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Status Report for Supplemental Sampling at Material Disposal Area A, Technical Area 21

Los Alamos
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EXECUTIVE SUMMARY

This status report presents results from the 2007 supplemental investigation at Material Disposal Area (MDA) A, within Technical Area 21 at Los Alamos National Laboratory (the Laboratory). The 2007 supplemental sampling investigation of MDA A was conducted as a continuation of the 2006 investigation report. Specific requirements for the supplemental sampling investigation were agreed upon by the New Mexico Environment Department and the Laboratory.

The three objectives of the 2007 MDA A supplemental investigation were to (1) assess the vertical extent of tritium pore gas beneath MDA A, (2) further characterize tritium and volatile organic compound (VOC) extent in pore gas beneath MDA A with additional sampling, and (3) plug and abandon open boreholes.

The 2007 supplemental sampling field activities included deepening one sample and sampling pore gas from it, collecting an additional round of pore-gas samples from five other existing boreholes, and plugging and abandoning twelve open boreholes.

Thirty-eight pore-gas samples were collected and analyzed for tritium and VOCs. Of the 38 tritium results, none were above 1100 pCi/L. The maximum tritium activity (1073.84 pCi/L) was detected at borehole location 21-26596 (BH-11) at a depth of 34 to 35 ft below ground surface (bgs), located to the east of the Eastern Pits. Tritium activities either remained relatively consistent or decreased with depth, including results for borehole location 21-26484 (BH-15). The vertical and lateral extent of tritium in pore gas are defined at MDA A.

Twenty-four VOCs were detected in pore gas at concentrations less than 240 $\mu g/m^3$. Toluene was detected at 3500 $\mu g/m^3$ in borehole location 21-26481 (BH-5) at a depth of 40.5 to 42 ft bgs; however, toluene concentrations decreased to 190 $\mu g/m^3$ in the 45 to 46 ft bgs sample. The vertical extent of pore-gas VOCs is defined by borehole locations 21-26588 (BH-12) and 21-26593 (BH-8); VOC concentrations decreased with depth at both locations (360 ft bgs and 115 ft bgs, respectively). The vertical and lateral extent of VOCs in pore gas are defined at MDA A.

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1.0 INTRODUCTION

This status report presents results from the 2007 supplemental sampling of Material Disposal Area (MDA) A, solid waste management unit (SWMU) 21-014, within Technical Area (TA) 21 at Los Alamos National Laboratory (LANL or the Laboratory) (Figure 1.0-1).

MDA A contains the following features: two 50,000-gal. cylindrical underground steel storage tanks, two vertical shafts, two eastern pits, one central pit, and a former drum storage area. MDA A was historically used to dispose of wastes generated during the TA-21 decontamination and decommissioning (D&D) operations. As a result of its operational history, MDA A contains both radioactive and hazardous components. 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 (DOE) policy.

The 2007 supplemental sampling of MDA A was conducted as a follow-up to the 2006 MDA A investigation report to address concerns by NMED (LANL 2006, 095046). In response to NMED's approval with modification (NMED 2007, 095047), the Laboratory proposed to deepen existing borehole (BH) location 21-26593 (BH-8) and collect pore-gas samples. The Laboratory also proposed collecting additional pore-gas samples in borehole locations 21-26481 (BH-5), 21-26485 (BH-3), 21-26588 (BH-12), and 21-26596 (BH-11) (LANL 2007, 098321). The pore-gas samples were analyzed for tritium and volatile organic compounds (VOCs). The Laboratory's proposal was accepted by NMED, with NMED also making a request that the Laboratory collect additional tritium samples from borehole location 21-26484 (BH-15) to further determine the need for long-term vapor monitoring (NMED 2007, 098322). The Laboratory responded by proposing collection and analysis of pore-gas samples for VOCs in addition to tritium from borehole location 21-26484.

In summary, the three objectives of the 2007 supplemental sampling were to

- assess the vertical extent of tritium at borehole location 21-26593 (BH-8) by deepening the borehole and collecting pore-gas samples from that location;
- further characterize tritium and VOC pore gas beneath MDA A by sampling borehole locations 21-26485, 21-26481, 21-26593, 21-26596, 21-26588, and 21-26484; and
- plug and abandon borehole locations 21-26480 (BH-4), 21-26481 (BH-5), 21-26482 (BH-13), 21-26484 (BH-15), 21-26485, 21-26588 (BH-12), 21-26591 (BH-6), 21-26592 (BH-7), 21-26594 (BH-9), 21-26595 (BH-10), 21-26596 (BH-11), and 21-26597 (BH-2) after sampling activities in accordance with section 5.8 of the approved investigation work plan for MDA A (LANL 2005, 089415, Attachment 2).

Drilling activities were conducted in accordance with the Nuclear Environmental Site (NES) Documented Safety Analysis for Drilling Procedure at a NES (NES-DOP-0101, R1), regulated under 10 CFR 830. The data gathered by the supplemental sampling will aid in the final remediation evaluation of MDA A to meet the March 1, 2005, Compliance Order on Consent (the Consent Order).

This report is presented in five sections with four supporting appendixes. Section 1 is the introduction. Section 2 summarizes MDA A operational history. Section 3 describes the field activities conducted during the 2007 supplemental sampling and provides an overview of the results of the latest round of pore-gas data for MDA A. Section 4 presents the conclusions and recommendations. Section 5 cites all references supporting this report. Appendixes include acronyms, glossary, conversions, and data qualifier definitions; field measurements; borehole logs; and analytical results and reports (on CD) from the 2007 supplemental sampling.

2.0 SITE HISTORY

MDA A is a Hazard Category 2 nuclear facility (Steele 2003, 087047, p. 1) composed of a 1.25-acre, fenced and radiologically controlled area situated on the eastern end of Delta Prime (DP) Mesa. MDA A is bounded by DP Canyon to the north and Los Alamos Canyon to the south. MDA A is currently inactive and undergoing corrective action. A comprehensive review of the site history and facility investigations is presented in the MDA A investigation report (LANL 2006, 095046).

2.1 Operational History

TA-21 comprises two operational areas, DP West and DP East, both of which produced liquid and solid radioactive wastes. The operations at DP West included plutonium processing, while the operations at DP East included the production of weapons initiators. MDA A was used between 1945 and 1978 to store solid and liquid wastes as described below. As a result of its operational history, MDA A contains both radioactive and hazardous components.

MDA A currently contains the following features and was historically used to dispose of wastes generated during the TA-21 decontamination and decommissioning operations:

- Two 50,000-gal. cylindrical underground steel storage tanks
- Two vertical shafts
- Two eastern pits
- One central pit
- A former drum storage area

The two 50,000-gal. cylindrical steel storage tanks (referred to as the General's Tanks and designated TA-21-107 [West] and TA-21-108 [East]) were constructed for underground storage and contain residual sludge from waste solutions contaminated with plutonium-239/240 and americium-241. The two tanks received material from 1947 to 1974 (LANL 2005, 088052.5, pp. 2-3).

The two vertical shafts (approximately 65 below ground surface [bgs]) were installed for the purpose of clarifying rinse water generated by cleaning cement paste from a transfer hose between the pug mill and the General's Tanks. The General's Tanks were never filled with cement paste and the shafts were never used. The vertical shafts were constructed in 1975 and filled with soil in 1977 (LANL 2005, 088052.5, p. 3).

The two eastern pits contain solid waste potentially contaminated with polonium, plutonium, uranium, thorium, and other unidentified chemicals associated with Laboratory operations. These pits received waste from 1945 to 1946 and were backfilled with crushed Bandelier Tuff (LANL 2005, 088052.5, pp. 3–4).

The central pit contains TA-21 D&D debris potentially contaminated with plutonium-239/240, plutonium-238, uranium-235, depleted uranium, and other unspecified radionuclides. This pit also contains asphalt. The central pit received waste from 1969 to 1978 and was covered with crushed tuff.

The former surface drum storage area provided temporary storage of several hundred 55-gal. drums containing a sodium hydroxide solution, stable iodine, and possibly some plutonium and uranium. Corrosion of the drums resulted in liquid releases to the surface soil at MDA A. The drum storage area was used from the late 1940s to 1960 when the drums were removed and the area was paved (LANL 2005, 088052.5, pp. 4-5).

Site stabilization activities, such as removing surface contamination, adding cover material, recontouring, and reseeding, were performed in 1985. In 1987, isolated areas at MDA A were reseeded and fertilizer was applied. Gravel mulch was also spread on the north side of the site (LANL 2005, 088052.5, p. 2).

2.2 Investigations

The MDA A investigation report provides a comprehensive review of the previous investigations (LANL 2006, 095046). The following is a brief description of these previous investigations.

2.2.1 Geophysical Surveys

Geophysical surveys were conducted at MDA A in 1989, 1996, 1999, and 2003 (LANL 2005, 088052.5, pp. 5-6). These surveys were conducted to determine the geometry of each of the disposal units and the General's Tanks. Additional features, including paleochannels (outside MDA A) and miscellaneous buried debris (inside MDA A), were also identified.

2.2.2 Pre–Resource Conservation and Recovery Act (RCRA) Facility Investigations (RFIs)

As described in the MDA A historical investigation report (LANL 2005, 088052.5, pp. 7-10), the pre-RFI sampling and activities conducted before 1994 included surface and subsurface sample collection.

Surface Investigations

Pre-RFI surface soil activities were performed in 1980, 1984, and 1990. As described in the approved MDA A investigation work plan (LANL 2005, 088052.113, p. 11; LANL 2005, 089415, Attachment 2), samples were analyzed for radiological constituents only. The surface soil data collected from the 1990 investigation are qualitative only because a sampling location map is unavailable. The conclusions of these three investigations were that concentrations of plutonium-238, plutonium-239/240, americium-241, uranium, and tritium were above established background values (BVs) and fallout values (FVs) in most sampling locations in the area surrounding MDA A (LANL 2005, 088052.5, pp. 8-10).

Subsurface Investigations

Pre-RFI subsurface activities were conducted in 1969, 1974, and 1983 within the fenced perimeter of MDA A. The 1969 investigation was an evaluation of fracture and joint patterns conducted during the excavation of the central disposal pit. The 1974 and 1983 investigations included the installation of 10 vertical boreholes (four in 1974 and six in 1983), with augers near the General's Tanks to determine if the tanks had leaked. The results from these two sampling events indicated the tanks had not leaked as of 1983 (LANL 2005, 088052.5, pp. 7-9).

2.2.3 1992 and 1994 RFIs

In 1992 (LANL 1994, 026073) and 1994 (LANL 1997, 062292), RFI surface soil activities were performed in the areas outside the MDA A fence line immediately surrounding and downslope from the facility to the north. Surface and shallow subsurface soil samples were collected at depths up to 1.5 ft bgs. Samples were analyzed for radionuclides, metals, VOCs, and semivolatile organic compounds. As with previous investigations, americium-241, plutonium-238, uranium, and tritium were detected above BVs/FVs in most samples. Several metals, including arsenic, cadmium, lead, and mercury, were detected above BVs. Organic compounds were detected in a small number of these samples.

3.0 CURRENT ACTIVITIES AT MDA A

This section describes the field activities conducted during the 2007 supplemental sampling, including borehole deepening, borehole (neutron logging) geophysical survey, collection of pore-gas samples, and borehole abandonment. The locations of the activities are shown in Figure 3.0-1. This section also presents the 2007 supplemental pore-gas sampling data.

3.1 Borehole Deepening and Neutron Logging, Location 21-26593

Borehole location 21-26593 (BH-8) was deepened from 35 to 115 ft bgs for the collection of pore-gas samples. The borehole was drilled through the Qbt 3/Qbt 2 contact and completed at 115 ft bgs.

Neutron logging was accomplished using the Laboratory-owned Mount Sopris downhole geophysical logging equipment. A CPN Corporation 503DR Hydroprobe Moisture Depth Gauge (e.g., neutron probe) was used in accordance with Subsurface Moisture Measurements Using Neutron Probes, DOP FMU64-023, R.0 (Henson 1992, 009803). Volumetric moisture content of borehole location 21-26593 (BH-8) is presented in Figure 3.1-1.

3.2 Sampling of Vapor Monitoring Boreholes

A second round of vapor-phase VOC and tritium pore-gas samples was collected from previously sampled depths of five boreholes locations: 21-26481, 21-26484, 21-26485, 21-26588, and 21-26596. In addition, borehole location 21-26593 was drilled from 35 to 115 ft bgs, and tritium and VOC pore-gas samples were collected every 20 ft from 35 to 115 ft bgs. See Table 3.2-1 for sample locations and depths.

Before sample collection, the pore-gas system was purged; once proper purge of the sampling system was verified, vapor sampling proceeded in accordance with Standard Operating Procedure 5074, Sampling for Subatmospheric Air. Subsurface pore-gas samples were collected in SUMMA canisters for VOC analysis and in silica gel samplers for tritium analysis.

3.3 Borehole Plugging and Abandonment

Twelve of the 13 open boreholes at MDA A [borehole locations 21-26480 (BH-4), 21-26481 (BH-5), 21-26482 (BH-13), 21-26484 (BH- 15), 21-26485 (BH-3), 21-26588 (BH-12), 21-26591 (BH-6), 21-26592 (BH-7), 21-26594 (BH-9), 21-26595 (BH-10), 21-26596 (BH-11), and 21-26597 (BH-2)] were plugged and abandoned in accordance with section 5.8 of the approved investigation work plan for MDA A (LANL 2005, 089415).

3.4 Data Review of Neutron Logging and Pore-Gas Sampling Results

Data collected during the 2007 field activities are presented below. Borehole location 21-26593 geophysical logging (neutron logging) results are discussed in section 3.4.1. VOC and tritium pore-gas results are provided in section 3.4.2. Field data from the supplemental sampling is provided in Appendix B. The analytical data are provided in Appendix C (on CD).

3.4.1 Neutron Logging, Location 21-26593

Neutron logging was accomplished using Mount Sopris downhole geophysical logging equipment. A CPN Corporation 503DR Hydroprobe Moisture Depth Gauge (e.g., neutron probe) was used in accordance with Subsurface Moisture Measurements Using Neutron Probes, DOP FMU64-023, R.0 (LANL 1999, 090803). Neutrons generated by the probe interact with the subsurface media to create thermal neutron flux. The neutrons collide with hydrogen in the media (e.g., pore moisture) and the instrument records these collisions. The data are converted to volumetric moisture content using media specific calibration curves developed in DOP FMU64-023, R.0 (LANL 1999, 090803). The volumetric moisture content of borehole location 21-2626593 (BH-8) is presented in Figure 3.1-1. In general, the vertical profile has less than 5% volumetric moisture, with the exception of the 96 to 98 ft bgs interval. This interval reported moisture up to 27% and was located at the Qbt 3/Qbt 2 contact.

3.4.2 MDA A Subsurface Vapor Data

A summary of VOC and tritium results is presented in the following sections.

VOCs

Thirty-eight pore-gas samples were collected and analyzed for VOCs. Twenty-four VOCs were detected in the 2007 pore-gas samples. Most results were less than 240 µg/m^3; the higher results are discussed in detail. Concentrations are generally below VOC pore-gas levels measured in 2006. Nine of the 24 compounds were detected in over half of the samples analyzed. Toluene was detected in borehole location 21-26481 (BH-5) at a concentration of 3,500 µg/m^3 from a depth of 40.5 to 42 ft bgs and decreased to 190 µg/m^3 in the 45 to 46 ft bgs sample. This was the highest VOC concentration detected in pore gas from the 2007 sampling. Distribution of the nine most prevalent compounds in the boreholes with the maximum concentrations indicated concentrations decreased with depth for butanone [2-], tetrachloroethene, toluene, trichloroethane [1,1,1-], and xylene [1,3-] + xylene [1,4-], remained unchanged for chloroform and dichlorofluoromethane, and increased with depth for acetone and trichloroethene.

The vertical extent of pore-gas VOCs is defined by the two deeper boreholes at borehole locations 21-26588 (BH-12) and 21-26593 (BH-8). The results from these two boreholes show that concentrations of some VOCs may increase with depth over the 0- to 50-ft interval, as noted in other shallow boreholes, but then decrease with depth toward the bottom of the borehole. Lateral extent of VOCs in pore gas is defined for all detected VOCs.

VOC pore-gas results from 2007 indicate fewer VOCs were detected (24 VOCs in 2007 versus 31 VOCs in 2006) and at lower concentrations. VOCs detected in 2006 but not detected in the 2007 samples included bromodichloro-methane, carbon tetrachloride, chloromethane, dichloroethane [1,1-], dichloroethane [1,2-], dichloropropane [1,2-], ethanol, methylene chloride, propanol [2-], styrene, and trichloro-1,2,2-tri-fluoroethane-[1,1,2-].

Table 3.4-1 summarizes the VOC pore-gas results for the 2007 supplemental sampling. Graphical plots of 2006 and 2007 VOC results for each of the six boreholes sampled are presented in Figures 3.4-1 to 3.4-6. Plate 1 presents the 2007 VOC and tritium pore-gas results.

Evaluation of VOC Pore Gas

The VOC results were screened to evaluate whether concentrations in the subsurface pore gas are a potential source of groundwater contamination. Because screening levels are not available for pore gas to address the potential for groundwater contamination, the evaluation is based on groundwater cleanup levels contained in the Consent Order and Henry's Law constants. The screening calculations describe the equilibrium relationship between vapor and water concentrations. Henry's Law constants were obtained from either the NMED soil screening level technical background document (NMED 2006, 092513) or the Pennsylvania Department of Environmental Protection chemical and physical properties database (http://www.dep.state.pa.us/physicalproperties/Default.htm). The screening value calculations and full description are provided in the MDA A investigation report (LANL 2006, 095046, Appendix I).

If the screening value is less than 1, the maximum concentration of the VOC in pore gas is not sufficiently high to cause the water screening level to be exceeded, even if the VOCs were in contact with groundwater. As shown in Table 3.4-2, 20 of the 24 VOCs detected have a maximum contaminant level (MCL), New Mexico Water Quality Control Commission NMWQCC) standard, and/or U.S. Environmental Protection Agency (EPA) Region 6 tap water screening level (EPA 2007, 095866). For each of these VOCs, screening was performed using the maximum detected pore-gas concentration. The results show that the screening value is below 1 for all VOCs. The results of this screening indicate that VOCs in subsurface pore gas at MDA A are not a potential source of groundwater contamination.

Tritium

Table 3.4-3 summarizes the tritium pore-gas results for the supplemental sampling. Graphical plots of the 2006 and 2007 tritium results for each of the six boreholes are presented in Figures 3.4-7 to 3.4-12. Plate 1 presents the 2007 pore-gas results for VOCs and tritium.

Thirty-eight samples of pore water vapor were collected and analyzed for tritium. Of the 38 tritium results, none were above 1100 pCi/L. The maximum detected tritium activity (1073.84 pCi/L pCi/L) was detected at borehole location 21-26596 (BH-11) at a depth of 34 to 35 ft bgs.

Tritium results from 2007 are over an order of magnitude lower than the levels measured at the same locations in 2006. Tritium levels in 2007 ranged from nondetect to 1073.84 pCi/L. Tritium activities either remained relatively consistent or decreased with depth. Concentrations decreased laterally away from the maximum activity measured in 2007 at borehole location 21-26596. The vertical and lateral extent of tritium in pore gas are defined at MDA A. The maximum detected level of tritium was approximately 5% of the MCL for tritium. Therefore, the tritium detected in the subsurface at MDA A is not a potential source of groundwater contamination.

4.0 CONCLUSIONS AND RECOMMENDATIONS

The vertical and lateral extent of VOCs and tritium in pore gas are defined at MDA A based upon the 2006 and 2007 sampling results. Long-term vapor monitoring at MDA A is not recommended.

5.0 REFERENCES

The following list includes all documents cited in this report. Parenthetical information following each reference provides the author(s), publication date, and ER ID 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 documents 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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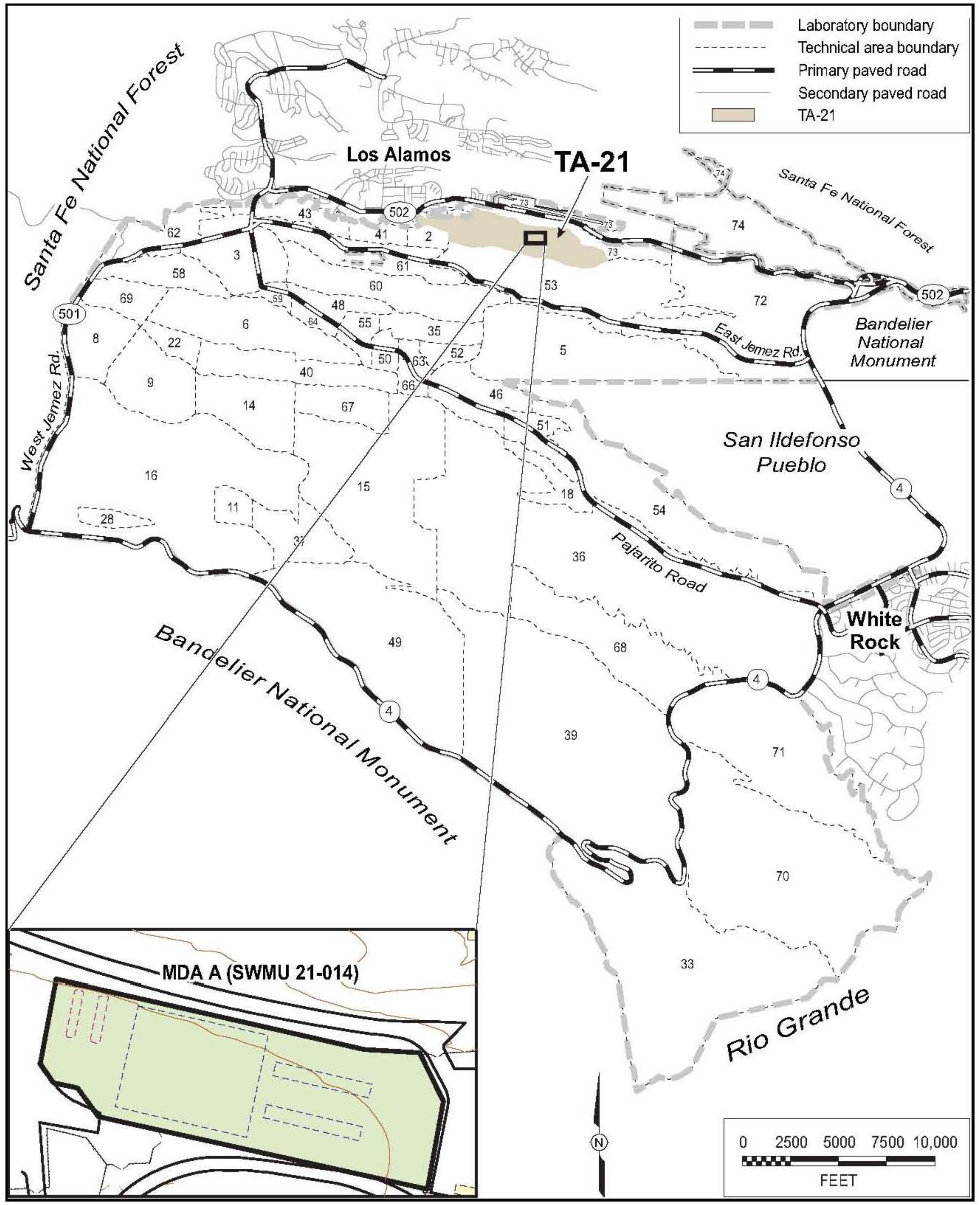


Figure 1.0-1 Location of MDA A (SWMU 21-014) within TA-21 at the Laboratory

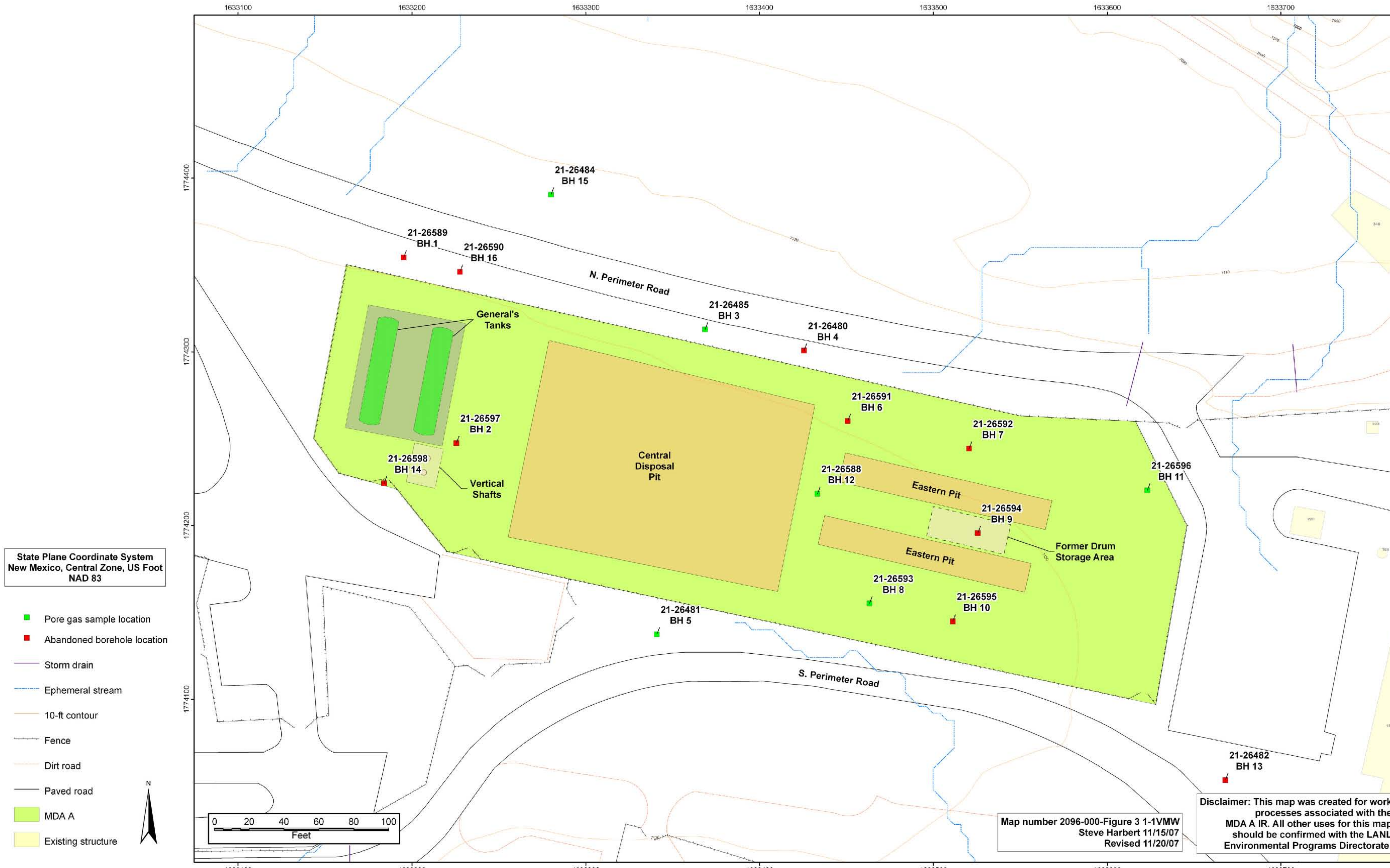


Figure 3.0-1 Location of pore-gas sample collection and borehole abandonment at MDA A

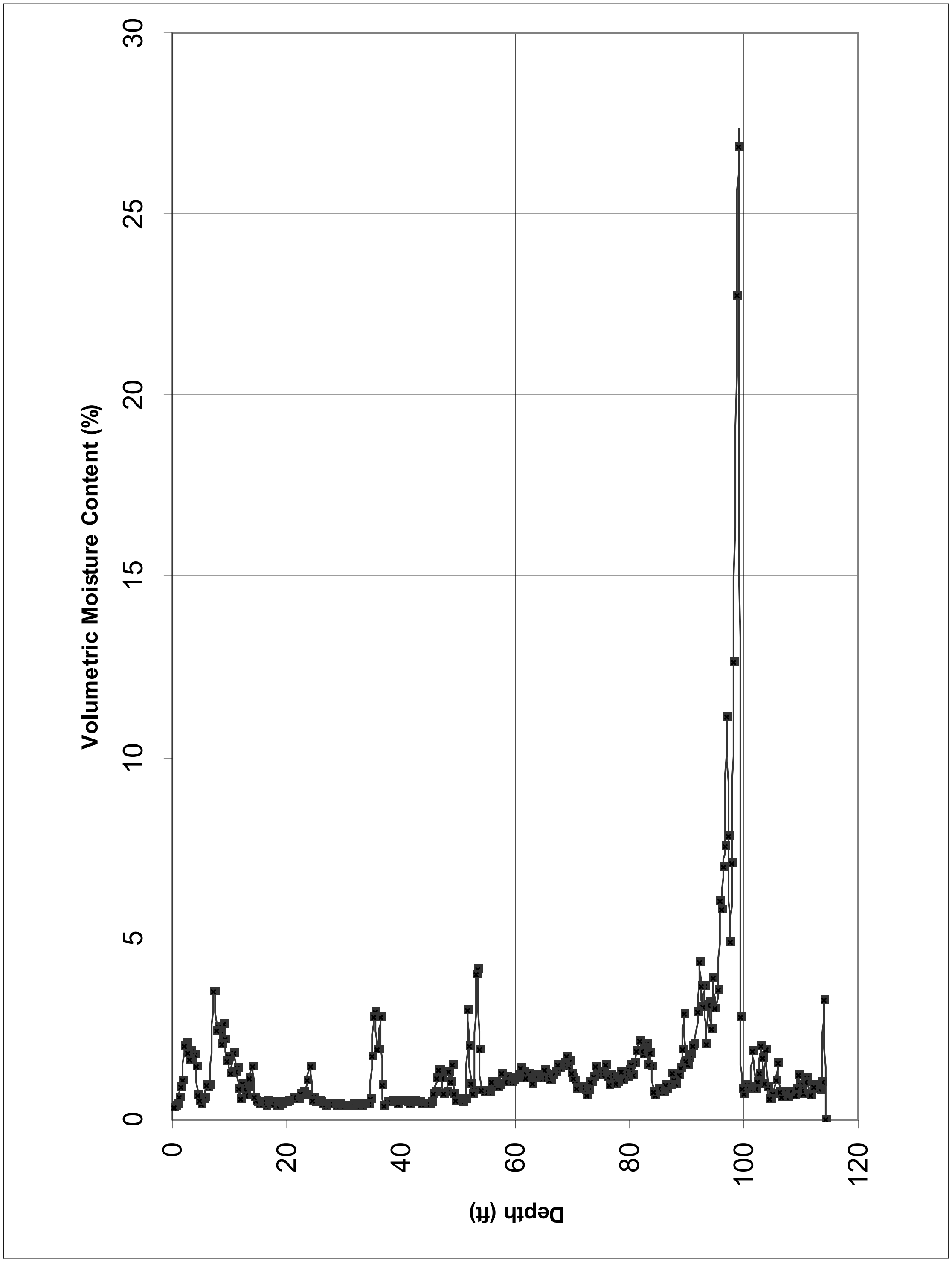
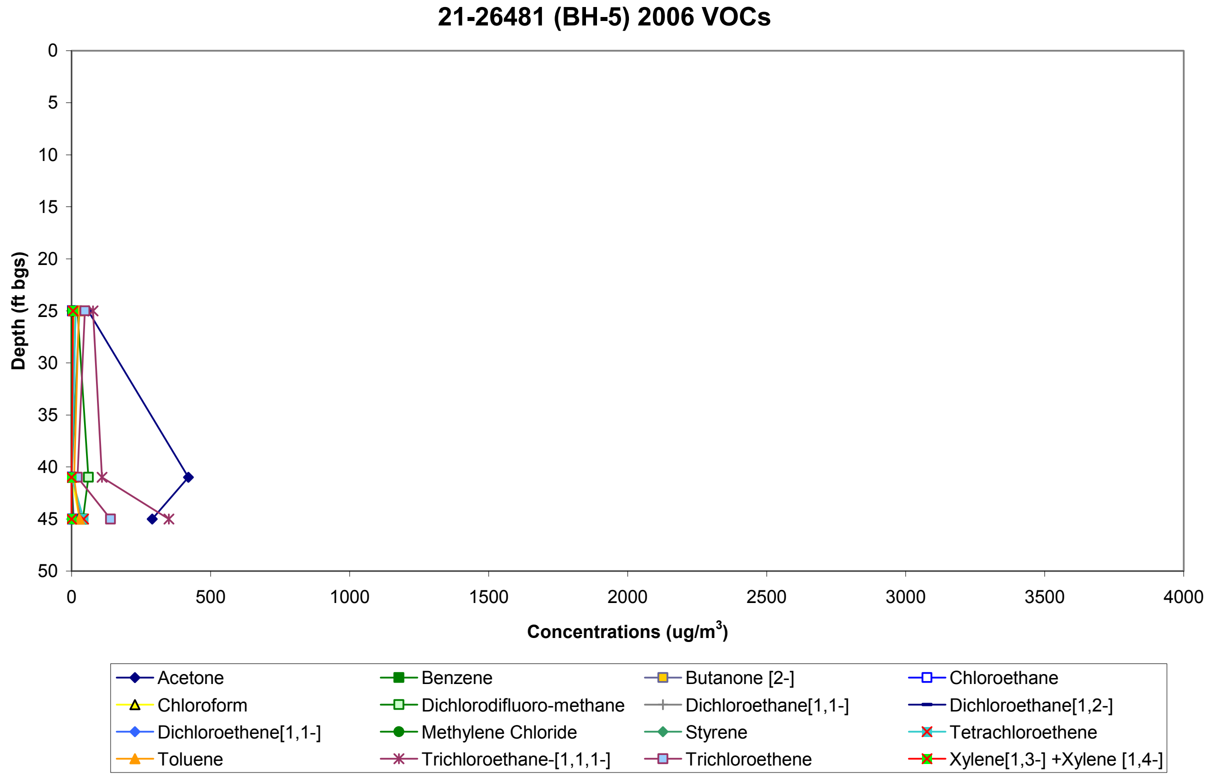


Figure 3.1-1 Neutron probe moisture results, borehole location 21-26593 (BH-8)



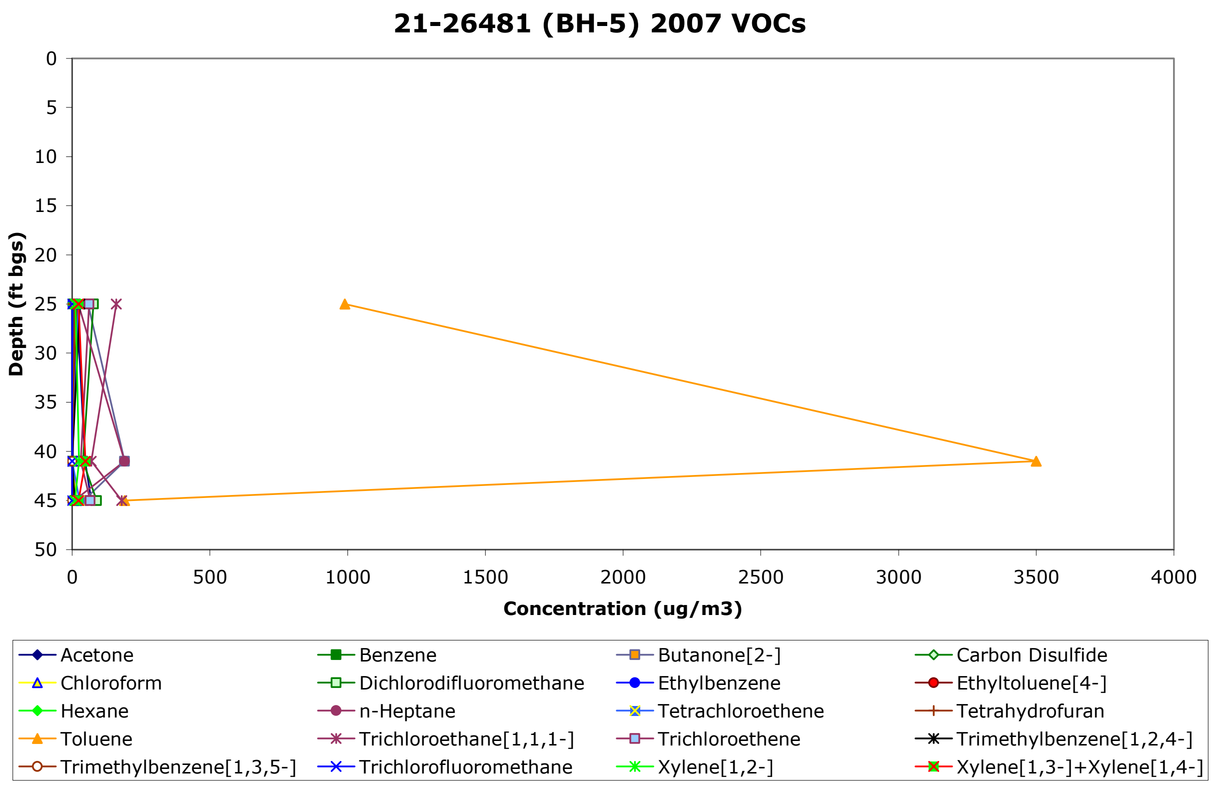
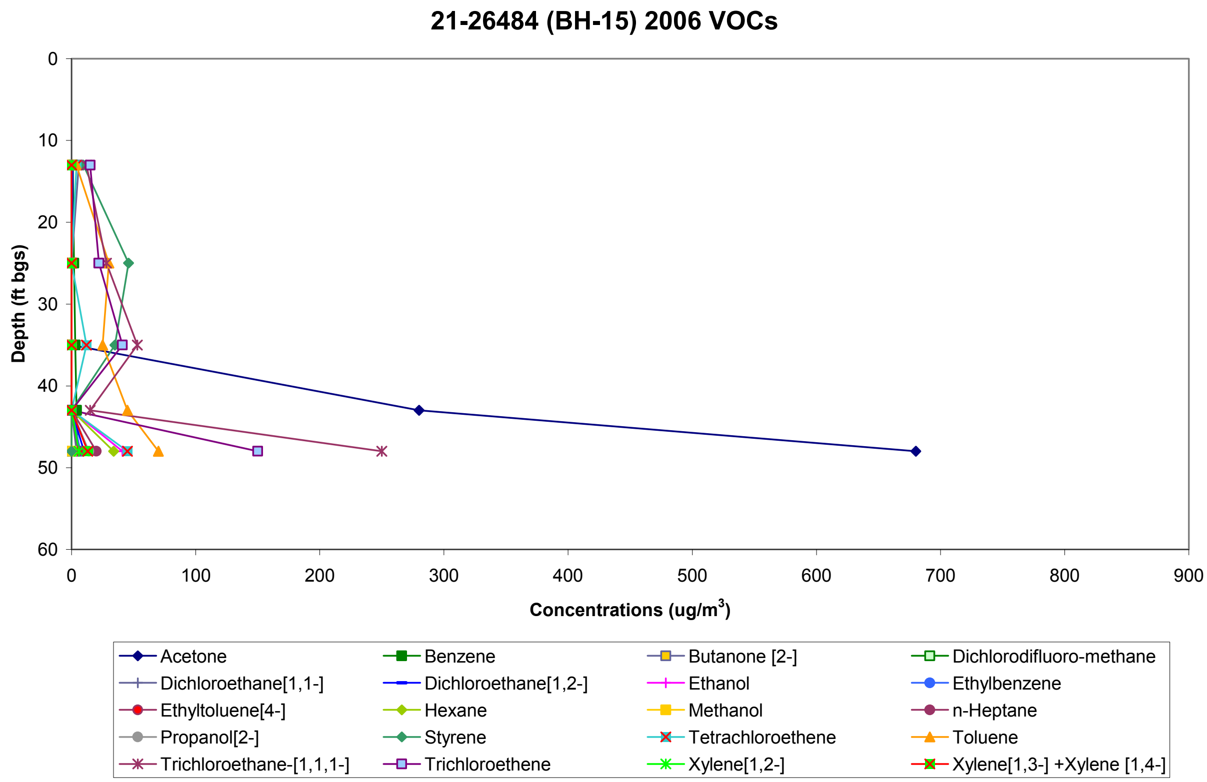


Figure 3.4-1 2006 and 2007 VOC results, borehole location 21-26481 (BH-5)



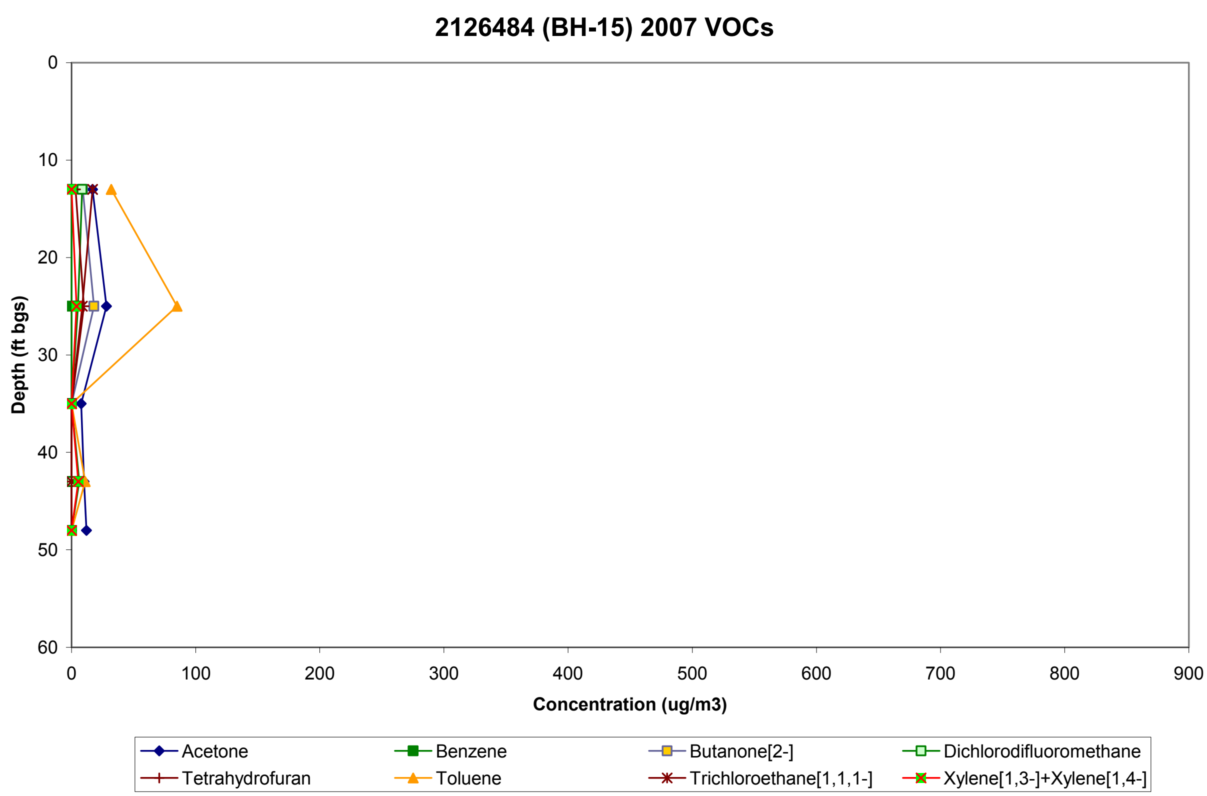
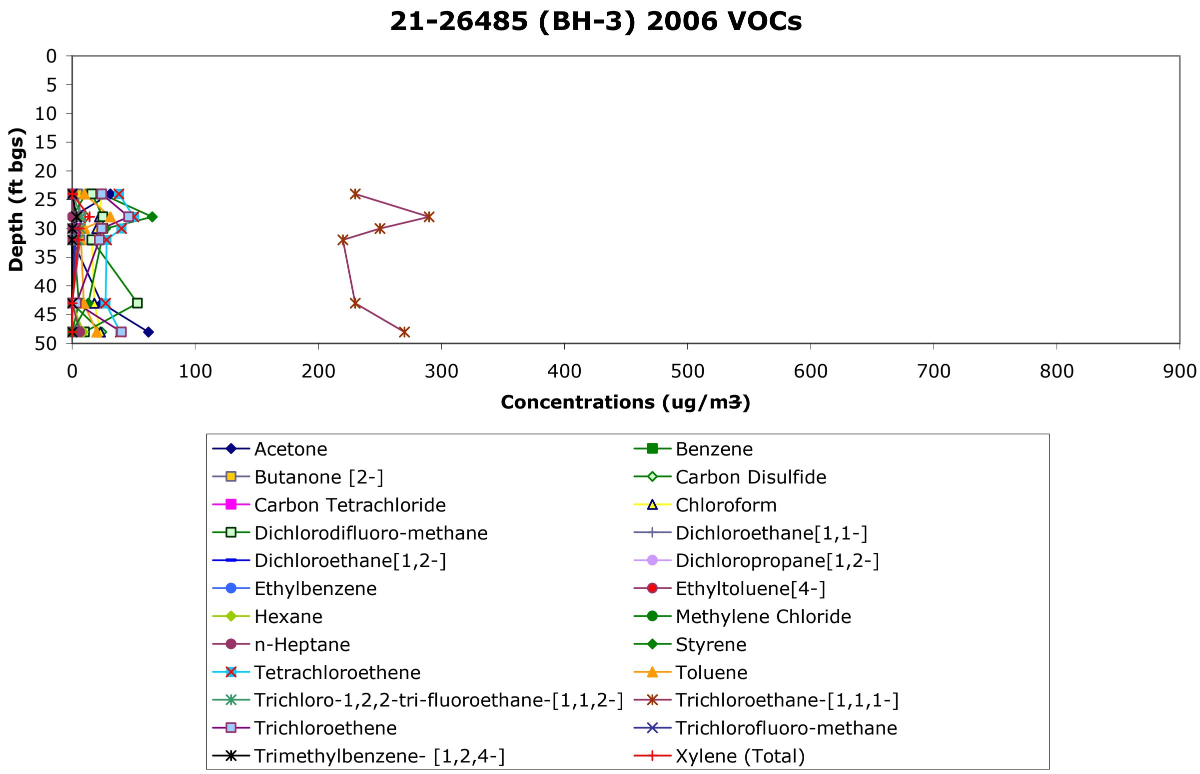


Figure 3.4-2 2006 and 2007 VOC results, borehole location 21-26484 (BH-15)



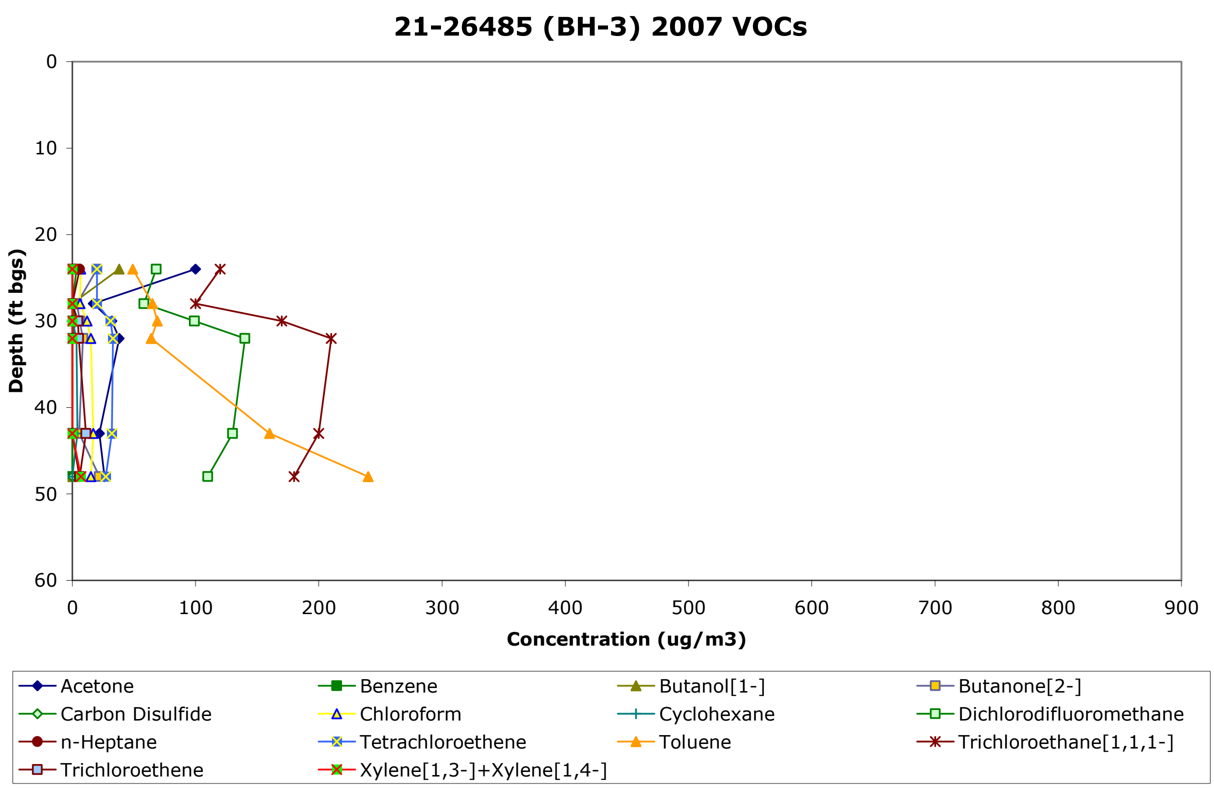
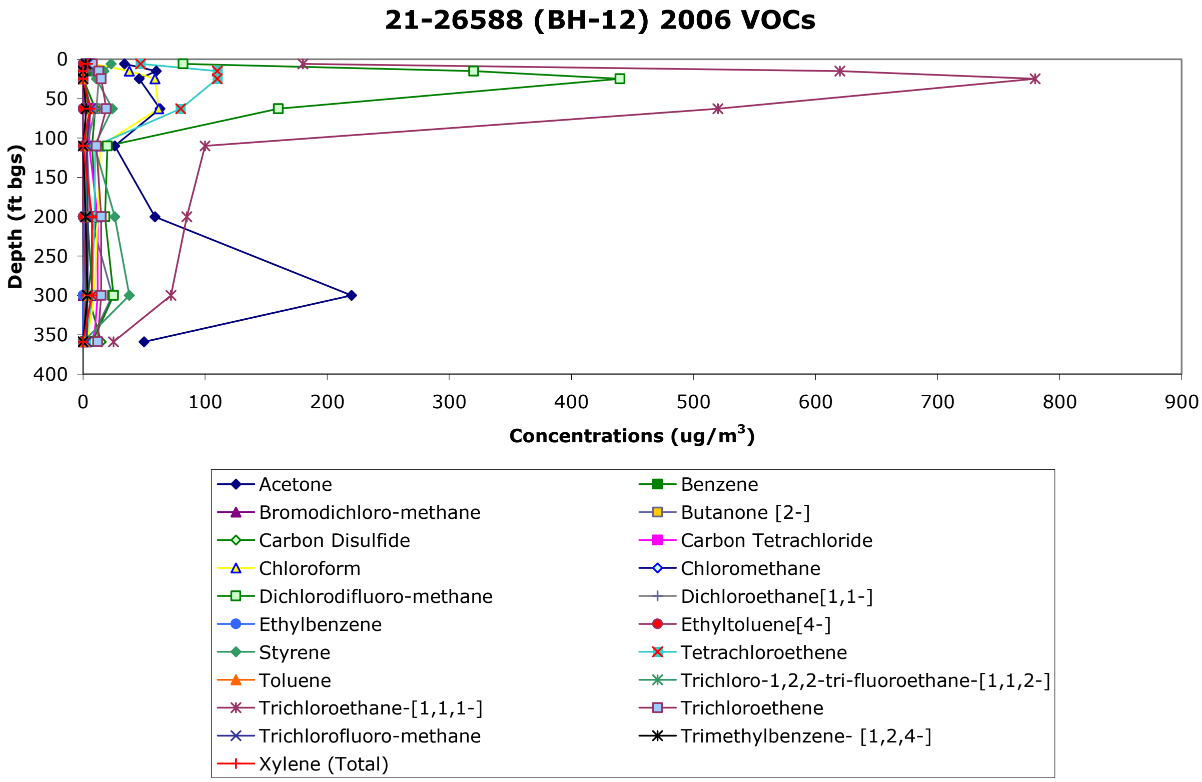


Figure 3.4-3 2006 and 2007 VOC results, borehole location 21-26485 (BH-3)



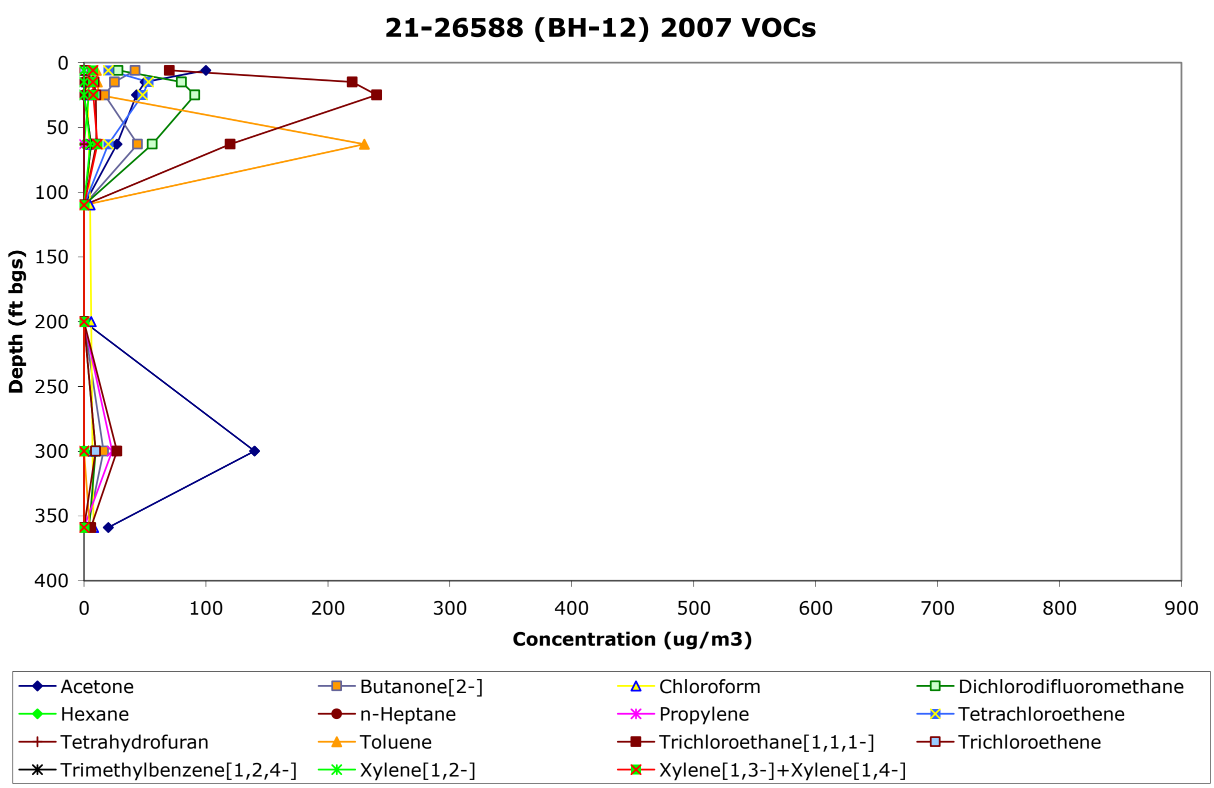
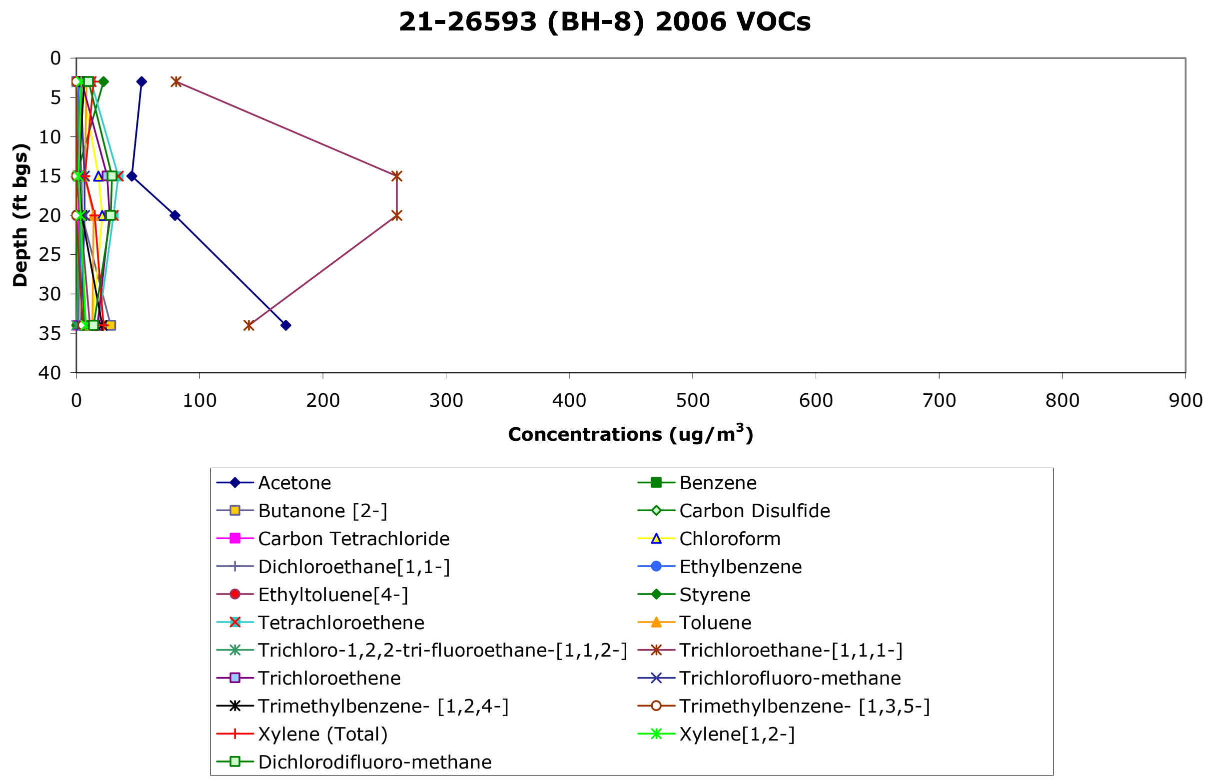


Figure 3.4-4 2006 and 2007 VOC results, borehole location 21-26588 (BH-12)



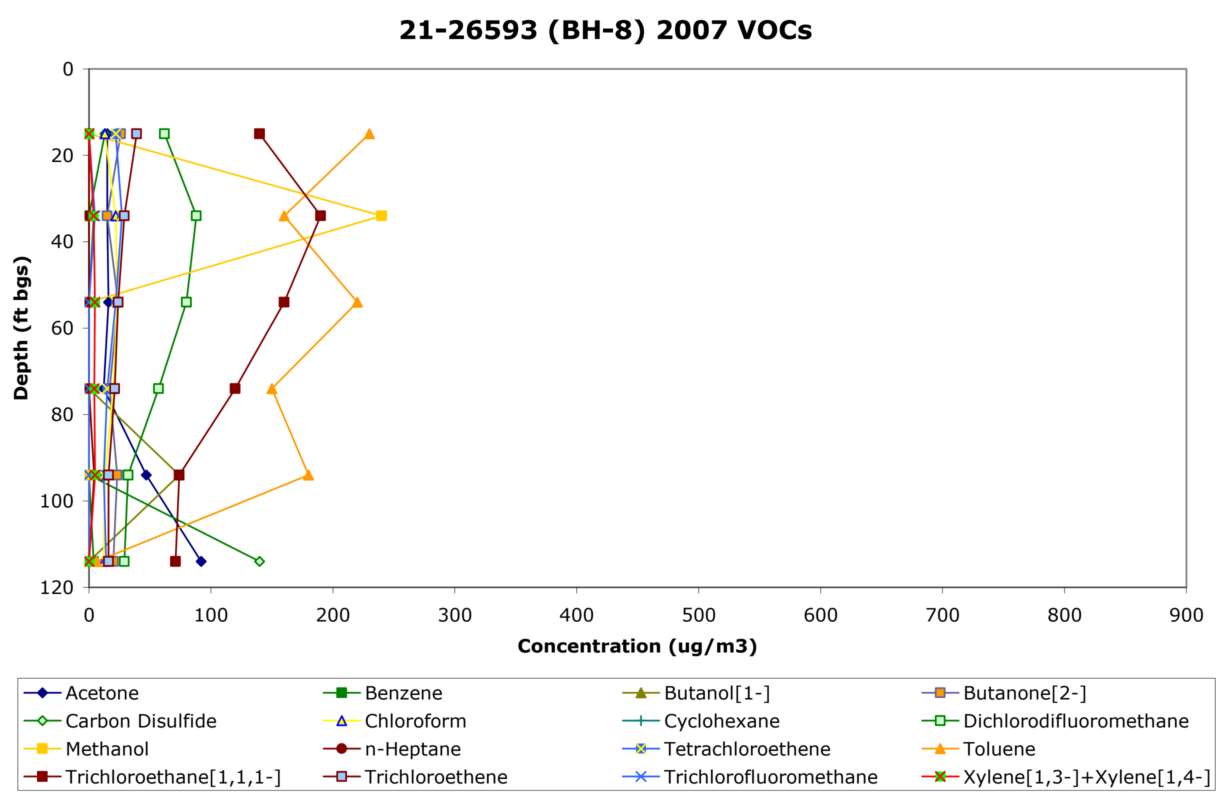
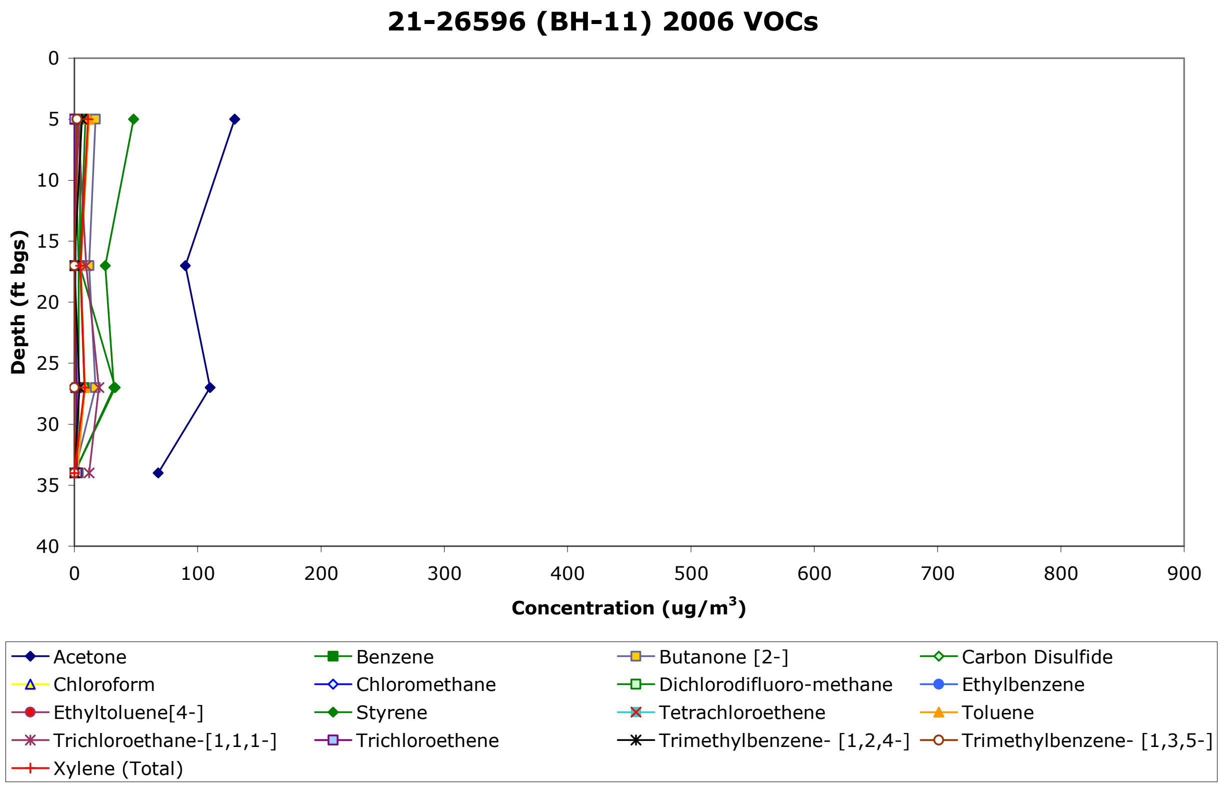


Figure 3.4-5 2006 and 2007 VOC results, borehole location 21-26593 (BH-8)



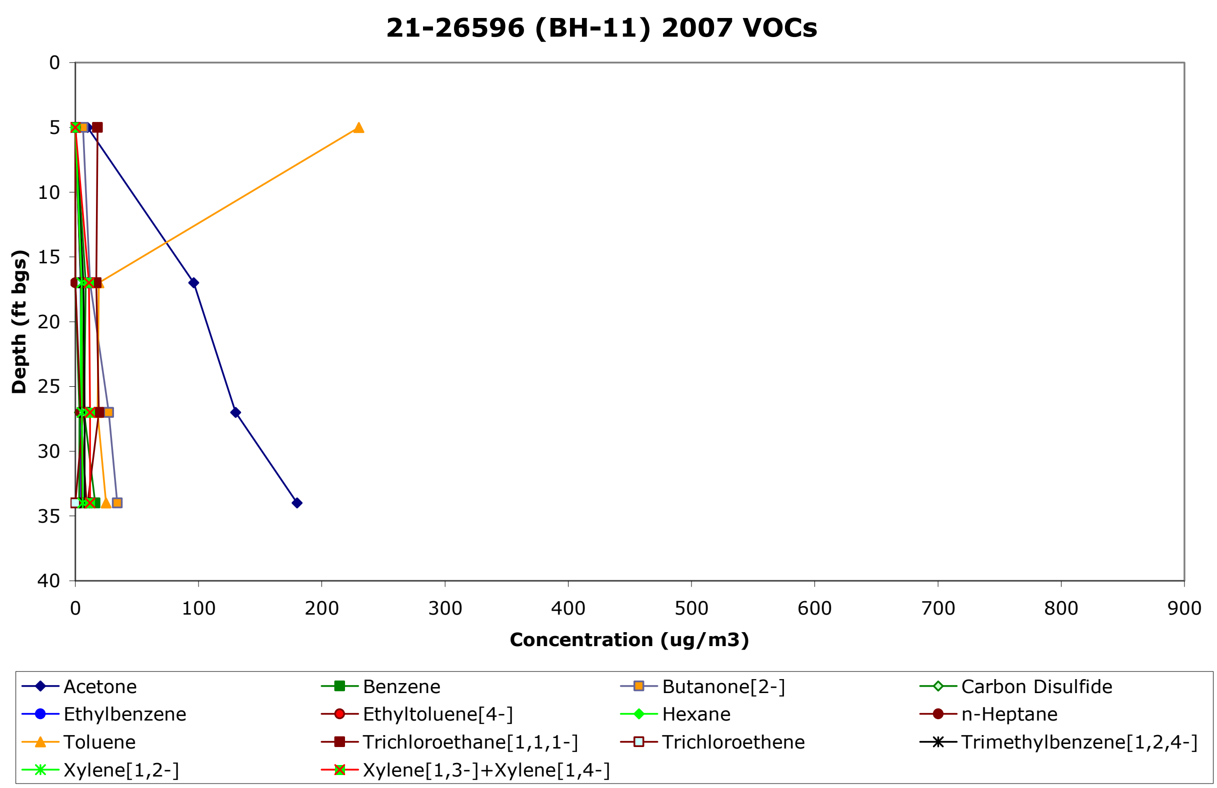


Figure 3.4-6 2006 and 2007 VOC results, borehole location 21-26596 (BH-11)

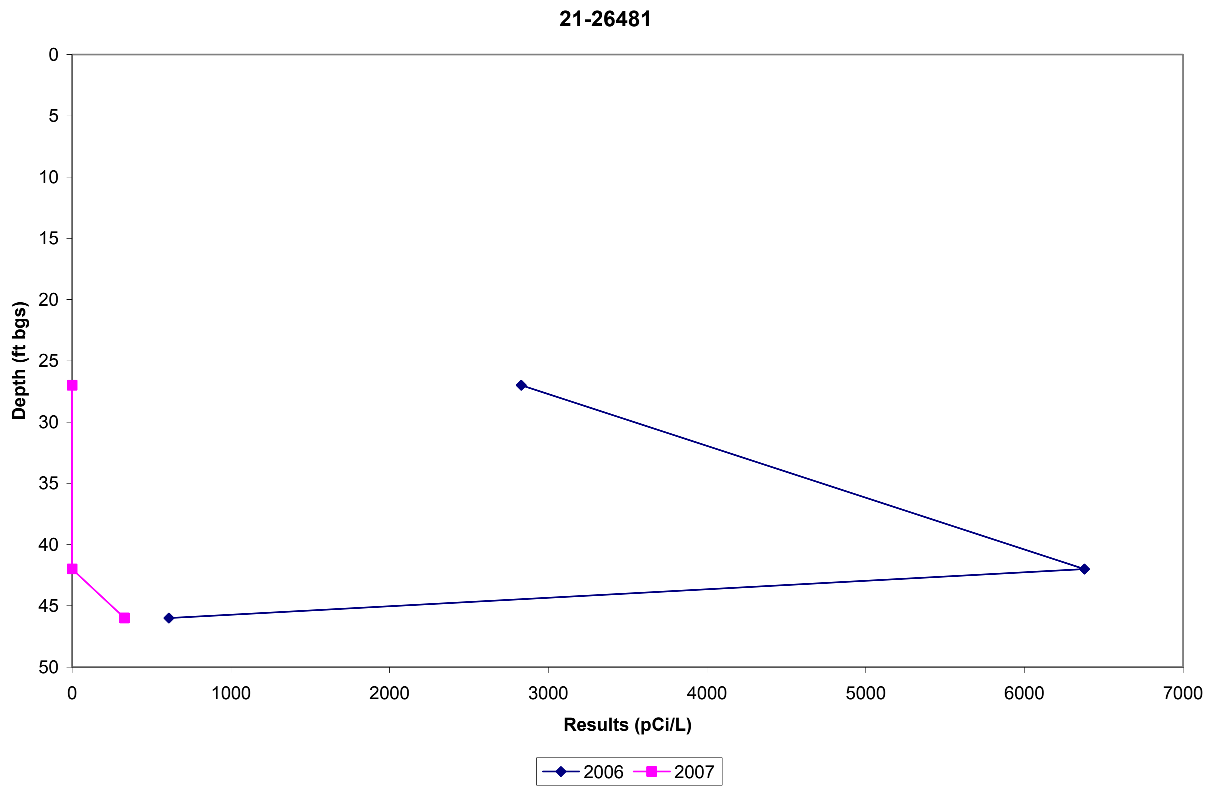


Figure 3.4-7 2006 and 2007 tritium results, borehole location 21-26481 (BH-5)

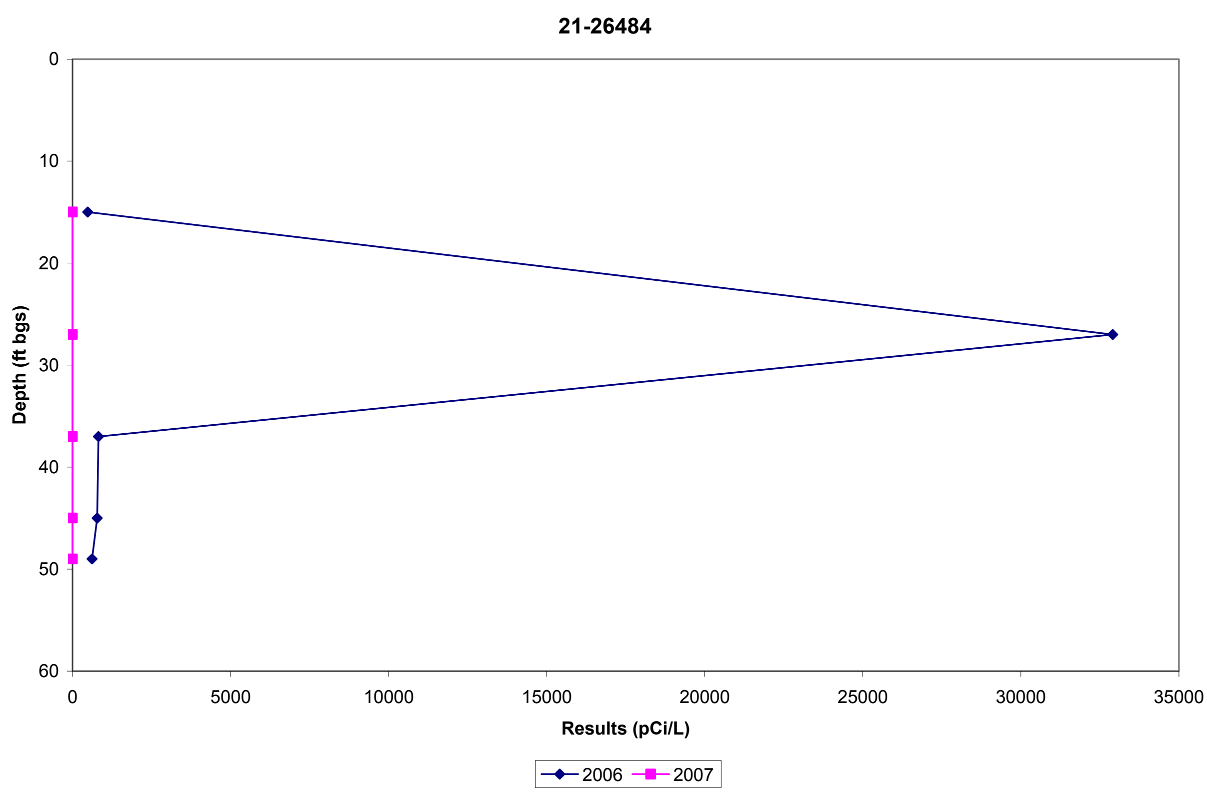


Figure 3.4-8 2006 and 2007 tritium results, borehole location 21-26484 (BH-15)

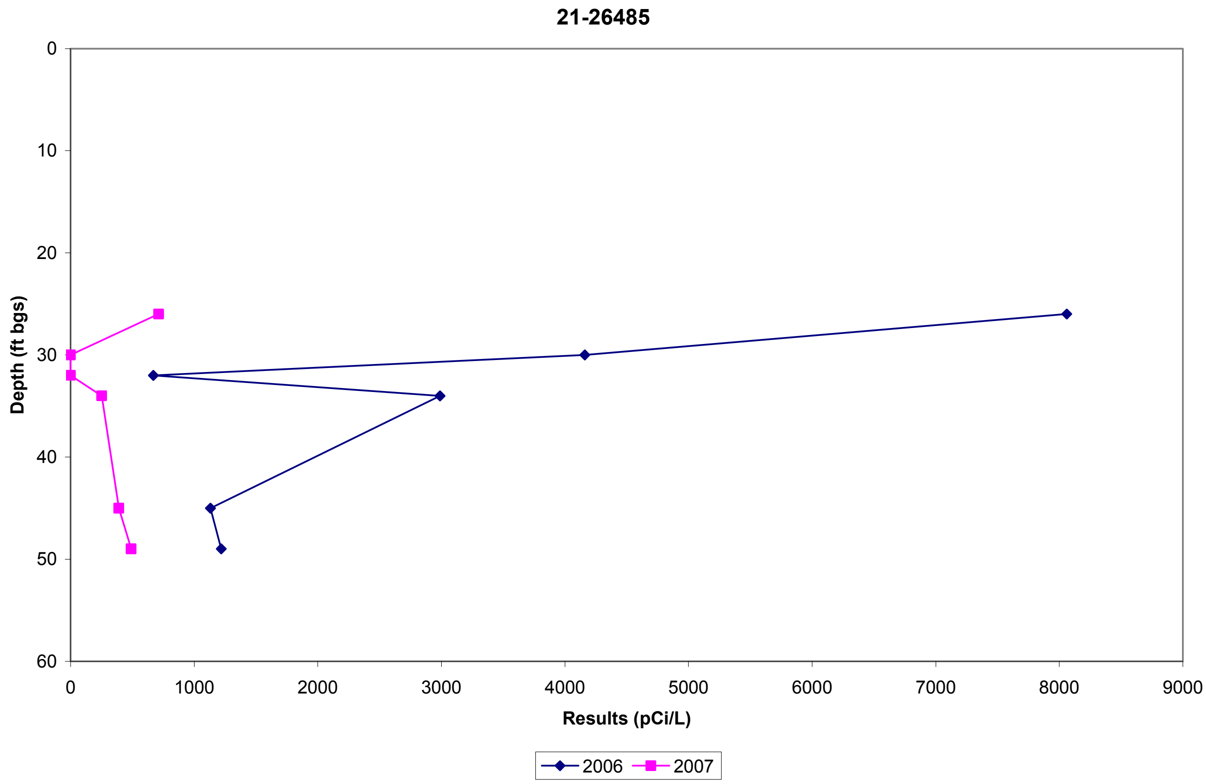


Figure 3.4-9 2006 and 2007 tritium results, borehole location 21-26485 (BH-3)

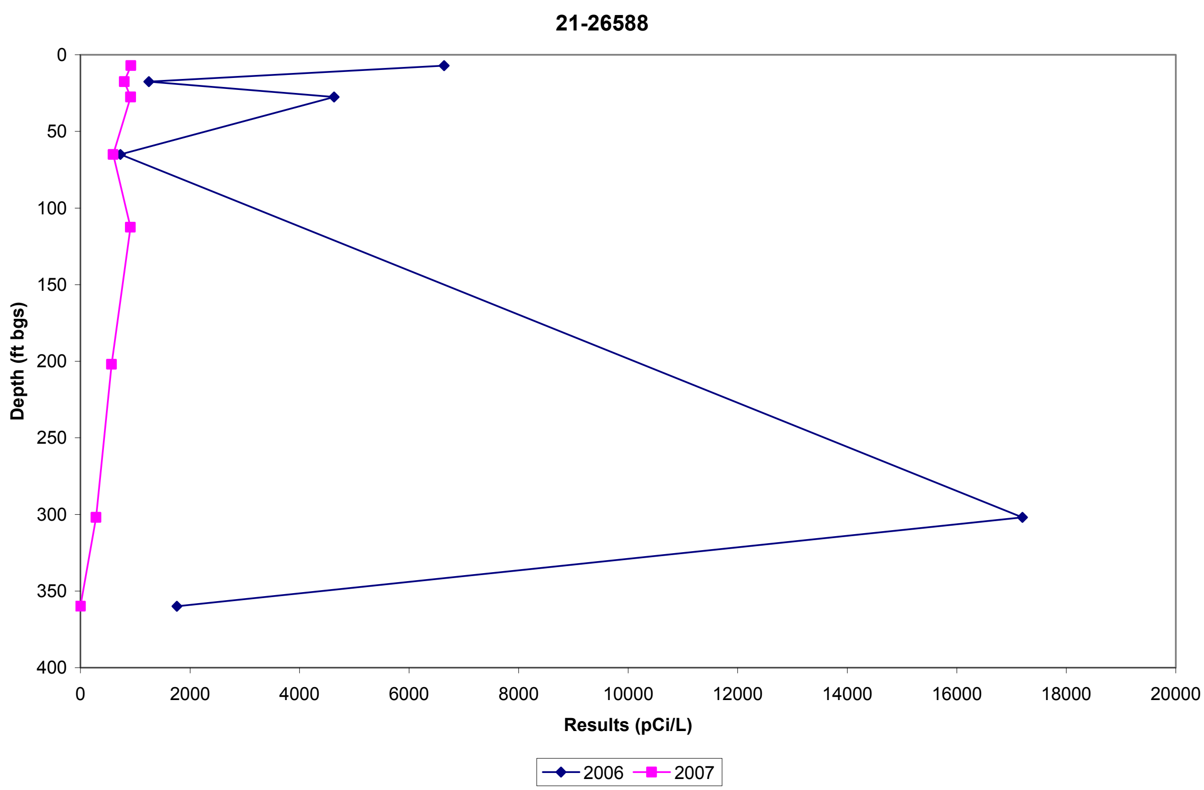


Figure 3.4-10 2006 and 2007 tritium results, borehole location 21-26588 (BH-12)

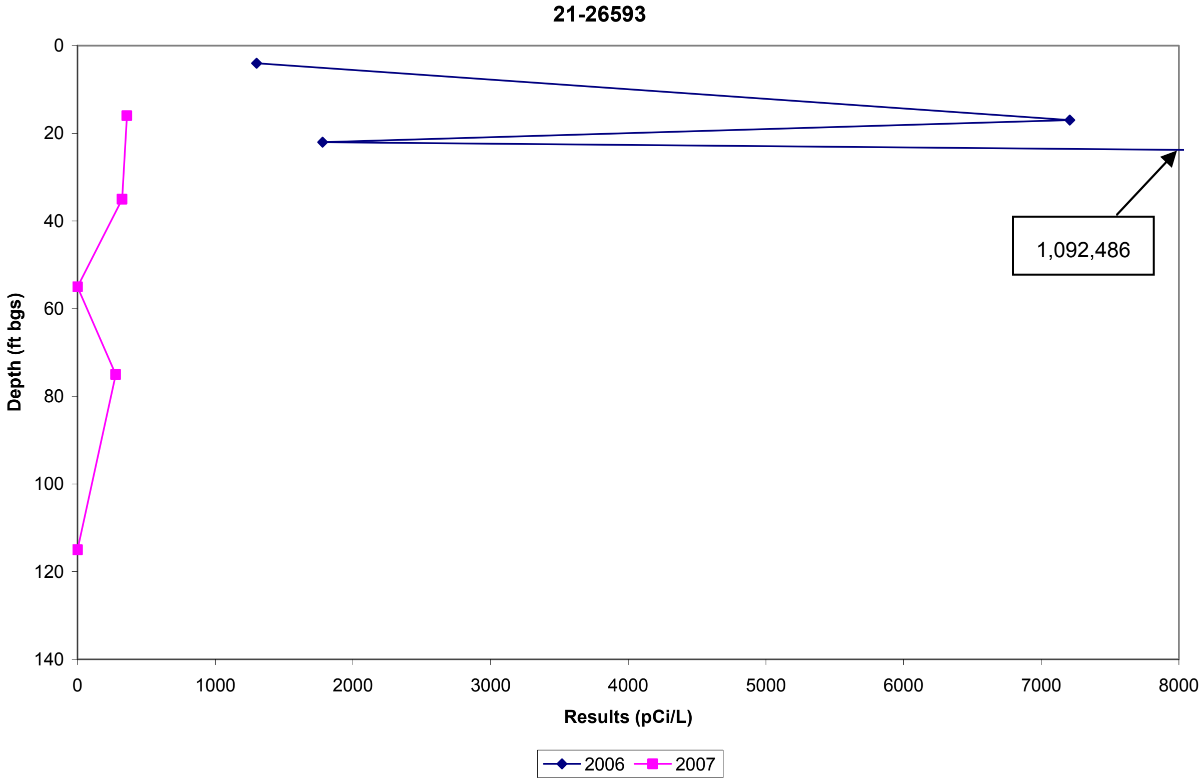


Figure 3.4-11 2006 and 2007 tritium results, borehole location 21-26593 (BH-8)

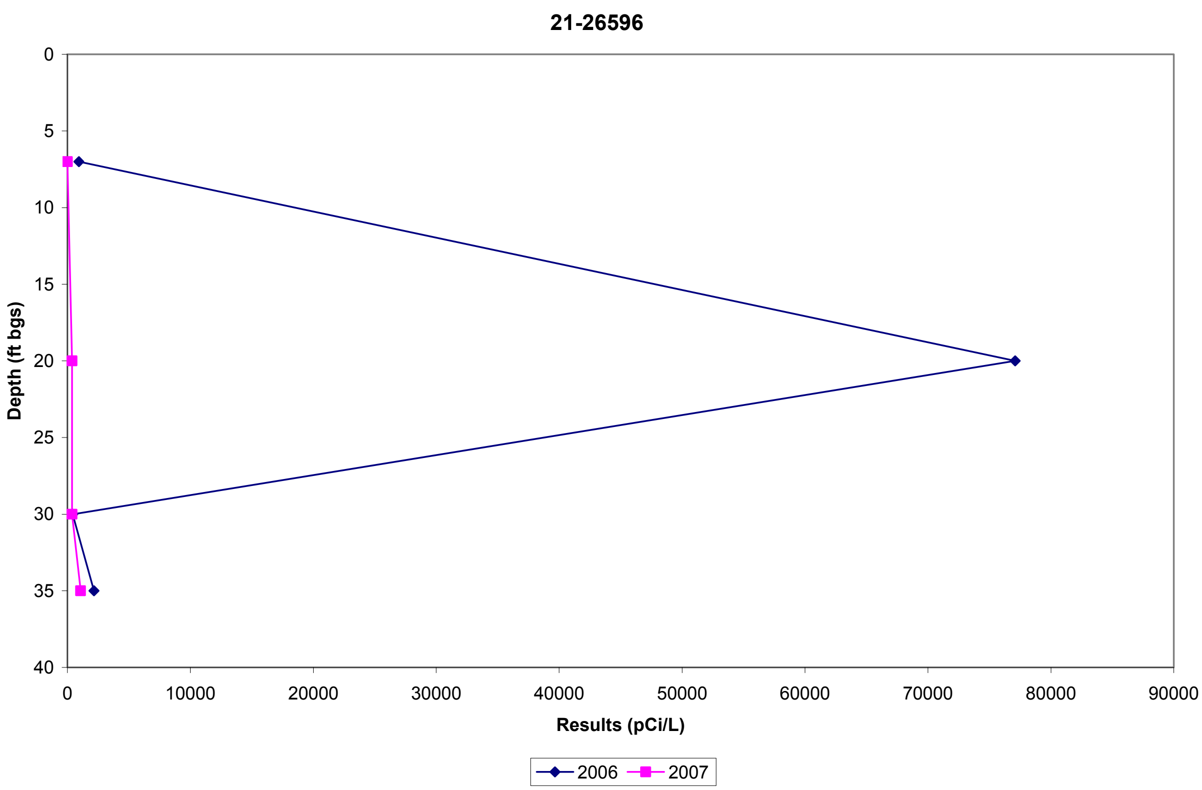


Figure 3.4-12 2006 and 2007 tritium results, borehole location 21-26596 (BH-11)

Table 3.2-1
Summary of Pore-Gas Samples Collected and Analyses Requested at MDA A

Sample ID	Location ID	Depth (ft)	Borehole	Tritium (EPA Method 906)	VOCs (TO15)
MD21-07-6943	21-26481	25.00–27.00	5	X[a]	X
MD21-07-6942	21-26481	40.50–42.00	5	X	X
MD21-07-6941	21-26481	45.00–46.00	5	X	X
MD21-07-7014[b]	21-26481	45.00–46.00	5	X	X
MD21-07-6950	21-26484	13.00–15.00	15	X	X
MD21-07-6949	21-26484	25.00–27.00	15	X	X
MD21-07-6948	21-26484	35.00–37.00	15	X	X
MD21-07-6947	21-26484	43.00–45.00	15	X	X
MD21-07-6946	21-26484	48.00–49.00	15	X	X
MD21-07-6958	21-26485	24.00–26.00	3	X	X
MD21-07-6992[b]	21-26485	24.00–26.00	3	X	X
MD21-07-6957	21-26485	28.00–30.00	3	X	X
MD21-07-6956	21-26485	30.00–32.00	3	X	X
MD21-07-6955	21-26485	32.00–34.00	3	X	X
MD21-07-6954	21-26485	43.00–45.00	3	X	X
MD21-07-6953	21-26485	48.00–49.00	3	X	X
MD21-07-6961	21-26588	5.50–7.00	12	X	X
MD21-07-7013[b]	21-26588	5.50–7.00	12	X	X
MD21-07-6962	21-26588	15.00–17.50	12	X	X
MD21-07-6963	21-26588	25.00–27.50	12	X	X
MD21-07-6964	21-26588	62.50–65.00	12	X	X
MD21-07-6968	21-26588	110.00–112.50	12	X	X
MD21-07-6967	21-26588	200.00–202.50	12	X	X
MD21-07-6966	21-26588	300.00–302.00	12	X	X
MD21-07-6965	21-26588	359.00–360.00	12	X	X
MD21-07-6982	21-26593	14.0–15.0	8	X	X
MD21-07-6981	21-26593	34.00–35.00	8	X	X
MD21-07-6980	21-26593	54.00–55.00	8	X	X
MD21-07-6979	21-26593	74.00–75.00	8	X	X
MD21-07-6978	21-26593	94.00–95.00	8	X	X
MD21-07-6977	21-26593	114.00–115.00	8	X	X
MD21-07-6974	21-26596	5.00–7.00	11	X	X
MD21-07-6973	21-26596	17.00–20.00	11	X	X
MD21-07-6972	21-26596	27.00–30.00	11	X	X
MD21-07-6971	21-26596	34.00–35.00	11	X	X

[a] X = Sample collected and analysis requested.
[b] Samples are field duplicates.

Table 3.4-1
Summary of VOC Concentrations in Subsurface Vapor at MDA A

Sample ID	Location ID	Depth (ft)	Acetone	Benzene	Butanol[1-]	Butanone[2-]	Carbon Disulfide	Chloroform	Cyclohexane	Dichlorodifluoromethane
MD21-07-6943	21-26481	25.0–27.0	17	4.2	—*	57	—	15	—	77
MD21-07-6942	21-26481	40.5–42.0	47	—	—	190	—	—	—	39
MD21-07-6941	21-26481	45.0–46.0	69	9.1	—	41	3	16	—	88
MD21-07-6950	21-26484	13.0–15.0	17	—	—	9	—	—	—	8.5
MD21-07-6949	21-26484	25.0–27.0	28	—	—	18	—	—	—	5.1
MD21-07-6948	21-26484	35.0–37.0	7.7 (J)	—	—	—	—	—	—	—
MD21-07-6947	21-26484	43.0–45.0	10	6.2	—	—	—	—	—	—
MD21-07-6946	21-26484	48.0–49.0	12	—	—	—	—	—	—	—
MD21-07-6958	21-26485	24.0–26.0	100	3.3	38	20	—	6.8	—	68
MD21-07-6957	21-26485	28.0–30.0	17	—	—	3.8	—	6.3	—	58
MD21-07-6956	21-26485	30.0–32.0	32	—	—	5.8	2.7	12	—	99
MD21-07-6955	21-26485	32.0–34.0	38	—	—	8.5	—	15	3.4	140
MD21-07-6954	21-26485	43.0–45.0	22	—	—	5.6	—	17	4.1	130
MD21-07-6953	21-26485	48.0–49.0	26	—	—	22	—	15	—	110
MD21-07-6961	21-26588	5.5–7.0	100	—	—	42	—	—	—	28
MD21-07-6962	21-26588	15.0–17.5	50	—	—	25	—	14	—	80
MD21-07-6963	21-26588	25.0–27.5	43	—	—	17	—	20	—	91
MD21-07-6964	21-26588	62.0–65.0	27	—	—	44	—	15	—	56
MD21-07-6966	21-26588	300.0–302.0	140	—	—	16	—	4.8	—	9.6
MD21-07-6965	21-26588	359.0–360.0	20	—	—	3	—	—	—	4.2 (J)
MD21-07-6982	21-26593	15.0–16.0	15	—	—	26	13	13	—	62
MD21-07-6981	21-26593	34.0–35.0	15	—	—	15	—	22	3.7	88
MD21-07-6980	21-26593	54.0–55.0	16	—	—	24	—	23	—	80
MD21-07-6979	21-26593	74.0–75.0	12	—	—	17	—	20	—	57
MD21-07-6978	21-26593	94.0–95.0	47	—	74	23	—	13	—	32
MD21-07-6977	21-26593	114.0–115.0	92	3.8	—	20	140	12	—	29
MD21-07-6974	21-26596	5.0–7.0	10	—	—	6.3	—	—	—	—
MD21-07-6973	21-26596	17.0–20.0	96	8.3	—	12	—	—	—	—
MD21-07-6972	21-26596	27.0–30.0	130	7.2	—	27	3.4	—	—	—
MD21-07-6971	21-26596	34.0–35.0	180	16	—	34	3.1	—	—	—

Table 3.4-1 (continued)

Sample ID	Location ID	Depth (ft)	Ethylbenzene	Ethyltoluene[4-]	Hexane	Methanol	n-Heptane	Propylene	Tetrachloroethene	Tetrahydrofuran
MD21-07-6943	21-26481	25.0–27.0	6.9	18	—	—	22	—	23 (J+)	—
MD21-07-6942	21-26481	40.5–42.0	17	—	—	—	190	—	—	—
MD21-07-6941	21-26481	45.0–46.0	8.6	7.3	5.3	—	7.3	—	26 (J+)	7.6
MD21-07-6950	21-26484	13.0–15.0	—	—	—	—	—	—	—	3.1
MD21-07-6949	21-26484	25.0–27.0	—	—	—	—	—	—	—	9.9
MD21-07-6948	21-26484	35.0–37.0	—	—	—	—	—	—	—	—
MD21-07-6947	21-26484	43.0–45.0	—	—	—	—	—	—	—	—
MD21-07-6946	21-26484	48.0–49.0	—	—	—	—	—	—	—	—
MD21-07-6958	21-26485	24.0–26.0	—	—	—	—	5.9	—	20	—
MD21-07-6957	21-26485	28.0–30.0	—	—	—	—	—	—	20	—
MD21-07-6956	21-26485	30.0–32.0	—	—	—	—	—	—	31	—
MD21-07-6955	21-26485	32.0–34.0	—	—	—	—	—	—	33	—
MD21-07-6954	21-26485	43.0–45.0	—	—	—	—	—	—	32	—
MD21-07-6953	21-26485	48.0–49.0	—	—	—	—	5.7	—	27	—
MD21-07-6961	21-26588	5.5–7.0	—	—	3.7	—	—	—	20 (J+)	5
MD21-07-6962	21-26588	15.0–17.5	—	—	3.9	—	—	—	53 (J+)	2.6
MD21-07-6963	21-26588	25.0–27.5	—	—	3.9	—	—	—	48 (J+)	—
MD21-07-6964	21-26588	62.0–65.0	—	—	—	—	5.8	—	20 (J+)	—
MD21-07-6966	21-26588	300.0–302.0	—	—	—	—	—	23	—	—
MD21-07-6965	21-26588	359.0–360.0	—	—	—	—	—	—	—	—
MD21-07-6982	21-26593	15.0–16.0	—	—	—	—	—	—	22	—
MD21-07-6981	21-26593	34.0–35.0	—	—	—	240	—	—	27	—
MD21-07-6980	21-26593	54.0–55.0	—	—	—	—	—	—	22	—
MD21-07-6979	21-26593	74.0–75.0	—	—	—	—	—	—	15	—
MD21-07-6978	21-26593	94.0–95.0	—	—	—	—	4.1	—	12	—
MD21-07-6977	21-26593	114.0–115.0	—	—	—	—	—	—	14 (J+)	—
MD21-07-6974	21-26596	5.0–7.0	—	—	—	—	—	—	—	—
MD21-07-6973	21-26596	17.0–20.0	4.2	4.5	4.4	—	—	—	—	—
MD21-07-6972	21-26596	27.0–30.0	4.4	4.9	4.3	—	4.2	—	—	—
MD21-07-6971	21-26596	34.0–35.0	4.7	5.2	8.9	—	9	—	—	—

Table 3.4-1 (continued)

Sample ID	Location ID	Depth (ft)	Toluene	Trichloroethane[1,1,1-]	Trichloroethene	Trichlorofluoromethane	Trimethylbenzene[1,2,4-]	Trimethylbenzene[1,3,5-]	Xylene[1,2-]	Xylene[1,3-]+Xylene[1,4-]
MD21-07-6943	21-26481	25.0–27.0	990	160	61	—	28	9.5	12	23
MD21-07-6942	21-26481	40.5–42.0	3500	69	31	—	—	—	25	48
MD21-07-6941	21-26481	45.0–46.0	190	180	65	—	9.8	—	9.8	23
MD21-07-6950	21-26484	13.0–15.0	32	17	—	—	—	—	—	—
MD21-07-6949	21-26484	25.0–27.0	85	8.6	—	—	—	—	—	4.1
MD21-07-6948	21-26484	35.0–37.0	—	—	—	—	—	—	—	—
MD21-07-6947	21-26484	43.0–45.0	11	—	—	—	—	—	—	5.4
MD21-07-6946	21-26484	48.0–49.0	—	—	—	—	—	—	—	—
MD21-07-6958	21-26485	24.0–26.0	49	120	—	—	—	—	—	—
MD21-07-6957	21-26485	28.0–30.0	65	100	—	—	—	—	—	—
MD21-07-6956	21-26485	30.0–32.0	69	170	4.5 (J)	—	—	—	—	—
MD21-07-6955	21-26485	32.0–34.0	64	210	5.2	—	—	—	—	—
MD21-07-6954	21-26485	43.0–45.0	160	200	11	—	—	—	—	—
MD21-07-6953	21-26485	48.0–49.0	240	180	5.8	—	—	—	—	7
MD21-07-6961	21-26588	5.5–7.0	10	70	—	—	—	—	—	7.4
MD21-07-6962	21-26588	15.0–17.5	11	220	8.3	—	—	—	—	7.3
MD21-07-6963	21-26588	25.0–27.5	12	240	9.8	—	—	—	—	7.5
MD21-07-6964	21-26588	62.0–65.0	230	120	10	—	5.8	—	5.3	11
MD21-07-6966	21-26588	300.0–302.0	—	27	9.6	—	—	—	—	—
MD21-07-6965	21-26588	359.0–360.0	4.6	5.6	—	—	—	—	—	—
MD21-07-6982	21-26593	15.0–16.0	230	140	39	—	—	—	—	—
MD21-07-6981	21-26593	34.0–35.0	160	190	29	4.9 (J)	—	—	—	3.8
MD21-07-6980	21-26593	54.0–55.0	220	160	24	—	—	—	—	4.8
MD21-07-6979	21-26593	74.0–75.0	150	120	21	—	—	—	—	4.3
MD21-07-6978	21-26593	94.0–95.0	180	74	16	—	—	—	—	5.1
MD21-07-6977	21-26593	114.0–115.0	6.3	71	16	—	—	—	—	—
MD21-07-6974	21-26596	5.0–7.0	230	18	—	—	—	—	—	—
MD21-07-6973	21-26596	17.0–20.0	19	17	4.9	—	6.5	—	5.1	11
MD21-07-6972	21-26596	27.0–30.0	18	19	6.4	—	7.4	—	5.3	12
MD21-07-6971	21-26596	34.0–35.0	25	10	—	—	7.5	—	5.9	12

Note: VOC concentrations are in $\mu g/m^3$.

* — = The analyte was not detected.

Table 3.4-2
VOC Pore-Gas Screening Results

Chemical	Maximum Detected Concentration ($\mu g/m^3$)	H' (dimensionless)	Groundwater Screening Level ($\mu g/L$)	Screening Value
Acetone	180	0.0016	5500[a]	2.05E-02
Benzene	16	0.228	5[b]	1.40E-02
Butanol[1-]	74	0.000347	37,000[a]	5.76E-02
Butanone[2-]	190	0.0011	7,100[a]	2.43E-02
Carbon disulfide	140	1.2	1000[a]	1.17E-04
Chloroform	23	0.15	100[c]	1.53E-03
Cyclohexane	4.1	0.193	13,000[a]	1.63E-06
Dichlorodifluoromethane	140	4.1	390[a]	8.76E-05
Ethylbenzene	17	0.323	700[b]	7.52E-05
Ethyltoluene[4-]	18	0.00493	na[d]	na
Hexane	8.9	5	420[a]	4.24E-06
Methanol	240	0.000109	18,000[a]	1.22E-01
Heptane[n-]	190	2.06	na[d]	na
Propylene	23	0.0000854	na[d]	na
Tetrachloroethene	53	0.754	5[b]	1.41E-02
Tetrahydrofuran	9.9	0.00289	8.8[a]	3.89E-01
Toluene	3500	0.272	750[c]	1.72E-02
Trichloroethane[1,1,1-]	240	0.705	60[c]	5.67E-03
Tricloroethene	61	0.422	5[b]	2.89E-02
Trichlorofluoromethane	4.9	4	1300[a]	9.42E-07
Trimethylbenzene[1,2,4-]	28	0.23	13[a]	9.36-03
Trimethylbenzene[1,3,5-]	9.5	0.32	12[a]	2.47E-04
Xylene[1,2-]	25	0.213	620[c]	1.89E-04
Xylene[1,3-]+Xylene[1,4-]	48	0.3	620[c]	2.58E-04

[a] EPA Region 6 tap water screening level (EPA 2007, 095866).

[b] EPA MCL.

[c] NMWQCC groundwater standard.

[d] na = Not available.

Table 3.4-3
Summary of Tritium Activities in Subsurface Vapor at MDA A

Sample ID	Location ID	Depth Range (ft)	Tritium Activity
MD21-07-6943	21-26481	25.00–27.00	—*
MD21-07-6942	21-26481	40.50–42.00	—
MD21-07-6941	21-26481	45.00–46.00	329.656
MD21-07-6950	21-26484	13.00–15.00	—
MD21-07-6949	21-26484	25.00–27.00	—
MD21-07-6948	21-26484	35.00–37.00	—
MD21-07-6947	21-26484	43.00–45.00	—
MD21-07-6946	21-26484	48.00–49.00	—
MD21-07-6957	21-26485	28.00–30.00	—
MD21-07-6956	21-26485	30.00–32.00	—
MD21-07-6955	21-26485	32.00–34.00	252.997
MD21-07-6954	21-26485	43.00–45.00	391.019
MD21-07-6953	21-26485	48.00–49.00	490.804(J-)
MD21-07-6961	21-26588	5.50–7.00	921.662
MD21-07-6962	21-26588	15.00–17.50	800.545
MD21-07-6963	21-26588	25.00–27.50	917.729
MD21-07-6964	21-26588	62.50–65.00	594.588
MD21-07-6968	21-26588	110.00–112.50	911.306(J-)
MD21-07-6967	21-26588	200.00–202.50	569.78(J-)
MD21-07-6966	21-26588	300.00–302.00	283.644
MD21-07-6965	21-26588	359.00–360.00	—
MD21-07-6982	21-26593	15.00–16.00	359.048
MD21-07-6981	21-26593	34.00–35.00	323.456
MD21-07-6980	21-26593	54.00–55.00	—
MD21-07-6979	21-26593	34.00–35.00	277.793
MD21-07-6978	21-26593	94.00–95.00	—
MD21-07-6977	21-26593	114.00–115.00	—
MD21-07-6974	21-26596	5.00–7.00	—
MD21-07-6973	21-26596	15.00–20.00	375.046
MD21-07-6972	21-26596	27.00–30.00	382.272
MD21-07-6971	21-26596	34.00–35.00	1073.84

Note: Tritium activities are in pCi/L.
* — = The analyte was not detected.

Appendix A

Acronyms and Abbreviations, Glossary,
Metric Conversions, and Data Qualifier Definitions

A-1.0 ACRONYMS AND ABBREVIATIONS

bgs	below ground surface
BV	background value
CD	compact disc
Consent Order	Compliance Order on Consent
D&D	decontamination and decommissioning
DOE	Department of Energy (U.S.)
DP	Delta Prime
EPA	Environmental Protection Agency (U.S.)
FV	fallout value
ID	identification
IDW	investigation-derived waste
LANL	Los Alamos National Laboratory
MCL	maximum contaminant level
MDA	material disposal area
NES	nuclear environmental site
NMED	New Mexico Environment Department
NMWQCC	New Mexico Water Quality Control Commission
PPE	personal protective equipment
QA	quality assurance
QC	quality control
RCRA	Resource Conservation and Recovery Act
RFI	RCRA facility investigation
RPF	Records Processing Facility
SOP	standard operating procedure
SWMU	solid waste management unit
TA	technical area
VOC	volatile organic compound
WCSF	waste characterization strategy form
WPF	waste profile form

A-2.0 GLOSSARY

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

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

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

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

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

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

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

chemical—Any naturally occurring or human-made substance characterized by a definite molecular composition.

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

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

Consent Order—See Compliance Order on Consent.

contaminant—(1) Chemicals and radionuclides present in environmental media or on debris above background levels. (2) According to the March 1, 2005, Compliance Order on Consent (Consent Order), any hazardous waste listed or identified as characteristic in 40 Code of Federal Regulations (CFR) 261 (incorporated by 20.4.1.200 New Mexico Administrative Code [NMAC]); any hazardous constituent listed in 40 CFR 261 Appendix VIII (incorporated by 20.4.1.200 NMAC) or 40 CFR 264 Appendix IX (incorporated by 20.4.1.500 NMAC); any groundwater contaminant listed in the Water Quality Control Commission (WQCC) Regulations at 20.6.3.3103 NMAC; any toxic pollutant listed in the WQCC Regulations at 20.6.2.7 NMAC; explosive compounds; nitrate; and perchlorate. (Note: Under the Consent Order, the term "contaminant" does not include radionuclides or the radioactive portion of mixed waste.)

decommissioning—The permanent removal of facilities and their components from service after the discontinued use of structures or buildings that are deemed no longer useful. Decommissioning must take place in accordance with regulatory requirements and applicable environmental policies.

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

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

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

disposal—The discharge, deposit, injection, dumping, spilling, leaking, or placing of any solid waste or hazardous waste into, or on, any land or water so that such solid waste or hazardous waste or any constituent thereof may enter the environment or be emitted into the air or discharged into any waters, including groundwaters.

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

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

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

field sample—See sample.

geophysical survey—The systematic collection of geophysical data for spatial studies, especially by seismic, electromagnetic, and radioactivity methods.

grab sample—A specimen collected by a single application of a field sampling procedure to a target population (e.g., the surface soil from a single hole collected after the spade-and-scoop sampling procedure, or a single air filter left in the field for three months).

gravimetric moisture content—See water content.

groundwater—Water in a subsurface saturated zone; water beneath the regional water table.

hazardous constituent (hazardous waste constituent)—According to the March 1, 2005, Compliance Order of Consent (Consent Order), any constituent identified in Appendix VIII of Part 261, Title 40 Code of Federal Regulations (CFR) (incorporated by 20.4.1.200 New Mexico Administrative Code [NMAC]) or any constituent identified in 40 CFR 264, Appendix IX (incorporated by 20.4.1.500 NMAC).

hazardous waste—(1) Solid waste that is listed as a hazardous waste, or exhibits any of the characteristics of hazardous waste (i.e., ignitability, corrosivity, reactivity, or toxicity, as provided in 40 CFR, Subpart C). (2) According to the March 1, 2005, Compliance Order of Consent (Consent Order), any solid waste or combination of solid wastes that, because of its quantity, concentration, or physical, chemical, or infectious characteristics, meets the description set forth in New Mexico

Statutes Annotated 1978, § 74-4-3(K) and is listed as a hazardous waste or exhibits a hazardous waste characteristic under 40 CFR 261 (incorporated by 20.4.1.200 New Mexico Administrative Code).

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

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

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

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

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

material disposal area (MDA)—A subset of the solid waste management units at Los Alamos National Laboratory (the Laboratory) that include disposal units such as trenches, pits, and shafts. Historically, various disposal areas (but not all) were designated by the Laboratory as MDAs.

maximum contaminant level (MCL)—Under the Safe Drinking Water Act, the maximum permissible level of a contaminant in water that is delivered to any user of a public water system serving 15 or more connections and 25 or more people. MCLs are enforceable standards and take into account the feasibility and cost of attaining the standards.

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

medium (geological)—The solid part of the hydrogeological system; may be unsaturated or saturated.

method—A body of procedures and techniques for systematically performing an activity.

nature and extent (of contamination)—The "nature" of contamination is the chemicals (naturally occurring or human-made) present in or that have been released to the environment and are determined by detection of a chemical in one or more environmental samples. In the case of naturally occurring or widespread human-made chemicals, detection is determined by comparison to background levels. The "extent" of contamination means how much of a given chemical is present in the environment and is determined by comparison to site baseline values, if applicable, and/or analysis of trends in the data.

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

notices of approval, of approval with modification, or of disapproval—Notices issued by the New Mexico Environment Department (NMED). Upon receipt of a work plan, schedule, report, or other deliverable document, NMED reviews the document and approves the document as submitted, modifies the document and approves it as modified, or disapproves the document. A notice of approval means that the document is approved as submitted. A notice of approval with modifications means that the document is approved but with modifications specified by NMED. A notice of disapproval means that the document is disapproved and it states the deficiencies and other reasons for disapproval.

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

organic chemical—Compound of elements that contains carbon such as carbon dioxide.

quality assurance (QA)—All those planned and systematic actions necessary to provide adequate confidence that a facility, structure, system, or component will perform satisfactorily in service.

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

quality control (QC). (1) All those actions necessary to control and verify the features and characteristics of a material, process, product, or service to specified requirements. QC is the process through which actual quality performance is measured and compared with standards. (2) All methods and procedures used to obtain accurate and reliable results from environmental sampling and analysis. Includes rules for when, where, and how samples are taken; sample storage, preservation and transport; and the use of blanks, duplicates, and split samples during the analysis.

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

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

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

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

radionuclide—Radioactive particle (human-made or natural) with a distinct atomic weight number.

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

reference set—A hard-copy compilation of reference items cited in Environmental Remediation and Surveillance Program documents.

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

release—Any spilling, leaking, pumping, pouring, emitting, emptying, discharging, injecting, escaping, leaching, dumping, or disposing of hazardous waste or hazardous constituents into the environment (including the abandonment or discarding of barrels, containers, and other closed receptacles that contain any hazardous wastes or hazardous constituents).

request number—An identifying number assigned by the Environmental Remediation and Surveillance Program to a group of samples submitted for analysis.

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

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

site characterization—Defining the pathways and methods of migration of hazardous waste or constituents, including the media affected; the extent, direction and speed of the contaminants; complicating factors influencing movement; or concentration profiles.

soil—(1) A material that overlies bedrock and has been subject to soil-forming processes. (2) A sample media group that includes naturally occurring and artificial fill materials.

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

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

solid waste management unit (SWMU)—(1) Any discernible site at which solid wastes have been placed at any time, whether or not the site use was intended to be the management of solid or hazardous waste. SWMUs include any site at a facility at which solid wastes have been routinely and systematically released. This definition includes regulated sites (i.e., landfills, surface impoundments, waste piles, and land treatment sites), but does not include passive leakage or one-time spills from production areas and sites in which wastes have not been managed (e.g., product storage areas). (2) According to the March 1, 2005, Compliance Order on Consent (Consent Order), any discernible site at which solid waste has been placed at any time, and from which the New Mexico Environment Department determines there may be a risk of a release of hazardous waste or hazardous waste constituents (hazardous constituents), whether or not the site use was intended to be the management of solid or hazardous waste. Such sites include any area in Los Alamos National Laboratory at which solid wastes have been routinely and systematically released; they do not include one-time spills.

standard operating procedure (SOP)—A document that details the method for an operation, *analysi*s, or action with thoroughly prescribed techniques and steps, and is officially approved as the method for performing certain routine or repetitive tasks.

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

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

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

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

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

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

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

A-3.0 METRIC TO ENGLISH CONVERSIONS

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-4.0 DATA QUALIFIER DEFINITIONS

Data Qualifier	Definition
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.
U	The analyte was analyzed for but not detected.
UJ	The analyte was not positively identified in the sample, and the associated value is an estimate of the sample-specific detection or quantitation limit.
R	The data are rejected as a result of major problems with quality assurance/quality control (QA/QC) parameters.

Appendix B

Pore-Gas Field Measurements

Sample ID	Location ID	Depth (ft)	Borehole	O_2%	CO_2%
MD21-07-6943	21-26481	25.00–27.00	5	1.4	19.6
MD21-07-6942	21-26481	40.50–42.00	5	0.7	22.7
MD21-07-6941	21-26481	45.00–46.00	5	0.8	20.3
MD21-07-7014	21-26481	45.00–46.00	5	0.8	20.3
MD21-07-6950	21-26484	13.00–15.00	15	0.6	20.3
MD21-07-6949	21-26484	25.00–27.00	15	0.4	21.3
MD21-07-6948	21-26484	35.00–37.00	15	0.4	21.6
MD21-07-6947	21-26484	43.00–45.00	15	0.4	22.1
MD21-07-6946	21-26484	48.00–49.00	15	0.0	23.0
MD21-07-6958	21-26485	24.00–26.00	3	1.5	20.6
MD21-07-6992	21-26485	24.00–26.00	3	1.5	20.6
MD21-07-6957	21-26485	28.00–30.00	3	1.3	20.7
MD21-07-6956	21-26485	30.00–32.00	3	1.6	20.1
MD21-07-6955	21-26485	32.00–34.00	3	1.9	20.6
MD21-07-6954	21-26485	43.00–45.00	3	1.9	20.0
MD21-07-6953	21-26485	48.00–49.00	3	2.0	20.4
MD21-07-6961	21-26588	5.50–7.00	12	0.6	20.7
MD21-07-7013	21-26588	5.50–7.00	12	0.6	20.7
MD21-07-6962	21-26588	15.00–17.50	12	—*	—
MD21-07-6963	21-26588	25.00–27.50	12	0.7	19.4
MD21-07-6964	21-26588	62.50–65.00	12	1.0	20.8
MD21-07-6968	21-26588	110.00–112.50	12	0.1	21.2
MD21-07-6967	21-26588	200.00–202.50	12	0.1	21.6
MD21-07-6966	21-26588	300.00–302.00	12	0.4	20.7
MD21-07-6965	21-26588	359.00–360.00	12	0.3	20.8
MD21-07-6982	21-26593	15.0–16.0	8	1.1	20.4
MD21-07-6981	21-26593	34.00–35.00	8	1.6	21.1
MD21-07-6980	21-26593	54.00–55.00	8	1.1	21.1
MD21-07-6979	21-26593	74.00–75.00	8	0.8	20.9
MD21-07-6978	21-26593	94.00–95.00	8	0.7	20.1
MD21-07-6977	21-26593	114.00–115.00	8	0.4	21.2
MD21-07-6974	21-26596	5.00–7.00	11	0.3	20.7
MD21-07-6973	21-26596	17.00–20.00	11	0.9	21.5
MD21-07-6972	21-26596	27.00–30.00	11	0.5	20.2
MD21-07-6971	21-26596	34.00–35.00	11	0.8	20.9

*— = Data not recorded.

Appendix C

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

Appendix D

Waste Management

D-1.0 INTRODUCTION

This appendix contains the waste management and disposal records for waste streams generated during the 2007 final status report for Material Disposal Area (MDA) A, Solid Waste Management Unit 21-014, at Technical Area 21. The waste characterization strategy form (WCSF) and amendment 1 were prepared to address characterization approach, on-site waste management, and final disposition options. The waste profile forms (WPFs) and chemical waste disposal request forms are still in process as of the date of this submittal and are not included in this appendix.

D-2.0 SUMMARY

The waste streams generated at MDA A during the 2007 investigation activities are outlined below.

Barcode Identification Number	Waste Storage Container	Waste Type	Approximate Volumes (yd^3)	Waste Disposal Status
10069969	1-yd^3 king bag	Drill cuttings	1	Pending
10069970	1-yd^3 king bag	Drill cuttings	1	Pending
10069971	15-gal. plastic drum	Contact waste (plastic sheeting, personal protective equipment, and sample equipment waste)	0.5	Pending

The drill cuttings are stored in 1-yd^3 king bags and staged on-site along with a 15-gal. drum of contact waste. This waste is being handled as nonhazardous low-level radioactive waste and is staged pending disposal.

The designated waste management coordinator prepared investigation-derived waste (IDW) documents, including the WCSF, WPFs, and all waste disposal requests.

D-3.0 WCSF

The WCSF and the November 6, 2007, amendment 1 were prepared before IDW generation. Both are included as Attachment D-1.

Attachment D-1

Waste Characterization Strategy Form and Amendment 1

ATTACHMENT 2: AMENDMENT TO THE WCSF

5022-3

Amendment to the WCSF

Records Use only

Los Alamos NATIONAL LABORATORY EST. 1943

Introduction:

Amendment 1 to WCSF ER-2006-0249 "Site Investigation at TA-21, MDA A", new catalog # EP2007-0598. See Attached.

Background:

See Attached.

Waste Description:

See Attached.

AK from IR Tables 6.3-2, 6.3-3, 6.3-4 and 6.3-5

Characterization, Management, and Disposal:

See Attached changes, management in a non-haz, rad area, based upon AK.

EP-ERSS Project Leader/Waste Generator:	EP-ERSS Waste Management Coordinator:
[signature] 11/6/07	Mike Le Scouarnec [signature] 10.31.07
Printed Name/Signature — Date	Printed Name/Signature — Date
ENV-RCRA Representative: John Tymkowych	WS-WA Representative: Andy W. Elicio
[signature] 10-16-07	[signature] 11/1/07
Printed Name/Signature — Date	Printed Name/Signature — Date

FORM 5022-3 Continued.

RE: WCSF TA-21, MDA A: Site Investigation at A-21, MDA A [ER2006-0249], Amendment 1 [EP2007-0598]

INTRODUCTION: This amendment is to work is associated with SWMU 21-014, and the WCSF is amended to provide and reference analytical data results from the 2006 Site Investigation. Waste evaluation data the 2006 characterization event are attached for reference. Based upon AK, the soil cuttings derived from deepening of existing borehole 21-26593 (BH-8) from 35-ft bgs to 115-ft bgs (waste stream #1) and associated potential waste streams #2 (decontamination fluids) and #3 (contact waste), will be managed as non-hazardous low-level waste in a radioactive waste area. Wastes will be stored within the MDA A fenced area.
BACKGROUND: Original WCSF [ER2006-0249] listed seven waste streams, of these waste streams numbers 1, 2, 3, 6, and 7 may be generated during this field effort. Based upon available AK the wastes to be generated do not require establishment of a < 90-day hazardous waste accumulation area.
WASTE DESCRIPTION: Waste will be generated during drilling activities. Hollow-stem auger method drilling will generate dry soil/tuff cuttings. It is estimated that less than 5-cubic yards of cuttings (waste stream #1) will be generated. Contact waste (waste stream #3) to be generated will consist of spent PPE and plastic sheeting and the volume is estimated at than 1 cubic yard. Dry decon methods are anticipated, no decontamination fluids (waste stream #2) are anticipated, however potential volume would be less than 5-gallons. PCS and PCS absorbents (waste streams #6 and 7) may result if a release associated with the normal operation of the drilling equipment should occur, however, none is anticipated.
CHARACTERIZATION, MANAGEMENT AND DISPOSAL: Waste will be characterized as noted in ER2006-0249. Waste will be stored at MDA A in King bags or equivalent in a designated radioactive waste area. If the waste is designated as low-level non-hazardous, disposal will be arranged through TA-54 Area G or at an approved off-site LLW disposal facility.

Waste Characterization Strategy Form

Project Title	Site Investigation at TA-21 MDA A
Solid Waste Management Unit or Area of Concern #	21-014
Activity Type	Site Characterization – Field surveys, borehole drilling and sampling, surface soil/sediment sampling
Field Team Leader	Shanon Goldberg
Field Waste Management Coordinator	Victor Garde
Completed by	Victor Garde, Paul Sandoval, and Adrian Romero
Date	4-10-06

Description of Activity:

Field Characterization of Underlying Soils

The field investigation of Material Disposal Area A (MDA A) will consist of the activities summarized below. The location of MDA A within TA-21 is shown on Figure 1.

Field survey- The exact location of each waste pit, the General's Tanks, the vertical shafts, and the borehole/soil sampling locations will be determined with a geodetic survey. Utility surveys will be performed as part of the excavation permitting process. Each location will be thoroughly examined to identify potential hazards for subsurface drilling.

Radiological surface survey- Radiological walkover surface surveys will be performed prior to initiation of any field activities. Beta/Gamma surveys will be conducted on 10-ft interval transects.

Installation of 16 boreholes- Three angled and thirteen vertical boreholes will be installed at MDA A. The angled boreholes will be installed adjacent to the General's Tanks to determine the lateral and vertical extent of potential chemical migration. All other waste units will be investigated by using vertical boreholes to determine the lateral and vertical extent of potential chemical migration from MDA A.

Collection of core samples for analysis- Continuous core samples will be collected from each borehole. Core will be visually inspected and field screened for VOCs and alpha and beta/gamma radioactivity. Tuff samples will be collected at specified intervals. Field analytical screening will be performed for PCBs on all samples from all boreholes. Four sample intervals will be collected for laboratory analysis from each borehole based on the following criteria: (1) the highest field screening or field analytical detection; (2) the maximum depth of a field-screening or field analytical detection; (3) the base depth to pits, vertical shafts, tanks or other structure of potential concern; and (4) the total depth (TD) of the borehole. A fifth sample, representing the native soil immediately under the cover fill will be collected from boreholes 2, 6, 7, 8, 9, 10, 11, 12, 14, and 16. Additional subsurface cover-fill samples will be collected from a depth of 1.5-2.0 ft. depending on the cover fill thickness composition. For each borehole less that 100 ft in total depth, two additional samples will be collected from fractures, fracture-fill materials, moist zones, and surge beds or higher permeability intervals. For boreholes exceeding 100 ft. in total depth, four additional samples will be collected from fractures, fracture-fill materials, moist zones, and surge beds or higher permeability intervals. However, if subsurface conditions are extremely variable, additional samples may be collected. All samples will be analyzed by an off-site laboratory in conformance with ENV-ECR quality procedures (QPs) 7.1 and 7.2.

Soil and sediment sampling and analysis- Ten soil and sediment locations will be sampled at two depths (0-0.5 ft. and 1.5-2.0 ft.) from the DP Canyon hill slope north of MDA A. Samples will be collected in drainages and other areas of deposition to determine if there is down slope migration of contaminants from MDA A. In addition, six historical RFI sampling locations will be re-sampled at two depths (0-0.5 ft. and 1.5-2.0 ft.) to verify if the data are still representative of hill slope surface conditions. All samples will be analyzed by an off-site laboratory in conformance with ENV-ECR quality procedures (QPs) 7.1 and 7.2.

MDA A cover/fill sampling and analysis- Nine cover/fill samples will be collected from the surface of the existing MDA A cover (0-0.5 ft.) in conjunction with the boreholes (2, 6, 7, 8, 10, 11, 12, 14, and 16) located within the perimeter fence. Borehole 9 will not have a surface sample collected due to the existence of an asphalt pad at the location. The sample collection objectives are to (1) characterize the potential presence of COPCs in the cover/fill material, (2) determine the thickness of cover/fill material, and (3) evaluate if the cover/fill material may be utilized in closure.

Geophysical logging and fracture characterization-Geophysical logging and fracture characterization will be conducted on all boreholes.

Pore-gas and groundwater sampling- After drilling is completed, subsurface pore-gas samples will be collected from each depth interval selected for core analyses at an off-site laboratory. Analyses will include VOCs, tritium, and percent moisture. Field measurement will include percent oxygen, organic vapors, percent carbon dioxide, and static surface pressure. If purged groundwater is encountered during implementation of the field investigation, purged groundwater samples will be collected. Analyses will include metals, anions, perchlorate, alkalinity, total organic carbon, total inorganic carbon, and total dissolved solids.

Site History and Description:

MDA A is a Hazard Category 2 nuclear facility (DOE 2003, 87047) comprised of a fenced 1.25-acre radiologically controlled area situated on the east end of Delta Prime (DP) Mesa. MDA A was used to dispose of wastes generated during TA-21 operations. MDA A includes the two storage tanks (referred to as the General's Tanks) that are buried within the MDA. MDA A also includes two vertical shafts; two eastern pits, one central pit, and a former drum surface storage area.

The two 50,000-gallon cylindrical steel tanks contain residual sludge from waste solutions contaminated with plutonium-239/240 and americium-241. The volume of sludge remaining in these tanks is unknown. Liquid waste no longer remains inside the two tanks.

The two 4 ft. diameter vertical shafts located south of the General's Tanks were excavated to a depth of approximately 65 ft. These shafts were originally drilled to clarify rinse water generated by cleaning cement paste from the transfer hose between the pug mill and the General's Tanks. The shafts were never used because the General's Tanks were never filled with cement paste. In 1977, the shafts were filled with soil.

The two eastern pits are located between the central disposal pit and the former drum storage area. These two pits were filled with solid waste generated by TA-21 activities. The pits received laboratory equipment, building construction material, paper, rubber gloves, filters from air-cleaning systems, and contaminated or toxic chemicals. The waste in these pits was potentially contaminated with polonium, plutonium, uranium, thorium, and other unidentified chemicals associated with TA-21 activities. Note: Polonium should no longer be present due to its short half-life (138.4 days).

The central pit located just east of the General's Tanks, contains TA-21 decontamination and decommissioning debris potentially contaminated with plutonium-238, plutonium-239, uranium-235, depleted uranium, decay products, and other radioactive isotopes. Asphalt is also a component of the waste.

The former surface drum storage area is located east of the disposal pits. This storage area contained several hundred 55-gallon drums of a sodium hydroxide solution (NaOH) and stable iodide contaminated with plutonium and possibly uranium. Corrosion of the drums resulted in releases to the surface soil at MDA A (Emelity 1978, 00487). In 1960, the drums were removed and the storage area was paved.

Characterization Strategy:

Waste #1: Drill cuttings from sampling activities.

Characterization Approach: This waste will be characterized using acceptable knowledge (AK) data from site characterization sampling data and by direct sampling of the containerized waste, if needed. The maximum detected concentration of radionuclides will be compared with background/fallout values. If maximum concentrations are above background/fallout values, the waste cuttings will be designated as low-level radioactive waste. Total concentrations of toxicity characteristic leaching procedure (TCLP) constituents will be compared with 20 times the TCLP regulatory level. If total concentrations are less than 20 times the TCLP regulatory level, the waste cuttings will be designated non-hazardous by characteristic. If concentrations exceed 20 times the regulatory level, the waste will be sampled and analyzed using the TCLP to determine if it is hazardous by characteristic. If potential listed waste constituents are detected, a review of historical records and data will be performed to determine whether the source of each constituent was a listed hazardous waste at its point of generation. If the source is determined to be a listed hazardous waste, the cuttings will be managed as hazardous or mixed waste (depending on the levels of radioactivity). LANL RCTs will perform radiological screening on all samples collected.

Storage and Disposal: These cuttings will be collected and containerized at the point of generation. This waste will be containerized in roll-off bins, 55-gallon drums, or both. Two <90 day hazardous waste accumulation areas and one satellite accumulation area will be set up to store waste generated from this event. One of the <90 day accumulation areas will be located inside the NES and the other will be located outside the NES. The satellite accumulation area will also be located outside the NES boundary and primarily utilized for the PCB test kits waste (Waste #5). Drill Cuttings will be managed in one of the <90 day hazardous waste accumulation areas as mixed waste, pending analytical results from site characterization samples. If the analytical data indicates that the waste is non-hazardous, the <90 day accumulation area will be decommissioned and the waste will be stored as non-hazardous solid waste or non-hazardous low-level. If the waste is designated as non-hazardous, it will be used for cover material at TA-54 or be disposed of at an off-site, permitted industrial waste landfill. If the waste is designated as non-hazardous LLW, it will be disposed of at TA-54, Area G or an approved off-site LLW disposal facility. The estimated volume for this waste stream is 25 cubic yards.

The Laboratory is pursuing an Area of Contamination (AOC) designation for MDA A; if approved by NMED, waste pending analytical characterization may be staged within the AOC boundary without the need for establishment of the < 90 day accumulation areas. If the AOC boundary designation is not approved, on-site waste staging will take place in the < 90 day accumulation areas, as described above.

Waste #2: Decontamination fluids.

This waste stream will consist of liquid waste from decontamination activities (e.g., rinse waters and/or decontamination solutions). This waste stream would only be generated if dry decontamination cannot be performed.

Characterization Approach: This waste will be characterized using analytical results from direct sampling of the containerized waste. The analytical testing for this waste will be based on meeting either the TA-50 RLW WAC or the SWWS WAC. This determination will be based on the results of the site characterization sampling. Any additional analysis needed to meet the facility WAC will be performed while waste is on-site.

Storage and Disposal Method: The liquid decontamination waste will be collected in containers at the point of generation. It is anticipated that this waste would be a candidate for disposal at either the TA-50 radioactive liquid waste treatment facility or the TA-46 Sanitary Waste-Water Systems (SWWS) facility. The waste volume is anticipated to be 300 gallons.

Waste #3: Contact Wastes.

Contact Wastes include PPE, plastics, disposable sampling equipment, packaging, paper towels, gloves, tyvek, etc. that comes in contact with potentially contaminated environmental media and/or equipment.

Characterization Approach: This waste stream will be characterized using AK from site characterization sampling data (i.e., analytical results from Wastes # 1 and # 2).

Storage and Disposal Method: Contact wastes will be conservatively managed in one of the <90 day hazardous waste accumulation areas as mixed waste. If the analytical data from the sampling activities indicates that the waste is non-hazardous, the <90 day accumulation area will be decommissioned. The waste will be stored as non-hazardous solid waste or, if radioactive, as non-hazardous low-level. This waste is a potential candidate for the LANL Green-Is-Clean Program. The GIC Program is unable to accept waste that is contaminated with excessive soil due to the presence of naturally occurring radioactivity. Therefore, muddy/excessively soiled waste will be segregated from clean waste. If the waste is characterized as non-hazardous, it will be sent to the

GIC Program for screening. Waste that passes screening requirements for the GIC Program will be disposed of at an off-site, permitted industrial landfill. Waste that fails the GIC screening process and the segregated muddy/excessively soiled waste would be disposed of at TA-54, Area G or an approved off-site LLW disposal facility. The anticipated waste volume for this waste stream is approximately 9 cubic yards, which will be placed into 55-gallon drums, 5-gallon buckets, or both.

As noted for Waste #1, the Laboratory is pursuing an Area of Contamination (AOC) designation for MDA A; if approved by NMED, waste pending analytical characterization may be staged within the AOC boundary without the need for establishment of the < 90 day accumulation areas. If the AOC boundary designation is not approved, on-site waste staging will take place in the < 90 day accumulation areas, as described above.

Waste #4: RCRA Empty Containers formerly containing Methanol.

The PCB test kits have buffer solution bottles containing methanol. The methanol will be transferred out of these containers into test tubes.

Characterization Approach: These containers will meet the definition of a RCRA empty container because (1) all the methanol has been removed using practices commonly employed to removal materials from this type of container and (2) no more than one inch of residue will remain in the bottom of the bottle. This waste stream will be characterized using Material Safety Data Sheet (MSDS) for methanol and acceptable knowledge of the process.

Storage and Disposal Method: This waste stream will be stored as non-hazardous solid waste and disposed of at an off-site, permitted industrial landfill.

Waste #5: PCB Testing Waste.

The PCB testing waste will be the samples (including containers), which were tested for PCBs via the PCB test kits.

Characterization Approach: This waste stream will be characterized using AK from the MSDS for the test kits, AK from site characterization sampling, and direct sampling of the waste if necessary. There is no known release of PCBs at this site. It is anticipated that waste having analytical results that indicate the presence of PCBs would be handled as PCB remediation waste.

Storage and Disposal Method: An SAA will be established for storage of the waste. Pending final characterization, the waste will be managed as "Hazardous Waste Pending Analysis". If the off-site analytical shows greater than 50 ppm PCB concentration, the waste will be managed as PCB waste and a registered PCB storage area would be established. In addition, the waste would be managed as either hazardous or non-hazardous; radioactive or non-radioactive, based on the results of the off-site analysis. The volume of this waste is anticipated to be less than 5 gallons.

Waste #6: Potential Petroleum-Contaminated Soil (PCS).

PCS generated from the release of commercial products such as hydraulic fluid, motor oil, and/or diesel fuel. This waste stream would only be generated in the event of an accidental release, such as a spill and/or rupture of a hydraulic hose.

Characterization Approach: The PCS will be characterized based on the MSDS for the released product, by AK from the direct sampling the cuttings waste and by direct sampling of the waste. LANL RCTs will conduct radiological surveys on all PCS.

Storage and Disposal Method: It is anticipated that 1 cu. yd. of potential waste will be stored in 55-gallon drums, staged in a designated New Mexico Special Waste (NMSW) storage area, and disposed of off-site at an NMSW-permitted facility.

Waste #7: Absorbent Material generated from PCS (potential).

These are the pads, absorbent material, etc which are used for the containment/soak-up of any released commercial product such as hydraulic fluid, motor oil, and/or diesel fuel. This waste stream would only be generated in the event of an accidental release, such as a spill and/or rupture of a hydraulic hose.

Characterization Approach: The PCS absorbent material will be characterized based on AK from characterization of the PCS, AK from the absorbent material, and direct sampling, if necessary. LANL RCTs will conduct radiological surveys on all PCS absorbent material

Storage and Disposal Method: It is anticipated that 1 55-gal drum of potential waste will be generated and staged in a designated New Mexico Special Waste (NMSW) storage area, and disposed of off-site at an NMSW-permitted facility.

References

DOE (US Department of Energy). November 26, 2003. "New Categorization of Existing Nuclear Facilities at LANL," memorandum from Christopher M. Steele, Senior Authorization Basis Manager, DOE-LASO, to Jim Holt, Associate Laboratory Director of Operations, Los Alamos National Laboratory, Los Alamos, New Mexico (DOE 2003, 87047).

Emelity, L.A., April 20, 1978. "Your Memo of 23 March 1978," Los Alamos Scientific Laboratory memorandum H7-78-143 to Margaret Anne Rogers (H-12) from L.A. Emelity (H-7 Alt. Group Leader), Los Alamos, New Mexico (Emelity 1978, 00487).

LANL (Los Alamos National Laboratory), August 31 2005, "Investigation Work Plan for Material Disposal Area A at Technical Area 21, Solid Waste Management Unit 21-014," Los Alamos National Laboratory Document LA-UR-05-0094, Los Alamos, New Mexico (ER2004-0561).

Environmental Restoration Project Quality Procedure, QP-7.1, Procurement.

Environmental Restoration Project Quality Procedure, QP-7.2, Supplier Evaluation.

ER SOP-1.06, Management of Environmental Restoration Project Waste.

ER SOP-1.10, Waste Characterization.

CHARACTERIZATION TABLE

Waste Description	Waste # _1_ Cuttings	Waste # _2_ Decon. Fluids	Waste # _3_ Contact Waste	Waste # _4_ Empty Containers
Volume	25 cu. yd	300 gal.	9 cu. yd.	5 gal.
Packaging	Roll off bins and/or 55-gallon drums	55-gallon drums	55-gallon drums and/or 5-gallon buckets	5-gallon bucket
Regulatory classification:				
Radioactive	X	X	X	
Solid	X	X	X	
Hazardous	X	X	X	
Mixed (hazardous and radioactive)	X	X	X	
Toxic Substances Control Act (TSCA)				
New Mexico Special Waste				
Industrial	X		X	X
Characterization Method				
Acceptable knowledge (AK): Existing Data/Documentation			X	X (d)
AK: Site Characterization	X		X (c)	
Direct Sampling of Containerized Waste	X	X (b)		
Analytical Testing				
Volatile Organic Compounds (SW-846 EPA 8260-B)	X (a)			
Semivolatile Organic Compounds (SW-846 EPA 8270-C)	X (a)			
Organic Pesticides (EPA 8081-A)				
Organic Herbicides (EPA 8151-A)				
PCBs (SW-846 EPA 8082)	X (a)	X		
Total Metals (EPA 6010-B/7471-A)	X (a)			
Cyanide (SW -846 9012A)	X (a)	X		
High Explosives Constituents (EPA 8330/8321-A)	X (a)			
Asbestos				
Total petroleum hydrocarbon (TPH)-GRO (EPA 8015-M)				
TPH-DRO (EPA 8015-M)				
Toxicity characteristic leaching procedure (TCLP) Metals (EPA 1311/6010-B)	X (j)	X		
TCLP Organics (EPA 1311/8260-B & 1311/8270-C)		X		
TCLP Pest. & Herb. (EPA 1311/8081-A/1311/8151-A)				
Gross Alpha (alpha counting) (EPA 900)		X		
Gross Beta (beta counting) (EPA 900)		X		
Tritium (liquid scintillation) (EPA 906.0)	X (a)	X		
Gamma spectroscopy (EPA 901.1)	X (a)	X		
Isotopic plutonium (chem. separation/alpha spec.) (HASL-300)	X (a)	X		
Isotopic uranium (chem. separation/alpha spec.) (HASL-300)	X (a)	X		
Total uranium SW-846 (6020 inductively coupled plasma mass spectroscopy [ICPMS])	X (a)	X		

Strontium-90 (EPA 905)	X (a)	X		
Americium-241 (chem. separation/alpha spec.) (HASL-300)	X (a)	X		
Nitrates (EPA Method 300.0)	X (a)	X		
Perchlorate (EPA Method314 or SW-846 8321 A)	X (a)	X		
Dioxins/Furans (SW-846 8290)	X (a)	X		
Total Iodide (By ICPMS)	X (a)	X		
PH Level (SW-846 9045C)	X (a)	X		
Waste Profile Form #	TBD	TBD	TBD	TBD

(a) Analytical testing will be performed on site characterization sampling; direct waste sampling will only be performed if necessary.

(b) Analytical testing will be performed to meet either the TA-50 LLW WAC or the TA-46 SWWS WAC depending on results from site characterization data.

(c) Characterization based on analytical results from Waste Stream #1 and #2.

(d) Characterization based on MSDS of methanol and Knowledge of the process.

(j) Analysis contingent on results of total metals analysis; the TCLP samples will be collected directly from the containerized waste.

CHARACTERIZATION TABLE (CONT.)

Waste Description	Waste # _5_ Testing Waste	Waste # _6_ FCS (potential)	Waste # _7_ PCS Absorbents (potential)	Waste #___
Volume	5 gal.	1 cu. yd	55 gal.	
Packaging	5-gallon bucket	55-gallon drums	55- gallon drum	
Regulatory classification:				
Radioactive	X	X	X	
Solid	X	X	X	
Hazardous	X	X	X	
Mixed (hazardous and radioactive)	X	X	X	
Toxic Substances Control Act (TSCA)	X			
New Mexico Special Waste		X	X	
Industrial	X	X	X	
Characterization Method				
Acceptable knowledge (AK): Existing Data/Documentation	X (e)	X (g)	X (h)	
AK: Site Characterization	X	X	X (i)	
Direct Sampling of Containerized Waste	X (f)	X	X (i)	
Analytical Testing				
Volatile Organic Compounds (SW-846 EPA 8260-B)	X (f)			
Semivolatile Organic Compounds (SW-846 EPA 8270-C)	X (f)			
Organic Pesticides (EPA 8081-A)				
Organic Herbicides (EPA 8151-A)				
PCBs (SW-846 EPA 8082)	X (f)			
Total Metals (EPA 6010-B/7471-A)	X (f)			
Cyanide (SW –846 9012A)	X (f)			
High Explosives Constituents (EPA 8330/8321-A)	X (f)			
Asbestos				
Total petroleum hydrocarbon (TPH)-GRO (EPA 8015-M)		X	X (i)	
TPH-DRO (EPA 8015-M)		X	X (i)	
Toxicity characteristic leaching procedure (TCLP) Metals (EPA 1311/6010-B)				
TCLP Organics (EPA 1311/8260-B & 1311/8270-C)				
TCLP Pest. & Herb. (EPA 1311/8081-A/1311/8151-A)				
Gross Alpha (alpha counting) (EPA 900)				
Gross Beta (beta counting) (EPA 900)				
Tritium (liquid scintillation) (EPA 906.0)	X (f)			
Gamma spectroscopy (EPA 901.1)	X (f)			
Isotopic plutonium (chem. separation/alpha spec.) (HASL-300)	X (f)			
Isotopic uranium (chem. separation/alpha spec.) (HASL-300)	X (f)			
Total uranium SW-846 (6020 inductively coupled plasma mass spectroscopy [ICPMS])	X (f)			

Strontium-90 (EPA 905)	X (f)			
Americium-241 (chem. separation/alpha spec.) (HASL-300)	X (f)			
Nitrates (EPA Method 300.0)	X (f)			
Per chlorate (EPA Method314 or SW-846 8321 A)	X (f)			
Dioxins/Furans (SW-846 8290)	X (f)			
Total Iodide (By ICPMS)	X (f)			
PH Level (SW-846 9045C)	X (f)			
TAL Metals (SW-846 6010B or SW-846 6020)				
Waste Profile Form #	TBD	TBD	TBD	

(e) Characterization based on MSDS from PCB Test Kits
(f) Analytical testing will be performed on site characterization sampling; direct waste sampling will only be performed if necessary.
(g) Characterization based on MSDS of released product
(h) Composition of Absorbent Material
(i) Characterization of Waste Stream #6; direct waste sampling will only be performed if necessary.

Waste Characterization Strategy Form (continued)

SIGNATURES	DATE
Project Leader (Print name and then sign below.) Ron Rager	4/10/06
ERS-ECR Waste Management Coordinator (Print name and then sign below.) Karen Styers	4/11/06
SWRC Representative (Print name and then sign below.) Kelly VanDerpoel	4/10/06
NWIS-SWO Representative (Print name and then sign below.) Michelle L. Coriz	4/11/06

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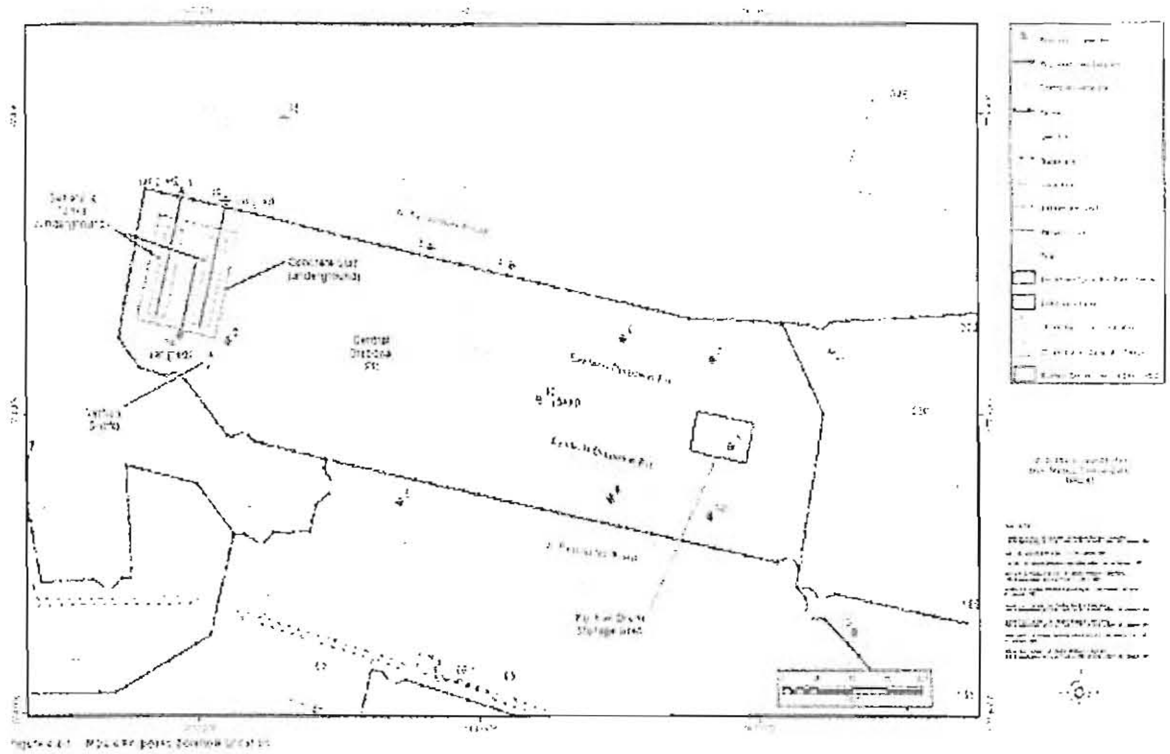

Figure 1. MDA A (with proposed Borehole locations).