3-1-2005

Justification for Class III Permit Modification March 2005, DSS Site 1006, Operable Unit 1295, Building 6741 Septic System at Technical Area III

Sandia National Laboratories/NM

Drain and Septic Systems (DSS) Area of Concern (AOC) Sites 1006, 1007, 1010, 1015 1020, 1024, 1028, 1029, 1083, 1086, 1108, and 1110

This work supported by the United States Department of Energy under contract DE-AC04-94AL85000.

Sandia National Laboratories

Environmental Restoration Project

Site Histories

Drain and septic system site histories for the twelve DSS AOCs are as follows:

AOC Site Number	Site Name	Location	Year Bldg. and System Built	Year Drain or Septic System Abandoned	Year(s) Septic Tank Effluent Sampled	Year Septic Tank Pumped For the Last Time
1006	Bldg 6741 Septic System	TA-III	1968	1994	1992, 1995	1996
1007	Bldg 6730 Septic System	TA-III	1964	Early 1990s	1992, 1995	1996
1010	Bldg 6536 Septic System and Seepage Pit	TA-III	1967	1991	1990/1991, 1992, 1995	1996
1015	Former MO 231-234 Septic System	TA-V	1988	1991	1990/1991, 1992, 1995	1996
1020	MO-146, MO-235, T-40 Septic System	TA-III	1978	1991	1990/1991, 1995	1996
1024	MO 242-245 Septic System	TA-III	1976	1991	1990/1991, 1992, 1995	1996
1028	Bldg 6560 Septic System and Seepage Pit	TA-III	1955	1991	1990/1991, 1992, 1995	1996
1029	Bldg 6584 North Septic System	TA-III	1963	1991	1990/1991, 1992, 1995	1996
1083	Bldg 6570 Septic System	TA-III	1956	1991	1990/1991	Unknown (backfilled before 1995)
1086	Bldg 6523 Septic System	TA-III	1954	1991	1990/1991	Unknown (backfilled before 1995)
1108	Bldg 6531 Seepage Pits	TA-III	1960	1991	No septic tank at this site.	NA
1110	Bldg 6536 Drain System	TA-III	1967	Early 1990s?	No septic tank at this site.	NA

Depth to Groundwater

Depth to groundwater at these twelve AOC sites is as follows:

DSS Site Number	Site Name	Location	Groundwater Depth (ft bgs)
1006	Bldg 6741 Septic System	TA-III	460
1007	Bldg 6730 Septic System	TA-III	465
1010	Bldg 6536 Septic System and Seepage Pit	TA-III	487
1015	Former MO 231-234 Septic System	TA-V	496
1020	MO-146, MO-235, T-40 Septic System	TA-III	487
1024	MO 242-245 Septic System	TA-III	485
1028	Bldg 6560 Septic System and Seepage Pit	TA-III	482
1029	Bldg 6584 North Septic System	TA-III	482
1083	Bldg 6570 Septic System	TA-III	493
1086	Bldg 6523 Septic System	TA-III	492
1108	Bldg 6531 Seepage Pits	TA-III	483
1110	Bldg 6536 Drain System	TA-III	480

Constituents of Concern

- VOCs, SVOCs, PCBs, HE compounds, metals, cyanide, and radionuclides.

Investigations

- A backhoe was used to positively locate buried components (drainfield drain lines, drywells) for placement of soil-vapor samplers and soil borings.
- Passive soil-vapor samples were collected in drainfield and seepage pit areas to screen for VOCs.
- Soil samples were collected from directly beneath drainfield drain lines, seepage pits, and drywells to determine if COCs were released to the environment from drain systems.

The years that site-specific characterization activities were conducted, and soil sampling depths at each of these twelve AOC sites are as follows:

DSS Site Number	Site Name	Buried Components (Drain Lines, Drywells) Located With A Backhoe	Soil Sampling Beneath Drainlines, Seepage Pits, Drywells	Type(s) of Drain System, and Soil Sampling Depths (ft bgs)	Passive Soil Vapor Sampling
1006	Bldg 6741 Septic System	1997	1998, 1999	Drainfield: 7, 12	2002
1007	Bldg 6730 Septic System	1997	1998, 1999	Drainfield: 4.5, 9.5	2002
1010	Bldg 6536 Septic System and Seepage Pit	None	2002	Septic System Seepage Pit: 15, 20 2nd Seepage Pit: 23, 28	2002
1015	Former MO 231-234 Septic System	1995	1998, 1999	Drainfield: 5, 10	None
1020	MO-146, MO-235, T-40 Septic System	1997	1998, 1999	Drainfield: 5.5, 10.5	None
1024	MO 242-245 Septic System	1997	1998, 1999	Drainfield: 5, 10	None
1028	Bldg 6560 Septic System and Seepage Pit	None	2002	Septic System Seepage Pit: 14, 19 2nd Seepage Pit: 7, 12	2002
1029	Bldg 6584 North Septic System	1997	1998, 1999	Drainfield: 5, 10	2002
1083	Bldg 6570 Septic System	2002	2002	Seepage Pit: 9, 14	2002
1086	Bldg 6523 Septic System	2003	2002	Seepage Pit: 10, 15	None
1108	Bldg 6531 Seepage Pits	None	2002	Seepage Pits: 10, 15	2002
1110	Bldg 6536 Drain System	1997	2002	Drain Pipe: 10, 15, 20	None

Summary of Data Used for NFA Justification

- Seven of the twelve DSS sites were selected by NMED for passive soil-vapor sampling to screen for VOCs, and no significant VOC contamination was identified at any of the seven sites.
- Soil samples were analyzed at on- and off-site laboratories for VOCs, SVOCs, PCBs, HE compounds, metals, cyanide, gross alpha/beta activity, and radionuclides by gamma spectroscopy.
- Very low levels of VOCs were detected at eleven sites, SVOCs and PCBs were detected at seven sites, and cyanide was identified at six of the sites. HE compounds were not detected at any of these sites.
- Arsenic was detected above background at six sites, and barium was detected above background at one site. No other metals were detected above background concentrations.
- Either U-235 or U-238 was detected at an activity slightly above the background activity at three of the twelve sites and, although not detected, the MDA for one or both of these two radionuclides exceeded background levels at five sites. Gross alpha activity was slightly above background in one sample from one of the twelve sites, and gross beta activity was below background in all samples from the twelve sites.
- All confirmatory soil sample analytical results were used for characterizing the sites, for performing the risk screening assessments, and as justification for the NFA proposals for these sites.

Recommended Future Land Use

- Industrial land use was established for these twelve DSS AOC sites.

Results of Risk Analysis

- Risk assessment results for the residential scenario are calculated per NMED risk assessment guidance as presented in "Supplemental Risk Document Supporting Class 3 Permit Modification Process" (SNL October 2003).
- Because COCs were present in concentrations greater than background-screening levels or because constituents were present that did not have background screening numbers, it was necessary to perform risk assessments for these twelve DSS sites. The risk assessment analyses evaluated the potential for adverse health effects for the residential land-use scenario.
- As shown in the table below, the total HIs and estimated excess cancer risks for six of the twelve DSS sites are below NMED guidelines for the residential land-use scenario.
- For five additional sites, the HIs are below the residential guideline, but the total estimated excess cancer risks are slightly above the residential guideline. However, the incremental excess cancer risk values for these five sites are below the NMED residential guideline.
- For one of the twelve sites (DSS Site 1029), the total HI and estimated excess cancer risk are slightly above the NMED guidelines for the residential land-use scenario due to an isolated detection of asphalt-like SVOCs in a single sample. With the removal of these SVOCs from the risk assessment, the incremental values are below the residential scenario guideline.
- The residential land-use scenario TEDEs ranged from none to 0.18 mrem/yr, all of which are substantially below the EPA guideline of 75 mrem/yr. Therefore, these DSS sites are eligible for unrestricted radiological release.
- Using the SNL predictive ecological risk assessment methodology, four of the twelve AOCs were evaluated for ecological risk based on the depth of the available data (i.e., 0 to 5 feet bgs). The ecological risk for all of these sites is acceptable.
- In conclusion, human health and ecological risks are acceptable per NMED guidance. Thus, these sites are proposed for CAC without institutional controls.

Residential land use scenario risk assessment values for COCs at the twelve AOCs are as follows:

DSS Site Number	DSS Site Name	Residential Land Use Scenario	
		Hazard Index	Excess Cancer Risk
1006	Bldg 6741 Septic System	0.26	1E-5 Total/2.62E-7 Incremental
1007	Bldg 6730 Septic System	0.22	1E-5 Total/7.72E-7 Incremental
1010	Bldg 6536 Septic System and Seepage Pit	0.00	2E-9
1015	Former MO 231-234 Septic Systems	0.23	1E-5 Total/1.29E-6 Incremental
1020	MO-146, MO-235, T-40 Septic System	0.00	none
1024	MO 242-245 Septic System	0.21	1E-5 Total/3.65E-7 Incremental
1028	Bldg 6560 Septic System and Seepage Pit	0.00	8E-10
1029	Bldg 6584 North Septic System	2.17 Total/0.06 Incremental (after removal of asphalt-like SVOCs)	8E-5 Total/2.93E-6 Incremental (after removal of asphalt-like SVOCs)
1083	Bldg 6570 Septic System	0.00	2E-9
1086	Bldg 6523 Septic System	0.00	2E-9
1108	Bldg 6531 Seepage Pits	0.26	1E-5 Total/2.98E-6 Incremental
1110	Bldg 6536 Drain System	0.00	3E-9
NMED Guidance		≤1	<1E-5

For More Information Contact

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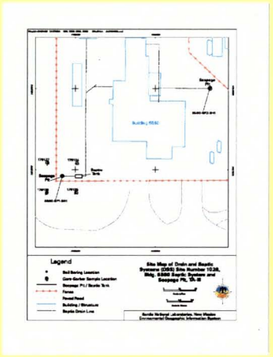
Sandia National Laboratories
Environmental Restoration Project
Task Leader: Brenda Langkopf
Telephone (505) 284-3272

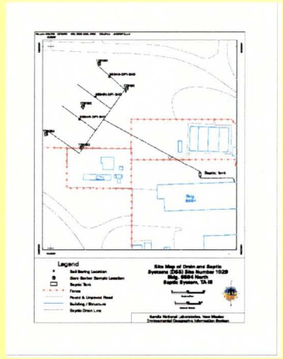
Drain and Septic Systems (DSS) Area of Concern (AOC) Sites 1028, 1029, 1083, 1086, 1108, and 1110

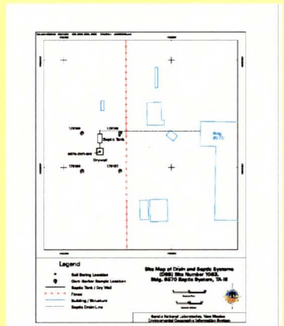
This work supported by the United States Department of Energy under contract DE-AC04-94AL85000.

Sandia National Laboratories

Environmental Restoration Project



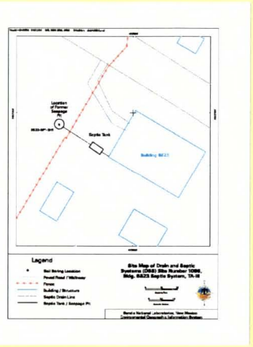


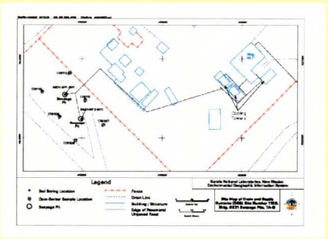


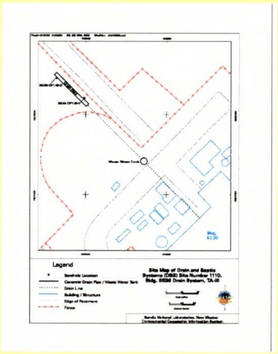
Collecting soil samples with the Geoprobe.

Subsurface soil recovered for analyses.

Seepage pit demolition and backfilling.







For More Information Contact

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Sandia National Laboratories

Justification for Class III Permit Modification

March 2005

DSS Site 1006
Operable Unit 1295
Building 6741 Septic System at Technical Area III

NFA (SWMU Assessment Report) Submitted March 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

ESHSEC

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

MAR 2 3 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 SWMU Assessment Reports and Proposals for No Further Action (NFA) for Drain and Septic Systems (DSS) Sites 1006, 1007, 1015, 1020, 1024, 1029, 1108, and 1110 at Sandia National Laboratories, New Mexico, EPA ID No. NM5890110518.

This submittal includes descriptions of the site characterization work, soil characterization data, and risk assessments for DSS Sites 1006, 1007, 1015, 1020, 1024, 1029, 1108, and 1110. The risk assessments conclude that for these eight 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.

DOE and Sandia are requesting a determination that these DSS sites are acceptable for No Further Action.

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

Sincerely,

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:
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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
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Sandia National Laboratories/New Mexico
Environmental Restoration Project

SWMU ASSESSMENT REPORT AND PROPOSAL FOR NO FURTHER ACTION DRAIN AND SEPTIC SYSTEMS SITE 1006, BUILDING 6741 SEPTIC SYSTEM

March 2004

United States Department of Energy
Sandia Site Office

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ACRONYMS AND ABBREVIATIONS

AOC	Area of Concern
AOP	Administrative Operating Procedure
BA	butyl acetate
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
FIP	Field Implementation Plan
GS	Gore-Sorber™
HE	high explosive(s)
HI	hazard index
HWB	Hazardous Waste Bureau
KAFB	Kirtland Air Force Base
MDL	method detection limit
mg	milligram(s)
NFA	no further action
NMED	New Mexico Environment Department
OU	Operable Unit
PCB	polychlorinated biphenyl
RCRA	Resource Conservation and Recovery Act
RPSD	Radiation Protection Sample Diagnostics
SAP	Sampling and Analysis Plan
SNL/NM	Sandia National Laboratories/New Mexico
SVOC	semivolatile organic compound
SWMU	Solid Waste Management Unit
TA	Technical Area
TB	trip blank
TOP	Technical Operating Procedure
VOC	volatile organic compound

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1.0 PROJECT BACKGROUND

Environmental characterization of Sandia National Laboratories/New Mexico (SNL/NM) Drain and Septic Systems (DSS) started in the early 1990s. These units consist of either septic systems (one or more septic tanks plumbed to either drainfields or seepage pits), or other types of miscellaneous drain units without septic tanks (including drywells or french drains, seepage pits, and surface outfalls). Initially, 23 of these sites were designated as Solid Waste Management Units (SWMUs) under Operable Unit (OU) 1295, Septic Tanks and Drainfields. Characterization work at 22 of these 23 SWMUs has taken place since 1994 as part of SNL/NM Environmental Restoration (ER) Project activities. The twenty-third site did not require any characterization, and an administrative proposal for no further action (NFA) was granted in July 1995.

Numerous other DSS sites that were not designated as SWMUs were also present throughout SNL/NM. An initial list of these non-SWMU sites was compiled and summarized in an SNL/NM document dated July 8, 1996; the list included a total of 101 sites, facilities, or systems (Bleakly July 1996). For tracking purposes, each of these 101 individual DSS sites was designated with a unique four-digit site identification number starting with 1001. This numbering scheme was devised to clearly differentiate these non-SWMU sites from existing SNL/NM SWMUs, which have been designated by one- to three-digit numbers. As work progressed on the DSS site evaluation project, it became apparent that the original 1996 list was in need of field verification and updating. This process included researching SNL/NM's extensive library of facilities engineering drawings and conducting field verification inspections jointly with SNL/NM ER personnel and New Mexico Environment Department (NMED)/Hazardous Waste Bureau (HWB) regulatory staff from July 1999 through January 2000. The goals of this additional work included the following:

- Determine to the degree possible whether each of the 101 systems included on the 1996 list was still in existence, or had ever existed.
- For systems confirmed or believed to exist, determine the exact or apparent locations and components of those systems (septic tanks, drainfields, seepage pits, etc.).
- Identify which systems would, or would not, need initial shallow investigation work as required by the NMED.
- For systems requiring characterization, determine the specific types of shallow characterization work (including passive soil-vapor sampling and/or shallow soil borings) that would be required by the NMED.

A number of additional drain systems were identified from the engineering drawings and field inspection work. It was also determined that some of the sites on the 1996 list actually contained more than one individual drain or septic system that had been combined under one four-digit site number. In order to reduce confusion, a decision was made to assign each individual system its own unique four-digit number. A new site list containing a total of 121 individual DSS sites was generated in 2000. Of these 121 sites, the NMED required environmental assessment work at a total of 61. No characterization was required at the remaining 60 sites because the sites either were found not to exist, were the responsibility of

other non-SNL/NM organizations, were already designated as individual SWMUs, or were considered by the NMED to pose no threat to human health or the environment. Subsequent backhoe excavation at DSS Site 1091 confirmed that the system did not exist, which decreased the number of DSS sites requiring characterization to 60.

Concurrent with the field inspection and site identification work, NMED/HWB and SNL/NM ER Project technical personnel worked together to reach consensus on a staged approach and specific procedures that would be used to characterize the DSS sites, as well as the remaining OU 1295 Septic Tanks and Drainfield SWMUs that had not been approved for NFA. These procedures are described in detail 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), which was approved by the NMED/HWB on January 28, 2000 (Bearzi January 2000). A follow-on document, "Field Implementation Plan [FIP], Characterization of Non-Environmental Restoration Drain and Septic Systems" (SNL/NM November 2001), was then written to formally document the updated DSS site list and the specific site characterization work required by the NMED for each of the 60 DSS sites. The FIP was approved by the NMED in February 2002 (Moats February 2002).

2.0 DSS SITE 1006: BUILDING 6741 SEPTIC SYSTEM

2.1 Summary

The SNL/NM ER Project conducted an assessment of DSS Site 1006, the Building 6741 Septic System. There are no known or specific environmental concerns at this site. The assessment was conducted to determine whether environmental contamination was released to the environment via the septic system present at the site. This report presents the results of the assessment and, based upon the findings, recommends a risk-based proposal for NFA for DSS Site 1006. This NFA proposal provides documentation that the site was sufficiently characterized, that no significant releases of contaminants to the environment occurred via the Building 6741 Septic System, and that it does not pose a threat to human health or the environment under either industrial or residential land-use scenarios. Current operations at the site are conducted in accordance with applicable laws and regulations that are protective of the environment, and septic system discharges are now directed to the City of Albuquerque sewer system.

Review and analysis of all relevant data for DSS Site 1006 indicate that concentrations of constituents of concern (COCs) at this site were found to be below applicable risk assessment action levels. Thus, DSS Site 1006 is proposed for an NFA decision based upon sampling data demonstrating that COCs released from the site into the environment pose an acceptable level of risk under current and projected future land uses as set forth by 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).

2.2 Site Description and Operational History

2.2.1 Site Description

DSS Site 1006 is located in SNL/NM Technical Area (TA)-III on federally owned land controlled by Kirtland Air Force Base (KAFB) and permitted to the U.S. Department of Energy. The site is located at the north end of the long sled track, approximately 5,000 feet west of the entrance to TA-III (Figure 2.2.1-1). The original septic system consisted of a septic tank and distribution box that emptied to a T-shaped drainfield, with a 40-foot-wide lateral at the end of a 65-foot-long drain line. The system was later expanded, probably when the building was modified in the early 1980s, and six additional drain lines, each 100 to 110 feet long, were added (Figure 2.2.1-2). Construction details are based upon engineering drawings (SNL/NM July 1967), site inspections, and backhoe excavations of the system. The system received discharges from Building 6741, approximately 90 feet to the northeast.

The surface geology at DSS Site 1006 is characterized by a veneer of aeolian sediments underlain by Upper Santa Fe Group alluvial fan deposits that interfinger with sediments of the ancestral Rio Grande west of the site. These deposits extend to, and probably far below, the water table at this site. The alluvial fan materials originated in the Manzanita Mountains east of DSS Site 1006, typically consist of a mixture of silts, sands, and gravels that are poorly sorted,

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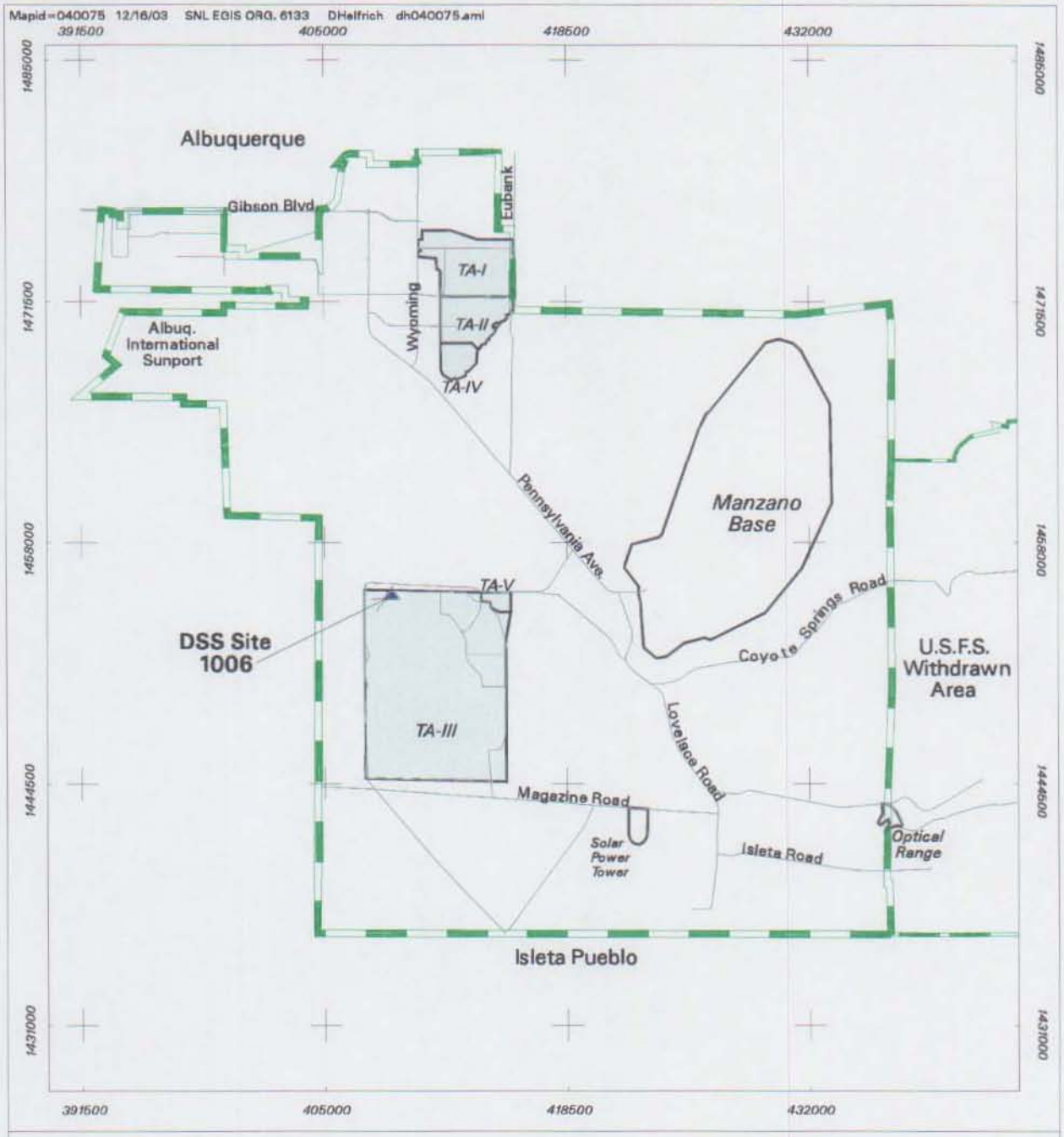

Legend

- DSS Site 1006
- Major Road
- KAFB Boundary
- USFS Withdrawn Area Boundary
- SNL Technical Area

Figure 2.2.1-1
Location Map of Drain and Septic Systems (DSS) Site Number 1006, Bldg. 6741 Septic System, TA-III

0 4500 9000
Scale in Feet

0 1080 2160
Scale in Meters

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Environmental Geographic Information System

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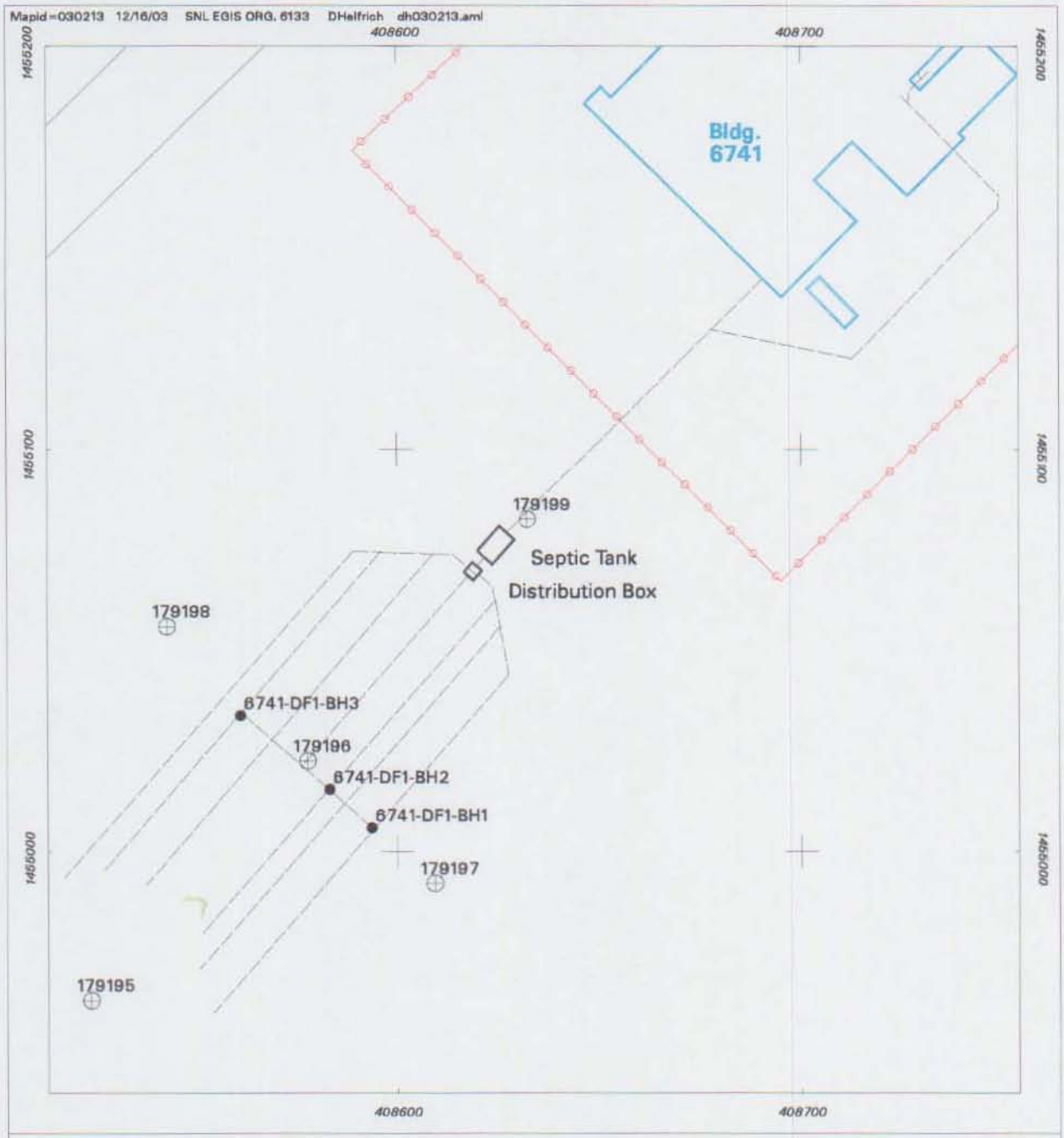

Legend

- Soil Boring Location
- Gore-Sorber Sample Location
- Septic Tank / Distribution Box
- Fence
- Unpaved Road
- Building / Structure
- Septic Drain Line

Figure 2.2.1-2
Site Map of Drain and Septic Systems (DSS) Site Number 1006
Bldg. 6741 Septic System, TA-III

0 20 40
Scale In Feet

0 4.8 9.6
Scale In Meters

Sandia National Laboratories, New Mexico
Environmental Geographic Information System

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and exhibit moderately connected lenticular bedding. Individual beds range from 1 to 5 feet in thickness with a preferred east-west orientation and have moderate to low hydraulic conductivities (SNL/NM March 1996). Site vegetation primarily consists of desert grasses, shrubs, and cacti.

The ground surface in the vicinity of the site is flat or slopes slightly to the west. The closest major drainage is the Arroyo del Coyote, located approximately 1.5 miles northeast of the site. No perennial surface-water bodies are present in the vicinity 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). Infiltration of precipitation is almost nonexistent as virtually all of the moisture subsequently undergoes evapotranspiration. The estimates of evapotranspiration rates for the KAFB area range from 95 to 99 percent of the annual rainfall (SNL/NM March 1996).

The site lies at an average elevation of approximately 5,343 feet above mean sea level (SNL/NM April 2003). Depth to groundwater is approximately 460 feet below ground surface (bgs) at the site. Groundwater flow is thought to be generally to the west-northwest in this area (SNL/NM March 2002). The production wells nearest to DSS Site 1006 are KAFB-4 and KAFB-2, which are approximately 2.5 and 3.3 miles north and northwest of the site, respectively. The nearest groundwater monitoring wells are in the northwest corner of TA-III, approximately 1,200 feet west of the site.

2.2.2 Operational History

Available information indicates that Building 6741 was constructed in 1968 (SNL/NM March 2003) as a control building for the long sled track, and it is assumed that the septic system was constructed at the same time. Because operational records were not available, the site investigation was planned to be consistent with other DSS site investigations and to sample for the COCs most commonly found at similar facilities. In 1994, the septic system discharges were routed to the City of Albuquerque sanitary sewer system (Aas April 1994). The old septic system line would have been disconnected, capped, and the system abandoned in place concurrent with this change (Romero September 2003).

2.3 Land Use

2.3.1 Current Land Use

The current land use for DSS Site 1006 is industrial.

2.3.2 Future/Proposed Land Use

The projected future land use for DSS Site 1006 is industrial (DOE et al. September 1995).

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3.0 INVESTIGATORY ACTIVITIES

3.1 Summary

Four assessment investigations have been conducted at this site. In 1992 and 1995, waste characterization samples were collected from the septic tank (Investigation 1). In June 1997, a backhoe was used to physically locate the buried drainfield drain lines at the site (Investigation 2). In June 1998 and August 1999, near-surface soil samples were collected from three borings in the drainfield (Investigation 3). In April and May 2002, a passive soil-vapor survey was conducted to determine whether areas of significant volatile organic compound (VOC) contamination were present in the soil around the drainfield (Investigation 4). Investigations 2, 3, and 4 were required by the NMED/HWB to adequately characterize the site and were conducted in accordance with procedures presented in the SAP (SNL/NM October 1999) and FIP (SNL/NM November 2001) described in Chapter 1.0. These investigations are discussed in the following sections.

3.2 Investigation 1—Septic Tank Sampling

Investigation 1 consisted of sampling efforts to characterize the waste contents of all SNL/NM septic tanks for chemical and radiological contamination. The primary goal of the sampling was to identify types and concentrations of potential contaminants in the waste within the tanks so that the appropriate waste disposal and remedial activities could be planned.

On June 30, 1992, and July 10, 1995, as part of the SNL/NM Septic System Monitoring Program, aqueous and sludge samples were collected from the Building 6741 septic tank (SNL/NM June 1993, SNL/NM December 1995). During the June 30, 1992 sampling, duplicate samples of the aqueous and sludge phases were also collected. Aqueous samples were analyzed at an off-site laboratory for VOCs, semivolatile organic compounds (SVOCs), pesticides, polychlorinated biphenyls (PCBs), total metals, phenolic compounds, nitrates/nitrites, formaldehyde, fluoride, cyanide, oil and grease, gross alpha/beta activity, tritium, and radionuclides by gamma spectroscopy. The sludge sample and duplicate were analyzed at an off-site laboratory for metals and gross alpha/beta activity, tritium, and radionuclides by gamma spectroscopy. The 1995 aqueous sample was analyzed for VOCs, SVOCs, pesticides, PCBs, total metals, phenolics, nitrates/nitrites, formaldehyde, fluoride, oil and grease, gross alpha/beta activity, tritium, and radionuclides by gamma spectroscopy. The 1995 sludge sample was analyzed for VOCs, SVOCs, pesticides, PCBs, isotopic plutonium, isotopic strontium, isotopic thorium, and isotopic uranium. The analytical results are presented in Annex A. A fraction of each sample was also submitted to the SNL/NM Radiation Protection Sample Diagnostics (RPSD) Laboratory for gamma spectroscopy analysis prior to off-site release. On February 1 and 13, 1996, the residual contents, approximately 903 gallons of waste and added water, were pumped out and managed according to SNL/NM policy (Shain August 1996).

3.3 Investigation 2—Backhoe Excavation

On June 2, 1997, a backhoe was used to determine the location, dimensions, and average depth of the original and modified DSS Site 1006 drainfield system (Figure 2.2.1-2). The original drain lines were located at a depth of 6.5 feet bgs. The depths of the six laterals in the

new drainfield ranged from 5 feet bgs for the northwest drain lines to 6.5 feet bgs for the southeast drain lines. No visible evidence of stained or discolored soil or odors indicating residual contamination were observed during the excavation. No samples were collected during the backhoe excavation at the site.

3.4 Investigation 3—Soil Sampling

Once the system drain lines were located, soil sampling was conducted in accordance with the rationale and procedures in the SAP (SNL/NM October 1999) approved by the NMED. On June 29, 1998, and again on August 18, 1999, soil samples were collected from three drainfield boreholes. Soil boring locations are shown on Figure 2.2.1-2. Figure 3.4-1 shows soil samples being collected at DSS Site 1006. A summary of the boreholes, sample depths, sample analyses, analytical methods, laboratories, and sample dates is presented in Table 3.4-1.

3.4.1 Soil Sampling Methodology

An auger drill rig was used to sample all boreholes at two depth intervals. In drainfields, the top of the shallow interval started at the bottom of the drain line trenches, as determined by the backhoe excavation, and the lower (deep) interval started at 5 feet beneath the top sample interval. Once the auger rig had reached the top of the sampling interval, a 3- or 4-foot-long by 1.5-inch inside diameter Geoprobe™ sampling tube lined with a butyl acetate (BA) sampling sleeve was inserted into the borehole and hydraulically driven downward 3 or 4 feet to fill the tube with soil.

Once the sample tube was retrieved from the borehole, the sample for VOC analysis was immediately collected by slicing off a 3- to 4-inch section from the lower end of the BA sleeve and capping the section ends with Teflon® film, then a rubber end cap, and finally sealing the tube with tape.

For the non-VOC analyses, the soil remaining in the BA 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.

Figure 3.4-1
Collecting soil samples with the Geoprobe™ at DSS Site 1006,
the Building 6741 drainfield. View to the northeast. August 18, 1999

Table 3.4-1
Summary of Area Sampled, Analytical Methods, and Laboratories Used for
DSS Site 1006, Building 6741 Septic System Soil Samples

Sampling Area	Number of Borehole Locations	Top of Sampling Intervals in each Borehole (ft bgs)	Total Number of Soil Samples	Analytical Parameters and EPA Methods[a]	Analytical Laboratory	Date Samples Collected
Drainfield	3	7, 12	6	VOCs EPA Method 8260	GEL	08-18-99
	3	7, 12	6 plus 1 Duplicate	SVOCs EPA Method 8270	GEL	06-29-98
	3	7, 12	6	PCBs EPA Method 8082	GEL	08-18-99
	3	7, 12	6 plus 1 Duplicate	HE Compounds EPA Method 8330; MEKC at ERCL	GEL, ERCL	06-29-98
	3	7, 12	6 plus 1 Duplicate	RCRA Metals EPA Methods 6000/7000	GEL, ERCL	06-29-98
	3	7, 12	6	Hexavalent Chromium EPA Method 7196A	GEL	08-18-99
	3	7, 12	6	Total Cyanide EPA Method 9012A	GEL	08-18-99
	3	7, 12	6 plus 1 Duplicate	Gamma Spectroscopy EPA Method 901.1	GEL, RPSD	06-29-98
	3	7, 12	6	Gross Alpha/Beta Activity EPA Method 900.0	GEL	06-29-98

[a]EPA November 1986.

bgs = Below ground surface.
DSS = Drain and Septic Systems.
EPA = U.S. Environmental Protection Agency.
ERCL = Environmental Restoration Chemistry Laboratory.
ft = Foot (feet).
GEL = General Engineering Laboratories, Inc.
HE = High explosive(s).
MEKC = Micellar Electro-Kinetic Chromatography.
PCB = Polychlorinated biphenyl.
RCRA = Resource Conservation and Recovery Act.
RPSD = Radiation Protection Sample Diagnostics Laboratory.
SVOC = Semivolatile organic compound.
VOC = Volatile organic compound.

3.4.2 Soil Sampling Results and Conclusions

Analytical results for the soil samples collected at DSS Site 1006 are presented and discussed in this section.

VOCs

VOC analytical results for the six soil samples collected from the drainfield boreholes are summarized in Table 3.4.2-1. Method detection limits (MDLs) for the VOC soil analyses are presented in Table 3.4.2-2. Toluene was detected in every soil sample; 2-butanone was detected in all but one of the samples. These compounds were not detected in the trip blank (TB) associated with these samples. They are common laboratory contaminants and may not indicate soil contamination at this site.

SVOCs

SVOC analytical results for the six soil samples and one duplicate collected from the drainfield boreholes are summarized in Table 3.4.2-3. MDLs for the SVOC soil analyses are presented in Table 3.4.2-4. The SVOC, bis-2(ethylhexyl) phthalate, was detected only in the 7-foot sample from borehole BH2. This compound is a common contaminant found in plastics and may not indicate soil contamination at this site.

PCBs

PCB analytical results for the six soil samples collected from the drainfield boreholes are summarized in Table 3.4.2-5. MDLs for the PCB soil analyses are presented in Table 3.4.2-6. No PCBs were detected in any sample collected at this site.

HE Compounds

High explosive (HE) compound analytical results for the six soil samples and one duplicate collected from the drainfield boreholes are summarized in Table 3.4.2-7. MDLs for the HE soil analyses are presented in Table 3.4.2-8. No HE compounds were detected in any sample collected at this site.

RCRA Metals and Hexavalent Chromium

Resource Conservation and Recovery Act (RCRA) metals and hexavalent chromium analytical results for the six soil samples and one duplicate collected from the drainfield boreholes are summarized in Table 3.4.2-9. MDLs for the metals in soil analyses are presented in Table 3.4.2-10. Arsenic was only detected slightly above the NMED-approved background in the 7-foot sample from borehole BH3. Barium was only detected slightly above the NMED-approved background in the 7-foot duplicate sample from borehole BH3.

Table 3.4.2-1
Summary of DSS Site 1006, Building 6741 Septic System
Confirmatory Soil Sampling, VOC Analytical Results
August 1999
(Off-Site Laboratory)

Sample Attributes			VOCs (EPA Method 8260[a]) (µg/kg)	
Record Number[b]	ER Sample ID	Sample Depth (ft)	2-Butanone	Toluene
602762	6741-DF1-BH1-7-S	7	**13**	**3.2**
602762	6741-DF1-BH1-12-S	12	**22**	**3.2**
602762	6741-DF1-BH2-7-S	7	**14**	**3.7**
602762	6741-DF1-BH2-12-S	12	**21**	**5.3**
602762	6741-DF1-BH3-7-S	7	ND (3.2)	**1.6**
602762	6741-DF1-BH3-12-S	12	**6.1**	**1.4**
Quality Assurance/Quality Control Sample (µg/L)				
602762	6620-SP1-TB[c]	NA	ND (5.9)	ND (0.5)

Note: Values in **bold** represent detected analytes.
[a]EPA November 1986.
[b]Analysis request/chain-of-custody record.
[c]ER sample ID reflects the final site for VOC samples included in this shipment.
BH = Borehole.
DF = Drainfield.
DSS = Drain and Septic Systems.
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.
S = Soil sample.
SP = Seepage pit.
TB = Trip blank.
VOC = Volatile organic compound.

Table 3.4.2-2
Summary of DSS Site 1006, Building 6741 Septic System
Confirmatory Soil Sampling, VOC Analytical MDLs
August 1999
(Off-Site Laboratory)

Analyte	EPA Method 8260[a] Detection Limit (µg/kg)
Acetone	10.3
Benzene	0.5
Bromodichloromethane	0.1
Bromoform	0.3
Bromomethane	0.3
2-Butanone	3.2
Carbon disulfide	0.3
Carbon tetrachloride	0.5
Chlorobenzene	0.3
Chloroethane	0.3
Chloroform	0.1
Chloromethane	0.2
Dibromochloromethane	0.2
1,1-Dichloroethane	0.1
1,2-Dichloroethane	0.2
1,1-Dichloroethene	0.3
cis-1,2-Dichloroethene	0.1
trans-1,2-Dichloroethene	0.1
1,2-Dichloropropane	0.2
cis-1,3-Dichloropropene	0.2
trans-1,3-Dichloropropene	0.3
Ethylbenzene	0.3
2-Hexanone	2.8
Methylene chloride	1.4
4-Methyl-2-pentanone	3.1
Styrene	0.3
1,1,2,2-Tetrachloroethane	0.6
Tetrachloroethene	0.4
Toluene	0.9
1,1,1-Trichloroethane	0.1
1,1,2-Trichloroethane	0.3
Trichloroethene	0.3
Vinyl acetate	2.1
Vinyl chloride	0.4
Xylene	0.7

[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.
VOC = Volatile organic compound.

Table 3.4.2-3
Summary of DSS Site 1006, Building 6741 Septic System
Confirmatory Soil Sampling, SVOC Analytical Results
June 1998
(Off-Site Laboratory)

Sample Attributes			SVOCs (EPA Method 8270[a]) (µg/kg)
Record Number[b]	ER Sample ID	Sample Depth (ft)	bis(2-Ethylhexyl) phthalate
600423	6741-DF1-BH1-7-S	7	ND (170)
600423	6741-DF1-BH1-12-S	12	ND (170)
600423	6741-DF1-BH2-7-S	7	**210 J (349)**
600423	6741-DF1-BH2-12-S	12	ND (170)
600423	6741-DF1-BH3-7-S	7	ND (170)
600423	6741-DF1-BH3-7-DU	7	ND (170)
600423	6741-DF1-BH3-12-S	12	ND (170)

Note: Values in **bold** represent detected analytes.
[a]EPA November 1986.
[b]Analysis request/chain-of-custody record.
BH = Borehole.
DF = Drainfield.
DU = Duplicate sample.
DSS = Drain and Septic Systems.
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.
µg/kg = Microgram(s) per kilogram.
ND ( ) = Not detected above the MDL, shown in parentheses.
S = Soil sample.
SVOC = Semivolatile organic compound.

Table 3.4.2-4
Summary of DSS Site 1006, Building 6741 Septic System
Confirmatory Soil Sampling, SVOC Analytical MDLs
June 1998
(Off-Site Laboratory)

Analyte	EPA Method 8270[a] Detection Limit (µg/kg)
Acenaphthene	170
Acenaphthylene	170
Anthracene	170
Benzoic acid	330
Benzo(a)anthracene	170
Benzo(a)pyrene	170
Benzo(b)fluoranthene	170
Benzo(g,h,i)perylene	170
Benzo(k)fluoranthene	170
Benzyl alcohol	170
4-Bromophenyl phenyl ether	170
Butylbenzyl phthalate	170
4-Chlorobenzenamine	330
bis(2-Chloroethoxy)methane	170
bis(2-Chloroethyl)ether	170
bis-Chloroisopropyl ether	170
4-Chloro-3-methylphenol	170
2-Chloronaphthalene	170
2-Chlorophenol	170
4-Chlorophenyl phenyl ether	170
Chrysene	170
o-Cresol	170
m,p-Cresol	170
Dibenz[a,h]anthracene	170
Dibenzofuran	170
1,2-Dichlorobenzene	170
1,3-Dichlorobenzene	170
1,4-Dichlorobenzene	170
3,3'-Dichlorobenzidine	830
2,4-Dichlorophenol	170
Diethylphthalate	170
2,4-Dimethylphenol	170
Dimethylphthalate	170
Di-n-butyl phthalate	170
Dinitro-o-cresol	170
2,4-Dinitrophenol	330
2,4-Dinitrotoluene	170
2,6-Dinitrotoluene	170
Di-n-octyl phthalate	170
1,2-Diphenylhydrazine	170
bis(2-Ethylhexyl) phthalate	170
Fluoranthene	170

Refer to footnotes at end of table.

Table 3.4.2-4 (Concluded)
Summary of DSS Site 1006, Building 6741 Septic System
Confirmatory Soil Sampling, SVOC Analytical MDLs
June 1998
(Off-Site Laboratory)

Analyte	EPA Method 8270[a] Detection Limit (µg/kg)
Fluorene	170
Hexachlorobenzene	170
Hexachlorobutadiene	170
Hexachlorocyclopentadiene	170
Hexachloroethane	170
Indeno(1,2,3-cd)pyrene	170
Isophorone	170
2-Methylnaphthalene	170
Naphthalene	170
2-Nitroaniline	170
3-Nitroaniline	170
4-Nitroaniline	170
Nitrobenzene	170
2-Nitrophenol	170
4-Nitrophenol	330
n-Nitrosodiphenylamine	170
n-Nitrosodipropylamine	170
Pentachlorophenol	170
Phenanthrene	170
Phenol	170
Pyrene	170
1,2,4-Trichlorobenzene	170
2,4,5-Trichlorophenol	170
2,4,6-Trichlorophenol	170

[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.

Table 3.4.2-5
Summary of DSS Site 1006, Building 6741 Septic System
Confirmatory Soil Sampling, PCB Analytical Results
August 1999
(Off-Site Laboratory)

Sample Attributes			PCBs (EPA Method 8082[a]) (µg/kg)
Record Number[b]	ER Sample ID	Sample Depth (ft)	
602762	6741-DF1-BH1-7-S	7	ND
602762	6741-DF1-BH1-12-S	12	ND
602762	6741-DF1-BH2-7-S	7	ND
602762	6741-DF1-BH2-12-S	12	ND
602762	6741-DF1-BH3-7-S	7	ND
602762	6741-DF1-BH3-12-S	12	ND

[a]EPA November 1986.
[b]Analysis request/chain-of-custody record.
BH = Borehole.
DF = Drainfield.
DSS = Drain and Septic Systems.
EPA = U.S. Environmental Protection Agency.
ER = Environmental Restoration.
ft = Foot (feet).
ID = Identification.
µg/kg = Microgram(s) per kilogram.
ND = Not detected.
PCB = Polychlorinated biphenyl.
S = Soil sample.

Table 3.4.2-6
Summary of DSS Site 1006, Building 6741 Septic System
Confirmatory Soil Sampling, PCB Analytical MDLs
August 1999
(Off-Site Laboratory)

Analyte	EPA Method 8082[a] Detection Limit (µg/kg)
Aroclor-1016	1.21
Aroclor-1221	2.8
Aroclor-1232	1.62
Aroclor-1242	1.66
Aroclor-1248	0.901
Aroclor-1254	1.16
Aroclor-1260	0.937

[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.

Table 3.4.2-7
Summary of DSS Site 1006, Building 6741 Septic System
Confirmatory Soil Sampling, HE Compound Analytical Results
June 1998
(On- and Off-Site Laboratories)

Sample Attributes			HE (EPA Method 8330[a] and MEKC) (mg/kg)
Record Number[b]	ER Sample ID	Sample Depth (ft)	
600422	6741-DF1-BH1-7-S	7	ND
600422	6741-DF1-BH1-12-S	12	ND
600422	6741-DF1-BH2-7-S	7	ND
600422	6741-DF1-BH2-12-S	12	ND
600422	6741-DF1-BH3-7-S	7	ND
600423	6741-DF1-BH3-7-DU	7	ND
600422	6741-DF1-BH3-12-S	12	ND

[a]EPA November 1986.
[b]Analysis request/chain-of-custody record.
BH = Borehole.
DF = Drainfield.
DSS = Drain and Septic Systems.
DU = Duplicate sample.
EPA = U.S. Environmental Protection Agency.
ER = Environmental Restoration.
ft = Foot (feet).
HE = High explosive(s).
ID = Identification.
MEKC = Micellar Electro-Kinetic Chromatography.
mg/kg = Milligram(s) per kilogram.
ND = Not detected.
S = Soil sample.

Table 3.4.2-8
Summary of DSS Site 1006, Building 6741 Septic System
Confirmatory Soil Sampling, HE Compound Analytical MDLs
June 1998
(On- and Off-Site Laboratories)

Analyte	EPA Method 8330[a] and MEKC Detection Limit (mg/kg)
2-Amino-4,6-dinitrotoluene	0.0066–0.13
4-Amino-2,6-dinitrotoluene	0.0055–0.11
1,3-Dinitrobenzene	0.0041–0.075
2,4-Dinitrotoluene	0.0062–0.25
2,6-Dinitrotoluene	0.0065–0.29
HMX	0.0053–0.13
Nitrobenzene	0.0052–0.17
2-Nitrotoluene	0.0078–0.15
3-Nitrotoluene	0.0011–0.15
4-Nitrotoluene	0.0011–0.13
PETN	0.0032–0.34
RDX	0.0097–0.18
1,3,5-Trinitrobenzene	0.0066–0.11
2,4,6-Trinitrotoluene	0.0057–0.29

[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.
MEKC = Micellar Electro-Kinetic Chromatography.
mg/kg = Milligram(s) per kilogram.
PETN = Pentaerythritol tetranitrate.
RDX = Hexahydro-1,3,5-trinitro-1,3,5-triazine.

Table 3.4.2-9
Summary of DSS Site 1006, Building 6741 Septic System
Confirmatory Soil Sampling, Metals Analytical Results
June 1998 and August 1999
(On- and Off-Site Laboratories)

Sample Attributes			Metals (EPA Method 6000/7000/7196A[a]) (mg/kg)								
Record Number[b]	ER Sample ID	Sample Depth (ft)	Arsenic	Barium	Cadmium	Chromium	Chromium (VI)	Lead	Mercury	Selenium	Silver
600422, 602762	6741-DF1-BH1-7-S	7	3.6	180	0.097 J (0.17)	7.5	ND (0.0337)	5.6	0.084 J (0.17)	0.43 J (1.3)	ND (0.042)
600422, 602762	6741-DF1-BH1-12-S	12	3.5	100	0.12 J (0.16)	10	ND (0.0339)	7	ND (0.041)	0.37 J (1.2)	ND (0.041)
600422, 602762	6741-DF1-BH2-7-S	7	3.5	180	0.14 J (0.17)	8.2	0.347	6.1	ND (0.042)	0.37 J (1.3)	ND (0.042)
600422, 602762	6741-DF1-BH2-12-S	12	3.8	90	0.15 J (0.16)	11	ND (0.0335)	7.2	0.048 J (0.16)	0.34 J (1.2)	ND (0.041)
600422, 602762	6741-DF1-BH3-7-S	7	**4.5**	170	0.11 J (0.17)	8.8	ND (0.034)	6.1	0.049 J (0.17)	0.41 J (1.2)	ND (0.042)
600423	6741-DF1-BH3-7-DU	7	4.38	**225**	0.136 J (0.497)	9.14	NS	5.59	ND (0.0173)	0.381 J (0.497)	ND (0.031)
600422, 602762	6741-DF1-BH3-12-S	12	2.7	62	0.1 J (0.16)	8.2	ND (0.0339)	6.4	0.043 J (0.16)	0.37 J (1.2)	ND (0.041)
Background Concentration—Southwest Area Supergroup[c]		NA	4.4	214	0.9	15.9	1	11.8	<0.1	<1	<1

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

[a]EPA November 1986.

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

[c]Dinwiddie September 1997.

BH = Borehole.
DF = Drainfield.
DSS = Drain and Septic Systems.
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 is less than the practical quantitation limit, shown in parentheses.
MDL = Method detection limit.
mg/kg = Milligram(s) per kilogram.
NA = Not applicable.
ND ( ) = Not detected above the MDL, shown in parentheses.
NS = Not sampled.
S = Soil sample.

Table 3.4.2-10
Summary of DSS Site 1006, Building 6741 Septic System
Confirmatory Soil Sampling, Metals Analytical MDLs
June 1998 and August 1999
(On- and Off-Site Laboratories)

Analyte	EPA Method 6000/7000/7196A[a] Detection Limit (mg/kg)
Arsenic	0.149–0.64
Barium	0.0166–0.53
Cadmium	0.0104–0.042
Chromium	0.0365–0.74
Chromium (VI)	0.0335–0.034
Lead	0.0339–0.32
Mercury	0.0173–0.042
Selenium	0.07–0.32
Silver	0.031–0.042

[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.

Total Cyanide

Total cyanide analytical results for the six soil samples collected from the drainfield boreholes are summarized in Table 3.4.2-11. MDLs for the cyanide soil analyses are presented in Table 3.4.2-12. Cyanide was not detected in any sample analyzed.

Radionuclides

Analytical results for the gamma spectroscopy analysis of the six soil samples and one duplicate collected from the drainfield boreholes are summarized in Table 3.4.2-13. No activities above NMED-approved background levels were detected in any sample analyzed.

Gross Alpha/Beta Activity

Gross alpha/beta analytical results for the six soil samples collected from the drainfield boreholes are summarized in Table 3.4.2-14. No gross alpha or beta activity was detected above the New Mexico-established background level (Miller September 2003) in any of the samples. These results indicate no significant levels of radioactive material are present in the soil at the site.

Table 3.4.2-11
Summary of DSS Site 1006, Building 6741 Septic System
Confirmatory Soil Sampling, Total Cyanide Analytical Results
August 1999
(Off-Site Laboratory)

Sample Attributes			Total Cyanide (EPA Method 9012A[a]) (mg/kg)
Record Number[b]	ER Sample ID	Sample Depth (ft)	
602762	6741-DF1-BH1-7-S	7	ND
602762	6741-DF1-BH1-12-S	12	ND
602762	6741-DF1-BH2-7-S	7	ND
602762	6741-DF1-BH2-12-S	12	ND
602762	6741-DF1-BH3-7-S	7	ND
602762	6741-DF1-BH3-12-S	12	ND

[a]EPA November 1986.
[b]Analysis request/chain-of-custody record.
BH = Borehole.
DF = Drainfield.
DSS = Drain and Septic Systems.
EPA = U.S. Environmental Protection Agency.
ER = Environmental Restoration.
ft = Foot (feet).
ID = Identification.
mg/kg = Milligram(s) per kilogram.
ND = Not detected.
S = Soil sample.

Table 3.4.2-12
Summary of DSS Site 1006, Building 6741 Septic System
Confirmatory Soil Sampling, Total Cyanide Analytical MDLs
August 1999
(Off-Site Laboratory)

Analyte	EPA Method 9012A[a] Detection Limit (mg/kg)
Total Cyanide	0.128–0.139

[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.

Table 3.4.2-13
Summary of DSS Site 1006, Building 6741 Septic System
Confirmatory Soil Sampling, Gamma Spectroscopy Analytical Results
June 1998
(On- and Off-Site Laboratories)

Sample Attributes			Activity (EPA Method 901.1[a]) (pCi/g)							
			Cesium-137		Thorium-232		Uranium-235		Uranium-238	
Record Number[b]	ER Sample ID	Sample Depth (ft)	Result	Error[c]	Result	Error[c]	Result	Error[c]	Result	Error[c]
600424	6741-DF1-BH1-7-S	7	ND (0.0145)	--	0.596	0.353	0.0439	0.0398	0.625	0.231
600424	6741-DF1-BH1-12-S	12	ND (0.0159)	--	0.789	0.365	0.0384	0.0357	0.934	0.281
600424	6741-DF1-BH2-7-S	7	0.00620	0.00878	0.642	0.464	ND (0.117)	--	0.607	0.497
600424	6741-DF1-BH2-12-S	12	ND (0.0181)	--	ND (0.0839)	--	ND (0.0511)	--	0.529	0.236
600424	6741-DF1-BH3-7-S	7	ND (0.0168)	--	0.617	0.298	ND (0.0937)	--	0.567	0.264
600423	6741-DF1-BH3-7-DU	7	ND (0.0122)	--	0.764	0.0996	ND (0.0642)	--	0.836	1.21
600424	6741-DF1-BH3-12-S	12	ND (0.0189)	--	0.724	0.351	ND (0.0858)	--	0.750	0.265
Background Activity—Southwest Area Supergroup[d]			0.079	NA	1.01	NA	0.16	NA	1.4	NA

[a]EPA November 1986.
[b]Analysis request/chain-of-custody record.
[c]Two standard deviations about the mean detected activity.
[d]Dinwiddie September 1997.

BH = Borehole.
DF = Drainfield.
DSS = Drain and Septic Systems.
DU = Duplicate sample.
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/g = Picocurie(s) per gram.
S = Soil sample.
-- = Error not calculated for nondetect results.

Table 3.4.2-14
Summary of DSS Site 1006, Building 6741 Septic System
Confirmatory Soil Sampling, Gross Alpha/Beta Analytical Results
June 1998
(Off-Site Laboratory)

Sample Attributes			Activity (EPA Method 900.0[a]) (pCi/g)			
			Gross Alpha		Gross Beta	
Record Number[b]	ER Sample ID	Sample Depth (ft)	Result	Error[c]	Result	Error[c]
600423	6741-DF1-BH1-7-S	7	6.45	2.6	9.7	3.07
600423	6741-DF1-BH1-12-S	12	12.1	3.68	17.6	3.45
600423	6741-DF1-BH2-7-S	7	6.53	2.67	17.8	3.55
600423	6741-DF1-BH2-12-S	12	11.7	3.73	19.2	3.67
600423	6741-DF1-BH3-7-S	7	7.63	2.77	16.4	3.36
600423	6741-DF1-BH3-12-S	12	15.8	4.11	19.3	3.75
Background Activity[d]		NA	17.4	NA	35.4	NA

[a]EPA November 1986.
[b]Analysis request/chain-of-custody record.
[c]Two standard deviations about the mean detected activity.
[d]Miller September 2003.
BH = Borehole.
DF = Drainfield.
DSS = Drain and Septic Systems.
EPA = U.S. Environmental Protection Agency.
ER = Environmental Restoration.
ft = foot (feet).
ID = Identification.
NA = Not applicable.
pCi/g = Picocurie(s) per gram.
S = Soil sample.

3.4.3 Soil Sampling Quality Assurance/Quality Control Samples and Data Validation Results

Throughout the DSS project, quality assurance/quality control samples were collected at an approximate frequency of 1 per 20 field samples. These included duplicates, equipment blanks (EBs), and TBs. Typically, samples were shipped to the laboratory in batches of up to 20 samples, so that any one shipment might contain samples from several sites. Aqueous EB samples were collected at an approximate frequency of 1 per 20 samples and sent to the laboratory. The EB samples were analyzed for the same analytical suite as the soil samples in that shipment. The analytical results for the EB samples appear only on the data tables for the site where they were collected. However, the results were used in the data validation process for all the samples in that batch. No EB samples were collected at this site.

Aqueous TB samples, for VOC analysis only, were included in every sample cooler containing VOC soil samples. The analytical results for the TB samples appear on the data tables for the sites in that shipment. The results were used in the data validation process for all samples in that batch. No VOCs were detected in the TB for DSS Site 1006 (Table 3.4.2-1).

As shown in Tables 3.4.2-3, 3.4.2-7, 3.4.2-9, and 3.4.2-13, to assess the precision and repeatability of sampling and analytical procedures, duplicate soil samples (designated 'DU')

were collected and analyzed at the off-site laboratory for SVOCs, HE, metals, and gamma spectroscopy. As shown in Tables 3.4.2-3, 3.4.2-7, and 3.4.2-13, no SVOCs, HE, or elevated radionuclide activities were detected in either the primary or duplicate samples from the 7-foot interval in borehole BH3. With the exception of mercury, the metals results for the 7-foot-bgs primary sample and duplicate from borehole BH3 are comparable (Table 3.4.2-9). Mercury was detected at 0.049 J milligram (mg)/kilogram in the primary sample, but was not detected in the duplicate. Barium was measured at 170 mg/kg in the primary sample and at 225 mg/kg in the duplicate. A duplicate hexavalent chromium sample was not collected at this site.

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," Administrative Operating Procedure (AOP) 00-03 (SNL/NM December 1999). In addition, SNL/NM Department 7713 (RPSD Laboratory) reviewed all gamma spectroscopy results according to "Laboratory Data Review Guidelines," Procedure No. RPSD-02-11, Issue No. 2 (SNL/NM July 1996). Annex B contains the data validation reports for the samples collected at this site. The data are acceptable for use in this NFA proposal.

3.5 Investigation 4—Passive Soil-Vapor Sampling

In April and May 2002, a passive soil-vapor survey was conducted in the Building 6741 Septic System drainfield area. This survey was required at this site by NMED/HWB regulators and was conducted to determine whether significant VOC contamination was present in the soil at the site.

3.5.1 Passive Soil-Vapor Sampling Methodology

A Gore-Sorber™ (GS) passive soil-vapor survey is a qualitative screening procedure that can be used to identify many VOCs present in the vapor phase in soil. The technique is highly sensitive to organic vapors, and the result produces a qualitative measure of organic soil vapor chemistry over a two- to three-week period rather than at one point in time.

Each GS soil-vapor sampler consists of a 1-foot-long, 0.25-inch-diameter tube of waterproof, vapor-permeable fabric containing 40 mg of absorbent material. At each sampling location, a 3-foot-deep by 1.5-inch-diameter borehole was drilled with the Geoprobe™. A sample identification tag and location string were attached to the GS sampler and lowered into the open borehole to a depth of 1 to 2 feet bgs. The location string was attached to a numbered pin flag at the surface. A cork was placed in the borehole above the sampler as a seal, and the upper 1-foot of the borehole, from the cork to the ground surface, was backfilled with site soil.

The vapor samplers were left in the ground for approximately two weeks before retrieval. After retrieval, each sampler was individually placed into a pre-cleaned jar, sealed, and sent to W.L. Gore and Associates for analysis by thermal desorption and gas chromatography using a modified U.S. Environmental Protection Agency (EPA) Method 8260. Analytical results for the VOCs of interest are reported as mass (expressed in micrograms) of the individual VOCs absorbed by the sampler while it was in the ground (Gore June 2002). All samples were documented and handled in accordance with applicable SNL/NM operating procedures.

3.5.2 Soil-Vapor Survey Results and Conclusions

A total of five GS passive soil-vapor samplers were placed in the drainfield area of the site (Figure 2.2.1-2). Samplers were installed at the site on April 30, 2002, and were retrieved on May 15, 2002. Sample locations are designated by the same six-digit sample number both on Figure 2.2.1-2 and in the analytical results tables presented in Annex C.

As shown in the analytical results tables in Annex C, the GS samplers were analyzed for a total of 30 individual or groups of VOCs, including trichloroethene, tetrachloroethene, cis- and trans-dichloroethene, and benzene/toluene/ethylbenzene/xylene. Low to trace-level (but quantifiable) amounts of 14 VOCs were detected in the GS samplers installed at this site. The analytical results indicated there were no areas of significant VOC contamination at the site that would require additional characterization.

3.6 Site Sampling Data Gaps

Analytical data from the site assessment were sufficient for characterizing the nature and extent of possible COC releases. There are no further data gaps regarding characterization of DSS Site 1006.

4.0 CONCEPTUAL SITE MODEL

The conceptual site model for DSS Site 1006, the Building 6741 Septic System, is based upon the COCs identified in the soil samples collected from 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 Site 1006 are VOCs, SVOCs, PCBs, HE compounds, cyanide, RCRA metals, hexavalent chromium, and radionuclides. There were no PCBs, HE compounds, or cyanide detected in any of the soil samples collected at this site. Two VOCs, 2-butanone and toluene, were detected in most of the site soil samples. The SVOC, bis(2-ethylhexyl) phthalate, was detected in one of the soil samples. Of the metals, arsenic and barium were detected in separate samples, slightly above the corresponding approved maximum background concentrations for SNL/NM Southwest Area Supergroup soils (Dinwiddie September 1997). When a metal concentration exceeded its maximum background screening value, or the nonquantified background value, it was considered further in the risk assessment process. None of the four representative gamma spectroscopy radionuclides were detected at activities exceeding the corresponding background levels. Finally, no gross alpha/beta activity was detected above the New Mexico-established background levels.

4.2 Environmental Fate

Potential COCs may have been released into the vadose zone via aqueous effluent discharged from the septic system and drainfield. Possible secondary release mechanisms include the uptake of COCs that may have been released into the soil beneath the drainfield (Figure 4.2-1). The depth to groundwater at the site (approximately 460 feet bgs) most likely precludes migration of potential COCs into the groundwater system. The potential pathways to receptors include soil ingestion, dermal contact, 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 D provides additional discussion on the fate and transport of COCs at DSS Site 1006.

Table 4.2-1 summarizes the potential COCs for DSS Site 1006. All potential COCs were retained in the conceptual model and were evaluated in both the human health and ecological risk assessments. The current and future land use for DSS Site 1006 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 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.

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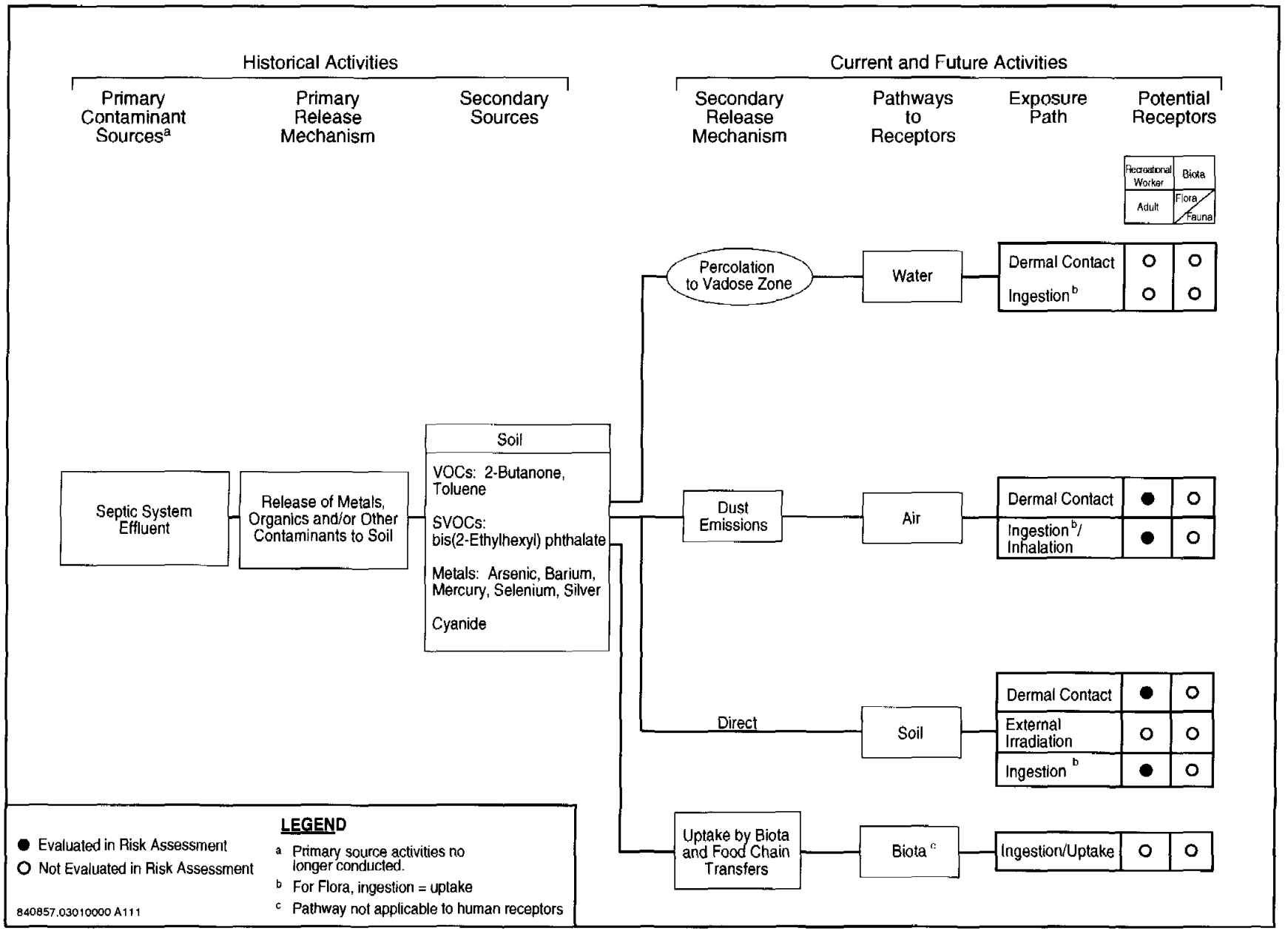

Figure 4.2-1

Conceptual Site Model Flow Diagram for DSS Site 1006, Building 6741 Septic System

Table 4.2-1
Summary of Potential COCs for DSS Site 1006, Building 1006 Septic System

COC Type		Number of Samples[a]	COCs Detected or with Concentrations Greater Than Background or Nonquantified Background	Maximum Background Limit/Southwest Area Supergroup[b] (mg/kg)	Maximum Concentration[c] (All Samples) (mg/kg)	Average Concentration[d] (mg/kg)	Number of Samples Where COCs Detected or with Concentrations Greater Than Background or Nonquantified Background[e]
VOCs		6	Toluene	NA	0.0053	0.0031	6
		6	2-Butanone	NA	0.022	0.013	5
SVOCs		7	bis(2-Ethylhexyl) phthalate	NA	0.210 J	0.103	1
PCBs		6	None	NA	NA	NA	None
HE Compounds		7	None	NA	NA	NA	None
RCRA Metals		7	Arsenic	4.4	4.5	3.71	1
		7	Barium	214	225	143.8	1
		7	Mercury	NQ	0.084 J	0.0403	None
		7	Selenium	NQ	0.43 J	0.382	None
		7	Silver	NQ	ND (0.042)	0.020	None
Hexavalent Chromium		6	None	NA	NA	NA	None
Cyanide		6	Cyanide	NQ	ND (0.135)	0.0672	None
Radionuclides (pCi/g)	Gamma Spectroscopy	7	None	NA	NA	NC[f]	None
	Gross Alpha	6	None	NA	NA	NA	None
	Gross Beta	6	None	NA	NA	NA	None

[a]Number of samples includes duplicates and splits.

[b]Dinwiddie September 1997.

[c]Maximum concentration is either the maximum amount detected, or if nothing was detected, the maximum MDL or MDA above background or nonquantified background.

[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.

COC = Constituent of concern.
DSS = Drain and Septic Systems.
HE = High explosive(s).
J = Estimated concentration.
MDA = Minimum detectable activity.
MDL = Method detection limit.
mg/kg = Milligram(s) per kilogram.
NA = Not applicable.
NC = Not calculated.
ND ( ) = Not detected above MDL, shown in parentheses.
NQ = Nonquantified background value.
PCB = Polychlorinated biphenyl.
pCi/g = Picocurie(s) per gram.
RCRA = Resource Conservation and Recovery Act.
SVOC = Semivolatile organic compound.
VOC = Volatile organic compound.

No pathways to groundwater and no intake routes through flora or fauna are considered appropriate for either the industrial or residential land-use scenarios. Annex D provides additional discussion of the exposure routes and receptors at DSS Site 1006.

4.3 Site Assessment

Site assessment at DSS Site 1006 included risk assessments for both human health and ecological risk. This section briefly summarizes the site assessment results, and Annex D discusses the risk assessment performed for DSS Site 1006 in more detail.

4.3.1 Summary

The site assessment concluded that DSS Site 1006 poses no significant threat to human health under either the industrial or residential land-use scenarios. Ecological risks were found to be insignificant because no pathways exist.

4.3.2 Risk Assessments

Risk assessments were performed for both human health and ecological risk at DSS Site 1006. This section summarizes the results.

4.3.2.1 Human Health

DSS Site 1006 has been recommended for an industrial land-use scenario (DOE et al. September 1995). Because 2-butanone, toluene, bis(2-ethylhexyl) phthalate, arsenic, barium, mercury, selenium, silver, and cyanide are present above background or nonquantified background, it was necessary to perform a human health risk assessment analysis for the site, which included these COCs. Annex D provides a complete discussion of the risk assessment process, results, 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 Site 1006 is 0.02 under 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 0.00. The excess cancer risk is 3E-6 for DSS Site 1006 COCs under 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 6.40E-8. Both the incremental HI and excess cancer risk are below NMED guidelines.

The HI calculated for the COCs at DSS Site 1006 is 0.26 under the residential 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 0.01. The excess cancer risk for DSS Site 1006 COCs is 1E-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 slightly above the suggested acceptable risk value. The incremental excess cancer risk is 2.62E-7. Both the incremental HI and incremental excess cancer risk are below NMED guidelines.

For the radiological COCs, none of the constituents had a minimum detected activity or reported value greater than the corresponding background values; therefore, no risk was calculated.

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

Table 4.3.2-1
Summation of Radiological and Nonradiological Risks from
DSS Site 1006, Building 6741 Septic System Carcinogens

Scenario	Nonradiological Risk	Radiological Risk	Total Risk
Industrial	6.40E-8	0.0	6.40E-8
Residential	2.62E-7	0.0	2.62E-7

DSS = Drain and Septic Systems.

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 1997) was performed as set forth by the NMED Risk-Based Decision Tree in the "RPMP Document Requirement Guide" (NMED March 1998). An early step in the evaluation compared COC concentrations and identified potentially bioaccumulative constituents (see Annex D, Sections IV, VII.2, and VII.2.1). This methodology 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 includes the estimation of exposure and ecological risk.

All COCs at DSS Site 1006 are located at depths greater than 5 feet bgs. Therefore, no complete ecological pathways exist at this site, and a more detailed ecological risk assessment is not necessary.

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 Site 1006 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 no complete pathways exist at DSS Site 1006, 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 Site 1006 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 Site 1006 is proposed for an NFA decision according to Criterion 5, which states, "the SWMU/AOC 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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6.0 REFERENCES

Aas, C.A. (Sandia National Laboratories/New Mexico), April 1994. Memorandum to T. Romero acknowledging and agreeing with the procedure to connect Building 6741 to the sanitary sewer. April 12, 1994.

Bearzi, J. (New Mexico Environment Department/Hazardous Waste Bureau), January 2000. Letter to M.J. Zamorski (U.S. Department of Energy) and L. Shephard (Sandia National Laboratories/New Mexico) approving the "Sampling and Analysis Plan for Characterizing and Assessing Potential Releases to the Environment for Septic and Other Miscellaneous Drain Systems at Sandia National Laboratories/New Mexico." January 28, 2000.

Bearzi, J.P. (New Mexico Environment Department), January 2001. Memorandum to RCRA-Regulated Facilities, "Risk-Based Screening Levels for RCRA Corrective Action Sites in New Mexico," Hazardous Waste Bureau, New Mexico Environment Department, Santa Fe, New Mexico. January 23, 2001.

Bleakly, D. (Sandia National Laboratories/New Mexico), July 1996. Memorandum, "List of Non-ER Septic/Drain Systems for the Sites Identified Through the Septic System Inventory Program." July 8, 1996.

Dinwiddie, R.S. (New Mexico Environment Department), September 1997. Letter to M.J. Zamorski (U.S. Department of Energy), Request for Supplemental Information: Background Concentrations Report, SNL/KAFB, September 24, 1997.

DOE, see U.S. Department of Energy.

EPA, see U.S. Environmental Protection Agency.

Gore, see Gore, W.L. and Associates.

Gore, W.L. and Associates (Gore), June 2002. "Gore-Sorber Screening Survey Final Report, Non-ER Drain and Septic, Kirtland AFB, NM," W.L. Gore Production Order Number 10960025, Sandia National Laboratories/New Mexico, June 6, 2002

IT, see IT Corporation.

IT Corporation (IT), July 1998. "Predictive Ecological Risk Assessment Methodology, Environmental Restoration Program, Sandia National Laboratories, New Mexico," IT Corporation, Albuquerque, New Mexico.

Miller, M. (Sandia National Laboratories/New Mexico), September 2003. Memorandum to F.B. Nimick (Sandia National Laboratories/New Mexico), regarding "State of New Mexico Background for Gross Alpha/Beta Assays in Soil Samples." September 12, 2003.

Moats, W. (New Mexico Environment Department/Hazardous Waste Bureau) February 2002. Letter to M.J. Zamorski (U.S. Department of Energy) and P. Davies (Sandia National Laboratories/New Mexico) approving the "Field Implementation Plan, Characterization of Non-Environmental Restoration Drain and Septic Systems." February 21, 2002.

National Oceanic and Atmospheric Administration (NOAA), 1990. "Local Climatological Data, Annual Summary with Comparative Data," Albuquerque, New Mexico.

New Mexico Environment Department (NMED) March 1998. "RPMP Document Requirement Guide," RCRA Permits Management Program, Hazardous and Radioactive Materials Bureau, New Mexico Environment Department, Santa Fe, New Mexico.

NMED, see New Mexico Environment Department.

NOAA, see National Oceanic and Atmospheric Administration.

Romero, T. (Sandia National Laboratories/New Mexico), September 2003. Internal communication to M. Sanders stating that during the connection of septic systems to the new City of Albuquerque sewer system, the old systems were disconnected and the lines capped. September 16, 2003.

Sandia National Laboratories (SNL/NM), July 1967. SNL/NM Facilities Engineering Drawing #90226 showing the original Building 6741 septic system, Sandia National Laboratories, Albuquerque, New Mexico.

Sandia National Laboratories/New Mexico (SNL/NM), June 1993. "Sandia National Laboratories/New Mexico Septic Tank Monitoring Report, 1992 Report," Sandia National Laboratories, Albuquerque, New Mexico.

Sandia National Laboratories/New Mexico (SNL/NM), July 1994. "Verification and Validation of Chemical and Radiochemical Data," Technical Operating Procedure (TOP) 94-03, Rev. 0, Sandia National Laboratories, Albuquerque, New Mexico.

Sandia National Laboratories/New Mexico (SNL/NM), December 1995. "Sandia National Laboratories Septic Tank Characterization Summary Tables of Analytical Reports, December 1995," Sandia National Laboratories, Albuquerque, New Mexico.

Sandia National Laboratories/New Mexico (SNL/NM), March 1996. "Site-Wide Hydrogeologic Characterization Project, Calendar Year 1995 Annual Report," Environmental Restoration Project, Sandia National Laboratories, Albuquerque, New Mexico.

Sandia National Laboratories/New Mexico (SNL/NM), July 1996. "Laboratory Data Review Guidelines," Radiation Protection Diagnostics Procedure No. RPSD-02-11, Issue No. 2, Sandia National Laboratories, Albuquerque, New Mexico.

Sandia National Laboratories/New Mexico (SNL/NM), October 1999. "Sampling and Analysis Plan for Characterizing and Assessing Potential Releases to the Environment From Septic and Other Miscellaneous Drain Systems at Sandia National Laboratories/New Mexico," Sandia National Laboratories, Albuquerque, New Mexico. October 19, 1999.

Sandia National Laboratories/New Mexico (SNL/NM), December 1999. "Data Validation Procedure for Chemical and Radiochemical Data," Administrative Operating Procedure (AOP) 00-03, Environmental Restoration Project, Sandia National Laboratories, Albuquerque, New Mexico.

Sandia National Laboratories/New Mexico (SNL/NM), November 2001. "Field Implementation Plan, Characterization of Non-Environmental Restoration Drain and Septic Systems," Sandia National Laboratories, Albuquerque, New Mexico.

Sandia National Laboratories/New Mexico (SNL/NM), March 2002. "Annual Groundwater Monitoring Report, Fiscal Year 2001," Sandia National Laboratories, Albuquerque, New Mexico.

Sandia National Laboratories/New Mexico (SNL/NM), March 2003. Database printout provided by SNL/NM Facilities Engineering showing the year that numerous SNL/NM buildings were constructed, Sandia National Laboratories, Albuquerque, New Mexico.

Sandia National Laboratories/New Mexico (SNL/NM), April 2003. DSS Sites Mean Elevation Computation Report, GIS Group, Environmental Restoration Department, Sandia National Laboratories, Albuquerque, New Mexico.

Shain, M. (IT Corporation), August 1996. Memorandum and spreadsheet to J. Jones (Sandia National Laboratories/New Mexico) summarizing dates, locations, and volume of effluent pumped from numerous Sandia National Laboratories/New Mexico septic tanks at Sandia National Laboratories/New Mexico, Albuquerque, New Mexico. August 23, 1996.

SNL/NM, see Sandia National Laboratories/New Mexico.

U.S. Department of Energy (DOE), U.S. Air Force, and U.S. Forest Service, September 1995. "Workbook: Future Use Management Area 2," prepared by Future Use Logistics and Support Working Group in cooperation with Department of Energy Affiliates, the U.S. Air Force, and the U.S. Forest Service. September 1995.

U.S. Environmental Protection Agency (EPA), November 1986. "Test Methods for Evaluating Solid Waste," 3rd ed., Update 3, SW-846, Office of Solid Waste and Emergency Response, U.S. Environmental Protection Agency, Washington D.C.

U.S. Environmental Protection Agency (EPA), 1989. "Risk Assessment Guidance for Superfund, Vol. 1: Human Health Evaluation Manual," EPA/540/1-89/002, Office of Emergency and Remedial Response, U.S. Environmental Protection Agency, Washington, D.C.

U.S. Environmental Protection Agency (EPA), 1997. "Ecological Risk Assessment Guidance for Superfund: Process for Designing and Conducting Ecological Risks," Interim Final, U.S. Environmental Protection Agency, Washington, D.C.

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ANNEX A
DSS Site 1006
Septic Tank Sampling Results

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Building 6741
Area 3
Sample ID Nos. SNLA008419 and SNLA008420 (duplicate)
Tank ID No. AD89022R

On June 30, 1992, aqueous and sludge samples and duplicate samples were collected from the dual compartment septic tank serving Building 6741. The samples were composited from both compartments. Analytical results of concern for the primary sample are noted below.

- Barium was detected in the primary aqueous sample at a level of 1.1 mg/L and in the duplicate at a level of 0.65 mg/L. The primary aqueous sample result exceeds the New Mexico Water Quality Control Commission Regulations discharge limit (NMDL) of 1.0 mg/L.

- Cadmium was detected in the primary aqueous sample at a level of 0.062 mg/L and in the duplicate at a level of 0.040 mg/L, which exceed the NMDL of 0.01 mg/L.

- Chromium was detected in the primary aqueous sample at a level of 0.051 mg/L and in the duplicate at a level of 0.027 mg/L. The primary aqueous sample result exceeds the NMDL of 0.05 mg/L.

- Lead was detected in the primary aqueous sample at a level of 0.16 mg/L and in the duplicate at a level of 0.11 mg/L, which exceed the NMDL of 0.05 mg/L.

- Manganese was detected in the primary aqueous sample at a level of 0.33 mg/L and in the duplicate at a level of 0.021 mg/L. The primary aqueous sample result exceeds the NMDL of 0.20 mg/L.

- Mercury was detected in the primary aqueous sample at a level of 0.0046 mg/L and in the duplicate at a level of 0.0016 mg/L,. The primary aqueous sample result exceeds the NMDL of 0.002 mg/L.

- Total phenolic compounds were detected in the primary aqueous sample at a level of 0.42 mg/L and in the duplicate at a level of 0.083 mg/L, which exceed the NMDL of 0.005 mg/L.

- Oil and grease was detected in the primary aqueous sample at a level of 432 mg/L and in the duplicate at a level of 5.2 mg/L. The primary aqueous sample result exceeds the City of Albuquerque (COA) discharge limit of 150 mg/L.

No other parameters were detected in the aqueous fractions above NMDLs, COA discharge limits, or Resource Conservation and Recovery Act toxicity characteristic limits that identify hazardous waste.

During data review, the following items were noted:

- Due to analytical laboratory error, the holding time for polychlorinated biphenyls and pesticides was exceeded by three days and that for cyanide was exceeded by two days. Exceeded holding times qualifies the data by presenting the possibility that the data is biased low.

- The value for oil and grease was quantitated incorrectly due to analyst error, with the result estimated to be 10 percent high. The sample could not be reanalyzed because of inadequate volume.

During review of the radiological data, no parameters were detected that exceed U.S. Department of Energy (DOE) derived concentration guideline (DCG) limits or the investigation levels (IL) established during this investigation.

Results of Septic Tank Analyses

(LIQUID SAMPLES)

Building No./Area:	6741 A-3
Tank ID No.:	AD 89022R
Date Sampled:	6/30/92
Sample ID No.:	SNLA-008419

Analytical Parameter	Measured Concentration	State Discharge Limit	COA Discharge Limit	Comments
Volatile Organics (EPA 624)	(mg/l)	(mg/l)	(mg/l)	
Toluene	0.0073	0.75	(TTO=5.0)	
Trichloroethene	0.0028	0.1	(TTO=5.0)	Below reporting limit
Semivolatile Organics (EPA 625)	(mg/l)	(mg/l)	(mg/l)	
None detected above laboratory		Parameter	(TTO=5.0)	
reporting limits		specific	(TTO=5.0)	
			(TTO=5.0)	
Pesticides (EPA 608)	(mg/l)	(mg/l)	(mg/l)	
None detected		All NR	(TTO=5.0)	
PCBs (EPA 608)	(mg/l)	(mg/l)	(mg/l)	
None detected		0.001	(TTO=5.0)	
Metals	(mg/l)	(mg/l)	(mg/l)	
Arsenic	0.0070	0.1	2	
Barium	1.1	1.0	20	Exceeds State Limit
Cadmium	0.062	0.01	2.8	Exceeds State Limit
Chromium	0.051	0.05	20	Exceeds State Limit
Copper	0.61	1	16.5	
Lead	0.16	0.05	3.2	Exceeds State Limit
Manganese	0.33	0.2	20	Exceeds State Limit
Mercury	0.0046	0.002	0.1	Exceeds State Limit
Nickel	----	NR	12	Not analyzed
Selenium	ND (0.010)	0.05	2	
Silver	ND (0.010)	0.05	5	
Thallium	ND (0.020)	NR	NR	
Zinc	2.3	10	28	
Uranium	0.0005	5	NR	
Miscellaneous Analytes	(mg/l)	(mg/l)	(mg/l)	
Phenolic Compounds	0.042	0.005	4	Exceeds State Limit
Nitrates/Nitrites	ND (0.10)	10	NR	
Formaldehyde	0.63	NR	260	
Fluoride	0.32	1.6	180	
Cyanide	0.014	0.2	8	
Oil and Grease	432	NR	150	Exceeds COA Limits
Radiological Analyses	(pCi/l)	(pCi/l)	(pCi/l)	
Radium 226	0 +/- 0.2	30	NR	
Radium 228	0 +/- 30	30	NR	
Gross Alpha	30 +/- 19	NR	NR	
Gross Beta	34 +/- 319	NR	NR	
Tritium	536 +/- 584	NR	NR	

NR = Not Regulated; ND (#.#) = Not detected (reporting limit)

Note: City and State Discharge Limits are for comparison purposes only. City limits apply to discharge of sanitary effluent and not sepec tank waste, state limits apply to effluent discharged onto or below the surface of the ground.

References - City of Albuquerque NM Sewer Use and Wastewater Control Ordinance (1990), Section 8-9-3, and New Mexico Water Quality Control Commision Regulations (1988), Section 3-100.

Results of Septic Tank Analyses

(LIQUID SAMPLES)

Building No./Area:	6741 A-3 Duplicate
Tank ID No.:	AD 89022R
Date Sampled:	6/30/92
Sample ID No.:	SNLA-008420

Analytical Parameter	Measured Concentration	State Discharge Limit	COA Discharge Limit	Comments
Volatile Organics (EPA 624)	(mg/l)	(mg/l)	(mg/l)	
Toluene	0.0048	0.75	(TTO=5.0)	Below reporting limit
Trichloroethene	0.0019	0.1	(TTO=5.0)	Below reporting limit
Semivolatile Organics (EPA 625)	(mg/l)	(mg/l)	(mg/l)	
None detected above laboratory		Parameter	(TTO=5.0)	
reporting limits		specific	(TTO=5.0)	
			(TTO=5.0)	
Pesticides (EPA 608)	(mg/l)	(mg/l)	(mg/l)	
None detected above laboratory		All NR	(TTO=5.0)	
reporting limits				
PCBs (EPA 608)	(mg/l)	(mg/l)	(mg/l)	
None detected above laboratory		0.001	(TTO=5.0)	
reporting limits				
Metals	(mg/l)	(mg/l)	(mg/l)	
Arsenic	0.0058	0.1	2	
Barium	0.65	1.0	20	
Cadmium	0.040	0.01	2.8	Exceeds State Limit
Chromium	0.027	0.05	20	
Copper	0.37	1	16.5	
Lead	0.11	0.05	3.2	Exceeds State Limit
Manganese	0.21	0.2	20	Exceeds State Limit
Mercury	0.0016	0.002	0.1	
Nickel	—	NR	12	Not analyzed
Selenium	ND (0.010)	0.05	2	
Silver	ND (0.010)	0.05	5	
Thallium	ND (0.010)	NR	NR	
Zinc	1.2	10	28	
Uranium	0.0005	5	NR	
Miscellaneous Analytes	(mg/l)	(mg/l)	(mg/l)	
Phenolic Compounds	0.083	0.005	4	Exceeds State Limit
Nitrates/Nitrites	ND (0.10)	10	NR	
Formaldehyde	0.57	NR	260	
Fluoride	0.27	1.6	180	
Cyanide	ND (0.010)	0.2	8	
Oil and Grease	5.2	NR	150	Exceeds COA Limits
Radiological Analyses	(pCi/l)	(pCi/l)	(pCi/l)	
Radium 226	0.1 +/- 0.2	30	NR	
Radium 228	0 +/- 30	30	NR	
Gross Alpha	11 +/- 15	NR	NR	
Gross Beta	72 +/- 331	NR	NR	
Tritium	449 +/- 583	NR	NR	

NR = Not Regulated; ND (#.#) = Not detected (reporting limit)

Note: City and State Discharge Limits are for comparison purposes only. City limits apply to discharge of sanitary effluent and not septic tank waste, state limits apply to effluent discharged onto or below the surface of the ground.

References - City of Albuquerque NM Sewer Use and Wastewater Control Ordinance (1990), Section 8-9-3, and New Mexico Water Quality Control Commision Regulations (1988), Section 3-100.

Results of Septic Tank Analyses (Sludge Sample)			
Building No./Area:	**6741 A-3**		
Tank ID No.:	**AD89022R**		
Date Sampled:	**6/30/92**		
Sample ID No.:	**SNLA008419**		
Analytical Parameter	**Measured Concentration**	**± 2 Sigma Uncertainty**	**Units**
Water Content	90.1	NA	%
Arsenic	.84	NA	mg/kg
Barium	98.0	NA	mg/kg
Cadmium	8.8	NA	mg/kg
Chromium	6.9	NA	mg/kg
Copper	41.2	NA	mg/kg
Lead	26.5	NA	mg/kg
Manganese	16.9	NA	mg/kg
Mercury	0.54	NA	mg/kg
Nickel	---	NA	mg/kg
Selenium	ND(0.50)	NA	mg/kg
Silver	1.4	NA	mg/kg
Thallium	ND(0.50)	NA	mg/kg
Zinc	119	NA	mg/kg
Gross Alpha	11	10	pCi/g
Gross Beta	11	24	pCi/g
Gross Alpha	20	12	pCi/g
Gross Beta	7	22	pCi/g
Gross Alpha	18	12	pCi/g
Gross Beta	32	29	pCi/g
Gross Alpha	14	10	pCi/g
Gross Beta	13	22	pCi/g
Tritium	536	584	pCi/L
Bismuth-214	0.0715	0.00991	pCi/mL
Cesium-137	0.0171	0.00408	pCi/mL
Potassium-40	1.69	0.122	pCi/mL
Lead-212	0.0720	0.0100	pCi/mL
Lead-214	0.0800	0.0146	pCi/mL
Radium-226	0.0302	0.0843	pCi/mL
Thorium-234	<0.231	NA	pCi/mL
Thallium-208	0.0284	0.00443	pCi/mL

ND = Not Detected
NA = Not Applicable

Result of Septic Tank Analyses
(Sludge Sample)

Building No./Area: 6741 A-3

Tank ID No.: AD89022R

Date Sampled: 6/30/92

Sample ID No.: SNLA008420

Analytical Parameter	Measured Concentration	± 2 Sigma Uncertainty	Units
Water Content	92.2	NA	%
Arsenic	0.73	NA	mg/kg
Barium	60.1	NA	mg/kg
Cadmium	8.7	NA	mg/kg
Chromium	3.0	NA	mg/kg
Copper	31.6	NA	mg/kg
Lead	27.1	NA	mg/kg
Manganese	12.6	NA	mg/kg
Mercury	0.53	NA	mg/kg
Nickel	---	NA	mg/kg
Selenium	ND(0.50)	NA	mg/kg
Silver	ND(1.0)	NA	mg/kg
Thallium	ND(0.50)	NA	mg/kg
Zinc	94.2	NA	mg/kg
Gross Alpha	16	11	pCi/g
Gross Beta	17	23	pCi/g
Gross Alpha	13	10	pCi/g
Gross Beta	19	22	pCi/g
Gross Alpha	18	11	pCi/g
Gross Beta	8	21	pCi/g
Gross Alpha	18	12	pCi/g
Gross Beta	26	25	pCi/g
Tritium	449	583	pCi/L
Bismuth-212	0.121	0.0317	pCi/mL
Bismuth-214	0.0690	0.00967	pCi/mL
Cesium-137	0.0209	0.00477	pCi/mL
Potassium-40	2.57	0.146	pCi/mL
Lead-212	0.113	0.0105	pCi/mL
Lead-214	0.0663	0.00925	pCi/mL
Radium-226	0.404	0.0930	pCi/mL
Thorium-234	<0.249	NA	pCi/mL
Thallium-208	0.0330	0.00450	pCi/mL

ND=Not Detected NA=Not Applicable

RESULTS OF SEPTIC TANK SAMPLING
CHEMICAL ANALYSES OF AQUEOUS SAMPLE

Building ID: Bldg 6741
Sample ID Number: 024407
Date Sampled: 7-10-95

Parameter (Method)	Result	Detection Limit (DL)	NM Discharge Limit[a]	COA Discharge Limit[b]	Comments
Volatile Organics (8260)	*(mg/L)*	*(mg/L)*	*(mg/L)*	*(mg/L)*	
Acetone	0.007J	0.010	NR	NR	
Semivolatile Organics (8270)	*(mg/L)*	*(mg/L)*	*(mg/L)*	*(mg/L)*	
ButylBenzylPhthalate	0.001J	0.010	NR	TTO = 5.0	
bis(2-Ethylhexyl)Phthalate	0.010B	0.010	NR	TTO = 5.0	
Pesticides/PCBs (8080)	*(mg/L)*	*(mg/L)*	*(mg/L)*	*(mg/L)*	
None detected above DL	ND	various	NR / PCBs = 0.001	TTO = 5.0	
Metals (6010/7470)	*(mg/L)*	*(mg/L)*	*(mg/L)*	*(mg/L)*	
Arsenic	0.0042J	0.010	0.1	2.0	
Barium	0.0783J	0.200	1.0	20.0	
Cadmium	0.0066	0.005	0.01	2.8	
Chromium	0.0035J	0.020	0.05	20.0	
Copper	0.0566	0.025	1.0	16.5	
Lead	0.0174	0.003	0.05	3.2	
Manganese	0.0922	0.015	0.2	20.0	
Nickel	0.0198J	0.040	0.2	12.0	
Selenium	ND	0.005	0.05	2.0	
Silver	ND	0.010	0.05	5.0	
Thallium	ND	0.010	NR	NR	
Zinc	0.182	0.020	10.0	28.0	
Mercury	ND	0.0004	0.002	0.1	
Miscellaneous Analyses	*(mg/L)*	*(mg/L)*	*(mg/L)*	*(mg/L)*	
Field pH	7.4 pH units	0 - 14 pH units	6 – 9 pH units	5 – 11 pH units	
Formaldehyde (NIOSH 3500)	0.53	0.25	NR	260.0	
Fluoride (300.0)	ND	0.10	1.6	180.0	

Refer to footnotes at end of table.

RESULTS OF SEPTIC TANK SAMPLING

CHEMICAL ANALYSES OF AQUEOUS SAMPLE

Building ID: Bldg 6741

Sample ID Number: 024407

Date Sampled: 7-10-95

Parameter (Method)	Result	Detection Limit (DL)	NM Discharge Limit[a]	COA Discharge Limit[b]	Comments
Miscellaneous Analyses	*(mg/L)*	*(mg/L)*	*(mg/L)*	*(mg/L)*	
Nitrate + Nitrite (353.1)	5.080	1.000	10.0	NR	
Oil + Grease (9070)	2.57	0.95	NR	150.0	
Total Phenol (9066)	ND	0.050	0.005	4.0	

Notes:
[a] New Mexico Water Quality Control Commission Regulations (1990), Section 3-103.
[b] City of Albuquerque Sewer Use and Wastewater Control Ordinance (1993), Section 8-9-3 M – *maximum* allowable concentration for grab sample.
B = Analyte detected in method blank.
DL = Detection limit indicated on laboratory report.
IDL = Instrument detection limit.
J = Estimated concentration of analyte, between DL and IDL.
ND = Not detected above DL indicated.
NR = Not regulated.
TTO = Total toxic organics.

RESULTS OF SEPTIC TANK SAMPLING

RADIOLOGICAL ANALYSES OF AQUEOUS SAMPLE

Building ID: Bldg 6741
Sample ID Number: 024407
Date Sampled: 7-10-95

Parameter (Method)	Result	MDA	Critical Level	NM Discharge Limit[a]	Comments
Radiological Analyses	*(pCi/L ± 2-σ)*	*(pCi/L)*	*(pCi/L)*	*(pCi/L)*	
Gross Alpha (9310)	3.35 ± 3.15	6.66	2.66	NR	
Gross Beta (9310)	35.8 ± 5.3	4.9	2.25	NR	
Isotopic Analyses	*(pCi/L ± 2-σ)*	*(pCi/L)*	*(pCi/L)*	*(pCi/L)*	
Tritium (906.0)	-28.0 ± 47.1	80.7	39.9	NR	
Gamma Spectroscopy[b]	*(pCi/mL ± 2-σ)*	*(pCi/mL)*	*(pCi/L)*	*(pCi/L)*	
None detected above MDA	ND	various	NL	NR	

Notes:
[a] New Mexico Water Quality Control Commission Regulations (1990), Section 3-103.
[b] Analyzed in-house by SNL/NM Department 7715.
MDA = Minimum detectable activity.
ND = Not detected above MDA indicated.
NL = Not listed.
NR = Not regulated.

RESULTS OF SEPTIC TANK SAMPLING

CHEMICAL ANALYSES OF SLUDGE SAMPLE

Building ID: Bldg 6741
Sample ID Number: 024407
Date Sampled: 7-10-95
Percent Moisture: 63.43

Parameter (Method)	Result	Detection Limit (DL)	NM Discharge Limit[a]	COA Discharge Limit[b]	Comments
Volatile Organics (8260)	*(µg/kg)*	*(µg/kg)*	*(mg/L)*	*(mg/L)*	
Acetone	520B	140	NR	NR	
Acetone (reanalyses)	510B	140	NR	NR	
Trichloroethene	120J	140	NR	TTO = 5.0	
Trichloroethene (reanalyses)	110J	140	NR	TTO = 5.0	
Toluene	570	140	0.75	TTO = 5.0	
Toluene (reanalyses)	520	140	0.75	TTO = 5.0	
Ethylbenzene	160	140	0.75	TTO = 5.0	
Ethylbenzene (reanalyses)	160	140	0.75	TTO = 5.0	
Semivolatile Organics (8270)	*(µg/kg)*	*(µg/kg)*	*(mg/L)*	*(mg/L)*	
bis(2-Ethylhexyl)Phthalate	12000E	890	NR	TTO = 5.0	
bis(2-Ethylhexyl)Phthalate (reanalyses)	17000D	1700	NR	TTO = 5.0	
Pesticides/PCBs (8080)	*(µg/kg)*	*(µg/kg)*	*(mg/L)*	*(mg/L)*	
beta-BHC	7.1	4.6	NR	TTO = 5.0	
delta-BHC	55	4.6	NR	TTO = 5.0	
gamma-BHC (Lindane)	18	4.6	NR	TTO = 5.0	
Aldrin	17	4.6	NR	TTO = 5.0	
4,4'-DDE	18	9.1	NR	TTO = 5.0	
Endrin	12	9.1	NR	TTO = 5.0	
Endosulfan Sulfate	34	9.1	NR	TTO = 5.0	
Endrin Aldehyde	16	9.1	NR	TTO = 5.0	
Metals (6010/7470)	*(mg/kg)*	*(mg/kg)*	*(mg/L)*	*(mg/L)*	
Arsenic	2.7J	2.7	0.1	2.0	
Barium	106	54.7	1.0	20.0	
Cadmium	10.4	1.4	0.01	2.8	

Refer to footnotes at end of table.

RESULTS OF SEPTIC TANK SAMPLING

CHEMICAL ANALYSES OF SLUDGE SAMPLE

Building ID: Bldg 6741

Sample ID Number: 024407

Date Sampled: 7-10-95

Percent Moisture: 63.43

Parameter (Method)	Result	Detection Limit (DL)	NM Discharge Limit[a]	COA Discharge Limit[b]	Comments
Metals (6010/7470)	*(mg/kg)*	*(mg/kg)*	*(mg/L)*	*(mg/L)*	
Chromium	57.2	5.5	0.05	20.0	
Copper	113	6.8	1.0	16.5	
Lead	221	0.82	0.05	3.2	
Manganese	88.6	4.1	0.2	20.0	
Nickel	88.1	10.9	0.2	12.0	
Selenium	ND	1.4	0.05	2.0	
Silver	2.4J	2.7	0.05	5.0	
Thallium	1.4J	2.7	NR	NR	
Zinc	406	5.5	10.0	28.0	
Mercury	0.91	0.55	0.002	0.1	

Notes:

[a] New Mexico Water Quality Control Commission Regulations (1990), Section 3-103.

[b] City of Albuquerque Sewer Use and Wastewater Control Ordinance (1993), Section 8-9-3 M – maximum allowable concentration for grab sample.

B = Analyte detected in method blank.

D = sample was diluted.

E = Exceeds calibration.

DL = Detection limit indicated on laboratory report.

IDL = Instrument detection limit.

J = Estimated concentration of analyte, between DL and IDL.

ND = Not detected above DL indicated.

NR = Not regulated.

TTO = Total toxic organics.

RESULTS OF SEPTIC TANK SAMPLING

RADIOLOGICAL ANALYSES OF SLUDGE SAMPLE

Building ID: Bldg 6741
Sample ID Number: 024407
Date Sampled: 7-10-95
Percent Moisture: 63.43

Parameter (Method)	Result	MDA	Critical Level	NM Discharge Limit[a]	Comments
Isotopic Analyses[b]	*(pCi/g ± 2-σ)*	*(pCi/g)*	*(pCi/g)*	*(pCi/g)*	
Plutonium-239/240	-0.002 ± 0.005	0.019	0.012	NR	
Plutonium-238	-0.002 ± 0.006	0.021	0.013	NR	
Strontium-90	-0.04 ± 0.00	0.31	0.15	NR	
Thorium-232	0.20 ± 0.08	0.029	0.024	NR	
Thorium-230	0.24 ± 0.09	0.029	0.024	NR	
Thorium-228	0.19 ± 0.08	0.034	0.026	NR	
Uranium-238	2.37 ± 0.56	0.031	0.025	NR	
Uranium-235/236	1.32 ± 0.35	0.034	0.030	NR	
Uranium-234	4.13 ± 0.94	0.036	0.028	NR	
Dry Gamma Spectroscopy[c]	*(pCi/g ± 2-σ)*	*(pCi/g)*	*(pCi/g)*	*(pCi/g)*	
Cesium-137	0.072 ± 0.023	0.019	0.009	NR	
Cesium-134	ND	0.014	0.007	NR	
Potassium-40	8.72 ± 0.96	0.20	0.096	NR	
Chromium-51	ND	0.14	0.069	NR	
Iron-59	ND	0.037	0.018	NR	
Cobalt-60	ND	0.017	0.008	NR	
Zirconium-95	ND	0.029	0.014	NR	
Ruthenium-103	ND	0.017	0.008	NR	
Ruthenium-106	ND	0.13	0.065	NR	
Cerium-144	ND	0.086	0.042	NR	
Thallium-208	0.12 ± 0.02	0.02	NL	NR	
Lead-212	0.32 ± 0.04	0.02	0.012	NR	
Lead-214	0.30 ± 0.04	0.03	0.016	NR	
Bismuth-212	0.26 ± 0.11	0.11	NL	NR	
Bismuth-214	0.28 ± 0.04	0.03	NL	NR	
Radium-226	0.29 ± 0.03	0.03	0.016	30.0[d]	

Refer to footnotes at end of table.

RESULTS OF SEPTIC TANK SAMPLING

RADIOLOGICAL ANALYSES OF SLUDGE SAMPLE

Building ID: Bldg 6741

Sample ID Number: 024407

Date Sampled: 7-10-95

Percent Moisture: 63.43

Parameter (Method)	Result	MDA	Critical Level	NM Discharge Limit[a]	Comments
Dry Gamma Spectroscopy[b]	*(pCi/g ± 2-σ)*	*(pCi/g)*	*(pCi/g)*	*(pCi/g)*	
Radium-226	0.33 ± 0.06	0.06	0.030	30.0[d]	
Actinium-228	0.33 ± 0.06	0.06	0.030	NR	
Thorium-231	ND	0.43	0.21	NR	
Thorium-232	0.33 ± 0.06	0.06	0.030	NR	
Thorium-234	0.83 ± 0.36	0.29	0.14	NR	
Uranium-235	ND	0.086	0.043	NR	
Uranium-238	0.83 ± 0.36	0.29	0.14	NR	
Americium-241	ND	0.093	0.046	NR	

Notes:

[a] New Mexico Water Quality Control Commission Regulations (1990), Section 3-103.

[b] Isotopic uranium analyzed by NAS-NS-3050; plutonium by SL13028/SL13033; strontium by 7500-SR; thorium by NAS-NS-3004.

[c] Analyzed by method HASL 300 at Quanterra, St. Louis.

[d] NMWQCCR standard for Ra-226 + Ra-228 combined in pCi/L.

MDA = Minimum detectable activity.

ND = Not detected above MDA indicated.

NR = Not regulated.

ANNEX B
DSS Site 1006
Soil Sample Data Validation Results

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SF 2001-COC (10-97)
Supersedes (5-97) Issue

Internal Lab Batch No.

ANALYSIS REQUEST AND CHAIN OF CUSTODY

SAR/WR No.

AR/COC- 600422

VOC = shelf 5
main = shelf 4

Dept. No./Mail Stop: 6133 MS-1147
Project/Task Manager: Mike Sanders
Project Name: 101 Non-ER Septic Fields
Record Center Code: ER/1295/DAT
Logbook Ref. No.:
Service Order No.: 0526

Date Samples Shipped: _____ SMO USE
Carrier/Waybill No.: _____
Lab Contact: Warren Strong/284-3313
Lab Destination: ERCL
SMO Contact/Phone: Doug Salmi/844-3110
Send Report to SMO: Suzi Montano

Contract No.:
Case No.: 7223.230
SMO Authorization _____
Bill to: Sandia National Laboratories
Supplier Services, Dept. _____
P.O. Box 5800 MS 0154

Location Tech Area III
Building 6741 Room

Reference LOV (available at SMO)

Sample No. - Fraction	ER Sample ID or Sample Location Detail	Beginning Depth in Ft.	ER Site No.	Date/Time Collected	Sample Matrix	Container Type	Container Volume	Preservative	Sample Collection Method	Sample Type	Parameter & Method Requested	LAB USE Lab Sample ID
041295-001	ER-1295-6741-DF1-BH1-7-S	7	N/A	6/29/98 0805	S	AC	300ml	4C	G	SA	VOCs (8260)	
041296-001	ER-1295-6741-DF1-BH1-12-S	12	N/A	6/29/98 0825	S	AC	300ml	4C	G	SA	VOCs (8260)	
041297-001	ER-1295-6741-DF1-BH2-7-S	7	N/A	6/29/98 0845	S	AC	300ml	4C	G	SA	VOCs (8260)	
041298-001	ER-1295-6741-DF1-BH2-12-S	12	N/A	6/29/98 0900	S	AC	300ml	4C	G	SA	VOCs (8260)	
041299-001	ER-1295-6741-DF1-BH3-7-S	7	N/A	6/29/98 0915	S	AC	300ml	4C	G	SA	VOCs (8260)	
041300-001	ER-1295-6741-DF1-BH3-12-S	12	N/A	6/29/98 0925	S	AC	300ml	4C	G	SA	VOCs (8260)	
041295-004	ER-1295-6741-DF1-BH1-7-S	7	N/A	6/29/98 0805	S	G	125ml	4C	G	SA	RCRA Metals, HE(8330)	
041296-004	ER-1295-6741-DF1-BH1-12-S	12	N/A	6/29/98 0825	S	G	125ml	4C	G	SA	RCRA Metals, HE(8330)	
041297-004	ER-1295-6741-DF1-BH2-7-S	7	N/A	6/29/98 0845	S	G	125ml	4C	G	SA	RCRA Metals, HE(8330)	
041298-004	ER-1295-6741-DF1-BH2-12-S	12	N/A	6/29/98 0900	S	G	125ml	4C	G	SA	RCRA Metals, HE(8330)	

RMMA ☐Yes No Ref. No.
Sample Disposal ☐Return to Client XDisposal by lab

Sample Tracking SMO USE
Date Entered (mm/dd/yy) _____
Entered by _____

Special Instructions/QC Requirements
EDD XYes ☐No
Raw data package XYes ☐No
Waiting for RAO memo from mark miller. KS
WR#98-169
Please list as separate report.

Abnormal Conditions on Receipt LAB USE

Turnaround Time XNormal ☐Rush Required Report Date _____ QC Initls. _____

	Name	Signature	Init	Company/Organization/Phone
Sample Team Members	Chris Cutchis	C. Cutchi	C.C.	MDM / 6131 / 554-3196
	CHRIS STEARNS	Chris Stearns	C.S.	SNL / 6731 / 844-9136
	J.A. Kaybal	J. Anthony Kaybal	JK	SNL / 6633 / 284-2475

1. Relinquished by	C. Cutchi	Org. 6131	Date 6/30/98	Time 1600	4. Relinquished by	Org.	Date Time
1. Received by	Kathleen Swenson	Org. 6133	Date 6/30/98	Time 1600	4. Received by	Org.	Date Time
2. Relinquished by		Org.	Date	Time	5. Relinquished by	Org.	Date Time
2. Received by		Org.	Date	Time	5. Received by	Org.	Date Time
3. Relinquished by		Org.	Date	Time	6. Relinquished by	Org.	Date Time
3. Received by		Org.	Date	Time	6. Received by	Org.	Date Time

Original To Accompany Samples, Laboratory Copy (White) | 1st Copy To Accompany Samples, Return to SMO (Blue) | 2nd Copy SMO Suspense Copy (Yellow) | 3rd Copy Field Copy (Pink)

SF 2001-COC (10-97)
Supersedes (5-97) issue

Internal Lab Batch No.

ANALYSIS REQUEST AND CHAIN OF CUSTODY

SAR/WR No.

AR/COC- 600422

VOC = 5
main = 6

Dept. No./Mail Stop: 6133 MS-1147 Project/Task Manager: Mike Sanders Project Name: 101 Non-ER Septic Fields Record Center Code: ER/1295/DAT Logbook Ref. No.: Service Order No.: 0526	Date Samples Shipped: _____ SMO USE Carrier/Waybill No.: _____ Lab Contact: Warren Strong/284-3313 Lab Destination: ERCL SMO Contact/Phone: Doug Salmi/844-3110 Send Report to SMO: Suzi Montano	Contract No.: Case No.: 7223.230 SMO Authorization _____ Bill to: Sandia National Laboratories Supplier Services, Dept. _____ P.O. Box 5800 MS 0154

Location Tech Area III
Building 6741 Room

Reference LOV (available at SMO)

Sample No. - Fraction	ER Sample ID or Sample Location Detail	Beginning Depth in Ft.	ER Site No.	Date/Time Collected	Sample Matrix	Container Type	Container Volume	Preservative	Sample Collection Method	Sample Type	Parameter & Method Requested	LAB USE Lab Sample ID
041299-004	ER-1295-6741-DF1-BH3-7-S	7	N/A	6/24/98 0915	S	G	125ml	4C	G	SA	RCRA Metals, HE(8330)	
041300-004	ER-1295-6741-DF1-BH3-12-S	12	N/A	6/24/98 0925	S	G	125ml	4C	G	SA	RCRA Metals, HE(8330)	

RMMA ☐XYes No Ref. No.
Sample Disposal ☐Return to Client XDisposal by lab

Sample Tracking SMO USE
Date Entered (mm/dd/yy) _____
Entered by _____

Special Instructions/QC Requirements
EDD XYes ☐No
Raw data package XYes ☐No

WR # 98-169

Abnormal Conditions on Receipt LAB USE

Turnaround Time XNormal ☐Rush Required Report Date _____ QC Inits: _____

	Name	Signature	Init	Company/Organization/Phone
Sample Team Members	Chris Catechis	C. Catechis	CC	MDM 6131 881-3196
	Chris Kearns	Chris Kearns	CK	SNL 6431/844-8336
	S.A. Roybal	X. Anthony Roybal	SR	SNL/6133/284-2475

Please list as separate report.

1. Relinquished by	C. Catechis	Org. 6131	Date 6/24/98	Time 1600	4. Relinquished by	Org.	Date	Time
1. Received by	Kathleen Swenson	Org. 6133	Date 6133	Time 1600	4. Received by	Org.	Date	Time
2. Relinquished by		Org.	Date	Time	5. Relinquished by	Org.	Date	Time
2. Received by		Org.	Date	Time	5. Received by	Org.	Date	Time
3. Relinquished by		Org.	Date	Time	6. Relinquished by	Org.	Date	Time
3. Received by		Org.	Date	Time	6. Received by	Org.	Date	Time

Original To Accompany Samples, Laboratory Copy (White) | 1st Copy To Accompany Samples, Return to SMO (Blue) | 2nd Copy SMO Suspense Copy (Yellow) | 3rd Copy Field Copy (Pink)

SAMPLE FINDINGS SUMMARY

Site: 101 Non-ER Septic Fields

AR COC: 600422 Data Classification: DV-2

Sample Fraction No.	Analysis	DV Qualifiers	Comments
ER-1295-6741-DF1-BH1-7-S	All method 8260	Q	MDLs and PQLs elevated due to dilution
ER-1295-6741-DF1-BH1-12-S	↓	↓	↓
ER-1295-6741-DF1-BH2-7-S			
ER-1295-6741-DF1-BH2-12-S			
ER-1295-6741-DF1-BH3-7-S			
ER-1295-6741-DF1-BH3-12-S			
ER-1295-6741-DF1-BH1-12-S	7439-97-6	U, B	analyte not detected in env. sample, but was detected in assoc. LMB
ER-1295-6741-DF1-BH2-7-S	↓	↓	↓

Sample No./Fraction No. - This value is located on the Chain of Custody in the ER Sample Id field.

Analysis - Use valid test methods provided below or if the result applies to an individual analyte within a test method, use the CAS number from the analytical data sheet.

DV Qualifiers - The entry will be taken from the list of valid qualifiers and associated comments. If other qualifiers not on the list are needed, contact Tina Sanchez to coordinate adding them to the list.

Comments - This is only to be used if a comment associated with the qualifier is not appropriate, needs modification because of an unusual circumstance, or additional clarification is warranted.

Test Methods - Anions_CE, EPA6010, EPA6020, EPA7470 1, EPA8015B, EPA8081, EPA8260, EPA8260-M3, EPA8270, HACH_ALK, HACH_NO2, HACH_NO3, MEKC_HE, PCBRISC

Reviewed by: T. Sanchez Date: 9/3/98

List of Data Qualifiers used in Data Validation and Associated Comment Responses

Qualifier	Comment
A	Laboratory accuracy and/or bias measurements for the associated Laboratory Control Sample (LCS) do not meet acceptance criteria.
A1	Laboratory accuracy and/or bias measurements for the associated Surrogate Spike do not meet acceptance criteria.
A2	Laboratory accuracy and/or bias measurements for the associated Matrix Spike (MS) do not meet acceptance criteria.
B	Analyte present in laboratory method blank
B1	Analyte present in trip blank.
B2	Analyte present in equipment blank.
B3	Analyte present in continuing calibration blank.
J	The associated value is an estimated quantity. (Note: this qualifier may be used in conjunction with other qualifiers (i.e., A,J)
J1	The method requirements for sample preservation/temperature were not met for the sample analysis. The associated value is an estimated quantity.
J2	The holding time was exceeded for the associated sample analysis. The associated value is an estimated quantity.
P	Laboratory precision measurements for the Laboratory Control Sample and duplicate (LCS/LCSD) do not meet acceptance criteria.
P1	Laboratory precision measurements for the Matrix Spike Sample and associated duplicate (MS/MSD) do not meet acceptance criteria.
P2	Insufficient quality control data to determine laboratory precision.
Q	Quantitation limit reported does not meet Data Quality Objective (DQO) requirements.
R	The data are unusable for their intended purpose (Note: Analyte may or may not be present.)
U	The analyte is a common laboratory contaminant. The associated result is less than ten times the concentration in any blank.
U1	The analyte was also detected in a blank. The associated result is less than five times the concentration in any blank.
UJ	The analyte was analyzed for but was not detected. The associated value is an estimate and may be inaccurate or imprecise.

* This is not a definitive list. Other qualifiers are potentially available, see TOP 94-03. Notify Tina Sanchez to revise list.

TOP 94-01
Attachment A
November 1995

Signed 11-9-95

DOCUMENTATION COMPLETENESS CHECKLIST
(DATA VERIFICATION/VALIDATION LEVEL 1 - DV1)

Project Leader: Tony Roybal / mike Sanders Project Name: 101 ~~EE~~ TA Non-ER Septic Fields Case No.: 7223.230

AR/COC No.: 600422 Analytical Lab: ERCL SDG No.: N/A

In the tables below, mark any information that is missing or incorrect and give an explanation.

1.0 Analysis Request and Chain of Custody Record

Line No.	Item	Complete? Yes	Complete? No	If no, explain	Resolved? Yes	Resolved? No
1.1	All items on COC complete - data entry clerk initialed and dated	✓				
1.2	Container type(s) correct for analyses requested	✓				
1.3	Sample volume adequate for # and types of analyses requested	✓				
1.4	Preservative correct for analyses requested	✓				
1.5	Custody records continuous and complete	✓				
1.6	Lab sample number(s) provided	✓				
1.7	Condition upon receipt information provided	✓		see narrative		
1.8	Tritium Screen data provided (Rad labs)	✓		See memo dated 7/7/98 from Mike Miller to Warren Shaw		

2.0 Analytical Laboratory Report

Line No.	Item	Complete? Yes	Complete? No	If no, explain	Resolved? Yes	Resolved? No
2.1	Data reviewed, signature	✓				
2.2	Date samples received	✓				
2.3	Method reference number(s) complete and correct	✓				
2.4	Quality control data provided (MB, LCS, LCD, Detection Limit)	✓				
2.5	Matrix spike/matrix spike duplicate data provided(if requested)	✓		Not requested, but data reported		
2.6	Narrative provided	✓				
2.7	TAT met	N/A		N/A		
2.8	Hold times met	✓				
2.9	All requested result data provided	✓				

Based on the review, this data package is complete ☑ Yes ☐ No

If no, provide: correction request tracking # _____ and date correction request was submitted: _____

Reviewed by: Tim Gallegos Date: 9/3/98 Closed by: _____ Date: _____

DATA QUALITY INDICATOR CHECKLIST
(DATA VERIFICATION/VALIDATION LEVEL 2—DV2)

Project Name 101 Non-ER Septic Fields

Case Number 7223.230

Sample Numbers 041295, 041296, 041297, 041298, 041299, 041300

AR/COC No. 600422 Analytical laboratory ERCL SDG No. N/A

AR/COC No. _____ Analytical laboratory _____ SDG No. _____

AR/COC No. _____ Analytical laboratory _____ SDG No. _____

AR/COC No. _____ Analytical laboratory _____ SDG No. _____

1.0 EVALUATION

Item	Yes	No	If no, Sample ID No./Fraction(s) and Analysis
1) Sample volume, container, and preservation correct?	✓		
2) Holding times met for all samples?	✓		
3) Reporting units appropriate for the matrix and meet project-specific requirements?	✓		
4) Quantitation limit met for all samples?	✓ TA	✓	(4) VOCs were diluted 5X. MDLs and PQLs are elevated.
5) Accuracy a) Laboratory control sample accuracy reported and met for all samples?	✓		
b) Surrogate data reported and met for all organic samples analyzed by a gas chromatography technique?	✓		

Reviewed by: Tim Rucks

Date: 9/3/98

DATA QUALITY INDICATOR CHECKLIST
(DATA VERIFICATION/VALIDATION LEVEL 2—DV2)

Item	Yes	No	If no. Sample ID No./Fraction(s) and Analysis
c) Matrix spike recovery data reported and met for all samples for which it was requested?	✓		Not requested, data was reported
6) Precision a) Laboratory control sample precision reported and met for all samples?	N/A		No LCS duplicate sample analyzed.
b) Matrix spike duplicate RPD data reported and met for all samples for which it was requested?		✓	(1) Not requested, data was reported and used. No MSD analyzed for VOCs.
7) Blank data a) Method or reagent blank data reported and met for all samples?		✓	(2) Hg and Pb were detected in the LMB (Batch 519820)
b) Sampling blank (e.g., field, trip, and equipment) data reported and met?		✓	(3) No trip blank submitted for VOCs.
8) Narrative included, correct, and complete?	✓		

2.0 COMMENTS: All items marked "No" above must be explained in this section. For each item, give SNL/NM ID No. and the analysis, if appropriate, of all samples affected by the finding.

(1) MS/MSD analysis was not requested, but the data was provided and validated. A MSD was not analyzed for VOCs. The LCS and MS were within QC limits

Reviewed by: T. Fields

Date: 9/3/98

DATA QUALITY INDICATOR CHECKLIST
(DATA VERIFICATION/VALIDATION LEVEL 2—DV2)

2.0 COMMENTS CONTINUATION SHEET

(2) Mercury and lead were detected > MDL in laboratory method blank (Batch # 519820).

(3) No VOC trip blank was submitted with samples. No VOCs were detected > MDL in any environmental sample.

(4) Note: VOCs were diluted 5X. The MDLs and PQLs are elevated.

TJ

9/3/98

Reviewed by: Tim Gaskins

Date: 9/3/98

DATA QUALITY INDICATOR CHECKLIST
(DATA VERIFICATION/VALIDATION LEVEL 2—DV2)

3.0 SUMMARY: Summarize the findings in the table below. List only samples/fractions for which deficiencies have been noted. Use the qualifiers given at the end of the table if possible. Explain any other qualifiers in the comments column.

Sample/ Fraction No.	Analysis	Qualifiers	Comments
	TH		
	9-3-94		

Attach continuation sheet for additional samples

QUALIFIERS:

J = Estimated quantity (provide reason)
B = Contamination in blank (indicate which blank)
P = Laboratory precision does not meet criteria
R = Reporting units inappropriate
N = There is presumptive evidence of the presence of the material
UJ = The material was analyzed for but was not detected. The associated value is an estimate and may be inaccurate or imprecise.
Q = Quantitation limit does not meet criteria
A = Laboratory accuracy does not meet criteria
U = Analyte is undetected (indicate which analyte and reason for qualification)
NJ = There is presumptive evidence of the presence of the material at an estimated quantity.

Reviewed by: T. Andrus

Date: 9/3/98

ER/./DAT

141166

CHAIN OF CUSTODY

SAMPLE FINDINGS SUMMARY

Site: ER Septic Fields

AR/COC: 600423 Data Classification:

Sample/ Fraction No.	Analysis	DV Qualifiers	Comments
ER-1295-6741-DF1-BH1-7-S	75-09-2 (methylene chloride)	~~UR~~	~~sample > MDL,~~ ICV RSD = 10% ~~< 5 x blank result~~ CCV %D=76
ER-1295-6741-DF1-BH3-7-SD	121-14-2 (2,4-dinitro-toluene)	UJ	~~ICV RSD>20~~ ICV slope < .05 ~~CCV %D>20~~
"	51-28-5 (2,4-dinitro phenol)	UJ	ICV RSD > 20 CCV %D > 20

Sample No./Fraction No. - This value is located on the Chain of Custody in the ER Sample Id field.

Analysis - Use valid test methods provided below or if the result applies to an individual analyte within a test method, use the CAS number from the analytical data sheet.

DV Qualifiers - The entry will be taken from the list of valid qualifiers and associated comments. If other qualifiers not on the list are needed, contact Tina Sanchez to coordinate adding them to the list.

Comments - This is only to be used if a comment associated with the qualifier is not appropriate, needs modification because of an unusual circumstance, or additional clarification is warranted.

Test Methods - Anions_CE, EPA6010, EPA6020, EPA7470/1, EPA8015B, EPA8081, EPA8260, EPA8260-M3, EPA8270, HACH_ALK, HACH_ NO2, HACH_NO3, MEKC_HE, PCBRISC

Reviewed by: [signature] Date: 1/26/99

COC 600423 SDG# 9807074
DVR comments

General comment: Sample ID ER-1295-6741-DF1-BH3-7-SD is identified as a field duplicate for VOC, SVOC, HE, G Spec, and Metals analyses, but is actually only used as a field duplicate for SVOC.

Organics

VOC (8260): Methylene chloride (75-09-2) is qualified R because the ICV RSD is 107% and the CCV %D is 76.2 (sample ER-1295-6741-DF1-BH3-7-SD).

MS/MSD results are from another SDG, lab narrative indicates that all acceptance criteria were met.

SVOC (8270): Results for 2,4-dinitrophenol are qualified UJ due to ICV RSD >20% and CCV %D >20 (all SVOC samples).

MS/MSD results are from another SDG, lab narrative indicates that all acceptance criteria were met.

No run log for 7/23 analyses was included in this package.

Explosives (8330): Result for 2,4-dinitrotoluene (121-14-2) is qualified UJ due to ICV slope <0.05(sample ER-1295-6741-DF1-BH3-7-SD).

Inorganics

No qualifiers are applied to inorganic data.

ICP: MS/MSD and serial dilution results are from another SDG; lab narrative indicates that all acceptance criteria were met.

No laboratory replicate sample was analyzed.

CVAA: MS/MSD results are from another SDG, lab narrative indicates that all acceptance criteria were met.

No laboratory replicate sample was analyzed.

Radiochemistry

GAB: No qualifications were applied to the results.

Duplicate analyses were run on samples from different SDGs. The case narrative states that replicate QC is acceptable.

Gamma spec: No qualifications were applied to the results.

1/26/99

SW-846 - Method 8260

Samples:

Number 1 Matrix: SOIL Number _____ Matrix: _____

IS	GC/MS		Min RF	Int	Calib RSD	Calib RF	CCV RPD	CCV RF	CCB	Field Blank	Field Dup	MS	MSD	MS RPD	LCS	LCSD	LCS RPD	ug/kg m+h blk
	Name	CAS #			20%	>.05	20%	>.05	N/A	N/A	N/A							
1	Chloromethane	74-87-3	0.10		✓	✓	33.2	✓										
1	Bromomethane	74-83-9	0.10		✓	✓	✓	✓										
1	vinyl chloride	75-01-4	0.10		22.1	✓	✓	✓										
1	Chloroethane	75-00-3	0.01		24.1	✓	✓	✓										
1	methylene chloride (10xblk)	75-09-2	0.01		107.5		76.2	✓										1.2
1	acetone(10xblk)	67-64-1	0.01		✓	✓	✓	✓										
1	carbon disulfide	75-15-0	0.10		✓	✓	✓	✓										
1	1,1-dichloroethene	75-35-4	0.20		✓	✓	✓	✓										
1	1,1-dichloroethane	75-34-3	0.10		✓	✓	✓	✓										
1	Chloroform	67-66-3	0.20		✓	✓	✓	✓										
1	1,2-dichloroethane	107-06-2	0.10		✓	✓	✓	✓										
1	2-butanone(10xblk)	78-93-3	0.01		✓	✓	30.4	✓										
2	1,1,1-trichloroethane	71-55-6	0.10		✓	✓	✓	✓										
2	carbon tetrachloride	56-23-5	0.10		✓	✓	✓	✓										
2	Bromodichloromethane	75-27-4	0.20		✓	✓	✓	✓										
2	1,2-dichloropropane	78-87-5	0.01		✓	✓	✓	✓										
2	cis-1,3-dichloropropene	10061-01-5	0.20		✓	✓	✓	✓										
2	Trichloroethene	79-01-6	0.30		✓	✓	20.6	✓										
2	Dibromochloromethane	124-48-1	0.10		✓	✓	✓	✓										
2	1,1,2-trichloroethane	79-00-5	0.10		✓	✓	✓	✓										
2	Benzene	71-43-2	0.50		✓	✓	✓	✓										
2	trans-1,3-dichloropropene	10061-02-6	0.10		✓	✓	✓	✓										
2	Bromoform	75-25-2	0.10		✓	✓	✓	✓										
3	4-methyl-2-pentanone	108-10-1	0.10		✓	✓	✓	✓										
3	2-hexanone	591-78-6	0.01		✓	✓	✓	✓										
3	Tetrachloroethene	127-18-4	0.20		✓	✓	20.0	✓										
3	1,1,2,2-tetrachloroethane	79-34-5	0.30		✓	✓	27.1	✓										
3	toluene(10xblk)	108-88-3	0.40		✓	✓	✓	✓										
3	Chlorobenzene	108-90-7	0.50		✓	✓	✓	✓										
3	Ethylbenzene	100-41-4	0.10		✓	✓	✓	✓										
3	Styrene	100-42-5	0.30		✓	✓	✓	✓										
3	xylenes(total)	1330-20-7	0.30		✓	✓	✓	✓										
	1,2-dichloroethylene(total)	540-59-0	0.01		✓	✓	✓	✓										
	1,2-cis-dichloroethylene	156-59-2			✓	✓	✓	✓										
	1,2-trans-dichloroethylene	156-60-5			✓	✓	✓	✓										

1/26/99

Surrogate Recovery and Internal Standard Outliers

Sample	SMC 1	SMC 2	SMC 3	IS 1-area	IS 1-RT	IS 2-area	IS 2-RT	IS 3- area	IS 3- RT

N/A

SMC 1: 4-Bromofluorobenzene
SMC 2: 1,2-Dichloroethane-d4
SMC 3: Toluene-d8

IS 1: Bromochloromethane
IS 2: 1,4-Difluorobenzene
IS 3: Chlorobenzene-d5

1/26/99

Radiochemistry

Samples:
Method: GAB Number 6 Matrix: soil Prep: _____

Method: ~~X spec~~ Number 1 Matrix: soil Prep: _____

Method: _____ Number _____ Matrix: _____ Prep: _____

Method: _____ Number _____ Matrix: _____ Prep: _____

Radiochem	Rep RER	PB	Field Dup n/a	Field Blank n/a	LCS	MS ~~n/a~~	-	Sample	Isotope	IS/Trace	Sample	Isotope	IS/Trace
CRITERIA	<1.0	U		U	20%	25%	-			50-105			50-105
H3							-						
U-238													
U-234													
U-235/236							-						
Th-232													
Th-228													
Th-230							-						
Pu-239/240													
GAB α	✓	1.09			✓	✓	-	n/a					
Ra226							-						
Ra228							-						
Gamma	✓	n/a			✓	n/a	-	n/a					
Ni-63							-						
Neg-vol/B	✓	1.42			✓	✓	-	n/a					
							-						

1/26/99

Inorganic Metals

Samples:
Method: ICP Number 1 Matrix: Soil Prep: _____

Method: CVAA Number 1 Matrix: Soil Prep: _____

Method: _____ Number _____ Matrix: _____ Prep: _____

Analyte	ICV %R	CCV %R	ICB ug/l	CCB ug/l	PB mg/kg	Field Blks	LCS	LCSD	LCS RPD	MS	MSD	MSD RPD	REP RPD	ICS AB	Ser dil	
	✓	✓				N/A	✓	✓	✓	✓	none	none	none	✓	✓	CRDL
7429-90-5 Al																✓
7440-39-3 Ba	✓	✓	✓	✓	✓					✓						✓
7440-41-7 Be																✓
7440-43-9 Cd	✓	✓	✓	✓	.025					✓						✓
7440-70-2 Ca																✓
7440-47-3 Cr	✓	✓	✓	✓	✓					✓						✓
7440-48-4 Co																✓
7440-50-8 Cu																✓
7439-89-6 Fe																✓
7439-95-4 Mg																✓
7439-96-5 Mn																✓
7440-02-0 Ni																✓
7440-09-7 K																✓
7440-22-4 Ag	✓	✓	✓	✓	✓					✓						✓
7440-23-5 Na																✓
7440-62-2 V																✓
7440-66-6 Zn																✓
																✓
7439-92-1 Pb	✓	✓	✓	✓	.103					✓						✓
7782-49-2 Se	✓	✓	✓	✓	✓					✓						✓
7440-38-2 As	✓	✓	✓	✓	✓					✓						72.8
7440-36-0 Sb																✓
7440-28-0 Tl																✓
															✓	
7439-97-6 Hg	✓	✓	<0.1	<0.1	✓		✓	✓	✓	✓					✓	67.5
N/A Cyanide CN	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	

1/26/99

SW846 Method 8330

Samples:

Number 1 Matrix: SOIL Number _____ Matrix: _____

Name	CAS #	CCV RPD	PB	Field blank	Field Dup	LCS	LCSD	LCS RPD	MS	MSD	MS RPD	Curve R^2	RPD/std ICV
		20%	U	U N/A	N/A			20%	25%	25%	20%	.995	.05
HMX	2691-41-0												
RDX	121-82-4												
1,2,3-Trinitrobenzene	99-35-4												
1,3-dinitrobenzene	99-64-0												
Nitrobenzene	98-95-3												
Tetryl	479-45-8												
2,4,6-trinitrotoluene	118-96-7												
2-amino-4,6-dinitrotoluene	35572-78-2												
4-amino-2,6-dinitrotoluene	1946-51-0												
2,4-dinitrotoluene	121-14-2												.001
2,6-dinitrotoluene	606-20-2												
2-nitrotoluene	88-72-2												
4-nitrotoluene	99-99-0												
3-nitrotoluene	99-08-1												
PETN	78-11-5												

Sample	SMC % rec	SMC RT		Sample	SMC % rec	SMC RT
		OK				

Confirmation N/A

Sample	CAS #	% diff > 25%	Sample	CAS #	% diff >25%
		N/A			

1/26/99

SW-846 - Method 8270

Samples:

Number 7 Matrix: soil Number _____ Matrix: _____

7/22 CCVRF; %RSD; 7/23 CCV %D

IS	CAS#	Name	Min RF	Int	Calib RSD	Calib RF	CCV RPD	CCB N/A	Field Blank N/A	Field Dup N/A	MS N/A	MSD N/A	MSD RPD N/A	LCS	LCSD	LCS RPD	7/23 CCV %D
1	108-95-2	Phenol	0.80		✓	✓	✓										
1	111-44-4	bis(2-Chloroethyl)ether	0.70		✓	✓	✓										21.6
1	95-57-8	2-Chlorophenol	0.80		✓	✓	✓										
1	541-73-1	1,3-Dichlorobenzene	0.60		✓	✓	✓										
1	106-46-7	1,4-Dichlorobenzene	0.50		✓	✓	✓										
1	95-50-1	1,2-Dichlorobenzene	0.40		✓	✓	✓										
1	95-48-7	2-Methylphenol	0.70		✓	✓	✓										
1	108-60-1	2,2'-oxybis(1-Chloropropane)	0.01		✓	✓	25.8										
1	106-44-5	4-Methylphenol	0.60		✓	✓	✓										
1	621-64-7	N-Nitroso-di-n-propylamine	0.50		✓	✓	✓										
1	67-72-1	Hexachloroethane	0.30		✓	✓	✓										
2	98-95-3	Nitrobenzene	0.20		✓	✓	✓										
2	78-59-1	Isophorone	0.40		✓	✓	✓										
2	88-75-5	2-Nitrophenol	0.10		✓	✓	✓										
2	105-67-9	2,4-Dimethylphenol	0.20		✓	✓	✓										
2	111-91-1	bis(2-Chloroethoxy)methane	0.30		✓	✓	✓										
2	120-83-2	2,4-Dichlorophenol	0.20		✓	✓	✓										
2	120-82-1	1,2,4-Trichlorobenzene	0.20		✓	✓	✓										
2	91-20-3	Naphthalene	0.70		✓	✓	✓										
2	106-47-8	4-Chloroaniline	0.01		✓	✓	✓										
2	87-68-3	Hexachlorobutadiene	0.01		✓	✓	✓										
2	59-50-7	4-Chloro-3-methylphenol	0.20		✓	✓	✓										
2	91-57-6	2-Methylnaphthalene	0.40		✓	✓	✓										
3	77-47-4	Hexachlorocyclopentadiene	0.01		✓	✓	✓										
3	88-06-2	2,4,6-Trichlorophenol	0.20		✓	✓	✓										
3	95-95-4	2,4,5-Trichlorophenol	0.20		✓	✓	✓										

11/6/99

SW 846 - Method 8270 : page 2

IS	CAS #	NAME	Min RF	Int	Calib RSD 20	Calib RF	CCV RPD	CCV RF	CCB	Field blank	Field Dup ✓	MS ✓	MSD ✓	MSD RPD ✓	LCS	LCSD	LCS RPD
3	91-58-7	2-Chloronaphthalene	0.80		✓	✓	✓	✓									
3	88-74-4	2-Nitroaniline	0.01		✓	✓	✓	✓									
3	131-11-3	Dimethylphthalate	0.01		✓	✓	✓	✓									
3	208-96-8	Acenaphthylene	0.90		✓	✓	✓	✓									
3	606-20-2	2,6-Dinitrotoluene	0.20		✓	✓	✓	✓									
3	99-09-2	3-Nitroaniline	0.01		✓	✓	✓	✓									
3	83-32-9	Acenaphthene	0.90		✓	.829	✓	✓									
3	51-28-5	2,4-Dinitrophenol	0.01		30.06	✓	25.8	✓									
3	100-02-7	4-Nitrophenol	0.01		✓	✓	✓	✓									
3	132-64-9	Dibenzofuran	0.80		✓	✓	✓	✓									
3	121-14-2	2,4-Dinitrotoluene	0.20		✓	✓	✓	✓									
3	84-66-2	Diethylphthalate	0.01		✓	✓	✓	✓									
3	7005-72-3	4-Chlorophenyl-phenylether	0.40		✓	✓	✓	✓									
3	86-73-7	Fluorene	0.90		✓	✓	✓	✓									
3	100-01-6	4-Nitroaniline	0.01		✓	✓	✓	✓									
4	534-52-1	4,6-Dinitro-2-methylphenol	0.01		28.09	✓	✓	✓									
4	86-30-6	N-Nitrosodiphenylamine (1)	0.01		✓	✓	✓	✓									
4	101-55-3	4-Bromophenyl-phenylether	0.10		✓	✓	✓	✓									
4	118-74-1	Hexachlorobenzene	0.10		✓	✓	✓	✓									
4	87-86-5	Pentachlorophenol	0.05		✓	✓	✓	✓									
4	85-01-8	Phenanthrene	0.70		✓	✓	✓	✓									
4	120-12-7	Anthracene	0.70		✓	✓	✓	✓									
4	86-74-8	Carbazole 8.748	0.01		✓	✓	✓	✓									
4	84-74-2	Di-n-butylphthalate	0.01		✓	✓	✓	✓									
4	206-44-0	Fluoranthene	0.60		✓	✓	✓	✓									
5	129-00-0	Pyrene	0.60		✓	✓	✓	✓									
5	85-68-7	Butylbenzylphthalate	0.01		✓	✓	✓	✓									
5	91-94-1	3,3'-Dichlorobenzidine	0.01		✓	✓	✓	✓									
5	56-55-3	Benzo(a)anthracene	0.80		✓	✓	✓	✓			✓	✓	✓	✓	✓	✓	✓

% RSD

1/26/94

SW 846 - Method 8270 : page 3

%RSD 7/23

IS	CAS #	NAME	Min RF	Int	Calib RSD	Calib RF	CCV RPD	CCV RF	CCB	Field blank	Field Dup	MS	MSD	MSD RPD	LCS	LCSD	LCS RPD	CCV %D
5	218-01-9	Chrysene	0.70		✓	✓	✓	✓										
5	117-81-7	bis(2-Ethylhexyl)phthalate	0.01		✓	✓	✓	✓										
6	117-84-0	Di-n-octylphthalate	0.01		✓	✓	✓	✓										
6	205-99-2	Benzo(b)fluoranthene	0.70		✓	✓	✓	✓										
6	207-08-9	Benzo(k)fluoranthene	0.70		✓	✓	✓	✓										
6	50-32-8	Benzo(a)pyrene	0.70		✓	✓	✓	✓										
6	193-39-5	Indeno(1,2,3-cd)pyrene	0.50		✓	✓	✓	✓										22.4
6	53-70-3	Dibenz(a,h)anthracene	0.40		✓	✓	✓	✓										22.9
6	191-24-2	Benzo(g,h,i)perylene	0.50		✓	✓	✓	✓										20.7

2 = 7/23/98

Surrogate Recovery Outliers OK

Sample	SMC 1	SMC 2	SMC 3	SMC 4	SMC 5	SMC 6	SMC 7	SMC 8

SMC 1: Nitrobenzene-d5 SMC 2: 2-Fluorobiphenyl SMC 3: p-Terphenyl-d14
SMC 4: Phenol-d5 SMC 5: 2-Fluorophenol SMC 6: 2,4,6-Tribromophenol
SMC 7: 2-2-Chlorophenol-d4 SMC 8: 1,2-Dichlorobenzene-d4

Internal Standard Outliers OK

Sample	IS 1-area	IS 1-RT	IS 2-area	IS 2-RT	IS 3-area	IS 3-RT	IS 4-area	IS 4-RT	IS 5-area	IS 5-RT	Is 6-area	IS 6-RT

IS 1: 1,4-Dichlorobenzene-d4 IS 2: Naphthalene-d8 IS 3: Acenaphthene-d10
IS 4: Phenathrene-d10 IS 5: Chrysene-d12 IS 6: Perylene-d12

1/26/99

SAMPLE FINDINGS SUMMARY

Site: Non-ER Septic Systems

AR/COC: 602762 Data Classification: Organic

Sample/ Fraction No.	Analysis	DV Qualifiers	Comments
	No qualifications applied		

Sample No./Fraction No. - This value is located on the Chain of Custody in the ER Sample Id field.

Analysis - Use valid test methods provided below or if the result applies to an individual analyte within a test method. use the CAS number from the analytical data sheet.

DV Qualifiers - The entry will be taken from the list of valid qualifiers and associated comments. If other qualifiers not on the list are needed, contact Tina Sanchez to coordinate adding them to the list.

Comments - This is only to be used if a comment associated with the qualifier is not appropriate, needs modification because of an unusual circumstance, or additional clarification is warranted.

Test Methods - Anions_CE, EPA6010, EPA6020, EPA7470/1, EPA8015B, EPA8081, EPA8260, EPA8260-M3, EPA8270, HACH_ALK, HACH_ NO2, HACH_NO3, MEKC_HE, PCBRISC

Reviewed by: [redacted] Date: 11/2/99

SAMPLE FINDINGS SUMMARY

Site: Non-ER Sputter Systems

AR/COC: 602762 Data Classification: General Chemistry

Sample/ Fraction No.	Analysis	DV Qualifiers	Comments
B6620-SP1-EB-Cr6	hexavalent chromium 18540-29-9	UJB	exceeded hold time

Sample No./Fraction No. - This value is located on the Chain of Custody in the ER Sample Id field.

Analysis - Use valid test methods provided below or if the result applies to an individual analyte within a test method. use the CAS number from the analytical data sheet.

DV Qualifiers - The entry will be taken from the list of valid qualifiers and associated comments. If other qualifiers not on the list are needed, contact Tina Sanchez to coordinate adding them to the list.

Comments - This is only to be used if a comment associated with the qualifier is not appropriate, needs modification because of an unusual circumstance, or additional clarification is warranted.

Test Methods - Anions_CE, EPA6010, EPA6020, EPA7470/1, EPA8015B, EPA8081, EPA8260, EPA8260-M3, EPA8270, HACH_ALK, HACH_ NO2, HACH_NO3, MEKC_HE, PCBRISC

Reviewed by: _____ Date: 11/2/99

DATA VALIDATION SUMMARY:

SITE/PROJECT: Nav ER Septic CASE #: 7223-230 # OF SAMPLES: 28 MATRIX: Soil
ARCOC #: 602762 LAB SAMPLE IDs: 9908768-01 thru -16
LABORATORY: CalL -22 thru -28, 33
LABORATORY REPORT #: 9908768

Cr 6+

ANALYSIS/ QC ELEMENT	VOC	SVOC	PEST/ PCB	HPLC (HE)	ICP/AES	GFAA/ AA	CVAA (Hg)	CN	RAD	OTHER
1. HOLDING TIMES/ PRESERVATION	✓		✓					✓		✓
2. CALIBRATIONS	✓		✓					✓		✓
3. METHOD BLANKS	✓		✓					✓		✓
4. MS/MSD	✓		✓					✓		✓
5. LABORATORY CONTROL SAMPLES	✓		✓					✓		✓
6. REPLICATES								✓		✓
7. SURROGATES	✓		✓							—
8. INTERNAL STDS	✓									—
9. TCL COMPOUND IDENTIFICATION	✓									—
10. ICP INTERFERENCE CHECK SAMPLE										—
11. ICP SERIAL DILUTION										—
12. CARRIER/CHEM TRACER RECOVERIES										—
13. OTHER QC	—		✓					✓		✓

CHECK MARK (√) – ACCEPTABLE
J – ESTIMATED
U – NOT DETECTED
SHADED CELLS – NOT APPLICABLE
UJ – NOT DETECTED, ESTIMATED
R – UNUSABLE

REVIEWED BY: _____ DATE: 11/6/99

DATA VALIDATION SUMMARY:

SITE/PROJECT: Nav. ER Septic CASE #: 7223.230
ARCOC #: 602762
LABORATORY: CEL
LABORATORY REPORT #: 9908768

OF SAMPLES: 5 MATRIX: aqueous
LAB SAMPLE IDs: 9908768 17, -18, -19, -20, -21

ANALYSIS/ QC ELEMENT	VOC	SVOC	PEST/ PCB	HPLC (HE)	ICP/AES	GFAA/ AA	CVAA (Hg)	CN	RAD	OTHER (6.6t)
1. HOLDING TIMES/ PRESERVATION	✓		✓					✓		UJ2
2. CALIBRATIONS	✓		✓					✓		✓
3. METHOD BLANKS	✓		✓					✓		✓
4. MS/MSD	—		—					—		✓
5. LABORATORY CONTROL SAMPLES	✓		✓					✓		✓
6. REPLICATES								✓		✓
7. SURROGATES	✓		✓							—
8. INTERNAL STDS	✓									—
9. TCL COMPOUND IDENTIFICATION	✓									—
10. ICP INTERFERENCE CHECK SAMPLE										—
11. ICP SERIAL DILUTION										—
12. CARRIER/CHEM TRACER RECOVERIES										—
13. OTHER QC	—		—					J		✓

CHECK MARK (√) – ACCEPTABLE
J – ESTIMATED
U – NOT DETECTED
SHADED CELLS – NOT APPLICABLE
UJ – NOT DETECTED, ESTIMATED
R – UNUSABLE

REVIEWED BY: _____ DATE: 11/2/99

HOLDING TIME/PRESERVATION:

SITE/PROJECT: Non-ER Septic ARCOC #: 602762
LABORATORY: CEL LABORATORY REPORT #: 9908768

Sample ID	Analysis	Holding Time Criteria	Days Holding Time was Exceeded	Preservation Criteria	Preservation Deficiency	Comments
36620-SP1-EB-C66	Cr6+	24hrs	1 day			UB2

Comments:

REVIEWED BY: _____ DATE: ~~10/~~ 11/2/99

Memorandum

Date: 11/02/99

To: File

From: Marcia Hilchey

Subject: Organic Data Review and Validation
Site: Non-ER Septic Systems
AR/COC: 602762
Case: 7223.230
Laboratory: GEL
SDG: 9908768

See attached Data Assessment Summary Forms for supporting documentation on the data review and validation.

Summary

All samples were prepared and analyzed with accepted procedures and with specified methods (VOC EPA8270, PCB EPA8082). All compounds were successfully analyzed.

No qualifications were applied to VOC sample data.

No qualifications were applied to PCB sample data.

Holding Times

The samples were analyzed within the prescribed holding times, with the exception of the analysis of the re-extracted PCB equipment blank. Since the original sample results were reported, no holding-time qualifications were applied.

Calibration

Initial calibration met acceptance criteria for both methods.

Several VOC analytes failed to meet CCV acceptance criteria. All exhibited less than 40%D, therefore no sample results were qualified.

According to the laboratory case narrative, several PCB analytes failed to meet CCV acceptance criteria. The method states that only Aroclors 1016 and 1260 must be present in the CCV standard. Aroclors 1016 and 1260 met CCV acceptance criteria, therefore no sample results were qualified.

Blanks

No target analytes were detected above the reporting limit in the method blanks, equipment blanks, or VOC trip blank.

Surrogates

All VOC surrogate recoveries met acceptance criteria.

Surrogate recovery for the PCB equipment blank (sample B6620-SP1-EB-PCB) was unacceptable. The sample was reextracted and reanalyzed with acceptable surrogate recovery and identical target analyte results (all non-detect). The re-extracted sample analysis exceeded the prescribed holding time. Since all sample results were non-detect, the original results were reported, and no qualifications were applied.

Note: The laboratory stated that the original results were reported for B6620-SP1-EB-PCB (see previous paragraph), however, the reported analysis date and surrogate recovery were incorrect. The reported analysis date and surrogate recovery actually correspond to the reanalysis. Data quality is unaffected

Matrix Spike/Matrix Spike Duplicates (MS/MSD)

Matrix spike sample analysis for soil VOC and PCB samples met acceptance criteria.

No aqueous MS/MSD samples were submitted with this SDG. No sample results were qualified.

Internal Standards

The VOC internal standards met QC acceptance criteria.

Laboratory Control Sample/Laboratory Control Sample Duplicate (LCS/LCSD)

LCS/LCSD samples met all acceptance criteria.

Other QC

No field duplicate samples were submitted for VOC analysis.

The PCB field duplicate sample analysis met RPD acceptance criteria.

No other specific issues were identified which affect data quality.

Please contact me if you have any questions or comments regarding the review of this package.

PCBs:
SW846 - Method 8082

SITE/PROJECT: NAEK Septic ARCOC #: 60276.2
LABORATORY: CEL LABORATORY REPORT #: 9908768

n/a

Name	CAS #	Intercept	Calib RSD / R^2	CCV RPD	Method Blks	LCS	LCSD	LCS RPD	MS	MSD	MS RPD	Field Dup RPD	Eq. Blks	Field Blks			
			<20% / 0.99	<20%				20%			20%						
PCBs																	
Aroclor-1016	12674-11-2	✓	✓	✓	✓							✓	✓				
Aroclor-1221	11104-28-2																
Aroclor-1232	1114-16-5																
Aroclor-1242	53469-21-9																
Aroclor-1248	12672-29-6																
Aroclor-1254	11097-69-1					✗	✗										
Aroclor-1260	11096-82-5	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓				

Sample	SMC % REC	SMC RT	Sample	SMC % REC	SMC RT
		n/a			

Confirmation

Sample	CAS #	RPD > 25%	Sample	CAS #	RPD > 25%
	n/a				

Comments:

REVIEWED BY: _____ DATE: 11/2/99

VOLATILE ORGANICS: Page 1 of 2
SW-846 - Method 8260

SITE/PROJECT: Non-ER Septic ARCOC #: 602762
LABORATORY: CEL LABORATORY REPORT #: 9908768

IS	GC/MS		Min RF	Intercept	Calib RF	Calib RSD / R^2	CCV %D (8/24)	Method Blks	LCS	LCSD	LCS RPD	MS	MSD	MS RPD	Field Dup RPD (n/a)	Eq. Blks	Trip Blks	TAL	CC (8/25)	CC (8/23)
	Name	CAS #			>.05	<20% / 0.99	20%													
1	Chloromethane	74-87-3	0.10	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	—		✓	✓		✓	
1	Bromomethane	74-83-9	0.10																	
1	vinyl chloride	75-01-4	0.10																	
1	Chloroethane	75-00-3	0.01																	
1	methylene chloride (10xblk)	75-09-2	0.01																	
1	acetone(10xblk)	67-64-1	0.01																	
1	carbon disulfide	75-15-0	0.10																	
1	1,1-dichloroethene	75-35-4	0.20																	
1	1,1-dichloroethane	75-34-3	0.10																	
1	Chloroform	67-66-3	0.20																	
1	1,2-dichloroethane	107-06-2	0.10																	
1	2-butanone(10xblk)	78-93-3	0.01																	
2	1,1,1-trichloroethane	71-55-6	0.10																	
2	carbon tetrachloride	56-23-5	0.10																	
2	Bromodichloromethane	75-27-4	0.20																	
2	1,2-dichloropropane	78-87-5	0.01																	
2	cis-1,3-dichloropropene	10061-01-5	0.20																	
2	Trichloroethene	79-01-6	0.30																	
2	Dibromochloromethane	124-48-1	0.10																	
2	1,1,2-trichloroethane	79-00-5	0.10																	
2	Benzene	71-43-2	0.50																	
2	trans-1,3-dichloropropene	10061-02-6	0.10																	
2	Bromoform	75-25-2	0.10																	
3	4-methyl-2-pentanone	108-10-1	0.10																	
3	2-hexanone	591-78-6	0.01				48.5												34	34.1
3	Tetrachloroethene	127-18-4	0.20																	
3	1,1,2,2-tetrachloroethane	79-34-5	0.30																	
3	toluene(10xblk)	108-88-3	0.40																	
3	Chlorobenzene	108-90-7	0.50																	
3	Ethylbenzene	100-41-4	0.10																	
3	Styrene	100-42-5	0.30																	
3	xylenes(total)	1330-20-7	0.30																	
	1,2-dichloroethylene(total)	540-59-0	0.01																	
	2-chloroethyl vinyl ether	110-75-8																		
	vinyl acetate			✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓		✓	✓		✓	✓

Comments:

REVIEWED BY: _____ DATE: 11/2/99

VOLATILE ORGANICS: Page 2 of 2
SW-846 - Method 8260

SITE/PROJECT: _____ ARCOC #: 60276L
LABORATORY: _____ LABORATORY REPORT #: _____

Surrogate Recovery and Internal Standard Outliers

Sample	SMC 1	SMC 2	SMC 3	IS 1-area	IS 1-RT	IS 2-area	IS 2-RT	IS 3- area	IS 3- RT			
				OK								

SMC 1: 4-Bromofluorobenzene
SMC 2: 1,2-Dichloroethane-d4
SMC 3: Toluene-d8

IS 1: Bromochloromethane
IS 2: 1,4-Difluorobenzene
IS 3: Chlorobenzene-d5

Comments:

Memorandum

Date: 11/02/99

To: File

From: Marcia Hilchey

Subject: General Chemistry Data Review and Validation
Site: Non-ER Septic Systems
AR/COC: 602762
Case: 7223.230
Laboratory: GEL
SDG: 9908768

See attached Data Assessment Summary Forms for supporting documentation on the data review and validation.

Summary

All samples were prepared and analyzed with accepted procedures and with specified methods (total cyanide EPA9012, hexavalent Cr EPA7196). All components were successfully analyzed.

No qualifications were applied to CN sample results.

Qualification was applied to a Cr6+ sample result due to exceeded holding time.

Holding Times

The CN samples were analyzed within the prescribed holding time.

The Cr6+ equipment blank sample was received and analyzed 1 day after the prescribed 24hr. holding time. Sample results were UJ2 qualified.

Calibration

Initial and continuing calibrations met QC acceptance criteria.

Blanks

The method blanks and equipment blanks were free of target analytes above reporting limits.

Matrix Spike Analysis

The matrix spike sample analyses met QC acceptance criteria.

Laboratory Control/Laboratory Control Duplicate Samples

The LCS/LCSD samples met QC acceptance criteria.

Laboratory Replicate Analysis

The replicate sample analyses met QC acceptance criteria.

Other QC

Field duplicate soil sample analyses met RPD acceptance criteria.

No other specific issues were identified which affect data quality.

Please contact me if you have any questions or comments regarding the review of this package.

GENERAL CHEMISTRY:

SITE/PROJECT: Non-CR Septic ARCOC #: 60276 2
LABORATORY: GEL LABORATORY REPORT #: 9908768
METHODS: CN, Cr6+

QC/ Analyte	CAS #	ICV	CCV	ICB	CCB	Method Blanks	LCS	LCSD	LCSD RPD	MS	MSD	MSD RPD	REP RPD	Serial Dilution	Field Dup. RPD	Equip. Blks	Field Blks			
Total cyanide		✓	✓	n/a	n/a	✓	✓	✓	✓	✓	n/a	n/a	✓	n/a	✓	✓	n/a			
Cr 6+	18540-29-9	✓	✓	"	"	✓	✓	✓	✓	✓	"	"	✓	" ✓	✓	✓	"			

Comments:

REVIEWED BY: [redacted] DATE: 10 4/2/99

ORIGINAL

Analysis Request And Chain Of Custody (Continuation)

AR/COC- 602762

Project Name: Non-ER Septic Systems Project/Task Manger: Mike Sanders Case No. 73510

Location: Building / Room	Tech Area	Depth in Ft	ER Site No.	Reference LOV (available at SMO)							Lab use
Sample No-Fraction	ER Sample ID or Sample Location detail			Date/Time Collected	Sample Matrix	Container Type	Container Volume	Preservative	Sample Collection Methods	Sample Type	Parameter & Method Requested	Lab Sample ID
048373-001	B6620-SPI-BH19-S	19 Ft	N/A	081899 0926	S		0926	4C	GR	SA[1]	VOC	
048374-002	B6620-SPI-BH1-19-S	19 Ft	N/A	081899 0955	S	AG	250 ml	4C	GR	SA[2]	PCB, CN, Cr6+	
048375-001	B6620-SPI-BH1-MS	19 Ft	N/A	081899 1023	S	AC	125ml	4C	GR	SA[3]	VOC	
048376-009	B6620-SPI-BH1-19-S	19 Ft	N/A	081899 1029	S	AG	250 ml	4C	GR	SA[4]	PCB, CN, Cr6+	
048377-002	B6620-SPI-BH1-MSD	19 Ft	N/A	081899 1056	S	AG	250 ml	4C	GR	SA[5]	PCB, CN, Cr6+	
048378-002	B6620-SPI-BH1-MSD	19 Ft	N/A	081899 0957	S	AG	250 ml	4C	GR	MS/SD[6]	PCB, CN, Cr6+	
048379-005	B6620-SPI-EB-CN	N/A	N/A	081899 1035	DIW	P	1 L	NaOH	GR	EB[7]	total CN	
048380-005	B6620-SPI-EB-Cr6	N/A	N/A	081899 1046	DIW	P	1X500ml	4C	GR	EB[8]	Cr6+	
048381-005	B6620-SPI-EB-PCB	N/A	N/A	081899 1047	DIW	AG	2X1 L	4C	GR[19]	EB	PCB	
048382-005	B6620-SPI-EB	N/A	N/A	081899 1048	DIW	G	3X40ml	HCl	GR[20]	EB	VOC	
048383-005	B6620-SPI-TB	N/A	N/A	081899 1049	N/A	G	3X40ml	HCL	GR[21]	TB	VOC	
048384-001	B6741-DPI-BH3-7-S	7 Ft	N/A	081899 1355	S	AC	125ml	4C	GR[22]	SA	VOC	
048384-002	B6741-DPI-BH3-7-S	7 Ft	N/A	081899 1359	S	AC	250 ml	4C	GR[23]	SA	PCB, CN, Cr6+	
048385-001	B6741-DPI-BH3-12-S	12 Ft	N/A	081899 1405	S	AC	125ml	4C	GR[24]	SA	VOC	
048385-002	B6741-DPI-BH3-12-S	12 Ft	N/A	081899 1405	S	AC	250 ml	4C	GR[25]	SA	PCB, CN, Cr6+	
048386-001	B6741-DPI-BH2-7-S	7 Ft	N/A	081899 1450	S	AC	125ml	4C	GR[26]	SA	VOC	
048386-002	B6741-DPI-BH2-7-S	7 Ft	N/A	081899 1450	S	AG	250 ml	4C	GR[27]	SA	PCB CN Cr6+	
048387-001	B6741-DPI-BH2-12-S	12 Ft	N/A	081899 1517	S	AC	125ml	4C	GR[28]	SA	VOC	
048387-002	B6741-DPI-BH2-12-S	12 Ft	N/A	081899 1517	S	AG	250ml	4C	GR[29]	SA	PCB CN Cr6+	
048388-001	B6741-DPI-BH1-7-S	7 Ft	N/A	081899 1536	S	AC	125ml	4C	GR[30]	SA	VOC	

samples 048382

EB samples 048383, 048389

ORIGINAL

Internal Lab

ANALYSIS REQUEST AND CHAIN OF CUSTODY

Page 1 of 3

AR/COC 602762

Batch No | SAR/WR No. | SMO Use

Dept. No./Mail Stop:	6135/1147	Contract No.:	AJ-2480A
Project/Task Manager:	NON-ER Septic Sys/M Sanders	Case No.:	7223.230
Project Name:	Non-ER Septic Systems	Lab Contact:	E Kent 803 556 8171
Record Center Code:	ER/1295/DAT	Lab Destination:	GEL
Logbook Ref. No.:		SMO Contact/Phone:	D Salmi 844-3110
Service Order No.:	CF 0686	Send Report to SMO:	S Jensen 844-3184
Location	Tech Area	Supplier Services Dept.:	
Building	Room	P.O. Box 5800 MS 0154	

ORIGINAL

9909768 Lab Use

Reference LOV(available at SMO)

Sample No.-Fraction	ER Sample ID or Sample Location Detail	Beginning Depth/ft.	ER Site No.	Date/Time Collected	Sample Matrix	Container Type	Container Volume	Preservative	Collection Method	Sample Type	Parameter & Method Requested	Lab Sample ID
048363-002	B6750-DF1-BH1-5-S	5 Ft	N/A	081799 1105	S	G	500ml	4C	GR 1	SA	PCB CN Cr6+	
048364-002	B6750-DF1-BH1-10-S	10 Ft	N/A	081799 1107	S	G	500ml	4C	GR 2	SA	PCB CN Cr6+	
048365-002	B6750-DF1-BH2-5-S	5 Ft	N/A	081799 1125	S	G	500ml	4C	GR 3	SA	PCB CN Cr6+	
048366-002	B6750-DF1-BH2-10-S	10 Ft	N/A	081799 1129	S	G	500ml	4C	GR 4	SA	PCB CN Cr6+	
048367-002	B6750-DF1-BH4-5-S	5 Ft	N/A	081799 1310	S	AG	250ml	4C	GR 5	SA	PCB, CN Cr6+	
048368-002	B6620-DF1-BH1-10-S	10 Ft	N/A	081799 1327	S	AG	250ml	4C	GR 6	SA	PCB CN Cr6+	
048369-002	B6620-DF1-BH2-5-S	5 Ft	N/A	081799 1338	S	AG	250ml	4C	GR 7	SA	PCB CN Cr6+	
048370-002	B6620-DF1-BH2-10-S	10 Ft	N/A	081799 1430	S	AG	250ml	4C	GR 8	SA	PCB CN Cr6+	
048371-002	B6620-DF1-BH3-5-S	5 Ft	N/A	081799 1503	S	AG	250ml	4C	GR 9	SA	PCB CN Cr6+	
048372-002	B6620-DF1-BH3-10-S	10 Ft	N/A	081799 1520	S	AG	250ml	4C	GR 10	SA	PCB CN Cr6+	

RMMA ☐ Yes ☒ No Ref. No.

Sample Disposal ☐ Return to Client ☒ Disposal by lab

Turnaround Time ☒ Normal ☐ Rush

Required Report Date

Special Instructions/QC Requirements

EDD ☒ Yes ☐ No

Raw Data Package ☒ Yes ☐ No

Send info to Mike Sanders (VOC (EPA 8260) CN (EPA 9010A) PCB (EPA 8082) Cr6+ (EPA 8270)) Please list as separate report. # VOA TB F... GEL ARRAN... WITH BUN... INFIRE...

Sample Team Members	Name	Signature	Init.	Company/Organization/Phone
	Margaret Sanchez		MS	Weston/6118/845-3267
	Gilbert Quintana		GQ	IT/6118/238-9417

1. Relinquished by		Org. GEL	Date 8-19-99	Time 0700	4. Relinquished by		Org.	Date	Time
1. Received by	SMO	Org. 7577	Date 8/19/99	Time 0700	4. Received by		Org.	Date	Time
2. Relinquished by		Org. 7577	Date 8/19/99	Time 1130	5. Relinquished by		Org.	Date	Time
2. Received by		Org. GEL	Date 8-20-99	Time 1015	5. Received by		Org.	Date	Time
3. Relinquished by		Org.	Date	Time	6. Relinquished by		Org.	Date	Time
3. Received by		Org.	Date	Time	6. Received by		Org.	Date	Time

1. H 048363 1327

ORIGINAL

Analysis Request And Chain Of Custody (Continuation)

3 3

Page 1 of 4

AR/COC- 602762

Project Name: Non-ER Septic Systems		Project/Task Manger		Mike Sanders									Case No.		
Location	Tech Area			Reference LOV (available at SMO)											Lab use
Building	Room														
Sample No- Fraction	ER Sample ID or Sample Location detail	Depth in Ft	ER Site No.	Date/Time Collected	Sample Matrix	Container Type	Container Volume	Preservative	Sample Collection Methods	Sample Type	Parameter & Method Requested	Lab Sample ID
048389-001	B6741-DR-B11-7-5	7 ft	N/A	081399 1557	S	AG	200ml	4C	GR	SA[1]	PCB CN Cr6+	
048389-001	B6741-DR-B11-12-5	12 ft	N/A	081399 1552	S	AG	125ml	4C	GR	SA[2]	VOC	
048389-002	B6741-DR-B11-12-5	12 ft	N/A	081399 1552	S	AG	250ml	4C	GR	SA[3]	PCB CN Cr6+	

ORIGINAL

Contract Verification Review (CVR)

Project Leader A. Roybal | Project Name Non-ER Septic Systems | Case No. 7223.230

AR/COC No. 602762 | Analytical Lab GEL | SDG No. 9908768

In the tables below, mark any information that is missing or incorrect and give an explanation.

1.0 Analysis Request and Chain of Custody Record and Log-In Information

Line No.	Item	Complete? Yes	Complete? No	If no, explain	Resolved? Yes	Resolved? No
1.1	All items on COC complete - data entry clerk initialed and dated	X				
1.2	Container type(s) correct for analyses requested	X				
1.3	Sample volume adequate for # and types of analyses requested	X				
1.4	Preservative correct for analyses requested	X				
1.5	Custody records continuous and complete	X				
1.6	Lab sample number(s) provided and SNL sample number(s) cross referenced and correct	X				
1.7	Date samples received	X				
1.8	Condition upon receipt information provided	X				

2.0 Analytical Laboratory Report

Line No.	Item	Complete? Yes	Complete? No	If no, explain	Resolved? Yes	Resolved? No
2.1	Data reviewed, signature	X				
2.2	Method reference number(s) complete and correct	X				
2.3	QC analysis and acceptance limits provided (MB, LCS, Replicate)	X				
2.4	Matrix spike/matrix spike duplicate data provided(if requested)	X				
2.5	Detection limits provided; PQL and MDL(or IDL), MDA and L_c	X				
2.6	QC batch numbers provided	X				
2.7	Dilution factors provided and all dilution levels reported	X				
2.8	Data reported in appropriate units and using correct significant figures	X				
2.9	Radiochemistry analysis uncertainty (2 sigma error) and tracer recovery (if applicable) reported	NA				
2.10	Narrative provided	X				
2.11	TAT met		X	Due to hurricane Floyd, GEL was granted several additional days to the TAT.		
2.12	Hold times met	X				
2.13	Contractual qualifiers provided	X				
2.14	All requested result and TIC (if requested) data provided	X				

Contract Verification Review (Continued)

3.0 Data Quality Evaluation

Item	Yes	No	If no, Sample ID No./Fraction(s) and Analysis
3.1 Are reporting units appropriate for the matrix and meet contract specified or project-specific requirements? Inorganics and metals reported as ppm (mg/liter or mg/Kg)? Tritium reported in picocuries per liter with percent moisture for soil samples? Units consistent between QC samples and sample data	X		
3.2 Quantitation limit met for all samples	X		
3.3 Accuracy a) Laboratory control samples accuracy reported and met for all samples	X		
b) Surrogate data reported and met for all organic samples analyzed by a gas chromatography technique	X		
c) Matrix spike recovery data reported and met	X		
3.4 Precision a) Replicate sample precision reported and met for all inorganic and radiochemistry samples	X		
b) Matrix spike duplicate RPD data reported and met for all organic samples	X		
3.5 Blank data a) Method or reagent blank data reported and met for all samples	X		
b) Sampling blank (e.g., field, trip, and equipment) data reported and met	X		
3.6 Contractual qualifiers provided: "J"- estimated quantity; "B"-analyte found in method blank above the MDL for organic or above the PQL for inorganic; "U"- analyte undetected (results are below the MDL, IDL, or MDA (radiochemical)); "H"-analysis done beyond the holding time	X		
3.7 Narrative addresses planchet flaming for gross alpha/beta	NA		
3.8 Narrative included, correct, and complete	X		
3.9 Second column confirmation data provided for methods 8330 (high explosives) and pesticides/PCBs	X		

Contract Verification Review (Continued)

4.0 Calibration and Validation Documentation

Item	Yes	No	Comments
4.1 GC/MS (8260, 8270, etc.)			
a) 12-hour tune check provided	X		
b) Initial calibration provided	X		
c) Continuing calibration provided	X		
d) Internal standard performance data provided	X		
e) Instrument run logs provided	X		
4.2 GC/HPLC (8330 and 8010)	NA		
a) Initial calibration provided	NA		
b) Continuing calibration provided	NA		
c) Instrument run logs provided	NA		
4.3 Inorganics (metals)			
a) Initial calibration provided	X		
b) Continuing calibration provided	X		
c) ICP interference check sample data provided	X		
d) ICP serial dilution provided	X		
e) Instrument run logs provided	X		
4.4 Radiochemistry			
a) Instrument run logs provided	NA		

Contract Verification Review (Concluded)

5.0 Problem Resolution

Summarize the findings in the table below. List only samples/fractions for which deficiencies have been noted.

Sample/Fraction No.	Analysis	Problems/Comments/Resolutions

Were deficiencies unresolved? ☐ Yes ☒ No

Based on the review, this data package is complete. ☒ Yes ☐ No

If no, provide nonconformance report or correction request number _____ and date correction request was submitted: _____

Reviewed by: _____ Date: 12-6-99 Closed by: _____ Date: _____

April 25, 2000

PAGE DELIBERATELY

NOT SCANNED

Must be viewed at the

Integrated Safety & Security (IS&S)
Records Center

For Assistance Call

844-4688

Contract Verification Review (CVR)

Project Leader A. Roybal | Project Name Non-ER Septic Systems | Case No. 7223.230

AR/COC No. 602762 | Analytical Lab GEL | SDG No. 9908768

In the tables below, mark any information that is missing or incorrect and give an explanation.

1.0 Analysis Request and Chain of Custody Record and Log-In Information

Line No.	Item	Complete? Yes	Complete? No	If no, explain	Resolved? Yes	Resolved? No
1.1	All items on COC complete - data entry clerk initialed and dated	X				
1.2	Container type(s) correct for analyses requested	X				
1.3	Sample volume adequate for # and types of analyses requested	X				
1.4	Preservative correct for analyses requested	X				
1.5	Custody records continuous and complete	X				
1.6	Lab sample number(s) provided and SNL sample number(s) cross referenced and correct	X				
1.7	Date samples received	X				
1.8	Condition upon receipt information provided	X				

2.0 Analytical Laboratory Report

Line No.	Item	Complete? Yes	Complete? No	If no, explain	Resolved? Yes	Resolved? No
2.1	Data reviewed, signature	X				
2.2	Method reference number(s) complete and correct	X				
2.3	QC analysis and acceptance limits provided (MB, LCS, Replicate)	X				
2.4	Matrix spike/matrix spike duplicate data provided(if requested)	X				
2.5	Detection limits provided; PQL and MDL(or IDL), MDA and L_c	X				
2.6	QC batch numbers provided	X				
2.7	Dilution factors provided and all dilution levels reported	X				
2.8	Data reported in appropriate units and using correct significant figures	X				
2.9	Radiochemistry analysis uncertainty (2 sigma error) and tracer recovery (if applicable) reported	NA				
2.10	Narrative provided	X				
2.11	TAT met		X	Due to huricane Floyd, GEL was granted several additional days to the TAT.		
2.12	Hold times met	X				
2.13	Contractual qualifiers provided	X				
2.14	All requested result and TIC (if requested) data provided	X				

Contract Verification Review (Continued)

3.0 Data Quality Evaluation

Item	Yes	No	If no, Sample ID No./Fraction(s) and Analysis
3.1 Are reporting units appropriate for the matrix and meet contract specified or project-specific requirements? Inorganics and metals reported as ppm (mg/liter or mg/Kg)? Tritium reported in picocuries per liter with percent moisture for soil samples? Units consistent between QC samples and sample data	X		
3.2 Quantitation limit met for all samples	X		
3.3 Accuracy a) Laboratory control samples accuracy reported and met for all samples	X		
b) Surrogate data reported and met for all organic samples analyzed by a gas chromatography technique	X		
c) Matrix spike recovery data reported and met	X		
3.4 Precision a) Replicate sample precision reported and met for all inorganic and radiochemistry samples	X		
b) Matrix spike duplicate RPD data reported and met for all organic samples	X		
3.5 Blank data a) Method or reagent blank data reported and met for all samples	X		
b) Sampling blank (e.g., field, trip, and equipment) data reported and met	X		
3.6 Contractual qualifiers provided: "J"- estimated quantity; "B"-analyte found in method blank above the MDL for organic or above the PQL for inorganic; "U"- analyte undetected (results are below the MDL, IDL, or MDA (radiochemical)); "H"-analysis done beyond the holding time	X		
3.7 Narrative addresses planchet flaming for gross alpha/beta	NA		
3.8 Narrative included, correct, and complete	X		
3.9 Second column confirmation data provided for methods 8330 (high explosives) and pesticides/PCBs	X		

Contract Verification Review (Continued)

4.0 Calibration and Validation Documentation

Item	Yes	No	Comments
4.1 GC/MS (8260, 8270, etc.)			
a) 12-hour tune check provided	X		
b) Initial calibration provided	X		
c) Continuing calibration provided	X		
d) Internal standard performance data provided	X		
e) Instrument run logs provided	X		
4.2 GC/HPLC (8330 and 8010)	NA		
a) Initial calibration provided	NA		
b) Continuing calibration provided	NA		
c) Instrument run logs provided	NA		
4.3 Inorganics (metals)			
a) Initial calibration provided	X		
b) Continuing calibration provided	X		
c) ICP interference check sample data provided	X		
d) ICP serial dilution provided	X		
e) Instrument run logs provided	X		
4.4 Radiochemistry			
a) Instrument run logs provided	NA		

Contract Verification Review (Concluded)

5.0 Problem Resolution

Summarize the findings in the table below. List only samples/fractions for which deficiencies have been noted.

Sample/Fraction No.	Analysis	Problems/Comments/Resolutions

Were deficiencies unresolved? ☐ Yes ☒ No

Based on the review, this data package is complete. ☒ Yes ☐ No

If no, provide nonconformance report or correction request number _____ and date correction request was submitted: _____

Reviewed by: [signature] Date: 12-6-99 Closed by: _____ Date: _____

GENERAL ENGINEERING LABORATORIES

Meeting today's needs with a vision for tomorrow.

October 21, 1999

Sandia National Laboratories
1515 Eubank SE
Albuquerque, New Mexico 87123
Attention: Suzi Jensen, MS-1042, Org. 7578, Building T6/ Room 8

Re: ARCOC- 602762, SDG# 9908768 vg(sms) 10/27/99

Dear Ms. Jensen:

Enclosed is a revised "Data Qualifier Definition" section for Sample Delivery Group (SDG) 9908768. This revised section includes pertinent comments addressing the use of prep corrected detection limit values in the data package. Please replace the existing "Data Qualifier Definition" section with the revised section.

As always, General Engineering Laboratories, Inc. appreciates the opportunity to provide you with analytical data. If you have additional questions concerning this response or any other issue, please call me at (843) 556-8171 Extension 4410.

Yours very truly,

for

Tristan L. Davis
Quality Assurance Officer

P O Box 30712 • Charleston, SC 29417 • 2040 Savage Road • 29407

(843) 556-8171 • Fax (843) 766-1178

REVISED

It is a requirement of the Sandia contract that the static MDL be reported on both the Certificate of Analysis (COA) and the EDD rather than the effective MDL.....However, the data qualifiers for individual results in this SDG reflect the effective MDL. Due to a change from SW846 Revision 2 to SW846 Revision 3 we need to temporarily report the effective MDL rather that the static MDL. The change to Revision 3 requires us to revise tables in our laboratory information management system (lims) in order to provide static MDLs. At this time, we have not completed the necessary revisions.

QL Quantitation Limit: The lowest concentration that can be reliably achieved within specified limits of precision and accuracy during routine laboratory operating conditions. The QL is generally 5 to 10 times the MDL. However, it may be nominally chosen within these guidelines to simplify data reporting. For many analytes the QL analyte concentration is selected as the lowest non-zero standard in the calibration curve.

Sample QL's are highly matrix-dependent. Sample specific preparation and dilution factors are applied to these limits when they are reported

The QL is always ≥ DL

RL Reporting Limit: Same as the QL except where driven by contract or client specifications. If the sample specific preparation and dilution factors cause the QL to be elevated above the RL, then the QL is used as the RL.

The quantitation limit is the lowest level at which a chemical may be accurately and reproducibly quantitated. It answers the question "HOW MUCH IS PRESENT".

NOTE: **Per contract specifications Sandia has requested that for radiochemistry samples only the actual critical level be reported on the Certificate of Analysis (COA) and the EDD where the MDL would normally be reported and that the MDA be reported where the RL would normally be reported.**

Interpretation of RESULT column on the Certificate of Analysis:

If the final concentration in the sample was found to be equal to or above the RL, then the value is reported without a qualifier; for RAD samples if the final concentration in the sample was found to be above the actual critical level, then the value is reported without a qualifier.

If the final concentration in the sample was found to be below the RL but equal to or above the effective DL, then the value reported is qualified with a "J"; there are no "J" qualifiers reported for RAD data.

Corrected Copy
Date 10/19/99
Rev. # 1
Page # 15

If the final concentration in the sample was found to be below the effective DL, the value is reported as "ND" and is qualified with a "U"; for RAD samples if the final concentration in the sample was found to be below the actual critical level, the value reported is qualified with a "U".

For organics, if the concentration of the compound is detected in the blank above the effective MDL, the sample result is qualified with a "B". For inorganics, if the concentration of the compound is detected in the blank above the effective PQL, the sample result is qualified with a "B". There are no "B" qualifiers reported for RAD data.

Corrected Copy
Date 10/19/99
Rev. # 1
Page # 11e

ANNEX C
DSS Site 1006
Gore-Sorber™ Passive Soil-Vapor Survey Analytical Results

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GORE
Creative Technologies Worldwide

W. L. GORE & ASSOCIATES, INC.

100 CHESAPEAKE BLVD., P.O. BOX 10 • ELKTON, MARYLAND 21922-0010 • PHONE: 410/392-7600
FAX: 410/506-4780

GORE-SORBER® EXPLORATION SURVEY
GORE-SORBER® SCREENING SURVEY

June 6, 2002

Mike Sanders
Sandia National Laboratories
Mail Stop 0719
1515 Eubank, SE
Building 9925, Room 108
Albuquerque, NM 87123

Site Reference: Non-ER Drain & Septic, Kirtland AFB, NM
Gore Production Order Number: 10960025

Dear Mr. Sanders:

Thank you for choosing a GORE-SORBER® Screening Survey.

The attached package consists of the following information (in duplicate):

- **Final report**
- **Chain of custody and analytical data table (included in Appendix A)**
- **Stacked total ion chromatograms (included in Appendix A)**

Please contact our office if you have any questions or comments concerning this report. We appreciate this opportunity to be of service to Sandia National Laboratories, and look forward to working with you again in the future.

Sincerely,
W.L. Gore & Associates, Inc.

Jay W. Hodny, Ph.D.
Associate

Attachments
cc: Andre Brown (W.L. Gore & Associates, Inc.)

I:\MAPPING\PROJECTS\10960025\020606R.DOC

W. L. GORE & ASSOCIATES, INC.

100 CHESAPEAKE BLVD., P.O. BOX 10 • ELKTON, MARYLAND 21922-0010 • PHONE: 410/392-7600
FAX: 410/506-4780

GORE-SORBER® Screening Survey
Final Report

Non-ER Drain & Septic
Kirtland AFB, NM

June 6, 2002

Prepared For:
Sandia National Laboratories
Mail Stop 0719, 1515 Eubank, SE
Albuquerque, NM 87123

W.L. Gore & Associates, Inc.

Written/Submitted by:
Jay W. Hodny, Ph.D., Project Manager

Reviewed/Approved by:
Jim E. Whetzel, Project Manager

Analytical Data Reviewed by:
Jim E. Whetzel, Chemist

I:\MAPPING\PROJECTS\1096002S\020606R.DOC

GORE-SORBER® Screening Survey
Final Report

REPORT DATE: June 6, 2002 **AUTHOR:** JWH

SITE INFORMATION

Site Reference: Non-ER Drain & Septic, Kirtland AFB, NM
Customer Purchase Order Number: 28518
Gore Production Order Number: 10960025 **Gore Site Code:** CCT, CCX

FIELD PROCEDURES

 # Modules shipped: 142
Installation Date(s): 4/23,24,25,26,29,30/2002; 5/1,6/2002
 # Modules Installed: 135
Field work performed by: Sandia National Laboratories

Retrieval date(s): 5/8,9,10,14,15,16,21/2002 **Exposure Time:** ~15 **[days]**
 # Modules Retrieved: 131 **# Trip Blanks Returned:** 3
 # Modules Lost in Field: 4 **# Unused Modules Returned:** 3
 # Modules Not Returned: 1

Date/Time Received by Gore: 5/17/2002 @ 2:00 PM; 5/24/2002@1:30PM **By:** MM
Chain of Custody Form attached: √
Chain of Custody discrepancies: None
Comments:
Modules #179227, -228, and -229 were identified as trip blanks.
Modules #179137, -138, -140, and -141 were not retrieved and considered lost from the field.
Module #179231 was not returned.
Modules #179230, 232, and –233 were returned unused.

GORE-SORBER® Screening Survey
Final Report

ANALYTICAL PROCEDURES

W.L. Gore & Associates' Screening Module Laboratory operates under the guidelines of its Quality Assurance Manual, Operating Procedures and Methods. The quality assurance program is consistent with Good Laboratory Practices (GLP) and ISO Guide 25, "General Requirements for the Competence of Calibration and Testing Laboratories", third edition, 1990.

Instrumentation consists of state of the art gas chromatographs equipped with mass selective detectors, coupled with automated thermal desorption units. Sample preparation simply involves cutting the tip off the bottom of the sample module and transferring one or more exposed sorbent containers (sorbers, each containing 40mg of a suitable granular adsorbent) to a thermal desorption tube for analysis. Sorbers remain clean and protected from dirt, soil, and ground water by the insertion/retrieval cord, and require no further sample preparation.

Analytical Method Quality Assurance:
The analytical method employed is a modified EPA method 8260/8270. Before each run sequence, two instrument blanks, a sorber containing 5µg BFB (Bromofluorobenzene), and a method blank are analyzed. The BFB mass spectra must meet the criteria set forth in the method before samples can be analyzed. A method blank and a sorber containing BFB is also analyzed after every 30 samples and/or trip blanks. Standards containing the selected target compounds at three calibration levels of 5, 20, and 50µg are analyzed at the beginning of each run. The criterion for each target compound is less than 35% RSD (relative standard deviation). If this criterion is not met for any target compound, the analyst has the option of generating second- or third-order standard curves, as appropriate. A second-source reference standard, at a level of 10µg per target compound, is analyzed after every ten samples and/or trip blanks, and at the end of the run sequence. Positive identification of target compounds is determined by 1) the presence of the target ion and at least two secondary ions; 2) retention time versus reference standard; and, 3) the analyst's judgment.

NOTE: All data have been archived. Any replicate sorbers not used in the initial analysis will be discarded fifteen (15) days from the date of analysis.

Laboratory analysis: thermal desorption, gas chromatography, mass selective detection
Instrument ID: # 2 **Chemist:** JW
Compounds/mixtures requested: Gore Standard VOC/SVOC Target Compounds (A1)
Deviations from Standard Method: None
Comments: Soil vapor analytes and abbreviations are tabulated in the Data Table Key (page 6).
Module #179091 was returned and noted as damaged, no carbonaceous sorbers; therefore, target compound masses reported in data table cannot be compared to the mass data from the other modules directly.
Module #179101, no identification tag was returned with this module.

GORE-SORBER® Screening Survey
Final Report

DATA TABULATION

 # CONTOUR MAPS ENCLOSED: No contour maps were generated.

NOTE: All data values presented in Appendix A represent masses of compound(s) desorbed from the GORE-SORBER Screening Modules received and analyzed by W.L. Gore & Associates, Inc., as identified in the Chain of Custody (Appendix A). The measurement traceability and instrument performance are reproducible and accurate for the measurement process documented. Semi-quantitation of the compound mass is based on either a single-level (QA Level 1) or three-level (QA Level 2) standard calibration.

General Comments:

- This survey reports soil gas mass levels present in the vapor phase. Vapors are subject to a variety of attenuation factors during migration away from the source concentration to the module. Thus, mass levels reported from the module will often be less than concentrations reported in soil and groundwater matrix data. In most instances, the soil gas masses reported on the modules compare favorably with concentrations reported in the soil or groundwater (e.g., where soil gas levels are reported at greater levels relative to other sampled locations on the site, matrix data should reveal the same pattern, and vice versa). However, due to a variety of factors, a perfect comparison between matrix data and soil gas levels can rarely be achieved.
- Soil gas signals reported by this method cannot be identified specifically to soil adsorbed, groundwater, and/or free-product contamination. The soil gas signal reported from each module can evolve from all of these sources. Differentiation between soil and groundwater contamination can only be achieved with prior knowledge of the site history (i.e., the site is known to have groundwater contamination only).
- QA/QC trip blank modules were provided to document potential exposures that were not part of the soil gas signal of interest (i.e., impact during module shipment, installation and retrieval, and storage). The trip blanks are identically manufactured and packaged soil gas modules to those modules placed in the subsurface. However, the trip blanks remain unopened during all phases of the soil gas survey. Levels reported on the trip blanks may indicate potential impact to modules other than the contaminant source of interest.

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- Unresolved peak envelopes (UPEs) are represented as a series of compound peaks clustered together around a central gas chromatograph elution time in the total ion chromatogram. Typically, UPEs are indicative of complex fluid mixtures that are present in the subsurface. UPEs observed early in the chromatogram are considered to indicate the presence of more volatile fluids, while UPEs observed later in the chromatogram may indicate the presence of less volatile fluids. Multiple UPEs may indicate the presence of multiple complex fluids.

Project Specific Comments:

- Stacked total ion chromatograms (TICs) are included in Appendix A. The six-digit serial number of each module is incorporated into the TIC identification (e.g.: 123456S.D represents module #123456).
- No target compounds were detected on the trip blanks and/or the method blanks. Thus, target analyte levels reported for the field-installed modules that exceed trip and method blank levels, and the analyte method detection limit, have a high probability of originating from on-site sources.
- A small subset of modules was placed at each of several site locations; therefore no contour mapping was performed. Larger and more comprehensive soil gas surveys may be warranted at the individual sites where elevated soil gas levels were observed.

GORE-SORBER® Screening Survey
Final Report

KEY TO DATA TABLE
Non-ER Drain & Septic, Kirtland AFB, NM

UNITS

µg	micrograms (per sorber), reported for compounds
MDL	method detection limit
bdl	below detection limit
nd	*non-detect*

ANALYTES

BTEX	combined masses of benzene, toluene, ethylbenzene and total xylenes (Gasoline Range Aromatics)
BENZ	benzene
TOL	toluene
EtBENZ	ethylbenzene
mpXYL	m-, p-xylene
oXYL	o-xylene
C11,C13&C15	combined masses of undecane, tridecane, and pentadecane (C11+C13+C15) (Diesel Range Alkanes)
UNDEC	undecane
TRIDEC	tridecane
PENTADEC	pentadecane
TMBs	combined masses of 1,3,5-trimethylbenzene and 1,2,4-trimethylbenzene
135TMB	1,3,5-trimethylbenzene
124TMB	1,2,4-trimethylbenzene
ct12DCE	cis- & trans-1,2-dichloroethene
t12DCE	trans-1,2-dichloroethene
c12DCE	cis-1,2-dichloroethene
NAPH&2-MN	combined masses of naphthalene and 2-methyl naphthalene
NAPH	naphthalene
2MeNAPH	2-methyl naphthalene
MTBE	methyl t-butyl ether
11DCA	1,1-dichloroethane
$CHCl_3$	chloroform
111TCA	1;1,1-trichloroethane
12DCA	1,2-dichloroethane
CCl_4	carbon tetrachloride
TCE	trichloroethene
OCT	octane
PCE	tetrachloroethene
ClBENZ	chlorobenzene
14DCB	1,4-dichlorobenzene

BLANKS

TBn	unexposed trip blanks, travels with the exposed modules
method blank	QA/QC module, documents analytical conditions during analysis

APPENDIX A:

1. CHAIN OF CUSTODY
2. DATA TABLE
3. STACKED TOTAL ION CHROMATOGRAMS

GORE-SORBER® Screening Survey Chain of Custody

For W.L. Gore & Associates use only
Production Order # 10960025

W. L. Gore & Associates, Inc., Survey Products Group
100 Chesapeake Boulevard • Elkton, Maryland 21921 • Tel: (410) 392-7600 • Fax (410) 506-4780

Instructions: Customer must complete ALL shaded cells

Customer Name: SANDIA NATIONAL LABS	Site Name: NON-ER DRAIN+ SEPTIC
Address: ACCOUNTS PAYABLE MS0154	Site Address: ~~KIVL 2ND~~ AFB, NM KIRTLAND
P.O.BOX 5130	
ALBUQUERQUE NM 87185 U.S.A.	Project Manager: MIKE SANDERS
Phone: 505-284-3303	Customer Project No.:
FAX: 505-284-2616	Customer P.O. #: 28518 Quote #: 211946

Serial # of Modules Shipped			# of Modules for Installation 135 # of Trip Blanks 7		
# 179087 - # 179144	#179087 - #179134		Total Modules Shipped: 142 Pieces		
# 179150 - # 179233	#179135 - #179136		Total Modules Received: 142 Pieces		
# - #	#179139 - #		Total Modules Installed: 135 Pieces		
# - #	#179142 - #179144		Serial # of Trip Blanks (*Client Decides*)	#	#
- #	#179150 - #179151		#179227	#	#
- #	# - #		#	#	#
# - #	# - #		#	#	#
# - #	# - #		#	#	#
# - #	# - #		#	#	#
# - #	# - #		#	#	#
			#	#	#
			#	#	#

Prepared By: Aurora Lujan
Verified By: Mary Anne Waugh

Installation Performed By:
Name (*please print*): GILBERT QUINTANA
Company/Affiliation: SNL/NM

Installation Method(s) (*circle those that apply*):
Slide Hammer Hammer Drill Auger
Other: GEOPROBE

Installation Start Date and Time: 4/23/02 1081ST : (AM) PM
Installation Complete Date and Time: 5/6/02 1090 1 : (AM) PM

Retrieval Performed By:
Name (*please print*): GILBERT QUINTANA
Company/Affiliation: SNL/NM

Total Modules Retrieved: _____ Pieces
Total Modules Lost in Field: _____ Pieces
Total Unused Modules Returned: _____ Pieces

Retrieval Start Date and Time: 5/8/02 / / : AM PM
Retrieval Complete Date and Time: / / : AM PM

	Date	Time		Date	Time
Relinquished By: Aurora Lujan Affiliation: W.L. Gore & Associates, Inc.	3-4-02	17:00	Received By: Mike Sanders Affiliation: Sandia / ER	3-6-02	
Relinquished By: William J Delzer Affiliation: 6135	5-14-02	12:58	Received By: Affiliation:	Date	Time
Relinquished By: Affiliation	Date	Time	Received By: Mary Anne Waugh Affiliation: W.L. Gore & Associates, Inc.	5/7/02	14:00

GORE-SORBER® Screening Survey Chain of Custody

For W.L. Gore & Associates use only
Production Order # 10960025

W. L. Gore & Associates, Inc., Survey Products Group

100 Chesapeake Boulevard • Elkton, Maryland 21921 • Tel: (410) 392-7600 • Fax (410) 506-4780

Instructions: Customer must complete ALL shaded cells

Customer Name: SANDIA NATIONAL LABS	Site Name: NON-ER DUAIN+ SEPTIC
Address: ACCOUNTS PAYABLE MS0154	Site Address: ~~KIVL 2ND~~ AFB, NM KIRTLAND
P.O.BOX 5130	Project Manager: MIKE SANDERS
ALBUQUERQUE NM 87185 U.S.A.	Customer Project No.:
Phone: 505-284-3303	Customer P.O. #: 28518 Quote #: 211946
FAX: 505-284-2616	

Serial # of Modules Shipped

# 179087	- # 179144	#179152	- # 179187				
# 179150	- # 179233	#179188	- # 179226				
#	- #	#	- #				
#	- #	#	- #				
	- #	#	- #	#179228	#	#	
	- #	#	- #	#179229	#	#	
#	- #	#	- #	#	#	#	
#	- #	#	- #	#	#	#	
#	- #	#	- #	#	#	#	
#	- #	#	- #	#	#	#	
				#	#	#	
				#	#	#	

# of Modules for Installation 135 # of Trip Blanks 7

Total Modules Shipped: 142 Pieces
Total Modules Received: 142 Pieces
Total Modules Installed: 135 Pieces

Serial # of Trip Blanks (*Client Decides*)

Prepared By: Clarence Ortiz
Verified By: Mary Anne Waugh

Installation Performed By:
Name (*please print*): GILBERT QUINTANA
Company/Affiliation: SNL/NM

Installation Method(s) (*circle those that apply*):
Slide Hammer Hammer Drill Auger
Other: GEOPROBE

Installation Start Date and Time: 4/23/02 1081ST : (AM) PM
Installation Complete Date and Time: 5/6/02 1094 01 : (AM) PM

Retrieval Performed By:
Name (*please print*): GILBERT QUINTANA
Company/Affiliation: SNL/NM

Total Modules Retrieved: 79 Pieces
Total Modules Lost in Field: 4 Pieces
Total Unused Modules Returned: 53 Pieces

Retrieval Start Date and Time: 5/8/02 / / : AM PM
Retrieval Complete Date and Time: / / : AM PM

	Date	Time		Date	Time
Relinquished By: [signature] Affiliation: W.L. Gore & Associates, Inc.	3-4-02	17:00	Received By: Mike Sanders Affiliation: Sandia ; 6133	3-7-02	
Relinquished By: William J. Rider Affiliation: Sandia N.L. 6135	5-21-02	0935	Received By: Affiliation:		
Relinquished By: Affiliation:			Received By: Mary Anne Waugh Affiliation: W.L. Gore & Associates, Inc.	5-24-02	13:30

GORE-SORBER® Screening Survey Installation and Retrieval Log

SITE NAME & LOCATION

1 of 4

LINE #	MODULE #	INSTALLATION DATE/TIME	RETRIEVAL DATE/TIME	EVIDENCE OF LIQUID HYDROCARBONS (LPH) or HYDROCARBON ODOR (Check as appropriate)			MODULE IN WATER (check one)		COMMENTS
				LPH	ODOR	NONE	YES	NO	
1.	179087	4/23/02, 0815	05-08-02, 0800					✓	1001/898-GS-5
2.	179088	0822							GS-3
3.	179089	0830							GS-2
4.	179090	0840							GS-1
5.	179091 ✓	0852						✓	GS-4
6.	179092	0952	0830					✓	1052/803-GS-1
7.	179093	1000							-4
8.	179094	1010							-3
9.	179095	1018						✓	-2
10.	179096	1135	0900						1030/6587- -5
11.	179097	1151							-6
12.	179098	1238							-4
13.	179099	1247							-3
14.	179100	1259							-2
15.	179101	1309							-1
16.	179102	1347	0920						1082/6620- -4
	179103	1355							-5
18.	179104	1404							-1
	179105 ✓	1431							-3
20.	179106	1440							-2
21.	179107	4/24/02, 0848	5-9-02, 0930						1108/6531- -5
22.	179108	0853							-6
23.	179109	0900							-4
24.	179110	0907							-2
25.	179111	0916							-3
26.	179112	0936							-1
27.	179113	4/25/02, 0746	5-10-02, 0812						1027/6530- -5
28.	179114	0754							-2
29.	179115	0800							-3
30.	179116	0810							-4
31.	179117	0818	0917						-1
32.	179118	0915	5-10-02, 0925						1010/6536- 5
33.	179119	0922							6
34.	179120	0931							4
35.	179121	0942							2
36.	179122	0947							1
37.	179123	0956	1002						3
38.	179124	1026	5-10-02, 1013						1028/6560- 1
39.	179125	1043							4
40.	179126	1052							3
41.	179127	1103	1041						2
42.	179128	1420	5-10-02 1045						1026/6501- 2

GORE-SORBER® Screening Survey Installation and Retrieval Log

SITE NAME & LOCATION

LINE #	MODULE #	INSTALLATION DATE/TIME	RETRIEVAL DATE/TIME	EVIDENCE OF LIQUID HYDROCARBONS (LPH) or HYDROCARBON ODOR (Check as appropriate)			MODULE IN WATER (check one)		COMMENTS	
				LPH	ODOR	NONE	YES	NO		
43.	179129	4/25/02, 1428	5-10-02, 1047						1026/6584-65-	3
44.	179130	1437	5-10-02, 1051						↓	1
45.	179131	1442	5-10-02, 1053						1025/6581-	1
46.	179132	1446	↓						↓	2
47.	179133	↓ 1504	5-10-02, 11:06						↓	3
48.	179134	4/26/02, 0905	5-10-02 1247						1093/6584-	1
49.	179135	0914	↓ 1254						↓	4
50.	179136	0930	5-10-02, 1305							2
51.	179137	0938	Lost							3
52.	179138	0948	Lost						↓	5
53.	179139	1018	5-10-02, 1322						1031/6600-	2
54.	179140	1026	Lost						↓	3
55.	179141	1030	Lost							4
56.	179142	1038	5-10-02, 1343						↓	1
57.	179143	1136	5-10-02, 11:36						276/829X-	2
[illegible]	179144	1142	↓						↓	3
[illegible]	179150	1150	↓						↓	4
60.	179151	↓ 1155	5-10-02, 11:54						↓	1
61.	179152	4/29/02, 0814	5-14-02 09:42						1084/6505-	1
62.	179153	0822	↓						↓	5
63.	179154	0829	↓						↓	3
64.	179155	0903	↓						↓	2
65.	179156	0845	5-14-02 ↓ 1021						↓	4
66.	179157	0930	05-14-02 0919						1083/6570-	4
67.	179158	0939	↓						↓	1
68.	179159	0946	↓						↓	2
69.	179160	0948	↓ 0940						↓	3
70.	179161	1050	05-14-02, 1025						1032/6610-	1
71.	179162	1100	↓						↓	2
72.	179163	1110	↓						↓	4
73.	179164	1114	↓						↓	3
74.	179165	1120	↓						↓	5
75.	179166	1126	05-14-02, 11:03						↓	6
76.	179167	1222	05-14-02, 11:06						1120/6643-	2
77.	179168	1230	↓						↓	3
78.	179169	1237	↓						↓	4
79.	179170	1242	05-14-02 ↓ 11:32						↓	1
80.	179171	1320	5-14-02 - 0844						1034/6710-	4
[illegible]	179172	1325	↓ 0917						↓	3
82.	179173	1332	↓ 0851						↓	2
83.	179174	1340	↓ 0855						↓	1
84.	179175	↓ 1423	5-14-02, 0814						1035/6715- ↓	4

GORE-SORBER® Screening Survey Installation and Retrieval Log

SITE NAME & LOCATION

LINE #	MODULE #	INSTALLATION DATE/TIME	RETRIEVAL DATE/TIME	EVIDENCE OF LIQUID HYDROCARBONS (LPH) or HYDROCARBON ODOR (Check as appropriate) LPH	ODOR	NONE	MODULE IN WATER (check one) YES	NO	COMMENTS	
85.	179176	4/29/02, 1431							1035/6715-65-3	
86.	179177	1440								2
87.	179178	1445	5-14-02 0837							1
88.	179179	4/30/02, 0910	5-15-02 0842						1003/915-	3
89.	179180	0919								2
90.	179181	0926								1
91.	179182	0937								4
92.	179183	0943								5
93.	179184	0947	5-15-02, 0912							6
94.	179185	1108	5-15-02, 1146						1007/6730-	4
95.	179186	1113								3
96.	179187	1119								2
97.	179188	1132								5
98.	179189	1140	5-15-02 1213							1
99.	179190	1238	5-15-02 10:09						1029/6584N-	1
100.	179191	1250								-2
.	179192	1300								-3
102.	179193	1313								-5
03.	179194	1318	5-15-02, 1032							-4
104.	179195	1445	5-15-02, 1405						1006/6741-	5
105.	179196	1450								3
106.	179197	1455								4
107.	179198	1502								2
108.	179199	1508	5-15-02, 1143							1
109.	179200	1525	5-15-02, 1039						1087/6743-	2
110.	179201	1530								3
111.	179202	1534								4
112.	179203	1540	5-15-02, 1059							1
113.	179204	5/1/02, 0822	5-16-02, 0801						1008/6750	3
114.	179205	0835								4
115.	179206	0843								1
116.	179207	0851	5-16-02, 0832							2
117.	179208	0944	5-16-02, 0841						1004/6568-	2
118.	179209	0952								4
119.	179210	1000								3
120.	179211	1009								5
121.	179212	1016	5-16-02, 0907							1
122.	179213	1110	5-16-02, 1105						1095/9938-	3
123.	179214	1116								2
124.	179215	1122	5-16-02, 11:21							1
125.	179216	1205	5-16-02 - 0931						1094/6582-	2
126.	179217	1218	5-16-02 - 0935							1

DSS SITE 1006

GORE SORBER SCRE[illegible]S SURVEY ANALYTICAL RESULTS
SANDIA NATIONAL LABS, ALBUQUERQUE, NM
GORE STANDARD TARGET VOCs/SVOCs (A1)
NON-ER DRAIN AND SEPTIC, KIRTLAND AFB, NM
SITES CCT AND CCX - PRODUCTION ORDER #10960025

DATE ANALYZED	SAMPLE NAME	BTEX, ug	BENZ, ug	TOL, ug	EtBENZ, ug	mpXYL, ug	oXYL, ug	C11, C13, &C15, ug	UNDEC, ug	TRIDEC, ug	PENTADEC, ug	TMBs, ug
	MDL=		0.03	0.02	0.01	0.01	0.01		0.02	0.01	0.02	
5/28/2002	179172	nd	nd	nd	nd	nd	nd	0.05	0.03	0.02	bdl	nd
5/29/2002	179173	0.39	0.09	0.18	nd	0.09	0.03	0.19	0.10	0.04	0.05	0.09
5/29/2002	179174	0.03	nd	nd	nd	0.03	nd	0.00	bdl	bdl	bdl	0.00
5/29/2002	179175	nd	nd	nd	nd	nd	nd	0.05	0.05	bdl	bdl	nd
5/29/2002	179176	0.19	0.08	0.10	nd	0.02	nd	1.20	1.12	0.06	0.03	0.04
5/29/2002	179177	0.34	0.14	0.11	nd	0.07	0.03	0.10	0.08	0.02	bdl	0.14
5/29/2002	179178	0.08	nd	0.05	0.01	0.02	nd	0.14	0.06	0.03	0.05	0.00
5/29/2002	179179	0.03	nd	0.03	nd	nd	nd	0.07	0.03	0.02	0.02	0.04
5/29/2002	179180	nd	nd	nd	nd	nd	nd	0.04	0.02	0.01	bdl	0.00
5/29/2002	179181	0.00	nd	nd	nd	bdl	nd	0.10	0.03	0.02	0.05	0.00
5/29/2002	179182	0.09	nd	0.08	nd	0.01	nd	0.08	0.03	0.02	0.03	0.00
5/29/2002	179183	nd	nd	nd	nd	nd	nd	0.08	0.04	bdl	0.04	0.00
5/29/2002	179184	nd	nd	nd	nd	nd	nd	0.09	0.03	0.02	0.04	0.00
5/29/2002	179185	nd	nd	nd	nd	nd	nd	0.05	bdl	0.01	0.04	nd
5/29/2002	179186	nd	nd	nd	nd	nd	nd	0.05	0.03	bdl	0.03	0.04
5/29/2002	179187	0.60	0.18	0.30	0.03	0.06	0.03	0.15	0.05	0.05	0.05	0.11
5/29/2002	179188	0.02	nd	nd	nd	0.02	nd	0.10	bdl	0.02	0.07	0.00
5/29/2002	179189	0.02	nd	nd	nd	0.02	nd	0.07	0.04	0.03	bdl	0.00
5/29/2002	179190	0.06	nd	0.03	nd	0.03	nd	0.11	0.05	0.03	0.04	0.00
5/29/2002	179191	0.10	nd	0.04	nd	0.05	nd	0.08	0.02	0.01	0.05	0.00
5/29/2002	179192	0.01	nd	nd	nd	0.01	nd	0.11	0.04	0.02	0.05	0.00
5/29/2002	179193	nd	nd	nd	nd	nd	nd	0.07	0.03	0.01	0.02	0.00
5/29/2002	179194	0.04	nd	nd	nd	0.04	nd	0.08	0.04	bdl	0.04	0.00
5/29/2002	179195	0.04	nd	nd	nd	0.04	nd	0.08	0.04	0.02	0.02	0.00
5/29/2002	179196	0.02	nd	nd	nd	0.02	nd	0.09	0.04	0.02	0.03	0.00
5/29/2002	179197	0.03	nd	nd	nd	0.03	nd	0.15	0.05	0.04	0.06	0.04
5/29/2002	179198	0.07	nd	0.04	nd	0.03	nd	0.09	0.04	0.03	0.03	nd
5/29/2002	179199	nd	nd	nd	nd	nd	nd	0.05	0.03	0.01	bdl	0.00
5/29/2002	179200	0.00	nd	nd	nd	bdl	nd	0.08	0.03	0.02	0.03	0.00
5/29/2002	179201	0.02	nd	nd	nd	0.02	nd	0.04	0.04	bdl	bdl	0.00
5/29/2002	179202	0.02	nd	nd	nd	0.02	nd	0.04	0.03	0.01	bdl	0.00
5/29/2002	179203	0.04	nd	0.04	nd	nd	nd	0.06	0.04	0.02	bdl	0.03
5/29/2002	179204	0.27	nd	0.22	nd	0.03	0.02	0.29	0.06	0.14	0.09	0.00
5/29/2002	179205	0.12	nd	0.09	nd	0.03	bdl	1.28	1.13	0.08	0.07	0.03
5/29/2002	179206	nd	nd	nd	nd	nd	nd	0.02	0.02	bdl	bdl	nd
5/29/2002	179207	0.03	nd	nd	nd	0.03	nd	0.04	0.04	bdl	bdl	0.00
5/29/2002	179208	0.06	nd	0.04	nd	0.02	nd	0.09	0.04	0.03	0.03	0.00
5/29/2002	179209	0.07	nd	0.04	nd	0.03	nd	0.01	bdl	0.01	bdl	0.00

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No mdl is available for summed combinations of analytes. In summed columns (eg., BTEX), the reported values should be considered ESTIMATED if any of the individual compounds were reported as bdl.

GORE SORBER SCREENING SURVEY ANALYTICAL RESULTS
SANDIA NATIONAL LABS, ALBUQUERQUE, NM
GORE STANDARD TARGET VOCs/SVOCs (A1)
NON-ER DRAIN AND SEPTIC, KIRTLAND AFB, NM
SITES CCT AND CCX - PRODUCTION ORDER #10960025

SAMPLE NAME	124TMB, ug	135TMB, ug	ct12DCE, ug	t12DCE, ug	c12DCE, ug	NAPH&2-MN, ug	NAPH, ug	2MeNAPH, ug	MTBE, ug	11DCA, ug	111TCA, ug	12DCA, ug
MDL=	0.03	0.02		0.14	0.03		0.01	0.02	0.04	0.04	0.02	0.02
179172	nd	nd	nd	nd	nd	0.00	nd	bdl	nd	nd	nd	nd
179173	0.06	0.03	nd	nd	nd	0.09	0.03	0.06	nd	nd	nd	nd
179174	bdl	bdl	nd	nd	nd	0.00	nd	bdl	nd	nd	nd	nd
179175	nd	nd	nd	nd	nd	0.00	nd	bdl	nd	nd	nd	nd
179176	0.04	bdl	nd	nd	nd	0.05	0.02	0.02	nd	nd	nd	nd
179177	0.10	0.04	nd	nd	nd	0.10	0.06	0.04	nd	nd	nd	nd
179178	bdl	bdl	nd	nd	nd	0.06	0.02	0.03	nd	nd	nd	nd
179179	0.04	bdl	nd	nd	nd	0.06	0.02	0.04	nd	nd	nd	nd
179180	bdl	bdl	nd	nd	nd	0.07	0.02	0.05	nd	nd	nd	nd
179181	bdl	bdl	nd	nd	nd	0.00	nd	bdl	nd	nd	nd	nd
179182	bdl	nd	nd	nd	nd	0.00	nd	bdl	nd	nd	nd	nd
179183	bdl	nd	nd	nd	nd	0.00	nd	bdl	nd	nd	nd	nd
179184	bdl	nd	nd	nd	nd	0.00	nd	bdl	nd	nd	nd	nd
179185	nd	nd	nd	nd	nd	0.00	nd	bdl	nd	nd	nd	nd
179186	0.04	nd	nd	nd	nd	0.02	nd	0.02	nd	nd	nd	nd
179187	0.09	0.02	nd	nd	nd	0.05	0.02	0.03	nd	nd	nd	nd
179188	bdl	nd	nd	nd	nd	0.00	nd	bdl	nd	nd	nd	nd
179189	bdl	bdl	nd	nd	nd	0.00	nd	bdl	nd	nd	nd	nd
179190	bdl	bdl	nd	nd	nd	0.07	0.02	0.04	nd	nd	nd	nd
179191	bdl	bdl	nd	nd	nd	0.00	nd	bdl	nd	nd	nd	nd
179192	bdl	nd	nd	nd	nd	0.05	0.02	0.03	nd	nd	nd	nd
179193	bdl	nd	nd	nd	nd	0.00	nd	bdl	nd	nd	nd	nd
179194	bdl	bdl	nd	nd	nd	0.02	0.02	bdl	nd	nd	nd	nd
179195	bdl	bdl	nd	nd	nd	0.10	0.03	0.07	nd	nd	nd	nd
179196	bdl	nd	nd	nd	nd	0.05	0.02	0.02	nd	nd	nd	nd
179197	0.04	bdl	nd	nd	nd	0.11	0.04	0.07	nd	nd	nd	nd
179198	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd
179199	bdl	nd	nd	nd	nd	0.00	nd	bdl	nd	nd	nd	nd
179200	bdl	nd	nd	nd	nd	0.02	nd	0.02	nd	nd	nd	nd
179201	bdl	nd	nd	nd	nd	0.00	nd	bdl	nd	nd	nd	nd
179202	bdl	nd	nd	nd	nd	0.00	nd	bdl	nd	nd	nd	nd
179203	0.03	bdl	nd	nd	nd	0.03	0.03	bdl	nd	nd	nd	nd
179204	bdl	nd	nd	nd	nd	0.11	0.04	0.07	nd	nd	bdl	nd
179205	0.03	bdl	nd	nd	nd	0.13	0.05	0.07	nd	nd	0.05	nd
179206	nd	nd	nd	nd	nd	0.03	nd	0.03	nd	nd	0.02	nd
179207	bdl	bdl	nd	nd	nd	0.00	nd	bdl	nd	nd	0.03	nd
179208	bdl	bdl	nd	nd	nd	0.00	nd	bdl	nd	nd	nd	nd
179209	bdl	bdl	nd	nd	nd	0.05	0.02	0.03	nd	nd	nd	nd

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No mdl is available for summed combinations of analytes. In summed columns (eg., BTEX), the reported values should be considered ESTIMATED if any of the individual compounds were reported as bdl.

GORE SORBER SCRE[illegible]G SURVEY ANALYTICAL RESULTS
SANDIA NATIONAL LABS, ALBUQUERQUE, NM
GORE STANDARD TARGET VOCs/SVOCs (A1)
NON-ER DRAIN AND SEPTIC, KIRTLAND AFB, NM
SITES CCT AND CCX - PRODUCTION ORDER #10960025

SAMPLE NAME	TCE, ug	OCT, ug	PCE, ug	14DCB, ug	CHCl3, ug	CCl4, ug	CIBENZ, ug
MDL=	0.02	0.02	0.01	0.01	0.03	0.03	0.01
179172	nd	nd	nd	nd	nd	nd	nd
179173	nd	0.14	0.02	nd	nd	nd	nd
179174	nd	nd	nd	nd	nd	nd	nd
179175	nd	nd	0.04	nd	nd	nd	nd
179176	nd	nd	0.03	nd	nd	nd	nd
179177	nd	0.09	0.02	nd	nd	nd	nd
179178	nd	nd	0.01	nd	nd	nd	nd
179179	0.13	nd	0.07	nd	0.05	nd	nd
179180	0.08	nd	0.02	nd	nd	nd	nd
179181	0.11	nd	0.03	nd	nd	nd	nd
179182	0.15	nd	0.04	nd	nd	nd	nd
179183	0.59	nd	0.08	nd	nd	nd	nd
179184	nd	nd	nd	nd	nd	nd	nd
179185	0.06	nd	nd	nd	nd	nd	nd
179186	nd	nd	nd	nd	nd	nd	nd
179187	0.13	nd	0.08	nd	nd	nd	nd
179188	nd	nd	0.11	nd	nd	nd	nd
179189	0.06	nd	0.02	nd	nd	nd	nd
179190	nd	nd	bdl	nd	nd	bdl	nd
179191	nd	nd	0.03	nd	nd	0.03	nd
179192	nd	nd	0.03	nd	nd	nd	nd
179193	nd	nd	0.08	nd	nd	nd	nd
179194	nd	nd	0.04	nd	nd	nd	nd
179195	nd	nd	nd	nd	nd	nd	nd
179196	nd	nd	nd	nd	nd	0.03	nd
179197	nd	nd	nd	nd	nd	bdl	nd
179198	nd	0.09	nd	nd	nd	nd	nd
179199	nd	nd	nd	nd	nd	bdl	nd
179200	nd	nd	0.09	nd	nd	nd	nd
179201	nd	nd	0.12	nd	nd	nd	nd
179202	nd	nd	0.12	nd	nd	nd	nd
179203	nd	nd	0.09	nd	nd	nd	nd
179204	1.49	nd	3.01	nd	nd	nd	nd
179205	4.14	nd	6.74	nd	nd	nd	nd
179206	4.72	nd	2.69	nd	nd	nd	nd
179207	2.89	nd	2.57	nd	nd	nd	nd
179208	nd	nd	nd	nd	0.05	nd	nd
179209	nd	nd	nd	nd	nd	nd	nd

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No mdl is available for summed combinations of analytes. In summed columns (eg., BTEX), the reported values should be considered ESTIMATED if any of the individual compounds were reported as bdl.

ANNEX D
DSS Site 1006
Risk Assessment

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DSS SITE 1006: RISK ASSESSMENT REPORT

I. Site Description and History

Drain and Septic Systems (DSS) Site 1006, the Building 6741 Septic System, at Sandia National Laboratories/New Mexico (SNL/NM), is located in Technical Area (TA)-III on federally owned land controlled by Kirtland Air Force Base (KAFB) and permitted to the U.S. Department of Energy (DOE). The original septic system consisted of septic tank and distribution box that emptied to a T-shaped drainfield, with a 40-foot-wide lateral at the end of a 65-foot-long drain line. The system was later expanded, probably when the building was modified in the early 1980s, to a drainfield with seven drain lines, each 100- to 110-feet long. Available information indicates that Building 6741 was constructed in 1968 (SNL/NM March 2003), and it is assumed that the septic system was also constructed at that time. In 1994, the septic system discharges were routed to the City of Albuquerque sanitary sewer system (Aas April 1994). The old septic system line was disconnected and capped, and the system was abandoned in place concurrent with this change (Romero September 2003).

Environmental concern about DSS Site 1006 is based upon the potential for the release of constituents of concern (COCs) in effluent discharged to the environment via the septic system at this site. Because operational records were not available, the investigation of the site was planned to be consistent with other 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 flat or slopes slightly to the west. The closest major drainage is the Arroyo del Coyote, located approximately 1.5 miles northeast of the site. No springs or perennial surface-water bodies are located within 2.5 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 slope is flat and slopes 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 Site 1006 is unpaved with some native vegetation, and no storm sewers are used to direct surface water away from the site.

DSS Site 1006 lies at an average elevation of approximately 5,343 feet above mean sea level. The groundwater beneath the site occurs in unconfined conditions in essentially unconsolidated silts, sands, and gravels. The depth to groundwater is approximately 460 feet below ground surface (bgs). Groundwater flow is to the west-northwest in this area (SNL/NM March 2002). The nearest groundwater monitoring wells are approximately 1,200 feet west of the site in the northwest corner of TA-III. The production wells nearest to DSS Site 1006 are northwest of the site and include KAFB-4 and KAFB-2, which are approximately 2.5 and 3.3 miles away, respectively.

II. Data Quality Objectives

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) and "Field Implementation Plan [FIP], Characterization of Non-Environmental Restoration Drain and Septic Systems" (SNL/NM November 2001) identified the site-specific sample locations, sample depths, sampling procedures, and analytical requirements for this and many other DSS sites. The DQOs outlined the quality assurance (QA)/quality control (QC) requirements necessary for producing defensible analytical data suitable for risk assessment purposes. The baseline 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 Site 1006 was effluent discharged to the environment from the drainfield at this site.

Table 1
Summary of Sampling Performed to Meet DQOs

DSS Site 1006 Sampling Area	Potential COC Source	Number of Sampling Locations	Sample Density (samples/acre)	Sampling Location Rationale
Soil beneath the septic system drainfield	Effluent discharged to the environment from the drainfield	3	NA	Evaluate potential COC releases to the environment from effluent discharged from the drainfield

COC = Constituent of concern.
DQO = Data Quality Objective.
DSS = Drain and Septic Systems.
NA = Not applicable.

The baseline soil samples were collected in three locations across DSS Site 1006. The samples were collected with a Geoprobe™ from two 3- or 4-foot-long sampling intervals at each boring location. Drainfield sampling intervals started at 7 and 12 feet bgs in each of the three drainfield borings. The soil samples were collected in accordance with the procedures described in the SAP (SNL/NM October 1999) and FIP (SNL/NM November 2001). Table 2 summarizes the types of confirmatory and QA/QC samples collected at the site and the laboratories that performed the analyses.

Table 2
Number of Confirmatory Soil and QA/QC Samples Collected from DSS Site 1006

Sample Type	VOCs	SVOCs	PCBs	HE	RCRA Metals	Hexavalent Chromium	Cyanide	Gamma Spectroscopy Radionuclides	Gross Alpha/Beta
Confirmatory	6	6	6	6	6	6	6	6	6
Duplicates	0	1	0	1	1	0	0	1	0
EBs and TBs (VOCs only)	1	0	0	0	0	0	0	0	0
Total Samples	7	7	6	7	7	6	6	7	6
Analytical Laboratory	GEL	GEL	GEL	GEL, ERCL	GEL, ERCL	GEL	GEL	GEL, RPSD	GEL

DSS = Drain and Septic Systems.
EB = Equipment blank.
ERCL = Environmental Restoration Chemistry Laboratory.
GEL = General Engineering Laboratories, Inc.
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.
SVOC = Semivolatile organic compound.
TB = Trip blank.
VOC = Volatile organic compound.

The DSS Site 1006 baseline soil samples were analyzed for volatile organic compounds (VOCs), semivolatile organic compounds (SVOCs), high explosive (HE) compounds, polychlorinated biphenyls (PCBs), Resource Conservation and Recovery Act (RCRA) metals, hexavalent chromium, cyanide, radionuclides, and gross alpha/beta activity. The samples were analyzed by an off-site laboratory (General Engineering Laboratories, Inc.) and the on-site SNL/NM Environmental Restoration (ER) Chemistry Laboratory (ERCL) and Radiation Protection Sample Diagnostics (RPSD) Laboratory. Table 3 summarizes the analytical methods and the data quality requirements from the SAP (SNL/NM October 1999) and FIP (SNL/NM November 2001).

Table 3
Summary of Data Quality Requirements for DSS Site 1006

Analytical Method[a]	Data Quality Level	GEL	ERCL	RPSD
VOCs EPA Method 8260	Defensible	6	None	None
SVOCs EPA Method 8270	Defensible	6	None	None
PCBs EPA Method 8082	Defensible	6	None	None
HE Compounds EPA Method 8330, MEKC	Defensible	None	6	None
RCRA Metals EPA Method 6000/7000	Defensible	None	6	None
Hexavalent Chromium EPA Method 7196A	Defensible	6	None	None
Total Cyanide EPA Method 9012A	Defensible	6	None	None
Gamma Spectroscopy Radionuclides EPA Method 901.1	Defensible	None	None	6
Gross Alpha/Beta Activity EPA Method 900.0	Defensible	6	None	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.
EPA = U.S. Environmental Protection Agency.
ERCL = Environmental Restoration Chemistry Laboratory.
GEL = General Engineering Laboratories, Inc.
HE = High explosive(s).
MEKC = Micellar Electro-Kinetic Chromatography.
PCB = Polychlorinated biphenyl.
QA = Quality assurance.
QC = Quality control.
RCRA = Resource Conservation and Recovery Act.
RPSD = Radiation Protection Sample Diagnostics Laboratory.
SVOC = Semivolatile organic compound.
VOC = Volatile organic compound.

The QA/QC samples were collected during the baseline sampling effort according to the ER Project Quality Assurance Project Plan. The QA/QC samples consisted of one trip blank (for VOCs only), one field duplicate for SVOCs, HE compounds, RCRA metals and gamma spectroscopy. No significant QA/QC problems were identified in the QA/QC samples.

All of the baseline soil sample results were verified/validated by SNL/NM 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," Administrative Operating Procedure (AOP) 00-03 (SNL/NM December 1999). The data validation reports are presented in the associated DSS Site 1006 proposal for no further action (NFA). 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). The gamma spectroscopy results are presented in the NFA proposal. The reviews confirmed that the analytical data are defensible and therefore acceptable for use in the NFA proposal. 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 Site 1006 is based upon an initial conceptual model validated with confirmatory sampling at the site. The initial conceptual model was developed from archival site research, site inspections, soil sampling, and passive soil-vapor sampling. The DQOs contained in the SAP (SNL/NM October 1999) and FIP (SNL/NM November 2001) 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 Site 1006, which is presented in Section 4.0 of the associated NFA proposal. 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 Site 1006 are evaluated using laboratory analyses of the soil samples. The analytical requirements included analyses for VOCs, SVOCs, HE compounds, PCBs, RCRA metals, hexavalent chromium, cyanide, radionuclides by gamma spectroscopy, and gross alpha/beta activity. The analytes and methods listed in Tables 2 and 3 are appropriate to characterize the COCs and potential degradation products at DSS Site 1006.

III.3 Rate of Contaminant Migration

The septic system at DSS Site 1006 was deactivated in the early 1990s when Building 6741 was connected to an extension of the City of Albuquerque sanitary sewer system. The migration rate of COCs that may have been introduced into the subsurface via the septic 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 septic 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 Site 1006.

III.4 Extent of Contamination

Subsurface baseline soil samples were collected from boreholes drilled at three locations beneath the effluent release area (drainfield) at the site to assess whether releases of effluent from the septic system caused any environmental contamination.

The baseline soil samples were collected at sampling depths starting at 7 and 12 feet bgs in the drainfield area. 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 New Mexico Environment Department (NMED) regulators and has been used at numerous DSS-type sites at SNL/NM. The baseline 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 Levels

Site history and characterization activities are used to identify potential COCs. The DSS Site 1006 NFA proposal 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 and all inorganic and radiological COCs for which samples were analyzed. When the detection limit of an organic compound was too high (i.e., could possibly cause an adverse effect to human health or the environment), the compound was 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 and 5.

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 included in this risk assessment consist of both inorganic and organic compounds.

Table 4 lists the nonradiological COCs and Table 5 lists the radiological COCs for the human health risk assessment at DSS Site 1006. All samples were collected from depths greater than 5 feet bgs; therefore, evaluation of ecological risk was not performed. Both tables show the associated SNL/NM maximum background concentration values (Dinwiddie September 1997). Section VI.4 discusses the results presented in Tables 4 and 5.

Table 4
Nonradiological COCs for Human Health Risk Assessment at DSS Site 1006 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						
Arsenic	4.5	4.4	**No**	44[c]	–	**Yes**
Barium	225	214	**No**	170[d]	–	**Yes**
Cadmium	0.15 J	0.9	Yes	64[c]	–	**Yes**
Chromium, total	11	15.9	Yes	16[c]	–	No
Chromium VI	0.347	1	Yes	16[c]	–	No
Cyanide	0.0695[e]	NC	**Unknown**	NC	–	**Unknown**
Lead	7.2	11.8	Yes	49[c]	–	**Yes**
Mercury	0.084 J	<0.1	**Unknown**	5,500[c]	–	**Yes**
Selenium	0.43 J	<1	**Unknown**	800[f]	–	**Yes**
Silver	0.021[e]	<1	**Unknown**	0.5[c]	–	No
Organic						
2-Butanone	0.022	NA	**NA**	1[g]	0.29[g]	No
bis(2-Ethylhexyl) phthalate	0.21 J	NA	**NA**	851[g]	7.6[h]	**Yes**
Toluene	0.0053	NA	**NA**	10.7[c]	2.69[c]	No

Note: **Bold** indicates the COCs that exceed the background screening values and/or are bioaccumulators.

[a]Dinwiddie September 1997, Southwest Area Supergroup.

[b]NMED March 1998.

[c]Yanicak March 1997.

[d]Neumann 1976.

[e]Parameter was not detected. Concentration listed is one-half the maximum detection limit.

[f]Callahan et al. 1979.

[g]Howard 1990.

[h]Micromedex, Inc. 1998.

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.
– = Information not available.

Table 5
Radiological COCs for Human Health Risk Assessment at DSS Site 1006 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 Activity 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 (0.0189)	0.079	Yes	900[d]	**Yes**
Th-232	0.789	1.01	Yes	900[d]	**Yes**
U-235	ND (0.117)	0.16	Yes	3,000[d]	**Yes**
U-238	0.934	1.4	Yes	3,000[d]	**Yes**

Note: **Bold** indicates COCs that exceed the background screening values and/or are bioaccumulators.
[a]Value listed is the greater of either the maximum detection or the highest MDA.
[b]Dinwiddie September 1997, Southwest Area Supergroup.
[c]NMED March 1998.
[d]Baker and Soldat 1992.
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.

V. Fate and Transport

The primary releases of COCs at DSS Site 1006 were to the subsurface soil resulting from the discharge of effluents from the Building 6741 Septic 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 mechanisms are considered to be of potential significance as transport mechanisms at this site. Because the septic system is no longer active, additional infiltration of water is not expected. Infiltration of precipitation is essentially nonexistent at DSS Site 1006, as virtually all of the moisture either drains away from the site or evaporates. Because groundwater at this site is approximately 460 feet bgs, the potential for COCs to reach groundwater through the unsaturated zone above the water table is extremely low.

COCs at DSS Site 1006 include both inorganic and organic constituents. The inorganic COCs are nonradiological analytes (no radiological analytes above background were detected). 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.

The organic COCs at DSS Site 1006 consist of bis(2-ethylhexyl) phthalate, 2-butanone, and toluene. 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 depth of the COCs in the soil, the loss of 2-butanone and toluene through volatilization is expected to be minimal.

Table 6 summarizes the fate and transport processes that can occur at DSS Site 1006. The COCs at this site include nonradiological inorganic and 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 groundwater at this site is highly unlikely.

Table 6
Summary of Fate and Transport at DSS Site 1006

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

DSS = Drain and Septic Systems.

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 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 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 Site 1006. Section II presents a comparison of results to DQOs. Section III discusses the nature, rate, and extent of contamination.

VI.3 Step 2. Pathway Identification

DSS Site 1006 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 and volatiles. 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 groundwater at DSS Site 1006 is approximately 460 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 site model flow diagram for DSS Site 1006.

Pathway Identification

Nonradiological Constituents	Radiological Constituents
Soil ingestion	Soil ingestion
Inhalation (dust and volatiles)	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 are compared to the approved SNL/NM maximum screening levels for this area (Dinwiddie September 1997). 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 Sections VI.6.2 and VI.7. Only the COCs that were detected above the corresponding SNL/NM maximum background screening levels or that did not have either a quantifiable or calculated background screening level are considered in further risk assessment analyses.

For radiological COCs that exceed the SNL/NM background screening levels, background values are 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 a background value and are detected above the analytical minimum detectable activity are carried through the risk assessment at the maximum activity levels. The resultant radiological COCs remaining after this step are referred to as background-adjusted radiological COCs.

VI.4.2 Results

Tables 4 and 5 show the DSS Site 1006 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, two constituents were measured at concentrations greater than the corresponding background screening values. Four constituents do not have quantified background screening concentrations; therefore, it is unknown whether these COCs exceed background. Three nonradiological COCs are organic compounds that do not have corresponding background screening values.

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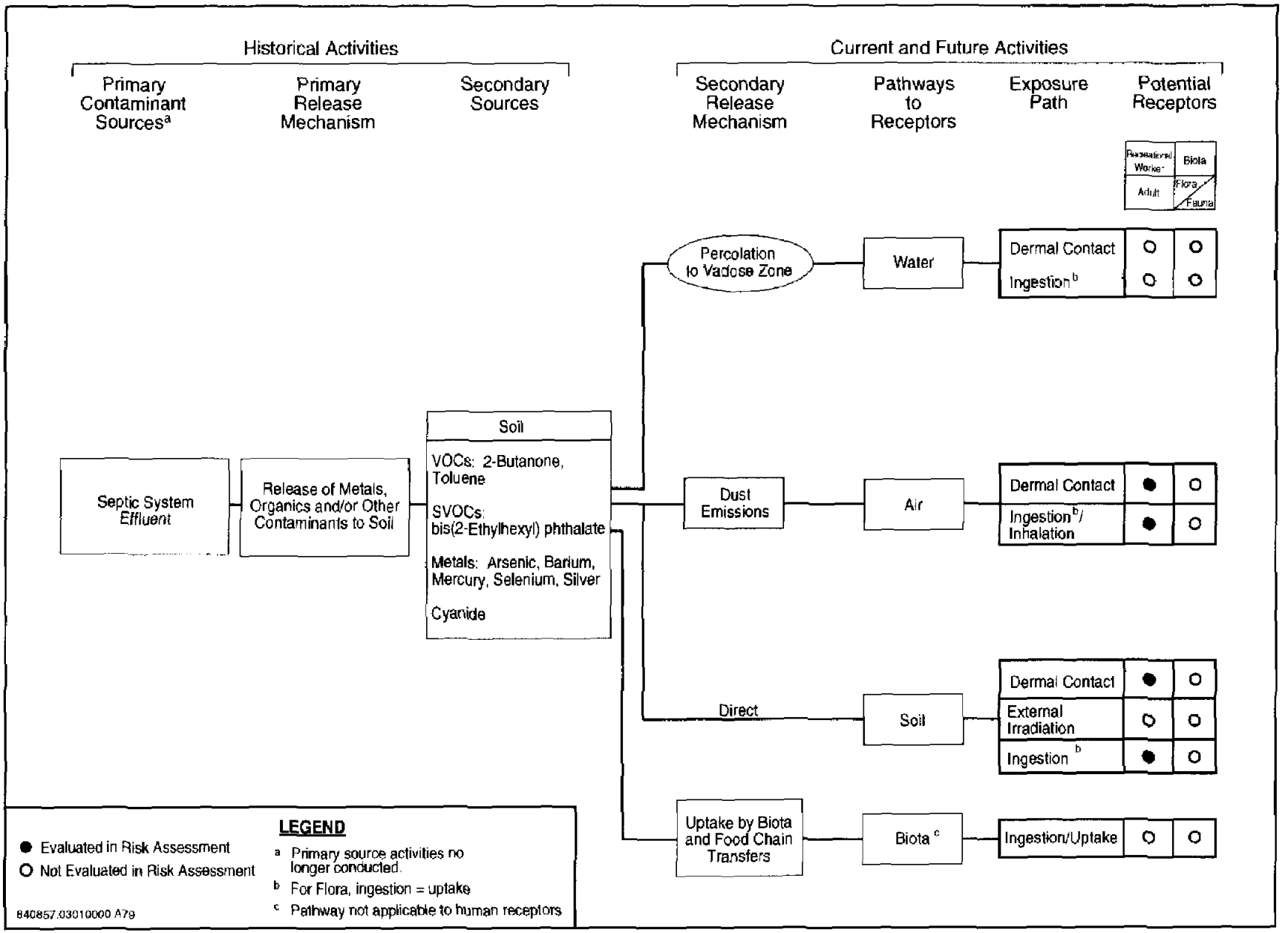

Figure 1

Conceptual Site Model Flow Diagram for DSS Site 1006, Building 6741 Septic System

For the radiological COCs, no constituents exceed background concentration values. Therefore, the radiological COCs are eliminated from further evaluation in the risk assessment.

VI.5 Step 4. Identification of Toxicological Parameters

Table 7 lists the nonradiological COCs retained in the risk assessment and provides the values for the available toxicological information. The toxicological values for nonradiological COCs presented in Table 7 were obtained from the Integrated Risk Information System (IRIS) (EPA 2003), the Technical Background Document for Development of Soil Screening Levels (NMED December 2000), the Health Effects Assessment Summary Tables (HEAST) (EPA 1997a), the EPA Region 6 electronic database (EPA 2002a), and the Risk Assessment Information System (ORNL 2003) electronic databases.

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-use scenarios.

VI.6.1 Exposure Assessment

Appendix 1 provides the equations and parameter input values used in calculating 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, and reflect the reasonable maximum exposure (RME) approach advocated by the RAGS (EPA 1989).

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

VI.6.2 Risk Characterization

Table 8 shows an HI of 0.02 for the DSS Site 1006 nonradiological COCs and an estimated excess cancer risk of 3E-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 9 shows an HI of 0.02 and an estimated excess cancer risk of 3E-6 for the DSS Site 1006 associated background constituents under the designated industrial land-use scenario.

Because none of the radiological COCs exceed background concentration values, these COCs are eliminated from further evaluation in the risk assessment for the industrial land-use scenario.

Table 7
Toxicological Parameter Values for DSS Site 1006 Nonradiological COCs

COC	RfD_o (mg/kg-d)	Confidence[a]	RfD_{inh} (mg/kg-d)	Confidence[a]	SF_o $(mg/kg\text{-}day)^{-1}$	SF_{inh} $(mg/kg\text{-}day)^{-1}$	Cancer Class[b]	ABS
Inorganic								
Arsenic	3E-4[c]	M	–	–	1.5E+0[c]	1.5E+1[c]	A	0.03[d]
Barium	7E-2[c]	M	1.4[e]	–	–	–	D	0.01[d]
Cyanide	2E-2[c]	M	–	–	–	–	D	0.1[d]
Mercury	3E-4[e]	–	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]
Organic								
2-Butanone	6E-1[c]	L	2.9E-1[c]	L	–	–	D	0.1[d]
bis(2-Ethylhexyl) phthalate	2E-2[f]	–	2E-2[f]	–	1.4E-2[f]	1.4E-2[f]	–	0.01[g]
Toluene	2E-1[c]	M	1.1E-1[c]	M	–	–	D	0.01[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.
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 HEAST (EPA 1997a).
[f]Toxicological parameter values from EPA Region 6 (EPA 2002a).
[g]Toxicological parameter values from Risk Assessment Information System (ORNL 2003).

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

Table 8
Risk Assessment Values for DSS Site 1006 Nonradiological COCs

COC	Maximum Concentration (All Samples) (mg/kg)	Industrial Land-Use Scenario[a]		Residential Land-Use Scenario[a]	
		Hazard Index	Cancer Risk	Hazard Index	Cancer Risk
Inorganic					
Arsenic	4.5	0.02	3E-6	0.21	1E-5
Barium	225	0.00	–	0.04	–
Cyanide	0.0695[b]	0.00	–	0.00	–
Mercury	0.084 J	0.00	–	0.00	–
Selenium	0.43 J	0.00	–	0.00	–
Silver	0.021[b]	0.00	–	0.00	–
Organic					
2-Butanone	0.022	0.00	–	0.00	–
bis(2-Ethylhexyl) phthalate	0.21 J	0.00	1E-9	0.00	5E-9
Toluene	0.0053	0.00	–	0.00	–
Total		**0.02**	**3E-6**	**0.26**	**1E-5**

[a]EPA 1989.
[b]Concentration was one-half the maximum 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.
– = Information not available.

Table 9
Risk Assessment Values for DSS Site 1006 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
Barium	214	–	–	0.04	–
Cyanide	NC	–	–	–	–
Mercury	<0.1	–	–	–	–
Selenium	<1	–	–	–	–
Silver	<1	–	–	–	–
Total		**0.02**	**3E-6**	**0.24**	**1E-5**

[a]Dinwiddie September 1997, Southwest Area Supergroup.
[b]EPA 1989.
COC = Constituent of concern.
DSS = Drain and Septic Systems.
EPA = U.S. Environmental Protection Agency.
mg/kg = Milligram(s) per kilogram.
NC = Not calculated.
– = Information not available.

For the nonradiological COCs under the residential land-use scenario, the HI is 0.26 with an estimated excess cancer risk of 1E-5. 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 9 shows an HI of 0.24 and an estimated excess cancer risk of 1E-5 for the DSS Site 1006 associated background constituents under the residential land-use scenario.

Because none of the radiological COCs exceed background concentration values, these COCs are eliminated from further evaluation in the risk assessment for the residential scenario.

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

The human health risk assessment analysis evaluates 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 0.02 (less than the numerical guideline of 1 suggested in the RAGS [EPA 1989]). The estimated excess cancer risk is 3E-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 determines risks considering background concentrations of the potential nonradiological COCs for both the industrial and residential land-use scenarios. 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 0.00 and the incremental estimated excess cancer risk is 6.40E-8 for the industrial land-use scenario. These incremental risk calculations indicate insignificant risk to human health from nonradiological COCs under an industrial land-use scenario.

Because none of the radiological COCs exceed background activity values, these COCs are eliminated from further evaluation in the risk assessment for the industrial land-use scenario.

The calculated HI for the nonradiological COCs under the residential land-use scenario is 0.26, which is below numerical guidance. The estimated excess cancer risk is 1E-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 slightly above the suggested acceptable risk value. The incremental HI is 0.01 and the estimated incremental cancer risk is 2.62E-7 for the residential land-use scenario. These incremental risk calculations indicate insignificant risk to human health from nonradiological COCs under the residential land-use scenario.

Because none of the radiological COCs exceed background activity values, these COCs are eliminated from further evaluation in the risk assessment for the residential land-use scenario.

VI.8 Step 7. Uncertainty Discussion

The determination of the nature, rate, and extent of contamination at DSS Site 1006 is based upon an initial conceptual model that was validated with baseline sampling conducted at the site. The baseline sampling was implemented in accordance with the SAP (SNL/NM October 1999) and FIP (SNL/NM November 2001). The DQOs contained in these two documents are appropriate for use in risk assessments. 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 for the risk assessment at DSS Site 1006.

Because of the location, history of the site, 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 the near-surface soil and the location and physical characteristics of the site, there is little 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 are probably overestimated. Maximum measured values of COC concentrations are used to provide conservative results.

Table 7 shows the uncertainties (confidence levels) in nonradiological toxicological parameter values. There is a combination of estimated values and values from the IRIS (EPA 2003), HEAST (EPA 1997a), EPA Regions 6, 9, and 3 (EPA 2002a, EPA 2002b, EPA 2002c), and 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), Risk Assessment Information System (ORNL 2003), or 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.

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 Site 1006 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 (0.02) is significantly lower than the accepted numerical guidance from the EPA. The estimated excess cancer risk is 3E-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 0.00, and the incremental estimated excess cancer risk is 6.40E-8 for the industrial land-use scenario. 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 (0.26) is below the accepted numerical guidance from the EPA. The estimated excess cancer risk is 1E-5. Thus, excess cancer risk is slightly above the acceptable risk value provided by the NMED for a residential land-use scenario (Bearzi January 2001). The incremental HI is 0.01 and the incremental estimated excess cancer risk is 2.62E-7 for the residential land-use scenario. The incremental risk calculations indicate insignificant risk to human health for the residential land-use scenario.

Because none of the radiological COCs exceed background concentration values, these COCs are eliminated from further evaluation in the risk assessment for both the industrial and residential land-use scenarios.

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 Office of Solid Waste and Emergency Response (OSWER) Directive No. 9200.4-18 (EPA 1997b). The summation of the nonradiological and radiological carcinogenic risks is tabulated in Table 10.

Table 10
Summation of Radiological and Nonradiological Risks from DSS Site 1006, Building 6741 Septic System Carcinogens

Scenario	Nonradiological Risk	Radiological Risk	Total Risk
Industrial	6.40E-8	0.0	6.40E-8
Residential	2.62E-7	0.0	2.62E-7

DSS = Drain and Septic Systems.

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 Site 1006. A component of the NMED Risk-Based Decision Tree (NMED March 1998) is to conduct an ecological risk assessment that corresponds with that presented in EPA's Ecological RAGS (EPA 1997c). The current methodology is tiered and contains an initial scoping assessment which is followed by a more detailed risk assessment if warranted by the results of the scoping 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 previous sections of this report. At the end of the scoping assessment, a determination is made as to whether a more detailed examination of potential ecological risk is necessary.

VII.2 Scoping Assessment

The scoping assessment primarily focuses 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 with respect to the existence of complete ecological exposure pathways, an evaluation of bioaccumulation potential, and a summary of fate and transport potential. A scoping risk-management decision (Section VII.2.4) involves summarizing the scoping results and determining whether further examination of potential ecological impacts is necessary.

VII.2.1 Data Assessment

As indicated in Section IV, all COCs at DSS Site 1006 are at depths greater than 5 feet bgs. Therefore, no complete ecological exposure pathways exist at this site and no COCs are considered to be COPECs.

VII.2.2 Bioaccumulation

Because no COPECs are associated with this site, bioaccumulation potential was not evaluated.

VII.2.3 Fate and Transport Potential

The potential for the COCs to migrate from the source of contamination to other media or biota is discussed in Section V. As noted in Table 6 (Section V), wind, surface water, and biota (food chain uptake) are expected to be of low significance as transport mechanisms for COCs at this site. Degradation, transformation, and radiological decay of the COCs also are expected to be of low significance.

VII.2.4 Scoping Risk-Management Decision

Based upon information gathered through the scoping assessment, it is concluded that complete ecological pathways are not associated with COCs at this site; therefore, no COPECs exist at the site, and a more detailed risk assessment is not deemed necessary to predict the potential level of ecological risk associated with this site.

VIII. References

Aas, C.A. (Sandia National Laboratories/New Mexico), April 1994. Memorandum to T. Romero *acknowledging and agreeing with the procedure to connect Building 6741 to the sanitary sewer.* April 12, 1994.

Baker, D.A., and J.K. Soldat, 1992. "Methods for Estimating Doses to Organisms from Radioactive Materials Released into the Aquatic Environment," PNL-8150, Pacific Northwest Laboratory, Richland, Washington.

Bearzi, J.P. (New Mexico Environment Department), January 2001. Memorandum to RCRA-Regulated Facilities, "Risk-Based Screening Levels for RCRA Corrective Action Sites in New Mexico," Hazardous Waste Bureau, New Mexico Environment Department, Santa Fe, New Mexico. January 23, 2001.

Callahan, M.A., M.W. Slimak, N.W. Gabel, I.P. May, C.F. Fowler, J.R. Freed, P. Jennings, R.L. Durfee, F.C. Whitmore, B. Maestri, W.R. Mabey, B.R. Holt, and C. Gould, 1979. "Water-Related Environmental Fate of 129 Priority Pollutants," EPA-440/4-79-029, Office of Water and Waste Management, Office of Water Planning and Standards, U.S. Environmental Protection Agency, Washington, D.C.

Dinwiddie, R.S. (New Mexico Environment Department), September 1997. Letter to M.J. Zamorski (U.S. Department of Energy), "Request for Supplemental Information: Background Concentrations Report, SNL/KAFB." September 24, 1997.

DOE, see U.S. Department of Energy.

EPA, see U.S. Environmental Protection Agency.

Howard, P.H., 1990. Volume II: "Solvents," *Handbook of Environmental Fate and Exposure Data for Organic Chemicals*, Lewis Publishers, Inc. Chelsea, Michigan.

Micromedex, Inc., 1998. "Registry of Toxic Effects of Chemical Substances (RTECS)," Hazardous Substances Databank.

National Oceanic and Atmospheric Administration (NOAA), 1990. "Local Climatological Data, Annual Summary with Comparative Data," Albuquerque, New Mexico.

Neumann, G., 1976. "Concentration Factors for Stable Metals and Radionuclides in Fish, Mussels and Crustaceans—A Literature Survey," Report 85-04-24, National Swedish Environmental Protection Board.

New Mexico Environment Department (NMED), March 1998. "Risk-Based Decision Tree Description," *in* New Mexico Environment Department, "RPMP Document Requirement Guide," RCRA Permits Management Program, Hazardous and Radioactive Materials Bureau, New Mexico Environment Department, Santa Fe, New Mexico.

New Mexico Environment Department (NMED), December 2000. "Technical Background Document for Development of Soil Screening Levels," Hazardous Waste Bureau and Ground Water Quality Bureau Voluntary Remediation Program, New Mexico Environment Department, Santa Fe, New Mexico.

NMED, see New Mexico Environment Department.

NOAA, see National Oceanographic and Atmospheric Administration.

Oak Ridge National Laboratory, 2003. "Risk Assessment Information System," electronic database maintained by Oak Ridge National Laboratory, Oak Ridge, Tennessee.

ORNL, Oak Ridge National Laboratory.

Romero, T. (Sandia National Laboratories/New Mexico), September 2003. Internal communication to M. Sanders stating that during the connection of septic systems to the new City of Albuquerque sewer system, the old systems were disconnected and the lines capped. September 16, 2003.

Sandia National Laboratories/New Mexico (SNL/NM), July 1994. "Verification and Validation of Chemical and Radiochemical Data," Technical Operation Procedure (TOP) 94-03, Rev. 0, Sandia National Laboratories, Albuquerque, New Mexico.

Sandia National Laboratories/New Mexico (SNL/NM), March 1996. "Site-Wide Hydrogeologic Characterization Project, Calendar Year 1995 Annual Report," Environmental Restoration Project, Sandia National Laboratories, Albuquerque, New Mexico.

Sandia National Laboratories/New Mexico (SNL/NM), July 1996. "Laboratory Data Review Guidelines," Radiation Protection Diagnostics Procedure No. RPSD-02-11, Issue No. 2, Sandia National Laboratories, Albuquerque, New Mexico.

Sandia National Laboratories/New Mexico (SNL/NM), October 1999. "Sampling and Analysis Plan for Characterizing and Assessing Potential Releases to the Environment From Septic and Other Miscellaneous Drain Systems at Sandia National Laboratories/New Mexico," Sandia National Laboratories, Albuquerque, New Mexico. October 19, 1999.

Sandia National Laboratories/New Mexico (SNL/NM), December 1999. "Data Validation Procedure for Chemical and Radiochemical Data," Administrative Operating Procedure (AOP) 00-03, Environmental Restoration Project, Sandia National Laboratories, Albuquerque, New Mexico.

Sandia National Laboratories/New Mexico (SNL/NM), November 2001. "Field Implementation Plan, Characterization of Non-Environmental Restoration Drain and Septic Systems," Sandia National Laboratories, Albuquerque, New Mexico.

Sandia National Laboratories/New Mexico (SNL/NM), March 2002. "Annual Groundwater Monitoring Report, Fiscal Year 2000," Sandia National Laboratories, Albuquerque, New Mexico.

Sandia National Laboratories/New Mexico (SNL/NM), March 2003. Database printout provided by SNL/NM Facilities Engineering showing the year that numerous SNL/NM buildings were constructed, Sandia National Laboratories, Albuquerque, New Mexico.

SNL/NM, See Sandia National Laboratories, New Mexico.

U.S. Department of Energy (DOE), 1993. "Radiation Protection of the Public and the Environment," DOE Order 5400.5, U.S. Department of Energy, Washington, D.C.

U.S. Department of Energy (DOE), U.S. Air Force, and U.S. Forest Service, September 1995. "Workbook: Future Use Management Area 2," prepared by the Future Use Logistics and Support Working Group in cooperation with U.S. Department of Energy Affiliates, the U.S. Air Force, and the U.S. Forest Service.

U.S. Environmental Protection Agency (EPA), November 1986. "Test Methods for Evaluating Solid Waste," 3rd ed., Update 3, SW-846, Office of Solid Waste and Emergency Response, U.S. Environmental Protection Agency, Washington, D.C.

U.S. Environmental Protection Agency (EPA), 1989. "Risk Assessment Guidance for Superfund, Vol. I: Human Health Evaluation Manual," EPA/540-1089/002, Office of Emergency and Remedial Response, U.S. Environmental Protection Agency, Washington, D.C.

U.S. Environmental Protection Agency (EPA), 1991. "Risk Assessment Guidance for Superfund, Volume I: Human Health Evaluation Manual (Part B)," Office of Emergency and Remedial Response, U.S. Environmental Protection Agency, Washington, D.C.

U.S. Environmental Protection Agency (EPA), 1997a. "Health Effects Assessment Summary Tables (HEAST), FY 1997 Update," EPA-540-R-97-036, Office of Research and Development and Office of Solid Waste and Emergency Response, U.S. Environmental Protection Agency, Washington, D.C.

U.S. Environmental Protection Agency (EPA), 1997b. "Establishment of Cleanup Levels for CERCLA Sites with Radioactive Contamination," OSWER Directive No. 9200.4-18, Office of Solid Waste and Emergency Response, U.S. Environmental Protection Agency, Washington, D.C.

U.S. Environmental Protection Agency (EPA), 1997c. "Ecological Risk Assessment Guidance for Superfund: Process for Designing and Conducting Ecological Risks," Interim Final, U.S. Environmental Protection Agency, Washington, D.C.

U.S. Environmental Protection Agency (EPA), 2002a. "Region 6 Preliminary Remediation Goals (PRGs) 2002," electronic database maintained by Region 6, U.S. Environmental Protection Agency, Dallas, Texas.

U.S. Environmental Protection Agency (EPA), 2002b. "Region 9 Preliminary Remediation Goals (PRGs) 2002," electronic database maintained by Region 9, U.S. Environmental Protection Agency, San Francisco, California.

U.S. Environmental Protection Agency (EPA), 2002c. "Risk-Based Concentration Table," electronic database maintained by Region 3, U.S. Environmental Protection Agency, Philadelphia, Pennsylvania.

U.S. Environmental Protection Agency (EPA), 2003. Integrated Risk Information System (IRIS) electronic database, maintained by the U.S. Environmental Protection Agency, Washington, D.C.

Yanicak, S. (Oversight Bureau, Department of Energy, New Mexico Environment Department), March 1997. Letter to M. Johansen (DOE/AIP/POC Los Alamos National Laboratory), "(Tentative) list of constituents of potential ecological concern (COPECs) which are considered to be bioconcentrators and/or biomagnifiers." March 3, 1997.

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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)

$$= C \times (CR \times EFD/BW/AT) \times \text{Toxicity Effect} \quad (1)$$

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):

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

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 December 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).

References

ANL, see Argonne National Laboratory.

Argonne National Laboratory (ANL), 1993. *Manual for Implementing Residual Radioactive Material Guidelines Using RESRAD*, Version 5.0, ANL/EAD/LD-2, Argonne National Laboratory, Argonne, IL.

DOE, see U.S. Department of Energy.

DOE and USAF, see U.S. Department of Energy and U.S. Air Force.

EPA, see U.S. Environmental Protection Agency.

New Mexico Environment Department (NMED), March 2000. "Assessing Human Health Risks Posed by Chemical: Screening-level Risk Assessment," Hazardous and Radioactive Materials Bureau, NMED, March 6, 2000.

New Mexico Environment Department (NMED), December 2000. "Technical Background Document for Development of Soil Screening Levels," Hazardous Waste Bureau and Ground Water Quality Bureau Voluntary Remediation Program, December 18, 2000.

Sandia National Laboratories/New Mexico (SNL/NM), February 1998. "RESRAD Input Parameter Assumptions and Justification," Sandia National Laboratories/New Mexico Environmental Restoration Project, Albuquerque, New Mexico.

U.S. Department of Energy (DOE), 1993. DOE Order 5400.5, "Radiation Protection of the Public and the Environment," U.S. Department of Energy, Washington, D.C.

U.S. Department of Energy (DOE), 1996. "Environmental Assessment of the Environmental Restoration Project at Sandia National Laboratories/New Mexico," U.S. Department of Energy, Kirtland Area Office.

U.S. Department of Energy, U.S. Air Force, and U.S. Forest Service, September 1995. "Workbook: Future Use Management Area 2," prepared by the Future Use Logistics and Support Working Group in cooperation with U.S. Department of Energy Affiliates, the U.S. Air Force, and the U.S. Forest Service.

U.S. Department of Energy, U.S. Air Force, and U.S. Forest Service, October 1995. "Workbook: Future Use Management Area 1," prepared by the Future Use Logistics and Support Working Group in cooperation with U.S. Department of Energy Affiliates, the U.S. Air Force, and the U.S. Forest Service.

U.S. Department of Energy and U.S. Air Force (DOE and USAF), January 1996. "Workbook: Future Use Management Areas 3,4,5,and 6," prepared by the Future Use Logistics and Support Working Group in cooperation with U.S. Department of Energy Affiliates, and the U.S. Air Force.

U.S. Department of Energy and U.S. Air Force (DOE and USAF), March 1996. "Workbook: Future Use Management Area 7," prepared by the Future Use Logistics and Support Working Group in cooperation with U.S. Department of Energy Affiliates and the U.S. Air Force.

U.S. Environmental Protection Agency (EPA), 1989. "Risk Assessment Guidance for Superfund, Volume I: Human Health Evaluation Manual," EPA/540-1089/002, U.S. Environmental Protection Agency, Office of Emergency and Remedial Response, Washington, D.C.

U.S. Environmental Protection Agency (EPA), 1991. "Risk Assessment Guidance for Superfund, Volume I: Human Health Evaluation Manual (Part B)," EPA/540/R-92/003, U.S. Environmental Protection Agency, Office of Emergency and Remedial Response, Washington, D.C.

U.S. Environmental Protection Agency (EPA), 1992. "Dermal Exposure Assessment: Principles and Applications," EPA/600/8-91/011B, Office of Research and Development, Washington, D.C.

U.S. Environmental Protection Agency (EPA), 1996. "Soil Screening Guidance: Technical Background Document," EPA/540/1295/128, Office of Solid Waste and Emergency Response, Washington, D.C.

U.S. Environmental Protection Agency (EPA), August 1997. *Exposure Factors Handbook*, EPA/600/8-89/043, U.S. Environmental Protection Agency, Office of Health and Environmental Assessment, Washington, D.C.

U.S. Environmental Protection Agency (EPA), 1997. (OSWER No. 9200.4-18) *Establishment of Cleanup Levels for CERCLA Sites with Radioactive Contamination*, U.S. EPA Office of Radiation and Indoor Air, Washington D.C, August 1997.