3-1-2005

Justification for Class III Permit Modification March 2005, DSS Site 1028, Operable Unit 1295, Building 6560 Septic System and Seepage Pit at Technical Area III

Sandia National Laboratories/NM

Recommended Citation

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

Sandia National Laboratories

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

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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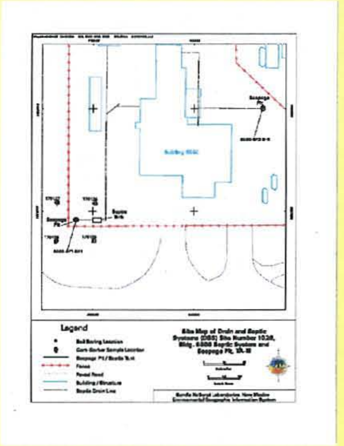
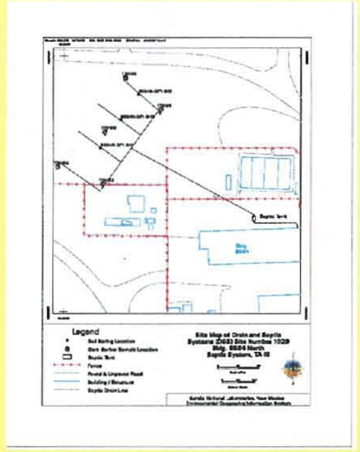
Sandia National Laboratories

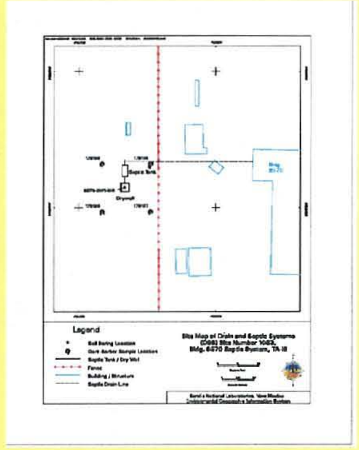
This work supported by the
United States Department of Energy
under contract DE-AC04-94AL85000.

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

Environmental Restoration Project



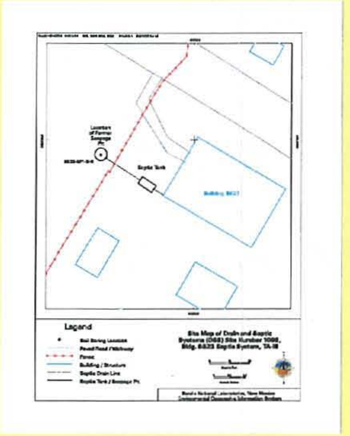


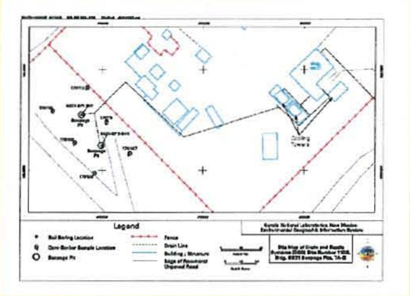


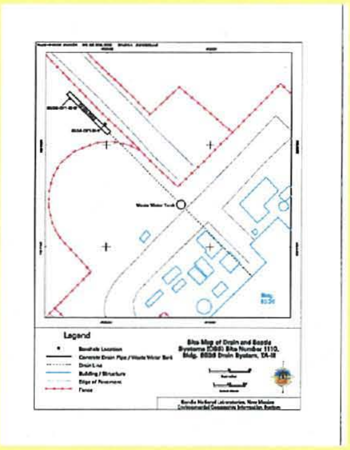
Collecting soil samples with the Geoprobe.

Subsurface soil recovered for analyses.

Seepage pit demolition and backfilling.







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Sandia National Laboratories

Justification for Class III Permit Modification

March 2005

DSS Site 1028
Operable Unit 1295
Building 6560 Septic System and Seepage Pit at Technical Area III

NFA (SWMU Assessment Report) Submitted June 2004

Environmental
Restoration
Project

United States Department of Energy
Sandia Site Office

NFA

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

JUN 1 8 2004

CERTIFIED MAIL-RETURN RECEIPT REQUESTED

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

Dear Mr. Kieling,

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

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

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

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

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

Sincerely,

Patty Wagner

Patty Wagner
Manager

Enclosure

cc w/ enclosure:
L. King, EPA, Region 6 (2 copies, via Certified Mail)
W. Moats, NMED-HWB (via Certified Mail)
M. Gardipe, NNSA/SC/ERD
C. Voorhees, NMED-OB (Santa Fe)
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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 1028, BUILDING 6560 SEPTIC SYSTEM AND SEEPAGE PIT

June 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
µg	microgram(s)
MDA	minimum detectable activity
MDL	method detection limit
mrem	millirem
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
TEDE	total effective dose equivalent
TOP	Technical Operating Procedure
VOC	volatile organic compound
yr	year(s)

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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 1028: BUILDING 6560 SEPTIC SYSTEM AND SEEPAGE PIT

2.1 Summary

The SNL/NM ER Project conducted an assessment of DSS Site 1028, the Building 6560 Septic System and Seepage Pit. 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 and seepage pit 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 1028. This NFA proposal provides documentation that the site was sufficiently characterized, that no significant releases of contaminants to the environment occurred via the Building 6560 Septic System and Seepage Pit, 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.

Review and analysis of all relevant data for DSS Site 1028 indicate that concentrations of constituents of concern (COCs) at this site were found to be below applicable risk assessment action levels. Thus, DSS Site 1028 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 1028 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 approximately 0.67 miles south of the entrance to TA-III (Figure 2.2.1-1). The septic system is on the southwest side of Building 6560, and the single seepage pit (with no associated septic tank) is on the northeast side of the building. The abandoned septic system consisted of a 750 gallon septic tank that emptied to a 4-foot internal diameter seepage pit with an aggregate bottom starting at approximately 12 feet below ground surface (bgs). The northeast seepage pit is 4 feet in diameter with an aggregate bottom starting at approximately 5 feet bgs (Figure 2.2.1-2). Construction details are based upon engineering drawings (SNL/NM June 1989) and inspections at the site.

The surface geology at DSS Site 1028 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 1028, typically consist of a mixture of silts, sands, and gravels that are poorly sorted, and exhibit

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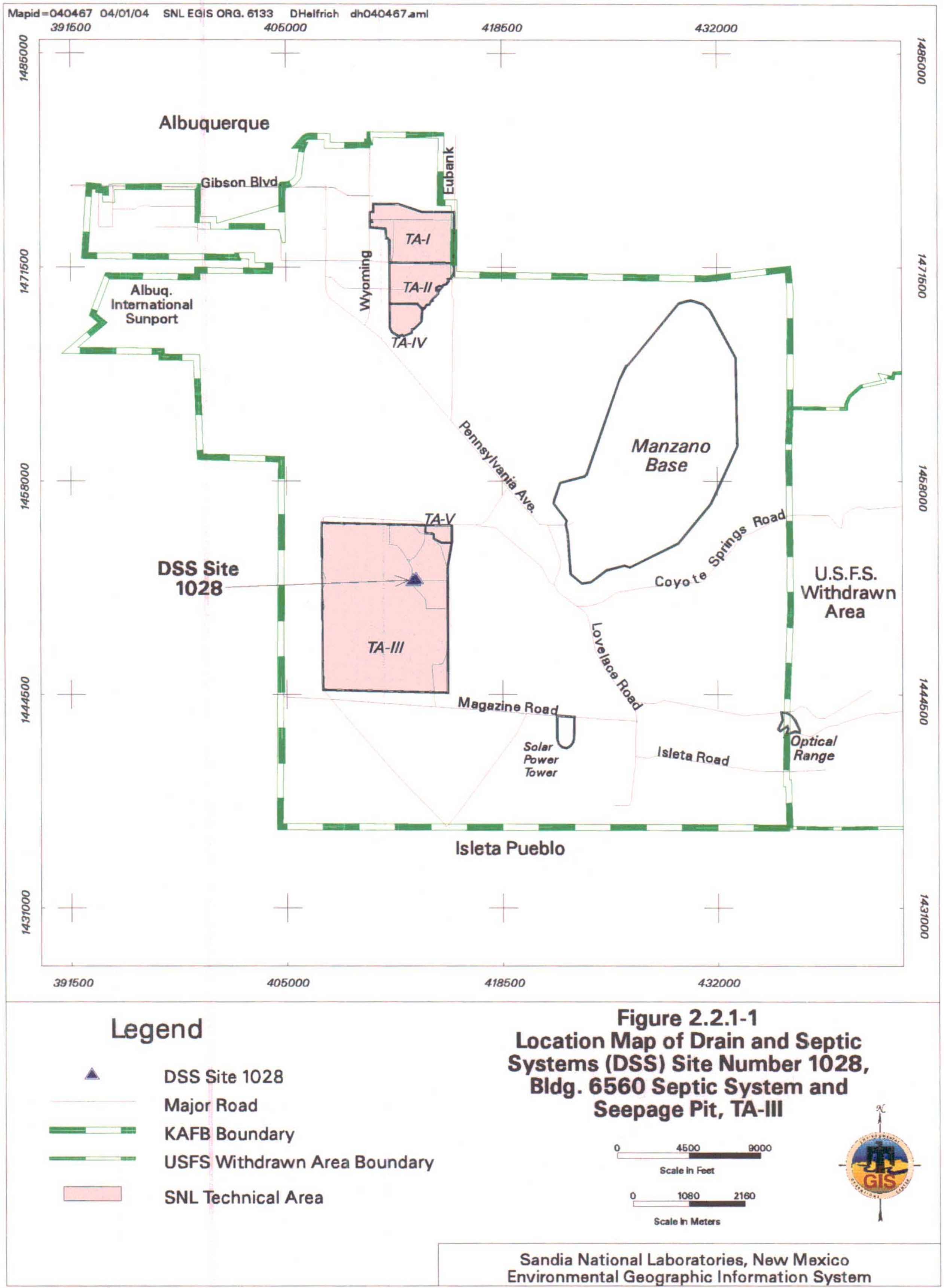

Figure 2.2.1-1
Location Map of Drain and Septic Systems (DSS) Site Number 1028, Bldg. 6560 Septic System and Seepage Pit, TA-III

Sandia National Laboratories, New Mexico
Environmental Geographic Information System

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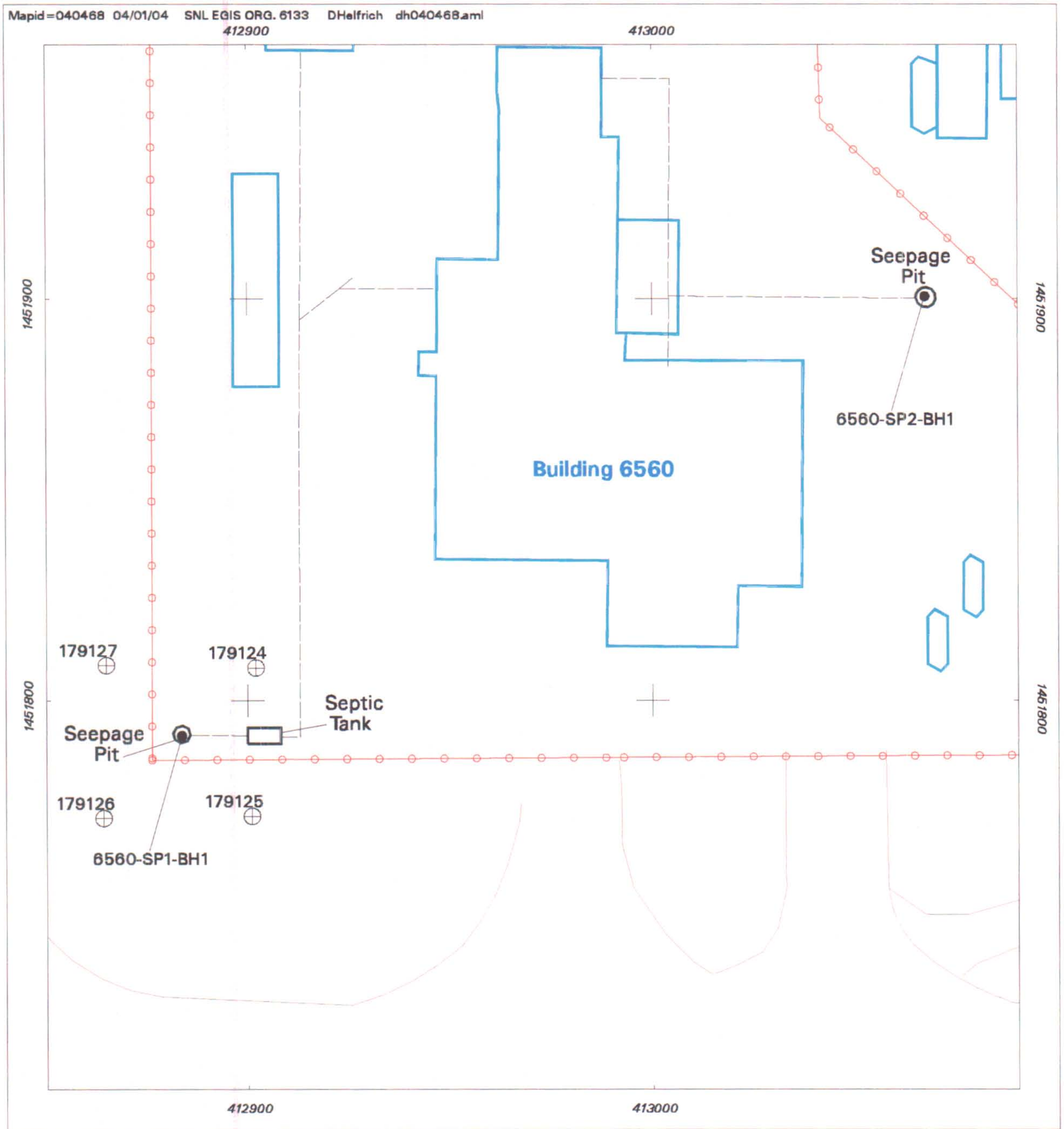

Legend

- ● Soil Boring Location
- ⊕ Gore-Sorber Sample Location
- ▬ Seepage Pit / Septic Tank
- –o–o–o– Fence
- — Paved Road
- — Building / Structure
- – – – Septic Drain Line

Figure 2.2.1-2
Site Map of Drain and Septic Systems (DSS) Site Number 1028, Bldg. 6560 Septic System and Seepage Pit, TA-III

Sandia National Laboratories, New Mexico
Environmental Geographic Information System

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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 to very slightly sloping to the west. The closest drainage channel is a shallow, low relief arroyo that lies approximately 0.85 miles south of the site, drains to the west, and terminates in a playa just west of KAFB. 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 5,402 feet above mean sea level (SNL/NM April 2003). Depth to groundwater is approximately 482 feet bgs at the site. Groundwater flow is thought to be generally to the west in this area (SNL/NM March 2002). The production wells nearest to DSS Site 1028 are KAFB-4 and KAFB-11, approximately 3.3 and 3.7 miles to the northwest and northeast, respectively. The nearest groundwater monitoring well is well MWL-BW1, approximately 1,100 feet west of the site.

2.2.2 Operational History

Available information indicates that Building 6560 was constructed in 1955 (SNL/NM March 2003), and it is assumed the septic system and seepage pit were constructed at the same time. This building is currently known as the Vibration Test Facility. By June 1991, the septic system discharges were routed to the City of Albuquerque sanitary sewer system (Jones June 1991). The old septic system and seepage pit lines would have been disconnected, capped, and the system abandoned in place concurrent with this change (Romero September 2003). Because operational records are 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.

2.3 Land Use

2.3.1 Current Land Use

The current land use for DSS Site 1028 is industrial.

2.3.2 Future/Proposed Land Use

The projected future land use for DSS Site 1028 is industrial (DOE et al. September 1995).

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3.0 INVESTIGATORY ACTIVITIES

3.1 Summary

Three assessment investigations have been conducted at DSS Site 1028. In late 1990 or early 1991, 1992, and 1995, waste characterization samples were collected from the septic tank (Investigation 1). In 2002, a passive soil-vapor survey was conducted to determine whether areas of significant volatile organic compound (VOC) contamination were present in the soil in the septic system area (Investigation 2). In 2002, near-surface soil samples were collected from two borings that were drilled through the center of, and beneath, the two seepage pits at DSS Site 1028 (Investigation 3). Investigations 2 and 3 were required by the NMED/HWB to adequately characterize DSS Site 1028 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

Aqueous samples collected in December 1990 or January 1991 were analyzed for VOCs, semivolatile organic compounds (SVOCs), oil and grease, nitrates, phenolics, metals, and gross alpha/beta activity (SNL/NM April 1991). A sludge sample collected on July 29, 1992, was analyzed at an off-site laboratory for gross alpha/beta activity, tritium, and radiological constituents by gamma spectroscopy (SNL/NM June 1993). Aqueous samples collected on July 5, 1995, were analyzed at an off-site laboratory for VOCs, SVOCs, pesticides, polychlorinated biphenyls (PCBs), metals, formaldehyde, fluoride, nitrate/nitrite, oil and grease, total phenol, gross alpha/beta activity, tritium, isotopic uranium, and radiological constituents by gamma spectroscopy. Sludge samples were also collected from the septic tank at the same time and were analyzed for VOCs, SVOCs, pesticides, PCBs, metals, and numerous radiological constituents. 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 (SNL/NM December 1995). The analytical results for these three septic tank sampling events are presented in Annex A.

On March 27, 1996, the residual contents, approximately 350 gallons of waste and added water, were pumped out of the Building 6560 septic tank and managed according to SNL/NM policy (Shain August 1996).

3.3 Investigation 2—Passive Soil-Vapor Sampling

In April and May 2002, a passive soil-vapor survey was conducted in the Building 6560 septic system area. This survey was required at DSS Site 1028 by NMED/HWB regulators and was conducted to determine whether significant VOC contamination was present in the soil at this site.

3.3.1 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 milligrams 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 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.

3.3.2 Soil-Vapor Survey Results and Conclusions

A total of four GS passive soil-vapor samplers were placed in the septic system area of DSS Site 1028 (Figure 2.2.1-2). Samplers were installed at DSS Site 1028 on April 25, 2002, and were retrieved on May 10, 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 B.

As shown in the analytical results tables in Annex B, 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. Quantifiable low to trace-level amounts of individual or groups of 10 VOCs were detected in the GS samplers installed at DSS Site 1028. The analytical results indicated there were no areas of significant VOC contamination at the site that would require additional characterization.

3.4 Investigation 3—Soil Sampling

Soil sampling was conducted in accordance with the rationale and procedures in the SAP (SNL/NM October 1999) approved by the NMED. On August 21 and 22, 2002, soil samples were collected from two boreholes which were drilled down through the center and beneath the two seepage pits at this site. Soil boring locations are shown on Figure 2.2.1-2. Figures 3.4-1 and 3.4-2 show soil samples being collected from beneath the septic system seepage pit on the southwest side of Building 6560 at this site. A summary of the boreholes, sample depths, sample analyses, analytical methods, laboratories, and sample dates is presented in Table 3.4-1.

Figure 3.4-1
Collecting soil samples at DSS Site 1028 from beneath the center of the septic system seepage pit on the southwest side of Building 6560. View to the northeast. August 21, 2002

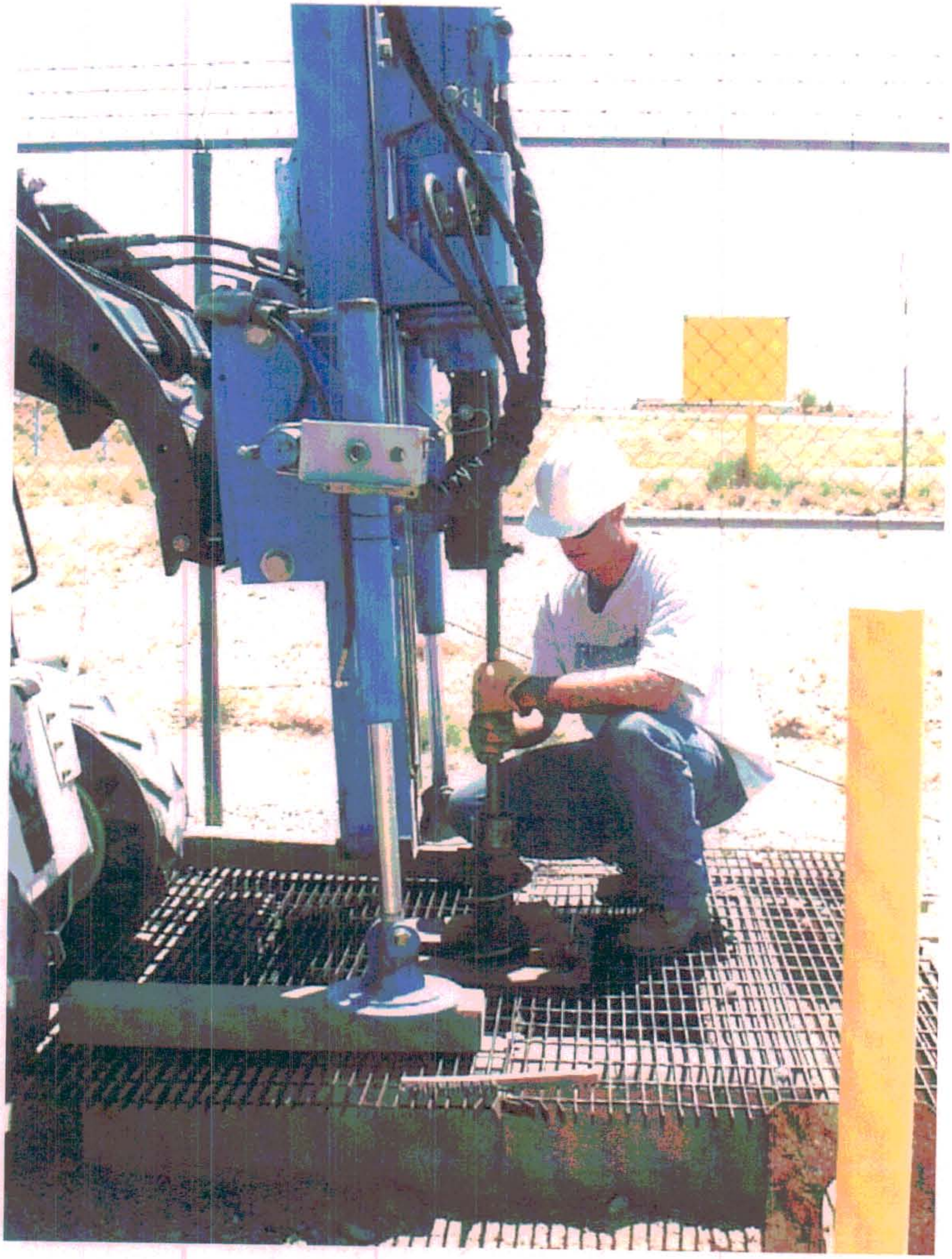

Figure 3.4-2
Platform and Geoprobe™ sampling equipment used to collect soil samples at DSS Site 1028 from beneath the septic system seepage pit. View to the south. August 21, 2002

Table 3.4-1
Summary of Areas Sampled, Analytical Methods, and Laboratories Used for DSS Site 1028, Building 6560 Septic System and Seepage Pit Soil Samples

Sampling Area(s)	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
Septic System Seepage Pit	1	14, 19	2	VOCs EPA Method 8260	GEL	08-21-02
	1	14, 19	2	SVOCs EPA Method 8270	GEL	08-21-02
	1	14, 19	2	PCBs EPA Method 8082	GEL	08-21-02
	1	14, 19	2	HE Compounds EPA Method 8330	GEL	08-21-02
	1	14, 19	2	RCRA Metals EPA Methods 6000/7000	GEL	08-21-02
	1	14, 19	2	Hexavalent Chromium EPA Method 7196A	GEL	08-21-02
	1	14, 19	2	Total Cyanide EPA Method 9012A	GEL	08-21-02
	1	14, 19	2	Gamma spectroscopy EPA Method 901.1	RPSD	08-21-02
	1	14, 19	2	Gross Alpha/Beta Activity EPA Method 900.0	GEL	08-21-02
Seepage Pit	1	7, 12	2	VOCs EPA Method 8260	GEL	08-22-02
	1	7, 12	2	SVOCs EPA Method 8270	GEL	08-22-02
	1	7, 12	2	PCBs EPA Method 8082	GEL	08-22-02
	1	7, 12	2	HE Compounds EPA Method 8330	GEL	08-22-02
	1	7, 12	2	RCRA Metals EPA Methods 6000/7000	GEL	08-22-02
	1	7, 12	2	Hexavalent Chromium EPA Method 7196A	GEL	08-22-02

Refer to footnotes at end of table.

Table 3.4-1 (Concluded)
Summary of Areas Sampled, Analytical Methods, and Laboratories Used for DSS Site 1028, Building 6560 Septic System and Seepage Pit Soil Samples

Sampling Area(s)	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
Seepage Pit (continued)	1	7, 12	2	Total Cyanide EPA Method 9012A	GEL	08-22-02
	1	7, 12	2	Gamma Spectroscopy EPA Method 901.1	RPSD	08-22-02
	1	7, 12	2	Gross Alpha/Beta Activity EPA Method 900.0	GEL	08-22-02

[a] EPA November 1986.

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

3.4.1 Soil Sampling Methodology

An auger drill rig was used to sample all boreholes at two depth intervals. In the boreholes drilled through the center of the seepage pits, the shallow sample interval started at the estimated base of the gravel aggregate in the seepage pit bottom, and the lower (deep) interval started 5 feet below the top of the upper 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.

3.4.2 Soil Sampling Results and Conclusions

Analytical results for the soil samples collected at DSS Site 1028 are presented and discussed in this section.

VOCs

VOC analytical results for the four soil samples collected from the two seepage pit 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. One VOC (2-butanone) was detected in three of four soil samples from this site. This compound was not detected in the associated trip (TB) or equipment blank (EB), but toluene was detected in both of the blanks. These compounds are common laboratory contaminants and may not indicate soil contamination at this site.

SVOCs

SVOC analytical results for the four soil samples collected from the two seepage pit boreholes are summarized in Table 3.4.2-3. MDLs for the SVOC soil analyses are presented in Table 3.4.2-4. One SVOC (bis[2-ethylhexyl] phthalate) was detected in the 7-foot-bgs sample from the northeast seepage pit borehole (SP2), and in the associated EB collected at DSS Site 1028. This compound is a common component found in plastics and may not indicate soil contamination at this site.

Table 3.4.2-1
Summary of DSS Site 1028, Building 6560 Septic System and Seepage Pit *Confirmatory Soil Sampling, VOC Analytical Results*
August 2002
(Off-Site Laboratory)

Sample Attributes			VOCs (EPA Method 8260[a]) (µg/kg)	
Record Number[b]	ER Sample ID[c]	Sample Depth (ft)	2-Butanone	Toluene
605651	6560-SP1-BH1-14-S	14	**15.4**	ND (0.34)
605651	6560-SP1-BH1-19-S	19	**13.3**	ND (0.34)
605651	6560-SP2-BH1-7-S	7	ND (3.74)	ND (0.34)
605651	6560-SP2-BH1-12-S	12	**16.8**	ND (0.34)
Quality Assurance/Quality Control Samples (all in µg/L)				
605651	6560-TB	NA	ND (2.31)	**0.405 J (1)**
605655	6560-EB	NA	ND (2.31)	**0.39 J (1)**

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.
DSS = Drain and Septic Systems.
EB = Equipment blank.
EPA = U.S. Environmental Protection Agency.
ER = Environmental Restoration.
ft = Foot (feet).
ID = Identification.
J ( ) = The reported value is greater than or equal to the MDL but is less than the practical quantitation limit, shown in parentheses.
MDL = Method detection limit.
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 1028, Building 6560 Septic System and Seepage Pit Confirmatory Soil Sampling, VOC Analytical MDLs
August 2002
(Off-Site Laboratory)

Analyte	EPA Method 8260[a] Detection Limit (µg/kg)
Acetone	3.52
Benzene	0.45
Bromodichloromethane	0.49
Bromoform	0.49
Bromomethane	0.5
2-Butanone	3.74
Carbon disulfide	2.36
Carbon tetrachloride	0.49
Chlorobenzene	0.41
Chloroethane	0.81
Chloroform	0.52
Chloromethane	0.37
Dibromochloromethane	0.5
1,1-Dichloroethane	0.47
1,2-Dichloroethane	0.43
1,1-Dichloroethene	0.5
cis-1,2-Dichloroethene	0.47
trans-1,2-Dichloroethene	0.53
1,2-Dichloropropane	0.48
cis-1,3-Dichloropropene	0.43
trans-1,3-Dichloropropene	0.25
Ethylbenzene	0.38
2-Hexanone	3.77
4-Methyl-,2-pentanone	4.03
Methylene chloride	1.35
Styrene	0.39
1,1,2,2-Tetrachloroethane	0.91
Tetrachloroethene	0.38
Toluene	0.34
1,1,1-Trichloroethane	0.53
1,1,2-Trichloroethane	0.54
Trichloroethene	0.45
Vinyl acetate	1.78
Vinyl chloride	0.56
Xylene	0.39

[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 1028, Building 6560 Septic System and Seepage Pit *Confirmatory Soil Sampling, SVOC Analytical Results*
August 2002
(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
605651	6560-SP1-BH1-14-S	14	ND (30)
605651	6560-SP1-BH1-19-S	19	ND (30)
605651	6560-SP2-BH1-7-S	7	**34.4 J (333)**
605651	6560-SP2-BH1-12-S	12	ND (30)
Quality Assurance/Quality Control Sample (µg/L)			
605655	6560-EB	NA	**2.58 J (9.66)**

Note: Values in **bold** represent detected analytes.

[a] EPA November 1986.

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

BH = Borehole.
DSS = Drain and Septic Systems.
EB = Equipment blank.
EPA = U.S. Environmental Protection Agency.
ER = Environmental Restoration.
ft = Foot (feet).
ID = Identification.
J ( ) = The reported value is greater than or equal to the MDL but is less than the practical quantitation limit, shown in parentheses.
MDL = Method detection limit.
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.
SVOC = Semivolatile organic compound.

Table 3.4.2-4
Summary of DSS Site 1028, Building 6560 Septic System and Seepage Pit
Confirmatory Soil Sample SVOC Analytical MDLs
August 2002
(Off-Site Laboratory)

Analyte	EPA Method 8270[a] Detection Limit (µg/kg)
Acenaphthene	8
Acenaphthylene	16.7
Anthracene	16.7
Benzo(a)anthracene	16.7
Benzo(a)pyrene	16.7
Benzo(b)fluoranthene	16.7
Benzo(g,h,i)perylene	16.7
Benzo(k)fluoranthene	16.7
4-Bromophenyl phenyl ether	34
Butylbenzyl phthalate	28.7
Carbazole	16.7
4-Chlorobenzenamine	167
4-Chloro-3-methylphenol	167
bis(2-Chloroethoxy)methane	12.3
bis(2-Chloroethyl)ether	37.3
bis-Chloroisopropyl ether	11
4-Chlorophenyl phenyl ether	19.7
2-Chloronaphthalene	13.7
2-Chlorophenol	15.3
Chrysene	16.7
o-Cresol	26
Dibenz[a,h]anthracene	16.7
Dibenzofuran	17
1,2-Dichlorobenzene	10
1,3-Dichlorobenzene	11.3
1,4-Dichlorobenzene	15.7
3,3'-Dichlorobenzidine	167
2,4-Dichlorophenol	20.7
Diethylphthalate	17.7
2,4-Dimethylphenol	167
Dimethylphthalate	18.3
Di-n-butyl phthalate	24
Dinitro-o-cresol	167
2,4-Dinitrophenol	167
2,4-Dinitrotoluene	25.3
2,6-Dinitrotoluene	33.3
Di-n-octyl phthalate	30.3
Diphenyl amine	22.3
bis(2-Ethylhexyl) phthalate	30
Fluoranthene	16.7
Fluorene	4
Hexachlorobenzene	20
Hexachlorobutadiene	12.7

Refer to footnotes at end of table.

Table 3.4.2-4 (Concluded)
Summary of DSS Site 1028, Building 6560 Septic System and Seepage Pit Confirmatory Soil Sample SVOC Analytical MDLs
August 2002
(Off-Site Laboratory)

Analyte	EPA Method 8270[a] Detection Limit (µg/kg)
Hexachlorocyclopentadiene	167
Hexachloroethane	22
Indeno(1,2,3-cd)pyrene	16.7
Isophorone	16
2-Methylnaphthalene	16.7
4-Methylphenol	33.3
Naphthalene	16.7
2-Nitroaniline	167
3-Nitroaniline	167
4-Nitroaniline	37
Nitrobenzene	20.3
4-Nitrophenol	167
2-Nitrophenol	17
n-Nitrosodipropylamine	22.7
Pentachlorophenol	167
Phenanthrene	16.7
Phenol	12.7
Pyrene	16.7
1,2,4-Trichlorobenzene	12.7
2,4,5-Trichlorophenol	17.3
2,4,6-Trichlorophenol	27.3

[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.

PCBs

PCB analytical results for the four soil samples collected from the two seepage pit boreholes are summarized in Table 3.4.2-5. MDLs for the PCB soil analyses are presented in Table 3.4.2-6. One PCB compound (Aroclor-1254) was detected in all four soil samples from this site, and PCBs were not detected in the associated EB.

HE Compounds

High explosives (HE) compound analytical results for the four soil samples collected from the seepage pit 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 of the soil samples or the EB from this site.

RCRA Metals and Hexavalent Chromium

Resource Conservation and Recovery Act (RCRA) metals and hexavalent chromium analytical results for the four soil samples collected from the seepage pit boreholes are summarized in Table 3.4.2-9. MDLs for the metals in soil analyses are presented in Table 3.4.2-10. None of the metal concentrations detected in the samples exceed the corresponding NMED-approved background concentrations, and significant metals concentrations were not detected in the metals EB.

Total Cyanide

Total cyanide analytical results for the four soil samples collected from the seepage pit 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 of the soil or EB samples from this site.

Radionuclides

Analytical results for the gamma spectroscopy analysis of the four soil samples collected from the seepage pit boreholes are summarized in Table 3.4.2-13. No activities above NMED-approved background levels were detected in any sample analyzed. Although not detected, the minimum detectable activities (MDAs) for uranium-235 in three of the four soil samples from this site exceeded their respective background activity because the standard gamma spectroscopy count time for soil samples (6,000 seconds) was not sufficient to reach the NMED-approved background activity established for SNL/NM soils. Although slightly elevated, the MDA values are still very low and the risk assessment outcome for the site is not significantly impacted by their use.

Gross Alpha/Beta Activity

Gross alpha/beta analytical results for the four soil samples collected from the seepage pit boreholes are summarized in Table 3.4.2-14. No gross alpha/beta activity was detected above the New Mexico-established background levels (Miller September 2003) in any of the soil

Table 3.4.2-5
Summary of DSS Site 1028, Building 6560 Septic System and Seepage Pit Confirmatory Soil Sampling, PCB Analytical Results
August 2002
(Off-Site Laboratory)

Sample Attributes			PCBs (EPA Method 8082^a) (µg/kg)
Record Number^b	ER Sample ID	Sample Depth (ft)	Aroclor-1254
605651	6560-SP1-BH1-14-S	14	**2.8 J (3.33)**
605651	6560-SP1-BH1-19-S	19	**0.82 J (3.33)**
605651	6560-SP2-BH1-7-S	7	**10.2**
605651	6560-SP2-BH1-12-S	12	**2.7 J (3.33)**
Quality Assurance/Quality Control Sample (µg/L)			
605655	6560-EB	NA	ND (0.0467)

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

BH = Borehole.
DSS = Drain and Septic Systems.
EB = Equipment Blank.
EPA = U.S. Environmental Protection Agency.
ER = Environmental Restoration.
ft = Foot (feet).
ID = Identification.
J ( ) = The reported value is greater than or equal to the method detection limit but is less than the practical quantitation limit, shown in parentheses.
µg/kg = Microgram(s) per kilogram.
µg/L = Microgram(s) per liter.
NA = Not applicable.
ND = Not detected above the method detection limit, shown in parentheses.
PCB = Polychlorinated biphenyl.
S = Soil sample.
SP = Seepage pit.

Table 3.4.2-6
Summary of DSS Site 1028, Building 6560 Septic System and Seepage Pit Confirmatory Soil Sampling, PCB Analytical MDLs
August 2002
(Off-Site Laboratory)

Analyte	EPA Method 8082[a] Detection Limit (µg/kg)
Aroclor-1016	1
Aroclor-1221	2.82
Aroclor-1232	1.67
Aroclor-1242	1.67
Aroclor-1248	1
Aroclor-1254	0.5
Aroclor-1260	1

[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 1028, Building 6560 Septic System and Seepage Pit Confirmatory Soil Sampling, HE Compound Analytical Results
August 2002
(Off-Site Laboratory)

Sample Attributes			HE
Record Number[b]	ER Sample ID	Sample Depth (ft)	(EPA Method 8330[a]) (µg/kg)
605651	6560-SP1-BH1-14-S	14	ND
605651	6560-SP1-BH1-19-S	19	ND
605651	6560-SP2-BH1-7-S	7	ND
605651	6560-SP2-BH1-12-S	12	ND
Quality Assurance/Quality Control Sample (µg/L)			
605655	6560-EB	NA	ND

[a]EPA November 1986.

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

BH = Borehole.
DSS = Drain and Septic Systems.
EB = Equipment blank.
EPA = U.S. Environmental Protection Agency.
ER = Environmental Restoration.
ft = Foot (feet).
HE = High explosive(s).
ID = Identification.
µg/kg = Microgram(s) per kilogram.
µg/L = Microgram(s) per liter.
NA = Not applicable.
ND = Not detected.
S = Soil sample.
SP = Seepage pit.

Table 3.4.2-8
Summary of DSS Site 1028, Building 6560 Septic System and Seepage Pit Confirmatory Soil Sampling, HE Compound Analytical MDLs
August 2002
(Off-Site Laboratory)

Analyte	EPA Method 8330[a] Detection Limit (µg/kg)
2-Amino-4,6-dinitrotoluene	18.1
4-Amino-2,6-dinitrotoluene	34.1
1,3-Dinitrobenzene	34.1
2,4-Dinitrotoluene	55
2,6-Dinitrotoluene	48
HMX	48
2-Nitrotoluene	24
3-Nitrotoluene	24
4-Nitrotoluene	24
Nitrobenzene	48
RDX	48
Tetryl	22.1
1,3,5-Trinitrobenzene	29
2,4,6-Trinitrotoluene	48

[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.
µg/kg = Microgram(s) per kilogram.
RDX = Hexahydro-1,3,5-trinitro-1,3,5-triazine.
Tetryl = Methyl-2,4,6-trinitrophenylnitramine.

Table 3.4.2-9
Summary of DSS Site 1028, Building 6560 Septic System and Seepage Pit Confirmatory Soil Sampling, Metals Analytical Results
August 2002
(Off-Site Laboratory)

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
605651	6560-SP1-BH1-14-S	14	2.68	66.2 J	0.214 J (0.5)	8.61 J	ND (0.0531)	5.03	ND (0.000932)	0.211 J (0.5)	ND (0.0902)
605651	6560-SP1-BH1-19-S	19	2.24	62.8 J	0.153 J (0.5)	7.3 J	ND (0.0516)	3.89	0.00275 J (0.00945)	0.185 J (0.5)	ND (0.0902)
605651	6560-SP2-BH1-7-S	7	3.64	75.5 J	0.259 J (0.463)	10.9 J	ND (0.0542)	6.39	0.00269 J (0.00923)	ND (0.15)	ND (0.0835)
605651	6560-SP2-BH1-12-S	12	2.9	104 J	0.216 J (0.459)	9.49 J	ND (0.0543)	5.84	0.00162 J (0.00926)	0.267 J (0.459)	ND (0.0828)
Background Concentration—Southwest Area Supergroup[c]			4.4	214	0.9	15.9	1	11.8	<0.1	<1	<1
Quality Assurance/Quality Control Sample (mg/L)											
605655	6560-EB	NA	ND (0.00224)	0.000329 J (0.005)	ND (0.000313)	0.000621 J (0.005)	ND (0.0054)	ND (0.00172)	ND (0.000047 J)	ND (0.00281)	ND (0.000835 J)

[a] EPA November 1986.

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

[c] Dinwiddie September 1997.

BH = Borehole.
DSS = Drain and Septic Systems.
EB = Equipment blank.
EPA = U.S. Environmental Protection Agency.
ER = Environmental Restoration.
ft = Foot (feet).
ID = Identification.
J ( ) = The reported value is greater than or equal to the MDL but is less than the practical quantitation limit, shown in parentheses.
J = Estimated concentration.
MDL = Method detection limit.
mg/kg = Milligram(s) per kilogram.
mg/L = Milligram(s) per liter.
NA = Not applicable.
ND ( ) = Not detected above the MDL, shown in parentheses.
S = Soil sample.
SP = Seepage pit.

Table 3.4.2-10
Summary of DSS Site 1028, Building 6560 Septic System and Seepage Pit Confirmatory Soil Sampling, Metals Analytical MDLs
August 2002
(Off-Site Laboratory)

Analyte	EPA Method 6000/7000/7196A[a] Detection Limit (mg/kg)
Arsenic	0.189–0.206
Barium	0.0612–0.0667
Cadmium	0.0439–0.0478
Chromium	0.148–0.161
Chromium (VI)	0.0516–0.0543
Lead	0.26–0.284
Mercury	0.000907–0.000929
Selenium	0.149–0.162
Silver	0.0828–0.0902

[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 3.4.2-11
Summary of DSS Site 1028, Building 6560 Septic System and Seepage Pit Confirmatory Soil Sampling, Total Cyanide Analytical Results
August 2002
(Off-Site Laboratory)

Sample Attributes			Total Cyanide (EPA Method 9012[a]) (mg/kg)
Record Number[b]	ER Sample ID	Sample Depth (ft)	
605651	6560-SP1-BH1-14-S	14	ND (0.0466)
605651	6560-SP1-BH1-19-S	19	ND (0.0419)
605651	6560-SP2-BH1-7-S	7	ND (0.0419)
605651	6560-SP2-BH1-12-S	12	ND (0.0419)
Quality Assurance/Quality Control Sample (mg/L)			
605655	6560-EB	NA	ND (0.00172)

[a] EPA November 1986.
[b] Analysis request/chain-of-custody record.
BH = Borehole.
DSS = Drain and Septic Systems.
EB = Equipment blank.
EPA = U.S. Environmental Protection Agency.
ER = Environmental Restoration.
ft = Foot (feet).
ID = Identification.
MDL = Method detection limit.
mg/kg = Milligram(s) per kilogram.
mg/L = Milligram(s) per liter.
NA = Not applicable.
ND ( ) = Not detected above the MDL, shown in parentheses.
S = Soil sample.
SP = Seepage pit.

Table 3.4.2-12
Summary of DSS Site 1028, Building 6560 Septic System and Seepage Pit Confirmatory Soil Sampling, Total Cyanide Analytical MDLs
August 2002
(Off-Site Laboratory)

Analyte	EPA Method 9012A[a] Detection Limit (mg/kg)
Total Cyanide	0.0419–0.0466

[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 1028, Building 6560 Septic System and Seepage Pit Confirmatory Soil Sampling, Gamma Spectroscopy Analytical Results
August 2002
(On-Site Laboratory)

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]
605640	6560-SP1-BH1-14-S	14	ND (0.0431)	--	0.855	0.422	**ND (0.251)**	--	ND (0.644)	--
605640	6560-SP1-BH1-19-S	19	ND (0.0341)	--	0.605	0.294	**ND (0.189)**	--	ND (0.485)	--
605640	6560-SP2-BH1-7-S	7	ND (0.0382)	--	0.75	0.367	0.103	0.184	ND (0.538)	--
605640	6560-SP2-BH1-12-S	12	ND (0.0371)	--	0.896	0.427	**ND (0.217)**	--	ND (0.532)	--
Background Activity—Southwest Area Supergroup[d]			0.079	NA	1.01	NA	0.16	NA	1.4	NA

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

[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.
DSS = Drain and Septic Systems.
EPA = U.S. Environmental Protection Agency.
ER = Environmental Restoration.
ft = Foot (feet).
ID = Identification.
MDA = Minimum detectable activity.
NA = Not applicable.
ND ( ) = Not detected above the MDA, shown in parentheses.
ND ( ) = Not detected, but the MDA (shown in parentheses) exceeds background activity.
pCi/g = Picocurie(s) per gram.
S = Soil sample.
SP = Seepage pit.
-- = Error not calculated for nondetect results.

Table 3.4.2-14
Summary of DSS Site 1028, Building 6560 Septic System and Seepage Pit
Confirmatory Soil Sampling, Gross Alpha/Beta Analytical Results
August 2002
(Off-Site Laboratory)

Sample Attributes			Activity (EPA Method 900.0[a]) (pCi/g)			
Record Number[b]	ER Sample ID	Sample Depth (ft)	Gross Alpha		Gross Beta	
			Result	Error[c]	Result	Error[c]
605651	6560-SP1-BH1-14-S	14	8.55	2.27	16.3	1.62
605651	6560-SP1-BH1-19-S	19	7.11	1.84	16.6	1.66
605651	6560-SP2-BH1-7-S	7	7.18	2.49	17	1.69
605651	6560-SP2-BH1-12-S	12	7.13	2	17.3	1.63
Background Activity[d]			17.4	NA	35.4	NA
Quality Assurance/Quality Control Sample (pCi/L)						
605655	6560-EB	NA	0.0901	0.226	0.448	0.244

[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.
DSS = Drain and Septic Systems.
EB = Equipment blank.
EPA = U.S. Environmental Protection Agency.
ER = Environmental Restoration.
ft = Foot (feet).
ID = Identification.
NA = Not applicable.
pCi/g = Picocurie(s) per gram.
pCi/L = Picocurie(s) per liter.
S = Soil sample.
SP = Seepage pit.

samples or the gross alpha/beta EB. These results indicate no significant levels of radioactive material are present in the soil at the site.

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 duplicate, EB, and TB samples. Typically, samples were shipped to the laboratory in batches of up to 20 samples; consequently any one shipment might contain samples from several sites. Aqueous EB samples were collected at an approximate frequency of 1 per 20 site samples. 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.

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 VOC data tables for the sites in that shipment. The results were used in the data validation process for all the samples in that batch. One VOC (toluene) was detected in the TB for DSS Site 1028 (Table 3.4.2-1).

A set of aqueous EB samples were collected following the completion of soil sampling at the Building 6560 Septic System and Seepage Pit in August 2002. The EB samples were analyzed for the same constituents as the soil samples that were sent to the off-site commercial laboratory for analysis. EB analytical results are presented in the DSS Site 1028 data summary tables, and are discussed in the previous section.

No duplicate samples were 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 C contains the data validation reports for the samples collected at this site. The data are acceptable for use in this NFA proposal.

3.5 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 1028.

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4.0 CONCEPTUAL SITE MODEL

The conceptual site model for DSS Site 1028, the Building 6560 Septic System and Seepage Pit, is based upon the COCs identified in the soil samples collected from beneath the two seepage pits at DSS Site 1028. 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 1028 are VOCs, SVOCs, PCBs, HE compounds, cyanide, RCRA metals, hexavalent chromium, and radionuclides. One VOC, one SVOC, and one PCB compound were detected, and there were no HE compounds, cyanide, or hexavalent chromium identified in any of the soil samples collected at this site. None of the eight RCRA metals were detected at concentrations above the approved maximum background concentrations for SNL/NM Southwest Area Supergroup soils (Dinwiddie September 1997) or above the nonquantified background concentrations. When a metal concentration exceeded its maximum background screening value, or had no quantified 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 However, the MDAs for three of the four uranium-235 analyses exceeded their corresponding background activities. 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 to the two seepage pits at this site. Possible secondary release mechanisms include the uptake of COCs that may have been released into the soil beneath the seepage pits (Figure 4.2-1). The depth to groundwater at the site (approximately 482 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 (the Risk Annex) provides additional discussion on the fate and transport of COCs at DSS Site 1028.

Table 4.2-1 summarizes the potential COCs for DSS Site 1028. 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 1028 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.

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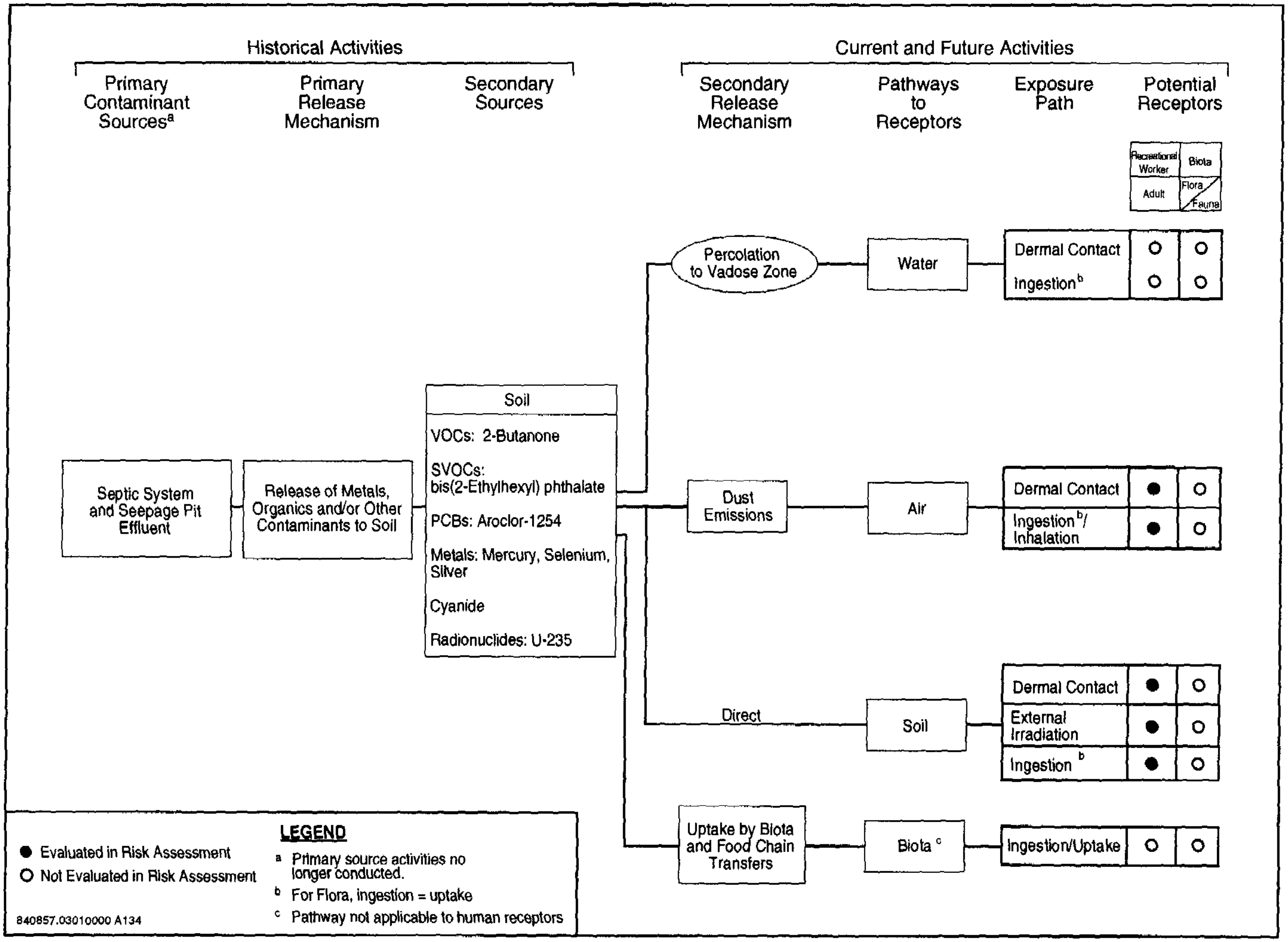

Figure 4.2-1

Conceptual Site Model Flow Diagram for DSS Site 1028, Building 6560 Septic System and Seepage Pit

Table 4.2-1
Summary of Potential COCs for DSS Site 1028, Building 6560 Septic System and Seepage Pit

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		4	2-Butanone	NA	0.0168	0.0118	3
SVOCs		4	bis(2-Ethylhexyl) phthalate	NA	0.0344 J	0.0199	1
PCBs		4	Aroclor-1254	NA	0.0102	0.0041	4
HE Compounds		4	None	NA	NA	NA	None
RCRA Metals		4	Mercury	NQ	0.0028 J	0.0019	None
		4	Selenium	NQ	0.267 J	0.1845	None
		4	Silver	NQ	ND (0.0902)	0.0433	None
Hexavalent Chromium		4	None	NA	NA	NA	None
Cyanide		4	Cyanide	NQ	ND (0.0466)	0.0215	None
Radionuclides (pCi/g)	Gamma Spectroscopy	4	Uranium-235	0.16	ND (0.251)	NC[f]	3
	Gross Alpha	4	None	NA	NA	NA	None
	Gross Beta	4	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 the MDA, 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.

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.

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 1028.

4.3 Site Assessment

Site assessment at DSS Site 1028 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 1028 in more detail.

4.3.1 Summary

The site assessment concluded that DSS Site 1028 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 1028. This section summarizes the results.

4.3.2.1 Human Health

DSS Site 1028 has been recommended for an industrial land-use scenario (DOE et al. September 1995). Because 2-butanone, bis(2-ethylhexyl) phthalate, PCBs, mercury, selenium, silver, cyanide and uranium-235 are present above background or have nonquantified background levels, it was necessary to perform a human health risk assessment analysis for the site, which included these COCs. Annex 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 soil at DSS Site 1028 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 1028 is 0.00 for the industrial land-use scenario, which is less than the numerical standard of 1.0 suggested by risk assessment guidance (EPA 1989). The incremental HI risk, determined by subtracting risk associated with background from potential nonradiological COC risk (without rounding), is 0.00. The excess cancer risk for DSS Site 1028 COCs is 2E-10 for the 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 1.79E-10. Both the incremental HI and excess cancer risk are below NMED guidelines.

The HI calculated for the COCs at DSS Site 1028 is 0.00 for the residential land-use scenario, which is less than the numerical standard of 1.0 suggested by risk assessment guidance (EPA 1989). Incremental HI risk, determined by subtracting risk associated with background from potential nonradiological COC risk (without rounding), is 0.00. The excess cancer risk for DSS Site 1028 COCs is 8E-10 for the 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 below the suggested acceptable risk value. The incremental excess cancer risk is 7.78E-10. Both the incremental HI and incremental excess cancer risk are below NMED guidelines.

For the radiological COCs, one of the constituents (uranium-235) had MDA values greater than the corresponding background values.

The incremental total effective dose equivalent (TEDE) and corresponding estimated cancer risk from radiological COCs are much lower than the EPA guidance values; the estimated TEDE is 1.3E-2 millirem (mrem)/year (yr) for the industrial land-use scenario. This value is much lower than the EPA's numerical guidance of 15 mrem/yr (EPA 1997a). The corresponding incremental estimated cancer risk value is 1.6E-7 for the industrial land-use scenario. Furthermore, the incremental TEDE for the residential land-use scenario that results from a complete loss of institutional controls is 3.4E-2 mrem/yr with an associated risk of 4.6E-7. The guideline for this scenario is 75 mrem/yr (SNL/NM February 1998). Therefore DSS Site 1028 is eligible for unrestricted radiological release.

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

Table 4.3.2-1
Summation of Incremental Radiological and Nonradiological Risks from
DSS Site 1028, Building 6560 Septic System and Seepage Pit Carcinogens

Scenario	Nonradiological Risk	Radiological Risk	Total Risk
Industrial	1.79E-10	1.6E-7	1.6E-7
Residential	7.78E-10	4.6E-7	4.6E-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 1997b) also 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 also required developing a site conceptual model and a food web model, as well as selecting ecological receptors, as presented in "Predictive Ecological Risk Assessment Methodology, Environmental Restoration Program, Sandia National Laboratories, New Mexico" (IT July 1998). The risk assessment also includes the estimation of exposure and ecological risk.

All COCs at DSS Site 1028 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 1028 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 1028, 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 1028 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 1028 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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ANNEX A
DSS Site 1028
Septic Tank Sampling Results

4-17-91

Results of septic tank sampling conducted between 12/18/90 and 1/8/91 for buildings noted.

DB Dionne

4-17-91

Nick Durand,

For your information.

David Dionne

TABLE 8

SUMMARY OF ANALYTICAL RESULTS FOR DETECTED PARAMETERS TECHNICAL AREA III AND COYOTE CANYON TEST FIELD SEPTIC TANK SAMPLING

BUILDING 6560

SAMPLE NUMBERS SNLA004886, SNLA004887

Parameter	Results	Units
VOLATILE ORGANICS		
Acetone*	15	µg/l
Toluene	12	µg/l
SEMIVOLATILE ORGANICS		
Bis (2-Ethylhexyl) phtalate	22	µg/l
INORGANICS		
Oil and Grease	0.24	mg/l
Nitrates as N	2.5	mg/l
Phenolics	0.029	mg/l
METALS		
Barium	0.17	mg/l
Cadmium	0.015	mg/l
Chromium	0.021	mg/l
Copper	0.49	mg/l
Lead	0.56	mg/l
Managanese	0.036	mg/l
Mercury	0.00026	mg/l
Zinc	0.84	mg/l
RADIOLOGICAL		
Gross Alpha	28	pCi/l
Gross Beta	42	pCi/l

*Not on total toxic organics list

Results of Septic Tank Analyses
(Sludge Sample)

Building No./Area:	**6560 A-3**
Tank ID No.:	**AD89010R**
Date Sampled:	**7/29/92**
Sample ID No.:	**SNLA008584**

Analytical Parameter	Measured Concentration	± 2 Sigma Uncertainty	Units
Gross Alpha	3E+1	2E+1	pCi/g
Gross Beta	3E+1	4E+1	pCi/g
Gross Alpha	2E+1	2E+1	pCi/g
Gross Beta	6E+1	5E+1	pCi/g
Gross Alpha	2E+1	2E+1	pCi/g
Gross Beta	4E+1	4E+1	pCi/g
Gross Alpha	4E+1	3E+1	pCi/g
Gross Beta	3E+1	4E+1	pCi/g
Tritium	1E+02	3E+02	pCi/L
Bismuth-214	0.0819	0.0121	pCi/mL
Cesium-137	0.00615	0.00317	pCi/mL
Potassium-40	0.328	0.0809	pCi/mL
Lead-212	0.0410	0.00960	pCi/mL
Lead-214	0.0675	0.00845	pCi/mL
Radium-226	0.645	0.0878	pCi/mL
Thorium-234	<0.281	NA	pCi/mL
Thallium-208	<0.0168	NA	pCi/mL

ND = Not Detected
NA = Not Applicable

Building 6560
Area 3
Sample ID No. SNLA008584
Tank ID No. AD 89010R

On July 29, 1992, a sludge sample was collected from the septic tank serving Building 6560. During review of the radiochemistry data, the following item was noted:

- ^{226}Ra was measured at 0.645 pCi/mL, which does not exceed the IL calculated during this monitoring effort. However, this finding exceeds U. S. Department of Energy derived concentration guideline limit of 0.5 pCi/mL. This indicates that reinvestigating this location using a more sensitive technique for assaying ^{226}Ra may be warranted.

RESULTS OF SEPTIC TANK SAMPLING
CHEMICAL ANALYSES OF AQUEOUS SAMPLE

Building ID: Bldg 6560
Sample ID Number: 024401
Date Sampled: 7-05-95

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)*	
None detected above DL	ND	various	various	TTO = 5.0	
Semivolatile Organics (8270)	*(mg/L)*	*(mg/L)*	*(mg/L)*	*(mg/L)*	
bis(2-Ethylhexyl)Phthalate	0.045	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	ND	0.010	0.1	2.0	
Barium	0.0571J	0.200	1.0	20.0	
Cadmium	ND	0.005	0.01	2.8	
Chromium	ND	0.020	0.05	20.0	
Copper	0.350	0.025	1.0	16.5	
Lead	ND	0.003	0.05	3.2	
Manganese	0.0842	0.015	0.2	20.0	
Nickel	ND	0.040	0.2	12.0	
Selenium	0.0034J	0.005	0.05	2.0	
Silver	ND	0.010	0.05	5.0	
Thallium	ND	0.010	NR	NR	
Zinc	0.0280	0.020	10.0	28.0	
Mercury	0.00027	0.0002	0.002	0.1	
Miscellaneous Analyses	*(mg/L)*	*(mg/L)*	*(mg/L)*	*(mg/L)*	
Field pH	8.4 pH units	0 - 14 pH units	6 – 9 pH units	5 – 11 pH units	
Formaldehyde (NIOSH 3500)	0.25	0.050	NR	260.0	
Fluoride (300.0)	0.89	0.10	1.6	180.0	
Nitrate + Nitrite (353.1)	2.010	0.500	10.0	NR	

Refer to footnotes at end of table.

RESULTS OF SEPTIC TANK SAMPLING

CHEMICAL ANALYSES OF AQUEOUS SAMPLE

Building ID: Bldg 6560

Sample ID Number: 024401

Date Sampled: 7-05-95

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)*	
Oil + Grease (9070)	38.6	0.93	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.

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 6560

Sample ID Number: 024401

Date Sampled: 7-05-95

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)	4.17 ± 1.38	2.21	0.96	NR	
Gross Beta (9310)	27.9 ± 3.1	1.7	0.82	NR	
Isotopic Analyses	*(pCi/L ± 2-σ)*	*(pCi/L)*	*(pCi/L)*	*(pCi/L)*	
Tritium (906.0)	-6.7 ± 52.5	89.3	44.2	NR	
Uranium-238[b]	1.34 ± 0.45	0.12	0.092	NR	
Uranium-235/236[b]	0.20 ± 0.16	0.17	0.12	NR	
Uranium-234[b]	2.63 ± 0.73	0.20	0.13	NR	
Gamma Spectroscopy[c]	*(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] Isotopic uranium analyzed by NAS-NS-3050.

[c] *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 6560
Sample ID Number: 024401
Date Sampled: 7-05-95
Percent Moisture: Not Reported

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	84	67	NR	NR	
Acetone (reanalyses)	68	67	NR	NR	
Toluene	130	67	0.75	TTO = 5.0	
Toluene (reanalyses)	190	67	0.75	TTO = 5.0	
Ethylbenzene	13J	67	0.75	TTO = 5.0	
Ethylbenzene (reanalyses)	19J	67	0.75	TTO = 5.0	
Semivolatile Organics (8270)	*(µg/kg)*	*(µg/kg)*	*(mg/L)*	*(mg/L)*	
Fluorene	330J	2200	NR	TTO = 5.0	
Phenanthrene	920J	2200	NR	TTO = 5.0	
Pyrene	400J	2200	NR	TTO = 5.0	
ButylBenzylPhthalate	450J	2200	NR	TTO = 5.0	
bis(2-Ethylhexyl)Phthalate	1700BJ	2200	NR	TTO = 5.0	
Pesticides/PCBs (8080)	*(µg/kg)*	*(µg/kg)*	*(mg/L)*	*(mg/L)*	
beta-BHC	45	11	NR	TTO = 5.0	
4,4'-DDE	ND X	130	NR	TTO = 5.0	
Endrin	ND X	45	NR	TTO = 5.0	
4,4'-DDT	ND X	81	NR	TTO = 5.0	
Aroclor-1254	1600	220	0.001	TTO = 5.0	
Metals (6010/7470)	*(mg/kg)*	*(mg/kg)*	*(mg/L)*	*(mg/L)*	
Arsenic	12.4	6.6	0.1	2.0	
Barium	226	132	1.0	20.0	
Cadmium	37.7	3.3	0.01	2.8	
Chromium	47.8	13.2	0.05	20.0	
Copper	2150	16.5	1.0	16.5	

Refer to footnotes at end of table.

RESULTS OF SEPTIC TANK SAMPLING

CHEMICAL ANALYSES OF SLUDGE SAMPLE

Building ID: Bldg 6560

Sample ID Number: 024401

Date Sampled: 7-05-95

Percent Moisture: Not Reported

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)*	
Lead	172	2.0	0.05	3.2	
Manganese	64.9	9.9	0.2	20.0	
Nickel	28.4	26.4	0.2	12.0	
Selenium	14.2	3.3	0.05	2.0	
Silver	10.4	6.6	0.05	5.0	
Thallium	ND	6.6	NR	NR	
Zinc	1590	13.2	10.0	28.0	
Mercury	5.2	0.66	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.
DL = Detection limit indicated on laboratory report.
IDL = Instrument detection limit.
J = Estimated value of analyte, detected between DL and IDL.
ND = Not detected above DL indicated.
NR = Not regulated.
TTO = Total toxic organics.
X = Elevated detection limit because of PCB interference.

RESULTS OF SEPTIC TANK SAMPLING
RADIOLOGICAL ANALYSES OF SLUDGE SAMPLE

Building ID: Bldg 6560
Sample ID Number: 024401
Date Sampled: 7-05-95
Percent Moisture: Not Reported

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	-0.006 ± 0.002	0.029	0.019	NR	
Plutonium-238	-0.006 ± 0.002	0.029	0.019	NR	
Strontium-90	0.15 ± 0.03	0.18	0.09	NR	
Thorium-232	0.22 ± 0.10	0.063	0.041	NR	
Thorium-230	0.25 ± 0.10	0.069	0.042	NR	
Thorium-228	0.51 ± 0.16	0.074	0.047	NR	
Uranium-238	15.4 ± 3.2	0.045	0.028	NR	
Uranium-235/236	2.71 ± 0.61	0.035	0.025	NR	
Uranium-234	24.1 ± 5.0	0.070	0.041	NR	
Dry Gamma Spectroscopy[c]	*(pCi/g ± 2-σ)*	*(pCi/g)*	*(pCi/g)*	*(pCi/g)*	
Cesium-137	0.020 ± 0.078	0.008	0.004	NR	
Cesium-134	ND	0.007	0.003	NR	
Potassium-40	4.69 ± 0.50	0.07	0.033	NR	
Chromium-51	ND	0.082	0.04	NR	
Iron-59	ND	0.020	0.01	NR	
Cobalt-60	ND	0.008	0.004	NR	
Zirconium-95	ND	0.015	0.007	NR	
Ruthenium-103	ND	0.008	0.004	NR	
Ruthenium-106	ND	0.064	0.031	NR	
Cerium-144	ND	0.050	0.025	NR	
Thallium-208	0.088 ± 0.013	0.008	NL	NR	
Lead-212	0.27 ± 0.03	0.01	0.006	NR	
Lead-214	0.22 ± 0.02	0.02	0.008	NR	
Bismuth-212	0.16 ± 0.05	0.06	NL	NR	
Bismuth-214	0.23 ± 0.03	0.02	NL	NR	
Radium-226	0.22 ± 0.02	0.02	0.008	30.0[d]	

Refer to footnotes at end of table.

RESULTS OF SEPTIC TANK SAMPLING
RADIOLOGICAL ANALYSES OF SLUDGE SAMPLE

Building ID: Bldg 6560

Sample ID Number: 024401

Date Sampled: 7-05-95

Percent Moisture: Not Reported

Parameter (Method)	Result	MDA	Critical Level	NM Discharge Limit[a]	Comments
Dry Gamma Spectroscopy[c]	*(pCi/g ± 2-σ)*	*(pCi/g)*	*(pCi/g)*	*(pCi/g)*	
Radium-228	0.22 ± 0.03	0.03	0.013	30.0[d]	
Actinium-228	0.22 ± 0.03	0.03	0.013	NR	
Thorium-231	ND	0.23	0.11	NR	
Thorium-232	0.22 ± 0.03	0.03	0.013	NR	
Thorium-234	1.80 ± 0.31	0.20	0.098	NR	
Uranium-235	0.13 ± 0.02	0.05	0.025	NR	
Uranium-238	1.80 ± 0.31	0.20	0.098	NR	
Americium-241	ND	0.23	0.11	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.
NL = Not listed.
NR = *Not regulated.*

ANNEX B
DSS Site 1028
Gore-Sorber™ Passive Soil-Vapor Survey Analytical Results

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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

Jay W. Hodny, Ph.D.
Associate

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

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

1 of 6

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
Jay W. Hodny

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

Analytical Data Reviewed by:
Jim E. Whetzel, Chemist
Jim Whetzel

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This document shall not be reproduced, except in full, without written approval of W.L. Gore & Associates

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
 # Modules Retrieved: 131
 # Modules Lost in Field: 4
 # Modules Not Returned: 1

Exposure Time: ~15 **[days]**
 # Trip Blanks Returned: 3
 # Unused Modules Returned: 3

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.

- 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
Address: ACCOUNTS PAYABLE MS0154
P.O.BOX 5130
ALBUQUERQUE NM 87185 U.S.A.
Phone: 505-284-3303
FAX: 505-284-2616

Site Name: NON-ER D~~U~~RAIN+ SEPTIC
Site Address: ~~KIVL 2ND~~ AFB, NM
KIRTLAND
Project Manager: MIKE SANDERS
Customer Project No.:
Customer P.O. #: 28518 Quote #: 211946

Serial # of Modules Shipped

# 179087	- # 179144	# 179087	- # 179134
# 179150	- # 179233	# 179135	- # 179136
#	- #	# 179139	- #
#	- #	# 179142	- # 179144
	- #	# 179150	- # 179151
	- #	#	- #
	- #	#	- #
#	- #	#	- #
#	- #	#	- #
#	- #	#	- #

# 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*)

		#
# 179227	#	#
#	#	#
#	#	#
#	#	#
#	#	#
#	#	#
#	#	#
#	#	#

Prepared By:
Verified By: Mary Ann Naughi

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 108157 : [✓ AM] PM
Installation Complete Date and Time: 5/6/02 109401 : [✓ 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 Affiliation: W.L. Gore & Associates, Inc.	3-4-02	12:00	Received By: Mike Sander Affiliation: Sandia / ER	3-6-02	
Relinquished By William J. Fehy Affiliation: 6135	5-14-02	1258	Received By: Affiliation:		
inquished By Affiliation			Received By: Mary Ann Naughi Affiliation: W.L. Gore & Associates, Inc.	5/17/02	14:00

GORE-SORBER ® Screening Survey is a registered service mark of W.L. Gore & Associates, Inc.

*FORM 8R.8
1/08/01*

GORE-SORBER® Screening Survey Chain of Custody

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

GORE Creative Technologies Worldwide

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
Address: ACCOUNTS PAYABLE MS0154
P.O.BOX 5130
ALBUQUERQUE NM 87185 U.S.A.
Phone: 505-284-3303
FAX: 505-284-2616

Site Name: NON-ER DUAIN+ SEPTIC
Site Address: ~~KIVL 2ND~~ AFB, NM
KIRTLAND
Project Manager: MIKE SANDERS
Customer Project No.:
Customer P.O. #: 28518 Quote #: 211946

Serial # of Modules Shipped

# of Modules for Installation 135 # of Trip Blanks 7

# 179087 - # 179144	[redacted]
# 179150 - # 179233	[redacted]
# - #	# - #
# - #	# - #
- #	# - #
- #	# - #
- #	# - #
# - #	# - #
# - #	# - #
# - #	# - #

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

Serial # of Trip Blanks (*Client Decides*)		#
[redacted]	#	#
[redacted]	#	#
#	#	#
#	#	#
#	#	#
#	#	#
#	#	#
#	#	#

Prepared By:
Verified By: Mary Anne

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 10815T : [✓ AM] PM
Installation Complete Date and Time: 5/6/02 109401 : [✓ AM] PM

Retrieval Performed By:
Name (*please print*): GILBERT QUINTANA
Company/Affiliation:1 SNL/NM

Total Modules Retrieved: 79 Pieces
Total Modules Lost in Field: 4 Pieces
Total Unused Modules Returned: 3 Pieces

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

	Date	Time		Date	Time
Relinquished By Affiliation: W.L. Gore & Associates, Inc.	3-4-02	12:00	Received By: Mike Sanders Affiliation: Sandia ; 6133	3-9-02	
Relinquished By William J Riley Affiliation: Sandia NL, 6135	5-21-02	0935	Received By: Affiliation:		
Relinquished By Affiliation			Received By: Mary Anne Affiliation: W.L. Gore & Associates, Inc.	5-24-02	13:30

GORE-SORBER ® Screening Survey is a registered service mark of W.L. Gore & Associates, Inc.

FORM 8R.8
1/08/01

GORE-SORBER® Screening Survey Installation and Retrieval Log

of 4

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						1026/6504-65- 3
44.	179130	1437	5-10-02, 1051						↓ 1
45.	179131	1442	5-10-02, 1053						1025/6504- 1
46.	179132	1446	↓						2
47.	179133	↓ 1509	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
	179144	1142							3
	179150	1150	↓						4
	179151	↓ 1155	5-10-02, 11:54						↓ 1
	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 ↓ 10:21						↓ 4
66.	179157	0930	05-14-02 0919						1083/6570- 4
67.	179158	0934							1
68.	179159	0940							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, 11:13						↓ 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
	179172	1325	0902						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 is a registered service mark of W.L. Gore & Associates, Inc.

FORM 29R.1
6/13/01

GORE-SORBER® Screening Survey
Installation and Retrieval Log

1 of 4

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	
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	1254							-2
15.	179101	1304							-1
16.	179102	1347	0920						1082/6620- -4
	179103	1355							-5
18.	179104	1404							-1
19.	179105 ✓	1431							-[illegible]
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
	179125	1043							4
40.	179126	1052							3
41.	179127	1103	1041						2
42.	179128	1420	5-10-02 1045						1026/6501- 2

DSS SITE 1028

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FORM 29R.1
6/13/01

GORE SORBER SCREE 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	
5/20/2002	179087	0.03	nd	nd	bdl	0.01	0.02	0.51	0.04	0.02	0.45	0.06
5/20/2002	179088	nd	nd	nd	nd	nd	nd	0.53	0.03	0.02	0.48	0.00
5/20/2002	179089	nd	nd	nd	nd	nd	nd	0.35	0.04	0.02	0.29	0.00
5/20/2002	179090	0.02	nd	nd	nd	0.02	nd	0.94	0.06	0.03	0.85	0.04
5/20/2002	179091	0.13	nd	0.06	nd	0.05	0.02	0.12	0.03	0.04	0.05	0.03
5/20/2002	179092	nd	nd	nd	nd	nd	nd	0.22	0.04	0.01	0.17	0.00
5/20/2002	179093	0.00	nd	nd	nd	bdl	nd	0.33	0.04	0.01	0.28	nd
5/20/2002	179094	0.00	nd	bdl	nd	nd	nd	0.41	0.03	0.01	0.37	nd
5/20/2002	179095	nd	nd	nd	nd	nd	nd	0.45	0.05	0.06	0.34	0.00
5/20/2002	179096	nd	nd	nd	nd	nd	nd	0.44	0.06	0.05	0.33	0.06
5/20/2002	179097	0.05	nd	nd	nd	0.03	0.02	0.60	0.04	0.02	0.53	0.03
5/20/2002	179098	0.02	nd	nd	nd	0.02	nd	0.80	0.04	0.02	0.74	0.00
5/20/2002	179099	nd	nd	nd	nd	nd	nd	0.63	0.05	0.01	0.57	0.00
5/20/2002	179100	nd	nd	nd	nd	nd	nd	0.24	0.04	0.03	0.18	nd
5/21/2002	179101	0.06	nd	0.04	nd	0.02	nd	1.66	0.11	0.21	1.33	0.00
5/21/2002	179102	0.01	nd	nd	nd	0.01	nd	0.45	0.04	0.03	0.38	0.00
5/21/2002	179103	0.44	nd	0.19	0.04	0.17	0.04	1.04	0.11	0.05	0.89	0.04
5/21/2002	179104	0.01	nd	nd	nd	0.01	nd	0.39	0.04	0.01	0.34	0.00
5/21/2002	179105	nd	nd	nd	nd	nd	nd	0.08	0.04	0.02	0.03	0.00
5/21/2002	179106	0.03	nd	0.03	bdl	nd	nd	0.48	0.03	0.03	0.43	0.00
5/21/2002	179107	0.09	nd	0.07	nd	0.02	nd	0.30	0.09	0.12	0.10	0.04
5/21/2002	179108	0.06	nd	0.04	nd	0.02	bdl	0.04	0.03	0.01	bdl	0.00
5/21/2002	179109	0.02	nd	nd	nd	0.02	nd	0.00	bdl	bdl	bdl	0.00
5/21/2002	179110	0.00	nd	bdl	nd	nd	nd	0.03	0.03	bdl	bdl	0.00
5/21/2002	179111	nd	nd	nd	nd	nd	nd	0.07	0.04	0.01	0.02	0.00
5/21/2002	179112	0.04	nd	0.03	nd	0.01	nd	0.02	0.02	bdl	bdl	0.00
5/21/2002	179113	0.02	nd	0.02	nd	nd	nd	0.02	0.02	bdl	bdl	0.00
5/21/2002	179114	nd	nd	nd	nd	nd	nd	0.09	0.04	0.02	0.03	0.00
5/21/2002	179115	0.02	nd	nd	nd	0.02	nd	0.09	0.03	0.03	0.03	0.00
5/21/2002	179116	nd	nd	nd	nd	nd	nd	0.05	0.03	0.02	bdl	nd
5/21/2002	179117	0.09	nd	0.07	nd	0.03	nd	1.21	0.05	0.32	0.85	0.00
5/21/2002	179118	0.16	nd	0.11	nd	0.05	nd	0.05	0.05	bdl	bdl	0.00
5/21/2002	179119	0.08	nd	0.06	nd	0.01	nd	0.06	0.04	0.02	bdl	0.00
5/21/2002	179120	0.33	nd	0.21	nd	0.09	0.03	0.12	0.07	0.03	0.02	0.00
5/21/2002	179121	0.07	0.05	nd	nd	0.02	nd	0.05	0.04	0.02	bdl	0.00
5/21/2002	179122	nd	nd	nd	nd	nd	nd	0.05	0.03	0.01	bdl	nd
5/21/2002	179123	nd	nd	nd	nd	nd	nd	0.00	bdl	nd	bdl	nd
5/21/2002	179124	0.10	nd	0.08	nd	0.02	nd	0.05	0.04	0.01	bdl	nd

DSS SITE
1028

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

SSD SITE 1028

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	
5/21/2002	179125	0.10	nd	0.08	nd	0.02	nd	0.05	0.04	0.01	bdl	0.00
5/21/2002	179126	0.00	nd	nd	nd	bdl	nd	0.04	0.03	0.02	bdl	0.00
5/21/2002	179127	0.09	nd	0.05	nd	0.02	0.01	0.04	0.04	bdl	bdl	0.00
5/21/2002	179128	0.07	nd	0.05	nd	0.02	nd	0.08	0.04	0.01	0.03	0.00
5/21/2002	179129	0.02	nd	nd	nd	0.02	nd	0.06	0.03	0.03	bdl	0.00
5/21/2002	179130	0.21	nd	0.15	nd	0.04	0.02	0.15	0.07	0.03	0.05	0.00
5/21/2002	179131	nd	nd	nd	nd	nd	nd	0.07	0.04	0.01	0.02	nd
5/21/2002	179132	nd	nd	nd	nd	nd	nd	0.05	bdl	0.02	0.02	0.00
5/21/2002	179133	0.08	nd	0.08	nd	nd	nd	0.19	0.04	0.09	0.05	nd
5/21/2002	179134	nd	nd	nd	nd	nd	nd	0.05	0.03	0.02	bdl	0.00
5/21/2002	179135	0.11	nd	0.10	nd	0.01	nd	0.16	0.04	0.04	0.08	0.00
5/21/2002	179136	0.09	nd	0.09	nd	nd	nd	0.04	0.02	0.01	bdl	0.00
5/21/2002	179139	nd	nd	nd	nd	nd	nd	0.68	0.07	0.10	0.51	0.00
5/21/2002	179142	0.11	nd	0.07	nd	0.03	0.01	0.25	0.12	0.07	0.06	0.00
5/21/2002	179143	nd	nd	nd	nd	nd	nd	0.07	0.03	0.02	0.03	nd
5/21/2002	179144	0.17	nd	0.09	0.02	0.05	0.01	0.08	0.04	0.01	0.02	0.00
5/21/2002	179150	0.40	nd	0.19	0.04	0.13	0.04	0.07	0.05	0.02	bdl	0.00
5/21/2002	179151	nd	nd	nd	nd	nd	nd	0.03	0.03	bdl	bdl	0.00
5/28/2002	179152	0.09	nd	0.05	nd	0.03	0.02	0.19	0.06	0.02	0.11	0.08
5/28/2002	179153	0.13	nd	0.08	nd	0.04	0.02	0.13	0.03	0.02	0.08	0.13
5/28/2002	179154	nd	nd	nd	nd	nd	nd	0.11	0.02	0.01	0.07	0.00
5/28/2002	179155	nd	nd	nd	nd	nd	nd	0.06	bdl	0.02	0.04	0.00
5/28/2002	179156	nd	nd	nd	nd	nd	nd	0.22	0.15	0.01	0.06	0.00
5/28/2002	179157	nd	nd	nd	nd	nd	nd	0.12	0.04	0.02	0.06	0.00
5/28/2002	179158	0.01	nd	nd	nd	0.01	nd	0.11	0.05	0.01	0.05	0.00
5/28/2002	179159	0.00	nd	nd	nd	bdl	nd	0.07	0.03	0.01	0.03	0.00
5/28/2002	179160	nd	nd	nd	nd	nd	nd	0.02	bdl	0.02	bdl	0.00
5/28/2002	179161	0.00	nd	nd	nd	bdl	nd	0.08	0.03	0.02	0.03	0.00
5/28/2002	179162	0.01	nd	nd	nd	0.01	nd	0.10	0.03	0.03	0.04	0.00
5/28/2002	179163	0.01	nd	nd	nd	0.01	nd	0.07	0.02	0.02	0.03	0.00
5/28/2002	179164	0.02	nd	nd	nd	0.02	bdl	0.14	0.06	0.02	0.06	0.00
5/28/2002	179165	nd	nd	nd	nd	nd	nd	0.08	0.03	bdl	0.05	0.00
5/28/2002	179166	0.00	nd	bdl	nd	nd	nd	0.05	0.03	0.01	bdl	0.00
5/28/2002	179167	nd	nd	nd	nd	nd	nd	0.02	0.02	bdl	bdl	0.00
5/28/2002	179168	0.04	nd	0.03	nd	0.01	nd	0.09	0.04	0.02	0.03	0.00
5/28/2002	179169	nd	nd	nd	nd	nd	nd	0.06	0.03	0.01	0.02	nd
5/28/2002	179170	0.03	nd	nd	nd	0.03	nd	0.06	0.04	0.02	bdl	0.00
5/28/2002	179171	nd	nd	nd	nd	nd	nd	0.04	0.03	0.02	bdl	0.00

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 SCREE 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
179087	0.06	bdl	nd	nd	nd	0.11	0.06	0.05	nd	nd	nd	nd
179088	bdl	bdl	nd	nd	nd	0.02	0.02	bdl	nd	nd	nd	nd
179089	bdl	bdl	nd	nd	nd	0.04	0.02	0.02	nd	nd	nd	nd
179090	0.04	bdl	nd	nd	nd	0.15	0.10	0.05	nd	nd	nd	nd
179091	0.03	bdl	nd	nd	nd	0.02	0.02	bdl	nd	nd	nd	nd
179092	bdl	nd	nd	nd	nd	0.00	nd	bdl	nd	nd	nd	nd
179093	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd
179094	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd
179095	bdl	nd	nd	nd	nd	0.00	nd	bdl	nd	nd	nd	nd
179096	0.06	bdl	nd	nd	nd	0.56	0.34	0.23	nd	nd	0.03	nd
179097	0.03	bdl	nd	nd	nd	0.04	0.02	0.02	nd	nd	nd	nd
179098	bdl	nd	nd	nd	nd	0.00	nd	bdl	nd	nd	nd	nd
179099	bdl	nd	nd	nd	nd	0.00	nd	bdl	nd	nd	nd	nd
179100	nd	nd	nd	nd	nd	0.00	nd	bdl	nd	nd	nd	nd
179101	bdl	bdl	nd	nd	nd	0.02	0.02	bdl	nd	nd	nd	nd
179102	bdl	nd	nd	nd	nd	0.00	nd	bdl	nd	nd	nd	nd
179103	0.04	bdl	nd	nd	nd	0.10	0.04	0.06	nd	nd	nd	nd
179104	bdl	nd	nd	nd	nd	0.00	nd	bdl	nd	nd	nd	nd
179105	bdl	nd	nd	nd	nd	0.00	nd	bdl	nd	nd	nd	nd
179106	bdl	bdl	nd	nd	nd	0.00	nd	bdl	nd	nd	nd	nd
179107	0.04	bdl	nd	nd	nd	0.09	0.07	0.02	nd	nd	nd	nd
179108	bdl	bdl	nd	nd	nd	0.00	nd	bdl	nd	nd	nd	nd
179109	bdl	nd	nd	nd	nd	0.01	0.01	bdl	nd	nd	nd	nd
179110	bdl	nd	nd	nd	nd	0.02	0.02	bdl	nd	nd	nd	nd
179111	bdl	nd	nd	nd	nd	0.00	nd	bdl	nd	nd	nd	nd
179112	bdl	bdl	nd	nd	nd	0.03	nd	0.03	nd	nd	nd	nd
179113	bdl	nd	nd	nd	nd	0.00	nd	bdl	nd	nd	nd	nd
179114	bdl	bdl	nd	nd	nd	0.02	0.02	bdl	nd	nd	nd	nd
179115	bdl	nd	nd	nd	nd	0.00	nd	bdl	nd	nd	nd	nd
179116	nd	nd	nd	nd	nd	0.00	nd	bdl	nd	nd	nd	nd
179117	bdl	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd
179118	bdl	nd	nd	nd	nd	0.00	nd	bdl	nd	nd	nd	nd
179119	bdl	bdl	nd	nd	nd	0.00	nd	bdl	nd	nd	0.03	nd
179120	bdl	bdl	nd	nd	nd	0.00	nd	bdl	nd	nd	bdl	nd
179121	bdl	bdl	nd	nd	nd	0.02	0.02	bdl	nd	nd	nd	nd
179122	nd	nd	nd	nd	nd	0.00	nd	bdl	nd	nd	nd	nd
179123	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd
179124	nd	nd	nd	nd	nd	0.00	nd	bdl	nd	nd	nd	nd

DSS SITE 1028

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

DSS SITE 1028

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
179125	bdl	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd
179126	bdl	nd	nd	nd	nd	0.00	nd	bdl	nd	nd	nd	nd
179127	nd	bdl	nd	nd	nd	0.00	nd	bdl	nd	nd	nd	nd
179128	bdl	nd	nd	nd	nd	0.00	nd	bdl	nd	nd	nd	nd
179129	bdl	nd	nd	nd	nd	0.00	nd	bdl	nd	nd	nd	nd
179130	bdl	bdl	nd	nd	nd	0.00	nd	bdl	nd	nd	nd	nd
179131	nd	nd	nd	nd	nd	0.00	nd	bdl	nd	nd	nd	nd
179132	bdl	nd	nd	nd	nd	0.00	nd	bdl	nd	nd	bdl	nd
179133	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd
179134	bdl	nd	nd	nd	nd	0.00	nd	bdl	nd	nd	nd	nd
179135	bdl	bdl	nd	nd	nd	0.02	0.02	bdl	nd	nd	nd	nd
179136	bdl	nd	nd	nd	nd	0.00	nd	bdl	nd	nd	nd	nd
179139	bdl	nd	nd	nd	nd	0.00	nd	bdl	nd	nd	nd	nd
179142	bdl	bdl	nd	nd	nd	0.01	0.01	bdl	nd	nd	nd	nd
179143	nd	nd	nd	nd	nd	0.00	nd	bdl	nd	nd	nd	nd
179144	bdl	nd	nd	nd	nd	0.00	nd	bdl	nd	nd	nd	nd
179150	bdl	bdl	nd	nd	nd	0.02	0.02	bdl	nd	nd	bdl	nd
179151	bdl	nd	nd	nd	nd	nd	nd	nd	nd	nd	bdl	nd
179152	0.06	0.03	nd	nd	nd	0.11	0.05	0.06	nd	nd	nd	nd
179153	0.09	0.03	nd	nd	nd	0.16	0.09	0.07	nd	nd	nd	nd
179154	bdl	bdl	nd	nd	nd	0.04	0.02	0.02	nd	nd	nd	nd
179155	bdl	bdl	nd	nd	nd	0.00	nd	bdl	nd	nd	nd	nd
179156	bdl	bdl	nd	nd	nd	0.00	nd	bdl	nd	nd	nd	nd
179157	bdl	bdl	nd	nd	nd	0.03	nd	0.03	nd	nd	nd	nd
179158	bdl	bdl	nd	nd	nd	0.04	0.02	0.03	nd	nd	nd	nd
179159	bdl	bdl	nd	nd	nd	0.00	nd	bdl	nd	nd	nd	nd
179160	bdl	nd	nd	nd	nd	0.00	nd	bdl	nd	nd	nd	nd
179161	nd	bdl	nd	nd	nd	0.11	0.05	0.06	nd	nd	nd	nd
179162	bdl	nd	nd	nd	nd	0.05	0.02	0.03	nd	nd	nd	nd
179163	bdl	bdl	nd	nd	nd	0.02	0.02	bdl	nd	nd	nd	nd
179164	bdl	bdl	nd	nd	nd	0.04	0.02	0.02	nd	nd	nd	nd
179165	bdl	nd	nd	nd	nd	0.00	nd	bdl	nd	nd	nd	nd
179166	bdl	nd	nd	nd	nd	0.04	0.02	0.02	nd	nd	nd	nd
179167	bdl	nd	nd	nd	nd	0.04	nd	0.04	nd	nd	nd	nd
179168	bdl	bdl	nd	nd	nd	0.07	0.02	0.04	nd	nd	nd	nd
179169	nd	nd	nd	nd	nd	0.00	nd	bdl	nd	nd	nd	nd
179170	bdl	nd	nd	nd	nd	0.02	0.02	bdl	nd	nd	nd	nd
179171	bdl	bdl	nd	nd	nd	0.08	0.03	0.05	nd	nd	nd	nd

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 NATIO[illegible] 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	ClBENZ, ug
MDL=	0.02	0.02	0.01	0.01	0.03	0.03	0.01
179087	0.78	nd	0.03	0.02	bdl	nd	nd
179088	0.22	nd	0.02	nd	nd	nd	nd
179089	0.21	nd	0.03	nd	nd	nd	nd
179090	0.13	nd	0.02	nd	nd	nd	nd
179091	0.09	0.20	0.04	bdl	nd	nd	nd
179092	nd	nd	0.23	nd	nd	nd	nd
179093	nd	nd	0.03	nd	nd	nd	nd
179094	0.09	nd	0.33	nd	nd	nd	nd
179095	nd	nd	0.63	nd	nd	nd	nd
179096	0.05	nd	0.41	nd	nd	nd	nd
179097	bdl	nd	0.56	nd	nd	nd	nd
179098	bdl	nd	0.24	nd	nd	nd	nd
179099	0.04	nd	0.40	nd	nd	nd	nd
179100	0.12	nd	0.22	nd	nd	nd	nd
179101	0.04	nd	0.14	nd	nd	nd	nd
179102	nd	nd	0.05	nd	nd	nd	nd
179103	nd	0.18	0.03	nd	nd	nd	nd
179104	nd	nd	nd	nd	nd	nd	nd
179105	nd	nd	0.01	nd	nd	nd	nd
179106	nd	nd	0.05	nd	nd	nd	nd
179107	nd	nd	0.06	nd	nd	nd	nd
179108	nd	nd	0.02	nd	nd	nd	nd
179109	nd	nd	0.02	nd	nd	nd	nd
179110	nd	nd	0.02	nd	nd	nd	nd
179111	nd	nd	0.03	nd	nd	nd	nd
179112	nd	nd	nd	nd	nd	nd	nd
179113	0.14	nd	0.03	nd	nd	nd	nd
179114	2.52	0.07	0.09	nd	nd	nd	nd
179115	0.30	nd	0.06	nd	nd	nd	nd
179116	0.43	nd	0.02	nd	nd	nd	nd
179117	2.71	nd	0.10	nd	nd	nd	nd
179118	1.74	nd	0.33	nd	nd	nd	nd
179119	2.50	nd	0.88	nd	nd	nd	nd
179120	7.82	0.13	0.39	nd	nd	nd	nd
179121	11.48	nd	0.31	nd	nd	nd	nd
179122	4.17	nd	0.06	nd	nd	bdl	nd
179123	14.22	nd	0.24	nd	nd	nd	nd
179124	bdl	0.09	1.72	nd	nd	nd	nd

DSS SITE 1028 →

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

DSS SITE 1028

SAMPLE NAME	TCE, ug	OCT, ug	PCE, ug	14DCB, ug	CHCl3, ug	CCl4, ug	ClBENZ, ug
MDL=	0.02	0.02	0.01	0.01	0.03	0.03	0.01
179125	0.03	nd	1.24	nd	nd	nd	nd
179126	nd	nd	0.52	nd	nd	nd	nd
179127	nd	nd	0.55	nd	nd	nd	nd
179128	nd	nd	nd	nd	nd	nd	nd
179129	nd	nd	0.01	nd	nd	nd	nd
179130	nd	0.12	0.02	nd	nd	nd	nd
179131	nd	nd	nd	nd	nd	nd	nd
179132	nd	nd	0.75	nd	nd	nd	nd
179133	nd	nd	0.18	nd	nd	nd	nd
179134	nd	nd	0.33	nd	nd	nd	nd
179135	nd	nd	0.38	bdl	nd	nd	nd
179136	nd	nd	0.65	nd	0.05	nd	nd
179139	nd	nd	0.14	nd	nd	nd	nd
179142	nd	0.12	0.42	nd	nd	nd	nd
179143	0.41	nd	0.25	nd	nd	nd	nd
179144	0.84	0.13	0.21	nd	nd	nd	nd
179150	2.50	0.14	0.18	bdl	nd	nd	nd
179151	0.71	nd	0.32	nd	nd	nd	nd
179152	nd	nd	0.06	0.02	nd	nd	nd
179153	nd	nd	0.03	nd	0.08	nd	nd
179154	nd	nd	nd	nd	nd	nd	nd
179155	nd	nd	nd	nd	nd	bdl	nd
179156	nd	nd	nd	nd	nd	nd	nd
179157	nd	nd	0.38	nd	nd	nd	nd
179158	nd	nd	0.56	nd	nd	nd	nd
179159	nd	nd	0.60	nd	nd	nd	nd
179160	nd	nd	0.37	nd	nd	nd	nd
179161	nd	nd	nd	nd	nd	nd	nd
179162	nd	nd	bdl	nd	nd	nd	nd
179163	nd	nd	nd	nd	nd	nd	nd
179164	nd	nd	0.01	nd	nd	nd	nd
179165	nd	nd	nd	nd	nd	nd	nd
179166	nd	nd	nd	nd	nd	nd	nd
179167	nd	nd	nd	nd	nd	nd	nd
179168	nd	nd	nd	nd	nd	bdl	nd
179169	nd	nd	nd	nd	nd	nd	nd
179170	nd	nd	nd	nd	nd	nd	nd
179171	nd	nd	nd	nd	nd	nd	nd

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 C
DSS Site 1028
Soil Sample Data Validation Results

CONTRA LABORATORY
ANALYSIS REQUEST AND CHAIN OF CUSTODY

Internal Lab

Page 1 of 1

Batch No.

SMO Use

AR/COC 605651

Dept. No./Mail Stop: 6135/1089
Project/Task Manager: ~~Mike Sanders~~ Collins
Project Name: DSS soil sampling
Record Center Code: ER/1295/DSS/DAT
Logbook Ref. No.: ER 090
Service Order No. CF032-02

Date Samples Shipped: 8/22/02
Carrier/Waybill No. 11714
Lab Contact: Edie Kent 803-556-8171
Lab Destination: GEL
SMO Contact/Phone: Pam Puissant/505-844-3185
Send Report to SMO: Wendy Palencia/505-844-3132

Project/Task No.: 7223.02.03.02
SMO Authorization: Pam Puissant
Contract #: PO 21671
See attached letter order

☑ ~~Waste Characterization~~ JPC
-Send preliminary/copy report to:

☐ Released by COC No.:
☑ Validation Required

Bill To: Sandia National Labs (Accounts Payable)
P.O. Box 5800 MS 0154
Albuquerque, NM 87185-0154

Location: Tech Area
Building 6560 Room

Reference LOV(available at SMO)

Sample No.-Fraction	ER Sample ID or Sample Location Detail	Pump Depth (ft)	ER Site No.	Date/Time(hr) Collected	Sample Matrix	Container Type	Container Volume	Preservative	Collection Method	Sample Type	Parameter & Method Requested	Lab Sample ID
059686-001	6560/1028-SP1-BH1-14-S	14'	1028	8-21-02/1415	S	AS	4oz	4c	G	SA	VOC (8260B)	
059687-001	6560/1028-SP1-BH1-19-S	19'		1435	S	AS	4oz	4c	G	SA	VOC (8260B)	
059686-002	6560/1028-SP1-BH1-14-S	14'		1420	S	AG	500ml	4c	G	SA	see below for parameter *	
059687-002	6560/1028-SP1-BH1-19-S	19'		1440	S	AG	500ml	4c	G	SA	see below for parameter	
059688-001	6560/1028-SP2-BH1-7-S	7'		8-22-02/0905	S	AS	4oz	4c	G	SA	VOC (8260B)	
059689-001	6560/1028-SP2-BH1-12-S	12'		0925	S	AS	4oz	4c	G	SA	VOC (8260B)	
059688-002	6560/1028-SP2-BH1-7-S	7'		0910	S	AG	500ml	4c	G	SA	see below for parameter	
059689-002	6560/1028-SP2-BH1-12-S	12'		0930	S	AG	500ml	4c	G	SA	see below for parameter	
059690-001	6560/1028-SP2-BH1-TB			0935	DIW	G	3x40ml	HCL	G	TB	VOC (8260B)	

RMMA ☐ Yes ☑ No Ref. No.
Sample Disposal ☐ Return to Client ☑ Disposal by lab
Turnaround Time ☑ Normal ☐ Rush
Return Samples By:
Level of Rush:

Sample Tracking — Smo Use
Date Entered(mm/dd/yy) 08/29/02
Entered by: JPC
QC inits. RK

	Name	Signature	Init	Company/Organization/Phone/Cellular
Sample Team Members	J.Lee			Weston/6135/505-284-3309
	W.Gibson	William Gibson		MDM/6135/505-845-3267
	G.Quintana			Shaw/6135/505-284-3309

Special Instructions/QC Requirements
EDD ☑ Yes ☐ No
Level C Package ☑ Yes ☐ No

*Send report to:
Mike Sanders
Dept6135/MS/1089
Phone/505-284/2478
*Please list as separate report.

* SVOC (8270C)
PCBs(8082)Cr6+(7197)
HE(8330
Total Cyanide(9010)
RCRA Metals(6020,7000,
7471)
Gross alpha/beta (900)

Abnormal Conditions on Receipt

Lab Use

1.Relinquished by	Org. 6135	Date 8-22-02	Time 10:20
1. Received by M. Salazar	Org. 3125	Date 8/22/02	Time 1020
2.Relinquished by M. Salazar	Org. 3125	Date 8/22/02	Time 1050
2. Received by	Org.	Date	Time
3.Relinquished by	Org.	Date	Time
3. Received by	Org.	Date	Time
4.Relinquished by	Org.	Date	Time
4. Received by	Org.	Date	Time
5.Relinquished by	Org.	Date	Time
5. Received by	Org.	Date	Time
6.Relinquished by	Org.	Date	Time
6. Received by	Org.	Date	Time

CONTRACT LABORATORY
ANALYSIS REQUEST AND CHAIN OF CUSTODY

Internal Lab

Page 1 of __

Batch No.

SMO Use

AR/COC 605655

Dept. No./Mail Stop:	6135/1089	Date Samples Shipped:	8/22/02	Project/Task No.: 7223.02.03.02	☑ ~~Waste Characterization~~
Project/Task Manager:	~~Mike Sanders~~ Collins	Carrier/Waybill No.	11714	SMO Authorization: Pam Puissant	-Send preliminary/copy report to:
Project Name:	DSS soil sampling	Lab Contact:	Edie Kent 803-556-8171	Contract #: PO 21671	
Record Center Code:	ER/1295/DSS/DAT	Lab Destination:	GEL	See attached bottle order	☐ Released by COC No.:
Logbook Ref. No.:	ER 090	SMO Contact/Phone:	Pam Puissant/505-844-3185		☑ Validation Required
Service Order No.	CF032-02	Send Report to SMO:	Wendy Palencia/505-844-3132		Bill To: Sandia National Labs (Accounts Payable)
Location	Tech Area				P.O. Box 5800 MS 0154
Building 6560	Room		Reference LOV(available at SMO)		Albuquerque, NM 87185-0154

Sample No.-Fraction	ER Sample ID or Sample Location Detail	Pump Depth (ft)	ER Site No.	Date/Time(hr) Collected	Sample Matrix	Container Type	Container Volume	Preservative	Collection Method	Sample Type	Parameter & Method Requested	Lab Sample ID
059639-001	6560/1028-SP2-EB		NA	8-22-02/0800	L	G	3x40ml	HCL	G	SA	VOC (8260B)	
059639-002	6560/1028-SP2-EB			0805	L	AG	2x1lt	none	G	SA	SVOC (8270C)	
059639-003	6560/1028-SP2-EB			0810	L	AG	2x1lt	none	G	SA	PCB (8082)	
059639-004	6560/1028-SP2-EB			0815	L	AG	2x1lt	none	G	SA	HE (8330)	
059639-005	6560/1028-SP2-EB			0820	L	P	1lt	NaOH	G	SA	Total Cyanide(9010)	
059639-006	6560/1028-SP2-EB			0825	L	P	500ml	none	G	SA	Hex Chromium (7196)	
059639-007	6560/1028-SP2-EB			0830	L	P	500ml	HNO3	G	SA	RCRA metals (6010,7470)	
059639-008	6560/1028-SP2-EB			0835	L	P	1lt	HNO3	G	SA	Gross Alpha/Beta (900)	
059639-009	6560/1028-SP2-TB			0840	DIW	G	3x40ml	HCL	G	~~SA~~ TB	VOC (8260B)	

RMMA ☐ Yes ☑ No Ref. No.

Sample Disposal ☐ Return to Client ☑ Disposal by lab

Turnaround Time ☑ Normal ☐ Rush

Return Samples By:

Level of Rush:

Sample Tracking Smo Use

Date Entered(mm/dd/yy) 08/29/02

Entered by: JAC

QC inits.

Special Instructions/QC Requirements

EDD ☑ Yes ☐ No

Level C Package ☑ Yes ☐ No

***Send report to:**

Mike Sanders
Dept6135/MS/1089
Phone/505-284/2478

***Please list as separate report.**

Abnormal Conditions on Receipt

Lab Us

Sample Team Members

Name	Signature	Init	Company/Organization/Phone/Cellular
J.Lee			Weston/6135/505-284-3309
W.Gibson			MDM/6135/505-845-3267
G.Quintana			Shaw/6135/505-284-3309

1.Relinquished by	Org. 6135	Date 8-22-02	Time 10:20	4.Relinquished by	Org.	Date	Time
1. Received by	Org. 3125	Date 8/22/02	Time 1020	4. Received by	Org.	Date	Time
2.Relinquished by	Org. 3125	Date 8/22/02	Time 1050	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

Contra[illegible]rification Review (CVR)

Project Leader Collins
Project Name DSS Soil Sampling
Case No. 7223_02.03.02

AR/COC No. 605649, 650, 651, 655
Analytical Lab GEL
SDG No. 65936A, B, C, D

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	No	If no, explain	Resolved? Yes	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		605649-one vial received w/ headspace, was not used for analyses		

2.0 Analytical Laboratory Report

Line No.	Item	Complete? Yes	No	If no, explain	Resolved? Yes	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	X				
2.10	Narrative provided	X				
2.11	TAT met	X				
2.12	Hold times met		X	tetryl re-extracted and re-analyzed out of holding limits for HE analysis		
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	tetryl re-extracted and analyzed out of holding time for HE analysis
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	HE MS recovery data not within SNL contractual limits but within GEL acceptance limits; NPN MS not within SNL limits but within GEL acceptance limits; barium not within acceptance limits; alpha MS recovery failed low
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	bis(2-Ethylhexyl)phthalate detected in SVOC method blank; barium, chromium, lead, silver detected in RCRA metals DI water method blank; cyanide detected in method blank
b) Sampling blank (e.g., field, trip, and equipment) data reported and met		X	toluene detected in VOC trip blank; barium, detected in RCRA metals DI water equipment blank
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	X		
3.8 Narrative included, correct, and complete	X		
3.9 Second column confirmation data provided for methods 8330 (high explosives) and 8082 (pesticides/PCBs)	X		

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 and 8082)			
a) Initial calibration provided	X		
b) Continuing calibration provided	X		
c) Instrument run logs provided	X		
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	X		

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
059687-001	VOC	incorrect sample ID/Client Description (page 51): correct ID is 6560/1028-SP1-BH1-19S
059639-007	RCRA Metals	missing reviewed by signature (page 242)

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 4886 and date correction request was submitted: 10/07/02

Reviewed by: Date: 10/07/02 Closed by: Date: 10·09·02

Site: [illegible] soil sampling

ARCOC: 6[illegible]9, -50, -51, -55

Data: Organic, inorganic an[illegible]ochemistry

Sample ID	All VOC(8260) compounds	SVOC	117-81-7 (bis(2-ethylhexyl)phthalate)	PCB	11097-69-1 (aroclor-1254)	HE	479-45-8 (tetryl)	Metals	7440-39-3 (barium)	7440-43-9 (cadmium)	7440-47-3 (chromium)	7782-49-2 (selenium)	7440-22-4 (silver)	7439-97-6 (mercury)	General Chemistry	5955-70-0 (total cyanide)	18540-29-9 (hexavalent chromium)	Radiochemistry	70543-80-0 (gross alpha)		All HE (8330) compounds
059690-001 8505/1084-DF1-BH3-TB	P2																				
[illegible]-BH1-TB	P2																				
059690-001 6560/1028-SP2-BH1-TB	P2																				
059639-001 6560/1028-SP2-EB	P2																				
059639-009 6560/1028-SP2-TB	P2																				
059639-002 6560/1028-SP2-EB			9.86U,B																		
059639-005 6560/1028-SP2-EB																	UJ,HT				
059639-007 6560/1028-SP2-EB									J,B		J,B,B3		UJ,B3	UJ,B3							
																				Sample ID	
059673-002 6505/1084-DF1-BH1-3-S							UJ, A		J, A2	J, B3	J	UJ,B3							J,A2	059673-002 6505/1084-DF1-BH1-3-S-RE	UJ, HT
059674-002 6505/1084-DF1-BH1-8-S							UJ, A		J, A2	J, B3	J	UJ,B3				J,B			J,A2	059674-002 6505/1084-DF1-BH1-8-S-RE	UJ, HT
059675-002 6505/1084-DF1-BH2-3-DU							UJ, A		J, A2	J, B3	J	UJ,B3							J,A2	059675-002 6505/1084-DF1-BH2-3-DU-RE	UJ, HT
059676-002 6505/1084-DF1-BH2-3-S							UJ, A		J, A2	J, B3	J	UJ,B3				J,B			J,A2	059676-002 6505/1084-DF1-BH2-3-S-RE	UJ, HT
059677-002 6505/1084-DF1-BH2-8-S							UJ, A		J, A2	J, B3	J	J, B3				J,B			J,A2	059677-002 6505/1084-DF1-BH2-8-S-RE	UJ, HT
059678-002 6505/1084-DF1-BH3-3-S							UJ, A		J, A2	J, B3	J	UJ,B3				J,B			J,A2	059678-002 6505/1084-DF1-BH3-3-S-RE	UJ, HT
059679-002 6505/1084-DF1-BH3-8-S							UJ, A		J, A2	J, B3	J	UJ,B3				J,B			J,A2	059679-002 6505/1084-DF1-BH3-8-S-RE	UJ, HT
059681-002 6610/1032-OF1-BH1-2-S							UJ, A		J, A2	J, B3	J	UJ,B3							J,A2	059681-002 6610/1032-OF1-BH1-2-S-RE	UJ, HT
059682-002 6610/1032-OF1-BH1-7-S							UJ, A		J, A2		J	UJ,B3							J,A2	059682-002 6610/1032-OF1-BH1-7-S-RE	UJ, HT
059683-002 6610/1032-SP1-BH1-12-S							UJ, A		J, A2	J, B3	J	J, B3							J,A2	059683-002 6610/1032-SP1-BH1-12-S-RE	UJ, HT
059684-002 6610/1032-SP1-BH1-17-S							UJ, A		J, A2	J, B3	J	UJ,B3							J,A2	059684-002 6610/1032-SP1-BH1-17-S-RE	UJ, HT
059686-002 6610/1028-SP1-BH1-14-S							UJ, A		J, A2	J, B3	J	J, B3							J,A2	059686-002 6610/1028-SP1-BH1-14-S-RE	UJ, HT
059687-002 6560/1028-SP1-BH1-19-S					J		UJ, A		J, A2	J, B3	J	J, B3							J,A2	059687-002 6560/1028-SP1-BH1-19-S-RE	UJ, HT
059688-002 6560/1028-SP2-BH1-7-S							UJ, A		J, A2		J	UJ,B3							J,A2	059688-002 6560/1028-SP2-BH1-7-S-RE	UJ, HT
059689-002 6560/1028-SP2-BH1-12-S							UJ, A		J, A2	J, B3	J	J, B3							J,A2	059689-002 6560/1028-SP2-BH1-12-S-RE	UJ, HT
																				059639-004 6560/1028-SP2-EB-RE	UJ, HT

Validated By:

Date: 10/23/02

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MEMORANDUM

DATE: October 23, 2002

TO: File

FROM: Linda Thal

SUBJECT: Radiochemical Data Review and Validation - SNL
Site: DSS soil sampling
ARCOC 605649 605650 605651 605655
GEL SDG # 65936 and 65944 Project/Task No. 7223.02.03.02

See the attached Data Validation Worksheets for supporting documentation on the data review and validation. This validation was performed according to SNL/NM ER Project AOP 00-03.

Summary

All samples were prepared and analyzed with approved procedures using method EPA 900 (Gross Alpha/Beta). Problems were identified with the data package that resulted in the qualification of data.

Batch 198983 soils
The MS/MSD %R for gross alpha (73/68%) was < QC acceptance criteria (75–125%). All associated sample results were > MDA and will be qualified "J, A2".

Data are acceptable and QC measures appear to be adequate. The following sections discuss the data review and validation.

Holding Times/Preservation

All Analyses: All samples were analyzed within the prescribed holding times and properly preserved.

Calibration

All Analyses: The case narrative stated the instruments used were properly calibrated.

Blanks

No target analytes were detected in the method blank at concentrations > the associated MDAs. The equipment blank (65944-012) had a nonvolatile beta value > MDA. However, all associated sample results were > 5X the EB value; thus no data will be qualified.

Matrix Spike (MS) Analysis

The MS/MSD analyses met all QC acceptance criteria except as mentioned above in the summary section and as follows:

> Batch 198970 water
> The MS/MSD was performed on a sample of similar matrix from another SNL SDG. No data will be qualified as a result.

Laboratory Control Sample (LCS) Analysis

The LCS analyses met all QC acceptance criteria.

Replicates

The replicate analyses met all QC acceptance criteria.

Tracer/Carrier Recoveries

No tracer/carrier required.

Negative Bias

All sample results met negative bias QC acceptance criteria.

Detection Limits/Dilutions

All detection limits were properly reported. No samples were diluted.

Other QC

A field duplicate and equipment blank (EB) was submitted on the ARCOC. There are no "required" validation procedures for assessing a file duplicate.
No field blank was submitted on the ARCOC.

No raw data was submitted with the package.

No other specific issues were identified which affect data quality.

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MEMORANDUM

DATE: 10/18/02

TO: File

FROM: Linda Thal

SUBJECT: Organic Data Review and Validation - SNL
Site: DSS soil sampling
ARCOC # 605649, 605650, 605651, 605655
GEL SDG # 65936 and 65944
Project/Task No. 7223.02.03.02

See the attached Data Validation Worksheets for supporting documentation on the data review and validation. Data are evaluated using SNL/NM ER Project AOP 00-03.

Summary

The samples were prepared and analyzed with approved procedures using methods SW-846 8260A/B (VOC), 8270C (SVOC), 8082 (PCBs) and 8330 (HEs). Problems were identified with the data package that resulted in the qualification of data.

VOC – Batch 197301 water
No MS/MSD or replicate sample was performed for the batch. All associated sample results will have the "P2" descriptor added due to lack of precision information.

SVOC – Batch 196776 water
Bis (2-ethylhexyl) phthalate was detected in the method blank (MB) at a value > DL but < RL. Sample 65944-006 (equipment blank) had a bis(2-ethylhexyl) phthalate value > DL, < RL and < 10X the MB value and will be qualified "U, B" at the RL.

PCB – Batch196833 soil
Sample 65936-028 had an aroclor 1254 value > DL but < RL. The RPD (34%) between the primary and confirmation column was > QC acceptance criteria (25%). The highest detected result is reported and will be qualified "J".

HE – Batch 196863 soil
The LCS %R for tetryl (51%) was < QC acceptance criteria (65-124%). All associated samples were non-detect for tetryl and will be qualified "UJ, A".

HE – Batch 201462 soil
Samples 65936 –016 thru -030 required reanalysis due to a QC failure. Both sets of data are on the Certificate of Analysis and both sets of data will be validated. The reanalysis was o of holding time. The reanalysis calibration, sample and QC data are provided. All associate sample results were non-detect and will be qualified "UJ, HT".

HE – Batch 201060 water
Sample 65944-008 (equipment blank) was reanalyzed at more than 2X the method specified holding time. Both sets of data are on the Certificate of Analysis and both sets of data will be validated. The reanalysis calibration, sample and QC data are provided. The associated sample results were non-detect and will be qualified "UJ, HT".

Data are acceptable and QC measures appear to be adequate. The following sections discuss the data review and validation.

Holding Times/Preservation

All Analysis: The samples were properly preserved and analyzed within the method prescribed holding time except as mentioned above in the summary section.

VOC – Batch 197301 water: It should be noted that, according to the sample receipt and review form, sample 65944-001 was received with a little headspace. It is not known what affect this will have on the data; thus no data will be qualified.

Calibration

All Analysis: All initial and continuing calibration acceptance criteria were met with the exception of the following:

VOC-Batch 196955 soil
The CCV had a %D >20% but < 40% with a positive bias for dibromochloromethane (23%). The associated sample results were non-detect for dibromochloromethane and are therefore unaffected by a positive bias. No data will be qualified.

VOC-Batch 197301 water
The CCV had a %D >20% but < 40% with a negative bias for cis-1,3-dichloropropene (24%) and trans-1,3-dichlorpropene (25%).The associated sample results were non-detect for cis-1,3-dichloropropene and trans-1,3-dichloropropene and no data will be qualified.

SVOC – Batch 196839 soil
The initial calibration had a correlation coefficient >0.9 but <0.99 for 2-nitrophenol and 4-chlorophenyl-phenylether. The associated sample results were non-detect and no data will be qualified.
The CCV had a %D > 20% but < 40% with a negative bias for 3,3'-dichlorobenzidine (23%) and 4-chloroaniline (26%). The associated sample results were non-detect and no data will be qualified.
The CCV had a %D > 20% but < 40% with a positive bias for several compounds (see DV worksheet). The associated sample results were non-detect and therefore unaffected by a positive bias; thus no data will be qualified.

SVOC – Batch 196776 water
The CCV had a %D > 20% but < 40% with a negative bias for 2,4-dimethylphenol (25%). The associated sample results were non-detect and no data will be qualified.

Blanks

All Analysis: All method blank, equipment blank and trip blank acceptance criteria were met except as mentioned above in the summary section and as follows:

VOC
Trip blanks 65944-003 and –005 had toluene values > DL but < RL. The associated sample results were non-detect and no data will be qualified.

Surrogates

All Analysis: All surrogate acceptance criteria were met.

Internal Standards (ISs)

All Analysis: All internal standard acceptance criteria were met.

Matrix Spike/Matrix Spike Duplicate (MS/MSD) Analysis

All Analysis: All MS/MSD acceptance criteria were met except as mentioned above in the summary section and as follows:

VOC-Soils

It should be noted that the sample used for the MS/MSD was of similar matrix from SNL SDG 65745. No data will be qualified as a result.

SVOC – Batch 196839 soil and 196776 water
Several compounds (see DV worksheet) had %R < QC acceptance criteria (75 – 125%). Using professional judgment, no data will be qualified.
Several compounds (soils only - see DV worksheet) had RPDs > QC acceptance criteria (20%). Using professional judgment, no data will be qualified.

HE – Batch 201462 soil
It should be noted that the sample used for the MS/MSD was of similar matrix from SNL SDG 65475. No data will be qualified as a result.

HE – Batch 196860 and 201060 water
No MS/MSD was extracted with these batches. An LCS/LCSD was extracted and passed all QC acceptance criteria for accuracy and precision.

Laboratory Control Samples (LCS/LCSD) Analysis

All Analysis: The LCS acceptance criteria were met except as mentioned above in the summary section and as follows:

VOC – Soils and Waters
It should be noted that no compound was associated with internal standard 1,4-dichlorobenzene-d4. No data will be qualified as a result.

VOC – Waters
The LCS acceptance criteria were met by the successful analysis of a second source CCV.

SVOC – Soils and Waters
It should be noted that no compound was associated with internal standard perylene-d12. No data will be qualified as a result.

HE – Batch 201462 soil
The %R for 4-amino-2,6-dinitrotoluene (74%) was < QC acceptance recovery (79 – 130%). The MS/MSD %R for 4-amino-2,6-dinitrotoluene was in criteria, and using professional judgment no data will be qualified.

HE – Batch 196860 and 201060 water
An LCS/LCSD was extracted and passed all QC acceptance criteria for accuracy and precision

Detection Limits/Dilutions

All Analysis: All detection limits were properly reported. Samples were not diluted.

SVOC – Batch 196776 water
It should be noted that 500ml was used for the MS/MSD extraction (DF=2X).

Confirmation Analyses

VOC and SVOC: No confirmation analyses required.

PCB: All confirmation acceptance criteria were met except as mentioned above in the summary section.

HE: The sample results were non-detect and therefore no confirmation analysis was required.

Other QC

VOC: A trip blank, equipment blank and a field duplicate were submitted on the ARCOC. There are no "required" validation procedures for a field duplicate.

SVOC, PCB and HE: An equipment blank and field duplicate was submitted on the ARCOC. There are no "required" validation procedures for a field duplicate. No field blank was submitted on the ARCOC.

No raw data was submitted with the package.

No other specific issues were identified which affect data quality.

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MEMORANDUM

DATE: 10/23/02

TO: File

FROM: Linda Thal

SUBJECT: Inorganic Data Review and Validation - SNL
Site: DSS soil sampling
ARCOC # 605649, 605650, 505651, 605655
GEL SDG # 65936 and 65944
Project/Task No. 7223.02.03.02

See the attached Data Validation Worksheets for supporting documentation on the data review and validation. Data are evaluated using SNL/NM ER Project AOP 00-03.

Summary

The samples were prepared and analyzed with approved procedures using methods SW-846 6010 (ICP-AES metals), SW-846 7470/1 (Hg), SW-846 9012A (total CN) and SW-846 7196A (hexavalent chromium).
Problems were identified with the data package that resulted in the qualification of data.

ICP-AES – Metals soils

Cadmium was detected in the continuing calibration blank (CCB) at a value > DL but < RL. All associated sample results for cadmium (excluding sample 65936-024 and –029) had cadmium values < 5X the CCB value and will be qualified "J, B3".

Selenium was detected in the CCB at a negative value, with an absolute value > DL but < RL. Sample 65936-020, -25, -27, -28 and –30 had selenium values > DL but < 5X the CCB value and will be qualified "J, B3". All remaining samples had selenium values that were non-detect and will be qualified "UJ, B3"

The MS %R for barium (134%) was > QC acceptance criteria (75-125%). All associated sample results were > RL and will be qualified "J, A2".

The replicate RPD for chromium (46%) was > QC acceptance criteria (20%). All associated sample values for chromium were > 5X RL and will be qualified "J".

ICP-AES – Metals water
Barium was detected in the method blank (MB), and chromium in the MB and CCB at values greater than the DL but < RL. The sample results were < 5X the blank values and will be qualified "J, B" for barium and "J, B, B3" for chromium.

Silver was detected in the initial calibration blank (ICB) at a negative value, with an absolute value > DL but < RL. The sample result was non-detect and will be qualified "UJ, B3".

HG – water
Mercury was detected in the CCB at a negative value, with an absolute value > DL but < RL. The sample result was non-detect and will be qualified "UJ, B3".

Total Cyanide - soil
The MB had a value > DL but < RL. Samples 65936-017, -019, -020, -021 and –022 results were > DL but < 5X the MB value and will be qualified "J, B".

Hexavalent Chromium – water
Sample 65944-010 (equipment blank) was run after the method specified hold time had expired but within 2X the method specified hold time. The sample result was non-detect and will be qualified "UJ, HT".

Data are acceptable and QC measures appear to be adequate. The following sections discuss the data review and validation.

Holding Times/Preservation

All Analyses: The samples were analyzed within the prescribed holding time and properly preserved except as mentioned above in the summary section.

Calibration

All Analyses: The initial and continuing calibration data met QC acceptance criteria.

Blanks

All Analyses: All blank criteria were met except as mentioned above in the summary section and as follows:

ICP-AES – Metals soils
Chromium and barium were detected in the EB (65944-011) at a value > DL but < RL. All associated sample results were > 5X the EB value and will not be qualified.

Cadmium was detected in the CCB at a value > DL but < RL. Sample 65936-024 and –029 had cadmium values > 5X the CCB value and will not be qualified.

ICP-AES – Metals water
Lead, silver and selenium were detected in one or more of the blanks at values > DL but < RL. The sample results for lead and selenium were non-detect and will not be qualified. The sample result for silver was non-detect and is qualified due to a negative value observed in the ICB. The silver result will not be further qualified.

Total Cyanide - soil
The MB had a value > DL but < RL. Samples 65936-016, -018, -023 through -030 results were non-detect and will not be qualified.

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

All Analyses: The LCS met QC acceptance criteria. No LCSD was performed. No data will be qualified as a result.

Matrix Spike (MS) Analysis

All Analyses: The MS met QC acceptance criteria except as mentioned above in the summary section and as follows:

ICP-AES – Metals water
The sample used for the MS was of similar matrix from SNL SDG 66619. No data will be qualified as a result.

HG – soils
The sample used for the MS was of similar matrix from SNL SDG 65745. No data will be qualified as a result.

HG – water
The sample used for the MS was of similar matrix from SNL SDG 65748. No data will be qualified as a result.

Total Cyanide - water
The sample used for the MS was of similar matrix from SNL SDG 66197. No data will be qualified as a result.

Replicate Analysis

All Analyses: The replicate analysis met QC acceptance criteria except as mentioned above in the summary section and as follows:

ICP-AES – Metals water
The sample used for the replicate was of similar matrix from SNL SDG 66619. No data will be qualified as a result.

HG – soils
The sample used for the replicate was of similar matrix from SNL SDG 65745. No data will be qualified as a result.

HG – water
The sample used for the replicate was of similar matrix from SNL SDG 65748. No data will be qualified as a result.

Total Cyanide - water
The sample used for the replicate was of similar matrix from SNL SDG 66197. No data will be qualified as a result.

ICP Interference Check Sample (ICS)

ICP-AES soils and water: The ICS-AB met QC acceptance criteria.

All Other Analyses: No ICS required.

ICP Serial Dilution

ICP-AES soils and water: The serial dilutions met QC acceptance criteria except as follows:

ICP-AES – Metals water
The sample used for the serial dilution was of similar matrix from SNL SDG 66619. No data will be qualified as a result.

All Other Analyses: No serial dilutions required.

Detection Limits/Dilutions

All Analyses: All detection limits were properly reported.

ICP-AES soils: All samples were diluted 2X. Sample 65936-016 and –019 were diluted 5X for selenium.

All Other Analyses: No dilutions were performed.

Other QC

All Analyses: A field duplicate and equipment blank was submitted on the ARCOC.
No field blank was submitted on the ARCOC.

The ARCOC requests metals analysis by method SW-846 6020 (ICP-MS).

No raw data was submitted with the package.

No other specific issues were identified which affect data quality.

Data Validation Summary

Site/Project: OSS Soil Sampling Project/Task #: 7223.02.03.02
AR/COC #: 605649, -50, -51, -55
Laboratory: GEL
Laboratory Report #: 65936
\# of Samples: 30/12 Matrix: Soils / Aqueous
Laboratory Sample IDs: 65936-001 thru -030
65944-001 thru 012

QC Element	Analysis									
	Organics				Inorganics				RAD	Hexavale Other Chromiu
	VOC	SVOC	Pesticide/ PCB	HPLC (HE)	ICP/AES	GFAA/ AA	CVAA (Hg)	CN		
1. Holding Times/Preservation	✓	✓	✓	✓ / UJ, HT	✓		✓	✓	✓	✓ / UJ HT
2. Calibrations	✓	✓	✓	✓	✓		✓	✓	✓	✓
3. Method Blanks	✓	✓ / U, B	✓	✓	J, UJ, B3 / J, UJ, B, B3		✓ / UJ, B3	J, B / ✓	✓	✓
4. MS/MSD	✓ / P2	✓	✓	✓	J, A2 / ✓		✓	✓	J, A2 / ✓	✓
5. Laboratory Control Samples	✓	✓	✓	UJ, A / ✓	✓		✓	✓	✓	✓
6. Replicates					J / ✓		✓	✓	✓	✓
7. Surrogates	✓	✓	✓	✓						NA
8. Internal Standards	✓	✓								
9. TCL Compound Identification	✓	✓								
10. ICP Interference Check Sample					✓					
11. ICP Serial Dilution					✓					
12. Carrier/Chemical Tracer Recoveries									NA	
13. Other QC	TB EB DUP /	EB DUP /	* EB DUP /	EB DUP /	EB DUP /		DUP EB /	DUP EB /	DUP EB /	DUP EB /

J = Estimated
U = Not Detected
UJ = Not Detected, Estimated
R = Unusable

Check (√) = Acceptable
Shaded Cells = Not Applicable (also "NA")
NP = Not Provided
Other: *PCB confirmation "J"

Reviewed By:
Date: 10.23.02

Holding Time and Preservation

Site/Project: DSS Soil Sampling AR/COC #: 605649, -50, -51, -55 Laboratory Sample IDs: 65936 - 001 thru -030

Laboratory: GEL Laboratory Report #: 65936 / -944 65944 - 001 thru -012

# of Samples: 42 Matrix: Soil & H_2O

Sample ID	Analytical Method	Holding Time Criteria	Days Holding Time was Exceeded	Preservation Criteria	Preservation Deficiency	Comments
65936 - 0~~0~~16 thru -030 -RF	SW-846 - 8330	14 days	~~28~~ 14 days	NA	NA	All results qualified.
65944 - 008 - RF	SW846 - 8330	7 days	~~14~~ 15 LT days	NA	NA	VJ, HT
65944 - 010	SW-846 - 7196A	24 hours	7 hours 50 mins	NA	NA	VJ, HT

Reviewed By: Date: 10.23.02

Volatile Organics (SW 846 Method 8260)

Page 1 of 2

Site/Project: DSS Soil Sampling AR/COC #: 605649, -50, -51, -55 # of Samples: 15 Matrix: Soil

Laboratory: GEL Laboratory Report #: 65936 Laboratory Sample IDs: 65936 -001 thru -015

Methods: SW 846 8260A Batch #s: 196955

IS	CAS #	Name	TCL	Min. RF	Intercept	Calib. RF	Calib. RSD/ R^2	CCV %D	Method Blks	LCS	LCSD	LCS RPD	MS	MSD	MS RPD	Field Dup. RPD	*see *Equip. Blanks	separate *Trip Blanks	WS.	
						>.05	<20% / 0.99	20%												
1	71-55-6	1,1,1-trichloroethane	✓	0.10		✓	✓	✓	✓							NA	✓			
2	79-34-5	1,1,2,2-tetrachloroethane		0.30																
2	79-00-5	1,1,2-trichloroethane		0.10																
1	75-34-3	**1,1-dichloroethane**		0.10																
1	75-35-4	**1,1-dichloroethene**		0.20						✓			✓	✓	✓					
1	107-06-2	**1,2-dichloroethane**		0.10																
1	540-59-0	**1,2-dichloroethene(total)**		0.01																
1	78-87-5	**1,2-dichloropropane**	✓	0.01																
1	78-93-3	**2-butanone (MEK) (10xblk)**	✓	0.01																
1	110-75-8	2-chloroethyl vinyl ether																		
2	591-78-6	2-hexanone (MBK)	✓	0.01																
2	108-10-1	4-methyl-2-pentanone (MIBK)		0.10																
1	67-64-1	**acetone(10xblk)**		0.01	✓	✓	✓													
1	71-43-2	**benzene**		0.50						✓			✓	✓	✓					
1	75-27-4	bromodichloromethane		0.20																
3	75-25-2	bromoform		0.10	✓	✓	✓													
1	74-83-9	bromomethane		0.10																
1	75-15-0	carbon disulfide		0.10																
1	56-23-5	**carbon tetrachloride**		0.10																
2	108-90-7	**chlorobenzene**		0.50						✓			✓	✓	✓					
1	75-00-3	chloroethane		0.01																
1	67-66-3	**chloroform**		0.20																
1	74-87-3	chloromethane		0.10																
1	10061-01-5	cis-1,3-dichloropropene		0.20																
2	124-48-1	dibromochloromethane		0.10				+23												
2	100-41-4	ethylbenzene		0.10				✓												
1	75-09-2	methylene chloride (10xblk)		0.01	✓	✓	✓													
2	100-42-5	styrene		0.30																
2	127-18-4	**tetrachloroethene**		0.20																
2	108-88-3	toluene(10xblk)		0.40						✓			✓	✓	✓					
2	10061-02-6	trans-1,3-dichloropropene		0.10																
1	79-01-6	**trichloroethene**		0.30						✓			✓	✓	✓					
1	75-01-4	**vinyl chloride**		0.10																
2	1330-20-7	xylenes(total)		0.30																
		cis-1,2-dichloroethene																		
		trans-1,2-dichloroethene																		

Comments: vinyl acetate ✓
MS/MSD 65745-001
SNL SOG.

Notes: Shaded rows are RCRA compounds.

Reviewed By: DWal Date: 10.18.02

Volatile Organics

Site/Project: ______ AR/COC #: 605649, -50, -51, -55 Batch #s: ______

Laboratory: ______ Laboratory Report #: ______ # of Samples: ______ Matrix: ______

Surrogate Recovery and Internal Standard Outliers (SW 846 Method 8260)

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
IN CRITERIA									

SMC 1: 4-Bromofluorobenzene
SMC 2: Dibromofluoromethane
SMC 3: Toluene-d8

IS 1: Fluorobenzene
IS 2: Chorobenzene-d5
IS 3: 1,4-Dichlorobenzene-d4

Comments:

Volatile Organics (SW 846 Method 8260)

Page 1 of 2

Site/Project: DSS soil sampling AR/COC #: 605649, -50, -51, -55 # of Samples: 5 Matrix: Aqueous

Laboratory: GEL Laboratory Report #: 65944 Laboratory Sample IDs: 65944 - 001 thru - 005

Methods: SW-846 8260B Batch #s: 197301

IS	CAS #	Name	TCL	Min. RF	Intercept	Calib. RF	Calib. RSD/ R²	CCV %D	Method Blks	LCS	LCSD	LCS RPD	MS	MSD	MS RPD	Field Dup. RPD	Equip. Blanks	Trip Blanks		
						>.05	<20% / 0.99	20%												
1	71-55-6	1,1,1-trichloroethane	✓	0.10		✓	✓	✓	✓		NA									
2	79-34-5	1,1,2,2-tetrachloroethane		0.30																
2	79-00-5	1,1,2-trichloroethane		0.10																
1	75-34-3	1,1-dichloroethane		0.10																
1	75-35-4	1,1-dichloroethene		0.20						✓										
1	107-06-2	1,2-dichloroethane		0.10																
1	540-59-0	1,2-dichloroethene(total)		0.01																
1	78-87-5	1,2-dichloropropane	✓	0.01																
1	78-93-3	2-butanone (MEK) (10xblk)	✓	0.01	✓	✓	✓													
1	110-75-8	2-chloroethyl vinyl ether																		
2	591-78-6	2-hexanone (MBK)	✓	0.01																
2	108-10-1	4-methyl-2-pentanone (MIBK)		0.10																
1	67-64-1	acetone(10xblk)		0.01	✓	✓	✓													
1	71-43-2	benzene		0.50						✓										
1	75-27-4	bromodichloromethane		0.20																
3	75-25-2	bromoform		0.10																
1	74-83-9	bromomethane		0.10																
1	75-15-0	carbon disulfide		0.10																
1	56-23-5	carbon tetrachloride		0.10			✓ ~~[illegible]~~ LT													
2	108-90-7	chlorobenzene		0.50						✓										
1	75-00-3	chloroethane		0.01																
1	67-66-3	chloroform		0.20																
1	74-87-3	chloromethane		0.10	✓	✓	✓													
1	10061-01-5	cis-1,3-dichloropropene		0.20				-24												
2	124-48-1	dibromochloromethane		0.10				✓												
2	100-41-4	ethylbenzene		0.10																
1	75-09-2	methylene chloride (10xblk)		0.01	✓	✓	✓													
2	100-42-5	styrene		0.30																
2	127-18-4	tetrachloroethene		0.20																
2	108-88-3	toluene(10xblk)		0.40						✓										
2	10061-02-6	trans-1,3-dichloropropene		0.10				-25												
1	79-01-6	trichloroethene		0.30		0.27•3		✓		✓										
1	75-01-4	vinyl chloride		0.10		✓														
2	1330-20-7	xylenes(total)		0.30																
		cis - 1,2-dichloroethene																		
		trans - 1,2-dichloroethene																		

Comments: 059680-001 little headspace.
65944-001

NO MS/MSD, no rep. all P.

CCV & LCS same file

Notes: Shaded rows are RCRA compounds.

Reviewed By: Date: 10.18.02.

TBs & EB.

Volatile Organics

Site/Project: ____ AR/COC #: 605649- 50, -51, -55 Batch #s: ____

Laboratory: ____ Laboratory Report #: ____ # of Samples: ____ Matrix: ____

Surrogate Recovery and Internal Standard Outliers (SW 846 Method 8260)

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
IN CRITERIA									

SMC 1: 4-Bromofluorobenzene
SMC 2: Dibromofluoromethane
SMC 3: Toluene-d8

IS 1: Fluorobenzene
IS 2: Chorobenzene-d5
IS 3: 1,4-Dichlorobenzene-d4

Comments:

Tol detected in 65944 - 003 >DL
TB for 65936 - 12, -13, -14, -15

Tol detected in 65944 - 005 TB >DL
for 65944 -004 EB (~~65944~~ All 65936 SA)

65944 - 004 EB to be applied to all s

Semivolatile Organics (SW 846 Method 8270) - 016

Page 1 of 3

Site/Project: DSS Soil Sampling AR/COC #: 605649, -50, -51, -55 Laboratory Sample IDs: 65936 - ~~00~~ thru - 030 (soil)

65944 - 006 (EB)

Laboratory: GEL Laboratory Report #: 65936 / 65944

Methods: SW-846 8270 C

# of Samples: 15 ~~30~~ & 1 Matrix: Soil & EB Batch #s: 196839 (① soil) 196776 (② EB)

IS	BNA	CAS #	NAME	TCL	Min. RF	Intercept		Calib. RF		Calib. RSD/ R^2		CCV %D		Method Blanks		LCS		LCSD	LCS RPD	MS		MSD		MS RPD		Field Dup. RPD	Equip. Blanks	Field Blanks
						1	2	1 >.05	2	1 <20%/ 0.99	2	1 20%	2	1	2	1	2			1	2	1	2	1	2	NA	-006	NA
2	BN	120-82-1	1,2,4-Trichlorobenzene	✓	0.20			✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	NA		✓	✓	✓	✓	✓	✓		✓	
1	BN	95-50-1	1,2-Dichlorobenzene		0.40																							
1	BN	541-73-1	1,3-Dichlorobenzene		0.60																							
1	BN	106-46-7	1,4-Dichlorobenzene		0.50											✓	✓			✓	✓	✓	✓	✓	✓			
3	A	95-95-4	2,4,5-Trichlorophenol		0.20											✓	✓			63	✓	61	✓	✓	✓			
3	A	88-06-2	2,4,6-Trichlorophenol		0.20											✓	✓			54	✓	42	✓	26	✓			
2	A	120-83-2	2,4-Dichlorophenol		0.20																							
2	A	105-67-9	2,4-Dimethylphenol		0.20								-29															
3	A	51-28-5	2,4-dinitrophenol		0.01	✓	✓	✓	✓	✓	✓	+32	✓															
3	BN	121-14-2	2,4-Dinitrotoluene		0.20							+20.5				✓	✓			✓	✓	✓	✓	✓	✓			
3	BN	606-20-2	2,6-Dinitrotoluene		0.20							✓																
3	BN	91-58-7	2-Chloronaphthalene		0.80																							
1	A	95-57-8	2-Chlorophenol		0.80											✓	✓			✓	✓	✓	✓	✓	✓			
2	BN	91-57-6	2-Methylnaphthalene		0.40																							
1	A	95-48-7	2-Methylphenol (o-cresol)		0.70											✓	✓			65	B	53	✓	21	✓			
3	BN	88-74-4	2-Nitroaniline		0.01																							
2	A	88-75-5	2-Nitrophenol		0.10	✓		✓		0.983																		
5	BN	91-94-1	3,3'-Dichlorobenzidine		0.01					✓		-23																
3	BN	99-09-2	3-Nitroaniline		0.01					✓																		
4	A	534-52-1	4,6-Dinitro-2-methylphenol		0.01	✓		✓		✓		+25																
4	BN	101-55-3	4-Bromophenyl-phenylether		0.10					✓		✓																
3	BN	7005-72-3	4-Chlorophenyl-phenylether		0.40	✓		✓		.986																		
2	A	59-50-7	4-Chloro-3-methylphenol		0.20					✓						✓	✓			✓	✓	✓	✓	✓	✓			
2	BN	106-47-8	4-Chloroaniline		0.01							-26																
1	A	106-44-5	4-Methylphenol (p-cresol)		0.60							✓																

Comments: m,p-cresol ✓

No raw data

196776 MS/MSD 500 mL = 2X

Notes: Shaded rows are RCRA compounds.

✓✓ 66/69 X 49/73 30 ✓

Reviewed By: Date: 10.21.0

Semivolatile Organics

Site/Project: ____________ AR/COC #: 605649, -50, -51, -55 Batch #s: ____________

Laboratory: ____________ Laboratory Report #: ____________ # of Samples: ____________ Matrix: ____________

I S	BNA	CAS #	NAME	T C L	Min. RF	Intercept		Calib. RF		Calib. RSD/ R^2		CCV %D		Method Blanks		LCS		LCSD	LCS RPD	MS		MSD		MS RPD		Field Dup. RPD	Equip. Blanks	Field Blanks		
						1	2	>.05 1	2	<20% / 0.99 1	2	20% 1	2	1	2	1	2			1	2	1	2	1	2					
3	BN	100-01-6	4-Nitroaniline	✓	0.01			✓	✓	✓	✓	✓	✓	✓	✓			NA								NA	✓	NA		
3	A	100-02-7	4-Nitrophenol		0.01							x23.5				✓	✓			✓	✓	✓	✓	✓	✓					
3	BN	83-32-9	Acenaphthene		0.90							✓				✓	✓			✓	✓	✓	✓	✓	✓					
3	BN	208-96-8	Acenaphthylene		0.90																									
4	BN	120-12-7	Anthracene		0.70																									
5	BN	56-55-3	Benzo(a)anthracene		0.80																									
6	BN	50-32-8	Benzo(a)pyrene		0.70		✓		✓		✓																			
6	BN	205-99-2	Benzo(b)fluoranthene		0.70																									
6	BN	191-24-2	Benzo(g,h,i)perylene		0.50		✓		✓		✓	x57																		
6	BN	207-08-9	Benzo(k)fluoranthene		0.70							✓																		
2	BN	111-91-1	bis(2-Chloroethoxy)methane		0.30							✓																		
1	BN	111-44-4	bis(2-Chloroethyl)ether		0.70							x54																		
1	BN	108-60-1	bis(2-chloroisopropyl)ether		0.01							x23																		
5	BN	117-81-7	bis(2-Ethylhexyl)phthalate		0.01		✓		✓		✓	✓			2.2J												2.58J →		U,B at RL.	
5	BN	85-68-7	Butylbenzylphthalate		0.01																						✓			
4	BN	86-74-8	Carbazole		0.01																									
5	BN	218-01-9	Chrysene		0.70																									
6	BN	53-70-3	Dibenz(a,h)anthracene		0.40	✓	✓	✓	✓	✓	✓	x48																		
3	BN	132-64-9	Dibenzofuran		0.80							✓																		
3	BN	84-66-2	Diethylphthalate		0.01																									
3	BN	131-11-3	Dimethylphthalate		0.01																									
4	BN	84-74-2	Di-n-butylphthalate		0.01																									
6	BN	117-84-0	Di-n-octylphthalate		0.01		✓		✓		✓																			
4	BN	206-44-0	Fluoranthene		0.60																									
3	BN	86-73-7	Fluorene		0.90	✓		✓		✓																				
4	BN	118-74-1	Hexachlorobenzene		0.10											✓	✓			50	✓	43	✓	✓	✓					
2	BN	87-68-3	Hexachlorobutadiene		0.01	✓		✓		✓						✓	✓			41	✓	35	✓	✓	✓					
3	BN	77-47-4	Hexachlorocyclopentadiene		0.01																									
1	BN	67-72-1	Hexachloroethane		0.30											✓	✓			40/66		37/70		✓	✓					

Comments:

Semivolatile Organics

Site/Project: ______ AR/COC #: 605649, -50, -51, -55 Batch #s: ______

Laboratory: ______ Laboratory Report #: ______ # of Samples: ______ Matrix: ______

IS	BNA	CAS #	NAME	TCL	Min. RF	Intercept	Calib. RF	Calib. RSD/ R^2	CCV %D	Method Blanks	LCS	LCS D	LCS RPD	MS	MSD	MS RPD	Field Dup. RPD	Equip. Blanks	Field Blanks		
							>.05	<20% / 0.99	20%	1 2	1 2			1 2	1 2	1 2					
6	BN	193-39-5	Indeno(1,2,3-cd)pyrene	✓	0.50	✓ ✓	✓ ✓	✓ ✓	45 ✓	✓ ✓		NA					NA	✓	NA		
2	BN	78-59-1	Isophorone		0.40				✓												
2	BN	91-20-3	Naphthalene		0.70																
2	BN	98-95-3	Nitrobenzene		0.20						✓ ✓			74	54 ✓	✓ ✓					
4	BN	86-30-6	N-Nitrosodiphenylamine (1)		0.01																
1	BN	621-64-7	N-Nitroso-di-propylamine	✓	0.50						✓ ✓			✓ ✓	✓ ✓	✓ ✓					
4	A	87-86-5	Pentachlorophenol		0.05	✓	✓	✓			✓ ✓			✓ ✓	✓ ✓	✓ ✓					
4	BN	85-01-8	Phenanthrene		0.70																
1	A	108-95-2	Phenol		0.80						✓ ✓			✓ ✓	✓ ✓	✓ ✓					
5	BN	129-00-0	Pyrene		0.60						✓ ✓			✓ ✓	✓ ✓	✓ ✓					
			Diphenylamine																		

Surrogate Recovery Outliers

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

SMC 1: Nitrobenzene-d5 (BN)
SMC 2: 2-Fluorobiphenyl (BN)
SMC 3: p-Terphenyl-d14 (BN)
SMC 4: Phenol-d6 (A)
SMC 5: 2-Fluorophenol (A)
SMC 6: 2,4,6-Tribromophenol (A)
SMC 7: 2-2-Chlorophenol-d4 (A)
SMC 8: 1,2-Dichlorobenzene-d4 (BN)

Comments: Pyride on H_2O QC not TAL not valida

Internal Standard Outliers

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
IN CRITERIA												

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

PCBs (SW 846 - Method 8082)

Site/Project: DSS Soil Sampling AR/COC #: 605649, -50, -51, -55 Laboratory Sample IDs: 65936-016 thru -030

Laboratory: GEL Laboratory Report #: 65936, 65944 65944-007 (EB)

Methods: SW-846 8082

\# of Samples: 15 & 1 Matrix: Soil & EB Batch #s: ① 196833 (soil) ② 196769 (H2O)

CAS #	Name	TCL	Intercept	Calib RSD / R²	CCV %D	Method Blanks	LCS	LCSD	LCS RPD	MS	MSD	MS RPD	Field Dup. RPD	Equip. Blanks	Field Blanks		
				<20% / 0.99 2	20% 2	1 2	1 2		20%	1 2	1 2	1 20% 2					
12674-11-2	Aroclor-1016		NA	✓ ✓	✓ ✓	✓ ✓		NA					✓	✓	NA		
11104-28-2	Aroclor-1221					✓ ✓							✓	✓			
11141-16-5	Aroclor-1232					✓ ✓							✓	✓			
53469-21-9	Aroclor-1242			✓ ✓		✓ ✓							✓	✓			
12672-29-6	Aroclor-1248			✓ ✓		✓ ✓							✓	✓			
11097-69-1	Aroclor-1254			✓ ✓	✓	✓ ✓							✓	✓			
11096-82-5	Aroclor-1260			✓ ✓	✓ ✓	✓ ✓	✓ ✓			✓ ✓	✓ ✓	✓ ✓	✓	✓			

Sample	SMC % REC	SMC RT	Sample	SMC % REC	SMC RT
IN CRITERIA					

Comments: 196769 The confi
column had a 1016 C
720%. As the sample
ND, this would have
impact on the data
and confirmation is no
necessary.

Confirmation

Sample	CAS #	RPD > 25%	Sample	CAS #	RPD > 25%
65936-028	1254	34%			
The highest	detected	result i	reported &	will be	qualified

"J"

NO RAW DATA!

Reviewed By: Date: 10.21.02

High Explosives (SW 846 Method 8330)

Site/Project: DJJ Soil Sampling AR/COC #: 605649, -50, -51, -55 Laboratory Sample IDs: 65936 - 016 thru - 030

Laboratory: GEL Laboratory Report #: 65936

Methods: SW- 846 8330

of Samples: 15 Matrix: Soils Batch #s: ① 196863 ② Re 201462 (Soils)

CAS #	NAME	1/L	Intercept	Curve R²		CCV %D		Method Blanks		LCS	LCSD	LCS RPD	MS		MSD		MS RPD		Field. Dup. RPD	Equip. Blanks	Field Blanks	
				1 .99	2	1 20%	2	1 U	2	1	2	20%	1	2	1	2	1 20%	2		U	U	
2691-41-0	HMX		NA	✓	✓	✓	✓	✓	✓	✓	✓	NA	✓	✓	✓	✓	✓	✓	✓	✓	NA	
121-82-4	RDX																					
99-35-49	1,3,5-Trinitrobenzene																					
99-65-0	1,3-dinitrobenzene																					
98-95-3	Nitrobenzene									(65-124%)												
479-45-8	Tetryl									51	*											
118-96-7	2,4,6-trinitrotoluene									✓												
35572-78-2	2-amino-4,6-dinitrotoluene										(79-123%)											
19406-51-0	4-amino-2,6-dinitrotoluene										74											
121-14-2	2,4-dinitrotoluene										✓											
606-20-2	2,6-dinitrotoluene																					
88-72-2	2-nitrotoluene																					
99-99-0	4-nitrotoluene																					
99-08-1	3-nitrotoluene																					
78-11-5	PETN																					

Sample	SMC %REC	SMC RT	Sample	SMC %REC	SMC RT
IN CRITERIA					

Comments: 201462 MS/MSD 65~~745~~ 475 HT JNK SOG

All samples
196863 - Tetryl UJ, A

201462 - All compounds UJ, HT

Confirmation

Sample	CAS #	RPD > 25%	Sample	CAS #	RPD > 25%
NA					

Solids-to-aqueous conversion:
mg / kg = µg / g : [(µg / g) x (sample mass (g) / sample vol. (ml)) x (1000 ml / 1 liter)] / Dilution Factor = µg / l

Reviewed By: Date: 10.21.0

High Explosives (SW 846 Method 8330)

Site/Project: DSS Soil Sampling AR/COC #: 6056 LT 49 55 Laboratory Sample IDs: 65944 - 008

Laboratory: GEL Laboratory Report #:

Methods: SW - 846 8330

# of Samples: 1 Matrix: Aqueous Batch #s: 196860 re 201060

CAS #	NAME	T / I	Intercept	Curve R²	CCV %D	Method Blanks	LCS	LCSD	LCS RPD	MS	MSD	MS RPD	Field. Dup. RPD	Equip. Blanks	Field Blanks		
				.99	20%	/ U 2	/ 2	/ 2	/20%			20%		U	U		
2691-41-0	HMX		NA	✓	✓	✓	✓ ✓	✓ ✓	✓ ✓	NA			N/A	NA	NA		
121-82-4	RDX																
99-35-4	1,3,5-Trinitrobenzene																
99-65-0	1,3-dinitrobenzene																
98-95-3	Nitrobenzene																
479-45-8	Tetryl																
118-96-7	2,4,6-trinitrotoluene																
35572-78-2	2-amino-4,6-dinitrotoluene																
1946-51-0	4-amino-2,6-dinitrotoluene																
121-14-2	2,4-dinitrotoluene																
606-20-2	2,6-dinitrotoluene																
88-72-2	2-nitrotoluene																
99-99-0	4-nitrotoluene																
99-08-1	3-nitrotoluene																
78-11-5	PETN																

Sample	SMC %REC	SMC RT	Sample	SMC %REC	SMC RT

Comments: 201060
196860 NO MS/MSD. MS/LCSD used for accuracy & precision

Requested XT sheet for 196859 & CCVS for 196860.

Confirmation

Sample	CAS #	RPD > 25%	Sample	CAS #	RPD > 25%

Solids-to-aqueous conversion:

mg / kg = µg / g : [(µg / g) x (sample mass {g} / sample vol. {ml}) x (1000 ml / 1 liter)] / Dilution Factor = µg / l

Reviewed By: NHal Date: 10.21.0

Inorganic Metals

Site/Project: OU3 Soil Sampling AR/COC #: 605649, -50, -51, -55 Laboratory Sample IDs: 65936-016 thru -030

Laboratory: GEL Laboratory Report #: 65936

Methods: SW-846 7471 (Hg) 6010 (Metals)

# of Samples: ~~16~~ 15 LT Matrix: Soils Batch #s: 197745 (Hg) 196732 (Metals)

QC Element

ug/l

CAS #/ Analyte	TAL	ICV	CCV	ICB	CCB	Method Blanks	LCS	LCSD	LCSD RPD	MS ②	MSD	MSD RPD	① Rep. RPD	ICS AB	Serial Dilu-tion	LT ~~Field Dup RPD~~	65944 + Equip. Blanks 011	Field Blanks	Field Dup RPD	
7429-90-5 Al								NA			NA							NA		
7440-39-3 Ba	✓	✓	✓	✓	✓	✓	✓			134			✓	✓	✓	.000329 mg/l			✓	
7440-41-7 Be																				
7440-43-9 Cd	✓	✓	✓	✓	0.517	✓	✓			✓			NA	✓	NA		✓		✓	
7440-70-2 Ca																				
7440-47-3 Cr	✓	✓	✓	✓	✓	✓	✓			✓			46%	✓	✓	.000621 mg/l			✓	
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	✓	✓	✓	✓	✓④	✓	✓			✓			NA	✓	NA		✓		✓	
7440-23-5 Na																				
7440-62-2 V																				
7440-66-6 Zn																				
7439-92-1 Pb	✓	✓	✓	✓	✓	✓	✓			✓			✓	✓	✓		✓		✓	
7782-49-2 Se	✓	✓	✓	✓	③ ④	✓	✓			✓			NA	✓	NA		✓		✓	
7440-38-2 As	✓	✓	✓	✓	✓	✓	✓			✓			✓	✓	NA		✓		✓	
7440-36-0 Sb																				
7440-28-0 Tl																				
7439-97-6 Hg	✓	✓	✓	✓	✓	✓	✓			✓			NA				✓		↑✓	
Cyanide CN																				

Notes: Shaded rows are RCRA metals. **Solids-to-aqueous conversion:** mg / kg = µg / g : [(µg / g) x (sample mass {g} / sample vol. {ml}) x (1000 ml / 1 liter)] / Dilution Factor = µg / l

Comments: Hg Dup/MS SDG 65745

All soils 2x Sa 16 & 19 rr Se 5X

① SA 75% rr cc.

Reviewed By: Date: 10.21.02

③ ~~SA~~ SE 20 CCB -2.0ug/l 9/7
SA 17 & 18 -2.08ug/l 9/10
SA 16 & 19 -1.66 ug/l 9/10

④ SE & Hg - ND
SA 21 → 30 9/11
SE -2.52ug/l

B-14

Inorganic Metals

Site/Project: DSS Soil Sampling AR/COC #: 605649, -50, -51, -55 Laboratory Sample IDs: 65936-016 thru -030

Laboratory: GEL Laboratory Report #: 65936

Methods: SW-846 7471 (Hg) 6010 (Metals)

# of Samples: ~~16~~ 15 Matrix: Soils Batch #s: 197745 (Hg) 196732 (Metals)

CAS #/ Analyte	TAL	ICV	CCV	ICB	CCB	Method Blanks	LCS	LCSD	LCSD RPD	MS ②	MSD	MSD RPD	① Rep. RPD	ICS AB	Serial Dilution	~~Field Dup RPD~~	65944+ Equip. Blanks 011	Field Blanks	Field Dup RPD	
	ug/l																			
7429-90-5 Al								NA			NA							NA		
7440-39-3 Ba	✓	✓	✓	✓	✓	✓	✓			134			✓	✓	✓		.000329 mg/l		✓	
7440-41-7 Be																				
7440-43-9 Cd	✓	✓	✓	✓	0.517	✓	✓			✓			NA	✓	NA		✓		✓	
7440-70-2 Ca																				
7440-47-3 Cr	✓	✓	✓	✓	✓	✓	✓			✓			46%	✓	✓		.000621 mg/l		✓	
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	✓	✓	✓	✓	✓④	✓	✓			✓			NA	✓	NA		✓		✓	
7440-23-5 Na																				
7440-62-2 V																				
7440-66-6 Zn																				
7439-92-1 Pb	✓	✓	✓	✓	✓	✓	✓			✓			✓	✓	✓		✓		✓	
7782-49-2 Se	✓	✓	✓	✓	③ ④	✓	✓			✓			NA	✓	NA		✓		✓	
7440-38-2 As	✓	✓	✓	✓	✓	✓	✓			✓			✓	✓	NA		✓		✓	
7440-36-0 Sb																				
7440-28-0 Tl																				
7439-97-6 Hg	✓	✓	✓	✓	✓	✓	✓			✓			NA				✓		↑✓	
Cyanide CN																				

Notes: Shaded rows are RCRA metals. Solids-to-aqueous conversion: mg / kg = µg / g : [(µg / g) x (sample mass {g} / sample vol. {ml}) x (1000 ml / 1 liter)] / Dilution Factor = µg / l

Comments: Hg Dup/MS SNX 65745 SDG

AS) soils 2X Sa 16 & 19 cc se 5X

① SA 75X eh cc.

Reviewed By: Khal Date: 10.21.02

③ ~~SA~~ SE 20 CCB -2.0ug/l 9/7

B-14 SA 17 & 18 -2.08ug/l 9/10

SA 16 & 19 -1.66 ug/l 9/10

④ SE & Ag - ND

SA 21 → 30 9/11

SE ±2ug/l

Inorganic Metals

Site/Project: DSS Soil Sampling AR/COC #: 605655

Laboratory Sample IDs: 65944-011 (EB)

Laboratory: GEL Laboratory Report #: 65944

Methods: SW-846 7470 (Hg) 6010B (Metals)

# of Samples: 1 Matrix: Aqueous

Batch #s: 197121 (Hg) 199969 (Metals)

QC Element

CAS #/ Analyte	TAL	ICV	CCV	ICB	CCB	Method Blanks	LCS	LCSD	LCSD RPD	MS	MSD	MSD RPD	Rep. RPD	ICS AB	Serial Dilution	Field Dup. RPD	Equip. Blanks	Field Blanks	5X DL	5X B
				ug/l		ug/l													ug/l	
7429-90-5 Al																				
7440-39-3 Ba	✓	✓	✓	✓		.00025	✓	NA		✓	NA		✓	✓	✓	NA	NA	NA		.00125
7440-41-7 Be																				<5X
7440-43-9 Cd	✓	✓	✓	✓		✓	✓			✓			NA	✓	NA					
7440-70-2 Ca																				
7440-47-3 Cr	✓	✓	✓	✓	.00104	.000867	✓			✓			NA	✓	NA					J, B,
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																			ND =	
7440-22-4 Ag	✓	✓	✓	[-.00108]	.0026	.00085	✓			✓			NA	✓	NA				UJ, B3	
7440-23-5 Na																				
7440-62-2 V																				
7440-66-6 Zn																				
7439-92-1 Pb	✓	✓	✓	✓	.00195	.00259	✓			✓			NA	✓	NA					ND N
7782-49-2 Se	✓	✓	✓	✓	.00317	✓	✓			✓			NA	✓	NA					ND N
7440-38-2 As	✓	✓	✓	✓		✓	✓			✓			✓	✓	NA					
7440-36-0 Sb																				
7440-28-0 Tl																			ND =	
7439-97-6 Hg	✓	✓	✓	✓	[.0000658]	✓	✓			✓ ✓			NA						UJ, B3	
Cyanide CN																				

Notes: Shaded rows are RCRA metals. Solids-to-aqueous conversion: mg / kg = µg / g : [(µg / g) x (sample mass {g} / sample vol. {ml}) x (1000 ml / 1 liter)] / Dilution Factor = µg / l

Comments: Metals DUP MS SD 66619 SNLS SDG

Hg Dup MS 65748 SNLS SDG
65920

Reviewed By: Date: 10.22.00

General Chemistry

Site/Project: DSS Soil Sampling AR/COC #: 605649 -50, -51, -55 Laboratory Sample IDs: 65936 - 016 thru - 030 (Soils)
Laboratory: GEL Laboratory Report #: 65936 65944 - 010, - 009 (EB)
Methods: SW-~~846~~ 9012A (TCN) 7196A (Hex Cr) 197510 (prep - 8/29) 196887 (prep 8/29)
# of Samples: 15 1 Matrix: Soils EB Batch #s: 197511 (soil TCN) 196888 (soil Cr⁶)

CAS #	Analyte Soils	TAL	ICV	CCV	ICB	CCB	Method Blanks	LCS	LCSD	LCSD RPD	MS	MSD	MSD RPD	Rep. RPD	ICS AB	Serial Dilution	Field Dup. RPD	Equip. Blanks	Field Blanks	MB X
							ug/kg QC Element													
	Total CN		✓	✓	✓	✓	0.0869 J	✓✓	NA	NA	✓✓	NA	NA	NA	NA	NA	✓	ND	NA	0.43
	Hexavalent Chromium		✓	✓	✓	✓	✓	✓	NA	NA	✓✓	NA	NA	NA	NA	NA	✓	ND	NA	
*	H2O (EB)																			
	Total CN		✓	✓	✓	✓	✓	✓	NA	NA	✓	NA	—	NA	→					
	Hexavalent Chromium		✓	✓	✓	✓	✓	✓	NA	NA	✓ 76	NA	—	NA	→					
											(80 - 122 % gel criteria) (75 - 125 % DV criteria)									

Comments:

* EB = 65944 - 009 (Total CN) Method 9010B (prep) 9012A (a) 199200 prep 9/04 (13 days) 199201 Anal 9/05

65944 - 010 (Cr⁶) Method 7196A 196733 (Anal 8/23 16.15) Coll on 8/22 @ 8.25 "UJ, ② HT" >7

TCN - H2O — Dup/MS 66197

Reviewed By: Dural Date: 10.23.0

JB ① -017, -019, -020, -021, -022, < 5X MB value

Radiochemistry

Site/Project: DSS Soil Sampling AR/COC #: 605649, -50, -51, -55 Laboratory Sample IDs: 65936 -016 thru - 030 soils
65944 - 012 (EB)

Laboratory: GEL Laboratory Report #: 65936

Methods: EPA 900 (Gross A/B)

# of Samples: 15 & 1 Matrix: Soils & Aqueous (EB) Batch #s: 198983 (soils) 198970 (H2O)

	Analyte	QC Element												
		Method Blanks	LCS	MS/msd	Rep RER	Equip. Blanks	Field Dup. RER	Field Blanks	Sample ID	Isotope	IS/Trace	Sample ID	Isotope	IS/Tr
	Criteria	U	20%	25%	<1.0	U	<1.0	U	NA		50-105			50-1
	H3													
	U-238													
	U-234													
	U-235/-236													
	Th-232													
	Th-228													
	Th-230			(75-125%)										
	Pu-239/-240													
Soils	Gross Alpha ✓	✓	✓	73/68	✓	ND	✓	NA						
	Nonvolatile Beta ✓	✓	✓	✓ ✓	✓	0.448	✓	NA						
	Ra-226					> MDA								
	Ra-28													
	Ni-63					5X = 2.24								
	Gamma Spec. Am-241													
	Gamma Spec. Cs-137													
	Gamma Spec. Co-60													
EB	Gross Alpha	✓	✓	✓✓	✓	NA	NA	NA						
	Nonvolatile Beta	✓	✓	✓✓	✓	1	1	1						

Parameter	Method	Typical Tracer	Typical Carrier
Iso-U	Alpha spec.	U-232	NA
Iso-Pu	Alpha spec.	Pu-242	NA
Iso-Th	Alpha spec.	Th-229	NA
Am-241	Alpha spec.	Am-242	NA
Sr-90	Beta	Y ingrowth	NA
Ni-63	Beta	NA	Ni by ICP
Ra-226	Deamination	NA	NA
Ra-226	Alpha spec.	Ba-133 or Ra-225	NA
Ra-228	Gamma spec.	Ba-133	NA

Gamma spec. LCS contains: Am-241, Cs-137, and Co-60

Comments: H2O - 65919 - Dup/ms

Gross α All detects J, A_2
All SA > 5X EB. Nonvolatile β

Reviewed By: DWal Date: 10.2

ANNEX D
DSS Site 1028
Risk Assessment

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DSS SITE 1028: RISK ASSESSMENT REPORT

I. Site Description and History

Drain and Septic Systems (DSS) Site 1028, the Building 6560 Septic System and Seepage Pit, 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 septic system consisted of a 750-gallon septic tank connected to a single seepage pit, and a second separate seepage pit with no associated septic tank on the opposite (northeast) side of Building 6560. Available information indicates that Building 6560 was constructed in 1955 (SNL/NM March 2003), and it is assumed that the septic system and seepage pit were also constructed at that time. By June 1991, effluent discharges were routed to the City of Albuquerque sanitary sewer system (Jones June 1991). The old septic system and seepage pit lines were disconnected and capped, and the systems were abandoned in place concurrent with this change (Romero September 2003).

Environmental concern about DSS Site 1028 is based upon the potential for the release of constituents of concern (COCs) in effluent discharged to the environment via the septic system and seepage pit at this site. Because operational records were not available, the investigation 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 drainage channel is a shallow, low relief arroyo that lies approximately 0.85 miles south of the site, and drains to and terminates in a playa just west of KAFB. No springs or perennial surface-water bodies are located within 2.4 miles of the site. Average annual rainfall in the SNL/NM and KAFB area, as measured at Albuquerque International Sunport, is 8.1 inches (NOAA 1990). Surface-water runoff in the vicinity of the site is minor because the surface is flat or slopes slightly 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 1028 is unpaved with some native vegetation, and no storm sewers are used to direct surface water away from the site.

DSS Site 1028 lies at an average elevation of approximately 5,402 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 482 feet below ground surface (bgs). Groundwater flow is thought to be generally to the west in this area (SNL/NM March 2002). The nearest groundwater monitoring well is approximately 1,100 feet west of the site. The nearest production wells to DSS Site 1028 are KAFB-4 and KAFB-11, approximately 3.3 and 3.7 miles to the northwest and northeast, 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 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 1028 was effluent discharged to the environment from the two seepage pits at this site.

Table 1
Summary of Sampling Performed to Meet DQOs

DSS Site 1028 Sampling Area(s)	Potential COC Source	Number of Sampling Locations	Sample Density (samples/acre)	Sampling Location Rationale
Soil beneath the septic system seepage pit	Effluent discharged to the environment from the septic system seepage pit	1	NA	Evaluate potential COC releases to the environment from effluent discharged from the septic system seepage pit.
Soil beneath the northeast seepage pit	Effluent discharged to the environment from the northeast seepage pit	1	NA	Evaluate potential COC releases to the environment from effluent discharged from the northeast seepage pit.

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

The soil samples were collected at two boring locations across DSS Site 1028 with a Geoprobe^{TM} from two 3- or 4-foot-long sampling intervals. Septic system seepage pit sampling intervals started at 14 and 19 feet bgs, and 7 and 12 feet bgs in the single (northeast) seepage pit boring. 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 1028

Sample Type	VOCs	SVOCs	PCBs	HE	RCRA Metals	Hexavalent Chromium	Cyanide	Gamma Spectroscopy Radionuclides	Gross Alpha/Beta
Confirmatory	4	4	4	4	4	4	4	4	4
Duplicates	0	0	0	0	0	0	0	0	0
EBs and TBs (VOCs only)	2	1	1	1	1	1	1	0	1
Total Samples	6	5	5	5	5	5	5	4	5
Analytical Laboratory	GEL	GEL	GEL	GEL	GEL	GEL	GEL	RPSD	GEL

DSS = Drain and Septic Systems.
EB = Equipment blank.
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 1028 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 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 1028

Analytical Method[a]	Data Quality Level	GEL	RPSD
VOCs EPA Method 8260	Defensible	4	None
SVOCs EPA Method 8270	Defensible	4	None
PCBs EPA Method 8082	Defensible	4	None
HE Compounds EPA Method 8330	Defensible	4	None
RCRA Metals EPA Method 6000/7000	Defensible	4	None
Hexavalent Chromium EPA Method 7196A	Defensible	4	None
Total Cyanide EPA Method 9012A	Defensible	4	None
Gamma Spectroscopy Radionuclides EPA Method 901.1	Defensible	None	4
Gross Alpha/Beta Activity EPA Method 900.0	Defensible	4	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.
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.
VOC = Volatile organic compound.

The QA/QC samples were collected during the sampling effort according to the Environmental Restoration (ER) Project Quality Assurance Project Plan. The QA/QC samples consisted of one trip blank (for VOCs only), and one set of equipment blanks. No significant QA/QC problems were identified in the QA/QC samples.

All of the 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 1028 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 1028 was 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 1028, 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 1028 were 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 any potential degradation products at DSS Site 1028.

III.3 Rate of Contaminant Migration

The septic system and seepage pit at DSS Site 1028 were deactivated in the early 1990s when Building 6560 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 two seepage pits 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 and seepage pit were 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 1028.

III.4 Extent of Contamination

Subsurface soil samples were collected from boreholes drilled at two locations beneath the effluent release points and areas (the two seepage pits) at DSS Site 1028 to assess whether releases of effluent from the septic system caused any environmental contamination.

The DSS Site 1028 soil samples were collected at sampling depths starting at 14 and 19 feet beneath the septic system seepage pit, and 7 and 12 feet beneath the seepage pit on the northeast side of Building 6560. Sampling intervals started at the depths at which effluent discharged from the seepage pits would have entered the subsurface environment at the site. This sampling procedure was required by the New Mexico Environment Department (NMED) regulators and has been used at numerous DSS-type of sites at SNL/NM. The soil samples are considered to be representative of the soil potentially contaminated with the COCs at DSS Site 1028 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 1028 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 is too high (i.e., could possibly cause an adverse effect to human health or the environment), the compound is retained. Nondetected organic compounds not included in this assessment were determined to have detection limits low enough to ensure protection of human health and the environment. In order to provide conservatism in this risk assessment, the calculation uses only the maximum concentration value of each COC found for the entire site. The SNL/NM maximum background concentration (Dinwiddie September 1997) was selected to provide the background screen listed in Tables 4 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 1028. 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.

V. Fate and Transport

The primary releases of COCs at DSS Site 1028 were to the subsurface soil resulting from the discharge of effluents from the Building 6560 septic system and seepage pit. Wind, water, and biota are natural mechanisms of COC transport from the primary release point; however, because the discharge was to subsurface soil, none of these are considered to be of potential

Table 4
Nonradiological COCs for Human Health Risk Assessment at DSS Site 1028 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	3.64	4.4	Yes	44[c]	–	**Yes**
Barium	104 J	214	Yes	170[d]	–	**Yes**
Cadmium	0.259 J	0.9	Yes	64[c]	–	**Yes**
Chromium, total	10.9 J	15.9	Yes	16[c]	–	No
Chromium VI	0.0272[e]	1	Yes	16[c]	–	No
Cyanide	0.0233[e]	NC	**Unknown**	NC	–	**Unknown**
Lead	6.39	11.8	Yes	49[c]	–	**Yes**
Mercury	0.0028 J	<0.1	**Unknown**	5,500[c]	–	**Yes**
Selenium	0.267 J	<1	**Unknown**	800[f]	–	**Yes**
Silver	0.0451[e]	<1	**Unknown**	0.5[c]	–	No
Organic						
2-Butanone	0.0168	NA	**NA**	1[g]	0.29[g]	No
bis(2-Ethylhexyl) phthalate	0.0344 J	NA	**NA**	851[h]	7.6[i]	**Yes**
PCBs (Aroclor 1254)	0.0102	NA	**NA**	31,200[c]	6.72[c]	**Yes**

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] Howard 1989.

[i] 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.
PCB = Polychlorinated biphenyl.
SNL/NM = Sandia National Laboratories/New Mexico.
– = Information not available.

Table 5
Radiological COCs for Human Health Risk Assessment at DSS Site 1028 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 (0.0431)	0.079	Yes	3,000[d]	**Yes**
Th-232	0.896	1.01	Yes	3,000[d]	**Yes**
U-235	**ND (0.251)**	0.16	**No**	900[d]	**Yes**
U-238	ND (0.644)	1.4	Yes	900[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.
ND ( ) = Not detected, but the MDA (shown in parentheses) exceed background.
NMED = New Mexico Environment Department.
pCi/g = Picocurie(s) per gram.
SNL/NM = Sandia National Laboratories/New Mexico.

significance as transport mechanisms at this site. Because the seepage pits are no longer active, additional infiltration of water is not expected. Infiltration of precipitation is essentially nonexistent at DSS Site 1028, as virtually all of the moisture either drains away from the site, or evaporates. Because groundwater at this site is approximately 482 feet bgs, the potential for COCs to reach groundwater through the unsaturated zone above the water table is extremely low.

The COCs at DSS Site 1028 include both inorganic and organic constituents. The inorganic COCs include both radiological and nonradiological analytes. With the exception of cyanide, the inorganic COCs are elemental in form and are not considered to be degradable. Transformations of these inorganic constituents could include changes in valence (oxidation/reduction reactions) or incorporation into organic forms (e.g., the conversion of selenite or selenate from soil to seleno-amino acids in plants). Cyanide can be metabolized by soil biota. Radiological COCs will undergo decay to stable isotopes or radioactive daughter elements. However, because of the long half-life of the radiological COC (U-235), the aridity of the environment at this site, and the lack of potential contact with biota, none of these mechanisms is expected to result in significant losses or transformations of the inorganic COCs.

The organic COCs at DSS Site 1028 are limited to 2-butanone and bis(2-ethylhexyl) phthlate. Organic COCs may be degraded through photolysis, hydrolysis, and biotransformation. Photolysis requires light and therefore takes place in the air, at the ground surface, or in surface water. Hydrolysis includes chemical transformations in water and may occur in the soil solution. Biotransformation (i.e., transformation caused by plants, animals, and microorganisms) may occur; however, biological activity may be limited by the arid environment at this site. Because of the depth of the COCs in the soil, the loss of 2-butanone through volatilization is expected to be minimal.

Table 6 summarizes the fate and transport processes that can occur at DSS Site 1028. The COCs at DSS Site 1028 include both radiological and nonradiological inorganic analytes as well as organic analytes. Wind, surface water, and biota are considered to be of low significance as potential transport mechanisms at this site. Significant leaching into the subsurface soil is unlikely, and leaching into the groundwater at this site is highly unlikely. The potential for transformation of COCs is low, and loss through decay of the radiological COC is insignificant because of its long half-life.

Table 6
Summary of Fate and Transport at DSS Site 1028

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 (TEDE) and incremental estimated cancer risk are calculated by subtracting applicable background concentrations directly from maximum on-site contaminant values. This background subtraction applies only when a radiological COC occurs as contamination and exists as a natural background radionuclide.
Step 6.	These values are compared with guidelines established by the U.S. Environmental Protection Agency (EPA), NMED, and the DOE to determine whether further evaluation and potential site cleanup are required. Nonradiological COC risk values also are compared to background risk so that an incremental risk can be calculated.
Step 7.	Uncertainties of the above steps are addressed.

VI.2 Step 1. Site Data

Section I of this risk assessment provides the site description and history for DSS Site 1028. 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 1028 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 1028 is approximately 482 feet bgs. No intake routes through plant, meat, or milk ingestion are considered appropriate for either the industrial or residential land-use scenarios. Figure 1 shows the conceptual model flow diagram for DSS Site 1028.

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. The SNL/NM maximum background concentration was selected to provide the background screen in Table 4 and used to calculate risk attributable to background in Section VI.6.2. Only the COCs that were detected above the corresponding SNL/NM maximum background screening levels or that do 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 (MDA) are carried through the risk assessment at the maximum levels. The resultant radiological COCs remaining after this step are referred to as background-adjusted radiological COCs.

VI.4.2 Results

Tables 4 and 5 show the DSS Site 1028 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, four constituents do not have quantified background screening concentrations; therefore, it is unknown whether these COCs exceed background. Three constituents are organic compounds that do not have corresponding background screening values.

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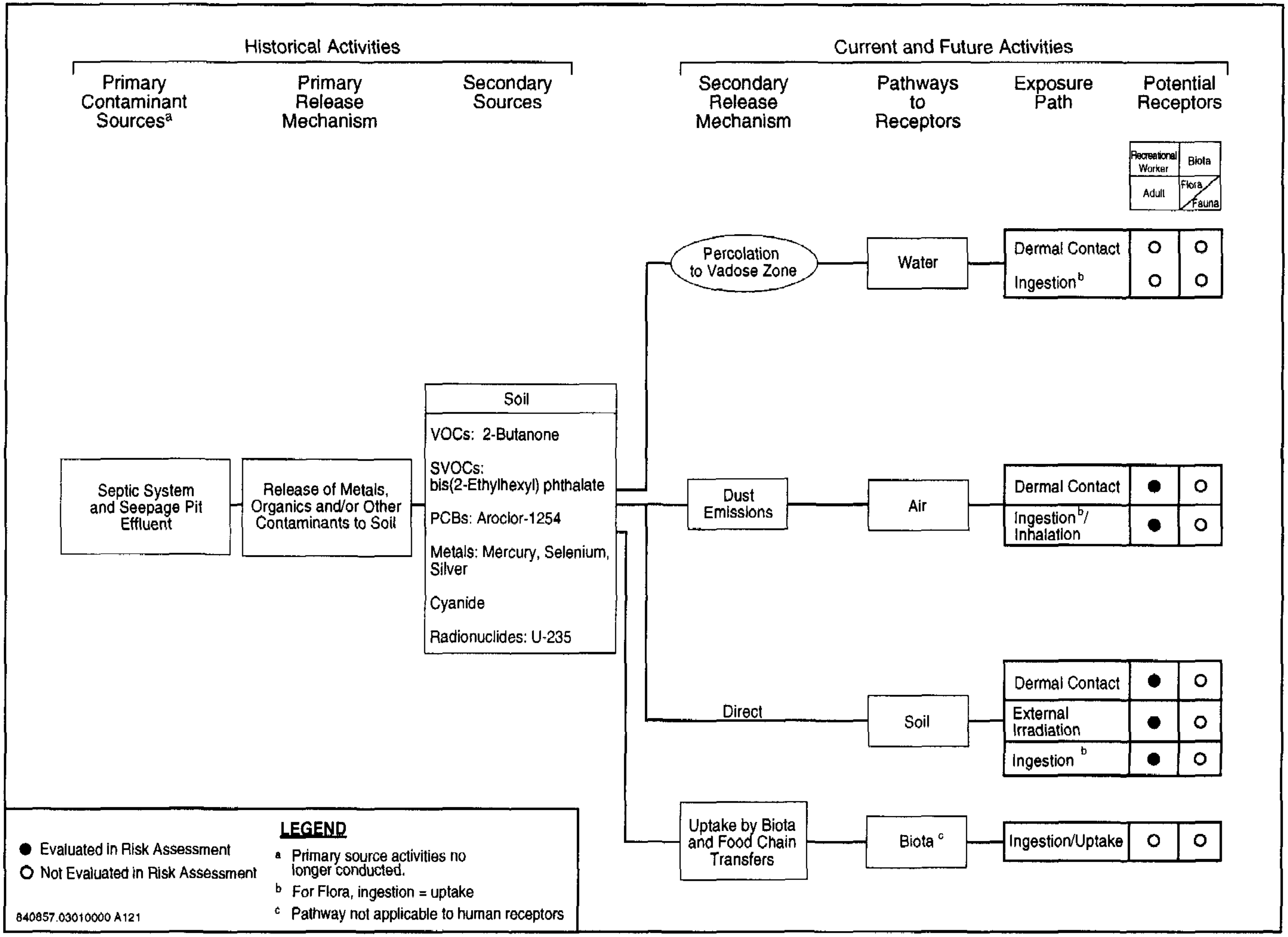

Figure 1

Conceptual Site Model Flow Diagram for DSS Site 1028, Building 6560 Septic System and Seepage Pit

The maximum concentration value for total PCBs was 0.0102 milligrams (mg)/kilogram (kg). This concentration is less than the EPA screening level of 1 mg/kg (Title 40, Code of Federal Regulations, Part 761). Because the maximum concentration for PCBs at this site is less than the screening value, PCBs are eliminated from further consideration in the human health risk assessment.

For the radiological COCs, one constituent (U-235) exhibited an MDA greater than its background screening level.

VI.5 Step 4. Identification of Toxicological Parameters

Tables 7 (nonradiological) and 8 (radiological) list the COCs retained in the risk assessment and the values for the available toxicological information. The toxicological values for the nonradiological COCs presented in Table 7 were obtained from the Integrated Risk Information System (IRIS) (EPA 2003), the Health Effects Assessment Summary Tables (HEAST) (EPA 1997a), the Technical Background Document for Development of Soil Screening Levels (NMED December 2000), the EPA Region 6 electronic database (EPA 2002a), and the Risk Assessment Information System (ORNL 2003) electronic databases. Dose conversion factors (DCFs) used in determining the excess TEDE values for radiological COCs for the individual pathways were the default values provided in the RESRAD computer code (Yu et al. 1993a) as developed in the following documents:

- DCFs for ingestion and inhalation were taken from "Federal Guidance Report No. 11, Limiting Values of Radionuclide Intake and Air Concentration and Dose Conversion Factors for Inhalation, Submersion, and Ingestion" (EPA 1988).

- DCFs for surface contamination (contamination on the surface of the site) were taken from DOE/EH-0070, "External Dose-Rate Conversion Factors for Calculation of Dose to the Public" (DOE 1988).

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

VI.6 Step 5. Exposure Assessment and Risk Characterization

Section VI.6.1 describes the exposure assessment for this risk assessment. Section VI.6.2 provides the risk characterization, including the HI and excess cancer risk for both the potential nonradiological COCs and associated background for the 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.

Table 7
Toxicological Parameter Values for DSS Site 1028 Nonradiological COCs

COC	RfD$_o$ (mg/kg-d)	Confidence[a]	RfD$_{inh}$ (mg/kg-d)	Confidence[a]	SF$_o$ (mg/kg-d)$^{-1}$	SF$_{inh}$ (mg/kg-d)$^{-1}$	Cancer Class[b]	ABS
Inorganic								
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]

[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):

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

Table 8
Radiological Toxicological Parameter Values for DSS Site 1028 COCs Obtained from RESRAD Risk Coefficients[a]

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

[a] Yu et al. 1993a.

[b] EPA weight-of-evidence classification system for carcinogenicity (EPA 1989): A = Human carcinogen for high dose and high dose rate (i.e., greater than 50 rem per year). For low-level environmental exposures, the carcinogenic effect has not been observed and documented.

1/pCi = One per picocurie.
COC = Constituent of concern.
DSS = Drain and Septic Systems.
EPA = U.S. Environmental Protection Agency.
g/pCi-yr = Gram(s) per picocurie-year.
SF_{ev} = External volume exposure slope factor.
SF_{inh} = Inhalation slope factor.
SF_o = Oral (ingestion) slope factor.

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). For the radiological COC, the coded equation provided in RESRAD computer code is used to estimate the incremental TEDE and cancer risk for individual exposure pathways. Further discussion of this process is provided in the "Manual for Implementing Residual Radioactive Material Guidelines Using RESRAD" (Yu et al. 1993a).

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

VI.6.2 Risk Characterization

Table 9 shows an HI of 0.00 for the DSS Site 1028 nonradiological COCs and an estimated excess cancer risk of 2E-10 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 10 shows an HI of 0.00 and no quantified estimated excess cancer risk for the DSS Site 1028 associated background constituents under the designated industrial land-use scenario.

For the radiological COC, contribution from the direct gamma exposure pathway is included. For the industrial land-use scenario, a TEDE was calculated that results in an incremental TEDE of 1.3E-2 millirem (mrem)/year (yr). In accordance with EPA guidance found in Office of Solid Waste and Emergency Response (OSWER) Directive No. 9200.4-18 (EPA 1997b), an incremental TEDE of 15 mrem/yr is used for the probable land-use scenario (industrial in this

Table 9
Risk Assessment Values for DSS Site 1028 Nonradiological COCs

COC	Maximum Concentration (mg/kg)	Industrial Land-Use Scenario[a]		Residential Land-Use Scenario[a]	
		Hazard Index	Cancer Risk	Hazard Index	Cancer Risk
Inorganic					
Cyanide	0.0233[b]	0.00	–	0.00	–
Mercury	0.0028 J	0.00	–	0.00	–
Selenium	0.267 J	0.00	–	0.00	–
Silver	0.0451[b]	0.00	–	0.00	–
Organic					
2-Butanone	0.0168	0.00	–	0.00	–
bis(2-Ethylhexyl) phthalate	0.0344 J	0.00	2E-10	0.00	8E-10
Total		0.00	2E-10	0.00	8E-10

[a]EPA 1989.
[b]Concentration is one-half the maximum detection limit.
COC = Constituent of concern.
DSS = Drain and Septic Systems.
J = Estimated concentration.
mg/kg = Milligram(s) per kilogram.
– = Information not quantified.

Table 10
Risk Assessment Values for DSS Site 1028 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
Cyanide	NC	–	–	–	–
Mercury	<0.1	–	–	–	–
Selenium	<1	–	–	–	–
Silver	<1	–	–	–	–
Total		–	–	–	–

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

case); the calculated dose value for DSS Site 1028 for the industrial land-use scenario is well below this guideline. The estimated excess cancer risk is 1.6E-7.

For the nonradiological COCs under the residential land-use scenario, the HI is 0.00 with an estimated excess cancer risk of 8E-10 (Table 9). 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 10 shows an HI of 0.00 and no quantified estimated excess cancer risk for the DSS Site 1028 associated background constituents under the residential land-use scenario.

For the radiological COCs, the incremental TEDE for the residential land-use scenario is 3.4E-2 mrem/yr. The guideline being used is an excess TEDE of 75 mrem/yr (SNL/NM February 1998) for a complete loss of institutional controls (residential land use in this case); the calculated dose value for DSS Site 1028 for the residential land-use scenario is well below this guideline. Consequently, DSS Site 1028 is eligible for unrestricted radiological release as the residential land-use scenario results in an incremental TEDE of less than 75 mrem/yr to the on-site receptor. The estimated excess cancer risk is 4.6E-7. The excess cancer risk from the nonradiological and radiological COCs should be summed to provide risk estimates for persons exposed to both types of carcinogenic contaminants, as noted in OSWER Directive No. 9200.4-18 "Establishment of Cleanup Levels for CERCLA Sites with Radioactive Contamination," (EPA 1997b). This summation is tabulated in Section VI.9, Summary.

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 0.00 (less than the numerical guideline of 1 suggested in the RAGS [EPA 1989]). The estimated excess cancer risk is 2E-10. NMED guidance states that cumulative excess lifetime cancer risk must be less than 1E-5 (Bearzi January 2001); thus the excess cancer risk for this site is below the suggested acceptable risk value. This assessment also determined risks considering background concentrations of the potential nonradiological COCs for both the industrial and residential land-use scenarios. Assuming the industrial land-use scenario, there is neither a quantifiable HI nor an excess cancer risk for nonradiological COCs. 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 1.79E-10 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.

For the radiological COCs under the industrial land-use scenario, the incremental TEDE is 1.3E-2 mrem/yr, which is significantly less than EPA's numerical guideline of 15 mrem/yr. The incremental estimated excess cancer risk is 1.6E-7.

The calculated HI for the nonradiological COCs under the residential land-use scenario is 0.00, which is below numerical guidance. The estimated excess cancer risk is 8E-10. 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 HI is 0.00 and the estimated incremental cancer risk is 7.78E-10 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.

The incremental TEDE for a residential land-use scenario from the radiological components is 3.4E-2 mrem/yr, which is significantly less than the numerical guideline of 75 mrem/yr suggested in the SNL/NM "RESRAD Input Parameter Assumptions and Justification" (SNL/NM February 1998). The estimated excess cancer risk is 4.6E-7.

VI.8 Step 7. Uncertainty Discussion

The determination of the nature, rate, and extent of contamination at DSS Site 1028 is based upon an initial conceptual model that was validated with sampling conducted at the site. The 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 used to perform the risk assessment at DSS Site 1028.

Because of the location, history of the site, and future land use (DOE et al. September 1995), 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 and residential land-use scenarios compared to established numerical guidance.

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

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

VI.9 Summary

DSS Site 1028 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 (0.00) is significantly lower than the accepted numerical guidance from the EPA. The estimated excess cancer risk is 2E-10; 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 1.79E-10 for the industrial land-use scenario. The incremental risk calculations indicate insignificant risk to human health for the industrial land-use scenario.

Using conservative assumptions and an RME approach to risk assessment, calculations for nonradiological COCs show that for the residential land-use scenario the HI (0.00) is below the accepted numerical guidance from the EPA. The estimated excess cancer risk is 8E-10. Thus, excess cancer risk is below the acceptable risk value provided by the NMED for a residential land-use scenario (Bearzi January 2001). The incremental HI is 0.00 and the incremental estimated excess cancer risk is 7.78E-10 for the residential land-use scenario. The incremental risk calculations indicate insignificant risk to human health for the residential land-use scenario.

The incremental TEDE and corresponding estimated cancer risk from radiological COCs are much less than EPA guidance values; the estimated TEDE is 1.3E-2 mrem/yr for the industrial land-use scenario, which is much less than the EPA's numerical guidance of 15 mrem/yr (EPA 1997b). The corresponding incremental estimated cancer risk value is 1.6E-7 for the industrial land-use scenario. Furthermore, the incremental TEDE for the residential land-use scenario that results from a complete loss of institutional control is 3.4E-2 mrem/yr with an associated risk of 4.6E-7. The guideline for this scenario is 75 mrem/yr (SNL/NM February 1998). Therefore, DSS Site 1028 is eligible for unrestricted radiological release.

The excess cancer risk from the nonradiological and radiological COCs should be summed to provide risk estimates for persons exposed to both types of carcinogenic contaminants, as noted in OSWER Directive No. 9200.4-18 (EPA 1997b). The summation of the nonradiological and radiological carcinogenic risks is tabulated in Table 11.

Table 11
Summation of Incremental Radiological and Nonradiological Risks from DSS Site 1028, Building 6560 Septic System and Seepage Pit Carcinogens

Scenario	Nonradiological Risk	Radiological Risk	Total Risk
Industrial	1.79E-10	1.6E-7	1.6E-7
Residential	7.78E-10	4.6E-7	4.6E-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 1028. 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 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 focuses primarily on the likelihood of exposure of biota at, or adjacent to, the DSS Site 1028 to constituents associated with site activities. Included in this section is 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) summarizes the scoping results and assesses the need for further examination of potential ecological impacts.

VII.2.1 Data Assessment

As indicated in Section IV, all COCs at DSS Site 1028 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 COC 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 DSS Site 1028. Therefore, no COPECs exist at the site, and a more detailed risk assessment was not deemed necessary to predict the potential level of ecological risk associated with the site.

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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)

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

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):

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

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 (m³/day)	20[a,b]	15 Child[a] 30 Adult[a]	10 Child[a] 20 Adult[a]
Volatilization Factor (m³/kg)	Chemical Specific	Chemical Specific	Chemical Specific
Particulate Emission Factor (m³/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/cm²)	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 (cm²/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).

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