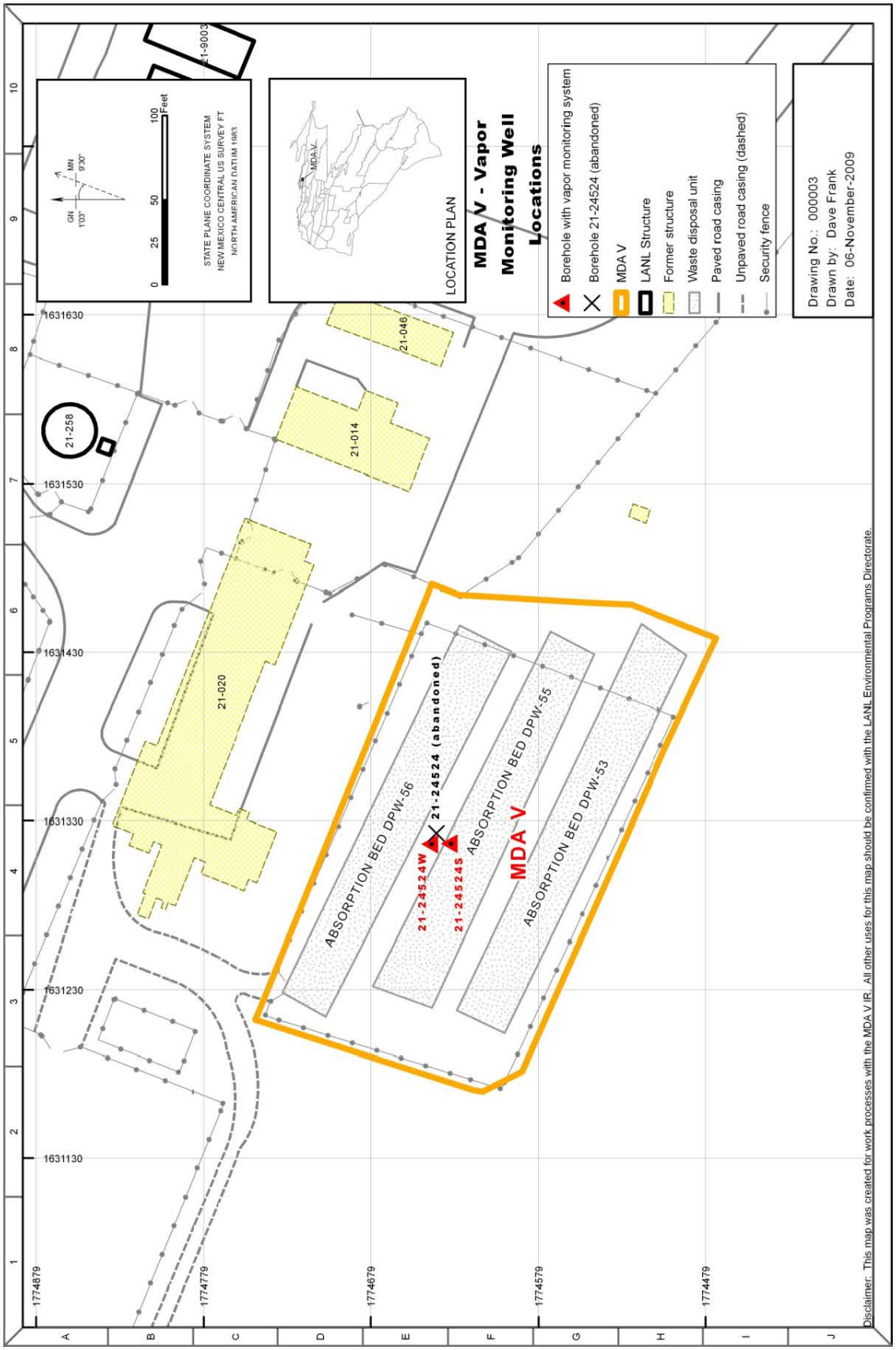

Figure 1.0-2 Locations of MDA V vapor-monitoring wells and associated structures and features

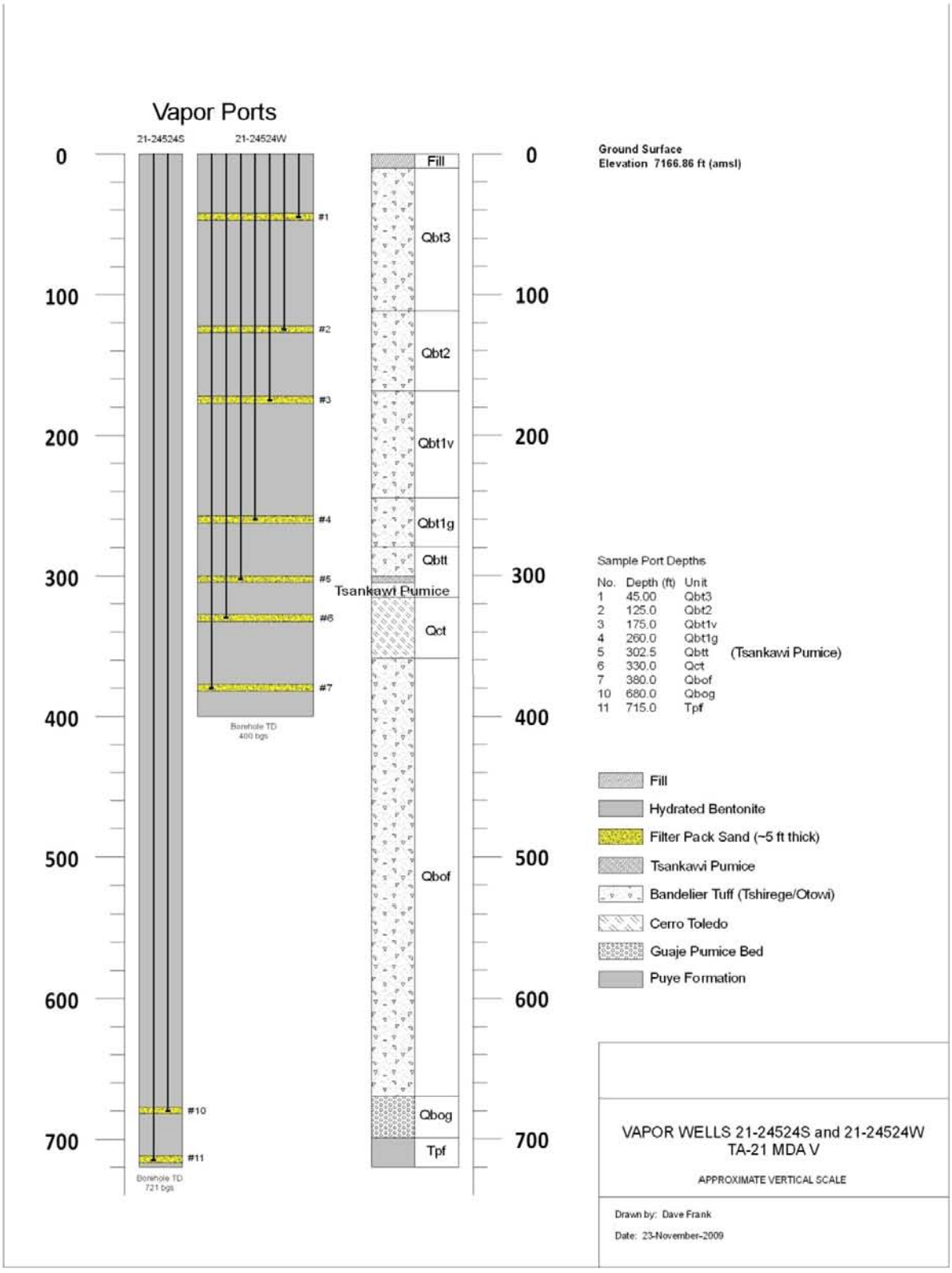

Figure 1.0-3 Schematic of vapor-monitoring wells 21-24524W/21-24524S installation at MDA V

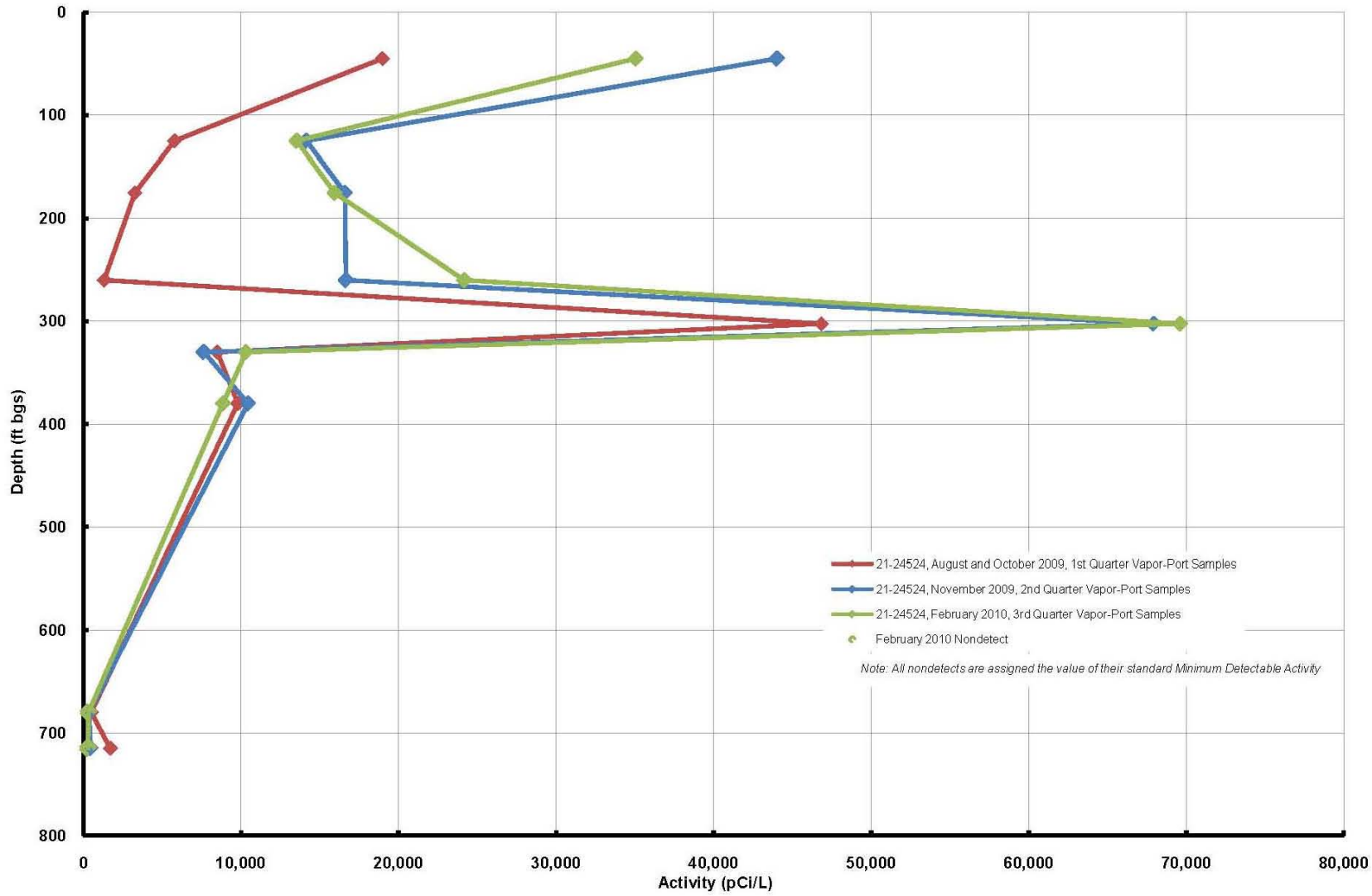

Figure 5.1-1 Vertical profile of tritium vapor-port samples from vapor-monitoring wells 21-24524W and 21-24524S, August 2009–February 2010

Table 1.0-1
History of Vapor-Monitoring Events at Vapor-Monitoring Well 21-24524

Quarter/Monitoring Event	Date	Event ID	Vapor-Monitoring Wells Sampled	Associated Report
Third (current) Quarter, FY2010	February 2010	2561	21-24524S/ 21-24524W	February 2010 MDA V periodic monitoring report
Second Quarter, FY2010	November 2009	2442	21-24524S/ 21-24524W	November 2009 MDA V periodic monitoring report (LANL 2010, 109094)
First Quarter, FY2010	June–October 2009	2215/756	21-24524S/ 21-24524W[a]	June–October 2009 MDA V periodic monitoring report (LANL 2009,108134)
2006 Investigation	May–June 2006	9902	21-24524[b]	Investigation report for MDA V (LANL 2006, 094361)
2005 Investigation	July–August 2005	5782	21-24524	Investigation report for MDA V (LANL 2006, 094361)

[a] Vapor-monitoring wells 21-24524S and 21-24524W were completed in 2009 and are within 10 ft of original borehole location 21-24524. Vapor-monitoring wells 21-24524S and 21-24524W were evaluated as a single well.

[b] Vapor-monitoring well 21-24524 was abandoned in June 2006.

Table 2.0-1
MDA V Pore-Gas Sampling Depths and Collection Dates,
August 2009–February 2010

Vapor-Monitoring Well ID	Sampling Port	Begin Depth (ft bgs)	End Depth (ft bgs)	First Quarter Date (Event ID 2215)	Second Quarter Collection Date (Event ID 2442)	Third Quarter Collection Date (Event ID 2561)
21-24524W	1	42.5	47.5	08/20/2009	11/23/2009	02/01/2010
21-24524W	2	122.5	127.5	08/20/2009	11/23/2009	02/01/2010
21-24524W	3	172.5	177.5	08/20/2009	11/23/2009	02/02/2010
21-24524W	4	257.5	262.5	08/20/2009	11/23/2009	02/01/2010
21-24524W	5	300.0	305.0	08/20/2009	11/23/2009	02/01/2010
21-24524W	6	327.5	332.5	08/20/2009	11/23/2009	02/02/2010
21-24524W	7	377.5	382.5	08/20/2009	11/23/2009	02/01/2010
21-24524S	10	677.5	682.5	10/14/2009	11/23/2009	02/01/2010
21-24524S	11	712.5	717.5	10/14/2009	11/23/2009	02/01/2010

Note: Event IDs refer to the SCL and COC packages provided in Appendix D.

Table 2.0-2
Summary of Tritium Vapor Samples Collected at MDA V, February 2010

Sample ID	Vapor- Monitoring Well ID	Sampling Port	Depth (ft bgs)	Collection Date	Field QC Type	Request Number
MD21-10-10151	21-24524W	1	42.5–47.5	02/01/2010	n/a*	10-1546
MD21-10-10152	21-24524W	2	122.5–127.5	02/01/2010	n/a	10-1546
MD21-10-10153	21-24524W	3	172.5–177.5	02/02/2010	n/a	10-1546
MD21-10-10154	21-24524W	4	257.5–262.5	02/01/2010	n/a	10-1546
MD21-10-10160	21-24524W	4	257.5–262.5	02/01/2010	FD	10-1546
MD21-10-10155	21-24524W	5	300–305	02/01/2010	n/a	10-1546
MD21-10-10156	21-24524W	6	327.5–332.5	02/02/2010	n/a	10-1546
MD21-10-10157	21-24524W	7	377.5–382.5	02/01/2010	n/a	10-1546
MD21-10-10158	21-24524S	10	677.5–682.5	02/01/2010	n/a	10-1546
MD21-10-10159	21-24524S	11	712.5–717.5	02/01/2010	n/a	10-1546

*n/a = Not applicable.

Table 4.0-1
Summary of Field-Screening Results, February 2010

Event ID	Collection Date	Sampling Quarter	Location ID	Sampling Port Number	Top Depth (ft bgs)	Bottom Depth (ft bgs)	$\%CO_2$	$\%O_2$
2561	02/01/2010	Third	21-24524W	1	42.5	47.5	1.6	19.0
2561	02/01/2010	Third	21-24524W	2	122.5	127.5	0.4	20.2
2561	02/02/2010	Third	21-24524W	3	172.5	177.5	0.4	20.2
2561	02/01/2010	Third	21-24524W	4	257.5	262.5	0.2	20.4
2561	02/01/2010	Third	21-24524W	5	300.0	305.0	0.0	20.6
2561	02/02/2010	Third	21-24524W	6	327.5	332.5	0.2	20.4
2561	02/01/2010	Third	21-24524W	7	377.5	382.5	0.2	20.5
2561	02/01/2010	Third	21-24524S	10	677.5	682.5	0.0	20.1
2561	02/01/2010	Third	21-24524S	11	712.5	717.5	0.4	19.8

Note: Event IDs refer to the SCL and COC packages provided in Appendix D.

Table 4.0-2
Barometric Pressure, Relative Humidity, and Temperature at KLAM Weather Station during Sample Collection, February 2010

Sampling Quarter	Date of Measurement	Average Barometric Pressure (in Hg)*	Average Relative Humidity (%)*	Average Temperature (°F)*
Third Quarter	02/01/2010	29.97	66	32

* Data from http://www.srh.noaa.gov/data/obhistory/KLAM.html.

Table 5.1-1
Summary of Tritium Results for Vapor Samples
Collected at Monitoring Well 21-24524, August 2009–February 2010

Sample ID	Vapor-Monitoring Well ID	Depth (ft bgs)	Collection Date	Tritium Result (pCi/L)
1st Quarter, August/October 2009 Samples				
MD21-09-12336	21-24524W	42.5–47.5	08/20/2009	18980
MD21-09-12337	21-24524W	122.5–127.5	08/20/2009	5791
MD21-09-12338	21-24524W	172.5–177.5	08/20/2009	3268
MD21-09-12339	21-24524W	257.5–262.5	08/20/2009	1324
MD21-09-12340	21-24524W	300–305	08/20/2009	46830
MD21-09-12341	21-24524W	327.5–332.5	08/20/2009	8495
MD21-09-12342	21-24524W	377.5–382.5	08/20/2009	9808
MD21-09-12343	21-24524S	677.5–682.5	10/14/2009	495
MD21-09-12344	21-24524S	712.5–717.5	10/14/2009	1713
2nd Quarter, November 2009 Samples				
MD21-10-5343	21-24524W	42.5–47.5	11/23/2009	44020
MD21-10-5344	21-24524W	122.5–127.5	11/23/2009	14159
MD21-10-5345	21-24524W	172.5–177.5	11/23/2009	16601
MD21-10-5346	21-24524W	257.5–262.5	11/23/2009	16664
MD21-10-5347	21-24524W	300–305	11/23/2009	67924
MD21-10-5348	21-24524W	327.5–332.5	11/23/2009	7649
MD21-10-5349	21-24524W	377.5–382.5	11/23/2009	10458
MD21-10-5350	21-24524S	677.5–682.5	11/23/2009	349
MD21-10-5351	21-24524S	712.5–717.5	11/23/2009	464
3rd Quarter, February 2010 Samples				
MD21-10-10151	21-24524W	42.5–47.5	02/01/2010	35063
MD21-10-10152	21-24524W	122.5–127.5	02/01/2010	13546
MD21-10-10153	21-24524W	172.5–177.5	02/02/2010	15951
MD21-10-10154	21-24524W	257.5–262.5	02/01/2010	24174
MD21-10-10155	21-24524W	300–305	02/01/2010	69612
MD21-10-10156	21-24524W	327.5–332.5	02/02/2010	10327
MD21-10-10157	21-24524W	377.5–382.5	02/01/2010	8866
MD21-10-10158	21-24524S	677.5–682.5	02/01/2010	—*
MD21-10-10159	21-24524S	712.5–717.5	02/01/2010	—

*— = Not detected.

Appendix A

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

A-1.0 ACRONYMS AND ABBREVIATIONS

%R	percent recovery
bgs	below ground surface
CCV	continuing calibration verification
COC	chain of custody
DER	duplicate error ratio
EPA	Environmental Protection Agency (U.S.)
ICV	initial calibration verifications
FD	field duplicate
FY	fiscal year
LANL	Los Alamos National Laboratory
LCS	laboratory control sample
MDA	material disposal area
MDC	minimum detectable concentration
MS	matrix spike
NMED	New Mexico Environment Department
PB	performance blank
QA	quality assurance
QC	quality control
RPF	Records Processing Facility
SCL	sample collection log
SMO	Sample Management Office
SOP	standard operating procedures
SOW	statement of work
TA	technical area
TD	total depth

A-2.0 METRIC CONVERSION TABLE

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

A-3.0 DATA QUALIFIER DEFINITIONS

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

Appendix B

Field Methods

B-1.0 INTRODUCTION

This appendix summarizes the field methods used during the third quarter fiscal year 2010 sampling activities conducted in February 2010 at Material Disposal Area (MDA) V, Consolidated Unit 21 018(a)-99, in Technical Area 21 at Los Alamos National Laboratory (LANL or the Laboratory). All activities were conducted in accordance with the applicable standard operating procedures (SOPs), quality procedures, Laboratory implementation requirements, and Laboratory procedural requirements. Table B-1.0-1 provides a summary of the field methods used, and Table B-1.0-2 lists the applicable procedures.

B-2.0 FIELD METHODS

All work was conducted per a site-specific health and safety plan and an integrated work document. Field activities conducted according to SOPs are discussed below.

B-2.1 Tritium Pore-Gas Field Screening

Field screening was conducted in accordance with the current version of EP-ERSS-SOP-5074. Before each sampling event, each sampling port was purged and monitored with a LANDTEC GEM2000 instrument (or equivalent) until the percent carbon dioxide (%CO_2) and percent oxygen (O_2%) levels stabilized at values representative of subsurface pore-gas conditions. Each instrument rental was shipped factory-calibrated to the Laboratory and returned to a LANDTEC authorized service facility for service/calibration, as needed. As described in the LANDTEC documentation, accuracies for %O_2 and %CO_2 for LANDTEC instrumentation are +/- 1.0% and +/- 3.0%, respectively. Once purging and field screening were complete, vapor samples were collected for tritium analysis. Field-screening results were recorded on the appropriate sample collection log (SCL) and/or in the field logbook. Field chains-of-custody forms and SCLs are provided in Appendix D.

The %CO_2 and %O_2 levels are presented in Table 4.0-1 of this report. The calibrations of %CO_2 and %O_2 levels were within the manufacturer's acceptable calibration limits. The February 2010 %CO_2 levels ranged from 0% to 1.6%, are within acceptable limits, and are representative of subsurface pore-gas conditions. The February %O_2 levels ranged from 19.0% to 20.6%, are within acceptable limits, and are representative of subsurface pore-gas conditions.

All samples were submitted to the Sample Management Office (SMO) for processing and transport to off-site contract analytical laboratories.

B-2.2 Tritium Pore-Gas Sample Collection

All tritium samples were collected in accordance with the current version of EP-ERSS-SOP-5074. Water vapor intended for tritium analysis was collected from pore gas by pulling a pore-gas sample through a canister of silica gel, and the sampling information was recorded in the appropriate SCL (Appendix D on CD). Silica gel column field duplicate samples were also collected at a frequency greater than or equal to 10% per sampling event in accordance with the current version of EP-ERSS-SOP-5059.

Following delivery of the canister and silica gel sample to the analytical laboratory, the silica gel was heated and the moisture driven off was collected for liquid scintillation counting. Silica gel was prepared for sampling by drying it at a temperature above 100°C. Before sample collection, the amount of silica gel used in each sample was weighed (typically about 135 g) as well as the sample canister with silica gel. EP-ERSS-SOP-5074 required that at least 5 g of moisture be collected. After sampling, sample canister with silica gel was weighed again.

The sample (canister plus silica gel) was shipped to the analytical laboratory where the canister with silica gel was weighed again. The silica gel was emptied into a distillation apparatus and heated to 110^{o}C, driving moisture off the silica gel. This moisture was collected and analyzed for tritium by liquid scintillation. The laboratory also weighed the empty canister and calculated the percent moisture of the sample, as the amount of moisture collected divided by the calculated weight of the wet silica gel. The value of the tritium activity and the calculated percent moisture were reported to the Laboratory in the analytical data package provided in Appendix D (on CD).

Table B-1.0-1
Summary of Field Methods

Method	Summary
General Instructions for Field Investigations	This procedure provides an overview of instructions regarding activities to be performed before, during, and after field investigations. The procedure covers premobilization activities; mobilization to the site; documentation and sample collection activities; sample media evaluation; surveillance; and completion of lessons learned. It is assumed that field investigations involved the use of standard sampling equipment, personal protective equipment, waste management, and site-control equipment/materials.
Sample Containers and Preservation	Specific requirements/processes for sample containers, preservation techniques, and holding times were based on the U.S. Environmental Protection Agency guidance for environmental sampling, preservation, and quality assurance. Specific requirements were met for each sample and were printed in the sample collection logs provided by the Laboratory's SMO (size and type of container, preservatives, etc.). All samples were preserved by placing them in insulated containers with ice to maintain a temperature of 4°C.
Handling, Packaging, and Transporting Field Samples	Field team members sealed and labeled samples before packing them to ensure sample and transport containers were free of external contamination. All environmental samples were collected, preserved, packaged, and transported to the SMO under COC. The SMO arranged for shipping of the samples to analytical laboratories. Any levels of radioactivity (i.e., action-level or limited-quantity ranges) were documented in SCLs submitted to the SMO.
Sample Control and Field Documentation	The collection, screening, and transport of samples were documented in standard forms generated by the SMO. These forms included SCLs, COC forms, sample container labels, and custody seals. Collection logs were completed at the time of sample collection and were signed by the sampler and a reviewer who verified the logs for completeness and accuracy. Corresponding labels were initialed and applied to each sample container, and custody seals were placed around container lids or openings. COC forms were completed and signed to verify the samples were not left unattended.
Field Quality Control Samples	Field quality control samples were collected as follows: Field duplicates were collected at a frequency of 10% at the same time as a regular sample and submitted for the same analyses.
Sampling of Sub-Atmospheric Air	Vapor sampling was performed on two monitoring wells in accordance with the current version of EP-ERSS-SOP-5074 and analyzed for tritium. This SOP describes the process of sampling subatmospheric air from vapor ports in monitoring wells and boreholes. The procedure covers presampling activities; SUMMA sampling (a passive collection and containment system of laboratory-quality air samples); adsorbent column sampling; and postsampling activities.

Table B-1.0-2
List of Applicable General Procedures for MDA V Pore-Gas Monitoring Activities

Document Number	Laboratory Procedure Title
EP-ERSS-SOP-5055	General Instructions for Field Investigations
EP-ERSS-SOP-5056	Sample Containers and Preservation
EP-ERSS-SOP-5057	Handling, Packaging, and Transporting Field Samples
EP-ERSS-SOP-5058	Sample Control and Field Documentation
EP-ERSS-SOP-5059	Field Quality Control Samples
EP-ERSS-SOP-5061	Field Decontamination of Equipment
EP-ERSS-SOP-5074	Sampling for Sub-Atmospheric Air
P 101-6	Personal Protective Equipment
SOP-01.12	Field Site Closeout Checklist
SOP-01.13	Initiating and Managing Data Set Requests
SOP-5181	Notebook Documentation for Environmental Restoration Technical Activities
SOP-5228	ADEP Reporting Requirements for Abnormal Events

Appendix C

Quality Assurance/Quality Control Program

C-1.0 INTRODUCTION

This appendix presents the analytical methods and summarizes the data quality review for the pore-gas samples collected in February 2010 during the third quarter fiscal year 2010 monitoring event at Material Disposal Area (MDA) V, Consolidated Unit 21-018(a)-99, at Technical Area 21, at Los Alamos National Laboratory (LANL or the Laboratory).

Quality assurance (QA), quality control (QC), and data validation procedures were implemented in accordance with the "Quality Assurance Project Plan Requirements for Sampling and Analysis" (LANL 1996, 054609), and the Laboratory's statement of work (SOW) 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 blanks, duplicates, matrix spikes (MSs), laboratory control samples (LCSs), initial calibration verifications (ICVs) and continuing calibration verifications (CCVs) were used to assess analytical laboratory accuracy and bias.

The type and frequency of QC analyses are described in the analytical services SOW (LANL 2000, 071233). Other QC factors such as sample preservation and holding times were also assessed. The requirements for sample preservation and holding times are presented in Standard Operating Procedure (SOP) EP-ERSS-SOP-5056, 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) that included a more detailed review of the raw data results. The SOP used for data validation is presented in Table C-1.0-1. Copies of the analytical data, laboratory logbooks, and instrument printouts are provided in Appendix D (on CD). As a result of the data validation and assessment efforts, qualifiers have been assigned to the appropriate analytical records. Definitions of the data qualifiers are presented in Appendix A.

C-2.0 ANALYTICAL DATA ORGANIZATION AND VINTAGE

The February 2010 pore-gas analytical data were obtained from 10 samples (9 characterization samples and 1 field duplicate sample) collected during the third quarter sampling event from vapor-monitoring well locations 21-24524W and 21-24524S. Table 2.0-1 of the periodic monitoring report summarizes all samples collected and the analyses requested. Complete data packages and sample documentation for the third quarter samples are provided in Appendix D (on CD).

C-3.0 RADIONUCLIDE ANALYSIS METHODS

The vapor samples collected in February 2010 were analyzed by U.S. Environmental Protection Agency (EPA) Method 906.0 for tritium (Table C-3.0-1). All tritium results are provided in Appendix D (on CD).

C-3.1 Radionuclide QA/QC Samples

The minimum detectable concentration (MDC) for tritium in performance blanks (PBs), method blanks, laboratory duplicates, LCSs, and MS samples were analyzed to assess the accuracy and precision of the radionuclide analysis. The qualifiers and sample types for radionuclides are defined in the analytical services SOW (LANL 2000, 071233), described in the applicable validation SOPs, and discussed briefly below. The validation of radionuclide data using QA/QC samples and other methods may have resulted in the rejection of data or the assignment of various qualifiers to individual sample results.

The MDC for each radionuclide is defined as the minimum concentration the analytical laboratory equipment can detect in 95% of the analyzed samples and is used to assess analytical performance.

Uncertainty and MDC results for tritium have been modified in the same manner as the analytical results to account for the bound water found in silica gel used for sample collection.

The PBs and method blanks are used to measure bias and assess potential cross-contamination of samples during preparation and analysis. Blank results should be less than the MDC for each radionuclide.

Laboratory duplicates are used to assess or demonstrate acceptable laboratory method precision at the time of analysis as well as to assess the long-term precision of an analytical method on various matrices. Duplicate results are used to calculate a duplicate error ratio (DER). The DER is based on 1 standard deviation of the sample and the duplicate sample and should be less than 4.

The LCS serves as a monitor of the overall performance of each step during the analysis, and the acceptance criteria for LC Ss are method-specific. For radionuclide methods, LCS percent recoveries (%Rs) should fall within the control limits of 80% to 120%.

The accuracy of radionuclide analyses is also assessed using MS samples. These samples are designed to provide information about the effect of the sample matrix on the sample preparation procedures and analytical technique. The MS %Rs should be within the acceptance range of 75% to 125%; however, if the sampling result is more than 4 times the amount of the spike added, these acceptance criteria do not apply.

The quality of the third quarter MDA V tritium data is summarized below.

C-3.1.1 Tritium Qualified Data

During the February 2010 monitoring event, 10 pore-gas samples (including 1 field duplicate) were collected and submitted for tritium analysis.

No tritium data were rejected, and no data quality issues were identified.

Two tritium results were qualified as (U) because the associated sample activity was less than or equal to the MDC.

All validated tritium investigation pore-gas data collected in February 2010 from MDA V pore gas were used to evaluate tritium.

C-4.0 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. This information is also included in text citations. ER IDs are assigned by the Environmental Programs Directorate's Records Processing Facility (RPF) and are used to locate the document at the RPF and, where applicable, in the master reference set.

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

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 C-1.0-1
Data Validation Procedures

Procedure	Title	Effective Date
SOP-5166, Rev. 0	Routine Validation of Gamma Spectroscopy, Chemical Separation Alpha Spectrometry, Gas Proportional Counting, and Liquid Scintillation Analytical Data	06/30/2008

Table C-3.0-1
Analytical Methods for MDA V Pore-Gas Samples

Analytical Method	Analytical Description	Analytical Suite
EPA Method 906.0	Liquid Scintillation	Tritium

Appendix D

Analytical Suites and Results and Analytical Reports
(on CD included with this document)