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Justification for Class III Permit Modification SWMU 37 Operable Unit 1306 Proto Oil Spill

Sandia National Laboratories/NM

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Justification for Class III Permit Modification

April 2001

SWMU 37
Operable Unit 1306
PROTO Oil Spill

NFA Originally Submitted June 1996
NOD Originally Submitted July 1998

Environmental Restoration Project

United States Department of Energy
Albuquerque Operations Office

Justification for Class III Permit Modification

April 2001

Solid Waste Management Unit 37
Operable Unit 1306

(RCRA Permit No. NM5890110518)

NFA Originally Submitted June 1996
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1.0 INTRODUCTION

1.1 Site Background

The Sandia National Laboratories/New Mexico (SNL/NM) Environmental Restoration (ER) Project is chartered with the assessment and cleanup of inactive waste sites at its facilities. This document presents the results of the Resource Conservation and Recovery Act (RCRA) Facility Investigation (RFI) of the SNL/NM sites within Technical Areas III and V (TA-III/V). The sites were identified during a preliminary assessment/site investigation (PA/SI) (DOE 1987) as potential areas of concern or as solid waste management units (SWMUs) as a result of past practices in TA-III/V. Detailed descriptions of these sites are found in the TA-III/V RFI Work Plan (SNL/NM 1993a, 1993b). The purpose of the RFI was to determine the presence or absence of contamination at each of the TA-III/V ER sites.

Sandia Corporation, a subsidiary of Lockheed Martin Corporation, operates SNL/NM as a prime contractor to the U.S. Department of Energy (DOE), which owns SNL/NM. SNL/NM conducts research, development, design, and testing of nuclear and conventional weapons, energy systems, and other programs. Figure 1-1 identifies SNL/NM and its technical areas in relation to Kirtland Air Force Base (KAFB) and the city of Albuquerque, and several surrounding physical features. TA-III/V were established in 1953 for testing weapons components in a variety of natural and simulated environments. TA-III/V are located approximately 6 kilometers (km) south of the main laboratories and offices known as Technical Area I (TA-I) (Figure 1-1).

1.2 RFI Work Plan Overview and Objectives

This RFI has been conducted in accordance with the U.S. Environmental Protection Agency (EPA)-approved TA-III/V RFI Work Plan (SNL/NM 1993a) and its amendment (SNL/NM 1993b). A total of 19 sites in TA-III/V were originally identified as requiring investigation. Varying levels of investigation were conducted at all sites originally identified in the RFI Work Plan. Table 1-1 provides a summary of the sites, their status, and the field investigations conducted at each site and Figure 1-2 shows the location of each site.

Sites were classified as active and inactive, based on use at the time of this RFI. Both active and inactive sites were investigated but full investigation and remediation of active sites was postponed until facility decommissioning. Two sites that were originally grouped together in the Work Plan were subdivided based on physical separation and difference in historical activities: Site 18 was divided into Site 18 (Concrete Pad) and Site 241 (Storage Yard); Site 83 was divided into Site 83 (Long Sled Track) and Site 240 (Short Sled Track).

The objectives of the RFI were to identify the nature and extent of contamination at sites within TA-III/V, evaluate potential risks posed by the contamination, and provide guidance for selecting remedial alternatives. The objective of this RFI report is to document and transmit this information to all stakeholders, including SNL/NM, the DOE, the EPA, the New Mexico Environment Department (NMED), and the general public.

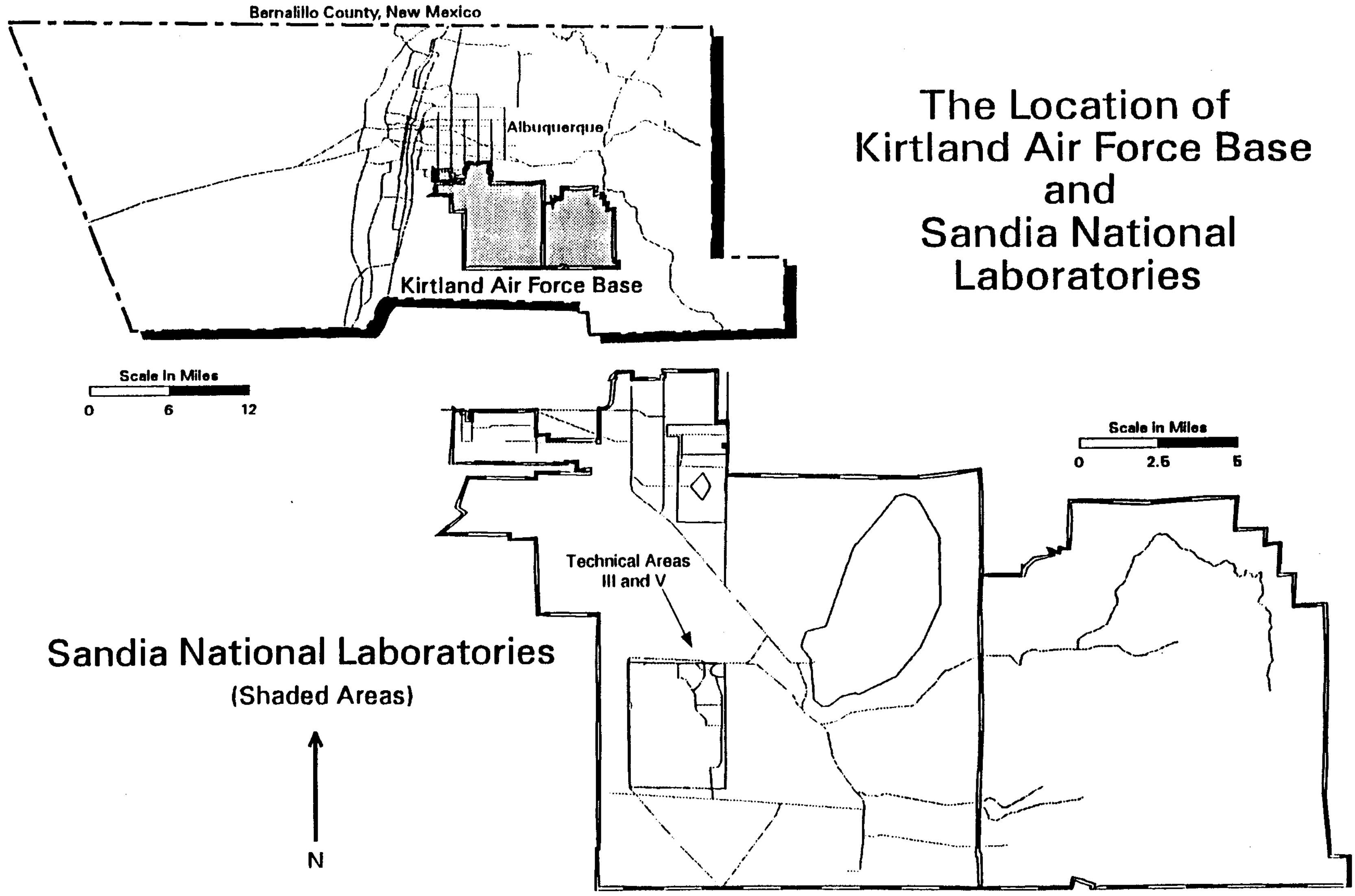


Figure 1-1 Location of Technical Areas III and V at Sandia National Laboratories, Albuquerque

Table 1-1
Summary of Environmental Restoration Sites Within Technical Areas III and V

Site Number	Site Name	Location	Areal Extent	Potential Contaminants[a]/ Detected During RFI?	Period of Operation (Status)	Sampling Method and Date	Total Samples	Field Screen Samples	Off-Site Analyses	Notes[b]
18	Concrete Pad	Central TA-III; South of Short Sled Track.	125 ft by 400 ft	Metals/Yes Radionuclides/Yes HEs/No Oil/Yes PCBs/Yes	1979 - present (Active).	Phase I: Surface, 04/27/94.	43	43	12	Rad. VCM completed. Extent of contamination defined for metals, PCBs, and TPH.
						Phase II: Auger, 01/24/95.	13	13	9	VCM planned.
26	Burial Site	West TA-III; West of Long Sled Track.	145 acres	Metals/NA[c] Radionuclides/Yes	Prior to 1989 (Inactive). Co-located with active Long Sled Track.	NA	NA	NA	NA	Geophysics done; found potential burials. These to be investigated with Site 83. Proposed for NFA.
31	Transformer Oil Spill	Central TA-III; Centrifuge Facility.	20 ft by 20 ft	Oil/No PCBs/No	1971 - present (Active).	Surface, 03/29/94.	11	3	11	No COCs above background. Proposed for NFA.
34	Centrifuge Oil Spill	Central TA-III; Centrifuge Facility.	90-ft diameter	Oil/No	1955 - present (Active).	Shallow subsurface, 05/20/95.	18	18	10	No COCs above background. Proposed for NFA.
35	Vibration Facility Oil Spill	Central TA-III.	20 ft by 50 ft	Oil/Yes PCBs/No	1955 - present (Active).	Phase I: Surface, 04/15/94.	4	0	4	Extent of oil defined. Proposed for NFA.
						Phase II: Shallow subsurface, 06/29/94.	13	13	4	

[a] Contaminants as follows: HEs = high explosives; PCBs = polychlorinated biphenyls; VOCs = volatile organic compounds.

[b] VCM = Voluntary Corrective Measure; TPH = Total petroleum hydrocarbons; NFA = No Further Action; COC = constituent of concern.

[c] NA = Not applicable. These sites were not sampled during the RCRA Facility Investigation (RFI); see Notes column.

Table 1-1
Summary of Environmental Restoration Sites Within Technical Areas III and V (Continued)

Site Number	Site Name	Location	Areal Extent	Potential Contaminants[a]/ Detected During RFI?	Period of Operation (Status)	Sampling Method and Date	Total Samples	Field Screen Samples	Off-Site Analyses	Notes[b]
36	HERMES Oil Spill	Central TA-V; North of Bldg 6596.	1 acre	Oil/Yes VOCs/Yes	1968 - 1989 (Inactive).	Phase I: Shallow subsurface, 07/6/94.	28	28	11	No oil detected in shallow subsurface. Defined extent of oil and VOCs. Proposed for NFA.
						Phase II: Drilling, 03/10/95.	40	40	36	
37	PROTO Oil Spill	Central TA-V; East of Bldg 6597.	1 acre	Oil/No	1978 - 1989 (Inactive).	Auger, 06/9/94.	23	23	8	No COCs above background. Proposed for NFA.
51	Bldg 6924 Pad, Tank, Pit	Southeast TA-III; Northwest of Site 241.	1/2 acre	Metals/Yes HEs/No VOCs/No	1963 - 1990 (Inactive).	Excavation, 09/6/94.	5	4	5	No COCs above background. Proposed for NFA.
78	Gas Cylinder Disposal Pit	Southeast TA-III; East of Chemical Waste Landfill.	80 ft by 180 ft	Toxic, corrosive, reactive, and flammable gases/Yes Radionuclides/Yes Metals/Yes HEs/Yes	1963 - 1984 (Inactive).	Phase I: Excavation - Radioactive.	94	386	91	Health and safety and geophysics surveys. Began VCM 07/94; finished 02/95.
						Phase I: Excavation - Chemical.	94	37	186	Detected chromium, thorium, gases, and reactive chemicals.
						Phase II: Gas analyses.	97	0	97	
						Phase II: Reactive chemicals.	32	32	0	No off-site analysis of reactive chemicals was feasible.
						Phase III: Confirmatory shallow subsurface.	20	0	20	No COCs above background during Phase III. Proposed for NFA.

[a] Contaminants as follows: HEs = high explosives; PCBs = polychlorinated biphenyls; VOCs = volatile organic compounds.

[b] VCM = Voluntary Corrective Measure; TPH = Total petroleum hydrocarbons; NFA = No Further Action; COC = constituent of concern.

[c] NA = Not applicable. These sites were not sampled during the RCRA Facility Investigation (RFI); see Notes column.

Table 1-1
Summary of Environmental Restoration Sites Within Technical Areas III and V (Continued)

Site Number	Site Name	Location	Areal Extent	Potential Contaminants[a]/ Detected During RFI?	Period of Operation (Status)	Sampling Method and Date	Total Samples	Field Screen Samples	Off-Site Analyses	Notes[b]
83	Long Sled Track	West TA-III boundary.	350 acres	Metals/NA[c] HEs/NA Radionuclides/Yes	1966 - present (Active).	Surface, 04/15/94.	6	0	6	Minor surface sampling done. Rad. VCM completed. Full RFI when site deemed inactive.
84	Gun Facilities	West-central TA-III; East of Long Sled Track.	2 acres	Metals/NA HEs/NA Radionuclides/Yes	1965 - present (Active).	NA	NA	NA	NA	Rad. VCM completed. Full RFI when site deemed inactive.
100	Bldg 6620 Drain/Sump	Central TA-III, immediately southeast of Short Sled Track.	25 ft by 60 ft	Metals/NA HEs/NA	1958 - unknown (Inactive).	Exploratory trenching, 07/25/94.	0	0	0	Site not located during RFI. Proposed for NFA.
102	Radioactive Disposal Area	East of TA-V.	155 acres	Radionuclides/No	Unknown - 1967 (Inactive).	Excavation, 07/25/94.	3	0	3	Rad. survey done. No COCs above background. Proposed for NFA.
105	Mercury Spill at Bldg 6536	North-central TA-III.	20 ft by 20 ft	Mercury/NA	1972 - 1985 (Inactive).	Document search.	NA	NA	NA	Administrative NFA approved July 1995.
107	Explosives Test Area	Southeast TA-III; West of Chemical Waste Landfill.	25 acres	Metals/No HEs/No Nitrate and nitrite/No Radionuclides/No	1953 - 1972 (Inactive).	Surface, 05/17/94.	11	11	11	No COCs above background. Proposed for NFA. Future site of TU-CAMU.

[a] Contaminants as follows: HEs = high explosives; PCBs = polychlorinated biphenyls; VOCs = volatile organic compounds.
[b] VCM = Voluntary Corrective Measure; TPH = Total petroleum hydrocarbons; NFA = No Further Action; COC = constituent of concern.
[c] NA = Not applicable. These sites were not sampled during the RCRA Facility Investigation (RFI); see Notes column.

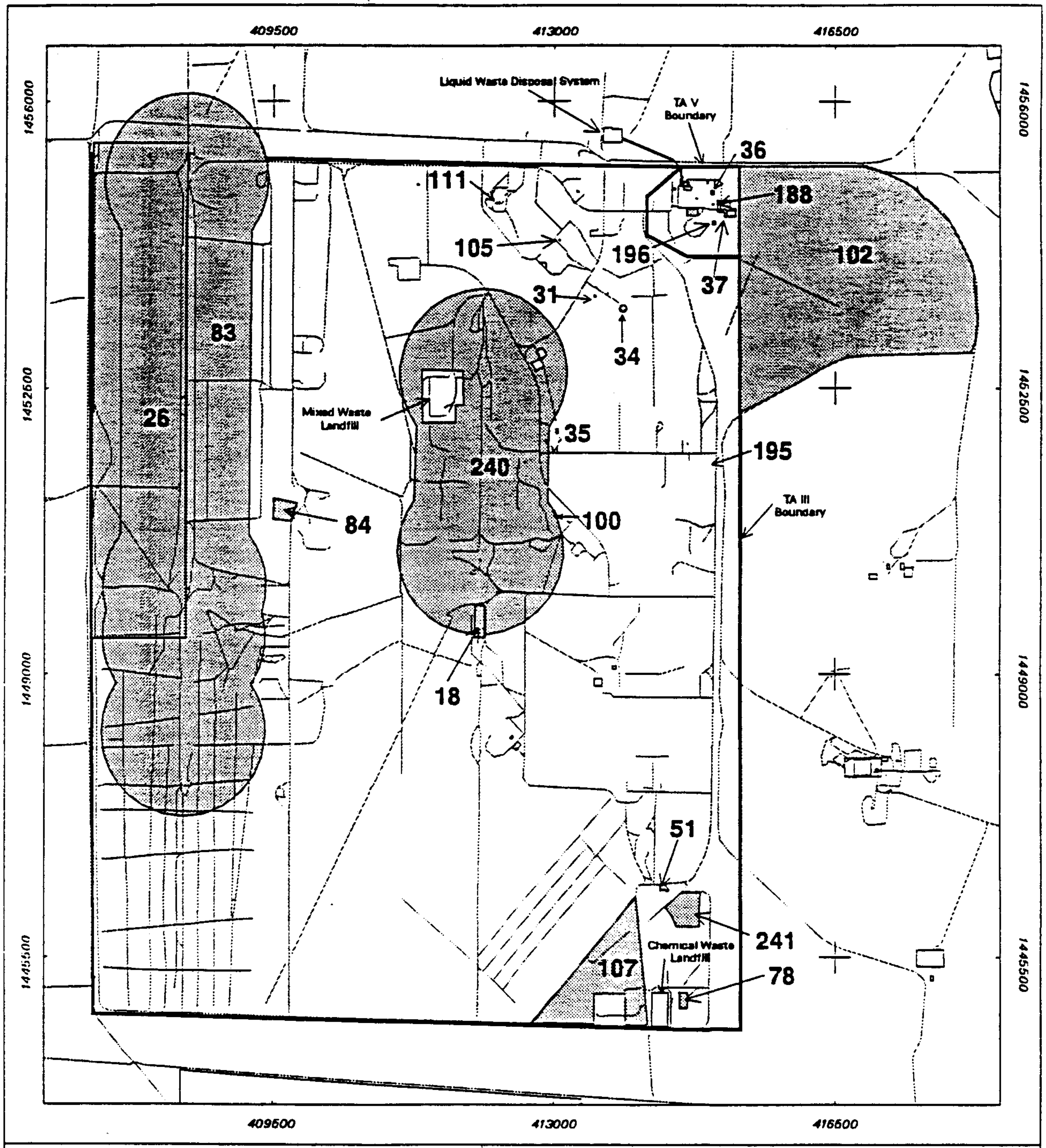
Table 1-1
Summary of Environmental Restoration Sites Within Technical Areas III and V (Concluded)

Site Number	Site Name	Location	Areal Extent	Potential Contaminants[a]/ Detected During RFI?	Period of Operation (Status)	Sampling Method and Date	Total Samples	Field Screen Samples	Off-Site Analyses	Notes[b]
111	Bldg 6715 Sump/Drain	North-central TA-III.	20 ft by 20 ft	Silver/No HEs/No VOCs/No	1971 - 1988 (Inactive).	Shallow subsurface, 06/17/94.	10	9	4	No COCs above background. Proposed for NFA.
188	Bldg 6597 Aboveground Spill Contain.	TA-V; co-located with Site 37.	15 ft by 25 ft	Used oil/NA[c]	1983 - 1986 (?) (Inactive).	Aerial photographs; confirmatory sampling.	37	22	22	Administrative NFA approved July 1995 - water tanks.
195	Experimental Test Pit	East-central TA-III.	6 ft by 6 ft	Cobalt-60/NA	1955 - 1956 (Inactive).	Document search.	NA	NA	NA	Administrative NFA approved July 1995.
196	TA-V Cistern	South TA-V; West of Bldg 6597.	25-ft diameter	Metals/Yes Oil/Yes VOCs/No	Unknown - 1989 (Inactive).	Phase I: Sludge sampling, 06/27/94 and 10/10/94.	4	3	1	Defined extent of metals in soil. No VOCs or PCBs. Proposed for NFA.
						Phase II: Excavation, 05/95.	2	0	2	
						Phase III: Auger, 06/5/95.	26	26	3	
240	Short Sled Track	Central TA-III.	160 acres	Metals/Yes HEs/No Radionuclides/Yes	1951 - 1966 (Inactive).	Surface, 06/13/94 and 06/22/94.	201	40	40	Rad. VCM completed. Detected rad. and lead.
241	Storage Yard	Southeast TA-III, North of Site 78.	3 acres	Metals/Yes HEs/No Radionuclides/No	1953 - 1994 (Inactive).	Surface, 05/24/94.	29	29	16	Defined extent of lead. Proposed for NFA.

[a] Contaminants as follows: HEs = high explosives; PCBs = polychlorinated biphenyls; VOCs = volatile organic compounds.

[b] VCM = Voluntary Corrective Measure; TPH = Total petroleum hydrocarbons; NFA = No Further Action; COC = constituent of concern.

[c] NA = Not applicable. Thzese sites were not sampled during the RCRA Facility Investigation (RFI); see Notes column.



Legend

▨ **TA-III/V ER Sites**

☐ **Technical Area Boundary**

— **Roads**

Buildings, Elevation Contours and Drainages not shown.

Sandia National Laboratories, New Mexico
Environmental Restoration Geographic Information System

Figure 1-2
ER Sites within
Technical Areas III/V

0 1000 2000
Scale in Feet

0 240 480
Scale in Meters

Unclassified

FINAL

1:24000

Transverse Mercator Projection, New Mexico State Plane Coordinate System, Central Zone
1927 North American Horizontal Datum, 1929 North American Vertical Datum

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This RFI report consists of an executive summary, an introduction, a discussion of the Sampling and Analysis Program, descriptions of investigations conducted at individual sites, Voluntary Corrective Measures (VCMs) conducted at several sites, a summary and conclusion, a list of references, and supporting documentation in several appendices.

1.3 Facility Setting

SNL/NM consists of 2,820 acres of research laboratories and office facilities entirely contained within the 52,223-acre confines of KAFB (Figure 1-1). KAFB is bounded on the north and northwest by the city of Albuquerque, on the east by the Cibola National Forest, on the south by the Isleta Indian Reservation, and on the west by land owned by the State of New Mexico, the KAFB buffer zones, and the Albuquerque International Airport. Cibola National Forest access is controlled by the U.S. Forest Service (USFS) and is restricted within the buffer zones on the southwest corner of the base and within the Isleta Indian Reservation.

KAFB is located on a high, arid mesa (mean elevation of 5,350 feet [ft]) approximately 5 miles (mi) east of the Rio Grande. The mesa is cut by Tijeras Arroyo, which runs east-west and ultimately drains into the Rio Grande. The east side of KAFB is bounded by the southern end of the Sandia Mountains and the Manzanita Mountains. Most of the area is relatively flat, although the eastern portions of KAFB and SNL/NM extend into the Manzanita Mountains where some of the terrain is precipitous, rough, and cut by numerous arroyos (ERDA 1977).

1.4 Climate

The climate for SNL/NM is typical of high altitude, dry continental climates with a normal daily winter temperature range of 23 degrees Fahrenheit (°F) to 52°F and a normal daily summer temperature range of 57°F to 91°F (Bonzon et al. 1974). The average annual precipitation for the Albuquerque area is 8.54 inches (in.), and most rain occurs in the summer months (Williams 1986). Wind speeds seldom exceed 32 miles per hour (mph) but strong east winds, often accompanied by blowing dust, can occur (Bonzon et al. 1974).

1.5 Geology

The Albuquerque-Belen structural basin is one of the largest north- to south-trending basins in the Rio Grande Rift. The basin is a compound graben measuring 90 mi long and 30 mi wide, bordered by uplifted fault blocks to the east and west (Bjorklund and Maxwell 1961). The eastern boundary is marked by the Sandia, Manzanita, and Manzano mountains. The western side of the basin is bounded by the Lucero uplift, with the Ladron Mountains to the south and minor physiographic relief on the northwest side of the basin.

During the Miocene and Pliocene epochs, erosion from the surrounding highlands filled the Albuquerque Basin with up to 10,000 ft of sediments. This sequence of sediments is called the Santa Fe Group and consists of debris flows and channel, floodplain, and aeolian deposits; the Santa Fe Group thins toward the edges of the basin and is truncated by the bounding uplifts. The Santa Fe Group sediments are interbedded with Tertiary and Quaternary basalts and pyroclastics, and are overlain in places by the Pliocene-age Ortiz gravel deposits and Rio Grande fluvial deposits (Bjorklund and Maxwell 1961).

1.6 Soil Characteristics

According to the Bernalillo County Soil Survey (USDA 1977), soils in TA-III/V consist of the Tijeras Series. The Tijeras Series is a deep, well-drained soil formed in decomposed granitic alluvium on old alluvial fans. The surface layer is a 4-in.-thick, brown, gravelly, sandy loam. The subsoil consists of 15 in. of brown, sandy loam, with some accumulation of calcium carbonate in the lower part. Below 19 in. is a pale brown, very gravelly, loamy sand extending to a depth of 5 ft. The gravel is angular and derived from granite (USDA 1977).

The Tijeras Series is a level to gently sloping soil (0 to 5 percent) subject to moderate runoff and water erosion. Permeability is moderate, with an available water capacity of 0.10 to 0.16 in. This soil is moderately alkaline and the effective rooting depth is 5 ft deep or more (USDA 1977).

1.7 Hydrogeology

The Rio Grande flows in a southerly direction and is the primary surface drainage feature in the Albuquerque-Belen Basin. In the basin, the ground-water system is controlled by the Rio Grande and its floodplain, tributary inflow, mountain front runoff, and recharge.

The principal aquifer in the area occurs in the unconsolidated and semiconsolidated sands, gravels, silts, and clays of the Santa Fe Group. The aquifer is generally unconfined, although semiconfined conditions may exist locally because of discontinuous, lenticular silt and clay-rich deposits.

Beneath KAFB, the regional aquifer generally flows toward the Rio Grande at an average gradient of approximately 10 ft/mi; however, local perturbations in the water table exist near municipal wells and as a result of lithologic and structural controls. Prior to extensive development of the regional aquifer by the city of Albuquerque and KAFB, the predominant ground-water flow direction in the SNL/NM KAFB area was west-southwest (Bjorklund and Maxwell 1961); however, pumping by the city of Albuquerque and KAFB has substantially affected the natural ground-water flow regime (Reeder et al. 1967; Kues 1987). The production wells have a substantial effect on the hydraulic gradient in the area, creating a depression in the potentiometric surface in the northern portion of KAFB. U.S. Geological Survey (USGS) projections indicate that, by the end of the century, the water table in the Albuquerque area will drop an estimated 30 to 50 ft from 1989 levels (Reeder et al. 1967).

Major structural controls on the local flow regime are in the form of a complex assemblage of faults along the margin of the basin. These fault systems include the Manzano, Hubbell Springs, Sandia, and Tijeras faults, all of which are expressed within a zone 1.5 mi east of TA-V. The specific impact of local faulting on ground-water flow is largely unknown; however, the Tijeras and Hubbell Springs faults may control ground-water movement. It has been postulated that travertine deposition (precipitation of calcium carbonate from solution in ground water) within fault fractures has reduced permeabilities such that the faults act as barriers to ground-water movement. Springs have been observed along the fault alignments, and there is a shallow water table east of the faults. The primary regional aquifer, the valley fill, underlies KAFB west of the Hubbell Springs fault at a depth of 400 to 600 ft and east of the fault at a depth of 50 to 150 ft (DOE 1987).

The primary source of ground water in the TA-III/V area is the unconsolidated and semiconsolidated sedimentary deposits of the basin-fill aquifer. A relatively thick unsaturated zone of approximately 460 ft overlies the Santa Fe Group deposits. The basin-fill aquifer underlying TA-III/V is recharged primarily by inflow from the mountain areas to the east. Recharge resulting from direct infiltration of precipitation is inferred to be minor because of high surface coverage, high evaporation, low precipitation, and an extensive vadose zone.

Based on water levels measured in monitoring wells near the Liquid Waste Disposal System (LWDS) in TA-V and near the Chemical Waste Landfill (CWL) and MWL in TA-III, the depth to ground water is approximately 480 to 490 ft below ground surface (bgs) in TA-III/V. Water levels measured in all wells in TA-III indicate the general ground-water flow direction is west-northwest.

2.0 SAMPLING AND ANALYSIS PROGRAM

The sampling and analysis program for the sites in TA-III/V followed standard EPA procedures for sample collection (EPA 1987a), quality assurance/quality control (QA/QC) protocols (EPA 1987b, 1980), and statistical analysis (EPA 1992a). Each of these is discussed in the following sections.

2.1 Field Methods

Field investigations at the ER sites within TA-III/V followed phased approaches according to those proposed in the RFI Work Plan (SNL/NM 1993a, 1993b), except at six sites. Field conditions dictated that methods other than those specified in the Work Plan be used at Sites 34, 36, 78, 102, 111, and 196. Deviations from the Work Plan are noted in the individual descriptions of site activities (Sections 6.0, 8.0, 11.0, 15.0, 18.0, and 21.0).

The methods of investigation used during the TA-III/V RFI included the following:

- Aerial photograph analysis and ground-truthing;
- Nonintrusive geophysical investigations;
- Radiological surveying and scrap/debris removal;
- Surface soil sampling;
- Shallow subsurface soil sampling and deep subsurface soil sampling; and
- Trenching and excavation.

Protocols for sampling and analysis at SNL/NM followed the methodologies in the ER Project Quality Assurance Project Plan (QAPjP) and Operating Procedures (OPs) developed specifically for the ER Project. A complete list of OPs used during this project is provided in Table 2-1. Although much of the field work was done before the formal issuance of the SNL/NM ER OPs, activities were conducted in accordance with generally accepted practices and professional experience and judgment (i.e., American Society for Testing and Materials [ASTM] procedures, best engineering practices, and draft OPs), which ultimately formed the basis of the final OPs. All work was conducted following the requirements of site-specific Health and Safety Plans (HASPs), which are available for review in the Environmental Operations Records Center (EORC).

The following activities were conducted at the sites noted:

- Aerial photographic interpretation—all sites;

- Geophysical surveys—Sites 26, 78, and 84;

- Radiation surveys and associated removal of radioactive anomalies—Sites 18, 83, 84, 102, 240, and 241;

Table 2-1
Sandia National Laboratories/New Mexico Environmental Restoration Project Operating Procedures Applicable to Technical Areas III and V RFI Work

Operating Procedure (OP) Number	Title
AOP 94-40	ER Project Site Posting and Security
FOP 94-01	Safety Meetings, Inspections, and Pre-Entry Briefings
FOP 94-05	Borehole Lithologic Logging
FOP 94-22	Deep Soil Gas Sampling
FOP 94-23	Hand Auger and Thin-Wall Tube Sampler
FOP 94-25	Documentation of Field Activities
FOP 94-26	General Equipment Decontamination
FOP 94-27	Thin-Walled Tube Sampling of Soils
FOP 94-28	Health and Safety Monitoring of Organic Vapors (Flame Ionization Detector [FID] and Photoionization Detector [PID])
FOP 94-30	Health and Safety Monitoring of Combustible Gas Levels
FOP 94-34	Field Sample Management and Custody
FOP 94-38	Drilling Methods and Drill Site Management
FOP 94-39	Excavating Methods
FOP 94-40	Test Pit Logging, Mapping, and Sampling
FOP 94-52	Spade and Scoop Method for Collection of Soil Samples
FOP 94-57	Decontaminating Drilling and Other Field Equipment
FOP 94-68	Field Change Control
FOP 94-69	Personnel Decontamination (Level D, C & B Protection)
FOP 94-71	Land Surveying
FOP 94-78	Environmental Restoration Project Waste Management and Characterization Procedure
FOP 94-81	Establishment and Management of Less-Than-90-Day Accumulation Areas for Environmental Restoration Project Sites
FOP 95-23	Shallow Subsurface Drilling and Soil Sampling Using Mechanized Hydraulic Augers or the Geoprobe® Soil Core Sampler

Source: SNL/NM (1995a).

- Sampling of surface soils—Sites 18, 31, 35, 78, 107, 240, and 241;
- Subsurface sampling using augers, a hydraulic probe, or a full-size drill rig—Sites 18, 34, 35, 36, 37, 78, and 111;
- Trenching, excavation, and other cleaning—Sites 51, 78, 100, 102, 196, and 241; and
- Voluntary removal actions or cleanups (excluding the radiological removals)—Site 78.

Further investigation of Sites 26, 83, 84, and 240 (active sites) will be postponed until site decommissioning in the future. Site 26 is proposed in this RFI report (Section 4.0) to be combined with Site 83 for future investigation. No schedule for decommissioning or corrective action at these sites has been identified at this time.

Two VCMs were conducted during the course of the RFI. One was performed to survey and remove radiological constituents at the six sites listed above; details of this VCM are provided in Section 24.0. The second was performed at Site 78 to remove gas cylinders and mitigate health and safety hazards; the details of this VCM are provided in Section 11.0.

Subsurface and ground-water investigations conducted at the neighboring LWDS in TA-V are detailed in the RFI report submitted for that site in September 1995 (SNL/NM 1995b). Because no ground-water investigations were conducted during the TA-III/V RFI, the LWDS RFI report should be consulted for information on this subject. Reports on the ongoing investigation at the CWL in TA-III also should be consulted for ground-water information.

2.1.1 Aerial Photograph Analysis and Ground-Truthing

An examination of aerial photographs was conducted to locate possible additional ER sites within TA-III/V and to gather supplemental data on existing sites. Aerial photographs from 1973 to 1990 were assembled and digitized using an Arc/Info Geographic Information System (GIS) and were used to produce a set of year-specific overlays. A base photographic image was combined with the year-specific overlays to illustrate the changes in surface features over time (Plate I). All of the sites were evaluated within 1,000 ft of the site boundaries (unless noted otherwise) for signs of soil disturbance, vegetation changes, or new construction. Surface features were grouped into eight categories including cleared or disturbed surface, concrete pad, landfill, pile, possible excavation, tank/concrete target, trench, and unknown. An attempt was made to further subcategorize features, but no additional or valuable information was revealed.

After the aerial photograph interpretation was completed, ground-truthing (field verification) was performed to determine whether the interpretations were valid. Field personnel inspected the suspect areas for evidence of potential site impacts; e.g., cleared or disturbed surfaces were located to within 10 ft of the area seen on the photographs and were examined for signs of burning, scraping, or blading for road or facility construction, and were validated as such. In a few instances, revegetation and cultural activities did not permit the unequivocal verification of features identified in early photographs. Site-specific discussions of the aerial photograph interpretation are included in each site section.

2.1.2 Nonintrusive Geophysical Investigations

Nonintrusive electromagnetic (EM) conductivity (metal detection) and vertical-gradient magnetometer surveys were conducted at ER Sites 26, 78, and 84 to locate any potential subsurface objects. The sites were gridded to detect objects of a certain size and are listed below.

- Site 26, Northern Portion—Locate and map any objects equivalent to or larger than two 55-gallon (gal.) drums buried at a depth of 5 ft.

- Site 26, Southern Portion—Locate and map any objects equivalent to or larger than one 55-gal. drum buried at a depth of 5 ft.

- Site 78—Locate and map subsurface concentrations of metal, particularly cylinders with dimensions of 12 in. by 2 in.

- Site 84—Locate major fragments of depleted uranium (DU), lead, and metallic materials larger than 3 in. by 3 in. buried to a depth of 1.5 ft; and significant burials equivalent to a 5-gal. bucket buried to a depth of 3 ft.

Wooden stakes and plastic pin flags were used to delineate the traverse spacings. Electromagnetic data were gathered using a Geonics Ltd.^{TM} EM-61 high-precision metal detector; magnetic data were gathered using a Geometrics^{TM} G-856-AX proton precession magnetometer deployed in the vertical mode. A brief description of each follows.

The EM-61 generates EM pulses by passing a current through a 1-square-meter (m^2) coil. These pulses penetrate the subsurface and briefly induce secondary EM fields; soil has relatively low conductivity, and the secondary fields dissipate rapidly. Buried metallic objects have essentially infinite conductivity when compared to soil, and their secondary fields persist much longer. The EM-61 measures the strength of the secondary fields during the "off time" between the primary pulses. The measurement is delayed until the response from the soil has dissipated and only the response of buried metal is present. The secondary EM fields are measured by a 1-m^2 main sensor which is coincident with the transmitter coil, and by a second focusing coil positioned 40 centimeters (cm) above the main coil. Each sensor coil measures the secondary field strength during a time period between the primary pulses. Two sensor coils are used to allow differentiation between shallow objects and deeper objects. The EM-61 was deployed in the trailer mode, towed on wheels behind the operator, with data acquisition triggered by the wheel approximately every 20 cm.

The G-856-AX consists of two magnetic sensors mounted on the same vertical staff separated by a known distance. The instrument generates a pulse and registers the difference in time for the return magnetic pulse to be recorded by the top and bottom sensors. This difference is then converted to a standard reading. The G-856-AX was held vertically, and moved along the traverse manually, from grid node to grid node. Data acquisition was performed manually or programmed to be collected at regular intervals (every few seconds [sec]).

2.1.3 Surface Radiological Survey and Scrap/Debris Removal

Nonintrusive surface radiological surveys were performed at 64 sites at SNL/NM including six sites within TA-III/V, as part of a coordinated facility-wide assessment and removal VCM. Surveys were conducted in a manual sweep pattern using a line of five to six 2-in. by 2-in. sodium iodide (NaI) detectors optimized to detect DU. Gridded areas were surveyed by technicians in straight traverses, each covering a 6-ft-wide swath.

A list of radioactive anomalies (both point and area sources) at each site was compiled. After the surveys were complete, all the point sources and the majority of the area sources were removed by hand and placed in a container. Subsequent to the removal action, soil samples were collected to confirm effective cleanup. Brief discussions of results are included in the individual site sections, and a more detailed description of the radiological surveys conducted at the sites within TA-III/V that were suspected of exhibiting radioactive soil contamination is provided in Section 24.0.

2.1.4 Surface Soil Sampling

Surface soil samples were collected from a depth of 0 to 1 ft bgs using a stainless-steel trowel and bowl. All sampling equipment was cleaned between samples using dry decontamination methods (i.e., paper towels, brushing, etc.) where possible or rinsed with distilled water. Sample location coordinates are provided in Appendix A.

2.1.5 Shallow Subsurface Soil Sampling

Shallow subsurface soil sampling was accomplished using either hand or power augers or a small-diameter hydraulic probe. Discussions of these techniques follow.

Auger Sampling

Augering using a hand bucket or power auger and thin-walled stainless-steel samplers was generally performed at sites where sampling depth was a maximum of 10 ft bgs. Soil augering was performed to a predetermined depth approximately 6 in. above the level to be sampled, and the bucket auger was extracted. Loose soil was removed, and a separate sampling auger was used to collect the sample. All augering and sampling equipment was cleaned between sample locations using dry decontamination methods where possible or rinsed with distilled water.

Small-Diameter Boring

At sites where augering techniques would not attain the desired depths (generally greater than 10 ft bgs), a vehicle-mounted, hydraulically powered soil probing machine that uses static force and a percussion hammer was utilized to advance small-diameter sampling tools into the subsurface to collect soil samples to 30 ft bgs. The unit used was manufactured by Geoprobe^{TM}. The probe produced no drill cuttings and obtained samples through probe holes of 1 to 1.5 in. diameter with typical penetration rates of 1 to 2 ft per minute.

Small quantities of soil were obtained by driving the probe to a predetermined depth, disengaging an expendable drive point at the target depth and pulling back 3 to 6 in. on the probe rods, and then redriving the hollow rods. The end of the rod was filled with soil cut from the wall of the hole.

2.1.6 Deep Subsurface Sampling

Drilling was conducted at Site 36 using an air rotary casing hammer rig to drill to depths of greater than 300 ft bgs. A more detailed discussion of the drilling and sampling procedures used at the site is included with the Site 36 activity description in Section 8.0.

2.1.7 Excavation and Trenching

Excavation, trenching, and cleanouts were accomplished using a backhoe, trackhoe, clamshell, or front-end loader at several sites. Details of the excavations and cleanouts are provided in the individual site sections for Sites 51, 78, 100, 102, 196, and 241.

2.2 Field Screening and On-Site Laboratory Analysis Methods

Where feasible, field screening was conducted on approximately 100 percent of the collected soil samples from all sites investigated in TA-III/V. At least 20 percent of these were submitted for confirmatory analysis at an EPA-approved Contract Laboratory Program (CLP) laboratory (Section 2.3). The field screening data for each site are included in Appendix B. Discussions of the following field-screening methods used during the RFI are included in subsequent sections:

- Photoionization detection (PID) and flame ionization detection (FID) of volatile organic compounds (VOCs);
- Soil vapor detection of VOCs;
- Thermal desorption detection of mineral oil;
- Immunoassay detection of polychlorinated biphenyls (PCBs) and high explosives (HEs);
- X-ray fluorescence (XRF) analysis of metals;
- Direct current plasma (DCP) and inductively coupled plasma (ICP) analysis of metals; and
- Gamma spectroscopic analysis of radionuclides.

2.2.1 Photoionization Detection and Flame Ionization Detection of Volatile Organic Compounds

Screening for VOCs in the field was generally accomplished using hand-held PIDs and FIDs. The units used were manufactured by HNU and Foxboro. Soil samples were placed in a glass jar, sealed, agitated, and warmed to allow volatile constituents to develop in the headspace of the jar. The PID or FID sample probe was placed in the headspace, where a sample of vapor was drawn into a chamber, ionized, and interpreted by the instrument. The low sample rate allowed for only very localized readings. Monitoring for health and safety levels was also performed during drilling activities at 5-ft intervals downhole, as well as in the breathing zone. Where elevated organic vapor levels were encountered, monitoring was performed continuously in the breathing zone. The instrument calibrations and readings were recorded in the field logbook.

2.2.2 Soil Vapor Analysis

Soil samples were collected for on-site analysis of soil vapor for the presence of VOCs during drilling activities at Site 36 and were immediately transported to the TA-III ER Field Laboratory for analysis. Soil vapors were collected by polyethylene tubing connected to a glass bulb using a pump under vacuum.

Soil vapor analyses were conducted by purging a 500-milliliter (mL) gas bulb for 20 minutes (min) with helium onto a trap and desorbing the trap onto a gas chromatograph equipped with a mass selective detector (MSD). Purging the entire contents of the sample bulb allowed attainment of lower detection levels for the sensitive soil vapor analysis. All analyses were performed on an HP 5972 MSD with an HP 5890 Series II plus gas chromatograph. EPA Methods 8240/8260 (EPA 1986) procedures were used for calibration and quantitation. The target analyte list (TAL) for EPA Method 8240 was used. For heavily contaminated soils, a smaller aliquot of gas was subsampled from the 500-mL bulb.

2.2.3 Thermal Desorption/Gas Chromatography

SNL/NM ER personnel conducted an investigation of available technologies to locate an alternative heavy-end total petroleum hydrocarbon (TPH) field-screening technique that was more reliable than the Hanby Method. Neither the Hanby Method nor field screening using immunoassay kits was effective because neither is sensitive to the nonaromatic High Energy Radiation Megavolt Electron Source (HERMES) transformer oil (discussed below). As a response to these ineffective screening methods, SNL/NM developed a technique that employs thermal desorption/gas chromatography (TD/GC) to rapidly quantify non-PCB-containing transformer oil in soil.

The transformer oil used at the HERMES-II facility is primarily a mixture of aliphatic and alicyclic hydrocarbons, and contains no significant quantities of EPA-regulated hazardous constituents as manufactured (e.g., PCBs or VOCs). Indeed, any appreciable amount of VOCs in the dielectric oil would have significantly altered the insulating properties of the oil. The boiling point for the mineral oil ranges from approximately 120 degrees Celsius (°C) to 365°C; its relatively low volatility makes it undetectable by real-time field monitoring instruments such as PIDs and FIDs, which rely on volatilization of contaminants at ambient conditions.

TD/GC has been used to characterize fuel-contaminated soils (i.e., those containing volatile and/or semivolatile constituents) and soils containing PCBs (Goldsmith 1994). The technique utilizes the direct injection of organic contaminants from soil onto a GC column, avoiding the use of environmentally harmful solvents. The method detection limit (MDL) is 10 milligrams per kilogram (mg/kg). The low MDL is a result of direct sample analysis without the potential dilution problems associated with sample preparation. Method sensitivity is also enhanced by analysis of the soil sample within hours of field collection, which minimizes potential storage loss and cross-contamination.

TD/GC analyses for mineral oil were performed using an SRI Model 8610 GC equipped with a TD oven and a manual sampling valve. The system was equipped with an FID that was used for the detection and quantitation of the oil after it had passed through the TD/GC sequence. An aliquot of soil (approximately 1.0 gram [g]) was placed in the desorption chamber for 1 min at 325°C to vaporize organic constituents. The vapors were then swept onto the GC column for separation. A relatively nonpolar megabore capillary column (J&W Scientific, DB-5, 8 ft by 0.53 millimeter [mm]) was used for constituent separation and quantitation. A five-point calibration curve was generated by spiking clean sand with a mixture of HERMES oil in toluene (10 to 500 mg/kg). The curve was linear with a correlation coefficient of $r^2 = 0.998$. TPH in soil was quantified by "pattern recognition" using the total area under the distinctive mineral oil chromatogram. An external standard (dodecane) was added to determine sample matrix interference and injection efficacy. QA samples included replicate analyses for every 10 samples and a mid-range calibration check standard prior to daily sample analyses, after every 20 samples, or at the end of a 12-hour (hr) period.

2.2.4 Immunoassay Tests for Polychlorinated Biphenyls and High Explosives

Immunoassay tests for chemical constituents are based on the antibody response of mammalian immune systems to the introduction of chemical contaminants. To produce the desired antibodies in the kit, predetermined concentrations of specific chemicals are introduced into a test animal, causing the animal's immune system to produce antibodies to that chemical. Antibodies are extracted, separated, purified, and encapsulated for test kits. The antibodies in the test kits respond to varying concentrations of chemical compounds by giving varying responses. The test kits for PCBs and HEs, both manufactured by EnSys Inc., are discussed below.

PCBs

The protocol for PCB test kits conforms to SW-4020, immunoassay-based field screening for PCBs in soil. Detection limits range from 400 microgram per kilogram (µg/kg) for Aroclors 1254 and 1260 (prevalent Aroclors in dielectric fluids at SNL/NM) to 1, 2, 4, and 4 mg/kg for Aroclors 1248, 1242, 1016, and 1232, respectively. The test is specific to PCBs and has no anticipated interferences. The field test is positively biased for PCBs. Rigorous testing against lab-GC SW-8080 (prior to commercial availability of the test kit) resulted in false negatives in less than 1 percent of field tests performed. When testing samples, the method requires standard replicate analysis with each environmental sample analyzed; the relative standard deviation must be within ±20 percent, or the sample analysis will be repeated.

HEs

The field test kit for HE conforms to proposed SW-8515 for field screening for trinitrotoluene (TNT) in soil and can detect TNT, dinitrotoluene (DNT) isomers, and trinitrobenzene at concentrations of approximately 1 mg/kg in soil as measured by colorimetric reaction. The test is positively biased for HEs. Prior to commercialization of the test kit, false negatives were identified by SW-8515 in less than one percent of the field samples.

2.2.5 X-Ray Fluorescence

XRF was conducted using a Spectrace® 6000 Spectrometer. XRF is a whole-rock quantitation method for analyzing concentrations of elemental metals in environmental samples. Characteristic X-ray spectra are emitted when a specimen is irradiated with a beam of sufficiently short wavelength X-radiation. Standard reference materials of the National Institute of Standards and Testing (NIST) are used to verify the accuracy of the calibration. XRF can analyze metals with detection limits of 10 to 60 mg/kg. XRF is a nondestructive method for analyzing environmental samples and generates no waste; samples are dried and ground prior to analysis. XRF was used during sampling activities as a field-screening tool for metals to direct the sampling for off-site laboratory analyses.

2.2.6 Direct Current Plasma/Inductively-Coupled Plasma

DCP and ICP elemental analyses for metals concentrations were conducted in accordance with SW-6010A using a Leeman PS 1000 sequential ICP. Soil samples were prepared by microwave-assisted acid digestion (EPA Methods 3051 and 6010 QA requirements). An aerosolized sample is introduced into a plasma of argon gas, producing characteristic spectra.

2.2.7 Mercury Analysis

Soil samples were analyzed for mercury content following EPA SW-7471A, "Mercury in Solid or Semisolid Waste (Manual Cold-Vapor Technique)" (EPA 1994). The instruments used were a Leeman AP200 Automated Mercury Preparation System and a Leeman PS200 Automated Mercury Analyzer. A 0.1-g aliquot of soil was used for sample preparation and analysis. The practical limit of quantitation (PLQ) was 0.3 µg/kg.

2.2.8 Gamma Spectroscopy

All soil samples collected from areas suspected to be impacted by radioactive compounds were screened for radiological constituents using gamma spectroscopy. In some instances, these screens were mandatory to allow samples to be shipped to an off-site laboratory for chemical analysis. In other cases, the only analysis of the samples was the gamma spectroscopy.

Soil samples were collected in 500-mL Marinelli beakers, sealed, swiped, and counted in the field for loose, surface, radioactive contamination. Upon completion of the field check, the samples were transported to the SNL/NM 7715 laboratory for fixed gamma spectroscopic analysis.

The equipment used by the SNL/NM 7715 laboratory consists of a Canberra high purity germanium (HPGE) detector shielded by 4 in. of lead lined with cadmium and copper sheets. Twelve samples in Marinelli beakers can be run unattended using an autosampler. A typical sample is counted for 600 sec. Peaks generated during the gamma spectroscopy are matched against a user-defined library to identify individual radionuclides. Laboratory control sample (LCS) analyses are performed for americium-241, cesium-137, and cobalt-60 with identical analytical methods to monitor routine sample analysis data usability.

2.3 Off-Site Laboratory Chemical Analyses

Off-site laboratory analyses for constituents of concern (COCs) from each site were conducted in accordance with the EPA-approved protocols listed in SW-846 (EPA 1986). The COCs, field-screening techniques, laboratory analysis methods, and the corresponding method numbers are listed in Table 2-2. The data are provided in electronic format in Appendix C.

Table 2-2
Field Screening and Laboratory Analyses for Constituents of Concern[a]

Constituent of Concern	Field-Screening Techniques	On-Site Laboratory Analysis Methods	Off-Site Laboratory Analysis Methods	EPA Method Number
Metals	NA[a]	X-ray Fluorescence/ Directly Coupled Plasma	Inductively Coupled Plasma/Atomic Absorption	6010/7000
Volatile Organic Compounds (VOCs)	Photoionization Detector/ Flame Ionization Detector	Gas Chromatography/ Mass Spectrometry	Gas Chromatography/ Mass Spectrometry/ Toxicity Characteristic Leaching Procedure	8240 1311
Total Petroleum Hydrocarbons (TPH)	NA	Thermal Desorption/Gas Chromatography	Infrared	418.1
High Explosives (HEs)	Colorimetry	High-Performance Liquid Chromatography	High-Performance Liquid Chromatography	8330
Polychlorinated Biphenyls (PCBs)	Immunoassay	NA	Gas Chromatography	8080
Nitrates/Nitrites	NA	Colorimetry	Colorimetry	353.2
Radionuclides	G-M Pancake Probe/Sodium Iodide (NaI) Scintillometer	Gamma Spectroscopy	Gamma Spectroscopy/ Isotopic Analyses	6010

Source: EPA 1986.

[a]NA = Not applicable.

2.4 Summary of Quality Assurance/Quality Control Activities

As part of the sampling activities conducted in support of the RFI, a plan for QA/QC was developed to ensure that sampling procedures and laboratory analyses were performed to a rigid standard. The following QA/QC soil and water samples were collected to assure sampling procedure integrity and laboratory quality:

- Field Blank—Water poured directly from a freshly opened bottle of distilled water into laboratory-prepared sample bottles to determine whether any field conditions affected sample collection.

- Trip Blank—Laboratory-prepared water sample for analysis of VOCs to determine whether any VOCs were inadvertently introduced during sampling or shipment.

- Equipment Blank—Water sample prepared in the field after decontaminating equipment to determine whether any contaminants were introduced from improperly cleaned equipment.

- Duplicate—Soil sample split from an original field sample to determine reproducibility of laboratory analytical results.

- Matrix Spike/Matrix Spike Duplicate—Soil sample split from an original field sample to determine effects of matrix (e.g., soil) on laboratory results (i.e., whether any interference occurred); sample is spiked with a known concentration of a reference chemical, then analyzed to ascertain recovery of that chemical.

Results of the QA/QC program indicated very few problems with the collection of the data. Some general trends in laboratory QC were noted. The off-site laboratory used for the chemical analyses has consistently shown levels of VOCs (primarily acetone and methylene chloride) in their method blanks; however, this mainly impacted the data collected for Site 36, where elevated levels of several VOCs were noted (see Section 8.0). Independent analyses conducted by the on-site SNL/NM laboratory confirmed the presence of contamination in the samples, however, so the impact of laboratory contamination is somewhat lessened.

Some elevated levels of VOCs were noted in some soil trip blanks submitted for Site 78. Preparation of the soil trip blanks involved collection of soil from an area known to be uncontaminated, followed by heating of the sample to drive off any potential VOCs, which effectively removed any moisture that might have been in the sample. It is believed that, because the sample was dehydrated, when it reached the laboratory, the ambient humidity and vapor-phase VOCs typical of many laboratories (i.e., those VOCs commonly used for sample preparation [acetone, methylene chloride, toluene, etc.]) caused rapid adsorption of the laboratory chemicals onto the soil matrix, producing erroneous results. The process for preparing soil blanks on-site is currently under review, because it does not appear to be a useful tool in its present form, given the problems cited above. Regardless of the results of the trip blanks for Site 78, no elevated VOCs were noted in the soil samples collected for confirmatory analyses.

The same laboratory exhibited low concentrations of lead in their blanks, affecting the data for the rinsate and field blanks from Sites 18 and 107, but at concentrations too low to account for the concentrations detected above the statistical background levels for Site 18.

Matrix spike/matrix spike duplicate (ms/msd) data indicated occasional elevated recoveries for some metals (antimony, barium, beryllium, and zinc) that are ubiquitous in the surrounding granite-derived soils. No general problems with the laboratory's recovery were noted, however. The single exception is for the ms/msd data for antimony at Site 241. Because of apparent erroneous recovery data, the sample that had been split for a ms/msd had an anomalously high antimony concentration (29.6 mg/kg). The location (plus two others) was resampled and found to have nondetectable antimony. The results of the QA/QC program are provided in electronic format in Appendix D.

2.5 Statistical Analysis of Background Data

To determine whether the soil sampling results for potentially contaminated sites within TA-III/V indicated the presence of COCs, the results were compared to the samples collected from TA-III and TA-V during the site-wide investigation of background concentrations at SNL/NM (IT 1994a). Thus, a subset of the full site-wide background data set was selected for the TA-III/V evaluation. The COCs for evaluation (barium, beryllium, cadmium, chromium, copper, lead, nickel, silver, uranium, and zinc) were chosen based on site knowledge and their likelihood of being a site contaminant within TA-III/V. At the time the statistical tests were completed, no site-wide background data sets existed for other COCs of interest (e.g., antimony, mercury, PCBs, etc.); thus a direct comparison to the applicable site-wide upper tolerance limits (UTLs, discussed below) updated in January 1996 was made for those COCs.

2.5.1 Background Concentration Determinations

To determine the range of background concentrations, the 95th UTL and 95th percentile were calculated for parametric and nonparametric data sets, respectively. The following steps were completed: (1) a priori screening of the data; (2) determination of the percentage of nondetects in the data sets, with a cutoff level of 15 percent; (3) distribution analysis of the portion of the data set that exhibited less than 15 percent nondetects, including coefficients of skewness, histograms, and probability plots; (4) a second screening of the data performed by the calculation of the T_n statistic for parametric data; and finally (5) calculation of the UTL for parametric data sets or the 95th percentile for nonparametric data sets. Each is discussed in the following sections, and example calculations, together with histograms and probability plots, are provided in Appendix E.

A Priori Screening

The a priori test involved a visual inspection of the data to eliminate any outliers. The data values were sorted from highest to lowest to facilitate the inspection. Maximum values that were a factor of three higher than their nearest neighbor were removed from the data set before the next test in the sequence was applied.

Determination of Parametric Versus Nonparametric Data

The data sets were divided into parametric or nonparametric by this process (discussed in the following paragraphs):

- Initial division based on the percentage of nondetect data; and
- Subdivision of the data sets with fewer than 15 percent nondetect values into normal, lognormal, or nonparametric.

First, the percentage of nondetect data in each of the data sets was determined. Raw nondetect data were not equated with "zero" values; rather, they were replaced with a coded value of one-half of the PLQ (EPA 1992a). Those sets with fewer than 15 percent nondetect values were identified as eligible for parametric distribution analysis; those sets with greater than 15 percent nondetect values were identified as eligible for nonparametric analysis. Coded data sets tend to skew the data toward zero and decrease the effectiveness of reporting the mean. Therefore, the median is reported as the measure of central tendency when greater than 15 percent of the data are nondetects (i.e., the data set appears nonparametric).

Distribution analyses then were conducted on the data to determine whether the data were parametric (normal or lognormal) or nonparametric. The distribution analyses included computing the coefficients of skewness and producing the histograms and probability plots for each COC for normal and lognormal (i.e., log transformed) data; the histograms and probability plots for each tested COC are included in Appendix E.

Calculation of T_n Statistic

The T_n statistic test was performed on data determined to be parametric (normal or lognormal) after the distribution analysis was completed to verify that no other statistical outliers existed. The datum was considered an outlier if the T_n statistic exceeded the critical number (C_n) identified in the EPA guidance for a given sample size (EPA 1992a). The test was run iteratively until the largest value in the data set passed. A new mean and standard deviation were calculated for each data set that had outliers removed in the T_n statistic analysis before the test was run again.

Calculation of UTL and 95th Percentile

Basic statistical parameters, including the mean, standard deviation, and UTL, were calculated for each normal or lognormal parametric population data set. The UTL establishes a concentration range that is constructed to contain a specified proportion of the population with a specified confidence. The proportion of the population included is referred to as the coverage, and the probability with which the tolerance interval includes the proportion is referred to as the tolerance coefficient. The EPA-recommended coverage value of 95 percent and tolerance coefficient value of 95 percent were used to calculate the UTLs (EPA 1992a). Most elementary statistical textbooks provide detailed descriptions of basic parametric statistics.

Nonparametric statistics were used when data sets did not exhibit normal or lognormal distributions, or when the percentage of nondetects exceeded 15 percent. The data sets examined exhibited fewer than 90 percent nondetects, so the median (50th percentile) was used to describe central tendency, and the 95th percentile was used for background comparison. Most elementary statistical textbooks provide detailed descriptions of basic nonparametric statistics.

Results

Table 2-3 presents the results of the a priori tests conducted on the data sets. None of the COCs examined were determined a priori to be outliers.

Table 2-4 provides the results of the probability plot, coefficient of skewness, and histogram for determination of the distribution type for each TA-III/V background data set. Background distributions for barium, beryllium, cadmium, copper, lead, nickel, and zinc were lognormal. The data set for silver was nonparametric, and the data set for total uranium (U_{tot}) was normally distributed.

Tests were performed for outliers using the T_n statistic (Table 2-5). Only the nickel data set was censored for the calculation of TA-III/V background values by removing the three highest values for nickel (30.9, 30.0, and 29.5 mg/kg. Three possible reasons for the anomalously high nickel data are noted. Nickel might exhibit a wide natural variation, and this sampling effort happened to access areas that were relatively mineral rich. Alternatively, laboratory error might have produced elevated analytical results. It is also possible that the higher nickel concentrations are anthropogenic, although these higher concentrations are well below the proposed RCRA Subpart S soil action level for nickel (2,000 mg/kg). To be conservative, these values were removed from the data set, and the censored data set was used for all subsequent comparisons for TA-III/V sites.

The natural logs of the means and standard deviations of the TAL metals and their corresponding UTLs or 95th percentiles are provided in Table 2-6. Proposed RCRA Subpart S soil action levels for the COCs detected during the RFI sampling effort are provided in Table 2-7. As stated earlier, only those COCs

Table 2-3
Technical Areas III and V Background Samples - A Priori Sampling

Parameter	Maximum Value	Next Maximum	X Factor[a]	Result
Barium	730	320	2.28	Pass
Beryllium	1.1	1.1	1.00	Pass
Cadmium	8.5	7.7	1.10	Pass
Chromium	58.1	57.3	1.01	Pass
Copper	29	27.5	1.05	Pass
Lead	73	73	1.00	Pass
Nickel	30.9	30	1.03	Pass
Silver	10	9.7	1.03	Pass
Uranium (total)	4.66	4.61	1.01	Pass
Zinc	59.9	56	1.07	Pass

[a] X factor is the ratio of the maximum value to the next maximum. If the ratio is greater than or equal to 3, it indicates the maximum value is anomalously high.

Table 2-4
Results of the Distribution Analysis for Technical Areas III and V

Parameter	Probability Plot	Coefficient of Skewness[a]	Histogram	Distribution Type
Barium	Lognormal	-2.3	Lognormal	Lognormal
Beryllium	Lognormal	-0.30	Lognormal	Lognormal
Cadmium	Lognormal	0.49	Lognormal	Lognormal
Chromium	Lognormal	-1.72	Lognormal	Lognormal
Copper	Lognormal	-0.15	Lognormal	Lognormal
Lead	Lognormal	0.50	Lognormal	Lognormal
Nickel	Lognormal	-0.48	Lognormal	Lognormal
Silver	Nonparametric	-0.59	Nonparametric	Nonparametric
Uranium (total)	Normal	-0.23	Lognormal	Normal
Zinc	Lognormal	0.69	Lognormal	Lognormal

[a] Critical Coefficient of Skewness is -1 to 1.

Table 2-5
Technical Areas III and V T_n Statistic Analysis for Target Analyte List Metals

Parameter	Distribution	Natural Log (Ln) of Maximum Value	Natural Log Mean	Natural Log Standard Deviation	T_n Statistic	Number of Samples	Critical Value[a]	Pass or Fail T_n Statistic
Barium	Lognormal	6.59	3.84	1.13	2.44	503	3.74	Pass
Beryllium	Lognormal	0.10	-1.14	0.43	2.87	331	3.60	Pass
Cadmium	Lognormal	2.14	-0.89	0.99	3.06	176	3.39	Pass
Chromium	Lognormal	4.06	1.86	0.8	2.75	538	3.76	Pass
Copper	Lognormal	3.37	1.82	0.48	3.22	392	3.66	Pass
Lead	Lognormal	4.29	1.89	0.73	3.29	259	3.52	Pass
Nickel (first iteration)	Lognormal	3.43	1.84	0.43	3.70	403	3.67	Fail
Nickel (second iteration)	Lognormal	3.40	1.83	0.42	3.74	402	3.67	Fail
Nickel (third iteration)	Lognormal	3.38	1.83	0.42	3.70	401	3.67	Fail
Nickel (fourth iteration)	Lognormal	3.31	1.83	0.41	3.62	400	3.67	Pass
Silver	Nonparametric	ND[b]	ND	ND	ND	247	ND	ND
Uranium (total)	Normal	4.66[c]	2.05[c]	0.99[c]	2.64	81	3.13	Pass
Zinc	Lognormal	4.09	3.1	0.34	2.89	158	3.36	Pass

[a] One-sided critical values for the upper 5 percent significance level; critical values derived from Table 8 (EPA 1992a) for given number of samples.
[b] ND = Not determined.
[c] Normal maximum values (i.e., actual values) provided for normally distributed uranium.

Table 2-6
Upper Tolerance Limits for Target Analyte List Metals in Technical Areas III and V Soil

Target Analyte List (TAL) Metal	Distribution	Censored?	Natural Log Mean	Natural Log Standard Deviation	Mean	Standard Deviation	One-Sided Tolerance Factor (K)	Natural Log UTL	UTL	Number of Samples
Barium	Lognormal	No	3.84	1.13	NA[a]	NA	1.76	5.83	341.0	503
Beryllium	Lognormal	No	-1.14	0.43	NA	NA	1.79	-0.37	0.7	331
Cadmium	Lognormal	No	-0.89	0.99	NA	NA	1.85	0.94	2.6	176
Chromium	Lognormal	No	1.86	0.8	NA	NA	1.76	3.27	26.2	538
Copper	Lognormal	No	1.82	0.48	NA	NA	1.78	2.67	14.5	392
Lead	Lognormal	No	1.89	0.73	NA	NA	1.81	3.21	24.8	259
Nickel	Lognormal	Yes	1.83	0.4	NA	NA	1.78	4.40	81.3	400
Silver[a]	Nonparametric	NA	NA	NA	NA	NA	NA	NA	NA	247
Uranium (total)	Normal	No	NA	NA	2.05	0.99	1.96	NA	4.0	81
Zinc	Lognormal	No	3.1	0.34	NA	NA	1.86	3.73	41.8	158

[a] NA = Not applicable.

[b] For silver, the 50th percentile value was 1 mg/kg and the 95th percentile value was 4 mg/kg; these describe the central tendency for nonparametrically distributed parameters.

Table 2-7
Generic Proposed Soil Action Levels Under Proposed RCRA Subpart S

Analyte	Proposed RCRA Subpart S Soil Action Level (mg/kg)
1,2-Dichloroethane	8
Acetone	8,000
Aluminum	NA[a]
Antimony	30
Arsenic	20
Barium	6,000
Beryllium	0.2
Bis (2-Ethylhexyl) Phthalate	50
2-Butanone	50,000
Cadmium	80
Calcium	NA
Chromium (VI)	400
Cobalt	NA
Copper	NA
2-Hexanone	NA
Iron	NA
Lead	2,000[b]
Lithium	NA
Magnesium	NA
Manganese	NA
Mercury	20
Nickel	2,000
Nitrate	100,000
Nitrite	8,000
Polychlorinated Biphenyls	0.1
Potassium	NA
Selenium	400
Silver	400
Sodium	NA
Toluene	20,000
Total Petroleum Hydrocarbon	100[c]
Uranium	NA
Vanadium	600
Xylenes (total)	200,000
Zinc	20,000

[a] NA = No proposed RCRA Subpart S soil action level is currently listed for the analyte.
[b] Lead action level not formally promulgated; proposed 2,000 mg/kg (EPA 1996).
[c] Not EPA-regulated. Standard from New Mexico Environmental Improvement Board Underground Storage Tank Regulations (NMEIB/USTR 1990).

for which site-wide background data sets existed (at the time of this RFI) were analyzed for statistical significance. The proposed RCRA Subpart S soil action levels for the remaining COCs are provided for comparison to site sampling data.

2.5.2 Comparison Tests: Background Data Versus Environmental Restoration Site Data

Two nonparametric, two parametric tests, and one test that utilized both parametric and nonparametric analyses were used to compare TA-III/V background data to data from potentially contaminated TA-III/V ER sites (Appendix E). The nonparametric tests included the Wilcoxon Rank Sum (WRS) Test and the Quantile test. The parametric tests included Student's t-tests using assumptions of equal and of unequal variance. The hot-measurement comparison uses either the 95th UTL calculation (for parametric data) or the 95th percentile calculation (in the case of nonparametric data) as recommended by the EPA (EPA 1992a). Nonparametric tests were applied to all soil data; however, parametric tests were not applied to nonparametric data.

The WRS test is performed by ordering all observations from background and the potentially contaminated site according to their magnitude and then assigning a rank from lowest to highest. The ranks in the potentially contaminated area are summed and compared to a table of critical values to determine whether the site is contaminated.

The WRS test is a nonparametric test more powerful than the Quantile test (described below) in determining whether the potentially contaminated area has concentrations uniformly higher than background (EPA 1992a). However, the WRS test allows for fewer less-than measurements than the Quantile test. As a general rule, the WRS test should be avoided if more than 40 percent of the measurements taken at the potentially contaminated area or at background areas are nondetects. All soil analytical data were subjected to the WRS test in this analysis, although the test power was known to be greatly reduced when the nondetect percent was greater than 40.

The Quantile test is performed by separating background data and individual site data. The data are then ordered from highest to lowest. The number of background and individual site data points are calculated. The number of data points for background and the selected potentially contaminated site is then compared to a table that identifies how many of the highest measurements must come from the potentially contaminated site versus background to indicate contamination.

The Quantile test is a nonparametric test that has more power than the WRS test to detect when only a small portion of the remediated site has not been completely cleaned up. Also, the Quantile test can be used even when a fairly large proportion of the measurements is below the limit of detection (EPA 1992a).

The hot-measurement comparison consists of comparing each measurement from the potentially contaminated area with an upper-limit concentration value. This upper-limit concentration value is such that any measurement from the potentially contaminated area that is equal to or greater than this value indicates an area of relatively high concentrations that must be further investigated (EPA 1992a). Concentrations exceeding the upper-limit value may indicate inappropriate sample collection, handling, or analysis procedures, or actual contamination. The upper-limit concentration value was calculated as previously described based on the 95th percentile for nonparametric data and the 95th UTL for parametric data.

The t-test is a parametric test that compares the means of two samples. To use the t-test statistic, both sampled populations must be approximately normally (or lognormally) distributed with approximately equal population variances, and the random samples must be selected independently of each other. The equations and methodology for applying the t-test are explained in most statistics books, including McClave and Dietrich (1982) and Mendenhall (1975).

Results
Comparison tests between background data and the maximum concentrations for TA-III/V site data were performed for metals at Sites 18, 51, 107, 111, 240, and 241 in accordance with the RFI Work Plan (SNL/NM 1993a). In the case of Site 78, a simple comparison of maximum metal concentrations to the TA-III/V background UTLs were made for the samples collected during the confirmatory sampling event. These were the only sites where metals were regarded as suspect contamination. The respective text sections herein contain discussions of the significance of the statistical tests on data for each site and comparisons to the relevant proposed RCRA Subpart S soil action levels (Table 2-7) for each constituent.

2.6 Contaminant Fate and Transport/Risk Assessment

The majority of contaminants detected at sites in TA-III/V were restricted to the upper 2 ft of surface soils. No conclusive evidence has been found that any sites investigated during this RFI have had an impact on the local ground water (at depths of 480 to 500 ft bgs).

For those sites at which contaminants were elevated with respect to background, a comparison was made of each elevated constituent relative to its proposed RCRA Subpart S soil action level. All COCs were at least one to two orders of magnitude below their corresponding action levels, except at Site 18 (which displayed PCBs above the proposed RCRA Subpart S soil action level). As indicated in the individual section for this site, the efficacy of conducting a VCM was evaluated. Three other sites (35, 36, and 196) also exhibited TPH above the New Mexico Underground Storage Tank Regulations (NMUSTR) standard, but each of these is proposed for NFA because TPH is in the form of a nonhazardous mineral oil.

9.0 ER SITE 37: PROTO OIL SPILL

Site 37, the PROTO Oil Spill, is a 1-acre site located on the southeast side of TA-V near Building 6597 (Figure 9-1). The PROTO I Facility was used to test the radiation effects on instruments and weapon components between 1978 and 1989. Oil was stored in seven 25,000-gal. USTs adjacent to Building 6597 and was pumped in a closed-loop system between the building and the tanks. Oil spills occurred over the course of operations at the PROTO I Facility. The boundaries of the site are based on the pathway most likely followed by any potential surface spill from the USTs (Figure 9-1).

The site adjoins Site 155, the PROTO UST site. The USTs were excavated and removed in 1993, in accordance with the NMUSTR (NMEIB 1990). Sampling beneath the tanks indicated no soil remained in the excavation that contained TPH in excess of the NMUSTR standard of 100 mg/kg. Based on this information, Site 155 was subsequently deleted from the ER site list following a Class 1 permit modification with prior EPA approval.

Potential COCs include mineral oil and PCBs. Discussions of the investigation activities conducted during the RFI follow.

9.1 Field Investigation Protocols

Field investigations at the site included aerial photograph interpretation and shallow subsurface soil sampling. A discussion of each follows.

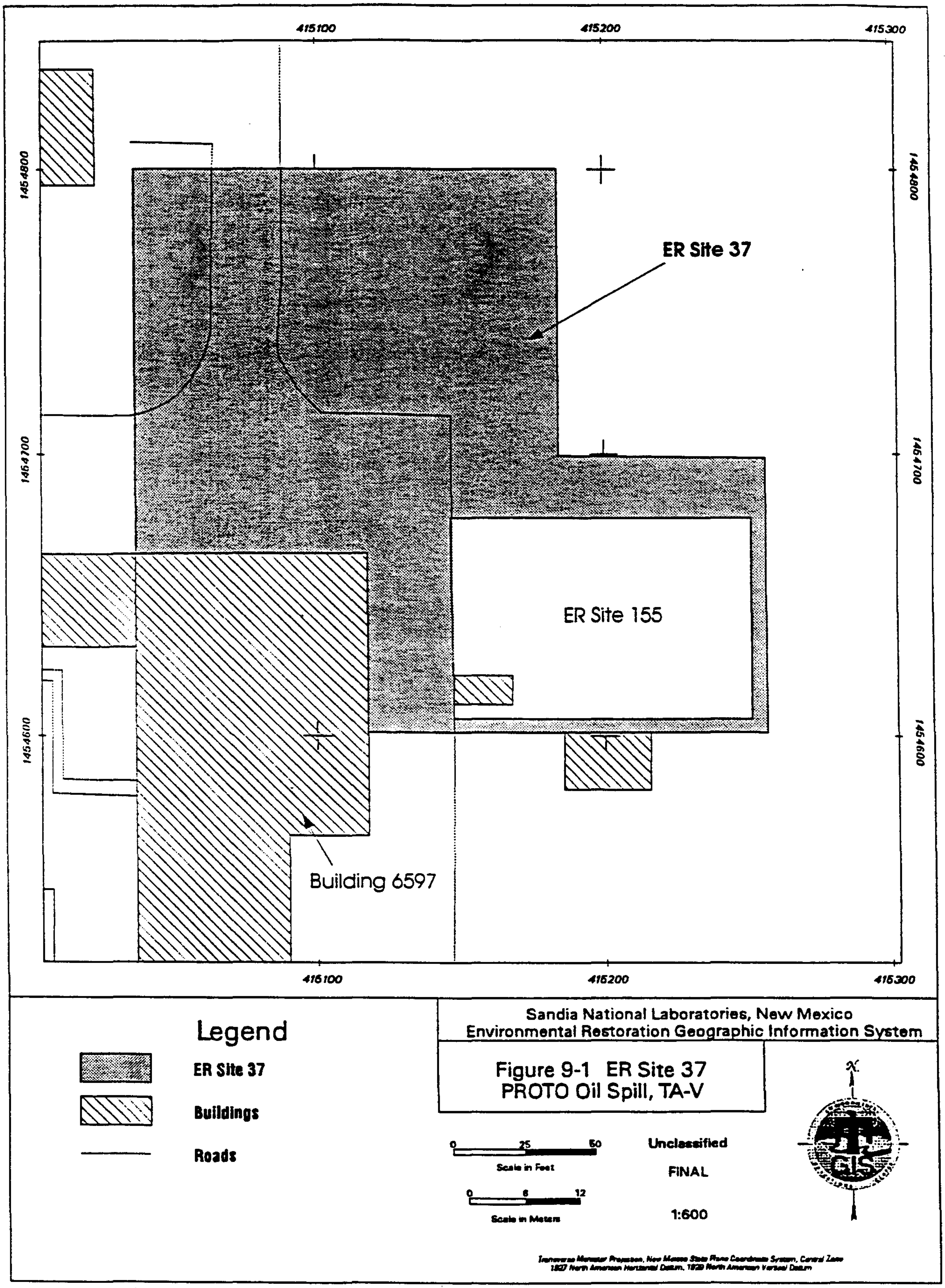
9.1.1 Aerial Photograph Analysis

Aerial photographs from 1973 to 1990 were assembled, digitized, and compared for changes in surface features in succeeding years at the PROTO Oil Spill site. The area within 1,000 ft of the site boundaries was studied for signs of soil disturbance, vegetation changes, or new construction.

9.1.2 Sampling Strategies

Subsurface soil sampling was conducted without modification from the RFI Work Plan (SNL/NM 1993a, 1993b). Eleven auger holes were advanced in the vicinity of the former USTs (Figure 9-2). Soil samples were collected following appropriate FOPs from depths of 1 and 5 ft bgs using a hand auger, for a total of 22 samples. Surveyed sample coordinates are provided in Appendix A.

Field screening of soil samples included immunoassay tests for PCBs and PID screening for VOCs. Based on field screening, seven samples (including a duplicate) were submitted for off-site laboratory analysis of TPH, and three samples were selected for analysis of PCBs and VOCs in accordance with the EPA methods listed in Table 2-2.

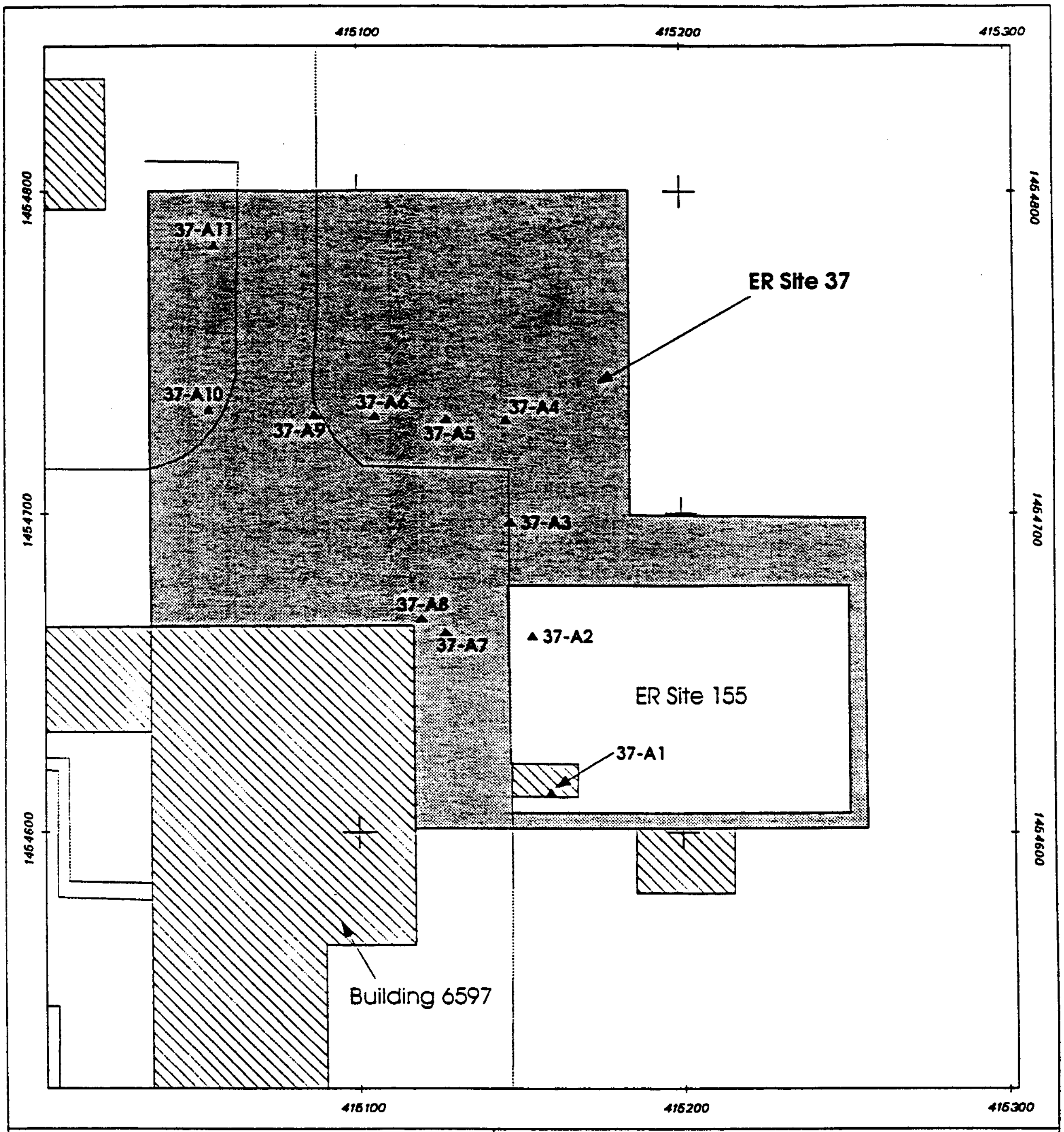


Sandia National Laboratories, New Mexico
Environmental Restoration Geographic Information System

Figure 9-1 ER Site 37
PROTO Oil Spill, TA-V

Transverse Mercator Projection, New Mexico State Plane Coordinate System, Central Zone
1927 North American Horizontal Datum, 1929 North American Vertical Datum

chebert SNL GIS ORG. 7512 02/05/96 MAPID=950924



Sandia National Laboratories, New Mexico
Environmental Restoration Geographic Information System

Figure 9-2 ER Site 37
Location of
Near-Surface Soil Samples, TA-V

Unclassified

FINAL

1:600

Transverse Mercator Projection, New Mexico State Plane Coordinate System, Central Zone
1927 North American Horizontal Datum, 1929 North American Vertical Datum

cheberl SNL GIS ORG. 7512 02/05/96 MAPID=950925

9.2 Field Investigation Results

9.2.1 Aerial Photograph Interpretation

There were no surface features within 1,000 ft of the site in the 1973, 1975, 1978, or 1979 photographs (Plate I). A discussion of the subsequent years follows in chronological order.

- 1982: Two features appeared in 1982. A pile was located approximately 1,000 ft southwest and a cleared or disturbed surface existed approximately 950 ft to the southeast of the site.
- 1983: No surface features appeared within 1,000 ft of the site in 1983.
- 1984: The same features appeared as in the 1982 photograph.
- 1990: There were no surface features within 1,000 ft of Site 37 in 1990. The pile and excavation found in 1982 and 1984 were probably related to construction or equipment storage.

Additional aerial photographs of TA-V from the same period (but at a lower altitude) showed many areas of stained soil adjacent to the PROTO USTs. However, as discussed above, the sampling conducted during the excavation and removal of the tanks at Site 155 indicated no soil TPH concentrations in excess of the NMUSTR standard of 100 mg/kg remained in the excavation.

9.2.2 Nature and Extent of Contamination

Field screening results are provided in Appendix B, soil sample analytical results are provided in detail in electronic format in Appendix C, and QA/QC data are provided in electronic format in Appendix D. Analyses results indicate that TPH was not detected above the MDL (20 mg/kg). For VOCs, only 1,2-dichloroethane was detected above the MDL in auger hole 37-A4 at a depth of 2 ft bgs (6.3 μg/kg), but the concentration was not above the proposed RCRA Subpart S soil action level for this constituent (8 mg/kg). No PCBs were detected above the method MDL (33 μg/kg). None of the QA/QC samples contained any COCs above their respective MDLs.

9.3 Summary and Conclusions

Based on the results cited above, the COCs clearly are not elevated, and no additional sampling or remediation appears to be warranted. This site is proposed for NFA in accordance with Criterion 3 listed in Section 4.4 of this RFI report.

NOD

Justification for Class III Permit Modification

April 2001

Solid Waste Management Unit 37
Operable Unit 1306

NOD Originally Submitted November 1997

PLEASE NOTE

Only pages relevant to this SWMU are included in the binder.

Status

ER Site 36 is proposed for NFA. Additional characterization of this site is necessary.

Response to Status

The horizontal and vertical extent of ER Site 36 has been defined from the UST and RFI investigations. The ER Project believes that further characterization of this site is not warranted.

VII. ER Site 37, TA-V: PROTO Oil Spill

Comment 21

Site 37 may be similar to ER Site 36 (HERMES Oil Spill) where VOC contamination did not begin to appear in the soil until a depth of 25 to 75 ft was reached. The contamination then increased to a depth of approximately 200 ft, possibly because of backfilling, leveling, etc. Also, VOCs may be present, as at ER Site 36, where it is suggested (p 8-13) that "The origin of most of the VOCs is postulated to be bacterial fermentation of the mineral oil."

For these reasons, deeper subsurface samples should be collected for VOC and semivolatile organic compound (SVOC) analysis at both ER Site 37 and 155. (Besides defining the extent of contamination at ER Site 37, these samples may provide information of value to the groundwater investigation beneath TA-V.)

Response to Comment 21

ER Site 37 is fundamentally different from ER Site 36. Whereas the soils at Site 36 exhibited high concentrations of TPH in the bottom of the UST excavation during tank removal operations in 1991, no such conditions existed at the PROTO UST site (Site 155). None of the soil samples collected beneath the PROTO USTs contained TPH above 100 ppm, the UST cleanup standard. As a result of the UST investigation, Site 155 was deleted from the HSWA permit with EPA Region VI approval.

Therefore, only potential surface spills of oil remained to be investigated at Site 37. The approved RFI work plan detailed shallow subsurface soil sampling to be performed. This sampling was conducted and demonstrated no mineral oil impact to the shallow subsurface. SNL/NM does not believe it is necessary to conduct additional investigation of either Site 37 or Site 155 since no soil contamination was found to be present immediately beneath the tanks or in the shallow subsurface. This absence of a source indicates that it is highly improbable that groundwater could be impacted by these two sites. Also, please see Responses to Comments 6 and 8.

Status

ER Site 37 is proposed for NFA. Characterization of the site must be completed and the results reviewed before NMED can make a decision regarding this site.

Response to Status

The ER Project proposes ER Site 37 for NFA because the site investigation has been completed and the results show that neither TPH nor PCBs were detected above their MDLs for any of the samples. Only 1,2 dichloroethane was detected at a depth of 2 ft bgs (0.0063 mg/kg), which is well below the RCRA Subpart S action level (8 mg/kg).

VIII. Site 51, TA-III: Building 6924 Pad, Tank, and Pit

No comments received.

IX. *ER Site 78, TA-III: Gas Cylinder Disposal Pit*

Comment 22

Arsenic and chromium were found in the surface verification samples above the TA-III&V UTL or 95th percentile. However, the sample taken at a depth of 5 ft within the same borehole showed arsenic and chromium below background. See General Comment No. 9.

Response to Comment 22

Please refer to response to Comment 9. Although Site 78 is designated as an industrial land-use area, arsenic and chromium (7.4 mg/kg and 26.2 mg/kg, respectively) were well below the more stringent RCRA Subpart S soil action levels for residential land-use (20 mg/kg for As and 400 mg/kg for CrVI) in all the surface verification samples collected at ER Site 78.

Status

ER Site 78 is proposed for NFA because the VCM involved a complete exhumation of the Gas Cylinder Disposal Pit, and because no subsurface soil samples exhibited any contamination in excess of the applicable RCRA proposed Subpart S soil action levels. This site may be appropriate for NFA after review of the information required above.

Response to Status

Verification sampling showed that the VCM of the Gas Cylinder Disposal Pit was successful at removing contaminated soils. The ER Project believes that an NFA for this site is appropriate.

NOD

Justification for Class III Permit Modification

April 2001

Solid Waste Management Unit 37
Operable Unit 1306

NOD Originally Submitted July 1998

PLEASE NOTE

Only pages relevant to this SWMU are included in the binder.

Specific Comments

ER Site 36, TA-V: Hermes Oil Spill

1. **DOE/SNL Response to Status**

   Additional site characterization may be necessary. See additional concerns for ER Site 36 in Enclosure B.

Enclosure B
Additional Concerns

ER Site 36, TA-V: Hermes Oil Spill

1. **Show on a map, the locations of the oil spills, the five 35,000 gal underground storage tanks, piping associated with the underground storage tanks, and sample locations.**

   Response: Three maps are provided (Attachment 36-1) which show the locations of the former USTs, and piping from the tanks. Two of the maps are from the HERMES II UST Removal Closure Report October 1991 prepared by IT Corporation (IT), and one map is from the On-Site Investigation Report prepared by IT in February 1992. Surface contamination features and staining in soil beneath the tanks are shown on these maps. Also included in Attachment 36-1 of this submission is the UST closure report text. Sample locations are shown on Figure 8-2.

2. **Provide the complete data set (hard copy form), including the analytical results for all QA/QC samples.**

   Response: The analytical data for the RFI sampling events are provided in Attachment 36-2. Copies of the laboratory QA/QC results are provided in Attachment 36-2.

3. **DOE/SNL must submit a copy of the closure letter issued by the NMED/UST Bureau.**

   Response: A copy of the closure letter from the NMED/UST Bureau is included in Attachment 36-3.

ER Site 37, TA-V: Proto Oil Spill

1. **DOE/SNL Response to Status**

   Additional site characterization may be necessary. See additional concerns for ER Site 37 in Enclosure B.

Enclosure B
Additional Concerns

ER Site 37, TA-V: Proto Oil Spill

1. **DOE/SNL must submit a copy of the closure letter issued by the NMED/UST Bureau for ER Site 155.**

   Response: The DOE has notified the NMED UST Bureau several times concerning the closure of the seven ER Site 37 USTs, but has not yet received a closure acceptance letter from the NMED. On June 28, 1993, Kathleen Carlson (DOE Kirtland Area Office [KAO] Area Manager) notified Shelda Mendoza (NMED UST Bureau) of the removal and final closure of the seven Site 37 USTs (6592-2 through 6597-8). Then, on April 29, 1994, John Olav Johnsen (DOE KAO Environmental Safety and Health (ES&H) Compliance Branch) sent a letter to Betsy Hovda of the NMED UST Bureau, requesting closure acceptance letters for a list of USTs which included the ER Site 37 USTs. The DOE is still awaiting the NMED's responses to these letters.

   Copies of both of these two letters to the NMED UST Bureau are presented in Attachment 37-1.

2. **Analytical results for the confirmation samples collected beneath the PROTO UST's must be provided. DOE/SNL must demonstrate that hazardous constituents were not released to the environment. This demonstration must include soil samples collected at depths that are below the bottoms of the UST's.**

   Response: ER Site 37 does not include the PROTO UST site (ER Site 155). ER Site 37 was designated as an ER site to investigate any surface spills that occurred during the operation of the PROTO USTs. Attachment 37-2 presents a detailed description of the removal and closure of the Building 6597 PROTO/IBEX UST System. Table 1 in this attachment presents TPH concentrations for the confirmation soil samples collected from beneath the PROTO USTs. All 16 soil samples collected during the 1993 tank removal operation were below the 100 parts per million (milligrams per kilogram [mg/kg]) TPH guidance standard set by NMED for UST sites. This attachment also includes the PCB analyses results from oil stored in the seven USTs from Site 37.

3. **Page 9-3, Figure 9-2 -- A new map must be provided which differentiates between samples analyzed by field methods and those analyzed in the laboratory.**

   Response: The table in Appendix B of the TA-III/V RFI Report compares the field screening analytical results to the laboratory analytical results for TPH and PCBs at Site 37. This table is presented in Attachment 37-3 of this NOD Response. The revised Figure 9-2 differentiates between samples analyzed by field methods and those analyzed in the laboratory. Samples analyzed in the laboratory were collected from locations A2, A4, A6, A7, and A8. Samples from all remaining sample locations at Site 37 were field-screened.

4. **Provide the complete data set (hard copy form, not in electronic format), including the analytical results for all QA/QC samples.**

Response: The analytical results, including QA/QC data, are provided in Attachment 37-4. This attachment includes the original TPH analytical results from samples collected when the UST system was removed.

5. **Show on a map the locations of the oil spills, the seven 25,000 gal underground storage tanks, piping associated with the underground storage tanks, and sample locations.**

Response: Figure 11-1 in the TA-III/V RFI Work plan shows the locations of the potential spill areas and the seven 25,000 gallon USTs. Figure 9-2 in the TA-III/V RFI Report shows the sample locations. Both of these figures are included in Attachment 37-2. The piping associated with the PROTO / IBEX USTs is shown on the original engineering design diagrams, which are also included in Attachment 37-5.

ER Site 78, TA-III: Gas Cylinder Disposal Pit

1. **DOE/SNL Response to Comment 22**

The maximum chromium value reported in the RFI report (Table 11.5) is 39.7 mg/kg, not 26.2 mg/kg. Additional site characterization may be needed because a minimum of two "clean" samples was not attained at the end of drilling. Pending review of the information that is requested below, additional site characterization may or may not be required.

In addition to chromium, maximum concentrations of verification soil samples exceed the approved background levels for As, Pb, and Ag. Because only limited data were provided in the RFI report, HRMB could not determine whether other metals also exceed approved background levels.

Response: Attachment 78-1 contain the analytical results for soils collected during confirmation sampling at the Gas Cylinder Disposal Pit (GCDP). The SNL/NM site-wide approved background levels were exceeded for As, Pb, Ag, and Ba. The NMED comment on two "clean" samples is an issue that has programmatic implications and will not be addressed in this submittal. DOE/SNL requests discussions with NMED regarding the two "clean" sample issue.

Attachment 37-1

Attachment 37-1

Letter from DOE to NMED UST Bureau on Underground Storage Tanks 6597-2 through 6597-8, dated June 28, 1993

Letter from DOE to NMED UST Bureau on Underground Storage Tanks 6597-2 through 6597-8, dated April 29, 1994

Department of Energy
Albuquerque Operations Office
Kirtland Area Office
P.O. Box 5400
Albuquerque New Mexico 87115

JUN 28 1993

CERTIFIED MAIL - RETURN RECEIPT REQUESTED

Mrs. Shelda Mendoza
Program Manager, Underground Storage Tank Bureau
New Mexico Environment Department
1100 St. Francis Drive
Santa Fe, New Mexico 87503

Dear Mrs. Mendoza:

This is to notify you of the removal and final closure of Underground Storage Tanks (USTs) 6597-2 through 6597-8 (IBEX Site USTs) at Sandia National Laboratories, New Mexico. Enclosed, for this purpose, is a completed EPA Form 7530-1 (Notification for Underground Storage Tanks), Tank Closure Worksheet, owner's copy of the Inspection Report provided by the on-site State Inspector, Mr. Mark Coffman, a Certificate of Destruction for each UST, and a copy of the certified soil sample analysis. These USTs were placed in out-of-service status on January 31, 1992; the actual removals occurred during the period April 26, 1993, through May 6, 1993 and involved the removal of seven 25,000 gallon steel USTs and associated piping.

Soil samples were taken approximately four feet from each end of each UST and approximately two feet below each UST bottom. A split for Hanby field analysis was taken with the remainder of the sample being sealed in a container to be analyzed by a certified laboratory. The analysis was for Total Petroleum Hydrocarbons (TPH). Fourteen samples were taken for analysis plus two quality control samples (one duplicate and one spike/matrix spike duplicate) and one equipment decontamination rinsate water sample. Results of the Hanby field screening indicated "blank" for all soil samples. Results of the certified analysis indicated, for the fourteen soil samples, ten "non-detect" (26 mg/kg detection limit) with the other four ranging between 26 and 96 mg/kg.

If you have any questions, please contact John Olav Johnsen, of my staff, at 845-4827.

Sincerely,

Kathleen A. Carlson
Area Manager
Kirtland Area Office

Enclosures

cc w/enclosures:
M. Coffman, NMED, UST Bureau

cc w/o enclosures:
J. T. Roybal, 7052, SNL

Department of Energy
Albuquerque Operations Office
Kirtland Area Office
P.O. Box 5400
Albuquerque New Mexico 87115

APR 2 9 1994

CERTIFIED MAIL - RETURN RECEIPT REQUESTED

Ms. Betsy Hovda
Underground Storage Tank Bureau
District I Office
New Mexico Environment Department
4131 Montgomery Boulevard, N. E.
Albuquerque, New Mexico 87109

Dear Ms. Hovda:

As we discussed several weeks ago, the Sandia National Laboratories, New Mexico (SNL/NM), which is operated under contract for the U. S. Department of Energy (DOE), has removed a number of Underground Storage Tanks (USTs) over the past four years. A review of records of both SNL/NM and the DOE Kirtland Area Office (KAO) for closure acceptance letters from the New Mexico Environment Department (NMED) indicates that sixteen closure acceptance letters are not in the files, nor is there any record of their receipt. The following is a list of the USTs for which we need closure acceptance letters:

605-12 840-1 6018-1 6028-1 6500-1 6505-1
6536-1 6581-1 6596-1 6597-2 thru-8
6630-1 6720-1 7570-1 9832-1 9970-1 Burn Site-7

Your assistance in this matter is appreciated. If you have any questions or require further information please contact me at 845-4827.

Sincerely,

John Olav Johnsen
Physical Scientist
Environment, Safety, Health,
and Compliance Branch
Kirtland Area Office

cc:
C. Fink, MS 1303, SNL
T. Roybal, MS 1347, SNL

Attachment 37-2

Attachment 37-2

UST 6597-2 through 6597-8 Removal and Closure Report, Sandia National Laboratories, 1993

Sample Results from UST Excavation and Oil from Tanks

Site 155: Building 6597 PROTO/IBEX UST System

ER Site 155 is the former location of the PROTO/IBEX underground storage tank (UST) system and is located on the east side of Building 6597 within Technical Area 5 (TA-5).

UST DESIGN AND REGISTRATION DATA

Seven USTs were previously located at ER Site 155 and supported PROTO and IBEX test operations conducted in Building 6597 (DOE, 1993b). The tanks were registered with the NMED UST Bureau as UST Nos. 6597-2 through 6597-8 (DOE, 1993c). This UST system was located about 50 ft (15.2 m) east of Building 6597 (Figure 1). The seven USTs were installed in 1972 and were taken out of service on January 31, 1992. The tanks were removed during April and May 1993.

The total capacity of the UST system was approximately 175,000 gallons (661,500 L) of transformer oil. The tanks stored petroleum-hydrocarbon based, non-PCB, insulating (dielectric) transformer oils with the trade names Diala A™, Diala AX™, Univolt™, and Shell 61™ (EXXON, 1989; Shell 1989). Each UST had a volume of 25,000 (94,500 L) gallons with a diameter and length of 11 ft (3.4 m) and 35 ft (11 m), respectively. The tanks were constructed of steel and were connected using manifolds along the east and west ends of the tanks. A pump house was located at the southwest corner of tank 6597-2 and connected the UST manifold system to a particulate filtration system in the Building 6597 oil filter room. The base of each tank was at a depth of 18 ft (6 m) BGS (below ground surface) and a vent was located at the east end of each tank. The tanks were not mounted to concrete pads. The tanks did not have secondary containment, overfill protection, or leak detection systems. No inventory control or precision testing data were kept. After removal, all seven tanks were pressure washed and inspected; no perforations were evident.

Six valve boxes were located along the tank manifolds (Figure 1). The six valve boxes have previously been incorrectly referred to as 12 drywells (DOE, 1993b). The valve boxes were constructed of vertical sections of 2.5-ft (0.8 m) diameter corrugated metal pipe (culverts) and each was about 20 ft (6.1 m) in length. The valve boxes extended about 1 ft (0.3 m) above ground level downward to the manifold valves. Ladders provided access to the valves.

No releases from the Building 6597 USTs or piping have been previously reported for Site 155. Before the tanks were excavated, the ground surface was inspected. No oil-stained soil was visible on the ground above the USTs or next to the tank vents and valve boxes; some oily residue was present on the vents but not on the soil (Roybal, 1993; Olguin, 1993).

Oil-stained soil was present around each aboveground pump located at the west ends of USTs 6597-3 and 6597-4. The oil-stained soil was confined to a 3 ft by 3 ft area within 2 ft of the ground surface at each of the two pumps. This approximate 18 ft^3 of soil at each pump was not sampled. However, the soil was not oil saturated. The soil was segregated during the tank removal operation. After the tank excavation was almost totally back filled, the stained soil was place back at its two original locations.

During the tank removal operation, the piping was inspected and determined to be intact except for one piping flange at the west end of UST 6597-3; approximately 1 ft^3 of soil was oil stained but not saturated. This soil was not sampled or segregated.

SITE GEOLOGY

Seven ft (2.1 m) of earthen fill material had covered the tanks with several inches of gravel served as ground cover. The geologic strata underlying the tank site consists of unconsolidated Quaternary sand and gravel. The depth to ground water is approximately 495 ft (151 m) (DOE, 1993c). An inactive water supply well, KAFB-10, is located about 300 ft (91 m) northwest of the tank site. The nearest active water supply wells, ~~KAFB-4 and~~ KAFB-8, ~~are~~ is located about ~~2.9 miles (4.7 km)~~ and 2.5 miles (4.0 km), respectively, northwest of the tank site.

REMOVAL OPERATION

Several organizations were involved in the 1993 tank removal operation. SNL/NM coordinated the tank pull. The tank removal contractor was Henderson Construction Inc. SNL/NM personnel collected soil samples from the tank excavation. An NMED UST inspector was present during some portions of the tank removal operation (NMED, 1993).

The contents of the tanks were sampled prior to the tank removal operation. The transformer oil was analyzed for 7 Aroclors (PCBs). Six PCBs were not detected in laboratory samples at the 1.0 ppm (mg/kg) detection limit. Aroclor-1254 was detected at 1.2 ppm (mg/kg). The oil was also analyzed for radiological constituents. No tritium or alpha and beta radiation exceeded background levels.

To remove the USTs, a 150 ft (46 m) long by 80 ft (24 m) wide excavation was dug to a depth of 18 ft (6 m). After removal, each tank interior was steamed cleaned and visually inspected. No tank perforations were evident. All seven tanks were subsequently cut up as scrap metal. The rinse water from tank washing was disposed of offsite.

No oil-stained soil was visible on the tank excavation floor including the areas beneath the tanks, manifolds, and valve boxes (Roybal, 1993; Olguin, 1993).

Soil samples were collected from the floor of the tank excavation on April 13, 1993. As shown on Figure 2, two grab samples were collected from beneath the west and east ends of each tank base at 20 ft BGS (below ground surface). The soil samples were collected at two ft below each tank base using a hand shovel. After the samples were field screened for TPH (total petroleum hydrocarbons), the tank excavation was back filled with clean native sand and gravel.

As shown in Table 1, the 16 soil samples were collected from 14 locations and submitted to the Encotec Analytical Laboratory in Ann Arbor, MI. The samples included two duplicate soil samples. The soil samples were analyzed for TPH using EPA Method 418.1. The reported concentrations ranged from below the detection limit of 25.0 ppm (mg/kg) to a maximum of 96.0 ppm (mg/kg) which is below the NM UST regulatory limit of 100 ppm TPH. The sampling location with the maximum TPH concentration was at west end of 6597-4. The vertical distance from this soil which yielded a TPH concentration of 96 ppm (mg/kg) to ground water is 473 ft (144 m).

All 16 soil samples were field screened using the Handby Direct Extraction Method (HDEM) which is a colorimetric field technique for determining TPH concentrations. The soil sample results using the Handby Method were below the detection limit of 1.0 ppm (Table 1).

A rinsate water sample (ER92004987) was also submitted to Encotec. The sample consisted of water used to wash soil sampling equipment. The water sample was prepared after soil sample ER92004975 was collected. The water sample was analyzed for TPH using EPA Method 418.1. TPH was not reported above the detection limit of 1.0 ppm (mg/L). This result indicates that equipment decontamination procedures were adequate.

Table 1. TPH concentrations for soil samples collected from PROTO/IBEX UST excavation at Building 6597.

Location #	Sample ID#	Media	Sample Location	TPH (ppm, mg/kg) by Method 418.1	TPH (ppm) by HDEM
1	ER92004971	soil	6597-2, west end	57.0	<1.0
2	ER92004972	soil	6597-2, east end	<25.0	<1.0
3	ER92004973	soil	6597-3, west end	27.0	<1.0
4	ER92004974	soil	6597-3, east end	26.0	<1.0
5	ER92004975	soil	6597-4, west end	96.0	<1.0
6	ER92004976	soil	6597-4, east end	<26.0	<1.0
7	ER92004977	soil	6597-5, west end	<25.0	<1.0
8	ER92004978	soil	6597-5, east end	<26.0	<1.0
9	ER92004979	soil	6597-6, west end	<25.0	<1.0
10	ER92004980	soil	6597-6, east end	<26.0	<1.0
11	ER92004981	soil	6597-7, west end	<25.0	<1.0
12	ER92004982	soil	6597-7, east end	<25.0	<1.0
13	ER92004983	soil	6597-8, west end	<25.0	<1.0
14	ER92004984	soil	6597-8, east end	<26.0	<1.0
15	ER92004985	soil	duplicate of #5	51.0	<1.0
16	ER92004986	soil	duplicate of #12	27.0	<1.0

CONCLUSION

The only potential chemical of concern for the UST system was transformer oil. Sixteen soil samples were used to characterize the tank excavation. The laboratory analytical results of the soil samples are adequate to conclude that all soil samples were below the 100 ppm (mg/kg) TPH guidance standard set by NMED for UST sites. The combined results of soil sampling and visual inspection demonstrate that the tank closure activities were sufficient in determining that no significant releases had occurred from the PROTO/IBEX UST system. SNL-NM sent a tank closure notification letter to NMED UST Bureau on June 28, 1993. (Carlson, 1993). A closure acceptance letter has not yet been received from NMED.

NFA

The results of the soil sampling are adequate to conclude that no further action (NFA) is warranted for this ER Site; no additional soil sampling is proposed. No remediation is necessary.

REFERENCES

Carlson, K. A. (1993) DOE/KAO letter to S. Mendoza, NMED UST Program, June 28, 1993, [closure of 6597-2 to 6597-8].

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Olguin, C. (1993), SNL-NM Dept. 7582, *personal communication* with J. R. Copland, SAIC, October 11, 1993.

Roybal, J. A. (1993), SNL-NM Dept. 7582, letter - *Underground Storage Tank (UST) 6597-2 Through -8 Removals and Final Closure*, to J. O. Johnsen, DOE/KAO/ESHCB, June 9, 1993.

Roybal, J. A., (1993), SNL-NM Dept. 7582, *personal communication* with J. R. Copland, SAIC, October 11, 1993.

Shell Company, USA (1989), MSDS 60.030-7 for Shell Diala(R) Oil AX - Petroleum Hydrocarbon Industrial Oil, September 4, 1989.

U.S. Department of Energy, (1993a), *Technical Areas 3 and 5 RCRA Facility Investigation Workplan,* Sandia National Laboratories/New Mexico.

U.S. Department of Energy, (1993b), *Notification for Underground Storage Tanks form OMB No. 2050-0049,* [submitted for UST 6597-2 thru 6597-8 to NMED].

U.S. Department of Energy, (1993c), *Ground water Monitoring Program Calendar year 1992 Annual Report Sandia National Laboratories/New Mexico.*

US 5 6597 02

Sandia National Laboratories
Albuquerque, New Mexico 87185

date: March 29, 1993

to: Carl Peterson, 7951

Tony Roybal

from: Tony Roybal, 7723

subject: Analytical Results for Project TW0266, the Removal of Building 6597 Tank Farm

For the record, I am attaching analytical results done for PCBs done on the oil held by Underground Storage Tanks 6597-2 through -8 located east of building 6597. Also attached are the radiological results of a soil survey for the excavation site and for an oil sample from the tanks. The two PCB samples indicated "none detected" (ND) above a reporting limit of 1.0 mg/kg for one sample and 1.2 mg/kg for the second sample. The radiological results indicate no radiation greater than background levels were found.

If you have any questions, please give me a call at 848-0451.

JAR:7723:jar d:\wp51\docs\6597anal.mem

Copy to:
7723 J. A. Roybal
7723 C. Olguin
7723 Dayfile
7724 Records Center UST Activity - Master File
7724 Records Center UST 6597-2 through -8 Files
7952-2 R. E. Simmons
7952-2 J. Harding
7025 T. E. Blejwas

INFORMATION ONLY

INTERNATIONAL
TECHNOLOGY
CORPORATION

June 24, 1992

Project No. 301181.14.01

Mr. Lewis Marlman
Sandia National Laboratories, Albuquerque
Department 7721
P.O. Box 5800
Albuquerque, NM 87185-5800

<u>PCB Analysis Results for Samples SNLA005326 and SNLA005327,
Collected June 2, 1992</u>

Dear Mr. Marlman:

Enclosed is a revised analytical report, original analytical report (superseded), and sample control documentation for samples SNLA005326 and SNLA005327. These samples were collected on June 2, 1992. SNLA005326 was identified as a soil (Safety Step^{TM} absorbent) and SNLA005327 was identified as an oil on the attached sample collection log. The samples were hand carried to the Assaigai laboratory for polychlorinated biphenyl (PCB) analysis immediately following sample collection.

Results for the analysis are contained in the attached, revised laboratory report. Results for sample SNLA005326 were reported as "none detected" (ND) above a reporting limit of 1.0 milligram per kilogram (mg/kg). The oil sample SNLA005327 contained 1.2 mg/kg of PCB aroclor 1254.

Analysis values in the revised laboratory report are slightly lower than the values originally reported by Assaigai on June 8, 1992. Assaigai issued the revised report in response to a corrective action investigation which resulted from their poor performance on duplicate blind spike samples submitted by the Sample Management Office. Revised and original analytical

Regional Office
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results for the blind spike samples and details of the corrective action response have been previously transmitted to Sandia under separate cover. If you have any questions concerning these data, please contact the undersigned at 262-8800.

Sincerely,

IT CORPORATION
Mark Lyon
Mark Lyon
Project Chemist

ML:vm
Enclosure

Received: 06/02/92

REPORT
Results by Sample

Work Order # 92-06-023

SAMPLE ID SNLA 5326
FRACTION 01A TEST CODE SPCB NAME PCBs only in soil
Date & Time Collected 06/02/92 10:30:00 Category SOIL

PARAMETER	RESULT	LIMIT	D_F	DATE_ANAL
PCB-1016	ND	0.033	1.0	06/05/92
PCB-1221	ND	0.033	1.0	06/05/92
PCB-1232	ND	0.033	1.0	06/05/92
PCB-1242	ND	0.033	1.0	06/05/92
PCB-1248	ND	0.033	1.0	06/05/92
PCB-1254	ND	0.033	1.0	06/05/92
PCB-1260	ND	0.033	1.0	06/05/92

Notes and Definitions for this Report:

EXTRACTED 06/04/92
ANALYST SK
FILE ID 119
UNITS mg/Kg
BATCH_ID GC-P0147
PRCNT_MOIST N/A

NVl

Page 3 REPORT Work Order # 92-06-023

Received: 06/02/92 Results by Sample

SAMPLE ID SWLA 5327 FRACTION 02A TEST CODE OPCB NAME PCBs only in oil

Date & Time Collected 06/02/92 10:30:00 Category OIL

PARAMETER	RESULT	LIMIT	D_F	DATE_ANAL
PCB-1016	ND	1.0	1.0	06/05/92
PCB-1221	ND	1.0	1.0	06/05/92
PCB-1232	ND	1.0	1.0	06/05/92
PCB-1242	ND	1.0	1.0	06/05/92
PCB-1248	ND	1.0	1.0	06/05/92
PCB-1254	1.2	1.0	1.0	06/05/92
PCB-1260	ND	1.0	1.0	06/05/92

Notes and Definitions for this Report:

EXTRACTED 06/04/92
ANALYST SK
FILE ID 118
UNITS mg/Kg
BATCH_ID GC-P0147
COMMENTS N/A

SANDIA NATIONAL LABORATORIES
Albuquerque, New Mexico 87185

date: March 11, 1993

to: T. Roybol, 7723

from: S.E. Narrow, 7714

subject: Radiological Survey Results for Tech Area V Tank Farm

A radiological survey was performed on March 8, 1993 on the Tech Area V tank farm. An oil sample was counted for tritium,alpha and beta contamination and soil from the tank farm was analyzed for alpha, beta, and gamma radiation. No radiation greater than background levels were found.

This site is not a radiologically controlled area and work can proceed without health physics coverage.

copy to:
7714 file 93/7714/057

Site 37 - Comparison of Field Screening to Laboratory Analytical Results

APPENDIX B. FIELD SCREENING RESULTS

SITE 37 SOIL SCREENING RESULTS

Sample Label	Location	TPH		PCBs	
		Field Results	Lab Results	Field Results	Lab Results
15226	37-A2-5	NA	NA	ND	ND
15229	37-A4-1	NA	ND	ND	NA
NA	37-A4-5	ND	NA	NA	NA
NA	37-A5-1	ND	NA	NA	NA
NA	37-A5-5	ND	NA	NA	NA
15235	37-A6-1	ND	ND	NA	NA
NA	37-A6-5	ND	NA	NA	NA
15237	37-A7-1	ND	ND	<10 ppm	ND
15238	37-A7-5	ND	ND	NA	ND
15239	37-A8-1	ND	ND	<10 ppm	ND
15240	37-A8-5	ND	ND	NA	NA
15241	37-A8-5D	ND	ND	NA	NA
NA	37-A9-1	ND	NA	NA	NA
NA	37-A9-5	ND	NA	NA	NA
NA	37-A10-1	ND	NA	NA	NA
NA	37-A10-5	ND	NA	NA	NA
NA	37-A11-1	ND	NA	NA	NA
NA	37-A11-5	ND	NA	NA	NA

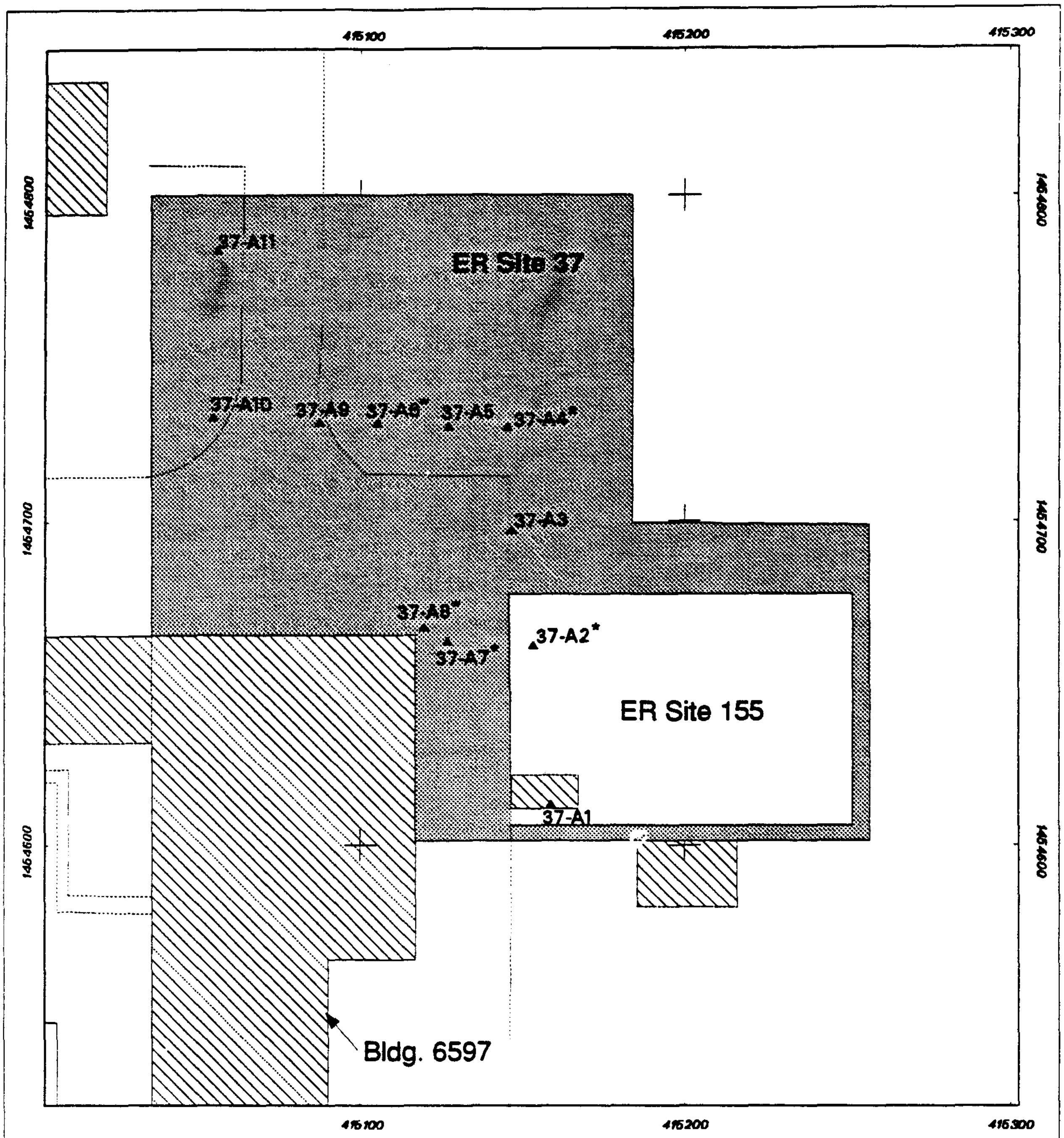
Definitions:

NA- Not Applicable
ND- Not Detected
PCBs- Polychlorinated Biphenyls
PPM- Parts Per Million
TPH- Total Petroleum Hydrocarbons

Attachment 37-3

Attachment 37-3

Figure 9-2 showing laboratory and field screening samples



Legend

▲37-A1	Auger Soil Sample analyzed by field screening only
▲37-A2*	Auger Soil Sample analyzed in the laboratory
┄┄┄	Road
▒	ER Site 37
▨	Building

Sandia National Laboratories, New Mexico
Environmental Restoration Geographic Information System

Figure 9-2 ER Site 37
Location of
Near-Surface Soil Samples, TA-V

0 25 50
Scale in Feet

0 6 12
Scale in Meters

Unclassified

FINAL

1:600

Transverse Mercator Projection, New Mexico State Plane Coordinate System, Central Zone
1927 North American Horizontal Datum, 1929 North American Vertical Datum

DHelfrich SNL GIS ORG. 6804 06/25/98 MAPID=980701

Attachment 37-4

Attachment 37-4

Laboratory Analytical Results for ER Site 37

Laboratory QA/QC – copied from laboratory reports

APPENDIX C. LABORATORY ANALYTICAL DATA

ERSITE	Test Method	Analyte	Sample ID	Sample Depth (ft)	Sample Date	Result	Units	Detection Lim	Qualifier
37	8240	1,2-DICHLOROETHANE	TA3/5-37-A4-2	2	09-JUN-94	6.3	ug/kg	5	
		ACETONE	TA3/5-37-A7-1	1	10-JUN-94	8	ug/kg	10	J
			TA3/5-37-A7-5	5	10-JUN-94	9.9	ug/kg	10	J
		METHYLENE CHLORIDE	TA3/5-37-A4-2	2	09-JUN-94	4.8	ug/kg	5	BJ
			TA3/5-37-A7-1	1	10-JUN-94	4.5	ug/kg	5	BJ
			TA3/5-37-A7-5	5	10-JUN-94	4.9	ug/kg	5	BJ
		TETRACHLOROETHENE	TA3/5-37-A4-2	2	09-JUN-94	2.1	ug/kg	5	J
		TRICHLOROETHENE	TA3/5-37-A4-2	2	09-JUN-94	1.9	ug/kg	5	J

ER Site 37 RFI Analytical Results; PCBs (Method 8080)

ER Sample ID	Sample Number	Sample Date	Sample Depth (Feet)	Analyte	Units	Sample Type	Amount Detected	QC Flag	Material Description
TA3/5-37-A2-5	SNL0130227	09-JUN-94	5	Aroclor 1016	ug/Kg	F	<33	U	SOIL
TA3/5-37-A2-5	SNL0130227	09-JUN-94	5	Aroclor 1221	ug/Kg	F	<33	U	SOIL
TA3/5-37-A2-5	SNL0130227	09-JUN-94	5	Aroclor 1232	ug/Kg	F	<33	U	SOIL
TA3/5-37-A2-5	SNL0130227	09-JUN-94	5	Aroclor 1242	ug/Kg	F	<33	U	SOIL
TA3/5-37-A2-5	SNL0130227	09-JUN-94	5	Aroclor 1248	ug/Kg	F	<33	U	SOIL
TA3/5-37-A2-5	SNL0130227	09-JUN-94	5	Aroclor 1254	ug/Kg	F	<33	U	SOIL
TA3/5-37-A2-5	SNL0130227	09-JUN-94	5	Aroclor 1260	ug/Kg	F	<33	U	SOIL
TA3/5-37-A4-1	SNL0130229	09-JUN-94	1	Aroclor 1016	ug/Kg	F	<33	U	SOIL
TA3/5-37-A4-1	SNL0130229	09-JUN-94	1	Aroclor 1221	ug/kg	F	<33	U	SOIL
TA3/5-37-A4-1	SNL0130229	09-JUN-94	1	Aroclor 1232	ug/Kg	F	<33	U	SOIL
TA3/5-37-A4-1	SNL0130229	09-JUN-94	1	Aroclor 1242	ug/Kg	F	<33	U	SOIL
TA3/5-37-A4-1	SNL0130229	09-JUN-94	1	Aroclor 1248	ug/Kg	F	<33	U	SOIL
TA3/5-37-A4-1	NL/NM015229-1	06-JUN-94	1	Aroclor 1254	ug/Kg	SD	36		SOIL
TA3/5-37-A4-1	SNL0130229	09-JUN-94	1	Aroclor 1254	ug/Kg	F	<33	U	SOIL
TA3/5-37-A4-1	SNL0130229	09-JUN-94	1	Aroclor 1260	ug/Kg	F	<33	U	SOIL
TA3/5-37-A7-1	SNL0130237	10-JUN-94	1	Aroclor 1016	ug/Kg	F	<33	U	SOIL
TA3/5-37-A7-1	SNL0130237	10-JUN-94	1	Aroclor 1221	ug/Kg	F	<33	U	SOIL
TA3/5-37-A7-1	SNL0130237	10-JUN-94	1	Aroclor 1232	ug/Kg	F	<33	U	SOIL
TA3/5-37-A7-1	SNL0130237	10-JUN-94	1	Aroclor 1242	ug/Kg	F	<33	U	SOIL
TA3/5-37-A7-1	SNL0130237	10-JUN-94	1	Aroclor 1248	ug/Kg	F	<33	U	SOIL
TA3/5-37-A7-1	SNL0130237	10-JUN-94	1	Aroclor 1254	ug/Kg	F	<33	U	SOIL
TA3/5-37-A7-1	SNL0130237	10-JUN-94	1	Aroclor 1260	ug/Kg	F	<33	U	SOIL
TA3/5-37-A7-5	SNL0130240	10-JUN-94	5	Aroclor 1016	ug/Kg	F	<33	U	SOIL
TA3/5-37-A7-5	SNL0130240	10-JUN-94	5	Aroclor 1221	ug/Kg	F	<33	U	SOIL
TA3/5-37-A7-5	SNL0130240	10-JUN-94	5	Aroclor 1232	ug/Kg	F	<33	U	SOIL
TA3/5-37-A7-5	SNL0130240	10-JUN-94	5	Aroclor 1242	ug/Kg	F	<33	U	SOIL
TA3/5-37-A7-5	SNL0130240	10-JUN-94	5	Aroclor 1248	ug/Kg	F	<33	U	SOIL
TA3/5-37-A7-5	SNL0130240	10-JUN-94	5	Aroclor 1254	ug/Kg	F	<33	U	SOIL
TA3/5-37-A7-5	SNL0130240	10-JUN-94	5	Aroclor 1260	ug/Kg	F	<33	U	SOIL
TA3/5-37-A8-1	SNL0130243	10-JUN-94	1	Aroclor 1016	ug/Kg	F	<33	U	SOIL
TA3/5-37-A8-1	SNL0130243	10-JUN-94	1	Aroclor 1221	ug/Kg	F	<33	U	SOIL
TA3/5-37-A8-1	SNL0130243	10-JUN-94	1	Aroclor 1232	ug/Kg	F	<33	U	SOIL
TA3/5-37-A8-1	SNL0130243	10-JUN-94	1	Aroclor 1242	ug/Kg	F	<33	U	SOIL
TA3/5-37-A8-1	SNL0130243	10-JUN-94	1	Aroclor 1248	ug/Kg	F	<33	U	SOIL
TA3/5-37-A8-1	SNL0130243	10-JUN-94	1	Aroclor 1254	ug/Kg	F	<33	U	SOIL
TA3/5-37-A8-1	SNL0130243	10-JUN-94	1	Aroclor 1260	ug/Kg	F	<33	U	SOIL
TA3/5-37-FBA	SNL0130232	09-JUN-94	0	Aroclor 1016	ug/L	FB	<1	U	WATER
TA3/5-37-FBA	SNL0130232	09-JUN-94	0	Aroclor 1221	ug/L	FB	<1	U	WATER
TA3/5-37-FBA	SNL0130232	09-JUN-94	0	Aroclor 1232	ug/L	FB	<1	U	WATER
TA3/5-37-FBA	SNL0130232	09-JUN-94	0	Aroclor 1242	ug/L	FB	<1	U	WATER
TA3/5-37-FBA	SNL0130232	09-JUN-94	0	Aroclor 1248	ug/L	FB	<1	U	WATER
TA3/5-37-FBA	SNL0130232	09-JUN-94	0	Aroclor 1254	ug/L	FB	<1	U	WATER
TA3/5-37-FBA	SNL0130232	09-JUN-94	0	Aroclor 1260	ug/L	FB	<1	U	WATER

ER Site 37 RFI Analytical Results; Volatile Organics (EPA Method 8240)

ER Sample ID	Sample Number	Sample Type	Sample Depth (Feet)	Analyte	Units	Amount Detected	QC Flag	Material Description
TA3/5-37-A4-2	SNL0130230	F	2	Acetone	ug/Kg	<10	U	SOIL
TA3/5-37-A4-2	SNL0130230	F	2	Benzene	ug/Kg	<5	U	SOIL
TA3/5-37-A4-2	SNL0130230	F	2	Bromodichloromethane	ug/Kg	<5	U	SOIL
TA3/5-37-A4-2	SNL0130230	F	2	Bromoform	ug/Kg	<5	U	SOIL
TA3/5-37-A4-2	SNL0130230	F	2	Bromomethane	ug/Kg	<10	U	SOIL
TA3/5-37-A4-2	SNL0130230	F	2	Butanone, 2-	ug/Kg	<10	U	SOIL
TA3/5-37-A4-2	SNL0130230	F	2	Carbon disulfide	ug/Kg	<5	U	SOIL
TA3/5-37-A4-2	SNL0130230	F	2	Carbon tetrachloride	ug/Kg	<5	U	SOIL
TA3/5-37-A4-2	SNL0130230	F	2	Chlorobenzene	ug/Kg	<5	U	SOIL
TA3/5-37-A4-2	SNL0130230	F	2	Chloroethane	ug/Kg	<10	U	SOIL
TA3/5-37-A4-2	SNL0130230	F	2	Chloroform	ug/Kg	<5	U	SOIL
TA3/5-37-A4-2	SNL0130230	F	2	Chloromethane	ug/Kg	<10	U	SOIL
TA3/5-37-A4-2	SNL0130230	F	2	Dibromochloromethane	ug/Kg	<5	U	SOIL
TA3/5-37-A4-2	SNL0130230	F	2	Dichlorodifluoromethane	ug/Kg	<20	U	SOIL
TA3/5-37-A4-2	SNL0130230	F	2	Dichloroethane, 1,1-	ug/Kg	<5	U	SOIL
TA3/5-37-A4-2	SNL0130230	F	2	Dichloroethane, 1,2-	ug/Kg	6.3		SOIL
TA3/5-37-A4-2	SNL0130230	F	2	Dichloroethene, 1,1-	ug/Kg	<5	U	SOIL
TA3/5-37-A4-2	SNL0130230	F	2	Dichloroethene, 1,2-	ug/Kg	<5	U	SOIL
TA3/5-37-A4-2	SNL0130230	F	2	Dichloromethane-methylene chloride	ug/Kg	4.8	BJ	SOIL
TA3/5-37-A4-2	SNL0130230	F	2	Dichloropropane, 1,2-	ug/Kg	<5	U	SOIL
TA3/5-37-A4-2	SNL0130230	F	2	Dichloropropene, cis-1,3-	ug/Kg	<5	U	SOIL
TA3/5-37-A4-2	SNL0130230	F	2	Dichloropropene, trans-1,3-	ug/Kg	<5	U	SOIL
TA3/5-37-A4-2	SNL0130230	F	2	Ethyl benzene	ug/Kg	<5	U	SOIL
TA3/5-37-A4-2	SNL0130230	F	2	Hexanone, 2-	ug/Kg	<10	U	SOIL
TA3/5-37-A4-2	SNL0130230	F	2	Pentanone, 4-methyl-, 2-	ug/Kg	<10	U	SOIL
TA3/5-37-A4-2	SNL0130230	F	2	Styrene	ug/Kg	<5	U	SOIL
TA3/5-37-A4-2	SNL0130230	F	2	Tetrachloroethane, 1,1,2,2-	ug/Kg	<5	U	SOIL
TA3/5-37-A4-2	SNL0130230	F	2	Tetrachloroethene	ug/Kg	2.1	J	SOIL
TA3/5-37-A4-2	SNL0130230	F	2	Toluene	ug/Kg	<5	U	SOIL
TA3/5-37-A4-2	SNL0130230	F	2	Trichloro-1,2,2-trifluoroethane, 1,1,2-	ug/Kg	<10	U	SOIL
TA3/5-37-A4-2	SNL0130230	F	2	Trichloroethane, 1,1,1-	ug/Kg	<5	U	SOIL
TA3/5-37-A4-2	SNL0130230	F	2	Trichloroethane, 1,1,2-	ug/Kg	<5	U	SOIL
TA3/5-37-A4-2	SNL0130230	F	2	Trichloroethene	ug/Kg	1.9	J	SOIL
TA3/5-37-A4-2	SNL0130230	F	2	Trichlorofluoromethane	ug/Kg	<5	U	SOIL
TA3/5-37-A4-2	SNL0130230	F	2	Vinyl acetate	ug/Kg	<10	U	SOIL
TA3/5-37-A4-2	SNL0130230	F	2	Vinyl chloride	ug/Kg	<10	U	SOIL
TA3/5-37-A4-2	SNL0130230	F	2	Xylenes, total	ug/Kg	<5	U	SOIL
TA3/5-37-A7-1	SNL0130238	F	1	Acetone	ug/Kg	8	J	SOIL
TA3/5-37-A7-1	SNL0130238	F	1	Benzene	ug/Kg	<5	U	SOIL
TA3/5-37-A7-1	SNL0130238	F	1	Bromodichloromethane	ug/Kg	<5	U	SOIL
TA3/5-37-A7-1	SNL0130238	F	1	Bromoform	ug/Kg	<5	U	SOIL
TA3/5-37-A7-1	SNL0130238	F	1	Bromomethane	ug/Kg	<10	U	SOIL
TA3/5-37-A7-1	SNL0130238	F	1	Butanone, 2-	ug/Kg	<10	U	SOIL
TA3/5-37-A7-1	SNL0130238	F	1	Carbon disulfide	ug/Kg	<5	U	SOIL
TA3/5-37-A7-1	SNL0130238	F	1	Carbon tetrachloride	ug/Kg	<5	U	SOIL
TA3/5-37-A7-1	SNL0130238	F	1	Chlorobenzene	ug/Kg	<5	U	SOIL
TA3/5-37-A7-1	SNL0130238	F	1	Chloroethane	ug/Kg	<10	U	SOIL
TA3/5-37-A7-1	SNL0130238	F	1	Chloroform	ug/Kg	<5	U	SOIL
TA3/5-37-A7-1	SNL0130238	F	1	Chloromethane	ug/Kg	<10	U	SOIL
TA3/5-37-A7-1	SNL0130238	F	1	Dibromochloromethane	ug/Kg	<5	U	SOIL
TA3/5-37-A7-1	SNL0130238	F	1	Dichlorodifluoromethane	ug/Kg	<20	U	SOIL
TA3/5-37-A7-1	SNL0130238	F	1	Dichloroethane, 1,1-	ug/Kg	<5	U	SOIL
TA3/5-37-A7-1	SNL0130238	F	1	Dichloroethane, 1,2-	ug/Kg	<5	U	SOIL
TA3/5-37-A7-1	SNL0130238	F	1	Dichloroethene, 1,1-	ug/Kg	<5	U	SOIL
TA3/5-37-A7-1	SNL0130238	F	1	Dichloroethene, 1,2-	ug/Kg	<5	U	SOIL
TA3/5-37-A7-1	SNL0130238	F	1	Dichloromethane-methylene chloride	ug/Kg	4.5	BJ	SOIL
TA3/5-37-A7-1	SNL0130238	F	1	Dichloropropane, 1,2-	ug/Kg	<5	U	SOIL
TA3/5-37-A7-1	SNL0130238	F	1	Dichloropropene, cis-1,3-	ug/Kg	<5	U	SOIL
TA3/5-37-A7-1	SNL0130238	F	1	Dichloropropene, trans-1,3-	ug/Kg	<5	U	SOIL
TA3/5-37-A7-1	SNL0130238	F	1	Ethyl benzene	ug/Kg	<5	U	SOIL
TA3/5-37-A7-1	SNL0130238	F	1	Hexanone, 2-	ug/Kg	<10	U	SOIL
TA3/5-37-A7-1	SNL0130238	F	1	Pentanone, 4-methyl-, 2-	ug/Kg	<10	U	SOIL
TA3/5-37-A7-1	SNL0130238	F	1	Styrene	ug/Kg	<5	U	SOIL
TA3/5-37-A7-1	SNL0130238	F	1	Tetrachloroethane, 1,1,2,2-	ug/Kg	<5	U	SOIL
TA3/5-37-A7-1	SNL0130238	F	1	Tetrachloroethene	ug/Kg	<5	U	SOIL

ER Site 37 RFI Analytical Results; Volatile Organics (EPA Method 8240)

ER Sample ID	Sample Number	Sample Type	Sample Depth (Feet)	Analyte	Units	Amount Detected	QC Flag	Material Description
TA3/5-37-A7-1	SNL0130238	F	1	Toluene	ug/Kg	<5	U	SOIL
TA3/5-37-A7-1	SNL0130238	F	1	Trichloro-1,2,2-trifluorethane, 1,1,2-	ug/Kg	<10	U	SOIL
TA3/5-37-A7-1	SNL0130238	F	1	Trichloroethane, 1,1,1-	ug/Kg	<5	U	SOIL
TA3/5-37-A7-1	SNL0130238	F	1	Trichloroethane, 1,1,2-	ug/Kg	<5	U	SOIL
TA3/5-37-A7-1	SNL0130238	F	1	Trichloroethene	ug/Kg	<5	U	SOIL
TA3/5-37-A7-1	SNL0130238	F	1	Trichlorofluoromethane	ug/Kg	<5	U	SOIL
TA3/5-37-A7-1	SNL0130238	F	1	Vinyl acetate	ug/Kg	<10	U	SOIL
TA3/5-37-A7-1	SNL0130238	F	1	Vinyl chloride	ug/Kg	<10	U	SOIL
TA3/5-37-A7-1	SNL0130238	F	1	Xylenes, total	ug/Kg	<5	U	SOIL
TA3/5-37-A7-5	SNL0130241	F	5	Acetone	ug/Kg	9.9	J	SOIL
TA3/5-37-A7-5	SNL0130241	F	5	Benzene	ug/Kg	<5	U	SOIL
TA3/5-37-A7-5	SNL0130241	F	5	Bromodichloromethane	ug/Kg	<5	U	SOIL
TA3/5-37-A7-5	SNL0130241	F	5	Bromoform	ug/Kg	<5	U	SOIL
TA3/5-37-A7-5	SNL0130241	F	5	Bromomethane	ug/Kg	<10	U	SOIL
TA3/5-37-A7-5	SNL0130241	F	5	Butanone, 2-	ug/Kg	<10	U	SOIL
TA3/5-37-A7-5	SNL0130241	F	5	Carbon disulfide	ug/Kg	<5	U	SOIL
TA3/5-37-A7-5	SNL0130241	F	5	Carbon tetrachloride	ug/Kg	<5	U	SOIL
TA3/5-37-A7-5	SNL0130241	F	5	Chlorobenzene	ug/Kg	<5	U	SOIL
TA3/5-37-A7-5	SNL0130241	F	5	Chloroethane	ug/Kg	<10	U	SOIL
TA3/5-37-A7-5	SNL0130241	F	5	Chloroform	ug/Kg	<5	U	SOIL
TA3/5-37-A7-5	SNL0130241	F	5	Chloromethane	ug/Kg	<10	U	SOIL
TA3/5-37-A7-5	SNL0130241	F	5	Dibromochloromethane	ug/Kg	<5	U	SOIL
TA3/5-37-A7-5	SNL0130241	F	5	Dichlorodifluoromethane	ug/Kg	<20	U	SOIL
TA3/5-37-A7-5	SNL0130241	F	5	Dichloroethane, 1,1-	ug/Kg	<5	U	SOIL
TA3/5-37-A7-5	SNL0130241	F	5	Dichloroethane, 1,2-	ug/Kg	<5	U	SOIL
TA3/5-37-A7-5	SNL0130241	F	5	Dichloroethene, 1,1-	ug/Kg	<5	U	SOIL
TA3/5-37-A7-5	SNL0130241	F	5	Dichloroethene, 1,2-	ug/Kg	<5	U	SOIL
TA3/5-37-A7-5	SNL0130241	F	5	Dichloromethane-methylene chloride	ug/Kg	4.9	BJ	SOIL
TA3/5-37-A7-5	SNL0130241	F	5	Dichloropropane, 1,2-	ug/Kg	<5	U	SOIL
TA3/5-37-A7-5	SNL0130241	F	5	Dichloropropene, cis-1,3-	ug/Kg	<5	U	SOIL
TA3/5-37-A7-5	SNL0130241	F	5	Dichloropropene, trans-1,3-	ug/Kg	<5	U	SOIL
TA3/5-37-A7-5	SNL0130241	F	5	Ethyl benzene	ug/Kg	<5	U	SOIL
TA3/5-37-A7-5	SNL0130241	F	5	Hexanone, 2-	ug/Kg	<10	U	SOIL
TA3/5-37-A7-5	SNL0130241	F	5	Pentanone, 4-methyl-, 2-	ug/Kg	<10	U	SOIL
TA3/5-37-A7-5	SNL0130241	F	5	Styrene	ug/Kg	<5	U	SOIL
TA3/5-37-A7-5	SNL0130241	F	5	Tetrachloroethane, 1,1,2,2-	ug/Kg	<5	U	SOIL
TA3/5-37-A7-5	SNL0130241	F	5	Tetrachloroethene	ug/Kg	<5	U	SOIL
TA3/5-37-A7-5	SNL0130241	F	5	Toluene	ug/Kg	<5	U	SOIL
TA3/5-37-A7-5	SNL0130241	F	5	Trichloro-1,2,2-trifluorethane, 1,1,2-	ug/Kg	<10	U	SOIL
TA3/5-37-A7-5	SNL0130241	F	5	Trichloroethane, 1,1,1-	ug/Kg	<5	U	SOIL
TA3/5-37-A7-5	SNL0130241	F	5	Trichloroethane, 1,1,2-	ug/Kg	<5	U	SOIL
TA3/5-37-A7-5	SNL0130241	F	5	Trichloroethene	ug/Kg	<5	U	SOIL
TA3/5-37-A7-5	SNL0130241	F	5	Trichlorofluoromethane	ug/Kg	<5	U	SOIL
TA3/5-37-A7-5	SNL0130241	F	5	Vinyl acetate	ug/Kg	<10	U	SOIL
TA3/5-37-A7-5	SNL0130241	F	5	Vinyl chloride	ug/Kg	<10	U	SOIL
TA3/5-37-A7-5	SNL0130241	F	5	Xylenes, total	ug/Kg	<5	U	SOIL
TA3/5-37-FBA	SNL0130233	FB	0	Acetone	ug/L	<10	U	WATER
TA3/5-37-FBA	SNL0130233	FB	0	Benzene	ug/L	<5	U	WATER
TA3/5-37-FBA	SNL0130233	FB	0	Bromodichloromethane	ug/L	<5	U	WATER
TA3/5-37-FBA	SNL0130233	FB	0	Bromoform	ug/L	<5	U	WATER
TA3/5-37-FBA	SNL0130233	FB	0	Bromomethane	ug/L	<10	U	WATER
TA3/5-37-FBA	SNL0130233	FB	0	Butanone, 2-	ug/L	<10	U	WATER
TA3/5-37-FBA	SNL0130233	FB	0	Carbon disulfide	ug/L	<5	U	WATER
TA3/5-37-FBA	SNL0130233	FB	0	Carbon tetrachloride	ug/L	<5	U	WATER
TA3/5-37-FBA	SNL0130233	FB	0	Chlorobenzene	ug/L	<5	U	WATER
TA3/5-37-FBA	SNL0130233	FB	0	Chloroethane	ug/L	<10	U	WATER
TA3/5-37-FBA	SNL0130233	FB	0	Chloroform	ug/L	<5	U	WATER
TA3/5-37-FBA	SNL0130233	FB	0	Chloromethane	ug/L	<10	U	WATER
TA3/5-37-FBA	SNL0130233	FB	0	Dibromochloromethane	ug/L	<5	U	WATER
TA3/5-37-FBA	SNL0130233	FB	0	Dichlorodifluoromethane	ug/L	<20	U	WATER
TA3/5-37-FBA	SNL0130233	FB	0	Dichloroethane, 1,1-	ug/L	<5	U	WATER
TA3/5-37-FBA	SNL0130233	FB	0	Dichloroethane, 1,2-	ug/L	<5	U	WATER
TA3/5-37-FBA	SNL0130233	FB	0	Dichloroethene, 1,1-	ug/L	<5	U	WATER

ER Site 37 RFI Analytical Results; Volatile Organics (EPA Method 8240)

ER Sample ID	Sample Number	Sample Type	Sample Depth (Feet)	Analyte	Units	Amount Detected	QC Flag	Material Description
TA3/5-37-FBA	SNL0130233	FB	0	Dichloroethene, 1,2-	ug/L	<5	U	WATER
TA3/5-37-FBA	SNL0130233	FB	0	Dichloromethane-methylene chloride	ug/L	2.6	BJ	WATER
TA3/5-37-FBA	SNL0130233	FB	0	Dichloropropane, 1,2-	ug/L	<5	U	WATER
TA3/5-37-FBA	SNL0130233	FB	0	Dichloropropene, cis-1,3-	ug/L	<5	U	WATER
TA3/5-37-FBA	SNL0130233	FB	0	Dichloropropene, trans-1,3-	ug/L	<5	U	WATER
TA3/5-37-FBA	SNL0130233	FB	0	Ethyl benzene	ug/L	<5	U	WATER
TA3/5-37-FBA	SNL0130233	FB	0	Hexanone, 2-	ug/L	<10	U	WATER
TA3/5-37-FBA	SNL0130233	FB	0	Pentanone, 4-methyl-, 2-	ug/L	<10	U	WATER
TA3/5-37-FBA	SNL0130233	FB	0	Styrene	ug/L	<5	U	WATER
TA3/5-37-FBA	SNL0130233	FB	0	Tetrachloroethane, 1,1,2,2-	ug/L	<5	U	WATER
TA3/5-37-FBA	SNL0130233	FB	0	Tetrachloroethene	ug/L	<5	U	WATER
TA3/5-37-FBA	SNL0130233	FB	0	Toluene	ug/L	<5	U	WATER
TA3/5-37-FBA	SNL0130233	FB	0	Trichloro-1,2,2-trifluorethane, 1,1,2-	ug/L	<10	U	WATER
TA3/5-37-FBA	SNL0130233	FB	0	Trichloroethane, 1,1,1-	ug/L	<5	U	WATER
TA3/5-37-FBA	SNL0130233	FB	0	Trichloroethane, 1,1,2-	ug/L	<5	U	WATER
TA3/5-37-FBA	SNL0130233	FB	0	Trichloroethene	ug/L	<5	U	WATER
TA3/5-37-FBA	SNL0130233	FB	0	Trichlorofluoromethane	ug/L	<5	U	WATER
TA3/5-37-FBA	SNL0130233	FB	0	Vinyl acetate	ug/L	<10	U	WATER
TA3/5-37-FBA	SNL0130233	FB	0	Vinyl chloride	ug/L	<10	U	WATER
TA3/5-37-FBA	SNL0130233	FB	0	Xylenes, total	ug/L	<5	U	WATER
TA3/5-37-TBA	SNL0130234	TB	0	Acetone	ug/L	3.5	J	WATER
TA3/5-37-TBA	SNL0130234	TB	0	Benzene	ug/L	<5	U	WATER
TA3/5-37-TBA	SNL0130234	TB	0	Bromodichloromethane	ug/L	<5	U	WATER
TA3/5-37-TBA	SNL0130234	TB	0	Bromoform	ug/L	<5	U	WATER
TA3/5-37-TBA	SNL0130234	TB	0	Bromomethane	ug/L	<10	U	WATER
TA3/5-37-TBA	SNL0130234	TB	0	Butanone, 2-	ug/L	<10	U	WATER
TA3/5-37-TBA	SNL0130234	TB	0	Carbon disulfide	ug/L	<5	U	WATER
TA3/5-37-TBA	SNL0130234	TB	0	Carbon tetrachloride	ug/L	<5	U	WATER
TA3/5-37-TBA	SNL0130234	TB	0	Chlorobenzene	ug/L	<5	U	WATER
TA3/5-37-TBA	SNL0130234	TB	0	Chloroethane	ug/L	<10	U	WATER
TA3/5-37-TBA	SNL0130234	TB	0	Chloroform	ug/L	<5	U	WATER
TA3/5-37-TBA	SNL0130234	TB	0	Chloromethane	ug/L	<10	U	WATER
TA3/5-37-TBA	SNL0130234	TB	0	Dibromochloromethane	ug/L	<5	U	WATER
TA3/5-37-TBA	SNL0130234	TB	0	Dichlorodifluoromethane	ug/L	<20	U	WATER
TA3/5-37-TBA	SNL0130234	TB	0	Dichloroethane, 1,1-	ug/L	<5	U	WATER
TA3/5-37-TBA	SNL0130234	TB	0	Dichloroethane, 1,2-	ug/L	<5	U	WATER
TA3/5-37-TBA	SNL0130234	TB	0	Dichloroethene, 1,1-	ug/L	<5	U	WATER
TA3/5-37-TBA	SNL0130234	TB	0	Dichloroethene, 1,2-	ug/L	<5	U	WATER
TA3/5-37-TBA	SNL0130234	TB	0	Dichloromethane-methylene chloride	ug/L	3.8	BJ	WATER
TA3/5-37-TBA	SNL0130234	TB	0	Dichloropropane, 1,2-	ug/L	<5	U	WATER
TA3/5-37-TBA	SNL0130234	TB	0	Dichloropropene, cis-1,3-	ug/L	<5	U	WATER
TA3/5-37-TBA	SNL0130234	TB	0	Dichloropropene, trans-1,3-	ug/L	<5	U	WATER
TA3/5-37-TBA	SNL0130234	TB	0	Ethyl benzene	ug/L	<5	U	WATER
TA3/5-37-TBA	SNL0130234	TB	0	Hexanone, 2-	ug/L	<10	U	WATER
TA3/5-37-TBA	SNL0130234	TB	0	Pentanone, 4-methyl-, 2-	ug/L	<10	U	WATER
TA3/5-37-TBA	SNL0130234	TB	0	Styrene	ug/L	<5	U	WATER
TA3/5-37-TBA	SNL0130234	TB	0	Tetrachloroethane, 1,1,2,2-	ug/L	<5	U	WATER
TA3/5-37-TBA	SNL0130234	TB	0	Tetrachloroethene	ug/L	<5	U	WATER
TA3/5-37-TBA	SNL0130234	TB	0	Toluene	ug/L	<5	U	WATER
TA3/5-37-TBA	SNL0130234	TB	0	Trichloro-1,2,2-trifluorethane, 1,1,2-	ug/L	<10	U	WATER
TA3/5-37-TBA	SNL0130234	TB	0	Trichloroethane, 1,1,1-	ug/L	<5	U	WATER
TA3/5-37-TBA	SNL0130234	TB	0	Trichloroethane, 1,1,2-	ug/L	<5	U	WATER
TA3/5-37-TBA	SNL0130234	TB	0	Trichloroethene	ug/L	<5	U	WATER
TA3/5-37-TBA	SNL0130234	TB	0	Trichlorofluoromethane	ug/L	<5	U	WATER
TA3/5-37-TBA	SNL0130234	TB	0	Vinyl acetate	ug/L	<10	U	WATER
TA3/5-37-TBA	SNL0130234	TB	0	Vinyl chloride	ug/L	<10	U	WATER
TA3/5-37-TBA	SNL0130234	TB	0	Xylenes, total	ug/L	<5	U	WATER

ER Site 37 RFI Analytical Results; Total Petroleum Hydrocarbons (Method 3550/418.)

ER Sample ID	Sample Number	Sample Date	Sample Depth (Feet)	Analyte	Units	Sample Type	Amount Detected	QC Flag	Material Description
TA3/5-37-A2-5	SNL0130226	09-JUN-94	5	Hydrocarbon, total petroleum	mg/kg	F	<20	U	SOIL
TA3/5-37-A4-1	SNL0130228	09-JUN-94	1	Hydrocarbon, total petroleum	mg/kg	F	<20	U	SOIL
TA3/5-37-A4-1	SNL/NM015229-1	06-JUN-94	1	Petroleum hydrocarbon, total	mg/kg	SD	231		SOIL
TA3/5-37-A6-1	SNL0130235	10-JUN-94	1	Hydrocarbon, total petroleum	mg/kg	F	<20	U	SOIL
TA3/5-37-A7-1	SNL0130236	10-JUN-94	1	Hydrocarbon, total petroleum	mg/kg	F	<20	U	SOIL
TA3/5-37-A7-5	SNL0130239	10-JUN-94	5	Hydrocarbon, total petroleum	mg/kg	F	<20	U	SOIL
TA3/5-37-A8-1	SNL0130242	10-JUN-94	1	Hydrocarbon, total petroleum	mg/kg	F	<20	U	SOIL
TA3/5-37-A8-5	SNL0130244	9-Jun-94	5	Hydrocarbon, total petroleum	mg/kg	F	<20	U	SOIL
TA3/5-37-A8-5D	SNL0130245	10-JUN-94	5	Hydrocarbon, total petroleum	mg/kg	D	<20	U	SOIL
TA3/5-37-FBA	SNL0130231	09-JUN-94	0	Hydrocarbon, total petroleum	mg/L	FB	<1	U	WATER

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SF 2001-COC (12-93)

ANALYSIS RE[illegible]UEST AND CHAIN OF CUSTODY RECORD

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PAGE 1 OF 2

Department No.: 7582
Project/Task Manager: CHRIS AAS / PAULA SLAVIN
Project Name: TA III/V - SITE 37
Sample Team Members: RAY PATTESON TPH
PAULA J SLAVIN PJS
ERNE YINSANT EY
SCL or Logbook Ref. No.: SCL-00419, 00422

Date Samples Shipped: 6/10/94
Carrier/Waybill No.: A 44331
Lab Destination: ENSECO RMAL
Lab Contact: E. LARIVIERE
SMO Contact/Phone: 505-262-8800
Send Report to SMO: MARK LYON / D. CONSTANT
SMO Reference No.: N/A

Bill to: Sandia National Laboratories
Supplier Services Department
P.O. Box 5800 MS 0154
Albuquerque, NM 87185-0154
Contract No.: 67-9736B
Case No.: 3617.300
SMO Authorization: D. McLaughlin

Sample Number - Fraction	Sample Matrix	Date/Time Collected	Container Type	Sample Volume	Preservative	Required Analytical Testing	Lab Sample Number	Condition on Receipt
SNL/NM 015226-1	SOIL	06/09/94 1126	Sleeve	300ml	ICE 4°C	TPH 418.1, PCBs 8080	36125 01	
" 015229-1	↓	1440	↓	↓	↓	TPH 418.1 (+MS/MSDUP), PCBs 8080	02	MS/SD
015229-2	↓	1440	Glass	125ml	↓	FREON 8240	03	
015233-1	WATER	1600		1X 32oz	H2SO4	TPH 418.1	04	
015233-2				2X 32oz	ICE 4°C	PCBs 8080	05	
015233-3				3X 40ml	HCl	FREON 8240	06	
015233-4	↓	↓	↓	1X 40ml	HCl	8240	07	
015235-1	SOIL	06/10/94 0920	Sleeve	300ml	ICE 4°C	TPH 418.1	08	
015237-1		0955	↓	300ml		TPH 418.1, PCBs 8080	09	
015237-2		0955	Glass	1X 125ml		FREON 8240	10	
015239-1	↓	1010	Sleeve	300ml	↓	TPH 418.1, PCBs 8080	11	

Possible Hazard Identification
☐ Non-hazard ☐ Flammable ☐ Skin Irritant ☐ Poison B ☐ Radiological

*Reference attached radiological screening for specific contact readings.

Turnaround Time
☑ Normal ☐ Rush Required Report Date

Sample Disposal
☐ Return to Client ☑ Disposal by Lab Archive Until

Special Instructions/QC Requirements ~~Please LIST AS separate report!~~
~~ANALYZE EXTRA VOLUME FOR MATRIX SPIKE AND MATRIX SPIKE DUPLICATE~~ MJ
PLEASE FAX RESULTS TO PAULA SLAVIN 505-848-0417
PLEASE LIST AS SEPARATE REPORT

	Org.	Date	Time
1. Relinquished by	7582	06/10/94	1205
1. Received by	SMO-7576	6/10/94	1205
2. Relinquished by	SMO-7576	6/10/94	1400
2. Received by		6/11/94	0813
3. Relinquished by			
3. Received by			
4. Relinquished by			
4. Received by			
5. Relinquished by			
5. Received by			
6. Relinquished by			
6. Received by			

WHITE - To Accompany Samples, Laboratory Copy
BLUE - To Accompany Samples, Return to SMO
YELLOW - SMO Suspense Copy
PINK - Field Copy

Sandia National Laboratories

ANALYSIS REQUEST AND CHAIN OF CUSTODY RECORD (cont.)

No: 00158

Page 2 of 2.

Project Name: TA-III/V - SITE 37 Project/Task Manager: CHRIS AAS/PAULA SLAVIN Case Number: 3617.300

Sample Number	Sample Type	Date/Time Collected	Container Type	Sample Volume	Preservative 9/8	Requested Testing Program	QC	Lab Sample Number	Condition on Receipt
SNL/NM 015238 . 2	Soil.	06/10/94 1010	Glass	1X125ml	Ice 4°C	FREON 8240	N	36125-12	
015239 . 1	↓	1020	Sleeve	1X300ml	↓	TPH 418.1/PCB 8080	|	13	
015240 . 1		1035	↓	↓		TPH 418.1	|	14	
015241 . "		1050				TPH 418.1	✓	15	
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White-To Accompany Samples, Laboratory Copy *Blue-To Accompany Samples, Return to SMO* *Pink-Field/Puchasing Copy* *Rev 0 10/92*

351550.20/04/92

RMAL Industrial Sample Checklist **Revision 6.0** **January 24, 1994**

Project #: 36125 Date/Time Received: 6/11/94 08:30

Company Name & Sampling Site: SANDIA

*Cooler #(s): ________ ________ ________ ________

Temperatures: 3.4°C ________ ________ ________

* Place copy of airbill inside all non-RMAL coolers. Describe here.

UNPACKING & LABELING CHECK POINTS:	Y	N	INITIALS
1. Radiation Checked; (record reading if > 0.5 mR/hr):		✓	JF
2. Cooler seals Intact:	✓		
3. Chain of Custody Present:	✓		
4. Bottles broken or leaking (comment if Y): -photograph broken bottles-		✓	
5. Containers labeled (comment if N):	✓		
6. Chain of Custody includes "received by" and "relinquished by" signatures, dates, and times:	✓		
7. CoC agrees with bottle count (comment if N):	✓		
8. CoC agrees with labels (comment if N):	✓		
9. VOA samples filled completely (comment if N):	✓		
10. Are VOA samples preserved? (Check for bottle labels)	✓		
11. Sediment present in "D" bottles:	NA		
12. Are analyses with short holding times requested?			
13. Is extra sample volume provided for Matrix Spike and/or matrix replicates?		✓	
14. Multi phase samples present (comment if Y): -photograph multiphase samples-	NA		
15. Clear picture taken, labeled, and stapled to project folder?	✓		JF

Comments: include action taken to resolve discrepancies/problems. Include a hard copy of VAX mail or extra paper if more space is needed.

Initials: ________

Rocky Mountain
Analytical Laboratory

Enseco

RECEIVED
JUL 14 1994
SNL/SMO

July 13, 1994

Mr. Jim Fish
c/o Ms. Katherine M. Becker
Sandia National Laboratory SMO
Organization 7576, Mail Stop 1305
BDM Building
2301 Buena Vista SE
Albuquerque, NM 87106

Dear Mr. Fish:

Enclosed is the report for eleven soil samples and four aqueous samples received at Enseco-Rocky Mountain Analytical Laboratory on June 11, 1994. Included with the report is a quality control summary.

Please call if you have any questions.

Sincerely,

Ellen La Riviere

Ellen La Riviere
Program Administrator

EL
Enclosures

RMAL #036125

DATA REVIEWED
By: M Garcia Date: 7-20-94
Checked:
Approved:

Enseco
4955 Yarrow Street
Arvada, Colorado 80002
303/421-6611 Fax: 303/431-7171

ANALYTICAL RESULTS
FOR
SANDIA NATIONAL LABORATORY
ENSECO-RMAL NO. 036125

JULY 13, 1994

Reviewed by: ______________________
Ellen La Riviere

Enseco
4955 Yarrow Street
Arvada, Colorado 80002
303/421-6611 Fax: 303/431-7171

I. OVERVIEW

On June 11, 1994, Enseco-Rocky Mountain Analytical Laboratory received eleven soil samples and four aqueous samples from Sandia National Laboratory.

This report presents the analytical results as well as supporting information to aid in the evaluation and interpretation of the data and is arranged in the following order:

I. Overview
II. Sample Description Information/Analytical Test Requests
III. Analytical Results
IV. Quality Control Report

"J" values have been reported for the volatiles, semivolatiles, and metals analyses. A "J" value indicates an estimated value. For Methods 8240 and 8270 a "J" value is where the mass spectra data indicate the presence of a compound which meets identification criteria; however, the result is less than the reporting limit but greater than the method detection limit (MDL). For metals analyses "J" values are reported for those analytes which lie between the instrument detection limit (IDL) and the Enseco reporting limit. Analytes which were not detected at or below the reporting limit are reported as "ND" and do not have "J" flags. Because "J values" may represent false positive concentrations, care should be used when interpreting these data.

Organic Data Review

The Method 8080 QC lot 15 JUN 94-N1 has the precision measurement for aroclor 1254 exceeding control limits. The matrix spike/matrix spike duplicate samples analyzed with the batch (RMAL samples 036125-0005-MS and -0005-SD) were within acceptable limits. Because no target compounds were detected in the sample, the data were deemed acceptable and are reported.

Wet Chemistry Data Review

Standard analytical protocols were followed in the wet chemistry analyses of the samples and no problems were encountered or anomalies observed. All laboratory QC samples analyzed in conjunction with the samples in this project were within established control limits.

II. SAMPLE DESCRIPTION INFORMATION/ANALYTICAL TEST REQUESTS

Sample Description Information

The Sample Description Information lists all of the samples received in this project together with the internal laboratory identification number assigned for each sample. Each project received at Enseco - RMAL is assigned a unique six digit number. Samples within the project are numbered sequentially. The laboratory identification number is a combination of the six digit project code and the sample sequence number.

Also given in the Sample Description Information is the Sample Type (matrix), Date of Sampling (if known) and Date of Receipt at the laboratory.

Analytical Test Requests

The Analytical Test Requests lists the analyses that were performed on each sample. The Custom Test column indicates where tests have been modified to conform to the specific requirements of this project.

SAMPLE DESCRIPTION INFORMATION
for
Sandia National Laboratory

Lab ID	Client ID	Matrix	Sampled Date	Time	Received Date
036125-0001-SA	SNL/NM015226-1	SOIL	09 JUN 94	11:25	11 JUN 94
036125-0002-SA	SNL/NM015229-1	SOIL	09 JUN 94	14:40	11 JUN 94
036125-0002-MS	SNL/NM015229-1	SOIL	09 JUN 94	14:40	11 JUN 94
036125-0002-SD	SNL/NM015229-1	SOIL	09 JUN 94	14:40	11 JUN 94
036125-0003-SA	SNL/NM015229-2	SOIL	09 JUN 94	14:40	11 JUN 94
036125-0004-SA	SNL/NM015233-1	AQUEOUS	09 JUN 94	16:00	11 JUN 94
036125-0005-SA	SNL/NM015233-2	AQUEOUS	09 JUN 94	16:00	11 JUN 94
036125-0006-SA	SNL/NM015233-3	AQUEOUS	09 JUN 94	16:00	11 JUN 94
036125-0007-TB	SNL/NM015233-4	AQUEOUS	09 JUN 94	16:00	11 JUN 94
036125-0008-SA	SNL/NM015235-1	SOIL	10 JUN 94	09:20	11 JUN 94
036125-0009-SA	SNL/NM015237-1	SOIL	10 JUN 94	09:55	11 JUN 94
036125-0010-SA	SNL/NM015237-2	SOIL	10 JUN 94	09:55	11 JUN 94
036125-0011-SA	SNL/NM015238-1	SOIL	10 JUN 94	10:10	11 JUN 94
036125-0012-SA	SNL/NM015238-2	SOIL	10 JUN 94	10:10	11 JUN 94
036125-0013-SA	SNL/NM015239-1	SOIL	10 JUN 94	10:20	11 JUN 94
036125-0014-SA	SNL/NM015240-1	SOIL	10 JUN 94	10:35	11 JUN 94
036125-0015-SA	SNL/NM015241-1	SOIL	10 JUN 94	10:50	11 JUN 94

ANALYTICAL TEST REQUESTS
for
Sandia National Laboratory

Lab ID: 036125	Group Code	Analysis Description	Custom Test?
0001 - 0002, 0009 , 0011, 0013	A	PCBs	N
		Prep - PCBs by GC	N
		Total Petroleum Hydrocarbons (TPH), IR	N
0003 , 0010, 0012	B	Volatile Organics	N
		Target Compound List (TCL)	N
		GC Screen For Low Level Soils	N
0004	C	Total Petroleum Hydrocarbons (TPH), IR	N
		Prep - Total Petroleum Hydrocarbons, IR	N
0005	D	PCBs	N
		Prep - PCB by GC	N
0006 - 0007	E	Volatile Organics	N
		Target Compound List (TCL)	N
		Screen - Volatile Organics	N
0008 , 0014, 0015	F	Total Petroleum Hydrocarbons (TPH), IR	N

III. ANALYTICAL RESULTS

The analytical results for this project are presented in the following data tables. Each data table includes sample identification information, and when available and appropriate, dates sampled, received, authorized, prepared and analyzed. The authorization date is the date when the project was defined by the client such that laboratory work could begin. The date prepared is typically the date an extraction or digestion was initiated. For volatile organic compounds in water, the date prepared is the date the screening of the sample was performed.

Data sheets contain a listing of the parameters measured in each test, the analytical results and the Enseco reporting limit. Reporting limits are adjusted to reflect dilution of the sample, when appropriate. Solid and waste samples are reported on an "as received" basis, i.e., no correction is made for moisture content.

Volatile Organics
Target Compound List (TCL)
Method 8240

Client Name: Sandia National Laboratory
Client ID: SNL/NM015229-2
Lab ID: 036125-0003-SA
Matrix: SOIL Sampled: 09 JUN 94 Received: 11 JUN 94
Authorized: 11 JUN 94 Prepared: 18 JUN 94 Analyzed: 18 JUN 94

Parameter	Result	Wet wt. Units	Reporting Limit	
Acetone	ND	ug/kg	10	
Benzene	ND	ug/kg	5.0	
Bromodichloromethane	ND	ug/kg	5.0	
Bromoform	ND	ug/kg	5.0	
Bromomethane	ND	ug/kg	10	
2-Butanone (MEK)	ND	ug/kg	10	
Carbon disulfide	ND	ug/kg	5.0	
Carbon tetrachloride	ND	ug/kg	5.0	
Chlorobenzene	ND	ug/kg	5.0	
Chloroethane	ND	ug/kg	10	
Chloroform	ND	ug/kg	5.0	
Chloromethane	ND	ug/kg	10	
Dibromochloromethane	ND	ug/kg	5.0	
1,1-Dichloroethane	ND	ug/kg	5.0	
1,2-Dichloroethane	6.3	ug/kg	5.0	
1,1-Dichloroethene	ND	ug/kg	5.0	
1,2-Dichloroethene (total)	ND	ug/kg	5.0	
1,2-Dichloropropane	ND	ug/kg	5.0	
cis-1,3-Dichloropropene	ND	ug/kg	5.0	
trans-1,3-Dichloropropene	ND	ug/kg	5.0	
Ethylbenzene	ND	ug/kg	5.0	
2-Hexanone	ND	ug/kg	10	
Methylene chloride	4.8	ug/kg	5.0	BJ
4-Methyl-2-pentanone (MIBK)	ND	ug/kg	10	
Styrene	ND	ug/kg	5.0	
1,1,2,2-Tetrachloroethane	ND	ug/kg	5.0	
Tetrachloroethene	2.1	ug/kg	5.0	J
Toluene	ND	ug/kg	5.0	
1,1,1-Trichloroethane	ND	ug/kg	5.0	
1,1,2-Trichloroethane	ND	ug/kg	5.0	
Trichloroethene	1.9	ug/kg	5.0	J
Vinyl acetate	ND	ug/kg	10	
Vinyl chloride	ND	ug/kg	10	
Xylenes (total)	ND	ug/kg	5.0	
Dichlorodifluoromethane	ND	ug/kg	20	
Trichlorofluoromethane	ND	ug/kg	5.0	
1,1,2 Trichloro-1,2,2-trifluoroethane	ND	ug/kg	10	

(continued on following page)

ND = Not detected
NA = Not applicable

Reported By: Sandra Jones Approved By: Audrey Verniero

Volatile Organics
Target Compound List (TCL)
Method 8240

Client Name: Sandia National Laboratory
Client ID: SNL/NM015229-2
Lab ID: 036125-0003-SA
Matrix: SOIL
Authorized: 11 JUN 94
Sampled: 09 JUN 94
Prepared: 18 JUN 94
Received: 11 JUN 94
Analyzed: 18 JUN 94

Surrogate	Recovery	
Toluene-d8	104	%
4-Bromofluorobenzene	98	%
1,2-Dichloroethane-d4	105	%

Note B : Compound is also detected in the blank.

Note J : Result is detected below the reporting limit or is an estimated concentration.

ND = Not detected
NA = Not applicable

Reported By: Sandra Jones

Approved By: Audrey Verniero

Volatile Organics
Target Compound List (TCL)
Method 8240

Client Name: Sandia National Laboratory
Client ID: SNL/NM015233-3
Lab ID: 036125-0006-SA
Matrix: AQUEOUS Sampled: 09 JUN 94 Received: 11 JUN 94
Authorized: 11 JUN 94 Prepared: 22 JUN 94 Analyzed: 22 JUN 94

Parameter	Result	Units	Reporting Limit	
Acetone	ND	ug/L	10	
Benzene	ND	ug/L	5.0	
Bromodichloromethane	ND	ug/L	5.0	
Bromoform	ND	ug/L	5.0	
Bromomethane	ND	ug/L	10	
2-Butanone (MEK)	ND	ug/L	10	
Carbon disulfide	ND	ug/L	5.0	
Carbon tetrachloride	ND	ug/L	5.0	
Chlorobenzene	ND	ug/L	5.0	
Chloroethane	ND	ug/L	10	
Chloroform	ND	ug/L	5.0	
Chloromethane	ND	ug/L	10	
Dibromochloromethane	ND	ug/L	5.0	
1,1-Dichloroethane	ND	ug/L	5.0	
1,2-Dichloroethane	ND	ug/L	5.0	
1,1-Dichloroethene	ND	ug/L	5.0	
1,2-Dichloroethene (total)	ND	ug/L	5.0	
1,2-Dichloropropane	ND	ug/L	5.0	
cis-1,3-Dichloropropene	ND	ug/L	5.0	
trans-1,3-Dichloropropene	ND	ug/L	5.0	
Ethylbenzene	ND	ug/L	5.0	
2-Hexanone	ND	ug/L	10	
Methylene chloride	2.6	ug/L	5.0	BJ
4-Methyl-2-pentanone (MIBK)	ND	ug/L	10	
Styrene	ND	ug/L	5.0	
1,1,2,2-Tetrachloroethane	ND	ug/L	5.0	
Tetrachloroethene	ND	ug/L	5.0	
Toluene	ND	ug/L	5.0	
1,1,1-Trichloroethane	ND	ug/L	5.0	
1,1,2-Trichloroethane	ND	ug/L	5.0	
Trichloroethene	ND	ug/L	5.0	
Vinyl acetate	ND	ug/L	10	
Vinyl chloride	ND	ug/L	10	
Xylenes (total)	ND	ug/L	5.0	
Dichlorodifluoromethane	ND	ug/L	20	
Trichlorofluoromethane	ND	ug/L	5.0	
1,1,2 Trichloro-1,2,2-trifluoroethane	ND	ug/L	10	

(continued on following page)

ND = Not detected
NA = Not applicable

Reported By: Sandra Jones Approved By: Audrey Verniero

Volatile Organics
Target Compound List (TCL)
Method 8240

Client Name:	Sandia National Laboratory				
Client ID:	SNL/NM015233-3				
Lab ID:	036125-0006-SA				
Matrix:	AQUEOUS	Sampled:	09 JUN 94	Received:	11 JUN 94
Authorized:	11 JUN 94	Prepared:	22 JUN 94	Analyzed:	22 JUN 94

Surrogate	Recovery	
Toluene-d8	100	%
4-Bromofluorobenzene	100	%
1,2-Dichloroethane-d4	96	%

Note B : Compound is also detected in the blank.

Note J : Result is detected below the reporting limit or is an estimated concentration.

ND = Not detected
NA = Not applicable

Reported By: Sandra Jones

Approved By: Audrey Verniero

Volatile Organics
Target Compound List (TCL)
Method 8240

Client Name:	Sandia National Laboratory		
Client ID:	SNL/NM015233-4		
Lab ID:	036125-0007-TB		
Matrix:	AQUEOUS	Sampled: 09 JUN 94	Received: 11 JUN 94
Authorized:	11 JUN 94	Prepared: 22 JUN 94	Analyzed: 22 JUN 94

Parameter	Result	Units	Reporting Limit	
Acetone	3.5	ug/L	10	J
Benzene	ND	ug/L	5.0	
Bromodichloromethane	ND	ug/L	5.0	
Bromoform	ND	ug/L	5.0	
Bromomethane	ND	ug/L	10	
2-Butanone (MEK)	ND	ug/L	10	
Carbon disulfide	ND	ug/L	5.0	
Carbon tetrachloride	ND	ug/L	5.0	
Chlorobenzene	ND	ug/L	5.0	
Chloroethane	ND	ug/L	10	
Chloroform	ND	ug/L	5.0	
Chloromethane	ND	ug/L	10	
Dibromochloromethane	ND	ug/L	5.0	
1,1-Dichloroethane	ND	ug/L	5.0	
1,2-Dichloroethane	ND	ug/L	5.0	
1,1-Dichloroethene	ND	ug/L	5.0	
1,2-Dichloroethene (total)	ND	ug/L	5.0	
1,2-Dichloropropane	ND	ug/L	5.0	
cis-1,3-Dichloropropene	ND	ug/L	5.0	
trans-1,3-Dichloropropene	ND	ug/L	5.0	
Ethylbenzene	ND	ug/L	5.0	
2-Hexanone	ND	ug/L	10	
Methylene chloride	3.8	ug/L	5.0	BJ
4-Methyl-2-pentanone (MIBK)	ND	ug/L	10	
Styrene	ND	ug/L	5.0	
1,1,2,2-Tetrachloroethane	ND	ug/L	5.0	
Tetrachloroethene	ND	ug/L	5.0	
Toluene	ND	ug/L	5.0	
1,1,1-Trichloroethane	ND	ug/L	5.0	
1,1,2-Trichloroethane	ND	ug/L	5.0	
Trichloroethene	ND	ug/L	5.0	
Vinyl acetate	ND	ug/L	10	
Vinyl chloride	ND	ug/L	10	
Xylenes (total)	ND	ug/L	5.0	
Dichlorodifluoromethane	ND	ug/L	20	
Trichlorofluoromethane	ND	ug/L	5.0	
1,1,2 Trichloro-1,2,2-trifluoroethane	ND	ug/L	10	

(continued on following page)

ND = Not detected
NA = Not applicable

Reported By: Sandra Jones

Approved By: Audrey Verniero

Volatile Organics
Target Compound List (TCL)
Method 8240

Client Name: Sandia National Laboratory
Client ID: SNL/NM015233-4
Lab ID: 036125-0007-TB
Matrix: AQUEOUS
Authorized: 11 JUN 94
Sampled: 09 JUN 94
Prepared: 22 JUN 94
Received: 11 JUN 94
Analyzed: 22 JUN 94

Surrogate	Recovery	
Toluene-d8	102	%
4-Bromofluorobenzene	104	%
1,2-Dichloroethane-d4	99	%

Note J : Result is detected below the reporting limit or is an estimated concentration.

Note B : Compound is also detected in the blank.

ND = Not detected
NA = Not applicable

Reported By: Sandra Jones

Approved By: Audrey Verniero

Volatile Organics
Target Compound List (TCL)
Method 8240

Client Name:	Sandia National Laboratory		
Client ID:	SNL/NM015237-2		
Lab ID:	036125-0010-SA		
Matrix:	SOIL	Sampled: 10 JUN 94	Received: 11 JUN 94
Authorized:	11 JUN 94	Prepared: 20 JUN 94	Analyzed: 20 JUN 94

Parameter	Result	Wet wt. Units	Reporting Limit	
Acetone	8.0	ug/kg	10	J
Benzene	ND	ug/kg	5.0	
Bromodichloromethane	ND	ug/kg	5.0	
Bromoform	ND	ug/kg	5.0	
Bromomethane	ND	ug/kg	10	
2-Butanone (MEK)	ND	ug/kg	10	
Carbon disulfide	ND	ug/kg	5.0	
Carbon tetrachloride	ND	ug/kg	5.0	
Chlorobenzene	ND	ug/kg	5.0	
Chloroethane	ND	ug/kg	10	
Chloroform	ND	ug/kg	5.0	
Chloromethane	ND	ug/kg	10	
Dibromochloromethane	ND	ug/kg	5.0	
1,1-Dichloroethane	ND	ug/kg	5.0	
1,2-Dichloroethane	ND	ug/kg	5.0	
1,1-Dichloroethene	ND	ug/kg	5.0	
1,2-Dichloroethene (total)	ND	ug/kg	5.0	
1,2-Dichloropropane	ND	ug/kg	5.0	
cis-1,3-Dichloropropene	ND	ug/kg	5.0	
trans-1,3-Dichloropropene	ND	ug/kg	5.0	
Ethylbenzene	ND	ug/kg	5.0	
2-Hexanone	ND	ug/kg	10	
Methylene chloride	4.5	ug/kg	5.0	BJ
4-Methyl-2-pentanone (MIBK)	ND	ug/kg	10	
Styrene	ND	ug/kg	5.0	
1,1,2,2-Tetrachloroethane	ND	ug/kg	5.0	
Tetrachloroethene	ND	ug/kg	5.0	
Toluene	ND	ug/kg	5.0	
1,1,1-Trichloroethane	ND	ug/kg	5.0	
1,1,2-Trichloroethane	ND	ug/kg	5.0	
Trichloroethene	ND	ug/kg	5.0	
Vinyl acetate	ND	ug/kg	10	
Vinyl chloride	ND	ug/kg	10	
Xylenes (total)	ND	ug/kg	5.0	
Dichlorodifluoromethane	ND	ug/kg	20	
Trichlorofluoromethane	ND	ug/kg	5.0	
1,1,2 Trichloro-1,2,2-trifluoroethane	ND	ug/kg	10	

(continued on following page)

ND = Not detected
NA = Not applicable

Reported By: Sandra Jones

Approved By: Audrey Verniero

Volatile Organics
Target Compound List (TCL)
Method 8240

Client Name: Sandia National Laboratory
Client ID: SNL/NM015237-2
Lab ID: 036125-0010-SA
Matrix: SOIL
Authorized: 11 JUN 94
Sampled: 10 JUN 94
Prepared: 20 JUN 94
Received: 11 JUN 94
Analyzed: 20 JUN 94

Surrogate	Recovery	
Toluene-d8	101	%
4-Bromofluorobenzene	98	%
1,2-Dichloroethane-d4	98	%

Note J : Result is detected below the reporting limit or is an estimated concentration.

Note B : Compound is also detected in the blank.

ND = Not detected
NA = Not applicable

Reported By: Sandra Jones

Approved By: Audrey Verniero

Volatile Organics
Target Compound List (TCL)
Method 8240

Client Name: Sandia National Laboratory
Client ID: SNL/NM015238-2
Lab ID: 036125-0012-SA
Matrix: SOIL
Sampled: 10 JUN 94
Received: 11 JUN 94
Authorized: 11 JUN 94
Prepared: 20 JUN 94
Analyzed: 20 JUN 94

Parameter	Result	Wet wt. Units	Reporting Limit	
Acetone	9.9	ug/kg	10	J
Benzene	ND	ug/kg	5.0	
Bromodichloromethane	ND	ug/kg	5.0	
Bromoform	ND	ug/kg	5.0	
Bromomethane	ND	ug/kg	10	
2-Butanone (MEK)	ND	ug/kg	10	
Carbon disulfide	ND	ug/kg	5.0	
Carbon tetrachloride	ND	ug/kg	5.0	
Chlorobenzene	ND	ug/kg	5.0	
Chloroethane	ND	ug/kg	10	
Chloroform	ND	ug/kg	5.0	
Chloromethane	ND	ug/kg	10	
Dibromochloromethane	ND	ug/kg	5.0	
1,1-Dichloroethane	ND	ug/kg	5.0	
1,2-Dichloroethane	ND	ug/kg	5.0	
1,1-Dichloroethene	ND	ug/kg	5.0	
1,2-Dichloroethene (total)	ND	ug/kg	5.0	
1,2-Dichloropropane	ND	ug/kg	5.0	
cis-1,3-Dichloropropene	ND	ug/kg	5.0	
trans-1,3-Dichloropropene	ND	ug/kg	5.0	
Ethylbenzene	ND	ug/kg	5.0	
2-Hexanone	ND	ug/kg	10	
Methylene chloride	4.9	ug/kg	5.0	BJ
4-Methyl-2-pentanone (MIBK)	ND	ug/kg	10	
Styrene	ND	ug/kg	5.0	
1,1,2,2-Tetrachloroethane	ND	ug/kg	5.0	
Tetrachloroethene	ND	ug/kg	5.0	
Toluene	ND	ug/kg	5.0	
1,1,1-Trichloroethane	ND	ug/kg	5.0	
1,1,2-Trichloroethane	ND	ug/kg	5.0	
Trichloroethene	ND	ug/kg	5.0	
Vinyl acetate	ND	ug/kg	10	
Vinyl chloride	ND	ug/kg	10	
Xylenes (total)	ND	ug/kg	5.0	
Dichlorodifluoromethane	ND	ug/kg	20	
Trichlorofluoromethane	ND	ug/kg	5.0	
1,1,2 Trichloro-1,2,2-trifluoroethane	ND	ug/kg	10	

(continued on following page)

ND = Not detected
NA = Not applicable

Reported By: Sandra Jones

Approved By: Audrey Verniero

Volatile Organics
Target Compound List (TCL)
Method 8240

Client Name: Sandia National Laboratory
Client ID: SNL/NM015238-2
Lab ID: 036125-0012-SA
Matrix: SOIL
Authorized: 11 JUN 94
Sampled: 10 JUN 94
Prepared: 20 JUN 94
Received: 11 JUN 94
Analyzed: 20 JUN 94

Surrogate	Recovery	
Toluene-d8	101	%
4-Bromofluorobenzene	100	%
1,2-Dichloroethane-d4	101	%

Note J : Result is detected below the reporting limit or is an estimated concentration.

Note B : Compound is also detected in the blank.

ND = Not detected
NA = Not applicable

Reported By: Sandra Jones

Approved By: Audrey Verniero

IV. QUALITY CONTROL REPORT

The Enseco laboratories operate under a vigorous QA/QC program designed to ensure the generation of scientifically valid, legally defensible data by monitoring every aspect of laboratory operations. Routine QA/QC procedures include the use of approved methodologies, independent verification of analytical standards, use of duplicate Laboratory Control Samples to assess the precision and accuracy of the methodology on a routine basis, and a rigorous system of data review.

The standard laboratory QC package is designed to:

1) establish a strong, cost-effective QC program that ensures the generation of scientifically valid, legally defensible data;

2) assess the laboratory's performance of the analytical method using control limits generated with a well-defined matrix;

3) establish clear-cut guidelines for acceptability of analytical data so that QC decisions can be made immediately at the bench; and

4) provide a standard set of reportables which assures the client of the quality of his data.

The Enseco QC program is based upon monitoring the precision and accuracy of an analytical method by analyzing a set of Duplicate Control Samples (DCS) at frequent, well-defined intervals. Each DCS is a well-characterized matrix which is spiked with target compounds at 5-100 times the reporting limit, depending upon the methodology being monitored. The purpose of the DCS is not to duplicate the sample matrix, but rather to provide an interference-free, homogeneous matrix from which to gather data to establish control limits. These limits are used to determine whether data generated by the laboratory on any given day is in control.

Control limits for accuracy (percent recovery) are based on the average, historical percent recovery +/- 3 standard deviation units. Control limits for precision (relative percent difference) range from 0 (identical duplicate DCS results) to the average, historical relative percent difference + 3 standard deviation units. These control limits are fairly narrow based on the consistency of the matrix being monitored and are updated on a quarterly basis.

For each batch of samples analyzed, an additional control measure is taken in the form of a Single Control Sample (SCS). The SCS consists of a control matrix that is spiked with surrogate compounds appropriate to the method being used. In cases where no surrogate is available, (e.g., metals or conventional analyses) a single DCS serves as the control sample. An SCS is prepared for each sample lot for which the DCS pair are not analyzed. The recovery of the SCS is charted in exactly the same manner as described for the DCS, and provides a daily check on the performance of the method.

Accuracy for DCS and SCS is measured by Percent Recovery.

$$\%\ \text{Recovery} = \frac{\text{Measured Concentration}}{\text{Actual Concentration}} \times 100$$

Precision for DCS is measured by Relative Percent Difference (RPD).

$$\text{RPD} = \frac{\left|\text{Measured Concentration DCS1} - \text{Measured Concentration DCS2}\right|}{(\text{Measured Concentration DCS1} + \text{Measured Concentration DCS2})/2} \times 100$$

All samples analyzed concurrently by the same test are assigned the same QC lot number. Projects which contain numerous samples, analyzed over several days, may have multiple QC lot numbers associated with each test. The QC information which follows includes a listing of the QC lot numbers associated with each of the samples reported, DCS and SCS (where applicable) recoveries from the QC lots associated with the samples, and control limits for these lots. The QC data is reported by test code, in the order that the tests are reported in the analytical results section of this report.

QC LOT ASSIGNMENT REPORT
Volatile Organics by GC/MS

Laboratory Sample Number	QC Matrix	QC Category	QC Lot Number (DCS)	QC Run Number (SCS/BLANK)
036125-0003-SA	SOIL	8240-SL	18 JUN 94-D	18 JUN 94-D
036125-0006-SA	AQUEOUS	624-A	22 JUN 94-D	22 JUN 94-D
036125-0007-TB	AQUEOUS	624-A	22 JUN 94-D	22 JUN 94-D
036125-0010-SA	SOIL	8240-SL	20 JUN 94-D	20 JUN 94-D
036125-0012-SA	SOIL	8240-SL	20 JUN 94-D	20 JUN 94-D

DUPLICATE CONTROL SAMPLE REPORT
Volatile Organics by GC/MS

Analyte	Concentration				Accuracy Average(%)		Precision (RPD)	
	Spiked	Measured						
		DCS1	DCS2	AVG	DCS	Limits	DCS	Limit
Category: 8240-SL Matrix: SOIL QC Lot: 18 JUN 94-D Concentration Units: ug/kg								
1,1-Dichloroethene	50.0	54.1	61.0	57.6	115	65-137	12	20
Trichloroethene	50.0	54.2	56.1	55.2	110	83-118	3.4	12
Benzene	50.0	52.7	54.0	53.4	107	80-119	2.4	10
Toluene	50.0	58.9	55.4	57.2	114	80-119	6.1	12
Chlorobenzene	50.0	51.8	52.4	52.1	104	80-119	1.2	12
Category: 624-A Matrix: AQUEOUS QC Lot: 22 JUN 94-D Concentration Units: ug/L								
1,1-Dichloroethene	50.0	53.1	48.3	50.7	101	74-124	9.5	17
Trichloroethene	50.0	51.0	48.9	50.0	100	77-119	4.2	13
Benzene	50.0	50.1	48.2	49.2	98	80-117	3.9	12
Toluene	50.0	49.6	47.7	48.6	97	80-119	3.9	1[illegible]
Chlorobenzene	50.0	49.3	47.9	48.6	97	81-120	2.9	14
Category: 8240-SL Matrix: SOIL QC Lot: 20 JUN 94-D Concentration Units: ug/kg								
1,1-Dichloroethene	50.0	48.2	45.1	46.6	93	65-137	6.6	20
Trichloroethene	50.0	46.0	49.7	47.8	96	83-118	7.7	12
Benzene	50.0	46.6	49.7	48.2	96	80-119	6.4	10
Toluene	50.0	46.3	48.3	47.3	95	80-119	4.2	12
Chlorobenzene	50.0	47.1	47.9	47.5	95	80-119	1.7	12

Calculations are performed before rounding to avoid round-off errors in calculated results.

SINGLE CONTROL SAMPLE REPORT
Volatile Organics by GC/MS

Category: 8240-SL
Matrix: SOIL
QC Lot: 18 JUN 94-D QC Run: 18 JUN 94-D
Concentration Units: ug/kg

Analyte	Concentration Spiked	Concentration Measured	Accuracy(%) SCS	Accuracy(%) Limits
1,2-Dichloroethane-d4	50.0	51.3	103	82-112
4-Bromofluorobenzene	50.0	50.7	101	84-109
Toluene-d8	50.0	50.2	100	90-112

Category: 624-A
Matrix: AQUEOUS
QC Lot: 22 JUN 94-D QC Run: 22 JUN 94-D
Concentration Units: ug/L

Analyte	Concentration Spiked	Concentration Measured	Accuracy(%) SCS	Accuracy(%) Limits
1,2-Dichloroethane-d4	50.0	47.5	95	85-111
4-Bromofluorobenzene	50.0	49.9	100	86-110
Toluene-d8	50.0	50.2	100	91-110

Category: 8240-SL
Matrix: SOIL
QC Lot: 20 JUN 94-D QC Run: 20 JUN 94-D
Concentration Units: ug/kg

Analyte	Concentration Spiked	Concentration Measured	Accuracy(%) SCS	Accuracy(%) Limits
1,2-Dichloroethane-d4	50.0	48.9	98	82-112
4-Bromofluorobenzene	50.0	51.3	103	84-109
Toluene-d8	50.0	51.1	102	90-112

Calculations are performed before rounding to avoid round-off errors in calculated results

METHOD BLANK REPORT
Volatile Organics by GC/MS

Test: 8240CPL-TCL-S
Matrix: SOIL
QC Lot: 18 JUN 94-D QC Run: 18 JUN 94-D

Analyte	Result	Units	Reporting Limit	
Acetone	ND	ug/kg	10	
Benzene	ND	ug/kg	5.0	
Bromodichloromethane	ND	ug/kg	5.0	
Bromoform	ND	ug/kg	5.0	
Bromomethane	ND	ug/kg	10	
2-Butanone (MEK)	ND	ug/kg	10	
Carbon disulfide	ND	ug/kg	5.0	
Carbon tetrachloride	ND	ug/kg	5.0	
Chlorobenzene	ND	ug/kg	5.0	
Chloroethane	ND	ug/kg	10	
Chloroform	ND	ug/kg	5.0	
Chloromethane	ND	ug/kg	10	
Dibromochloromethane	ND	ug/kg	5.0	
1,1-Dichloroethane	ND	ug/kg	5.0	
1,2-Dichloroethane	ND	ug/kg	5.0	
1,1-Dichloroethene	ND	ug/kg	5.0	
1,2-Dichloroethene (total)	ND	ug/kg	5.0	
1,2-Dichloropropane	ND	ug/kg	5.0	
cis-1,3-Dichloropropene	ND	ug/kg	5.0	
trans-1,3-Dichloropropene	ND	ug/kg	5.0	
Ethylbenzene	ND	ug/kg	5.0	
2-Hexanone	1.8	ug/kg	10	J
Methylene chloride	2.0	ug/kg	5.0	J
4-Methyl-2-pentanone (MIBK)	ND	ug/kg	10	
Styrene	ND	ug/kg	5.0	
1,1,2,2-Tetrachloroethane	ND	ug/kg	5.0	
Tetrachloroethene	ND	ug/kg	5.0	
Toluene	ND	ug/kg	5.0	
1,1,1-Trichloroethane	ND	ug/kg	5.0	
1,1,2-Trichloroethane	ND	ug/kg	5.0	
Trichloroethene	ND	ug/kg	5.0	
Vinyl acetate	ND	ug/kg	10	
Vinyl chloride	ND	ug/kg	10	
Xylenes (total)	ND	ug/kg	5.0	
Dichlorodifluoromethane	ND	ug/kg	20	
Trichlorofluoromethane	ND	ug/kg	5.0	
1,1,2 Trichloro-1,2,2-trifluoroethane	ND	ug/kg	10	

J = Result is detected below the reporting limit or is an estimated concentration.

METHOD BLANK REPORT
Volatile Organics by GC/MS (cont.)

Test: 8240CP-TCL-AP
Matrix: AQUEOUS
QC Lot: 22 JUN 94-D QC Run: 22 JUN 94-D

Analyte	Result	Units	Reporting Limit	
Acetone	ND	ug/L	10	
Benzene	ND	ug/L	5.0	
Bromodichloromethane	ND	ug/L	5.0	
Bromoform	ND	ug/L	5.0	
Bromomethane	ND	ug/L	10	
2-Butanone (MEK)	ND	ug/L	10	
Carbon disulfide	ND	ug/L	5.0	
Carbon tetrachloride	ND	ug/L	5.0	
Chlorobenzene	ND	ug/L	5.0	
Chloroethane	ND	ug/L	10	
Chloroform	ND	ug/L	5.0	
Chloromethane	ND	ug/L	10	
Dibromochloromethane	ND	ug/L	5.0	
1,1-Dichloroethane	ND	ug/L	5.0	
1,2-Dichloroethane	ND	ug/L	5.0	
1,1-Dichloroethene	ND	ug/L	5.0	
1,2-Dichloroethene (total)	ND	ug/L	5.0	
1,2-Dichloropropane	ND	ug/L	5.0	
cis-1,3-Dichloropropene	ND	ug/L	5.0	
trans-1,3-Dichloropropene	ND	ug/L	5.0	
Ethylbenzene	ND	ug/L	5.0	
2-Hexanone	3.7	ug/L	10	J
Methylene chloride	2.8	ug/L	5.0	J
4-Methyl-2-pentanone (MIBK)	ND	ug/L	10	
Styrene	ND	ug/L	5.0	
1,1,2,2-Tetrachloroethane	ND	ug/L	5.0	
Tetrachloroethene	ND	ug/L	5.0	
Toluene	ND	ug/L	5.0	
1,1,1-Trichloroethane	ND	ug/L	5.0	
1,1,2-Trichloroethane	ND	ug/L	5.0	
Trichloroethene	ND	ug/L	5.0	
Vinyl acetate	ND	ug/L	10	
Vinyl chloride	ND	ug/L	10	
Xylenes (total)	ND	ug/L	5.0	
Dichlorodifluoromethane	ND	ug/L	20	
Trichlorofluoromethane	ND	ug/L	5.0	
1,1,2 Trichloro-1,2,2-trifluoroethane	ND	ug/L	10	

J = Result is detected below the reporting limit or is an estimated concentration.

METHOD BLANK REPORT
Volatile Organics by GC/MS (cont.)

Test: 8240CPL-TCL-S
Matrix: SOIL
QC Lot: 20 JUN 94-D QC Run: 20 JUN 94-D

Analyte	Result	Units	Reporting Limit	
Acetone	ND	ug/kg	10	
Benzene	ND	ug/kg	5.0	
Bromodichloromethane	ND	ug/kg	5.0	
Bromoform	ND	ug/kg	5.0	
Bromomethane	ND	ug/kg	10	
2-Butanone (MEK)	ND	ug/kg	10	
Carbon disulfide	ND	ug/kg	5.0	
Carbon tetrachloride	ND	ug/kg	5.0	
Chlorobenzene	ND	ug/kg	5.0	
Chloroethane	ND	ug/kg	10	
Chloroform	ND	ug/kg	5.0	
Chloromethane	ND	ug/kg	10	
Dibromochloromethane	ND	ug/kg	5.0	
1,1-Dichloroethane	ND	ug/kg	5.0	
1,2-Dichloroethane	ND	ug/kg	5.0	
1,1-Dichloroethene	ND	ug/kg	5.0	
1,2-Dichloroethene (total)	ND	ug/kg	5.0	
1,2-Dichloropropane	ND	ug/kg	5.0	
cis-1,3-Dichloropropene	ND	ug/kg	5.0	
trans-1,3-Dichloropropene	ND	ug/kg	5.0	
Ethylbenzene	ND	ug/kg	5.0	
2-Hexanone	ND	ug/kg	10	
Methylene chloride	3.0	ug/kg	5.0	J
4-Methyl-2-pentanone (MIBK)	ND	ug/kg	10	
Styrene	ND	ug/kg	5.0	
1,1,2,2-Tetrachloroethane	ND	ug/kg	5.0	
Tetrachloroethene	ND	ug/kg	5.0	
Toluene	ND	ug/kg	5.0	
1,1,1-Trichloroethane	ND	ug/kg	5.0	
1,1,2-Trichloroethane	ND	ug/kg	5.0	
Trichloroethene	ND	ug/kg	5.0	
Vinyl acetate	ND	ug/kg	10	
Vinyl chloride	ND	ug/kg	10	
Xylenes (total)	ND	ug/kg	5.0	
Dichlorodifluoromethane	ND	ug/kg	20	
Trichlorofluoromethane	ND	ug/kg	5.0	
1,1,2 Trichloro-1,2,2-trifluoroethane	ND	ug/kg	10	

J = Result is detected below the reporting limit or is an estimated concentration.

QC LOT ASSIGNMENT REPORT
Semivolatile Organics by GC

Laboratory Sample Number	QC Matrix	QC Category	QC Lot Number (DCS)	QC Run Number (SCS/BLANK)
036125-0001-SA	SOIL	PCB-S	15 JUN 94-N1	15 JUN 94-N1
036125-0002-SA	SOIL	PCB-S	15 JUN 94-N1	15 JUN 94-N1
036125-0002-MS	SOIL	PCB-S	15 JUN 94-N1	15 JUN 94-N1
036125-0002-SD	SOIL	PCB-S	15 JUN 94-N1	15 JUN 94-N1
036125-0005-SA	AQUEOUS	PCB-A	15 JUN 94-N1	15 JUN 94-N1
036125-0009-SA	SOIL	PCB-S	15 JUN 94-N1	15 JUN 94-N1
036125-0011-SA	SOIL	PCB-S	15 JUN 94-N1	15 JUN 94-N1
036125-0013-SA	SOIL	PCB-S	15 JUN 94-N1	15 JUN 94-N1

DUPLICATE CONTROL SAMPLE REPORT
Semivolatile Organics by GC

Analyte	Concentration Spiked	Measured DCS1	Measured DCS2	AVG	Accuracy Average(%) DCS	Accuracy Limits	Precision (RPD) DCS	Precision (RPD) Limit
Category: PCB-S Matrix: SOIL QC Lot: 15 JUN 94-N1 Concentration Units: ug/kg								
Aroclor 1254	33.3	28.1	30.8	29.4	88	49-130	9.2	20
Category: PCB-A Matrix: AQUEOUS QC Lot: 15 JUN 94-N1 Concentration Units: ug/L								
Aroclor 1254	1.00	0.638	0.796	0.717	72	46-130	22	20

Calculations are performed before rounding to avoid round-off errors in calculated results.

METHOD BLANK REPORT
Semivolatile Organics by GC

Analyte	Result	Units	Reporting Limit
Test: 8080-PCB-SAN-S Matrix: SOIL QC Lot: 15 JUN 94-N1 QC Run: 15 JUN 94-N1			
Aroclor 1016	ND	ug/kg	33
Aroclor 1221	ND	ug/kg	33
Aroclor 1232	ND	ug/kg	33
Aroclor 1242	ND	ug/kg	33
Aroclor 1248	ND	ug/kg	33
Aroclor 1254	ND	ug/kg	33
Aroclor 1260	ND	ug/kg	33
Test: 8080-PCB-SAN-A Matrix: AQUEOUS QC Lot: 15 JUN 94-N1 QC Run: 15 JUN 94-N1			
Aroclor 1016	ND	ug/L	1.0
Aroclor 1221	ND	ug/L	1.0
Aroclor 1232	ND	ug/L	1.0
Aroclor 1242	ND	ug/L	1.0
Aroclor 1248	ND	ug/L	1.0
Aroclor 1254	ND	ug/L	1.0
Aroclor 1260	ND	ug/L	1.0

MATRIX SPECIFIC QC
ASSIGNMENT REPORT
Semivolatile Organics by GC

QC SAMPLE TYPE	TEST	LABORATORY SAMPLE NUMBER	QC LOT
MATRIX SPIKE DUPLICATE	8080-PCB-SAN-S	036125-0002-SD	15 JUN 94-N1
MATRIX SPIKE	8080-PCB-SAN-S	036125-0002-MS	15 JUN 94-N1

MATRIX SPIKE / MATRIX SPIKE DUPLICATE REPORT
Semivolatile Organics by GC

Test: 8080-PCB-SAN-S
Matrix SOIL
Sample: 036125-0002
Units: ug/kg

Analyte	Sample	Concentration Matrix Spike	Concentration Matrix Spike Dup	Spiked MS	Spiked MSD	%Recovery MS	%Recovery MSD	% RPD
Aroclor 1254	ND	32	36	33	33	95	109	13

ND = Not detected
NC = Not calculated, calculation not applicable

All calculations are performed before rounding to avoid round-off errors in calculated results.

QC LOT ASSIGNMENT REPORT - MS QC
Semivolatile Organics by GC

Laboratory Sample Number	QC Matrix	QC Category	QC Lot Number (DCS)	QC Run Number (SCS/BLANK)	MS QC Run Number (SA,MS,SD,DU)
036125-0001-SA	SOIL	PCB-S	15 JUN 94-N1	15 JUN 94-N1	15 JUN 94-N1
036125-0002-MS	SOIL	PCB-S	15 JUN 94-N1	15 JUN 94-N1	15 JUN 94-N1
036125-0002-SA	SOIL	PCB-S	15 JUN 94-N1	15 JUN 94-N1	15 JUN 94-N1
036125-0002-SD	SOIL	PCB-S	15 JUN 94-N1	15 JUN 94-N1	15 JUN 94-N1
036125-0005-SA	AQUEOUS	PCB-A	15 JUN 94-N1	15 JUN 94-N1	15 JUN 94-N1
036125-0009-SA	SOIL	PCB-S	15 JUN 94-N1	15 JUN 94-N1	15 JUN 94-N1
036125-0011-SA	SOIL	PCB-S	15 JUN 94-N1	15 JUN 94-N1	15 JUN 94-N1
036125-0013-SA	SOIL	PCB-S	15 JUN 94-N1	15 JUN 94-N1	15 JUN 94-N1

MATRIX SPIKE/MATRIX SPIKE DUPLICATE QC REPORT
Semivolatile Organics by GC
Project: 036125

Category: PCB-S PCBs
Matrix: SOIL
Sample: 036125-0002
QC Lot: 15 JUN 94-N1 MS Run: 15 JUN 94-N1
Units: ug/kg Units Qualifier: Wet wt.

Analyte	Concentration			Amount Spiked		%Recovery		%RPD
	Sample Result	MS Result	MSD Result	MS	MSD	MS	MSD	MS-MSD
Aroclor 1254	ND	32	36	33	33	95	109	13

Category: PCB-A PCBs
Matrix: AQUEOUS
Sample: 036125-0005
QC Lot: 15 JUN 94-N1 MS Run: 15 JUN 94-N1
Units: ug/L Units Qualifier:

Analyte	Concentration			Amount Spiked		%Recovery		%RPD
	Sample Result	MS Result	MSD Result	MS	MSD	MS	MSD	MS-MSD
[illegible]oclor 1254	ND	0.94	1.0	1.0	1.0	94	102	8.4

ND = Not Detected

C[illegible]lations are performed before rounding to avoid round-off errors in calculated results.

QC LOT ASSIGNMENT REPORT
Wet Chemistry Analysis and Preparation

Laboratory Sample Number	QC Matrix	QC Category	QC Lot Number (DCS)	QC Run Number (SCS/BLANK)
036125-0001-SA	SOIL	TPH-IR-S	23 JUN 94-9D	23 JUN 94-9D
036125-0002-SA	SOIL	TPH-IR-S	23 JUN 94-9D	23 JUN 94-9D
036125-0002-MS	SOIL	TPH-IR-S	23 JUN 94-9D	23 JUN 94-9D
036125-0002-SD	SOIL	TPH-IR-S	23 JUN 94-9D	23 JUN 94-9D
036125-0004-SA	AQUEOUS	TPH-IR-A	05 JUL 94-9D	05 JUL 94-9D
036125-0008-SA	SOIL	TPH-IR-S	23 JUN 94-9D	23 JUN 94-9D
036125-0009-SA	SOIL	TPH-IR-S	23 JUN 94-9D	23 JUN 94-9D
036125-0011-SA	SOIL	TPH-IR-S	23 JUN 94-9D	23 JUN 94-9D
036125-0013-SA	SOIL	TPH-IR-S	23 JUN 94-9D	23 JUN 94-9D
036125-0014-SA	SOIL	TPH-IR-S	23 JUN 94-9D	23 JUN 94-9D
036125-0015-SA	SOIL	TPH-IR-S	23 JUN 94-9D	23 JUN 94-9D

DUPLICATE CONTROL SAMPLE REPORT
Wet Chemistry Analysis and Preparation

Analyte	Concentration				Accuracy Average(%)		Precision (RPD)	
	Spiked	Measured						
		DCS1	DCS2	AVG	DCS	Limits	DCS	Limit
Category: TPH-IR-S Matrix: SOIL QC Lot: 23 JUN 94-9D Concentration Units: mg/kg								
Total Petroleum Hydrocarbons	1450	1360	1350	1360	94	75-123	1.1	17
Category: TPH-IR-A Matrix: AQUEOUS QC Lot: 05 JUL 94-9D Concentration Units: mg/L								
Total Petroleum Hydrocarbons	20.0	18.6	18.6	18.6	93	64-111	0.0	18

Calculations are performed before rounding to avoid round-off errors in calculated results.

METHOD BLANK REPORT
Wet Chemistry Analysis and Preparation

Analyte	Result	Units	Reporting Limit
Test: TPH-IR-S Matrix: SOIL QC Lot: 23 JUN 94-9D QC Run: 23 JUN 94-9D			
Total Petroleum Hydrocarbons	ND	mg/kg	20.0
Test: TPH-IR-A Matrix: AQUEOUS QC Lot: 05 JUL 94-9D QC Run: 05 JUL 94-9D			
Total Petroleum Hydrocarbons	ND	mg/L	1.0
Test: TPH-IR-S Matrix: SOIL QC Lot: 23 JUN 94-9D QC Run: 23 JUN 94-9D			
Total Petroleum Hydrocarbons	ND	mg/kg	20.0

MATRIX SPECIFIC QC
ASSIGNMENT REPORT
Wet Chemistry Analysis and Preparation

QC SAMPLE TYPE	TEST	LABORATORY SAMPLE NUMBER	QC LOT
MATRIX SPIKE DUPLICATE	TPH-IR-S	036125-0002-SD	23 JUN 94-9D
MATRIX SPIKE	TPH-IR-S	036125-0002-MS	23 JUN 94-9D

MATRIX SPIKE / MATRIX SPIKE DUPLICATE REPORT
Wet Chemistry Analysis and Preparation

Test: TPH-IR-S
Matrix SOIL
Sample: 036125-0002
Units: mg/kg

Analyte	Sample	Concentration Matrix Spike	Concentration Matrix Spike Dup	Spiked MS	Spiked MSD	%Recovery MS	%Recovery MSD	% RPD
Total Petroleum Hydrocarbons	ND	242	231	250	250	97	92	5

ND = Not detected
NC = Not calculated, calculation not applicable

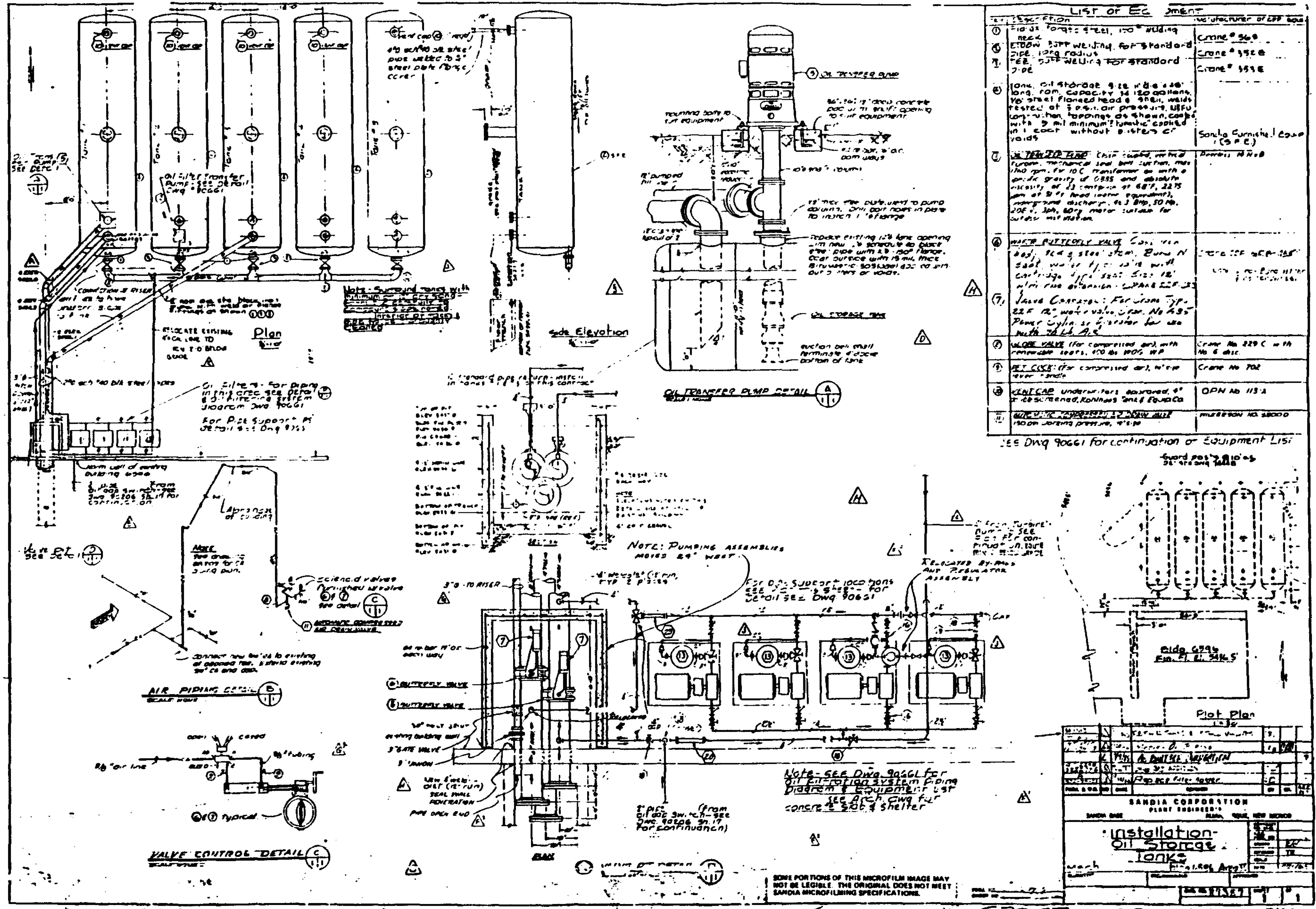
All calculations are performed before rounding to avoid round-off errors in calculated results.

Attachment 37-5

Attachment 37-5

Engineered drawing of piping system for USTs 6597-2 through 6597-8

US5659702



LIST OF EQUIPMENT

	Description	Manufacturer or Equ.
①	Flanges forged steel, 150# welding neck	Crane # 560
③	Elbow butt welding for standard pipe, long radius	Crane # 352 E
④	Tee, butt welding for standard pipe	Crane # 353 E
⑤	Tank, oil storage size 11' dia x 48' long, nom. capacity 34,120 gallons, 1/2" steel flanged head & shell, welds tested at 5 p.s.i. air pressure, U.L. construction, tappings as shown, coated with 5 mil minimum "Bitumastic" applied in 1 coat without blisters or voids	Sandia Furnished Equip. (S.F.E.)
⑥	Oil transfer pump: close coupled, vertical turbine, mechanical seal, bell suction, max 1760 rpm. for 10 C transformer oil with a specific gravity of 0.895 and absolute viscosity of 23 centipoise at 68°F, 2275 gpm at 51 ft head (water equipment), underground discharge, 40 Bhp, 50 Hp, 208 v, 3ph, 60cy motor suitable for outdoor installation	Peerless [illegible]
⑥	Wafer butterfly valve: cast iron body, 416 s steel stem, Buna N seat, wafer type valve with cartridge type seat. Size 12" with rue extension	Crane 22F [illegible]
⑦	Valve Operator: For Crane Type 22F 12" wafer valve, Crane No 435 Power Cylinder Operator for use with 70 Lb. A.S.	
⑧	Globe valve (for compressed air), with renewable seats, 400 lbs WOG WP	Crane No 229 C with No 6 disc
⑨	Pet cock (for compressed air), w/ tee lever handle	Crane No 702
⑩	Vent cap underwriters approved, 4" size screened, Robinson Tank & Equip Co	OPN No 113-A
⑪	Automatic compressed air drain valve, 150 psi working pressure, 1/2" size	Muzzerson No 18000

See Dwg 90661 for continuation of Equipment List

SANDIA CORPORATION
PLANT ENGINEERING
SANDIA BASE
ALBUQUERQUE, NEW MEXICO

Installation -
Oil Storage
Tanks

Mech

Replace filter tower

87357 ORIGINAL