3-1-2005

Justification for Class III Permit Modification March 2005 DSS Site 1007 Operable Unit 1295 Building 6730 Septic System at Technical Area III

Sandia National Laboratories/NM

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

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

Sandia National Laboratories

Environmental Restoration Project

Site Histories

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

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

Depth to Groundwater

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

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

Constituents of Concern

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

Investigations

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

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

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

Summary of Data Used for NFA Justification

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

Recommended Future Land Use

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

Results of Risk Analysis

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

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

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

For More Information Contact

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Environmental Restoration Project
Task Leader: Brenda Langkopf
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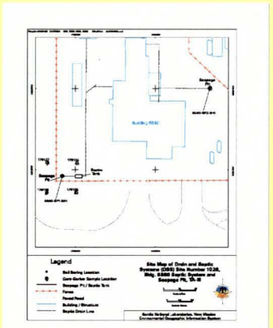
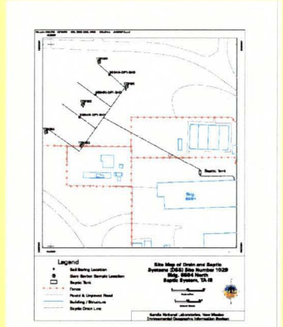
Drain and Septic Systems (DSS) Area of Concern (AOC) Sites 1028, 1029, 1083, 1086, 1108, and 1110

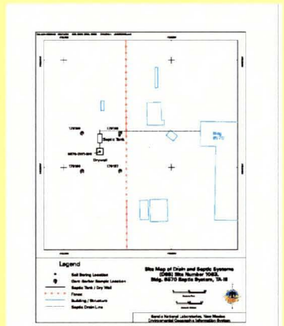
This work supported by the United States Department of Energy under contract DE-AC04-94AL85000.

Sandia National Laboratories

Environmental Restoration Project



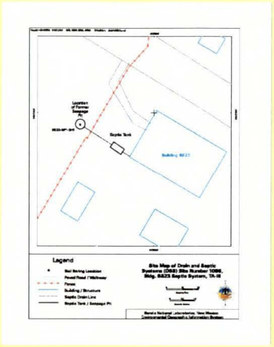


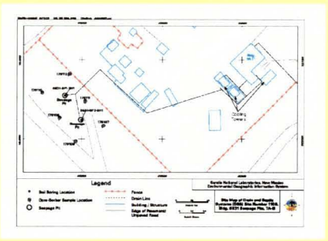


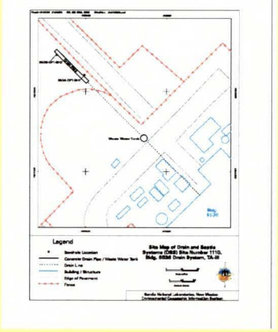
Collecting soil samples with the Geoprobe.

Subsurface soil recovered for analyses.

Seepage pit demolition and backfilling.







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Sandia National Laboratories

Justification for Class III Permit Modification

March 2005

DSS Site 1007
Operable Unit 1295
Building 6730 Septic System at Technical Area III

NFA (SWMU Assessment Report) Submitted March 2004

Environmental
Restoration
Project

United States Department of Energy
Sandia Site Office

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

NFA

ESH SEC

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

MAR 2 3 2004

CERTIFIED MAIL-RETURN RECEIPT REQUESTED

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

Dear Mr. Kieling:

On behalf of the Department of Energy (DOE) and Sandia Corporation, DOE is submitting the enclosed SWMU Assessment Reports and Proposals for No Further Action (NFA) for Drain and Septic Systems (DSS) Sites 1006, 1007, 1015, 1020, 1024, 1029, 1108, and 1110 at Sandia National Laboratories, New Mexico, EPA ID No. NM5890110518.

This submittal includes descriptions of the site characterization work, soil characterization data, and risk assessments for DSS Sites 1006, 1007, 1015, 1020, 1024, 1029, 1108, and 1110. The risk assessments conclude that for these eight sites (1) there is no significant risk to human health under both the industrial and residential land-use scenarios, and (2) that there are no ecological risks associated with these sites.

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

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

Sincerely,

Patty Wagner
Manager

Enclosure

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

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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 1007, FORMER BUILDING 6730 SEPTIC SYSTEM

March 2004

United States Department of Energy
Sandia Site Office

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ACRONYMS AND ABBREVIATIONS

AOC	Area of Concern
AOP	Administrative Operating Procedure
BA	butyl acetate
bgs	below ground surface
COC	constituent of concern
DSS	Drain and Septic Systems
EB	equipment blank
EPA	U.S. Environmental Protection Agency
ER	Environmental Restoration
FIP	Field Implementation Plan
GS	Gore-Sorber™
HE	high explosive(s)
HI	hazard index
HWB	Hazardous Waste Bureau
KAFB	Kirtland Air Force Base
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

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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, 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 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 1007: FORMER BUILDING 6730 SEPTIC SYSTEM

2.1 Summary

The SNL/NM ER Project conducted an assessment of DSS Site 1007, the Former Building 6730 Septic System. There are no known or specific environmental concerns at this site. The assessment was conducted to determine whether environmental contamination was released to the environment via the septic system present at the site. This report presents the results of the assessment and, based upon the findings, recommends a risk-based proposal for NFA for DSS Site 1007. This NFA proposal provides documentation that the site was sufficiently characterized, that no significant releases of contaminants to the environment occurred via the Former Building 6730 Septic System, and that it does not pose a threat to human health or the environment under either industrial or residential land-use scenarios. Building 6730 was demolished in December 2002.

Review and analysis of all relevant data for DSS Site 1007 indicate that concentrations of constituents of concern (COCs) at this site were found to be below applicable risk assessment action levels. Thus, DSS Site 1007 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 1007 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 (Figure 2.2.1-1). The site is located 35 feet northwest of former Building 6730 and 20 feet north of former Building 6731 (Figure 2.2.1-2). The abandoned septic system consisted of a septic tank and distribution box that emptied to eight drainlines, each approximately 30 feet long (Figure 2.2.1-2). Construction details are based upon engineering drawings (SNL/NM February 1988), site inspections, and backhoe excavations of the system. The system received discharges from both of the former Buildings 6731 and 6730.

The surface geology at DSS Site 1007 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 1007 typically consist of a mixture of silts, sands, and gravels that are poorly sorted, and exhibit moderately connected lenticular bedding. Individual beds range from 1 to 5 feet in thickness with a preferred east-west orientation and have moderate to low hydraulic conductivities (SNL/NM March 1996). Site vegetation primarily consists of desert grasses, shrubs, and cacti.

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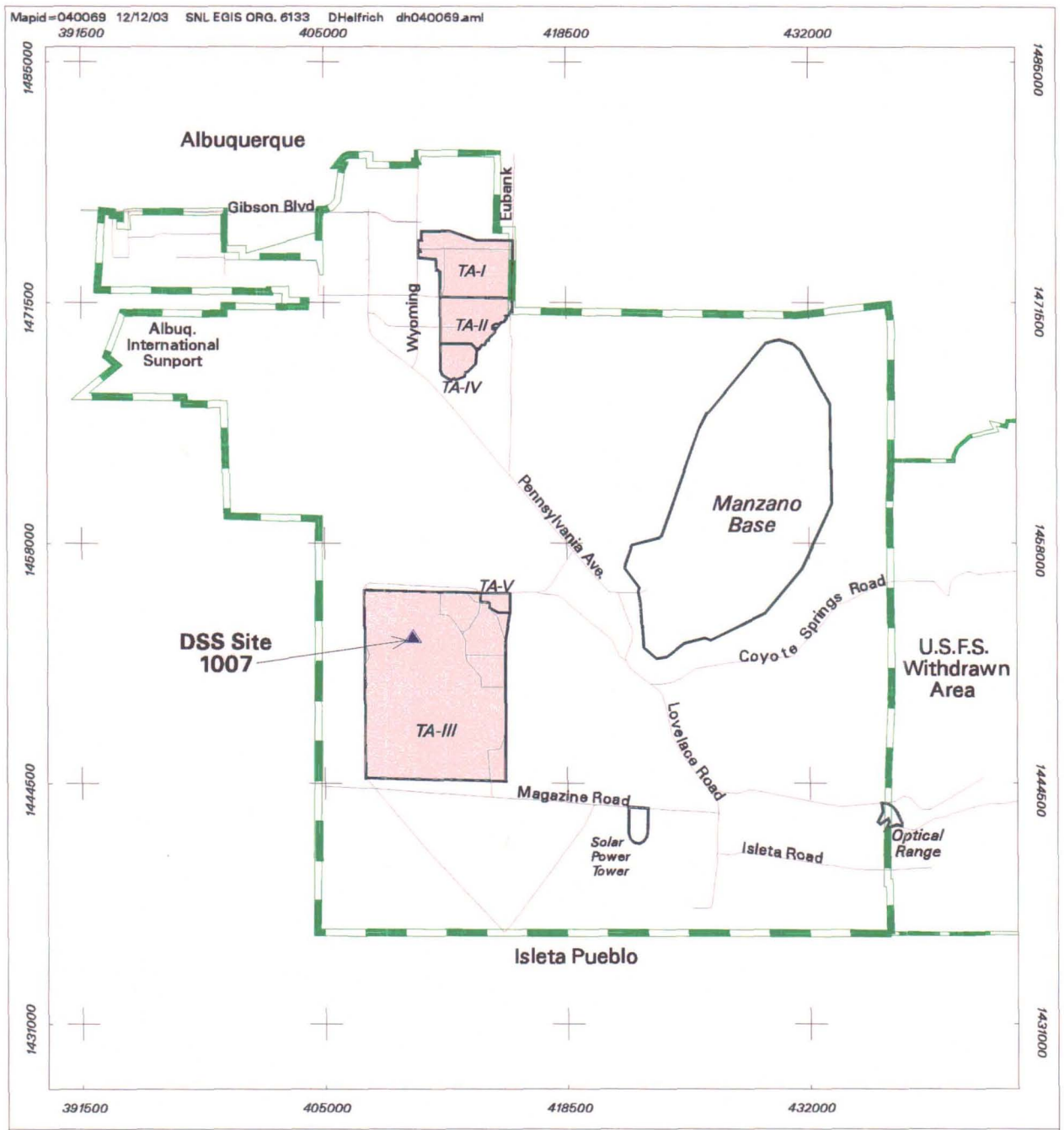

Legend

- DSS Site 1007
- Major Road
- KAFB Boundary
- USFS Withdrawn Area Boundary
- SNL Technical Area

Figure 2.2.1-1
Location Map of Drain and Septic Systems (DSS) Site Number 1007, Bldg. 6730 Septic System, TA-III

0 4500 9000
Scale In Feet

0 1080 2160
Scale In Meters

Sandia National Laboratories, New Mexico
Environmental Geographic Information System

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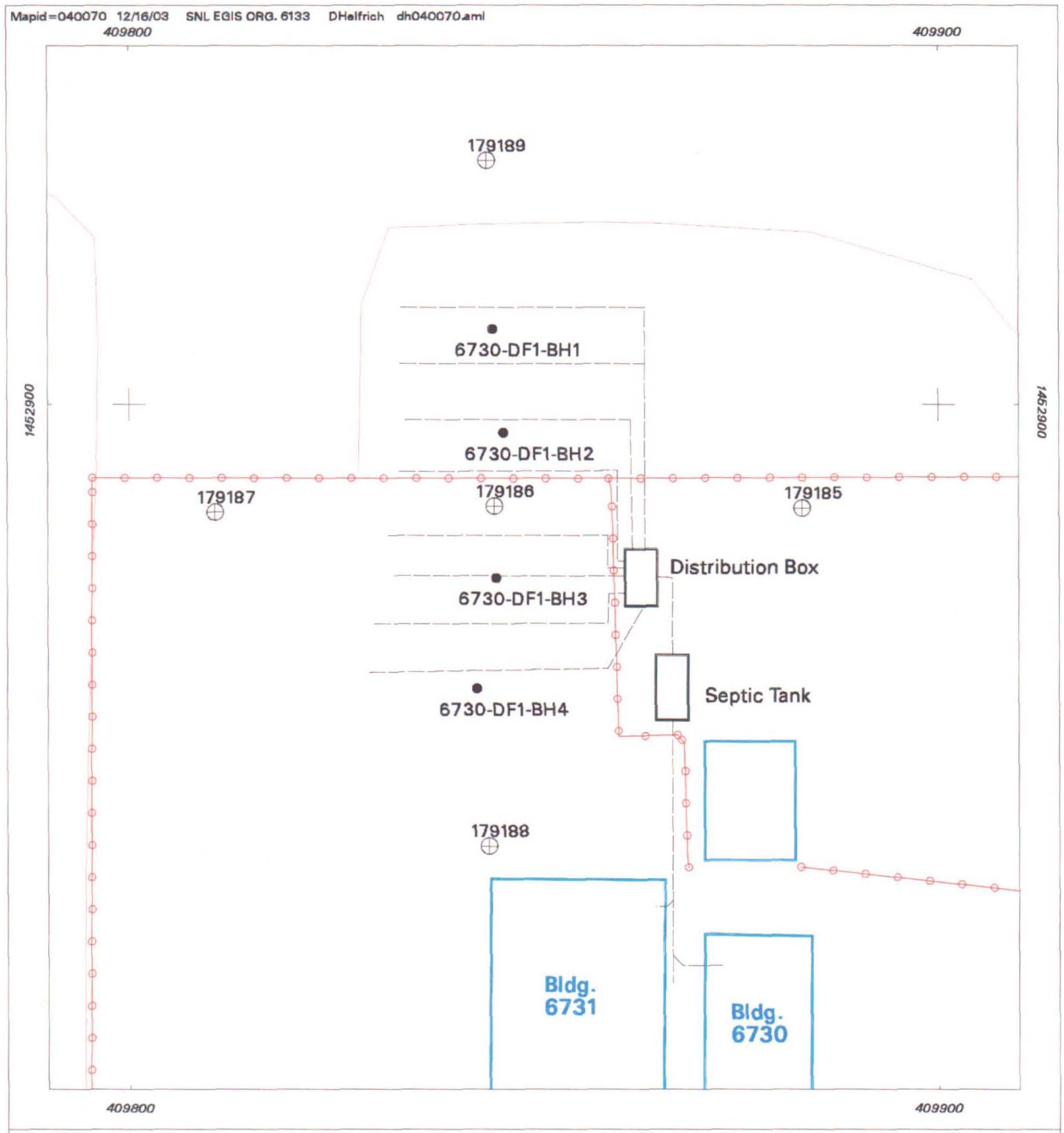

Legend

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

Figure 2.2.1-2
Site Map of Drain and Septic Systems (DSS) Site Number 1007, Bldg. 6730 Septic System, TA-III

0 10 20
Scale In Feet

0 2.4 4.8
Scale In Meters

Sandia National Laboratories, New Mexico
Environmental Geographic Information System

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The ground surface in the vicinity of the site is flat or slopes slightly to the west. The closest major drainage lies south of the site 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 5,355 feet above mean sea level (SNL/NM April 2003). Depth to groundwater is approximately 465 feet below ground surface (bgs) at the site. Groundwater flow is generally to the west in this area (SNL/NM March 2002). The production wells nearest to DSS Site 1007 are KAFB-4, approximately 2.9 miles to the northwest, and KAFB-11, approximately 3.7 miles to the northeast. The nearest groundwater monitoring well is MWL-MW6 at the Mixed Waste Landfill, approximately 1,000 feet southeast of the site.

2.2.2 Operational History

Available information indicates that Building 6730 was constructed in 1964 (SNL/NM March 2003) as a dynamic shock test facility, and it is assumed that the septic system was constructed at the same time. 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. In the early 1990s, the septic system discharges were routed to the City of Albuquerque sanitary sewer system (Jones July 1993). The old septic system line would have been disconnected, capped, and the system abandoned in place concurrent with this change (Romero September 2003).

2.3 Land Use

2.3.1 Current Land Use

The current land use for DSS Site 1007 is industrial.

2.3.2 Future/Proposed Land Use

The projected future land use for DSS Site 1007 is industrial (DOE et al. September 1995).

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3.0 INVESTIGATORY ACTIVITIES

3.1 Summary

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

3.2 Investigation 1—Septic Tank Sampling

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

On June 30, 1992, and July 11, 1995, as part of the SNL/NM Septic System Monitoring Program, aqueous and sludge samples were collected from the Building 6730 septic tank (SNL/NM June 1993, SNL/NM December 1995). The 1992 aqueous samples were analyzed at an off-site laboratory for VOCs, semivolatile organic compounds (SVOCs), pesticides, polychlorinated biphenyls (PCBs), total metals, phenolic compounds, nitrates/nitrites, formaldehyde, fluoride, cyanide, oil and grease, gross/alpha beta activity, tritium, and radionuclides by gamma spectroscopy. The sludge samples were analyzed at an off-site laboratory for metals and for gross/alpha beta activity, tritium, and radionuclides by gamma spectroscopy. The 1995 sludge sample was analyzed for VOCs, SVOCs, pesticides, PCBs, and metals, as well as isotopic plutonium, isotopic strontium, isotopic thorium, and isotopic uranium. The analytical results are presented in Annex A. A fraction of each sample was also submitted to the SNL/NM Radiation Protection Sample Diagnostics (RPSD) Laboratory for gamma spectroscopy analysis prior to off-site release.

On February 14, 1996, the residual contents, approximately 1,400 gallons of waste and added water, were pumped out and managed according to SNL/NM policy (Shain August 1996).

3.3 Investigation 2—Backhoe Excavation

On May 16, 1997, a backhoe was used to determine the location, dimensions, and average depth of the DSS Site 1007 drainfield system. The drainfield was found to have eight laterals, arranged as shown on Figure 2.2.1-2, with an average drain line depth of 3 feet bgs. No visible evidence of stained or discolored soil or odors indicating residual contamination was observed during the excavation. No samples were collected during the backhoe excavation at the site.

3.4 Investigation 3—Soil Sampling

Once the system drain lines were located, soil sampling was conducted in accordance with the rationale and procedures in the SAP (SNL/NM October 1999) approved by the NMED. An initial round of soil samples was collected from four drainfield borehole locations on June 22, 1998. On August 16 and 17, 1999, the four borehole locations were sampled again for additional analyses. Soil boring locations are shown on Figure 2.2.1-2. Figures 3.4-1 and 3.4-2 show soil samples being collected at DSS Site 1007. A summary of the boreholes, sample depths, sample analyses, analytical methods, laboratories, and sample dates is presented in Table 3.4-1.

3.4.1 Soil Sampling Methodology

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

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

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

All samples were documented and handled in accordance with applicable SNL/NM operating procedures and transported to on- and off-site laboratories for analysis. The area sampled, analytical methods, and laboratories used for the DSS Site 1007 soil samples are summarized in Table 3.4-1.

3.4.2 Soil Sampling Results and Conclusions

Analytical results for the soil samples collected at DSS Site 1007 are presented and discussed in this section.

Figure 3.4-1
Collecting soil samples in the DSS Site 1007, Former Building 6730
Septic System Drainfield. View to the south. August 16, 1999

Figure 3.4-2
Collecting soil samples in the DSS Site 1007, Former Building 6730
Septic System Drainfield. View to the east. August 17, 1999

Table 3.4-1
Summary of Area Sampled, Analytical Methods, and Laboratories Used for
DSS Site 1007, Former Building 6730 Septic System Soil Samples

Sampling Area	Number of Borehole Locations	Top of Sampling Intervals in each Borehole (ft bgs)	Total Number of Soil Samples	Analytical Parameters and EPA Methods[a]	Analytical Laboratory	Date Samples Collected
Drainfield	4	4.5, 9.5	8	VOCs EPA Method 8260	ERCL	06-22-98
	4	4.5, 9.5	8	SVOCs EPA Method 8270	GEL	06-22-98
	4	4.5, 9.5	8	PCBs EPA Method 8082	GEL	08-16-99 08-17-99
	4	4.5, 9.5	8	HE Compounds EPA Method 8095	ERCL	06-22-98
	4	4.5, 9.5	8	RCRA Metals EPA Methods 6000/7000	ERCL	06-22-98
	4	4.5, 9.5	8	Hexavalent Chromium EPA Method 7196A	GEL	08-16-99 08-17-99
	4	4.5, 9.5	8	Total Cyanide EPA Method 9012A	GEL	08-16-99 08-17-99
	4	4.5, 9.5	8	Gamma spectroscopy EPA Method 901.1	RPSD	06-22-98
	4	4.5, 9.5	8	Gross Alpha/Beta Activity EPA Method 900.0	GEL	06-22-98

[a]EPA November 1986.
bgs = Below ground surface.
DSS = Drain and Septic Systems.
EPA = U.S. Environmental Protection Agency.
ERCL = Environmental Restoration Chemistry Laboratory.
ft = Foot (feet).
GEL = General Engineering Laboratories, Inc.
HE = High explosive(s).
PCB = Polychlorinated biphenyl.
RCRA = Resource Conservation and Recovery Act.
RPSD = Radiation Protection Sample Diagnostics Laboratory.
SVOC = Semivolatile organic compound.
VOC = Volatile organic compound.

VOCs

VOC analytical results for the eight soil samples collected from the four drainfield boreholes are summarized in Table 3.4.2-1. Method detection limits (MDLs) for the VOC analyses are presented in Table 3.4.2-2. No VOCs were detected in any of the soil samples or the trip blank (TB) sample associated with this site.

SVOCs

SVOC analytical results for the eight soil samples collected from the four drainfield boreholes are summarized in Table 3.4.2-3. MDLs for the SVOC analyses are presented in Table 3.4.2-4. No SVOCs were detected in any of the soil samples.

PCBs

PCB analytical results for the eight soil samples collected from the four drainfield boreholes are summarized in Table 3.4.2-5. MDLs for the PCB analyses are presented in Table 3.4.2-6. Aroclor-1242 was detected in the 4.5-foot-bgs sample from borehole BH1. No PCBs were detected in any of the other soil samples or the aqueous equipment blank (EB) associated with this site.

HE Compounds

High explosive (HE) compound analytical results for the eight soil samples collected from the four drainfield boreholes are summarized in Table 3.4.2-7. MDLs for the HE analyses are presented in Table 3.4.2-8. No HE compounds were detected in any of the soil samples.

RCRA Metals and Hexavalent Chromium

Resource Conservation and Recovery Act (RCRA) metals and hexavalent chromium analytical results for the eight soil samples collected from the four drainfield boreholes are summarized in Table 3.4.2-9. MDLs for the metals analyses are presented in Table 3.4.2-10. Arsenic was detected above the NMED-approved background in four of the eight samples. All other metals were below the corresponding NMED-approved background concentrations.

Total Cyanide

Total cyanide analytical results for the eight soil samples collected from the four drainfield boreholes are summarized in Table 3.4.2-11. MDLs for the cyanide analyses are presented in Table 3.4.2-12. Cyanide was detected only in the 4.5-foot-bgs sample from borehole BH1.

Table 3.4.2-1
Summary of DSS Site 1007, Former Building 6730 Septic System
Confirmatory Soil Sampling, VOC Analytical Results
June 1998
(On-Site Laboratory)

Sample Attributes			VOCs (EPA Method 8260[a]) (µg/kg)
Record Number[b]	ER Sample ID	Sample Depth (ft)	
600395	6730-DF1-BH1-4.5-S	4.5	ND
600395	6730-DF1-BH1-9.5-S	9.5	ND
600395	6730-DF1-BH2-4.5-S	4.5	ND
600395	6730-DF1-BH2-9.5-S	9.5	ND
600395	6730-DF1-BH3-4.5-S	4.5	ND
600395	6730-DF1-BH3-9.5-S	9.5	ND
600395	6730-DF1-BH4-4.5-S	4.5	ND
600395	6730-DF1-BH4-9.5-S	9.5	ND
Quality Assurance/Quality Control Sample (µg/L)			
600395	6750-DF1-TB[c]	NA	ND

[a]EPA November 1986.
[b]Analysis request/chain-of-custody record.
[c]ER sample ID reflects the final site for VOC samples included in this shipment.
BH = Borehole.
DF = Drainfield.
DSS = Drain and Septic Systems.
EPA = U.S. Environmental Protection Agency.
ER = Environmental Restoration.
ft = Foot (feet).
ID = Identification.
µg/kg = Microgram(s) per kilogram.
µg/L = Microgram(s) per liter.
NA = Not applicable.
ND = Not detected.
S = Soil sample.
TB = Trip blank.
VOC = Volatile organic compound.

Table 3.4.2-2
Summary of DSS Site 1007, Former Building 6730 Septic System
Confirmatory Soil Sampling, VOC Analytical MDLs
June 1998
(On-Site Laboratory)

Analyte	EPA Method 8260[a] Detection Limit (µg/kg)
Acetone	5.2–6
Benzene	1–1.2
Bromodichloromethane	1–1.2
Bromoform	1–1.2
Bromomethane	1–1.2
2-Butanone	5.2–6
Carbon disulfide	1–1.2
Carbon tetrachloride	1–1.2
Chlorobenzene	1–1.2
Chloroethane	1–1.2
Chloroform	1–1.2
Chloromethane	1–1.2
Dibromochloromethane	1–1.2
1,1-Dichloroethane	1–1.2
1,2-Dichloroethane	1–1.2
1,1-Dichloroethene	1–1.2
cis-1,2-Dichloroethene	1–1.2
trans-1,2-Dichloroethene	1–1.2
1,2-Dichloropropane	1–1.2
cis-1,3-Dichloropropene	0.52–0.6
trans-1,3-Dichloropropene	1–1.2
Ethylbenzene	2.1–2.4
2-Hexanone	5.2–6
4-Methyl-2-pentanone	5.2–6
Methylene chloride	1–1.2
Styrene	1–1.2
1,1,2,2-Tetrachloroethane	1–1.2
Tetrachloroethene	2.1–2.4
Toluene	1–1.2
1,1,1-Trichloroethane	1–1.2
1,1,2-Trichloroethane	1–1.2
Trichloroethene	1–1.2
Vinyl chloride	1–1.2
m-, p-Xylene	3.1–3.6
o-Xylene	2.1–2.4

[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 1007, Former Building 6730 Septic System
Confirmatory Soil Sampling, SVOC Analytical Results
June 1998
(Off-Site Laboratory)

Sample Attributes			SVOCs (EPA Method 8270[a]) (µg/kg)
Record Number[b]	ER Sample ID	Sample Depth (ft)	
600396	6730-DF1-BH1-4.5-S	4.5	ND
600396	6730-DF1-BH1-9.5-S	9.5	ND
600396	6730-DF1-BH2-4.5-S	4.5	ND
600396	6730-DF1-BH2-9.5-S	9.5	ND
600396	6730-DF1-BH3-4.5-S	4.5	ND
600396	6730-DF1-BH3-9.5-S	9.5	ND
600396	6730-DF1-BH4-4.5-S	4.5	ND
600396	6730-DF1-BH4-9.5-S	9.5	ND

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

Table 3.4.2-4
Summary of DSS Site 1007, Former Building 6730 Septic System
Confirmatory Soil Sampling, SVOC Analytical MDLs
June 1998
(Off-Site Laboratory)

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

Refer to footnotes at end of table.

Table 3.4.2-4 (Concluded)
Summary of DSS Site 1007, Former Building 6730 Septic System
Confirmatory Soil Sampling, SVOC Analytical MDLs
June 1998
(Off-Site Laboratory)

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

[a]EPA November 1986.
DSS = Drain and Septic Systems.
EPA = U.S. Environmental Protection Agency.
MDL = Method detection limit.
µg/kg = Microgram(s) per kilogram.
SVOC = Semivolatile organic compound.

Table 3.4.2-5
Summary of DSS Site 1007, Former Building 6730 Septic System
Confirmatory Soil Sampling, PCB Analytical Results
August 1999
(Off-Site Laboratory)

Sample Attributes			PCBs (EPA Method 8082[a]) (µg/kg)
Record Number[b]	ER Sample ID	Sample Depth (ft)	Aroclor-1242
602761	6730-DF1-BH1-4.5-S	4.5	**2.6 J (3.33)**
602761	6730-DF1-BH1-9.5-S	9.5	ND (1.67)
602761	6730-DF1-BH2-4.5-S	4.5	ND (8.35)
602761	6730-DF1-BH2-9.5-S	9.5	ND (1.67)
602761	6730-DF1-BH3-4.5-S	4.5	ND (1.67)
602761	6730-DF1-BH3-9.5-S	9.5	ND (1.67)
602761	6730-DF1-BH4-4.5-S	4.5	ND (1.67)
602761	6730-DF1-BH4-9.5-S	9.5	ND (1.67)
Quality Assurance/Quality Control Sample (µg/L)			
602761	6730-DF1-EB	NA	ND (0.051 J)

Note: Values in **bold** represent detected analytes.
[a]EPA November 1986.
[b]Analysis request/chain-of-custody record.
BH = Borehole.
DF = Drainfield.
DSS = Drain and Septic Systems.
EPA = U.S. Environmental Protection Agency.
EB = Equipment blank.
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.
PCB = Polychlorinated biphenyl.
S = Soil sample.

Table 3.4.2-6
Summary of DSS Site 1007, Former Building 6730 Septic System
Confirmatory Soil Sampling, PCB Analytical MDLs
August 1999
(Off-Site Laboratory)

Analyte	EPA Method 8082[a] Detection Limit (µg/kg)
Aroclor-1016	1.22–6.08
Aroclor-1221	2.82–14.1
Aroclor-1232	1.63–8.15
Aroclor-1242	1.67–8.35
Aroclor-1248	0.907–4.53
Aroclor-1254	1.16–5.82
Aroclor-1260	0.943–4.72

[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 1007, Former Building 6730 Septic System
Confirmatory Soil Sampling, HE Compound Analytical Results
June 1998
(On-Site Laboratory)

Sample Attributes			HE (EPA Method 8095[a]) (mg/kg)
Record Number[b]	ER Sample ID	Sample Depth (ft)	
600395	6730-DF1-BH1-4.5-S	4.5	ND
600395	6730-DF1-BH1-9.5-S	9.5	ND
600395	6730-DF1-BH2-4.5-S	4.5	ND
600395	6730-DF1-BH2-9.5-S	9.5	ND
600395	6730-DF1-BH3-4.5-S	4.5	ND
600395	6730-DF1-BH3-9.5-S	9.5	ND
600395	6730-DF1-BH4-4.5-S	4.5	ND
600395	6730-DF1-BH4-9.5-S	9.5	ND

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

Table 3.4.2-8
Summary of DSS Site 1007, Former Building 6730 Septic System
Confirmatory Soil Sampling, HE Compound Analytical MDLs
June 1998
(On-Site Laboratory)

Analyte	EPA Method 8095[a] Detection Limit (mg/kg)
2-Amino-4,6-dinitrotoluene	0.12–0.13
4-Amino-2,6-dinitrotoluene	0.1–0.11
1,3-Dinitrobenzene	0.07–0.078
2,4-Dinitrotoluene	0.23–0.26
2,6-Dinitrotoluene	0.27–0.3
HMX	0.12–0.13
Nitrobenzene	0.16–0.18
2-Nitrotoluene	0.14–0.16
3-Nitrotoluene	0.14–0.16
4-Nitrotoluene	0.12–0.13
PETN	0.32–0.36
RDX	0.17–0.19
1,3,5-Trinitrobenzene	0.1–0.11
2,4,6-Trinitrotoluene	0.27–0.3

[a]EPA November 1986.
DSS = Drain and Septic Systems.
EPA = U.S. Environmental Protection Agency.
HE = High explosive(s).
HMX = Octahydro-1,3,5,7-tetranitro-1,3,5,7-tetrazocine.
MDL = Method detection limit.
mg/kg = Milligram(s) per kilogram.
PETN = Pentaerythritol tetranitrate.
RDX = Hexahydro-1,3,5-trinitro-1,3,5-triazine.

Table 3.4.2-9
Summary of DSS Site 1007, Former Building 6730 Septic System
Confirmatory Soil Sampling, Metals Analytical Results
June 1998 and August 1999
(On- and Off-Site Laboratories)

Sample Attributes			Metals (EPA Method 6000/7000/7196A[a]) (mg/kg)								
Record Number[b]	ER Sample ID	Sample Depth (ft)	Arsenic	Barium	Cadmium	Chromium	Chromium (VI)	Lead	Mercury	Selenium	Silver
600395, 602761	6730-DF1-BH1-4.5-S	4.5	**4.6**	99 J	ND (0.041)	8.7	ND (0.0339)	6	ND (0.041)	0.56 J (1.2)	ND (0.041)
600395, 602761	6730-DF1-BH1-9.5-S	9.5	3.2	55 J	ND (0.039)	7	ND (0.0339)	5.6	ND (0.039)	0.35 J (1.2)	ND (0.039)
600395, 602761	6730-DF1-BH2-4.5-S	4.5	**4.7**	72 J	ND (0.041)	7.4	0.139 J (0.2)	6.1	ND (0.041)	0.49 J (1.2)	ND (0.041)
600395, 602761	6730-DF1-BH2-9.5-S	9.5	2.6	46 J	ND (0.042)	6	0.0566 J (0.198)	4.7	ND (0.042)	0.39 J (1.2)	ND (0.042)
600395, 602761	6730-DF1-BH3-4.5-S	4.5	**4.7**	160 J	ND (0.043)	7.5	ND (0.034)	6.5	ND (0.043)	0.64 J (1.3)	ND (0.043)
600395, 602761	6730-DF1-BH3-9.5-S	9.5	3.5	110 J	ND (0.045)	6.7	0.0797 J (0.199)	6.4	ND (0.045)	0.42 J (1.4)	ND (0.045)
600395, 602761	6730-DF1-BH4-4.5-S	4.5	2.7	100 J	ND (0.042)	6	ND (0.034)	4.9	ND (0.042)	ND (0.31)	ND (0.042)
600395, 602761	6730-DF1-BH4-9.5-S	9.5	**4.6**	160 J	0.71	12	ND (0.034)	7.3	ND (0.042)	0.38 J (1.3)	ND (0.042)
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)											
602761	6730-DF1-EB	NA	NA	NA	NA	NA	ND (0.006 JH)	NA	NA	NA	NA

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

[a]EPA November 1986.

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

[c]Dinwiddie September 1997.

BH = Borehole.
DF = Drainfield.
DSS = Drain and Septic Systems.
EB = Equipment Blank.
EPA = U.S. Environmental Protection Agency.
ER = Environmental Restoration.
ft = Foot (feet).
H = The holding time was exceeded for the associated sample analysis.
ID = Identification.
J = Analytical result was qualified as an estimated value.
J ( ) = The reported value is greater than or equal to the MDL but is less than the practical quantitation limit, shown in parentheses.
MDL = Method detection limit.
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.

Table 3.4.2-10
Summary of DSS Site 1007, Former Building 6730 Septic System
Confirmatory Soil Sampling, Metals Analytical MDLs
June 1998 and August 1999
(On- and Off-Site Laboratories)

Analyte	EPA Method 6000/7000/7196A[a] Detection Limit (mg/kg)
Arsenic	0.59–0.68
Barium	0.49–0.56
Cadmium	0.039–0.045
Chromium	0.69–0.79
Chromium VI	0.0339–0.2
Lead	0.29–0.34
Mercury	0.039–0.045
Selenium	0.29–0.34
Silver	0.039–0.045

[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 1007, Former Building 6730 Septic System
Confirmatory Soil Sampling, Total Cyanide Analytical Results
August 1999
(Off-Site Laboratory)

Sample Attributes			Total Cyanide (EPA Method 9012A[a]) (mg/kg)
Record Number[b]	ER Sample ID	Sample Depth (ft)	
602761	6730-DF1-BH1-4.5-S	4.5	**0.175 J (0.495)**
602761	6730-DF1-BH1-9.5-S	9.5	ND (0.137)
602761	6730-DF1-BH2-4.5-S	4.5	ND (0.137)
602761	6730-DF1-BH2-9.5-S	9.5	ND (0.135)
602761	6730-DF1-BH3-4.5-S	4.5	ND (0.133)
602761	6730-DF1-BH3-9.5-S	9.5	ND (0.134)
602761	6730-DF1-BH4-4.5-S	4.5	ND (0.139)
602761	6730-DF1-BH4-9.5-S	9.5	ND (0.134)
Quality Assurance/Quality Control Sample (mg/L)			
602761	6730-DF1-EB	NA	ND (0.00197)

Note: Values in **bold** represent detected analytes.
[a]EPA November 1986.
[b]Analysis request/chain-of-custody record.
BH = Borehole.
DF = Drainfield.
DSS = Drain and Septic Systems.
EPA = U.S. Environmental Protection Agency.
EB = Equipment blank.
ER = Environmental Restoration.
ft = Foot (feet).
ID = Identification.
J ( ) = The reported value is greater than or equal to the MDL but is less than the practical quantitation limit, shown in parentheses.
MDL = Method detection limit.
mg/kg = Milligram(s) per kilogram.
mg/L = Milligram(s) per liter.
NA = Not applicable.
ND ( ) = Not detected above the MDL, shown in parentheses.
S = Soil sample.

Table 3.4.2-12
Summary of DSS Site 1007, Former Building 6730 Septic System
Confirmatory Soil Sampling, Total Cyanide MDLs
August 1999
(Off-Site Laboratory)

Analyte	EPA Method 9012A[a] Detection Limit (mg/kg)
Total Cyanide	0.133–0.139

[a]EPA November 1986.
DSS = Drain and Septic Systems.
EPA = U.S. Environmental Protection Agency.
MDL = Method detection limit.
mg/kg = Milligram(s) per kilogram.

Radionuclides

Analytical results for the gamma spectroscopy analysis of the eight soil samples collected from the four drainfield boreholes are summarized in Table 3.4.2-13. Uranium-238 was detected slightly above the NMED-approved background value in the 9.5-foot-bgs sample from borehole BH3. However, although not detected, the minimum detectable activities (MDAs) for uranium-235 and all but one of the uranium-238 analyses exceeded the corresponding background activities because the standard gamma spectroscopy count time for soil samples (6,000 seconds) was not sufficient to reach the NMED-approved background activities established for SNL/NM soils. Even though the MDAs may be slightly elevated, they are still very low, and the risk assessment outcome for the site is not significantly impacted by their use.

Gross Alpha/Beta Activity

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

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, so that any one shipment might contain samples from several sites. Aqueous EB samples were collected at an approximate frequency of 1 per 20 samples and sent to the laboratory. The EB samples were analyzed for the same analytical suite as the soil samples in that shipment. The analytical results for the EB samples appear only on the data tables for the site where they were collected. However, the results were used in the data validation process for all the samples in that batch.

Table 3.4.2-13
Summary of DSS Site 1007, Former Building 6730 Septic System
Confirmatory Soil Sampling, Gamma Spectroscopy Analytical Results
June 1998
(On-Site Laboratory)

Sample Attributes			Activity (EPA Method 901.1[a]) (pCi/g)							
Record Number[b]	ER Sample ID	Sample Depth (ft)	Cesium-137		Thorium-232		Uranium-235		Uranium-238	
			Result	Error[c]	Result	Error[c]	Result	Error[c]	Result	Error[c]
600398	6730-DF1-BH1-4.5-S	4.5	ND (0.0309)	--	0.673	0.425	**ND (0.217)**	--	**ND (3.06)**	--
600398	6730-DF1-BH1-9.5-S	9.5	ND (0.0327)	--	0.560	0.291	**ND (0.234)**	--	**ND (3.29)**	--
600398	6730-DF1-BH2-4.5-S	4.5	ND (0.032)	--	0.657	0.336	**ND (0.226)**	--	**ND (3.26)**	--
600398	6730-DF1-BH2-9.5-S	9.5	ND (0.0356)	--	0.604	0.568	**ND (0.235)**	--	**ND (3.32)**	--
600398	6730-DF1-BH3-4.5-S	4.5	ND (0.0326)	--	0.625	0.318	**ND (0.231)**	--	**ND (3.30)**	--
600398	6730-DF1-BH3-9.5-S	9.5	ND (0.0344)	--	0.647	0.327	**ND (0.245)**	--	**1.44**	1.51
600398	6730-DF1-BH4-4.5-S	4.5	ND (0.0323)	--	0.535	0.294	**ND (0.237)**	--	**ND (3.29)**	--
600398	6730-DF1-BH4-9.5-S	9.5	ND (0.0361)	--	0.673	0.362	**ND (0.247)**	--	**ND (3.33)**	--
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.
DF = Drainfield.
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.
-- = Error not calculated for nondetect results.

Table 3.4.2-14
Summary of DSS Site 1007, Former Building 6730 Septic System
Confirmatory Soil Sampling, Gross Alpha/Beta Analytical Results
June 1998
(Off-Site Laboratory)

Sample Attributes			Activity (EPA Method 900.0[a]) (pCi/g)			
Record Number[b]	ER Sample ID	Sample Depth (ft)	Gross Alpha		Gross Beta	
			Result	Error[c]	Result	Error[c]
600396	6730-DF1-BH1-4.5-S	4.5	9.78	3.09	17.4	3.46
600396	6730-DF1-BH1-9.5-S	9.5	8.98	3.21	20.3	3.9
600396	6730-DF1-BH2-4.5-S	4.5	3.65	2.16	13.6	3.24
600396	6730-DF1-BH2-9.5-S	9.5	11.7	3.44	21.6	3.82
600396	6730-DF1-BH3-4.5-S	4.5	13.5	3.94	16.5	3.64
600396	6730-DF1-BH3-9.5-S	9.5	8.49	2.91	17.2	3.49
600396	6730-DF1-BH4-4.5-S	4.5	7.35	2.89	12.8	3.21
600396	6730-DF1-BH4-9.5-S	9.5	10.4	3.03	15.4	3.2
Background Activity[d]			17.4	NA	35.4	NA

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

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

A set of aqueous EB samples were collected following the completion of soil sampling in the Building 6730 drainfield in August 1999. The EB samples were analyzed for PCBs, hexavalent chromium, and total cyanide. No PCBs or cyanide were detected in the EB samples. No hexavalent chromium was detected in the EB sample; however the sample was analyzed outside of holding time and was qualified (Table 3.4.2-9).

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 B contains the data validation reports for the samples collected at this site. The data are acceptable for use in this NFA proposal.

3.5 Investigation 4—Passive Soil-Vapor Sampling

In April and May 2002, a passive soil-vapor survey was conducted in the Building 6730 Septic System drainfield area. This survey was required at this site by NMED/HWB regulators and was conducted to determine whether significant VOC contamination was present in the soil at the site.

3.5.1 Passive Soil-Vapor Sampling Methodology

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

Each GS soil-vapor sampler consists of a 1-foot-long, 0.25-inch-diameter tube of waterproof, vapor-permeable fabric containing 40 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 U.S. Environmental Protection Agency (EPA) Method 8260. Analytical results for the VOCs of interest are reported as mass (expressed in micrograms) of the individual VOCs absorbed by the sampler while it was in the ground (Gore June 2002). All samples were documented and handled in accordance with applicable SNL/NM operating procedures.

3.5.2 Soil-Vapor Survey Results and Conclusions

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

As shown in the analytical results tables in Annex C, the GS samplers were analyzed for a total of 30 individual or groups of VOCs, including trichloroethene, tetrachloroethene, cis- and

trans-dichloroethene, and benzene/toluene/ethylbenzene/xylene. Low to trace-level (but quantifiable) amounts of 18 VOCs were detected in the GS samplers installed at this site. The analytical results indicated there were no areas of significant VOC contamination at the site that would require additional characterization.

3.6 Site Sampling Data Gaps

Analytical data from the site assessment were sufficient for characterizing the nature and extent of possible COC releases. There are no further data gaps regarding characterization of DSS Site 1007.

4.0 CONCEPTUAL SITE MODEL

The conceptual site model for DSS Site 1007, the Former Building 6730 Septic System, is based upon the COCs identified in the soil samples collected from beneath the drainfield at this site. This section summarizes the nature and extent of contamination and the environmental fate of the COCs.

4.1 Nature and Extent of Contamination

Potential COCs at DSS Site 1007 are VOCs, SVOCs, PCBs, HE compounds, RCRA metals, cyanide, hexavalent chromium, and radionuclides. There were no VOCs, SVOCs, or HE compounds detected in any of the soil samples collected at this site. Aroclor-1242 and cyanide were detected in one soil sample. Arsenic was the only RCRA metal detected at concentrations above the approved maximum background concentration for the 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 the nonquantified background value, it was carried forward in the risk assessment process. Uranium-238 was detected in one sample at an activity exceeding the corresponding background level, and the MDAs for the remaining uranium-238 and all the uranium-235 analyses exceed the 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 from the septic system and drainfield. Possible secondary release mechanisms include the uptake of COCs that may have been released into the soil beneath the drainfield (Figure 4.2-1). The depth to groundwater at the site (approximately 465 feet bgs) most likely precludes migration of potential COCs into the groundwater system. The potential pathways to receptors include soil ingestion, dermal contact, and inhalation, which could occur as a result of receptor exposure to contaminated subsurface soil at the site. No intake routes through plant, meat, or milk ingestion are considered appropriate for either the industrial or residential land-use scenarios. Annex D provides additional discussion on the fate and transport of COCs at DSS Site 1007.

Table 4.2-1 summarizes the potential COCs for DSS Site 1007. 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 1007 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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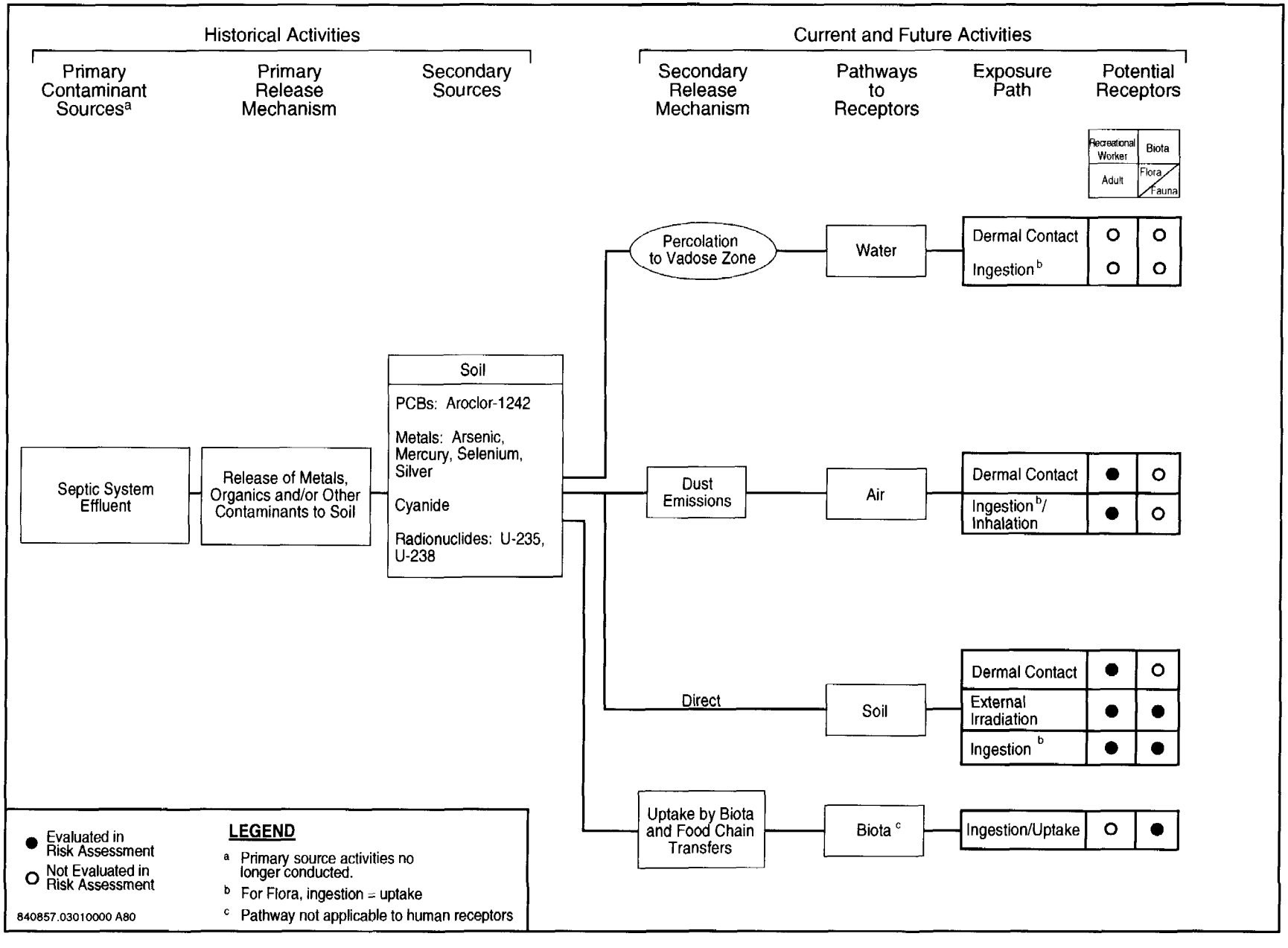

Figure 4.2-1

Conceptual Site Model Flow Diagram for DSS Site 1007, Former Building 6730 Septic System

Table 4.2-1
Summary of Potential COCs for DSS Site 1007, Former Building 6730 Septic System

COC Type		Number of Samples[a]	COCs Detected or with Concentrations Greater than Background or Nonquantified Background	Maximum Background Limit/Southwest Area Super Group[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		8	None	NA	NA	NA	None
SVOCs		8	None	NA	NA	NA	None
PCBs		8	Aroclor-1242	NA	0.00266 J	0.0015	1
HE Compounds		8	None	NA	NA	NA	None
RCRA Metals		8	Arsenic	4.4	4.7	3.82	4
		8	Mercury	NQ	ND (0.045)	0.0209	None
		8	Selenium	NQ	0.64 J	0.423	None
		8	Silver	NQ	ND (0.045)	0.0209	None
Hexavalent Chromium		8	None	NA	NA	NA	None
Cyanide		8	Cyanide	NQ	0.175 J	0.081	1
Radionuclides (pCi/g)	Gamma Spectroscopy	8	U-235	0.16	ND (0.247)	NC[f]	8
		8	U-238	1.4	1.44	NC[f]	8
	Gross Alpha	8	None	NA	NA	NA	None
	Gross Beta	8	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 the maximum MDL or MDA if nothing was detected.
[d]Average concentration includes all samples except blanks. The average is calculated as the sum of detected amounts and one-half of the MDLs for nondetect results, divided by the number of samples.
[e]See appropriate data table for sample locations.
[f]An average MDA is not calculated because of the variability in instrument counting error and the number of reported nondetect activities for gamma spectroscopy.

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

Potential biota receptors include flora and fauna at the site. Major exposure routes for biota include direct soil ingestion, ingesting COCs through food chain transfers, and direct contact with COCs in soil. Annex D provides additional discussion of the exposure routes and receptors at DSS Site 1007.

4.3 Site Assessment

Site assessment at DSS Site 1007 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 1007 in more detail.

4.3.1 Summary

The site assessment concluded that DSS Site 1007 poses no significant threat to human health under either the industrial or residential land-use scenarios. Ecological risks are expected to be very low.

4.3.2 Risk Assessments

Risk assessments were performed for both human health and ecological risk at DSS Site 1007. This section summarizes the results.

4.3.2.1 Human Health

DSS Site 1007 has been recommended for an industrial land-use scenario (DOE et al. September 1995). Because PCBs, cyanide, arsenic, mercury, selenium, silver, uranium-235, and uranium-238 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 site's soil by calculating the hazard index (HI) and excess cancer risk for both industrial and residential land-use scenarios.

The HI calculated for the COCs at DSS Site 1007 is 0.02 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 is 3E-6 for DSS Site 1007 COCs for an industrial land-use scenario. NMED guidance states that cumulative excess lifetime cancer risk must be less than 1E-5 (Bearzi January 2001); thus the excess cancer risk for this site is below the suggested acceptable risk value. The incremental excess cancer risk is 1.89E-7. Both the incremental HI and excess cancer risk are below NMED guidelines.

The HI calculated for the COCs at DSS Site 1007 is 0.22 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 0.02. The excess cancer risk for DSS Site 1007 COCs is 1E-5 for a residential land-use scenario. NMED guidance states that cumulative excess lifetime cancer risk must be less than 1E-5 (Bearzi January 2001); thus the excess cancer risk for this site is slightly above the suggested acceptable risk value. The incremental excess cancer risk is 7.72E-7. Both the incremental HI and incremental excess cancer risk are below NMED guidelines.

For the radiological COCs, two of the constituents (uranium-235 and uranium-238) 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 6.4E-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 6.3E-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 0.18 mrem/yr with an associated risk of 2.1E-6. The guideline for this scenario is 75 mrem/yr (SNL/NM February 1998). Therefore DSS Site 1007 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 Radiological and Nonradiological Risks from
DSS Site 1007, Former Building 6730 Septic System Carcinogens

Scenario	Nonradiological Risk	Radiological Risk	Total Risk
Industrial	1.89E-7	6.3E-7	8.3E-7
Residential	7.72E-7	2.1E-6	2.9E-6

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.3). This methodology also required developing a site conceptual model and a food web model, as well as selecting ecological receptors, as presented in "Predictive Ecological Risk Assessment Methodology,

Environmental Restoration Program, Sandia National Laboratories, New Mexico" (IT July 1998). The risk assessment also includes the estimation of exposure and ecological risk.

Table 17 of Annex D presents the results of the ecological risk assessment. Site-specific information was incorporated into the risk assessment when such data were available. All hazard quotient values predicted for the constituents of potential ecological concern at this site are found to be less than unity with the exception of arsenic. Therefore, ecological risks associated with this site are expected to be very low.

4.4 Baseline Risk Assessments

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

4.4.1 Human Health

Because the results of the human health risk assessment summarized in Section 4.3.2.1 indicate that DSS Site 1007 poses insignificant risk to human health under both the industrial and residential land-use scenarios, a baseline human health risk assessment is not required for this site.

4.4.2 Ecological

Because the results of the ecological risk assessment summarized in Section 4.3.2.2 indicate that ecological risks at DSS Site 1007 are expected to be very low, a baseline ecological risk assessment is not required for the site.

5.0 NO FURTHER ACTION PROPOSAL

5.1 Rationale

Based upon field investigation data and the human health and ecological risk assessment analyses, an NFA decision is recommended for DSS Site 1007 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 after conservative exposure assumptions are analyzed.

5.2 Criterion

Based upon the evidence provided in Section 5.1, DSS Site 1007 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 1007
Septic Tank Sampling Results

Buildings 6730 and 6731
Area 3
Sample ID No. SNLA008418
Tank ID No. AD89021R

On June 30, 1992, aqueous and sludge samples were collected from the septic tank serving Buildings 6730 and 6731. Analytical results of concern are noted below.

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

- Cadmium was detected in the aqueous sample at a level of 0.027 mg/L, which exceeds the NMDL of 0.01 mg/L.

- Chromium was detected in the aqueous sample at a level of 0.22 mg/L, which exceeds the NMDL of 0.05 mg/L.

- Lead was detected in the aqueous sample at a level of 0.14 mg/L, which exceed the NMDL of 0.05 mg/L.

- Manganese was detected in the aqueous sample at a level of 0.76 mg/L, which exceeds the NMDL of 0.20 mg/L.

- Total phenolic compounds were detected in the aqueous sample at a level of 0.023 mg/L, which exceeds the NMDL of 0.005 mg/L.

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

Two items were noted during data review that qualify portions of the data for this septic tank. These items and the associated analyses are described below.

- Holding times were exceeded for two analyses due to analytical laboratory error: polychlorinated biphenyls and pesticides analysis by three days and cyanide by two days. Exceeded holding times qualifies the data by presenting the possibility that the data is biased low.

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

During review of the sludge radiochemistry data, the following item was noted:

- ^{226}Ra was measured at 0.768 pCi/mL, which does not exceed the investigation level (IL) calculated during this monitoring effort. However, this finding exceeds the U.S. Department of Energy derived concentration guideline of 0.5 pCi/mL. A more sensitive technique for assaying ^{226}Ra may be warranted. ^{226}Ra was measured in the aqueous sample at 0.005 pCi/mL.

Septic Tank Septic Tank Data Review Form

(LIQUID SAMPLES)

Building No./Area:	6730/Area 3
Tank ID No.:	AD89021R
Date Sampled:	6/30/92
Sample ID No.:	SNLA-008418

Analytical Parameter	Measured Concentration	State Discharge Limit	COA Discharge Limit	Comments
Volatile Organics (EPA 624)	(mg/l)	(mg/l)	(mg/l)	
Toluene	0.0018	0.75	(TTO=5.0)	Below reporting limit
Trichloroethene	0.0067	0.1	(TTO=5.0)	
Semivolatile Organics (EPA 625)	(mg/l)	(mg/l)	(mg/l)	
Bis(2-Ethylhexyl)phthalate	0.0012	NR	(TTO=5.0)	Below reporting limit
Pesticides (EPA 608)	(mg/l)	(mg/l)	(mg/l)	
None detected above laboratory		NR	(TTO=5.0)	
reporting limit				
PCBs (EPA 608)	(mg/l)	(mg/l)	(mg/l)	
None detected above laboratory		0.001	(TTO=5.0)	
reporting limit				
Metals	(mg/l)	(mg/l)	(mg/l)	
Arsenic	0.017	0.1	2.0	Exceeds State Limit
Barium	1.1	1.0	20.0	Exceeds State Limit
Cadmium	0.027	0.01	2.8	Exceeds State Limit
Chromium	0.22	0.05	20.0	Exceeds State Limit
Copper	0.88	1.0	16.5	
Lead	0.14	0.05	3.2	Exceeds State Limit
Manganese	0.76	0.20	20.0	Exceeds State Limit
Mercury	0.0017	0.002	0.1	
Nickel	---	NR	12.0	Not analyzed
Selenium	ND (0.010)	0.05	2.0	
Silver	ND (0.010)	0.05	5.0	
Thallium	ND (0.010)	NR	NR	
Zinc	2.1	10.0	28.0	
Uranium	0.004	5.0	NR	
Miscellaneous Analytes	(mg/l)	(mg/l)	(mg/l)	
Phenolic Compounds	0.023	0.005	4.0	Exceeds State Limits
Nitrates/Nitrites	0.15	10.0	NR	
Formaldehyde	ND (0.20)	NR	260.0	
Fluoride	0.56	1.6	180.0	
Cyanide	ND (0.010)	0.2	8.0	
Oil and Grease	2.6	NR	150.0	
Radiological Analyses	(pCi/l)	(pCi/l)	(pCi/l)	
Radium 226	0.5 +/- 0.2	30.0	NR	
Radium 228	-10 +/- 30	30.0	NR	
Gross Alpha	9 +/- 15	NR	NR	
Gross Beta	61 +/- 44	NR	NR	
Tritium	0 +/- 600	NR	NR	

NR = Not Regulated; ND(#.#) = Not Detected (Reporting Limit)

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

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

Results of Septic Tank Analyses (Sludge Sample)			
Building No./Area:	**6730/31 A-3**		
Tank ID No.:	**AD89021R**		
Date Sampled:	**6/30/92**		
Sample ID No.:	**SNLA008418**		
Analytical Parameter	**Measured Concentration**	**± 2 Sigma Uncertainty**	**Units**
Water Content	81.1	NA	%
Arsenic	0.60	NA	mg/kg
Barium	60.7	NA	mg/kg
Cadmium	2.0	NA	mg/kg
Chromium	4.2	NA	mg/kg
Copper	36.1	NA	mg/kg
Lead	10.0	NA	mg/kg
Manganese	46.0	NA	mg/kg
Mercury	0.12	NA	mg/kg
Nickel	---	NA	mg/kg
Selenium	0.59	NA	mg/kg
Silver	ND(1.0)	NA	mg/kg
Thallium	ND(0.50)	NA	mg/kg
Zinc	71.0	NA	mg/kg
Gross Alpha	19	12	pCi/g
Gross Beta	27	24	pCi/g
Gross Alpha	15	11	pCi/g
Gross Beta	27	25	pCi/g
Gross Alpha	9	9	pCi/g
Gross Beta	30	24	pCi/g
Gross Alpha	26	13	pCi/g
Gross Beta	40	23	pCi/g
Tritium	0E+2	6E+2	pCi/L
Bismuth-214	0.285	0.0197	pCi/mL
Cesium-137	<0.0338	NA	pCi/mL
Potassium-40	4.70	0.221	pCi/mL
Lead-212	0.250	0.0181	pCi/mL
Lead-214	0.245	0.0187	pCi/mL
Radium-226	0.768	0.133	pCi/mL
Thorium-234	<0.365	NA	pCi/mL
Thallium-208	0.0971	0.00910	pCi/mL

ND = Not Detected
NA = Not Applicable

RESULTS OF SEPTIC TANK SAMPLING
CHEMICAL ANALYSES OF AQUEOUS SAMPLE

Building ID: Bldg 6730
Sample ID Number: 024405
Date Sampled: 7-11-95

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	0.002BJ	0.010	NR	TTO = 5.0	
Pesticides/PCBs (8080)	*(mg/L)*	*(mg/L)*	*(mg/L)*	*(mg/L)*	
None detected above DL	ND	various	NR / PCBs = 0.001	TTO = 5.0	
Metals (6010/7470)	*(mg/L)*	*(mg/L)*	*(mg/L)*	*(mg/L)*	
Arsenic	0.0027J	0.010	0.1	2.0	
Barium	0.110J	0.200	1.0	20.0	
Cadmium	ND	0.005	0.01	2.8	
Chromium	ND	0.020	0.05	20.0	
Copper	0.0164J	0.025	1.0	16.5	
Lead	ND	0.003	0.05	3.2	
Manganese	0.060	0.015	0.2	20.0	
Nickel	ND	0.040	0.2	12.0	
Selenium	0.0046J	0.005	0.05	2.0	
Silver	ND	0.010	0.05	5.0	
Thallium	ND	0.010	NR	NR	
Zinc	0.0431	0.020	10.0	28.0	
Mercury	ND	0.0004	0.002	0.1	
Miscellaneous Analyses	*(mg/L)*	*(mg/L)*	*(mg/L)*	*(mg/L)*	
Field pH	8.0 pH units	0 - 14 pH units	6 – 9 pH units	5 – 11 pH units	
Formaldehyde (NIOSH 3500)	ND	0.050	NR	260.0	
Fluoride (300.0)	0.36	0.10	1.6	180.0	
Nitrate + Nitrite (353.1)	ND	0.050	10.0	NR	

Refer to footnotes at end of table.

RESULTS OF SEPTIC TANK SAMPLING

CHEMICAL ANALYSES OF AQUEOUS SAMPLE

Building ID: Bldg 6730

Sample ID Number: 024405

Date Sampled: 7-11-95

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)	5.49	0.98	NR	150.0	
Total Phenol (9066)	ND	0.050	0.005	4.0	

Notes:

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

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

B = Analyte detected in method blank.

DL = Detection limit indicated on laboratory report.

IDL = Instrument detection limit.

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

ND = Not detected above DL indicated.

NR = Not regulated.

TTO = Total toxic organics.

RESULTS OF SEPTIC TANK SAMPLING

RADIOLOGICAL ANALYSES OF AQUEOUS SAMPLE

Building ID: Bldg 6730

Sample ID Number: 024405

Date Sampled: 7-11-95

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)	4.50 ± 1.80	2.34	1.03	NR	
Gross Beta (9310)	7.00 ± 1.29	1.72	0.83	NR	
Isotopic Analyses	*(pCi/L ± 2-σ)*	*(pCi/L)*	*(pCi/L)*	*(pCi/L)*	
Tritium (906.0)	-9.3 ± 47.3	80.7	39.9	NR	
Gamma Spectroscopy[b]	*(pCi/mL ± 2-σ)*	*(pCi/mL)*	*(pCi/L)*	*(pCi/L)*	
None detected above MDA	ND	various	NL	NR	

Notes:

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

[b] Analyzed in-house by SNL/NM Department 7715.

MDA = Minimum detectable activity.

ND = Not detected above MDA indicated.

NL = Not listed.

NR = Not regulated.

RESULTS OF SEPTIC TANK SAMPLING

CHEMICAL ANALYSES OF SLUDGE SAMPLE

Building ID: Bldg 6730
Sample ID Number: 024405
Date Sampled: 7-11-95
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	140B	38	NR	NR	
Benzene	4J	38	0.01	TTO = 5.0	
Toluene	14J	38	0.75	TTO = 5.0	
Ethylbenzene	38J	38	0.75	TTO = 5.0	
Semivolatile Organics (8270)	*(µg/kg)*	*(µg/kg)*	*(mg/L)*	*(mg/L)*	
Napthalene	160J	1300	NR	TTO = 5.0	
Fluoranthene	140J	1300	NR	TTO = 5.0	
Pyrene	150J	1300	NR	TTO = 5.0	
bis(2-Ethylhexyl)Phthalate	1200J	1300	NR	TTO = 5.0	
Pesticides/PCBs (8080)	*(µg/kg)*	*(µg/kg)*	*(mg/L)*	*(mg/L)*	
beta-BHC	15	6.4	NR	TTO = 5.0	
delta-BHC	13	6.4	NR	TTO = 5.0	
Metals (6010/7470)	*(mg/kg)*	*(mg/kg)*	*(mg/L)*	*(mg/L)*	
Arsenic	3.5J	3.9	0.1	2.0	
Barium	177	77.1	1.0	20.0	
Cadmium	14.9	1.9	0.01	2.8	
Chromium	18.2	7.7	0.05	20.0	
Copper	273	9.6	1.0	16.5	
Lead	47.2	1.2	0.05	3.2	
Manganese	101	5.8	0.2	20.0	
Nickel	12.4J	15.4	0.2	12.0	
Selenium	4.7	1.9	0.05	2.0	
Silver	3.8J	3.9	0.05	5.0	
Thallium	ND	3.9	NR	NR	

Refer to footnotes at end of table.

RESULTS OF SEPTIC TANK SAMPLING

CHEMICAL ANALYSES OF SLUDGE SAMPLE

Building ID: Bldg 6730

Sample ID Number: 024405

Date Sampled: 7-11-95

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)*	
Zinc	605	7.7	10.0	28.0	
Mercury	1.3	0.77	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 concentration of analyte, between DL and IDL.

ND = Not detected above DL indicated.

NR = Not regulated.

TTO = Total toxic organics.

Refer to footnotes at end of table.

RESULTS OF SEPTIC TANK SAMPLING

RADIOLOGICAL ANALYSES OF SLUDGE SAMPLE

Building ID: Bldg 6730
Sample ID Number: 024405
Date Sampled: 7-11-95
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	-0.003 ± 0.005	0.022	0.014	NR	
Plutonium-238	-0.0001 ± 0.0090	0.026	0.016	NR	
Strontium-90	-0.13 ± 0.01	0.44	0.21	NR	
Thorium-232	0.081 ± 0.040	0.022	0.016	NR	
Thorium-230	0.20 ± 0.07	0.022	0.016	NR	
Thorium-228	0.071 ± 0.040	0.049	0.030	NR	
Uranium-238	0.98 ± 0.19	0.010	0.008	NR	
Uranium-235/236	0.13 ± 0.04	0.012	0.010	NR	
Uranium-234	1.56 ± 0.29	0.013	0.010	NR	
Dry Gamma Spectroscopy[c]	*(pCi/g ± 2-σ)*	*(pCi/g)*	*(pCi/g)*	*(pCi/g)*	
Cesium-137	0.031 ± 0.089	0.009	0.004	NR	
Cesium-134	ND	0.007	0.003	NR	
Potassium-40	11.9 ± 1.2	0.1	0.048	NR	
Chromium-51	ND	0.090	0.044	NR	
Iron-59	ND	0.027	0.013	NR	
Cobalt-60	ND	0.010	0.005	NR	
Zirconium-95	ND	0.019	0.009	NR	
Ruthenium-103	ND	0.010	0.005	NR	
Ruthenium-106	ND	0.069	0.033	NR	
Cerium-144	ND	0.037	0.018	NR	
Thallium-208	0.16 ± 0.02	0.009	NL	NR	
Lead-210	0.60 ± 0.15	0.15	NL	NR	
Lead-212	0.48 ± 0.05	0.01	0.005	NR	
Lead-214	0.39 ± 0.04	0.02	0.008	NR	
Bismuth-212	0.36 ± 0.08	0.07	NL	NR	
Bismuth-214	0.39 ± 0.03	0.02	NL	NR	

Refer to footnotes at end of table.

RESULTS OF SEPTIC TANK SAMPLING

RADIOLOGICAL ANALYSES OF SLUDGE SAMPLE

Building ID: Bldg 6730

Sample ID Number: 024405

Date Sampled: 7-11-95

Percent Moisture: Not Reported

Parameter (Method)	Result	MDA	Critical Level	NM Discharge Limit[a]	Comments
Dry Gamma Spectroscopy[f]	*(pCi/g ± 2-σ)*	*(pCi/g)*	*(pCi/g)*	*(pCi/g)*	
Radium-224	1.35 ± 0.21	0.13	NL	NR	
Radium-226	0.39 ± 0.02	0.02	0.008	30.0[d]	
Radium-228	0.45 ± 0.04	0.04	0.018	30.0[d]	
Actinium-228	0.45 ± 0.04	0.04	0.018	NR	
Thorium-231	ND	0.20	0.10	NR	
Thorium-232	0.45 ± 0.04	0.04	0.018	NR	
Thorium-234	0.80 ± 0.16	0.08	0.041	NR	
Uranium-235	0.074 ± 0.011	0.037	0.018	NR	
Uranium-238	0.80 ± 0.16	0.08	0.041	NR	
Americium-241	ND	0.013	0.006	NR	

Notes:

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

[b] Isotopic uranium analyzed by NAS-NS-3050; plutonium by SL13026/SL13033; strontium by 7500-SR; thorium by NAS-NS-3004.

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

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

MDA = Minimum detectable activity.

ND = Not detected above MDA indicated.

NR = Not regulated.

ANNEX B
DSS Site 1007
Soil Sample Data Validation Results

TOP 0? 03
Rev. 1
Attachment A
November 1995

11-9-95

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

Project Leader: Tony Roybal | Project Name: 101 Non-ER Septic Fields | Case No.: 7223.230

AR/COC No.: 600395 | Analytical Lab: ERCL | SDG No.: NA

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

1.0 Analysis Request and Chain of Custody Record

Line No.	Item	Complete? Yes	Complete? No	If no, explain	Resolved? Yes	Resolved? No
1.1	All items on COC complete - data entry clerk initialed and dated	NA		Not applicable		
1.2	Container type(s) correct for analyses requested	✓				
1.3	Sample volume adequate for # and types of analyses requested	✓				
1.4	Preservative correct for analyses requested	✓				
1.5	Custody records continuous and complete	✓				
1.6	Lab sample number(s) provided	✓				
1.7	Condition upon receipt information provided	✓				
1.8	Tritium Screen data provided (Rad labs)	NA		Not applicable, non-RMMA location		

2.0 Analytical Laboratory Report

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

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

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

Reviewed by: Jeffrey A. Rale Date: 10/19/98 Closed by: _____ Date: _____

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

Internal Lab Batch No.

ANALYSIS REQUEST AND CHAIN OF CUSTODY

SAR/WR No.

AR/COC- 600355

FRIDGE #4 SHELF #2 600395
FRIDGE #3 SHELF #4

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

Location Tech Area III

Building 6626/6748/6758 Room

Sample No. - Fraction	ER Sample ID or Sample Location Detail	Beginning Depth in Ft.	ER Site No.	Date/Time Collected	Reference LOV (available at SMO)						Parameter & Method Requested	LAB USE Lab Sample ID
					Sample Matrix	Container Type	Container Volume	Preservative	Sample Collection Method	Sample Type		
1 ✓ 041077-001	ER-1295-6620-DF1-BH1-5-S	5	N/A	6/23/98 0830	S	AC	300ml	4C	G	SA	VOCs (8260)	
2 ✓ 041078-001	ER-1295-6620-DF1-BH1-10-S	10	N/A	6/23/98 0845	S	AC	300ml	4C	G	SA	VOCs (8260)	
3 ✓ 041079-001	ER-1295-6620-DF1-BH2-5-S	5	N/A	6/23/98 0920	S	AC	300ml	4C	G	SA	VOCs (8260)	
4 ✓ 041252-001	ER-1295-6620-DF1-BH2-10-S	10	N/A	6/23/98 0935	S	AC	300ml	4C	G	SA	VOCs (8260)	
5 ✓ 041253-001	ER-1295-6620-DF1-BH3-5-S	5	N/A	6/23/98 1110	S	AC	300ml	4C	G	SA	VOCs (8260)	
6 ✓ 041254-001	ER-1295-6620-DF1-BH3-10-S	10	N/A	6/23/98 1115	S	AC	300ml	4C	G	SA	VOCs (8260)	
7 ✓ 041077-004	ER-1295-6620-DF1-BH1-5-S	5	N/A	6/23/98 0830	S	G	125ml	4C	G	SA	RCRA Metals, HE(8330)	
8 ✓ 041078-004	ER-1295-6620-DF1-BH1-10-S	10	N/A	6/23/98 0845	S	G	125ml	4C	G	SA	RCRA Metals, HE(8330)	
9 ✓ 041079-004	ER-1295-6620-DF1-BH2-5-S	5	N/A	6/23/98 0920	S	G	125ml	4C	G	SA	RCRA Metals, HE(8330)	
10 ✓ 041252-004	ER-1295-6620-DF1-BH2-10-S	10	N/A	6/23/98 0935	S	G	125ml	4C	G	SA	RCRA Metals, HE(8330)	

RMMA ☐Yes XNo Ref. No.

Sample Disposal ☐Return to Client XDisposal by lab

Turnaround Time XNormal ☐Rush Required Report Date

Sample Tracking

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

	Name	Signature	Ink	Company/Organization/Phone
Sample Team Members	CHRIS SEARS	Chris Sears	BL	SNL/6131/844-1136
	Chris Catechis	C. Catechis	BL	MDM/6131/581-3186

Please list as separate report.

1. Relinquished by	Chris Sears	Org.	6131	Date	6/23/98	Time	1532	4. Relinquished by	Org.	Date	Time
1. Received by	James L. Barnett	Org.	6133	Date	6/23/98	Time	1532	4. Received by	Org.	Date	Time
2. Relinquished by		Org.		Date		Time		5. Relinquished by	Org.	Date	Time
2. Received by		Org.		Date		Time		5. Received by	Org.	Date	Time
3. Relinquished by		Org.		Date		Time		6. Relinquished by	Org.	Date	Time
3. Received by		Org.		Date		Time		6. Received by	Org.	Date	Time

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

SF 2001-COC (10-97)
Supersedes (5-87) Issue

ANALYSIS REQUEST AND CHAIN OF CUSTODY (Continuation)

Press F1 for instructions for each field.

AR/COC- 600355

Project Name: 101 Non-ER Septic Fields | Project/Task Manager: Mike Sanders | Case No.: 7223.230

Location | Tech Area 18 | Building 6620/6730/6750 Room

	Sample No. - Fraction	ER Sample ID or Sample Location Detail	Beginning Depth in Ft.	ER Site No.	Date/Time Collected	Reference LOV (available at SMO)						LAB USE	
						Sample Matrix	Container Type	Container Volume	Preservative	Sample Collection Method	Sample Type	Parameter & Method Requested	Lab Sample #
11	041253-004	ER-1295-6620-DF1-BH3-5-S	5	N/A	6/23/98 1110	S	G	125ml	4C	G	SA	RCRA Met, HE(8330)	
12	041254-004	ER-1295-6620-DF1-BH3-10-S	10	N/A	6/23/98 1115	S	G	125ml	4C	G	SA	RCRA Met, HE(8330)	
13	041259-001	ER-1295-6730-DF1-BH1-4.5-S	4.5	N/A	6/22/98 0755	S	AC	300ml	4C	G	SA	VOCs (8260)	
14	041260-001	ER-1295-6730-DF1-BH1-9.5-S	9.5	N/A	6/22/98 0850	S	AC	300ml	4C	G	SA	VOCs (8260)	
15	041261-001	ER-1295-6730-DF1-BH2-4.5-S	4.5	N/A	6/22/98 0915	S	AC	300ml	4C	G	SA	VOCs (8260)	
16	041262-001	ER-1295-6730-DF1-BH2-9.5-S	9.5	N/A	6/22/98 0945	S	AC	300ml	4C	G	SA	VOCs (8260)	
17	041263-001	ER-1295-6730-DF1-BH3-4.5-S	4.5	N/A	6/22/98 1000	S	AC	300ml	4C	G	SA	VOCs (8260)	
18	041264-001	ER-1295-6730-DF1-BH3-9.5-S	9.5	N/A	6/22/98 1025	S	AC	300ml	4C	G	SA	VOCs (8260)	
19	041265-001	ER-1295-6730-DF1-BH4-4.5-S	4.5	N/A	6/22/98 1040	S	AC	300ml	4C	G	SA	VOCs (8260)	
20	041266-001	ER-1295-6730-DF1-BH4-9.5-S	9.5	N/A	6/22/98 1055	S	AC	300ml	4C	G	SA	VOCs (8260)	
21	041259-004	ER-1295-6730-DF1-BH1-4.5-S	4.5	N/A	6/22/98 0755	S	G	125ml	4C	G	SA	RCRA Met, HE(8330)	
22	041260-004	ER-1295-6730-DF1-BH1-9.5-S	9.5	N/A	6/22/98 0850	S	G	125ml	4C	G	SA	RCRA Met, HE(8330)	
23	041261-004	ER-1295-6730-DF1-BH2-4.5-S	4.5	N/A	6/22/98 0915	S	G	125ml	4C	G	SA	RCRA Met, HE(8330)	
24	041262-004	ER-1295-6730-DF1-BH2-9.5-S	9.5	N/A	6/22/98 0945	S	G	125ml	4C	G	SA	RCRA Met, HE(8330)	
25	041263-004	ER-1295-6730-DF1-BH3-4.5-S	4.5	N/A	6/22/98 1000	S	G	125ml	4C	G	SA	RCRA Met, HE(8330)	
26	041264-004	ER-1295-6730-DF1-BH3-9.5-S	9.5	N/A	6/22/98 1025	S	G	125ml	4C	G	SA	RCRA Met, HE(8330)	
27	041265-004	ER-1295-6730-DF1-BH4-4.5-S	4.5	N/A	6/22/98 1040	S	G	125ml	4C	G	SA	RCRA Met, HE(8330)	
28	041266-004	ER-1295-6730-DF1-BH4-9.5-S	9.5	N/A	6/22/98 1055	S	G	125ml	4C	G	SA	RCRA Met, HE(8330)	
29	041267-001	ER-1295-6750-DF1-BH1-5-S	5	N/A	6/22/98 1205	S	AC	300ml	4C	G	SA	VOCs (8260)	
30	041268-001	ER-1295-6750-DF1-BH1-10-S	10	N/A	6/22/98 1215	S	AC	300ml	4C	G	SA	VOCs (8260)	
31	041269-001	ER-1295-6750-DF1-BH2-5-S	5	N/A	6/22/98 1205	S	AC	300ml	4C	G	SA	VOCs (8260)	
32	041270-001	ER-1295-6750-DF1-BH2-10-S	10	N/A	6/22/98 1315	S	AC	300ml	4C	G	SA	VOCs (8260)	
33	041267-004	ER-1295-6750-DF1-BH1-5-S	5	N/A	6/22/98 1205	S	G	125ml	4C	G	SA	RCRA Met, HE(8330)	
34	041268-004	ER-1295-6750-DF1-BH1-10-S	10	N/A	6/22/98 1215	S	G	125ml	4C	G	SA	RCRA Met, HE(8330)	
35	041269-004	ER-1295-6750-DF1-BH2-5-S	5	N/A	6/22/98 1205	S	G	125ml	4C	G	SA	RCRA Met, HE(8330)	

LAB USE

Abnormal Conditions on Receipt:

Recipient Initials: DB

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

FAX: 254 2616

SF 2001-COC (10-9...
Supersedes (5-97) issue

ANALYSIS REQUEST AND CHAIN OF CUSTODY (Continuation)

Press F1 for instructions for each field.

AR/COC- 600355

Project Name: 101 Non-ER Septic Fields | Project/Task Manager: Mike Sanders | Case No.: 7223.230

Location	Tech Area III	Beginning Depth in Ft.	ER Site No.	Date/Time Collected	Reference LOV (available at SMO)						LAB USE	
Building 6629/6730/675 Room						Container						
Sample No. - Fraction	ER Sample ID or Sample Location Detail				Sample Matrix	Type	Volume	Preservative	Sample Collection Method	Sample Type	Parameter & Method Requested	Lab Sample ID
041270-004	ER-1295-6750-DF1-BH2-10-S	10	N/A	6/22/98 1315	S	G	125ml	4C	G	SA	RCRA Met, HE(8330)	
041280-001	ER-1295-6750-DF1-TB	N/A	N/A	6/22/98 1330	DIW	G	2x40ml	HCl+4C	G	SA TB	VOCs	
041281-001	ER-1295-6750-DF1-EB	N/A	N/A	6/22/98 1340	DCW	G	3x40ml	HCl+4C	G	SA EB	VOCs	
041281-006	ER-1295-6750-DF1-EB	N/A	N/A	6/22/98 1350	DCW	AG	1L	4C	G	SA EB	SVOCs	
041281-007	ER-1295-6750-DF1-EB	N/A	N/A	6/22/98 1346	DCW	P	1L	HNO3+4C	G	SA EB	RCRA Metals	
041281-008	ER-1295-6750-DF1-EB	N/A	N/A	6/22/98 1345	DCW	AG	1L	4C	G	SA EB	HE	

Abnormal Conditions on Receipt: LAB USE

Recipient Initials: J B

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

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

Project Name 101 Non-ER Septic Fields

Case Number 7223.230

Sample Numbers 41 samples (see analytical report for specific sample #s)

AR/COC No. 600395 Analytical laboratory ERCL SDG No. NA

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

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

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

1.0 EVALUATION

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

Reviewed by: Jeffrey A. Rabe

Date: 10/19/98

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

Item	Yes	No	If no, Sample ID No./Fraction(s) and Analysis
c) Matrix spike recovery data reported and met for all samples for which it was requested?		✓	S198-15 ⇒ Ba no results ① S198-16 ⇒ Ba (biased low)
6) Precision a) Laboratory control sample precision reported and met for all samples?	NA		Not applicable; LCS duplicate not analyzed with submitted Samples (VOA, HE, Metals)
b) Matrix spike duplicate RPD data reported and met for all samples for which it was requested?			S198-15 ⇒ Ba (No results) ①
7) Blank data a) Method or reagent blank data reported and met for all samples?		✓	S198-15 ⇒ Hg and Pb S198-16 ⇒ As ②
b) Sampling blank (e.g., field, trip, and equipment) data reported and met?		✓	ER-1295-6750-EB ⇒ Ba ③
8) Narrative included, correct, and complete?	✓		

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

① Percent recoveries and the relative percent difference were not reported for Ba in the MS/MSD samples (S198-15). Percent recoveries were biased low for Ba

Reviewed by: Jeffrey A. Kale

Date: 10/19/98

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

2.0 COMMENTS CONTINUATION SHEET

in the MS1 and MIO samples for Ba (S198-16).

③ "J" values were reported in the metals LMB samples

S198-15 ⇒ Hg and Pb

S198-16 ⇒ As

③ "J" value reported for Ba in the equipment blank.

10/19/98

Reviewed by: Jeffrey A. Rabe

Date: 10/19/98

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

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

Sample/ Fraction No.	Analysis	Qualifiers	Comments

Attach continuation sheet for additional samples

QUALIFIERS:

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

Reviewed by: Jeffrey A. Rabe

Date: 10/19/98

SAMPLE FINDINGS SUMMARY

Site: 101 Non-ER Septic Fields

AR COC: 600395 Data Classification: DV-2

Sample Fraction No.	Analysis	DV Qualifiers	Comments
ER-1295-6620 -DF1	7439-97-6	B	
-BH1-5-S	↓	↓	
-BH1-10-S			
-BH2-5-S			
-BH2-10-S			
-BH3-5-S			
-BH3-10-S			
ER-1295-6620 -DF1	7440-39-3	J A2, P2	
-BH1-5-S	↓	↓	
-BH1-10-S			
-BH2-5-S			
-BH2-10-S			
-BH3-5-S			
-BH3-10-S			
ER-1295-6750 -DF1	7440-38-2	U1	
-BH1-5-S	↓	↓	
-BH1-10-S			
-BH2-5-S			
-BH2-10-S			

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

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

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

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

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

Reviewed by: Jeffrey A. Rabe Date: 10/9/98

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

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

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

SAMPLE FINDINGS SUMMARY

Site: 101 Non-ER Septic Fields

AR COC: 600395 Data Classification: DV-2

Sample Fraction No.	Analysis	DV Qualifiers	Comments
ER-1295-6750 -DF1	7440-39-3	J, A2	
-BH1-5-S -BH1-10-S	↓	↓	
-BH2-5-S -BH2-10-S	↓	↓	
ER-1295-6730 -DF1	7440-38-2	U1	
-BH1-4.5-S -BH1-9.5-S	↓	↓	
-BH2-4.5-S -BH2-9.5-S	↓	↓	
-BH3-4.5-S -BH3-9.5-S	↓	↓	
-BH4-4.5-S -BH4-9.5-S	↓	↓	
ER-1295-6730 -DF1	7440-39-3	J, A2	
-BH1-4.5-S -BH1-9.5-S	↓	↓	
-BH2-4.5-S -BH2-9.5-S	↓	↓	

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

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

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

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

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

Reviewed by: Jeffrey A. Rahe Date: 10/19/98

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

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

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

SAMPLE FINDINGS SUMMARY

Site: 101 Non-ER Septic Fields

AR COC: 600395 Data Classification: DV-2

Sample Fraction No.	Analysis	DV Qualifiers	Comments
ER-1295-6730 -DF1	7440-39-3	J, A2	
-BH3-4.5-S -BH3-9.5-S	↓	↓	
-BH4-4.5-S -BH4-9.5-S	↓	↓	
EPA 6020	7440-39-3	B2	

JR 10/19/98

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

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

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

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

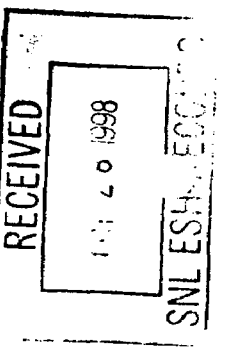
Test Methods - Anions_CE, EPA6010, EPA6020, EPA7470.1, EPA8015B, EPA8081, EPA8260, EPA8260-MS, EPA8270, HACH_ALK, HACH_NO2, HACH_NO3, MEKC_HE, PCBRISC

Reviewed by: Jeffrey L. Rabb Date: 10/19/98

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

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

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



Records Center Code: ER / 1295 / DAT

SMO ANALYTICAL DATA ROUTING FORM

Project Name:	Non-ER Septic Tanks	**Case No./Service Order:**	7223.230/CF0526
SNL Task Leader:	ROYBAL	**Org/Mail Stop:**	6133 / 1147
SMO Project Coordinator:	SALMI	**Sample Ship Date:**	6/26/98

ARCOC	Lab	Lab ID	Preliminary Received	Final Received	EDD Req'd YES	EDD Req'd NO	EDD Rec'd YES	EDD Rec'd NO
600396	GEL	9806828		7/28/98	x		x	

	Date		
Correction Requested from Lab:		**Correction Request #:**	
Corrections Received:		**Requester:**	
Review Complete:	7-29-98	**Signature:**	W. Palencia
Priority Data Faxed:		**Faxed To:**	
Preliminary Notification:	~~4/7/98~~	**Person Notified:**	~~[redacted]~~
Final Transmittal:	7-29-98	**Transmitted To:**	Sanders
		Transmitted By:	Palencia
TO ER! **~~Filed in Records Center~~:**	7/29/98	**Filed By:**	Montaño

Comments: ~~Original w data in other spaceSaver~~ OK

INFORMATION COPY

Received (Records Center) By: _____ SHEARS # 16234

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

Internal Lab Batch No. A Roopal

ANALYSIS REQUEST AND CHAIN OF CUSTODY

SAR/WR No.

AR/COC- 600396

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

Date Samples Shipped: 6/26/98 SMO use
Carrier/Waybill No.: 209115
Lab Contact: Edie Kent/803-556-8171
Lab Destination: GEL
SMO Contact/Phone: Doug Salmi/844-3110
Send Report to SMO: Suzi Montano

Contract No.: AJ-2480A
Case No.: 7223.230
SMO Authorization: S Montano
Bill to: Sandia National Laboratories
Supplier Services, Dept.
P.O. Box 5800 MS 0154

Location Tech Area III
Building 6620, 6730, 6731 Room

Sample No. - Fraction	ER Sample ID or Sample Location Detail	Beginning Depth in Ft.	ER Site No.	Date/Time Collected	Reference LOV: Sample Matrix	Container: Type	Container: Volume	Reference LOV: Preservative	Reference LOV: Sample Collection Method	Reference LOV: Sample Type	Parameter & Method Requested	LAB USE: Lab Sample ID
041077-002	ER-1295-6620-DF1-BH1-5-S	5	N/A	6/23/98 0830	S	AG	500ml	4C	G	SA	SVOCs (8270) Gross A/B	
041078-002	ER-1295-6620-DF1-BH1-10-S	10	N/A	6/23/98 0845	S	AG	500ml	4C	G	SA	SVOCs (8270) Gross A/B	
041079-002	ER-1295-6620-DF1-BH2-5-S	5	N/A	6/23/98 0920	S	AG	500ml	4C	G	SA	SVOCs (8270) Gross A/B	
041252-002	ER-1295-6620-DF1-BH2-10-S	10	N/A	6/23/98 0935	S	AG	500ml	4C	G	SA	SVOCs (8270) Gross A/B	
041253-002	ER-1295-6620-DF1-BH3-5-S	5	N/A	6/23/98 1110	S	AG	500ml	4C	G	SA	SVOCs (8270) Gross A/B	
041254-002	ER-1295-6620-DF1-BH3-10-S	5	N/A	6/23/98 1115	S	AG	500ml	4C	G	SA	SVOCs (8270) Gross A/B	
041259-002	ER-1295-6730-DF1-BH1-4.5-S	4.5	N/A	6/22/98 0755	S	AG	500ml	4C	G	SA	SVOC(8270)Gross A/B	
041260-002	ER-1295-6730-DF1-BH1-9.5-S	9.5	N/A	6/22/98 0850	S	AG	500ml	4C	G	SA	SVOC(8270)Gross A/B	
041261-002	ER-1295-6730-DF1-BH2-4.5-S	4.5	N/A	6/22/98 0915	S	AG	500ml	4C	G	SA	SVOC(8270)Gross A/B	
041262-002	ER-1295-6730-DF1-BH2-9.5-S	9.5	N/A	6/22/98 0945	S	AG	500ml	4C	G	SA	SVOC(8270)Gross A/B	

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

Sample Tracking SMO use
Date Entered (mm/dd/yy): 7/6/98
Entered by: JT

QC Initials: JTM

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

Abnormal Conditions on Receipt LAB USE

Turnaround Time XNormal ☐Rush Required Report Date

	Name	Signature	Init	Company/Organization/Phone
Sample Team Members	Chris Catechis	Chris Catechis	CC	MDM/6131/881-3196
	CHRIS SEARS	Chris Sears	CS	SNL/6131/844-1136

Please list as separate report.

1. Relinquished by	Chris Sears	Org.	6131	Date	6/24/98	Time	1532	4. Relinquished by / Org. / Date / Time
1. Received by	S Montano	Org.	7524	Date	6/24/98	Time	1532	4. Received by / Org. / Date / Time
2. Relinquished by	S Montano	Org.	7524	Date	6/26/98	Time	1300	5. Relinquished by / Org. / Date / Time
2. Received by		Org.		Date		Time		5. Received by / Org. / Date / Time
3. Relinquished by		Org.		Date		Time		6. Relinquished by / Org. / Date / Time
3. Received by		Org.		Date		Time		6. Received by / Org. / Date / Time

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

SF 2001-COC (10-

Supersedes (5-97) Issue

ANALYSIS REQUEST AND CHAIN OF CUSTODY (Continuation)

Press F1 for instructions for each field.

AR/COC- 600396

Project Name: 101 Non-ER Septic Fields | Project/Task Manager: Mike Sanders | Case No.: 7223.230

Location | Tech Area III

Building 6620, 6730, 6739, 6631 Room

Sample No. - Fraction	ER Sample ID or Sample Location Detail	Beginning Depth in Ft.	ER Site No.	Date/Time Collected	Reference LOV (available at SMO)						LAB USE
					Sample Matrix	Container Type	Container Volume	Preservative	Sample Collection Method	Sample Type	Parameter & Method Requested / Lab Sample ID
041263-002	ER-1295-6730-DF1-BH3-4.5-S	4.5	N/A	6/22/98 1000	S	AG	500ml	4C	G	SA	SVOC(8270) Gross A/B
041264-002	ER-1295-6730-DF1-BH3-9.5-S	9.5	N/A	6/22/98 1025	S	AG	500ml	4C	G	SA	SVOC(8270) Gross A/B
041265-002	ER-1295-6730-DF1-BH4-4.5-S	4.5	N/A	6/22/98 1040	S	AG	500ml	4C	G	SA	SVOC(8270) Gross A/B
041266-002	ER-1295-6730-DF1-BH4-9.5-S	9.5	N/A	6/22/98 1055	S	AG	500ml	4C	G	SA	SVOC(8270) Gross A/B
041267-002	ER-1295-6750-DF1-BH1-5-S	5	N/A	6/22/98 1205	S	AG	500ml	4C	G	SA	SVOC(8270) Gross A/B
041268-002	ER-1295-6750-DF1-BH1-10-S	10	N/A	6/22/98 1215	S	AG	500ml	4C	G	SA	SVOC(8270) Gross A/B
041269-002	ER-1295-6750-DF1-BH2-5-S	5	N/A	6/22/98 1205	S	AG	500ml	4C	G	SA	SVOC(8270) Gross A/B
041270-002	ER-1295-6750-DF1-BH2-10-S	10	N/A	6/22/98 1315	S	AG	500ml	4C	G	SA	SVOC(8270) Gross A/B
041276-001	ER-1295-6631-DF1-BH1-11-SD	11	N/A	6/24/98 0850	S	AC	300ml	4C	G	DU	VOCs (8260)
041255-002	ER-1295-6631-DF1-BH1-6-S	6	N/A	6/24/98 0750	S	AG	500ml	4C	G	SA	SVOC(8270) Gross A/B
041256-002	ER-1295-6631-DF1-BH1-11-S	11	N/A	6/24/98 0910	S	AG	500ml	4C	G	SA	SVOC(8270) Gross A/B
041257-002	ER-1295-6631-DF1-BH2-6-S	6	N/A	6/24/98 0930	S	AG	500ml	4C	G	SA	SVOC(8270) Gross A/B
041258-002	ER-1295-6631-DF1-BH2-11-S	11	N/A	6/24/98 0945	S	AG	500ml	4C	G	SA	SVOC(8270) Gross A/B
041255-003	ER-1295-6631-BH1-6-11-SD	6,11	N/A	6/24/98 0850	S	AG	1L	4C	G	DU	SVOC(8270) HE 8330,
											G Spec,RCRA Met+Cu
041284-001	ER-1295-6631-TB-SD	N/A	N/A	6/24/98 1020	DCW	G	2x40ml	HCl+4C	G	DU	VOCs
041284-006	ER-1295-6631-EB	N/A	N/A	6/24/98 1024	DCW	AG	1L	4C	G	S	SVOCs

Abnormal Conditions on Receipt — LAB USE

Recipient Initials _____

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

Contract Verification Review (CVR)

Project Leader ROYBAL Project Name NON-ER SEPTIC TANKS Case No. 7223.230

AR/COC No. 600396 Analytical Lab GEL SDG No. 9806828

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

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

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

2.0 Analytical Laboratory Report

Line No.	Item	Complete? Yes	Complete? No	If no, explain	Resolved? Yes	Resolved? No
2.1	Data reviewed, signature	X				
2.2	Method reference number(s) complete and correct	X				
2.3	QC analysis and acceptance limits provided (MB, LCS, LCD)	X				
2.4	Matrix spike/matrix spike duplicate data provided(if requested)	NA				
2.5	Detection Limits provided; PQL and MDL(or IDL)	X				
2.6	QC batch numbers provided	X				
2.7	Dilution Factors provided	X				
2.8	Data reported using correct sig. fig. (2 for org.; 3 for inorg.)	X				
2.9	Rad analysis uncertainty provided (2 sigma error)	X				
2.10	Narrative provided	X				
2.11	TAT met	X				
2.12	Hold times met	X				
2.13	Were contractual qualifiers provided	X				
2.14	All requested result data provided	X				

3.0 Data Quality Evaluation

Item	Yes	No	If no, Sample ID No./Fraction(s) and Analysis
3.1) 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). Units consistent between QC samples and sample data.	X		
3.2) Quantitation limit met for all samples?	X		
3.3) Accuracy a) Laboratory control sample accuracy reported and met for all samples?	X		
b) Surrogate data reported and met for all organic samples analyzed by a gas chromatography technique?		X	1 SURROGATE OUTSIDE RECOVERY LIMITS FOR SVOC LCD (AQUEOUS)
c) If requested, matrix spike recovery data reported and met .	NA		
3.4) Precision a) Laboratory control sample precision reported and met for all samples? For rad analysis, sample duplicate precision reported and met.		X	NO LCD REPORTED FOR METHOD 8330
b) If requested, matrix spike duplicate RPD data reported and met.	NA		
3.5) Blank data a) Method or reagent blank data reported and met for all samples?		X	2-AMINO-4,6-DINITROTOLUENE DETECTED IN EXPLOSIVES METHOD BLANK METHYLENE CHLORIDE DETECTED IN BOTH VOC METHOD BLANKS
b) Sampling blank (e.g., field, trip, and equipment) data reported and met?	NA		
3.6) Contractual qualifiers provided: "J"- estimated quantity; "B"-analyte found in method blank; "U"- analyte undetected (results are below the MDL or L_c (rad)); "H"-analysis done beyond the holding time.	X		
3.7) Narrative included, correct, and complete?	X		

4.0 Data Quality Evaluation Continuation

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

Sample/ Fraction No.	Analysis	Qualifiers	Comments

Were deficiencies noted. ☹ Yes ☺ No

Based on the review, this data package is complete. ☺ Yes ☹ No

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

Reviewed by: W. Palencia Date: 7-29-98 Closed by: _____ Date: _____

SAMPLE FINDINGS SUMMARY

Site: ST & DF

AR/COC: 600396 Data Classification: Radiometrics

Sample Fraction No.	Analysis	DV Qualifiers	Comments
No Data is Qualified			
Data is Acceptable			
QC measures are adequate			

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

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

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

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

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

Reviewed by: Kevin A Lambert Date: 8/4/98

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

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

* This is not a definitive list. Other qualifiers are potentially available, see TOP 94-03. Notify Tina Sanchez to revise list. **Updated:March 10, 1998**

ANALYTICAL RADIOCHEMISTRY DATA VALIDATION CHECKLIST

Project Name ST + DF				Site Name Case # 7223.2300	
Laboratory Name/Job No./Batch No. GEL / 9806828				Chain of Custody No. 600396	
Analysis Method EPA900.0, HASL 300.0				Parameter List: Gross Alpha/Beta, Gamma Spec	
REVIEW ITEM	YES	NO	NA	COMMENTS	
A. HOLDING TIMES					
1. Preparation and analysis holding times met?				SEE CVR Form	
2. Short-half life parameters analyzed for and checked?					
B. CALIBRATION VERIFICATION				Met criteria	
1. Detectors numbered and documented?	✓				
2. Frequency: Daily ✓, weekly ____, or monthly ____?	✓				
3. Acceptance criteria: Met?	✓				
C. LABORATORY CONTROL SAMPLES				Met acceptance criteria	
1. Standard: Independent, certified reference material?	✓				
2. Frequency: Each batch?	✓				
3. % Recovery 80-120% or ____?	✓				
D. METHOD BLANK				No target analytes were above acceptance limits	
1. Frequency: Each batch?	✓				
2. Matrix: Matrix specific?	✓				
3. Preparation: Entire procedure?	✓				
4. Blanks show contamination?		✓			
E. MATRIX SPIKE					
1. Frequency: Each batch?		✓		No MS/MSD for Gamma Spec. Dup analysis from another ARCOC group in batch met criteria. No data qualified. MS/MSD for Gross A/B met acceptance criteria	
2. Matrix: Matrix specific?	✓				
3. Preparation: Entire procedure?	✓				
4. % Recovery: 75-125% or ____?	✓				
F. ANALYTICAL YIELDS/OTHER				Not Applicable	
1. Tracer: Correct type, recovery met?			✓		
2. Ingrowth and/or decay: Correct factors applied?			✓		
3. Solids density: Planchette loading <5 mg/cm^2?			✓		
G. DUPLICATE				RPDs for Gross A/B did not met criteria, however, the DER which is the appropriate measure of Lab precision met criteria No data is qualified. The duplicate analysis for G. Spec is from another ARCOC group in the batch and met criteria No data is qualified	
1. Type: Lab or field?	✓				
2. Frequency: Each batch?	✓				
3. Matrix: Matrix specific?	✓				

ANALYTICAL RADIOCHEMISTRY DATA VALIDATION CHECKLIST (CONTINUED)

Project Name				Site Name
Laboratory Name/Job No./Batch No.				Chain of Custody No.
Analysis Method				Parameter List:
REVIEW ITEM	YES	NO	NA	COMMENTS
4. Preparation: Entire procedure?	✓			
H. ANALYTE DETECTION				
1. Detection limit sample/batch specific?	✓			
2. Errors evaluated?	✓			
3. False positives/negatives suspected?		✓		

Reviewed by: Kevin t Lambert

(1) All samples were prepared and analyzed with accepted procedures and specified methods. All compounds were succesfully analyzed. No problems were identified during KR 8/4/98 data package review.

(2) All QC measures met acceptance criteria
Note: RPDs for Cross A/B duplicate analysis did not meet criteria. However, the Duplicate Error Ratio (DER), which is more appropriate measure of lab precision met acceptance criteria. No data is qualified.

(3) Data is acceptable, No data is qualified

(4) QC measures are adequate.

SAMPLE FINDINGS SUMMARY

Site: ST + DF

AR/COC: 600396 Data Classification: Organic

Sample Fraction No.	Analysis	DV Qualifiers	Comments
No data were qualified			
Data is acceptable			
QC measures are adequate			

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

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

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

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

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

Reviewed by: Kevin A Lambert Date: 8/6/98

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

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

* This is not a definitive list. Other qualifiers are potentially available, see TOP 94-03. Notify Tina Sanchez to revise list. **Updated:March 10, 1998**

ORGANIC DATA ASSESSMENT SUMMARY FORM
(Data Verification/Validation Level 3 DV-3)

SITE OR PROJECT ST4DF
ANALYTICAL LABORATORY GEL
LABORATORY REPORT # 9806828
CASE NO. 7223.2300
ARCOC# 600396

SAMPLE IDS 26 : 24 soil, 2 aqueous
NO. OF SAMPLES
ER-1295-6620-XXX, ER-1295-6730-XXX,
ER-1295-6750-XXX, ER-1295-6631-XXX,

DATA ASSESSMENT SUMMARY

Describe problems/qualifications below (Action Items and Areas of Concern)

		VOC	SVOC	PEST/PCB	~~OTHER~~ HE KAL 8/4/98
1.	HOLDING TIMES/PRESERVATION	✓	✓	NA	✓
2.	GC/MS INST. PERFORM.	✓	✓		✓
3.	CALIBRATIONS/WINDOWS	✓	✓		✓
4.	BLANKS	✓	✓		✓
5.	SURROGATES	✓	✓		✓
6.	MATRIX SPIKE/DUP	✓	✓		✓
7.	LABORATORY CONTROL SAMPLES	✓	✓		✓
8.	INTERNAL STANDARDS	✓	✓		✓
9.	COMPOUND IDENTIFICATION	✓	✓		✓
10.	SYSTEM PERFORMANCE	✓	✓		✓
11.	OVERALL ASSESSMENT	✓	✓	✓	✓

✓ (check mark) — Acceptable: Data had no problems or qualified due to minor problems
N - Data qualified due to major problems
X - Problems, but do not affect data
NA - Not Applicable
Qualifiers: J - Estimate
UJ - Undetected, estimated

KAL 8/4/98
~~ACTION ITEMS:~~ All samples were prepared and analyzed with accepted procedures and specified methods. All compounds were successfully analyzed. No problems were
KAL 8/6/98
~~AREAS OF CONCERN:~~ observed in the data package review that results in data qualification. The following sections discuss the data reviews and validation

Reviewed By: Kevin A Lambert
Date: 8/6/98

ORGANIC DATA ASSESSMENT SUMMARY FORM
(Data Verification/Validation Level 3 DV-3)

PROJECT/TASK LEADER: _____

KAL 8/6/98 (2)
~~ACTION ITEMS:~~ SVOC Analysis: Initial calibration met acceptance criteria. Continuing calibration met acceptance criteria except several compounds were outside acceptance list (SEE QC summary data). The majority of these compounds are not on the TCL. Some compounds are on TCL but are KAL 8/6/98 non-detect non-detects in the site sample. No data is qualified. No target analytes were detected in blanks. Surrogate %Rec met acceptance criteria except for Nitrobenzene-d5 in the LCSD. The LCS met criteria, site samples met criteria. No data qualified. MS/MSD met acceptance criteria. LCS/LCSD met acceptance criteria

KAL 8/6/98
~~AREAS OF CONCERN:~~ except 1,4-Dichlorobenzene %REC in LCSD was slightly low. The LCS met acceptance criteria, No data is qualified. Internal Standards met acceptance criteria.

(3) VOC Analysis: Initial & Continuing Calibration met acceptance criteria except for several compound not on TCL and some on TCL that are non-detects (SEE QC summary data). No data is qualified. No target analytes were detected in blanks except for Methylene Chloride in the TB. The compound was not detected in the site samples, No data is qualified. Surrogate %REC met criteria. No MS/MSD was run on ARCOC group but was run on another ARCOC group in the batch and met accept criteria except for 3 compounds (SEE Case narrative). These compound were not detected in site samples, No data is qualified. LCS/LCSD met acceptance criteria and Internal Stds were within control limits

~~OVERALL DATA QUALITY ASSESSMENT~~ (4) HE Analysis: Calibration met acceptance criteria. No target analytes were detected in blanks except for 2-Amino-4, 6-DNT in the MB. This compound was not detected in the site sample, No data is qualified. Surrogate %REC met acceptance criteria, No MS/MSD was run on ARCOC group but was run on another ARCOC group in the batch and met acceptance criteria for 1 compound (SEE case narrative). The compound was not detected in the site sample, No data is qualified. The LCS met acceptance criteria, No LCSD was run.

(5) No Field Duplicate Pair was submitted on ARCOC.

(6) Data is acceptable

(7) QC measures are adequate

Reviewed By: Kevin A Lambert
Date: 8/6/98

ORGANIC DATA ASSESSMENT SUMMARY FORM
(Data Verification/Validation Level 3 DV-3)

1.0 HOLDING TIMES AND PRESERVATION

Indicate the holding time criteria below that was used to evaluate the samples.

SW-846, 3rd. ed.
Other: _____

List below samples that were over holding time criteria.

Sample ID	VTSR	Date Analyzed	Action

SEE CVR FORM

NOTE: VTSR = Validated time of sample receipt.

Were the correct preservatives used? Yes ☐ No ☐

List below samples that were incorrectly preserved.

Sample No.	Type of Sample	Deficiency	Action

Reviewed By: Kevin A Lambert 8/4/98
Date:

ORGANIC DATA ASSESSMENT SUMMARY FORM
(Data Verification/Validation Level 3 DV-3)

2.0 GC/MS TUNING CRITERIA

Has a GC/MS tuning performance been analyzed for every twelve hours of sample analysis for each GC/MS instrument used? Yes ☑ No ☐

Was the correct standard (listed in the EPA Method) used? Yes ☑ No ☐

Have the ion abundance criteria been met for each tune? Yes ☑ No ☐

NOTE: GC/MS abundance criteria is specified by EPA method for GC/MS analysis (EPA 8240A or 8270A).

If no for any of the above, list all the data associated with the tune that either failed criteria or in which there was no tune.

Date/Time	Problem	Sample Affected (Action)
	Met criteria	

Check for transcription/calculation errors. If errors are present, briefly summarize necessary changes:

Is the spectra of the mass calibration acceptable? Yes ☑ No ☐

Reviewed By: Kevin A Lambert
Date: 8/4/98

ORGANIC DATA ASSESSMENT SUMMARY FORM
(Data Verification/Validation Level 3 DV-3)

3.3 DDT and Endrin Degradation Not Applicable

List below the standards that have a DDT or Endrin breakdown of >20% (or a combined breakdown of >20%).

Date/Time	Standard ID	DDT/Endrin	% Breakdown	Action	Affected Samples

3.4 DBC Retention Time Check

Is the %D between EVAL A and each analysis (quantitation and confirmation) DBC retention time within QC limits (2% for packed column, 0.3% capillary ID <0.32 mm, and 1% for megabore)?

Yes ☐ No ☐

Date	Sample ID	DBC %D	Action

For the above criteria outlined in Sections 8.1–8.4, check for transcription/calculation errors.

If errors are found, list below with necessary corrections: _____

_____

_____

_____

Reviewed By: Kevin A Lambert
Date: 8/4/98

ORGANIC DATA ASSESSMENT SUMMARY FORM
(Data Verification/Validation Level 3 DV-3)

3.0 GC INSTRUMENT PERFORMANCE.

Not Applicable

3.1 DDT Retention Time

Is DDT retention time for packed columns >12 minutes (except for OV-1 and OV-101)?
Yes ☐ No ☐

If no, list below the DDT standards that failed criteria: _____

Affected samples and compounds: _____

_____

_____

3.2 Retention Time Windows

List below compounds that were not within the retention time windows.

Date.Time	Compound	RT	RT Window	Action	Affected Samples

Reviewed By: Kevin A Lambert 8/4/98
Date:

ORGANIC DATA ASSESSMENT SUMMARY FORM
(Data Verification/Validation Level 3 DV-3)

4.0 INITIAL CALIBRATION

Has initial calibration been performed as required in the EPA method? Yes ☑ No ☐

Were the correct number of standards used to calibrate the instrument? Yes ☑ No ☐

For GC analyses of PCBs and Pesticides, did the laboratory follow the correct 72-hour sequence of analysis?
Yes ☐ No ☐ Not Applicable

List below compounds which did not meet initial calibration criteria outlined by the EPA method.

Instrument ID	Date	Compound	RF/%RSD	Action	Samples Affected
VOC: Several compounds are outside acceptance limits (see QC summary data). Majority are not on TCL. Those on TCL are NON-detects in site sample. No data is qualified					
SVOC: Met criteria					
HE: Met criteria					

Check for transcription/calculation errors. If errors are present, summarize necessary corrections below:

Reviewed By: Kevin A Lambert
Date: 8/4/98

ORGANIC DATA ASSESSMENT SUMMARY FORM
(Data Verification/Validation Level 3 DV-3)

5.0 CONTINUING CALIBRATION

Have continuing calibration standards been analyzed at the frequency specified in the EPA method?
Yes ☑ No ☐

List below all compounds which did not meet continuing calibration requirements.

Instrument ID	Date	Compound	RF/%D	Action	Samples Affected
VOC: Several compounds are outside acceptance limits (see QC summary data). Majority are not on TCL. Those compounds on TCL are non-detects in site samples. No data is qualified					
SVOC: Several compounds are outside acceptance limits (see QC summary data). Majority are not on TCL. Those compounds on TCL are non-detects in site samples. No data is qualified					

Check for transcription and calculation errors. If errors are found, briefly summarize necessary corrections below:

HE: Met acceptance criteria

Reviewed By: Kevin A Lambert
Date: 8/4/98

ORGANIC DATA ASSESSMENT SUMMARY FORM
(Data Verification/Validation Level 3 DV-3)

6.0 BLANK ANALYSES

6.1 Method/Reagent and Instrument Blanks

Has a method/reagent blank been analyzed for each set of samples or for every 20 samples of similar matrix, whichever is more frequent? Yes ☑ No ☐

Has an instrument blank been analyzed at least once every twelve hours for each GC/MS system used? Yes ☑ No ☐

6.2 Field/Rinse/Equipment Blanks

Are there field/rinse/equipment blanks associated with each sampling day or at frequency specified in the sampling plan. Yes ☑ No ☐ SVOCs Only

List below compounds for which analyses were requested that were detected in any of the blanks analyzed:

Date	Blank ID	Compound	Conc. ( )	PQL ( )	Action Level	Samples Affected (Action)
Batch 125500 7/7/98 1401	ER-1295-6631-TB-SD	methylene chloride	2.9 ug/l	1.0 ug/l	Not detected No data	in site sample is qualified
124879 6/30/98 1627	QC517681	2-Amino-4, 6-DNT	120 ug/kg	80 ug/kg	Not detected No data	in site sample is qualified
~~SVOC~~	KAL 8/4/98					

PQL = Practical Quantitation Limit from EPA Method.

Note: VOCs - Methylene Chloride was observed at estimated values ("J" coded) in MBs. No detectable concentration was observed in site sample, no data is qualified.

Reviewed By: Kevin A Lambert
Date: 8/4/98

ORGANIC DATA ASSESSMENT SUMMARY FORM
(Data Verification/Validation Level 3 DV-3)

Are there any TICs present in the blanks that are also present in the samples? Yes ☐ No ☑
If yes, list below.

7.0 SURROGATE RECOVERY

Were surrogate recoveries evaluated for each of the samples analyzed by GC or GC/MS?
Yes ☑ No ☐

If surrogate standards other than those presented by SW-846 are used, list below with reference to applicable control limits used to evaluate the percent recoveries.

Surrogate Compound	Control Limits

List below the percent recoveries which did not meet either SW-846 criteria or criteria listed above.

Batch 125068

Date	Sample ID/Matrix	Surrogate Compound	%Rec		Action
7/14/98 1328	QC518392/ LCSD / Aqueous	Nitrobenzene-d5	33.8	35-111	LCS met criteria. Only surrogate outside control limits. No data is qualified. Site samples met criteria for surrogate % REC.
VOC:	Met criteria				
HE:	Met criteria				

Reviewed By: Kevin A Lambert
Date: 8/4/98

ORGANIC DATA ASSESSMENT SUMMARY FORM

(Data Verification/Validation Level 3 DV-3)

If surrogate recovery was outside of control limits, were the samples or method blank reanalyzed?

Yes ☐ No ☐ Not Applicable

Are method blank surrogate recoveries outside of limits upon reanalysis? Yes ☐ No ☑ ~~Not Applica~~ Not Applicable KAL 8/4/98 KAL 8/4/98

Are transcription/calculation errors present? Yes ☐ No ☑

If yes, note necessary corrections. _____

Reviewed By: Kevin A Lambert 8/4/98
Date:

ORGANIC DATA ASSESSMENT SUMMARY FORM

(Data Verification/Validation Level 3 DV-3)

8.0 MATRIX SPIKE/MATRIX SPIKE DUPLICATE (MS/MSD) ANALYSIS

Were MS/MSDs analyzed at the frequency required by the EPA method or QAPjP for each matrix type?

Yes ☑ No ☐ SVOC + H KAL 8/4/98 Only VOC & HE from another ARCOC group in respective batches

List below %-recoveries and RPDs of compounds which did not meet criteria. Indicate on chart criteria used to evaluate recoveries and RPDs.

Date	Sample ID/Matrix	Compound	%Rec RPD	Action
VOC:	No MS/MSD was run on ARCOC group. However, the MS/MSD from another ARCOC group in batch met acceptance criteria except for toluene, chlorobenzene, & 1,1-dichlor RPDs were low. Suspect matrix interferences due to sample inhomogeneity and confirmed by acceptability of LCS/LCSD %REC. No data is qualified. No detectable concentration were observed in site sample			
SVOC:	Met acceptance criteria			

HE: No MS/MSD was run on ARCOC group. However, MS/MSD from another ARCOC group in the batch met acceptance criteria except for MS %REC of 2-Amino-4,6-DNT was high. MSD met acceptance criteria. No detectable concentration were observed in site sample. No data is qualified

Reviewed By: Kevin A Lambert
Date: 8/4/98

ORGANIC DATA ASSESSMENT SUMMARY FORM
(Data Verification/Validation Level 3 DV-3)

10.0 INTERNAL STANDARDS EVALUATION

List below the internal standard areas of samples or blanks which did not meet criteria.

Date	Sample ID	Internal Out	Acceptable Range	Action
		Met Criteria		

Are retention times of the internal standards within 30 seconds of the associated calibration standard?
Yes ☑ No ☐

11.0 TARGET COMPOUND LIST ANALYTES
11.1 GC/MS Analyses

Are the reconstructed ion chromatograms, the mass spectra for the identified compounds, and the data system printouts included? Yes ☑ No ☐

Is chromatographic performance acceptable with respect to:

Baseline stability? Yes ☑ No ☐

Resolution? Yes ☑ No ☐

Peak shape? Yes ☑ No ☐

Full-scale graph (attenuation)? Yes ☑ No ☐

Reviewed By: Kevin A Lambert
Date: 8/4/98

ORGANIC DATA ASSESSMENT SUMMARY FORM
(Data Verification/Validation Level 3 DV-3)

9.0 LABORATORY CONTROL SAMPLE ANALYSIS

Have laboratory control samples containing a representative number of the compounds of interest been analyzed at the frequency specified in the EPA method or QAPjP?

Yes ☑ No ☐

Evaluate percent recoveries based on control limits established in individual EPA methods, or use established laboratory control limits. List below recoveries of compounds which did not meet criteria with reference to control limits used.

Batch 125068

Date	Compound	%Rec	Control Limits	Action	Samples Affected
7/14/98 LCSD 1328	1,4-Dichlorobenzene	42	48-92	LCS met criteria. Not detected in site samples. No data is qualified	
VOC:	Met criteria				
HE:	LCS met criteria, NO LCSD was run				

Control Limit Reference: _____

Evaluate RPD based on control limits established in individual EPA methods, or use established laboratory control limits. List below recoveries of compounds which did not meet criteria with reference to control limits used.

Date	Compound	%Rec	Control Limits	Action	Samples Affected
			Met criteria		

Control Limit Reference: _____

Reviewed By: Kevin A Lambert
Date: 8/4/98

ORGANIC DATA ASSESSMENT SUMMARY FORM
(Data Verification/Validation Level 3 DV-3)

Other: _____

Is the RRT of each reported compound within the limits given in the method of the standard RRT in the continuing calibration? Yes ☑ No ☐

Are all the ions present in the standard mass spectrum at a relative intensity greater than 10% also present in the mass spectrum? Yes ☑ No ☐

Do sample and standard relative intensities agree within 20%? Yes ☑ No ☐

If no for any of the above, indicate below problems and qualifications made to data:

_____

_____

_____

11.2 GC Analyses Not Applicable

Are there any transcription/calculation errors between the raw data and the reporting forms?
Yes ☐ No ☐

If yes, review errors and necessary corrections below; if errors are large, resubmittal of laboratory package may be necessary.

_____

_____

_____

Are retention times of sample compounds within the calculated retention time windows for both quantitation and confirmation analysis? Yes ☐ No ☐

Was GC/MS confirmation performed when required by the EPA method? Yes ☐ No ☐

If no for any of the above, reject positive results except for retention time windows if associated standard compounds are similarly shifted.

Reviewed By: Kevin A Lambert
Date: 8/4/98

ORGANIC DATA ASSESSMENT SUMMARY FORM
(Data Verification/Validation Level 3 DV-3)

Samples affected: Not Applicable

Check chromatograms for false negatives, especially for the multiple peak components (toxaphene and PCBs). If false negatives are apparent and the appropriate PCB standards were not analyzed, or if confirmed analysis was not present, flag the affected data.

Samples affected: _____

NOTE: Due to the complexities of PCB/pesticide analysis, each analytical run should be reviewed to verify identification and column performance.

12.0 FIELD DUPLICATE ANALYSIS

Were field duplicates submitted for analysis? Yes ☐ No ☑

If yes, calculate RPD and use professional judgment to determine if the data needs to be qualified. List results below.

Date	Sample ID	Compound	Sample Result	Duplicate Result	RPD	Affected Samples
		Not submitted on ARCOC				

13.0 COMPOUND QUANTITATION/REPORTED DETECTION LIMITS

Are there any transcription/calculation errors from raw data to reported results (check at least 10% of positive results)? Yes ☐ No ☑

In addition, verify that the correct internal standard, quantitation ion, and RRF were used to calculate the result for a minimum of 10% of sample data.

Reviewed By: Kevin A Lambert
Date: 8/4/98

ORGANIC DATA ASSESSMENT SUMMARY FORM
(Data Verification/Validation Level 3 DV-3)

13.1 Chromatogram Quality

Were baselines stable? Yes ☑ No ☐

Were any negative peaks or unusual peaks present? Yes ☐ No ☑

Were early eluting peaks resolved to baseline? Yes ☑ No ☐

If incorrect quantitations are evident, note corrections necessary below: _____

_____

_____

Are the required quantitation limits (detection limits) adjusted to reflect sample dilutions and for soils, sample moisture? Yes ☑ No ☐

If no, make necessary corrections and note below.

_____

_____

_____

14.0 TENTATIVELY IDENTIFIED COMPOUNDS Not Applicable

Are Tentatively Identified Compounds (TIC) properly identified with scan number or retention time, estimated concentration, and J qualifier? Yes ☐ No ☐

Are the mass spectra for TICs and associated "best match" spectra included? Yes ☐ No ☐

Are any TCL compounds listed as TIC compounds? Yes ☐ No ☐

Are each of the ions present in the reference mass spectra with a relative intensity greater than 10% also present in the sample mass spectrum? Yes ☐ No ☐

Reviewed By: Kevin A Lambert
Date: 8/4/98

ORGANIC DATA ASSESSMENT SUMMARY FORM
(Data Verification/Validation Level 3 DV-3)

Do TIC and "best match" standard relative ion intensities agree within 20%? Yes ☐ No ☐

Comments Not Applicable

Reviewed By: Kevin A Lambert

Date: 8/4/98

Approved By:* _____

Date _____

*Data package must be approved by Project/Task Leader.

SAMPLE FINDINGS SUMMARY

Site: ST & DF

AR'COC: 600396 Data Classification: Inorganic

Sample Fraction No.	Analysis	DV Qualifiers	Comments
No data is qualified			
Data is acceptable			
QC measures are adequate			

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

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

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

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

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

Reviewed by: Kevin A Lambert Date: 8/4/98

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

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

* This is not a definitive list. Other qualifiers are potentially available, see TOP 94-03. Notify Tina Sanchez to revise list. **Updated:March 10, 1998**

INORGANIC DATA ASSESSMENT SUMMARY FORM

(Data Verification/Validation Level 3—DV3)

SITE OR PROJECT ST4DF

CASE NO. 7223.2300

ANALYTICAL LABORATORY GEL

SAMPLE IDS

LABORATORY REPORT # 9806828

ER-1295-6631-BH1-6-11-SD

~~TASK LEADER~~ ARCOC# 600396

NO. OF SAMPLES 1 soil

DATA ASSESSMENT SUMMARY

		ICP	AA	MERCURY	CYANIDE
1.	HOLDING TIMES	✓	NA	✓	NA
2.	CALIBRATIONS	✓		✓	
3.	BLANKS	✓		✓	
4.	ICS	✓			
5.	LCS	✓			
6.	DUPLICATE ANALYSIS	✓		✓	
7.	MATRIX SPIKE	✓		✓	
8.	MSA				
9.	SERIAL DILUTION	✓			
10.	SAMPLE VERIFICATION	✓		✓	
11.	OTHER QC	✓		✓	
12.	OVERALL ASSESSMENT	✓		✓	

✓ (check mark) — Acceptable

Other — Qualified:

J - Estimate

UJ - Undetected, estimated

R - Unusable (analyte may or may not be present)

NA - Not Applicable

KH 8/4/98

~~ACTION ITEMS:~~ ① All samples were prepared and analyzed with accepted procedures and specified methods. All compounds were successfully analyzed. No Major/minor problems

KH 8/4/98

~~AREAS OF CONCERN:~~ were identified during data package review.

② Calibration met acceptance criteria. No target analytes were detected in the MB. LCS/LCSD met

REVIEWED BY: Kim A Lambert

DATE REVIEWED: 8/4/98

INORGANIC DATA ASSESSMENT SUMMARY FORM
(Data Verification/Validation Level 3—DV3)

KAC 8/4/98

~~ACTION ITEMS:~~ met acceptance criteria. No MS/MSD was run on ARCOC group, however the MS/MSD from another ARCOC group met acceptance criteria. No field duplicate or EB were submitted on ARCOC.

(3) No data is qualified

(4) Data is acceptable

(5) QC measures are adequate

AREAS OF CONCERN: None

OVERALL DATA QUALITY ASSESSMENT see above

Reviewed By: Kevin A Lambert Date: 8/4/98

INORGANIC DATA ASSESSMENT SUMMARY FORM
(Data Verification/Validation Level 3—DV3)

1.0 HOLDING TIMES

List holding time criteria used to evaluate samples, indicating which samples exceed the holding time. Holding time begins with validated time of sample collection.

Parameter	Holding Time Criteria	Sample ID	Days Holding Time was Exceeded	Action

SEE CVR FORM

Were the correct preservatives used? Yes ☐ No ☐

List below samples that were incorrectly preserved.

Sample No.	Type of Samples	Deficiency	Action

Reviewed By: Kevin A Lambert Date: 8/4/98

INORGANIC DATA ASSESSMENT SUMMARY FORM
(Data Verification/Validation Level 3—DV3)

2.0 INSTRUMENT CALIBRATION

2.1 Percent Recovery Criteria

Indicate %Recovery (%R) criteria used to evaluate calibration standards:

Metals: 90 - 110
Mercury: 80 - 120
Cyanide: _____
Other: _____

List below the analytes which did not meet %R criteria for initial and continuing calibration standards:

Analysis Date	ICV/CCV #	Analyte	%R	Action	Samples Affected
			Met Criteria		

2.2 Analytical Sequence

Did the laboratory use the proper number of standards for calibration as described in the EPA method? Yes ☑ No ☐

Have initial calibrations been performed at the beginning of each analysis and at the frequency indicated by the EPA method? Yes ☑ No ☐

Have continuing calibration standards been analyzed at the beginning of sample analysis and at a minimum frequency indicated by the EPA method and at the end of the analysis sequence? Yes ☑ No ☐

If no for any of the above, outline deviations and actions taken below:

_____

_____

_____

Reviewed By: Kevin A Lambert Date: 8/4/98

INORGANIC DATA ASSESSMENT SUMMARY FORM
(Data Verification/Validation Level 3—DV3)

3.2 Method Blank

Was one method blank analyzed for:

Each of 20 samples? Yes ☑ No ☐
Each digestion batch? Yes ☑ No ☐
Each matrix type? Yes ☑ No ☐
Both AA and ICP when both are used for the same analyte? Yes ☐ No ☐ Not Applicable
or
At the frequency indicated in the EPA method or QAPjP? Yes ☑ No ☐

NOTE: Method blank is the same as the calibration blank for mercury and for wet chemistry analysis.

List analytes detected in method blank samples below. NOTE: For soil samples, be sure to calculate blank values using digestion weights and volumes.

Preparation Date	Analyte	Conc.	Required Detection Limits	Action Level	Samples Affected

No Target Analytes were detected

Is concentration in the method blank below the detection limit? Yes ☑ No ☐

Affected samples: _____

Reviewed By: Kevin A Lambert Date: 8/4/98

INORGANIC DATA ASSESSMENT SUMMARY FORM
(Data Verification/Validation Level 3—DV3)

Were the correlation coefficients for the calibration curves for AA, Hg, CN, and other spectrophotometric methods ≥0.995? (Check calculations performed for calibration curves.) Yes ☑ No ☐

If no, list: _____

Date	Analyte	Coefficient	Action	Samples Affected

Check for transcription and calculation errors involving calibration summary forms and raw data. Briefly summarize errors and associated actions when data quality might have been affected.

3.0 BLANK ANALYSIS

3.1 Initial and Continuing Calibration Blanks

Have Initial and Continuing Calibration Blanks (ICB/CCB) been analyzed at the frequency required in the EPA method? Yes ☑ No ☐

If no, summarize problems and resolutions in the narrative report.

List analytes detected in ICB and CCBs below:

NOTE: For soil samples, convert blank values to mg/kg using digestion weights and volumes.

Analysis Date	ICB/CCB No.	Analyte	Conc.	Required Detection Limits	Action Level	Samples Affected
				Met Criteria		

Reviewed By: Kevin A Lambert Date: 8/4/98

INORGANIC DATA ASSESSMENT SUMMARY FORM
(Data Verification/Validation Level 3—DV3)

3.3 Field/Rinse/Equipment Blanks

Was a field/equipment blank analyzed as required by the EPA method or QAPjP? Yes ☐ No ☑

List below analytes detected in the field blanks. NOTE: For soil samples, calculate blank values using digestion weights and volumes.

Collection Date	Blank ID	Analyte	Conc.	Required Detection Limits	Action Level	Samples Affected

Not submitted on ARCOL

4.0 ICP INTERFERENCE CHECK SAMPLE ANALYSIS

Was an ICP interference check sample (ICS) analyzed at the beginning and end of a run or at least twice every 8 hours? (Not required for Ca, Mg, K, and Na) Yes ☑ No ☐

Samples affected: _____

Are the values of the ICS for solution AB within 80-120%R? Yes ☑ No ☐

If no, is the concentration of Al, Ca, Fe, or Mg lower than in ICS? Yes ☐ No ☐ Not Applicable

Reviewed By: Kevin A. Lambert Date: Kevin A. Lambert 8/4/98
KAL 8/4/98

INORGANIC DATA ASSESSMENT SUMMARY FORM
(Data Verification/Validation Level 3—DV3)

If no, list below all analytes which did not meet %R criteria and in which the concentration of Al, Ca, Fe, or Mg is higher than in the ICS: Not Applicable

Date	Analyte	%R	Action	Samples Affected

Are any results > IDL for those analytes which are not present in the ICS solution A? Yes ☐ No ☑

If yes, results >2 (absolute value of the IDL) indicate either a positive or negative interference and must be qualified.

Samples affected: _____

_____

Check for transcription/calculation errors. Briefly summarize errors and associated actions when data quality might have been affected.

5.0 LABORATORY CONTROL SAMPLES (LCS)

Was an LCS analyzed at required frequency? Yes ☑ No ☐

Samples affected: _____

_____

_____

_____

_____

_____

Reviewed By: Kevin A Lambert Date: 8/4/98

INORGANIC DATA ASSESSMENT SUMMARY FORM
(Data Verification/Validation Level 3—DV3)

List below any LCS recoveries not within limits.

Preparation Date	Analyte	%R	Action	Samples Affected
			Met Criteria	

6.0 LABORATORY DUPLICATE ANALYSIS

Were laboratory duplicates analyzed at required frequency? Yes ☑ No ☐

Samples affected: _____

_____

Was laboratory duplicate analysis performed on field or equipment blanks? Yes ☐ No ☑

Samples affected: _____

_____

_____

Is any value for sample duplicate pair <PQL and the other value >10xPQL? Yes ☐ No ☑

Samples affected: _____

_____

_____

Reviewed By: Kevin A Lambert Date: 8/4/98

INORGANIC DATA ASSESSMENT SUMMARY FORM
(Data Verification/Validation Level 3—DV3)

List below concentrations of any analyte that did not meet criteria for duplicate precision:

Sample ID	Matrix	Preparation Date	Analyte	PQL	RPD	Action	Samples Affected
			Met Criteria				

Check for transcription/calculation errors. Briefly summarize errors and associated actions when data quality might have been affected.

7.0 FIELD DUPLICATE SAMPLE ANALYSIS

Were field duplicates collected at the frequency indicated in the EPA method or QAPjP?
Yes ☐ No ☑ Not Submitted on ARCOC

If yes, qualify data associated only with the field duplicate pair. Calculate RPDs for each analyte in which both values are greater than the IDL.

Is any value for sample duplicate < practical quantitation limit (PQL) and other value >10xPQL? Yes ☐ No ☐
Not Applicable

Reviewed By: Kevin A Lambert Date: 8/4/98

INORGANIC DATA ASSESSMENT SUMMARY FORM
(Data Verification/Validation Level 3—DV3)

Samples affected: _____

List below the analytes that do not meet RPD or PQL criteria. Use the same criteria as those used for laboratory duplicate analysis or criteria specified in EPA method or sampling plan.

Sample ID	Matrix	Collection Date	RPD	Control Limit	Action	Samples Affected
					Not Submitted on ARCOC	

Check for transcription/calculation errors. Briefly summarize errors and associated actions when data quality might have been affects.

8.0 MATRIX SPIKE ANALYSIS

NOTE: *This matrix spike is a predigestion/predistallation spike.*

Was a matrix spike prepared and analyzed at the required frequency? Yes ☐ No ☑ Not run on ARCOC group, however MS/MSD from another ARCOC group met acceptance criteria

Reviewed By: Kevin A Lambert Date: 8/4/98

INORGANIC DATA ASSESSMENT SUMMARY FORM
(Data Verification/Validation Level 3—DV3)

Were matrix spikes performed at the concentrations specified by the EPA method? Yes ☑ No ☐

Samples affected: _____

Was matrix spike analysis performed on field or equipment blanks? Yes ☐ No ☑

If equipment or field blanks are the only aqueous samples, matrix spike analysis may be performed; however, matrix spike samples must be present for the other matrices.

Samples affected: _____

List below the % recoveries for analytes that did not meet the criteria:

Sample ID	Matrix	Preparation Date	Analyte	%R	Action	Samples Affected

Another ARCO group in batch met criteria

Check for transcription/calculation errors. Also check to ensure matrix spike concentrations are not affected by sample dilutions performed. If matrix spike concentrations are diluted below or close to IDL based on sample dilutions performed, use professional judgment in qualifying data. Ensure that the laboratory performed sample dilutions only when necessary as indicated by QA/QC requirements. Briefly summarize errors and associated actions when data quality might have been affected.

Reviewed By: Kevin A Lambert Date: 8/4/98

INORGANIC DATA ASSESSMENT SUMMARY FORM
(Data Verification/Validation Level 3—DV3)

NOTE: If preparation blank spikes are analyzed, evaluate recoveries. These recoveries can indicate whether excursions in matrix spike recovery are caused by sample matrix effects or poor digestion efficiencies and/or problems with matrix spike solution. For example, if matrix spike recovery for selenium is 0% and preparation blank spike recovery for selenium is 92%, this may indicate sample matrix effects.

9.0 FURNACE ATOMIC ABSORPTION ANALYSIS

Not Applicable

Were duplicate injections present for each sample, including required QC analyses (not required if MSA is done)? Yes ☐ No ☐

Samples affected: _____

_____

_____

Were postdigestion spikes analyzed for samples, including QC samples? Yes ☐ No ☐

Were postdigestion spikes analyzed at the required concentration? Yes ☐ No ☐

Samples affected: _____

_____

_____

Was a dilution analyzed for samples with postdigestion spike recovery <40%? Yes ☐ No ☐

Samples affected: _____

_____

_____

MSA Analysis (Method of Standard Additions)—MSA is required when serial dilutions are not with ± 10%. Was MSA required for any sample but not performed? Yes ☐ No ☐

Are MSA calculations outside the linear range of the calibration curve? Yes ☐ No ☐

Reviewed By: Kevin A Lambert Date: 8/4/98

INORGANIC DATA ASSESSMENT SUMMARY FORM
(Data Verification/Validation Level 3—DV3)

NOTE: Ensure the spiking concentrations used for MSA analysis were at 50–100% and 150% of sample concentration or absorbance.

Samples affected: _____

_____

_____

10.0 SERIAL DILUTION ANALYSIS

NOTE: Serial dilution analysis (ICP) is required only for initial concentrations equal to or greater than 10xIDL.

If applicable, was a serial dilution performed for:

Each 20 samples? Yes ☑ No ☐
Each matrix type? Yes ☑ No ☐

Note: Not run on this ARCOC Group. Another ARCOC group met acceptance criteria

Samples affected: _____

_____

List below results which did not meet criteria of %D <10% for analyte concentrations greater than 50xIDL before dilution:

Analysis Date	Sample ID	Analyte	IDL	%D	Action	Samples Affected

Met Criteria from another ARCOC group in batch

Check for calculation errors and negative interferences.

Reviewed By: Kevin A Lambert Date: 8/4/98

INORGANIC DATA ASSESSMENT SUMMARY FORM
(Data Verification/Validation Level 3—DV3)

11.0 SAMPLE RESULT VERIFICATION

11.1 Verification of Instrumental Parameters

Are instrument detection limits present and verified on a quarterly basis? Yes ☐ No ☐ Not Applicable

Are IDLs present for each analyte and each instrument used? Yes ☑ No ☐

Is the IDL greater than the required detection limits for any analyte? Yes ☐ No ☑
(If IDL > required detection limits, flag values less than 5xIDL.)

Samples affected: _____

_____

_____

Are ICP Interelement Correction Factors established and verified annually? Yes ☐ No ☐ Not Applicable

Are ICP Linear Ranges established and verified quarterly? Yes ☐ No ☐ Not Applicable

If no for any of the above, review problems and resolutions in narrative report. _____

_____

_____

11.2 Reporting Requirements

Were sample results reported down to the PQL? Yes ☑ No ☐

If no, indicate necessary corrections. _____

_____

Were sample results that were analyzed by ICP for Se, Tl, As, or Pb at least 5xIDL? Yes ☑ No ☐

Were sample weights, volumes, and dilutions taken into account when reporting sample results and detection limits? Yes ☑ No ☐

Reviewed By: Kevin A Lambert Date: 8/4/98

INORGANIC DATA ASSESSMENT SUMMARY FORM
(Data Verification/Validation Level 3—DV3)

If no for any of the above, sample results may be inaccurate. Note necessary changes and if errors are present, request resubmittal of laboratory package.

Were any sample results higher than the linear range of calibration curve and not subsequently reanalyzed at the appropriate dilution? Yes ☐ No ☑

Samples affected: _____

11.3 Sample Quantitation

Check a minimum of 10% of positive sample results for transcription/calculation errors. Summarize necessary corrections. If errors are large, request resubmittal of laboratory package.

Comments:

OK Look Good

Approved By:* _____

Date: _____

*Task/Project Leader is responsible for approval of data set.

Reviewed By: Kevin A Lambert Date: 8/4/98

Records Center Code: ER / 1295 / DAT

SMO ANALYTICAL DATA ROUTING FORM

Project Name: Non-ER Septic Systems
Case No./Service Order: 7223.230 / CF0686
SNL Task Leader: ROYBAL
Org/Mail Stop: 6135 / 1089
SMO Project Coordinator: SALMI
Sample Ship Date: 8/18/99

ARCOC	Lab	Lab ID	Preliminary Received	Final Received	EDD Req'd YES	EDD Req'd NO	EDD Rec'd YES	EDD Rec'd NO
602761	GEL	9908674		9/22/99	x		x	

	Date		
Correction Requested from Lab:		Correction Request #:	
Corrections Received:		Requester:	
Review Complete:	10-4-99	Signature:	W. Palencia
Priority Data Faxed:		Faxed To:	
Preliminary Notification:		Person Notified:	
Final Transmittal:	10-4-99	Transmitted To:	Roybal
		Transmitted By:	Palencia
Filed in Records Center/ER:		Filed By:	

Comments:

RECEIVED
OCT 12 1999

Received (Records Center) By:

SAMPLE FINDINGS SUMMARY

Site: Non-ER Spotzi

AR/COC: 602761 Data Classification: Organic

Sample/ Fraction No.	Analysis	DV Qualifiers	Comments
B6730-DF1-RN-PCB	EPA8082 PCB	UJ	low surrogate recovery

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

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

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

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

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

Reviewed by: [signature] Date: 10/29/99

SAMPLE FINDINGS SUMMARY

Site: Non-ER Septic

AR/COC: 602761 Data Classification: General Chemistry

Sample/ Fraction No.	Analysis	DV Qualifiers	Comments
B6730-D1-RN-CR6	hexavalent Cr. 18540-29-9	UJ2	exceeded hold time

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

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

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

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

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

Reviewed by: _____ Date: 10/29/99

DATA VALIDATION SUMMARY:

SITE/PROJECT: Non-ER Septic CASE #: 7223.230
ARCOC #: 602761
LABORATORY: CEL
LABORATORY REPORT #: 9908674

OF SAMPLES: 1 MATRIX: aqueous
LAB SAMPLE IDs: 9908674-21

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

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

REVIEWED BY: _____ DATE: 10/28/99

HOLDING TIME/PRESERVATION:

SITE/PROJECT: Non ER Spatic ARCOC #: 602761
LABORATORY: CEC LABORATORY REPORT #: 9908674

Sample ID	Analysis	Holding Time Criteria	Days Holding Time was Exceeded	Preservation Criteria	Preservation Deficiency	Comments
B6730-DFI-RN-Cr6	Cr 6+	24 hr.	1 day			UJ2

Comments:

REVIEWED BY: _____ DATE: 10/29/99

Memorandum

Date: 10/29/99

To: File

From: Marcia Hilchey

Subject: Organic Data Review and Validation
Site: Non-ER Septic Systems
AR/COC: 602761
Case: 7223.230
Laboratory: GEL
SDG: 9908674

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

Summary

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

Qualification was applied to a PCB sample result due to low surrogate recovery.

Application of the UJ qualifier to equipment blank results (see Surrogate section above) does not affect field sample data quality.

Holding Times

The samples were analyzed within the prescribed holding times.

Calibration

Initial calibration met acceptance criteria.

CCV analyses on 8/26/99 at 1845 (Aroclor-1232) and 1904 (Aroclor-1221) exceeded percent difference criteria. These CCVs were only associated with the equipment blank sample. The laboratory case narrative indicates that these failures indicate a positive bias. Since the sample results were non-detect, no results were qualified.

Blanks

No target analytes were detected above the reporting limit in the method blanks.

Surrogates

Surrogate recovery in sample B6730-DF1-RN-PCB failed to meet acceptance recovery - low. Non-detect results for this equipment blank were qualified UJ.

Note: The laboratory case narrative incorrectly states that surrogate recovery for sample B6922-DF1-BH2-10S (instead of B6730-DF1-RN-PCB) failed to meet acceptance criteria.

PCBs:
SW846 - Method 8082

SITE/PROJECT: Non-ER-Sonic ARCOC #: 602761
LABORATORY: CEL LABORATORY REPORT #: 9908674

n/9

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

Sample	SMC % REC	SMC RT		Sample	SMC % REC	SMC RT
-21	38.1					

Confirmation

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

Comments:

REVIEWED BY: _____ DATE: 10/29/99

Memorandum

Date: 10/29/99

To: File

From: Marcia Hilchey

Subject: General Chemistry Data Review and Validation
Site: Non-ER Septic Systems
AR/COC: 602761
Case: 7223.230
Laboratory: GEL
SDG: 9908674

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

Summary

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

No qualifications were applied to CN sample results.

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

Holding Times

The CN samples were analyzed within the prescribed holding time.

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

Calibration

Initial and continuing calibrations met QC acceptance criteria.

Blanks

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

Matrix Spike Analysis

The matrix spike sample analyses met QC acceptance criteria.

Laboratory Control/Laboratory Control Duplicate Samples

The LCS/LCSD samples met QC acceptance criteria.

Laboratory Replicate Analysis

The replicate sample analyses met QC acceptance criteria.

Other QC

Field duplicate sample analyses met RPD acceptance criteria.

No other specific issues were identified which affect data quality.

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

GENERAL CHEMISTRY:

SITE/PROJECT: Non-ER septic ARCOC #: 602761
LABORATORY: GEL LABORATORY REPORT #: 9908674
METHODS: Cn, Cr61

QC/ Analyte	CAS #	ICV	CCV	ICB	CCB	Method Blanks	LCS	LCSD	LCSD RPD	MS	MSD	MSD RPD	REP RPD	Serial Dilution	Field Dup RPD	Equip. Blks	Field Blks			
											n/a	n/a								
CN total		✓	✓	n/a	n/a	✓	✓	✓	✓	✓	n/a	n/a	✓	n/a	✓	✓	n/a			
Cr 6+		✓	✓	"	"	✓	✓	✓	✓	✓	"	"	~~200~~	"	✓	✓				

Comments:

REVIEWED BY: _____ DATE: 10/29/99

Contract Verification Review (CVR)

Project Leader ROYBAL Project Name NON-ER SEPTIC SYSTEMS Case No. 7223.230

AR/COC No. 602761 Analytical Lab GEL SDG No. 9908674

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

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

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

2.0 Analytical Laboratory Report

Line No.	Item	Complete? Yes	Complete? No	If no, explain	Resolved? Yes	Resolved? No
2.1	Data reviewed, signature	X				
2.2	Method reference number(s) complete and correct	X				
2.3	QC analysis and acceptance limits provided (MB, LCS, Replicate)	X				
2.4	Matrix spike/matrix spike duplicate data provided(if requested)	X				
2.5	Detection limits provided; PQL and MDL(or IDL), MDA and L_c	X				
2.6	QC batch numbers provided	X				
2.7	Dilution factors provided and all dilution levels reported	X				
2.8	Data reported in appropriate units and using correct significant figures	X				
2.9	Radiochemistry analysis uncertainty (2 sigma error) and tracer recovery (if applicable) reported	NA				
2.10	Narrative provided	X				
2.11	TAT met	X				
2.12	Hold times met	X		CHROMIUM 6 + EQUIPMENT BLANK RECEIVED OUT OF HOLDING TIME	X	
2.13	Contractual qualifiers provided	X				
2.14	All requested result and TIC (if requested) data provided	X				

Contract Verification Review (Continued)

3.0 Data Quality Evaluation

Item	Yes	No	If no, Sample ID No./Fraction(s) and Analysis
3.1 Are reporting units appropriate for the matrix and meet contract specified or project-specific requirements? Inorganics and metals reported as ppm (mg/liter or mg/Kg)? Tritium reported in picocuries per liter with percent moisture for soil samples? Units consistent between QC samples and sample data	X		
3.2 Quantitation limit met for all samples	X		
3.3 Accuracy a) Laboratory control samples accuracy reported and met for all samples	X		
b) Surrogate data reported and met for all organic samples analyzed by a gas chromatography technique		X	DECACHLOROBIPHENYL FAILED RECOVERY FOR PCB SAMPLE #9908674-21
c) Matrix spike recovery data reported and met	X		
3.4 Precision a) Replicate sample precision reported and met for all inorganic and radiochemistry samples	X		
b) Matrix spike duplicate RPD data reported and met for all organic samples	X		
3.5 Blank data a) Method or reagent blank data reported and met for all samples	X		
b) Sampling blank (e.g., field, trip, and equipment) data reported and met	X		
3.6 Contractual qualifiers provided: "J"- estimated quantity; "B"-analyte found in method blank above the MDL for organic or above the PQL for inorganic; "U"-analyte undetected (results are below the MDL, IDL, or MDA (radiochemical)); "H"-analysis done beyond the holding time	X		
3.7 Narrative addresses planchet flaming for gross alpha/beta	NA		
3.8 Narrative included, correct, and complete	X		
3.9 Second column confirmation data provided for methods 8330 (high explosives) and pesticides/PCBs	X		

Contract Verification Review (Continued)

4.0 Calibration and Validation Documentation

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

Contract Verification Review (Concluded)

5.0 Problem Resolution

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

Sample/Fraction No.	Analysis	Problems/Comments/Resolutions

Were deficiencies unresolved? ☐ Yes ☑ No

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

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

Reviewed by: W. Palencia Date: 10-4-99 Closed by: _____ Date: _____

Internal Lab

ANALYSIS REQUEST AND CHAIN OF CUSTODY

Page 1 of 3

AR/COC 602761

Batch No. | SAR/WR No. | SMO Use

Dept. No./Mail Stop:	6135/1147 A. Rolybal	[redacted]		Contract No.:	AJ-2480A
Project/Task Manager:	NON-ER Septic Sys/M Gardner			Case No.:	7223.230
Project Name:	Non-ER Septic Systems	Lab Contact:	E Kent 803 556 8171	SMO Authorization	
Record Center Code:	ER/1295/DAT	Lab Destination:	GEL	Bill To: Sandia National Laboratories	
Logbook Ref. No.:	N/A	SMO Contact/Phone:	D Salmi 844-3110	Supplier Services Dept.:	
Service Order No.	CF 0686	Send Report to SMO:	S Jensen 844-3184	P.O. Box 5800 MS 0154	
Location	Tech Area				
Building	Room	Reference LOV(available at SMO)			

Sample No.-Fraction	ER Sample ID or Sample Location Detail	Beginning Depth/ft.	ER Site No.	Date/Time Collected	Sample Matrix	Container Type	Container Volume	Preservative	Collection Method	Sample Type	Parameter & Method Requested	Lab Use Lab Sample ID
048278-002	B6922-DFI-BH1-5-S	5 ft	N/A	081699 1000	S	G	500 ml	4C	GR	SA	PCB, CN, Cr6+	[redacted]
048279-002	B6922-DFI-BH1-10-S	10 ft	N/A	081699 1085	S	G	500ml	4C	GR	SA	PCB, CN, Cr6+	
048280-002	B6922-DFI-BH2-5-S	5 ft	N/A	081699 11:10	S	G	500ml	4C	GR	SA	PCB, CN, Cr6+	
048281-002	B6922-DFI-BH2-10-S	10 ft	N/A	081699 11:30	S	G	500ml	4C	GR	SA	PCB, CN, Cr6+	
048282-002	B6631-DFI-BH1-6-S	6 ft	N/A	081699 1400	S	G	500ml	4C	GR	SA	PCB, CN, Cr6+	
048283-002	B6631-DFI-BH1-11-S	11 ft	N/A	081699 1440	S	G	500ml	4C	GR	SA	PCB, CN, Cr6+	
048284-002	B6631-DFI-BH2-6-S	6 ft	N/A	081699 1300	S	G	500ml	4C	GR	SA	PCB, CN, Cr6+	
048285-002	B6631-DFI-BH2-11-S	11 ft	N/A	081699 1335	S	G	500ml	4C	GR	DU SA	PCB, CN, Cr6+	
048286-002	B6631-DFI-BH2-6-DU	6 ft	N/A	081699 1300	S	G	500ml	4C	GR	DU SA	PCB, CN, Cr6+	
048287-002	B6730-DFI-BH1-45-S	4.5 ft	N/A	081699 1530	S	G	500ml	4C	GR	SA	PCB, CN, Cr6+	

RMMA ☐ Yes ☒ No Ref. No.

Sample Disposal ☐ Return to Client ☒ Disposal by lab

Turnaround Time ☒ Normal ☐ Rush

Required Report Date Vg 8/19/99

Special Instructions/QC Requirements

EDD ☒ Yes ☐ No

Raw Data Package ☒ Yes ☐ No

Send info to Mike Sanderse

VOC (EPA 8260)
CN (EPA 9010A)
PCB (EPA 8082)
Cr6+ (EPA 8270)

Please list as separate report.

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

1. Relinquished by		Org. 6118	Date 8-17-99	Time 1600	4. Relinquished by		Org.	Date	Time
1. Received by	GMO	Org. ITI	Date 8/17/99	Time 1600	4. Received by		Org.	Date	Time
2. Relinquished by		Org. ITI	Date 8/18/99	Time 11:30	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

Analysis Request And Chain Of Custody (Continuation)

2 MS

AR/COC- **602761**

Project Name: Non-ER Septic Systems Project/Task Manger: Mike Sanders Case No. 72223

Location: Tech Area / Building / Room

Reference LOV (available at SMO)

Sample No-Fraction	ER Sample ID or Sample Location detail	Depth in Ft	ER Site No.	Date/Time Collected	Sample Matrix	Container Type	Container Volume	Preservative	Sample Collection Methods	Sample Type	Parameter & Method Requested	Lab use: Lab Sample ID
048288-002	B6730-DFI-BH1-4.5-4.5	4.5 Ft	N/A	081699 1530	S	G	2x500ml	4C	GR	MSDS	PCB, CN, Cr6+	
048289-002	B6730-DFI-BH1-9.5-S	9.5 Ft	N/A	081699 1540	S	G	500ml	4C	GR	SA	PCB, CN, Cr6+	
048290-002	B6730-DFI-BH2-4.5-S	4.5 Ft	N/A	081699 1606	S	G	500ml	4C	GR	SA	PCB, CN, Cr6+	
048291-002	B6730-DFI-BH2-9.5-S	9.5 Ft	N/A	081699 1620	S	G	500ml	4C	GR	SA	PCB, CN, Cr6+	
048292-002	B6730-DFI-BH3-4.5-S	4.5 Ft	N/A	081799 0845	S	G	500 ml	4C	GR	SA	PCB CN, Cr6+	
048293-002	B6730-DFI-BH3-9.5-S	9.5 Ft	N/A	081799 0857	S	G	500 ml	4C	GR	SA	PCB CN Cr6+	
048294-002	B6730-DFI-BH4-4.5-S	4.5 Ft	N/A	081799 0905	S	G	500 ml	4C	GR	SA	PCB CN Cr6+	
048295-002	B6730-DFI-BH4-9.5-S	9.5 Ft	N/A	081799 0912	S	G	500ml	4C	GR	SA	PCB CN Cr6+	
048357-005	B6730-DFI-RN-CN	N/A	N/A	081799 0930	DIW	P	4x1L	NaOH	GR	EB	total CN	
048356-005	B6730-DFI-RN-Cr6	N/A	N/A	081799 0945	DIW	P	4x500ml	4C	GR	EB	Chrome 6+	
048358-005	B6730-DFI-RN-PCB	N/A	N/A	081799 0947	DIWAG	G	3x1L	4C	GR	EB	PCB	

048357

048361

ANNEX C
DSS Site 1007
Gore-Sorber™ Passive Soil-Vapor Survey
Analytical Results

GORE
Creative Technologies Worldwide

W. L. GORE & ASSOCIATES, INC.

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

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

June 6, 2002

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

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

Dear Mr. Sanders:

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

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

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

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

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

Jay W. Hodny, Ph.D.
Associate

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

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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® Screening Survey
Final Report

Non-ER Drain & Septic
Kirtland AFB, NM

June 6, 2002

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

W.L. Gore & Associates, Inc.

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

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

Analytical Data Reviewed by:
Jim E. Whetzel, Chemist

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

GORE-SORBER® Screening Survey
Final Report

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

SITE INFORMATION

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

FIELD PROCEDURES

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

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

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

GORE-SORBER® Screening Survey
Final Report

ANALYTICAL PROCEDURES

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

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

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

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

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

GORE-SORBER® Screening Survey
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DATA TABULATION

 # CONTOUR MAPS ENCLOSED: No contour maps were generated.

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

General Comments:

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

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

Project Specific Comments:

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

GORE-SORBER® Screening Survey
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KEY TO DATA TABLE
Non-ER Drain & Septic, Kirtland AFB, NM

UNITS

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

ANALYTES

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

BLANKS

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

APPENDIX A:

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

GORE-SORBER® Screening Survey Chain of Custody

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

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

Instructions: Customer must complete ALL shaded cells

Customer Name: SANDIA NATIONAL LABS	Site Name: NON-ER DRAIN+ SEPTIC
Address: ACCOUNTS PAYABLE MS0154	Site Address: ~~KIVL 2ND~~ AFB, NM KIRTLAND
P.O.BOX 5130	
ALBUQUERQUE NM 87185 U.S.A.	Project Manager: MIKE SANDERS
Phone: 505-284-3303	Customer Project No.:
FAX: 505-284-2614	Customer P.O. #: 28518 Quote #: 211946

Serial # of Modules Shipped			# of Modules for Installation 135 # of Trip Blanks 7		
# 179087 - # 179144	# 179087 - # 179134		Total Modules Shipped: 142 Pieces		
# 179150 - # 179233	# 179135 - # 179136		Total Modules Received: 142 Pieces		
# - #	# 179139 - #		Total Modules Installed: 135 Pieces		
# - #	# 179142 - # 179144		Serial # of Trip Blanks (*Client Decides*)	#	#
- #	# 179150 - # 179151		# 171227	#	#
- #	# - #		#	#	#
- #	# - #		#	#	#
- #	# - #		#	#	#
# - #	# - #		#	#	#
# - #	# - #		#	#	#
Prepared By: Aurora Vigil			#	#	#
Verified By: Mary Ann Naughi			#	#	#

Installation Performed By:	Installation Method(s) (*circle those that apply*):
Name (*please print*): GILBERT QUINTANA	Slide Hammer Hammer Drill Auger
Company/Affiliation: SNL/NM	Other: GEOPROBE
Installation Start Date and Time: 4/23/02 1081ST :	AM PM
Installation Complete Date and Time: 5/6/02 1094 01 :	AM PM
Retrieval Performed By:	Total Modules Retrieved: Pieces
Name (*please print*): GILBERT QUINTANA	Total Modules Lost in Field: Pieces
Company/Affiliation: SNL/NM	Total Unused Modules Returned: Pieces
Retrieval Start Date and Time: 5/8/02 / / :	AM PM
Retrieval Complete Date and Time: / / :	AM PM

Relinquished By	Date	Time	Received By: Mike Sander	Date	Time
Affiliation: W.L. Gore & Associates, Inc	3-4-02	17:00	Affiliation: Sandia / ER	3-6-02	
Relinquished By William J Kelly	Date	Time	Received By:	Date	Time
Affiliation: 6135	5-14-02	12:58	Affiliation:		
Relinquished By	Date	Time	Received By: Mary Ann Naughi	Date	Time
Affiliation			Affiliation: W.L. Gore & Associates, Inc.	5/7/02	14:00

GORE-SORBER® Screening Survey Chain of Custody

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

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

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

Instructions: Customer must complete ALL shaded cells

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

Serial # of Modules Shipped				# of Modules for Installation 135 # of Trip Blanks 7		
# 179087	# 179144	#179152	# 179187	Total Modules Shipped: 142 Pieces		
# 179150	# 179233	#179188	# 179226	Total Modules Received: 142 Pieces		
#	#	#	#	Total Modules Installed: 135 Pieces		
#	#	#	#	Serial # of Trip Blanks (*Client Decides*)	#	#
	#	#	#	#179228	#	#
	#	#	#	#179229	#	#
	#	#	#	#	#	#
	#	#	#	#	#	#
#	#	#	#	#	#	#
#	#	#	#	#	#	#
				#	#	#
				#	#	#

Prepared By: Suzanne Tift
Verified By: Mary Anne Waugh

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

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

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

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

Total Modules Retrieved: 74 Pieces
Total Modules Lost in Field: 4 Pieces
Total Unused Modules Returned: 63 Pieces

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

	Date	Time		Date	Time
Relinquished By: W.L. Gore & Associates, Inc.	3-4-02	12:00	Received By: Mike Sanders Affiliation: Sandia ; 6133	3-7-02	
Relinquished By: William J. Zelenka Affiliation: Sandia N.L. 6135	5-21-02	0935	Received By: Affiliation:	Date	Time
Relinquished By: Affiliation	Date	Time	Received By: Mary Anne Waugh Affiliation: W.L. Gore & Associates, Inc.	5-24-02	13:30

GORE-SORBER® Screening Survey Installation and Retrieval Log

3 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		
85.	179176	4/29/02, 1431							1035/6715-65-3	
86.	179177	1440								2
87.	179178	1445	5-14-02 0837							1
88.	179179	4/30/02, 0910	5-15-02 0842						1003/6915-	3
89.	179180	0919								2
90.	179181	0926								1
91.	179182	0937								4
92.	179183	0943								5
93.	179184	0947	5-15-02, 0917							6
94.	179185	1108	5-15-02, 1146						1007/6730-	4
95.	179186	1113								3
96.	179187	1119								2
97.	179188	1132								5
98.	179189	1140	5-15-02 1213							1
99.	179190	1238	5-15-02, 10:09						1029/6588N-	1
100.	179191	1250								-2
	179192	1300								-3
102.	179193	1313								-5
103.	179194	1318	5-15-02, 0832							-9
104.	179195	1445	5-15-02, 14:05						1006/6741-	
105.	179196	1450								
106.	179197	1455								4
107.	179198	1502								2
108.	179199	1508	5-15-02, 1143							1
109.	179200	1525	5-15-02, 1039						1087/6743-	2
110.	179201	1530								3
111.	179202	1534								4
112.	179203	1540	5-15-02, 1059							1
113.	179204	5/1/02, 0822	5-16-02, 0801						1008/6750	3
114.	179205	0835								4
115.	179206	0843								1
116.	179207	0851	5-16-02, 0832							2
117.	179208	0944	5-16-02, 0841						1004/6569-	2
118.	179209	0952								4
119.	179210	1000								3
120.	179211	1009								5
121.	179212	1016	5-16-02, 0907							1
122.	179213	1110	5-16-02, 1105						1095/9938-	3
123.	179214	1116								2
124.	179215	1122	5-16-02, 11:21							1
125.	179216	1205	5-16-02 - 0931						1094/6582-	2
126.	179217	1218	5-16-02 - 0935							1

1007 SS

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

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

DSS 1007 A-1 A

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

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

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

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

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

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

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

ANNEX D
DSS Site 1007
Risk Assessment

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DSS SITE 1007: RISK ASSESSMENT REPORT

I. Site Description and History

Drain and Septic Systems (DSS) Site 1007, the Former Building 6730 Septic System, at Sandia National Laboratories/New Mexico (SNL/NM), is located in Technical Area (TA)-III on federally owned land controlled by Kirtland Air Force Base (KAFB) and permitted to the U.S. Department of Energy (DOE). The septic system consisted of a septic tank connected to a drainfield consisting of eight 30-foot-long drain lines. Available information indicates that Building 6730 was constructed in 1964 (SNL/NM March 2003), and it is assumed that the septic system was also constructed at that time. By 1993, the septic system discharges were routed to the City of Albuquerque sanitary sewer system (Jones July 1993). The old septic system line was disconnected and capped, and the system was abandoned in-place concurrent with this change (Romero September 2003). Building 6730 was demolished in December 2002.

Environmental concern about DSS Site 1007 is based upon the potential for the release of constituents of concern (COCs) in effluent discharged to the environment via the septic system at this site. Because operational records are not available, the investigation of the site was planned to be consistent with other DSS site investigations and to sample for the COCs most commonly found at similar facilities.

The ground surface in the vicinity of the site is flat or very slightly sloping to the west. The closest major drainage lies south of the site and terminates in the playa just west of KAFB. No springs or 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). Surface-water runoff in the vicinity of the site is minor because the surface slope is flat to gently inclined 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 1007 is unpaved with some native vegetation, and no storm sewers are used to direct surface water away from the site.

DSS Site 1007 lies at an average elevation of approximately 5,355 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 465 feet below ground surface (bgs). Groundwater flow is generally to the west in this area (SNL/NM March 2002). The nearest groundwater monitoring wells are approximately 1,000 feet southeast of the site at the Mixed Waste Landfill in TA-III. The nearest production wells are north of the site and include KAFB-4 and KAFB-11, which are approximately 2.9 and 3.7 miles away, respectively.

II. Data Quality Objectives

The Data Quality Objectives (DQOs) presented in the "Sampling and Analysis Plan [SAP] for Characterizing and Assessing Potential Releases to the Environment From Septic and Other Miscellaneous Drain Systems at Sandia National Laboratories/New Mexico" (SNL/NM October 1999) and "Field Implementation Plan [FIP], Characterization of Non-Environmental Restoration

Drain and Septic Systems" (SNL/NM November 2001) identified the site-specific sample locations, sample depths, sampling procedures, and analytical requirements for this and many other DSS sites. The DQOs outlined the quality assurance (QA)/quality control (QC) requirements necessary for producing defensible analytical data suitable for risk-assessment purposes. The baseline sampling conducted at this site was designed to:

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

Table 1 summarizes the rationale for determining the sampling locations at this site. The source of potential COCs at DSS Site 1007 was effluent discharged to the environment from the drainfield at this site.

Table 1
Summary of Sampling Performed to Meet DQOs

DSS Site 1007 Sampling Area	Potential COC Source	Number of Sampling Locations	Sample Density (samples/acre)	Sampling Location Rationale
Soil beneath the septic system drainfield	Effluent discharged to the environment from the drainfield	4	NA	Evaluate potential COC releases to the environment from effluent discharged from the drainfield

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

The baseline soil samples were collected with a Geoprobe™ in four locations across DSS Site 1007 from two 3-foot-long sampling intervals at each boring location. Drainfield sampling intervals started at 4.5 and 9.5 feet bgs in each of the four drainfield borings. The soil samples were collected in accordance with the procedures described in the SAP (SNL/NM October 1999) and FIP (SNL/NM November 2001). Table 2 summarizes the types of confirmatory and QA/QC samples collected at the site and the laboratories that performed the analyses.

The DSS Site 1007 baseline soil samples were analyzed for volatile organic compounds (VOCs), semivolatile organic compounds (SVOCs), high explosive (HE) compounds, polychlorinated biphenyls (PCBs), Resource Conservation and Recovery Act (RCRA) metals, hexavalent chromium, cyanide, radionuclides, and gross alpha/beta activity. The samples were analyzed by an off-site laboratory (General Engineering Laboratories, Inc.) and the on-site SNL/NM Environmental Restoration (ER) Chemistry Laboratory and Radiation Protection Sample Diagnostics (RPSD) Laboratory. Table 3 summarizes the analytical methods and the

Table 2
Number of Confirmatory Soil and QA/QC Samples Collected from DSS Site 1007

Sample Type	VOCs	SVOCs	PCBs	HE	RCRA Metals	Hexavalent Chromium	Cyanide	Gamma Spectroscopy Radionuclides	Gross Alpha/Beta
Confirmatory	8	8	8	8	8	8	8	8	8
Duplicates	0	0	0	0	0	0	0	0	0
EBs and TBs (VOCs only)	1	0	1	0	0	1	1	0	0
Total Samples	9	8	9	8	8	9	9	8	8
Analytical Laboratory	ERCL	GEL	GEL	ERCL	ERCL	GEL	GEL	RPSD	GEL

DSS = Drain and Septic Systems.
EB = Equipment blank.
ERCL = Environmental Restoration Chemistry Laboratory.
GEL = General Engineering Laboratories, Inc.
HE = High explosive(s).
PCB = Polychlorinated biphenyl.
QA = Quality assurance.
QC = Quality control.
RCRA = Resource Conservation and Recovery Act.
RPSD = Radiation Protection Sample Diagnostics Laboratory.
SVOC = Semivolatile organic compound.
TB = Trip blank.
VOC = Volatile organic compound.

Table 3
Summary of Data Quality Requirements for DSS Site 1007

Analytical Method[a]	Data Quality Level	GEL	ERCL	RPSD
VOCs EPA Method 8260	Defensible	None	8	None
SVOCs EPA Method 8270	Defensible	None	8	None
PCBs EPA Method 8082	Defensible	8	None	None
HE Compounds EPA Method 8095	Defensible	None	8	None
RCRA metals EPA Method 6000/7000	Defensible	None	8	None
Hexavalent Chromium EPA Method 7196A	Defensible	8	None	None
Total Cyanide EPA Method 9012A	Defensible	8	None	None
Gamma Spectroscopy Radionuclides EPA Method 901.1	Defensible	None	None	8
Gross Alpha/Beta Activity EPA Method 900.0	Defensible	8	None	None

Note: The number of samples does not include QA/QC samples such as duplicates, trip blanks, and equipment blanks.
[a]EPA November 1986.
DSS = Drain and Septic Systems.
EPA = U.S. Environmental Protection Agency.
ERCL = Environmental Restoration Chemistry Laboratory.
GEL = General Engineering Laboratories, Inc.
HE = High explosive(s).
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.

data quality requirements from the SAP (SNL/NM October 1999) and FIP (SNL/NM November 2001).

The QA/QC samples were collected during the baseline sampling effort according to the ER Project Quality Assurance Project Plan. The QA/QC samples consisted of one trip blank (for VOCs only), and one set of equipment blanks (EBs) for PCBs, hexavalent chromium, and cyanide. Apart from the hexavalent chromium EB sample being analyzed outside holding time; no significant QA/QC problems were identified in the QA/QC samples.

All of the baseline soil sample results were verified/validated by SNL/NM according to "Verification and Validation of Chemical and Radiochemical Data," Technical Operating Procedure (TOP) 94-03, Rev. 0 (SNL/NM July 1994) or SNL/NM ER Project "Data Validation

Procedure for Chemical and Radiochemical Data," Administrative Operating Procedure (AOP) 00-03 (SNL/NM December 1999). The data validation reports are presented in the associated DSS Site 1007 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 1007 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 1007, which is presented in Section 4.2 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 1007 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 potential degradation products at DSS Site 1007.

III.3 Rate of Contaminant Migration

The septic system at DSS Site 1007 was deactivated in the early 1990s when Building 6730 was connected to an extension of the City of Albuquerque sanitary sewer system. The building was demolished in December 2002. The migration rate of COCs that may have been introduced into the subsurface via the septic system at this site was therefore dependent upon the volume of aqueous effluent discharged to the environment from this system when it was operational. Any migration of COCs from this site after use of the septic system was discontinued has been dependent predominantly on 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 1007.

III.4 Extent of Contamination

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

The baseline soil samples were collected at sampling depths starting at 4.5 and 9.5 feet bgs in the drainfield area. Sampling intervals started at the depths at which effluent discharged from the drainfield drain lines would have entered the subsurface environment at the site. This sampling procedure was required by New Mexico Environment Department (NMED) regulators, and has been used at numerous DSS-type sites at SNL/NM. The baseline soil samples are considered to be representative of the soil potentially contaminated with the COCs at this site and are sufficient to determine the vertical extent, if any, of COCs.

IV. Comparison of COCs to Background Screening Levels

Site history and characterization activities are used to identify potential COCs. The DSS Site 1007 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 that were evaluated in this risk assessment included all detected organic, inorganic, and radiological COCs for which samples were analyzed. When the detection limit of an organic compound was too high (i.e., could possibly cause an adverse effect to human health or the environment), the compound was retained. Nondetected organic compounds not included in this assessment were determined to have detection limits low enough to ensure protection of human health and the environment. In order to provide conservatism in this risk assessment, the calculation used only the maximum concentration value of each COC found for the entire site. The SNL/NM maximum background concentration (Dinwiddie September 1997) was selected to provide the background screen listed in Tables 4 through 7.

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 the risk assessment consist of both inorganic and organic compounds; however, only inorganic compounds are included in the risk assessment as no organic compounds were detected.

Tables 4 and 5 list the nonradiological COCs for the human health and the ecological risk assessments at DSS Site 1007, respectively. Tables 6 and 7 list radiological COCs for the human health and ecological risk assessments, respectively. All tables show the associated SNL/NM maximum background concentration values (Dinwiddie September 1997). Section VI.4 discusses the results presented in Tables 4 and 6; Sections VII.2 and VII.3 discuss the results presented in Tables 5 and 7.

Table 4
Nonradiological COCs for Human Health Risk Assessment at DSS Site 1007 with Comparison to the Associated SNL/NM Background Screening Value, BCF, and Log K_{ow}

COC	Maximum Concentration (All Samples) (mg/kg)	SNL/NM Background Concentration (mg/kg)[a]	Is Maximum COC Concentration Less Than or Equal to the Applicable SNL/NM Background Screening Value?	BCF (maximum aquatic)	Log K_{ow} (for organic COCs)	Bioaccumulator?[b] (BCF>40, Log K_{ow}>4)
Inorganic						
Arsenic	4.7	4.4	**No**	44[c]	–	**Yes**
Barium	160 J	214	Yes	170[d]	–	**Yes**
Cadmium	0.71	0.9	Yes	64[c]	–	**Yes**
Chromium, total	12	15.9	Yes	16[c]	–	No
Chromium VI	0.139 J	1	Yes	16[c]	–	No
Cyanide	0.175 J	NC	**Unknown**	NC	–	**Unknown**
Lead	7.3	11.8	Yes	49[c]	–	**Yes**
Mercury	0.0225[e]	<0.1	**Unknown**	5,500[c]	–	**Yes**
Selenium	0.64 J	<1	**Unknown**	800[f]	–	**Yes**
Silver	0.0225[e]	<1	**Unknown**	0.5[c]	–	No
Organic						
PCBs, total	0.00418[f]	NA	**NA**	31,200[g]	6.72[g]	**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 used is one-half of the highest detection limit.
[f]Value listed is the greater of either the maximum detection or one-half of the highest detection limit.
[g]Callahan et al. 1979.

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

Table 5
Nonradiological COCs for Ecological Risk Assessment at DSS Site 1007 with Comparison to the Associated SNL/NM Background Screening Value, BCF, and Log K_{ow}

COC	Maximum Concentration (Samples ≤ 5 ft bgs) (mg/kg)	SNL/NM Background Concentration (mg/kg)[a]	Is Maximum COC Concentration Less Than or Equal to the Applicable SNL/NM Background Screening Value?	BCF (Maximum Aquatic)	Log K_{ow} (for Organic COCs)	Bioaccumulator?[b] (BCF>40, Log K_{ow}>4)
Inorganic						
Arsenic	4.7	4.4	**No**	44[c]	–	**Yes**
Barium	160 J	214	Yes	170[d]	–	**Yes**
Cadmium	0.0215[e]	0.9	Yes	64[c]	–	**Yes**
Chromium, total	8.7	15.9	Yes	16[c]	–	No
Chromium VI	0.139 J	1	Yes	16[c]	–	No
Cyanide	0.175 J	NC	**Unknown**	NC	–	No
Lead	6.5	11.8	Yes	49[c]	–	**Unknown**
Mercury	0.0215[e]	<0.1	**Unknown**	5,500[c]	–	**Yes**
Selenium	0.64 J	<1	**Unknown**	800[f]	–	**Yes**
Silver	0.0215[e]	<1	**Unknown**	0.5[c]	–	No
Organic						
PCBs, total	0.00418[f]	NA	**NA**	31,200[g]	6.72[g]	**Yes**

Note: **Bold** indicates the COCs that exceed the background screening values and/or are bioaccumulators.
[a]Dinwiddie 1997, Southwest Area Supergroup.
[b]NMED March 1998.
[c]Yanicak March 1997.
[d]Neumann 1976.
[e]Parameter was not detected. Concentration is one-half the detection limit.
[f]Value listed is the greater of either the maximum detection or one-half of the highest detection limit.
[g]Callahan et al. 1979.

BCF = Bioconcentration factor.
bgs = Below ground surface.
COC = Constituent of concern.
DSS = Drain and Septic Systems.
ft = Foot (feet).
J = Estimated concentration.
K_{ow} = Octanol-water partition coefficient.
Log = Logarithm (base 10).
mg/kg = Milligram(s) per kilogram.
NA = Not applicable.
NC = Not calculated.
NMED = New Mexico Environment Department.
PCB = Polychlorinated biphenyls.
SNL/NM = Sandia National Laboratories/New Mexico.
– = Information not available.

Table 6
Radiological COCs for Human Health Risk Assessment at DSS Site 1007 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 (0.0361)	0.079	Yes	3,000[d]	**Yes**
Th-232	0.673	1.01	Yes	3,000[d]	**Yes**
U-235	**ND (0.247)**	0.16	**No**	900[d]	**Yes**
U-238	**ND (3.33)**	1.4	**No**	900[d]	**Yes**

Note: **Bold** indicates COCs that exceed background screening values and/or are bioaccumulators.
[a]Value listed is the greater of either the maximum detection or the highest MDA.
[b]Dinwiddie September 1997, Southwest Area Supergroup.
[c]NMED March 1998.
[d]Baker and Soldat 1992.
BCF = Bioconcentration factor.
COC = Constituent of concern.
DSS = Drain and Septic Systems.
MDA = Minimum detectable activity.
ND ( ) = Not detected above the MDA, shown in parentheses.
NMED = New Mexico Environment Department.
pCi/g = Picocurie(s) per gram.
SNL/NM = Sandia National Laboratories/New Mexico.

Table 7
Radiological COCs for Ecological Risk Assessment at DSS Site 1007 with Comparison to the Associated SNL/NM Background Screening Value and BCF

COC	Maximum Activity (Samples ≤ 5 ft bgs) (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 (0.0326)	0.079	Yes	3,000[d]	**Yes**
Th-232	0.673	1.01	Yes	3,000[d]	**Yes**
U-235	**ND (0.237)**	0.16	**No**	900[d]	**Yes**
U-238	**ND (3.30)**	1.4	**No**	900[d]	**Yes**

[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.
bgs = Below ground surface.
ft = Foot (feet).
COC = Constituent of concern.
DSS = Drain and Septic Systems.
MDA = Minimum detectable activity.
ND ( ) = Not detected, above the MDA, shown in parentheses.
NMED = New Mexico Environment Department.
pCi/g = Picocurie(s) per gram.
SNL/NM = Sandia National Laboratories/New Mexico.

V. Fate and Transport

The primary releases of COCs at DSS Site 1007 were to the subsurface soil resulting from the discharge of effluents from the Former Building 6730 Septic System. Wind, water, and biota are natural mechanism of COC transport from the primary release point; however, because the discharge was to subsurface soil, none of these mechanisms are considered to be of potential significance as a transport mechanism at this site. Because the septic system is no longer active, additional water infiltration is not expected. Infiltration of precipitation is essentially nonexistent at DSS Site 1007, as virtually all of the moisture either drains away from the site or evaporates. Because groundwater at this site is approximately 465 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 1007 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 COCs (U-235 and U-238), 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 1007 are limited to PCBs. Organic constituents 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.

Table 8 summarizes the fate and transport processes that can occur at DSS Site 1007. COCs at this site include organic analytes as well as radiological and nonradiological inorganic 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 COCs is insignificant because of their long half-lives.

Table 8
Summary of Fate and Transport at DSS Site 1007

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 1007. 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 1007 has been designated with a future land-use scenario of industrial (DOE et al. September 1995) (see Appendix 1 for default exposure pathways and parameters). However, the residential land-use scenario is also considered in the pathway analysis. Because of the location and characteristics of the potential contaminants, the primary pathway for human exposure is considered to be soil ingestion for the nonradiological COCs and direct gamma exposure for the radiological COCs. The inhalation pathway for both nonradiological and radiological COCs is included because the potential exists to inhale dust. Soil ingestion is included for the radiological COCs as well. The dermal pathway is included for the nonradiological COCs because of the potential for the receptor to be exposed to contaminated

soil. No water pathways to the groundwater are considered; depth to groundwater at DSS Site 1007 is approximately 465 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 1007.

Pathway Identification

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

VI.4 Step 3. Background Screening Procedure

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

VI.4.1 Methodology

Maximum concentrations of nonradiological COCs were compared to the approved SNL/NM maximum screening levels for this area. The SNL/NM maximum background concentration was selected to provide the background screen in Table 4 and used to calculate risk attributable to background in Section VI.6.2. Only the COCs that were detected above the corresponding SNL/NM maximum background screening levels or did not have either a quantifiable or calculated background screening level were considered in further risk assessment analyses.

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

VI.4.2 Results

Tables 4 and 6 show DSS Site 1007 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, one constituent was measured at a concentration greater than its background screening value. Four constituents do not have quantified background screening concentrations; therefore, it is unknown whether these COCs exceed background values. One nonradiological COC was an organic compound that does not have a corresponding background screening value.

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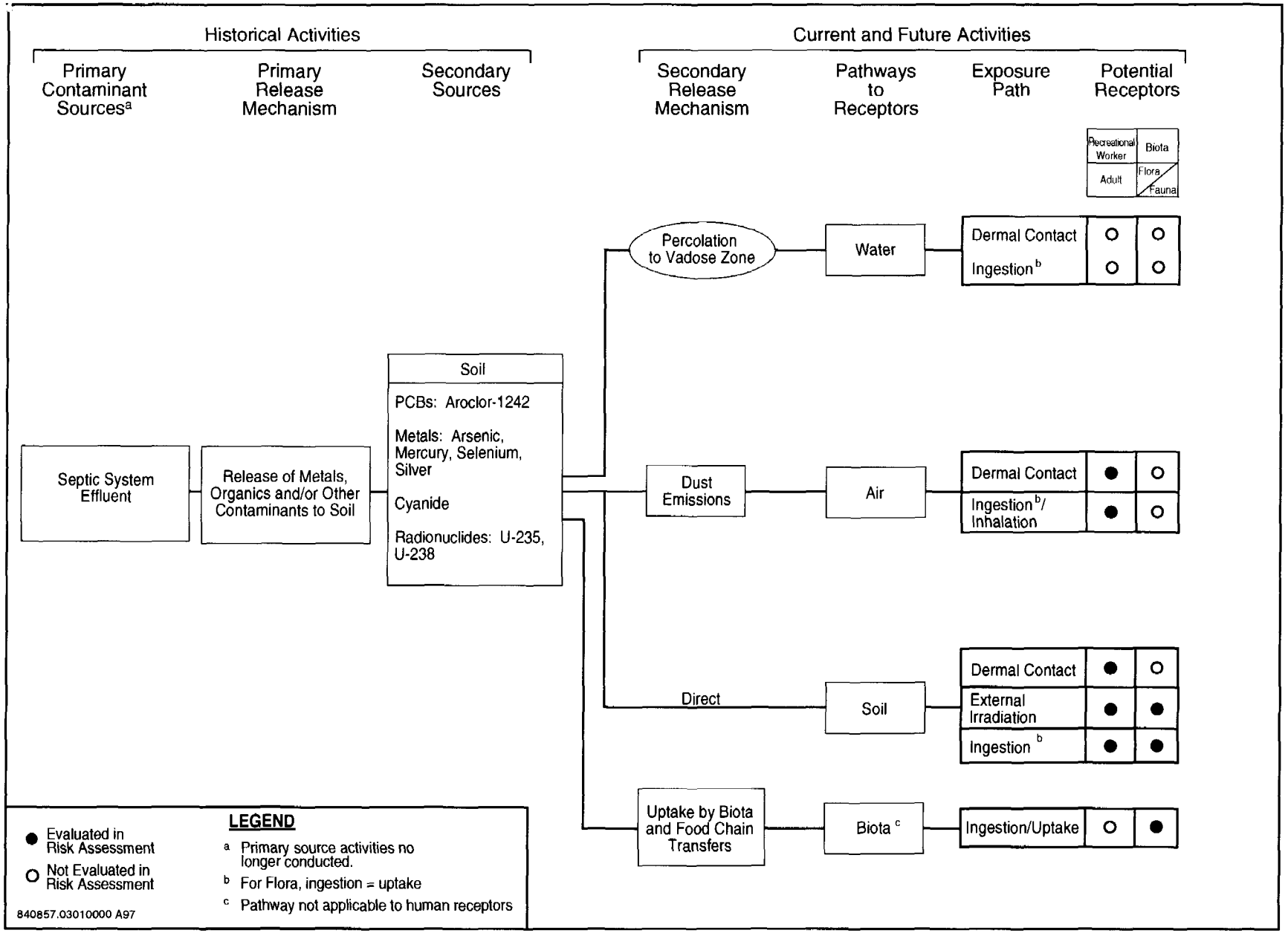

Figure 1

Conceptual Site Model Flow Diagram for DSS Site 1007, Former Building 6730 Septic System

The maximum concentration value used for total PCBs is the greater of either the maximum detection or one-half of the highest detection limit, 0.00418 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 used 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, two constituents (U-235 and U-238) had MDA values greater than the background screening levels. The greater of either the maximum detection or the highest MDA is conservatively used in the risk assessment.

VI.5 Step 4. Identification of Toxicological Parameters

Tables 9 and 10 list the COCs retained in the risk assessment and provides the values for the available toxicological information. The toxicological values for the nonradiological COCs presented in Table 9 were obtained from the Integrated Risk Information System (IRIS) (EPA 2003), the Health Effects Assessment Summary Tables (HEAST) (EPA 1997a), and the Technical Background Document for Development of Soil Screening Levels (NMED December 2000). Dose conversion factors (DCFs) used in determining the excess TEDE values for radiological COCs for the individual pathways are the default values provided in the RESRAD computer code (Yu et al. 1993a) as developed in the following documents:

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

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

- 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. The incremental TEDE and incremental estimated cancer risk are provided for the background-adjusted radiological COCs for both industrial and residential land-use scenarios.

Table 9
Toxicological Parameter Values for DSS Site 1007 Nonradiological COCs

COC	RfD_o (mg/kg-d)	Confidence[a]	RfD_{inh} (mg/kg-d)	Confidence[a]	SF_o $(mg/kg\text{-}day)^{-1}$	SF_{inh} $(mg/kg\text{-}day)^{-1}$	Cancer Class[b]	ABS
Arsenic	3E-4[c]	M	–	–	1.5E+0[c]	1.5E+1[c]	A	0.03[d]
Cyanide	2E-2[c]	M	–	–	–	–	D	0.1[d]
Mercury	3E-4[e]	–	8.6E-5[c]	M	–	–	D	0.01[d]
Selenium	5E-3[c]	H	–	–	–	–	D	0.01[d]
Silver	5E-3[c]	L	–	–	–	–	D	0.01[d]

[a]Confidence associated with IRIS (EPA 2003) database values. Confidence: L = low, M = medium, H = high.
[b]EPA weight-of-evidence classification system for carcinogenicity (EPA 1989) taken from IRIS (EPA 2003):
A = Human carcinogen.
D = Not classifiable as to human carcinogenicity.
[c]Toxicological parameter values from IRIS electronic database (EPA 2003).
[d]Toxicological parameter values from NMED December 2000.
[e]Toxicological parameter values from HEAST (EPA 1997a).

ABS = Gastrointestinal absorption coefficient.
COC = Constituent of concern.
DSS = Drain and Septic Systems.
EPA = U.S. Environmental Protection Agency.
HEAST = Health Effects Assessment Summary Tables.
IRIS = Integrated Risk Information System.
mg/kg-d = Milligram(s) per kilogram day.
$mg/kg\text{-}day^{-1}$ = Per milligram per kilogram day.
NMED = New Mexico Environmental 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 10
Toxicological Parameter Values for DSS Site 1007 Radiological 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
U-238	6.20E-11	1.20E-08	6.60E-08	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.

VI.6.1 Exposure Assessment

Appendix 1 provides the equations and parameter input values used to calculate intake values and subsequent HI and excess cancer risk values for the individual exposure pathways. The appendix shows parameters for both industrial and residential land-use scenarios. The equations for nonradiological COCs are based upon the Risk Assessment Guidance for Superfund (RAGS) (EPA 1989). Parameters are based upon information from the RAGS (EPA 1989), the Technical Background Document for Development of Soil Screening Levels (NMED December 2000), as well as other EPA and NMED guidance documents. Parameters reflect the reasonable maximum exposure (RME) approach advocated by the RAGS (EPA 1989). For radiological COCs, the coded equations provided in RESRAD computer code are used to estimate the incremental TEDE and cancer risk for individual exposure pathways. Further discussion of this process is provided in the "Manual for Implementing Residual Radioactive Material Guidelines Using RESRAD" (Yu et al. 1993a). Although the designated land-use scenario for this site is industrial, risk and TEDE values for a residential land-use scenario are also presented.

VI.6.2 Risk Characterization

Table 11 shows an HI of 0.02 for the DSS Site 1007 nonradiological COCs and an estimated excess cancer risk of 3E-6 for the designated industrial land-use scenario. The numbers presented include exposure from soil ingestion, dermal contact, and dust and volatile inhalation for nonradiological COCs. Table 12 shows an HI of 0.02 and an estimated excess cancer risk of 3E-6 for the DSS Site 1007 associated background constituents under the designated industrial land-use scenario.

Table 11
Risk Assessment Values for DSS Site 1007 Nonradiological COCs

COC	Maximum Concentration (All Samples) (mg/kg)	Industrial Land-Use Scenario[a]		Residential Land-Use Scenario[a]	
		Hazard Index	Cancer Risk	Hazard Index	Cancer Risk
Arsenic	4.7	0.02	3E-6	0.22	1E-5
Cyanide	0.175 J	0.00	–	0.00	–
Mercury	0.0225[b]	0.00	–	0.00	–
Selenium	0.64 J	0.00	–	0.00	–
Silver	0.0225[b]	0.00	–	0.00	–
Total		**0.02**	**3E-6**	**0.22**	**1E-5**

[a]EPA 1989.
[b]Maximum concentration was one-half of the detection limit.
COC = Constituent of concern.
DSS = Drain and Septic Systems.
EPA = U.S. Environmental Protection Agency.
J = Concentration was qualified as an estimated value.
mg/kg = Milligram(s) per kilogram.
– = Information not available.

Table 12
Risk Assessment Values for DSS Site 1007 Nonradiological Background Constituents

COC	Background Concentration[a] (mg/kg)	Industrial Land-Use Scenario[b]		Residential Land-Use Scenario[b]	
		Hazard Index	Cancer Risk	Hazard Index	Cancer Risk
Arsenic	4.4	0.02	3E-6	0.20	1E-5
Cyanide	NC	–	–	–	–
Mercury	<0.1	–	–	–	–
Selenium	<1	–	–	–	–
Silver	<1	–	–	–	–
Total		**0.02**	**3E-6**	**0.20**	**1E-5**

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

For the radiological COCs, contribution from the direct gamma exposure pathway is included. For the industrial land-use scenario, a TEDE is calculated for an individual on the site, which results in an incremental TEDE of 6.4E-2 millirem (mrem)/year (yr). In accordance with EPA guidance found in Office of Solid Waste and Emergency Response (OSWER) Directive No. 9200.4-18 (EPA 1997b), an incremental TEDE of 15 mrem/yr is used for the probable land-use scenario (industrial in this case); the calculated dose value for DSS Site 1007 for the industrial land use is well below this guideline. The estimated excess cancer risk is 6.3E-7.

The HI is 0.22 with an estimated excess cancer risk of 1E-5 for the nonradiological COCs under the residential land-use scenario (Table 11). The numbers in the table include exposure from soil ingestion, dermal contact, and dust inhalation. Although the EPA (1991) guidelines generally recommend 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. Based upon the nature of local soil, other exposure pathways are not evaluated (see Appendix 1). Table 12 shows an HI of 0.20 and an estimated excess cancer risk of 1E-5 for the associated background constituents at DSS Site 1007 under the residential land-use scenario.

For the radiological COCs, the incremental TEDE for the residential land-use scenario is 0.18 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 1007 for the residential land-use scenario is well below this guideline. Consequently, DSS Site 1007 is eligible for unrestricted radiological release as the residential land-use scenario resulted in an incremental TEDE of less than 75 mrem/yr to the on-site receptor. The estimated excess cancer risk is 2.1E-6. The excess cancer risk from the nonradiological and radiological COCs should be summed to provide risk estimates for persons exposed to both types of carcinogenic contaminants, as noted in OSWER Directive No. 9200.4-18, "Establishment of Cleanup Levels for CERCLA [Comprehensive Environmental Response, Compensation, and Liability Act] Sites with Radioactive Contamination" (EPA 1997b). This summation is tabulated in Section VI.9, "Summary."

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

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

For the nonradiological COCs under the industrial land-use scenario, the HI is 0.02 (lower than the numerical guideline of 1 suggested in the RAGS [EPA 1989]). The excess cancer risk is 3E-6. NMED guidance states that cumulative excess lifetime cancer risk must be less than 1E-5 (Bearzi January 2001); thus the excess cancer risk for this site is below the suggested acceptable risk value. This assessment also determines risks by evaluating background concentrations of the potential nonradiological COCs for both the industrial and residential land-use scenarios. The incremental risk is determined by subtracting risk associated with background from potential COC risk. These numbers are not rounded before the difference is determined and therefore may appear to be inconsistent with numbers presented in tables and within the text. For conservatism, the background constituents that do not have quantified background concentrations are assumed to have a hazard quotient (HQ) of 0.00. The incremental HI is 0.00 and the estimated incremental cancer risk is 1.89E-7 for the industrial

land-use scenario. These incremental risk calculations indicate insignificant risk to human health from nonradiological COCs considering an industrial land-use scenario.

For the radiological COCs under the industrial land-use scenario, the incremental TEDE is 6.4E-2 mrem/yr, which is significantly lower than EPA's numerical guideline of 15 mrem/yr (EPA 1997b). The incremental estimated excess cancer risk is 6.3E-7.

For the nonradiological COCs under the residential land-use scenario, the calculated HI is 0.22, which is below the numerical guidance. The excess cancer risk is 1E-5. NMED guidance states that cumulative excess lifetime cancer risk must be less than 1E-5 (Bearzi January 2001); thus the excess cancer risk for this site is slightly above the suggested acceptable risk value. The incremental HI is 0.02 and the estimated incremental cancer risk is 7.72E-7 for the residential land-use scenario. These incremental risk calculations indicate insignificant risk to human health from nonradiological COCs under a residential land-use scenario.

The incremental TEDE for a residential land-use scenario from the radiological components is 0.18 mrem/yr, which is significantly lower than the numerical guideline of 75 mrem/yr suggested in the SNL/NM "RESRAD Input Parameter Assumptions and Justification" (SNL/NM February 1998). The estimated excess cancer risk is 2.1E-6.

VI.8 Step 7. Uncertainty Discussion

The determination of the nature, rate, and extent of contamination at DSS Site 1007 is based upon an initial conceptual model that was validated with baseline sampling conducted at the site. The baseline sampling was implemented in accordance with the SAP (SNL/NM October 1999) and FIP (SNL/NM November 2001). The DQOs contained in these two documents are appropriate for use in risk assessments. The data from soil samples collected at effluent release points are representative of potential COC releases to the site. The analytical requirements and results satisfy the DQOs, and data quality is verified/validated in accordance with SNL/NM procedures. Therefore, there is no certainty associated with the data quality for this risk assessment.

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

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

Table 9 shows the uncertainties (confidence levels) in nonradiological toxicological parameter values. There is a mixture of estimated values and values from the IRIS (EPA 2003), HEAST (EPA 1997a), and the Technical Background Document for Development of Soil Screening Levels (NMED December 2000). Where values are not provided, information is not available from the HEAST (EPA 1997a), IRIS (EPA 2003), Technical Background Document for Development of Soil Screening Levels (NMED December 2000), the Risk Assessment Information System (ORNL 2003) or the EPA regions (EPA 2002a, EPA 2002b, EPA 2002c).

Because of the conservative nature of the RME approach, uncertainties in toxicological values are not expected to change the conclusion from the risk assessment analysis.

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

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

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

VI.9 Summary

DSS Site 1007 contains identified COCs consisting of some inorganic 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 inhalation for chemical COCs and soil ingestion, dust inhalation, and direct gamma exposure for radionuclides. The same exposure pathways are applied to the residential land-use scenario.

Using conservative assumptions and an RME approach to risk assessment, calculations for nonradiological COCs show that for the industrial land-use scenario the HI (0.02) is significantly lower than the accepted numerical guidance from the EPA. The estimated excess cancer risk is 3E-6. Thus, excess cancer risk is also below the acceptable risk value provided by the NMED for an industrial land-use scenario (Bearzi January 2001). The incremental HI is 0.00, and the incremental excess cancer risk is 1.89E-7 for the industrial land-use scenario. Incremental risk calculations indicate insignificant risk to human health for the industrial land-use scenario.

Using conservative assumptions and an RME approach to risk assessment, calculations for nonradiological COCs show that for the residential land-use scenario the HI (0.22) is also below the accepted numerical guidance from the EPA. The estimated excess cancer risk is 1E-5. Thus, excess cancer risk is slightly above the acceptable risk value provided by the NMED for a residential land-use scenario (Bearzi January 2001). The incremental HI is 0.02 and the incremental excess cancer risk is 7.72E-7 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 lower than EPA guidance values. The estimated TEDE is 6.4E-2 mrem/yr for the industrial land-use scenario, which is much lower than the EPA's numerical guidance of 15 mrem/yr (EPA 1997b). The corresponding incremental estimated cancer risk value is 6.3E-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 0.18 mrem/yr with an associated risk of 2.1E-6. The guideline for this scenario is 75 mrem/yr (SNL/NM February 1998). Therefore, DSS Site 1007 is eligible for unrestricted radiological release.

The summation of the nonradiological and radiological carcinogenic risks is tabulated in Table 13.

Table 13
Summation of Radiological and Nonradiological Risks from DSS Site 1007, Former Building 6730 Septic System Carcinogens

Scenario	Nonradiological Risk	Radiological Risk	Total Risk
Industrial	1.89E-7	6.3E-7	8.3E-7
Residential	7.72E-7	2.1E-6	2.9E-6

DSS = Drain and Septic Systems.

Uncertainties associated with the calculations are considered small relative to the conservatism of this 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 1007. A component of the NMED Risk-Based Decision Tree (NMED March 1998) is to conduct an ecological 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. Initial components of NMED's decision tree (a discussion of DQOs, data assessment, and evaluations of both bioaccumulation and fate and transport potential) are addressed in previous sections of this report. Following the completion of the scoping assessment, a determination is made as to whether a more detailed examination of potential ecological risk is necessary. If deemed necessary, the scoping assessment proceeds to a risk assessment whereby a more quantitative estimate of ecological risk is conducted. Although this assessment is conservative in the estimation of ecological risks, ecological relevance and professional judgment are also used as recommended by the EPA (1998) to ensure that predicted exposures of selected ecological receptors reflect those reasonably expected to occur at the site.

VII.2 Scoping Assessment

The scoping assessment focuses primarily on the likelihood of exposure of biota at, or adjacent to, the site to constituents associated with site activities. Included in this section are an evaluation of existing data and a comparison of maximum detected concentrations to background concentrations, examination of bioaccumulation potential, and fate and transport potential. A scoping risk-management decision (Section VII.2.4) involves summarizing the

scoping results and determining whether further examination of potential ecological impacts is necessary.

VII.2.1 Data Assessment

As indicated in Section IV (Tables 5 and 7), constituents in soil within the 0- to 5-foot depth interval that are identified as COPECs for this site include the following:

- Arsenic
- Cyanide
- Mercury
- PCBs, total
- Selenium
- Silver
- U-235
- U-238

VII.2.2 Bioaccumulation

Among the COPECs listed in Section VII.2.1, the following are considered to have bioaccumulation potential in aquatic environments (Section IV, Tables 5 and 7):

- Arsenic
- Mercury
- Selenium
- PCBs, total
- U-235
- U-238

However, it should be noted that as directed by the NMED (March 1998), bioaccumulation for inorganic constituents is assessed exclusively based upon maximum reported bioconcentration factors (BCFs) for aquatic species. Because only aquatic BCFs are used to evaluate the bioaccumulation potential for metals, bioaccumulation in terrestrial species is likely to be overpredicted.

VII.2.3 Fate and Transport Potential

The potential for the COPECs to migrate from the source of contamination to other media or biota is discussed in Section V. As noted in Table 8 (Section V), wind, surface water, and biota (food chain uptake) are expected to be of low significance as transport mechanisms for COPECs at this site. Degradation, transformation, and radiological decay of the COPECs are also 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 may be associated with this site and that COPECs also exist at the site. As a consequence, a detailed ecological risk assessment is deemed necessary to predict the potential level of ecological risk associated with the site.

VII.3 Risk Assessment

As concluded in Section VII.2.4, both complete ecological pathways and COPECs are associated with this site. The ecological risk assessment performed for the site involves a quantitative estimate of current ecological risks using exposure models in association with exposure parameters and toxicity information obtained from the literature. The estimation of potential ecological risks is conservative to ensure that ecological risks are not underpredicted.

Components within the risk assessment include the following:

- Problem Formulation—sets the stage for the evaluation of potential exposure and risk.
- Exposure Estimation—provides a quantitative estimate of potential exposure.
- Ecological Effects Evaluation—presents benchmarks used to gauge the toxicity of COPECs to specific receptors.
- Risk Characterization—characterizes the ecological risk associated with exposure of the receptors to environmental media at the site.
- Uncertainty Assessment—discusses uncertainties associated with the estimation of exposure and risk.
- Risk Interpretation—evaluates ecological risk in terms of HQs and ecological significance.
- Risk Assessment Scientific/Management Decision Point—presents the decision to risk managers based upon the results of the risk assessment.

VII.3.1 Problem Formulation

Problem formulation is the initial stage of the risk assessment that provides the introduction to the risk evaluation process. Components that are addressed in this section include a discussion of ecological pathways and the ecological setting, identification of COPECs, and selection of ecological receptors. The conceptual model, ecological food webs, and ecological endpoints (other components commonly addressed in an ecological risk assessment) are presented in "Predictive Ecological Risk Assessment Methodology, Environmental Restoration Program, Sandia National Laboratories, New Mexico" (IT July 1998) and are not duplicated here.

VII.3.1.1 Ecological Pathways and Setting

DSS Site 1007 is less than 1 acre in size. The site is located in an area dominated by grassland habitat. The site is unpaved and open to use by wildlife. No threatened or endangered species exist at this site (IT February 1995), and no surface-water bodies, seeps, or springs are associated with the site.

Complete ecological pathways may exist at this site through the exposure of plants and wildlife to COPECs in the soil at this site. It is assumed that direct uptake of COPECs from soil is the major route of exposure for plants and that exposure of plants to wind-blown soil is minor. Exposure modeling for the wildlife receptors is limited to the food and soil ingestion pathways and external radiation. Because of the lack of surface water at this site, exposure to COPECs through the ingestion of surface water is considered insignificant. Inhalation and dermal contact also are considered insignificant pathways with respect to ingestion (Sample and Suter 1994). Groundwater is not expected to be affected by COPECs at this site.

VII.3.1.2 COPECs

Discharge of waste water from the septic system of Building 6730 is the primary source of COPECs at DSS Site 1007. All COPECs identified for this site are listed in Section VII.2. The COPECs include both radiological and nonradiological analytes. The analytes were screened against background concentrations and those that exceeded the approved SNL/NM background screening levels (Dinwiddie September 1997) for the area were considered to be COPECs. All organic analytes detected in the soil and inorganics with uncertain background levels were retained as COPECs. Nonradiological inorganic constituents that are essential nutrients, such as iron, magnesium, calcium, potassium, and sodium, are not included in this risk assessment as set forth by the EPA (1989). In order to provide conservatism, this ecological risk assessment is based upon the maximum soil concentrations of the COPECs measured in the upper 5 feet of soil at this site. Tables 5 and 7 present maximum concentrations for the COPECs.

VII.3.1.3 Ecological Receptors

A nonspecific perennial plant is selected as the receptor to represent plant species at the site (IT July 1998). Vascular plants are the principal primary producers at the site and are key to the diversity and productivity of the wildlife community associated with the site. The deer mouse (*Peromyscus maniculatus*) and the burrowing owl (*Speotyto cunicularia*) are used to represent wildlife use. Because of its opportunistic food habits, the deer mouse is used to represent a mammalian herbivore, omnivore, and insectivore. The burrowing owl is selected to represent a top predator at this site. The burrowing owl is present at SNL/NM and is designated a species of management concern by the U.S. Fish and Wildlife Service in Region 2, which includes the state of New Mexico (USFWS September 1995).

VII.3.2 Exposure Estimation

For nonradiological COPECs, direct uptake from the soil is considered the only significant route of exposure for terrestrial plants. Exposure modeling for the wildlife receptors is limited to food and soil ingestion pathways. Inhalation and dermal contact are considered insignificant

pathways with respect to ingestion (Sample and Suter 1994). Drinking water is also considered an insignificant pathway because of the lack of surface water at this site. The deer mouse is modeled under three dietary regimes: as an herbivore (100 percent of its diet as plant material), as an omnivore (50 percent of its diet as plants and 50 percent as soil invertebrates), and as an insectivore (100 percent of its diet as soil invertebrates). The burrowing owl is modeled as a strict predator on small mammals (100 percent of its diet as deer mice). Because the exposure in the burrowing owl from a diet consisting of equal parts of herbivorous, omnivorous, and insectivorous mice would be equivalent to the exposure consisting of only omnivorous mice, the diet of the burrowing owl is modeled with intake of omnivorous mice only. Both species are modeled with soil ingestion comprising 2 percent of the total dietary intake. Table 14 presents the species-specific factors used in modeling exposures in the wildlife receptors. Justification for use of the factors presented in this table is described in the ecological risk assessment methodology document (IT July 1998).

Although home range is also included in this table, exposures for this risk assessment are modeled using an area use factor of 1.0, implying that all food items and soil ingested come from the site being investigated. The maximum COPEC concentrations measured in the upper five feet of soil were used to conservatively estimate potential exposures and risks to plants and wildlife at this site.

For the radiological dose-rate calculations, the deer mouse is modeled as an herbivore (100 percent of its diet as plants), and the burrowing owl is modeled as a strict predator on small mammals (100 percent of its diet as deer mice). Both are modeled with soil ingestion comprising 2 percent of the total dietary intake. Receptors are exposed to radiation both internally and externally from U-235 and U-238. Internal and external dose rates to the deer mouse and the burrowing owl are approximated using modified dose-rate models from DOE (1995) as presented in the ecological risk assessment methodology document for the SNL/NM ER Project (IT July 1998). Radionuclide-dependent data for the dose-rate calculations were obtained from Baker and Soldat (1992). The external dose-rate model examines the total-body dose rate to a receptor residing in soil exposed to radionuclides. The soil surrounding the receptor is assumed to be an infinite medium uniformly contaminated with gamma-emitting radionuclides. The external dose-rate model is the same for both the deer mouse and the burrowing owl. The internal total-body dose-rate model assumes that a fraction of the radionuclide concentration ingested by a receptor is absorbed by the body and concentrated at the center of a spherical body shape. This provides for a conservative estimate for absorbed dose. This concentrated radiation source at the center of the body of the receptor is assumed to be a "point" source. Radiation emitted from this point source is absorbed by the body tissues to contribute to the absorbed dose. Alpha and beta emitters are assumed to transfer 100 percent of their energy to the receptor as they pass through tissues. Gamma-emitting radionuclides transfer only a fraction of their energy to the tissues because gamma rays interact less with matter than do beta or alpha emitters. The external and internal dose-rate results are summed to calculate a total dose rate from exposure to U-235 and U-238 in soil.

Table 15 provides the transfer factors used in modeling the concentrations of COPECs through the food chain. Table 16 presents maximum concentrations in soil and derived concentrations in tissues of the various food chain elements that are used to model dietary exposures for each of the wildlife receptors.

Table 14
Exposure Factors for Ecological Receptors at DSS Site 1007

Receptor Species	Class/Order	Trophic Level	Body Weight (kg)[a]	Food Intake Rate (kg/day)[b]	Dietary Composition[c]	Home Range (acres)
Deer Mouse (*Peromyscus maniculatus*)	Mammalia/ Rodentia	Herbivore	2.39E-2[d]	3.72E-3	Plants: 100% (+ Soil at 2% of intake)	2.7E-1[e]
Deer Mouse (*Peromyscus maniculatus*)	Mammalia/ Rodentia	Omnivore	2.39E-2[d]	3.72E-3	Plants: 50% Invertebrates: 50% (+ Soil at 2% of intake)	2.7E-1[e]
Deer Mouse (*Peromyscus maniculatus*)	Mammalia/ Rodentia	Insectivore	2.39E-2[d]	3.72E-3	Invertebrates: 100% (+ Soil at 2% of intake)	2.7E-1[e]
Burrowing owl (*Speotyto cunicularia*)	Aves/ Strigiformes	Carnivore	1.55E-1[f]	1.73E-2	Rodents: 100% (+ Soil at 2% of intake)	3.5E+1[g]

[a]Body weights are in kg wet weight.
[b]Food intake rates are estimated from the allometric equations presented in Nagy (1987). Units are kg dry weight per day.
[c]Dietary compositions are generalized for modeling purposes. Default soil intake value of 2 percent of food intake.
[d]Silva and Downing 1995.
[e]EPA 1993, based upon the average home range measured in semiarid shrubland in Idaho.
[f]Dunning 1993.
[g]Haug et al. 1993.
DSS = Drain and Septic Systems.
EPA = U.S. Environmental Protection Agency.
kg = Kilogram(s).

Table 15
Transfer Factors Used in Exposure Models for COPECs at DSS Site 1007

COPEC	Soil-to-Plant Transfer Factor	Soil-to-Invertebrate Transfer Factor	Food-to-Muscle Transfer Factor
Inorganic			
Arsenic	4.0E-2[a]	1.0E+0[b]	2.0E-3[a]
Cyanide	0.0E+0[c]	0.0E+0[c]	0.0E+0[c]
Mercury	1.0E+0[d]	1.0E+0[b]	2.5E-1[a]
Selenium	5.0E-1[d]	1.0E+0[b]	1.0E-1[d]
Silver	1.0E+0[d]	2.5E-1[e]	5.0E-3[d]
Organic[f]			
PCBs (as Aroclor-1254[g])	1.3E-2	2.6E+1	3.2E-2

[a]Baes et al. 1984.
[b]Default value.
[c]No data found for food chain transfers of cyanide; however, because of its high metabolic activity, cyanide is assumed not to transfer in the food chain.
[d]NCRP January 1989.
[e]Stafford et al. 1991.
[f]Soil-to-plant and food-to-muscle transfer factors from equations developed in Travis and Arms (1988). Soil-to-invertebrate transfer factors from equations developed in Connell and Markwell (1990). All three equations based upon relationship of the transfer factor to the Log K_{ow} value of compound.
[g]PCBs evaluated as aroclor-1254, the most conservative case for aroclors.
COPEC = Constituent of potential ecological concern.
DSS = Drain and Septic Systems.
K_{ow} = Octanol-water partition coefficient.
Log = Logarithm (base 10).
NCRP = National Council on Radiation Protection and Measurements.
PCB = Polychlorinated biphenyl.

Table 16
Media Concentrations[a] for COPECs at DSS Site 1007

COPEC	Soil (Maximum)[a]	Plant Foliage[b]	Soil Invertebrate[b]	Deer Mouse Tissues[c]
Inorganic				
Arsenic	4.7E+0	1.9E-1	4.7E+0	1.8E-3
Cyanide	1.8E-1[d]	0.0E+0	0.0E+0	0.0E+0
Mercury	2.2E-2[e]	2.2E-2	2.2E-2	1.7E-2
Selenium	6.4E-1[d]	3.2E-1	6.4E-1	1.5E-1
Silver	2.2E-2[e]	2.2E-2	5.9E-3	3.5E-4
Organic				
PCBs (as Aroclor-1254[f])	4.2E-3[e]	5.2E-5	1.1E-1	5.5E-3

[a]In milligrams per kilogram. All biotic media are based upon dry weight of the media. Soil concentration measurements are assumed to have been based upon dry weight. Values have been rounded to two significant digits after calculation.
[b]Product of the soil concentration and the corresponding transfer factor.
[c]Based upon the deer mouse with an omnivorous diet. Product of the average concentration ingested in food and soil times the food-to-muscle transfer factor times a wet weight-dry weight conversion factor of 3.125 (EPA 1993).
[d]Estimated value.
[e]Analyte not detected. Maximum concentration is one-half of the detection limit.
[f]PCBs evaluated as aroclor-1254, the most conservative case for aroclors.
COPEC = Constituent of potential ecological concern.
DSS = Drain and Septic Systems.
PCB = Polychlorinated biphenyl.

VII.3.3 Ecological Effects Evaluation

Table 17 shows benchmark toxicity values for the plant and wildlife receptors. For plants, the benchmark soil concentrations are based upon the lowest-observed-adverse-effect level (LOAEL). For wildlife, the toxicity benchmarks are based upon the no-observed-adverse-effect level (NOAEL) for chronic oral exposure in a taxonomically similar test species. Sufficient toxicity information was not available to estimate the LOAELs or NOAELs for some COPECs.

The benchmark used for exposure of terrestrial receptors to radiation was 0.1 rad/day. This value has been recommended by the International Atomic Energy Agency (IAEA 1992) for the protection of terrestrial populations. Because plants and insects are less sensitive to radiation than vertebrates (Whicker and Schultz 1982), the dose of 0.1 rad/day should also protect other groups within the terrestrial habitat of DSS Site 1007.

VII.3.4 Risk Characterization

Maximum concentrations in soil and estimated dietary exposures are compared to plant and wildlife benchmark values, respectively. Table 18 presents the results of these comparisons. HQs are used to quantify the comparison with benchmarks for plants and wildlife exposure.

Table 17
Toxicity Benchmarks for Ecological Receptors at DSS Site 1007

COPEC	Plant Benchmark[a,b]	Mammalian NOAELs			Avian NOAELs		
		Mammalian Test Species[c,d]	Test Species NOAEL[d,e]	Deer Mouse NOAEL[e,f]	Avian Test Species[d]	Test Species NOAEL[d,e]	Burrowing Owl NOAEL[e,g]
Inorganic							
Arsenic	10	mouse	0.126	0.133	mallard	5.14	5.14
Cyanide	–	rat[h]	68.7	126	–	–	–
Mercury (organic)	0.3	rat	0.03	0.06	mallard	0.0064	0.0064
Mercury (inorganic)	0.3	mouse	13.2	14.0	Japanese quail	0.45	0.45
Selenium	1	rat	0.2	0.391	screech owl	0.44	0.44
Silver	2	rat	17.8[i]	34.8	–	–	–
Organic							
PCBs (as Aroclor-1254[j])	40	oldfield mouse	0.068	0.059	ring-necked pheasant	0.18	0.18

[a]In mg/kg soil dry weight.
[b]Efroymson et al. 1997.
[c]Body weights (in kg) for the NOAEL conversion are as follows: lab mouse, 0.030; lab rat, 0.350; oldfield mouse, 0.014 (except where noted).
[d]From Sample et al. (1996), except where noted.
[e]In mg/kg body weight per day.
[f]Based upon NOAEL conversion methodology presented in Sample et al. (1996), using a deer mouse body weight of 0.0239 kg and a mammalian scaling factor of 0.25.
[g]Based upon NOAEL conversion methodology presented in Sample et al. (1996). The avian scaling factor of 0.0 was used, making the NOAEL independent of body weight.
[h]Body weight: 0.273 kg.
[i]Based upon a rat lowest-observed-adverse-effect level of 89 mg/kg/day (EPA 2003) and an uncertainty factor of 0.2.
[j]PCBs evaluated as aroclor-1254, the most conservative case for aroclors.

COPEC = Constituent of potential ecological concern.
DSS = Drain and Septic Systems.
kg = Kilogram(s).
mg/kg = Milligram(s) per kilogram.
NOAEL = No-observed-adverse-effect level.
PCB = Polychlorinated biphenyl.
– = Insufficient toxicity data.

Table 18
HQs for Ecological Receptors at DSS Site 1007

COPEC	Plant HQ	Deer Mouse HQ (Herbivorous)	Deer Mouse HQ (Omnivorous)	Deer Mouse HQ (Insectivorous)	Burrowing Owl HQ
Inorganic					
Arsenic	4.7E-1	3.3E-1	**3.0E+01**	**5.6E+0**	2.4E-3
Cyanide	–	4.3E-6	4.3E-6	4.3E-6	–
Mercury (organic)	7.2E-2	5.5E-2	5.5E-2	5.2E-2	3.1E-1
Mercury (inorganic)	7.2E-2	2.4E-4	2.4E-4	2.4E-4	4.4E-3
Selenium	6.4E-1	1.3E-1	2.0E-1	2.6E-1	4.2E-2
Silver	1.1E-2	9.8E-5	6.2E-5	2.6E-5	–
Organic					
PCBs (as Aroclor-1254[a])	1.0E-4	3.6E-4	1.4E-1	2.9E-1	3.5E-3
HI[b]	**1.2E+0**	5.2E-1	**3.4E+0**	**6.2E+0**	3.5E-1

Note: **Bold** text indicates HQ or HI exceeds unity.
[a]PCBs evaluated as aroclor-1254, the most conservative case for aroclors.
[b]The HI is the sum of individual HQs.
COPEC = Constituent of potential ecological concern.
DSS = Drain and Septic Systems.
HI = Hazard index.
HQ = Hazard quotient.
PCB = Polychlorinated biphenyl.
– = Insufficient toxicity data available for risk estimation purposes.

The only HQs that exceed unity are arsenic for the omnivorous and insectivorous deer mice. Because of a lack of sufficient toxicity information, the HQ for plants could not be determined for cyanide. Similarly for the burrowing owl, HQs could not be determined for cyanide, and silver. As directed by the NMED, HIs were calculated for each of the receptors (the HI is the sum of chemical-specific HQs for all pathways for a given receptor). Total HIs are greater than unity for plants and both the omnivorous and insectivorous deer mice, with a maximum HI of 6.2 for the insectivorous deer mouse.

Tables 19 and 20 summarize the internal and external dose rate model results for U-235 and U-238 for the deer mouse and burrowing owl, respectively. The total radiation dose rate to the deer mouse was predicted to be 6.0E-4 rad/day and that for the burrowing owl was 5.8E-4 rad/day. The dose rates for the deer mouse and the burrowing owl are lower than the benchmark of 0.1 rad/day.

VII.3.5 Uncertainty Assessment

Many uncertainties are associated with the characterization of ecological risks at DSS Site 1007. These uncertainties result from assumptions used in calculating risk that may overestimate or underestimate true risk presented at the site. For this risk assessment, assumptions are made that are more likely to overestimate exposures and risk rather than to underestimate them. These conservative assumptions are used to be more protective of the ecological resources potentially affected by the site. Conservatisms incorporated into this risk assessment include the use of maximum analyte concentrations measured in soil to evaluate risk, the use of wildlife toxicity benchmarks based upon NOAEL values, and the incorporation of strict herbivorous and strict insectivorous diets for predicting the extreme HQ values for the deer mouse. Each of these uncertainties, which are consistent among each of the site-specific ecological risk assessments, is discussed in greater detail in the uncertainty section of the ecological risk assessment methodology document for the SNL/NM ER Program (IT July 1998). It should be noted that of the six COPECs, mercury and silver are 100 percent nondetect, and the exposure estimates for these nondetected analytes are conservatively based upon one half of the detection limit. Further, the maximum concentrations of cyanide and selenium are estimated values.

Uncertainties associated with the estimation of risk to ecological receptors following exposure to U-235 and U-238 are primarily related to those inherent in the radionuclide-specific data. Radionuclide-dependent data are measured values that have their associated errors. The dose-rate models used for these calculations are based upon conservative estimates on receptor shape, radiation absorption by body tissues, and intake parameters. The goal is to provide a realistic but conservative estimate of a receptor's internal and external exposure to radionuclides in soil. These dose estimates are conservatively based upon detection limits of the two radionuclides, neither of which was detected at the site.

In the estimation of ecological risk, background concentrations are included as a component of maximum on-site concentrations. Conservatisms in the modeling of exposure and risk can result in the prediction of risk to ecological receptors when exposed at background concentrations. As shown in Table 21, HQs associated with exposures to background are greater than 1.0 for arsenic. It is therefore likely that the actual risks from arsenic at DSS Site 1007 are overestimated by the HQs calculated in this assessment because of conservatisms incorporated into the exposure assessment and in the toxicity benchmarks for

Table 19
Total Dose Rates for Deer Mice
Exposed to Radionuclides at DSS Site 1007

Radionuclide	Maximum Activity (pCi/g)	Total Dose (rad/day)
U-235	**ND (0.24)**	6.8E-6
U-238	**ND (3.3)**	5.9E-4
Total Dose		6.0E-4

DSS = Drain and Septic Systems.
MDA = Minimum detectable activity.
ND ( ) = Not detected above the MDA, shown in parentheses.
pCi/g = Picocurie(s) per gram.

Table 20
Total Dose Rates for Burrowing Owls
Exposed to Radionuclides at DSS Site 1007

Radionuclide	Maximum Activity (pCi/g)	Total Dose (rad/day)
U-235	**ND (0.24)**	5.2E-6
U-238	**ND (3.3)**	5.7E-4
Total Dose		5.8E-4

DSS = Drain and Septic Systems.
MDA = Minimum detectable activity.
ND ( ) = Not detected above the MDA, shown in parentheses.
pCi/g = Picocurie(s) per gram.

Table 21
HQs for Ecological Receptors Exposed to Background Concentrations at DSS Site 1007

Constituent of Potential Ecological Concern	Plant HQ	Deer Mouse HQ (Herbivorous)	Deer Mouse HQ (Omnivorous)[a]	Deer Mouse HQ (Insectivorous)[a]	Burrowing Owl HQ
Arsenic	4.4E-1	3.1E-1	**2.8E+0**	**5.2E+0**	2.2E-3

[a]**Bold** text indicates HQ exceeds unity.
DSS = Drain and Septic Systems.
HQ = Hazard quotient.

this COPEC. It should be noted that in the cases of arsenic, exposure to background concentrations may account for the majority (93 percent) of the HQ values shown in Table 18.

VII.3.6 Risk Interpretation

Ecological risks associated with DSS Site 1007 are estimated through a risk assessment that incorporates site-specific information when available. All HQ values predicted for the COPECs at this site are found to be less than unity with the exception of arsenic. For arsenic, the contribution due to background accounts for the majority (93 percent) of the HQ values.

Analysis of the uncertainties associated with these predicted values indicate that they are more likely to overestimate actual risk rather than underestimate it. Based upon this final analysis, the potential for ecological risks associated with DSS Site 1007 is expected to be very low.

VII.3.7 Risk Assessment Scientific/Management Decision Point

After potential ecological risks associated with the site have been assessed, a decision is made regarding whether the site should be recommended for NFA or whether additional data should be collected to more thoroughly assess actual ecological risk at the site. With respect to this site, ecological risks are predicted to be very low. The scientific/management decision is to recommend this site for NFA.

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APPENDIX 1
EXPOSURE PATHWAY DISCUSSION FOR CHEMICAL AND RADIONUCLIDE CONTAMINATION

Introduction

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

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

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

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

- Ingestion of contaminated drinking water
- Ingestion of contaminated soil

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

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

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

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

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

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

Table 1
Exposure Pathways Considered for Various Land-Use scenarios

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

Equations and Default Parameter Values for Identified Exposure Routes

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

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

Generic Equation for Calculation of Risk Parameter Values

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

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

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

where;

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

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

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

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

Soil Ingestion

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

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

where:

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

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

Soil Inhalation

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

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

where:

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

Soil Dermal Contact

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

where:

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

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

Groundwater Ingestion

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

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

where:

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

Groundwater Inhalation

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

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

where:

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

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

Tables 2 and 3 show the default parameter values suggested for use by SNL/NM at SWMUs, based upon the selected land-use scenarios for nonradiological and radiological COCs,

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

Summary

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

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

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

[a]Technical Background Document for Development of Soil Screening Levels (NMED 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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