7-1-2004

Justification for Class III Permit Modifcation July 2004 DSS SIte 1072 Operable Unit 1295 Building T-52 and Former Building 6500 Septic System

Sandia National Laboratories/NM

Sandia National Laboratories

Justification for Class III Permit Modification

July 2004

DSS Site 1072
Operable Unit 1295
Building T-52 and
Former Building 6500 Septic System

NFA (SWMU Assessment Report) Submitted June 2003

Environmental
Restoration
Project

United States Department of Energy
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Department of Energy
National Nuclear Security Administration
Sandia Site Office
P.O. Box 5400
Albuquerque, New Mexico 87185-5400

JUL 10 2003

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 1003, 1008, 1072, 1082, and 1091, 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 1003, 1008, 1072, and 1082. The risk assessments conclude that for these four 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. A petition for an administrative NFA proposal is also made for DSS Site 1091 because this site was shown not to exist.

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,

Karen L. Boardman
Manager

JUL 10 2003

cc w/enclosure:
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SSO Legal File

JUL 10 2000

Sandia National Laboratories/New Mexico
Environmental Restoration Project

SWMU ASSESSMENT REPORT AND PROPOSAL FOR NO FURTHER ACTION BUILDING T-52 AND FORMER BUILDING 6500 SEPTIC SYSTEM, DRAIN AND SEPTIC SYSTEMS SITE 1072

June 2003

United States Department of Energy
Sandia Site Office

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ACRONYMS AND ABBREVIATIONS

AOC	area of concern
BA	butyl acetate
bgs	below ground surface
COC	constituent of concern
DOE	U.S. Department of Energy
DSS	Drain And Septic Systems
EB	equipment blank
EPA	U.S. Environmental Protection Agency
ER	Environmental Restoration
ERCL	Environmental Restoration Chemistry Laboratory
FIP	Field Implementation Plan
GEL	General Engineering Laboratories, Inc.
HE	high explosive(s)
HI	hazard index
HWB	Hazardous Waste Bureau
KAFB	Kirtland Air Force Base
kg	kilogram(s)
MDA	minimum detectable activity
MDL	method detection limit
µg	microgram(s)
mg	milligram(s)
ND	not detected
NFA	no further action
NMED	New Mexico Environment Department/
OU	Operable Unit
PCB	polychlorinated biphenyl
QA	quality assurance
QC	quality control
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
VOC	volatile organic compound

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1.0 PROJECT BACKGROUND

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

It was also known that numerous other miscellaneous DSS sites that were not designated as SWMUs were 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, and 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:

- Determine to the degree possible whether each of the 101 systems included on the 1996 list was still in existence, or had ever actually 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, and would not, need initial shallow investigation work as required by 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 NMED.

A number of additional drain systems were identified from the engineering drawing 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 drain and septic systems was generated in 2000. Of these 121 sites, NMED required environmental assessment work at a total of 61; no evaluation of the remaining 60 systems was necessary. Subsequent backhoe excavation at DSS Site 1091 confirmed that the

system did not in fact 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 closely 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 no further action. 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 NMED/HWB on January 28, 2000 (Bearzi January 2000). A follow-on document, the "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 NMED for each of the 60 DSS sites. The FIP was approved by NMED in February 2002 (Moats February 2002).

2.0 BUILDING T-52 AND FORMER BUILDING 6500 SEPTIC SYSTEM

2.1 Summary

The SNL/NM ER Project has conducted an assessment of DSS Site 1072, the Building T-52 and former Building 6500 septic system. There are no known or specific environmental concerns at this DSS site. It is one of many SNL/NM DSS sites at which environmental characterization is being required by NMED/HWB. An 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 the Building T-52 and former Building 6500 septic system. This NFA proposal provides documentation that the site was sufficiently characterized and that no significant releases of contaminants to the environment occurred via the Building T-52 and former Building 6500 septic system and that the site does not pose a threat to human health or the environment under industrial or residential scenarios. Current operations at the site are conducted in accordance with applicable laws and regulations that are protective of the environment, and septic system discharges are now directed to the City of Albuquerque sewer system.

Review and analysis of all relevant data for Building T-52 and former Building 6500 septic system indicate that concentrations of constituents of concern (COCs) at this site were found to be below applicable risk assessment action levels. Thus DSS Site 1072, the Building T-52 and former Building 6500 septic system, 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

Building T-52 and former Building 6500 septic system is located in SNL/NM Technical Area (TA)-V on federally-owned land, which is controlled by Kirtland Air Force Base (KAFB) and permitted to the U.S. Department of Energy (Figure 2.2.1-1). DSS Site 1072 is located approximately 175 feet southwest of the entrance to TA-V and is on the north side of Building T-52 (Figure 2.2.1-2). As shown in Figure 2.2.1-2, the abandoned septic system consists of a septic tank and distribution box that empty to an 80-foot-long drainline with eight 22-foot-long branching laterals. The system received discharges from former Building 6500, approximately 80 feet to the northeast and the adjacent Building T-52. Construction details are based upon engineering drawings (SNL/NM July 1973), site inspections, and backhoe excavations of the system.

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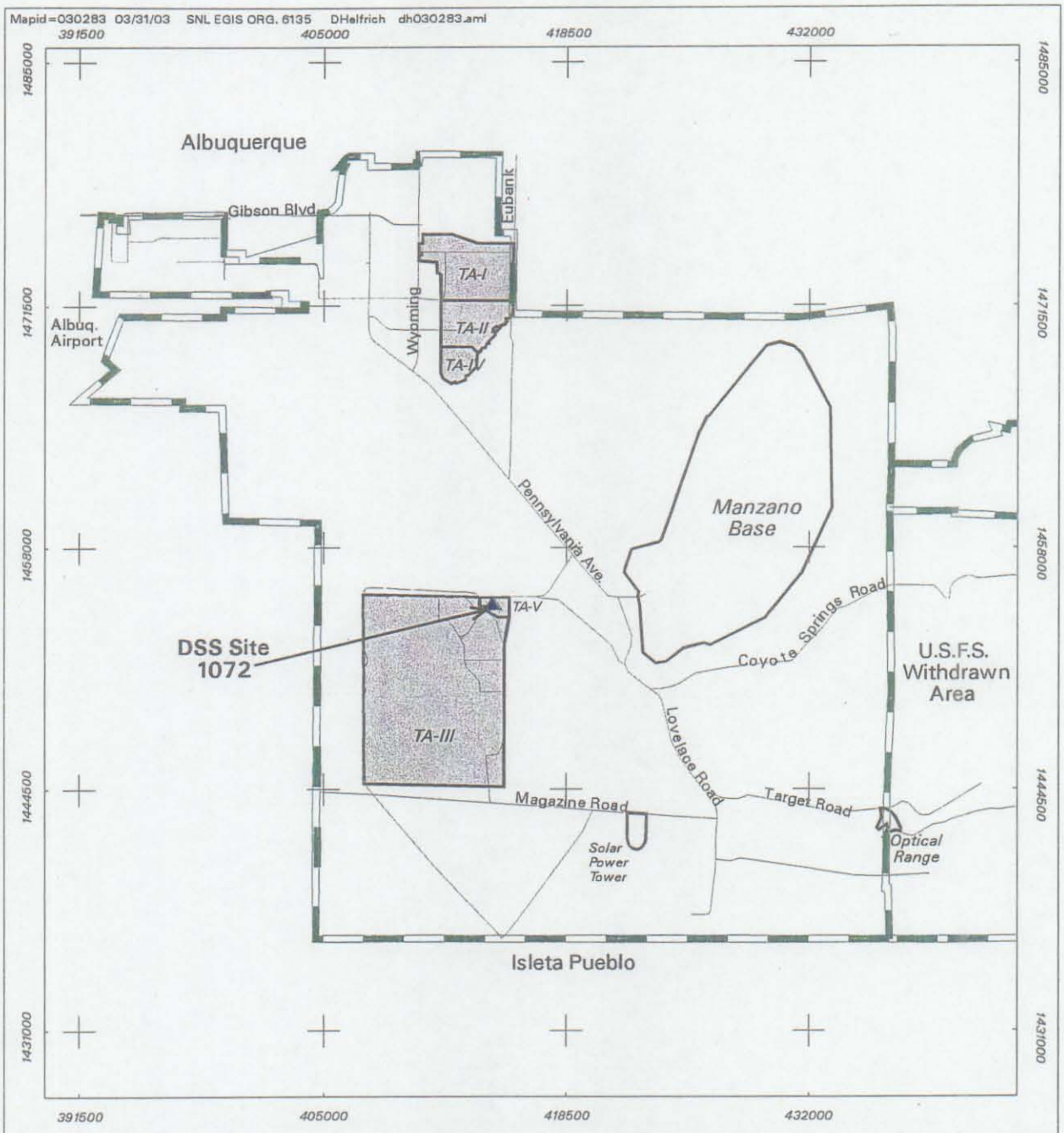

Legend

- DSS Site 1072
- Major Road
- KAFB Boundary
- SNL Technical Area (TA)

Figure 2.2.1-1
Location Map of the Building T-52 and Former Building 6500 Septic System, TA-V, Drain and Septic Systems Site 1072

0 4500 9000
Scale in Feet

0 1080 2160
Scale in Meters

Sandia National Laboratories, New Mexico
Environmental Geographic Information System

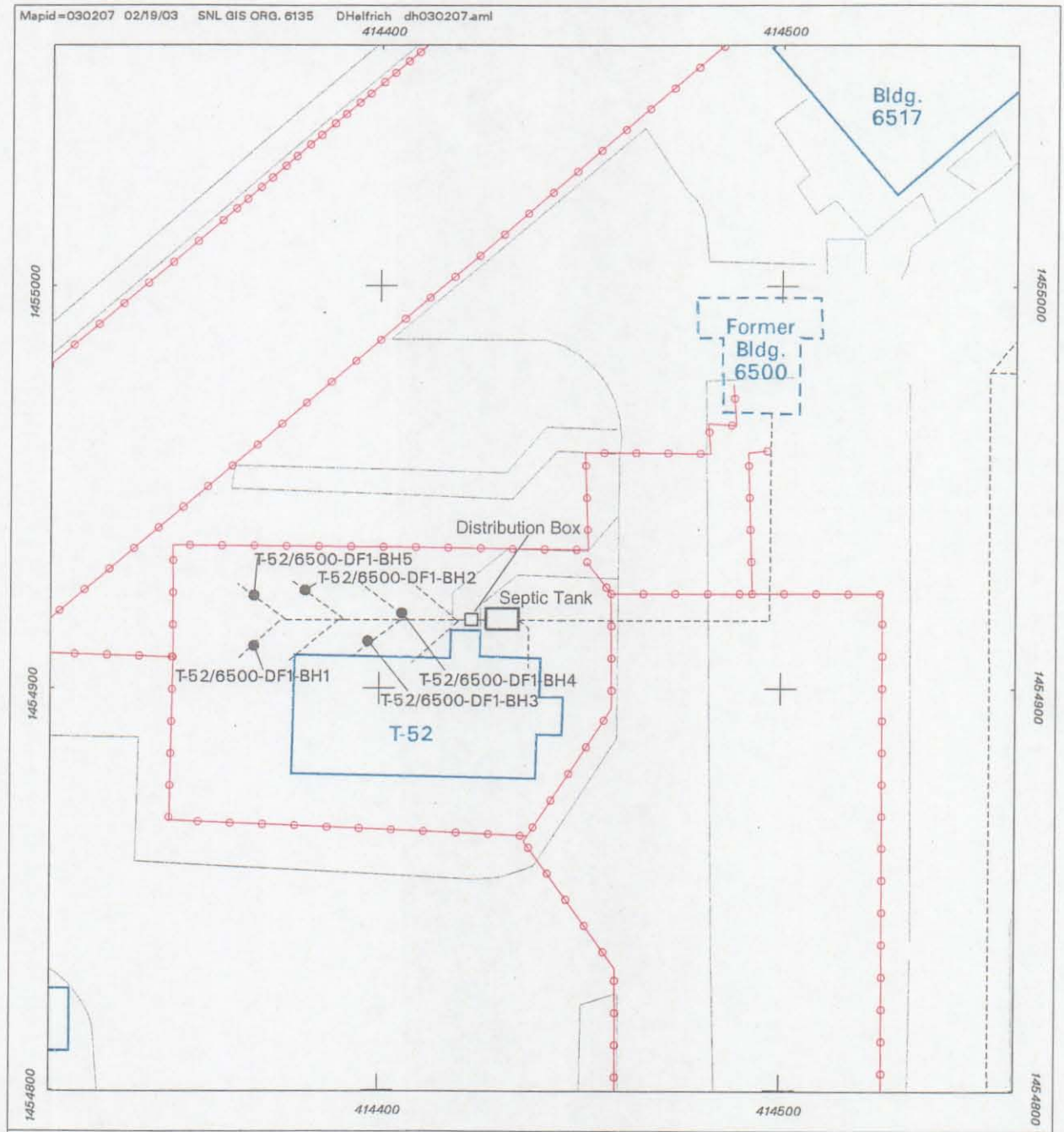

Figure 2.2.1-2
Site Map of the Building T-52 and Former Building 6500 Septic System, TA-V, Drain and Septic Systems Site 1072

The surface geology at DSS Site 1072 is characterized by a veneer of aeolian sediments that are underlain by Upper Santa Fe Group alluvial fan deposits that interfinger with sediments of the ancestral Rio Grande west of the site. These deposits extend to, and probably far below, the water table at this site. The alluvial fan materials originated in the Manzanita Mountains east of DSS Site 1072, and 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). Vegetation primarily consists of desert grasses, shrubs, and cacti.

The ground surface in the vicinity of the site is flat to very slightly inclined to the west. The closest major drainage lies south of the site and terminates in a playa just west of KAFB. No perennial surface-water bodies are present in the vicinity of the site. Average annual rainfall in the SNL/NM and KAFB area, as measured at Albuquerque International Sunport is 8.1 inches (NOAA 1990). Infiltration of precipitation is almost nonexistent as virtually all of the moisture subsequently undergoes evapotranspiration. The estimates of evapotranspiration rates for the KAFB area range from 95 to 99 percent of the annual rainfall (Thompson and Smith 1985, SNL/NM March 1996).

The site lies at an average elevation of approximately 5,424 feet above mean sea level. Depth to groundwater is approximately 500 feet below ground surface (bgs) at the site. The groundwater flow direction is thought to be generally to the west in this area (SNL/NM March 2002). The nearest production wells to DSS Site 1072 are KAFB-11, approximately 3 miles to the northeast and KAFB-2, approximately 4 miles to the northwest. The nearest groundwater monitoring well is LWDS-MW-1, approximately 125 feet northwest of the site (SNL/NM August 2002).

2.2.2 Operational History

Although no precise construction information is available, records indicate that Building T-52 and former Building 6500 were in operation and discharging to the septic system from about 1961 to 1993 (SNL/NM March 2003). Because operational records were not available, the investigation was planned to be consistent with other DSS site investigations and to sample for the most commonly anticipated COCs found at similar facilities. By July 1993, the septic system discharges were routed to the City of Albuquerque sanitary sewer system (Jones July 1993). It is assumed that the DSS Site 1072 septic system was abandoned prior to this change.

2.3 Land Use

2.3.1 Current Land Use

The current land use for DSS Site 1072 is industrial.

2.3.2 Future/Proposed Land Use

The projected future land use for DSS Site 1072 is industrial (DOE et al. September 1995).

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3.0 INVESTIGATORY ACTIVITIES

Three assessment investigations of Building T-52 and former Building 6500 septic system have been conducted. Two of these investigations were required by NMED/HWB to adequately characterize this site, and were conducted in accordance with procedures presented in the 1999 SAP and 2001 FIP, described in Chapter 1.0. These investigations are discussed in the following sections.

3.1 Summary

Three assessment activities have been conducted at the site. In 1992 and 1995, waste characterization samples were collected from the septic tank (Investigation 1). In June 1997 a backhoe was used to physically locate the buried drainfield drain lines at the site (Investigation 2). Shallow subsurface soil samples were then collected from borings in the drainfield in July 1998 and August 1999 (Investigation 3). These investigations are discussed below.

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 effort was to identify types and concentrations of potential contaminants in the waste within the tanks so that the appropriate waste disposal and remedial activities could be planned.

On October 1, 1992 and July 20, 1995, as part of the SNL/NM Septic System Monitoring Program, aqueous and sludge samples were collected from the Building T-52 septic tank (SNL/NM June 1993; SNL December 1995). Aqueous samples were analyzed for volatile organic compounds (VOCs), semivolatile organic compounds (SVOCs), pesticides, polychlorinated biphenyls (PCBs), total metals, phenolitic compounds, nitrates/nitrates, formaldehyde, fluoride, cyanide, oil and grease, and radiological constituents. The 1992 sludge samples were analyzed for metals and radiological constituents. The 1995 sludge samples were analyzed for VOCs, SVOCs, pesticides, PCBs, and metals. Samples were submitted to an off-site laboratory for chemical and radiological analysis. A fraction of each sample was submitted to the SNL/NM Radiation Protection Sample Diagnostics (RPSD) Laboratory for gamma spectroscopy analysis. The analytical results are presented in Annex A.

On August 13, 1996, the residual contents were pumped and the tank was cleaned out (Shain August 1996). Approximately 530 gallons of waste were disposed of properly.

3.3 Investigation 2—Backhoe Excavation

A backhoe was used on June 12, 1997 to determine the location, dimensions, and average depth of the DSS Site 1072 drainfield system. The drainfield was found to have eight laterals, arranged as shown on Figure 2.2.1-2, with an average drain line depth of 4 to 6 feet bgs. No visible evidence of stained or discolored soil or odors indicative of 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 described in the NMED-approved 1999 SAP (SNL/NM October 1999).

NMED regulators required soil samples to be collected from a total of four boring locations in the drainfield area of this site. These original four locations are designated as T-52/6500-DF1-BH1 through BH4 on Figure 2.2.1-2. The initial round of sampling was conducted on July 8 and 9, 1998. However, because of auger refusal problems at depth, only the shallow interval (6 feet bgs) samples were successfully collected from the T-52/6500-DF1-BH1 borehole location; no deep interval (11 feet bgs) samples were retrieved. For this reason, the deep interval samples were instead collected from a new, fifth borehole location (T-52/6500-DF1-BH5 on Figure 2.2.1-2).

On August 26, 1999, additional VOC, PCB, total cyanide, and hexavalent chromium samples were collected from the same original four NMED-required sample locations. Refusal problems at depth were not experienced at any of the four borehole locations at this time.

Soil boring locations are shown on Figure 2.2.1-2. Figures 3.4-1 and 3.4-2 show soil samples being collected at DSS Site 1072. A summary of the sample depths, sample analyses, 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 locations, the top of the shallow interval started at the bottom of the drainline trenches, as determined by the backhoe excavation. The lower (deep) interval started at 5 feet below the top sample interval. Once the auger rig had reached the top of the sampling interval, a 1.5-inch inside diameter by 3-foot-long Geoprobe™ sampling tube lined with a butyl acetate (BA) sampling sleeve was inserted into the borehole and hydraulically driven 3 feet down 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 first with Teflon film, then a rubber end cap, and finally sealing 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 to 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.

Figure 3.4-1
Collecting Soil Samples with the Geoprobe in Building T-52 and
Former Building 6500 Septic System Drainfield Area (DSS Site 1072), TA-V.
August 26, 1999.

Figure 3.4-2
Collecting Soil Samples with the Geoprobe in Building T-52 and
Former Building 6500 Septic System Drainfield Area (DSS Site 1072), TA-V.
August 26, 1999.

Table 3.4-1
Summary of Soil Samples Collected at Building T-52/Former Building 6500 Septic System
(DSS Site 1072)

Sampling Area	Analytical Parameters	Number of Borehole Locations	Top of Sampling Intervals in Each Borehole (ft bgs)	Total Number of Soil Samples	Total Number of Duplicate Samples	Date Samples Collected
Drainfield	VOCs	4	6, 11	8		08-26-99
	SVOCs	5	6, 11	8	1	07-08-98 to 07-09-98
	PCBs	4	6, 11	8		08-26-99
	HE	5	6, 11	8	1	07-08-98 to 07-09-98
	RCRA Metals	5	6, 11	8	1	07-08-98 to 07-09-98
	Hexavalent Chromium	4	6, 11	8		08-26-99
	Total Cyanide	4	6, 11	8		08-26-99
	Gamma Spectroscopy	5	6, 11	8	1	07-08-98 to 07-09-98
	Gross Alpha/Beta Activity	5	6, 11	8		07-08-98 to 07-09-98

bgs = Below ground surface.
DSS = Drain and septic systems.
ft = Foot (feet).
HE = High explosive(s).
PCB = Polychlorinated biphenyl.
RCRA = Resource Conservation and Recovery Act.
SVOC = Semivolatile organic compound.
VOC = Volatile organic compound.

Drainfield soil samples were submitted to the SNL/NM ER Chemistry Laboratory (ERCL) for high explosives (HE) and Resource Conservation and Recovery Act (RCRA) metals analyses, and to the SNL/NM RPSD Laboratory for gamma spectroscopy analyses. Samples for VOC, SVOC, PCB, cyanide, hexavalent chromium analyses, and gross alpha/beta activity were sent to General Engineering Laboratories, Inc. (GEL) in Charleston, South Carolina. All samples were documented and handled in accordance with applicable SNL/NM Operating Procedures and transported to on- and off-site laboratories for analysis.

VOCs were analyzed by EPA Method 8260; SVOCs by EPA Method 8270; HE by EPA Method 8330 (EPA 8095 equivalent at the on-site ERCL); PCBs by EPA Method 8082; RCRA metals and hexavalent chromium by EPA Methods 7196A and 6020; total cyanide by EPA Method 9012A; gamma spectroscopy by EPA Method 901.1 (or equivalent at the on-site RPSD Laboratory); and gross alpha/beta activity by EPA Method 900.0, or equivalent (EPA November 1986).

3.4.2 Soil Sampling Results and Conclusions

Analytical results for the soil samples collected at DSS Site 1072 are presented and discussed below. Sample locations are shown on Figure 2.2.1-2.

VOCs

Analytical results for the eight soil samples collected from the drainfield boreholes are presented in Table 3.4.2-1. Method detection limits (MDLs) for the VOC analyses are presented in Table 3.4.2-2. As shown on Table 3.4.2-1, four VOCs were detected in these samples. All of the detected VOCs are common laboratory contaminants and may not be indicative of soil contamination at the site.

SVOCs

Analytical results for the nine soil samples collected from the drainfield boreholes are presented in Table 3.4.2-3. MDLs for the SVOC analyses are presented in Table 3.4.2-4. No SVOCs were detected in any sample collected at this site.

PCBs

Analytical results for the eight soil samples collected from the drainfield boreholes are presented in Table 3.4.2-5. MDLs for the PCB analyses are presented in Table 3.4.2-6. As shown on Table 3.4.2-5, Aroclor-1254 was detected in only one of the eight samples.

HE

Analytical results for the nine soil samples collected from the drainfield boreholes are presented in Table 3.4.2-7. MDLs for the HE analyses are presented in Table 3.4.2-8. No HE compounds were detected in any sample collected at this site.

RCRA Metals and Hexavalent Chromium

Analytical results for the nine soil samples collected from the drainfield boreholes are presented in Table 3.4.2-9. MDLs for the metals analyses are presented in Table 3.4.2-10. As shown in Table 3.4.2-9, arsenic and barium were detected at concentrations above the NMED-approved background. All other metals were below their respective background concentrations.

Total Cyanide

Analytical results for the eight soil samples collected from the drainfield boreholes are presented in Table 3.4.2-11. MDLs for the cyanide analyses are presented in Table 3.4.2-12. Cyanide was not detected in any sample collected at this site.

Table 3.4.2-1
Summary of Building T-52/Former Building 6500 Septic System (DSS Site 1072)
Confirmatory Soil Sampling, VOC Analytical Results
August 1999
(Off-Site Laboratory)

Sample Attributes			VOCs (Method 8260[a]) (µg/kg)			
Record Number[b]	ER Sample ID	Sample Depth (ft)	2-Butanone	Methylene chloride	Toluene	Xylene
602765	T52/6500-DF1-BH1-6-S	6	**69**	**2 J (5)**	**2.8**	ND (0.7)
602765	T52/6500-DF1-BH1-11-S	11	**18**	**1.9 J (5)**	**25**	**0.74 J (2)**
602765	T52/6500-DF1-BH2-6-S	6	**55**	ND (1.4)	ND (0.9)	ND (0.7)
602765	T52/6500-DF1-BH2-11-S	11	**24**	**2 J (5)**	**2.7**	ND (0.7)
602765	T52/6500-DF1-BH3-6-S	6	**19**	**2.3 J (5)**	ND (0.9)	ND (0.7)
602765	T52/6500-DF1-BH3-11-S	11	**59**	**2.6 J (5)**	**6.2**	ND (0.7)
602765	T52/6500-DF1-BH4-6-S	6	**94**	**2.2 J (5)**	**3.3**	ND (0.7)
602765	T52/6500-DF1-BH4-11-S	11	**55**	**3 J (5)**	**2.4**	ND (0.7)

Note: Values in **bold** represent detected analytes.
[a]EPA November 1986.
[b]Analysis Request/Chain-of-Custody Record.
BH = Borehole.
DSS = Drain and Septic Systems.
DF = Drainfield.
EPA = U.S. Environmental Protection Agency.
ER = Environmental Restoration.
ft = Foot (feet).
ID = Identification.
J ( ) = The reported value is greater than or equal to the method detection limit but is less than the practical quantitation limit, shown in parentheses.
µg/kg = Microgram(s)per kilogram.
ND ( ) = Not detected above the method detection limit, shown in parentheses.
S = Soil sample.
VOC = Volatile organic compound.

Table 3.4.2-2
Summary of Building T-52/Former Building 6500 Septic System (DSS Site 1072)
Confirmatory Soil Sampling, VOC Analytical Method Detection Limits
August 1999
(Off-Site Laboratory)

Analyte	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
trans-1,3-Dichloropropene	0.3
cis-1,3-Dichloropropene	0.2
Ethyl benzene	0.3
2-Hexanone	2.8
Methylene chloride	1.4
4-methyl-, 2-Pentanone	3.1
Styrene	0.3
1,1,1-Trichloroethane	0.1
1,1,2-Trichloroethane	0.3
1,1,2,2-Tetrachloroethane	0.6
Tetrachloroethene	0.4
Toluene	0.9
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.
µg/kg = Microgram(s) per kilogram.
VOC = Volatile organic compound.

Table 3.4.2-3
Summary of Building T-52/Former Building 6500 Septic System (DSS Site 1072)
Confirmatory Soil Sampling, SVOC Analytical Results
July 1998
(Off-Site Laboratory)

Sample Attributes			SVOCs (Method 8270[a]) (µg/kg)
Record Number[b]	ER Sample ID	Sample Depth (ft)	
600438	T52/6500-DF1-BH1-6-S	6	ND
600438	T52/6500-DF1-BH1-6-DU	6	ND
600438	T52/6500-DF1-BH2-6-S	6	ND
600438	T52/6500-DF1-BH2-11-S	11	ND
600438	T52/6500-DF1-BH3-6-S	6	ND
600438	T52/6500-DF1-BH3-11-S	11	ND
600438	T52/6500-DF1-BH4-6-S	6	ND
600438	T52/6500-DF1-BH4-11-S	11	ND
600438	T52/6500-DF1-BH5-11-S	11	ND

[a]EPA November 1986.
[b]Analysis Request/Chain-of-Custody Record.
BH = Borehole.
DF = Drainfield.
DSS = Drain and Septic Systems.
DU = Duplicate sample.
EPA = U.S. Environmental Protection Agency.
ER = Environmental Restoration.
ft = Foot (feet).
ID = Identification.
µg/kg = Microgram(s) per kilogram.
ND = Not detected above the method detection limit.
S = Soil sample.
SVOC = Semivolatile organic compound.

Table 3.4.2-4
Summary of Building T-52/Former Building 6500 Septic System (DSS Site 1072)
Confirmatory Soil Sampling, SVOC Analytical Method Detection Limits
July 1998
(Off-Site Laboratory)

Analyte	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(ghi)perylene	170
Benzoic acid	330
Benzo(k)fluoranthene	170
Benzyl alcohol	170
bis(2-Chloroethoxy) methane	170
bis(2-Chloroethyl) ether	170
bis-Chloroisopropyl ether	170
bis(2-Ethylhexyl) phthalate	170
4-Bromophenyl phenyl ether	170
Butylbenzyl phthalate	170
4-Chloro-3-methylphenol	170
4-Chlorobenzenamine	330
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
Di-n-octyl phthalate	170
Dinitro-o-cresol	170
2,4-Dinitrophenol	330
2,4-Dinitrotoluene	170
2,6-Dinitrotoluene	170
1,2-Diphenylhydrazine	170
Fluoranthene	170
Fluorene	170
Hexachlorobenzene	170

Refer to footnotes at end of table.

Table 3.4.2-4 (Concluded)
Summary of Building T-52/Former Building 6500 Septic System (DSS Site 1072)
Confirmatory Soil Sampling, SVOC Analytical Method Detection Limits
July 1998
(Off-Site Laboratory)

Analyte	Method 8270[a] Detection Limit (µg/kg)
Hexachlorobutadiene	170
Hexachlorocyclopentadiene	170
Hexachloroethane	170
Indeno(1,2,3-c,d)pyrene	170
Isophorone	170
2-Methylnaphthalene	170
Naphthalene	170
2-Nitroaniline	170
3-Nitroaniline	170
4-Nitroaniline	170
Nitro-benzene	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.
µg/kg = Microgram(s) per kilogram.
SVOC = Semivolatile organic compound.

Table 3.4.2-5
Summary of Building T-52/Former Building 6500 Septic System (DSS Site 1072)
Confirmatory Soil Sampling, PCB Analytical Results
August 1999
(Off-Site Laboratory)

Sample Attributes			PCB (Method 8082[a]) (µg/kg)						
Record Number[b]	ER Sample ID	Sample Depth (ft)	Aroclor-1016	Aroclor-1221	Aroclor-1232	Aroclor-1242	Aroclor-1248	Aroclor-1254	Aroclor-1260
602765	T52/6500-DF1-BH1-6-S	6	ND (1.22)	ND (2.82)	ND (1.63)	ND (1.67)	ND (0.907)	ND (1.16)	ND (0.943)
602765	T52/6500-DF1-BH1-11-S	11	ND (1.22)	ND (2.82)	ND (1.63)	ND (1.67)	ND (0.907)	ND (1.16)	ND (0.943)
602765	T52/6500-DF1-BH2-6-S	6	ND (1.22)	ND (2.82)	ND (1.63)	ND (1.67)	ND (0.907)	ND (1.16)	ND (0.943)
602765	T52/6500-DF1-BH2-11-S	11	ND (1.22)	ND (2.82)	ND (1.63)	ND (1.67)	ND (0.907)	ND (1.16)	ND (0.943)
602765	T52/6500-DF1-BH3-6-S	6	ND (1.22) HT	ND (2.82) HT	ND (1.63) HT	ND (1.67) HT	ND (0.907) HT	**3.1 J (3.33) HT**	ND (0.943) HT
602765	T52/6500-DF1-BH3-11-S	11	ND (1.22)	ND (2.82)	ND (1.63)	ND (1.67)	ND (0.907)	ND (1.16)	ND (0.943)
602765	T52/6500-DF1-BH4-6-S	6	ND (1.22)	ND (2.82)	ND (1.63)	ND (1.67)	ND (0.907)	ND (1.16)	ND (0.943)
602765	T52/6500-DF1-BH4-11-S	11	ND (1.22)	ND (2.82)	ND (1.63)	ND (1.67)	ND (0.907)	ND (1.16)	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).
HT = The holding time was exceeded for the associated sample analysis.
ID = Identification.
J ( ) = The reported value is greater than or equal to the method detection limit but is less than the practical quantitation limit, shown in parentheses.
µg/kg = Microgram(s)per kilogram.
ND ( ) = Not detected above the method detection limit, shown in parentheses.
PCB = Polychlorinated biphenyls.
S = Soil sample.

Table 3.4.2-6
Summary of Building T-52/Former Building 6500 Septic System (DSS Site 1072)
Confirmatory Soil Sampling, PCB Analytical Method Detection Limits
August 1999
(Off-Site Laboratory)

Analyte	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.
µg/kg = Microgram(s) per kilogram.
PCB = Polychlorinated biphenyls.

Table 3.4.2-7
Summary of Building T-52/Former Building 6500 Septic System (DSS Site 1072)
Confirmatory Soil Sampling, HE Compounds Analytical Results
July 1998
(On-Site Laboratory, Except As Noted)

Sample Attributes			HE (Method 8330[a]) (mg/kg)
Record Number[b]	ER Sample ID	Sample Depth (ft)	
600437	T52/6500-DF1-BH1-6-S	6	ND
600438	T52/6500-DF1-BH1-6-DU (Off-site laboratory split)	6	ND
600437	T52/6500-DF1-BH2-6-S	6	ND
600437	T52/6500-DF1-BH2-11-S	11	ND
600437	T52/6500-DF1-BH3-6-S	6	ND
600437	T52/6500-DF1-BH3-11-S	11	ND
600437	T52/6500-DF1-BH4-6-S	6	ND
600437	T52/6500-DF1-BH4-11-S	11	ND
600437	T52/6500-DF1-BH5-11-S	11	ND

[a]EPA November 1986
[b]Analysis Request/Chain-of-Custody Record.
BH = Borehole.
DF = Drainfield.
DSS = Drain and Septic Systems.
DU = Duplicate sample.
EPA = U.S. Environmental Protection Agency.
ER = Environmental Restoration.
ft = Foot (feet).
HE = High explosive(s).
ID = Identification.
mg/kg = Milligram(s) per kilogram.
ND = Not detected above the method detection limit.
S = Soil sample.

Table 3.4.2-8
Summary of Building T-52/Former Building 6500 Septic System (DSS Site 1072)
Confirmatory Soil Sampling, HE Compounds Analytical Method Detection Limits
July 1998
(Off-Site Laboratory)

Analyte	Method 8330[a] Detection Limit (mg/kg)
2-Amino-4,6-dinitrotoluene	0.0066–0.13
4-Amino-2,6-dinitrotoluene	0.0055–0.11
1,3-Dinitrobenzene	0.0041–0.076
2,4-Dinitrotoluene	0.0062–0.25
2,6-Dinitrotoluene	0.0065–0.29
HMX	0.0053–0.13
Nitro-benzene	0.0052–0.17
2-Nitrotoluene	0.0078–0.15
3-Nitrotoluene	0.0011–0.15
4-Nitrotoluene	0.0011–0.13
Pentaerythritol tetranitrate	0.0075–0.35
RDX	0.0097–0.18
1,3,5-Trinitrobenzene	0.0067–0.11
2,4,6-Trinitrotoluene	0.0057–0.29

[a]EPA November 1986.
DSS = Drain and Septic Systems.
EPA = U.S. Environmental Protection Agency.
HE = High Explosive(s).
HMX = 1,3,5,7-tetranitro-1,3,5,7-tetrazacyclooctane.
mg/kg = Milligram(s) per kilogram.
RDX = 1,3,5-trinitro-1,3,5-triazacyclohexane.

Table 3.4.2-9
Summary of Building T-52/Former Building 6500 Septic System (DSS Site 1072)
Confirmatory Soil Sampling, Metals Analytical Results
July 1998–August 1999
(On- and Off-Site Laboratories)

Sample Attributes			Metals (Methods 6010A/7471/6020/7196A[a]) (mg/kg)								
Record Number[b]	ER Sample ID	Sample Depth (ft)	Arsenic	Barium	Cadmium	Chromium	Chromium (VI)	Lead	Mercury	Selenium	Silver
600437, 602765	T52/6500-DF1-BH1-6-S	6	2.8	71 J	0.044 J (0.16)	11	0.06 J (0.2)	3.3	ND (0.039)	ND (0.29)	ND (0.039)
600438	T52/6500-DF1-BH1-6-DU (Off-Site Laboratory)	6	2.02	94.8 J	ND (0.0104)	4.91	NS	3.33 J	ND (0.0173)	ND (0.07)	0.383 J (0.479)
602765	T52/6500-DF1-BH1-11-S	11	NS	NS	NS	NS	0.0594 J (0.198)	NS	NS	NS	NS
600437, 602765	T52/6500-DF1-BH2-6-S	6	2.5	50 J	ND (0.041)	5.2	0.0588 J (0.196)	3.6	ND (0.041)	ND (0.3)	ND (0.041)
600437, 602765	T52/6500-DF1-BH2-11-S	11	2.2 J (2.4)	53 J	0.067 J (0.16)	5.9	0.0804 J (0.201)	5	ND (0.04)	ND (0.3)	ND (0.04)
600437, 602765	T52/6500-DF1-BH3-6-S	6	2.5 J (2.7)	**310 J**	0.069 J (0.18)	7.2	0.0595 J (0.198)	4.8	ND (0.044)	ND (0.33)	ND (0.044)
600437, 602765	T52/6500-DF1-BH3-11-S	11	2.1 J (2.6)	84 J	0.067 J (0.17)	6.2	0.1 J (0.2)	5.3	ND (0.044)	ND (0.33)	ND (0.044)
600437, 602765	T52/6500-DF1-BH4-6-S	6	**4.8**	160 J	0.12 J (0.17)	5.4	0.0489 J (0.196)	3.7	ND (0.043)	0.45 J (1.3)	ND (0.043)
600437, 602765	T52/6500-DF1-BH4-11-S	11	3.1	68 J	0.18	9.7	0.181 J (0.191)	6	ND (0.044)	ND (0.33)	ND (0.044)
600437, 602765	T52/6500-DF1-BH5-11-S	11	3.6	70 J	0.11 J (0.17)	8.8	NS	7.5	ND (0.043)	ND (0.32)	ND (0.043)
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 their respective background concentration.

[a]EPA November 1986.

[b]Analysis Request/Chain-of-Custody Record.

[c]Dinwiddie September 1997.

BH = Borehole.
DF = Drainfield.
DSS = Drain and Septic Systems.
DU = Duplicate sample.
EPA = U.S. Environmental Protection Agency.
ER = Environmental Restoration.
ft = Foot (feet).
ID = Identification.
J = Analytical result was qualified as an estimated value during data validation, see data validation report.
J ( ) = The reported value is greater than or equal to the method detection limit but is less than the practical quantitation limit, shown in parentheses.
mg/kg = Milligram(s) per kilogram.
ND ( ) = Not detected above the method detection limit, shown in parentheses.
NS = Not sampled.
S = Soil sample.

Table 3.4.2-10
Summary of Building T-52/Former Building 6500 Septic System (DSS Site 1072)
Confirmatory Soil Sampling, Metals Analytical Method Detection Limits
July 1998 and August 1999
(On- and Off-Site Laboratories)

Analyte	Method 6010A/7471/6020/7196A[a] Detection Limit (mg/kg)
Arsenic	0.149–0.67
Barium	0.0166–0.56
Cadmium	0.0104–0.044
Chromium	0.0365–0.78
Chromium (VI)	0.0324–0.0342
Lead	0.0339–0.33
Mercury	0.0173–0.044
Selenium	0.07–0.33
Silver	0.031–0.044

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

Table 3.4.2-11
Summary of Building T-52/Former Building 6500 Septic System (DSS Site 1072)
Confirmatory Soil Sampling, Total Cyanide Analytical Results
August 1999
(Off-Site Laboratory)

Sample Attributes			Cyanide (Method 9012A[a]) (mg/kg)
Record Number[b]	ER Sample ID	Sample Depth (ft)	Total Cyanide
602765	T52/6500-DF1-BH1-6-S	6	ND
602765	T52/6500-DF1-BH1-11-S	11	ND
602765	T52/6500-DF1-BH2-6-S	6	ND
602765	T52/6500-DF1-BH2-11-S	11	ND
602765	T52/6500-DF1-BH3-6-S	6	ND
602765	T52/6500-DF1-BH3-11-S	11	ND
602765	T52/6500-DF1-BH4-6-S	6	ND
602765	T52/6500-DF1-BH4-11-S	11	ND

[a]EPA November 1986.
[b]Analysis Request/Chain-of-Custody Record.
BH = Borehole.
DF = Drainfield.
DSS = Drain and Septic Systems.
EPA = U.S. Environmental Protection Agency.
ER = Environmental Restoration.
ft = Foot (feet).
ID = Identification.
mg/kg = Milligram(s) per kilogram.
ND = Not detected above the method detection limit.
S = Soil sample.

Table 3.4.2-12
Summary of Building T-52/Former Building 6500 Septic System (DSS Site 1072)
Confirmatory Soil Sampling, Total Cyanide Analytical Method Detection Limit
August 1999
(Off-Site Laboratory)

Analyte	Method 9012A[a] Detection Limit (mg/kg)
Total Cyanide	0.138–0.139

[a]EPA November 1986.
DSS = Drain and Septic Systems.
EPA = U.S. Environmental Protection Agency.
mg/kg = Milligrams per kilogram.

Radionuclides

Analytical results for the nine gamma spectroscopy analysis of the nine soil samples collected from the drainfield boreholes are presented in Table 3.4.2-13. No readings above NMED-approved background values were detected in any sample collected at this site.

Gross Alpha/Beta Activity

Analytical results for the eight soil samples collected from the drainfield boreholes are presented in Table 3.4.2-14. No elevated readings of gross alpha were detected in any of the samples. The 11 feet bgs sample from Borehole T52/6500-DF1-BH3-11-S had a gross beta reading of 88.5 picocuries (pCi)/g, but this is within the order of magnitude range for readings at this site, and is interpreted as indicating no significant levels of residual radioactive material in soil at the site.

3.4.3 Soil Sampling Data Quality

As shown in Tables 3.4.2-3, 3.4.2-7, 3.4.2-9, and 3.4.2-13, to assess the precision and repeatability of sampling and analytical procedures duplicate soil samples (designated DU) were collected and analyzed at both the on- and off-site laboratory for SVOCs, HE, RCRA metals, and gamma spectroscopy.

No SVOCs or HE compounds were detected in either the sample or duplicate. As shown on Table 3.4.2-9, no mercury or selenium was detected in either the sample or duplicate. Arsenic concentrations in the sample and duplicate were comparable at 2.8 and 2.02 milligrams (mg)/kilogram (kg), respectively. Lead concentrations were also comparable at 3.3 and 3.33 J mg/kg respectively, as was barium (71 J and 94.8 J mg/kg). Chromium (11 and 4.91 mg/kg) was detected at higher concentrations in the primary sample than in the duplicate. Cadmium was detected at 0.044 J mg/kg in the primary sample and not detected in the duplicate; silver was not detected in the primary sample, but was detected in the duplicate (0.383 J mg/kg). The duplicate sample was not analyzed for hexavalent chromium. All detections in the duplicate sample were below the NMED-approved background.

As shown on Table 3.4.2-13, the gamma spectroscopy results for the sample are comparable with no detections of cesium-137 or uranium-235 in either the primary sample or duplicate. Thorium-232 and uranium-238 were both detected in the primary sample, but not in the duplicate. All gamma spectroscopy detections were below the NMED-approved background activities for the Southwest Area.

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

Quality assurance (QA)/quality control (QC) samples were collected at an approximate frequency of 1 per 20 field samples. These typically included sample duplicates and matrix spike/matrix spike duplicates. Typically, samples were shipped to the laboratory in batches of 20, so that any one shipment might contain samples from several sites. Aqueous equipment

Table 3.4.2-13
Summary of Building T-52/Former Building 6500 Septic System (DSS Site 1072)
Confirmatory Soil Sampling, Gamma Spectroscopy Analytical Results
July 1998
(On-Site Laboratory, Except Where Noted)

Sample Attributes			Activity (pCi/g)							
Record Number[a]	ER Sample ID	Sample Depth (ft)	Cesium-137		Thorium-232		Uranium-235		Uranium-238	
			Result	Error[b]	Result	Error[b]	Result	Error[b]	Result	Error[b]
600439	T52/6500-DF1-BH1-6-S	6	ND (0.0162)	--	0.621	0.295	ND (0.115)	--	0.612	0.235
600438	T52/6500-DF1-BH1-6-DU (Off-Site Laboratory)	6	ND (0.00898)	--	ND (0.0158)	--	ND (0.0456)	--	ND (0.272)	--
600439	T52/6500-DF1-BH2-6-S	6	ND (0.0138)	--	0.526	0.239	ND (0.0977)	--	0.572	0.268
600439	T52/6500-DF1-BH2-11-S	11	ND (0.0160)	--	0.733	0.341	ND (0.116)	--	0.815	0.255
600439	T52/6500-DF1-BH3-6-S	6	ND (0.0198)	--	0.657	0.305	ND (0.0688)	--	0.541	0.181
600439	T52/6500-DF1-BH3-11-S	11	ND (0.0177)	--	0.704	0.332	0.0919	0.0889	0.735	0.251
600439	T52/6500-DF1-BH4-6-S	6	ND (0.0180)	--	0.684	0.324	ND (0.102)	--	0.748	0.356
600439	T52/6500-DF1-BH4-11-S	11	ND (0.0178)	--	0.693	0.333	ND (0.106)	--	0.404	0.227
600439	T52/6500-DF1-BH5-11-S	11	ND (0.0154)	--	0.762	0.343	ND (0.0470)	--	0.717	0.391
Background Activity (Southwest Area Supergroup)[c]			0.079	NA	1.01	NA	0.16	NA	1.4	NA

Note: Values in **bold** represent analytes detected above their respective background activity level.
[a]Analysis Request/Chain-of-Custody Record.
[b]Two standard deviations about the mean detected activity.
[c]Dinwiddie September 1997.
BH = Borehole.
DF = Drainfield.
DSS = Drain and Septic Systems.
DU = Duplicate sample.
ER = Environmental Restoration.
ft = Foot (feet).
ID = Identification.
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 nondetect results.

Table 3.4.2-14
Summary of Building T-52/Former Building 6500 Septic System (DSS Site 1072)
Confirmatory Soil Sampling, Gross Alpha and Beta Analytical Results
July 1998
(Off-Site Laboratory)

Sample Attributes			Activity (pCi/g)			
Record Number[a]	ER Sample ID	Sample Depth (ft)	Gross Alpha		Gross Beta	
			Result	Error[b]	Result	Error[b]
600438	T52/6500-DF1-BH1-6-S	6	6.96	3.04	17.6	3.63
600438	T52/6500-DF1-BH2-6-S	6	6.28	2.94	16.6	3.61
600438	T52/6500-DF1-BH2-11-S	11	4.25	2.29	14.5	3.47
600438	T52/6500-DF1-BH3-6-S	6	6.95	2.72	19.4	3.71
600438	T52/6500-DF1-BH3-11-S	11	11.2	3.57	88.5	6.69
600438	T52/6500-DF1-BH4-6-S	6	4.92	2.53	15.9	3.61
600438	T52/6500-DF1-BH4-11-S	11	12.7	4.07	19.4	3.88
600438	T52/6500-DF1-BH5-11-S	11	14.6	3.82	15.7	3.43

[a]Analysis Request/Chain-of-Custody Record.
[b]Two standard deviations about the mean detected activity.
BH = Borehole.
DF = Drainfield.
DSS = Drain and Septic Systems.
ER = Environmental Restoration.
ft = Foot (feet).
ID = Identification.
pCi/g = Picocurie(s) per gram.
S = Soil sample.

blanks (EBs) were collected at an approximate frequency of 1 per 20 samples and sent to the laboratory. EBs were analyzed for the same analytical suite as the soil samples in that shipment. Aqueous trip blanks (TBs) were used for VOC analysis only and were included in every sample cooler containing VOC soil samples. The analytical results for the EB and TB samples only appear on the data tables for the last site sampled in any one shipment, although the results were used in the data validation process for all the samples in that batch.

All laboratory data were reviewed and verified/validated according to Data Verification/ Validation Level 3 (SNL/NM July 1994) or "Data Validation Procedure for Chemical and Radiochemical Data," in SNL/NM Environmental Restoration Project Administrative Operating Procedure 00-03, Rev 0 (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 DSS Site 1072. The data are acceptable for use in the DSS Site 1072 NFA proposal.

3.5 Site Sampling Data Gaps

Analytical data from the site assessment were sufficient for characterizing the nature and extent of possible COC releases. There are no further data gaps regarding characterization of Building T-52/former Building 6500 septic system, DSS Site 1072.

4.0 CONCEPTUAL SITE MODEL

The conceptual site model for Building T-52/former Building 6500 septic system, DSS Site 1072, 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 COCs.

4.1 Nature and Extent of Contamination

Potential COCs at DSS Site 1072 are VOCs, SVOCs, PCBs, HE compounds, cyanide, RCRA metals, hexavalent chromium, radionuclides detected by gamma spectroscopy, and gross alpha/beta activity. There were no SVOCs, HE compounds, or cyanide detected in any of the soil samples collected at this site. Low concentrations of VOCs were detected in every sample. One PCB congener was detected in one sample. Only two RCRA metal detections exceeded the approved maximum background concentrations for SNL/NM Southwest Area Supergroup soils (Dinwiddie September 1997). If metal concentrations exceeded the maximum background screening value or the nonquantifiable background value, then the sample was carried forward in the risk assessment process. None of the four representative gamma spectroscopy radionuclides were detected. Finally, gross alpha/beta activity did not indicate any radioactive contamination at the site.

4.2 Environmental Fate

Potential COCs may have been released into the vadose zone via aqueous effluent discharged from the septic system drainfield. Possible secondary release mechanisms include uptake of COCs that may have been released to the soil beneath the drainfield (Figure 4.2-1). The depth to groundwater at the site (approximately 500 feet bgs) most likely precludes migration of COCs into the groundwater system. The potential pathways to receptors include soil ingestion, inhalation, and dermal contact, which could occur as a result of excavation of potentially contaminated subsurface soil that could take place at the site. Annex C provides additional discussion on the fate and transport of COCs at DSS Site 1072.

Table 4.2-1 summarizes residual COCs for DSS Site 1072. Only minor VOC contamination was found in any of the soil samples collected at this site. 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 1072 is industrial (DOE et al. September 1995).

The potential receptors at the site are considered to be an industrial worker and resident. The exposure route for the receptors are dermal contact and ingestion/inhalation for all applicable pathways; however, this is a realistic possibility only if contaminated soil is excavated at the site. The major exposure route modeled in the human health risk assessment is soil ingestion of the COCs. The inhalation pathway is also included because of the potential to inhale dust and volatile compounds. The dermal pathway is included because of the potential exposure of the receptors to the contaminated soil.

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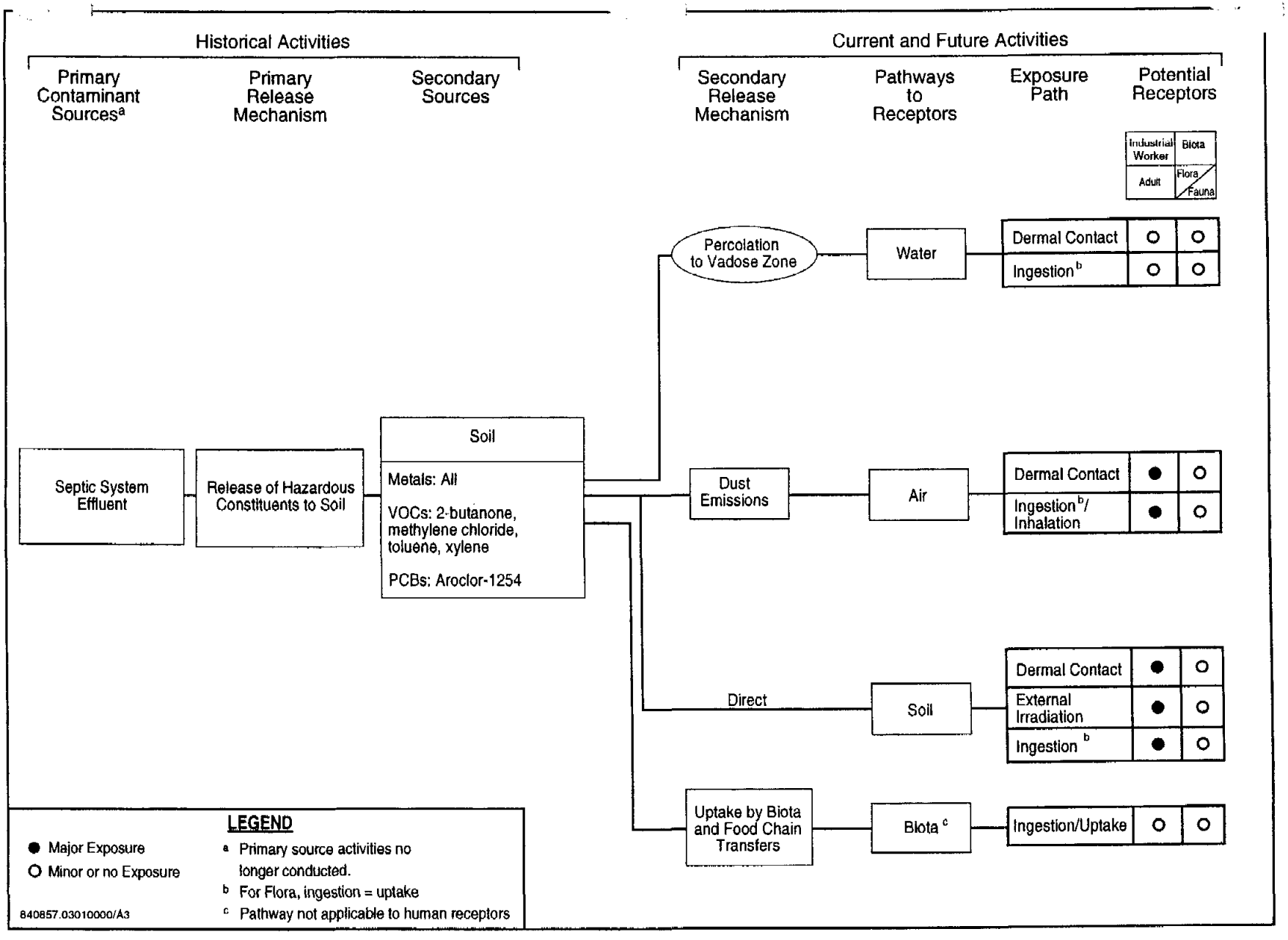

Figure 4.2-1

Conceptual Site Model Flow Diagram for Building T-52 and Former Building 6500 Septic System, DSS Site 1072

Table 4.2-1
Summary of Potential COCs for Building T-52/Former Building 6500 Septic System
(DSS Site 1072)

COC Type	Number of Samples[a]	COCs Greater than Background	Maximum Background Limit/Southwest Area Supergroup[b] (mg/kg)	Maximum Concentration[c] (mg/kg)	Average Concentration[d] (mg/kg)	Number of Samples Where Background Concentration Exceeded[e]
VOCs	8	2-Butanone	NA	0.094	0.0491	8
	8	Methylene Chloride	NA	0.003	0.0021	7
	8	Toluene	NA	0.025	0.0054	6
	8	Xylene	NA	0.00074 J	0.0004	1
SVOCs	9	None	NA	NA	NA	None
PCBs	8	Aroclor-1254	NA	0.0031 J	0.0009	1
HE	9	None	NA	NA	NA	None
RCRA Metals	9	Arsenic	4.4	4.8	2.85	1
	9	Barium	214	310 J	106.8	1
Hexavalent Chromium	8	None	1	0.181 J	0.081	None
Cyanide	8	None	NA	NA	NA	None
Radionuclides (pCi/g)	9	None	NA	NA	Not calculated[f]	None

[a]Number of samples includes duplicates and splits.
[b]Dinwiddie September 1997.
[c]Maximum concentration is either the maximum amount detected, or the maximum MDL or MDA if nothing was detected.
[d]Average concentration includes all samples except blanks. The average is calculated as the sum of detected amounts and one-half of the MDLs for nondetect results, divided by the number of samples.
[e]See appropriate data table for sample locations.
[f]An average MDA is not calculated because of the variability in instrument counting error and the number of reported nondetect activities.

COC = Constituent of concern.
DSS = Drain and Septic Systems.
HE = High explosive(s).
MDA = Minimum detectable activity.
MDL = Method detection limit.
mg/kg = Milligram(s) per kilogram.
NA = Not applicable.
ND ( ) = Not detected above the MDL shown in parentheses.
PCB = Polychlorinated biphenyls.
pCi/g = Picocurie(s) per gram.
RCRA = Resource Conservation and Recovery Act.
SVOCs = Semivolatile organic compounds.
VOCs = Volatile organic compounds.

4.3 Site Assessments

Site assessment at DSS Site 1072 included risk assessments for both human health and ecological risk. This section briefly summarizes the risk assessment results, and Annex C presents the risk assessment performed for DSS Site 1072 in more detail.

4.3.1 Summary

The site assessment concluded that DSS Site 1072 poses no significant threat to human health under either the industrial or residential land use scenarios. It was concluded that complete ecological pathways are not associated with COCs at this site; therefore, no constituents of potential ecological concern exist at the site. As a consequence, a more detailed risk assessment was not deemed necessary to predict the potential level of ecological risk associated with the site.

4.3.2 Risk Assessments

Risk assessments were performed for both human health and ecological risks at DSS Site 1072. This section summarizes the results.

4.3.2.1 Human Health

DSS Site 1072 has been recommended for an industrial land use scenario (DOE et al. September 1995). Because metals, organic constituents and radionuclides are present, it was necessary to perform a human health risk assessment analysis for the site, which included all COCs detected. 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 industrial and residential land use scenarios.

In summary, the HI calculated for the COCs is 0.02 at DSS Site 1072 under the industrial land use scenario, which is less than the numerical standard of 1.0 suggested by risk assessment guidance (EPA 1989). Incremental HI risk, determined by subtracting risk associated with background from potential nonradiological COC risk (without rounding), is 0.00. The excess cancer risk for DSS Site 1072 COCs is 3E-6 for an industrial land use setting. 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 2E-8. The summation of the radiological and nonradiological risk from site carcinogens for the industrial land use is 3.6E-6.

In summary, the HI calculated for the COCs is 0.3 at DSS Site 1072 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 0.04. Although the estimated excess cancer risk is at the NMED guideline for the residential land use scenario, a comparison of the maximum arsenic concentrations (4.8 mg/kg) to both the background screening value (4.4 mg/kg) and the range of arsenic background concentrations (0.033 to

17 mg/kg) indicates that the maximum concentration is most likely part of the background population. In addition, the calculated incremental excess cancer risk is zero. Therefore, considering the background screening value, the range of background concentrations, and the incremental estimated excess cancer risk, the maximum arsenic concentration does not indicate contamination. The summation of the radiological and nonradiological risk from site carcinogens for the residential land use is 1.2E-5.

Uncertainties associated with the calculations are considered small relative to the conservativeness of 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 risk assessment that corresponds with the procedures in the EPA's Ecological Risk Assessment Guidance for Superfund (EPA 1997) was performed as set forth by the NMED Risk-Based Decision Tree description 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 the "Predictive Ecological Risk Assessment Methodology for SNL/NM ER Program, Sandia National Laboratories/New Mexico" (IT July 1998). The risk assessment also includes the estimation of exposure and ecological risk.

All COCs at DSS Site 1072 are located at more than 5 feet bgs. Therefore, no complete ecological pathways exist at the site. As a consequence, a more detailed ecological risk assessment is not necessary.

4.4 Baseline Risk Assessments

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

4.4.1 Human Health

Because the results of the human health risk assessment summarized in Section 4.3.2.1 indicate that DSS Site 1072 poses insignificant risk to human health under both industrial and residential land use scenarios, a baseline human health risk assessment is not required for this site.

4.4.2 Ecological

Because all COCs at DSS Site 1072 are located at depths greater than 5 feet bgs and no complete ecological pathways exist at the site, a baseline ecological risk assessment is not required for this site.

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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 1072 for the following reasons:

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

5.2 Criterion

Based upon the evidence provided above, DSS Site 1072 is proposed for an NFA decision according to Criterion 5, which states, "the SWMU/AOC has been characterized or remediated in accordance with current applicable state or federal regulations, and the available data indicate that contaminants pose an acceptable level of risk under current and projected future land use" (NMED March 1998).

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ANNEX A
Septic Tank Sampling Results

Buildings 6500 and T-52
Area 3/Area 5
SNLA ID No. SNLA008602
Tank ID. No. AD89031R

On October 1, 1992, aqueous and sludge samples were collected from the inactive septic tank serving Buildings 6500 and T-52. Analytical results of concern are noted below.

- Trichloroethene (TCE) was detected in the aqueous sample at a level of 2.3 mg/L, which exceeds the New Mexico Water Quality Control Commission Regulations (NMWQCCR) discharge limit (NMDL) of 0.1 mg/L and the Resource Conservation and Recovery Act (RCRA) toxicity characteristic (TC) limit of 0.5 mg/L.

- Total phenolics was detected in the aqueous sample at a level of 0.041 mg/L, which exceeds the NMDL of 0.005 mg/L.

- Zinc, which is regulated under the NMWQCCR and the City of Albuquerque (COA) wastewater ordinance, was detected in the sludge sample at a level of 1370 mg/kg.

No other parameters were detected above NMDLs, COA discharge limits, or RCRA TC limits that identify hazardous waste.

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

Result of Septic Tank Analyses
(Sludge Sample)

Building No./Area:	**6500/T-52 A-3/5**
Tank ID No.:	**AD890341R**
Date Sampled:	**10/01/92**
Sample ID No.:	**SNL008602**

Analytical Parameter	Measured Concentration	± 2 Sigma Uncertainty	Units
Water Content	89.0	NA	%
Arsenic	5.7	NA	mg/kg
Barium	297	NA	mg/kg
Cadmium	9.3	NA	mg/kg
Chromium	27.3	NA	mg/kg
Copper	284	NA	mg/kg
Lead	53.2	NA	mg/kg
Manganese	373	NA	mg/kg
Mercury	2.0	NA	mg/kg
Nickel	---	NA	mg/kg
Selenium	3.5	NA	mg/kg
Silver	9.8	NA	mg/kg
Thallium	---	NA	mg/kg
Zinc	1370	NA	mg/kg
Gross Alpha	10	20	pCi/g
Gross Beta	0	30	pCi/g
Gross Alpha	10	20	pCi/g
Gross Beta	-20	30	pCi/g
Gross Alpha	10	20	pCi/g
Gross Beta	20	30	pCi/g
Gross Alpha	20	20	pCi/g
Gross Beta	10	30	pCi/g
Tritium	-200	300	pCi/L
Actinium-228	0.2	.005	pCi/g
Bismuth-212	0.4	0.3	pCi/g
Bismuth-214	.17	.004	pCi/g
Cesium-137	<0.010	NA	pCi/g
Potassium-40	4.2	0.4	pCi/g
Lead-210	0.3	0.4	pCi/g
Lead-212	0.1	0.2	pCi/g
Lead-214	0.18	0.04	pCi/g
Radium-226	<0.165	NA	pCi/g
Thorium-234	0.3	0.2	pCi/g
Thallium-208	0.05	0.02	pCi/g

ND=Not Detected NA=Not Applicable

Results of Septic Tank Analyses

(LIQUID SAMPLES)

Building No./Area:	6500/T-52 A-5
Tank ID No.:	AD89031R
Date Sampled:	10/1/92
Sample ID No.:	SNLA-008602

Analytical Parameter	Measured Concentration	State Discharge Limit	COA Discharge Limit	Comments
Volatile Organics (EPA 624)	(mg/l)	(mg/l)	(mg/l)	
Tetrachlorethene	0.047	0.75	(TTO=5.0)	Below Reporting Limits
Trichloroethene	2.3	0.1	(TTO=5.0)	Exceeds State Limits; Exceeds RCRA TC limit of 0.5 mg/L
Semivolatile Organics (EPA 625)	(mg/l)	(mg/l)	(mg/l)	
None detected above laboratory		Parameter	(TTO=5.0)	
reporting limit		Specific	(TTO=5.0)	
Pesticides (EPA 608)	(mg/l)	(mg/l)	(mg/l)	
None detected above laboratory		NR	(TTO=5.0)	
reporting limits				
PCBs (EPA 608)	(mg/l)	(mg/l)	(mg/l)	
None detected above laboratory		0.001	(TTO=5.0)	
reporting limits				
Metals	(mg/l)	(mg/l)	(mg/l)	
Arsenic	ND (0.0050)	0.1	2.0	
Barium	0.068	1.0	20.0	
Cadmium	ND (0.00050)	0.01	2.8	
Chromium	ND (0.010)	0.05	20.0	
Copper	ND (0.020)	1.0	16.5	
Lead	ND (0.0050)	0.05	3.2	
Manganese	0.064	0.20	20.0	
Mercury	ND (0.00020)	0.002	0.1	
Nickel	—	NR	12.0	
Selenium	ND (0.0050)	0.05	2.0	
Silver	ND (0.010)	0.05	5.0	
Thallium	ND (0.010)	NR	NR	
Zinc	0.072	10.0	28.0	
Uranium	0.007	5.0	NR	
Miscellaneous Analytes	(mg/l)	(mg/l)	(mg/l)	
Phenolic Compounds	0.041	0.005	4.0	Exceeds State Limit
Nitrates/Nitrites	ND (0.10)	10.0	NR	
Formaldehyde	ND (0.50)	NR	260.0	
Fluoride	0.38	1.6	180.0	
Cyanide	0.039	0.2	8.0	
Oil and Grease	ND (1.0)	NR	150.0	
Radiological Analyses	(pCi/l)	(pCi/l)	(pCi/l)	
Radium 226	0.5+/- 0.2	30.0	NR	
Radium 228	1 +/- 6	30.0	NR	
Gross Alpha	10 +/- 20	NR	NR	
Gross Beta	60 +/- 50	NR	NR	
Tritium	-200 +/- 300	NR	NR	

NR = Not Regulated; ND(#.#) = Not Detected (Reporting Limit); TC=Toxicity Characteristic of Hazardous Waste

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

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

RESULTS OF SEPTIC TANK SAMPLING

CHEMICAL ANALYSES OF AQUEOUS SAMPLE

Building ID: T52/6500

Sample ID Number: 024380

Date Sampled: 7-20-95

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	
Toluene	0.004J	0.010	0.75	TTO = 5.0	
Semivolatile Organics (8270)	*(mg/L)*	*(mg/L)*	*(mg/L)*	*(mg/L)*	
4-Methylphenol	0.004J	0.010	NR	NR	
4-Methylphenol (reanalyses)	0.003J	0.010	NR	NR	
2,4-Dimethylphenol	0.005J	0.010	NR	TTO = 5.0	
2,4-Dimethylphenol (reanalyses)	0.005J	0.010	NR	TTO = 5.0	
bis(2-Ethylhexyl)Phthalate	0.004BJ	0.010	NR	TTO = 5.0	
bis(2-Ethylhexyl)Phthalate (reanalyses)	0.009BJ	0.010	NR	TTO = 5.0	
Di-N-Butylphthalate (reanalyses)	0.001J	0.010	NR	TTO = 5.0	
Pesticides/PCBs (8080)	*(mg/L)*	*(mg/L)*	*(mg/L)*	*(mg/L)*	
None detected above DL	ND	various	NR / PCBs = 0.001	TTO = 5.0	
Metals (6010/7470)	*(mg/L)*	*(mg/L)*	*(mg/L)*	*(mg/L)*	
Arsenic	0.0030J	0.010	0.1	2.0	
Barium	0.094J	0.200	1.0	20.0	
Cadmium	ND	0.005	0.01	2.8	
Chromium	ND	0.020	0.05	20.0	
Copper	0.020J	0.025	1.0	16.5	
Lead	0.0021J	0.003	0.05	3.2	
Manganese	0.068	0.015	0.2	20.0	
Nickel	0.020J	0.040	0.2	12.0	
Selenium	0.0029J	0.005	0.05	2.0	
Silver	ND	0.010	0.05	5.0	

Refer to footnotes at end of table.

RESULTS OF SEPTIC TANK SAMPLING

CHEMICAL ANALYSES OF AQUEOUS SAMPLE

Building ID: T52/6500
Sample ID Number: 024380
Date Sampled: 7-20-95

Parameter (Method)	Result	Detection Limit (DL)	NM Discharge Limit[a]	COA Discharge Limit[b]	Comments
Thallium	0.0052J	0.010	NR	NR	
Metals (6010/7470)	*(mg/L)*	*(mg/L)*	*(mg/L)*	*(mg/L)*	
Zinc	0.14	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)	ND	0.50	NR	260.0	
Fluoride (300.0)	ND	0.10	1.6	180.0	
Nitrate + Nitrite (353.1)	0.174	0.100	10.0	NR	
Oil + Grease (9070)	5.58	0.96	NR	150.0	
Total Phenol (9066)	0.180	0.050	0.005	4.0	Exceeds NM Discharge limit.

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: T52/6500

Sample ID Number: 024380

Date Sampled: 7-20-95

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)	0.27 ± 0.66	9.05	3.74	NR	
Gross Beta (9310)	74.4 ± 11.2	11.8	5.62	NR	
Isotopic Analyses	*(pCi/L ± 2-σ)*	*(pCi/L)*	*(pCi/L)*	*(pCi/L)*	
Tritium (906.0)	-31.2 ± 58.6	100	49.5	NR	
Gamma Spectroscopy[b]	*(pCi/mL ± 2-σ)*	*(pCi/mL)*	*(pCi/L)*	*(pCi/L)*	
None detected above MDA	ND	various	NL	NR	

Notes:

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

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

MDA = Minimum detectable activity.

ND = Not detected above MDA indicated.

NL = Not listed.

NR = Not regulated.

RESULTS OF SEPTIC TANK SAMPLING

CHEMICAL ANALYSES OF SLUDGE SAMPLE

Building ID: T52/6500
Sample ID Number: 024380
Date Sampled: 7-20-95
Percent Moisture: Not Reported

Parameter (Method)	Result	Detection Limit (DL)	NM Discharge Limit[a]	COA Discharge Limit[b]	Comments
Volatile Organics (8260)	*(µg/kg)*	*(µg/kg)*	*(mg/L)*	*(mg/L)*	
Acetone	31	10	NR	NR	
Toluene	27	10	0.75	TTO = 5.0	
Semivolatile Organics (8270)	*(µg/kg)*	*(µg/kg)*	*(mg/L)*	*(mg/L)*	
Fluorene	170J	1600	NR	TTO = 5.0	
n-Nitrosodiphenylamine	420J	1600	NR	TTO = 5.0	
Phenanthrene	820J	1600	NR	TTO = 5.0	
ButylBenzylPhthalate	250J	1600	NR	TTO = 5.0	
bis(2-Ethylhexyl)Phthalate	210J	1600	NR	TTO = 5.0	
Pesticides/PCBs (8080)	*(µg/kg)*	*(µg/kg)*	*(mg/L)*	*(mg/L)*	
4,4'-DDE	5.5	3.3	NR	TTO = 5.0	
Endosulfan Sulfate	8.5	3.3	NR	TTO = 5.0	
Metals (6010/7470)	*(mg/kg)*	*(mg/kg)*	*(mg/L)*	*(mg/L)*	
Arsenic	0.35J	1.0	0.1	2.0	
Barium	23.4	20.0	1.0	20.0	
Cadmium	ND	0.50	0.01	2.8	
Chromium	0.84J	2.0	0.05	20.0	
Copper	22.6	2.5	1.0	16.5	
Lead	2.8	0.30	0.05	3.2	
Manganese	15.9	1.5	0.2	20.0	
Nickel	2.7J	4.0	0.2	12.0	
Selenium	ND	0.50	0.05	2.0	
Silver	0.26J	1.0	0.05	5.0	
Thallium	ND	1.0	NR	NR	
Zinc	149	2.0	10.0	28.0	

Refer to footnotes at end of table.

RESULTS OF SEPTIC TANK SAMPLING

CHEMICAL ANALYSES OF SLUDGE SAMPLE

Building ID: T52/6500

Sample ID Number: 024380

Date Sampled: 7-20-95

Percent Moisture: Not Reported

Parameter (Method)	Result	Detection Limit (DL)	NM Discharge Limit[a]	COA Discharge Limit[b]	Comments
Metals (6010/7470)	*(mg/kg)*	*(mg/kg)*	*(mg/L)*	*(mg/L)*	
Mercury	0.36	0.10	0.002	0.1	

Notes:

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

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

B = Analyte detected in method blank.

DL = Detection limit indicated on laboratory report.

IDL = Instrument detection limit.

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

ND = Not detected above DL indicated.

NR = Not regulated.

RESULTS OF SEPTIC TANK SAMPLING
RADIOLOGICAL ANALYSES OF SLUDGE SAMPLE

Building ID: T52/6500
Sample ID Number: 024380
Date Sampled: 7-20-95
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	0.014 ± 0.012	0.022	0.012	NR	
Plutonium-238	0.11 ± 0.03	0.021	0.012	NR	
Strontium-90	-0.05 ± 0.08	0.15	0.07	NR	
Thorium-232	0.082 ± 0.053	0.049	0.035	NR	
Thorium-230	0.53 ± 0.15	0.056	0.038	NR	
Thorium-228	0.55 ± 0.16	0.060	0.040	NR	
Uranium-238	3.67 ± 1.24	0.11	0.083	NR	
Uranium-235/236	0.28 ± 0.19	0.13	0.100	NR	
Uranium-234	7.02 ± 2.24	0.12	0.089	NR	
Dry Gamma Spectroscopy[f]	*(pCi/g ± 2-σ)*	*(pCi/g)*	*(pCi/g)*	*(pCi/g)*	
Cesium-137	0.014 ± 0.094	0.010	0.005	NR	
Cesium-134	ND	0.009	0.004	NR	
Potassium-40	3.44 ± 0.46	0.10	0.045	NR	
Chromium-51	ND	0.099	0.049	NR	
Iron-59	ND	0.027	0.013	NR	
Cobalt-60	ND	0.011	0.006	NR	
Zirconium-95	ND	0.021	0.010	NR	
Ruthenium-103	ND	0.011	0.005	NR	
Ruthenium-106	ND	0.085	0.042	NR	
Cerium-144	ND	0.059	0.029	NR	
Thallium-208	0.078 ± 0.013	0.010	NL	NR	
Lead-210	0.89 ± 0.43	0.44	NL	NR	
Lead-212	0.22 ± 0.03	0.01	0.006	NR	
Lead-214	0.14 ± 0.02	0.02	0.009	NR	
Bismuth-212	0.20 ± 0.07	0.07	NL	NR	
Bismuth-214	0.13 ± 0.02	0.02	NL	NR	

Refer to footnotes at end of table.

RESULTS OF SEPTIC TANK SAMPLING

RADIOLOGICAL ANALYSES OF SLUDGE SAMPLE

Building ID: T52/6500
Sample ID Number: 024380
Date Sampled: 7-20-95
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-224	0.49 ± 0.19	0.17	NL	NR	
Radium-226	0.13 ± 0.02	0.02	0.011	30.0[d]	
Radium-228	0.24 ± 0.03	0.04	0.017	30.0[d]	
Actinium-228	0.24 ± 0.03	0.04	0.017	NR	
Thorium-231	ND	0.26	0.13	NR	
Thorium-232	0.24 ± 0.03	0.04	0.017	NR	
Thorium-234	1.93 ± 0.30	0.14	0.070	NR	
Uranium-235	0.10 ± 0.02	0.05	0.026	NR	
Uranium-238	1.93 ± 0.30	0.14	0.070	NR	
Americium-241	ND	0.034	0.017	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.
NL = Not listed.

SAMPLE FINDINGS SUMMARY

Site: Non-ER Spec System

AR/COC: 602765 Data Classification: Organic

Sample/ Fraction No.	Analysis	DV Qualifiers	Comments
[redacted]	[redacted] (Aroclor-1016)	[redacted] J	
	[redacted] (Aroclor-1221)	J	
	[redacted] (Aroclor-1232)	J	
	[redacted] (Aroclor-1242)	J	Verified By [redacted] 11/10/2000
	[redacted] (Aroclor-1248)	J	
	[redacted] (Aroclor-1254)	[redacted] J	
	[redacted] (Aroclor-1260)	[redacted] J	
B5898-DF1-BH3-PCB	[redacted] PCBs	[redacted] J	[redacted]
[redacted]			
12/14/99			

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

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

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

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

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

Reviewed by: [redacted] Date: 11/23/99

SAMPLE FINDINGS SUMMARY

Site: Non-ER Septic Systems

AR/COC: 602765 Data Classification: General Chemistry

Sample/ Fraction No.	Analysis	DV Qualifiers	Comments
	No Data Qualified		

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

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

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

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

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

Reviewed by: [redacted] Date: 11/23/99

SAMPLE FINDINGS SUMMARY

Site: 101 Non-ER Septic Fields

AR COC: 600437 Data Classification: DV-2

Sample Fraction No.	Analysis	DV Qualifiers	Comments
ER-1295-6500-DF1-	7440-39-3	J, A2	
✓BH1-6-S ✓BH2-6-S			
✓BH5-11-S ✓BH2-11-S			
✓BH3-6-S ✓BH3-11-S			
✓BH4-6-S ✓BH4-11-S			

JR 10/14/98

3/9/99

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 J. Rale Date: 10/14/98

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

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

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

TOP [illegible]-03
Re
Attachmen
November 1995

Wmd 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.: 600437 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: Anthony A. Roybal Date: 10/14/98 Closed by: _____ Date: _____

ANNEX B
Soil Sample Data Validation Results

SAMPLE FINDINGS SUMMARY

Site: 101 Non-ER Septic Fields

AR COC: 600437 Data Classification: DV-2

Sample Fraction No.	Analysis	DV Qualifiers	Comments
ER-1295-6500-DF1-	7440-39-3	J, A2	
✓BH1-6-S ✓BH2-6-S			
✓BH5-11-S ✓BH2-11-S			
✓BH3-6-S ✓BH3-11-S			
✓BH4-6-S ✓BH4-11-S			
		JR	

10/14/98

Amt 3/9/99

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

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

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

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

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

Reviewed by: Jeffrey A. Rale Date: 10/14/98

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

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

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

TOP 9-
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.: 600437 | 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	Trilium 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: A. Roybal Date: 10/14/98 Closed by: _____ Date: _____

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

Project Name 101 Non-ER Septic Fields

Case Number 7223.230

Sample Numbers 16 soil samples (refer to analytical report)

AR/COC No. 600437 Analytical laboratory ERCL SDG No. NA

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

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

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

1.0 EVALUATION

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

Reviewed by: Jeffrey A. Rale

Date: 10/14/98

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?		—	5198-24 ⇒ barium (biased low). ①
6) Precision a) Laboratory control sample precision reported and met for all samples?	NA		Not applicable; LCS duplicate not analyzed with submitted samples
b) Matrix spike duplicate RPD data reported and met for all samples for which it was requested?	—		
7) Blank data a) Method or reagent blank data reported and met for all samples?	—		
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.

① The percent recovery for barium was biased low in the MS sample. The percent recovery for barium was within control limits in the MSD sample. The relative percent difference

Reviewed by: Jeffrey A. Rabe

Date: 10/14/98

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

2.0 COMMENTS CONTINUATION SHEET

for the MS/MSD pair was within limits.

JR
10/14/98

Reviewed by: Jeffrey J. Rake

Date: 10/14/98

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

JF 10/14/98

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: Kathy A. Robertson

Date: 10/14/98

SAMPLE FINDINGS SUMMARY

Site: Non-ER Spoke System

AR/COC: 602765 Data Classification: Organic

Sample/ Fraction No.	Analysis	DV Qualifiers	Comments
T52/6500-DF1-BH3-6-5	12674-11-2 (Aroclor-1016)	UJ2	
	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)	J2	
	11096-82-5 (Aroclor-1260)	UJ2	
~~B5898-DF1-BH3-PCB~~	EPA 8082 PCBs	UJ	low surrogate recovery
B898-DF1-BH3-PCB			
12/14/99			

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

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

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

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

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

Reviewed by: [redacted] Date: 11/23/99

SAMPLE FINDINGS SUMMARY

Site: Non-ER Septic Systems

AR/COC: 602765 Data Classification: General Chemistry

Sample/ Fraction No.	Analysis	DV Qualifiers	Comments
	No Data Qualified		

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

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

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

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

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

Reviewed by: [redacted] Date: 11/23/99

DATA VALIDATION SUMMARY:

SITE/PROJECT: NavER Septic CASE #: 7223.02.02.01 # OF SAMPLES: 39 MATRIX: Soil
ARCOC #: 60226.5 LAB SAMPLE IDs:
LABORATORY: GEL 9908E51-01 thru -18, -44
LABORATORY REPORT #: 9908E51

ANALYSIS/ QC ELEMENT	VOC	SVOC	PEST/ PCB	HPLC (HE)	ICP/ES	GFAA	CVAA (HG)	CN	VPHD	OTHER
1. HOLDING TIMES/ PRESERVATION	✓		J2/UJ2					✓		✓
2. CALIBRATIONS	✓		✓					✓		✓
3. METHOD BLANKS	✓		✓					✓		✓
4. MS/MSD	✓		✓					✓		✓
5. LABORATORY CONTROL SAMPLES	✓		✓					✓		✓
6. REPLICATES								✓		✓
7. SURROGATES	✓		✓							
8. INTERNAL STDS	✓									
9. TCL COMPOUND IDENTIFICATION	✓									
10. ICP INTERFERENCE CHECK SAMPLE										
11. ICP SERIAL DILUTION										
12. CARRIER/ITEM TRACER RECOVERIES										
13. OTHER QC	J/UJ MH		✓							

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

REVIEWED BY: [redacted] DATE: 11/23/99

DATA VALIDATION SUMMARY:

SITE/PROJECT: Nor-El Septic CASE #: 7223.02.02.01
ARCOC #: 602265
LABORATORY: CEL
LABORATORY REPORT #: 9908E51

OF SAMPLES: 5 MATRIX: Aqueous
LAB SAMPLE IDs: 9908E51-39 thru -43

ANALYSIS/ QC ELEMENT	VOC (8260)	SVOC	PEST/ PCB (8081)	HPLC (8330)	ICP/AES	GFAA/ AA	CVAA (7470)	CN	PHOS	OTHER (CC6+)
1. HOLDING TIMES/ PRESERVATION	✓		✓					✓		✓
2. CALIBRATIONS	✓		✓					✓		✓
3. METHOD BLANKS	✓		✓					✓		✓
4. MS/MSD	—		✓					✓		✓
5. LABORATORY CONTROL SAMPLES	✓		✓					✓		✓
6. REPLICATES								✓		✓
7. SURROGATES	✓		UJ							
8. INTERNAL STDS	✓									
9. TCL COMPOUND IDENTIFICATION	✓									
10. ICP INTERFERENCE CHECK SAMPLE										
11. ICP SERIAL DILUTION										
12. CARRIER/CHEM TRACER RECOVERIES										
13. OTHER QC										

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

REVIEWED BY: _____ DATE: 11/23/99

Memorandum

Date: 11/23/99

To: File

From: Marcia Hilchey

Subject: Organic Data Review and Validation
Site: Non-ER Septic systems
AR/COC: 602765
Case: 7223.02.02.01
Laboratory: GEL
SDG: 9908E51

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

Summary

All samples were prepared and analyzed with accepted procedures and with specified methods (VOC EPA8260, PCB EPA8082). All compounds were successfully analyzed.

No qualifications were applied to VOC sample data.

Qualifications were applied to PCB sample data due to exceeded holding time and failure to meet surrogate recovery acceptance criteria.

Holding Times

All VOC samples were analyzed within prescribed holding times.

The original analysis of PCB sample T52/6500-DF1-BH3-6-S exhibited low surrogate recovery. It was re-extracted and reanalyzed outside of holding time, with acceptable surrogate recovery. The re-extracted results were reported. Positive sample results were J2 qualified; non-detected results were UJ2 qualified. See attached Sample Findings Summary.

Calibration

Several VOC CCVs exhibited percent differences of >20%, but <40%. No sample data were qualified as a result.

Several PCB CCVs failed to meet %D acceptance criteria on the secondary column (DBXLB). None of these failures were for analytes which had positive results on the primary column (requiring confirmation), therefore no qualifications were applied.

Blanks

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

Methylene chloride was detected in the VOC method blanks, but since all sample results were non-detect, no qualifications were applied. Note: The CVR states that a VOC method blank exhibited toluene, but no samples from this SDG were associated with that method blank.

No target analytes were detected in either the VOC or PCB equipment blanks.

Surrogates

All VOC surrogate recoveries met acceptance criteria.

PCB samples T52/6500-DF1-BH1-6-S and B898-DF1-BH1-10-S exhibited high surrogate recovery. Since these samples had no positive results, no data were qualified. Sample B898-DF1-BH3-PCB (equipment blank) exhibited low surrogate recovery. Results for this sample were UJ qualified.

Matrix Spike/Matrix Spike Duplicates (MS/MSD)

Matrix spike samples for soil VOC and all PCB analyses met acceptance criteria.

No aqueous VOC MS/MSD samples were analyzed. No sample results were qualified.

Internal Standards

All VOC internal standard acceptance criteria were met.

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

LCS/LCSD sample analysis for soil VOC and all PCB analyses met acceptance criteria.

No aqueous VOC LCSD was analyzed. The aqueous VOC LCS met acceptance criteria. No sample results were qualified.

Other QC

VOC field duplicate RPDs were high for 2-butanone and toluene.

All PCB field duplicate RPDs met acceptance criteria.

No other specific issues were identified which affect data quality.

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

PCBs (SW 846 - Method 8082)

Site/Project: Navy ER, Sprdz AR/COC #: 602765 Laboratory Sample IDs: -42

Laboratory: CEL Laboratory Report #: 9908E51

Methods: 8082

# of Samples: 1 Matrix: aqueous Batch #s: 98E51W

CAS #	Name	TCL	Internal Std	Calib RSD/R²	CCV %D	Method Blanks	LCS	LCSD	LCS RPD	MS	MSD	MS RPD	% Field Dup. RPD	Equip. Blanks	Trip Blanks		
				<30% / 0.99	25%				20%			20%					
12674-11-2	Aroclor-1016		✓	✓	✓	✓	X										
11104-28-2	Aroclor-1221																
11141-16-5	Aroclor-1232																
53469-21-9	Aroclor-1242																
12672-29-6	Aroclor-1248																
11097-69-1	Aroclor-1254																
11096-82-5	Aroclor-1260		✓	✓	✓	✓	✓	✓	✓	✓	✓	✓					

Sample	SMC % REC	SMC RT	Sample	SMC % REC	SMC RT
-42	19.1 DCB				
QC644579 -MS	23.4				
QC644580 MSD	23.7				

Comments:

Confirmation

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

Reviewed By: [signature] Date: 11/23/99

PCBs (SW 846 - Method 8082)

Site/Project: Non-ER Spatic AR/COC #: 602765 Laboratory Sample IDs: -2, 4, 6, 8, 9, 10, 12, 14, 15, 18, 20, 22, 24, 26, 28, 30, 32, 34, 36, 38

Laboratory: GEL Laboratory Report #: 99085 51

Methods: 8082

# of Samples: 20 Matrix: Soil Batch #: 98515

CAS #	Name	TCL	Instrument	Calib. RSD / r² <30% / 0.99	CCV %D 20%	Method Blanks	LCS	LCSD	LCS RPD 20%	MS	MSD	MS RPD 20%	Field Dup. RPD	Equip. Blanks	Field Blanks		
12674-11-2	Aroclor-1016		✓	✓	✓	✓							✓	U5			
11104-28-2	Aroclor-1221																
11141-16-5	Aroclor-1232																
53469-21-9	Aroclor-1242																
12672-29-6	Aroclor-1248																
11097-69-1	Aroclor-1254																
11096-82-5	Aroclor-1260		↓	↓	✓	↓	✓	✓	✓	✓	✓	✓	↓	↓			

Sample	SMC % REC	SMC RT	Sample	SMC % REC	SMC RT
-24	127 4COMX				
-30	126 "				

Comments:

Confirmation

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

Reviewed By: _____ Date: 11/23/99

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

SITE/PROJECT: Naa-ER Sodz. ARCOC #: 60276.5 aq.
LABORATORY: GEL LABORATORY REPORT #: 9908E51

IS	GC/MS Name	CAS #	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	Eq. Blks	Trip Blks	TAL		
1	Chloromethane	74-87-3	0.10	✓	✓	✓	23.0	✓												
1	Bromomethane	74-83-9	0.10				✓													
1	Vinyl chloride	75-01-4	0.10																	
1	Chloroethane	75-00-3	0.01				-26.9	—												
1	methylene chloride (10xblk)	75-09-2	0.01				✓	1.5												
1	acetone (10xblk)	67-64-1	0.01																	
1	carbon disulfide	75-15-0	0.10																	
1	1,1-dichloroethene	75-35-4	0.20						✓											
1	1,1-dichloroethane	75-34-3	0.20																	
1	Chloroform	67-66-3	0.20																	
1	1,2-dichloroethane	107-06-2	0.10																	
1	2-butanone (MEK)	78-93-3	0.01																	
2	1,1,1-trichloroethane	71-55-6	0.10				26.9													
2	carbon tetrachloride	56-23-5	0.10				✓													
2	Bromodichloromethane	75-27-4	0.20																	
2	1,2-dichloropropane	78-87-5	0.01																	
2	cis-1,3-dichloropropene	10061-01-5	0.20																	
2	Trichloroethene	79-01-6	0.30						✓											
2	Dibromochloromethane	124-48-1	0.10																	
2	1,1,2-trichloroethane	79-00-5	0.10																	
2	Benzene	71-43-2	0.30						✓											
2	trans-1,3-dichloropropene	10061-02-6	0.10																	
2	Bromoform	75-25-2	0.10				✓													
3	4-methyl-2-pentanone	108-10-1	0.10																	
3	2-hexanone	591-78-6	0.01				21.2													
3	Tetrachloroethene	127-18-4	0.20																	
3	1,1,2,2-tetrachloroethane	79-34-5	0.30																	
3	toluene (10xblk)	108-88-3	0.40						✓											
3	Chlorobenzene	108-90-7	0.30																	
3	Ethylbenzene	100-41-4	0.10																	
3	Styrene	100-42-5	0.30																	
3	xylenes (total)	1330-20-7	0.30																	
3	1,2-dichloroethylene (total)	540-59-0	0.01																	
	2-chloroethyl vinyl ether	110-75-8																		
	vinyl acetate			—	—	—	—	—												

Comments:

REVIEWED BY: _____ DATE: 11/23/99

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

SITE/PROJECT: _____ ARCOC #: 602765 oq.
LABORATORY: _____ LABORATORY REPORT #: _____

Surrogate Recovery and Internal Standard Outliers

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

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

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

Comments:

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

SITE/PROJECT: Navy ER Spatic ARCOC #: 602765 SOIL
LABORATORY: GEL LABORATORY REPORT #: 99085E1

6:35 9/3

IS	GC/MS Name	CAS #	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	Eq. Blks	Trip Blks	TAL	CCV 9/3	CCV 9/7	CCV 9/7
1	Chloromethane	74-87-3	0.10	✓	✓	✓	✓	✓							✓	✓	✓		26.3	✓	23.0
1	Bromomethane	74-83-9	0.10																		
1	vinyl chloride	75-01-4	0.10																		
1	Chloroethane	75-00-3	0.01																28.1	29.2	26.9
1	methylene chloride (10xblk)	75-09-2	0.01					1.51													
1	acetone (10xblk)	67-64-1	0.01																		
1	carbon disulfide	75-15-0	0.10																		
1	1,1-dichloroethene	75-35-4	0.10						✓	✓	✓	✓	✓	✓							
1	1,1-dichloroethane	75-34-3	0.20																		
1	chloroform	67-66-3	0.20																		
1	1,2-dichloroethane	107-06-2	0.10																		
1	2-butanone (10xblk)	78-93-3	0.01																25.1	25.7	26.9
2	1,1,1-trichloroethane	71-55-6	0.10												✓						
2	carbon tetrachloride	56-23-5	0.10																		
2	Bromodichloromethane	75-27-4	0.20																		
2	1,2-dichloropropane	78-87-5	0.10																		
2	cis-1,3-dichloropropene	10061-01-5	0.20																		
2	trichloroethene	79-01-6	0.30						✓												
2	Dibromochloromethane	124-48-1	0.10																		
2	1,1,2-trichloroethane	79-00-5	0.10																		
2	benzene	71-43-2	0.30						✓	✓	✓	✓	✓	✓							
2	trans-1,3-dichloropropene	10061-02-6	0.10																		
2	Bromoform	75-25-2	0.10																		
3	4-methyl-2-pentanone	108-10-1	0.10																		
3	2-hexanone	591-78-6	0.01																		
3	Tetrachloroethene	127-18-4	0.20																		24.2
3	1,1,2,2-tetrachloroethane	79-34-5	0.30																		
3	toluene (10xblk)	108-88-3	0.40					MLH 0.7	✓	✓	✓	✓	✓	✓	hi						
3	Chlorobenzene	108-90-7	0.50																		
3	Ethylbenzene	100-41-4	0.10																		
3	Styrene	100-42-5	0.30																		
3	xylenes (total)	1330-20-7	0.30																		
3	1,3-dichloroethylene (total)	540-59-0	0.30																		
	2-chloroethyl vinyl ether	110-75-8		✓	✓	✓	✓	✓							✓	✓	✓				
	vinyl acetate																				

Comments: 1 QC646258 only: associated with samples 44
2 QC645493 only " " " this is CCVH

REVIEWED BY: _____ DATE: 11/23/99

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

SITE/PROJECT: _____ ARCOC #: 602.765 soil
LABORATORY: _____ LABORATORY REPORT #: _____

Surrogate Recovery and Internal Standard Outliers

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

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

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

Comments:

Memorandum

Date: 11/23/99

To: File

From: Marcia Hilchey

Subject: General Chemistry Data Review and Validation
Site: Non-ER Septic Systems
AR/COC: 602765
Case: 7223.02.02.01
Laboratory: GEL
SDG: 9908E51

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

Summary

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

No qualifications were applied to CN sample results.

No qualifications were applied to a Cr6+ sample results.

Holding Times

All samples were analyzed within the prescribed holding time.

Calibration

Initial and continuing calibrations met QC acceptance criteria.

Blanks

Cr6+ method blanks and equipment blanks were free of target analytes above reporting limits.

The CN method blank associated with sample B898-DF1-BH3-CN (equipment blank) exhibited cyanide, but the sample exhibited none. No sample results were qualified. All other CN method blanks were free of target analyte.

Matrix Spike Analysis

The matrix spike sample analyses met QC acceptance criteria for both methods.

Laboratory Control/Laboratory Control Duplicate Samples

The LCS/LCSD samples met QC acceptance criteria for both methods

Laboratory Replicate Analysis

The replicate sample analyses met QC acceptance criteria for both methods.

Other QC

Field duplicate soil sample analyses met RPD acceptance criteria.

No other specific issues were identified which affect data quality.

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

GENERAL CHEMISTRY:

SITE/PROJECT: Non-ER Septic ARCOC #: 602765
LABORATORY: GEL LABORATORY REPORT #: 99085E51
METHODS: Cyanide (9012), hexavalent Cr (7196)

QC/ Analyte	CAS #	ICV	CCV	ICB	CCB	Method Blanks	LCS	LCSD	LCSD RPD	MS	MSD	MSD RPD	REP RPD	Serial Dilution	Field Dup RPD	Equip. Blks	Field Blks			
Total Cyanide		✓	✓	n/a	n/a	.0025U	✓	✓	✓	✓	n/a	n/a	✓	n/a	✓	✓	n/a			
Cr6+		✓	✓	✓	✓	✓	✓	✓	✓	✓	n/a	n/a	✓	n/a	✓	✓	n/a			

Comments:
1 QC6YY8 associated with EB only

REVIEWED BY: _____ DATE: 11/25/99

Internal Lab

ANALYSIS REQUEST AND CHAIN OF CUSTODY

Batch No. SAR/WR No. SMO Use

AR/COC 602765

Dept. No./Mail Stop:	6135/1147	[redacted]		Contract No.:	AJ-2480A
Project/Task Manager:	NON-ER Septic Sys/M Sanders			Case No.:	7223.290
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)			

ORIGINAL

9908E518

Lab Use

Sample No.-Fraction	ER Sample ID or Sample Location Detail	Beginning Depth/ft.	ER Site No.	Date/Time Collected	Sample Matrix	Container Type	Container Volume	Preservative	Collection Method	Sample Type	Parameter & Method Requested	Lab Sample ID	
050011-001	B6587-SP1-BH1-19-S	14 ft	N/A	082599 1200	S	AC	125ml	4C	GR	SA	VOC	[redacted]	1
050011-002	B6587-SP1-BH1-19-S	14 ft	N/A	082599 1200	S	AG	250ml	4C	GR	SA	PCB CN Cr6+	[redacted]	2
050012-001	B6587-SP1-BH1-19-S	19 ft	N/A	082599 1205	S	AC	125ml	4C	GR	SA	VOC	[redacted]	3
050012-002	B6587-SP1-BH1-19-S	19 ft	N/A	082599 1205	S	AG	250ml	4C	GR	SA	PCB CN Cr6+	[redacted]	4
050015 ~~050013~~-001	B6587-SP2-BH1-14-S	14 ft	N/A	082599 1415	S	AC	125ml	4C	GR	SA	VOC	[redacted]	5
050013-002	B6587-SP2-BH1-14-S	14 ft	N/A	082599 1415	S	AG	250ml	4C	GR	SA	PCB CN Cr6+	[redacted]	6
050014-001	B6587-SP2-BH1-19-S	19 ft	N/A	082599 1453	S	AC	125ml	4C	GR	SA	VOC	[redacted]	7
050014-002	B6587-SP2-BH1-19-S	19 ft	N/A	082599 1453	S	AG	250ml	4C	GR	SA	PCB CN Cr6+	[redacted]	8
050015-002	B6587-SP2-BH1-14-DU	14 ft	N/A	082599 1415	S	AG	250ml	4C	GR	DU	PCB CN Cr6+	[redacted]	9
050016-002	B6587-SP2-BH1-14-MS/MSD	14 ft	N/A	082599 1415	S	AG	250ml	4C	GR	MS/MSD	PCB CN Cr6+	[redacted]	10

RMMA ☐ Yes ☒ No Ref. No [redacted]

Sample Disposal ☐ Return to Client ☒ Disposal by lab

Turnaround Time ☒ Normal ☐ Rush

Required Report Date

Special Instructions/QC Requirements

EDD ☒ Yes ☐ No

Raw Data Package ☒ Yes ☐ No

Send info to Mike Sanders

VOC (8260)

PCB (8082)

CN (9012 w/9010 prep)

Cr6 (7196 w/ 3060A prep)

*TAL's From GEL Lab [illegible]

[redacted]

Sample Team Members	Name	Signature	Init	Company/Organization/Phone
	Margaret Sanchez	Margaret Sanchez	MS	Weston/6118/845-3267
	~~Gilbert Beltran~~			~~ITM/118/238-0417~~

1. Relinquished by Margaret Sanchez	Org. 6118	Date 8/30/99	Time 0848	4. Relinquished by	Org.	Date	Time
1. Received by [signature]	Org. 7574	Date 8/30/99	Time 0848	4. Received by	Org.	Date	Time
2. Relinquished by [signature]	Org. 7577	Date 8/30/99	Time 1100	5. Relinquished by	Org.	Date	Time
2. Received by P. [illegible]	Org. GEL	Date 8/31/99	Time 09:30	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

050011

050035 >25

ORIGINAL 2

Analysis Request And Chain Of Custody (Continuation)

AR/COC 166765

Project Name: Non-ER Sypetic System | Project/Task Manger: M Sanders | Case No.:7223 230

Location: Tech Area / Building / Room

Reference LOV (available at SMO)

Sample No-Fraction	ER Sample ID or Sample Location detail	Depth in Ft	ER Site No	Date/Time Collected	Sample Matrix	Container Type	Container Volume	Preservative	Sample Collection Methods	Sample Type	Parameter & Method Requested	Lab use Lab Sample ID	
050017-001	TS2/6500-DFI-BH3-6-S	6 Ft	N/A	082699 0800	S	AG	125ml	4C	SA GR	SA	VOC		11
050017-002	" -6-S	6 Ft	N/A	082699 0800	S	AG	250ml	4C	SA CR	SA	PCB CN Cr6+		12
050018-001	" -11-S	11 Ft	N/A	082699 0926	S	AG	125ml	4C	GR	SA	VOC		13
050018-002	" -11-S	11 Ft	N/A	082699 0926	S	AG	250ml	4C	GR	SA	PCB CN Cr6+		14
050019-001	TS2/6500-DFI-BH4-6-S	6 Ft	N/A	082699 0955	S	AG	125ml	4C	GR	SA	VOC		15
050019-002	" -6-S	6 Ft	N/A	082699 0955	S	AG	250ml	4C	GR	SA	PCB CN Cr6+		16
050020-001	" -11-S	11 Ft	N/A	082699 1013	S	AG	125ml	4C	GR	SA	VOC		17
050020-002	" -11-S	11 Ft	N/A	082699 1013	S	AG	250ml	4C	GR	SA	PCB CN Cr6+		18
050021-001	TS2/6500-DFI-BH2-6-S	6 Ft	N/A	082699 1050	S	AG	125ml	4C	GR	SA	VOC		19
050021-002	" -6-S	6 Ft	N/A	082699 1050	S	AG	250ml	4C	GR	SA	PCB CN Cr6+		20
050022-001	" -11-S	11 Ft	N/A	082699 1316	S	AG	125ml	4C	GR	SA	VOC		21
050022-002	" -11-S	11 Ft	N/A	082699 1316	S	AG	250ml	4C	GR	SA	PCB CN Cr6+		22
050023-001	TS2/6500-DFI-BH1-6-S	6 Ft	N/A	082699 1344	S	AG	125ml	4C	GR	SA	VOC		23
050023-002	" -6-S	6 Ft	N/A	082699 1344	S	AG	250ml	4C	GR	SA	PCB CN Cr6+		24
050024-001	" -11-S	11 Ft	N/A	082699 1430	S	AG	125ml	4C	GR	SA	VOC		25
050024-002	" -11-S	11 Ft	N/A	082699 1430	S	AG	250ml	4C	GR	SA	PCB CN Cr6+		26
050025-001	B898-DFI-BH1-5-S	5 Ft	N/A	082799 0903	S	AG	125ml	4C	GR	SA	VOC		27
050025-002	B898-DFI-BH1-5-S	5 Ft	N/A	082799 0903	S	AG	250ml	4C	GR	SA	PCB CN Cr6+		28
050026-001	" -10-S	10 Ft	N/A	082799 0913	S	AG	125ml	4C	GR	SA	VOC		29
050026-002	" -10-S	10 Ft	N/A	082799 0913	S	AG	250ml	4C	GR	A	PCB CN Cr6+		30

ORIGINAL

Analysis Request And Chain Of Custody (Continuation)

AR/COC-# 1002765

Project Name: Non-ER Sypetic System	Project/Task Manger: M Sanders	Case No.: 7223.230	Reference LOV (available at SMO)										Lab use
Location: Tech Area / 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	
050027-001	B898-DF1-BH2-5-S	5Ft	NA	082799 0935	S	AC	125ml	4C	GR	SA	VOC		31
050027-002	B899-DF1-BH2-5-S	5Ft	NA	082799 0935	S	AG	250ml	4C	GR	SA	PCB CN Cr6t		32
050028-001	" " -10-S	10Ft	NA	082799 0945	S	AC	125ml	4C	GR	SA	VOC		33
050028-002	" " -10-S	10Ft	NA	082799 0945	S	AG	250ml	4C	GR	SA	PCB CN Cr6t		34
050029-001	6898-DF1-BH3-5-S	5Ft	NA	082799 1030	S	AC	125ml	4C	GR	SA	VOC		35
050029-002	" -5-S	5Ft	NA	082799 1030	S	AG	250ml	4C	GR	SA	PCB CN Cr6t		36
050030-001	" -10-S	10Ft	NA	082799 1040	S	AC	125ml	4C	GR	SA	VOC		37
050030-002	" -10-S	10Ft	NA	082799 1040	S	AG	250ml	4C	GR	SA	PCB CN Cr6t		38
050-031-005	" -10-TB	10Ft	N/A	082799 0845	DW	G	3x40ml	HCL	—	TB	VOC		39
050-032-005	-CN	N/A	N/A	083099 0930	DW	P	1L	4C	GR	EB	Total Cyanide		40
050-033-005	" -Cr6+	N/A	N/A	083099 0932	DW	P	500ml	4C	GR	EB	Chromium 6		41
050-034-005	" -PCB	N/A	N/A	083099 0930	DW	AG	2x1L	4C	GR	EB	PCB		42
050-035-005	" -VOC EB	N/A	N/A	083099 0930	DW	G	3x40ml	HCL	GR	EB	VOC		43
050015-001	BG587-SP2-BH1-10-SV	10ft	N/A	082599 1415	S	AC	125ml	4C	GR	DU	VOC EAL		44

* Date & Time for TB3 08/25/99 1200

Contract Verification Review (CVR)

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

AR/COC No. 602765 Analytical Lab GEL SDG No. 9908E51

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	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				
2.13	Contractual qualifiers provided	X				
2.14	All requested result and TIC (if requested) data provided	X				

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	SURROGATE RECOVERY OUTSIDE ACCEPTANCE LIMITS FOR PCB SAMPLES #9908E51-24, -30, -42 & -42MS/MSD
c) Matrix spike recovery data reported and met	X		
3.4 Precision a) Replicate sample precision reported and met for all inorganic and radiochemistry samples	X		
b) Matrix spike duplicate RPD data reported and met for all organic samples	X		
3.5 Blank data a) Method or reagent blank data reported and met for all samples		X	METHYLENE CHLORIDE & TOLUENE DETECTED IN VOC METHOD BLANKS
b) Sampling blank (e.g., field, trip, and equipment) data reported and met	X		
3.6 Contractual qualifiers provided: "J"- estimated quantity; "B"-analyte found in method blank above the MDL for organic or above the PQL for inorganic; "U"-analyte undetected (results are below the MDL, IDL, or MDA (radiochemical)); "H"-analysis done beyond the holding time	X		
3.7 Narrative addresses planchet flaming for gross alpha/beta	NA		
3.8 Narrative included, correct, and complete	X		
3.9 Second column confirmation data provided for methods 8330 (high explosives) and pesticides/PCBs	X		

Contract Verification Review (Continued)

4.0 Calibration and Validation Documentation

Item	Yes	No	Comments
4.1 GC/MS (8260, 8270, etc.)			
a) 12-hour tune check provided	X		
b) Initial calibration provided	X		
c) Continuing calibration provided	X		
d) Internal standard performance data provided	X		
e) Instrument run logs provided	X		
4.2 GC/HPLC (8330 and 8010 and 8082)			
a) Initial calibration provided	X		
b) Continuing calibration provided	X		
c) Instrument run logs provided	X		
4.3 Inorganics (metals)			
a) Initial calibration provided	NA		
b) Continuing calibration provided	NA		
c) ICP interference check sample data provided	NA		
d) ICP serial dilution provided	NA		
e) Instrument run logs provided	NA		
4.4 Radiochemistry			
a) Instrument run logs provided	NA		

Contract Verification Review (Concluded)

5.0 Problem Resolution

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

Sample/Fraction No.	Analysis	Problems/Comments/Resolutions

Were deficiencies unresolved? ☐ Yes ☑ No

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

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

Reviewed by: W. Palencia Date: 10-19-99 Closed by: _____ Date: _____

Contract Verification Review (CVR)

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

AR/COC No. 602765 Analytical Lab GEL SDG No. 9908E51

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Line No.	Item	Complete? Yes	Complete? No	If no, explain	Resolved? Yes	Resolved? No
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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				
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2.10	Narrative provided	X				
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Contract Verification Review (Continued)

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3.5 Blank data a) Method or reagent blank data reported and met for all samples		X	METHYLENE CHLORIDE & TOLUENE DETECTED IN VOC METHOD BLANKS
b) Sampling blank (e.g., field, trip, and equipment) data reported and met	X		
3.6 Contractual qualifiers provided: "J"- estimated quantity; "B"-analyte found in method blank above the MDL for organic or above the PQL for inorganic; "U"-analyte undetected (results are below the MDL, IDL, or MDA (radiochemical)); "H"-analysis done beyond the holding time	X		
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Contract Verification Review (Continued)

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Item	Yes	No	Comments
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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		

5.0 Problem Resolution

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

Sample/Fraction No.	Analysis	Problems/Comments/Resolutions

Were deficiencies unresolved? ☐ Yes ☑ No

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

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

Reviewed by: W. Palencia Date: 10-19-99 Closed by: _____ Date: _____

ANNEX C
Risk Assessment

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DSS SITE 1072: RISK ASSESSMENT REPORT

I. Site Description and History

Drain and Septic Systems (DSS) Site 1072, the Building T-52 and former Building 6500 septic system, in Technical Area (TA)-V at Sandia National Laboratories/New Mexico (SNL/NM), consists of a septic tank connected to a drainfield made up of an 80-foot-long drainline with eight branching laterals, each 22 feet long.

The site is located approximately 175 feet southwest of the entrance to TA-V on federally owned land controlled by Kirtland Air Force Base (KAFB) and permitted to the U.S. Department of Energy (DOE). Although no precise information is available, records indicate that Building T-52 and former Building 6500 were in operation and discharging to the septic system in 1961. By July 1993, the septic system discharges were routed to the City of Albuquerque sanitary sewer system (Jones July 1993); it is assumed that the DSS Site 1072 septic system was abandoned by then.

Environmental concern about DSS Site 1072 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 was planned to be consistent with other DSS site investigations and to sample for the most commonly anticipated COCs found at similar facilities.

No springs or perennial surface-water bodies are located within 2.3 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 inclined to the west. During most rainfall events, precipitation quickly infiltrates the soil at DSS Site 1072. However, 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 around DSS Site 1072 is unpaved with some native vegetation, and storm sewers are used to direct surface water away from the site.

DSS Site 1072 lies at an average elevation of approximately 5,424 feet above mean sea level. The depth to groundwater is approximately 500 feet below ground surface (bgs). The nearest groundwater monitoring well is LWDS-MW-1, approximately 125 feet northwest of the site. The groundwater beneath the site occurs in unconfined conditions in essentially unconsolidated silts, sands, and gravels. The production wells nearest to DSS Site 1072 are KAFB-11, approximately 3 miles to the northeast, and KAFB-2, approximately 4 miles to the northwest.

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 the follow-on "Field Implementation Plan [FIP], Characterization of Non-Environmental Restoration Drain and Septic Systems" (SNL/NM November 2001)

identified the site-specific sample locations, sample depths, sampling procedures, and analytical requirements for this and many other DSS sites. The DQOs outlined the Quality Assurance (QA)/Quality Control (QC) requirements necessary for producing defensible analytical data suitable for risk-assessment purposes. The baseline sampling conducted at DSS Site 1072 was designed to:

- Determine to the degree possible whether each of the 101 systems included on the 1996 list was still in existence, or had ever actually 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, and would not, need initial shallow investigation work as required by 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 NMED.

Table 1 summarizes the rationale for determining the sampling locations at this site.

Table 1
Summary of Sampling Performed to Meet DQOs

DSS Site 1072 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	4 to 5	NA	Evaluate potential COC releases to the environment from effluent discharged from the drainfield

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

The baseline soil samples were collected in either four or five locations across DSS Site 1072. The samples were collected with a Geoprobe™ drilling rig from two 3-foot-long sampling intervals at each sample location. Drainfield sampling intervals started at 6 and 11 feet bgs. The soil samples were collected using the same procedures in accordance with procedures described in the Operable Unit (OU) 1295 SAP and FIP. Table 2 summarizes the types of confirmatory and QA/QC samples collected at the site, and the laboratories that performed the analyses.

The DSS Site 1072 baseline soil samples were analyzed for volatile organic compounds (VOCs), semivolatile organic compounds (SVOCs), high explosive (HE) compounds,

Table 2
Number of Confirmatory Soil and QA/QC Samples Collected From DSS Site 1072

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

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

polychlorinated biphenyls (PCBs), Resource Conservation and Recovery Act (RCRA) metals, hexavalent chromium, cyanide, radionuclides, and gross alpha and beta activities. The samples were analyzed by an offsite laboratory (General Engineering Laboratories, Inc. [GEL]), and the on-site SNL/NM Environmental Restoration (ER) Chemistry Laboratory and Radiation Protection Sample Diagnostics (RPSD) Laboratory. Table 3 summarizes the analytical methods and some of the data quality requirements from the OU 1295 SAP and FIP.

Table 3
Summary of Data Quality Requirements

Analytical Method[a]	Data Quality Level	GEL	ERCL	RPSD
VOCs EPA Method 8260	Defensible	8 samples	None	None
SVOCs EPA Method 8270	Defensible	8 samples	None	None
PCBs EPA Method 8082	Defensible	8 samples	None	None
HE Compounds EPA Method 8330	Defensible	1 sample	8 samples	None
RCRA metals EPA Method 6020/7000	Defensible	1 sample	8 samples	None
Hexavalent Chromium EPA Method 7196A	Defensible	8 samples	None	None
Total Cyanide EPA Method 9012A	Defensible	8 samples	None	None
Gamma Spectroscopy Radionuclides	Defensible	1 sample	None	8 samples
Gross Alpha/Beta Activity	Defensible	8 samples	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.
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 Conversation and Recovery Act.
RPSD = Radiation Protection Sample Diagnostics Laboratory.
SVOC = Semivolatile organic compound.
VOC = Volatile organic compound.

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

All of the baseline soil sample results were verified/validated by SNL/NM. The off-site laboratory results from GEL were reviewed according to "Data Validation Procedure for

Chemical and Radiochemical Data" SNL/NM ER Project Analytical Operating Procedure (AOP) 00-03, Rev. 0 (SNL/NM December 1999). The data validation reports are presented in the associated DSS Site 1072 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. 02 (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 1072 was based upon an initial conceptual model validated with confirmatory sampling at the site. The initial conceptual model was developed from archival site research, site inspections, and soil sampling. The DQOs contained in the OU 1295 SAP and FIP 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 1072, 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 are described below.

III.2 Nature of Contamination

Both the nature of contamination and the potential for the degradation of COCs at DSS Site 1072 were evaluated using laboratory analyses of the soil samples (Section V). The analytical requirements included analyses for VOCs, SVOCs, HE compounds, PCBs, RCRA metals, hexavalent chromium, cyanide, radionuclides by gamma spectroscopy, and gross alpha and beta activities. The analytes and methods listed in Tables 2 and 3 are appropriate to characterize the COCs and any potential degradation products at DSS Site 1072.

III.3 Rate of Contaminant Migration

The septic system at DSS Site 1072 was deactivated in the early 1990s when Building T-52 and former Building 6500 were 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 on the volume of aqueous effluent discharged to the environment from this system when it was operational. Any migration of COCs from this site after use of the septic system was discontinued has been dependent predominantly on precipitation, although 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 1072.

III.4 Extent of Contamination

Subsurface baseline soil samples were collected from boreholes drilled at five locations beneath the effluent release points and areas (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 6 and 11 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 of 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 1072 NFA proposal describes the identification of COCs and the sampling that was conducted in order to determine the concentration levels of those COCs across the site. Generally, COCs that were evaluated in this risk assessment included all detected organic 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 used only the maximum concentration value of each COC found for the entire site. The SNL/NM maximum background concentration (Dinwiddie September 1997) was selected to provide the background screen listed in Tables 4 and 5.

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

Table 4 lists the nonradiological COCs for the human health risk assessment at DSS Site 1072; Table 5 lists radiological COCs for the human health risk assessment. All samples were collected at depths greater than 5 feet bgs; therefore, calculation of ecological risk was not performed. All tables show the associated SNL/NM maximum background concentration values (Dinwiddie September 1997). Section VI.4 provides discussion of Tables 4 and 5.

V. Fate and Transport

The primary releases of COCs at DSS Site 1072 were to the subsurface soil resulting from the discharge of waste water from the Building 6500 septic system to the drainfield. Wind, water, and biota are natural mechanisms of COC transport from the primary release point. However, because waste water discharged to subsurface soil at depths greater than 5 feet bgs, none of these are considered to be significant transport mechanisms at this site.

Table 4
Nonradiological COCs for Human Health Risk Assessment at DSS Site 1072 with Comparison to the Associated SNL/NM Background Screening Value, BCF, and Log K_{ow}

COC	Maximum Concentration (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)
Arsenic	4.8	4.4	**No**	44[c]	–	**Yes**
Barium	310 J	214	**No**	170[d]	–	**Yes**
Cadmium	0.18	0.9	Yes	64[c]	–	**Yes**
Chromium, total	11	15.9	Yes	16[c]	–	No
Chromium VI	0.181 J	1	Yes	16[c]	–	No
Cyanide	0.07[c]	NC	Unknown	NC	–	Unknown
Lead	7.5	11.8	Yes	49[c]	–	**Yes**
Mercury	0.022[e]	<0.1	**Unknown**	5,500[c]	–	**Yes**
Selenium	0.45 J	<1	**Unknown**	800[f]	–	**Yes**
Silver	0.383 J	<1	**Unknown**	0.5[d]	–	No
PCBs, total	0.0031 J	NA	**NA**	31,200[d]	6.72[d]	**Yes**
2-Butanone	0.094	NA	**NA**	1[g]	0.29[g]	No
Methylene chloride	0.003 J	NA	**NA**	5[g]	1.25[g]	No
Toluene	0.025	NA	**NA**	10.7[d]	2.69[d]	No
Xylene	0.00074 J	NA	**NA**	23.4[g]	1.5[h]	No

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

[a]Dinwiddie September 1997, Southwest Supergroup.

[b]NMED March 1998.

[c]Yanicak March 1997.

[d]Neumann 1976.

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

[f]Callahan et al. 1979.

[g]Howard 1990.

[h]Micromedex 1998.

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

Table 5
Radiological COCs for Human Health Risk Assessment at DSS Site 1072 with Comparison to the Associated SNL/NM Background Screening Value and BCF

COC	Maximum Activity (pCi/g)	SNL/NM Background Activity (pCi/g)[a]	Is Maximum COC Activity Less Than or Equal to the Applicable SNL/NM Background Screening Value?	BCF (maximum aquatic)	Is COC a Bioaccumulator?[b] (BCF >40)
Cs-137	ND (0.02)	0.079	Yes	3,000[c]	Yes
U-235	ND (0.12)	0.16	Yes	900[c]	Yes
U-238	0.82	1.4	Yes	900[c]	Yes
Th-232	0.76	1.01	Yes	3,000[c]	No

Note: **Bold** indicates COCs that exceed background screening values and/or are bioaccumulators.
[a]Dinwiddie September 1997, Southwest Supergroup.
[b]NMED March 1998.
[c]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.

Water at DSS Site 1072 is currently received as precipitation (approximately 8.1 inches annually) (NOAA 1990). Precipitation will either evaporate at or near the point of contact, infiltrate into the soil, or form runoff. Infiltration at the site is enhanced by the sandy texture of the soil. However, the depth of percolation of water into the soil is limited, and it is estimated that 95 to 99 percent of the annual precipitation in this area is lost through evapotranspiration. Therefore, the potential for further downward movement of COCs through leaching is low. Because groundwater at this site is approximately 500 feet bgs, the potential for COCs to reach groundwater through the unsaturated zone above the water table is extremely low.

COCs at DSS Site 1072 include both organic and inorganic constituents. The inorganic constituents include both radiological and nonradiological analytes. The inorganic COCs are elemental in form, and are not considered to be degradable. Transformations of the nonradiological inorganics 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). However, because of the aridity of the environment at this site and the lack of potential contact with biota, none of these mechanisms is expected to result in significant transformations of the inorganic COCs. The radiological COCs will undergo decay to stable isotopes or radioactive daughter elements. However, because of the long half-lives of the radionuclides, radiological decay is not expected to result in significant losses or transformations of these COCs.

The organic COCs at DSS Site 1072 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 includes transformation due to plants, animals, and microorganisms. Because of the depth of these COCs in the soil, none of these mechanisms are expected to result in significant loss of organic COCs at this site.

Table 6 summarizes the fate and transport processes that can occur at DSS Site 1072. COCs at this site include organic analytes as well as radiological and nonradiological inorganic analytes. For the reasons detailed above, wind, surface water, and biota are considered to be of low significance as potential transport mechanisms at this site. The potential for transformation of nonradiological inorganic constituents and organic compounds is low, and loss through decay of radiological COCs is insignificant because of their long half-lives.

Table 6
Summary of Fate and Transport at DSS Site 1072

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 System

VI. Human Health Risk Assessment

VI.1 Introduction

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

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

Step 6.	These values are compared with guidelines established by the U.S. Environmental Protection Agency (EPA), NMED, and the DOE to determine whether further evaluation and potential site cleanup are required. Nonradiological COC risk values also are compared to background risk so that an incremental risk can be calculated.
Step 7.	Uncertainties of the above steps are also addressed.

VI.2 Step 1. Site Data

Section I of this risk assessment provides the description and site history for DSS Site 1072. 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 1072 has been designated 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 within the pathway analysis. Because of the location and the 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 exposure of the receptor to contaminated soil. No water pathways to groundwater are considered. Depth to groundwater at DSS Site 1072 is approximately 500 feet bgs. No intake routes through plant, meat, or milk ingestion are considered appropriate for either the industrial or residential land use scenarios. Figure 1 shows the conceptual model flow diagram for DSS Site 1072.

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, which includes the background screening procedure. The procedure compares the maximum COC concentration to the background screening level. The methodology and results are described below.

VI.4.1 Methodology

Maximum concentrations of nonradiological COCs were compared to the approved SNL/NM maximum screening level for this area (Dinwiddie September 1997). The SNL/NM maximum background concentration was selected to provide the background screen in Table 4 and was

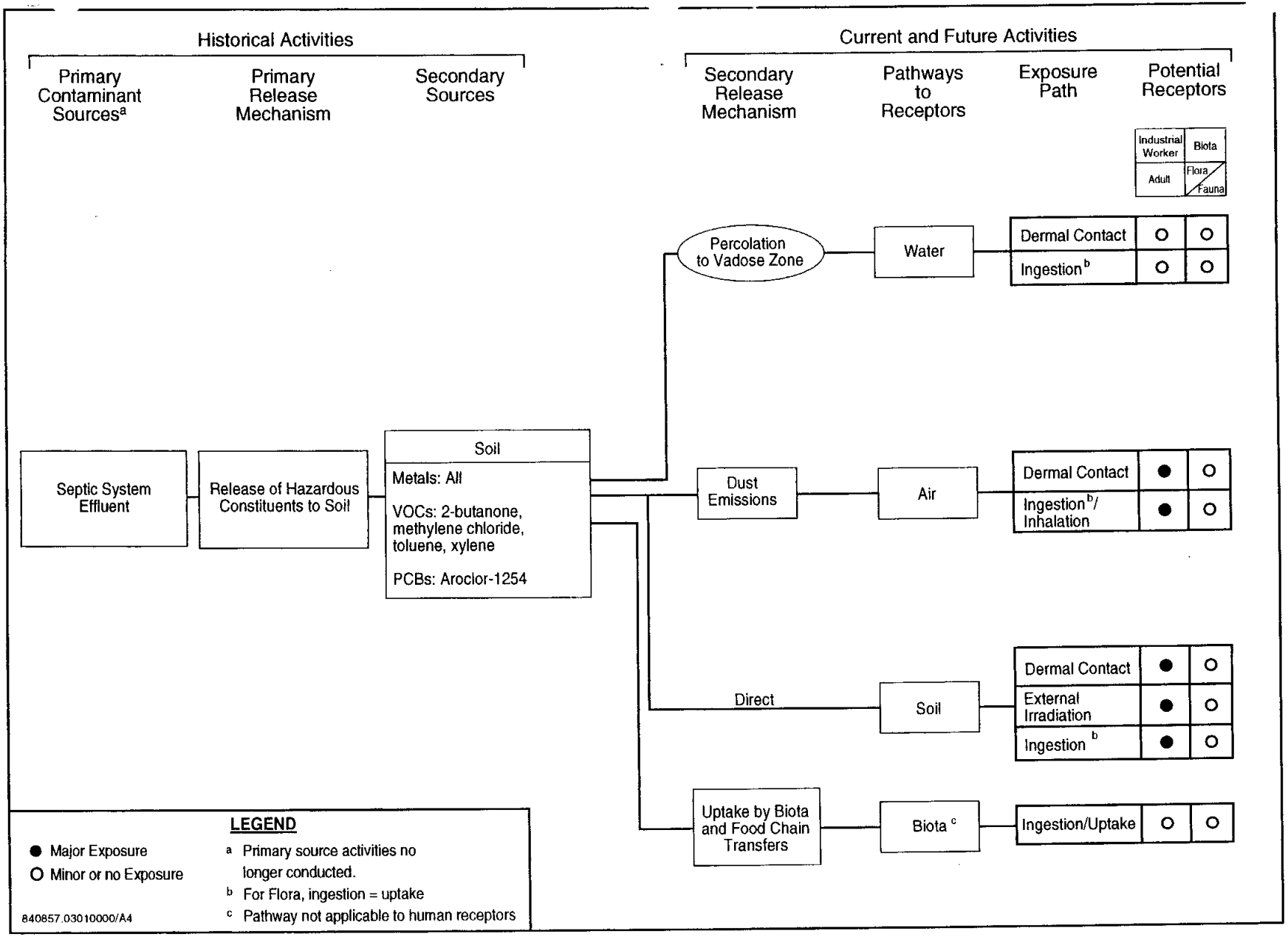

Figure 1

Conceptual Site Model Flow Diagram for Building T-52 and Former Building 6500 Septic System, DSS Site 1072

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 did not have either a quantifiable or a calculated background screening level were considered in further risk assessment analyses.

For radiological COCs that exceeded the SNL/NM background screening levels, background values were subtracted from the individual maximum radionuclide concentrations. Those that did not exceed these background levels were 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 (MDA) were carried through the risk assessment at their maximum levels. The resultant radiological COCs remaining after this step are referred to as background-adjusted radiological COCs.

VI.4.2 Results

Tables 4 and 5 show DSS Site 1072 maximum COC concentrations that were compared to the SNL/NM maximum background values (Dinwiddie September 1997) for the human health risk assessment. For the nonradiological COCs, two constituents were measured at concentrations greater than their respective background screening values. Three constituents did not have quantified background screening concentrations, therefore it is unknown if these COCs exceeded background. Five constituents were organic compounds and do not have corresponding background screening values.

The maximum concentration value for PCBs was 0.0031 J (estimated concentration) milligrams (mg)/kilogram (kg). This concentration is less than the EPA screening level of 1 mg/kg (40 CFR 761). Since 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, no constituents had MDAs or reported values greater than the corresponding background values.

VI.5 Step 4. Identification of Toxicological Parameters

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

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 the excess cancer risk for both the potential nonradiological COCs and associated background for industrial and residential land

Table 7
Toxicological Parameter Values for DSS Site 1072 Nonradiological COCs

COC	RfD_o (mg/kg-d)	Confidence[a]	RfD_{inh} (mg/kg-d)	Confidence[a]	SF_o $(mg/kg-d)^{-1}$	SF_{inh} $(mg/kg-d)^{-1}$	Cancer Class[b]	ABS
Arsenic	3E-4[c]	M	–	–	1.5E+0[c]	1.5E+1[c]	A	0.03[d]
Barium	7E-2[c]	M	1.4E-4[e]	–	–	–	D	0.01[d]
Cyanide	2E-2[c]	M	–	–	–	–	D	0.1[d]
Mercury	3E-4[e]	–	8.6E-5[c]	M	–	–	D	0.01[d]
Selenium	5E-3[c]	H	–	–	–	–	D	0.01[d]
Silver	5E-3[c]	L	–	–	–	–	D	0.01[d]
2-Butanone	6E-1[c]	L	2.9E-1[c]	L	–	–	D	0.1[d]
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]
Xylene	2E+0[c]	M	2E-1[f]	–	–	–	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. Indicates 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 EPA Region 6 electronic database (EPA 2002a).

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

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

VI.6.1 Exposure Assessment

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

VI.6.2 Risk Characterization

Table 8 shows an HI of 0.02 for the DSS Site 1072 nonradiological COCs and an estimated excess cancer risk of 3E-6 for the designated industrial land use scenario. The numbers presented included exposure from soil ingestion, dermal contact, and dust and volatile inhalation for nonradiological COCs. Table 9 shows an HI of 0.02 and an estimated excess cancer risk of 3E-6 for the designated industrial land use scenario.

There was no exposure for the radiological COCs as all results were lower than background.

For the residential land use scenario nonradioactive COCs, the HI is 0.3 and the estimated excess cancer risk is 1E-5 (Table 8). The numbers in the table included exposure from soil ingestion, dermal contact, and dust and volatile inhalation. Although the EPA (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, subsequently, for dust to be present in predominantly residential areas. Because of the nature of the local soil, other exposure pathways are not considered (see Appendix 1). Table 9 shows that for the DSS Site 1072 associated background constituents, there is an HI of 0.2 and an estimated excess cancer risk of 1E-5.

For the radiological COCs, there was no exposure, since all results were lower than background.

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 land use scenario (the designated land use scenario for this site) and the residential land use scenario.

For the industrial land use scenario nonradiological COCs, the HI is 0.02, which is less than the numerical guideline of 1 suggested in the RAGS (EPA 1989). The excess cancer risk was

Table 8
Risk Assessment Values for DSS Site 1072 Nonradiological COCs

COC	Maximum Concentration (mg/kg)	Industrial Land Use Scenario[a]		Residential Land Use Scenario[a]	
		Hazard Index	Cancer Risk	Hazard Index	Cancer Risk
Arsenic	4.8	0.02	3E-6	0.22	1E-5
Barium	310 J	0.00	–	0.06	–
Cyanide	0.07	0.00	–	0.00	–
Mercury	0.022[b]	0.00	–	0.00	–
Selenium	0.45 J	0.00	–	0.00	–
Silver	0.383 J	0.00	–	0.00	–
2-Butanone	0.094	0.00	–	0.00	–
Methylene chloride	0.003 J	0.00	2E-8	0.00	4E-8
Toluene	0.025	0.00	–	0.00	–
Xylene	0.00074 J	0.00	–	0.00	–
Total		**0.02**	**3E-6**	**0.3**	**1E-5**

[a]EPA 1989.
[b]Maximum concentration was one-half 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.
NA = Not applicable.
– = Information not available.

Table 9
Risk Assessment Values for DSS Site 1072 Nonradiological Background Constituents

COC	Background Concentration[a] (mg/kg)	Industrial Land Use Scenario[b]		Residential Land Use Scenario[c]	
		Hazard Index	Cancer Risk	Hazard Index	Cancer Risk
Arsenic	4.4	0.02	3E-6	0.20	1E-5
Barium	214	0.00	–	0.04	–
Cyanide	NC	–	–	–	–
Mercury	<0.1	–	–	–	–
Selenium	<1	–	–	–	–
Silver	<1	–	–	–	–
Total		**0.02**	**3E-6**	**0.2**	**1E-5**

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

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 industrial and residential land use scenarios. Assuming the industrial land use scenario, for nonradiological COCs the HI is 0.02 and the estimated excess cancer risk was 3E-6. 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 may therefore appear to be inconsistent with numbers presented in tables and within the text. For conservatism, the background constituents that do not have quantifiable background screening values are assumed to have a hazard quotient of 0.00. The incremental HI is 0.00 and the incremental estimated excess cancer risk is 2.00E-8 for the industrial land use scenario. These incremental risk calculations indicate insignificant risk to human health from nonradiological COCs considering an industrial land use scenario.

For the radiological COCs, there was no exposure, as all results were lower than background.

The calculated HI for the residential land use scenario nonradiological COCs is 0.3, which is below the numerical guidance. The excess cancer risk is 1E-5. NMED guidance states that cumulative excess lifetime cancer risk must be less than 1E-5 (Bearzi January 2001), thus the excess cancer risk for this site is slightly above the suggested acceptable risk value. For background concentrations of the nonradiological COCs, the HI is 0.2 and the estimated excess cancer risk is 1E-5. The incremental HI is 0.04 and the estimated incremental cancer risk is 4.00E-8 for the residential land use scenario. These incremental risk calculations indicate insignificant risk to human health from nonradiological COCs, considering a residential land use scenario.

For the radiological COCs, there was no exposure, as all results were lower than background.

VI.8 Step 7. Uncertainty Discussion

The determination of the nature, rate, and extent of contamination at DSS Site 1072 was 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 OU 1295 SAP and FIP, and the DQOs contained in these two documents are appropriate for use in risk assessments. The data from soil samples collected at effluent release points are representative of potential COC releases to the site. The analytical requirements and results satisfy the DQOs, and data quality was verified/validated in accordance with SNL/NM procedures. Therefore, there is no uncertainty associated with the data quality used to perform the risk assessment at DSS Site 1072.

Because of the location, history of the site, and future land use (DOE et al. September 1995), there is low uncertainty in the land use scenario and the potentially affected populations that were considered in performing the risk assessment analysis. Because the COCs are found in near-surface soils and because of the location and physical characteristics of the site, there is little uncertainty in the exposure pathways relevant to the analysis.

An RME approach was used to calculate the risk assessment values. This means that the parameter values in the calculations are conservative and that calculated intakes are probably overestimates. Maximum measured values of COC concentrations are used to provide conservative results.

Table 8 shows the uncertainties (confidence) in nonradiological toxicological parameter values. There is a mixture of estimated values and values from the IRIS (EPA 2003), HEAST (EPA 1997a), the Technical Background Document for Development of Soil Screening Levels (NMED December 2000), and the EPA Region 6 (EPA 2002a) electronic database. Where values are not provided, information is not available from the HEAST (EPA 1997a), IRIS (EPA 2003), Technical Background Document for Development of Soil Screening Levels (NMED December 2000), the Risk Assessment Information System (ORNL 2003) or the EPA regions (EPA 2002a, EPA 2002b, EPA 2002c). Because of the conservative nature of the RME approach, uncertainties in toxicological values are not expected to change the conclusion from the risk assessment analysis.

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

The HI for the nonradiological COCs is within the human health acceptable range for the residential land use scenario in established numerical guidance. Although the estimated excess cancer risk is slightly above the NMED guideline for the residential land use scenario, maximum concentrations were used in the risk calculation. Because the site has been adequately characterized, average concentrations are more representative of actual site conditions. The upper 95% upper confidence limit (UCL) of the average concentrations for arsenic (3.4 mg/kg), the main contributor to excess cancer risk (Appendix 2), is below background (4.4 mg/kg) and therefore arsenic is eliminated from the risk calculation. With the removal of arsenic, the total estimated excess cancer risk is reduced to 4E-8, and the incremental excess cancer risk is reduced to 4.00E-8. Thus, by using realistic concentrations

that more accurately depict actual site conditions in the risk calculations, the total and incremental estimated excess cancer risk are below NMED guidelines.

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 1072 contains identified COCs consisting of some inorganic and radiological compounds. Because of the location of the site, the designated industrial land use scenario, and the nature of contamination, potential exposure pathways identified for this site included soil ingestion, dermal contact, and dust and volatile inhalation for chemical COCs, and soil ingestion, dust inhalation, and direct gamma exposure for radionuclides. The same exposure pathways were 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 less than the accepted numerical guidance from the EPA. The estimated excess cancer risk is 3E-6; thus excess cancer risk is also below the acceptable risk value provided by the NMED for an industrial land use scenario (Bearzi January 2001). The incremental HI is 0.00, and the incremental excess cancer risk was 2.00E-8 for the industrial land use scenario. Incremental risk calculations indicate insignificant risk to human health for the industrial land use scenario.

Using conservative assumptions and an RME approach to risk assessment, calculations for nonradiological COCs show that for the residential land use scenario, the HI (0.3) is also below the accepted numerical guidance from the EPA. The estimated excess cancer risk is 1E-5. Thus, excess cancer risk is slightly above the acceptable risk value provided by the NMED for a residential land use scenario (Bearzi January 2001). The incremental HI is 0.04, and the incremental excess cancer risk is 4.00E-8 for the residential land use scenario. The incremental risk calculations indicate insignificant risk to human health for the residential land use scenario.

The HI for the nonradiological COCs is within the acceptable range for human health for the residential land use scenario in established numerical guidance. Although the estimated excess cancer risk is slightly above the NMED guideline for the residential land use scenario, maximum concentrations were used in the risk calculation. Because the site has been adequately characterized, average concentrations are more representative of actual site conditions. The 95% UCL of the average concentrations for arsenic (3.4 mg/kg), the main contributor to excess cancer risk (Appendix 2), is below background (4.4 mg/kg), and therefore arsenic is eliminated from the risk calculation. With the removal of arsenic, the total estimated excess cancer risk is reduced to 4E-8, and the incremental excess cancer risk is reduced to 4.00E-8. Thus, by using realistic concentrations that more accurately depict actual site conditions in the risk calculations, the total and incremental estimated excess cancer risk are below NMED guidelines.

There was no exposure for the radiological COCs, as all results were lower than background.

Uncertainties associated with the calculations are considered small relative to the conservativeness of 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.

The summation of the nonradiological and radiological carcinogenic risks are tabulated in Table 10 below:

Table 10
Summation of Radiological and Nonradiological Risks from Site Carcinogens

Scenario	Nonradiological Risk	Radiological Risk	Total Risk
Industrial	3E-6	6.4E-7	3.6E-6
Residential	1E-5	1.9E-6	1.2E-5

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 1072. A component of the NMED Risk-Based Decision Tree (NMED March 1998) is to conduct an ecological risk assessment that corresponds with that presented in the EPA's Ecological RAGS (EPA 1997b). The current methodology is tiered and contains an initial scoping assessment, which is followed by a more detailed risk assessment if warranted by the results of the scoping assessment. Initial components of 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. At the end of the scoping assessment, a determination is made as to whether a more detailed examination of potential ecological risk is necessary.

VII.2 Scoping Assessment

The scoping assessment focuses primarily on the likelihood of exposure of biota at/or adjacent to the site to constituents associated with site activities. Included in this section are an evaluation of existing data with respect to the existence of complete ecological exposure pathways, an evaluation of bioaccumulation potential, and a summary of fate and transport potential. A scoping risk management decision (Section VII.2.4) involves summarizing the scoping results and determining whether further examination of potential ecological impacts is necessary.

VII.2.1 Data Assessment

As indicated in Section IV, all COCs at DSS Site 1072 are located at depths greater than 5 feet bgs. Therefore, no complete ecological exposure pathways exist at this site, and no COCs are considered to be COPECs.

VII.2.2 Bioaccumulation

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

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 6 (Section V), wind, surface water, and biota (food chain uptake) are expected to be of low significance as transport mechanisms for COPECs at this site. Degradation, transformation, and radiological decay of the COPECs also are expected to be of low significance.

VII.2.4 Scoping Risk-Management Decision

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

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APPENDIX 1
EXPOSURE PATHWAY DISCUSSION FOR CHEMICAL AND RADIONUCLIDE CONTAMINATION

Introduction

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

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

At SNL/NM, all SWMUs exist within the boundaries of the Kirtland Air Force Base. Approximately 240 potential waste and release sites have been identified where hazardous, radiological, or mixed materials may have been released to the environment. Evaluation and characterization activities have occurred at all of these sites to varying degrees. Among other documents, the SNL/NM ER draft Environmental Assessment (DOE 1996) presents a summary of the hydrogeology of the sites and the biological resources present. When evaluating potential human health risk the current or reasonably foreseeable land use negotiated and approved for the specific SWMU/AOC, aggregate, or watershed will be used. The following references generally document these land uses: *Workbook: Future Use Management Area 2 (September 1995); Workbook: Future Use Management Area 1 (October 1995); Workbook: Future Use Management Areas 3, 4, 5, and 6 (January 1996); Workbook: Future Use Management Area 7 (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 6, 2000) and "Technical Background Document for Development of Soil Screening Levels" (NMED December 18, 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 1 X 10^{-5} and with a molecular weight of 200 grams/mole or less (EPA 1991).

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

Summary

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

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

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

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

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

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

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

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APPENDIX 2
95% UPPER CONFIDENCE LIMITS OF THE MEAN CONCENTRATION

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

Summary Statistics for Arsenic	
Number of Samples	9
Minimum	2.02
Maximum	4.8
Mean	2.846667
Median	2.5
Standard Deviation	0.890842
Variance	0.7936
Coefficient of Variation	0.312942
Skewness	1.491655
Shapiro-Wilk Test Statistic	0.854897
Shapiro-Wilk 5% Critical Value	0.829
Data are Normal at 5% Significance Level	
Recommended UCL to use	Student's-t
95% UCL (Assuming Normal Data)	
Student's-t	3.398855
95% UCL (Adjusted for Skewness)	
Adjusted-CLT	3.492865
Modified-t	3.423463
95% Non-parametric UCL	
CLT	3.335102
Jackknife	3.398855
Standard Bootstrap	3.294733
Bootstrap-t	3.830947
Chebyshev (Mean, Std)	4.141031

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