3-1-2005

Justification for Class III Permit Modification March 2005 SWMU 135 Operable Unit 1303 Building 906 Drain System at Technical Area II

Sandia National Laboratories/NM

Sandia National Laboratories

Justification for Class III Permit Modification

March 2005

SWMU 135
Operable Unit 1303
Building 906 Drain System at Technical Area II

NFA Originally Submitted October 1994
Comment Responses May 1995
NOD Response January 2000
RSI Response June 2004
Soil Vapor Sampling June 2004

Environmental
Restoration
Project

United States Department of Energy
Sandia Site Office

Sandia is a multiprogram laboratory operated by Sandia Corporation, a Lockheed Martin Company, for the United States Department of Energy's National Nuclear Security Administration under contract DE-AC04-94AL85000.

NFA

Department of Energy
Albuquerque Operations Office
Kirtland Area Office
P. O. Box 5400
Albuquerque, New Mexico 87185-5400

OCT 03 1994

CERTIFIED MAIL - RETURN RECEIPT REQUESTED

Mr. Allyn M. Davis, Director
Hazardous Waste Management Division
U.S. Environmental Protection Agency, Region 6
1445 Ross Avenue, Suite 1200
Dallas, TX 75202-2733

Dear Mr. Davis:

The purpose of this letter is to resubmit officially and supersede a letter covering the same topic, dated September 28, 1994. The replacement is required to correct information contained on the enclosed public notice and due to the uncertainty of correct distribution. We apologize for the inconvenience of this resubmittal.

The Department of Energy (DOE) is requesting a Class 3 permit modification to remove a total of 22 solid waste management units (SWMUs) from the Resource Conservation and Recovery Act (RCRA) Hazardous and Solid Waste Amendments (HSWA) Final Permit for Sandia National Laboratories/New Mexico (SNL/NM) (EPA ID No. NM5890110518).

In accordance with 270.42(c)(1) and Section IV.B.3.b of the above referenced permit, the following information is provided.

DOE requests that the following SWMUs be removed from Table 2 of the HSWA module:

OU 1295	Site 139	Building 9964 Septic System
OU 1302	Site 25	Burial site (South of TA-1)
	Site 32	Steam Plant Oil Spill (TA-1)
	Site 41	Building 838 Mercury Spill (TA-1)
	Site 73	Hazardous Waste Repackaging/Storage (Bldg 895)
	Site 104	PCB Spill, Computer Facility

OU 1303	Site 3	Chemical Disposal Pit (TA-2)
	Site 43	Radioactive Material Storage Yard (TA-2)
	Site 44	Uranium Calibration Pits and Decontamination Area
	Site 113	Area II Firing Sites
	Site 135	Building 906 Septic System
	Site 165	Building 901 Septic System
OU 1306	Site 105	Mercury Spill (Building 6536) (TA-3)
	Site 188	Bldg 6597 Above Ground Containment Spill Tank (TA-5)
	Site 195	Experimental Test Pit (TA-3)
OU 1334	Site 20	Schoolhouse Mesa Burn Site
	Site 21	Metal Scrap
	Site 47	Unmanned Seismic Observatory
	Site 62	Greystone Manor Site
	Site 69	Old Borrow Pit
	Site 71	Moonlight Shot Area
	Site 88a	Firing Site: Ranchhouse

This permit modification is needed to terminate the schedule of compliance for the identified SWMUs; this will be accomplished by an EPA determination that no further action is needed. Each of these SWMUs has been investigated and the investigations are documented in no further action (NFA) proposals. Two copies of each NFA proposal are enclosed. As required by Section IV.M of the RCRA permit, each NFA proposal contains information demonstrating that "there are no releases of hazardous waste including hazardous constituents from a particular SWMU at the facility that pose a threat to human health and/or the environment..."

The requested modification, asking that a no further action (NFA) determination be made for each of the identified SWMUs, is a Class 3 permit modification.

Approval of this request would result in changes only to the HSWA module of the RCRA permit; there would be no changes to the information required by 40 CFR 270.13 through 270.21, 270.62, or 270.63.

OCT 0 3 1994

A notice about the permit modification request, enclosed, will be mailed to all persons on the facility mailing list and will be published in the Albuquerque Tribune and the Albuquerque Journal. The notice will be mailed and published within seven days of the date of this modification request. The notice will contain all information required by 40 CFR 270.42(c)(2).

As required by 40 CFR 270.42(c)(3)-(5), DOE will: make available copies of the permit modification request and supporting documents in the public reading rooms, host a public meeting in Albuquerque within the allotted time frame, and provide a 60-day comment period for public input.

If you have any questions, please contact John Gould of my staff at (505) 845-6089.

Sincerely,

George K. Laskar
for Kathleen A. Carlson
Area Manager

Enclosures

cc w/enclosures:
J. Johnsen, KAO-AIP (two copies)
T. Trujillo, DOE/AL, ERPO

cc w/o enclosures:
D. Neleigh, EPA, Region VI
N. Morlock, EPA, Region VI
C. Soden, DOE/AL:EPD
B. Garcia, NMED
W. Cox, MS 1347, SNL
B. Doremus, MS 1347, SNL
J. A. Roybal, MS 1347, SNL
M. J. Davis, MS 1347, SNL
S. Smith, MS 1347, SNL
T. Vandenberg, MS 0141, SNL
E. Krauss, MS 0141, SNL

Sandia National Laboratories

PROPOSAL FOR ADMINISTRATIVE NO FURTHER ACTION ENVIRONMENTAL RESTORATION SITE 135, BUILDING 906 SEPTIC SYSTEM OPERABLE UNIT 1303

August 1994

Environmental
Restoration
Project

United States Department of Energy
Albuquerque Operations Office

PROPOSAL FOR ADMINISTRATIVE NO FURTHER ACTION

SITE 135, Bldg. 906 Septic System
OU 1303

SANDIA NATIONAL LABORATORIES/NEW MEXICO

1.0 INTRODUCTION

Sandia National Laboratories/New Mexico (SNL/NM) is proposing an administrative No Further Action (NFA) decision for Environmental Restoration (ER) Site 135, Bldg. 906 Septic System, Operable Unit (OU) 1303.

Background information concerning ER Site 135 is limited. Building 906 originally was built for the decontamination of radioactively contaminated weapon components returned from the Nevada Test Site (NTS) and was most recently used for storage purposes until it was closed in May 1991. Various surveys and soil sampling was performed at this area. Results are summarized below.

2.0 HISTORY OF UNIT

Building 906 was constructed in 1950 and is located in the central part of Technical Area (TA)-II, about 125 feet west of Building 920 (Attachment 1). It is approximately 900 square feet and contains a fume hood sink and two floor drains, all of which are connected to the septic system. No toilet or septic tank was ever installed. The original septic leachfield, on the west side of the building, included a dry well that was connected to the laboratory drain system. The leachfield consists of four-inch perforated lines in two gravel-filled trenches; the trenches measure two feet by two feet by 20 feet. The area of the dry-well cross section is approximately 11 square feet. The dry well was used from 1950 to 1978, when it was disconnected from the septic drain system. Depth to the dry well base is not known. In the late 1970s, a shower was installed in the northern end of the building. At that time, the shower drain was connected to the outside laboratory drain.

Information regarding early operations at Building 906 and the types and amounts of hazardous materials that may have been used there is sparse. It is known that test materials returned from the NTS were stored and cleaned in the building. These materials may have been contaminated with metals, including lead, zinc, and lithium, and radioactive constituents, including uranium, tritium, and fission products. High Explosive (HE) compounds and hexafluorine also may have been stored in the building during this time. In the 1960s, paints and solvents, including trichloroethylene (TCE), trichloroacetic acid (TCA), and acetone were stored there. Between 1978 and 1980, leaking transformers containing polychlorinated biphenyls (PCBs) may have been temporarily stored in the building. Herbicides also may have been used near the west side of the building. During the 1980s, the building was used as a chemical laboratory and for conducting electrical battery research and development.

3.0 EVALUATION OF RELEVANT EVIDENCE

In order to determine that no potential threats exist to human health or the environment at this site, environmental testing was conducted. Testing included a surface radiation survey, passive soil-vapor survey, geophysical survey, and soil sampling. As summarized below, results indicate that further investigation is not necessary and that Site 135 should be removed from the ER Site List.

On March 20, 1994, a surface radiation survey was performed over the Building 906 septic system leachfield area. The surface area surrounding Building 906 has been identified as ER Site #44, Decontamination Area. The radiation survey was performed using a gamma scintillometer, at six-foot centers (100% coverage) over the entire site area, and a pressurized ionization chamber (PIC). In the area west of Building 906, background activities were measured between 11 to 13 mR/h with the PIC. Three areas, all within 15 feet of the building, were identified with gamma activity that was 30 percent or greater than the natural background. These anomalies are soil in nature with no visible evidence of radioactive material (i.e., DU fragments, uranium oxide). The anomalous areas have been identified as 44E1-SA, 44E2-SA, and 44E3-SP (Attachment 2). Exposure rates were measured between 13 mr/hr to 36 mr/hr at location 44E1-SA, 13 mr/hr to 15 mr/hr at location 44E2-SA, and at 20 mr/hr at location 44E3-SP. This information will be incorporated into the ER Site #44 SWMU investigation.

From November 11 to December 3, 1993, a passive soil-vapor-survey (SVS) investigation was conducted in the area surrounding Building 906 (NERI, 1994). No volatile organic compounds (VOCs) or semi-volatile organic compounds (SVOCs) were identified from the SVS investigation in the vicinity of the Building 906 septic system and leachfield.

The area surrounding Building 906 was part of a geophysical Surface Towed Ordinance Locator System (STOLS™) survey conducted in December 1993 (Geo-Centers, 1994) and an electromagnetic (EM) survey conducted in December 1993 (LAMB, 1994). No anomalies related to buried material, other than underground utilities, were identified.

On March 7 and 8, 1994, one borehole (TA2-BH-01) was drilled behind Building 906 located in the area of the abandoned dry well and the center of the leachfield (area suspected of highest contamination). The borehole was drilled to a total depth of 151 feet below ground surface (BGS). Soil samples were collected at depths of 3, 8, 14, 23, 30, 39, 52, 58, and 74.5 feet BGS. Analyses performed included: tritium for all samples; metals, HE compounds, radioisotopes, and total uranium for samples collected to a depth of 52 feet BGS; and VOCs and SVOCs for samples collected to a depth of 14 feet BGS.

Toluene was the only VOC detected, with concentrations of 6.2 ppb (6.5 feet BGS) and 6.9 ppb (10.25 feet BGS). Fluoranthene and bis (2-ethylhexyl) phthalate were the only SVOCs detected, fluoranthene at 370 mg/kg (6 feet BGS) and bis (2-ethylhexyl) phthalate at 530 mg/kg (11.6 feet BGS). Bis (2-ethylhexyl) phthalate is a common contaminant from latex gloves found as a result of sampling activities and is not usually a environmental contaminant. Additionally, bis (2-ethylhexyl) phthalate is not a constituent of concern at this site. No HE compounds were detected in any of the borehole soil samples.

The following two metals of concern (based on background information) were detected: lead (2.6 mg/kg to 6.2 mg/kg) and zinc (18.4 mg/kg to 53.9 mg/kg). SNL/NM background concentration for lead is 15 mg/kg and for zinc is 46.74 mg/kg . Tritium results ranged from <210 pCi/g to 340 pCi/g. A background tritium concentration has not been established for SNL/NM. However, results of a dose assessment using the RESRAD model indicate acceptable levels of tritium in soil based on DOE guidance. Total uranium results ranged from 1.3 μg/g to 2.1 μg/g. SNL/NM background concentration for total uranium is 3.5 mg/kg. No other radioactive constituents were observed.

4.0 CONCLUSION

Comparison of analytical results to RCRA proposed Subpart S action levels shows that toluene, fluoranthene, and zinc are all below the prescribed action levels of 20,000 mg/kg, 3000 mg/kg, and 20,000 mg/kg, respectively. The results of the surveys and soil sampling indicate that there is no release of hazardous constituents from this site which pose a threat to human health or the environment.

5.0 REFERENCES

GEO-CENTERS, Inc. (Geo-Centers, 1994), "Final Technical Report STOLS™ Survey at Sandia National Laboratories Technical Area 2," January 1994.

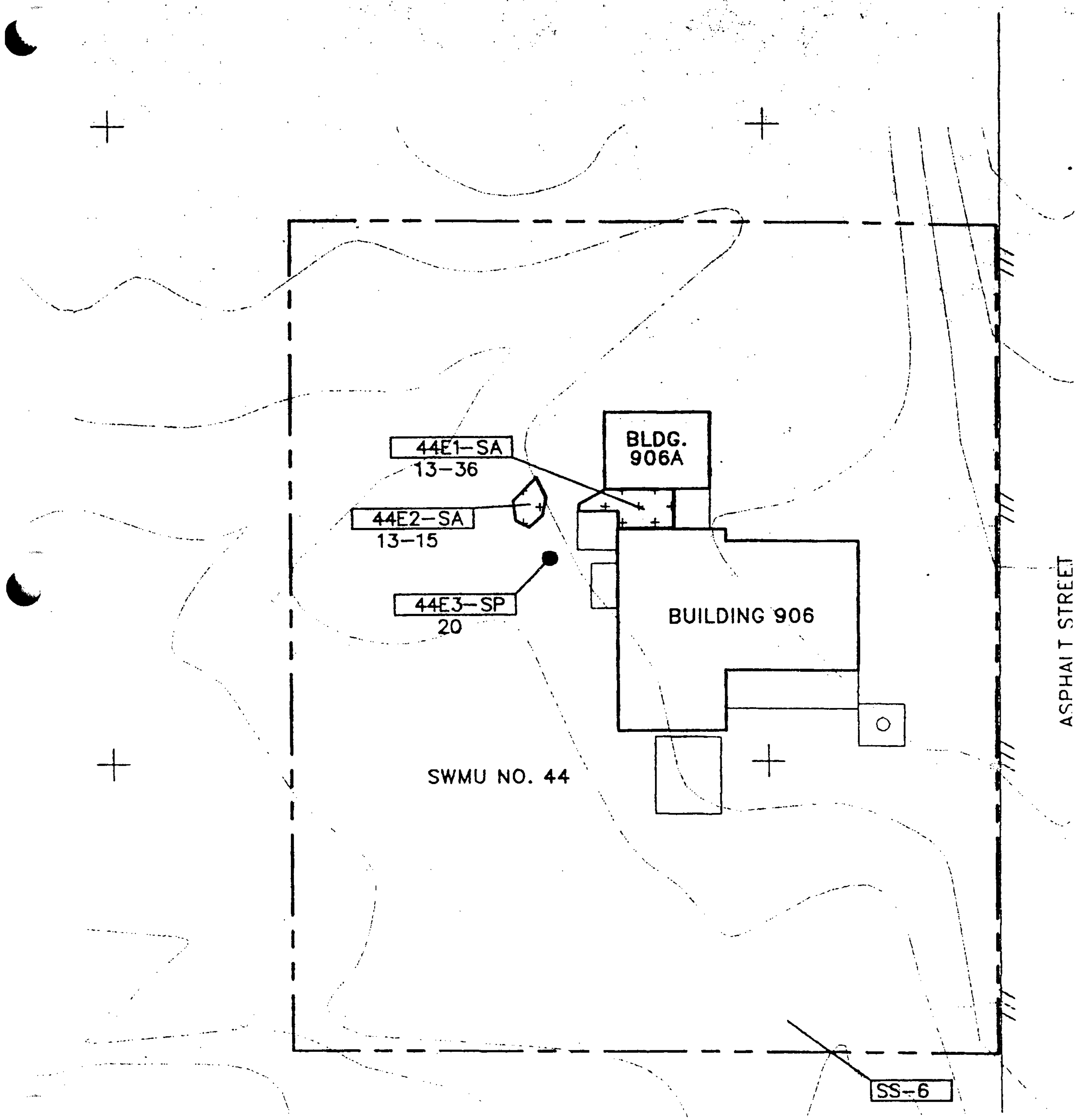
LAMB Associates, Inc. (LAMB, 1994), "Electromagnetic Surveys of Technical Area II Sandia National Laboratories," May 1994.

Northeast Research Institute LLC (NERI 1994), "PETREX Soil Gas Survey Results Conducted at Technical Area II," June 9, 1994.

6.0 LIST OF ATTACHMENTS

Attachment 1
Map showing the location of the Building 906 Septic System area, Technical Area II, SNL/NM

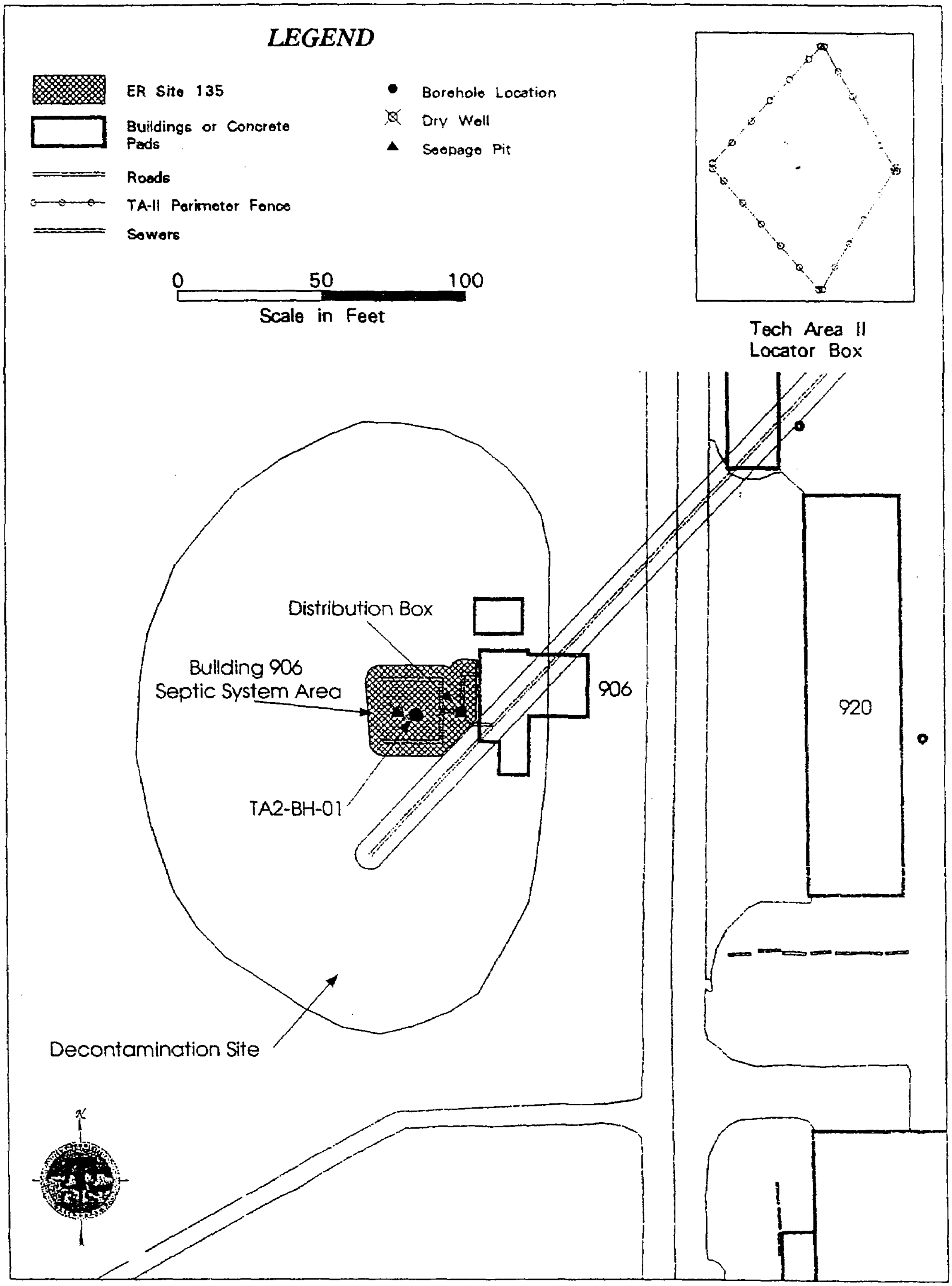
Attachment 2
Map showing the results of the surface radiation survey surrounding Building 906



Attachment 2

Map showing the results of the surface radiation survey surrounding Building 906

SNL ER GIS DEPT 7583 GIS MAP-ID = 940150 04-MAY-1994 ersite135DIGITAL MAP PREPARED BY: rej



Attachment 1

Map showing the location of the Building 906 Septic System area, Technical Area II, SNL/NM.

Comment Response

Copy [illegible] ER/NFA/REV 195

MAY 12 1995

Department of Energy
Field Office, Albuquerque
Kirtland Area Office
P.O. Box 5400
Albuquerque, New Mexico 87115

MAY 12 1995

CERTIFIED MAIL - RETURN RECEIPT REQUESTED

Mr. Benito Garcia, Bureau Chief
New Mexico Environment Department
Hazardous and Radioactive Materials Bureau
525 Camino de los Marquez, Suite 4
P.O. Box 26110
Santa Fe, NM 87502

Dear Mr. Garcia,

Enclosed are two copies of the Sandia National Laboratories, New Mexico, responses to the EPA comments on the submission of 22 "Proposals for Administrative No Further Action, Environmental Restoration, FY94".

If you have any questions, please contact John Gould at (505) 845-6089.

Sincerely,

George K. Laskar

for Michael J. Zamorski
Acting Area Manager

Enclosure

cc w/o enclosure:
T. Trujillo, ERD, AL
J. Johnsen, KAO/AIP
W. Cox, SNL, MS 1347
F. Nimick, SNL, MS 1347
D. Fate, SNL, MS 1347
T. Roybal, SNL, MS 1347
T. Vandenberg, SNL. MS 0141
E. Krauss, SNL, MS 0141
N. Morlock, EPA, Region VI
W. Honker, EPA, Region VI

10/1/95

EC1 /PLA/95

Sandia National Laboratories
Albuquerque, New Mexico

Proposals for Administrative No Further Action
Environmental Restoration
FY94

Comment Responses to USEPA
May 1995

INTRODUCTION

This document responds to comments received in a letter from USEPA to DOE (Carlson, April 7, 1995) documenting the review of twenty two No Further Action (NFA) proposals. These NFA proposals were submitted as part of a Class III Modification to the Hazardous Waste Permit (Permit No. NM5890110518) for Sandia National Laboratories/New Mexico (SNL/NM).

This response document is organized as follows. A table summarizing the applicable NFA criteria (as described in Section 4.5.3.2.2 of SNL's Program Implementation Plan) for each site is found on the page 2 of the report. Next, on page 3, responses to the general comments are provided.

The remainder of the document is organized in numerical order by Operable Unit (OU) number and subdivided in numerical order by Site number. Each OU section provides responses to the specific comments by site number and, further, by comment number and letter as provided in the call for response to comments. Each OU section also provides clarifying information regarding sources of supporting information used in the development of each NFA proposal. This clarifying information is designated "Sources of Supporting Information" and will be an integral part of future NFA submissions.

Summary Table of Applicable NFA Criteria for 22 Sites Submitted for NFA Approval

OU No.	ER Site No.	Site Name	Criteria for NFA
1295	139	Bldg. 9964 Septic System	1) The unit has never contained constituents of concern; and 2) The unit has not released hazardous waste or constituents into the environment
1302	25	Burial Site (South of TA-I)	The unit has never contained constituents of concern
1302	32	Steam Plant Oil Spill (TA-I)	The unit clearly has not released hazardous waste or constituents into the environment[a]
1302	41	Building 838 Mercury Spill (TA-I)	The unit clearly has not released hazardous waste or constituents into the environment
1302	73	Hazardous Waste Repackaging /Storage (Building 895)	The unit has design and/or operating characteristics that effectively prevent releases to the environment
1302	104	PCB Spill, Computer Facility	The unit clearly has not released hazardous waste or constituents into the environment
1303	3	Chemical Disposal Pit (TA-II)	**Will be submitted for name change**
1303	43	Radioactive Material Storage Yard (TA-II)	The unit clearly has not released hazardous waste or constituents into the environment
1303	44	Uranium Calibration Pits and Decontamination Area	The unit clearly has not released hazardous waste or constituents into the environment[b]
1303	113	Area II Firing Sites (Active)	The unit clearly has not released hazardous waste or constituents into the environment
1303	135	Building 906 Septic System	The unit clearly has not released hazardous waste or constituents into the environment
1303	165	Building 901 Septic System	The unit clearly has not released hazardous waste or constituents into the environment
1306	105	Mercury Spill (Building 6536)	1) The unit has design and/or operating characteristics that effectively prevent releases to the environment and 2) the unit clearly has not released hazardous waste or constituents into the environment
1306	188	Building 6597 Above Ground Containment Spill Tank	The unit clearly has not released hazardous waste or constituents into the environment
1306	195	Experimental Test Pit	1) The unit has design and/or operating characteristics that effectively prevent releases to the environment and 2) the unit clearly has not released hazardous waste or constituents into the environment
1334	20	Schoolhouse Mesa Burn Site	The unit has design and/or operating characteristics that effectively prevent releases to the environment
1334	21	Metal Scrap (Coyote Springs)	The unit has never contained constituents of concern
1334	47	Unmanned Seismic Observatory	The unit has never contained constituents of concern
1334	62	Greystone Manor Site	The unit has design and/or operating characteristics that effectively prevent releases to the environment
1334	69	Old Borrow Pit	The unit has never contained constituents of concern
1334	71	Moonlight Shot Area	The unit has never contained constituents of concern
1334	88A	Firing Site: Ranch House	The unit has never contained constituents of concern

a: Because the contaminant of concern at Site 32 is a petroleum product, this criterion is used based on UST regulations, for which "the environment" is assumed to be the water table rather than the overlying soil. See the NFA proposal and comment responses for Site 32 for additional discussion.

b: A Voluntary Corrective Action was performed on the Uranium Calibration Pits (44a) to removed contaminated soil in the vicinity of the pits. Thus, for Site 44a, "the unit" should be construed to be the pits themselves plus the volume of soil removed.

GENERAL COMMENTS

1. **Comment.** Any sources cited in the NFA proposal should be documented and referenced. The source documents should be readily available to the public and reviewers.

   Response. Agreed. All sources used in the development of these NFA proposals are cited in the proposals and are available for inspection in the ER Records Center. Included in this response, with each site's specific comments, is an addendum that provides "Sources of Supporting Information".

2. **Comment.** Many of the proposals discuss field screening for radioactive materials. What were the detection limits for the instruments used? What was the basis for the background investigation levels discussed? How do the background levels, and the measured levels, compare to risk-based levels.

   Response. All work conducted at ER sites which have been designated as Radioactive Material Management Areas (RMMA) must comply with Section 19D of the SNL/NM ES&H manual. Additionally, a copy of the December, 1994 Final Report for the Surface Gamma Radiation Surveys conducted by Geotech at Sandia ER sites has been sent to EPA and NMED under separate cover. All information regarding the field screening for radioactive materials is discussed in this report.

3. **Comment.** Interviews alone are not sufficient documentation to make an NFA determination. Site history and interviews can be used to guide an investigation or confirm other evidence, but are not sufficient by themselves. In the absence of any other supporting information, screening sampling should be conducted to further corroborate the interview and site history data.

   Response. For those proposals relying primarily upon information gathered through interviews, additional information was located and is provided in the responses to site-specific comments. Additionally, an addendum is included with the specific comments for each site that provides clarifying information regarding sources of supporting information used in the development of each NFA proposal. This subsection is designated "Sources of Supporting Information" and will be an integral part of future NFA submissions.

4. **Comment.** A sampling and analysis plan or RFI Work Plan should be submitted to the EPA and NMED prior to the start of any sampling activities conducted as a result of this NOD.

   Response. Agreed. Sampling and analysis plans will be provided for any sampling activities needed as a result of these comments. Additionally, for future confirmatory sampling NFA proposal submissions, sampling and analysis plans will be provided for review prior to sampling.

OU 1303 Site 135, Building 906 Septic System

SPECIFIC COMMENTS

18. Site 135, Building 906 Septic System, OU 1303 (TA-II)

Comment (a). The EPA understands that VOCs and SVOCs were only sampled to a depth of 14 ft bgl in the 3/94 borehole due to the results of the passive soil vapor survey. Please provide additional details concerning the soil vapor survey, including the coverage of the survey.

Response (a). Please see the figure provided in response to Comment 8a (Appendix A) which shows that the passive soil vapor survey coverage includes Site 135, the Building 906 Septic System (and Site 44, the Decontamination Area). Also refer to the NERI Petrex report (provided under separate cover) for additional details on the passive soil vapor survey which covered much of Technical Area II (Northeast Research Institute LLC (NERI 1994) PETREX Soil Gas Survey Results Conducted at Technical Area II, June 9, 1994).

Comment (b). Why didn't Sandia sample for PCBs if leaking transformers may have been stored in Building 906? If the transformers were actually stored in Building 920 as has been suggested by more recent interviews, please provide the references and documentation for those interviews.

Response (b). A copy of a cover memo is attached (Appendix B) regarding the results of PCB sampling conducted in 1993 at Building 920 (not Building 906). The memo states on the first line that Building 920 was the "previous PCB storage disposal facility".

Comment (c). Sandia should provide a better figure showing the location of the dry well, borehole, leachfield, and new ground water monitoring well. Also, please provide additional information concerning the newly installed monitoring well. How frequently is the well sampled? Which analyses are performed?

Response (c). A figure is attached (Appendix C) showing the locations of the dry well, leachfield, and borehole/monitoring well. Borehole TA2-BH-01 (drilled in March 1994) was completed in June/July 1994 as monitor well TA2-W-01 (see Appendix C). Except for the first quarter of 1995, ground-water samples have been and will continue to be collected from monitor well TA2-W-01 on a quarterly basis for an entire suite of chemicals, including organics, inorganics, cations, anions, total dissolved solids, and metals.

Comment (d). A summary of analytical data from any other nearby monitoring wells should be included. The water chemistry, particularly the levels of major cations and anions, should be evaluated. In general, additional investigations appear warranted due to the length of operations at this site.

Response (d). The nearest monitor wells in the vicinity of TA2-W-01 are located over 800 ft SW (TA2/SW1/320) and over 850 ft NW (TA2-NW1-325; TA2-NW1-595). A summary of analytical data from these wells is included in Tables 23 through 26 and Tables 16 - 20 (Appendix D) (taken from the Groundwater Protection Program's Annual Groundwater Monitoring Report Calendar Year 1993 - 1994).

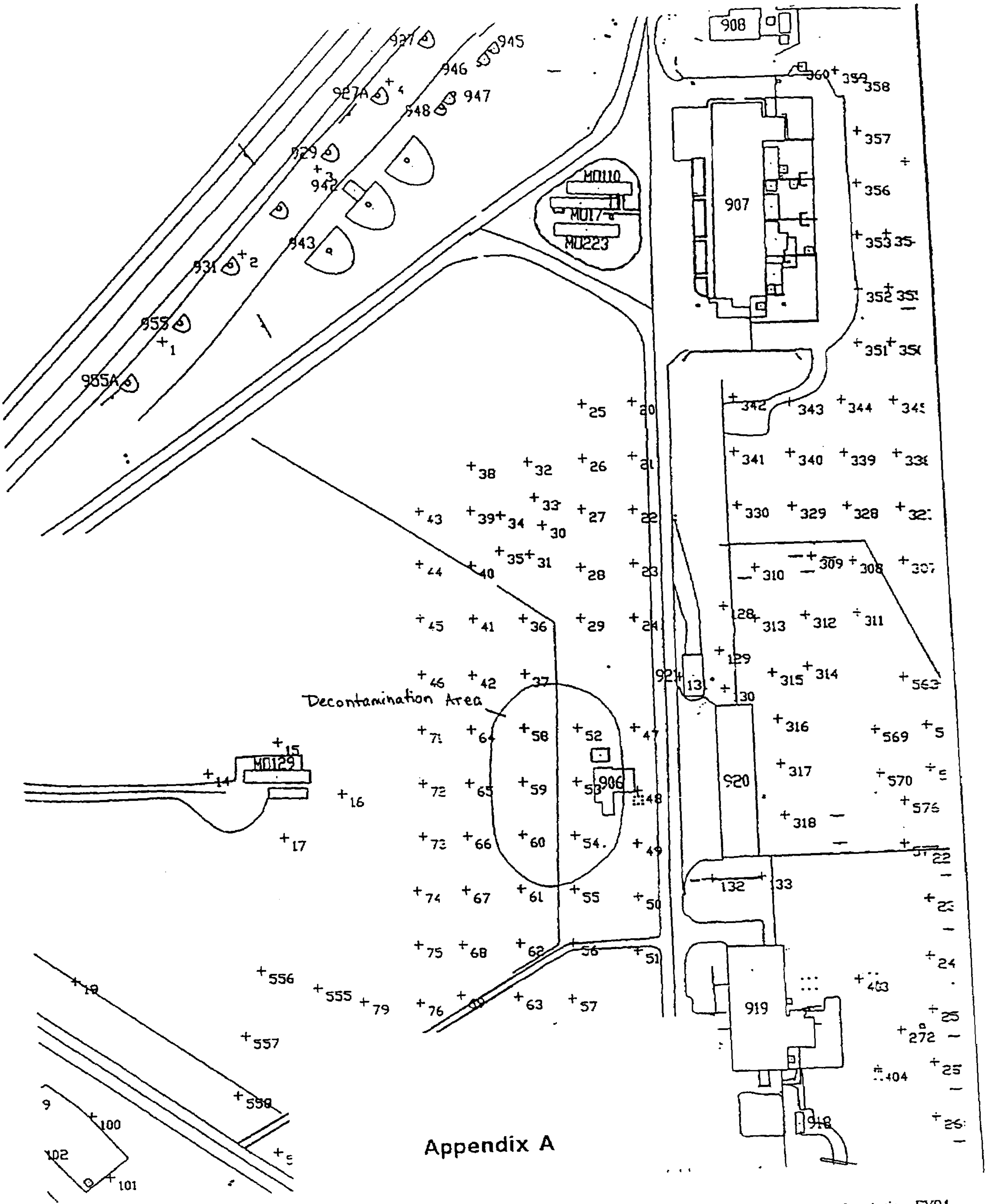
Based on results of site investigations at Building 906 and at ten other TA-II sites, environmental contamination has not been identified. Additional investigations are not determined to be warranted at this time.

Appendix A: Passive Soil Vapor Survey of Decontamination Area

Appendix B: PCB Sampling Results Memo

Appendix C: Map Showing the Location of the Building 906 Septic System Area

Appendix D: Summary of Analytical Data from Monitoring Wells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Decontamination Area
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Appendix A

Sandia National Laboratories/NM
Albuquerque, New Mexico 87185

Date: 08/12/93

To: Clay Pryor, 7043

From: David Szklarz, PCB Program Coordinator, Department 7042

Subject: PCB Sample Results

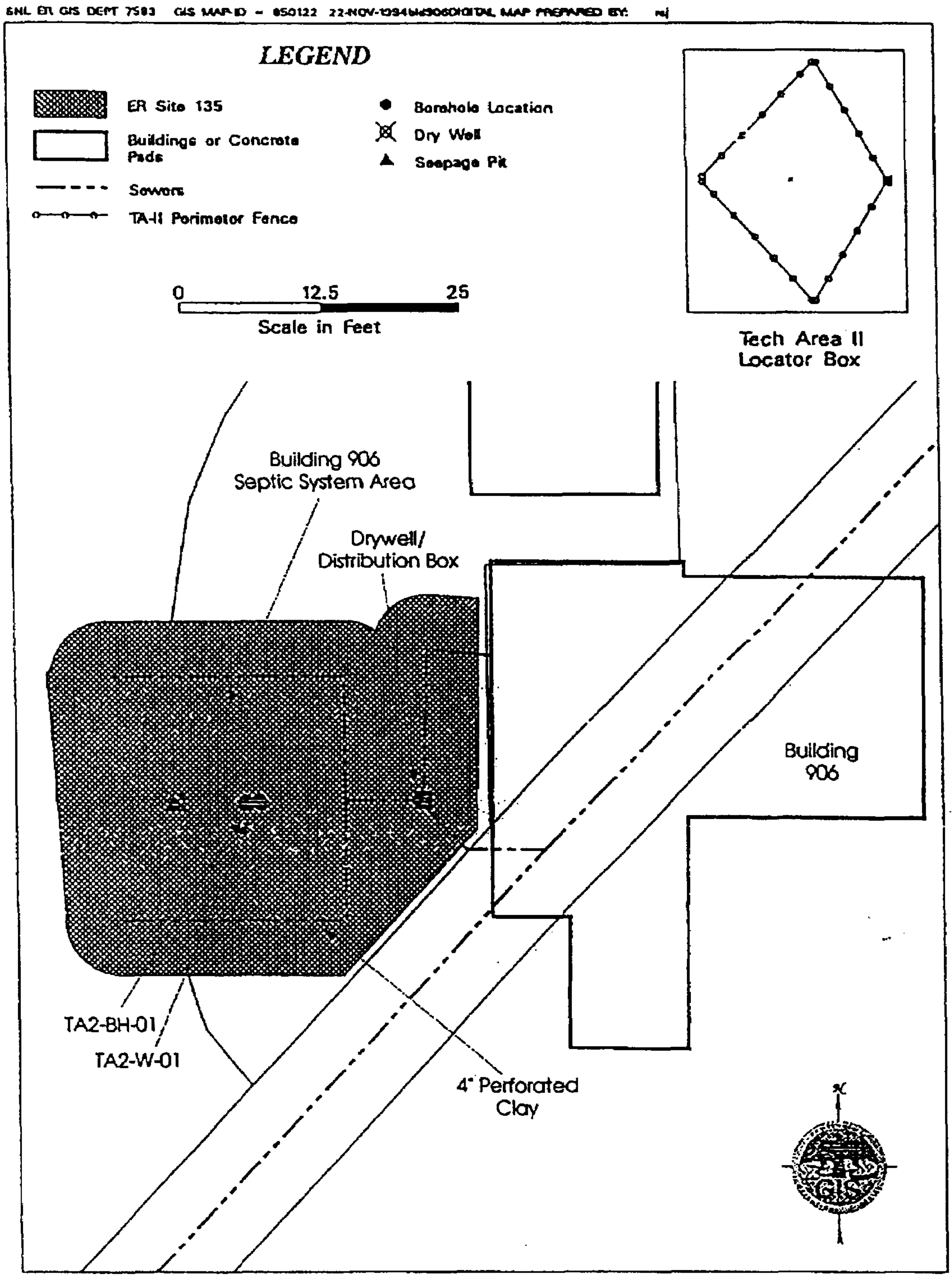
Enclosed are the official sample results for wipe samples taken from A-II, 920N (previous PCB storage for disposal facility) on 06/15/93. The samples taken came back below the regulatory level for PCB's on high-contact, restricted access solid surfaces (< 10 micrograms per 100 square centimeters). Please keep this information in your files for future reference.

If you still plan on occupying the building for lead storage purposes, you will need to change building ownership, as well as building ES&H Coordinator from my name to your designated representative (contact Lloyd Bonzon, 2514). Failure to do this in a timely manner will result in the building being placed "up for grabs" to the first needing individual/organization that requests its' use in a official capacity, i.e. changing ownership responsibilities.

If you have any questions concerning these or any other PCB sample results please contact me at one of the following numbers. Thank you.

Hazardous Waste Management Facility office: 844-0594
BDM Building office: 848-0479
Cellular phone: 263-3591
SNL pager: 845-0142, 2956

Appendix C



Map showing the location of the Building 906 Septic System area, Technical Area II, SNL/NM.

Table 23
Summary of Analytical Results for Detected Organic Compounds
Sandia National Laboratories/New Mexico
TA-2 Groundwater Monitoring, 1993

			Volatile Organic Compounds				
Analyte			Acetone	2-Butanone	Methylene Chloride	Semivolatile Organic Compounds	Phenolics
		MDL[a]	10 μg/L	10 μg/L	5 μg/L	Varies with compound	0.01 mg/L
Sample Location	Sample Date	Sample #	All results in μg/L				Results in mg/L
TA-2/W-001	11/22/92	ER92003616	14	ND[b]	ND	NA	NA
TA-2/W-002	3/26/93	ER92004632	4.8 B1[c]	ND	1	ND	ND

[a]MDL = Minimum method detection limit obtained for nondetected parameters.
[b]ND = not detected.
[c]B1 = Method blank contained 3.5 mg/L acetone.

Table 24

Summary of Analytical Results for Inorganic Compounds
Sandia National Laboratories/New Mexico
TA-2 Groundwater Monitoring, 1993

Analyte			Alkalinity	Chloride	Fluoride	Nitrate Plus Nitrite	Ammonia	Sulfate	Total Phosphorus	pH	Specific Conductance
MDL[a], units			10	2.0	0.1	0.05	0.1	20	0.05	Standard pH units, no MDL	1.0
Sample Location	Sample Date	Sample #	All results in mg/L								µmhos/cm
TA-2/W-001	11/22/92	ER92003616	NA[b]	NA	NA	9.4	NA	NA	0.14	NA	NA
TA-2/W-002	3/26/93	ER92004632	95.7	98.9	0.35	4.1	ND[c]	111	NA	7.8	740
TA-2/W-003	6/11/93	ER92004934	158	14.8	0.42	1.3 (Nitrate)	ND	77.4	NA	7.9	517
TA-2/W-003	6/13/93	ER92004940	153	15.1	0.47	4.6	ND	40.1	NA	7.9	473

[a]MDL = Minimum method detection limit obtained for nondetected parameters.
[b]NA = Not analyzed for.
[c]ND = Not detected at MDL indicated.

AL/6-2-94/WP/SNL:T3205/16

Table 25

Summary of Ion Charge Balance and Total Dissolved Solids for Groundwater Samples
Sandia National Laboratories/New Mexico
TA-2 Groundwater Monitoring, 1993

Sampling Location	Sample Date	Sample #	Sum of Cations, meq/L[a]	Sum of Anions, meq/L	Relative Percent Difference[b]	Total Dissolved Solids, mgL
TA-2/W-001	3/26/93	ER92004632	6.8	7	2.90	457
TA-2/W-003	6/11/93	ER92004934	5.6	5.3	5.50	306
TA-2/W-003	6/13/93	ER92004940	5	4.6	8.33	294

[a]meq/L = Milliequivalents per liter.
[b]RPD = Relative percent difference ((A-B)/((A+B)/2)*100).

AL/02-94/WP/SNL:T3205/37

Table 26
Summary of Analytical Results for Total Metals
Sandia National Laboratories/New Mexico
TA-2 Groundwater Monitoring, 1993

Analyte			Aluminum	Antimony	Arsenic	Barium	Beryllium	Cadmium	Calcium	Chromium	Cobalt
MDL[a]			0.1	0.06	0.01	0.01	0.002	0.01	0.2	0.01	0.01
Sampling Location	Sample Date	Sample #	All results in mg/L.								
TA-2/W-002	3/26/93	ER92004632	0.03	ND[c]	ND	0.15	ND	ND	94.0	ND	ND
TA-2/W-003	6/11/93	ER92004934	NA[b]	NA	NA	NA	NA	NA	68.1	NA	NA
TA-2/W-003	6/13/93	ER92004940	NA	NA	NA	NA	NA	NA	60.4	NA	NA
TA-2/W-003	6/24/93	ER92004947	NA	NA	NA	NA	NA	NA	64.0	NA	NA

Analyte			Copper	Iron	Lead	Mercury	Magnesium	Manganese	Nickel	Potassium	Selenium
MDL			0.02	0.1	0.01	0.0002	0.2	0.01	0.04	5	0.01
Sampling Location	Sample Date	Sample #									
TA-2/W-002	3/26/93	ER92004632	0.0033	0.07	ND	ND	13.5	0.17	ND	3.1	0.01
TA-2/W-003	6/11/93	ER92004934	NA	0.21	NA	NA	11.9	NA	NA	ND	NA
TA-2/W-003	6/13/93	ER92004940	NA	0.21	NA	NA	11.1	NA	NA	ND	NA
TA-2/W-003	6/24/93	ER92004947	NA	0.47	NA	NA	11.8	NA	NA	5.5	NA

Analyte			Silver	Sodium	Thallium	Vanadium	Zinc
MDL			0.01	5	0.05	0.01	0.02
Sampling Location	Sample Date	Sample #					
TA-2/W-002	3/26/93	ER92004632	ND	22.0	ND	ND	0.02
TA-2/W-003	6/11/93	ER92004934	NA	29.3	NA	NA	NA
TA-2/W-003	6/13/93	ER92004940	NA	24.2	NA	NA	NA
TA-2/W-003	6/24/93	ER92004947	NA	27.6	NA	NA	NA

[a]MDL - Minimum method detection limit obtained for nondetected parameters.
[b]NA - Not analyzed for in this sample.
[c]ND - Not detected at MDL indicated.

AL/02-93/WP/SNL:T2059.18

Table 16

Summary of Analytical Results for Detected Organic Compounds
Sandia National Laboratories/New Mexico
TA-2 Groundwater Monitoring, 1994

		Analyte	Volatile Organic Compounds: Acetone	Volatile Organic Compounds: Trichlororathene	Volatile Organic Compounds: Toluene	Volatile Organic Compounds: Methylene Chloride	Semivolatile Organic Compounds	TOC[a]	TOX[b]
		MCL[c], mg/L[d]	NE[e]	0.005 mg/L	1 mg/L	NE	Varies with Compound	NE	NE
		MDL[f], mg/L	0.010	0.001	0.001–0.005	0.001–0.005	Varies with Compound	0.5	5 µg/L[g]
Sample Location	Sample Date	Sample #	All results in mg/L						Results in µg/L
TA2-SW1-320	01/05/94	TA2S-013922	ND[h]	ND	0.005	0.001 J[i]	ND	ND	28
TA2-NW1-325	01/06/94	TA2N-013920	ND	ND	ND	0.001 J	ND	ND	61
TA2-SW1-320	04/07/94	T2SW-014913	ND	ND	ND	0.001 J, B[j]	ND	ND	ND
Trip Blank (4/8/94)	Lab prepared	T2SW-014913	ND	ND	ND	0.002 J, B	NA[k]	NA	NA
TA2-NW1-325	4/11/94	T2NW-014914	ND	ND	ND	0.002 J, B	ND	5.6	19
TA2-NW1-325	4/11/94	T2NW-014915 (Duplicate of T2NW-014914)	ND	ND	ND	ND	ND	0.91	16
Trip Blank (4/12/94)	Lab prepared	T2NW-014915	ND	ND	ND	0.002 J B	NA	NA	NA
TA2-SW1-320	7/15/94	SNL/NM016750	ND	ND	ND	ND	ND	ND	27
Trip Blank (7/18/94)	Lab prepared	SNL/NM016750	ND	ND	ND	ND	NA	NA	NA
TA2-NW1-325	7/18/94	SNL/NM016751	0.004 J B	ND	ND	0.006 B	0.006 J (Di-n-butyl phthalate)	ND	9
Trip Blank (7/19/94)	Lab prepared	SNL/NM016751	0.004 J B	ND	ND	0.007 B	NA	NA	NA
TA2-NW1-325	7/18/94	SNL/NM016752 (Duplicate of SNL/NM016751)	0.005 J B	ND	ND	0.005 B	0.001 J (Di-n-butyl phthalate)	ND	9
TA2-W-01	7/20/94	SNL/NM016753	0.006 J B	ND	ND	0.007 B	ND	0.6	6
Trip Blank (7/20/94)	Lab prepared	SNL/NM016753	0.005 J B	ND	ND	0.006 B	NA	NA	NA
Equipment Blank	10/12/94	SNL/NM019402	NA	ND	0.004	0.001 B	ND	NA	NA
TA2-SW1-320	10/12/94	SNL/NM019403	NA	ND	0.002	0.002 B	ND	NA	NA
TA2-SW1-320 (duplicate)	10/12/94	SNL/NM019404	NA	ND	0.001	0.002 B	ND	NA	NA

Table 16 *(Continued)*

Summary of Analytical Results for Detected Organic Compounds
Sandia National Laboratories/New Mexico
TA-2 Groundwater Monitoring, 1994

			Volatile Organic Compounds				Semivolatile Organic Compounds	TOC[a]	TOX[b]
		Analyte	Acetone	Trichloroethene	Toluene	Methylene Chloride			
		MCL[c], mg/L[d]	NE[e]	0.005 mg/L	1 mg/L	NE	Varies with Compound	NE	NE
		MDL[f], mg/L	0.010	0.001	0.001–0.005	0.001–0.005	Varies with Compound	0.5	5 µg/L[g]
Sample Location	Sample Date	Sample #	All results in mg/L						Results in µg/L
Trip Blank (10/12/94)	*Lab prepared*	SNL/NM019405	NA	ND	ND	0.001 B	NA	NA	NA
TA2-NW1-328	10/13/94	SNL/NM019406	NA	ND	0.002	0.002 B	ND	NA	NA
Trip Blank (10/13/94)	Lab prepared	SNL/NM019409	NA	ND	ND	0.003 B	NA	NA	NA
TA2-W-01	10/14/94	SNL/NM019410	NA	0.001	0.001	0.003 B	ND	NA	NA
Trip Blank (10/14/94)	Lab prepared	SNL/NM019411	NA	ND	ND	0.002 B	NA	NA	NA

[a]TOC = Total organic carbon.
[b]TOX = Total organic halides.
[c]MCL = Maximum concentration level established by U.S. Environmental Protection Agency (EPA) Primary Drinking Water Regulations (PDWR) in 40 CFR 141.11 (b) and subsequent amendments.
[d]mg/L = *Milligrams per liter.*
[e]NE = Not established for this constituent.
[f]MDL = Minimum method detection limit obtained for nondetected parameters (mg/L).
[g]µg/L = Micrograms per liter.
[h]ND = Not detected.
[i]J = Analyte present at level less than detection limit.
[j]B = Analyte present in method blank.
[k]NA = No analysis was performed for this analyte.

Table 17

Summary of Analytical Results for Inorganic Compounds
Sandia National Laboratories/New Mexico
TA-2 Groundwater Monitoring, 1994

		Analyte	Alkalinity[a]	Bromide	Chloride	Fluoride	Nitrate Plus Nitrite	Sulfate	pH
		MCL[b], mg/L[c]	NE[d]	NE	NE	4.0	10	NE	
		MDL[e], mg/L	10	0.05-0.10	2.0-4.0	0.1	0.05-0.5	5-20	Standard pH units, no MDL
Sample Location	Sample Date	Sample #	All results in mg/L						
TA2-SW1-320	1/05/94	TA2S-013922	140	0.30	30	0.5	24	18	7.7
TA2-NW1-325	1/06/94	TA2N-013920	92	1.4	120	0.4	4.1	93	7.4
TA2-SW1-320	4/07/94	T2SW-014913	110	0.37	30	0.4	22	18	7.7
TA2-NW1-325	4/11/94	T2NW-014914	91	1.7	130	0.31	4	100	7.7
TA2-NW1-325	4/11/94	T2NW-014915 (Duplicate of T2NW-014914)	89	1.4	120	0.29	3.8	98	7.7
TA2-SW1-320	7/15/94	SNL/NM016750	120	0.43	32	0.4	23	14	7.6
TA2-NW1-325	7/18/94	SNL/NM016751	77	1.6	140	0.7	4.3	98	7.7
TA2-NW1-325	7/18/94	SNL/NM016752 (Duplicate of SNL/NM016751)	83	1.6	130	0.7	4.0	97	7.7
TA2-W-01	7/20/94	SNL/NM016753	120	1.1	78	0.7	3.2	48	7.2
Equipment Blank	10/12/94	SNL/NM019402	ND[f]	NA[g]	ND	NA	ND[h]	ND	NA
TA2-SW1-320	10/12/94	SNL/NM019403	100	NA	33	NA	26[h]	18	NA
TA2-SW1-320 (duplicate)	10/12/94	SNL/NM019404	110	NA	34	NA	24[h]	15	NA
TA2-NW1-325	10/13/94	SNL/NM019408	88	NA	120	NA	0.23[h]	100	NA
TA2-W-01	10/14/94	SNL/NM019410	120	NA	88	NA	6.2[h]	37	NA

[a]Alkalinity = Total alkalinity as $CaCO_3$.
[b]MCL = Maximum concentration level established by U.S. Environmental Protection Agency (EPA) Primary Drinking Water Regulations (PDWR) in 40 CFR 141.11 (b) and subsequent amendments.
[c]mg/L = Milligrams per liter.
[d]NE = Not established for this constituent.
[e]MDL = Minimum method detection limit obtained for nondetected parameters (mg/L).
[f]ND = Not detected.
[g]NA = No analysis was performed for this analyte.
[h]Nitrate as nitrogen.

Table 18

Summary of Analytical Results for Total Metals
Sandia National Laboratories/New Mexico
TA-2 Groundwater Monitoring, 1994

Sampling Location	Sample Date	Sample #	Aluminum	Arsenic	Barium	Cadmium	Calcium	Chromium	Iron	Lead	Magnesium	Manganese	Mercury	Potassium	Selenium	Silicon	Silver	Sodium
		MCL[a], mg/L[b]	NE[c]	0.05	2.0	0.005	NE	0.10	NE	0.05	NE	NE	0.002	NE	0.05	NE	NE	NE
		MDL[d], mg/L	0.20	0.002-0.01	0.01-0.02	0.005-0.01	0.2	0.01-0.02	0.02-0.1	0.01-0.04	0.2	0.005-0.01	0.0002	0.20-5	0.002-0.01	0.20	0.01	0.20-5
			All results in mg/L															
TA2-SW1-320	1/05/94	TA2S-013922	NA[e]	0.006	1.9	ND[f]	190	ND	17	ND	20	0.77	ND	7.8	0.003	48	ND	22
TA2-NW1-325	1/06/94	TA2N-013920	NA	ND	.24	ND	100	ND	0.08	ND	14	ND	ND	2.1	0.005	10	ND	24
TA2-SW1-320	4/07/94	T2SW-014913	NA	0.004	0.36	ND	97	0.05	15	ND	17	0.39	ND	4.9	0.004	55	ND	18
TA2-NW1-325	4/11/94	T2NW-014914	NA	ND	0.25	ND	110	ND	0.08	ND	15	ND	ND	2.1	0.006	10	ND	25
TA2-NW1-325	4/11/94	T2NW-014915 (Duplicate of T2NW-014914)	NA	ND	0.24	ND	110	ND	0.09	ND	14	ND	ND	2.0	0.007	10	ND	24
TA2-SW1-320	7/15/94	SNL/NM016750	18	0.005	0.44	ND	130	0.04	18	ND	19	0.59	ND	5.8	0.003	46	ND	18
TA2-NW1-325	7/18/94	SNL/NM016751	ND	ND	0.23	ND	110	ND	0.02	ND	14	ND	ND	1.8	0.006	11	ND	24
TA2-NW1-325	7/18/94	SNL/NM016752 (Duplicate of SNL/NM016751)	ND	ND	0.24	ND	110	0.02	0.02	ND	15	ND	ND	2.0	0.008	11	ND	25
TA2-W-01	7/20/94	SNL/NM016753	3.1	0.003	1.3	ND	74	0.02	5.4	ND	10	0.97	ND	5.5 B[g]	0.003	17	ND	40
Equipment Blank	10/12/94	SNL/NM019402	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
TA2-SW1-320	10/12/94	SNL/NM019403	7.6	ND	1.4	ND	81	ND	7.3	ND	14	0.19	ND	8.2	ND	ND	ND	23
TA2-SW1-320 (duplicate)	10/12/94	SNL/NM019404	3.8	ND	1.4	ND	72	ND	3.8	ND	13	0.10	ND	ND	ND	ND	ND	22
TA2-NW1-325	10/13/94	SNL/NM019408	ND	ND	0.23	ND	110	ND	ND	ND	15	ND	ND	ND	0.005	ND	ND	25
TA2-W-01	10/14/94	SNL/NM019410	0.97	ND	ND	ND	68	ND	1.0	ND	9.0	0.22	ND	ND	0.005	ND	ND	45

[a]MCL = Maximum concentration level established by U.S. Environmental Protection Agency (EPA) Primary Drinking Water Regulations (PDWR) in 40 CFR 141.11 (b) and subsequent amendments.
[b]mg/L = Milligrams per liter.
[c]NE = Not established for this constituent.
[d]MDL = Minimum method detection limit obtained for nondetected parameters.
[e]NA = No analysis was performed for this analyte.
[f]ND = Not detected.
[g]B = Analyte present in method blank.

Table 19
Summary of Radiological Results
Sandia National Laboratories/New Mexico
TA-2 Groundwater Monitoring, 1994

	Analyte	Results (pCi/L)[a]	2-Sigma[b] (pCi/L)	DOE Guideline[c] (pCi/L)	Critical Level, Lc (counts)	Decision Amount, DA[d] (pCi/L)
Sample #: TA2N013920 Well ID: TA2-NW1-325 Sampling Date: 1/6/94	Gross Alpha	4.1	2.7	15	3	1
	Gross Beta	3.1	1.7	30	24	1
	Tritium	78	150	80000	39	138
Sample #: TA2S013922 Well ID: TA2-SW1-320 Sampling Date: 1/5/94	Gross Alpha	3.2	1.7	15	3	0
	Gross Beta	3.4	1.6	30	24	1
	Tritium	31	150	80000	39	134
Sample #: T2SW014913 Well ID: TA2-SW1-320 Sampling Date: 4/7/94	Gross Alpha	40	10	15	14	2
	Gross Beta	45	7.7	30	51	2
	Tritium	180	150	80000	40	130
Sample #: T2NW014914 Well ID: TA2-NW1-325 Sampling Date: 4/11/94	Gross Alpha	4.8	1.6	15	14	1
	Gross Beta	5.3	1.1	30	51	1
	Tritium	48	240	80000	40	130
Sample #: T2NW-014915 Well ID: TA2-NW1-325 Sampling Date: 4/11/94 (Duplicate of T2NW014914)	Gross Alpha	4.7	1.5	15	14	1
	Gross Beta	5	1.1	30	51	1
	Tritium	110	150	80000	40	130
Sample #: SNL/NM016750 Well ID: TA2-SW1-320 Sampling Date: 7/15/94	Gross Alpha	53	21	15	7	8
	Gross Beta	52	13	30	28	6
	Tritium	230[e]	150	80000	39	129
Sample #: SNL/NW016751 Well ID: TA2-NW1-325 Sampling Date: 7/18/94	Gross Alpha	1.0	1.7	15	7	2
	Gross Beta	4.3	1.6	30	28	1
	Tritium	230[e]	150	80000	39	128
Sample #: SNL/NW016752 Well ID: TA2-NW1-325 Sampling Date: 7/18/94 (Duplicate of SNL/NW016752)	Gross Alpha	3.4	2.4	15	7	2
	Gross Beta	2.9	1.7	30	28	1
	Tritium	400	150	80000	39	129
Sample #: SNL/NW016753 Well ID: TA2-W-01 Sampling Date: 7/20/94	Gross Alpha	16	6.1	15	7	3
	Gross Beta	14	4.3	30	28	3
	Tritium	350	160	80000	39	137

[a] pCi/L = Picocuries per liter.
[b] Counting error.
[c] DOE Guideline = U.S. Department of Energy, "Radiation Protection to the Public and the Environment," DOE 5400.5, 02-08-90, Chapter III, U.S. Department of Energy, Washington, D.C.
[d] DA = Decision amount = critical level / [(Aliquot × Yield × Eff. × 2.22] (Time)].
[e] Analyte also detected in method blank.

Table 20
Summary of Groundwater Elevations for TA-2 Monitoring Wells
Sandia National Laboratories/New Mexico

Monitoring Well	Date of Measurement	POM[a] (FAMSL)[b]	Depth to Water (ft)	Water Elevation (FAMSL)
TA2-SW1-320	01/05/94	5409.18	310.75	5098.43
	02/08/94	5409.18	310.81	5098.37
	03/04/94	5409.18	310.87	5098.31
	04/06/94	5409.18	311.12	5098.06
	05/10/94	5409.18	311.10	5098.08
	06/06/94	5409.18	311.09	5098.09
	06/30/94	5409.18	311.07	5098.11
	08/08/94	5409.18	311.07	5098.11
	09/06/94	5409.18	311.04	5098.14
	10/07/94	5409.18	311.03	5098.15
	11/07/94	5409.18	311.15	5098.03
	12/09/94	5409.18	311.22	5097.96
TA2-NW1-325	01/05/94	5418.59	308.56	5110.03
	02/08/94	5418.59	308.52	5110.07
	03/04/94	5418.59	308.73	5109.86
	04/06/94	5418.59	308.95	5109.64
	05/10/94	5418.59	308.88	5109.71
	06/06/94	5418.59	309.01	5109.58
	06/30/94	5418.59	308.96	5109.63
	08/08/94	5418.59	308.98	5109.61
	09/06/94	5418.59	308.94	5109.65
	10/07/94	5418.59	308.95	5109.64
	11/07/94	5418.59	309.11	5109.48
	12/09/94	5418.59	309.20	5109.39
TA2-NW1-595	01/05/94	5419.27	528.25	4891.02
	02/08/94	5419.27	527.30	4891.97
	03/04/94	5419.27	527.62	4891.65
	04/06/94	5419.27	528.10	4891.17
	05/10/94	5419.27	529.56	4889.71
	06/06/94	5419.27	529.72	4889.55
	06/30/94	5419.27	530.21	4889.06
	08/08/94	5419.27	530.00	4889.27
	09/06/94	5419.27	529.94	4889.33
	10/07/94	5419.27	529.61	4889.66
	11/07/94	5419.27	NM[c]	NM
	12/09/94	5419.27	NM	NM
TA2-W-01	08/08/94	5417.32	320.02	5097.30
	09/06/94	5417.32	319.96	5097.36
	10/07/94	5417.32	319.97	5097.35
	11/07/94	5417.32	320.20	5097.12
	12/09/94	5417.32	320.27	5097.05

[a]POM = Point of measurement; elevation in FAMSL.
[b]FAMSL = Feet above mean sea level.
[c]NM = Not measured.

Refer to footnotes at end of table.

AL/12-94/WP/SNL:T3565/99 301455.213.01

ADDENDUM

Sources of Supporting Information

In preparation for requesting an administrative with confirmatory sampling NFA decision for ER Site 135, a background study was conducted to collect available and relevant site information. Background information sources included existing records and reports of site activity. In addition, interviews were conducted with SNL/NM staff and contractors familiar with site operational history.

The following information sources were available for use in the evaluation of ER Site 135:

- Results for soil samples from a borehole drilled behind Building 906 in the area of the abandoned dry well and the center of the leachfield;
- Results from a passive soil vapor survey (SVS) investigation conducted in the area surrounding Building 906 (NERI 1994);
- Results of a surface radiation survey performed over the Building 906 septic system leachfield area;
- Results from a geophysical Surface Towed Ordinance Locator System (STOLS™) survey (Geo-Centers 1994) and an electromagnetic (EM) survey (LAMB 1994); and
- Interviews [combined and summarized in three reports (Anonymous, no date; Haines, Kelly and Cochran, 1991, and Byrd, 1991)].

NOD

SHEARS #176234

U.S. Department of Energy
Albuquerque Operations Office
Kirtland Area Office
P.O. Box 5400
Albuquerque, NM 87185-5400

M.J.
Fran
David
Dick
Laine
Mtth.
Brenda
Copied 1/31/00

JAN 26 2000

CERTIFIED MAIL - RETURN RECEIPT REQUESTED

Mr. James Bearzi, Chief
Hazardous and Radioactive Materials Bureau
New Mexico Environment Department
2044 Galisteo Street
P.O. Box 26110
Santa Fe, NM 87502-2100

Dear Mr. Bearzi:

Enclosed is one of two NMED copies of the Department of Energy and Sandia National Laboratories/New Mexico response to the NMED Notice of Deficiency (NOD), dated October 13, 1999, for Environmental Restoration sites 7, 46, 48, 50, 136, 159, 166, 227, 229, 230, 231, 233, 234, and 235. These sites were all included in the 2nd batch of No Further Action (NFA) proposals.

If you have any questions, please contact John Gould at (505) 845-6089.

Sincerely,

George K. Laskar

Michael J. Zamorski
Area Manager

Enclosure

Sandia National Laboratories
Albuquerque, New Mexico
December 1999

Environmental Restoration Project
Responses to NMED Notice of Deficiency
No Further Action Proposals (2nd Round)
Dated June 1995

INTRODUCTION

Sandia National Laboratories/New Mexico (SNL/NM) is submitting this Notice of Deficiency (NOD) response for sites managed by the Tijeras Arroyo Operable Unit (OU) 1309 and the Technical Area (TA) II OU 1303. This response addresses Enclosures A and B comments in the October 13, 1999 NOD (NMED, 1999).

This is the second NOD response for Environmental Restoration (ER) Sites 50 and 235. Most of the following information addresses omissions in the ER Sites 50 and 235 No Further Action (NFA) Proposals (SNL/NM, 1995) and the first ER Sites 50 and 235 NOD responses (SNL/NM, 1996). This response addresses the need for reorganizing the confirmatory sampling analytical data and conducting human health and ecological risk assessments. For ER Site 50, this response also contains additional analytical data obtained during the Voluntary Corrective Measure activities recently conducted at nearby ER Site 228A (the Centrifuge Dump Site) in 1999 (SNL/NM, 1999). For ER Site 235, this response addresses the need for reorganizing the confirmatory sampling analytical data and conducting human and ecological risk assessments.

TABLE OF CONTENTS

Site-Specific Comments

RESPONSES TO NMED NOTICE OF DEFICIENCY COMMENTS
ON NO FURTHER ACTION PROPOSALS
ER SITES 7, 46, 48, 135, 136, 159, 165, 166, 167, 227, 229, 230, 231, 232, 233, AND 234
JUNE 1995 (2ND ROUND)

ENCLOSURE B

The following discussion documents the negotiations between SNL/NM ER staff and NMED HRMB staff as requested in NMED (1999). These negotiations were finalized in a November 17, 1999 meeting.

OU 1303

ER Sites 48, 135, 136, 159, 165, 166, and 167 (TA-2 Septic Systems)

Additional site characterization work proposed includes:

1. ***Finish compiling and provide the information requested in Stu Dindwiddie's letter to Michael Zamorski (DOE) and Joan Woodard (SNLNM) (dated December 11, 1998).***

   Response: The information requested in the referenced letter is listed below and is followed by the SNL/NM response.

   a. **Please submit maps showing the locations of boreholes with respect to seepage pits and other septic-system components for the above ER sites (48, 135, 136, 159, 165, 166, and 167).**

   Response: The existing site maps have been revised to reflect the best-known information on all the TA-II septic and drain system sites. The changes are based on SNL/NM Facilities Engineering drawings and Global Positioning System (GPS) mapping of visible system components. To improve the accuracy of the site maps, an excavator and GPS surveying will be used to locate system components below grade, confirm drainfield dimensions, and pinpoint effluent release locations. Planning for this work is in progress. Accurate site maps will be available in May 2000. Any further sampling at TA-II ER septic and drain system sites will be discussed with NMED HRMB staff when the maps are finalized. Note that this comment also addresses ER Sites 135 and 165, which were not incorporated in the 2nd Round of the NFA proposals. After discussions with NMED HRMB, the HE rinse-water drain from Site 48 will be investigated at the same time as co-located ER Sites 227 and 229, which are managed by Tijeras Arroyo OU 1309.

   b. **Please submit all analytical results of soil samples obtained from these boreholes. Data tables must include a listing of all constituents analyzed for, analytical methods, detection limits, and concentrations.**

Site-Specific Comments

Response: The requested soil analytical results for the boreholes at TA-II ER septic and drain system sites will be submitted with the revised site maps.

2. **Summarize in written form, as applicable, all geologic, hydrologic, and ground-water quality data for all boreholes and ground-water monitor wells in the vicinity of TA-2.**

Response: SNL/NM will summarize in written form, as applicable, all geologic, hydrologic, and groundwater quality data for all boreholes and groundwater monitor wells in the vicinity of the TA-II ER sites. This information will be presented in the Sandia North Groundwater Investigation Annual Report for FY01 or FY02.

RSI

National Nuclear Security Administration
Sandia Site Office
P.O. Box 5400
Albuquerque, New Mexico 87185-5400

JUN 1 8 2004

CERTIFIED MAIL-RETURN RECEIPT REQUESTED

Mr. John E. Kieling, Manager
Permits Management Program
Hazardous Waste Bureau
New Mexico Environment Department
2905 Rodeo Park Rd., Building E
Santa Fe, NM 87505

Dear Mr. Kieling,

On behalf of the Department of Energy (DOE) and Sandia Corporation, DOE is submitting the enclosed Solid Waste Management Unit (SWMU) Assessment Reports and Proposals for No Further Action (NFA) for Drain and Septic Systems (DSS) Sites 1010, 1028, 1083, and 1086. DOE is also submitting the Request for Supplemental Information (RSI) responses for SWMUs 48, 135, 136, 159, 165, 166, and 167; and a soil vapor summary report for Technical Area II at Sandia National Laboratories, New Mexico, EPA ID No. NM5890110518. These documents are compiled as DSS Round 5 and NFA Batch 23.

On April 29, 2004, the final Compliance Order on Consent (Consent Order) for Sandia National Laboratories was issued, replacing the HSWA Module as the sole enforceable mechanism for corrective action. The enclosed SWMU Assessment Reports/NFA Proposals and RSI responses were in the final stage of preparation when the Order was issued; thus, the enclosed documents contain language related to a NFA determination. We are requesting, consistent with the terminology in the Consent Order, an NMED determination of corrective action complete for each of these DSS sites.

This submittal includes descriptions of the site characterization work and risk assessments for DSS Sites 1010, 1028, 1083, and 1086, and SWMUs 48, 135, 136, 159, 165, 166, and 167. The risk assessments conclude that for these eleven sites: (1) there is no significant risk to human health under both the industrial and residential land-use scenarios; and (2) that there are no ecological risks associated with these sites.

Based on the information provided, DOE and Sandia are requesting a determination of corrective action complete without controls for these DSS sites.

If you have any questions, please contact John Gould at (505) 845-6089.

Sincerely,

Patty Wagner

Patty Wagner
Manager

Enclosure

cc w/ enclosure:
L. King, EPA, Region 6 (2 copies, via Certified Mail)
W. Moats, NMED-HWB (via Certified Mail)
M. Gardipe, NNSA/SC/ERD
C. Voorhees, NMED-OB (Santa Fe)
D. Bierley, NMED-OB

cc w/o enclosure:
J. Bearzi, NMED-HWB
K. Thomas, EPA, Region 6
F. Nimick, SNL, MS 1089
D. Stockham, SNL, MS 1087
P. Freshour, SNL, MS 1087
M. Sanders, SNL, MS 1087
R. Methvin, SNL MS 1089
J. Pavletich, SNL MS 1087
A. Villareal, SNL, MS 1035
A. Blumberg, SNL, MS 0141
M. J. Davis, SNL, MS 1089
ESHSEC Records Center, MS 1087

Sandia National Laboratories/New Mexico
Environmental Restoration Project

REQUEST FOR SUPPLEMENTAL INFORMATION RESPONSE FOR DRAIN AND SEPTIC SYSTEMS SWMU 135, BUILDING 906 DRAIN SYSTEM AT TECHNICAL AREA II

June 2004

United States Department of Energy
Sandia Site Office

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ACRONYMS AND ABBREVIATIONS

AOP	Administrative Operating Procedure
ARCH	air-rotary casing hammer
bgs	below ground surface
COC	constituent of concern
DSS	Drain and Septic Systems
EB	equipment blank
EPA	U.S. Environmental Protection Agency
ER	Environmental Restoration
HE	high explosive(s)
HI	hazard index
HWB	Hazardous Waste Bureau
KAFB	Kirtland Air Force Base
MDA	minimum detectable activity
MDL	method detection limit
mrem	millirem
NFA	no further action
NMED	New Mexico Environment Department
NOD	Notice of Deficiency
PCB	polychlorinated biphenyl
RCRA	Resource Conservation and Recovery Act
RPSD	Radiation Protection Sample Diagnostics
RSI	Request for Supplemental Information
SNL/NM	Sandia National Laboratories/New Mexico
SVOC	semivolatile organic compound
SWMU	Solid Waste Management Unit
TA	Technical Area
TAG	Tijeras Arroyo Groundwater
TB	trip blank
TEDE	total effective dose equivalent
TOP	Technical Operating Procedure
VOC	volatile organic compound
yr	year

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1.0 INTRODUCTION

1.1 Investigation History

In August 1994, no further action (NFA) proposals were submitted for Solid Waste Management Units (SWMUs) 135 and 165 in Technical Area (TA)-II at Sandia National Laboratories/New Mexico (SNL/NM). In July 1995, NFA proposals were also submitted for TA-II SWMUs 48, 136, 159, 166, and 167. These seven SWMUs are shown on Figure 1.1-1.

In November 1995, the New Mexico Environment Department (NMED) Hazardous Waste Bureau (HWB) responded with comments on the NFA proposals submitted for SWMUs 48, 136, 159, 166, and 167 and recommended that a Resource Conservation and Recovery Act (RCRA) Facility Investigation Work Plan, which included these SWMUs, be developed for TA-II. At that time, the SNL/NM Environmental Restoration (ER) Project decided to undertake the investigation and cleanup of these sites and others in TA-II as Voluntary Corrective Actions, and formal work plans were not submitted.

On October 13, 1999, the NMED-HWB issued a Notice of Deficiency (NOD) for these seven SWMUs. Negotiations on November 17, 1999, further defined specific procedures for sampling these seven SWMUs and transferred a requirement for groundwater reporting for these SWMUs to the ongoing Tijeras Arroyo Groundwater (TAG) Investigation. The NOD subsequently was changed by the NMED to a Request for Supplemental Information (RSI).

The requirements negotiated to fulfill the RSI for these seven TA-II SWMUs were:

- Submit revised site maps showing septic and drain system component locations (as determined by backhoe excavation).
- Submit the results for passive soil-vapor surveys and active soil-vapor monitoring wells at TA-II.
- Collect soil samples at a depth equal to the base, and 5 feet below the base, of septic tanks, seepage pits, and drain lines. Sample locations in drainfields and system outfalls were approved by HWB personnel.
- Analyze soil samples for volatile organic compounds (VOCs), semivolatile organic compounds (SVOCs), high explosive (HE) compounds, polychlorinated biphenyls (PCBs), RCRA metals, including hexavalent chromium, and total cyanide, radionuclides by gamma spectroscopy, and gross alpha/beta activity.
- Submit revised risk assessments for all seven SWMUs using all available soil data.

On January 26, 2000, the SNL/NM ER Project submitted a response to the NMED RSI, agreeing to excavations to locate system components below ground surface (bgs), confirm drainfield dimensions, pinpoint effluent release points, and investigate the SWMU 48 HE rinse-water drain line. SNL/NM also agreed to discuss additional sampling with the NMED-HWB when the maps were finalized and to submit the groundwater data requested in a subsequent TAG Investigation report.

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Legend

Road
Fence
Building / Structure
DSS SWMU

Figure 1.1-1
Location Map of Drain and Septic Systems (DSS) SWMUs at Technical Area-II (TA-II)

0 200 400
Scale In Feet

0 48 96
Scale In Meters

Sandia National Laboratories, New Mexico
Environmental Geographic Information System

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For tracking purposes, these seven SWMUs are included with sites listed in the SNL/NM Drain and Septic Systems (DSS) program reporting schedule. In this RSI response, they will be referred to as the "Drain and Septic Systems SWMUs at TA-II."

1.2 Additional Investigation Information

Although not specifically required as part of the RSI, this report presents additional information for several TA-II SWMUs as follows:

- In May 2003, soil-vapor monitoring wells were installed at SWMUs 159 and 165 as part of a separate site-wide DSS investigation. Additional details and sampling results for these wells are presented in the soil-vapor sampling chapter of this RSI response.
- Residual material in catch (settling) boxes for HE compound particulates located on HE rinse-water drain lines at SWMUs 48 and 136 was sampled as part of the site characterization process. The results are presented in the SWMU 48 and SWMU 136 chapters of this RSI response.

1.3 Report Organization

This RSI response presents the required information as follows:

- The soil-vapor survey information is presented as a whole and is not discussed on a site-by-site basis.
- Because NFA proposals were previously submitted for these SWMUs, only a brief description and history for each site is presented. Each SWMU is discussed in a separate report. The soil sampling analytical results and risk assessments for each site are presented in separate annexes for each SWMU.

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2.0 SOIL SAMPLING AT TA-II

2.1 Soil Sampling Methodology

Soil samples were collected at the TA-II DSS SWMUs using a variety of methods. Some shallow soil samples were collected from trenches excavated with a backhoe. For deep borehole sampling, either auger or air-rotary casing hammer (ARCH) drill rigs were used to drill down to the top of the desired sample interval. A drive sampler (split-spoon or thin-wall tube sampler) lined with stainless steel or brass sleeves was then mechanically advanced into the undisturbed soil below the drilled depth. For shallow soil sampling, a Geoprobe™ sample tube system with an inner butyl acetate liner was used through hollow-stem augers. The length of the recovered interval varied with the length of the sampling system, ranging from 2 feet using a split-spoon-type sampler, to up to 4 feet using a Geoprobe™ system. Following retrieval from the borehole, the sample for VOC analysis was collected by immediately capping and sealing either one of the metal liners from the split-spoon sampler or a cut portion of the butyl acetate liner from the Geoprobe™ sampler.

For the non-VOC analyses, the soil remaining in the sample sleeves or liner was emptied into a decontaminated mixing bowl, and aliquots of soil were transferred into appropriate sample containers for analysis. On occasion, the amount of soil recovered in the first sampling run was insufficient for sample volume requirements. In this case, additional sampling runs were completed until an adequate soil volume was recovered. Soil recovered from these additional runs was emptied into the mixing bowl and blended with the soil already collected. Aliquots of the blended soil were then transferred into sample containers and submitted for analysis.

All samples were documented and handled in accordance with applicable SNL/NM operating procedures and transported to on- and off-site laboratories for analysis.

2.2 Soil Sampling Events for DSS SWMUs at TA-II

In August and September 1992, 10 boreholes were drilled and sampled in the SWMU 165 drainfield. Samples were collected and analyzed for VOCs, SVOCs, HE compounds, metals, radionuclides by gamma spectroscopy, gross alpha/beta activity, and tritium. In November 1992, the groundwater monitoring well TA2-SW1-320 was installed in the shallow aquifer beneath the SWMU 165 drainfield, and soil samples collected from the borehole during drilling were analyzed for VOCs, SVOCs, PCBs, HE compounds, metals, cyanide, radionuclides by gamma spectroscopy, gross alpha/beta activity, and tritium.

In October and November 1993, trenches were excavated across septic and other drain system drain lines at SWMUs 48, 136, 165, and 166. At each trench-drain line intersection, samples were collected at three depths: the surface (0 to 0.5 feet bgs), at the top of the piping, and immediately below the piping. Samples were analyzed for VOCs, SVOCs, HE compounds, metals, radionuclides by gamma spectroscopy, and tritium.

From March to December 1994, 18 boreholes to depths of at least 50 feet were drilled throughout TA-II. The locations were chosen to be in and around the anomalies identified by the passive soil-vapor surveys, and also near the septic tanks, drain lines, and catch boxes that may have had releases. Fourteen borehole locations were near or within the seven SWMUs addressed in this RSI response. The borehole locations are shown on the appropriate sample location maps for each SWMU. The DSS SWMU 135 borehole, TA2-BH-01, was completed as groundwater monitoring well TA2-W-01. All borehole soil samples were analyzed for VOCs, SVOCs, HE compounds, metals, radionuclides by gamma spectroscopy, and tritium. Some samples were also analyzed for cyanide and gross alpha/beta activity.

In August 1995, soil samples were collected from borings drilled next to the septic tanks at SWMUs 48, 136, 159, 165, 166, and 167 using a Geoprobe™ sampling system. Samples were collected starting at the approximate depth of the septic tank bottom and analyzed for VOCs, SVOCs, HE compounds, metals, including hexavalent chromium, and total cyanide, and radionuclides by gamma spectroscopy.

In August and October 2000, additional soil sampling was conducted at the seven TA-II SWMUs to fulfill the RSI requirements. Borehole soil samples were collected at depths starting at the base and 5 feet below the base of septic tanks, seepage pits, drywells, and septic drainfield drain lines. Sample locations in drainfields and system outfalls were approved by NMED-HWB personnel. The samples were analyzed for VOCs, SVOC, PCBs, HE compounds, RCRA metals, total cyanide, and radionuclides by gamma spectroscopy.

2.2.1 Soil Sampling Events at DSS SWMU 135

Soil samples were collected from three boreholes at DSS SWMU 135. The 1994 borehole samples were collected using a hollow-stem auger and a 2-foot-long, split-spoon-type drive sampler. Samples in the drainfield were collected in 2000 with a Geoprobe™ from two 3-foot-long sampling intervals at each boring location. Drainfield sampling intervals started at 12 and 16 feet bgs in the north lateral sampling location and 8 and 13 feet bgs in the south lateral sampling location.

The drainfield lateral soil samples were collected in accordance with the procedures developed for, and described in, the Operable Unit 1295 Sampling and Analysis Plan (SNL/NM October 1999) and subsequent "Field Implementation Plan, Characterization of Non-Environmental Restoration Drain and Septic Systems" (SNL/NM November 2001) approved by the NMED. The 1994 and 2000 sampling events were conducted using similar procedures.

3.0 DSS SWMU 135: BUILDING 906 DRAIN SYSTEM

3.1 Site Description

Building 906, located approximately near the center of TA-II (Figure 3.1-1), was constructed in 1950. Little information regarding early operations at Building 906 is available. The building was used for cleaning and storing test materials from the Nevada Test Site, storing paints, chemicals, and leaking transformers, and conducting electric battery research. Additional information on the operational history for Building 906 can be found on the SNL/NM ER Project web page (SNL/NM January 2003) and in the original NFA proposal (SNL/NM August 1994). The building was decontaminated and demolished in 1999. The drain system comprising SWMU 135 is shown on Figure 3.1-2. A summary of the Building 906 drain system investigated is presented in Table 3.1-1.

3.2 DSS SWMU 135 Soil Sampling Results and Conclusions

Soil sampling was conducted at DSS SWMU 135 as described in Section 2.2. Figure 3.1-2 shows the soil sampling locations at DSS SWMU 135. The analytical data summary tables are presented in Annex A. Because there were several sampling events at this site, the results are grouped by general area or location in the analytical tables.

VOCs

VOC analytical results for soil samples collected from the DSS SWMU 135 boreholes are summarized in Table A-1, and method detection limits (MDLs) for the VOC soil analyses are presented in Table A-2.

Acetone, 2-butanone, methylene chloride, and toluene were detected in the soil samples from the groundwater monitoring well borehole BH-01. Acetone was detected in both equipment blank (EB) samples, while methylene chloride was detected in only one of the two EB samples and one of the two trip blank (TB) samples associated with the borehole BH-01 samples.

No VOCs were detected in the drainfield borehole samples or in the one duplicate sample collected in August 2000. Carbon disulfide was detected only in the EB sample associated with this sampling period, while chloromethane was detected only in the TB associated with the drainfield borehole samples. Most of the VOCs detected are common laboratory contaminants and may not indicate soil contamination at this site.

SVOCs

SVOC analytical results for the soil samples collected from the DSS SWMU 135 boreholes are summarized in Table A-3, and MDLs for the SVOC soil analyses are presented in Table A-4. Ten SVOCs were detected in the 6-foot sample from the monitoring well borehole BH-01 collected in March 1994. One SVOC, bis(2-ethylhexyl) phthalate, was also detected in all three

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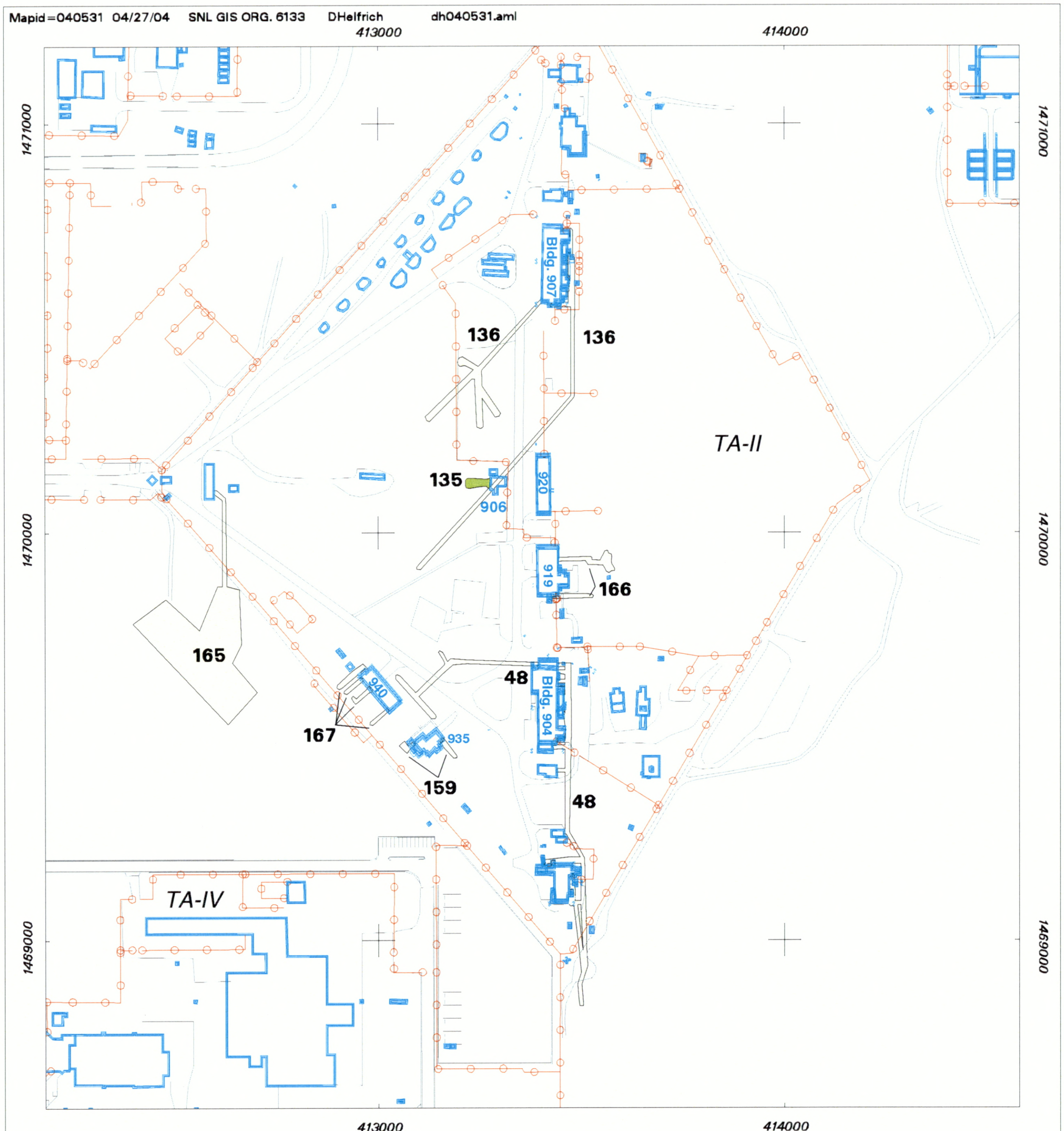

Legend

Road

Fence

Building / Structure

DSS SWMU 135

Other DSS SWMU

Figure 3.1-1
Drain and Septic Systems (DSS) SWMU 135, Bldg. 906 Drain System, TA-II

0 200 400
Scale in Feet

0 48 96
Scale in Meters

Sandia National Laboratories, New Mexico
Environmental Geographic Information System

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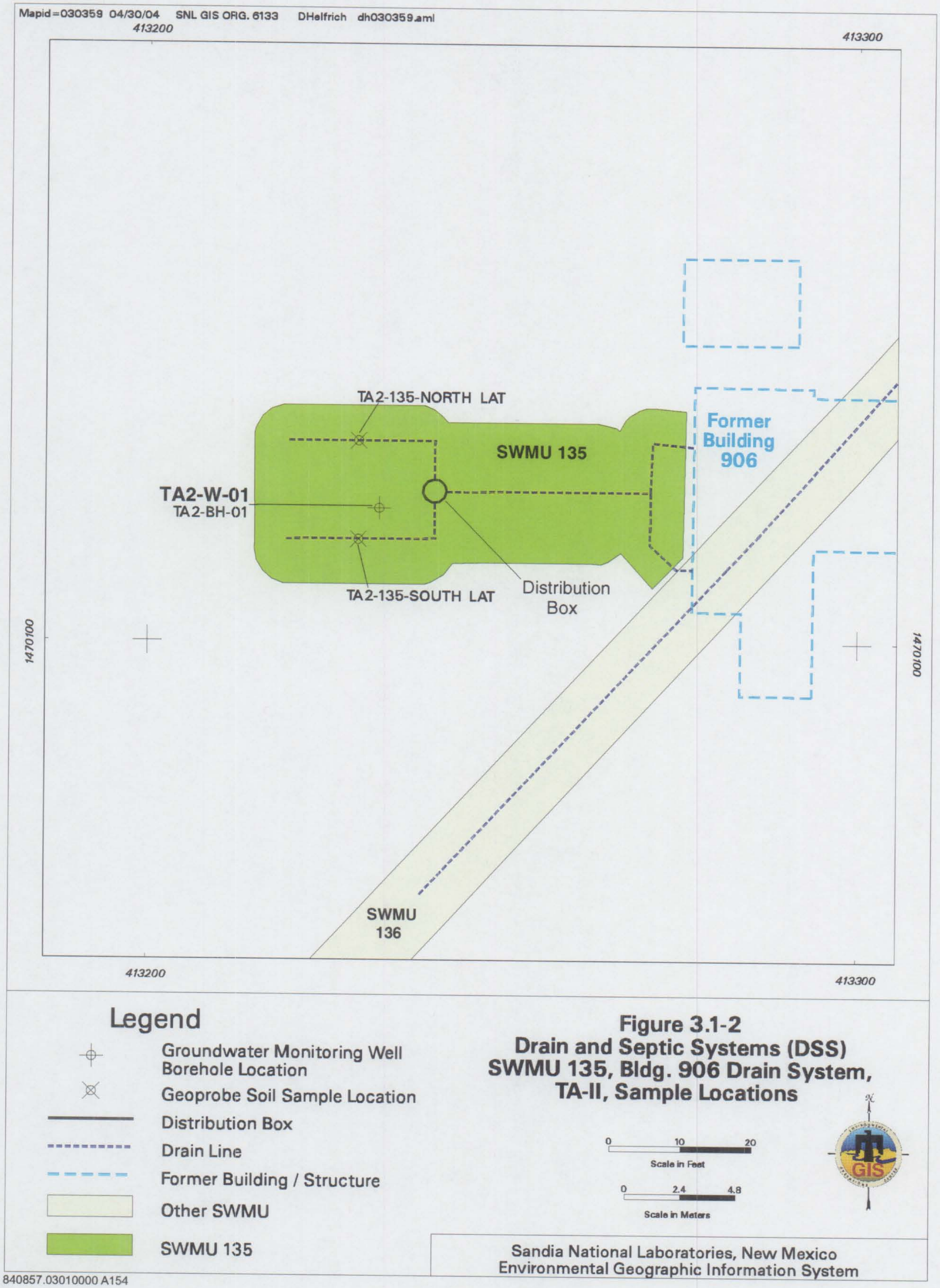

Legend

Figure 3.1-2
Drain and Septic Systems (DSS)
SWMU 135, Bldg. 906 Drain System,
TA-II, Sample Locations

Sandia National Laboratories, New Mexico
Environmental Geographic Information System

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Table 3.1-1
Summary of DSS SWMU 135, Building 906 Drain System

Building 906 Drain Systems	System Operational Years	Building 906 System Description	System Status
1-drain system	1950–1978, 1978–1990s	The original drain system consisted of a drywell that received discharges from a fume hood sink and two floor drains. The drywell was used from 1950 to 1978, when the newer drainfield was installed to serve a shower installed in the north end of the building. The new drainfield was installed across the location of the old drywell and consisted of two gravel-filled trenches, each approximately 20 feet long. Each trench was 2 feet wide, 2 feet deep, and contained a 4-inch-diameter drain line (Figure 3.1-2). No toilet or septic tank was ever installed at this building.	Drain system abandoned in place.

DSS = Drain and Septic Systems.
SWMU = Solid Waste Management Unit.

samples from borehole BH-01, and in one of the two EBs associated with borehole BH-01. No SVOCs were detected in the drainfield borehole samples, the duplicate, or the associated EB collected in August 2000.

PCBs

PCB analytical results for the soil samples collected from the DSS SWMU 135 boreholes are summarized in Table A-5, and MDLs for the PCB soil analyses are presented in Table A-6. No PCBs were detected in any of the drainfield borehole samples or the duplicate collected in August 2000. Aroclor-1260 was detected in the EB associated with these samples.

HE Compounds

HE compound analytical results for the soil samples collected from the DSS SWMU 135 boreholes are summarized in Table A-7, and MDLs for the HE compound soil analyses are presented in Table A-8. No HE compounds were detected in any of the soil samples, duplicates, or EB samples collected at this site.

Metals, including Cyanide

Metals, including cyanide, analytical results for the soil samples collected from the DSS SWMU 135 boreholes are summarized in Table A-9, and MDLs for the metals and cyanide soil analyses are presented in Table A-10. Eight metals were detected at concentrations above their respective NMED-approved background concentrations for SNL/NM North Area Supergroup soils (Dinwiddie September 1997) or above the nonquantified background concentration in the monitoring well borehole (BH-01) samples. Analytical results were comparable for the primary and duplicate soil sample pairs collected in 1994 and 2000.

Cyanide was not detected in any sample where an analysis for it was performed.

Barium, silver, manganese, uranium, and zinc were detected in one or both of the EBs associated with the March 1994 samples. Arsenic, chromium, and lead were detected in the EB associated with the August 2000 samples.

Radionuclides

Analytical results for the gamma spectroscopy analysis of the soil samples collected from the DSS SWMU 135 boreholes are summarized in Table A-11. Uranium-235 was detected above the NMED-approved background in two of the four samples from the drainfield borehole samples collected in August 2000. All other radionuclides were not detected. Higher activities for thorium-232 and uranium-235 were measured in the 8-foot-bgs duplicate sample from the southern lateral drainfield borehole.

In addition, although not detected, the minimum detectable activities (MDAs) for uranium-235 exceeded the background activity in two of the drainfield borehole samples because the standard gamma spectroscopy count time for soil samples (6,000 seconds) was not sufficient to reach the NMED-approved background activities established for SNL/NM soils (Dinwiddie

September 1997). Even though the MDAs may be slightly elevated, they are still very low, and the risk assessment outcome for the site is not significantly impacted by their use.

Tritium

Tritium analytical results for of the soil samples collected from the DSS SWMU 135 boreholes are summarized in Table A-12. Tritium was not detected above the SNL/NM-established background for soil (Tharp February 1999) in any sample collected. The results for the duplicate sample analysis for the 50-foot-bgs monitoring well borehole sample were comparable.

3.2.1 Soil Sampling Quality Assurance/Quality Control Samples and Data Validation

Quality assurance/quality control samples were collected according to the ER Project guidelines and operating procedures in effect at the time of sampling. These included duplicate, EB, and TB samples. EB samples were analyzed for the same analytical suite as the soil samples. TB samples were included with soil sample shipments sent to laboratories for VOC analysis. The analytical results for the EB and TB samples appear only on the data tables for the site where they were reported. However, the results would have been used in the data validation process for all the samples analyzed at that time. EB and TB results are discussed with the associated analytical results above.

As shown in the results tables in Annex A, to assess the precision and repeatability of sampling and analytical procedures, duplicate soil samples (designated 'DU') were collected and analyzed. Duplicate sample results are discussed with the associated analytical results in Section 3.2.

All laboratory data were reviewed and verified/validated according to "Verification and Validation of Chemical and Radiochemical Data," Technical Operating Procedure (TOP) 94-03, Rev. 0 (SNL/NM July 1994) or SNL/NM ER Project "Data Validation Procedure for Chemical and Radiochemical Data," in Administrative Operating Procedure (AOP) 00-03 (SNL/NM December 1999). In addition, SNL/NM Department 7713 (Radiation Protection Sample Diagnostics [RPSD] Laboratory) reviewed all on-site gamma spectroscopy results according to "Laboratory Data Review Guidelines," Procedure No. RPSD-02-11, Issue No. 2 (SNL/NM July 1996). The data are acceptable for use in this RSI response.

3.3 Site Sampling Data Gaps

Analytical data from the site assessment were sufficient for characterizing the nature and extent of possible constituent of concern (COC) releases. There are no further data gaps regarding characterization of DSS SWMU 135.

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4.0 CONCEPTUAL SITE MODEL

The conceptual site model for DSS SWMU 135, the Building 906 Drain System, is based upon the COCs identified in the soil samples collected from boreholes near, and beneath, the drainfield at this site. This section summarizes the nature and extent of contamination and the environmental fate of the COCs.

4.1 Nature and Extent of Contamination

Potential COCs at DSS SWMU 135 are VOCs, SVOCs, PCBs, HE compounds, metals, cyanide, and radionuclides. There were no PCBs or HE compounds detected in any of the soil samples. Four VOCs and 10 SVOCs were detected in the soil samples. Eight metals were detected at concentrations above the approved maximum background concentrations for SNL/NM North Area Supergroup soils (Dinwiddie September 1997) or above the nonquantified background concentrations. Cyanide was not detected above the nonquantified background concentration. When a metal concentration exceeded its maximum background screening value, had MDLs above background, or had no quantified background value, it was considered further in the risk assessment process. Uranium-235 was detected at activities above the corresponding background level. For some of the uranium-235 analyses, the MDA exceeded the corresponding background activity.

4.2 Environmental Fate

Potential COCs may have been released into the vadose zone via aqueous effluent discharged from the former drywell and drainfield. Possible secondary release mechanisms include the uptake of COCs that may have been released into the soil beneath the former drywell and drainfield (Figure 4.2-1).

Two water-bearing zones, a shallow groundwater system and the regional aquifer, underlie DSS SWMU 135. The depth to the shallow groundwater system is approximately 300 feet bgs. The shallow groundwater system is not used as a water supply. The depth to the regional aquifer is approximately 545 feet bgs. Both the City of Albuquerque and Kirtland Air Force Base (KAFB) utilize the regional aquifer as a water supply. Groundwater flow in the shallow groundwater system is to the southeast, while regional groundwater flow is predominantly to the north-northwest in this portion of KAFB. The nearest downgradient water-supply wells are KAFB-4 and KAFB-1, which are approximately 1.1 and 1.3 miles west and northwest of the site, respectively. The depth to the shallow and regional aquifers at the site (approximately 300 and 545 feet bgs) most likely precludes migration of potential COCs into the groundwater system. The potential pathways to receptors include soil ingestion, dermal contact, irradiation, and inhalation, which could occur as a result of receptor exposure to contaminated subsurface soil at the site. No intake routes through plant, meat, or milk ingestion are considered appropriate for either the industrial or residential land-use scenarios. Annex B provides additional discussion on the fate and transport of COCs at DSS SWMU 135.

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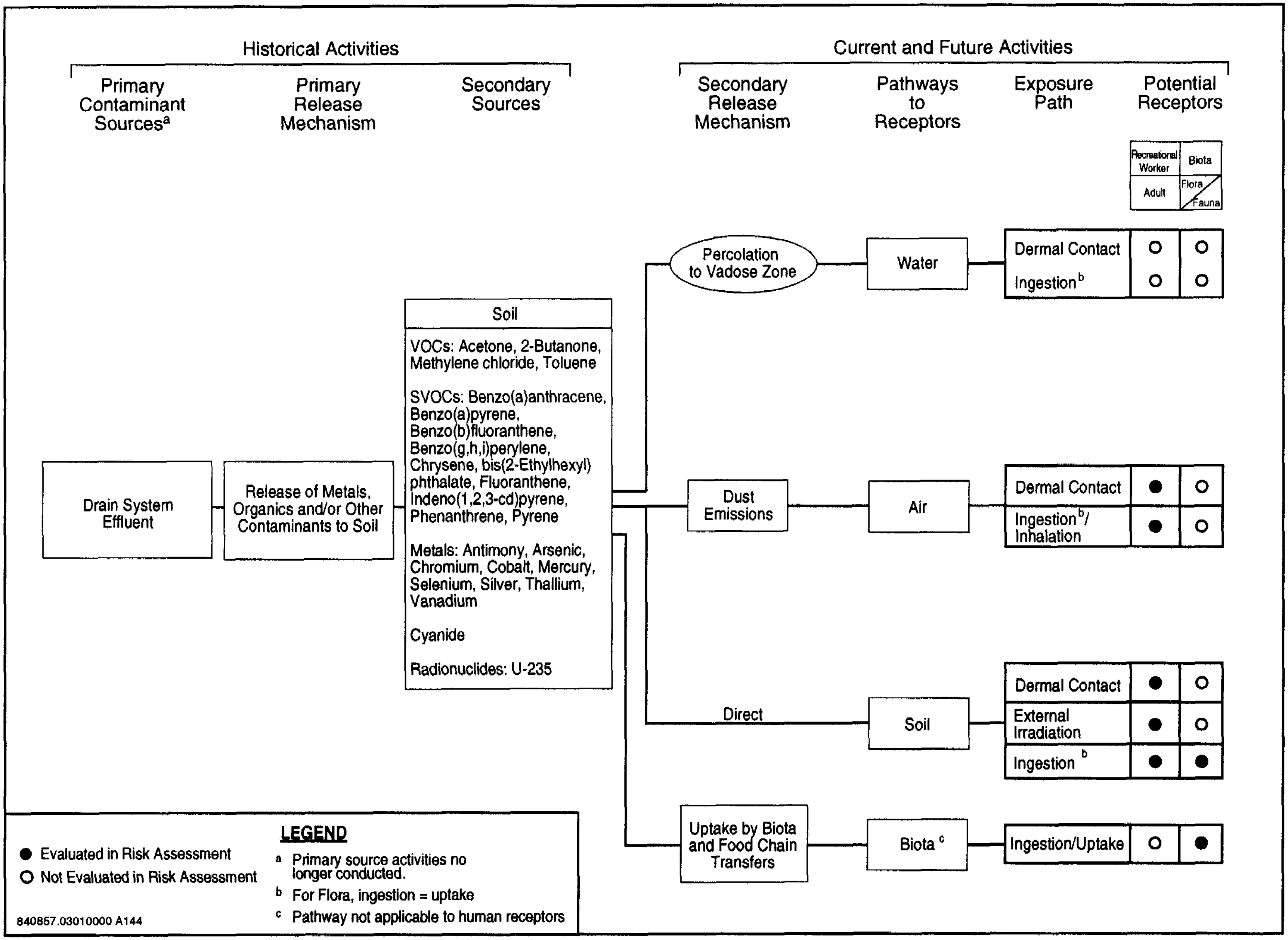

Figure 4.2-1

Conceptual Site Model Flow Diagram for DSS SWMU 135, Building 906 Drain System

Table 4.2-1 summarizes the potential COCs for DSS SWMU 135. All potential COCs were retained in the conceptual model and evaluated in both the human health and ecological risk assessments. The current and future land use for DSS SWMU 135 is industrial (DOE et al. September 1995).

The potential human receptors at the site are considered to be an industrial worker and resident. The exposure routes for the receptors are dermal contact and ingestion/inhalation; however, these are realistic possibilities only if contaminated soil is excavated at the site. The major exposure route modeled in the human health risk assessment is soil ingestion for the COCs. The inhalation pathway is included because of the potential to inhale dust and volatiles. The dermal pathway is included because of the potential for receptors to be exposed to the contaminated soil.

Potential biota receptors include flora and fauna at the site. Major exposure routes for biota include direct soil ingestion, ingesting COCs through food chain transfers, and direct contact with COCs in the soil. Annex B provides additional discussion of the exposure routes and receptors at DSS SWMU 135.

4.3 Site Assessment

Site assessment at DSS SWMU 135 included risk assessments for both human health and ecological risk. This section briefly summarizes the site assessment results, and Annex B discusses the risk assessment performed for DSS SWMU 135 in more detail.

4.3.1 Summary

The site assessment concluded that DSS SWMU 135 poses no significant threat to human health under either the industrial or residential land-use scenarios. Ecological risks are expected to be very low.

4.3.2 Risk Assessments

Risk assessments were performed for both human health and ecological risk at DSS SWMU 135. This section summarizes the results.

4.3.2.1 Human Health

DSS SWMU 135 has been recommended for an industrial land-use scenario (DOE et al. September 1995). Because acetone, 2-butanone, methylene chloride, toluene, benzo(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene, benzo(g,h,i)perylene, chrysene, bis(2-ethylhexyl) phthalate, fluoranthene, ideno(1,2,3-cd)pyrene, phenanthrene, pyrene, arsenic, chromium, cobalt, mercury, selenium, silver, thallium, vanadium, cyanide, and uranium-235 are present above background or have nonquantified background levels, it was necessary to perform a human health risk assessment analysis for the site, which included these COCs. Annex B provides a complete discussion of the risk assessment process, results,

Table 4.2-1
Summary of Potential COCs in Soil for DSS SWMU 135, Building 906 Drain System

COC Type	Number of Soil Samples[a]	COCs Detected or with Concentrations Greater than Background or Nonquantified Background	Maximum Background Limit/North Area Supergroup[b] (mg/kg)	Maximum Concentration[c] (All Samples) (mg/kg)	Average Concentration[d] (mg/kg)	Number of Samples Where COCs Detected with Concentrations Greater than Background or Nonquantified Background[e]
VOCs	9	Acetone	NA	0.037	0.0156	3
	9	2-Butanone	NA	0.0064 J	0.0031	2
	9	Methylene Chloride	NA	0.016	0.0045	4
	9	Toluene	NA	0.0069	0.0022	3
SVOCs	8	Benzo(a)anthracene	NA	0.120 J	0.060	1
	8	Benzo(a)pyrene	NA	0.140 J	0.063	1
		Benzo(b)fluoranthene	NA	0.180 J	0.069	1
	8	Benzo(g,h,i)perylene	NA	0.093 J	0.097	1
	8	Chrysene	NA	0.150 J	0.065	1
	8	bis(2-Ethylhexyl) phthalate	NA	0.530	0.238	3
	8	Fluoranthene	NA	0.370	0.095	1
	8	Ideno(1,2,3-cd)pyrene	NA	0.085 J	0.078	1
	8	Phenanthrene	NA	0.310 J	0.085	1
	8	Pyrene	NA	0.320 J	0.131	1
PCBs	5	None	NA	NA	NA	None
HE Compounds	13	None	NA	NA	NA	None
Metals	9	Antimony	3.9	ND (6)	2.99	None
	14	Arsenic	4.4	6.2	2.54	2
	14	Chromium	12.8	41.3	10.06	1
	9	Cobalt	7.1	8.4	5.64	1
	14	Mercury	NQ	0.51 J	0.068	1
	14	Selenium	NQ	ND (2)	0.347	None
	14	Silver	NQ	1	0.500	1
	9	Thallium	NQ	ND (1)	0.472	None
	9	Vanadium	33	34	25.86	1

Refer to footnotes at end of table.

Table 4.2-1 (Concluded)
Summary of Potential COCs in Soil for DSS SWMU 135, Building 906 Drain System

COC Type		Number of Soil Samples[a]	COCs Detected or with Concentrations Greater than Background or Nonquantified Background	Maximum Background Limit/North Area Supergroup[b] (mg/kg)	Maximum Concentration[c] (All Samples) (mg/kg)	Average Concentration[d] (mg/kg)	Number of Samples Where COCs Detected with Concentrations Greater than Background or Nonquantified Background[e]
Cyanide		5	Cyanide	NQ	ND (0.091)	0.046	None
Radionuclides (pCi/g)	Gamma Spectroscopy	5	Uranium-235	0.18	0.326	NC[f]	2

[a]Number of soil samples includes duplicates and splits.
[b]Dinwiddie September 1997.
[c]Maximum concentration for metals and cyanide, or maximum activity for radionuclides, is the greater of either the maximum amount detected or the maximum MDL or MDA above background or nonquantified background. For other COCs, the value listed is the maximum amount detected.
[d]Average concentration includes all samples except blanks. The average is calculated as the sum of detected amounts and one-half of the MDLs for nondetect results, divided by the number of samples.
[e]See appropriate data table for sample locations.
[f]An average MDA is not calculated because of the variability in instrument counting error and the number of reported nondetect activities for gamma spectroscopy or tritium analyses.

COC = Constituent of concern.
DSS = Drain and Septic Systems.
HE = High explosive(s).
J = Analytical result was qualified as an estimated value.
MDA = Minimum detectable activity.
MDL = Method detection limit.
mg/kg = Milligram(s) per kilogram.
NA = Not applicable.
NC = Not calculated.
ND ( ) = Not detected above the MDA shown in parentheses.
NQ = Nonquantified background value.
PCB = Polychlorinated biphenyl.
pCi/g = Picocurie(s) per gram.
SVOC = Semivolatile organic compound.
SWMU = Solid Waste Management Unit.
VOC = Volatile organic compound.

and uncertainties. The risk assessment process provides a quantitative evaluation of the potential adverse human health effects from constituents in the site's soil by calculating the hazard index (HI) and excess cancer risk for both industrial and residential land-use scenarios.

The HI calculated for the COCs at DSS SWMU 135 is 0.17 for the industrial land-use scenario, which is less than the numerical standard of 1.0 suggested by risk assessment guidance (EPA 1989). The incremental HI risk, determined by subtracting risk associated with background from potential nonradiological COC risk (without rounding), is 0.15. The excess cancer risk for DSS SWMU 135 COCs is 5E-6 for an industrial land-use scenario. NMED guidance states that cumulative excess lifetime cancer risk must be less than 1E-5 (Bearzi January 2001); thus the excess cancer risk for this site is below the suggested acceptable risk value. The incremental excess cancer risk is 2.61E-6. Both the incremental HI and excess cancer risk are below NMED guidelines.

The HI calculated for the COCs at DSS SWMU 135 is 1.04 for the residential land-use scenario, which is above than the numerical standard of 1.0 suggested by risk assessment guidance (EPA 1989). The incremental HI risk, determined by subtracting risk associated with background from potential nonradiological COC risk (without rounding), is 0.77. The excess cancer risk for DSS SWMU 135 COCs is 2E-5 for a residential land-use scenario. NMED guidance states that cumulative excess lifetime cancer risk must be less than 1E-5 (Bearzi January 2001); thus the excess cancer risk for this site is above the suggested acceptable risk value. The incremental excess cancer risk is 9.43E-6. Both the incremental HI and excess cancer risk are below NMED guidelines.

Although the total HI is at, and the total estimated excess cancer risk is slightly above, the NMED guideline for the residential land-use scenario, maximum concentrations were used in the risk calculation. Because the site has been adequately characterized, average concentrations are more representative of actual site conditions. Using the 95% upper confidence limit of the average concentrations for arsenic, the main contributor to risk (4.95 milligrams/kilogram), reduces the total and incremental HI to 0.99 and 0.72, respectively. The total estimated excess cancer risk is reduced to 1.8E-5, and the incremental excess cancer risk is reduced to 6.21E-6. Thus, by using realistic concentrations in the risk calculations that more accurately depict actual site conditions, the incremental estimated cancer risk is below NMED guidelines.

For the radiological COCs, one of the constituents (uranium-235) had MDA values greater than the corresponding background values. The incremental total effective dose equivalent (TEDE) and corresponding estimated cancer risk from radiological COCs are much lower than the U.S. Environmental Protection Agency (EPA) guidance values. The estimated TEDE is 1.7E-2 millirem (mrem)/year (yr) for the industrial land-use scenario, which is much lower than the EPA's numerical guidance of 15 mrem/yr (EPA 1997a). The corresponding incremental estimated cancer risk value is 1.5E-7 for the industrial land-use scenario. Furthermore, the incremental TEDE for the residential land-use scenario that results from a complete loss of institutional controls is 5.1E-2 mrem/yr with an associated risk of 5.3E-7. The guideline for this scenario is 75 mrem/yr (SNL/NM February 1998). Therefore, DSS SWMU 135 is eligible for unrestricted radiological release.

The incremental nonradiological and radiological carcinogenic risks are tabulated and summed in Table 4.3.2-1.

Table 4.3.2-1
Summation of Incremental Radiological and Nonradiological Risks from
DSS SWMU 135, Building 906 Drain System Carcinogens

Scenario	Nonradiological Risk	Radiological Risk	Total Risk
Industrial	2.61E-6	1.5E-7	2.8E-6
Residential	6.21E-6	5.3E-7	6.7E-6

DSS = Drain and Septic Systems.
SWMU = Solid Waste Management Unit.

Uncertainties associated with the calculations are considered small relative to the conservatism of the risk assessment analysis. Therefore, it is concluded that this site poses insignificant risk to human health under both the industrial and residential land-use scenarios.

4.3.2.2 Ecological

An ecological assessment that corresponds with the procedures in the EPA's Ecological Risk Assessment Guidance for Superfund (EPA 1997b) also was performed as set forth by the NMED Risk-Based Decision Tree in the "RPMP [RCRA Permits Management Program] Document Requirement Guide" (NMED March 1998). An early step in the evaluation compared COC concentrations and identified potentially bioaccumulative constituents (see Annex B, Sections IV, VII.2, and VII.3). This methodology also required developing a site conceptual model and a food web model, as well as selecting ecological receptors, as presented in "Predictive Ecological Risk Assessment Methodology, Environmental Restoration Program, Sandia National Laboratories, New Mexico" (IT July 1998). The risk assessment also includes the estimation of exposure and ecological risk.

Uranium was the only analyte detected in the upper 5 feet of soil. However, the maximum concentration is less than its corresponding background screening value for the site. Therefore, no constituents of potential ecological concern are identified for ecological risk at DSS SWMU 135, and the ecological risks associated with DSS SWMU 135 are expected to be very low.

4.4 Baseline Risk Assessments

This section discusses the baseline risk assessments for human health and ecological risk.

4.4.1 Human Health

Because the results of the human health risk assessment summarized in Section 4.3.2.1 indicate that DSS SWMU 135 poses insignificant risk to human health under both the industrial and residential land-use scenarios, a baseline human health risk assessment is not required for this site.

4.4.2 Ecological

Because the results of the ecological risk assessment summarized in Section 4.3.2.2 indicate that ecological risks at DSS SWMU 135 are expected to be low, a baseline ecological risk assessment is not required for the site.

5.0 NO FURTHER ACTION PROPOSAL

5.1 Rationale

Based upon field investigation data and the human health and ecological risk assessment analyses, an NFA decision is recommended for DSS SWMU 135 for the following reasons:

- The soil has been sampled for all potential COCs.
- No COCs are present in the soil at levels considered hazardous to human health for either an industrial or residential land-use scenario.
- None of the COCs warrant ecological concern because no complete pathways exist at the site.

5.2 Criterion

Based upon the evidence provided in Section 5.1, DSS SWMU 135 is proposed for an NFA decision according to Criterion 5, which states, "the SWMU/AOC [area of concern] has been characterized or remediated in accordance with current applicable state or federal regulations, and the available data indicate that contaminants pose an acceptable level of risk under current and projected future land use" (NMED March 1998).

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ANNEX A
DSS SWMU 135
Analytical Data Summary Tables

LIST OF TABLES

Table

Table A-1
Summary of DSS SWMU 135, Building 906 Drain System
Confirmatory Soil Sampling, VOC Analytical Results
March 1994–August 2000
(Off-Site Laboratories)

Sample Attributes				VOCs (EPA Method 8000[a]) (µg/kg)					
Record Number[b]	ER Sample ID	Sample Depth (ft)	Sample Date	Acetone	2-Butanone	Carbon disulfide	Chloromethane	Methylene chloride	Toluene
Monitoring well borehole samples									
508477	TA2-BH-01	6.5	3-7-94	**12**	ND (10)	ND (5)	ND (10)	**4.6 J (5)**	**6.2**
508477	TA2-BH-01	10.2	3-7-94	**36**	**6.4 J (10)**	ND (5)	ND (10)	**4 J (5)**	**6.9**
508477	TA2-BH-01	16.5	3-7-94	**37**	**5.3 J (10)**	ND (5)	ND (10)	**3.4 J (5)**	**1.7 J (5)**
508243	TA2-BH-01	261.5	6-16-94	ND (10)	ND (10)	ND (5)	ND (10)	**16**	ND (5)
Drainfield borehole samples									
603364	TA2-135-NORTH LAT-S-12	12	8-21-00	ND (20 J)	ND (2.5)	ND (1.6)	ND (2.8)	ND (5)	ND (1.1)
603364	TA2-135-NORTH LAT-S-16	16	8-21-00	ND (20 J)	ND (2.5)	ND (1.6)	ND (2.8)	ND (5)	ND (1.1)
603364	TA2-135-SOUTH LAT-S-8	8	8-21-00	ND (20 J)	ND (2.5)	ND (1.6)	ND (2.8)	ND (5)	ND (1.1)
603364	TA2-135-SOUTH LAT-S-DU-8	8	8-21-00	ND (21 U)	ND (2.5)	ND (1.6)	ND (2.8)	ND (5)	ND (1.1)
603364	TA2-135-SOUTH LAT-S-13	13	8-21-00	ND (20 J)	ND (2.5)	ND (1.6)	ND (2.8)	ND (5)	ND (1.1)
Quality Assurance/Quality Control Samples (µg/L)									
508475	TA2-BH-01 (EB)	NA	3-9-94	**6.5 J (10)**	ND (10)	ND (5)	ND (10)	**1.8 J (5)**	ND (5)
508477	TA2-BH-01 (EB)	NA	3-8-94	**12**	ND (10)	ND (5)	ND (10)	ND (5)	ND (5)
508475	TA2-BH-01 (TB)	NA	3-9-94	ND (10)	ND (10)	ND (5)	ND (10)	**2.1 J (5)**	ND (5)
508477	TA2-BH-01 (TB)	NA	3-8-94	ND (10)	ND (10)	ND (5)	ND (10)	ND (5)	ND (5)
603364	TA2-135-SPT-EB	NA	8-21-00	ND (10 J)	R	**0.78 J (1)**	ND (0.26)	R	ND (5 J)
603364	TA2-135-SPT-TB	NA	8-21-00	ND (10 J)	R	ND (0.3)	**0.51 J (2)**	R	ND (1.1 U)

Note: Values in **bold** represent detected analytes.
[a]EPA November 1986.
[b]Analysis request/chain-of-custody record.
BH = Borehole.
DSS = Drain and Septic Systems.
DU = Duplicate sample.
EB = Equipment blank.
EPA = U.S. Environmental Protection Agency.
ER = Environmental Restoration.
ft = Foot (feet).
ID = Identification.
J = Analytical result was qualified as an estimated value.
J ( ) = The reported value is greater than or equal to the MDL but is less than the practical quantitation limit, shown in parentheses.
MDL = Method detection limit.

Table A-1 (Concluded)
Summary of DSS SWMU 135, Building 906 Drain System
Confirmatory Soil Sampling, VOC Analytical Results
March 1994–August 2000
(Off-Site Laboratories)

µg/kg	= Microgram(s) per kilogram.
µg/L	= Microgram(s) per liter.
NA	= Not applicable.
ND ( )	= Not detected above the MDL, shown in parentheses.
NORTH LAT	= Northern lateral.
R	= Value rejected during data validation.
S	= Soil sample.
SOUTH LAT	= Southern lateral.
SPT	= Septic tanks project.
SWMU	= Solid Waste Management Unit.
TA	= Technical Area.
TB	= Trip blank.
U	= Analytical result was qualified as not detected.
VOC	= Volatile organic compound.

Table A-2
Summary of DSS SWMU 135, Building 906 Drain System
Confirmatory Soil Sampling, VOC Analytical MDLs
March 1994–August 2000
(Off-Site Laboratories)

Analyte	EPA Method 8000[a] Detection Limits (µg/kg)
Acetone	10
Benzene	1.3–50
Bromodichloromethane	1.2–5
Bromoform	2.6–5
Bromomethane	0.67–10
2-Butanone	2.5–10
Carbon disulfide	1.6–5
Carbon tetrachloride	1.2–5
Chlorobenzene	1.7–50
Chloroethane	0.84–10
2-Chloroethyl vinyl ether	1.8
Chloroform	0.82–5
Chloromethane	2.8–10
Dibromochloromethane	1.3–5
1,1-Dichloroethane	0.5–5
1,2-Dichloroethane	0.98–5
1,1-Dichloroethene	1.2–50
cis-1,2-Dichloroethene	0.7
trans-1,2-Dichloroethene	0.71
1,2-Dichloroethene	5
1,2-Dichloropropane	1.1–5
cis-1,3-Dichloropropene	1.1–5
trans-1,3-Dichloropropene	1.7–5
Ethylbenzene	1.6–5
2-Hexanone	3–10
Methylene chloride	5
4-Methyl-2-pentanone	1.9–10
Styrene	1.2–5
1,1,2,2-Tetrachloroethane	2.9–5
Tetrachloroethene	1.5–5
Toluene	1.1–50
1,1,1-Trichloroethane	0.83–5
1,1,2-Trichloroethane	1.6–5
Trichloroethene	1.2–50

Refer to footnotes at end of table.

Table A-2 (Concluded)
Summary of DSS SWMU 135, Building 906 Drain System
Confirmatory Soil Sampling, VOC Analytical MDLs
March 1994–August 2000
(Off-Site Laboratories)

Analyte	EPA Method 8000[a] Detection Limits (µg/kg)
Vinyl acetate	10
Vinyl chloride	3.4–10
Xylene	3.4–5

Note: Because of the long time period covering sample collection at this site, MDL ranges are presented. MDLs were not routinely reported, or were reported as ranges, by the laboratories for analyses performed in the early- to mid-1990s.
[a]EPA November 1986.
DSS = Drain and Septic Systems.
EPA = U.S. Environmental Protection Agency.
MDL = Method detection limit.
µg/kg = Microgram(s) per kilogram.
SWMU = Solid Waste Management Unit.
VOC = Volatile organic compound.

Table A-3
Summary of DSS SWMU 135, Building 906 Drain System
Confirmatory Soil Sampling, SVOC Analytical Results
March 1994–August 2000
(Off-Site Laboratories)

Sample Attributes				SVOCs (EPA Method 8270[a]) (µg/kg)									
Record Number[b]	ER Sample ID	Sample Depth (ft)	Sample Date	Benzo(a)anthracene	Benzo(a)pyrene	Benzo(b)fluoranthene	Benzo(g,h,i)perylene	Chrysene	Fluoranthene	Indeno(1,2,3-cd)pyrene	Phenanthrene	Pyrene	bis(2-Ethylhexyl) phthalate
Monitoring well borehole samples													
508477	TA2-BH-01	6	3-7-94	**120 J (330)**	**140 J (330)**	**180 J (330)**	**93 J (330)**	**150 J (330)**	**370**	**85 J (330)**	**310 J (330)**	**320 J (330)**	**340**
508477	TA2-BH-01	11.6	3-7-94	ND (330)	ND (330)	ND (330)	ND (330)	ND (330)	ND (330)	ND (330)	ND (330)	ND (330)	**530**
508477	TA2-BH-01	16	3-7-94	ND (330)	ND (330)	ND (330)	ND (330)	ND (330)	ND (330)	ND (330)	ND (330)	ND (330)	**210 J (330)**
Drainfield borehole samples													
603364	TA2-135-NORTH LAT-S-12	12	8-21-00	ND (13)	ND (15)	ND (17)	ND (140)	ND (15)	ND (25 J)	ND (82)	ND (15 J)	ND (160)	ND (330 J)
603364	TA2-135-NORTH LAT-S-16	16	8-21-00	ND (13)	ND (15)	ND (17)	ND (140)	ND (15)	ND (25)	ND (82)	ND (15)	ND (160)	ND (330 J)
603364	TA2-135-SOUTH LAT-S-8	8	8-21-00	ND (13)	ND (15)	ND (17)	ND (140)	ND (15)	ND (25)	ND (82)	ND (15)	ND (160)	ND (330 J)
603364	TA2-135-SOUTH LAT-S-DU-8	8	8-21-00	ND (13)	ND (15)	ND (17)	ND (140)	ND (15)	ND (25)	ND (82)	ND (15)	ND (160)	ND (330 J)
603364	TA2-135-SOUTH LAT-S-13	13	8-21-00	ND (13)	ND (15)	ND (17)	ND (140)	ND (15)	ND (25)	ND (82)	ND (15)	ND (160)	ND (330 J)
Quality Assurance/Quality Control Samples (µg/L)													
508477	TA2-BH-01 (EB)	NA	3-8-94	ND (10)	ND (10)	ND (10)	ND (10)	ND (10)	ND (10)	ND (10)	ND (10)	ND (10)	ND (10)
508475	TA2-BH-01 (EB)	NA	3-9-94	ND (10)	ND (10)	ND (10)	ND (10)	ND (10)	ND (10)	ND (10)	ND (10)	ND (10)	**1.4 J (10)**
603364	TA2-135-SPT-EB	NA	8-21-00	ND (0.58)	ND (0.6)	ND (0.88)	ND (0.95)	ND (0.42)	ND (0.6)	ND (0.61)	ND (0.46)	ND (0.71)	ND (10 J)

Note: Values in **bold** represent detected analytes.
[a]EPA November 1986.
[b]Analysis request/chain-of-custody record.

BH	= Borehole.
DSS	= Drain and Septic Systems.
DU	= Duplicate Sample.
EB	= Equipment blank.
EPA	= U.S. Environmental Protection Agency.
ER	= Environmental Restoration.
ft	= Foot (feet).
ID	= Identification.
J	= Analytical result was qualified as an estimated value.
J ( )	= The reported value is greater than or equal to the MDL but is less than the practical quantitation limit, shown in parentheses.
MDL	= Method detection limit.
µg/kg	= Microgram(s) per kilogram.
µg/L	= Microgram(s) per liter.
NA	= Not applicable.
ND ( )	= Not detected above the MDL, shown in parentheses.
NORTH LAT	= Northern lateral.
S	= Soil sample.
SOUTH LAT	= Southern lateral.
SPT	= Septic tanks project.
SVOC	= Semivolatile organic compound.
SWMU	= Solid Waste Management Unit.
TA	= Technical Area.

Table A-4
Summary of DSS SWMU 135, Building 906 Drain System
Confirmatory Soil Sampling, SVOC Analytical MDLs
March 1994–August 2000
(Off-Site Laboratories)

Analyte	EPA Method 8270[a] Detection Limits (µg/kg)
Acenaphthene	22–3300
Acenaphthylene	26–330
Anthracene	21–330
Benzo(a)anthracene	13–330
Benzo(a)pyrene	15–330
Benzo(b)fluoranthene	17–330
Benzo(g,h,i)perylene	140–330
Benzo(k)fluoranthene	33–330
Benzoic acid	1600
Benzyl alcohol	330
4-Bromophenyl phenyl ether	24–330
Butylbenzyl phthalate	16–330
Carbazole	93
4-Chlorobenzenamine	54–330
bis(2-Chloroethoxy)methane	24–330
bis(2-Chloroethyl)ether	29–330
bis-Chloroisopropyl ether	34–330
4-Chloro-3-methylphenol	75–6700
2-Chloronaphthalene	19–330
2-Chlorophenol	39–6700
4-Chlorophenyl phenyl ether	32–330
Chrysene	15–330
o-Cresol	40–330
Dibenz[a,h]anthracene	33–330
Dibenzofuran	28–330
1,2-Dichlorobenzene	35–330
1,3-Dichlorobenzene	33–330
1,4-Dichlorobenzene	30–3300
3,3'-Dichlorobenzidine	28–660
2,4-Dichlorophenol	60–330
Diethylphthalate	55–330
2,4-Dimethylphenol	39–330
Dimethylphthalate	42–330
Di-n-butyl phthalate	25–330
Dinitro-o-cresol	120–1600
2,4-Dinitrophenol	54–1600
2,4-Dinitrotoluene	74–3300
2,6-Dinitrotoluene	59–330
Di-n-octyl phthalate	27–330
bis(2-Ethylhexyl) phthalate	36–330
Fluoranthene	25–330
Fluorene	32–330

Refer to footnotes at end of table.

Table A-4 (Concluded)
Summary of DSS SWMU 135, Building 906 Drain System
Confirmatory Soil Sampling, SVOC Analytical MDLs
March 1994–August 2000
(Off-Site Laboratories)

Analyte	EPA Method 8270[a] Detection Limits (µg/kg)
Hexachlorobenzene	24–330
Hexachlorobutadiene	23–330
Hexachlorocyclopentadiene	25–330
Hexachloroethane	29–330
Indeno(1,2,3-cd)pyrene	82–330
Isophorone	27–330
2-Methylnaphthalene	30–330
4-Methylphenol	51–330
Naphthalene	22–330
2-Nitroaniline	56–1600
3-Nitroaniline	37–1600
4-Nitroaniline	52–1600
Nitrobenzene	30–330
2-Nitrophenol	39–330
4-Nitrophenol	79–6700
n-Nitrosodiphenylamine	30–330
n-Nitrosodipropylamine	37–3300
Pentachlorophenol	65–6700
Phenanthrene	15–330
Phenol	45–6700
Pyrene	160–3300
1,2,4-Trichlorobenzene	23–3300
2,4,5-Trichlorophenol	86–1600
2,4,6-Trichlorophenol	55–330

Note: Because of the long time period covering sample collection at this site, MDL ranges are presented. MDLs were not routinely reported, or were reported as ranges, by the laboratories for analyses performed in the early- to mid-1990s.
[a]EPA November 1986.
DSS = Drain and Septic Systems.
EPA = U.S. Environmental Protection Agency.
MDL = Method detection limit.
µg/kg = Microgram(s) per kilogram.
SVOC = Semivolatile organic compound.
SWMU = Solid Waste Management Unit.

Table A-5
Summary of DSS SWMU 135, Building 906 Drain System
Confirmatory Soil Sampling, PCB Analytical Results
August 2000
(Off-Site Laboratory)

Sample Attributes				PCBs (EPA Method 8082[a]) (µg/kg)
Record Number[b]	ER Sample ID	Sample Depth (ft)	Sample Date	Aroclor-1260
Drainfield borehole samples				
603364	TA2-135-NORTH LAT-S-12	12	8-21-00	ND (31)
603364	TA2-135-NORTH LAT-S-16	16	8-21-00	ND (31)
603364	TA2-135-SOUTH LAT-S-8	8	8-21-00	ND (31)
603364	TA2-135-SOUTH LAT-S-DU-8	8	8-21-00	ND (31)
603364	TA2-135-SOUTH LAT-S-13	13	8-21-00	ND (31)
Quality Assurance/Quality Control Samples (µg/L)				
603364	TA2-135-SPT-EB	NA	8-21-00	**2.8**

Note: Values in **bold** represent detected analytes.
[a]EPA November 1986.
[b]Analysis request/chain-of-custody record.

DSS	= Drain and Septic Systems.
DU	= Duplicate Sample.
EB	= Equipment blank.
EPA	= U.S. Environmental Protection Agency.
ER	= Environmental Restoration.
ft	= Foot (feet).
ID	= Identification.
MDL	= Method detection limit.
µg/kg	= Microgram(s) per kilogram.
µg/L	= Microgram(s) per liter.
NA	= Not applicable.
ND ( )	= Not detected above the MDL, shown in parentheses.
NORTH LAT	= Northern lateral.
PCB	= Polychlorinated biphenyl.
S	= Soil sample.
SOUTH LAT	= Southern lateral.
SPT	= Septic tanks project.
SWMU	= Solid Waste Management Unit.
TA	= Technical Area.

Table A-6
Summary of DSS SWMU 135, Building 906 Drain System
Confirmatory Soil Sampling, PCB Analytical MDLs
August 2000
(Off-Site Laboratory)

Analyte	EPA Method 8082[a] Detection Limit (µg/kg)
Aroclor-1016	30
Aroclor-1221	30
Aroclor-1232	30
Aroclor-1242	30
Aroclor-1248	30
Aroclor-1254	31
Aroclor-1260	31

[a]EPA November 1986.
DSS = Drain and Septic Systems.
EPA = U.S. Environmental Protection Agency.
MDL = Method detection limit.
µg/kg = Microgram(s) per kilogram.
PCB = Polychlorinated biphenyl.
SWMU = Solid Waste Management Unit.

Table A-7
Summary of DSS SWMU 135, Building 906 Drain System
Confirmatory Soil Sampling, HE Compounds Analytical Results
March 1994–August 2000
(Off-Site Laboratories)

Sample Attributes				HE
Record Number[b]	ER Sample ID	Sample Depth (ft)	Sample Date	(EPA Method 8330[a]) (Units as indicated)
Monitoring well borehole samples (mg/kg)				
508477	TA2-BH-01	6	3-7-94	ND
508477	TA2-BH-01	11.6	3-7-94	ND
508477	TA2-BH-01	16	3-7-94	ND
508477	TA2-BH-01	25	3-8-94	ND
508477	TA2-BH-01	32	3-8-94	ND
508477	TA2-BH-01	40	3-8-94	ND
508477	TA2-BH-01	55	3-8-94	ND
508477	TA2-BH-01 (DU)	55	3-8-94	ND
Drainfield borehole samples (µg/kg)				
603364	TA2-135-NORTH LAT-S-12	12	8-21-00	ND
603364	TA2-135-NORTH LAT-S-16	16	8-21-00	ND
603364	TA2-135-SOUTH LAT-S-8	8	8-21-00	ND
603364	TA2-135-SOUTH LAT-S-DU-8	8	8-21-00	ND
603364	TA2-135-SOUTH LAT-S-13	13	8-21-00	ND
Quality Assurance/Quality Control Samples (µg/L)				
508475	TA2-BH-01 (EB)	NA	3-9-94	ND
508477	TA2-BH-01 (EB)	NA	3-8-94	ND
603364	TA2-135-SPT-EB	NA	8-21-00	ND

[a]EPA November 1986.
[b]Analysis request/chain-of-custody record.

BH = Borehole.
DSS = Drain and Septic Systems.
DU = Duplicate sample.
EB = Equipment blank.
EPA = U.S. Environmental Protection Agency.
ER = Environmental Restoration.
ft = Foot (feet).
HE = High explosive(s).
ID = Identification.
µg/kg = Microgram(s) per kilogram.
µg/L = Microgram(s) per liter.
mg/kg = Milligrams per kilogram.
NA = Not applicable.
ND = Not detected.
NORTH LAT = Northern lateral.
S = Soil sample.
SOUTH LAT = Southern lateral.
SPT = Septic tanks project.
SWMU = Solid Waste Management Unit.
TA = Technical Area.

Table A-8
Summary of DSS SWMU 135, Building 906 Drain System
Confirmatory Soil Sampling, HE Compound Analytical MDLs
March 1994–August 2000
(Off-Site Laboratories)

Analyte	EPA Method 8330[a] Detection Limit (mg/kg)
2-Amino-4,6-dinitrotoluene	0.036
4-Amino-2,6-dinitrotoluene	0.039
1,3-Dinitrobenzene	0.036–1
2,4-Dinitrotoluene	0.035–1
2,6-Dinitrotoluene	0.110–1
HMX	0.081–1
Nitrobenzene	0.038–1
2-Nitrotoluene	0.052
3-Nitrotoluene	0.036
4-Nitrotoluene	0.073
PETN	0.124
RDX	0.038–1
Tetryl	0.021–1
1,3,5-Trinitrobenzene	0.031–1
2,4,6-Trinitrotoluene	0.020–1

Note: Because of the long time period covering sample collection at this site, MDL ranges are presented. MDLs were not routinely reported, or were reported as ranges, by the laboratories for analyses performed in the early- to mid-1990s.
[a]EPA November 1986.
DSS = Drain and Septic Systems.
EPA = U.S. Environmental Protection Agency.
HE = High explosive(s).
HMX = Octahydro-1,3,5,7-tetranitro-1,3,5,7-tetrazocine.
MDL = Method detection limit.
mg/kg = Milligrams per kilogram.
PETN = Pentaerythritol tetranitrate.
RDX = Hexahydro-1,3,5-trinitro-1,3,5-triazine.
SWMU = Solid Waste Management Unit.
Tetryl = Methyl-2,4,6-trinitrophenylnitramine.

Table A-9
Summary of DSS SWMU 135, Building 906 Drain System
Confirmatory Soil Sampling, Metals and Cyanide Analytical Results
March 1994–August 2000
(Off-Site Laboratories)

Sample Attributes				Metals (EPA Methods 6000/7000/9010A/908[a]) (mg/kg)																		
Record Number[b]	ER Sample ID	Sample Depth (ft)	Sample Date	Antimony	Arsenic	Barium	Beryllium	Cadmium	Chromium	Cobalt	Copper	Cyanide	Lead	Manganese	Mercury	Nickel	Selenium	Silver	Thallium	Uranium	Vanadium	Zinc
Monitoring well borehole samples																						
508477	TA2-BH-01	6	3-7-94	2.9 J (6)	**5.3**	147	0.38	0.77	10	5.2	11	NR	6.2	179	**ND (0.1)**	8.9	0.34 J (2)	0.7 J (1)	ND (1)	1.4[c] [5 ft]	**34**	27.5
508477	TA2-BH-01	11.6	3-7-94	**ND (6)**	2.9	116	ND (0.2)	ND (0.5)	10.4	5.2	12.8	NR	4	199	**ND (0.1)**	6.3	**ND (2)**	0.62 J (1)	ND (1)	1.7[c] [10 ft]	24.5	21.3
508477	TA2-BH-01	16	3-7-94	**ND (6)**	1.8	81.4	ND (0.2)	0.59	8.6	**8.4**	9.1	NR	3.2	271	**ND (0.1)**	8.4	**ND (1)**	0.96 J (1)	ND (1)	1.5[c] [15 ft]	19.9	53.9
508477	TA2-BH-01	25	3-8-94	**ND (6)**	2.4	94.1	ND (0.2)	ND (0.5)	**41.3**	5	8.1	NR	3.9	166	**ND (0.1)**	22.1	**ND (1)**	**1**	ND (1)	1.8	23.7	20.6
508477	TA2-BH-01	32	3-8-94	**ND (6)**	1.3	36.7	ND (0.2)	ND (0.5)	4.6	4.1	6.7	NR	2.6	151	**ND (0.1)**	4.3	0.12 J (1)	0.65 J (1)	ND (0.5)	1.5	24.6	18.4
508477	TA2-BH-01	40	3-8-94	**ND (6)**	**6.2**	31.7	0.36	ND (0.5)	7.8	5.6	10.3	NR	5.9	209	**ND (0.1)**	9.8	**ND (1)**	0.6 J (1)	ND (1)	1.3	25.4	26
508477	TA2-BH-01	55	3-8-94	**ND (6)**	1.8	64.8	ND (0.2)	ND (0.5)	9.9	6.6	11.8	NR	3.6	223	**ND (0.1)**	4.5	**ND (1)**	0.83 J (1)	ND (1)	1.8	28.9	23
508477	TA2-BH-01 (DU)	55	3-8-94	**ND (6)**	1.7	90.5	ND (0.2)	ND (0.5)	8.5	5.3	10.4	NR	3.6	196	**ND (0.1)**	5.6	**ND (1)**	0.81 J (1)	ND (1)	2.1	32.5	21.2
50823	TA2-BH-01	262	6-16-94	**ND (6)**	2.1	83.7	0.77	ND (0.5)	6.3	5.4	7.4	NR	6.7	294	**0.51 J (0.1)**	7.4	ND (0.6)	0.49 J (1)	ND (1)	NR	19.2	33
Drainfield borehole samples																						
603364	TA2-135-NORTH LAT-S-12	12	8-21-00	NR	2	156	NR	ND (0.03)	5.4	NR	NR	**ND (0.091)**	4.3 J	NR	ND (0.017)	NR	ND (0.24)	ND (0.14)	NR	NR	NR	NR
603364	TA2-135-NORTH LAT-S-16	16	8-21-00	NR	2.9	132	NR	ND (0.03)	7.6	NR	NR	**ND (0.091)**	4.6 J	NR	ND (0.017)	NR	ND (0.24)	ND (0.14)	NR	NR	NR	NR
603364	TA2-135-SOUTH LAT-S-8	8	8-21-00	NR	1.6	82.3	NR	ND (0.03)	6.4	NR	NR	**ND (0.091)**	5.4 J	NR	ND (0.017)	NR	ND (0.24)	ND (0.14)	NR	NR	NR	NR
603364	TA2-135-SOUTH LAT-S-DU-8	8	8-21-00	NR	1.7	74.9	NR	ND (0.03)	8	NR	NR	**ND (0.091)**	4.2 J	NR	ND (0.017)	NR	ND (0.24)	ND (0.14)	NR	NR	NR	NR
603364	TA2-135-SOUTH LAT-S-13	13	8-21-00	NR	1.9	94.8	NR	ND (0.03)	6	NR	NR	**ND (0.091)**	3 J	NR	ND (0.017)	NR	ND (0.24)	ND (0.14)	NR	NR	NR	NR
Background Concentration—North Area Supergroup[d]		NA	NA	3.9	4.4	200	0.8	0.9	12.8	7.1	17	NQ	11.2	831[e]	<0.1	25.4	<1	<1	<1.1	2.3	33	76
Quality Assurance/Quality Control Samples (mg/L)																						
508477	TA2-BH-01 (EB)	NA	3-8-94	ND (0.06)	ND (0.005)	0.0036 J (0.01)	ND (0.004)	ND (0.005)	ND (0.01)	ND (0.01)	ND (0.02)	NR	ND (0.005)	ND (0.01)	ND (0.0002)	ND (0.04)	ND (0.005)	ND (0.01)	ND (0.005)	0.00003 J (0.00005)	ND (0.01)	0.029
508475	TA2-BH-01 (EB)	NA	3-9-94	ND (0.06)	ND (0.005)	0.0054 J (0.01)	ND (0.004)	ND (0.005)	ND (0.01)	ND (0.01)	ND (0.02)	NR	ND (0.005)	0.0073 J (0.01)	ND (0.0002)	ND (0.04)	ND (0.005)	0.0035 J (0.01)	ND (0.005)	0.00003 J (0.00005)	ND (0.01)	0.014 J (0.02)
603364	TA2-135-SPT-EB	NA	8-21-00	NR	0.0016 J (0.01)	ND (0.0032)	NR	ND (0.0003)	0.002 J (0.005)	NR	NR	ND (1.6)	0.0023 J (0.003)	NR	ND (0.0001)	NR	ND (0.0024)	ND (0.0014 J)	NR	NR	NR	NR

Note: Values in **bold** exceed background soil concentrations.

[a]EPA November 1986.

[b]Analysis request/chain-of-custody record.

[c]Sample depth shown in brackets.

[d]Dinwiddie September 1997.

[e]USGS 1994.

BH	= Borehole.
DSS	= Drain and Septic Systems.
DU	= Duplicate sample.
EB	= Equipment blank.
EPA	= U.S. Environmental Protection Agency.
ER	= Environmental Restoration.
ft	= Foot (feet).
ID	= Identification.
J ()	= The reported value is greater than or equal to the MDL but is less than the practical quantitation limit, shown in parentheses.
MDL	= Method detection Limit.
mg/kg	= Milligram(s) per kilogram.
mg/L	= Milligram(s) per liter.
NA	= Not applicable.
ND ()	= Not detected above the MDL, shown in parentheses.
ND ()	= Not detected but the MDL, shown in parentheses, equals or exceeds the background concentration.
NORTH LAT	= Northern lateral.
NQ	= Nonquantified background value.
NR	= Not reported.
S	= Soil sample.
SOUTH LAT	= Southern lateral.
SPT	= Septic tanks project.
SWMU	= Solid Waste Management Unit.
TA	= Technical Area.
USGS	= U.S. Geological Survey.

Table A-10
Summary of DSS SWMU 135, Building 906 Drain System
Confirmatory Soil Sampling, Metals and Cyanide Analytical MDLs
March 1994–August 2000
(Off-Site Laboratories)

Analyte	EPA Method 6000/7000/9010A/908[a] Detection Limits (mg/kg)
Antimony	6–50
Arsenic	0.14–3
Barium	0.32–200
Beryllium	0.2–5
Cadmium	0.03–5
Chromium	0.11–20
Cobalt	1–50
Copper	2–25
Cyanide	0.091
Lead	0.19–3
Manganese	1–50
Mercury	0.017–0.5
Nickel	4–50
Potassium	500–5000
Selenium	0.24–3
Silver	0.14–5
Thallium	0.5–3
Uranium	0.001–0.05
Vanadium	1–50
Zinc	2–50

Note: Because of the long time period covering sample collection at this site, MDL ranges are presented. MDLs were not routinely reported, or were reported as ranges, by the laboratories for analyses performed in the early- to mid-1990s.
[a]EPA November 1986.
DSS = Drain and Septic Systems.
EPA = U.S. Environmental Protection Agency.
MDL = Method detection limit.
mg/kg = Milligram(s) per kilogram.
SWMU = Solid Waste Management Unit.

Table A-11
Summary of DSS SWMU 135 Building 906 Drain System
Confirmatory Soil Sampling, Gamma Spectroscopy Analytical Results
March 1994–August 2000
(On- and Off-Site Laboratories)

Sample Attributes				Activity (EPA 900.0[a]) (pCi/g)							
				Cesium-137		Thorium-232		Uranium-235		Uranium-238	
Record Number[b]	ER Sample ID	Sample Depth (ft)	Sample Date	Result	Error[c]	Result	Error[c]	Result	Error[c]	Result	Error[c]
Monitoring well borehole samples											
508478	TA2-BH-01	5	3-7-94	ND (0.058)	--	1.1	0.35	NR	--	NR	--
508478	TA2-BH-01	10	3-7-94	ND (0.048)	--	0.9	0.28	NR	--	NR	--
508478	TA2-BH-01	15	3-7-94	ND (0.049)	--	0.87	0.33	NR	--	NR	--
508478	TA2-BH-01	25	3-8-94	ND (0.056)	--	0.84	0.33	NR	--	NR	--
508478	TA2-BH-01	32	3-8-94	ND (0.048)	--	0.83	0.25	NR	--	NR	--
508478	TA2-BH-01	40	3-8-94	ND (0.044)	--	0.81	0.32	NR	--	NR	-
508478	TA2-BH-01	55	3-8-94	ND (0.058)	--	0.77	0.35	NR	--	NR	--
508478	TA2-BH-01 (DU)	55	3-8-94	ND (0.062)	--	0.99	0.4	NR	--	NR	--
Drainfield borehole samples											
603363	TA2-135-NORTH LAT-S-12	12	8-21-00	ND (0.0318)	--	0.901	0.417	**ND (0.191)**	--	ND (0.763)	--
603363	TA2-135-NORTH LAT-S-16	16	8-21-00	ND (0.0286)	--	0.785	0.38	**0.326**	0.168	ND (0.727)	--
603363	TA2-135-SOUTH LAT-S-8	8	8-21-00	ND (0.0302)	--	ND (0.134)	--	0.13	0.181	ND (0.783)	--
603363	TA2-135-SOUTH LAT-S-DU-8	8	8-21-00	ND (0.0305)	--	0.793	0.373	**0.189**	0.178	ND (0.748)	--
603363	TA2-135-SOUTH LAT-S-13	13	8-21-00	ND (0.0255)	--	0.548	0.329	**ND (0.182)**	--	ND (0.615)	--
Background Activity—North Area Supergroup[d]				0.084		1.54		0.18		1.3	
Quality Assurance/Quality Control Samples (pCi/mL)											
508478	TA2-BH-01 (EB)	NA	3-8-94	ND (0.020)	--	NR	--	NR	--	NR	--
508476	TA2-BH-01 (EB)	NA	3-9-94	ND (0.024)	--	NR	--	NR	--	NR	--
603363	TA2-135-SPT-EB	NA	8-21-00	ND (0.0216)	--	ND (0.145)	--	ND (0.154)	--	ND (0.386)	--

Note: Values in **bold** exceed background soil activity.
[a]EPA November 1986.
[b]Analysis request/chain-of-custody record.
[c]Two standard deviations around the mean detected activity.
[d]Dinwiddie September 1997.

BH = Borehole.
DSS = Drain and Septic Systems.
DU = Duplicate sample.
EB = Equipment blank.
EPA = U.S. Environmental Protection Agency.
ER = Environmental Restoration.
ft = Foot (feet).
ID = Identification.
MDA = Minimum detectable activity.
NA = Not applicable.
ND ( ) = Not detected above the MDA shown in parentheses.
ND ( ) = Not detected but the MDA shown in parentheses, exceeds background activity.
NORTH LAT = Northern lateral.
NR = Not reported.
pCi/g = Picocurie(s) per gram.
pCi/mL = Picocurie(s) per milliliter.
S = Soil sample.
SOUTH LAT = Southern lateral.
SPT = Septic tanks project.
SWMU = Solid Waste Management Unit.
TA = Technical Area.
-- = Error not calculated for nondetect results.

Table A-12
Summary of DSS SWMU 135, Building 906 Drain System
Confirmatory Soil Sampling, Tritium Analytical Results
March–June 1994
(Off-Site Laboratory)

Sample Attributes				Activity (EPA 906.0[a]) (pCi/L)	
Record Number[b]	ER Sample ID	Sample Depth (ft)	Sample Date	Result	Error[c]
Monitoring well borehole samples					
508478	TA2-BH-01	5	3-7-94	ND (250)	--
508478	TA2-BH-01	10	3-7-94	180	190
508478	TA2-BH-01	15	3-7-94	290	160
508478	TA2-BH-01	25	3-8-94	180	160
508478	TA2-BH-01	32	3-8-94	110	150
508478	TA2-BH-01	40	3-8-94	45	150
508478	TA2-BH-01	50	3-8-94	180	160
508478	TA2-BH-01 (DU)	50	3-8-94	110	160
508478	TA2-BH-01	58	3-8-94	81	150
508478	TA2-BH-01	75	3-8-94	ND (250)	--
508476	TA2-BH-01	99	3-9-94	180	140
508476	TA2-BH-01	150	3-9-94	340	140
508251	TA2-BH-01	200	6-16-94	310	150
508251	TA2-BH-01	260	6-16-94	260	150
508247	TA2-BH-01	298	6-21-94	290	150
Background Activity[d]				420	NA
Quality Assurance/Quality Control (pCi/L)					
508478	TA2-BH-01 (EB)	NA	3-8-94	ND (250)	--
508476	TA2-BH-01 (EB)	NA	3-9-94	ND (250)	--

[a]Laboratory analyses performed by tritium distillation method (EPA November 1986).
[b]Analysis request/chain-of-custody record.
[c]Two standard deviations around the mean detected activity.
[d]Tharp February 1999. 420 pCi/L = 0.021 pCi/g, assuming a soil density of 1 gram/cubic centimeter and 5 percent soil moisture.

BH = Borehole.
DSS = Drain and Septic Systems.
DU = Duplicate sample.
EB = Equipment blank.
EPA = U.S. Environmental Protection Agency.
ER = Environmental Restoration.
ft = Foot (feet).
ID = Identification.
MDA = Minimum detectable activity.
NA = Not applicable.
ND ( ) = Not detected above the MDA, shown in parentheses.
pCi/L = Picocurie(s) per liter.
SWMU = Solid Waste Management Unit.
TA = Technical Area.
-- = Error not calculated for nondetect results.

ANNEX B
DSS SWMU 135
Risk Assessment

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DSS SWMU 135: RISK ASSESSMENT REPORT

I. Site Description and History

Solid Waste Management Unit (SWMU) 135, the Building 906 Drain System, at Sandia National Laboratories/New Mexico (SNL/NM), is located in Technical Area (TA)-II on federally owned land controlled by Kirtland Air Force Base (KAFB) and permitted to the U.S. Department of Energy (DOE). The building drains originally discharged to a drywell. The drywell was used from 1950 to 1978 when a new drainfield was installed to serve a shower installed in the building. The drainfield consisted of two approximately 20-foot-long laterals. Available information indicates that Building 906 was constructed in 1950 (SNL/NM January 2003), and it is assumed that the drain system was also constructed at that time. Building 906 was used until sometime in the 1990s, after which time it was abandoned, decontaminated, and finally demolished in 1999. The drain system was abandoned in place.

Environmental concern about DSS SWMU 135 is based upon the potential for the release of constituents of concern (COCs) in effluent discharged to the environment via the drain system at this site. Because operational records were not available, the investigation was planned to be consistent with other drain and septic systems (DSS) site investigations and to sample for the COCs most commonly found at similar facilities.

The ground surface in the vicinity of the site is essentially flat or slopes slightly to the west. The closest major drainage is Tijeras Arroyo, located approximately 2,700 feet east of the site. No springs or perennial surface-water bodies are located within 2 miles of the site. Average annual rainfall in the SNL/NM and KAFB area, as measured at Albuquerque International Sunport, is 8.1 inches (NOAA 1990). Surface-water runoff in the vicinity of the site is minor because the surface is flat or inclines to the west. Infiltration of precipitation is almost nonexistent as virtually all of the moisture subsequently undergoes evapotranspiration. The estimates of evapotranspiration for the KAFB area range from 95 to 99 percent of the annual rainfall (SNL/NM March 1996). Most of the area immediately surrounding DSS SWMU 135 is unpaved with some native vegetation, and no storm sewers are used to direct surface water away from the site.

DSS SWMU 135 lies at an average elevation of approximately 5,414 feet above mean sea level. The groundwater beneath the site occurs in unconfined conditions in essentially unconsolidated silts, sands, and gravels. Two water-bearing zones, a shallow groundwater system and the regional aquifer, underlie DSS SWMU 135. The depth to the shallow groundwater system is approximately 300 feet below ground surface (bgs). The shallow groundwater system is not used for water supply purposes. The depth to the regional aquifer is approximately 545 feet bgs (SNL/NM May 2003). Both the City of Albuquerque and KAFB utilize the regional aquifer as a water supply. Groundwater flow in the shallow groundwater system is to the southeast, while regional groundwater flow is predominantly to the north-northwest in this portion of KAFB. The nearest water-supply wells are southwest and northwest of the site and include KAFB-1 and KAFB-4, which are approximately 1.2 and 1.1 miles away, respectively.

II. Data Quality Objectives

Between 1992 and 1994, borehole drilling, monitoring well installation, and sampling in trenches were performed in accordance with the DOE-approved "Interim RCRA [Resource Conservation and Recovery Act] Facility Investigation [RFI] Workplan" (SNL/NM 1991). Beginning in late 1994, borehole drilling and sampling were performed in accordance with the Quality Assurance Project Plan (QAPjP) for the RFI for TA-II (SNL/NM August 1994).

The sampling events completed in 2000 were conducted in accordance with the Data Quality Objectives (DQOs) presented in the "Sampling and Analysis Plan [SAP] for Characterizing and Assessing Potential Releases to the Environment From Septic and Other Miscellaneous Drain Systems at Sandia National Laboratories/New Mexico" (SNL/NM October 1999). Negotiations held on November 17, 1999, with the New Mexico Environment Department (NMED) Hazardous Waste Bureau (HWB) defined specific soil sampling procedures for the seven DSS SWMUs and transferred a requirement for groundwater reporting for these SWMUs to the ongoing Tijeras Arroyo groundwater investigation. The DQOs outlined the quality assurance (QA)/quality control (QC) requirements necessary for producing defensible analytical data suitable for risk assessment purposes. The sampling conducted at this site was designed to:

- Determine whether hazardous waste or hazardous constituents were released at the site.
- Characterize the nature and extent of any releases.
- Provide analytical data of sufficient quality to support risk assessments.

Table 1 summarizes the rationale for determining the sampling locations at this site. The source of potential COCs at DSS SWMU 135 was effluent discharged to the environment from the drainfield and former drywell at this site.

Table 1
Summary of Sampling Performed to Meet DQOs

DSS SWMU 135 Sampling Area	Potential COC Source	Number of Sampling Locations	Sample Density (samples/acre)	Sampling Location Rationale
Soil beneath the drainfield laterals and center of the drainfield	Effluent discharged to the environment from the drainfield and former drywell	3	NA	Evaluate potential COC releases to the environment from effluent discharged from the drainfield and former drywell.

COC = Constituent of concern.
DQO = Data Quality Objective.
DSS = Drain and Septic Systems.
NA = Not applicable.
SWMU = Solid Waste Management Unit.

The soil samples were collected from one area at DSS SWMU 135. The 1994 borehole samples were collected using a hollow-stem auger and a 2-foot-long, split-spoon-type drive sampler. Samples in the drainfield were collected in 2000 with a Geoprobe™ from two 3-foot-long sampling intervals at each boring location. Drainfield sampling intervals started at 12 and 16 feet bgs in the north lateral sampling location and 8 and 13 feet bgs in the south lateral sampling location. The drainfield lateral soil samples were collected in accordance with the procedures developed for, and described in, the Operable Unit (OU) 1295 SAP (SNL/NM October 1999) and subsequent "Field Implementation Plan [FIP], Characterization of Non-Environmental Restoration Drain and Septic Systems" (SNL/NM November 2001) approved by the NMED. The 1994 and 2000 sampling events were conducted using similar procedures. Table 2 summarizes the types of confirmatory and QA/QC samples collected at the site and the laboratories that performed the analyses.

The DSS SWMU 135 soil samples were analyzed for volatile organic compounds (VOCs), semivolatile organic compounds (SVOCs), high-explosive (HE) compounds, polychlorinated biphenyls (PCBs), metals, cyanide, radionuclides by gamma spectroscopy, and H-3. The samples were analyzed by off-site laboratories (Enseco, Inc. [ENS], Severn Trent Laboratories [STL], Thermo Analytical Inc./Eberline Laboratories [TMA]) and at the on-site Radiation Protection Sample Diagnostics (RPSD) Laboratory. Table 3 summarizes the analytical methods and the data quality requirements based upon the subsequently developed OU 1295 SAP (SNL/NM October 1999) and FIP (SNL/NM November 2001).

The QA/QC samples were collected during the sampling effort according to the Environmental Restoration (ER) Project QAPjP. The QA/QC samples consisted of three trip blanks and three equipment blanks (EBs) for VOCs, three EBs for SVOCs, HE compounds, metals, and gamma spectroscopy, two EBs for H-3, and one EB for PCBs and cyanide. During the 1994 borehole sampling activities, field duplicates were collected for HE compounds, metals, gamma spectroscopy, and H-3. During the 2000 drainfield sampling activities, field duplicate samples were collected for all analyses performed. No significant QA/QC problems were identified in the QA/QC samples.

All of the DSS SWMU 135 soil sample results were verified/validated by SNL/NM. The off-site laboratory results from ENS, STL, and TMA were reviewed according to either SNL/NM ER Project "Verification and Validation of Chemical and Radiochemical Data," Technical Operating Procedure (TOP) 94-03, Rev. 0 (SNL/NM July 1994) or earlier ER Project Administrative Operating Procedures. The gamma spectroscopy data from the RPSD Laboratory were reviewed according to "Laboratory Data Review Guidelines," Procedure No. RPSD-02-11, Issue No. 2 (SNL/NM July 1996) or an earlier procedure. The reviews confirmed that the analytical data are defensible and therefore acceptable for use in the response to the Request for Supplemental Information (RSI). Therefore, the DQOs have been fulfilled.

III. Determination of Nature, Rate, and Extent of Contamination

III.1 Introduction

The determination of the nature, migration rate, and extent of contamination at DSS SWMU 135 is based upon an initial conceptual model validated with confirmatory sampling at the site. The initial conceptual model is developed from archival site research, site inspections, soil sampling, and passive soil-vapor sampling. The DQOs contained in the RFI Workplan (SNL/NM 1991)

Table 2
Number of Confirmatory Soil and QA/QC Samples Collected from DSS SWMU 135

Sample Type	VOCs	SVOCs	PCBs	HE	RCRA Metals	Cyanide	Gamma Spectroscopy Radionuclides	H-3
Confirmatory	8	7	4	11	12	4	11	14
Duplicates	1	1	1	2	2	1	2	1
EBs and TBs[a]	6	3	1	3	3	1	3	2
Total Samples	15	11	6	16	17	6	16	17
Analytical Laboratory	ENS, STL	ENS, STL	STL	ENS, STL	ENS, STL	STL	TMA, RPSD	TMA

[a]TBs for VOCs only.
DSS = Drain and Septic Systems.
EB = Equipment blank.
ENS = Enseco, Inc., Arvada, Colorado.
HE = High explosive(s).
PCB = Polychlorinated biphenyl.
QA = Quality assurance.
QC = Quality control.
RCRA = Resource Conservation and Recovery Act.
RPSD = Radiation Protection Sample Diagnostics Laboratory.
STL = Severn Trent Laboratories.
SVOC = Semivolatile organic compound.
SWMU = Solid Waste Management Unit.
TB = Trip blank.
TMA = Thermo Analytical Inc./Eberline Laboratories.
VOC = Volatile organic compound.

Table 3
Summary of Data Quality Requirements for DSS SWMU 135

Analytical Method[a]	Data Quality Level	ENS	STL	TMA	RPSD
VOCs EPA Method 8000	Defensible	4	4	None	None
SVOCs EPA Method 8270	Defensible	3	4	None	None
PCBs EPA Method 8082	Defensible	None	4	None	None
HE Compounds EPA Method 8330	Defensible	7	4	None	None
Metals EPA Methods 6000/7000	Defensible	8	4	None	None
Total Cyanide EPA Method 9012A	Defensible	None	4	None	None
Gamma Spectroscopy Radionuclides EPA Method 901.1	Defensible	None	None	7	4
H-3 EPA Method 906.0	Defensible	None	None	14	None

Note: The number of samples does not include QA/QC samples such as duplicates, trip blanks, and equipment blanks.
[a]EPA November 1986.
DSS = Drain and Septic Systems.
ENS = Enseco, Inc., Arvada, Colorado.
EPA = U.S. Environmental Protection Agency.
HE = High explosive(s).
PCB = Polychlorinated biphenyl.
QA = Quality assurance.
QC = Quality control.
RPSD = Radiation Protection Sample Diagnostics Laboratory.
STL = Severn Trent Laboratories.
SVOC = Semivolatile organic compound.
SWMU = Solid Waste Management Unit.
TMA = Thermo Analytical Inc./Eberline Laboratories.
VOC = Volatile organic compound.

and the SAP (SNL/NM October 1999), as well as the negotiations with the NMED-HWB held on November 17, 1999, identified the sample locations, sample density, sample depth, and analytical requirements. The sample data were subsequently used to develop the final conceptual model for DSS SWMU 135, which is presented in Section 4.0 of the associated RSI response. The quality of the data specifically used to determine the nature, migration rate, and extent of contamination is described in the following sections.

III.2 Nature of Contamination

Both the nature of contamination and the potential for the degradation of COCs at DSS SWMU 135 were evaluated using laboratory analyses of the soil samples. The analytical requirements included analyses for VOCs, SVOCs, HE compounds, PCBs, metals, cyanide, radionuclides by gamma spectroscopy, and H-3. The analytes and methods listed in Tables 2 and 3 are appropriate to characterize the COCs and potential degradation products at DSS SWMU 135.

III.3 Rate of Contaminant Migration

The drain system at DSS SWMU 135 was deactivated in the 1990s when Building 906 was decommissioned and subsequently demolished. The migration rate of COCs that may have been introduced into the subsurface via the drain system at this site was therefore dependent upon the volume of aqueous effluent discharged to the environment from this system when it was operational. Any migration of COCs from this site after use of the drain system was discontinued has been predominantly dependent upon precipitation. However, it is highly unlikely that sufficient precipitation has fallen on the site to reach the depth at which COCs may have been discharged to the subsurface from this system. Analytical data generated from the soil sampling conducted at the site are adequate to characterize the rate of COC migration at DSS SWMU 135.

III.4 Extent of Contamination

Subsurface soil samples were collected from boreholes at the site drilled at two locations beneath the effluent release points and in one area (drainfield center) to assess whether releases of effluent from the drain system caused any environmental contamination.

The DSS SWMU 135 soil samples were collected from sampling depths starting at 12 and 16 feet bgs beneath the north drainfield lateral, 8 and 13 feet bgs beneath the south drainfield lateral, and from 6 to 298 feet bgs in the drainfield monitoring well borehole. Drainfield lateral sampling intervals started at the depths at which effluent discharged from the drainfield drain lines would have entered the subsurface environment at the site. This sampling procedure was required by NMED regulators and has been used at numerous DSS-type sites at SNL/NM. The soil samples are considered to be representative of the soil potentially contaminated with the COCs at this site and are sufficient to determine the vertical extent, if any, of COCs.

IV. Comparison of COCs to Background Screening Levels

Site history and characterization activities are used to identify potential COCs. The DSS SWMU 135 RSI response describes the identification of COCs and the sampling that was conducted in order to determine the concentration levels of those COCs across the site. Generally, COCs evaluated in this risk assessment include all detected organic compounds and all inorganic and radiological COCs for which samples were analyzed. When the detection limit of an organic compound is too high (i.e., could possibly cause an adverse effect to human health or the environment), the compound is retained. Nondetected organic compounds not included in this assessment were determined to have detection limits low enough to ensure protection of human health and the environment. In order to provide conservatism in this risk assessment, the calculation uses only the maximum concentration value of each COC found for the entire site. The SNL/NM maximum background concentration (Dinwiddie September 1997) was selected to provide the background screen listed in Tables 4 through 6.

Table 4
Nonradiological COCs for Human Health Risk Assessment at DSS SWMU 135 with Comparison to the Associated SNL/NM Background Screening Value, BCF, and Log K_{ow}

COC	Maximum Concentration (All Samples) (mg/kg)	SNL/NM Background Concentration (mg/kg)[a]	Is Maximum COC Concentration Less Than or Equal to the Applicable SNL/NM Background Screening Value?	BCF (maximum aquatic)	Log K_{ow} (for organic COCs)	Bioaccumulator?[b] (BCF>40, Log K_{ow}>4)
Inorganic						
Antimony	3[c]	3.9	Yes	16,000[d]	–	**Yes**
Arsenic	6.2	4.4	**No**	44[e]	–	**Yes**
Barium	156	200	Yes	170[f]	–	**Yes**
Beryllium	0.77	0.80	Yes	19[e]	–	No
Cadmium	0.77	0.9	Yes	64[e]	–	**Yes**
Chromium, total	41.3	12.8	**No**	16[e]	–	No
Cobalt	8.4	7.1	**No**	10,000[g]	–	**Yes**
Copper	12.8	17	Yes	6[e]	–	No
Cyanide	0.0455[c]	NC	**Unknown**	NC	–	**Unknown**
Lead	6.7	11.2	Yes	49[e]	–	**Yes**
Manganese	294	831[h]	Yes	100,000[g]	–	**Yes**
Mercury	0.51 J	<0.1	**No**	5,500[e]	–	**Yes**
Nickel	22.1	25.4	Yes	47[e]	–	**Yes**
Selenium	1[c]	<1	**No**	800[d]	–	**Yes**
Silver	1	<1	**No**	0.5[e]	–	No
Thallium	0.5[c]	<1.1	**Unknown**	119[e]	–	**Yes**
Uranium	2.1	2.3	Yes	20[f]	–	No
Vanadium	34	33	**No**	3,000[f]	–	**Yes**
Zinc	53.9	76	Yes	47[e]	–	**Yes**
Organic						
Acetone	0.037	NA	**NA**	0.69[i]	-0.24[i]	No
Benzo(a)anthracene	0.12 J	NA	**NA**	10,000[j]	5.61[j]	**Yes**
Benzo(a)pyrene	0.14 J	NA	**NA**	3,000[e]	6.04[e]	**Yes**
Benzo(b)fluoranthene	0.18 J	NA	**NA**	–	6.124[j]	**Yes**

Refer to footnotes at end of table.

Table 4 (Concluded)
Nonradiological COCs for Human Health Risk Assessment at DSS SWMU 135 with Comparison to the Associated SNL/NM Background Screening Value, BCF, and Log K_{ow}

COC	Maximum Concentration (All Samples) (mg/kg)	SNL/NM Background Concentration (mg/kg)[a]	Is Maximum COC Concentration Less Than or Equal to the Applicable SNL/NM Background Screening Value?	BCF (maximum aquatic)	Log K_{ow} (for organic COCs)	Bioaccumulator?[b] (BCF>40, Log K_{ow}>4)
Benzo(g,h,i)perylene	0.093 J	NA	**NA**	58,884[j]	6.58[j]	**Yes**
2-Butanone	0.0064 J	NA	**NA**	1[i]	0.29[i]	No
Chrysene	0.15 J	NA	**NA**	18,000[j]	5.91[j]	**Yes**
bis(2-Ethylheyxl) phthalate	0.53	NA	**NA**	851[k]	7.6[j]	**Yes**
Fluoranthene	0.37	NA	**NA**	12,302[j]	4.90[j]	**Yes**
Indeno(1,2,3-cd)pyrene	0.085 J	NA	**NA**	59,407[j]	6.58[j]	**Yes**
Methylene chloride	0.016	NA	**NA**	5[i]	1.25[i]	No
Phenanthrene	0.31 J	NA	**NA**	23,800[e]	4.63[e]	**Yes**
Pyrene	0.32 J	NA	**NA**	36,300[e]	5.32[j]	**Yes**
Toluene	0.0069	NA	**NA**	10.7[e]	2.69[e]	No

Note: **Bold** indicates the COCs that exceed the background screening values and/or are bioaccumulators.
[a]Dinwiddie September 1997, North Area Supergroup.
[b]NMED March 1998.
[c]Parameter was not detected or not detected above background. Concentration is one-half of the maximum detection limit.
[d]Callahan et al. 1979.
[e]Yanicak March 1997.
[f]Neumann 1976.
[g]Vanderploeg et al. 1975.
[h]USGS 1994.
[i]Howard 1990.
[j]Micromedex 1998.
[k]Howard 1989.

BCF = Bioconcentration factor.
COC = Constituent of concern.
DSS = Drain and Septic Systems.
J = Estimated concentration.
K_{ow} = Octanol-water partition coefficient.
Log = Logarithm (base 10).
mg/kg = Milligram(s) per kilogram.
NA = Not applicable.
NC = Not calculated.
NMED = New Mexico Environment Department.
SNL/NM = Sandia National Laboratories/New Mexico.
SWMU = Solid Waste Management Unit.
USGS = U.S. Geological Survey.
– = Information not available.

Table 5
Nonradiological COCs for Ecological Risk Assessment at DSS SWMU 135 with Comparison to the Associated SNL/NM Background Screening Value, BCF, and Log K_{ow}

COC	Maximum Concentration (Samples ≤ 5 ft bgs) (mg/kg)	SNL/NM Background Concentration (mg/kg)[a]	Is Maximum COC Concentration Less Than or Equal to the Applicable SNL/NM Background Screening Value?	BCF (Maximum Aquatic)	Log K_{ow} (for Organic COCs)	Bioaccumulator?[b] (BCF>40, Log K_{ow}>4)
Inorganic						
Uranium	1.4	2.3	Yes	20[c]	–	No

[a]Dinwiddie September 1997, North Area Supergroup.
[b]NMED March 1998.
[c]Yanicak March 1997.

BCF = Bioconcentration factor.
bgs = Below ground surface.
COC = Constituent of concern.
DSS = Drain and Septic Systems.
ft = Foot (feet).
K_{ow} = Octanol-water partition coefficient.
Log = Logarithm (base 10).
mg/kg = Milligram(s) per kilogram.
NMED = New Mexico Environment Department.
SNL/NM = Sandia National Laboratories/New Mexico.
SWMU = Solid Waste Management Unit.
– = Information not available.

Table 6
Radiological COCs for Human Health Risk Assessment at DSS SWMU 135 with Comparison to the Associated SNL/NM Background Screening Value and BCF

COC	Maximum Activity (All Samples) (pCi/g)[a]	SNL/NM Background Activity (pCi/g)[b]	Is Maximum COC Concentration Less Than or Equal to the Applicable SNL/NM Background Screening Value?	BCF (maximum aquatic)	Is COC a Bioaccumulator?[c] (BCF >40)
Cs-137	ND (0.062)	0.084	Yes	3,000[d]	**Yes**
H-3	0.017[e]	0.021[e]	Yes	NA	No
Th-232	1.1	1.54	Yes	3,000[d]	**Yes**
U-235	**0.326**	0.18	**No**	900[d]	**Yes**
U-238	ND (0.783)	1.3	Yes	900[d]	**Yes**

Note: **Bold** indicates COCs that exceed background screening values and/or are bioaccumulators.
[a]Value is the greater of either the maximum detection or the highest MDA.
[b]Dinwiddie September 1997, North Area Supergroup.
[c]NMED March 1998.
[d]Baker and Soldat 1992.
[e]Tharp February 1999. 420 pCi/L = 0.021 pCi/g, assuming a soil density of 1 gram/cubic centimeter and 5 percent soil moisture.

BCF = Bioconcentration factor.
COC = Constituent of concern.
DSS = Drain and Septic Systems.
MDA = Minimum detectable activity.
ND ( ) = Not detected above the MDA, shown in parentheses.
NMED = New Mexico Environment Department.
pCi/g = Picocurie(s) per gram.
SNL/NM = Sandia National Laboratories/New Mexico.
SWMU = Solid Waste Management Unit.

By agreement with the NMED, two metals samples analyzed by the on-site laboratory are not included in the risk assessment due to high method detection limits (MDLs) (Pavletich May 2003). The justification being that sufficient data was collected to adequately characterize the site, and the risk assessment would not be negatively impacted by exclusion of these samples.

Nonradiological inorganic constituents that are essential nutrients, such as iron, magnesium, calcium, potassium, and sodium, are not included in this risk assessment (EPA 1989). Both radiological and nonradiological COCs are evaluated. The nonradiological COCs evaluated include inorganic and organic compounds.

Tables 4 and 5 list the nonradiological COCs for the human health and ecological risk assessments at DSS SWMU 135, respectively. Table 6 lists the radiological COCs for the human health risk assessment (there are no radiological COCs for the ecological risk assessment). All tables show the associated SNL/NM maximum background screening values (Dinwiddie September 1997). Section VI.4 discusses the results presented in Tables 4 and 6, while Sections VII.2 and VII.3 discuss Table 5.

V. Fate and Transport

The primary releases of COCs at DSS SWMU 135 were to the subsurface soil resulting from the discharge of waste water from the Building 906 Drain System. Wind, water, and biota are natural mechanisms of COC transport from the primary release point; however, because the discharge was to subsurface soil, none of these are considered to be of potential significance as transport mechanisms at this site. Because the drain system is no longer active, additional infiltration of water is not expected. Infiltration of precipitation is essentially nonexistent at DSS SWMU 135, as virtually all of the moisture either drains away from the site or evaporates. Because the regional aquifer is approximately 545 feet bgs at this site, the potential for COCs to reach groundwater through the unsaturated zone above the water table is extremely low.

The COCs at DSS SWMU 135 include both inorganic and organic constituents. The inorganic COCs include both radiological and nonradiological analytes. With the exception of cyanide, the inorganic COCs are elemental in form and are not considered to be degradable. Transformations of these inorganic constituents could include changes in valence (oxidation/reduction reactions) or incorporation into organic forms (e.g., the conversion of selenite or selenate from soil to seleno-amino acids in plants). Cyanide can be metabolized by soil biota. Radiological COCs will undergo decay to stable isotopes or radioactive daughter elements. However, because of the long half-life of the radiological COC, the aridity of the environment at this site, and the lack of potential contact with biota, none of these mechanisms are expected to result in significant losses or transformations of the inorganic COCs.

The organic COCs at DSS SWMU 135 include both VOCs and SVOCs. Organic COCs may be degraded through photolysis, hydrolysis, and biotransformation. Photolysis requires light and therefore takes place in the air, at the ground surface, or in surface water. Hydrolysis includes chemical transformations in water and may occur in the soil solution. Biotransformation (i.e., transformation caused by plants, animals, and microorganisms) may occur; however, biological activity may be limited by the arid environment at this site. Because of the depth of the COCs in the soil, the loss of VOCs through volatilization is expected to be minimal.

Table 7 summarizes the fate and transport processes that can occur at DSS SWMU 135. The COCs at this site include both radiological and nonradiological inorganic analytes as well as organic analytes. Wind, surface water, and biota are considered to be of low significance as potential transport mechanisms at this site. Significant leaching into the subsurface soil is unlikely, and leaching into the regional groundwater at this site is highly unlikely. The potential for transformation of COCs is low, and loss through decay of the radiological COC is insignificant because of its long half-life.

Table 7
Summary of Fate and Transport at DSS SWMU 135

Transport and Fate Mechanism	Existence at Site	Significance
Wind	Yes	Low
Surface runoff	Yes	Low
Migration to regional groundwater	No	None
Food chain uptake	Yes	Low
Transformation/degradation	Yes	Low to moderate

DSS = Drain and Septic Systems.
SWMU = Solid Waste Management Unit.

VI. Human Health Risk Assessment

VI.1 Introduction

The human health risk assessment of this site includes a number of steps that culminate in a quantitative evaluation of the potential adverse human health effects caused by constituents located at the site. The steps to be discussed include the following:

Step 1.	Site data are described that provide information on the potential COCs, as well as the relevant physical characteristics and properties of the site.
Step 2.	Potential pathways are identified by which a representative population might be exposed to the COCs.
Step 3.	The potential intake of these COCs by the representative population is calculated using a tiered approach. The first component of the tiered approach is a screening procedure that compares the maximum concentration of the COC to an SNL/NM maximum background screening value. COCs that are not eliminated during the first screening procedure are carried forward in the risk assessment process.
Step 4.	Toxicological parameters are identified and referenced for COCs that were not eliminated during the screening procedure.
Step 5.	Potential toxicity effects (specified as a hazard index [HI]) and estimated excess cancer risks are calculated for nonradiological COCs and background. For radiological COCs, the incremental total effective dose equivalent (TEDE) and incremental estimated cancer risk are calculated by subtracting applicable background concentrations directly from maximum on-site contaminant values. This background subtraction applies only when a radiological COC occurs as contamination and exists as a natural background radionuclide.
Step 6.	These values are compared with guidelines established by the U.S. Environmental Protection Agency (EPA), NMED, and the DOE to determine whether further evaluation and potential site cleanup are required. Nonradiological COC risk values also are compared to background risk so that an incremental risk can be calculated.
Step 7.	Uncertainties of the above steps are addressed.

VI.2 Step 1. Site Data

Section I of this risk assessment provides the site description and history for DSS SWMU 135. Section II presents a comparison of results to DQOs. Section III discusses the nature, rate, and extent of contamination.

By agreement with the NMED, two metals samples analyzed by the on-site laboratory are not included in the risk assessment due to high MDLs (Pavletich May 2003). The justification being that sufficient data was collected to adequately characterize the site, and the risk assessment would not be negatively impacted by exclusion of these samples.

VI.3 Step 2. Pathway Identification

DSS SWMU 135 has been designated with a future land-use scenario of industrial (DOE et al. September 1995) (see Appendix 1 for default exposure pathways and parameters). However, the residential land-use scenario is also considered in the pathway analysis. Because of the location and characteristics of the potential contaminants, the primary pathway for human exposure is considered to be soil ingestion for the nonradiological COCs and direct gamma exposure for the radiological COCs. The inhalation pathway for both nonradiological and radiological COCs is included because the potential exists to inhale dust. Soil ingestion is included for the radiological COCs as well. The dermal pathway is included for the nonradiological COCs because of the potential for the receptor to be exposed to contaminated soil. No water pathways to the groundwater are considered; depth to the regional aquifer at DSS SWMU 135 is approximately 545 feet bgs. No intake routes through plant, meat, or milk ingestion are considered appropriate for either the industrial or residential land-use scenarios. Figure 1 shows the conceptual model flow diagram for DSS SWMU 135.

Pathway Identification

Nonradiological Constituents	Radiological Constituents
Soil ingestion	Soil ingestion
Inhalation (dust)	Inhalation (dust)
Dermal contact	Direct gamma

VI.4 Step 3. Background Screening Procedure

This section discusses Step 3, the background screening procedure, which compares the maximum COC concentration to the background screening level. The methodology and results are described in the following sections.

VI.4.1 Methodology

Maximum concentrations of nonradiological COCs were compared to the approved SNL/NM maximum screening levels for this area. The SNL/NM maximum background concentration was selected to provide the background screen in Table 4 and used to calculate risk attributable to background in Section VI.6.2. Only the COCs that were detected above the corresponding

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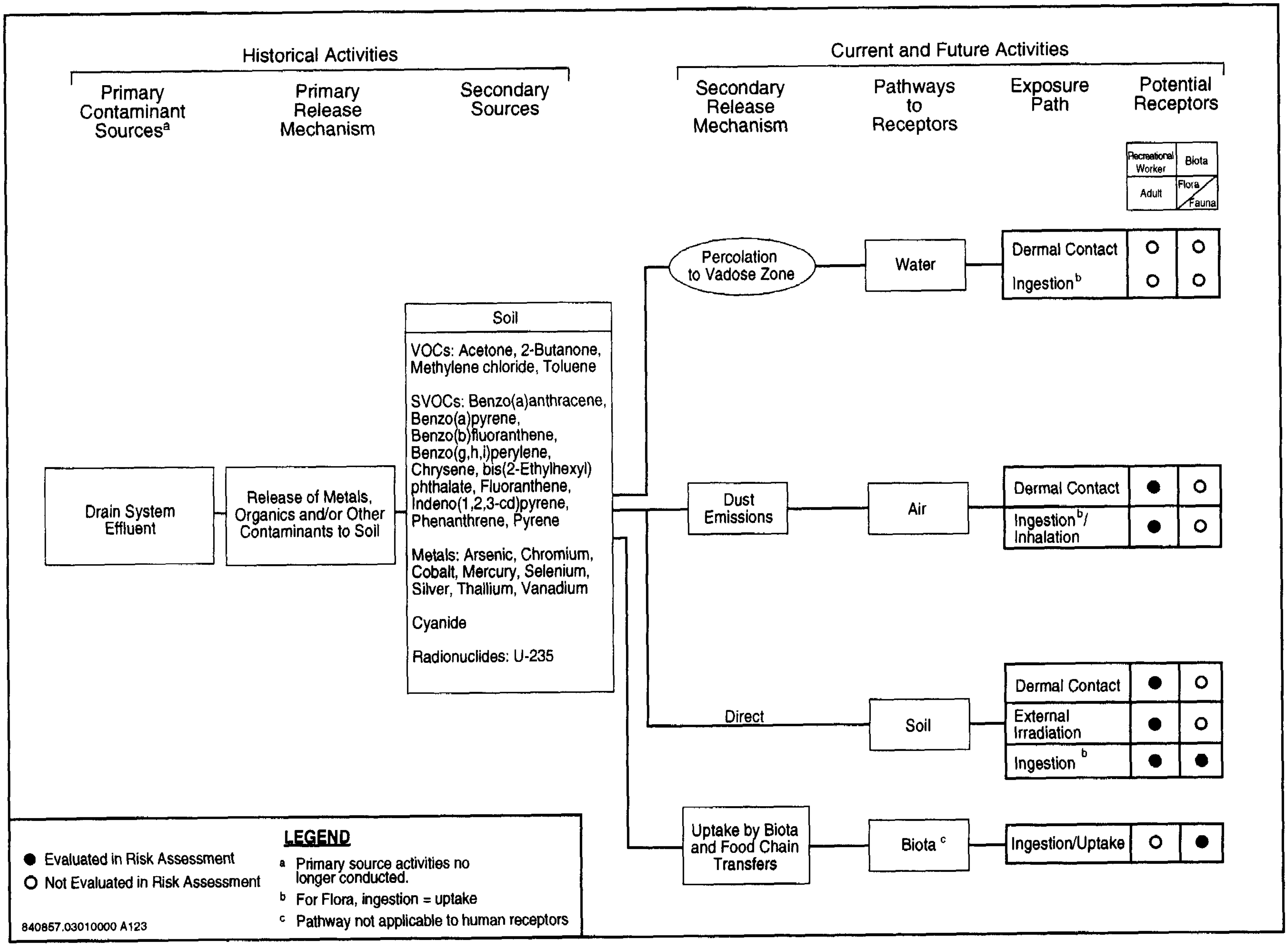

Figure 1
Conceptual Site Model Flow Diagram for DSS SWMU 135, Building 906 Drain System

SNL/NM maximum background screening levels or did not have either a quantifiable or calculated background screening level were considered in further risk assessment analyses.

For the radiological COCs that exceed the SNL/NM background screening levels, background values were subtracted from the individual maximum radionuclide concentrations. Those that do not exceed these background levels are not carried any further in the risk assessment. This approach is consistent with DOE Order 5400.5, "Radiation Protection of the Public and the Environment" (DOE 1993). Radiological COCs that do not have background screening values and were detected above the analytical minimum detectable activity (MDA) are carried through the risk assessment at the maximum levels. The resultant radiological COCs remaining after this step are referred to as background-adjusted radiological COCs.

VI.4.2 Results

Tables 4 and 6 show the DSS SWMU 135 maximum COC concentrations that were compared to the SNL/NM maximum background values (Dinwiddie September 1997) for the human health risk assessment. For the nonradiological COCs, seven constituents were measured at concentrations greater than the background screening values. Two constituents do not have quantified background screening concentrations; therefore, it is unknown whether these COCs exceed background values. Fourteen nonradiological COCs are organic compounds that do not have corresponding background screening values.

For the radiological COCs, one constituent (U-235) had detections greater than the background screening levels. The greater of either the maximum detection or the highest MDA is conservatively used in the risk assessment.

VI.5 Step 4. Identification of Toxicological Parameters

Tables 8 (nonradiological) and 9 (radiological) list the COCs retained in the risk assessment and provide the values for the available toxicological information. The toxicological values for the nonradiological COCs presented in Table 8 were obtained from the Integrated Risk Information System (IRIS) (EPA 2003), the Health Effects Assessment Summary Tables (HEAST) (EPA 1997a), the Technical Background Document for Development of Soil Screening Levels (NMED December 2000), Risk Assessment Information System (ORNL 2003), and the EPA Regions 6 and 9 electronic databases (EPA 2002a, EPA 2002b). Dose conversion factors (DCFs) used in determining the excess TEDE values for radiological COCs for the individual pathways are the default values provided in the RESRAD computer code (Yu et al. 1993a) as developed in the following documents:

- DCFs for ingestion and inhalation were taken from "Federal Guidance Report No. 11, Limiting Values of Radionuclide Intake and Air Concentration and Dose Conversion Factors for Inhalation, Submersion, and Ingestion" (EPA 1988).
- DCFs for surface contamination of the site were taken from DOE/EH-0070, "External Dose-Rate Conversion Factors for Calculation of Dose to the Public" (DOE 1988).

Table 8
Toxicological Parameter Values for DSS SWMU 135 Nonradiological COCs

COC	RfD_o (mg/kg-d)	Confidence[a]	RfD_{inh} (mg/kg-d)	Confidence[a]	SF_o $(mg/kg\text{-}d)^{-1}$	SF_{inh} $(mg/kg\text{-}d)^{-1}$	Cancer Class[b]	ABS
Inorganic								
Arsenic	3E-4[c]	M	–	–	1.5E+0[c]	1.5E+1[c]	A	0.03[d]
Chromium III	1.5E+0[c]	L	–	–	–	–	D	0.01[d]
Chromium VI	3E-3[c]	L	2.3E-6[c]	L	–	4.2E+1[c]	A	0.01[d]
Cobalt	2E-2[e]	–	5.7E-6[e]	–	–	9.8E+0[f]	–	0.01[d]
Cyanide	2E-2[c]	M	–	–	–	–	D	0.1[d]
Mercury	3E-4[g]	–	8.6E-5[c]	M	–	–	D	0.01[d]
Selenium	5E-3[c]	H	–	–	–	–	D	0.01[d]
Silver	5E-3[c]	L	–	–	–	–	D	0.01[d]
Thallium	6.6E-5[e]	–	–	–	–	–	–	0.01[d]
Vanadium	7E-3[g]	–	–	–	–	–	–	0.01[d]
Organic								
Acetone	1E-1[c]	L	1E-1[f]	–	–	–	D	0.01[h]
Benzo(a)anthracene	–	–	–	–	7.3E-1[f]	3.1E-1[f]	B2	0.13[d]
Benzo(a)pyrene	–	–	–	–	7.3E+0[c]	3.1E+0[f]	B2	0.13[d]
Benzo(b)fluoranthene	–	–	–	–	7.3E-1[f]	3.1E-1[f]	B2	0.13[d]
Benzo(g,h,i)perylene	–	–	–	–	7.3E+0[f]	3.1E+0[f]	B2	0.13[d]
2-Butanone	6E-1[c]	L	2.9E-1[c]	L	–	–	D	0.1[d]
Chrysene	–	–	–	–	7.3E-3[f]	3.1E-3[f]	B2	0.13[d]
bis(2-Ethylhexyl) phthalate	2E-2[f]	–	2E-2[f]	–	1.4E-2[f]	1.4E-2[f]	–	0.01[h]
Fluoranthene	4E-2[c]	L	4E-2[f]	–	–	–	D	0.13[d]
Indeno(1,2,3-cd)pyrene	–	–	–	–	7.3E-1[f]	3.1E-1[f]	B2	0.13[d]
Methylene chloride	6E-2[c]	M	8.6E-1[g]	–	7.5E-3[c]	1.6E-3[c]	B2	0.1[d]

Refer to footnotes at end of table.

Table 8 (Concluded)
Toxicological Parameter Values for DSS SWMU 135 Nonradiological COCs

COC	RfD_o (mg/kg-d)	Confidence[a]	RfD_{inh} (mg/kg-d)	Confidence[a]	SF_o $(mg/kg\text{-}d)^{-1}$	SF_{inh} $(mg/kg\text{-}d)^{-1}$	Cancer Class[b]	ABS
Phenanthrene[i]	3E-1[c]	L	3E-1[f]	–	–	–	D	0.1[d]
Pyrene	3E-2[c]	L	3E-2[f]	–	–	–	D	0.1[d]
Toluene	2E-1[c]	M	1.1E-1[c]	M	–	–	D	0.1[d]

[a]Confidence associated with IRIS (EPA 2003) database values. Confidence: L = low, M = medium, H = high.
[b]EPA weight-of-evidence classification system for carcinogenicity (EPA 1989) taken from IRIS (EPA 2003):
A = Human carcinogen.
B2 = Probable human carcinogen. Sufficient evidence in animals and inadequate or no evidence in humans.
D = Not classifiable as to human carcinogenicity.
[c]Toxicological parameter values from IRIS electronic database (EPA 2003).
[d]Toxicological parameter values from NMED (December 2000).
[e]Toxicological parameter values from EPA Region 9 electronic database (EPA 2002b).
[f]Toxicological parameter values from EPA Region 6 electronic database (EPA 2002a).
[g]Toxicological parameter values from HEAST (EPA 1997a).
[h]Toxicological parameter values from Risk Assessment Information System (ORNL 2003).
[i]Toxicological parameter values for phenanthrene could not be found. Anthracene was used as a surrogate.

ABS = Gastrointestinal absorption coefficient.
COC = Constituent of concern.
DSS = Drain and Septic Systems.
EPA = U.S. Environmental Protection Agency.
HEAST = Health Effects Assessment Summary Tables.
IRIS = Integrated Risk Information System.
mg/kg-d = Milligram(s) per kilogram-day.
$(mg/kg\text{-}d)^{-1}$ = Per milligram per kilogram-day.
NMED = New Mexico Environment Department.
RfD_{inh} = Inhalation chronic reference dose.
RfD_o = Oral chronic reference dose.
SF_{inh} = Inhalation slope factor.
SF_o = Oral slope factor.
SWMU = Solid Waste Management Unit.
– = Information not available.

Table 9
Radiological Toxicological Parameter Values for DSS SWMU 135 COCs Obtained from RESRAD Risk Coefficients[a]

COC	SF_o (1/pCi)	SF_{inh} (1/pCi)	SF_{ev} (g/pCi-yr)	Cancer Class[b]
U-235	4.70E-11	1.30E-08	2.70E-07	A

[a]Yu et al. 1993a.
[b]EPA weight-of-evidence classification system for carcinogenicity (EPA 1989): A = Human carcinogen for high dose and high dose rate (i.e., greater than 50 rem per year). For low-level environmental exposures, the carcinogenic effect has not been observed and documented.
1/pCi = One per picocurie.
COC = Constituent of concern.
DSS = Drain and Septic Systems.
EPA = U.S. Environmental Protection Agency.
g/pCi-yr = Gram(s) per picocurie-year.
SF_{ev} = External volume exposure slope factor.
SF_{inh} = Inhalation slope factor.
SF_o = Oral (ingestion) slope factor.
SWMU = Solid Waste Management Unit.

- DCFs for volume contamination (exposure to contamination deeper than the immediate surface of the site) were calculated using the methods discussed in "Dose-Rate Conversion Factors for External Exposure to Photon Emitters in Soil" (Kocher 1983) and in ANL/EAIS-8, "Data Collection Handbook to Support Modeling the Impacts of Radioactive Material in Soil" (Yu et al. 1993b).

VI.6 Step 5. Exposure Assessment and Risk Characterization

Section VI.6.1 describes the exposure assessment for this risk assessment. Section VI.6.2 provides the risk characterization, including the HI and excess cancer risk for both the potential nonradiological COCs and associated background for industrial and residential land uses. The incremental TEDE and incremental estimated cancer risk are provided for the background-adjusted radiological COCs for both industrial and residential land uses.

VI.6.1 Exposure Assessment

Appendix 1 provides the equations and parameter input values used to calculate intake values and subsequent HI and excess cancer risk values for the individual exposure pathways. The appendix shows parameters for both industrial and residential land-use scenarios. The equations for nonradiological COCs are based upon the Risk Assessment Guidance for Superfund (RAGS) (EPA 1989). Parameters are based upon information from the RAGS (EPA 1989), the Technical Background Document for Development of Soil Screening Levels (NMED December 2000), as well as other EPA and NMED guidance documents. The parameters reflect the reasonable maximum exposure (RME) approach advocated by the RAGS (EPA 1989). For radiological COCs, the coded equations provided in RESRAD computer code are used to estimate the incremental TEDE and cancer risk for individual exposure pathways.

Further discussion of this process is provided in the "Manual for Implementing Residual Radioactive Material Guidelines Using RESRAD" (Yu et al. 1993a).

Although the designated land-use scenario for this site is industrial, risk and TEDE values for a residential land-use scenario are also presented.

VI.6.2 Risk Characterization

Table 10 shows an HI of 0.17 for the DSS SWMU 135 nonradiological COCs and an estimated excess cancer risk of 5E-6 for the designated industrial land-use scenario. The numbers presented include exposure from soil ingestion, dermal contact, and dust and volatile inhalation for nonradiological COCs. Table 11 shows an HI of 0.02 and an estimated excess cancer risk of 3E-6 for nonradiological background constituents for the designated industrial land-use scenario.

For the radiological COCs, contribution from the direct gamma exposure pathway is included. For the industrial land-use scenario, a TEDE was calculated for an individual who spends 4 hours per week on the site. This results in an incremental TEDE of 1.7E-2 millirem (mrem)/year (yr). In accordance with EPA guidance found in Office of Solid Waste and Emergency Response (OSWER) Directive No. 9200.4-18 (EPA 1997b), an incremental TEDE of 15 mrem/yr is used for the probable land-use scenario (industrial in this case); the calculated dose value for DSS SWMU 135 for the industrial land-use scenario is well below this guideline. The estimated excess cancer risk is 1.5E-7.

For the nonradiological COCs under the residential land-use scenario, the HI is 1.04 and the estimated excess cancer risk is 2E-5 (Table 10). The numbers in the table include exposure from soil ingestion, dermal contact, and dust and volatile inhalation. Although the EPA (1991) generally recommends that inhalation not be included in a residential land-use scenario, this pathway is included because of the potential for soil in Albuquerque, New Mexico, to be eroded and for dust to be present in predominantly residential areas. Because of the nature of the local soil, other exposure pathways are not considered (see Appendix 1). Table 11 shows that for the DSS SWMU 135 associated background constituents, the HI is 0.27 and the estimated excess cancer risk is 1E-5.

For the radiological COC, the incremental TEDE for the residential land-use scenario is 5.1E-2 mrem/yr. The guideline being used is an excess TEDE of 75 mrem/yr (SNL/NM February 1998) for a complete loss of institutional controls (residential land use in this case); the calculated dose value for DSS SWMU 135 for the residential land-use scenario is well below this guideline. Consequently, DSS SWMU 135 is eligible for unrestricted radiological release as the residential land-use scenario resulted in an incremental TEDE of less than 75 mrem/yr to the on-site receptor. The estimated excess cancer risk is 5.3E-7. The excess cancer risk from the nonradiological and radiological COCs should be summed to provide risk estimates for persons exposed to both types of carcinogenic contaminants, as noted in OSWER Directive No. 9200.4-18, "Establishment of Cleanup Levels for CERCLA [Comprehensive Environmental Response, Compensation, and Liability Act] Sites with Radioactive Contamination" (EPA 1997b). This summation is tabulated in Section VI.9, "Summary."

Table 10
Risk Assessment Values for DSS SWMU 135 Nonradiological COCs

COC	Maximum Concentration (mg/kg)	Industrial Land-Use Scenario[a]		Residential Land-Use Scenario[a]	
		Hazard Index	Cancer Risk	Hazard Index	Cancer Risk
Inorganic					
Arsenic	6.2	0.02	4E-6	0.29	2E-5
Chromium, total[b]	41.3	0.02	9E-8	0.19	2E-7
Cobalt	8.4	0.00	4E-9	0.01	9E-9
Cyanide	0.0455[c]	0.00	–	0.00	–
Mercury	0.51 J	0.00	–	0.02	–
Selenium	1[c]	0.00	–	0.00	–
Silver	1	0.00	–	0.00	–
Thallium	0.5[c]	0.01	–	0.10	–
Vanadium	34	0.01	–	0.06	–
Organic					
2-Butanone	0.0064 J	0.00	–	0.00	–
Acetone	0.037	0.00	–	0.00	–
Benzo(a)anthracene	0.12 J	0.00	6E-8	0.00	2E-7
Benzo(a)pyrene	0.14 J	0.00	7E-7	0.00	2E-6
Benzo(b)fluoranthene	0.18 J	0.00	9E-8	0.00	3E-7
Benzo(g,h,i)perylene	0.093 J	0.00	4E-7	0.00	2E-6
bis(2-Ethylhexyl) phthalate	0.53	0.00	3E-9	0.00	1E-8
Chrysene	0.15 J	0.00	7E-10	0.00	2E-9
Fluoranthene	0.37	0.00	–	0.00	–
Indeno(1,2,3-cd)pyrene	0.085 J	0.00	4E-8	0.00	1E-7
Methylene chloride	0.016	0.00	1E-7	0.00	2E-7
Phenanthrene	0.31 J	0.11	–	0.37	–
Pyrene	0.32 J	0.00	–	0.00	–
Toluene	0.0069	0.00	–	0.00	–
Total		**0.17**	**5E-6**	**1.04**	**2E-5**

[a]EPA 1989.
[b]Chromium, total is considered to be chromium VI (most conservative).
[c]Maximum concentration is one-half of the detection limit.
COC = Constituent of concern.
DSS = Drain and Septic Systems.
EPA = U.S. Environmental Protection Agency.
J = Estimated concentration.
mg/kg = Milligram(s) per kilogram.
SWMU = Solid Waste Management Unit.
– = Information not available.

Table 11
Risk Assessment Values for DSS SWMU 135 Nonradiological Background Constituents

COC	Background Concentration[a] (mg/kg)	Industrial Land-Use Scenario[b]		Residential Land-Use Scenario[b]	
		Hazard Index	Cancer Risk	Hazard Index	Cancer Risk
Arsenic	4.4	0.02	3E-6	0.20	1E-5
Chromium, total[c]	12.8	0.00	–	0.00	–
Cobalt	7.1	0.00	4E-9	0.01	8E-9
Cyanide	NC	–	–	–	–
Mercury	<0.1	–	–	–	–
Selenium	<1	–	–	–	–
Silver	<1	–	–	–	–
Thallium	<1.1	–	–	–	–
Vanadium	33	0.00	–	0.06	–
Total		**0.02**	**3E-6**	**0.27**	**1E-5**

[a]Dinwiddie September 1997, North Area Supergroup.
[b]EPA 1989.
[c]Chromium, total is considered to be chromium III (most conservative).
COC = Constituent of concern.
DSS = Drain and Septic Systems.
EPA = U.S. Environmental Protection Agency.
mg/kg = Milligram(s) per kilogram.
NC = Not calculated.
SWMU = Solid Waste Management Unit.
– = Information not available.

VI.7 Step 6. Comparison of Risk Values to Numerical Guidelines

The human health risk assessment analysis evaluated the potential for adverse health effects for both the industrial (the designated land-use scenario for this site) and residential land-use scenarios.

For the nonradiological COCs under the industrial land-use scenario, the HI is 0.17 (less than the numerical guideline of 1 suggested in the RAGS [EPA 1989]). The excess cancer risk is estimated at 5E-6. NMED guidance states that cumulative excess lifetime cancer risk must be less than 1E-5 (Bearzi January 2001); thus the excess cancer risk for this site is below the suggested acceptable risk value. This assessment also determined risks considering background concentrations of the potential nonradiological COCs for both the industrial and residential land-use scenarios. Assuming the industrial land-use scenario, for nonradiological COCs the HI is 0.02 and the excess cancer risk is 3E-6. The incremental risk is determined by subtracting risk associated with background from potential COC risk. These numbers are not rounded before the difference is determined and, therefore, may appear to be inconsistent with numbers presented in tables and within the text. For conservatism, the background constituents that do not have quantified background screening concentrations are assumed to have a hazard quotient of 0.00. The incremental HI is 0.15 and the estimated incremental cancer risk is 2.61E-6 for the industrial land-use scenario. These incremental risk calculations indicate insignificant risk to human health from nonradiological COCs considering an industrial land-use scenario.

For the radiological COCs under the industrial land-use scenario, the incremental TEDE is 1.7E-2 mrem/yr, which is significantly lower than EPA's numerical guideline of 15 mrem/yr. The incremental estimated excess cancer risk is 1.5E-7.

The calculated HI for the nonradiological COCs under the residential land-use scenario is 1.04, which is at the numerical guidance. The excess cancer risk is estimated to be 2E-5. NMED guidance states that cumulative excess lifetime cancer risk must be less than 1E-5 (Bearzi January 2001); thus the excess cancer risk for this site is above the suggested acceptable risk value. The HI for associated background for the residential land-use scenario is 0.27; the estimated excess cancer risk is 1E-5. The incremental HI is 0.77 and the estimated incremental cancer risk is 9.43E-6 for the residential land-use scenario. The incremental excess cancer risk calculations are below NMED guidelines considering a residential land-use scenario.

The incremental TEDE for a residential land-use scenario from the radiological components is 5.1E-2 mrem/yr, which is significantly lower than the numerical guideline of 75 mrem/yr suggested in the SNL/NM "RESRAD Input Parameter Assumptions and Justification" (SNL/NM February 1998). The estimated excess cancer risk is 5.3E-7.

VI.8 Step 7. Uncertainty Discussion

The determination of the nature, rate, and extent of contamination at DSS SWMU 135 is based upon an initial conceptual model that was validated with sampling conducted at the site. The sampling was implemented in accordance with procedures and DQOs outlined in the RFI Workplan (SNL/NM 1991) and the SAP (SNL/NM October 1999), as well as negotiations with the NMED-HWB. The data from soil samples collected at effluent release points are representative of potential COC releases to the site. The analytical requirements and results satisfy the DQOs, and data quality was verified/validated in accordance with SNL/NM procedures. Therefore, there is no uncertainty associated with the data quality used to perform the risk assessment at DSS SWMU 135.

Because of the location, history, and future land use, there is low uncertainty in the land-use scenario and the potentially affected populations that were considered in performing the risk assessment analysis. Based upon the COCs found in near-surface soil and the location and physical characteristics of the site, there is low uncertainty in the exposure pathways relevant to the analysis.

An RME approach is used to calculate the risk assessment values. Specifically, the parameter values in the calculations are conservative and calculated intakes may be overestimated. Maximum measured values of COC concentrations are used to provide conservative results.

Table 8 shows the uncertainties (confidence levels) in nonradiological toxicological parameter values. There is a mixture of estimated values and values from the IRIS (EPA 2003), HEAST (EPA 1997a), and the Technical Background Document for Development of Soil Screening Levels (NMED December 2000). Where values are not provided, information is not available from the HEAST (EPA 1997a), IRIS (EPA 2003), Technical Background Document for

Development of Soil Screening Levels (NMED December 2000), the Risk Assessment Information System (ORNL 2003), or the EPA regions (EPA 2002a, EPA 2002b, EPA 2002c). Because of the conservative nature of the RME approach, uncertainties in toxicological values are not expected to change the conclusion from the risk assessment analysis.

Risk assessment values for nonradiological COCs are within the acceptable range for human health under the industrial land-use scenario compared to established numerical guidance.

Although the HI is at, and the estimated excess cancer risk is slightly above, the NMED guideline for the residential land-use scenario, maximum concentrations were used in the risk calculation. Because the site has been adequately characterized, average concentrations are more representative of actual site conditions. Using the 95% upper confidence limit (UCL) of the mean concentrations for arsenic, the main contributor to risk (4.95 milligrams [mg]/ kilogram [kg], Appendix 2), reduces the total and incremental HI to 0.99 and 0.72, respectively. The total estimated excess cancer risk is reduced to 1.8E-5, and the incremental excess cancer risk is reduced to 6.21E-6. Thus, by using realistic concentrations in the risk calculations that more accurately depict actual site conditions, the incremental estimated excess cancer risk is below NMED guidelines.

For the radiological COCs, the conclusion of the risk assessment is that potential effects on human health for both industrial and residential land-use scenarios are within guidelines and represent only a small fraction of the estimated 360 mrem/yr received by the average U.S. population (NCRP 1987).

The overall uncertainty in all of the steps in the risk assessment process is not considered to be significant with respect to the conclusion reached.

VI.9 Summary

DSS SWMU 135 contains identified COCs consisting of some inorganic, organic, and radiological compounds. Because of the location of the site, the designated industrial land-use scenario, and the nature of contamination, potential exposure pathways identified for this site include soil ingestion, dermal contact, and dust and volatile inhalation for chemical COCs and soil ingestion, dust inhalation, and direct gamma exposure for radionuclides. The same exposure pathways are applied to the residential land-use scenario.

Using conservative assumptions and an RME approach to risk assessment, calculations for nonradiological COCs show that for the industrial land-use scenario the HI (0.17) is significantly lower than the accepted numerical guidance from the EPA. Estimated excess cancer risk is 5E-6. Thus, excess cancer risk is also below the acceptable risk value provided by the NMED for an industrial land-use scenario (Bearzi January 2001). The incremental HI is 0.15 and the incremental excess cancer risk is 2.61E-6 for the industrial land-use scenario. The incremental risk calculations indicate insignificant risk to human health for the industrial land-use scenario.

Using conservative assumptions and an RME approach to risk assessment, calculations for nonradiological COCs show that for the residential land-use scenario the HI (1.04) is at the accepted numerical guidance from the EPA. Estimated excess cancer risk is 2E-5. Thus, excess cancer risk is above the acceptable risk value provided by the NMED for a residential land-use scenario (Bearzi January 2001). The incremental HI is 0.77 and the incremental excess cancer risk is 9.43E-6 for the residential land-use scenario. The incremental risk calculations indicate insignificant risk for the residential land-use scenario.

Although the total HI is at, and the total estimated excess cancer risk is slightly above, the NMED guideline for the residential land-use scenario, maximum concentrations were used in the risk calculation. Because the site has been adequately characterized, average concentrations are more representative of actual site conditions. Using the 95% UCL of the average concentrations for arsenic, the main contributor to risk (4.95 mg/kg), reduces the total and incremental HI to 0.99 and 0.72, respectively. The total estimated excess cancer risk is reduced to 1.8E-5, and the incremental excess cancer risk is reduced to 6.21E-6. Thus, by using realistic concentrations in the risk calculations that more accurately depict actual site conditions, the incremental estimated excess cancer risk is below NMED guidelines.

The incremental TEDE and corresponding estimated cancer risk from radiological COCs are much lower than EPA guidance values; the estimated TEDE is 1.7E-2 mrem/yr for the industrial land-use scenario, which is much less than the EPA's numerical guidance of 15 mrem/yr (EPA 1997b). The corresponding incremental estimated cancer risk value is 1.5E-7 for the industrial land-use scenario. Furthermore, the incremental TEDE for the residential land-use scenario that results from a complete loss of institutional control is 5.1E-2 mrem/yr with an associated risk of 5.3E-7. The guideline for this scenario is 75 mrem/yr (SNL/NM February 1998). Therefore, DSS SWMU 135 is eligible for unrestricted radiological release.

The summation of the incremental nonradiological and radiological carcinogenic risks is tabulated in Table 12.

Table 12
Summation of Incremental Radiological and Nonradiological Risks from DSS SWMU 135

Scenario	Nonradiological Risk	Radiological Risk	Total Risk
Industrial	2.61E-6	1.5E-7	2.8E-6
Residential	6.21E-6	5.3E-7	6.7E-6

DSS = Drain and Septic Systems.
SWMU = Solid Waste Management Unit.

Uncertainties associated with the calculations are considered small relative to the conservatism of the risk assessment analysis. Therefore, it is concluded that this site poses insignificant risk to human health under both the industrial and residential land-use scenarios.

VII. Ecological Risk Assessment

VII.1 Introduction

This section addresses the ecological risks associated with exposure to constituents of potential ecological concern (COPECs) in the soil at DSS SWMU 135. A component of the NMED Risk-Based Decision Tree (NMED March 1998) is to conduct an ecological screening assessment that corresponds with that presented in EPA's Ecological RAGS (EPA 1997c). The current methodology is tiered and contains an initial scoping assessment followed, if needed, by a more detailed risk assessment. Initial components of NMED's decision tree (a discussion of DQOs, data assessment, and evaluations of bioaccumulation as well as fate and transport potential) are addressed in Sections II through V of this report. Following the completion of the scoping assessment, a determination is made as to whether a more detailed, quantitative examination of potential ecological risk is necessary.

VII.2 Scoping Assessment

The scoping assessment focuses primarily on the likelihood of exposure of biota at, or adjacent to, the site to constituents associated with site activities. Included in this section are an evaluation of existing data and a comparison of maximum detected concentrations to background concentrations, examination of bioaccumulation potential, and fate and transport potential. A scoping risk-management decision summarizes the scoping results and assesses the need for further examination of potential ecological impacts.

VII.2.1 Data Assessment

Only those constituents detected in the upper 5 feet of soil are considered accessible to ecological receptors. As shown in Section IV (Table 5), uranium was the only analyte detected in this interval at DSS SWMU 135. However, the maximum concentration of this analyte was less than its corresponding background screening value for the site. For this reason, uranium is considered to be within the range of background and was not identified as a COPEC. No radiological analytes were identified in the upper 5 feet of soil. Therefore, no COPECs are identified for DSS SWMU 135.

VII.2.2 Bioaccumulation

Because no COPECs are identified for this site, the evaluation of bioaccumulation potential is not applicable to this assessment.

VII.2.3 Fate and Transport Potential

Because no COPECs are identified for this site, the evaluation of fate and transport potential is not applicable to this assessment.

VII.2.4 Scoping Risk-Management Decision

Based upon information gathered through the scoping assessment, it was concluded that no complete ecological pathways are associated with DSS SWMU 135 because no COPECs were detected above background in the accessible soil interval (the upper 5 feet). For this reason, no COPECs are identified for the site. Therefore, a more detailed assessment to predict the potential level of ecological risk associated with the site is not deemed necessary.

VIII. References

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APPENDIX 1
EXPOSURE PATHWAY DISCUSSION FOR CHEMICAL AND RADIONUCLIDE CONTAMINATION

Introduction

Sandia National Laboratories/New Mexico (SNL/NM) uses a default set of exposure routes and associated default parameter values developed for each future land-use designation being considered for SNL/NM Environmental Restoration (ER) Project sites. This default set of exposure scenarios and parameter values are invoked for risk assessments unless site-specific information suggests other parameter values. Because many SNL/NM solid waste management units (SWMUs) have similar types of contamination and physical settings, SNL/NM believes that the risk assessment analyses at these sites can be similar. A default set of exposure scenarios and parameter values facilitates the risk assessments and subsequent review.

The default exposure routes and parameter values used are those that SNL/NM views as resulting in a Reasonable Maximum Exposure (RME) value. Subject to comments and recommendations by the U.S. Environmental Protection Agency (EPA) Region VI and New Mexico Environment Department (NMED), SNL/NM will use these default exposure routes and parameter values in future risk assessments.

At SNL/NM, all SWMUs exist within the boundaries of the Kirtland Air Force Base. Approximately 240 potential waste and release sites have been identified where hazardous, radiological, or mixed materials may have been released to the environment. Evaluation and characterization activities have occurred at all of these sites to varying degrees. Among other documents, the SNL/NM ER draft Environmental Assessment (DOE 1996) presents a summary of the hydrogeology of the sites and the biological resources present. When evaluating potential human health risk the current or reasonably foreseeable land use negotiated and approved for the specific SWMU/AOC, aggregate, or watershed will be used. The following references generally document these land uses: *Workbook: Future Use Management Area 2 (DOE et al. September 1995); Workbook: Future Use Management Area 1 (DOE et al. October 1995); Workbook: Future Use Management Areas 3, 4, 5, and 6 (DOE and USAF January 1996); Workbook: Future Use Management Area 7 (DOE and USAF March 1996)*. At this time, all SNL/NM SWMUs have been tentatively designated for either industrial or recreational future land use. The NMED has also requested that risk calculations be performed based upon a residential land-use scenario. Therefore, all three land-use scenarios will be addressed in this document.

The SNL/NM ER Project has screened the potential exposure routes and identified default parameter values to be used for calculating potential intake and subsequent hazard index (HI), excess cancer risk and dose values. The EPA (EPA 1989) provides a summary of exposure routes that could potentially be of significance at a specific waste site. These potential exposure routes consist of:

- Ingestion of contaminated drinking water
- Ingestion of contaminated soil

- Ingestion of contaminated fish and shellfish
- Ingestion of contaminated fruits and vegetables
- Ingestion of contaminated meat, eggs, and dairy products
- Ingestion of contaminated surface water while swimming
- Dermal contact with chemicals in water
- Dermal contact with chemicals in soil
- Inhalation of airborne compounds (vapor phase or particulate)
- External exposure to penetrating radiation (immersion in contaminated air; immersion in contaminated water; and exposure from ground surfaces with photon-emitting radionuclides)

Based upon the location of the SNL/NM SWMUs and the characteristics of the surface and subsurface at the sites, we have evaluated these potential exposure routes for different land-use scenarios to determine which should be considered in risk assessment analyses (the last exposure route is pertinent to radionuclides only). At SNL/NM SWMUs, there is currently no consumption of fish, shellfish, fruits, vegetables, meat, eggs, or dairy products that originate on site. Additionally, no potential for swimming in surface water is present due to the high-desert environmental conditions. As documented in the RESRAD computer code manual (ANL 1993), risks resulting from immersion in contaminated air or water are not significant compared to risks from other radiation exposure routes.

For the industrial and recreational land-use scenarios, SNL/NM ER has, therefore, excluded the following four potential exposure routes from further risk assessment evaluations at any SNL/NM SWMU:

- Ingestion of contaminated fish and shellfish
- Ingestion of contaminated fruits and vegetables
- Ingestion of contaminated meat, eggs, and dairy products
- Ingestion of contaminated surface water while swimming
- Dermal contact with chemicals in water

That part of the exposure pathway for radionuclides related to immersion in contaminated air or water is also eliminated.

Based upon this evaluation, for future risk assessments the exposure routes that will be considered are shown in Table 1.

Table 1
Exposure Pathways Considered for Various Land-Use Scenarios

Industrial	Recreational	Residential
Ingestion of contaminated drinking water	Ingestion of contaminated drinking water	Ingestion of contaminated drinking water
Ingestion of contaminated soil	Ingestion of contaminated soil	Ingestion of contaminated soil
Inhalation of airborne compounds (vapor phase or particulate)	Inhalation of airborne compounds (vapor phase or particulate)	Inhalation of airborne compounds (vapor phase or particulate)
Dermal contact (nonradiological constituents only) soil only	Dermal contact (nonradiological constituents only) soil only	Dermal contact (nonradiological constituents only) soil only
External exposure to penetrating radiation from ground surfaces	External exposure to penetrating radiation from ground surfaces	External exposure to penetrating radiation from ground surfaces

Equations and Default Parameter Values for Identified Exposure Routes

In general, SNL/NM expects that ingestion of compounds in drinking water and soil will be the more significant exposure routes for chemicals; external exposure to radiation may also be significant for radionuclides. All of the above routes will, however, be considered for their appropriate land-use scenarios. The general equation for calculating potential intakes via these routes is shown below. The equations are taken from "Assessing Human Health Risks Posed by Chemicals: Screening-Level Risk Assessment" (NMED March 2000) and "Technical Background Document for Development of Soil Screening Levels" (NMED December 2000). Equations from both documents are based upon the "Risk Assessment Guidance for Superfund" (RAGS): Volume 1 (EPA 1989, 1991). These general equations also apply to calculating potential intakes for radionuclides. A more in-depth discussion of the equations used in performing radiological pathway analyses with the RESRAD code may be found in the RESRAD Manual (ANL 1993). RESRAD is the only code designated by the U.S. Department of Energy (DOE) in DOE Order 5400.5 for the evaluation of radioactively contaminated sites (DOE 1993). The Nuclear Regulatory Commission (NRC) has approved the use of RESRAD for dose evaluation by licensees involved in decommissioning, NRC staff evaluation of waste disposal requests, and dose evaluation of sites being reviewed by NRC staff. EPA Science Advisory Board reviewed the RESRAD model. EPA used RESRAD in their rulemaking on radiation site cleanup regulations. RESRAD code has been verified, undergone several benchmarking analyses, and been included in the International Atomic Energy Agency's VAMP and BIOMOVS II projects to compare environmental transport models.

Also shown are the default values SNL/NM ER will use in RME risk assessment calculations for industrial, recreational, and residential land-use scenarios, based upon EPA and other governmental agency guidance. The pathways and values for chemical contaminants are discussed first, followed by those for radionuclide contaminants. RESRAD input parameters that are left as the default values provided with the code are not discussed. Further information relating to these parameters may be found in the RESRAD Manual (ANL 1993) or by directly accessing the RESRAD websites at: http://web.ead.anl.gov/resrad/home2/ or http://web.ead.anl.gov/resrad/documents/.

Generic Equation for Calculation of Risk Parameter Values

The equation used to calculate the risk parameter values (i.e., hazard quotients/HI, excess cancer risk, or radiation total effective dose equivalent [TEDE] [dose]) is similar for all exposure pathways and is given by:

Risk (or Dose) = Intake x Toxicity Effect (either carcinogenic, noncarcinogenic, or radiological)

= C x (CR x EFD/BW/AT) x Toxicity Effect (1)

where;

C = contaminant concentration (site specific)
CR = contact rate for the exposure pathway
EFD= exposure frequency and duration
BW = body weight of average exposure individual
AT = time over which exposure is averaged.

For nonradiological constituents of concern (COCs), the total risk/dose (either cancer risk or HI) is the sum of the risks/doses for all of the site-specific exposure pathways and contaminants. For radionuclides, the calculated radiation exposure, expressed as TEDE is compared directly to the exposure guidelines of 15 millirem per year (mrem/year) for industrial and recreational future use and 75 mrem/year for the unlikely event that institutional control of the site is lost and the site is used for residential purposes (EPA 1997).

The evaluation of the carcinogenic health hazard produces a quantitative estimate for excess cancer risk resulting from the COCs present at the site. This estimate is evaluated for determination of further action by comparison of the quantitative estimate with the potentially acceptable risk of 1E-5 for nonradiological carcinogens. The evaluation of the noncarcinogenic health hazard produces a quantitative estimate (i.e., the HI) for the toxicity resulting from the COCs present at the site. This estimate is evaluated for determination of further action by comparison of this quantitative estimate with the EPA standard HI of unity (1). The evaluation of the health hazard from radioactive compounds produces a quantitative estimate of doses resulting from the COCs present at the site. This estimated dose is used to calculate an assumed risk. However, this calculated risk is presented for illustration purposes only, not to determine compliance with regulations.

The specific equations used for the individual exposure pathways can be found in RAGS (EPA 1989) and are outlined below. The RESRAD Manual (ANL 1993) describes similar equations for the calculation of radiological exposures.

Soil Ingestion

A receptor can ingest soil or dust directly by working in the contaminated soil. Indirect ingestion can occur from sources such as unwashed hands introducing contaminated soil to food that is then eaten. An estimate of intake from ingesting soil will be calculated as follows:

$$I_s = \frac{C_s * IR * CF * EF * ED}{BW * AT}$$

where:

I_s = Intake of contaminant from soil ingestion (milligrams [mg]/kilogram [kg]-day)
C_s = Chemical concentration in soil (mg/kg)
IR = Ingestion rate (mg soil/day)
CF = Conversion factor (1E-6 kg/mg)
EF = Exposure frequency (days/year)
ED = Exposure duration (years)
BW = Body weight (kg)
AT = Averaging time (period over which exposure is averaged) (days)

It should be noted that it is conservatively assumed that the receptor only ingests soil from the contaminated source.

Soil Inhalation

A receptor can inhale soil or dust directly by working in the contaminated soil. An estimate of intake from inhaling soil will be calculated as follows (EPA August 1997):

$$I_s = \frac{C_s * IR * EF * ED * \left(\frac{1}{VF} \; or \; \frac{1}{PEF} \right)}{BW * AT}$$

where:

I_s = Intake of contaminant from soil inhalation (mg/kg-day)
C_s = Chemical concentration in soil (mg/kg)
IR = Inhalation rate (cubic meters [m^3]/day)
EF = Exposure frequency (days/year)
ED = Exposure duration (years)
VF = soil-to-air volatilization factor (m^3/kg)
PEF = particulate emission factor (m^3/kg)
BW = Body weight (kg)
AT = Averaging time (period over which exposure is averaged) (days)

Soil Dermal Contact

$$D_a = \frac{C_s * CF * SA * AF * ABS * EF * ED}{BW * AT}$$

where:

D_a = Absorbed dose (mg/kg-day)
C_s = Chemical concentration in soil (mg/kg)
CF = Conversion factor (1E-6 kg/mg)
SA = Skin surface area available for contact (cm^2/event)
AF = Soil to skin adherence factor (mg/cm^2)
ABS = Absorption factor (unitless)
EF = Exposure frequency (events/year)

ED = Exposure duration (years)
BW = Body weight (kg)
AT = Averaging time (period over which exposure is averaged) (days)

Groundwater Ingestion

A receptor can ingest water by drinking it or through using household water for cooking. An estimate of intake from ingesting water will be calculated as follows (EPA August 1997):

$$I_w = \frac{C_w * IR * EF * ED}{BW * AT}$$

where:

I_w = Intake of contaminant from water ingestion (mg/kg/day)
C_w = Chemical concentration in water (mg/liter [L])
IR = Ingestion rate (L/day)
EF = Exposure frequency (days/year)
ED = Exposure duration (years)
BW = Body weight (kg)
AT = Averaging time (period over which exposure is averaged) (days)

Groundwater Inhalation

The amount of a constituent taken into the body via exposure to volatilization from showering or other household water uses will be evaluated using the concentration of the constituent in the water source (EPA 1991 and 1992). An estimate of intake from volatile inhalation from groundwater will be calculated as follows (EPA 1991):

$$I_w = \frac{C_w * K * IR_i * EF * ED}{BW * AT}$$

where:

I_w = Intake of volatile in water from inhalation (mg/kg/day)
C_w = Chemical concentration in water (mg/L)
K = volatilization factor (0.5 L/m^3)
IR_i = Inhalation rate (m^3/day)
EF = Exposure frequency (days/year)
ED = Exposure duration (years)
BW = Body weight (kg)
AT = Averaging time (period over which exposure is averaged—days)

For volatile compounds, volatilization from groundwater can be an important exposure pathway from showering and other household uses of groundwater. This exposure pathway will only be evaluated for organic chemicals with a Henry's Law constant greater than $1x10^{-5}$ and with a molecular weight of 200 grams/mole or less (EPA 1991).

Tables 2 and 3 show the default parameter values suggested for use by SNL/NM at SWMUs, based upon the selected land-use scenarios for nonradiological and radiological COCs, respectively. References are given at the end of the table indicating the source for the chosen parameter values. SNL/NM uses default values that are consistent with both regulatory guidance and the RME approach. Therefore, the values chosen will, in general, provide a conservative estimate of the actual risk parameter. These parameter values are suggested for use for the various exposure pathways, based upon the assumption that a particular site has no unusual characteristics that contradict the default assumptions. For sites for which the assumptions are not valid, the parameter values will be modified and documented.

Summary

SNL/NM will use the described default exposure routes and parameter values in risk assessments at sites that have an industrial, recreational, or residential future land-use scenario. There are no current residential land-use designations at SNL/NM ER sites, but NMED has requested this scenario to be considered to provide perspective of the risk under the more restrictive land-use scenario. For sites designated as industrial or recreational land use, SNL/NM will provide risk parameter values based upon a residential land-use scenario to indicate the effects of data uncertainty on risk value calculations or in order to potentially mitigate the need for institutional controls or restrictions on SNL/NM ER sites. The parameter values are based upon EPA guidance and supplemented by information from other government sources. If these exposure routes and parameters are acceptable, SNL/NM will use them in risk assessments for all sites where the assumptions are consistent with site-specific conditions. All deviations will be documented.

Table 2
Default Nonradiological Exposure Parameter Values for Various Land-Use Scenarios

Parameter	Industrial	Recreational	Residential
General Exposure Parameters			
Exposure Frequency (day/yr)	250[a,b]	8.7 (4 hr/wk for 52 wk/yr)[a,b]	350[a,b]
Exposure Duration (yr)	25[a,b,c]	30[a,b,c]	30[a,b,c]
Body Weight (kg)	70[a,b,c]	70 Adult[a,b,c] 15 Child[a,b,c]	70 Adult[a,b,c] 15 Child[a,b,c]
Averaging Time (days) for Carcinogenic Compounds (= 70 yr x 365 day/yr) for Noncarcinogenic Compounds (= ED x 365 day/yr)	25,550[a,b] 9,125[a,b]	25,550[a,b] 10,950[a,b]	25,550[a,b] 10,950[a,b]
Soil Ingestion Pathway			
Ingestion Rate (mg/day)	100[a,b]	200 Child[a,b] 100 Adult[a,b]	200 Child[a,b] 100 Adult[a,b]
Inhalation Pathway			
Inhalation Rate (m^3/day)	20[a,b]	15 Child[a] 30 Adult[a]	10 Child[a] 20 Adult[a]
Volatilization Factor (m^3/kg)	Chemical Specific	Chemical Specific	Chemical Specific
Particulate Emission Factor (m^3/kg)	1.36E9[a]	1.36E9[a]	1.36E9[a]
Water Ingestion Pathway			
Ingestion Rate (liter/day)	2.4[a]	2.4[a]	2.4[a]
Dermal Pathway			
Skin Adherence Factor (mg/cm^2)	0.2[a]	0.2 Child[a] 0.07 Adult[a]	0.2 Child[a] 0.07 Adult[a]
Exposed Surface Area for Soil/Dust (cm^2/day)	3,300[a]	2,800 Child[a] 5,700 Adult[a]	2,800 Child[a] 5,700 Adult[a]
Skin Adsorption Factor	Chemical Specific	Chemical Specific	Chemical Specific

[a]Technical Background Document for Development of Soil Screening Levels (NMED 2000).
[b]Risk Assessment Guidance for Superfund, Vol. 1, Part B (EPA 1991).
[c]Exposure Factors Handbook (EPA August 1997).
ED = Exposure duration.
EPA = U.S. Environmental Protection Agency.
hr = Hour(s).
kg = Kilogram(s).
m = Meter(s).
mg = Milligram(s).
NA = Not available.
wk = Week(s).
yr = Year(s).

Table 3
Default Radiological Exposure Parameter Values for Various Land-Use Scenarios

Parameter	Industrial	Recreational	Residential
General Exposure Parameters			
Exposure Frequency	8 hr/day for 250 day/yr	4 hr/wk for 52 wk/yr	365 day/yr
Exposure Duration (yr)	25[a,b]	30[a,b]	30[a,b]
Body Weight (kg)	70 Adult[a,b]	70 Adult[a,b]	70 Adult[a,b]
Soil Ingestion Pathway			
Ingestion Rate	100 mg/day[c]	100 mg/day[c]	100 mg/day[c]
Averaging Time (days) (= 30 yr x 365 day/yr)	10,950[d]	10,950[d]	10,950[d]
Inhalation Pathway			
Inhalation Rate (m^3/yr)	7,300[d,e]	10,950[e]	7,300[d,e]
Mass Loading for Inhalation g/m^3	1.36 E-5[d]	1.36 E-5[d]	1.36 E-5[d]
Food Ingestion Pathway			
Ingestion Rate, Leafy Vegetables (kg/yr)	NA	NA	16.5[c]
Ingestion Rate, Fruits, Non-Leafy Vegetables & Grain (kg/yr)	NA	NA	101.8[b]
Fraction Ingested	NA	NA	0.25[b,d]

[a]Risk Assessment Guidance for Superfund, Vol. 1, Part B (EPA 1991).
[b]Exposure Factors Handbook (EPA August 1997).
[c]EPA Region VI guidance (EPA 1996).
[d]For radionuclides, RESRAD (ANL 1993).
[e]SNL/NM (February 1998).
EPA = U.S. Environmental Protection Agency.
g = Gram(s)
hr = Hour(s).
kg = Kilogram(s).
m = Meter(s).
mg = Milligram(s).
NA = Not applicable.
wk = Week(s).
yr = Year(s).

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APPENDIX 2
CALCULATION OF THE UPPER CONFIDENCE LIMITS OF MEAN CONCENTRATIONS

For conservatism, Sandia National Laboratories/New Mexico uses the maximum concentration of the constituents of concern (COCs) for initial risk calculation. If the maximum concentrations produce risk above New Mexico Environment Department (NMED) guidelines, conservatism with this approach is evaluated and, if appropriate, a more realistic approach is applied. When the site has been adequately characterized, an estimate of the mean concentration of the COCs is more representative of actual site conditions. The NMED has proposed the use of the 95% upper confidence limit (UCL) of the mean to represent average concentrations at a site (NMED December 2000). The 95% UCL is calculated according to NMED guidance (Tharp June 2002) using the U.S. Environmental Protection Agency ProUCL program (EPA April 2002). Attached are the outputs from that program and the calculated UCLs used in the risk analysis.

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ATTACHMENT

SWMU 135	
Summary Statistics for	Arsenic
Number of Samples	14
Minimum	1.3
Maximum	6.2
Mean	2.542857
Median	1.95
Standard Deviation	1.4442
Variance	2.085714
Coefficient of Variation	0.567944
Skewness	1.926827
Shapiro-Wilk Test Statisitic	0.717492
Shapiro-Wilk 5% Critical Value	0.874
Data not Normal at 5% Significance Level	
Data not Lognormal: Try Non-parametric UCL	
97.5 % UCL (Assuming Normal Data)	
Student's-t	3.376713
97.5 % UCL (Adjusted for Skewness)	
Adjusted-CLT	3.587006
Modified-t	3.409841
97.5 % Non-parametric UCL	
CLT	3.299362
Jackknife	3.376713
Standard Bootstrap	3.274797
Bootstrap-t	4.651989
Chebyshev (Mean, Std)	4.953294

SV Sampling

Sandia National Laboratories/New Mexico
Environmental Restoration Project

REQUEST FOR SUPPLEMENTAL INFORMATION RESPONSE FOR DRAIN AND SEPTIC SYSTEMS SWMUs 48, 135, 136, 159, 165, 166, AND 167 AT TECHNICAL AREA II SOIL-VAPOR SAMPLING

June 2004

United States Department of Energy
Sandia Site Office

TABLE OF CONTENTS

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LIST OF FIGURES

Figure

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LIST OF ANNEXES

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ACRONYMS AND ABBREVIATIONS

bgs	below ground surface
BTEX	benzene, toluene, ethylbenzene, and xylene
DCB	dichlorobenzene
DSS	Drain and Septic Systems
ER	Environmental Restoration
HE	high explosive(s)
HWB	Hazardous Waste Bureau
MDL	method detection limit
NFA	no further action
NMED	New Mexico Environment Department
NOD	Notice of Deficiency
PCE	tetrachloroethene
RCRA	Resource Conservation and Recovery Act
RSI	Response for Supplemental Information
SNL/NM	Sandia National Laboratories/New Mexico
SVOC	semivolatile organic compound
SWMU	Solid Waste Management Unit
TA	Technical Area
TAG	Tijeras Arroyo Groundwater
TCA	trichloroethane
TCE	trichloroethene
VOC	volatile organic compound

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1.0 INTRODUCTION

1.1 Investigation History

In August 1994, no further action (NFA) proposals were submitted for Solid Waste Management Units (SWMUs) 135 and 165 in Technical Area (TA)-II at Sandia National Laboratories/New Mexico (SNL/NM). In July 1995, NFA proposals were also submitted for TA-II SWMUs 48, 136, 159, 166, and 167. These seven SWMUs are shown on Figure 1.1-1.

In November 1995, the New Mexico Environment Department (NMED) Hazardous Waste Bureau (HWB) responded with comments on the NFA proposals submitted for SWMUs 48, 136, 159, 166, and 167 and recommended that a Resource Conservation and Recovery Act (RCRA) Facility Investigation Work Plan, which included these SWMUs, be developed for TA-II. At that time, the SNL/NM Environmental Restoration (ER) Project decided to undertake the investigation and cleanup of these sites and others in TA-II as Voluntary Corrective Actions, and formal work plans were not submitted.

On October 13, 1999, the NMED-HWB issued a Notice of Deficiency (NOD) for these seven SWMUs. Negotiations on November 17, 1999, further defined specific procedures for sampling these seven SWMUs and transferred a requirement for groundwater reporting for these SWMUs to the ongoing Tijeras Arroyo Groundwater (TAG) Investigation. The NOD subsequently was changed by NMED to a Request for Supplemental Information (RSI). The requirements negotiated to fulfill the RSI for these seven TA-II SWMUs were:

- Submit revised site maps showing septic and drain system component locations (as determined by backhoe excavation).
- Submit the results for passive soil-vapor surveys and active soil-vapor monitoring wells at TA-II.
- Collect soil samples at a depth equal to the base, and 5 feet below the base, of septic tanks, seepage pits, and drain lines. Sample locations in drainfields and system outfalls were approved by HWB personnel.
- Analyze soil samples for volatile organic compounds (VOCs), semivolatile organic compounds (SVOCs), high explosive (HE) compounds, polychlorinated biphenyls, RCRA metals, including hexavalent chromium, and total cyanide, radionuclides by gamma spectroscopy, and gross alpha/beta activity.
- Submit revised risk assessments for all seven SWMUs using all available soil data.

On January 26, 2000, the SNL/NM ER Project submitted a response to the NMED RSI, agreeing to excavations to locate system components below ground surface (bgs), confirm drainfield dimensions, pinpoint effluent release points, and investigate the SWMU 48 HE rinse-water drain line. SNL/NM also agreed to discuss additional sampling with the NMED-HWB when the maps were finalized and to submit the groundwater data requested in a subsequent TAG Investigation report.

For tracking purposes, these seven SWMUs are included with sites listed in the SNL/NM Drain and Septic Systems (DSS) program reporting schedule. In this RSI response, they will be referred to as the "Drain and Septic Systems SWMUs at TA-II."

1.2 Additional Investigation Information

Although not specifically required as part of the RSI, this report presents additional information for several TA-II SWMUs as follows:

- In May 2003, soil-vapor monitoring wells were installed at SWMUs 159 and 165 as part of a separate site-wide DSS investigation. Additional details and sampling results for these wells are presented in the soil-vapor sampling chapter of this RSI response.
- Residual material in catch (settling) boxes for HE compound particulates located on HE rinse-water drain lines at SWMUs 48 and 136 was sampled as part of the site characterization process. The results are presented in the SWMU 48 and SWMU 136 chapters of this RSI response.

1.3 Report Organization

This RSI response presents the required information as follows:

- The soil-vapor survey information is presented as a whole and is not discussed on a site-by-site basis.
- Because NFA proposals were previously submitted for these SWMUs, only a brief description and history for each site is presented. Each SWMU is discussed as a separate report. The soil sampling analytical results and risk assessments are presented in separate annexes for each SWMU.

2.0 SOIL-VAPOR SAMPLING AT TA-II

2.1 Introduction

Soil-vapor data was collected using passive and active sampling methods at TA-II. The passive technique uses buried samplers to collect soil-vapor components onto suitable adsorbent material. After an appropriate period, the samplers are retrieved and analyzed for the components of interest. Active soil-vapor sampling analyzes soil-vapor volumes collected at discrete borehole depths while drilling or by specially designed vapor monitoring wells.

Passive soil-vapor surveys were conducted at TA-II in 1993 and 1994 to identify possible source areas. In November and December 1996, three boreholes were drilled in TA-II and sampled at 10-foot intervals for soil vapor. Two of these boreholes were later converted to permanent soil-vapor monitoring wells. In May 2003, soil-vapor monitoring wells were installed at SWMUs 159 and 165 as part of the SNL/NM site-wide DSS investigation. Additional details and the analytical results are presented in the following sections.

2.2 Passive Soil-Vapor Sampling at TA-II

2.2.1 Passive Soil-Vapor Sampling Methodology

PETREX™ passive soil-vapor sampling involves burying collectors containing activated carbon adsorption elements in shallow holes throughout the area to be investigated. After an appropriate period, usually approximately two weeks, the collectors are removed and submitted for analysis by thermal desorption-mass spectrometry. The methodology reports compound detections as relative intensities or response levels rather than the actual concentration of the compound in soil vapor. The data are best utilized as a semiquantitative measure, with an order of magnitude change in ion count values considered significant for interpreting potential source areas and migration/dispersion pathways versus background areas. Full details on the procedures, analytical methodology, and associated quality assurance/quality control measures are presented in the report prepared by Northeast Research Institute, Inc. (NERI 1994).

2.2.2 Passive Soil-Vapor Sampling Results

Two phases of passive soil-vapor sampling using PETREX™ collectors were conducted at TA-II (NERI 1994). The first phase, conducted between November and December 1993, installed 365 collectors throughout portions of TA-II. The second phase, conducted between January and February 1994, installed 99 additional collectors. Phase I was a broad reconnaissance survey to determine the types and locations of VOCs and SVOCs at the site. The Phase II survey further investigated potential areas of concern identified in Phase I.

As part of Phase I, eighteen collectors were installed west of TA-II in unimpacted areas assumed to represent background. It was later determined that these "background" areas may have been part of the old Oxnard Field runway where much activity occurred during the 1940s.

With the exception of some petroleum hydrocarbons, the areas provided suitable background data for VOCs and SVOCs.

The sample locations and identifications are shown on Figure 2.2.2-1. The analytical results for Phases I and II are presented in Tables A-1 and A-2 in Annex A. As shown in Table A-1, the majority of compounds detected in the soil-vapor samples were the chlorinated solvents trichloroethene (TCE) and tetrachloroethene (PCE) and the petroleum hydrocarbons benzene, toluene, ethylbenzene, and xylene(s) (BTEX). Table A-2 lists additional compounds detected during the surveys and shows that trichloroethane (TCA), dichlorobenzene (DCB), Freon-11 (trichlorofluoromethane), and Freon-113 (trichlorotrifluoroethane) were also detected in some samples.

Figures 2.2.2-2, 2.2.2-3, and 2.2.2-4 show the ion count contour plots for TCE, PCE, and BTEX respectively. Because TCA, DCB, Freon-11, and Freon-113 were detected only in a few samples, their distributions are not plotted. The highest TCE and BTEX ion counts were also identified near Buildings 913 and 914 at the southern end of TA-II. The survey concluded that the potential source area for these detections might exist southeast of TA-II (NERI 1994). No SVOCs were detected in any of the samples.

Figures 2.2.2-5 through 2.2.2-13 show the PETREX™ soil-vapor sample locations and, where appropriate, the soil-vapor monitoring wells for each of the TA-II SWMUs addressed in this RSI response. The analytical results for the passive soil-vapor samples at individual SWMUs are presented in Tables A-1 and A-2. The soil-vapor monitoring well analytical results are discussed Section 2.3.2.

2.3 Active Soil-Vapor Sampling at TA-II

2.3.1 Active Soil-Vapor Sampling Methodology

Active soil-vapor sampling typically involves directly pumping soil-vapor from the subsurface for analysis. Vapor collection can be through simple open pipe systems analogous to groundwater monitoring wells screened in the interval of interest, or through sophisticated "down hole" systems with individual inlet port and collection tube sets placed at multiple depths. The extracted soil-vapor can be collected onto adsorbent media and analyzed immediately, or collected into special canisters for later laboratory analysis.

2.3.2 Active Soil-Vapor Sampling Results

In November and December 1996, boreholes BH-020, BH-021, and BH-023 were drilled at TA-II (Figure 2.3.2-1) and sampled at 10-foot intervals during drilling for VOCs in soil-vapor. Permanent soil-vapor wells were constructed in boreholes BH-020 and BH-021 (TA2-VW-20 and TA2-VW-21). BH-023 was abandoned by backfilling with cuttings after drilling and sampling. Vapor well TA2-VW-020 was constructed so that vapor samples could be collected at 72 feet bgs. Vapor well TA2-VW-021 was constructed so that vapor samples could be collected at 52 and 92 feet bgs. The vapor wells were sampled for VOCs on an approximately quarterly basis between July 1997 and March 2002.

The July 1997 samples were collected onto adsorbent media both during and after purging of the collection system and were analyzed at the on-site Environmental Restoration Chemistry Laboratory. All subsequent samples were collected into special vacuum canisters and analyzed at various off-site laboratories. Sample results for wells TA2-VW-020 and TA2-VW-021 are presented in Tables A-3 and A-4, respectively. The results collected during the drilling of borehole BH-023 are presented in Table A-5. Method detection limits (MDLs) for the VOC analyses are presented in Table A-6.

The results for samples collected during the drilling for all three boreholes show the apparent widespread presence of VOCs in soil vapor at TA-II. Although the long-term monitoring data show a large amount of scatter, the results for vapor wells TA2-VW-20 and TA2-VW-21 indicate that VOC concentrations are somewhat steady with no apparent periodicity.

In May 2003, as part of the SNL/NM ER Project site-wide DSS investigation, soil-vapor monitoring wells were installed at SWMUs 159 and 165 (Figures 2.3.2-1, 2.2.2-10 and 2.2.2-11). Each vapor well was 150 feet deep and had vapor sampling ports at depths of 5, 20, 70, 100, 150 feet bgs. After installation, subsurface conditions were allowed to equilibrate over three months before the wells were sampled. The wells were sampled in September 2003 and the results are presented in Table A-7 for vapor well 159-VW-01 and Table A-8 for vapor well 165-VW-01. MDLs for the VOC analyses are presented in Table A-6.

In accordance with previous agreements with the NMED (SNL/NM October 1999), because the total VOC concentrations in the 150-foot-bgs sample from each well were less than 10 parts per million by volume, no additional soil-vapor sampling from these two wells, or soil-vapor or groundwater monitoring wells were required by the NMED at SWMUs 159 and 165.

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3.0 REFERENCES

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FIGURES

Legend

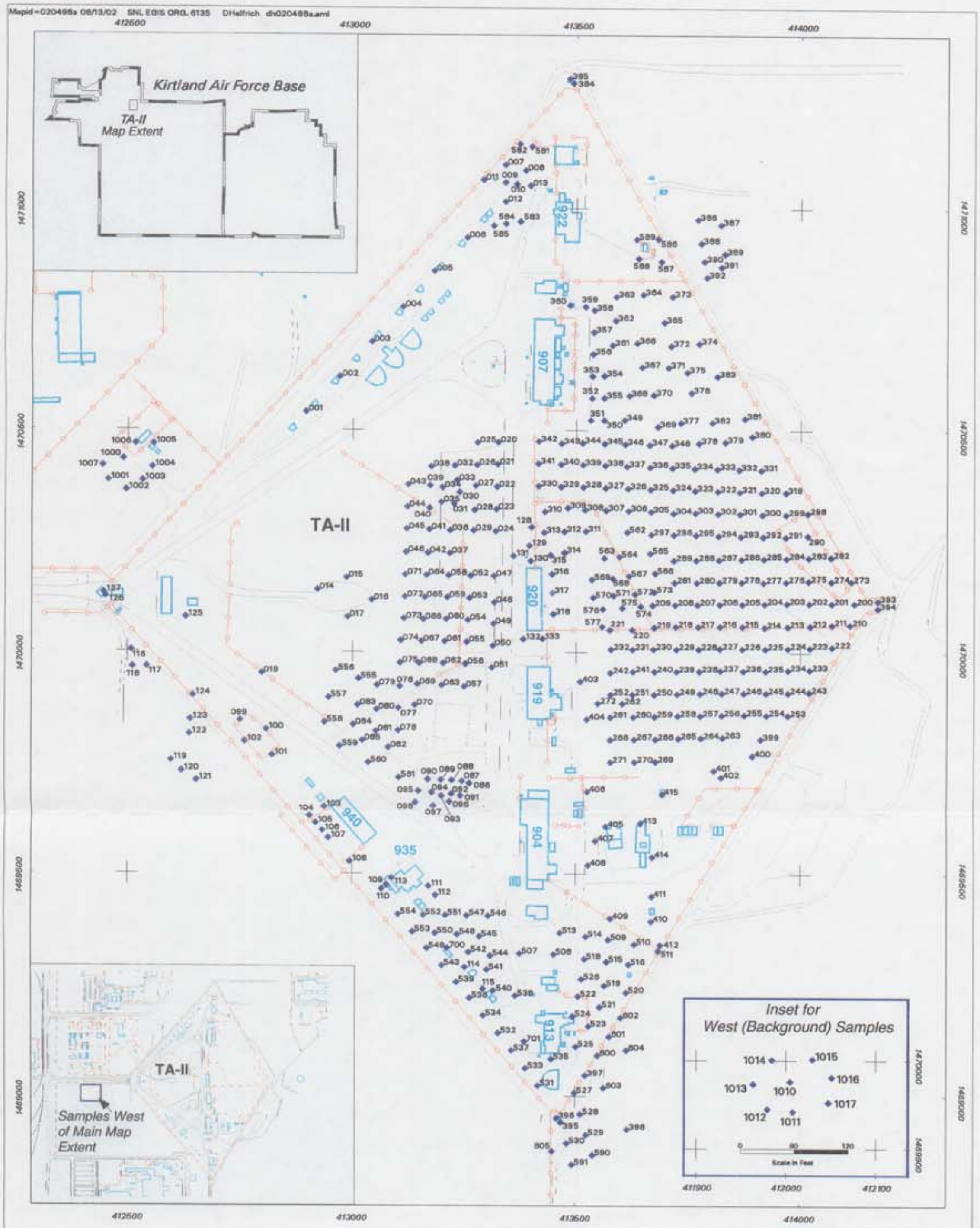
Road
Fence
Building / Structure
DSS SWMU

Figure 1.1-1
Location Map of Drain and Septic Systems (DSS) SWMUs at Technical Area-II (TA-II)

0 200 400
Scale In Feet
0 48 96
Scale In Meters

Sandia National Laboratories, New Mexico
Environmental Geographic Information System

840857.03010000 A159



Legend

Sample Location and Identification Number

Fence

Paved and Unpaved Road

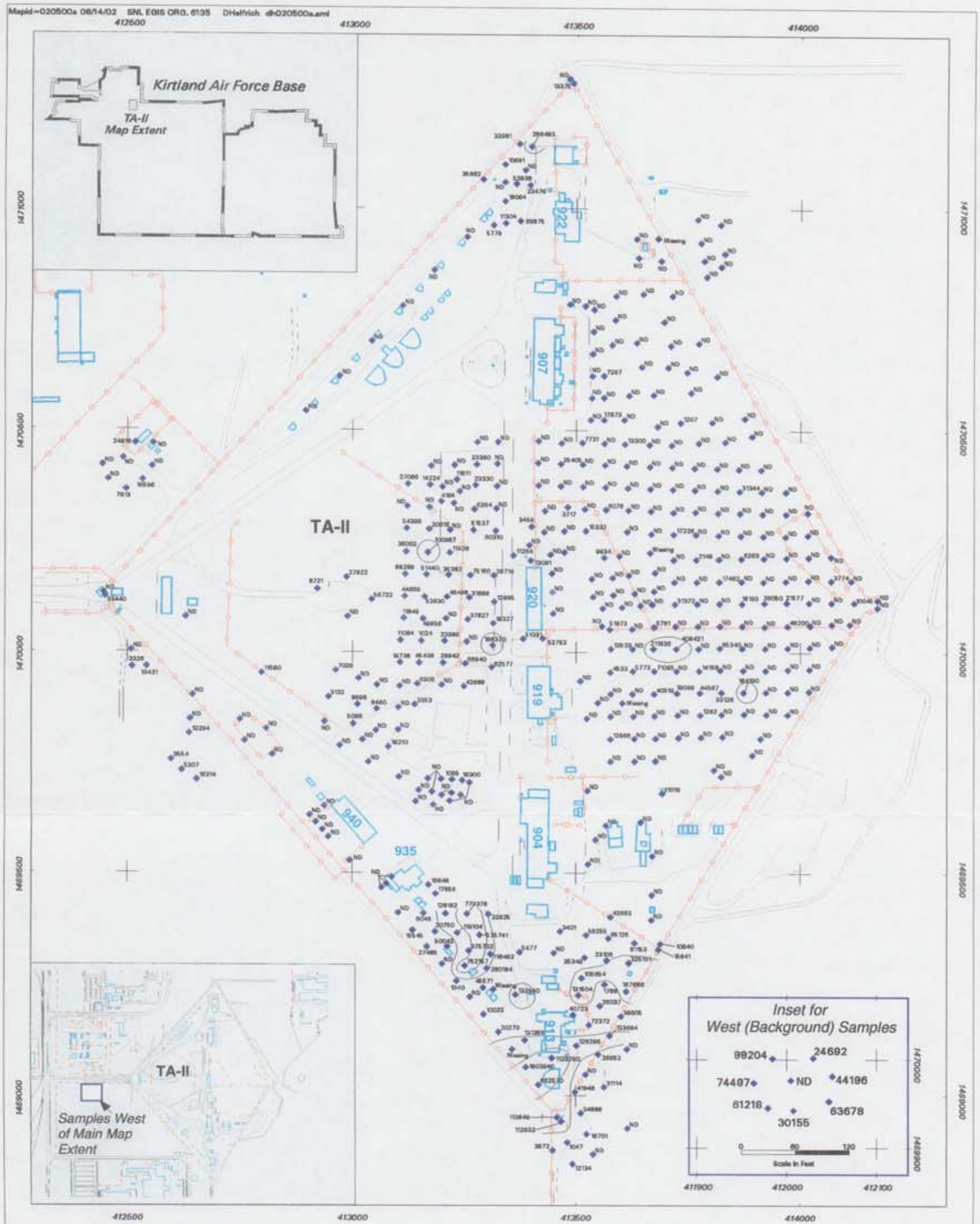
Building / Structure

Figure 2.2.2-1
Technical Area-II
PETREX™ Passive Soil-Vapor
Sample Locations and
Identification Numbers

0 240 480
Scale in Feet
0 58 116
Scale in Meters

Sandia National Laboratories, New Mexico
Environmental Geographic Information System

840857.03010000 B1



Legend

Sample Location and Relative Response Value

Fence

Paved and Unpaved Road

Building / Structure

Relative Response (Ion Count) 100,000 - 499,999

Relative Response (Ion Count) ≥ 500,000

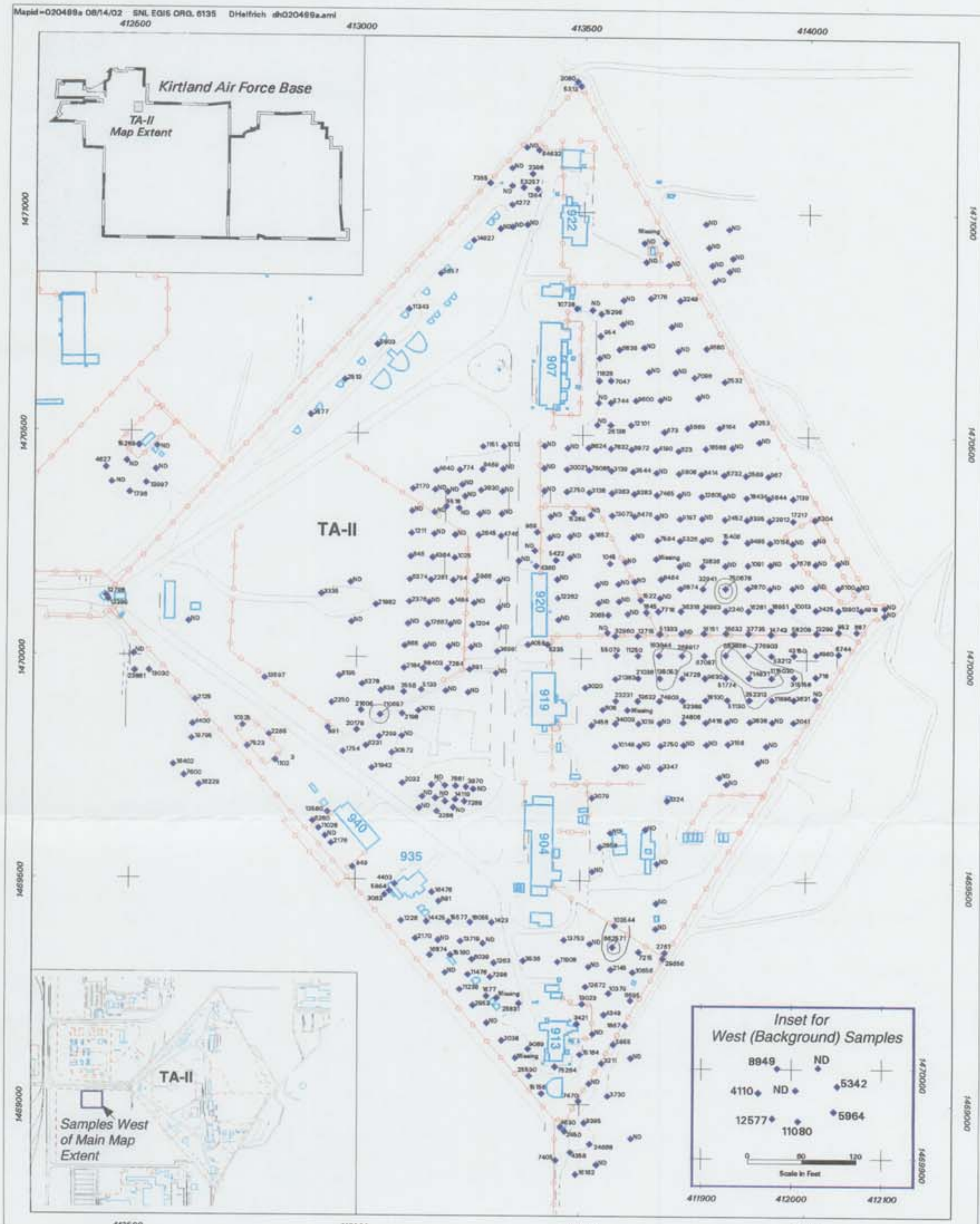
Figure 2.2.2-2
Technical Area-II
PETREX Passive Soil-Vapor Sample Locations and Trichloroethene (TCE) Relative Response (Ion Count) Values

0 240 480
Scale in Feet

0 58 116
Scale in Meters

Sandia National Laboratories, New Mexico
Environmental Geographic Information System

840857.03010000 B2



Legend

Sample Location and Relative Response Value

Fence

Paved and Unpaved Road

Building / Structure

Relative Response (Ion Count) 100,000 - 499,999

Relative Response (Ion Count) ≥ 500,000

Figure 2.2.2-3
Technical Area-II
PETREX™ Passive Soil-Vapor Sample Locations and Tetrachloroethene (PCE) Relative Response (Ion Counts) Values

0 240 480
Scale in Feet

0 58 116
Scale in Meters

Sandia National Laboratories, New Mexico
Environmental Geographic Information System

840857.03010000 B3

Mapid=020501a 08/14/02 SNL EGIS ORG. 6135 DHelfrich dh020501a.aml

Legend

205372 Sample Location and Relative Response Value

Fence

Paved and Unpaved Road

Building / Structure

Relative Response (Ion Count) 200,000 - 1,499,999

Relative Response (Ion Count) ≥ 1,500,000

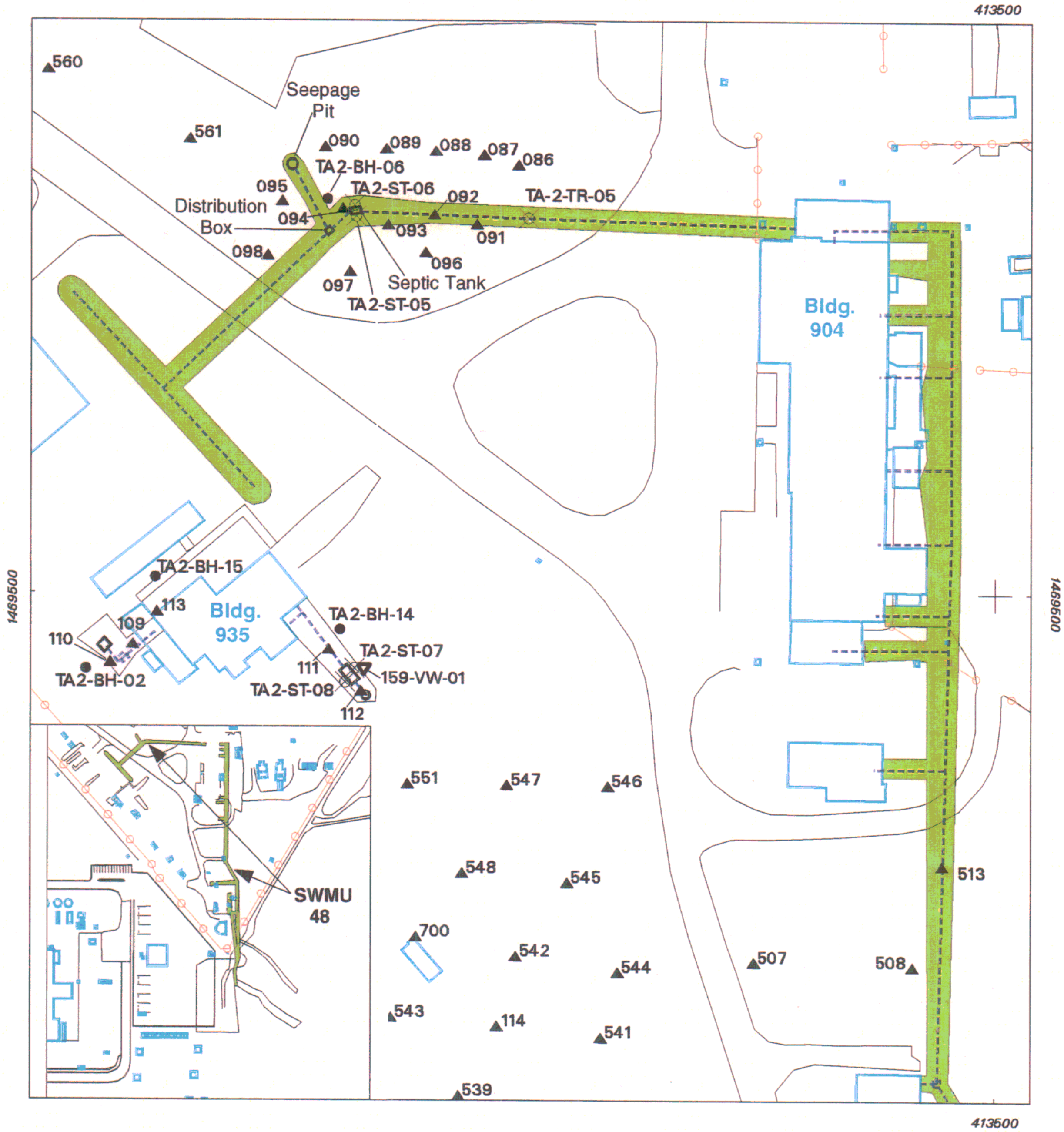
Figure 2.2.2-4
Technical Area-II
PETREX™ Passive Soil-Vapor Sample Locations and Benzene, Toluene, Ethylbenzene, and Xylene (BTEX) Relative Response (Ion Count) Values

0 240 480
Scale in Feet
0 58 116
Scale in Meters

Sandia National Laboratories, New Mexico
Environmental Geographic Information System

840857.03010000 B4

Mapid=040484 04/08/04 SNL EGIS ORG. 6133 DHelfrich dh040484.aml



▲542	PETREX™ Soil-Vapor Sample & Identification
▽	Soil-Vapor Monitor Well
●	Borehole Location
⊠	Geoprobe or Trench Sample
	Road
	Fence
	Former Building / Structure
	Drain Line
	Septic Tank / Seepage Pit
	SWMU 48
	Other SWMU

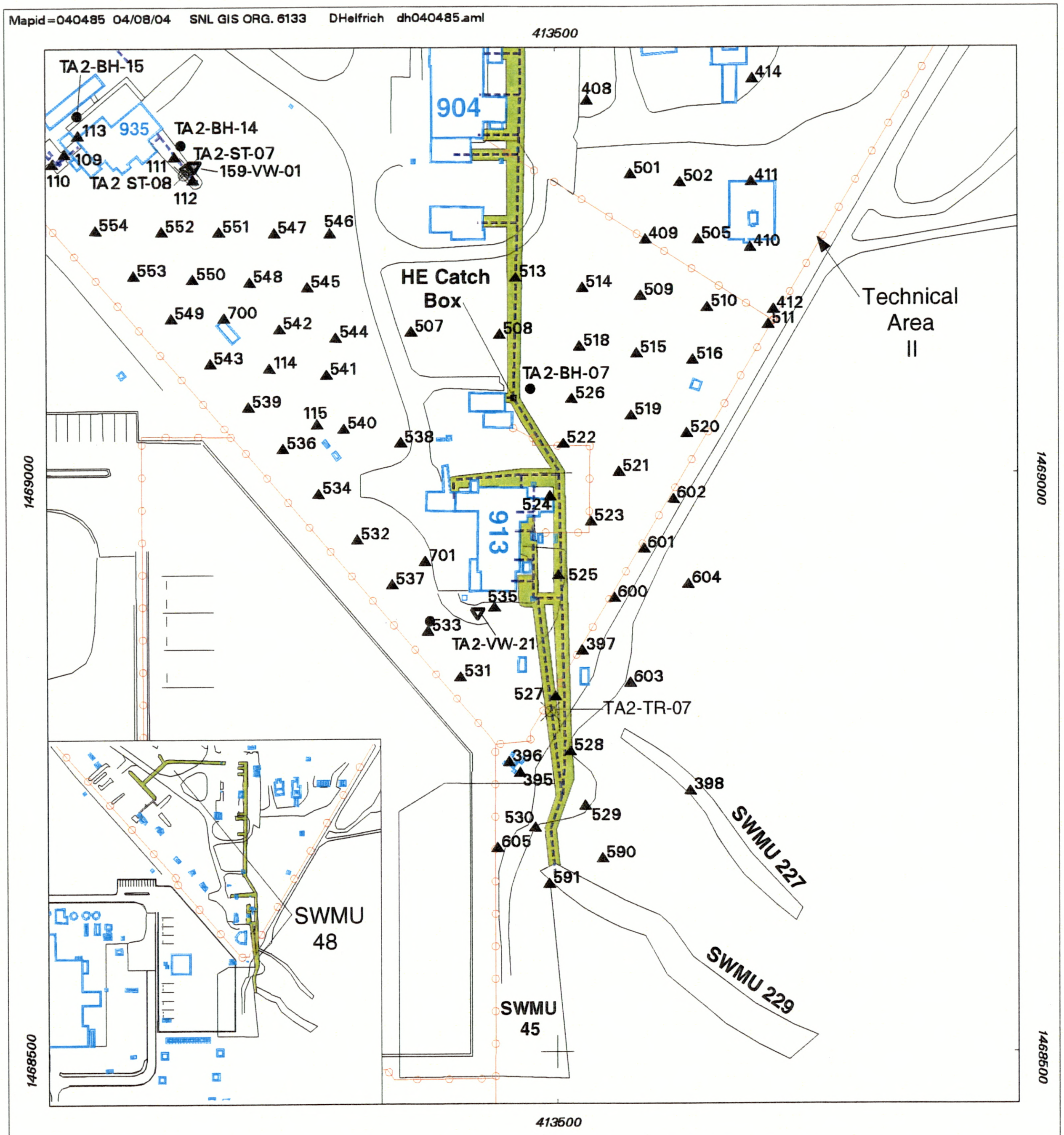
Figure 2.2.2-5
Drain and Septic Systems (DSS) SWMU 48, Building 904 (Northern Extent) PETREX™ Soil-Vapor Sample Locations

0 40 80
Scale in Feet

0 9.6 19.2
Scale in Meters

Sandia National Laboratories, New Mexico
Environmental Geographic Information System

840857.03010000 A172



▲590	PETREX[TM] Soil-Vapor Sample & Identification
▼	Soil-Vapor Monitor Well
●	Borehole Location
⊠	Geoprobe or Trench Sample
	Road
	Fence
	Former Building / Structure
	Drain Line
	Septic Tank / Seepage Pit
	SWMU 48
	Other SWMU

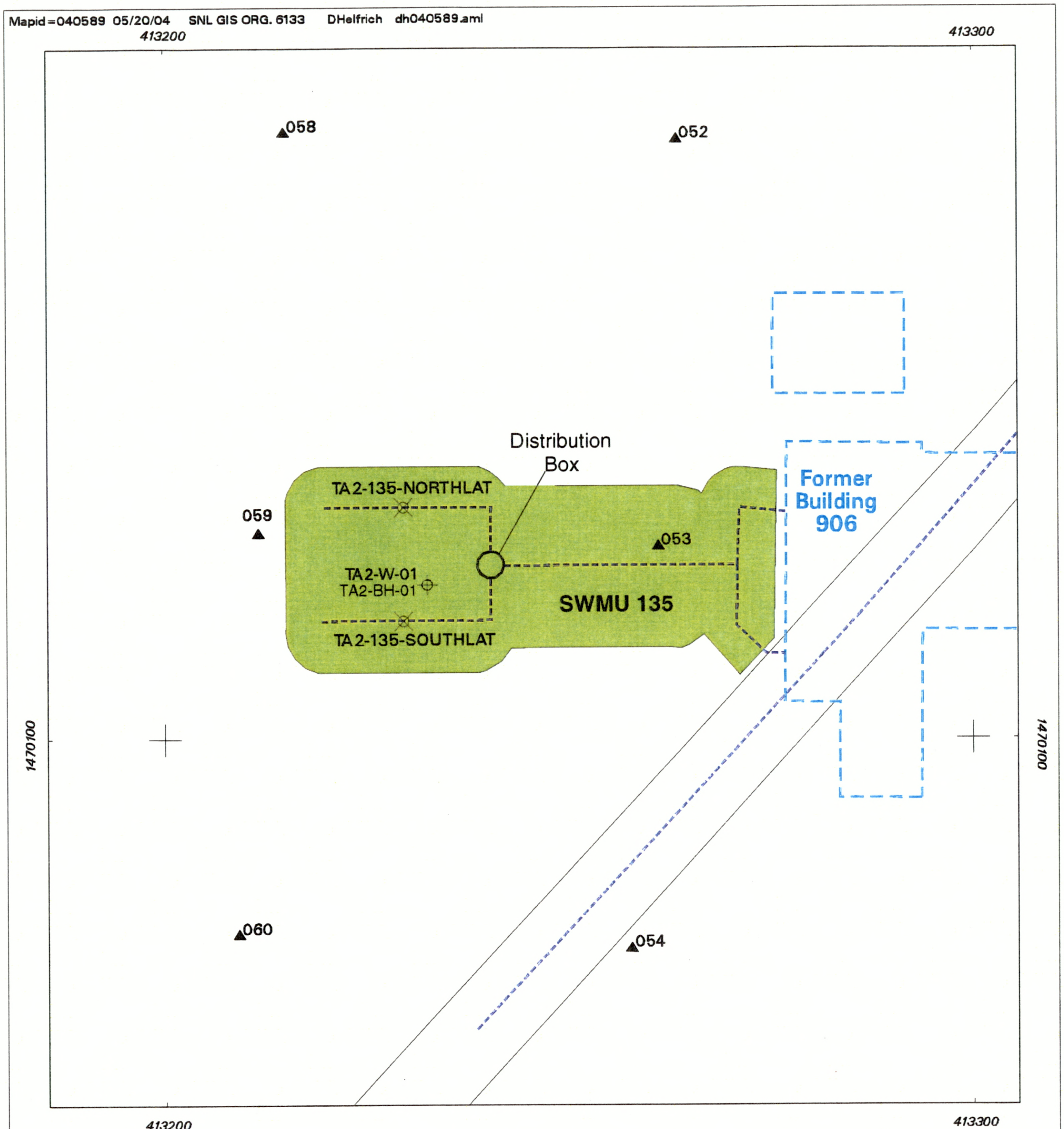
Figure 2.2.2-6
Drain and Septic Systems (DSS) SWMU 48, Building 904 (Southern Extent) PETREX[TM] Soil-Vapor Sample Locations

Scale in Feet: 0 70 140

Scale in Meters: 0 16.8 33.6

Sandia National Laboratories, New Mexico
Environmental Geographic Information System

840857.03010000 A173



PETREX™ Soil-Vapor Sample & Identification (symbol: ▲059)

Groundwater Monitoring Well

Geoprobe Sample

Distribution Box

Drain Line

Former Building / Structure

Other SWMU

SWMU 135

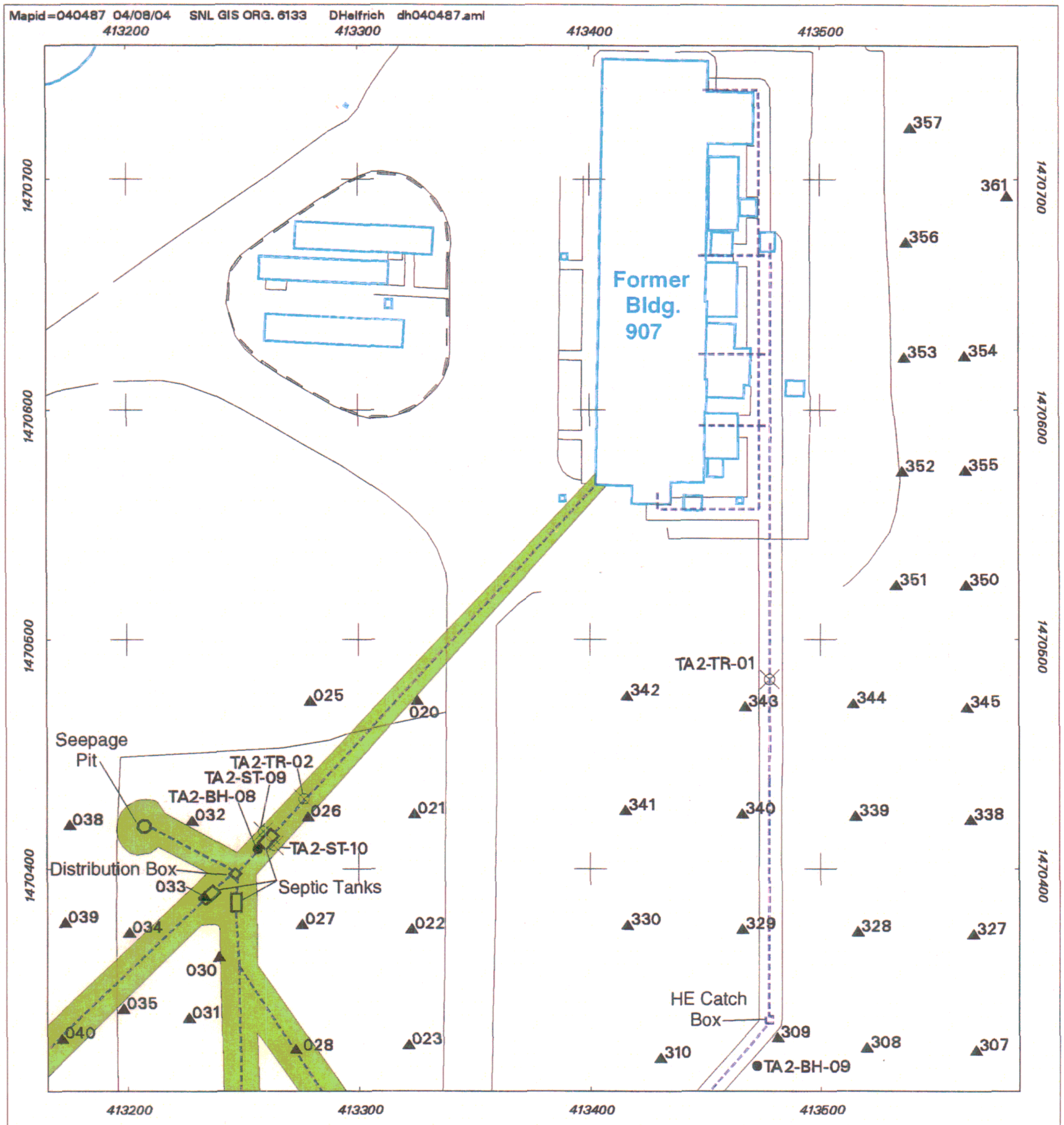
Figure 2.2.2-7
Drain and Septic Systems (DSS)
SWMU 135, Building 906
PETREX™ Soil-Vapor
Sample Locations

Scale in Feet: 0 10 20

Scale in Meters: 0 2.4 4.8

Sandia National Laboratories, New Mexico
Environmental Geographic Information System

840857.03010000 A181



361 PETREX[TM] Soil-Vapor Sample & Identification

Borehole Location

Geoprobe or Trench Sample

Road

Former Building / Structure

Septic Tank / Seepage Pit / Distribution Box

Drain Line

SWMU 136

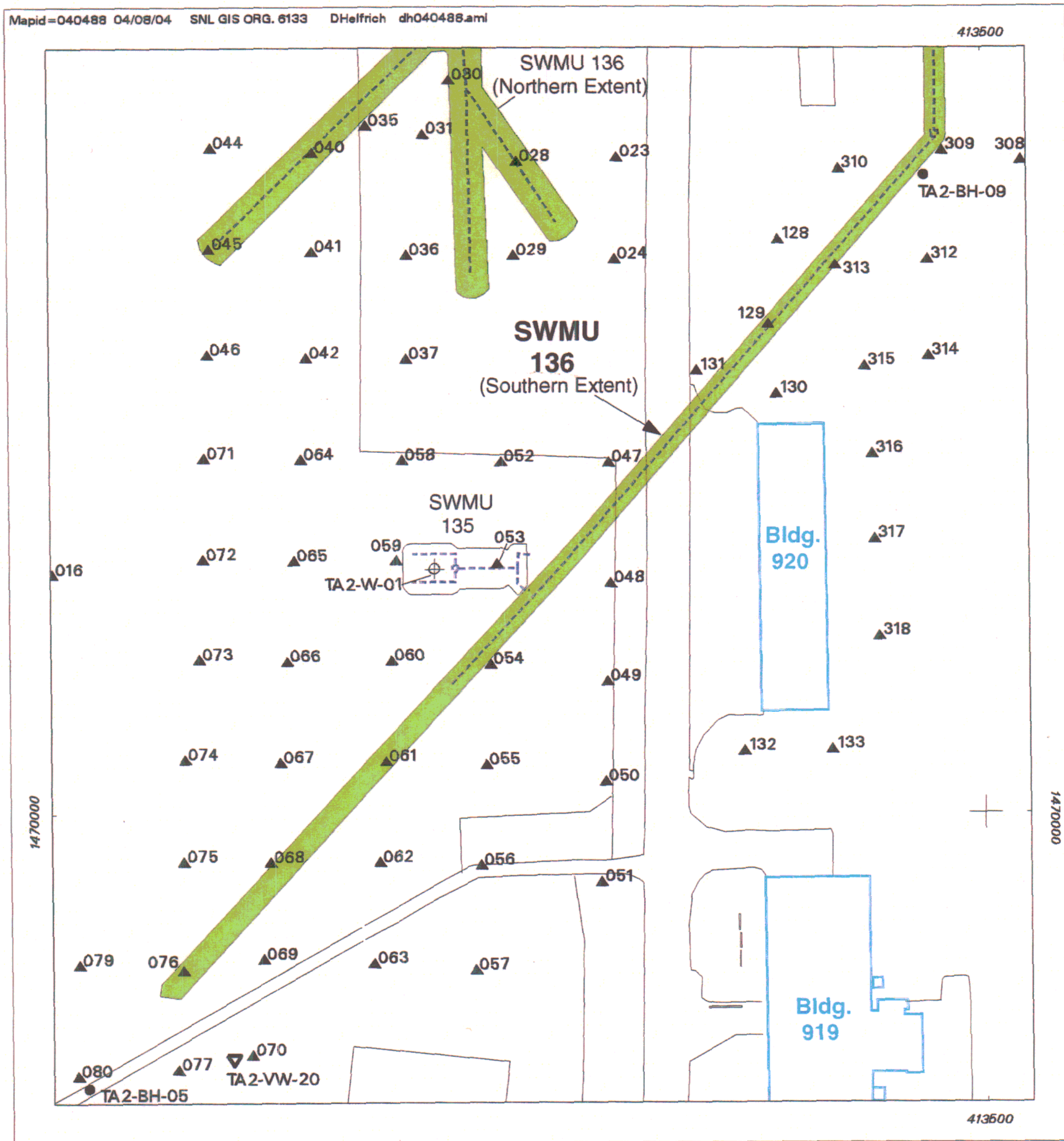
Figure 2.2.2-8
Drain and Septic Systems (DSS) SWMU 136, Building 907 (Northern Extent) PETREX[TM] Soil-Vapor Sample Locations

0 35 70
Scale in Feet

0 8.4 16.8
Scale in Meters

Sandia National Laboratories, New Mexico
Environmental Geographic Information System

840857.03010000 A175



▲076 PETREX™ Soil-Vapor Sample & Identification

▽ Soil-Vapor Monitor Well

● Borehole Location

⊕ Groundwater Monitoring Well

Road

Drain Line

Building / Structure

Other SWMU

SWMU 136

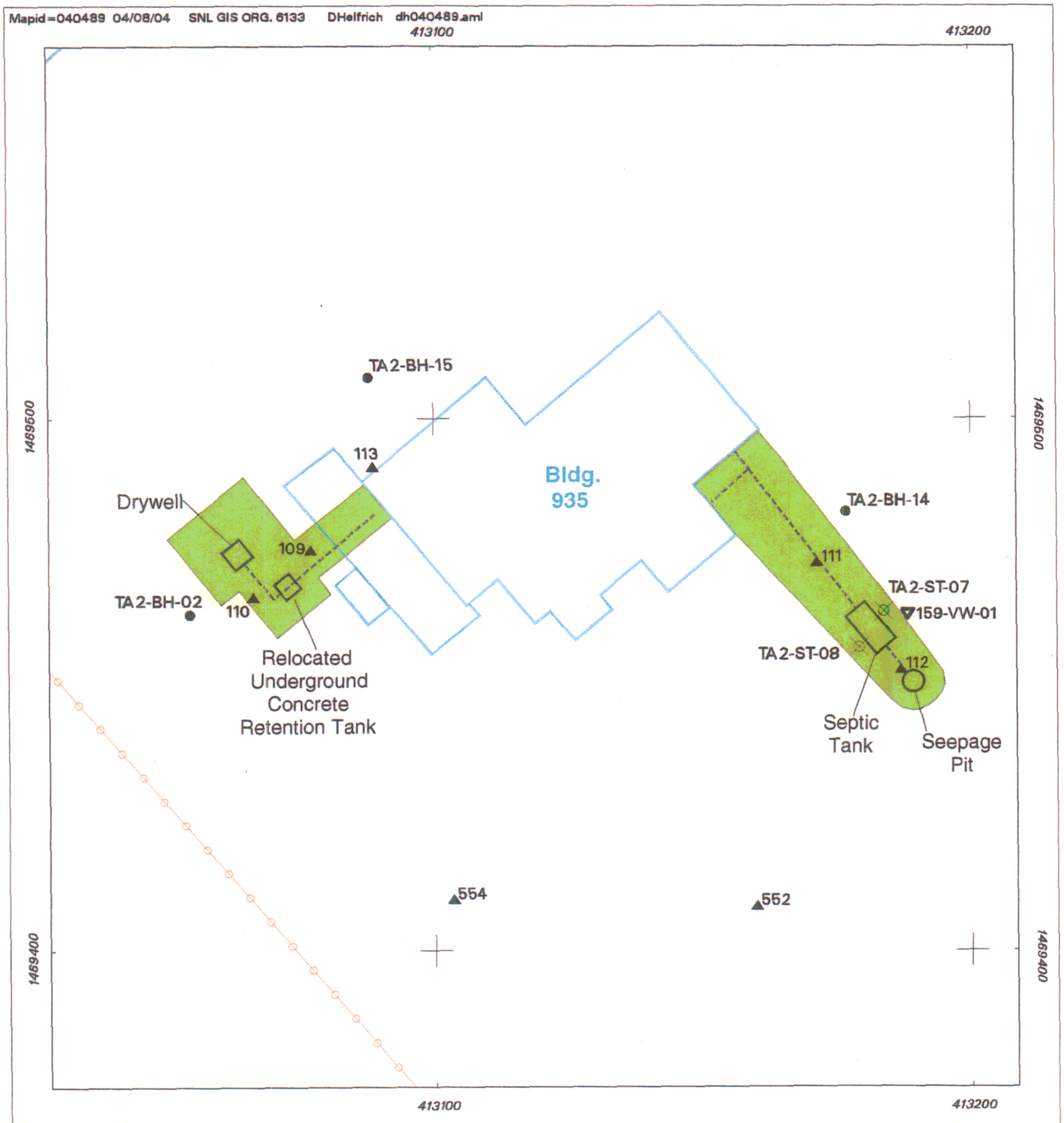
Figure 2.2.2-9
Drain and Septic Systems (DSS) SWMU 136, Building 907 (Southern Extent) PETREX™ Soil-Vapor Sample Locations

0 40 80
Scale in Feet

0 9.6 19.2
Scale in Meters

Sandia National Laboratories, New Mexico
Environmental Geographic Information System

840857.03010000 A176



554 PETREX™ Soil-Vapor Sample & Identification
Soil-Vapor Monitoring Well
Borehole Location
Geoprobe Location
Fence
Building / Structure
Drain Line
Septic Tank / Dry Well / Seepage Pit
SWMU 159

Figure 2.2.2-10
Drain and Septic Systems (DSS) SWMU 159, Building 935 PETREX™ Soil-Vapor Sample Locations

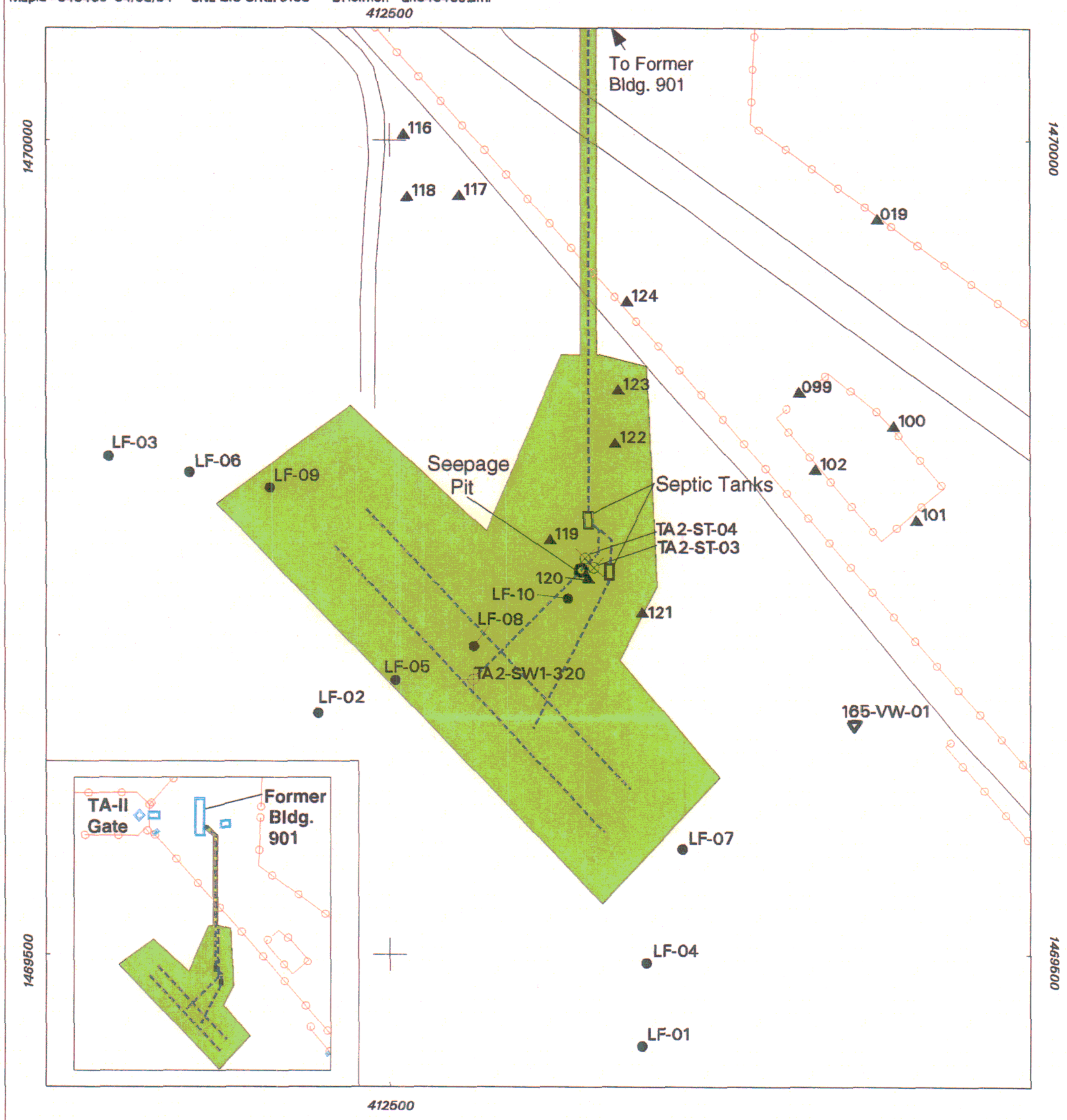
0 15 30
Scale in Feet

0 3.6 7.2
Scale in Meters

Sandia National Laboratories, New Mexico
Environmental Geographic Information System

840857.03010000 A177

Mapid=040469 04/08/04 SNL GIS ORG. 6133 DHelfrich dh040469.aml



▲019 PETREX™ Soil-Vapor Sample & Identification

▽ Soil-Vapor Monitoring Well

Groundwater Monitoring Well

● Borehole Location

Geoprobe Location

Road

Fence

Septic Tank / Seepage Pit

Drain Line

SWMU 165

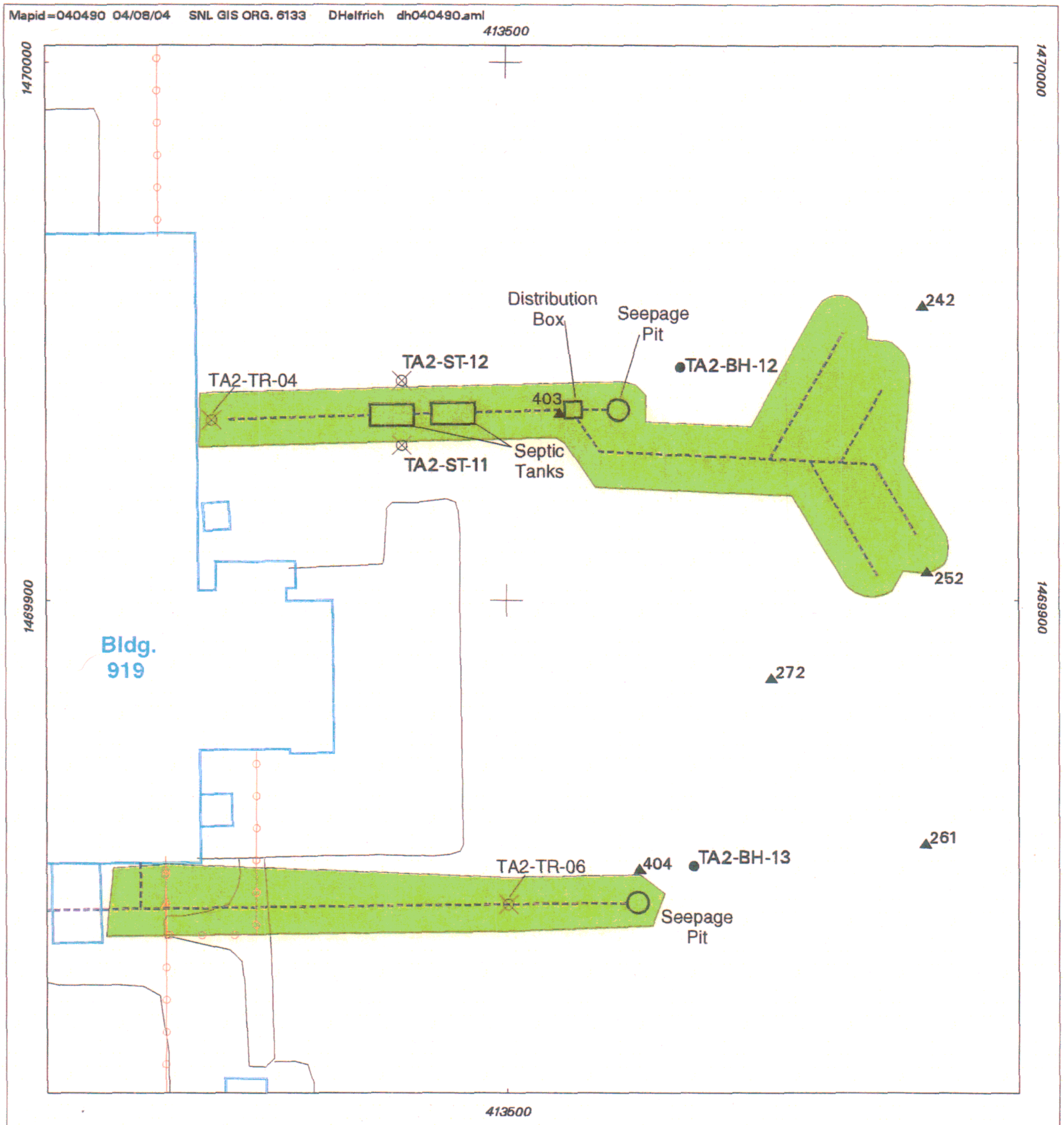
Figure 2.2.2-11
Drain and Septic Systems (DSS) SWMU 165, Building 901 PETREX™ Soil-Vapor Sample Locations

0 50 100
Scale in Feet

0 12 24
Scale in Meters

Sandia National Laboratories, New Mexico
Environmental Geographic Information System

840857.03010000 A169



▲404 PETREX™ Soil-Vapor Sample & Identification

● Borehole Location

⊠ Geoprobe or Trench Sample

Road / Walkway

Fence

Building / Structure

Drain Line

Seepage Pit / Septic Tank / Distribution Box

SWMU 166

Figure 2.2.2-12
Drain and Septic Systems (DSS) SWMU 166, Building 919 PETREX™ Soil-Vapor Sample Locations

0 15 30
Scale in Feet

0 3.6 7.2
Scale in Meters

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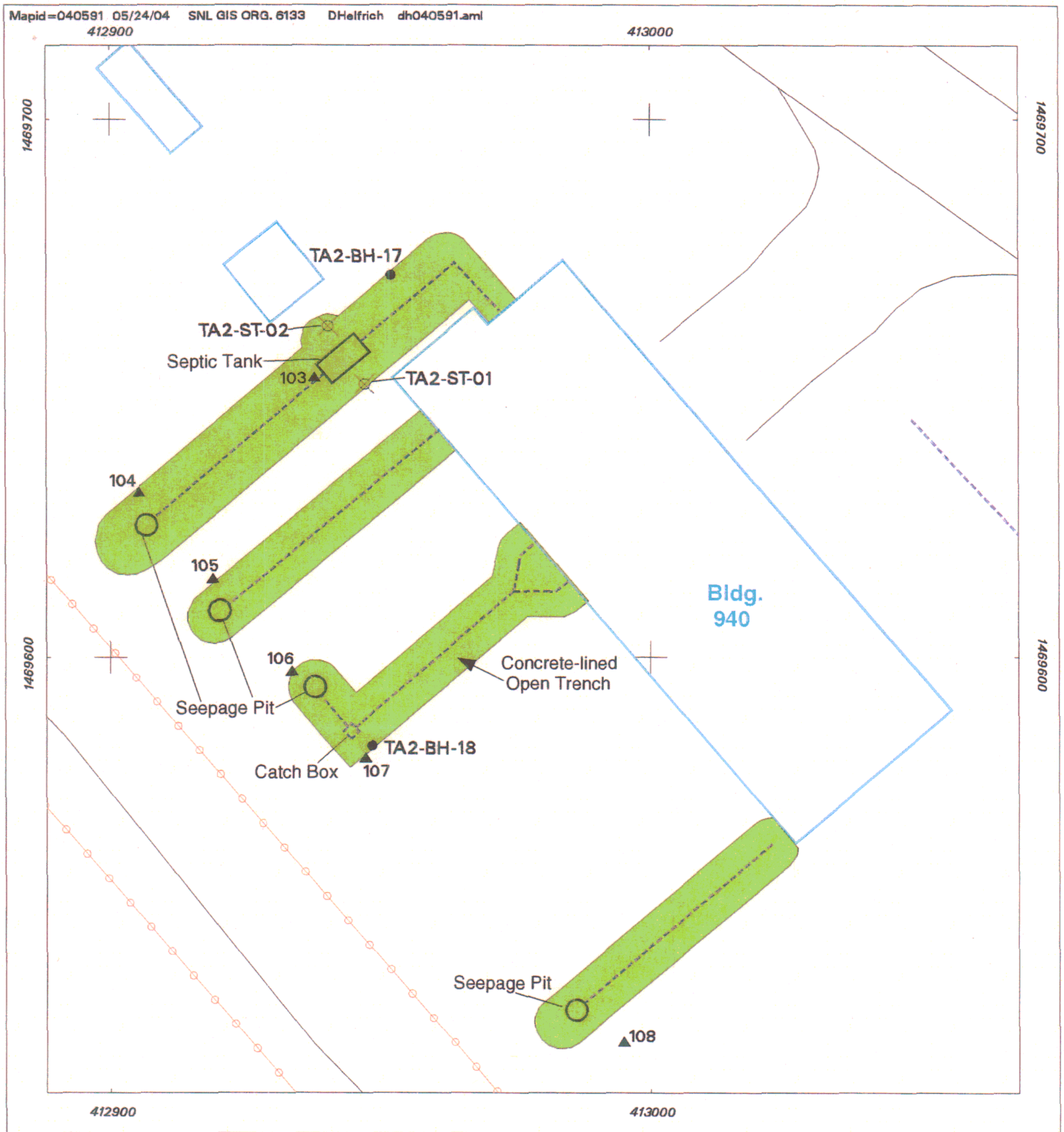


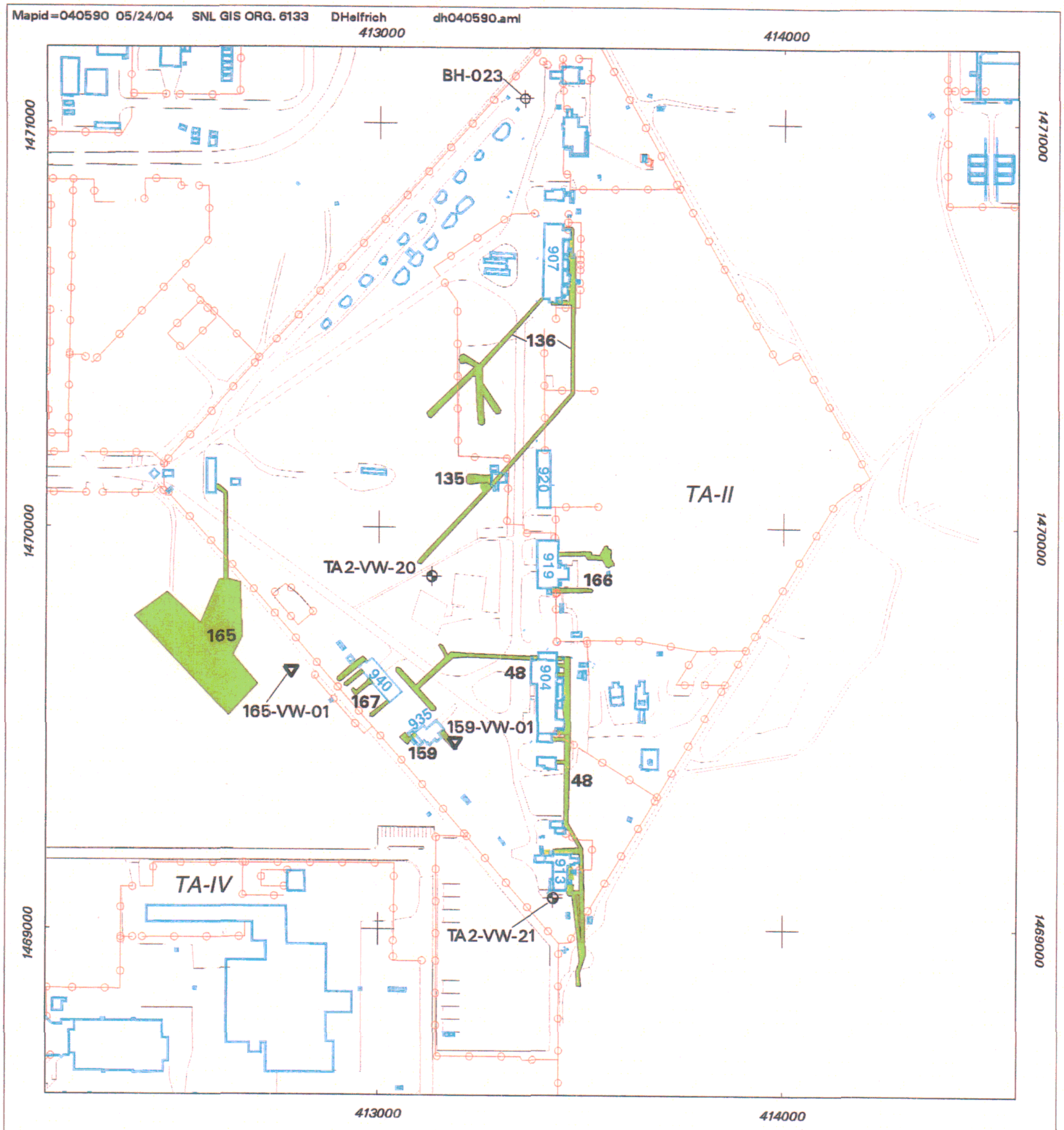
108 PETREX™ Soil-Vapor Sample & Identification
Borehole Location
Geoprobe Location
Road
Fence
Septic Tank / Seepage Pit
Drain Line
Former Building / Structure
SWMU 167

Figure 2.2.2-13
Drain and Septic Systems (DSS) SWMU 167, Building 940 PETREX™ Soil-Vapor Sample Locations

0 15 30
Scale in Feet

0 3.6 7.2
Scale in Meters

Sandia National Laboratories, New Mexico
Environmental Geographic Information System



Legend

- Borehole
- Borehole Completed as a Soil-Vapor Monitoring Well
- Drain and Septic Systems Investigation Soil-Vapor Monitoring Well
- Road
- Fence
- Building / Structure
- DSS SWMU

Figure 2.3.2-1 Location Map of Active Soil-Vapor Monitoring Wells at Technical Area-II

0 200 400
Scale in Feet

0 48 96
Scale in Meters

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Environmental Geographic Information System

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ANNEX A
Soil-Vapor Analytical Data Summary Tables

LIST OF TABLES

Table

Table A-1
Summary of Technical Area II PETREX™ Passive Soil-Vapor Sampling
VOC Analytical Results
Phase I (November–December 1993) and Phase II (January–February 1994)

Sample Number	PETREX™ Response Values (ion counts)		
	TCE	PCE	BTEX
Phase I Samples (November-December 1993)			
001	ND	3577	44658
002	ND	2513	14682
003	ND	5903	22835
004	ND	11343	1148671
005	ND	5657	58446
006	ND	14927	29763
007	10691	ND	93901
008	ND	2398	1239482
009	ND	ND	14537
010	53938	53257	2529709
011	35882	7355	39477
012	18064	4272	416172
013	23476	1264	123305
014	8721	3335	195836
015	27922	ND	320554
016	56732	21982	292794
017	ND	ND	23225
018	ND	ND	41953
019	11560	13597	105389
020	ND	1013	14680
021	ND	ND	1429
022	ND	ND	84641
023	ND	ND	5620
024	60310	4746	115046
025	ND	1151	31192
026	23360	8469	190091
027	23330	3930	68376
028	6264	ND	22224
029	51537	2645	62724
030	ND	ND	106647
031	ND	ND	23402
032	ND	774	11582
033	11611	ND	20100
034	ND	ND	12692
035	4164	5518	47653
036	ND	ND	37113
037	11928	1025	7147
037-DU	17256	3829	11332
038	ND	4640	8537
038-DU	ND	3878	15434
039	14224	ND	8265
040	ND	ND	2508
041	20616	ND	32679

Refer to footnotes at end of table.

Table A-1 (Continued)
Summary of Technical Area II PETREX™ Passive Soil-Vapor Sampling
VOC Analytical Results
Phase I (November–December 1993) and Phase II (January–February 1994)

Sample Number	PETREX™ Response Values (ion counts)		
	TCE	PCE	BTEX
042	100987	4364	44688
043	27066	2170	19618
044	ND	ND	20875
045	54398	1211	65712
046	38002	848	10004
047	28716	ND	117525
048	12995	ND	215394
049	19327	ND	20882
050	196370	3699	60986
051	62577	ND	15142
052	75160	5966	25965
053	31699	ND	23253
054	37827	1204	36597
055	ND	ND	38122
056	66940	891	23192
057	42688	ND	24305
058	35382	794	10320
059	46468	1484	41486
060	ND	ND	12066
061[a]	22986	ND	15948
062	29942	7284	64346
063	ND	ND	24194
063-DU	ND	ND	31862
064	51440	2281	36361
065	52630	ND	4798
066	49956	17667	72670
067	1024	ND	4529
068	45438	88403	3245175
069	6306	5133	125305
070	3353	3010	44799
071	68289	6374	55509
072	44669	2376	47154
073	11849	ND	27785
074	11804	866	148279
074-DU	24355	ND	377027
075	19738	2184	32998
076	ND	3556	66733
077	ND	2198	35987
078	ND	ND	39125
078-DU	ND	ND	90355
079	ND	838	18874
080	8460	110697	2802941
082	16210	30572	1021261
083	8698	21606	434147

Refer to footnotes at end of table.

Table A-1 (Continued)
Summary of Technical Area II PETREX™ Passive Soil-Vapor Sampling
VOC Analytical Results
Phase I (November–December 1993) and Phase II (January–February 1994)

Sample Number	PETREX™ Response Values (ion counts)		
	TCE	PCE	BTEX
084	5066	20179	181512
085	ND	6231	156083
086	ND	ND	73504
087	16300	3970	598169
088	1095	7881	181011
089	ND	ND	66966
090	ND	ND	52599
091	ND	7288	201377
092	ND	14119	292030
093	ND	ND	24085
093-DU	ND	ND	59981
094	ND	ND	14986
094-DU	ND	ND	3888
095	ND	ND	2327
095-DU	ND	ND	6303
096	ND	ND	30828
097	ND	3288	87841
098	ND	ND	52081
099	ND	10525	109307
100	ND	2268	59834
101	ND	11023	169190
102	ND	7523	391150
103	ND	13560	14220
103-DU	ND	30270	35014
104	ND	6280	6294
104-DU	ND	6622	9747
105	ND	11028	138354
105-DU	ND	2599	27159
106	ND	ND	88660
107	ND	2178	154277
108	ND	949	117484
109	ND	5964	121794
110	ND	3063	157573
111	16849	16478	192491
112	17865	891	71058
113	ND	4403	133746
114	752157	11476	214968
115	45571	1677	26565
116	ND	ND	106728
116-DU	ND	ND	168846
117	13431	13030	861072
118	3326	23881	443240
119	3554	16402	461746
120	5307	7600	198122

Refer to footnotes at end of table.

Table A-1 (Continued)
Summary of Technical Area II PETREX™ Passive Soil-Vapor Sampling
VOC Analytical Results
Phase I (November–December 1993) and Phase II (January–February 1994)

Sample Number	PETREX™ Response Values (ion counts)		
	TCE	PCE	BTEX
121	16314	16229	385502
122	13294	19795	1593673
123	ND	4400	300988
124	ND	2125	215462
125	ND	ND	15947
126	33440	13399	346774
127	ND	12798	268590
127-DU	ND	7324	179772
128	3459	969	16836
129	ND	ND	3505
130	13091	4360	63396
131	11264	ND	50239
132	51331	4058	183237
133	52753	5235	60742
180	ND	699	16063
200	10045	4918	43186
201	ND	13907	43933
201-DU	ND	3400	15394
202	ND	2425	19242
202-DU	ND	2600	15505
203	21577	10013	29072
204	28050	18951	67496
205	18193	16281	79010
206	ND	2240	23244
207	ND	14936	252546
208	31372	36318	398632
209-DU	ND	1020	48050
209	ND	7718	182033
210	ND	887	2688
211	ND	952	28052
212	ND	13299	76903
213	48200	58209	114605
214	ND	14743	54377
215	ND	37735	148570
215-DU	ND	15626	57474
216	ND	16632	49430
217	ND	16151	52019
218	ND	ND	4008
219	5781	51333	3789231
220	ND	12715	171842
221	51973	32960	2067854
222	ND	6744	123014
223	ND	4960	184108
224	ND	43150	44875

Refer to footnotes at end of table.

Table A-1 (Continued)
Summary of Technical Area II PETREX™ Passive Soil-Vapor Sampling
VOC Analytical Results
Phase I (November–December 1993) and Phase II (January–February 1994)

Sample Number	PETREX™ Response Values (ion counts)		
	TCE	PCE	BTEX
225	ND	53212	238452
226	ND	276903	101944
227	85340	683858	108698
228	ND	67087	107686
229	408421	268917	183502
230	211836	183944	444318
231	ND	11250	171278
232	13533	55079	62032
233	ND	718	2316
234	ND	315158	174269
235	ND	1115030	315273
236	ND	714931	292585
237	ND	51774	117518
238	14158	9630	140515
239	ND	14728	26668
240	71095	135052	87584
241	5773	21038	536222
242	4533	21383	73118
243	ND	ND	88290
244	ND	3631	20936
245	ND	11896	52083
246	164190	252313	381029
247	93126	51130	123712
248	44567	18100	6812
249	19099	62389	282088
250	40519	74903	256628
251	ND	13632	106594
252	ND	23231	1094550
253	ND	2041	11031
254	ND	ND	14626
255	ND	3838	11495
256	ND	ND	9115
257	1282	6418	23448
258	ND	24806	227567
259	ND	ND	12618
260	ND	1019	8928
261	ND	34003	141854
261-DU	ND	10041	95682
263	ND	3156	18379
264	ND	ND	4488
265	ND	ND	ND
266	ND	2750	27438
267	ND	ND	3238
268	12966	10148	68719

Refer to footnotes at end of table.

Table A-1 (Continued)
Summary of Technical Area II PETREX™ Passive Soil-Vapor Sampling
VOC Analytical Results
Phase I (November–December 1993) and Phase II (January–February 1994)

Sample Number	PETREX™ Response Values (ion counts)		
	TCE	PCE	BTEX
269	ND	3347	15035
270	ND	ND	ND
271	ND	780	34172
272	ND	808	64059
273	ND	ND	5853
274	3774	6100	19211
275	ND	ND	26772
276	ND	ND	2462
277	ND	ND	4687
278	ND	2870	43612
279	17462	750678	182791
280	ND	32941	14538
281[a]	ND	6874	2463628
282	ND	ND	2571
283	ND	ND	4654
284	ND	7676	44504
285	ND	ND	1378
286	6263	1091	52349
287	ND	ND	27074
288	2148	13836	87944
289	ND	ND	22095
290	ND	ND	1324
290-DU	ND	ND	6664
291	ND	ND	31243
292	ND	10156	26882
292-DU	ND	7440	18285
293	ND	9495	70017
294	ND	15406	100381
295	ND	ND	47885
296	17226	5326	11862
296-DU	17964	10405	13166
297	ND	7594	45292
298	ND	6204	84965
299	ND	17217	73208
300	ND	22912	177263
301	ND	8395	84771
302	ND	2452	48826
303	ND	ND	4878
304	ND	9197	84921
305	ND	ND	9493
305-DU	ND	ND	921
306	4973	6476	115253
307	6076	13073	212214
308	ND	ND	71802

Refer to footnotes at end of table.

Table A-1 (Continued)
Summary of Technical Area II PETREX™ Passive Soil-Vapor Sampling
VOC Analytical Results
Phase I (November–December 1993) and Phase II (January–February 1994)

Sample Number	PETREX™ Response Values (ion counts)		
	TCE	PCE	BTEX
309	3717	15269	348676
310	ND	ND	43022
311	15332	1652	422404
312	ND	ND	126546
313	ND	ND	42071
314	ND	ND	13102
315	ND	5422	9636
316	ND	ND	ND
317	ND	12282	95862
318	ND	ND	65394
319	ND	1139	11012
320	ND	5644	31396
320-DU	ND	926	16657
321[b]	31144	18434	3840395
322	ND	ND	19173
323	ND	12605	50370
324	ND	ND	ND
324-DU	ND	ND	ND
325	ND	7465	97390
325-DU	ND	3465	63036
326	ND	9283	123620
327	ND	9363	28528
328	ND	3138	21492
329	ND	2750	134787
330	ND	ND	21781
331	ND	967	5447
332	ND	2569	6555
333	ND	8732	74842
333-DU	ND	22418	163380
334	ND	8414	79897
335	ND	5908	23938
336	ND	ND	ND
336-DU	ND	ND	ND
337	ND	3544	26261
338	ND	3139	14319
339	ND	78088	157513
340	25405	20021	1295188
341	ND	ND	29253
342	ND	ND	34544
343	ND	ND	63459
344	7731	8624	145416
345	ND	7832	74145
346	13300	8972	245500
347	ND	4190	508695

Refer to footnotes at end of table.

Table A-1 (Continued)
Summary of Technical Area II PETREX™ Passive Soil-Vapor Sampling
VOC Analytical Results
Phase I (November–December 1993) and Phase II (January–February 1994)

Sample Number	PETREX™ Response Values (ion counts)		
	TCE	PCE	BTEX
347-DU	ND	6553	703828
348	ND	823	27897
349	ND	12101	68118
350	17873	26138	1902777
351	ND	ND	61338
352	ND	ND	63150
353	ND	11828	88529
354	7297	7047	8922
355	ND	5744	24105
356	ND	ND	8620
357	ND	954	3624
358	ND	15296	114701
359	ND	ND	13266
360	ND	40738	10309
361	ND	6838	35830
362	ND	ND	28010
363	ND	ND	ND
363-DU	ND	ND	ND
364	ND	2178	17676
365	ND	ND	36622
366	ND	ND	25588
367	ND	ND	37510
368	ND	9600	28764
369	ND	673	472126
369-DU	ND	650	404020
370	ND	ND	3455
371	ND	ND	14538
372	ND	ND	18862
373	ND	3249	19203
374	ND	4680	63223
375	ND	7098	201750
376	ND	ND	5739
376-DU	ND	ND	2554
377	1207	5869	15168
378	ND	16586	312058
379	ND	ND	33960
380	ND	ND	18058
381	2146	8253	69551
382	ND	8164	16261
383	ND	2532	47441
384	13375	5313	158854
385	ND	2080	104626
385-DU	ND	5144	116846
386	ND	6425	148005

Refer to footnotes at end of table.

Table A-1 (Continued)
Summary of Technical Area II PETREX™ Passive Soil-Vapor Sampling
VOC Analytical Results
Phase I (November–December 1993) and Phase II (January–February 1994)

Sample Number	PETREX™ Response Values (ion counts)		
	TCE	PCE	BTEX
387	ND	ND	ND
387-DU	ND	ND	ND
388	ND	ND	20760
389	ND	ND	7312
390	ND	ND	18477
391	ND	ND	3910
392	ND	ND	19871
393	3296	ND	27789
394	ND	ND	17184
395	112632	2450	182445
396	113649	4630	48974
397	ND	ND	12995
398	ND	ND	25323
399	ND	ND	1163
400	ND	ND	16558
401	ND	ND	26988
402	ND	ND	4270
403	ND	3020	897764
404	ND	3458	37561
405	ND	ND	117652
405-DU	ND	ND	59474
406	ND	3079	154685
407	ND	2858	168264
408	ND	ND	39614
408-DU	ND	ND	1618
409	42683	103544	3534084
410	ND	ND	18638
410-DU	ND	1943	26259
411	ND	ND	113479
412	10840	2761	52299
413	ND	ND	193354
414	ND	ND	119306
415	11019	1324	589485
1000	ND	ND	122435
1001	ND	ND	54694
1002	7913	1738	1613984
1003	16596	13997	2128636
1004	ND	ND	53067
1005	ND	ND	124957
1006	24918	15289	536918
1007	ND	4627	185336
1010	ND	ND	51470
1011	30155	11080	615554
1012	61218	12577	1775077

Refer to footnotes at end of table.

Table A-1 (Continued)
Summary of Technical Area II PETREX™ Passive Soil-Vapor Sampling
VOC Analytical Results
Phase I (November–December 1993) and Phase II (January–February 1994)

Sample Number	PETREX™ Response Values (ion counts)		
	TCE	PCE	BTEX
1013	74497	4110	252034
1014	99204	8949	297788
1015	24692	ND	355430
1016	44196	5342	373555
1017	63678	5964	317064
2000	ND	15002	143273
Phase II Samples (January-February 1994)			
42	7150	ND	73181
60	ND	ND	12066
66	140502	11934	18071
68	ND	ND	8666
80	ND	932	83164
81	ND	7299	73634
216	ND	ND	62478
227	84801	198874	24686
229[c]	178643	29509	40857
234	2585	11950	76896
262	4178	21257	192011
321	ND	ND	24278
339	22976	5489	200428
279	ND	ND	26977
507	ND	3536	491679
508	ND	ND	3788108
509	95126	662571	73707
510	81153	7215	3516771
511	15841	29656	971812
513	3401	13753	1304214
514	58255	ND	129058
515	23108	2145	135898
516	325191	10656	2536416
518	35349	ND	36300
519	1788	10379	774028
520	167686	8695	123153
521	26037	4349	50500
522	131504	13023	36130
523	72372	ND	46143
524	40723	3421	39868
525	128296	15164	156616
526	105854	12672	103113
527	41948	7470	79943
528	34886	9395	180840
529	16701	24668	271567
530	1047	4358	50304
531	662570	15156	7651910

Refer to footnotes at end of table.

Table A-1 (Continued)
Summary of Technical Area II PETREX™ Passive Soil-Vapor Sampling
VOC Analytical Results
Phase I (November–December 1993) and Phase II (January–February 1994)

Sample Number	PETREX™ Response Values (ion counts)		
	TCE	PCE	BTEX
532	20273	2038	1105503
533	1803940	25590	2889485
534	10023	ND	281539
535	1128790	75264	302364
536	ND	2953	10103350
538	132940	25831	11095640
539	1340	11236	196334
541	280184	7298	128463
542	375732	6039	120996
543	ND	ND	109070
544	116462	1263	133112
545	575741	ND	97651
546	32925	1423	67228
547	779378	18055	113306
548	119104	13719	536477
549	27485	16874	107852
550	20750	ND	325639
551	128182	15577	1092330
552	8048	14425	2381538
553	15545	2170	56478
554	ND	1228	388859
555	ND	6278	234318
556	7026	8195	445219
557	3132	2250	302313
558	ND	891	131337
559	ND	1754	57661
560	ND	31942	111984
561	ND	2032	65480
562	ND	ND	112234
563	9934	10451	15485
564	ND	ND	10239
566	ND	8464	219617
567	ND	ND	33126
568	ND	ND	39071
569	ND	ND	63104
570	ND	ND	4133
571	ND	ND	46820
572	ND	ND	21915
573	ND	ND	48233
574	ND	1845	28380
575	ND	ND	91749
576	ND	2065	41809
577	ND	ND	193741
581	286483	64632	2267857

Refer to footnotes at end of table.

Table A-1 (Concluded)
Summary of Technical Area II PETREX™ Passive Soil-Vapor Sampling
VOC Analytical Results
Phase I (November–December 1993) and Phase II (January–February 1994)

Sample Number	PETREX™ Response Values (ion counts)		
	TCE	PCE	BTEX
582	32981	ND	29889
583	69875	ND	211763
584	11304	ND	10264
585	5779	ND	16267
586	MISSING	MISSING	MISSING
587	ND	ND	90188
590	ND	ND	10437
591	12134	16162	205372
581	286483	64632	2267857
600	26652	3211	180061
601	123694	5955	680101
602	39805	1867	133891
603	31114	3730	68391
604	ND	ND	14131
605	3782	7405	115613
700	50042	15160	11279240
701	131355	9089	3780479
908	ND	ND	2494249
910	143838	9293	1755741
914	61556	ND	152262
916	378129	11156	2248256
922	88777	13378	25666
926	55521	1945	48394
929	18789	17065	291392
962	ND	ND	125956
968	ND	ND	24803
972	ND	ND	9635
Quality Assurance/Quality Control Samples			
TB 2001	ND	ND	78838
TB 2002	ND	ND	3153
TB 2003	ND	ND	ND
TB 2004	ND	ND	ND

[a]Value elevated due to interference with terpene compounds.
[b]Sampler integrity compromised; value may be elevated due to incidental cross-contamination.
[c]Sampler exposed approximately 10 days longer than the remaining data set.
BTEX = Benzene, toluene, ethylbenzene, and xylene(s).
DU = Duplicate analysis. In laboratory reports, these samples are prefixed with a "3" before the sample number.
ND = Not detected above the PETREX™ background value.
PCE = Tetracholoroethene.
TB = Trip blank.
TCE = Trichloroethene.
VOC = Volatile organic compound.

Table A-2
Summary of Technical Area II PETREX™ Passive Soil-Vapor Sampling
Additional VOCs Detected
Phase I (November–December 1993) and Phase II (January–February 1994)

Sample Number	PETREX™ Response Values (ion counts)			
	TCA	DCB	Freon-11	Freon-113
Phase I Samples (November-December 1993)				
5	ND	221746	ND	ND
10	ND	415426	ND	ND
68	ND	704865	ND	ND
80	ND	886514	ND	ND
83	ND	1742220	ND	ND
85	ND	271140	ND	ND
216	ND	ND	100532	ND
219	ND	2122370	ND	ND
225	ND	ND	227552	137744
226	ND	ND	558425	478299
227	ND	ND	204234	88984
228	ND	ND	408375	284606
231	ND	ND	554822	ND
235	ND	ND	379641	274423
236	ND	ND	500416	447926
238	ND	ND	600607	510369
239	ND	ND	222725	111590
240	ND	ND	146644	ND
246	ND	ND	174304	135227
247	109033	ND	ND	ND
251	ND	212469	ND	ND
346	ND	470719	ND	ND
406	ND	161433	ND	ND
409	ND	391198	ND	ND
Phase II Samples (January-February 1994)				
531	ND	ND	247990	ND
801[a]	ND	ND	183453	ND

[a]No known sample point with this designation, possibly referring to Sample 81.
DCB = Dichlorobenzene.
Freon-11 = Trichlorofluoromethane.
Freon-113 = Trichlorotrifluoroethane.
ND = Not detected above the PETREX™ background value.
TCA = Trichloroethane.
VOC = Volatile organic compound.

Table A-3
Summary of Technical Area II Active Soil-Vapor Monitoring Well VW-20 Sampling
Soil-Vapor VOC Analytical Results
November 1996 to March 2002
(On- and Off-Site Laboratories)

Sample Attributes / VOCs (EPA Method 8260-M3[a], TO-14/TO-14A[b]) Units as indicated

Laboratory and Record Number[c]	ER Sample ID	Sample Depth (ft)	Sample Date	Acetone	Benzene	Bromodichloromethane	1,3-Butadiene	2-Butanone	Carbon disulfide	Carbon tetrachloride	Chloroform	Chloroethane	Chloromethane	Cyclohexene	1,2-Dibromoethane	1,2-Dichlorobenzene	1,3-Dichlorobenzene
Soil-vapor samples collected during borehole drilling ppb(v/v)																	
ATL 9267	TA2-BH-020-10-SV	10	11-14-96	180	21	ND (7.0)	13	28	ND (7.0)	ND (1.8)	ND (1.8)	ND (1.8)	ND (1.8)	ND (7.0)	ND (1.8)	ND (1.8)	ND (1.8)
ATL 9267	TA2-BH-020-20-SV	20	11-14-96	130	6.8	ND (4.4)	7.9	12	ND (4.4)	ND (1.1)	ND (1.1)	ND (1.1)	ND (1.1)	ND (4.4)	ND (1.1)	ND (1.1)	ND (1.1)
ATL 9267	TA2-BH-020-30-SV	30	11-14-96	320	38	ND (6.2)	36	38	ND (6.2)	ND (1.6)	ND (1.6)	ND (1.6)	ND (1.6)	ND (6.2)	ND (1.6)	ND (1.8)	ND (1.6)
ATL 9267	TA2-BH-020-40-SV	40	11-14-96	130	7.7	ND (4.9)	6.8	14	ND (4.9)	ND (1.2)	ND (1.2)	ND (1.2)	ND (1.2)	ND (4.9)	ND (1.2)	ND (1.2)	ND (1.2)
ATL 9268	TA2-BH-020-40-SV-DU	40	11-14-96	150	11	ND (4.1)	9.4	24	ND (4.1)	2.1	3.5	ND (1.0)	ND (1.0)	ND (4.1)	ND (1.0)	ND (1.0)	ND (1.0)
ATL 9268	TA2-BH-020-50-SV	50	11-14-96	75	31	ND (3.7)	29	15	5.4	ND (0.92)	2.3	ND (0.92)	ND (0.92)	ND (3.7)	ND (0.92)	ND (0.92)	ND (0.92)
ATL 9268	TA2-BH-020-60-SV	60	11/14/96	240	46	ND (3.7)	22	50	6.2	3.8	5.8	ND (0.92)	ND (0.92)	75	ND (0.92)	ND (0.92)	ND (0.92)
ATL 9268	TA2-BH-020-70-SV	70	11-15-96	170	17	ND (3.5)	20	21	6.2	1.5	3.2	ND (0.88)	ND (0.88)	22	ND (0.88)	ND (0.88)	ND (0.88)
ATL 9268	TA2-BH-020-80-SV	80	11-15-96	460	41	ND (12)	42	95	25	4.2	7.4	ND (3.0)	ND (3.0)	ND (12)	ND (3.0)	ND (3.0)	ND (3.0)
ATL 9268	TA2-BH-020-90-SV	90	11-15-96	330	32	ND (23)	ND (23)	58	ND (23)	ND (5.7)	9.5	ND (5.7)	ND (5.7)	ND (23)	ND (5.7)	ND (5.7)	ND (5.7)
ATL 9268	TA2-BH-020-100-SV	100	11-15-96	400	86	ND (18)	96	57	18	4.3 J (4.6)	13	ND (4.6)	ND (4.6)	ND (18)	ND (4.6)	ND (4.6)	ND (4.6)
ATL 9268	TA2-BH-020-100-SV-DU	100	11-15-96	380	94	ND (3.7)	100	62	19	5.8	15	ND (0.92)	ND (0.92)	ND (3.7)	ND (0.92)	ND (0.92)	ND (0.92)
Soil-vapor concentration mg/m³																	
ERCL 6173	TA2-VW-20-72-P	72	07-17-97	NR	ND (1.2)	ND (1.2)	NA	NR	ND (1.2)	ND (1.2)	ND (1.2)	NA	NR	NA	NR	NR	NR
ERCL 6173	TA2-VW-20-72-S	72	07-17-97	NR	ND (1.2)	ND (1.2)	NA	NR	ND (1.2)	ND (1.2)	ND (1.2)	NA	NR	NA	NR	NR	NR
ERCL 6942	TA2-VW-20-72-P	72	09-04-97	NR	ND (1.25)	ND (1.25)	NA	NR	ND (1.25)	ND (1.25)	ND (1.25)	NA	NR	NA	NR	NR	NR
ERCL 6942	TA2-VW-20-72-S	72	09-04-97	NR	ND (1.25)	ND (1.25)	NA	NR	ND (1.25)	ND (1.25)	ND (1.25)	NA	NR	NA	NR	NR	NR
Soil-vapor concentration ppb(v/v)																	
Core 600308	TA2-VW-20-72	72	05-14-98	ND (1.0)	ND (1.0)	ND (1.0)	ND (1)	ND (1.0)	ND (1.0)	ND (1.0)	ND (1.0)	ND (1)	ND (1.0)	NR	ND (1.0)	ND (1.0)	ND (1.0)
Core 600308	TA2-VW-20-72-DU	72	05-14-98	ND (1.0)	ND (1.0)	ND (1.0)	ND (1)	ND (1.0)	ND (1.0)	ND (1.0)	7.0	ND (1)	ND (1.0)	NR	ND (1.0)	ND (1.0)	ND (1.0)
Quanterra 600796	TA2-VW-20-72	72	09-02-98	16	0.97 J (2)	ND (0.27)	ND (0.57)	ND (3.5)	ND (0.73)	2.6	5.6	ND (1.5)	ND (1.4)	NR	2.7	43	4.1
Quanterra 600796	TA2-VW-20-72-DU	72	09-02-98	20	ND (0.42J)	ND (0.27)	ND (0.57)	ND (3.5)	ND (0.73)	2.2	5.1	ND (1.5)	ND (1.4)	NR	1.7 J (2)	29	2.7
Quanterra 601237	TA2-VW-20-72	72	12-02-98	ND (2)	ND (0.8J)	ND (0.8)	ND (1)	ND (2)	ND (2)	3 J	5.8	ND (0.8)	ND (1)	NR	ND (0.5)	ND (0.8)	ND (0.5)
Quanterra 601237	TA2-VW-20-72-DU	72	12-02-98	ND (2)	ND (0.8J)	ND (0.8)	ND (1)	ND (2)	ND (2)	3 J	5.4	ND (0.8)	ND (1)	NR	ND (0.5)	ND (0.8)	ND (0.5)
Quanterra 601638	TA2-VW-20-72	72	03-22-99	31	ND (0.8)	ND (0.8)	ND (1)	ND (2)	ND (2)	3.6	6.8	ND (0.8)	ND (1)	NR	ND (0.5)	1 J (2)	ND (0.5)
Quanterra 601638	TA2-VW-20-72-DU	72	03-22-99	23	ND (0.8)	ND (0.8)	ND (1)	ND (2)	ND (2)	3.7	7.7	ND (0.8)	ND (1)	NR	ND (0.5)	ND (0.8)	ND (0.5)
Quanterra 601823	TA2-VW-20-72	72	06-24-99	50	ND (0.8)	ND (0.8)	ND (1)	3 J (10)	ND (2)	2.9	5.8	ND (0.8)	ND (1)	NR	ND (0.5)	3.6	ND (0.5)
Quanterra 601823	TA2-VW-20-72-DU	72	06-24-99	43	ND (0.8)	ND (0.8)	ND (1)	3 J (10)	ND (2)	3.2	6	ND (0.8)	ND (1)	NR	ND (0.5)	4.5	ND (0.5)
Quanterra 602830	TA2-VW-20-72	72	09-07-99	4.1 J (10)	ND (0.8)	ND (0.8)	ND (1)	ND (2)	ND (2)	2.7	5.9	ND (0.8)	ND (1)	NR	ND (0.5)	ND (0.8)	ND (0.5)
Quantarra 602830	TA2-VW-20-72-DU	72	09-07-99	6.9 J (10)	ND (0.8)	ND (0.8)	ND (1)	ND (2)	ND (2)	1.9 J (2)	4.3	ND (0.8)	ND (1)	NR	ND (0.5)	ND (0.8)	ND (0.5)

Laboratory and Record Number[c]	ER Sample ID	Sample Depth (ft)	Sample Date	1,4-Dichlorobenzene	Dichlorodifluoromethane	1,1-Dichloroethene	cis-1,2-Dichloroethene	Ethanol	Ethyl benzene	4-Ethyltoluene	Heptane	Hexane	2-Hexanone	Methylene chloride	4-Methyl-2-pentanone	2-Propanol	Propylene
Soil-vapor samples collected during borehole drilling ppb(v/v)																	
ATL 9267	TA2-BH-020-10-SV	10	11-14-96	ND (1.8)	ND (1.8)	ND (1.8)	ND (1.8)	36	8.6	ND (7.0)	35	11	ND (7.0)	ND (1.8)	ND (7.0)	ND (7.0)	ND (7.0)
ATL 9267	TA2-BH-020-20-SV	20	11-14-96	ND (1.1)	1.3	ND (1.1)	ND (1.1)	21	6.8	9.1	38	6.4	ND (4.4)	ND (1.1)	ND (4.4)	ND (4.4)	ND (4.4)
ATL 9267	TA2-BH-020-30-SV	30	11-14-96	ND (1.6)	ND (1.6)	ND (1.6)	ND (1.6)	ND (6.2)	8.0	12	38	19	ND (6.2)	ND (1.6)	ND (6.2)	ND (6.2)	ND (6.2)
ATL 9267	TA2-BH-020-40-SV	40	11-14-96	ND (1.2)	1.9	ND (1.2)	ND (1.2)	15	4.6	ND (4.9)	26	5.7	ND (4.9)	ND (1.2)	ND (4.9)	ND (4.9)	ND (4.9)
ATL 9268	TA2-BH-020-40-SV-DU	40	11-14-96	ND (1.0)	1.8	ND (1.0)	ND (1.0)	16	3.7	ND (4.1)	15	6.6	ND (4.1)	ND (1.0)	ND (4.1)	ND (4.1)	ND (4.1)
ATL 9268	TA2-BH-020-50-SV	50	11-14-96	ND (0.92)	1.1	ND (0.92)	1.2	430	5.8	5.5	22	10	ND (3.7)	ND (0.92)	ND (3.7)	ND (3.7)	ND (3.7)
ATL 9268	TA2-BH-020-60-SV	60	11/14/96	ND (0.92)	1.7	ND (0.92)	ND (0.92)	18	11	9.3	59	54	4.5	ND (0.92)	ND (3.7)	ND (3.7)	ND (3.7)
ATL 9268	TA2-BH-020-70-SV	70	11-15-96	ND (0.88)	1.0	ND (0.88)	ND (0.88)	17	5.1	4.4	19	20	ND (3.5)	ND (0.88)	ND (3.5)	ND (3.5)	ND (3.5)
ATL 9268	TA2-BH-020-80-SV	80	11-15-96	ND (3.0)	ND (3.0)	ND (3.8)	ND (3.0)	55	26	12	100	44	ND (12)	ND (3.0)	ND (12)	ND (12)	ND (12)
ATL 9268	TA2-BH-020-90-SV	90	11-15-96	ND (5.7)	ND (5.7)	ND (5.7)	ND (5.7)	78	19	ND (23)	83	31	ND (23)	ND (5.7)	ND (23)	ND (23)	ND (23)
ATL 9268	TA2-BH-020-100-SV	100	11-15-96	ND (4.6)	3.0 J (4.6)	ND (4.8)	ND (4.6)	80	36	8.8 J (18)	200	86	ND (18)	ND (4.6)	ND (18)	ND (18)	ND (18)
ATL 9268	TA2-BH-020-100-SV-DU	100	11-15-96	ND (0.92)	2.7	ND (0.92)	ND (0.92)	71	36	8.3	190	100	ND (2.7)	ND (0.92)	ND (3.7)	ND (3.7)	ND (3.7)
Soil-vapor concentration mg/m³																	
ERCL 6173	TA2-VW-20-72-P	72	07-17-97	NR	NR	ND (1.2)	ND (1.2)	NA	ND (1.2)	NR	NA	NA	NR	29 J (4.8)	NA	NA	NA
ERCL 6173	TA2-VW-20-72-S	72	07-17-97	NR	NR	ND (1.2)	ND (1.2)	NA	ND (1.2)	NR	NA	NA	NR	18	NA	NA	NA
ERCL 6942	TA2-VW-20-72-P	72	09-04-97	NR	NR	ND (1.25)	ND (1.25)	NA	ND (1.25)	NR	NA	NA	NR	23	NA	NA	NA
ERCL 6942	TA2-VW-20-72-S	72	09-04-97	NR	NR	ND (1.25)	ND (1.25)	NA	ND (1.25)	NR	NA	NA	NR	5.3	NA	NA	NA
Soil-vapor concentration ppb(v/v)																	
Core 600308	TA2-VW-20-72	72	05-14-98	ND (1.0)	ND (1.0)	ND (1.0)	ND (1.0)	NR	ND (1.0)	ND (1.0)	NR	NR	NR	ND (1.0)	NR	NR	NR
Core 600308	TA2-VW-20-72-DU	72	05-14-98	ND (1.0)	ND (1.0)	ND (1.0)	ND (1.0)	NR	ND (1.0)	ND (1.0)	NR	NR	NR	4.0	NR	NR	NR
Quanterra 600796	TA2-VW-20-72	72	09-02-98	10	1.5 J (2)	ND (0.87)	ND (0.54)	NR	1.9 J (2)	0.48 J (2)	NR	NR	ND (3.9)	ND (0.44)	ND (0.38)	NR	NR
Quanterra 600796	TA2-VW-20-72-DU	72	09-02-98	6.9	1.4 J (2)	ND (0.87)	ND (0.54)	NR	1.2 J (2)	0.31 J (2)	NR	NR	ND (3.9)	ND (0.44)	ND (0.38)	NR	NR
Quanterra 601237	TA2-VW-20-72	72	12-02-98	ND (0.8)	1.6 J (2)	ND (0.5)	ND (0.8)	NR	ND (0.5)	ND (0.5)	NR	NR	ND (3)	ND (0.8)	ND (2)	NR	NR
Quanterra 601237	TA2-VW-20-72-DU	72	12-02-98	ND (0.8)	1.5 J (2)	ND (0.5)	ND (0.8)	NR	ND (0.5)	ND (0.5)	NR	NR	ND (3)	ND (0.8)	ND (2)	NR	NR
Quanterra 601638	TA2-VW-20-72	72	03-22-99	1.5 J (2)	1.9 J (2)	ND (8.5)	ND (0.8)	NR	ND (0.5)	ND (0.5)	NR	NR	ND (3)	ND (0.8)	ND (2)	NR	NR
Quanterra 601638	TA2-VW-20-72-DU	72	03-22-99	2	2.1	ND (0.5)	ND (0.8)	NR	ND (0.5)	ND (0.5)	NR	NR	ND (3)	ND (0.8)	ND (2)	NR	NR
Quanterra 601823	TA2-VW-20-72	72	06-24-99	ND (0.8)	1.6 J (2)	ND (0.5)	ND (0.8)	NR	0.51 J (2)	0.62 J (2)	NR	NR	ND (3)	ND (0.8)	ND (2)	NR	NR
Quanterra 601823	TA2-VW-20-72-DU	72	06-24-99	ND (0.8)	1.8 J (2)	ND (0.5)	ND (0.8)	NR	ND (0.5)	0.52 J (2)	NR	NR	ND (3)	ND (0.8)	ND (2)	NR	NR
Quanterra 602830	TA2-VW-20-72	72	09-07-99	ND (0.8)	1.7 J (2)	ND (0.5)	ND (0.8)	NR	ND (0.5)	ND (0.5)	NR	NR	ND (3)	ND (0.8)	ND (2)	NR	NR
Quantarra 602830	TA2-VW-20-72-DU	72	09-07-99	ND (0.8)	1.2 J (2)	ND (0.5)	ND (0.8)	NR	0.55 J (2)	0.7 J (2)	NR	NR	ND (3)	ND (0.8)	ND (2)	NR	NR

Laboratory and Record Number[c]	ER Sample ID	Sample Depth (ft)	Sample Date	Styrene	Tetrachloroethene	Toluene	1,2,4-Trichlorobenzene	1,1,1-Trichloroethane	Trichloroethene	Trichlorofluoromethane	1,1,2-Trichloro-1,2,2-trifluoroethane	1,2,4-Trimethylbenzene	1,3,5-Trimethylbenzene	o-Xylene	m-, p-Xylene	Total Xylene
Soil-vapor samples collected during borehole drilling ppb(v/v)																
ATL 9267	TA2-BH-020-10-SV	10	11-14-96	2.7	ND (1.8)	300	ND (1.8)	ND (1.8)	3.4	ND (1.8)	18	14	6.6	11	32	NR
ATL 9267	TA2-BH-020-20-SV	20	11-14-96	1.2	ND (1.1)	300	ND (1.1)	ND (1.1)	5.3	ND (1.1)	24	20	8.5	9.2	29	NR
ATL 9267	TA2-BH-020-30-SV	30	11-14-96	2.9	ND (1.6)	260	ND (1.6)	ND (1.6)	4.6	ND (1.6)	17	22	9.6	11	30	NR
ATL 9267	TA2-BH-020-40-SV	40	11-14-96	ND (1.2)	ND (1.2)	200	ND (1.2)	ND (1.2)	12	2.3	60	8.5	3.4	7.0	18	NR
ATL 9268	TA2-BH-020-40-SV-DU	40	11-14-96	1.0 J (1.0)	ND (1.0)	130	ND (1.0)	ND (1.0)	14	2.5	80	6.8	3.0	5.5	15	NR
ATL 9268	TA2-BH-020-50-SV	50	11-14-96	2.5	ND (0.92)	150	ND (0.92)	ND (0.92)	7.5	1.4	35	11	4.7	7.2	19	NR
ATL 9268	TA2-BH-020-60-SV	60	11/14/96	2.2	ND (0.92)	280	ND (0.92)	ND (0.92)	24	4.0	120	28	12	20	58	NR
ATL 9268	TA2-BH-020-70-SV	70	11-15-96	ND (0.88)	ND (0.88)	100	ND (0.88)	ND (0.88)	11	1.7	45	10	3.9	6.7	20	NR
ATL 9268	TA2-BH-020-80-SV	80	11-15-96	3.2	ND (3.0)	960	ND (3.0)	ND (3.0)	30	4.6	140	29	12	38	110	NR
ATL 9268	TA2-BH-020-90-SV	90	11-15-96	ND (5.7)	ND (5.7)	690	ND (5.7)	ND (5.7)	41	6.2	190	15	6.9	26	72	NR
ATL 9268	TA2-BH-020-100-SV	100	11-15-96	ND (4.6)	ND (4.6)	1600	ND (4.6)	ND (4.6)	47	6.2	200	22	11	44	140	NR
ATL 9268	TA2-BH-020-100-SV-DU	100	11-15-96	3.2	ND (0.92)	1408 J	ND (0.92)	ND (0.92)	52	7.2	220	22	9.4	47	150	NR
Soil-vapor concentration mg/m³																
ERCL 6173	TA2-VW-20-72-P	72	07-17-97	ND (1.2)	ND (1.2)	5.5 J (4.8)	NR	ND (1.2)	ND (1.2)	NR	ND (1.2)	NR	NR	ND (1.2)	5.2 J (9.5)	NR
ERCL 6173	TA2-VW-20-72-S	72	07-17-97	ND (1.2)	ND (1.2)	ND (1.2)	NR	ND (1.2)	ND (1.2)	NR	1.8 J (4.8)	NR	NR	ND (1.2)	ND (2.5)	NR
ERCL 6942	TA2-VW-20-72-P	72	09-04-97	ND (1.25)	ND (1.25)	ND (1.25)	NR	ND (1.25)	ND (1.25)	NR	ND (1.25)	NR	NR	ND (1.25)	ND (2.5)	NR
ERCL 6942	TA2-VW-20-72-S	72	09-04-97	ND (1.25)	ND (1.25)	ND (1.25)	NR	ND (1.25)	ND (1.25)	NR	ND (1.25)	NR	NR	ND (1.25)	ND (2.5)	NR
Soil-vapor concentration ppb(v/v)																
Core 600308	TA2-VW-20-72	72	05-14-98	ND (1.0)	ND (1.0)	9.0	ND (1.0)	ND (1.0)	8.0	ND (1.0)	42	ND (1.0)	ND (1.0)	ND (1.0)	ND (1.0)	ND (1.0)
Core 600308	TA2-VW-20-72-DU	72	05-14-98	ND (1.0)	ND (1.0)	ND (1.0)	ND (1.0)	ND (1.0)	9.0	ND (1.0)	38	ND (1.0)	ND (1.0)	ND (1.0)	ND (1.0)	ND (1.0)
Quanterra 600796	TA2-VW-20-72	72	09-02-98	ND (0.64)	21	5.6	6.3 J (20)	ND (0.49)	31	4.1	120	0.88 J (2)	0.42 J (2)	NR	NR	9.3
Quanterra 600796	TA2-VW-20-72-DU	72	09-02-98	ND (0.64)	14	3.5	4.4 J (20)	ND (0.49)	28	3.7	110	0.68 J (2)	ND (0.29)	NR	NR	6
Quanterra 601237	TA2-VW-20-72	72	12-02-98	ND (0.5)	0.51 J (2)	ND (0.5)	ND (3J)	ND (0.5)	21	4	120	ND (0.5)	ND (0.5)	NR	NR	ND (0.8)
Quanterra 601237	TA2-VW-20-72-DU	72	12-02-98	ND (0.5)	ND (0.5)	ND (0.5)	ND (3J)	ND (0.5)	21	3.9	110	ND (0.5)	ND (0.5)	NR	NR	ND (0.8)
Quanterra 601638	TA2-VW-20-72	72	03-22-99	ND (0.5)	0.57 J (2)	ND (0.5)	ND (3)	ND (0.5)	25	4.9	110	ND (0.5)	ND (0.8)	0.52 J (2)	1.5 J (2)	NR
Quanterra 601638	TA2-VW-20-72-DU	72	03-22-99	ND (0.5)	0.67 J (2)	0.74 J (2)	ND (3)	ND (0.5)	28	5.3	120	ND (0.5)	ND (0.8)	ND (0.5)	1.1 J (2)	NR
Quanterra 601823	TA2-VW-20-72	72	06-24-99	ND (0.5)	3.6	2.5	ND (3)	ND (0.5)	24	4	97	1 J (2)	ND (0.8)	2.6	2	NR
Quanterra 601823	TA2-VW-20-72-DU	72	06-24-99	ND (0.5)	4.5	1.8 J (2)	ND (3)	0.6 J (2)	25	4.3	100	1 J (2)	ND (0.8)	2.4	1.8 J (2)	NR
Quanterra 602830	TA2-VW-20-72	72	09-07-99	ND (0.5)	ND (0.5)	0.51 J (2)	ND (3)	ND (0.5)	20	4.7	130	ND (0.5)	ND (0.8)	ND (0.5)	ND (0.8)	NR
Quantarra 602830	TA2-VW-20-72-DU	72	09-07-99	ND (0.5)	3.5	3.8	ND (3)	0.84 J (2)	17	3.1	95	0.99 J (2)	ND (0.8)	0.75 J (2)	2.3	NR

Refer to footnotes at end of table.

Table A-3 (Concluded)
Summary of Technical Area II Active Soil-Vapor Monitoring Well VW-20 Sampling
Soil-Vapor VOC Analytical Results
November 1996 to March 2002
(On- and Off-Site Laboratories)

Sample Attributes; VOCs (EPA Method 8260-M3[a], TO-14/TD-14A[b]) Units as indicated

Laboratory and Record Number[c]	ER Sample ID	Sample Depth (ft)	Sample Date	Acetone	Benzene	Bromodichloromethane	1,3-Butadiene	2-Butanone	Carbon disulfide	Carbon tetrachloride	Chloroform	Chloroethane	Chloromethane	Cyclohexane	1,2-Dibromoethane	1,2-Dichlorobenzene	1,3-Dichlorobenzene	1,4-Dichlorobenzene	Dichlorodifluoromethane	1,1-Dichloroethene	cis-1,2-Dichloroethene	Ethanol
Quanterra 602989	TA2-VW-20-72	72	12-07-99	ND (2)	ND (0.8)	ND (0.8)	ND (1)	ND (2)	ND (2)	**4.7**	**8.1**	ND (0.8)	ND (1)	NR	ND (0.5)	ND (0.8)	ND (0.5)	ND (0.8)	**2.2**	ND (0.5)	ND (0.8)	NR
Quanterra 602989	TA2-VW-20-72-DU	72	12-07-99	ND (2)	ND (0.8)	ND (0.8)	ND (1)	ND (2)	ND (2)	**4.5**	**7.7**	ND (0.8)	ND (1)	NR	ND (0.5)	ND (0.8)	ND (0.5)	ND (0.8)	**2.1**	ND (0.5)	ND (0.8)	NR
Q/STL 603136	TA2-VW-20-72	72	03-01-00	**100**	ND (0.8)	ND (0.8)	ND (1)	ND (2)	ND (2)	**2.8**	**5**	ND (0.8)	ND (1)	NR	ND (0.5)	ND (0.8)	ND (0.5)	ND (0.8)	**1.4 J** (2)	ND (0.5)	ND (0.8)	NR
Q/STL 603136	TA2-VW-20-72-DU	72	03-01-00	**42**	ND (0.8)	ND (0.8)	ND (1)	ND (2)	ND (2)	**3.2**	**6**	ND (0.8)	ND (1)	NR	ND (0.5)	ND (0.8)	ND (0.5)	ND (0.8)	**1.7 J** (2)	ND (0.5)	ND (0.8)	NR
Q/STL 603340	TA2-VW-020-72	72	06-20-00	**14**	**1.9 J** (2)	ND (0.8)	ND (1)	ND (2)	ND (2)	**3.1**	**5.2**	ND (0.8)	ND (1)	NR	ND (0.5)	ND (0.8)	ND (0.5)	ND (0.8)	**1.3 J** (2)	ND (0.5)	ND (0.8)	NR
Q/STL 603340	TA2-VW-020-72-DU	72	06-20-00	**9.8 J** (10)	**1.9 J** (2)	ND (0.8)	ND (1)	ND (2)	ND (2)	**3**	**5.3**	ND (0.8)	ND (1)	NR	ND (0.5)	ND (0.8)	ND (0.5)	ND (0.8)	**1.4 J** (2)	ND (0.5)	ND (0.8)	NR
Q/STL 603661	TA2-VW-20-72	72	09-13-00	**7.4 J** (10)	ND (0.8)	ND (0.8)	ND (1)	ND (2)	ND (2)	**2.1**	**3.6**	ND (0.8)	ND (1)	NR	ND (0.5)	ND (0.8)	ND (0.6)	ND (0.8)	**1.1 J** (2)	ND (0.5)	ND (0.8)	NR
Q/STL 603661	TA2-VW-20-72-DU	72	09-13-00	**6.3 J** (10)	ND (0.8)	ND (0.8)	ND (1)	ND (2)	ND (2)	**2.7**	**4.6**	ND (0.8)	ND (1)	NR	ND (0.5)	ND (0.8)	ND (0.6)	ND (0.8)	**1.4 J** (2)	ND (0.5)	ND (0.8)	NR
Q/STL 603898	TA2-VW-20-72	72	12-11-00	**5.2 J** (10)	ND (0.8)	ND (0.8)	ND (1)	ND (2)	ND (2)	**4.3**	**7**	ND (0.8)	ND (1)	NR	ND (0.5)	ND (0.8)	ND (0.6)	ND (0.8)	**1.9 J** (2)	**0.94 J** (2)	ND (0.8)	NR
Q/STL 603898	TA2-VW-20-72-DU	72	12-11-00	**4.3 J** (10)	ND (0.8)	ND (0.8)	ND (1)	ND (2)	**5.3 J** (10)	**4.5**	**7.1**	ND (0.8)	ND (1)	NR	ND (0.5)	ND (0.8)	ND (0.6)	ND (0.8)	**1.9 J** (2)	ND (0.5)	ND (0.8)	NR
Q/STL 604434	TA2-VW-20-72	72	04-19-01	**9 J** (10)	ND (0.8)	ND (0.8)	ND (1)	**2.3 J** (10)	ND (2)	**3.7**	**6.9**	ND (0.8)	ND (1)	NR	ND (0.5)	ND (0.8)	ND (0.6)	ND (0.8)	**2.6**	**1.1 J** (2)	ND (0.8)	NR
Q/STL 604643	TA2-VW-20-72	72	06-22-01	ND (2)	ND (0.8)	ND (0.8)	ND (1)	ND (2)	ND (2)	**3.7**	**6.6**	ND (0.8)	ND (1)	NR	ND (0.5)	ND (0.8)	ND (0.6)	ND (0.8)	**2.3**	ND (0.5)	ND (0.8)	NR
Q/STL 604921	TA2-VW-20-72	72	09-25-01	**4.2 J** (10)	ND (0.8)	ND (0.8)	ND (1)	ND (2)	ND (2)	**4.1**	**6.2**	ND (0.8)	ND (1)	NR	ND (0.5)	ND (0.8)	ND (0.6)	ND (0.8)	**2.3**	ND (0.5)	ND (0.8)	NR
Q/STL 605162	TA2-VW-20-72	72	12-11-01	**6.3 J** (13)	**2.1 J** (2.6)	ND (1)	ND (1.3)	ND (2.6)	ND (2.6)	**2.5 J** (2.6)	**5.8**	ND (1)	ND (1.3)	NR	ND (0.64)	ND (1)	ND (0.77)	ND (1)	ND (0.64)	ND (0.64)	ND (1)	NR
Q/STL 605407	TA2-VW-20-72	72	3-19-02	**10**	ND (0.8)	ND (0.8)	ND (1)	**2.4 J** (10)	ND (2)	**2.6**	**4.6**	ND (0.8)	**3.5 J** (4)	NR	ND (0.5)	ND (0.8)	ND (0.6)	ND (0.8)	**1.6 J** (2)	ND (0.5)	ND (0.8)	NR
Quality Assurance/Quality Control Sample ppb(v/v)																						
ATL 9268	TA2-BH-020-000-FB	--	11-15-96	**16**	ND (1.0)	ND (1.0)	ND (1.0)	ND (1.0)	ND (1.0)	ND (1.0)	ND (1.0)	ND (1.0)	ND (1.0)	ND (1.0)	ND (1.0)	ND (1.0)	ND (1.0)	ND (1.0)	ND (1.0)	ND (1.0)	ND (1.0)	**9.9**

Laboratory and Record Number[c]	ER Sample ID	Sample Date	Ethyl benzene	4-Ethyltoluene	Heptane	Hexane	2-Hexanone	Methylene chloride	4-Methyl-2-pentanone	2-Propanol	Propylene	Styrene	Tetrachloroethene	Toluene	1,2,4-Trichlorobenzene	1,1,1-Trichloroethane	Trichloroethene	Trichlorofluoromethane	1,1,2-Trichloro-1,2,2-trifluoroethane	1,2,4-Trimethylbenzene	1,3,5-Trimethylbenzene	o-Xylene	m-, p-Xylene	Total Xylene
Quanterra 602989	TA2-VW-20-72	12-07-99	**0.69 J** (2)	ND (0.5)	NR	NR	ND (3)	**0.82 J** (2)	ND (2)	NR	NR	ND (0.5)	**0.59 J** (2)	**1.8 J** (2)	ND (3)	ND (0.5)	**25**	**5.7**	**130**	**0.67 J** (2)	ND (0.8)	**0.99 J** (2)	**3.9**	NR
Quanterra 602989	TA2-VW-20-72-DU	12-07-99	ND (0.5)	ND (0.5)	NR	NR	ND (3)	**0.93 J** (2)	ND (2)	NR	NR	ND (0.5)	**0.73 J** (2)	**0.69 J** (2)	ND (3)	ND (0.5)	**25**	**5.7**	**120**	ND (0.5)	ND (0.8)	ND (0.5)	ND (0.8)	NR
Q/STL 603136	TA2-VW-20-72	03-01-00	**8**	ND (0.5)	NR	NR	ND (3)	ND (0.8)	ND (2)	NR	NR	ND (0.5)	**0.7 J** (2)	**20**	ND (3)	ND (0.5)	**16**	**3.6**	**98**	**0.75 J** (2)	ND (0.8)	**7.3**	**27**	NR
Q/STL 603136	TA2-VW-20-72-DU	03-01-00	**15**	**0.9 J** (2)	NR	NR	ND (3)	ND (0.8)	ND (2)	NR	NR	ND (0.5)	ND (0.5)	**42**	ND (3)	ND (0.5)	**19**	**4.1**	**120**	**0.96 J** (2)	ND (0.8)	**24**	**54**	NR
Q/STL 603340	TA2-VW-020-72	06-20-00	ND (0.5)	ND (0.5)	NR	NR	ND (3)	ND (0.8)	ND (2)	NR	NR	ND (0.5)	ND (0.5)	ND (0.5)	ND (3)	ND (0.5)	**19**	**3.8**	**110**	ND (0.5)	ND (0.8)	ND (0.5)	ND (0.8)	NR
Q/STL 603340	TA2-VW-020-72-DU	06-20-00	ND (0.5)	ND (0.5)	NR	NR	ND (3)	ND (0.8)	ND (2)	NR	NR	ND (0.5)	**0.51 J** (2)	ND (0.5)	ND (3)	ND (0.5)	**19**	**3.6**	**100**	ND (0.5)	ND (0.8)	ND (0.5)	ND (0.8)	NR
Q/STL 603661	TA2-VW-20-72	09-13-00	ND (0.5)	ND (0.6)	NR	NR	ND (3)	ND (0.8)	ND (2)	NR	NR	ND (0.5)	ND (0.6)	ND (0.5)	ND (3)	ND (0.5)	**13**	**2.7**	**73**	ND (0.5)	ND (0.8)	ND (0.6)	ND (0.8)	NR
Q/STL 603661	TA2-VW-20-72-DU	09-13-00	ND (0.5)	ND (0.6)	NR	NR	ND (3)	ND (0.8)	ND (2)	NR	NR	ND (0.5)	ND (0.6)	ND (0.5)	ND (3)	ND (0.5)	**17**	**3.6**	**96**	ND (0.5)	ND (0.8)	ND (0.6)	ND (0.8)	NR
Q/STL 603898	TA2-VW-20-72	12-11-00	ND (0.5)	ND (0.6)	NR	NR	ND (3)	ND (0.8)	ND (2)	NR	NR	ND (0.5)	**0.62 J** (2)	ND (0.5)	ND (3)	ND (0.5)	**20**	**4.8**	**120**	ND (0.5)	ND (0.8)	ND (0.6)	ND (0.8)	NR
Q/STL 603898	TA2-VW-20-72-DU	12-11-00	ND (0.5)	ND (0.6)	NR	NR	ND (3)	ND (0.8)	ND (2)	NR	NR	ND (0.5)	ND (0.6)	ND (0.5)	ND (3)	ND (0.5)	**20**	**4.9**	**120**	**0.65 J** (2)	ND (0.8)	ND (0.6)	ND (0.8)	NR
Q/STL 604434	TA2-VW-20-72	04-19-01	**0.75 J** (2)	ND (0.6)	NR	NR	ND (3)	**0.86 J** (2)	ND (2)	NR	NR	ND (0.5)	**0.64 J** (2)	**3.1**	ND (3)	ND (0.5)	**21**	**5.2**	**130**	ND (0.5)	ND (0.8)	ND (0.6)	**2**	NR
Q/STL 604643	TA2-VW-20-72	06-22-01	ND (0.5)	ND (0.6)	NR	NR	ND (3)	ND (0.8)	ND (2)	NR	NR	ND (0.5)	ND (0.6)	ND (0.5)	ND (3)	ND (0.5)	**20**	**5.2**	**120**	ND (0.5)	ND (0.8)	ND (0.6)	ND (0.8)	NR
Q/STL 604921	TA2-VW-20-72	09-25-01	ND (0.5)	ND (0.6)	NR	NR	ND (3)	ND (0.8)	ND (2)	NR	NR	ND (0.5)	ND (0.6)	ND (0.5)	ND (3)	ND (0.5)	**34**	**5**	**110**	ND (0.5)	ND (0.8)	ND (0.6)	ND (0.8)	NR
Q/STL 605162	TA2-VW-20-72	12-11-01	**0.87 J** (2.6)	**1.6 J** (2.6)	NR	NR	ND (1.3)	ND (1)	ND (2.6)	NR	NR	ND (0.64)	ND (0.77)	**3.5**	ND (0.77)	ND (0.64)	**36**	**4.1**	**92**	**3.3**	**1.5 J** (2.6)	ND (0.77)	**2.3 J** (2.6)	NR
Q/STL 605407	TA2-VW-20-72	3-19-02	ND (0.5)	ND (0.7)	NR	NR	ND (1)	ND (0.8)	ND (2)	NR	NR	ND (0.5)	ND (0.6)	ND (0.5)	ND (0.6)	ND (0.5)	**47**	**3.1**	**67**	ND (0.5)	ND (0.8)	ND (0.6)	ND (0.8)	NR
Quality Assurance/Quality Control Sample ppb(v/v)																								
ATL 9268	TA2-BH-020-000-FB	11-15-96	ND (1.0)	ND (1.0)	ND (1.0)	ND (1.0)	ND (1.0)	ND (1.0)	ND (1.0)	ND (1.0)	ND (1.0)	ND (1.0)	ND (1.0)	**6.4**	ND (1.0)	ND (1.0)	ND (1.0)	ND (1.0)	ND (1.0)	ND (1.0)	ND (1.0)	ND (1.0)	ND (1.0)	ND (1.0)

Note: Values in **bold** represent detected analytes.
[a]EPA November 1986.
[b]EPA January 1997.
[c]Analysis request/chain-of-custody record.

BH = Borehole.
ATL = Air Toxics Ltd. Laboratory.
Core = Core Laboratories.
DU = Duplicate sample.
EPA = U.S. Environmental Protection Agency.
ER = Environmental Restoration.
ERCL = Environmental Restoration Chemistry Laboratory.
FB = Field Blank.
ft = Foot (feet).
ID = Identification.
J () = The reported value is greater than or equal to the MDL but less than the practical quantitation limit, shown in parentheses.
MDL = Method detection limit.
mg/m³ = Milligram(s) per cubic meter (air).
NA = Not Applicable
ND () = Not detected above the MDL, shown in parentheses.
NR = Not reported.
ppb(v/v) = Part(s) per billion on a volume per volume basis.
OVA = Organic vapor analyzer.
P = Sample collected while system tubing was being purged and before OVA readings stabilized.
Quanterra = Quanterra Laboratory.
Q/STL = Quanterra/Severn Trent Laboratories.
S = Sample collected after system tubing fully purged and OVA readings stabilized.
SV = Soil vapor.
TA = Technical Area.
VOC = Volatile organic compound.
VW = Vapor well.
-- = Not applicable.

Table A-4
Summary of Technical Area II Active Soil-Vapor Monitoring Well VW-21 Sampling
Soil-Vapor VOC Analytical Results
November 1996 to March 2002
(On- and Off-Site Laboratories)

Sample Attributes / VOCs (EPA Method 8260-M3[a], TO-14/TO-14A[b]) Units as indicated

Laboratory and Record Number[c]	ER Sample ID	Sample Depth (ft)	Sample Date	Acetone	Benzene	Bromodichloromethane	1,3-Butadiene	2-Butanone	Carbon disulfide	Carbon tetrachloride	Chloroform	Chloroethane	Chloromethane	Cyclohexane	1,2-Dibromoethane	1,2-Dichlorobenzene	1,3-Dichlorobenzene	1,4-Dichlorobenzene	Dichlorodifluoromethane	1,1-Dichloroethene	cis-1,2-Dichloroethene	Ethanol
Soil-vapor samples collected during drilling ppb(v/v)																						
ATL 9264	TA2-BH-021-10-SV	10	11-12-96	72	11	ND (3.2)	ND (3.2)	10	ND (3.2)	ND (0.79)	0.92	ND (0.79)	2.2	7.4	NR	ND (0.79)	ND (0.79)	ND (0.79)	1.6	ND (0.79)	ND (0.79)	ND (3.2)
ATL 9264	TA2-BH-021-20-SV	20	11-12-96	380	13	ND (4.1)	ND (4.1)	52	4.8	ND (1.0)	ND (1.0)	6.3	ND (1.0)	13	NR	ND (1.0)	ND (1.0)	ND (1.0)	ND (1.0)	ND (1.0)	ND (1.0)	ND (4.1)
ATL 9264	TA2-BH-021-20-SV-DU	20	11-12-96	320	9.8	ND (4.0)	ND (4.0)	44	7.2	ND (1.0)	ND (1.0)	6.6	9.9	ND (4.0)	NR	ND (1.0)	ND (1.0)	ND (1.0)	1.3	ND (1.0)	ND (1.0)	19
ATL 9264	TA2-BH-021-30-SV	30	11-12-96	66	22	ND (9.8)	ND (9.8)	ND (4.6)	ND (9.8)	ND (2.4)	13	ND (2.4)	ND (2.4)	41	NR	ND (2.4)	ND (2.4)	ND (2.4)	6.2	ND (2.4)	ND (2.4)	ND (9.8)
ATL 9264	TA2-BH-021-40-SV	40	11-12-96	48	63	ND (13)	ND (13)	ND (13)	ND (13)	ND (3.3)	26	ND (3.3)	ND (3.3)	80	NR	ND (3.3)	ND (3.3)	ND (3.3)	5.9	ND (3.3)	ND (3.3)	ND (13)
ATL 9264	TA2-BH-021-50-SV	50	11-12-96	2500	73	ND (31)	84	420	ND (31)	ND (7.9)	17	ND (7.9)	36	ND (31)	NR	ND (7.9)	ND (7.9)	ND (7.9)	ND (7.9)	ND (7.9)	ND (7.9)	ND (31)
ATL 9264	TA2-BH-021-60-SV	60	11-12-96	230	140	ND (40)	ND (40)	48	ND (40)	ND (10)	44	ND (10)	ND (10)	320	NR	ND (10)	ND (10)	ND (10)	ND (10)	ND (10)	ND (10)	ND (40)
ATL 9264	TA2-BH-021-70-SV	70	11-12-96	160	3.3	7.2	ND (6.4)	24	12	ND (1.6)	45	ND (1.6)	ND (1.6)	ND (6.4)	NR	ND (1.6)	ND (1.6)	ND (1.6)	2.1	ND (1.6)	1.8	28
ATL 9265	TA2-BH-021-80-SV	80	11-12-96	160	5.8	6.6	ND (3.8)	26	5.4	ND (0.96)	41	ND (0.96)	ND (0.96)	ND (3.8)	NR	ND (0.96)	ND (0.96)	ND (0.96)	2.2	ND (0.96)	2.3	14
ATL 9265	TA2-BH-021-90-SV	90	11-12-96	550	40	ND (11)	ND (11)	92	ND (11)	ND (2.9)	45	ND (2.9)	ND (2.9)	ND (11)	NR	ND (2.9)	ND (2.9)	ND (2.9)	ND (2.9)	ND (2.9)	ND (2.9)	23
ATL 9265	TA2-BH-021-100-SV	100	11-12-96	170	16	ND (6.4)	16	30	7.0	ND (1.6)	38	ND (1.6)	ND (1.6)	ND (6.4)	NR	ND (1.6)	ND (1.6)	ND (1.6)	2.0	ND (1.6)	3.5	86
ATL 9265	TA2-BH-021-110-SV	110	11-13-96	110	3.2	ND (5.1)	ND (5.1)	17	ND (5.1)	ND (1.3)	ND (1.3)	ND (1.3)	ND (1.3)	ND (5.1)	NR	ND (1.3)	ND (1.3)	ND (1.3)	ND (1.3)	ND (1.3)	ND (1.3)	11
Soil-vapor concentration mg/m[3]																						
ERCL 6173	TA2-VW-21-50-P	50	07-17-97	NR	ND (1.2)	ND (1.2)	NA	NR	ND (1.2)	ND (1.2)	ND (1.2)	NA	NR	NA	NR	NR	NR	NR	NR	ND (1.2)	ND (1.2)	NA
ERCL 6173	TA2-VW-21-50-S	50	07-17-97	NR	ND (1.2)	ND (1.2)	NA	NR	ND (1.2)	ND (1.2)	ND (1.2)	NA	NR	NA	NR	NR	NR	NR	NR	ND (1.2)	ND (1.2)	NA
ERCL 6173	TA2-VW-21-92-P	92	07-17-97	NR	ND (1.2)	ND (1.2)	NA	NR	ND (1.2)	ND (1.2)	ND (1.2)	NA	NR	NA	NR	NR	NR	NR	NR	ND (1.2)	ND (1.2)	NA
ERCL 6173	TA2-VW-21-92-S	92	07-17-97	NR	ND (1.2)	ND (1.2)	NA	NR	ND (1.2)	ND (1.2)	ND (1.2)	NA	NR	NA	NR	NR	NR	NR	NR	ND (1.2)	ND (1.2)	NA
ERCL 6942	TA2-VW-21-50-P	50	09-04-97	NR	ND (1.25)	ND (1.25)	NA	NR	ND (1.25)	ND (1.25)	ND (1.25)	NA	NR	NA	NR	NR	NR	NR	NR	ND (1.25)	ND (1.25)	NA
ERCL 6942	TA2-VW-21-50-S	50	09-04-97	NR	ND (1.25)	ND (1.25)	NA	NR	ND (1.25)	ND (1.25)	ND (1.25)	NA	NR	NA	NR	NR	NR	NR	NR	ND (1.25)	ND (1.25)	NA
ERCL 6942	TA2-VW-21-92-P	92	09-04-97	NR	ND (1.25)	ND (1.25)	NA	NR	ND (1.25)	ND (1.25)	ND (1.25)	NA	NR	NA	NR	NR	NR	NR	NR	ND (1.25)	ND (1.25)	NA
ERCL 6942	TA2-VW-21-92-S	92	09-04-97	NR	ND (1.25)	ND (1.25)	NA	NR	ND (1.25)	ND (1.25)	ND (1.25)	NA	NR	NA	NR	NR	NR	NR	NR	ND (1.25)	ND (1.25)	NA
Soil-vapor concentration ppb(v/v)																						
Core 600308	TA2-VW-21-50	50	05-14-98	ND (1.0)	ND (1.0)	ND (1.0)	NA	ND (1.0)	ND (1.0)	ND (1.0)	7.0	ND (1)	ND (1.0)	NA	ND (1.0)	ND (1.0)	ND (1.0)	ND (1.0)	ND (1.0)	ND (1.0)	ND (1.0)	NA
Core 600308	TA2-VW-21-92	92	05-14-98	ND (1.0)	ND (1.0)	ND (1.0)	NA	ND (1.0)	ND (1.0)	ND (1.0)	27	ND (1)	ND (1.0)	NA	ND (1.0)	ND (1.0)	ND (1.0)	ND (1.0)	ND (1.0)	ND (1.0)	ND (1.0)	NA
Core 600308	TA2-VW-21-92-DU	92	05-14-98	ND (1.0)	ND (1.0)	ND (1.0)	NA	ND (1.0)	ND (1.0)	ND (1.0)	22	ND (1)	ND (1.0)	NA	ND (1.0)	ND (1.0)	ND (1.0)	ND (1.0)	ND (1.0)	ND (1.0)	ND (1.0)	NA
Quanterra 600796	TA2-VW-21-50	50	09-02-98	11 J (34)	ND (0.42J)	0.95 J (6.8)	ND (0.57)	ND (3.5)	ND (0.73)	ND (0.42)	13	ND (1.5)	ND (1.4)	NA	ND (0.37)	3.7 J (6.8)	ND (0.48)	ND (0.68)	2.3 J (6.8)	ND (0.87)	ND (0.54)	NA
Quanterra 600796	TA2-VW-21-92	92	09-02-98	ND (2.4)	ND (0.42J)	ND (0.27)	ND (0.57)	ND (3.5)	ND (0.73)	ND (0.42)	19	ND (1.5)	ND (1.4)	NA	ND (0.37)	30	ND (0.48)	7.4 J (15)	ND (0.45)	ND (0.87)	ND (0.54)	NA
Quanterra 600796	TA2-VW-21-92-DU	92	09-02-98	ND (2.4)	ND (0.42J)	ND (0.27)	ND (0.57)	ND (3.5)	ND (0.73)	ND (0.42)	21	ND (1.5)	ND (1.4)	NA	ND (0.37)	19	ND (0.48)	ND (0.68)	ND (0.45)	ND (0.87)	ND (0.54)	NA
Quanterra 601237	TA2-VW-21-50	50	12-02-98	ND (2)	ND (0.8J)	ND (0.8)	ND (1)	ND (2)	ND (2)	ND (0.5)	14	ND (0.8)	ND (1)	NA	ND (0.5)	ND (0.8)	ND (0.5)	ND (0.8)	2.5 J (8.4)	ND (0.5)	ND (0.8)	NA
Quanterra 601237	TA2-VW-21-92	92	12-02-98	ND (2)	ND (0.8J)	ND (0.8)	ND (1)	ND (2)	ND (2)	ND (0.5)	20 J (22)	ND (0.8)	ND (1)	NA	ND (0.5)	ND (0.8)	ND (0.5)	ND (0.8)	ND (0.5)	7.1 J (22)	ND (0.8)	NA
Quanterra 601237	TA2-VW-21-SV-DU	92	12-02-98	ND (2)	ND (0.8J)	ND (0.8)	ND (1)	ND (2)	ND (2)	ND (0.5)	20	ND (0.8)	ND (1)	NA	ND (0.5)	ND (0.8)	ND (0.5)	ND (0.8)	ND (0.5)	8.2 J (17)	ND (0.8)	NA
Quanterra 601638	TA2-VW-21-50	50	03-22-99	33	ND (0.8)	2.8	ND (1)	ND (2)	ND (2)	ND (0.5)	20	ND (0.8)	ND (1)	NA	ND (0.5)	ND (0.8)	ND (0.5)	ND (0.8)	3	ND (0.5)	1.8 J (2)	NA

Laboratory and Record Number[c]	ER Sample ID	Ethyl benzene	4-Ethyltoluene	Heptane	Hexane	2-Hexanone	Methylene chloride	4-Methyl-2-pentanone	2-Propanol	Propylene	Styrene	Tetrachloroethene	Toluene	1,2,4-Trichlorobenzene	1,1,1-Trichloroethane	Trichloroethene	Trichlorofluoromethane	1,1,2-Trichloro-1,2,2-trifluoroethane	1,2,4-Trimethylbenzene	1,3,5-Trimethylbenzene	o-Xylene	m-, p-Xylene	Total Xylene
Soil-vapor samples collected during drilling ppb(v/v)																							
ATL 9264	TA2-BH-021-10-SV	5.4	14	7.0	7.3	ND (3.2)	ND (0.79)	ND (3.2)	4.7	ND (3.2)	60	ND (0.79)	20	ND (0.79)	ND (0.79)	56	2.3	ND (0.79)	18	7.0	8.1	13	NR
ATL 9264	TA2-BH-021-20-SV	5.8	16	15	18	ND (4.1)	ND (1.0)	ND (4.1)	8.8	430	5.2	1.9	28	ND (1.0)	ND (1.0)	17	ND (1.0)	ND (1.0)	23	8.8	7.1	10	NR
ATL 9264	TA2-BH-021-20-SV-DU	2.4	11	9.8	12	ND (4.0)	ND (1.0)	ND (4.0)	ND (4.0)	ND (4.0)	3.3	2.2	17	ND (1.0)	ND (1.0)	15	ND (1.0)	ND (1.0)	22	9.1	7.5	9.7	NR
ATL 9264	TA2-BH-021-30-SV	ND (2.4)	ND (9.8)	30	39	ND (9.8)	ND (2.4)	ND (9.8)	ND (9.8)	ND (9.8)	ND (2.4)	3.0	34	ND (2.4)	ND (2.4)	690	13	ND (2.4)	12	4.6	6.5	18	NR
ATL 9264	TA2-BH-021-40-SV	10	ND (13)	54	75	ND (13)	ND (3.3)	ND (13)	ND (13)	ND (13)	7.0	5.0	94	ND (3.3)	ND (3.3)	1100	9.5	ND (3.3)	35	14	19	47	NR
ATL 9264	TA2-BH-021-50-SV	63	210	160	86	40	ND (7.9)	48	ND (31)	ND (31)	13	ND (7.9)	1500	ND (7.9)	ND (7.9)	570	ND (7.9)	ND (7.9)	280	130	130	230	NR
ATL 9264	TA2-BH-021-60-SV	24	ND (40)	270	330	ND (40)	ND (10)	ND (40)	ND (40)	ND (40)	ND (10)	ND (10)	250	ND (10)	ND (10)	920	ND (10)	ND (10)	77	34	46	110	NR
ATL 9264	TA2-BH-021-70-SV	5.2	ND (6.4)	14	ND (6.4)	ND (6.4)	2.7	ND (6.4)	ND (6.4)	ND (6.4)	1.9	2.9	170	ND (1.6)	ND (1.6)	640	3.5	ND (1.6)	7.9	3.0	7.8	21	NR
ATL 9265	TA2-BH-021-80-SV	4.7	9.1	17	4.7	ND (3.8)	3.6	ND (3.8)	ND (3.8)	ND (3.8)	3.0	3.7	150	ND (0.96)	ND (0.96)	720	4.0	2.0	13	5.5	7.4	17	NR
ATL 9265	TA2-BH-021-90-SV	16	43	91	46	ND (11)	4.6	ND (11)	ND (11)	ND (11)	5.6	4.3	550	ND (2.9)	ND (2.9)	820	3.9	ND (2.9)	63	29	27	63	NR
ATL 9265	TA2-BH-021-100-SV	17	13	71	18	ND (6.4)	7.1	9.6	ND (6.4)	ND (6.4)	5.8	4.1	560	ND (1.6)	ND (1.6)	950	3.9	ND (1.6)	22	9.9	20	66	NR
ATL 9265	TA2-BH-021-110-SV	6.5	40	47	5.2	ND (5.1)	ND (1.3)	ND (5.1)	ND (5.1)	160	5.2	ND (1.3)	340	ND (1.3)	ND (1.3)	22	ND (1.3)	ND (1.3)	45	29	13	20	NR
Soil-vapor concentration mg/m[3]																							
ERCL 6173	TA2-VW-21-50-P	ND (1.2)	NR	NA	NA	NR	ND (1.2)	NA	NA	NA	ND (1.2)	ND (1.2)	ND (1.2)	NR	ND (1.2)	2.9 J (4.8)	NR	ND (1.2)	NR	NR	ND (1.2)	ND (2.5)	NR
ERCL 6173	TA2-VW-21-50-S	ND (1.2)	NR	NA	NA	NR	3.5 J (4.8)	NA	NA	NA	ND (1.2)	ND (1.2)	ND (1.2)	NR	ND (1.2)	ND (1.2)	NR	2 J (4.8)	NR	NR	ND (1.2)	ND (2.5)	NR
ERCL 6173	TA2-VW-21-92-P	ND (1.2)	NR	NA	NA	NR	1.9 J (4.8)	NA	NA	NA	ND (1.2)	ND (1.2)	ND (1.2)	NR	ND (1.2)	ND (1.2)	NR	ND (1.2)	NR	NR	ND (1.2)	ND (2.5)	NR
ERCL 6173	TA2-VW-21-92-S	4 J (4.8)	NR	NA	NA	NR	37 J (4.8)	NA	NA	NA	2.6 J (4.8)	ND (1.2)	ND (1.2)	NR	ND (1.2)	ND (1.2)	NR	6.7 J (4.8)	NR	NR	5.2 J (4.8)	24 J (9.5)	NR
ERCL 6942	TA2-VW-21-50-P	ND (1.25)	NR	NA	NA	NR	5.2	NA	NA	NA	ND (1.25)	ND (1.25)	ND (1.25)	NR	ND (1.25)	4.2 J (5)	NR	ND (1.25)	NR	NR	ND (1.25)	ND (2.5)	NR
ERCL 6942	TA2-VW-21-50-S	ND (1.25)	NR	NA	NA	NR	11	NA	NA	NA	ND (1.25)	ND (1.25)	ND (1.25)	NR	ND (1.25)	ND (1.25)	NR	ND (1.25)	NR	NR	ND (1.25)	ND (2.5)	NR
ERCL 6942	TA2-VW-21-92-P	ND (1.25)	NR	NA	NA	NR	10	NA	NA	NA	ND (1.25)	ND (1.25)	ND (1.25)	NR	ND (1.25)	45	NR	1.7 J (5)	NR	NR	ND (1.25)	ND (2.5)	NR
ERCL 6942	TA2-VW-21-92-S	ND (1.25)	NR	NA	NA	NR	74	NA	NA	NA	ND (1.25)	ND (1.25)	ND (1.25)	NR	ND (1.25)	8.9	NR	7.7	NR	NR	ND (1.25)	ND (2.5)	NR
Soil-vapor concentration ppb(v/v)																							
Core 600308	TA2-VW-21-50	ND (1.0)	ND (1.0)	NA	NA	NR	13	NR	NA	NA	ND (1.0)	2.0	1.0	ND (1.0)	ND (1.0)	230	ND (1.0)	ND (1.0)	ND (1.0)	ND (1.0)	ND (1.0)	ND (1.0)	ND (1.0)
Core 600308	TA2-VW-21-92	ND (1.0)	ND (1.0)	NA	NA	NR	10	NR	NA	NA	ND (1.0)	ND (1.0)	ND (1.0)	ND (1.0)	ND (1.0)	190	ND (1.0)	ND (1.0)	ND (1.0)	ND (1.0)	ND (1.0)	ND (1.0)	ND (1.0)
Core 600308	TA2-VW-21-92-DU	ND (1.0)	ND (1.0)	NA	NA	NR	ND (1.0)	NR	NA	NA	ND (1.0)	ND (1.0)	ND (1.0)	ND (1.0)	ND (1.0)	98	ND (1.0)	ND (1.0)	ND (1.0)	ND (1.0)	ND (1.0)	ND (1.0)	ND (1.0)
Quanterra 600796	TA2-VW-21-50	ND (0.32)	ND (0.25)	NA	NA	ND (3.9)	ND (0.44)	ND (0.38)	NA	NA	ND (0.64)	4.9 J (6.8)	1.8 J (6.8)	ND (3.3)	ND (0.49)	460	3.7 J (6.8)	ND (0.52)	ND (0.32)	ND (0.29)	NR	NR	ND (0.57)
Quanterra 600796	TA2-VW-21-92	ND (0.32)	ND (0.25)	NA	NA	ND (3.9)	13 J (15)	ND (0.38)	NA	NA	ND (0.64)	20	5.2 J (15)	ND (3.3)	ND (0.49)	970	ND (0.27)	ND (0.52)	ND (0.32)	ND (0.29)	NR	NR	10 J (15)
Quanterra 600796	TA2-VW-21-92-DU	ND (0.32)	ND (0.25)	NA	NA	ND (3.9)	14 J (15)	ND (0.38)	NA	NA	ND (0.64)	14 J (15)	ND (0.33)	ND (3.3)	ND (0.49)	1100	2 J (15)	ND (0.52)	ND (0.32)	ND (0.29)	NR	NR	ND (0.57)
Quanterra 601237	TA2-VW-21-50	ND (0.5)	ND (0.5)	NA	NA	ND (3)	ND (0.8)	ND (2)	NA	NA	ND (0.5)	2.4 J (8.4)	ND (0.5)	ND (3J)	ND (0.5)	510	3.9 J (8.4)	ND (0.5)	ND (0.5)	ND (0.5)	NR	NR	ND (0.8)
Quanterra 601237	TA2-VW-21-92	ND (0.5)	ND (0.5)	NA	NA	ND (3)	21 J (22)	ND (2)	NA	NA	ND (0.5)	6.3 J (22)	ND (0.5)	ND (3J)	ND (0.5)	1300	ND (0.5)	ND (0.5)	ND (0.5)	ND (0.5)	NR	NR	ND (0.8)
Quanterra 601237	TA2-VW-21-SV-DU	ND (0.5)	ND (0.5)	NA	NA	ND (3)	21	ND (2)	NA	NA	ND (0.5)	6.4 J (17)	ND (0.5)	ND (3J)	ND (0.5)	1400	ND (0.5)	4.2 J (17)	ND (0.5)	ND (0.5)	NR	NR	ND (0.8)
Quanterra 601638	TA2-VW-21-50	ND (0.5)	ND (0.5)	NA	NA	ND (3)	ND (0.8)	ND (2)	NA	NA	ND (0.5)	4.4	0.53 J (2)	ND (3)	0.74 J (2)	520	5.4	1.6 J (2)	ND (0.5)	ND (0.8)	ND (0.5)	ND (0.8)	NR

Refer to footnotes at end of table.

Table A-4 (Continued)
Summary of Technical Area II Active Soil-Vapor Monitoring Well VW-21 Sampling
Soil-Vapor VOC Analytical Results
November 1996 to March 2002
(On- and Off-Site Laboratories)

Sample Attributes / VOCs (EPA Method 8260-M3[a], TO-14/TO-14A[b]) Units as indicated

Laboratory and Record Number[c]	ER Sample ID	Sample Depth (ft)	Sample Date	Acetone	Benzene	Bromodichloromethane	1,3-Butadiene	2-Butanone	Carbon disulfide	Carbon tetrachloride	Chloroform	Chloroethane	Chloromethane
Quanterra 601638	TA2-VW-21-92	92	03-22-99	16	ND (0.8)	3.8	ND (1)	ND (2)	ND (2)	ND (0.5)	23	ND (0.8)	ND (1)
Quanterra 601638	TA2-VW-21-DU	92	03-22-99	16 J (26)	ND (2.1)	3.4 J (5.2)	ND (2.6)	ND (5.2)	ND (5.2)	ND (1.3)	22	ND (2.1)	ND (2.6)
Quanterra 601823	TA2-VW-21-50	50	06-24-99	8.9 J (22)	ND (1.8)	ND (1.8)	ND (2.2)	ND (4.4)	ND (4.4)	ND (1.1)	17	ND (1.8)	ND (2.2)
Quanterra 601823	TA2-VW-21-92	92	06-24-99	25 J (44)	ND (3.5)	ND (3.5)	ND (4.4)	ND (8.8)	ND (8.8)	ND (2.2)	15	ND (3.5)	ND (4.4)
Quanterra 601823	TA2-VW-21-92-DU	92	06-24-99	26 J (77)	ND (6.2)	ND (6.2)	ND (7.7)	ND (15)	ND (15)	ND (3.8)	24	ND (6.2)	ND (7.7)
Quanterra 602830	TA2-VW-21-50	50	09-07-99	ND (7.3)	ND (2.9)	ND (2.9)	ND (3.7)	ND (7.3)	ND (7.3)	ND (1.8)	17	ND (2.9)	ND (3.7)
Quanterra 602830	TA2-VW-21-92	92	09-07-99	ND (11)	ND (4.4)	ND (4.4)	ND (5.5)	ND (11)	ND (11)	ND (2.7)	22	ND (4.4)	ND (5.5)
Quanterra 602830	TA2-VW-21-92-DU	92	09-07-99	ND (11)	ND (4.4)	ND (4.4)	ND (5.5)	ND (11)	ND (11)	ND (2.7)	27	ND (4.4)	ND (5.5)
Quanterra 602989	TA2-VW-21-50	50	12-07-99	ND (4.5)	ND (1.8)	3.6 J (4.5)	ND (2.2)	ND (4.5)	ND (4.5)	ND (1.1)	20	ND (1.8)	ND (2.2)
Quanterra 602989	TA2-VW-21-92	92	12-07-99	ND (13)	ND (5.4)	ND (5.4)	ND (6.7)	ND (13)	ND (13)	ND (3.4)	23	ND (5.4)	ND (6.7)
Quanterra 602989	TA2-VW-21-92-DU	92	12-07-99	13 J (40)	ND (3.2)	4 J (8.1)	ND (4)	ND (8.1)	ND (8.1)	ND (2)	24	ND (3.2)	ND (4)
Q/STL 603136	TA2-VW-21-50	50	03-01-00	ND (6)	ND (2.4)	2.5 J (6)	ND (3)	ND (6)	ND (6)	ND (1.5)	18	ND (2.4)	ND (3)
Q/STL 603136	TA2-VW-21-92	92	03-01-00	ND (14)	ND (5.6)	ND (5.6)	ND (7)	ND (14)	ND (14)	ND (3.5)	21	ND (5.6)	ND (7)
Q/STL 603136	TA2-VW-21-92-DU	92	03-01-00	ND (12)	ND (4.8)	ND (4.8)	ND (6)	ND (12)	ND (12)	ND (3)	16	ND (4.8)	ND (6)
Q/STL 603340	TA2-VW-021-50	50	06-20-00	ND (3.2)	2.6 J (3.2)	2.7 J (3.2)	ND (1.6)	ND (3.2)	ND (3.2)	ND (0.8)	16	ND (1.3)	ND (1.6)
Q/STL 603340	TA2-VW-021-92	92	06-20-00	ND (7.2)	ND (2.9)	3.6 J (7.3)	ND (3.6)	ND (7.2)	ND (7.2)	ND (1.8)	18	ND (2.9)	ND (3.6)
Q/STL 603340	TA2-VW-021-92-DU	92	06-20-00	ND (5.4)	2.9 J (5.4)	3.3 J (5.4)	ND (2.7)	ND (5.4)	ND (5.4)	ND (1.3)	19	ND (2.2)	ND (2.7)
Q/STL 603661	TA2-VW-21-50	50	09-13-00	ND (2.9)	ND (1.2)	2.3 J (2.9)	ND (1.5)	ND (2.9)	ND (2.9)	ND (0.74)	15	ND (1.2)	ND (1.5)
Q/STL 603661	TA2-VW-21-92	92	09-13-00	ND (7.2)	ND (2.9)	3.5 J (7.3)	ND (3.6)	ND (7.2)	ND (7.2)	ND (1.8)	19	ND (2.9)	ND (3.6)
Q/STL 603661	TA2-VW-21-92-DU	92	09-13-00	ND (7.4)	ND (2.9)	3.2 J (7.4)	ND (3.7)	ND (7.4)	ND (7.4)	ND (1.8)	20	ND (2.9)	ND (3.7)
Q/STL 603898	TA2-VW-21-50	50	12-11-00	14	ND (0.8)	2.6	ND (1)	ND (2)	16	ND (0.5)	23	ND (0.8)	ND (1)
Q/STL 603898	TA2-VW-21-92	92	12-11-00	5.9 J (27)	ND (2.2)	2.8 J (5.4)	ND (2.7)	ND (5.4)	ND (5.4)	ND (1.3)	23	ND (2.2)	ND (2.7)
Q/STL 603898	TA2-VW-21-92-DU	92	12-11-00	2 J (10)	ND (0.81)	3	ND (1)	ND (2)	ND (2)	ND (0.5)	27	ND (0.81)	ND (1)
Q/STL 604434	TA2-VW-21-50	50	04-19-01	3.4 J (10)	ND (0.8)	2.3	ND (1)	ND (2)	ND (2)	ND (0.5)	24	ND (0.8)	ND (1)
Q/STL 604434	TA2-VW-21-92	92	04-19-01	ND (10)	ND (4.1)	ND (4.1)	ND (5.1)	ND (10)	ND (10)	ND (2.6)	25	ND (4.1)	ND (5.1)
Q/STL 604643	TA2-VW-21-50	50	06-22-01	7.6 J (21)	ND (1.7)	2.8 J (4.2)	ND (2.1)	ND (4.1)	ND (4.1)	ND (1)	21	ND (1.7)	ND (2.1)
Q/STL 604643	TA2-VW-21-92	92	06-22-01	ND (11)	ND (4.3)	ND (4.3)	ND (5.4)	ND (11)	ND (11)	ND (2.7)	25	ND (4.3)	ND (5.4)
Q/STL 604921	TA2-VW-21-50	50	09-25-01	4.6 J (10)	ND (0.8)	2.9	ND (1)	ND (2)	ND (2)	ND (0.5)	21	ND (0.8)	ND (1)
Q/STL 604921	TA2-VW-21-92	92	09-25-01	13 J (54)	ND (4.4)	ND (4.4)	ND (5.4)	ND (11)	ND (11)	ND (2.7)	27	ND (4.4)	ND (5.4)
Q/STL 605162	TA2-VW-21-50	50	12-11-01	ND (2)	ND (0.8)	2.3	ND (1)	ND (2)	ND (2)	ND (0.5)	19	ND (0.8)	ND (1)
Q/STL 605162	TA2-VW-21-92	92	12-11-01	ND (9.5)	ND (3.8)	ND (3.8)	ND (4.7)	ND (9.5)	ND (9.5)	ND (2.4)	18	ND (3.8)	ND (4.7)

Laboratory and Record Number[c]	ER Sample ID	Cyclohexane	1,2-Dibromoethane	1,2-Dichlorobenzene	1,3-Dichlorobenzene	1,4-Dichlorobenzene	Dichlorodifluoromethane	1,1-Dichloroethene	cis-1,2-Dichloroethene	Ethanol	Ethyl benzene	4-Ethyltoluene	Heptane	Hexane	2-Hexanone	Methylene chloride	4-Methyl-2-pentanone	2-Propanol
Quanterra 601638	TA2-VW-21-92	NA	ND (0.5)	ND (0.8)	ND (0.5)	0.82 J (2)	1 J (2)	8.8	2.4	NA	ND (0.5)	ND (0.5)	NA	NA	ND (3)	23	ND (2)	NA
Quanterra 601638	TA2-VW-21-DU	NA	ND (1.3)	ND (2.1)	ND (1.3)	ND (2.1)	ND (1.3)	8.7	2.4 J (5.2)	NA	ND (1.3)	ND (1.3)	NA	NA	ND (7.8)	22	ND (5.2)	NA
Quanterra 601823	TA2-VW-21-50	NA	ND (1.1)	ND (1.8)	ND (1.1)	ND (1.8)	3 J (4.4)	ND (1.1)	ND (1.8)	NA	ND (1.1)	ND (1.1)	NA	NA	ND (6.6)	ND (1.8)	ND (4.4)	NA
Quanterra 601823	TA2-VW-21-92	NA	ND (2.2)	ND (3.5)	ND (2.2)	ND (3.5)	ND (2.2)	3.4 J (8.8)	ND (3.5)	NA	ND (2.2)	ND (2.2)	NA	NA	ND (13)	13	ND (8.8)	NA
Quanterra 601823	TA2-VW-21-92-DU	NA	ND (3.8)	ND (6.2)	ND (3.8)	ND (6.2)	ND (3.8)	5.9 J (15)	ND (6.2)	NA	ND (3.8)	ND (3.8)	NA	NA	ND (23)	20	ND (15)	NA
Quanterra 602830	TA2-VW-21-50	NA	ND (1.8)	ND (2.9)	ND (1.8)	ND (2.9)	2.2 J (7.3)	ND (1.8)	ND (2.9)	NA	ND (1.8)	ND (1.8)	NA	NA	ND (11)	ND (2.9)	ND (7.3)	NA
Quanterra 602830	TA2-VW-21-92	NA	ND (2.7)	ND (4.4)	ND (2.7)	ND (4.4)	ND (2.7)	4.7 J (11)	ND (4.4)	NA	ND (2.7)	ND (2.7)	NA	NA	ND (16)	14	ND (11)	NA
Quanterra 602830	TA2-VW-21-92-DU	NA	ND (2.7)	ND (4.4)	ND (2.7)	ND (4.4)	ND (2.7)	6.4 J (11)	ND (4.4)	NA	ND (2.7)	ND (2.7)	NA	NA	ND (16)	16	ND (11)	NA
Quanterra 602989	TA2-VW-21-50	NA	ND (1.1)	ND (1.8)	ND (1.1)	ND (1.8)	2.5 J (4.5)	ND (1.1)	ND (1.8)	NA	ND (1.1)	ND (1.1)	NA	NA	ND (6.7)	ND (1.8)	ND (4.5)	NA
Quanterra 602989	TA2-VW-21-92	NA	ND (3.4)	ND (5.4)	ND (3.4)	ND (5.4)	ND (3.4)	10 J (13)	ND (5.4)	NA	ND (3.4)	ND (3.4)	NA	NA	ND (20)	29	ND (13)	NA
Quanterra 602989	TA2-VW-21-92-DU	NA	ND (2)	ND (3.2)	ND (2)	ND (3.2)	ND (2)	13	ND (3.2)	NA	ND (2)	ND (2)	NA	NA	ND (12)	31	ND (8.1)	NA
Q/STL 603136	TA2-VW-21-50	NA	ND (1.5)	ND (2.4)	ND (1.5)	ND (2.4)	2.2 J (6)	ND (1.5)	ND (2.4)	NA	ND (1.5)	ND (1.5)	NA	NA	ND (9)	ND (2.4)	ND (6)	NA
Q/STL 603136	TA2-VW-21-92	NA	ND (3.5)	ND (5.6)	ND (3.5)	ND (5.6)	ND (3.5)	5.8 J (14)	ND (5.6)	NA	ND (3.5)	ND (3.5)	NA	NA	ND (21)	15	ND (14)	NA
Q/STL 603136	TA2-VW-21-92-DU	NA	ND (3)	ND (4.8)	ND (3)	ND (4.8)	ND (3)	4.4 J (12)	ND (4.8)	NA	ND (3)	ND (3)	NA	NA	ND (18)	14	ND (12)	NA
Q/STL 603340	TA2-VW-021-50	NA	ND (0.8)	ND (1.3)	ND (0.8)	ND (1.3)	1.9 J (3.2)	ND (0.8)	ND (1.3)	NA	ND (0.8)	ND (0.8)	NA	NA	ND (4.8)	ND (1.3)	ND (3.2)	NA
Q/STL 603340	TA2-VW-021-92	NA	ND (1.8)	ND (2.9)	ND (1.8)	ND (2.9)	ND (1.8)	4 J (7.3)	ND (2.9)	NA	ND (1.8)	ND (1.8)	NA	NA	ND (11)	14	ND (7.2)	NA
Q/STL 603340	TA2-VW-021-92-DU	NA	ND (1.3)	ND (2.2)	ND (1.3)	ND (2.2)	ND (1.3)	4.1 J (5.4)	ND (2.2)	NA	ND (1.3)	ND (1.3)	NA	NA	ND (8.1)	15	ND (5.4)	NA
Q/STL 603661	TA2-VW-21-50	NA	ND (0.74)	ND (1.2)	ND (0.88)	ND (1.2)	1.8 J (2.9)	ND (0.74)	ND (1.2)	NA	ND (0.74)	ND (0.88)	NA	NA	ND (4.4)	ND (1.2)	ND (2.9)	NA
Q/STL 603661	TA2-VW-21-92	NA	ND (1.8)	ND (2.9)	ND (2.2)	ND (2.9)	ND (1.8)	4 J (7.3)	ND (2.9)	NA	ND (1.8)	ND (2.2)	NA	NA	ND (11)	12	ND (7.2)	NA
Q/STL 603661	TA2-VW-21-92-DU	NA	ND (1.8)	ND (2.9)	ND (2.2)	ND (2.9)	ND (1.8)	4.3 J (7.4)	ND (2.9)	NA	ND (1.8)	ND (2.2)	NA	NA	ND (11)	12	ND (7.4)	NA
Q/STL 603898	TA2-VW-21-50	NA	ND (0.5)	ND (0.8)	ND (0.6)	ND (0.8)	2.5	ND (0.5)	1.2 J (2)	NA	ND (0.5)	ND (0.6)	NA	NA	ND (3)	ND (0.8)	ND (2)	NA
Q/STL 603898	TA2-VW-21-92	NA	ND (1.3)	ND (2.2)	ND (1.6)	ND (2.2)	ND (1.3)	8.1	ND (2.2)	NA	ND (1.3)	ND (1.6)	NA	NA	ND (8.1)	14	ND (5.4)	NA
Q/STL 603898	TA2-VW-21-92-DU	NA	ND (0.5)	ND (0.81)	ND (0.61)	ND (0.81)	ND (0.5)	8.8	2.4	NA	ND (0.5)	ND (0.61)	NA	NA	ND (3)	17	ND (2)	NA
Q/STL 604434	TA2-VW-21-50	NA	ND (0.5)	ND (0.8)	ND (0.6)	ND (0.8)	2.5	ND (0.5)	1.2 J (2)	NA	ND (0.5)	ND (0.6)	NA	NA	ND (3)	ND (0.8)	ND (2)	NA
Q/STL 604434	TA2-VW-21-92	NA	ND (2.6)	ND (4.1)	ND (3.1)	ND (4.1)	ND (2.6)	6.9 J (10)	ND (4.1)	NA	ND (2.6)	ND (3.1)	NA	NA	ND (15)	21	ND (10)	NA
Q/STL 604643	TA2-VW-21-50	NA	ND (1)	ND (1.7)	ND (1.2)	ND (1.7)	2.7 J (4.2)	ND (1)	ND (1.7)	NA	ND (1)	ND (1.2)	NA	NA	ND (6.2)	ND (1.7)	ND (4.1)	NA
Q/STL 604643	TA2-VW-21-92	NA	ND (2.7)	ND (4.3)	ND (3.2)	ND (4.3)	ND (2.7)	5.7 J (11)	ND (4.3)	NA	ND (2.7)	ND (3.2)	NA	NA	ND (16)	14	ND (11)	NA
Q/STL 604921	TA2-VW-21-50	NA	ND (0.5)	ND (0.8)	ND (0.6)	ND (0.8)	2.5	ND (0.5)	0.88 J (2)	NA	ND (0.5)	ND (0.6)	NA	NA	ND (3)	ND (0.8)	ND (2)	NA
Q/STL 604921	TA2-VW-21-92	NA	ND (2.7)	ND (4.4)	ND (3.3)	ND (4.4)	ND (2.7)	5.3 J (11)	ND (4.4)	NA	ND (2.7)	ND (3.3)	NA	NA	ND (16)	15	ND (11)	NA
Q/STL 605162	TA2-VW-21-50	NA	ND (0.5)	ND (0.8)	ND (0.6)	ND (0.8)	0.88 J (2)	ND (0.5)	ND (0.8)	NA	ND (0.5)	ND (0.7)	NA	NA	NE (1)	ND (0.8)	ND (2)	NA
Q/STL 605162	TA2-VW-21-92	NA	ND (2.4)	ND (3.8)	ND (2.8)	ND (3.8)	ND (2.4)	10	ND (3.8)	NA	ND (2.4)	ND (3.3)	NA	NA	ND (4.7)	25	ND (9.5)	NA

Laboratory and Record Number[c]	ER Sample ID	Propylene	Styrene	Tetrachloroethene	Toluene	1,2,4-Trichlorobenzene	1,1,1-Trichloroethane	Trichloroethene	Trichlorofluoromethane	1,1,2-Trichloro-1,2,2-trifluoroethane	1,2,4-Trimethylbenzene	1,3,5-Trimethylbenzene	o-Xylene	m-, p-Xylene	Total Xylene
Quanterra 601638	TA2-VW-21-92	NA	ND (0.5)	10	1 J (2)	ND (3)	1 J (2)	1200	3.1	4.4	ND (0.5)	ND (0.8)	ND (0.5)	1.3 J (2)	NR
Quanterra 601638	TA2-VW-21-DU	NA	ND (1.3)	6.3	ND (1.3)	ND (7.8)	ND (1.3)	1200	2.9 J (5.2)	4.2 J (5.2)	ND (1.3)	ND (2.1)	ND (1.3)	ND (2.1)	NR
Quanterra 601823	TA2-VW-21-50	NA	ND (1.1)	2.8 J (4.4)	ND (1.1)	ND (6.6)	ND (1.1)	410	4.6	1.7 J (4.4)	ND (1.1)	ND (1.8)	ND (1.1)	ND (1.8)	NR
Quanterra 601823	TA2-VW-21-92	NA	ND (2.2)	5.2 J (8.8)	2.5 J (8.8)	ND (13)	ND (2.2)	530	ND (3.5)	2.3 J (8.8)	ND (2.2)	ND (3.5)	ND (2.2)	ND (3.5)	NR
Quanterra 601823	TA2-VW-21-92-DU	NA	ND (3.8)	7.7 J (15)	ND (3.8)	ND (23)	ND (3.8)	920	ND (6.2)	ND (3.8)	ND (3.8)	ND (6.2)	ND (3.8)	ND (6.2)	NR
Quanterra 602830	TA2-VW-21-50	NA	ND (1.8)	2.9 J (7.3)	ND (1.8)	ND (11)	ND (1.8)	460	3.7 J (7.3)	ND (1.8)	ND (1.8)	ND (2.9)	ND (1.8)	ND (2.9)	NR
Quanterra 602830	TA2-VW-21-92	NA	ND (2.7)	6.2 J (11)	8.6 J (11)	ND (16)	ND (2.7)	960	ND (2.7)	3.2 J (11)	ND (2.7)	ND (4.4)	ND (2.7)	ND (4.4)	NR
Quanterra 602830	TA2-VW-21-92-DU	NA	ND (2.7)	6.9 J (11)	ND (2.7)	ND (16)	ND (2.7)	960	3.2 J (11)	4.4 J (11)	ND (2.7)	ND (4.4)	ND (2.7)	ND (4.4)	NR
Quanterra 602989	TA2-VW-21-50	NA	ND (1.1)	3.1 J (4.5)	ND (1.1)	ND (6.7)	ND (1.1)	470	4.5	1.7 J (4.5)	ND (1.1)	ND (1.8)	ND (1.1)	ND (1.8)	NR
Quanterra 602989	TA2-VW-21-92	NA	ND (3.4)	8.4 J (13)	ND (3.4)	ND (20)	ND (3.4)	1500	3.7 J (13)	6.6 J (13)	ND (3.4)	ND (5.4)	ND (3.4)	ND (5.4)	NR
Quanterra 602989	TA2-VW-21-92-DU	NA	ND (2)	9.4	ND (2)	ND (12)	ND (2)	1500	4.4 J (8.1)	7.7 J (8.1)	ND (2)	ND (3.2)	ND (2)	ND (3.2)	NR
Q/STL 603136	TA2-VW-21-50	NA	ND (1.5)	ND (1.5)	ND (1.5)	ND (9)	ND (1.5)	440	3.6 J (6)	ND (1.5)	ND (1.5)	ND (2.4)	ND (1.5)	ND (2.4)	NR
Q/STL 603136	TA2-VW-21-92	NA	ND (3.5)	6.9 J (14)	ND (3.5)	ND (21)	ND (3.5)	1200	ND (3.5)	3.8 J (14)	ND (3.5)	ND (5.6)	ND (3.5)	ND (5.6)	NR
Q/STL 603136	TA2-VW-21-92-DU	NA	ND (3)	5.5 J (12)	ND (3)	ND (18)	ND (3)	850	ND (3)	3.1 J (12)	ND (3)	ND (4.8)	ND (3)	ND (4.8)	NR
Q/STL 603340	TA2-VW-021-50	NA	ND (0.8)	2.7 J (3.2)	ND (0.3)	ND (4.8)	ND (0.8)	470	3 J (3.2)	1 J (3.2)	ND (0.8)	ND (1.3)	ND (0.8)	ND (1.3)	NR
Q/STL 603340	TA2-VW-021-92	NA	ND (1.8)	5.2 J (7.3)	ND (1.8)	ND (11)	ND (1.8)	1100	1.9 J (7.3)	2.9 J (7.3)	ND (1.8)	ND (2.9)	ND (1.8)	ND (2.9)	NR
Q/STL 603340	TA2-VW-021-92-DU	NA	ND (1.3)	4.4 J (5.4)	ND (1.3)	ND (8.1)	ND (1.3)	1200	1.7 J (5.4)	2.9 J (5.4)	ND (1.3)	ND (2.2)	ND (1.3)	ND (2.2)	NR
Q/STL 603661	TA2-VW-21-50	NA	ND (0.74)	2.4 J (2.9)	ND (0.74)	ND (4.4)	ND (0.74)	400	3	1 J (2.9)	ND (0.74)	ND (1.2)	ND (0.88)	ND (1.2)	NR
Q/STL 603661	TA2-VW-21-92	NA	ND (1.8)	4.3 J (7.3)	ND (1.8)	ND (11)	ND (1.8)	870	1.9 J (7.3)	3 J (7.3)	ND (1.8)	ND (2.9)	ND (2.2)	ND (2.9)	NR
Q/STL 603661	TA2-VW-21-92-DU	NA	ND (1.8)	4.2 J (7.4)	ND (1.8)	ND (11)	ND (1.8)	850	2.1 J (7.4)	3 J (7.4)	ND (1.8)	ND (2.9)	ND (2.2)	ND (2.9)	NR
Q/STL 603898	TA2-VW-21-50	NA	ND (0.5)	2.1	ND (0.5)	ND (3)	ND (0.5)	350	3.9	1.6 J (2)	ND (0.5)	ND (0.8)	ND (0.6)	ND (0.8)	NR
Q/STL 603898	TA2-VW-21-92	NA	ND (1.3)	6.5	ND (1.3)	ND (8.1)	ND (1.3)	1000	2.5 J (5.4)	4.8 J (5.4)	ND (1.3)	ND (2.2)	ND (1.6)	ND (2.2)	NR
Q/STL 603898	TA2-VW-21-92-DU	NA	ND (0.5)	6.5	ND (0.6)	ND (3)	ND (0.5)	1100	3	5.7	ND (0.5)	ND (0.81)	ND (0.61)	ND (0.81)	NR
Q/STL 604434	TA2-VW-21-50	NA	ND (0.5)	2.5	ND (0.6)	ND (3)	ND (0.5)	360	3.8	1.5 J (2)	ND (0.5)	ND (0.8)	ND (0.6)	ND (0.8)	NR
Q/STL 604434	TA2-VW-21-92	NA	ND (2.6)	6.2 J (10)	ND (2.6)	ND (15)	ND (2.6)	1000	ND (2.6)	5 J (10)	ND (2.6)	ND (4.1)	ND (3.1)	ND (4.1)	NR
Q/STL 604643	TA2-VW-21-50	NA	ND (1)	2.5 J (4.2)	ND (1)	ND (6.2)	ND (1)	370	3.9 J (4.2)	1.5 J (4.2)	ND (1)	ND (1.7)	ND (1.2)	ND (1.7)	NR
Q/STL 604643	TA2-VW-21-92	NA	ND (2.7)	5.3 J (11)	ND (2.7)	ND (16)	ND (2.7)	870	ND (2.7)	3.9 J (11)	ND (2.7)	ND (4.3)	ND (3.2)	ND (4.3)	NR
Q/STL 604921	TA2-VW-21-50	NA	ND (0.5)	2.5	ND (0.6)	ND (3)	ND (0.5)	370	4.3	1.5 J (2)	ND (0.5)	ND (0.8)	ND (0.6)	ND (0.8)	NR
Q/STL 604921	TA2-VW-21-92	NA	ND (2.7)	5.9 J (11)	ND (2.7)	ND (16)	ND (2.7)	890	ND (2.7)	5.4 J (11)	ND (2.7)	ND (4.4)	ND (3.3)	ND (4.4)	NR
Q/STL 605162	TA2-VW-21-50	NA	ND (0.5)	2.2	ND (0.6)	ND (0.6)	ND (0.5)	330	2.8	1.2 J (2)	ND (0.5)	ND (0.8)	ND (0.6)	ND (0.8)	NR
Q/STL 605162	TA2-VW-21-92	NA	ND (2.4)	9.5	ND (2.4)	ND (2.8)	ND (2.4)	1500	3 J (9.5)	7.2 J (9.5)	ND (2.4)	ND (3.8)	ND (2.8)	ND (3.8)	NR

Refer to footnotes at end of table.

Table A-4 (Concluded)
Summary of Technical Area II Active Soil-Vapor Monitoring Well VW-21 Sampling
Soil-Vapor VOC Analytical Results
November 1996 to March 2002
(On- and Off-Site Laboratories)

Sample Attributes				VOCs (EPA Method 8260-M3[a], TO-14/TO-14A[b]) Units as indicated																				
Laboratory and Record Number[c]	ER Sample ID	Sample Depth (ft)	Sample Date	Acetone	Benzene	Bromodichloromethane	1,3-Butadiene	2-Butanone	Carbon disulfide	Carbon tetrachloride	Chloroform	Chloroethane	Chloromethane	Cyclohexane	1,2-Dibromoethane	1,2-Dichlorobenzene	1,3-Dichlorobenzene	1,4-Dichlorobenzene	Dichlorodifluoromethane	1,1-Dichloroethene	cis-1,2-Dichloroethene	Ethanol
Q/STL 605407	TA2-VW-21-50	50	3-19-02	**3.8 J (13)**	ND (1.1)	**3.1**	ND (1.3)	**4.6 J (13)**	ND (2.7)	ND (0.67)	**15**	ND (1.1)	ND (1.3)	NA	ND (0.67)	ND (1.1)	ND (0.8)	ND (1.1)	**1.6 J (2.7)**	ND (0.67)	ND (1.1)	NA
Q/STL 605407	TA2-VW-21-92	92	3-19-02	ND (6.9)	ND (2.8)	**4.4 J (6.9)**	ND (3.4)	ND (6.9)	ND (6.9)	ND (1.7)	**19**	ND (2.8)	ND (3.4)	NA	ND (1.7)	ND (2.8)	ND (2.1)	ND (2.8)	ND (1.7)	**4 J (6.9)**	ND (2.8)	NA

Laboratory and Record Number[c]	ER Sample ID	Ethyl benzene	4-Ethyltoluene	Heptane	Hexane	2-Hexanone	Methylene chloride	4-Methyl-2-pentanone	2-Propanol	Propylene	Styrene	Tetrachloroethene	Toluene	1,2,4-Trichlorobenzene	1,1,1-Trichloroethane	Trichloroethene	Trichlorofluoromethane	1,1,2-Trichloro-1,2,2-trifluoroethane	1,2,4-Trimethylbenzene	1,3,5-Trimethylbenzene	o-Xylene	m-, p-Xylene	Total Xylene
Q/STL 605407	TA2-VW-21-50	ND (0.67)	ND (0.94)	NA	NA	ND (1.3)	ND (1.1)	ND (2.7)	NA	NA	ND (0.67)	**1.5 J (2.7)**	ND (0.67)	ND (0.8)	ND (0.67)	**270**	**2.4 J (2.7)**	**0.95 J (2.7)**	ND (0.67)	ND (1.1)	ND (0.8)	ND (1.1)	NR
Q/STL 605407	TA2-VW-21-92	ND (1.7)	ND (2.4)	NA	NA	ND (3.4)	**14**	ND (6.9)	NA	NA	ND (1.7)	**4.8 J (6.9)**	ND (1.7)	ND (2.1)	ND (1.7)	**980**	ND (1.7)	**3.2 J (6.9)**	ND (1.7)	ND (2.8)	ND (2.1)	ND (2.8)	NR

Note: Values in **bold** represent detected analytes.
[a]EPA November 1986.
[b]EPA January 1997.
[c]Analysis request/chain-of-custody record.

ATL	= Air Toxics Ltd. Laboratory.
BH	= Borehole.
Core	= Core Laboratories.
DU	= Duplicate sample.
EPA	= U.S. Environmental Protection Agency.
ER	= Environmental Restoration.
ERCL	= Environmental Restoration Chemistry Laboratory.
ft	= Foot (feet).
ID	= Identification.
J ()	= The reported value is greater than or equal to the MDL but less than the practical quantitation limit, shown in parentheses.
MDL	= Method detection limit.
mg/m^3	= Milligram(s) per cubic meter (air).
NA	= Not analyzed.
ND ()	= Not detected above the MDL, shown in parentheses.
NR	= Not Reported.
ppb(v/v)	= Part(s) per billion on a volume per volume basis.
OVA	= Organic vapor analyzer.
P	= Sample collected while system tubing was being purged and before OVA readings stabilized.
Quanterra	= Quanterra Laboratory.
Q/STL	= Quanterra/Severn Trent Laboratories.
S	= Sample collected after system tubing fully purged and OVA readings stabilized.
STL	= Severn Trent Laboratories.
SV	= Soil vapor.
TA	= Technical Area.
VOC	= Volatile organic compound.
VW	= Vapor well.

Table A-5
Summary of Technical Area II Active Soil Vapor Sampling During Borehole BH-023 Drilling
Soil-Vapor VOC Analytical Results
November 1996
(Off-Site Laboratory)

VOCs (EPA Method TO-14[a]) ppb(v/v)

Laboratory and Record Number[b]	ER Sample ID	Sample Depth (ft)	Sample Date	Acetone	Benzene	Bromodichloromethane	1,3-Butadiene	2-Butanone	Carbon disulfide	Carbon tetrachloride	Chloroform	Chloroethane	Chloromethane
Soil-vapor samples collected during borehole drilling													
ATL 9265	TA2-BH-023-10-SV	10	11-13-96	100	4.9	ND (3.3)	10	16	11	ND (0.82)	ND (0.82)	ND (0.82)	1.2
ATL 9265	TA2-BH-023-20-SV	20	11-13-96	40	1.7	ND (3.4)	ND (3.4)	5.4	10	ND (0.86)	ND (0.86)	ND (0.86)	ND (0.86)
ATL 9265	TA2-BH-023-30-SV	30	11-13-96	12	7.0	ND (3.4)	ND (3.4)	ND (3.4)	5.8	ND (0.86)	3.0	ND (0.86)	ND (0.86)
ATL 9265	TA2-BH-023-30-SV-DU	30	11-13-96	11	7.9	ND (3.4)	ND (3.4)	ND (3.4)	4.7	ND (0.86)	2.2	ND (0.86)	ND (0.86)
ATL 9265	TA2-BH-023-40-SV	40	11-13-96	150	18	ND (9.8)	17	18	26	ND (2.4)	ND (2.4)	ND (2.4)	ND (2.4)
ATL 9265	TA2-BH-023-50-SV	50	11-13-96	19	4.1	ND (3.5)	ND (3.5)	ND (3.5)	11	ND (0.88)	8.6	ND (0.88)	ND (0.88)
ATL 9266	TA2-BH-023-50-SV-DU	50	11-13-96	18	1.8	ND (3.3)	ND (3.3)	ND (3.3)	8.4	ND (0.82)	5.2	ND (0.82)	ND (0.82)
ATL 9266	TA2-BH-023-60-SV	60	11-13-96	18	ND (0.84)	ND (3.4)	ND (3.4)	6.2	ND (3.4)	1.9	9.5	ND (0.84)	ND (0.84)
ATL 9266	TA2-BH-023-60-SV-DU	60	11-13-96	17	ND (1.0)	ND (4.1)	ND (4.1)	6.1	ND (4.1)	1.5	9.1	ND (1.0)	ND (1.0)
ATL 9266	TA2-BH-023-70-SV	70	11-13-96	26	ND (0.86)	ND (3.4)	ND (3.4)	ND (3.4)	4.8	ND (0.86)	4.9	ND (0.86)	ND (0.86)
ATL 9267	TA2-BH-023-80-SV	80	11-13-96	43	3.2	ND (3.5)	ND (3.5)	6.9	ND (3.5)	1.2	5.5	ND (0.88)	ND (0.88)
ATL 9267	TA2-BH-023-90-SV	90	11-13-96	12	7.2	ND (3.6)	ND (3.6)	ND (3.6)	ND (3.6)	4.2	17	ND (0.90)	ND (0.90)
ATL 9267	TA2-BH-023-100-SV	100	11-14-96	59	ND (0.88)	ND (3.5)	ND (3.5)	21	ND (3.5)	ND (0.88)	ND (0.88)	ND (0.88)	ND (0.88)

ER Sample ID	Cyclohexane	1,2-Dibromoethane	1,2-Dichlorobenzene	1,3-Dichlorobenzene	1,4-Dichlorobenzene	Dichlorodifluoromethane	1,1-Dichloroethene	cis-1,2-Dichloroethene	Ethanol	Ethyl benzene	4-Ethyltoluene	Heptane	Hexane
TA2-BH-023-10-SV	ND (3.3)	ND (0.82)	ND (0.82)	ND (0.82)	ND (0.82)	0.85	ND (0.82)	ND (0.82)	7.8	8.0	ND (3.3)	21	7.4
TA2-BH-023-20-SV	ND (3.4)	ND (0.86)	ND (0.86)	ND (0.86)	ND (0.86)	ND (0.86)	ND (0.86)	ND (0.86)	7.9	2.8	ND (3.4)	6.2	ND (3.4)
TA2-BH-023-30-SV	7.6	ND (0.86)	ND (0.86)	ND (0.86)	ND (0.86)	1.1	ND (0.86)	ND (0.86)	ND (3.4)	1.7	ND (3.4)	11	10
TA2-BH-023-30-SV-DU	7.4	ND (0.86)	ND (0.86)	ND (0.86)	ND (0.86)	1.4	ND (0.86)	ND (0.86)	ND (3.4)	1.9	ND (3.4)	14	7.1
TA2-BH-023-40-SV	ND (9.8)	ND (2.4)	ND (2.4)	ND (2.4)	ND (2.4)	ND (2.4)	ND (2.4)	ND (2.4)	30	19	ND (9.8)	71	20
TA2-BH-023-50-SV	3.8	ND (0.88)	ND (0.88)	ND (0.88)	ND (0.88)	1.1	ND (0.88)	4.5	7.9	ND (0.88)	ND (3.5)	ND (3.5)	ND (3.5)
TA2-BH-023-50-SV-DU	ND (3.3)	ND (0.82)	ND (0.82)	ND (0.82)	ND (0.82)	1.9	ND (0.82)	3.1	7.6	ND (0.82)	ND (3.3)	ND (3.3)	ND (3.3)
TA2-BH-023-60-SV	ND (3.4)	ND (0.84)	ND (0.84)	ND (0.84)	ND (0.84)	1.3	ND (0.84)	5.6	26	ND (0.84)	ND (3.4)	ND (3.4)	ND (3.4)
TA2-BH-023-60-SV-DU	ND (4.1)	ND (1.0)	ND (1.0)	ND (1.0)	ND (1.0)	1.1	ND (1.0)	5.7	28	ND (1.0)	ND (4.1)	ND (4.1)	ND (4.1)
TA2-BH-023-70-SV	ND (3.4)	ND (0.86)	ND (0.86)	ND (0.86)	ND (0.86)	2.4	ND (0.86)	2.8	ND (3.4)	ND (0.86)	ND (3.4)	ND (3.4)	ND (3.4)
TA2-BH-023-80-SV	ND (3.5)	ND (0.88)	ND (0.88)	ND (0.88)	ND (0.88)	ND (0.88)	ND (0.88)	7.3	12	3.9	ND (3.5)	12	ND (3.5)
TA2-BH-023-90-SV	9.4	ND (0.90)	ND (0.90)	ND (0.90)	ND (0.90)	1.5	1.1	25	ND (3.6)	1.2	ND (3.6)	4.2	3.6
TA2-BH-023-100-SV	ND (3.5)	ND (0.88)	ND (0.88)	ND (0.88)	ND (0.88)	ND (0.88)	ND (0.88)	ND (0.88)	23	7.4	ND (3.5)	24	3.6

ER Sample ID	2-Hexanone	Methylene chloride	4-Methyl-2-pentanone	2-Propanol	Propylene	Styrene	Tetrachloroethene	Toluene	1,2,4-Trichlorobenzene	1,1,1-Trichloroethane	Trichloroethene	Trichlorofluoromethane	1,1,2-Trichloro-1,2,2-trifluoroethane	1,2,4-Trimethylbenzene	1,3,5-Trimethylbenzene	o-Xylene	m-, p-Xylene
TA2-BH-023-10-SV	ND (3.3)	1.7	ND (3.3)	ND (3.3)	ND (3.3)	1.0	1.4	250	ND (0.82)	ND (0.82)	7.5	ND (0.82)	1.2	7.5	2.7	8.2	28
TA2-BH-023-20-SV	ND (3.4)	ND (0.86)	ND (3.4)	ND (3.4)	ND (3.4)	ND (0.86)	ND (0.86)	88	ND (0.86)	ND (0.86)	1.1	ND (0.86)	ND (0.86)	1.9	0.90	3.6	10
TA2-BH-023-30-SV	ND (3.4)	ND (0.86)	ND (3.4)	ND (3.4)	ND (3.4)	ND (0.86)	2.7	22	ND (0.86)	ND (0.86)	46	ND (0.86)	7.5	9.7	3.5	6.3	12
TA2-BH-023-30-SV-DU	ND (3.4)	ND (0.86)	ND (3.4)	ND (3.4)	ND (3.4)	ND (0.86)	2.2	30	ND (0.86)	ND (0.86)	43	ND (0.86)	5.7	9.1	3.5	6.6	13
TA2-BH-023-40-SV	ND (9.8)	ND (2.4)	ND (9.8)	ND (9.8)	ND (9.8)	ND (2.4)	2.8	780	ND (2.4)	ND (2.4)	46	ND (2.4)	7.0	14	5.1	19	72
TA2-BH-023-50-SV	ND (3.5)	ND (0.88)	ND (3.5)	ND (3.5)	ND (3.5)	ND (0.88)	4.9	7.2	ND (0.88)	ND (0.88)	130	ND (0.88)	21	1.0	ND (0.88)	1.0	2.3
TA2-BH-023-50-SV-DU	ND (3.3)	ND (0.82)	ND (3.3)	ND (3.3)	ND (3.3)	ND (0.82)	3.4	7.5	ND (0.82)	ND (0.82)	100	ND (0.82)	11	0.82	ND (0.82)	ND (0.82)	1.8
TA2-BH-023-60-SV	ND (3.4)	ND (0.84)	ND (3.4)	ND (3.4)	ND (3.4)	ND (0.84)	5.2	2.0	ND (0.84)	ND (0.84)	160	ND (0.84)	24	ND (0.84)	ND (0.84)	ND (0.84)	ND (0.84)
TA2-BH-023-60-SV-DU	ND (4.1)	ND (1.0)	ND (4.1)	ND (4.1)	ND (4.1)	ND (1.0)	5.2	1.8	ND (1.0)	ND (1.0)	150	ND (1.0)	25	ND (1.0)	ND (1.0)	ND (1.0)	ND (1.0)
TA2-BH-023-70-SV	ND (3.4)	ND (0.86)	ND (3.4)	ND (3.4)	18	ND (0.86)	3.0	2.1	ND (0.86)	ND (0.86)	120	ND (0.86)	9.8	ND (0.86)	ND (0.86)	ND (0.86)	ND (0.86)
TA2-BH-023-80-SV	ND (3.5)	ND (0.88)	ND (3.5)	ND (3.5)	34	ND (0.88)	2.5	150	ND (0.88)	ND (0.88)	96	ND (0.88)	17	1.8	ND (0.88)	4.6	14
TA2-BH-023-90-SV	ND (3.6)	ND (0.90)	ND (3.6)	ND (3.6)	ND (3.6)	ND (0.90)	6.9	26	ND (0.90)	ND (0.90)	310	ND (0.90)	59	2.4	ND (0.90)	1.8	5.0
TA2-BH-023-100-SV	ND (3.5)	ND (0.88)	ND (3.5)	ND (3.5)	120	1.9	ND (0.88)	290	ND (0.88)	ND (0.88)	3.3	ND (0.88)	ND (0.88)	1.5	ND (0.88)	7.8	31

Note: Values in **bold** represent detected analytes.
[a]EPA January 1997.
[b]Analysis request/chain-of-custody record.
ATL = Air Toxics Ltd. Laboratory.
BH = Borehole.
DU = Duplicate sample.
EPA = U.S. Environmental Protection Agency.
ER = Environmental Restoration.
ft = Foot (feet).
ID = Identification.
MDL = Method detection Limit.
ND ( ) = Not detected above the MDL, shown in parentheses.
ppb(v/v) = Part(s) per billion on a volume per volume basis.
SV = Soil vapor.
VOC = Volatile organic compound.

Table A-6
Summary of Active Soil-Vapor VOC Analytical Method Detection Limits
November 1996 to September 2003
(On- and Off-Site Laboratories)

Analyte	EPA Method 8260-M3[a] Detection Limit On-Site Laboratory July and September 1997 (mg/m^3)	EPA Method TD-14[b] Detection Limit Dff-Site Laboratories November 1996–March 2002 [ppb(v/v)]	EPA Method TO-14[b] Detection Limit Off-Site Laboratory September 2003 [ppb(v/v)]
Acetone	NA	2–560	2–4.1
Benzene	1.2–1.25	0.42–230	0.8–1.6
Benzyl chloride	NA	0.8–230	0.8–1.6
Bromodichloromethane	1.2–1.25	0.27–230	0.8–1.6
Bromoform	1.2–1.25	0.22–140	0.5–1
Bromomethane	NA	0.68–280	1–2
2-Butanone	NA	2–560	2–4.1
Carbon disulfide	1.2–1.25	0.73–560	2–4.1
Carbon tetrachloride	1.2–1.25	0.42–140	0.5–1
Chlorobenzene	1.2–1.25	0.5–140	0.5–1
Chloroethane	NA	0.8–230	0.8–1.6
Chloroform	1.2–1.25	0.39–230	0.8–1.6
Chloromethane	NA	1–280	1–2
Dibromochloromethane	1.2–1.25	0.23–140	0.5–1
1,2-Dibromoethane	NA	0.37–140	0.5–1
1,2-Dichlorobenzene	NA	0.69–230	0.8–1.6
1,3-Dichlorobenzene	NA	0.48–170	0.7–1.4
1,4-Dichlorobenzene	NA	0.68–230	0.8–1.6
Dichlorodifluoromethane	NA	0.45–140	0.5–1
1,1-Dichloroethane	1.2–1.25	0.5–140	0.5–1
1,2-Dichloroethane	1.2–1.25	0.76–230	0.8–1.6
1,1-Dichloroethene	1.2–1.25	0.5–140	0.5–1
cis-1,2-Dichloroethene	1.2–1.25	0.54–230	0.8–1.6
trans-1,2-Dichloroethene	1.2–1.25	0.5–140	0.5–1
1,2-Dichloropropane	1.2–1.25	0.8–230	0.8–1.6
cis-1,3-Dichloropropene	1.2–1.25	0.5–140	0.5–1
trans-1,3-Dichloropropene	1.2–1.25	0.8–230	0.8–1.6
Ethylbenzene	1.2–1.25	0.32–140	0.5–1
4-Ethyltoluene	NA	0.25–200	0.7–1.4
Hexachlorobutadiene	NA	0.57–280	1–2
2-Hexanone	NA	1–630	1–2
Methylene chloride	1.2–1.25	0.44–230	0.8–1.6
4-methyl-2-Pentanone	NA	0.38–560	2–4.1
Styrene	1.2–1.25	0.5–140	0.6–1.2
1,1,2,2-Tetrachloroethane	1.2–1.25	0.41–140	0.5–1
Tetrachloroethene	1.2–1.25	0.5–170	0.6–1.2
1,2-Dichloro-1,1,2,2-tetrafluoroethane	NA	0.36–230	0.8–1.6
Toluene	1.2–1.25	0.33–140	0.5–1
1,2,4-Trichlorobenzene	NA	0.6–630	1–2
1,1,1-Trichloroethane	1.2–1.25	0.49–140	0.5–1
1,1,2-Trichloroethane	1.2–1.25	0.5–170	0.6–1.2
Trichloroethene	1.2–1.25	0.28–140	0.5–1
1,1,2-Trichloro-1,2,2-trifluoroethane	0.25–1.25	0.5–140	0.5–1

Refer to footnotes at end of table.

Table A-6 (Concluded)
Summary of Active Soil-Vapor VOC Analytical Method Detection Limits
November 1996 to September 2003
(On- and Off-Site Laboratories)

Analyte	EPA Method 8260-M3[a] Detection Limit On-Site Laboratory July and September 1997 (mg/m^3)	EPA Method TO-14[b] Detection Limit Off-Site Laboratories November 1996–March 2002 [ppb(v/v)]	EPA Method TO-14[b] Detection Limit Off-Site Laboratory September 2003 [ppb(v/v)]
Trichlorofluoromethane	NA	0.27–140	0.5–1
1,2,4-Trimethylbenzene	NA	0.32–140	0.8–1.6
1,3,5-Trimethylbenzene	NA	0.29–230	0.8–1.6
Vinyl acetate	NA	1.2–560	2–4.1
Vinyl chloride	1.2–1.25	0.8–230	0.8–1.6
m-, p-Xylene	2.5	0.8–230	1–2
o-Xylene	1.2–1.25	0.5–170	0.6–1.2
Xylene (total)	NA	0.57–0.8	NA

[a]EPA November 1986.
[b]EPA January 1997.
EPA = U.S. Environmental Protection Agency.
mg/m^3 = Milligram(s) per cubic meter (air).
NA = Not analyzed.
ppb(v/v) = Part(s) per billion on a volume/volume basis.
VOC = Volatile organic compound.

Table A-7
Summary of Technical Area II Active Soil-Vapor Monitoring Well 159-VW-01 Sampling
Soil-Vapor VOC Analytical Results
September 2003
(Off-Site Laboratory)

Sample Attributes				VOCs (EPA Method TO-14/TO-14A[a]) ppb(v/v)										
Laboratory and Record Number[b]	ER Sample ID	Sample Depth (ft)	Sample Date	Acetone	Benzene	Bromodichloromethane	1,3-Butadiene	2-Butanone	Carbon disulfide	Carbon tetrachloride	Chloroform	Chloroethane	Chloromethane	Cyclohexane
STL 606760	159-VW-01-5-SV	5	9-9-03	ND (10)	ND (2.0)	ND (2.0)	ND (1.0)	ND (10)	ND (10)	**1.4 J (2.0)**	ND (2.0)	ND (0.80)	ND (4.0)	NA
STL 606760	159-VW-01-20-SV	20	9-9-03	ND (10)	ND (2.0)	ND (2.0)	ND (1.0)	ND (10)	ND (10)	**2.4**	ND (2.0)	ND (0.80)	ND (4.0)	NA
STL 606760	159-VW-01-70-SV	70	9-9-03	**2.8 J (10)**	ND (2.0)	ND (2.0)	ND (1.0)	ND (10)	ND (10)	**11**	**1.9 J (2.0)**	ND (0.80)	ND (4.0)	NA
STL 606760	159-VW-01-100-SV	100	9-9-03	**3.1 J (10)**	ND (2.0)	ND (2.0)	ND (1.0)	ND (10)	ND (10)	**14**	**2.6**	ND (0.80)	ND (3.0)	NA
STL 606760	159-VW-01-150-SV	150	9-9-03	**6.7 J (20)**	ND (4.1)	ND (4.1)	ND (2.0)	**31**	**11 J (20)**	**7.2**	**2.0 J (4.1)**	ND (1.6)	ND (8.1)	NA
STL 606760	159-VW-01-150-DU	150	9-9-03	**7.7 J (20)**	ND (4.0)	ND (4.0)	ND (2.0)	**54**	**4.4 J (20)**	**6.9**	**2.0 J (4.0)**	ND (1.6)	**2.1 J (8.0)**	NA

ER Sample ID	1,2-Dibromoethane	1,2-Dichlorobenzene	1,3-Dichlorobenzene	1,4-Dichlorobenzene	Dichlorodifluoromethane	1,1-Dichloroethene	cis-1,2-Dichloroethene	Ethanol	Ethyl benzene	4-Ethyltoluene	Heptane	Hexane	2-Hexanone	Methylene chloride	4-Methyl-2-pentanone	2-Propenol
159-VW-01-5-SV	ND (2.0)	ND (2.0)	ND (2.0)	ND (2.0)	**0.70 J (2.0)**	ND (2.0)	ND (2.0)	NA	ND (2.0)	ND (2.0)	NA	NA	ND (1.0)	ND (2.0)	ND (2.0)	NA
159-VW-01-20-SV	ND (2.0)	ND (2.0)	ND (2.0)	ND (2.0)	**0.94 J (2.0)**	ND (2.0)	ND (2.0)	NA	ND (2.0)	ND (2.0)	NA	NA	ND (1.0)	ND (2.0)	ND (2.0)	NA
159-VW-01-70-SV	ND (2.0)	ND (2.0)	ND (2.0)	ND (2.0)	**2.5**	**1.3 J (2.0)**	ND (2.0)	NA	ND (2.0)	ND (2.0)	NA	NA	ND (1.0)	ND (2.0)	ND (2.0)	NA
159-VW-01-100-SV	ND (2.0)	ND (2.0)	ND (2.0)	ND (2.0)	**4.8**	**2.5**	ND (2.0)	NA	ND (2.0)	ND (2.0)	NA	NA	ND (1.0)	ND (2.0)	ND (2.0)	NA
159-VW-01-150-SV	ND (4.1)	ND (4.1)	ND (4.1)	ND (4.1)	**4.4**	**2.3 J (4.1)**	ND (4.1)	NA	ND (4.1)	ND (4.1)	NA	NA	ND (2.0)	ND (4.1)	ND (4.1)	NA
159-VW-01-150-DU	ND (4.0)	ND (4.0)	ND (4.0)	ND (4.0)	**4.3**	**2.1 J (4.0)**	ND (4.0)	NA	ND (4.0)	ND (4.0)	NA	NA	ND (2.0)	ND (4.0)	ND (4.0)	NA

ER Sample ID	Propylene	Styrene	Tetrachloroethene	Toluene	1,2,4-Trichlorobenzene	1,1,1-Trichloroethane	Trichloroethene	Trichlorofluoromethane	1,1,2-Trichloro-1,2,2-trifluoroethane	1,2,4-Trimethylbenzene	1,3,5-Trimethylbenzene	o-Xylene	m-, p-Xylene	Total Xylene
159-VW-01-5-SV	NA	ND (2.0)	ND (2.0)	**0.67 J (2.0)**	ND (5.0)	ND (2.0)	**24**	**1.7 J (2.0)**	**29**	ND (2.0)	ND (2.0)	ND (2.0)	ND (2.0)	NR
159-VW-01-20-SV	NA	ND (2.0)	ND (2.0)	**1.7 J (2.0)**	ND (5.0)	ND (2.0)	**37**	**2.1**	**57**	ND (2.0)	ND (2.0)	ND (2.0)	ND (2.0)	NR
159-VW-01-70-SV	NA	ND (2.0)	**1.2 J (2.0)**	**2.6**	ND (5.0)	ND (2.0)	**140**	**7.7**	**250**	ND (2.0)	ND (2.0)	ND (2.0)	ND (2.0)	NR
159-VW-01-100-SV	NA	ND (2.0)	**1.6 J (2.0)**	**3.0**	ND (5.0)	ND (2.0)	**320**	**19**	**480**	ND (2.0)	ND (2.0)	ND (2.0)	ND (2.0)	NR
159-VW-01-150-SV	NA	ND (4.1)	**1.4 J (4.1)**	**1.4 J (4.1)**	ND (10)	ND (4.1)	**440**	**18**	**440**	ND (4.1)	ND (4.1)	ND (4.1)	ND (4.1)	NR
159-VW-01-150-DU	NA	ND (4.0)	**1.6 J (4.0)**	**2.0 J (4.0)**	ND (10)	ND (4.0)	**450**	**18**	**440**	ND (4.0)	ND (4.0)	ND (4.0)	ND (4.0)	NR

Note: Values in **bold** represent detected analytes.
[a]EPA January 1997.
[b]Analysis request/chain-of-custody record.
DU = Duplicate sample.
EPA = U.S. Environmental Protection Agency.
ER = Environmental Restoration.
ft = Foot (feet).
ID = Identification.
J () = The reported value is greater than or equal to the MDL but less than the practical quantitation limit, shown in parentheses.
MDL = Method detection Limit.
NA = Not analyzed.
ND ( ) = Not detected above the MDL, shown in parentheses.
NR = Not Reported.
ppb(v/v) = Part(s) per billion on a volume per volume basis.
STL = Severn Trent Laboratories.
SV = Soil vapor.
VOC = Volatile organic compound.
VW = Vapor well.

Table A-8
Summary of Technical Area II Active Soil-Vapor Monitoring Well 165-VW-01 Sampling
Soil-Vapor VOC Analytical Results
September 2003
(Off-Site Laboratory)

Sample Attributes				VOCs (EPA Methods TO-14/TD-14A[a]) ppb(v/v)																
Laboratory and Record Number[b]	ER Sample ID	Sample Port Depth (ft)	Sample Date	Acetone	Benzene	Bromodichloromethane	1,3-Butadiene	2-Butanone	Carbon disulfide	Carbon tetrachloride	Chloroform	Chloroethane	Chloromethane	Cyclohexane	1,2-Dibromoethane	1,2-Dichlorobenzene	1,3-Dichlorobenzene	1,4-Dichlorobenzene	Dichlorodifluoromethane	1,1-Dichloroethene
STL 606761	165-VW-01-5-SV	5	9-9-03	**4.0 J** (10)	ND (2.0)	ND (2.0)	ND (1.0)	ND (10)	**3.8 J** (10)	**0.60 J** (2.0)	**6.9**	ND (1.0)	ND (4.0)	NA	ND (2.0)	ND (2.0)	ND (2.0)	ND (1.2)	**0.51 J** (2.0)	ND (2.0)
STL 606761	165-VW-01-20-SV	20	9-9-03	ND (10)	ND (2.0)	ND (2.0)	ND (1.0)	ND (10)	ND (10)	**1.0 J** (2.0)	**17**	ND (0.80)	ND (4.0)	NA	ND (2.0)	ND (2.0)	ND (2.0)	ND (2.0)	ND (2.0)	ND (2.0)
STL 606761	165-VW-01-70-SV	70	9-9-03	**15**	ND (2.0)	ND (2.0)	ND (1.0)	ND (10)	ND (10)	ND (2.0)	**21**	ND (0.80)	ND (4.0)	NA	ND (2.0)	ND (2.0)	ND (2.0)	ND (2.0)	**0.57 J** (2.0)	ND (2.0)
STL 606761	165-VW-01-100-SV	100	9-9-03	**3.4 J** (10)	ND (2.0)	**2.1**	ND (1.0)	ND (10)	ND (10)	**8.1**	**140**	ND (0.80)	ND (4.0)	NA	ND (2.0)	ND (2.0)	ND (2.0)	ND (2.0)	**1.1 J** (2.0)	**0.93 J** (2.0)
STL 606761	165-VW-01-150-SV	150	9-9-03	**3.4 J** (10)	ND (2.0)	ND (2.0)	ND (1.0)	ND (10)	ND (10)	**6.9**	**120**	ND (0.80)	ND (4.0)	NA	ND (2.0)	ND (2.0)	ND (2.0)	ND (2.0)	**1.1 J** (2.0)	**0.88 J** (2.0)

Sample Attributes				VOCs (EPA Methods TO-14/TD-14A[a]) ppb(v/v) (continued)																									
Laboratory and Record Number[b]	ER Sample ID	Sample Port Depth (ft)	Sample Date	cis-1,2-Dichloroethene	Ethanol	Ethyl benzene	4-Ethyltoluene	Heptane	Hexane	2-Hexanone	Methylene chloride	4-Methyl-2-pentanone	2-Propanol	Propylene	Styrene	Tetrachloroethene	Toluene	1,2,4-Trichlorobenzene	1,1,1-Trichloroethane	Trichloroethene	Trichlorofluoromethane	1,1,2-Trichloro-1,2,2-trifluoroethane	1,2,4-Trimethylbenzene	1,3,5-Trimethylbenzene	o-Xylene	m-, p-Xylene	Total Xylene
STL 606761	165-VW-01-5-SV	5	9-9-03	ND (2.0)	NA	ND (2.0)	ND (2.0)	NA	NA	ND (1.0)	ND (2.0)	ND (2.0)	NA	NA	ND (2.0)	ND (2.0)	ND (2.0)	ND (5.0)	ND (2.0)	**1.7 J** (2.0)	**1.5 J** (2.0)	**10**	ND (2.0)	ND (2.0)	ND (2.0)	ND (2.0)	NR
STL 606761	165-VW-01-20-SV	20	9-9-03	ND (2.0)	NA	ND (2.0)	ND (2.0)	NA	NA	ND (1.0)	ND (2.0)	ND (2.0)	NA	NA	ND (2.0)	ND (2.0)	**0.63 J** (2.0)	ND (5.0)	ND (2.0)	**3.4**	**0.85 J** (2.0)	**8.2**	ND (2.0)	ND (2.0)	ND (2.0)	ND (2.0)	NR
STL 606761	165-VW-01-70-SV	70	9-9-03	ND (2.0)	NA	ND (2.0)	ND (2.0)	NA	NA	ND (1.0)	**1.7 J** (2.0)	ND (2.0)	NA	NA	ND (2.0)	ND (2.0)	**2.9**	ND (5.0)	ND (2.0)	**3.4**	**0.58 J** (2.0)	**8.3**	ND (2.0)	ND (2.0)	ND (2.0)	ND (2.0)	NR
STL 606761	165-VW-01-100-SV	100	9-9-03	ND (2.0)	NA	ND (2.0)	ND (2.0)	NA	NA	ND (1.0)	**8.0**	ND (2.0)	NA	NA	ND (2.0)	**1.4 J** (2.0)	**1.6 J** (2.0)	ND (5.0)	ND (2.0)	**26**	**4.4**	**170**	ND (2.0)	ND (2.0)	ND (2.0)	ND (2.0)	NR
STL 606761	165-VW-01-150-SV	150	9-9-03	ND (2.0)	NA	ND (2.0)	ND (2.0)	NA	NA	ND (1.0)	**14**	ND (2.0)	NA	NA	ND (2.0)	**1.5 J** (2.0)	**2.8**	ND (5.0)	ND (2.0)	**8.2**	**3.4**	**170**	ND (2.0)	ND (2.0)	ND (2.0)	ND (2.0)	NR

Note: Values in **bold** represent detected analytes.
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VOC = Volatile organic compound.
VW = Vapor well.