3-1-2006

Justification for Class III Permit Modification March 2006 SWMU 140 Operable Unit 1295 Building 9965 Septic System and Drywell (Thunder Range)

Sandia National Laboratories/NM

Sandia National Laboratories

Drain and Septic Systems (DSS) Solid Waste Management Units 49, 101, 116, 138, 140, 147, 149, 150, 154, and 161 (Poster 1 of 3)

This work supported by the United States Department of Energy under contract DE-AC04-94I85000.

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Site Histories

Drain and septic system site histories for the ten sites are as follows:

Site Number	Site Name	Location	Year Bldg and System Built	Year Drain or Septic System Abandoned	Year(s) Septic Tank Effluent Sampled	Year(s) Septic Tank and Seepage Pits Backfilled
49	Bldg 9820 Drains	Lurance Canyon	1958	1995 (distal end of drainpipe sealed)	No septic tank at this site	NA
101	Bldg 9926 Explosive Contaminated Sumps and Drains	Coyote Test Field	1960	1991	1992, 1994	1995/1996
116	Bldg 9990 Septic System	Coyote Test Field	1971	Early 1990s	1992, 1994, 1995	1996
138	Bldg 6630 Septic System	TA-III	1959	1991	1994, 1995	1995
140	Bldg 9965 Septic System	Thunder Range	1965	1991	1992, 1994	1995/1996
147	Bldg 9925 Septic Systems	Coyote Test Field	1959 (south system); 1965/1966 (west system); 1980 (north system)	Before 1994 (south system); 1991 (west and north system)	1992, 1994, 1995 (west system); 1992, 1995 (north system)	Before 1994 (south system tanks); 1996 (north and west system tanks)
149	Bldg 9930 Septic System	Coyote Test Field	1961	1993	1992, 1994	1996
150	Bldg 9939/9939A Septic System	Coyote Test Field	1974 (Bldg. 9939); 1982 (Bldg. 9939A)	1993	1992, 1994	1996
154	Bldg 9960 Septic Systems	Coyote Test Field	1965	1991 (seepage pits); 1993 (septic tank)	1992, 1994	1996 (septic system) 2005 (HE seepage pits)
161	Bldg 6636 Septic System	TA-III	1971	1993	1992, 1994	1996

Depth to Groundwater

Depth to the regional aquifer at the ten sites is as follows:

Site Number	Site Name	Location	Groundwater Depth (ft bgs)
49	Bldg 9820 Drains	Lurance Canyon	107
101	Bldg 9926 Explosive Contaminated Sumps and Drains	Coyote Test Field	420
116	Bldg 9990 Septic System	Coyote Test Field	230
138	Bldg 6630 Septic System	TA-III	475
140	Bldg 9965 Septic System	Thunder Range	230
147	Bldg 9925 Septic Systems	Coyote Test Field	41
149	Bldg 9930 Septic System	Coyote Test Field	302
150	Bldg 9939/9939A Septic System	Coyote Test Field	315
154	Bldg 9960 Septic Systems	Coyote Test Field	44
161	Bldg 6636 Septic System	TA-III	466

Constituents of Concern

Site Number	Site Name	COCs
49	Bldg 9820 Drains	VOCs, SVOCs, metals, cyanide, chromium VI, and radionuclides
101	Bldg 9926 Explosive Contaminated Sumps and Drains	VOCs, SVOCs, metals, cyanide, chromium VI, and radionuclides
116	Bldg 9990 Septic System	VOCs, SVOCs, metals, cyanide, chromium VI, PCBs, and radionuclides
138	Bldg 6630 Septic System	VOCs, SVOCs, metals, cyanide, PCBs, and radionuclides
140	Bldg 9965 Septic System	VOCs, SVOCs, metals, nitrate, cyanide, chromium VI and radionuclides
147	Bldg 9925 Septic Systems	VOCs, SVOCs, metals, and radionuclides
149	Bldg 9930 Septic System	VOCs, SVOCs, metals, cyanide, chromium VI, and radionuclides
150	Bldg 9939/9939A Septic System	VOCs, SVOCs, metals, PCBs, and radionuclides
154	Bldg 9960 Septic Systems	VOCs, SVOCs, metals, nitrate, chromium VI, HE compounds, and radionuclides
161	Bldg 6636 Septic System	VOCs, SVOCs, metals, cyanide, chromium VI, and radionuclides

Investigations

- All of these sites were selected by NMED for passive soil-vapor sampling to screen for VOCs and SVOCs, and no significant contamination was identified at any of the ten sites.
- A backhoe was used to positively locate buried components (drainfield drain lines, drywells, and seepage pits) so that locations for soil vapor samplers and soil borings could be selected.
- Soil samples were collected from directly beneath drainfield drain lines, next to or beneath seepage pits, and on either side of septic tanks to determine if COCs were released to the environment from drain systems.
- A 160-ft-deep groundwater monitoring well (CYN-MW5), a 265-ft-deep groundwater monitoring well (CTF-MW1), a 365-ft-deep groundwater monitoring well (CTF-MW3), and a 135-ft-deep groundwater monitoring well (CTF-MW2) were installed at SWMUs 49, 116, 149, and 154, respectively. Groundwater samples were collected on a quarterly basis for eight quarters beginning in July 2002. Samples were analyzed for VOCs, SVOCs, HE compounds, RCRA metals, chromium VI, cyanide, nitrate plus nitrite, gross alpha/beta activity, and major anions and cations.

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

Site Number	Site Name	Buried Components (Drain Lines, Drywells) Located With Backhoe	Soil Sampling Beneath Drainlines, Seepage Pits, Drywells	Type(s) of Drain System, and Soil Sampling Depths (ft bgs)	Passive Soil-Vapor Sampling	Groundwater Monitor Well Installation and Sampling Period
49	Bldg 9820 Drains	None	1994, 1995	Drain Outfall: 1, 11 Surface Discharge: 1, 11	1994	2001; 8 quarters of sampling (2002-2004)
101	Bldg 9926 Explosive Contaminated Sumps and Drains	1995	1994, 1995	West Seepage Pit: 12, 22 Middle and East Seepage Pit: 16, 26 Septic Tank: 9 Drywell: 4, 14	1994	None
116	Bldg 9990 Septic System	1995	1995, 2002	Seepage Pits: 13 Septic Tank: 8.5	1994	2001; 8 quarters of sampling (2002-2004)
138	Bldg 6630 Septic System	1994	1994	Drainfield: 6.5, 16.5 Septic Tank: 10	1994	None
140	Bldg 9965 Septic System	1995	1994, 1995, 2003	Seepage Pit: 11, 16, 21, 26 Septic Tank: 7 Drywell: 8, 18	1994	None
147	Bldg 9925 Septic Systems	1994	1995, 2002	**North System:** Drainfield: 9, 19 Septic Tank: 9 **West System:** Drainfield: 5, 15 Septic Tank: 9 **South System:** Drainfield: 5, 15 Septic Tank: 10	1994	None
149	Bldg 9930 Septic System	1994	1995, 2002	Seepage Pit: 8 Septic Tank: 7	1994	2001; 8 quarters of sampling (2002-2004)
150	Bldg 9939/9939A Septic System	1995	1995	Drainfield: 4 Septic Tank: 8 East and West Seepage Pits: 8	1994	None
154	Bldg 9960 Septic Systems	None	1994, 1995, 1996, 1997, 1998, 2005	**Septic System:** Seepage Pit: 10, 20 Septic Tank: 9.5 **West System:** North HE Seepage Pit: 21.5, 24 South HE Seepage Pit: 22, 23	1994	2001; 8 quarters of sampling (2002-2004)
161	Bldg 6636 Septic System	1994	1994	Drainfield: 10, 20 Septic Tank: 7.5	1994	None

Drain and Septic Systems (DSS) Solid Waste Management Units 49, 101, 116, 138, 140, 147, 149, 150, 154, and 161 (Poster 2 of 3)

This work supported by the United States Department of Energy under contract DE-AC04-94I85000.

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Summary of Data Used for NFA Justification

- Soil samples were analyzed at on- and off-site laboratories for constituents of concern as listed in the table above.
- There were detections of VOCs at all ten sites; SVOCs were detected at SWMUs 49, 138, 147, and 154; PCBs were detected at SWMU 116; HE compounds were detected at SWMU 154.
- Arsenic was detected above the background value at SWMUs 140 and 154. Total chromium was detected above the background value at SWMUs 101, 154, and 161. Barium was detected above the background value at SWMUs 138, 140, 147, and 154. Silver was detected above the background value at SWMUs 49, 101, 116, 138, 154, and 161. Selenium was detected above the background value at SWMUs 101, 140, and 154. Lead was detected above the background value at SWMUs 147 and 154. Nickel was detected above the background value at SWMU 138 and mercury was detected above the background value at SWMU 49. No other metals were detected above background values.
- Cyanide was detected above the MDL at SWMUs 101, 116, 140, and 161.
- Tritium was detected slightly above the background activity at SWMUs 101, 147, and 149. Tritium was not detected, but the MDA exceeded the background activity at SWMU 138. U-235 and U-238 were not detected, but MDAs exceeded background activities at SWMUs 49, 101, 140, 147, 150, and 154. U-235 was not detected, but the MDA exceeded the background activity for SWMUs 116, 149, and 161.
- All confirmatory soil sample analytical results for each site were used for characterizing that site, for performing the risk screening assessment, and as justification for the NFA proposal.

Recommended Future Land Use

- Industrial land use was established for these ten sites.

Results of Risk Analysis

- Risk assessment results for industrial and residential land-use scenarios are calculated per NMED risk assessment guidance as presented in "Supplemental Risk Document Supporting Class 3 Permit Modification Process."
- Because COCs were present in concentrations greater than background-screening levels or because constituents were present that did not have background-screening levels, it was necessary to perform risk assessments for these ten sites. The risk assessment analysis evaluated the potential for adverse health effects for the residential land-use scenarios for nine of the sites. For the remaining site, SWMU 154, the risk assessment analysis evaluated the potential for adverse health effects for the industrial land-use scenario.
- The maximum value for lead was 30 mg/kg at SWMU 154 and 39.7 mg/kg at SWMU 147; both exceed the background value. The EPA intentionally does not provide any human health toxicological data on lead; therefore, no risk parameter values could be calculated. The NMED guidance for lead screening concentrations for construction and industrial land-use scenarios are 750 and 1,500 mg/kg, respectively. The EPA screening guidance value for a residential land-use scenario is 400 mg/kg. Because, the maximum concentration for lead at these sites is less than the screening values, lead was eliminated from further consideration in the human health risk assessment.
- The non-radiological total human health HIs and estimated excess cancer risks for eight of the ten sites are below NMED guidelines for the residential land-use scenarios.
- For SWMU 140, the HI is below the residential land-use guideline, but the total estimated excess cancer risk is slightly above the residential land-use guideline. However, the incremental excess cancer risk value for this site is below the NMED residential land-use guideline.
- For SWMU 154, the total HI and the estimated excess cancer risk are above the NMED guidelines for the residential land-use scenario due to the levels of 2,4,6-trinitrotoluene, the main contributor to the risk). Thus, the results for an industrial land use are presented here. The HI and the total estimated excess cancer risk for SWMU 154 exceed the NMED industrial land-use guidelines. However, the incremental HI and excess cancer risk values for SWMU 154 are below the NMED industrial land-use guidelines.
- The incremental human health TEDEs for the industrial land-use scenario for the ten sites ranged from 1.5E-1 to 5.3E-8 mrem/yr, all of which are substantially below the EPA numerical guideline of 15 mrem/yr. The incremental human health TEDEs for residential land-use scenario ranged from 4.0E-1 to 4E-8 mrem/yr, all of which are substantially below the EPA numerical guideline of 75 mrem/yr. Therefore, these sites are eligible for unrestricted radiological release.
- Using the SNL predictive ecological risk and scoping assessment methodologies, it was concluded that there is not a complete ecological pathway for seven of the sites. For the remaining three sites (SWMUs 49, 101, and 150) the ecological risk is predicted to be very low.
- In conclusion, human health risk under a residential land-use scenario and ecological risk are acceptable per NMED guidance for nine of the ten sites. Thus, these nine sites are proposed for CAC without institutional controls. For the remaining site, SWMU 154, the human health risk under an industrial land-use scenario and the ecological risk are acceptable per NMED guidance. Thus, SWMU 154 is proposed for CAC with institutional controls.

The total HIs and excess cancer risk values for the nonradiological COCs at the ten sites are as follows:

Site Number	Site Name	Residential Land-Use Scenario	
		Hazard Index	Excess Cancer Risk
49	Bldg 9820 Drains	0.00	5E-8 Total
101	Bldg 9926 Explosive Contaminated Sumps and Drains	0.00	1E-7 Total
116	Bldg 9990 Septic System	0.01	4E-8 Total
138	Bldg 6630 Septic System	0.20	6E-8 Total
140	Bldg 9965 Septic System	0.33	1E-5[a] Total / 3.40E-6 Incremental
147	Bldg 9925 Septic System	0.07	5E-8 Total
149	Bldg 9930 Septic System	0.00	3E-8 Total
150	Bldg 9939/9939A Septic System	0.00	4E-8 Total
161	Bldg 6636 Septic System	0.11	5E-8 Total
	NMED Guidance	< 1	<1E-5

Site Number	Site Name	Industrial Land-Use Scenario	
		Hazard Index	Excess Cancer Risk
154	Bldg 9960 Septic System	4.72[a] Total / 0.36 Incremental	3E-5[a] Total / 2.43E-6 Incremental
	NMED Guidance	< 1	<1E-5

[a]Value exceeds NMED guidance for the specified land-use scenario; therefore, the incremental values are shown.

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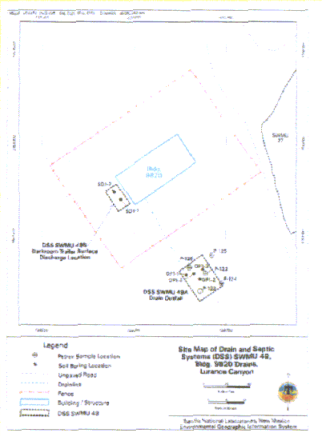
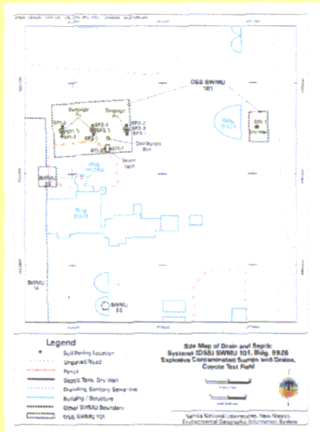
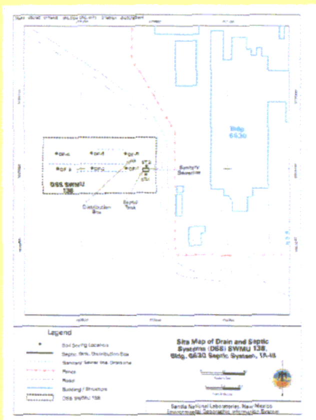
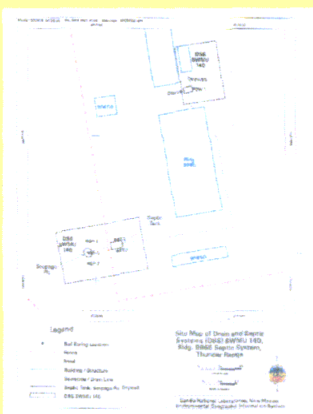
Drain and Septic Systems (DSS) Solid Waste Management Units 49, 101, 116, 138, 140, 147, 149, 150, 154, and 161 (Poster 3 of 3)

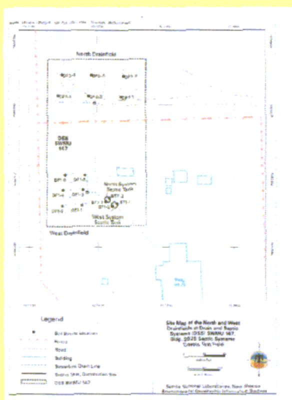
Environmental Restoration Project

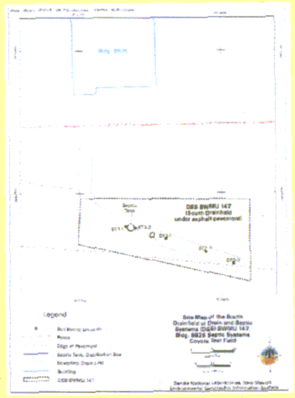


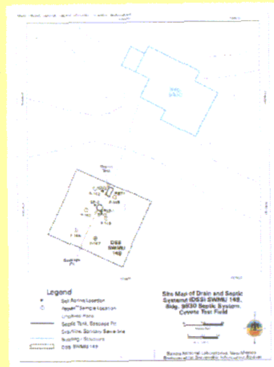


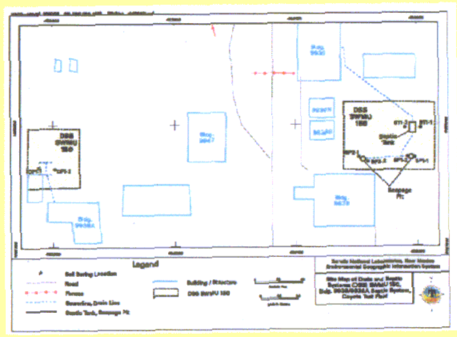


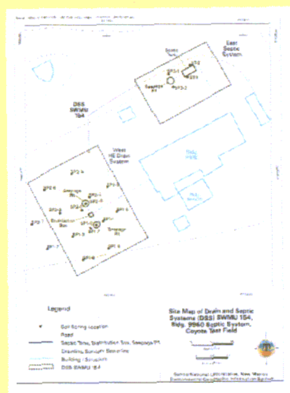


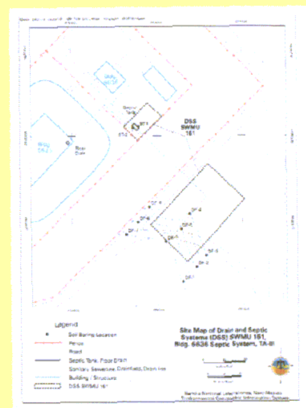


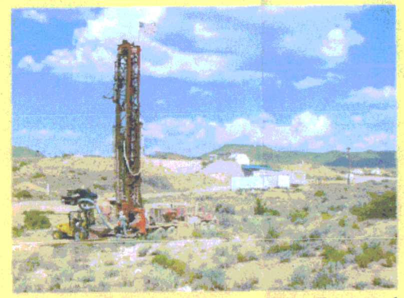












Drilling groundwater monitoring well CTF-MW3 west of SWMU 149

Drilling groundwater monitoring CYN-MW5 northwest of SWMU 49

Drilling groundwater monitoring well CTF-MW1 south-west of SWMU 116.

Drilling groundwater monitoring well CTF-MW2 north-west of SWMU 154 with the two HE seepage pits and an HE storage bunker in the foreground.

Drilling groundwater monitoring well CTF-MW2 north-west of SWMU 154 with the two HE seepage pits and an HE storage bunker in the foreground.

For More Information Contact

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Justification for Class III Permit Modification

March 2006

SWMU 140
Operable Unit 1295
Building 9965 Septic System and Drywell
(Thunder Range)

NFA Submitted January 1997
RSI Response Submitted September 1999
RSI Response Submitted September 2005

Environmental
Restoration
Project

United States Department of Energy
Sandia Site Office

Department of Energy

Albuquerque Operations Office
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P.O. Box 5400
Albuquerque, New Mexico 87115

JAN 30 1997

CERTIFIED MAIL - RETURN RECEIPT REQUESTED

Mr. Benito Garcia, Bureau Chief
New Mexico Environment Department
Hazardous and Radioactive Materials Bureau
2044 Galisteo Street
P.O. Box 26110
Santa Fe, NM 87505-2100

Dear Mr. Garcia:

Enclosed are two copies of the sixth submission of No Further Action (NFA) proposals for Sandia National Laboratories/New Mexico (SNL/NM), ID Number NM5890110518-1. Nine SNL/NM environmental restoration sites are included in this package:

OU 1295

Site 137	Building 6540/6542 Septic System
Site 140	Building 9965 Septic System
Site 150	Building 9939/9939A Septic System
Site 152	Building 9950 Septic System
Site 153	Building 9956 Septic System

OU 1335

Site 86	Firing Site (Building 9927)
Site 90	Beryllium Firing Site (Thunder Range)(Active)
Site 115	Firing Site (Building 9930)(Active)
Site 191	Equus Red

Ecological risk assessments are not included with these proposals, but will be submitted as addenda following an agreement between NMED and DOE regarding how these assessments will be conducted and presented.

If you have any questions, please contact John Gould at (505) 845-6089, or Mark Jackson at (505) 845-6288.

Sincerely,

George K. Laskar

Michael J. Zamorski
for Acting Area Manager

Enclosures

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FEB 3 1997

PROPOSAL FOR
NO FURTHER ACTION
Environmental Restoration Project

Site 140, Building 9965 Septic System
Operable Unit 1295
January 1997

Prepared by
Sandia National Laboratories/New Mexico
Environmental Restoration Project
Albuquerque, New Mexico

Prepared for the
Department of Energy

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1.0 INTRODUCTION

1.1 ER Site 140, Building 9965 Septic System

Sandia National Laboratories/New Mexico (SNL/NM) is proposing a no further action (NFA) decision based on confirmatory sampling for Environmental Restoration (ER) Site 140, Building 9965 Septic System, Operable Unit (OU) 1295. ER Site 140 is listed in the Hazardous and Solid Waste Amendments (HSWA) Module IV (EPA August 1993) of the SNL/NM Resource Conservation and Recovery Act (RCRA) Hazardous Waste Management Facility Permit (NM5890110518-1) (EPA August 1992).

1.2 SNL/NM Administrative NFA Process

This proposal for a determination of an NFA decision based on confirmatory sampling was prepared using the process presented in Section 4.5.3 of the SNL/NM Program Implementation Plan (PIP) (SNL/NM February 1995) . It follows guidance documented in 40 CFR 264.514[a] [2]) that states NFAs "must contain information demonstrating that there are no releases of hazardous waste (including hazardous constituents) from solid waste management units (SWMUs) at the facility that may pose a threat to human health or the environment" (EPA July 1990). The HSWA Module IV contains the same requirements for an NFA demonstration:

> "Based on the results of the RFI [RCRA Facility Investigation] and other relevant information, the Permittee may submit an application to the Administrative Authority for a Class III permit modification under 40 CFR 270.42(c) to terminate the RFI/CMS [corrective measures study] process for a specific unit. This permit modification application must contain information demonstrating that there are no releases of hazardous waste including hazardous constituents from a particular SWMU at the facility that pose threats to human health and/or the environment, as well as additional information required in 40 CFR 270.42(c) (EPA August 1993)."

If the available archival evidence is not considered convincing, SNL/NM performs confirmatory sampling to increase the weight of the evidence and allow an informed decision on whether to proceed with the administrative-type NFA or to return to the site characterization program for additional data collection (SNL/NM February 1995).

The Environmental Protection Agency (EPA) acknowledged that the extent of sampling required may vary greatly, stating that:

> the agency does not intend this rule [the second codification of HSWA] to require extensive sampling and monitoring at every SWMU. . . . Sampling is generally required only in situations where there is insufficient evidence on which to make an initial release determination. . . . The actual extent of sampling will vary . . . depending on the amount and quality of existing information available (EPA December 1987).

This request for an NFA decision for ER Site 140 is based primarily on results of confirmatory soil samples collected at the site. Concentrations of site-specific constituents of concern (COCs) detected in the soil samples were first compared to background 95th percentile or upper tolerance limit (UTL) concentrations of COCs found in SNL/NM soils (IT March 1996), or other relevant background limits. If no SNL/NM background limit was available for a particular COC, or if the COC concentration exceeded the SNL/NM or other relevant background limit, then the constituent concentration was compared to the proposed 40 CFR Part 264 Subpart S (Subpart S) or other relevant soil action level for the compound (EPA July 1990).

A site is eligible for an NFA proposal if it meets one or more of the following criteria presented in the Environmental Restoration Document of Understanding (NMED November 1995):

- NFA Criterion 1: The site cannot be located or has been found not to exist, is a duplicate potential release site (PRS) or is located within and therefore, investigated as part of another PRS.

- NFA Criterion 2: The site has never been used for the management (that is, generation, treatment, storage, or disposal) of RCRA solid or hazardous wastes and/or constituents or other CERCLA hazardous substances.

- NFA Criterion 3: No release to the environment has occurred, nor is likely to occur in the future.

- NFA Criterion 4: There was a release, but the site was characterized and/or remediated under another authority which adequately addresses corrective action, and documentation, such as a closure letter, is available.

- NFA Criterion 5: The PRS 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.

Review and analysis of the ER Site 140 soil sample analytical data indicates that the concentration of each of the COCs detected in soils at this site is either less than (1) the relevant SNL/NM or other applicable background concentration, or (2) proposed Subpart S or other action level. Thus, ER Site 140 is being proposed for an NFA decision based on confirmatory sampling data demonstrating that hazardous waste or COCs that may have been released from this SWMU into the environment pose an acceptable level of risk under current and projected future land use (Criterion 5).

1.3 Local Setting

SNL/NM occupies 2,829 acres of land owned by the Department of Energy (DOE), with an additional 14,920 acres of land provided by land-use permits with Kirtland Air Force Base (KAFB), the United States Forest Service (USFS), the State of New Mexico, and the Isleta Indian Reservation. SNL/NM has been involved in nuclear weapons research, component development, assembly, testing, and other research and development activities since 1945 (DOE September 1987).

ER Site 140 is located in Thunder Range on KAFB and is approximately 0.8 miles southeast of Technical Area III (TA III). Access to the site is provided by paved and graded dirt roads that extend southwest from Lovelace Road, and south from Magazine Road (Figure 1-1). ER Site 140 consists of the immediate area around the seepage pit and septic tank southwest of Building 9965, and the immediate area around the drywell that is north of Building 9965 (Figure 1-2). The area around the seepage pit and septic tank is approximately 0.05 acres and the area around the drywell is approximately 0.03 acres. Both areas are at a mean elevation of 5,487 feet above mean sea level (amsl).

The surficial geology at ER Site 140 is characterized by alluvial fan deposits (SNL/NM March 1996). Based on drilling records of similar deposits at KAFB, the alluvial fan materials are highly heterogeneous, composed primarily of medium to fine silty sands with frequent coarse sand, gravel, and cobble lenses. The alluvial fan deposits probably extend to the water-table. Vegetation consists predominantly of grasses including gramma, muhly, dropseed, and galleta. Shrubs commonly associated with the grasslands include sand sage, winter fat, saltbrush, and rabbitbush. Cacti are common, and include cholla, pincushion, strawberry, and prickly pear (SNL/NM March 1993).

The water-table elevation is approximately 5,280 feet amsl at this location, so depth to ground water is approximately 207 feet below the ground surface (fbgs). Local groundwater flow is believed to be in a generally west to northwest direction in the vicinity of this site (SNL/NM March 1996). The nearest production wells are northwest of the site and include KAFB-2, KAFB-4, and KAFB-7 which are approximately 5.4 to 6.2 miles away. The ground-water monitoring wells closest to ER Site 140 include the group of wells installed around the Chemical Waste Landfill in the southeast corner of TA III. These wells are located approximately 0.9 miles northwest of ER Site 140 (SNL/NM October 1995).

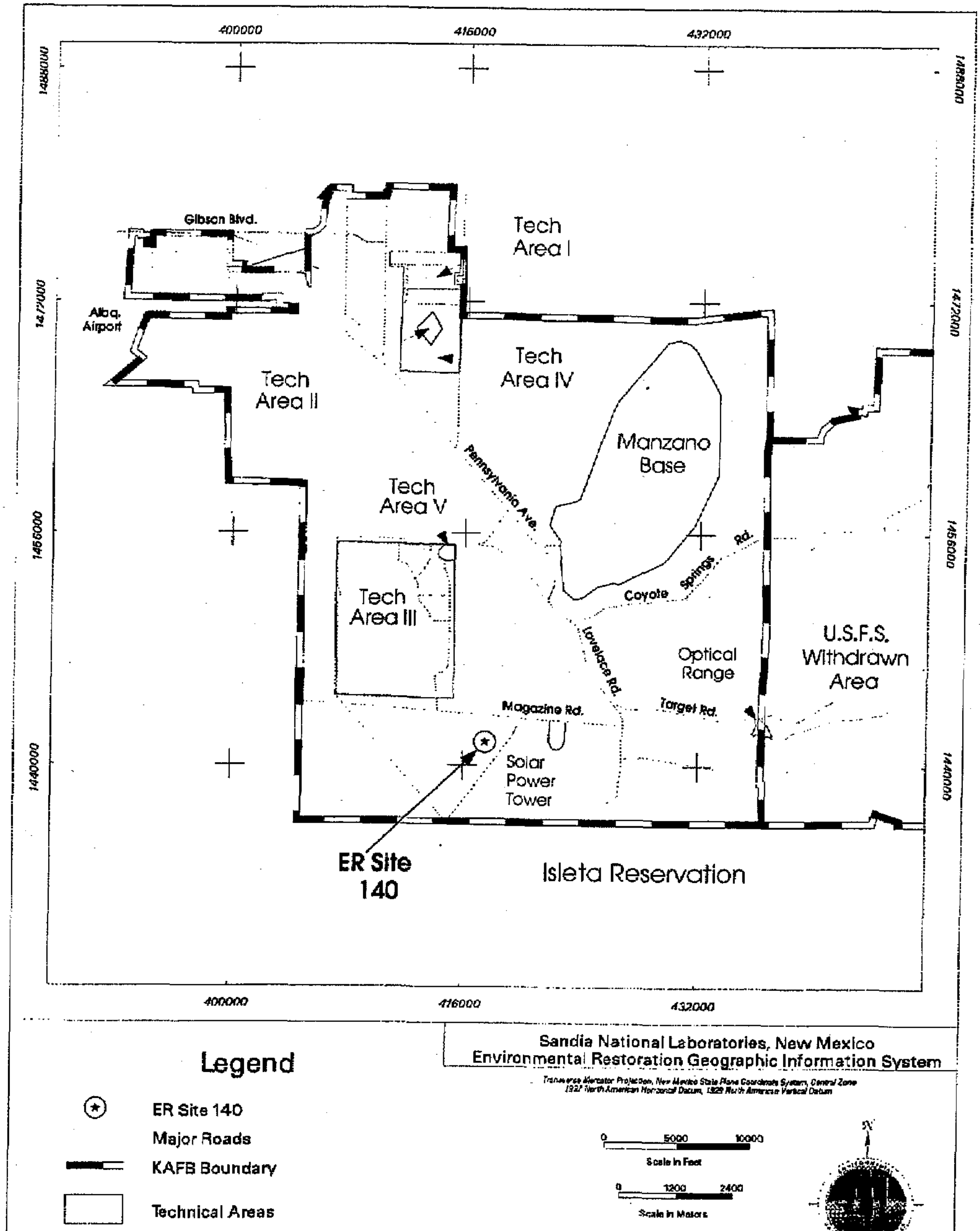

FIGURE 1-1
Location Map for Site 140
Sandia National Laboratories,
New Mexico

sm990699.prl scmorri SNL GIS ORG. 7512 06/12/96 MAPID=960931

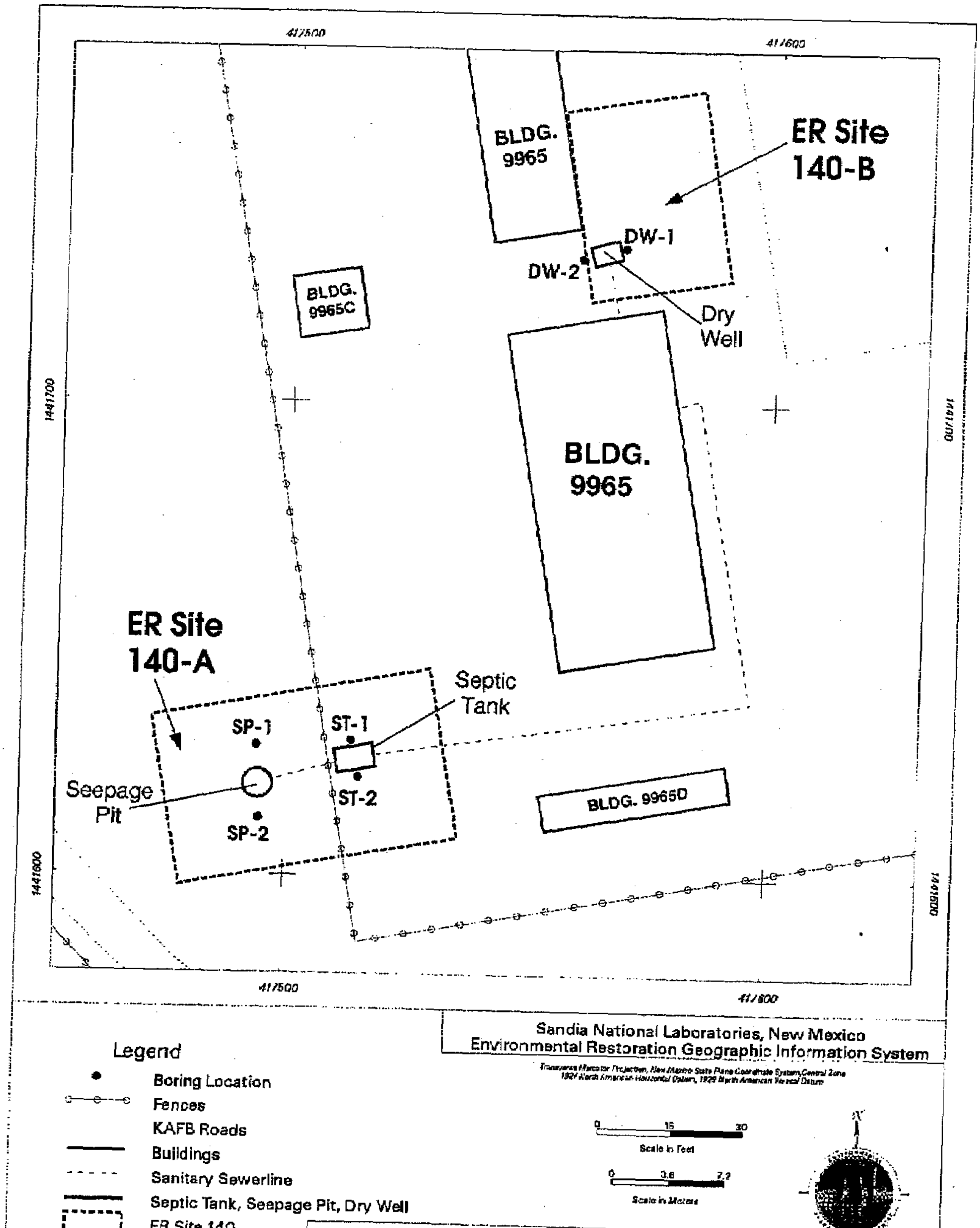

FIGURE 1-2
Site Map for ER Site 140
Sandia National Laboratories,
New Mexico

sm990700.prl semorri SNL GIS ORG. 7512 07/08/96 MAPID=961007

2.0 HISTORY OF THE SWMU

2.1 Sources of Supporting Information

In preparing the confirmatory sampling NFA proposal for ER Site 140, available background information was reviewed to quantify potential releases and to select analytes for the soil sampling. Background information was collected from SNL/NM Facilities Engineering drawings and interviews with employees familiar with site operational history. The following sources of information were used to evaluate ER Site 140:

- Confirmatory subsurface soil sampling and backhoe excavation conducted in September 1994 (SNL/NM September 1994a), November 1994 (SNL/NM November 1994a) and January 1995 (SNL/NM January 1995a and b);

- Two survey reports, including a geophysical survey (Lamb 1994), and a passive soil gas survey (NERI June 1995);

- Results of samples collected from the septic tank in 1992 (SNL/NM June 1993) and 1994 (SNL/NM April 1994 and November 1994b);

- Approved RCRA Facility Investigation (RFI) Work Plan and addenda for OU 1295, Septic Tanks and Drainfields (SNL/NM March 1993, November 1994c, December 1994, January 1995c, March 1995a, March 1995b, and May 1995; and EPA September 1994, January 1995, and March 1995);

- Photographs and field notes collected at the site by SNL/NM ER staff;

- SNL/NM Facilities Engineering building drawings (SNL/NM June 1967 and August 1987);

- SNL/NM Geographic Information System (GIS) data; and

- The RCRA Facility Assessment (RFA) report (EPA April 1987).

2.2 Previous Audits, Inspections, and Findings

ER Site 140 was first listed as a potential release site in the RFA report to the EPA in 1987 (EPA April 1987). This report contained a generic statement about this and many other SNL/NM septic systems that sanitary and industrial wastes may have been discharged to septic tanks and drainfields during past operations. This SWMU was included in the RFA report as Site 79, along with other septic and drain systems at SNL/NM. All the sites included in Site 79 are now designated by individual SWMU numbers.

2.3 Historical Operations

The following historical information has been excerpted from several sources, including SNL/NM March 1993, IT March 1994, and SNL/NM November 1994c.

Building 9965 was constructed in 1965 and used as a control building for the Shock Facility. The building was also used as a darkroom for photographic processing of black and white film. The building has one restroom, two hand sinks, and two floor drains. One hand sink was used for disposal of photographic processing wastewater. The second sink is located in the main equipment area and was used principally for hand washing. The two floor drains are connected to a drywell north of the building. The RFI indicated that there were two drywells associated with Building 9965, one that was abandoned in place and a second drywell installed in July 1972 to replace the first. Excavation, both north and west of the active drywell at the site, did not find evidence of a drywell abandoned in place (SNL/NM January 1995d). Therefore, only one drywell was included in the investigation of ER Site 140.

Potential contaminants from Building 9965 included elemental carbon, aluminum oxide, photoprocessing waste, and possibly nitric acid. It was assumed for completeness that any of these wastes could have been disposed to either the septic system or the drywell at ER Site 140.

The drywell and septic system are no longer active. Building 9965, as of 1993, is connected to an extension of the City of Albuquerque sanitary sewer system.

3.0 EVALUATION OF RELEVANT EVIDENCE

3.1 Unit Characteristics

There are no safeguards inherent in the drain systems from Buildings 9965, or in facility operations that could have prevented past releases to the environment.

3.2 Operating Practices

As discussed in Section 2.3, effluent was released to the Building 9965 septic tank and seepage pit when the septic system was active. Also, effluent may have been released to the drywell. Hazardous wastes were not managed or contained at ER Site 140.

3.3 Presence or Absence of Visual Evidence

No visible evidence of soil discoloration, staining, or odors indicating residual contamination was observed when soil samples were collected around the seepage pit and septic tank in September 1994 (SNL/NM September 1994a) and November 1994 (SNL/NM November 1994a), near the drywell in January 1995 (SNL/NM January 1995a and January 1995d), or in the backhoe excavations near the seepage pit in January 1995 (SNL/NM January 1995e).

3.4 Results of Previous Sampling/Surveys

Sludge and aqueous samples were collected from the ER Site 140 septic tank in July 1992. The aqueous sample was analyzed for volatile organic compounds (VOCs), semivolatile organic compounds (SVOCs), pesticides, polychlorinated biphenyls (PCBs), metals, selected radionuclide constituents and several miscellaneous analytes. The VOC trichloroethene (TCE) was identified. The pesticides beta-BHC, 4,4'-DDD, and 4,4'-DDE were detected. Several metals and radionuclides were detected as well as phenolic compounds, nitrates/nitrites, formaldehyde, fluoride, cyanide, and oil and grease. No PCBs were detected.

The sludge sample was analyzed for heavy metals and selected radionuclide constituents. Several metals and radionuclides were detected. The analytical results of the 1992 aqueous and sludge samples are presented in Appendix A.1.

A second round of septic tank sludge samples were collected for waste characterization purposes in April 1994 and were analyzed for VOCs and RCRA Toxicity Characteristic Leaching Procedure (TCLP) metals. Concentrations of eight VOC compounds (acetone, benzene, 2-butanone, carbon disulfide, ethyl benzene, methylene chloride, toluene, and total xylenes) were identified in the material. Two RCRA TCLP metals, barium and mercury, were detected in the sludge. The analytical results of the second round of septic tank samples are presented in Appendix A.2.

A third round of waste characterization sludge and liquid samples were collected in November 1994 and were analyzed for SVOCs, isotopic uranium, gamma spectroscopy radionuclides, and tritium (SNL/NM November 1994b). No SVOCs were detected. Several radionuclides were detected. The analytical results of the third round of septic tank sludge characterization samples are also presented in Appendix A.2.

A geophysical survey was conducted in June 1994 using a Schonstedt 52B magnetic locator (Lamb 1994). The purpose of this survey was to locate the two drywells thought to exist north of Building 9965. The active drywell generated a distinct magnetic signature and was easy to locate with high confidence. Another feature west of the active drywell generated a weak magnetic signature, and was thought to possibly be the second drywell. However, because the second feature had such a poor magnetic signature, it was thought that what was identified as a second drywell might actually be a magnetic anomaly due to other buried metal.

A passive soil-gas survey conducted in June and July 1994 used PETREX™ sampling tubes to identify any releases of VOCs and SVOCs that may have occurred from the seepage pit, septic tank, and drywell (SNL/NM June 1994). A PETREX™ tube soil-gas survey is a semi-quantitative screening procedure that can be used to identify many VOCs and SVOCs. This technique may be used to guide VOC and SVOC site investigations. The advantages of this sampling methodology are that large areas can be surveyed at relatively low cost, the technique is highly sensitive to organic vapors, and the result produces a measure of soil vapor chemistry over a two- to three-week period rather than at one point in time. Each PETREX™ soil-gas sampler consists of two activated-charcoal-coated wires housed in a reusable glass test tube container. At each sampling location, sample tubes are buried in an inverted position so that the mouth of the sampler is about 1 foot below grade. Samplers are left in place for a two- to three-week period, and are then removed from the ground and sent to the manufacturer, Northeast Research Institute (NERI), for analysis using thermal desorption-gas chromatography/mass spectrometry. The analytical laboratory reports all sample results in terms of "ion counts" instead of concentrations, and identifies those samples that contain compounds above the PETREX™ technique detection limits. In NERI's experience, levels below 100,000 ion counts for a single compound (such as perchloroethene [PCE] or trichloroethene [TCE]), and 200,000 ion counts for mixtures (such as BTEX or aliphatic compounds [C4-C11 cycloalkanes]), under normal site conditions, would not represent detectable levels by standard quantitative methods for soils and/or groundwater (NERI June 1995).

Six PETREX™ tube samplers were placed in a grid pattern that surrounded the seepage pit and septic tank, and another six were placed in a grid pattern surrounding the drywell (SNL/NM June 1994). The locations of all PETREX™ samples are shown in Appendix A.3. The locations of those surrounding the drywell are approximate; a final survey of their locations was not completed. The results from all the samplers at ER Site 140 caused NERI to classify ER Site 140 as having 'no significant soil gas detections.' The analytical results from the ER Site 140 passive soil gas survey are presented in Appendix A.3.

3.5 Assessment of Gaps in Information

The most recent material in the tank was not necessarily representative of all discharges to the unit that have occurred since it was put into service in 1965. The analytical results of the various rounds of septic tank sampling were used, along with process knowledge and other available information, to help identify the most likely COCs that might be found in soils surrounding the septic tank, seepage pit and drywell, and to help select the types of analyses to be performed on soil samples collected from the site. While the history of past releases at the site is incomplete,

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3.6 Confirmatory Sampling

Although the likelihood of hazardous waste releases at ER Site 140 was considered low, confirmatory soil sampling was conducted to determine whether COCs above background or detectable levels were released at this site. Soil samples were collected from the area immediately around the seepage pit, septic tank, and drywell in September 1994 (SNL/NM September 1994a), November 1994 (SNL/NM November 1994a) and January 1995 (SNL/NM January 1995a). With the exceptions noted in the next paragraph, the confirmatory soil sampling program was performed in accordance with the rationale and procedures described in the approved Septic Tank and Drainfields (ADS-1295) RFI Work Plan (SNL/NM March 1993, November 1994c, December 1994, January 1995c, March 1995a, March 1995b, and May 1995; and EPA September 1994, January 1995, and March 1995). A summary of the types of samples, number of sample locations, sample depths and analytical requirements for confirmatory soil samples collected at this site is presented in Table 3-1.

Soil samples were collected from borings located on opposite sides of the seepage pit, septic tank, and drywell in September and November 1994, and January 1995 respectively (Figure 1-2). Sampling around the seepage pit was started at 11 fbgs; the Geoprobe™ met resistance at about 14 fbgs at all locations around the seepage pit. This difficulty meant that the shallow samples had to be collected from six separate closely-spaced locations. Four of the locations were north of the seepage pit within two ft of the SP-1 location shown on Figure 1-2, and two were south of the seepage pit within two ft of the location of SP-2 shown on Figure 1-2. The four tries are thus identified as SP-1 and the two tries SP-2. Also, because of the refusal at 14 fbgs, it was not possible to obtain a deep sample. Backhoe excavation in January 1995 uncovered two caliche layers at this site (SNL/NM January 1995e). One layer was 0.5 to 1.0 ft thick at 8 to 9 fbgs. The other layer started at about 13 fbgs and could not be penetrated with a backhoe.

In each of the two septic tank borings, the depth interval for the sample started at a depth level with the bottom of the septic tank which was measured to be 7 fbgs (SNL/NM November 1994a). The soil sampling operation next to the septic tank is shown in the upper photograph of Figure 3-1. Finally, in January 1995 soil samples were collected from two different intervals in boreholes near the drywell. The shallow sampling interval started at the bottom of the drywell at

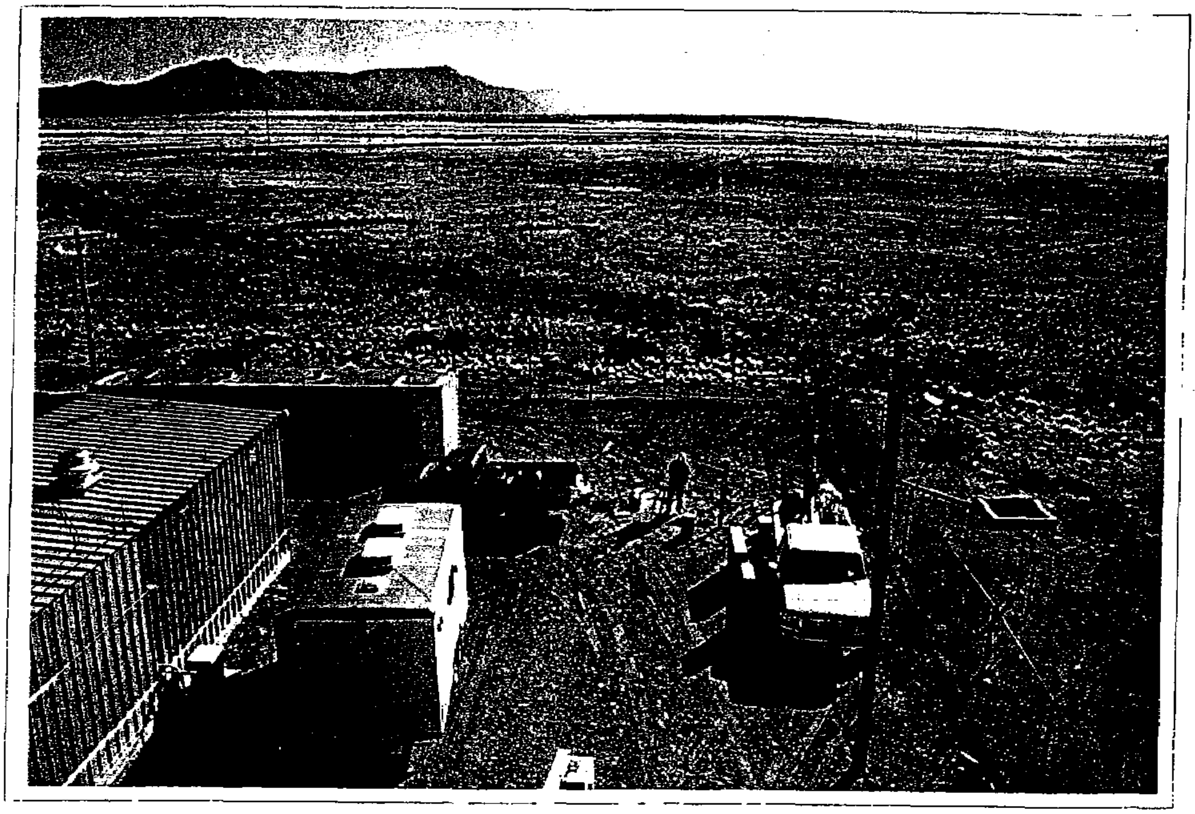
Table 3-1
ER Site 140: Confirmatory Sampling Summary Table

Sampling Location	Analytical Parameters	of Borehole Locations	Top of Sampling Intervals at Each Boring Location	Total Number of Investigative Samples	Total Number of Duplicate Samples	Date(s) Samples Collected
Seepage pit	VOCs	2	11'	2	1	9/26/94
	SVOCs	2	11'	2	1	
	RCRA metals + Cr^{6+}	2	11'	2	1	
	Cyanide	2	11'	2	1	
	Nitrates	2	11'	2	1	
	Isotopic uranium	2	11'	2		
	Gamma spectroscopy	2	11'	2		
Septic Tank	VOCs	2	7'	2		11/15/94
	SVOCs	2	7'	2		
	RCRA metals + Cr^{6+}	2	7'	2		
	Cyanide	2	7'	2		
	Nitrates	2	7'	2		
Drywell	VOCs	2	8', 18'	4		1/11/95
	SVOCs	2	8', 18'	4		
	RCRA metals + Cr^{6+}	2	8', 18'	4		
	Cyanide	2	8', 18'	4		
	Tritium composite	2	8', 18'	2		
	Gamma spec. composite	2	8', 18'	2		

Notes
Cr^{6+} = Hexavalent chromium
RCRA = Resource Conservation and Recovery Act
Spec. = Spectroscopy
SVOCs = Semivolatile organic compounds
VOCs = Volatile organic compounds
* Note: Although the seepage pit and septic tank samples were analyzed for nitrates, the specified hold time of 48 hours was exceeded because of the SNL/NM sample release procedures required because ER Site 140 was designated a Radioactive Materials Management Area (RMMA). The drywell soil samples were not analyzed for nitrates because of this problem.

8 fbgs , and the deeper interval started at 10 feet below the top of the upper interval, or 18 fbgs (SNL/NM January 1995a). Subsurface refusal problems were not encountered in either of the two drywell boreholes.

The Geoprobe™ sampling system was used to collect subsurface soil samples at this site. The Geoprobe™ sampling tool was fitted with a butyl acetate (BA) sampling sleeve and was then hydraulically driven to the top of the designated sampling depth. The sampling tool was opened,



Collecting soil samples around the Building 9965 septic tank with the Geoprobe™, November 15, 1994. View looking south.

Building 9965 septic tank septage removal and cleaning operation, December 12, 1995. View looking southwest.

Figure 3-1. ER Site 140 Photographs

and driven an additional two feet in order to fill the two-foot long by approximately 1.25-inch diameter BA sleeve. The sampling tool and soil-filled sleeve were then retrieved from the borehole. In order to minimize the potential for loss of volatile compounds (if present), the soil to be analyzed for VOCs was not emptied from the BA sleeve into another sample container. The filled BA sleeve was removed from the sampling tool, and the top seven inches were cut off. Both ends of the seven-inch section of filled sleeve were immediately capped with a teflon membrane and rubber end cap, sealed with tape, and placed in an ice-filled cooler at the site. The soil in this section of sleeve was submitted for a VOC analysis.

Soil from the remainder of the sleeve was then emptied into a decontaminated mixing bowl. Following this, additional sampling runs were completed at each interval in order to recover enough soil to satisfy sample volume requirements for the interval. Soil recovered from these additional runs also was emptied into the mixing bowl, and blended with remaining soil from the first sampling run. The soil was then transferred from the bowl into sample containers using a decontaminated plastic spatula.

Seepage pit and septic tank samples were analyzed for VOCs, SVOCs, cyanide, nitrates, RCRA metals, and hexavalent chromium by an offsite commercial laboratory. Drywell samples were analyzed by an offsite commercial laboratory for VOCs, SVOCs, cyanide, RCRA metals, and hexavalent chromium. Samples were shipped to the offsite commercial laboratories by an overnight delivery service. To determine if radionuclides were released from past activities at this site, samples were collected from seepage pit borings and were analyzed by an offsite commercial laboratory for isotopic uranium, and screened for other radionuclides using SNL/NM in-house gamma spectroscopy (SNL/NM July 1995). Composite tritium soil samples were also collected from the drywell shallow and deep intervals for analysis by an offsite commercial laboratory. Composite soil samples from the drywell shallow and deep intervals were also screened for other radionuclides using SNL/NM in-house gamma spectroscopy. Routine SNL/NM chain-of-custody and sample documentation procedures were employed for all samples collected at this site.

Quality assurance/quality control (QA/QC) samples collected during this effort consisted of a set of duplicate soil samples from ST-1 (Figure 1-2) and an aqueous equipment rinsate (equipment blank) sample. These samples were analyzed for most of the same non-radiologic constituents as the other soil samples. No significant concentrations of COCs were detected in the equipment blank sample, and the concentrations of constituents detected in the duplicate soil sample were in good agreement with those detected in the other seepage pit samples from the same interval. Also, soil trip blank samples were included with each the shipments of ER Site 140 seepage pit and septic tank soil samples to the offsite laboratory and were analyzed for VOCs only. Three or more of the following compounds were detected in each of the trip blanks: acetone, ethyl-benzene, 2-hexanone, methyl ethyl ketone (MEK), methyl isobutyl ketone (MIBK), methylene chloride, toluene, and xylenes. These common laboratory contaminants were either not detected, or were found in lower concentrations in the site samples than the trip blanks. Soil used for the trip blanks was prepared by heating the material, and then transferring it immediately to the sample container. This heating process drives off any residual organic compounds (if present), and soil moisture, that may be contained in the material. It is thought that when the soil trip blank container was opened at the laboratory, it immediately adsorbed both moisture and VOCs present in the laboratory atmosphere, and therefore became slightly contaminated.

Summaries of all constituents detected in these confirmatory samples by either commercial laboratory analyses or by the SNL/NM field laboratory are presented in Tables 3-2, 3-3, and 3-4. Results of the SNL/NM in-house gamma spectroscopy soil sample screening for other radionuclides are presented in Appendices A.4 through A.7. Complete soil sample analytical data packages are archived in the SNL/NM Environmental Operations Records Center and are readily available for review and verification (SNL/NM September 1994b, November 1994d, and January 1995b).

3.7 Rationale for Pursuing a Confirmatory Sampling NFA Decision

As discussed in Section 3.4, the passive soil gas survey did not identify any significant concentrations of VOCs at any of the twelve PETREX™ soil-gas sampling locations near the seepage pit, septic tank and drywell at this site.

Confirmatory soil sampling near the seepage pit, septic tank, and drywell did not identify any residual COCs indicating past discharges that could pose a threat to human health or the environment. As shown in Table 3-2, only four VOC compounds (acetone, MEK, methylene chloride, and MIBK), which are common laboratory contaminants, were detected in soil samples collected from this site. All of these VOCs were also detected in one of the trip blanks and all but MIBK was identified in the other trip blank sent to the laboratory. The concentrations of VOCs found in the samples are well below the proposed Subpart S action levels for soil. No SVOCs were detected in the soil samples collected at this site. Cyanide was detected in one of the septic tank soil samples at a concentration of 1,200 micrograms per kilogram (ug/kg) and in both of the soil samples collected near the seepage pit at concentrations of 1,200 and 1,800 ug/kg. These concentrations are much lower than the proposed Subpart S action level of 2,000,000 ug/kg for this constituent. Cyanide was not identified in any of the other septic tank or drywell soil samples.

Although nitrate concentrations are reported in Table 3-2 for the seepage pit and septic tank, the hold time specified for the nitrate analysis was exceeded; the sampling release procedures required because ER Site 140 was designated a Radioactive Material Management Area (RMMA), and the offsite shipping caused the short specified hold time of 48 hours to be exceeded. The drywell soil samples were not analyzed for nitrates because of this problem. The nitrate analysis that was completed detected nitrates in all of the seepage pit and septic soil samples at concentrations ranging from 3,300 to 3,900 ug/kg. These concentrations are much lower than the proposed Subpart S nitrate action level in soil of 100,000,000 ug/kg.

ER Site 140
Summary of Organic and Other Constituents in Confirmatory Soil Samples Collected Around the Septic Tank, Seepage Pit, and Drywell

Sample Number	Sample Matrix	Sample Type	Sample Date	Sample Location (Fig. 1-2)	Top of Sample Interval (fbgs)	VOCs Method 8240 Acetone	Ethyl-benzene	2-Hexa-none	MEK	Methylene Chloride	MIBK	Toluene	Xylenes	SVOCs Method 8270	Cyanide Method 9010/9012	Nitrates Method 300 modified	Units
Septic Tank Soil and QA Samples:																	
018479-1,2	Soil	Field	11/15/94	ST-1	7	16	ND	ND	25	2.3 J	1.4 J	ND	ND	ND	1,200	3,900	ug/kg
018480-1,2	Soil	Dupl.	11/15/94	STD-1	7	11 B	ND	ND	26	2.1 J	2.5 J	ND	ND	ND	ND	3,700	ug/kg
018478-1,2	Soil	Field	11/15/94	ST-2	7	12 B	ND	ND	9.7 J	2 J	2.2 J	ND	ND	ND	ND	3,600	ug/kg
018481-1	Soil	TB	11/15/94	Site 140	NA	150	1.9 J	9.7 J	41	12	4.7 J	5	11	NS	NS.	NS	ug/kg
Seepage Pit Soil and QA Samples:																	
017932-1,2	Soil	Field	9/26/94	SP-1	11	ND	ND	ND	ND	3.8 B,J	ND	ND	ND	ND	1,800	3,800	ug/kg
017934-1,2	Soil	Field	9/26/94	SP-2	11	ND	ND	ND	ND	2.6 B,J	ND	ND	ND	ND	1,200	3,300	ug/kg
017935-1,2	Soil	TB	9/26/94	Site 140	NA	67	ND	ND	3.9 J	4.4 B,J	ND	ND	ND	NS	NS	NS	ug/kg
Drywell Soil and QA Samples:																	
018902-1,2	Soil	Field	1/11/95	DW-1	8	8.7 J	ND	ND	ND	1.7 J	ND	ND	ND	ND	ND	NS	ug/kg
018903-1,2	Soil	Field	1/11/95	DW-1	18	6.5 J	ND	ND	ND	1.6 J	ND	ND	ND	ND	ND	NS	ug/kg
018904-1,2	Soil	Field	1/11/95	DW-2	8	10	ND	ND	ND	1.7 J	ND	ND	ND	ND	ND	NS	ug/kg
018905-1,2	Soil	Field	1/11/95	DW-2	18	8.5 J	ND	ND	ND	1.4 J	ND	ND	ND	ND	ND	NS	ug/kg
018906-1,2,4	Water	EB	1/11/95	Site 140	NA	ND	ND	ND	ND	3.6 B,J	ND	ND	ND	ND	ND	NS	ug/L
021453-1	Soil	TB	1/12/95	Site 140	NA	47	ND	1.6 J	19	4.3 J	ND	2.3 J	1.4 J	NS	NS	ug/kg	
Laboratory Detection Limit for Soil						10	5	10	10	5	10	5	5	330 or 1,600	500	500	ug/kg
Laboratory Detection Limit for Water						10	5	10	10	5	10	5	5	10	10	NA	ug/L
Proposed Subpart S Action Level For Soil						8E+06	8E+06	None	8E+06	9E+04	4E+06	2E+07	2E+08	NA	2E+06	1E+08	ug/kg

Notes:

B = Compound detected in associated blank sample
Dupl. = Duplicate soil sample
EB = Equipment blank
fbgs = feet below ground surface

J = Result is detected below the reporting limit or is an estimated concentration.
MEK = Methyl ethyl ketone
MIBK = Methyl isobutyl ketone, or 4-methyl-2-pentanone
NA = Not applicable
ND = Not detected

NS = No sample
QA = Quality Assurance
SVOCs = Semivolatile organic compounds
TB = Trip blank
VOCs = Volatile organic compounds

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Table 3-3

ER Site 140

Summary of RCRA Metals and Hexavalent Chromium in Confirmatory Soil Samples Collected Around the Septic Tank, Seepage Pit, and Drywell

Sample Number	Sample Matrix	Sample Type	Sample Date	Sample Location (Fig. 1-2)	Top of Sample Interval (fbgs)	RCRA Metals, Methods 6010 and 7471								Other Metals: Cr^{6+} Method 7196	Units
						As	Ba	Cd	Cr, total	Pb	Hg	Se	Ag		
Septic Tank Soil Samples:															
018479-2	Soil	Field	11/15/94	ST-1	7	4.9	162	ND	2.3	ND	ND	ND	ND	ND	mg/kg
018480-2	Soil	Dupl.	11/15/94	STD-1	7	4.1	184	ND	1.6 J	ND	ND	ND	ND	ND	mg/kg
018478-2	Soil	Field	11/15/94	ST-2	7	5.6	254	ND	2.9	ND	ND	ND	ND	ND	mg/kg
Seepage Pit Soil Samples:															
017932-2	Soil	Field	9/26/94	SP-1	11	3.7	155	ND	5.3	4.1 J	ND	4.6	ND	ND	mg/kg
017934-2	Soil	Field	9/26/94	SP-2	11	3.9	69.7	ND	4.9	7.1 J	ND	4.5	ND	ND	mg/kg
Drywell Soil Samples:															
018902-2	Soil	Field	1/11/95	DW-1	8	3.6	77.1	ND	3.3	3.5 J	ND	ND	ND	ND	mg/kg
018903-2	Soil	Field	1/11/95	DW-1	18	4.2	67.2	ND	3.6	5.6	ND	ND	ND	ND	mg/kg
018904-2	Soil	Field	1/11/95	DW-2	8	5.1	87.6	ND	4.5	3.7 J	ND	ND	ND	ND	mg/kg
018905-2	Soil	Field	1/11/95	DW-2	18	5.7	48.8	ND	2.3	ND	ND	ND	ND	ND	mg/kg
018906-3	Water	EB	1/11/95	Site 140	NA	ND	ND	ND	ND	0.004	ND	ND	ND	NS	mg/L
Laboratory Detection Limit For Soil						1	1	0.5	1-2 ****	5-10 ****	0.1	0.5	1	0.05 - 0.1 ****	mg/kg
Laboratory Detection Limit for Water						0.01	0.01	0.005	0.01	0.003	0.0002	0.005	0.01	NA	mg/L
Number of SNL/NM Background Soil Sample Analyses *						15	727	1,740	647	536	1,724	2,134	2,302	393	NA
SNL/NM Soil Background Range *						2.1-7.9	0.5-495	0.0027-6.2	0.5-31.4	0.75-103	0.0001-0.68	0.037-17.2	0.0016-8.7	0.02-<2.5	mg/kg
SNL/NM Soil Background UTL or 95th Percentile *						7	214	0.9	15.9	11.8	<0.1	<1.0	<1.0	<2.5	mg/kg
Proposed Subpart S Action Level For Soil						0.50	6,000	80	80,000 **	400 ***	20	400	400	400 **	mg/kg

Table 3-3, concluded:

ER Site 140
Summary of RCRA Metals and Hexavalent Chromium in Confirmatory Soil Samples Collected Around the Septic Tank, Seepage Pit, and Drywell

Notes:

As = Arsenic. Arsenic background concentrations presented above are based on analyses of subsurface soil samples collected in the Coyote Test Field (CTF) area.
Ba = Barium. Barium background concentrations presented above are based on analyses of subsurface soil samples collected in the Southwest and CTF areas.
Cd = Cadmium. Cadmium background concentrations presented above are based on analyses of subsurface soil samples collected in the North, Tijeras, Southwest, CTF, and Offsite areas.
Cr = Chromium. Chromium background concentrations presented above are based on analyses of subsurface soil samples collected in the Southwest area.
Cr^{6+} = Hexavalent chromium. Hexavalent chromium background concentrations presented above are based on analyses of surface and subsurface soil samples collected in the Southwest area.
Pb = Lead. Lead background concentrations presented above are based on analyses of subsurface samples collected in the Southwest and Offsite areas.
Hg = Mercury. Mercury background concentrations presented above are based on analyses of subsurface soil samples collected in the North, Tijeras, Southwest, CTF and Offsite areas.
Se = Selenium. Selenium background concentrations presented above are based on analyses of surface and subsurface soil samples collected in the North, Tijeras, Southwest, CTF and Offsite areas.
Ag = Silver. Silver background concentrations presented above are based on analyses of subsurface soil samples collected in the North, Tijeras, Southwest, CTF, and Offsite areas.

Dupl. = Duplicate soil sample
EB = Equipment blank
fbgs = Feet below ground surface
J = Result is detected below the reporting limit or is an estimated concentration.
NA = Not applicable
ND = Not detected
NS = No sample
UTL = Upper Tolerance Limit
* IT March 1996
** 80,000 mg/kg is for Cr^{3+} only. For Cr^{6+}, proposed Subpart S action level is 400 mg/kg.
*** No proposed Subpart S action level for lead in soil, 400 ppm is EPA proposed action level (EPA July 1994)
**** Detection limit varies due to dilution factor applied to some sample analyses by laboratory.

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Table 3-4

ER Site 140
Summary of Isotopic Uranium and Tritium in Confirmatory Soil Samples Collected Around the Seepage Pit and Drywell

Sample Number	Sample Matrix	Sample Type	Sample Date	Sample Location (Fig. 1-2)	Top of Sample Interval (fbgs)	Isotopic Uranium Method EPI A-011B (pCi/g) U-233/ U-234 Result	U-233/ U-234 Error *	U-233/ U-234 D.L.	U-235 Result	U-235 Error *	U-235 D.L.	U-238 Result	U-238 Error *	U-238 D.L.	Tritium Method EPA-600 906.0 (pCi/L) Result	Error *	D.L.
Seepage Pit Soil Samples:																	
023858-1	Soil	Field	9/26/94	SP-1	11	0.773	0.117	0.09	0.037 J	0.021	0.09	0.679	0.107	0.09			
023859-1	Soil	Field	9/26/94	SP-2	11	0.578	0.099	0.09	ND	0.020	0.09	0.543	0.096	0.09			
Drywell Composite Tritium Soil Samples:																	
018902-4	Soil	Compos.	1/11/95	DW-1/2	8										ND	150	250
018903-4	Soil	Compos.	1/11/95	DW-1/2	18										ND	150	240
Number of SNL/NM Background Soil Sample Analyses **						14			283			90			U		
SNL/NM Soil Background Range **						0.44-<5.02			0.004-3			0.153-2.3			U		
SNL/NM Soil Background 95th Percentile **						<5.02			0.16			1.4			U		
Nationwide Tritium Range in Precipation and Drinking Water ***						NA			NA			NA			100-400		

Notes:

U-233 = Uranium 233

U-234 = Uranium 234. Uranium 233/234 background concentrations presented above are based on analyses of surface and subsurface soil samples collected in the Southwest area.

U-235 = Uranium 235. Uranium 235 background concentrations presented above are based on analyses of surface and subsurface soil samples collected in the Southwest area.

U-238 = Uranium 238. Uranium 238 background concentrations presented above are based on analyses of surface and subsurface soil samples collected in the Southwest area.

Compos. = Composite sample
D.L. = Detection limit
fbgs = Feet below ground surface
ND = Not detected
pCi/g = Picocuries per gram
pCi/L = Picocuries per liter

U = Undefined for SNL/NM soils
UTL = Upper Tolerance Limit
* Error = +- 2 sigma uncertainty
** IT March 1996
*** EPA October 1993

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As shown on Table 3-3, in all but three cases, soil sample analytical results indicate that the nine metals that were targeted in the Site 140 investigation were either (1) not detected, or (2) were detected in concentrations below the background UTL or 95th percentile concentrations presented in the SNL/NM study of naturally-occurring constituents (IT March 1996). The concentration of barium in the soil from borehole ST-2 near the septic tank was 254 milligrams per kilogram (mg/kg), which is greater than the SNL/NM soil background UTL of 214 mg/kg for barium. However, this concentration is well below the proposed Subpart S action level of 6,000 mg/kg for barium. Also, selenium was detected in both of the seepage pit boreholes at concentrations of 4.5 and 4.6 mg/kg which is above the 95th percentile selenium concentration of <1.0 mg/kg for SNL/NM soils. However, these concentrations are substantially lower than the 400 mg/kg Subpart S action level for selenium.

Isotopic uranium activity levels that were detected in the seepage pit soil samples were found to be below the corresponding 95th percentile background activity levels presented in the IT March 1996 report for those radionuclides (Table 3-4). Tritium activity was not detected in the drywell shallow and deep interval composite samples.

Also, the gamma spectroscopy semi-qualitative screening of soil samples from this site did not indicate that the soil at ER Site 140 had been contaminated by other radionuclides (Appendices A.4 through A.7).

Finally, the ER Site 140 septic tank contents were removed and the tank was cleaned in December 1995 (SNL/NM December 1995a). The bottom photograph in Figure 3 shows this operation. After it was cleaned, the tank was then inspected by a representative of the New Mexico Environment Department (NMED) to verify that the tank contents had been removed and the tank had been closed in accordance with applicable State of New Mexico regulations (SNL/NM December 1995b).

Ecological risk has not been addressed in this NFA. It is being addressed for ER Site 140 but is not yet complete. When the risk analysis is complete, the results will be forwarded to NMED and EPA.

4.0 CONCLUSION

Sample analytical results generated from this confirmatory sampling investigation have shown that detectable or significant concentrations of COCs are not present in soils at ER Site 140, and that additional investigations are unwarranted and unnecessary. Based on archival information and chemical and radiological analytical results of soil samples collected next to the seepage pit, septic tank, and drywell, SNL/NM has demonstrated that any contaminants present at this site pose an acceptable level of risk under current and projected future land use (Criterion 5 of Section 1.2). Therefore, ER Site 140 is recommended for an NFA determination.

5.0 REFERENCES

5.1 ER Site 140 References

Sandia National Laboratories/New Mexico (SNL/NM), June 1967, "SNL/NM Facilities Engineering Utility Plot Plan and Mechanical Details," Drawing number 089621, Sheets 35, 37 and 38, KAFB, Albuquerque, NM.

Sandia National Laboratories/New Mexico (SNL/NM), August 1987, "SNL/NM Facilities Engineering Plumbing Plan," Drawing number 86657M005, KAFB, Albuquerque, NM.

Sandia National Laboratories/New Mexico (SNL/NM), April 1994, Field Log #0080, Page 6, 4/12/94, Field notes for ER Site 140 second round sampling of the septic tank for waste characterization purposes.

Sandia National Laboratories/New Mexico (SNL/NM), June 1994, Field Log #0080, Pages 30, 36, 50, 53, and 56, 6/14/94, 6/15/94, and 8/4/94, Field notes for ER Site 140 passive soil gas survey of the septic tank and seepage pit.

Sandia National Laboratories/New Mexico (SNL/NM), September 1994a, Field Log #0096, Pages 38-41, 9/26/94 - 9/27/94, Field notes for ER Site 140 seepage pit soil sampling.

Sandia National Laboratories/New Mexico (SNL/NM), September 1994b, Environmental Operations Records Center, Record Number ER/1295-140/DAT, Chain of Custody Numbers 792, 3578 and 3579, Analytical reports for ER Site 140 seepage pit soil sampling.

Sandia National Laboratories/New Mexico (SNL/NM), November 1994a, Field Log #0100, Pages 3-5, 4/12/94, Field notes for ER Site 140 third round sampling of the septic tank for waste characterization purposes.

Sandia National Laboratories/New Mexico (SNL/NM), November 1994b, Field Log #0096, Pages 110-111, 11/15/94, Field notes for ER Site 140 septic tank soil sampling.

Sandia National Laboratories/New Mexico (SNL/NM), November 1994d, Environmental Operations Records Center, Record Number ER/1295-140/DAT, Chain of Custody Number 2158, Analytical reports for ER Site 140 soil sampling near the septic tank.

Sandia National Laboratories/New Mexico (SNL/NM), January 1995a, Field Log #0096, Pages 185-186, 1/11/95, Field notes for ER Site 140 drywell soil sampling.

Sandia National Laboratories/New Mexico (SNL/NM), January 1995b, Environmental Operations Records Center, Record Number ER/1295-140/DAT, Chain of Custody Numbers 2491, 2493 and 2494, Analytical reports for ER Site 140 drywell soil sampling.

Sandia National Laboratories/New Mexico (SNL/NM), January 1995d, Field Log #0102, Page 11, 1/10/95, Field notes for backhoe excavation to find abandoned drywell at ER Site 140.

Sandia National Laboratories/New Mexico (SNL/NM), January 1995e, Field Log #0102, Pages 26-27, 1/19/95, Field notes for backhoe exploration to determine nature of hard layer at about 15 fbgs near the seepage pit at ER Site 140.

Sandia National Laboratories/New Mexico (SNL/NM), July 1995, Field Log #0102, Page 58, 7/6/95, Field notes for collecting samples for gamma spectroscopy and isotopic uranium from existing soil samples collected on 9/26/94 and archived at Building 870B for ER Site 140.

Sandia National Laboratories/New Mexico (SNL/NM), December 1995a, Field Log #0147, Pages 78-82, 12/12/95, Field notes for the ER Site 140 septic tank septage removal and cleaning operation.

Sandia National Laboratories/New Mexico (SNL/NM), December 1995b, Field Log #0147, Pages 93- 94, 12/15/95, Field notes for the NMED empty tank verification inspection for the ER Site 140 septic tank.

5.2 Other References

Department of Energy (DOE), Albuquerque Operations Office, Environmental Safety and Health Division, Environmental Program Branch, September 1987, draft "Comprehensive Environmental Assessment and Response Program (CEARP) Phase 1: Installation Assessment, Sandia National Laboratories, Albuquerque", Department of Energy, Albuquerque Operations Office, Albuquerque, New Mexico.

IT Corporation (IT), March 1994, "Sampling and Analysis Plan for Shallow Subsurface Soil Sampling, RCRA Facility Investigation of Septic Tanks and Drainfields (OU 1295)", IT Corporation, Albuquerque, New Mexico.

IT Corporation (IT), March 1996, "Background Concentrations of Constituents of Concern to the Sandia National Laboratories/New Mexico Environmental Restoration Project and the Kirtland Air Force Base Installation Restoration Program", IT Corporation, Albuquerque, New Mexico.

Lamb Associates, Inc. (Lamb). 1994, "Geophysical Surveys at 23 Sites, Septic Tanks and Drainfields, ADS #1295", Lamb Associates, Inc., Albuquerque, NM.

New Mexico Environment Department (NMED), November 1995, "Environmental Restoration Document of Understanding", Santa Fe, New Mexico.

Northeast Research Institute (NERI), June 1995, "PETREX Soil Gas Survey Results Conducted at Various Sites of the Septic Tanks and Drainfields Operating Units, Sandia National Laboratories", Albuquerque, New Mexico, Northeast Research Institute, Lakewood, Colorado.

Sandia National Laboratories/New Mexico (SNL/NM), March 1993, "Septic Tanks and Drainfields (ADS-1295) RCRA Facility Investigation Work Plan", Albuquerque, New Mexico.

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

Sandia National Laboratories/New Mexico (SNL/NM), November 1994c, "Comment Responses to USEPA Notice of Deficiency November 1994", Sandia National Laboratories, Albuquerque, New Mexico.

Sandia National Laboratories/New Mexico (SNL/NM), December 1994, memo (via fax) from EPA to SNL/NM titled "Sandia National Laboratories, Septic Tanks and Drainfields RFI Workplan, December 1994". Memo addresses additional technical issues and questions regarding the SNL/NM November 1994 NOD response document.

Sandia National Laboratories/New Mexico (SNL/NM), January 1995c, "SNL/DOE Response to EPA Issue Paper, Septic Tanks and Drainfields RFI Work Plan, January 26, 1995," memo from SNL/NM (Bob Galloway) to EPA responding to technical issues and questions posed by the EPA in the January 9, 1995 "Issue Paper," memo conveyed to EPA by DOE/KAO (John Gould) on February 13, 1995, Sandia National Laboratories, Albuquerque, New Mexico.

Sandia National Laboratories/New Mexico (SNL/NM), February 1995, "Program Implementation Plan for Albuquerque Potential Release Sites", Sandia National Laboratories Environmental Restoration Program, Albuquerque, New Mexico.

Sandia National Laboratories/New Mexico (SNL/NM), March 1995a, Letter with attachments dated March 14, 1995 from SNL/NM (Mike Sanders) to EPA (Nancy Morlock (via fax) clarifying the number of samples and types of analyses used to characterize the OU 1295 ER sites.

Sandia National Laboratories/New Mexico (SNL/NM), March 1995b, Letter dated March 17, 1995 from SNL/NM (Bob Galloway) to Nancy Morlock (EPA) describing proposed procedures for additional soil sampling at OU 1295 ER Sites 49 and 144.

Appendix A.1

ER Site 140
Summary of Constituents Detected in 1992 Septic Tank Samples

Building 9965
Coyote Test Field
Sample ID No. SNLA008427
Tank ID No. AD89046R

On July 16, 1992, aqueous and sludge samples were collected from the inactive septic tank serving Building 9965. Analytical results of concern are noted below.

- Trichloroethene (TCE) was detected in the aqueous sample at a level of 8.1 mg/L, which exceeds the New Mexico Water Quality Control Commission discharge limit (NMDL) of 0.1 mg/L, the City of Albuquerque (COA) discharge limit of 5.0 mg/L and the Resource Conservation and Recovery Act (RCRA) toxicity characteristic (TC) limit of 0.5 mg/L.

- Barium was detected in the aqueous sample at a level of 1.1 mg/L, which exceeds the NMDL of 1.0 mg/L.

- Cadmium was detected in the aqueous sample at a level of 0.014 mg/L, which exceeds the NMDL of 0.01 mg/L.

- Chromium was detected in the aqueous sample at a level of 0.28 mg/L, which exceeds the NMDL of 0.05 mg/L.

- Copper was detected in the aqueous sample at a level of 1.6 mg/L, which exceeds the NMDL of 1.0 mg/L.

- Lead was detected in the aqueous sample at a level of 0.51 mg/L, which exceeds the NMDL of 0.05 mg/L.

- Manganese was detected in the aqueous sample at a level of 0.39 mg/L, which exceeds the NMDL of 0.20 mg/L.

- Mercury was detected in the aqueous sample at a level of 0.0078 mg/L, which exceeds the NMDL of 0.002 mg/L.

- Total phenolic compounds were detected in the aqueous sample at a level of 0.024 mg/L, which exceeds the NMDL of 0.005 mg/L.

- Nitrate/nitrite was detected in the aqueous sample at a level of 11.2 mg/L, which exceeds the NMDL of 10.0 mg/L.

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

Appendix A.1, continued:

ER Site 140
Summary of Constituents Detected in 1992 Septic Tank Samples

Laboratory control samples for phenolics were out of laboratory control limits (no analyte was detected), but the analyses were not repeated. The analytical data for phenolics is, therefore, qualified.

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.

ER Site 140

Summary of Constituents Detected in 1992 Septic Tank Samples

Results of Septic Tank Analyses

(LIQUID SAMPLES)

Building No./Area:	9965 CTF
Tank ID No.:	AD89046R
Date Sampled:	7/16/92
Sample ID No.:	SNLA-008427

Analytical Parameter	Measured Concentration	State Discharge Limit	COA Discharge Limit	Comments
Volatile Organics (EPA 624)	(mg/l)	(mg/l)	(mg/l)	
Trichloroethene	8.1	0.1	(TTO=5.0)	Exceeds State and COA 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 limits		Specific		
Pesticides (EPA 608)	(mg/l)	(mg/l)	(mg/l)	
beta-BHC	0.00015	NR	(TTO=5.0)	
4,4'-DDD	0.00026	NR	(TTO=5.0)	
4,4'-DDE	0.00029	NR	(TTO=5.0)	
PCBs (EPA 608)	(mg/l)	(mg/l)	(mg/l)	
None detected above laboratory		0.001	(TTO=5.0)	
reporting limits				
Metals	(mg/l)	(mg/l)	(mg/l)	
Arsenic	0.012	0.1	2.0	
Barium	1.1	1.0	20.0	Exceeds State limit
Cadmium	0.065	0.01	2.8	Exceeds State limit
Chromium	0.28	0.05	20.0	Exceeds State limit
Copper	1.6	1.0	16.5	Exceeds State limit
Lead	0.51	0.05	3.2	Exceeds State limit
Manganese	0.39	0.20	20.0	Exceeds State limit
Mercury	0.0078	0.002	0.1	Exceeds State limit
Nickel	---	NR	12.0	Not analyzed
Selenium	ND (0.010)	0.05	2.0	
Silver	0.029	0.05	5.0	
Thallium	ND (0.010)	NR	NR	
Zinc	6.6	10.0	28.0	
Uranium	ND (0.007)	5.0	NR	
Miscellaneous Analytes	(mg/l)	(mg/l)	(mg/l)	
Phenolic Compounds	0.024	0.005	4.0	Exceeds State limit
Nitrates/Nitrites	11.2	10.0	NR	Exceeds State limit
Formaldehyde	0.98	NR	260.0	
Fluoride	0.35	1.6	180.0	
Cyanide	0.053	0.2	8.0	
Oil and Grease	3.6	NR	150.0	
Radiological Analyses	(pCi/l)	(pCi/l)	(pCi/l)	
Radium 226	0.5 +/- 0.1	30.0	NR	
Radium 228	0 +/- 30	30.0	NR	
Gross Alpha	200 +/- 100	NR	NR	
Gross Beta	300 +/- 200	NR	NR	
Tritium	-137 +/- 597	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 Commission Regulations (1988) Section 3-100

Appendix A.1, concluded:

ER Site 140
Summary of Constituents Detected in 1992 Septic Tank Samples

Results of Septic Tank Analyses (Sludge Sample)			
Building No./Area:	9965 CTF		
Tank ID No.:	AD89046R		
Date Sampled:	7/16/92		
Sample ID No.:	SNLA008427		
Analytical Parameter	Measured Concentration	± 2 Sigma Uncertainty	Units
Water Content	92.8	NA	%
Arsenic	ND (0.50)	NA	mg/kg
Barium	54.1	NA	mg/kg
Cadmium	1.5	NA	mg/kg
Chromium	80.2	NA	mg/kg
Copper	24.5	NA	mg/kg
Lead	13.0	NA	mg/kg
Manganese	12.8	NA	mg/kg
Mercury	0.64	NA	mg/kg
Nickel	---	NA	mg/kg
Selenium	ND (0.50)	NA	mg/kg
Silver	ND (1.0)	NA	mg/kg
Thallium	ND (0.50)	NA	mg/kg
Zinc	129	NA	mg/kg
Gross Alpha	11	12	pCi/g
Gross Beta	17	22	pCi/g
Gross Alpha	20	16	pCi/g
Gross Beta	35	34	pCi/g
Gross Alpha	4	11	pCi/g
Gross Beta	27	24	pCi/g
Gross Alpha	20	14	pCi/g
Gross Beta	24	24	pCi/g
Tritium	-137	597	pCi/L
Bismuth-214	<0.0326 (<16.9)	NA	pCi/mL
Cesium-137	<0.0159 (<3.93)	NA	pCi/mL
Potassium-40	0.337 (<173)	0.0662	pCi/mL
Lead-212	0.0255 (<13.0)	0.00670	pCi/mL
Lead-214	0.0483 (<18.3)	0.0119	pCi/mL
Radium-226	0.430 (<159)	0.0852	pCi/mL
Thorium-234	0.632 (<89.6)	0.0789	pCi/mL
Thallium-208	0.0183 (<9.50)	0.00391	pCi/mL

ND = Not Detected
NA = Not Applicable
Note: Values in parenthesis are measurements reported by Enseco/RMAL in pCi/g (wet weight).

Appendix A.2

ER Site 140
Summary of Constituents Detected in 1994 Septic Tank Samples

Appendix A.2

ER Site 140
Summary of Constituents in 1994 Septic Tank Samples

Sample Number	Sample Matrix	Sample Type	Sample Date	Method	Compound Name	Result	Detection Limit or M.D.A.	+- 2 Sigma Uncertainty	Units
April 1994 Samples:									
015441-3	Sludge	Field	4/12/94	8240 (VOCs)	Acetone	0.089	0.010	NA	mg/kg
				8240 (VOCs)	Benzene	0.002 J	0.005	NA	mg/kg
				8240 (VOCs)	2-Butanone	0.014	0.010	NA	mg/kg
				8240 (VOCs)	Carbon Disulfide	0.005	0.005	NA	mg/kg
				8240 (VOCs)	Ethyl Benzene	0.014	0.005	NA	mg/kg
				8240 (VOCs)	Methylene Chloride	0.002 J B	0.005	NA	mg/kg
				8240 (VOCs)	Toluene	0.10	0.005	NA	mg/kg
				8240 (VOCs)	Xylenes (Total)	0.020	0.005	NA	mg/kg
015441-1	Sludge	Field	4/12/94	TCLP/6010	Arsenic	ND	0.10	NA	mg/L
				TCLP/6010	Barium	2.1	0.02	NA	mg/L
				TCLP/6010	Cadmium	ND	0.005	NA	mg/L
				TCLP/6010	Chromium	ND	0.02	NA	mg/L
				TCLP/6010	Lead	ND	0.04	NA	mg/L
				TCLP/7470	Mercury	0.0003	0.0002	NA	mg/L
				TCLP/6010	Selenium	ND	0.10	NA	mg/L
				TCLP/6010	Silver	ND	0.01	NA	mg/L
015441-1	Sludge	Field	4/12/94	9065	Total Phenols	11	2.3	NA	mg/kg
November 1994 Samples:									
018423-1	Sludge	Field	11/3/94	8270 (SVOCs)	SVOCs	ND	NA	NA	ug/kg
018423-3	Sludge	Field	11/3/94	EPA-600 906.0	Tritium	ND	230	140	pCi/L
		Field	11/3/94	HASL 300	Uranium 238	9.7	0.065	1.1	pCi/g
		Field	11/3/94	HASL 300	Uranium 235	0.25	0.055	0.078	pCi/g
		Field	11/3/94	HASL 300	Uranium 233/234	13	0.074	1.5	pCi/g
018424-3	Liquid	Field	11/3/94	EERF H.01	Tritium	ND	303	168	pCi/L
		Dupl.	11/3/94	EERF H.01	Tritium	ND	303	172	pCi/L
018424-5	Liquid	Field	11/3/94	HASL 300	Uranium 238	0.95	0.055	0.24	pCi/L
	Liquid	Field	11/3/94	HASL 300	Uranium 235	0.001 J	0.07	0.022	pCi/L
	Liquid	Field	11/3/94	HASL 300	Uranium 233/234	2	0.11	0.43	pCi/L
018423-2	Sludge	Field	11/3/94	Gamma Spec.	Uranium Series				
					Lead 214	0.048 J	0.06	0.036	pCi/g
					Thorium Series:				
					Thorium 234	0.52	0.51	0.31	pCi/g
					Lead 212	0.032 J	0.044	0.025	pCi/g
					Other Radionuclides:				
					Potassium 40	1.21	0.55	0.47	pCi/g
018424-1	Liquid	Field	11/3/94	Gamma Spec.	75 radionuclides	NV	7.6E-3 to 5.0	NA	pCi/mL

Appendix A.2, concluded

ER Site 140

Summary of Constituents in 1994 Septic Tank Samples

Notes

B = Compound detected in the laboratory blank.
Dupl.=Duplicate
J = Result is detected below the reporting limit or is an estimated concentration.
M.D.A. = Minimum Detectable Activity
mg/kg = Milligrams per kilogram
mg/L = Milligrams per liter
NA = Not applicable
ND = Not detected
NV = No values reported (results were ND, short half-life, or not significant)
pCi/g = Picocuries per gram
pCi/L = Picocuries per liter
pCi/mL = Picocuries per milliliter
Spec. = Spectroscopy
SVOCs = Semivolatile organic compounds
TCLP = Toxicity Characteristic Leaching Procedure
ug/kg = Micrograms per kilogram
VOCs = Volatile organic compounds

Appendix A.3

ER Site 140
Summary of 1994 PETREX^{TM} Passive Soil-Gas Survey Results

Appendix A.3

ER Site 140
Summary of 1994 PETREX™ Passive Soil-Gas Survey Results

Table 8
PETREX Relative Soil Gas Response Values
(in ion counts)
STD SITE 140

Sample	PCE	TCE	BTEX	Aliphatics
132	ND	ND	22470	4575
133	ND	ND	13515	844
134	ND	ND	1575	ND
135	ND	ND	25552	61981
136	ND	ND	865	4805
137	ND	ND	26541	2226
D-1137	ND	ND	86935	3798
* 900	ND	ND	4553	6219
* 901	ND	ND	4732	ND

PCE - Tetrachloroethene
Indicator Mass Peak(s) 164

TCE - Trichloroethene
Indicator Mass Peak(s) 130

BTEX - Benzene, Toluene, Ethylbenzene/Xylene(s)
Indicator Mass Peak(s) 78, 92, 106

Aliphatics - C4-C11 Cycloalkanes/Alkenes
Indicator Mass Peak(s) 56, 70, 84, 98, 112, 126, 140, 154

D - Duplicate Sample
Sample numbers in thousands duplicate of sample numbers in hundreds

* QA/QC Blank Sample - No Compounds Detected above the PETREX Normal reporting Limits

Appendix A.3, concluded:

ER Site 140
Summary of 1994 PETREX™ Passive Soil-Gas Survey Results

Table 25
PETREX Relative Soil Gas Response Values
(in ion counts)
STD SITE 140N

Sample	PCE	TCE	BTEX	Aliphatics
336	ND	ND	25487	14947
337	ND	ND	2353	ND
338	ND	ND	1862	8686
339	ND	ND	8970	5487
340	ND	ND	855	ND
341	ND	ND	27201	40293
D-1340	ND	ND	901	ND
* 354	ND	ND	ND	ND
* 355	ND	ND	ND	ND

PCE - Tetrachloroethene
Indicator Mass Peak(s) 164

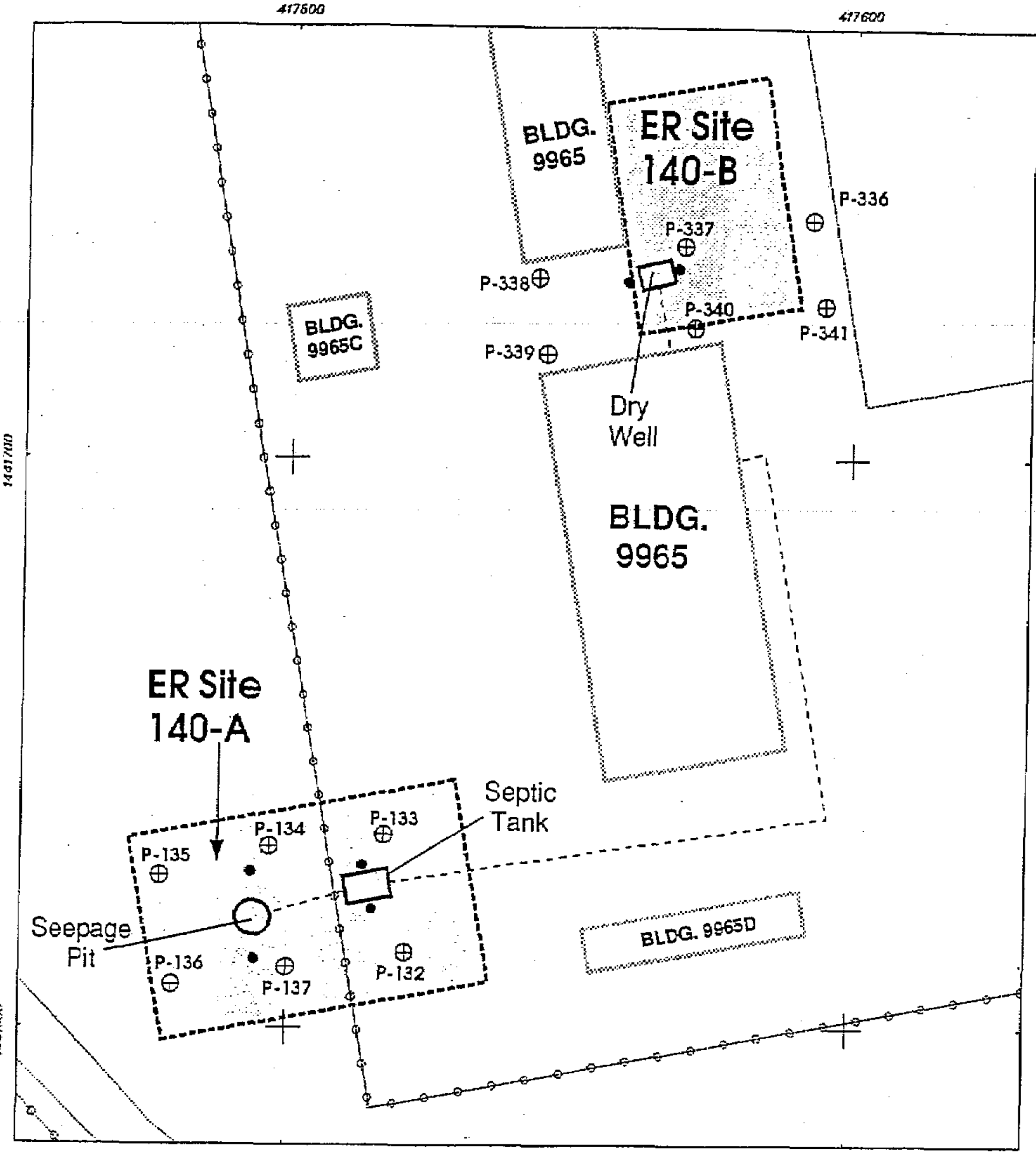
TCE - Trichloroethene
Indicator Mass Peak(s) 130

BTEX - Benzene, toluene, Ethylbenzene/xylene(s)
Indicator Mass Peak(s) 78, 92, 106

Aliphatics - C4-C11 Cycloalkanes/Alkenes
Indicator Mass Peak(s) 56, 70, 84, 98, 112, 126, 140, 154

D - Duplicate Sample
Sample numbers in thousands duplicate of sample numbers in hundreds

* QA/QC Blank Sample - No Compounds Detected above the PETREX Normal reporting Limits



Legend

- ⊕ PETREX™ Sampling Location
- • Boring Location
- Fences
- KAFB Roads
- Buildings
- Sanitary Sewerline
- Septic Tank, Seepage Pit, Dry Well
- ER Site 140

Sandia National Laboratories, New Mexico
Environmental Restoration Geographic Information System

DRAFT
Unclassified

0 15 30
Scale in Feet

0 3.6 7.2
Scale in Meters

APPENDIX A.3
Map Showing
PETREX™ Sampling Locations
for ER Site 140

ecmorri SNL GIS ORG. 7512 07/10/96 MAPID=961022

Appendix A.4

ER Site 140
Gamma Spectroscopy Screening Results for a
Shallow Interval Soil Sample on the North Side of the Seepage Pit

Appendix A.4

ER Site 140
Gamma Spectroscopy Screening Results for a
Shallow Interval Soil Sample on the North Side of the Seepage Pit

```
***********************************************************************
*                 Sandia National Laboratories                        *
*   Radiation Protection Sample Diagnostics Program [881 Laboratory]  *
*                     7-06-95  8:23:00 PM                             *
***********************************************************************
*                                                                     *
* Analyzed by:                 7/7/95   Reviewed by:          7/7/95  *
***********************************************************************

Customer             : SANDERS/RANKIN (7582)
Customer Sample ID   : 023858-1A / 140SP-11'
Lab Sample ID        : 50051505

Sample Description   : MARINELLI SOIL SAMPLE
Sample Type          : Solid
Sample Geometry      : 2SMAR
Sample Quantity      :   804.000  gram
Sample Date/Time     :  7-06-95  11:00:00 AM
Acquire Start Date   :  7-06-95   7:49:29 PM
Detector Name        : LAB02
Elapsed Live Time    :   1800 seconds
Elapsed Real Time    :   1801 seconds

Comments:
***********************************************************************
```

Nuclide	Activity (pCi/gram)	2S Error	MDA
U-238	Not Detected	--------	4.70
TH-234	Not Detected	--------	1.09
U-234	Not Detected	--------	1.77E+01
RA-226	1.21	5.85E-01	8.31E-01
PB-214	6.91E-01	1.31E-01	8.99E-02
BI-214	5.66E-01	1.08E-01	7.42E-02
PB-210	Not Detected	--------	4.42E+02
TH-232	4.11E-01	1.86E-01	2.50E-01
RA-228	3.39E-01	1.81E-01	2.49E-01
AC-228	Not Detected	--------	2.83E-01
TH-228	3.89E-01	2.77E-01	6.98E-01
RA-224	Not Detected	--------	6.25E-01
PB-212	3.81E-01	9.15E-02	5.90E-02
BI-212	Not Detected	--------	7.92E-01
TL-208	2.95E-01	1.03E-01	1.27E-01
U-235	Not Detected	--------	3.54E-01
TH-231	Not Detected	--------	8.08E-01
PA-231	Not Detected	--------	1.61
AC-227	Not Detected	--------	2.47
TH-227	Not Detected	--------	4.62E-01
RA-223	Not Detected	--------	2.68E-01
RN-219	Not Detected	--------	4.31E-01
PB-211	Not Detected	--------	9.52E-01
TL-207	Not Detected	--------	1.90E+01
AM-241	Not Detected	--------	7.83E-01
PU-239	Not Detected	--------	3.90E+02
NP-237	Not Detected	--------	5.08E-01
PA-233	Not Detected	--------	8.68E-02
TH-229	Not Detected	--------	4.05E-01

Appendix A.4, concluded:

ER Site 140
Gamma Spectroscopy Screening Results for a
Shallow Interval Soil Sample on the North Side of the Seepage Pit

[Summary Report] - Sample ID: 50051505

Nuclide	Activity (pCi/gram)	2S Error	MDA
AG-110m	Not Detected	--------	4.47E-02
AR-41	Not Detected	--------	1.92
BA-133	Not Detected	--------	9.74E-02
BA-140	Not Detected	--------	1.53E-01
CD-109	Not Detected	--------	1.66
CD-115	Not Detected	--------	9.68E-02
CE-139	Not Detected	--------	4.45E-02
CE-141	Not Detected	--------	7.80E-02
CE-144	Not Detected	--------	3.38E-01
CO-56	Not Detected	--------	5.08E-02
CO-57	Not Detected	--------	4.31E-02
CO-58	Not Detected	--------	4.78E-02
CO-60	Not Detected	--------	5.34E-02
CR-51	Not Detected	--------	3.52E-01
CS-134	Not Detected	--------	7.88E-02
CS-137	Not Detected	--------	5.17E-02
CU-64	Not Detected	--------	1.57E+01
EU-152	Not Detected	--------	3.75E-01
EU-154	Not Detected	--------	2.54E-01
EU-155	Not Detected	--------	2.09E-01
FE-59	Not Detected	--------	1.06E-01
GD-153	Not Detected	--------	1.58E-01
HG-203	Not Detected	--------	4.34E-02
I-131	Not Detected	--------	4.26E-02
IN-115m	Not Detected	--------	3.53E-01
IR-192	Not Detected	--------	4.28E-02
K-40	1.49E+01	2.22	4.14E-01
LA-140	Not Detected	--------	5.18E-02
MN-54	Not Detected	--------	5.21E-02
MN-56	Not Detected	--------	5.86E-01
MO-99	Not Detected	--------	4.12E-01
NA-22	Not Detected	--------	6.65E-02
NA-24	Not Detected	--------	7.24E-02
NB-95	Not Detected	--------	2.24E-01
ND-147	Not Detected	--------	2.75E-01
NI-57	Not Detected	--------	8.84E-02
BE-7	Not Detected	--------	3.29E-01
RU-103	Not Detected	--------	3.68E-02
RU-106	Not Detected	--------	3.88E-01
SB-122	Not Detected	--------	5.92E-02
SB-124	Not Detected	--------	4.36E-02
SB-125	Not Detected	--------	1.17E-01
SC-46	Not Detected	--------	8.41E-02
SR-85	Not Detected	--------	5.14E-02
TA-182	Not Detected	--------	2.47E-01
TA-183	Not Detected	--------	7.13E-01
TE-132	Not Detected	--------	4.00E-02
TL-201	Not Detected	--------	2.54E-01
XE-133	Not Detected	--------	2.04E-01
Y-88	Not Detected	--------	4.18E-02
ZN-65	Not Detected	--------	1.63E-01
ZR-95	Not Detected	--------	8.58E-02

Appendix A.5

ER Site 140
Gamma Spectroscopy Screening Results for a
Shallow Interval Soil Sample on the South Side of the Seepage Pit

Appendix A.5

ER Site 140
Gamma Spectroscopy Screening Results for a
Shallow Interval Soil Sample on the South Side of the Seepage Pit

```
****************************************************************************
*                    Sandia National Laboratories                          *
*   Radiation Protection Sample Diagnostics Program [881 Laboratory]       *
*                       7-06-95  9:02:29 PM                                *
****************************************************************************
*                                                                          *
* Analyzed by:  Cole 7/7/95      Reviewed by:          7/7/95              *
****************************************************************************

Customer              : SANDERS/RANKIN (7582)
Customer Sample ID    : 023859-1A / 140SP-111
Lab Sample ID         : 50051506

Sample Description    : MARINELLI SOIL SAMPLE
Sample Type           : Solid
Sample Geometry       : 2SMAR
Sample Quantity       :   718.000  gram
Sample Date/Time      :  7-06-95  11:10:00 AM
Acquire Start Date    :  7-06-95   8:29:11 PM
Detector Name         : LAB02
Elapsed Live Time     :   1800 seconds
Elapsed Real Time     :   1801 seconds

Comments:
****************************************************************************
```

Nuclide	Activity (pCi/gram)	2S Error	MDA
U-238	Not Detected	--------	4.99
TH-234	Not Detected	--------	1.19
U-234	Not Detected	--------	1.86E+01
RA-226	1.33	7.22E-01	1.06
PB-214	7.14E-01	1.35E-01	8.53E-02
BI-214	5.60E-01	1.14E-01	8.93E-02
PB-210	Not Detected	--------	4.76E+02
TH-232	4.18E-01	1.86E-01	2.47E-01
RA-228	2.36E-01	2.54E-01	4.03E-01
AC-228	Not Detected	--------	3.06E-01
TH-228	Not Detected	--------	1.17
RA-224	Not Detected	--------	6.31E-01
PB-212	3.95E-01	9.69E-02	6.48E-02
BI-212	3.60E-01	3.19E-01	4.87E-01
TL-208	3.37E-01	1.03E-01	1.12E-01
U-235	Not Detected	--------	3.71E-01
TH-231	Not Detected	--------	8.47E-01
PA-231	Not Detected	--------	1.62
AC-227	Not Detected	--------	2.56
TH-227	Not Detected	--------	4.93E-01
RA-223	Not Detected	--------	2.81E-01
RN-219	Not Detected	--------	4.12E-01
PB-211	Not Detected	--------	9.77E-01
TL-207	Not Detected	--------	1.98E+01
AM-241	Not Detected	--------	8.61E-01
PU-239	Not Detected	--------	4.16E+02
NP-237	Not Detected	--------	5.18E-01
PA-233	Not Detected	--------	9.11E-02
TH-229	Not Detected	--------	4.08E-01

Appendix A.5, concluded:

ER Site 140
Gamma Spectroscopy Screening Results for a
Shallow Interval Soil Sample on the South Side of the Seepage Pit

[Summary Report] - Sample ID: 50051506

Nuclide	Activity (pCi/gram)	2S Error	MDA
AG-110m	Not Detected	--------	4.55E-02
AR-41	Not Detected	--------	2.38
BA-133	Not Detected	--------	1.00E-01
BA-140	Not Detected	--------	1.52E-01
CD-109	Not Detected	--------	1.78
CD-115	Not Detected	--------	1.06E-01
CE-139	Not Detected	--------	4.28E-02
CE-141	Not Detected	--------	8.39E-02
CE-144	Not Detected	--------	3.74E-01
CO-56	Not Detected	--------	5.24E-02
CO-57	Not Detected	--------	4.51E-02
CO-58	Not Detected	--------	5.07E-02
CO-60	Not Detected	--------	6.03E-02
CR-51	Not Detected	--------	3.71E-01
CS-134	Not Detected	--------	8.19E-02
CS-137	Not Detected	--------	5.12E-02
CU-64	Not Detected	--------	2.13E+01
EU-152	Not Detected	--------	4.03E-01
EU-154	Not Detected	--------	2.64E-01
EU-155	Not Detected	--------	2.07E-01
FE-59	Not Detected	--------	1.13E-01
GD-153	Not Detected	--------	1.67E-01
HG-203	Not Detected	--------	4.69E-02
I-131	Not Detected	--------	4.04E-02
IN-115m	Not Detected	--------	4.15E-01
IR-192	Not Detected	--------	4.33E-02
K-40	1.34E+01	2.05	4.20E-01
LA-140	Not Detected	--------	6.93E-02
MN-54	Not Detected	--------	5.30E-02
MN-56	Not Detected	--------	6.90E-01
MO-99	Not Detected	--------	3.70E-01
NA-22	Not Detected	--------	6.28E-02
NA-24	Not Detected	--------	9.26E-02
NB-95	Not Detected	--------	2.42E-01
ND-147	Not Detected	--------	2.94E-01
NI-57	Not Detected	--------	9.63E-02
BE-7	Not Detected	--------	3.73E-01
RU-103	Not Detected	--------	4.10E-02
RU-106	Not Detected	--------	4.41E-01
SB-122	Not Detected	--------	6.87E-02
SB-124	Not Detected	--------	5.00E-02
SB-125	Not Detected	--------	1.21E-01
SC-46	Not Detected	--------	8.29E-02
SR-85	Not Detected	--------	5.57E-02
TA-182	Not Detected	--------	2.45E-01
TA-183	Not Detected	--------	7.86E-01
TE-132	Not Detected	--------	4.20E-02
TL-201	Not Detected	--------	2.70E-01
XE-133	Not Detected	--------	2.22E-01
Y-88	Not Detected	--------	4.30E-02
ZN-65	Not Detected	--------	1.65E-01
ZR-95	Not Detected	--------	9.17E-02

Appendix A.6

ER Site 140
Gamma Spectroscopy Screening Results for the Drywell
Shallow Interval Composite Soil Sample

ER Site 140

Gamma Spectroscopy Screening Results for the Drywell Shallow Interval Composite Soil Sample

```
*************************************************************************
*                    Sandia National Laboratories                       *
*   Radiation Protection Sample Diagnostics Program [881 Laboratory]    *
*                       1-13-95  8:56:01 AM                             *
*************************************************************************
*                                                                       *
* Analyzed by:            1/13/95   Reviewed by:            1/13/95     *
*************************************************************************

Customer              : B.GALLOWAY/McLAUGHLIN (7582/SMO)
Customer Sample ID    : 018902-03
Lab Sample ID         : 50003503

Sample Description    : MARINELLI SOLID SAMPLE
Sample Type           : Solid
Sample Geometry       : 1SMAR
Sample Quantity       :   683.000  Gram
Sample Date/Time      :  1-11-95  10:00:00 AM
Acquire Start Date    :  1-12-95   4:20:35 PM
Detector Name         : LAB01
Elapsed Live Time     :   1800 seconds
Elapsed Real Time     :   1801 seconds

Comments:

*************************************************************************
```

Nuclide	Activity (pCi/Gram)	2S Error	MDA
U-238	Not Detected	--------	2.20
TH-234	1.36	4.78E-01	5.36E-01
U-234	Not Detected	--------	5.90E+01
RA-226	1.58	5.21E-01	5.11E-01
PB-214	5.87E-01	1.65E-01	5.15E-02
BI-214	6.14E-01	1.19E-01	6.17E-02
PB-210	Not Detected	--------	5.73E+02
TH-232	3.30E-01	1.37E-01	1.42E-01
RA-228	5.19E-01	1.80E-01	2.00E-01
AC-228	Not Detected	--------	3.19E-01
TH-228	4.72E-01	2.87E-01	5.00E-01
RA-224	Not Detected	--------	4.39E-01
PB-212	3.83E-01	1.23E-01	4.04E-02
BI-212	Not Detected	--------	8.52E-01
TL-208	3.68E-01	9.62E-02	8.47E-02
U-235	Not Detected	--------	3.08E-01
TH-231	Not Detected	--------	7.66E-01
PA-231	Not Detected	--------	1.37
AC-227	Not Detected	--------	2.29
TH-227	Not Detected	--------	4.08E-01
RA-223	Not Detected	--------	2.53E-01
RN-219	Not Detected	--------	3.32E-01
PB-211	Not Detected	--------	8.36E-01
TL-207	Not Detected	--------	2.37E+01
AM-241	Not Detected	--------	3.16E-01
PU-239	Not Detected	--------	3.61E+02
NP-237	Not Detected	--------	2.58E-01
PA-233	Not Detected	--------	7.18E-02
TH-229	Not Detected	--------	3.84E-01

Appendix A.6, concluded:

ER Site 140
Gamma Spectroscopy Screening Results for the Drywell
Shallow Interval Composite Soil Sample

[Summary Report] - Sample ID: 50003503

Nuclide	Activity (pCi/Gram)	2S Error	MDA
AG-110m	Not Detected	--------	4.88E-02
AR-41	Not Detected	--------	8.32E+03
BA-133	Not Detected	--------	7.63E-02
BA-140	Not Detected	--------	1.68E-01
CD-109	Not Detected	--------	1.05
CD-115	Not Detected	--------	1.14E-01
CE-139	Not Detected	--------	3.77E-02
CE-141	Not Detected	--------	7.12E-02
CE-144	Not Detected	--------	3.15E-01
CO-56	Not Detected	--------	4.09E-02
CO-57	Not Detected	--------	4.29E-02
CO-58	Not Detected	--------	5.55E-02
CO-60	Not Detected	--------	6.99E-02
CR-51	Not Detected	--------	2.87E-01
CS-134	Not Detected	--------	6.30E-02
CS-137	Not Detected	--------	5.93E-02
CU-64	Not Detected	--------	7.49E+01
EU-152	Not Detected	--------	4.16E-01
EU-154	Not Detected	--------	2.72E-01
EU-155	Not Detected	--------	1.89E-01
FE-59	Not Detected	--------	1.25E-01
GD-153	Not Detected	--------	1.39E-01
HG-203	Not Detected	--------	3.40E-02
I-131	Not Detected	--------	4.22E-02
IN-115m	Not Detected	--------	8.64
IR-192	Not Detected	--------	3.52E-02
K-40	1.22E+01	1.92	3.83E-01
LA-140	Not Detected	--------	1.18E-01
MN-54	Not Detected	--------	5.91E-02
MN-56	Not Detected	--------	2.40E+02
MO-99	Not Detected	--------	5.71E-01
NA-22	Not Detected	--------	7.71E-02
NA-24	Not Detected	--------	2.69E-01
NB-95	Not Detected	--------	2.35E-01
ND-147	Not Detected	--------	3.05E-01
NI-57	Not Detected	--------	1.82E-01
BE-7	Not Detected	--------	3.29E-01
RU-103	Not Detected	--------	3.74E-02
RU-106	Not Detected	--------	4.38E-01
SB-122	Not Detected	--------	8.30E-02
SB-124	Not Detected	--------	4.25E-02
SB-125	Not Detected	--------	1.18E-01
SC-46	Not Detected	--------	8.94E-02
SR-85	Not Detected	--------	5.24E-02
TA-182	Not Detected	--------	2.62E-01
TA-183	Not Detected	--------	3.23E-01
TE-132	Not Detected	--------	4.21E-02
TL-201	Not Detected	--------	1.94E-01
XE-133	Not Detected	--------	2.27E-01
Y-88	Not Detected	--------	7.55E-02
ZN-65	Not Detected	--------	1.76E-01
ZR-95	Not Detected	--------	1.02E-01

Appendix A.7

ER Site 140
Gamma Spectroscopy Screening Results for the Drywell
Deep Interval Composite Soil Sample

ER Site 140
Gamma Spectroscopy Screening Results for the Drywell Deep Interval Composite Soil Sample

```
**************************************************************************
*                    Sandia National Laboratories                        *
*   Radiation Protection Sample Diagnostics Program [881 Laboratory]     *
*                      1-12-95  5:45:16 PM                               *
**************************************************************************
*
* Analyzed by:              1/13/95    Reviewed by:              1/13/95
**************************************************************************
```

Customer : B.GALLOWAY/McLAUGHLIN(7582/SMO)
Customer Sample ID : 018903-03
Lab Sample ID : 50003504

Sample Description : MARINELLI SOLID SAMPLE
Sample Type : Solid
Sample Geometry : 1SMAR
Sample Quantity : 775.000 Gram
Sample Date/Time : 1-11-95 10:30:00 AM
Acquire Start Date : 1-12-95 5:12:16 PM
Detector Name : LAB01
Elapsed Live Time : 1800 seconds
Elapsed Real Time : 1801 seconds

Comments:

****

Nuclide	Activity (pCi/Gram)	2S Error	MDA
U-238	Not Detected	--------	2.27
TH-234	1.29	4.68E-01	5.51E-01
U-234	Not Detected	--------	5.78E+01
RA-226	1.48	4.91E-01	5.10E-01
PB-214	5.56E-01	1.56E-01	5.02E-02
BI-214	5.49E-01	1.07E-01	5.73E-02
PB-210	Not Detected	--------	5.61E+02
TH-232	4.93E-01	1.75E-01	1.48E-01
RA-228	7.38E-01	2.11E-01	2.16E-01
AC-228	Not Detected	--------	3.39E-01
TH-228	5.73E-01	3.07E-01	5.12E-01
RA-224	1.19	4.97E-01	4.01E-01
PB-212	5.06E-01	1.62E-01	3.79E-02
BI-212	Not Detected	--------	8.36E-01
TL-208	5.44E-01	1.20E-01	8.08E-02
U-235	Not Detected	--------	3.02E-01
TH-231	Not Detected	--------	7.48E-01
PA-231	Not Detected	--------	1.36
AC-227	Not Detected	--------	2.08
TH-227	Not Detected	--------	4.21E-01
RA-223	Not Detected	--------	2.48E-01
RN-219	Not Detected	--------	3.23E-01
PB-211	Not Detected	--------	8.48E-01
TL-207	Not Detected	--------	2.39E+01
AM-241	Not Detected	--------	3.07E-01
PU-239	Not Detected	--------	3.66E+02
NP-237	Not Detected	--------	2.61E-01
PA-233	Not Detected	--------	7.33E-02
TH-229	Not Detected	--------	3.93E-01

Appendix A.7, concluded:

ER Site 140
Gamma Spectroscopy Screening Results for the Drywell
Deep Interval Composite Soil Sample

[Summary Report] - Sample ID: 50003504

Nuclide	Activity (pCi/Gram)	2S Error	MDA
AG-110m	Not Detected	--------	4.94E-02
AR-41	Not Detected	--------	9.79E+03
BA-133	Not Detected	--------	7.39E-02
BA-140	Not Detected	--------	1.66E-01
CD-109	Not Detected	--------	8.97E-01
CD-115	Not Detected	--------	1.14E-01
CE-139	Not Detected	--------	3.69E-02
CE-141	Not Detected	--------	6.93E-02
CE-144	Not Detected	--------	3.03E-01
CO-56	Not Detected	--------	5.55E-02
CO-57	Not Detected	--------	4.31E-02
CO-58	Not Detected	--------	5.18E-02
CO-60	Not Detected	--------	6.88E-02
CR-51	Not Detected	--------	2.71E-01
CS-134	Not Detected	--------	5.69E-02
CS-137	Not Detected	--------	5.69E-02
CU-64	Not Detected	--------	8.02E+01
EU-152	Not Detected	--------	4.13E-01
EU-154	Not Detected	--------	2.75E-01
EU-155	Not Detected	--------	1.95E-01
FE-59	Not Detected	--------	1.36E-01
GD-153	Not Detected	--------	1.42E-01
HG-203	Not Detected	--------	3.44E-02
I-131	Not Detected	--------	4.05E-02
IN-115m	Not Detected	--------	9.15
IR-192	Not Detected	--------	3.39E-02
K-40	2.18E+01	3.19	3.47E-01
LA-140	Not Detected	--------	1.21E-01
MN-54	Not Detected	--------	5.90E-02
MN-56	Not Detected	--------	2.28E+02
MO-99	Not Detected	--------	5.81E-01
NA-22	Not Detected	--------	7.90E-02
NA-24	Not Detected	--------	3.07E-01
NB-95	Not Detected	--------	2.45E-01
ND-147	Not Detected	--------	3.04E-01
NI-57	Not Detected	--------	1.77E-01
BE-7	Not Detected	--------	3.52E-01
RU-103	Not Detected	--------	3.76E-02
RU-106	Not Detected	--------	3.99E-01
SB-122	Not Detected	--------	8.15E-02
SB-124	Not Detected	--------	4.28E-02
SB-125	Not Detected	--------	1.15E-01
SC-46	Not Detected	--------	8.97E-02
SR-85	Not Detected	--------	5.25E-02
TA-182	Not Detected	--------	2.61E-01
TA-183	Not Detected	--------	3.15E-01
TE-132	Not Detected	--------	4.13E-02
TL-201	Not Detected	--------	1.90E-01
XE-133	Not Detected	--------	2.26E-01
Y-88	Not Detected	--------	6.83E-02
ZN-65	Not Detected	--------	1.77E-01
ZR-95	Not Detected	--------	9.69E-02

RSI

Sandia National Laboratories
Albuquerque, New Mexico
September 1999

Environmental Restoration Project
Responses to NMED Request for Supplemental Information
No Further Action Proposals (6th Round)
Dated January 1997

INTRODUCTION

This document responds to comments received in a letter from the State of New Mexico Environment Department to the U.S. Department of Energy (Kieling, June 9, 1999) documenting the review of nine No Further Action (NFA) Proposals submitted January 1997.

The following two operable units (OU) and nine Environmental Restoration (ER) Sites were included in the January 1997 NFA proposals:

- OU 1295
  - ER Site 137, Building 6540/6542 Septic System
  - ER Site 140, Building 9965 Septic System
  - ER Site 150, Building 9939/9939A Septic System
  - ER Site 152, Building 9950 Septic System
  - ER Site 153, Building 9956 Septic System
- OU 1335
  - ER Site 86, Firing Site (Building 9927) (Active)
  - ER Site 90, Beryllium Firing Site (Thunder Range) (Active)
  - ER Site 115, Firing Site (Building 9930) (Active)
  - ER Site 191, Equus Red

Sandia National Laboratories
Albuquerque, New Mexico
September 1999

Environmental Restoration Project
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  - ER Site 153, Building 9956 Septic System
- OU 1335
  - ER Site 86, Firing Site (Building 9927) (Active)
  - ER Site 90, Beryllium Firing Site (Thunder Range) (Active)
  - ER Site 115, Firing Site (Building 9930) (Active)
  - ER Site 191, Equus Red

This response document is organized on the first level by OU number and on the second level by ER site number. Each OU section restates the New Mexico Environment Department comments (in **bold** font) in the same order in which they were provided in the call for response to comments. Following each comment, the word "Response" introduces the reply (in normal font style) of the U.S. Department of Energy/Sandia National Laboratories/New Mexico. Responses to general technical comments begin on page 4 and responses to site-specific technical comments begin on page 7. Additional supporting information for the site-specific comments is included in the attachments that follow each OU section. Changes to previously submitted text or tables are provided with redline/strikeout indicators and are labeled "Revised." Changes to previously submitted figures are not provided with redline/strikeout indicators but are labeled "Revised." Newly submitted information (including text, tables, and figures) is labeled "Supplemental."

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RESPONSES TO COMMENTS
ON NO FURTHER ACTION PROPOSALS
JANUARY 1997 (6TH ROUND)

GENERAL COMMENTS

1. **Drafts of maps, supporting documents, appendices, and data tables are unfinished products. For the purpose of a No Further Action (NFA) proposal, final versions of these and other types of information must be submitted.**

   Response: Final versions of maps, supporting documents, appendices, and data tables will be submitted in this response or subsequent to any additional work.

2. **Tables of laboratory data supplied with some NFA proposals are incomplete. As applicable, data tables should include sample identification numbers, analytical methods, method detection limits (MDL's), analytical results, maximum contaminant limits, and approved background levels. Also, offsite laboratory results must be included and clearly identified.**

   Response: All tables will be completed as requested.

3. **It is helpful to include analytical results for field and equipment blanks, and duplicates in data tables. QA/QC data should not be mixed with environmental data in the same tables. If applicable, the QA/QC data tables should also include comparisons of offsite and onsite laboratory results (e.g., RPD's). The text should include a discussion of field and laboratory quality control results (the good points as well as the not-so-good points) and should indicate whether the sampling results are generally acceptable.**

   Response: For those NFAs for which additional information is requested, the data presentation will be examined and the information requested will be provided in the recommended format.

4. **Many data tables for volatile organic compounds (VOC's), semi-volatile organic compounds (SVOC's), high explosives (HE), and polychlorinated biphenyls (PCB's) list only the constituents that were detected, or list just whether any constituent of a group was detected. While summary tables like these are acceptable (and preferred for review purposes), they provide only part of the information needed to fully evaluate a NFA proposal. To complete the data package, additional tables must be submitted listing all of the various constituents that were analyzed for and their MDL's. Please note that "J-coded" data must be reported as detected constituents.**

   Response: The additional information will be provided for those specific NFAs for which such information has been requested as part of this Request for Supplemental

Information. J-coded data will be reported as detects, as previously agreed to between the U.S. Department of Energy, Sandia National Laboratories/New Mexico and the Hazardous and Radioactive Materials Bureau.

5. **For many data tables, sample locations and depths must be inferred from the sample identification numbers. Notes describing how such information is encoded into the sample identification numbers must be added to the tables or to the text.**

Response: The data tables or text referring to the data tables will be revised so that map location, sample location, and depth correspond.

6. **To ensure that appropriate background levels are utilized, Area or Super Groups need to be specified for all NFA proposals. The background levels shown in the tables and discussed in the text of some NFA proposals are not approved values.**

Response: The area or supergroup for approved background values will be clearly identified. Correct values will be used.

7. **Composite sample results and analyses of TCLP/EP Toxicity constituents are not acceptable for the purpose of site characterization.**

Response: Where samples have been composited for site characterization, the U.S. Department of Energy and Sandia National Laboratories/New Mexico will confer with Mr. Will Moats of the Hazardous and Radioactive Materials Bureau to designate locations and analytes for additional discrete samples. Compositing and toxicity characteristic leaching procedure/extraction procedure were used to guide assessment activities and are used to add to the total picture of nature and extent at the individual sites, rather than as a sole basis for evaluation.

8. **Because they are designed to discharge liquids, all septic systems are a potential threat to ground water. Even if concentrations of contaminants in the unsaturated zone are low, it has been demonstrated that large septic systems (such as those at TA-5) can cause ground-water contamination at depths of as much as 500 ft. In recognition of this, the threat to ground water posed by smaller septic systems can not be ignored by the HRMB.**

In most cases, DOE/SNL can only speculate as to the volume of wastes and the total volume of liquids that may have been discharged into a small septic system. Over 20-30 year periods, the larger discharge rates reported for some of these smaller septic systems appear to be sufficient to drive contaminated liquids to the water. Additionally, a number of small septic systems are located in canyon or pediment areas where the unsaturated zone is made up chiefly of permeable gravel, sand, and potentially permeable fractured bedrock, and where ground water is relatively shallow. There is certainly potential in these cases that hazardous constituents (such

as VOC's and cyanide) can cause ground water to become contaminated to unacceptable levels.

Therefore, HRMB will not approve NFA status for any septic systems without ground-water characterization, unless the agency can gain confidence that such approvals will be protective of human health and the environment. The only way that HRMB can achieve such confidence is for DOE/SNL to conduct a study of a sample population of septic systems. HRMB wishes to negotiate a technical and decision-making approach for such a study, so that this issue can be resolved and significant progress can be achieved in a timely manner.

Response: It is anticipated that the recently negotiated characterization strategy for the remaining septic systems will provide the basis upon which to evaluate the impacts that these units may have had on the groundwater. This strategy is detailed in "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" (May 1999). This sampling and analysis plan is currently in the process of being transmitted to New Mexico Environment Department for final signature approval.

Site-Specific Comments

ER Site 140, Building 9965 Septic System

ER Site 140 is not appropriate for NFA petition.

1. **The maps shown in Figures 1-1 and 1-2 are labeled "draft". See general comment 1.**

   Response: Replacement Figures 1-1 and 1-2 without the word "draft" are provided in Attachment C.

2. **Table 3-2 – See general comment 4.**

   Response: Soil samples and an associated aqueous equipment blank sample taken from ER Site 140 in late 1994 and early 1995 were analyzed by an off-site commercial laboratory (Quanterra in Arvada, Colorado) for organic constituents, including volatile organic compounds using EPA Method 8240 and semivolatile organic compounds using EPA Method 8270. The analytical report from the laboratory included only the reporting limits (practical quantitation limits) and did not include the method detection limits. Tables containing a complete list of the volatile organic compound and semivolatile organic compound constituents for which these samples were analyzed and their respective reporting limits are provided in Attachment D.

3. **Cyanide and selenium must be evaluated in a risk assessment.**

   Response: Cyanide was detected at concentrations of 1,200 to 1,800 µg/kg in three soil samples from three boring locations at the site. Selenium was also detected at concentrations of 4.5 and 4.6 mg/kg at two boring locations; these selenium concentrations are above the maximum approved background concentration of 1 mg/kg. A risk screening assessment was not completed for ER Site 140 because all concentrations of constituents of concern at the site were detected at less than their respective Resource Conservation and Recovery Act proposed Subpart S action levels. However, the risk screening assessment methodology has changed considerably since the NFA proposal for ER Site 140 was written in January 1997. It is also possible that additional deep soil vapor sampling, and perhaps even groundwater monitoring, may be required at this site in the future, in accordance with procedures specified in the sampling and analysis plan. This sampling and analysis plan is currently in the final stages of review and approval by representatives of the New Mexico Environment Department, Sandia National Laboratories/New Mexico, and the U.S. Department of Energy. The risk screening assessment for this site will be conducted again when all sampling has been completed at the site and will follow the most current risk assessment procedures in place at the time the new evaluation is completed.

Site-Specific Comments

4. **See general comment 8.**

Response: Sandia National Laboratories/New Mexico recognizes that this and other potential deep groundwater environmental restoration and non-environmental restoration septic and drain system sites may be candidates for additional deep soil vapor sampling and perhaps for groundwater monitoring, in accordance with procedures specified in the sampling and analysis plan. It will not be determined whether additional work will be required at this site until all shallow soil sampling and shallow passive soil gas surveys are completed at the approximately 101 non-environmental restoration septic and drain system sites currently thought to exist at Sandia National Laboratories/New Mexico.

5. **Please provide an estimate of waste volume or mass, and the total volume or mass of liquids discharged. Also, please provide the size of the lines (for example, 4" pipe). How deep is the seepage pit?**

Response: The "Septic Tanks and Drainfields (ADS-1295), RCRA Facility Investigation Work Plan" (hereinafter referred to as the Work Plan), which was completed in March 1993, states that effluent discharge rates from Building 9965 were estimated to range from 10 to 500 gallons per day. This suggested effluent rate was based on the number of full- and part-time people who, it was estimated, worked in Building 9965 since it was constructed in 1965. Based on the estimated length of time the building septic and drain systems were in operation (1965 to approximately 1992, or approximately 28 years), and assuming a 5 day-per-week, 50 week-per-year operation, the total amount of effluent discharged from the facility would have ranged from 70,000 to 3,500,000 gallons.

Historical engineering drawings maintained by Sandia National Laboratories/New Mexico indicate that the drain line from Building 9965 to the septic tank and seepage pit southwest of the building was constructed of 4-inch diameter vitrified clay pipe. Engineering drawings also indicate that the drain line from the building to the drywell on the northeastern corner of the building consisted of 2-inch diameter pipe.

The top of the aggregate in the southwest seepage pit was 8 feet below ground surface prior to sampling. Engineering drawings from Sandia National Laboratories/New Mexico facilities indicated that the aggregate layer in the bottom of the typical seepage pit constructed at Sandia National Laboratories/New Mexico was approximately 3 feet thick. It was, therefore, assumed that the aggregate layer in the seepage pit at this site was 3 feet thick. This would result in a total depth of the seepage pit of 11 feet below ground surface. The base of the aggregate in the drywell northeast of Building 9965 was determined through backhoe excavation to be 8 feet below ground surface.

6. **A deep sample was not collected at the seepage pit (the maximum sampling depth was only 11 ft) because of tool refusal. Ground-water monitor wells may need to be installed at this site.**

Site-Specific Comments

Response: Sandia National Laboratories/New Mexico recognizes that this and other potential deep groundwater environmental restoration and non-environmental restoration septic and drain system sites may be candidates for additional deep soil vapor sampling, and perhaps for groundwater monitoring, in accordance with procedures specified in the sampling and analysis plan. It will not be determined whether additional work will be required at this site until all shallow soil sampling and shallow passive soil gas surveys are completed at the approximately 101 non-environmental restoration septic and drain system sites currently thought to exist at Sandia National Laboratories/New Mexico.

ATTACHMENT C

ER SITE 140
REVISED FIGURES 1-1 AND 1-2

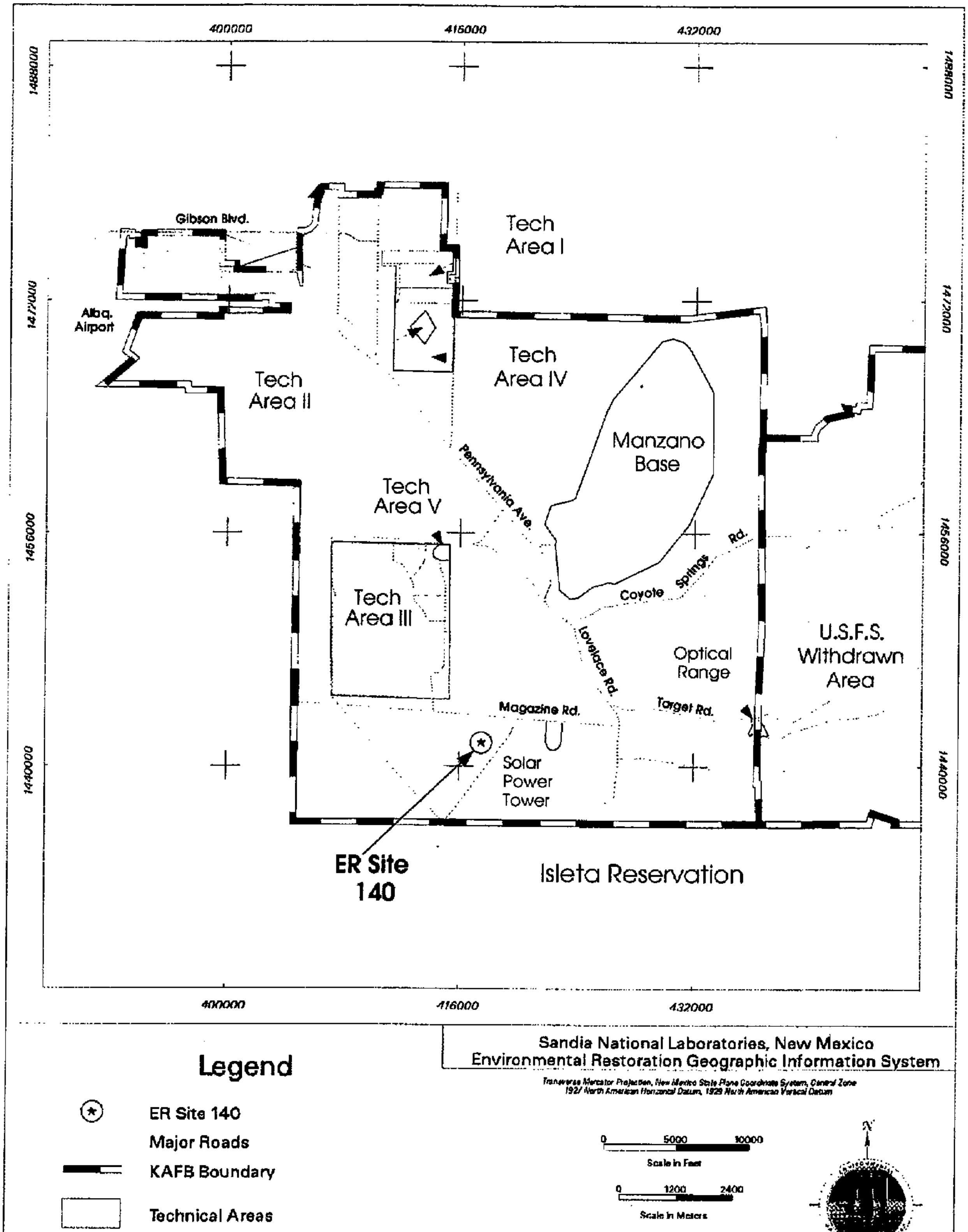

FIGURE 1-1
Location Map for Site 140
Sandia National Laboratories,
New Mexico

sm990699.prj scmorri SNL GIS ORG. 7512 06/12/96 MAPID=960931

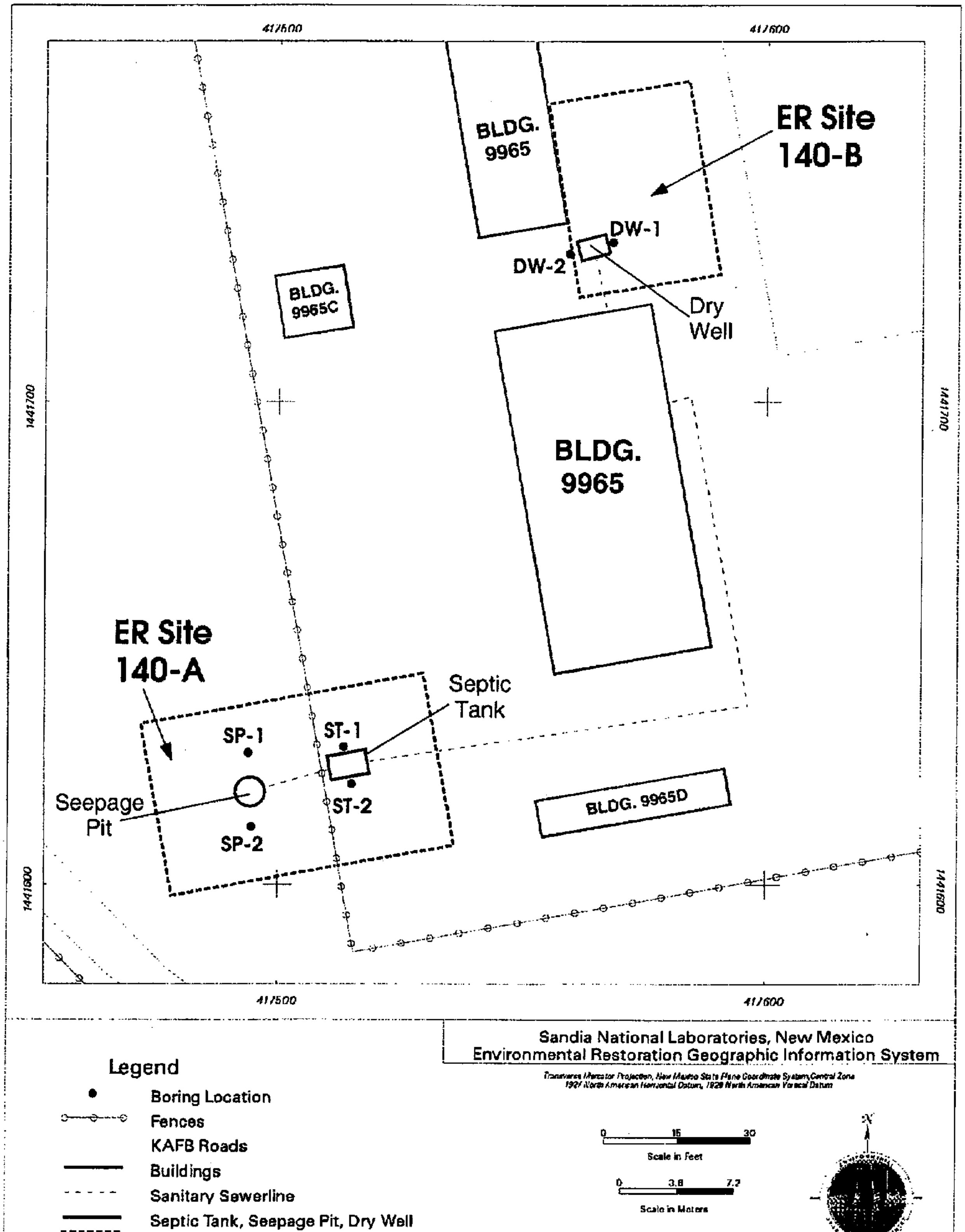

FIGURE 1-2
Site Map for ER Site 140
Sandia National Laboratories,
New Mexico

sm990700.pri scmorri SNL GIS ORG. 7512 07/08/96 MAPID=961007

ATTACHMENT D

ER SITE 140
SUPPLEMENTAL TABLES 3-2A AND 3-2B

Specific Comments

Table 3-2A
Summary of VOC Analytical Detection Limits Used for
ER Site 140 Soil Sampling, September and November 1994, and January 1995
(Off-site laboratory)

Analyte	Reporting Limit (µg/kg)
Acetone	10
Benzene	5
Bromodichloromethane	5
Bromoform	5
Bromomethane	10
2-butanone	10
Carbon disulfide	5
Carbon tetrachloride	5
Chlorobenzene	5
Chloroethane	10
Chloroform	5
Chloromethane	10
Dibromochloromethane	5
1,1-dichloroethane	5
1,2-dichloroethane	5
1,1-dichloroethene	5
1,2-dichloroethene	5
1,2-dichloropropane	5
cis-1,3-dichloropropene	5
trans-1,3-dichloropropene	5
Ethyl benzene	5
2-hexanone	10
Methylene chloride	5
4-methyl-2-pentanone	10
Styrene	5
1,1,2,2-tetrachloroethane	5
Tetrachloroethene	5
Toluene	5
1,1,1-trichloroethane	5
1,1,2-trichloroethane	5
Trichloroethene	5
Vinyl acetate	10
Vinyl chloride	10
Xylene	5

µg/kg = Microgram(s) per kilogram.
VOC = Volatile organic compound.

Specific Comments

Table 3-2B
Summary of SVOC Analytical Detection Limits Used for
ER Site 140 Soil Sampling, September and November 1994, and January 1995
(Off-site laboratory)

Analyte	Reporting Limit (µg/kg)
Acenaphthene	330
Acenaphthylene	330
Anthracene	330
Benzo(a)anthracene	330
Benzo(a)pyrene	330
Benzo(b)fluoranthene	330
Benzo(ghi)perylene	330
Benzo(k)fluoranthene	330
Benzoic acid	1600
Benzyl alcohol	330
4-bromophenyl phenyl ether	330
Butylbenzyl phthalate	330
Carbazole	330
4-chloro-3-methylphenol	330
4-chlorobenzenamine	330
bis(2-chloroethoxy)methane	330
bis(2-chloroethyl)ether	330
2-chloronaphthalene	330
2-chlorophenol	330
4-chlorophenyl phenyl ether	330
Chrysene	330
o-cresol	330
Dibenz(a,h)anthracene	330
Dibenzofuran	330
1,2-dichlorobenzene	330
1,3-dichlorobenzene	330
1,4-dichlorobenzene	330
3,3'-dichlorobenzidine	660
2,2'-dichlorodiisopropyl ether	330
2,4-dichlorphenol	330
Diethylphthalate	330
2,4-dimethylphenol	330
Dimethylphthalate	330
Di-n-butyl phthalate	330
Dinitro-o-cresol	1600
2,4-dinitrophenol	1600
2,4-dinitrotoluene	330

Refer to footnotes at end of table.

Specific Comments

Table 3-2B (Concluded)
Summary of SVOC Analytical Detection Limits Used for
ER Site 140 Soil Sampling, September and November 1994, and January 1995
(Off-site laboratory)

Analyte	Reporting Limit (µg/kg)
2,6-dinitrotoluene	330
Di-n-octyl phthalate	330
bis(2-ethylhexyl)phthalate	330
Fluoranthene	330
Fluorene	330
Hexachlorobenzene	330
Hexachlorobutadiene	330
Hexachlorocyclopentadiene	330
Hexachloroethane	330
Indeno(1,2,3-c,d)pyrene	330
Isophorone	330
2-methylnaphthalene	330
4-methylphenol	330
Naphthalene	330
2-nitroaniline	1600
3-nitroaniline	1600
4-nitroaniline	1600
Nitrobenzene	330
2-nitrophenol	330
4-nitrophenol	1600
n-nitrosodiphenylamine	330
n-nitrosodipropylamine	330
Pentachlorophenol	1600
Phenanthrene	330
Phenol	330
Pyrene	330
1,2,4-trichlorobenzene	330
2,4,5-trichlorophenol	1600
2,4,6-trichlorophenol	330

µg/kg = Microgram(s) per kilogram.
SVOC = Semivolatile organic compound.

RSI

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

SEP 2 1 2005

CERTIFIED MAIL – RETURN RECEIPT REQUESTED

Mr James Bearzi, Chief
Hazardous Waste Bureau
New Mexico Environment Department
2905 Rodeo Park Road East, Building 1
Santa Fe, NM 87505

Dear Mr. Bearzi:

On behalf of the Department of Energy (DOE) and Sandia Corporation, DOE is submitting the enclosed Solid Waste Management Unit (SWMU) Assessment Reports and Proposals for Corrective Action Complete (CAC) for Drain and Septic Systems (DSS) Area of Concern (AOC) Sites 1094, 1095, 1114, 1115, 1116, and 1117. DOE is also submitting responses to Requests for Supplemental Information (RSIs) for SWMUs 140, 147, and 150 at Sandia National Laboratories, New Mexico, EPA ID No. NM5890110518. These documents are compiled as DSS Round 10 and CAC (formerly No further Action [NFA]) Batch 28.

This submittal includes descriptions of the site characterization work and risk assessments for DSS AOCs and SWMUs 1094, 1095, 1114, 1115, 1116, 1117, 140, 147, and 150. The risk assessments conclude that, for these nine sites: (1) there is no significant risk to human health under both the industrial and residential land-use scenarios; and (2) that there are no ecological risks associated with these sites.

Based on the information provided, DOE and Sandia are requesting a determination of Corrective Action Complete without controls for these nine sites.

If you have any questions, please contact me at (505) 845-6036, or John Gould at (505) 845-6089.

Sincerely,

Patty Wagner
Manager

Enclosure

cc w/enclosure:
L. King, USEPA, Region 6 (Via Certified Mail)
W. Moats, NMED-HWB (Via Certified Mail)
J. Volkerding, DOE-NMED-OB (2 copies)

cc w/o enclosure.:
T. Longo, NNSA/NA-56
F. Nimick, SNL, MS 1089
P. Freshour, SNL, MS 1089
D. Stockham, SNL, MS 1087
B. Langkopf, SNL, MS 1087
M. Sanders, SNL, MS 1087
R. Methvin, SNL MS 1087
J. Pavletich, SNL MS 1087
A. Villareal, SNL, MS 1035
A. Blumberg, SNL, MS 0141
R. E. Fate, SNL, MS 1089
M. J. Davis, SNL, MS 1089
ESHSEC Records Center, MS 1087

Sandia National Laboratories/New Mexico
Environmental Restoration Project

REQUEST FOR SUPPLEMENTAL INFORMATION RESPONSE AND PROPOSAL FOR CORRECTIVE ACTION COMPLETE DRAIN AND SEPTIC SYSTEMS SWMU 140, BUILDING 9965 SEPTIC SYSTEM

September 2005

United States Department of Energy
Sandia Site Office

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B DSS SWMU 140 Exposure Pathway Discussion for Chemical and Radionuclide Contamination

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ACRONYMS AND ABBREVIATIONS

ADS	Activity Data Sheet
AOC	Area of Concern
AOP	Administrative Operating Procedure
bgs	below ground surface
CAC	Corrective Action Complete
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
COC	constituent of concern
COPEC	constituent of potential ecological concern
DCF	dose conversion factor
DOE	U.S. Department of Energy
DQO	data quality objective
DSS	drain and septic systems
EB	equipment blank
EPA	U.S. Environmental Protection Agency
ER	Environmental Restoration
GEL	General Engineering Laboratories, Inc.
HEAST	Health Effects Assessment Summary Tables
HI	hazard index
HRMB	Hazardous and Radioactive Materials Bureau
IRIS	Integrated Risk Information System
KAFB	Kirtland Air Force Base
MDA	minimum detectable activity
MDL	method detection limit
mrem	millirem
NFA	No Further Action
NMED	New Mexico Environment Department
OSWER	Office of Solid Waste and Emergency Response
OU	Operable Unit
QA	quality assurance
QC	quality control
QES	Quanterra Environmental Services
RAGS	Risk Assessment Guidance for Superfund
RCRA	Resource Conservation and Recovery Act
RFI	RCRA Facility Investigation
RME	reasonable maximum exposure
RPSD	Radiation Protection Sample Diagnostics
RSI	Request for Supplemental Information
SAP	Sampling and Analysis Plan
SNL/NM	Sandia National Laboratories/New Mexico
SVOC	semivolatile organic compound
SWMU	Solid Waste Management Unit
TB	trip blank
TEDE	total effective dose equivalent
TMA	Thermo Analytical Inc./Eberline Laboratories
TOP	Technical Operating Procedure
VOC	volatile organic compound
yr	year(s)

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1.0 INTRODUCTION

1.1 Investigation History

Solid Waste Management Unit (SWMU) 140 was originally one of 23 SWMUs designated as Operable Unit (OU) 1295 at Sandia National Laboratories/New Mexico (SNL/NM). This number was reduced to 22 when a petition for Administrative No Further Action (NFA) was approved by the New Mexico Environment Department (NMED) for SWMU 139 in 1995.

In January 1997, an NFA proposal was submitted to the NMED for SWMU 140 (SNL/NM January 1997). In June 1999, the NMED Hazardous and Radioactive Materials Bureau (HRMB) responded with a Request for Supplemental Information (RSI) on the NFA proposal (NMED June 1999) with the following specific requirements for SWMU 140:

- Provide final versions of the general location and site figures.
- Provide revised analytical tables that include complete analyte lists and method detection limits (MDLs) for the analytes.
- Provide estimates of effluent volumes discharged to the system.
- Provide information on the size (diameter) of the drain lines and depth of the seepage pit.
- Submit a revised risk assessment that includes cyanide and selenium.

The NMED/HRMB also stated that no NFA would be approved without groundwater characterization, unless the agency gained confidence that such approvals would be protective of human health and the environment after SNL/NM conducted a study of a sample population of septic systems. In addition, because the deepest sample collected at the SWMU 140 seepage pit was 11 feet below ground surface (bgs), a groundwater monitoring well might be required (NMED June 1999).

SNL/NM responded to the RSI in September 1999 (SNL/NM September 1999) and submitted revised maps, amended data tables, and committed to completing a revised risk assessment in accordance with current risk assessment procedures, once all required sampling had been completed at the site. SNL/NM also reported that the drain line from Building 9965 to the septic tank and seepage pit was constructed of 4-inch-diameter, vitrified clay pipe and the drain line to the drywell at the northeast corner of the building consisted of 2-inch-diameter pipe. The depth of the seepage pit was estimated from engineering drawings to be 11 feet bgs, while a backhoe excavation determined the drywell depth to be 8 feet bgs. SNL/NM also estimated that the total amount of effluent discharged from Building 9965 would have ranged from 70,000 to 3,500,000 gallons. SNL/NM stated that it would not be determined whether additional work would be required at this site until all shallow soil sampling and shallow passive soil-vapor surveys had been completed at the non-Environmental Restoration (ER) drain and septic system (DSS) sites at SNL/NM (SNL/NM September 1999).

At that time, negotiations were being conducted to define a technical and decision-making approach to complete environmental assessment and characterization work at the 22 OU 1295 SWMUs and 61 other DSS Area of Concern (AOC) sites at SNL/NM. A Sampling and Analysis Plan (SAP) (SNL/NM October 1999) was written that documented investigations planned for completion at all OU 1295 SWMUs and AOC sites. The plan was approved by the NMED in January 2000 (Bearzi January 2000). Technical details for soil sampling procedures, soil sample locations, laboratory analytical methods, and passive soil-vapor sampling requirements at these sites were specified in a follow-up Field Implementation Plan (SNL/NM November 2001), which was also approved by the NMED (Moats February 2002).

Because of the physical similarity of the SWMUs with the AOC sites, and because the same characterization procedures were used for both, the 22 SWMUs were combined into the AOC site investigation procedures outlined in the SAP (SNL/NM October 1999). Shallow subsurface soil and soil-vapor sampling investigations were completed at the SWMUs and AOC sites by November 2002. The data were evaluated and the candidate SWMU and AOC sites were ranked in order to select sites for deep soil-vapor well installation and sampling.

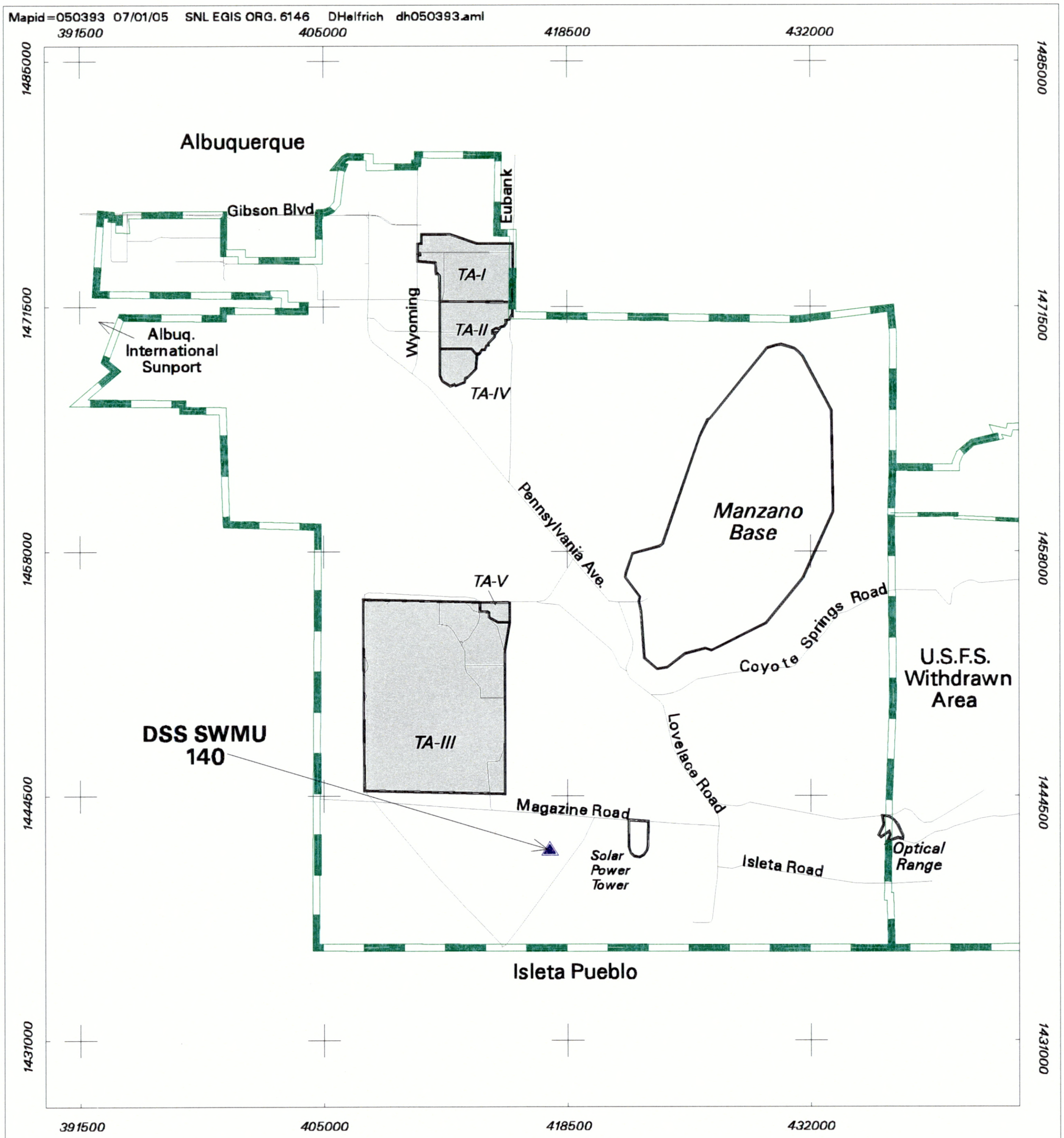
SWMU 140 was not one of the sites selected for deep soil-vapor well sampling or installation of a groundwater monitoring well. However, the original cyanide samples collected in 1994 exceeded the 1 part-per-million trigger level subsequently specified in the SAP (SNL/NM October 1999). In addition, because deep-interval volatile organic compound (VOC) samples could not be collected due to subsurface refusal, the NMED required additional soil samples for VOCs and total cyanide to be collected from a borehole through, and beneath, the seepage pit (McDonald August 2003). These samples were collected on September 5, 2003.

1.2 Remaining RSI Requirements

The following remaining requirements to fulfill the June 1999 RSI for SWMU 140 are addressed in this RSI response:

- Submit the analytical results for the additional VOC and total cyanide soil samples collected at SWMU 140 in September 2003.
- Submit a revised risk assessment using all available soil data.

An updated general location map (Figure 1.2-1), and an updated site location map showing the soil sampling locations at this site (Figure 1.2-2) are also provided. Because the site description and operational history were presented in the initial NFA proposal (SNL/NM January 1997), the information is only briefly summarized in the risk assessment report in Chapter 3.0.



Legend

- ▲ DSS SWMU 140
- Major Road
- KAFB Boundary
- USFS Withdrawn Area Boundary
- SNL Technical Area

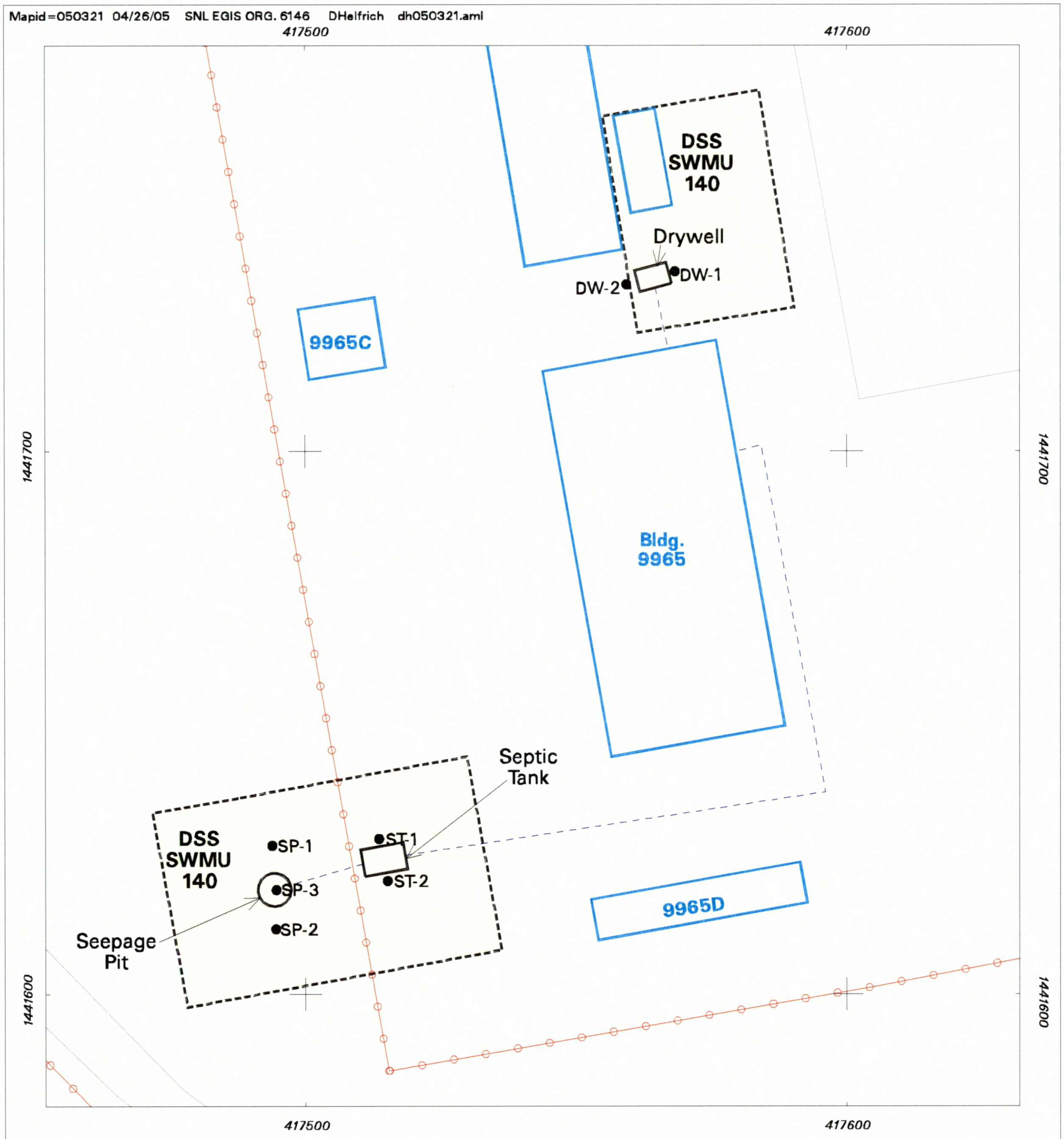
Figure 1.2-1
Location Map of Drain and Septic Systems (DSS) SWMU 140, Bldg. 9965 Septic System, Thunder Range

0 4500 9000
Scale in Feet

0 1080 2160
Scale in Meters

Sandia National Laboratories, New Mexico
Environmental Geographic Information System

840857.03010000 A250



Legend

- Soil Boring Location
- Fence
- Road
- Building / Structure
- Sewerline / Drain Line
- Septic Tank, Seepage Pit, Drywell
- DSS SWMU 140

Figure 1.2-2
Site Map of Drain and Septic Systems (DSS) SWMU 140, Bldg. 9965 Septic System, Thunder Range

0 15 30
Scale in Feet

0 3.6 7.2
Scale in Meters

Sandia National Laboratories, New Mexico
Environmental Geographic Information System

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2.0 ADDITIONAL SOIL SAMPLING AT DSS SWMU 140

On September 5, 2003, two additional soil samples for VOC analysis and four soil samples for total cyanide analysis were collected from a borehole drilled through, and beneath, the seepage pit at DSS SWMU 140 (Figure 1.2-2). Sampling details and results are presented in the following sections.

2.1 2003 Soil Sampling Methodology

On September 5, 2003, a truck-mounted auger drill rig was used to collect two additional VOC and four total cyanide soil samples at DSS SWMU 140. The VOC samples were collected at depths of 11 and 16 feet bgs and the total cyanide samples were collected at depths of 11, 16, 21, and 26 feet bgs at the SP-3 seepage pit borehole location (Figure 1.2-2). Once the auger rig had reached the top of the sampling interval, a 2-foot-long, split-spoon sampler lined with four 2-inch-diameter, 6-inch-long brass sleeves was inserted into the borehole and driven downward 2 feet by successive blows from a 140-pound weight (slide hammer) to fill the brass liners with soil. Refusal due to shallow bedrock limited sampling to a maximum depth of approximately 26 feet bgs. Because of the low sample volume recovered, only cyanide analyses were performed on the samples from the two deeper intervals.

Once the split-spoon sampler was retrieved from the borehole, the soil sample for analysis was collected by emptying the soil from the brass liners directly into the appropriate sample container. All samples were documented and handled in accordance with applicable SNL/NM operating procedures and were transported to an off-site laboratory for VOC and total cyanide analyses by U.S. Environmental Protection Agency (EPA) Methods 8260 and 9012A, respectively.

2.2 2003 Soil Sampling Results and Conclusions

Analytical results for the additional VOC and total cyanide soil samples collected at DSS SWMU 140 are presented and discussed in this section.

<u>VOCs</u>

VOC analytical results for the two soil samples collected from the seepage pit borehole are summarized in Table 2.2-1. MDLs for the VOC soil analyses are presented in Table 2.2-2. Acetone was detected only in the equipment blank (EB) associated with these samples. Low concentrations of toluene were detected in the two VOC soil samples but not in the trip blank (TB) or EB associated with these samples. Although toluene was not detected in the TB or EB, it is a common laboratory contaminant and may not indicate soil contamination at this site.

Table 2.2-1
Summary of DSS SWMU 140, Building 9965 Septic System
Confirmatory Soil Sampling, VOC Analytical Results
September 2003
(Off-Site Laboratory)

Sample Attributes			VOCs (EPA Method 8260[a]) (µg/kg)	
Record Number[b]	ER Sample ID	Sample Depth (ft)	Acetone	Toluene
606785	140-SP1-BH3-11-S	11	ND (3.52)	**0.472 J (1)**
606785	140-SP1-BH3-16-S	16	ND (3.52)	**1.06**
Quality Assurance/Quality Control Samples (µg/L)				
606785	140-SP1-BH3-TB	NA	ND (4.5 J)	ND (0.39)
606785	140-SP1-BH3-EB	NA	**4.95 J (5 J)**	ND (0.39)

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

BH	= Borehole.
DSS	= Drain and Septic Systems.
EB	= Equipment blank.
EPA	= U.S. Environmental Protection Agency.
ER	= Environmental Restoration.
ft	= Foot (feet).
ID	= Identification.
J	= Analytical result was qualified as an estimated value.
J ( )	= The reported value is greater than or equal to the MDL but is less than the practical quantitation limit, shown in parentheses.
MDL	= Method detection limit.
µg/kg	= Microgram(s) per kilogram.
µg/L	= Microgram(s) per liter.
NA	= Not applicable.
ND ( )	= Not detected above the MDL, shown in parentheses.
S	= Soil sample.
SP	= Seepage pit.
SWMU	= Solid Waste Management Unit.
TB	= Trip blank.
VOC	= Volatile organic compound.

Table 2.2-2
Summary of DSS SWMU 140, Building 9965 Septic System
Confirmatory Soil Sampling, VOC Analytical MDLs
September 2003
(Off-Site Laboratory)

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

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

Total Cyanide

Total cyanide analytical results for the four soil samples collected from the seepage pit borehole are summarized in Table 2.2-3. MDLs for the cyanide soil analyses are presented in Table 2.2-4. Cyanide was not detected in any soil sample collected or in the EB associated with these samples.

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

Throughout the DSS Project, quality assurance (QA)/quality control (QC) samples were collected at an approximate frequency of 1 per 20 field samples. These included duplicate, EB, and TB samples. Typically, samples were shipped to the laboratory in batches of up to 20 samples, so that any one shipment might contain samples from several sites. Aqueous EB samples were collected at an approximate frequency of 1 per 20 site samples. The EB samples were analyzed for the same analytical suite as the soil samples in that shipment. The analytical results for the EB samples appear only in the data tables for the site where they were collected. However, the results were used in the data validation process for all the samples in that batch. A trace amount of acetone was detected in the EB sample for the 2003 soil sampling event (Table 2.2-1).

Aqueous TB samples, for VOC analysis only, were included in every sample cooler containing VOC soil samples. The analytical results for the TB samples appear in the VOC data tables for the sites in that shipment. The results were used in the data validation process for all the samples in that batch. No VOCs were detected in the TB for DSS SWMU 140 (Table 2.2-1). No duplicate samples were collected during the September 2003 resampling of SWMU 140.

All laboratory data were reviewed and verified/validated according to "Verification and Validation of Chemical and Radiochemical Data," Technical Operating Procedure (TOP) 94-03, Rev. 0 (SNL/NM July 1994) or SNL/NM ER Project "Data Validation Procedure for Chemical and Radiochemical Data," Administrative Operating Procedure (AOP) 00-03 (SNL/NM December 1999). Annex A contains the data validation reports for the samples collected in September 2003 at this site. In addition, SNL/NM Department 7713 (Radiation Protection Sample Diagnostics [RPSD] Laboratory) reviewed all gamma spectroscopy results. The data are acceptable for use in this request for a determination of Corrective Action Complete (CAC) without controls.

2.4 Site Sampling Data Gaps

Analytical data from the site assessment were sufficient for characterizing the nature and extent of possible constituent of concern (COC) releases. There are no further data gaps regarding characterization of DSS SWMU 140.

Table 2.2-3
Summary of DSS SWMU 140, Building 9965 Septic System
Confirmatory Soil Sampling, Total Cyanide Analytical Results
September 2003
(Off-Site Laboratory)

Sample Attributes			Total Cyanide (EPA Method 9012A[a]) (mg/kg)
Record Number[b]	ER Sample ID	Sample Depth (ft)	
606785	140-SP1-BH3-11-S	11	ND
606785	140-SP1-BH3-16-S	16	ND
606785	140-SP1-BH3-21-S	21	ND
606785	140-SP1-BH3-26-S	26	ND
Quality Assurance/Quality Control Sample (mg/L)			
606785	140-SP1-BH3-EB	NA	ND

[a]EPA November 1986.
[b]Analysis request/chain-of-custody record.
BH = Borehole.
DSS = Drain and Septic Systems.
EPA = U.S. Environmental Protection Agency.
EB = Equipment blank.
ER = Environmental Restoration.
ft = Foot (feet).
ID = Identification.
mg/kg = Milligram(s) per kilogram.
mg/L = Milligram(s) per liter.
NA = Not applicable.
ND = Not detected.
S = Soil sample.
SP = Seepage pit.
SWMU = Solid Waste Management Unit.

Table 2.2-4
Summary of DSS SWMU 140, Building 9965 Septic System
Confirmatory Soil Sampling, Total Cyanide Analytical MDLs
September 2003
(Off-Site Laboratory)

Analyte	EPA Method 9012A[a] Detection Limit (mg/kg)
Total Cyanide	0.0416--0.042

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

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3.0 RISK ASSESSMENT REPORT FOR DSS SWMU 140

3.1 Site Description and History

DSS SWMU 140, the Building 9965 Septic System at SNL/NM, is located in the Thunder Range test area on federally owned land controlled by Kirtland Air Force Base (KAFB) and permitted to the U.S. Department of Energy (DOE). SWMU 140 consists of two abandoned drain systems (Figure 1.2-2). A septic system on the southwest side of Building 9965 consisted of a septic tank connected to a single seepage pit. The second drain system discharged to a drywell on the north side of the building. Available information indicates that Building 9965 was constructed in 1965 (SNL/NM March 2003), and it is assumed that the septic system and drywell were also constructed at that time. By 1991, the septic system discharges were routed to the City of Albuquerque sanitary sewer system (Jones June 1991) and the drywell was deactivated in the early 1990s (SNL/NM January 1997). The old septic system line was disconnected and capped, and the system was abandoned in place concurrent with this change (Romero September 2003). Waste in the septic tank was removed and managed according to SNL/NM policy. The empty and decontaminated septic tank was inspected by the NMED on December 15, 1995, and a closure form was signed (SNL/NM January 1996). The septic tank was then backfilled with clean, native soil from the area in late 1995 or early 1996.

Environmental concern about DSS SWMU 140 is based upon the potential for the release of COCs in effluent discharged to the environment via the septic system seepage pit and drywell 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 possible COCs that may have been released during facility operations.

The ground surface in the vicinity of the site is flat or slopes slightly to the west. The closest major drainage lies north of the site and terminates in the playa just west of KAFB. No springs or perennial surface-water bodies are located within 2.4 miles of the site. Average annual rainfall in the SNL/NM and KAFB area, as measured at Albuquerque International Sunport, is 8.1 inches (NOAA 1990). Surface-water runoff in the vicinity of the site is minor because the surface is nearly flat. Infiltration of precipitation is almost nonexistent as virtually all of the moisture subsequently undergoes evapotranspiration. The estimates of evapotranspiration for the KAFB area range from 95 to 99 percent of the annual rainfall (SNL/NM March 1996). Most of the area immediately surrounding DSS SWMU 140 is unpaved with some native vegetation, and no storm sewers are used to direct surface water away from the site.

DSS SWMU 140 lies at an average elevation of approximately 5,490 feet above mean sea level. The groundwater in this area of KAFB generally occurs in unconfined conditions in essentially unconsolidated silts, sands, and gravels. However, local areas with shallow bedrock can be produced by faulting or erosional unconformities. Groundwater is approximately 230 feet bgs. Groundwater flow is thought to be to the northwest in this area (SNL/NM April 2004). The nearest groundwater monitoring wells are at the Chemical Waste Landfill approximately 4,250 feet northwest of the site in the southeast section of Technical Area III. The nearest production wells are northwest and north of the site and include KAFB-4 and KAFB-11, which are approximately 5.4 and 5.2 miles away, respectively.

3.2 Data Quality Objectives

Soil sampling was conducted in 1994, 1995, and 2003 in accordance with the rationale and procedures described in the approved "Septic Tanks and Drainfields (ADS [Activity Data Sheet]-1295) RCRA [Resource Conservation and Recovery Act] Facility Investigation [RFI] Work Plan" (SNL/NM March 1993), the SAP for the RFI of the septic tanks and drainfields (IT March 1994), and subsequent site-specific addenda to the Work Plan and SAP based upon discussions with the NMED/HRMB.

The sampling conducted at this site was designed to:

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

Table 3.2-1 summarizes the rationale for determining the sampling locations at this site. The source of potential COCs at DSS SWMU 140 was effluent discharged to the environment from the seepage pit and drywell at this site.

Table 3.2-1
Summary of Sampling Performed to Meet Data Quality Objectives

DSS SWMU 140 Sampling Area(s)	Potential COC Source	Number of Sampling Locations	Sample Density (samples/acre)	Sampling Location Rationale
Soil adjacent to, and beneath, the drywell	Effluent discharged to the environment from the drywell	2	NA	Evaluate potential COC releases to the environment from effluent discharged from the drywell
Soil adjacent to, and beneath, the septic tank	Effluent discharged to the environment from the septic tank	2	NA	Evaluate potential COC releases to the environment from effluent discharged from the septic tank
Soil adjacent to, and beneath, the seepage pit	Effluent discharged to the environment from the seepage pit	3	NA	Evaluate potential COC releases to the environment from effluent discharged from the seepage pit

COC = Constituent of concern.
DSS = Drain and Septic Systems.
NA = Not applicable.
SWMU = Solid Waste Management Unit.

In 1994 and 1995, soil samples were collected from boreholes drilled adjacent to the septic tank, seepage pit, and drywell using a Geoprobe™. The septic tank borehole intervals started at 7 feet bgs, a depth equal to the base of the tank. The seepage pit borehole interval started at 11 feet bgs, a depth equal to the base of the structure. The drywell sampling intervals started at 8 and 18 feet bgs, a depth equal to the base of the structure, and 10 feet below the shallower sampling interval, respectively. In 2003, additional soil samples were collected from a borehole drilled through, and beneath, the seepage pit using an auger drill rig and split-spoon sampler. Samples were collected at depths of 11 and 16 feet bgs for VOCs, and 11, 16, 21, and 26 feet bgs for cyanide. Soil samples were collected using procedures described in the RFI Work Plan (SNL/NM March 1993), the SAP for the RFI of septic tanks and drainfields (IT March 1994), and the SAP subsequently developed for septic and miscellaneous drain systems at SNL/NM (SNL/NM October 1999). Table 3.2-2 summarizes the types of confirmatory and QA/QC samples collected at the site, and the laboratories that performed the analyses.

The soil samples were analyzed for VOCs, semivolatile organic compounds (SVOCs), RCRA metals, hexavalent chromium, total cyanide, nitrates, isotopic uranium, tritium, and radionuclides by gamma spectroscopy. The samples were analyzed by off-site laboratories (General Engineering Laboratories Inc. [GEL], Quanterra Environmental Services [QES], and Thermo Analytical Inc./Eberline Laboratories [TMA]) and the on-site SNL/NM RPSD Laboratory. Table 3.2-3 summarizes the analytical methods and the data quality requirements.

QA/QC samples were collected during the sampling effort according to the ER Project Quality Assurance Project Plan. The QA/QC samples consisted of four TBs (for VOCs only), one set of field duplicate samples, two sets of EBs for VOCs and total cyanide, and one set of EBs for SVOCs and RCRA metals. No significant QA/QC problems were identified in the QA/QC samples.

All of the DSS SWMU 140 soil sample results were verified/validated by SNL/NM. The off-site laboratory results from GEL, QES, and TMA were reviewed according to "Verification and Validation of Chemical and Radiochemical Data," TOP 94-03, Rev. 0 (SNL/NM July 1994) or SNL/NM ER Project "Data Validation Procedure for Chemical and Radiochemical Data," AOP 00-03 (SNL/NM December 1999). The gamma spectroscopy data from the RPSD Laboratory were reviewed according to "Laboratory Data Review Guidelines," Procedure No. RPSD-02-11, Issue No. 2 (SNL/NM July 1996) or an earlier procedure. The reviews confirmed that the analytical data are defensible and therefore acceptable for use in this RSI response. Therefore, the data quality objectives (DQOs) have been fulfilled.

3.3 Determination of Nature, Rate, and Extent of Contamination

3.3.1 Introduction

The determination of the nature, migration rate, and extent of contamination at DSS SWMU 140 is based upon an initial conceptual model validated with confirmatory sampling at the site. The initial conceptual model was developed from archival site research, site inspections, soil sampling, backhoe excavation, and passive soil-vapor sampling. The DQOs contained in the RFI Work Plan (SNL/NM March 1993), the SAP for the RFI of septic tanks and drainfields (IT March 1994), and subsequent negotiations with the NMED/HRMB identified the sample locations, sample density, sample depth, and analytical requirements. The sample data were

Table 3.2-2
Number of Confirmatory Soil and QA/QC Samples Collected from DSS SWMU 140

Sample Type	VOCs	SVOCs	RCRA Metals	Hexavalent Chromium	Total Cyanide	Nitrates	Isotopic Uranium	Tritium	Gamma Spectroscopy Radionuclides
Confirmatory	10	8	8	8	12	4	2	2	4
Duplicates	1	1	1	1	1	1	0	0	0
EBs and TBs[a]	6	1	1	0	2	0	0	0	0
Total Samples	17	10	10	9	15	5	2	2	4
Analytical Laboratory	GEL, QES	QES	QES	QES	GEL, QES	QES	GEL	TMA	RPSD

[a]TBs for VOCs only.
DSS = Drain and Septic Systems.
EB = Equipment blank.
GEL = General Engineering Laboratories, Inc.
QA/QC = Quality assurance/quality control.
QES = Quanterra Environmental Services.
RCRA = Resource Conservation and Recovery Act.
RPSD = Radiation Protection Sample Diagnostics Laboratory.
SVOC = Semivolatile organic compound.
SWMU = Solid Waste Management Unit.
TB = Trip blank.
TMA = Thermo Analytical Inc./Eberline Laboratories.
VOC = Volatile organic compound.

Table 3.2-3
Summary of Data Quality Requirements for DSS SWMU 140

Analytical Method[a]	Data Quality Level	GEL	QES	TMA	RPSD
VOCs EPA Method 8240/8260	Defensible	2	8	None	None
SVOCs EPA Method 8270	Defensible	None	8	None	None
RCRA Metals EPA Method 6000/7000	Defensible	None	8	None	None
Hexavalent Chromium EPA Method 7196A	Defensible	None	8	None	None
Total Cyanide EPA Method 9012A	Defensible	4	8	None	None
Nitrates EPA Method 300 Modified	Defensible	None	4	None	None
Isotopic Uranium HASL-300	Defensible	2	None	None	None
Tritium EPA Method 906.0 or equivalent	Defensible	None	None	2	None
Gamma Spectroscopy Radionuclides EPA Method 901.1	Defensible	None	None	None	4

Note: The number of samples does not include QA/QC samples such as duplicates, trip blanks, and equipment blanks.
[a]EPA Methods from EPA (November 1986).
DSS = Drain and Septic Systems.
EPA = U.S. Environmental Protection Agency.
GEL = General Engineering Laboratories, Inc.
HASL = Health and Safety Laboratory New York (Environmental Measurements Laboratory).
QA/QC = Quality assurance/quality control.
QES = Quanterra Environmental Services.
RCRA = Resource Conservation and Recovery Act.
RPSD = Radiation Protection Sample Diagnostics Laboratory.
SVOC = Semivolatile organic compound.
SWMU = Solid Waste Management Unit.
TMA = Thermo Analytical Inc./Eberline Laboratories.
VOC = Volatile organic compound.

subsequently used to develop the final conceptual site model for SWMU 140, which is presented in this risk assessment. The quality of the data specifically used to determine the nature, migration rate, and extent of contamination is described in the following sections.

3.3.2 Nature of Contamination

Both the nature of contamination and the potential for the degradation of COCs at DSS SWMU 140 were evaluated using laboratory analyses of the soil samples. The analytical requirements included analyses for VOCs, SVOCs, RCRA metals, hexavalent chromium, total cyanide, nitrates, isotopic uranium, tritium, and radionuclides by gamma spectroscopy. The analytes and methods listed in Tables 3.2-2 and 3.2-3 are appropriate to characterize the COCs and potential degradation products at SWMU 140.

3.3.3 Rate of Contaminant Migration

The seepage pit and drywell at DSS SWMU 140 were deactivated in the early 1990s when Building 9965 was connected to an extension of the City of Albuquerque sanitary sewer system. The migration rate of COCs that may have been introduced into the subsurface via the seepage pit and drywell at this site was therefore dependent upon the volume of aqueous effluent discharged to the environment from these systems when they were operational. Any migration of COCs from this site after use of the seepage pit and drywell was discontinued has been predominantly dependent upon precipitation. However, it is highly unlikely that sufficient precipitation has fallen on the site to reach the depth at which COCs may have been discharged to the subsurface from these systems. Analytical data generated from the soil sampling conducted at the site are adequate to characterize the rate of COC migration at SWMU 140.

3.3.4 Extent of Contamination

Subsurface soil samples were collected from boreholes drilled at seven locations adjacent to, and beneath, the effluent release points and areas (septic tank, seepage pit, and drywell) at the site to assess whether releases of effluent from these systems caused any environmental contamination.

The soil samples were collected at sampling depths starting at 7 feet bgs in boreholes adjacent to the septic tank; at 8 and 18 feet bgs in boreholes adjacent to the drywell; at 11 feet bgs in boreholes adjacent to the seepage pit; and at 11, 16, 21, and 28 feet bgs in the borehole through, and beneath, the seepage pit. Sampling intervals started at the depths at which effluent discharged from the septic tank, seepage pit, and drywell would have entered the subsurface environment at the site. This sampling procedure was required by NMED regulators and has been used at numerous DSS-type sites at SNL/NM. The 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 of COCs.

3.4 Comparison of COCs to Background Levels

Site history and characterization activities are used to identify potential COCs. This RSI response for DSS SWMU 140 and request for a determination of CAC without controls describes the identification of COCs and the sampling that was conducted in order to determine the concentration levels of those COCs across the site. Generally, COCs evaluated in this risk assessment include all detected organic and all inorganic and radiological COCs for which samples were analyzed. When the detection limit of an organic compound is too high (i.e., could possibly cause an adverse effect to human health or the environment), the compound is retained. Nondetected organic compounds not included in this assessment were determined to have detection limits low enough to ensure protection of human health and the environment. In order to provide conservatism in this risk assessment, the calculation uses only the maximum concentration value of each COC found for the entire site. The SNL/NM maximum background concentration (Dinwiddie September 1997) was selected to provide the background screen listed in Tables 3.4-1 and 3.4-2.

Table 3.4-1
Nonradiological COCs for Human Health Risk Assessment at DSS SWMU 140 with Comparison to the Associated SNL/NM Background Screening Value, BCF, and Log K_{ow}

COC	Maximum Concentration (All Samples) (mg/kg)	SNL/NM Background Concentration (mg/kg)[a]	Is Maximum COC Concentration Less Than or Equal to the Applicable SNL/NM Background Screening Value?	BCF (maximum aquatic)	Log K_{ow} (for organic COCs)	Bioaccumulator?[b] (BCF>40, Log K_{ow}>4)
Inorganic						
Arsenic	5.7	4.4	**No**	44[c]	--	**Yes**
Barium	254	214	**No**	170[d]	--	**Yes**
Cadmium	0.25[e]	0.9	Yes	64[c]	--	**Yes**
Chromium, total	5.3	15.9	Yes	16[c]	--	No
Chromium VI	0.05[e]	1	Yes	16[c]	--	No
Cyanide	1.8	NC	**Unknown**	NC	--	**Unknown**
Lead	7.1 J	11.8	Yes	49[c]	--	**Yes**
Mercury	0.05[e]	<0.1	Yes	5,500[c]	--	**Yes**
Nitrate	3.9	NC	**Unknown**	NC	--	**Unknown**
Selenium	4.6	<1	**No**	800[f]	--	**Yes**
Silver	0.5[e]	<1	Yes	0.5[c]	--	No
Organic						
Acetone	0.016	NA	**NA**	0.69[g]	-0.24[g]	No
Methylene chloride	0.0038 J	NA	**NA**	5[g]	1.25[g]	No
Methyl ethyl ketone	0.026	NA	**NA**	1[h]	0.29[h]	No
Methyl isobutyl ketone	0.005[e]	NA	**NA**	5[i]	1.19[i]	No
Toluene	0.0025[e]	NA	**NA**	10.7[c]	2.69[c]	No

Note: **Bold** indicates the COCs that exceed the background screening values and/or are bioaccumulators.
[a]Dinwiddie September 1997, Southwest Area Supergroup.
[b]NMED March 1998a.
[c]Yanicak March 1997.
[d]Neumann 1976.
[e]Nondetected concentration (i.e., one-half the maximum detection limit if value is greater than the maximum detected concentration or analyte was not detected at all).
[f]Callahan et al. 1979.
[g]Howard 1990.
[h]Howard 1993.

Table 3.4-1 (Concluded)
Nonradiological COCs for Human Health Risk Assessment at DSS SWMU 140 with Comparison to the Associated SNL/NM Background Screening Value, BCF, and Log K_{ow}

[i]Micromedex, Inc. 1998.

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

Table 3.4-2
Radiological COCs for Human Health Risk Assessment at DSS SWMU 140 with Comparison to the Associated SNL/NM Background Screening Value and BCF

COC	Maximum Activity (All Samples) (pCi/g)[a]	SNL/NM Background Activity (pCi/g)[b]	Is Maximum COC Activity Less Than or Equal to the Applicable SNL/NM Background Screening Value?	BCF (maximum aquatic)	Is COC a Bioaccumulator?[c] (BCF >40)
Cesium-137	ND (0.0593)	0.079	Yes	3,000[d]	**Yes**
Thorium-232	0.493	1.01	Yes	3,000[d]	**Yes**
Tritium	ND (0.0125)	0.021[e]	Yes	NA	No
Uranium-235	**ND (0.371)**	0.16	**No**	900[d]	**Yes**
Uranium-238	**ND (4.99)**	1.4	**No**	900[d]	**Yes**

Note: **Bold** indicates COCs that exceed the background screening values and/or are bioaccumulators.
[a]Value listed is the greater of either the maximum detection or the highest MDA.
[b]Dinwiddie September 1997, Southwest Area Supergroup.
[c]NMED March 1998a.
[d]Baker and Soldat 1992.
[e]Tharp February 1999, 420 pCi/L = 0.021 pCi/g assuming a soil density of 1 gram/cubic centimeter and a 5 percent soil moisture.

BCF = Bioconcentration factor.
COC = Constituent of concern.
DSS = Drain and Septic Systems.
MDA = Minimum detectable activity.
NA = Not applicable.
ND ( ) = Not detected above the MDA, shown in parentheses.
ND ( ) = Not detected, but the MDA (shown in parentheses) exceeds background activity.
NMED = New Mexico Environment Department.
pCi/g = Picocurie(s) per gram.
pCi/L = Picocurie(s) per liter.
SNL/NM = Sandia National Laboratories/New Mexico.
SWMU = Solid Waste Management Unit.

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

Table 3.4-1 lists the nonradiological COCs and Table 3.4-2 lists the radiological COCs for the human health risk assessment at DSS SWMU 140. All samples were collected from depths of 5 feet bgs or greater; therefore, evaluation of ecological risk was not performed. Both tables show the associated SNL/NM maximum background concentration values (Dinwiddie September 1997). Section 3.6.4 discusses the results presented in Tables 3.4-1 and 3.4-2.

3.5 Fate and Transport

The primary releases of COCs at DSS SWMU 140 were to the subsurface soil resulting from the discharge of effluents from the Building 9965 septic and drywell systems. Wind, water, and biota are natural mechanisms of COC transport from the primary release point; however, because the discharge was to subsurface soil, none of these mechanisms are considered to be of potential significance as transport mechanisms at this site. Because the systems are no longer active, additional infiltration of water is not expected. Infiltration of precipitation is essentially nonexistent at SWMU 140, as virtually all of the moisture either drains away from the site or evaporates. Because groundwater at this site is approximately 230 feet bgs, the potential for COCs to reach groundwater through the unsaturated zone above the water table is extremely low.

The COCs at DSS SWMU 140 include both inorganic and organic constituents. The inorganic COCs include both radiological and nonradiological analytes. With the exception of cyanide and nitrate, the inorganic COCs are elemental in form and are not considered to be degradable. Transformations of these inorganic constituents could include changes in valence (oxidation/reduction reactions) or incorporation into organic forms (e.g., the conversion of selenite or selenate from soil to seleno-amino acids in plants). Cyanide and nitrate can be metabolized by soil biota. Radiological COCs will undergo decay to stable isotopes or radioactive daughter elements. However, because of the long half-lives of the radiological COCs (uranium-235 and uranium-238), the aridity of the environment at this site, and the lack of potential contact with biota, none of these mechanisms are expected to result in significant losses or transformations of the inorganic COCs.

The organic COCs at DSS SWMU 140 are limited to VOCs. Organic COCs may be degraded through photolysis, hydrolysis, and biotransformation. Photolysis requires light and therefore takes place in the air, at the ground surface, or in surface water. Hydrolysis includes chemical transformations in water and may occur in the soil solution. Biotransformation (i.e., transformation caused by plants, animals, and microorganisms) may occur; however, biological activity may be limited by the arid environment at this site. Because of the depth of the COCs in the soil, the loss of VOCs through volatilization is expected to be minimal.

Table 3.5-1 summarizes the fate and transport processes that can occur at DSS SWMU 140. The COCs at this site include both radiological and nonradiological inorganic analytes as well as organic analytes. Wind, surface water, and biota are considered to be of low significance as potential transport mechanisms at this site. Significant leaching into the subsurface soil is unlikely, and leaching into the groundwater at this site is highly unlikely. The potential for transformation of COCs is low, and loss through decay of the radiological COCs is insignificant because of the long half-lives.

Table 3.5-1
Summary of Fate and Transport at DSS SWMU 140

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 to moderate

DSS = Drain and Septic Systems.
SWMU = Solid Waste Management Unit.

3.6 Human Health Risk Assessment

3.6.1 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 estimated incremental 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 EPA, NMED, and DOE to determine whether further evaluation and potential site cleanup are required. Nonradiological COC risk values also are compared to background risk so that an incremental risk can be calculated.
Step 7.	Uncertainties of the above steps are addressed.

3.6.2 Step 1. Site Data

Section 3.1 of this risk assessment provides the site description and history for DSS SWMU 140. Section 3.2 presents a comparison of results to DQOs. Section 3.3 discusses the nature, rate, and extent of contamination.

3.6.3 Step 2. Pathway Identification

DSS SWMU 140 has been designated with a future land-use scenario of industrial (DOE and USAF March 1996) (see Annex B for default exposure pathways and parameters). However, the residential land-use scenario is also considered in the pathway analysis. Because of the location and characteristics of the potential contaminants, the primary pathway for human exposure is considered to be soil ingestion for the nonradiological COCs and direct gamma exposure for the radiological COCs. The inhalation pathway for both nonradiological and radiological COCs is included because the potential exists to inhale dust and volatiles. Soil ingestion is included for the radiological COCs as well. The dermal pathway is included for the nonradiological COCs because of the potential for the receptor to be exposed to contaminated soil. No water pathways to the groundwater are considered. Depth to groundwater at SWMU 140 is approximately 230 feet bgs. No intake routes through plant, meat, or milk ingestion are considered appropriate for either the industrial or residential land-use scenarios. Figure 3.6.3-1 shows the conceptual site model flow diagram for SWMU 140.

Pathway Identification

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

3.6.4 Step 3. Background Screening Procedure

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

3.6.4.1 Methodology

Maximum concentrations of nonradiological COCs are compared to the approved SNL/NM maximum screening levels for this area. The SNL/NM maximum background concentration was selected to provide the background screen in Table 3.4-1 and used to calculate risk attributable to background in Section 3.6.6.2. Only the COCs that were detected above the corresponding SNL/NM maximum background screening levels or that do not have either a quantifiable or calculated background screening level are considered in further risk assessment analyses.

For radiological COCs that exceed the SNL/NM background screening levels, background values are subtracted from the individual maximum radionuclide concentrations. Those that do not exceed these background levels are not carried any further in the risk assessment. This

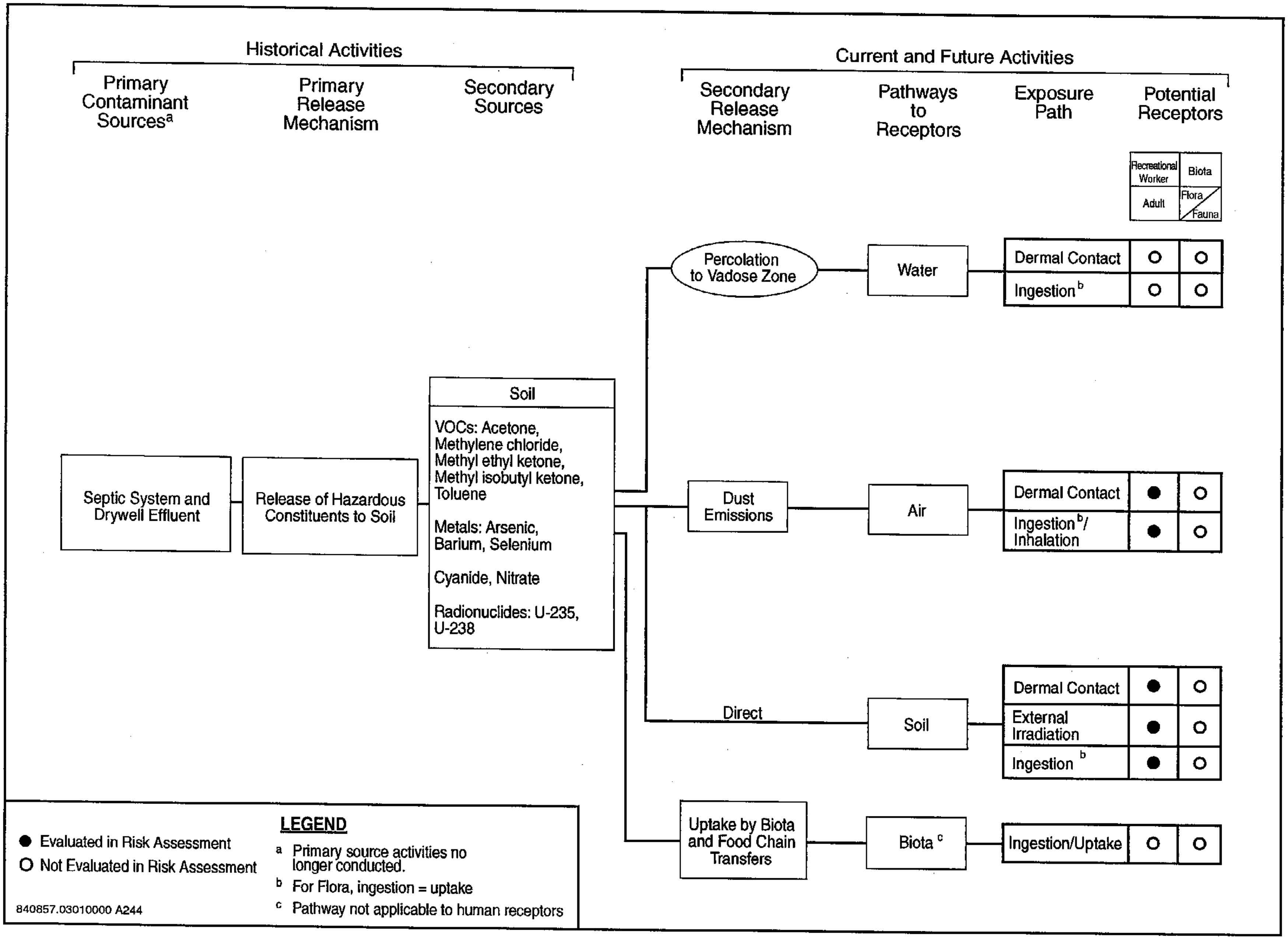

Figure 3.6.3-1
Conceptual Site Model Flow Diagram for DSS SWMU 140, Building 9965 Septic System

approach is consistent with DOE Order 5400.5, "Radiation Protection of the Public and the Environment" (DOE 1993). Radiological COCs that do not have a background value and are detected above the analytical minimum detectable activity (MDA) are carried through the risk assessment at the maximum levels. The resultant radiological COCs remaining after this step are referred to as background-adjusted radiological COCs.

3.6.4.2 Results

Tables 3.4-1 and 3.4-2 show the DSS SWMU 140 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, three constituents (arsenic, barium, selenium) were measured at concentrations greater than the background screening values. Two constituents (cyanide, nitrate) do not have quantified background screening concentrations; therefore it is unknown whether these COCs exceed background. Five constituents are organic compounds that do not have corresponding background screening values.

For the radiological COCs, two constituents (uranium-235 and uranium-238) exhibited an MDA greater than their background screening levels.

3.6.5 Step 4. Identification of Toxicological Parameters

Tables 3.6.5-1 (nonradiological) and 3.6.5-2 (radiological) list the COCs retained in the risk assessment and provide the values for the available toxicological information. The toxicological values for the nonradiological COCs presented in Table 3.6.5-1 were obtained from the Integrated Risk Information System (IRIS) (EPA 2004a), the Health Effects Assessment Summary Tables (HEAST) (EPA 1997a), the Technical Background Document for Development of Soil Screening Levels (NMED February 2004), Risk Assessment Information System (ORNL 2003), and EPA Region 6 (EPA 2004b). Dose conversion factors (DCFs) used in determining the excess TEDE values for radiological COCs for the individual pathways are the default values provided in the RESRAD computer code (Yu et al. 1993a) as developed in the following documents:

- DCFs for ingestion and inhalation were taken from "Federal Guidance Report No. 11, Limiting Values of Radionuclide Intake and Air Concentration and Dose Conversion Factors for Inhalation, Submersion, and Ingestion" (EPA 1988).
- DCFs for surface contamination (contamination on the surface of the site) were taken from DOE/EH-0070, "External Dose-Rate Conversion Factors for Calculation of Dose to the Public" (DOE 1988).
- DCFs for volume contamination (exposure to contamination deeper than the immediate surface of the site) were calculated using the methods discussed in "Dose-Rate Conversion Factors for External Exposure to Photon Emitters in Soil" (Kocher 1983) and in ANL/EAIS-8, "Data Collection Handbook to Support Modeling the Impacts of Radioactive Material in Soil" (Yu et al. 1993b).

Table 3.6.5-1
Toxicological Parameter Values for DSS SWMU 140 Nonradiological COCs

COC	RfD_o (mg/kg-d)	Confidence[a]	RfD_{inh} (mg/kg-d)	Confidence[a]	SF_o $(mg/kg\text{-}d)^{-1}$	SF_{inh} $(mg/kg\text{-}d)^{-1}$	Cancer Class[b]	ABS
Inorganic								
Arsenic	3E-4[c]	M	--	--	1.5E+0[c]	1.5E+1[c]	A	0.03[d]
Barium	7E-2[c]	M	1.4E-4[e]	--	--	--	D	0.01[d]
Cyanide	2E-2[c]	M	--	--	--	--	D	0.1[d]
Nitrate	1.6E+0[c]	H	--	--	--	--	--	0.1[d]
Selenium	5E-3[c]	H	--	--	--	--	D	0.01[d]
Organic								
Acetone	1E-1[c]	L	1E-1[f]	--	--	--	D	0.01[g]
Methylene chloride	6E-2[c]	M	8.6E-1[f]	--	7.5E-3[c]	1.6E-3[c]	B2	0.1[d]
Methyl ethyl ketone	6E-1[c]	L	2.9E-1[c]	L	--	--	D	0.1[d]
Methyl isobutyl ketone	8E-2[e]	--	2.3E-2[e]	--	--	--	--	0.01[g]
Toluene	2E-1[c]	M	1.1E-1[c]	M	--	--	D	0.1[d]

[a]Confidence associated with IRIS (EPA 2004a) database values. Confidence: L = low, M = medium, H = High.
[b]EPA weight-of-evidence classification system for carcinogenicity (EPA 1989) taken from IRIS (EPA 2004a):
A = Human carcinogen.
B2 = Probable human carcinogen. Sufficient evidence in animals and inadequate or no evidence in humans.
D = Not classifiable as to human carcinogenicity.
[c]Toxicological parameter values from IRIS electronic database (EPA 2004a).
[d]Toxicological parameter values from NMED (February 2004).
[e]Toxicological parameter values from HEAST (EPA 1997a).
[f]Toxicological parameter values from EPA Region 6 (EPA 2004b).
[g]Toxicological parameter values from Risk Assessment Information System (ORNL 2003).

ABS = Gastrointestinal absorption coefficient.
COC = Constituent of concern.
DSS = Drain and Septic Systems.
EPA = U.S. Environmental Protection Agency.
HEAST = Health Effects Assessment Summary Tables.
IRIS = Integrated Risk Information System.
mg/kg-d = Milligram(s) per kilogram-day.
$(mg/kg\text{-}d)^{-1}$ = 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.
SWMU = Solid Waste Management Unit.
-- = Information not available.

Table 3.6.5-2
Radiological Toxicological Parameter Values for DSS SWMU 140 COCs
Obtained from RESRAD Risk Coefficients[a]

COC	SF_o (1/pCi)	SF_{inh} (1/pCi)	SF_{ev} (g/pCi-yr)	Cancer Class[b]
Uranium-235	4.70E-11	1.30E-08	2.70E-07	A
Uranium-238	6.20E-11	1.20E-08	6.60E-08	A

[a]Yu et al. 1993a.
[b]EPA weight-of-evidence classification system for carcinogenicity (EPA 1989): A = Human carcinogen for high dose and high dose rate (i.e., greater than 50 rem per year). For low-level environmental exposures, the carcinogenic effect has not been observed and documented.
1/pCi = One per picocurie.
COC = Constituent of concern.
DSS = Drain and Septic Systems.
EPA = U.S. Environmental Protection Agency.
g/pCi-yr = Gram(s) per picocurie-year.
SF_{ev} = External volume exposure slope factor.
SF_{inh} = Inhalation slope factor.
SF_o = Oral (ingestion) slope factor.
SWMU = Solid Waste Management Unit.

3.6.6 Step 5. Exposure Assessment and Risk Characterization

Section 3.6.6.1 describes the exposure assessment for this risk assessment. Section 3.6.6.2 provides the risk characterization, including the HI and excess cancer risk for both the potential nonradiological COCs and associated background for the industrial and residential land-use scenarios. The incremental TEDE and estimated incremental cancer risk are provided for the background-adjusted radiological COCs for both the industrial and residential land-use scenarios.

3.6.6.1 Exposure Assessment

Annex B 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 February 2004), as well as other EPA and NMED guidance documents, and reflect the reasonable maximum exposure (RME) approach advocated by the RAGS (EPA 1989). For the radiological COCs, the coded equation provided in RESRAD computer code is used to estimate the incremental TEDE and cancer risk for individual exposure pathways. Further discussion of this process is provided in the "Manual for Implementing Residual Radioactive Material Guidelines Using RESRAD" (Yu et al. 1993a). Although the designated land-use scenario for this site is industrial, risk and TEDE values for a residential land-use scenario are also presented.

3.6.6.2 *Risk Characterization*

Table 3.6.6-1 shows an HI of 0.03 for the DSS SWMU 140 nonradiological COCs and an estimated excess cancer risk of 4E-6 for the designated industrial land-use scenario. The numbers presented include exposure from soil ingestion, dermal contact, and dust and volatile inhalation for nonradiological COCs. Table 3.6.6-2 shows an HI of 0.02 and an estimated excess cancer risk of 3E-6 for the SWMU 140 associated background constituents under the designated industrial land-use scenario.

For the radiological COCs, contribution from the direct gamma exposure pathway is included. For the industrial land-use scenario, a TEDE was calculated that results in an incremental TEDE of 0.13 millirem (mrem)/year (yr). In accordance with EPA guidance found in Office of Solid Waste and Emergency Response (OSWER) Directive No. 9200.4-18 (EPA 1997b), an incremental TEDE of 15 mrem/yr is used for the probable land-use scenario (industrial in this case); the calculated dose value for DSS SWMU 140 for the industrial land-use scenario is well below this guideline. The estimated excess cancer risk is 1.1E-6.

For the nonradiological COCs under the residential land-use scenario, the HI is 0.33 with an estimated excess cancer risk of 1E-5 (Table 3.6.6-1). The numbers in the table include exposure from soil ingestion, dermal contact, and dust and volatile inhalation. Although the EPA (1991) guidelines generally recommend that inhalation not be included in a residential land-use scenario, this pathway is included because of the potential for soil in Albuquerque, New Mexico, to be eroded and for dust to be present in predominantly residential areas. Because of the nature of the local soil, other exposure pathways are not considered (see Annex B). Table 3.6.6-2 shows an HI of 0.24 and an estimated excess cancer risk of 1E-5 for the DSS SWMU 140 associated background constituents under the residential land-use scenario.

For the radiological COCs, the incremental TEDE for the residential land-use scenario is 0.32 mrem/yr. The guideline being used is an excess TEDE of 75 mrem/yr (SNL/NM February 1998) for a complete loss of institutional controls (residential land use in this case); the calculated dose value for DSS SWMU 140 for the residential land-use scenario is well below this guideline. Consequently, SWMU 140 is eligible for unrestricted radiological release as the residential land-use scenario results in an incremental TEDE of less than 75 mrem/yr to the on-site receptor. The estimated excess cancer risk is 3.3E-6. The excess cancer risk from the nonradiological and radiological COCs should be summed to provide risk estimates for persons exposed to both types of carcinogenic contaminants, as noted in OSWER Directive No. 9200.4-18 "Establishment of Cleanup Levels for CERCLA [Comprehensive Environmental Response, Compensation, and Liability Act] Sites with Radioactive Contamination," (EPA 1997b). This summation is tabulated in Section 3.6.9.

3.6.7 Step 6. Comparison of Risk Values to Numerical Guidelines

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

For the nonradiological COCs under the industrial land-use scenario, the HI is 0.03 (less than the numerical guideline of 1 suggested in the RAGS [EPA 1989]). The estimated excess cancer risk is 4E-6. NMED guidance states that cumulative excess lifetime cancer risk must be less

Table 3.6.6-1
Risk Assessment Values for DSS SWMU 140 Nonradiological COCs

COC	Maximum Concentration (mg/kg)	Industrial Land-Use Scenario[a]		Residential Land-Use Scenario[a]	
		Hazard Index	Cancer Risk	Hazard Index	Cancer Risk
Inorganic					
Arsenic	5.7	0.02	4E-6	0.26	1E-5
Barium	254	0.00	--	0.05	--
Cyanide	1.8	0.00	--	0.00	--
Nitrate	3.9	0.00	--	0.00	--
Selenium	4.6	0.00	--	0.01	--
Organic					
Acetone	0.016	0.00	--	0.00	--
Methylene chloride	0.0038 J	0.00	2E-8	0.00	5E-8
Methyl ethyl ketone	0.026	0.00	--	0.00	--
Methyl isobutyl ketone	0.005[b]	0.00	--	0.00	--
Toluene	0.0025[b]	0.00	--	0.00	--
Total		0.03	4E-6	0.33	1E-5

[a]EPA 1989.
[b]Nondetected concentration (i.e., one-half the maximum detection limit is greater than the maximum detected concentration).
COC = Constituent of concern.
DSS = Drain and Septic Systems.
EPA = U.S. Environmental Protection Agency.
J = Estimated concentration.
mg/kg = Milligram(s) per kilogram.
SWMU = Solid Waste Management Unit.
-- = Information not available.

Table 3.6.6-2
Risk Assessment Values for DSS SWMU 140 Nonradiological Background Constituents

COC	Background Concentration[a] (mg/kg)	Industrial Land-Use Scenario[b]		Residential Land-Use Scenario[b]	
		Hazard Index	Cancer Risk	Hazard Index	Cancer Risk
Arsenic	4.4	0.02	3E-6	0.20	1E-5
Barium	214	0.00	--	0.04	--
Cyanide	NC	--	--	--	--
Nitrate	NC	--	--	--	--
Selenium	<1	--	--	--	--
Total		0.02	3E-6	0.24	1E-5

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

than 1E-5 (Bearzi January 2001); thus the excess cancer risk for this site is below the suggested acceptable risk value. This assessment also determines risks considering background concentrations of the potential nonradiological COCs for both the industrial and residential land-use scenarios. Assuming the industrial land-use scenario, there is neither a quantifiable HI nor an excess cancer risk for nonradiological COCs. The incremental risk is determined by subtracting risk associated with background from potential COC risk. These numbers are not rounded before the difference is determined and therefore may appear to be inconsistent with numbers presented in tables and within the text. For conservatism, the background constituents that do not have quantified background screening concentrations are assumed to have a hazard quotient of 0.00. The incremental HI is 0.01 and the estimated incremental excess cancer risk is 8.42E-7 for the industrial land-use scenario. These incremental risk calculations indicate insignificant risk to human health from nonradiological COCs under an industrial land-use scenario.

For the radiological COCs under the industrial land-use scenario, the incremental TEDE is 0.13 mrem/yr, which is significantly lower than the EPA's numerical guideline of 15 mrem/yr (EPA 1997b). The estimated incremental excess cancer risk is 1.1E-6.

The calculated HI for the nonradiological COCs under the residential land-use scenario is 0.33, which is below numerical guidance. The estimated excess cancer risk is 1E-5. NMED guidance states that cumulative excess lifetime cancer risk must be less than 1E-5 (Bearzi January 2001); thus the excess cancer risk for this site is slightly above the suggested acceptable risk value. The incremental HI is 0.08 and the estimated incremental excess cancer risk is 3.40E-6 for the residential land-use scenario. These incremental risk calculations indicate insignificant risk to human health from nonradiological COCs under the residential land-use scenario.

The incremental TEDE for a residential land-use scenario from the radiological components is 0.32 mrem/yr, which is significantly lower than the numerical guideline of 75 mrem/yr suggested in the SNL/NM "RESRAD Input Parameter Assumptions and Justification" (SNL/NM February 1998). The estimated incremental excess cancer risk is 3.3E-6.

3.6.8 Step 7. Uncertainty Discussion

The determination of the nature, rate, and extent of contamination at DSS SWMU 140 is based upon an initial conceptual model that was validated with sampling conducted at the site. The sampling was implemented in accordance with procedures and DQOs in the RFI Work Plan (SNL/NM March 1993), the SAP for the RFI of septic tanks and drainfields (IT March 1994), and subsequent negotiations with the NMED/HRMB. 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 SWMU 140.

Because of the location, history of the site, and future land use (DOE and USAF March 1996), there is low uncertainty in the land-use scenario and the potentially affected populations that were considered in performing the risk assessment analysis. Based upon the COCs found in the near-surface soil and the location and physical characteristics of the site, there is little uncertainty in the exposure pathways relevant to the analysis.

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

Table 3.6.5-1 shows the uncertainties (confidence levels) in nonradiological toxicological parameter values. There is a combination of estimated values and values from the IRIS (EPA 2004a), HEAST (EPA 1997a), EPA Region 6 (EPA 2004b), Technical Background Document for Development of Soil Screening Levels (NMED February 2004), and the Risk Assessment Information System (ORNL 2003). Where values are not provided, information is not available from the HEAST (EPA 1997a), IRIS (EPA 2004a), Technical Background Document for Development of Soil Screening Levels (NMED February 2004), Risk Assessment Information System (ORNL 2003), or EPA regions (EPA 2004b, EPA 2002a, EPA 2002b). Because of the conservative nature of the RME approach, uncertainties in toxicological values are not expected to change the conclusion from the risk assessment analysis.

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

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

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

3.6.9 Summary

DSS SWMU 140 contains identified COCs consisting of some inorganic, organic, and radiological compounds. Because of the location of the site, the designated industrial land-use scenario, and the nature of contamination, potential exposure pathways identified for this site include soil ingestion, dermal contact, and dust and volatile inhalation for chemical COCs, and soil ingestion, dust inhalation, and direct gamma exposure for radionuclides. The same exposure pathways are applied to the residential land-use scenario.

Using conservative assumptions and an RME approach to risk assessment, calculations for the nonradiological COCs show that for the industrial land-use scenario the HI (0.03) is significantly lower than the accepted numerical guidance from the EPA. The estimated excess cancer risk is 4E-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 0.01 and the estimated incremental excess cancer risk is 8.42E-7 for the industrial land-use scenario. These 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 the nonradiological COCs show that for the residential land-use scenario the HI (0.33) is below the accepted numerical guidance from the EPA. The estimated excess cancer risk is 1E-5. Thus, excess cancer risk is slightly above the acceptable risk value provided by the NMED for a residential land-use scenario (Bearzi January 2001). The incremental HI is 0.08 and the estimated incremental excess cancer risk is 3.40E-6 for the residential land-use scenario. These incremental risk calculations indicate insignificant risk to human health for the residential land-use scenario.

The incremental TEDE and corresponding estimated cancer risk from the radiological COCs are much less than EPA guidance values. The estimated TEDE is 0.13 mrem/yr for the industrial land-use scenario, which is much lower than the EPA's numerical guidance of 15 mrem/yr (EPA 1997b). The corresponding estimated incremental excess cancer risk value is 1.1E-6 for the industrial land-use scenario. Furthermore, the incremental TEDE for the residential land-use scenario that results from a complete loss of institutional control is 0.32 mrem/yr with an associated risk of 3.3E-6. The guideline for this scenario is 75 mrem/yr (SNL/NM February 1998). Therefore, DSS SWMU 140 is eligible for unrestricted radiological release.

The excess cancer risk from the nonradiological and radiological COCs should be summed to provide risk estimates for persons exposed to both types of carcinogenic contaminants, as noted in OSWER Directive No. 9200.4-18 (EPA 1997b). The summation of the nonradiological and radiological carcinogenic risks is tabulated in Table 3.6.9-1.

Table 3.6.9-1
Summation of Incremental Nonradiological and Radiological Risks from DSS SWMU 140, Building 9965 Septic System Carcinogens

Scenario	Nonradiological Risk	Radiological Risk	Total Risk
Industrial	8.42E-7	1.1E-6	1.9E-6
Residential	3.40E-6	3.3E-6	6.7E-6

DSS = Drain and Septic Systems.
SWMU = Solid Waste Management Unit.

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

3.7 Ecological Risk Assessment

3.7.1 Introduction

This section addresses the ecological risks associated with exposure to constituents of potential ecological concern (COPECs) in the soil at DSS SWMU 140. A component of the NMED Risk-Based Decision Tree (NMED March 1998a) is to conduct an ecological risk assessment that corresponds with that presented in EPA's Ecological RAGS (EPA 1997c). The current methodology is tiered and contains an initial scoping assessment followed by a more detailed risk assessment if warranted by the results of the scoping assessment. Initial components of NMED's decision tree (a discussion of DQOs, data assessment, and evaluations of bioaccumulation as well as fate and transport potential) are addressed in previous sections of this report. At the end of the scoping assessment, a determination is made as to whether a more detailed examination of potential ecological risk is necessary.

3.7.2 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 3.7.2.4) summarizes the scoping results and assesses the need for further examination of potential ecological impacts.

3.7.2.1 Data Assessment

As indicated in Section 3.4, all COCs at DSS SWMU 140 are located at depths of 5 feet bgs or greater. Therefore, no complete ecological exposure pathways exist at this site, and no COCs are considered to be COPECs.

3.7.2.2 Bioaccumulation

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

3.7.2.3 Fate and Transport Potential

The potential for the COCs to migrate from the source of contamination to other media or biota is discussed in Section 3.5. As noted in Table 3.5-1, wind, surface water, and biota (food chain uptake) are expected to be of low significance as transport mechanisms for COCs at this site. Degradation, transformation, and radiological decay of the COCs also are expected to be of low significance.

3.7.2.4 Scoping Risk-Management Decision

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

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4.0 RECOMMENDATION FOR CORRECTIVE ACTION COMPLETE WITHOUT CONTROLS DETERMINATION

4.1 Rationale

Based upon field investigation data and the human health and ecological risk assessment analyses, a determination of CAC without controls (NMED April 2004) is recommended for DSS SWMU 140 for the following reasons:

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

4.2 Criterion

Based upon the evidence provided in Section 4.1, a determination of CAC without controls (NMED April 2004) is recommended for DSS SWMU 140. This is consistent with the NMED's NFA 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 1998b).

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5.0 REFERENCES

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

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

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

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

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

DOE, see U.S. Department of Energy.

EPA, see U.S. Environmental Protection Agency.

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

Howard, P.H., 1993. Volume IV: "Solvents 2," *Handbook of Environmental Fate and Exposure Data for Organic Chemicals*, Lewis Publishers, Inc., Chelsea, Michigan.

IT, see IT Corporation.

IT Corporation (IT), March 1994. "Sampling and Analysis Plan for Shallow Subsurface Soil Sampling, RCRA Facility Investigation of Septic Tanks and Drainfields (OU 1295)," IT Corporation, Albuquerque, New Mexico.

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

Kocher, D.C. 1983. "Dose-Rate Conversion Factors for External Exposure to Photon Emitters in Soil," *Health Physics*, Vol. 28, pp. 193–205.

McDonald W.F. (New Mexico Environment Department/Hazardous Waste Bureau), August 2003. Personal communication to M.R. Sanders (Sandia National Laboratories/New Mexico) requiring the DSS Sampling and Analysis Plan protocol be followed for collecting additional VOC and cyanide samples at SWMU 140. August 6, 2003.

Micromedex, Inc., 1998. Hazardous Substances Databank.

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

National Council on Radiation Protection and Measurements (NCRP), 1987. "Exposure of the Population in the United States and Canada from Natural Background Radiation," *NCRP Report* No. 94, National Council on Radiation Protection and Measurements, Bethesda, Maryland.

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

NCRP, see National Council on Radiation Protection and Measurements.

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

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

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

New Mexico Environment Department (NMED), June 1999. "Request for Supplemental Information – Proposals for No Further Action, January 1997, 6th Round." New Mexico Environment Department, Santa Fe, New Mexico. June 9, 1999.

New Mexico Environment Department (NMED), February 2004. "Technical Background Document for Development of Soil Screening Levels, Revision 2," Hazardous Waste Bureau and Ground Water Quality Bureau Voluntary Remediation Program, New Mexico Environment Department, Santa Fe, New Mexico.

New Mexico Environment Department (NMED), April 2004. "Compliance Order on Consent Pursuant to New Mexico Hazardous Waste Act § 74-4-10," New Mexico Environment Department, Santa Fe, New Mexico. April 29, 2004.

NMED, see New Mexico Environment Department.

NOAA, see National Oceanographic and Atmospheric Administration.

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

ORNL, see Oak Ridge National Laboratory.

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

Sandia National Laboratories/New Mexico (SNL/NM) March 1993. "Septic Tanks and Drainfields (ADS-1295) RCRA Facility Investigation Work Plan," Sandia National Laboratories, Albuquerque, New Mexico.

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

Sandia National Laboratories/New Mexico (SNL/NM), January 1996. "Septic Tank Closure Book III: Logbook # 0147, November 8, 1995 to January 26, 1996," Environmental Restoration Project, Sandia National Laboratories, Albuquerque, New Mexico.

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

Sandia National Laboratories/New Mexico (SNL/NM), January 1997. "Proposal for No Further Action, Environmental Restoration Project Site 140, Building 9965 Septic System, Operable Unit 1295," Environmental Restoration Project, Sandia National Laboratories, Albuquerque, New Mexico.

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

Sandia National Laboratories/New Mexico (SNL/NM), September 1999. "Environmental Restoration Project Responses to NMED Request for Supplemental Information, No Further Action Proposals (6th Round) Dated January 1997," Environmental Restoration Project, Sandia National Laboratories, Albuquerque, New Mexico.

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

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

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

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

Sandia National Laboratories/New Mexico (SNL/NM), April 2004. "Fiscal Year 2003 Annual Groundwater Monitoring Report," Report #75-10077-6, Sandia National Laboratories, Albuquerque, New Mexico.

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

Tharp, T.L. (Sandia National Laboratories/New Mexico), February 1999. Memorandum to F.B. Nimick (Sandia National Laboratories/New Mexico), regarding Tritium Background Data Statistical Analysis for Site-Wide Surface Soils. February 25, 1999.

USAF, see U.S. Air Force.

U.S. Department of Energy (DOE), 1988. "External Dose-Rate Conversion Factors for Calculation of Dose to the Public," DOE/EH-0070, Assistant Secretary for Environment, Safety and Health, U.S. Department of Energy, Washington, D.C.

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

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

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

U.S. Environmental Protection Agency (EPA), 1988. "Federal Guidance Report No. 11, Limiting Values of Radionuclide Intake and Air Concentration and Dose Conversion Factors for Inhalation, Submersion, and Ingestion," Office of Radiation Programs, U.S. Environmental Protection Agency, Washington, D.C.

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

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

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

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

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

U.S. Environmental Protection Agency (EPA), 2002a. "Region 9 Preliminary Remediation Goals (PRGs) 2004," electronic database maintained by Region 9, U.S. Environmental Protection Agency, San Francisco, California.

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

U.S. Environmental Protection Agency (EPA), 2004a. Integrated Risk Information System (IRIS) electronic database, maintained by the U.S. Environmental Protection Agency, Washington, D.C.

U.S. Environmental Protection Agency (EPA), 2004b. "Region 6 Preliminary Remediation Goals (PRGs) 2004," electronic database maintained by Region 6, U.S. Environmental Protection Agency, Dallas, Texas.

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

Yu, C., A.J. Zielen, J.-J. Cheng, Y.C. Yuan, L.G. Jones, D.J. LePoire, Y.Y. Wang, C.O. Loureiro, E. Gnanapragasam, E. Faillace, A. Wallo III, W.A. Williams, and H. Peterson, 1993a. "Manual for Implementing Residual Radioactive Material Guidelines Using RESRAD," Version 5.0. Environmental Assessment Division, Argonne National Laboratory, Argonne, Illinois.

Yu, C., C. Loureiro, J.-J. Cheng, L.G. Jones, Y.Y. Wang, Y.P. Chia, and E. Faillace, 1993b. "Data Collection Handbook to Support Modeling the Impacts of Radioactive Material in Soil," ANL/EAIS-8, Argonne National Laboratory, Argonne, Illinois.

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ANNEX A
DSS SWMU 140
September 2003 Soil Sample Data Validation Results

RECORDS CENTER CODE: ____________

SMO ANALYTICAL DATA ROUTING FORM

PROJECT NAME: DSS-NFA
PROJECT/TASK: 7223_02.02.01
SNL TASK LEADER: Collins
ORG/MS/CF0#: 6133/1087/CF023-03
SMO PROJECT LEAD: Palencia
SAMPLE SHIP DATE: 9/8/2003

ARCOC	LAB	LAB ID	PRELIM DATE	FINAL DATE	EDD	EDD ON Q	Cust CD	RC CD
606785	GEL	87627		9/30/2003	X	X		

DATA PACKAGE TAT:		RUSH	X	NORMAL
CORRECTIONS REQUESTED BY/DATE:				
PROBLEM #/DATE CORRECTION RECEIVED:				
CVR COMPLETED BY/DATE:	L. Herrera		10.01.03	
FINAL TRANSMITTED TO/DATE:	M. Sanders		10.01.03	
SENT TO VALIDATION BY/DATE:	J. Conn		10/01/03	
REVISIONS REQUESTED/REVISIONS RECEIVED (DATE):				
VALIDATION COMPLETED BY/DATE:	KHL 10.23.03			
COPY TO WM BY/DATE:				
CD REQUESTED BY/DATE	J. Conn		10/01/03	
CD RECEIVED BY/DATE	J. Conn		10/05/03	
TO ERDMS OR RECORDS CENTER BY/DATE:	R. Kavanaugh		10/28/03	

COMMENTS:

Internal Lab

CONTRACT LABORATORY
ANALYSIS REQUEST AND CHAIN OF CUSTODY

AR/COC 606785

Batch No. N/A

Dept. No./Mail Stop:	6133/ MS *089
Project/Task Manager:	Dwight Stockham
Project Name:	140 Soil SPLG.
Record Center Code:	
Logbook Ref. No.:	
Service Order No.	CF032-03
Location	Tech Area
Building	Room

SMO Use

Date Samples Shipped:	9-8-03
Carrier/Waybill No.	26656
Lab Contact	Edie Kent/ (843) 769-7385
Lab Destination:	GEL
SMO Contact/Phone:	Doug Perry/(505) 845-0857
Send Report to SMO:	Wendy Palencia (505) 844-3132

Project/Task No. 7223 .02.07.03
SMO Authorization:
Contract #: PO21671 87627

Reference LOV(available at SMO) 872671

☐ Waste Characterization
-Send preliminary/copy report to:

☐ Released by COC No.:
☐ Validation Required

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

Sample No.-Fraction	ER Sample ID or Sample Location Detail	Pump Depth (ft)	ER Site No.	Date/Time(hr) Collected	Sample Matrix	Container Type	Container Volume	Preservative	Collection Method	Sample Type	Parameter & Method Requested	Lab Sample ID
063159-001	140-SP1-BH3-11.0-S	11	140	9-5-03/1200	S	SL	125 ml	None	SA	SA	VOCs	001
063159-002	140-SP1-BH3-11.0-S	11	140	9-5-03/1200	S	G	4 oz	None	SA	SA	CYANIDE	003
063161-001	140-SP1-BH3-16.0-S	16	140	9-5-03/1212	S	SL	125 ml	None	SA	SA	VOCs	002
063161-002	140-SP1-BH3-16.0-S	16	140	9-5-03/1212	S	G	4 oz	None	SA	SA	CYANIDE	004
063162-002	140-SP1-BH3-21.0-S	21	140	9-5-03/1225	S	G	4 oz	None	SA	SA	CYANIDE	005
063163-002	140-SP1-BH3-26.0-S	26	140	9-5-03/1250	S	G	4 oz	None	SA	SA	CYANIDE	006
063165-001	140-SP1-BH3-0.0-S	0	140	9-5-03/1255	L	G	3x40 ml	HCL	TB	TB	VOCs	87268 001
063166-001	140-SP1-BH3-0.0-S	0	140	9-5-03/1320	L	G	3x40 ml	HCL	EB	SA	VOCs	002
063166-002	140-SP1-BH3-0.0-S	0	140	9-5-03/1320	L	P	500 ml	NAOH	EB	EB	CYANIDE	003

RMMA ☐ Yes ☑ No Ref. No.
Sample Disposal ☐ Return to Client ☑ Disposal by lab
Turnaround Time ☐ 7 Day ☐ 15 Day ☑ 30 Day ☐ Negotiated TAT
Return Samples By:

Sample Tracking — Smo Use
Date Entered(mm/dd/yy)
Entered by:
QC inits.

Special Instructions/QC Requirements
EDD ☑ Yes ☐ No
Level D Package ☑ Yes ☐ No
*Send report to:
Mike Sanders/284-2478/ MS1089

*Please list as separate report.

Abnormal Conditions on Receipt

Lab Use
Temp 3

Sample Team Members

Name	Signature	Init	Company/Organization/Phone/Cellular
Jeff Lee	[signature]	JDL	Weston/6135/284-3309

	Org.	Date	Time		Org.	Date	Time
1. Relinquished by [signature]	6135	9/8/03	0850	4. Relinquished by			
1. Received by [signature]	6134	9/8/03	0850	4. Received by			
2. Relinquished by [signature]	6133	9/8/03	1130	5. Relinquished by			
2. Received by [signature]	GEL	9-9-03	0735	5. Received by			
3. Relinquished by				6. Relinquished by			
3. Received by				6. Received by			

Sample Finc)s Summary

Site: DSS-NFA **AR/COC:** 606785 **Data Type:** Organic & G. Chem

	67-67-1 (Acetone)
063165-001 / 140-SP1-BH3-0.0-S	UJ, P2
063166-001 / 140-SP1-BH3-0.0-S	J, P2

EPA8260B VOC: Flag other sample results "P2."

EPA9012A Cyanide: Analysis met QC acceptance criteria. No data will be qualified.

Validated By: Kevin A Lambert

Date: 10/23/03

Data Validation Qualifiers and Descriptive Flags*

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

Qualifiers	Comment
J	The associated value is an estimated quantity.
J1	The method requirements for sample preservation/temperature were not met for the sample analysis. The associated value is an estimated quantity.
J2	The holding time was exceeded for the associated sample analysis. The associated value is an estimated quantity.
UJ	The analyte was analyzed for but was not detected. The associated value is an estimate and may be inaccurate or imprecise.
U	The associated result is less than ten times the concentration in any blank and is determined to be non-detect. The analyte is a common laboratory contaminant.
U1	The associated result is less than five times the concentration in any blank and is determined to be non-detect.
R	The data are unusable for their intended purpose. The analyte may or may not be present. (Note: Resampling and reanalysis is necessary for verification.)

Descriptive Flags

A	Laboratory accuracy and/or bias measurements for the associated Laboratory Control Sample and/or duplicate (LCS/LCSD) do not meet acceptance criteria.
A1	Laboratory accuracy and/or bias measurements for the associated Surrogate Spike do not meet acceptance criteria.
A2	Laboratory accuracy and/or bias measurements for the associated Matrix Spike and/or duplicate (MS/MSD) do not meet acceptance criteria.
A3	Insufficient quality control data to determine laboratory accuracy.
B	Analyte present in laboratory method blank
B1	Analyte present in trip blank.
B2	Analyte present in equipment blank.
B3	Analyte present in calibration blank.
P	Laboratory precision measurements for the Laboratory Control Sample and duplicate (LCS/LCSD) do not meet acceptance criteria.
P1	Laboratory precision measurements for the Matrix Spike Sample and associated duplicate (MS/MSD) do not meet acceptance criteria
P2	Insufficient quality control data to determine laboratory precision.

* This is not a definitive list. Other qualifiers are potentially available, see TOP 94-03.

Updated: September 14, 1999

Beginning January 2000

Application of Data Validation Qualifiers to Data Tables

Laboratory Qualifier → Application to Data Tables

J → J (Reporting Limit)

U → ND (Detection Limit)

None → Detected concentration; See Data Validation Report

Laboratory Descriptive Flag

B → Analyte concentration; See Data Validation Report, analyte present in method blank

Data Validation Qualifier

J (Estimated quantity) → J*   * - See Data Validation Report

UJ (Analyzed for but not detected; associated value is an estimate and may be inaccurate or imprecise) → ND (Detection Limit J); See Data Validation Report

U (Analyzed for but not detected) → ND (Reporting Limit or Reported Value if > Reporting Limit); See Data Validation Report

R (Data unusable) → R*   * - See Data Validation Report

N (Presumptive evidence of the presence of the material) → Detected concentration(N); See Data Validation Report

NJ (Presumptive evidence of the presence of the material at an estimated quantity) → Detected concentration (NJ); See Data Validation Report

None (Data conforms to QC requirements) → Use Laboratory Qualifier

Note: Both the laboratory and data validation qualifiers are required to assure the data is correctly qualified. The descriptive flags are meant to assist the user in understanding the qualification of the data and in writing up the results of the data validation process. They are not for incorporation into the data tables.

Analytical Quality Associates, Inc.
616 Maxine NE
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Phone: 505-299-5201
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Email: minteer@aol.com

MEMORANDUM

DATE: October 23, 2003

TO: File

FROM: Kevin Lambert

SUBJECT: Inorganic Data Review and Validation – SNL
DSS-NFA, AR/COC No. 606785, SDG No. 87327/87628 (GEL), and Project/Task No. 7223.02.02.01

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

Summary

The samples were prepared and analyzed with accepted procedures using methods EPA9012A total cyanide. No problems were identified with the data package that result in the qualification of data.

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

Holding Times/Preservation

All samples were analyzed within the prescribed holding times and properly preserved for the applicable analyses.

Calibration

The initial and continuing calibration data met QC acceptance criteria for the applicable analyses.

Blanks

No target analytes were detected in the blanks for the applicable analyses.

Matrix Spike (MS)

The MS met QC acceptance criteria for the applicable analyses.

Replicate

The replicate met QC acceptance criteria for the applicable analyses.

Laboratory Control Sample (LCS)

The LCS met QC acceptance criteria for the applicable analyses. It should be noted that no LCSD was provided with the SDG. No data will be qualified as a result. Laboratory precision was assessed using the replicate, which met QC acceptance criteria.

Detection Limits/Dilutions

All detection limits were properly reported for the applicable analyses; no dilutions were required.

Other QC

An equipment blank (EB) was submitted on the ARCOC. No field blank (FB) or field duplicate pair was submitted on the ARCOC.

No other specific issues were identified which affect data quality.

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MEMORANDUM

DATE: October 23, 2003

TO: File

FROM: Kevin Lambert

SUBJECT: Organic Data Review and Validation – SNL
DSS-NFA, AR/COC No. 606785, SDG No. 87627/87628 (GEL), and Project/Task No. 7223.02.02.01

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

Summary

All samples were prepared and analyzed with accepted procedures using method EPA8260A/B VOC. All compounds were successfully analyzed. Problems were identified with the data package that result in the qualification of data.

1. VOC: For field QC samples, no MS/MSD or LCSD was run on the SDG. No measure of precision was provided and associated sample results will be flagged "P2" to indicate insufficient QC data to determine laboratory precision.

2. VOC: For field QC samples, the CCV %D for acetone (51%) was > 40% but ≤ 60%. Associated detects will be qualified "J" and non-detects (ND) will be qualified "UJ."

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

Holding Times

All samples were extracted and analyzed within the prescribed holding times and properly preserved for the applicable analyses.

Calibration

The initial calibration and continuing calibration data met QC acceptance criteria for the applicable analyses except as follows.

VOC: For field QC samples, the CCV %D for 2-butanone (25%) and vinyl acetate (30%) were > 20% but ≤ 40%. Associated sample results were ND and as a result based on professional judgment no data will be qualified.

VOC: For field samples, the calibration RF for trichloroethene (0.26) was < the specified minimum RF (0.30). However, the calibration RSD and CCV %D for trichloroethene met QC acceptance criteria. Associated sample results were non-detect (ND) and as a result based on professional judgment no data will be qualified. The CCV %D for acetone (33%), chloromethane (-23%), and vinyl acetate (24%) were > 20% but ≤ 40%. Associated sample results were ND and as a result based on professional judgment no data will be qualified.

Blanks

No target analytes were detected in the blanks for the applicable analyses except as follows.

VOC: Acetone was detected (≥ DL) in the equipment blank (EB). Associated sample results were ND and no data will be qualified as a result.

Surrogates

The surrogate recoveries met QC acceptance criteria for the applicable analyses.

Internal Standards

Internal standards data met QC acceptance criteria for the applicable analyses.

Matrix Spike/Matrix Spike Duplicate (MS/MSD)

The MS/MSD met QC acceptance criteria for the applicable analyses except as noted above in the summary section.

Laboratory Control Sample (LCS)

The LCS met QC acceptance criteria for the applicable analyses except as noted above in the summary section and as follows.

VOC: For field samples, it should be noted that no LCSD was provided with the SDG. Laboratory precision was assessed using the MS/MSD, which met QC acceptance criteria. No data will be qualified as a result.

Detection Limits/Dilutions

All detection limits were properly reported; no dilutions were required for the applicable analyses.

Other QC

A trip blank (TB) and equipment blank (EB) were submitted on the ARCOC. No field duplicate pair was submitted on the ARCOC.

No other specific issues were identified which affect data quality.

Data Validation Summary

Site/Project: DSS-NFA Project/Task #: 7223.02.02.01 # of Samples: 9 Matrix: 6 soil, 3 aqueous

AR/COC #: 606785 Laboratory Sample IDs: 87627-001 to -006 (Field Samples)

Laboratory: GEL 87628-001 to -003 (TB & EBs)

SDG #: 87627, 87628

QC Element	Analysis									
	Organics				Inorganics					
	VOC	SVOC	Pesticide/ PCB	HPLC (HE)	ICP/AES	GFAA/ AA	CVAA (Hg)	CN	RAD	Other
1. Holding Times/Preservation	✓							✓		
2. Calibrations	✓							✓		
3. Method Blanks	✓							✓		
4. MS/MSD	✓							✓		
5. Laboratory Control Samples	✓		N/A			N/A		✓		
6. Replicates								✓	N/A	
7. Surrogates	✓									
8. Internal Standards	✓									
9. TCL Compound Identification	✓									
10. ICP Interference Check Sample										
11. ICP Serial Dilution										
12. Carrier/Chemical Tracer Recoveries										
13. Other QC EB, TB	J, UJ, R2							✓		

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

Check (√) = Acceptable
Shaded Cells = Not Applicable (also "NA")
NP = Not Provided
Other: ______

Reviewed By: Kevin A Lambert Date: 10-23-03

Volatile Organics (SW 846 Method 8260)

Site/Project: DSS-NFA AR/COC #: 606785 # of Samples: 2 Matrix: aqueous

Laboratory: GEL SDG #: 87628 Laboratory Sample IDs: 87628-001 (TB) & -002 (EB)

Methods: EPA8260B (VOC) Batch #s: 276302

IS	CAS #	Name	TCL	Min. RF	Intercept	Calib. RF	Calib. RSD/ R^2	CCV %D ①	Method Blks	LCS	LCSD	LCS RPD	MS	MSD	MS RPD	Field Dup. RPD	Equip. Blanks	Trip Blanks		
						>.05	<20% / 0.99	20%												
1	71-55-6	1,1,1-trichloroethane	✓	0.10	NA	✓	✓	✓	✓											
2	79-34-5	1,1,2,2-tetrachloroethane	✓	0.30		✓	✓													
2	79-00-5	1,1,2-trichloroethane	✓	0.10		✓	✓													
1	75-34-3	1,1-dichloroethane	✓	0.10		✓	✓													
1	75-35-4	1,1-dichloroethene	✓	0.20		✓	✓			✓										
1	107-06-2	1,2-dichloroethane	✓	0.10		✓	✓													
~~1~~	~~540-59-0~~	~~1,2-dichloroethene(total)~~	✓	0.01		✓	✓													
1	78-87-5	1,2-dichloropropane	✓	0.01		✓	✓	✓												
1	78-93-3	2-butanone (MEK) (10xblk)	✓	0.01		✓	✓	25												
~~1~~	~~110-75-8~~	~~2-chloroethyl vinyl ether~~	✓			✓	✓	✓												
2	591-78-6	2-hexanone (MBK)	✓	0.01		✓	✓													
2	108-10-1	4-methyl-2-pentanone (MIBK)	✓	0.10		✓	✓	✓												
1	67-64-1	acetone(10xblk)	✓	0.01		✓	✓	51									NA			
1	71-43-2	benzene	✓	0.50		✓	✓	✓		✓	NA			NA						
1	75-27-4	bromodichloromethane	✓	0.20		✓	✓													
3	75-25-2	bromoform	✓	0.10		✓	✓													
1	74-83-9	bromomethane	✓	0.10		✓	✓													
1	75-15-0	carbon disulfide	✓	0.10		✓	✓													
1	56-23-5	carbon tetrachloride	✓	0.10		✓	✓													
2	108-90-7	chlorobenzene	✓	0.50	✓	✓	✓			✓										
1	75-00-3	chloroethane	✓	0.01	✓	✓	✓													
1	67-66-3	chloroform	✓	0.20	NA	✓	✓													
1	74-87-3	chloromethane	✓	0.10		✓	✓													
1	10061-01-5	cis-1,3-dichloropropene	✓	0.20		✓	✓													
2	124-48-1	dibromochloromethane	✓	0.10		✓	✓													
2	100-41-4	ethylbenzene	✓	0.10	✓	✓	✓													
1	75-09-2	methylene chloride (10xblk)	✓	0.01	✓	✓	✓													
2	100-42-5	styrene	✓	0.30	NA	✓	✓													
2	127-18-4	tetrachloroethene	✓	0.20		✓	✓													
2	108-88-3	toluene(10xblk)	✓	0.40		✓	✓			✓										
2	10061-02-6	trans-1,3-dichloropropene	✓	0.10		✓	✓													
1	79-01-6	trichloroethene	✓	0.30		✓	✓			✓										
1	75-01-4	vinyl chloride	✓	0.10		✓	✓													
2	1330-20-7	xylenes(total)	✓	0.30		✓	✓	✓												
	108-05-4	vinyl acetate	✓		✓	✓	✓	30	✓											

156-59-2 cis-1,2-dichloroethene

156-60-5 trans-1,2-dichloroethene

Comments: NA - Not Applicable **Notes:** Shaded rows are RCRA compounds.

Note: No measure of precision provided, data will be flagged "P2" to indicate insufficient QC data to determine Lab precision

Reviewed By: Kevin A Lambert Date: 10-23-03

Volatile Organics (SW 846 Method 8260)

Site/Project: DSS-NFA AR/COC #: 606785 # of Samples: 2 Matrix: soil

Laboratory: GEL SDG #: 87627 Laboratory Sample IDs: 87627-001 & -002

Methods: EPA8260A(VOC) Batch #s: 276471/276473

154-59-2 cis-1,2-dichloroethene

156-60-5 trans-1,2-dichloroethene

IS	CAS #	Name	TCL	Min. RF	Intercept	① Calib. RF	Calib. RSD/ R^2	② CCV %D	Method Blks	LCS	LCSD	LCS RPD	MS	MSD	MS RPD	Field Dup. RPD	③ Equip. Blanks	Trip Blanks		
						>.05	<20% / 0.99	20%												
1	71-55-6	1,1,1-trichloroethane	✓	0.10	NA	✓	✓	✓	✓							NA	✓	✓		
2	79-34-5	1,1,2,2-tetrachloroethane	✓	0.30		✓	✓													
2	79-00-5	1,1,2-trichloroethane	✓	0.10		✓	✓													
1	75-34-3	1,1-dichloroethane	✓	0.10		✓	✓													
1	75-35-4	1,1-dichloroethene	✓	0.20		✓	✓			✓			✓	✓	✓					
1	107-06-2	1,2-dichloroethane	✓	0.10		✓	✓													
1	~~540-59-0~~	~~1,2-dichloroethene(total)~~	✓	0.01		✓	✓													
1	78-87-5	1,2-dichloropropane	✓	0.01		✓	✓													
1	78-93-3	2-butanone (MEK) (10xblk)	✓	0.01		✓	✓													
1	~~110-75-8~~	~~2-chloroethyl vinyl ether~~	✓			✓	✓													
2	591-78-6	2-hexanone (MBK)	✓	0.01		✓	✓													
2	108-10-1	4-methyl-2-pentanone (MIBK)	✓	0.10	✓	✓	✓	✓									✓			
1	67-64-1	acetone(10xblk)	✓	0.01	✓	✓	✓	33									4.95 J			
1	71-43-2	benzene	✓	0.50	NA	✓	✓	✓		✓	NA		✓	✓	✓					
1	75-27-4	bromodichloromethane	✓	0.20		✓	✓													
3	75-25-2	bromoform	✓	0.10		✓	✓													
1	74-83-9	bromomethane	✓	0.10		✓	✓													
1	75-15-0	carbon disulfide	✓	0.10		✓	✓													
1	56-23-5	carbon tetrachloride	✓	0.10		✓	✓													
2	108-90-7	chlorobenzene	✓	0.50		✓	✓			✓			✓	✓	✓					
1	75-00-3	chloroethane	✓	0.01		✓	✓													
1	67-66-3	chloroform	✓	0.20		✓	✓	✓												
1	74-87-3	chloromethane	✓	0.10		✓	✓	-23												
1	10061-01-5	cis-1,3-dichloropropene	✓	0.20		✓	✓	✓												
2	124-48-1	dibromochloromethane	✓	0.10		✓	✓													
2	100-41-4	ethylbenzene	✓	0.10	✓	✓	✓													
1	75-09-2	methylene chloride (10xblk)	✓	0.01	✓	✓	✓													
2	100-42-5	styrene	✓	0.30	NA	✓	✓													
2	127-18-4	tetrachloroethene	✓	0.20		✓	✓													
2	108-88-3	toluene(10xblk)	✓	0.40		✓	✓			✓			✓	✓	✓					
2	10061-02-6	trans-1,3-dichloropropene	✓	0.10		✓	✓													
1	79-01-6	trichloroethene	✓	0.30		0.26	✓			✓			✓	✓	✓					
1	75-01-4	vinyl chloride	✓	0.10		✓	✓													
2	1330-20-7	xylenes(total)	✓	0.30	✓	✓	✓	✓												
	108-05-4	vinyl acetate	✓		✓	✓	✓	24	✓							✓	✓	✓		

Comments: NA-Not Applicable Notes: Shaded rows are RCRA compounds.

Reviewed By: Kevin A Lambert Date: 10-23-03

① The Calib RF for trichloroethene was < the specified min RF, RSD & CCV %D met QC criteria, Associated sample results were ND and as a result based on professional judgment NO data will be qualified

Volatile Organics

Site/Project: ______ AR/COC #: 606785 Batch #s: 276471/276473

Laboratory: ______ SDG #: 87627 # of Samples: 2 Matrix: soil

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

Sample	SMC 1	SMC 2	SMC 3	IS 1 area	IS 1 RT	IS 2 area	IS 2 RT	IS 3 area	IS 3 RT
		Met				Met			
		Criteria							
						Criteria			

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

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

Comments:

(2) The CCV %D for acetone, chloromethane, & vinyl acetate were > 20 but < 40. Associated sample results were ND and as a result based on professional judgment NO data will be qualified.

(3) Acetone was detected in the EB. Associated sample results were ND. No data will be qualified as a result.

General Chemistry

Site/Project: DSS-NFA AR/COC #: 606785

Laboratory: GEL SDG #: 87627, ~~86~~ 87628 KH

Methods: EPA9012A (CN)

\# of Samples: 5 Matrix: 1 aqueous, 4 soil

Laboratory Sample IDs: 87628-003 (EB)
87627-003 to -006 (Field Sample)

Batch #s: 276311/276312A (EB), 276314/276315 (Field Sample)

	CAS #	Analyte	QC Element: TAL	ICV	CCV	ICB	CCB	Method Blanks	LCS	LCSD	LCSD RPD	MS	MSD	MSD RPD	Rep. RPD	ICS AB	Serial Dilution	Field Dup. RPD	Equip. Blanks	Field Blanks	
276312	5455-70-0	Total CN	✓	✓	✓	✓	✓	✓	✓	NA	NA	✓	NA	NA	✓	NA	NA	NA	NA	NA	
276315	5455-70-0	Total CN	✓	✓	✓	✓	✓	✓	✓	NA	NA	✓	NA	NA	✓	NA	NA	NA	✓	NA	

Comments: NA - Not Applicable

Reviewed By: Kevin A Lambert Date: 10-23-03

Contract Verification Review (CVR)

Project Leader: Collins | Project Name: DSS-NFA | Case No. 7223_02.02.01

AR/COC No. 606785 | Analytical Lab: GEL | SDG No. 87627

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

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

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

2.0 Analytical Laboratory Report

Line No.	Item	Complete? Yes	Complete? No	If no, explain	Resolved? Yes	Resolved? No
2.1	Data reviewed, signature	X				
2.2	Method reference number(s) complete and correct	X				
2.3	QC analysis and acceptance limits provided (MB, LCS, Replicate)	X				
2.4	Matrix spike/matrix spike duplicate data provided (if requested)	X				
2.5	Detection limits provided: PQL and MDL (or IDL), MDA and L_c	X				
2.6	QC batch numbers provided	X				
2.7	Dilution factors provided and all dilution levels reported	X				
2.8	Data reported in appropriate units and using correct significant figures	X				
2.9	Radiochemistry analysis uncertainty (2 sigma error) and tracer recovery (if applicable) reported	N/A				
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				

Contract Verification Review (Continued)

3.0 Data Quality Evaluation

Item	Yes	No	If no, Sample ID No./Fraction(s) and Analysis
3.1 Are reporting units appropriate for the matrix and meet contract specified or project-specific requirements? Inorganics and metals reported as ppm (mg/liter or mg/Kg)? Tritium reported in picocuries per liter with percent moisture for soil samples? Units consistent between QC samples and sample data	X		
3.2 Quantitation limit met for all samples	X		
3.3 Accuracy			
a) Laboratory control samples accuracy reported and met for all samples	X		
b) Surrogate data reported and met for all organic samples analyzed by a gas chromatography technique	X		
c) Matrix spike recovery data reported and met	X		
3.4 Precision			
a) Replicate sample precision reported and met for all inorganic and radiochemistry samples	X		
b) Matrix spike duplicate RPD data reported and met for all organic samples	X		
3.5 Blank data a) Method or reagent blank data reported and met for all samples	X		
b) Sampling blank (e.g., field, trip, and equipment) data reported and met		X	Acetone detected in VOC equipment blank (063166-001)
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	N/A		
3.8 Narrative included, correct, and complete	X		
3.9 Second column confirmation data provided for methods 8330 (high explosives) and 8082 (pesticides/PCBs)	N/A		

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	N/A		
b) Continuing calibration provided	N/A		
c) Instrument run logs provided	N/A		
4.3 Inorganics (metals)			
a) Initial calibration provided	N/A		
b) Continuing calibration provided	N/A		
c) ICP interference check sample data provided	N/A		
d) ICP serial dilution provided	N/A		
e) Instrument run logs provided	N/A		
4.4 Radiochemistry			
a) Instrument run logs provided	N/A		

Contract Verification Review (Concluded)

5.0 Problem Resolution

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

Sample/Fraction No.	Analysis	Problems/Comments/Resolutions

Were deficiencies unresolved? Yes No

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

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

Reviewed by: [signature] Date: 10/01/03 Closed by: ____________ Date: ________

ANNEX B
DSS SWMU 140
Exposure Pathway Discussion for Chemical and Radionuclide Contamination

ANNEX B
EXPOSURE PATHWAY DISCUSSION FOR CHEMICAL AND RADIONUCLIDE CONTAMINATION

Introduction

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

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

At SNL/NM, all SWMUs exist within the boundaries of the Kirtland Air Force Base. Approximately 240 potential waste and release sites have been identified where hazardous, radiological, or mixed materials may have been released to the environment. Evaluation and characterization activities have occurred at all of these sites to varying degrees. Among other documents, the SNL/NM ER draft Environmental Assessment (DOE 1996) presents a summary of the hydrogeology of the sites and the biological resources present. When evaluating potential human health risk the current or reasonably foreseeable land use negotiated and approved for the specific SWMU/AOC, aggregate, or watershed will be used. The following references generally document these land uses: *Workbook: Future Use Management Area 2 (DOE et al. September 1995); Workbook: Future Use Management Area 1 (DOE et al. October 1995); Workbook: Future Use Management Areas 3, 4, 5, and 6 (DOE and USAF January 1996); Workbook: Future Use Management Area 7 (DOE and USAF March 1996)*. At this time, all SNL/NM SWMUs have been tentatively designated for either industrial or recreational future land use. The NMED has also requested that risk calculations be performed based upon a residential land-use scenario. Therefore, all three land-use scenarios will be addressed in this document.

The SNL/NM ER Project has screened the potential exposure routes and identified default parameter values to be used for calculating potential intake and subsequent hazard index (HI), excess cancer risk and dose values. The EPA (EPA 1989) provides a summary of exposure routes that could potentially be of significance at a specific waste site. These potential exposure routes consist of:

- Ingestion of contaminated drinking water
- Ingestion of contaminated soil

- Ingestion of contaminated fish and shellfish
- Ingestion of contaminated fruits and vegetables
- Ingestion of contaminated meat, eggs, and dairy products
- Ingestion of contaminated surface water while swimming
- Dermal contact with chemicals in water
- Dermal contact with chemicals in soil
- Inhalation of airborne compounds (vapor phase or particulate)
- External exposure to penetrating radiation (immersion in contaminated air; immersion in contaminated water; and exposure from ground surfaces with photon-emitting radionuclides)

Based upon the location of the SNL/NM SWMUs and the characteristics of the surface and subsurface at the sites, we have evaluated these potential exposure routes for different land-use scenarios to determine which should be considered in risk assessment analyses (the last exposure route is pertinent to radionuclides only). At SNL/NM SWMUs, there is currently no consumption of fish, shellfish, fruits, vegetables, meat, eggs, or dairy products that originate on site. Additionally, no potential for swimming in surface water is present due to the high-desert environmental conditions. As documented in the RESRAD computer code manual (ANL 1993), risks resulting from immersion in contaminated air or water are not significant compared to risks from other radiation exposure routes.

For the industrial and recreational land-use scenarios, SNL/NM ER has, therefore, excluded the following five potential exposure routes from further risk assessment evaluations at any SNL/NM SWMU:

- Ingestion of contaminated fish and shellfish
- Ingestion of contaminated fruits and vegetables
- Ingestion of contaminated meat, eggs, and dairy products
- Ingestion of contaminated surface water while swimming
- Dermal contact with chemicals in water

That part of the exposure pathway for radionuclides related to immersion in contaminated air or water is also eliminated.

Based upon this evaluation, for future risk assessments the exposure routes that will be considered are shown in Table 1.

Table 1
Exposure Pathways Considered for Various Land-Use Scenarios

Industrial	Recreational	Residential
Ingestion of contaminated drinking water	Ingestion of contaminated drinking water	Ingestion of contaminated drinking water
Ingestion of contaminated soil	Ingestion of contaminated soil	Ingestion of contaminated soil
Inhalation of airborne compounds (vapor phase or particulate)	Inhalation of airborne compounds (vapor phase or particulate)	Inhalation of airborne compounds (vapor phase or particulate)
Dermal contact (nonradiological constituents only) soil only	Dermal contact (nonradiological constituents only) soil only	Dermal contact (nonradiological constituents only) soil only
External exposure to penetrating radiation from ground surfaces	External exposure to penetrating radiation from ground surfaces	External exposure to penetrating radiation from ground surfaces

Equations and Default Parameter Values for Identified Exposure Routes

In general, SNL/NM expects that ingestion of compounds in drinking water and soil will be the more significant exposure routes for chemicals; external exposure to radiation may also be significant for radionuclides. All of the above routes will, however, be considered for their appropriate land-use scenarios. The general equation for calculating potential intakes via these routes is shown below. The equations are taken from "Assessing Human Health Risks Posed by Chemicals: Screening-Level Risk Assessment" (NMED March 2000) and "Technical Background Document for Development of Soil Screening Levels" (NMED December 2000). Equations from both documents are based upon the "Risk Assessment Guidance for Superfund" (RAGS): Volume 1 (EPA 1989, 1991). These general equations also apply to calculating potential intakes for radionuclides. A more in-depth discussion of the equations used in performing radiological pathway analyses with the RESRAD code may be found in the RESRAD Manual (ANL 1993). RESRAD is the only code designated by the U.S. Department of Energy (DOE) in DOE Order 5400.5 for the evaluation of radioactively contaminated sites (DOE 1993). The Nuclear Regulatory Commission (NRC) has approved the use of RESRAD for dose evaluation by licensees involved in decommissioning, NRC staff evaluation of waste disposal requests, and dose evaluation of sites being reviewed by NRC staff. EPA Science Advisory Board reviewed the RESRAD model. EPA used RESRAD in their rulemaking on radiation site cleanup regulations. RESRAD code has been verified, undergone several benchmarking analyses, and been included in the International Atomic Energy Agency's VAMP and BIOMOVS II projects to compare environmental transport models.

Also shown are the default values SNL/NM ER will use in RME risk assessment calculations for industrial, recreational, and residential land-use scenarios, based upon EPA and other governmental agency guidance. The pathways and values for chemical contaminants are discussed first, followed by those for radionuclide contaminants. RESRAD input parameters that are left as the default values provided with the code are not discussed. Further information relating to these parameters may be found in the RESRAD Manual (ANL 1993) or by directly accessing the RESRAD websites at: http://web.ead.anl.gov/resrad/home2/ or http://web.ead.anl.gov/resrad/documents/.

Generic Equation for Calculation of Risk Parameter Values

The equation used to calculate the risk parameter values (i.e., hazard quotients/HI, excess cancer risk, or radiation total effective dose equivalent [TEDE] [dose]) is similar for all exposure pathways and is given by:

Risk (or Dose) = Intake x Toxicity Effect (either carcinogenic, noncarcinogenic, or radiological)

= C x (CR x EFD/BW/AT) x Toxicity Effect (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):

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

where:

I_s = Intake of contaminant from soil inhalation (mg/kg-day)
C_s = Chemical concentration in soil (mg/kg)
IR = Inhalation rate (cubic meters [m^3]/day)
EF = Exposure frequency (days/year)
ED = Exposure duration (years)
VF = soil-to-air volatilization factor (m^3/kg)
PEF = particulate emission factor (m^3/kg)
BW = Body weight (kg)
AT = Averaging time (period over which exposure is averaged) (days)

Soil Dermal Contact

$$D_a = \frac{C_s * CF * SA * AF * ABS * EF * ED}{BW * AT}$$

where:

D_a = Absorbed dose (mg/kg-day)
C_s = Chemical concentration in soil (mg/kg)
CF = Conversion factor (1E-6 kg/mg)
SA = Skin surface area available for contact (cm^2/event)
AF = Soil to skin adherence factor (mg/cm^2)
ABS = Absorption factor (unitless)
EF = Exposure frequency (events/year)

ED = Exposure duration (years)
BW = Body weight (kg)
AT = Averaging time (period over which exposure is averaged) (days)

Groundwater Ingestion

A receptor can ingest water by drinking it or through using household water for cooking. An estimate of intake from ingesting water will be calculated as follows (EPA August 1997):

$$I_w = \frac{C_w * IR * EF * ED}{BW * AT}$$

where:

I_w = Intake of contaminant from water ingestion (mg/kg/day)
C_w = Chemical concentration in water (mg/liter [L])
IR = Ingestion rate (L/day)
EF = Exposure frequency (days/year)
ED = Exposure duration (years)
BW = Body weight (kg)
AT = Averaging time (period over which exposure is averaged) (days)

Groundwater Inhalation

The amount of a constituent taken into the body via exposure to volatilization from showering or other household water uses will be evaluated using the concentration of the constituent in the water source (EPA 1991 and 1992). An estimate of intake from volatile inhalation from groundwater will be calculated as follows (EPA 1991):

$$I_w = \frac{C_w * K * IR_i * EF * ED}{BW * AT}$$

where:

I_w = Intake of volatile in water from inhalation (mg/kg/day)
C_w = Chemical concentration in water (mg/L)
K = volatilization factor (0.5 L/m^3)
IR_i = Inhalation rate (m^3/day)
EF = Exposure frequency (days/year)
ED = Exposure duration (years)
BW = Body weight (kg)
AT = Averaging time (period over which exposure is averaged—days)

For volatile compounds, volatilization from groundwater can be an important exposure pathway from showering and other household uses of groundwater. This exposure pathway will only be evaluated for organic chemicals with a Henry's Law constant greater than $1x10^{-5}$ and with a molecular weight of 200 grams/mole or less (EPA 1991).

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

Summary

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

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

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

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

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

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

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

References

ANL, see Argonne National Laboratory.

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

DOE, see U.S. Department of Energy.

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

EPA, see U.S. Environmental Protection Agency.

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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