3-1-2005

Justification for Class III Permit Modification March 2005 DSS Site 1024 Operable Unit 1295 MO 242-245 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

U.S. Department of Energy
Sandia Site Office
Environmental Restoration
Mr. John Gould
Telephone (505) 845-6089

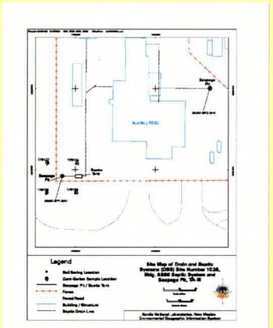
Sandia National Laboratories
Environmental Restoration Project
Task Leader: Brenda Langkopf
Telephone (505) 284-3272

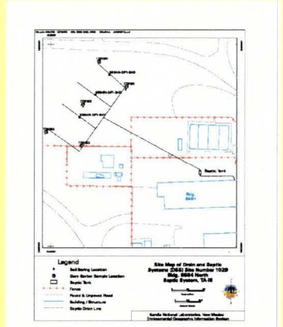
Drain and Septic Systems (DSS) Area of Concern (AOC) Sites 1028, 1029, 1083, 1086, 1108, and 1110

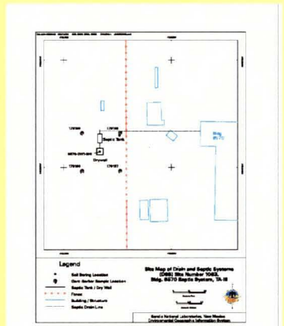
This work supported by the United States Department of Energy under contract DE-AC04-94AL85000.

Sandia National Laboratories

Environmental Restoration Project



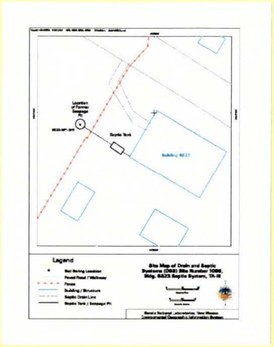


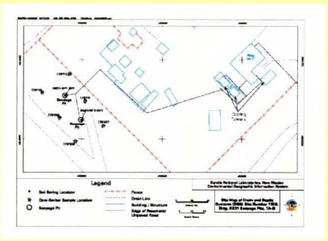


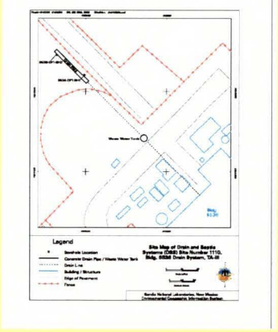
Collecting soil samples with the Geoprobe.

Subsurface soil recovered for analyses.

Seepage pit demolition and backfilling.







For More Information Contact

U.S. Department of Energy
Sandia Site Office
Environmental Restoration
Mr. John Gould
Telephone (505) 845-6089

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

Sandia National Laboratories

Justification for Class III Permit Modification

March 2005

DSS Site 1024
Operable Unit 1295
MO 242-245 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

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

Sandia National Laboratories/New Mexico
Environmental Restoration Project

SWMU ASSESSMENT REPORT AND PROPOSAL FOR NO FURTHER ACTION DRAIN AND SEPTIC SYSTEMS SITE 1024, MO 242-245 SEPTIC SYSTEM

March 2004

United States Department of Energy
Sandia Site Office

TABLE OF CONTENTS

TABLE OF CONTENTS

LIST OF FIGURES

Figure

This page intentionally left blank.

LIST OF TABLES

Table

LIST OF TABLES (Concluded)

Table

LIST OF ANNEXES

Annex

This page intentionally left blank.

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
ER	Environmental Restoration
FIP	Field Implementation Plan
HE	high explosive(s)
HI	hazard index
HWB	Hazardous Waste Bureau
KAFB	Kirtland Air Force Base
MDL	method detection limit
MO	Mobile Office
NFA	no further action
NMED	New Mexico Environment Department
OU	Operable Unit
PCB	polychlorinated biphenyl
RCRA	Resource Conservation and Recovery Act
RPSD	Radiation Protection Sample Diagnostics
SAP	Sampling and Analysis Plan
SNL/NM	Sandia National Laboratories/New Mexico
SVOC	semivolatile organic compound
SWMU	Solid Waste Management Unit
TA	Technical Area
TB	trip blank
TOP	Technical Operating Procedure
VOC	volatile organic compound

This page intentionally left blank.

1.0 PROJECT BACKGROUND

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

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

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

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

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

Concurrent with the field inspection and site identification work, NMED/HWB and SNL/NM ER Project technical personnel worked together to reach consensus on a staged approach and specific procedures that would be used to characterize the DSS sites, as well as the remaining OU 1295 Septic Tanks and Drainfield SWMUs that had not been approved for NFA. These procedures are described in detail in the "Sampling and Analysis Plan [SAP] for Characterizing and Assessing Potential Releases to the Environment From Septic and Other Miscellaneous Drain Systems at Sandia National Laboratories/New Mexico" (SNL/NM October 1999), which was approved by the NMED/HWB on January 28, 2000 (Bearzi January 2000). A follow-on document, "Field Implementation Plan [FIP], Characterization of Non-Environmental Restoration Drain and Septic Systems" (SNL/NM November 2001), was then written to formally document the updated DSS site list and the specific site characterization work required by the NMED for each of the 60 DSS sites. The FIP was approved by the NMED in February 2002 (Moats February 2002).

2.0 DSS SITE 1024: MO 242-245 SEPTIC SYSTEM

2.1 Summary

The SNL/NM ER Project conducted an assessment of DSS Site 1024, the Mobile Office (MO) 242-245 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 1024. This NFA proposal provides documentation that the site was sufficiently characterized, that no significant releases of contaminants to the environment occurred via the MO 242-245 Septic System, and that it does not pose a threat to human health or the environment under either industrial or residential land-use scenarios. Current operations at the site are conducted in accordance with applicable laws and regulations that are protective of the environment. Septic system discharges are now directed to the City of Albuquerque sewer system.

Review and analysis of all relevant data for DSS Site 1024 indicate that concentrations of constituents of concern (COCs) at this site were found to be below applicable risk assessment action levels. Thus, DSS Site 1024 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 1024 is located approximately 100 feet north of the northern boundary of SNL/NM Technical Area (TA)-III on federally owned land controlled by Kirtland Air Force Base (KAFB) (Figure 2.2.1 1). The site is located approximately 400 feet west-northwest of the entrance to TA-III and is approximately 120 feet northwest of the northwest corner of the MO 242-245 complex (Figure 2.2.1-2). The abandoned septic system consisted of a septic tank and distribution box that emptied to five 40-foot-long parallel drain lines (Figure 2.2.1-2) buried an average of 3 feet below ground surface (bgs). Construction details are based upon site inspections and backhoe excavations of the system. The system received discharges from the MO 242-245 complex.

The surface geology at DSS Site 1024 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

This page intentionally left blank.

Legend

- DSS Site 1024
- Major Road
- KAFB Boundary
- USFS Withdrawn Area Boundary
- SNL Technical Area

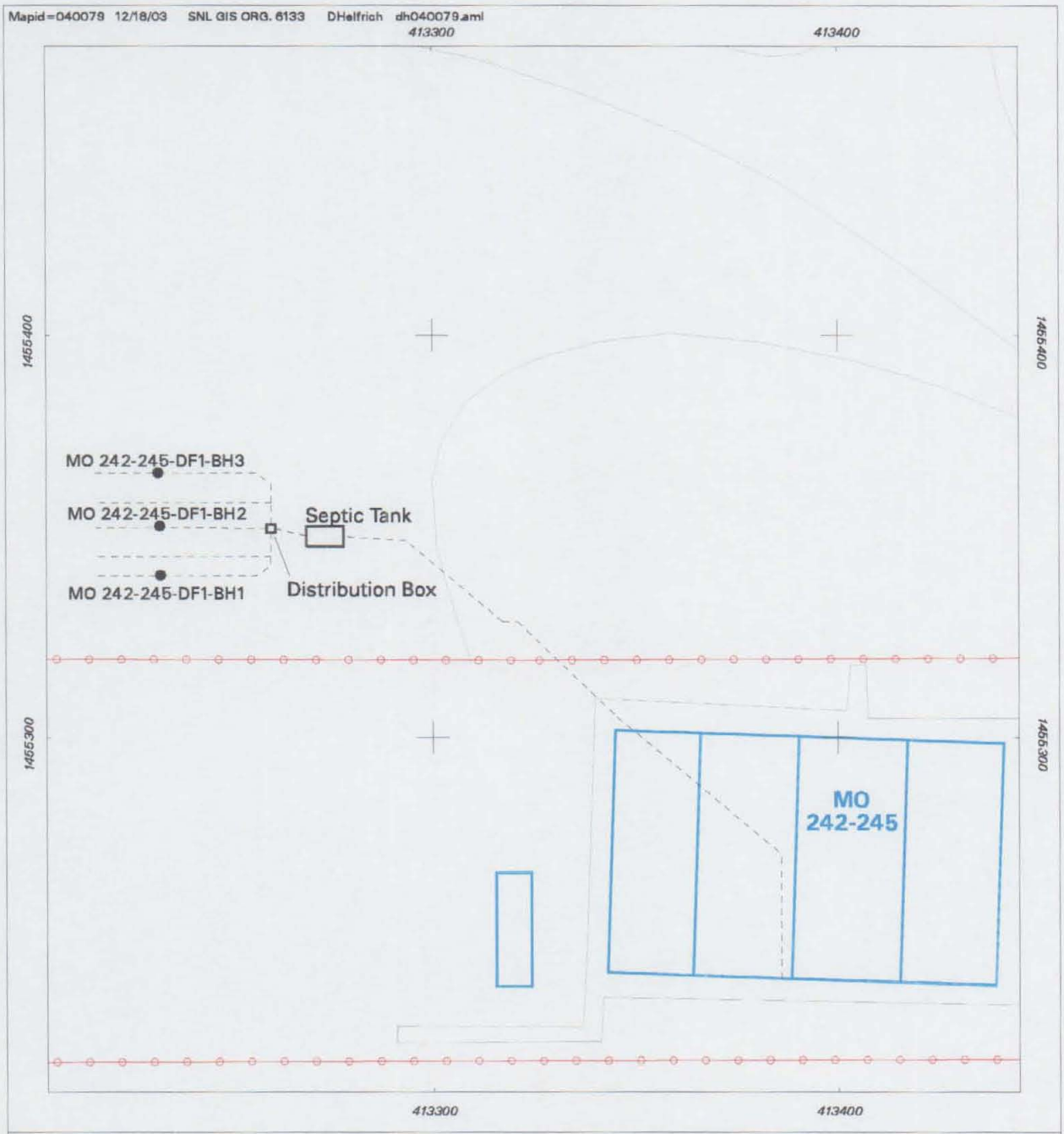
Figure 2.2.1-1
Location Map of Drain and Septic Systems (DSS) Site Number 1024, MO 242-245 Septic System, TA-III

0 4500 9000
Scale in Feet

0 1080 2160
Scale in Meters

Sandia National Laboratories, New Mexico
Environmental Geographic Information System

840857.03010000 A98



Legend

- Soil Boring Location
- Road / Edge of Pavement
- Sanitary Sewer line / Drainfield Drain line
- Fence
- MO 242-245
- Septic Tank / Distribution Box

Figure 2.2.1-2
Site Map of Drain and Septic Systems (DSS) Site Number 1024, MO 242-245 Septic System, TA-III

0 20 40
Scale in Feet

0 4.8 9.6
Scale in Meters

Sandia National Laboratories, New Mexico
Environmental Geographic Information System

840857.03010000 A117

DSS Site 1024, 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.

The ground surface in the vicinity of the site is flat or slopes slightly to the west. The closest major drainage is the Arroyo del Coyote, located approximately 1.1 miles north of the site. No perennial surface-water bodies are present in the vicinity of the site. Average annual rainfall in the SNL/NM and KAFB area, as measured at Albuquerque International Sunport, is 8.1 inches (NOAA 1990). Infiltration of precipitation is almost nonexistent as virtually all of the moisture subsequently undergoes evapotranspiration. The estimates of evapotranspiration rates for the KAFB area range from 95 to 99 percent of the annual rainfall (SNL/NM March 1996).

The site lies at an average elevation of approximately 5,408 feet above mean sea level (SNL/NM April 2003). Depth to groundwater is approximately 485 feet 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 1024 are KAFB-4 and KAFB-11, approximately 2.65 and 3.0 miles northwest and northeast of the site, respectively. The nearest groundwater monitoring well is TAV-MW5, approximately 100 feet southwest of the site.

2.2.2 Operational History

Available information indicates that the MO 242-245 complex was constructed in 1976 (SNL/NM March 2003), and it is assumed the septic system was constructed at the same time. The mobile buildings are currently being used as offices. 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. By June 1991, the MO 242-245 complex was connected to an extension of the City of Albuquerque sanitary sewer system (Jones June 1991). The old septic system line was disconnected and capped, and the system was 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 1024 is industrial.

2.3.2 Future/Proposed Land Use

The projected future land use for DSS Site 1024 is industrial (DOE et al. September 1995).

This page intentionally left blank.

3.0 INVESTIGATORY ACTIVITIES

3.1 Summary

Three assessment investigations have been conducted at this site. In late 1990 or early 1991, 1992, and 1995, waste characterization samples were collected from the septic tank (Investigation 1). In 1997, a backhoe was used to physically locate the buried drainfield drain lines at the site (Investigation 2). In 1998 and 1999, near-surface soil samples were collected from three borings in the drainfield area (Investigation 3). Investigations 2 and 3 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.

As part of the SNL/NM Septic System Monitoring Program, aqueous and/or sludge waste characterization samples were collected from the MO 242-245 septic tank in late 1990 or early 1991, 1992, and again in 1995 (SNL/NM April 1991, SNL/NM June 1993, SNL/NM December 1995). Aqueous samples collected in late 1990 or early 1991 were analyzed at an off-site laboratory for volatile organic compounds (VOCs), semivolatile organic compounds (SVOCs), oil and grease, phenolics, metals, gross beta activity, tritium, and plutonium. Sludge samples collected on July 28, 1992, were analyzed at an off-site laboratory for gross alpha/beta activity, tritium, and radionuclides by gamma spectroscopy. Aqueous and sludge samples were also collected from the septic tank on July 18, 1995, and were analyzed at an off-site laboratory for VOCs, SVOCs, pesticides, polychlorinated biphenyls (PCBs), metals, formaldehyde, fluoride, nitrates/nitrites, oil and grease, total phenol, gross alpha/beta activity, and radiological constituents. A fraction of each sample was also submitted to the SNL/NM Radiation Protection Sample Diagnostics (RPSD) Laboratory for gamma spectroscopy analysis prior to off-site release. The analytical results for these three septic tank sampling events are presented in Annex A.

On February 15, 1996, the residual contents, approximately 775 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 27, 1997, a backhoe was used to determine the location, dimensions, and average depth of the DSS Site 1024 drainfield system. The drainfield was found to have five approximately 40-foot-long parallel drain lines, arranged as shown on Figure 2.2.1-2, with an average drain line depth of approximately 3 feet bgs. No visible evidence of stained or discolored soil or odors indicating residual contamination were observed during the excavation. No samples were collected during the backhoe excavation at the site.

3.4 Investigation 3—Soil Sampling

Once the system drain lines were located, soil sampling was conducted in accordance with the rationale and procedures in the SAP (SNL/NM October 1999) approved by the NMED. On July 6 and 7, 1998, and again on August 23 and 24, 1999, soil samples were collected from three drainfield boreholes. Soil boring locations are shown on Figure 2.2.1-2. Figure 3.4-1 shows the DSS Site 1024 drainfield area with the MO 242-245 complex in the background. A summary of the boreholes, sample depths, sample analyses, analytical methods, laboratories, and sample dates are 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 1024 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 1024 are presented and discussed in this section.

Figure 3.4-1
View of DSS Site 1024, the MO 242-245 Septic System drainfield area (enclosed by the wire fence). View looking southeast toward the MO 242-245 complex. August 24, 1999

Table 3.4-1
Summary of Area Sampled, Analytical Methods, and Laboratories Used for
DSS Site 1024, MO 242-245 Septic System Soil Samples

Sampling Area	Number of Borehole Locations	Top of Sampling Intervals in each Borehole (ft bgs)	Total Number of Soil Samples	Analytical Parameters and EPA Methods[a]	Analytical Laboratory	Date Samples Collected
Drainfield	3	5, 10	6	VOCs EPA Method 8260	GEL	08/23/99, 08/24/99
	3	5, 10	6	SVOCs EPA Method 8270	GEL	07/06/98, 07/07/98
	3	5, 10	6	PCBs EPA Method 8082	GEL	08/23/99, 08/24/99
	3	5, 10	6	HE Compounds EPA Method 8330	ERCL	07/06/98, 07/07/98
	3	5, 10	6	RCRA Metals EPA Methods 6000/7000	ERCL	07/06/98, 07/07/98
	3	5, 10	6	Hexavalent Chromium EPA Method 7196A	GEL	08/23/99, 08/24/99
	3	5, 10	6	Total Cyanide EPA Method 9012A	GEL	08/23/99, 08/24/99
	3	5, 10	6	Gamma Spectroscopy EPA Method 901.1	RPSD	07/06/98, 07/07/98
	3	5, 10	6	Gross Alpha/Beta Activity EPA Method 900.0	GEL	07/06/98, 07/07/98

[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).
MO = Mobile Office.
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 six soil samples collected from the three drainfield boreholes are summarized in Table 3.4.2-1. Method detection limits (MDLs) for the VOC soil analyses are presented in Table 3.4.2-2. Three VOCs that are common laboratory contaminants (2-butanone, methylene chloride, and toluene) and a fourth compound (carbon disulfide) were detected in the VOC soil samples collected from this site. No VOCs were detected in the trip blank (TB) associated with these samples.

SVOCs

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

PCBs

PCB analytical results for the six soil samples collected from the three drainfield boreholes are summarized in Table 3.4.2-5. MDLs for the PCB soil analyses are presented in Table 3.4.2-6. Aroclor-1260 was detected in two of the six soil samples from this site.

HE Compounds

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

RCRA Metals and Hexavalent Chromium

Resource Conservation and Recovery Act (RCRA) metals and hexavalent chromium analytical results for the six soil samples collected from the three drainfield boreholes are summarized in Table 3.4.2-9. MDLs for the metals soil analyses are presented in Table 3.4.2-10. Arsenic was detected at a concentration slightly above the NMED-approved background concentration only in the 10-foot sample from borehole BH3. All other metal concentrations were below the corresponding NMED-approved background concentrations.

Total Cyanide

Total cyanide analytical results for the six soil samples collected from the three drainfield boreholes are summarized in Table 3.4.2-11. MDLs for the cyanide soil analyses are presented in Table 3.4.2-12. Cyanide was detected in the 10-foot sample from borehole BH3.

Table 3.4.2-1
Summary of DSS Site 1024, MO 242-245 Septic System
Confirmatory Soil Sampling, VOC Analytical Results
August 1999
(Off-Site Laboratory)

Sample Attributes			VOCs (EPA Method 8260[a]) (µg/kg)			
Record Number[b]	ER Sample ID	Sample Depth (ft)	2-Butanone	Carbon disulfide	Methylene chloride	Toluene
602764	MO242/245-DF1-BH1-5-S	5	ND (3.2 J)	ND (0.3)	ND (1.4)	ND (0.9)
602764	MO242/245-DF1-BH1-10-S	10	ND (3.2 J)	ND (0.3)	**7.8**	ND (0.9)
602764	MO242/245-DF1-BH2-5-S	5	**3.8 J (5 J)**	ND (0.3)	**1.7 J (5)**	**1.1**
602764	MO242/245-DF1-BH2-10-S	10	ND (3.2 J)	ND (0.3)	**1.7 J (5)**	ND (0.9)
602764	MO242/245-DF1-BH3-5-S	5	**14 J**	**2.8 J (5 J)**	**1.9 J (5)**	**3.1**
602764	MO242/245-DF1-BH3-10-S	10	**18 J**	ND (0.3)	**2 J (5)**	ND (0.9)
Quality Assurance/Quality Control Sample (µg/L)						
602763	T12/T42/T43-SP1-BH1-19-TB[c]	NA	ND (5.9)	ND (1.8)	ND (1.2)	ND (0.5)

Note: Values in **bold** represent detected analytes.
[a]EPA November 1986.
[b]Analysis request/chain-of-custody record.
[c]ER sample ID reflects the final site for VOC samples included in this shipment.
BH = Borehole.
DF = Drainfield.
DSS = Drain and Septic Systems.
EPA = U.S. Environmental Protection Agency.
ER = Environmental Restoration.
ft = Foot (feet).
ID = Identification.
J = Analytical result was qualified as an estimated value during data validation.
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.
MO = Mobile Office.
µg/kg = Microgram(s) per kilogram.
µg/L = Microgram(s) per liter.
NA = Not applicable.
ND ( ) = Not detected above the MDL, shown in parentheses.
S = Soil sample.
SP = Seepage pit.
TB = Trip blank.
VOC = Volatile organic compound.

Table 3.4.2-2
Summary of DSS Site 1024, MO 242-245 Septic System
Confirmatory Soil Sampling, VOC Analytical MDLs
August 1999
(Off-Site Laboratory)

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

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

Table 3.4.2-3
Summary of DSS Site 1024, MO 242-245 Septic System
Confirmatory Soil Sampling, SVOC Analytical Results
July 1998
(Off-Site Laboratory)

Sample Attributes			SVOCs (EPA Method 8270[a]) (µg/kg)
Record Number[b]	ER Sample ID	Sample Depth (ft)	
600400	MO242/245-DF1-BH1-5-S	5	ND
600400	MO242/245-DF1-BH1-10-S	10	ND
600400	MO242/245-DF1-BH2-5-S	5	ND
600400	MO242/245-DF1-BH2-10-S	10	ND
600400	MO242/245-DF1-BH3-5-S	5	ND
600400	MO242/245-DF1-BH3-10-S	10	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.
MO = Mobile Office.
ND = Not detected.
S = Soil sample.
SVOC = Semivolatile organic compound.

Table 3.4.2-4
Summary of DSS Site 1024, MO 242-245 Septic System
Confirmatory Soil Sampling, SVOC Analytical MDLs
July 1998
(Off-Site Laboratory)

Analyte	EPA Method 8270[a] Detection Limit (µg/kg)
Acenaphthene	170
Acenaphthylene	170
Anthracene	170
Benzo(a)anthracene	170
Benzo(a)pyrene	170
Benzo(b)fluoranthene	170
Benzo(g,h,i)perylene	170
Benzo(k)fluoranthene	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

Refer to footnotes at end of table.

Table 3.4.2-4 (Concluded)
Summary of DSS Site 1024, MO 242-245 Septic System
Confirmatory Soil Sampling, SVOC Analytical MDLs
July 1998
(Off-Site Laboratory)

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

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

Table 3.4.2-5
Summary of DSS Site 1024, MO 242-245 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-1260
602764	MO242/245-DF1-BH1-5-S	5	**1.9 J (3.33)**
602764	MO242/245-DF1-BH1-10-S	10	ND (0.943)
602764	MO242/245-DF1-BH2-5-S	5	**2.7 J (3.33)**
602764	MO242/245-DF1-BH2-10-S	10	ND (0.943)
602764	MO242/245-DF1-BH3-5-S	5	ND (0.943)
602764	MO242/245-DF1-BH3-10-S	10	ND (0.943)

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.
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.
µg/kg = Microgram(s) per kilogram.
MDL = Method detection limit.
MO = Mobile Office.
ND ( ) = Not detected above the MDL, shown in parentheses.
PCB = Polychlorinated biphenyl.
S = Soil sample.

Table 3.4.2-6
Summary of DSS Site 1024, MO 242-245 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
Aroclor-1221	2.82
Aroclor-1232	1.63
Aroclor-1242	1.67
Aroclor-1248	0.907
Aroclor-1254	1.16
Aroclor-1260	0.943

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

Table 3.4.2-7
Summary of DSS Site 1024, MO 242-245 Septic System
Confirmatory Soil Sampling, HE Compound Analytical Results
July 1998
(On-Site Laboratory)

Sample Attributes			HE (EPA Method 8330[a]) (mg/kg)
Record Number[b]	ER Sample ID	Sample Depth (ft)	
600399	MO242/245-DF1-BH1-5-S	5	ND
600399	MO242/245-DF1-BH1-10-S	10	ND
600399	MO242/245-DF1-BH2-5-S	5	ND
600399	MO242/245-DF1-BH2-10-S	10	ND
600399	MO242/245-DF1-BH3-5-S	5	ND
600399	MO242/245-DF1-BH3-10-S	10	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.
MO = Mobile Office.
ND = Not detected.
S = Soil sample.

Table 3.4.2-8
Summary of DSS Site 1024, MO 242-245 Septic System
Confirmatory Soil Sampling, HE Compound Analytical MDLs
July 1998
(On-Site Laboratory)

Analyte	EPA Method 8330[a] Detection Limit (mg/kg)
2-Amino-4,6-dinitrotoluene	0.11–0.13
4-Amino-2,6-dinitrotoluene	0.096–0.11
1,3-Dinitrobenzene	0.067–0.075
2,4-Dinitrotoluene	0.22–0.24
2,6-Dinitrotoluene	0.26–0.29
HMX	0.11–0.13
Nitrobenzene	0.15–0.17
2-Nitrotoluene	0.13–0.15
3-Nitrotoluene	0.13–0.15
4-Nitrotoluene	0.11–0.13
PETN	0.3–0.34
RDX	0.16–0.18
1,3,5-Trinitrobenzene	0.096–0.11
2,4,6-Trinitrotoluene	0.26–0.29

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

Table 3.4.2-9
Summary of DSS Site 1024, MO 242-245 Septic System
Confirmatory Soil Sampling, Metals Analytical Results
July 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
600399, 602764	MO242/245-DF1-BH1-5-S	5	4 J	53 J	0.065 J (0.16)	4.4 J	ND (0.0343)	3.2 J	0.041 J (0.16)	ND (0.3 J)	ND (0.04 J)
600399, 602764	MO242/245-DF1-BH1-10-S	10	3.6 J	53 J	0.077 J (0.16)	5.5 J	0.0704 J (0.201)	4.4 J	0.052 J (0.16)	ND (0.31 J)	ND (0.041 J)
600399, 602764	MO242/245-DF1-BH2-5-S	5	3.1 J	94 J	0.082 J (0.15)	4.7 J	0.0902 J (0.201)	3.8 J	0.04 J (0.15)	ND (0.29 J)	ND (0.038 J)
600399, 602764	MO242/245-DF1-BH2-10-S	10	3.2 J	53 J	0.13 J (0.16)	6.8 J	ND (0.0342)	4.7 J	0.068 J (0.16)	ND (0.31 J)	0.057 J (0.16)
600399, 602764	MO242/245-DF1-BH3-5-S	5	3.6 J	75 J	0.097 J (0.16)	8.1 J	0.0603 J (0.201)	4.2 J	0.051 J (0.16)	ND (0.3 J)	ND (0.039 J)
600399, 602764	MO242/245-DF1-BH3-10-S	10	**4.5 J**	50 J	0.1 J (0.16)	10 J	0.0592 J (0.197)	6 J	0.046 J (0.16)	ND (0.31 J)	ND (0.041 J)
Background Concentration—Southwest Area Supergroup[c]			4.4	214	0.9	15.9	1	11.8	<0.1	<1	<1

Note: Values in **bold** represent analytes detected above the background 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.
EPA = U.S. Environmental Protection Agency.
ER = Environmental Restoration.
ft = Foot (feet).
ID = Identification.
J = Analytical result was qualified as an estimated value during data validation.
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.
MO = Mobile Office.
ND = Not detected above the MDL, shown in parentheses.
S = Soil sample.

Table 3.4.2-10
Summary of DSS Site 1024, MO 242-245 Septic System
Confirmatory Soil Sampling, Metals Analytical MDLs
July 1998 and August 1999
(On- and Off-Site Laboratories)

Analyte	EPA Method 6000/7000/7196[a] Detection Limit (mg/kg)
Arsenic	0.57–0.62
Barium	0.48–0.52
Cadmium	0.038–0.041
Chromium	0.67–0.72
Chromium (VI)	0.0336–0.0343
Lead	0.29–0.31
Mercury	0.038–0.041
Selenium	0.29–0.31
Silver	0.038–0.041

[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.
MO = Mobile Office.

Table 3.4.2-11
Summary of DSS Site 1024, MO 242-245 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)	
602764	MO242/245-DF1-BH1-5-S	5	ND (0.138)
602764	MO242/245-DF1-BH1-10-S	10	ND (0.128)
602764	MO242/245-DF1-BH2-5-S	5	ND (0.138)
602764	MO242/245-DF1-BH2-10-S	10	ND (0.137)
602764	MO242/245-DF1-BH3-5-S	5	ND (0.13)
602764	MO242/245-DF1-BH3-10-S	10	**0.161 J (0.497)**

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.
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.
MO = Mobile Office.
ND ( ) = Not detected above the MDL, shown in parentheses.
S = Soil sample.

Table 3.4.2-12
Summary of DSS Site 1024, MO 242-245 Septic System
Confirmatory Soil Sampling, Total Cyanide Analytical MDLs
August 1999
(Off-Site Laboratory)

Analyte	EPA Method 9012[a] Detection Limit (mg/kg)
Total Cyanide	0.128–0.138

[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.
MO = Mobile Office.

Radionuclides

Analytical results for the gamma spectroscopy analysis of the six soil samples collected from the three drainfield summarized in Table 3.4.2-13. No activities above NMED-approved background levels for the four representative radionuclides were detected in any sample analyzed.

Gross Alpha/Beta Activity

Gross alpha/beta activity analytical results for the six soil samples collected from the three 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 duplicates, equipment blanks (EBs), and TBs. Typically, samples were shipped to the laboratory in batches of up to 20 samples, so that any one shipment might contain samples from several sites. Aqueous EB samples were collected at an approximate frequency of 1 per 20 samples and sent to the laboratory. The EB samples were analyzed for the same analytical suite as the soil samples in that shipment. The analytical results for the EB samples appear only on the data tables for the site where they were collected. However, the results were used in the data validation process for all the samples in that batch.

Aqueous TB samples, for VOC analysis only, were included in every sample cooler containing VOC soil samples. The analytical results for the TB samples appear on the VOC data tables for all 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 for DSS Site 1024 (Table 3.4.2-1).

No duplicate samples or EB 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.

Table 3.4.2-13
Summary of DSS Site 1024, MO 242-245 Septic System
Confirmatory Soil Sampling, Gamma Spectroscopy Radionuclide Analytical Results
July 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]
600401	MO242/245-DF1-BH1-5-S	5	ND (0.0158)	--	0.559	0.271	0.0460	0.0798	0.578	0.289
600401	MO242/245-DF1-BH1-10-S	10	ND (0.0154)	--	0.482	0.237	ND (0.0898)	--	0.430	0.264
600401	MO242/245-DF1-BH2-5-S	5	ND (0.0155)	--	0.595	0.293	ND (0.0894)	--	0.607	0.334
600401	MO242/245-DF1-BH2-10-S	10	ND (0.0152)	--	0.520	0.237	ND (0.0888)	--	0.442	0.294
600401	MO242/245-DF1-BH3-5-S	5	ND (0.0162)	--	0.637	0.307	ND (0.0931)	--	0.532	0.275
600401	MO242/245-DF1-BH3-10-S	10	ND (0.0171)	--	0.656	0.387	0.0433	0.0862	0.718	0.342
Background Activity—Southwest Area Supergroup[d]			0.079	NA	1.01	NA	0.16	NA	1.4	NA

[a]EPA November 1986.
[b]Analysis request/chain-of-custody record.
[c]Two standard deviations about the mean detected activity.
[d]Dinwiddie September 1997.
BH = Borehole.
DF = Drainfield.
DSS = Drain and Septic Systems.
EPA = U.S. Environmental Protection Agency.
ER = Environmental Restoration.
ft = Foot (feet).
ID = Identification.
MO = Mobile Office.
NA = Not applicable.
ND ( ) = Not detected above the minimum detectable activity, shown in parentheses.
pCi/g = Picocurie(s) per gram.
S = Soil sample.
-- = Error not calculated for nondetectable results.

Table 3.4.2-14
Summary of DSS Site 1024, MO 242-245 Septic System
Confirmatory Soil Sampling, Gross Alpha/Beta Analytical Results
July 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]
600400	MO242/245-DF1-BH1-5-S	5	5.28	2.6	21.3	3.88
600400	MO242/245-DF1-BH1-10-S	10	9.7	3.31	20.4	3.81
600400	MO242/245-DF1-BH2-5-S	5	12.4	3.71	16.9	3.77
600400	MO242/245-DF1-BH2-10-S	10	10.7	3.74	19	4.09
600400	MO242/245-DF1-BH3-5-S	5	11.2	3.47	17	3.48
600400	MO242/245-DF1-BH3-10-S	10	9.69	3.33	20.3	3.66
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.
MO = Mobile Office.
NA = Not applicable.
pCi/g = Picocurie(s) per gram.
S = Soil sample.

3.5 Site Sampling Data Gaps

Analytical data from the site assessment were sufficient for characterizing the nature and extent of possible COC releases. There are no further data gaps regarding characterization of DSS Site 1024.

This page intentionally left blank.

4.0 CONCEPTUAL SITE MODEL

The conceptual site model for DSS Site 1024, the MO 242-245 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 1024 are VOCs, SVOCs, PCBs, HE compounds, cyanide, RCRA metals, hexavalent chromium, and radionuclides. Four VOCs, one PCB compound, and cyanide were detected, and there were no SVOCs or HE compounds detected in any of the soil samples collected at this site. Aside from arsenic in one sample interval, none of the eight RCRA metals or hexavalent chromium were detected at concentrations above the approved maximum background concentrations for SNL/NM Southwest Area Supergroup soils (Dinwiddie September 1997) or above the nonquantified background concentrations. When a metal concentration exceeded its maximum background screening value, or the nonquantified background value, it was considered further in the risk assessment process. None of the four representative gamma spectroscopy radionuclides were detected at activities exceeding the corresponding background levels. Finally, no gross alpha/beta activity was detected above the New Mexico-established background levels.

4.2 Environmental Fate

Potential COCs may have been released into the vadose zone via aqueous effluent discharged from the septic system and drainfield. Possible secondary release mechanisms include the uptake of COCs that may have been released into the soil beneath the drainfield and seepage pit (Figure 4.2-1). The depth to groundwater at the site (approximately 485 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 C provides additional discussion on the fate and transport of COCs at DSS Site 1024.

Table 4.2-1 summarizes the potential COCs for DSS Site 1024. 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 1024 is industrial (DOE et al. September 1995).

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

This page intentionally left blank.

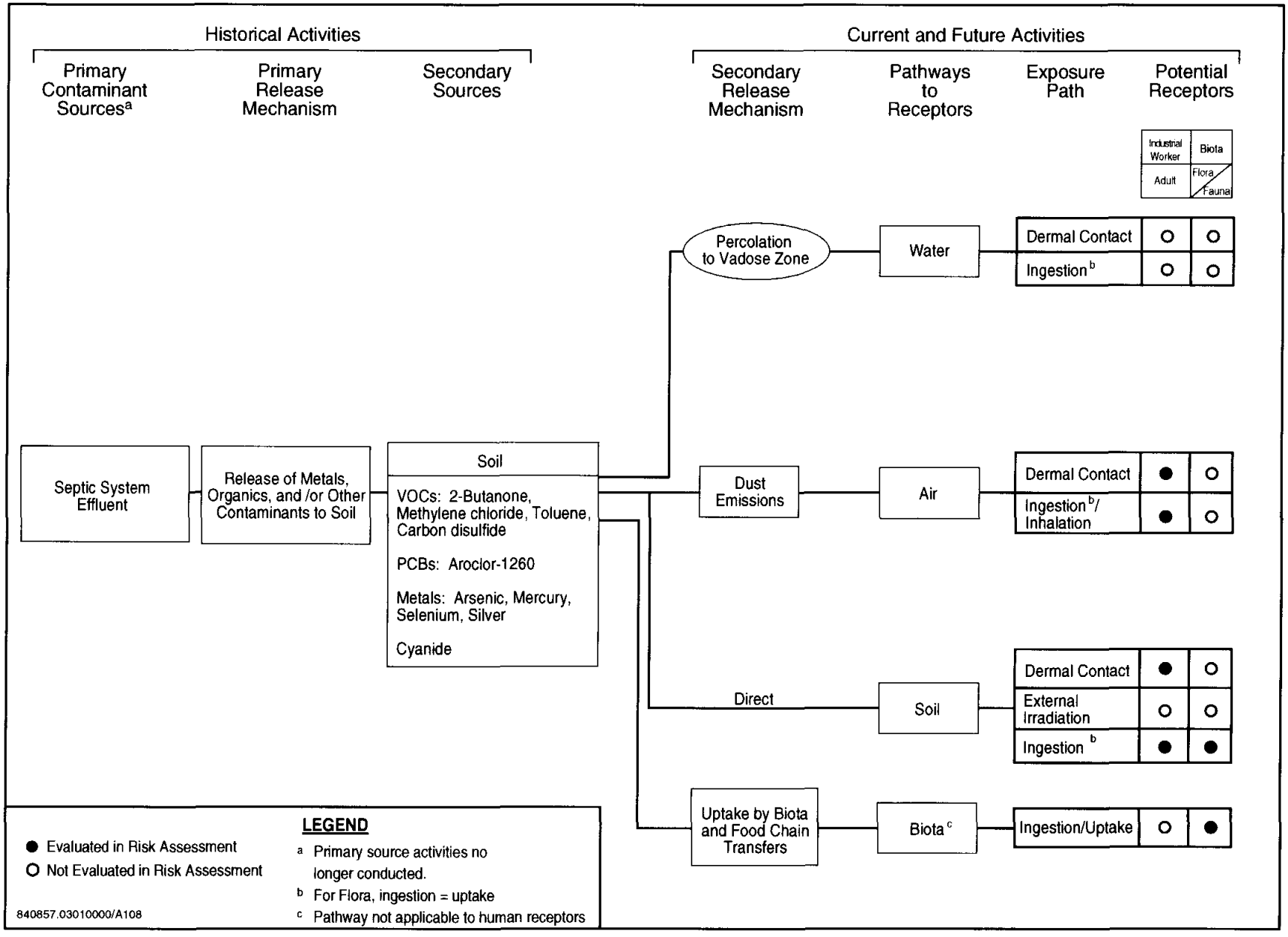


Figure 4.2-1

Conceptual Site Model Flow Diagram for DSS Site 1024, MO 242-245 Septic System

Table 4.2-1
Summary of Potential COCs for DSS Site 1024, MO 242-245 Septic System

COC Type		Number of Samples[a]	COCs Detected or with Concentrations Greater Than Background or Nonquantified Background	Maximum Background Limit/Southwest Area Supergroup[b] (mg/kg)	Maximum Concentration[c] (All Samples) (mg/kg)	Average Concentration[d] (mg/kg)	Number of Samples Where COCs Detected or with Concentrations Greater Than Background or Nonquantified Background[e]
VOCs		6	2-Butanone	NA	0.018 J	0.0067	3
		6	Carbon disulfide	NA	0.0028 J	0.0006	1
		6	Methylene chloride	NA	0.0078	0.0026	5
		6	Toluene	NA	0.0031	0.001	2
SVOCs		6	None	NA	NA	NA	None
PCBs		6	Aroclor-1260	NA	0.0027 J	0.0011	2
HE Compounds		6	None	NA	NA	NA	None
RCRA Metals		6	Arsenic	4.4	4.5 J	3.66	1
		6	Mercury	NQ	0.068 J	0.049	None
		6	Selenium	NQ	ND (0.31 J)	0.152	None
		6	Silver	NQ	0.057 J	0.029	None
Hexavalent Chromium		6	None	NA	NA	NA	None
Cyanide		6	Cyanide	NQ	0.161 J	0.083	1
Radionuclides (pCi/g)	Gamma Spectroscopy	6	None	NA	NA	NA	None
	Gross Alpha	6	None	NA	NA	NA	None
	Gross Beta	6	None	NA	NA	NA	None

[a]Number of samples includes duplicates and splits.
[b]Dinwiddie September 1997.
[c]Maximum concentration is either the maximum amount detected, or if nothing was detected, the maximum MDL or MDA above background or nonquantified background.
[d]Average concentration includes all samples except blanks. The average is calculated as the sum of detected amounts and one-half of the MDLs for nondetect results, divided by the number of samples.
[e]See appropriate data table for sample locations.

COC = Constituent of concern.
DSS = Drain and Septic Systems.
HE = High explosive(s).
J = Estimated concentration.
MDA = Minimum detectable activity.
MDL = Method detection limit.
mg/kg = Milligram(s) per kilogram.
MO = Mobile Office.
NA = Not applicable.
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.

Potential biota receptors include flora and fauna at the site. Major exposure routes for biota include direct soil ingestion, ingestion of COCs through food chain transfers, and direct contact with COCs in the soil. Annex C provides additional discussion of the exposure routes and receptors at DSS Site 1024.

4.3 Site Assessment

Site assessment at DSS Site 1024 included risk assessments for both human health and ecological risk. This section briefly summarizes the site assessment results, and Annex C discusses the risk assessment performed for DSS Site 1024 in more detail.

4.3.1 Summary

The site assessment concluded that DSS Site 1024 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 1024. This section summarizes the results.

4.3.2.1 Human Health

DSS Site 1024 has been recommended for an industrial land-use scenario (DOE et al. September 1995). Because VOCs, PCBs, cyanide, arsenic, mercury, selenium, and silver are present above background or nonquantified background levels, it was necessary to perform a human health risk assessment analysis for the site, which included these COCs. Annex C 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 the industrial and residential land-use scenarios.

The HI calculated for the COCs at DSS Site 1024 is 0.02 under the industrial land-use scenario, which is less than the numerical standard of 1.0 suggested by risk assessment guidance (EPA 1989). The incremental HI risk, determined by subtracting risk associated with background from potential nonradiological COC risk (without rounding), is 0.00. The excess cancer risk for DSS Site 1024 COCs is 3E-6 under an industrial land-use scenario. NMED guidance states that cumulative excess lifetime cancer risk must be less than 1E-5 (Bearzi January 2001); thus the excess cancer risk for this site is below the suggested acceptable risk value. The incremental excess cancer risk is 1.13E-7. Both the incremental HI and excess cancer risk are below NMED guidelines.

The HI calculated for the COCs at DSS Site 1024 is 0.21 under 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 0.01. The excess cancer risk for DSS Site 1024 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 3.65E-7. Both the incremental HI and incremental excess cancer risk are below NMED guidelines.

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

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

Table 4.3.2-1
Summation of Radiological and Nonradiological Risks from
DSS Site 1024, MO 242-245 Septic System Carcinogens

Scenario	Nonradiological Risk	Radiological Risk	Total Risk
Industrial	1.13E-7	0.0	1.13E-7
Residential	3.65E-7	0.0	3.65E-7

DSS = Drain and Septic Systems.
MO = Mobile Office.

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 U.S. Environmental Protection Agency's Ecological Risk Assessment Guidance for Superfund (EPA 1997) 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 C, 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 C presents the results of the ecological risk assessment. Site-specific information was incorporated into the risk assessment when such data were available. No hazard quotients greater than 1 were originally predicted. 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 1024 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 1024 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 1024 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 1024 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).

This page intentionally left blank.

6.0 REFERENCES

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

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

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

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

DOE, see U.S. Department of Energy.

EPA, see U.S. Environmental Protection Agency.

IT, see IT Corporation.

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

Jones, J. (Sandia National Laboratories/New Mexico), June 1991. Internal Memorandum to D. Dionne listing the septic tanks that were removed from service with the construction of the Area III sanitary sewer system. June 21, 1991.

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

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

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

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

NMED, see New Mexico Environment Department.

NOAA, see National Oceanic and Atmospheric Administration.

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

Sandia National Laboratories/New Mexico (SNL/NM), April 1991. "Sandia National Laboratories Septic Tank Characterization Summary Tables of Analytical Results for Detected Parameters, Technical Area III and Coyote Canyon Test Field, April 1991," Sandia National Laboratories, Albuquerque, New Mexico.

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

This page intentionally left blank.

ANNEX A
DSS Site 1024
Septic Tank Sampling Results

This page intentionally left blank.

4-17-91

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

DB Dionne

4-17-91

Nick Durand,

For your information.

David Dionne

TABLE 27

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

BUILDING MO 242 - 245

SAMPLE NUMBERS SNLA004897, SNLA004898

Parameter	Results	Units
VOLATILE ORGANICS		
Acetone*	21	µg/l
Toluene	5.1	µg/l
SEMIVOLATILE ORGANICS		
Phenol*	200	µg/l
4-Methylphenol*	440	µg/l
Benzoic Acid*	740	µg/l
INORGANICS		
Oil and Grease	0.71	mg/l
Phenolics	0.21	mg/l
METALS		
Barium	.50	mg/l
Copper	0.59	mg/l
Lead	0.0073	mg/l
Manganese	0.11	mg/l
Mercury	0.00093	mg/l
Zinc	0.51	mg/l
RADIOLOGICAL		
Gross Beta	49	pCi/l
Tritium	9.2	pCi/ml
Plutonium 239/240	1.1	pCi/l

*Not on total toxic organics list

Mobile Offices 242-245
Area 3
Sample ID No. SNLA008576
Tank ID No. AD89028R

On July 28, 1992, a sludge sample was collected for radiochemical analysis from the septic tank serving Mobile Offices 242-245. During review of the radiological data, no parameters were detected that exceeded U.S. Department of Energy derived concentration guidelines or the sewage investigation levels established during this investigation.

Results of Septic Tank Analyses (Sludge Sample)	
Building No./Area:	**MO 242-245 A-3**
Tank ID No.:	**AD89028R**
Date Sampled:	**7/28/92**
Sample ID No.:	**SNLA008576**

Analytical Parameter	Measured Concentration	± 2 Sigma Uncertainty	Units
Gross Alpha	0	12	pCi/g
Gross Beta	42	56	pCi/g
Gross Alpha	4	16	pCi/g
Gross Beta	33	42	pCi/g
Gross Alpha	0	9	pCi/g
Gross Beta	34	34	pCi/g
Gross Alpha	16	17	pCi/g
Gross Beta	17	34	pCi/g
Tritium	-1E+02	3E+02	pCi/L
Bismuth-214	<0.0252	NA	pCi/mL
Cesium-137	<0.00982	NA	pCi/mL
Potassium-40	0.670	0.0711	pCi/mL
Lead-212	0.0463	0.00682	pCi/mL
Lead-214	0.0572	0.00835	pCi/mL
Radium-226	0.296	0.0648	pCi/mL
Thorium-234	<0.154	NA	pCi/mL
Thallium-208	0.0143	0.00309	pCi/mL

ND = Not Detected
NA = Not Applicable

RESULTS OF SEPTIC TANK SAMPLING

CHEMICAL ANALYSES OF AQUEOUS SAMPLE

Building ID: Bldg MO242-245

Sample ID Number: 024419

Date Sampled: 7-18-95

Parameter (Method)	Result	Detection Limit (DL)	NM Discharge Limit[a]	COA Discharge Limit[b]	Comments
Volatile Organics (8260)	*(mg/L)*	*(mg/L)*	*(mg/L)*	*(mg/L)*	
Acetone	0.006BJ	0.010	NR	NR	
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)*	
gamma-BHC (Lindane)	0.00009	0.00005	NR	TTO = 5.0	
Metals (6010/7470)	*(mg/L)*	*(mg/L)*	*(mg/L)*	*(mg/L)*	
Arsenic	ND	0.010	0.1	2.0	
Barium	0.050J	0.200	1.0	20.0	
Cadmium	ND	0.005	0.01	2.8	
Chromium	ND	0.020	0.05	20.0	
Copper	0.028	0.025	1.0	16.5	
Lead	ND	0.003	0.05	3.2	
Manganese	0.049	0.015	0.2	20.0	
Nickel	0.039J	0.040	0.2	12.0	
Selenium	ND	0.005	0.05	2.0	
Silver	ND	0.010	0.05	5.0	
Thallium	0.0066J	0.010	NR	NR	
Zinc	0.038	0.020	10.0	28.0	
Mercury	ND	0.0002	0.002	0.1	
Miscellaneous Analyses	*(mg/L)*	*(mg/L)*	*(mg/L)*	*(mg/L)*	
Field pH	Not recorded	0 - 14 pH units	6 – 9 pH units	5 – 11 pH units	
Formaldehyde (NIOSH 3500)	2.4	0.50	NR	260.0	
Fluoride (300.0)	ND	0.10	1.6	180.0	
Nitrate + Nitrite (353.1)	6.620	1.000	10.0	NR	

Refer to footnotes at end of table.

RESULTS OF SEPTIC TANK SAMPLING

CHEMICAL ANALYSES OF AQUEOUS SAMPLE

Building ID: Bldg MO242-245

Sample ID Number: 024419

Date Sampled: 7-18-95

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)	ND	1.0	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 MO242-245

Sample ID Number: 024419

Date Sampled: 7-18-95

Parameter (Method)	Result	MDA	Critical Level	NM Discharge Limit[a]	Comments
Radiological Analyses	*(pCi/L ± 2-σ)*	*(pCi/L)*	*(pCi/L)*	*(pCi/L)*	
Gross Alpha (9310)	3.20 ± 3.19	4.94	2.18	NR	
Gross Beta (9310)	7.65 ± 2.58	4.09	1.98	NR	
Isotopic Analyses	*(pCi/L ± 2-σ)*	*(pCi/L)*	*(pCi/L)*	*(pCi/L)*	
Tritium (906.0)	-13.9 ± 52.6	89.8	44.4	NR	
Uranium-238[b]	0.70 ± 0.28	0.11	0.085	NR	
Uranium-235/236[b]	0.022 ± 0.053	0.12	0.095	NR	
Uranium-234[b]	1.47 ± 0.45	0.13	0.092	NR	
Gamma Spectroscopy[c]	*(pCi/mL ± 2-σ)*	*(pCi/mL)*	*(pCi/L)*	*(pCi/L)*	
Potassium-40	2.08E-01 ± 1.37E-01	1.97E-01	NL	NR	

Notes:
[a] New Mexico Water Quality Control Commission Regulations (1990), Section 3-103.
[b] Isotopic uranium analyzed by NAS-NS-3050.
[c] Analyzed in-house by SNL/NM Department 7715.
MDA = Minimum detectable activity.
ND = Not detected above MDA indicated.
NL = Not listed.
NR = Not regulated.

RESULTS OF SEPTIC TANK SAMPLING
CHEMICAL ANALYSES OF SLUDGE SAMPLE

Building ID: Bldg MO242-245
Sample ID Number: 024419
Date Sampled: 7-18-95
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)*	
Toluene	720	50	0.75	TTO = 5.0	
Semivolatile Organics (8270)	*(µg/kg)*	*(µg/kg)*	*(mg/L)*	*(mg/L)*	
bis(2-Ethylhexyl)Phthalate	410J	990	NR	TTO = 5.0	
Pesticides/PCBs (8080)	*(µg/kg)*	*(µg/kg)*	*(mg/L)*	*(mg/L)*	
Aldrin	8.2	1.7	NR	TTO = 5.0	
4,4'-DDD	4.0	3.3	NR	TTO = 5.0	
Metals (6010/7470)	*(mg/kg)*	*(mg/kg)*	*(mg/L)*	*(mg/L)*	
Arsenic	ND	1.0	0.1	2.0	
Barium	49.5	20	1.0	20.0	
Cadmium	ND	0.50	0.01	2.8	
Chromium	0.94J	2.0	0.05	20.0	
Copper	54.4	2.5	1.0	16.5	
Lead	1.1	0.30	0.05	3.2	
Manganese	9.2	1.5	0.2	20.0	
Nickel	ND	4.0	0.2	12.0	
Selenium	ND	0.50	0.05	2.0	
Silver	0.24J	1.0	0.05	5.0	
Thallium	ND	1.0	NR	NR	
Zinc	70.5	2.0	10.0	28.0	
Mercury	0.72	0.10	0.002	0.1	

Refer to footnotes at end of table.

RESULTS OF SEPTIC TANK SAMPLING

CHEMICAL ANALYSES OF SLUDGE SAMPLE

Building ID: Bldg MO242-245

Sample ID Number: 024419

Date Sampled: 7-18-95

Percent Moisture: Not Reported

Parameter (Method)	Result	Detection Limit (DL)	NM Discharge Limit[a]	COA Discharge Limit[b]	Comments

Notes:

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

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

DL = Detection limit indicated on laboratory report.

IDL = Instrument detection limit.

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

ND = Not detected above DL indicated.

NR = Not regulated.

TTO = Total toxic organics.

RESULTS OF SEPTIC TANK SAMPLING

RADIOLOGICAL ANALYSES OF SLUDGE SAMPLE

Building ID: Bldg MO242-245
Sample ID Number: 024419
Date Sampled: 7-18-95
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	0.002 ± 0.006	0.018	0.012	NR	
Plutonium-238	0.0004 ± 0.0064	0.020	0.013	NR	
Strontium-90	-0.12 ± 0.01	0.48	0.23	NR	
Thorium-232	0.060 ± 0.034	0.023	0.017	NR	
Thorium-230	0.11 ± 0.05	0.025	0.018	NR	
Thorium-228	0.27 ± 0.09	0.040	0.026	NR	
Uranium-238	4.33 ± 0.78	0.024	0.016	NR	
Uranium-235/236	1.40 ± 0.28	0.025	0.018	NR	
Uranium-234	7.08 ± 1.25	0.029	0.019	NR	
Dry Gamma Spectroscopy[f]	*(pCi/g ± 2-σ)*	*(pCi/g)*	*(pCi/g)*	*(pCi/g)*	
Cesium-137	ND	0.035	0.017	NR	
Cesium-134	ND	0.030	0.014	NR	
Potassium-40	5.01 ± 0.85	0.34	0.16	NR	
Chromium-51	ND	0.26	0.12	NR	
Iron-59	ND	0.072	0.034	NR	
Cobalt-60	ND	0.035	0.016	NR	
Zirconium-95	ND	0.059	0.028	NR	
Ruthenium-103	ND	0.031	0.015	NR	
Ruthenium-106	ND	0.28	0.14	NR	
Cerium-144	ND	0.19	0.092	NR	
Thallium-208	0.19 ± 0.04	0.03	NL	NR	
Lead-212	0.51 ± 0.07	0.04	0.021	NR	
Lead-214	0.14 ± 0.05	0.06	0.030	NR	
Bismuth-212	0.35 ± 0.23	0.24	NL	NR	
Bismuth-214	0.17 ± 0.07	0.07	NL	NR	
Radium-224	1.01 ± 0.56	0.55	NL	NR	

Refer to footnotes at end of table.

RESULTS OF SEPTIC TANK SAMPLING

RADIOLOGICAL ANALYSES OF SLUDGE SAMPLE

Building ID: Bldg MO242-245

Sample ID Number: 024419

Date Sampled: 7-18-95

Percent Moisture: Not Reported

Parameter (Method)	Result	MDA	Critical Level	NM Discharge Limit[a]	Comments
Dry Gamma Spectroscopy[c]	*(pCi/g ± 2-σ)*	*(pCi/g)*	*(pCi/g)*	*(pCi/g)*	
Radium-226	0.15 ± 0.04	0.07	0.033	30.0[d]	
Radium-228	0.50 ± 0.11	0.11	0.051	30.0[d]	
Actinium-228	0.50 ± 0.11	0.11	0.051	NR	
Thorium-231	ND	0.91	0.44	NR	
Thorium-232	0.50 ± 0.11	0.11	0.051	NR	
Thorium-234	2.75 ± 0.61	0.48	0.24	NR	
Uranium-235	0.25 ± 0.05	0.22	0.11	NR	
Uranium-238	2.75 ± 0.61	0.48	0.24	NR	
Americium-241	ND	0.10	0.050	NR	

Notes:

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

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

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

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

MDA = Minimum detectable activity.

ND = Not detected above MDA indicated.

NR = Not regulated.

ANNEX B
DSS Site 1024
Soil Sample Data Validation Results

This page intentionally left blank.

HE-028

High Explosives by Capillary Electrophoresis QC Check List

Analyst: Jim Barnett Date: 7/16 - 7/18/98

Peer Reviewer: Linda Kear Date: 8/10/98

Instrument Run Date: 7/16-7/18/98 Instrument Run ID#:

Instrument-related QC:		
[1] Did ICAL pass?	Yes[✓] No[ ]	and all Pearson Coefficients > 0.995
[2] Calibration Slopes Correct?	Yes[✓] No[ ]	Are the slopes from the ICAL cut and pasted correctly into the CCV calculations?
[3] Did bracketing CCV pass?	Yes[ ] No[✓]	Target analytes recovered ~~80-110%~~ 85-115%, bracketing CCV every 10 samples
Batch-related QC:	(A batch is less than or equal to 20 samples)	
[4] Did Surrogates Recover?	Yes[✓] No[ ]	Recovery should be inside charted range.
[5] Did LMB Pass?	Yes[✓] No[ ]	All analytes < PQL. Must prepare and analyze at least one LMB with each batch.
[6] Did LCS Pass?	Yes[✓] No[ ]	All analytes recovered 80-120%. Must prepare and analyze at least one LCS with each batch of up to 20 samples.
[7] Did MS/MSD %REC Pass?	Yes[✓] No[ ]	All analytes recovered 75-125% Must prepare and analyze an MS and MSD with each batch.
[8] Did MS/MSD RPD's Pass?	Yes[✓] No[ ]	All analytes recovered less than +/- 20%
Sample-related QC:		
[9] Analytes inside Calibration?	Yes[✓] No[ ]	Target analytes must be bracketed by calibration values or valid LRS.
[10] Migration Times?	Yes[✓] No[ ]	Are migration times reasonable compared to bracketing CCV's and batch related QC such as LCS and MS/MSD?

(3) CCV %rec. low for Tetryl on "Stds 1649" but has no effect to data because tetryl is not a compd which is reported

KCKH, 61, W

Metals by ICP-MS QC Check List

Analyst:	Linda Kear **Date:** 7/15 98	**NCAR#:**	98-107
Peer Reviewer:	Kathleen Swenson **Date:** 7/31/98	**Preparation Batch ID#:**	519822
Standards:		**Instrument Run Date:**	7/15 98
Cal Level 0 (ICB, CCB)	51-14	**Instrument Run ID#:**	519822
Cal Level 1	61-17	**ICS-A**	136-05
Cal Level 2	71-09	**ICS-AB**	146-09
Cal Level 3	81-09	**LRS**	118-01
Cal Level 4	N/A	**ISS**	156-02
ICV, CCV	106-08	**ICP-TUNE**	171-08

Instrument-related QC:

[1] Did Tune Pass?	Yes[✓]	No[ ]	4 reps < 5% RPD for internal standards Li, Y, In, Bi
[2a] Did ICV pass?	Yes[✓]	No[ ]	Target analytes recovered 90-110%
[2b] Did ICB Pass?	Yes[✓]	No[ ]	All analytes < PQL
[2c] Did CCV pass?	Yes[✓]	No[ ]	Target analytes recovered 90-110%
[2d] Did CCB Pass?	Yes[✓]	No[ ]	All analytes < PQL
[2e] Did ISS recovery pass?	Yes[✓]	No[ ]	Internal standards 60-125% of initial calibration values
[3] Did ICS_A's Pass?	Yes[✓]	No[ ]	All analytes not present < PQL
[4] Did ICS_AB's Pass?	Yes[✓]	No[ ]	All analytes present recovered 80-120%
[5] Did LRS pass?	Yes[✓]	No[ ]	Linear dynamic range check (if run) must agree to 95-105% of stated value to validate beyond calibration values

Batch-related QC: (A batch is less than or equal to 20 samples) ≥ MDL

[6] Did LMB Pass?	Yes[ ]	No[✓]	All analytes <~~PQL~~ MDL. Must prepare and analyze at least one LRB with each batch.
[7] Did LCS/LCSD Pass?	Yes[ ]	No[✓]	All analytes recovered 80-120%. Must prepare and analyze at least one LCS with each batch.
[8] Did MS/MSD Pass?	Yes[ ]	No[✓]	All analytes recovered 75-125%. Recovery not required if spike < 30% of sample analyte level Must prepare and analyze an MS and MSD with each batch.
[9] Did M/MDup Pass?	Yes[ ]	No[✓]	All analytes RPD 20% at 5 times the PQL. Must prepare and analyze at least one with each batch
[10] Did M/Mdil Pass?	Yes[✓]	No[ ]	All analytes > 10X the MDL in the 5X dilution agree 90-110% with the undiluted reference. Must prepare and analyze at least one with each batch.
[11] Digestion Problems?	No[✓]	Yes[ ]	Digestion 3015, 3051 problems?

Sample-related QC:

[11] Did sample ISS pass?	Yes[✓]	No[ ]	Internal standards >= 60% or <= 125% or sample must be rerun at a 5X dilution.
[12] Analytes inside Calibration?	Yes[✓]	No[ ]	Target analytes must be bracketed by calibration values or valid LDR.
[13] Analyte carryover OK?	No[✓]	Yes[ ]	Using the sequence order, was carry over contamination probable?

Note: When the HP Enviroquant software refers to an IDL, we are using the ERCL MDL; when it refers to a CRDL, we are using the ERCL PQL which is 4 times the MDL

(6) LMB is ok. As present at a level slightly above the MDL, but less than the PQL, samples will have a "B" qualifier by AS

(7) LCS the recovery is 2x higher than it is supposed to be. This is due to this batch being spiked with improperly prepared ICAL-3 solution. The problem has been fixed so it will not occur.

(8) MS recoveries high for Ba & Hg. The Hg is due to the spike problem mentioned in (7) above. ~~The~~ All MSD recoveries are low, which leads to poor RPDs. Because the low values are consistent for all elements, this points to error during sample prep (too little spike added). Note that all MPS recoveries (except Hg which is 2x too high) are good; the ~~s~~ sparing data is not compromised.

(9) MDup RPD high out of criteria for Ba, most likely due to sample nonhomogeneity.

Received by QA 8/4/98

11C of 4

VOC Peer Review Check List

Batch ID: 5VOC-044

Did BFB Pass?	Yes ☑	No ☐	
Did the ICAL Pass %RSD ≤ 30%	Yes ☐	No ☐	
Did the ICAL and CCV pass:			
± 20% recovery for the individual analytes?	Yes ☐	No ☒	See NCR
Calibration Check Compounds in criteria?	Yes ☐	No ☐	Case Narrative
System Performance Check Compounds in criteria?	Yes ☑	No ☐	
Did the blank pass?	Yes ☑	No ☐	
Did the MS/MSD pair pass accuracy and precision and criteria?	Yes ☑	No ☐	
Did LCS pass accuracy criteria?	Yes ☑	No ☐	N/A ☐
Were all IS areas within a factor of 2 of the average area in the ICAL	Yes ☑	No ☐	
Did Retention Times remain inside windows for all standards and samples?	Yes ☑	No ☐	
Did all surrogates pass criteria for each standard and sample?	Yes ☑	No ☐	

Check for:

Carry-over contamination	OK ☑
Correct interpretation of mass spectra	OK ☑
Errors in data entry, rounding and/or calculations	OK ☑

Reviewed by: Kathleen Swinson Date: 5/16/96

QA Officer Review Checklist

SNL/NM Environmental Restoration Chemistry Laboratory

	YES	NO	Comments
1. Samples were preserved and handled in accordance with QAPjP and LOPs	✓		
2. The appropriate number and type of laboratory QC check samples were analyzed	✓		
3. Laboratory QC checks met the established acceptance criteria		✓	See Case Narrative
4. Deviations from analytical methods are documented	N/A		
5. Data package is complete, per section 10.4 of the ERCL QAPjP	✓		

Data Package Checklist

	YES	NO	Comments
Date of Issue	✓		
Case Narrative	✓		
Description of data package	✓		
Index of samples, including sampling ID and laboratory ID	✓		
Description of any problems encountered in analysis	✓		
Circumstances leading to the use of data qualifiers	✓		
Type of digestion used for general inorganic analysis of soil samples	✓		
Analytical results for each sample - must include the parameter name, the parameter value, uncertainty value (where applicable), MDL and PQL, units of measure, data qualifier(s), method of analysis, and analysis date	✓		
Calibration ranges	✓		
QC Summaries	✓		
Surrogate data	✓		
Matrix spike or LCS recovery data for accuracy	✓		
MS/MSD or LCS/LCSD for precision	✓		
Method or reagent blank data	✓		
QA review documentation:	✓		
QA Officer Review Checklist	✓		
Electronic copy of the analytical data	✓		
COC	✓		

Data Package COC No. 600399 Reviewed by Margie Marley Date 8/25/98

'ocument\ercl\reports\qacheck.doc

TOP 94-03
Rev. 1
Attachment A
November 1995

Signed 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.: 600399 | 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 with submitted samples		
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: 10/15/98 Closed by: _____ Date: _____

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

Project Name 101 Nav-ER Septic Fields

Case Number 7223.230

Sample Numbers ER-1295-M0242-DF1-BH1(2,3)-5(10)-S

AR/COC No. 600399 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?		✓	S198-22 ⇒ Hg (biased high) ①
b) Surrogate data reported and met for all organic samples analyzed by a gas chromatography technique?	✓		

Reviewed by: Jeffrey A. Rabe

Date: 10/15/98

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?		—	S198-22 ⇒ Cr, Ba, Pb and Hg ②
6) Precision a) Laboratory control sample precision reported and met for all samples?	NA		Not applicable; LCS duplicate was not analyzed with the submitted samples
b) Matrix spike duplicate RPD data reported and met for all samples for which it was requested?		—	S198-22 ⇒ As, Ba, Cd, Cr, Hg, Pb, Ag and Se ②
7) Blank data a) Method or reagent blank data reported and met for all samples?		—	S198-22 ⇒ "J" value reported For As ③
b) Sampling blank (e.g., field, trip, and equipment) data reported and met?	NA		Not applicable
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.

② The percent recovery for mercury was biased high in the LCS (S198-22).

Reviewed by: Jeffrey J. Rabe

Date: 10/15/98

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

2.0 COMMENTS CONTINUATION SHEET

② The following analytes were outside of QC windows for percent recovery in the MS and MSD samples: MS ⇒ Ba and Hg (biased high), MSD ⇒ Ba and Pb (biased low) and Hg (biased high). Relative percent difference values were outside of QC windows for all RCRA analytes (biased high)

③ "J" value was reported for arsenic in the metals LMB (SI98-22). All detected results were greater than or equal to 5x the blank contamination.

JR
10/15/98

Reviewed by: Jeffrey J. Rabe

Date: 10/15/98

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

see page 5 of 5 JP 10/15/98

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 T. Rabe

Date: 10/15/98

SAMPLE FINDINGS SUMMARY

Site: 101 Non-ER Septic Fields

AR COC: 600399 Data Classification: DV-2

Sample Fraction No.	Analysis	DV Qualifiers	Comments
ER-1295-M0242-DF1-	7440-22-4	UJ, P1	* Sample # ER-1295-M0242-DF1-BH2-10-S should be qualified J, P1
BH 1-5-S BH 1-10-S	7440-38-2	J, P1	
BH2-5-S BH2-10-S	7440-39-3	J A2, P1	
BH 3-5-S BH3-10-S	7440-43-9	J, P1	
(All samples submitted for metals analysis)	7440-47-3	J A2, P1	
	7439-97-6	J, A A2, P1	
	7439-92-1	J A2, P1	
	7782-49-2	UJ, P1	
	10/15/98 JR		

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. Rake Date: 10/15/98

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.

144826

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

Internal Lab Batch No.

ANALYSIS REQUEST AND CHAIN OF CUSTODY

SAR/WR No.

AR/COC- 600399

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

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

Contract No.:
Case No.: 7223,230
SMO Authorization _____
Bill to: Sandia National Laboratories
Supplier Services, Dept. _____
P.O. Box 5800 MS 0154

Fridge 3 shelf 5

Fridge 4 shelf 3

Location Tech Area III
Building MO242 Room

Reference LOV (available at SMO)

Sample No. - Fraction	ER Sample ID or Sample Location Detail	Beginning Depth in Ft.	ER Site No.	Date/Time Collected	Sample Matrix	Container Type	Container Volume	Preservative	Sample Collection Method	Sample Type	Parameter & Method Requested	LAB USE Lab Sample ID
041285-001	ER-1295-MO242-DF1-BH1-5-S	5	N/A	7/6/98 0915	S	AC	300ml	4C	G	SA	VOCs (8260)	
041286-001	ER-1295-MO242-DF1-BH1-10-S	10	N/A	7/6/98 1030	S	AC	300ml	4C	G	SA	VOCs (8260)	
041287-001	ER-1295-MO242-DF1-BH2-5-S	5	N/A	7/6/98 1140	S	AC	300ml	4C	G	SA	VOCs (8260)	
041288-001	ER-1295-MO242-DF1-BH2-10-S	10	N/A	7/7/98 0755	S	AC	300ml	4C	G	SA	VOCs (8260)	
041289-001	ER-1295-MO242-DF1-BH3-5-S	5	N/A	7/7/98 0830	S	AC	300ml	4C	G	SA	VOCs (8260)	
041290-001	ER-1295-MO242-DF1-BH3-10-S	10	N/A	7/7/98 0920	S	AC	300ml	4C	G	SA	VOCs (8260)	
041285-004	ER-1295-MO242-DF1-BH1-5-S	5	N/A	7/6/98 0915	S	G	125ml	4C	G	SA	RCRA Metals, HE(8330)	
041286-004	ER-1295-MO242-DF1-BH1-10-S	10	N/A	7/6/98 1030	S	G	125ml	4C	G	SA	RCRA Metals, HE(8330)	
041287-004	ER-1295-MO242-DF1-BH2-5-S	5	N/A	7/6/98 1140	S	G	125ml	4C	G	SA	RCRA Metals, HE(8330)	
041288-004	ER-1295-MO242-DF1-BH2-10-S	10	N/A	7/7/98 0755	S	G	125ml	4C	G	SA	RCRA Metals, HE(8330)	

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

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

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

Abnormal Conditions on Receipt LAB USE

Turnaround Time XNormal ☐Rush Required Report Date

QC Inits.

	Name	Signature	Init	Company/Organization/Phone
Sample Team Members	Chris Catechis	Chris Catechis	CC	MDN/6131/884-3946
	CHRIS SEAL	Phillip Lear	PL	SNL/6134/844-1136

Please list as separate report.

1. Relinquished by	Phillip Lear	Org. 6131	Date 7/7/98	Time 1518	4. Relinquished by	Org.	Date	Time
1. Received by	[signature]	Org. 6133	Date 7/7/98	Time 1514	4. Received by	Org.	Date	Time
2. Relinquished by		Org.	Date	Time	5. Relinquished by	Org.	Date	Time
2. Received by		Org.	Date	Time	5. Received by	Org.	Date	Time
3. Relinquished by		Org.	Date	Time	6. Relinquished by	Org.	Date	Time
3. Received by		Org.	Date	Time	6. Received by	Org.	Date	Time

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

SF 2001-COC (10-97)

Supersedes (5-97) issue

ANALYSIS REQUEST AND CHAIN OF CUSTODY (Continuation)

Press F1 for instructions for each field.

AR/COC- 600399

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

Location | Tech Area III | Building MO242 | 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
041289-004	ER-1295-MO242-DF1-BH3-5-S	5	N/A	7/7/98 0830	S	G	125ml	4C	G	SA	RCRA Met, HE(8330)	
041290-004	ER-1295-MO242-DF1-BH3-10-S	10	N/A	7/7/98 0820	S	G	125ml	4C	G	SA	RCRA Met, HE(8330)	

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 (Pink)

SAMPLE FINDINGS SUMMARY

Site: NON ER SEPTIC TANKS

AR/COC: 600400 600429 600550 Data Classification: INORGANICS

Sample Fraction No.	Analysis	DV Qualifiers	Comments
~~041477-003~~	~~Pb~~	~~J~~	~~@ 0.0984 mg/kg J.~~
ER-12795-M0231-OF1-B	Ag	U J-us	~~0.162 mg/kg~~ Detection Limit 0.595 mg/kg
ER-12795-M0231-OF1-B Hits	BA	R+J	MS out 60.9 with window (67.0 - 131) MSD 51 (67-131)
"	All	B_3	~~Numerous Analytes detected in each CCB (1-13)~~
"	~~As, Cd, Cr, Cu, Pb, Hg, Se, Ag~~ EN	A_2	~~CRDL STANDARD FOR ICP All out of limits except for Pb.~~
	DATA IS	ACCEPTABLE	

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: 12/29/98

[signature] 1/8/99

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: Non ER Septic Tanks
CASE NO.: 7223.2300
ANALYTICAL LABORATORY: GEL
SAMPLE IDS:
LABORATORY REPORT #: 9807247 A,B,C,
AR COC's 600400
TASK LEADER: A Roybal
600429
NO. OF SAMPLES: 14 soils.
600510

DATA ASSESSMENT SUMMARY CVAA

		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)

ACTION ITEMS: None

AREAS OF CONCERN: None — Except ICB1/CCB1 → B detected small amounts of analyte in Blank - Does Not significantly impact data, Case narrative not supported by reported QC report for serial dilution and LCS/LCSD deficiencies written in narrative. Task leader may need to seek revised case narrative.

REVIEWED BY: D Bennett

DATE REVIEWED: 12/29/98

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

ACTION ITEMS: _____

AREAS OF CONCERN: _____

Page 1 of 4

OVERALL DATA QUALITY ASSESSMENT _____

Reviewed By: D Bennett Date: 12/29/98

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

CVR FORM criteria met

Were the correct preservatives used? Yes ☐ No ☐

List below samples that were incorrectly preserved.

Sample No.	Type of Samples	Deficiency	Action

Reviewed By: [signature] Date: 12/29/98

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: _____
Mercury: _____
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
7/15/98	ICV 11	Cadmium	112.4	J	041471-003
↓	↓	Chromium	110.4	J	↓
		Lead	111.2	J	
↓	↓	Selinium	110.1	J	↓

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: W Daniel Date: 12/27/98

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
		criteria		
	met			

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
7/15/98	ICB1/CCB4,5	Hg		0.6 ug/L	J	04/1471-003
	CCB1/CCB3,6	Cu / Hg		2.5 / 0.6		
	CCB2	BA, Cu, Pb, Hg		50/2.5/5.0/0.6		
	CCB7	Cu		2.5		
	CCB8	BA, Pb		50/5.0		
	CCB11	BA		5.0		
	CCB12	As		5.0		
	CCB13	Se		5.0		

Reviewed By: _____ Date: 12/29/98

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
7/15/98	LEAD	0.0984	4.2	7439-92-1	041471-003
"	SILVER	0.0162	0.7	7440-22-4	"

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

Affected samples: _____

Reviewed By: _____ Date: 12/29/98

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 ARCOC				

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 ☐ NA

Reviewed By: _____ Date: 12/27/98

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:

Date	Analyte	%R	Action	Samples Affected
			N/A	

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: _____ Date: 12/29/98

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: W Brinck Date: 12/29/98

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

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 ☐

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 ☒

Reviewed By: _____ Date: 12/29/98

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
041471-003	Soil	7/9/98	60.9	(67.0-131)	J	A
	Barium					

12/29/98

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 ☐

Reviewed By: _____ Date: 12/29/98

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
041471-003	~~Soil~~ Soil	7/15/98	BA	60.9	(67.0-131)	1

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: _____ Date: 12/29/98

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 NA

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: D Brunell Date: 12/29/98

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 ☐

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

Check for calculation errors and negative interferences.

Reviewed By: W Brunell Date: 12/28/98

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 ☐ NA

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 ☐ NA

Are ICP Linear Ranges established and verified quarterly? Yes ☐ No ☐ NA

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: _____ Date: 12/29/98

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- data is Good/Acceptable

Approved By:* _____

Date: _____

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

Reviewed By: _____ Date: 12/29/98

SAMPLE FINDINGS SUMMARY

Site: NON ER SEPTIC TANKS

AR/COC: 600400 600429 600510 Data Classification: Radiologics.

Sample Fraction No.	Analysis	DV Qualifiers	Comments
641471-003	~~Americium 241~~	~~B, U~~	~~+10X~~ 1-8-99 KAL
	~~Actinium 228~~	~~B~~	~~+10X~~ 1-8-99 KAL
	~~Lead 212~~	~~B~~	~~+10X~~ 1-8-99 KAL
	~~Radium 220~~	~~B~~	~~+10X~~ 1-8-99 KAL
	~~Radium 228~~	~~B~~	~~+10~~ 1-8-99 KAL
	~~Thorium 232~~	~~B~~	~~+10X~~ 1-8-99 KAL
	Thorium 234	B U1	~~+10X~~ 1-8-99 KAL
↓	U 238	B, U1	~~+10~~ 1-8-99 KAL

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: 12/29/98

Kevin A Zumbro

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	NON ER SEPTIC TANKS			Site Name	
Laboratory Name/Job No./Batch No.	GEL / 9807247			Chain of Custody No.	600400 600429 600510
Analysis Method	EPA 900 HASL 300			Parameter List:	
REVIEW ITEM	YES	NO	NA	COMMENTS	
A. HOLDING TIMES				MET CRITERIA	
1. Preparation and analysis holding times met?	✓				
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 CRITERIA	
1. Standard: Independent, certified reference material?	✓				
2. Frequency: Each batch?	✓				
% Recovery 80-120% or ____?	✓				
D. METHOD BLANK					
1. Frequency: Each batch?	✓				
2. Matrix: Matrix specific?	✓				
3. Preparation: Entire procedure?	✓				
4. Blanks show contamination?	✓				
E. MATRIX SPIKE				MET CRITERIA	
1. Frequency: Each batch?	✓				
2. Matrix: Matrix specific?	✓				
3. Preparation: Entire procedure?	✓				
4. % Recovery: 75-125% or ____?	✓				
F. ANALYTICAL YIELDS/OTHER				MET CRITERIA	
1. Tracer: Correct type, recovery met?	✓				
2. Ingrowth and/or decay: Correct factors applied?	✓		NA		
3. Solids density: Planchette loading <5 mg/cm^2?	✓				
G. DUPLICATE				MET CRITERIA	
1. Type: Lab or field?	✓				
2. Frequency: Each batch?	✓				
3. Matrix: Matrix specific?	✓				

ANALYTICAL RADIOCHEMISTRY DATA VALIDATION CHECKLIST (CONTINUED)

Project Name	NON ER SEPTIC TANKS			Site Name	
Laboratory Name/Job No./Batch No.	GEL / 9807247			Chain of Custody No.	600400, 600429, 600510
Analysis Method	EPA 900.0 HASL 300			Parameter List:	
REVIEW ITEM	YES	NO	NA	COMMENTS	
4. Preparation: Entire procedure?	✓				
H. ANALYTE DETECTION				met criteria	
1. Detection limit sample/batch specific?	✓				
2. Errors evaluated?	✓				
3. False positives/negatives suspected?		✓			

Reviewed by: [signature] 12/29/98

SAMPLE FINDINGS SUMMARY

Site: NON ER SEPTIC TANKS

AR/COC: 600400/600429/600510 Data Classification: ORGANIC

or ARCOC's 600400 600429 600510

Sample Fraction No.	Analysis	DV Qualifiers	Comments
~~041471-003~~	~~HE~~	~~P1~~	~~[illegible] MD in control (R 130)~~ 1-8-99 KAL
~~All FR MPAA~~	~~SVOC~~	~~J~~	~~initial calib out for several analytes does not impact~~ 1-8-99 KAL
~~All FR MPAA~~	~~VOC~~	~~J~~	~~continuing calib out ok, does not impact~~ 1-8-99
~~AC 120458~~	~~VOC~~	~~U~~	~~methylene chloride in Blank~~ 1-8-99 KAL KAL
	DATA IS ACCEPTABLE		

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: 12/29/98

Kevin A Lambert 1-8-99

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 NON ER SEPTIC TANK
ANALYTICAL LABORATORY GEL
LABORATORY REPORT # 9807247
CASE NO. 7223.230

SAMPLE IDS
NO. OF SAMPLES 16 Soils
COC - 600400 600429
600510

DATA ASSESSMENT SUMMARY

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

		VOC	SVOC	PEST/PCB	OTHER
1.	HOLDING TIMES/PRESERVATION	✓	✓	NA	NA
2.	GC/MS INST. PERFORM.	✓	✓		
3.	CALIBRATIONS/WINDOWS	W	W ✓		
4.	BLANKS	X	X		
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
Qualifiers: J - Estimate
UJ - Undetected, estimated

NA = NOT APPLICABLE

ACTION ITEMS: NONE to be taken

For VOC/SVOC
AREAS OF CONCERN: Small contamination in ICB/CCB's but does not significantly affect data.

HE - used MS from 126117 - missed @ D/O R on MS
All MSD w/in Acceptance

Reviewed By: [signature]
Date: 12-29-98

ORGANIC DATA ASSESSMENT SUMMARY FORM

(Data Verification/Validation Level 3 DV-3)

PROJECT/TASK LEADER: NON ER SEPTIC TANKS / ROYBAL

ACTION ITEMS:

AREAS OF CONCERN:

OVERALL DATA QUALITY ASSESSMENT Acceptable

Reviewed By: [signature]
Date: 12-29-98

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

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: D Brand 12/29/98

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: [signature]
Date: 12 29 98

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

3.0 GC INSTRUMENT PERFORMANCE.

NA

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: [signature] 12/29/98

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

NA

3.3 DDT and Endrin Degradation

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: D Brunel
Date: 8-19-98

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 ☐ NA

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

Instrument ID	Date	Compound	RF/%RSD	Action	Samples Affected
HP RTE VOA 8.1	21-MAY 98	ACROLEIN	96.371	↓ 0.05 / ± 30.0%	NOT ON TCL
		trichlorotrifluoroethane	50.393		NOT ON TCL
		Isobutyl Alcohol	52.312		ON TCL, ND
		Allyl Chloride	37.992		ON TCL, ND
		methylene chloride	107.461		ON TCL, ND, JB
		Ethyl acetate	45.938		NOT ON TCL
		Propionitrile	61.119		ON TCL, ND
↓	↓	1,2 dibromo 3 chloropropane	26.720	↓	ON TCL, ND

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

Reviewed By: [signature]
Date: 12 29 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	
MSD2.i	7/27/98	Pyridine	31.0	20.0	ON TCL; ND	110-86-1
		bis(2-chloroethyl) ether	20.2		ON TCL; ND	111-44-4
		Benzyl Alcohol	31.2		ON TCL; ND	100-51-6
		Acetophenone	28.9		on TCL; ND	98-86-2
		2-Methylnaphthalene	23.2		on TCL; ND	91-57-6
		1-Methyl Naphthalene	25.1		Not on TCL	
		Hexachlorocyclo pentadiene	29.1		ON TCL ND	77-47-4

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

		Acenaphthylene	22.9		on TCL ND	208-96-8
		2,4-dinitrophenol	28.4		on TCL ND	51-28-5
		4-bromophenyl phenyl ether	23.7		on TCL ND	101-55-3
		pyrene	27.1		on TCL ND	129-00-0
		benzo(a) anthracene	22.4		on TCL ND	56-55-3
		chrysene	23.7		on TCL ND	218-01-9
		benzo(k) fluoranthene	22.8		on TCL ND	207-08-9
MSD7.i	7-31-98	pyridine	24.2	20.0	ON TCL, ND	110-86-1
		3-Nitroaniline	32.9		on TCL ND	99-09-2
		4- "	31.0		on TCL ND	100-01-6
		benzidine	36.7		NOT ON TCL	
		3,3,dichlorobenzidine	28.0		ON TCL ND	91-94-1

Reviewed By: D Bauer
Date: 12 29 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 ☒ Not submitted w/ ARCOC

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

Date	Blank ID	Compound	Conc. ug/(kg)	PQL ( )	Action Level	Samples Affected (Action)
7/17/98	126458	methylene chloride	1.2	5 ug/kg	ND in sample	———

PQL = Practical Quantitation Limit from EPA Method.

Reviewed By: [signature]
Date: 12 29 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:

Date	Sample ID/Matrix	Surrogate Compound	%Rec	Action

met criteria

Reviewed By: D Bruell
Date: 12 29 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 ☐ NA

Are method blank surrogate recoveries outside of limits upon reanalysis? Yes ☐ No ☐ NA

Are transcription/calculation errors present? Yes ☐ No ☑

If yes, note necessary corrections. _____

Reviewed By: [signature]
Date: 11 26 96

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 ☐

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
		met criteria		

Reviewed By: [signature]
Date: 12 29 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.

Date	Compound	%Rec	Control Limits	Action	Samples Affected
7/27/98	1,4 Dichlorobenzene	47.4	(47.8 - 105)	- ND in Sample	—

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: _____
Date: 12 29 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: [signature]
Date: 12 27 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

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: _____
Date: 12 29 98

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

Samples affected: _____

N/A

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 AR COC				

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: _____
Date: 12 29 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

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: _____
Date: 12 29 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 NA

Reviewed By: [signature]

Date: 12 29 98

Approved By:* _____

Date _____

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

Records Center Code: ER / 1295 / DAT

SMO ANALYTICAL DATA ROUTING FORM

Project Name:	Non-ER Septic Fields	**Case No./Service Order:**	7223.230 / CF0526
SNL Task Leader:	ROYBAL	**Org/Mail Stop:**	6133 / 1147
SMO Project Coordinator:	SALMI	**Sample Ship Date:**	7/8/98

ARCOC	Lab	Lab ID	Preliminary Received	Final Received	EDD Req'd YES	EDD Req'd NO	EDD Rec'd YES	EDD Rec'd NO
600400	GEL	9807247		8/10/98	X		x	
600429	GEL	9807247		8/10/98	X		x	
600510	GEL	9807247		8/10/98	X		x	

	Date		
Correction Requested from Lab:		**Correction Request #:**	
Corrections Received:		**Requester:**	
Review Complete:	9-17-98	**Signature:**	W. Palencia
Priority Data Faxed:		**Faxed To:**	
Preliminary Notification:		**Person Notified:**	
Final Transmittal:	9-17-98	**Transmitted To:**	Sanders
		Transmitted By:	Palencia
Filed in ~~Records Center~~ ER:	9-18-98	**Filed By:**	A. Jensen

Comments:

Received (Records Center) By:

Contract Verification Review (CVR)

Project Leader SANDERS | Project Name NON-ER SEPTIC FIELDS | Case No. 7223.230

AR/COC No. 600400/600429/600510 | Analytical Lab GEL | SDG No. 9807247

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		
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		
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		
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: 9-17-98 Closed by: _____ Date: _____

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

Internal Lab Batch No. N/A

ANALYSIS REQUEST AND CHAIN OF CUSTODY

SAR/WR No.

AR/COC- 600429

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: 7/8/98 SMO Use
Carrier/Waybill No.: 710268
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
Bill to: Sandia National Laboratories
Supplier Services, Dept.
P.O. Box 5800 MS 0154

Location Tech Area III
Building MO231 Room

Reference LOV (available at SMO)

9807247 LAB USE

Sample No. - Fraction	ER Sample ID or Sample Location Detail	Beginning Depth in Ft.	ER Site No.	Date/Time Collected	Sample Matrix	Container Type	Container Volume	Preservative	Sample Collection Method	Sample Type	Parameter & Method Requested	Lab Sample ID
041308-002	ER-1295-MO231-DF1-BH1-5-S	5	N/A	7/7/98 1120	S	AG	500ml	4C	G	SA	SVOCs (8270) Gross A/B	01
041309-002	ER-1295-MO231-DF1-BH1-10-S	10	N/A	7/7/98 1105	S	AG	500ml	4C	G	SA	SVOCs (8270) Gross A/B	02
041310-002	ER-1295-MO231-DF1-BH2-5-S	5	N/A	7/7/98 1225	S	AG	500ml	4C	G	SA	SVOCs (8270) Gross A/B	03
041311-002	ER-1295-MO231-DF1-BH2-10-S	10	N/A	7/7/98 1230	S	AG	500ml	4C	G	SA	SVOCs (8270) Gross A/B	04
041470-001	ER-1295-MO231-DF1-BH2-10-SD	10	N/A	7/7/98 1230	S	AC	300ml	4C	G	DU	VOCs (8260)	05
041471-003	ER-1295-MO231-DF1-BH2-10-SD	10	N/A	7/7/98 1230	S	AG	1L	4C	G	DU	SVOC8270, HE 8330, G Spec, RCRA Met+Zn,Cu	06

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

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

Special Instructions/QC Requirements
EDD XYes ☐No
Raw data package XYes ☐No
Please list as separate report.

Abnormal Conditions on Receipt LAB USE
02

Turnaround Time XNormal ☐Rush Required Report Date

QC Inits

Sample Team Members	Name	Signature	Init	Company/Organization/Phone
	Chris Catechis	C.J. Catechis	C.C.	ADM/6131/881-3196
	Chris Sears	Chris Sears	CS	SNL/6131/844-1136

1. Relinquished by		Org. 6131	Date 7/7/98	Time 1445	4. Relinquished by	Org.	Date	Time
1. Received by		Org. 7577	Date 7/7/98	Time 1445	4. Received by	Org.	Date	Time
2. Relinquished by		Org. 7577	Date 7/8/98	Time 1130	5. Relinquished by	Org.	Date	Time
2. Received by	Patricia Hood	Org. GEL	Date 7/9/98	Time 09:00	5. Received by	Org.	Date	Time
3. Relinquished by		Org.	Date	Time	6. Relinquished by	Org.	Date	Time
3. Received by		Org.	Date	Time	6. Received by	Org.	Date	Time

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

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

Internal Lab Batch No. N/A

ANALYSIS REQUEST AND CHAIN OF CUSTODY

SAR/WR No.

AR/COC- 600429

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: 7/8/98 SMO USE
Carrier/Waybill No.: 710268
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:
Bill to: Sandia National Laboratories
Supplier Services, Dept.
P.O. Box 5800 MS 0154

Location Tech Area III
Building MO231 Room

Reference LOV (available at SMO)

LAB USE

Sample No. - Fraction	ER Sample ID or Sample Location Detail	Beginning Depth in Ft.	ER Site No.	Date/Time Collected	Sample Matrix	Container Type	Container Volume	Preservative	Sample Collection Method	Sample Type	Parameter & Method Requested	Lab Sample ID
041308-002	ER-1295-MO231-DF1-BH1-5-S	5	N/A	7/7/98 1120	S	AG	500ml	4C	G	SA	SVOCs (8270) Gross A/B	
041309-002	ER-1295-MO231-DF1-BH1-10-S	10	N/A	7/7/98 1105	S	AG	500ml	4C	G	SA	SVOCs (8270) Gross A/B	
041310-002	ER-1295-MO231-DF1-BH2-5-S	5	N/A	7/7/98 1225	S	AG	500ml	4C	G	SA	SVOCs (8270) Gross A/B	
041311-002	ER-1295-MO231-DF1-BH2-10-S	10	N/A	7/7/98 1230	S	AG	500ml	4C	G	SA	SVOCs (8270) Gross A/B	
041470-001	ER-1295-MO231-DF1-BH2-10-SD	10	N/A	7/7/98 1230	S	AC	300ml	4C	G	DU	VOCs (8260)	
041471-003	ER-1295-MO231-DF1-BH2-10-SD	10	N/A	7/7/98 1230	S	AG	1L	4C	G	DU	SVOC8270, HE 8330, G Spec, RCRA Met+Zn,Cu	

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

Sample Tracking Group#
Date Entered (mm/dd/yy): 7/25/98
Entered by: KB

QC Initials:

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		CC	MDM / 6131 / 881-3196
	CHRIS SEAMS		CS	SNL/6131/844-1136

Please list as separate report.

1. Relinquished by		Org. 6131	Date 7/7/98	Time 1445	4. Relinquished by	Org.	Date	Time
1. Received by		Org. 7577	Date 7/7/98	Time 1445	4. Received by	Org.	Date	Time
2. Relinquished by		Org. 7577	Date 7/8/98	Time 1130	5. Relinquished by	Org.	Date	Time
2. Received by		Org.	Date	Time	5. Received by	Org.	Date	Time
3. Relinquished by		Org.	Date	Time	6. Relinquished by	Org.	Date	Time
3. Received by		Org.	Date	Time	6. Received by	Org.	Date	Time

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

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

Internal Lab Batch No. N/A

ANALYSIS REQUEST AND CHAIN OF CUSTODY

SAR/WR No.

AR/COC- 600510

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: 7/8/98 SMO USE
Carrier/Waybill No.: 710268

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
Bill to: Sandia National Laboratories
Supplier Services, Dept.
P.O. Box 5800 MS 0154

Location Tech Area III
Building NW6584 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) Sample Matrix	Container Type	Container Volume	Preservative	Sample Collection Method	Sample Type	Parameter & Method Requested	LAB USE Lab Sample ID
~~041480-002~~	~~ER-1295-NW6584-DF1-BH2-10-S~~	~~10~~	~~N/A~~		~~S~~	~~AG~~	~~500ml~~	~~4C~~	~~G~~	~~SA~~	SVOCs (8270) Gross A/B	
041506-002	ER-1295-NW6584-DF1-BH3-5-S	5	N/A	7/6/98 0750	S	AG	500ml	4C	G	SA	SVOCs (8270) Gross A/B	
041507-002	ER-1295-NW6584-DF1-BH3-10-S	10	N/A	7/6/98 0810	S	AG	500ml	4C	G	SA	SVOCs (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) 5/27/98
Entered by LA QC Initials AMV

Special Instructions/QC Requirements
EDD XYes ☐No
Raw data package XYes ☐No
Please list as separate report.

Abnormal Conditions on Receipt LAB USE

Turnaround Time XNormal ☐Rush Required Report Date

Sample Team Members	Name	Signature	Init	Company/Organization/Phone
	Chris Gotchis	Ch. Gotch	C.G.	MDM/6131/881-3196
	CHRIS SEARS	Chris Sears	CS	SNL/6131/844-1136

1. Relinquished by	Chris Sears	Org.	6131	Date	7/7/98	Time	1445	4. Relinquished by	Org.	Date	Time
1. Received by	[illegible]	Org.	7577	Date	7/7/98	Time	1445	4. Received by	Org.	Date	Time
2. Relinquished by	[illegible]	Org.	7577	Date	7/8/98	Time	1130	5. Relinquished by	Org.	Date	Time
2. Received by		Org.		Date		Time		5. Received by	Org.	Date	Time
3. Relinquished by		Org.		Date		Time		6. Relinquished by	Org.	Date	Time
3. Received by		Org.		Date		Time		6. Received by	Org.	Date	Time

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

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

Internal Lab Batch No. N/A

ANALYSIS REQUEST AND CHAIN OF CUSTODY

SAR/WR No.

AR/COC- 600400

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: 7/8/98 SMO USE
Carrier/Waybill No.: 710268
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
Bill to: Sandia National Laboratories
Supplier Services, Dept.
P.O. Box 5800 MS 0154

Location — Tech Area III — Building MO242 — 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): Sample Matrix	Container: Type	Container: Volume	Preservative	Sample Collection Method	Sample Type	Parameter & Method Requested	LAB USE: Lab Sample ID
041285-002	ER-1295-MO242-DF1-BH1-5-S	5	N/A	7/6/98 0915	S	AG	500ml	4C	G	SA	SVOCs (8270) Gross A/B	
041286-002	ER-1295-MO242-DF1-BH1-10-S	10	N/A	7/6/98 1020	S	AG	500ml	4C	G	SA	SVOCs (8270) Gross A/B	
041287-002	ER-1295-MO242-DF1-BH2-5-S	5	N/A	7/6/98 1140	S	AG	500ml	4C	G	SA	SVOCs (8270) Gross A/B	
041288-002	ER-1295-MO242-DF1-BH2-10-S	10	N/A	7/7/98 0755	S	AG	500ml	4C	G	SA	SVOCs (8270) Gross A/B	
041289-002	ER-1295-MO242-DF1-BH3-5-S	5	N/A	7/7/98 0830	S	AG	500ml	4C	G	SA	SVOCs (8270) Gross A/B	
041290-002	ER-1295-MO242-DF1-BH3-10-S	5 10	N/A	7/7/98 0920	S	AG	500ml	4C	G	SA	SVOCs (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): 7/24/98
Entered by: [illegible]
QC Initials: KJM

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 SEARS	[signature]	CL	SNL/6131/844-1136
	Chris Catechis	[signature]	C.C	MDA / 6131 / 881-3196

Please list as separate report.

1. Relinquished by	[signature]	Org. 6131	Date 7/7/98	Time 1445	4. Relinquished by	Org.	Date	Time
1. Received by	[signature]	Org. 7577	Date 7/7/98	Time 1445	4. Received by	Org.	Date	Time
2. Relinquished by	[signature]	Org. 7577	Date 7/8/98	Time 1130	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)

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: 8/25/99

ARCOC	Lab	Lab ID	Preliminary Received	Final Received	EDD Req'd YES	EDD Req'd NO	EDD Rec'd YES	EDD Rec'd NO
602764	GEL	9908965		9/27/99	x		x	

	Date		
Correction Requested from Lab:	10-13-99 ~~2177~~	Correction Request #:	2177
Corrections Received:	10-26-99	Requester:	Palencia
Review Complete:	10-13-99	Signature:	W. Palencia
Priority Data Faxed:		Faxed To:	
Preliminary Notification:		Person Notified:	
Final Transmittal:	10-13-99	Transmitted To:	Sanders
		Transmitted By:	Palencia
Filed in Records Center/ER:	10-26-99	Filed By:	Palencia

Comments:

RECEIVED
NOV 02 1999

Received (Records Center) By: _____

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:**	8/25/99

ARCOC	Lab	Lab ID	Preliminary Received	Final Received	EDD Req'd YES	EDD Req'd NO	EDD Rec'd YES	EDD Rec'd NO
602764	GEL	9908965		9/27/99	x		x	

	Date		
Correction Requested from Lab:	10-13-99 ~~2177~~	**Correction Request #:**	2177
Corrections Received:	10-26-99	**Requester:**	Palencia
Review Complete:	10-13-99	**Signature:**	W. Palencia
Priority Data Faxed:		**Faxed To:**	
Preliminary Notification:		**Person Notified:**	
Final Transmittal:	10-13-99	**Transmitted To:**	Sanders
		Transmitted By:	Palencia
Filed in Records Center/ER:	10-26-99	**Filed By:**	Palencia

Comments:

RECEIVED
NOV 02 1999

Received (Records Center) By: _____

Data Validation Qualifiers and Descriptive Flags*

Note: Qualifiers may be used in conjunction with descriptive flags [e.g., J, A; UJ, P; U, B].

Qualifiers	Comment
J	The associated value is an estimated quantity.
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.
UJ	The analyte was analyzed for but was not detected. The associated value is an estimate and may be inaccurate or imprecise.
U	The associated result is less than ten times the concentration in any blank and is determined to be non-detect. The analyte is a common laboratory contaminant.
U1	The associated result is less than five times the concentration in any blank and is determined to be non-detect.
R	The data are unusable for their intended purpose. The analyte may or may not be present. (Note: Resampling and reanalysis is necessary for verification.)
Descriptive Flags	
A	Laboratory accuracy and/or bias measurements for the associated Laboratory Control Sample and/or duplicate (LCS/LCSD) 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 and/or duplicate (MS/MSD) do not meet acceptance criteria.
A3	Insufficient quality control data to determine laboratory accuracy.
B	Analyte present in laboratory method blank
B1	Analyte present in trip blank.
B2	Analyte present in equipment blank.
B3	Analyte present in calibration blank.
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.

* This is not a definitive list. Other qualifiers are potentially available. Notify Tina Sanchez to revise list.

Updated: September 14, 1999

ARCOC #602764 Organic Analyses (VOCs) Sample No.-Fraction	75-15-0 (carbon disulfide)	75-09-2 (methylene chloride)	78-93-3 (2-butanone)	79-01-6 (trichloroethene)
049955-001			UJ	UJ
049956-001		7.8U,B	UJ	UJ
049957-001		5U,B	J	UJ
049958-001		5U,B	UJ	UJ
049959-001	J	5U,B	J	UJ
049960-001		5U,B	J	UJ
049961-001		5U,B	UJ	UJ
049962-001		5U,B	J	UJ
049963-001		7.3U,B	J	UJ
049964-001		5U,B	UJ	UJ
049965-001		5U,B	J	UJ
~~049958-001~~ 049968-001		5U,B	J	UJ

[signature]
12/14/99
Per Kevin Lambert

SAMPLE FINDINGS SUMMARY

Site: Non-ER Septic Systems

AR/COC: 602764 Data Classification: Inorganics (EPA 9012A ↓ 7196A)

Sample/ Fraction No.	Analysis	DV Qualifiers	Comments
	No Data were qualified.		
	Data are acceptable.		
QC	Measures appear	to be	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: [signature] Date: 12/6/99

MEMORANDUM

DATE: December 6, 1999

TO: File

FROM: Kenneth Salaz KAS

SUBJECT: Organic Data Review and Validation
Non-ER Septic Systems, ARCOC #602764,
Project/Task No. 7223.02.02.01

See the 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 specified methods: EPA8260A (VOCs) and EPA8082 (PCBs). Problems were identified with the data package that result in the qualification of data.

1. VOC Analysis: The initial calibration response factor (RF) of trichloroethene was less than (<) the required minimum. The associated results of samples 9908965-01, -03, -05, -07, -09, -11, -13, -15, -17, -19, -21, and -25 were non-detect (ND) and will be qualified "UJ." The continuing calibration verification (CCV) percent difference (%D) of 2-butanone was greater than (>) 40%. The associated results of samples -05, -09, -11, -15, -17, -21, and -25 were positive and will be qualified "J." The associated results of samples -01, -03, -07, -13, and -19 were ND and will be qualified "UJ." Carbon disulfide had a CCV %D >20%. The associated result of sample -09 was positive and will be qualified "J."

2. VOC Analysis: In the method blank, methylene chloride was detected. The associated results of samples 9908965-03 and -17 were positive, <10X the blank concentration, > the reporting limit (RL), and will be qualified "7.8U,B" and "7.3U,B," respectively. The associated results of samples -05, -07, -09, -11, -13, -15, -19, -21, and -25 were < the RL and will be qualified "5U,B."

3. PCB Analysis: The surrogate percent recovery (%REC) for sample 9908965-20 was < QC limits. The sample results were ND and will be qualified "UJ,A1."

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

Holding Times

VOC Analysis: All samples were analyzed within the prescribed holding times.

PCB Analysis: All samples were analyzed within the prescribed holding times except the following. Sample 9908965-20 was re-extracted 1 day beyond the holding time as a result of an initial QC failure. However, the recoveries from the reanalysis were similar to the original, and the original results were reported. Thus, no data were qualified.

Calibration

VOC Analysis: The initial and continuing calibrations met QC acceptance criteria except as noted above in the summary section and the following. Chloromethane, bromomethane, chloroethane, acetone, 1,2-dichloroethane, 2-hexanone, trans-1,3-dichloropropene, 4-methyl-2-pentanone, and vinyl acetate had CCV %Ds outside QC limits. However, all associated sample results were ND. Thus, no data were qualified.

PCB Analysis: The initial and continuing calibrations met QC acceptance criteria.

Blanks

VOC Analysis: No target analytes were detected in the method blanks except as noted above in the summary section.

PCB Analysis: No target analytes were detected in the method blanks.

Surrogates

VOC Analysis: The surrogate %RECs met QC acceptance criteria.

PCB Analysis: The surrogate %RECs met QC acceptance criteria except as noted above in the summary section.

Internal Standards (ISs)

VOC Analysis: The IS areas and retention times (RTs) met QC acceptance criteria.

PCB Analysis: No internal standards were required for this method.

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

VOC Analysis: The MS/MSD met QC acceptance criteria.

PCB Analysis: The MS/MSD met QC acceptance criteria except for the following. The MSD relative percent difference (RPD) of Aroclor-1260 was > QC limits. However, the MS/MSD %RECs met QC acceptance criteria. Thus, no data were qualified.

Data Validation Summary

Site/Project: Non-ER Septic Systems Project/Task #: 7223.02.02.01 # of Samples: 26 Matrix: soil

AR/COC #: 602764 Laboratory Sample IDs: 9908965-01 thru -26

Laboratory: GEL

Laboratory Report #: 9908965

QC Element	Analysis									
	Organics				Inorganics				RAD	Other (Cr^{6+})
	VOC	SVOC	Pesticide/ PCB	HPLC (HE)	ICP/AES	GFAA/ AA	CVAA (Hg)	CN		
1. Holding Times/Preservation	✓	NA	✓	NA	NA	NA	NA	✓	NA	✓
2. Calibrations	J; UJ	↓	✓	↓	↓	↓	↓	✓	↓	✓
3. Method Blanks	u, B	↓	✓	↓	↓	↓	↓	✓	↓	✓
4. MS/MSD	✓	↓	✓	↓	↓	↓	↓	✓	↓	✓
5. Laboratory Control Samples	✓	↓	✓	↓	↓	↓	↓	✓	↓	✓
6. Replicates					↓	↓	↓	NA	↓	NA
7. Surrogates	✓	↓	UJ, A1	↓						NA
8. Internal Standards	✓	↓								
9. TCL Compound Identification	✓	↓								
10. ICP Interference Check Sample					↓					
11. ICP Serial Dilution					↓					
12. Carrier/Chemical Tracer Recoveries										
13. Other QC	NA	↓	NA	↓	↓	↓	↓	NA	↓	↓

J = Estimated
UJ = Not Detected, Estimated
R = Unusable
Check (√) = Acceptable
Shaded Cells = Not Applicable (also "NA")
NP = Not Provided
Other _____

Reviewed By: [signature] Date: 12/6/99

Holding Time and Preservation

Site/Project: Non-ER Septic Systems AR/COC #: 602764 Laboratory Sample IDs: 9908965-01 thru -26

Laboratory: GEL Laboratory Report #: 9908965

# of Samples: 26 Matrix: Soil

Sample ID	Analytical Method	Holding Time Criteria	Days Holding Time was Exceeded	Preservation Criteria	Preservation Deficiency	Comments
9908965-70	±PA 8082 (PCBs)	14 days	1	NA	NA	Re-extracted out of holding due to Surrogate failure, Original run used.

Reviewed By: [signature] Date: 10/6/99

Volatile Organics (SW 846 Method 8260)

Site/Project: Non-ER Septic Systems AR/COC #: 602764 # of Samples: 12 Matrix: Soil

Laboratory: GEL Laboratory Report #: 9908965 Laboratory Sample IDs: 9908965-01,-03,-05,-07,-09,-11,-13,-15,-17,-19,-21,-25

Methods: EPA 8260A Batch #s: 157266,

IS	CAS #	Name	TCL	Min. RF	Intercept	Calib. RF >.05	Calib. RSD/ R^2 <20%/ 0.99	CCV %D 20%	Method Blks	LCS	LCSD	LCS RPD	MS	MSD	MS RPD	Field Dup. RPD	① Equip. Blanks	Trip Blanks	② Method Blk	CCV %D 30%
1	74-87-3	Chloromethane	✓	0.10	✓	✓	✓	✓	✓							NA	NA	NA	✓	-38.2
1	74-83-9	Bromomethane	✓	0.10	NA	✓	✓	35.0												✓
1	75-01-4	vinyl chloride	✓	0.10	↓	✓	✓	✓												
1	75-00-3	Chloroethane	✓	0.01		✓	✓	25.0												
1	75-09-2	methylene chloride (10xblk)	✓	0.01	✓	✓	✓	✓											1.6J	↓
1	67-64-1	acetone(10xblk)	✓	0.01	NA	✓	✓	32.9											✓	23.0
1	75-15-0	carbon disulfide	✓	0.10		✓	✓	23.2												✓
1	75-35-4	1,1-dichloroethene	✓	0.20		✓	✓	✓		✓	✓	✓	✓	✓	✓					
1	75-34-3	1,1-dichloroethane	✓	0.10		✓	✓													
1	67-66-3	Chloroform	✓	0.20		✓	✓	↓												
1	107-06-2	1,2-dichloroethane	✓	0.10		✓	✓	24.1												↓
1	78-93-3	2-butanone(10xblk)	✓	0.01		✓	✓	45.6												41.3
2	71-55-6	1,1,1-trichloroethane	✓	0.10		✓	✓	✓												✓
2	56-23-5	carbon tetrachloride	✓	0.10		✓	✓													
2	75-27-4	Bromodichloromethane	✓	0.20		✓	✓													
2	78-87-5	1,2-dichloropropane	✓	0.01		✓	✓													
2	10061-01-5	cis-1,3-dichloropropene	✓	0.20		✓	✓													
2	79-01-6	Trichloroethene	✓	0.30	0.23	✓	✓			✓	✓	✓	✓	✓	✓					
2	124-48-1	Dibromochloromethane	✓	0.10		✓	✓													
2	79-00-5	1,1,2-trichloroethane	✓	0.10		✓	✓													
2	71-43-2	Benzene	✓	0.30		✓	✓	↓		✓	✓	✓	✓	✓	✓					✓
2	10061-02-6	trans-1,3-dichloropropene	✓	0.10		✓	✓	22.3												23.0
2	75-25-2	Bromoform	✓	0.10		✓	✓	✓												✓
3	108-10-1	4-methyl-2-pentanone	✓	0.10		✓	✓	24.0												✓
3	591-78-6	2-hexanone	✓	0.01		✓	✓	34.6												25.7
3	127-18-4	Tetrachloroethene	✓	0.20		✓	✓	✓												✓
3	79-34-5	1,1,2,2-tetrachloroethane	✓	0.30		✓	✓													
3	108-88-3	toluene(10xblk)	✓	0.40		✓	✓			✓	✓	✓	✓	✓	✓					
3	108-90-7	Chlorobenzene	✓	0.50		✓	✓			✓	✓	✓	✓	✓	✓					
3	100-41-4	Ethylbenzene	✓	0.10		✓	✓													
3	100-42-5	Styrene	✓	0.30		✓	✓													
3	1330-20-7	xylenes(total)	✓	0.30		✓	✓													
	540-59-0	1,2-dichloroethylene(total)	✓	0.01		✓	✓	↓	↓										↓	↓
	110-75-8	2-chloroethyl vinyl ether				NA	NA	NA	NA										NA	NA
	108-05-4	Vinyl Acetate	✓		↓	✓	✓	21.7	✓							↓	↓	↓	✓	✓

Comments:
① No EB or FB submitted on the COC (or field dup.)
② Method blank applies to samples -03 and -17 only. (CCV also)

Notes: Shaded rows are RCRA compounds.

NA = Not Applicable

Reviewed By: [signature] Date: 12/6/05

Volatile Organics

Site/Project: Non-ER Septic Systems AR/COC #: 602764 Batch #s: 157266

Laboratory: GEL Laboratory Report #: 9908965 # of Samples: 12 Matrix: Soil

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

Sample	SMC 1	SMC 2	SMC 3	IS 1 area	IS 1 RT	IS 2 area	IS 2 RT	IS 3 area	IS 3 RT
All									
Passed									

SMC 1: ~~4~~Bromofluorobenzene
SMC 2: ~~1,2-Dichloroethane-d4~~
SMC 3: Toluene-d8
Dibromofluoromethane KAS 12/21/99

IS 1: ~~Bromochloromethane~~ Fluorobenzene
IS 2: 1,4-Di~~fluoro~~chlorobenzene-d4
IS 3: Chlorobenzene-d5

Comments:

*Summary:

Calibration:

⇒ Trichloroethene had an RF < the min. All results were ND and will be qualified "UJ."

⇒ 2-butanone had CCV %Ds > 40%. Results of samples -05, -09, -11, -15, -17, -21, and -25 were pos. and will be qualified "J" All other results were ND; qualified "UJ."

⇒ Carbon disulfide had a CCV %D >20%. Result of -09 was pos.; qualified "J."

⇒ chloromethane, bromomethane, chloroethane, acetone, 1,2-dichloroethane, 2-hexanone, trans-1,3-dichloropene, 4-methyl-2-pentanone, and vinyl acetate had CCV %Ds outside QC limits. All results were ND; No data were qualified.

Method Blank:

⇒ Methylene chloride was detected. The results of -03 and -17 were > the RL and will be qualified "7.8U,B" and "7.3U,B," respectively. The results of -05, -07, -09, -11, -13

PCBs (SW 846 - Method 8082)

Site/Project: Non-ER Septic Systems AR/COC #: 602764 Laboratory Sample IDs: 9908965-02, -04, -06, -08, -10, -12, -14, -16, -18, -20, -22, -23, -24, -26

Laboratory: GEL Laboratory Report #: 9908965

Methods: EPA 8082

# of Samples: 14 Matrix: Soil Batch #s: 157301

CAS #	Name	TCL	Intercept	Calib RSD / R^2 <20% / 0.99	CCV %D 20%	Method Blanks	LCS	LCSD	LCS RPD 20%	MS	MSD	MS RPD 20%	(1) Field Dup. RPD	(2) Equip. Blanks	Field Blanks		
12674-11-2	Aroclor-1016	√	NA	√	√	√							NA	NA	NA		
11104-28-2	Aroclor-1221	√	↓	↓		↓							↓	↓	↓		
11141-16-5	Aroclor-1232	√	↓	↓		↓							↓	↓	↓		
53469-21-9	Aroclor-1242	√	↓	↓	√	↓							↓	↓	↓		
12672-29-6	Aroclor-1248	√	↓	↓	√	↓							↓	↓	↓		
11097-69-1	Aroclor-1254	√	↓	↓	√	↓							↓	↓	↓		
11096-82-5	Aroclor-1260	√	↓	↓	√	↓	√	√	√	√	√	47.3	↓	↓	↓		

NA = Not Applicable

Sample	SMC % REC	SMC RT	Sample	SMC % REC	SMC RT
9908965-20	44.3 ↓	√			
9908965-24MSD	44.3 ↓	√			

Comments:
(1) All results for the field duplicate pair were ND. Thus, no RPDs were calculated.
(2) No EB or FB submitted on the COC

Confirmation

Sample	CAS #	RPD > 25%	Sample	CAS #	RPD ≥ 25%
All Passed					

*Summary:

MSD:
The RPD was > QC limits. However, the MS/MSD %RECs met QC criteria. Thus, no data were qualified.

Surrogates:
The surrogate %REC for sample -20 was < QC limits. All results were

Reviewed By: [signature] Date: 12/16/09

General Chemistry

Site/Project: Non-ER Septic Systems AR/COC #: 602764 Laboratory Sample IDs: 9908965-02, -04, -06, -08, -10, -12, -14, -16,
" -18, -20, -22, -23, -24, -26

Laboratory: GEL Laboratory Report #: 9908965

Methods: EPA 9012A (CN), EPA 7196A (Cr6+)

# of Samples: 14 Matrix: Soil Batch #s: 157237 (-02 → -18), 157442

CAS #	Analyte	QC Element: T A L	ICV	CCV	ICB	CCB	Method Blanks	LCS	LCSD	LCSD RPD	MS	MSD	MSD RPD	Rep. RPD (2)	ICS AB (1)	Serial Dilution	Field Dup. RPD (2)	Equip. Blanks (3)	Field Blanks
5955-70-0	CN	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	NA	NA	NA	NA	NA	NA	NA	NA
18540-29-9	Cr6+	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	NA	NA	↓	↓	↓	↓	↓	↓

Comments:
(1) No ICS or serial dilution required for these methods.
(2) Field duplicate pair was submitted. However, results were < the RL. Thus, no RPDs were calculated.
(3) No EB or FB submitted on the COC.
(4) Replicate criteria do not apply to sample results < the RL.

* Summary
⇒ All QC criteria met. No data were qualified.

NA = Not Applicable

Reviewed By: [signature] Date: 12/6/09

GENERAL ENGINEERING LABORATORIES
Meeting today's needs with a vision for tomorrow.

REVISED

October 21, 1999

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

Re: ARCOC- 602764, SDG# 9908965 rg(smo) 10/27/99

Dear Ms. Jensen:

Enclosed is a revised "Data Qualifier Definition" section for Sample Delivery Group (SDG) 9908965. This revised section includes pertinent comments addressing the use of prep corrected detection limit values in the data package. Please replace the existing "Data Qualifier Definition" section with the revised section.

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

Yours very truly,

Tristan L. Davis
Quality Assurance Officer

P O Box 30712 • Charleston, SC 29417 • 2040 Savage Road • 29407
(843) 556-8171 • Fax (843) 766-1178

GENERAL ENGINEERING LABORATORIES

Meeting today's needs with a vision for tomorrow.

October 22, 1999

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

Re: ARCOC-602764, SDG# 9908965

Dear Ms. Jensen:

Enclosed is the response to correction request number 2177 submitted by Wendy Palencia on October 13, 1999. The request involves samples from Chain of Custody (COC) 602764 and Sample Delivery Group (SDG) 9908965. The format for this response will be reiteration of the request followed by the appropriate laboratory response.

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

Yours very truly,

Tristan L. Davis

Tristan L. Davis
Quality Assurance Officer

fc: SNLS #2177

P O Box 30712 • Charleston, SC 29417 • 2040 Savage Road • 29407
(843) 556-8171 • Fax (843) 766-1178

REVISED

SNLS #2177 Response

SNLS concern #1:

- *Sample #9908965-20 for PCB analyses and samples #9908965-20 - 24, -26 for total cyanide analyses were not listed in the analytical case narratives.*

GEL Response #1:

- **The PCB and Total Cyanide case narratives have been revised to include the missing cross-references. Copies of these revised pages are included with this response.**

SNLS concern #2:

- *The re-extracted run for PCB sample #9908965-20 was reported instead of the original run as indicated in the narrative.*

GEL Response #2:

- **The original analysis information has been re-entered into the LIMS system. A copy of the revised certificate of analysis for the original analysis is included with this response.**

GENERAL ENGINEERING LABORATORIES
PO Box 30712 • Charleston, SC 29417 • 2040 Savage Road • 29407
(803) 556-8171 • Fax (803) 766-1178

Palencia, Wendy J

From: Palencia, Wendy J
Sent: Wednesday, October 13, 1999 10:19 AM
To: 'Edie Kent'
Cc: 'Tristan Davis'
Subject: Corrections for COC602764 / SDG9908965

emailcorr10-13-99.doc

Date:	10-13-99	*No. of Pages:*	1
Send to:	Edie Kent	*From:*	Wendy J. Palencia
Org/Company:	GEL	*Org:*	7578
Phone:	(843) 556-8171	*Phone:*	(505) 844-3132

Correction Request

COC: 602764 SDG: 9908965 Tracking No: 2177

NOTE: Edie,

- Sample #9908965-20 for PCB analyses and samples #9908965-20-26 for total cyanide analyses were not listed in the analytical case narratives.
- The re-extracted run for PCB sample #9908965-20 was reported instead of the original run as indicated in the narrative.

Please make these corrections and resubmit the pages.
Thanks,
Wendy

Sandia National Laboratories
Sample Management Office
P.O. Box 5800
Albuquerque, New Mexico 87185-1331

EContract Verification Review (CVR)

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

AR/COC No. 602764 Analytical Lab GEL SDG No. 9908965

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	PCB SAMPLE #9908965-20 RE-EXTRACTED OUTSIDE HOLDNG 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	SURROGATES OUTSIDE RECOVERY LIMITS FOR PCB SAMPLES #9908965-06, -14 & -20
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	RPD FOR CHROMIUM ABOVE ACCEPTANCE LIMITS FOR SAMPLE #9908965-24DUP
b) Matrix spike duplicate RPD data reported and met for all organic samples		X	RPD FOR PCB 1260 ABOVE ACCEPTANCE LIMITS
3.5 Blank data a) Method or reagent blank data reported and met for all samples		X	METHYLENE CHLORIDE DETECTED IN VOC METHOD BLANK
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 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	SEVERAL PCB & CYANIDE SAMPLES NOT LISTED IN CASE NARRATIVES
3.9 Second column confirmation data provided for methods 8330 (high explosives) and pest[illegible]s/PCBs	X		

Contract Verification Review (Continued)

4.0 Calibration and Validation Documentation

Item	Yes	No	Comments
4.1 GC/MS (8260, 8270, etc.)			
a) 12-hour tune check provided	X		
b) Initial calibration provided	X		
c) Continuing calibration provided	X		
d) Internal standard performance data provided	X		
e) Instrument run logs provided	X		
4.2 GC/HPLC (8330 and 8010 and 8081)			
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
9908965-20	8082	NOT LISTED IN CASE NARRATIVE
9908965-20—26	9012A	NOT LISTED IN CASE NARRATIVE

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 2177 and date correction request was submitted: 10-13-99

Reviewed by: W. Palencia Date: 10-13-99 Closed by: W. Palencia Date: 10-26-99

Internal Lab

ANALYSIS REQUEST AND CHAIN OF CUSTODY

Pg. 1 of 2

AR/COC 602764

Batch No.		SAR/WR No.		SMO Use	
Dept. No./Mail Stop:	6135/1147	[redacted]		Contract No.:	AJ-2480A
Project/Task Manager:	NON-ER Septic Sys/M Sanders	[redacted]		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.:		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
049955-001	MD242/245-DFI-BH1-5-5	5 Ft	N/A	082399 1445	S	AC	125ml	4C	GR	SA	VOC	[redacted]
049955-002	MD242/245-DFI-BH1-5-5	5 ft	N/A	082399 1445	S	AG	250ml	4C	GR	SA	PCB CN Cr6+	
049956-001	MD242/245-DFI-BH10-5	10 5 ft	N/A	082399 0911	S	AC	125ml	4C	GR	SA	VOC	
049956-002	MD242/245-DFI-BH1-10-5	10 ft	N/A	082499 0911	S	AG	250ml	4C	GR	SA	PCB CN Cr6+	
049957-001	MD242/245-DFI-BH2-5-5	5 Ft	N/A	082499 0940	S	AC	125ml	4C	GR	SA	VOC	
049957-002	MD242/245-DFI-BH2-5-5	5 Ft	N/A	082499 0940	S	AG	250ml	4C	GR	SA	PCB CN Cr6+	
049958-001	MD242/245-DFI-BH2-10-5	10 ft	N/A	082499 0955	S	AC	125ml	4C	GR	SA	VOC	
049958-002	MD242/245-DFI-BH2-10-5	10 ft	N/A	082499 0955	S	AG	250ml	4C	GR	SA	PCB CN Cr6+	
049959-001	MD242/245-DFI-BH3-5-5	5 Ft	N/A	082499 1046	S	AC	125ml	4C	GR	SA	VOC	
049959-002	MD242/245-DFI-BH3-5-5	5 ft	N/A	082499 1046	S	AG	250ml	4C	GR	SA	PCB CN Cr6+	

RMMA ☐ Yes ☒ No Ref. No. [redacted]

Sample Disposal ☐ Return to Client ☒ Disposal by lab

Turnaround Time ☒ Normal ☐ Rush [redacted]

Required Report Date Voy 8/26/99

Special Instructions/QC Requirements

EDD ☒ Yes ☐ No

Raw Data Package ☒ Yes ☐ No

Send Info to Mike Sanders

VOC (8260)
PCB (EPA 8082)
CN (9012A w/ 9010 prep)
Cr6 (7196A w/ 3060A)
Please list as separate report.

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

1.Relinquished by	Margaret Sanchez	Org. 6118	Date 8/25/99	Time 1120	4.Relinquished by		Org.	Date	Time
1. Received by	[signature]	Org. 7527	Date 8/25/99	Time 1120	4. Received by		Org.	Date	Time
2.Relinquished by	[signature]	Org. 7527	Date 8/25/99	Time 1230	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

049955
↓
049979
> 25

Analysis Request And Chain Of Custody (Continuation)

2 2

Page 1 of 1

AR/COC- 602764

Project Name:	Non-ER Sypetic System	Project/Task Manger: M Sanders			Case No.:7223.230								
Location	Tech Area				Reference LOV (available at SMO)								Lab use
Building	Room												
Sample No- Fraction	ER Sample ID or Sample Location detail	Depth in Ft	ER Site No.	Date/Time Collected	Sample Matrix	Container Type	Container Volume	Preservative	Sample Collection Methods	Sample Type	Parameter & Method Requested	Lab Sample ID
049960-001	MD242/245-DFI-BH3-10-S	10ft	N/A	082499 1372	S	AC	125ml	$	GR	SA	VOC	
049960-002	MD242/245-DFI-BH3-10-S	10ft	N/A	082499 1372	S	AG	250ml	$	GR	SA	PCB CN Cr6+	
049961-001	B6584NW-DFI-BH1-5-S	5ft	N/A	082499 1402	S	AC	125ml	$	GR	SA	VOC	
049961-002	B6584NW-DFI-BH1-5-S	5ft	N/A	082499 1402	S	AG	250ml	$	GR	SA	PCB CN Cr6+	
049962-001	B6584NW-DFI-BH1-10-S	10ft	N/A	082499 1511	S	AC	125ml	$	GR	SA	VOC	
049962-002	B6584NW-DFI-BH1-10-S	10ft	N/A	082499 1511	S	AG	250ml	$	GR	SA	PCB CN Cr6+	
049963-001	B6584 NW-DFI-BH2-5-S	5ft	N/A	082499 1555	S	AC	125ml	$	GR	SA	VOC	
049963-002	B6584 NW-DFI-BH2-5-S	5ft	N/A	082499 1555	S	AG	250ml	$	GR	SA	PCB CN Cr6+	
049964-001	B6584 NW-DFI-BH2-10-S	10ft	N/A	082599 0923	S	AC	125ml	$	GR	SA	VOC	
049964-002	B6584 NW-DFI-BH2-10-S	10ft	N/A	082599 0923	S	AG	250ml	$	GR	SA	PCB CN Cr6+	
049965-001	B6584 NW-DFI-BH3-5-S	5ft	N/A	082599 0945	S	AC	125ml	$	GR	SA	VOC	
049965-002	B6584NW-DFI-BH3-5-S	5ft	N/A	082599 0945	S	AG	250ml	$	GR	SA	PCB CN Cr6+	
049965-003	B6584NW-DFI-BH3-5-DUP	5ft	N/A	082599 0945	S	AG	250 ml	$	GR	DU	PCB CN Cr6+	
049967-002	B6584NW-DFI-BH3-5-MSDS	5ft	N/A	082599 0945	S	AG	2x250ml	$	GR	MSDS	PCB CN Cr6+	
049968-001	B6584NW-DFI-BH3-10-S	10ft	N/A	082599 1000	S	AC	125ml	$	GR	SA	VOC	
049968-002	B6584NW-DFI-BH3-10-S	10ft	N/A	082599 1000	S	AG	250ml	$	GR	SA	PCB CN Cr6+	
049968-												

ANNEX C
DSS Site 1024
Risk Assessment

This page intentionally left blank.

TABLE OF CONTENTS

This page intentionally left blank.

LIST OF TABLES

LIST OF FIGURES

DSS SITE 1024: RISK ASSESSMENT REPORT

I. Site Description and History

Drain and Septic Systems (DSS) Site 1024, the Mobile Office (MO) 242-245 Septic System, at Sandia National Laboratories/New Mexico (SNL/NM), is located approximately 100 feet north of the northern boundary of SNL/NM Technical Area (TA)-III on federally owned land controlled by Kirtland Air Force Base (KAFB). The site is situated approximately 400 feet west-northwest of the entrance to TA-III, and is approximately 120 feet northwest of the northwest corner of the MO 242-245 complex. The abandoned septic system consisted of a septic tank and distribution box that emptied to five approximately 40-foot-long parallel drain lines. Available information indicates that the MO 242-245 complex was constructed in 1976 (SNL/NM March 2003), and it is assumed that the septic system was also constructed at that time. By June 1991, the septic system discharges were routed to the City of Albuquerque sanitary sewer system (Jones June 1991). The old septic system line was disconnected and capped, and the system was abandoned in place concurrent with this change (Romero September 2003).

Environmental concern about DSS Site 1024 is based upon the potential for the release of constituents of concern (COCs) in effluent discharged to the environment via the septic system at this site. Because operational records were not available, the investigation of the site was planned to be consistent with other DSS site investigations and to sample for the COCs most commonly found at similar facilities.

The ground surface in the vicinity of the site is flat to very slightly sloping to the west. The closest major drainage is the Arroyo del Coyote, located approximately 1.1 miles north of the site. No springs or perennial surface-water bodies are located within 2 miles of the site. Average annual rainfall in the SNL/NM and KAFB area, as measured at Albuquerque International Sunport, is 8.1 inches (NOAA 1990). Surface-water runoff in the vicinity of the site is minor because the surface slope is flat to gently sloping 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 1024 is unpaved with some native vegetation, and no storm sewers are used to direct surface water away from the site.

DSS Site 1024 lies at an average elevation of approximately 5,408 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 485 feet below ground surface (bgs). Groundwater flow is to the west in this area (SNL/NM March 2002). The nearest groundwater monitoring well is approximately 100 feet southwest of the site, on the north side of the TA-III boundary fence. The production wells nearest to DSS Site 1024 are KAFB-4 and KAFB-11, approximately 2.65 and 3.0 miles northwest and northeast, respectively, from the site.

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-type 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 1024 was effluent discharged to the environment from the drainfield at this site.

Table 1
Summary of Sampling Performed to Meet DQOs

DSS Site 1024 Sampling Areas	Potential COC Source	Number of Sampling Locations	Sample Density (samples/acre)	Sampling Location Rationale
Soil beneath the septic system drainfield	Effluent discharged to the environment from the drainfield	3	NA	Evaluate potential COC releases to the environment from effluent discharged from the drainfield

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

The baseline soil samples were collected in three locations across DSS Site 1024. The samples were collected with a Geoprobe™ from two 3- to 4-foot-long sampling intervals at each boring location. Drainfield sampling intervals started at 5 and 10 feet bgs in each of the three drainfield borings. The soil samples were collected in accordance with the procedures described in the SAP (SNL/NM October 1999) and FIP (SNL/NM November 2001). Table 2 summarizes the types of confirmatory and QA/QC samples collected at the site and the laboratories that performed the analyses.

Table 2
Number of Confirmatory Soil and QA/QC Samples Collected from DSS Site 1024

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

The DSS Site 1024 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.), the on-site SNL/NM Environmental Restoration (ER) Chemistry Laboratory (ERCL), and the Radiation Protection Sample Diagnostics (RPSD) Laboratory. Table 3 summarizes the analytical methods and the data quality requirements from the SAP (SNL/NM October 1999) and FIP (SNL/NM November 2001).

Table 3
Summary of Data Quality Requirements for DSS Site 1024

Analytical Method[a]	Data Quality Level	GEL	ERCL	RPSD
VOCs EPA Method 8260	Defensible	6	None	None
SVOCs EPA Method 8270	Defensible	6	None	None
PCBs EPA Method 8082	Defensible	6	None	None
HE Compounds EPA Method 8330	Defensible	None	6	None
RCRA Metals EPA Method 6000/7000	Defensible	None	6	None
Hexavalent Chromium EPA Method 7196A	Defensible	6	None	None
Total Cyanide EPA Method 9012A	Defensible	6	None	None
Gamma Spectroscopy Radionuclides EPA Method 901.1	Defensible	None	None	6
Gross Alpha/Beta Activity EPA Method 900.0	Defensible	6	None	None

Note: The number of samples does not include QA/QC samples such as duplicates, trip blanks, and equipment blanks.
[a]EPA November 1986.
DSS = Drain and Septic Systems.
EPA = U.S. Environmental Protection Agency.
ERCL = Environmental Restoration Chemistry Laboratory.
GEL = General Engineering Laboratories, Inc.
HE = High explosive(s).
PCB = Polychlorinated biphenyl.
QA = Quality assurance.
QC = Quality control.
RCRA = Resource Conservation and Recovery Act.
RPSD = Radiation Protection Sample Diagnostics Laboratory.
SVOC = Semivolatile organic compound.
VOC = Volatile organic compound.

The QA/QC samples were collected during the baseline sampling effort according to the ER Project Quality Assurance Project Plan. The QA/QC sample consisted of one trip blank (for VOCs only). No significant QA/QC problems were identified in the QA/QC sample.

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 1024 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 1024 is based upon an initial conceptual model validated with confirmatory sampling at the site. The initial conceptual model was developed from archival site research, site inspections, and soil 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 1024, which is presented in Section 4.0 of the associated NFA proposal. The quality of the data specifically used to determine the nature, migration rate, and extent of contamination is described in the following sections.

III.2 Nature of Contamination

Both the nature of contamination and the potential for the degradation of COCs at DSS Site 1024 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 1024.

III.3 Rate of Contaminant Migration

The septic system at DSS Site 1024 was deactivated in the early 1990s when the MO 242-245 complex was connected to an extension of the City of Albuquerque sanitary sewer system. The migration rate of COCs that may have been introduced into the subsurface via the septic system at this site was therefore dependent upon the volume of aqueous effluent discharged to the environment from this system when it was operational. Any migration of COCs from this

site after use of the septic system was discontinued has been predominantly dependent upon infiltrating 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 1024.

III.4 Extent of Contamination

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

The baseline soil samples were collected at sampling depths starting at 5 and 10 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 1024 NFA proposal describes the identification of COCs and the sampling that was conducted in order to determine the concentration levels of those COCs across the site. Generally, COCs evaluated in this risk assessment include all detected organic compounds and all inorganic and radiological COCs for which samples were analyzed. When the detection limit of an organic compound was too high (i.e., could possibly cause an adverse effect to human health or the environment), the compound was retained. Nondetected organic compounds not included in this assessment were determined to have detection limits low enough to ensure protection of human health and the environment. In order to provide conservatism in this risk assessment, the calculation uses only the maximum concentration value of each COC found for the entire site. The SNL/NM maximum background concentration (Dinwiddie September 1997) was selected to provide the background screen listed in Tables 4 through 7.

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

Tables 4 and 5 list the nonradiological COCs for the human health and ecological risk assessments at DSS Site 1024, respectively; Tables 6 and 7 list the 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.4.2 discusses Tables 4 and 6, Section VII.2 discusses Tables 5 and 7, and Section VII.3 discusses Table 5.

Table 4
Nonradiological COCs for Human Health Risk Assessment at DSS Site 1024 with Comparison to the Associated SNL/NM Background Screening Value, BCF, and Log K_{ow}

COC	Maximum Concentration (All Samples) (mg/kg)	SNL/NM Background Concentration (mg/kg)[a]	Is Maximum COC Concentration Less Than or Equal to the Applicable SNL/NM Background Screening Value?	BCF (maximum aquatic)	Log K_{ow} (for organic COCs)	Bioaccumulator?[b] (BCF>40, Log K_{ow}>4)
Inorganic						
Arsenic	4.5 J	4.4	**No**	44[c]	–	**Yes**
Barium	94 J	214	Yes	170[d]	–	**Yes**
Cadmium	0.13 J	0.9	Yes	64[c]	–	**Yes**
Chromium, total	10 J	15.9	Yes	16[c]	–	No
Chromium VI	0.0902 J	1	Yes	16[c]	–	No
Cyanide	0.161 J	NC	**Unknown**	NC	–	**Unknown**
Lead	6 J	11.8	Yes	49[c]	–	**Yes**
Mercury	0.0680 J	<0.1	**Unknown**	5,500[c]	–	**Yes**
Selenium	0.155[e]	<1	**Unknown**	800[f]	–	**Yes**
Silver	0.057 J	<1	**Unknown**	0.5[c]	–	No
Organic						
2-Butanone	0.018 J	NA	**NA**	1[g]	0.29[g]	No
Carbon Disulfide	0.0028 J	NA	**NA**	7.9[g]	2.93[g]	No
Methylene Chloride	0.0078	NA	**NA**	5[g]	1.25[g]	No
Toluene	0.0031	NA	**NA**	10.7[g]	2.69[c]	No
PCBs, total	0.0027 J	NA	**NA**	31,200[f]	6.72[f]	**Yes**

Note: **Bold** indicates the COCs that exceed the background screening values and/or are bioaccumulators.
[a]Dinwiddie September 1997, Southwest Area Supergroup.
[b]NMED March 1998.
[c]Yanicak March 1997.
[d]Neumann 1976.
[e]Parameter was not detected. Concentration listed is one-half the maximum detection limit.
[f]Callahan et al. 1979.
[g]Howard 1990.

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 1024 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 J	4.4	Yes	44[c]	–	**Yes**
Barium	94 J	214	Yes	170[d]	–	**Yes**
Cadmium	0.097 J	0.9	Yes	64[c]	–	**Yes**
Chromium, total	8.1 J	15.9	Yes	16[c]	–	No
Chromium VI	0.0902 J	1	Yes	16[c]	–	No
Cyanide	0.069[e]	NC	**Unknown**	NC	–	**Unknown**
Lead	4.2 J	11.8	Yes	49[c]	–	**Yes**
Mercury	0.051 J	<0.1	**Unknown**	5,500[c]	–	**Yes**
Selenium	0.15[e]	<1	**Unknown**	800[f]	–	**Yes**
Silver	0.02[e]	<1	**Unknown**	0.5[c]	–	No
Organic						
2-Butanone	0.014 J	NA	**NA**	1[g]	0.29[g]	No
Carbon Disulfide	0.0028 J	NA	**NA**	7.9[g]	2.93[g]	No
Methylene Chloride	0.0019 J	NA	**NA**	5[g]	1.25[g]	No
Toluene	0.0031	NA	**NA**	10.7[g]	2.69[c]	No
PCBs, total	0.0027 J	NA	**NA**	31,200[f]	6.72[f]	**Yes**

Note: **Bold** indicates the COCs that exceed the background screening values and/or are bioaccumulators.
[a]Dinwiddie September 1997, Southwest Area Supergroup.
[b]NMED March 1998.
[c]Yanicak March 1997.
[d]Neumann 1976.
[e]Parameter was not detected. Concentration listed is one-half the maximum detection limit.
[f]Callahan et al. 1979.
[g]Howard 1990.

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 biphenyl.
SNL/NM = Sandia National Laboratories/New Mexico.
– = Information not available.

Table 6
Radiological COCs for Human Health Risk Assessment at DSS Site 1024 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 (0.0171)	0.079	Yes	3,000[d]	**Yes**
Th-232	0.656	1.01	Yes	3,000[d]	**Yes**
U-235	ND (0.0931)	0.16	Yes	900[d]	**Yes**
U-238	0.718	1.4	Yes	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 1024 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 (0.0162)	0.079	Yes	3,000[d]	**Yes**
Th-232	0.637	1.01	Yes	3,000[d]	**Yes**
U-235	ND (0.0931)	0.16	Yes	900[d]	**Yes**
U-238	0.607	1.4	Yes	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.
bgs = Below ground surface.
COC = Constituent of concern.
DSS = Drain and Septic Systems.
ft = Foot (feet).
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 1024 were to the subsurface soil resulting from the discharge of effluents from the MO 242-245 septic system. Wind, water, and biota are natural mechanisms of COC transport from the primary release point; however, because the discharge was to subsurface soil, none of these mechanisms are considered to be of potential significance as transport mechanisms at this site. Because the septic system is no longer active, additional infiltration of water is not expected. Infiltration of precipitation is essentially nonexistent at DSS Site 1024, as virtually all of the moisture either drains away from the site or evaporates. Because groundwater at this site is approximately 485 feet bgs, the potential for COCs to reach groundwater through the unsaturated zone above the water table is extremely low.

COCs at DSS Site 1024 include both inorganic and organic constituents. The inorganic COCs are nonradiological analytes (no radiological analytes above background were detected). With the exception of cyanide, the inorganic COCs are elemental in form and are not considered to be degradable. Transformations of these inorganic constituents could include changes in valence (oxidation/reduction reactions) or incorporation into organic forms (e.g., the conversion of selenite or selenate from soil to seleno-amino acids in plants). Cyanide can be metabolized by soil biota.

The organic COCs at DSS Site 1024 consist of Aroclor-1260 (total PCBs), 2-butanone, carbon disulfide, methylene chloride, and toluene. Organic COCs may be degraded through photolysis, hydrolysis, and biotransformation. Photolysis requires light and therefore takes place in the air, at the ground surface, or in surface water. Hydrolysis includes chemical transformations in water and may occur in the soil solution. Biotransformation (i.e., transformation caused by plants, animals, and microorganisms) may occur; however, biological activity may be limited by the arid environment at this site. Because of the depth of the COCs in the soil, the loss of 2-butanone, carbon disulfide, methylene chloride, and toluene through volatilization is expected to be minimal.

Table 8 summarizes the fate and transport processes that can occur at DSS Site 1024. The COCs at this site include nonradiological inorganic and organic analytes. Wind, surface water, and biota are considered to be of low significance as potential transport mechanisms at this site. Significant leaching into the subsurface soil is unlikely, and leaching into the groundwater at this site is highly unlikely.

Table 8
Summary of Fate and Transport at DSS Site 1024

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

DSS = Drain and Septic Systems.

VI. Human Health Risk Assessment

VI.1 Introduction

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

Step 1.	Site data are described that provide information on the potential COCs, as well as the relevant physical characteristics and properties of the site.
Step 2.	Potential pathways are identified by which a representative population might be exposed to the COCs.
Step 3.	The potential intake of these COCs by the representative population is calculated using a tiered approach. The first component of the tiered approach is a screening procedure that compares the maximum concentration of the COC to an SNL/NM maximum background screening value. COCs that are not eliminated during the first screening procedure are carried forward in the risk assessment process.
Step 4.	Toxicological parameters are identified and referenced for COCs that were not eliminated during the screening procedure.
Step 5.	Potential toxicity effects (specified as a hazard index [HI]) and estimated excess cancer risks are calculated for nonradiological COCs and background. For radiological COCs, the incremental total effective dose equivalent and incremental estimated cancer risk are calculated by subtracting applicable background concentrations directly from maximum on-site contaminant values. This background subtraction applies only when a radiological COC occurs as contamination and exists as a natural background radionuclide.
Step 6.	These values are compared with guidelines established by the U.S. Environmental Protection Agency (EPA), NMED, and the U.S. Department of Energy (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 1024. 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 1024 has been designated with a future land-use scenario of industrial (DOE et al. September 1995) (see Appendix 1 for default exposure pathways and parameters). However, the residential land-use scenario is also considered in the pathway analysis. Because of the location and characteristics of the potential contaminants, the primary pathway for human exposure is considered to be soil ingestion for the nonradiological COCs and direct gamma exposure for the radiological COCs. The inhalation pathway for both nonradiological and radiological COCs is included because the potential exists to inhale dust and volatiles. Soil ingestion is included for the radiological COCs as well. The dermal pathway is included for the nonradiological COCs because of the potential for the receptor to be exposed to contaminated soil. No water pathways to the groundwater are considered. Depth to groundwater at

DSS Site 1024 is approximately 485 feet bgs. No intake routes through plant, meat, or milk ingestion are considered appropriate for either the industrial or residential land-use scenarios. Figure 1 shows the conceptual site model flow diagram for DSS Site 1024.

Pathway Identification

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

VI.4 Step 3. Background Screening Procedure

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

VI.4.1 Methodology

Maximum concentrations of nonradiological COCs are compared to the approved SNL/NM maximum screening levels for this area (Dinwiddie September 1997). The SNL/NM maximum background concentration was selected to provide the background screen in Table 4 and used to calculate risk attributable to background in Sections VI.6.2 and VI.7. Only the COCs that were detected above the corresponding SNL/NM maximum background screening levels or that do not have either a quantifiable or calculated background screening level are considered in further risk assessment analyses.

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

VI.4.2 Results

Tables 4 and 6 show the DSS Site 1024 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 the background screening value. Four constituents do not have quantified background screening concentrations; therefore, it is unknown whether these COCs exceed background. Five nonradiological COCs are organic compounds that do not have corresponding background screening values.

This page intentionally left blank.

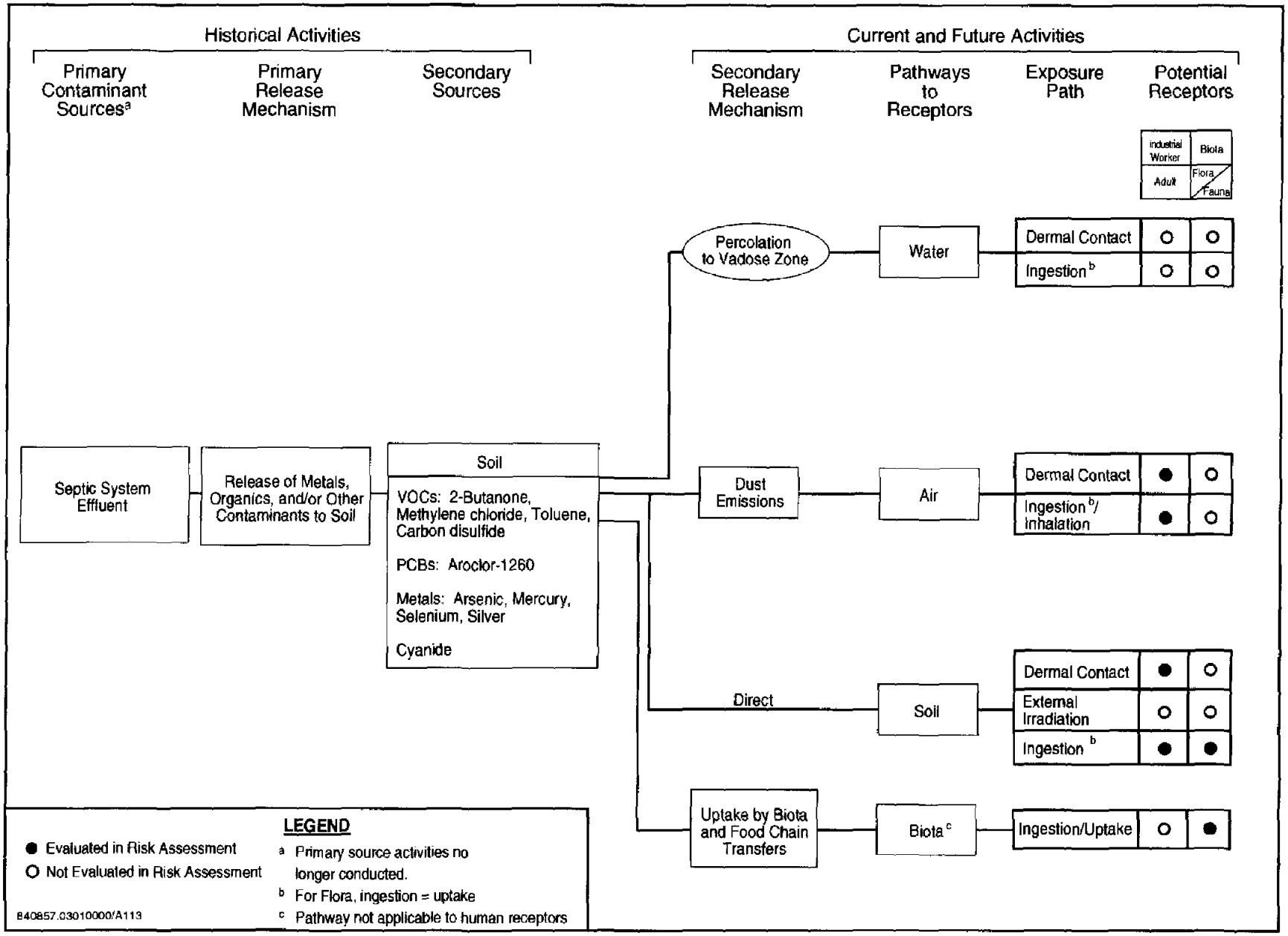


Figure 1

Conceptual Site Model Flow Diagram for DSS Site 1024, MO 242-245 Septic System

The maximum concentration value for total PCBs is 0.0027 milligrams (mg)/kilogram (kg). This concentration is less than the EPA screening level of 1 mg/kg (Title 40, Code of Federal Regulations, Part 761). Because the maximum concentration for PCBs at this site is less than the screening value, PCBs are eliminated from further consideration in the human health risk assessment.

For the radiological COCs, none of the constituents exceed background activity values. Therefore, the radiological COCs are eliminated from further evaluation in the risk assessment.

VI.5 Step 4. Identification of Toxicological Parameters

Table 9 lists the nonradiological 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), the Technical Background Document for Development of Soil Screening Levels (NMED December 2000), and the Risk Assessment Information System (ORNL 2003) electronic databases.

VI.6 Step 5. Exposure Assessment and Risk Characterization

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

VI.6.1 Exposure Assessment

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

VI.6.2 Risk Characterization

Table 10 shows an HI of 0.02 for the DSS Site 1024 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 11 shows an HI of 0.02 and an estimated excess cancer risk of 3E-6 for the DSS Site 1024 associated background constituents under the designated industrial land-use scenario.

Table 9
Toxicological Parameter Values for DSS Site 1024 Nonradiological COCs

COC	RfD_o (mg/kg-d)	Confidence[a]	RfD_{inh} (mg/kg-d)	Confidence[a]	SF_o $(mg/kg\text{-}d)^{-1}$	SF_{inh} $(mg/kg\text{-}d)^{-1}$	Cancer Class[b]	ABS
Inorganic								
Arsenic	3E-4[c]	M	–	–	1.5E+0[c]	1.5E+1[c]	A	0.03[d]
Cyanide	2E-2[c]	M	–	–	–	–	D	0.1[d]
Mercury	3E-4[e]	–	8.6E-5[c]	M	–	–	D	0.01[d]
Selenium	5E-3[c]	H	–	–	–	–	D	0.01[d]
Silver	5E-3[c]	L	–	–	–	–	D	0.01[d]
Organic								
2-Butanone	6E-1[c]	L	2.9E-1[c]	L	–	–	D	0.1[d]
Carbon Disulfide	1E-1[c]	M	2E-1[c]	M	–	–	–	0.25[f]
Methylene Chloride	6E-2[c]	M	8.6E-1[e]	–	7.5E-3[c]	1.6E-3[c]	B2	0.1[d]
Toluene	2E-1[c]	M	1.1E-1[c]	M	–	–	D	0.1[d]

[a]Confidence associated with IRIS (EPA 2003) database values. Confidence: L = low, M = medium, H = high.
[b]EPA weight-of-evidence classification system for carcinogenicity (EPA 1989) taken from IRIS (EPA 2003):
A = Human carcinogen.
B2 = Probable human carcinogen. Sufficient evidence in animals and inadequate or no evidence in humans.
D = Not classifiable as to human carcinogenicity.
[c]Toxicological parameter values from IRIS electronic database (EPA 2003).
[d]Toxicological parameter values from NMED December 2000.
[e]Toxicological parameter values from HEAST (EPA 1997a).
[f]Toxicological parameter values from ORNL 2003.
ABS = Gastrointestinal absorption coefficient.
COC = Constituent of concern.
DSS = Drain and Septic Systems.
EPA = U.S. Environmental Protection Agency.
HEAST = Health Effects Assessment Summary Tables.
IRIS = Integrated Risk Information System.
mg/kg-d = Milligram(s) per kilogram day.
$(mg/kg\text{-}d)^{-1}$ = Per milligram per kilogram day.
NMED = New Mexico Environment Department.
ORNL = Oak Ridge National Laboratory.
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
Risk Assessment Values for DSS Site 1024 Nonradiological COCs

COC	Maximum Concentration (All Samples) (mg/kg)	Industrial Land-Use Scenario[a]		Residential Land-Use Scenario[a]	
		Hazard Index	Cancer Risk	Hazard Index	Cancer Risk
Inorganic					
Arsenic	4.5 J	0.02	3E-6	0.21	1E-5
Cyanide	0.161 J	0.00	–	0.00	–
Mercury	0.0680 J	0.00	–	0.00	–
Selenium	0.155[b]	0.00	–	0.00	–
Silver	0.057 J	0.00	–	0.00	–
Organic					
2-Butanone	0.018 J	0.00	–	0.00	–
Carbon Disulfide	0.0028 J	0.00	–	0.00	–
Methylene Chloride	0.0078 J	0.00	5E-8	0.00	1E-7
Toluene	0.0001	0.00	–	0.00	–
Total		**0.02**	**3E-6**	**0.21**	**1E-5**

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

Table 11
Risk Assessment Values for DSS Site 1024 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 September 1997, Southwest Area Supergroup.
[b]EPA 1989.
COC = Constituent of concern.
DSS = Drain and Septic Systems.
EPA = U.S. Environmental Protection Agency.
mg/kg = Milligram(s) per kilogram.
NC = Not calculated.
– = Information not available.

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

For the nonradiological COCs under the residential land-use scenario, the HI is 0.21 with an estimated excess cancer risk of 1E-5. The numbers in the table include exposure from soil ingestion, dermal contact, and dust and volatile inhalation. Although the EPA (1991) generally recommends that inhalation not be included in a residential land-use scenario, this pathway is included because of the potential for soil in Albuquerque, New Mexico, to be eroded and for dust to be present in predominantly residential areas. Because of the nature of the local soil, other exposure pathways are not considered (see Appendix 1). Table 11 shows an HI of 0.20 and an estimated excess cancer risk of 1E-5 for the DSS Site 1024 associated background constituents under the residential land-use scenario.

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

VI.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 (less than the numerical guideline of 1 suggested in the RAGS [EPA 1989]). The estimated excess cancer risk is 3E-6. NMED guidance states that cumulative excess lifetime cancer risk must be less than 1E-5 (Bearzi January 2001); thus the excess cancer risk for this site is below the suggested acceptable risk value. This assessment also determined risks considering background concentrations of the potential nonradiological COCs for both the industrial and residential land-use scenarios. Assuming the industrial land-use scenario, there is neither a quantifiable HI nor an excess cancer risk for nonradiological COCs. The incremental risk is determined by subtracting risk associated with background from potential COC risk. These numbers are not rounded before the difference is determined and therefore may appear to be inconsistent with numbers presented in tables and within the text. For conservatism, the background constituents that do not have quantified background screening concentrations are assumed to have a hazard quotient (HQ) of 0.00. The incremental HI is 0.00 and the incremental estimated excess cancer risk is 1.13E-7 for the industrial land-use scenario. These incremental risk calculations indicate insignificant risk to human health from nonradiological COCs under an industrial land-use scenario.

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

The calculated HI for the nonradiological COCs under the residential land-use scenario is 0.21, which is below numerical guidance. The estimated excess cancer risk is 1E-5. NMED guidance states that cumulative excess lifetime cancer risk must be less than 1E-5 (Bearzi January 2001); thus the excess cancer risk for this site is slightly above the suggested acceptable risk value. The incremental HI is 0.01 and the estimated incremental cancer risk is 3.65E-7 for the residential land-use scenario. These incremental risk calculations indicate

insignificant risk to human health from nonradiological COCs under the residential land-use scenario.

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

VI.8 Step 7. Uncertainty Discussion

The determination of the nature, rate, and extent of contamination at DSS Site 1024 is based upon an initial conceptual model that was validated with baseline sampling conducted at the site. The baseline sampling was implemented in accordance with the SAP (SNL/NM October 1999) and FIP (SNL/NM November 2001). The DQOs contained in these two documents are appropriate for use in risk assessments. The data from soil samples collected at effluent release points are representative of potential COC releases to the site. The analytical requirements and results satisfy the DQOs, and data quality was verified/validated in accordance with SNL/NM procedures. Therefore, there is no uncertainty associated with the data quality for the risk assessment at DSS Site 1024.

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

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

Table 9 shows the uncertainties (confidence levels) in nonradiological toxicological parameter values. There is a combination of estimated values and values from the IRIS (EPA 2003), HEAST (EPA 1997a), EPA Regions 6, 9, and 3 (EPA 2002a, EPA 2002b, EPA 2002c), and Technical Background Document for Development of Soil Screening Levels (NMED December 2000). Where values are not provided, information is not available from the HEAST (EPA 1997a), IRIS (EPA 2003), Technical Background Document for Development of Soil Screening Levels (NMED December 2000), Risk Assessment Information System (ORNL 2003), or EPA regions (EPA 2002a, EPA 2002b, EPA 2002c). Because of the conservative nature of the RME approach, uncertainties in toxicological values are not expected to change the conclusion from the risk assessment analysis.

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

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

VI.9 Summary

DSS Site 1024 contains identified COCs consisting of some inorganic and organic compounds. Because of the location of the site, the designated industrial land-use scenario, and the nature of contamination, potential exposure pathways identified for this site include soil ingestion, dermal contact, and dust and volatile inhalation for chemical COCs. The same exposure pathways are applied to the residential land-use scenario.

Using conservative assumptions and an RME approach to risk assessment, calculations for nonradiological COCs show that for the industrial land-use scenario the HI (0.02) is significantly lower than the accepted numerical guidance from the EPA. The estimated excess cancer risk is 3E-6; thus, excess cancer risk is also below the acceptable risk value provided by the NMED for an industrial land-use scenario (Bearzi January 2001). The incremental HI is 0.00, and the incremental estimated excess cancer risk is 1.13E-7 for the industrial land-use scenario. The incremental risk calculations indicate insignificant risk to human health for the industrial land-use scenario.

Using conservative assumptions and an RME approach to risk assessment, calculations for nonradiological COCs show that for the residential land-use scenario the HI (0.21) is below the accepted numerical guidance from the EPA. The estimated excess cancer risk is 1E-5. Thus, excess cancer risk is slightly above the acceptable risk value provided by the NMED for a residential land-use scenario (Bearzi January 2001). The incremental HI is 0.01 and the incremental estimated excess cancer risk is 3.65E-7 for the residential land-use scenario. The incremental risk calculations indicate insignificant risk to human health for the residential land-use scenario.

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

The excess cancer risk from the nonradiological and radiological COCs should be summed to provide risk estimates for persons exposed to both types of carcinogenic contaminants, as noted in Office of Solid Waste and Emergency Response (OSWER) Directive No. 9200.4-18 (EPA 1997b). The summation of the nonradiological and radiological carcinogenic risks is tabulated in Table 12.

Table 12
Summation of Radiological and Nonradiological Risks from DSS Site 1024, MO 242-245 Septic System Carcinogens

Scenario	Nonradiological Risk	Radiological Risk	Total Risk
Industrial	1.13E-7	0.0	1.13E-7
Residential	3.65E-7	0.0	3.65E-7

DSS = Drain and Septic Systems.
MO = Mobile Office.

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

VII. Ecological Risk Assessment

VII.1 Introduction

This section addresses the ecological risks associated with exposure to constituents of potential ecological concern (COPECs) in the soil at DSS Site 1024. A component of the NMED Risk-Based Decision Tree (NMED March 1998) is to conduct an ecological assessment that corresponds with that presented in the 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 the NMED's decision tree (a discussion of DQOs, data assessment, and evaluations of bioaccumulation as well as fate and transport potential) are addressed in previous sections of this report. 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 incorporates conservatisms into 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 (Table 5), inorganic constituents in the soil within the 0- to 5-foot depth interval that exceed background concentrations or have no quantified background concentration are as follows:

- Cyanide
- Mercury
- Selenium
- Silver

Organic analytes detected in the soil are as follows:

- 2-Butanone
- Carbon disulfide
- Methylene chloride
- Toluene
- Total PCBs (Aroclor-1260)

As shown in Table 7, no radiological COPECs were identified for this site.

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):

- Mercury
- Selenium
- Total PCBs

It should be noted, however, that as directed by the NMED (March 1998), bioaccumulation for inorganic compounds 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 are expected to be of low significance as transport mechanisms for COPECs at this site. Migration to groundwater is not anticipated. In general, transformation of COPECs is expected to be of low significance. Volatile COPECs (2-butanone, carbon disulfide, methylene chloride, and toluene) that are near the soil surface may be lost to the atmosphere.

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 exist at the site. As a consequence, a risk assessment was 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 DSS Site 1024. The 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 ecological risk assessment.

VII.3.1 Problem Formulation

Problem formulation is the initial stage of the ecological 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 a 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 1024 is less than an acre in size. The site is located in an area originally dominated by grassland habitat; however, this habitat has been highly disturbed in the area of the site. 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. It is assumed that direct uptake of COPECs from the 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. 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 are also considered insignificant pathways with respect to ingestion (Sample and Suter 1994). Groundwater is not expected to be affected by COCs at this site.

VII.3.1.2 COPECs

Discharge of waste water from the MO 242-245 Septic System is the primary source of COPECs at DSS Site 1024. Inorganic and organic COPECs identified for this site are listed in Section VII.2.1. The inorganic analytes were screened against background concentrations, and those that exceed the approved SNL/NM background screening levels (Dinwiddie September 1997) for the area and those for which there is no quantified background value are considered to be COPECs. No radiological COPECs were identified for the site. 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). All organic analytes detected within the upper 5 feet of soil are considered to be COPECs for the site. 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. Table 5 presents the 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 represents 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

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 to be 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 13 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 surface soil samples are used to conservatively estimate potential exposures and risks to plants and wildlife at this site. Table 14 provides the transfer factors used in modeling the concentrations of COPECs through the food chain. Table 15 presents the 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.

VII.3.3 Ecological Effects Evaluation

Table 16 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 is not available to estimate the LOAELs or NOAELs for some COPECs.

VII.3.4 Risk Characterization

Maximum concentrations in soil and estimated dietary exposures are compared to plant and wildlife benchmark values, respectively. Table 17 presents the results of these comparisons. HQs are used to quantify the comparison with benchmarks for plant and wildlife exposure.

None of the HQs for this site exceed unity. Because of a lack of sufficient toxicity information, an HQ for plants could not be determined for cyanide, 2-butanone, carbon disulfide, and methylene chloride. HQs for the burrowing owl could not be determined for cyanide, silver, 2-butanone, carbon disulfide, methylene chloride, and toluene. As directed by the NMED, HIs are calculated for each of the receptors (the HI is the sum of chemical-specific HQs for all pathways for a given receptor). None of the HIs exceed unity, with a maximum HI of 0.74 for the burrowing owl.

VII.3.5 Uncertainty Assessment

Many uncertainties are associated with the characterization of ecological risks at DSS Site 1024. These uncertainties result from assumptions used in calculating risk that could 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

Table 13
Exposure Factors for Ecological Receptors at DSS Site 1024

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% 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 14
Transfer Factors Used in Exposure Models for COPECs at DSS Site 1024

COPEC	Soil-to-Plant Transfer Factor	Soil-to-Invertebrate Transfer Factor	Food-to-Muscle Transfer Factor
Inorganic			
Cyanide	0.0E+0[a]	0.0E+0[a]	0.0E+0[a]
Mercury	1.0E+0[b]	1.0E+0[c]	2.5E-1[d]
Selenium	5.0E-1[b]	1.0E+0[c]	1.0E-1[b]
Silver	1.0E+0[b]	2.5E-1[e]	5.0E-3[b]
Organic[f]			
2-Butanone	2.6E+1	1.4E+1	3.7E-8
Carbon Disulfide	7.8E-1	1.8E+1	2.0E-5
Methylene Chloride	7.3E+0	1.5E+1	3.6E-7
Toluene	1.0E+0	1.8E+1	1.3E-5
PCBs, total	1.3E-2	2.6E+1	3.2E-2

[a]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.
[b]NCRP January 1989.
[c]Default value.
[d]Baes et al. 1984.
[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 are based upon the relationship of the transfer factor to the Log K_{ow} value of compound.
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 15
Media Concentrations[a] for COPECs at DSS Site 1024

COPEC	Soil (Samples ≤ 5 ft bgs) (maximum)[a]	Plant Foliage[b]	Soil Invertebrate[b]	Deer Mouse Tissues[c]
Inorganic				
Cyanide	6.9E-2[d]	0.0E+0	0.0E+0	0.0E+0
Mercury	5.1E-2[e]	5.1E-2	5.1E-2	4.1E-2
Selenium	1.5E-1[d]	7.5E-2	1.5E-1	3.6E-2
Silver	2.0E-2[d]	2.0E-2	5.0E-3	2.0E-4
Organic				
2-Butanone	1.4E-2[e]	3.7E-1	1.9E-1	3.2E-8
Carbon Disulfide	2.8E-3[e]	2.2E-3	5.2E-2	1.7E-6
Methylene Chloride	1.9E-3[e]	1.4E-2	2.9E-2	2.4E-8
Toluene	3.1E-3	3.1E-3	5.6E-2	1.2E-6
PCBs, total	2.7E-3[e]	3.4E-5	7.1E-2	3.6E-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]Concentration of parameter is one-half the maximum detection limit.
[e]Estimated value.
bgs = Below ground surface.
COPEC = Constituent of potential ecological concern.
DSS = Drain and Septic Systems.
ft = Foot (feet).
PCB = Polychlorinated biphenyl.

Table 16
Toxicity Benchmarks for Ecological Receptors at DSS Site 1024

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							
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							
2-Butanone	–	rat	1,771	3,464	–	–	–
Carbon Disulfide	–	rabbit	1.1	3.91	–	–	–
Methylene Chloride	–	rat	5.85	11.4	–	–	–
Toluene	200	mouse	26.0	27.5	–	–	–
PCBs, total (as Aroclor 1254)	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 (except where noted); oldfield mouse, 0.014.
[d]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/d (EPA 2003) and an uncertainty factor of 0.2.

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

Table 17
HQs for Ecological Receptors at DSS Site 1024

COPEC	Plant HQ	Deer Mouse HQ (Herbivorous)	Deer Mouse HQ (Omnivorous)	Deer Mouse HQ (Insectivorous)	Burrowing Owl HQ
Inorganic					
Cyanide	–	1.7E-6	1.7E-6	1.7E-6	–
Mercury (Organic)	1.7E-1	1.3E-1	1.3E-1	1.3E-1	7.3E-1
Mercury (Inorganic)	1.7E-1	5.8E-4	5.8E-4	5.8E-4	1.0E-2
Selenium	1.5E-1	3.1E-2	4.6E-2	6.1E-2	9.9E-3
Silver	1.0E-2	9.1E-5	5.8E-5	2.4E-5	–
Organic					
2-Butanone	–	1.7E-5	1.3E-5	8.6E-6	–
Carbon Disulfide	–	9.0E-5	1.1E-3	2.1E-3	–
Methylene Chloride	–	1.9E-4	2.9E-4	3.9E-4	–
Toluene	1.6E-5	1.8E-5	1.7E-4	3.2E-4	–
PCBs, total	6.8E-5	2.3E-4	9.3E-2	1.9E-1	2.2E-3
HI[a]	3.3E-1	1.6E-1	2.7E-1	3.8E-1	7.4E-1

[a]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.

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 nine COPECs, cyanide, selenium, and silver are nondetections, and the exposure estimates for these nondetected analytes are conservatively based upon one half of the detection limit. Further, the maximum concentration of all the remaining COPECs are estimated values with the exception of toluene.

Because no HQs greater than unity were predicted and because these HQs are based upon conservative estimates of exposure and toxicity, the potential for ecological risks at DSS Site 1024 is expected to be very low.

VII.3.6 Risk Interpretation

Ecological risks associated with DSS Site 1024 were estimated through a risk assessment that incorporated site-specific information when available. All HQ and HI values predicted for the COPECs at this site were found to be less than unity. 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 1024 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 assess actual ecological risk at the site more thoroughly. With respect to this site, ecological risks are predicted to be very low. The scientific/management decision is to recommend this site for NFA.

VIII. References

Baes, III, C.F., R.D. Sharp, A.L. Sjoreen, and R.W. Shor, 1984. "A Review and Analysis of Parameters for Assessing Transport of Environmentally Released Radionuclides through Agriculture," ORNL-5786, Oak Ridge National Laboratory, Oak Ridge, Tennessee.

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

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

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

Connell, D.W., and R.D. Markwell, 1990. "Bioaccumulation in Soil to Earthworm System," *Chemosphere*, Vol. 20, pp. 91–100.

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

DOE, see U.S. Department of Energy.

Dunning, J.B., 1993. *CRC Handbook of Avian Body Masses*, CRC Press, Boca Raton, Florida.

Efroymson, R.A., M.E. Will, G.W. Suter II, and A.C. Wooten, 1997. "Toxicological Benchmarks for Screening Potential Contaminants of Concern for Effects on Terrestrial Plants: 1997 Revision," ES/ER/TM-85/R3, Oak Ridge National Laboratory, Oak Ridge, Tennessee.

EPA, see U.S. Environmental Protection Agency.

Haug, E.A., B.A. Millsap, and M.S. Martell, 1993. "*Speotyto cunicularia* Burrowing Owl," *in* A. Poole and F. Gill (eds.), *The Birds of North America*, No. 61, The Academy of Natural Sciences of Philadelphia.

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

IT, see IT Corporation.

IT Corporation (IT), February 1995. "Sensitive Species Survey Results, Environmental Restoration Project, Sandia National Laboratories/New Mexico," IT Corporation, Albuquerque, New Mexico.

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

Jones, J. (Sandia National Laboratories/New Mexico), June 1991. Internal memorandum to D. Dionne listing the septic tanks that were removed from service with the construction of the Area III sanitary sewer system. June 21, 1991.

Nagy, K.A., 1987. "Field Metabolic Rate and Food Requirement Scaling in Mammals and Birds," *Ecological Monographs*, Vol. 57, No. 2, pp. 111–128.

National Council on Radiation Protection and Measurements (NCRP), 1987. "Exposure of the Population in the United States and Canada from Natural Background Radiation," National Council on Radiation Protection and Measurements, Bethesda, Maryland.

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

NCRP, see National Council on Radiation Protection and Measurements.

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

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

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

NMED, see New Mexico Environment Department.

NOAA, see National Oceanic and Atmospheric Administration.

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

ORNL, see Oak Ridge National Laboratory.

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

Sample, B.E., and G.W. Suter II, 1994. "Estimating Exposure of Terrestrial Wildlife to Contaminants," ES/ER/TM-125, Oak Ridge National Laboratory, Oak Ridge, Tennessee.

Sample, B.E., D.M. Opresko, and G.W. Suter II, 1996. "Toxicological Benchmarks for Wildlife: 1996 Revision," ES/ER/TM-86/R3, Risk Assessment Program, Health Sciences Research Division, Oak Ridge National Laboratory, Oak Ridge, Tennessee.

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

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

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

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

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

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

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

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

Silva, M., and J.A. Downing, 1995. *CRC Handbook of Mammalian Body Masses*, CRC Press, Boca Raton, Florida.

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

Stafford, E.A., J.W. Simmers, R.G. Rhett, and C.P. Brown, 1991. "Interim Report: Collation and Interpretation of Data for Times Beach Confined Disposal Facility, Buffalo, New York," *Miscellaneous Paper* D-91-17, U.S. Army Corps of Engineers, Buffalo, New York.

Travis, C.C., and A.D. Arms, 1988. "Bioconcentration of Organics in Beef, Milk, and Vegetables," *Environmental Science Technology*, Vol. 22, No. 3, pp. 271–274.

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

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

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

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

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

U.S. Environmental Protection Agency (EPA), 1993. "Wildlife Exposure Factors Handbook, Volume I of II," EPA/600/R-93/187a, Office of Research and Development, U.S. Environmental Protection Agency, Washington, D.C.

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

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

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

U.S. Environmental Protection Agency (EPA), 1998. "Guidelines for Ecological Risk Assessment," EPA/630/R-95/002F, Risk Assessment Forum, U.S. Environmental Protection Agency, Washington, D.C.

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

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

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

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

U.S. Fish and Wildlife Service (USFWS), September 1995. "Migratory Nongame Birds of Management Concern in the United States: The 1995 List," Office of Migratory Bird Management, U.S. Fish and Wildlife Service, Washington, D.C.

USFWS, see U.S. Fish and Wildlife Service.

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

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).

References

ANL, see Argonne National Laboratory.

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

DOE, see U.S. Department of Energy.

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

EPA, see U.S. Environmental Protection Agency.

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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