1-1-2000

Statement of Basis Approval of No Further Action Volume 20 of 30 January 2000 Solid Waste Management Unit 27 Operable Unit 1332 Round 10

Sandia National Laboratories/NM

Sandia National Laboratories

Statement of Basis
Approval of No Further Action
Volume 20 of 30

January 2000

Solid Waste Management Unit 27
Operable Unit 1332
Round 10

(RCRA Permit No. NM5890110518)

NFA Originally Submitted June 30, 1998 (Chapter 2)

Environmental Restoration Project

United States Department of Energy
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2.0 SOLID WASTE MANAGEMENT UNIT 27, BUILDING 9820— ANIMAL DISPOSAL PIT

2.1 Summary

Sandia National Laboratories/New Mexico (SNL/NM) is proposing a risk-based no further action (NFA) decision for Solid Waste Management Unit (SWMU) 27, Building 9820 (Animal Disposal Pit), Operable Unit (OU) 1332. SWMU 27 is the former location of an animal disposal pit and other buried debris. Review and analysis of all relevant data for SWMU 27 indicate that concentrations of constituents of concern (COC) at this SWMU are less than applicable risk assessment action levels. SWMU 27 has been characterized and remediated in accordance with current applicable state or federal regulations, and the available data indicate that the contaminants pose an acceptable level of risk under current and projected future land use, per NFA Criterion 5, which states "The SWMU has been fully characterized in accordance with current and applicable state or federal regulations, and that available data indicate that contaminants pose an acceptable level of risk under current and projected future land use" (NMED March 1998). Therefore, the site is being proposed for a NFA decision.

Refer to Annex 2-B for a detailed discussion of the Voluntary Corrective Measure (VCM) remediation and postremediation confirmatory sampling that was completed at SWMU 27. Annex 2-B discusses the scope of the VCM as well as the excavation and sampling analysis results and postremediation confirmatory sampling results.

2.2 Description and Operational History

2.2.1 Site Description

Prior to a VCM conducted in September 1997, SWMU 27 consisted of a pit that is said to have contained animal carcasses. Borrow piles were present around this pit. Because only burned debris rather than animal carcasses were actually found in this pit during the VCM, the pit is hereinafter referred to as the *Burn Pit*. A mounded area was also present approximately 70 to 100 feet north of the Burn Pit (Figure 2.2.1-1). The mounded area is hereinafter referred to as the *Mound Area*. The Mound Area contained scattered debris that included broken glass bottles, ceramic and metal fragments, wire, and black residue. During the Resource Conservation and Recovery Act (RCRA) facility investigation (RFI)/VCM, animal carcasses were found beneath the mound. Building 9820 is located approximately 75 feet west-southwest of SWMU 27 (Figure 2.2.1-2). This site had been used for animal guidance experiments using rats, donkeys, and electronic equipment (Byrd 1994). The site has been regraded to its original topography and revegetated with native grasses. Access to the site is from Coyote Springs Road.

SWMU 27 is situated within OU 1332, which is also known as the Foothills Test Area. It occupies approximately 9,333 acres in the central portion of the Coyote Test Field, which is in the eastern portion of Kirtland Air Force Base (KAFB) within an unrestricted remote test area used by the U.S. Department of Defense and the U.S. Department of Energy (DOE) activities (Figure 2.2.1-3). The OU 1332 SWMU sites are located near the boundary between the U.S. Forest Service (USFS) Withdrawn Area of the Cibola National Forest and KAFB. SWMU 27 is located on USFS land withdrawn from the Bureau of Land Management (BLM) and permitted to the DOE (Figure 2.2.1-4).

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Legend

- Mound Area
- Radiation Anomaly
- Burn Pit
- Road
- 10 Foot Contour
- Surface Drainage
- Fence
- Rad Survey Boundary, SWMU 27
- Building
- Other SWMU Site
- Solid Waste Management Unit 27

Figure 2.2.1-1
Solid Waste Management Unit 27, Bldg. 9820 Animal Disposal Pit

0 37.5 75
Scale in Feet

0 9 18
Scale in Meters

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Mapid=980338 04/01/98 SNL GIS ORG. 6804 DHelfrich dh980338.aml

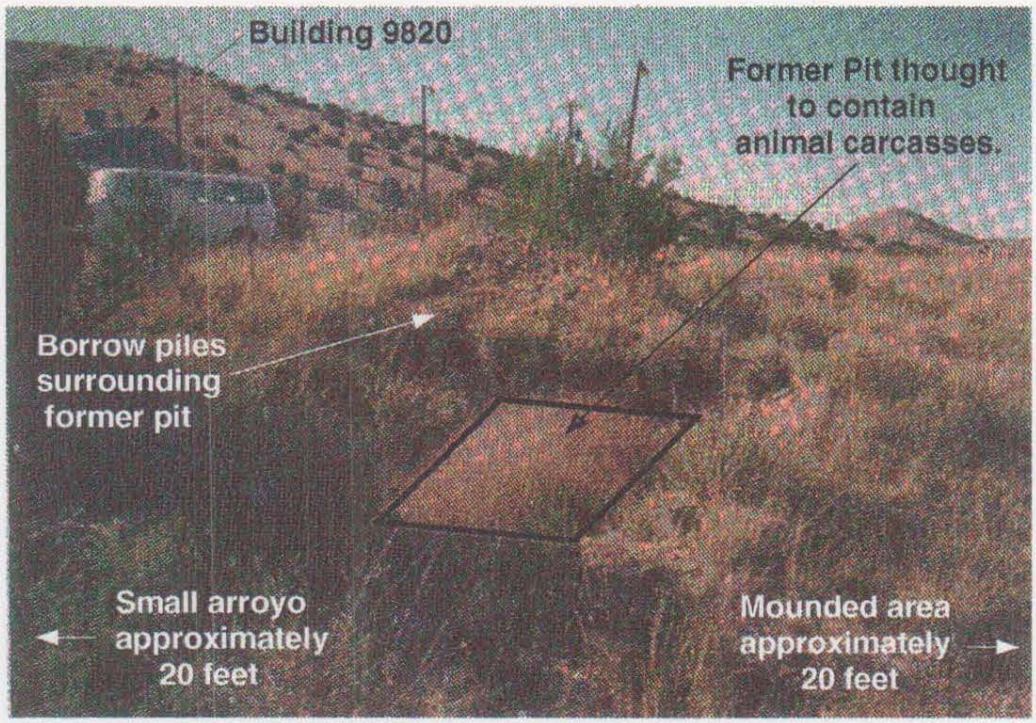

Figure 2.2.1-2
Photograph of Solid Waste Management Unit 27, Building 9820 Animal Disposal Pit. View to the Northwest

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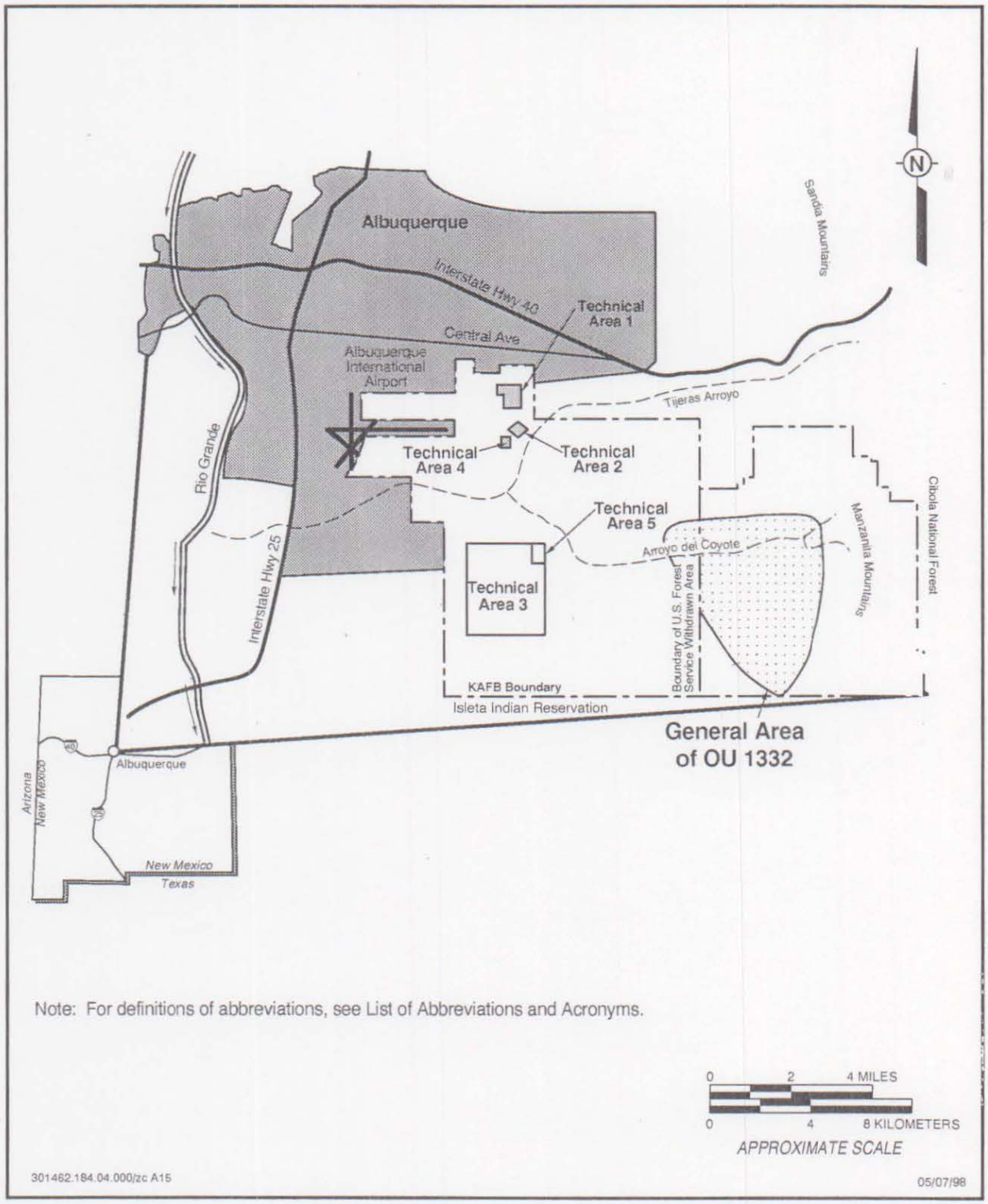

Note: For definitions of abbreviations, see List of Abbreviations and Acronyms.

Figure 2.2.1-3
Location of KAFB and OU 1332

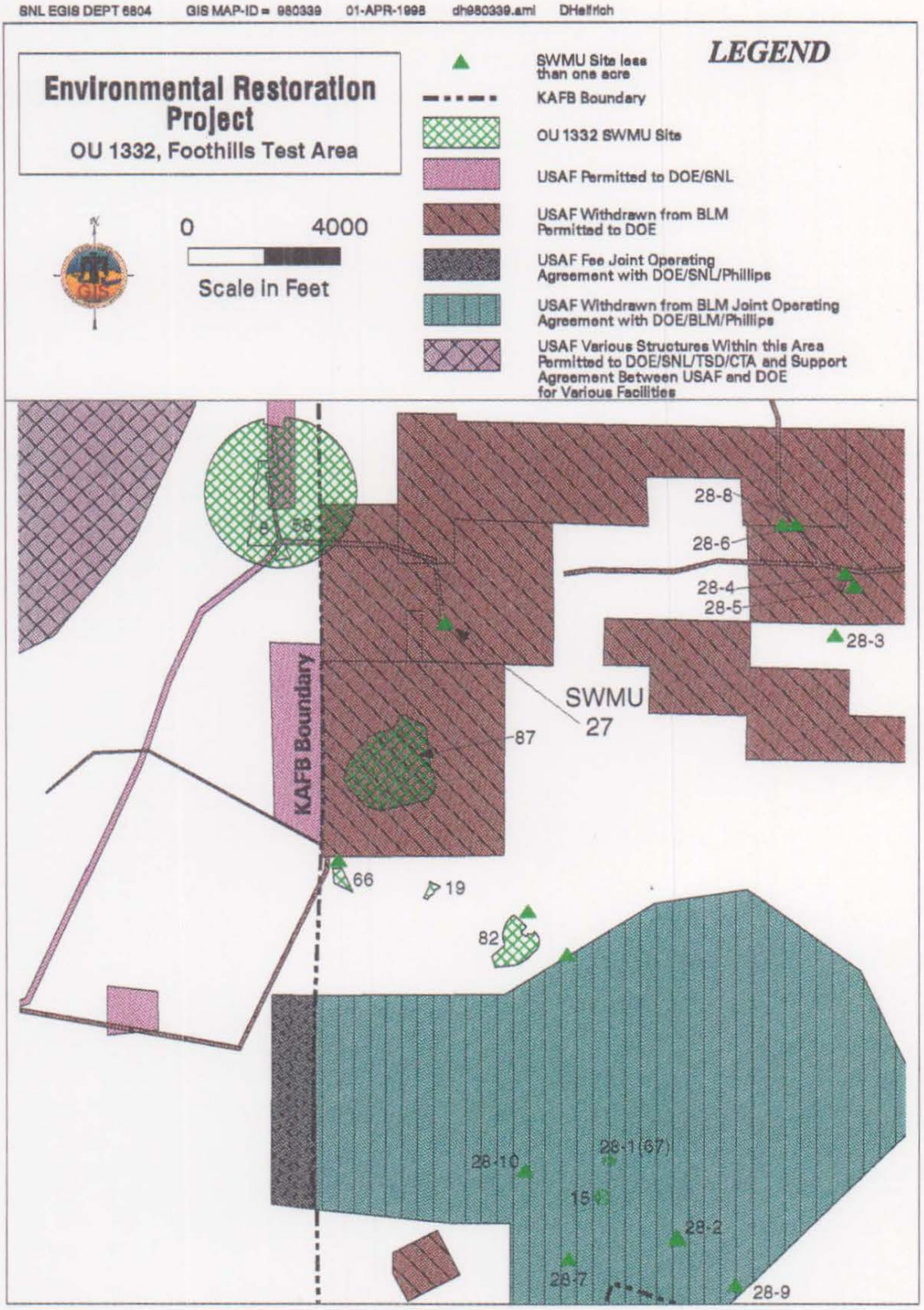

Figure 2.2.1-4
OU 1332 SWMU Sites and Associated Land Uses Within KAFB Boundary and Vicinity

The site is located in a canyon at the western edge of the Manzanita Mountains. A small arroyo lies to the southeast of Building 9820 and drains to the northeast (Figure 2.2.1-1). Bedrock in the area is comprised of Precambrian-age rocks, primarily biotite-granites, and metavolcanic and metasedimentary rocks. The soils are comprised of a thin veneer of poorly weathered alluvium derived from the underlying bedrock. The depth to groundwater at SWMU 27 is 158 to 200 feet below ground surface (bgs), based upon observations of nearby monitoring wells, and occurs in the fractured granitic bedrock. For a detailed discussion regarding the local setting of SWMU 27, refer to the approved "RCRA RFI Work Plan for Operable Unit 1332, Foothills Test Area" (SNL/NM June 1995).

2.2.2 Operational History

Constructed in 1958, Building 9820 was used for several months for high explosives (HE) synthesis (Wrightson, 1994a). Animal guidance experiments using electronic equipment were conducted at Building 9820 in 1958 and 1959 using rats and, later, donkeys (Byrd 1994). The experiments were conducted for the U.S. Navy and were classified *top secret*. Security guards were posted around the area during the experiments. Interviews with employees who participated in experiments indicated that four donkeys, stabled in one end of Building 9820, were used in the experiments (Byrd 1994). Some of the donkeys died as a result of the experiments and were buried in an area near the building. The highly classified nature of the tests prevented access to information regarding the exact cause of death and because the project was highly sensitive, the interviewees stated that the excess soil was graded off so that no visible evidence was left after the burial (Byrd 1994).

In the mid-1960s, a machine shop was opened in Building 9820 (Byrd 1994). From the mid-1970s to 1988, photographic processing was conducted inside Building 9820 and in a darkroom trailer parked on the west side of the building (Byrd 1994). Wastes from these activities were found in the burial pit, and are part of SWMU 49 (refer to Figure 2.2.1-1 for the location of SWMU 49). Building 9820 is currently owned by the photometrics department and SNL/NM Department 7535.

The animal burial pit was originally listed as a SWMU based upon a Comprehensive Environmental Assessment and Response Program (CEARP) interview conducted in 1985, during which an individual who had been associated with the security organization at SNL/NM stated that radiation studies were conducted on animals in this area (DOE September 1987). This information conflicts with more recent information from interviews with technical personnel directly involved in the experiments, including the organization director who had been responsible for the experiments, two technicians who had performed the experiments, and a third technician who had worked at Building 9820 not long after the experiments had been conducted (Byrd 1994). According to these individuals, the tests involved experiments on animals using sophisticated electronic equipment; no radioactive or hazardous materials were used in the tests nor were film badges required (Sandhaus, 1994, Wrightson, 1994a). Another individual who had worked at the time in the SNL/NM Health Physics Organization (now called Radiation Protection Operations) stated that SNL/NM policy required that the Health Physics Organization be involved in projects where radioactive materials were used; the organization was not involved in these tests (Wrightson, 1994a).

In the 1970s, Army Defense Nuclear Agency personnel disposed of several animal carcasses (e.g., deceased dog, skunk, etc) in a pit located at SWMU 27. Pesticides and herbicides were

applied to the bottom of the pit to keep down weeds and to keep other animals away (Byrd 1997). The pesticides and herbicides were used for the purposes for which they were intended, and therefore, they are not considered RCRA COCs.

The military also recently has conducted training maneuvers in the vicinity of SWMU 27.

2.3 Land Use

2.3.1 Current

SWMU 27 is currently an inactive site located on USFS land withdrawn from the BLM and permitted to the DOE (Figure 2.2.1-4).

2.3.2 Future/Proposed

SWMU 27 has been recommended for recreational activities for purposes of future use planning (DOE et al. October 1995). The recreational activities will include hiking and the use of motorized vehicles.

2.4 Investigatory Activities

2.4.1 Summary

SWMU 27 was initially investigated under the CEARP in the mid-1980's and included nonsampling data collection (initial interviews, records search and literature survey, etc.) and a site inspection (Investigation #1). Based on this information, the site was listed as "Building 9820—Animal Disposal Pit." Beginning in 1994, preliminary investigations were conducted that included an unexploded ordnance (UXO)/high explosives (HE) survey and a radiological survey (Investigation #2), RFI sampling (Investigation #3), and a VCM/post-VCM activities (Investigation #4).

The ordnance collected at SWMU 27 during the UXO/HE survey was presumably a remnant of recent police, paramilitary, and military training exercises. One point source radiation anomaly was found at SWMU 27; the point source was identified as a fragment of DU, and is not associated with the site since no radioactive materials were used in the animal experiments conducted at the site. The RFI sampling included scoping surface soil sampling in June 1995 to obtain preliminary analytical data. Additional RFI sampling was conducted in June 1997 to collect site-specific background samples and to determine the presence or absence of animal remains and/or hazardous constituents at the site. Both surface and subsurface (excavation) sampling was conducted during this RFI sampling effort. In August-September 1997, a VCM was conducted at SWMU 27 to excavate and remove the animal remains and associated debris buried at the site. Postremediation confirmatory sampling was conducted at the site to determine that all of the debris had been removed during the VCM and to confirm that no COCs at levels exceeding background levels or action levels were still present at the site.

2.4.2 Investigation #1—Comprehensive Environmental Assessment and Response Program

2.4.2.1 CEARP Nonsampling Data Collection

The DOE CEARP Phase I report (DOE September 1987) and the RCRA Facility Assessment report (EPA April 1987) first identified SWMU 27 as a potential release site based upon interviews, records search, and a field inspection. Based upon this information the site was listed as "Building 9820—Animal Disposal Pit." The CEARP report described a disposal pit "located east of Building 9820" that contained animal remains from a classified radiation study using donkeys. The CEARP report noted that "information on the radionuclide content of these animals was not found."

2.4.2.2 CEARP Sampling Data Collection

No samples were collected during the CEARP.

2.4.2.3 CEARP Data Gaps

No data were available to confirm whether hazardous or radioactive materials or wastes were disposed of or released to the surrounding environment.

2.4.2.4 Results and Conclusions

The Comprehensive Environmental Response, Compensation, and Liability Act findings were uncertain for Federal Facility Site Discovery and Identification Findings, Preliminary Assessment, and Preliminary Site Inspection; and therefore, there was no U.S. Environmental Protection Agency (EPA) high ranking migration mode score for this site.

2.4.3 Investigation #2—SNL/NM Environmental Restoration Preliminary Investigations

2.4.3.1 Nonsampling Data Collection

2.4.3.1.1 Background Review

A background review was conducted to collect available and relevant information regarding SWMU 27. Background information sources included interviews with SNL/NM staff and contractors familiar with site operational history and existing historical site records and reports. The study was completely documented and has provided traceable references that sustain the integrity of the NFA proposal. The following lists these information sources that were used to assist in the evaluation of SWMU 27.

- Photographs and field notes from site inspections conducted at the site by SNL/NM Environmental Restoration (ER) staff (Wrightson 1994b, Mignardot 1996, 1997)

- Seven interviews with five facility personnel (current and retired) (Byrd 1994, Sandhaus 1994, Wrightson 1994a, 1994c)

- One interview with a current New Mexico Environment Department (NMED) employee who was involved with spraying pesticides/herbicides at SWMU 27 (Byrd 1997)

- Miscellaneous information sources including SNL/NM personnel correspondence (memorandum, letters, and notes regarding SWMU 27)

2.4.3.1.2 UXO/HE Survey

In November 1993, KAFB Explosive Ordnance Disposal (EOD) personnel conducted a visual surface survey for UXO/HE on the ground surface at SWMU 27 and found one 40-millimeter (mm) practice cartridge, one clip of 5.56-mm blanks, and numerous pieces of ordnance debris. The EOD Unit removed the ordnance from the site (SNL/NM September 1994). The ordnance collected was related to activities from police, paramilitary, and military groups (including Defender Challenge and the KAFB security police) that use the Coyote Springs area as a training/bivouac area. The ordnance collected during this survey was probably the remnant of training exercises conducted by one or more of these groups. Based upon the type and age of the ordnance found, it is not from the SWMU activities.

2.4.3.1.3 Radiological Survey(s)

On November 24, 1993, RUST Geotech Inc. (December 1994) conducted a surface radiation survey over the Burn Pit and the area immediately surrounding the pit. This survey revealed one radiation anomaly greater than or equal to 1.3 times background. The radiation survey measurements at this point were 650 counts per second (cps) gamma, with 120-cps gamma background. This point source radiation anomaly was identified as a fragment of DU and was located approximately 50 feet from the pit. It is not associated with the pit because no radioactive material was used in the experiments. The location of the radiation anomaly is shown on Figure 2.4.3-1. This source, although not associated with the activities at SWMU 27, was removed as part of the surface radiation VCM conducted by SNL/NM ER in March 1995 (SNL/NM September 1997).

2.4.3.1.4 Cultural-Resources Survey

A cultural resources survey of SWMU 27 was conducted in 1994 in support of the environmental assessment of the ER Project at SNL/NM (DOE March 1996). No cultural-resource concerns were identified at or in the vicinity of SWMU 27 during the survey (Hoagland and Dello-Russo 1995).

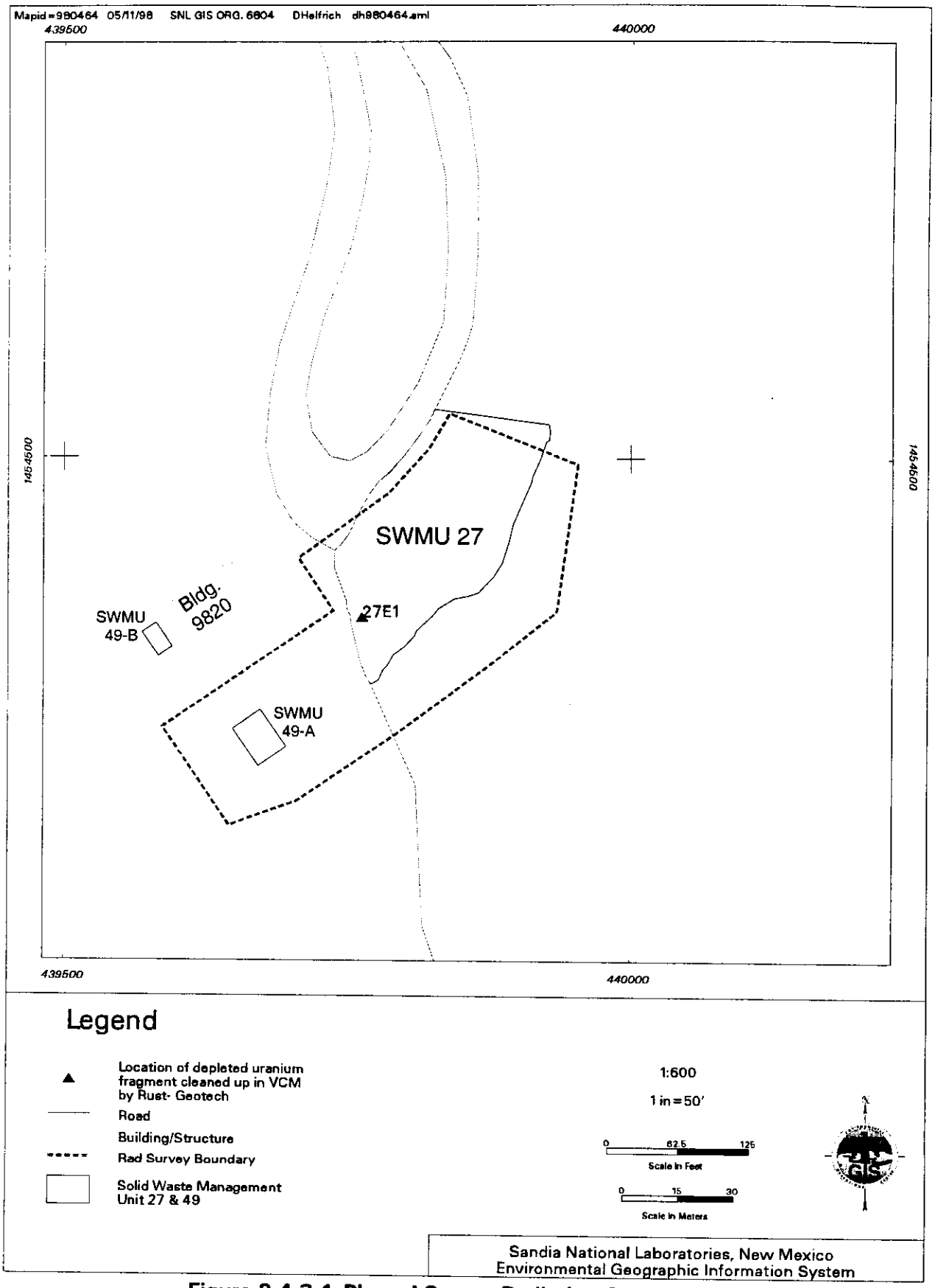

Figure 2.4.3-1 Phase I Survey Radiation Anomalies at Solid Waste Management Unit 27

2.4.3.1.5 *Sensitive-Species Survey*

In a sensitive-species survey conducted in 1994 as part of a biological assessment of SWMU 27 (Sullivan and Knight May 1994), grama grass cacti, visnagita cacti, and Wright's pincushion cacti were found, although these plant species are not sensitive species. Another sensitive-species survey was conducted at the site in July 1997 (IT July 1997). Because no evidence was found that indicated that state or federally listed threatened, endangered, or sensitive species reside at the site, there would be no impact to such species by field activities such as a VCM.

2.4.3.2 *Scoping Sampling Data Collection*

Scoping sampling was conducted in June 1995. The purpose of this sampling was to obtain preliminary analytical data to support the ER Project site ranking and prioritization. Five soil samples were collected from the Burn Pit and borrow piles (Figure 2.4.3-2). Samples were collected from the 0- to 6-inch-depth interval in accordance with Field Operating Procedure (FOP) 94-52 (SNL/NM December 1994a) using standard equipment (stainless steel bowl, trowel, etc.) and standard decontamination procedures in accordance with ER FOP 94-57 (SNL/NM May 1994). All samples were field-screened for radioactivity using a beta-gamma (pancake) probe. QA/QC samples included one duplicate sample, one equipment rinsate sample, and one field blank sample.

The samples were managed in accordance with ER FOP 94-34 (SNL/NM May 1995). Samples were sent to the SNL/NM Department 7713 Radiation Protection Sample Diagnostics Laboratory and were analyzed for radionuclides (gamma spectroscopy) using EPA Method 901.1 (EPA November 1986). SNL/NM chain-of custody and sample documentation procedures were followed for all samples collected. The results are provided in Section 2.4.3.4. Selection of the radiological analysis performed on individual samples was based upon historical and process knowledge for the site.

2.4.3.3 *Preliminary ER Investigation Data Gaps*

Because the analytical data obtained from scoping sampling only determined whether radiological contamination was present, and a recent interview with an employee who had assisted in maintenance of animals and plants at the site identified other potential COCs at the site (Byrd 1997), additional sampling and excavation was required to characterize the site adequately. This information aided in the selection of the types of analyses to be performed on RFI/VCM soil samples.

2.4.3.4 *Preliminary ER Investigation Results and Conclusions*

Table 2.4.3-1 presents the on-site analytical results for radionuclides (gamma spectroscopy) from four samples plus one duplicate collected during the scoping sampling. Complete results of gamma spectroscopy analyses are provided in Annex 2-A.

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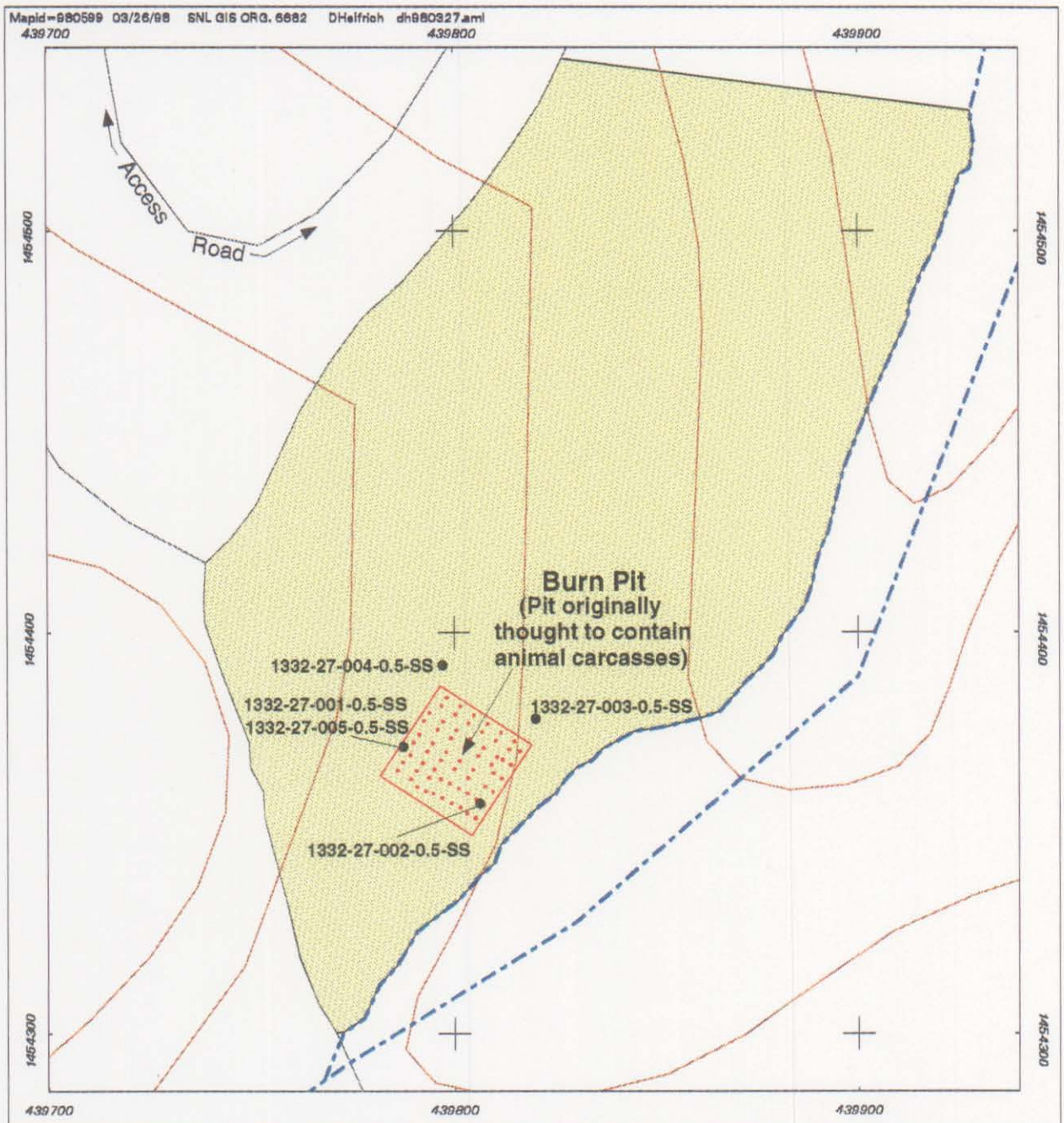

Legend

- Scoping Sample (ID information: 1332 = operable unit; 27 = SWMU; 001 = Sample number; 0.5 = sample depth; SS = soil sample)
- Road
- 5 Foot Contour
- Surface Drainage
- Pit
- SWMU 27

Figure 2.4.3-2
Scoping Surface Soil Sample Locations at SWMU 27

0 20 40
Scale in Feet

0 4.8 9.6
Scale in Meters

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Table 2.4.3-1
Summary of SWMU 27 Scoping Soil Sampling Analytical Results; Radiological Constituents (Gamma Spectroscopy)

Sample Number	ER Sample ID	Sample Matrix	Sample Date	Sample Depth	Gamma Spectroscopy Activity[a] (EPA Method 901.1)						Units
					U-238[b]	Th-234[b]	Th-232[b]	Ra-228[b]	U-235[b]	Cs-137[b]	
1332-27-001-0.5-SS	1332-27-001-0.5-SS	Soil	6/30/95	0.0-0.5 ft	ND (2.25E+00)	ND (1.08E+00)	7.83E-01	7.35E-01	ND (4.02E-01)	ND (6.36E-02)	pCi/g
1332-27-002-0.5-SS	1332-27-002-0.5-SS	Soil	6/30/95	0.0-0.5 ft	ND (2.16E+00)	ND (8.49E-01)	7.59E-01	8.93E-01	ND (3.97E-01)	ND (6.44E-02)	pCi/g
1332-27-003-0.5-SS	1332-27-003-0.5-SS	Soil	6/30/95	0.0-0.5 ft	ND 2.00E+00	ND 8.75E-01	8.31E-01	9.02E-01	ND (3.75E-01)	ND (6.84E-02)	pCi/g
1332-27-004-0.5-SS	1332-27-004-0.5-SS	Soil	6/30/95	0.0-0.5 ft	ND (1.97E+00)	1.32E+00	7.98E-01	8.15E-01	ND (3.63E-01)	ND (5.94E-02)	pCi/g
1332-27-005-0.5-SS	1332-27-005-0.5-SS	Soil	6/30/95	0.0-0.5 ft	ND (1.80E+00)	ND (6.86E-01)	3.48E-01	4.12E-01	ND (3.35E-01)	1.62E-01	pCi/g
1332-27-005-0.5-D	1332-27-005-0.5-D	Soil	6/30/95	0.0-0.5 ft	ND (1.79E+00)	ND (6.59E-01)	4.62E-01	2.96E-01	ND (3.36E-01)	1.81E-01	pCi/g
1332-27-005-0.5-R	1332-27-005-0.5-R	Water	6/30/95	NA	ND (5.61E-01)	ND (2.81E-01)	ND (1.38E-01)	ND (1.19E-01)	ND (1.43E-01)	ND (2.08E-02)	pCi/mL
1332-27-005-0.5-FB	1332-27-005-FB	Water	6/30/95	NA	ND (5.77E-01)	ND (2.68E-01)	ND (1.30E-01)	ND (1.24E-01)	ND (1.43E-01)	ND (2.17E-02)	pCi/mL
Quality Assurance/Quality Control Samples											
SNL/NM Foothills Background Range[c]		NA	NA	NA	0.153–2.86	0.69–2.03	0.113–1.18	0.113–1.32	0.004–3.0	0.007–0.876	pCi/g
HRMB Maximum Background[d]		NA	NA	NA	2.31	2.31	1.03	1.08	0.16	1.063	pCi/g

ER Sample ID Information: 1332 = Operable Unit; 27 = SWMU sample location; 001 = sample number; 0.5 = depth of sample.

[a]Uranium-238 and thorium-232 decay chain isotopes with a short half-life are not presented in this table.
[b]Value in parenthesis represents the minimum detectable activity.
[c]IT March 1996.
[d]Dinwiddie September 24, 1997.

Cs = Cesium.
D = Duplicate.
EPA = U.S. Environmental Protection Agency.
ER = Environmental restoration.
FB = Field blank.
ft = Foot (feet).
g = Gram(s).
HRMB = Hazardous and Radioactive Materials Bureau
ID = Identification.
IT = IT Corporation.
MDA = Minimum detectable activity.
mL = Milliliter(s).
NA = Not applicable.
ND = Nondetect—the analyte was not observed above the MDA.
pCi = Picocurie(s).
R = Rinsate blank.
Ra = Radium.
SNL/NM = Sandia National Laboratories, New Mexico.
SS = Soil sample.
SWMU = Solid waste management unit.
Th = Thorium.
U = Uranium.

All samples contained uranium-238, thorium-234, thorium-232, radium-228, and cesium-137 concentration levels below their respective Hazardous and Radioactive Materials Bureau (HRMB) maximum background concentration levels (concentrations from the SNL/NM Canyons Background Area Group) (Dinwiddie September 24, 1997). A Lower Canyon Area group background concentration was also used when a Canyons background concentration level was not available. All samples contained uranium-235 concentration levels less than the minimum detectable activity (MDA), which exceeded the HRMB maximum background concentration level of 0.16 picocurie (pCi) per gram (g), but were below the SNL/NM Foothills maximum background level of 3.0 pCi/g (IT March 1996). Although the MDA for gamma-emitting radionuclides was sometimes higher than the background level for that radionuclide, they were nevertheless orders of magnitude less than a risk-based preliminary remediation goal (PRG) which is based upon a 15 millirem per year (mrem/yr) effective dose equivalent (EDE) maximum dose limit found in EPA's Office of Solid Waste and Emergency Response (OSWER) Directive No. 9200.4-18, "Establishment of Cleanup Levels for CERCLA Sites with Radioactive Contamination" (EPA 1997). Therefore the analytical results are acceptable. In summary, these results are indicative of naturally occurring background radiation.

2.4.4 Investigation #3—SWMU 27 RFI Sampling

RFI sampling was conducted by SNL/NM ER in June 1997. The purpose of the RFI sampling activities was as follows:

- To collect site-specific background samples
- To determine the presence or absence of animal remains buried at the site
- To determine the presence or absence of hazardous constituents at the site

The RFI activities included surface debris and soil sampling followed by excavation and subsurface sampling.

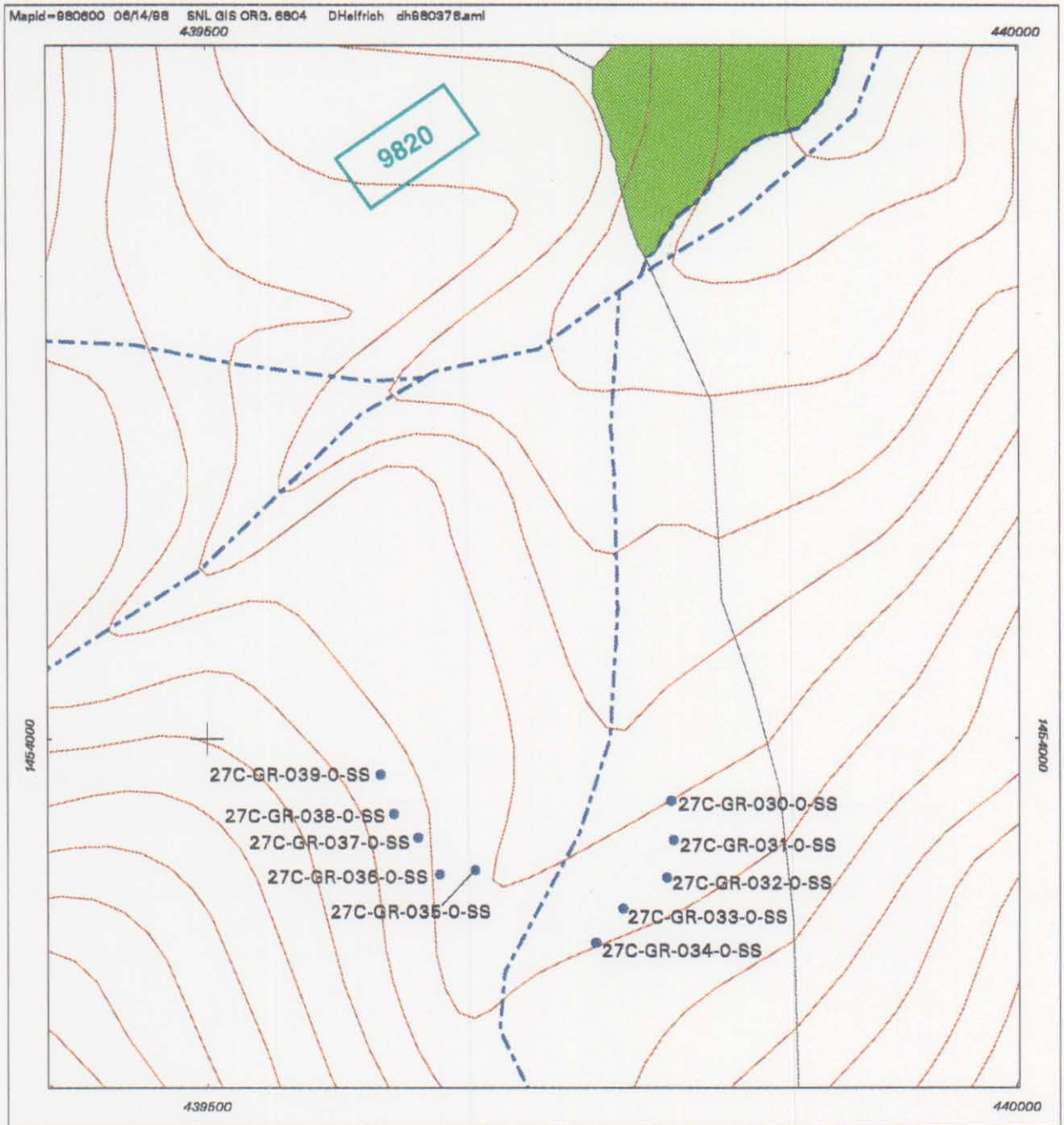
The site-specific background soil samples were collected immediately up-gradient of the site (Figure 2.4.4-1), and the remaining RFI sampling and excavation activities were conducted within the vicinity of SWMU 27, specifically at two distinct areas including the:

- Mound Area (located 70 to 100 feet north of the Burn Pit)
- Burn Pit

These areas are shown to scale in Figure 2.4.4-2.

After site-specific background samples were collected, surface debris samples were collected from the Mound Area followed by confirmatory surface soil samples. Then, after the Burn Pit was excavated and sampled, the Mound Area was excavated and confirmatory samples were collected. The sample methods and results are provided in the following sections.

SNL/NM chain-of custody and sample documentation procedures were followed for all samples collected. All samples collected for radiological analysis were analyzed by gamma spectroscopy (Method EPA 901.1 [EPA November 1986]) at the SNL/NM Department 7713, Radiation Protection Sample Diagnostics Laboratory; all samples collected for chemical



Legend

- Background Sample Location (ID information: 27C = SWMU sample location; GR = grab sample; 039 = sample number; 0 = sample depth; SS = soil sample)
- Road
- 5 Foot Contour
- Surface Drainage
- Building 9820
- SWMU 27

Figure 2.4.4-1
RFI Site-Specific Background Sample Locations at SWMU 27

0 50 100
Scale in Feet

0 12 24
Scale in Meters

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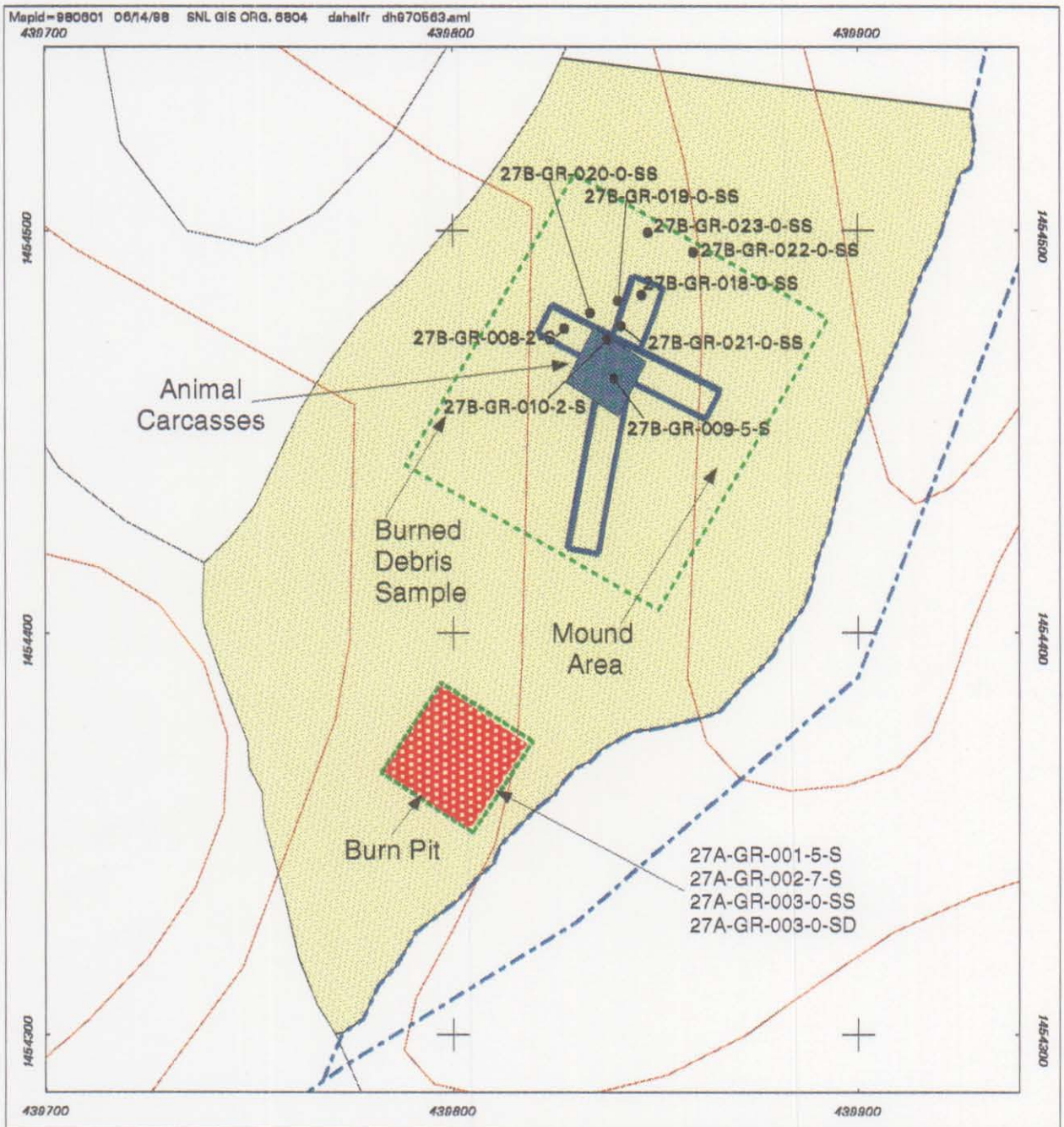

Legend

- Debris Sample Location (ID information: 27B = SWMU sample location; GR = grab sample; 010 = sample number; 2 = sample depth; SS = soil sample)
- Excavation Area
- Road
- 5 Foot Contour
- Surface Drainage
- Burn Pit
- Trench
- SWMU 27

Figure 2.4.4-2
RFI Debris Sample Locations at Solid Waste Management Unit 27

0 20 40
Scale in Feet

0 4.8 9.6
Scale in Meters

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analysis were analyzed off site at General Engineering Laboratory in Charleston, South Carolina. The results are given in Section 2.4.4.4.

Selection of the chemical and radiological analysis performed on individual samples was based upon recent interviews and process knowledge.

2.4.4.1 RFI Nonsampling Data Collection

On July 9, 1997, a contractor who had worked for the Army Defense Nuclear Agency in the 1970s and assisted in disposing of several animal carcasses in a pit located at SWMU 27 was interviewed. The remains were those of animals whose demise was incidental (e.g., deceased dog, skunk, etc.). Pesticides and herbicides were applied to the area to keep down weeds and to keep other animals away (Byrd 1997). The pesticides and herbicides, however, were used for the purposes for which they were intended, and therefore, are not considered RCRA COCs.

2.4.4.2 RFI Sampling Data Collection

2.4.4.2.1 RFI Site-Specific Background Soil Sampling

Ten site-specific background soil samples were collected upgradient from SWMU 27 (Figure 2.4.4-1). The samples were collected from the 0- to 6-inch-depth interval, in accordance with the SNL/NM procedures described in Section 2.4.3.2. The samples were collected and analyzed for radionuclides (gamma spectroscopy and gross alpha/gross beta) to determine the background radiation levels in soils in the vicinity of SWMU 27.

2.4.4.2.2 RFI Sampling at Mound Area

<u>RFI Surface Debris Sampling—Mound Area</u>

Six surface debris samples were collected within the Mound Area (Samples 27B-GR-018-0-SS through 27B-GR-023-0-SS on Figure 2.4.4-2). The ER Sample Identification indicates the following: 27B SWMU sample location; GR = grab sample; 018 = sample number; 0 = sample depth; SS = soil sample. The samples were collected where solid debris (e.g., broken glass bottles, ceramic, metal fragments, wire, black residue) was present on the ground at the 0- to 6-inch-depth interval in accordance with the SNL/NM procedures described in Section 2.4.3.2. All of the samples were analyzed off site. Based upon confirmatory sampling, all of the debris was removed and disposed of during the September 1997 VCM.

<u>RFI Surface Confirmatory Soil Sampling—Mound Area</u>

Six confirmatory surface soil samples were collected from the Mound Area (Samples 27B-GR-024-0.5-S through 27B-GR-029-0.5-S on Figure 2.4.4-3). Each of the samples was collected immediately beneath the six debris sample locations discussed above. The soil samples were collected to determine whether any leaching took place in the underlying soils and to confirm the absence of debris mixed in the soils. The samples were collected at the

6- to 12-inch-depth interval in accordance with the SNL/NM procedures described in Section 2.4.3.2.

RFI Excavation and Subsequent Sampling of Debris—Mound Area

The Mound Area was excavated to determine whether buried materials were present beneath the surface (source area). A portion of the source area was found and removed.

Two trenches were excavated perpendicular to each other across the area (Figure 2.4.4-2) and three debris samples were collected (Samples 27B-GR-008-2-5, 27B-GR-009-5-S, and 27B-GR-010-2-S on Figure 2.4.4-2). The trenching was performed in accordance with FOP 94-39 (SNL/NM December 1994b), Excavating Methods, and sampling was performed according to the methods described in Section 2.4.3.2.

One east-west-trending and one north-south-trending trench was excavated through the Mound Area to depths ranging from 8 to 14 feet bgs (Figure 2.4.4-2). Soil mixed with animal carcasses (at least three carcasses) and hides, metal, wire, glass, glass bottles with oil residue, burned materials, and five small medical vials (one vial contained 1 to 2 ounces of liquid) was found in both trenches, removed, and then sampled.

The majority of the buried materials were encountered in the area where the two trenches intersected each other. One area along the northwest edge of the Mound Area approximately 4 by 4 feet in size contained the burned materials (Sample 27B-GR-010-2-S).

Excavation continued until it was determined through visual observation that no debris or stained soils were present. One confirmatory soil sample (Sample 27B –GR-013-8-S on Figure 2.4.4.3) was collected from the floor of the southern end of the north-south trench.

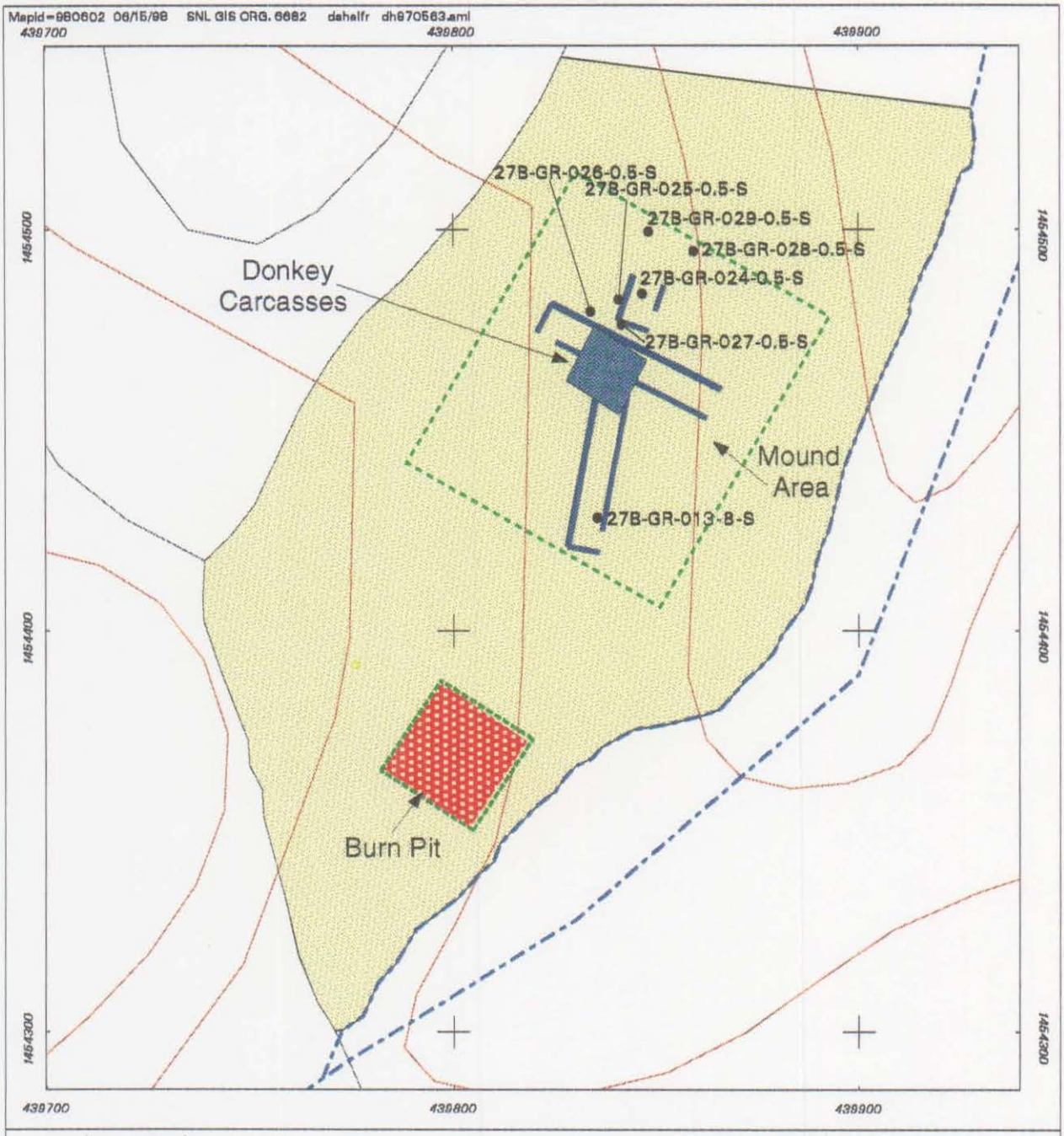
2.4.4.2.3 RFI Excavation and Subsequent Sampling of Debris at Burn Pit

A portion of the subsurface of the Burn Pit was investigated during the excavation, which was conducted in accordance with the SNL/NM procedure FOP 94-39 (SNL/NM December 1994b), "Excavating Methods," to determine whether buried materials were present at the pit. Sampling was performed as described in Section 2.4.3.2.

A 10-foot-diameter pit was excavated to a depth of 8 feet bgs. The buried debris was removed from the pit and sampled. Three debris samples plus one duplicate (Samples 27A-GR-001-5-S, 27A-GR-002-7-S, 27A-GR-003-0-SS, and 27A-GR-003-0-SD on Figure 2.4.4-2) were collected. The debris consisted of soil mixed with burned metal (including pipes, wire, and shavings), glass, film waste, drum lids (but no drums), plastic, wood, laboratory bottles, and other burned materials.

2.4.4.3 RFI Data Gaps

Information was gathered through personnel interviews and scoping/RFI sampling. These methods aided in identifying the potential COCs and scope of work required to remediate



Legend

- Confirmatory Sample Location (ID information: 27B = SWMU sample location; GR = grab sample; 025 = sample number; 0.5 = sample depth; S = soil sample)
- Excavation Area
- Road
- 5 Foot Contour
- Surface Drainage
- Burn Pit
- Trench
- SWMU 27

Figure 2.4.4-3
RFI Confirmatory Soil Sample Locations at Solid Waste Management Unit 27

0 20 40
Scale in Feet

0 4.8 9.6
Scale in Meters

Sandia National Laboratories, New Mexico
Environmental Geographic Information System

SWMU 27 and in the selection of the type of remediation activities and analyses to be performed under the VCM. Because a significant amount of debris was found in the Burn Pit and the Mound Area during the RFI and the vertical/horizontal extent of the debris was not determined, additional sampling and excavation beyond the RFI was required to characterize and remediate the site. The remediation was performed under a VCM in September 1997 (Annex 2-B).

2.4.4.4 RFI Results and Conclusions

It should be noted that all of the debris and soils sampled and removed from the Mound Area and the Burn Pit during the RFI were subsequently disposed of as RCRA-regulated waste during the VCM conducted in September 1997 (Annex 2-B). Therefore, the following results for this sampling (Sections 2.4.4.4.2 and 2.4.4.4.3) are presented merely for informational purposes.

2.4.4.4.1 RFI Site-Specific Background Soil Sampling Results

Analytical results from the ten site-specific background samples collected are shown in Tables 2.4.4-1 and 2.4.4-2, and the associated sample locations are shown in Figure 2.4.4-1. The background samples are called out by the 27C identifiers in the ER Sample ID column of the tables and relate to the location of the sample (e.g., site-specific background).

Samples were analyzed for radionuclides using gamma spectroscopy: All samples contained uranium-238, thorium-234, radium-228, uranium-235, and cesium-137 concentration levels below their respective HRMB maximum background concentration levels (Dinwiddie September 24, 1997) (Table 2.4.4-1). Four samples contained thorium-232 concentration levels slightly exceeding the HRMB maximum background concentration level of 1.03 pCi/g (Dinwiddie September 24, 1997), but were below the SNL/NM Foothills maximum background concentration level of 1.18 pCi/g. Although the MDA for gamma-emitting radionuclides was sometimes higher than the background level for that radionuclide, they were nevertheless orders of magnitude less than a risk-based PRG which is based upon a 15 mrem/yr EDE maximum dose limit found in EPA's OSWER Directive No. 9200.4-18, "Establishment of Cleanup Levels for CERCLA Sites with Radioactive Contamination" (EPA 1997). Therefore the analytical results are acceptable. Complete results of gamma spectroscopy analyses are provided in Annex 2-A.

Samples were analyzed for radionuclides (gross alpha and gross beta): All samples contained gross alpha and gross beta concentration levels within an order of magnitude of SNL/NM basewide background radiation levels (SNL/NM August 1997) (Table 2.4.4-2). Background concentration levels were also consistent with New Mexico-wide radiation levels (NMED November 1990).

In summary, the background samples collected at SWMU 27 indicate naturally occurring background radiation and were used for comparing other samples (e.g., debris and verification samples) collected at this site.

Table 2.4.4-1
Summary of SWMU 27 RFI Site-Specific Background Soil Sampling Analytical Results;
Radiological Constituents (Gamma Spectroscopy)

Sample Number	ER Sample ID	Sample Matrix	Sample Date	Sample Depth	Gamma Spectroscopy Activity[a] (EPA Method 901.1)						Units
					U-238[b]	Th-234[b]	Th-232[b]	Ra-228[b]	U-235[b]	Cs-137[b]	
034979-004	27C-GR-030-0-SS	Soil	6/10/97	0.0–0.5 ft	ND (1.74E+00)	1.21E+00	1.10E+00	8.95E-01	ND (2.35E-01)	6.15E-02	pCi/g
034980-004	27C-GR-031-0-SS	Soil	6/10/97	0.0–0.5 ft	ND (1.20E+00)	ND (5.89E-01)	7.76E-01	9.03E-01	ND (2.07E-01)	2.06E-01	pCi/g
034981-004	27C-GR-032-0-SS	Soil	6/10/97	0.0–0.5 ft	ND (1.86E+00)	6.36E-01	9.30E-01	1.00E+00	ND (2.50E-01)	1.16E-01	pCi/g
034982-004	27C-GR-033-0-SS	Soil	6/10/97	0.0–0.5 ft	ND (1.95E+00)	ND (7.72E-01)	1.07E+00	9.15E-01	ND (2.64E-01)	1.94E-01	pCi/g
034983-004	27C-GR-034-0-SS	Soil	6/10/97	0.0–0.5 ft	ND (1.94E+00)	1.13E+00	1.12E+00	9.35E-01	ND (2.52E-01)	2.15E-01	pCi/g
034984-004	27C-GR-035-0-SS	Soil	6/10/97	0.0–0.5 ft	ND (1.70E+00)	8.90E-01	7.70E-01	8.70E-01	ND (2.30E-01)	2.34E-01	pCi/g
034985-004	27C-GR-036-0-SS	Soil	6/10/97	0.0–0.5 ft	7.85E-01	ND (6.13E-01)	7.69E-01	6.68E-01	ND (2.12E-01)	1.22E-01	pCi/g
034986-004	27C-GR-037-0-SS	Soil	6/10/97	0.0–0.5 ft	ND (1.95E+00)	8.29E-01	1.02E+00	1.04E+00	ND (2.64E-01)	1.12E-01	pCi/g
034987-004	27C-GR-038-0-SS	Soil	6/10/97	0.0–0.5 ft	ND (1.83E+00)	ND (6.07E-01)	1.04E+00	9.70E-01	ND (2.52E-01)	2.16E-01	pCi/g
034988-004	27C-GR-039-0-SS	Soil	6/10/97	0.0–0.5 ft	ND (1.74E+00)	ND (7.00E-01)	9.25E-01	8.72E-01	ND (1.42E-01)	1.24E-01	pCi/g
Quality Assurance/Quality Control Samples											
034991-004	27C-GR-042-FB	Water	6/12/97	NA	ND (7.81E-01)	ND (3.08E-01)	ND (1.52E-01)	ND (1.64E-01)	ND (1.37E-01)	ND (2.87E-02)	pCi/mL
034992-004	27C-GR-043-EB	Water	6/12/97	NA	ND (8.08E-01)	ND (3.26E-01)	ND (1.60E-01)	ND (1.57E-01)	ND (1.38E-01)	ND (2.78E-02)	pCi/mL
0034996-004	27-GR-044-DCW	Water	6/16/97	NA	ND (9.74E-01)	ND (3.00E-01)	ND (1.39E-01	ND (1.20E-01	ND (1.30E-01	ND (2.13E-02)	pCi/mL
SNL/NM Foothills Background Range[c]		NA	NA	NA	0.153–2.86	0.69–2.03	0.113–1.18	0.113–1.32	0.004–3.0	0.007–0.876	pCi/g
HRMB Maximum Background[d]		NA	NA	NA	2.31	2.31	1.03	1.08	0.16	1.063	pCi/g

ER Sample ID Information: 27C = SWMU sample location; GR = grab sample; 030 = sample number; 0 = depth of sample; SS = soil sample.

[a]Uranium-238 and thorium-232 decay chain isotopes with a short half-life are not presented in this table.
[b]Value in parenthesis represents the minimum detection activity.
[c]IT March 1996.
[d]Dinwiddie September 24, 1997.

Cs = Cesium.
DCW = Decontamination water sample.
EB = Equipment blank.
EPA = U.S. Environmental Protection Agency.
ER = Environmental restoration.
FB = Field blank.
ft = Foot (feet).
g = Gram(s).
GR = Grab sample.
HRMB = Hazardous and Radioactive Materials Bureau.
ID = Identification.
IT = IT Corporation.
MDA = Minimum detectable activity.
mL = Milliliter(s).
NA = Not applicable.
ND = Nondetect - the analyte was not observed above the MDA.
pCi = Picocurie(s)
Ra = Radium.
RCRA = Resource Conservation and Recovery Act.
RFI = RCRA facility investigation.
SNL/NM = Sandia National Laboratories/New Mexico.
SS = Surface soil sample.
SWMU = Solid waste management unit.
Th = Thorium.
U = Uranium.

Table 2.4.4-2
Summary of SWMU 27 RFI Site-Specific Background Soil Sampling Analytical Results;
Radiological Constituents (Gross Alpha and Gross Beta)

Sample Number	ER Sample ID	Sample Matrix	Sample Date	Sample Depth	Gross Alpha and Gross Beta (EPA Method 900.0)				Units
					Gross Alpha	Uncertainty, Gross Alpha (+/-)	Gross Beta	Uncertainty, Gross Beta (+/-)	
034979-003	27C-GR-030-0-SS	Soil	6/10/97	0.0–0.5 ft	14.8	3.52	28.7	3.44	pCi/g
034980-003	27C-GR-031-0-SS	Soil	6/10/97	0.0–0.5 ft	12.5	3.81	24.6	3.54	pCi/g
034981-003	27C-GR-032-0-SS	Soil	6/10/97	0.0–0.5 ft	15.4	3.85	22.2	3.58	pCi/g
034982-003	27C-GR-033-0-SS	Soil	6/10/97	0.0–0.5 ft	15.7	3.78	29.8	3.52	pCi/g
034983-003	27C-GR-034-0-SS	Soil	6/10/97	0.0–0.5 ft	20.0	4.41	27.9	3.64	pCi/g
034984-003	27C-GR-035-0-SS	Soil	6/10/97	0.0–0.5 ft	19.6	4.59	26.9	3.58	pCi/g
034985-003	27C-GR-036-0-SS	Soil	6/10/97	0.0–0.5 ft	11.2	3.36	17.3	3.24	pCi/g
034986-003	27C-GR-037-0-SS	Soil	6/10/97	0.0–0.5 ft	17.4	3.86	19.4	3.20	pCi/g
034987-003	27C-GR-038-0-SS	Soil	6/10/97	0.0–0.5 ft	17.5	4.28	25.7	3.56	pCi/g
034988-003	27C-GR-039-0-SS	Soil	6/10/97	0.0–0.5 ft	13.5	3.92	28.4	3.7	pCi/g
SNL/NM Complex Average Background[a]		Soil	NA	NA	-0.47	1.26 (2 standard deviations)	10.76	6.54 (2 standard deviations)	pCi/g

ER Sample ID Information: 27C = SWMU sample location; GR = grab sample; 030 = sample number; 0 = depth of sample; SS = soil sample.

[a]SNL/NM August 1997.

EPA = U.S. Environmental Protection Agency.
ER = Environmental restoration.
ft = feet.
GR = Grab sample.
ID = Identification.
NA = Not applicable.
pCi/g = Picocurie(s) per gram.
RCRA = Resource Conservation and Recovery Act.
RFI = RCRA facility investigation.
SNL/NM = Sandia National Laboratories/New Mexico.
SS = Surface soil sample.
SWMU = Solid waste management unit.

2.4.4.4.2 RFI Sampling Results at Mound Area

The results for this sampling are presented for informational purposes only because all of the debris and soils were removed and disposed of as RCRA-regulated waste during the VCM conducted in September 1997.

RFI Surface Debris Sampling Results—Mound Area

Tables 2.4.4-3 through 2.4.4-8 provide the analytical results for surface debris samples collected at six locations (Samples 27B-GR-018-0-SS through 27B-GR-023-0-SS) within the Mound Area, and the corresponding sample locations are shown in Figure 2.4.4-2. The debris samples are called out by the 27B identifiers in the ER Sample ID column of the tables and correlate to location where the samples were collected (e.g., 27B = Mound Area).

Using the Toxicity Characteristic Leaching Procedure (TCLP) for metals: All metal concentration levels for the six debris samples collected (Samples 27B-GR-018-0-SS through 27B-GR-023-0-SS) were below the method detection limits (EPA Methods 6010A and 7470) or the Toxicity Characteristic reporting level (EPA November 1986) (Table 2.4.4-3).

Using TCLP for semivolatile organic compounds (SVOC): All SVOC concentration levels in the six debris samples collected (Samples 27B-GR-018-0-SS through 27B-GR-023-0-SS) were below the method detection limits (EPA Method 8270 [EPA November 1986]) provided in Table 2.4.4-4.

Using TCLP for volatile organic compounds (VOC): All VOC concentration levels in the six debris samples collected (Samples 27B-GR-018-0-SS through 27B-GR-023-0-SS) were below the method detection limits (EPA Method 8260 [EPA November 1986]) given in Table 2.4.4-5.

Using TCLP for pesticides/herbicides: The pesticides/herbicides analysis were included at NMED's request. All pesticide/herbicide concentration levels in the two debris samples collected (Samples 27B-GR-018-0-SS and 27B-GR-021-0-SS) were below the method detection limits (EPA Methods 8081 and 8151 [EPA November 1986]) shown in Table 2.4.4-6.

For radionuclides (gamma spectroscopy) using EPA Method 900.1 (EPA November 1986), all six debris samples (Samples 27B-GR-018-0-SS through 27B-GR-023-0-SS) contained uranium-238, thorium-234, and cesium-137 concentration levels below their respective HRMB maximum background concentration levels (Dinwiddie September 24, 1997) (Table 2.4.4-7). Two samples (Samples 27B-GR-018-0-SS through 27B-GR-023-0-SS) contained thorium-232 concentration levels above the HRMB maximum background concentration level of 1.03 pCi/g, but were below the SNL/NM Foothills maximum background concentration level of 1.18 pCi/g. One sample (Sample 27B-GR-023-0-SS) contained a radium-228 concentration level greater than the HRMB maximum background concentration level of 1.08 pCi/g, but was below the SNL/NM Foothills maximum background level of 1.32 pCi/g. All samples contained uranium-235 concentration levels less than the MDA, which exceeded the HRMB maximum background concentration level of 0.16 pCi/g but were below the SNL/NM Foothills maximum background concentration level of 3.0 pCi/g. Although the MDA for gamma-emitting radionuclides was sometimes higher than the background level for that radionuclide, they were nevertheless orders of magnitude less than a risk-based PRG which is based upon a 15 mrem/yr EDE

Table 2.4.4-3
Summary of SWMU 27 RFI Mound Area Surface Debris Sampling Analytical Results; Inorganic Constituents (TCLP Metals)

Sample Number	ER Sample ID	Sample Matrix	Sample Date	Sample Depth	TCLP Metals (EPA Methods 6010A, 7470/7471* and 1311)										Units
					Ag	As	Ba	Be	Cd	Cr	Hg	Ni	Pb	Se	
034967-002	27B-GR-018-0-SS	Soil	6/10/97	0.0–0.5 ft	0.00174J	0.00689J	0.526B	NR	0.00126J	ND (0.00621)	ND (0.0001)	NR	ND (0.00136)	0.00830JB	mg/L
034968-002	27B-GR-019-0-SS	Soil	6/10/97	0.0–0.5 ft	0.00138J	0.0129J	0.949B	NR	0.00602J	0.00225J	ND (0.0001)	NR	0.0221	0.0106B	mg/L
034969-002	27B-GR-020-0-SS	Soil	6/10/97	0.0–0.5 ft	0.00194J	0.0120J	1.18B	NR	0.0156	ND (0.000621)	ND (0.0001)	NR	0.602	0.0100B	mg/L
034970-002	27B-GR-021-0-SS	Soil	6/10/97	0.0–0.5 ft	0.00233J	0.0143J	1.56B	NR	0.0373	ND (0.000621)	ND (0.0001)	NR	2.62	0.00874JB	mg/L
034971-002	27B-GR-022-0-SS	Soil	6/10/97	0.0–0.5 ft	0.00168J	0.00906J	1.01B	NR	0.0272	0.0162J	ND (0.0001)	NR	0.0129	0.00792JB	mg/L
034972-002	27B-GR-023-0-SS	Soil	6/10/97	0.0–0.5 ft	ND (0.000424)	0.00825J	0.980B	NR	0.0226	0.00347J	ND (0.0001)	NR	0.00617J	0.00547JB	mg/L
Quality Assurance/Quality Control Samples															
034996-011	27-GR-044-DCW	Water	6/16/97	NA	0.0196J	ND (0.00276)	0.283B	NR	0.0297J	0.0106J	ND (0.0001)	NR	0.221	0.0259J	mg/L
Toxicity Characteristic Regulatory Level*		NA	NA	NA	5	5.0	100	NG	1.0	5.0	0.2	NG	5.0	1.0	mg/L

ER Sample ID Information: 27B = SWMU sample location; GR = grab sample; 018 = sample number; 0 = depth of sample; SS = soil sample.

*Maximum concentration of contaminant for the toxicity characteristic (EPA November 1986).

Ag = Silver.
As = Arsenic.
B = Concentration of the compound was detected in the blank above the practical quantitation limit.
Ba = Barium.
Be = Beryllium.
Cd = Cadmium.
Cr = Chromium.
DCW = Decontamination water sample.
EPA = U.S. Environmental Protection Agency.
ER = Environmental restoration.
ft = Foot (feet).
GR = Grab sample.
Hg = Mercury.
ID = Identification.
J = The estimated value reported is either above the MDL and less than the practical quantitation limit or above the instrument detection limit and less than the contract required detection limit.
MDL = Method detection limit.
mg/L = Milligram(s) per liter.
NA = Not applicable.
ND ( ) = Not detected at or above the MDL, shown in parenthesis.
NG = Not given.
Ni = Nickel.
NR = Not reported.
Pb = Lead.
RCRA = Resource Conservation and Recovery Act.
RFI = RCRA facility investigation.
Se = Selenium.
SS = Surface soil sample.
SWMU = Solid waste management unit.
TCLP = Toxicity characteristic leaching procedure.

Table 2.4.4-4
Summary of Site 27 RFI Organic Constituents
(TCLP SVOCs) and Method Detection Limits

Parameter	Method Detection Limit	Reporting Limit	Units
2,4,5-trichlorophenal	5	100	µg/L
2,4,6-trichlorophenal	5	100	µg/L
2,4-dinitrotoluene	5	100	µg/L
Hexachlorobenzene	5	100	µg/L
Hexachlorobutadiene	5	100	µg/L
Hexachloroethane	5	100	µg/L
Nitrobenzene	5	100	µg/L
Pentachlorophenol	5	100	µg/L
Pyridine	5	100	µg/L
m.p-cresol	5	100	µg/L
o-cresol	5	100	µg/L

RCRA = Resource Conservation and Recovery Act.
RFI = RCRA facility investigation.
SVOC = Semivolatile organic compound.
TCLP = Toxicity characteristic leaching procedure.
µg/L = Microgram(s) per liter.

Table 2.4.4-5
Summary of Site 27 RFI Organic Constituents
(TCLP VOCs) and Method Detection Limits

Parameter	Method Detection Limit	Reporting Limit	Units
1-1-dichloroethylene	1	20	µg/L
1,2-dichloroethane	1	20	µg/L
1,4-dichororbenzene	1	20	µg/L
2-butanone	2	50	µg/L
Benzene	1	20	µg/L
Carbon Tetrachloride	1	20	µg/L
Chlorobenzene	1	20	µg/L
Tetrachloroethylene	1	20	µg/L
Trichloroethylene	1	20	µg/L
Vinyl chloride	1	20	µg/L

RCRA = Resource Conservation and Recovery Act.
RFI = RCRA facility investigation.
TCLP = Toxicity characteristic leaching procedure.
VOC = Volatile organic compound.
µg/L = Microgram(s) per liter.

Table 2.4.4-6
Summary of Site 27 RFI Organic Constituents (TCLP Pesticides and Herbicides) and Method Detection Limits

Parameter	Method Detection Limit	Reporting Limit	Units
Herbicide 2,4,5-TP	0.000008	0.02	mg/L
Herbicide 2,4-D	0.000008	0.02	mg/L
Pesticide chlordane	0.005	0.0125	mg/L
Pesticide endrine	0.00002	0.002	mg/L
Pesticide heptachlor	0.00001	0.001	mg/L
Pesticide heptachlor and heptochlor epoxide	0.00071	0.002	mg/L
Pesticide heptachlor epoxide	0.00001	0.001	mg/L
Pesticide methoxychlor	0.0001	0.01	mg/L
Pesticide toxaphene	0.00075	0.05	mg/L
Pesticide gamma-BHC	0.00001	0.001	mg/L

2,4-D = 2,4-dichlorophenoxyacetic acid.
2,4,5-TP = Silvex.
BHC = Benzene hexachloride.
mg/L = Milligram(s) per liter.
RCRA = Resource Conservation and Recovery Act.
RFI = RCRA facility investigation.
TCLP = Toxicity characteristic leaching procedure.

Table 2.4.4-7
Summary of SWMU 27 RFI Mound Area Subsurface Debris Sampling Analytical Results;
Radiological Constituents (Gamma Spectroscopy)

Sample Number	ER Sample ID	Sample Matrix	Sample Date	Sample Depth	Gamma Spectroscopy Activity[a] (EPA Method 901.1)						Units
					U-238[b]	Th-234[b]	Th-232[b]	Ra-228[b]	U-235[b]	Cs-137[b]	
034967-004	27B-GR-018-0-SS	Soil	6/10/97	0.0–0.5 ft	9.91E-01	ND (7.42E-01)	1.08E+00	1.02E+00	ND (2.56E-01)	7.95E-02	pCi/g
034968-004	27B-GR-019-0-SS	Soil	6/10/97	0.0–0.5 ft	ND (1.77E+00)	1.13E+00	1.00E+00	9.43E-01	ND (2.34E-01)	2.91E-01	pCi/g
034969-004	27B-GR-020-0-SS	Soil	6/10/97	0.0–0.5 ft	ND (1.84E+00)	1.13E+00	8.44E-01	1.08E+00	ND (2.52E-01)	7.07E-01	pCi/g
034970-004	27B-GR-021-0-SS	Soil	6/10/97	0.0–0.5 ft	ND (1.39E+00)	ND (7.08E-01)	1.01E+00	8.54E-01	ND (2.48E-01)	5.42E-01	pCi/g
034971-004	27B-GR-022-0-SS	Soil	6/10/97	0.0–0.5 ft	8.85E-01	9.36E-01	8.79E-01	1.02E+00	ND (2.26E-01)	5.02E-01	pCi/g
034972-004	27B-GR-023-0-SS	Soil	6/10/97	0.0–0.5 ft	ND (1.93E+00)	1.29E+00	1.10E+00	1.24E+00	ND (2.53E-01)	2.94E-01	pCi/g
Quality Assurance/Quality Control Samples											
034991-004	27C-GR-042-FB	Water	6/12/97	NA	ND (7.81E-01)	ND (3.08E-01)	ND (1.52E-01)	ND (1.64E-01)	ND (1.37E-01)	ND (2.87E-02)	pCi/mL
034992-004	27C-GR-043-EB	Water	6/12/97	NA	ND (8.08E-01)	ND (3.26E-01)	ND (1.60E-01)	ND (1.57E-01)	ND (1.38E-01)	ND (2.78E-02)	pCi/mL
0034996-004	27-GR-044-DCW	Water	6/16/97	NA	ND (9.74E-01)	ND (3.00E-01)	ND (1.39E-01	ND (1.20E-01	ND (1.30E-01	ND (2.13E-02)	pCi/mL
SNL/NM Foothills Background Range[c]		NA	NA	NA	0.153–2.86	0.69–2.03	0.113–1.18	0.113–1.32	0.004–3.0	0.007–0.876	pCi/g
HRMB Maximum Background[d]		NA	NA	NA	2.31	2.31	1.03	1.08	0.16	1.063	pCi/g

ER Sample ID Information: 27B = SWMU sample location; GR = grab sample; 018 = sample number; 0 = depth of sample; SS = soil sample.

[a]Uranium-238 and thorium-232 decay chain isotopes with a short half-life are not presented in this table.
[b]Value in parenthesis represents the MDA.
[c]IT March 1996.
[d]Dinwiddie September 24, 1997.

Cs = Cesium.
DCW = Decontamination water sample.
EB = Equipment blank.
EPA = U.S. Environmental Protection Agency.
ER = Environmental restoration.
FB = Field blank.
ft = Foot (feet).
g = Gram(s)
GR = Grab sample.
HRMB = Hazardous and Radioactive Materials Bureau.
ID = Identification.
IT = IT Corporation.
MDA = minimum detectable activities.
mL = Milliliter(s).
NA = Not applicable.
ND = Nondetect—the analyte was not observed above the MDA.
pCi = Picocurie(s).
Ra = Radium.
RCRA = Resource Conservation and Recovery Act.
RFI = RCRA facility investigation.
SNL/NM = Sandia National Laboratories/New Mexico.
SS = Surface soil sample.
SWMU = Solid waste management unit.
Th = Thorium.
U = Uranium.

Table 2.4.4-8
Summary of SWMU 27 RFI Mound Area Surface Debris Sampling Analytical Results;
Radiological Constituents (Gross Alpha and Gross Beta)

Sample Number	ER Sample ID	Sample Matrix	Sample Date	Sample Depth	Gross Alpha and Gross Beta (EPA Method 900.0)				Units
					Gross Alpha	Accuracy, Gross Alpha (+/-)	Gross Beta	Accuracy, Gross Beta (+/-)	
034967-003	27B-GR-018-0-SS	Soil	6/10/97	0.0–0.5 ft	18.6	4.44	25.8	3.72	pCi/g
034968-003	27B-GR-019-0-SS	Soil	6/10/97	0.0–0.5 ft	21.1	4.61	24.8	3.91	pCi/g
034969-003	27B-GR-020-0-SS	Soil	6/10/97	0.0–0.5 ft	27.9	5.09	31.8	3.81	pCi/g
034970-003	27B-GR-021-0-SS	Soil	6/10/97	0.0–0.5 ft	18.9	4.02	25.2	3.44	pCi/g
034971-003	27B-GR-022-0-SS	Soil	6/10/97	0.0–0.5 ft	18.3	4.15	26.6	3.49	pCi/g
034972-003	27B-GR-023-0-SS	Soil	6/10/97	0.0–0.5 ft	18.7	4.23	22.3	3.60	pCi/g
SNL/NM Complex Average Background[a]		Soil	NA	NA	-0.47	1.26 (2 standard deviations)	10.76	6.54 (2 standard deviations)	pCi/g

ER Sample ID Information: 27B = SWMU sample location; GR = grab sample; 018 = sample number; 0 = depth of sample; SS = soil sample.

[a]SNL/NM August 1997.

EPA = U.S. Environmental Protection Agency.
ER = Environmental restoration.
ft = Foot (feet).
g = gram(s).
GR = Grab sample.
ID = Identification.
NA = Not applicable.
pCi = Picocurie(s).
SNL/NM = Sandia National Laboratories/New Mexico.
SS = Soil sample.
RFI = RCRA facility investigation.
SWMU = Solid waste management unit.

maximum dose limit found in EPA's OSWER Directive No. 9200.4-18, "Establishment of Cleanup Levels for CERCLA Sites with Radioactive Contamination" (EPA 1997). Therefore the analytical results are acceptable. Complete results of gamma spectroscopy analyses are provided in Annex 2-A.

For radionuclides (gross alpha/gross beta) using EPA Method 900.0 [EPA November 1986]): All six debris samples (Samples 27B-GR-018-0-SS through 27B-GR-023-0-SS) contained gross alpha and gross beta concentration levels consistent with the SWMU 27 site-specific background samples (Table 2.4.4-8).

RFI Surface Confirmatory Soil Sampling Results—Mound Area

Confirmatory soil samples were collected to ensure that all of the debris located on the surface of the Mound Area was removed. Tables 2.4.4-9 through 2.4.4-17 present the analytical results from surface confirmatory soil samples collected at the Mound Area, and the corresponding sample locations are provided in Figure 2.4.4-3. The confirmatory soil samples were collected prior to RFI excavation activities. The soil samples are called out by the 27B identifiers in the ER Sample ID column of the tables and pertain to the location where the samples were collected (e.g., 27B = Mound Area).

For RCRA metals plus beryllium and nickel: Except for silver, copper, and mercury, all metals concentration levels for the six surface confirmatory soil samples (Samples 27B-GR-024-0.5-S through 27B-GR-029-0.5-S) were below the method detection limits using EPA Methods 6010A and 7471 (EPA November 1986) or the SNL/NM 95th-percentile background concentration level (SNL/NM December 1997) (Table 2.4.4-9). Silver, copper, and mercury were detected in several samples at concentration levels slightly above the 95th-percentile background concentration level and the SNL/NM Foothills maximum background range concentration levels.

For Target Compound List (TCL) SVOCs using EPA Method 8270 (EPA November 1986): Di-n-octyl phthalate was detected in one of the six surface confirmatory soil samples (Sample 27B-GR-029-0.5-S), at an estimated concentration level of 289 micrograms per kilogram (µg/kg) (Table 2.4.4-10). This COC is a common laboratory contaminant; however, the associated field and equipment blank samples did not have detections of this compound. Therefore, the detection of di-n-octyl phthalate in the soil sample cannot be associated with the blank samples. For a complete list of organic compounds included in the TCL SVOC analyses including their respective method detection limits and reporting limits, refer to Table 2.4.4-11.

For TCL VOCs using EPA Method 8260 (EPA November 1986): Methylene chloride was detected in all of the six surface confirmatory soil samples collected (Samples 27B-GR-024-0.5-S through 27B-GR-029-0.5-S) in J-value concentration levels (Table 2.4.4-12) but is a common laboratory contaminant. One of the trip blank samples (26C-GR-040-0-TB) had detections of methylene chloride at 7.29B µg/L. Following EPA guidance for blank sample detections (EPA February 1994), the sample detection concentrations were well below the 5x or 10x ratio requirements allowing the sample detection to be attributed to sampling or laboratory contamination. For a complete list of compounds included in the TCL VOC analyses, including their respective method detection limits and reporting limits, refer to Table 2.4.4-13.

Table 2.4.4-9
Summary of SWMU 27 RFI Mound Area Confirmatory Soil Sampling Analytical Results; Inorganic Constituents (RCRA Metals)

Sample Number	ER Sample ID	Sample Matrix	Sample Date	Sample Depth	RCRA Metals, (EPA Methods 6010A and 7470/7471[a])											Units
					Ag	As	Ba	Be	Cd	Cu	Cr	Hg	Ni	Pb	Se	
034973-006	27B-GR-024-0.5-S	Soil	6/10/97	0.0–0.5 ft	0.178J	4.66	85.4	0.594	ND (0.0105)	12.4	10.5	0.0261J	9.8	9.31	0.592	mg/kg
034974-006	27B-GR-025-0.5-S	Soil	6/10/97	0.0–0.5 ft	1.4	3.96	108	0.456J	ND (0.0105)	18.8	8.12	0.679	8.12	14.8	0.530	mg/kg
034975-006	27B-GR-026-0.5-S	Soil	6/10/97	0.0–0.5 ft	1.44	4.55	154	0.539	0.180J	15.3	9.51	ND (0.0167)	9.30	14.4	0.552	mg/kg
034976-006	27B-GR-027-0.5-S	Soil	6/10/97	0.0–0.5 ft	0.587J	3.70	96.0	0.443J	ND (0.0105)	16.4	8.24	0.0248J	8.35	13.0	0.647	mg/kg
034977-006	27B-GR-028-0.5-S	Soil	6/10/97	0.0–0.5 ft	0.0970J	4.60	118	0.629	ND (0.0105)	10.1	9.96	ND (0.0167)	9.15	8.16	0.723	mg/kg
034978-006	27B-GR-029-0.5-S	Soil	6/10/97	0.0–0.5 ft	0.221J	4.70	119	0.615	ND (0.0105)	11.5	9.71	0.0182J	8.90	10.9	0.560	mg/kg
034962-006[b]	27B-GR-013-8-S	Soil	6/12/97	8.0–9.0 ft	0.0976J	3.68	117	0.403J	ND (0.0105)	7.84	6.08	ND (0.0167)	7.38	6.91	0.347J	mg/kg
Quality Assurance/Quality Control Samples																
034992-007	27C-GR-043-EB	Water	6/12/97	NA	0.000998 J	ND (0.00276)	0.00123J	ND (0.000135)	0.000516J	ND (0.00114)	ND (0.000621)	ND (0.0001)	ND (0.000996)	ND (0.00136)	ND (0.00228)	mg/L
034991-007	27C-GR-042-FB	Water	6/12/97	NA	0.000734 J	ND (0.00276)	0.000298J	ND (0.000135)	ND (0.000209)	ND (0.00114)	ND (0.000621)	ND (0.0001)	ND (0.000996)	ND (0.00136)	0.00268J	mg/L
SNL/NM Foothills Background Range[c]		Soil	Na	NA	0.01–0.50	1.6–9.6	39–400	0.2–0.73	0.09–0.99	6.1–17.5	2.5–20	0.01–0.13	5.3–16	4.7–51	0.56–3.1	mg/kg
SNL/NM Foothills Soil Background UTL or 95th-Percentile Range[c]		Soil	Na	NA	<0.5[d]	9.8	246	0.75	0.64[d]	17.1	18.8	0.055[d]	16.6	18.9[d]	3.0[d]	mg/kg

ER Sample ID Information: 27B = SWMU sample location; GR = grab sample; 024 = sample number; 0.5 = depth of sample; S = soil sample.

[a]EPA November 1986.
[b]Confirmatory sample collected at the 8.0- to 9.0-ft-depth interval.
[c]SNL/NM December 1997 (all metals background values, except Se, were verbally approved by NMED HRMB as of May 1998).
[d]95th-percentile provided instead of UTL.

Ag = Silver.
As = Arsenic.
Ba = Barium.
Be = Beryllium.
Cd = Cadmium.
Cr = Chromium.
Cu = Copper.
EB = Equipment blank.
EPA = U.S. Environmental Protection Agency.
ER = Environmental restoration.
FB = Field blank.
ft = Foot (feet).
GR = Grab sample.
Hg = Mercury.
HRMB = Hazardous and Radioactive Materials Bureau.
ID = Identification.
J = The estimated value reported is either above the MDL and less than the practical quantitation limit or above the instrument detection limit and less than the contract required detection limit.
kg = Kilogram(s)
mg = Milligram(s).
L = Liter(s).
MDL = Method detection limit.
NA = Not applicable.
ND ( ) = Not detected at or above the MDL, shown in parenthesis.
Ni = Nickel.
NMED = New Mexico Environment Department.
Pb = Lead.
RCRA = Resource Conservation and Recovery Act.
RFI = RCRA facility investigation.
S = Soil sample.
Se = Selenium.
SNL/NM = Sandia National Laboratories/New Mexico.
SWMU = Solid waste management unit.
UTL = Upper tolerance limit.

Table 2.4.4-10
Summary of SWMU 27 RFI Mound Area Confirmatory Soil Sampling
Analytical Results; Organic Constituents (TCL SVOCs)

Sample Number	ER Sample ID	Sample Matrix	Sample Date	Sample Depth	TCL Semivolatile Organic Compounds (EPA Method 8270)	Units
					Di-n-octyl phthalate	
034973-006	27B-GR-024-0.5-S	Soil	6/10/97	0.0–0.5 ft	ND (167)	µg/kg
034974-006	27B-GR-025-0.5-S	Soil	6/10/97	0.0–0.5 ft	ND (167)	µg/kg
034975-006	27B-GR-026-0.5-S	Soil	6/10/97	0.0–0.5 ft	ND (167)	µg/kg
034976-006	27B-GR-027-0.5-S	Soil	6/10/97	0.0–0.5 ft	ND (167)	µg/kg
034977-006	27B-GR-028-0.5-S	Soil	6/10/97	0.0–0.5 ft	ND (167)	µg/kg
034978-006	27B-GR-029-0.5-S	Soil	6/10/97	0.0–0.5 ft	289J	µg/kg
034962-006[a]	27B-GR-013-8-S	Soil	6/12/97	8.0–9.0 ft	ND (167)	µg/kg
Quality Assurance/Quality Control Samples						
034991-008	27C-GR-042-FB	Water	6/12/97	NA	ND (5)	µg/L
034992-008	27C-GR-0-043-EB	Water	6/12/97	NA	ND (5)	µg/L

ER Sample ID Information: 27B = SWMU sample location; GR = grab sample; 024 = sample number; 0.5 = depth of sample; S = soil sample.

[a]Confirmatory sample collected at the 8.0- to 9.0-ft-depth interval.

EB = Equipment rinsate blank.
EPA = U.S. Environmental Protection Agency.
ER = Environmental restoration.
FB = Field blank.
ft = Foot (feet).
GR = Grab sample.
ID = Identification.
J = The estimated value reported is either above the MDL and less than the practical quantitation limit or above the instrument detection limit and less than the contract required detection limit.
kg = Kilogram(s).
L = Liter(s).
MDL = Method detection limit.
NA = Not applicable.
ND ( ) = Not detected at or above the MDL, shown in parenthesis.
RCRA = Resource Conservation and Recovery Act.
RFI = RCRA facility investigation.
S = Soil sample.
SWMU = Solid waste management unit.
TCL = Target compound list.
µg = Microgram(s).

Table 2.4.4-11
Summary of SWMU 27 Organic Constituents (TCL SVOCs)
and Method Detection Limits; EPA Method 8270

Parameter	Detection Limit	Reporting Limit	Units
1,2,4-Trichlorobenzene	167	329	µg/kg
1,2-Dichlorobenzene	167	329	µg/kg
1,3-Dichlorobenzene	167	329	µg/kg
1,4-Dichlorobenzene	167	329	µg/kg
2,4,5-Trichlorophenal	167	329	µg/kg
2,4,6-Trichlorophenal	167	329	µg/kg
2,4-Dichlorophenol	167	329	µg/kg
2,4-Dimethylphenol	167	329	µg/kg
2,4-Dinitrophenol	333	658	µg/kg
2,4-Dinitrotoluene	167	329	µg/kg
2,6-Dinitrotoluene	167	329	µg/kg
2-Chloronaphthalene	167	329	µg/kg
2-Chlorophenol	167	329	µg/kg
2-Methylnaphthalene	167	329	µg/kg
2-Nitrophenol	167	329	µg/kg
2-methyl-4,6-dinitrophenol	167	329	µg/kg
3,3'-Dichlorobenzidine	833	1640	µg/kg
4-Bromophenyl phenyl ether	167	329	µg/kg
4-Chloroaniline	167	329	µg/kg
4-Chlorophenyl phenyl ether	167	329	µg/kg
4-Nitrophenol	167	658	µg/kg
4-chloro-3-methyl phenol	167	329	µg/kg
Acenaphthene	167	329	µg/kg
Acenaphthylene	167	329	µg/kg
Anthracene	167	329	µg/kg
Benzo(a)anthracene	167	329	µg/kg
Benzo(a)pyrene	167	329	µg/kg
Benzo(b)fluoranthene	167	329	µg/kg
Benzo(ghi)perylene	167	329	µg/kg
Benzo(k)fluoranthene	167	329	µg/kg
Benzoic Acid	333	658	µg/kg
Benzyl Alcohol	167	329	µg/kg
Butyl benzyl phthalate	167	329	µg/kg
Chrysene	167	329	µg/kg
Di-n-butyl phthalate	167	329	µg/kg
Di-n-octyl phthalate	167	329	µg/kg
Dibenzo(a.h)anthracene	167	329	µg/kg
Dibenzofuran	167	329	µg/kg
Diethyl phthalate	167	329	µg/kg
Dimethyl phthalate	167	329	µg/kg

Table 2.4.4-11 (Concluded)
Summary of SWMU 27 Organic Constituents (TCL SVOCs)
and Method Detection Limits; EPA Method 8270

Parameter	Detection Limit	Reporting Limit	Units
Fluoranthene	167	329	µg/kg
Fluorene	167	329	µg/kg
Hexachlorobenzene	167	329	µg/kg
Hexachlorobutadiene	167	329	µg/kg
Hexachlorocyclopentadiene	167	329	µg/kg
Hexachloroethane	167	329	µg/kg
Indeno(1,2,3-c,d)pyrene	167	329	µg/kg
Isophorone	167	329	µg/kg
N-Nitrosodiphenylamine	167	329	µg/kg
N-Nitrosodipropylamine	167	329	µg/kg
Naphthalene	167	329	µg/kg
Nitrobenzene	167	329	µg/kg
Pentachlorophenol	167	329	µg/kg
Phenanthrene	167	329	µg/kg
Phenol	167	329	µg/kg
Pyrene	167	329	µg/kg
bis(2-Chloroethoxy)methane	167	329	µg/kg
bis(2-Chloroethyl) ether	167	329	µg/kg
bis(2-Chloroisopropyl)ether	167	329	µg/kg
bis(2-Ethylhexyl)phthalate	167	329	µg/kg
m.p-Cresol	167	329	µg/kg
m-Nitroaniline	167	329	µg/kg
o-Cresol	167	329	µg/kg
o-Nitroaniline	167	329	µg/kg
p-Nitroaniline	167	329	µg/kg

Table 2.4.4-12
Summary of SWMU 27 RFI Confirmatory Soil Sampling Analytical Results; Organic Constituents (TCL VOCs)

Sample Number	ER Sample ID	Sample Matrix	Sample Date	Sample Depth	TCL Volatile Organic Compounds (EPA Method 8260)			Units
					Methylene Chloride	Acetone	Styrene	
034973-005	27B-GR-024-0.5-S	Soil	6/10/97	0.0–0.5 ft	2.89JB	ND (10.0)	ND (2.00)	µg/kg
034974-005	27B-GR-025-0.5-S	Soil	6/10/97	0.0–0.5 ft	2.71JB	ND (10.0)	ND (2.00)	µg/kg
034975-005	27B-GR-026-0.5-S	Soil	6/10/97	0.0–0.5 ft	3.03JB	ND (10.0)	ND (2.00)	µg/kg
034976-005	27B-GR-027-0.5-S	Soil	6/10/97	0.0–0.5 ft	2.67JB	ND (10.0)	ND (2.00)	µg/kg
034977-005	27B-GR-028-0.5-S	Soil	6/10/97	0.0–0.5 ft	3.21JB	ND (10.0)	ND (2.00)	µg/kg
034978-005	27B-GR-029-0.5-S	Soil	6/10/97	0.0–0.5 ft	3.58JB	ND (10.0)	ND (2.00)	µg/kg
034962-005[a]	27B-GR-013-8-S	Soil	6/12/97	8.0–9.0 ft	4.37JB	ND (10.0)	ND (2.00)	µg/kg
Quality Assurance/Quality Control Samples								
034989-005	27C-GR-040-0-TB	Water	6/12/97	NA	7.29B	6.11J	1.72J	µg/L
034990-005	27C-GR-041-0-TB	Water	6/12/97	NA	ND (5.00)	ND (10.0)	ND (2.00)	µg/L
034991-005	27C-GR-042-FB	Water	6/12/97	NA	ND (5.00)	ND (10.0)	ND (2.00)	µg/L
034992-005	27C-GR-043-EB	Water	6/12/97	NA	ND (5.00)	ND (10.0)	ND (2.00)	µg/L

ER Sample ID Information: 27B = SWMU sample location; GR = grab sample; 024 = sample number; 0.5 = depth of sample; S = soil sample.

[a]Confirmatory soil sample collected at the 8.0- to 9.0-ft-depth interval.

B = The organic compound was detected in the blank.
C = Composite.
EB = Equipment blank.
EPA = U.S. Environmental Protection Agency.
ER = Environmental restoration.
FB = Field blank.
ft = Foot (feet).
GR = Grab sample.
ID = Identification.
J = The estimated value reported is either above the MDL and less than the practical quantitation limit or above the instrument detection limit and less than the contract required detection limit.
kg = Kilogram(s).
L = Liter(s).
MDL = Method detection limit.
NA = Not applicable.
ND ( ) = Not detected at or above the MDL, shown in parenthesis.
RCRA = Resource Conservation and Recovery Act.
RFI = RCRA facility investigation.
S = Soil sample.
TB = Trip blank.
TCL = Target Compound List.
VOC = Volatile organic compound.
µg = Microgram(s).

Table 2.4.4-13
Summary of SWMU 27 RFI Organic Constituents (TCL VOCs)
and Method Detection Limits; EPA Method 8260

Parameter	Detection Limit	Reporting Limit	Units
1,1,1-Trichloroethane	1	2	µg/kg
1,1,2,2-Tetrachloroethane	1	2	µg/kg
1,1,2-Trichloroethane	1	2	µg/kg
1,1-Dichloroethane	1	2	µg/kg
1-1-Dichloroethylene	1	2	µg/kg
1,2-Dichloroethane	1	2	µg/kg
1,2-Dichloropropane	1	2	µg/kg
1,2-cis-Dichloroethylene	1	2	µg/kg
1,2-trans-Dischloroethylene	1	2	µg/kg
2-Butanone	2	5	µg/kg
2-Hexanone	2	5	µg/kg
4-Methyl-2-pentanone	2	5	µg/kg
Acetone	2	10	µg/kg
Benzene	1	2	µg/kg
Bromoform	1	2	µg/kg
Carbon Disulfide	2	5	µg/kg
Carbon Tetrachloride	1	2	µg/kg
Chlorobenzene	1	2	µg/kg
Chlorodibromomethane	1	2	µg/kg
Chloroethane	1	2	µg/kg
Chloroform	1	2	µg/kg
Dichlorobromomethane	1	2	µg/kg
Ethylbenzene	1	2	µg/kg
Methyl bromide	1	2	µg/kg
Methyl Chloride	1	2	µg/kg
Methylene Chloride	1	5	µg/kg
Styrene	1	2	µg/kg
Tetrachloroethylene	1	2	µg/kg
Toluene	1	2	µg/kg
Trichloroethylene	1	2	µg/kg
Vinyl Acetate	2	5	µg/kg
Vinyl chloride	1	2	µg/kg
Xylenes (TOTAL)	2	6	µg/kg
cis-1,3-Dichloropropylene	1	2	µg/kg
trans-1,3-Dichloropropylene	1	2	µg/kg

Table 2.4.4-14
Summary of SWMU 27 RFI Mound Area Confirmatory Soil Sampling
Analytical Results; Organic Constituents (TCL Pesticides and Herbicides)

Sample Number	ER Sample ID	Sample Matrix	Sample Date	Sample Depth	TCL Pesticides and Herbicides (EPA Methods 8080 and 8151)		Units
					2,4,5-TP	Gamma-Chlordane	
034973-006	27B-GR-024-0.5-S	Soil	6/10/97	0.0–0.5 ft	15.7	1.43J	µg/kg
Quality Assurance/Quality Control Samples							
034991-009	27C-GR-042-FB	Water	6/12/97	NA	ND (0.008)	NA	µg/kg
034991-010	27C-GR-042-FB	Water	6/12/97	NA	NA	ND (0.02)	µg/kg
034992-009	27C-GR-043-EB	Water	6/12/97	NA	ND (0.008)	NA	µg/kg
034992-010	27C-GR-043-EB	Water	6/12/97	NA	NA	ND (0.02)	µg/kg

ER Sample ID Information: 27B = SWMU sample location; GR = grab sample; 024 = sample number; 0.5 = depth of sample; S = soil sample.

2,4,5-TP = Silvex.
EB = Equipment blank.
EPA = U.S. Environmental Protection Agency.
ER = Environmental restoration.
FB = Field blank.
ft = Foot (feet).
GR = Grab sample.
ID = Identification.
J = The estimated value reported is either above the MDL and less than the practical quantitation limit or above the instrument detection limit and less than the contract required detection limit.
kg = Kilogram.
MDL = Method detection limit.
NA = Not applicable.
ND ( ) = Not detected at or above the MDL, shown in parenthesis.
RCRA = Resource Conservation and Recovery Act.
RFI = RCRA facility investigation.
S = Soil sample.
SWMU = Solid waste management unit.
TCL = Target compound list.
µg/kg = Microgram(s).

Table 2.4.4-15
Summary of SWMU 27 RFI Organic Constituents (TCL Pesticides and Herbicides) and Method Detection Limits; EPA Methods 8080 and 8151

Parameter	Detection Limit	Reporting Limit	Units
Herbicide 2,4,5-trichlorophenal	0.0821	2	µg/kg
Herbicide 2,4,5-TP	0.0936	2	µg/kg
Herbicide 2,4-dinitrotoluene	0.0906	2	µg/kg
Pesticide 4,4'-DDD	0.66	3.33	µg/kg
Pesticide 4,4'-DDE	0.66	1.67	µg/kg
Pesticide 4,4'-DDT	0.66	3.33	µg/kg
Pesticide Aldrin	0.33	0.833	µg/kg
Pesticide Chlordane	4.17	8.33	µg/kg
Pesticide Dieldrin	0.66	1.67	µg/kg
Pesticide Endosulfan I	0.33	1.67	µg/kg
Pesticide Endosulfan II	0.66	3.33	µg/kg
Pesticide Endosulfan sulfate	0.66	3.33	µg/kg
Pesticide Endrin	0.66	1.67	µg/kg
Pesticide Endrin aldehyde	0.66	4.17	µg/kg
Pesticide Heptachlor	0.33	1.67	µg/kg
Pesticide Heptachlor Epoxide	0.33	1.67	µg/kg
Pesticide Methoxychlor	3.33	16.7	µg/kg
Pesticide PCB-1016	1.5	4.17	µg/kg
Pesticide PCB-1221	1.5	4.17	µg/kg
Pesticide PCB-1232	1.5	4.17	µg/kg
Pesticide PCB-1242	1.5	4.17	µg/kg
Pesticide PCB-1248	1.5	4.17	µg/kg
Pesticide PCB-1254	1.5	4.17	µg/kg
Pesticide PCB-1260	1.5	4.17	µg/kg
Pesticide Toxaphene	16.5	33.3	µg/kg
Pesticide alpha-BHC	0.33	0.833	µg/kg
Pesticide beta-BHC	0.33	1.67	µg/kg
Pesticide delta-BHC	0.33	1.67	µg/kg
Pesticide gamma-BHC	0.33	0.833	µg/kg

2,4,5-TP = Silvex.
2,4-D = 2,4-dichlorophenoxyacetic acid.
DDT = 1,1,1-trichloro-2,2-bis(p-chlorophenyl)ethane.
DDD = Bis (6-hydroxy-2-naphthyl) disulfide.
DDE = dichloro diphenal dichloro ethylene.
TCL =Target Compound list.
BHC = Benzene hexachloride.

Table 2.4.4-16
Summary of SWMU 27 RFI Confirmatory Soil Sampling Analytical Results; Radiological Constituents (Gamma Spectroscopy)

Sample Number	ER Sample ID	Sample Matrix	Sample Date	Sample Depth	Gamma Spectroscopy Activity[a] (EPA Method 901.1)						Units
					U-238[b]	Th-234[b]	Th-232[b]	Ra-228[b]	U-235[b]	Cs-137[b]	
034973-004	27B-GR-024-0.5-S	Soil	6/10/97	0.0–0.5 ft	ND (1.96E+00)	1.49E+00	1.15E+00	1.26E+00	ND (2.81E-01)	1.35E-01	pCi/g
034974-004	27B-GR-025-0.5-S	Soil	6/10/97	0.0–0.5 ft	ND (1.87E+00)	1.49E+00	ND (1.93E-01)	1.21E+00	ND (1.31E-01)	1.14E-01	pCi/g
034975-004	27B-GR-026-0.5-S	Soil	6/10/97	0.0–0.5 ft	ND (1.79E+00)	1.40E+00	9.52E-01	8.96E-01	ND (2.43E-01)	6.12E-02	pCi/g
034976-004	27B-GR-027-0.5-SS	Soil	6/10/97	0.0–0.5 ft	ND (1.72E+00)	1.09E+00	1.05E+00	8.85E-01	ND (2.37E-01)	1.49E-01	pCi/g
034977-004	27B-GR-028-0.5-SS	Soil	6/10/97	0.0–0.5 ft	ND (1.86E+00)	1.29E+00	1.00E+00	1.02E+00	ND (1.19E-01)	ND (5.02E-02)	pCi/g
034978-004	27B-GR-029-0.5-SS	Soil	6/10/97	0.0–0.5 ft	ND (2.04E+00)	1.38E+00	1.17E+00	1.24E+00	ND (2.68E-01)	9.18E-02	pCi/g
034962-004[c]	27B-GR-013-8-S	Soil	6/12/97	0.0–0.5 ft	ND (1.41E+00)	6.54E-01	9.68E-01	1.11E+00	ND (2.10E-01)	3.45E-02	pCi/g
Quality Assurance/Quality Control Samples											
034991-004	27C-GR-042-FB	Water	6/12/97	NA	ND (7.81E-01)	ND (3.08E-01)	ND (1.52E-01)	ND (1.64E-01)	ND (1.37E-01)	ND (2.87E-02)	pCi/mL
034992-004	27C-GR-043-EB	Water	6/12/97	NA	ND (8.08E-01)	ND (3.26E-01)	ND (1.60E-01)	ND (1.57E-01)	ND (1.38E-01)	ND (2.78E-02)	pCi/mL
0034996-004	27-GR-044-DCW	Water	6/16/97	NA	ND (9.74E-01)	ND (3.00E-01)	ND (1.39E-01)	ND (1.20E-01)	ND (1.30E-01	ND (2.13E-02)	pCi/mL
SNL/NM Foothills Background Range[d]		NA	NA	NA	0.153–2.86	0.69–2.03	0.113–1.18	0.113–1.32	0.004–3.0	0.007–0.876	pCi/g
HRMB Maximum Background[d]		NA	NA	NA	2.31	2.31	1.03	1.08	0.16	1.063	pCi/g

ER Sample ID Information: 27B = SWMU sample location; GR = grab sample; 024 = sample number; 0.5 = depth of sample; S = soil sample.

[a]Uranium-238 and thorium-232 decay chain isotopes with a short half-life are not presented in this table.
[b]Value in parenthesis represents the MDA.
[c]Confirmatory soil sample collected at the 8.0- to 9.0-ft-depth interval.
[d]IT March 1996.
[d]Dinwiddie September 24, 1997.

Cs = Cesium.
DCW = Decontamination water sample.
EB = Equipment blank.
EPA = U.S. Environmental Protection Agency.
ER = Environmental restoration.
FB = Field blank.
ft = Foot (feet).
g = Gram(s).
GR = Grab sample.
HRMB = Hazardous and Radioactive Materials Bureau.
ID = Identification.
IT = IT Corporation.
MDA = minimum detectable activities.
mL = Milliliter(s).
NA = Not applicable.
ND ( ) = Nondetect—the analyte was not observed above the MDA.
pCi = Picocurie(s).
Ra = Radium.
RCRA = Resource Conservation and Recovery Act.
RFI = RCRA facility investigation.
S = Soil sample.
SNL/NM = Sandia National Laboratories/New Mexico.
SS = Soil sample.
SWMU = Solid waste management unit.
Th = Thorium.
U = Uranium.

Table 2.4.4-17
Summary of SWMU 27 RFI Confirmatory Soil Sampling Analytical Results; Radiological Constituents (Gross Alpha and Gross Beta)

Sample Number	ER Sample ID	Sample Matrix	Sample Date	Sample Depth	Gross Alpha and Gross Beta (EPA Method 900.0)				Units
					Gross Alpha	Accuracy, Gross Alpha (+/-)	Gross Beta	Accuracy, Gross Beta (+/-)	
034973-003	27B-GR-024-0.5-S	Soil	6/10/97	0.0–0.5 ft	14.5	3.67	23.5	3.34	pCi/g
034974-003	27B-GR-025-0.5-S	Soil	6/10/97	0.0–0.5 ft	13.4	3.71	25.7	3.61	pCi/g
034975-003	27B-GR-026-0.5-S	Soil	6/10/97	0.0–0.5 ft	14.3	3.83	22.2	3.40	pCi/g
034976-003	27B-GR-027-0.5-S	Soil	6/10/97	0.0–0.5 ft	13.6	3.53	26.7	3.53	pCi/g
034977-003	27B-GR-028-0.5-S	Soil	6/10/97	0.0–0.5 ft	20.8	4.43	28.4	3.68	pCi/g
034978-003	27B-GR-029-0.5-S	Soil	6/10/97	0.0–0.5 ft	23.9	7.01	32.2	5.52	pCi/g
034962-003[a]	27B-GR-013-8-S	Soil	6/12/97	8.0–9.0 ft	21.5	5.81	26.9	4.23	pCi/g
SNL/NM Complex Average Background[b]		Soil	NA	NA	-0.47	1.26 (2 standard deviations)	10.76	6.54 (2 standard deviations)	pCi/g

ER Sample ID Information: 27B = SWMU sample location; GR = grab sample; 024 = sample number; 0.5 = depth of sample; S = soil sample.

[a]Confirmatory soil sample collected at the 8.0- to 9.0-ft-depth interval.
[b]SNL/NM August 1997.

EPA = U.S. Environmental Protection Agency.
ER = Environmental restoration.
ft = Foot (feet).
GR = Grab sample.
ID = Identification.
NA = Not applicable.
pCi/g = Picocurie(s) per gram.
RCRA = Resource Conservation and Recovery Act.
RFI = RCRA facility investigation.
S = Soil sample.
SNL/NM = Sandia National Laboratories/New Mexico.
SWMU = Solid waste management unit.

For TCL pesticides/herbicides using EPA Methods 8081 and 8151 (EPA November 1986): Contaminants 2,4,5-TP (silvex) and gamma-chlordane were detected in the single surface confirmatory soil sample (Sample 27B-GR-024-0.5-S) at concentration levels of 15.7 µg/kg and 1.43J µg/kg, respectively (Table 2.4.4-14). All associated field and equipment blank samples were ND for all pesticides and herbicides. Therefore, the soil sample detections are not the result of sampling or laboratory contamination. For a complete list of organic compounds included in the TCL pesticides/herbicides analyses, including their respective method detection limits and reporting limits, refer to Table 2.4.4-15. It should be noted that the reporting limit for individual samples analyzed for TCL pesticides/herbicides varies slightly.

For radionuclides (gamma spectroscopy) using EPA Method 900.1 (EPA November 1986): All surface confirmatory soil samples collected (Samples 27B-GR-024-0.5-S through 27B-GR-029-0.5-S) contained uranium-238, uranium-235, thorium-234, and cesium-137 concentration levels below their respective HRMB maximum background concentration levels (Dinwiddie September 24, 1997) (Table 2.4.4-16). Three samples (Samples 27B-GR-024-0.5-S, 27B-GR-027-0.5-SS, and 27B-GR-029-0.5-SS) contained thorium-232 concentration levels above the HRMB maximum background concentration level of 1.03 pCi/g but were below the SNL/NM Foothills maximum background concentration level of 1.18 pCi/g. Four samples (Samples 27B-GR-024-0.5-S, 27B-GR-025-0.5-S, 27B-GR-029-0.5-SS, and 27B-GR-013-8-S) contained radium-228 concentration levels greater than the HRMB maximum background concentration level of 1.08 pCi/g, but were below the SNL/NM Foothills maximum background concentration level of 1.32 pCi/g. Although the MDA for gamma-emitting radionuclides was sometimes higher than the background level for that radionuclide, they were nevertheless orders of magnitude less than a risk-based PRG which is based upon a 15 mrem/yr EDE maximum dose limit found in EPA's OSWER Directive No. 9200.4-18, "Establishment of Cleanup Levels for CERCLA Sites with Radioactive Contamination" (EPA 1997). Therefore the analytical results are acceptable. Complete results of gamma spectroscopy analyses are provided in Annex 2-A.

For radionuclides (gross alpha and gross beta) using EPA Method 900.0 (EPA November 1986): All six surface confirmatory surface soil samples (Samples 27B-GR-024-0.5-S through 27B-GR-029-0.5-S) contained gross alpha and gross beta concentration levels consistent with the SWMU 27 site-specific background samples (Table 2.4.4-17).

RFI Excavation and Subsequent Sampling Results for Debris—Mound Area

Tables 2.4.4-18 through 2.4.4-20 present the analytical results from sampling of subsurface debris at the Mound Area, and the associated sample locations are provided in Figure 2.4.4-2. The debris samples are called out by the 27B identifiers in the ER Sample ID column of the tables and pertain to the location where the samples were collected (e.g., 27B = Mound Area).

For TCLP metals using EPA Methods 6010A and 7470 (EPA November 1986): Except for lead, all metals concentration levels for the three subsurface debris samples (Samples 27B-GR-008-2-S, 27B-GR-009-5-S, and 27B-GR-010-2-S) were below the method detection limits or the TCLP reporting level (EPA November 1986) (Table 2.4.4-18). Lead was detected in one sample (Sample 27B-GR-010-2-S) at a concentration level (9.55 mg/L) exceeding the TCLP reporting level of 5.0 mg/L (EPA November 1986).

Table 2.4.4-18
Summary of SWMU 27 RFI Mound Area Subsurface Debris Sampling Analytical Results; Inorganic Constituents (TCLP Metals)

Sample Number	ER Sample ID	Sample Matrix	Sample Date	Sample Depth	TCLP Metals (EPA Methods 6010A, 7470/7471 and 1311[a])								Units
					Ag	As	Ba	Cd	Cr	Hg	Pb	Se	
034957-002	27B-GR-008-2-S	Soil	6/12/97	2.0–3.0 ft	0.00256J	0.00741J	2.10B	0.0728	ND (0.000621)	0.00153J	2.05	0.00905JB	mg/L
034958-002	27B-GR-009-5-S	Soil	6/12/97	5.0–6.0 ft	0.00274J	0.0143J	0.305B	ND (0.000209)	ND (0.000621)	0.0265	ND (0.00136)	0.00678JB	mg/L
034959-002	27B-GR-010-2-S	Soil	6/12/97	2.0–3.0 ft	0.00227J	0.0125J	0.390B	0.271	0.00194J	ND (0.0001)	9.55	0.0109B	mg/L
Quality Assurance/Quality Control Samples													
034996-011	27-GR-044-DCW	Water	6/16/97	NA	0.0196J	ND (0.00276)	0.283B	0.0297J	0.0106J	ND (0.0001)	0.221	0.0259J	mg/L
Toxicity Characteristic Regulatory Level[a]		NA	NA	NA	5	5.0	100	1.0	5.0	0.2	5.0	1.0	mg/L

ER Sample ID Information: 27B = SWMU sample location; GR = grab sample; 008 = sample number; 2 = depth of sample; S = soil sample.

[a]Maximum concentration of contaminant for the toxicity characteristic (EPA November 1986).

Ag = Silver.
As = Arsenic.
B = Decontamination water sample.
Ba = Barium.
Be = Beryllium.
Cd = Cadmium.
Cr = Chromium.
DCW = Decontamination water sample.
EPA = U.S. Environmental Protection Agency.
ER = Environmental restoration.
ft = Foot (feet).
GR = Grab sample.
Hg = Mercury.
ID = Identification.
J = The estimated value reported is either above the MDL and less than the practical quantitation limit or above the instrument detection limit and less than the contract required detection limit.
L = Liter.
MDL = Method detection limit.
mg = Milligram(s).
NA = Not applicable.
ND ( ) = Not detected at or above the MDL, shown in parenthesis.
NG = Not given.
Pb = Lead.
RCRA = Resource Conservation and Recovery Act.
RFI = RCRA facility investigation.
S = Soil sample.
Se = Selenium.
SWMU = Solid waste management unit.
TCLP = Toxicity characteristic leaching procedure.

Table 2.4.4-19
Summary of SWMU 27 RFI Mound Area Subsurface Debris Sampling
Analytical Results; Radiological Constituents (Gamma Spectroscopy)

Sample Number	ER Sample ID	Sample Matrix	Sample Date	Sample Depth	Gamma Spectroscopy Activity[a] (EPA Method 901.1)						Units
					U-238[b]	Th-234[b]	Th-232[b]	Ra-228[b]	U-235[b]	Cs-137[b]	
034957-004	27B-GR-008-2-S	Soil	6/12/97	2.0–3.0 ft	ND (1.83E+00)	ND (7.17E-01)	1.05E+00	8.39E-01	ND (2.59E-01)	4.97E-01	pCi/g
034958-004	27B-GR-009-5-S	Soil	6/12/97	5.0–6.0 ft	ND (2.40E+00)	ND (9.91E-01)	7.59E-01	8.60E-01	ND (3.31E-01)	9.45E-02	pCi/g
034959-004	27B-GR-010-2-S	Soil	6/12/97	2.0–3.0 ft	ND (2.11E+00)	6.14E-01	6.94E-01	7.48E-01	ND (2.90E-01)	1.18E-01	pCi/g
Quality Assurance/Quality Control Samples											
034991-004	27C-GR-042-FB	Water	6/12/97	NA	ND (7.81E-01)	ND (3.08E-01)	ND (1.52E-01)	ND (1.64E-01)	ND (1.37E-01)	ND (2.87E-02)	pCi/mL
034992-004	27C-GR-043-EB	Water	6/12/97	NA	ND (8.08E-01)	ND (3.26E-01)	ND (1.60E-01)	ND (1.57E-01)	ND (1.38E-01)	ND (2.78E-02)	pCi/mL
0034996-004	27-GR-044-DCW	Water	6/16/97	NA	ND (9.74E-01)	ND (3.00E-01)	ND (1.39E-01	ND (1.20E-01	ND (1.30E-01	ND (2.13E-02)	pCi/mL
SNL/NM Foothills Background Range[c]		NA	NA	NA	0.153–2.86	0.69–2.03	0.113–1.18	0.113–1.32	0.004–3.0	0.007–0.876	pCi/g
HRMB Maximum Background[d]		NA	NA	NA	2.31	2.31	1.03	1.08	0.16	1.063	pCi/g

ER Sample ID Information: 27B = SWMU sample location; GR = grab sample; 008 = sample number; 2 = depth of sample; S = soil sample.

[a]Uranium-238 and thorium-232 decay chain isotopes with a short half-life are not presented in this table.
[b]Value in parenthesis represents the minimum detection activity.
[c]IT March 1996.
[d]Dinwiddie September 24, 1997.

Cs = Cesium.
DCW = Decontamination water sample.
EB = Equipment blank.
EPA = U.S. Environmental Protection Agency.
ER = Environmental restoration.
FB = Field blank.
ft = Foot (feet).
g = Gram(s).
GR = Grab sample.
HRMB = Hazardous and Radioactive Materials Bureau
ID = Identification.
IT = IT Corporation.
MDA = minimum detectable activity.
mL = Milliliter(s).
NA = Not applicable.
ND ( ) = Nondetect—the analyte was not observed above the MDA.
pCi = Picocurie(s).
Ra = Radium.
RCRA = Resource Conservation and Recovery Act.
RFI = RCRA facility investigation.
S = Soil sample.
SNL/NM = Sandia National Laboratories/New Mexico.
SWMU = Solid waste management unit.
Th = Thorium.
U = Uranium.

Table 2.4.4-20
Summary of SWMU 27 RFI Mound Area Subsurface Debris Sampling
Analytical Results; Radiological Constituents (Gross Alpha and Gross Beta)

Sample Number	ER Sample ID	Sample Matrix	Sample Date	Sample Depth	Gross Alpha and Gross Beta (EPA Method 900.0)				Units
					Gross Alpha	Accuracy, Gross Alpha (+/-)	Gross Beta	Accuracy, Gross Beta (+/-)	
034957-003	27B-GR-008-2-S	Soil	6/12/97	2.0–3.0 ft	20.1	6.03	27.8	4.81	pCi/g
034958-003	27B-GR-009-5-S	Soil	6/12/97	5.0–6.0 ft	13.3	5.17	14.7	4.21	pCi/g
034959-003	27B-GR-010-2-S	Soil	6/12/97	2.0–3.0 ft	10.5	4.18	23.1	4.39	pCi/g
SNL/NM Complex Average Background[a]		Soil	NA	NA	-0.47	1.26 (2 standard deviations)	10.76	6.54 (2 standard deviations)	pCi/g

ER Sample ID Information: 27B = SWMU sample location; GR = grab sample; 008 = sample number; 2 = depth of sample; S = soil sample.

[a]SNL/NM August 1997.

EPA = U.S. Environmental Protection Agency.
ft = Foot (feet).
g = Gram(s).
GR = Grab sample.
ER = Environmental restoration.
ID = Identification.
NA = Not applicable.
pCi = Picocurie(s).
RFI = RCRA facility investigation.
RCRA = Resource Conservation and Recovery Act.
S = Soil sample.
SNL/NM = Sandia National Laboratories/New Mexico.
SWMU = Solid waste management unit.

For TCLP SVOCs using EPA Method 8270 (EPA November 1986): All SVOC concentration levels in the three subsurface debris samples (Samples 27B-GR-008-2-S, 27B-GR-009-5-S, and 27B-GR-010-2-S) were below the method detection limits (refer to Table 2.4.4-4 for a list of TCLP SVOC constituents and their respective detection limits).

For TCLP VOCs using EPA Method 8260 (EPA November 1986): All VOC concentration levels in the three subsurface debris samples (Samples 27B-GR-008-2-S, 27B-GR-009-5-S, and 27B-GR-010-2-S) were below the method detection limits (refer to Table 2.4.4-5 for a list of TCLP VOC constituents and their respective detection limits).

For TCLP pesticides/herbicides using EPA Methods 8080 and 8151 (EPA November 1986): All pesticide/herbicide concentration levels in the three subsurface debris samples (Samples 27B-GR-008-2-S, 27B-GR-009-5-S, and 27B-GR-010-2-S) were below the method detection limits (refer to Table 2.4.4-6 for a list of TCLP pesticide/herbicide constituents and their respective detection limits).

For radionuclides (gamma spectroscopy) using EPA Method 900.1 (EPA November 1986): All three subsurface debris samples (Samples 27B-GR-008-2-S, 27B-GR-009-5-S, and 27B-GR-010-2-S) contained uranium-238, thorium-234, radium-228, and cesium-137 concentration levels below their respective HRMB maximum background concentration levels (Dinwiddie September 24, 1997) (Table 2.4.4-19). One sample contained a thorium-232 concentration level (1.05 pCi/g) greater than the HRMB maximum background concentration level of 1.03 pCi/g but was below the SNL/NM Foothills maximum background concentration level of 1.18 pCi/g. All three samples contained uranium-235 concentration levels less than the MDA, which exceeded the HRMB maximum concentration level of 0.16 pCi/g, but were below the SNL/NM Foothills background concentration level of 3.0 pCi/g. Although the MDA for gamma-emitting radionuclides was sometimes higher than the background level for that radionuclide, they were nevertheless orders of magnitude less than a risk-based PRG which is based upon a 15 mrem/yr EDE maximum dose limit found in EPA's OSWER Directive No. 9200.4-18, "Establishment of Cleanup Levels for CERCLA Sites with Radioactive Contamination" (EPA 1997). Therefore the analytical results are acceptable. Complete results of gamma spectroscopy analyses are provided in Annex 2-A.

For radionuclides (gross alpha and gross beta) using EPA Method 900.0 (EPA November 1986): All three subsurface debris samples (Samples 27B-GR-008-2-S, 27B-GR-009-5-S, and 27B-GR-010-2-S) contained gross alpha and gross beta concentration levels consistent with the SWMU 27 site-specific background samples (Table 2.4.4-20).

RFI Excavation and Subsequent Sampling Results for Soil—Mound Area

One subsurface confirmatory soil sample (Sample ID 27B-GR-013-8-S) was collected from the Mound Area during the RFI excavation activities, from the base of the north-south trench (Figure 2.4.4-3). Additional subsurface confirmatory soil samples were collected during the VCM in September 1997 (Annex 2-B).

Because only one subsurface sample was collected during the RFI, analytical results for this sample are presented with the analytical result tables for the RFI surface confirmatory soil

samples collected from the Mound Area (Tables 2.4.4-9, 2.4.4-10, 2.4.4-12, 2.4.4-16, and 2.4.4-17). The subsurface samples are called out by a 27B identifier in the ER Sample ID column of those tables and pertains to the location where the samples were collected (e.g., 27B = Mound Area).

For RCRA metals plus beryllium and nickel using EPA Methods 6010A and 7471 (EPA November 1986): With the exception of silver, all metals concentration levels for the subsurface confirmatory soil sample (Sample 27B-GR-013-8-S) were below the method detection limits or the SNL/NM 95th-percentile background concentration level (SNL/NM December 1997) (Table 2.4.4-9). Silver does not have a quantified background concentration; however, in terms of risk, the silver concentration does not pose significant risk to either human health or ecological receptors.

For TCL SVOCs using EPA Method 8270 (EPA November 1986): All SVOC concentration levels for the single subsurface confirmatory soil sample (Sample 27B-GR-013-8-S) were below the method detection limits (EPA Method 8270) (Table 2.4.4-10). Refer to Table 2.4.4-11 for a complete list of organic compounds included in the TCL SVOC analyses including their respective method detection limits and reporting limits.

For TCL VOCs using EPA Method 8260 (EPA November 1986): Methylene chloride was detected in the single subsurface confirmatory soil sample (Sample 27B-GR-013-8-S) at a concentration level of 4.37JB (Table 2.4.4-12) but is a common laboratory contaminant. The trip blank contained a methylene chloride concentration level of 7.29B. Therefore, based upon EPA guidance for blank sample detections (EPA February 1994), methylene chloride can be contributed to laboratory contamination, and is not considered as a COC any further. Refer to Table 2.4.4-13 for a complete list of organic compounds included in the TCL VOC analyses including their respective method detection limits and reporting limits.

For TCL pesticides/herbicides: Pesticide/herbicide analysis was not performed on Sample 27B-GR-013-8-S.

For radionuclides (gamma spectroscopy) using EPA Method 900.1 (EPA November 1986): The subsurface confirmatory soil sample collected (Sample 27B-GR-013-8-S) contained uranium-238, thorium-234, thorium-232, and cesium-137 concentration levels below their respective HRMB maximum background concentration levels (Dinwiddie September 24, 1997) (Table 2.4.4-16). The soil sample contained a radium-228 concentration level above the HRMB maximum background concentration level of 1.08 pCi/g, but was below the SNL/NM Foothills maximum background concentration level of 1.32 pCi/g. The soil sample also contained a uranium-235 concentration level below the MDA, which exceeded the HRMB maximum background concentration level of 0.16 pCi/g but was below the SNL/NM Foothills background concentration level of 3.0 pCi/g. Although the MDA for gamma-emitting radionuclides was sometimes higher than the background level for that radionuclide, they were nevertheless orders of magnitude less than a risk-based PRG which is based upon a 15 mrem/yr EDE maximum dose limit found in EPA's OSWER Directive No. 9200.4-18, "Establishment of Cleanup Levels for CERCLA Sites with Radioactive Contamination" (EPA 1997). Therefore the analytical results are acceptable. Complete results of gamma spectroscopy analyses are provided in Annex 2-A.

For radionuclides (gross alpha and gross beta) using EPA Method 900.0 (EPA November 1986): The subsurface confirmatory soil sample (Sample 27B-GR-013-8-S) contained gross alpha and gross beta concentration levels consistent with the SWMU 27 site-specific background samples (Table 2.4.4-17).

2.4.4.4.3 RFI Excavation and Subsequent Sampling Results for Debris at Burn Pit

The results for this sampling are presented for informational purposes only since all of the debris and soils were removed and disposed of as RCRA-regulated waste during the VCM conducted in September 1997. Details regarding: 1) quantity of debris excavated; 2) quantity of soils returned to the trench and disposition of the debris; etc., are presented in the SWMU 27 VCM report (Annex 2-B).

Tables 2.4.4-21 through 2.4.4-23 give the analytical results from sampling of subsurface debris conducted at the Burn Pit, and the corresponding sample locations are shown in Figure 2.4.4-2. The debris samples are called out by the 27A identifiers in the ER Sample ID column of the tables and pertain to the location where the samples were collected (e.g., 27A = Burn Pit).

For TCLP metals using EPA Methods 6010A and 7470 (EPA November 1986): Except for lead, all metals concentration levels for the three subsurface debris samples (plus one duplicate) (27A-GR-001-5-S, 27A-GR-002-7-S, 27A-GR-003-0-SS, and 27A-GR-003-0-SD) were below the method detection limits or the TCLP reporting level (EPA November 1986) (Table 2.4.4-21). Lead was detected in one sample (Sample 27A-GR-001-5-S) at a concentration level (5.31 mg/L) slightly exceeding the TCLP reporting level of 5.0 mg/L (EPA November 1986).

For TCLP SVOCs using EPA Method 8270 (EPA November 1986): All SVOC concentration levels in the samples (27A-GR-001-5-S, 27A-GR-002-7-S, 27A-GR-003-0-SS, and 27A-GR-003-0-SD) were below the method detection limits (refer to Table 2.4.4-4 for a list of TCLP SVOC constituents and their respective detection limits).

For TCLP VOCs using EPA Method 8260 (EPA November 1986): All VOC concentration levels in the samples (27A-GR-001-5-S, 27A-GR-002-7-S, 27A-GR-003-0-SS, and 27A-GR-003-0-SD) were below the method detection limits (refer to Table 2.4.4-5 for a list of TCLP VOC constituents and their respective detection limits).

For TCLP pesticides/herbicides using EPA Methods 8080 and 8151 (EPA November 1986): All pesticide/herbicide concentration levels in the samples (27A-GR-001-5-S, 27A-GR-002-7-S, 27A-GR-003-0-SS, and 27A-GR-003-0-SD) were below the method detection limits (refer to Table 2.4.4-6 for a list of TCLP pesticide/herbicide constituents and their respective detection limits).

For radionuclides (gamma spectroscopy) using EPA Method 900.1 (EPA November 1986): All samples (27A-GR-001-5-S, 27A-GR-002-7-S, 27A-GR-003-0-SS, and 27A-GR-003-0-SD) contained uranium-238, thorium-234, thorium-232, radium-228, and cesium-137 concentration levels below their respective HRMB maximum background concentration levels (Dinwiddie September 24, 1997) (Table 2.4.4-22). All samples contained uranium-235 concentration levels below the MDA, which exceeded the HRMB maximum concentration level of 0.16 pCi/g but

Table 2.4.4-21
Summary of SWMU 27 RFI Burn Pit Subsurface Debris Sampling Analytical Results; Inorganic Constituents (TCLP Metals)

Sample Number	ER Sample ID	Sample Matrix	Sample Date	Sample Depth	TCLP Metals (EPA Methods 6010A, 7470/7471 and 1311[a])								Units
					Ag	As	Ba	Cd	Cr	Hg	Pb	Se	
034950-002	27A-GR-001-5-S	Soil	6/11/97	5.0–6.0 ft	0.00201J	0.00971J	2.72B	0.419	ND (0.000621)	ND (0.0001)	5.31	0.00886JB	mg/L
034951-002	27A-GR-002-7-S	Soil	6/11/97	7.0–8.0 ft	0.00265J	0.00701J	0.849B	0.0452	ND (0.000621)	ND (0.0001)	0.612	0.0104B	mg/L
034952-002	27A-GR-003-0-SS	Soil	6/12/97	0.0–0.5 ft	0.00313J	ND (0.00276)	1.30B	0.111	ND (0.000621)	ND (0.0001)	1.48	0.00524JB	mg/L
034994-002	27A-GR-003-0-SD	Soil	6/12/97	0.0–0.5 ft	0.00261J	0.00777J	1.33B	0.114	ND (0.000729)	ND (0.000104)	1.63	0.00862JB	mg/L
Quality Assurance/Quality Control Samples													
034996-011	27-GR-044-DCW	Water	6/16/97	NA	0.0196J	ND (0.00276)	0.283B	0.0297J	0.0106J	ND (0.0001)	0.221	0.0259J	mg/L
Toxicity Characteristic Regulatory Level[a]		NA	NA	NA	5	5.0	100	1.0	5.0	0.2	5.0	1.0	mg/L

ER Sample ID Information: 27A = SWMU sample location; GR = grab sample; 001 = sample number; 5 = depth of sample; S = soil sample.

[a]Maximum concentration of contaminant for the toxicity characteristic (EPA November 1986).

Ag = Silver.
As = Arsenic.
B =
Ba = Barium.
Cd = Cadmium.
Cr = Chromium.
DCW = Decontamination water sample.
EPA = U.S. Environmental Protection Agency.
ER = Environmental restoration.
ft = Foot (feet).
GR = Grab sample.
ID = Identification.
J = The estimated value reported is either above the MDL and less than the practical quantitation limit or above the instrument detection limit and less than the contract required detection limit.
MDL = Method detection limit.
mg/L = Milligram(s) per liter.
NA = Not applicable.
ND ( ) = Not detected at or above the MDL, shown in parenthesis
Pb = Lead.
RCRA = Resource Conservation and Recovery Act.
RFI = RCRA facility investigation.
S = Soil sample.
SD = Soil sample duplicate.
Se = Selenium.
SS = Soil sample.
SWMU = Solid waste management unit.
TCLP = Toxicity characteristic leaching procedure.

Table 2.4.4-22
Summary of SWMU 27 RFI Burn Pit Debris Sampling Analytical Results; Radiological Constituents (Gamma Spectroscopy)

Sample Number	ER Sample ID	Sample Matrix	Sample Date	Sample Depth	Gamma Spectroscopy Activity[a] (EPA Method 901.1)						Units
					U-238[b]	Th-234[b]	Th-232[b]	Ra-228[b]	U-235[b]	Cs-137[b]	
034950-004	27A-GR-001-5-S	Soil	6/11/97	5.0–6.0 ft	ND (1.51E+00)	5.32E-01	5.75-01	6.44E-01	ND (2.07E-01	1.47E-01	pCi/g
034951-004	27A-GR-002-7-S	Soil	6/11/97	7.0–8.0 ft	ND (1.01E+00)	7.72E-01	9.63E-01	9.85E-01	ND (2.21E-01)	2.79E-01	pCi/g
034952-004	27A-GR-003-SS	Soil	6/12/97	0.0–0.5 ft	ND (1.46E+00)	5.30E-01	7.31E-01	7.28E-01	ND (1.94E-01)	1.69E-01	pCi/g
034994-004	27A-GR-003-SD	Soil	6/12/97	NA	ND (9.25E-01)	4.67E-01	6.30E-01	6.44E-01	ND (2.07E-01)	2.04E-01	pCi/g
Quality Assurance/Quality Control Samples											
034991-004	27C-GR-042-FB	Water	6/12/97	NA	ND (7.81E-01)	ND (3.08E-01)	ND (1.52E-01)	ND (1.64E-01)	ND (1.37E-01)	ND (2.87E-02)	pCi/mL
034992-004	27C-GR-043-EB	Water	6/12/97	NA	ND (8.08E-01)	ND (3.26E-01)	ND (1.60E-01)	ND (1.57E-01)	ND (1.38E-01)	ND (2.78E-02)	pCi/mL
0034996-004	27-GR-044-DCW	Water	6/16/97	NA	ND (9.74E-01)	ND (3.00E-01)	ND (1.39E-01)	ND (1.20E-01)	ND (1.30E-01)	ND (2.13E-02)	pCi/mL
SNL/NM Foothills Background Range[c]		NA	NA	NA	0.153–2.86	0.69–2.03	0.113–1.18	0.113–1.32	0.004–3.0	0.007–0.876	pCi/g
HRMB Maximum Background[d]		NA	NA	NA	2.31	2.31	1.03	1.08	0.16	1.063	pCi/g

ER Sample ID Information: 27A = SWMU sample location; GR = grab sample; 001 = sample number; 5 = depth of sample; S = soil sample.

[a]Uranium-238 and thorium-232 decay chain isotopes with a short half-life are not presented in this table.
[b]Value in parenthesis represents the minimum detection activity.
[c]IT March 1996.
[d]Dinwiddie September 24, 1997.

Cs = Cesium.
DCW = Decontamination water sample.
EB = Equipment blank.
EPA = U.S. Environmental Protection Agency.
ER = Environmental restoration.
FB = Field blank.
ft = Foot (feet).
GR = Grab sample.
g = Gram(s).
HRMB = Hazardous and Radioactive Materials Bureau
ID = Identification.
IT = IT Corporation.
mL = Milliliter(s).
NA = Not applicable.
ND = Nondetect - the analyte was not observed above the MDA.
pCi = Picocurie(s).
Ra = Radium.
RCRA = Resource Conservation and Recovery Act.
RFI = RCRA facility investigation.
S = Soil sample.
SD = Soil duplicate.
SNL/NM = Sandia National Laboratories/New Mexico.
SWMU = Solid waste management unit.
Th = Thorium.
U = Uranium.

Table 2.4.4-23
Summary of SWMU 27 RFI Burn Pit Debris Sampling Analytical Results; Radiological Constituents (Gross Alpha and Gross Beta)

Sample Number	ER Sample ID	Sample Matrix	Sample Date	Sample Depth	Gross Alpha and Gross Beta (EPA Method 900.0)				Units
					Gross Alpha	Accuracy, Gross Alpha (+/-)	Gross Beta	Accuracy, Gross Beta (+/-)	
034950-003	27A-GR-001-5-S	Soil	6/11/97	5.0–6.0 ft	14.3	6.16	16.7	4.31	pCi/g
034951-003	27A-GR-002-7-S	Soil	6/11/97	7.0–8.0 ft	12.1	4.88	22.4	4.42	pCi/g
034952-003	27A-GR-003-0-S	Soil	6/11/97	0.0–0.5 ft	11.7	5.12	22.0	4.55	pCi/g
034994-003	27A-GR-003-0-SD	Soil	6/12/97	0.0–0.5 ft	15.2	5.98	20.1	4.35	pCi/g
SNL/NM Complex Average Background[a]		Soil	NA	NA	-0.47	1.26 (2 standard deviations)	10.76	6.54 (2 standard deviations)	pCi/g

ER Sample ID Information: 27A = SWMU sample location; GR = grab sample; 001 = sample number; 5 = depth of sample; S = soil sample.

[a]SNL/NM August 1997.

D = Duplicate.
EPA = U.S. Environmental Protection Agency.
ER = Environmental restoration.
ft = Foot (feet).
g = Gram(s).
ID = Identification.
NA = Not applicable.
pCi/g = Picocurie(s) per gram.
RCRA = Resource Conservation and Recovery Act.
RFI = RCRA facility investigation.
S = Soil sample.
SNL/NM = Sandia National Laboratories/New Mexico.
SWMU = Solid waste management unit.

were below the SNL/NM Foothills background concentration level of 3.0 pCi/g. Although the MDA for gamma-emitting radionuclides was sometimes higher than the background level for that radionuclide, they were nevertheless orders of magnitude less than a risk-based PRG which is based upon a 15 mrem/yr EDE maximum dose limit found in EPA's OSWER Directive No. 9200.4-18, "Establishment of Cleanup Levels for CERCLA Sites with Radioactive Contamination" (EPA 1997). Therefore the analytical results are acceptable. Complete results of gamma spectroscopy analyses are provided in Annex 2-A.

For radionuclides (gross alpha and gross beta) using EPA Method 900.0 (EPA November 1986): All samples (27A-GR-001-5-S, 27A-GR-002-7-S, 27A-GR-003-0-SS, and 27A-GR-003-0-SD) contained gross alpha and gross beta concentration levels consistent with the SWMU 27 site-specific background samples (Table 2.4.4-23).

2.4.5 Investigation #4—SNL/NM ER Project Voluntary Corrective Measure and Confirmatory Sampling

A VCM followed by confirmatory sampling was conducted in September 1997 (Annex 2-B). Prior to the VCM, another UXO/HE survey was conducted in July 1997, and no UXO/HE was found at the site (Mignardot 1997). A sensitive-species survey was also conducted in July 1997 (IT July 1997); no evidence was found that indicated that the use of the site would affect listed threatened, endangered, or sensitive species; therefore, no impact to such species by the VCM would occur.

During the VCM field activities, soil mixed with animal remains, glass, metals, wood, and burned materials were removed from the Burn Pit and the Mound Area at SWMU 27. Approximately 20 cubic yards of RCRA-regulated waste and 20 cubic yards of non-RCRA-regulated solid waste were removed and disposed of off site. After the VCM removal activities were completed, confirmatory soil samples were collected from the Burn Pit and Mound Area excavations and from the soil piles; the results are presented in the following sections.

2.4.5.1 VCM Nonsampling Data Collection

There was no nonsampling data collection associated with this VCM.

2.4.5.2 VCM Sampling Data Collection

The VCM sampling activities were conducted in accordance with the SWMU 27 VCM Plan (Annex 2-B).

2.4.5.2.1 VCM Activities

From August 27 through September 29, 1997, SNL/NM ER conducted VCM activities to remove the animal remains and associated debris from SWMU 27. The Mound Area and the Burn Pit were remediated (refer to Figure 2.4.4-2 for location of these features), and exploratory trenching confirmed that no further burial had been conducted at the site.

2.4.5.2.2 *VCM Confirmatory Soil Sampling*

SNL/NM conducted postremediation confirmatory sampling in late September 1997 to determine that all debris had been removed during the VCM and to confirm that no COCs at levels exceeding background levels or action levels were still present at the site. The confirmatory soil sampling program was performed in accordance with the rationale and procedures described in the VCM plan for SWMU 27 (Annex 2-B). Refer to the VCM plan for a detailed discussion of the VCM activities and results for SWMU 27.

Confirmatory soil samples were collected from the floors and walls of the Burn Pit, Mound Area, and Exploratory Trenches (Figure 2.4.5-1). In addition, confirmatory soil samples were collected from the soil piles, which were subsequently placed back into the trenches. SNL/NM chain-of-custody and sample documentation procedures were followed for all samples collected. Of the 26 samples (both trench and soil pile samples) collected, 100 percent were analyzed on site at SNL/NM for radionuclides (gamma spectroscopy) using EPA Method 901.1 (EPA November 1986) and off site for RCRA metals plus beryllium and nickel EPA Methods 6010 and 7471 (EPA November 1986). In addition, 14 (trench samples) of the 26 samples were analyzed off site for TCL pesticides/herbicides using EPA Method 8081/8151 (EPA November 1986). SNL/NM Department 7713 (Radiation Protection Sample Diagnostics Laboratory) analyzed the samples on site for radionuclides (gamma spectroscopy); and General Engineering Laboratory of Charleston, South Carolina, analyzed the samples for RCRA metals plus beryllium and nickel and TCL pesticides/herbicides. The results are given in Section 2.4.5.4. Because no VOCs were observed in the RFI samples and no VOCs were identified during field screening activities (PID) during the RFI/VCM, no additional samples were collected for VOC laboratory analysis during the VCM.

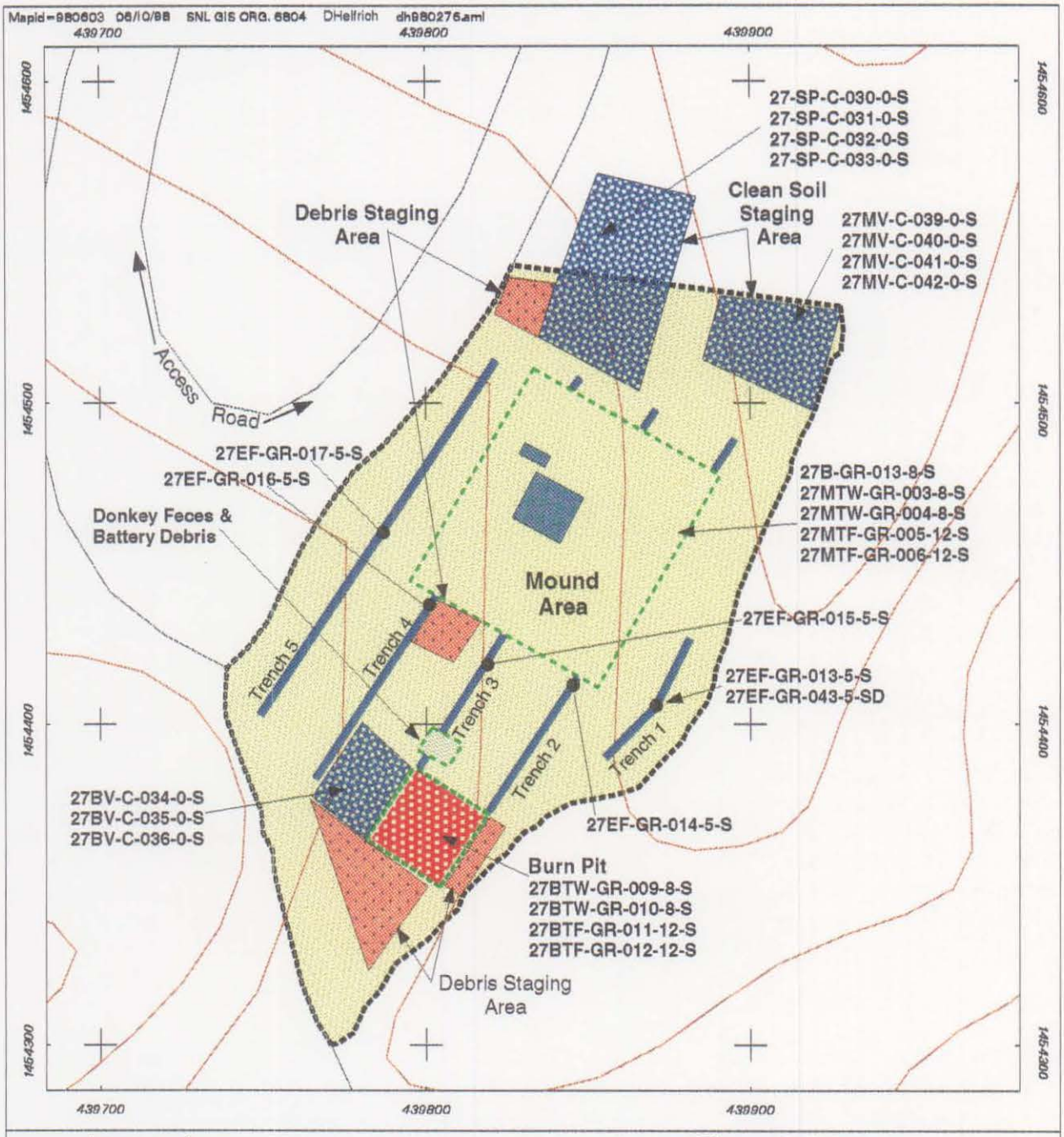
Selection of the chemical and radiological analysis performed on individual confirmatory samples was based upon historical and process knowledge and the types of debris that were reported to have been buried at the site, as well as scoping and RFI analytical data collected for the site. The pesticide and herbicide analyses were included at NMED's request. Pesticides and herbicides are not considered RCRA-regulated COCs because they were used for their intended purpose.

2.4.5.3 *VCM Data Gaps*

Information gathered through process knowledge, site files, records search and literature survey, and personnel interviews for SWMU 27 aided in identifying the most likely COCs at this site and in the selecting of the types of analyses performed on the soil and debris samples. Although the history of past releases at the site is incomplete, analytical data from VCM/confirmatory sampling and radiological and organic vapor screening are sufficient to determine that all debris disposed of at the site was removed and that no releases of COCs occurred at the site.

2.4.5.4 *VCM Confirmatory Soil Sampling Results and Conclusions*

Full results are provided in the VCM Report (Annex 2-B) and are summarized below.



Legend

- VCM Sample Location (ID information: 27 = SWMU sample location; GR = grab sample; 034 = sample number; 0 = sample depth; S = soil sample)
- Road
- 5 Foot Contour
- Excavation Area
- Exploratory Trench
- Burn Pit
- SWMU 27 Exclusion Area
- Excavated Materials
- Soil Staging Area
- Debris Staging Area

Scale in Feet: 0 25 50

Scale in Meters: 0 6 12

Figure 2.4.5-1
Confirmatory Soil Sample Locations at Solid Waste Management Unit 27

Sandia National Laboratories, New Mexico
Environmental Geographic Information System

2.4.5.4.1 *VCM Confirmatory Sampling—Soil Pile Analyses*

The soil pile samples were analyzed for site-specific potential COCs, including RCRA metals plus beryllium and nickel (using EPA Method 6010A and 7471) and radionuclides (using gamma spectroscopy) (EPA November 1986). In addition, field readings from a calibrated organic vapor meter (PID) identified no ionizable volatile organics, and thus confirmatory sampling for organic constituents was not necessary.

The soil pile samples are identified by the 27SP, 27BV, 27BVD, and 27MV designators in the ER Sample ID column of the table and relate to the locations from which the samples were collected (e.g., MV = Mound Area). The results are given below.

Metals—Soil Piles

Table 2.4.5-1 presents the off-site analytical results for inorganic compounds (RCRA metals) for the 11 samples collected from the soil piles generated at SWMU 27 during the RFI/VCM.

With the exception of mercury and silver, all metal concentration levels were either below method detection limits or below the SNL/NM 95th-percentile background concentration level and SNL/NM Foothills maximum background concentration level (SNL/NM December 1997). Mercury was detected in three samples at concentration levels exceeding the SNL/NM 95th-percentile background concentration level (0.055 mg/kg) but were less than the SNL/NM Foothills maximum background concentration level (0.13 mg/kg) (SNL/NM December 1997). Silver does not have a quantified background concentration; however, in terms of risk, the silver concentration levels do not pose significant risk to either human health or ecological receptors.

Radionuclides—Soil Piles

Table 2.4.5-2 presents the on-site analytical results for radionuclides (using gamma spectroscopy) for samples collected from the RFI/VCM soil piles at SWMU 27. Nine of the 11 samples collected contained uranium-238 concentration levels below the MDAs for uranium-238 (MDAs ranged from 1.44 to 3.89 pCi/g); the two remaining samples with detectable activities were below the HRMB maximum background concentration level (2.31 pCi/g) (Dinwiddie September 24, 1997). The MDAs for uranium-238 in four confirmatory soil pile samples exceeded the SNL/NM maximum background concentration level of 2.86 pCi/g (IT March 1996). These values are orders of magnitude less than the PRGs (see VCM report, Annex 2-B) and do not pose a threat to human health or the environment. All samples contained thorium-234 concentration levels below the HRMB maximum background concentration level (2.31 pCi/g). Five samples contained thorium-232 concentration levels above the HRMB maximum background concentration level (1.03 pCi/g) but were below the SNL/NM Foothills maximum background concentration level (1.18 pCi/g). Four samples contained radium-228 concentration levels exceeding the HRMB maximum background concentration level (1.08 pCi/g) but were less than the SNL/NM Foothills maximum background concentration level (1.32 pCi/g). All samples contained uranium-235 concentration levels below the MDAs. However, the MDAs were slightly above the HRMB maximum background concentration but less than the SNL/NM Foothills maximum background concentration level of 3.0 pCi/g. These values are orders of magnitude less than the PRGs as discussed in

Table 2.4.5-1
Summary of SWMU 27 VCM Confirmatory Soil Pile Sampling Analytical Results; Inorganic Constituents (RCRA Metals)

Sample Number	ER Sample ID	Sample Matrix	Sample Date	Sample Depth	RCRA Metals (EPA Methods 6010A and 7470/7471[a])										Units
					Ag	As	Ba	Be	Cd	Cr	Hg	Ni	Pb	Se	
034188-010	27SP-C-030-0-S	Soil	9/8/97	0.0–0.5 ft	0.177J	4.32	132	0.604	ND (0.0104)	11.0	ND (0.0173)	8.95	8.81	ND (0.07)	mg/kg
034189-010	27SP-C-031-0-S	Soil	9/8/97	0.0–0.5 ft	0.140J	4.03	155	0.515	ND (0.0104)	8.79	0.0158J	9.09	8.04	ND (0.07)	mg/kg
034190-010	27SP-C-032-0-S	Soil	9/8/97	0.0–0.5 ft	0.173J	4.01	113	0.472J	ND (0.0104)	9.17	0.0272J	8.33	9.35	ND (0.07)	mg/kg
034191-010	27SP-C-033-0-S	Soil	9/8/97	0.0–0.5 ft	0.254J	4.56	157	0.610	ND (0.0104)	12.0	0.0256J	10.2	9.06	ND (0.07)	mg/kg
034192-010	27BV-C-034-0-S	Soil	9/9/97	0.0–0.5 ft	ND (0.031)	5.40	139	0.487	0.109J	8.86B	0.0787	7.86	7.26	0.451J	mg/kg
034193-010	27BV-C-035-0-S	Soil	9/9/97	0.0–0.5 ft	0.113J	4.06	129	0.475J	0.0803J	8.84B	0.0598	7.71	7.10	0.292J	mg/kg
034194-010	27BVD-C-036-0-S	Soil	9/9/97	0.0–0.5 ft	0.0947J	5.08	141	0.586	0.102J	11.1B	0.0562	9.23	8.29	0.378J	mg/kg
034224-010	27MV-C-039-0-S	Soil	9/11/97	0.0–0.5 ft	ND (0.031)	4.88	131	0.421J	0.0777J	6.05	ND (0.0173)	7.42	9.35	0.865	mg/kg
034225-010	27MV-C-040-0-S	Soil	9/11/97	0.0–0.5 ft	0.210J	3.86	86.9	0.430J	0.0510J	6.73	ND (0.0173)	8.09	7.40	0.310J	mg/kg
034226-010	27MV-C-041-0-S	Soil	9/11/97	0.0–0.5 ft	0.162J	3.52	136	0.454J	0.0717J	6.97	ND (0.0173)	7.79	7.41	0.558	mg/kg
034227-010	27MV-C-042-0-S	Soil	9/11/97	0.0–0.5 ft	0.268J	3.58	118	0.494	0.0952J	7.97	ND (0.0173)	7.39	9.17	0.591	mg/kg
Quality Assurance/Quality Control Samples															
034141-004	27-GR-020-0-FB	Water	9/9/97	NA	ND (0.00062)	ND (0.00293)	ND (0.000332)	ND (0.000223)	0.000335J	ND (0.000729)	ND (0.000104)	ND (0.00227)	0.000934J	ND (0.0014)	mg/L
034142-004	27-GR-021-0-EB	Water	9/9/97	NA	ND (0.00062)	ND (0.00293)	0.000604J	ND (0.000223)	0.000350J	ND (0.000729)	ND (0.000104)	ND (0.00227)	ND (0.000678)	ND (0.0014)	mg/L
034195-004	27-GR-037-0-FB	Water	9/11/97	NA	0.00165J	ND (0.00293)	0.000707J	ND (0.000223)	0.000298J	ND (0.000729)	ND (0.000104)	ND (0.00227)	0.000841J	ND (0.0014)	mg/L
034196-004	27-GR-038-0-EB	Water	9/11/97	NA	0.00240J	ND (0.00293)	0.00216J	ND (0.000223)	ND (0.000208)	ND (0.000729)	ND (0.000104)	ND (0.00227)	0.000858J	ND (0.0014)	mg/L
SNL/NM Foothills Background Range[b]		Soil	Na	NA	0.01-0.50	1.6-9.6	39-400	0.2-0.73	0.09-0.99	2.5-20	0.01-0.13	5.3-16	4.7-51	0.56-3.1	mg/kg
SNL/NM Foothills Soil Background UTL or 95th-Percentile Range[b]		Soil	NA	NA	<0.5[c]	9.8	246	0.75	0.64[c]	18.8	0.055[c]	16.6	18.9[c]	3.0[c]	mg/kg

ER Sample ID Information: 27SP = SWMU sample location; C = composite; 030 = sample number; 0 = depth of sample; S = soil sample.

[a]EPA November 1996.
[b]SNL/NM December 1997 (all metals background values, except Se, were verbally approved by NMED HRMB as of May 1998).
[c]95th-percentile provided instead of UTL.

Ag = Silver.
As = Arsenic.
Ba = Barium.
Be = Beryllium.
Cd = Cadmium.
Cr = Chromium.
EB = Equipment blank.
EPA = U.S. Environmental Protection Agency.
ER = Environmental restoration.
FB = Field blank.
ft = Foot (feet).
GR = Grab sample.
Hg = Mercury.
HRMB = Hazardous and Radioactive Materials Bureau.
J = The estimated value reported is either above the MDL and less than the practical quantitation limit or above the instrument detection limit and less than the contract required detection limit.
kg = Kilogram(s).
L = Liter(s).
MDL = Method detection limit.
mg = Milligram(s).
NA = Not applicable.
ND ( ) = Not detected at or above the MDL, shown in parenthesis.
Ni = Nickel.
NMED = New Mexico Environment Department
Pb = Lead.
RCRA = Resource Conservation and Recovery Act.
S = Soil sample.
Se = Selenium.
SNL/NM = Sandia National Laboratories, New Mexico
SWMU = Solid Waste Management Unit.
UTL = Upper tolerance limit.
VCM = Voluntary corrective measures.

Table 2.4.5-2
Summary of SWMU 27 VCM Confirmatory Soil Pile Sampling Analytical Results; Radiological Constituents (Gamma Spectroscopy)

Sample Number	ER Sample ID	Sample Matrix	Sample Date	Sample Depth	Gamma Spectroscopy Activity[a] (EPA Method 901.1)						Units
					U-238[b]	Th-234[b]	Th-232[b]	Ra-228[b]	U-235[b]	Cs-137[b]	
034188-003	27SP-C-030-0-S	Soil	9/8/97	0.0–0.5 ft	ND (3.89E+00)	9.54E-01	1.13E+00	1.10E+00	ND (2.73E-01)	3.99E-02	pCi/g
034189-003	27SP-C-031-0-S	Soil	9/8/97	0.0–0.5 ft	ND (3.77E+00)	1.23E+00	1.13E+00	1.04E+00	ND (2.71E-01)	2.66E-02	pCi/g
034190-003	27SP-C-032-0-S	Soil	9/8/97	0.0–0.5 ft	ND (3.51E+00)	1.14E+00	9.13E-01	9.37E-01	ND (2.51E-01)	1.18E-01	pCi/g
034191-003	27SP-C-033-0-S	Soil	9/8/97	0.0–0.5 ft	ND (3.84E+00)	1.31E+00	1.00E+00	9.85E-01	ND (2.72E-01)	3.93E-02	pCi/g
034192-003	27BV-C-034-0-S	Soil	9/9/97	0.0–0.5 ft	6.73E-01	1.38E+00	1.08E+00	1.05E+00	ND (2.21E-01)	ND (4.69E-02)	pCi/g
034193-003	27BV-C-035-0-S	Soil	9/9/97	0.0–0.5 ft	1.24E+00	1.30E+00	9.44E-01	ND (1.95E-01)	ND (2.08E-01)	ND (4.25E-02)	pCi/g
034194-003	27BVD-C-036-0-S	Soil	9/9/97	0.0–0.5 ft	ND (1.44E+00)	1.05E+00	9.22E-01	8.74E-01	ND (2.08E-01)	ND (4.62E-02)	pCi/g
034224-003	27MV-C-039-0-S	Soil	9/11/97	0.0–0.5 ft	ND (1.99E+00)	9.95E-01	9.99E-01	1.17E+00	ND 2.20E-01	ND (3.21E-02)	pCi/g
034225-003	27MV-C-040-0-S	Soil	9/11/97	0.0–0.5 ft	ND (1.61E+00)	1.15E+00	8.03E-01	8.01E-01	ND (2.17E-01)	ND (3.93E-02)	pCi/g
034226-003	27MV-C-041-0-S	Soil	9/11/97	0.0–0.5 ft	ND (1.77E+00)	1.21E+00	1.07E+00	1.20E+00	ND (2.31E-01)	ND (4.20E-02)	pCi/g
034227-003	27MV-C-042-0-S	Soil	9/11/97	0.0–0.5 ft	ND (1.69E+00)	1.79E+00	1.05E+00	1.20E+00	ND (2.32E-01)	ND (4.21E-02)	pCi/g
Quality Assurance/Quality Control Samples											
034141-003	27-GR-020-0-FB	Water	9/9/97	NA	ND (8.64E-01)	ND (2.96E-01)	ND (1.41E-01)	ND (1.16E-01)	ND (1.29E-01)	ND (1.93E-02)	pCi/mL
034142-003	27-GR-021-0-EB	Water	9/9/97	NA	ND (8.78E-01)	ND (2.91E-01)	ND (1.31E-01)	ND (1.19E-01)	ND (1.27E-01)	ND (2.06E-02)	pCi/ml
035230-003	27-GR-044-0-EB	Water	9/17/97	NA	ND (1.72E+00)	ND (4.18E-01)	ND (1.64E-01)	ND (1.31E-01)	ND (1.60E-01)	ND (2.39E-02)	pCi/mL
035229-003	27-GR-043-0-FB	Water	9/17/97	NA	ND (1.83E+00)	ND (3.99E-01)	ND (1.50E-01)	ND (1.43E-01)	ND (1.52E-01)	ND (2.19E-02)	pCi/mL
034195-003	27-GR-037-0-FB	Water	9/11/97	NA	ND (7.89E-01)	ND (3.24E-01)	ND (1.51E-01)	ND (1.69E-01)	ND (1.35E-01)	ND (2.72E-02)	pCi/mL
034196-003	27-GR-038-0-EB	Water	9/11/97	NA	ND (7.86E-01)	ND (2.17E-01)	ND (1.53E-01)	ND (1.40E-01)	ND (1.36E-01)	ND (2.76E-02)	pCi/mL
SNL/NM Foothills Background Range[c]		NA	NA	NA	0.153–2.86	0.69–2.03	0.113–1.18	0.113–1.32	0.004–3.0	0.007–0.876	pCi/g
HRMB Maximum Background[d]		NA	NA	NA	2.31	2.31	1.03	1.08	0.16	1.063	pCi/g

ER Sample ID Information: 27SP = SWMU sample location; C = composite; 030 = sample number; 0 = depth of sample; S = soil sample.

[a]Uranium-238 and thorium-232 decay chain isotopes with a short half-life are not presented in this table.
[b]Value in parenthesis represents the minimum detection activity.
[c]IT March 1996.
[d]Dinwiddie September 24, 1997.

Cs = Cesium.
EB = Equipment blank.
EPA = U.S. Environmental Protection Agency.
ER = Environmental restoration.
FB = Field blank.
ft = Foot (feet).
g = Gram(s).
GR = Grab sample.
HRMB = Hazardous and Radioactive Materials Bureau
ID = Identification.
IT = IT Corporation.
MDA = Minimum detectable activity.
mL = Milliliter(s).
NA = Not applicable.
ND ( ) = Nondetect—the analyte was not observed above the MDA.
pCi = Picocurie(s)
Ra = Radium.
S = Soil sample.
SNL/NM = Sandia National Laboratories/New Mexico.
SWMU = Solid waste management unit.
Th = Thorium.
U = Uranium.
VCM = Voluntary corrective measures.

Section 2.4.1 of the VCM report (Annex 2-B) and do not pose a threat to human health or the environment. All samples contained cesium-137 concentration levels below the HRMB maximum background concentration level (1.063 pCi/g). Complete results of gamma spectroscopy analyses are provided in Annex 2-B.

2.4.5.4.2 VCM Confirmatory Sampling—Trench Floor/Wall Sample Analyses

The confirmatory samples (Floor/Wall Samples from Burn Pit, Mound Area, and exploratory trenches) were analyzed for RCRA metals plus beryllium and nickel (using EPA Methods 6010A and 7470/7471), TCL pesticides/herbicides (using Method 8080 [EPA November 1986]) and radionuclides (using gamma spectroscopy [EPA November 1986]). In addition, field readings from a calibrated organic vapor meter (PID) identified no ionizable volatile organics, and thus confirmatory sampling for organic constituents was not necessary.

The confirmatory samples are identified by the 27BTF, 27BTW, 27MTF, 27MTW, 27EF and 27B (RFI sample only) designators in the ER Sample ID column of the table and relate to the locations from which the samples were collected (e.g., BTW = Burn Pit wall sample). The results are given below.

Metals—Trench Floor/Wall

The off-site laboratory analytical results for inorganic compounds (RCRA metals) for the confirmatory samples (trench wall and floor) collected during the VCM are presented in Table 2.4.5-3. In addition, one confirmatory sample was collected during the RFI sampling in June 1997, and the results for this sample are also provided in Table 2.4.5-3. Lead was detected in one of the 15 samples at a concentration level (19.1 mg/kg) exceeding the SNL/NM 95th-percentile background concentration level (18.9 mg/kg) but was below the SNL/NM Foothills maximum background concentration level (51 mg/kg) (SNL/NM December 1997). Mercury was detected in 1 of the 15 samples at a concentration level of 0.0636 mg/kg, exceeding the SNL/NM 95th-percentile background concentration level (0.055 mg/kg) but was below the SNL/NM Foothills maximum background concentration level of 0.13 mg/kg. Based upon the information mentioned above, the elevated lead and mercury concentration levels are probably naturally occurring at SWMU 27. All other metal concentration levels were either below the method detection limit or below the SNL/NM 95th-percentile background concentration level. Silver, however, does not have a quantified background concentration. In terms of risk, the silver concentration levels do not pose significant risk to either human health or ecological receptors.

Pesticides/Herbicides—Trench Floor/Wall

Table 2.4.5-4 presents the off-site analytical results for inorganic compounds (TCL pesticides/ herbicides) for the 14 confirmatory soil samples collected during the VCM. Aldrin was detected in two samples with a maximum concentration level of 0.75J µg/kg; Dieldrin was found in one sample (maximum concentration level is 1.3J µg/kg); alpha-Lindane was found in five samples (maximum concentration level is 0.52J µg/kg); delta-Lindane was found in two samples (maximum concentration level is 1.1J µg/kg); gamma-Lindane was detected in six samples

Table 2.4.5-3
Summary of SWMU 27 VCM Confirmatory Trench Soil Sampling Analytical Results; Inorganic Constituents (RCRA Metals)

Sample Number	ER Sample ID	Sample Matrix	Sample Date	Sample Depth	RCRA Metals (EPA Methods 6010A and 7470/7471[a])										Units
					Ag	As	Ba	Be	Cd	Cr	Hg	Ni	Pb	Se	
034962-006	27B-GR-013-8-S	Soil	6/12/97	8.0–9.0 ft	0.0976J	3.68	117	0.403J	ND (0.0105)	6.08	ND (0.0167)	7.38	6.91	0.347J	mg/kg
034130-002	27BTW-GR-009-8-S	Soil	9/9/97	8.0–9.0 ft	ND (0.031)	3.79	135	0.426J	ND (0.0104)	8.69B	ND (0.0173)	4.60	5.91	ND (0.07)	mg/kg
034131-002	27BTW-GR-010-8-S	Soil	9/9/97	8.0–9.0 ft	ND (0.031)	2.35	216	0.201J	ND (0.0104)	3.48B	ND (0.0173)	3.52	4.30	0.179J	mg/kg
034132-002	27BTF-GR-011-12-S	Soil	9/9/97	12.0–13.0 ft	ND (0.031)	2.77	72.0	0.356J	ND (0.0104)	7.15B	ND (0.0173)	4.63	5.15	ND (0.07)	mg/kg
034133-002	27BTF-GR-012-12-S	Soil	9/9/97	12.0–13.0 ft	ND (0.031)	2.93	46.8	0.304J	ND (0.0104)	5.88B	ND (0.0173)	3.90	4.62	ND (0.07)	mg/kg
034124-002	27MTW-GR-003-8-S	Soil	9/11/97	8.0–9.0 ft	0.154J	3.78	89.0	0.429	0.0810J	6.76	ND (0.0173)	7.44	7.13	0.368J	mg/kg
034125-002	27MTW-GR-004-8-S	Soil	9/11/97	8.0–9.0 ft	0.216J	3.46	105	0.521	0.0875J	6.86	0.0636	7.01	7.48	0.335J	mg/kg
034126-002	27MTW-GR-005-12-S	Soil	9/11/97	12.0–13.0 ft	0.191J	5.44	107	0.478	0.0671J	8.64	ND (0.0173)	7.84	6.70	0.315J	mg/kg
034127-002	27MTW-GR-006-12-S	Soil	9/11/97	12.0–13.0 ft	0.181J	7.76	66.4	0.363J	0.0823J	5.43	ND (0.0173)	5.81	19.1	0.323J	mg/kg
035231-002	27EF-GR-043-5-SD	Soil	9/17/97	5.0–6.0 ft	0.130J	5.45	67.9	0.465J	0.150J	7.29	ND (0.0173)	8.08	7.03	0.162J	mg/kg
035134-002	27EF-GR-013-5-S	Soil	9/17/97	5.0–6.0 ft	0.103J	6.96	79.6	0.488	0.147J	7.65	0.0200J	8.20	6.79	0.247J	mg/kg
035135-002	27EF-GR-014-5-S	Soil	9/17/97	5.0–6.0 ft	0.149J	6.20	85.6	0.410J	0.112J	6.68	ND (0.0173)	9.28	6.21	0.146J	mg/kg
035136-002	27EF-GR-015-5-S	Soil	9/17/97	5.0–6.0 ft	0.166J	2.60	95.4	0.266J	0.118J	5.07	ND (0.0173)	5.46	4.91	0.374J	mg/kg
035137-002	27EF-GR-016-5-S	Soil	9/17/97	5.0–6.0 ft	0.147J	2.74	105	0.342J	0.102J	5.62	0.0186J	6.19	4.54	0.387J	mg/kg
035138-002	27EF-GR-017-5-S	Soil	9/17/97	5.0–6.0 ft	0.0765J	2.23	88.9	0.344J	0.119J	6.90	0.0238J	6.66	6.47	ND (0.07)	mg/kg
Quality Assurance/Quality Control Samples															
034141-004	27-GR-020-0-FB	Water	9/9/97	NA	ND (0.00062)	ND (0.00293)	ND (0.000332)	ND (0.000223)	0.000335J	ND (0.000729)	ND (0.000104)	ND (0.00227)	0.000934J	ND (0.0014)	mg/L
034142-004	27-GR-021-0-EB	Water	9/9/97	NA	ND (0.00062)	ND (0.00293)	0.000604J	ND (0.000223)	0.000350J	ND (0.000729)	ND (0.000104)	ND (0.00227)	ND (0.000678)	ND (0.0014)	mg/L
034195-004	27-GR-037-0-FB	Water	9/11/97	NA	0.00165J	ND (0.00293)	0.000707J	ND (0.000223)	0.000298J	ND (0.000729)	ND (0.000104)	ND (0.00227)	0.000841J	ND (0.0014)	mg/L
034196-004	27-GR-038-0-EB	Water	9/11/97	NA	0.00240J	ND (0.00293)	0.00216J	ND (0.000223)	ND (0.000208)	ND (0.000729)	ND (0.000104)	ND (0.00227)	0.000858J	ND (0.0014)	mg/L

Refer to footnotes at end of table.

Table 2.4.5-3 (Concluded)
Summary of SWMU 27 VCM Confirmatory Trench Soil Sampling Analytical Results; Inorganic Constituents (RCRA Metals)

Sample Number	ER Sample ID	Sample Matrix	Sample Date	Sample Depth	RCRA Metals (EPA Methods 6010A and 7470/7471[a])										Units
					Ag	As	Ba	Be	Cd	Cr	Hg	Ni	Pb	Se	
035230-004	27-GR-044-0-EB	Water	9/17/97	NA	ND (0.00062)	ND (0.00293)	ND (0.000332)	ND (0.000223)	ND (0.000208)	ND (0.000729)	ND (0.000104)	ND (0.00227)	ND (0.000678)	ND (0.0014)	mg/L
035229-004	27-GR-043-0-FB	Water	9/17/97	NA	ND (0.00062)	ND (0.00293)	ND (0.000332)	ND (0.000223)	ND (0.000208)	ND (0.000729)	ND (0.000104)	ND (0.00227)	ND (0.000678)	ND (0.0014)	mg/L
SNL/NM Foothills Background Range[b]		Soil	NA	NA	0.01–0.50	1.6–9.6	39–400	0.2–0.73	0.09–0.99	2.5–20	0.01–0.13	5.3–16	4.7–51	0.56–3.1	mg/kg
SNL/NM Foothills Soil Background UTL or 95th-Percentile[b]		Soil	NA	NA	<0.5[c]	9.8	246	0.75	0.64[c]	18.8	0.055[c]	16.6	18.9[c]	3.0[c]	mg/kg

ER Sample ID Information: 27B = SWMU sample location; GR = grab sample; 013 = sample number; 8 = depth of sample; S = soil sample.

[a]EPA November 1986.
[b]SNL/NM December 1997 (all metals background values, except Se, were verbally approved by NMED HRMB as of May 1998).
[c]95th-percentile provided instead of UTL.

Ag = Silver.
As = Arsenic.
Ba = Barium.
Be = Beryllium.
BTF = Burn pit excavation floor sample.
BTW = Burn pit excavation wall sample.
Cd = Cadmium.
Cr = Chromium.
D = Duplicate.
EB = Equipment blank.
EF = Exploratory trench excavation floor sample.
EPA = U.S. Environmental Protection Agency.
ER = Environmental restoration.
FB = Field blank.
ft = Foot (feet).
GR = Grab sample.
Hg = Mercury.
HRMB = Hazardous and Radioactive Materials Bureau.
ID = Identification.
J = The estimated value reported is either above the MDL and less than the practical quantitation limit or above the instrument detection limit and less than the contract required detection limit.
kg = Kilogram(s).
L = Liter(s).
MDL = Method detection limit.
mg = Milligram(s).
MTW = Mound area excavation wall sample.
NA = Not applicable.
ND ( ) = Not detected at or above the MDL, shown in parenthesis.
Ni = Nickel.
NMED = New Mexico Environment Department.
Pb = Lead.
RCRA = Resource Conservation and Recovery Act.
SD = Soil sample duplicate.
Se = Selenium.
SNL/NM = Sandia National Laboratories, New Mexico
SWMU = Solid waste management unit.
UTL = Upper tolerance limit.
VCM = Voluntary corrective measures.

Table 2.4.5-4
Summary of SWMU 27 VCM Confirmatory Trench Soil Sampling Analytical Results; Organic Constituents (TCL Pesticides and Herbicides)

Sample Number	ER Sample ID	Sample Matrix	Sample Date	Sample Depth	TCL Pesticides and Herbicides (EPA Methods 8080 and 8151)						Units
					Aldrin	Dieldrin	alpha-Lindane	delta-Lindane	gamma-Lindane	2,4,5-TP (silvex)	
034130-002	27BTW-GR-009-8-S	Soil	9/9/97	8.0–9.0 ft	ND (0.33)	ND (0.66)	ND (0.33)	ND (0.33)	ND (0.33)	ND (0.0936)	µg/kg
034131-002	27BTW-GR-010-8-S	Soil	9/9/97	8.0–9.0 ft	ND (0.33)	ND (0.66)	0.45J	ND (0.33)	ND (0.33)	ND (0.0936)	µg/kg
034132-002	27BTF-GR-011-12-S	Soil	9/9/97	12.0–13.0 ft	ND (0.33)	ND (0.66)	0.47J	ND (0.33)	ND (0.33)	ND (0.0936)	µg/kg
034133-002	27BTF-GR-012-12-S	Soil	9/9/97	12.0–13.0 ft	ND (0.33)	ND (0.66)	ND (0.33)	ND (0.33)	ND (0.33)	4.0	µg/kg
034124-002	27MTW-GR-003-8-S	Soil	9/11/97	8.0–9.0 ft	ND (0.33)	ND (0.66)	ND (0.33)	ND (0.33)	0.47J	ND (0.0936)	µg/kg
034125-002	27MTW-GR-004-8-S	Soil	9/11/97	8.0–9.0 ft	0.75J	ND (0.66)	0.49J	ND (0.33)	0.47J	ND (0.0936)	µg/kg
034126-002	27MTF-GR-005-12-S	Soil	9/11/97	12.0–13.0 ft	ND (0.33)	ND (0.66)	ND (0.33)	ND (0.33)	0.53J	ND (0.0936)	µg/kg
034127-002	27MTF-GR-006-12-S	Soil	9/11/97	12.0–13.0 ft	ND (0.33)	ND (0.66)	ND (0.33)	ND (0.33)	ND (0.33)	ND (0.0936)	µg/kg
035231-002	27EF-GR-043-5-SD	Soil	9/17/97	5.0–6.0 ft	ND (0.33)	ND (0.66)	ND (0.33)	0.86J	0.43J	ND (0.0936)	µg/kg
035134-002	27EF-GR-013-5-S	Soil	9/17/97	5.0–6.0 ft	ND (0.33)	ND (0.66)	0.51J	ND (0.33)	0.68J	ND (0.0936)	µg/kg
035135-002	27EF-GR-014-5-S	Soil	9/17/97	5.0–6.0 ft	ND (0.33)	ND (0.66)	ND (0.33)	ND (0.33)	ND (0.33)	ND (0.0936)	µg/kg
035136-002	27EF-GR-015-5-S	Soil	9/17/97	5.0–6.0 ft	ND (0.33)	1.3J	ND (0.33)	1.1J	ND (0.33)	ND (0.0936)	µg/kg
035137-002	27EF-GR-016-5-S	Soil	9/17/97	5.0–6.0 ft	0.61J	ND (0.66)	ND (0.33)	ND (0.33)	ND (0.33)	ND (0.0936)	µg/kg
035138-002	27EF-GR-017-5-S	Soil	9/17/97	5.0–6.0 ft	ND (0.33)	ND (0.66)	0.52J	ND (0.33)	0.44J	ND (0.0936)	µg/kg
Quality Assurance/Quality Control Samples											
034141-005	27-GR-020-0-FB	Water	9/9/97	NA	ND (0.01)	ND (0.02)	ND (0.01)	ND (0.01)	ND (0.01)	NR	µg/L
034141-006	27-GR-020-0-FB	Water	9/9/97	NA	NR	NR	NR	NR	NR	ND (0.008)	µg/L
034142-005	27-GR-021-0-EB	Water	9/9/97	NA	ND (0.01)	ND (0.02)	ND (0.01)	0.0308J	ND (0.01)	NR	µg/L
034142-006	27-GR-021-0-EB	Water	9/9/97	NA	NR	NR	NR	NR	NR	ND (0.008)	µg/L
034195-005	27-GR-037-0-FB	Water	9/11/97	NA	ND (0.01)	ND (0.02)	ND (0.01)	ND (0.01)	ND (0.01)	NR	µg/L
034195-006	27-GR-037-0-FB	Water	9/11/97	NA	NR	NR	NR	NR	NR	ND (0.008)	µg/L
034196-005	27-GR-038-0-EB	Water	9/11/97	NA	0.0177J	ND (0.02)	ND (0.01)	ND (0.01)	ND (0.01)	NR	µg/L
034196-006	27-GR-038-0-EB	Water	9/11/97	NA	NR	NR	NR	NR	NR	ND (0.008)	µg/L
035230-005	27-GR-044-0-EB	Water	9/17/97	NA	ND (0.01)	ND (0.02)	ND (0.01)	ND (0.01)	ND (0.01)	NR	µg/L
035230-006	27-GR-044-0-EB	Water	9/17/97	NA	NR	NR	NR	NR	NR	ND (0.008)	µg/L
035229-005	27-GR-043-0-FB	Water	9/17/97	NA	ND (0.01)	ND (0.02)	ND (0.01)	ND (0.01)	ND (0.01)	NR	µg/L
035229-006	27-GR-043-0-FB	Water	9/17/97	NA	NR	NR	NR	NR	NR	5.8	µg/L

ER Sample ID Information: 27 = SWMU sample location; BTW = burn pit excavation wall sample; GR = grab sample; 009 = sample number; 8 = depth of sample; S = soil sample.

BTF = Burn pit excavation floor sample.
BTW = Burn pit excavation wall sample.
D = Duplicate.
EB = Equipment blank.
EF = Exploratory trench excavation floor sample.
EPA = U.S. Environmental Protection Agency.
ER = Environmental restoration.
FB = Field blank.
ft = Foot (feet).
GR = Grab sample.
ID = Identification.
J = The estimated value reported is either above the MDL and less than the practical quantitation limit or above the instrument detection limit and less than the contract required detection limit.
kg = Kilogram(s).
L = Liter(s).
MDL = Method detection limit.
MTF = Mound area excavation floor sample.
MTW = Mound area excavation wall sample.
NA = Not applicable.
ND ( ) = Not detected at or above the MDL, shown in parenthesis.
NR = Not reported.
S = Soil sample.
SWMU = Solid waste management unit.
TCL = Target compound list.
VCM = Voluntary corrective measures.
µg = Microgram(s).

(maximum concentration level is 0.68J µg/kg); 2,4,5-TP (silvex) was found in one sample (concentration level is 4 µg/kg). The presence of these compounds at residual levels is the result of their use in inhibiting weed growth in the immediate area. Refer to Table 2.4.4-15 for a complete list of organic compounds included in the TCL pesticides/herbicides analyses, including their respective method detection limits and reporting limits.

A risk assessment was performed on the results from pesticide/herbicide analysis for all of the confirmatory soil samples collected from SWMU 27 (Annex 2-C). The assessment indicates that the concentration levels of pesticides/herbicides found at the site do not pose a threat to human health or the environment. Pesticides/herbicides were found in samples at depths greater than 5 feet bgs, therefore, no ecological risk assessment was performed.

Radionuclides—Trench Floor/Wall

Table 2.4.5-5 presents the on-site analytical results for radionuclides (using gamma spectroscopy) for the VCM confirmatory samples (trench floor and wall) collected from SWMU 27. Additionally, one confirmatory sample was collected during the RFI sampling in June 1997, and the results for this sample are also provided in Table 2.4.5-5. Fourteen of the fifteen samples collected contained uranium-238 concentration levels below the MDA for uranium-238; the one remaining sample with detectable activity was below the HRMB maximum background concentration level (2.31 pCi/g) (Dinwiddie September 24, 1997). The MDAs for 7 of the 15 uranium-238 confirmatory soil trench wall samples exceeded the SNL/NM Foothills maximum background concentration level (2.86 pCi/g) (IT March 1996). Based upon guidelines for radiological constituents in soils (Yu et al. 1993), these values are orders of magnitude less than the PRGs (see VCM report, Annex 2-B) and do not pose a threat to human health or the environment. Although the MDA for gamma-emitting radionuclides was sometimes higher than the background level for that radionuclide, they were nevertheless orders of magnitude less than a risk-based PRG which is based upon a 15 mrem/yr EDE maximum dose limit found in EPA's OSWER Directive No. 9200.4-18, "Establishment of Cleanup Levels for CERCLA Sites with Radioactive Contamination" (EPA 1997). Therefore the analytical results are acceptable. All samples contained thorium-234 concentration levels below MDAs or below the HRMB maximum background concentration level (2.31 pCi/g). Two samples contained thorium-232 concentration levels above the HRMB maximum background concentration level (1.03 pCi/g) but were below the SNL/NM Foothills maximum background concentration level (1.18 pCi/g). Two samples contained radium-228 concentration levels exceeding the HRMB maximum background concentration level (1.08 pCi/g) but was less than the SNL/NM Foothills maximum background concentration level (1.32 pCi/g). All samples contained uranium-235 concentration levels below the MDAs. However, all the MDAs exceed the HRMB maximum background concentration level of 0.16 pCi/g but did not exceed the SNL/NM Foothills maximum background concentration level of 3.0 pCi/g. Based upon guidelines for radiological constituents in soils (Yu et al. 1993), these values are much less than the PRGs (see the VCM report, Annex 2-B), and do not pose a threat to human health the environment. All samples contained cesium-137 concentration levels below the HRMB maximum background concentration level (1.063 pCi/g). Complete results of gamma spectroscopy analyses are provided in Annex 2-B.

2.4.6 Quality Assurance/Quality Control Results

Metals

Tables 2.4.4-3, 2.4.4-9, 2.4.4-21, 2.4.5-1, and 2.4.5-3 present the results of metals QA/QC samples collected during the RFI program at SWMU 27. The sample analytical results in these tables include, scoping, background, debris characterization, and confirmatory soil samples. An off-site laboratory performed all QA/QC for metals analyses. In addition, QA/QC samples consisted of five field blanks (27C-GR-042-FB [034991-004], 27C-GR-042-FB [034991-007], 27-GR-020-0-FB [034141-004], 27-GR-037-0-FB [034195-004], and 27-GR-043-0-FB [035229-004]), five equipment rinsate blanks (27C-GR-043-EB [034992-004], 27-C-GR-043-EB [034992-007], 27-GR-021-0-EB [034142-004], 27-GR-038-0-EB [034196-004], and 27-GR-044-0-EB [035230-004]), and a check sample of the water used for decontamination of equipment during field work (27-GR-044-DCW [034996-011]). Results of the blank analyses showed concentrations of several metals just above their respective detection levels. Three of the field blanks had metal detections for cadmium; with barium, silver, and lead each being detected twice and selenium being detected once. Equipment blank samples had silver and cadmium detected twice, barium detected in three samples, and lead detected in one. One of the two decontamination water samples had detections of silver, barium, cadmium, chromium, lead, and selenium. The other sample was ND for all metals.

One duplicate debris sample was collected during RFI sampling (27A-GR-003-0-SD [034994-002]) at SWMU 27 and analyzed off-site for TCLP metals. The relative percent difference (RPD) for the various metals ranged from two to 64 percent.

Radionuclides

Tables 2.4.3-1, 2.4.4-1, 2.4.4-7, 2.4.4-16, 2.4.4-19, 2.4.4-22, and 2.4.5-2 present the analytical results of gamma spectroscopy analyses of radionuclides in QA/QC samples collected during debris characterization and RFI soil sampling at SWMU 27. Table 2.4.4-23 shows the results for gross alpha and beta analyses. All QA/QC analyses for radionuclides were performed on site at SNL/NM. QA/QC samples included five field blanks (1332-27-005-FB, 27C-GR-042-FB [034991-004], 27GR-020-0-FB [034141-003], 27-GR-043-0-FB [035229-003], and 27-GR-037-0-FB [034195-003]), five equipment rinsate blanks (1332-27-005-R, 27C-GR-043-EB [034992-004], 27-GR-021-0-EB [034142-003], 27-GR-044-0-EB [035230-003], and 27-GR-038-0-EB [034196-003]), and one decontamination rinse water sample (27-GR-044-DCW). No radionuclides were detected in any of the blank or rinsate water samples.

Three duplicate soil/debris samples were collected for gamma spectroscopy analyses (1332-27-005-0.5-D, 27A-GR-003-SD, and 27BVD-C-036-0-S) and one duplicate sample for gross alpha beta analysis of debris (27A-GR-003-0-SD). All samples were all analyzed on site at SNL/NM for radionuclides. Activities of the radionuclides in the duplicate samples were closely comparable except for radium-228 in sample 27BVD-C-036-0-S. The primary sample, 27BV-035-0-S was ND for this radionuclide while the duplicate sample had a reported concentration well above the detection level at 8.74E-01 pCi/g (Table 2.4.5-2); this could be explained by an inhomogeneity in one or both of these samples. RPD values cannot be calculated for this sample pair since the primary sample was non-detect.

Table 2.4.5-5
Summary of SWMU 27 VCM Confirmatory Trench Soil Sampling Analytical Results; Radiological Constituents (Gamma Spectroscopy)

Sample Number	ER Sample ID	Sample Matrix	Sample Date	Sample Depth	Gamma Spectroscopy Activity[a] (EPA Method 901.1)						Units
					U-238[b]	Th-234[b]	Th-232[b]	Ra-228[b]	U-235[b]	Cs-137[b]	
034962-004	27B-GR-013-8-S	Soil	6/12/97	8.0–9.0 ft	ND (1.41E+00)	6.54E-01	9.68E-01	1.11E+00	ND (2.10E-01)	3.45E-02	pCi/g
034130-003	27BTW-GR-009-8-S	Soil	9/9/97	8.0–9.0 ft	ND (1.80E+00)	1.12E+00	1.02E+00	8.39E-01	ND (2.37E-01)	ND (4.62E-02)	pCi/g
034131-003	27BTW-GR-010-8-S	Soil	9/9/97	8.0–9.0 ft	ND (1.05E+00)	9.73E-01	1.05E+00	1.01E+00	ND (2.04E-01)	ND (3.90E-02)	pCi/g
034132-003	27BTF-GR-011-12-S	Soil	9/9/97	12.0–13.0 ft	ND (1.71E+00)	1.04E+00	8.82E-01	8.87E-01	ND (2.27E-01)	ND (4.26E-02)	pCi/g
034133-003	27BTF-GR-012-12-S	Soil	9/9/97	12.0–13.0 ft	4.99E-01	1.11E+00	8.97E-01	8.21E-01	ND (2.00E-01)	ND (3.94E-02)	pCi/g
034124-003	27MTW-GR-003-8-S	Soil	9/11/97	8.0–9.0 ft	ND (3.23E+00)	1.12E+00	ND (1.42E-01)	1.02E+00	ND (2.39E-01)	ND (3.29E-02)	pCi/g
034125-003	27MTW-GR-004-8-S	Soil	9/11/97	8.0–9.0 ft	ND (1.71E+00)	1.31E+00	1.11E+00	1.19E+00	ND (2.29E-01)	ND (4.16E-02)	pCi/g
034126-003	27MTF-GR-005-12-S	Soil	9/11/97	12.0–13.0 ft	ND (1.42E+00)	1.39E+00	9.86E-01	9.97E-01	ND (2.02E-01)	ND (3.93E-02)	pCi/g
034127-003	27MTF-GR-006-12-S	Soil	9/11/97	12.0–13.0 ft	ND (1.54E+00)	1.27E+00	7.79E-01	9.34E-01	ND (2.10E-01)	ND (3.89E-02)	pCi/g
035231-003	27EF-GR-043-5-SD	Soil	9/17/97	5.0–6.0 ft	ND (3.18E+00)	7.38E-01	8.93E-01	7.46E-01	ND (2.35E-01)	ND (3.14E-02)	pCi/g
035134-003	27EF-GR-013-5-S	Soil	9/17/97	5.0–6.0 ft	ND (3.19E+00)	1.05E+00	9.27E-01	8.86E-01	ND (2.41E-01)	ND (3.13E-02)	pCi/g
035135-003	27EF-GR-014-5-S	Soil	9/17/97	5.0–6.0 ft	ND (3.06E+00)	ND (7.29E-01)	9.78E-01	1.08E+00	ND (2.21E-01)	ND (3.08E-02)	pCi/g
035136-003	27EF-GR-015-5-S	Soil	9/17/97	5.0–6.0 ft	ND (2.96E+00)	9.86E-01	8.44E-01	8.36E-01	ND (2.23E-01)	1.33E-02	pCi/g
035137-003	27EF-GR-016-5-S	Soil	9/17/97	5.0–6.0 ft	ND (3.61E+00)	ND (8.48E-01)	9.16E-01	8.75E-01	ND (2.50E-01)	ND (2.07E-02)	pCi/g
035138-003	27EF-GR-017-5-S	Soil	9/17/97	5.0–6.0 ft	ND (3.40E+00)	1.35E+00	8.72E-01	8.90E-01	ND (2.50E-01)	ND (3.52E-02)	pCi/g
Quality Assurance/Quality Control Samples											
034141-003	27-GR-020-0-FB	Water	9/9/97	NA	ND (8.64E-01)	ND (2.96E-01)	ND (1.41E-01)	ND (1.16E-01)	ND(1.29E-01)	ND(1.93E-02)	pCi/mL
034142-003	27-GR-021-0-EB	Water	9/9/97	NA	ND (8.78E-01)	ND (2.91E-01)	ND (1.31E-01)	ND (1.19E-01)	ND (1.27E-01)	ND (2.06E-02)	pCi/ml
035230-003	27-GR-044-0-EB	Water	9/17/97	NA	ND (1.72E+00)	ND (4.18E-01)	ND (1.64E-01)	ND (1.31E-01)	ND (1.60E-01)	ND (2.39E-02)	pCi/mL
035229-003	27-GR-043-0-FB	Water	9/17/97	NA	ND (1.83E+00)	ND (3.99E-01)	ND (1.50E-01)	ND (1.43E-01)	ND (1.52E-01)	ND (2.19E-02)	pCi/mL
034195-003	27-GR-037-0-FB	Water	9/11/97	NA	ND (7.89E-01)	ND (3.24E-01)	ND (1.51E-01)	ND (1.69E-01)	ND (1.35E-01)	ND (2.72E-02)	pCi/mL
034196-003	27-GR-038-0-EB	Water	9/11/97	NA	ND (7.86E-01)	ND (2.17E-01)	ND (1.53E-01)	ND (1.40E-01)	ND (1.36E-01)	ND (2.76E-02)	pCi/mL
SNL/NM Foothills Background Range[c]		NA	NA	NA	0.153–2.86	0.69–2.03	0.113–1.18	0.113–1.32	0.004–3.0	0.007–0.876	pCi/g
HRMB Maximum Background[d]		NA	NA	NA	2.31	2.31	1.03	1.08	0.16	1.063	pCi/g

ER Sample ID Information: 27B = SWMU sample location; GR = grab sample; 013 = sample number; 8 = depth of sample; S = soil sample.

[a]Uranium-238 and thorium-232 decay chain isotopes with a short half-life are not presented in this table.

[b]Value in parenthesis represents the minimum detection activity.

[c]JT March 1996.

[d]Dinwiddie September 24, 1997.

Cs = Cesium.
D = Duplicate.
EB = Equipment blank.
EPA = U.S. Environmental Protection Agency.
ER = Environmental restoration.
FB = Field blank.
ft = Foot (feet).
g = Gram(s).
HRMB = Hazardous and Radioactive Materials Bureau
ID = Identification.
L = Liter(s).
NA = Not applicable.
ND ( ) = Nondetect—the analyte was not observed above the MDA.
pCi = Picocurie(s).
Ra = Radium.
S = Soil sample.
SD = Soil sample duplicate.
SNL/NM = Sandia National Laboratories/New Mexico.
SWMU = Solid waste management unit.
Th = Thorium.
U = Uranium.
VCM = Voluntary corrective measures.

Pesticides and Herbicides

Tables 2.4.4-14 and 2.4.5-4 present the analytical results of herbicides and pesticides in QA/QC samples collected during confirmatory soil sampling at SWMU 27. All samples were analyzed off-site. QA/QC samples consisted of one field blank (27C-GR-042-FB [034991-009 and 010]) and one equipment rinsate blank (27C-GR-043-EB [034992-009 and 010]). All of the blank samples were ND for these chemicals except for three isolated occurrences. Aldrin and delta-Lindane were reported at just above their detection level and 2,4,5-TP (silvex) was reported at 5.8 µg/L (Table 2.4.5-4).

One duplicate sample (27A-GR-003-0-SD [034994-004]) was collected during confirmatory sampling at SWMU 27. The analytical results for both the primary and duplicate samples were nondetect for pesticides and herbicides.

VOCs and SVOCs

Tables 2.4.4-10 and 2.4.4-12 present the QA/QC results of confirmatory soil samples collected for VOC and SVOC analyses at SWMU 27. All QA/QC samples for VOCs and SVOCs were analyzed off-site. QA/QC samples consisted of two field blanks (27C-GR-042-FB [034991-008] and 27C-GR-042-FB [034991-005]), two equipment blanks (27C-GR-0-043-EB [034992-008] and 27C-GR-043-EB [034992-005]), and two trip blanks for VOC samples (27C-GR-040-0-TB and 27C-GR-041-0-TB). All but one of the field, trip, and equipment blanks were non-detect for all compounds. Trip blank sample 27C-GR-040-0-TB had reported detections for methylene chloride 7.29B µg/L, acetone 6.11J µg/L, and styrene 1.72J µg/L.

One duplicate VOC and SVOC sample (27A-GR-003-0-SD [034994-004] was collected during RFI soil sampling. All VOCs and SVOCs were below their respective detection limits.

2.4.7 Data Validation

The SNL/NM ER Project Office conducted Data Validation I and Data Validation II reviews of the off-site data in accordance with Technical Operating Procedure 94-03, Rev. 0 (SNL/NM July 1994).

The data validation review was performed for TCLP metals, RCRA metals, and pesticides/herbicides analysis. The review included assessment of holding times, method blanks, matrix spike/matrix spike duplicates (MS/MSD), laboratory control sample/laboratory control sample duplicates (LCS/LCSD), surrogate data, and field/equipment rinsate blank data. All of the solid and liquid samples were prepared and analyzed in accordance with specified EPA methods and accepted procedures. All compounds were successfully analyzed. No significant problems were noted during the review of the data packages. A few minor problems were identified and are presented below.

TCLP Metals Analyses

All samples were analyzed within the prescribed holding times. Instrument calibration was within acceptance criteria. LCS/LCSD met recovery and RPD control limits, except for percent

recovery for selenium. It was slightly greater than the upper control limit. The MS/MSD met recovery and RPD control limits for all analytes, including selenium. No data was qualified. No target analytes were detected in the method blank, except for arsenic. The sample concentration for arsenic was less than five times the method blank concentration and was U-coded (nondetect) according to the blank rule (SNL/NM July 1994).

RCRA Metals Analyses

Prescribed holding times were met for all the samples analyzed for RCRA metals. Instrument calibration was within acceptance criteria. QC measurements (LCS/LCSD and MS/MSD) met acceptable criteria except aluminum, calcium, and magnesium, which were detected in the method blank. The sample concentrations were five times greater than the method blank concentration, and according to the blank rule (SNL/NM July 1994), no data was qualified. No target analytes were detected in the field blanks or equipment rinsate blanks, and no data were qualified.

Pesticides/Herbicides Analyses

All samples were analyzed within the prescribed holding times. Instrument calibration was acceptable for all analytes except methoxychlor, which was high biased. This analyte was not detected, therefore, the calibration biased has no impact on data quality. Surrogates met acceptable criteria for percent recovery. LCS/LCSD and MS/MSD met recovery and RPD control limits. No target analytes were detected in the field blanks or equipment rinsate blanks. No data was qualified.

In summary, the data was considered representative of materials sampled, matrix interference was not observed as a problem, and there is no uncertainty resulting from the materials sampled. Analytical data packages and data validation checklists are archived in the SNL/NM ER Records Center located in Room 122 of Building 6584, Technical Area III.

2.5 Site Conceptual Model

2.5.1 Nature and Extent of Contamination

The COCs from confirmatory soil samples (includes soil pile and trench floor/wall samples) at SWMU 27 are metals and radionuclides. Although pesticides and herbicides were found at SWMU 27, they were used for purposes for which they were intended, and are not RCRA COCs. In all cases, the COCs are only slightly elevated above approved SNL/NM maximum background concentration limits and/or are slightly above levels of detection (IT March 1996; Dinwiddie September 24, 1997; SNL/NM December 1997). Silver does not have a quantified background concentration level; however, in terms of risk, the silver concentration levels do not pose significant risk to either human health or ecological receptors. For metals and radionuclides, background concentration levels include either a 95th upper tolerance limit (UTL) or 95th percentile. The 95th UTL or 95th percentile implies that 5 percent of the background concentration levels comprising the natural background population are expected to be above the 95th UTL or 95th percentile. Therefore, SWMU 27 samples did contain concentration levels above the 95th UTL or 95th percentile, but do not necessarily represent contamination. The COCs for SWMU 27 are summarized in Table 2.5.1-1.

Table 2.5.1-1
Summary of COCs from Confirmatory Soil Samples at SWMU 27

Number of Samples	COCs Greater than Background or Detection Limit	Maximum Background UTL Limit[a]	Maximum Concentration	Average Concentration[b]	Sampling Locations Where Approved SNL/NM Maximum Background Concentration Limit Exceeded or Detection Limit Exceeded
24 environmental (soil pile and trench floor/wall) samples 2 duplicates	Mercury	0.055 mg/kg	0.0787 mg/kg	0.03 mg/kg	27MTW-GR-004-8-S 27BV-C-034-0-S 27BV-C-035-0-S 27BVD-C-036-0-S
24 environmental (soil pile and trench floor/wall) samples 2 duplicates	Lead	18.9 mg/kg	19.1 mg/kg	7.48 mg/kg	27MTW-GR-006-12-S
13 environmental (trench floor/wall) samples 1 duplicate	Aldrin[c]	NA	0.75J µg/kg	0.38 µg/kg	27MTW-GR-004-8-S 27EF-GR-016-5-S
13 environmental (trench floor/wall) samples 1 duplicate	Dieldrin[c]	NA	1.3J µg/kg	0.71 µg/kg	27EF-GR-015-5-S
13 environmental (trench floor/wall) samples 1 duplicate	alpha-Lindane[c]	NA	0.52J µg/kg	0.39 µg/kg	27BTW-GR-010-8-S 27BTF-GR-011-12-S 27MTW-GR-004-8-S 27EF-GR-013-5-S 27EF-GR-017-5-S
13 environmental (trench floor/wall) samples 1 duplicate	delta-Lindane[c]	NA	1.1J	0.42 µg/kg	27EF-GR-043-5-SD 27EF-GR-015-5-S
13 environmental (trench floor/wall) samples 1 duplicate	gamma-Lindane[c]	NA	0.68J µg/kg	0.40 µg/kg	27MTW-GR-003-8-S 27MTW-GR-004-8-S 27MTF-GR-005-12-S 27EF-GR-043-5-SD 27EF-GR-013-5-S 27EF-GR-017-5-S
13 environmental (trench floor/wall) samples 1 duplicate	2,4,5-TP (silvex)[c]	NA	4 µg/kg	0.37 µg/kg	27BTF-GR-012-12-S
24 environmental (soil pile and trench) samples 2 duplicates	Th-232	1.03 pCi/g	1.13 pCi/g	Not calculated[d]	27BTW-GR-010-8-S 27MTW-GR-004-8-S 27SP-C-030-0-S 27SP-C-031-0-S 27BV-C-034-0-S 27MV-C-041-0-S 27MV-C-042-0-S

Refer to footnotes at end of table.

Table 2.5.1-1 (Concluded)
Summary of COCs from Confirmatory Soil Samples at SWMU 27

Number of Samples	COCs Greater than Background or Detection Limit	Maximum Background UTL Limit[a]	Maximum Concentration	Average Concentration[b]	Sampling Locations Where Approved SNL/NM Maximum Background Concentration Limit Exceeded or Detection Limit Exceeded
24 environmental 2 duplicate (soil pile and trench floor/wall) samples	Ra-228	1.08 pCi/g	1.2 pCi/g	Not calculated	27B-GR-013-8-S 27MTW-GR-04-8-S 27SP-C-030-0-S 27MV-C-039-0-S 27MV-C-041-0-S 27MV-C-042-0-S

[a]Dinwiddie September 24, 1997; SNL/NM December 1997.
[b]Average concentration includes all samples and duplicates. For nondetectable results, the detection limit is used to calculate the average.
[c]Not a Resource Conservation and Recovery Act (RCRA) COC because this pesticide/herbicide was used for the purpose for which it was intended.
[d]An average MDA is not calculated because of the variability of the counting error and the number of reported nondetectable activities. These nondetectable activities are solely a function of instrument counting duration, rather than an indication of presence or absence of a specific radionuclide in the environment.

BTF = Burn pit excavation floor sample.
BV = Burn pit excavation soil pile sample.
BVD = Burn pit excavation soil pile sample duplicate.
C = Composite.
COC = Constituent of concern
EF = Exploratory trench excavation floor sample.
g = Gram(s).
GR = Grab sample.
J = The estimated value reported is either above the highest calibration standard or less than the practical quantification limit.
kg = Kilogram(s).
MDA = Minimum detectable activities.
mg = Milligram(s).
MTW = Mound area excavation soil sample.
MV = Mound excavation soil sample.
NA = Not applicable.
pCi = Picocurie(s).
Ra = Radium.
RCRA = Resource Conservation and Recovery Act.
S = Soil sample.
SD = Soil sample duplicate.
SNL/NM = Sandia National Laboratories/New Mexico.
SP = Soil pile.
SWMU = Solid waste management unit.
Th = Thorium.
U = Uranium.
UTL = Upper tolerance limit.
µg = Microgram(s).

Table 2.5.1-1 summarizes potential COCs for SWMU 27. Of the 24 confirmatory soil samples collected for metals and radionuclide analysis, four samples exceeded the SNL/NM maximum background limit for mercury; one sample exceeded the limit for lead; seven samples exceeded the limit for thorium-232; and six samples exceeded the limit for radium-228. Of the 13 confirmatory soil samples collected for pesticides/herbicides analysis, two samples exceeded the detection limit for aldrin; one sample exceeded the limit for dieldrin; five samples exceeded the limit for alpha-Lindae; two samples exceeded the limit for delta-Lindane; six samples exceeded the limit for gamma-Lindane; and one sample exceeded the limit for silvex. Based upon the nature and extent of contamination at the site (Section 2.5.1), COCs occurred sporadically in the surface and subsurface soil and in the debris at the site at concentrations slightly above the maximum background concentration levels. All potential COCs are retained in the conceptual model and evaluated in the human health and ecological risk assessments.

The COCs that exceed the maximum background limits or are slightly above levels of detection typically occur as isolated occurrences of one or two different COCs with no particular COC associations or no correlation to a particular former burial feature (e.g., Burn Pit).

The nature and extent of contamination was delineated vertically by excavating to the bottom of the buried debris, then collecting confirmatory samples beneath the debris locations. In addition, exploratory trenches were excavated across the entire site to define the lateral extent of contamination. Therefore, the potential contaminant source(s) have been removed from the site and if any COCs remain at the site they are below any risk-based remediation goal and do not pose a hazard to human health or the environment.

2.5.2 Environmental Fate

Primary sources of COCs for the SWMU 27 were the debris formerly located on the surface at the site and the former burial pits and associated residues from these features. All of the debris (primarily soil) was removed during the RFI/VCM efforts conducted in 1997. This soil/debris met the criteria for unrestricted release of nonradioactive, nonhazardous/hazardous waste (SNL/NM April 1996). Prior to removal of the soil/debris, the primary release mechanism of COCs to the surface soil resulted from the weathering of metal residues; the release mechanism of COCs to the subsurface soil resulted from the uncontained burial of debris.

After the removal of the surface and buried soil/debris from the site, the secondary source of COCs are residual metals and radionuclides in the subsurface soil. The secondary release mechanisms at SWMU 27 are leaching and percolation through the vadose zone, dust emissions, and the uptake of COCs in the soil by biota (Figure 2.5.2-1). High partitioning coefficients and low mobility of these ions in the transporting medium would enhance dilution of the low concentrations of the COCs. In addition, depth to groundwater is estimated to be approximately 158 to 200 feet bgs. For these reasons, groundwater is not a viable contaminant migration pathway. For these reasons, groundwater is not a viable contaminant migration pathway. The pathways to receptors are surface water, soil water, air, and soil (radionuclides). Biota are also a pathway through food chain transfers. Additional discussion of the fate and transport of COCs at SWMU 27 is provided in Annex 2-C.

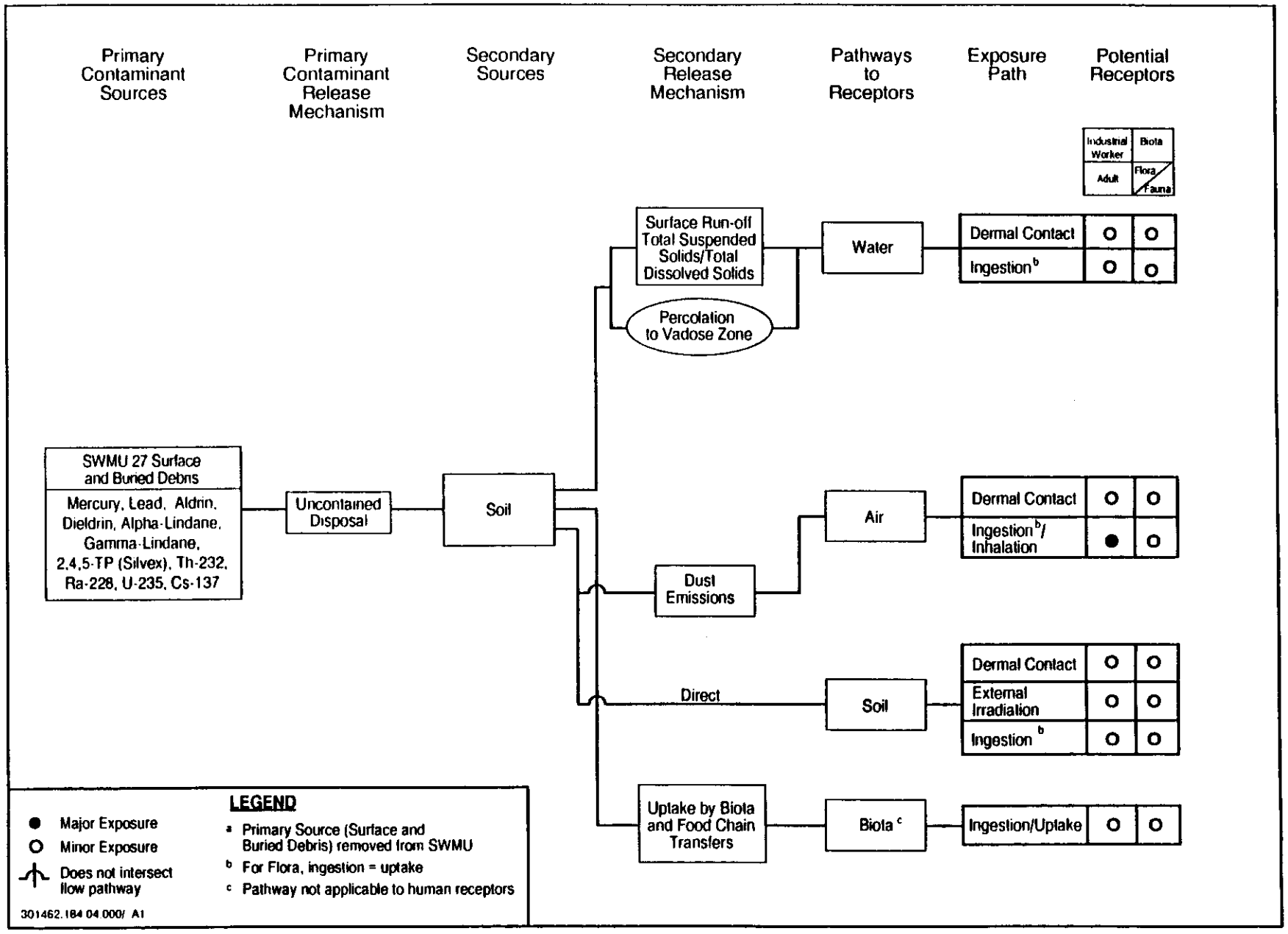


Figure 2.5.2-1

Conceptual Model Flow Diagram for SWMU 27, Building 9820 – Animal Disposal Pit

The current and future land use for SWMU 27 is recreational (DOE et al. October 1995). The potential human receptor is the recreational user of the site. External irradiation, ingestion, and inhalation of soil are considered minor exposure routes for the receptor. Potential biota receptors include flora and fauna at the site. The exposure route for biota and food chain transfers is direct uptake of COCs. Along with external irradiation, these are considered to be minor exposure routes. Additional discussion of the exposure routes and receptors at SWMU 27 is provided in Annex 2-C.

2.6 Site Assessments

2.6.1 Summary

The risk screening assessments conclude that SWMU 27 does not have significant potential to affect human health under a recreational land-use scenario. After considering the uncertainties associated with the available data and conservative modeling assumptions, potential ecological risks at SWMU 27 were found to be insignificant (or low). Brief descriptions of the human health and ecological screening assessments are provided below and detailed in the Risk Assessment Report (Annex 2-C).

2.6.2 Risk Screening Assessments

2.6.2.1 Human Health Risk Screening Assessment

SWMU 27 has been recommended for recreational land-use (DOE et al. October 1995). A complete discussion of the risk assessment process, results, and uncertainties is provided in Annex 2-C. Due to the presence of metal COCs and radionuclides in concentrations or activities greater than background levels, it was necessary to perform a human health risk screening assessment for the site. Besides the metal COCs, any relevant radionuclide compounds detected either above background levels and/or at MDAs were included in this assessment. The risk assessment process provides a quantitative evaluation of the potential adverse human health effects caused by constituents in the site's soil. The Risk Assessment Report (Annex 2-C) calculated the Hazard Index (HI) and excess cancer risk for both a recreational land-use and residential land-use setting. The excess cancer risk from nonradiological COCs and the radiological COCs is not additive (EPA 1989).

In summary, the HI calculated for SWMU 27 nonradiological COCs is 0.00 for a recreational land-use setting, which is less than the numerical standard of 1.0 suggested by risk assessment guidance (EPA 1989). Incremental risk is determined by subtracting the risk associated with background levels from potential nonradiological COC risk. The incremental HI is 0.00. The excess cancer risk for SWMU 27 nonradiological COCs is 2×10^{-9} for a recreational land-use setting. Guidance from the NMED indicates that excess lifetime risk of developing cancer by an individual must be less than 10^{-6} for Class A and B carcinogens and less than 10^{-5} for Class C carcinogens (NMED March 1998). Thus, the excess cancer risk for this site is below the suggested acceptable risk value (10^{-6}). The incremental excess cancer risk for SWMU 27 is 1.5×10^{-9}.

The incremental total effective dose equivalent (TEDE) for radionuclides for a recreational (or residential with loss of institutional control, or industrial, as appropriate) land-use setting for SWMU 27 is 3.5×10^{-2} mrem/yr, which is well below the standard dose limit of 15 mrem/yr found in EPA's Office of Solid Waste and Emergency Response Directive No. 9200.4-18 (EPA August 1997) and reflected in a document entitled "Sandia National Laboratories/New Mexico Environmental Restoration Project—RESRAD Input Parameter Assumptions and Justifications." The incremental excess cancer risk for SWMU 27 radionuclides is 5.8×10^{-7} for a recreational land-use scenario, which is much less than risk values calculated due to naturally occurring radiation and from intakes considered background concentration values.

The residential land-use scenarios for this site are provided only for comparison in the Risk Assessment Report (Annex 2-C). The report concludes that SWMU 27 does not have significant potential to affect human health under a recreational land-use scenario.

2.6.2.2 Ecological Risk Screening Assessment

An ecological screening assessment that corresponds with the screening procedures (NMED March 1998) in EPA's Ecological Risk Assessment Guidance for Superfund (EPA 1997) was performed as set forth by the NMED Risk-Based Decision Tree. An early step in the evaluation is comparison of COC concentration levels and identification of potentially bioactive constituents. This is presented in Annex 2-C, Sections III and VI; and Section VII.2 and VII.3. This methodology also requires the development of a site conceptual model and food web model, and selection of ecological receptors. Each of these items is presented in the "Predictive Ecological Risk Assessment Methodology for SNL/NM ER Program, Sandia National Laboratories/New Mexico" (IT June 1998) and will not be duplicated here. The screening assessment also includes the estimation of exposure and ecological risk.

The results of the ecological screening assessment screen are presented in Tables 16 through 19 of Annex 2-C. Site-specific information was incorporated into the screening assessment when such data were available. Hazard Quotients greater than unity were originally predicted; however, closer examination of the exposure assumptions revealed an overestimation of risk primarily attributed to exposure concentration (maximum COC concentration was used in the estimation of risk), and exposure setting (area use factors of one were assumed) as exposure concentrations. Based upon the evaluation of these uncertainties, ecological risks associated with this site are expected to be low.

2.6.3 Baseline Risk Assessments

2.6.3.1 Human Health Baseline Risk Assessment

Based upon the Human Health results of the screening assessment summarized in Section 2.6.2.1 which indicate that SWMU 27 does not have a potential to affect human health under a recreational land use scenario, a baseline human health risk assessment is not required for SWMU 27.

2.6.3.2 Ecological Baseline Risk Assessment

Based upon the screening assessment summarized in Section 2.6.2.2, an ecological baseline risk assessment is not required for SWMU 27.

2.6.4 Other Applicable Assessments

No other applicable assessments have been performed at SWMU 27.

2.7 No Further Action Proposal

2.7.1 Rationale for NFA

Based upon historical and process knowledge, field investigation data, remediation and confirmatory sampling data, and human health and ecological risk screening assessments, an NFA decision is recommended for SWMU 27 for the following reasons.

- All debris was removed from SWMU 27 during the RFI/VCM excavation activities and was confirmed by collection of confirmatory soil samples.
- No nonradiological or radiological COCs at concentration levels considered hazardous to human health for a recreational land-use scenario were present in soil remaining at the site.
- No VOCs or radionuclides were detected during the RFI/VCM field-screening programs.
- The risk screening assessment for ecological receptors indicate that the ecological risks associated SWMU 27 are low.

2.7.2 Criterion

Based upon the evidence provided above, SWMU 27 is proposed for an NFA decision in conformance with Criterion 5 (NMED March 1998), which states that the SWMU has been characterized and remediated in accordance with current and applicable state or federal regulations and that available data indicate that contaminants pose an acceptable level of risk under current and projected future land use.

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Annex 2-A

ANNEX 2-A
Results of SWMU 27 Sampling Analysis-Gamma Spectroscopy

ANNEX 2-A.1
Results of SWMU 27 RFI Scoping Soil Sampling
Analysis-Gamma Spectroscopy

****
* Sandia National Laboratories *
* Radiation Protection Sample Diagnostics Program [881 Laboratory] *
7-12-95 2:47:16 AM
****
* *
* Analyzed by: 7/12/95 Reviewed by: 7/12/95 *
****

Customer : S.WRIGHTSON (7585)
Customer Sample ID : 1332-27-001-0.5-SS
Lab Sample ID : 50051111

Sample Description : MARINELLI SOIL SAMPLE
Sample Type : Solid
Sample Geometry : 1SMAR
Sample Quantity : 684.000 gram
Sample Date/Time : 6-30-95 1:00:00 PM
Acquire Start Date : 7-12-95 2:12:53 AM
Detector Name : LAB01
Elapsed Live Time : 1800 seconds
Elapsed Real Time : 1801 seconds

Comments:
****

Nuclide	Activity (pCi/gram)	2S Error	MDA
U-238	Not Detected	--------	2.25
TH-234	Not Detected	--------	1.08
U-234	Not Detected	--------	2.08E+01
RA-226	9.08E-01	5.89E-01	8.90E-01
PB-214	7.04E-01	1.37E-01	1.04E-01
BI-214	6.09E-01	1.23E-01	1.02E-01
PB-210	Not Detected	--------	4.41E+01
TH-232	7.83E-01	2.66E-01	3.26E-01
RA-228	7.35E-01	2.72E-01	2.46E-01
AC-228	1.01	2.37E-01	2.12E-01
TH-228	1.15	5.07E-01	8.01E-01
RA-224	2.34	5.71E-01	7.61E-01
PB-212	1.02	2.05E-01	7.38E-02
BI-212	1.19	4.97E-01	6.46E-01
TL-208	8.04E-01	1.85E-01	1.82E-01
U-235	Not Detected	--------	4.02E-01
TH-231	Not Detected	--------	4.68E-01
PA-231	Not Detected	--------	2.29
AC-227	Not Detected	--------	2.99
TH-227	Not Detected	--------	6.75E-01
RA-223	Not Detected	--------	5.18E-01
RN-219	Not Detected	--------	3.58E-01
PB-211	Not Detected	--------	1.22
TL-207	Not Detected	--------	2.53E+01
AM-241	Not Detected	--------	2.73E-01
PU-239	Not Detected	--------	4.73E+02
NP-237	Not Detected	--------	3.37E-01
PA-233	Not Detected	--------	1.07E-01
TH-229	Not Detected	--------	4.28E-01

[Summary Report] - Sample ID: 50051111

Nuclide	Activity (pCi/gram)	2S Error	MDA
AG-110m	Not Detected	--------	6.15E-02
AR-41	Not Detected	--------	1.00E+26
BA-133	Not Detected	--------	1.10E-01
BA-140	Not Detected	--------	3.70E-01
CD-109	Not Detected	--------	1.18
CD-115	Not Detected	--------	4.36
CE-139	Not Detected	--------	5.92E-02
CE-141	Not Detected	--------	1.18E-01
CE-144	Not Detected	--------	4.19E-01
CO-56	Not Detected	--------	7.34E-02
CO-57	Not Detected	--------	5.38E-02
CO-58	Not Detected	--------	6.77E-02
CO-60	Not Detected	--------	6.66E-02
CR-51	Not Detected	--------	5.60E-01
CS-134	Not Detected	--------	9.29E-02
CS-137	Not Detected	--------	6.36E-02
CU-64	Not Detected	--------	4.92E+07
EU-152	Not Detected	--------	4.82E-01
EU-154	Not Detected	--------	3.46E-01
EU-155	Not Detected	--------	2.20E-01
FE-59	Not Detected	--------	1.50E-01
GD-153	Not Detected	--------	1.87E-01
HG-203	Not Detected	--------	6.53E-02
I-131	Not Detected	--------	1.43E-01
IN-115m	Not Detected	--------	5.03E+17
IR-192	Not Detected	--------	5.52E-02
K-40	1.94E+01	2.83	5.25E-01
LA-140	Not Detected	--------	7.62
MN-54	Not Detected	--------	6.87E-02
MN-56	Not Detected	--------	1.00E+26
MO-99	Not Detected	--------	7.94
NA-22	Not Detected	--------	7.37E-02
NA-24	Not Detected	--------	2.33E+04
NB-95	Not Detected	--------	2.89
ND-147	Not Detected	--------	7.45E-01
NI-57	Not Detected	--------	1.88E+01
BE-7	Not Detected	--------	5.14E-01
RU-103	Not Detected	--------	6.52E-02
RU-106	Not Detected	--------	5.22E-01
SB-122	Not Detected	--------	1.48
SB-124	Not Detected	--------	7.30E-02
SB-125	Not Detected	--------	1.50E-01
SC-46	Not Detected	--------	1.08E-01
SR-85	Not Detected	--------	7.38E-02
TA-182	Not Detected	--------	3.09E-01
TA-183	Not Detected	--------	1.12
TE-132	Not Detected	--------	5.70E-01
TL-201	Not Detected	--------	2.23
XE-133	Not Detected	--------	7.80
Y-88	Not Detected	--------	5.18E-02
ZN-65	Not Detected	--------	1.97E-01
ZR-95	Not Detected	--------	1.17E-01

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*****************************************************************************
*                    Sandia National Laboratories                           *
*    Radiation Protection Sample Diagnostics Program [881 Laboratory]       *
                        7-12-95  3:29:11 AM                                 *
   ***************************************************************************
*                                                                           *
* Analyzed by:  7/12/95          Reviewed by:  7/12/95                      *
*****************************************************************************
```

Customer : S.WRIGHTSON (7585)
Customer Sample ID : 1332-27-002-0.5-SS
Lab Sample ID : 50051112

Sample Description : MARINELLI SOIL SAMPLE
Sample Type : Solid
Sample Geometry : 1SMAR
Sample Quantity : 747.000 gram
Sample Date/Time : 6-30-95 1:02:00 PM
Acquire Start Date : 7-12-95 2:54:41 AM
Detector Name : LAB01
Elapsed Live Time : 1800 seconds
Elapsed Real Time : 1801 seconds

Comments:

Nuclide	Activity (pCi/gram)	2S Error	MDA
U-238	Not Detected	--------	2.16
TH-234	Not Detected	--------	8.49E-01
U-234	Not Detected	--------	2.14E+01
RA-226	1.48	6.16E-01	7.36E-01
PB-214	7.16E-01	1.41E-01	1.16E-01
BI-214	6.18E-01	1.20E-01	9.55E-02
PB-210	Not Detected	--------	3.90E+01
TH-232	7.59E-01	2.66E-01	3.36E-01
RA-228	8.93E-01	2.99E-01	2.40E-01
AC-228	9.24E-01	2.23E-01	2.12E-01
TH-228	9.38E-01	4.09E-01	8.19E-01
RA-224	2.01	4.99E-01	6.82E-01
PB-212	9.32E-01	1.77E-01	6.48E-02
BI-212	8.33E-01	5.05E-01	7.43E-01
TL-208	8.01E-01	1.60E-01	1.15E-01
U-235	Not Detected	--------	3.97E-01
TH-231	Not Detected	--------	3.99E-01
PA-231	Not Detected	--------	2.22
AC-227	Not Detected	--------	2.90
TH-227	Not Detected	--------	6.18E-01
RA-223	Not Detected	--------	4.99E-01
RN-219	Not Detected	--------	4.56E-01
PB-211	Not Detected	--------	1.14
TL-207	Not Detected	--------	2.38E+01
AM-241	Not Detected	--------	2.70E-01
PU-239	Not Detected	--------	3.05E+02
NP-237	Not Detected	--------	2.81E-01
PA-233	Not Detected	--------	1.03E-01
TH-229	Not Detected	--------	4.09E-01

[Summary Report] - Sample ID: 50051112

Nuclide	Activity (pCi/gram)	2S Error	MDA
AG-110m	Not Detected	--------	5.98E-02
AR-41	Not Detected	--------	1.00E+26
BA-133	Not Detected	--------	1.04E-01
BA-140	Not Detected	--------	3.65E-01
CD-109	Not Detected	--------	9.83E-01
CD-115	Not Detected	--------	4.10
CE-139	Not Detected	--------	5.61E-02
CE-141	Not Detected	--------	1.13E-01
CE-144	Not Detected	--------	4.12E-01
CO-56	Not Detected	--------	6.66E-02
CO-57	Not Detected	--------	5.16E-02
CO-58	Not Detected	--------	6.06E-02
CO-60	Not Detected	--------	6.50E-02
CR-51	Not Detected	--------	5.17E-01
CS-134	Not Detected	--------	8.75E-02
CS-137	Not Detected	--------	6.44E-02
CU-64	Not Detected	--------	4.94E+07
EU-152	Not Detected	--------	4.30E-01
EU-154	Not Detected	--------	3.05E-01
EU-155	Not Detected	--------	2.10E-01
FE-59	Not Detected	--------	1.53E-01
GD-153	Not Detected	--------	1.77E-01
HG-203	Not Detected	--------	5.99E-02
I-131	Not Detected	--------	1.32E-01
IN-115m	Not Detected	--------	5.18E+17
IR-192	Not Detected	--------	5.29E-02
K-40	1.98E+01	2.86	5.95E-01
LA-140	Not Detected	--------	6.91
MN-54	Not Detected	--------	5.62E-02
MN-56	Not Detected	--------	1.00E+26
MO-99	Not Detected	--------	7.66
NA-22	Not Detected	--------	7.55E-02
NA-24	Not Detected	--------	2.15E+04
NB-95	Not Detected	--------	2.65
ND-147	Not Detected	--------	7.69E-01
NI-57	Not Detected	--------	1.69E+01
BE-7	Not Detected	--------	4.97E-01
RU-103	Not Detected	--------	5.95E-02
RU-106	Not Detected	--------	5.17E-01
SB-122	Not Detected	--------	1.37
SB-124	Not Detected	--------	6.61E-02
SB-125	Not Detected	--------	1.52E-01
SC-46	Not Detected	--------	9.84E-02
SR-85	Not Detected	--------	7.34E-02
TA-182	Not Detected	--------	2.83E-01
TA-183	Not Detected	--------	1.11
TE-132	Not Detected	--------	5.63E-01
TL-201	Not Detected	--------	2.16
XE-133	Not Detected	--------	7.42
Y-88	Not Detected	--------	4.64E-02
ZN-65	Not Detected	--------	1.83E-01
ZR-95	Not Detected	--------	1.17E-01

****
* Sandia National Laboratories *
* Radiation Protection Sample Diagnostics Program [881 Laboratory] *
* 7-12-95 4:11:11 AM *
****
* *
* Analyzed by: 7/12/95 Reviewed by: 7/12/95 *
****

Customer : S.WRIGHTSON (7585)
Customer Sample ID : 1332-27-003-0.5-SS
Lab Sample ID : 50051113

Sample Description : MARINELLI SOIL SAMPLE
Sample Type : Solid
Sample Geometry : 1SMAR
Sample Quantity : 807.000 gram
Sample Date/Time : 6-30-95 12:59:00 PM
Acquire Start Date : 7-12-95 3:36:45 AM
Detector Name : LAB01
Elapsed Live Time : 1800 seconds
Elapsed Real Time : 1801 seconds

Comments:
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Nuclide	Activity (pCi/gram)	2S Error	MDA
U-238	Not Detected	--------	2.00
TH-234	Not Detected	--------	8.75E-01
U-234	Not Detected	--------	1.93E+01
RA-226	1.58	7.41E-01	1.07
PB-214	5.34E-01	1.16E-01	1.11E-01
BI-214	4.37E-01	1.01E-01	1.03E-01
PB-210	Not Detected	--------	3.87E+01
TH-232	8.31E-01	2.31E-01	2.40E-01
RA-228	9.02E-01	2.81E-01	2.18E-01
AC-228	9.46E-01	2.16E-01	1.91E-01
TH-228	9.30E-01	4.39E-01	8.14E-01
RA-224	1.76	4.53E-01	6.94E-01
PB-212	9.41E-01	1.76E-01	6.16E-02
BI-212	8.50E-01	4.32E-01	6.06E-01
TL-208	7.84E-01	1.62E-01	1.34E-01
U-235	Not Detected	--------	3.75E-01
TH-231	Not Detected	--------	7.34E-01
PA-231	Not Detected	--------	2.08
AC-227	Not Detected	--------	2.81
TH-227	Not Detected	--------	6.01E-01
RA-223	Not Detected	--------	4.73E-01
RN-219	Not Detected	--------	4.94E-01
PB-211	Not Detected	--------	1.10
TL-207	Not Detected	--------	2.41E+01
AM-241	Not Detected	--------	2.47E-01
PU-239	Not Detected	--------	4.08E+02
NP-237	Not Detected	--------	3.32E-01
PA-233	Not Detected	--------	9.56E-02
TH-229	Not Detected	--------	3.91E-01

[Summary Report] - Sample ID: 50051113

Nuclide	Activity (pCi/gram)	2S Error	MDA
AG-110m	Not Detected	--------	6.14E-02
AR-41	Not Detected	--------	1.00E+26
BA-133	Not Detected	--------	9.64E-02
BA-140	Not Detected	--------	3.47E-01
CD-109	Not Detected	--------	1.16
CD-115	Not Detected	--------	4.08
CE-139	Not Detected	--------	5.50E-02
CE-141	Not Detected	--------	1.08E-01
CE-144	Not Detected	--------	3.82E-01
CO-56	Not Detected	--------	6.79E-02
CO-57	Not Detected	--------	4.96E-02
CO-58	Not Detected	--------	6.49E-02
CO-60	Not Detected	--------	6.21E-02
CR-51	Not Detected	--------	5.29E-01
CS-134	Not Detected	--------	7.74E-02
CS-137	Not Detected	--------	6.84E-02
CU-64	Not Detected	--------	5.09E+07
EU-152	Not Detected	--------	4.53E-01
EU-154	Not Detected	--------	2.96E-01
EU-155	Not Detected	--------	2.04E-01
FE-59	Not Detected	--------	1.46E-01
GD-153	Not Detected	--------	1.67E-01
HG-203	Not Detected	--------	5.61E-02
I-131	Not Detected	--------	1.29E-01
IN-115m	Not Detected	--------	5.74E+17
IR-192	Not Detected	--------	5.20E-02
K-40	2.47E+01	3.49	5.99E-01
LA-140	Not Detected	--------	6.61
MN-54	Not Detected	--------	6.57E-02
MN-56	Not Detected	--------	1.00E+26
MO-99	Not Detected	--------	7.43
NA-22	Not Detected	--------	7.19E-02
NA-24	Not Detected	--------	2.20E+04
NB-95	Not Detected	--------	2.60
ND-147	Not Detected	--------	7.29E-01
NI-57	Not Detected	--------	1.83E+01
BE-7	Not Detected	--------	4.87E-01
RU-103	Not Detected	--------	5.64E-02
RU-106	Not Detected	--------	4.95E-01
SB-122	Not Detected	--------	1.37
SB-124	Not Detected	--------	6.17E-02
SB-125	Not Detected	--------	1.36E-01
SC-46	Not Detected	--------	9.26E-02
SR-85	Not Detected	--------	6.77E-02
TA-182	Not Detected	--------	2.70E-01
TA-183	Not Detected	--------	1.02
TE-132	Not Detected	--------	5.54E-01
TL-201	Not Detected	--------	2.08
XE-133	Not Detected	--------	6.93
Y-88	Not Detected	--------	4.49E-02
ZN-65	Not Detected	--------	1.66E-01
ZR-95	Not Detected	--------	1.09E-01

****
* Sandia National Laboratories *
* Radiation Protection Sample Diagnostics Program [881 Laboratory] *
7-12-95 4:52:56 AM
****
* *
* Analyzed by: 7/12/95 Reviewed by: 7/12/95 *
****

Customer : S.WRIGHTSON (7585)
Customer Sample ID : 1332-27-004-0.5-SS
Lab Sample ID : 50051114

Sample Description : MARINELLI SOIL SAMPLE
Sample Type : Solid
Sample Geometry : 1SMAR
Sample Quantity : 858.000 gram
Sample Date/Time : 6-30-95 12:58:00 PM
Acquire Start Date : 7-12-95 4:18:22 AM
Detector Name : LAB01
Elapsed Live Time : 1800 seconds
Elapsed Real Time : 1801 seconds

Comments:
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Nuclide	Activity (pCi/gram)	2S Error	MDA
U-238	Not Detected	--------	1.97
TH-234	1.32	4.88E-01	6.15E-01
U-234	Not Detected	--------	1.91E+01
RA-226	1.56	6.09E-01	8.30E-01
PB-214	5.25E-01	1.12E-01	1.04E-01
BI-214	4.37E-01	9.33E-02	8.51E-02
PB-210	Not Detected	--------	3.69E+01
TH-232	7.98E-01	2.35E-01	2.63E-01
RA-228	8.15E-01	2.67E-01	2.12E-01
AC-228	8.04E-01	1.87E-01	1.63E-01
TH-228	5.06E-01	3.36E-01	9.06E-01
RA-224	1.98	4.72E-01	6.34E-01
PB-212	9.07E-01	1.70E-01	6.13E-02
BI-212	9.82E-01	3.97E-01	5.10E-01
TL-208	8.00E-01	1.60E-01	1.25E-01
U-235	Not Detected	--------	3.63E-01
TH-231	Not Detected	--------	4.33E-01
PA-231	Not Detected	--------	2.00
AC-227	Not Detected	--------	2.71
TH-227	Not Detected	--------	5.75E-01
RA-223	Not Detected	--------	4.58E-01
RN-219	Not Detected	--------	3.14E-01
PB-211	Not Detected	--------	1.03
TL-207	Not Detected	--------	2.31E+01
AM-241	Not Detected	--------	2.45E-01
PU-239	Not Detected	--------	4.17E+02
NP-237	Not Detected	--------	2.84E-01
PA-233	Not Detected	--------	8.99E-02
TH-229	Not Detected	--------	3.67E-01

[Summary Report] - Sample ID: 50051114

Nuclide	Activity (pCi/gram)	2S Error	MDA
AG-110m	Not Detected	--------	5.25E-02
AR-41	Not Detected	--------	1.00E+26
BA-133	Not Detected	--------	9.10E-02
BA-140	Not Detected	--------	3.16E-01
CD-109	Not Detected	--------	9.93E-01
CD-115	Not Detected	--------	3.80
CE-139	Not Detected	--------	5.39E-02
CE-141	Not Detected	--------	1.04E-01
CE-144	Not Detected	--------	3.78E-01
CO-56	Not Detected	--------	6.02E-02
CO-57	Not Detected	--------	4.87E-02
CO-58	Not Detected	--------	5.94E-02
CO-60	Not Detected	--------	6.10E-02
CR-51	Not Detected	--------	4.94E-01
CS-134	Not Detected	--------	7.45E-02
CS-137	Not Detected	--------	5.94E-02
CU-64	Not Detected	--------	5.09E+07
EU-152	Not Detected	--------	4.04E-01
EU-154	Not Detected	--------	2.84E-01
EU-155	Not Detected	--------	1.94E-01
FE-59	Not Detected	--------	1.26E-01
GD-153	Not Detected	--------	1.60E-01
HG-203	Not Detected	--------	5.41E-02
I-131	Not Detected	--------	1.18E-01
IN-115m	Not Detected	--------	5.92E+17
IR-192	Not Detected	--------	4.89E-02
K-40	2.43E+01	3.41	5.01E-01
LA-140	Not Detected	--------	7.18
MN-54	Not Detected	--------	5.72E-02
MN-56	Not Detected	--------	1.00E+26
MO-99	Not Detected	--------	7.48
NA-22	Not Detected	--------	7.04E-02
NA-24	Not Detected	--------	2.22E+04
NB-95	Not Detected	--------	2.50
ND-147	Not Detected	--------	6.95E-01
NI-57	Not Detected	--------	1.72E+01
BE-7	Not Detected	--------	4.31E-01
RU-103	Not Detected	--------	5.45E-02
RU-106	Not Detected	--------	4.83E-01
SB-122	Not Detected	--------	1.34
SB-124	Not Detected	--------	5.98E-02
SB-125	Not Detected	--------	1.36E-01
SC-46	Not Detected	--------	9.24E-02
SR-85	Not Detected	--------	6.36E-02
TA-182	Not Detected	--------	2.62E-01
TA-183	Not Detected	--------	1.02
TE-132	Not Detected	--------	5.03E-01
TL-201	Not Detected	--------	2.02
XE-133	Not Detected	--------	6.69
Y-88	Not Detected	--------	4.56E-02
ZN-65	Not Detected	--------	1.70E-01
ZR-95	Not Detected	--------	1.04E-01

Sandia National Laboratories
Radiation Protection Sample Diagnostics Program [881 Laboratory]
7-12-95 5:34:56 AM

Analyzed by: 7/12/95 Reviewed by: 7/12/95

Customer : S.WRIGHTSON (7585)
Customer Sample ID : 1332-27-005-0.5-SS
Lab Sample ID : 50051115

Sample Description : MARINELLI SOIL SAMPLE
Sample Type : Solid
Sample Geometry : 1SMAR
Sample Quantity : 862.000 gram
Sample Date/Time : 6-30-95 12:55:00 PM
Acquire Start Date : 7-12-95 5:00:25 AM
Detector Name : LAB01
Elapsed Live Time : 1800 seconds
Elapsed Real Time : 1801 seconds

Comments:

Nuclide	Activity (pCi/gram)	2S Error	MDA
U-238	Not Detected	--------	1.80
TH-234	Not Detected	--------	6.86E-01
U-234	Not Detected	--------	1.65E+01
RA-226	1.11	5.93E-01	8.74E-01
PB-214	5.71E-01	1.13E-01	9.08E-02
BI-214	5.36E-01	1.06E-01	8.74E-02
PB-210	Not Detected	--------	3.27E+01
TH-232	3.48E-01	1.64E-01	2.26E-01
RA-228	4.12E-01	1.74E-01	2.22E-01
AC-228	5.35E-01	1.41E-01	1.31E-01
TH-228	Not Detected	--------	1.36
RA-224	1.55	4.39E-01	6.15E-01
PB-212	4.66E-01	1.29E-01	5.80E-02
BI-212	5.92E-01	3.01E-01	4.07E-01
TL-208	4.57E-01	1.11E-01	1.06E-01
U-235	Not Detected	--------	3.35E-01
TH-231	Not Detected	--------	6.17E-01
PA-231	Not Detected	--------	1.87
AC-227	Not Detected	--------	2.40
TH-227	Not Detected	--------	4.52E-01
RA-223	Not Detected	--------	4.01E-01
RN-219	Not Detected	--------	3.86E-01
PB-211	Not Detected	--------	9.07E-01
TL-207	Not Detected	--------	1.99E+01
AM-241	Not Detected	--------	2.16E-01
PU-239	Not Detected	--------	3.52E+02
NP-237	Not Detected	--------	2.33E-01
PA-233	Not Detected	--------	8.84E-02
TH-229	Not Detected	--------	3.28E-01

[Summary Report] - Sample ID: 50051115

Nuclide	Activity (pCi/gram)	2S Error	MDA
AG-110m	Not Detected	--------	6.80E-02
AR-41	Not Detected	--------	1.00E+26
BA-133	Not Detected	--------	8.91E-02
BA-140	Not Detected	--------	2.81E-01
CD-109	Not Detected	--------	8.14E-01
CD-115	Not Detected	--------	3.15
CE-139	Not Detected	--------	4.63E-02
CE-141	Not Detected	--------	9.60E-02
CE-144	Not Detected	--------	3.35E-01
CO-56	Not Detected	--------	5.60E-02
CO-57	Not Detected	--------	4.18E-02
CO-58	Not Detected	--------	5.02E-02
CO-60	Not Detected	--------	5.15E-02
CR-51	Not Detected	--------	4.47E-01
CS-134	Not Detected	--------	7.57E-02
CS-137	1.62E-01	4.21E-02	4.50E-02
CU-64	Not Detected	--------	4.39E+07
EU-152	Not Detected	--------	3.58E-01
EU-154	Not Detected	--------	2.36E-01
EU-155	Not Detected	--------	1.72E-01
FE-59	Not Detected	--------	1.22E-01
GD-153	Not Detected	--------	1.42E-01
HG-203	Not Detected	--------	4.96E-02
I-131	Not Detected	--------	1.08E-01
IN-115m	Not Detected	--------	5.45E+17
IR-192	Not Detected	--------	4.57E-02
K-40	1.32E+01	1.95	4.15E-01
LA-140	Not Detected	--------	4.98
MN-54	Not Detected	--------	5.02E-02
MN-56	Not Detected	--------	1.00E+26
MO-99	Not Detected	--------	6.66
NA-22	Not Detected	--------	5.36E-02
NA-24	Not Detected	--------	1.82E+04
NB-95	Not Detected	--------	1.98
ND-147	Not Detected	--------	5.70E-01
NI-57	Not Detected	--------	1.54E+01
BE-7	Not Detected	--------	4.11E-01
RU-103	Not Detected	--------	4.66E-02
RU-106	Not Detected	--------	3.82E-01
SB-122	Not Detected	--------	1.16
SB-124	Not Detected	--------	5.64E-02
SB-125	Not Detected	--------	1.13E-01
SC-46	Not Detected	--------	8.25E-02
SR-85	Not Detected	--------	5.43E-02
TA-182	Not Detected	--------	2.36E-01
TA-183	Not Detected	--------	9.00E-01
TE-132	Not Detected	--------	4.65E-01
TL-201	Not Detected	--------	1.75
XE-133	Not Detected	--------	5.96
Y-88	Not Detected	--------	3.93E-02
ZN-65	Not Detected	--------	1.53E-01
ZR-95	Not Detected	--------	8.32E-02

****
* Sandia National Laboratories *
* Radiation Protection Sample Diagnostics Program [881 Laboratory] *
7-11-95 9:34:24 PM *
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* *
* Analyzed by: 7/12/95 Reviewed by: 7/12/95 *
****

Customer : S.WRIGHTSON (7585)
Customer Sample ID : 1332-27-005-0.5-R
Lab Sample ID : 50051116

Sample Description : MARINELLI WATER SAMPLE
Sample Type : Liquid
Sample Geometry : 1WMAR
Sample Quantity : 500.000 mL
Sample Date/Time : 6-30-95 1:05:00 PM
Acquire Start Date : 7-11-95 7:51:31 PM
Detector Name : LAB01
Elapsed Live Time : 6000 seconds
Elapsed Real Time : 6002 seconds

Comments:
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Nuclide	Activity (pCi/mL)	2S Error	MDA
U-238	Not Detected	--------	5.61E-01
TH-234	Not Detected	--------	2.81E-01
U-234	Not Detected	--------	7.28
RA-226	Not Detected	--------	4.33E-01
PB-214	Not Detected	--------	5.02E-02
BI-214	Not Detected	--------	5.62E-02
PB-210	Not Detected	--------	6.56E+01
TH-232	Not Detected	--------	1.38E-01
RA-228	Not Detected	--------	1.19E-01
AC-228	Not Detected	--------	7.62E-02
TH-228	Not Detected	--------	4.74E-01
RA-224	Not Detected	--------	3.82E-01
PB-212	Not Detected	--------	3.47E-02
BI-212	Not Detected	--------	2.88E-01
TL-208	Not Detected	--------	6.25E-02
U-235	Not Detected	--------	1.43E-01
TH-231	Not Detected	--------	1.92E-01
PA-231	Not Detected	--------	6.53E-01
AC-227	Not Detected	--------	1.05
TH-227	Not Detected	--------	1.34E-01
RA-223	Not Detected	--------	1.22E-01
RN-219	Not Detected	--------	1.55E-01
PB-211	Not Detected	--------	4.13E-01
TL-207	Not Detected	--------	7.80
AM-241	Not Detected	--------	7.79E-02
PU-239	Not Detected	--------	1.49E+02
NP-237	Not Detected	--------	1.21E-01
PA-233	Not Detected	--------	4.01E-02
TH-229	Not Detected	--------	1.26E-01

[Summary Report] - Sample ID: 50051116

Nuclide	Activity (pCi/mL)	2S Error	MDA
AG-110m	Not Detected	--------	2.05E-02
AR-41	Not Detected	--------	1.00E+26
BA-133	Not Detected	--------	2.87E-02
BA-140	Not Detected	--------	1.31E-01
CD-109	Not Detected	--------	4.24E-01
CD-115	Not Detected	--------	1.22
CE-139	Not Detected	--------	2.02E-02
CE-141	Not Detected	--------	4.03E-02
CE-144	Not Detected	--------	1.38E-01
CO-56	Not Detected	--------	3.22E-02
CO-57	Not Detected	--------	1.77E-02
CO-58	Not Detected	--------	2.27E-02
CO-60	Not Detected	--------	2.32E-02
CR-51	Not Detected	--------	2.02E-01
CS-134	Not Detected	--------	2.81E-02
CS-137	Not Detected	--------	2.08E-02
CU-64	Not Detected	--------	1.22E+07
EU-152	Not Detected	--------	2.02E-01
EU-154	Not Detected	--------	9.12E-02
EU-155	Not Detected	--------	6.81E-02
FE-59	Not Detected	--------	4.69E-02
GD-153	Not Detected	--------	4.99E-02
HG-203	Not Detected	--------	2.05E-02
I-131	Not Detected	--------	4.80E-02
IN-115m	Not Detected	--------	6.13E+16
IR-192	Not Detected	--------	2.08E-02
K-40	Not Detected	--------	2.53E-01
LA-140	Not Detected	--------	2.40
MN-54	Not Detected	--------	2.27E-02
MN-56	Not Detected	--------	1.00E+26
MO-99	Not Detected	--------	2.75
NA-22	Not Detected	--------	2.03E-02
NA-24	Not Detected	--------	6.10E+03
NB-95	Not Detected	--------	5.45E-01
ND-147	Not Detected	--------	2.56E-01
NI-57	Not Detected	--------	5.52
BE-7	Not Detected	--------	1.73E-01
RU-103	Not Detected	--------	2.36E-02
RU-106	Not Detected	--------	2.00E-01
SB-122	Not Detected	--------	5.58E-01
SB-124	Not Detected	--------	2.70E-02
SB-125	Not Detected	--------	5.48E-02
SC-46	Not Detected	--------	2.69E-02
SR-85	Not Detected	--------	3.02E-02
TA-182	Not Detected	--------	7.49E-02
TA-183	Not Detected	--------	3.11E-01
TE-132	Not Detected	--------	1.84E-01
TL-201	Not Detected	--------	5.15E-01
XE-133	Not Detected	--------	1.48
Y-88	Not Detected	--------	2.34E-02
ZN-65	Not Detected	--------	4.82E-02
ZR-95	Not Detected	--------	3.63E-02

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* Sandia National Laboratories *
* Radiation Protection Sample Diagnostics Program [881 Laboratory] *
* 7-11-95 11:23:28 PM *
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* *
* Analyzed by: 7/12/95 Reviewed by: 7/12/95 *
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Customer : S.WRIGHTSON (7585)
Customer Sample ID : 1332-27-005-0.5-FB
Lab Sample ID : 50051117

Sample Description : MARINELLI WATER SAMPLE
Sample Type : Liquid
Sample Geometry : 1WMAR
Sample Quantity : 500.000 mL
Sample Date/Time : 6-30-95 1:05:00 PM
Acquire Start Date : 7-11-95 9:40:43 PM
Detector Name : LAB01
Elapsed Live Time : 6000 seconds
Elapsed Real Time : 6002 seconds

Comments:
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Nuclide	Activity (pCi/mL)	2S Error	MDA
U-238	Not Detected	--------	5.77E-01
TH-234	Not Detected	--------	2.68E-01
U-234	Not Detected	--------	6.02
RA-226	Not Detected	--------	4.41E-01
PB-214	Not Detected	--------	4.67E-02
BI-214	Not Detected	--------	4.96E-02
PB-210	Not Detected	--------	6.45E+01
TH-232	Not Detected	--------	1.30E-01
RA-228	Not Detected	--------	1.24E-01
AC-228	Not Detected	--------	7.92E-02
TH-228	Not Detected	--------	4.61E-01
RA-224	Not Detected	--------	3.73E-01
PB-212	Not Detected	--------	3.44E-02
BI-212	Not Detected	--------	3.10E-01
TL-208	Not Detected	--------	5.59E-02
U-235	Not Detected	--------	1.43E-01
TH-231	Not Detected	--------	1.87E-01
PA-231	Not Detected	--------	6.35E-01
AC-227	Not Detected	--------	1.03
TH-227	Not Detected	--------	1.34E-01
RA-223	Not Detected	--------	1.19E-01
RN-219	Not Detected	--------	1.66E-01
PB-211	Not Detected	--------	4.25E-01
TL-207	Not Detected	--------	8.30
AM-241	Not Detected	--------	7.68E-02
PU-239	Not Detected	--------	1.45E+02
NP-237	Not Detected	--------	1.18E-01
PA-233	Not Detected	--------	3.94E-02
TH-229	Not Detected	--------	1.25E-01

[Summary Report] - Sample ID: 50051117

Nuclide	Activity (pCi/mL)	2S Error	MDA
AG-110m	Not Detected	--------	2.01E-02
AR-41	Not Detected	--------	1.00E+26
BA-133	Not Detected	--------	2.62E-02
BA-140	Not Detected	--------	1.15E-01
CD-109	Not Detected	--------	4.13E-01
CD-115	Not Detected	--------	1.18
CE-139	Not Detected	--------	1.98E-02
CE-141	Not Detected	--------	3.91E-02
CE-144	Not Detected	--------	1.36E-01
CO-56	Not Detected	--------	3.14E-02
CO-57	Not Detected	--------	1.69E-02
CO-58	Not Detected	--------	2.12E-02
CO-60	Not Detected	--------	2.14E-02
CR-51	Not Detected	--------	1.98E-01
CS-134	Not Detected	--------	2.39E-02
CS-137	Not Detected	--------	2.17E-02
CU-64	Not Detected	--------	1.41E+07
EU-152	Not Detected	--------	2.02E-01
EU-154	Not Detected	--------	1.01E-01
EU-155	Not Detected	--------	6.57E-02
FE-59	Not Detected	--------	4.22E-02
GD-153	Not Detected	--------	4.82E-02
HG-203	Not Detected	--------	2.18E-02
I-131	Not Detected	--------	4.80E-02
IN-115m	Not Detected	--------	7.64E+16
IR-192	Not Detected	--------	2.04E-02
K-40	Not Detected	--------	2.59E-01
LA-140	Not Detected	--------	2.63
MN-54	Not Detected	--------	2.30E-02
MN-56	Not Detected	--------	1.00E+26
MO-99	Not Detected	--------	2.61
NA-22	Not Detected	--------	2.09E-02
NA-24	Not Detected	--------	6.39E+03
NB-95	Not Detected	--------	5.55E-01
ND-147	Not Detected	--------	2.33E-01
NI-57	Not Detected	--------	5.42
BE-7	Not Detected	--------	1.82E-01
RU-103	Not Detected	--------	2.34E-02
RU-106	Not Detected	--------	1.92E-01
SB-122	Not Detected	--------	5.39E-01
SB-124	Not Detected	--------	2.53E-02
SB-125	Not Detected	--------	5.53E-02
SC-46	Not Detected	--------	2.33E-02
SR-85	Not Detected	--------	3.00E-02
TA-182	Not Detected	--------	6.73E-02
TA-183	Not Detected	--------	3.10E-01
TE-132	Not Detected	--------	1.87E-01
TL-201	Not Detected	--------	4.82E-01
XE-133	Not Detected	--------	1.44
Y-88	Not Detected	--------	2.19E-02
ZN-65	Not Detected	--------	4.36E-02
ZR-95	Not Detected	--------	3.56E-02

****
* Sandia National Laboratories *
* Radiation Protection Sample Diagnostics Program [881 Laboratory] *
7-12-95 8:44:54 AM
****
* Analyzed by: 7/12/95 Reviewed by: 7/12/95 *
****

Customer : S.WRIGHTSON (7585)
Customer Sample ID : 1332-27-005-0.5-D
Lab Sample ID : 50051118

Sample Description : MARINELLI SOIL SAMPLE
Sample Type : Solid
Sample Geometry : 1SMAR
Sample Quantity : 851.000 gram
Sample Date/Time : 6-30-95 12:55:00 PM
Acquire Start Date : 7-12-95 8:09:50 AM
Detector Name : LAB01
Elapsed Live Time : 1800 seconds
Elapsed Real Time : 1801 seconds

Comments:
****

Nuclide	Activity (pCi/gram)	2S Error	MDA
U-238	Not Detected	--------	1.79
TH-234	Not Detected	--------	6.59E-01
U-234	Not Detected	--------	1.77E+01
RA-226	1.62	7.27E-01	1.04
PB-214	6.55E-01	1.29E-01	1.07E-01
BI-214	6.71E-01	1.20E-01	8.24E-02
PB-210	Not Detected	--------	3.49E+01
TH-232	4.62E-01	2.10E-01	2.92E-01
RA-228	2.96E-01	1.61E-01	2.26E-01
AC-228	6.01E-01	1.54E-01	1.44E-01
TH-228	5.81E-01	3.11E-01	6.99E-01
RA-224	1.83	4.89E-01	6.28E-01
PB-212	5.86E-01	1.48E-01	6.08E-02
BI-212	3.00E-01	3.21E-01	5.09E-01
TL-208	5.31E-01	1.23E-01	1.15E-01
U-235	Not Detected	--------	3.36E-01
TH-231	Not Detected	--------	6.35E-01
PA-231	Not Detected	--------	1.96
AC-227	Not Detected	--------	2.52
TH-227	Not Detected	--------	4.90E-01
RA-223	Not Detected	--------	4.11E-01
RN-219	Not Detected	--------	2.77E-01
PB-211	Not Detected	--------	9.48E-01
TL-207	Not Detected	--------	2.07E+01
AM-241	Not Detected	--------	2.22E-01
PU-239	Not Detected	--------	3.80E+02
NP-237	Not Detected	--------	4.11E-01
PA-233	Not Detected	--------	8.98E-02
TH-229	Not Detected	--------	3.47E-01

[Summary Report] - Sample ID: 50051118

Nuclide	Activity (pCi/gram)	2S Error	MDA
AG-110m	Not Detected	--------	6.93E-02
AR-41	Not Detected	--------	1.00E+26
BA-133	Not Detected	--------	9.49E-02
BA-140	Not Detected	--------	2.81E-01
CD-109	Not Detected	--------	8.29E-01
CD-115	Not Detected	--------	3.53
CE-139	Not Detected	--------	4.82E-02
CE-141	Not Detected	--------	9.74E-02
CE-144	Not Detected	--------	3.43E-01
CO-56	Not Detected	--------	6.01E-02
CO-57	Not Detected	--------	4.43E-02
CO-58	Not Detected	--------	4.90E-02
CO-60	Not Detected	--------	5.25E-02
CR-51	Not Detected	--------	4.83E-01
CS-134	Not Detected	--------	8.02E-02
CS-137	1.81E-01	4.29E-02	4.17E-02
CU-64	Not Detected	--------	5.92E+07
EU-152	Not Detected	--------	3.90E-01
EU-154	Not Detected	--------	2.46E-01
EU-155	Not Detected	--------	1.76E-01
FE-59	Not Detected	--------	1.19E-01
GD-153	Not Detected	--------	1.48E-01
HG-203	Not Detected	--------	5.12E-02
I-131	Not Detected	--------	1.13E-01
IN-115m	Not Detected	--------	9.54E+17
IR-192	Not Detected	--------	4.72E-02
K-40	1.49E+01	2.18	4.56E-01
LA-140	Not Detected	--------	7.06
MN-54	Not Detected	--------	5.18E-02
MN-56	Not Detected	--------	1.00E+26
MO-99	Not Detected	--------	6.90
NA-22	Not Detected	--------	6.48E-02
NA-24	Not Detected	--------	2.42E+04
NB-95	Not Detected	--------	2.20
ND-147	Not Detected	--------	6.23E-01
NI-57	Not Detected	--------	1.83E+01
BE-7	Not Detected	--------	4.28E-01
RU-103	Not Detected	--------	4.91E-02
RU-106	Not Detected	--------	4.13E-01
SB-122	Not Detected	--------	1.22
SB-124	Not Detected	--------	6.07E-02
SB-125	Not Detected	--------	1.20E-01
SC-46	Not Detected	--------	8.74E-02
SR-85	Not Detected	--------	5.84E-02
TA-182	Not Detected	--------	2.50E-01
TA-183	Not Detected	--------	9.41E-01
TE-132	Not Detected	--------	4.98E-01
TL-201	Not Detected	--------	1.94
XE-133	Not Detected	--------	6.45
Y-88	Not Detected	--------	4.26E-02
ZN-65	Not Detected	--------	1.63E-01
ZR-95	Not Detected	--------	8.75E-02

Sandia National Laboratories

ANALYSIS REQUEST AND CHAIN OF CUSTODY RECORD

BATCH # 500511

No: 508940

Department No: 7585
Project/Task Manager: SKIP Wrighton
Project Name: DOE 1332 Scoping Sampling
Sample Team Members: C.C.
John Boyd
ER Site 27

Date Samples Shipped:
Carrier/Waybill No:
Lab Destination:
Lab Contact:
SMO Contact/Phone:
Send Report to SMO:
SMO Reference No:

Bill to: Sandia National Laboratories
Supplier Services Department 0154
P.O. Box 5800
Albuquerque, NM 87185
Contract No: NA
Case No: 362B.60D
SMO Authorization:

Sample Number	Sample Type	Date/Time Collected	Container Type	Sample Volume	Preservative	Requested Testing Program	QC	Lab Sample Number	Condition on Receipt
1332-27-001-05 SS	S	6-30-95 1300	Poly	500 ml	None	GAMMA SPEC.			
1332-27-002	S	1302							
-003	S	1259							
-004	S	1258							
-005 DS	S	1255							
005 R	W	1305							
005 FB	W	1305							
-005 D	S	1256							

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

Turnaround Time
Normal ☒ Rush ☐ Required Report Date

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

Special Instructions/QC Requirements

	Org	Date	Time
1. Relinquished by	7584	7.5.95	9:30am
1. Received by	SNL7715	7/5/95	9:30
2. Relinquished by	SNL7715	7/12/95	4:45
2. Received by	7584	7/12/95	4:45
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 Pink-Field/Purchasing Copy Rev 0 10/92

Sandia National Laboratories

ANALYSIS REQUEST AND CHAIN OF CUSTODY RECORD

BATCH # 500511

No: 508940

Department No: 7585
Project/Task Manager: Skip Wrightson
Project Name: RD 1332 Scoping Sampling
Sample Team Members: E.C.
John Boyd
ER Site 27

Date Samples Shipped:
Carrier/Waybill No:
Lab Destination:
Lab Contact:
SMO Contact/Phone:
Send Report to SMO:
SMO Reference No:

Bill to: Sandia National Laboratories
Supplier Services Department 0154
P.O. Box 5800
Albuquerque, NM 87185
Contract No: NA
Case No: 3628.600
SMO Authorization:

Sample Number	Sample Type	Date/Time Collected	Container Type	Sample Volume	Preservative	Requested Testing Program	QC	Lab Sample Number	Condition on Receipt
1332-27-001-05 95	S	6-30-95 1300	Poly	500 ml	None	GAMMA SPEC.			
1332-27-002	S	1302							
-003	S	1257							
-004	S	1258							
-005 DS	S	1255							
005 R	W	1305							
005 FB	W	1305							
-005 D	S	1256							

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

Turnaround Time
Normal ☒ Rush ☐ Required Report Date

Sample Disposal
Return to Client ☒ Dispose by Lab ☐ Archive Until

Special Instructions/QC Requirements

	Org	Date	Time
1. Relinquished by	7584	7.5.95	9:30am
1. Received by	SNL 7715	7/5/95	9:30
2. Relinquished by	SNL 7715	7/12/95	4:45
2. Received by	7584	7/12/95	4:45
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 Pink-Field/Purchasing Copy Rev 0 10/92

ANNEX 2-A.2
Results of SWMU 27 RFI Site-Specific Background Soil Sampling Analysis-Gamma Spectroscopy

****
* Sandia National Laboratories *
* Radiation Protection Sample Diagnostics Program [881 Laboratory] *
* 6-13-97 1:20:16 PM *
****

* Analyzed by: 6/16/97 Reviewed by: 6/16/97 *

Customer : C.BYRD/C.STEFANOV (6685/SMO)
Customer Sample ID : 034979-004
Lab Sample ID : 70098801

Sample Description : MARINELLI SOIL SAMPLE
Sample Quantity : 677.000 gram
Sample Date/Time : 6-10-97 2:00:00 PM
Acquire Start Date/Time : 6-13-97 11:36:38 AM
Detector Name : LAB01
Elapsed Live/Real Time : 6000 / 6002 seconds

Comments:

Nuclide Name	Activity (pCi/gram)	2-sigma Error	MDA (pCi/gram)
U-238	Not Detected	---------	1.74E+00
TH-234	1.21E+00	3.85E-01	5.02E-01
RA-226	1.61E+00	8.92E-01	6.67E-01
PB-214	7.16E-01	1.53E-01	6.18E-02
BI-214	6.46E-01	1.38E-01	5.46E-02
TH-232	1.10E+00	5.58E-01	1.77E-01
RA-228	8.95E-01	2.94E-01	2.19E-01
AC-228	1.02E+00	2.79E-01	1.14E-01
TH-228	7.64E-01	6.41E-01	5.55E-01
RA-224	1.08E+00	3.42E-01	9.34E-02
PB-212	1.01E+00	1.67E-01	4.62E-02
BI-212	1.17E+00	3.55E-01	4.40E-01
TL-208	8.72E-01	1.76E-01	8.84E-02
U-235	Not Detected	---------	2.35E-01
TH-231	Not Detected	---------	9.98E+00
PA-231	Not Detected	---------	1.61E+00
TH-227	Not Detected	---------	4.38E-01
RA-223	Not Detected	---------	1.89E-01
RN-219	Not Detected	---------	4.79E-01
PB-211	Not Detected	---------	1.07E+00
TL-207	Not Detected	---------	1.87E+01
AM-241	Not Detected	---------	2.16E-01
PU-239	Not Detected	---------	3.93E+02
NP-237	~~6.06E-01~~	~~2.15E-01~~	2.53E-01 not detected 6/16/97
PA-233	Not Detected	---------	6.63E-02
TH-229	Not Detected	---------	2.25E-01

[Summary Report] - Sample ID: : 70098801

Nuclide Name	Activity (pCi/gram)	2-sigma Error	MDA (pCi/gram)
AG-108m	Not Detected	---------	5.53E-02
AG-110m	Not Detected	---------	4.58E-02
BA-133	Not Detected	---------	6.10E-02
BE-7	Not Detected	---------	3.00E-01
CD-109	Not Detected	---------	1.13E+00
CD-115	Not Detected	---------	2.01E-01
CE-139	Not Detected	---------	3.02E-02
CE-141	Not Detected	---------	5.42E-02
CE-144	Not Detected	---------	2.12E-01
CO-56	Not Detected	---------	4.70E-02
CO-57	Not Detected	---------	2.73E-02
CO-58	Not Detected	---------	4.24E-02
CO-60	Not Detected	---------	5.44E-02
CR-51	Not Detected	---------	2.80E-01
CS-134	Not Detected	---------	5.39E-02
CS-137	6.15E-02	4.37E-02	2.76E-02
EU-152	Not Detected	---------	8.03E-02
EU-154	Not Detected	---------	2.56E-01
EU-155	Not Detected	---------	1.31E-01
FE-59	Not Detected	---------	1.05E-01
GD-153	Not Detected	---------	9.26E-02
HG-203	Not Detected	---------	3.83E-02
I-131	Not Detected	---------	4.20E-02
IR-192	Not Detected	---------	3.19E-02
K-40	2.23E+01	3.45E+00	3.89E-01
MN-52	Not Detected	---------	6.41E-02
MN-54	Not Detected	---------	4.40E-02
MO-99	Not Detected	---------	6.31E-01
NA-22	Not Detected	---------	5.99E-02
NA-24	Not Detected	---------	1.12E+00
NB-95	Not Detected	---------	3.25E-01
ND-147	Not Detected	---------	2.99E-01
NI-57	Not Detected	---------	2.52E-01
PB-210	Not Detected	---------	8.87E+00
RU-103	Not Detected	---------	3.81E-02
RU-106	Not Detected	---------	3.70E-01
SB-122	Not Detected	---------	1.01E-01
SB-124	Not Detected	---------	3.73E-02
SB-125	Not Detected	---------	1.08E-01
SN-113	Not Detected	---------	4.66E-02
SR-85	Not Detected	---------	4.83E-02
TA-182	Not Detected	---------	2.07E-01
TA-183	Not Detected	---------	2.73E-01
TC-99m	Not Detected	---------	8.51E+01
TL-201	Not Detected	---------	2.37E-01
XE-133	Not Detected	---------	2.74E-01
Y-88	Not Detected	---------	3.54E-02
ZN-65	Not Detected	---------	1.38E-01
ZR-95	Not Detected	---------	7.67E-02

****
* Sandia National Laboratories *
* Radiation Protection Sample Diagnostics Program [881 Laboratory] *
* 6-13-97 5:09:30 PM *
****

* Analyzed by: 6/16/97 Reviewed by: 6/16/97 *

****

Customer : C.BYRD/C.STEFANOV (6685/SMO)
Customer Sample ID : 034984-004
Lab Sample ID : 70098802

Sample Description : MARINELLI SOIL SAMPLE
Sample Quantity : 639.000 gram
Sample Date/Time : 6-10-97 2:40:00 PM
Acquire Start Date/Time : 6-13-97 3:21:07 PM
Detector Name : LAB01
Elapsed Live/Real Time : 6000 / 6002 seconds

Comments:

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Nuclide Name	Activity (pCi/gram)	2-sigma Error	MDA (pCi/gram)
U-238	Not Detected	---------	1.70E+00
TH-234	8.90E-01	3.40E-01	5.05E-01
RA-226	1.36E+00	5.29E-01	5.81E-01
PB-214	5.68E-01	3.86E-01	5.96E-02
BI-214	5.37E-01	1.22E-01	5.11E-02
TH-232	7.70E-01	4.18E-01	1.75E-01
RA-228	8.70E-01	2.78E-01	1.91E-01
AC-228	8.49E-01	2.55E-01	1.02E-01
TH-228	7.16E-01	5.70E-01	5.25E-01
RA-224	9.08E-01	3.68E-01	9.04E-02
PB-212	8.37E-01	1.43E-01	4.62E-02
BI-212	1.03E+00	9.87E-01	4.47E-01
TL-208	7.58E-01	1.67E-01	8.48E-02
U-235	Not Detected	---------	2.30E-01
TH-231	Not Detected	---------	9.98E+00
PA-231	Not Detected	---------	1.64E+00
TH-227	Not Detected	---------	4.20E-01
RA-223	Not Detected	---------	1.85E-01
RN-219	Not Detected	---------	4.63E-01
PB-211	Not Detected	---------	1.03E+00
TL-207	Not Detected	---------	1.70E+01
AM-241	Not Detected	---------	2.08E-01
PU-239	Not Detected	---------	3.86E+02
NP-237	~~4.09E-01~~	~~1.73E-01~~	2.38E-01 Not detected 6/16/97
PA-233	Not Detected	---------	6.62E-02
TH-229	Not Detected	---------	2.24E-01

[Summary Report] - Sample ID: : 70098802

Nuclide Name	Activity (pCi/gram)	2-sigma Error	MDA (pCi/gram)
AG-108m	Not Detected	---------	5.25E-02
AG-110m	Not Detected	---------	6.23E-02
BA-133	Not Detected	---------	5.92E-02
BE-7	Not Detected	---------	3.18E-01
CD-109	Not Detected	---------	1.06E+00
CD-115	Not Detected	---------	1.98E-01
CE-139	Not Detected	---------	3.02E-02
CE-141	Not Detected	---------	5.36E-02
CE-144	Not Detected	---------	2.16E-01
CO-56	Not Detected	---------	4.70E-02
CO-57	Not Detected	---------	2.65E-02
CO-58	Not Detected	---------	4.05E-02
CO-60	Not Detected	---------	5.21E-02
CR-51	Not Detected	---------	2.96E-01
CS-134	Not Detected	---------	5.24E-02
CS-137	2.34E-01	6.00E-02	3.02E-02
EU-152	Not Detected	---------	7.98E-02
EU-154	Not Detected	---------	2.43E-01
EU-155	Not Detected	---------	1.28E-01
FE-59	Not Detected	---------	1.02E-01
GD-153	Not Detected	---------	9.15E-02
HG-203	Not Detected	---------	3.76E-02
I-131	Not Detected	---------	4.33E-02
IR-192	Not Detected	---------	3.23E-02
K-40	2.06E+01	3.26E+00	3.05E-01
MN-52	Not Detected	---------	6.35E-02
MN-54	Not Detected	---------	4.40E-02
MO-99	Not Detected	---------	6.34E-01
NA-22	Not Detected	---------	5.61E-02
NA-24	Not Detected	---------	1.23E+00
NB-95	Not Detected	---------	3.18E-01
ND-147	Not Detected	---------	2.90E-01
NI-57	Not Detected	---------	2.35E-01
PB-210	Not Detected	---------	9.01E+00
RU-103	Not Detected	---------	3.97E-02
RU-106	Not Detected	---------	3.55E-01
SB-122	Not Detected	---------	1.05E-01
SB-124	Not Detected	---------	3.93E-02
SB-125	Not Detected	---------	1.02E-01
SN-113	Not Detected	---------	4.47E-02
SR-85	Not Detected	---------	4.82E-02
TA-182	Not Detected	---------	2.03E-01
TA-183	Not Detected	---------	2.67E-01
TC-99m	Not Detected	---------	1.15E+02
TL-201	Not Detected	---------	2.42E-01
XE-133	Not Detected	---------	2.81E-01
Y-88	Not Detected	---------	3.75E-02
ZN-65	Not Detected	---------	1.37E-01
ZR-95	Not Detected	---------	7.87E-02

****
* Sandia National Laboratories *
* Radiation Protection Sample Diagnostics Program [881 Laboratory] *
* 6-15-97 4:31:46 PM *
****

* Analyzed by: 6/19/97 Reviewed by: 6/23/97 *

****

Customer : C.BYRD/CSTEFANOV (6685/SMO)
Customer Sample ID : 034980-004
Lab Sample ID : 70098901

Sample Description : MARINELLI SOLID SAMPLE
Sample Quantity : 784.000 gram
Sample Date/Time : 6-10-97 2:05:00 PM
Acquire Start Date/Time : 6-15-97 2:49:07 PM
Detector Name : LAB01
Elapsed Live/Real Time : 6000 / 6003 seconds

Comments:

****

Nuclide Name	Activity (pCi/gram)	2-sigma Error	MDA (pCi/gram)
U-238	Not Detected	---------	1.20E+00
TH-234	Not Detected	---------	5.89E-01
RA-226	1.09E+00	4.65E-01	5.49E-01
PB-214	4.73E-01	1.28E-01	4.72E-02
BI-214	4.62E-01	1.12E-01	4.70E-02
TH-232	7.76E-01	3.80E-01	1.55E-01
RA-228	9.03E-01	3.14E-01	1.91E-01
AC-228	8.50E-01	3.36E-01	1.10E-01
TH-228	6.82E-01	3.40E-01	4.37E-01
RA-224	8.64E-01	2.81E-01	8.31E-02
PB-212	8.00E-01	1.46E-01	4.12E-02
BI-212	7.93E-01	5.50E-01	3.66E-01
TL-208	7.62E-01	1.80E-01	7.64E-02
U-235	Not Detected	---------	2.07E-01
TH-231	Not Detected	---------	8.74E+00
PA-231	Not Detected	---------	1.47E+00
TH-227	Not Detected	---------	3.67E-01
RA-223	Not Detected	---------	1.88E-01
RN-219	Not Detected	---------	4.11E-01
PB-211	Not Detected	---------	9.29E-01
TL-207	Not Detected	---------	1.60E+01
AM-241	Not Detected	---------	1.83E-01
PU-239	Not Detected	---------	3.54E+02
NP-237	~~3.15E-01~~	~~1.07E-01~~	~~2.11E-01~~ NOT DETECTED 6/18/97
PA-233	Not Detected	---------	5.84E-02
TH-229	Not Detected	---------	2.00E-01

[Summary Report] - Sample ID: : 70098901

Nuclide Name	Activity (pCi/gram)	2-sigma Error	MDA (pCi/gram)
AG-108m	Not Detected	---------	4.52E-02
AG-110m	Not Detected	---------	5.28E-02
BA-133	Not Detected	---------	5.21E-02
BE-7	Not Detected	---------	2.90E-01
CD-109	Not Detected	---------	9.74E-01
CD-115	Not Detected	---------	3.18E-01
CE-139	Not Detected	---------	2.69E-02
CE-141	Not Detected	---------	4.96E-02
CE-144	Not Detected	---------	1.91E-01
CO-56	Not Detected	---------	4.15E-02
CO-57	Not Detected	---------	2.52E-02
CO-58	Not Detected	---------	3.65E-02
CO-60	Not Detected	---------	4.29E-02
CR-51	Not Detected	---------	2.72E-01
CS-134	Not Detected	---------	4.26E-02
CS-137	2.06E-01	4.06E-01	2.59E-02
EU-152	Not Detected	---------	7.47E-02
EU-154	Not Detected	---------	2.09E-01
EU-155	Not Detected	---------	1.15E-01
FE-59	Not Detected	---------	9.57E-02
GD-153	Not Detected	---------	8.19E-02
HG-203	Not Detected	---------	3.40E-02
I-131	Not Detected	---------	4.52E-02
IR-192	Not Detected	---------	2.99E-02
K-40	2.28E+01	3.40E+00	2.44E-01
MN-52	Not Detected	---------	6.45E-02
MN-54	Not Detected	---------	3.98E-02
MO-99	Not Detected	---------	9.91E-01
NA-22	Not Detected	---------	5.18E-02
NA-24	Not Detected	---------	1.03E+01
NB-95	Not Detected	---------	4.04E-01
ND-147	Not Detected	---------	3.07E-01
NI-57	Not Detected	---------	5.40E-01
PB-210	Not Detected	---------	7.50E+00
RU-103	Not Detected	---------	3.56E-02
RU-106	Not Detected	---------	3.19E-01
SB-122	Not Detected	---------	1.56E-01
SB-124	Not Detected	---------	3.41E-02
SB-125	Not Detected	---------	9.58E-02
SN-113	Not Detected	---------	4.11E-02
SR-85	Not Detected	---------	4.10E-02
TA-182	Not Detected	---------	1.81E-01
TA-183	Not Detected	---------	3.07E-01
TC-99m	Not Detected	---------	2.80E+04
TL-201	Not Detected	---------	3.32E-01
XE-133	Not Detected	---------	4.69E-01
Y-88	Not Detected	---------	2.98E-02
ZN-65	Not Detected	---------	1.20E-01
ZR-95	Not Detected	---------	6.99E-02

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* Sandia National Laboratories *
* Radiation Protection Sample Diagnostics Program [881 Laboratory] *
* 6-15-97 6:16:49 PM *
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* Analyzed by: 6/19/97 Reviewed by: 6/23/97 *
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Customer : C.BYRD/CSTEFANOV (6685/SMO)
Customer Sample ID : 034981-004
Lab Sample ID : 70098902

Sample Description : MARINELLI SOLID SAMPLE
Sample Quantity : 609.000 gram
Sample Date/Time : 6-10-97 2:10:00 PM
Acquire Start Date/Time : 6-15-97 4:34:10 PM
Detector Name : LAB01
Elapsed Live/Real Time : 6000 / 6002 seconds

Comments:
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Nuclide Name	Activity (pCi/gram)	2-sigma Error	MDA (pCi/gram)
U-238	Not Detected	---------	1.86E+00
TH-234	6.36E-01	4.24E-01	6.26E-01
RA-226	2.08E+00	8.29E-01	7.48E-01
PB-214	8.35E-01	1.74E-01	6.30E-02
BI-214	7.51E-01	1.73E-01	5.95E-02
TH-232	9.30E-01	5.04E-01	1.93E-01
RA-228	1.00E+00	3.32E-01	2.20E-01
AC-228	8.92E-01	2.31E-01	1.33E-01
TH-228	7.92E-01	4.57E-01	6.11E-01
RA-224	1.03E+00	4.58E-01	1.06E-01
PB-212	1.07E+00	4.95E-01	4.84E-02
BI-212	1.38E+00	9.22E-01	4.94E-01
TL-208	9.52E-01	2.19E-01	9.48E-02
U-235	Not Detected	---------	2.50E-01
TH-231	Not Detected	---------	1.07E+01
PA-231	Not Detected	---------	1.74E+00
TH-227	Not Detected	---------	4.76E-01
RA-223	Not Detected	---------	2.32E-01
RN-219	Not Detected	---------	5.23E-01
PB-211	Not Detected	---------	1.15E+00
TL-207	Not Detected	---------	1.85E+01
AM-241	Not Detected	---------	2.33E-01
PU-239	Not Detected	---------	4.36E+02
NP-237	Not Detected	---------	3.55E-01
PA-233	Not Detected	---------	7.60E-02
TH-229	Not Detected	---------	2.42E-01

[Summary Report] - Sample ID: : 70098902

Nuclide Name	Activity (pCi/gram)	2-sigma Error	MDA (pCi/gram)
AG-108m	Not Detected	---------	5.81E-02
AG-110m	Not Detected	---------	5.60E-02
BA-133	Not Detected	---------	6.70E-02
BE-7	Not Detected	---------	3.38E-01
CD-109	~~1.45E+00~~	~~6.18E-01~~	~~5.37E-01~~ NOT DETECTED 6/19/97
CD-115	Not Detected	---------	4.13E-01
CE-139	Not Detected	---------	3.28E-02
CE-141	Not Detected	---------	6.20E-02
CE-144	Not Detected	---------	2.37E-01
CO-56	Not Detected	---------	3.86E-02
CO-57	Not Detected	---------	3.07E-02
CO-58	Not Detected	---------	4.44E-02
CO-60	Not Detected	---------	5.25E-02
CR-51	Not Detected	---------	3.39E-01
CS-134	Not Detected	---------	5.57E-02
CS-137	1.16E-01	4.68E-02	3.07E-02
EU-152	Not Detected	---------	9.02E-02
EU-154	Not Detected	---------	2.70E-01
EU-155	Not Detected	---------	1.41E-01
FE-59	Not Detected	---------	1.09E-01
GD-153	Not Detected	---------	1.03E-01
HG-203	Not Detected	---------	4.28E-02
I-131	Not Detected	---------	5.60E-02
IR-192	Not Detected	---------	3.72E-02
K-40	2.03E+01	3.29E+00	4.11E-01
MN-52	Not Detected	---------	8.03E-02
MN-54	Not Detected	---------	5.17E-02
MO-99	Not Detected	---------	1.20E+00
NA-22	Not Detected	---------	6.03E-02
NA-24	Not Detected	---------	1.22E+01
NB-95	Not Detected	---------	5.35E-01
ND-147	Not Detected	---------	3.67E-01
NI-57	Not Detected	---------	7.45E-01
PB-210	Not Detected	---------	5.55E+00
RU-103	Not Detected	---------	4.09E-02
RU-106	Not Detected	---------	4.09E-01
SB-122	Not Detected	---------	1.96E-01
SB-124	Not Detected	---------	3.97E-02
SB-125	Not Detected	---------	1.14E-01
SN-113	Not Detected	---------	5.10E-02
SR-85	Not Detected	---------	5.23E-02
TA-182	Not Detected	---------	2.29E-01
TA-183	Not Detected	---------	3.96E-01
TC-99m	Not Detected	---------	4.01E+04
TL-201	Not Detected	---------	4.33E-01
XE-133	Not Detected	---------	5.86E-01
Y-88	Not Detected	---------	4.09E-02
ZN-65	Not Detected	---------	1.52E-01
ZR-95	Not Detected	---------	8.54E-02

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* Sandia National Laboratories *
* Radiation Protection Sample Diagnostics Program [881 Laboratory] *
* 6-15-97 8:01:48 PM *
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* Analyzed by: KK 6/19/97 Reviewed by: [illegible] 6/23/97 *

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Customer : C.BYRD/CSTEFANOV (6685/SMO)
Customer Sample ID : 034982-004
Lab Sample ID : 70098903

Sample Description : MARINELLI SOLID SAMPLE
Sample Quantity : 558.000 gram
Sample Date/Time : 6-10-97 2:25:00 PM
Acquire Start Date/Time : 6-15-97 6:19:13 PM
Detector Name : LAB01
Elapsed Live/Real Time : 6000 / 6002 seconds

Comments:

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Nuclide Name	Activity (pCi/gram)	2-sigma Error	MDA (pCi/gram)	
U-238	Not Detected	---------	1.95E+00	
TH-234	Not Detected	---------	7.72E-01	
RA-226	1.59E+00	7.56E-01	6.41E-01	
PB-214	6.76E-01	1.50E-01	6.65E-02	
BI-214	6.59E-01	1.46E-01	6.82E-02	
TH-232	1.07E+00	5.42E-01	2.12E-01	
RA-228	9.15E-01	3.19E-01	2.26E-01	
AC-228	9.08E-01	2.48E-01	1.33E-01	
TH-228	6.17E-01	4.56E-01	6.23E-01	
RA-224	9.66E-01	4.85E-01	1.03E-01	
PB-212	9.27E-01	1.62E-01	5.33E-02	
BI-212	1.01E+00	6.85E-01	4.66E-01	
TL-208	1.01E+00	2.26E-01	1.02E-01	
U-235	~~1.53E-01~~	~~1.08E-01~~	~~2.64E-01~~	NOT DETECTED 6/19/97 KK
TH-231	Not Detected	---------	1.12E+01	
PA-231	Not Detected	---------	1.87E+00	
TH-227	Not Detected	---------	4.82E-01	
RA-223	Not Detected	---------	2.43E-01	
RN-219	Not Detected	---------	5.52E-01	
PB-211	Not Detected	---------	1.24E+00	
TL-207	Not Detected	---------	1.94E+01	
AM-241	Not Detected	---------	2.42E-01	
PU-239	Not Detected	---------	4.34E+02	
NP-237	~~4.51E-01~~	~~2.06E-01~~	~~2.30E-01~~	NOT DETECTED 6/19/97 KK
PA-233	Not Detected	---------	7.39E-02	
TH-229	Not Detected	---------	2.47E-01	

[Summary Report] - Sample ID: : 70098903

Nuclide Name	Activity (pCi/gram)	2-sigma Error	MDA (pCi/gram)
AG-108m	Not Detected	---------	6.02E-02
AG-110m	Not Detected	---------	6.64E-02
BA-133	Not Detected	---------	6.62E-02
BE-7	Not Detected	---------	3.67E-01
CD-109	Not Detected	---------	1.23E+00
CD-115	Not Detected	---------	4.43E-01
CE-139	Not Detected	---------	3.35E-02
CE-141	Not Detected	---------	6.40E-02
CE-144	Not Detected	---------	2.42E-01
CO-56	Not Detected	---------	4.09E-02
CO-57	Not Detected	---------	3.16E-02
CO-58	Not Detected	---------	4.86E-02
CO-60	Not Detected	---------	5.41E-02
CR-51	Not Detected	---------	3.41E-01
CS-134	Not Detected	---------	6.26E-02
CS-137	1.94E-01	4.96E-02	3.48E-02
EU-152	Not Detected	---------	9.39E-02
EU-154	Not Detected	---------	2.75E-01
EU-155	Not Detected	---------	1.40E-01
FE-59	Not Detected	---------	1.25E-01
GD-153	Not Detected	---------	1.00E-01
HG-203	Not Detected	---------	4.32E-02
I-131	Not Detected	---------	6.29E-02
IR-192	Not Detected	---------	3.77E-02
K-40	2.34E+01	3.80E+00	3.99E-01
MN-52	Not Detected	---------	8.66E-02
MN-54	Not Detected	---------	5.14E-02
MO-99	Not Detected	---------	1.21E+00
NA-22	Not Detected	---------	6.07E-02
NA-24	Not Detected	---------	1.34E+01
NB-95	Not Detected	---------	5.57E-01
ND-147	Not Detected	---------	3.69E-01
NI-57	Not Detected	---------	7.68E-01
PB-210	Not Detected	---------	9.59E+00
RU-103	Not Detected	---------	4.53E-02
RU-106	Not Detected	---------	4.15E-01
SB-122	Not Detected	---------	2.06E-01
SB-124	Not Detected	---------	4.69E-02
SB-125	Not Detected	---------	1.16E-01
SN-113	Not Detected	---------	5.19E-02
SR-85	Not Detected	---------	5.38E-02
TA-182	Not Detected	---------	2.20E-01
TA-183	Not Detected	---------	4.15E-01
TC-99m	Not Detected	---------	4.88E+04
TL-201	Not Detected	---------	4.29E-01
XE-133	Not Detected	---------	6.17E-01
Y-88	Not Detected	---------	4.19E-02
ZN-65	Not Detected	---------	1.51E-01
ZR-95	Not Detected	---------	9.15E-02

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* Sandia National Laboratories *
* Radiation Protection Sample Diagnostics Program [881 Laboratory] *
* 6-15-97 9:46:46 PM *
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* Analyzed by: 6/19/97 Reviewed by: 6/23/97 *
****

Customer : C.BYRD/CSTEFANOV (6685/SMO)
Customer Sample ID : 034983-004
Lab Sample ID : 70098904

Sample Description : MARINELLI SOLID SAMPLE
Sample Quantity : 604.000 gram
Sample Date/Time : 6-10-97 2:35:00 PM
Acquire Start Date/Time : 6-15-97 8:04:12 PM
Detector Name : LAB01
Elapsed Live/Real Time : 6000 / 6002 seconds

Comments:
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Nuclide Name	Activity (pCi/gram)	2-sigma Error	MDA (pCi/gram)
U-238	Not Detected	---------	1.94E+00
TH-234	1.13E+00	3.96E-01	5.34E-01
RA-226	1.80E+00	6.06E-01	5.92E-01
PB-214	6.84E-01	1.45E-01	6.43E-02
BI-214	6.98E-01	1.59E-01	6.19E-02
TH-232	1.12E+00	5.83E-01	1.83E-01
RA-228	9.35E-01	2.79E-01	2.12E-01
AC-228	9.67E-01	2.73E-01	1.21E-01
TH-228	1.05E+00	4.78E-01	5.51E-01
RA-224	1.04E+00	4.27E-01	8.25E-02
PB-212	1.02E+00	1.76E-01	4.69E-02
BI-212	1.01E+00	6.62E-01	4.64E-01
TL-208	9.62E-01	2.50E-01	9.15E-02
U-235	Not Detected	---------	2.52E-01
TH-231	Not Detected	---------	1.05E+01
PA-231	Not Detected	---------	1.78E+00
TH-227	Not Detected	---------	4.69E-01
RA-223	Not Detected	---------	2.31E-01
RN-219	Not Detected	---------	5.00E-01
PB-211	Not Detected	---------	1.15E+00
TL-207	Not Detected	---------	1.87E+01
AM-241	Not Detected	---------	2.21E-01
PU-239	Not Detected	---------	4.23E+02
NP-237	~~5.81E-01~~	~~2.13E-01~~	~~2.65E-01~~ NOT DETECTED CLIGHT
PA-233	Not Detected	---------	7.25E-02
TH-229	Not Detected	---------	2.36E-01

[Summary Report] - Sample ID: : 70098904

Nuclide Name	Activity (pCi/gram)	2-sigma Error	MDA (pCi/gram)
AG-108m	Not Detected	---------	5.61E-02
AG-110m	Not Detected	---------	6.37E-02
BA-133	Not Detected	---------	6.23E-02
BE-7	Not Detected	---------	3.48E-01
CD-109	Not Detected	---------	1.19E+00
CD-115	Not Detected	---------	4.43E-01
CE-139	Not Detected	---------	3.08E-02
CE-141	Not Detected	---------	6.06E-02
CE-144	Not Detected	---------	2.29E-01
CO-56	Not Detected	---------	3.67E-02
CO-57	Not Detected	---------	2.92E-02
CO-58	Not Detected	---------	4.80E-02
CO-60	Not Detected	---------	5.37E-02
CR-51	Not Detected	---------	3.23E-01
CS-134	Not Detected	---------	5.97E-02
CS-137	2.15E-01	5.76E-02	3.08E-02
EU-152	Not Detected	---------	8.79E-02
EU-154	Not Detected	---------	2.59E-01
EU-155	Not Detected	---------	1.36E-01
FE-59	Not Detected	---------	1.08E-01
GD-153	Not Detected	---------	9.98E-02
HG-203	Not Detected	---------	4.25E-02
I-131	Not Detected	---------	5.83E-02
IR-192	Not Detected	---------	3.43E-02
K-40	2.12E+01	3.38E+00	3.66E-01
MN-52	Not Detected	---------	8.07E-02
MN-54	Not Detected	---------	4.78E-02
MO-99	Not Detected	---------	1.19E+00
NA-22	Not Detected	---------	5.75E-02
NA-24	Not Detected	---------	1.43E+01
NB-95	Not Detected	---------	5.41E-01
ND-147	Not Detected	---------	3.74E-01
NI-57	Not Detected	---------	7.16E-01
PB-210	Not Detected	---------	9.44E+00
RU-103	Not Detected	---------	4.18E-02
RU-106	Not Detected	---------	3.90E-01
SB-122	Not Detected	---------	1.94E-01
SB-124	Not Detected	---------	4.28E-02
SB-125	Not Detected	---------	1.16E-01
SN-113	Not Detected	---------	4.93E-02
SR-85	Not Detected	---------	5.28E-02
TA-182	Not Detected	---------	2.10E-01
TA-183	Not Detected	---------	3.83E-01
TC-99m	Not Detected	---------	5.75E+04
TL-201	Not Detected	---------	4.37E-01
XE-133	Not Detected	---------	6.23E-01
Y-88	Not Detected	---------	3.82E-02
ZN-65	Not Detected	---------	1.39E-01
ZR-95	Not Detected	---------	8.24E-02

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* Sandia National Laboratories *
* Radiation Protection Sample Diagnostics Program [881 Laboratory] *
* 6-15-97 11:32:04 PM *
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* *
* Analyzed by: 6/19/97 Reviewed by: 6/23/97 *
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Customer : C.BYRD/CSTEFANOV (6685/SMO)
Customer Sample ID : 034985-004
Lab Sample ID : 70098905

Sample Description : MARINELLI SOLID SAMPLE
Sample Quantity : 653.000 gram
Sample Date/Time : 6-10-97 2:45:00 PM
Acquire Start Date/Time : 6-15-97 9:49:33 PM
Detector Name : LAB01
Elapsed Live/Real Time : 6000 / 6002 seconds

Comments:

Nuclide Name	Activity (pCi/gram)	2-sigma Error	MDA (pCi/gram)
U-238	7.85E-01	8.07E-01	1.27E+00
TH-234	Not Detected	---------	6.13E-01
RA-226	1.01E+00	7.25E-01	5.42E-01
PB-214	4.47E-01	1.08E-01	5.42E-02
BI-214	4.14E-01	1.20E-01	5.18E-02
TH-232	7.69E-01	4.28E-01	1.67E-01
RA-228	6.68E-01	2.52E-01	1.99E-01
AC-228	6.83E-01	5.00E-01	1.07E-01
TH-228	6.35E-01	3.97E-01	5.33E-01
RA-224	6.92E-01	3.16E-01	8.66E-02
PB-212	6.65E-01	1.19E-01	4.21E-02
BI-212	6.29E-01	3.31E-01	3.11E-01
TL-208	5.60E-01	1.36E-01	8.44E-02
U-235	Not Detected	---------	2.12E-01
TH-231	Not Detected	---------	8.70E+00
PA-231	Not Detected	---------	1.46E+00
TH-227	Not Detected	---------	3.68E-01
RA-223	Not Detected	---------	1.86E-01
RN-219	Not Detected	---------	4.18E-01
PB-211	Not Detected	---------	9.74E-01
TL-207	Not Detected	---------	1.65E+01
AM-241	Not Detected	---------	1.88E-01
PU-239	~~1.94E+02~~	~~1.62E-02~~	~~2.52E+02~~ NOT DETECTED 6/19/97
NP-237	Not Detected	---------	2.85E-01
PA-233	Not Detected	---------	5.77E-02
TH-229	Not Detected	---------	2.02E-01

[Summary Report] - Sample ID: : 70098905

Nuclide Name	Activity (pCi/gram)	2-sigma Error	MDA (pCi/gram)
AG-108m	Not Detected	---------	4.37E-02
AG-110m	Not Detected	---------	4.99E-02
BA-133	Not Detected	---------	5.06E-02
BE-7	Not Detected	---------	2.96E-01
CD-109	~~9.41E-01~~	~~3.22E-01~~	~~6.93E-01~~ NOT DETECTED 6/19/99
CD-115	Not Detected	---------	3.56E-01
CE-139	Not Detected	---------	2.68E-02
CE-141	Not Detected	---------	5.11E-02
CE-144	Not Detected	---------	1.93E-01
CO-56	Not Detected	---------	4.42E-02
CO-57	Not Detected	---------	2.42E-02
CO-58	Not Detected	---------	3.71E-02
CO-60	Not Detected	---------	4.25E-02
CR-51	Not Detected	---------	2.76E-01
CS-134	Not Detected	---------	4.75E-02
CS-137	1.22E-01	3.71E-02	2.62E-02
EU-152	Not Detected	---------	7.24E-02
EU-154	Not Detected	---------	2.02E-01
EU-155	Not Detected	---------	1.11E-01
FE-59	Not Detected	---------	9.53E-02
GD-153	Not Detected	---------	8.45E-02
HG-203	Not Detected	---------	3.51E-02
I-131	Not Detected	---------	4.71E-02
IR-192	Not Detected	---------	2.97E-02
K-40	1.54E+01	4.17E+00	3.48E-01
MN-52	Not Detected	---------	7.48E-02
MN-54	Not Detected	---------	4.10E-02
MO-99	Not Detected	---------	1.09E+00
NA-22	Not Detected	---------	5.00E-02
NA-24	Not Detected	---------	1.36E+01
NB-95	Not Detected	---------	4.30E-01
ND-147	Not Detected	---------	3.11E-01
NI-57	Not Detected	---------	7.01E-01
PB-210	Not Detected	---------	7.73E+00
RU-103	Not Detected	---------	3.55E-02
RU-106	Not Detected	---------	3.20E-01
SB-122	Not Detected	---------	1.75E-01
SB-124	Not Detected	---------	3.51E-02
SB-125	Not Detected	---------	9.48E-02
SN-113	Not Detected	---------	4.06E-02
SR-85	Not Detected	---------	4.48E-02
TA-182	Not Detected	---------	1.75E-01
TA-183	Not Detected	---------	3.28E-01
TC-99m	Not Detected	---------	5.82E+04
TL-201	Not Detected	---------	3.49E-01
XE-133	Not Detected	---------	5.06E-01
Y-88	Not Detected	---------	3.33E-02
ZN-65	Not Detected	---------	1.18E-01
ZR-95	Not Detected	---------	7.01E-02

****
* Sandia National Laboratories *
* Radiation Protection Sample Diagnostics Program [881 Laboratory] *
* 6-16-97 1:17:03 AM *
****

* Analyzed by: 6/19/97 Reviewed by: 6/23/97 *

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Customer : C.BYRD/CSTEFANOV (6685/SMO)
Customer Sample ID : 034986-004
Lab Sample ID : 70098906

Sample Description : MARINELLI SOLID SAMPLE
Sample Quantity : 576.000 gram
Sample Date/Time : 6-10-97 3:00:00 PM
Acquire Start Date/Time : 6-15-97 11:34:27 PM
Detector Name : LAB01
Elapsed Live/Real Time : 6000 / 6002 seconds

Comments:

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Nuclide Name	Activity (pCi/gram)	2-sigma Error	MDA (pCi/gram)	
U-238	Not Detected	---------	1.95E+00	
TH-234	8.29E-01	4.48E-01	6.00E-01	
RA-226	1.66E+00	6.55E-01	7.12E-01	
PB-214	6.88E-01	1.36E-01	6.22E-02	
BI-214	6.24E-01	1.50E-01	6.12E-02	
TH-232	1.02E+00	4.96E-01	1.82E-01	
RA-228	1.04E+00	4.12E-01	2.26E-01	
AC-228	1.01E+00	2.88E-01	1.25E-01	
TH-228	9.96E-01	5.49E-01	5.58E-01	
RA-224	1.02E+00	5.65E-01	1.12E-01	
PB-212	1.02E+00	1.73E-01	4.71E-02	
BI-212	1.11E+00	5.81E-01	4.28E-01	
TL-208	9.50E-01	2.11E-01	8.72E-02	
U-235	~~1.54E-01~~	~~1.88E-01~~	~~2.64E-01~~	NOT DETECTED which KS
TH-231	Not Detected	---------	1.08E+01	
PA-231	Not Detected	---------	1.77E+00	
TH-227	Not Detected	---------	4.80E-01	
RA-223	Not Detected	---------	2.34E-01	
RN-219	~~3.48E-01~~	~~4.19E-01~~	~~5.28E-01~~	NOT DETECTED which KS
PB-211	Not Detected	---------	1.14E+00	
TL-207	Not Detected	---------	2.01E+01	
AM-241	Not Detected	---------	2.39E-01	
PU-239	Not Detected	---------	4.28E+02	
NP-237	~~2.60E-01~~	~~1.74E-01~~	~~2.15E-01~~	NOT DETECTED which KS
PA-233	Not Detected	---------	7.29E-02	
TH-229	Not Detected	---------	2.36E-01	

[Summary Report] - Sample ID: : 70098906

Nuclide Name	Activity (pCi/gram)	2-sigma Error	MDA (pCi/gram)
AG-108m	Not Detected	---------	6.00E-02
AG-110m	Not Detected	---------	5.63E-02
BA-133	Not Detected	---------	6.57E-02
BE-7	Not Detected	---------	3.59E-01
CD-109	Not Detected	---------	7.35E-01
CD-115	Not Detected	---------	4.46E-01
CE-139	Not Detected	---------	3.26E-02
CE-141	Not Detected	---------	6.32E-02
CE-144	Not Detected	---------	2.25E-01
CO-56	Not Detected	---------	5.06E-02
CO-57	Not Detected	---------	3.07E-02
CO-58	Not Detected	---------	4.37E-02
CO-60	Not Detected	---------	4.80E-02
CR-51	Not Detected	---------	3.40E-01
CS-134	Not Detected	---------	6.20E-02
CS-137	1.12E-01	2.90E-02	2.89E-02
EU-152	Not Detected	---------	9.22E-02
EU-154	Not Detected	---------	2.77E-01
EU-155	Not Detected	---------	1.41E-01
FE-59	Not Detected	---------	1.09E-01
GD-153	Not Detected	---------	9.90E-02
HG-203	Not Detected	---------	4.24E-02
I-131	Not Detected	---------	6.07E-02
IR-192	Not Detected	---------	3.70E-02
K-40	1.93E+01	3.08E+00	3.48E-01
MN-52	Not Detected	---------	8.71E-02
MN-54	Not Detected	---------	4.94E-02
MO-99	Not Detected	---------	1.29E+00
NA-22	Not Detected	---------	6.00E-02
NA-24	Not Detected	---------	1.68E+01
NB-95	Not Detected	---------	5.69E-01
ND-147	Not Detected	---------	3.72E-01
NI-57	Not Detected	---------	8.42E-01
PB-210	Not Detected	---------	9.63E+00
RU-103	Not Detected	---------	4.18E-02
RU-106	Not Detected	---------	4.01E-01
SB-122	Not Detected	---------	2.10E-01
SB-124	Not Detected	---------	4.58E-02
SB-125	Not Detected	---------	1.15E-01
SN-113	Not Detected	---------	5.29E-02
SR-85	Not Detected	---------	5.40E-02
TA-182	Not Detected	---------	2.14E-01
TA-183	Not Detected	---------	4.22E-01
TC-99m	Not Detected	---------	8.37E+04
TL-201	Not Detected	---------	4.52E-01
XE-133	Not Detected	---------	6.37E-01
Y-88	Not Detected	---------	4.01E-02
ZN-65	Not Detected	---------	1.48E-01
ZR-95	Not Detected	---------	8.41E-02

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* Sandia National Laboratories *
* Radiation Protection Sample Diagnostics Program [881 Laboratory] *
* 6-16-97 3:02:02 AM *
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* Analyzed by: 6/16/97 Reviewed by: 6/23/97 *

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Customer : C.BYRD/CSTEFANOV (6685/SMO)
Customer Sample ID : 034987-004
Lab Sample ID : 70098907

Sample Description : MARINELLI SOLID SAMPLE
Sample Quantity : 596.000 gram
Sample Date/Time : 6-10-97 3:07:00 PM
Acquire Start Date/Time : 6-16-97 1:19:26 AM
Detector Name : LAB01
Elapsed Live/Real Time : 6000 / 6002 seconds

Comments:

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Nuclide Name	Activity (pCi/gram)	2-sigma Error	MDA (pCi/gram)
U-238	Not Detected	---------	1.83E+00
TH-234	Not Detected	---------	6.07E-01
RA-226	1.23E+00	5.34E-01	6.20E-01
PB-214	6.26E-01	1.26E-01	6.25E-02
BI-214	5.91E-01	1.42E-01	6.70E-02
TH-232	1.04E+00	5.22E-01	1.83E-01
RA-228	9.70E-01	2.88E-01	2.20E-01
AC-228	1.00E+00	2.79E-01	1.14E-01
TH-228	8.12E-01	8.14E-01	5.16E-01
RA-224	1.16E+00	4.47E-01	1.10E-01
PB-212	1.04E+00	1.74E-01	4.95E-02
BI-212	1.32E+00	6.21E-01	4.43E-01
TL-208	9.67E-01	2.22E-01	9.83E-02
U-235	Not Detected	---------	2.52E-01
TH-231	Not Detected	---------	1.08E+01
PA-231	Not Detected	---------	1.79E+00
TH-227	Not Detected	---------	4.71E-01
RA-223	Not Detected	---------	2.36E-01
RN-219	Not Detected	---------	4.88E-01
PB-211	Not Detected	---------	1.10E+00
TL-207	Not Detected	---------	1.83E+01
AM-241	Not Detected	---------	2.25E-01
PU-239	Not Detected	---------	4.18E+02
NP-237	Not Detected	---------	3.58E-01
PA-233	Not Detected	---------	6.97E-02
TH-229	Not Detected	---------	2.40E-01

[Summary Report] - Sample ID: : 70098907

Nuclide Name	Activity (pCi/gram)	2-sigma Error	MDA (pCi/gram)
AG-108m	Not Detected	---------	5.64E-02
AG-110m	Not Detected	---------	6.40E-02
BA-133	Not Detected	---------	6.47E-02
BE-7	Not Detected	---------	3.64E-01
CD-109	~~1.99E+00~~	~~6.35E-01~~	~~7.20E-01~~ NOT DETECTED KG 6/15/07
CD-115	Not Detected	---------	4.68E-01
CE-139	Not Detected	---------	3.23E-02
CE-141	Not Detected	---------	6.15E-02
CE-144	Not Detected	---------	2.41E-01
CO-56	Not Detected	---------	4.98E-02
CO-57	Not Detected	---------	2.88E-02
CO-58	Not Detected	---------	4.56E-02
CO-60	Not Detected	---------	4.86E-02
CR-51	Not Detected	---------	3.14E-01
CS-134	Not Detected	---------	5.81E-02
CS-137	2.16E-01	5.22E-02	3.17E-02
EU-152	Not Detected	---------	8.58E-02
EU-154	Not Detected	---------	2.61E-01
EU-155	Not Detected	---------	1.35E-01
FE-59	Not Detected	---------	1.10E-01
GD-153	Not Detected	---------	9.92E-02
HG-203	Not Detected	---------	4.18E-02
I-131	Not Detected	---------	5.87E-02
IR-192	Not Detected	---------	3.35E-02
K-40	1.75E+01	2.85E+00	3.47E-01
MN-52	Not Detected	---------	8.32E-02
MN-54	Not Detected	---------	4.75E-02
MO-99	Not Detected	---------	1.34E+00
NA-22	Not Detected	---------	5.83E-02
NA-24	Not Detected	---------	1.87E+01
NB-95	Not Detected	---------	5.63E-01
ND-147	Not Detected	---------	3.67E-01
NI-57	Not Detected	---------	7.73E-01
PB-210	Not Detected	---------	9.20E+00
RU-103	Not Detected	---------	4.18E-02
RU-106	Not Detected	---------	3.79E-01
SB-122	Not Detected	---------	2.15E-01
SB-124	Not Detected	---------	4.27E-02
SB-125	Not Detected	---------	1.11E-01
SN-113	Not Detected	---------	4.99E-02
SR-85	Not Detected	---------	5.24E-02
TA-182	Not Detected	---------	2.18E-01
TA-183	Not Detected	---------	4.00E-01
TC-99m	Not Detected	---------	9.71E+04
TL-201	Not Detected	---------	4.46E-01
XE-133	Not Detected	---------	6.50E-01
Y-88	Not Detected	---------	3.27E-02
ZN-65	Not Detected	---------	1.45E-01
ZR-95	Not Detected	---------	8.02E-02

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* Sandia National Laboratories *
* Radiation Protection Sample Diagnostics Program [881 Laboratory] *
* 6-16-97 4:47:01 AM *
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* Analyzed by: 6/19/97 Reviewed by: 6/23/97 *

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Customer : C.BYRD/CSTEFANOV (6685/SMO)
Customer Sample ID : 034988-004
Lab Sample ID : 70098908

Sample Description : MARINELLI SOLID SAMPLE
Sample Quantity : 637.000 gram
Sample Date/Time : 6-10-97 3:15:00 PM
Acquire Start Date/Time : 6-16-97 3:04:26 AM
Detector Name : LAB01
Elapsed Live/Real Time : 6000 / 6002 seconds

Comments:

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Nuclide Name	Activity (pCi/gram)	2-sigma Error	MDA (pCi/gram)	
U-238	Not Detected	---------	1.74E+00	
TH-234	Not Detected	---------	7.00E-01	
RA-226	Not Detected	---------	6.32E-01	
PB-214	5.95E-01	1.21E-01	6.19E-02	
BI-214	5.33E-01	1.36E-01	6.03E-02	
TH-232	9.25E-01	4.96E-01	1.75E-01	
RA-228	8.72E-01	3.69E-01	1.99E-01	
AC-228	9.69E-01	2.66E-01	1.07E-01	
TH-228	7.14E-01	5.38E-01	5.35E-01	
RA-224	8.32E-01	3.13E-01	1.03E-01	
PB-212	9.97E-01	1.68E-01	4.59E-02	
BI-212	1.03E+00	9.23E-01	4.02E-01	
TL-208	8.44E-01	1.74E-01	8.65E-02	
U-235	~~9.34E-02~~	~~8.42E-02~~	~~1.42E-01~~	NOT DETECTED 6/19/97
TH-231	Not Detected	---------	1.02E+01	
PA-231	Not Detected	---------	1.67E+00	
TH-227	Not Detected	---------	4.45E-01	
RA-223	Not Detected	---------	2.18E-01	
RN-219	~~2.51E-01~~	~~4.12E-01~~	~~5.12E-01~~	NOT DETECTED 6/19/97
PB-211	Not Detected	---------	1.10E+00	
TL-207	Not Detected	---------	1.72E+01	
AM-241	Not Detected	---------	2.22E-01	
PU-239	Not Detected	---------	4.09E+02	
NP-237	~~3.84E-01~~	~~1.79E-01~~	~~2.21E-01~~	NOT DETECTED 6/19/97
PA-233	Not Detected	---------	6.84E-02	
TH-229	Not Detected	---------	2.29E-01	

[Summary Report] - Sample ID: : 70098908

Nuclide Name	Activity (pCi/gram)	2-sigma Error	MDA (pCi/gram)	
AG-108m	Not Detected	---------	5.48E-02	
AG-110m	Not Detected	---------	5.37E-02	
BA-133	Not Detected	---------	6.08E-02	
BE-7	Not Detected	---------	3.43E-01	
CD-109	Not Detected	---------	1.11E+00	
CD-115	Not Detected	---------	4.33E-01	
CE-139	Not Detected	---------	3.13E-02	
CE-141	Not Detected	---------	5.62E-02	
CE-144	Not Detected	---------	2.21E-01	
CO-56	Not Detected	---------	4.87E-02	
CO-57	Not Detected	---------	2.82E-02	
CO-58	Not Detected	---------	4.18E-02	
CO-60	Not Detected	---------	4.91E-02	
CR-51	Not Detected	---------	3.14E-01	
CS-134	Not Detected	---------	5.64E-02	
CS-137	1.24E-01	3.77E-02	2.87E-02	
EU-152	Not Detected	---------	8.46E-02	
EU-154	Not Detected	---------	2.53E-01	
EU-155	Not Detected	---------	1.31E-01	
FE-59	Not Detected	---------	1.00E-01	
GD-153	Not Detected	---------	9.31E-02	
HG-203	Not Detected	---------	4.09E-02	
I-131	Not Detected	---------	5.25E-02	
IR-192	Not Detected	---------	3.36E-02	
K-40	1.95E+01	3.13E+00	3.18E-01	
MN-52	Not Detected	---------	8.16E-02	
MN-54	~~2.45E-02~~	~~4.11E-02~~	~~2.36E-02~~	NOT DETECTED 6/14/97 KRT
MO-99	Not Detected	---------	1.19E+00	
NA-22	Not Detected	---------	5.75E-02	
NA-24	Not Detected	---------	1.86E+01	
NB-95	Not Detected	---------	5.36E-01	
ND-147	Not Detected	---------	3.52E-01	
NI-57	Not Detected	---------	8.53E-01	
PB-210	Not Detected	---------	9.00E+00	
RU-103	Not Detected	---------	3.83E-02	
RU-106	Not Detected	---------	3.65E-01	
SB-122	Not Detected	---------	2.07E-01	
SB-124	Not Detected	---------	4.28E-02	
SB-125	Not Detected	---------	1.09E-01	
SN-113	Not Detected	---------	4.55E-02	
SR-85	Not Detected	---------	5.10E-02	
TA-182	Not Detected	---------	2.06E-01	
TA-183	Not Detected	---------	3.99E-01	
TC-99m	Not Detected	---------	1.12E+05	
TL-201	Not Detected	---------	4.29E-01	
XE-133	~~9.48E-02~~	~~6.19E-02~~	~~2.52E-01~~	NOT DETECTED 6/14/97 KRT
Y-88	Not Detected	---------	3.68E-02	
ZN-65	Not Detected	---------	1.40E-01	
ZR-95	Not Detected	---------	8.29E-02	

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* Sandia National Laboratories *
* Radiation Protection Sample Diagnostics Program [881 Laboratory] *
* 6-17-97 12:19:19 PM *
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* Analyzed by: KG 6/19/97 Reviewed by: JJ 6/23/97 *

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Customer : C.BYRD/C.STEFANOV (6685/SMO)
Customer Sample ID : 034991-004
Lab Sample ID : 70098926

Sample Description : MARINELLI LIQUID SAMPLE
Sample Quantity : 500.000 mL
Sample Date/Time : 6-12-97 2:40:00 PM
Acquire Start Date/Time : 6-17-97 10:36:26 AM
Detector Name : LAB01
Elapsed Live/Real Time : 6000 / 6001 seconds

Comments:

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Nuclide Name	Activity (pCi/mL)	2-sigma Error	MDA (pCi/mL)
U-238	Not Detected	---------	7.81E-01
TH-234	Not Detected	---------	3.08E-01
RA-226	Not Detected	---------	3.77E-01
PB-214	Not Detected	---------	5.35E-02
BI-214	Not Detected	---------	6.26E-02
TH-232	Not Detected	---------	1.52E-01
RA-228	Not Detected	---------	1.64E-01
AC-228	Not Detected	---------	1.01E-01
TH-228	Not Detected	---------	4.78E-01
RA-224	Not Detected	---------	1.63E-01
PB-212	Not Detected	---------	4.06E-02
BI-212	Not Detected	---------	3.45E-01
TL-208	Not Detected	---------	8.31E-02
U-235	Not Detected	---------	1.37E-01
TH-231	Not Detected	---------	4.72E+00
PA-231	Not Detected	---------	1.06E+00
TH-227	Not Detected	---------	1.57E-01
RA-223	Not Detected	---------	1.00E-01
RN-219	Not Detected	---------	3.11E-01
PB-211	Not Detected	---------	6.88E-01
TL-207	Not Detected	---------	1.12E+01
AM-241	Not Detected	---------	9.56E-02
PU-239	Not Detected	---------	2.08E+02
NP-237	Not Detected	---------	1.35E-01
PA-233	Not Detected	---------	4.38E-02
TH-229	Not Detected	---------	1.19E-01

[Summary Report] - Sample ID: : 70098926

Nuclide Name	Activity (pCi/mL)	2-sigma Error	MDA (pCi/mL)
AG-108m	Not Detected	---------	2.49E-02
AG-110m	Not Detected	---------	2.46E-02
BA-133	Not Detected	---------	3.34E-02
BE-7	Not Detected	---------	1.90E-01
CD-109	Not Detected	---------	4.44E-01
CD-115	Not Detected	---------	1.71E-01
CE-139	Not Detected	---------	1.84E-02
CE-141	Not Detected	---------	3.31E-02
CE-144	Not Detected	---------	1.24E-01
CO-56	Not Detected	---------	3.54E-02
CO-57	Not Detected	---------	1.57E-02
CO-58	Not Detected	---------	3.00E-02
CO-60	Not Detected	---------	3.29E-02
CR-51	Not Detected	---------	2.02E-01
CS-134	Not Detected	---------	2.86E-02
CS-137	Not Detected	---------	2.87E-02
EU-152	Not Detected	---------	4.69E-02
EU-154	Not Detected	---------	1.15E-01
EU-155	Not Detected	---------	6.67E-02
FE-59	Not Detected	---------	4.56E-02
GD-153	Not Detected	---------	5.10E-02
HG-203	Not Detected	---------	2.39E-02
I-131	Not Detected	---------	3.36E-02
IR-192	Not Detected	---------	2.22E-02
K-40	Not Detected	---------	3.93E-01
MN-52	Not Detected	---------	4.90E-02
MN-54	Not Detected	---------	2.57E-02
MO-99	Not Detected	---------	6.80E-01
NA-22	Not Detected	---------	3.21E-02
NA-24	Not Detected	---------	6.42E+00
NB-95	Not Detected	---------	1.79E-01
ND-147	Not Detected	---------	2.15E-01
NI-57	Not Detected	---------	3.81E-01
PB-210	Not Detected	---------	3.41E+00
RU-103	Not Detected	---------	2.93E-02
RU-106	Not Detected	---------	2.28E-01
SB-122	Not Detected	---------	1.04E-01
SB-124	Not Detected	---------	2.74E-02
SB-125	Not Detected	---------	7.14E-02
SN-113	Not Detected	---------	2.93E-02
SR-85	Not Detected	---------	3.33E-02
TA-182	Not Detected	---------	8.29E-02
TA-183	Not Detected	---------	1.56E-01
TC-99m	Not Detected	---------	1.11E+04
TL-201	Not Detected	---------	1.70E-01
XE-133	Not Detected	---------	2.40E-01
Y-88	Not Detected	---------	3.92E-02
ZN-65	Not Detected	---------	6.15E-02
ZR-95	Not Detected	---------	4.70E-02

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Sandia National Laboratories

Radiation Protection Sample Diagnostics Program [881 Laboratory]

6-15-97 2:28:28 PM

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Analyzed by: 6/16/97 Reviewed by: 6/16/97

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Customer : C.BYRD/CSTEFANOV (6685/SMO)
Customer Sample ID : 034992-004
Lab Sample ID : 70098806

Sample Description : MARINELLI WATER SAMPLE
Sample Quantity : 500.000 mL
Sample Date/Time : 6-12-97 4:00:00 PM
Acquire Start Date/Time : 6-15-97 12:44:14 PM
Detector Name : LAB01
Elapsed Live/Real Time : 6000 / 6001 seconds

Comments:

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Nuclide Name	Activity (pCi/mL)	2-sigma Error	MDA (pCi/mL)
U-238	Not Detected	---------	8.08E-01
TH-234	Not Detected	---------	3.26E-01
RA-226	Not Detected	---------	4.72E-01
PB-214	Not Detected	---------	5.24E-02
BI-214	Not Detected	---------	6.24E-02
TH-232	Not Detected	---------	1.60E-01
RA-228	Not Detected	---------	1.57E-01
AC-228	Not Detected	---------	1.08E-01
TH-228	Not Detected	---------	5.35E-01
RA-224	Not Detected	---------	1.71E-01
PB-212	Not Detected	---------	3.94E-02
BI-212	Not Detected	---------	3.68E-01
TL-208	Not Detected	---------	7.12E-02
U-235	Not Detected	---------	1.38E-01
TH-231	Not Detected	---------	4.67E+00
PA-231	Not Detected	---------	1.01E+00
TH-227	Not Detected	---------	1.54E-01
RA-223	Not Detected	---------	8.77E-02
RN-219	Not Detected	---------	3.05E-01
PB-211	Not Detected	---------	6.62E-01
TL-207	Not Detected	---------	1.18E+01
AM-241	Not Detected	---------	9.30E-02
PU-239	Not Detected	---------	2.15E+02
NP-237	Not Detected	---------	1.33E-01
PA-233	Not Detected	---------	4.49E-02
TH-229	Not Detected	---------	1.21E-01

[Summary Report] - Sample ID: : 70098806

Nuclide Name	Activity (pCi/mL)	2-sigma Error	MDA (pCi/mL)
AG-108m	Not Detected	---------	2.53E-02
AG-110m	Not Detected	---------	2.54E-02
BA-133	Not Detected	---------	3.11E-02
BE-7	Not Detected	---------	1.97E-01
CD-109	Not Detected	---------	4.63E-01
CD-115	Not Detected	---------	9.68E-02
CE-139	Not Detected	---------	1.76E-02
CE-141	Not Detected	---------	3.11E-02
CE-144	Not Detected	---------	1.15E-01
CO-56	Not Detected	---------	3.78E-02
CO-57	Not Detected	---------	1.64E-02
CO-58	Not Detected	---------	2.47E-02
CO-60	Not Detected	---------	2.88E-02
CR-51	Not Detected	---------	1.80E-01
CS-134	Not Detected	---------	2.95E-02
CS-137	Not Detected	---------	2.78E-02
EU-152	Not Detected	---------	4.93E-02
EU-154	Not Detected	---------	1.15E-01
EU-155	Not Detected	---------	7.06E-02
FE-59	Not Detected	---------	4.93E-02
GD-153	Not Detected	---------	4.69E-02
HG-203	Not Detected	---------	2.23E-02
I-131	Not Detected	---------	3.29E-02
IR-192	Not Detected	---------	2.09E-02
K-40	Not Detected	---------	3.43E-01
MN-52	Not Detected	---------	3.48E-02
MN-54	Not Detected	---------	2.47E-02
MO-99	Not Detected	---------	3.52E-01
NA-22	Not Detected	---------	2.96E-02
NA-24	Not Detected	---------	7.60E-01
NB-95	Not Detected	---------	1.19E-01
ND-147	Not Detected	---------	1.99E-01
NI-57	Not Detected	---------	1.45E-01
PB-210	Not Detected	---------	3.66E+00
RU-103	Not Detected	---------	2.62E-02
RU-106	Not Detected	---------	2.38E-01
SB-122	Not Detected	---------	6.46E-02
SB-124	Not Detected	---------	2.92E-02
SB-125	Not Detected	---------	7.10E-02
SN-113	Not Detected	---------	2.87E-02
SR-85	Not Detected	---------	3.32E-02
TA-182	Not Detected	---------	9.08E-02
TA-183	Not Detected	---------	1.17E-01
TC-99m	Not Detected	---------	4.91E+01
TL-201	Not Detected	---------	1.14E-01
XE-133	Not Detected	---------	1.30E-01
Y-88	Not Detected	---------	2.70E-02
ZN-65	Not Detected	---------	5.65E-02
ZR-95	Not Detected	---------	4.68E-02

****
* Sandia National Laboratories *
* Radiation Protection Sample Diagnostics Program [881 Laboratory] *
* 6-17-97 4:12:32 PM *
****
* *
* Analyzed by: 6/17/97 Reviewed by: 6/18/97 *
****

Customer : C.BYRD/C.STEFANOV (6685/SMO)
Customer Sample ID : 034996-004
Lab Sample ID : 70100801

Sample Description : MARINELLI WATER SAMPLE
Sample Quantity : 500.000 mL
Sample Date/Time : 6-16-97 2:00:00 PM
Acquire Start Date/Time : 6-17-97 2:29:39 PM
Detector Name : LAB04
Elapsed Live/Real Time : 6000 / 6001 seconds

Comments:

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Nuclide Name	Activity (pCi/mL)	2-sigma Error	MDA (pCi/mL)
U-238	Not Detected	---------	9.74E-01
TH-234	Not Detected	---------	3.00E-01
RA-226	Not Detected	---------	4.23E-01
PB-214	4.50E-02	2.61E-02	2.77E-02
BI-214	Not Detected	---------	5.45E-02
TH-232	Not Detected	---------	1.39E-01
RA-228	Not Detected	---------	1.20E-01
AC-228	Not Detected	---------	7.67E-02
TH-228	Not Detected	---------	4.62E-01
RA-224	Not Detected	---------	1.04E-01
PB-212	Not Detected	---------	3.59E-02
BI-212	Not Detected	---------	2.67E-01
TL-208	Not Detected	---------	5.80E-02
U-235	Not Detected	---------	1.30E-01
TH-231	Not Detected	---------	4.70E+00
PA-231	Not Detected	---------	9.34E-01
TH-227	Not Detected	---------	1.35E-01
RA-223	Not Detected	---------	7.65E-02
RN-219	Not Detected	---------	2.53E-01
PB-211	Not Detected	---------	5.82E-01
TL-207	Not Detected	---------	8.20E+00
AM-241	Not Detected	---------	1.15E-01
PU-239	Not Detected	---------	2.01E+02
NP-237	Not Detected	---------	1.35E-01
PA-233	Not Detected	---------	3.99E-02
TH-229	Not Detected	---------	1.14E-01

[Summary Report] - Sample ID: : 70100801

Nuclide Name	Activity (pCi/mL)	2-sigma Error	MDA (pCi/mL)
AG-108m	Not Detected	---------	2.03E-02
AG-110m	Not Detected	---------	1.96E-02
BA-133	Not Detected	---------	3.03E-02
BE-7	Not Detected	---------	1.51E-01
CD-109	Not Detected	---------	2.70E-01
CD-115	Not Detected	---------	4.67E-02
CE-139	Not Detected	---------	1.65E-02
CE-141	Not Detected	---------	2.68E-02
CE-144	Not Detected	---------	1.18E-01
CO-56	Not Detected	---------	2.06E-02
CO-57	Not Detected	---------	1.53E-02
CO-58	Not Detected	---------	1.98E-02
CO-60	Not Detected	---------	2.20E-02
CR-51	Not Detected	---------	1.49E-01
CS-134	Not Detected	---------	2.56E-02
CS-137	Not Detected	---------	2.13E-02
EU-152	Not Detected	---------	4.61E-02
EU-154	Not Detected	---------	9.34E-02
EU-155	Not Detected	---------	6.42E-02
FE-59	Not Detected	---------	3.71E-02
GD-153	Not Detected	---------	4.72E-02
HG-203	Not Detected	---------	1.88E-02
I-131	Not Detected	---------	2.02E-02
IR-192	Not Detected	---------	1.76E-02
K-40	Not Detected	---------	2.43E-01
MN-52	Not Detected	---------	2.60E-02
MN-54	Not Detected	---------	2.09E-02
MO-99	Not Detected	---------	1.87E-01
NA-22	Not Detected	---------	2.25E-02
NA-24	Not Detected	---------	6.66E-02
NB-95	Not Detected	---------	7.53E-02
ND-147	Not Detected	---------	1.25E-01
NI-57	Not Detected	---------	4.72E-02
PB-210	Not Detected	---------	3.93E+00
RU-103	Not Detected	---------	2.13E-02
RU-106	Not Detected	---------	1.77E-01
SB-122	Not Detected	---------	3.13E-02
SB-124	Not Detected	---------	2.21E-02
SB-125	Not Detected	---------	4.86E-02
SN-113	Not Detected	---------	2.46E-02
SR-85	Not Detected	---------	2.86E-02
TA-182	Not Detected	---------	7.30E-02
TA-183	Not Detected	---------	1.12E-01
TC-99m	Not Detected	---------	2.57E-01
TL-201	Not Detected	---------	6.94E-02
XE-133	Not Detected	---------	7.34E-02
Y-88	Not Detected	---------	2.24E-02
ZN-65	Not Detected	---------	4.94E-02
ZR-95	Not Detected	---------	3.27E-02

ANNEX 2-A.3
Results of SWMU 27 RFI Confirmatory Soil Sampling Analysis-Gamma Spectroscopy

****
* Sandia National Laboratories *
* Radiation Protection Sample Diagnostics Program [881 Laboratory] *
* 6-13-97 8:41:51 PM *
****

* Analyzed by: 6/16/97 Reviewed by: 6/16/97 *

****

Customer : C.BYRD/C.STEFANOV (6685/SMO)
Customer Sample ID : 034974-004
Lab Sample ID : 70098804

Sample Description : MARINELLI SOIL SAMPLE
Sample Quantity : 647.000 gram
Sample Date/Time : 6-10-97 11:30:00 AM
Acquire Start Date/Time : 6-13-97 6:57:39 PM
Detector Name : LAB01
Elapsed Live/Real Time : 6000 / 6003 seconds

Comments:

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Nuclide Name	Activity (pCi/gram)	2-sigma Error	MDA (pCi/gram)
U-238	Not Detected	---------	1.87E+00
TH-234	1.49E+00	4.45E-01	5.46E-01
RA-226	1.56E+00	5.83E-01	6.50E-01
PB-214	7.95E-01	1.46E-01	6.22E-02
BI-214	7.91E-01	1.83E-01	6.50E-02
TH-232	Not Detected	---------	1.93E-01
RA-228	1.21E+00	3.50E-01	2.07E-01
AC-228	1.14E+00	2.97E-01	1.18E-01
TH-228	1.02E+00	1.19E+00	6.03E-01
RA-224	1.14E+00	3.83E-01	8.98E-02
PB-212	1.16E+00	2.07E-01	4.74E-02
BI-212	9.59E-01	4.10E-01	4.17E-01
TL-208	1.12E+00	2.12E-01	8.76E-02
U-235	1.31E-01	1.85E-01	2.59E-01
TH-231	Not Detected	---------	1.06E+01
PA-231	Not Detected	---------	1.69E+00
TH-227	Not Detected	---------	4.77E-01
RA-223	Not Detected	---------	2.06E-01
~~RN-219~~	~~3.05E-01~~	~~1.17E-01~~	5.19E-01 not detected 6/16/97
PB-211	Not Detected	---------	1.14E+00
TL-207	Not Detected	---------	1.91E+01
AM-241	Not Detected	---------	2.34E-01
PU-239	Not Detected	---------	4.19E+02
~~NP-237~~	~~6.35E-01~~	~~1.93E-01~~	2.44E-01 not detected 6/16/97
PA-233	Not Detected	---------	7.06E-02
TH-229	Not Detected	---------	2.35E-01

[Summary Report] - Sample ID: : 70098804

Nuclide Name	Activity (pCi/gram)	2-sigma Error	MDA (pCi/gram)
AG-108m	Not Detected	---------	5.58E-02
AG-110m	Not Detected	---------	5.27E-02
BA-133	Not Detected	---------	6.45E-02
BE-7	Not Detected	---------	3.40E-01
CD-109	Not Detected	---------	1.20E+00
CD-115	Not Detected	---------	2.39E-01
CE-139	Not Detected	---------	3.18E-02
CE-141	Not Detected	---------	5.87E-02
CE-144	Not Detected	---------	2.27E-01
CO-56	Not Detected	---------	4.50E-02
CO-57	Not Detected	---------	2.92E-02
CO-58	Not Detected	---------	4.18E-02
CO-60	Not Detected	---------	4.81E-02
CR-51	Not Detected	---------	3.03E-01
CS-134	Not Detected	---------	6.11E-02
CS-137	1.14E-01	5.32E-02	3.52E-02
EU-152	Not Detected	---------	8.75E-02
EU-154	Not Detected	---------	2.58E-01
EU-155	Not Detected	---------	1.39E-01
FE-59	Not Detected	---------	1.04E-01
GD-153	Not Detected	---------	9.89E-02
HG-203	Not Detected	---------	4.03E-02
I-131	Not Detected	---------	4.82E-02
IR-192	Not Detected	---------	3.29E-02
K-40	1.96E+01	3.11E+00	3.59E-01
MN-52	Not Detected	---------	7.03E-02
MN-54	Not Detected	---------	4.74E-02
MO-99	Not Detected	---------	7.61E-01
NA-22	Not Detected	---------	5.75E-02
NA-24	Not Detected	---------	1.64E+00
NB-95	Not Detected	---------	3.83E-01
ND-147	Not Detected	---------	3.18E-01
NI-57	Not Detected	---------	3.00E-01
PB-210	Not Detected	---------	9.47E+00
RU-103	Not Detected	---------	4.10E-02
RU-106	Not Detected	---------	3.82E-01
SB-122	Not Detected	---------	1.28E-01
SB-124	Not Detected	---------	4.08E-02
SB-125	Not Detected	---------	1.11E-01
SN-113	Not Detected	---------	5.04E-02
SR-85	Not Detected	---------	5.18E-02
TA-182	Not Detected	---------	2.09E-01
TA-183	Not Detected	---------	3.12E-01
TC-99m	Not Detected	---------	2.91E+02
TL-201	Not Detected	---------	2.82E-01
XE-133	Not Detected	---------	3.30E-01
Y-88	Not Detected	---------	3.98E-02
ZN-65	Not Detected	---------	1.43E-01
ZR-95	Not Detected	---------	8.33E-02

****
* Sandia National Laboratories *
* Radiation Protection Sample Diagnostics Program [881 Laboratory] *
* 6-16-97 10:48:10 PM *
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* Analyzed by: 6/19/97 Reviewed by: 6/23/97 *

****

Customer : C.BYRD/C.STEFANOV (6685/SMO)
Customer Sample ID : 034973-004
Lab Sample ID : 70098914

Sample Description : MARINELLI SOLID SAMPLE
Sample Quantity : 558.000 gram
Sample Date/Time : 6-10-97 11:25:00 AM
Acquire Start Date/Time : 6-16-97 9:05:30 PM
Detector Name : LAB01
Elapsed Live/Real Time : 6000 / 6002 seconds

Comments:

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Nuclide Name	Activity (pCi/gram)	2-sigma Error	MDA (pCi/gram)
U-238	Not Detected	---------	1.96E+00
TH-234	1.49E+00	5.32E-01	5.87E-01
RA-226	2.13E+00	9.06E-01	7.94E-01
PB-214	7.63E-01	1.68E-01	6.69E-02
BI-214	7.19E-01	2.13E-01	6.65E-02
TH-232	1.15E+00	5.51E-01	1.80E-01
RA-228	1.26E+00	3.94E-01	2.09E-01
AC-228	1.15E+00	3.24E-01	1.16E-01
TH-228	8.52E-01	6.08E-01	6.02E-01
RA-224	1.01E+00	6.55E-01	1.56E-01
PB-212	1.15E+00	1.92E-01	5.33E-02
BI-212	1.33E+00	6.22E-01	4.51E-01
TL-208	1.20E+00	1.19E+00	1.01E-01
U-235	~~1.54E-01~~	~~2.00E-01~~	~~2.81E-01~~ 6/19/97 NOT DETECTED
TH-231	Not Detected	---------	1.13E+01
PA-231	Not Detected	---------	1.85E+00
TH-227	Not Detected	---------	5.16E-01
RA-223	Not Detected	---------	2.59E-01
RN-219	Not Detected	---------	5.54E-01
PB-211	Not Detected	---------	1.25E+00
TL-207	Not Detected	---------	2.07E+01
AM-241	Not Detected	---------	2.46E-01
PU-239	Not Detected	---------	4.64E+02
NP-237	Not Detected	---------	2.76E-01
PA-233	Not Detected	---------	7.84E-02
TH-229	Not Detected	---------	2.53E-01

[Summary Report] - Sample ID: : 70098914

Nuclide Name	Activity (pCi/gram)	2-sigma Error	MDA (pCi/gram)	
AG-108m	Not Detected	---------	6.21E-02	
AG-110m	Not Detected	---------	6.06E-02	
BA-133	Not Detected	---------	6.72E-02	
BE-7	Not Detected	---------	3.77E-01	
CD-109	~~2.39E+00~~	~~7.10E-01~~	~~9.42E-01~~	NOT DETECTED AS WCP
CD-115	Not Detected	---------	6.73E-01	
CE-139	Not Detected	---------	3.58E-02	
CE-141	Not Detected	---------	6.93E-02	
CE-144	Not Detected	---------	2.44E-01	
CO-56	Not Detected	---------	4.14E-02	
CO-57	Not Detected	---------	2.99E-02	
CO-58	Not Detected	---------	4.85E-02	
CO-60	Not Detected	---------	5.07E-02	
CR-51	Not Detected	---------	3.61E-01	
CS-134	Not Detected	---------	6.71E-02	
CS-137	1.35E-01	7.48E-02	3.50E-02	
EU-152	Not Detected	---------	8.92E-02	
EU-154	Not Detected	---------	2.81E-01	
EU-155	Not Detected	---------	1.45E-01	
FE-59	Not Detected	---------	1.12E-01	
GD-153	Not Detected	---------	1.08E-01	
HG-203	Not Detected	---------	4.48E-02	
I-131	Not Detected	---------	6.66E-02	
IR-192	Not Detected	---------	3.87E-02	
K-40	1.81E+01	3.05E+00	3.62E-01	
MN-52	Not Detected	---------	1.04E-01	
MN-54	Not Detected	---------	4.90E-02	
MO-99	Not Detected	---------	1.82E+00	
NA-22	Not Detected	---------	6.27E-02	
NA-24	Not Detected	---------	6.29E+01	
NB-95	Not Detected	---------	7.55E-01	
ND-147	Not Detected	---------	4.21E-01	
NI-57	Not Detected	---------	1.48E+00	
PB-210	Not Detected	---------	1.03E+01	
RU-103	Not Detected	---------	4.61E-02	
RU-106	Not Detected	---------	3.94E-01	
SB-122	Not Detected	---------	2.98E-01	
SB-124	Not Detected	---------	4.40E-02	
SB-125	Not Detected	---------	1.19E-01	
SN-113	Not Detected	---------	5.27E-02	
SR-85	Not Detected	---------	5.76E-02	
TA-182	Not Detected	---------	2.35E-01	
TA-183	Not Detected	---------	4.99E-01	
TC-99m	Not Detected	---------	1.58E+06	
TL-201	Not Detected	---------	6.24E-01	
XE-133	Not Detected	---------	9.44E-01	
Y-88	Not Detected	---------	4.56E-02	
ZN-65	Not Detected	---------	1.56E-01	
ZR-95	Not Detected	---------	8.95E-02	

****
* Sandia National Laboratories *
* Radiation Protection Sample Diagnostics Program [881 Laboratory] *
* 6-17-97 12:33:14 AM *
****
* *
* Analyzed by: Reviewed by: 6/23/97 *
****

Customer : C.BYRD/C.STEFANOV (6685/SMO)
Customer Sample ID : 034975-004
Lab Sample ID : 70098915

Sample Description : MARINELLI SOLID SAMPLE
Sample Quantity : 634.000 gram
Sample Date/Time : 6-10-97 11:40:00 AM
Acquire Start Date/Time : 6-16-97 10:50:37 PM
Detector Name : LAB01
Elapsed Live/Real Time : 6000 / 6002 seconds

Comments:
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Nuclide Name	Activity (pCi/gram)	2-sigma Error	MDA (pCi/gram)
U-238	Not Detected	---------	1.79E+00
TH-234	1.40E+00	4.15E-01	5.35E-01
RA-226	1.50E+00	5.89E-01	6.33E-01
PB-214	7.21E-01	3.65E-01	6.14E-02
BI-214	5.98E-01	1.37E-01	6.01E-02
TH-232	9.52E-01	4.63E-01	1.88E-01
RA-228	8.96E-01	2.87E-01	2.24E-01
AC-228	1.02E+00	3.07E-01	1.29E-01
TH-228	6.80E-01	3.30E-01	4.51E-01
RA-224	9.63E-01	4.27E-01	1.16E-01
PB-212	1.05E+00	1.87E-01	4.73E-02
BI-212	9.47E-01	6.52E-01	4.37E-01
TL-208	8.95E-01	3.76E-01	9.11E-02
U-235	~~2.19E-01~~	~~1.73E-01~~	~~2.43E-01~~ NOT DETECTED 6/24/97
TH-231	Not Detected	---------	1.03E+01
PA-231	Not Detected	---------	1.57E+00
TH-227	Not Detected	---------	4.61E-01
RA-223	Not Detected	---------	2.38E-01
RN-219	Not Detected	---------	4.96E-01
PB-211	Not Detected	---------	1.13E+00
TL-207	Not Detected	---------	1.84E+01
AM-241	Not Detected	---------	2.30E-01
PU-239	Not Detected	---------	4.14E+02
NP-237	Not Detected	---------	3.32E-01
PA-233	Not Detected	---------	6.76E-02
TH-229	Not Detected	---------	2.29E-01

[Summary Report] - Sample ID: : 70098915

Nuclide Name	Activity (pCi/gram)	2-sigma Error	MDA (pCi/gram)	
AG-108m	Not Detected	---------	5.50E-02	
AG-110m	Not Detected	---------	4.76E-02	
BA-133	Not Detected	---------	6.10E-02	
BE-7	Not Detected	---------	3.18E-01	
CD-109	~~1.89E+00~~	~~5.74E-01~~	~~8.37E-01~~	NOT DETECTED 6/10/20 KK
CD-115	Not Detected	---------	6.09E-01	
CE-139	Not Detected	---------	3.11E-02	
CE-141	Not Detected	---------	5.97E-02	
CE-144	Not Detected	---------	2.23E-01	
CO-56	Not Detected	---------	3.59E-02	
CO-57	Not Detected	---------	2.82E-02	
CO-58	Not Detected	---------	4.12E-02	
CO-60	Not Detected	---------	4.91E-02	
CR-51	Not Detected	---------	3.10E-01	
CS-134	Not Detected	---------	5.63E-02	
CS-137	6.12E-02	3.21E-02	2.93E-02	
EU-152	Not Detected	---------	8.36E-02	
EU-154	Not Detected	---------	2.54E-01	
EU-155	Not Detected	---------	1.33E-01	
FE-59	Not Detected	---------	1.04E-01	
GD-153	Not Detected	---------	9.22E-02	
HG-203	Not Detected	---------	4.07E-02	
I-131	Not Detected	---------	6.21E-02	
IR-192	Not Detected	---------	3.35E-02	
K-40	1.88E+01	2.93E+00	3.39E-01	
MN-52	Not Detected	---------	8.54E-02	
MN-54	~~1.64E-02~~	~~1.84E-02~~	~~2.36E-02~~	NOT DETECTED 6/10/20 KK
MO-99	Not Detected	---------	1.65E+00	
NA-22	Not Detected	---------	5.88E-02	
NA-24	Not Detected	---------	5.63E+01	
NB-95	Not Detected	---------	6.81E-01	
ND-147	Not Detected	---------	3.78E-01	
NI-57	Not Detected	---------	1.43E+00	
PB-210	Not Detected	---------	8.93E+00	
RU-103	Not Detected	---------	4.04E-02	
RU-106	Not Detected	---------	3.75E-01	
SB-122	Not Detected	---------	2.60E-01	
SB-124	Not Detected	---------	4.04E-02	
SB-125	Not Detected	---------	1.05E-01	
SN-113	Not Detected	---------	4.85E-02	
SR-85	Not Detected	---------	4.98E-02	
TA-182	Not Detected	---------	1.99E-01	
TA-183	Not Detected	---------	4.71E-01	
TC-99m	Not Detected	---------	1.67E+06	
TL-201	Not Detected	---------	5.35E-01	
XE-133	Not Detected	---------	8.86E-01	
Y-88	Not Detected	---------	4.06E-02	
ZN-65	Not Detected	---------	1.33E-01	
ZR-95	Not Detected	---------	8.22E-02	

****
* Sandia National Laboratories *
* Radiation Protection Sample Diagnostics Program [881 Laboratory] *
* 6-17-97 2:18:21 AM *
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* Analyzed by: 6/19/97 Reviewed by: 6/23/97 *

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Customer : C.BYRD/C.STEFANOV (6685/SMO)
Customer Sample ID : 034976-004
Lab Sample ID : 70098916

Sample Description : MARINELLI SOLID SAMPLE
Sample Quantity : 690.000 gram
Sample Date/Time : 6-10-97 1:00:00 PM
Acquire Start Date/Time : 6-17-97 12:35:44 AM
Detector Name : LAB01
Elapsed Live/Real Time : 6000 / 6002 seconds

Comments:

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Nuclide Name	Activity (pCi/gram)	2-sigma Error	MDA (pCi/gram)
U-238	Not Detected	---------	1.72E+00
TH-234	1.09E+00	4.57E-01	5.18E-01
RA-226	1.71E+00	8.80E-01	6.39E-01
PB-214	6.38E-01	1.33E-01	5.62E-02
BI-214	5.77E-01	1.36E-01	5.75E-02
TH-232	1.05E+00	5.56E-01	1.88E-01
RA-228	8.85E-01	2.66E-01	2.12E-01
AC-228	9.23E-01	2.38E-01	1.18E-01
TH-228	1.11E+00	5.93E-01	5.74E-01
RA-224	1.01E+00	3.84E-01	1.06E-01
PB-212	9.68E-01	1.62E-01	4.37E-02
BI-212	1.27E+00	4.58E-01	3.71E-01
TL-208	9.32E-01	2.34E-01	8.59E-02
U-235	Not Detected	---------	2.37E-01
TH-231	Not Detected	---------	9.79E+00
PA-231	Not Detected	---------	1.66E+00
TH-227	Not Detected	---------	4.29E-01
RA-223	Not Detected	---------	2.29E-01
RN-219	~~3.25E-01~~	~~3.72E-01~~	~~4.68E-01~~ NOT DETECTED 6/19/97
PB-211	Not Detected	---------	1.09E+00
TL-207	Not Detected	---------	1.84E+01
AM-241	Not Detected	---------	2.15E-01
PU-239	Not Detected	---------	4.11E+02
NP-237	Not Detected	---------	3.25E-01
PA-233	Not Detected	---------	6.44E-02
TH-229	Not Detected	---------	2.29E-01

[Summary Report] - Sample ID: : 70098916

Nuclide Name	Activity (pCi/gram)	2-sigma Error	MDA (pCi/gram)
AG-108m	Not Detected	---------	5.55E-02
AG-110m	Not Detected	---------	5.50E-02
BA-133	Not Detected	---------	5.67E-02
BE-7	Not Detected	---------	3.19E-01
CD-109	~~1.70E+00~~	~~5.68E-01~~	~~6.54E-01~~ NOT DETECTED 6/19/97 KAS
CD-115	Not Detected	---------	6.03E-01
CE-139	Not Detected	---------	3.07E-02
CE-141	Not Detected	---------	5.93E-02
CE-144	Not Detected	---------	2.19E-01
CO-56	Not Detected	---------	4.38E-02
CO-57	Not Detected	---------	2.78E-02
CO-58	Not Detected	---------	4.47E-02
CO-60	Not Detected	---------	4.73E-02
CR-51	Not Detected	---------	3.04E-01
CS-134	Not Detected	---------	5.42E-02
CS-137	1.49E-01	5.28E-02	2.66E-02
EU-152	Not Detected	---------	8.23E-02
EU-154	Not Detected	---------	2.56E-01
EU-155	Not Detected	---------	1.28E-01
FE-59	Not Detected	---------	1.05E-01
GD-153	Not Detected	---------	9.29E-02
HG-203	Not Detected	---------	3.98E-02
I-131	Not Detected	---------	5.88E-02
IR-192	Not Detected	---------	3.19E-02
K-40	2.07E+01	3.22E+00	3.51E-01
MN-52	Not Detected	---------	9.35E-02
MN-54	Not Detected	---------	1.93E-02
MO-99	Not Detected	---------	1.56E+00
NA-22	Not Detected	---------	5.85E-02
NA-24	Not Detected	---------	5.51E+01
NB-95	Not Detected	---------	6.34E-01
ND-147	Not Detected	---------	3.67E-01
NI-57	Not Detected	---------	1.23E+00
PB-210	Not Detected	---------	8.89E+00
RU-103	Not Detected	---------	3.84E-02
RU-106	Not Detected	---------	3.52E-01
SB-122	Not Detected	---------	2.57E-01
SB-124	Not Detected	---------	3.85E-02
SB-125	Not Detected	---------	1.05E-01
SN-113	Not Detected	---------	4.49E-02
SR-85	Not Detected	---------	4.91E-02
TA-182	Not Detected	---------	2.13E-01
TA-183	Not Detected	---------	4.40E-01
TC-99m	Not Detected	---------	1.76E+06
TL-201	Not Detected	---------	5.28E-01
XE-133	Not Detected	---------	8.40E-01
Y-88	Not Detected	---------	3.51E-02
ZN-65	Not Detected	---------	1.43E-01
ZR-95	Not Detected	---------	8.08E-02

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* Sandia National Laboratories *
* Radiation Protection Sample Diagnostics Program [881 Laboratory] *
* 6-17-97 4:03:25 AM *
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Analyzed by: 6/19/97 Reviewed by: 6/23/97

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Customer : C.BYRD/C.STEFANOV (6685/SMO)
Customer Sample ID : 034977-004
Lab Sample ID : 70098917

Sample Description : MARINELLI SOLID SAMPLE
Sample Quantity : 589.000 gram
Sample Date/Time : 6-10-97 1:15:00 PM
Acquire Start Date/Time : 6-17-97 2:20:48 AM
Detector Name : LAB01
Elapsed Live/Real Time : 6000 / 6002 seconds

Comments:

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Nuclide Name	Activity (pCi/gram)	2-sigma Error	MDA (pCi/gram)
U-238	Not Detected	---------	1.86E+00
TH-234	1.29E+00	4.22E-01	5.47E-01
RA-226	7.91E-01	1.40E+00	6.52E-01
PB-214	5.85E-01	1.21E-01	6.40E-02
BI-214	5.90E-01	1.37E-01	6.37E-02
TH-232	1.00E+00	5.39E-01	1.83E-01
RA-228	1.02E+00	3.00E-01	2.19E-01
AC-228	1.08E+00	2.64E-01	1.30E-01
TH-228	7.24E-01	9.76E-01	5.84E-01
RA-224	1.11E+00	5.94E-01	9.84E-02
PB-212	1.05E+00	1.75E-01	4.81E-02
BI-212	1.07E+00	4.73E-01	4.49E-01
TL-208	9.00E-01	2.15E-01	9.90E-02
U-235	Not Detected	---------	1.19E-01
TH-231	Not Detected	---------	1.07E+01
PA-231	Not Detected	---------	1.75E+00
TH-227	Not Detected	---------	4.80E-01
RA-223	Not Detected	---------	2.52E-01
RN-219	Not Detected	---------	5.06E-01
PB-211	Not Detected	---------	1.14E+00
TL-207	Not Detected	---------	1.95E+01
AM-241	Not Detected	---------	2.30E-01
PU-239	Not Detected	---------	4.21E+02
NP-237	Not Detected	---------	3.47E-01
PA-233	Not Detected	---------	7.08E-02
TH-229	Not Detected	---------	2.39E-01

[Summary Report] - Sample ID: : 70098917

Nuclide Name	Activity (pCi/gram)	2-sigma Error	MDA (pCi/gram)	
AG-108m	Not Detected	---------	5.98E-02	
AG-110m	Not Detected	---------	4.33E-02	
BA-133	Not Detected	---------	6.18E-02	
BE-7	Not Detected	---------	3.24E-01	
CD-109	~~1.91E+00~~	~~5.91E-01~~	~~2.00E-01~~	NOT DETECTED 6/19/97 KAG
CD-115	Not Detected	---------	6.59E-01	
CE-139	Not Detected	---------	3.24E-02	
CE-141	Not Detected	---------	6.23E-02	
CE-144	Not Detected	---------	2.28E-01	
CO-56	Not Detected	---------	3.18E-02	
CO-57	Not Detected	---------	2.93E-02	
CO-58	Not Detected	---------	4.79E-02	
CO-60	Not Detected	---------	5.21E-02	
CR-51	Not Detected	---------	3.36E-01	
CS-134	Not Detected	---------	5.88E-02	
CS-137	Not Detected	---------	5.02E-02	
EU-152	Not Detected	---------	8.70E-02	
EU-154	Not Detected	---------	2.76E-01	
EU-155	Not Detected	---------	1.40E-01	
FE-59	Not Detected	---------	1.15E-01	
GD-153	Not Detected	---------	9.85E-02	
HG-203	Not Detected	---------	4.24E-02	
I-131	Not Detected	---------	6.47E-02	
IR-192	Not Detected	---------	3.55E-02	
K-40	2.00E+01	3.20E+00	4.00E-01	
MN-52	Not Detected	---------	8.95E-02	
MN-54	~~2.09E-02~~	~~3.22E-02~~	~~2.91E-02~~	NOT DETECTED 6/19/97 KAG
MO-99	Not Detected	---------	1.68E+00	
NA-22	Not Detected	---------	5.74E-02	
NA-24	Not Detected	---------	5.80E+01	
NB-95	Not Detected	---------	7.14E-01	
ND-147	Not Detected	---------	4.24E-01	
NI-57	Not Detected	---------	1.24E+00	
PB-210	Not Detected	---------	9.57E+00	
RU-103	Not Detected	---------	4.23E-02	
RU-106	Not Detected	---------	3.87E-01	
SB-122	Not Detected	---------	2.81E-01	
SB-124	Not Detected	---------	4.28E-02	
SB-125	Not Detected	---------	1.09E-01	
SN-113	Not Detected	---------	5.24E-02	
SR-85	Not Detected	---------	5.36E-02	
TA-182	Not Detected	---------	2.02E-01	
TA-183	Not Detected	---------	4.76E-01	
TC-99m	Not Detected	---------	2.22E+06	
TL-201	Not Detected	---------	5.94E-01	
XE-133	Not Detected	---------	9.33E-01	
Y-88	Not Detected	---------	4.84E-02	
ZN-65	Not Detected	---------	1.38E-01	
ZR-95	Not Detected	---------	8.22E-02	

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* Sandia National Laboratories *
* Radiation Protection Sample Diagnostics Program [881 Laboratory] *
* 6-17-97 5:48:25 AM *
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* Analyzed by: KA 6/19/97 Reviewed by: [illegible] 6/23/97 *

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Customer : C.BYRD/C.STEFANOV (6685/SMO)
Customer Sample ID : 034978-004
Lab Sample ID : 70098918

Sample Description : MARINELLI SOLID SAMPLE
Sample Quantity : 550.000 gram
Sample Date/Time : 6-10-97 1:25:00 PM
Acquire Start Date/Time : 6-17-97 4:05:52 AM
Detector Name : LAB01
Elapsed Live/Real Time : 6000 / 6002 seconds

Comments:

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Nuclide Name	Activity (pCi/gram)	2-sigma Error	MDA (pCi/gram)
U-238	Not Detected	---------	2.04E+00
TH-234	1.38E+00	5.42E-01	5.77E-01
RA-226	1.80E+00	1.12E+00	8.21E-01
PB-214	6.23E-01	1.50E-01	7.08E-02
BI-214	5.80E-01	1.51E-01	6.42E-02
TH-232	1.17E+00	6.19E-01	2.24E-01
RA-228	1.24E+00	8.73E-01	2.38E-01
AC-228	1.19E+00	3.69E-01	1.21E-01
TH-228	8.62E-01	5.34E-01	7.29E-01
RA-224	1.19E+00	4.41E-01	1.26E-01
PB-212	1.17E+00	1.96E-01	5.25E-02
BI-212	1.78E+00	6.73E-01	4.66E-01
TL-208	9.65E-01	2.53E-01	1.09E-01
U-235	Not Detected	---------	2.68E-01
TH-231	Not Detected	---------	1.14E+01
PA-231	Not Detected	---------	1.88E+00
TH-227	Not Detected	---------	5.18E-01
RA-223	Not Detected	---------	2.74E-01
RN-219	Not Detected	---------	5.57E-01
PB-211	Not Detected	---------	1.22E+00
TL-207	Not Detected	---------	2.05E+01
AM-241	Not Detected	---------	2.46E-01
PU-239	Not Detected	---------	4.48E+02
NP-237	Not Detected	---------	3.75E-01
PA-233	Not Detected	---------	7.82E-02
TH-229	Not Detected	---------	2.57E-01

[Summary Report] - Sample ID: : 70098918

Nuclide Name	Activity (pCi/gram)	2-sigma Error	MDA (pCi/gram)
AG-108m	Not Detected	---------	6.50E-02
AG-110m	Not Detected	---------	5.72E-02
BA-133	Not Detected	---------	6.55E-02
BE-7	Not Detected	---------	3.86E-01
CD-109	~~1.55E+00~~	~~5.64E-01~~	~~1.00E+00~~ NOT DETECTED 6/19/97 KAC
CD-115	Not Detected	---------	7.36E-01
CE-139	Not Detected	---------	3.48E-02
CE-141	Not Detected	---------	6.56E-02
CE-144	Not Detected	---------	2.52E-01
CO-56	Not Detected	---------	5.68E-02
CO-57	Not Detected	---------	3.09E-02
CO-58	Not Detected	---------	4.68E-02
CO-60	Not Detected	---------	6.06E-02
CR-51	Not Detected	---------	3.55E-01
CS-134	Not Detected	---------	6.00E-02
CS-137	9.18E-02	3.60E-02	3.64E-02
EU-152	Not Detected	---------	9.06E-02
EU-154	Not Detected	---------	3.00E-01
EU-155	Not Detected	---------	1.41E-01
FE-59	Not Detected	---------	1.26E-01
GD-153	Not Detected	---------	1.05E-01
HG-203	Not Detected	---------	4.65E-02
I-131	Not Detected	---------	7.18E-02
IR-192	Not Detected	---------	3.74E-02
K-40	2.28E+01	3.56E+00	3.92E-01
MN-52	Not Detected	---------	1.15E-01
MN-54	Not Detected	---------	5.01E-02
MO-99	Not Detected	---------	1.84E+00
NA-22	Not Detected	---------	6.39E-02
NA-24	Not Detected	---------	7.32E+01
NB-95	Not Detected	---------	7.77E-01
ND-147	Not Detected	---------	4.35E-01
NI-57	Not Detected	---------	1.47E+00
PB-210	Not Detected	---------	1.05E+01
RU-103	Not Detected	---------	4.53E-02
RU-106	Not Detected	---------	4.10E-01
SB-122	Not Detected	---------	3.18E-01
SB-124	Not Detected	---------	4.38E-02
SB-125	Not Detected	---------	1.20E-01
SN-113	Not Detected	---------	5.41E-02
SR-85	Not Detected	---------	5.95E-02
TA-182	Not Detected	---------	2.27E-01
TA-183	Not Detected	---------	5.13E-01
TC-99m	Not Detected	---------	2.84E+06
TL-201	Not Detected	---------	6.35E-01
XE-133	Not Detected	---------	9.85E-01
Y-88	Not Detected	---------	4.35E-02
ZN-65	Not Detected	---------	1.52E-01
ZR-95	Not Detected	---------	9.38E-02

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* Sandia National Laboratories *
* Radiation Protection Sample Diagnostics Program [881 Laboratory] *
* 6-17-97 6:36:58 PM *
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* Analyzed by: 6/19/97 Reviewed by: 6/23/97 *
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Customer : C.BYRD/C.STEFANOV (6685/SMO)
Customer Sample ID : 034962-004
Lab Sample ID : 70098922

Sample Description : MARINELLI SOLID SAMPLE
Sample Quantity : 781.000 gram
Sample Date/Time : 6-12-97 12:40:00 PM
Acquire Start Date/Time : 6-17-97 4:47:10 PM
Detector Name : LAB01
Elapsed Live/Real Time : 6000 / 6003 seconds

Comments:
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Nuclide Name	Activity (pCi/gram)	2-sigma Error	MDA (pCi/gram)
U-238	Not Detected	---------	1.41E+00
TH-234	6.54E-01	6.25E-01	4.82E-01
RA-226	1.41E+00	5.46E-01	6.03E-01
PB-214	6.27E-01	1.36E-01	5.34E-02
BI-214	5.73E-01	1.45E-01	5.30E-02
TH-232	9.68E-01	5.04E-01	1.68E-01
RA-228	1.11E+00	3.34E-01	1.67E-01
AC-228	9.35E-01	2.41E-01	1.10E-01
TH-228	6.39E-01	4.31E-01	5.36E-01
RA-224	9.00E-01	3.97E-01	7.33E-02
PB-212	8.97E-01	1.52E-01	4.22E-02
BI-212	1.10E+00	6.20E-01	3.52E-01
TL-208	7.95E-01	1.64E-01	7.92E-02
U-235	Not Detected	---------	2.10E-01
TH-231	Not Detected	---------	9.18E+00
PA-231	Not Detected	---------	1.47E+00
TH-227	Not Detected	---------	3.95E-01
RA-223	Not Detected	---------	2.01E-01
RN-219	Not Detected	---------	4.15E-01
PB-211	Not Detected	---------	9.58E-01
TL-207	Not Detected	---------	1.65E+01
AM-241	Not Detected	---------	1.91E-01
PU-239	Not Detected	---------	3.78E+02
NP-237	~~3.01E-01~~	~~1.60E-01~~	~~2.06E-01~~ NOT DETECTED 6/19/97
PA-233	Not Detected	---------	5.92E-02
TH-229	Not Detected	---------	2.08E-01

[Summary Report] - Sample ID: : 70098922

Nuclide Name	Activity (pCi/gram)	2-sigma Error	MDA (pCi/gram)
AG-108m	Not Detected	---------	4.77E-02
AG-110m	Not Detected	---------	3.91E-02
BA-133	Not Detected	---------	5.23E-02
BE-7	Not Detected	---------	3.00E-01
CD-109	Not Detected	---------	1.01E+00
CD-115	Not Detected	---------	3.57E-01
CE-139	Not Detected	---------	2.78E-02
CE-141	Not Detected	---------	5.13E-02
CE-144	Not Detected	---------	2.02E-01
CO-56	Not Detected	---------	4.24E-02
CO-57	Not Detected	---------	2.53E-02
CO-58	Not Detected	---------	4.21E-02
CO-60	Not Detected	---------	4.50E-02
CR-51	Not Detected	---------	2.68E-01
CS-134	Not Detected	---------	5.04E-02
CS-137	3.45E-02	4.21E-02	2.52E-02
EU-152	Not Detected	---------	7.43E-02
EU-154	Not Detected	---------	2.19E-01
EU-155	Not Detected	---------	4.82E-02
FE-59	Not Detected	---------	9.55E-02
GD-153	Not Detected	---------	8.59E-02
HG-203	Not Detected	---------	3.42E-02
I-131	Not Detected	---------	4.87E-02
IR-192	Not Detected	---------	2.83E-02
K-40	2.17E+01	3.27E+00	2.90E-01
MN-52	Not Detected	---------	6.77E-02
MN-54	Not Detected	---------	4.10E-02
MO-99	Not Detected	---------	1.05E+00
NA-22	Not Detected	---------	5.46E-02
NA-24	Not Detected	---------	1.19E+01
NB-95	Not Detected	---------	4.55E-01
ND-147	Not Detected	---------	3.10E-01
NI-57	Not Detected	---------	6.22E-01
PB-210	Not Detected	---------	7.93E+00
RU-103	Not Detected	---------	3.42E-02
RU-106	Not Detected	---------	3.43E-01
SB-122	Not Detected	---------	1.65E-01
SB-124	Not Detected	---------	3.52E-02
SB-125	Not Detected	---------	8.98E-02
SN-113	Not Detected	---------	3.97E-02
SR-85	Not Detected	---------	4.36E-02
TA-182	Not Detected	---------	1.80E-01
TA-183	Not Detected	---------	3.29E-01
TC-99m	Not Detected	---------	4.16E+04
TL-201	Not Detected	---------	3.72E-01
XE-133	Not Detected	---------	5.02E-01
Y-88	Not Detected	---------	3.30E-02
ZN-65	Not Detected	---------	1.20E-01
ZR-95	Not Detected	---------	7.11E-02

****
* Sandia National Laboratories *
* Radiation Protection Sample Diagnostics Program [881 Laboratory] *
* 6-17-97 12:19:19 PM *
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* Analyzed by: 6/19/97 Reviewed by: 6/23/97 *

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Customer : C.BYRD/C.STEFANOV (6685/SMO)
Customer Sample ID : 034991-004
Lab Sample ID : 70098926

Sample Description : MARINELLI LIQUID SAMPLE
Sample Quantity : 500.000 mL
Sample Date/Time : 6-12-97 2:40:00 PM
Acquire Start Date/Time : 6-17-97 10:36:26 AM
Detector Name : LAB01
Elapsed Live/Real Time : 6000 / 6001 seconds

Comments:

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Nuclide Name	Activity (pCi/mL)	2-sigma Error	MDA (pCi/mL)
U-238	Not Detected	---------	7.81E-01
TH-234	Not Detected	---------	3.08E-01
RA-226	Not Detected	---------	3.77E-01
PB-214	Not Detected	---------	5.35E-02
BI-214	Not Detected	---------	6.26E-02
TH-232	Not Detected	---------	1.52E-01
RA-228	Not Detected	---------	1.64E-01
AC-228	Not Detected	---------	1.01E-01
TH-228	Not Detected	---------	4.78E-01
RA-224	Not Detected	---------	1.63E-01
PB-212	Not Detected	---------	4.06E-02
BI-212	Not Detected	---------	3.45E-01
TL-208	Not Detected	---------	8.31E-02
U-235	Not Detected	---------	1.37E-01
TH-231	Not Detected	---------	4.72E+00
PA-231	Not Detected	---------	1.06E+00
TH-227	Not Detected	---------	1.57E-01
RA-223	Not Detected	---------	1.00E-01
RN-219	Not Detected	---------	3.11E-01
PB-211	Not Detected	---------	6.88E-01
TL-207	Not Detected	---------	1.12E+01
AM-241	Not Detected	---------	9.56E-02
PU-239	Not Detected	---------	2.08E+02
NP-237	Not Detected	---------	1.35E-01
PA-233	Not Detected	---------	4.38E-02
TH-229	Not Detected	---------	1.19E-01

[Summary Report] - Sample ID: : 70098926

Nuclide Name	Activity (pCi/mL)	2-sigma Error	MDA (pCi/mL)
AG-108m	Not Detected	---------	2.49E-02
AG-110m	Not Detected	---------	2.46E-02
BA-133	Not Detected	---------	3.34E-02
BE-7	Not Detected	---------	1.90E-01
CD-109	Not Detected	---------	4.44E-01
CD-115	Not Detected	---------	1.71E-01
CE-139	Not Detected	---------	1.84E-02
CE-141	Not Detected	---------	3.31E-02
CE-144	Not Detected	---------	1.24E-01
CO-56	Not Detected	---------	3.54E-02
CO-57	Not Detected	---------	1.57E-02
CO-58	Not Detected	---------	3.00E-02
CO-60	Not Detected	---------	3.29E-02
CR-51	Not Detected	---------	2.02E-01
CS-134	Not Detected	---------	2.86E-02
CS-137	Not Detected	---------	2.87E-02
EU-152	Not Detected	---------	4.69E-02
EU-154	Not Detected	---------	1.15E-01
EU-155	Not Detected	---------	6.67E-02
FE-59	Not Detected	---------	4.56E-02
GD-153	Not Detected	---------	5.10E-02
HG-203	Not Detected	---------	2.39E-02
I-131	Not Detected	---------	3.36E-02
IR-192	Not Detected	---------	2.22E-02
K-40	Not Detected	---------	3.93E-01
MN-52	Not Detected	---------	4.90E-02
MN-54	Not Detected	---------	2.57E-02
MO-99	Not Detected	---------	6.80E-01
NA-22	Not Detected	---------	3.21E-02
NA-24	Not Detected	---------	6.42E+00
NB-95	Not Detected	---------	1.79E-01
ND-147	Not Detected	---------	2.15E-01
NI-57	Not Detected	---------	3.81E-01
PB-210	Not Detected	---------	3.41E+00
RU-103	Not Detected	---------	2.93E-02
RU-106	Not Detected	---------	2.28E-01
SB-122	Not Detected	---------	1.04E-01
SB-124	Not Detected	---------	2.74E-02
SB-125	Not Detected	---------	7.14E-02
SN-113	Not Detected	---------	2.93E-02
SR-85	Not Detected	---------	3.33E-02
TA-182	Not Detected	---------	8.29E-02
TA-183	Not Detected	---------	1.56E-01
TC-99m	Not Detected	---------	1.11E+04
TL-201	Not Detected	---------	1.70E-01
XE-133	Not Detected	---------	2.40E-01
Y-88	Not Detected	---------	3.92E-02
ZN-65	Not Detected	---------	6.15E-02
ZR-95	Not Detected	---------	4.70E-02

****
* Sandia National Laboratories *
* Radiation Protection Sample Diagnostics Program [881 Laboratory] *
* 6-17-97 4:12:32 PM *
****
* *
* Analyzed by: 6/17/97 Reviewed by: 6/18/97 *
****

Customer : C.BYRD/C.STEFANOV (6685/SMO)
Customer Sample ID : 034996-004
Lab Sample ID : 70100801

Sample Description : MARINELLI WATER SAMPLE
Sample Quantity : 500.000 mL
Sample Date/Time : 6-16-97 2:00:00 PM
Acquire Start Date/Time : 6-17-97 2:29:39 PM
Detector Name : LAB04
Elapsed Live/Real Time : 6000 / 6001 seconds

Comments:

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Nuclide Name	Activity (pCi/mL)	2-sigma Error	MDA (pCi/mL)
U-238	Not Detected	---------	9.74E-01
TH-234	Not Detected	---------	3.00E-01
RA-226	Not Detected	---------	4.23E-01
PB-214	4.50E-02	2.61E-02	2.77E-02
BI-214	Not Detected	---------	5.45E-02
TH-232	Not Detected	---------	1.39E-01
RA-228	Not Detected	---------	1.20E-01
AC-228	Not Detected	---------	7.67E-02
TH-228	Not Detected	---------	4.62E-01
RA-224	Not Detected	---------	1.04E-01
PB-212	Not Detected	---------	3.59E-02
BI-212	Not Detected	---------	2.67E-01
TL-208	Not Detected	---------	5.80E-02
U-235	Not Detected	---------	1.30E-01
TH-231	Not Detected	---------	4.70E+00
PA-231	Not Detected	---------	9.34E-01
TH-227	Not Detected	---------	1.35E-01
RA-223	Not Detected	---------	7.65E-02
RN-219	Not Detected	---------	2.53E-01
PB-211	Not Detected	---------	5.82E-01
TL-207	Not Detected	---------	8.20E+00
AM-241	Not Detected	---------	1.15E-01
PU-239	Not Detected	---------	2.01E+02
NP-237	Not Detected	---------	1.35E-01
PA-233	Not Detected	---------	3.99E-02
TH-229	Not Detected	---------	1.14E-01

[Summary Report] - Sample ID: : 70100801

Nuclide Name	Activity (pCi/mL)	2-sigma Error	MDA (pCi/mL)
AG-108m	Not Detected	---------	2.03E-02
AG-110m	Not Detected	---------	1.96E-02
BA-133	Not Detected	---------	3.03E-02
BE-7	Not Detected	---------	1.51E-01
CD-109	Not Detected	---------	2.70E-01
CD-115	Not Detected	---------	4.67E-02
CE-139	Not Detected	---------	1.65E-02
CE-141	Not Detected	---------	2.68E-02
CE-144	Not Detected	---------	1.18E-01
CO-56	Not Detected	---------	2.06E-02
CO-57	Not Detected	---------	1.53E-02
CO-58	Not Detected	---------	1.98E-02
CO-60	Not Detected	---------	2.20E-02
CR-51	Not Detected	---------	1.49E-01
CS-134	Not Detected	---------	2.56E-02
CS-137	Not Detected	---------	2.13E-02
EU-152	Not Detected	---------	4.61E-02
EU-154	Not Detected	---------	9.34E-02
EU-155	Not Detected	---------	6.42E-02
FE-59	Not Detected	---------	3.71E-02
GD-153	Not Detected	---------	4.72E-02
HG-203	Not Detected	---------	1.88E-02
I-131	Not Detected	---------	2.02E-02
IR-192	Not Detected	---------	1.76E-02
K-40	Not Detected	---------	2.43E-01
MN-52	Not Detected	---------	2.60E-02
MN-54	Not Detected	---------	2.09E-02
MO-99	Not Detected	---------	1.87E-01
NA-22	Not Detected	---------	2.25E-02
NA-24	Not Detected	---------	6.66E-02
NB-95	Not Detected	---------	7.53E-02
ND-147	Not Detected	---------	1.25E-01
NI-57	Not Detected	---------	4.72E-02
PB-210	Not Detected	---------	3.93E+00
RU-103	Not Detected	---------	2.13E-02
RU-106	Not Detected	---------	1.77E-01
SB-122	Not Detected	---------	3.13E-02
SB-124	Not Detected	---------	2.21E-02
SB-125	Not Detected	---------	4.86E-02
SN-113	Not Detected	---------	2.46E-02
SR-85	Not Detected	---------	2.86E-02
TA-182	Not Detected	---------	7.30E-02
TA-183	Not Detected	---------	1.12E-01
TC-99m	Not Detected	---------	2.57E-01
TL-201	Not Detected	---------	6.94E-02
XE-133	Not Detected	---------	7.34E-02
Y-88	Not Detected	---------	2.24E-02
ZN-65	Not Detected	---------	4.94E-02
ZR-95	Not Detected	---------	3.27E-02

Sandia National Laboratories
Radiation Protection Sample Diagnostics Program [881 Laboratory]
6-15-97 2:28:28 PM

Analyzed by: 6/16/97 Reviewed by: 6/16/97

Customer : C.BYRD/CSTEFANOV (6685/SMO)
Customer Sample ID : 034992-004
Lab Sample ID : 70098806

Sample Description : MARINELLI WATER SAMPLE
Sample Quantity : 500.000 mL
Sample Date/Time : 6-12-97 4:00:00 PM
Acquire Start Date/Time : 6-15-97 12:44:14 PM
Detector Name : LAB01
Elapsed Live/Real Time : 6000 / 6001 seconds

Comments:

Nuclide Name	Activity (pCi/mL)	2-sigma Error	MDA (pCi/mL)
U-238	Not Detected	---------	8.08E-01
TH-234	Not Detected	---------	3.26E-01
RA-226	Not Detected	---------	4.72E-01
PB-214	Not Detected	---------	5.24E-02
BI-214	Not Detected	---------	6.24E-02
TH-232	Not Detected	---------	1.60E-01
RA-228	Not Detected	---------	1.57E-01
AC-228	Not Detected	---------	1.08E-01
TH-228	Not Detected	---------	5.35E-01
RA-224	Not Detected	---------	1.71E-01
PB-212	Not Detected	---------	3.94E-02
BI-212	Not Detected	---------	3.68E-01
TL-208	Not Detected	---------	7.12E-02
U-235	Not Detected	---------	1.38E-01
TH-231	Not Detected	---------	4.67E+00
PA-231	Not Detected	---------	1.01E+00
TH-227	Not Detected	---------	1.54E-01
RA-223	Not Detected	---------	8.77E-02
RN-219	Not Detected	---------	3.05E-01
PB-211	Not Detected	---------	6.62E-01
TL-207	Not Detected	---------	1.18E+01
AM-241	Not Detected	---------	9.30E-02
PU-239	Not Detected	---------	2.15E+02
NP-237	Not Detected	---------	1.33E-01
PA-233	Not Detected	---------	4.49E-02
TH-229	Not Detected	---------	1.21E-01

[Summary Report] - Sample ID: : 70098806

Nuclide Name	Activity (pCi/mL)	2-sigma Error	MDA (pCi/mL)
AG-108m	Not Detected	---------	2.53E-02
AG-110m	Not Detected	---------	2.54E-02
BA-133	Not Detected	---------	3.11E-02
BE-7	Not Detected	---------	1.97E-01
CD-109	Not Detected	---------	4.63E-01
CD-115	Not Detected	---------	9.68E-02
CE-139	Not Detected	---------	1.76E-02
CE-141	Not Detected	---------	3.11E-02
CE-144	Not Detected	---------	1.15E-01
CO-56	Not Detected	---------	3.78E-02
CO-57	Not Detected	---------	1.64E-02
CO-58	Not Detected	---------	2.47E-02
CO-60	Not Detected	---------	2.88E-02
CR-51	Not Detected	---------	1.80E-01
CS-134	Not Detected	---------	2.95E-02
CS-137	Not Detected	---------	2.78E-02
EU-152	Not Detected	---------	4.93E-02
EU-154	Not Detected	---------	1.15E-01
EU-155	Not Detected	---------	7.06E-02
FE-59	Not Detected	---------	4.93E-02
GD-153	Not Detected	---------	4.69E-02
HG-203	Not Detected	---------	2.23E-02
I-131	Not Detected	---------	3.29E-02
IR-192	Not Detected	---------	2.09E-02
K-40	Not Detected	---------	3.43E-01
MN-52	Not Detected	---------	3.48E-02
MN-54	Not Detected	---------	2.47E-02
MO-99	Not Detected	---------	3.52E-01
NA-22	Not Detected	---------	2.96E-02
NA-24	Not Detected	---------	7.60E-01
NB-95	Not Detected	---------	1.19E-01
ND-147	Not Detected	---------	1.99E-01
NI-57	Not Detected	---------	1.45E-01
PB-210	Not Detected	---------	3.66E+00
RU-103	Not Detected	---------	2.62E-02
RU-106	Not Detected	---------	2.38E-01
SB-122	Not Detected	---------	6.46E-02
SB-124	Not Detected	---------	2.92E-02
SB-125	Not Detected	---------	7.10E-02
SN-113	Not Detected	---------	2.87E-02
SR-85	Not Detected	---------	3.32E-02
TA-182	Not Detected	---------	9.08E-02
TA-183	Not Detected	---------	1.17E-01
TC-99m	Not Detected	---------	4.91E+01
TL-201	Not Detected	---------	1.14E-01
XE-133	Not Detected	---------	1.30E-01
Y-88	Not Detected	---------	2.70E-02
ZN-65	Not Detected	---------	5.65E-02
ZR-95	Not Detected	---------	4.68E-02

ANNEX 2-A.4
Results of SWMU 27 RFI Mound Area Subsurface Debris Sampling Analysis-Gamma Spectroscopy

****
* Sandia National Laboratories *
* Radiation Protection Sample Diagnostics Program [881 Laboratory] *
* 6-17-97 4:44:22 PM *
****

* Analyzed by: 6/19/97 Reviewed by: 6/23/97 *
****

Customer : C.BYRD/C.STEFANOV (6685/SMO)
Customer Sample ID : 034957-004
Lab Sample ID : 70098921

Sample Description : MARINELLI SOLID SAMPLE
Sample Quantity : 619.000 gram
Sample Date/Time : 6-12-97 9:15:00 AM
Acquire Start Date/Time : 6-17-97 2:56:38 PM
Detector Name : LAB01
Elapsed Live/Real Time : 6000 / 6002 seconds

Comments:
****

Nuclide Name	Activity (pCi/gram)	2-sigma Error	MDA (pCi/gram)
U-238	Not Detected	---------	1.83E+00
TH-234	Not Detected	---------	7.17E-01
RA-226	1.88E+00	7.79E-01	6.41E-01
PB-214	6.68E-01	1.29E-01	6.26E-02
BI-214	6.07E-01	1.35E-01	6.47E-02
TH-232	1.05E+00	5.40E-01	1.76E-01
RA-228	8.39E-01	3.72E-01	2.27E-01
AC-228	9.93E-01	4.26E-01	1.19E-01
TH-228	7.87E-01	4.68E-01	6.19E-01
RA-224	1.14E+00	4.17E-01	1.04E-01
PB-212	1.03E+00	1.72E-01	4.68E-02
BI-212	Not Detected	---------	3.66E-01
TL-208	8.85E-01	1.85E-01	9.12E-02
U-235	Not Detected	---------	2.59E-01
TH-231	Not Detected	---------	1.04E+01
PA-231	Not Detected	---------	1.71E+00
TH-227	Not Detected	---------	4.70E-01
RA-223	Not Detected	---------	2.27E-01
RN-219	Not Detected	---------	5.14E-01
PB-211	Not Detected	---------	1.20E+00
TL-207	Not Detected	---------	1.92E+01
AM-241	Not Detected	---------	2.25E-01
PU-239	Not Detected	---------	4.27E+02
NP-237	~~4.48E-01~~	~~3.18E-01~~	~~2.40E-01~~ NOT DETECTED 6/19/97
PA-233	Not Detected	---------	7.15E-02
TH-229	Not Detected	---------	2.42E-01

[Summary Report] - Sample ID: : 70098921

Nuclide Name	Activity (pCi/gram)	2-sigma Error	MDA (pCi/gram)
AG-108m	Not Detected	---------	5.40E-02
AG-110m	Not Detected	---------	8.59E-02
BA-133	Not Detected	---------	6.35E-02
BE-7	Not Detected	---------	3.61E-01
CD-109	Not Detected	---------	1.20E+00
CD-115	Not Detected	---------	4.38E-01
CE-139	Not Detected	---------	3.18E-02
CE-141	Not Detected	---------	6.15E-02
CE-144	Not Detected	---------	2.28E-01
CO-56	Not Detected	---------	4.96E-02
CO-57	Not Detected	---------	2.99E-02
CO-58	Not Detected	---------	4.48E-02
CO-60	Not Detected	---------	4.95E-02
CR-51	Not Detected	---------	3.27E-01
CS-134	Not Detected	---------	5.87E-02
CS-137	4.97E-01	9.16E-02	3.54E-02
EU-152	Not Detected	---------	8.81E-02
EU-154	Not Detected	---------	2.49E-01
EU-155	Not Detected	---------	6.79E-02
FE-59	Not Detected	---------	1.09E-01
GD-153	Not Detected	---------	9.84E-02
HG-203	Not Detected	---------	4.02E-02
I-131	Not Detected	---------	5.77E-02
IR-192	Not Detected	---------	3.55E-02
K-40	1.96E+01	4.28E+00	3.76E-01
MN-52	Not Detected	---------	8.18E-02
MN-54	~~1.01E-02~~	~~2.45E-02~~	~~2.82E-02~~ NOT DETECTED 6/19/97
MO-99	Not Detected	---------	1.17E+00
NA-22	Not Detected	---------	6.18E-02
NA-24	Not Detected	---------	1.55E+01
NB-95	Not Detected	---------	5.49E-01
ND-147	Not Detected	---------	3.52E-01
NI-57	Not Detected	---------	7.82E-01
PB-210	Not Detected	---------	9.25E+00
RU-103	Not Detected	---------	4.18E-02
RU-106	Not Detected	---------	3.87E-01
SB-122	Not Detected	---------	2.02E-01
SB-124	Not Detected	---------	4.36E-02
SB-125	Not Detected	---------	1.14E-01
SN-113	Not Detected	---------	5.34E-02
SR-85	Not Detected	---------	5.04E-02
TA-182	Not Detected	---------	2.05E-01
TA-183	Not Detected	---------	3.89E-01
TC-99m	Not Detected	---------	5.95E+04
TL-201	Not Detected	---------	4.21E-01
XE-133	Not Detected	---------	5.95E-01
Y-88	Not Detected	---------	3.88E-02
ZN-65	Not Detected	---------	1.43E-01
ZR-95	Not Detected	---------	7.41E-02

****
* Sandia National Laboratories *
* Radiation Protection Sample Diagnostics Program [881 Laboratory] *
* 6-17-97 8:27:25 PM *
****

* Analyzed by: 6/19/97 Reviewed by: 6/23/97 *

****

Customer : C.BYRD/C.STEFANOV (6685/SMO)
Customer Sample ID : 034958-004
Lab Sample ID : 70098923

Sample Description : MARINELLI SOLID SAMPLE
Sample Quantity : 334.000 gram
Sample Date/Time : 6-12-97 1:30:00 PM
Acquire Start Date/Time : 6-17-97 6:39:53 PM
Detector Name : LAB01
Elapsed Live/Real Time : 6000 / 6001 seconds

Comments:

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Nuclide Name	Activity (pCi/gram)	2-sigma Error	MDA (pCi/gram)
U-238	Not Detected	---------	2.40E+00
TH-234	Not Detected	---------	9.91E-01
RA-226	1.81E+00	7.76E-01	8.67E-01
PB-214	6.49E-01	1.94E-01	1.04E-01
BI-214	6.65E-01	2.12E-01	9.34E-02
TH-232	7.59E-01	5.14E-01	2.57E-01
RA-228	8.60E-01	4.37E-01	2.85E-01
AC-228	8.35E-01	2.83E-01	1.73E-01
TH-228	1.85E-01	2.05E-01	6.46E-01
RA-224	8.47E-01	4.10E-01	1.73E-01
PB-212	7.11E-01	3.86E-01	7.93E-02
BI-212	1.05E+00	6.01E-01	6.12E-01
TL-208	6.43E-01	1.94E-01	1.38E-01
U-235	Not Detected	---------	3.31E-01
TH-231	Not Detected	---------	1.38E+01
PA-231	Not Detected	---------	2.40E+00
TH-227	Not Detected	---------	5.94E-01
RA-223	Not Detected	---------	2.92E-01
RN-219	Not Detected	---------	6.79E-01
PB-211	Not Detected	---------	1.50E+00
TL-207	Not Detected	---------	2.62E+01
AM-241	Not Detected	---------	2.82E-01
PU-239	Not Detected	---------	5.64E+02
NP-237	~~3.10E-01~~	~~1.06E-01~~	~~2.80E-01~~ NOT DETECTED 6/19/97
PA-233	Not Detected	---------	1.02E-01
TH-229	Not Detected	---------	3.22E-01

[Summary Report] - Sample ID: : 70098923

Nuclide Name	Activity (pCi/gram)	2-sigma Error	MDA (pCi/gram)
AG-108m	Not Detected	---------	7.83E-02
AG-110m	Not Detected	---------	7.32E-02
BA-133	Not Detected	---------	9.01E-02
BE-7	Not Detected	---------	4.77E-01
CD-109	Not Detected	---------	1.52E+00
CD-115	Not Detected	---------	5.58E-01
CE-139	Not Detected	---------	4.38E-02
CE-141	Not Detected	---------	8.27E-02
CE-144	Not Detected	---------	2.98E-01
CO-56	Not Detected	---------	8.31E-02
CO-57	Not Detected	---------	3.97E-02
CO-58	Not Detected	---------	6.27E-02
CO-60	Not Detected	---------	7.02E-02
CR-51	Not Detected	---------	4.49E-01
CS-134	Not Detected	---------	8.39E-02
CS-137	9.45E-02	6.47E-02	4.53E-02
EU-152	Not Detected	---------	1.17E-01
EU-154	Not Detected	---------	3.63E-01
EU-155	Not Detected	---------	1.82E-01
FE-59	Not Detected	---------	1.38E-01
GD-153	Not Detected	---------	1.30E-01
HG-203	Not Detected	---------	5.51E-02
I-131	Not Detected	---------	7.64E-02
IR-192	Not Detected	---------	5.01E-02
K-40	1.40E+01	2.64E+00	5.78E-01
MN-52	Not Detected	---------	1.10E-01
MN-54	Not Detected	---------	6.66E-02
MO-99	Not Detected	---------	1.73E+00
NA-22	Not Detected	---------	7.59E-02
NA-24	Not Detected	---------	1.90E+01
NB-95	Not Detected	---------	6.95E-01
ND-147	Not Detected	---------	5.02E-01
NI-57	Not Detected	---------	1.06E+00
PB-210	Not Detected	---------	1.34E+01
RU-103	Not Detected	---------	6.08E-02
RU-106	Not Detected	---------	5.23E-01
SB-122	Not Detected	---------	2.76E-01
SB-124	Not Detected	---------	6.11E-02
SB-125	Not Detected	---------	1.61E-01
SN-113	Not Detected	---------	6.41E-02
SR-85	Not Detected	---------	7.26E-02
TA-182	Not Detected	---------	2.83E-01
TA-183	Not Detected	---------	4.88E-01
TC-99m	Not Detected	---------	7.36E+04
TL-201	Not Detected	---------	5.65E-01
XE-133	Not Detected	---------	7.92E-01
Y-88	Not Detected	---------	5.71E-02
ZN-65	Not Detected	---------	1.91E-01
ZR-95	Not Detected	---------	1.09E-01

****
* Sandia National Laboratories *
* Radiation Protection Sample Diagnostics Program [881 Laboratory] *
* 6-13-97 3:10:02 PM *
****
* *
* Analyzed by: 6/16/97 Reviewed by: 6/16/97 *
****

Customer : C.BYRD/C.STEFANOV (6685/SMO)
Customer Sample ID : 034959-004
Lab Sample ID : 70098805

Sample Description : MARINELLI SOIL SAMPLE
Sample Quantity : 451.000 gram
Sample Date/Time : 6-12-97 1:50:00 PM
Acquire Start Date/Time : 6-13-97 1:21:27 PM
Detector Name : LAB01
Elapsed Live/Real Time : 6000 / 6002 seconds

Comments:
****

Nuclide Name	Activity (pCi/gram)	2-sigma Error	MDA (pCi/gram)
U-238	Not Detected	---------	2.11E+00
TH-234	6.14E-01	3.50E-01	5.93E-01
RA-226	1.53E+00	7.39E-01	8.39E-01
PB-214	8.87E-01	1.79E-01	7.45E-02
BI-214	7.41E-01	1.86E-01	7.68E-02
TH-232	6.94E-01	3.97E-01	2.28E-01
RA-228	7.48E-01	2.80E-01	2.20E-01
AC-228	9.16E-01	3.31E-01	1.55E-01
TH-228	4.54E-01	7.74E-02	4.86E-01
RA-224	8.61E-01	4.28E-01	1.25E-01
PB-212	8.31E-01	1.54E-01	5.56E-02
BI-212	8.79E-01	7.57E-01	5.19E-01
TL-208	8.37E-01	2.57E-01	1.11E-01
U-235	Not Detected	---------	2.90E-01
TH-231	Not Detected	---------	1.18E+01
PA-231	Not Detected	---------	1.99E+00
TH-227	Not Detected	---------	5.05E-01
RA-223	Not Detected	---------	2.01E-01
RN-219	Not Detected	---------	6.12E-01
PB-211	Not Detected	---------	1.38E+00
TL-207	Not Detected	---------	2.27E+01
AM-241	Not Detected	---------	2.55E-01
PU-239	Not Detected	---------	4.56E+02
NP-237	Not Detected	---------	3.96E-01
PA-233	Not Detected	---------	8.35E-02
TH-229	Not Detected	---------	2.74E-01

[Summary Report] - Sample ID: : 70098805

Nuclide Name	Activity (pCi/gram)	2-sigma Error	MDA (pCi/gram)
AG-108m	Not Detected	---------	6.49E-02
AG-110m	Not Detected	---------	6.30E-02
BA-133	Not Detected	---------	7.77E-02
BE-7	Not Detected	---------	3.87E-01
CD-109	~~1.66E+00~~	~~6.76E-01~~	9.36E-01 not detected
CD-115	Not Detected	---------	1.27E-01
CE-139	Not Detected	---------	3.56E-02
CE-141	Not Detected	---------	6.34E-02
CE-144	Not Detected	---------	2.59E-01
CO-56	Not Detected	---------	4.69E-02
CO-57	Not Detected	---------	3.30E-02
CO-58	Not Detected	---------	5.20E-02
CO-60	Not Detected	---------	5.94E-02
CR-51	Not Detected	---------	3.33E-01
CS-134	Not Detected	---------	7.12E-02
CS-137	1.18E-01	6.08E-02	3.77E-02
EU-152	Not Detected	---------	9.90E-02
EU-154	Not Detected	---------	2.98E-01
EU-155	Not Detected	---------	1.55E-01
FE-59	Not Detected	---------	1.22E-01
GD-153	Not Detected	---------	1.10E-01
HG-203	Not Detected	---------	4.47E-02
I-131	Not Detected	---------	4.56E-02
IR-192	Not Detected	---------	3.87E-02
K-40	1.76E+01	2.95E+00	4.85E-01
MN-52	Not Detected	---------	6.13E-02
MN-54	Not Detected	---------	5.98E-02
MO-99	Not Detected	---------	4.93E-01
NA-22	Not Detected	---------	6.51E-02
NA-24	Not Detected	---------	1.63E-01
NB-95	Not Detected	---------	2.61E-01
ND-147	Not Detected	---------	3.18E-01
NI-57	Not Detected	---------	1.25E-01
PB-210	Not Detected	---------	1.11E+01
RU-103	Not Detected	---------	4.57E-02
RU-106	Not Detected	---------	4.67E-01
SB-122	Not Detected	---------	7.51E-02
SB-124	Not Detected	---------	4.88E-02
SB-125	Not Detected	---------	1.22E-01
SN-113	Not Detected	---------	5.94E-02
SR-85	Not Detected	---------	5.90E-02
TA-182	Not Detected	---------	2.57E-01
TA-183	Not Detected	---------	2.48E-01
TC-99m	Not Detected	---------	5.10E-01
TL-201	Not Detected	---------	1.79E-01
XE-133	Not Detected	---------	1.78E-01
Y-88	Not Detected	---------	4.12E-02
ZN-65	Not Detected	---------	1.81E-01
ZR-95	Not Detected	---------	8.93E-02

****
* Sandia National Laboratories *
* Radiation Protection Sample Diagnostics Program [881 Laboratory] *
* 6-15-97 2:28:28 PM *
****
*
* Analyzed by: 6/16/97 Reviewed by: 6/16/97
****

Customer : C.BYRD/CSTEFANOV (6685/SMO)
Customer Sample ID : 034992-004
Lab Sample ID : 70098806

Sample Description : MARINELLI WATER SAMPLE
Sample Quantity : 500.000 mL
Sample Date/Time : 6-12-97 4:00:00 PM
Acquire Start Date/Time : 6-15-97 12:44:14 PM
Detector Name : LAB01
Elapsed Live/Real Time : 6000 / 6001 seconds

Comments:
****

Nuclide Name	Activity (pCi/mL)	2-sigma Error	MDA (pCi/mL)
U-238	Not Detected	---------	8.08E-01
TH-234	Not Detected	---------	3.26E-01
RA-226	Not Detected	---------	4.72E-01
PB-214	Not Detected	---------	5.24E-02
BI-214	Not Detected	---------	6.24E-02
TH-232	Not Detected	---------	1.60E-01
RA-228	Not Detected	---------	1.57E-01
AC-228	Not Detected	---------	1.08E-01
TH-228	Not Detected	---------	5.35E-01
RA-224	Not Detected	---------	1.71E-01
PB-212	Not Detected	---------	3.94E-02
BI-212	Not Detected	---------	3.68E-01
TL-208	Not Detected	---------	7.12E-02
U-235	Not Detected	---------	1.38E-01
TH-231	Not Detected	---------	4.67E+00
PA-231	Not Detected	---------	1.01E+00
TH-227	Not Detected	---------	1.54E-01
RA-223	Not Detected	---------	8.77E-02
RN-219	Not Detected	---------	3.05E-01
PB-211	Not Detected	---------	6.62E-01
TL-207	Not Detected	---------	1.18E+01
AM-241	Not Detected	---------	9.30E-02
PU-239	Not Detected	---------	2.15E+02
NP-237	Not Detected	---------	1.33E-01
PA-233	Not Detected	---------	4.49E-02
TH-229	Not Detected	---------	1.21E-01

[Summary Report] - Sample ID: : 70098806

Nuclide Name	Activity (pCi/mL)	2-sigma Error	MDA (pCi/mL)
AG-108m	Not Detected	---------	2.53E-02
AG-110m	Not Detected	---------	2.54E-02
BA-133	Not Detected	---------	3.11E-02
BE-7	Not Detected	---------	1.97E-01
CD-109	Not Detected	---------	4.63E-01
CD-115	Not Detected	---------	9.68E-02
CE-139	Not Detected	---------	1.76E-02
CE-141	Not Detected	---------	3.11E-02
CE-144	Not Detected	---------	1.15E-01
CO-56	Not Detected	---------	3.78E-02
CO-57	Not Detected	---------	1.64E-02
CO-58	Not Detected	---------	2.47E-02
CO-60	Not Detected	---------	2.88E-02
CR-51	Not Detected	---------	1.80E-01
CS-134	Not Detected	---------	2.95E-02
CS-137	Not Detected	---------	2.78E-02
EU-152	Not Detected	---------	4.93E-02
EU-154	Not Detected	---------	1.15E-01
EU-155	Not Detected	---------	7.06E-02
FE-59	Not Detected	---------	4.93E-02
GD-153	Not Detected	---------	4.69E-02
HG-203	Not Detected	---------	2.23E-02
I-131	Not Detected	---------	3.29E-02
IR-192	Not Detected	---------	2.09E-02
K-40	Not Detected	---------	3.43E-01
MN-52	Not Detected	---------	3.48E-02
MN-54	Not Detected	---------	2.47E-02
MO-99	Not Detected	---------	3.52E-01
NA-22	Not Detected	---------	2.96E-02
NA-24	Not Detected	---------	7.60E-01
NB-95	Not Detected	---------	1.19E-01
ND-147	Not Detected	---------	1.99E-01
NI-57	Not Detected	---------	1.45E-01
PB-210	Not Detected	---------	3.66E+00
RU-103	Not Detected	---------	2.62E-02
RU-106	Not Detected	---------	2.38E-01
SB-122	Not Detected	---------	6.46E-02
SB-124	Not Detected	---------	2.92E-02
SB-125	Not Detected	---------	7.10E-02
SN-113	Not Detected	---------	2.87E-02
SR-85	Not Detected	---------	3.32E-02
TA-182	Not Detected	---------	9.08E-02
TA-183	Not Detected	---------	1.17E-01
TC-99m	Not Detected	---------	4.91E+01
TL-201	Not Detected	---------	1.14E-01
XE-133	Not Detected	---------	1.30E-01
Y-88	Not Detected	---------	2.70E-02
ZN-65	Not Detected	---------	5.65E-02
ZR-95	Not Detected	---------	4.68E-02

****
* Sandia National Laboratories *
* Radiation Protection Sample Diagnostics Program [881 Laboratory] *
* 6-17-97 12:19:19 PM *
****
*
* Analyzed by: 6/19/97 Reviewed by: 6/23/97 *
****

Customer : C.BYRD/C.STEFANOV (6685/SMO)
Customer Sample ID : 034991-004
Lab Sample ID : 70098926

Sample Description : MARINELLI LIQUID SAMPLE
Sample Quantity : 500.000 mL
Sample Date/Time : 6-12-97 2:40:00 PM
Acquire Start Date/Time : 6-17-97 10:36:26 AM
Detector Name : LAB01
Elapsed Live/Real Time : 6000 / 6001 seconds

Comments:
****

Nuclide Name	Activity (pCi/mL)	2-sigma Error	MDA (pCi/mL)
U-238	Not Detected	---------	7.81E-01
TH-234	Not Detected	---------	3.08E-01
RA-226	Not Detected	---------	3.77E-01
PB-214	Not Detected	---------	5.35E-02
BI-214	Not Detected	---------	6.26E-02
TH-232	Not Detected	---------	1.52E-01
RA-228	Not Detected	---------	1.64E-01
AC-228	Not Detected	---------	1.01E-01
TH-228	Not Detected	---------	4.78E-01
RA-224	Not Detected	---------	1.63E-01
PB-212	Not Detected	---------	4.06E-02
BI-212	Not Detected	---------	3.45E-01
TL-208	Not Detected	---------	8.31E-02
U-235	Not Detected	---------	1.37E-01
TH-231	Not Detected	---------	4.72E+00
PA-231	Not Detected	---------	1.06E+00
TH-227	Not Detected	---------	1.57E-01
RA-223	Not Detected	---------	1.00E-01
RN-219	Not Detected	---------	3.11E-01
PB-211	Not Detected	---------	6.88E-01
TL-207	Not Detected	---------	1.12E+01
AM-241	Not Detected	---------	9.56E-02
PU-239	Not Detected	---------	2.08E+02
NP-237	Not Detected	---------	1.35E-01
PA-233	Not Detected	---------	4.38E-02
TH-229	Not Detected	---------	1.19E-01

[Summary Report] - Sample ID: : 70098926

Nuclide Name	Activity (pCi/mL)	2-sigma Error	MDA (pCi/mL)
AG-108m	Not Detected	---------	2.49E-02
AG-110m	Not Detected	---------	2.46E-02
BA-133	Not Detected	---------	3.34E-02
BE-7	Not Detected	---------	1.90E-01
CD-109	Not Detected	---------	4.44E-01
CD-115	Not Detected	---------	1.71E-01
CE-139	Not Detected	---------	1.84E-02
CE-141	Not Detected	---------	3.31E-02
CE-144	Not Detected	---------	1.24E-01
CO-56	Not Detected	---------	3.54E-02
CO-57	Not Detected	---------	1.57E-02
CO-58	Not Detected	---------	3.00E-02
CO-60	Not Detected	---------	3.29E-02
CR-51	Not Detected	---------	2.02E-01
CS-134	Not Detected	---------	2.86E-02
CS-137	Not Detected	---------	2.87E-02
EU-152	Not Detected	---------	4.69E-02
EU-154	Not Detected	---------	1.15E-01
EU-155	Not Detected	---------	6.67E-02
FE-59	Not Detected	---------	4.56E-02
GD-153	Not Detected	---------	5.10E-02
HG-203	Not Detected	---------	2.39E-02
I-131	Not Detected	---------	3.36E-02
IR-192	Not Detected	---------	2.22E-02
K-40	Not Detected	---------	3.93E-01
MN-52	Not Detected	---------	4.90E-02
MN-54	Not Detected	---------	2.57E-02
MO-99	Not Detected	---------	6.80E-01
NA-22	Not Detected	---------	3.21E-02
NA-24	Not Detected	---------	6.42E+00
NB-95	Not Detected	---------	1.79E-01
ND-147	Not Detected	---------	2.15E-01
NI-57	Not Detected	---------	3.81E-01
PB-210	Not Detected	---------	3.41E+00
RU-103	Not Detected	---------	2.93E-02
RU-106	Not Detected	---------	2.28E-01
SB-122	Not Detected	---------	1.04E-01
SB-124	Not Detected	---------	2.74E-02
SB-125	Not Detected	---------	7.14E-02
SN-113	Not Detected	---------	2.93E-02
SR-85	Not Detected	---------	3.33E-02
TA-182	Not Detected	---------	8.29E-02
TA-183	Not Detected	---------	1.56E-01
TC-99m	Not Detected	---------	1.11E+04
TL-201	Not Detected	---------	1.70E-01
XE-133	Not Detected	---------	2.40E-01
Y-88	Not Detected	---------	3.92E-02
ZN-65	Not Detected	---------	6.15E-02
ZR-95	Not Detected	---------	4.70E-02

****
* Sandia National Laboratories *
* Radiation Protection Sample Diagnostics Program [881 Laboratory] *
* 6-17-97 4:12:32 PM *
****
* *
* Analyzed by: 6/17/97 Reviewed by: 6/18/97 *
****

Customer : C.BYRD/C.STEFANOV (6685/SMO)
Customer Sample ID : 034996-004
Lab Sample ID : 70100801

Sample Description : MARINELLI WATER SAMPLE
Sample Quantity : 500.000 mL
Sample Date/Time : 6-16-97 2:00:00 PM
Acquire Start Date/Time : 6-17-97 2:29:39 PM
Detector Name : LAB04
Elapsed Live/Real Time : 6000 / 6001 seconds

Comments:

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Nuclide Name	Activity (pCi/mL)	2-sigma Error	MDA (pCi/mL)
U-238	Not Detected	---------	9.74E-01
TH-234	Not Detected	---------	3.00E-01
RA-226	Not Detected	---------	4.23E-01
PB-214	4.50E-02	2.61E-02	2.77E-02
BI-214	Not Detected	---------	5.45E-02
TH-232	Not Detected	---------	1.39E-01
RA-228	Not Detected	---------	1.20E-01
AC-228	Not Detected	---------	7.67E-02
TH-228	Not Detected	---------	4.62E-01
RA-224	Not Detected	---------	1.04E-01
PB-212	Not Detected	---------	3.59E-02
BI-212	Not Detected	---------	2.67E-01
TL-208	Not Detected	---------	5.80E-02
U-235	Not Detected	---------	1.30E-01
TH-231	Not Detected	---------	4.70E+00
PA-231	Not Detected	---------	9.34E-01
TH-227	Not Detected	---------	1.35E-01
RA-223	Not Detected	---------	7.65E-02
RN-219	Not Detected	---------	2.53E-01
PB-211	Not Detected	---------	5.82E-01
TL-207	Not Detected	---------	8.20E+00
AM-241	Not Detected	---------	1.15E-01
PU-239	Not Detected	---------	2.01E+02
NP-237	Not Detected	---------	1.35E-01
PA-233	Not Detected	---------	3.99E-02
TH-229	Not Detected	---------	1.14E-01

[Summary Report] - Sample ID: : 70100801

Nuclide Name	Activity (pCi/mL)	2-sigma Error	MDA (pCi/mL)
AG-108m	Not Detected	---------	2.03E-02
AG-110m	Not Detected	---------	1.96E-02
BA-133	Not Detected	---------	3.03E-02
BE-7	Not Detected	---------	1.51E-01
CD-109	Not Detected	---------	2.70E-01
CD-115	Not Detected	---------	4.67E-02
CE-139	Not Detected	---------	1.65E-02
CE-141	Not Detected	---------	2.68E-02
CE-144	Not Detected	---------	1.18E-01
CO-56	Not Detected	---------	2.06E-02
CO-57	Not Detected	---------	1.53E-02
CO-58	Not Detected	---------	1.98E-02
CO-60	Not Detected	---------	2.20E-02
CR-51	Not Detected	---------	1.49E-01
CS-134	Not Detected	---------	2.56E-02
CS-137	Not Detected	---------	2.13E-02
EU-152	Not Detected	---------	4.61E-02
EU-154	Not Detected	---------	9.34E-02
EU-155	Not Detected	---------	6.42E-02
FE-59	Not Detected	---------	3.71E-02
GD-153	Not Detected	---------	4.72E-02
HG-203	Not Detected	---------	1.88E-02
I-131	Not Detected	---------	2.02E-02
IR-192	Not Detected	---------	1.76E-02
K-40	Not Detected	---------	2.43E-01
MN-52	Not Detected	---------	2.60E-02
MN-54	Not Detected	---------	2.09E-02
MO-99	Not Detected	---------	1.87E-01
NA-22	Not Detected	---------	2.25E-02
NA-24	Not Detected	---------	6.66E-02
NB-95	Not Detected	---------	7.53E-02
ND-147	Not Detected	---------	1.25E-01
NI-57	Not Detected	---------	4.72E-02
PB-210	Not Detected	---------	3.93E+00
RU-103	Not Detected	---------	2.13E-02
RU-106	Not Detected	---------	1.77E-01
SB-122	Not Detected	---------	3.13E-02
SB-124	Not Detected	---------	2.21E-02
SB-125	Not Detected	---------	4.86E-02
SN-113	Not Detected	---------	2.46E-02
SR-85	Not Detected	---------	2.86E-02
TA-182	Not Detected	---------	7.30E-02
TA-183	Not Detected	---------	1.12E-01
TC-99m	Not Detected	---------	2.57E-01
TL-201	Not Detected	---------	6.94E-02
XE-133	Not Detected	---------	7.34E-02
Y-88	Not Detected	---------	2.24E-02
ZN-65	Not Detected	---------	4.94E-02
ZR-95	Not Detected	---------	3.27E-02

ANNEX 2-A.5
Results of SWMU 27 RFI Burn Pit Debris Sampling Analysis-Gamma Spectroscopy

****
* Sandia National Laboratories *
* Radiation Protection Sample Diagnostics Program [881 Laboratory] *
* 6-17-97 7:34:50 AM *
****
* *
* Analyzed by: 6/19/97 Reviewed by: 6/23/97 *
****

Customer : C.BYRD/C.STEFANOV (6685/SMO)
Customer Sample ID : 034950-004
Lab Sample ID : 70098919

Sample Description : MARINELLI SOLID SAMPLE
Sample Quantity : 611.000 gram
Sample Date/Time : 6-11-97 10:35:00 AM
Acquire Start Date/Time : 6-17-97 5:50:49 AM
Detector Name : LAB01
Elapsed Live/Real Time : 6000 / 6002 seconds

Comments:
****

Nuclide Name	Activity (pCi/gram)	2-sigma Error	MDA (pCi/gram)
U-238	Not Detected	---------	1.51E+00
TH-234	5.32E-01	3.44E-01	4.68E-01
RA-226	9.09E-01	1.20E+00	6.80E-01
PB-214	4.02E-01	1.04E-01	5.21E-02
BI-214	3.81E-01	3.10E-01	5.64E-02
TH-232	5.75E-01	3.00E-01	1.64E-01
RA-228	6.44E-01	2.86E-01	1.70E-01
AC-228	6.03E-01	1.76E-01	1.10E-01
TH-228	Not Detected	---------	3.71E-01
RA-224	5.48E-01	2.65E-01	1.20E-01
PB-212	6.55E-01	1.44E-01	3.97E-02
BI-212	8.87E-01	4.01E-01	3.35E-01
TL-208	5.58E-01	1.61E-01	8.85E-02
U-235	Not Detected	---------	2.07E-01
TH-231	Not Detected	---------	8.38E+00
PA-231	Not Detected	---------	1.50E+00
TH-227	Not Detected	---------	3.82E-01
RA-223	Not Detected	---------	1.91E-01
RN-219	Not Detected	---------	4.42E-01
PB-211	Not Detected	---------	9.71E-01
TL-207	Not Detected	---------	1.62E+01
AM-241	Not Detected	---------	1.88E-01
PU-239	Not Detected	---------	3.69E+02
NP-237	~~2.41E-01~~	~~1.62E-01~~	~~2.04E-01~~ NOT DETECTED 6/19/97
PA-233	Not Detected	---------	6.03E-02
TH-229	Not Detected	---------	2.09E-01

[Summary Report] - Sample ID: : 70098919

Nuclide Name	Activity (pCi/gram)	2-sigma Error	MDA (pCi/gram)
AG-108m	Not Detected	---------	4.85E-02
AG-110m	Not Detected	---------	5.55E-02
BA-133	Not Detected	---------	5.19E-02
BE-7	Not Detected	---------	3.02E-01
CD-109	Not Detected	---------	6.98E-01
CD-115	Not Detected	---------	4.27E-01
CE-139	Not Detected	---------	2.78E-02
CE-141	Not Detected	---------	5.12E-02
CE-144	Not Detected	---------	1.97E-01
CO-56	Not Detected	---------	4.67E-02
CO-57	Not Detected	---------	2.48E-02
CO-58	Not Detected	---------	3.93E-02
CO-60	Not Detected	---------	4.53E-02
CR-51	Not Detected	---------	2.79E-01
CS-134	Not Detected	---------	4.93E-02
CS-137	1.47E-01	3.98E-02	2.64E-02
EU-152	Not Detected	---------	7.48E-02
EU-154	Not Detected	---------	2.23E-01
EU-155	Not Detected	---------	1.17E-01
FE-59	Not Detected	---------	8.84E-02
GD-153	Not Detected	---------	8.48E-02
HG-203	Not Detected	---------	3.58E-02
I-131	Not Detected	---------	5.26E-02
IR-192	Not Detected	---------	3.09E-02
K-40	1.52E+01	2.44E+00	3.50E-01
MN-52	Not Detected	---------	7.80E-02
MN-54	Not Detected	---------	4.21E-02
MO-99	Not Detected	---------	1.23E+00
NA-22	Not Detected	---------	5.06E-02
NA-24	Not Detected	---------	2.58E+01
NB-95	Not Detected	---------	4.98E-01
ND-147	Not Detected	---------	3.37E-01
NI-57	Not Detected	---------	8.69E-01
PB-210	Not Detected	---------	7.69E+00
RU-103	Not Detected	---------	3.62E-02
RU-106	Not Detected	---------	3.24E-01
SB-122	Not Detected	---------	1.99E-01
SB-124	Not Detected	---------	3.76E-02
SB-125	Not Detected	---------	9.69E-02
SN-113	Not Detected	---------	4.19E-02
SR-85	Not Detected	---------	4.73E-02
TA-182	Not Detected	---------	1.81E-01
TA-183	Not Detected	---------	3.52E-01
TC-99m	Not Detected	---------	2.36E+05
TL-201	Not Detected	---------	3.98E-01
XE-133	Not Detected	---------	5.79E-01
Y-88	Not Detected	---------	3.27E-02
ZN-65	Not Detected	---------	1.24E-01
ZR-95	Not Detected	---------	6.70E-02

****
* Sandia National Laboratories *
* Radiation Protection Sample Diagnostics Program [881 Laboratory] *
* 6-17-97 2:53:44 PM *
****
* *
* Analyzed by: 6/19/97 Reviewed by: 6/23/97 *
****

Customer : C.BYRD/C.STEFANOV (6685/SMO)
Customer Sample ID : 034951-004
Lab Sample ID : 70098920

Sample Description : MARINELLI SOLID SAMPLE
Sample Quantity : 743.000 gram
Sample Date/Time : 6-11-97 1:15:00 PM
Acquire Start Date/Time : 6-17-97 1:05:51 PM
Detector Name : LAB01
Elapsed Live/Real Time : 6000 / 6003 seconds

Comments:
****

Nuclide Name	Activity (pCi/gram)	2-sigma Error	MDA (pCi/gram)
U-238	Not Detected	---------	1.01E+00
TH-234	7.72E-01	3.19E-01	5.48E-01
RA-226	1.14E+00	5.24E-01	6.09E-01
PB-214	6.13E-01	1.85E-01	5.45E-02
BI-214	6.16E-01	1.39E-01	5.55E-02
TH-232	9.63E-01	4.77E-01	1.77E-01
RA-228	9.85E-01	3.12E-01	1.82E-01
AC-228	8.78E-01	2.52E-01	1.18E-01
TH-228	5.00E-01	3.91E-01	5.77E-01
RA-224	8.98E-01	3.01E-01	1.06E-01
PB-212	9.01E-01	1.50E-01	4.43E-02
BI-212	1.07E+00	3.42E-01	3.96E-01
TL-208	7.64E-01	1.87E-01	7.62E-02
U-235	Not Detected	---------	2.21E-01
TH-231	Not Detected	---------	9.44E+00
PA-231	Not Detected	---------	1.53E+00
TH-227	Not Detected	---------	4.04E-01
RA-223	Not Detected	---------	2.16E-01
RN-219	Not Detected	---------	4.54E-01
PB-211	Not Detected	---------	1.02E+00
TL-207	Not Detected	---------	1.69E+01
AM-241	Not Detected	---------	2.00E-01
PU-239	Not Detected	---------	3.78E+02
NP-237	~~3.21E-01~~	~~1.37E-01~~	~~2.09E-01~~ NOT DETECTED 6/19/97
PA-233	Not Detected	---------	6.03E-02
TH-229	Not Detected	---------	2.08E-01

[Summary Report] - Sample ID: : 70098920

Nuclide Name	Activity (pCi/gram)	2-sigma Error	MDA (pCi/gram)
AG-108m	Not Detected	---------	4.99E-02
AG-110m	Not Detected	---------	6.26E-02
BA-133	Not Detected	---------	5.42E-02
BE-7	Not Detected	---------	3.13E-01
CD-109	Not Detected	---------	1.02E+00
CD-115	Not Detected	---------	4.84E-01
CE-139	Not Detected	---------	2.85E-02
CE-141	Not Detected	---------	5.49E-02
CE-144	Not Detected	---------	1.99E-01
CO-56	Not Detected	---------	3.25E-02
CO-57	Not Detected	---------	2.69E-02
CO-58	Not Detected	---------	4.05E-02
CO-60	Not Detected	---------	4.47E-02
CR-51	Not Detected	---------	2.91E-01
CS-134	Not Detected	---------	5.30E-02
CS-137	2.79E-01	7.14E-02	2.69E-02
EU-152	Not Detected	---------	7.93E-02
EU-154	Not Detected	---------	2.32E-01
EU-155	Not Detected	---------	1.22E-01
FE-59	Not Detected	---------	1.06E-01
GD-153	Not Detected	---------	8.61E-02
HG-203	Not Detected	---------	3.77E-02
I-131	Not Detected	---------	5.30E-02
IR-192	Not Detected	---------	3.07E-02
K-40	2.07E+01	3.16E+00	3.17E-01
MN-52	Not Detected	---------	8.09E-02
MN-54	Not Detected	---------	1.90E-02
MO-99	Not Detected	---------	1.30E+00
NA-22	Not Detected	---------	5.40E-02
NA-24	Not Detected	---------	3.13E+01
NB-95	Not Detected	---------	5.47E-01
ND-147	Not Detected	---------	3.49E-01
NI-57	Not Detected	---------	9.76E-01
PB-210	Not Detected	---------	8.31E+00
RU-103	Not Detected	---------	3.80E-02
RU-106	Not Detected	---------	3.40E-01
SB-122	Not Detected	---------	2.16E-01
SB-124	Not Detected	---------	3.73E-02
SB-125	Not Detected	---------	1.00E-01
SN-113	Not Detected	---------	4.49E-02
SR-85	Not Detected	---------	4.68E-02
TA-182	Not Detected	---------	1.93E-01
TA-183	Not Detected	---------	3.85E-01
TC-99m	Not Detected	---------	4.13E+05
TL-201	Not Detected	---------	4.46E-01
XE-133	Not Detected	---------	6.84E-01
Y-88	Not Detected	---------	3.37E-02
ZN-65	Not Detected	---------	1.30E-01
ZR-95	Not Detected	---------	7.56E-02

****
* Sandia National Laboratories *
* Radiation Protection Sample Diagnostics Program [881 Laboratory] *
* 6-18-97 12:08:51 AM *
****
* *
* Analyzed by: 6/19/97 Reviewed by: 6/23/97 *
****

Customer : C.BYRD/C.STEFANOV (6685/SMO)
Customer Sample ID : 034952-004
Lab Sample ID : 70098925

Sample Description : MARINELLI SOLID SAMPLE
Sample Quantity : 729.000 gram
Sample Date/Time : 6-12-97 3:30:00 PM
Acquire Start Date/Time : 6-17-97 10:21:02 PM
Detector Name : LAB01
Elapsed Live/Real Time : 6000 / 6002 seconds

Comments:
****

Nuclide Name	Activity (pCi/gram)	2-sigma Error	MDA (pCi/gram)
U-238	Not Detected	---------	1.46E+00
TH-234	5.30E-01	3.32E-01	4.62E-01
RA-226	1.12E+00	4.50E-01	5.04E-01
PB-214	4.38E-01	1.13E-01	5.12E-02
BI-214	4.14E-01	9.63E-02	4.55E-02
TH-232	7.31E-01	4.09E-01	1.51E-01
RA-228	7.28E-01	3.39E-01	1.74E-01
AC-228	6.58E-01	7.20E-01	9.73E-02
TH-228	5.12E-01	3.29E-01	4.15E-01
RA-224	6.12E-01	3.64E-01	7.87E-02
PB-212	6.39E-01	1.16E-01	3.76E-02
BI-212	7.09E-01	3.94E-01	3.63E-01
TL-208	6.61E-01	1.49E-01	7.27E-02
U-235	Not Detected	---------	1.94E-01
TH-231	Not Detected	---------	8.07E+00
PA-231	Not Detected	---------	1.40E+00
TH-227	Not Detected	---------	3.55E-01
RA-223	Not Detected	---------	1.75E-01
RN-219	Not Detected	---------	3.95E-01
PB-211	Not Detected	---------	8.92E-01
TL-207	Not Detected	---------	1.56E+01
AM-241	Not Detected	---------	1.75E-01
PU-239	Not Detected	---------	3.45E+02
NP-237	~~3.09E-01~~	~~1.60E-01~~	~~1.88E-01~~ NOT DETECTED 6/19/97
PA-233	Not Detected	---------	5.58E-02
TH-229	Not Detected	---------	1.83E-01

[Summary Report] - Sample ID: : 70098925

Nuclide Name	Activity (pCi/gram)	2-sigma Error	MDA (pCi/gram)
AG-108m	Not Detected	---------	4.56E-02
AG-110m	Not Detected	---------	5.21E-02
BA-133	Not Detected	---------	4.70E-02
BE-7	Not Detected	---------	2.86E-01
CD-109	Not Detected	---------	6.41E-01
CD-115	Not Detected	---------	3.46E-01
CE-139	Not Detected	---------	2.48E-02
CE-141	Not Detected	---------	4.71E-02
CE-144	Not Detected	---------	1.83E-01
CO-56	Not Detected	---------	3.86E-02
CO-57	Not Detected	---------	2.41E-02
CO-58	Not Detected	---------	3.32E-02
CO-60	Not Detected	---------	4.06E-02
CR-51	Not Detected	---------	2.49E-01
CS-134	Not Detected	---------	4.59E-02
CS-137	1.69E-01	4.22E-02	2.71E-02
EU-152	Not Detected	---------	7.12E-02
EU-154	Not Detected	---------	2.10E-01
EU-155	Not Detected	---------	1.10E-01
FE-59	Not Detected	---------	8.34E-02
GD-153	Not Detected	---------	7.66E-02
HG-203	Not Detected	---------	3.17E-02
I-131	Not Detected	---------	4.47E-02
IR-192	Not Detected	---------	2.76E-02
K-40	1.43E+01	2.29E+00	2.83E-01
MN-52	Not Detected	---------	6.60E-02
MN-54	Not Detected	---------	2.05E-02
MO-99	Not Detected	---------	9.19E-01
NA-22	Not Detected	---------	4.62E-02
NA-24	Not Detected	---------	1.32E+01
NB-95	Not Detected	---------	4.20E-01
ND-147	Not Detected	---------	2.84E-01
NI-57	Not Detected	---------	6.31E-01
PB-210	Not Detected	---------	7.24E+00
RU-103	Not Detected	---------	3.28E-02
RU-106	Not Detected	---------	2.99E-01
SB-122	Not Detected	---------	1.62E-01
SB-124	Not Detected	---------	3.40E-02
SB-125	Not Detected	---------	9.04E-02
SN-113	Not Detected	---------	3.86E-02
SR-85	Not Detected	---------	4.11E-02
TA-182	Not Detected	---------	1.55E-01
TA-183	Not Detected	---------	3.06E-01
TC-99m	Not Detected	---------	5.27E+04
TL-201	Not Detected	---------	3.42E-01
XE-133	Not Detected	---------	4.64E-01
Y-88	Not Detected	---------	3.21E-02
ZN-65	Not Detected	---------	1.06E-01
ZR-95	Not Detected	---------	6.24E-02

Sandia National Laboratories
Radiation Protection Sample Diagnostics Program [881 Laboratory]
6-17-97 12:19:19 PM

Analyzed by: 6/19/97 Reviewed by: 6/23/97

Customer : C.BYRD/C.STEFANOV (6685/SMO)
Customer Sample ID : 034991-004
Lab Sample ID : 70098926

Sample Description : MARINELLI LIQUID SAMPLE
Sample Quantity : 500.000 mL
Sample Date/Time : 6-12-97 2:40:00 PM
Acquire Start Date/Time : 6-17-97 10:36:26 AM
Detector Name : LAB01
Elapsed Live/Real Time : 6000 / 6001 seconds

Comments:

Nuclide Name	Activity (pCi/mL)	2-sigma Error	MDA (pCi/mL)
U-238	Not Detected	---------	7.81E-01
TH-234	Not Detected	---------	3.08E-01
RA-226	Not Detected	---------	3.77E-01
PB-214	Not Detected	---------	5.35E-02
BI-214	Not Detected	---------	6.26E-02
TH-232	Not Detected	---------	1.52E-01
RA-228	Not Detected	---------	1.64E-01
AC-228	Not Detected	---------	1.01E-01
TH-228	Not Detected	---------	4.78E-01
RA-224	Not Detected	---------	1.63E-01
PB-212	Not Detected	---------	4.06E-02
BI-212	Not Detected	---------	3.45E-01
TL-208	Not Detected	---------	8.31E-02
U-235	Not Detected	---------	1.37E-01
TH-231	Not Detected	---------	4.72E+00
PA-231	Not Detected	---------	1.06E+00
TH-227	Not Detected	---------	1.57E-01
RA-223	Not Detected	---------	1.00E-01
RN-219	Not Detected	---------	3.11E-01
PB-211	Not Detected	---------	6.88E-01
TL-207	Not Detected	---------	1.12E+01
AM-241	Not Detected	---------	9.56E-02
PU-239	Not Detected	---------	2.08E+02
NP-237	Not Detected	---------	1.35E-01
PA-233	Not Detected	---------	4.38E-02
TH-229	Not Detected	---------	1.19E-01

[Summary Report] - Sample ID: : 70098926

Nuclide Name	Activity (pCi/mL)	2-sigma Error	MDA (pCi/mL)
AG-108m	Not Detected	---------	2.49E-02
AG-110m	Not Detected	---------	2.46E-02
BA-133	Not Detected	---------	3.34E-02
BE-7	Not Detected	---------	1.90E-01
CD-109	Not Detected	---------	4.44E-01
CD-115	Not Detected	---------	1.71E-01
CE-139	Not Detected	---------	1.84E-02
CE-141	Not Detected	---------	3.31E-02
CE-144	Not Detected	---------	1.24E-01
CO-56	Not Detected	---------	3.54E-02
CO-57	Not Detected	---------	1.57E-02
CO-58	Not Detected	---------	3.00E-02
CO-60	Not Detected	---------	3.29E-02
CR-51	Not Detected	---------	2.02E-01
CS-134	Not Detected	---------	2.86E-02
CS-137	Not Detected	---------	2.87E-02
EU-152	Not Detected	---------	4.69E-02
EU-154	Not Detected	---------	1.15E-01
EU-155	Not Detected	---------	6.67E-02
FE-59	Not Detected	---------	4.56E-02
GD-153	Not Detected	---------	5.10E-02
HG-203	Not Detected	---------	2.39E-02
I-131	Not Detected	---------	3.36E-02
IR-192	Not Detected	---------	2.22E-02
K-40	Not Detected	---------	3.93E-01
MN-52	Not Detected	---------	4.90E-02
MN-54	Not Detected	---------	2.57E-02
MO-99	Not Detected	---------	6.80E-01
NA-22	Not Detected	---------	3.21E-02
NA-24	Not Detected	---------	6.42E+00
NB-95	Not Detected	---------	1.79E-01
ND-147	Not Detected	---------	2.15E-01
NI-57	Not Detected	---------	3.81E-01
PB-210	Not Detected	---------	3.41E+00
RU-103	Not Detected	---------	2.93E-02
RU-106	Not Detected	---------	2.28E-01
SB-122	Not Detected	---------	1.04E-01
SB-124	Not Detected	---------	2.74E-02
SB-125	Not Detected	---------	7.14E-02
SN-113	Not Detected	---------	2.93E-02
SR-85	Not Detected	---------	3.33E-02
TA-182	Not Detected	---------	8.29E-02
TA-183	Not Detected	---------	1.56E-01
TC-99m	Not Detected	---------	1.11E+04
TL-201	Not Detected	---------	1.70E-01
XE-133	Not Detected	---------	2.40E-01
Y-88	Not Detected	---------	3.92E-02
ZN-65	Not Detected	---------	6.15E-02
ZR-95	Not Detected	---------	4.70E-02

Sandia National Laboratories
Radiation Protection Sample Diagnostics Program [881 Laboratory]
6-15-97 2:28:28 PM

Analyzed by: 6/16/97 Reviewed by: 6/16/97

Customer : C.BYRD/CSTEFANOV (6685/SMO)
Customer Sample ID : 034992-004
Lab Sample ID : 70098806

Sample Description : MARINELLI WATER SAMPLE
Sample Quantity : 500.000 mL
Sample Date/Time : 6-12-97 4:00:00 PM
Acquire Start Date/Time : 6-15-97 12:44:14 PM
Detector Name : LAB01
Elapsed Live/Real Time : 6000 / 6001 seconds

Comments:

Nuclide Name	Activity (pCi/mL)	2-sigma Error	MDA (pCi/mL)
U-238	Not Detected	---------	8.08E-01
TH-234	Not Detected	---------	3.26E-01
RA-226	Not Detected	---------	4.72E-01
PB-214	Not Detected	---------	5.24E-02
BI-214	Not Detected	---------	6.24E-02
TH-232	Not Detected	---------	1.60E-01
RA-228	Not Detected	---------	1.57E-01
AC-228	Not Detected	---------	1.08E-01
TH-228	Not Detected	---------	5.35E-01
RA-224	Not Detected	---------	1.71E-01
PB-212	Not Detected	---------	3.94E-02
BI-212	Not Detected	---------	3.68E-01
TL-208	Not Detected	---------	7.12E-02
U-235	Not Detected	---------	1.38E-01
TH-231	Not Detected	---------	4.67E+00
PA-231	Not Detected	---------	1.01E+00
TH-227	Not Detected	---------	1.54E-01
RA-223	Not Detected	---------	8.77E-02
RN-219	Not Detected	---------	3.05E-01
PB-211	Not Detected	---------	6.62E-01
TL-207	Not Detected	---------	1.18E+01
AM-241	Not Detected	---------	9.30E-02
PU-239	Not Detected	---------	2.15E+02
NP-237	Not Detected	---------	1.33E-01
PA-233	Not Detected	---------	4.49E-02
TH-229	Not Detected	---------	1.21E-01

[Summary Report] - Sample ID: : 70098806

Nuclide Name	Activity (pCi/mL)	2-sigma Error	MDA (pCi/mL)
AG-108m	Not Detected	---------	2.53E-02
AG-110m	Not Detected	---------	2.54E-02
BA-133	Not Detected	---------	3.11E-02
BE-7	Not Detected	---------	1.97E-01
CD-109	Not Detected	---------	4.63E-01
CD-115	Not Detected	---------	9.68E-02
CE-139	Not Detected	---------	1.76E-02
CE-141	Not Detected	---------	3.11E-02
CE-144	Not Detected	---------	1.15E-01
CO-56	Not Detected	---------	3.78E-02
CO-57	Not Detected	---------	1.64E-02
CO-58	Not Detected	---------	2.47E-02
CO-60	Not Detected	---------	2.88E-02
CR-51	Not Detected	---------	1.80E-01
CS-134	Not Detected	---------	2.95E-02
CS-137	Not Detected	---------	2.78E-02
EU-152	Not Detected	---------	4.93E-02
EU-154	Not Detected	---------	1.15E-01
EU-155	Not Detected	---------	7.06E-02
FE-59	Not Detected	---------	4.93E-02
GD-153	Not Detected	---------	4.69E-02
HG-203	Not Detected	---------	2.23E-02
I-131	Not Detected	---------	3.29E-02
IR-192	Not Detected	---------	2.09E-02
K-40	Not Detected	---------	3.43E-01
MN-52	Not Detected	---------	3.48E-02
MN-54	Not Detected	---------	2.47E-02
MO-99	Not Detected	---------	3.52E-01
NA-22	Not Detected	---------	2.96E-02
NA-24	Not Detected	---------	7.60E-01
NB-95	Not Detected	---------	1.19E-01
ND-147	Not Detected	---------	1.99E-01
NI-57	Not Detected	---------	1.45E-01
PB-210	Not Detected	---------	3.66E+00
RU-103	Not Detected	---------	2.62E-02
RU-106	Not Detected	---------	2.38E-01
SB-122	Not Detected	---------	6.46E-02
SB-124	Not Detected	---------	2.92E-02
SB-125	Not Detected	---------	7.10E-02
SN-113	Not Detected	---------	2.87E-02
SR-85	Not Detected	---------	3.32E-02
TA-182	Not Detected	---------	9.08E-02
TA-183	Not Detected	---------	1.17E-01
TC-99m	Not Detected	---------	4.91E+01
TL-201	Not Detected	---------	1.14E-01
XE-133	Not Detected	---------	1.30E-01
Y-88	Not Detected	---------	2.70E-02
ZN-65	Not Detected	---------	5.65E-02
ZR-95	Not Detected	---------	4.68E-02

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*****************************************************************************
*                    Sandia National Laboratories                           *
*    Radiation Protection Sample Diagnostics Program [881 Laboratory]       *
*                        6-17-97 10:18:08 PM                                *
*****************************************************************************
*                                                                           *
* Analyzed by:                          Reviewed by:                      *
*****************************************************************************
Customer                  : C.BYRD/C.STEFANOV (6685/SMO)
Customer Sample ID        : 034994-004
Lab Sample ID             : 70098924

Sample Description        : MARINELLI SOLID SAMPLE
Sample Quantity           :   690.000  gram
Sample Date/Time          :  6-12-97   3:30:00 PM
Acquire Start Date/Time   :  6-17-97   8:30:15 PM
Detector Name             : LAB01
Elapsed Live/Real Time    :   6000 /   6002 seconds

Comments:
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Nuclide Name	Activity (pCi/gram)	2-sigma Error	MDA (pCi/gram)
U-238	Not Detected	---------	9.25E-01
TH-234	4.67E-01	3.30E-01	4.73E-01
RA-226	8.97E-01	4.38E-01	5.18E-01
PB-214	4.62E-01	9.93E-02	5.35E-02
BI-214	4.04E-01	9.38E-02	5.38E-02
TH-232	6.30E-01	3.60E-01	1.58E-01
RA-228	6.44E-01	2.64E-01	1.71E-01
AC-228	7.57E-01	4.33E-01	8.47E-02
TH-228	5.60E-01	6.48E-01	4.75E-01
RA-224	7.25E-01	3.25E-01	7.22E-02
PB-212	6.86E-01	1.21E-01	3.88E-02
BI-212	6.34E-01	4.90E-01	3.23E-01
TL-208	6.64E-01	1.53E-01	7.64E-02
U-235	Not Detected	---------	2.07E-01
TH-231	Not Detected	---------	8.43E+00
PA-231	Not Detected	---------	1.45E+00
TH-227	Not Detected	---------	3.72E-01
RA-223	Not Detected	---------	1.89E-01
RN-219	Not Detected	---------	4.14E-01
PB-211	Not Detected	---------	9.40E-01
TL-207	Not Detected	---------	1.55E+01
AM-241	Not Detected	---------	1.83E-01
PU-239	Not Detected	---------	3.52E+02
NP-237	~~2.30E-01~~	~~1.02E-01~~	~~1.71E-01~~ NOT DETECTED 6/19/97
PA-233	Not Detected	---------	5.76E-02
TH-229	Not Detected	---------	1.92E-01

[Summary Report] - Sample ID: : 70098924

Nuclide Name	Activity (pCi/gram)	2-sigma Error	MDA (pCi/gram)	
AG-108m	Not Detected	---------	4.60E-02	
AG-110m	Not Detected	---------	5.63E-02	
BA-133	Not Detected	---------	5.02E-02	
BE-7	Not Detected	---------	2.83E-01	
CD-109	Not Detected	---------	9.54E-01	
CD-115	Not Detected	---------	3.39E-01	
CE-139	Not Detected	---------	2.61E-02	
CE-141	Not Detected	---------	5.00E-02	
CE-144	Not Detected	---------	1.89E-01	
CO-56	Not Detected	---------	4.27E-02	
CO-57	Not Detected	---------	2.39E-02	
CO-58	Not Detected	---------	3.57E-02	
CO-60	Not Detected	---------	4.21E-02	
CR-51	Not Detected	---------	2.56E-01	
CS-134	Not Detected	---------	4.64E-02	
CS-137	2.04E-01	5.20E-02	2.67E-02	
EU-152	Not Detected	---------	7.12E-02	
EU-154	Not Detected	---------	2.12E-01	
EU-155	Not Detected	---------	1.15E-01	
FE-59	Not Detected	---------	9.11E-02	
GD-153	Not Detected	---------	7.72E-02	
HG-203	Not Detected	---------	3.35E-02	
I-131	Not Detected	---------	4.46E-02	
IR-192	Not Detected	---------	2.71E-02	
K-40	1.47E+01	2.39E+00	3.07E-01	
MN-52	Not Detected	---------	6.42E-02	
MN-54	Not Detected	---------	3.83E-02	
MO-99	Not Detected	---------	1.02E+00	
NA-22	Not Detected	---------	4.83E-02	
NA-24	Not Detected	---------	1.22E+01	
NB-95	Not Detected	---------	4.37E-01	
ND-147	Not Detected	---------	3.02E-01	
NI-57	Not Detected	---------	5.83E-01	
PB-210	Not Detected	---------	7.66E+00	
RU-103	Not Detected	---------	3.44E-02	
RU-106	Not Detected	---------	2.97E-01	
SB-122	Not Detected	---------	1.56E-01	
SB-124	Not Detected	---------	3.34E-02	
SB-125	Not Detected	---------	9.63E-02	
SN-113	~~9.82E-03~~	~~2.48E-03~~	~~1.89E-02~~	NOT DETECTED KRT 6/19/99
SR-85	Not Detected	---------	4.34E-02	
TA-182	Not Detected	---------	1.78E-01	
TA-183	Not Detected	---------	3.16E-01	
TC-99m	Not Detected	---------	4.38E+04	
TL-201	Not Detected	---------	3.39E-01	
XE-133	Not Detected	---------	4.78E-01	
Y-88	Not Detected	---------	3.04E-02	
ZN-65	Not Detected	---------	1.19E-01	
ZR-95	Not Detected	---------	6.76E-02	

****
* Sandia National Laboratories *
* Radiation Protection Sample Diagnostics Program [881 Laboratory] *
* 6-17-97 4:12:32 PM *
****

* Analyzed by: 6/17/97 Reviewed by: 6/18/97 *
****

Customer : C.BYRD/C.STEFANOV (6685/SMO)
Customer Sample ID : 034996-004
Lab Sample ID : 70100801

Sample Description : MARINELLI WATER SAMPLE
Sample Quantity : 500.000 mL
Sample Date/Time : 6-16-97 2:00:00 PM
Acquire Start Date/Time : 6-17-97 2:29:39 PM
Detector Name : LAB04
Elapsed Live/Real Time : 6000 / 6001 seconds

Comments:
****

Nuclide Name	Activity (pCi/mL)	2-sigma Error	MDA (pCi/mL)
U-238	Not Detected	---------	9.74E-01
TH-234	Not Detected	---------	3.00E-01
RA-226	Not Detected	---------	4.23E-01
PB-214	4.50E-02	2.61E-02	2.77E-02
BI-214	Not Detected	---------	5.45E-02
TH-232	Not Detected	---------	1.39E-01
RA-228	Not Detected	---------	1.20E-01
AC-228	Not Detected	---------	7.67E-02
TH-228	Not Detected	---------	4.62E-01
RA-224	Not Detected	---------	1.04E-01
PB-212	Not Detected	---------	3.59E-02
BI-212	Not Detected	---------	2.67E-01
TL-208	Not Detected	---------	5.80E-02
U-235	Not Detected	---------	1.30E-01
TH-231	Not Detected	---------	4.70E+00
PA-231	Not Detected	---------	9.34E-01
TH-227	Not Detected	---------	1.35E-01
RA-223	Not Detected	---------	7.65E-02
RN-219	Not Detected	---------	2.53E-01
PB-211	Not Detected	---------	5.82E-01
TL-207	Not Detected	---------	8.20E+00
AM-241	Not Detected	---------	1.15E-01
PU-239	Not Detected	---------	2.01E+02
NP-237	Not Detected	---------	1.35E-01
PA-233	Not Detected	---------	3.99E-02
TH-229	Not Detected	---------	1.14E-01

[Summary Report] - Sample ID: : 70100801

Nuclide Name	Activity (pCi/mL)	2-sigma Error	MDA (pCi/mL)
AG-108m	Not Detected	---------	2.03E-02
AG-110m	Not Detected	---------	1.96E-02
BA-133	Not Detected	---------	3.03E-02
BE-7	Not Detected	---------	1.51E-01
CD-109	Not Detected	---------	2.70E-01
CD-115	Not Detected	---------	4.67E-02
CE-139	Not Detected	---------	1.65E-02
CE-141	Not Detected	---------	2.68E-02
CE-144	Not Detected	---------	1.18E-01
CO-56	Not Detected	---------	2.06E-02
CO-57	Not Detected	---------	1.53E-02
CO-58	Not Detected	---------	1.98E-02
CO-60	Not Detected	---------	2.20E-02
CR-51	Not Detected	---------	1.49E-01
CS-134	Not Detected	---------	2.56E-02
CS-137	Not Detected	---------	2.13E-02
EU-152	Not Detected	---------	4.61E-02
EU-154	Not Detected	---------	9.34E-02
EU-155	Not Detected	---------	6.42E-02
FE-59	Not Detected	---------	3.71E-02
GD-153	Not Detected	---------	4.72E-02
HG-203	Not Detected	---------	1.88E-02
I-131	Not Detected	---------	2.02E-02
IR-192	Not Detected	---------	1.76E-02
K-40	Not Detected	---------	2.43E-01
MN-52	Not Detected	---------	2.60E-02
MN-54	Not Detected	---------	2.09E-02
MO-99	Not Detected	---------	1.87E-01
NA-22	Not Detected	---------	2.25E-02
NA-24	Not Detected	---------	6.66E-02
NB-95	Not Detected	---------	7.53E-02
ND-147	Not Detected	---------	1.25E-01
NI-57	Not Detected	---------	4.72E-02
PB-210	Not Detected	---------	3.93E+00
RU-103	Not Detected	---------	2.13E-02
RU-106	Not Detected	---------	1.77E-01
SB-122	Not Detected	---------	3.13E-02
SB-124	Not Detected	---------	2.21E-02
SB-125	Not Detected	---------	4.86E-02
SN-113	Not Detected	---------	2.46E-02
SR-85	Not Detected	---------	2.86E-02
TA-182	Not Detected	---------	7.30E-02
TA-183	Not Detected	---------	1.12E-01
TC-99m	Not Detected	---------	2.57E-01
TL-201	Not Detected	---------	6.94E-02
XE-133	Not Detected	---------	7.34E-02
Y-88	Not Detected	---------	2.24E-02
ZN-65	Not Detected	---------	4.94E-02
ZR-95	Not Detected	---------	3.27E-02

Annex 2-B

ANNEX 2-B
SWMU 27: Voluntary Corrective Measure to Remove Subsurface Debris

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1.0 SWMU 27: VOLUNTARY CORRECTIVE MEASURE TO REMOVE SUBSURFACE DEBRIS

This report presents the details and results of the Voluntary Corrective Measure (VCM) conducted at Solid Waste Management Unit (SWMU) 27, Building 9820, Animal Disposal Pit. This VCM involved the excavation, field screening, sampling, and off-site disposal of the excavated animal remains and debris at the site.

1.1 Site Location and Description

SWMU 27 is identified as the Building 9820, Animal Disposal Pit, in the Hazardous and Solid Waste Amendments Module of Sandia National Laboratories/New Mexico (SNL/NM) Resource Conservation and Recovery Act (RCRA) Permit. The site is located in a canyon at the western edge of the Manzanita Mountains. A small arroyo lies southeast of Building 9820 and drains to the northeast (Figure 1.1-1). Prior activity at SWMU 27 included tests involving the electrical stimulation of the nervous system of donkeys. The site contained the buried remains of these test animals. Burned material found at the site were probably associated both with these tests and with other activities conducted in Building 9820.

Before the RCRA Facility Investigation (RFI) was conducted in June 1997, it was believed that SWMU 27, consisting of an excavated pit and the borrow piles from the pit, was the area of the donkey burial remains and that they were later removed. During the RFI excavation and the subsequent VCM conducted in September 1997, a significant amount of burned materials were exhumed from the pit (Figure 1.1-2), but no animal remains were found. Because of this finding, this pit was described as a burn pit, and is hereinafter referred to as the *Burn Pit*.

A slight mound, approximately 20 feet in diameter and about 70 to 100 feet north of the Burn Pit was investigated during the RFI sampling. This mound contained broken glass bottles and other debris on its surface. What appeared to be small amounts of oil were discovered on some of the glass fragments and bottles. During RFI/VCM excavation activities, animal remains (Figure 1.1-3) and burned materials were exhumed from beneath the mound. The mound and surrounding area are hereinafter referred to as the *Mound Area*.

For a detailed discussion regarding the location and physical setting of SWMU 27, refer to the appropriate sections of the no further action (NFA) proposal and to the RFI work plan for Operable Unit (OU) 1332 (SNL/NM June 1995). Specific details regarding the soil and debris removed during the VCM are presented below. A site map showing the site layout and primary excavation features is presented as Figure 1.1-4.

1.2 VCM Basis

The rationale for performing the VCM was to remediate possible hazardous contamination in the subsurface resulting from previous site activities. The risk to human health and the environment at SWMU 27 was the potential release of contaminants to the surface waters and surface and subsurface soils. The constituents of concern (COC) included heavy metals and herbicides/pesticides, and biological waste. The pesticides and herbicides were used for the

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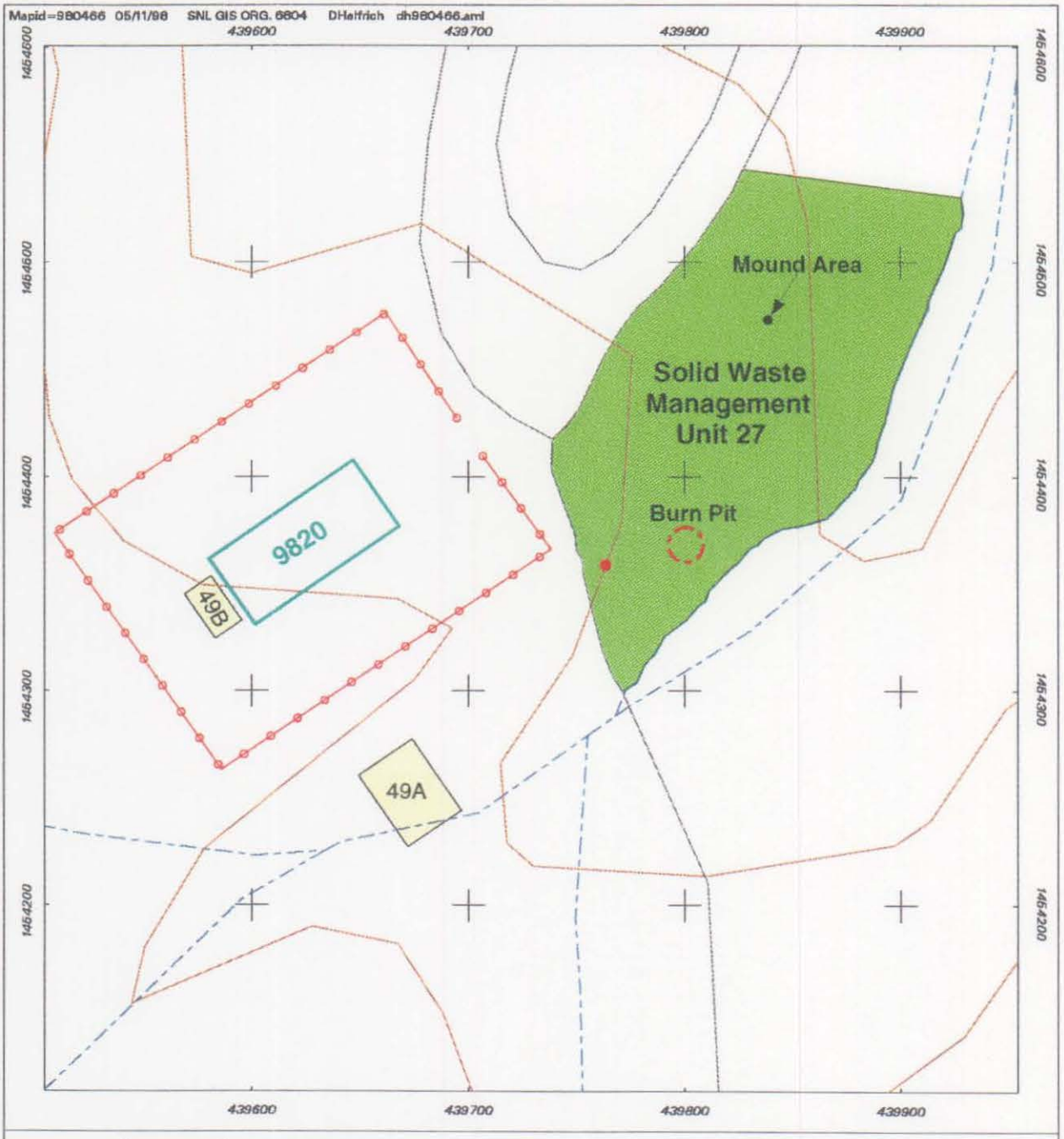

Legend

- Mound Area
- Radiation Anomaly
- Burn Pit
- Road
- 10 Foot Contour
- Surface Drainage
- Fence
- Building
- Other SWMU Site
- Solid Waste Management Unit 27

Figure 1.1-1
Solid Waste Management Unit 27, Bldg. 9820 Animal Disposal Pit

0 37.5 75
Scale in Feet

0 9 18
Scale in Meters

Sandia National Laboratories, New Mexico
Environmental Geographic Information System

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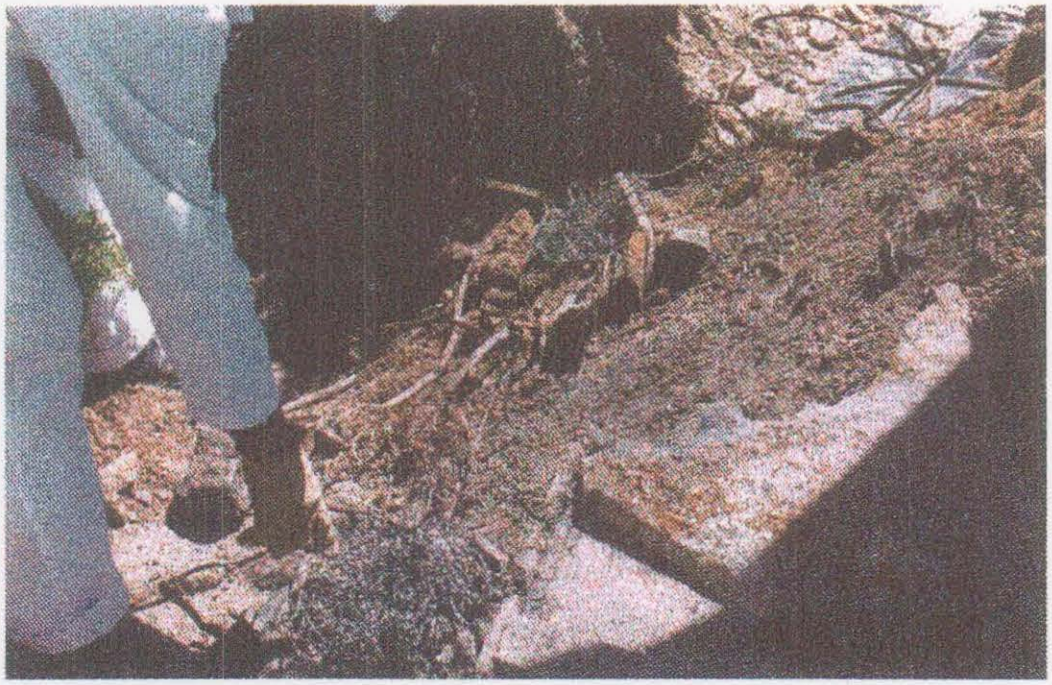

Figure 1.1-2
Photograph of Burned Materials Exhumed from the Burn Pit, Solid Waste Management Unit 27

Sandia National Laboratories, New Mexico
Environmental Geographic Information System

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Figure 1.1-3
Photograph of Animal Bones Exhumed from the Mound Area, Solid Waste Management Unit 27

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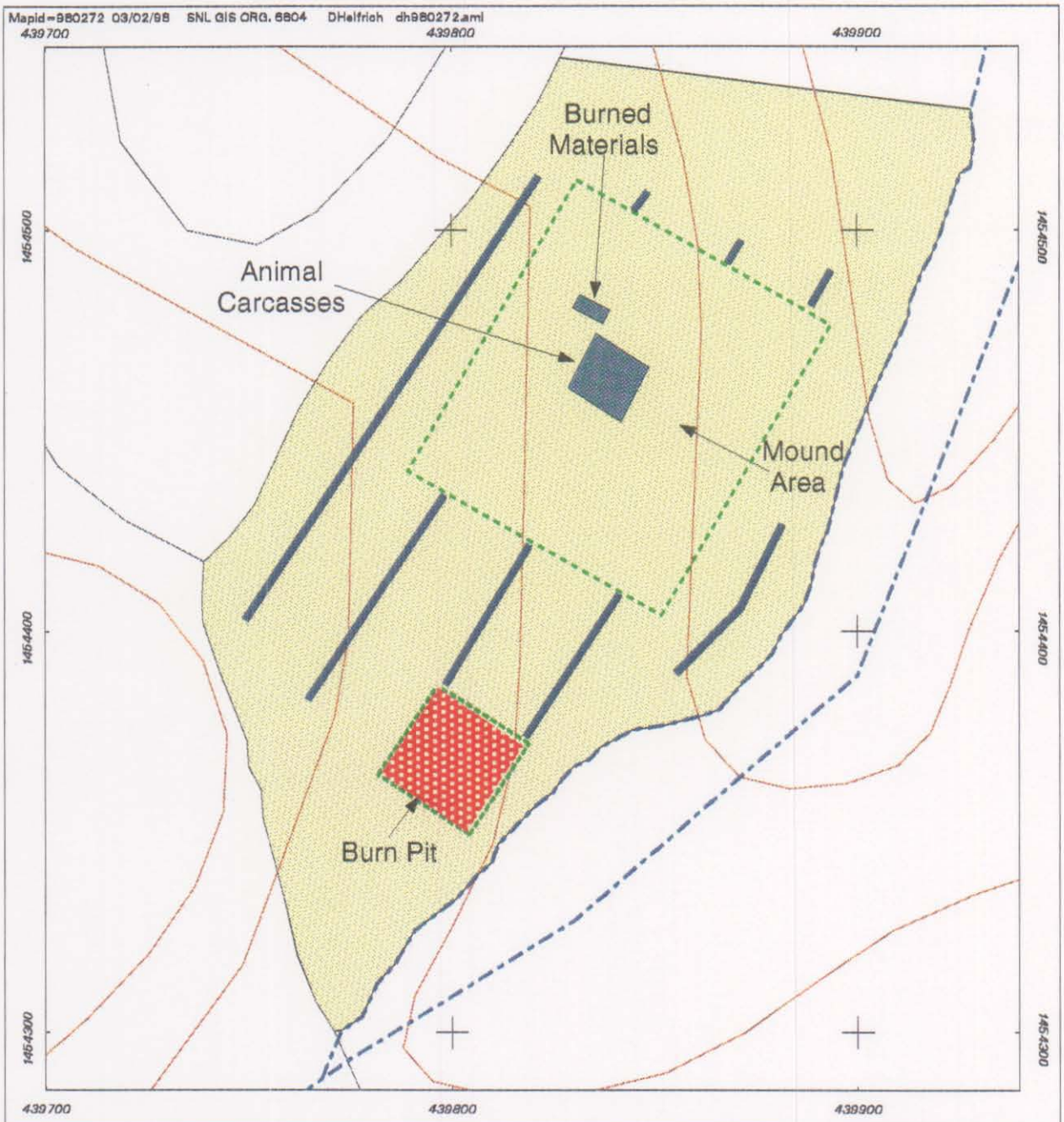

Legend

- Road
- 5 Foot Contour
- Surface Drainage
- Excavation Area
- Exploratory Trench
- Burn Pit
- Excavated Materials
- SWMU 27

Figure 1.1-4
VCM Excavations & Exploratory Trenches
at Solid Waste Management Unit 27

0 20 40
Scale in Feet

0 4.8 9.6
Scale in Meters

Sandia National Laboratories, New Mexico
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purposes for which they were intended, and are therefore, not RCRA COCs. Removal of the source materials would eliminate any potential release to the environment and any potential impact to surface water.

1.2.1 VCM Field Protocol

The SWMU 27 VCM field work included the excavation, field screening, segregation, and off-site disposal of regulated and solid waste debris. Detailed procedures and field protocol were developed for this VCM Plan (Annex I), in the project Health and Safety Plan of the RFI work plan (SNL/NM June 1995), in the waste management plan (SNL/NM August 1997a), in the health and safety plan (HASP) addendum (SNL/NM August 1997b), and in all SNL/NM operating procedures (OP).

Radiation and organic vapor monitoring were also incorporated into the removal action during field screening to provide preliminary characterization data for health and safety, as well as waste management purposes. During the course of the VCM project, field screening and sampling and analysis activities ensured the appropriate segregation and handling of animal remains, metals fragments, biological waste, battery debris, general debris, and clean soil that were excavated and removed.

1.2.2 Debris Excavation and Field Screening

The excavation, field screening, and inspection activities for the VCM at SWMU 27 proceeded as set forth by this VCM Plan (Annex I) and are summarized below. Excavation took place at the site as part of the RFI and the subsequent VCM. The effort included manually sorting and field screening the soils and debris, which were then divided into separate piles for sampling.

1.2.2.1 RFI-Phase Soil and Debris Excavated in June 1997

During the June 1997 RFI, soils and debris were excavated from the Burn Pit and Mound Area (animal carcasses were exhumed from Mound Area) and placed adjacent to each of the excavations (Figure 1.1-4).

The debris was composite-sampled and analyzed for toxicity characteristic leaching procedure (TCLP) metals, TCLP volatile organic compounds, TCLP semivolatile organic compounds, TCLP pesticides/herbicides, and radionuclides (gamma spectroscopy and gross alpha/gross beta). This sampling was performed for waste characterization/disposal purposes (see results in Section 2.4). Refer to Annex I of this VCM Plan for a detailed discussion of the RFI assessment activities.

During the September 1997 VCM, the debris that had been generated during the RFI was transported to a designated screening area (Figure 1.2.2-1) and spread out in 0.5-foot lifts by a front-end loader. SNL/NM environmental restoration (ER) technicians used a photoionization detector (PID) to field-screen the debris for organic contamination. SNL/NM radiation control technicians (RCT) used a beta-gamma/NaI probe to screen for radiation. Additionally, the debris was visually inspected for potential soil contamination and suspect materials. Based upon analytical results from the June 1997 debris sampling (see Section 2.4.4.4 of the NFA

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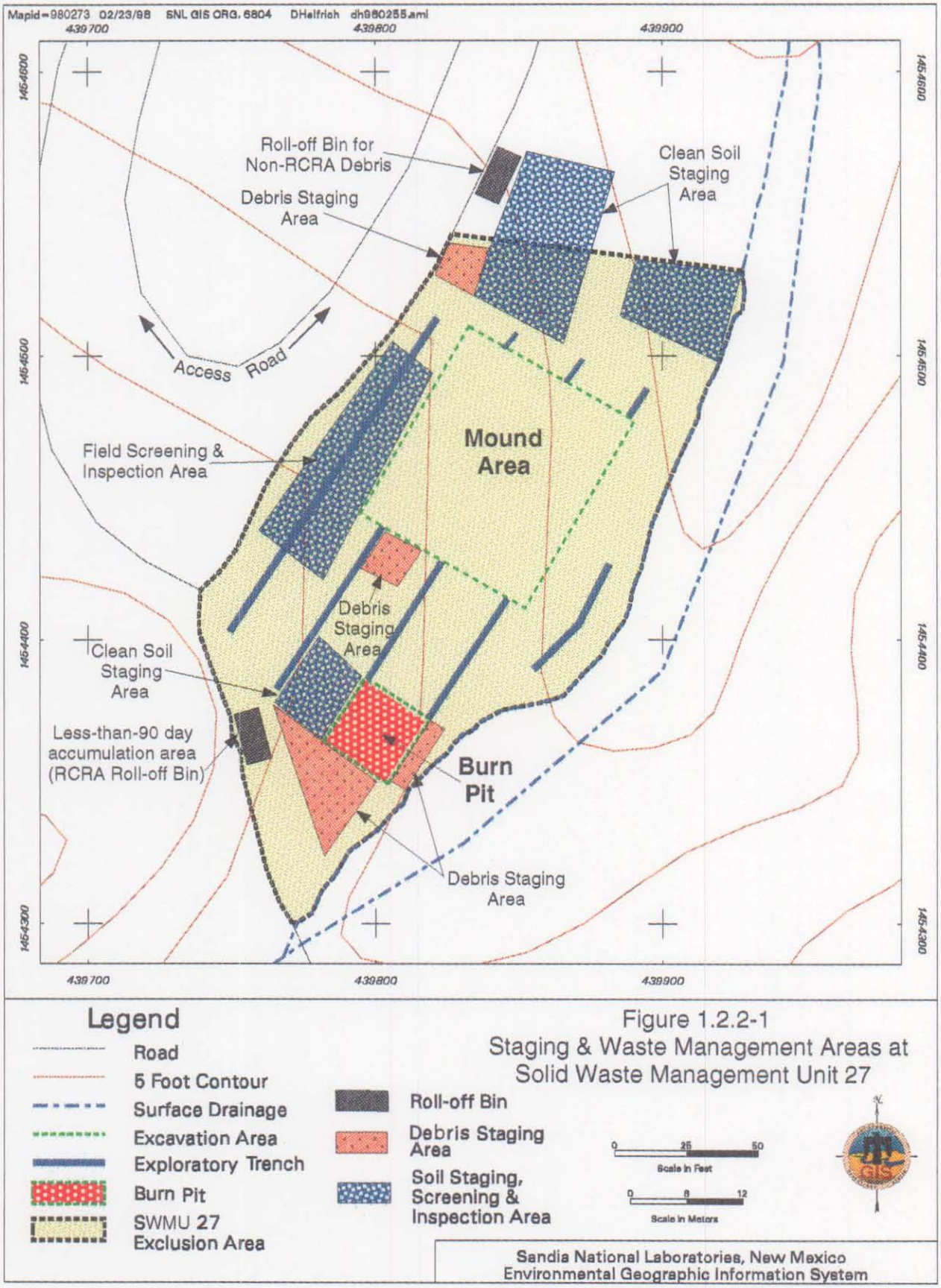

Figure 1.2.2-1
Staging & Waste Management Areas at Solid Waste Management Unit 27

proposal), the debris was loaded into a 20-cubic yard (yd^3) roll-off container and managed as RCRA-regulated waste.

During the September 1997 VCM, the clean soil pile that had been generated during the RFI was transported to a staging area at the north-central portion of the site (Figure 1.2.2-1). The pile was then composite-sampled for target analyte list (TAL) metals and radionuclides (using gamma spectroscopy) (see Section 2.4). The soil pile was used as fill and placed into the open trenches during the VCM.

1.2.2.2 VCM-Phase Debris Excavated from Burn Pit—September 1997

The remaining buried debris from the Burn Pit was excavated in September 1997, stockpiled, composite-sampled, and then field-screened and visually inspected according to the VCM Plan (Annex I). Composite samples for TCLP metals, TCLP herbicides/pesticides, and radionuclides (using gamma spectroscopy) were collected to determine waste characterization/disposal options. Section 2.4 discusses the laboratory analytical results for these samples. The debris was then distributed within a designated screening area, field screened for organic contamination and radiation, and visually inspected. The debris was then loaded into a 20-yd^3 roll-off container and managed as RCRA-regulated waste.

1.2.2.3 VCM-Phase Soil and Debris Excavated from the Mound Area—September 1997

During the September 1997 VCM, the remaining animal carcasses (bones and hides) and surrounding soils were excavated from the Mound Area (Figure 1.1-4). Seven additional trenches were excavated up to 15 feet below ground surface (bgs) from the center to the perimeter of Mound Area (Figure 1.2.2-2) in order to verify that no other carcasses or anomalies existed in the subsurface at this area.

The soil and debris were staged in piles adjacent to the Mound Area and to the north of this area. The debris piles were composite-sampled for TCLP metals, TCLP pesticides/herbicides, and radionuclides (using gamma spectroscopy). Refer to Section 2.4 for analytical results for this debris. The debris was then spread, field screened, and visually inspected according to the VCM Plan (Annex I). Based upon analytical results, the debris was then loaded into 20-yd^3 roll-off containers and managed as RCRA-regulated and nonregulated solid waste.

1.2.2.4 VCM-Phase Soil Excavated from Exploratory Trenches—September 1997

After all of the debris from the Burn Pit and Mound Area had been removed and disposed of, five exploratory trenches were excavated in the north-south direction across the entire site (Figure 1.2.2-3). Each trench was excavated to 6 to 7 feet bgs, and excavated soils were staged along the edge of each trench and visually inspected. Only Trench #3 contained debris (Figure 1.2.2-3). The debris, consisting of a very insignificant amount of battery debris and donkey feces, was immediately containerized.

One confirmatory soil sample was collected from the floor of each trench (Figure 1-7). The soils were then placed back into the open trenches.

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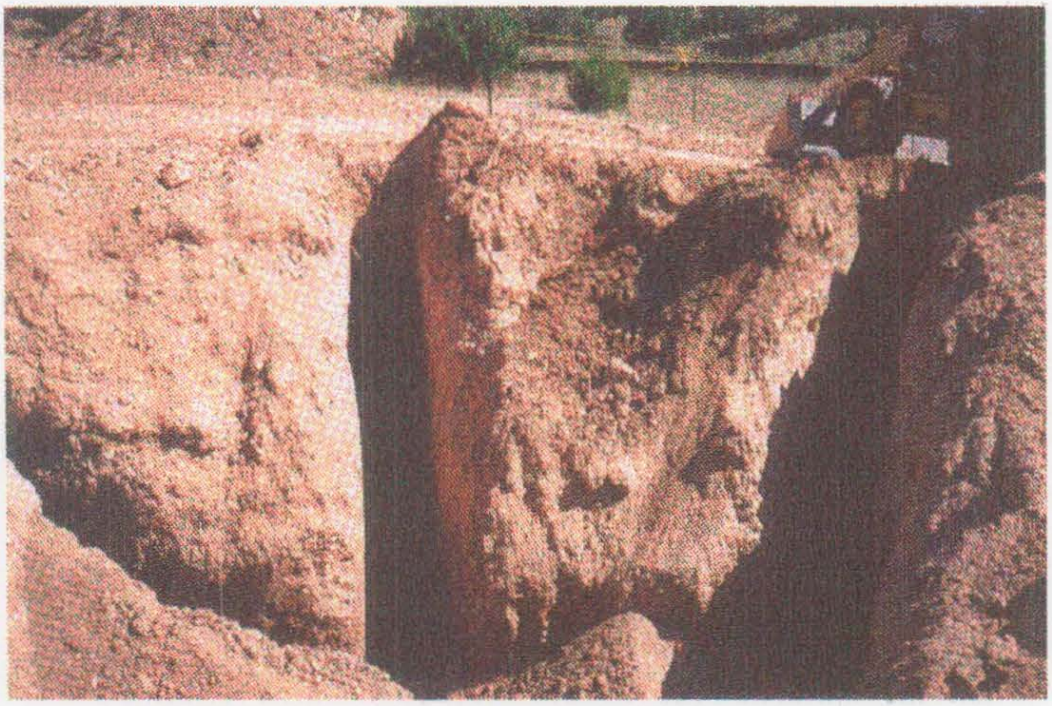

Figure 1.2.2-2
Photograph of Verification Trenches Excavated from the Center to the Perimeter of the Mound Area, Solid Waste Management Unit 27 (View to the Northeast)

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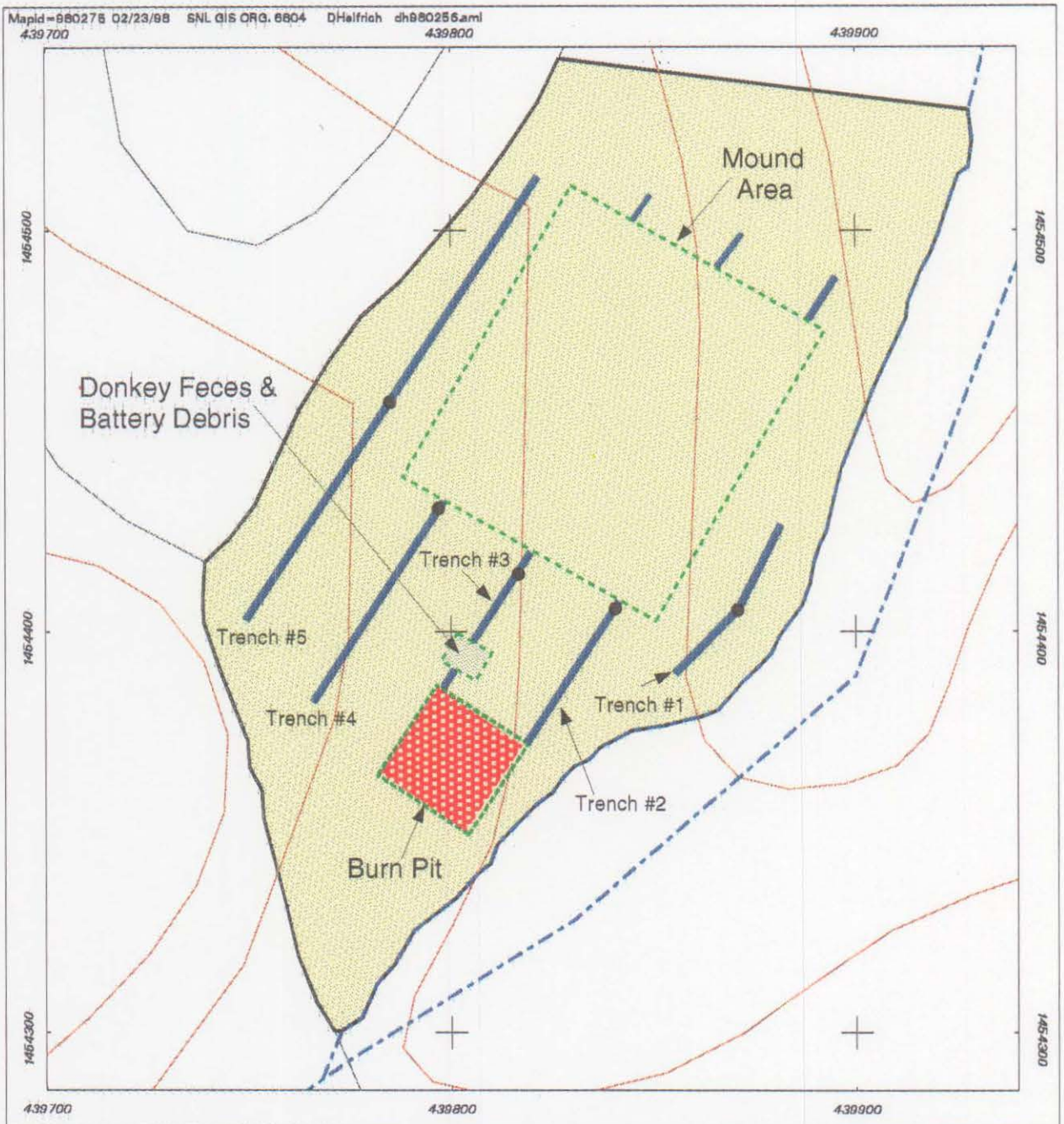

Legend

- Approximate Confirmatory Soil Sample Location
- Road
- 5 Foot Contour
- Surface Drainage
- Excavation Area
- Exploratory Trench
- Burn Pit
- SWMU 27/Exclusion Area

Figure 1.2.2-3
Exploratory Trenches at
Solid Waste Management Unit 27

0 20 40
Scale in Feet

0 4.8 9.6
Scale in Meters

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1.3 Site Controls and Health and Safety

A project-specific HASP addendum (SNL/NM August 1997b) was developed in conjunction with the OU 1332 HASP. The HASP defined specific requirements and responsibilities for site workers, discussed monitoring requirements, and detailed the potential hazards associated with each field task. The only known hazard was connected with the excavation activities. The presence of unexploded ordnance (UXO) was identified as a potential hazard and was specifically addressed in the HASP. Kirtland Air Force Base Explosive Ordnance personnel provided a back-up resource in the event that UXO was identified. Because of the U.S. Department of Energy (DOE) Radioactive Materials Management Area (RMMA) classification of the site and the potential presence of subsurface radioactive contamination implied by the posted radiation warning signs, all site workers were required to comply with DOE Radiological Worker II training requirements.

To reduce personnel exposure, real-time monitoring with NaI meters (gamma radiation) and a PID was performed during the VCM excavation work as set forth by the VCM Plan (Annex I). In addition, all personnel scanned themselves with a Geiger-Mueller detector equipped with a pancake beta-gamma probe before exiting the exclusion zone as RMMA procedures require (SNL/NM Radiation Protection [RP] OP-811).

1.4 City of Albuquerque Topsoil Disturbance Permit

Because SWMU 27 is less than 0.75 acre in size, a City of Albuquerque Topsoil Disturbance Permit was not required for the RFI/VCM excavation work. However, the grading of equipment access areas, the screening of areas, and surface runoff ditches resulted in disturbed areas. A silt fence was installed topographically downgradient from the excavations and trenches at the site. Additionally, a storm-water channel was installed above the VCM area to divert water from running onto the site. These erosion controls precluded soil from washing into the arroyo.

1.5 Equipment Calibration and Maintenance

Site-specific gamma radiation background levels were measured on a daily basis with the NaI detector as set forth by SNL/NM RPOP-08-810 (SNL/NM December 1994a). The Geiger-Mueller beta-gamma detector was source-checked each day using a cesium-137 source as discussed in SNL/NM RPOP-811 (SNL/NM February 1994). Calibration checks of the PID were performed twice each working day as set forth by SNL/NM FOP-94-28 (SNL/NM October 1994). All factory and daily calibration checks/source checks were documented.

1.6 Decontamination

Equipment decontamination was conducted at the end of the field work. Hand excavation and heavy equipment were decontaminated at the exclusion zone exit point with potable water from the water trailer until they were free of visible dirt. All field-screening data and radioactive contamination release survey data of material leaving the exclusion zone indicated that no contamination was present at the site. Rinse water was discharged to the surface in the exclusion zone because of the absence of detectable contamination.

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2.0 EXCAVATION AND SAMPLING/ANALYSIS RESULTS

2.1 Exceptions to the VCM Plan

The VCM Plan was submitted for regulatory review in July 1997. The final VCM Plan addressed the details requested in the regulatory comments regarding soil and debris sampling, waste characterization analysis, and material disposition. During the VCM field activities, the New Mexico Environmental Department (NMED) provided additional comments regarding the VCM field work, including the following:

- On September 5, 1997, NMED personnel inspected the VCM activities, and requested that the clean soil piles that had been generated during the RFI and VCM excavations be composite-sampled for TAL metals and radionuclides (gamma spectroscopy);

- On September 16, 1997, NMED personnel inspected the trenches at the Burn Pit and at the Mound Area and concurred with SNL/NM ER representatives that the trenches were sufficiently deep and laterally extended to characterize the site adequately.

2.2 Debris from VCM Excavation

The following sections present the results of the VCM excavation work. The work performed at SWMU 27 was conducted in three primary areas: the Burn Pit, the Mound Area, and the exploratory trenches. A fenced-off area around the entire site was used as an exclusion zone boundary, and a contamination reduction zone was installed on the western edge of the site, which provided the only access to and from the exclusion zone.

For the RFI phase conducted in June 1997, excavation work began at the Burn Pit and continued at the Mound Area. During the VCM in September 1997, excavation activities began at the Burn Pit, continued at the Mound Area, and finally, extended to the exploratory trenches. The total volume of animal remains and debris removed at this site was approximately 1,085 cubic feet (ft^3) (40.2 yd^3) (Table 2.2-1).

Table 2.2-1
Approximate Volumes of Animal Remains and Debris Removed from SWMU 27

Debris Type	Debris Description	Volume
Animal carcasses	Five carcasses including four skulls	4 ft^3
Donkey feces	Deteriorated feces preserved in soil	1 ft^3
Biological waste	Five small glass medical vials, one vial containing 1 to 2 ounces of liquid, one vial was labeled as penicillin	NA
Battery	One deteriorated battery (6 x 6 x 6 inches)	NA
Non-RCRA-regulated soil/debris	Soil containing donkey carcasses and hides, metal, and plastic	540 ft^3
RCRA-regulated soil/debris	Soil containing burned debris including metals, plastic, glass, wire, brick, and concrete	540 ft^3
		1,085 ft^3

Analytical results for the confirmatory sampling from the floors and walls of all of the excavations are presented in Section 2.4.3.

2.2.1 Soil and Debris (June 1997) from Burn Pit and Mound Area

Approximately 20 yd^3 of soil and debris (primarily soil) were excavated from the Burn Pit and the Mound Area as part of the RFI field work in June 1997. Excavations ranged from 8 to 14 feet bgs. The Burn Pit contained soil mixed with metal, glass, plastic, wood, wire, photographic waste (i.e., empty film reels), and burned materials. The Mound Area primarily consisted of soil containing donkey carcasses and hides, metal, wire, glass, glass bottles with oil residue, burned materials, and biological waste (five medical vials, one of which contained 1 to 2 ounces of liquid). One area, approximately 4 by 4 by 1 foot in size, situated along the northwestern edge of the Mound Area (Figure 1.1-4) contained burned materials.

Results of the field screening and debris inspection of the Burn Pit and the Mound Area soils and debris generated in June 1997 revealed no obvious hazardous components. Off-site analytical results (see Section 2.4.1), however, determined that the debris contained inorganic contamination (primarily lead). The waste was managed as RCRA-regulated, nonradioactive waste and was disposed of in accordance with the Waste Management Plan. The carcasses were disposed of as nonregulated, nonradioactive waste. Upon review of analytical results (see Section 2.4.2), the clean soil was placed back into the Burn Pit/Mound Area excavations at the end of the VCM activities.

2.2.2 Soil and Debris (September 1997) from Burn Pit

Approximately 8 yd^3 of debris were excavated from the Burn Pit in September 1997. The final dimensions of the pit were 24 feet in diameter by 12 feet deep. The debris was staged into piles situated adjacent to the pit and at the northwestern end of the site (Figure 1.2.2-1). Field-screening/inspection of the debris revealed no obvious contamination. The soil and debris looked similar to the material excavated in June that was found to be RCRA waste; therefore, it was assumed the material would be hazardous in order to expedite the excavation process.

Based upon results from laboratory analysis, the clean soil pile was returned to the open pit at the Burn Pit at the end of the VCM activities.

2.2.3 Soil and Debris (September 1997) from Mound Area

Approximately 12 yd^3 of soil and debris (primarily soil) was removed from the Mound Area in September 1997. These materials were staged both adjacent to the area and north-northwest of the area (Figure 1.2.2-1). A total of five carcasses were exhumed from the site; however, only 4 skulls were found. The carcasses were found at different locations and levels beneath the surface but were relatively close to each other (less than 10 feet apart) (Figure 1.1-4). No additional burned debris was found in the Mound Area excavations during the VCM.

No obvious contamination was identified through the field-screening efforts during the VCM. Based upon laboratory results (Section 2.4.1), the debris was managed and disposed of as

nonregulated, nonradioactive waste. The clean soil excavated from the Mound Area in September 1997 was used as fill material in the open trenches.

2.2.4 Soil and Debris (September 1997) from Exploratory Trenches

Approximately 650 feet of trenches were excavated across the site (Figure 1.2.2-3) in September 1997. With the exception of Trench #3, no debris was found in the trenches during the excavation work. A small quantity (less than 1 ft^3) of donkey feces, one old battery (6 x 6 x 6 inches in size), and one rope was found in Trench #3 (Figure 1.2.2-3), at the southern end of the trench. These materials were found approximately 2 feet bgs. The area was further excavated, both vertically and horizontally. No additional debris was found.

The feces and battery debris were sampled for TCLP metals and radionuclides (using gamma spectroscopy). Additionally, the battery debris was analyzed for pH. The pH result for the battery debris was 7.6. These materials were managed and disposed of as RCRA-regulated nonradioactive waste. Section 2.4.1 discusses the TCLP metals and radionuclides analytical results from these samples.

2.3 Waste Management

No radioactive or mixed waste was generated during the excavation work. However, approximately 20 yd^3 of RCRA-regulated waste and 20 yd^3 of nonregulated solid waste were generated and disposed of during the RFI/VCM. Based upon field screening, all excavated materials were free of obvious contamination. The excavated and screened soil from each area (e.g., Burn Pit or Mound Area) was individually stockpiled, then sampled to confirm the field-screening results. Section 2.4.2 describes the confirmatory sampling and analysis work.

All materials, including animal carcasses, hides, feces, biological waste, metal scrap, burned materials, and equipment, were surveyed for radioactive contamination by an SNL/NM RCT prior to release from the site as set forth by SNL/NM RPOP-04-411 (SNL/NM April 1996). No radioactive contamination was detected during these release surveys. Other material removed from the exclusion zone (one concrete block and one old sign) was released after an SNL/NM RCT surveyed for radioactive contamination, and was disposed of as nonregulated solid waste.

2.4 Waste Characterization and Confirmatory Sampling/Analysis

This section presents the waste characterization and confirmatory sampling/analytical results for the SWMU 27 RFI/VCM. Table 2.4-1 provides the number of samples collected per debris pile or material, and Figure 2.4-1 shows the locations for samples collected in September 1997. The samples were taken from composite samples collected at judgmental locations around the piles using the spade-and-scoop method described in SNL/NM FOP 94-52 (see the SWMU 27 NFA proposal [RFI sampling] for analytical results from June 1997 samples). Table 2.4-2 shows the number of confirmatory samples collected per soil pile or trench, and Figure 2.4-2 shows the associated sample locations. The soil pile composite samples were taken from representative

Table 2.4-1
RFI/VCM Debris Sampling/Analysis

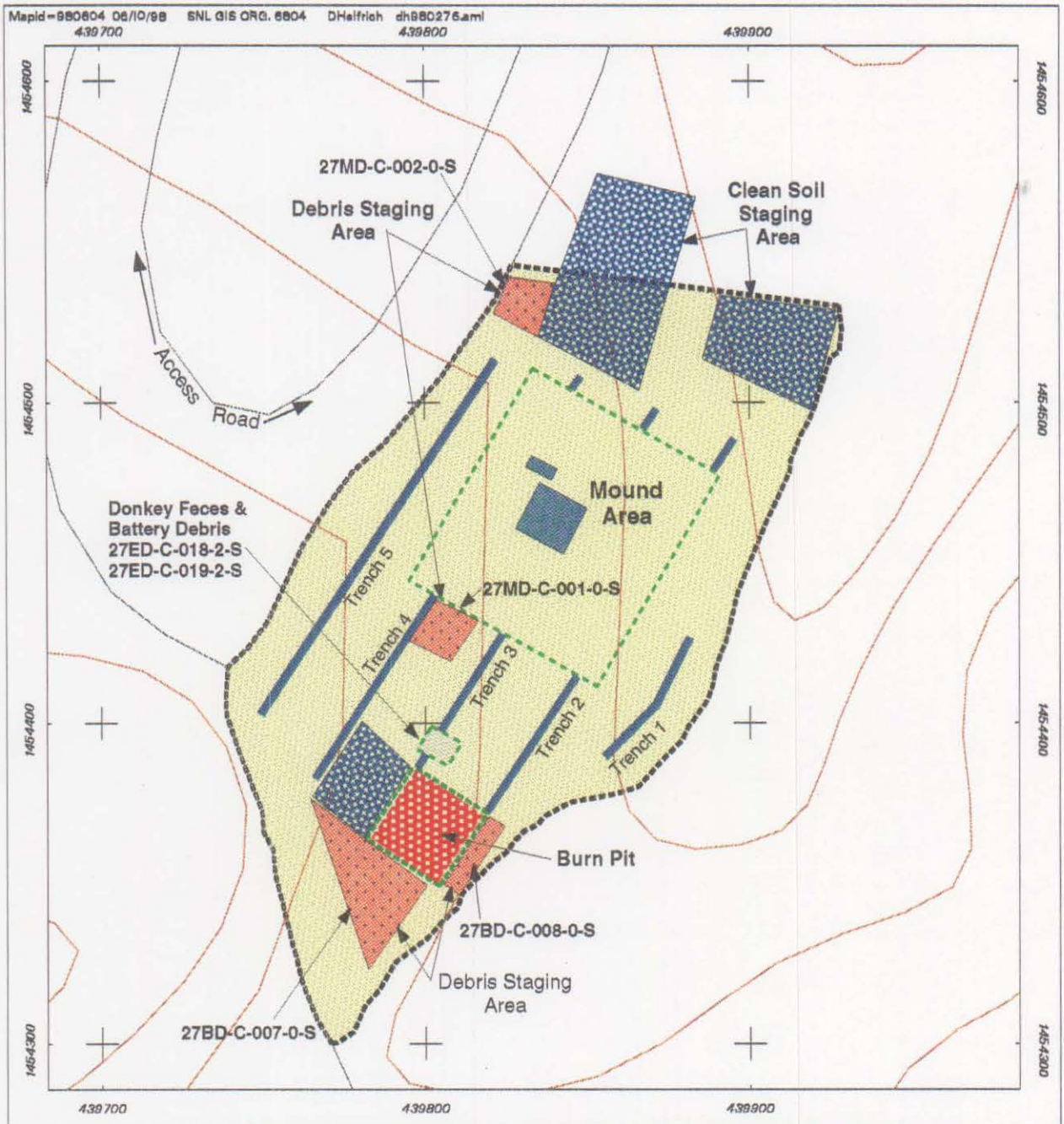
Feature	Number of Samples
Burn Pit debris pile generated and sampled in June 1997[a]	3
Burn Pit debris pile generated and sampled in September 1997	2
Mound Area debris pile generated and sampled in June 1997[a]	3
Mound Area debris pile generated and sampled in September 1997	2
Exploratory trench battery debris sample collected in September 1997	1
Exploratory trench donkey feces sample collected in September 1997	1

[a]Analytical results and associated sample locations for samples collected in June 1997 are provided in the SWMU 27 NFA proposal, Section 2.4.4.4 (RFI Sampling).

Table 2.4-2
RFI/VCM Confirmatory Soil Sampling/Analysis

Feature	Number of Samples
Burn Pit wall sample collected in September 1997	2
Burn Pit floor sample collected in September 1997	2
Burn Pit soil pile generated and sampled in September 1997	3 (includes one duplicate)
Mound Area floor sample collected in June 1997	1[b]
Mound Area wall sample collected in September 1997	2
Mound Area floor sample collected in September 1997	2
Mound Area soil pile generated and sampled in September 1997	4[c]
Burn Pit/Mound Area soil pile generated in June 1997 and sampled in September 1997	4[a]
Exploratory trench floor sample collected in September 1997	6 (includes one duplicate)

[a]Soils excavated from the Burn Pit and Mound Area in June 1997, which were originally staged adjacent to each area, were subsequently transported to the north-central portion of the site in September 1997, consolidated into a single large pile, and composite-sampled.
[b]Sample location for the June 1997 trench floor sample is 27B-GR-013-8-S.
[c]Soils excavated from the Mound Area in September 1997, which were originally staged adjacent to the Mound Area, were subsequently transported to the far northeastern corner of the site, consolidated into one large pile, and composite-sampled.



Legend

- Road
- 5 Foot Contour
- Excavation Area
- Exploratory Trench
- Burn Pit
- SWMU 27 Exclusion Area
- Excavated Materials
- Soil Staging Area
- Debris Staging Area

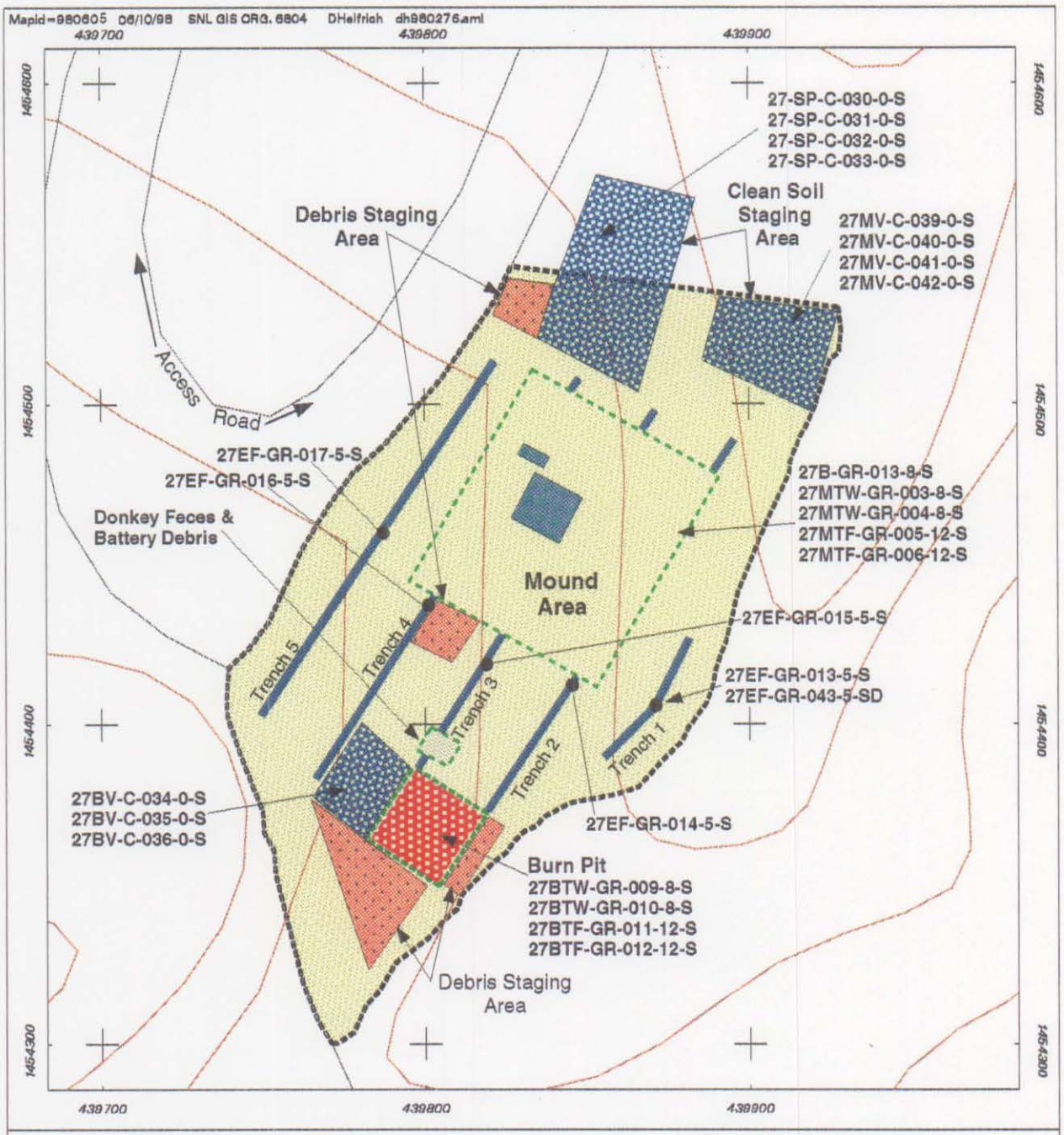
ER Sample Identification: 27ED = SWMU sample location; C = composite; 007 = sample number; 0 = sample depth; S = soil sample)

Figure 2.4-1
September 1997
Debris Sample Locations at
Solid Waste Management Unit 27

0 25 50
Scale in Feet

0 6 12
Scale in Meters

Sandia National Laboratories, New Mexico
Environmental Geographic Information System



Legend

- VCM Sample Location (ID information: 27BV = SWMU sample location; GR = grab sample; 034 = sample number; 8 = sample depth; S = soil sample)
- Road
- 5 Foot Contour
- Excavation Area
- Exploratory Trench
- Burn Pit
- SWMU 27 Exclusion Area
- Excavated Materials
- Soil Staging Area
- Debris Staging Area

Scale in Feet: 0 25 50

Scale in Meters: 0 6 12

Figure 2.4-2
Confirmatory Soil Sample Locations at Solid Waste Management Unit 27

Sandia National Laboratories, New Mexico
Environmental Geographic Information System

locations around the pile using the spade-and-scoop method described in SNL/NM FOP 94-52 (SNL/NM December 1994b). Confirmatory samples were collected from the floor of the trenches and/or from half-way up the trench walls.

The number of samples collected was proportional to the size of the debris or soil pile and/or was determined based upon the size and length of the excavation, and in accordance with the VCM Plan (Annex I).

2.4.1 Waste Characterization—Debris Sample Analyses

The debris samples were analyzed for site-specific potential COCs including TCLP metals (using U.S. Environmental Protection Agency [EPA] Methods 6010A, 7470, and 1311 [EPA 1986]), TCLP pesticides/herbicides (using EPA Methods 8151 and 8080 [EPA 1986]), radionuclides (using gamma spectroscopy EPA Method 901.1), and pH (battery debris only). The debris samples are identified by the 27BD, 27MD, and 27ED designation in the ER Sample Identification (ID) column of each of the tables and refer to the locations from which the samples were collected (i.e., BD = Burn Pit debris, MD = Mound Area debris, and ED = exploratory trench debris, respectively). The results are given below.

Metals

The off-site analytical results for inorganic compounds (TCLP metals) in debris samples collected during the VCM are presented in Table 2.4.1-1. All metal concentration levels were below the method reporting limits or the toxicity characteristic reporting level (EPA November 1986). The pH result for the battery debris sample collected from Trench #3 during the VCM was noncorrosive (at 7.6).

The soil/debris excavated during the June 1997 RFI activities did not pass TCLP for metals (see NFA proposal, Section 2.4.4.4). Hence, this material was containerized and disposed of as RCRA-regulated waste during the VCM.

Pesticides/Herbicides

Heptachlor was detected in one sample at a concentration level of 0.00065J milligrams (mg) per liter. Table 2.4.1-2 presents the off-site analytical detection limits for inorganic compounds (TCLP pesticides/herbicides) in debris samples collected during the VCM. All debris was disposed of off-site.

Radionuclides

Table 2.4.1-3 presents the on-site analytical results for radionuclides (using gamma spectroscopy) for VCM debris samples from SWMU 27. U-238, Th-234, Th-232, Ra-228, U-235, and Cs-137 isotopes are presented in this table, but isotopes with a short half-life are not relevant to this report and are not discussed. The laboratory results of the gamma spectroscopy analyses of the debris samples are presented in Annex 2-A.

Table 2.4.1-1
Summary of SWMU 27 VCM Debris Sampling Analytical Results; Inorganic Constituents (TCLP Metals)

Sample Number	ER Sample ID	Sample Matrix	Sample Date	Sample Depth	TCLP Metals (EPA Methods 6010A, 7470, and 1311)[a]										Units
					Ag	As	Ba	Be	Cd	Cr	Hg	Ni	Pb	Se	
035140-001	27ED-C-019-2-S	debris	9/17/97	2.0-3.0 ft	0.00188J	0.00698J	1.69B	0.00108J	0.0246	0.0121	ND (0.000104)	0.0687	0.0527	0.00999J	mg/L
034128-001	27BD-C-007-0-S	debris	9/9/97	0.0-0.5 ft	ND (0.00062)	0.0137B	1.71B	ND (0.000446)	0.0777	ND (0.000729)	ND (0.000104)	0.168B	1.85	0.00717JB	mg/L
034129-001	27BD-C-008-0-S	debris	9/9/97	0.0-0.5 ft	ND (0.00062)	0.0140B	0.844B	ND (0.000446)	0.00181J	0.00476J	ND (0.000104)	0.0742B	0.00319 J	0.00675JB	mg/L
034122-001	27MD-C-001-0-S	debris	9/11/97	0.0-0.5 ft	ND (0.00062)	0.0238B	0.175	ND (0.000446)	0.00106J	ND (0.000729)	ND (0.000104)	0.00521J	0.00281 J	0.00807J	mg/L
034123-001	27MD-C-002-0-S	debris	9/11/97	0.0-0.5 ft	ND (0.00062)	0.0181B	0.207	ND (0.000446)	0.000981 J	ND (0.000729)	0.00113J	0.00456J	0.00426 J	ND (0.0014)	mg/L
035139-001	27ED-C-018-2-S	debris	9/17/97	0.0-0.5 ft	0.00206J	0.00987J	1.23B	0.000829J	0.0373	ND (0.000729)	ND (0.000104)	0.0125	0.816	ND (0.0014)	mg/L
Toxicity Characteristic Regulatory Level[a]		NA	NA	NA	5	5.0	100	NA	1.0	5.0	0.2	NA	5.0	1.0	mg/L

ER Sample ID Information: 27 = SWMU sample location; ED = exploratory trench excavation debris sample; C = composite; 019 = sample number; 2 = depth of sample; S = soil sample.

[a]Maximum concentration of contaminant for the toxicity characteristic (EPA November 1986).

Ag = Silver.
As = Arsenic.
Ba = Barium.
Be = Beryllium.
BD = Burn pit excavation debris sample.
Cd = Cadmium.
Cr = Chromium.
ED = Exploratory trench excavation debris sample.
EPA = U.S. Environmental Protection Agency.
Hg = Mercury.
J = The estimated value reported is either above the method detection limit (MDL) and less than the practical quantitation limit or above the instrument detection limit and less than the contract required detection limit.
MD = Mound area excavation debris sample.
mg/L = Milligrams per liter.
NA = Not applicable.
ND ( ) = Not detected at or above the MDL, shown in parenthesis.
Ni = Nickel.
Pb = Lead.
Se = Selenium.

Table 2.4.1-2
Summary of SWMU 27 VCM Organic Constituents (TCLP Pesticides/Herbicides) and Detection Limits—EPA Methods 8080 and 8151

Parameter	Detection Limit	Reporting Limit	Units
Herbicide 2,4,5-TP (silvex)	0.000008	0.02	mg/L
Herbicide 2,4-D	0.000008	0.02	mg/L
Pesticide chlordane	0.005	0.0125	mg/L
Pesticide endrine	0.00002	0.002	mg/L
Pesticide heptachlor	0.00001	0.001	mg/L
Pesticide heptachlor and heptochlor epoxide	0.00071	0.002	mg/L
Pesticide heptachlor epoxide	0.00001	0.001	mg/L
Pesticide methoxychlor	0.0001	0.01	mg/L
Pesticide toxaphene	0.00075	0.05	mg/L
Pesticide gamma-BHC	0.00001	0.001	mg/L

mg/L = Milligrams per liter.
SWMU = Solid waste management unit.
TCLP = Toxicity characteristic leaching procedure.
VCM = Voluntary corrective measures.

Table 2.4.1-3
Summary of SWMU 27 VCM Debris Sampling Analytical Results; Radiological Constituents (Gamma Spectroscopy)

Sample Number	ER Sample ID	Sample Matrix	Sample Date	Sample Depth	Gamma Spectroscopy Activity[a] (EPA Method 901.1)						Units
					U-238[b]	Th-234[b]	Th-232[b]	Ra-228[b]	U-235[b]	Cs-137[b]	
034128-003	27BD-C-007-0-S	Debris	9/9/97	0.0-0.5 ft	ND (1.38E+00)	ND (4.78E-01)	6.79E-01	8.88E-01	ND (2.09E-01)	8.29E-02	pCi/g
034129-003	27BD-C-008-0-S	Debris	9/9/97	0.0-0.5 ft	ND (1.65E+00)	7.85E-01	8.77E-01	8.66E-01	ND (2.17E-01)	ND (4.21E-02)	pCi/g
034122-003	27MD-C-001-0-S	Debris	9/11/97	0.0-0.5 ft	ND (1.87E+00)	ND (7.60E-01)	1.07E+00	1.22E+00	ND (2.59E-01	ND (4.74E-02)	pCi/g
034123-003	27MD-C-002-0-S	Debris	9/11/97	0.0-0.5 ft	ND (1.89E+00)	7.89E-01	1.03E+00	1.18E+00	ND (2.54E-01)	ND (3.12E-02)	pCi/g
035139-003	27ED-C-018-2-S	Debris	9/17/97	2.0-3.0 ft	ND (4.27E+00)	1.31E+00	9.78E-01	1.07E+00	ND (3.01E-01)	ND (3.16E-02)	pCi/g
035140-003	27ED-C-019-2-S	Debris	9/17/97	2.0-3.0 ft	ND (3.43E+00)	1.43E+00	8.63E-01	1.03E+00	ND (2.57E-01)	ND (9.41E-02)	pCi/g
Quality Assurance/Quality Control Samples											
034141-003	27-GR-020-0-FB	Water	9/9/97	NA	ND (8.64E-01)	ND (2.96E-01)	ND (1.41E-01)	ND (1.16E-01)	ND (1.29E-01)	ND (1.93E-02)	pCi/mL
034142-003	27-GR-021-0-EB	Water	9/9/97	NA	ND (8.78E-01)	ND (2.91E-01)	ND (1.31E-01)	ND (1.19E-01)	ND (1.27E-01)	ND (2.06E-02)	pCi/ml
035230-003	27-GR-044-0-EB	Water	9/17/97	NA	ND (1.72E+00)	ND (4.18E-01)	ND (1.64E-01)	ND (1.31E-01)	ND (1.60E-01)	ND (2.39E-02)	pCi/mL
035229-003	27-GR-043-0-FB	Water	9/17/97	NA	ND (1.83E+00)	ND (3.99E-01)	ND (1.50E-01)	ND (1.43E-01)	ND (1.52E-01)	ND (2.19E-02)	pCi/mL
034195-003	27-GR-037-0-FB	Water	9/11/97	NA	ND (7.89E-01)	ND (3.24E-01)	ND (1.51E-01)	ND (1.69E-01)	ND (1.35E-01)	ND (2.72E-02)	pCi/mL
034196-003	27-GR-038-0-EB	Water	9/11/97	NA	ND (7.86E-01)	ND (2.17E-01)	ND (1.53E-01)	ND (1.40E-01)	ND (1.36E-01)	ND (2.76E-02)	pCi/mL
SNL/NM Foothills Background Range[c]		NA	NA	NA	0.153-2.86	0.69-2.03	0.113-1.18	0.113-1.32	0.004-3.0	0.007-0.876	pCi/g
HRMB Maximum Background[d]		NA	NA	NA	2.31	2.31	1.03	1.08	0.16	1.063	pCi/g

ER Sample ID Information: 27 = SWMU sample location; BD = burn pit excavation debris sample; C = composite; 007 = sample number; 0 = depth of sample; S = soil sample.

[a]U-238 and Th-232 decay chain isotopes with a short half-life are not presented in this table.
[b]Value in parenthesis represents the minimum detection activity.
[c]IT March 1996.
[d]Dinwiddie September 1997.

BD = Burn pit excavation debris sample.
Cs = Cesium.
D = Duplicate.
EB = Equipment blank.
ED = Exploratory trench excavation debris sample.
EPA = U.S. Environmental Protection Agency.
ER = Environmental restoration.
FB = Field blank.
HRMB = Hazardous and Radioactive Materials Bureau.
ID = Identification.
MD = Mound area excavation debris sample.
NA = Not applicable.
ND = Nondetect - the analyte was not observed above the MDA.
pCi/g = PicoCuries per gram.
pCi/mL = PicoCuries per milliliter.
Ra = Radium.
S = Soil sample.
Th = Thorium.
U = Uranium.

All of the 6 debris samples collected contained U-238 concentration levels below the minimum detectable activity (MDA) for U-238. All samples contained Th-234 concentration levels below MDA or the Hazardous and Radioactive Materials Bureau (HRMB) maximum background concentration level (2.31 PicoCuries per gram [pCi/g]) (Dinwiddie September 1997). One sample contained Th-232 at a concentration level above the HRMB maximum background concentration level (at 1.03 pCi/g) but was below the SNL/NM foothills maximum background concentration level (1.18 pCi/g). Two samples contained Ra-228 at levels exceeding the HRMB maximum background concentration level (1.08 pCi/g), but they were less than the SNL/NM foothills maximum background concentration level (1.32 pCi/g). All samples contained Cs-137 concentration levels below the HRMB maximum background concentration level (1.063 pCi/g). All debris was disposed of off site.

All samples contained U-235 concentration levels below the MDAs, but the MDAs were above the HRMB maximum background concentration levels. All the U-238 results are below the MDAs; however, 3 of the samples' MDAs exceeded the HRMB maximum background concentration level. The MDAs for gamma-emitting radionuclides was sometimes higher than the background level for that radionuclide, they were nevertheless orders of magnitude less than a risk-based preliminary remediation goal (PRG) which is based upon a 15 millirem per year (mrem/yr) effective dose equivalent (EDE) maximum dose limit found in EPA's OSWER Directive No. 9220.4-18, "Establishment of Cleanup Levels for Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) Sites with Radioactive Contamination" (EPA 1997). Therefore the analytical results are acceptable. Although the MDAs for these samples exceed the SNL/NM foothills maximum background concentration level, the RESRAD-calculated PRG (Yu et al., 1993) for U-238 and U-235 are orders of magnitude greater than the concentration levels of radionuclides found in soil/debris at SWMU 27. Table 2.4.1-4 shows the maximum U-235/U-238 MDAs for all debris/soil samples collected from SWMU 27 compared to the site-specific PRGs. Based upon this comparison, the concentration levels of radionuclides found in soil/debris at SWMU 27 do not pose a threat to human health or the environment and will be discussed in a risk assessment for the site (see Annex 2-C NFA proposal [Risk Assessment report for SWMU 27]).

Table 2.4.1-4
Maximum Minimum Detectable Activity for U-238/U-235 Samples Collected from SWMU 27 Compared to Site-Specific Preliminary Remediation Goals

Isotope	Highest Minimum Detectable Activity (pCi/g)	Preliminary Remediation Goal (pCi/g)
U-238	4.27	576
U-235	0.301	97.7

A Geiger-Mueller detector with a pancake probe was used to field screen samples, equipment, or personnel during field activities, and no elevated beta-gamma readings relative to site background were observed.

2.4.2 Confirmatory Sampling—Soil Pile Analyses

The soil pile samples were analyzed for site-specific potential COCs, including TAL metals (using EPA Method 6010A and 7471) and radionuclides (using gamma spectroscopy). The soil

pile samples are identified by the 27SP, 27BV, 27BVD, and 27MV designators in the ER Sample ID column of the table and relate to the locations from which the samples were collected (e.g., MV = Mound Area). The results are given below.

Metals

Table 2.4.2-1 presents the off-site analytical results for inorganic compounds (RCRA metals) for the 11 samples collected from the soil piles generated at SWMU 27 during the RFI/VCM. With the exception of mercury, all metal concentration levels were either below method reporting limits or below the SNL/NM 95th-percentile background concentration level and SNL/NM foothills background concentration level (Zamorski December 1997). Mercury was detected in three samples of concentration levels exceeding the SNL/NM 95th-percentile background concentration level (0.055 mg/kilogram [kg]) but were less than the SNL/NM foothills maximum background concentration level (0.13 mg/kg) (Zamorski December 1997).

Radionuclides

Table 2.4.2-2 presents the on-site analytical results for radionuclides (using gamma spectroscopy) for samples collected from the RFI/VCM soil piles at SWMU 27. Nine of the 11 samples collected contained U-238 concentration levels below the MDA for U-238; the two remaining samples with detectable activities were below the HRMB maximum background concentration level (2.31 pCi/g) (Dinwiddie September 1997). The MDAs for U-238 in 4 confirmatory soil pile samples exceeded the SNL/NM foothills maximum background concentration level of 2.86 pCi/g (IT March 1996). These values are orders of magnitude less than the PRGs, as discussed in Section 2.4.1, and do not pose a threat to human health or the environment. All samples contained Th-234 concentration levels below the HRMB maximum background concentration level (2.31 pCi/g). Five samples contained Th-232 concentration levels above the HRMB maximum background concentration level (1.03 pCi/g) but were below the SNL/NM foothills maximum background concentration level (1.18 pCi/g). Four samples contained Ra-228 concentration levels exceeding the HRMB maximum background concentration level (1.08 pCi/g) but were less than the SNL/NM foothills maximum background concentration level (1.32 pCi/g). All samples contained U-235 concentration levels below the MDAs. However, the MDAs were slightly above the HRMB maximum background concentration level and less than the SNL/NM foothills maximum background concentration level of 3.0 pCi/g. The MDAs for gamma-emitting radionuclides was sometimes higher than the background level for that radionuclide, they were nevertheless orders of magnitude less than a risk-based PRG which is based upon a 15 mrem/yr EDE maximum dose limit found in EPA's OSWER Directive No. 9220.4-18, "Establishment of Cleanup Levels for CERCLA Sites with Radioactive Contamination" (EPA 1997). Therefore the analytical results are acceptable. These values are orders of magnitude less than the PRGs as discussed in Section 2.4.1 and do not pose a threat to human health or the environment. All samples contained Cs-137 concentration levels below the HRMB maximum background concentration level (1.063 pCi/g). The laboratory results of the gamma spectroscopy analyses for the soil pile are presented in Annex 2-A.

2.4.3 Confirmatory Sampling—Trench Floor/Wall Sample Analyses

The confirmatory samples (Floor/Wall Samples from Burn Pit, Mound Area, and exploratory trenches) were analyzed for site-specific COCs, including RCRA metals plus beryllium

Table 2.4.2-1
Summary of SWMU 27 Confirmatory Soil Pile Sampling Analytical Results; Inorganic Constituents (RCRA Metals)

Sample Number	ER Sample ID	Sample Matrix	Sample Date	Sample Depth	RCRA Metals (EPA Methods 6010A and 7470/7471[a])										Units
					Ag	As	Ba	Be	Cd	Cr	Hg	Ni	Pb	Se	
034188-010	27SP-C-030-0-S	soil	9/8/97	0.0-0.5 ft	0.177J	4.32	132	0.604	ND (0.0104)	11.0	ND (0.0173)	8.95	8.81	ND (0.07)	mg/kg
034189-010	27SP-C-031-0-S	soil	9/8/97	0.0-0.5 ft	0.140J	4.03	155	0.515	ND (0.0104)	8.79	0.0158J	9.09	8.04	ND (0.07)	mg/kg
034190-010	27SP-C-032-0-S	soil	9/8/97	0.0-0.5 ft	0.173J	4.01	113	0.472J	ND (0.0104)	9.17	0.0272J	8.33	9.35	ND (0.07)	mg/kg
034191-010	27SP-C-033-0-S	soil	9/8/97	0.0-0.5 ft	0.254J	4.56	157	0.610	ND (0.0104)	12.0	0.0256J	10.2	9.06	ND (0.07)	mg/kg
034192-010	27BV-C-034-0-S	soil	9/9/97	0.0-0.5 ft	ND (0.031)	5.40	139	0.487	0.109J	8.86B	0.0787	7.86	7.26	0.451J	mg/kg
034193-010	27BV-C-035-0-S	soil	9/9/97	0.0-0.5 ft	0.113J	4.06	129	0.475J	0.0803J	8.84B	0.0598	7.71	7.10	0.292J	mg/kg
034194-010	27BVD-C-036-0-S	soil	9/9/97	0.0-0.5 ft	0.0947J	5.08	141	0.586	0.102J	11.1B	0.0562	9.23	8.29	0.378J	mg/kg
034224-010	27MV-C-039-0-S	soil	9/11/97	0.0-0.5 ft	ND (0.031)	4.88	131	0.421J	0.0777J	6.05	ND (0.0173)	7.42	9.35	0.865	mg/kg
034225-010	27MV-C-040-0-S	soil	9/11/97	0.0-0.5 ft	0.210J	3.86	86.9	0.430J	0.0510J	6.73	ND (0.0173)	8.09	7.40	0.310J	mg/kg
034226-010	27MV-C-041-0-S	soil	9/11/97	0.0-0.5 ft	0.162J	3.52	136	0.454J	0.0717J	6.97	ND (0.0173)	7.79	7.41	0.558	mg/kg
034227-010	27MV-C-042-0-S	soil	9/11/97	0.0-0.5 ft	0.268J	3.58	118	0.494	0.0952J	7.97	ND (0.0173)	7.39	9.17	0.591	mg/kg
Quality Assurance/Quality Control Samples															
034141-004	27-GR-020-0-FB	water	9/9/97	NA	ND (0.00062)	ND (0.00293)	ND (0.000332)	ND (0.000223)	0.000335J	ND (0.000729)	ND (0.000104)	ND (0.00227)	0.000934J	ND (0.0014)	mg/L
034142-004	27-GR-021-0-EB	water	9/9/97	NA	ND (0.00062)	ND (0.00293)	0.000604J	ND (0.000223)	0.000350J	ND (0.000729)	ND (0.000104)	ND (0.00227)	ND (0.000678)	ND (0.0014)	mg/L
034195-004	27-GR-037-0-FB	water	9/11/97	NA	0.00165J	ND (0.00293)	0.000707J	ND (0.000223)	0.000298J	ND (0.000729)	ND (0.000104)	ND (0.00227)	0.000841J	ND (0.0014)	mg/L
034196-004	27-GR-038-0-EB	water	9/11/97	NA	0.00240J	ND (0.00293)	0.00216J	ND (0.000223)	ND (0.000208)	ND (0.000729)	ND (0.000104)	ND (0.00227)	0.000858J	ND (0.0014)	mg/L
035230-004	27-GR-044-0-EB	water	9/17/97	NA	ND (0.00062)	ND (0.00293)	ND (0.000332)	ND (0.000223)	ND (0.000208)	ND (0.000729)	ND (0.000104)	ND (0.00227)	ND (0.000678)	ND (0.0014)	mg/L
035229-004	27-GR-043-0-FB	water	9/17/97	NA	ND (0.00062)	ND (0.00293)	ND (0.000332)	ND (0.000223)	ND (0.000208)	ND (0.000729)	ND (0.000104)	ND (0.00227)	ND (0.000678)	ND (0.0014)	mg/L
SNL/NM Foothills Background Range[b]		soil	NA	NA	0.01-0.50	1.6-9.6	39-400	0.2-0.73	0.09-0.99	2.5-20	0.01-0.13	5.3-16	4.7-51	0.56-3.1	mg/kg
SNL/NM Foothills Soil Background UTL or 95th-Percentile[b]		soil	NA	NA	<0.5[c]	9.8	246	0.75	0.64[c]	18.8	0.055[c]	16.6	18.9[c]	3.0[c]	mg/kg

ER Sample ID Information: 27 = SWMU sample location; SP = soil pile sample; C = composite; 030 = sample number; 0 = depth of sample; S = soil sample.

[a]EPA November 1986.
[b]Zamorski December 1997 (all metals background values, except Se, were verbally approved by NMED HRMB as of May 1998).
[c]95th-percentile provided instead of UTL.

Ag = Silver.
As = Arsenic.
Ba = Barium.
Be = Beryllium.
BV = Burn Pit excavation soil pile sample.
BVD = Burn Pit excavation soil pile sample duplicate.
Cd = Cadmium.
Cr = Chromium.
EB = Equipment blank.
EPA = U.S. Environmental Protection Agency.
FB = Field blank.
Hg = Mercury.
HRMB = Hazardous and Radioactive Materials Bureau.
J = The estimated value reported is either above the method detection limit (MDL) and less than the practical quantitation limit or above the instrument detection limit and less than the contract required detection limit.
mg/kg = Milligrams per kilogram.
mg/L = Milligrams per liter.
MV = Mound Area excavation soil sample.
NA = Not applicable.
ND ( ) = Not detected at or above the MDL, shown in parenthesis.
NMED = New Mexico Environment Department.
Ni = Nickel.
Pb = Lead.
S = Soil sample.
Se = Selenium.
SP = Soil pile.

Table 2.4.2-2
Summary of SWMU 27 Confirmatory Soil Pile Sampling Analytical Results; Radiological Constituents (Gamma Spectroscopy)

Sample Number	ER Sample ID	Sample Matrix	Sample Date	Sample Depth	Gamma Spectroscopy Activity[a] (EPA Method 901.1)						Units
					U-238[b]	Th-234[b]	Th-232[b]	Ra-228[b]	U-235[b]	Cs-137[b]	
034188-003	27SP-C-030-0-S	Soil	9/8/97	0.0-0.5 ft	ND (3.89E+00)	9.54E-01	1.13E+00	1.10E+00	ND (2.73E-01)	3.99E-02	pCi/g
034189-003	27SP-C-031-0-S	Soil	9/8/97	0.0-0.5 ft	ND (3.77E+00)	1.23E+00	1.13E+00	1.04E+00	ND (2.71E-01)	2.66E-02	pCi/g
034190-003	27SP-C-032-0-S	Soil	9/8/97	0.0-0.5 ft	ND (3.51E+00)	1.14E+00	9.13E-01	9.37E-01	ND (2.51E-01)	1.18E-01	pCi/g
034191-003	27SP-C-033-0-S	Soil	9/8/97	0.0-0.5 ft	ND (3.84E+00)	1.31E+00	1.00E+00	9.85E-01	ND (2.72E-01)	3.93E-02	pCi/g
034192-003	27BV-C-034-0-S	Soil	9/9/97	0.0-0.5 ft	6.73E-01	1.38E+00	1.08E+00	1.05E+00	ND (2.21E-01)	ND (4.69E-02)	pCi/g
034193-003	27BV-C-035-0-S	Soil	9/9/97	0.0-0.5 ft	1.24E+00	1.30E+00	9.44E-01	ND (1.95E-01)	ND (2.08E-01)	ND (4.25E-02)	pCi/g
034194-003	27BVD-C-036-0-S	Soil	9/9/97	0.0-0.5 ft	ND (1.44E+00)	1.05E+00	9.22E-01	8.74E-01	ND (2.08E-01)	ND (4.62E-02)	pCi/g
034224-003	27MV-C-039-0-S	Soil	9/11/97	0.0-0.5 ft	ND (1.99E+00)	9.95E-01	9.99E-01	1.17E+00	ND 2.20E-01	ND (3.21E-02)	pCi/g
034225-003	27MV-C-040-0-S	Soil	9/11/97	0.0-0.5 ft	ND (1.61E+00)	1.15E+00	8.03E-01	8.01E-01	ND (2.17E-01)	ND (3.93E-02)	pCi/g
034226-003	27MV-C-041-0-S	Soil	9/11/97	0.0-0.5 ft	ND (1.77E+00)	1.21E+00	1.07E+00	1.20E+00	ND (2.31E-01)	ND (4.20E-02)	pCi/g
034227-003	27MV-C-042-0-S	Soil	9/11/97	0.0-0.5 ft	ND (1.69E+00)	1.79E+00	1.05E+00	1.20E+00	ND (2.32E-01)	ND (4.21E-02)	pCi/g
Quality Assurance/Quality Control Samples											
034141-003	27-GR-020-0-FB	Water	9/9/97	NA	ND (8.64E-01)	ND (2.96E-01)	ND (1.41E-01)	ND (1.16E-01)	ND (1.29E-01)	ND (1.93E-02)	pCi/mL
034142-003	27-GR-021-0-EB	Water	9/9/97	NA	ND (8.78E-01)	ND (2.91E-01)	ND (1.31E-01)	ND (1.19E-01)	ND (1.27E-01)	ND (2.06E-02)	pCi/ml
035230-003	27-GR-044-0-EB	Water	9/17/97	NA	ND (1.72E+00)	ND (4.18E-01)	ND (1.64E-01)	ND (1.31E-01)	ND (1.60E-01)	ND (2.39E-02)	pCi/mL
035229-003	27-GR-043-0-FB	Water	9/17/97	NA	ND (1.83E+00)	ND (3.99E-01)	ND (1.50E-01)	ND (1.43E-01)	ND (1.52E-01)	ND (2.19E-02)	pCi/mL
034195-003	27-GR-037-0-FB	Water	9/11/97	NA	ND (7.89E-01)	ND (3.24E-01)	ND (1.51E-01)	ND (1.69E-01)	ND (1.35E-01)	ND (2.72E-02)	pCi/mL
034196-003	27-GR-038-0-EB	Water	9/11/97	NA	ND (7.86E-01)	ND (2.17E-01)	ND (1.53E-01)	ND (1.40E-01)	ND (1.36E-01)	ND (2.76E-02)	pCi/mL
SNL/NM Foothills Background Range[c]		NA	NA	NA	0.153-2.86	0.69-2.03	0.113-1.18	0.113-1.32	0.004-3.0	0.007-0.876	pCi/g
HRMB Maximum Background[d]		NA	NA	NA	2.31	2.31	1.03	1.08	0.18	1.063	pCi/g

ER Sample ID Information: 27 = SWMU sample location; SP = soil pile sample; C = composite; 030 = sample number; 0 = depth of sample; S = soil sample.

[a]U-238 and Th-232 decay chain isotopes with a short half-life are not presented in this table.
[b]Value in parenthesis represents the minimum detection activity.
[c]IT March 1996.
[d]Dinwiddie September 1997.

BV = Burn Pit excavation soil pile sample.
BVD = Burn Pit excavation soil pile sample duplicate.
Cs = Cesium.
D = Duplicate.
EB = Equipment blank.
EPA = U.S. Environmental Protection Agency.
ER = Environmental restoration.
FB = Field blank.
HRMB = Hazardous and Radioactive Materials Bureau.
ID = Identification.
MV = Mound Area excavation soil sample.
NA = Not applicable.
ND = Nondetect - the analyte was not observed above the MDA.
pCi/g = PicoCuries per gram.
pCi/mL = PicoCuries per milliliter.
Ra = Radium.
S = Soil sample.
SP = Soil pile.
Th = Thorium.
U = Uranium.

and nickel (using EPA Methods 6010A and 7470/7471), target compound list (TCL) pesticides/herbicides (using Method 8080), and radionuclides (using gamma spectroscopy). The confirmatory samples are identified by the 27BTF, 27BTW, 27MTF, 27MTW, 27EF and 27B (RFI sample only) designators in the ER Sample ID column of the table and relate to the locations from which the samples were collected (e.g., BTW = Burn Pit wall sample). The results are given below.

Metals

The off-site laboratory analytical results for inorganic compounds (RCRA metals) for the confirmatory samples (trench wall and floor) collected during the VCM are presented in Table 2.4.3-1. In addition, one confirmatory sample was collected during the RFI sampling in June 1997, and the results for this sample are also provided in Table 2.4.3-1. Lead was detected in one of the 15 samples at a concentration level (19.1 mg/kg) exceeding the SNL/NM 95th-percentile background concentration level (18.9 mg/kg) but was below the SNL/NM foothills background maximum concentration level (51 mg/kg) (Zamorski December 1997). Mercury was detected in 1 of 15 samples at a concentration level of 0.0636 mg/kg, exceeding the SNL/NM 95th percentile background concentration level of 0.055 mg/kg, but was below the SNL/NM foothills background maximum concentration level of 0.13 mg/kg. The elevated lead and mercury concentration levels are probably naturally occurring at SWMU 27. All other metal concentration levels were either below the method detection limit or below the SNL/NM 95th-percentile background concentration level.

Pesticides/Herbicides

Table 2.4.3-2 presents the off-site analytical results for inorganic compounds (TCL pesticides/ herbicides) for the 14 confirmatory soil samples collected during the VCM. Aldrin was detected in two samples with a maximum concentration level of 0.75J micrograms (µg)/kg; dieldrin was found in one sample (maximum concentration level is 1.3J µg/kg); alpha-Lindane was found in five samples (maximum concentration level is 0.52J µg/kg); delta-Lindane was found in two samples (maximum concentration level is 1.1J µg/kg); gamma-Lindane was detected in six samples (maximum concentration level is 0.68J µg/kg); 2,4,5-TP (silvex) was found in one sample (concentration level is 4 µg/kg).

A risk assessment was performed on the results from pesticide/herbicide analysis for all of the confirmatory soil samples collected from SWMU 27 (see SWMU 27 NFA proposal, Annex 6.1). The assessment indicates that the concentration levels of pesticides/herbicides found at the site do not pose a threat to human health or the environment.

Radionuclides

Table 2.4.3-3 presents the on-site analytical results for radionuclides (using gamma spectroscopy) for the VCM confirmatory samples (trench floor and wall) collected from SWMU 27. Additionally, one confirmatory sample was collected during the RFI sampling in June 1997, and the results for this sample are also provided in Table 2.4.3-3. Fourteen of the fifteen samples collected contained U-238 concentration levels below the MDA for U-238; the one remaining sample with detectable activity was below the HRMB maximum background concentration level (2.31 pCi/g) (Dinwiddie September 1997). The U-238 MDAs for seven of the

Table 2.4.3-1
Summary of SWMU 27 Confirmatory Trench Soil Sampling Analytical Results; Inorganic Constituents (RCRA Metals)

Sample Number	ER Sample ID	Sample Matrix	Sample Date	Sample Depth	RCRA Metals (EPA Methods 6010A and 7470/7471*)										Units
					Ag	As	Ba	Be	Cd	Cr	Hg	Ni	Pb	Se	
034962-006	27B-GR-013-8-S	soil	6/12/97	8.0-9.0 ft	0.0976J	3.68	117	0.403J	ND (0.0105)	6.08	ND (0.0167)	7.38	6.91	0.347J	mg/kg
034130-002	27BTW-GR-009-8-S	soil	9/9/97	8.0-9.0 ft	ND (0.031)	3.79	135	0.426J	ND (0.0104)	8.69B	ND (0.0173)	4.60	5.91	ND (0.07)	mg/kg
034131-002	27BTW-GR-010-8-S	soil	9/9/97	8.0-9.0 ft	ND (0.031)	2.35	216	0.201J	ND (0.0104)	3.48B	ND (0.0173)	3.52	4.30	0.179J	mg/kg
034132-002	27BTF-GR-011-12-S	soil	9/9/97	12.0-13.0 ft	ND (0.031)	2.77	72.0	0.356J	ND (0.0104)	7.15B	ND (0.0173)	4.63	5.15	ND (0.07)	mg/kg
034133-002	27BTF-GR-012-12-S	soil	9/9/97	12.0-13.0 ft	ND (0.031)	2.93	46.8	0.304J	ND (0.0104)	5.88B	ND (0.0173)	3.90	4.62	ND (0.07)	mg/kg
034124-002	27MTW-GR-003-8-S	soil	9/11/97	8.0-9.0 ft	0.154J	3.78	89.0	0.429	0.0810J	6.76	ND (0.0173)	7.44	7.13	0.368J	mg/kg
034125-002	27MTW-GR-004-8-S	soil	9/11/97	8.0-9.0 ft	0.216J	3.46	105	0.521	0.0875J	6.86	0.0636	7.01	7.48	0.335J	mg/kg
034126-002	27MTW-GR-005-12-S	soil	9/11/97	12.0-13.0 ft	0.191J	5.44	107	0.478	0.0671J	8.64	ND (0.0173)	7.84	6.70	0.315J	mg/kg
034127-002	27MTW-GR-006-12-S	soil	9/11/97	12.0-13.0 ft	0.181J	7.76	66.4	0.363J	0.0823J	5.43	ND (0.0173)	5.81	19.1	0.323J	mg/kg
035231-002	27EF-GR-043-5-SD	soil	9/17/97	5.0-6.0 ft	0.130J	5.45	67.9	0.465J	0.150J	7.29	ND (0.0173)	8.08	7.03	0.162J	mg/kg
035134-002	27EF-GR-013-5-S	soil	9/17/97	5.0-6.0 ft	0.103J	6.96	79.6	0.488	0.147J	7.65	0.0200J	8.20	6.79	0.247J	mg/kg
035135-002	27EF-GR-014-5-S	soil	9/17/97	5.0-6.0 ft	0.149J	6.20	85.6	0.410J	0.112J	6.68	ND (0.0173)	9.28	6.21	0.146J	mg/kg
035136-002	27EF-GR-015-5-S	soil	9/17/97	5.0-6.0 ft	0.166J	2.60	95.4	0.266J	0.118J	5.07	ND (0.0173)	5.46	4.91	0.374J	mg/kg
035137-002	27EF-GR-016-5-S	soil	9/17/97	5.0-6.0 ft	0.147J	2.74	105	0.342J	0.102J	5.62	0.0186J	6.19	4.54	0.387J	mg/kg
035138-002	27EF-GR-017-5-S	soil	9/17/97	5.0-6.0 ft	0.0765J	2.23	88.9	0.344J	0.119J	6.90	0.0238J	6.66	6.47	ND (0.07)	mg/Kg
Quality Assurance/Quality Control Samples															
034141-004	27-GR-020-0-FB	water	9/9/97	NA	ND (0.00062)	ND (0.00293)	ND (0.000332)	ND (0.000223)	0.000335J	ND (0.000729)	ND (0.000104)	ND (0.00227)	0.000934J	ND (0.0014)	mg/L
034142-004	27-GR-021-0-EB	water	9/9/97	NA	ND (0.00062)	ND (0.00293)	0.000604J	ND (0.000223)	0.000350J	ND (0.000729)	ND (0.000104)	ND (0.00227)	ND (0.000678)	ND (0.0014)	mg/L
034195-004	27-GR-037-0-FB	water	9/11/97	NA	0.00165J	ND (0.00293)	0.000707J	ND (0.000223)	0.000298J	ND (0.000729)	ND (0.000104)	ND (0.00227)	0.000841J	ND (0.0014)	mg/L
034196-004	27-GR-038-0-EB	water	9/11/97	NA	0.00240J	ND (0.00293)	0.00216J	ND (0.000223)	ND (0.000208)	ND (0.000729)	ND (0.000104)	ND (0.00227)	0.000858J	ND (0.0014)	mg/L
035230-004	27-GR-044-0-EB	water	9/17/97	NA	ND (0.00062)	ND (0.00293)	ND (0.000332)	ND (0.000223)	ND (0.000208)	ND (0.000729)	ND (0.000104)	ND (0.00227)	ND (0.000678)	ND (0.0014)	mg/L

Refer to footnotes at end of table.

Table 2.4.3-1 (Concluded)
Summary of SWMU 27 Confirmatory Trench Soil Sampling Analytical Results; Inorganic Constituents (RCRA Metals)

Sample Number	ER Sample ID	Sample Matrix	Sample Date	Sample Depth	RCRA Metals (EPA Methods 6010A and 7470/7471[a])										Units
					Ag	As	Ba	Be	Cd	Cr	Hg	Ni	Pb	Se	
035229-004	27-GR-043-0-FB	water	9/17/97	NA	ND (0.00062)	ND (0.00293)	ND (0.000332)	ND (0.000223)	ND (0.000208)	ND (0.000729)	ND (0.000104)	ND (0.00227)	ND (0.000678)	ND (0.0014)	mg/L
SNL/NM Foothills Background Range[b]		soil	NA	NA	0.01-0.50	1.6-9.6	39-400	0.2-0.73	0.09-0.99	2.5-20	0.01-0.13	5.3-16	4.7-51	0.56-3.1	mg/kg
SNL/NM Foothills Soil Background UTL or 95th-Percentile[b]		soil	NA	NA	<0.5[c]	9.8	246	0.75	0.64[c]	18.8	0.055[c]	16.6	18.9[c]	3.0[c]	mg/kg

ER Sample ID Information: 27B = SWMU sample location; GR = grab sample; 013 = sample number; 8 = depth of sample; S = soil sample.

[a]EPA November 1986.
[b]Zamorski December 1997 (all metals background values, except Se, were verbally approved by NMED HRMB as of May 1998).
[c]95th percentile provided instead of UTL.

Ag = Silver.
As = Arsenic.
Ba = Barium.
Be = Beryllium.
BTF = Burn Pit excavation floor sample.
BTW = Burn Pit excavation wall sample.
Cd = Cadmium.
Cr = Chromium.
EF = Exploratory trench excavation floor sample.
EB = Equipment blank.
EPA = U.S. Environmental Protection Agency.
FB = Field blank.
Hg = Mercury.
HRMB = Hazardous and Radioactive Materials Bureau.
J = The estimated value reported is either above the method detection limit (MDL) and less than the practical quantitation limit or above the instrument detection limit and less than the contract required detection limit.
MTW = Mound Area excavation wall sample.
NA = Not applicable.
ND ( ) = Not detected at or above the MDL, shown in parenthesis.
Ni = Nickel.
NMED = New Mexico Environment Department.
Pb = Lead.
Se = Selenium.
µg/kg = Microgram per kilogram.
µg/L = Micrograms per liter.
UTL = Upper tolerance limit.

Table 2.4.3-2
Summary of SWMU 27 Confirmatory Trench Soil Sampling Analytical Results; Organic Constituents (TCL Pesticides and Herbicides)

Sample Number	ER Sample ID	Sample Matrix	Sample Date	Sample Depth	TCL Pesticides and Herbicides (EPA Methods 8080 and 8151)						Units
					Aldrin	Dieldrin	alpha-Lindane	delta-Lindane	gamma-Lindane	2,4,5-TP (silvex)	
034130-002	27BTW-GR-009-8-S	soil	9/9/97	8.0-9.0 ft	ND (0.33)	ND (0.66)	ND (0.33)	ND (0.33)	ND (0.33)	ND (0.0936)	µg/kg
034131-002	27BTW-GR-010-8-S	soil	9/9/97	8.0-9.0 ft	ND (0.33)	ND (0.66)	0.45J	ND (0.33)	ND (0.33)	ND (0.0936)	µg/kg
034132-002	27BTF-GR-011-12-S	soil	9/9/97	12.0-13.0 ft	ND (0.33)	ND (0.66)	0.47J	ND (0.33)	ND (0.33)	ND (0.0936)	µg/kg
034133-002	27BTF-GR-012-12-S	soil	9/9/97	12.0-13.0 ft	ND (0.33)	ND (0.66)	ND (0.33)	ND (0.33)	ND (0.33)	4.0	µg/kg
034124-002	27MTW-GR-003-8-S	soil	9/11/97	8.0-9.0 ft	ND (0.33)	ND (0.66)	ND (0.33)	ND (0.33)	0.47J	ND (0.0936)	µg/kg
034125-002	27MTW-GR-004-8-S	soil	9/11/97	8.0-9.0 ft	0.75J	ND (0.66)	0.49J	ND (0.33)	0.47J	ND (0.0936)	µg/kg
034126-002	27MTF-GR-005-12-S	soil	9/11/97	12.0-13.0 ft	ND (0.33)	ND (0.66)	ND (0.33)	ND (0.33)	0.53J	ND (0.0936)	µg/kg
034127-002	27MTF-GR-006-12-S	soil	9/11/97	12.0-13.0 ft	ND (0.33)	ND (0.66)	ND (0.33)	ND (0.33)	ND (0.33)	ND (0.0936)	µg/kg
035231-002	27EF-GR-043-5-SD	soil	9/17/97	5.0-6.0 ft	ND (0.33)	ND (0.66)	ND (0.33)	0.86J	0.43J	ND (0.0936)	µg/kg
035134-002	27EF-GR-013-5-S	soil	9/17/97	5.0-6.0 ft	ND (0.33)	ND (0.66)	0.51J	ND (0.33)	0.68J	ND (0.0936)	µg/kg
035135-002	27EF-GR-014-5-S	soil	9/17/97	5.0-6.0 ft	ND (0.33)	ND (0.66)	ND (0.33)	ND (0.33)	ND (0.33)	ND (0.0936)	µg/kg
035136-002	27EF-GR-015-5-S	soil	9/17/97	5.0-6.0 ft	ND (0.33)	1.3J	ND (0.33)	1.1J	ND (0.33)	ND (0.0936)	µg/kg
035137-002	27EF-GR-016-5-S	soil	9/17/97	5.0-6.0 ft	0.61J	ND (0.66)	ND (0.33)	ND (0.33)	ND (0.33)	ND (0.0936)	µg/kg
035138-002	27EF-GR-017-5-S	soil	9/17/97	5.0-6.0 ft	ND (0.33)	ND (0.66)	0.52J	ND (0.33)	0.44J	ND (0.0936)	µg/kg
Quality Assurance/Quality Control Samples											
034141-005	27-GR-020-0-FB	water	9/9/97	NA	ND (0.01)	ND (0.02)	ND (0.01)	ND (0.01)	ND (0.01)	NR	µg/L
034141-006	27-GR-020-0-FB	water	9/9/97	NA	NR	NR	NR	NR	NR	ND (0.008)	µg/L
034142-005	27-GR-021-0-EB	water	9/9/97	NA	ND (0.01)	ND (0.02)	ND (0.01)	0.0308J	ND (0.01)	NR	µg/L
034142-006	27-GR-021-0-EB	water	9/9/97	NA	NR	NR	NR	NR	NR	ND (0.008)	µg/L
034195-005	27-GR-037-0-FB	water	9/11/97	NA	ND (0.01)	ND (0.02)	ND (0.01)	ND (0.01)	ND (0.01)	NR	µg/L
034195-006	27-GR-037-0-FB	water	9/11/97	NA	NR	NR	NR	NR	NR	ND (0.008)	µg/L
034196-005	27-GR-038-0-EB	water	9/11/97	NA	0.0177J	ND (0.02)	ND (0.01)	ND (0.01)	ND (0.01)	NR	µg/L
034196-006	27-GR-038-0-EB	water	9/11/97	NA	NR	NR	NR	NR	NR	ND (0.008)	µg/L
035230-005	27-GR-044-0-EB	water	9/17/97	NA	ND (0.01)	ND (0.02)	ND (0.01)	ND (0.01)	ND (0.01)	NR	µg/L
035230-006	27-GR-044-0-EB	water	9/17/97	NA	NR	NR	NR	NR	NR	ND (0.008)	µg/L
035229-005	27-GR-043-0-FB	water	9/17/97	NA	ND (0.01)	ND (0.02)	ND (0.01)	ND (0.01)	ND (0.01)	NR	µg/L
035229-006	27-GR-043-0-FB	water	9/17/97	NA	NR	NR	NR	NR	NR	5.8	µg/L

ER Sample ID Information: 27 = SWMU sample location; BTW = Burn Pit excavation wall sample; GR = grab sample; 009 = sample number; 8 = depth of sample; S = soil sample.

BTF = Burn Pit excavation floor sample.
BTW = Burn Pit excavation wall sample.
BV = Burn Pit excavation soil pile sample.
BVD = Burn Pit excavation soil pile sample duplicate.
EB = Equipment blank.
ED = Exploratory trench excavation debris sample.
EF = Exploratory trench excavation floor sample.
EPA = U.S. Environmental Protection Agency.
ER = Environmental restoration.
GR = Grab sample.
ID = Identification.
J = The estimated value reported is either above the method detection limit (MDL) and less than the practical quantitation limit or above the instrument detection limit and less than the contract required detection limit.
MD = Mound Area excavation debris sample.
MTF = Mound Area excavation floor sample.
MTW = Mound Area excavation wall sample.
NA = Not applicable.
ND ( ) = Not detected at or above the MDL, shown in parenthesis.
NR = Not reported.
S = Soil sample.
TCL = Target compound list.
µg/kg = Microgram per kilogram.
µg/L = Micrograms per liter.

Table 2.4.3-3
Summary of SWMU 27 Confirmatory Trench Soil Sampling Analytical Results; Radiological Constituents (Gamma Spectroscopy)

Sample Number	ER Sample ID	Sample Matrix	Sample Date	Sample Depth	Gamma Spectroscopy Activity[a] (EPA Method 901.1)						Units
					U-238[b]	Th-234[b]	Th-232[b]	Ra-228[b]	U-235[b]	Cs-137[b]	
034962-004	27B-GR-013-8-S	Soil	6/12/97	8.0-9.0 ft	ND (1.41E+00)	6.54E-01	9.68E-01	1.11E+00	ND (2.10E-01)	3.45E-02	pCi/g
034130-003	27BTW-GR-009-8-S	Soil	9/9/97	8.0-9.0 ft	ND (1.80E+00)	1.12E+00	1.02E+00	8.39E-01	ND (2.37E-01)	ND (4.62E-02)	pCi/g
034131-003	27BTW-GR-010-8-S	Soil	9/9/97	8.0-9.0 ft	ND (1.05E+00)	9.73E-01	1.05E+00	1.01E+00	ND (2.04E-01)	ND (3.90E-02)	pCi/g
034132-003	27BTF-GR-011-12-S	Soil	9/9/97	12.0-13.0 ft	ND (1.71E+00)	1.04E+00	8.82E-01	8.87E-01	ND (2.27E-01)	ND (4.26E-02)	pCi/g
034133-003	27BTF-GR-012-12-S	Soil	9/9/97	12.0-13.0 ft	4.99E-01	1.11E+00	8.97E-01	8.21E-01	ND (2.00E-01)	ND (3.94E-02)	pCi/g
034124-003	27MTW-GR-003-8-S	Soil	9/11/97	8.0-9.0 ft	ND (3.23E+00)	1.12E+00	ND (1.42E-01)	1.02E+00	ND (2.39E-01)	ND (3.29E-02)	pCi/g
034125-003	27MTW-GR-004-8-S	Soil	9/11/97	8.0-9.0 ft	ND (1.71E+00)	1.31E+00	1.11E+00	1.19E+00	ND (2.29E-01)	ND (4.16E-02)	pCi/g
034126-003	27MTF-GR-005-12-S	Soil	9/11/97	12.0-13.0 ft	ND (1.42E+00)	1.39E+00	9.86E-01	9.97E-01	ND (2.02E-01)	ND (3.93E-02)	pCi/g
034127-003	27MTF-GR-006-12-S	Soil	9/11/97	12.0-13.0 ft	ND (1.54E+00)	1.27E+00	7.79E-01	9.34E-01	ND (2.10E-01)	ND (3.89E-02)	pCi/g
035231-003	27EF-GR-043-5-SD	Soil	9/17/97	5.0-6.0 ft	ND (3.18E+00)	7.38E-01	8.93E-01	7.46E-01	ND (2.35E-01)	ND (3.14E-02)	pCi/g
035134-003	27EF-GR-013-5-S	Soil	9/17/97	5.0-6.0 ft	ND (3.19E+00)	1.05E+00	9.27E-01	8.86E-01	ND (2.41E-01)	ND (3.13E-02)	pCi/g
035135-003	27EF-GR-014-5-S	Soil	9/17/97	5.0-6.0 ft	ND (3.06E+00)	ND (7.29E-01)	9.78E-01	1.08E+00	ND (2.21E-01)	ND (3.08E-02)	pCi/g
035136-003	27EF-GR-015-5-S	Soil	9/17/97	5.0-6.0 ft	ND (2.96E+00)	9.86E-01	8.44E-01	8.36E-01	ND (2.23E-01)	1.33E-02	pCi/g
035137-003	27EF-GR-016-5-S	Soil	9/17/97	5.0-6.0 ft	ND (3.61E+00)	ND (8.48E-01)	9.16E-01	8.75E-01	ND (2.50E-01)	ND (2.07E-02)	pCi/g
035138-003	27EF-GR-017-5-S	Soil	9/17/97	5.0-6.0 ft	ND (3.40E+00)	1.35E+00	8.72E-01	8.90E-01	ND (2.50E-01)	ND (3.52E-02)	pCi/g
Quality Assurance/Quality Control Samples											
034141-003	27-GR-020-0-FB	Water	9/9/97	NA	ND (8.64E-01)	ND (2.96E-01)	ND (1.41E-01)	ND (1.16E-01)	ND(1.29E-01)	ND(1.93E-02)	pCi/mL
034142-003	27-GR-021-0-EB	Water	9/9/97	NA	ND (8.78E-01)	ND (2.91E-01)	ND (1.31E-01)	ND (1.19E-01)	ND (1.27E-01)	ND (2.06E-02)	pCi/ml
035230-003	27-GR-044-0-EB	Water	9/17/97	NA	ND (1.72E+00)	ND (4.18E-01)	ND (1.64E-01)	ND (1.31E-01)	ND (1.60E-01)	ND (2.39E-02)	pCi/mL
035229-003	27-GR-043-0-FB	Water	9/17/97	NA	ND (1.83E+00)	ND (3.99E-01)	ND (1.50E-01)	ND (1.43E-01)	ND (1.52E-01)	ND (2.19E-02)	pCi/mL
034195-003	27-GR-037-0-FB	Water	9/11/97	NA	ND (7.89E-01)	ND (3.24E-01)	ND (1.51E-01)	ND (1.69E-01)	ND (1.35E-01)	ND (2.72E-02)	pCi/mL
034196-003	27-GR-038-0-EB	Water	9/11/97	NA	ND (7.86E-01)	ND (2.17E-01)	ND (1.53E-01)	ND (1.40E-01)	ND (1.36E-01)	ND (2.76E-02)	pCi/mL
SNL/NM Foothills Background Range[c]		NA	NA	NA	0.153-2.86	0.69-2.03	0.113-1.18	0.113-1.32	0.004-3.0	0.007-0.876	pCi/g
HRMB Maximum Background[d]		NA	NA	NA	2.31	2.31	1.03	1.08	0.16	1.063	pCi/g

ER Sample ID Information: 27B = SWMU sample location; GR = grab sample; 013 = sample number; 8 = depth of sample; S = soil sample.

[a]U-238 and Th-232 decay chain isotopes with a short half-life are not presented in this table.
[b]Value in parenthesis represents the minimum detection activity.
[c]IT March 1996.
[d]Dinwiddie September 1997.

BTF = Burn Pit excavation floor sample.
BTW = Burn Pit excavation wall sample.
Cs = Cesium.
D = Duplicate.
EB = Equipment blank.
EF = Exploratory trench excavation floor sample.
EPA = U.S. Environmental Protection Agency.
ER = Environmental restoration.
FB = Field blank.
ID = Identification.
MTF = Mound Area excavation floor sample.
MTW = Mound Area excavation wall sample.
NA = Not applicable.
ND = Nondetect - the analyte was not observed above the MDA.
pCi/g = PicoCuries per gram.
pCi/L = PicoCuries per liter.
Ra = Radium.
S = Soil sample.
SD = Soil sample duplicate.
Th = Thorium.
U = Uranium.

15 confirmatory soil trench wall samples were found at levels exceeding the SNL/NM foothills maximum background concentration level (2.86 pCi/g) (IT March 1996). These values are orders of magnitude less than the PRGs, as discussed in Section 2.4.1, and do not pose a threat to human health or the environment. All samples contained Th-234 concentration levels below MDAs or below the HRMB maximum background concentration level (2.31 pCi/g). Two samples contained Th-232 concentration levels above the HRMB maximum background concentration level (1.03 pCi/g) but were below the SNL/NM foothills maximum background concentration level (1.18 pCi/g). Two samples contained Ra-228 concentration levels exceeding the HRMB maximum background concentration level (1.08 pCi/g) but were less than the SNL/NM foothills maximum background concentration level (1.32 pCi/g). All samples contained U-235 concentration levels below the MDAs. However, all the MDAs exceed the HRMB maximum background concentration level of 0.16 pCi/g, but did not exceed the SNL/NM foothills maximum background concentration level of 3.0 pCi/g. The MDAs for gamma-emitting radionuclides was sometimes higher than the background level for that radionuclide, they were nevertheless orders of magnitude less than a risk-based PRG which is based upon a 15 mrem/yr EDE maximum dose limit found in EPA's OSWER Directive No. 9220.4-18, "Establishment of Cleanup Levels for CERCLA Sites with Radioactive Contamination" (EPA 1997). Therefore the analytical results are acceptable. These values are much less than the PRGs, as discussed in Section 2.4.1, and do not pose a threat to human health or the environment. All samples contained Cs-137 concentration levels below the HRMB maximum background concentration level (1.063 pCi/g). The laboratory results of the gamma spectroscopy analyses of the trench floor/wall samples are presented in Annex 2-C.

2.4.4 Quality Assurance/Quality Control Results

Metals

Tables 2.4.1-1, 2.4.2-1, and 2.4.3-1 present the results of metals quality assurance/quality control (QA/QC) samples collected during the debris characterization and confirmatory soil sampling programs. All QA/QC for metals analyses was performed on samples sent off-site for analysis. In addition, QA/QC samples consisted of three field blanks (27-GR-020-0-FB, 27-GR-037-0-FB, and 27-GR-043-0-FB) and three equipment blanks (27-GR-021-0-EB, 27-GR-038-0-EB, and 27-GR-044-0-EB). Results of the blank analyses showed concentration levels of several constituents just above their respective detection levels. Cadmium and lead were detected in two of the field blanks and silver and barium detected in one. Barium was detected in two equipment blanks and silver, lead, and cadmium in one blank. No other metals were detected in either the field or equipment blank samples.

Two duplicate soil samples were collected during confirmatory soil sampling (27-BVD-C-036-0-S and 27EF-GR-043-5-SD) at SWMU 27 and analyzed off site for metals. The relative percent difference (RPD) for the various metals ranged from one to 34 percent.

Radionuclides

Tables 2.4.1-3, 2.4.2-2, and 2.4.3-3 present the analytical results of gamma spectroscopy analyses for radionuclides in QA/QC samples collected during debris characterization and confirmatory soil sampling at SWMU 27. All QA/QC analyses for radionuclides were performed on site. QA/QC samples consisted of three field blanks (27-GR-020-0-FB, 27-GR-043-0-FB,

and 27-GR-037-0-FB) and three equipment blanks (27-GR-021-0-EB, 27-GR-044-0-EB, and 27-GR-038-0-EB). No radionuclides were detected in any of the field or equipment blank samples.

Two duplicate soil samples were collected during confirmatory soil sampling at SWMU 27 and were analyzed on site for radionuclides using gamma spectroscopy (27-BVD-C-036-0-S and 27EF-GR-043-5-SD). Activities of the radionuclides in the duplicate samples were comparable to those detected in the equivalent primary sample (Annex 2-B).

Pesticides and Herbicides

Table 2.4.3-2 presents the analytical results of herbicides and pesticides in QA/QC samples collected during confirmatory sampling. All QA/QC samples were analyzed by an off site laboratory. QA/QC samples consisted of three field blanks (27-GR-020-0-FB, 27-GR-037-0-FB, and 27-GR-043-0-FB) and three equipment blanks (27-GR-021-0-EB, 27-GR-038-0-EB, and 27-GR-044-0-EB). All of the blank samples were not detected (ND) for pesticides and herbicides except for two isolated occurrences. Sample 27-GR-021-0-EB had a reported detection of delta-Lindane at 0.10308J micrograms per liter (µg/L) and sample 27-GR-038-0-EB had a reported Aldrin concentration of 0.0177J µg/L.

One duplicate soil sample (27-EF-GR-043-5-SD) was collected during confirmatory sampling at SWMU 27 and analyzed off site for pesticides and herbicides. The analytical results from the primary and duplicate samples were closely comparable for all parameters except delta-Lindane. The RPD between the two samples cannot be calculated since the primary sample was ND however, the difference in concentration between the duplicate and primary samples was at least 0.53 µg/kg (detection limit for delta-Lindane in the primary sample was 0.33 µg/kg).

Data Validation

The SNL/NM Sample Management Office conducted Data Validation I and Data Validation II reviews of off-site data in accordance with Technical Operating Procedure 94-03, Rev. 0 (SNL/NM July 1994). All gamma spectroscopy data were reviewed by SNL/NM Department 7713 in accordance with the RPSD Procedure RPSD-02-11 (SNL/NM July 1996).

2.5 VCM Results and Conclusions

In conclusion, the VCM at the SWMU 27 Building 9820, Animal Disposal Pit, was conducted safely and according to the SWMU 27 NFA Plan and SNL/NM OPs and was field- and photo-documented. The soil and debris from each of the excavated features were stockpiled into *potentially clean* soil piles or debris piles. The soil and debris was then sampled to determine final disposition. Except for on-site analysis for gamma spectroscopy, all of the soil and debris samples collected were analyzed off site. Results from field screening for radiation and organic-vapors indicated that no elevated radiation or organic vapors were present.

After the excavation activities had been complete and all of the debris was stockpiled, the debris was then distributed over a designated screening area by a front-end loader. The debris was then field-screened and visually inspected to determined whether any anomalies such as stained or burned materials were present. Specific debris, including the animal carcasses and

hides, donkey feces, biological waste, battery debris, and burned materials, was also field screened and sampled. Based upon results from chemical analysis, all of the debris was either disposed of off site as RCRA-regulated waste or as nonregulated solid waste.

When all of the *potentially clean* soil had been stockpiled, confirmatory soil samples were collected from each of the soil piles to verify that contamination was not present in the excavated soil. Results from chemical analysis determined that the soil piles were not contaminated with COCs.

After completion of the excavation of the pit or trench, confirmatory soil samples were also collected from the floor and/or wall of the pit/trench to verify that remediation activities had been completed. Chemical results verified that the confirmatory samples were not contaminated with COCs.

The clean soil piles (verified by analytical data) were placed back into the open pits and trenches, thereby finalizing excavation activities. In March 1998, after all sample results were received from the laboratory and reviewed and validated, the site was regraded and revegetated with native grasses.
The detailed results of the site assessment, an interpretation of the analytical data collected, an assessment of the nature and extent of contamination, and an analysis of the risks posed to human health and the environment are provided within the NFA proposal for SWMU 27.

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ANNEXES

Annex I Voluntary Corrective Measure Plan for Excavation and Debris Removal at Environmental Restoration Site 27 Operable Unit 1332, Foothills Test Area July 1997

Annex II Results of SMWU 27 VCM Sampling Analysis-Gamma Spectroscopy

II-A Results of SWMU 27 VCM Debris Sampling Analysis-Gamma Spectroscopy

II-B Results of SWMU 27 VCM Confirmatory Soil Pile Sampling Analysis-Gamma Spectroscopy

II-C Results of SWMU 27 VCM Trench Soil Analysis-Gamma Spectroscopy

ANNEX I

Voluntary Corrective Measure Plan for Excavation and Debris Removal at Environmental Restoration Site 27 Operable Unit 1332, Foothills Test Area
July 1997

Voluntary Corrective Measure Plan for Excavation and Debris Removal at Environmental Restoration Site 27 Operable Unit 1332, Foothills Test Area

July 1997

Prepared by
Sandia National Laboratories/New Mexico
Environmental Restoration Project

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3 VCM Schedule

1.0 Introduction

This document describes the proposed plan for conducting expedited cleanup/voluntary corrective measures (VCM) at Environmental Restoration (ER) Site 27, BLDG. 9820 Animal Disposal Pit. The VCM will address the buried debris found during RFI assessment of ER Site 27. This document was drafted in accordance with Annex D of the Document of Understanding (DOU), negotiated and agreed upon by Sandia National Laboratories/New Mexico (SNL/NM), the Department of Energy (DOE), the New Mexico Environment Department (NMED), and the Environmental Protection Agency (EPA).

The objective of the VCM at ER Site 27 is to accelerate mitigation of a site which has the potential for posing hazards to human health and the environment. This action involves excavating and removing two areas of buried material found during the RFI assessment work and the area around the burial areas, identifying contaminants, disposing of solid waste and any hazardous and/or radioactive waste (if generated), and backfilling the excavation with fill material. Soil that does not pose a significant risk to human health and the environment may be returned to the excavations. This action is designed to remove from the subsurface of the site any materials that could potentially expose humans and/or the environment to unacceptable levels of hazardous and/or radioactive materials. It is further intended to reduce the overall cost of Resource Conservation and Recovery Act (RCRA) corrective actions and compress the clean-up schedule at this site, rendering the site available for future recreational use.

SNL/NM considered several factors in determining the need for VCM at ER Site 27. These factors are:

- the potential presence of hazardous and/or radioactive contamination that may pose a threat of release or potential for human exposure;

- traditional assessment approaches, such as surface sampling or sampling from boreholes, would not succeed in fully characterizing the nature and extent of contamination and

- significant cost savings and environmental, safety, and health (ES&H) risk reduction would be achieved by combining characterization and cleanup into one action.

1.1 Description of ER Site 27 - BLDG 9820 Animal Disposal Pit

ER Site 27 is identified as the BLDG 9820 Animal Disposal Pit in the Hazardous and Solid Waste Amendments (HSWA) Module of SNL's Resource Conservation and Recovery Act (RCRA) Permit. It comprises approximately .57 acres of USAF land withdrawn from the BLM and permitted to the DOE. Figure 1 shows the regional location of ER Site 27.

The site is located in canyon at the western edge of the Manzanita Mountains. A small arroyo lies to the southeast of Building 9820, and drains to the northeast (see Figure 2). Activity at ER Site 27 involved electrical stimulation of the nervous system of donkeys. The site contains the buried remains of these test animals and burned material probably associated with the tests, and other activities conducted in Building 9820.

This area had an excavated pit and the borrow piles from the pit. This was the site where the donkeys had reportedly been buried and later removed. The pit was partly excavated during assessment activities. This site was found to contain burned debris starting at about 4 feet below ground level and extending to at least 10 feet. The pit is currently about 12 feet across. Debris still remains in the pit walls. This site is hereafter referred to as "the burn pit".

A slight mound approximately 20 feet in diameter was located about 70-100 feet to the north of the burn pit. This mound had broken glass bottles and other debris on its surface. What appeared to be small amounts of oil were observed on some of the glass fragments. This mound was partially excavated during the assessment. An east-west trench and a north-south trench, approximately 50 feet long and up to 14 feet deep, were excavated through the mound area. The remains of three donkeys, mostly bones and a small amount of hide, were found under a thin layer of white material assumed to be lye. Other debris, including small a burn area, was found in the trenches in small isolated patches. This debris included at least 5 glass bottles of the type used to fill syringes. A partially legible label on a bottle contained the word penicillin and a units designation.

1.1.1 Operational History

Building 9820 was constructed in 1958, and was used for several months for high explosives (HE) synthesis. Animal guidance experiments using electronic equipment were conducted at Building 9820 in 1958 and 1959 using rats and, later, donkeys. The experiments were conducted for the U.S. Navy, and were classified as top secret. Security guards were posted around the area during the experiments. Two recent interviews with a technical employee who actually conducted the U.S. Navy experiments indicate that four donkeys, stabled in one end of Building 9820, were used in the experiments. Some of the donkeys died as a result of the experiments and were buried in a pit near the building. Due to the highly classified nature of the tests, the exact cause of death is not disclosed herein. Since the project was highly sensitive, the excess soil was graded off so that no visible evidence was left after the burial.

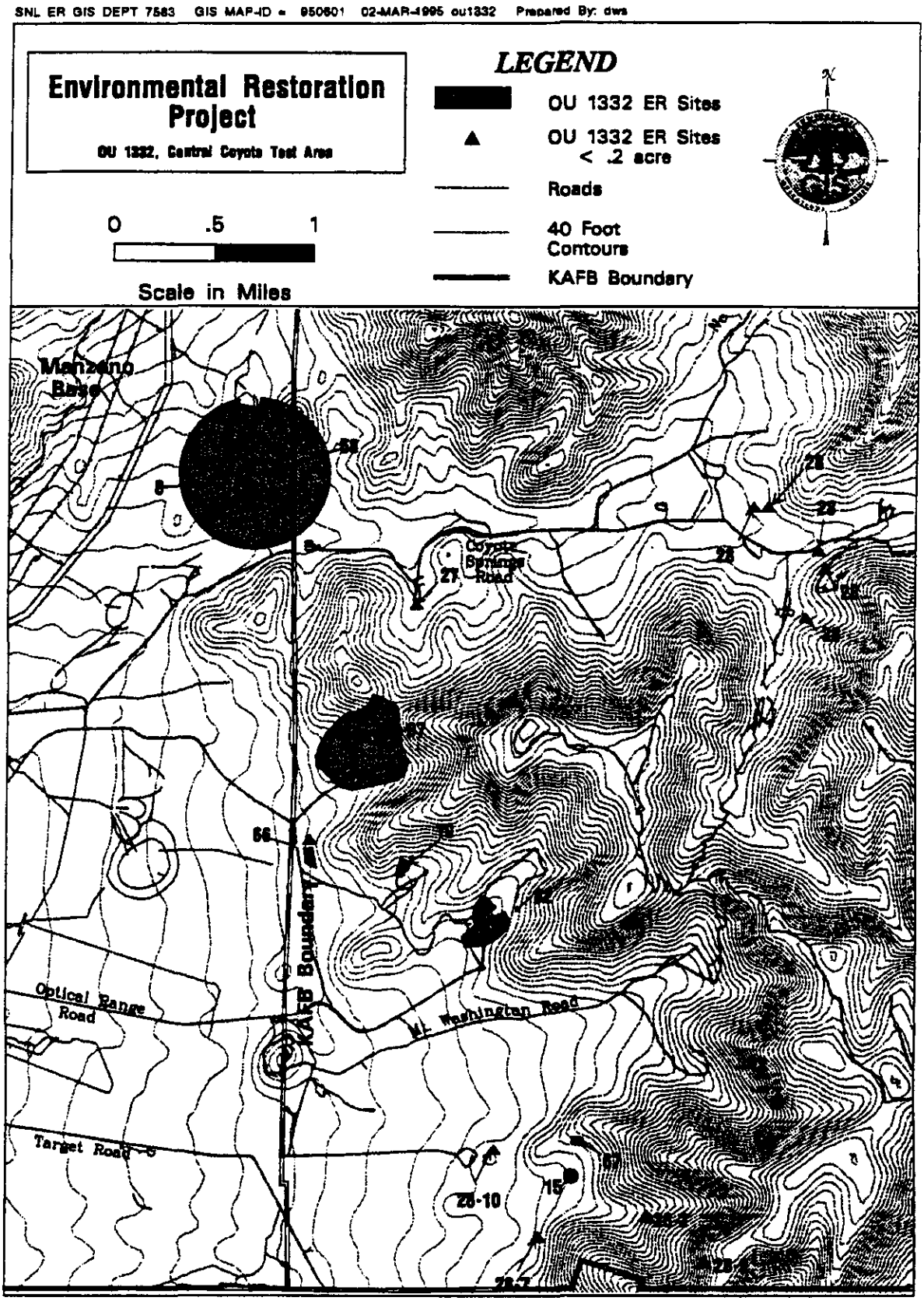
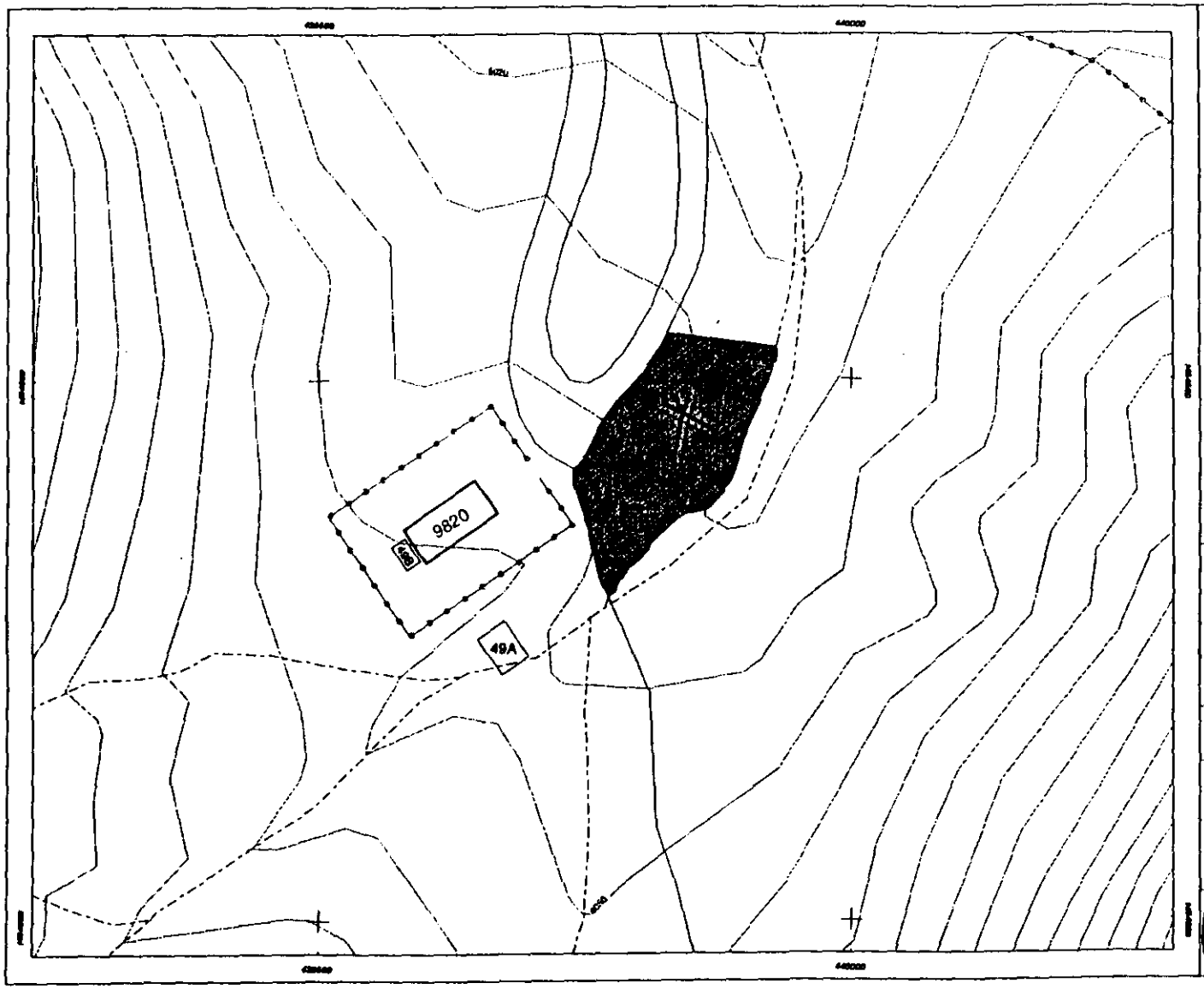


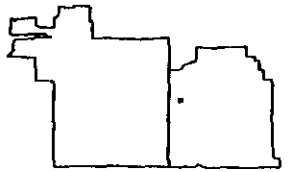
Figure 1
Locations of OU 1332 ER Sites



Legend

- Burn Area
- Radiation Anomaly
- Burn Pit
- Road
- 10 Foot Contour
- Surface Drainage
- Fence
- Trench
- Building
- Other ER Site
- ER Site 27

0 100 200
Scale in Feet
0 20 40
Scale in Meters



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Environmental Geographic Information System

Figure 2
ER Site 27
Bldg. 9820
Animal Disposal Pit

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Unclassified	DRAFT	SNL GIS ORG. 6683
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In the mid 1960s, a machine shop was opened in Building 9820. From the mid-1970s to 1988, photographic processing was conducted inside Building 9820 and in a darkroom trailer parked on the west side of the building. Wastes from these activities may have been deposited in the burn pit since a fair amount of film material was found in the pit. Building 9820 is presently occupied by the photometrics department and Department 7535. The military also recently has conducted training maneuvers in the vicinity.

The animal burial pit was originally listed as a SWMU based on a CEARP interview conducted in 1985, in which an individual who was associated with the security organization at SNL/NM stated that radiation studies were conducted on animals in this area. This information conflicts with more recent information from interviews with technical personnel directly involved in the experiments, including the organization director who was responsible for the experiments, two technicians who performed the experiments, and a third technician who worked at Building 9820 not long after the experiments were conducted. According to these individuals, the tests involved experiments on animal using sophisticated electronic equipment; no radioactive or hazardous materials were used in the tests nor were film badges required. A fourth individual who worked in the SNL/NM Health Physics organization (now named Radiation Protection) at that time stated that SNL/NM policy required the Health Physics organization to be involved in projects where radioactive materials were used; this organization was not involved in these tests.

1.1.2 Physical Setting

ER Site 27 is next to an arroyo channel on the canyon-floor alluvium in the Lurance Canyon drainage in the Manzanita Mountains. The Lurance Canyon drainage is surrounded by moderately steep sloping canyon walls. The canyon floor at the site is isolated by the canyon walls except for the northern drainage into Arroyo del Coyote. Coyote Springs Road follows this drainage and is the main access into Lurance Canyon. The mean elevation of the site is 6,040 ft above sea level. Figure 1 shows the regional setting of Site 27.

Bedrock in the area is comprised of Precambrian-age rocks, primarily metarhyolite. The soils are comprised of a thin veneer of poorly weathered alluvium derived from the underlying bedrock.

Surface water in the area flows across the surface and into the arroyo. The depth to ground water at ER Site 27 in unknown, but from observations of a nearby monitoring well, ground water occurs in fractured igneous bedrock. Based on the log of the TSA1 monitoring well, located about 3,000 feet northeast of Site 27, ground water is located approximately 160 feet below the surface in fractured bedrock.

The data generally cited for climatological information are taken from the meteorological stations at the Albuquerque International Airport, located approximately 9 miles northwest of the site. Mountain slopes in the OU 1332 area generally are thought to receive higher precipitation (rain and snow) than the alluvial fans between the mountains and the Rio Grande, but no substantiating data are currently available. The Albuquerque area climate is characterized by low precipitation; wide temperature extremes; frequent, drying winds; heavy rain showers, usually of short duration and often with erosive effects; and erratic, seasonal distribution of precipitation. The average annual temperature in Albuquerque is 56 degrees Fahrenheit (F), with an average diurnal temperature fluctuation of 28 F. In the Albuquerque region, the valley and mesa areas are arid, with annual precipitation averaging 8 inches (in.), whereas the average annual precipitation in the mountains exceeds 20 in.; half of the annual precipitation occurs during intense summer thunderstorms between July and September (SNL/NM January 1993). The prevailing winds in the SNL area are from the east, although winter winds at the 100-ft elevation (above ground surface) are more frequently from the north. The diurnal wind direction variations in the SNL/NM canyons are generally up the canyons in the morning and down the canyons in the evening, as indicated by the data collected at the Schoolhouse Building (Building 9850), which began collecting data on the area near OU 1332 in 1994. The OU 1332 RFI Work Plan (SNL/NM June 1995), the PIP (SNL/NM February 1995), and SNL/NM Environmental Baseline Update (SNL/NM January 1993) present collected climatologic data in more detail.

1.2 Assumptions

Key assumptions on which the VCM activities proposed for ER Site 27 are based include:

- thorough characterization and remediation can be accomplished in one field effort, saving time and money over more traditional characterization approaches,
- the potential remedy is obvious and can be readily applied,
- the remedy will probably be a final solution, and will prevent any potential releases or migration of hazardous or radioactive material in the future, and
- adequate treatment, storage, and disposal capacity is available for all expected waste types.

2.0 Results of Quality Assurance/Quality Control Activities

A summary of previous investigative work at ER Site 27 is presented in Section 3.0. This summary includes the RFI sampling and analysis effort conducted in June, 1997, involving exploratory trenches through suspect areas. Blanks, duplicates and rinsates were collected as part of this sampling.

3.0 Results of Investigations

This section describes the results of previous investigations related to ER Site 27. The findings of the Comprehensive Environmental Assessment and Response Program (CEARP) Phase I report (DOE September 1987) and RCRA Facility Assessment RFA report (EPA April 1987) are presented in Section 3.1. The results of preliminary field investigations conducted by the SNL/NM ER Project are presented in Section 3.2. Section 3.3 provides an evaluation of these investigation results. Conclusions and recommendations that form the basis for the proposed VCM are summarized in Section 3.4.

3.1 Summary of Prior Investigations

ER Site 27 was identified during investigations conducted under the CEARP (DOE September 1987) and the RFA (EPA April 1987). The CEARP Phase I Draft reports that allegedly, according to an interview, a classified radiation study using donkeys was conducted in a stable area near Building 9820. Animal remains were buried in the pit east of the building. There was no information on the radionuclide count of the animals. The exact location of this pit was undetermined from this investigation. RFA records indicate that it was not known whether these carcasses contained radioactive materials. The exact location and the dimensions of the pit were also unknown (EPA April 1987).

3.2 Field Investigations

The following section provides a summary of the significant investigations conducted at ER Site 27. These include the cultural resource and sensitive species surveys, the Surface Radiation Survey and Surface Radiation VCM, and the UXO/HE survey. Preliminary investigations that were performed specifically to support the characterization of ER Site 27 included scoping sampling and analysis conducted in 1995, and the exploratory trenching and sampling conducted in 1997. The investigation summaries and results are presented below.

Cultural Resources Survey

A cultural resources survey was conducted. No cultural resources were identified at, or in the near vicinity of, ER Site 27 (DOE March 1996).

Sensitive Species Survey

A sensitive species survey was conducted as part of a biological assessment of ER Site 27. Grama grass cacti, visnagita cacti, and Wright's pincushion cacti were found during the survey. Field personnel will be instructed to mark and avoid any small cacti in the work area(s) (DOE March 1996).

UXO/HE Survey

In November 1993, Kirtland Air Force Base (KAFB) Explosive Ordnance Disposal (EOD) personnel conducted a visual survey for the presence of unexploded ordnance/high explosives (UXO/HE) on the ground surface at ER Site 27. The survey identified one live 40-mm practice cartridge and one clip of 5.56-mm blanks, and numerous pieces of ordnance debris, all of which were removed from the site.

Radiological Surveys and Surface Radiation VCM Activities at ER Site 27

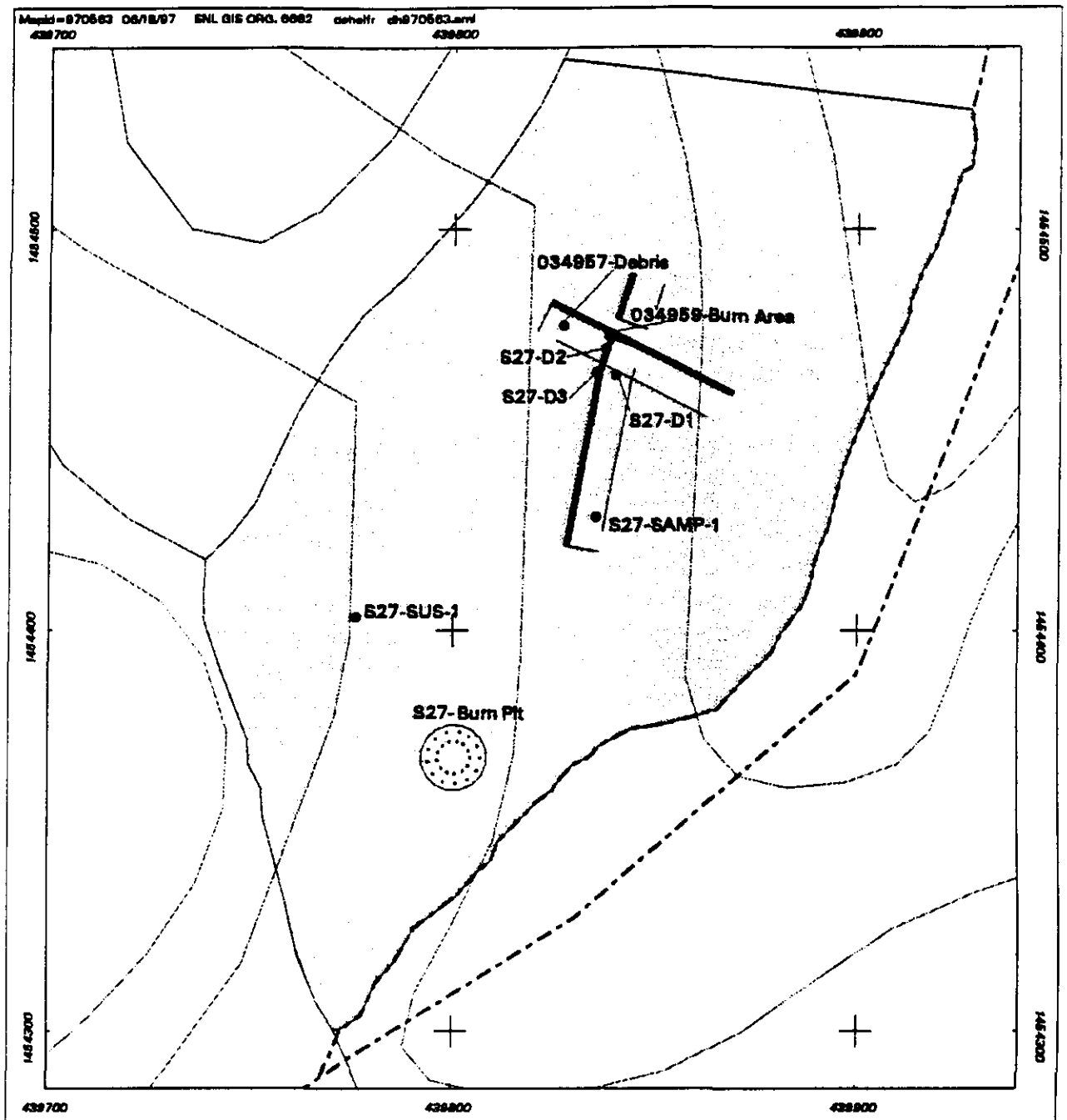
The radiological survey around the burn pit was conducted during November 1993. No radiation anomalies greater or equal to 1.3 times natural background were identified during the survey. One point source radiation anomaly identified as a fragment of depleted uranium was detected about 40 feet west of the burn pit. The fragment is not believed to be associated with the pit since the most reliable background information indicates that no radioactive materials were used in the study. The fragment measured 650 counts per second gamma, background was 120. A detailed summary of the surface radiological survey is presented in Section 5.6.2 of the Surface Gamma Radiation Surveys Final Report (Geotech 1994). Surface Radiation VCM activities that were conducted during March 1995 removed the fragment.

Scoping Sampling

Five soil samples were collected from the burn pit and surrounding area on June 30, 1995 and analyzed by gamma spectroscopy. The results were indicative of naturally occurring background.

Exploratory Excavation

RFI sampling was conducted during June 10-12, 1997. The burn pit and two trenches through the mound area were excavated to a depth ranging from 8 to 14 feet (Figure 3). The burn pit debris was found in the pit originally thought to be the burial site of the donkeys. The burn pit contained battery debris, film waste, drum lids (but no drums), glass and metal containers, metal (including pipes, wire, and shavings), laboratory bottles and stained soil. Two trenches were excavated through a mound that contained surface debris (primarily broken glass). The mound contained general metal and glass debris, including glass vials of the type used to fill syringes. At least one of the vials still contained liquid. The remains of three donkeys were found along with other areas of buried debris.



Legend

- GPS & Sample Location
- Road
- 5 Foot Contour
- Surface Drainage
- Pit
- Trench
- ER Site 27

Figure 3
Pit & Trench Locations at ER Site 27

0 20 40
Scale in Feet

0 4.8 9.6
Scale in Meters

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Samples were taken from the surface, each trench, and the pit. These samples are considered worse case contamination locations and will be used to define COCs for analysis during the VCM. Preliminary results for some of the samples have been received for SVOCs and VOCs, both of which were not found to be present. Partial metals results show a slight elevation in silver and zinc. Additional results are expected soon. Results will also be used to define waste disposal options. Field screening did not detect any elevated VOCs or radiation levels during the excavation.

3.3. Summary and Evaluation of Results

The exploratory excavation found buried debris. The most effective way to remediate this site is a one-pass approach involving excavation, segregation, sampling, and waste disposal.

3.3.1 Background Comparison

Radiological components of the site appear to be natural background. Data on other potential COCs have not been received yet.

Potential Contaminants at Site 27

At this time, a definitive list of contaminants at Site 27 does not exist. The site may potentially contain metals, bones and animal hides and vials that contained antibiotics and possibly other drugs.

3.4 Conclusions and Recommendations

Additional data are required to adequately characterize the nature and extent of contamination at Site 27. This VCM Plan presents the technical basis for conducting excavation, removal of debris, verification sampling and analyses, and a risk assessment that should provide the necessary information to propose the site for NFA. Final disposition of the site will be dependent upon evaluation of the VCM results, which will include performing a cumulative risk assessment. This risk assessment will use the verification analytical data that will be collected after excavation activities.

3.5 Sampling and Analysis Plan

A verification sampling and analysis plan is provided in section 4.5. This verification sampling will take place after each excavation is completed to ensure that the VCM has achieved risked-based clean up goals. This will be demonstrated by performing a cumulative risk assessment. Sampling and analysis of waste generated will be defined in the waste management plan, which is currently being developed.

Samples will be taken after all visible debris has been removed to verify cleanup completion.

4.0 Expedited Cleanup

4.1 Overview and Rationale

The proposed VCM will reduce impacts to human health and the environment by accelerating characterization and mitigation of a site that has the potential for posing hazards to human health and the environment. Preliminary investigations do not indicate the presence of significant contamination; however, the exploratory excavations clearly show areas of debris burial. Excavation of these areas is necessary to fully characterize the presence or absence of significant contamination. Verification sampling of the excavations after removing debris and contaminated material, if encountered, will provide the data needed to perform a cumulative risk assessment. The results of this risk assessment will determine final disposition of the site. This VCM should achieve restoration of the site, rendering it suitable for future recreational use.

4.2 Permitting, Approval, and Notification Requirements

This VCM Plan presents the technical basis for conducting excavation, sampling and analyses, and a risk assessment that should provide the necessary information to propose the site for NFA. The remediation is covered under the Environmental Assessment of the Environmental Restoration Project at Sandia National Laboratories/New Mexico. A City of Albuquerque Topsoil Disturbance Permit will not be obtained because less than 0.75

acres will be disturbed by the VCM activities. Final disposition of the site will be dependent upon evaluation of the VCM results, which will include performing a cumulative risk assessment. This risk assessment will use the verification analytical data to be collected after completing excavation activities.

The NFA Proposal will be submitted for regulatory review and approval. After approval, a Class III permit modification will be submitted.

4.3 Cleanup Activities

Field operations to be implemented under this VCM consist of excavation with heavy equipment, radiological field screening measurements, organic vapor screening, soil and debris segregation, verification sampling and analysis, decontamination of personnel and equipment, and management and characterization of waste materials and soils generated during these activities. Each of these activities will be performed in accordance with this VCM Plan and the OU 1332 HASP to ensure the safety of field personnel. All significant field activities and measurements will be documented in the field log book or on appropriate field forms as stipulated in SNL/NM ER Field Operating Procedure (FOP) 94-21. It is anticipated that field measurements for the ER Site 27 VCM will be limited to alpha/beta/gamma radiation surveys and organic vapor surveys of the excavated materials. These measurements will be used to segregate excavated materials, to ensure the safety of on-site personnel, and to verify that all appropriate material is removed and that excavated materials meet project-specific release criteria.

The VCM involves excavating the burn pit and mound area that have been identified as containing buried debris(see Figure 4 and Table 1). These areas and any additional areas will be excavated until all significant metal and other debris has been removed. If contamination is detected through field screening or sampling/analysis, additional excavation will be performed to remove contaminated soil exceeding risk-based action levels. Verification sampling and analysis will be performed to support a cumulative risk assessment.

Five more exploratory trenches will be excavated at the locations shown in Figure 4. These trenches are intended to cover the area around the known burial locations. The area has surface debris, several depression and mounds that are suspect. The trenches cover the area between the road and the arroyo. The trenches will be excavated to 5 feet, based on the depth of debris found during the previous excavation. If additional debris is found, the areas will be added to the VCM for cleanup, and debris removal will continue until undisturbed soils are encountered.

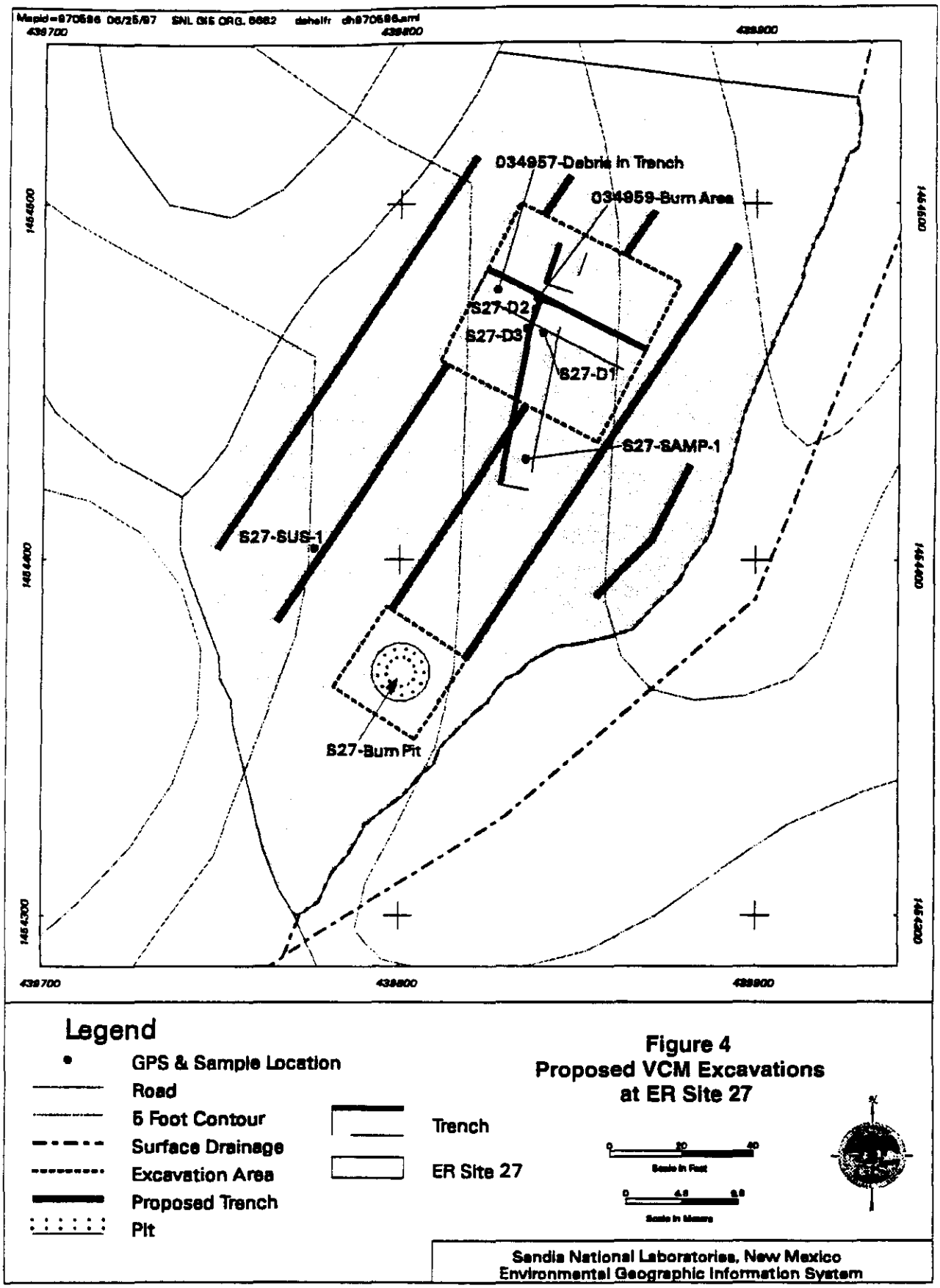

Figure 4
Proposed VCM Excavations at ER Site 27

Sandia National Laboratories, New Mexico
Environmental Geographic Information System

The dimensions of the excavations have been estimated based on the size of debris found during the exploratory trenching activities. The assumed depth of 15 feet is based on the previous trenching.

Table 1 - Excavation Soil Volume Estimates

Excavation Area	*Dimensions of Trench*	*Est. Volume (including sloping)*	*Volume Including Fluff (30%)*
Burn pit	**25 by 25 by 15 feet deep**	**9,375**	**12,187**
Mound area	**50 by 50 by 15 feet deep**	**37,500**	**48,750**
	Total	**46,875**	**60,937**

It is assumed that the debris can be separated from the soil, thus the actual volume for disposal will be significantly less than shown above. Excavation will be performed with a blast shield equipped backhoe for protection from potential UXO. The trenches will be sloped to meet OSHA safety standards, such that the lower 3 feet of the excavation is a vertical face, and the upper 5 feet will be sloped back at a 1:1 ratio. The excavation area will have at least one spotter who will also perform limited screening of the excavation with a Sodium Iodide (NaI) meter and photoionization detector (PID) as the digging proceeds to minimize the potential of mixing contaminated and clean material. The spotter will also visually inspect the area for any signs of UXO and HE, as well as drums or other intact containers that may require special handling during the excavation process. Soil and debris will be excavated and placed in a segregation and field screening area. This area will be located in the immediate vicinity of the excavation and will be used to: (1) separate metal, other debris, medical waste, bones, and soil, (2) spread out soil to a thin, approximately 6-inch thick layer for surveying with the NaI and PID meters, and (3) segregate clean soil and debris from contaminated material based on field screening results. Soil will be screened with the NaI and PID meters. Metal and debris will be screened with the same meters, as well as a GM meter with Pancake Probe.

A silt fence has been installed topographically down gradient from the excavations and trenches. A storm water diversion channel has been installed above the VCM area to divert water from running onto the site. These erosion controls preclude soil from washing into the arroyo next to the site.

Excavation activities could result in airborne fugitive dust. Fugitive dust will be mitigated by site personnel performing watering of the excavation and work area as necessary based on site conditions. A water trailer will be used onsite during excavation activities for dust control. A City of Albuquerque Topsoil Disturbance Permit will not be obtained because less than 0.75 acres will be disturbed by the VCM activities.

Because ER Site 27 is listed as a potential Radioactive Materials Management Area (RMMA), all equipment, materials, PPE, and portable facilities used at this site must be screened for radioactivity before removal from the site. SNL/NM Radiation Control Technicians will perform all release surveys of equipment and materials used or staged in

the work area, as well as any metal scrap or debris to be removed from the site for recycling or disposal as solid waste, in accordance with Radiation Protection Operating Procedures.

4.4 Waste Management Issues

A waste management plan will be prepared to address handling, segregating, staging, characterizing, and managing the waste generated as a result of the Site 27 VCM. Waste will be segregated into categories: debris, medical waste, bones and hides, contaminated soil, and clean soil. Each waste category will be characterized for waste disposal. Based on the results of the preliminary field investigations, it appears that metal contaminated soil will be the most likely waste generated. If soil contamination levels are below acceptable risk-based actions levels based on the results of constituent-specific waste characterization analytical data, the soil will be returned to the excavation as fill material.

4.5 Verification Plan

Verification sampling will be performed prior to backfilling each of the excavations to ensure that cleanup to appropriate risk-based levels has been achieved. This will be verified by performing a cumulative risk assessment with the verifications results. Subsurface soil samples will be collected from the side walls and the base of the excavation according to SNL/NM ER Field Operating Procedure 94-52. The number of samples per excavation is dependent on the size of the excavation (see section 4.3 for estimated trench dimensions)

Verification samples will be collected at each location where debris has been found. If no debris is found and the material appears to be native, one sample will be taken in the floor of the trench. The total number of verification samples per excavation is summarized below, as well as the analytical methods. All samples to be used in the risk assessment will be analyzed at the off-site commercial laboratory and SNL/NM Radiochemistry Laboratory (Dept. 7715). Some characterization sampling requiring rapid turn-around may be analyzed by the on-site chemical laboratory.

Table 2
Number of Confirmatory Samples for Site 27 VCM

Burn Pit	Mound Area	Additional Trenches
Walls: 2 Floor: 2	Walls: 2 Floor: 2	Floor: 5
4	4	5

The following analyses will be conducted for the above samples: RCRA metals plus beryllium by Methods 6010/7000, TPH by method 8015, and gross alpha, gross beta and gamma spectroscopy.

Quality assurance/quality control (QA/QC) procedures for sampling and analyzing the verification samples will follow the protocol defined in the OU 1332 RFI Work Plan, and by reference, the February 1995 SNL/NM Program Implementation Plan (PIP), Appendix F, ER Generic Quality Assurance Project Plan (QAPjP). Field duplicates, equipment rinsate blanks, and matrix spike/matrix spike duplicates will all be included as described in the QAPjP.

4.6 Site Restoration Plan

After completing the excavation and receiving confirmatory sampling and analysis data, the site will be backfilled, graded and revegetated.

4.7 Final Inspection

Upon completion of the field activities associated with the VCM, a final inspection will be scheduled. Anticipated attendees include representatives of NMED-Hazardous and Radioactive Materials Bureau (NMED-HRMB) and DOE Oversight Bureau (NMED-DOE/OB), EPA, DOE, SNL/NM, and the public.

4.8 Final Report

Upon completion of the VCM and evaluation of all data, a final report in the form of a NFA Proposal will be prepared and submitted for regulatory review. The report will include any exceptions to the VCM Plan, reasons for the exceptions, verification/confirmation data, and the rationale and justification of the NFA. A final request for a Class III permit modification will be submitted after approval of the NFA Proposal.

5.0 Project Management

5.1 Cost

The estimated cost of performing the VCM detailed in section 4.0 is approximately $212,000. based on current assumptions.

5.2 Schedule

The estimated start of field work is September 1, 1997. Field work could be completed as early as the September 14, 1997 depending on the amount of debris found. Additional time is necessary for verification analyses to be performed, analytical results to be evaluated, and a cumulative risk assessment to be performed prior to backfilling the excavation.

5.3 Stakeholder Notifications

A briefing on the proposed VCM will be presented at the August 1997 Quarterly Public Meeting. This VCM Plan will be submitted to the NMED, DOE-OB, and EPA for regulatory review.

Table 3 - VCM Schedule

Task Description	Schedule Start	Schedule Finish
Premobilization Requirements:		
HASP Addendum Approval	July 2, 1997	July 25, 1997
Waste Management Plan Approval	July 9, 1997	July 30, 1997
Sampling Plan	June 25, 1997	July 9, 1997
Conduct Readiness Review	August 15, 1997	August 15, 1997
Site Preparation:		
Establish site controls, exclusion zone, segregation/screening area, temp. waste staging area, and support zone	August 25, 1997	August 29, 1997
Field Operations:		
Conduct excavation and confirmatory sampling	September 1, 1997	September 1, 1997

6.0 References

RUST Geotech Inc., May 1993. "Project Work Plan for Phase I." P-GJPO-1352. U.S. Department of Energy Grand Junction Project Office, Grand Junction, Colorado.

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7.0 Implementation Plans

7.1 Quality Assurance Plan

This VCM will follow the QA/QC guidance contained in the OU 1332 RFI Work Plan, and by reference, the February 1995 SNL/NM Program Implementation Plan. Appendix F, ER Generic Quality Assurance Project Plan (QAPjP), and applicable SNL/NM ER Field Operation Procedures.

7.2 Health and Safety Plan

This VCM will be covered under the OU 1332 RFI Health and Safety Plan, including recent addenda covering excavation work specifically developed for this project. The addenda are currently being reviewed by SNL/NM safety personnel and will be approved prior to initiating field work.

7.3 Waste Management Plan

The waste management plan covering this VCM is currently under preparation and will be approved by SNL/NM waste management personnel prior to initiating field work. This plan will include specific protocol for constituent-specific and TCLP waste characterization sampling and analyses.

Annex II

Results of SWMU 27 VCM Sampling Analysis-Gamma Spectroscopy

ANNEX II-A
Results of SWMU 27 VCM Debris Sampling Analysis-Gamma Spectroscopy

Sandia National Laboratories
Radiation Protection Sample Diagnostics Program [881 Laboratory]
9-12-97 10:43:46 AM

Analyzed by: 9/12/97 Reviewed by: 9/12/97

Customer : C.BYRD/MAC (6685/SMO)
Customer Sample ID : 034122-003
Lab Sample ID : 70160101

Sample Description : MARINELLI SOLID SAMPLE
Sample Quantity : 604.000 gram
Sample Date/Time : 9-11-97 8:45:00 AM
Acquire Start Date/Time : 9-12-97 8:55:27 AM
Detector Name : LAB01
Elapsed Live/Real Time : 6000 / 6002 seconds

Comments:

Nuclide Name	Activity (pCi/gram)	2-sigma Error	MDA (pCi/gram)
U-238	Not Detected	---------	1.87E+00
TH-234	Not Detected	---------	7.60E-01
RA-226	2.07E+00	1.08E+00	7.59E-01
PB-214	8.90E-01	1.60E-01	6.45E-02
BI-214	7.94E-01	1.85E-01	6.94E-02
TH-232	1.07E+00	5.58E-01	1.84E-01
RA-228	1.22E+00	3.55E-01	2.19E-01
AC-228	1.14E+00	3.54E-01	1.44E-01
TH-228	6.73E-01	4.71E-01	6.41E-01
RA-224	1.07E+00	3.50E-01	1.47E-01
PB-212	1.17E+00	1.96E-01	4.75E-02
BI-212	1.40E+00	7.35E-01	3.97E-01
TL-208	1.02E+00	2.21E-01	8.87E-02
U-235	Not Detected	---------	2.59E-01
TH-231	Not Detected	---------	1.11E+01
PA-231	Not Detected	---------	1.76E+00
TH-227	Not Detected	---------	4.93E-01
RA-223	Not Detected	---------	1.83E-01
RN-219	Not Detected	---------	4.99E-01
PB-211	Not Detected	---------	1.18E+00
TL-207	Not Detected	---------	1.94E+01
AM-241	Not Detected	---------	2.42E-01
PU-239	Not Detected	---------	4.51E+02
NP-237	~~[illegible]~~	~~[illegible]~~	2.76E-01 Not detected 9/12/97
PA-233	Not Detected	---------	7.08E-02
TH-229	Not Detected	---------	2.47E-01

[Summary Report] - Sample ID: : 70160101

Nuclide Name	Activity (pCi/gram)	2-sigma Error	MDA (pCi/gram)
AG-108m	Not Detected	---------	5.84E-02
AG-110m	Not Detected	---------	3.92E-02
BA-133	Not Detected	---------	6.95E-02
BE-7	Not Detected	---------	3.20E-01
BI-207	Not Detected	---------	4.04E-02
CD-109	Not Detected	---------	1.24E+00
CD-115	Not Detected	---------	1.20E-01
CE-139	Not Detected	---------	3.21E-02
CE-141	Not Detected	---------	5.81E-02
CE-144	Not Detected	---------	2.37E-01
CO-56	Not Detected	---------	3.72E-02
CO-57	Not Detected	---------	2.96E-02
CO-58	Not Detected	---------	4.57E-02
CO-60	Not Detected	---------	5.41E-02
CR-51	Not Detected	---------	3.06E-01
CS-134	Not Detected	---------	5.53E-02
CS-137	Not Detected	---------	4.74E-02
EU-152	Not Detected	---------	8.91E-02
EU-154	Not Detected	---------	2.75E-01
EU-155	Not Detected	---------	1.39E-01
FE-59	Not Detected	---------	1.06E-01
GD-153	Not Detected	---------	1.03E-01
HG-203	Not Detected	---------	3.98E-02
I-131	Not Detected	---------	4.18E-02
IR-192	Not Detected	---------	3.34E-02
K-40	2.00E+01	3.22E+00	3.71E-01
MN-52	Not Detected	---------	4.87E-02
MN-54	Not Detected	---------	3.13E-02
MO-99	Not Detected	---------	4.34E-01
NA-22	Not Detected	---------	6.58E-02
NA-24	Not Detected	---------	1.56E-01
NB-95	Not Detected	---------	2.54E-01
ND-147	Not Detected	---------	2.93E-01
NI-57	Not Detected	---------	1.11E-01
PB-210	Not Detected	---------	9.71E+00
RU-103	Not Detected	---------	4.08E-02
RU-106	Not Detected	---------	3.87E-01
SB-122	Not Detected	---------	6.99E-02
SB-124	Not Detected	---------	3.99E-02
SB-125	Not Detected	---------	1.11E-01
SN-113	Not Detected	---------	4.65E-02
SR-85	Not Detected	---------	5.08E-02
TA-182	Not Detected	---------	2.21E-01
TA-183	Not Detected	---------	2.36E-01
TC-99m	Not Detected	---------	2.37E-01
TL-201	Not Detected	---------	1.70E-01
XE-133	Not Detected	---------	1.65E-01
Y-88	Not Detected	---------	4.16E-02
ZN-65	Not Detected	---------	1.51E-01
ZR-95	Not Detected	---------	7.94E-02

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* Sandia National Laboratories *
* Radiation Protection Sample Diagnostics Program [881 Laboratory] *
* 9-12-97 1:46:12 PM *
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* Analyzed by: 9/15/97 Reviewed by: 9/16/97 *

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Customer : C.BYRD/MAC (6685/SMO)
Customer Sample ID : 034123-003
Lab Sample ID : 70160201

Sample Description : MARINELLI SOLID SAMPLE
Sample Quantity : 629.000 gram
Sample Date/Time : 9-11-97 8:51:00 AM
Acquire Start Date/Time : 9-12-97 12:03:18 PM
Detector Name : LAB01
Elapsed Live/Real Time : 6000 / 6002 seconds

Comments:

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Nuclide Name	Activity (pCi/gram)	2-sigma Error	MDA (pCi/gram)
U-238	Not Detected	---------	1.89E+00
TH-234	7.89E-01	4.20E-01	5.86E-01
RA-226	1.86E+00	6.96E-01	7.11E-01
PB-214	7.89E-01	1.47E-01	6.50E-02
BI-214	7.61E-01	1.55E-01	6.50E-02
TH-232	1.03E+00	5.02E-01	1.78E-01
RA-228	1.18E+00	2.11E+00	2.16E-01
AC-228	1.02E+00	3.10E-01	1.46E-01
TH-228	4.45E-01	3.59E-01	5.52E-01
RA-224	1.12E+00	3.65E-01	1.31E-01
PB-212	1.06E+00	1.78E-01	4.43E-02
BI-212	8.48E-01	4.12E-01	4.50E-01
TL-208	9.61E-01	2.11E-01	9.32E-02
U-235	Not Detected	---------	2.54E-01
TH-231	Not Detected	---------	1.08E+01
PA-231	Not Detected	---------	1.70E+00
TH-227	Not Detected	---------	4.72E-01
RA-223	Not Detected	---------	1.82E-01
RN-219	Not Detected	---------	4.98E-01
PB-211	Not Detected	---------	1.14E+00
TL-207	Not Detected	---------	1.90E+01
AM-241	Not Detected	---------	2.35E-01
PU-239	Not Detected	---------	4.28E+02
NP-237	~~[illegible]~~	~~[illegible]~~	2.43E-01 not detected 9/15/97
PA-233	Not Detected	---------	6.98E-02
TH-229	Not Detected	---------	2.38E-01

[Summary Report] - Sample ID: : 70160201

Nuclide Name	Activity (pCi/gram)	2-sigma Error	MDA (pCi/gram)
AG-108m	Not Detected	---------	5.82E-02
AG-110m	Not Detected	---------	4.13E-02
BA-133	Not Detected	---------	6.52E-02
BE-7	Not Detected	---------	3.29E-01
BI-207	Not Detected	---------	3.98E-02
CD-109	Not Detected	---------	1.21E+00
CD-115	Not Detected	---------	1.20E-01
CE-139	Not Detected	---------	3.28E-02
CE-141	Not Detected	---------	5.63E-02
CE-144	Not Detected	---------	2.33E-01
CO-56	Not Detected	---------	4.89E-02
CO-57	Not Detected	---------	2.94E-02
CO-58	Not Detected	---------	4.24E-02
CO-60	Not Detected	---------	5.29E-02
CR-51	Not Detected	---------	2.98E-01
CS-134	Not Detected	---------	5.44E-02
CS-137	Not Detected	---------	3.12E-02
EU-152	Not Detected	---------	8.72E-02
EU-154	Not Detected	---------	2.68E-01
EU-155	Not Detected	---------	1.38E-01
FE-59	Not Detected	---------	1.05E-01
GD-153	Not Detected	---------	1.00E-01
HG-203	Not Detected	---------	3.86E-02
I-131	Not Detected	---------	4.01E-02
IR-192	Not Detected	---------	3.28E-02
K-40	2.00E+01	3.25E+00	2.92E-01
MN-52	Not Detected	---------	4.45E-02
MN-54	Not Detected	---------	4.96E-02
MO-99	Not Detected	---------	4.25E-01
NA-22	Not Detected	---------	5.78E-02
NA-24	Not Detected	---------	1.47E-01
NB-95	Not Detected	---------	2.48E-01
ND-147	Not Detected	---------	2.89E-01
NI-57	Not Detected	---------	1.17E-01
PB-210	Not Detected	---------	9.34E+00
RU-103	Not Detected	---------	3.85E-02
RU-106	Not Detected	---------	3.78E-01
SB-122	Not Detected	---------	6.93E-02
SB-124	Not Detected	---------	3.88E-02
SB-125	Not Detected	---------	1.09E-01
SN-113	Not Detected	---------	4.98E-02
SR-85	Not Detected	---------	5.12E-02
TA-182	Not Detected	---------	2.05E-01
TA-183	Not Detected	---------	2.33E-01
TC-99m	Not Detected	---------	7.01E-01
TL-201	Not Detected	---------	1.76E-01
XE-133	Not Detected	---------	1.64E-01
Y-88	Not Detected	---------	3.52E-02
ZN-65	Not Detected	---------	1.43E-01
ZR-95	Not Detected	---------	7.92E-02

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* Sandia National Laboratories *
* Radiation Protection Sample Diagnostics Program [881 Laboratory] *
* 9-09-97 5:51:36 PM *
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* Analyzed by: 9/9/97 Reviewed by: *

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Customer : C.BYRD/MAC (6685/SMO)
Customer Sample ID : 034128-003
Lab Sample ID : 70157401

Sample Description : MARINELLI SOLID SAMPLE
Sample Quantity : 778.000 gram
Sample Date/Time : 9-09-97 9:43:00 AM
Acquire Start Date/Time : 9-09-97 4:07:21 PM
Detector Name : LAB01
Elapsed Live/Real Time : 6000 / 6002 seconds

Comments:

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Nuclide Name	Activity (pCi/gram)	2-sigma Error	MDA (pCi/gram)
U-238	Not Detected	---------	1.38E+00
TH-234	Not Detected	---------	4.78E-01
RA-226	9.79E-01	4.23E-01	5.32E-01
PB-214	4.28E-01	9.30E-02	4.96E-02
BI-214	4.35E-01	9.94E-02	5.35E-02
TH-232	6.79E-01	3.46E-01	1.49E-01
RA-228	8.88E-01	3.14E-01	1.67E-01
AC-228	7.87E-01	9.22E-01	1.10E-01
TH-228	8.80E-01	4.26E-01	5.25E-01
RA-224	6.96E-01	3.22E-01	1.20E-01
PB-212	7.66E-01	1.22E-01	3.81E-02
BI-212	7.47E-01	3.45E-01	3.04E-01
TL-208	6.59E-01	1.90E-01	6.84E-02
U-235	Not Detected	---------	2.09E-01
TH-231	Not Detected	---------	8.30E+00
PA-231	Not Detected	---------	1.35E+00
TH-227	Not Detected	---------	3.65E-01
RA-223	Not Detected	---------	1.34E-01
RN-219	Not Detected	---------	3.86E-01
PB-211	Not Detected	---------	8.89E-01
TL-207	Not Detected	---------	1.51E+01
AM-241	Not Detected	---------	1.82E-01
PU-239	Not Detected	---------	3.47E+02
NP-237	~~2.26E-01~~	~~1.30E-01~~	1.61E-01 Not detected 9/9/97
PA-233	Not Detected	---------	5.56E-02
TH-229	Not Detected	---------	1.91E-01

[Summary Report] - Sample ID: : 70157401

Nuclide Name	Activity (pCi/gram)	2-sigma Error	MDA (pCi/gram)
AG-108m	Not Detected	---------	4.20E-02
AG-110m	Not Detected	---------	4.12E-02
BA-133	Not Detected	---------	4.75E-02
BE-7	Not Detected	---------	2.54E-01
BI-207	Not Detected	---------	3.24E-02
CD-109	Not Detected	---------	5.46E-01
CD-115	Not Detected	---------	7.12E-02
CE-139	Not Detected	---------	2.52E-02
CE-141	Not Detected	---------	4.49E-02
CE-144	Not Detected	---------	1.84E-01
CO-56	Not Detected	---------	3.84E-02
CO-57	Not Detected	---------	2.40E-02
CO-58	Not Detected	---------	3.57E-02
CO-60	Not Detected	---------	3.98E-02
CR-51	Not Detected	---------	2.30E-01
CS-134	Not Detected	---------	3.99E-02
CS-137	8.29E-02	3.23E-02	2.59E-02
EU-152	Not Detected	---------	7.21E-02
EU-154	Not Detected	---------	1.96E-01
EU-155	Not Detected	---------	1.06E-01
FE-59	Not Detected	---------	8.32E-02
GD-153	Not Detected	---------	7.71E-02
HG-203	Not Detected	---------	3.06E-02
I-131	Not Detected	---------	2.96E-02
IR-192	Not Detected	---------	2.58E-02
K-40	1.92E+01	2.99E+00	2.65E-01
MN-52	Not Detected	---------	3.47E-02
MN-54	Not Detected	---------	3.75E-02
MO-99	Not Detected	---------	3.03E-01
NA-22	Not Detected	---------	4.85E-02
NA-24	Not Detected	---------	5.07E-02
NB-95	~~1.24E-02~~	~~1.88E-02~~	7.54E-02 not detected 9/9/97
ND-147	Not Detected	---------	2.17E-01
NI-57	Not Detected	---------	5.75E-02
PB-210	Not Detected	---------	7.56E+00
RU-103	Not Detected	---------	3.08E-02
RU-106	Not Detected	---------	2.95E-01
SB-122	Not Detected	---------	4.43E-02
SB-124	Not Detected	---------	3.09E-02
SB-125	Not Detected	---------	8.78E-02
SN-113	Not Detected	---------	3.76E-02
SR-85	Not Detected	---------	3.78E-02
TA-182	Not Detected	---------	1.72E-01
TA-183	Not Detected	---------	1.60E-01
TC-99m	Not Detected	---------	5.08E-02
TL-201	Not Detected	---------	1.11E-01
XE-133	Not Detected	---------	9.85E-02
Y-88	Not Detected	---------	2.70E-02
ZN-65	Not Detected	---------	1.22E-01
ZR-95	Not Detected	---------	6.33E-02

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* Sandia National Laboratories *
* Radiation Protection Sample Diagnostics Program [881 Laboratory] *
* 9-09-97 7:38:47 PM *
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* Analyzed by: 9/9/97 Reviewed by: 9/10/97 *

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Customer : C.BYRD/MAC (6685/SMO)
Customer Sample ID : 034129-003
Lab Sample ID : 70157402

Sample Description : MARINELLI SOLID SAMPLE
Sample Quantity : 718.000 gram
Sample Date/Time : 9-09-97 9:50:00 AM
Acquire Start Date/Time : 9-09-97 5:54:30 PM
Detector Name : LAB01
Elapsed Live/Real Time : 6000 / 6003 seconds

Comments:

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Nuclide Name	Activity (pCi/gram)	2-sigma Error	MDA (pCi/gram)	
U-238	Not Detected	---------	1.65E+00	
TH-234	7.85E-01	6.13E-01	4.48E-01	
RA-226	9.57E-01	7.28E-01	5.84E-01	
PB-214	5.14E-01	1.24E-01	5.52E-02	
BI-214	4.57E-01	1.03E-01	5.52E-02	
TH-232	8.77E-01	4.56E-01	1.72E-01	
RA-228	8.66E-01	2.99E-01	1.89E-01	
AC-228	9.06E-01	2.66E-01	1.45E-01	
TH-228	7.05E-01	4.33E-01	5.24E-01	
RA-224	9.95E-01	4.15E-01	9.72E-02	
PB-212	9.02E-01	1.91E-01	3.98E-02	
BI-212	1.09E+00	4.69E-01	3.91E-01	
TL-208	8.28E-01	1.97E-01	8.05E-02	
U-235	Not Detected	---------	2.17E-01	
TH-231	~~1.28E-00~~	~~1.68E-00~~	9.25E+00	not detected 9/9/97
PA-231	Not Detected	---------	1.50E+00	
TH-227	Not Detected	---------	4.04E-01	
RA-223	Not Detected	---------	1.46E-01	
RN-219	Not Detected	---------	4.41E-01	
PB-211	Not Detected	---------	9.98E-01	
TL-207	Not Detected	---------	1.81E+01	
AM-241	Not Detected	---------	2.01E-01	
PU-239	Not Detected	---------	3.81E+02	
NP-237	~~1.03E-01~~	~~1.94E-01~~	2.11E-01	not detected 9/9/97
PA-233	Not Detected	---------	6.15E-02	
TH-229	Not Detected	---------	2.11E-01	

[Summary Report] - Sample ID: : 70157402

Nuclide Name	Activity (pCi/gram)	2-sigma Error	MDA (pCi/gram)
AG-108m	Not Detected	---------	4.87E-02
AG-110m	Not Detected	---------	3.51E-02
BA-133	Not Detected	---------	5.62E-02
BE-7	Not Detected	---------	2.83E-01
BI-207	Not Detected	---------	3.59E-02
CD-109	Not Detected	---------	1.03E+00
CD-115	Not Detected	---------	8.06E-02
CE-139	Not Detected	---------	2.84E-02
CE-141	Not Detected	---------	4.87E-02
CE-144	Not Detected	---------	2.06E-01
CO-56	Not Detected	---------	4.39E-02
CO-57	Not Detected	---------	2.62E-02
CO-58	Not Detected	---------	4.02E-02
CO-60	Not Detected	---------	4.61E-02
CR-51	Not Detected	---------	2.52E-01
CS-134	Not Detected	---------	4.56E-02
CS-137	Not Detected	---------	4.21E-02
EU-152	Not Detected	---------	7.91E-02
EU-154	Not Detected	---------	2.28E-01
EU-155	Not Detected	---------	1.25E-01
FE-59	Not Detected	---------	9.54E-02
GD-153	Not Detected	---------	8.68E-02
HG-203	Not Detected	---------	3.38E-02
I-131	Not Detected	---------	3.17E-02
IR-192	Not Detected	---------	2.99E-02
K-40	2.55E+01	3.80E+00	2.91E-01
MN-52	Not Detected	---------	4.02E-02
MN-54	Not Detected	---------	4.29E-02
MO-99	Not Detected	---------	3.26E-01
NA-22	Not Detected	---------	5.49E-02
NA-24	Not Detected	---------	5.93E-02
NB-95	Not Detected	---------	1.83E-01
ND-147	Not Detected	---------	2.32E-01
NI-57	Not Detected	---------	6.57E-02
PB-210	Not Detected	---------	8.14E+00
RU-103	Not Detected	---------	3.47E-02
RU-106	Not Detected	---------	3.37E-01
SB-122	Not Detected	---------	5.26E-02
SB-124	Not Detected	---------	3.61E-02
SB-125	Not Detected	---------	9.58E-02
SN-113	Not Detected	---------	4.12E-02
SR-85	Not Detected	---------	4.26E-02
TA-182	Not Detected	---------	1.89E-01
TA-183	Not Detected	---------	1.79E-01
TC-99m	Not Detected	---------	6.48E-02
TL-201	Not Detected	---------	1.25E-01
XE-133	Not Detected	---------	1.13E-01
Y-88	Not Detected	---------	3.15E-02
ZN-65	Not Detected	---------	1.29E-01
ZR-95	Not Detected	---------	6.93E-02

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* Sandia National Laboratories *
* Radiation Protection Sample Diagnostics Program [881 Laboratory] *
* 9-19-97 3:24:33 AM *
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* Analyzed by: 9/15/97 Reviewed by: 9/19/97 *
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Customer : C. BYRD/D. BISWELL (6685/SMO)
Customer Sample ID : 035139-003
Lab Sample ID : 70164707

Sample Description : MARINELLI SOLID SAMPLE
Sample Quantity : 549.000 gram
Sample Date/Time : 9-17-97 11:50:00 AM
Acquire Start Date/Time : 9-19-97 1:41:50 AM
Detector Name : LAB02
Elapsed Live/Real Time : 6000 / 6003 seconds

Comments:
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Nuclide Name	Activity (pCi/gram)	2-sigma Error	MDA (pCi/gram)
U-238	Not Detected	---------	4.27E+00
TH-234	1.31E+00	6.74E-01	8.00E-01
RA-226	1.70E+00	6.55E-01	7.55E-01
PB-214	6.92E-01	1.50E-01	5.66E-02
BI-214	6.21E-01	1.24E-01	5.41E-02
TH-232	9.78E-01	5.33E-01	1.92E-01
RA-228	1.07E+00	2.88E-01	1.79E-01
AC-228	1.08E+00	9.54E-01	1.05E-01
TH-228	9.52E-01	3.13E-01	5.93E-01
RA-224	1.01E+00	3.18E-01	1.12E-01
PB-212	9.83E-01	1.67E-01	4.87E-02
BI-212	1.07E+00	5.42E-01	3.85E-01
TL-208	9.20E-01	1.40E+00	7.93E-02
U-235	Not Detected	---------	3.01E-01
TH-231	Not Detected	---------	1.56E+01
PA-231	Not Detected	---------	1.80E+00
TH-227	Not Detected	---------	4.42E-01
RA-223	Not Detected	---------	2.66E-01
RN-219	Not Detected	---------	4.69E-01
PB-211	Not Detected	---------	1.08E+00
TL-207	Not Detected	---------	1.73E+01
AM-241	Not Detected	---------	6.05E-01
PU-239	Not Detected	---------	5.54E+02
NP-237	Not Detected	---------	4.83E-01
PA-233	Not Detected	---------	7.20E-02
TH-229	Not Detected	---------	3.13E-01

[Summary Report] - Sample ID: : 70164707

Nuclide Name	Activity (pCi/gram)	2-sigma Error	MDA (pCi/gram)
AG-108m	Not Detected	---------	5.34E-02
AG-110m	Not Detected	---------	5.15E-02
BA-133	Not Detected	---------	7.90E-02
BE-7	Not Detected	---------	3.24E-01
~~CD-109~~	~~2.20E+00~~	~~1.13E+00~~	1.32E+00 not detected
CD-115	Not Detected	---------	1.35E-01
CE-139	Not Detected	---------	3.73E-02
CE-141	Not Detected	---------	6.70E-02
CE-144	Not Detected	---------	3.05E-01
CO-56	Not Detected	---------	3.15E-02
CO-57	Not Detected	---------	3.74E-02
CO-58	Not Detected	---------	4.14E-02
CO-60	Not Detected	---------	4.56E-02
CR-51	Not Detected	---------	2.94E-01
CS-134	Not Detected	---------	5.88E-02
CS-137	Not Detected	---------	3.16E-02
EU-152	Not Detected	---------	1.12E-01
EU-154	Not Detected	---------	2.46E-01
EU-155	Not Detected	---------	1.87E-01
FE-59	Not Detected	---------	9.23E-02
GD-153	Not Detected	---------	1.29E-01
HG-203	Not Detected	---------	4.08E-02
I-131	Not Detected	---------	4.03E-02
IR-192	Not Detected	---------	3.44E-02
K-40	2.11E+01	3.18E+00	3.50E-01
MN-52	Not Detected	---------	4.32E-02
MN-54	Not Detected	---------	4.54E-02
MO-99	Not Detected	---------	4.43E-01
NA-22	Not Detected	---------	5.31E-02
NA-24	Not Detected	---------	2.33E-01
NB-95	Not Detected	---------	2.75E-01
ND-147	Not Detected	---------	2.88E-01
NI-57	Not Detected	---------	1.24E-01
PB-210	Not Detected	---------	4.41E+01
RU-103	Not Detected	---------	3.74E-02
RU-106	Not Detected	---------	3.75E-01
SB-122	Not Detected	---------	7.54E-02
SB-124	Not Detected	---------	3.98E-02
SB-125	Not Detected	---------	9.94E-02
SN-113	Not Detected	---------	4.59E-02
SR-85	Not Detected	---------	4.89E-02
TA-182	Not Detected	---------	1.82E-01
TA-183	Not Detected	---------	6.47E-01
TC-99m	Not Detected	---------	2.84E+00
TL-201	Not Detected	---------	3.22E-01
XE-133	Not Detected	---------	2.87E-01
Y-88	Not Detected	---------	3.77E-02
ZN-65	Not Detected	---------	1.28E-01
ZR-95	Not Detected	---------	7.31E-02

5/15/97

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* Sandia National Laboratories *
* Radiation Protection Sample Diagnostics Program [881 Laboratory] *
* 9-19-97 9:57:11 AM *
****

* Analyzed by: 9/19/97 Reviewed by: 9/19/97 *

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Customer : C. BYRD/D. BISWELL (6685/SMO)
Customer Sample ID : 035140-003
Lab Sample ID : 70164708

Sample Description : MARINELLI SOLID SAMPLE
Sample Quantity : 690.000 gram
Sample Date/Time : 9-17-97 12:00:00 PM
Acquire Start Date/Time : 9-19-97 3:26:41 AM
Detector Name : LAB02
Elapsed Live/Real Time : 6000 / 6003 seconds

Comments:

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Nuclide Name	Activity (pCi/gram)	2-sigma Error	MDA (pCi/gram)
U-238	Not Detected	---------	3.43E+00
TH-234	1.43E+00	8.39E-01	7.11E-01
RA-226	1.36E+00	5.33E-01	5.53E-01
PB-214	5.95E-01	1.22E-01	5.34E-02
BI-214	5.34E-01	1.48E-01	4.78E-02
TH-232	8.63E-01	4.25E-01	1.56E-01
RA-228	1.03E+00	2.97E-01	1.52E-01
AC-228	8.94E-01	2.11E-01	8.33E-02
TH-228	9.46E-01	2.79E-01	4.79E-01
RA-224	9.36E-01	3.05E-01	7.06E-02
PB-212	9.01E-01	1.48E-01	4.31E-02
BI-212	1.03E+00	3.79E-01	2.97E-01
TL-208	8.33E-01	1.65E-01	7.29E-02
U-235	Not Detected	---------	2.57E-01
TH-231	Not Detected	---------	1.36E+01
PA-231	Not Detected	---------	1.51E+00
TH-227	Not Detected	---------	3.79E-01
RA-223	Not Detected	---------	2.33E-01
RN-219	Not Detected	---------	4.03E-01
PB-211	Not Detected	---------	9.01E-01
TL-207	Not Detected	---------	1.43E+01
AM-241	Not Detected	---------	5.03E-01
PU-239	Not Detected	---------	4.72E+02
NP-237	Not Detected	---------	4.12E-01
PA-233	Not Detected	---------	6.23E-02
TH-229	Not Detected	---------	2.70E-01

[Summary Report] - Sample ID: : 70164708

Nuclide Name	Activity (pCi/gram)	2-sigma Error	MDA (pCi/gram)
AG-108m	Not Detected	---------	4.42E-02
AG-110m	Not Detected	---------	4.20E-02
BA-133	Not Detected	---------	6.68E-02
BE-7	Not Detected	---------	2.67E-01
CD-109	~~1.84E+00~~	~~9.92E-01~~	1.24E+00 not detected 5/13/9
CD-115	Not Detected	---------	1.16E-01
CE-139	Not Detected	---------	3.15E-02
CE-141	Not Detected	---------	5.72E-02
CE-144	Not Detected	---------	2.56E-01
CO-56	Not Detected	---------	2.74E-02
CO-57	Not Detected	---------	3.21E-02
CO-58	Not Detected	---------	3.51E-02
CO-60	Not Detected	---------	3.79E-02
CR-51	Not Detected	---------	2.54E-01
CS-134	Not Detected	---------	4.90E-02
CS-137	9.41E-02	2.89E-02	2.49E-02
EU-152	Not Detected	---------	9.66E-02
EU-154	Not Detected	---------	2.02E-01
EU-155	Not Detected	---------	1.60E-01
FE-59	Not Detected	---------	7.97E-02
GD-153	Not Detected	---------	1.10E-01
HG-203	Not Detected	---------	3.43E-02
I-131	Not Detected	---------	3.39E-02
IR-192	Not Detected	---------	2.94E-02
K-40	2.00E+01	2.95E+00	2.75E-01
MN-52	Not Detected	---------	3.68E-02
MN-54	Not Detected	---------	3.86E-02
MO-99	Not Detected	---------	3.73E-01
NA-22	Not Detected	---------	4.54E-02
NA-24	Not Detected	---------	2.10E-01
NB-95	Not Detected	---------	2.39E-01
ND-147	Not Detected	---------	2.34E-01
NI-57	Not Detected	---------	6.33E-02
PB-210	Not Detected	---------	3.64E+01
RU-103	Not Detected	---------	3.20E-02
RU-106	Not Detected	---------	3.04E-01
SB-122	Not Detected	---------	6.22E-02
SB-124	Not Detected	---------	3.26E-02
SB-125	Not Detected	---------	8.56E-02
SN-113	Not Detected	---------	4.02E-02
SR-85	Not Detected	---------	4.03E-02
TA-182	Not Detected	---------	1.54E-01
TA-183	Not Detected	---------	5.36E-01
TC-99m	Not Detected	---------	2.89E+00
TL-201	Not Detected	---------	2.80E-01
XE-133	Not Detected	---------	2.57E-01
Y-88	Not Detected	---------	2.69E-02
ZN-65	Not Detected	---------	1.06E-01
ZR-95	Not Detected	---------	6.42E-02

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* Sandia National Laboratories *
* Radiation Protection Sample Diagnostics Program [881 Laboratory] *
* 9-09-97 5:29:28 PM *
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*
* Analyzed by: 9/9/97 Reviewed by: 9/10/97 *
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Customer : C.BYRD/MAC (6685/SMO)
Customer Sample ID : 034141-003
Lab Sample ID : 70157501

Sample Description : MARINELLI WATER SAMPLE
Sample Quantity : 500.000 mL
Sample Date/Time : 9-09-97 10:41:00 AM
Acquire Start Date/Time : 9-09-97 3:45:17 PM
Detector Name : LAB04
Elapsed Live/Real Time : 6000 / 6001 seconds

Comments:
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Nuclide Name	Activity (pCi/mL)	2-sigma Error	MDA (pCi/mL)
U-238	Not Detected	---------	8.64E-01
TH-234	Not Detected	---------	2.96E-01
RA-226	Not Detected	---------	4.37E-01
PB-214	Not Detected	---------	4.10E-02
BI 214	Not Detected	---------	4.95E-02
TH-232	Not Detected	---------	1.41E-01
RA-228	Not Detected	---------	1.16E-01
AC-228	Not Detected	---------	7.14E-02
TH-228	Not Detected	---------	4.29E-01
RA-224	Not Detected	---------	1.10E-01
PB-212	2.77E-02	2.31E-02	2.33E-02
BI-212	Not Detected	---------	2.70E-01
TL-208	Not Detected	---------	6.73E-02
U-235	Not Detected	---------	1.29E-01
TH-231	Not Detected	---------	4.67E+00
PA-231	Not Detected	---------	9.17E-01
TH-227	Not Detected	---------	1.29E-01
RA-223	Not Detected	---------	7.44E-02
RN-219	Not Detected	---------	2.41E-01
PB-211	Not Detected	---------	5.30E-01
TL-207	Not Detected	---------	7.49E+00
AM-241	Not Detected	---------	1.05E-01
PU-239	Not Detected	---------	2.12E+02
NP-237	Not Detected	---------	1.38E-01
PA-233	Not Detected	---------	3.97E-02
TH-229	Not Detected	---------	1.16E-01

[Summary Report] - Sample ID: : 70157501

Nuclide Name	Activity (pCi/mL)	2-sigma Error	MDA (pCi/mL)
AG-108m	Not Detected	---------	2.05E-02
AG-110m	Not Detected	---------	1.94E-02
BA-133	Not Detected	---------	2.58E-02
BE-7	Not Detected	---------	1.68E-01
BI-207	Not Detected	---------	1.99E-02
CD-109	Not Detected	---------	4.63E-01
CD-115	Not Detected	---------	3.67E-02
CE-139	Not Detected	---------	1.59E-02
CE-141	Not Detected	---------	2.67E-02
CE-144	Not Detected	---------	1.18E-01
CO-56	Not Detected	---------	2.09E-02
CO-57	Not Detected	---------	1.44E-02
CO-58	Not Detected	---------	1.84E-02
CO-60	Not Detected	---------	2.36E-02
CR-51	Not Detected	---------	1.52E-01
CS-134	Not Detected	---------	2.36E-02
CS-137	Not Detected	---------	1.93E-02
EU-152	Not Detected	---------	4.34E-02
EU-154	Not Detected	---------	9.54E-02
EU-155	Not Detected	---------	6.79E-02
FE-59	Not Detected	---------	3.47E-02
GD-153	Not Detected	---------	4.70E-02
HG-203	Not Detected	---------	1.73E-02
I-131	Not Detected	---------	1.76E-02
IR-192	Not Detected	---------	1.80E-02
K-40	Not Detected	---------	2.27E-01
MN-52	Not Detected	---------	1.77E-02
MN-54	Not Detected	---------	2.04E-02
MO-99	Not Detected	---------	1.53E-01
NA-22	Not Detected	---------	2.19E-02
NA-24	Not Detected	---------	2.41E-02
NB-95	Not Detected	---------	6.16E-02
ND-147	Not Detected	---------	1.30E-01
NI-57	Not Detected	---------	3.06E-02
PB-210	Not Detected	---------	4.06E+00
RU-103	Not Detected	---------	2.01E-02
RU-106	Not Detected	---------	2.02E-01
SB-122	Not Detected	---------	2.68E-02
SB-124	Not Detected	---------	2.26E-02
SB-125	Not Detected	---------	4.80E-02
SN-113	Not Detected	---------	2.42E-02
SR-85	Not Detected	---------	2.86E-02
TA-182	Not Detected	---------	6.83E-02
TA-183	Not Detected	---------	9.27E-02
TC-99m	Not Detected	---------	2.28E-02
TL-201	Not Detected	---------	5.67E-02
XE-133	Not Detected	---------	5.73E-02
Y-88	Not Detected	---------	2.31E-02
ZN-65	Not Detected	---------	4.96E-02
ZR-95	Not Detected	---------	3.09E-02

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* Sandia National Laboratories *
* Radiation Protection Sample Diagnostics Program [881 Laboratory] *
* 9-09-97 7:10:33 PM *
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* *
* Analyzed by: 9/5/97 Reviewed by: 9/10/97 *
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Customer : C.BYRD/MAC (6685/SMO)
Customer Sample ID : 034142-003
Lab Sample ID : 70157502

Sample Description : MARINELLI WATER SAMPLE
Sample Quantity : 500.000 mL
Sample Date/Time : 9-09-97 10:30:00 AM
Acquire Start Date/Time : 9-09-97 5:27:51 PM
Detector Name : LAB04
Elapsed Live/Real Time : 6000 / 6001 seconds

Comments:
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Nuclide Name	Activity (pCi/mL)	2-sigma Error	MDA (pCi/mL)
U-238	Not Detected	---------	8.78E-01
TH-234	Not Detected	---------	2.91E-01
RA-226	Not Detected	---------	4.21E-01
PB-214	Not Detected	---------	4.34E-02
BI-214	Not Detected	---------	4.40E-02
TH-232	Not Detected	---------	1.31E-01
RA-228	Not Detected	---------	1.19E-01
AC-228	Not Detected	---------	7.29E-02
TH-228	Not Detected	---------	4.21E-01
RA-224	Not Detected	---------	8.12E-02
PB-212	Not Detected	---------	3.22E-02
BI-212	Not Detected	---------	2.86E-01
TL-208	Not Detected	---------	5.59E-02
U-235	Not Detected	---------	1.27E-01
TH-231	Not Detected	---------	4.67E+00
PA-231	Not Detected	---------	9.32E-01
TH-227	Not Detected	---------	1.15E-01
RA-223	Not Detected	---------	7.42E-02
RN-219	Not Detected	---------	2.36E-01
PB-211	Not Detected	---------	5.10E-01
TL-207	Not Detected	---------	8.59E+00
AM-241	Not Detected	---------	1.10E-01
PU-239	Not Detected	---------	2.08E+02
NP-237	Not Detected	---------	1.37E-01
PA-233	Not Detected	---------	3.92E-02
TH-229	Not Detected	---------	1.15E-01

[Summary Report] - Sample ID: : 70157502

Nuclide Name	Activity (pCi/mL)	2-sigma Error	MDA (pCi/mL)
AG-108m	Not Detected	---------	2.07E-02
AG-110m	Not Detected	---------	1.87E-02
BA-133	Not Detected	---------	2.69E-02
BE-7	Not Detected	---------	1.64E-01
BI-207	Not Detected	---------	1.84E-02
CD-109	Not Detected	---------	4.43E-01
CD-115	Not Detected	---------	3.61E-02
CE-139	Not Detected	---------	1.54E-02
CE-141	Not Detected	---------	2.70E-02
CE-144	Not Detected	---------	1.17E-01
CO-56	Not Detected	---------	2.05E-02
CO-57	Not Detected	---------	1.41E-02
CO-58	Not Detected	---------	1.86E-02
CO-60	Not Detected	---------	2.20E-02
CR-51	Not Detected	---------	1.54E-01
CS-134	Not Detected	---------	2.24E-02
CS-137	Not Detected	---------	2.06E-02
EU-152	Not Detected	---------	4.25E-02
EU-154	Not Detected	---------	9.54E-02
EU-155	Not Detected	---------	6.55E-02
FE-59	Not Detected	---------	3.67E-02
GD-153	Not Detected	---------	4.73E-02
HG-203	Not Detected	---------	1.91E-02
I-131	Not Detected	---------	1.99E-02
IR-192	Not Detected	---------	1.84E-02
K-40	Not Detected	---------	2.68E-01
MN-52	Not Detected	---------	1.86E-02
MN-54	Not Detected	---------	2.09E-02
MO-99	Not Detected	---------	1.51E-01
NA-22	Not Detected	---------	2.00E-02
NA-24	Not Detected	---------	2.75E-02
NB-95	Not Detected	---------	5.61E-02
ND-147	Not Detected	---------	1.23E-01
NI-57	Not Detected	---------	3.18E-02
PB-210	Not Detected	-------	3.74E+00
RU-103	Not Detected	---------	2.11E-02
RU-106	Not Detected	---------	1.95E-01
SB-122	Not Detected	---------	2.79E-02
SB-124	Not Detected	---------	2.25E-02
SB-125	Not Detected	---------	5.05E-02
SN-113	Not Detected	---------	2.24E-02
SR-85	Not Detected	------	2.78E-02
TA-182	Not Detected	---------	5.89E-02
TA-183	Not Detected	---------	9.74E-02
TC-99m	Not Detected	---------	3.23E-02
TL-201	Not Detected	---------	5.76E-02
XE-133	Not Detected	---------	5.58E-02
Y-88	Not Detected	---------	2.31E-02
ZN-65	Not Detected	---------	3.93E-02
ZR-95	Not Detected	---------	3.52E-02

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* **Sandia National Laboratories** *
* **Radiation Protection Sample Diagnostics Program [881 Laboratory]** *
* **9-15-97 11:25:08 AM** *
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* *
* Analyzed by: 9/15/97 Reviewed by: 9/16/97 *
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Customer : C.BYRD/MAC (6685/SMO)
Customer Sample ID : 034195-003
Lab Sample ID : 70160207

Sample Description : MARINELLI WATER SAMPLE
Sample Quantity : 485.000 mL
Sample Date/Time : 9-11-97 11:10:00 AM
Acquire Start Date/Time : 9-15-97 9:43:17 AM
Detector Name : LAB01
Elapsed Live/Real Time : 6000 / 6001 seconds

Comments:

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Nuclide Name	Activity (pCi/mL)	2-sigma Error	MDA (pCi/mL)
U-238	Not Detected	---------	7.89E-01
TH-234	Not Detected	---------	3.24E-01
RA-226	Not Detected	---------	4.73E-01
PB-214	Not Detected	---------	6.06E-02
BI-214	Not Detected	---------	5.65E-02
TH-232	Not Detected	---------	1.51E-01
RA-228	Not Detected	---------	1.69E-01
AC-228	Not Detected	---------	1.05E-01
TH-228	Not Detected	---------	5.54E-01
RA-224	Not Detected	---------	1.65E-01
PB-212	Not Detected	---------	2.59E-02
BI-212	Not Detected	---------	3.74E-01
TL-208	Not Detected	---------	7.74E-02
U-235	Not Detected	---------	1.35E-01
TH-231	Not Detected	---------	4.60E+00
PA-231	Not Detected	---------	1.08E+00
TH-227	Not Detected	---------	1.60E-01
RA-223	Not Detected	---------	9.11E-02
RN-219	Not Detected	---------	3.08E-01
PB-211	Not Detected	---------	6.94E-01
TL-207	Not Detected	---------	1.06E+01
AM-241	Not Detected	---------	9.96E-02
PU-239	Not Detected	---------	2.16E+02
NP-237	Not Detected	---------	1.45E-01
PA-233	Not Detected	---------	4.41E-02
TH-229	Not Detected	---------	1.22E-01

[Summary Report] - Sample ID: : 70160207

Nuclide Name	Activity (pCi/mL)	2-sigma Error	MDA (pCi/mL)
AG-108m	Not Detected	---------	2.61E-02
AG-110m	Not Detected	---------	2.37E-02
BA-133	Not Detected	---------	3.38E-02
BE-7	Not Detected	---------	2.06E-01
BI-207	Not Detected	---------	2.87E-02
CD-109	Not Detected	---------	4.85E-01
CD-115	Not Detected	---------	1.25E-01
CE-139	Not Detected	---------	1.87E-02
CE-141	Not Detected	---------	3.28E-02
CE-144	Not Detected	---------	1.27E-01
CO-56	Not Detected	---------	3.90E-02
CO-57	Not Detected	---------	1.61E-02
CO-58	Not Detected	---------	2.75E-02
CO-60	Not Detected	---------	2.98E-02
CR-51	Not Detected	---------	2.04E-01
CS-134	Not Detected	---------	2.74E-02
CS-137	Not Detected	---------	2.72E-02
EU-152	Not Detected	---------	4.87E-02
EU-154	Not Detected	---------	1.22E-01
EU-155	Not Detected	---------	6.87E-02
FE-59	Not Detected	---------	4.72E-02
GD-153	Not Detected	---------	5.00E-02
HG-203	Not Detected	---------	2.51E-02
I-131	Not Detected	---------	3.24E-02
IR-192	Not Detected	---------	2.29E-02
K-40	Not Detected	---------	3.86E-01
MN-52	Not Detected	---------	4.32E-02
MN-54	Not Detected	---------	2.72E-02
MO-99	Not Detected	---------	5.35E-01
NA-22	Not Detected	---------	2.51E-02
NA-24	Not Detected	---------	2.09E+00
NB-95	Not Detected	---------	1.53E-01
ND-147	Not Detected	---------	2.17E-01
NI-57	Not Detected	---------	2.16E-01
PB-210	Not Detected	---------	3.61E+00
RU-103	Not Detected	---------	2.92E-02
RU-106	Not Detected	---------	2.29E-01
SB-122	Not Detected	---------	7.98E-02
SB-124	Not Detected	---------	2.79E-02
SB-125	Not Detected	---------	7.60E-02
SN-113	Not Detected	---------	3.08E-02
SR-85	Not Detected	---------	3.59E-02
TA-182	Not Detected	---------	8.29E-02
TA-183	Not Detected	---------	1.44E-01
TC-99m	Not Detected	---------	9.09E+02
TL-201	Not Detected	---------	1.41E-01
XE-133	Not Detected	---------	1.86E-01
Y-88	Not Detected	---------	3.30E-02
ZN-65	Not Detected	---------	5.62E-02
ZR-95	Not Detected	---------	4.51E-02

****
* Sandia National Laboratories *
* Radiation Protection Sample Diagnostics Program [881 Laboratory] *
* 9-15-97 1:09:02 PM *
****
* *
* Analyzed by: 9/15/97 Reviewed by: 9/16/97 *
****

Customer : C.BYRD/MAC (6685/SMO)
Customer Sample ID : 034196-003
Lab Sample ID : 70160208

Sample Description : MARINELLI WATER SAMPLE
Sample Quantity : 500.000 mL
Sample Date/Time : 9-11-97 11:00:00 AM
Acquire Start Date/Time : 9-15-97 11:27:09 AM
Detector Name : LAB01
Elapsed Live/Real Time : 6000 / 6001 seconds

Comments:

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Nuclide Name	Activity (pCi/mL)	2-sigma Error	MDA (pCi/mL)
U-238	Not Detected	---------	7.86E-01
TH-234	Not Detected	---------	2.17E-01
RA-226	Not Detected	---------	4.78E-01
PB-214	Not Detected	---------	5.28E-02
BI-214	Not Detected	---------	6.01E-02
TH-232	Not Detected	---------	1.53E-01
RA-228	Not Detected	---------	1.40E-01
AC-228	Not Detected	---------	9.90E-02
TH-228	Not Detected	---------	5.31E-01
RA-224	Not Detected	---------	1.42E-01
PB-212	Not Detected	---------	4.09E-02
BI-212	Not Detected	---------	3.77E-01
TL-208	Not Detected	---------	7.78E-02
U-235	Not Detected	---------	1.36E-01
TH-231	Not Detected	---------	4.81E+00
PA-231	Not Detected	---------	1.02E+00
TH-227	Not Detected	---------	1.55E-01
RA-223	Not Detected	---------	9.45E-02
RN-219	Not Detected	---------	3.03E-01
PB-211	Not Detected	---------	6.88E-01
TL-207	Not Detected	---------	1.03E+01
AM-241	Not Detected	---------	9.77E-02
PU-239	Not Detected	---------	2.22E+02
NP-237	Not Detected	---------	1.38E-01
PA-233	Not Detected	---------	4.58E-02
TH-229	Not Detected	---------	1.15E-01

[Summary Report] - Sample ID: : 70160208

Nuclide Name	Activity (pCi/mL)	2-sigma Error	MDA (pCi/mL)
AG-108m	Not Detected	---------	2.71E-02
AG-110m	Not Detected	---------	2.32E-02
BA-133	Not Detected	---------	3.18E-02
BE-7	Not Detected	---------	1.82E-01
BI-207	Not Detected	---------	2.25E-02
CD-109	Not Detected	---------	4.65E-01
CD-115	Not Detected	---------	1.35E-01
CE-139	Not Detected	---------	1.74E-02
CE-141	Not Detected	---------	3.24E-02
CE-144	Not Detected	---------	1.24E-01
CO-56	Not Detected	---------	3.59E-02
CO-57	Not Detected	---------	1.62E-02
CO-58	Not Detected	---------	2.85E-02
CO-60	Not Detected	---------	2.74E-02
CR-51	Not Detected	---------	1.98E-01
CS-134	Not Detected	---------	2.75E-02
CS-137	Not Detected	---------	2.76E-02
EU-152	Not Detected	---------	4.78E-02
EU-154	Not Detected	---------	1.26E-01
EU-155	Not Detected	---------	6.33E-02
FE-59	Not Detected	---------	5.29E-02
GD-153	Not Detected	---------	4.84E-02
HG-203	Not Detected	---------	2.12E-02
I-131	Not Detected	---------	3.17E-02
IR-192	Not Detected	---------	2.12E-02
K-40	Not Detected	---------	3.26E-01
MN-52	Not Detected	---------	4.72E-02
MN-54	Not Detected	---------	2.80E-02
MO-99	Not Detected	---------	5.16E-01
NA-22	Not Detected	---------	2.73E-02
NA-24	Not Detected	---------	2.61E+00
NB-95	Not Detected	---------	1.53E-01
ND-147	Not Detected	---------	2.18E-01
NI-57	Not Detected	---------	2.72E-01
PB-210	Not Detected	---------	3.70E+00
RU-103	Not Detected	---------	2.74E-02
RU-106	Not Detected	---------	2.28E-01
SB-122	Not Detected	---------	8.53E-02
SB-124	Not Detected	---------	2.88E-02
SB-125	Not Detected	---------	7.37E-02
SN-113	Not Detected	---------	2.89E-02
SR-85	Not Detected	---------	3.33E-02
TA-182	Not Detected	---------	7.93E-02
TA-183	Not Detected	---------	1.43E-01
TC-99m	Not Detected	---------	1.17E+03
TL-201	Not Detected	---------	1.33E-01
XE-133	Not Detected	---------	1.89E-01
Y-88	Not Detected	---------	3.11E-02
ZN-65	Not Detected	---------	6.00E-02
ZR-95	Not Detected	---------	4.77E-02

****
* Sandia National Laboratories *
* Radiation Protection Sample Diagnostics Program [881 Laboratory] *
* 9-19-97 8:37:33 AM *
****
* *
* Analyzed by: 9/19/97 Reviewed by: 9/19/97 *
****

Customer : C. BYRD/D. BISWELL (6685/SMO)
Customer Sample ID : 035229-003
Lab Sample ID : 70164710

Sample Description : MARINELLI WATER SAMPLE
Sample Quantity : 500.000 mL
Sample Date/Time : 9-17-97 12:25:00 PM
Acquire Start Date/Time : 9-19-97 6:55:30 AM
Detector Name : LAB02
Elapsed Live/Real Time : 6000 / 6001 seconds

Comments:
****

Nuclide Name	Activity (pCi/mL)	2-sigma Error	MDA (pCi/mL)
U-238	Not Detected	---------	1.83E+00
TH-234	Not Detected	---------	3.99E-01
RA-226	Not Detected	---------	4.59E-01
PB-214	Not Detected	---------	4.98E-02
BI-214	Not Detected	---------	5.56E-02
TH-232	Not Detected	---------	1.50E-01
RA-228	Not Detected	---------	1.43E-01
AC-228	Not Detected	---------	8.45E-02
TH-228	Not Detected	---------	4.94E-01
RA-224	Not Detected	---------	1.15E-01
PB-212	Not Detected	---------	3.59E-02
BI-212	Not Detected	---------	3.25E-01
TL-208	Not Detected	---------	6.24E-02
U-235	Not Detected	---------	1.52E-01
TH-231	Not Detected	---------	6.15E+00
PA-231	Not Detected	---------	1.01E+00
TH-227	Not Detected	---------	1.33E-01
RA-223	Not Detected	---------	1.06E-01
RN-219	Not Detected	---------	2.35E-01
PB-211	Not Detected	---------	5.33E-01
TL-207	Not Detected	---------	8.45E+00
AM-241	Not Detected	---------	2.57E-01
PU-239	Not Detected	---------	2.66E+02
NP-237	Not Detected	---------	1.82E-01
PA-233	Not Detected	---------	4.03E-02
TH-229	Not Detected	---------	1.44E-01

[Summary Report] - Sample ID: : 70164710

Nuclide Name	Activity (pCi/mL)	2-sigma Error	MDA (pCi/mL)
AG-108m	Not Detected	---------	2.41E-02
AG-110m	Not Detected	---------	2.02E-02
BA-133	Not Detected	---------	3.09E-02
BE-7	Not Detected	---------	1.83E-01
CD-109	Not Detected	---------	6.29E-01
CD-115	Not Detected	---------	6.34E-02
CE-139	Not Detected	---------	1.96E-02
CE-141	Not Detected	---------	3.37E-02
CE-144	Not Detected	---------	1.52E-01
CO-56	Not Detected	---------	3.06E-02
CO-57	Not Detected	---------	1.84E-02
CO-58	Not Detected	---------	2.11E-02
CO-60	Not Detected	---------	2.25E-02
CR-51	Not Detected	---------	1.70E-01
CS-134	Not Detected	---------	2.57E-02
CS-137	Not Detected	---------	2.19E-02
EU-152	Not Detected	---------	5.52E-02
EU-154	Not Detected	---------	1.12E-01
EU-155	Not Detected	---------	8.67E-02
FE-59	Not Detected	---------	4.38E-02
GD-153	Not Detected	---------	5.96E-02
HG-203	Not Detected	---------	2.13E-02
I-131	Not Detected	---------	2.57E-02
IR-192	Not Detected	---------	1.94E-02
K-40	Not Detected	---------	2.64E-01
MN-52	Not Detected	---------	2.83E-02
MN-54	Not Detected	---------	2.19E-02
MO-99	Not Detected	---------	2.51E-01
NA-22	Not Detected	---------	2.50E-02
NA-24	Not Detected	---------	1.83E-01
NB-95	Not Detected	---------	8.56E-02
ND-147	Not Detected	---------	1.52E-01
NI-57	Not Detected	---------	7.01E-02
PB-210	Not Detected	---------	1.42E+01
RU-103	Not Detected	---------	2.44E-02
RU-106	Not Detected	---------	2.22E-01
SB-122	Not Detected	---------	4.39E-02
SB-124	Not Detected	---------	2.46E-02
SB-125	Not Detected	---------	5.61E-02
SN-113	Not Detected	---------	2.66E-02
SR-85	Not Detected	---------	3.08E-02
TA-182	Not Detected	---------	7.61E-02
TA-183	Not Detected	---------	2.72E-01
TC-99m	~~1.22E+00~~	~~1.07E+00~~	2.07E+00 Not detected
TL-201	Not Detected	---------	1.37E-01
XE-133	Not Detected	---------	1.23E-01
Y-88	Not Detected	---------	2.56E-02
ZN-65	Not Detected	---------	5.19E-02
ZR-95	Not Detected	---------	3.66E-02

5/15/97

****
* Sandia National Laboratories *
* Radiation Protection Sample Diagnostics Program [881 Laboratory] *
* 9-19-97 6:53:30 AM *
****

* Analyzed by: 9/19/97 Reviewed by: 9/19/97 *

****

Customer : C. BYRD/D. BISWELL (6685/SMO)
Customer Sample ID : 035230-003
Lab Sample ID : 70164709

Sample Description : MARINELLI WATER SAMPLE
Sample Quantity : 500.000 mL
Sample Date/Time : 9-17-97 12:36:00 PM
Acquire Start Date/Time : 9-19-97 5:11:36 AM
Detector Name : LAB02
Elapsed Live/Real Time : 6000 / 6001 seconds

Comments:

****

Nuclide Name	Activity (pCi/mL)	2-sigma Error	MDA (pCi/mL)
U-238	Not Detected	---------	1.72E+00
TH-234	Not Detected	---------	4.18E-01
RA-226	Not Detected	---------	4.88E-01
PB-214	Not Detected	---------	5.02E-02
BI-214	Not Detected	---------	5.39E-02
TH-232	Not Detected	---------	1.64E-01
RA-228	Not Detected	---------	1.31E-01
AC-228	Not Detected	---------	8.59E-02
TH-228	Not Detected	---------	4.94E-01
RA-224	Not Detected	---------	1.38E-01
PB-212	Not Detected	---------	3.44E-02
BI-212	Not Detected	---------	3.64E-01
TL-208	Not Detected	---------	7.03E-02
U-235	Not Detected	---------	1.60E-01
TH-231	Not Detected	---------	6.80E+00
PA-231	Not Detected	---------	1.02E+00
TH-227	Not Detected	---------	1.36E-01
RA-223	Not Detected	---------	1.12E-01
RN-219	Not Detected	---------	2.56E-01
PB-211	Not Detected	---------	5.73E-01
TL-207	Not Detected	---------	9.07E+00
AM-241	Not Detected	---------	2.33E-01
PU-239	Not Detected	---------	2.77E+02
NP-237	Not Detected	---------	1.83E-01
PA-233	Not Detected	---------	3.98E-02
TH-229	Not Detected	---------	1.50E-01

[Summary Report] - Sample ID: : 70164709

Nuclide Name	Activity (pCi/mL)	2-sigma Error	MDA (pCi/mL)
AG-108m	Not Detected	---------	2.60E-02
AG-110m	Not Detected	---------	2.27E-02
BA-133	Not Detected	---------	2.99E-02
BE-7	Not Detected	---------	1.90E-01
CD-109	Not Detected	---------	6.08E-01
CD-115	Not Detected	---------	6.62E-02
CE-139	Not Detected	---------	1.79E-02
CE-141	Not Detected	---------	3.48E-02
CE-144	Not Detected	---------	1.58E-01
CO-56	Not Detected	---------	3.04E-02
CO-57	Not Detected	---------	1.90E-02
CO-58	Not Detected	---------	2.26E-02
CO-60	Not Detected	---------	2.74E-02
CR-51	Not Detected	---------	1.73E-01
CS-134	Not Detected	---------	2.64E-02
CS-137	Not Detected	---------	2.39E-02
EU-152	Not Detected	---------	5.72E-02
EU-154	Not Detected	---------	1.20E-01
EU-155	Not Detected	---------	9.42E-02
FE-59	Not Detected	---------	4.50E-02
GD-153	Not Detected	---------	6.14E-02
HG-203	Not Detected	---------	2.13E-02
I-131	Not Detected	---------	2.32E-02
IR-192	Not Detected	---------	1.96E-02
K-40	Not Detected	---------	2.66E-01
MN-52	Not Detected	---------	3.05E-02
MN-54	Not Detected	---------	2.54E-02
MO-99	Not Detected	---------	2.58E-01
NA-22	Not Detected	---------	2.41E-02
NA-24	Not Detected	---------	1.66E-01
NB-95	Not Detected	---------	8.62E-02
ND-147	Not Detected	---------	1.55E-01
NI-57	Not Detected	---------	7.25E-02
PB-210	Not Detected	---------	1.40E+01
RU-103	Not Detected	---------	2.23E-02
RU-106	Not Detected	---------	2.37E-01
SB-122	Not Detected	---------	4.17E-02
SB-124	Not Detected	---------	2.56E-02
SB-125	Not Detected	---------	6.09E-02
SN-113	Not Detected	---------	2.68E-02
SR-85	Not Detected	---------	3.04E-02
TA-182	Not Detected	---------	7.51E-02
TA-183	Not Detected	---------	2.51E-01
TC-99m	~~5.90E-01~~	~~9.61E-01~~	1.46E+00 Not detected 5/15/97
TL-201	Not Detected	---------	1.40E-01
XE-133	Not Detected	---------	1.31E-01
Y-88	Not Detected	---------	2.72E-02
ZN-65	Not Detected	---------	4.99E-02
ZR-95	Not Detected	---------	3.99E-02

ANALYSIS REQUEST AND CHAIN OF CUSTODY

Internal Lab Batch No. 1LB 11

PAGE 1 OF 1

AR/COC- 06948

Dept. No./Mail Stop:
Project/Task Manager:
Project Name:
Record Center Code:
Logbook Ref No:
Service Order No:

Date Samples Shipped: 9/9/97
Carrier/Waybill No: HC
Lab Contact
Lab Destination
SMO Contact/Phone
Send Report to SMO

Contract No
Case No
SMO Authorization
Bill to: Sandia National Laboratories
Supplier Services Department
P O Box 5800 MS 0154
Albuquerque, NM 87185 0154

Parameter & Method Requested

Location Tech Area
Building Room

Reference LOV (available at SMO)

Sample No. - Fraction	ER Sample ID or Sample Location Detail	Beginning Depth in Ft.	ER Site No.	Date/Time Collected	Sample Matrix	Container Type	Container Volume	Preservative	Sample Collection Method	Sample Type	Lab Sample ID
✓											
✓											
✓											
✓											
✓											
✓											
✓											
✓											
✓											

RMMA ☒ Yes ☐ No Ref. No.

Sample Disposal ☒ Return to Client ☐ Disposal by lab

Turnaround Time ☐ Normal ☒ Rush Required Report Date

Sample Tracking
Date Entered (mm/dd/yy) 9/10/97
Entered by:
QC Inits.

Special Instructions/QC Requirements

Abnormal Conditions on Receipt

Sample Team Members

Name	Signature	Init	Company/Organization/Phone

	Org	Date	Time
1. Relinquished by			
1. Received by		9/9/97	1501
2. Relinquished by		9/9/97	1535
2. Received by		9/9/97	
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

ANALYSIS REQUEST AND CHAIN OF CUSTODY

KCAST | PAGE 1 OF 1

Internal Lab Batch No. 701647

AR/COC- 06964

Dept. No./Mail Stop: 6685 / 1148
Project/Task Manager: Caroline Byrd
Project Name: Site 27 VCA1
Record Center Code: ER/1332/27/DAT
Logbook Ref No: 006
Service Order No.: CF0359

Date Samples Shipped: 9/18/97
Carrier/Waybill No.: HC
Lab Contact: Fernando Dominguez
Lab Destination: KPSO Bldg 861
SMO Contact/Phone: Doug Galvez
Send Report to SMO: Angela Chavez

Contract No: N/A
Case No: 7633.006
SMO Authorization: [illegible]
Bill to: Sandia National Laboratories, Supplier Services Department, P.O. Box 5800 MS 0154, Albuquerque, NM 87185-0154

Location — Tech Area: N/A — Building: N/A — Room: N/A

Sample No. - Fraction	ER Sample ID or Sample Location Detail	Beginning Depth in Ft.	ER Site No.	Date/Time Collected	Sample Matrix	Container Type	Container Volume	Preservative	Sample Collection Method	Sample Type	Gamma Spec	Lab Sample ID
035231-003	27EE-GR-043-5-S	.5	27	9-17-97 1129	S	P	500ml	none	GR	DU	X	
035134-003	27EE-GR-013-5-S	5		1129						SA	X	
035135-003	27EE-GR-014-5-S	5		1134							X	
035136-003	27EE-GR-015-5-S	5		1137							X	
035137-003	27EE-GR-016-5-S	5		1140							X	
035138-003	27EE-GR-017-5-S	5		1145					GR		X	
035139-003	27ED-C-018-2-S	2		1150					C		X	
035140-003	27ED-C-019-2-S	2		1200	S				C	SA	X	
035230-003	27-GR-044-0-FB	0		1236	DIW				GR	FB	X	
035229-003	27-GR-043-0-FB	0		1225	DIW				GR	FB	X	

Parameter & Method Requested: Gamma Spec

RMMA ☒ Yes ☐ No Ref. No.

Sample Disposal ☒ Return to Client ☐ Disposal by lab

Turnaround Time ☐ Normal ☒ Rush Required Report Date 9/19/97

Sample Tracking — Date Entered (mm/dd/yy): 9/22/97 — Entered by: [illegible] — QC Initial/Date: [illegible]

Special Instructions/QC Requirements: C.O.C. #06964 releases C.O.C. #s 06963 and 06965 to GESL.

Abnormal Conditions on Receipt: LAB USE

Sample Team Members	Name	Signature	Init.	Company/Organization/Phone
	Rod Nagel	Rod Nagel	RN	TT/1684 - 2389416
	Chris Cotechis	Chris Cotechis	CC	MBA/Lab Services
	Kirsten DeWees	[illegible]	KD	MDM Consultants/GESL

	Org.	Date	Time
1. Relinquished by Rod Nagel	TT/1684	9/18/97	1325
1. Received by [illegible]	7578/910	9/18/97	1325
2. Relinquished by [illegible]	7578/910	9/18/97	1430
2. Received by [illegible]	7578	9/18/97	1430
3. Relinquished by [illegible]	SNL7578	9/19/97	1058
3. Received by [illegible]	7578/910	9/19/97	1058
4. Relinquished by			
4. Received by			
5. Relinquished by			
5. Received by			
6. Relinquished by			
6. Received by			

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

ANALYSIS REQUEST AND CHAIN OF CUSTODY

Internal Lab Batch No. _____

PAGE 1 OF 1

AR/COC- 06951

SF 2001 C10C (8-95)

Dept. No./Mail Stop: 6685/1148
Project/Task Manager: Caroline Byrd
Project Name: Site 27 VCM
Record Center Code: ER/1332/27/DAT
Logbook Ref No: 086
Service Order No.: CF0359

Date Sampled/Shipped:
Carrier/Waybill No.:
Lab Contact: Fernando Dominguez
Lab Destination: RPSD Bldg 881
SMO Contact/Phone: Doug Salmi
Send Report to SMO: Angela Chavez

Contract No.: NA
Case No. 3672400
SMO Authorization: [signature]
Bill to: Sandia National Laboratories, Supplier Services Department, P.O. Box 5800 MS 0154, Albuquerque, NM 87185-0154

Location — Tech Area: N/A; Building: N/A; Room: N/A

Sample No. - Fraction	ER Sample ID or Sample Location Detail	Beginning Depth in Ft.	ER Site No.	Date/Time Collected	Sample Matrix	Container Type	Container Volume	Preservative	Sample Collection Method	Sample Type	Gamma Spec	Lab Sample ID
034123-003	27MD-C-002-0-S	0		9-11-97 0851	S	P	500ml	None	C	SA	X	[redacted]
034125-003	27MTW-GR-001-8-S	8		1045					GR		X	[redacted]
034127-003	27MTE-GR-006-12-S	12		1000					GR		X	[redacted]
034225-003	27MV-C-040-0-S	0		0825					C		X	[redacted]
034226-003	27MV-C-041-0-S	0		0830					C		X	[redacted]
034227-003	27MV-C-042-0-S	0		0836	S				C		X	[redacted]
034195-003	27-GR-037-0-FB	0		1110	DIW				GR	FB	X	[redacted]
034196-003	27-GR-038-0-EB	0		1100	DIW				GR	EB	X	[redacted]

Reference LOV (available at SMO)

Parameter & Method Requested

RMMA ☒ Yes ☐ No Ref. No. _____

Sample Disposal ☒ Return to Client ☐ Disposal by lab

Turnaround Time ☒ Normal ☐ Rush Required Report Date _____

Sample Tracking: Date Entered (mm/dd/yy): Entered by:

QC Info:

Special Instructions/QC Requirements

Abnormal Conditions on Receipt: [redacted]

Sample Team Members	Name	Signature	Init	Company/Organization/Phone
	Rod Nagel	Rod Nagel	RN	IT/6684 238-9416

1. Relinquished by	Rod Nagel	Org. IT/6684	Date 9-12-97	Time 0900	4. Relinquished by	Org.	Date	Time
1. Received by	D M Boyle	Org. SNL 0578	Date 9/12/97	Time 0900	4. Received by	Org.	Date	Time
2. Relinquished by		Org.	Date	Time	5. Relinquished by	Org.	Date	Time
2. Received by		Org.	Date	Time	5. Received by	Org.	Date	Time
3. Relinquished by		Org.	Date	Time	6. Relinquished by	Org.	Date	Time
3. Received by		Org.	Date	Time	6. Received by	Org.	Date	Time

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

ANALYSIS REQUEST AND CHAIN OF CUSTODY

Internal Lab Batch No.

PAGE 1 OF 1

AR/COC- 06958

Dept. No./Mail Stop 6685/1148
Project/Task Manager Caroline Byrd
Project Name Site 27 UCM
Record Center Code ER/1332/27/OAT
Logbook Ref No: 006
Service Order No.: CF0359

Date Samples Shipped:
Carrier/Waybill No.:
Lab Contact Fernando Dominguez
Lab Destination RPSD Bldg 881
SMO Contact/Phone Doug Salmi
Send Report to SMO Angela Chavez

Contract No. NA
Case No. 3622.400
SMO Authorization [illegible]
Bill to: Sandia National Laboratories, Supplier Services Department, P.O. Box 5800 MS 0154, Albuquerque, NM 87185 0154

Parameter & Method Requested

Location — Tech Area N/A — Building N/A — Room N/A

Sample No. - Fraction	ER Sample ID or Sample Location Detail	Beginning Depth in Ft.	ER Site No.	Date/Time Collected	Sample Matrix	Container Type	Container Volume	Preservative	Sample Collection Method	Sample Type	Gamma Spec									Lab Sample ID
103414 1 - 003	27-GR-020-0-FB	0	27	9-9-97 1041	DIW	P	500ml	none	GR	FB	X									
103414 2 - 003	27-GR-021-0-EB	0	27	9-9-97 1030	DIW	P	500ml	none	GR	EB	X									

RMMA ☒ Yes ☐ No Ref. No.

Sample Disposal ☒ Return to Client ☐ Disposal by lab

Turnaround Time ☒ Normal ☐ Rush Required Report Date

Sample Tracking
Date Entered (mm/dd/yy)
Entered by:
QC Initials

Special Instructions/QC Requirements
• C.O.C. # 06958 releases C.O.C. # 06959 to GEL.

Abnormal Conditions on Receipt

Sample Team Members	Name	Signature	Init	Company/Organization/Phone
	Rod Nagel	Rod Nagel	RN	6684/IT 238-9416

1. Relinquished by Rod Nagel	Org. IT/6684	Date 9-9-97	Time 1505	4. Relinquished by	Org.	Date	Time
1. Received by	Org.	Date	Time	4. Received by	Org.	Date	Time
2. Relinquished by	Org.	Date	Time	5. Relinquished by	Org.	Date	Time
2. Received by	Org.	Date	Time	5. Received by	Org.	Date	Time
3. Relinquished by	Org.	Date	Time	6. Relinquished by	Org.	Date	Time
3. Received by	Org.	Date	Time	6. Received by	Org.	Date	

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

ANNEX II-B
Results of SWMU 27 VCM Confirmatory Soil Pile Sampling Analysis-Gamma Spectroscopy

****
* Sandia National Laboratories *
* Radiation Protection Sample Diagnostics Program [881 Laboratory] *
* 9-12-97 7:17:42 PM *
****

* Analyzed by: 9/15/97 Reviewed by: 9/16/97 *

Customer : C.BYRD/MAC (6685/SMO)
Customer Sample ID : 034225-003
Lab Sample ID : 70160204

Sample Description : MARINELLI SOLID SAMPLE
Sample Quantity : 778.000 gram
Sample Date/Time : 9-11-97 8:25:00 AM
Acquire Start Date/Time : 9-12-97 5:35:02 PM
Detector Name : LAB01
Elapsed Live/Real Time : 6000 / 6003 seconds

Comments:

Nuclide Name	Activity (pCi/gram)	2-sigma Error	MDA (pCi/gram)
U-238	Not Detected	---------	1.61E+00
TH-234	1.15E+00	3.62E-01	4.40E-01
RA-226	Not Detected	---------	5.50E-01
PB-214	5.47E-01	1.04E-01	5.04E-02
BI-214	4.88E-01	4.32E-01	5.29E-02
TH-232	8.03E-01	4.07E-01	1.60E-01
RA-228	8.01E-01	2.47E-01	2.02E-01
AC-228	8.09E-01	2.30E-01	1.28E-01
TH-228	7.11E-01	6.11E-01	4.90E-01
RA-224	9.68E-01	3.18E-01	8.17E-02
PB-212	8.57E-01	1.54E-01	4.17E-02
BI-212	8.55E-01	1.38E+00	4.19E-01
TL-208	7.95E-01	1.63E-01	6.56E-02
U-235	Not Detected	---------	2.17E-01
TH-231	Not Detected	---------	9.02E+00
PA-231	Not Detected	---------	1.44E+00
TH-227	Not Detected	---------	3.88E-01
RA-223	Not Detected	---------	1.55E-01
RN-219	~~2.56E-01~~	~~2.32E-01~~	4.20E-01 Not detected 9/15/97
PB-211	Not Detected	---------	9.36E-01
TL-207	Not Detected	---------	1.73E+01
AM-241	Not Detected	---------	1.99E-01
PU-239	Not Detected	---------	3.62E+02
NP-237	~~4.76E-01~~	~~2.51E-01~~	2.19E-01 Not detected 9/15/97
PA-233	Not Detected	---------	5.90E-02
TH-229	Not Detected	---------	2.08E-01

[Summary Report] - Sample ID: : 70160204

Nuclide Name	Activity (pCi/gram)	2-sigma Error	MDA (pCi/gram)
AG-108m	Not Detected	---------	4.81E-02
AG-110m	Not Detected	---------	3.52E-02
BA-133	Not Detected	---------	5.19E-02
BE-7	Not Detected	---------	2.72E-01
BI-207	Not Detected	---------	3.42E-02
CD-109	Not Detected	---------	9.99E-01
CD-115	Not Detected	---------	1.06E-01
CE-139	Not Detected	---------	2.75E-02
CE-141	Not Detected	---------	4.77E-02
CE-144	Not Detected	---------	1.95E-01
CO-56	Not Detected	---------	4.11E-02
CO-57	Not Detected	---------	2.50E-02
CO-58	Not Detected	---------	3.64E-02
CO-60	Not Detected	---------	4.59E-02
CR-51	Not Detected	---------	2.44E-01
CS-134	Not Detected	---------	4.33E-02
CS-137	Not Detected	---------	3.93E-02
EU-152	Not Detected	---------	7.56E-02
EU-154	Not Detected	---------	2.22E-01
EU-155	Not Detected	---------	1.18E-01
FE-59	Not Detected	---------	1.00E-01
GD-153	Not Detected	---------	8.32E-02
HG-203	Not Detected	---------	3.18E-02
I-131	Not Detected	---------	3.37E-02
IR-192	Not Detected	---------	2.79E-02
K-40	2.43E+01	3.61E+00	2.87E-01
MN-52	Not Detected	---------	4.77E-02
MN-54	Not Detected	---------	4.10E-02
MO-99	Not Detected	---------	3.76E-01
NA-22	Not Detected	---------	5.36E-02
NA-24	Not Detected	---------	1.79E-01
NB-95	Not Detected	---------	2.15E-01
ND-147	Not Detected	---------	2.52E-01
NI-57	Not Detected	---------	1.03E-01
PB-210	Not Detected	---------	7.90E+00
RU-103	Not Detected	---------	3.29E-02
RU-106	Not Detected	---------	3.00E-01
SB-122	Not Detected	---------	6.42E-02
SB-124	Not Detected	---------	3.41E-02
SB-125	Not Detected	---------	9.13E-02
SN-113	Not Detected	---------	3.90E-02
SR-85	Not Detected	---------	4.08E-02
TA-182	Not Detected	---------	1.79E-01
TA-183	Not Detected	---------	2.04E-01
TC-99m	Not Detected	---------	1.18E+00
TL-201	Not Detected	---------	1.50E-01
XE-133	Not Detected	---------	1.53E-01
Y-88	Not Detected	---------	3.05E-02
ZN-65	Not Detected	---------	1.25E-01
ZR-95	Not Detected	---------	6.77E-02

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* **Sandia National Laboratories** *
* **Radiation Protection Sample Diagnostics Program [881 Laboratory]** *
* **9-12-97 9:02:49 PM** *
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* Analyzed by: 9/15/97 Reviewed by: 9/16/97 *
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Customer : C.BYRD/MAC (6685/SMO)
Customer Sample ID : 034226-003
Lab Sample ID : 70160205

Sample Description : MARINELLI SOLID SAMPLE
Sample Quantity : 723.000 gram
Sample Date/Time : 9-11-97 8:30:00 AM
Acquire Start Date/Time : 9-12-97 7:20:09 PM
Detector Name : LAB01
Elapsed Live/Real Time : 6000 / 6003 seconds

Comments:
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Nuclide Name	Activity (pCi/gram)	2-sigma Error	MDA (pCi/gram)
U-238	Not Detected	---------	1.77E+00
TH-234	1.21E+00	3.72E-01	4.80E-01
RA-226	Not Detected	---------	6.58E-01
PB-214	7.22E-01	1.30E-01	5.45E-02
BI-214	6.60E-01	1.36E-01	5.63E-02
TH-232	1.07E+00	5.40E-01	1.82E-01
RA-228	1.20E+00	3.87E-01	1.83E-01
AC-228	1.05E+00	4.13E-01	1.25E-01
TH-228	9.62E-01	6.30E-01	5.78E-01
RA-224	1.07E+00	3.72E-01	8.71E-02
PB-212	1.03E+00	1.81E-01	4.31E-02
BI-212	1.16E+00	6.56E-01	3.94E-01
TL-208	1.03E+00	2.25E-01	8.56E-02
U-235	Not Detected	---------	2.31E-01
TH-231	Not Detected	---------	9.57E+00
PA-231	Not Detected	---------	1.56E+00
TH-227	Not Detected	---------	4.28E-01
RA-223	Not Detected	---------	1.66E-01
RN-219	~~1.14E-01~~	~~1.40E-01~~	2.32E-01 Not detected 9/15/97
PB-211	Not Detected	---------	1.02E+00
TL-207	Not Detected	---------	1.81E+01
AM-241	Not Detected	---------	2.06E-01
PU-239	Not Detected	---------	4.06E+02
NP-237	~~5.52E-01~~	~~2.75E-01~~	2.60E-01 Not detected 9/15/97
PA-233	Not Detected	---------	6.56E-02
TH-229	Not Detected	---------	2.23E-01

[Summary Report] - Sample ID: : 70160205

Nuclide Name	Activity (pCi/gram)	2-sigma Error	MDA (pCi/gram)
AG-108m	Not Detected	---------	5.23E-02
AG-110m	Not Detected	---------	3.57E-02
BA-133	Not Detected	---------	6.04E-02
BE-7	Not Detected	---------	2.93E-01
BI-207	Not Detected	---------	3.68E-02
CD-109	Not Detected	---------	1.11E+00
CD-115	Not Detected	---------	1.20E-01
CE-139	Not Detected	---------	2.84E-02
CE-141	Not Detected	---------	5.18E-02
CE-144	Not Detected	---------	2.13E-01
CO-56	Not Detected	---------	4.31E-02
CO-57	Not Detected	---------	2.69E-02
CO-58	Not Detected	---------	3.95E-02
CO-60	Not Detected	---------	4.86E-02
CR-51	Not Detected	---------	2.60E-01
CS-134	Not Detected	---------	4.92E-02
CS-137	Not Detected	---------	4.20E-02
EU-152	Not Detected	---------	8.12E-02
EU-154	Not Detected	---------	2.42E-01
EU-155	Not Detected	---------	1.26E-01
FE-59	Not Detected	---------	9.93E-02
GD-153	Not Detected	---------	8.91E-02
HG-203	Not Detected	---------	3.45E-02
I-131	Not Detected	---------	3.79E-02
IR-192	Not Detected	---------	3.04E-02
K-40	2.03E+01	3.09E+00	2.57E-01
MN-52	Not Detected	---------	4.41E-02
MN-54	Not Detected	---------	4.20E-02
MO-99	Not Detected	---------	4.40E-01
NA-22	Not Detected	---------	5.24E-02
NA-24	Not Detected	---------	1.95E-01
NB-95	Not Detected	---------	2.37E-01
ND-147	Not Detected	---------	2.67E-01
NI-57	Not Detected	---------	1.16E-01
PB-210	Not Detected	---------	8.61E+00
RU-103	Not Detected	---------	3.52E-02
RU-106	Not Detected	---------	3.49E-01
SB-122	Not Detected	---------	6.98E-02
SB-124	Not Detected	---------	3.71E-02
SB-125	Not Detected	---------	9.98E-02
SN-113	Not Detected	---------	4.25E-02
SR-85	Not Detected	---------	4.54E-02
TA-182	Not Detected	---------	1.91E-01
TA-183	Not Detected	---------	2.14E-01
TC-99m	Not Detected	---------	1.47E+00
TL-201	Not Detected	---------	1.66E-01
XE-133	Not Detected	---------	1.65E-01
Y-88	Not Detected	---------	3.89E-02
ZN-65	Not Detected	---------	1.28E-01
ZR-95	Not Detected	---------	7.38E-02

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* Sandia National Laboratories *
* Radiation Protection Sample Diagnostics Program [881 Laboratory] *
* 9-15-97 5:57:52 PM *
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* Analyzed by: 9/15/97 Reviewed by: 9/16/97 *

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Customer : C.BYRD/MAC (6685/SMO)
Customer Sample ID : 034227-003
Lab Sample ID : 70160206

Sample Description : MARINELLI SOLID SAMPLE
Sample Quantity : 738.000 gram
Sample Date/Time : 9-11-97 8:36:00 AM
Acquire Start Date/Time : 9-15-97 7:34:43 AM
Detector Name : LAB01
Elapsed Live/Real Time : 6000 / 6003 seconds

Comments:

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Nuclide Name	Activity (pCi/gram)	2-sigma Error	MDA (pCi/gram)
U-238	Not Detected	---------	1.69E+00
TH-234	1.79E+00	5.77E-01	5.15E-01
RA-226	1.43E+00	6.39E-01	6.63E-01
PB-214	7.40E-01	1.30E-01	5.33E-02
BI-214	6.63E-01	1.37E-01	5.74E-02
TH-232	1.05E+00	5.08E-01	1.43E-01
RA-228	1.20E+00	1.80E-01	2.25E-01
AC-228	1.13E+00	2.60E-01	1.23E-01
TH-228	1.12E+00	2.61E-01	5.09E-01
RA-224	1.22E+00	4.44E-01	8.61E-02
PB-212	1.04E+00	1.69E-01	4.35E-02
BI-212	1.13E+00	6.42E-01	4.31E-01
TL-208	1.03E+00	2.26E-01	7.22E-02
U-235	~~2.60E-02~~	~~1.66E-01~~	2.32E-01 Not detected 9/15/97
TH-231	Not Detected	---------	9.71E+00
PA-231	Not Detected	---------	1.58E+00
TH-227	Not Detected	---------	4.25E-01
RA-223	Not Detected	---------	1.95E-01
RN-219	Not Detected	---------	4.33E-01
PB-211	Not Detected	---------	9.78E-01
TL-207	Not Detected	---------	1.76E+01
AM-241	Not Detected	---------	2.11E-01
PU-239	Not Detected	---------	3.89E+02
NP-237	~~2.02E-01~~	~~2.21E-01~~	2.42E-01 Not detected 9/15/97
PA-233	Not Detected	---------	6.36E-02
TH-229	Not Detected	---------	2.27E-01

[Summary Report] - Sample ID: : 70160206

Nuclide Name	Activity (pCi/gram)	2-sigma Error	MDA (pCi/gram)
AG-108m	Not Detected	---------	5.21E-02
AG-110m	Not Detected	---------	3.70E-02
BA-133	Not Detected	---------	6.20E-02
BE-7	Not Detected	---------	2.70E-01
BI-207	Not Detected	---------	3.78E-02
CD-109	Not Detected	---------	1.08E+00
CD-115	Not Detected	---------	2.58E-01
CE-139	Not Detected	---------	2.86E-02
CE-141	Not Detected	---------	5.39E-02
CE-144	Not Detected	---------	2.07E-01
CO-56	Not Detected	---------	4.26E-02
CO-57	Not Detected	---------	2.74E-02
CO-58	Not Detected	---------	4.10E-02
CO-60	Not Detected	---------	4.52E-02
CR-51	Not Detected	---------	2.89E-01
CS-134	Not Detected	---------	4.52E-02
CS-137	Not Detected	---------	4.21E-02
EU-152	Not Detected	---------	8.14E-02
EU-154	Not Detected	---------	2.39E-01
EU-155	Not Detected	---------	1.24E-01
FE-59	Not Detected	---------	9.42E-02
GD-153	Not Detected	---------	9.12E-02
HG-203	Not Detected	---------	3.75E-02
I-131	Not Detected	---------	4.53E-02
IR-192	Not Detected	---------	3.11E-02
K-40	1.99E+01	3.11E+00	3.15E-01
MN-52	Not Detected	---------	5.96E-02
MN-54	Not Detected	---------	4.47E-02
MO-99	Not Detected	---------	8.14E-01
NA-22	Not Detected	---------	5.19E-02
NA-24	Not Detected	---------	2.84E+00
NB-95	Not Detected	---------	3.81E-01
ND-147	Not Detected	---------	3.04E-01
NI-57	Not Detected	---------	3.41E-01
PB-210	Not Detected	---------	8.55E+00
RU-103	Not Detected	---------	3.68E-02
RU-106	Not Detected	---------	3.28E-01
SB-122	Not Detected	---------	1.34E-01
SB-124	Not Detected	---------	3.61E-02
SB-125	Not Detected	---------	9.82E-02
SN-113	Not Detected	---------	4.36E-02
SR-85	Not Detected	---------	4.56E-02
TA-182	Not Detected	---------	1.87E-01
TA-183	Not Detected	---------	3.07E-01
TC-99m	Not Detected	---------	1.55E+03
TL-201	Not Detected	---------	2.87E-01
XE-133	Not Detected	---------	3.68E-01
Y-88	Not Detected	---------	3.55E-02
ZN-65	Not Detected	---------	1.29E-01
ZR-95	Not Detected	---------	7.03E-02

Sandia National Laboratories
Radiation Protection Sample Diagnostics Program [881 Laboratory]
9-15-97 11:25:08 AM

Analyzed by: 9/15/97 Reviewed by: 9/16/97

Customer : C.BYRD/MAC (6685/SMO)
Customer Sample ID : 034195-003
Lab Sample ID : 70160207

Sample Description : MARINELLI WATER SAMPLE
Sample Quantity : 485.000 mL
Sample Date/Time : 9-11-97 11:10:00 AM
Acquire Start Date/Time : 9-15-97 9:43:17 AM
Detector Name : LAB01
Elapsed Live/Real Time : 6000 / 6001 seconds

Comments:

Nuclide Name	Activity (pCi/mL)	2-sigma Error	MDA (pCi/mL)
U-238	Not Detected	---------	7.89E-01
TH-234	Not Detected	---------	3.24E-01
RA-226	Not Detected	---------	4.73E-01
PB-214	Not Detected	---------	6.06E-02
BI-214	Not Detected	---------	5.65E-02
TH-232	Not Detected	---------	1.51E-01
RA-228	Not Detected	---------	1.69E-01
AC-228	Not Detected	---------	1.05E-01
TH-228	Not Detected	---------	5.54E-01
RA-224	Not Detected	---------	1.65E-01
PB-212	Not Detected	---------	2.59E-02
BI-212	Not Detected	---------	3.74E-01
TL-208	Not Detected	---------	7.74E-02
U-235	Not Detected	---------	1.35E-01
TH-231	Not Detected	---------	4.60E+00
PA-231	Not Detected	---------	1.08E+00
TH-227	Not Detected	---------	1.60E-01
RA-223	Not Detected	---------	9.11E-02
RN-219	Not Detected	---------	3.08E-01
PB-211	Not Detected	---------	6.94E-01
TL-207	Not Detected	---------	1.06E+01
AM-241	Not Detected	---------	9.96E-02
PU-239	Not Detected	---------	2.16E+02
NP-237	Not Detected	---------	1.45E-01
PA-233	Not Detected	---------	4.41E-02
TH-229	Not Detected	---------	1.22E-01

[Summary Report] - Sample ID: : 70160207

Nuclide Name	Activity (pCi/mL)	2-sigma Error	MDA (pCi/mL)
AG-108m	Not Detected	---------	2.61E-02
AG-110m	Not Detected	---------	2.37E-02
BA-133	Not Detected	---------	3.38E-02
BE-7	Not Detected	---------	2.06E-01
BI-207	Not Detected	---------	2.87E-02
CD-109	Not Detected	---------	4.85E-01
CD-115	Not Detected	---------	1.25E-01
CE-139	Not Detected	---------	1.87E-02
CE-141	Not Detected	---------	3.28E-02
CE-144	Not Detected	---------	1.27E-01
CO-56	Not Detected	---------	3.90E-02
CO-57	Not Detected	---------	1.61E-02
CO-58	Not Detected	---------	2.75E-02
CO-60	Not Detected	---------	2.98E-02
CR-51	Not Detected	---------	2.04E-01
CS-134	Not Detected	---------	2.74E-02
CS-137	Not Detected	---------	2.72E-02
EU-152	Not Detected	---------	4.87E-02
EU-154	Not Detected	---------	1.22E-01
EU-155	Not Detected	---------	6.87E-02
FE-59	Not Detected	---------	4.72E-02
GD-153	Not Detected	---------	5.00E-02
HG-203	Not Detected	---------	2.51E-02
I-131	Not Detected	---------	3.24E-02
IR-192	Not Detected	---------	2.29E-02
K-40	Not Detected	---------	3.86E-01
MN-52	Not Detected	---------	4.32E-02
MN-54	Not Detected	---------	2.72E-02
MO-99	Not Detected	---------	5.35E-01
NA-22	Not Detected	---------	2.51E-02
NA-24	Not Detected	---------	2.09E+00
NB-95	Not Detected	---------	1.53E-01
ND-147	Not Detected	---------	2.17E-01
NI-57	Not Detected	---------	2.16E-01
PB-210	Not Detected	---------	3.61E+00
RU-103	Not Detected	---------	2.92E-02
RU-106	Not Detected	---------	2.29E-01
SB-122	Not Detected	---------	7.98E-02
SB-124	Not Detected	---------	2.79E-02
SB-125	Not Detected	---------	7.60E-02
SN-113	Not Detected	---------	3.08E-02
SR-85	Not Detected	---------	3.59E-02
TA-182	Not Detected	---------	8.29E-02
TA-183	Not Detected	---------	1.44E-01
TC-99m	Not Detected	---------	9.09E+02
TL-201	Not Detected	---------	1.41E-01
XE-133	Not Detected	---------	1.86E-01
Y-88	Not Detected	---------	3.30E-02
ZN-65	Not Detected	---------	5.62E-02
ZR-95	Not Detected	---------	4.51E-02

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* Sandia National Laboratories *
* Radiation Protection Sample Diagnostics Program [881 Laboratory] *
* 9-15-97 1:09:02 PM *
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* *
* Analyzed by: 9/15/97 Reviewed by: 9/16/97 *
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Customer : C.BYRD/MAC (6685/SMO)
Customer Sample ID : 034196-003
Lab Sample ID : 70160208

Sample Description : MARINELLI WATER SAMPLE
Sample Quantity : 500.000 mL
Sample Date/Time : 9-11-97 11:00:00 AM
Acquire Start Date/Time : 9-15-97 11:27:09 AM
Detector Name : LAB01
Elapsed Live/Real Time : 6000 / 6001 seconds

Comments:

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Nuclide Name	Activity (pCi/mL)	2-sigma Error	MDA (pCi/mL)
U-238	Not Detected	---------	7.86E-01
TH-234	Not Detected	---------	2.17E-01
RA-226	Not Detected	---------	4.78E-01
PB-214	Not Detected	---------	5.28E-02
BI-214	Not Detected	---------	6.01E-02
TH-232	Not Detected	---------	1.53E-01
RA-228	Not Detected	---------	1.40E-01
AC-228	Not Detected	---------	9.90E-02
TH-228	Not Detected	---------	5.31E-01
RA-224	Not Detected	---------	1.42E-01
PB-212	Not Detected	---------	4.09E-02
BI-212	Not Detected	---------	3.77E-01
TL-208	Not Detected	---------	7.78E-02
U-235	Not Detected	---------	1.36E-01
TH-231	Not Detected	---------	4.81E+00
PA-231	Not Detected	---------	1.02E+00
TH-227	Not Detected	---------	1.55E-01
RA-223	Not Detected	---------	9.45E-02
RN-219	Not Detected	---------	3.03E-01
PB-211	Not Detected	---------	6.88E-01
TL-207	Not Detected	---------	1.03E+01
AM-241	Not Detected	---------	9.77E-02
PU-239	Not Detected	---------	2.22E+02
NP-237	Not Detected	---------	1.38E-01
PA-233	Not Detected	---------	4.58E-02
TH-229	Not Detected	---------	1.15E-01

[Summary Report] - Sample ID: : 70160208

Nuclide Name	Activity (pCi/mL)	2-sigma Error	MDA (pCi/mL)
AG-108m	Not Detected	---------	2.71E-02
AG-110m	Not Detected	---------	2.32E-02
BA-133	Not Detected	---------	3.18E-02
BE-7	Not Detected	---------	1.82E-01
BI-207	Not Detected	---------	2.25E-02
CD-109	Not Detected	---------	4.65E-01
CD-115	Not Detected	---------	1.35E-01
CE-139	Not Detected	---------	1.74E-02
CE-141	Not Detected	---------	3.24E-02
CE-144	Not Detected	---------	1.24E-01
CO-56	Not Detected	---------	3.59E-02
CO-57	Not Detected	---------	1.62E-02
CO-58	Not Detected	---------	2.85E-02
CO-60	Not Detected	---------	2.74E-02
CR-51	Not Detected	---------	1.98E-01
CS-134	Not Detected	---------	2.75E-02
CS-137	Not Detected	---------	2.76E-02
EU-152	Not Detected	---------	4.78E-02
EU-154	Not Detected	---------	1.26E-01
EU-155	Not Detected	---------	6.33E-02
FE-59	Not Detected	---------	5.29E-02
GD-153	Not Detected	---------	4.84E-02
HG-203	Not Detected	---------	2.12E-02
I-131	Not Detected	---------	3.17E-02
IR-192	Not Detected	---------	2.12E-02
K-40	Not Detected	---------	3.26E-01
MN-52	Not Detected	---------	4.72E-02
MN-54	Not Detected	---------	2.80E-02
MO-99	Not Detected	---------	5.16E-01
NA-22	Not Detected	---------	2.73E-02
NA-24	Not Detected	---------	2.61E+00
NB-95	Not Detected	---------	1.53E-01
ND-147	Not Detected	---------	2.18E-01
NI-57	Not Detected	---------	2.72E-01
PB-210	Not Detected	---------	3.70E+00
RU-103	Not Detected	---------	2.74E-02
RU-106	Not Detected	---------	2.28E-01
SB-122	Not Detected	---------	8.53E-02
SB-124	Not Detected	---------	2.88E-02
SB-125	Not Detected	---------	7.37E-02
SN-113	Not Detected	---------	2.89E-02
SR-85	Not Detected	---------	3.33E-02
TA-182	Not Detected	---------	7.93E-02
TA-183	Not Detected	---------	1.43E-01
TC-99m	Not Detected	---------	1.17E+03
TL-201	Not Detected	---------	1.33E-01
XE-133	Not Detected	---------	1.89E-01
Y-88	Not Detected	---------	3.11E-02
ZN-65	Not Detected	---------	6.00E-02
ZR-95	Not Detected	---------	4.77E-02

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* Sandia National Laboratories *
* Radiation Protection Sample Diagnostics Program [881 Laboratory] *
* 9-08-97 5:18:33 PM *
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* Analyzed by: 9/9/97 Reviewed by: 9/9/97 *

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Customer : C.BYRD/MAC (6685/SMO)
Customer Sample ID : 034188-003
Lab Sample ID : 70156601

Sample Description : MARINELLI SOIL SAMPLE
Sample Quantity : 653.000 gram
Sample Date/Time : 9-08-97 9:00:00 AM
Acquire Start Date/Time : 9-08-97 3:35:41 PM
Detector Name : LAB02
Elapsed Live/Real Time : 6000 / 6003 seconds

Comments:

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Nuclide Name	Activity (pCi/gram)	2-sigma Error	MDA (pCi/gram)
U-238	Not Detected	---------	3.89E+00
TH-234	9.54E-01	4.16E-01	6.49E-01
RA-226	1.79E+00	6.20E-01	6.06E-01
PB-214	7.70E-01	1.55E-01	5.63E-02
BI-214	6.80E-01	8.15E-01	5.62E-02
TH-232	1.13E+00	8.95E-01	1.72E-01
RA-228	1.10E+00	3.93E-01	1.86E-01
AC-228	1.01E+00	2.20E-01	1.04E-01
TH-228	1.12E+00	2.13E-01	5.76E-01
RA-224	1.13E+00	3.49E-01	6.91E-02
PB-212	1.07E+00	8.73E-01	4.64E-02
BI-212	9.58E-01	4.88E-01	3.59E-01
TL-208	9.94E-01	2.20E-01	8.08E-02
U-235	Not Detected	---------	2.73E-01
TH-231	Not Detected	---------	1.45E+01
PA-231	Not Detected	---------	1.64E+00
TH-227	Not Detected	---------	4.20E-01
RA-223	Not Detected	---------	2.30E-01
RN-219	~~2.59E-01~~	~~2.69E-01~~	4.43E-01 not detected 9/5/97
PB-211	Not Detected	---------	9.98E-01
TL-207	Not Detected	---------	1.61E+01
AM-241	Not Detected	---------	5.65E-01
PU-239	Not Detected	---------	5.20E+02
NP-237	~~4.47E-01~~	~~1.88E-01~~	3.42E-01 not detected 9/5/97
PA-233	Not Detected	---------	6.81E-02
TH-229	Not Detected	---------	2.87E-01

[Summary Report] - Sample ID: : 70156601

Nuclide Name	Activity (pCi/gram)	2-sigma Error	MDA (pCi/gram)
AG-108m	Not Detected	---------	4.66E-02
AG-110m	Not Detected	---------	4.02E-02
BA-133	Not Detected	---------	7.38E-02
BE-7	Not Detected	---------	2.81E-01
CD-109	Not Detected	---------	1.16E+00
CD-115	Not Detected	---------	8.40E-02
CE-139	Not Detected	---------	3.38E-02
CE-141	Not Detected	---------	5.83E-02
CE-144	Not Detected	---------	2.79E-01
CO-56	Not Detected	---------	2.94E-02
CO-57	Not Detected	---------	3.44E-02
CO-58	Not Detected	---------	3.60E-02
CO-60	Not Detected	---------	3.93E-02
CR-51	Not Detected	---------	2.60E-01
CS-134	Not Detected	---------	5.28E-02
CS-137	3.99E-02	2.35E-02	2.50E-02
EU-152	Not Detected	---------	1.04E-01
EU-154	Not Detected	---------	2.16E-01
EU-155	Not Detected	---------	1.71E-01
FE-59	Not Detected	---------	8.12E-02
GD-153	Not Detected	---------	1.21E-01
HG-203	Not Detected	---------	3.62E-02
I-131	Not Detected	---------	3.31E-02
IR-192	Not Detected	---------	3.08E-02
K-40	2.19E+01	3.25E+00	2.37E-01
MN-52	Not Detected	---------	3.42E-02
MN-54	Not Detected	---------	4.05E-02
MO-99	Not Detected	---------	2.85E-01
NA-22	Not Detected	---------	4.98E-02
NA-24	Not Detected	---------	4.82E-02
NB-95	Not Detected	---------	2.04E-01
ND-147	Not Detected	---------	2.25E-01
NI-57	Not Detected	---------	3.36E-02
PB-210	Not Detected	---------	4.11E+01
RU-103	Not Detected	---------	3.26E-02
RU-106	Not Detected	---------	3.22E-01
SB-122	Not Detected	---------	4.77E-02
SB-124	Not Detected	---------	3.48E-02
SB-125	Not Detected	---------	9.36E-02
SN-113	Not Detected	---------	4.22E-02
SR-85	Not Detected	---------	4.34E-02
TA-182	Not Detected	---------	1.72E-01
TA-183	Not Detected	---------	4.98E-01
TC-99m	Not Detected	---------	7.01E-02
TL-201	Not Detected	---------	2.27E-01
XE-133	Not Detected	---------	1.75E-01
Y-88	Not Detected	---------	3.25E-02
ZN-65	Not Detected	---------	1.19E-01
ZR-95	Not Detected	---------	6.53E-02

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* Sandia National Laboratories *
* Radiation Protection Sample Diagnostics Program [881 Laboratory] *
* 9-08-97 7:03:35 PM *
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* *
* Analyzed by: 9/5/97 Reviewed by: 9/9/97 *
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Customer : C.BYRD/MAC (6685/SMO)
Customer Sample ID : 034189-003
Lab Sample ID : 70156602

Sample Description : MARINELLI SOIL SAMPLE
Sample Quantity : 675.000 gram
Sample Date/Time : 9-08-97 9:06:00 AM
Acquire Start Date/Time : 9-08-97 5:20:45 PM
Detector Name : LAB02
Elapsed Live/Real Time : 6000 / 6003 seconds

Comments:
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Nuclide Name	Activity (pCi/gram)	2-sigma Error	MDA (pCi/gram)
U-238	Not Detected	---------	3.77E+00
TH-234	1.23E+00	7.40E-01	7.12E-01
RA-226	1.40E+00	5.96E-01	5.92E-01
PB-214	7.68E-01	1.45E-01	5.11E-02
BI-214	6.63E-01	1.29E-01	5.29E-02
TH-232	1.13E+00	5.52E-01	1.59E-01
RA-228	1.04E+00	3.01E-01	1.66E-01
AC-228	1.04E+00	2.35E-01	9.08E-02
TH-228	Not Detected	---------	5.46E-01
RA-224	1.06E+00	3.27E-01	7.63E-02
PB-212	1.02E+00	2.74E-01	4.40E-02
BI-212	1.04E+00	5.54E-01	3.56E-01
TL-208	9.39E-01	4.82E-01	7.35E-02
U-235	Not Detected	---------	2.71E-01
TH-231	Not Detected	---------	1.45E+01
PA-231	Not Detected	---------	1.59E+00
TH-227	Not Detected	---------	4.05E-01
RA-223	Not Detected	---------	2.32E-01
RN-219	Not Detected	---------	4.08E-01
PB-211	Not Detected	---------	9.23E-01
TL-207	Not Detected	---------	1.49E+01
AM-241	Not Detected	---------	5.37E-01
PU-239	Not Detected	---------	4.94E+02
NP-237	Not Detected	---------	4.41E-01
PA-233	Not Detected	---------	6.53E-02
TH-229	Not Detected	---------	2.89E-01

[Summary Report] - Sample ID: : 70156602

Nuclide Name	Activity (pCi/gram)	2-sigma Error	MDA (pCi/gram)	
AG-108m	Not Detected	---------	4.56E-02	
AG-110m	Not Detected	---------	3.77E-02	
BA-133	Not Detected	---------	7.28E-02	
BE-7	Not Detected	---------	2.86E-01	
CD-109	~~1.69E+00~~	~~6.74E-01~~	1.21E+00	Not detected 9/5/57
CD-115	Not Detected	---------	8.54E-02	
CE-139	Not Detected	---------	3.29E-02	
CE-141	Not Detected	---------	5.90E-02	
CE-144	Not Detected	---------	2.75E-01	
CO-56	Not Detected	---------	2.79E-02	
CO-57	Not Detected	---------	3.35E-02	
CO-58	Not Detected	---------	3.50E-02	
CO-60	Not Detected	---------	4.18E-02	
CR-51	Not Detected	---------	2.52E-01	
CS-134	Not Detected	---------	5.05E-02	
CS-137	2.66E-02	2.87E-02	2.37E-02	
EU-152	Not Detected	---------	1.01E-01	
EU-154	Not Detected	---------	2.11E-01	
EU-155	Not Detected	---------	1.65E-01	
FE-59	Not Detected	---------	7.74E-02	
GD-153	Not Detected	---------	1.20E-01	
HG-203	Not Detected	---------	3.50E-02	
I-131	Not Detected	---------	3.35E-02	
IR-192	Not Detected	---------	3.00E-02	
K-40	1.98E+01	2.89E+00	2.63E-01	
MN-52	Not Detected	---------	3.39E-02	
MN-54	Not Detected	---------	3.88E-02	
MO-99	Not Detected	---------	2.92E-01	
NA-22	Not Detected	---------	4.67E-02	
NA-24	Not Detected	---------	5.01E-02	
NB-95	Not Detected	---------	1.99E-01	
ND-147	Not Detected	---------	2.24E-01	
NI-57	~~4.74E-02~~	~~3.19E-02~~	3.57E-02	Not detected 9/5/57
PB-210	Not Detected	---------	3.87E+01	
RU-103	Not Detected	---------	3.40E-02	
RU-106	Not Detected	---------	3.26E-01	
SB-122	Not Detected	---------	4.83E-02	
SB-124	Not Detected	---------	3.26E-02	
SB-125	Not Detected	---------	9.06E-02	
SN-113	Not Detected	---------	4.10E-02	
SR-85	Not Detected	---------	4.10E-02	
TA-182	Not Detected	---------	1.66E-01	
TA-183	Not Detected	---------	4.82E-01	
TC-99m	Not Detected	---------	8.37E-02	
TL-201	Not Detected	---------	2.17E-01	
XE-133	Not Detected	---------	1.83E-01	
Y-88	Not Detected	---------	3.04E-02	
ZN-65	Not Detected	---------	1.13E-01	
ZR-95	Not Detected	---------	6.38E-02	

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* Sandia National Laboratories *
* Radiation Protection Sample Diagnostics Program [881 Laboratory] *
* 9-08-97 8:48:39 PM *
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* Analyzed by: 9/9/97 Reviewed by: 9/9/97 *
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Customer : C.BYRD/MAC (6685/SMO)
Customer Sample ID : 034190-003
Lab Sample ID : 70156603

Sample Description : MARINELLI SOIL SAMPLE
Sample Quantity : 761.000 gram
Sample Date/Time : 9-08-97 9:14:00 AM
Acquire Start Date/Time : 9-08-97 7:05:46 PM
Detector Name : LAB02
Elapsed Live/Real Time : 6000 / 6003 seconds

Comments:
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Nuclide Name	Activity (pCi/gram)	2-sigma Error	MDA (pCi/gram)
U-238	Not Detected	---------	3.51E+00
TH-234	1.14E+00	3.91E-01	6.20E-01
RA-226	1.63E+00	5.13E-01	5.73E-01
PB-214	6.58E-01	1.18E-01	4.89E-02
BI-214	5.88E-01	3.31E-01	4.80E-02
TH-232	9.13E-01	1.23E+00	1.47E-01
RA-228	9.37E-01	2.64E-01	1.36E-01
AC-228	9.30E-01	2.34E-01	8.34E-02
TH-228	1.02E+00	1.45E+00	4.96E-01
RA-224	1.07E+00	3.19E-01	6.15E-02
PB-212	9.50E-01	2.77E-01	4.15E-02
BI-212	1.06E+00	1.09E+00	3.06E-01
TL-208	8.45E-01	1.58E-01	6.50E-02
U-235	Not Detected	---------	2.51E-01
TH-231	Not Detected	---------	1.36E+01
PA-231	Not Detected	---------	1.44E+00
TH-227	Not Detected	---------	3.73E-01
RA-223	Not Detected	---------	2.14E-01
RN-219	Not Detected	---------	3.79E-01
PB-211	Not Detected	---------	8.60E-01
TL-207	Not Detected	---------	1.40E+01
AM-241	Not Detected	---------	5.06E-01
PU-239	Not Detected	---------	4.65E+02
NP-237	~~6.32E-01~~	~~1.05E-01~~	3.12E-01 not detected 9/9/97
PA-233	Not Detected	---------	5.94E-02
TH-229	Not Detected	---------	2.65E-01

[Summary Report] - Sample ID: : 70156603

Nuclide Name	Activity (pCi/gram)	2-sigma Error	MDA (pCi/gram)	
AG-108m	Not Detected	---------	4.27E-02	
AG-110m	Not Detected	---------	4.24E-02	
BA-133	Not Detected	---------	6.53E-02	
BE-7	Not Detected	---------	2.71E-01	
CD-109	Not Detected	---------	1.06E+00	
CD-115	Not Detected	---------	7.82E-02	
CE-139	Not Detected	---------	3.15E-02	
CE-141	Not Detected	---------	5.48E-02	
CE-144	Not Detected	---------	1.06E-01	
CO-56	Not Detected	---------	2.73E-02	
CO-57	Not Detected	---------	3.13E-02	
CO-58	Not Detected	---------	3.32E-02	
CO-60	Not Detected	---------	3.90E-02	
CR-51	Not Detected	---------	2.39E-01	
CS-134	Not Detected	---------	4.44E-02	
CS-137	1.18E-01	3.05E-02	2.27E-02	
EU-152	Not Detected	---------	9.43E-02	
EU-154	Not Detected	---------	1.96E-01	
EU-155	Not Detected	---------	1.54E-01	
FE-59	Not Detected	---------	7.37E-02	
GD-153	Not Detected	---------	1.10E-01	
HG-203	Not Detected	---------	3.22E-02	
I-131	Not Detected	---------	3.07E-02	
IR-192	Not Detected	---------	2.73E-02	
K-40	2.12E+01	3.76E+00	2.58E-01	
MN-52	Not Detected	---------	3.03E-02	
MN-54	~~2.13E-02~~	~~1.95E-02~~	2.53E-02	Not detected 5/5/97
MO-99	Not Detected	---------	2.72E-01	
NA-22	Not Detected	---------	4.54E-02	
NA-24	Not Detected	---------	5.14E-02	
NB-95	Not Detected	---------	1.86E-01	
ND-147	Not Detected	---------	2.12E-01	
NI-57	Not Detected	---------	5.80E-02	
PB-210	Not Detected	---------	3.55E+01	
RU-103	Not Detected	---------	3.05E-02	
RU-106	Not Detected	---------	2.95E-01	
SB-122	Not Detected	---------	4.48E-02	
SB-124	Not Detected	---------	2.98E-02	
SB-125	Not Detected	---------	8.46E-02	
SN-113	Not Detected	---------	3.89E-02	
SR-85	Not Detected	---------	3.78E-02	
TA-182	Not Detected	---------	1.46E-01	
TA-183	Not Detected	---------	4.56E-01	
TC-99m	Not Detected	---------	5.38E-02	
TL-201	Not Detected	---------	2.07E-01	
XE-133	Not Detected	---------	1.71E-01	
Y-88	Not Detected	---------	2.76E-02	
ZN-65	Not Detected	---------	1.00E-01	
ZR-95	Not Detected	---------	5.85E-02	

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* Sandia National Laboratories *
* Radiation Protection Sample Diagnostics Program [881 Laboratory] *
* 9-08-97 10:33:42 PM *
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* Analyzed by: 9/9/97 Reviewed by: 9/9/97 *

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Customer : C.BYRD/MAC (6685/SMO)
Customer Sample ID : 034191-003
Lab Sample ID : 70156604

Sample Description : MARINELLI SOIL SAMPLE
Sample Quantity : 637.000 gram
Sample Date/Time : 9-08-97 9:15:00 AM
Acquire Start Date/Time : 9-08-97 8:50:56 PM
Detector Name : LAB02
Elapsed Live/Real Time : 6000 / 6003 seconds

Comments:

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Nuclide Name	Activity (pCi/gram)	2-sigma Error	MDA (pCi/gram)
U-238	Not Detected	---------	3.84E+00
TH-234	1.31E+00	4.69E-01	6.47E-01
RA-226	1.80E+00	6.56E-01	6.52E-01
PB-214	7.82E-01	4.23E-01	4.77E-02
BI-214	7.31E-01	5.61E-01	5.44E-02
TH-232	1.00E+00	4.79E-01	1.67E-01
RA-228	9.85E-01	2.68E-01	1.67E-01
AC-228	1.00E+00	2.58E-01	9.62E-02
TH-228	Not Detected	---------	5.51E-01
RA-224	9.99E-01	3.09E-01	8.83E-02
PB-212	1.04E+00	2.88E-01	4.53E-02
BI-212	1.44E+00	4.85E-01	2.99E-01
TL-208	9.50E-01	1.85E-01	6.98E-02
U-235	Not Detected	---------	2.72E-01
TH-231	Not Detected	---------	1.47E+01
PA-231	Not Detected	---------	1.64E+00
TH-227	Not Detected	---------	4.18E-01
RA-223	Not Detected	---------	2.35E-01
RN-219	Not Detected	---------	4.33E-01
PB-211	Not Detected	---------	9.70E-01
TL-207	Not Detected	---------	1.52E+01
AM-241	Not Detected	---------	5.47E-01
PU-239	Not Detected	---------	5.17E+02
NP-237	~~4.05E-01~~	~~1.86E-01~~	3.42E-01 not detected 9/9/97
PA-233	Not Detected	---------	6.49E-02
TH-229	Not Detected	---------	2.94E-01

[Summary Report] - Sample ID: : 70156604

Nuclide Name	Activity (pCi/gram)	2-sigma Error	MDA (pCi/gram)
AG-108m	Not Detected	---------	4.79E-02
AG-110m	Not Detected	---------	4.04E-02
BA-133	Not Detected	---------	7.51E-02
BE-7	Not Detected	---------	2.78E-01
CD-109	Not Detected	---------	1.16E+00
CD-115	Not Detected	---------	8.95E-02
CE-139	Not Detected	---------	3.27E-02
CE-141	Not Detected	---------	5.93E-02
CE-144	Not Detected	---------	2.75E-01
CO-56	Not Detected	---------	4.07E-02
CO-57	Not Detected	---------	3.36E-02
CO-58	Not Detected	---------	3.49E-02
CO-60	Not Detected	---------	3.97E-02
CR-51	Not Detected	---------	2.68E-01
CS-134	Not Detected	---------	5.35E-02
CS-137	3.93E-02	3.05E-02	2.59E-02
EU-152	Not Detected	---------	1.01E-01
EU-154	Not Detected	---------	2.22E-01
EU-155	Not Detected	---------	1.73E-01
FE-59	Not Detected	---------	8.22E-02
GD-153	Not Detected	---------	1.24E-01
HG-203	Not Detected	---------	3.59E-02
I-131	Not Detected	---------	3.33E-02
IR-192	Not Detected	---------	3.04E-02
K-40	1.95E+01	2.91E+00	2.94E-01
MN-52	Not Detected	---------	3.68E-02
MN-54	~~1.69E-02~~	~~1.58E-02~~	2.32E-02 not detected J 9/5/5
MO-99	Not Detected	---------	3.00E-01
NA-22	Not Detected	---------	4.72E-02
NA-24	Not Detected	---------	6.55E-02
NB-95	Not Detected	---------	2.11E-01
ND-147	Not Detected	---------	2.30E-01
NI-57	Not Detected	---------	4.02E-02
PB-210	Not Detected	---------	4.03E+01
RU-103	Not Detected	---------	3.26E-02
RU-106	Not Detected	---------	3.36E-01
SB-122	Not Detected	---------	4.94E-02
SB-124	Not Detected	---------	3.47E-02
SB-125	Not Detected	---------	9.16E-02
SN-113	Not Detected	---------	4.27E-02
SR-85	Not Detected	---------	4.28E-02
TA-182	Not Detected	---------	1.70E-01
TA-183	Not Detected	---------	5.01E-01
TC-99m	Not Detected	---------	1.24E-01
TL-201	Not Detected	---------	2.34E-01
XE-133	Not Detected	---------	1.91E-01
Y-88	Not Detected	---------	3.04E-02
ZN-65	Not Detected	---------	1.14E-01
ZR-95	Not Detected	---------	6.34E-02

****
* Sandia National Laboratories *
* Radiation Protection Sample Diagnostics Program [881 Laboratory] *
* 9-19-97 8:37:33 AM *
****

* Analyzed by: 9/19/97 Reviewed by: 9/19/97 *
****

Customer : C. BYRD/D. BISWELL (6685/SMO)
Customer Sample ID : 035229-003
Lab Sample ID : 70164710

Sample Description : MARINELLI WATER SAMPLE
Sample Quantity : 500.000 mL
Sample Date/Time : 9-17-97 12:25:00 PM
Acquire Start Date/Time : 9-19-97 6:55:30 AM
Detector Name : LAB02
Elapsed Live/Real Time : 6000 / 6001 seconds

Comments:
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Nuclide Name	Activity (pCi/mL)	2-sigma Error	MDA (pCi/mL)
U-238	Not Detected	---------	1.83E+00
TH-234	Not Detected	---------	3.99E-01
RA-226	Not Detected	---------	4.59E-01
PB-214	Not Detected	---------	4.98E-02
BI-214	Not Detected	---------	5.56E-02
TH-232	Not Detected	---------	1.50E-01
RA-228	Not Detected	---------	1.43E-01
AC-228	Not Detected	---------	8.45E-02
TH-228	Not Detected	---------	4.94E-01
RA-224	Not Detected	---------	1.15E-01
PB-212	Not Detected	---------	3.59E-02
BI-212	Not Detected	---------	3.25E-01
TL-208	Not Detected	---------	6.24E-02
U-235	Not Detected	---------	1.52E-01
TH-231	Not Detected	---------	6.15E+00
PA-231	Not Detected	---------	1.01E+00
TH-227	Not Detected	---------	1.33E-01
RA-223	Not Detected	---------	1.06E-01
RN-219	Not Detected	---------	2.35E-01
PB-211	Not Detected	---------	5.33E-01
TL-207	Not Detected	---------	8.45E+00
AM-241	Not Detected	---------	2.57E-01
PU-239	Not Detected	---------	2.66E+02
NP-237	Not Detected	---------	1.82E-01
PA-233	Not Detected	---------	4.03E-02
TH-229	Not Detected	---------	1.44E-01

[Summary Report] - Sample ID: : 70164710

Nuclide Name	Activity (pCi/mL)	2-sigma Error	MDA (pCi/mL)
AG-108m	Not Detected	---------	2.41E-02
AG-110m	Not Detected	---------	2.02E-02
BA-133	Not Detected	---------	3.09E-02
BE-7	Not Detected	---------	1.83E-01
CD-109	Not Detected	---------	6.29E-01
CD-115	Not Detected	---------	6.34E-02
CE-139	Not Detected	---------	1.96E-02
CE-141	Not Detected	---------	3.37E-02
CE-144	Not Detected	---------	1.52E-01
CO-56	Not Detected	---------	3.06E-02
CO-57	Not Detected	---------	1.84E-02
CO-58	Not Detected	---------	2.11E-02
CO-60	Not Detected	---------	2.25E-02
CR-51	Not Detected	---------	1.70E-01
CS-134	Not Detected	---------	2.57E-02
CS-137	Not Detected	---------	2.19E-02
EU-152	Not Detected	---------	5.52E-02
EU-154	Not Detected	---------	1.12E-01
EU-155	Not Detected	---------	8.67E-02
FE-59	Not Detected	---------	4.38E-02
GD-153	Not Detected	---------	5.96E-02
HG-203	Not Detected	---------	2.13E-02
I-131	Not Detected	---------	2.57E-02
IR-192	Not Detected	---------	1.94E-02
K-40	Not Detected	---------	2.64E-01
MN-52	Not Detected	---------	2.83E-02
MN-54	Not Detected	---------	2.19E-02
MO-99	Not Detected	---------	2.51E-01
NA-22	Not Detected	---------	2.50E-02
NA-24	Not Detected	---------	1.83E-01
NB-95	Not Detected	---------	8.56E-02
ND-147	Not Detected	---------	1.52E-01
NI-57	Not Detected	---------	7.01E-02
PB-210	Not Detected	---------	1.42E+01
RU-103	Not Detected	---------	2.44E-02
RU-106	Not Detected	---------	2.22E-01
SB-122	Not Detected	---------	4.39E-02
SB-124	Not Detected	---------	2.46E-02
SB-125	Not Detected	---------	5.61E-02
SN-113	Not Detected	---------	2.66E-02
SR-85	Not Detected	---------	3.08E-02
TA-182	Not Detected	---------	7.61E-02
TA-183	Not Detected	---------	2.72E-01
TC-99m	~~1.22E+00~~	~~1.07E+00~~	2.07E+00 Not detected
TL-201	Not Detected	---------	1.37E-01
XE-133	Not Detected	---------	1.23E-01
Y-88	Not Detected	---------	2.56E-02
ZN-65	Not Detected	---------	5.19E-02
ZR-95	Not Detected	---------	3.66E-02

5/19/97

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* Sandia National Laboratories *
* Radiation Protection Sample Diagnostics Program [881 Laboratory] *
* 9-19-97 6:53:30 AM *
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* Analyzed by: 9/19/97 Reviewed by: 9/19/97 *
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Customer : C. BYRD/D. BISWELL (6685/SMO)
Customer Sample ID : 035230-003
Lab Sample ID : 70164709

Sample Description : MARINELLI WATER SAMPLE
Sample Quantity : 500.000 mL
Sample Date/Time : 9-17-97 12:36:00 PM
Acquire Start Date/Time : 9-19-97 5:11:36 AM
Detector Name : LAB02
Elapsed Live/Real Time : 6000 / 6001 seconds

Comments:
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Nuclide Name	Activity (pCi/mL)	2-sigma Error	MDA (pCi/mL)
U-238	Not Detected	---------	1.72E+00
TH-234	Not Detected	---------	4.18E-01
RA-226	Not Detected	---------	4.88E-01
PB-214	Not Detected	---------	5.02E-02
BI-214	Not Detected	---------	5.39E-02
TH-232	Not Detected	---------	1.64E-01
RA-228	Not Detected	---------	1.31E-01
AC-228	Not Detected	---------	8.59E-02
TH-228	Not Detected	---------	4.94E-01
RA-224	Not Detected	---------	1.38E-01
PB-212	Not Detected	---------	3.44E-02
BI-212	Not Detected	---------	3.64E-01
TL-208	Not Detected	---------	7.03E-02
U-235	Not Detected	---------	1.60E-01
TH-231	Not Detected	---------	6.80E+00
PA-231	Not Detected	---------	1.02E+00
TH-227	Not Detected	---------	1.36E-01
RA-223	Not Detected	---------	1.12E-01
RN-219	Not Detected	---------	2.56E-01
PB-211	Not Detected	---------	5.73E-01
TL-207	Not Detected	---------	9.07E+00
AM-241	Not Detected	---------	2.33E-01
PU-239	Not Detected	---------	2.77E+02
NP-237	Not Detected	---------	1.83E-01
PA-233	Not Detected	---------	3.98E-02
TH-229	Not Detected	---------	1.50E-01

[Summary Report] - Sample ID: : 70164709

Nuclide Name	Activity (pCi/mL)	2-sigma Error	MDA (pCi/mL)
AG-108m	Not Detected	---------	2.60E-02
AG-110m	Not Detected	---------	2.27E-02
BA-133	Not Detected	---------	2.99E-02
BE-7	Not Detected	---------	1.90E-01
CD-109	Not Detected	---------	6.08E-01
CD-115	Not Detected	---------	6.62E-02
CE-139	Not Detected	---------	1.79E-02
CE-141	Not Detected	---------	3.48E-02
CE-144	Not Detected	---------	1.58E-01
CO-56	Not Detected	---------	3.04E-02
CO-57	Not Detected	---------	1.90E-02
CO-58	Not Detected	---------	2.26E-02
CO-60	Not Detected	---------	2.74E-02
CR-51	Not Detected	---------	1.73E-01
CS-134	Not Detected	---------	2.64E-02
CS-137	Not Detected	---------	2.39E-02
EU-152	Not Detected	---------	5.72E-02
EU-154	Not Detected	---------	1.20E-01
EU-155	Not Detected	---------	9.42E-02
FE-59	Not Detected	---------	4.50E-02
GD-153	Not Detected	---------	6.14E-02
HG-203	Not Detected	---------	2.13E-02
I-131	Not Detected	---------	2.32E-02
IR-192	Not Detected	---------	1.96E-02
K-40	Not Detected	---------	2.66E-01
MN-52	Not Detected	---------	3.05E-02
MN-54	Not Detected	---------	2.54E-02
MO-99	Not Detected	---------	2.58E-01
NA-22	Not Detected	---------	2.41E-02
NA-24	Not Detected	---------	1.66E-01
NB-95	Not Detected	---------	8.62E-02
ND-147	Not Detected	---------	1.55E-01
NI-57	Not Detected	---------	7.25E-02
PB-210	Not Detected	---------	1.40E+01
RU-103	Not Detected	---------	2.23E-02
RU-106	Not Detected	---------	2.37E-01
SB-122	Not Detected	---------	4.17E-02
SB-124	Not Detected	---------	2.56E-02
SB-125	Not Detected	---------	6.09E-02
SN-113	Not Detected	---------	2.68E-02
SR-85	Not Detected	---------	3.04E-02
TA-182	Not Detected	---------	7.51E-02
TA-183	Not Detected	---------	2.51E-01
TC-99m	~~5.90E-01~~	~~9.61E-01~~	1.46E+00 Not detected 5/15/97
TL-201	Not Detected	---------	1.40E-01
XE-133	Not Detected	---------	1.31E-01
Y-88	Not Detected	---------	2.72E-02
ZN-65	Not Detected	---------	4.99E-02
ZR-95	Not Detected	---------	3.99E-02

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* Sandia National Laboratories *
* Radiation Protection Sample Diagnostics Program [881 Laboratory] *
* 9-12-97 11:19:19 AM *
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*
* Analyzed by: 9/12/97 Reviewed by: 9/12/97 *
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Customer : C.BYRD/MAC (6685/SMO)
Customer Sample ID : 034224-003
Lab Sample ID : 70160104

Sample Description : MARINELLI SOLID SAMPLE
Sample Quantity : 732.000 gram
Sample Date/Time : 9-11-97 8:20:00 AM
Acquire Start Date/Time : 9-12-97 9:35:25 AM
Detector Name : LAB04
Elapsed Live/Real Time : 6000 / 6004 seconds

Comments:
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Nuclide Name	Activity (pCi/gram)	2-sigma Error	MDA (pCi/gram)
U-238	Not Detected	---------	1.99E+00
TH-234	9.95E-01	3.54E-01	4.35E-01
RA-226	1.75E+00	5.25E-01	5.16E-01
PB-214	7.06E-01	1.26E-01	4.38E-02
BI-214	6.39E-01	1.32E-01	4.62E-02
TH-232	9.99E-01	4.93E-01	1.30E-01
RA-228	1.17E+00	2.97E-01	1.39E-01
AC-228	9.90E-01	2.42E-01	8.69E-02
TH-228	6.45E-01	2.46E-01	4.34E-01
RA-224	1.12E+00	3.20E-01	6.45E-02
PB-212	1.04E+00	1.74E-01	3.59E-02
BI-212	1.04E+00	3.29E-01	2.92E-01
TL-208	9.00E-01	1.65E-01	6.30E-02
U-235	~~[illegible]~~	~~[illegible]~~	2.20E-01 not detected 9/12/97
TH-231	Not Detected	---------	9.68E+00
PA-231	Not Detected	---------	1.42E+00
TH-227	Not Detected	---------	3.64E-01
RA-223	Not Detected	---------	1.65E-01
RN-219	Not Detected	---------	3.64E-01
PB-211	Not Detected	---------	8.27E-01
TL-207	Not Detected	---------	1.32E+01
AM-241	Not Detected	---------	2.47E-01
PU-239	Not Detected	---------	3.68E+02
NP-237	Not Detected	---------	1.92E-01
PA-233	Not Detected	---------	5.73E-02
TH-229	Not Detected	---------	2.12E-01

[Summary Report] - Sample ID: : 70160104

Nuclide Name	Activity (pCi/gram)	2-sigma Error	MDA (pCi/gram)	
AG-108m	Not Detected	---------	4.07E-02	
AG-110m	Not Detected	---------	2.90E-02	
BA-133	Not Detected	---------	6.38E-02	
BE-7	Not Detected	---------	2.56E-01	
BI-207	Not Detected	---------	2.72E-02	
CD-109	~~2.55E+00~~	~~1.68E-01~~	6.50E-01	Not detected 9/12/97
CD-115	Not Detected	---------	9.05E-02	
CE-139	Not Detected	---------	2.68E-02	
CE-141	Not Detected	---------	4.80E-02	
CE-144	Not Detected	---------	2.01E-01	
CO-56	Not Detected	---------	3.08E-02	
CO-57	Not Detected	---------	2.58E-02	
CO-58	Not Detected	---------	3.13E-02	
CO-60	Not Detected	---------	3.48E-02	
CR-51	Not Detected	---------	2.37E-01	
CS-134	Not Detected	---------	4.55E-02	
CS-137	Not Detected	---------	3.21E-02	
EU-152	Not Detected	---------	7.75E-02	
EU-154	Not Detected	---------	1.88E-01	
EU-155	Not Detected	---------	1.21E-01	
FE-59	Not Detected	---------	7.10E-02	
GD-153	Not Detected	---------	9.09E-02	
HG-203	Not Detected	---------	3.03E-02	
I-131	Not Detected	---------	3.00E-02	
IR-192	Not Detected	---------	2.75E-02	
K-40	2.14E+01	3.08E+00	2.26E-01	
MN-52	Not Detected	---------	3.41E-02	
MN-54	Not Detected	---------	3.25E-02	
MO-99	Not Detected	---------	3.01E-01	
NA-22	Not Detected	---------	4.14E-02	
NA-24	Not Detected	---------	1.01E-01	
NB-95	Not Detected	---------	2.05E-01	
ND-147	Not Detected	---------	2.14E-01	
NI-57	~~[illegible]~~	~~[illegible]~~	4.09E-02	Not detected 9/12/97
PB-210	Not Detected	---------	9.72E+00	
RU-103	Not Detected	---------	2.87E-02	
RU-106	Not Detected	---------	2.79E-01	
SB-122	Not Detected	---------	5.14E-02	
SB-124	Not Detected	---------	2.87E-02	
SB-125	Not Detected	---------	7.75E-02	
SN-113	Not Detected	---------	3.57E-02	
SR-85	Not Detected	---------	3.73E-02	
TA-182	Not Detected	---------	1.40E-01	
TA-183	Not Detected	---------	2.38E-01	
TC-99m	Not Detected	---------	4.43E-01	
TL-201	Not Detected	---------	1.47E-01	
XE-133	Not Detected	---------	1.70E-01	
Y-88	Not Detected	---------	2.46E-02	
ZN-65	Not Detected	---------	9.58E-02	
ZR-95	Not Detected	---------	5.54E-02	

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* Sandia National Laboratories *
* Radiation Protection Sample Diagnostics Program [881 Laboratory] *
* 9-09-97 5:32:08 PM *
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* *
* Analyzed by: 9/5/97 Reviewed by: *
****

Customer : C.BYRD/MAC (6685/SMO)
Customer Sample ID : 034192-003
Lab Sample ID : 70157407

Sample Description : MARINELLI SOLID SAMPLE
Sample Quantity : 609.000 gram
Sample Date/Time : 9-09-97 9:30:00 AM
Acquire Start Date/Time : 9-09-97 3:48:46 PM
Detector Name : LAB03
Elapsed Live/Real Time : 6000 / 6003 seconds

Comments:
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Nuclide Name	Activity (pCi/gram)	2-sigma Error	MDA (pCi/gram)
U-238	6.73E-01	9.48E-01	9.63E-01
TH-234	1.38E+00	4.15E-01	4.95E-01
RA-226	1.80E+00	9.16E-01	6.74E-01
PB-214	5.98E-01	1.36E-01	5.95E-02
BI-214	5.63E-01	1.39E-01	6.26E-02
TH-232	1.08E+00	5.14E-01	1.80E-01
RA-228	1.05E+00	4.83E-01	2.25E-01
AC-228	9.80E-01	2.92E-01	1.20E-01
TH-228	1.13E+00	4.90E-01	5.59E-01
RA-224	9.65E-01	3.78E-01	9.47E-02
PB-212	9.77E-01	2.26E-01	4.69E-02
BI-212	1.32E+00	5.84E-01	4.46E-01
TL-208	8.93E-01	1.95E-01	9.42E-02
U-235	Not Detected	---------	2.21E-01
TH-231	Not Detected	---------	8.79E+00
PA-231	Not Detected	---------	1.57E+00
TH-227	Not Detected	---------	4.50E-01
RA-223	Not Detected	---------	1.42E-01
RN-219	Not Detected	---------	4.95E-01
PB-211	Not Detected	---------	1.12E+00
TL-207	Not Detected	---------	1.92E+01
AM-241	Not Detected	---------	1.87E-01
PU-239	Not Detected	---------	4.01E+02
NP-237	[illegible]	[illegible]	2.33E-01 Not detected 9/5/97
PA-233	Not Detected	---------	6.90E-02
TH-229	Not Detected	---------	2.17E-01

[Summary Report] - Sample ID: : 70157407

Nuclide Name	Activity (pCi/gram)	2-sigma Error	MDA (pCi/gram)
AG-108m	Not Detected	---------	5.58E-02
AG-110m	Not Detected	---------	4.42E-02
BA-133	Not Detected	---------	6.26E-02
BE-7	Not Detected	---------	3.23E-01
CD-109	Not Detected	---------	1.03E+00
CD-115	Not Detected	---------	9.12E-02
CE-139	Not Detected	---------	2.99E-02
CE-141	Not Detected	---------	4.81E-02
CE-144	Not Detected	---------	2.17E-01
CO-56	Not Detected	---------	4.20E-02
CO-57	Not Detected	---------	2.72E-02
CO-58	Not Detected	---------	4.31E-02
CO-60	Not Detected	---------	4.75E-02
CR-51	Not Detected	---------	2.83E-01
CS-134	Not Detected	---------	5.55E-02
CS-137	Not Detected	---------	4.69E-02
EU-152	Not Detected	---------	8.18E-02
EU-154	Not Detected	---------	2.59E-01
EU-155	Not Detected	---------	1.27E-01
FE-59	Not Detected	---------	1.00E-01
GD-153	Not Detected	---------	8.80E-02
HG-203	Not Detected	---------	3.56E-02
I-131	Not Detected	---------	3.62E-02
IR-192	Not Detected	---------	3.41E-02
K-40	2.27E+01	3.48E+00	4.10E-01
MN-52	Not Detected	---------	4.47E-02
MN-54	Not Detected	---------	4.84E-02
MO-99	Not Detected	---------	3.26E-01
NA-22	Not Detected	---------	5.78E-02
NA-24	Not Detected	---------	6.01E-02
NB-95	Not Detected	---------	2.16E-01
ND-147	Not Detected	---------	2.66E-01
NI-57	Not Detected	---------	7.22E-02
PB-210	Not Detected	---------	5.44E+00
RU-103	Not Detected	---------	3.48E-02
RU-106	Not Detected	---------	4.10E-01
SB-122	Not Detected	---------	5.39E-02
SB-124	Not Detected	---------	3.91E-02
SB-125	Not Detected	---------	1.03E-01
SN-113	Not Detected	---------	4.76E-02
SR-85	Not Detected	---------	4.69E-02
TA-182	Not Detected	---------	1.99E-01
TA-183	Not Detected	---------	1.64E-01
TC-99m	Not Detected	---------	5.47E-02
TL-201	Not Detected	---------	1.08E-01
XE-133	Not Detected	---------	1.03E-01
Y-88	Not Detected	---------	3.84E-02
ZN-65	Not Detected	---------	1.35E-01
ZR-95	Not Detected	---------	7.67E-02

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* Sandia National Laboratories *
* Radiation Protection Sample Diagnostics Program [881 Laboratory] *
* 9-09-97 7:15:50 PM *
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* Analyzed by: 9/9/97 Reviewed by: 9/10/97 *

Customer : C.BYRD/MAC (6685/SMO)
Customer Sample ID : 034193-003
Lab Sample ID : 70157408

Sample Description : MARINELLI SOLID SAMPLE
Sample Quantity : 689.000 gram
Sample Date/Time : 9-09-97 9:31:00 AM
Acquire Start Date/Time : 9-09-97 5:32:39 PM
Detector Name : LAB03
Elapsed Live/Real Time : 6000 / 6003 seconds

Comments:

Nuclide Name	Activity (pCi/gram)	2-sigma Error	MDA (pCi/gram)
U-238	1.24E+00	8.34E-01	1.22E+00
TH-234	1.30E+00	3.90E-01	4.31E-01
RA-226	1.37E+00	4.85E-01	5.07E-01
PB-214	6.30E-01	1.19E-01	5.07E-02
BI-214	5.36E-01	1.19E-01	5.89E-02
TH-232	9.44E-01	4.62E-01	1.79E-01
RA-228	Not Detected	---------	1.95E-01
AC-228	8.96E-01	2.47E-01	1.12E-01
TH-228	1.11E+00	5.44E-01	5.47E-01
RA-224	9.76E-01	3.43E-01	8.87E-02
PB-212	9.63E-01	1.67E-01	4.52E-02
BI-212	8.96E-01	4.01E-01	3.79E-01
TL-208	8.67E-01	3.59E-01	8.12E-02
U-235	Not Detected	---------	2.08E-01
TH-231	Not Detected	---------	7.98E+00
PA-231	Not Detected	---------	1.46E+00
TH-227	Not Detected	---------	4.21E-01
RA-223	Not Detected	---------	1.30E-01
RN-219	Not Detected	---------	4.31E-01
PB-211	Not Detected	---------	9.80E-01
TL-207	Not Detected	---------	1.65E+01
AM-241	Not Detected	---------	1.64E-01
PU-239	Not Detected	---------	3.70E+02
NP-237	~~[illegible]~~	~~[illegible]~~	1.93E-01 Not detected
PA-233	Not Detected	---------	6.27E-02
TH-229	Not Detected	---------	2.04E-01

9/9/97

[Summary Report] - Sample ID: : 70157408

Nuclide Name	Activity (pCi/gram)	2-sigma Error	MDA (pCi/gram)
AG-108m	Not Detected	---------	5.00E-02
AG-110m	Not Detected	---------	4.05E-02
BA-133	Not Detected	---------	5.27E-02
BE-7	Not Detected	---------	2.92E-01
CD-109	Not Detected	---------	9.58E-01
CD-115	Not Detected	---------	8.41E-02
CE-139	Not Detected	---------	2.76E-02
CE-141	Not Detected	---------	4.49E-02
CE-144	Not Detected	---------	2.00E-01
CO-56	Not Detected	---------	3.93E-02
CO-57	Not Detected	---------	2.47E-02
CO-58	Not Detected	---------	3.90E-02
CO-60	Not Detected	---------	4.70E-02
CR-51	Not Detected	---------	2.59E-01
CS-134	Not Detected	---------	5.42E-02
CS-137	Not Detected	---------	4.25E-02
EU-152	Not Detected	---------	7.49E-02
EU-154	Not Detected	---------	2.30E-01
EU-155	Not Detected	---------	1.16E-01
FE-59	Not Detected	---------	8.93E-02
GD-153	Not Detected	---------	8.32E-02
HG-203	Not Detected	---------	3.25E-02
I-131	Not Detected	---------	3.31E-02
IR-192	Not Detected	---------	3.00E-02
K-40	2.17E+01	3.31E+00	3.40E-01
MN-52	Not Detected	---------	4.35E-02
MN-54	Not Detected	---------	4.25E-02
MO-99	Not Detected	---------	3.19E-01
NA-22	Not Detected	---------	5.25E-02
NA-24	Not Detected	---------	6.19E-02
NB-95	Not Detected	---------	2.06E-01
ND-147	Not Detected	---------	2.32E-01
NI-57	Not Detected	---------	6.79E-02
PB-210	Not Detected	---------	4.78E+00
RU-103	Not Detected	---------	3.30E-02
RU-106	Not Detected	---------	3.60E-01
SB-122	Not Detected	---------	4.94E-02
SB-124	Not Detected	---------	3.69E-02
SB-125	Not Detected	---------	9.11E-02
SN-113	~~[illegible]~~	~~[illegible]~~	2.33E-02 Not detected
SR-85	Not Detected	---------	4.30E-02
TA-182	Not Detected	---------	1.78E-01
TA-183	Not Detected	---------	1.45E-01
TC-99m	Not Detected	---------	6.19E-02
TL-201	Not Detected	---------	1.04E-01
XE-133	Not Detected	---------	9.62E-02
Y-88	Not Detected	---------	2.92E-02
ZN-65	Not Detected	---------	1.22E-01
ZR-95	Not Detected	---------	7.54E-02

5/5/97

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* **Sandia National Laboratories** *
* Radiation Protection Sample Diagnostics Program [881 Laboratory] *
* 9-09-97 9:02:38 PM *
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* Analyzed by: 9/5/97 Reviewed by: 9/10/97 *

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Customer : C.BYRD/MAC (6685/SMO)
Customer Sample ID : 034194-003
Lab Sample ID : 70157409

Sample Description : MARINELLI SOLID SAMPLE
Sample Quantity : 693.000 gram
Sample Date/Time : 9-09-97 9:32:00 AM
Acquire Start Date/Time : 9-09-97 7:17:36 PM
Detector Name : LAB03
Elapsed Live/Real Time : 6000 / 6003 seconds

Comments:

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Nuclide Name	Activity (pCi/gram)	2-sigma Error	MDA (pCi/gram)	
U-238	Not Detected	---------	1.44E+00	
TH-234	1.05E+00	3.43E-01	4.38E-01	
RA-226	1.66E+00	5.00E-01	4.84E-01	
PB-214	7.14E-01	1.34E-01	5.26E-02	
BI-214	6.12E-01	2.40E-01	5.08E-02	
TH-232	9.22E-01	4.49E-01	1.60E-01	
RA-228	8.74E-01	9.16E-01	2.05E-01	
AC-228	9.42E-01	1.24E+00	1.10E-01	
TH-228	8.08E-01	4.35E-01	5.28E-01	
RA-224	9.63E-01	7.59E-01	1.15E-01	
PB-212	1.01E+00	1.67E-01	4.36E-02	
BI-212	1.02E+00	7.02E-01	4.25E-01	
TL-208	9.04E-01	2.09E-01	8.66E-02	
U-235	~~[illegible]~~	~~[illegible]~~	2.08E-01	Not detected 9/9/97
TH-231	Not Detected	---------	8.18E+00	
PA-231	Not Detected	---------	1.50E+00	
TH-227	Not Detected	---------	4.29E-01	
RA-223	Not Detected	---------	1.34E-01	
RN-219	Not Detected	---------	4.35E-01	
PB-211	Not Detected	---------	9.99E-01	
TL-207	Not Detected	---------	1.68E+01	
AM-241	Not Detected	---------	1.68E-01	
PU-239	Not Detected	---------	3.67E+02	
NP-237	~~[illegible]~~	~~[illegible]~~	2.13E-01	not detected 9/9/97
PA-233	Not Detected	---------	6.39E-02	
TH-229	Not Detected	---------	2.04E-01	

[Summary Report] - Sample ID: : 70157409

Nuclide Name	Activity (pCi/gram)	2-sigma Error	MDA (pCi/gram)
AG-108m	Not Detected	---------	5.44E-02
AG-110m	Not Detected	---------	3.86E-02
BA-133	Not Detected	---------	5.46E-02
BE-7	Not Detected	---------	2.81E-01
CD-109	Not Detected	---------	9.60E-01
CD-115	Not Detected	---------	8.62E-02
CE-139	Not Detected	---------	2.76E-02
CE-141	Not Detected	---------	4.53E-02
CE-144	Not Detected	---------	2.02E-01
CO-56	Not Detected	---------	3.97E-02
CO-57	Not Detected	---------	2.54E-02
CO-58	Not Detected	---------	4.10E-02
CO-60	Not Detected	---------	4.53E-02
CR-51	Not Detected	---------	2.50E-01
CS-134	Not Detected	---------	5.46E-02
CS-137	Not Detected	---------	4.26E-02
EU-152	Not Detected	---------	7.57E-02
EU-154	Not Detected	---------	2.50E-01
EU-155	Not Detected	---------	1.16E-01
FE-59	Not Detected	---------	9.79E-02
GD-153	Not Detected	---------	8.28E-02
HG-203	Not Detected	---------	3.31E-02
I-131	Not Detected	---------	3.30E-02
IR-192	Not Detected	---------	2.91E-02
K-40	2.15E+01	3.30E+00	3.12E-01
MN-52	Not Detected	---------	4.23E-02
MN-54	Not Detected	---------	4.14E-02
MO-99	Not Detected	---------	3.08E-01
NA-22	Not Detected	---------	5.59E-02
NA-24	Not Detected	---------	6.16E-02
NB-95	Not Detected	---------	2.12E-01
ND-147	Not Detected	---------	2.28E-01
NI-57	Not Detected	---------	7.45E-02
PB-210	1.20E+00	1.65E+00	3.06E+00
RU-103	Not Detected	---------	3.38E-02
RU-106	Not Detected	---------	3.50E-01
SB-122	Not Detected	---------	5.28E-02
SB-124	Not Detected	---------	3.47E-02
SB-125	Not Detected	---------	9.50E-02
SN-113	Not Detected	---------	4.28E-02
SR-85	Not Detected	---------	4.44E-02
TA-182	Not Detected	---------	1.83E-01
TA-183	Not Detected	---------	1.50E-01
TC-99m	Not Detected	---------	7.38E-02
TL-201	Not Detected	---------	1.06E-01
XE-133	Not Detected	---------	1.00E-01
Y-88	Not Detected	---------	2.81E-02
ZN-65	Not Detected	---------	1.23E-01
ZR-95	Not Detected	---------	6.80E-02

****
* Sandia National Laboratories *
* Radiation Protection Sample Diagnostics Program [881 Laboratory] *
* 9-09-97 5:29:28 PM *
****
* *
* Analyzed by: 9/9/97 Reviewed by: 9/10/97 *
****

Customer : C.BYRD/MAC (6685/SMO)
Customer Sample ID : 034141-003
Lab Sample ID : 70157501

Sample Description : MARINELLI WATER SAMPLE
Sample Quantity : 500.000 mL
Sample Date/Time : 9-09-97 10:41:00 AM
Acquire Start Date/Time : 9-09-97 3:45:17 PM
Detector Name : LAB04
Elapsed Live/Real Time : 6000 / 6001 seconds

Comments:
****

Nuclide Name	Activity (pCi/mL)	2-sigma Error	MDA (pCi/mL)
U-238	Not Detected	---------	8.64E-01
TH-234	Not Detected	---------	2.96E-01
RA-226	Not Detected	---------	4.37E-01
PB-214	Not Detected	---------	4.10E-02
BI 214	Not Detected	---------	4.95E-02
TH-232	Not Detected	---------	1.41E-01
RA-228	Not Detected	---------	1.16E-01
AC-228	Not Detected	---------	7.14E-02
TH-228	Not Detected	---------	4.29E-01
RA-224	Not Detected	---------	1.10E-01
PB-212	2.77E-02	2.31E-02	2.33E-02
BI-212	Not Detected	---------	2.70E-01
TL-208	Not Detected	---------	6.73E-02
U-235	Not Detected	---------	1.29E-01
TH-231	Not Detected	---------	4.67E+00
PA-231	Not Detected	---------	9.17E-01
TH-227	Not Detected	---------	1.29E-01
RA-223	Not Detected	---------	7.44E-02
RN-219	Not Detected	---------	2.41E-01
PB-211	Not Detected	---------	5.30E-01
TL-207	Not Detected	---------	7.49E+00
AM-241	Not Detected	---------	1.05E-01
PU-239	Not Detected	---------	2.12E+02
NP-237	Not Detected	---------	1.38E-01
PA-233	Not Detected	---------	3.97E-02
TH-229	Not Detected	---------	1.16E-01

[Summary Report] - Sample ID: : 70157501

Nuclide Name	Activity (pCi/mL)	2-sigma Error	MDA (pCi/mL)
AG-108m	Not Detected	---------	2.05E-02
AG-110m	Not Detected	---------	1.94E-02
BA-133	Not Detected	---------	2.58E-02
BE-7	Not Detected	---------	1.68E-01
BI-207	Not Detected	---------	1.99E-02
CD-109	Not Detected	---------	4.63E-01
CD-115	Not Detected	---------	3.67E-02
CE-139	Not Detected	---------	1.59E-02
CE-141	Not Detected	---------	2.67E-02
CE-144	Not Detected	---------	1.18E-01
CO-56	Not Detected	---------	2.09E-02
CO-57	Not Detected	---------	1.44E-02
CO-58	Not Detected	---------	1.84E-02
CO-60	Not Detected	---------	2.36E-02
CR-51	Not Detected	---------	1.52E-01
CS-134	Not Detected	---------	2.36E-02
CS-137	Not Detected	---------	1.93E-02
EU-152	Not Detected	---------	4.34E-02
EU-154	Not Detected	---------	9.54E-02
EU-155	Not Detected	---------	6.79E-02
FE-59	Not Detected	---------	3.47E-02
GD-153	Not Detected	---------	4.70E-02
HG-203	Not Detected	---------	1.73E-02
I-131	Not Detected	---------	1.76E-02
IR-192	Not Detected	---------	1.80E-02
K-40	Not Detected	---------	2.27E-01
MN-52	Not Detected	---------	1.77E-02
MN-54	Not Detected	---------	2.04E-02
MO-99	Not Detected	---------	1.53E-01
NA-22	Not Detected	---------	2.19E-02
NA-24	Not Detected	---------	2.41E-02
NB-95	Not Detected	---------	6.16E-02
ND-147	Not Detected	---------	1.30E-01
NI-57	Not Detected	---------	3.06E-02
PB-210	Not Detected	---------	4.06E+00
RU-103	Not Detected	---------	2.01E-02
RU-106	Not Detected	---------	2.02E-01
SB-122	Not Detected	---------	2.68E-02
SB-124	Not Detected	---------	2.26E-02
SB-125	Not Detected	---------	4.80E-02
SN-113	Not Detected	---------	2.42E-02
SR-85	Not Detected	---------	2.06E-02
TA-182	Not Detected	---------	6.83E-02
TA-183	Not Detected	---------	9.27E-02
TC-99m	Not Detected	---------	2.28E-02
TL-201	Not Detected	---------	5.67E-02
XE-133	Not Detected	---------	5.73E-02
Y-88	Not Detected	---------	2.31E-02
ZN-65	Not Detected	---------	4.96E-02
ZR-95	Not Detected	---------	3.09E-02

****
* Sandia National Laboratories *
* Radiation Protection Sample Diagnostics Program [881 Laboratory] *
* 9-09-97 7:10:33 PM *
****
*
* Analyzed by: 9/9/97 Reviewed by: 9/10/97 *
****

Customer : C.BYRD/MAC (6685/SMO)
Customer Sample ID : 034142-003
Lab Sample ID : 70157502

Sample Description : MARINELLI WATER SAMPLE
Sample Quantity : 500.000 mL
Sample Date/Time : 9-09-97 10:30:00 AM
Acquire Start Date/Time : 9-09-97 5:27:51 PM
Detector Name : LAB04
Elapsed Live/Real Time : 6000 / 6001 seconds

Comments:
****

Nuclide Name	Activity (pCi/mL)	2-sigma Error	MDA (pCi/mL)
U-238	Not Detected	---------	8.78E-01
TH-234	Not Detected	---------	2.91E-01
RA-226	Not Detected	---------	4.21E-01
PB-214	Not Detected	---------	4.34E-02
BI-214	Not Detected	---------	4.40E-02
TH-232	Not Detected	---------	1.31E-01
RA-228	Not Detected	---------	1.19E-01
AC-228	Not Detected	---------	7.29E-02
TH-228	Not Detected	---------	4.21E-01
RA-224	Not Detected	---------	8.12E-02
PB-212	Not Detected	---------	3.22E-02
BI-212	Not Detected	---------	2.86E-01
TL-208	Not Detected	---------	5.59E-02
U-235	Not Detected	---------	1.27E-01
TH-231	Not Detected	---------	4.67E+00
PA-231	Not Detected	---------	9.32E-01
TH-227	Not Detected	---------	1.15E-01
RA-223	Not Detected	---------	7.42E-02
RN-219	Not Detected	---------	2.36E-01
PB-211	Not Detected	---------	5.10E-01
TL-207	Not Detected	---------	8.59E+00
AM-241	Not Detected	---------	1.10E-01
PU-239	Not Detected	---------	2.08E+02
NP-237	Not Detected	---------	1.37E-01
PA-233	Not Detected	---------	3.92E-02
TH-229	Not Detected	---------	1.15E-01

[Summary Report] - Sample ID: : 70157502

Nuclide Name	Activity (pCi/mL)	2-sigma Error	MDA (pCi/mL)
AG-108m	Not Detected	---------	2.07E-02
AG-110m	Not Detected	---------	1.87E-02
BA-133	Not Detected	---------	2.69E-02
BE-7	Not Detected	---------	1.64E-01
BI-207	Not Detected	---------	1.84E-02
CD-109	Not Detected	---------	4.43E-01
CD-115	Not Detected	---------	3.61E-02
CE-139	Not Detected	---------	1.54E-02
CE-141	Not Detected	---------	2.70E-02
CE-144	Not Detected	---------	1.17E-01
CO-56	Not Detected	---------	2.05E-02
CO-57	Not Detected	---------	1.41E-02
CO-58	Not Detected	---------	1.86E-02
CO-60	Not Detected	---------	2.20E-02
CR-51	Not Detected	---------	1.54E-01
CS-134	Not Detected	---------	2.24E-02
CS-137	Not Detected	---------	2.06E-02
EU-152	Not Detected	---------	4.25E-02
EU-154	Not Detected	---------	9.54E-02
EU-155	Not Detected	---------	6.55E-02
FE-59	Not Detected	---------	3.67E-02
GD-153	Not Detected	---------	4.73E-02
HG-203	Not Detected	---------	1.91E-02
I-131	Not Detected	---------	1.99E-02
IR-192	Not Detected	---------	1.84E-02
K-40	Not Detected	---------	2.68E-01
MN-52	Not Detected	---------	1.86E-02
MN-54	Not Detected	---------	2.09E-02
MO-99	Not Detected	---------	1.51E-01
NA-22	Not Detected	---------	2.00E-02
NA-24	Not Detected	---------	2.75E-02
NB-95	Not Detected	---------	5.61E-02
ND-147	Not Detected	---------	1.23E-01
NI-57	Not Detected	---------	3.18E-02
PB-210	Not Detected	---------	3.74E+00
RU-103	Not Detected	---------	2.11E-02
RU-106	Not Detected	---------	1.95E-01
SB-122	Not Detected	---------	2.79E-02
SB-124	Not Detected	---------	2.25E-02
SB-125	Not Detected	---------	5.05E-02
SN-113	Not Detected	---------	2.24E-02
SR-85	Not Detected	---------	2.78E-02
TA-182	Not Detected	---------	5.89E-02
TA-183	Not Detected	---------	9.74E-02
TC-99m	Not Detected	---------	3.23E-02
TL-201	Not Detected	---------	5.76E-02
XE-133	Not Detected	---------	5.58E-02
Y-88	Not Detected	---------	2.31E-02
ZN-65	Not Detected	---------	3.93E-02
ZR-95	Not Detected	---------	3.52E-02

ANALYSIS REQUEST AND CHAIN OF CUSTODY

Internal Lab Batch No. 701566

PAGE 1 OF 1

AR/COC-1 06947

SF 2001 COC (6/95)

Dept. No./Mail Stop: 6685/1148
Project/Task Manager: Caroline Byrd
Project Name: Site 27 VCM
Record Center Code: ER/1332/27/DAT
Logbook Ref No: 006
Service Order No.: CF0359

Date Samples Shipped: 9/8/97
Carrier/Waybill No.: HC
Lab Contact: Fernando Dominguez
Lab Destination: RASD Bldg 881
SMO Contact/Phone: Doug Sathi
Send Report to SMO: Angela Chavez

Contract No: N/A
Case No: 3622-480
SMO Authorization: [illegible]
Bill to: Sandia National Laboratories, Supplier Services Department, P.O. Box 5800 MS 0154, Albuquerque, NM 87185 0154

Parameter & Method Requested

Location — Tech Area: N/A; Building: N/A; Room: N/A

Sample No. - Fraction	ER Sample ID or Sample Location Detail	Beginning Depth in Ft.	ER Site No.	Date/Time Collected	Sample Matrix	Container Type	Container Volume	Preservative	Sample Collection Method	Sample Type	Gamma Spec	Lab Sample ID
034198-003	27SP-C-030-0-S	0	27	9-8-97 0900	S	P	500ml	none	C	SA	X	
034189-003	27SP-C-031-0-S	↓	↓	0906	↓	↓	↓	↓	↓	↓	X	
034190-003	27SP-C-032-0-S			0914							X	
034191-003	27SP-C-033-0-S			0915							X	

RMMA ☒ Yes ☐ No Ref. No.

Sample Disposal ☒ Return to Client ☐ Disposal by lab

Turnaround Time ☐ Normal ☒ Rush Required Report Date

Sample Tracking: Date Entered (mm/dd/yy); Entered by; QC Initials

Special Instructions/QC Requirements: • C.O.C. # 06947 releases C.O.C. # 06946 to GEL

RUSH

Abnormal Conditions on Receipt

Sample Team Members	Name	Signature	Init	Company/Organization/Phone
	Rod Nagel	Rod Nagel	RN	IT/6684 238-9416

	Org	Date	Time
1. Relinquished by Rod Nagel	IT/6684	9-8-97	1525
1. Received by [illegible]	SMO 7578	9/8/97	1525
2. Relinquished by [illegible]	SMO 7578	9/8/97	1530
2. Received by Michael D. Hau	7578	9/8/97	1530
3. Relinquished by [illegible]	7578	9/9/97	8:40
3. Received by [illegible]	SMO 7578	9/9/97	0840
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

ANALYSIS REQUEST AND CHAIN OF CUSTODY

PAGE 1 OF 1

AR/COC- 06951

Internal Lab Batch No. 701602

Dept. No./Mail Stop:
Project/Task Manager:
Project Name:
Record Center Code:
Logbook Ref No:
Service Order No.:

Date Samples Shipped: 7/12/97
Carrier/Waybill No: HC
Lab Contact:
Lab Destination:
SMO Contact/Phone:
Send Report to SMO:

Contract No.:
Case No.:
SMO Authorization:
Bill to: Sandia National Laboratories
Supplier Services Department
P.O. Box 5800 MS 0154
Albuquerque, NM 87185 0154

Parameter & Method Requested

Location Tech Area 1

Building N/A Room N/A

Sample No. - Fraction	ER Sample ID or Sample Location Detail	Beginning Depth in Ft.	ER Site No.	Date/Time Collected	Sample Matrix	Container Type	Container Volume	Preservative	Sample Collection Method	Sample Type	Lab Sample ID
03412 5-003	[illegible]	[illegible]		[illegible]	S	P	[illegible]	[illegible]	C	SA	
03412 5-003	[illegible]	[illegible]		[illegible]	S	P	[illegible]	[illegible]	GA	SA	
03412 7-003	[illegible]	[illegible]		[illegible]	S	P	[illegible]	[illegible]	GA	SA	
03412 5-003	[illegible]	[illegible]		[illegible]	S	P	[illegible]	[illegible]	C	SA	
03412 6-003	[illegible]	[illegible]		[illegible]	S	P	[illegible]	[illegible]	C	SA	
03412 7-003	[illegible]	[illegible]		[illegible]	S	P	[illegible]	[illegible]	C	SA	
03415-0038-FB		[illegible]		[illegible]	DIW	P	[illegible]	[illegible]	GA	FB	
03416-0038-FB		[illegible]		[illegible]	DIW	P	[illegible]	[illegible]	GA	EB	

RMMA ☒ Yes ☐ No Ref. No.

Sample Disposal ☒ Return to Client ☐ Disposal by lab

Turnaround Time ☒ Normal ☐ Rush Required Report Date 7/22/97

Sample Tracking
Date Entered (mm/dd/yy) 9/18/97
Entered by:
QC Initials:

Special Instructions/QC Requirements

Abnormal Conditions on Receipt

Sample Team Members	Name	Signature	Init	Company/Organization/Phone
	[illegible]	[illegible]	[illegible]	[illegible]

1. Relinquished by [illegible]	Org. [illegible]	Date [illegible]	Time [illegible]	4. Relinquished by	Org. Date Time
1. Received by [illegible]	Org. SNL 7572	Date 7/12/97	Time 0940	4. Received by	Org. Date Time
2. Relinquished by [illegible]	Org. SNL 7572	Date 7/12/97	Time 0917	5. Relinquished by	Org. Date Time
2. Received by [illegible]	Org. SNL 7572	Date 7/12/97	Time 0917	5. Received by	Org. Date Time
3. Relinquished by [illegible]	Org. [illegible]	Date [illegible]	Time 0917	6. Relinquished by	Org. Date Time
3. Received by [illegible]	Org. [illegible]	Date [illegible]	Time [illegible]	6. Received by	Org. Date

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

ANALYSIS REQUEST AND CHAIN OF CUSTODY

PAGE 1 OF 1

AR/COC- 06948

Internal Lab Batch No. [illegible]

Dept. No./Mail Stop: [illegible]
Project/Task Manager: [illegible]
Project Name: [illegible]
Record Center Code: [illegible]
Logbook Ref No: [illegible]
Service Order No: [illegible]

Date Samples Shipped: 9/9/97
Carrier/Waybill No: HC
Lab Contact: [illegible]
Lab Destination: [illegible]
SMO Contact/Phone: [illegible]
Send Report to SMO: [illegible]

Contract No: [illegible]
Case No: [illegible]
SMO Authorization: [illegible]
Bill to: Sandia National Laboratories
Supplier Services Department
P.O. Box 5800 MS 0154
Albuquerque, NM 87185-0154

Location Tech Area [illegible]
Building [illegible] Room [illegible]

Reference LOV (available at SMO)

Parameter & Method Requested

Sample No. - Fraction	ER Sample ID or Sample Location Detail	Beginning Depth in Ft.	ER Site No.	Date/Time Collected	Sample Matrix	Container Type	Container Volume	Preservative	Sample Collection Method	Sample Type	Lab Sample ID
[illegible]	2100-[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	SA	
[illegible]	[illegible]			[illegible]							
[illegible]	[illegible]			[illegible]							
[illegible]	[illegible] B			[illegible]							
[illegible]	[illegible]			[illegible]							
[illegible]	[illegible]			[illegible]							
[illegible]	[illegible]			[illegible]							
[illegible]	[illegible]			[illegible]							
[illegible]	[illegible]			[illegible]							

RMMA ☒ Yes ☐ No Ref. No.

Sample Disposal ☒ Return to Client ☐ Disposal by lab

Turnaround Time ☐ Normal ☐ Rush Required Report Date

Sample Tracking
Date Entered (mm/dd/yy) 9/10/97
Entered by [illegible]
QC Info. [illegible]

Special Instructions/QC Requirements
[illegible]

Abnormal Conditions on Receipt
[illegible]

Sample Team Members	Name	Signature	Init	Company/Organization/Phone
	[illegible]	[illegible]	[illegible]	[illegible]

		Org	Date	Time
1. Relinquished by	[illegible]	[illegible]	[illegible]	[illegible]
1. Received by	D. Way[illegible]	SMO 7578	9/9/97	1501
2. Relinquished by	D. Way[illegible]	SMO 7578	9/9/97	1535
2. Received by	[illegible]	[illegible]	9/9/97	[illegible]
3. Relinquished by	[illegible]	[illegible]	[illegible]	[illegible]
3. Received by	[illegible]	[illegible]	[illegible]	[illegible]
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

Internal Lab Batch No. 7016H7

ANALYSIS REQUEST AND CHAIN OF CUSTODY

PAGE 1 OF 1

AR/COC- 06964

Dept. No./Mail Stop: 6685 / 1148
Project/Task Manager: Caroline Byrd
Project Name: Site 27 VCM
Record Center Code: ER/1332/27/DAT
Logbook Ref No: 006
Service Order No.: CF0357

Date Samples Shipped: 9/18/97
Carrier/Waybill No.: HC
Lab Contact: Fernando Dominguez
Lab Destination: KPSO Bldg 851
SMO Contact/Phone: Sang Tahir
Send Report to SMO: Angela Chavez

Contract No: N/A
Case No: 7627.000
SMO Authorization: [illegible]
Bill to: Sandia National Laboratories, Supplier Services Department, P.O. Box 5800 MS 0154, Albuquerque, NM 87185-0154

Location — Tech Area: N/A; Building: N/A; Room: N/A

Sample No. - Fraction	ER Sample ID or Sample Location Detail	Beginning Depth in Ft.	ER Site No.	Date/Time Collected	Sample Matrix	Container Type	Container Volume	Preservative	Sample Collection Method	Sample Type	Gamma Spec	Lab Sample ID
035231-003	27EF-GR-043-5-SO	5	27	9/17 1129	S	P	500ml	none	GR	DU	X	
035134-003	27EF-GR-013-5-S	5		1128						SA	X	
035135-003	27EF-GR-014-5-S	5		1134							X	
035136-003	27EF-GR-015-5-S	5		1137							X	
035137-003	27EF-GR-016-5-S	5		1140							X	
035138-003	27EF-GR-017-5-S	5		1145					GR		X	
035139-003	27ED-C-018-2-S	2		1150					C		X	
035140-003	27ED-C-019-2-S	2		1200	S				C	SA	X	
035230-003	27-GR-044-0-FB	0		1236	DIW				GR	FB	X	
035229-003	27-GR-043-0-FB	0		1225	DIW				GR	FB	X	

Parameter & Method Requested: Gamma Spec

RMMA ☒ Yes ☐ No Ref. No. ____

Sample Disposal ☒ Return to Client ☐ Disposal by lab

Turnaround Time ☐ Normal ☒ Rush Required Report Date 9/19/97

Sample Tracking — Date Entered (mm/dd/yy): 9/18/97; Entered by: [illegible]

Special Instructions/QC Requirements: • C.O.C. #06964 releases C.O.C. #s 06963 and 06965 to GESL.

Abnormal Conditions on Receipt

LAB USE

Sample Team Members	Name	Signature	Initials	Company/Organization/Phone
	Rod Nagel	Rod Nagel	RN	TT/1684 · 2389416
	Chris Cotleschi	Chris Cotleschi	CC	MDA/Lab Services
	Kirtan Dalwadi	[illegible]	KD	MDM Consultants-FEL

	Relinquished by	Received by
1.	Rod Nagel, Org. TT/1684, Date 9/18/97, Time 1325	Org. 7578/910, Date 9/18/97, Time 1325
2.	Org. 7578/910, Date 9/18/97, Time 1430	Org. 7578, Date 9/18/97, Time 1430
3.	FDR 65, Org. SNL 7578, Date 9/19/97, Time 1050	Org. 7578/910, Date 9/19/97, Time 1058
4.	Org.	Org.
5.	Org.	Org.
6.	Org.	Org.

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

ANALYSIS REQUEST AND CHAIN OF CUSTODY

Internal Lab Batch No. _____

PAGE 1 OF 1

AR/COC- 06951

SF 2001-COC (8/95)

Dept. No./Mail Stop: 6685/1148
Project/Task Manager: Caroline Byrd
Project Name: Site 27 VCM
Record Center Code: ER/1332/27/DAT
Logbook Ref No: 086
Service Order No.: CF0359

Date Sampled Shipped: [illegible]
Carrier/Waybill No.: [illegible]
Lab Contact: Fernando Dominguez
Lab Destination: RPSD Bldg 881
SMO Contact/Phone: Doug Salmi
Send Report to SMO: Angela Chavez

Contract No.: N/A
Case No.: 9622.400
SMO Authorization: [illegible]
Bill to: Sandia National Laboratories, Supplier Services Department, P.O. Box 5800 MS 0154, Albuquerque, NM 87185 0154

Location — Tech Area: N/A; Building: N/A; Room: N/A

Reference LOV (available at SMO)

Sample No. - Fraction	ER Sample ID or Sample Location Detail	Beginning Depth in Ft.	ER Site No.	Date/Time Collected	Sample Matrix	Container Type	Container Volume	Preservative	Sample Collection Method	Sample Type	Gamma Spec									Lab Sample ID
034123-003	27MD-C-042-0-S	0		9-9-97 0851	S	P	500ml	None	C	SA	X									[illegible]
034125-003	27MTW-GR-004-8-S	8		1045					GR		X									[illegible]
034127-003	27MTE-GR-004-12-S	12		1000					GR		X									[illegible]
034225-003	27MV-C-040-0-S	0		0825					C		X									[illegible]
034226-003	27MV-C-041-0-S	0		0830					C		X									[illegible]
034227-003	27MV-C-042-0-S	0		0836	S				C		X									[illegible]
034195-003	27-GR-037-0-FB	0		1110	DIW				GR	FB	X									[illegible]
034196-003	27-GR-038-0-EB	0		1100	DIW				GR	EB	X									[illegible]

RMMA ☒ Yes ☐ No Ref. No. _____

Sample Disposal ☒ Return to Client ☐ Disposal by lab

Turnaround Time ☒ Normal ☐ Rush Required Report Date _____

Sample Tracking: Date Entered (mm/dd/yy) _____ Entered by: _____ QC Info: [illegible]

Special Instructions/QC Requirements

Abnormal Conditions on Receipt: [illegible]

Sample Team Members	Name	Signature	Init	Company/Organization/Phone
	Rod Nagel	Rod Nagel	RN	IT/6684 238-9446

1. Relinquished by	Rod Nagel	Org. IT/6684	Date 9-12-97	Time 0900	4. Relinquished by	Org.	Date	Time
1. Received by	[illegible]	Org. SNL 8578	Date 9/12/97	Time 0900	4. Received by	Org.	Date	Time
2. Relinquished by		Org.	Date	Time	5. Relinquished by	Org.	Date	Time
2. Received by		Org.	Date	Time	5. Received by	Org.	Date	Time
3. Relinquished by		Org.	Date	Time	6. Relinquished by	Org.	Date	Time
3. Received by		Org.	Date	Time	6. Received by	Org.	Date	Time

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

ANALYSIS REQUEST AND CHAIN OF CUSTODY

Internal Lab Batch No.

PAGE 1 OF 1

AR/COC- 06958

Dept. No./Mail Stop: 6685/1148
Project/Task Manager: Caroline Byrd
Project Name: Site 27 VCM
Record Center Code: ER/1332/27/OAT
Logbook Ref No.: 006
Service Order No.: CF0359

Date Samples Shipped:
Carrier/Waybill No.:
Lab Contact: Fernando Dominguez
Lab Destination: RPSD Bldg 881
SMO Contact/Phone: Doug Salmi
Send Report to SMO: Angela Chavez

Contract No: N/A
Case No: 3622.400
SMO Authorization: [signature]
Bill to: Sandia National Laboratories, Supplier Services Department, P.O. Box 5800 MS 0154, Albuquerque, NM 87185 0154

Location — Tech Area: N/A — Building: N/A — Room: N/A

Sample No. - Fraction	ER Sample ID or Sample Location Detail	Beginning Depth in Ft.	ER Site No.	Date/Time Collected	Sample Matrix	Container Type	Container Volume	Preservative	Sample Collection Method	Sample Type	Gamma Spec	Lab Sample ID
103414 - 003	27-GR-020-0-FB	0	27	9-9-97 1041	DIW	P	500ml	none	GR	FB	X	
103412 - 003	27-GR-021-0-EB	0	27	9-9-97 1030	DIW	P	500ml	none	GR	EB	X	

Reference LOV (available at SMO)

Parameter & Method Requested

RMMA ☒ Yes ☐ No Ref. No.

Sample Disposal ☒ Return to Client ☐ Disposal by lab

Turnaround Time ☒ Normal ☐ Rush Required Report Date

Sample Tracking: Date Entered (mm/dd/yy): Entered by: QC Initials:

Special Instructions/QC Requirements: • C.O.C # 06958 releases C.O.C. # 06959 to GEL.

Abnormal Conditions on Receipt

Sample Team Members	Name	Signature	Init	Company/Organization/Phone
	Rod Nagel	Rod Nagel	RN	6684/IT 238-9416

	Org.	Date	Time
1. Relinquished by Rod Nagel	IT/6684	9-9-97	1505
1. Received by			
2. Relinquished by			
2. Received by			
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 - Accompany Samples, Laboratory Copy; BLUE - To Accompany Samples, Return to SMO; YELLOW - Suspense Copy; PINK - Field Copy

ANNEX II-C
Results of SWMU 27 VCM Trench Soil Sampling Analysis-Gamma Spectroscopy

****
* Sandia National Laboratories *
* Radiation Protection Sample Diagnostics Program [881 Laboratory] *
* 9-12-97 10:28:57 AM *
****

* Analyzed by: 9/12/97 Reviewed by: 9/12/97 *

Customer : C.BYRD/MAC (6685/SMO)
Customer Sample ID : 034124-003
Lab Sample ID : 70160102

Sample Description : MARINELLI SOLID SAMPLE
Sample Quantity : 845.000 gram
Sample Date/Time : 9-11-97 10:04:00 AM
Acquire Start Date/Time : 9-12-97 8:43:35 AM
Detector Name : LAB02
Elapsed Live/Real Time : 6000 / 6003 seconds

Comments:

Nuclide Name	Activity (pCi/gram)	2-sigma Error	MDA (pCi/gram)
U-238	Not Detected	---------	3.23E+00
TH-234	1.12E+00	4.21E-01	5.85E-01
RA-226	1.34E+00	5.41E-01	5.72E-01
PB-214	6.76E-01	1.14E-01	4.54E-02
BI-214	6.07E-01	1.22E-01	4.44E-02
TH-232	Not Detected	---------	1.42E-01
RA-228	1.02E+00	2.46E-01	1.39E-01
AC-228	1.02E+00	9.39E-01	8.28E-02
TH-228	6.70E-01	2.19E-01	4.32E-01
RA-224	1.02E+00	2.81E-01	6.63E-02
PB-212	9.48E-01	2.05E-01	3.98E-02
BI-212	9.88E-01	3.45E-01	2.87E-01
TL-208	8.26E-01	9.64E-01	6.56E-02
U-235	Not Detected	---------	2.39E-01
TH-231	Not Detected	---------	1.24E+01
PA-231	Not Detected	---------	1.40E+00
TH-227	Not Detected	---------	3.52E-01
RA-223	Not Detected	---------	2.07E-01
RN-219	[illegible]	[illegible]	3.62E-01
PB-211	Not Detected	---------	8.24E-01
TL-207	Not Detected	---------	1.29E+01
AM-241	Not Detected	---------	4.63E-01
PU-239	Not Detected	---------	4.39E+02
NP-237	Not Detected	---------	2.90E-01
PA-233	Not Detected	---------	5.64E-02
TH-229	Not Detected	---------	2.50E-01

Not detected 9/12/97

[Summary Report] - Sample ID: : 70160102

Nuclide Name	Activity (pCi/gram)	2-sigma Error	MDA (pCi/gram)
AG-108m	Not Detected	---------	3.97E-02
AG-110m	Not Detected	---------	3.00E-02
BA-133	Not Detected	---------	6.22E-02
BE-7	Not Detected	---------	2.47E-01
CD-109	~~1.59E+00~~	~~5.65E-01~~	9.85E-01 Not detected 9/14
CD-115	Not Detected	---------	8.69E-02
CE-139	Not Detected	---------	2.88E-02
CE-141	Not Detected	---------	5.28E-02
CE-144	Not Detected	---------	2.41E-01
CO-56	Not Detected	---------	2.39E-02
CO-57	Not Detected	---------	2.95E-02
CO-58	Not Detected	---------	3.13E-02
CO-60	Not Detected	---------	3.55E-02
CR-51	Not Detected	---------	2.31E-01
CS-134	Not Detected	---------	4.38E-02
CS-137	Not Detected	---------	3.29E-02
EU-152	Not Detected	---------	8.88E-02
EU-154	Not Detected	---------	1.84E-01
EU-155	Not Detected	---------	1.48E-01
FE-59	Not Detected	---------	7.33E-02
GD-153	Not Detected	---------	1.06E-01
HG-203	Not Detected	---------	3.15E-02
I-131	Not Detected	---------	2.97E-02
IR-192	Not Detected	---------	2.58E-02
K-40	2.23E+01	3.16E+00	2.31E-01
MN-52	Not Detected	---------	3.17E-02
MN-54	Not Detected	---------	1.94E-02
MO-99	Not Detected	---------	2.83E-01
NA-22	Not Detected	---------	4.17E-02
NA-24	Not Detected	---------	9.24E-02
NB-95	Not Detected	---------	1.94E-01
ND-147	Not Detected	---------	2.01E-01
NI-57	Not Detected	---------	6.97E-02
PB-210	Not Detected	---------	3.47E+01
RU-103	Not Detected	---------	2.92E-02
RU-106	Not Detected	---------	2.80E-01
SB-122	Not Detected	---------	4.85E-02
SB-124	Not Detected	---------	2.90E-02
SB-125	Not Detected	---------	7.86E-02
SN-113	Not Detected	---------	3.62E-02
SR-85	Not Detected	---------	3.57E-02
TA-182	Not Detected	---------	1.40E-01
TA-183	Not Detected	---------	4.46E-01
TC-99m	Not Detected	---------	3.86E-01
TL-201	Not Detected	---------	2.22E-01
XE-133	Not Detected	---------	1.88E-01
Y-88	Not Detected	---------	2.52E-02
ZN-65	Not Detected	---------	9.71E-02
ZR-95	Not Detected	---------	5.86E-02

****
* Sandia National Laboratories *
* Radiation Protection Sample Diagnostics Program [881 Laboratory] *
* 9-12-97 3:36:58 PM *
****

* Analyzed by: 9/15/97 Reviewed by: 9/16/97 *

Customer : C.BYRD/MAC (6685/SMO)
Customer Sample ID : 034125-003
Lab Sample ID : 70160202

Sample Description : MARINELLI SOLID SAMPLE
Sample Quantity : 760.000 gram
Sample Date/Time : 9-11-97 10:45:00 AM
Acquire Start Date/Time : 9-12-97 1:48:48 PM
Detector Name : LAB01
Elapsed Live/Real Time : 6000 / 6003 seconds

Comments:

Nuclide Name	Activity (pCi/gram)	2-sigma Error	MDA (pCi/gram)
U-238	Not Detected	---------	1.71E+00
TH-234	1.31E+00	6.41E-01	5.50E-01
RA-226	1.79E+00	1.04E+00	7.07E-01
PB-214	7.40E-01	1.35E-01	5.41E-02
BI-214	6.64E-01	3.61E-01	5.33E-02
TH-232	1.11E+00	5.45E-01	1.69E-01
RA-228	1.19E+00	3.78E-01	1.70E-01
AC-228	1.06E+00	2.62E-01	1.30E-01
TH-228	8.78E-01	5.35E-01	5.14E-01
RA-224	1.16E+00	4.32E-01	1.08E-01
PB-212	1.08E+00	4.47E-01	4.09E-02
BI-212	9.53E-01	6.75E-01	4.25E-01
TL-208	9.44E-01	3.03E-01	8.44E-02
U-235	Not Detected	---------	2.29E-01
TH-231	Not Detected	---------	9.79E+00
PA-231	Not Detected	---------	1.60E+00
TH-227	Not Detected	---------	4.27E-01
RA-223	Not Detected	---------	1.64E-01
RN-219	Not Detected	---------	4.28E-01
PB-211	Not Detected	---------	9.52E-01
TL-207	Not Detected	---------	1.70E+01
AM-241	Not Detected	---------	2.08E-01
PU-239	Not Detected	---------	3.95E+02
NP-237	~~3.69E-01~~	~~1.53E-01~~	2.17E-01 not detected 9/15/97
PA-233	Not Detected	---------	6.42E-02
TH-229	Not Detected	---------	2.18E-01

[Summary Report] - Sample ID: : 70160202

Nuclide Name	Activity (pCi/gram)	2-sigma Error	MDA (pCi/gram)
AG-108m	Not Detected	---------	5.13E-02
AG-110m	Not Detected	---------	3.61E-02
BA-133	Not Detected	---------	5.86E-02
BE-7	Not Detected	---------	2.77E-01
BI-207	Not Detected	---------	3.51E-02
CD-109	Not Detected	---------	1.08E+00
CD-115	Not Detected	---------	1.10E-01
CE-139	Not Detected	---------	2.86E-02
CE-141	Not Detected	---------	5.09E-02
CE-144	Not Detected	---------	2.13E-01
CO-56	Not Detected	---------	4.00E-02
CO-57	Not Detected	---------	2.62E-02
CO-58	Not Detected	---------	3.70E-02
CO-60	Not Detected	---------	4.43E-02
CR-51	Not Detected	---------	2.50E-01
CS-134	Not Detected	---------	4.75E-02
CS-137	Not Detected	---------	4.16E-02
EU-152	Not Detected	---------	7.83E-02
EU-154	Not Detected	---------	2.38E-01
EU-155	Not Detected	---------	1.25E-01
FE-59	Not Detected	---------	9.09E-02
GD-153	Not Detected	---------	8.74E-02
HG-203	Not Detected	---------	3.51E-02
I-131	Not Detected	---------	3.57E-02
IR-192	Not Detected	---------	2.92E-02
K-40	1.94E+01	3.02E+00	3.38E-01
MN-52	Not Detected	---------	4.46E-02
MN-54	Not Detected	---------	4.16E-02
MO-99	Not Detected	---------	3.83E-01
NA-22	Not Detected	---------	4.68E-02
NA-24	Not Detected	---------	1.36E-01
NB-95	Not Detected	---------	2.27E-01
ND-147	Not Detected	---------	2.44E-01
NI-57	Not Detected	---------	1.03E-01
PB-210	Not Detected	---------	8.58E+00
RU-103	Not Detected	---------	3.45E-02
RU-106	Not Detected	---------	3.26E-01
SB-122	Not Detected	---------	6.24E-02
SB-124	Not Detected	---------	3.47E-02
SB-125	Not Detected	---------	9.70E-02
SN-113	Not Detected	---------	4.28E-02
SR-85	Not Detected	---------	4.26E-02
TA-182	Not Detected	---------	1.81E-01
TA-183	Not Detected	---------	2.06E-01
TC-99m	Not Detected	---------	6.20E-01
TL-201	Not Detected	---------	1.54E-01
XE-133	Not Detected	---------	1.53E-01
Y-88	Not Detected	---------	3.27E-02
ZN-65	Not Detected	---------	1.22E-01
ZR-95	Not Detected	---------	7.03E-02

****
* Sandia National Laboratories *
* Radiation Protection Sample Diagnostics Program [881 Laboratory] *
* 9-12-97 10:32:47 AM *
****

* Analyzed by: 9/12/97 Reviewed by: 9/12/97 *

Customer : C.BYRD/MAC (6685/SMO)
Customer Sample ID : 034126-003
Lab Sample ID : 70160103

Sample Description : MARINELLI SOLID SAMPLE
Sample Quantity : 806.000 gram
Sample Date/Time : 9-11-97 10:50:00 AM
Acquire Start Date/Time : 9-12-97 8:48:54 AM
Detector Name : LAB03
Elapsed Live/Real Time : 6000 / 6004 seconds

Comments:

Nuclide Name	Activity (pCi/gram)	2-sigma Error	MDA (pCi/gram)
U-238	Not Detected	---------	1.42E+00
TH-234	1.39E+00	4.08E-01	4.53E-01
RA-226	1.54E+00	7.24E-01	5.45E-01
PB-214	6.65E-01	4.64E-01	5.04E-02
BI-214	6.44E-01	1.74E-01	5.26E-02
TH-232	9.86E-01	4.96E-01	1.57E-01
RA-228	9.97E-01	2.65E-01	1.73E-01
AC-228	9.19E-01	2.64E-01	1.08E-01
TH-228	7.31E-01	3.67E-01	4.52E-01
RA-224	1.06E+00	3.61E-01	8.22E-02
PB-212	9.91E-01	1.59E-01	3.81E-02
BI-212	1.07E+00	9.73E-01	3.85E-01
TL-208	9.07E-01	3.60E-01	7.16E-02
U-235	[illegible]	[illegible]	2.02E-01 not detected 9/12/97
TH-231	Not Detected	---------	7.83E+00
PA-231	Not Detected	---------	1.43E+00
TH-227	Not Detected	---------	3.92E-01
RA-223	Not Detected	---------	1.32E-01
RN-219	Not Detected	---------	4.04E-01
PB-211	Not Detected	---------	9.33E-01
TL-207	Not Detected	---------	1.56E+01
AM-241	Not Detected	---------	1.59E-01
PU-239	Not Detected	---------	3.59E+02
NP-237	[illegible]	[illegible]	2.11E-01 not detected 9/12/97
PA-233	Not Detected	---------	5.97E-02
TH-229	Not Detected	---------	1.92E-01

[Summary Report] - Sample ID: : 70160103

Nuclide Name	Activity (pCi/gram)	2-sigma Error	MDA (pCi/gram)
AG-108m	Not Detected	---------	4.76E-02
AG-110m	Not Detected	---------	3.64E-02
BA-133	Not Detected	---------	4.84E-02
BE-7	Not Detected	---------	2.71E-01
CD-109	Not Detected	---------	9.08E-01
CD-115	Not Detected	---------	9.37E-02
CE-139	Not Detected	---------	2.60E-02
CE-141	Not Detected	---------	4.39E-02
CE-144	Not Detected	---------	1.91E-01
CO-56	Not Detected	---------	3.91E-02
CO-57	Not Detected	---------	2.47E-02
CO-58	Not Detected	---------	3.62E-02
CO-60	Not Detected	---------	4.25E-02
CR-51	Not Detected	---------	2.46E-01
CS-134	Not Detected	---------	5.14E-02
CS-137	Not Detected	---------	3.93E-02
EU-152	Not Detected	---------	7.34E-02
EU-154	Not Detected	---------	2.20E-01
EU-155	Not Detected	---------	1.11E-01
FE-59	Not Detected	---------	8.15E-02
GD-153	Not Detected	---------	7.77E-02
HG-203	Not Detected	---------	3.17E-02
I-131	Not Detected	---------	3.32E-02
IR-192	Not Detected	---------	2.78E-02
K-40	2.11E+01	3.22E+00	3.68E-01
MN-52	Not Detected	---------	4.10E-02
MN-54	Not Detected	---------	3.91E-02
MO-99	Not Detected	---------	3.19E-01
NA-22	Not Detected	---------	4.77E-02
NA-24	Not Detected	---------	1.06E-01
NB-95	Not Detected	---------	2.14E-01
ND-147	Not Detected	---------	2.15E-01
NI-57	Not Detected	---------	8.69E-02
PB-210	Not Detected	---------	4.67E+00
RU-103	Not Detected	---------	3.07E-02
RU-106	Not Detected	---------	3.30E-01
SB-122	Not Detected	---------	5.35E-02
SB-124	Not Detected	---------	3.27E-02
SB-125	Not Detected	---------	8.39E-02
SN-113	~~7.34E-01~~	~~7.33E-01~~	1.52E-02 Not detected 9/12/97
SR-85	Not Detected	---------	3.88E-02
TA-182	Not Detected	---------	1.81E-01
TA-183	Not Detected	---------	1.53E-01
TC-99m	Not Detected	---------	2.94E-01
TL-201	Not Detected	---------	1.11E-01
XE-133	Not Detected	---------	1.12E-01
Y-88	Not Detected	---------	3.01E-02
ZN-65	Not Detected	---------	1.25E-01
ZR-95	Not Detected	---------	6.56E-02

****
* Sandia National Laboratories *
* Radiation Protection Sample Diagnostics Program [881 Laboratory] *
* 9-12-97 5:32:08 PM *
****

* Analyzed by: 9/15/97 Reviewed by: 9/16/97 *

Customer : C.BYRD/MAC (6685/SMO)
Customer Sample ID : 034127-003
Lab Sample ID : 70160203

Sample Description : MARINELLI SOLID SAMPLE
Sample Quantity : 827.000 gram
Sample Date/Time : 9-11-97 10:00:00 AM
Acquire Start Date/Time : 9-12-97 3:49:23 PM
Detector Name : LAB01
Elapsed Live/Real Time : 6000 / 6003 seconds

Comments:

Nuclide Name	Activity (pCi/gram)	2-sigma Error	MDA (pCi/gram)
U-238	Not Detected	---------	1.54E+00
TH-234	1.27E+00	4.84E-01	4.79E-01
RA-226	1.26E+00	1.24E+00	5.40E-01
PB-214	6.03E-01	1.28E-01	5.22E-02
BI-214	4.97E-01	1.33E-01	5.68E-02
TH-232	7.79E-01	4.01E-01	1.70E-01
RA-228	9.34E-01	1.39E+00	1.93E-01
AC-228	9.31E-01	1.18E+00	1.07E-01
TH-228	5.30E-01	3.91E-01	4.98E-01
RA-224	9.69E-01	4.51E-01	1.20E-01
PB-212	8.69E-01	1.45E-01	3.81E-02
BI-212	1.06E+00	5.13E-01	3.87E-01
TL-208	7.90E-01	1.63E-01	7.58E-02
U-235	Not Detected	---------	2.10E-01
TH-231	Not Detected	---------	8.83E+00
PA-231	Not Detected	---------	1.44E+00
TH-227	Not Detected	---------	3.78E-01
RA-223	Not Detected	---------	1.51E-01
RN-219	Not Detected	---------	4.01E-01
PB-211	Not Detected	---------	9.07E-01
TL-207	Not Detected	---------	1.72E+01
AM-241	Not Detected	---------	1.89E-01
PU-239	Not Detected	---------	3.64E+02
NP-237	~~[illegible]~~	~~[illegible]~~	2.35E-01 Not detected 9/15/97
PA-233	Not Detected	---------	6.01E-02
TH-229	Not Detected	---------	2.06E-01

[Summary Report] - Sample ID: : 70160203

Nuclide Name	Activity (pCi/gram)	2-sigma Error	MDA (pCi/gram)
AG-108m	Not Detected	---------	4.76E-02
AG-110m	Not Detected	---------	3.39E-02
BA-133	Not Detected	---------	5.21E-02
BE-7	Not Detected	---------	2.74E-01
BI-207	Not Detected	---------	3.07E-02
CD-109	Not Detected	---------	9.79E-01
CD-115	Not Detected	---------	9.84E-02
CE-139	Not Detected	---------	2.57E-02
CE-141	Not Detected	---------	4.70E-02
CE-144	Not Detected	---------	1.96E-01
CO-56	Not Detected	---------	4.03E-02
CO-57	Not Detected	---------	2.44E-02
CO-58	Not Detected	---------	3.58E-02
CO-60	Not Detected	---------	4.41E-02
CR-51	Not Detected	---------	2.39E-01
CS-134	Not Detected	---------	4.31E-02
CS-137	Not Detected	---------	3.89E-02
EU-152	Not Detected	---------	7.38E-02
EU-154	Not Detected	---------	2.21E-01
EU-155	Not Detected	---------	1.15E-01
FE-59	Not Detected	---------	9.18E-02
GD-153	Not Detected	---------	8.34E-02
HG-203	Not Detected	---------	3.19E-02
I-131	Not Detected	---------	3.39E-02
IR-192	Not Detected	---------	2.76E-02
K-40	2.42E+01	3.71E+00	2.93E-01
MN-52	Not Detected	---------	4.24E-02
MN-54	Not Detected	---------	2.27E-02
MO-99	Not Detected	---------	3.86E-01
NA-22	Not Detected	---------	5.05E-02
NA-24	Not Detected	---------	1.51E-01
NB-95	Not Detected	---------	2.04E-01
ND-147	Not Detected	---------	2.32E-01
NI-57	Not Detected	---------	9.58E-02
PB-210	Not Detected	---------	7.75E+00
RU-103	Not Detected	---------	3.02E-02
RU-106	Not Detected	---------	3.13E-01
SB-122	Not Detected	---------	5.97E-02
SB-124	Not Detected	---------	3.26E-02
SB-125	Not Detected	---------	8.95E-02
SN-113	Not Detected	---------	3.95E-02
SR-85	Not Detected	---------	4.03E-02
TA-182	Not Detected	---------	1.78E-01
TA-183	Not Detected	---------	1.91E-01
TC-99m	Not Detected	---------	7.62E-01
TL-201	Not Detected	---------	1.46E-01
XE-133	Not Detected	---------	1.42E-01
Y-88	Not Detected	---------	3.33E-02
ZN-65	Not Detected	---------	1.19E-01
ZR-95	Not Detected	---------	6.61E-02

****
* Sandia National Laboratories *
* Radiation Protection Sample Diagnostics Program [881 Laboratory] *
* 9-09-97 9:26:06 PM *
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* Analyzed by: 9/5/97 Reviewed by: 9/10/97 *
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Customer : C.BYRD/MAC (6685/SMO)
Customer Sample ID : 034130-003
Lab Sample ID : 70157403

Sample Description : MARINELLI SOLID SAMPLE
Sample Quantity : 638.000 gram
Sample Date/Time : 9-09-97 9:00:00 AM
Acquire Start Date/Time : 9-09-97 7:41:55 PM
Detector Name : LAB01
Elapsed Live/Real Time : 6000 / 6002 seconds

Comments:
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Nuclide Name	Activity (pCi/gram)	2-sigma Error	MDA (pCi/gram)
U-238	Not Detected	---------	1.80E+00
TH-234	1.12E+00	3.73E-01	4.91E-01
RA-226	1.47E+00	6.97E-01	6.96E-01
PB-214	6.34E-01	1.34E-01	6.05E-02
BI-214	5.75E-01	1.38E-01	6.14E-02
TH-232	1.02E+00	4.92E-01	1.67E-01
RA-228	8.39E-01	2.87E-01	1.94E-01
AC-228	9.55E-01	2.88E-01	1.42E-01
TH-228	9.29E-01	4.52E-01	5.45E-01
RA-224	1.11E+00	4.24E-01	1.10E-01
PB-212	9.98E-01	1.68E-01	4.39E-02
BI-212	1.25E+00	6.59E-01	3.81E-01
TL-208	8.87E-01	2.09E-01	9.07E-02
U-235	Not Detected	---------	2.37E-01
TH-231	Not Detected	---------	9.95E+00
PA-231	Not Detected	---------	1.63E+00
TH-227	Not Detected	---------	4.46E-01
RA-223	~~1.00E-01~~	~~7.522E-02~~	1.09E-01 Not detected 9/5/97
RN-219	Not Detected	---------	4.63E-01
PB-211	Not Detected	---------	1.06E+00
TL-207	Not Detected	---------	1.81E+01
AM-241	Not Detected	---------	2.23E-01
PU-239	Not Detected	---------	3.96E+02
NP-237	Not Detected	---------	3.32E-01
PA-233	Not Detected	---------	6.55E-02
TH-229	Not Detected	---------	2.24E-01

[Summary Report] - Sample ID: : 70157403

Nuclide Name	Activity (pCi/gram)	2-sigma Error	MDA (pCi/gram)
AG-108m	Not Detected	---------	5.38E-02
AG-110m	Not Detected	---------	4.02E-02
BA-133	Not Detected	---------	6.27E-02
BE-7	Not Detected	---------	3.04E-01
BI-207	Not Detected	---------	3.71E-02
CD-109	~~1.62E+00~~	~~5.41E-01~~	8.75E-01 Not detected. 9/9/9
CD-115	Not Detected	---------	9.32E-02
CE-139	Not Detected	---------	2.95E-02
CE-141	Not Detected	---------	5.23E-02
CE-144	Not Detected	---------	2.15E-01
CO-56	Not Detected	---------	4.66E-02
CO-57	Not Detected	---------	2.75E-02
CO-58	Not Detected	---------	4.12E-02
CO-60	Not Detected	---------	4.95E-02
CR-51	Not Detected	---------	2.68E-01
CS-134	Not Detected	---------	5.12E-02
CS-137	Not Detected	---------	4.62E-02
EU-152	Not Detected	---------	8.27E-02
EU-154	Not Detected	---------	2.50E-01
EU-155	Not Detected	---------	1.28E-01
FE-59	Not Detected	---------	9.35E-02
GD-153	Not Detected	---------	8.91E-02
HG-203	Not Detected	---------	3.61E-02
I-131	Not Detected	---------	3.62E-02
IR-192	Not Detected	---------	3.09E-02
K-40	1.98E+01	3.04E+00	3.25E-01
MN-52	Not Detected	---------	4.38E-02
MN-54	Not Detected	---------	4.61E-02
MO-99	Not Detected	---------	3.41E-01
NA-22	Not Detected	---------	6.12E-02
NA-24	Not Detected	---------	6.97E-02
NB-95	Not Detected	---------	2.06E-01
ND-147	Not Detected	---------	2.57E-01
NI-57	Not Detected	---------	7.96E-02
PB-210	Not Detected	---------	9.02E+00
RU-103	Not Detected	---------	3.70E-02
RU-106	Not Detected	---------	3.74E-01
SB-122	Not Detected	---------	5.73E-02
SB-124	Not Detected	---------	3.75E-02
SB-125	Not Detected	---------	1.04E-01
SN-113	Not Detected	---------	4.63E-02
SR-85	Not Detected	---------	4.70E-02
TA-182	Not Detected	---------	2.00E-01
TA-183	Not Detected	---------	2.01E-01
TC-99m	Not Detected	---------	9.73E-02
TL-201	Not Detected	---------	1.37E-01
XE-133	Not Detected	---------	1.25E-01
Y-88	Not Detected	---------	3.65E-02
ZN-65	Not Detected	---------	1.39E-01
ZR-95	Not Detected	---------	7.27E-02

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* Sandia National Laboratories *
* Radiation Protection Sample Diagnostics Program [881 Laboratory] *
* 9-09-97 11:13:27 PM *
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* Analyzed by: 9/10/97 Reviewed by: 9/10/97 *

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Customer : C.BYRD/MAC (6685/SMO)
Customer Sample ID : 034131-003
Lab Sample ID : 70157404

Sample Description : MARINELLI SOLID SAMPLE
Sample Quantity : 867.000 gram
Sample Date/Time : 9-09-97 9:08:00 AM
Acquire Start Date/Time : 9-09-97 9:30:50 PM
Detector Name : LAB01
Elapsed Live/Real Time : 6000 / 6003 seconds

Comments:

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Nuclide Name	Activity (pCi/gram)	2-sigma Error	MDA (pCi/gram)
U-238	Not Detected	---------	1.50E+00
TH-234	9.73E-01	3.19E-01	4.48E-01
RA-226	1.14E+00	3.82E-01	5.67E-01
PB-214	4.46E-01	8.76E-02	4.81E-02
BI-214	4.37E-01	9.18E-02	4.54E-02
TH-232	1.05E+00	5.06E-01	1.55E-01
RA-228	1.01E+00	2.88E-01	1.86E-01
AC-228	9.89E-01	2.61E-01	1.17E-01
TH-228	6.97E-01	3.54E-01	4.58E-01
RA-224	1.06E+00	3.43E-01	9.35E-02
PB-212	9.80E-01	4.05E-01	3.76E-02
BI-212	1.00E+00	5.01E-01	3.74E-01
TL-208	8.35E-01	1.68E-01	7.30E-02
U-235	Not Detected	---------	2.04E-01
TH-231	Not Detected	---------	8.48E+00
PA-231	Not Detected	---------	1.36E+00
TH-227	Not Detected	---------	3.81E-01
RA-223	Not Detected	---------	1.40E-01
RN-219	Not Detected	---------	3.90E-01
PB-211	Not Detected	---------	8.61E-01
TL-207	Not Detected	---------	1.60E+01
AM-241	Not Detected	---------	1.84E-01
PU-239	Not Detected	---------	3.44E+02
NP-237	~~1.26E-01~~	~~2.54E-01~~	2.22E-01 Not detected 9/10/97
PA-233	Not Detected	---------	5.93E-02
TH-229	Not Detected	---------	2.08E-01

[Summary Report] - Sample ID: : 70157404

Nuclide Name	Activity (pCi/gram)	2-sigma Error	MDA (pCi/gram)
AG-108m	Not Detected	---------	4.55E-02
AG-110m	Not Detected	---------	3.43E-02
BA-133	Not Detected	---------	4.91E-02
BE-7	Not Detected	---------	2.61E-01
BI-207	Not Detected	---------	3.26E-02
CD-109	Not Detected	---------	9.62E-01
CD-115	Not Detected	---------	8.26E-02
CE-139	Not Detected	---------	2.60E-02
CE-141	Not Detected	---------	4.46E-02
CE-144	Not Detected	---------	1.89E-01
CO-56	Not Detected	---------	3.76E-02
CO-57	Not Detected	---------	2.39E-02
CO-58	Not Detected	---------	3.52E-02
CO-60	Not Detected	---------	4.17E-02
CR-51	Not Detected	---------	2.27E-01
CS-134	Not Detected	---------	4.07E-02
CS-137	Not Detected	---------	3.90E-02
EU-152	Not Detected	---------	7.20E-02
EU-154	Not Detected	---------	2.10E-01
EU-155	Not Detected	---------	1.15E-01
FE-59	Not Detected	---------	8.41E-02
GD-153	Not Detected	---------	8.11E-02
HG-203	Not Detected	---------	3.09E-02
I-131	Not Detected	---------	3.06E-02
IR-192	Not Detected	---------	2.68E-02
K-40	2.60E+01	3.84E+00	2.67E-01
MN-52	Not Detected	---------	3.61E-02
MN-54	Not Detected	---------	3.96E-02
MO-99	Not Detected	---------	3.13E-01
NA-22	Not Detected	---------	5.40E-02
NA-24	Not Detected	---------	6.40E-02
NB-95	Not Detected	---------	1.79E-01
ND-147	Not Detected	---------	2.10E-01
NI-57	Not Detected	---------	6.32E-02
PB-210	Not Detected	---------	7.70E+00
RU-103	Not Detected	---------	3.09E-02
RU-106	Not Detected	---------	3.09E-01
SB-122	Not Detected	---------	4.78E-02
SB-124	Not Detected	---------	3.18E-02
SB-125	Not Detected	---------	8.67E-02
SN-113	Not Detected	---------	3.82E-02
SR-85	Not Detected	---------	3.88E-02
TA-182	Not Detected	---------	1.77E-01
TA-183	Not Detected	---------	1.67E-01
TC-99m	Not Detected	---------	1.02E-01
TL-201	Not Detected	---------	1.19E-01
XE-133	Not Detected	---------	1.07E-01
Y-88	Not Detected	---------	2.86E-02
ZN-65	Not Detected	---------	1.18E-01
ZR-95	Not Detected	---------	6.46E-02

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* **Sandia National Laboratories** *
* **Radiation Protection Sample Diagnostics Program** [881 Laboratory] *
* 9-10-97 7:57:05 AM *
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* *
* Analyzed by: 9/10/97 Reviewed by: 9/10/97 *
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Customer : C.BYRD/MAC (6685/SMO)
Customer Sample ID : 034132-003
Lab Sample ID : 70157405

Sample Description : MARINELLI SOLID SAMPLE
Sample Quantity : 688.000 gram
Sample Date/Time : 9-09-97 8:41:00 AM
Acquire Start Date/Time : 9-10-97 6:09:07 AM
Detector Name : LAB01
Elapsed Live/Real Time : 6000 / 6002 seconds

Comments:
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Nuclide Name	Activity (pCi/gram)	2-sigma Error	MDA (pCi/gram)
U-238	Not Detected	---------	1.71E+00
TH-234	1.04E+00	4.82E-01	5.04E-01
RA-226	1.33E+00	8.69E-01	6.18E-01
PB-214	5.35E-01	1.23E-01	5.58E-02
BI-214	4.83E-01	1.35E-01	6.24E-02
TH-232	8.82E-01	4.57E-01	1.71E-01
RA-228	8.87E-01	6.02E-01	1.82E-01
AC-228	9.27E-01	1.36E+00	1.22E-01
TH-228	9.72E-01	4.28E-01	5.11E-01
RA-224	9.37E-01	3.68E-01	1.10E-01
PB-212	9.62E-01	1.63E-01	4.28E-02
BI-212	9.04E-01	3.73E-01	3.49E-01
TL-208	8.49E-01	2.09E-01	7.94E-02
U-235	Not Detected	---------	2.27E-01
TH-231	Not Detected	---------	9.74E+00
PA-231	Not Detected	---------	1.58E+00
TH-227	Not Detected	---------	4.28E-01
RA-223	Not Detected	---------	1.62E-01
RN-219	Not Detected	---------	4.44E-01
PB-211	Not Detected	---------	1.01E+00
TL-207	Not Detected	---------	1.73E+01
AM-241	Not Detected	---------	2.08E-01
PU-239	Not Detected	---------	4.01E+02
NP-237	Not Detected	---------	2.42E-01
PA-233	Not Detected	---------	6.37E-02
TH-229	Not Detected	---------	2.19E-01

[Summary Report] - Sample ID: : 70157405

Nuclide Name	Activity (pCi/gram)	2-sigma Error	MDA (pCi/gram)
AG-108m	Not Detected	---------	5.34E-02
AG-110m	Not Detected	---------	3.73E-02
BA-133	Not Detected	---------	5.71E-02
BE-7	Not Detected	---------	2.77E-01
BI-207	Not Detected	---------	3.60E-02
CD-109	Not Detected	---------	1.08E+00
CD-115	Not Detected	---------	9.84E-02
CE-139	Not Detected	---------	2.84E-02
CE-141	Not Detected	---------	5.06E-02
CE-144	Not Detected	---------	2.10E-01
CO-56	Not Detected	---------	4.36E-02
CO-57	Not Detected	---------	2.61E-02
CO-58	Not Detected	---------	3.72E-02
CO-60	Not Detected	---------	4.97E-02
CR-51	Not Detected	---------	2.61E-01
CS-134	Not Detected	---------	4.54E-02
CS-137	Not Detected	---------	4.26E-02
EU-152	Not Detected	---------	7.85E-02
EU-154	Not Detected	---------	2.48E-01
EU-155	~~1.35E-00~~	~~2.09E-01~~	1.11E-01 Not detected 5/10/97
FE-59	Not Detected	---------	9.43E-02
GD-153	Not Detected	---------	8.73E-02
HG-203	Not Detected	---------	3.59E-02
I-131	Not Detected	---------	3.61E-02
IR-192	Not Detected	---------	2.98E-02
K-40	2.21E+01	4.50E+00	2.99E-01
MN-52	Not Detected	---------	4.55E-02
MN-54	Not Detected	---------	4.38E-02
MO-99	Not Detected	---------	4.06E-01
NA-22	Not Detected	---------	5.43E-02
NA-24	Not Detected	---------	1.18E-01
NB-95	Not Detected	---------	2.17E-01
ND-147	Not Detected	---------	2.43E-01
NI-57	Not Detected	---------	8.86E-02
PB-210	Not Detected	---------	8.62E+00
RU-103	Not Detected	---------	3.45E-02
RU-106	Not Detected	---------	3.40E-01
SB-122	Not Detected	---------	6.09E-02
SB-124	Not Detected	---------	3.50E-02
SB-125	Not Detected	---------	9.73E-02
SN-113	Not Detected	---------	4.43E-02
SR-85	Not Detected	---------	4.44E-02
TA-182	Not Detected	---------	1.97E-01
TA-183	Not Detected	---------	2.00E-01
TC-99m	Not Detected	---------	3.19E-01
TL-201	Not Detected	---------	1.47E-01
XE-133	Not Detected	---------	1.40E-01
Y-88	Not Detected	---------	3.30E-02
ZN-65	Not Detected	---------	1.31E-01
ZR-95	Not Detected	---------	7.46E-02

****
* Sandia National Laboratories *
* Radiation Protection Sample Diagnostics Program [881 Laboratory] *
* 9-09-97 10:42:20 PM *
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* *
* Analyzed by: 9/10/97 Reviewed by: *
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Customer : C.BYRD/MAC (6685/SMO)
Customer Sample ID : 034133-003
Lab Sample ID : 70157406

Sample Description : MARINELLI SOLID SAMPLE
Sample Quantity : 718.000 gram
Sample Date/Time : 9-09-97 8:53:00 AM
Acquire Start Date/Time : 9-09-97 8:59:00 PM
Detector Name : LAB03
Elapsed Live/Real Time : 6000 / 6003 seconds

Comments:

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Nuclide Name	Activity (pCi/gram)	2-sigma Error	MDA (pCi/gram)
U-238	4.99E-01	5.68E-01	9.86E-01
TH-234	1.11E+00	3.36E-01	4.06E-01
RA-226	1.35E+00	4.96E-01	4.98E-01
PB-214	6.19E-01	1.94E-01	4.93E-02
BI-214	5.62E-01	1.20E-01	5.64E-02
TH-232	8.97E-01	4.36E-01	1.67E-01
RA-228	8.21E-01	3.19E-01	1.77E-01
AC-228	1.00E+00	3.76E-01	9.81E-02
TH-228	5.98E-01	4.63E-01	4.72E-01
RA-224	9.11E-01	5.32E-01	9.27E-02
PB-212	1.01E+00	1.65E-01	4.14E-02
BI-212	1.12E+00	4.70E-01	3.78E-01
TL-208	8.31E-01	2.08E-01	8.32E-02
U-235	Not Detected	---------	2.00E-01
TH-231	Not Detected	---------	7.93E+00
PA-231	Not Detected	---------	1.45E+00
TH-227	Not Detected	---------	4.16E-01
RA-223	Not Detected	---------	1.30E-01
RN-219	Not Detected	---------	3.98E-01
PB-211	Not Detected	---------	9.54E-01
TL-207	Not Detected	---------	1.66E+01
AM-241	Not Detected	---------	1.72E-01
PU-239	Not Detected	---------	3.67E+02
NP-237	~~[illegible]~~	~~[illegible]~~	1.85E-01 Not detected 9/10/97
PA-233	Not Detected	---------	6.18E-02
TH-229	Not Detected	---------	1.99E-01

[Summary Report] - Sample ID: : 70157406

Nuclide Name	Activity (pCi/gram)	2-sigma Error	MDA (pCi/gram)
AG-108m	Not Detected	---------	5.03E-02
AG-110m	Not Detected	---------	3.67E-02
BA-133	Not Detected	---------	5.01E-02
BE-7	Not Detected	---------	2.86E-01
CD-109	Not Detected	---------	9.39E-01
CD-115	Not Detected	---------	8.60E-02
CE-139	Not Detected	---------	2.68E-02
CE-141	Not Detected	---------	4.44E-02
CE-144	Not Detected	---------	1.97E-01
CO-56	Not Detected	---------	3.79E-02
CO-57	Not Detected	---------	2.49E-02
CO-58	Not Detected	---------	3.65E-02
CO-60	Not Detected	---------	4.60E-02
CR-51	Not Detected	---------	2.53E-01
CS-134	Not Detected	---------	5.32E-02
CS-137	Not Detected	---------	3.94E-02
EU-152	Not Detected	---------	7.44E-02
EU-154	Not Detected	---------	2.30E-01
EU-155	Not Detected	---------	1.18E-01
FE-59	Not Detected	---------	9.40E-02
GD-153	Not Detected	---------	8.16E-02
HG-203	Not Detected	---------	3.14E-02
I-131	Not Detected	---------	3.25E-02
IR-192	Not Detected	---------	2.91E-02
K-40	2.16E+01	3.40E+00	3.45E-01
MN-52	Not Detected	---------	4.07E-02
MN-54	Not Detected	---------	4.23E-02
MO-99	Not Detected	---------	3.07E-01
NA-22	Not Detected	---------	5.06E-02
NA-24	Not Detected	---------	6.89E-02
NB-95	Not Detected	---------	2.10E-01
ND-147	Not Detected	---------	2.30E-01
NI-57	Not Detected	---------	7.57E-02
PB-210	Not Detected	---------	4.70E-00
RU-103	Not Detected	---------	3.29E-02
RU-106	Not Detected	---------	3.56E-01
SB-122	Not Detected	---------	5.13E-02
SB-124	Not Detected	---------	3.58E-02
SB-125	Not Detected	---------	9.17E-02
SN-113	Not Detected	---------	4.06E-02
SR-85	Not Detected	---------	4.20E-02
TA-182	Not Detected	---------	1.82E-01
TA-183	Not Detected	---------	1.56E-01
TC-99m	Not Detected	---------	9.40E-02
TL-201	Not Detected	---------	1.02E-01
XE-133	Not Detected	---------	1.00E-01
Y-88	Not Detected	---------	2.88E-02
ZN-65	Not Detected	---------	1.27E-01
ZR-95	Not Detected	---------	7.00E-02

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* Sandia National Laboratories *
* Radiation Protection Sample Diagnostics Program [881 Laboratory] *
* 9-18-97 6:39:39 PM *
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* Analyzed by: 5/15/97 Reviewed by: 9/19/97

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Customer : C. BYRD/D. BISWELL (6685/SMO)
Customer Sample ID : 035134-003
Lab Sample ID : 70164702

Sample Description : MARINELLI SOLID SAMPLE
Sample Quantity : 839.000 gram
Sample Date/Time : 9-17-97 11:28:00 AM
Acquire Start Date/Time : 9-18-97 4:56:58 PM
Detector Name : LAB02
Elapsed Live/Real Time : 6000 / 6003 seconds

Comments:

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Nuclide Name	Activity (pCi/gram)	2-sigma Error	MDA (pCi/gram)
U-238	Not Detected	---------	3.19E+00
TH-234	1.05E+00	3.79E-01	5.92E-01
RA-226	1.15E+00	5.29E-01	5.07E-01
PB-214	5.39E-01	1.03E-01	4.54E-02
BI-214	4.74E-01	9.81E-02	4.52E-02
TH-232	9.27E-01	4.41E-01	1.38E-01
RA-228	8.86E-01	2.55E-01	1.52E-01
AC-228	9.16E-01	2.19E-01	8.36E-02
TH-228	7.57E-01	2.55E-01	4.82E-01
RA-224	8.00E-01	3.42E-01	7.36E-02
PB-212	8.50E-01	1.48E-01	3.87E-02
BI-212	8.05E-01	1.10E+00	3.00E-01
TL-208	Not Detected	---------	5.96E-02
U-235	Not Detected	---------	2.41E-01
TH-231	Not Detected	---------	1.24E+01
PA-231	Not Detected	---------	1.36E+00
TH-227	Not Detected	---------	3.37E-01
RA-223	Not Detected	---------	2.08E-01
RN-219	Not Detected	---------	3.68E-01
PB-211	Not Detected	---------	8.26E-01
TL-207	Not Detected	---------	1.37E+01
AM-241	Not Detected	---------	4.67E-01
PU-239	Not Detected	---------	4.38E+02
NP-237	~~1.57E-01~~	~~1.62E-01~~	2.47E-01 not detected 5/15/97
PA-233	Not Detected	---------	5.43E-02
TH-229	Not Detected	---------	2.48E-01

[Summary Report] - Sample ID: : 70164702

Nuclide Name	Activity (pCi/gram)	2-sigma Error	MDA (pCi/gram)
AG-108m	Not Detected	---------	3.95E-02
AG-110m	Not Detected	---------	2.92E-02
BA-133	Not Detected	---------	5.80E-02
BE-7	Not Detected	---------	2.43E-01
CD-109	Not Detected	---------	8.38E-01
CD-115	Not Detected	---------	9.31E-02
CE-139	Not Detected	---------	2.84E-02
CE-141	Not Detected	---------	5.28E-02
CE-144	Not Detected	---------	2.41E-01
CO-56	Not Detected	---------	3.58E-02
CO-57	Not Detected	---------	2.96E-02
CO-58	Not Detected	---------	2.97E-02
CO-60	Not Detected	---------	3.62E-02
CR-51	Not Detected	---------	2.31E-01
CS-134	Not Detected	---------	4.00E-02
CS-137	Not Detected	---------	3.13E-02
EU-152	Not Detected	---------	8.91E-02
EU-154	Not Detected	---------	1.81E-01
EU-155	Not Detected	---------	1.47E-01
FE-59	Not Detected	---------	7.43E-02
GD-153	Not Detected	---------	1.04E-01
HG-203	Not Detected	---------	3.10E-02
I-131	Not Detected	---------	3.09E-02
IR-192	Not Detected	---------	2.65E-02
K-40	2.60E+01	3.74E+00	2.51E-01
MN-52	Not Detected	---------	3.26E-02
MN-54	Not Detected	---------	3.49E-02
MO-99	Not Detected	---------	3.09E-01
NA-22	Not Detected	---------	4.21E-02
NA-24	Not Detected	---------	1.28E-01
NB-95	Not Detected	---------	1.96E-01
ND-147	Not Detected	---------	2.05E-01
NI-57	Not Detected	---------	3.79E-02
PB-210	Not Detected	---------	3.33E+01
RU-103	Not Detected	---------	2.80E-02
RU-106	Not Detected	---------	2.75E-01
SB-122	Not Detected	---------	5.38E-02
SB-124	Not Detected	---------	2.81E-02
SB-125	Not Detected	---------	7.57E-02
SN-113	Not Detected	---------	3.54E-02
SR-85	Not Detected	---------	3.55E-02
TA-182	Not Detected	---------	1.42E-01
TA-183	Not Detected	---------	4.74E-01
TC-99m	Not Detected	---------	8.53E-01
TL-201	Not Detected	---------	2.33E-01
XE-133	Not Detected	---------	2.04E-01
Y-88	Not Detected	---------	2.39E-02
ZN-65	Not Detected	---------	9.45E-02
ZR-95	Not Detected	---------	5.70E-02

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* **Sandia National Laboratories** *
* **Radiation Protection Sample Diagnostics Program [881 Laboratory]** *
* **9-18-97 8:24:33 PM** *
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* Analyzed by: 9/19/97 Reviewed by: 9/19/97 *

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Customer : C. BYRD/D. BISWELL (6685/SMO)
Customer Sample ID : 035135-003
Lab Sample ID : 70164703

Sample Description : MARINELLI SOLID SAMPLE
Sample Quantity : 946.000 gram
Sample Date/Time : 9-17-97 11:34:00 AM
Acquire Start Date/Time : 9-18-97 6:41:43 PM
Detector Name : LAB02
Elapsed Live/Real Time : 6000 / 6004 seconds

Comments:

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Nuclide Name	Activity (pCi/gram)	2-sigma Error	MDA (pCi/gram)
U-238	Not Detected	---------	3.06E+00
TH-234	Not Detected	---------	7.29E-01
RA-226	1.09E+00	5.31E-01	5.17E-01
PB-214	5.29E-01	9.19E-02	4.29E-02
BI-214	4.15E-01	7.51E-02	4.14E-02
TH-232	9.78E-01	6.86E-01	1.36E-01
RA-228	1.08E+00	2.86E-01	1.52E-01
AC-228	9.79E-01	6.52E-01	7.26E-02
TH-228	9.33E-01	2.65E-01	4.41E-01
RA-224	1.10E+00	3.05E-01	4.55E-02
PB-212	9.31E-01	1.37E-01	3.69E-02
BI-212	9.21E-01	3.51E-01	3.05E-01
TL-208	8.78E-01	1.64E-01	6.04E-02
U-235	Not Detected	---------	2.21E-01
TH-231	Not Detected	---------	1.17E+01
PA-231	Not Detected	---------	1.31E+00
TH-227	Not Detected	---------	3.27E-01
RA-223	Not Detected	---------	1.97E-01
RN-219	~~[illegible]~~	~~[illegible]~~	3.37E-01 Not detected 9/19/97
PB-211	Not Detected	---------	7.65E-01
TL-207	Not Detected	---------	1.35E+01
AM-241	Not Detected	---------	4.35E-01
PU-239	Not Detected	---------	4.15E+02
NP-237	~~[illegible]~~	~~[illegible]~~	2.42E-01 Not detected 9/19/97
PA-233	Not Detected	---------	5.32E-02
TH-229	Not Detected	---------	2.39E-01

[Summary Report] - Sample ID: : 70164703

Nuclide Name	Activity (pCi/gram)	2-sigma Error	MDA (pCi/gram)	
AG-108m	Not Detected	---------	3.83E-02	
AG-110m	Not Detected	---------	2.84E-02	
BA-133	Not Detected	---------	5.44E-02	
BE-7	Not Detected	---------	2.30E-01	
CD-109	Not Detected	---------	8.23E-01	
CD-115	Not Detected	---------	9.04E-02	
CE-139	Not Detected	---------	2.75E-02	
CE-141	Not Detected	---------	4.92E-02	
CE-144	Not Detected	---------	2.31E-01	
CO-56	Not Detected	---------	3.17E-02	
CO-57	Not Detected	---------	2.86E-02	
CO-58	Not Detected	---------	3.08E-02	
CO-60	Not Detected	---------	3.57E-02	
CR-51	Not Detected	---------	2.18E-01	
CS-134	Not Detected	---------	4.02E-02	
CS-137	Not Detected	---------	3.08E-02	
EU-152	Not Detected	---------	8.59E-02	
EU-154	Not Detected	---------	1.76E-01	
EU-155	Not Detected	---------	1.42E-01	
FE-59	Not Detected	---------	7.31E-02	
GD-153	Not Detected	---------	9.90E-02	
HG-203	Not Detected	---------	2.97E-02	
I-131	Not Detected	---------	2.91E-02	
IR-192	Not Detected	---------	2.54E-02	
K-40	2.63E+01	3.72E+00	2.16E-01	
MN-52	Not Detected	---------	3.14E-02	
MN-54	[illegible]	[illegible]	1.82E-02	not detected 5/15/97
MO-99	Not Detected	---------	3.09E-01	
NA-22	Not Detected	---------	4.06E-02	
NA-24	Not Detected	---------	1.24E-01	
NB-95	Not Detected	---------	1.93E-01	
ND-147	Not Detected	---------	1.93E-01	
NI-57	[illegible]	[illegible]	4.84E-02	not detected 5/15/97
PB-210	Not Detected	---------	3.26E+01	
RU-103	Not Detected	---------	2.70E-02	
RU-106	Not Detected	---------	2.65E-01	
SB-122	Not Detected	---------	4.91E-02	
SB-124	Not Detected	---------	2.79E-02	
SB-125	Not Detected	---------	7.49E-02	
SN-113	Not Detected	---------	3.38E-02	
SR-85	Not Detected	---------	3.31E-02	
TA-182	Not Detected	---------	1.34E-01	
TA-183	Not Detected	---------	4.43E-01	
TC-99m	Not Detected	---------	9.71E-01	
TL-201	Not Detected	---------	2.27E-01	
XE-133	Not Detected	---------	2.01E-01	
Y-88	Not Detected	---------	2.23E-02	
ZN-65	Not Detected	---------	9.51E-02	
ZR-95	Not Detected	---------	5.38E-02	

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* Sandia National Laboratories *
* Radiation Protection Sample Diagnostics Program [881 Laboratory] *
* 9-19-97 9:20:14 AM *
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* Analyzed by: 5/15/97 Reviewed by: 9/19/97 *
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Customer : C. BYRD/D. BISWELL (6685/SMO)
Customer Sample ID : 035136-003
Lab Sample ID : 70164704

Sample Description : MARINELLI SOLID SAMPLE
Sample Quantity : 877.000 gram
Sample Date/Time : 9-17-97 11:37:00 AM
Acquire Start Date/Time : 9-18-97 8:26:51 PM
Detector Name : LAB02
Elapsed Live/Real Time : 6000 / 6003 seconds

Comments:
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Nuclide Name	Activity (pCi/gram)	2-sigma Error	MDA (pCi/gram)
U-238	Not Detected	---------	2.96E+00
TH-234	9.86E-01	3.59E-01	5.33E-01
RA-226	1.03E+00	4.87E-01	4.73E-01
PB-214	4.65E-01	8.60E-02	4.23E-02
BI-214	4.40E-01	9.71E-02	4.09E-02
TH-232	8.44E-01	4.06E-01	1.39E-01
RA-228	8.36E-01	2.43E-01	1.36E-01
AC-228	9.29E-01	2.24E-01	8.43E-02
TH-228	6.54E-01	2.41E-01	4.34E-01
RA-224	8.41E-01	2.63E-01	4.75E-02
PB-212	8.10E-01	1.32E-01	3.61E-02
BI-212	9.78E-01	4.76E-01	2.92E-01
TL-208	7.24E-01	1.52E-01	6.11E-02
U-235	Not Detected	---------	2.23E-01
TH-231	Not Detected	---------	1.14E+01
PA-231	Not Detected	---------	1.28E+00
TH-227	Not Detected	---------	3.21E-01
RA-223	Not Detected	---------	1.91E-01
RN-219	Not Detected	---------	3.36E-01
PB-211	Not Detected	---------	7.68E-01
TL-207	Not Detected	---------	1.33E+01
AM-241	Not Detected	---------	4.29E-01
PU-239	Not Detected	---------	4.15E+02
NP-237	~~3.87E-01~~	~~1.16E-01~~	2.34E-01 Not detected 5/19/97
PA-233	Not Detected	---------	5.40E-02
TH-229	Not Detected	---------	2.34E-01

[Summary Report] - Sample ID: : 70164704

Nuclide Name	Activity (pCi/gram)	2-sigma Error	MDA (pCi/gram)
AG-108m	Not Detected	---------	3.72E-02
AG-110m	Not Detected	---------	2.90E-02
BA-133	Not Detected	---------	5.39E-02
BE-7	Not Detected	---------	2.33E-01
CD-109	Not Detected	---------	7.95E-01
CD-115	Not Detected	---------	9.29E-02
CE-139	Not Detected	---------	2.70E-02
CE-141	Not Detected	---------	4.93E-02
CE-144	Not Detected	---------	2.24E-01
CO-56	Not Detected	---------	2.26E-02
CO-57	Not Detected	---------	2.80E-02
CO-58	Not Detected	---------	2.95E-02
CO-60	Not Detected	---------	3.26E-02
CR-51	Not Detected	---------	2.15E-01
CS-134	Not Detected	---------	4.06E-02
CS-137	1.33E-02	2.07E-02	1.72E-02
EU-152	Not Detected	---------	8.43E-02
EU-154	Not Detected	---------	1.73E-01
EU-155	Not Detected	---------	1.40E-01
FE-59	Not Detected	---------	6.95E-02
GD-153	Not Detected	---------	1.01E-01
HG-203	Not Detected	---------	2.95E-02
I-131	Not Detected	---------	2.80E-02
IR-192	Not Detected	---------	2.46E-02
K-40	2.37E+01	3.37E+00	1.93E-01
MN-52	Not Detected	---------	2.98E-02
MN-54	Not Detected	---------	3.28E-02
MO-99	Not Detected	---------	3.05E-01
NA-22	Not Detected	---------	4.09E-02
NA-24	Not Detected	---------	1.31E-01
NB-95	Not Detected	---------	1.92E-01
ND-147	Not Detected	---------	1.90E-01
NI-57	~~5.99E-02~~	~~2.59E-02~~	3.55E-02 Not detected 5/15/97
PB-210	Not Detected	---------	3.11E+01
RU-103	Not Detected	---------	2.68E-02
RU-106	Not Detected	---------	2.69E-01
SB-122	Not Detected	---------	5.01E-02
SB-124	Not Detected	---------	2.89E-02
SB-125	Not Detected	---------	7.40E-02
SN-113	Not Detected	---------	3.32E-02
SR-85	Not Detected	---------	3.28E-02
TA-182	Not Detected	---------	1.33E-01
TA-183	Not Detected	---------	4.38E-01
TC-99m	Not Detected	---------	1.17E+00
TL-201	Not Detected	---------	2.26E-01
XE-133	Not Detected	---------	2.01E-01
Y-88	Not Detected	---------	2.32E-02
ZN-65	Not Detected	---------	9.18E-02
ZR-95	Not Detected	---------	5.31E-02

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* Sandia National Laboratories *
* Radiation Protection Sample Diagnostics Program [881 Laboratory] *
* 9-18-97 11:54:40 PM *
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* Analyzed by: 9/19/97 Reviewed by: 9/19/97 *

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Customer : C. BYRD/D. BISWELL (6685/SMO)
Customer Sample ID : 035137-003
Lab Sample ID : 70164705

Sample Description : MARINELLI SOLID SAMPLE
Sample Quantity : 685.000 gram
Sample Date/Time : 9-17-97 11:40:00 AM
Acquire Start Date/Time : 9-18-97 10:11:58 PM
Detector Name : LAB02
Elapsed Live/Real Time : 6000 / 6003 seconds

Comments:

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Nuclide Name	Activity (pCi/gram)	2-sigma Error	MDA (pCi/gram)
U-238	Not Detected	---------	3.61E+00
TH-234	Not Detected	---------	8.48E-01
RA-226	1.71E+00	2.36E+00	5.65E-01
PB-214	5.97E-01	9.19E-02	5.24E-02
BI-214	5.69E-01	5.78E-01	4.93E-02
TH-232	9.16E-01	4.34E-01	1.50E-01
RA-228	8.75E-01	4.10E-01	1.75E-01
AC-228	8.99E-01	2.30E-01	8.76E-02
TH-228	7.81E-01	2.61E-01	5.19E-01
RA-224	9.90E-01	3.77E-01	7.97E-02
PB-212	9.30E-01	1.64E-01	4.26E-02
BI-212	1.09E+00	7.39E-01	3.20E-01
TL-208	8.30E-01	1.63E-01	7.33E-02
U-235	Not Detected	---------	2.50E-01
TH-231	Not Detected	---------	1.35E+01
PA-231	Not Detected	---------	1.54E+00
TH-227	Not Detected	---------	3.83E-01
RA-223	Not Detected	---------	2.27E-01
RN-219	Not Detected	---------	3.84E-01
PB-211	Not Detected	---------	8.84E-01
TL-207	Not Detected	---------	1.43E+01
AM-241	Not Detected	---------	5.15E-01
PU-239	Not Detected	---------	4.66E+02
NP-237	Not Detected	---------	2.85E-01
PA-233	Not Detected	---------	6.21E-02
TH-229	Not Detected	---------	2.79E-01

[Summary Report] - Sample ID: : 70164705

Nuclide Name	Activity (pCi/gram)	2-sigma Error	MDA (pCi/gram)
AG-108m	Not Detected	---------	4.42E-02
AG-110m	Not Detected	---------	3.40E-02
BA-133	Not Detected	---------	6.62E-02
BE-7	Not Detected	---------	2.69E-01
~~CD-109~~	~~1.37E+00~~	~~7.99E-01~~	9.67E-01 not detected 7/5/15
CD-115	Not Detected	---------	1.12E-01
CE-139	Not Detected	---------	3.09E-02
CE-141	Not Detected	---------	5.53E-02
CE-144	Not Detected	---------	2.58E-01
CO-56	Not Detected	---------	3.82E-02
CO-57	Not Detected	---------	3.27E-02
CO-58	Not Detected	---------	3.37E-02
CO-60	Not Detected	---------	3.65E-02
CR-51	Not Detected	---------	2.48E-01
CS-134	Not Detected	---------	4.93E-02
CS-137	Not Detected	---------	2.07E-02
EU-152	Not Detected	---------	9.84E-02
EU-154	Not Detected	---------	2.03E-01
EU-155	Not Detected	---------	1.62E-01
FE-59	Not Detected	---------	7.76E-02
GD-153	Not Detected	---------	1.18E-01
HG-203	Not Detected	---------	3.49E-02
I-131	Not Detected	---------	3.38E-02
IR-192	Not Detected	---------	2.92E-02
K-40	2.02E+01	2.96E+00	2.78E-01
MN-52	Not Detected	---------	3.56E-02
MN-54	Not Detected	---------	3.96E-02
MO-99	Not Detected	---------	3.69E-01
NA-22	Not Detected	---------	4.30E-02
NA-24	Not Detected	---------	1.77E-01
NB-95	Not Detected	---------	2.32E-01
ND-147	Not Detected	---------	2.25E-01
NI-57	Not Detected	---------	9.72E-02
PB-210	Not Detected	---------	3.82E+01
RU-103	Not Detected	---------	3.11E-02
RU-106	Not Detected	---------	3.18E-01
SB-122	Not Detected	---------	5.84E-02
SB-124	Not Detected	---------	3.29E-02
SB-125	Not Detected	---------	8.83E-02
SN-113	Not Detected	---------	3.85E-02
SR-85	Not Detected	---------	4.04E-02
TA-182	Not Detected	---------	1.50E-01
TA-183	Not Detected	---------	5.29E-01
TC-99m	Not Detected	---------	1.64E+00
TL-201	Not Detected	---------	2.69E-01
XE-133	Not Detected	---------	2.42E-01
Y-88	Not Detected	---------	2.68E-02
ZN-65	Not Detected	---------	1.03E-01
ZR-95	Not Detected	---------	6.36E-02

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* Sandia National Laboratories *
* Radiation Protection Sample Diagnostics Program [881 Laboratory] *
* 9-19-97 1:39:38 AM *
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* Analyzed by: 9/19/97 Reviewed by: 9/19/97 *
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Customer : C. BYRD/D. BISWELL (6685/SMO)
Customer Sample ID : 035138-003
Lab Sample ID : 70164706

Sample Description : MARINELLI SOLID SAMPLE
Sample Quantity : 759.000 gram
Sample Date/Time : 9-17-97 11:45:00 AM
Acquire Start Date/Time : 9-18-97 11:56:47 PM
Detector Name : LAB02
Elapsed Live/Real Time : 6000 / 6003 seconds

Comments:
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Nuclide Name	Activity (pCi/gram)	2-sigma Error	MDA (pCi/gram)
U-238	Not Detected	---------	3.40E+00
TH-234	1.35E+00	4.60E-01	6.55E-01
RA-226	1.32E+00	4.87E-01	5.44E-01
PB-214	5.57E-01	2.00E-01	4.68E-02
BI-214	4.95E-01	1.09E-01	5.02E-02
TH-232	8.72E-01	4.42E-01	1.52E-01
RA-228	8.90E-01	2.25E-01	1.63E-01
AC-228	1.03E+00	1.46E+00	8.95E-02
TH-228	9.12E-01	4.68E-01	4.83E-01
RA-224	1.02E+00	3.27E-01	6.12E-02
PB-212	9.58E-01	2.30E-01	4.23E-02
BI-212	8.80E-01	3.94E-01	3.14E-01
TL-208	8.02E-01	1.80E-01	7.13E-02
U-235	Not Detected	---------	2.50E-01
TH-231	Not Detected	---------	1.31E+01
PA-231	Not Detected	---------	1.50E+00
TH-227	Not Detected	---------	3.70E-01
RA-223	Not Detected	---------	2.23E-01
RN-219	Not Detected	---------	3.78E-01
PB-211	Not Detected	---------	8.60E-01
~~TL-207~~	~~3.98E+00~~	~~5.47E+00~~	6.96E+00 not detected 9/19/97
AM-241	Not Detected	---------	4.86E-01
PU-239	Not Detected	---------	4.69E+02
NP-237	Not Detected	---------	4.03E-01
PA-233	Not Detected	---------	5.98E-02
TH-229	Not Detected	---------	2.61E-01

[Summary Report] - Sample ID: : 70164706

Nuclide Name	Activity (pCi/gram)	2-sigma Error	MDA (pCi/gram)	
AG-108m	Not Detected	---------	4.27E-02	
AG-110m	Not Detected	---------	3.31E-02	
BA-133	Not Detected	---------	6.23E-02	
BE-7	Not Detected	---------	2.51E-01	
~~CD-109~~	~~1.63E+00~~	~~6.27E-01~~	9.45E-01	not detected 9/19/97
CD-115	Not Detected	---------	1.10E-01	
CE-139	Not Detected	---------	3.15E-02	
CE-141	Not Detected	---------	5.50E-02	
CE-144	Not Detected	---------	2.58E-01	
CO-56	Not Detected	---------	2.81E-02	
CO-57	Not Detected	---------	3.19E-02	
CO-58	Not Detected	---------	3.48E-02	
CO-60	Not Detected	---------	3.86E-02	
CR-51	Not Detected	---------	2.45E-01	
CS-134	Not Detected	---------	4.60E-02	
CS-137	Not Detected	---------	3.52E-02	
EU-152	Not Detected	---------	9.60E-02	
EU-154	Not Detected	---------	1.97E-01	
EU-155	Not Detected	---------	1.57E-01	
FE-59	Not Detected	---------	7.99E-02	
GD-153	Not Detected	---------	1.10E-01	
HG-203	Not Detected	---------	3.30E-02	
I-131	Not Detected	---------	3.35E-02	
IR-192	Not Detected	---------	2.88E-02	
K-40	2.64E+01	3.78E+00	2.53E-01	
MN-52	Not Detected	---------	3.75E-02	
~~MN-54~~	~~2.21E-02~~	~~1.37E-02~~	2.28E-02	not detected 9/19/97
MO-99	Not Detected	---------	3.63E-01	
NA-22	Not Detected	---------	4.73E-02	
NA-24	Not Detected	---------	1.69E-01	
NB-95	Not Detected	---------	2.27E-01	
ND-147	Not Detected	---------	2.32E-01	
~~NI-57~~	~~6.97E-02~~	~~7.20E-02~~	5.46E-02	not detected 9/19/97
PB-210	Not Detected	---------	3.61E+01	
RU-103	Not Detected	---------	3.05E-02	
RU-106	Not Detected	---------	3.18E-01	
SB-122	Not Detected	---------	6.23E-02	
SB-124	Not Detected	---------	3.19E-02	
SB-125	Not Detected	---------	8.37E-02	
SN-113	Not Detected	---------	3.96E-02	
SR-85	Not Detected	---------	3.96E-02	
TA-182	Not Detected	---------	1.58E-01	
TA-183	Not Detected	---------	5.10E-01	
TC-99m	Not Detected	---------	1.94E+00	
TL-201	Not Detected	---------	2.67E-01	
XE-133	Not Detected	---------	2.39E-01	
Y-88	Not Detected	---------	2.49E-02	
ZN-65	Not Detected	---------	1.08E-01	
ZR-95	Not Detected	---------	6.02E-02	

Sandia National Laboratories
Radiation Protection Sample Diagnostics Program [881 Laboratory]
9-09-97 5:29:28 PM

Analyzed by: 9/9/97 Reviewed by: 9/10/97

Customer : C.BYRD/MAC (6685/SMO)
Customer Sample ID : 034141-003
Lab Sample ID : 70157501

Sample Description : MARINELLI WATER SAMPLE
Sample Quantity : 500.000 mL
Sample Date/Time : 9-09-97 10:41:00 AM
Acquire Start Date/Time : 9-09-97 3:45:17 PM
Detector Name : LAB04
Elapsed Live/Real Time : 6000 / 6001 seconds

Comments:

Nuclide Name	Activity (pCi/mL)	2-sigma Error	MDA (pCi/mL)
U-238	Not Detected	---------	8.64E-01
TH-234	Not Detected	---------	2.96E-01
RA-226	Not Detected	---------	4.37E-01
PB-214	Not Detected	---------	4.10E-02
BI 214	Not Detected	---------	4.95E-02
TH-232	Not Detected	---------	1.41E-01
RA-228	Not Detected	---------	1.16E-01
AC-228	Not Detected	---------	7.14E-02
TH-228	Not Detected	---------	4.29E-01
RA-224	Not Detected	---------	1.10E-01
PB-212	2.77E-02	2.31E-02	2.33E-02
BI-212	Not Detected	---------	2.70E-01
TL-208	Not Detected	---------	6.73E-02
U-235	Not Detected	---------	1.29E-01
TH-231	Not Detected	---------	4.67E+00
PA-231	Not Detected	---------	9.17E-01
TH-227	Not Detected	---------	1.29E-01
RA-223	Not Detected	---------	7.44E-02
RN-219	Not Detected	---------	2.41E-01
PB-211	Not Detected	---------	5.30E-01
TL-207	Not Detected	---------	7.49E+00
AM-241	Not Detected	---------	1.05E-01
PU-239	Not Detected	---------	2.12E+02
NP-237	Not Detected	---------	1.38E-01
PA-233	Not Detected	---------	3.97E-02
TH-229	Not Detected	---------	1.16E-01

[Summary Report] - Sample ID: : 70157501

Nuclide Name	Activity (pCi/mL)	2-sigma Error	MDA (pCi/mL)
AG-108m	Not Detected	---------	2.05E-02
AG-110m	Not Detected	---------	1.94E-02
BA-133	Not Detected	---------	2.58E-02
BE-7	Not Detected	---------	1.68E-01
BI-207	Not Detected	---------	1.99E-02
CD-109	Not Detected	---------	4.63E-01
CD-115	Not Detected	---------	3.67E-02
CE-139	Not Detected	---------	1.59E-02
CE-141	Not Detected	---------	2.67E-02
CE-144	Not Detected	---------	1.18E-01
CO-56	Not Detected	---------	2.09E-02
CO-57	Not Detected	---------	1.44E-02
CO-58	Not Detected	---------	1.84E-02
CO-60	Not Detected	---------	2.36E-02
CR-51	Not Detected	---------	1.52E-01
CS-134	Not Detected	---------	2.36E-02
CS-137	Not Detected	---------	1.93E-02
EU-152	Not Detected	---------	4.34E-02
EU-154	Not Detected	---------	9.54E-02
EU-155	Not Detected	---------	6.79E-02
FE-59	Not Detected	---------	3.47E-02
GD-153	Not Detected	---------	4.70E-02
HG-203	Not Detected	---------	1.73E-02
I-131	Not Detected	---------	1.76E-02
IR-192	Not Detected	---------	1.80E-02
K-40	Not Detected	---------	2.27E-01
MN-52	Not Detected	---------	1.77E-02
MN-54	Not Detected	---------	2.04E-02
MO-99	Not Detected	---------	1.53E-01
NA-22	Not Detected	---------	2.19E-02
NA-24	Not Detected	---------	2.41E-02
NB-95	Not Detected	---------	6.16E-02
ND-147	Not Detected	---------	1.30E-01
NI-57	Not Detected	---------	3.06E-02
PB-210	Not Detected	---------	4.06E+00
RU-103	Not Detected	---------	2.01E-02
RU-106	Not Detected	---------	2.02E-01
SB-122	Not Detected	---------	2.68E-02
SB-124	Not Detected	---------	2.26E-02
SB-125	Not Detected	---------	4.80E-02
SN-113	Not Detected	---------	2.42E-02
SR-85	Not Detected	---------	2.86E-02
TA-182	Not Detected	---------	6.83E-02
TA-183	Not Detected	---------	9.27E-02
TC-99m	Not Detected	---------	2.28E-02
TL-201	Not Detected	---------	5.67E-02
XE-133	Not Detected	---------	5.73E-02
Y-88	Not Detected	---------	2.31E-02
ZN-65	Not Detected	---------	4.96E-02
ZR-95	Not Detected	---------	3.09E-02

Sandia National Laboratories
Radiation Protection Sample Diagnostics Program [881 Laboratory]
9-09-97 7:10:33 PM

Analyzed by: 5/5/97 Reviewed by: 9/12/97

Customer : C.BYRD/MAC (6685/SMO)
Customer Sample ID : 034142-003
Lab Sample ID : 70157502

Sample Description : MARINELLI WATER SAMPLE
Sample Quantity : 500.000 mL
Sample Date/Time : 9-09-97 10:30:00 AM
Acquire Start Date/Time : 9-09-97 5:27:51 PM
Detector Name : LAB04
Elapsed Live/Real Time : 6000 / 6001 seconds

Comments:

Nuclide Name	Activity (pCi/mL)	2-sigma Error	MDA (pCi/mL)
U-238	Not Detected	---------	8.78E-01
TH-234	Not Detected	---------	2.91E-01
RA-226	Not Detected	---------	4.21E-01
PB-214	Not Detected	---------	4.34E-02
BI-214	Not Detected	---------	4.40E-02
TH-232	Not Detected	---------	1.31E-01
RA-228	Not Detected	---------	1.19E-01
AC-228	Not Detected	---------	7.29E-02
TH-228	Not Detected	---------	4.21E-01
RA-224	Not Detected	---------	8.12E-02
PB-212	Not Detected	---------	3.22E-02
BI-212	Not Detected	---------	2.86E-01
TL-208	Not Detected	---------	5.59E-02
U-235	Not Detected	---------	1.27E-01
TH-231	Not Detected	---------	4.67E+00
PA-231	Not Detected	---------	9.32E-01
TH-227	Not Detected	---------	1.15E-01
RA-223	Not Detected	---------	7.42E-02
RN-219	Not Detected	---------	2.36E-01
PB-211	Not Detected	---------	5.10E-01
TL-207	Not Detected	---------	8.59E+00
AM-241	Not Detected	---------	1.10E-01
PU-239	Not Detected	---------	2.08E+02
NP-237	Not Detected	---------	1.37E-01
PA-233	Not Detected	---------	3.92E-02
TH-229	Not Detected	---------	1.15E-01

[Summary Report] - Sample ID: : 70157502

Nuclide Name	Activity (pCi/mL)	2-sigma Error	MDA (pCi/mL)
AG-108m	Not Detected	---------	2.07E-02
AG-110m	Not Detected	---------	1.87E-02
BA-133	Not Detected	---------	2.69E-02
BE-7	Not Detected	---------	1.64E-01
BI-207	Not Detected	---------	1.84E-02
CD-109	Not Detected	---------	4.43E-01
CD-115	Not Detected	---------	3.61E-02
CE-139	Not Detected	---------	1.54E-02
CE-141	Not Detected	---------	2.70E-02
CE-144	Not Detected	---------	1.17E-01
CO-56	Not Detected	---------	2.05E-02
CO-57	Not Detected	---------	1.41E-02
CO-58	Not Detected	---------	1.86E-02
CO-60	Not Detected	---------	2.20E-02
CR-51	Not Detected	---------	1.54E-01
CS-134	Not Detected	---------	2.24E-02
CS-137	Not Detected	---------	2.06E-02
EU-152	Not Detected	---------	4.25E-02
EU-154	Not Detected	---------	9.54E-02
EU-155	Not Detected	---------	6.55E-02
FE-59	Not Detected	---------	3.67E-02
GD-153	Not Detected	---------	4.73E-02
HG-203	Not Detected	---------	1.91E-02
I-131	Not Detected	---------	1.99E-02
IR-192	Not Detected	---------	1.84E-02
K-40	Not Detected	---------	2.68E-01
MN-52	Not Detected	---------	1.86E-02
MN-54	Not Detected	---------	2.09E-02
MO-99	Not Detected	---------	1.51E-01
NA-22	Not Detected	---------	2.00E-02
NA-24	Not Detected	---------	2.75E-02
NB-95	Not Detected	---------	5.61E-02
ND-147	Not Detected	---------	1.23E-01
NI-57	Not Detected	---------	3.18E-02
PB-210	Not Detected	---------	3.74E+00
RU-103	Not Detected	---------	2.11E-02
RU-106	Not Detected	---------	1.95E-01
SB-122	Not Detected	---------	2.79E-02
SB-124	Not Detected	---------	2.25E-02
SB-125	Not Detected	---------	5.05E-02
SN-113	Not Detected	---------	2.24E-02
SR-85	Not Detected	---------	2.78E-02
TA-182	Not Detected	---------	5.89E-02
TA-183	Not Detected	---------	9.74E-02
TC-99m	Not Detected	---------	3.23E-02
TL-201	Not Detected	---------	5.76E-02
XE-133	Not Detected	---------	5.58E-02
Y-88	Not Detected	---------	2.31E-02
ZN-65	Not Detected	---------	3.93E-02
ZR-95	Not Detected	---------	3.52E-02

****
* Sandia National Laboratories *
* Radiation Protection Sample Diagnostics Program [881 Laboratory] *
* 9-15-97 11:25:08 AM *
****
* *
* Analyzed by: 9/15/97 Reviewed by: 9/16/97 *
****

Customer : C.BYRD/MAC (6685/SMO)
Customer Sample ID : 034195-003
Lab Sample ID : 70160207

Sample Description : MARINELLI WATER SAMPLE
Sample Quantity : 485.000 mL
Sample Date/Time : 9-11-97 11:10:00 AM
Acquire Start Date/Time : 9-15-97 9:43:17 AM
Detector Name : LAB01
Elapsed Live/Real Time : 6000 / 6001 seconds

Comments:

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Nuclide Name	Activity (pCi/mL)	2-sigma Error	MDA (pCi/mL)
U-238	Not Detected	---------	7.89E-01
TH-234	Not Detected	---------	3.24E-01
RA-226	Not Detected	---------	4.73E-01
PB-214	Not Detected	---------	6.06E-02
BI-214	Not Detected	---------	5.65E-02
TH-232	Not Detected	---------	1.51E-01
RA-228	Not Detected	---------	1.69E-01
AC-228	Not Detected	---------	1.05E-01
TH-228	Not Detected	---------	5.54E-01
RA-224	Not Detected	---------	1.65E-01
PB-212	Not Detected	---------	2.59E-02
BI-212	Not Detected	---------	3.74E-01
TL-208	Not Detected	---------	7.74E-02
U-235	Not Detected	---------	1.35E-01
TH-231	Not Detected	---------	4.60E+00
PA-231	Not Detected	---------	1.08E+00
TH-227	Not Detected	---------	1.60E-01
RA-223	Not Detected	---------	9.11E-02
RN-219	Not Detected	---------	3.08E-01
PB-211	Not Detected	---------	6.94E-01
TL-207	Not Detected	---------	1.06E+01
AM-241	Not Detected	---------	9.96E-02
PU-239	Not Detected	---------	2.16E+02
NP-237	Not Detected	---------	1.45E-01
PA-233	Not Detected	---------	4.41E-02
TH-229	Not Detected	---------	1.22E-01

[Summary Report] - Sample ID: : 70160207

Nuclide Name	Activity (pCi/mL)	2-sigma Error	MDA (pCi/mL)
AG-108m	Not Detected	---------	2.61E-02
AG-110m	Not Detected	---------	2.37E-02
BA-133	Not Detected	---------	3.38E-02
BE-7	Not Detected	---------	2.06E-01
BI-207	Not Detected	---------	2.87E-02
CD-109	Not Detected	---------	4.85E-01
CD-115	Not Detected	---------	1.25E-01
CE-139	Not Detected	---------	1.87E-02
CE-141	Not Detected	---------	3.28E-02
CE-144	Not Detected	---------	1.27E-01
CO-56	Not Detected	---------	3.90E-02
CO-57	Not Detected	---------	1.61E-02
CO-58	Not Detected	---------	2.75E-02
CO-60	Not Detected	---------	2.98E-02
CR-51	Not Detected	---------	2.04E-01
CS-134	Not Detected	---------	2.74E-02
CS-137	Not Detected	---------	2.72E-02
EU-152	Not Detected	---------	4.87E-02
EU-154	Not Detected	---------	1.22E-01
EU-155	Not Detected	---------	6.87E-02
FE-59	Not Detected	---------	4.72E-02
GD-153	Not Detected	---------	5.00E-02
HG-203	Not Detected	---------	2.51E-02
I-131	Not Detected	---------	3.24E-02
IR-192	Not Detected	---------	2.29E-02
K-40	Not Detected	---------	3.86E-01
MN-52	Not Detected	---------	4.32E-02
MN-54	Not Detected	---------	2.72E-02
MO-99	Not Detected	---------	5.35E-01
NA-22	Not Detected	---------	2.51E-02
NA-24	Not Detected	---------	2.09E+00
NB-95	Not Detected	---------	1.53E-01
ND-147	Not Detected	---------	2.17E-01
NI-57	Not Detected	---------	2.16E-01
PB-210	Not Detected	---------	3.61E+00
RU-103	Not Detected	---------	2.92E-02
RU-106	Not Detected	---------	2.29E-01
SB-122	Not Detected	---------	7.98E-02
SB-124	Not Detected	---------	2.79E-02
SB-125	Not Detected	---------	7.60E-02
SN-113	Not Detected	---------	3.08E-02
SR-85	Not Detected	---------	3.59E-02
TA-182	Not Detected	---------	8.29E-02
TA-183	Not Detected	---------	1.44E-01
TC-99m	Not Detected	---------	9.09E+02
TL-201	Not Detected	---------	1.41E-01
XE-133	Not Detected	---------	1.86E-01
Y-88	Not Detected	---------	3.30E-02
ZN-65	Not Detected	---------	5.62E-02
ZR-95	Not Detected	---------	4.51E-02

Sandia National Laboratories
Radiation Protection Sample Diagnostics Program [881 Laboratory]
9-15-97 1:09:02 PM

Analyzed by: 9/15/97 Reviewed by: 9/16/97

Customer : C.BYRD/MAC (6685/SMO)
Customer Sample ID : 034196-003
Lab Sample ID : 70160208

Sample Description : MARINELLI WATER SAMPLE
Sample Quantity : 500.000 mL
Sample Date/Time : 9-11-97 11:00:00 AM
Acquire Start Date/Time : 9-15-97 11:27:09 AM
Detector Name : LAB01
Elapsed Live/Real Time : 6000 / 6001 seconds

Comments:

Nuclide Name	Activity (pCi/mL)	2-sigma Error	MDA (pCi/mL)
U-238	Not Detected	---------	7.86E-01
TH-234	Not Detected	---------	2.17E-01
RA-226	Not Detected	---------	4.78E-01
PB-214	Not Detected	---------	5.28E-02
BI-214	Not Detected	---------	6.01E-02
TH-232	Not Detected	---------	1.53E-01
RA-228	Not Detected	---------	1.40E-01
AC-228	Not Detected	---------	9.90E-02
TH-228	Not Detected	---------	5.31E-01
RA-224	Not Detected	---------	1.42E-01
PB-212	Not Detected	---------	4.09E-02
BI-212	Not Detected	---------	3.77E-01
TL-208	Not Detected	---------	7.78E-02
U-235	Not Detected	---------	1.36E-01
TH-231	Not Detected	---------	4.81E+00
PA-231	Not Detected	---------	1.02E+00
TH-227	Not Detected	---------	1.55E-01
RA-223	Not Detected	---------	9.45E-02
RN-219	Not Detected	---------	3.03E-01
PB-211	Not Detected	---------	6.88E-01
TL-207	Not Detected	---------	1.03E+01
AM-241	Not Detected	---------	9.77E-02
PU-239	Not Detected	---------	2.22E+02
NP-237	Not Detected	---------	1.38E-01
PA-233	Not Detected	---------	4.58E-02
TH-229	Not Detected	---------	1.15E-01

[Summary Report] - Sample ID: : 70160208

Nuclide Name	Activity (pCi/mL)	2-sigma Error	MDA (pCi/mL)
AG-108m	Not Detected	---------	2.71E-02
AG-110m	Not Detected	---------	2.32E-02
BA-133	Not Detected	---------	3.18E-02
BE-7	Not Detected	---------	1.82E-01
BI-207	Not Detected	---------	2.25E-02
CD-109	Not Detected	---------	4.65E-01
CD-115	Not Detected	---------	1.35E-01
CE-139	Not Detected	---------	1.74E-02
CE-141	Not Detected	---------	3.24E-02
CE-144	Not Detected	---------	1.24E-01
CO-56	Not Detected	---------	3.59E-02
CO-57	Not Detected	---------	1.62E-02
CO-58	Not Detected	---------	2.85E-02
CO-60	Not Detected	---------	2.74E-02
CR-51	Not Detected	---------	1.98E-01
CS-134	Not Detected	---------	2.75E-02
CS-137	Not Detected	---------	2.76E-02
EU-152	Not Detected	---------	4.78E-02
EU-154	Not Detected	---------	1.26E-01
EU-155	Not Detected	---------	6.33E-02
FE-59	Not Detected	---------	5.29E-02
GD-153	Not Detected	---------	4.84E-02
HG-203	Not Detected	---------	2.12E-02
I-131	Not Detected	---------	3.17E-02
IR-192	Not Detected	---------	2.12E-02
K-40	Not Detected	---------	3.26E-01
MN-52	Not Detected	---------	4.72E-02
MN-54	Not Detected	---------	2.80E-02
MO-99	Not Detected	---------	5.16E-01
NA-22	Not Detected	---------	2.73E-02
NA-24	Not Detected	---------	2.61E+00
NB-95	Not Detected	---------	1.53E-01
ND-147	Not Detected	---------	2.18E-01
NI-57	Not Detected	---------	2.72E-01
PB-210	Not Detected	---------	3.70E+00
RU-103	Not Detected	---------	2.74E-02
RU-106	Not Detected	---------	2.28E-01
SB-122	Not Detected	---------	8.53E-02
SB-124	Not Detected	---------	2.88E-02
SB-125	Not Detected	---------	7.37E-02
SN-113	Not Detected	---------	2.89E-02
SR-85	Not Detected	---------	3.33E-02
TA-182	Not Detected	---------	7.93E-02
TA-183	Not Detected	---------	1.43E-01
TC-99m	Not Detected	---------	1.17E+03
TL-201	Not Detected	---------	1.33E-01
XE-133	Not Detected	---------	1.89E-01
Y-88	Not Detected	---------	3.11E-02
ZN-65	Not Detected	---------	6.00E-02
ZR-95	Not Detected	---------	4.77E-02

****
* Sandia National Laboratories *
* Radiation Protection Sample Diagnostics Program [881 Laboratory] *
* 9-19-97 8:37:33 AM *
****
* *
* Analyzed by: 9/19/97 Reviewed by: 9/19/97 *
****

Customer : C. BYRD/D. BISWELL (6685/SMO)
Customer Sample ID : 035229-003
Lab Sample ID : 70164710

Sample Description : MARINELLI WATER SAMPLE
Sample Quantity : 500.000 mL
Sample Date/Time : 9-17-97 12:25:00 PM
Acquire Start Date/Time : 9-19-97 6:55:30 AM
Detector Name : LAB02
Elapsed Live/Real Time : 6000 / 6001 seconds

Comments:
****

Nuclide Name	Activity (pCi/mL)	2-sigma Error	MDA (pCi/mL)
U-238	Not Detected	---------	1.83E+00
TH-234	Not Detected	---------	3.99E-01
RA-226	Not Detected	---------	4.59E-01
PB-214	Not Detected	---------	4.98E-02
BI-214	Not Detected	---------	5.56E-02
TH-232	Not Detected	---------	1.50E-01
RA-228	Not Detected	---------	1.43E-01
AC-228	Not Detected	---------	8.45E-02
TH-228	Not Detected	---------	4.94E-01
RA-224	Not Detected	---------	1.15E-01
PB-212	Not Detected	---------	3.59E-02
BI-212	Not Detected	---------	3.25E-01
TL-208	Not Detected	---------	6.24E-02
U-235	Not Detected	---------	1.52E-01
TH-231	Not Detected	---------	6.15E+00
PA-231	Not Detected	---------	1.01E+00
TH-227	Not Detected	---------	1.33E-01
RA-223	Not Detected	---------	1.06E-01
RN-219	Not Detected	---------	2.35E-01
PB-211	Not Detected	---------	5.33E-01
TL-207	Not Detected	---------	8.45E+00
AM-241	Not Detected	---------	2.57E-01
PU-239	Not Detected	---------	2.66E+02
NP-237	Not Detected	---------	1.82E-01
PA-233	Not Detected	---------	4.03E-02
TH-229	Not Detected	---------	1.44E-01

[Summary Report] - Sample ID: : 70164710

Nuclide Name	Activity (pCi/mL)	2-sigma Error	MDA (pCi/mL)	
AG-108m	Not Detected	---------	2.41E-02	
AG-110m	Not Detected	---------	2.02E-02	
BA-133	Not Detected	---------	3.09E-02	
BE-7	Not Detected	---------	1.83E-01	
CD-109	Not Detected	---------	6.29E-01	
CD-115	Not Detected	---------	6.34E-02	
CE-139	Not Detected	---------	1.96E-02	
CE-141	Not Detected	---------	3.37E-02	
CE-144	Not Detected	---------	1.52E-01	
CO-56	Not Detected	---------	3.06E-02	
CO-57	Not Detected	---------	1.84E-02	
CO-58	Not Detected	---------	2.11E-02	
CO-60	Not Detected	---------	2.25E-02	
CR-51	Not Detected	---------	1.70E-01	
CS-134	Not Detected	---------	2.57E-02	
CS-137	Not Detected	---------	2.19E-02	
EU-152	Not Detected	---------	5.52E-02	
EU-154	Not Detected	---------	1.12E-01	
EU-155	Not Detected	---------	8.67E-02	
FE-59	Not Detected	---------	4.38E-02	
GD-153	Not Detected	---------	5.96E-02	
HG-203	Not Detected	---------	2.13E-02	
I-131	Not Detected	---------	2.57E-02	
IR-192	Not Detected	---------	1.94E-02	
K-40	Not Detected	---------	2.64E-01	
MN-52	Not Detected	---------	2.83E-02	
MN-54	Not Detected	---------	2.19E-02	
MO-99	Not Detected	---------	2.51E-01	
NA-22	Not Detected	---------	2.50E-02	
NA-24	Not Detected	---------	1.83E-01	
NB-95	Not Detected	---------	8.56E-02	
ND-147	Not Detected	---------	1.52E-01	
NI-57	Not Detected	---------	7.01E-02	
PB-210	Not Detected	---------	1.42E+01	
RU-103	Not Detected	---------	2.44E-02	
RU-106	Not Detected	---------	2.22E-01	
SB-122	Not Detected	---------	4.39E-02	
SB-124	Not Detected	---------	2.46E-02	
SB-125	Not Detected	---------	5.61E-02	
SN-113	Not Detected	---------	2.66E-02	
SR-85	Not Detected	---------	3.08E-02	
TA-182	Not Detected	---------	7.61E-02	
TA-183	Not Detected	---------	2.72E-01	
TC-99m	~~1.22E+00~~	~~1.07E-00~~	2.07E+00	Not detected
TL-201	Not Detected	---------	1.37E-01	
XE-133	Not Detected	---------	1.23E-01	
Y-88	Not Detected	---------	2.56E-02	
ZN-65	Not Detected	---------	5.19E-02	
ZR-95	Not Detected	---------	3.66E-02	

5/19/97

****
* Sandia National Laboratories *
* Radiation Protection Sample Diagnostics Program [881 Laboratory] *
* 9-19-97 6:53:30 AM *
****
* *
* Analyzed by: 9/19/97 Reviewed by: 9/19/97 *
****

Customer : C. BYRD/D. BISWELL (6685/SMO)
Customer Sample ID : 035230-003
Lab Sample ID : 70164709

Sample Description : MARINELLI WATER SAMPLE
Sample Quantity : 500.000 mL
Sample Date/Time : 9-17-97 12:36:00 PM
Acquire Start Date/Time : 9-19-97 5:11:36 AM
Detector Name : LAB02
Elapsed Live/Real Time : 6000 / 6001 seconds

Comments:
****

Nuclide Name	Activity (pCi/mL)	2-sigma Error	MDA (pCi/mL)
U-238	Not Detected	---------	1.72E+00
TH-234	Not Detected	---------	4.18E-01
RA-226	Not Detected	---------	4.88E-01
PB-214	Not Detected	---------	5.02E-02
BI-214	Not Detected	---------	5.39E-02
TH-232	Not Detected	---------	1.64E-01
RA-228	Not Detected	---------	1.31E-01
AC-228	Not Detected	---------	8.59E-02
TH-228	Not Detected	---------	4.94E-01
RA-224	Not Detected	---------	1.38E-01
PB-212	Not Detected	---------	3.44E-02
BI-212	Not Detected	---------	3.64E-01
TL-208	Not Detected	---------	7.03E-02
U-235	Not Detected	---------	1.60E-01
TH-231	Not Detected	---------	6.80E+00
PA-231	Not Detected	---------	1.02E+00
TH-227	Not Detected	---------	1.36E-01
RA-223	Not Detected	---------	1.12E-01
RN-219	Not Detected	---------	2.56E-01
PB-211	Not Detected	---------	5.73E-01
TL-207	Not Detected	---------	9.07E+00
AM-241	Not Detected	---------	2.33E-01
PU-239	Not Detected	---------	2.77E+02
NP-237	Not Detected	---------	1.83E-01
PA-233	Not Detected	---------	3.98E-02
TH-229	Not Detected	---------	1.50E-01

[Summary Report] - Sample ID: : 70164709

Nuclide Name	Activity (pCi/mL)	2-sigma Error	MDA (pCi/mL)
AG-108m	Not Detected	---------	2.60E-02
AG-110m	Not Detected	---------	2.27E-02
BA-133	Not Detected	---------	2.99E-02
BE-7	Not Detected	---------	1.90E-01
CD-109	Not Detected	---------	6.08E-01
CD-115	Not Detected	---------	6.62E-02
CE-139	Not Detected	---------	1.79E-02
CE-141	Not Detected	---------	3.48E-02
CE-144	Not Detected	---------	1.58E-01
CO-56	Not Detected	---------	3.04E-02
CO-57	Not Detected	---------	1.90E-02
CO-58	Not Detected	---------	2.26E-02
CO-60	Not Detected	---------	2.74E-02
CR-51	Not Detected	---------	1.73E-01
CS-134	Not Detected	---------	2.64E-02
CS-137	Not Detected	---------	2.39E-02
EU-152	Not Detected	---------	5.72E-02
EU-154	Not Detected	---------	1.20E-01
EU-155	Not Detected	---------	9.42E-02
FE-59	Not Detected	---------	4.50E-02
GD-153	Not Detected	---------	6.14E-02
HG-203	Not Detected	---------	2.13E-02
I-131	Not Detected	---------	2.32E-02
IR-192	Not Detected	---------	1.96E-02
K-40	Not Detected	---------	2.66E-01
MN-52	Not Detected	---------	3.05E-02
MN-54	Not Detected	---------	2.54E-02
MO-99	Not Detected	---------	2.58E-01
NA-22	Not Detected	---------	2.41E-02
NA-24	Not Detected	---------	1.66E-01
NB-95	Not Detected	---------	8.62E-02
ND-147	Not Detected	---------	1.55E-01
NI-57	Not Detected	---------	7.25E-02
PB-210	Not Detected	---------	1.40E+01
RU-103	Not Detected	---------	2.23E-02
RU-106	Not Detected	---------	2.37E-01
SB-122	Not Detected	---------	4.17E-02
SB-124	Not Detected	---------	2.56E-02
SB-125	Not Detected	---------	6.09E-02
SN-113	Not Detected	---------	2.68E-02
SR-85	Not Detected	---------	3.04E-02
TA-182	Not Detected	---------	7.51E-02
TA-183	Not Detected	---------	2.51E-01
TC-99m	~~5.90E-01~~	~~9.61E-01~~	1.46E+00 Not detected 5/15/97
TL-201	Not Detected	---------	1.40E-01
XE-133	Not Detected	---------	1.31E-01
Y-88	Not Detected	---------	2.72E-02
ZN-65	Not Detected	---------	4.99E-02
ZR-95	Not Detected	---------	3.99E-02

****
* Sandia National Laboratories *
* Radiation Protection Sample Diagnostics Program [881 Laboratory] *
* 9-18-97 4:54:53 PM *
****

* Analyzed by: 9/19/97 Reviewed by: 9/19/97 *
****

Customer : C. BYRD/D. BISWELL (6685/SMO)
Customer Sample ID : 035231-003
Lab Sample ID : 70164701

Sample Description : MARINELLI SOLID SAMPLE
Sample Quantity : 875.000 gram
Sample Date/Time : 9-17-97 11:29:00 AM
Acquire Start Date/Time : 9-18-97 3:12:11 PM
Detector Name : LAB02
Elapsed Live/Real Time : 6000 / 6004 seconds

Comments:
****

Nuclide Name	Activity (pCi/gram)	2-sigma Error	MDA (pCi/gram)
U-238	Not Detected	---------	3.18E+00
TH-234	7.38E-01	4.18E-01	5.34E-01
RA-226	1.08E+00	4.10E-01	4.66E-01
PB-214	5.16E-01	1.02E-01	4.86E-02
BI-214	4.68E-01	9.42E-02	4.33E-02
TH-232	8.93E-01	4.51E-01	1.47E-01
RA-228	7.46E-01	2.57E-01	1.51E-01
AC-228	8.73E-01	2.81E-01	8.06E-02
TH-228	7.87E-01	2.49E-01	4.82E-01
RA-224	9.16E-01	2.50E-01	6.10E-02
PB-212	8.56E-01	3.26E-01	3.96E-02
BI-212	1.02E+00	1.35E+00	3.48E-01
TL-208	8.00E-01	4.56E-01	6.60E-02
U-235	Not Detected	---------	2.35E-01
TH-231	Not Detected	---------	1.21E+01
PA-231	Not Detected	---------	1.36E+00
TH-227	Not Detected	---------	3.30E-01
RA-223	Not Detected	---------	2.01E-01
RN-219	Not Detected	---------	3.39E-01
PB-211	Not Detected	---------	7.81E-01
TL-207	Not Detected	---------	1.38E+01
AM-241	Not Detected	---------	4.51E-01
PU-239	Not Detected	---------	4.35E+02
NP-237	Not Detected	---------	2.69E-01
PA-233	Not Detected	---------	5.49E-02
TH-229	Not Detected	---------	2.46E-01

[Summary Report] - Sample ID: : 70164701

Nuclide Name	Activity (pCi/gram)	2-sigma Error	MDA (pCi/gram)
AG-108m	Not Detected	---------	3.92E-02
AG-110m	Not Detected	---------	2.95E-02
BA-133	Not Detected	---------	5.62E-02
BE-7	Not Detected	---------	2.28E-01
CD-109	~~[illegible]~~	~~[illegible]~~	9.12E-01 Not detected 7/15/97
CD-115	Not Detected	---------	8.92E-02
CE-139	Not Detected	---------	2.74E-02
CE-141	Not Detected	---------	5.16E-02
CE-144	Not Detected	---------	2.40E-01
CO-56	Not Detected	---------	3.51E-02
CO-57	Not Detected	---------	2.92E-02
CO-58	Not Detected	---------	3.15E-02
CO-60	Not Detected	---------	3.37E-02
CR-51	Not Detected	---------	2.16E-01
CS-134	Not Detected	---------	4.04E-02
CS-137	Not Detected	---------	3.14E-02
EU-152	Not Detected	---------	8.78E-02
EU-154	Not Detected	---------	1.82E-01
EU-155	Not Detected	---------	1.47E-01
FE-59	Not Detected	---------	7.39E-02
GD-153	Not Detected	---------	1.02E-01
HG-203	Not Detected	---------	3.03E-02
I-131	Not Detected	---------	2.97E-02
IR-192	Not Detected	---------	2.54E-02
K-40	2.64E+01	3.75E+00	2.12E-01
MN-52	Not Detected	---------	3.22E-02
MN-54	Not Detected	---------	3.42E-02
MO-99	Not Detected	---------	2.96E-01
NA-22	Not Detected	---------	4.23E-02
NA-24	Not Detected	---------	1.14E-01
NB-95	Not Detected	---------	1.89E-01
ND-147	Not Detected	---------	2.03E-01
NI-57	Not Detected	---------	4.67E-02
PB-210	Not Detected	---------	3.40E+01
RU-103	Not Detected	---------	2.84E-02
RU-106	Not Detected	---------	2.80E-01
SB-122	Not Detected	---------	5.18E-02
SB-124	Not Detected	---------	2.90E-02
SB-125	Not Detected	---------	7.55E-02
SN-113	Not Detected	---------	3.57E-02
SR-85	Not Detected	---------	3.54E-02
TA-182	Not Detected	---------	1.38E-01
TA-183	Not Detected	---------	4.51E-01
TC-99m	Not Detected	---------	6.86E-01
TL-201	Not Detected	---------	2.22E-01
XE-133	Not Detected	---------	1.98E-01
Y-88	Not Detected	---------	2.29E-02
ZN-65	Not Detected	---------	9.45E-02
ZR-95	Not Detected	---------	5.44E-02

ANALYSIS REQUEST AND CHAIN OF CUSTODY

PAGE 1 OF 1

Internal Lab Batch No. _____

AR/COC- 06950

SF 7001 COC (8/95)

Dept. No./Mail Stop: 6685/1148
Project/Task Manager: Caroline Byrd
Project Name: Site 27 VCM
Record Center Code: ER/1332/27/DAT
Logbook Ref No: 006
Service Order No.: CF0359

Date Sample(s) Shipped: 9/12/97
Carrier/Waybill No.:
Lab Contact: Fernando Dominguez
Lab Destination: RPSD Bldg 891
SMO Contact/Phone: Doug Salmi
Send Report to SMO: Angela Chavez

Contract No: NA
Case No: 3622, 460
SMO Authorization: D. Nagel
Bill to: Sandia National Laboratories, Supplier Services Department, P.O. Box 5800 MS 0154, Albuquerque, NM 87185 0154

Location — Tech Area: N/A; Building: N/A; Room: N/A

Reference LOV (available at SMO)

Sample No. - Fraction	ER Sample ID or Sample Location Detail	Beginning Depth in Ft.	ER Site No.	Date/Time Collected	Sample Matrix	Container Type	Container Volume	Preservative	Sample Collection Method	Sample Type	Gamma Spec	Lab Sample ID
034122-003	27MD-C-001-0-S	0	27	9-11-97 0845	S	P	500ml	None	C	SA	X	[redacted]
034124-003	27MTW-GR-003-8-S	8	↓	1004	↓	↓	↓	↓	GR	↓	X	[redacted]
034126-003	27MTE-GR-003-12	12	↓	1050	↓	↓	↓	↓	GR	↓	X	[redacted]
034224-003	27MV-C-039-0-S	8	↓	0820	↓	↓	↓	↓	C	↓	X	[redacted]

RMMA ☒ Yes ☐ No Ref. No. _____

Sample Disposal ☒ Return to Client ☐ Disposal by lab

Turnaround Time ☐ Normal ☒ Rush Required Report Date _____

Sample Tracking: Date Entered (mm/dd/yy): _____ Entered by: _____ QC Initials: _____

Special Instructions/QC Requirements:
- These are screening samples to release samples to GEL.
- C.O.C # 06950 releases C.O.C #'s 06961 and 06962 to GEL

Abnormal Conditions on Receipt: _____

Sample Team Members	Name	Signature	Init	Company/Organization/Phone
	Rod Nagel	Rod Nagel	RN	IT/1694 239-9416

	Org.	Date	Time
1. Relinquished by: Rod Nagel	IT/1694	9-12-97	0820
1. Received by			
2. Relinquished by			
2. Received by			
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

ANALYSIS REQUEST AND CHAIN OF CUSTODY

PAGE 1 OF 1

Internal Lab Batch No. 1L3.14

AR/COC- 06948

Dept. No./Mail Stop:
Project/Task Manager:
Project Name:
Record Center Code:
Logbook Ref No:
Service Order No.:

Date Samples Shipped: 9/9/97
Carrier/Waybill No.: HC
Lab Contact:
Lab Destination:
SMO Contact/Phone:
Send Report to SMO:

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

Parameter & Method Requested

Location — Tech Area: Building: Room:

Reference LOV (available at SMO)

Sample No. - Fraction	ER Sample ID or Sample Location Detail	Beginning Depth in Ft.	ER Site No.	Date/Time Collected	Sample Matrix	Container Type	Container Volume	Preservative	Sample Collection Method	Sample Type	Lab Sample ID
[illegible]	[illegible]										
[illegible]	[illegible]										
[illegible]	[illegible]										
[illegible]	[illegible]										
[illegible]	[illegible]										
[illegible]	[illegible]										
[illegible]	[illegible]										
[illegible]	[illegible]										
[illegible]	[illegible]										

RMMA ☒ Yes ☐ No Ref. No.

Sample Disposal ☒ Return to Client ☐ Disposal by lab

Turnaround Time ☐ Normal ☐ Rush Required Report Date

Sample Tracking
Date Entered (mm/dd/yy): 9/10/97
Entered by:
QC Initials:

Special Instructions/QC Requirements

Abnormal Conditions on Receipt

Sample Team Members	Name	Signature	Init	Company/Organization/Phone
	[illegible]	[illegible]		[illegible]

1. Relinquished by	[illegible]	Org. [illegible]	Date [illegible]	Time [illegible]	4. Relinquished by	Org.	Date	Time
1. Received by	[illegible]	Org. SNL 5718	Date 9/9/97	Time 1501	4. Received by	Org.	Date	Time
2. Relinquished by	[illegible]	Org. SNL 5718	Date 9/9/97	Time 1535	5. Relinquished by	Org.	Date	Time
2. Received by	[illegible]	Org. [illegible]	Date 9/9/97	Time 1535	5. Received by	Org.	Date	Time
3. Relinquished by	[illegible]	Org. [illegible]	Date [illegible]	Time [illegible]	6. Relinquished by	Org.	Date	Time
3. Received by	[illegible]	Org. [illegible]	Date [illegible]	Time [illegible]	6. Received by	Org.	Date	Time

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

Internal Lab Batch No. 701647

ANALYSIS REQUEST AND CHAIN OF CUSTODY RECORD

PAGE 1 OF 1

AR/COC- 06964

Dept. No./Mail Stop: 6685 / 1148
Project/Task Manager: Caroline Byrd
Project Name: Site 22 VCM
Record Center Code: ER/1332/27/OAT
Logbook Ref No: 006
Service Order No.: CF0357

Date Samples Shipped: 9-18-97
Carrier/Waybill No.: HC
Lab Contact: Fernando Domínguez
Lab Destination: KPSO Bldg 5611
SMO Contact/Phone: Doug Gabriel
Send Report to SMO: Angela Chavez

Contract No: N/A
Case No: 7622.006
SMO Authorization: [illegible]
Bill to: Sandia National Laboratories, Supplier Services Department, P.O. Box 5800 MS 0154, Albuquerque, NM 87185 0154

Location — Tech Area: N/A; Building: N/A; Room: N/A

Sample No. - Fraction	ER Sample ID or Sample Location Detail	Beginning Depth in Ft.	ER Site No.	Date/Time Collected	Sample Matrix	Container Type	Container Volume	Preservative	Sample Collection Method	Sample Type	Gamma Spec									Lab Sample ID
035231-003	22EF-GR-043-5-SO	5	22	9-17-97 1129	S	P	8oz	none	GR	DU	X									
035134-003	22EF-GR-013-5-S	5		1128						SA	X									
035135-003	22EF-GR-014-5-S	5		1134							X									
035136-003	22EF-GR-015-5-S	5		1137							X									
035137-003	22EF-GR-016-5-S	5		1140							X									
035138-003	22EF-GR-017-5-S	5		1145					GR		X									
035139-003	22ED-C-018-2-S	2		1150					C		X									
035140-003	22ED-C-019-2-S	2		1200	S				C	SA	X									
035230-003	22-GR-044-0-EB	0		1236	ATW				GR	EB	X									
035229-003	22-GR-043-0-EB	0		1225	ATW				GR	FB	X									

Parameter & Method Requested: Gamma Spec

RMMA ☒ Yes ☐ No Ref. No. ____

Sample Disposal ☒ Return to Client ☐ Disposal by lab

Turnaround Time ☐ Normal ☒ Rush Required Report Date 9/15/97

Sample Tracking: Date Entered (mm/dd/yy) 9/25/97; Entered by: [illegible]; QC Initial/Date

Special Instructions/QC Requirements: • C.O.C. # 06964 releases C.O.C. # 06963 and 06965 to GESL.

Abnormal Conditions on Receipt

LAB USE

Sample Team Members	Name	Signature	Init.	Company/Organization/Phone
	Rod Nagel	Rod Nagel	RN	TT/IT 84 2389416
	Chris Colechio	Chris Colechio	CC	ABA/Leah 5683
	Kirsten Delgado	[illegible]	KD	MDM Consultants-EG

	Org.	Date	Time
1. Relinquished by	TT/IT84	9/18/97	1325
1. Received by	7578/910	9/18/97	1325
2. Relinquished by	7578/910	9/18/97	1430
2. Received by	7578	9/18/97	1430
3. Relinquished by FDX 65	SNL 7578	9/19/97	1058
3. Received by	7578/910	9/19/97	1058
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

ANALYSIS REQUEST AND CHAIN OF CUSTODY

PAGE 1 OF 1

Internal Lab Batch No. _____

AR/COC- 06951

SF 8001 COC (6/95)

Dept. No./Mail Stop: 6685/1148
Project/Task Manager: Caroline Byrd
Project Name: Site 27 VCM
Record Center Code: ER/1332/27/DAT
Logbook Ref No: 066
Service Order No.: CF0359

Date Samples Shipped: [illegible]
Carrier/Waybill No.: [illegible]
Lab Contact: Fernando Dominguez
Lab Destination: RPSD Bldg 881
SMO Contact/Phone: Doug Salmi
Send Report to SMO: Angela Chavez

Contract No.: N/A
Case No.: 3622.400
SMO Authorization: [illegible]
Bill to: Sandia National Laboratories, Supplier Services Department, P.O. Box 5800 MS 0154, Albuquerque, NM 87185 0154

Location — Tech Area: N/A; Building: N/A; Room: N/A

Reference LOV (available at SMO)

Sample No. - Fraction	ER Sample ID or Sample Location Detail	Beginning Depth in Ft.	ER Site No.	Date/Time Collected	Sample Matrix	Container Type	Container Volume	Preservative	Sample Collection Method	Sample Type	Gamma Spec	Lab Sample ID
034123-003	27MD-C-002-0-S	0		9-11-97 0851	S	P	500ml	None	C	SA	X	[illegible]
034125-003	27MTW-GR-009-8-S	8		1045					GR		X	[illegible]
034127-003	27MTE-GR-006-12-S	12		1000					GR		X	[illegible]
034225-003	27MV-C-040-0-S	0		0825					C		X	[illegible]
034226-003	27MV-C-041-0-S	0		0830					C		X	[illegible]
034227-003	27MV-C-042-0-S	0		0836	S				C		X	[illegible]
034195-003	27-GR-037-0-FB	0		1110	DIW				GR	FB	X	[illegible]
034196-003	27-GR-038-0-EB	0		1100	DIW				GR	EB	X	[illegible]

Parameter & Method Requested

RMMA ☒ Yes ☐ No Ref. No. _____

Sample Disposal ☒ Return to Client ☐ Disposal by lab

Turnaround Time ☒ Normal ☐ Rush Required Report Date _____

Sample Tracking: Date Entered (mm/dd/yy): [illegible]; Entered by: [illegible]; QC Info: [illegible]

Special Instructions/QC Requirements

Abnormal Conditions Upon Receipt: [illegible]

Sample Team Members	Name	Signature	Init	Company/Organization/Phone
	Rod Nagel	Rod Nagel	RN	IT/6684 238-9416

	Org.	Date	Time
1. Relinquished by Rod Nagel	IT/6684	9-12-97	0900
1. Received by [illegible]	9107578	9/12/97	0900
2. Relinquished by			
2. Received by			
3. Relinquished by			
3. Received by			
4. Relinquished by			
4. Received by			
5. Relinquished by			
5. Received by			
6. Relinquished by			
6. Received by			

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ANALYSIS REQUEST AND CHAIN OF CUSTODY

Internal Lab Batch No.

PAGE 1 OF 1

AR/COC- 06958

SF 2001 COC (6/95)

Dept. No./Mail Stop: 6685/1148
Project/Task Manager: Caroline Byrd
Project Name: Site 27 VCM
Record Center Code: ER/1332/27/OAT
Logbook Ref No.: 006
Service Order No.: CF0359

Date Samples Shipped:
Carrier/Waybill No.:
Lab Contact: Fernando Dominguez
Lab Destination: RPSD Bldg. 881
SMO Contact/Phone: Doug Salmi
Send Report to SMO: Angela Chavez

Contract No: N/A
Case No: 3622.400
SMO Authorization: [signature]
Bill to: Sandia National Laboratories, Supplier Services Department, P.O. Box 5800 MS 0154, Albuquerque, NM 87185 0154

Parameter & Method Requested

Location Tech Area: N/A
Building: N/A Room: N/A

Sample No. - Fraction	ER Sample ID or Sample Location Detail	Beginning Depth in Ft.	ER Site No.	Date/Time Collected	Sample Matrix	Container Type	Container Volume	Preservative	Sample Collection Method	Sample Type	Gamma Spec	Lab Sample ID
103414 1-003	27-GR-020-0-FB	0	27	9-9-97 1041	DIW	P	500ml	none	GR	FB	X	
103414 2-003	27-GR-021-0-EB	0	27	9-9-97 1030	DIW	P	500ml	none	GR	EB	X	

RMMA ☒ Yes ☐ No Ref. No.

Sample Disposal ☒ Return to Client ☐ Disposal by lab

Turnaround Time ☒ Normal ☐ Rush Required Report Date

Sample Tracking
Date Entered (mm/dd/yy):
Entered by:
QC Inits.

Special Instructions/QC Requirements
• C.O.C. # 06958 releases C.O.C. # 06959 to G.E.L.

Abnormal Conditions on Receipt

Sample Team Members	Name	Signature	Init	Company/Organization/Phone
	Rod Nagel	Rod Nagel	RN	6684/IT 238-5416

1. Relinquished by: Rod Nagel	Org: IT/6684	Date: 9-9-97	Time: 1505	4. Relinquished by	Org.	Date	Time
1. Received by	Org.	Date	Time	4. Received by	Org.	Date	Time
2. Relinquished by	Org.	Date	Time	5. Relinquished by	Org.	Date	Time
2. Received by	Org.	Date	Time	5. Received by	Org.	Date	Time
3. Relinquished by	Org.	Date	Time	6. Relinquished by	Org.	Date	Time
3. Received by	Org.	Date	Time	6. Received by	Org.	Date	Time

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

Annex 2-C

ANNEX 2-C
SWMU 27 Risk Screening Assessment Report

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SWMU 27: RISK SCREENING ASSESSMENT REPORT

I. Site Description and History

Sandia National Laboratories/New Mexico (SNL/NM) Solid Waste Management Unit (SWMU) 27 is identified as the Building 9820 Animal Disposal Pit in the Hazardous and Solid Waste Amendments Module of SNL/NM's Resource Conservation and Recovery Act (RCRA) Permit. The site is located in a canyon at the western edge of the Manzanita Mountains. A small arroyo lies to the southeast of Building 9820 and drains to the northeast. Activity at SWMU 27 included electrical stimulation of the nervous systems of donkeys. The site contained the buried remains of test animals and burned material probably associated with the tests and other activities conducted in Building 9820.

Prior to the voluntary corrective measures (VCM) conducted in September 1997, SWMU 27 consisted of a pit that is said to have contained animal carcasses. Borrow piles were present around this pit. Because only burned debris rather than animal carcasses were actually found in this pit during the VCM, the pit is hereinafter referred to as the *Burn Pit*. A mounded area was also present approximately 70 to 100 feet north of the Burn Pit (see Figure 2.2.1-1 of the SWMU 27 No Further Action [NFA] proposal). The mounded area is hereinafter referred to as the *Mound Area*. The Mound Area contained scattered debris that included broken glass bottles, ceramic and metal fragments, wire, and black residue. The animal carcasses were found beneath the mound. Building 9820 is located approximately 75 feet west-southwest of SWMU 27 (see Figure 2.2.1-2 of the NFA proposal). This site had been used for animal guidance experiments using rats, donkeys, and electronic equipment (Byrd 1994). Although the site was remediated during the VCM, it is still posted as a SWMU. The site has been regraded to its original topography and revegetated with native grasses. Access to the site is from Coyote Springs Road.

II. Comparison of Results to Data Quality Objectives

The VCM confirmatory soil sampling conducted at SWMU 27 was designed to collect adequate samples to:

- Determine whether all buried debris (animal carcasses, metals, burned materials, etc.) was removed during the VCM
- Provide sufficient Level 3 analytical data to support risk screening assessments.

Table 1 summarizes the sampling strategy for SWMU 27. The potential constituents of concern (COC) at this site were heavy metals and pesticides/herbicides. The pesticides and herbicides were used for their intended purpose and are, therefore, not considered to be RCRA regulated COCs. In addition to these COCs, animal remains, biological waste (several medical vials), one deteriorated battery, and various burned materials were exhumed from the site during the VCM.

The number and location of the samples collected depended upon limited historical information and surface features of the site (Burn Pit and Mound Area). The buried materials in the Burn Pit and Mound Area could not be accurately located; therefore, these areas were completely

Table 1
Summary of VCM Sampling Performed at SWMU 27 to Meet Data Quality Objectives

Potential COC Source	Area of Site (acres)	Number of Sampling Locations	Sample Density (samples/acre)	Sampling Location Rationale
Heavy metals	0.56	26	50	Samples were collected at the location of surface debris and disturbance (Mound Area and Burn Pit) indicative of past disposal locations; exploratory trenches were excavated across the entire site and samples collected from the floor of each trench.
Pesticides/ herbicides		14	26	

excavated, and confirmatory samples were collected from the walls and floors of each excavation. Exploratory trenches were also dug across the site, and confirmatory samples were collected from the floor of each trench.

Table 2 summarizes the analytical methods and data quality requirements necessary to (1) determine that debris was completely removed during the SWMU 27 VCM and (2) support risk screening assessments.

Table 2
Summary of SWMU 27 Data Quality Requirements

Analytical Requirement	Data Quality Level	Radiation Protection Sample Diagnostics Laboratory, Department 7713, SNL/NM	General Engineering Laboratories, Charleston, South Carolina
RCRA metals plus Be and Ni, EPA Method 6010/7000	Level 3	Not applicable	26 samples
Pesticides/herbicides, EPA Method 8151	Level 3	Not applicable	14 samples
Radionuclides (gamma spectroscopy)	Level 2	26 samples	Not applicable

Be = Beryllium.
EPA = U.S. Environmental Protection Agency.
Ni = Nickel.
RCRA = Resource Conservation and Recovery Act.
SNL/NM = Sandia National Laboratories, New Mexico.

Twenty-six locations were sampled and analyzed for RCRA metals and beryllium (Be) and nickel (Ni), as well as radionuclides (using gamma spectroscopy). Fourteen sample locations were analyzed for pesticides/herbicides. The metals and pesticides/herbicides analyses were performed off site at General Engineering Laboratories, and radionuclide analysis (using gamma spectroscopy) was performed on site at the SNL/NM Radiation Protection Sample Diagnostics Laboratory, Department 7713.

The SNL/NM Sample Management Office conducted Data Validation I and II reviews for all off-site data in accordance with Technical Operating Procedure 94-03. Rev. 0 (SNL/NM July 1994). An independent review of the validation process confirmed that reviews performed by SNL/NM were accurate and that data are acceptable for use in the NFA proposal for SWMU 27. All

gamma spectroscopy data were reviewed by SNL/NM Department 7713 in accordance with the Radiation Protection Sample Diagnostics Procedure RPSD-02-11 (SNL/NM July 1996). The data quality objectives (DQO) for SWMU 27 have been met.

III. Determination of Nature, Rate, and Extent of Contamination

III.1 Introduction

The nature, rate, and extent of contamination at SWMU 27 was determined based upon an initial conceptual model validated by exploratory trenching and confirmatory sampling at the site. The initial conceptual model was developed from historical background information including numerous site inspections, personal interviews, historical photographs, and radiological surveys. The DQOs contained in the VCM Plan (SNL/NM August 1997) identified the sample locations, sample density, sample depth, and analytical requirements. The samples were collected in accordance with rationale and procedures described in the VCM Plan (SNL/NM August 1997) and Field Operating Procedure 94-52. The data collected were subsequently used to develop the final conceptual model for SWMU 27, which is presented in Section 2.5 of the associated NFA proposal. The data specifically used to determine the nature, rate, and extent of contamination are described below.

III.2 Nature of Contamination

The nature of contamination at SWMU 27 was determined with analytical testing of soil and debris and an evaluation of the potential for degradation of relevant COCs (Section V). The analytical requirements for the confirmatory sampling included RCRA metals plus Be and Ni and pesticides/herbicides to determine that all of the debris and contaminated soil was removed during the VCM. Gamma spectroscopy was used as a general screening analysis. These analytes and methods are appropriate to characterize the COCs found at the site.

III.3 Rate of Contaminant Migration

All primary sources of COCs were removed from SWMU 27 during the VCM conducted in September 1997. Although COCs were removed, the rate of COC migration predominantly depends upon site meteorological and surface hydrologic processes as described in Section V. Data available from the Site-Wide Hydrogeologic Characterization Project (published annually); numerous SNL/NM air, surface water, and radiological monitoring programs; biological surveys; and other governmental atmospheric monitoring at the Kirtland Air Force Base (KAFB) (i.e., National Oceanographic and Atmospheric Administration) are adequate to characterize the rate of COC migration at SWMU 27.

III.4 Extent of Contamination

Confirmatory soil samples were collected directly beneath the Burn Pit, Mound Area excavations, and from the floor of exploratory trenches across the entire SWMU. These sample locations are deemed appropriate to determine the vertical extent of COC migration.

The sample density was determined based upon the size of SWMU 27 and the former burial areas (Burn Pit and Mound Area). The sample number was deemed sufficient to establish the presence or absence of detectable heavy metals and/or pesticide/herbicide residues from the burial pits. The sample density for inorganics was 26 samples per one-half acre, which is a higher density than comparable U.S. Environmental Protection Agency (EPA) RCRA investigations/feasibility studies (Selman et al. 1994).

In summary, the design of the confirmatory sampling was appropriate and adequate to determine the nature, rate, and extent of contamination.

IV. Comparison of COCs to Background Screening Levels

Site history and characterization activities are used to identify potential COCs. The identification of COCs and the sampling to determine the concentration levels of those COCs across the site are described in the SWMU 27 NFA proposal. Generally, COCs evaluated in this risk assessment include all detected organics and relevant radiological constituents and all inorganic COCs that were analyzed for. If the detection limit of an organic compound was too high (could possibly cause an adverse effect to human health or the environment), the compound was retained. Nondetect organics not included in this assessment were determined to have sufficiently low detection limits to ensure protection of human health and the environment. In order to provide conservatism in this risk assessment, the calculation uses only the maximum concentration value of each COC determined for the entire site. The SNL/NM maximum background concentration (Dinwiddie September 24, 1997, Zamorski December 3, 1997) was selected to provide the background screen in Tables 3 through 6. Human health nonradiological COCs were also compared to SNL/NM proposed Subpart S action levels (Table 3) (IT July 1994).

Nonradiological inorganics that are essential nutrients such as iron, magnesium, calcium, potassium, and sodium are not included in this risk assessment (EPA 1989). Both radiological and nonradiological COCs are evaluated. The nonradiological COCs evaluated include herbicides, pesticides, and inorganics.

Nonradiological COCs for the human health risk assessment at SWMU 27 are listed in Table 3; nonradiological COCs for the ecological risk assessment are listed in Table 4. Radiological COCs for human health and ecological risk assessment are listed in Tables 5 and 6, respectively. All tables show the associated SNL/NM maximum background concentration values (Dinwiddie September 24, 1997, Zamorski December 3, 1997). Discussion of Tables 3 and 5 is provided in Section VI.4. Discussion of Tables 4 and 6 is provided in Sections VII.2 and VII.3.

V. Fate and Transport

The primary release of COCs at SWMU 27 was to the subsurface soil, resulting from the burial of animal carcasses and burned materials. Water and biota are natural mechanisms of COC transport from the primary release point. The subsequent excavation of the burial site and removal of the soil is a potential human-caused mechanism of transport to the surface. At the surface, the soil may be transported by wind and surface runoff. Because the site is within a

Table 3
Nonradiological COCs for Human Health Risk Assessment at SWMU 27 with Comparison to the Associated SNL/NM Background Screening Value, BCF, and Log K_{ow}

COC Name	Maximum Concentration (mg/kg)	SNL/NM Background Concentration (mg/kg)[a]	Is Maximum COC Concentration Less Than or Equal to the Applicable SNL/NM Background Screening Value?	BCF (maximum aquatic)	Log K_{ow} (for organic COCs)	Bioaccumulator?[h] (BCF>40, log K_{ow}>4)	Subpart S Screening Value[e]	Is Individual COC less than 1/10 of the Action Level?
Arsenic	7.76	9.8	Yes	44[c]	NA	Yes	0.5	No
Barium	216	246	Yes	170[d]	NA	Yes	6000	Yes
Beryllium	0.61	0.75	Yes	19[c]	NA	No	0.2	No
Cadmium	0.150 J	0.64	Yes	64[c]	NA	Yes	80	Yes
Chromium, total[f]	12	18.8	Yes	16[c]	NA	No	400	Yes
Lead	19.1	18.9	No	49[c]	NA	Yes	--	--
Mercury	0.0787	0.055	No	5500[c]	NA	Yes	20	Yes
Nickel	10.2	16.6	Yes	47[c]	NA	Yes	2000	Yes
Selenium	0.865	3	Yes	800[i]	NA	Yes	400	Yes
Silver	0.268 J	<0.5	Unknown	0.5[c]	NA	No	400	Yes
Aldrin	0.00075 J	NA	NA	46,670[c]	NA	Yes	0.04	Yes
Dieldrin	0.0013 J	NA	NA	4,670[c]	5.34[c]	Yes	0.04	Yes
alpha-Lindane	0.00052 J	NA	NA	442[c]	3.70[c]	Yes	0.1	Yes
delta-Lindane	0.0011 J	NA	NA	442[c]	3.70[c]	Yes	NC	--
gamma-Lindane	0.00068 J	NA	NA	442[c]	3.70[c]	Yes	20	Yes
2,4,5-TP (Silvex)	0.004	NA	NA	58[i]	3.8[i]	Yes	NC	--

[a]From Zamorski (December 1997) Canyons Areas.
[b]From IT Corporation (July 1994).
[c]BCF and/or Log K_{ow} from Yanicak (March 1997).
[d]BCF from Neumann (1976).
[e]Assumed to be chromium VI for Subpart S screening procedure.
[f]BCF from Callahan et al. (1979).
[h]NMED (March 1998).
[i]BCF and Log K_{ow} from Hazardous Substances Data Bank (1998).
BCF = Bioconcentration factor.
COC = Constituents of concern.
J = Estimated concentration.
K_{ow} = Octanol-water partition coefficient.
Log = Logarithm (base 10).
mg/kg = Milligram(s) per kilogram.
NA = Not applicable.
NC = Not calculated.
NMED = New Mexico Environment Department.
SNL/NM = Sandia National Laboratories/New Mexico
SWMU = Solid waste management unit.
-- = Information not available.

Table 4
Nonradiological COCs for Ecological Risk at SWMU 27 with Comparison to the Associated SNL/NM Background Screening Value, BCF, and Log K_{ow}

COC Name	Maximum Concentration (mg/kg)	SNL/NM Background Concentration (mg/kg)[a]	Is Maximum COC Concentration Less Than or Equal to the Applicable SNL/NM Background Screening Value?	BCF (maximum aquatic)	Log K_{ow} (for organic COCs)	Bioaccumulator?[h] (BCF>40, log K_{ow}>4)
Arsenic	5.4	9.8	Yes	44[b]	NA	**Yes**
Barium	157	246	Yes	170[c]	NA	**Yes**
Beryllium	0.61	0.75	Yes	19[b]	NA	No
Cadmium	0.109 J	0.64	Yes	64[b]	NA	**Yes**
Chromium, total	12	18.8	Yes	16[b]	NA	No
Lead	9.35	18.9	Yes	49[b]	NA	**Yes**
Mercury	0.0787	0.055	**No**	5500[b]	NA	**Yes**
Nickel	10.2	16.6	Yes	47[b]	NA	**Yes**
Selenium	0.865	3	Yes	800[d]	NA	**Yes**
Silver	0.268 J	<0.5	**Unknown**	0.5[b]	NA	No

[a]From Zamorski (December 1997) Canyons Areas.
[b]BCF from Yanicak (March 1997).
[c]BCF from Neumann (1976).
[d]BCF from Callahan et al. (1979).
[e]NMED (March 1998).

BCF = Bioconcentration factor.
COC = Constituents of concern.
J = Estimated concentration.
K_{ow} = Octanol-water partition coefficient.
Log = Logarithm (base 10).
mg/kg = Milligram(s) per kilogram.
NA = Not applicable.
NMED = New Mexico Environment Department.
SNL/NM = Sandia National Laboratories/New Mexico
SWMU = Solid waste management unit.

Table 5
Radiological COCs for Human Health Risk Assessment at SWMU 27 with Comparison to the Associated SNL/NM Background Screening Value, BCF, and Log K_{ow}

COC Name	Maximum Concentration (pCi/g)	SNL/NM Background Concentration (pCi/g)[a]	Is Maximum COC Concentration Less Than or Equal to the Applicable SNL/NM Background Screening Value?	BCF (maximum aquatic)	Bioaccumulator?[d] (BCF>40, log K_{ow}>4)
Cs-137	0.118	1.06	Yes	3000[c]	**Yes**
Ra-228	1.2	1.08	**No**	30,000[e]	No[f]
Th-232	1.13	1.03	**No**	3000[e]	No[f]
Th-234	1.79	2.31	Yes	3000[e]	No[f]
U-234[b]	0.155	2.31	Yes	900[e]	**Yes**
U-235[b]	0.017	0.16	Yes	900[e]	**Yes**
U-238	1.24	2.31	Yes	900[e]	**Yes**

[a]From Dinwiddie (September 1997), Canyons Background.
[b]U-234 and U-235 values were calculated using the U-238 concentration and assuming that the U-238 to U-234 ratio and U-238 to U-235 ratio was equal to that detected during waste characterization of DU-contaminated soils generated during the radiological voluntary corrective measures project, where U-234=U-238/8 and U-235=U-238/73 (Brown January 1998).
[c]BCF from Yanicak (March 1997).
[d]NMED (March 1998).
[e]Baker and Soldat (1992).
[f]Not considered a bioaccumulator (Yanicak March 1997).

BCF = Bioconcentration factor.
COC = Constituents of concern.
DU = Depleted uranium.
K_{ow} = Octanol-water partition coefficient.
Log = Logarithm (base 10).
pCi/g = Picocurie(s) per gram.
SNL/NM = Sandia National Laboratories/New Mexico.
SWMU = Solid waste management unit.

Table 6
Radiological COCs for Ecological Risk Assessment at SWMU 27 with Comparison to the Associated SNL/NM Background Screening Value, BCF, and Log K_{ow}

COC Name	Maximum Concentration (pCi/g)	SNL/NM Background Concentration (pCi/g)[a]	Is Maximum COC Concentration Less Than or Equal to the Applicable SNL/NM Background Screening Value?	BCF (maximum aquatic)	Bioaccumulator?[d] (BCF>40, log K_{ow}>4)
Cs-137	0.118	1.06	Yes	3000[c]	Yes[c]
Ra-228	1.2	1.08	No	30,000[e]	No[c]
Th-232	1.13	1.03	No	3000[e]	No[c]
Th-234	1.79	2.31	Yes	3000[e]	No[c]
U-234[b]	0.155	2.31	Yes	900[e]	Yes[e]
U-235[b]	0.017	0.16	Yes	900[e]	Yes[e]
U-238	1.24	2.31	Yes	900[e]	Yes[e]

[a]From Dinwiddie (September 1997), Canyons Background.
[b]U-234 and U-235 values were calculated using the U-238 concentration and assuming that the U-238 to U-234 ratio and U-238-to-U-235 ratio was equal to that detected during waste characterization of DU-contaminated soils generated during the radiological voluntary corrective measures project, where U-234=U-238/8 and U-235=U-238/73 (Brown January 1998).
[c]BCF from Yanicak (March 1997).
[d]NMED (March 1998).
[e]Baker and Saldat (1992).

BCF = Bioconcentration factor.
COC = Constituents of concern.
DU = Depleted uranium.
K_{ow} = Octanol-water partition coefficient.
Log = Logarithm (base 10).
NMED = New Mexico Environment Department
pCi/g = Picocurie(s) per gram.
SNL/NM = Sandia National Laboratories/New Mexico.
SWMU = Solid waste management unit.

small canyon and is protected by slopes on two sides and by the woodland vegetation, wind is probably not a significant transport mechanism for surface soils.

Water at SWMU 27 is received as precipitation (rain or occasionally snow). Precipitation will either infiltrate or form runoff. Infiltration at the site is enhanced by the coarse textures of the canyon soils (Tesajo-Millett stony sandy loam [USDA 1977]), but the slope at this site will produce runoff during intense rainfall events and during extended rainfall periods when soils are near saturation from previous rainfall events. Surface runoff is to the small, ephemeral drainage at the base of the slope, which is a tributary to the Arroyo del Coyote within the Lurance Canyon. Runoff may carry soil particles with adsorbed COCs. The distance of transport depends upon the size of the particle and the velocity of the water.

Water that infiltrates into the soil will continue to percolate through the soil until field capacity is reached. COCs desorbed from the soil particles into the soil solution may be leached more deeply into the subsurface soil with this percolation. Animal remains (i.e., bones) and burned materials were found between approximately 2 and 12 feet below ground surface (bgs) at this site. Runoff from the overlying slope and evapotranspiration from the soil make infiltration to or beyond this depth interval unlikely. Because groundwater at this site is approximately 158 to 220 feet bgs, the potential for COCs to reach groundwater through the unsaturated zone above the water table is highly unlikely.

Plant roots can take up COCs that are in the soil solution. These COCs may be transported to the aboveground tissues with the xylem stream. These may be consumed by herbivores or returned to the soil as litter. Aboveground litter is capable of transport by wind until consumed by decomposer organisms in the soil. Constituents in plant tissues that are consumed by herbivores may pass through the gut and be returned to the soil in feces (at the site or transported in the herbivore from the site) or absorbed to be held in tissues, metabolized, or may be excreted. The herbivore may be eaten by a primary carnivore or scavenger and the constituent held in the consumed tissues will repeat the sequence of absorption, metabolization, excretion, and consumption by higher predators, scavengers, and decomposers. The potential for transport of the constituents depends upon the mobility of the species that comprise the food chain and the potential for the constituent to be transferred across the links in the food chain. Degradation may occur for the pesticides detected in subsurface soil samples. Radiological decay will occur in the radionuclides.

Table 7 summarizes the fate and transport processes that may occur at SWMU 27. COCs at this site are inorganics (mercury, silver, and radionuclides) and pesticides in subsurface soil. COCs in soils from the 0- to 5-foot interval were only metals and radionuclides. Because the original sources of the COCs were buried below the depth of most biological activity (rooting and burrowing), significant food-chain transport is unlikely at this site. Significant leaching deeper into the subsurface soil is also unlikely, and leaching into the groundwater is highly unlikely. Excavation and removal of the soil during the VCM may have released some contaminated soil to the surface. Subsequent transport by surface runoff and wind may have occurred during this process; however, silt fences were used to prevent sediment transport to the adjacent drainage channel. The potential for significant wind erosion at this site is small because of the topography and vegetation. Degradation of the nonradiological inorganic COCs is insignificant, and decay of the radiological COCs will be slow because of the long half-lives of these isotopes.

Table 7
Summary of Fate and Transport at SWMU 27

Transport and Fate Mechanism	Viable Mechanism	Significance
Wind	Yes	Low
Surface runoff	Yes	Moderate
Migration to groundwater	Unlikely	Very low
Food chain uptake	Yes	Low
Transformation/degradation	Yes	Low

SWMU = Solid waste management unit.

VI. Human Health Risk Screening Assessment

VI.1 Introduction

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

Step 1.	Site data are described that provide information on the potential COCs, as well as the relevant physical characteristics and properties of the site.
Step 2.	Potential pathways are identified by which a representative population might be exposed to the COCs.
Step 3.	The potential intake of these COCs by the representative population is calculated using a tiered approach. The first component of the tiered approach includes two screening procedures. One screening procedure compares the maximum concentration of the COC to a SNL/NM maximum background screening value. COCs that are not eliminated during the first screening procedure are subjected to a second screening procedure that compares the maximum concentration of the COC to the SNL/NM proposed Subpart S action level.
Step 4.	Toxicological parameters are identified and referenced for COCs that were not eliminated during the screening steps.
Step 5.	Potential toxicity effects (specified as a Hazard Index [HI]) and excess cancer risks are calculated for nonradiological COCs and background. For radiological COCs, the incremental total effective dose equivalent (TEDE) and incremental estimated cancer risk are calculated by subtracting applicable background concentrations directly from maximum on-site contaminant values. This background subtraction only occurs when a radiological COC occurs as contamination and exists as a natural background radionuclide.
Step 6.	These values are compared with guidelines established by the U.S. Environmental Protection Agency (EPA) and U.S. Department of Energy (DOE) to determine if further evaluation, and potential site clean-up, is required. Nonradiological COC risk values are also compared to background risk so that an incremental risk may be calculated.
Step 7.	Uncertainties in the previous steps are discussed.

VI.2 Step 1. Site Data

The description and history for SWMU 27 is provided in Section I. Comparison of results to DQOs is presented in Section II. The determination of the nature, rate, and extent of contamination is described in Section III.

VI.3 Step 2. Pathway Identification

SWMU 27 has been designated with a future land-use scenario of recreational (DOE et al. October 1995) (see Appendix 1 for default exposure pathways and parameters). Because of the location and the characteristics of the potential contaminants, the primary pathway for human exposure is considered to be soil ingestion for the nonradiological COCs and direct gamma exposure for the radiological COCs. The inhalation pathway for both nonradiological and radiological COCs is included because of the potential to inhale dust and volatiles. Soil ingestion is included for the radiological COCs as well. No significant contamination at depth was left at the site after the VCM was completed; therefore, no water pathways to the groundwater are considered. Depth to groundwater at SWMU 27 is approximately 158 to 220 feet bgs. Because of the lack of surface water or other significant mechanisms for dermal contact, the dermal exposure pathway is considered not to be significant. No intake routes through plant, meat, or milk ingestion are considered appropriate for the recreational land-use scenario. However, plant uptake is considered for the residential land-use scenario.

Pathway Identification

Nonradiological Constituents	Radiological Constituents
Soil ingestion	Soil ingestion
Inhalation (dust and volatiles)	Inhalation (dust and volatiles)
Plant uptake (residential only)	Plant uptake (residential only)
	Direct gamma

VI.4 Step 3. COC Screening Procedures

Step 3 is discussed in this section and includes two screening procedures. The first screening procedure is a comparison of the maximum COC concentration to the background screening level. The second screening procedure compares maximum COC concentrations to SNL/NM proposed Subpart S action levels. This second procedure is applied only to COCs that are not eliminated during the first screening procedure.

VI.4.1 Background Screening Procedure

VI.4.1.1 Methodology

Maximum concentrations of nonradiological COCs are compared to the SNL/NM maximum screening level for this area. SNL/NM has been verbally informed that all the metals background values from the Canyons Study with the exception of selenium will be approved. Samples have been collected to resolve the selenium issue. The SNL/NM maximum background concentration is selected to provide the background screen in Table 3 and used to calculate risk attributable to background in Table 11. Only the COCs that are above their respective SNL/NM maximum background screening levels or do not have a quantifiable background screening level are considered in further risk assessment analyses.

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

VI.4.1.2 Background Screening Procedure Results

A comparison of SWMU 27 maximum COC concentrations to the SNL/NM maximum background values (Dinwiddie September 24, 1997, Zamorski December 3, 1997) for the human health risk assessment is presented in Tables 3 and 5. For the nonradiological COCs, two constituents have maximum measured values greater than their respective background screening levels. One nonradiological COC has no quantifiable background concentration, so it is not known whether that COC exceeded background. Six of the COCs are organic compounds and do not have background screening levels.

The maximum concentration value for lead is 19.1 milligrams per kilogram (mg/kg). The EPA intentionally provides no human health toxicological data on lead, and therefore, no risk parameter values can be calculated. However, EPA Region 6 guidance for the screening value for lead for an industrial land-use scenario is 2,000 mg/kg (EPA 1996a); for a residential land-use scenario, the EPA screening guidance value is 400 mg/kg (EPA July 1994). The maximum concentration value for lead at this site is less than both screening values, and therefore lead is eliminated from further consideration in the human health risk assessment.

For the radiological COCs, two constituents had maximum measured activities greater than their respective background (Ra-228 and Th-232). Each was only slightly above its respective background comparison value.

VI.4.2 Subpart S Screening Procedure

VI.4.2.1 Methodology

The maximum concentrations of nonradiological COCs not eliminated during the background screening process were compared with action levels (IT July 1994) calculated using methods and equations promulgated in the proposed RCRA Subpart S (EPA 1990) and Risk Assessment Guidance for Superfund (RAGS) (EPA 1989) documentation. Accordingly, all calculations were based upon the assumption that receptor doses from both toxic and potentially carcinogenic compounds result most significantly from ingestion of contaminated soil. Because the samples were all taken from the surface, this assumption is considered valid. If there were ten or fewer COCs and each had a maximum concentration less than one-tenth of the action level, then the site would be judged to pose no significant health hazard to humans. If there were more than ten COCs, the Subpart S screening procedure is not performed.

VI.4.2.2 Results

Table 3 shows the COCs and the associated proposed Subpart S action level. The table compares the maximum concentration values to 1/10 of the proposed Subpart S action level. This methodology was guidance given to SNL/NM from the EPA (EPA 1996b). Two COCs do not have proposed Subpart S action levels. Because of these two COCs, the site fails the Subpart S screening criteria, and a hazard quotient (HQ) and excess cancer risk value must be calculated for all the COCs.

Radiological COCs have no predetermined action levels analogous to proposed Subpart S levels, and therefore this step in the screening process is not performed for radiological COCs.

VI.5 Step 4. Identification of Toxicological Parameters

Tables 8 (nonradiological) and 9 (radiological) show the COCs retained in the risk assessment and the values for the available toxicological information. The toxicological values used for nonradiological COCs in Table 8 are from the Integrated Risk Information System (IRIS) (EPA 1998), Health Effects Assessment Summary Tables (HEAST) (EPA 1997a), and EPA Region 9 (EPA 1996c) databases. Dose conversion factors (DCF) used in determining the excess TEDE values for radiological COCs for the individual pathways were the default values provided in the RESRAD computer code (Yu et al. 1993a) as developed in the following documents:

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

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

- DCFs for volume contamination (exposure to contamination deeper than the immediate surface of the site) were calculated using the methods discussed in "Dose-Rate Conversion Factors for External Exposure to Photon Emitters in Soil" (Kocher 1983) and in ANL/EAIS-8, *Data Collection Handbook to Support Modeling the Impacts of Radioactive Material in Soil* (Yu et al. 1993b).

VI.6 Step 5. Exposure Assessment and Risk Characterization

Section VI.6.1 describes the exposure assessment for this risk assessment. Section VI.6.2 provides the risk characterization, including the HI and the excess cancer risk for both the potential nonradiological COCs and associated background for recreational and residential land uses. The incremental TEDE and incremental estimated cancer risk are provided for the background-adjusted radiological COCs for both recreational and residential land uses.

Table 8
Toxicological Parameter Values for SWMU 27 Nonradiological COCs

COC Name	RfD_o (mg/kg-d)	Confidence[a]	RfD_{inh} (mg/kg-d)	Confidence[a]	SF_o $(mg/kg\text{-}day)^{-1}$	SF_{inh} $(mg/kg\text{-}day)^{-1}$	Cancer Class[b]
Mercury	3E-4[c]	--	8.6E-5[d]	M	--	--	D
Silver	5E-3[d]	L	--	--	--	--	D
Aldrin	3E-5[d]	M	3E-5[e]	--	1.7E+1[d]	1.7E+1[e]	B2
Dieldrin	5E-5[d]	M	5E-5[e]	--	1.6E+1[d]	1.6E+1[d]	B2
alpha-Lindane	--	--	--	--	6.3E+0[d]	6.3E+0[d]	B2
delta-Lindane	--	--	--	--	--	--	D
gamma-Lindane	3E-4[d]	M	3E-4[e]	--	1.3E+0[c]	1.3E+0[e]	--
2,4,5-TP (Silvex)	8E-3[d]	L	8E-3[e]	--	--	--	D

[a]Confidence associated with IRIS (EPA 1998) database values. Confidence - L = low, M = medium, H = high.
[b]EPA weight-of-evidence classification system for carcinogenicity (EPA 1989) taken from IRIS (EPA 1998):

B2 = Probable human carcinogen. Indicates sufficient evidence in animals and inadequate or no evidence in humans.
D = Not classifiable as to human carcinogenicity.

[c]Toxicological parameter values from HEAST database (EPA 1997a).
[d]Toxicological parameter values from IRIS electronic database (EPA 1998).
[e]Toxicological parameter values from EPA Region IX electronic database (EPA 1996c).

COC = Constituents of concern.
EPA = U.S. Environmental Protection Agency.
HEAST = Health Effects Assessment Summary Tables.
IRIS = Integrated Risk Information System.
mg/kg-day = Milligram(s) per kilogram day.
$(mg/kg\text{-}day)^{-1}$ = Per milligram per kilogram day.
RfD_{inh} = Inhalation chronic reference dose.
RfD_o = Oral chronic reference dose.
SF_{inh} = Inhalation slope factor.
SF_o = Oral slope factor.
SWMU = Solid waste management unit.
-- = Information not available.

Table 9
Radiological Toxicological Parameter Values for SWMU 27 COCs Obtained from RESRAD Risk Coefficients[a]

COC Name	SF_o (1/pCi)	SF_{inh} (1/pCi)	SF_{ev} (g/pCi-yr)	Cancer Class[b]
Th-232	3.30E-11	1.90E-08	2.00E-11	A
Ra-228	2.50E-10	9.90E-10	3.30E-06	A

[a]From Yu et al. (1993a).
[b]EPA weight-of-evidence classification system for carcinogenicity (EPA 1989): A - human carcinogen.
1/pCi = One per Picocurie.
g/pCi-yr= Gram(s) per Picocurie-year.
COC = Constituents of concern.
EPA = U.S. Environmental Protection Agency.
SF_{ev} = External volume exposure slope factor.
SF_{inh} = Inhalation slope factor.
SF_o = Oral (ingestion) slope factor
SWMU = Solid waste management unit.

VI.6.1 Exposure Assessment

Appendix 1 shows the equations and parameter input values used in calculating intake values and subsequent HI and excess cancer risk values for the individual exposure pathways. The appendix shows parameters for both recreational and residential land-use scenarios. The equations for nonradiological COCs are based upon the RAGS (EPA 1989). Parameters are based upon information from the RAGS (EPA 1989) and other EPA guidance documents and reflect the reasonable maximum exposure (RME) approach advocated by the RAGS (EPA 1989). For radiological COCs, the coded equations provided in the RESRAD computer code are used to estimate the incremental TEDE and cancer risk for individual exposure pathways. Further discussion of this process is provided in the Manual for Implementing Residual Radioactive Material Guidelines Using RESRAD, Version 5.0 (Yu et al. 1993a).

Although the designated land-use scenario is recreational for this site, risk and TEDE values for a residential land-use scenario are also presented. These residential risk and TEDE values are presented only to provide perspective of potential risk to human health under the more restrictive land-use scenario.

VI.6.2 Risk Characterization

Table 10 shows an HI of 0.00 for the SWMU 27 nonradiological COCs, and an excess cancer risk of 2×10^{-9} for the designated recreational land-use scenario. The numbers presented included exposure from soil ingestion and dust and volatile inhalation for nonradiological COCs. Table 11 shows the HI is 0.00, assuming the maximum background concentrations of the SWMU 27 associated background constituents, and no quantifiable excess cancer risk for the designated recreational land-use scenario.

Table 10
Risk Assessment Values for SWMU 27 Nonradiological COCs

COC Name	Maximum Concentration (mg/kg)	Recreational Land-Use Scenario[a]		Residential Land-Use Scenario[a]	
		Hazard Index	Cancer Risk	Hazard Index	Cancer Risk
Mercury	0.0787	0.00	--	0.14	--
Silver	0.268 J	0.00	--	0.01	--
Aldrin	0.00075 J	0.00	5E-10	0.00	8E-8
Dieldrin	0.0013 J	0.00	8E-10	0.00	1E-6
alpha-Lindane	0.00052 J	0.00	2E-10	0.00	1E-7
delta-Lindane	0.0011 J	--	--	--	--
gamma-Lindane	0.00068 J	0.00	4E-11	0.00	3E-8
2,4,5-TP (Silvex)	0.004	0.00	--	0.00	--
Total		**0.00**	**2E-9**	**0.2**	**1E-6**

[a]From EPA (1989).
COC = Constituents of concern.
J = Estimated concentration.
mg/kg = Milligram(s) per kilogram.
SWMU = Solid waste management unit.
-- = Information not available.

Table 11
Risk Assessment Values for SWMU 27 Nonradiological Background Constituents

COC Name	Background Concentration[a] (mg/kg)	Recreational Land-Use Scenario[b]		Residential Land-Use Scenario[b]	
		Hazard Index	Cancer Risk	Hazard Index	Cancer Risk
Mercury	0.055	0.00	--	0.09	--
Silver	<0.5	--	--	--	--
Total		**0.00**	**--**	**0.09**	**--**

[a]From Zamorski (December 1997), Canyons Area.
[b]From EPA (1989).
COC = Constituents of concern.
SWMU = Solid waste management unit.
-- = Information not available.

For the radiological COCs, contribution from the direct gamma exposure pathway is included. For the recreational land-use scenario, a TEDE was calculated for an individual who spends 4 hours per week on the site. This resulted in an incremental TEDE of 3.5×10^{-2} millirem per year (mrem/yr). In accordance with EPA guidance found in Office of Solid Waste and Emergency Response Directive No. 9200.4-18 (EPA 1997b), an incremental TEDE of 15 mrem/yr is used for the probable land-use scenario (recreational in this case); the calculated dose value for SWMU 27 for the recreational land use is well below this guideline. The estimated excess cancer risk is 5.8×10^{-7}.

For the residential land-use scenario nonradioactive COCs, the HI increases to 0.2, and the excess cancer risk is 1×10^{-6} (Table 10). The numbers in the table included exposure from soil ingestion, dust and volatile inhalation, and plant uptake. Although the EPA (EPA 1991) generally recommends that inhalation not be included in a residential land-use scenario, this pathway is included because of the potential for soil in Albuquerque, New Mexico, to be eroded and, subsequently, for dust to be present in predominantly residential areas. Because of the nature of the local soil, other exposure pathways are not considered (see Appendix 1). Table 11 shows that for the SWMU 27 associated background constituents, the HI is 0.09, and there is no quantifiable excess cancer risk.

For the radiological COCs, the incremental TEDE for the residential land-use scenario is 0.59 mrem/yr. The guideline being used is an excess TEDE of 75 mrem/yr (SNL/NM February 1998) for a complete loss of institutional controls (residential land use in this case); the calculated dose value for SWMU 27 for the residential land-use scenario is well below this guideline. Consequently, SWMU 27 is eligible for unrestricted radiological release as the residential land-use scenario resulted in an incremental TEDE of less than 75 mrem/yr to the on-site receptor. The estimated excess cancer risk is 7.8×10^{-6}. The excess cancer risk from the nonradiological COCs and the radiological COCs is not additive, as noted in the RAGS (EPA 1989).

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

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

For the recreational land-use scenario nonradiological COCs, the HI calculated is 0.00 (less than the numerical guideline of 1 suggested in the RAGS [EPA 1989]). Excess cancer risk is estimated at 2×10^{-9}. Guidance from the New Mexico Environment Department (NMED) indicates that excess lifetime risk of developing cancer by an individual must be less than 10^{-6} for Class A and B carcinogens and less than 10^{-5} for Class C carcinogens (NMED March 1998). The excess cancer risk is driven by pesticides, all of which are Class B2 carcinogens. Thus, the excess cancer risk for this site is below the suggested acceptable risk value (10^{-6}). It should be noted that the pesticides and herbicides were used for the purpose for which they were intended and are therefore not RCRA-regulated COCs. This assessment also determined risks considering background concentrations of the potential nonradiological COCs for both the recreational and residential land-use scenarios. For nonradiological COCs, assuming the recreational land-use scenario, the HI is 0.00. There is no quantifiable excess cancer risk. Incremental risk is determined by subtracting risk associated with background from potential

COC risk. These numbers are not rounded before the difference is determined and, therefore, may appear to be inconsistent with numbers presented in tables and within the text. Incremental HI is 0.00, and incremental cancer risk is 1.5×10^{-9} for the recreational land-use scenario. These incremental risk calculations indicate insignificant risk to human health from nonradiological COCs considering a recreational land-use scenario.

For radiological COCs of the recreational land-use scenario, incremental TEDE is 3.5×10^{-2} mrem/yr, which is significantly less than EPA's numerical guideline of 15 mrem/yr. Incremental estimated excess cancer risk is 5.8×10^{-7}.

The calculated HI for the residential land-use scenario nonradiological COCs is 0.2, which is also below the numerical guidance. Excess cancer risk is estimated at 1×10^{-6}. Excess cancer risk again is driven by three pesticides, which are all a Class B2 carcinogens. Therefore, the excess cancer risk for this site is at the suggested acceptable risk value (10^{-6}). The HI for associated background for the residential land-use scenario is 0.09. There is no quantifiable excess cancer risk. The incremental HI is 0.06, and the incremental cancer risk is 1.2×10^{-6} for the residential land-use scenario. These incremental risk calculations indicate slightly elevated human health risk from the COCs considering a residential land-use scenario.

The incremental TEDE for a residential land-use scenario from the radiological components is 0.59 mrem/yr, which is significantly less than the numerical guideline of 75 mrem/yr suggested in the SNL/NM RESRAD Input Parameter Assumptions and Justification (SNL/NM February 1998). The estimated excess cancer risk is 7.8×10^{-6}.

VI.8 Step 7. Uncertainty Discussion

The determination of the nature, rate, and extent of contamination at SWMU 27 was based upon an initial conceptual model validated with confirmatory sampling at the site. The confirmatory samples were collected during the September 1997 VCM.

The confirmatory sampling was implemented in accordance with the SWMU 27 VCM Plan (SNL/NM August 1997) which is consistent with NMED guidelines (NMED March 1998). The DQOs contained in the VCM Plan (SNL/NM August 1997) are appropriate for use in risk screening assessments. The data collected, based upon sample location, density, and depth, are representative of the site. The analytical requirements and results satisfy the DQOs. Data quality was validated in accordance with SNL/NM procedures (SNL/NM July 1994) and was independently reviewed. Therefore, there is no uncertainty associated with the data quality used to perform the risk screening assessment at SWMU 27.

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

An RME approach was used to calculate the risk assessment values. This means that the parameter values in the calculations are conservative and that calculated intakes are probably

overestimates. Maximum measured values of COC concentrations are used to provide conservative results.

Table 8 shows the uncertainties (confidence) in nonradiological toxicological parameter values. There is a mixture of estimated values and values from IRIS (EPA 1998), HEAST (EPA 1997a), and EPA Region 9 (EPA 1996c) databases. Where values are not provided, information is not available from the HEAST (EPA 1997a), IRIS (EPA 1998), or the EPA regions (EPA 1996c, 1997c). Delta-Lindane does not have published toxicological parameter values. However, because of the low concentration of delta-Lindane and the insignificant risk associated with similar concentrations of alpha- and gamma-Lindane, delta-Lindane is not expected to contribute significant risk to human health. It should be noted that the pesticides and herbicides were used for the purpose for which they were intended and are, therefore, non RCRA-regulated COCs. Because of the conservative nature of the RME approach, uncertainties in toxicological values are not expected to change the conclusion from the risk assessment analysis.

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

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

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

VI.9 Summary

SWMU 27 has identified COCs consisting of some inorganic, organic, and radiological compounds. Because of the location of the site, the designated recreational land-use scenario, and the nature of contamination, potential exposure pathways identified for this site included soil ingestion and dust and volatile inhalation for chemical constituents and soil ingestion, dust inhalation, and direct gamma exposure for radionuclides. Plant uptake was included as an exposure pathway for the residential land-use scenario.

Using conservative assumptions and employing an RME approach to risk assessment, calculations for nonradiological COCs show that for the recreational land-use scenario the HI (0.00) is significantly less than the accepted numerical guidance from the EPA. Excess cancer risk (2×10^{-9}) is also below the acceptable risk value provided by the NMED for a recreational land use scenario (NMED March 1998). The incremental HI is 0.00, and the incremental cancer risk is 1.5×10^{-9} for the recreational land-use scenario. Incremental risk calculations indicate insignificant risk to human health for a recreational land-use scenario.

Incremental TEDE and corresponding estimated cancer risk from radiological COCs are much less than EPA guidance values; the estimated TEDE is 3.5×10^{-2} mrem/yr for the recreational land-use scenario. This value is much less than the numerical guidance of 15 mrem/yr in EPA guidance (EPA 1997b). The corresponding incremental estimated cancer risk value is

5.8×10^{-7} for the recreational land-use scenario. Furthermore, the incremental TEDE for the residential land-use scenario that results from a complete loss of institutional control is only 0.59 mrem/yr. The guideline for this scenario is 75 mrem/yr (SNL/NM February 1998). Therefore, SWMU 27 is eligible for unrestricted radiological release.

Uncertainties associated with the calculations are considered small relative to the conservativeness of risk assessment analysis. It is therefore concluded that this site does not have potential to affect human health under a recreational land-use scenario.

VII. Ecological Risk Screening Assessment

VII.1 Introduction

This section addresses the ecological risks associated with exposure to constituents of potential ecological concern (COPEC) in soils at SWMU 27 (the Building 9820 Animal Disposal Pit). A component of the NMED Risk-Based Decision Tree is to conduct an ecological screening assessment that corresponds with that presented in the EPA's Ecological Risk Assessment Guidance for Superfund (EPA 1997d). The current methodology is tiered and contains an initial scoping assessment followed by a more detailed screening assessment. Initial components of NMED's decision tree (a discussion of DQOs, a data assessment, and evaluations of bioaccumulation and fate-and-transport potential) are addressed in the scoping assessment (Section VII.2 of this report), with the exception of DQOs, which are reviewed in Section II of the NFA. Following the completion of the scoping assessment, a determination is made as to whether a more detailed examination of potential ecological risk is necessary. If deemed necessary, the scoping assessment proceeds to a screening assessment whereby a more quantitative estimate of ecological risk is conducted. This assessment incorporates conservatisms in the estimation of ecological risks; however, ecological relevance and professional judgment are also used as recommended by the EPA (EPA 1996c) to ensure that predicted exposures of selected ecological receptors reflect those reasonably expected to occur at the site.

VII.2 Scoping Assessment

The scoping assessment focuses primarily on the likelihood of exposure of biota at/or adjacent to the site to be exposed to constituents associated with site activities. Included in this section are an evaluation of existing data and a comparison of maximum detected concentrations to background concentrations, examination of bioaccumulation potential, and fate and transport potential. A Scoping Risk Management Decision will involve a summary of the scoping results and a determination as to whether further examination of potential ecological impacts is necessary.

VII.2.1 Data Assessment

As indicated in Section IV (Tables 4 and 6), constituents in soil within the 0- to 5-foot-depth interval that exceeded background concentrations were:

- Mercury
- Silver
- Th-232
- Ra-228

No organic analytes were detected in soil.

VII.2.2 Bioaccumulation

Among the COPECs listed in Section VII.2.1, only mercury was considered to have bioaccumulation potential in aquatic environments (Section IV, Tables 4 and 6). It should be noted, however, that as directed by the NMED (NMED March 1998), bioaccumulation is exclusively assessed based upon maximum reported bioconcentration factors (BCF) for aquatic species. Because only aquatic BCFs are used to evaluate the bioaccumulation potential for metals, bioaccumulation in terrestrial species is likely to be overpredicted.

VII.2.3 Fate and Transport Potential

The potential for the COPECs to move from the source of contamination to other media or biota is discussed in Section V. As noted in Table 7 (Section V), no significant fate and transport is expected to be associated with wind dispersion or food-chain uptake. Surface-water runoff is expected to be of moderate significance for soils brought to the surface during excavation, but silt fences were used to control their movement and to prevent release to surface drainages. Transformation and degradation of COPECs are expected to be of low significance. Migration to groundwater (between 158 and 220 feet bgs) is not anticipated.

VII.2.4 Scoping Risk Management Decision

Based on information gathered through the scoping assessment, it was concluded that complete ecological pathways may be associated with this SWMU and that COPECs also exist at the site. As a consequence, a screening assessment was deemed necessary to predict the potential level of ecological risk associated with the site.

VII.3 Screening Assessment

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

Components within the screening assessment include:

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

VII.3.1 Problem Formulation

Problem Formulation is the initial stage of the screening assessment that provides the introduction to the risk evaluation process. Components that are addressed in this section include a discussion of ecological pathways and the ecological setting, identification of COPECs, and selection of ecological receptors. The conceptual model, ecological food webs, and ecological endpoints (other components commonly addressed in a screening assessment) are presented in the "Predictive Ecological Risk Assessment Methodology for SNL/NM ER Program" (IT June 1998) and are not duplicated here.

VII.3.1.1 Ecological Pathways and Setting

SWMU 27 is located on Coyote Springs Road, east of Building 9820 in a small side-canyon along the south side of the Lurance Canyon. The animal disposal pits that comprise SWMU 27 are east and north of this building along the bank of a small drainage channel. Complete ecological pathways may exist at this site through the exposure of plants and wildlife to COPECs in surface and subsurface soil. This site was surveyed for sensitive species on June 6, 1994 (IT February 1995). A population of about five *visnagita cacti* (*Neolloydia intertexta*) was found along this bank east of Building 9820 but were not found in the immediate vicinity of the burial pits. A single Wright's pinchushion cactus (*Mammillaria wrightii*) was also found adjacent to the southern part of SWMU 27. Both species were previously listed as endangered by the New Mexico Forestry and Resources Conservation Division but have since been taken off the list.

Direct uptake of COPECs from soil was assumed to be the major route of exposure for plants, with minor exposure of plants to wind-blown soil. Exposure modeling for wildlife receptors was

limited to food and soil ingestion pathways. Because of the lack of surface water at this site, exposure to COPECs through the ingestion of surface water was considered insignificant. Inhalation and dermal contact were also considered insignificant pathways with respect to ingestion (Sample and Suter 1994). Groundwater is not expected to be affected by COPECs at this site.

VII.3.1.2 COPECs

Building 9820 was constructed in 1958 and was used for several months for high explosives synthesis. Animal experiments were conducted at Building 9820 in 1958 and 1959 using rats (and donkeys in the later experiments). The experiments were conducted for the U.S. Navy and were classified *top secret*. It is estimated that four donkeys were used in the experiments and were stabled in one end of Building 9820. Some of the donkeys died as a result of the experiments and were buried in a pit near the building. Because of the highly classified nature of the tests, the exact cause of the animals' demise is unknown.

The animal burial pit was originally listed as a SWMU based upon a Comprehensive Environmental Assessment and Response Program interview conducted in 1985, in which an individual who was associated with the security organization at SNL/NM stated that radiation studies were conducted on animals in this area. This information conflicts with more recent information from interviews with technical personnel directly involved in the experiments. According to these individuals, the test involved animal experiments using sophisticated electronic equipment and absolutely no radioactive materials were used in the tests (SNL/NM 1994). Information was also obtained through interviews with Radiation Protection Operations personnel, who are involved in all radioactive experiments. Based upon collected information and on a corroborative radiation survey of the site, it has been concluded that the unit never contained hazardous or radioactive COCs, and therefore, no potential exists for a release of hazardous waste (including hazardous and/or radiological constituents) that may pose a threat to human health or the environment.

In order to provide conservatism in this ecological risk screening assessment, it is based upon the maximum soil concentrations of the COPECs as measured in soil samples from the 0- to 5-foot depth interval for the entire site. Both radiological and nonradiological COPECs are evaluated. Nonradiological COPECs include inorganic analytes (i.e., metals). No organic analytes were detected in surface soil samples. Inorganic analytes were screened against background concentrations, and those exceeding the SNL/NM background screening levels (Dinwiddie September 24, 1997) for the area were considered to be COPECs.

Nonradiological inorganics that are essential nutrients such as iron, magnesium, calcium, potassium, and sodium were not included in this risk assessment (EPA 1989). Maximum concentrations for the inorganic and radioactive COPECs in soil are presented in Tables 4 and 6 in Section IV, respectively.

VII.3.1.3 Ecological Receptors

As described in detail in IT (June 1998), a nonspecific perennial plant was selected as the receptor to represent plant species at the site. Vascular plants are the principal primary

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

VII.3.2 Exposure Estimation

Direct uptake of COPECs from the soil was considered the only significant route of exposure for terrestrial plants. Exposure modeling for the wildlife receptors was limited to food and soil ingestion pathways. Inhalation and dermal contact were considered insignificant pathways with respect to ingestion (Sample and Suter 1994). Drinking water was also considered an insignificant pathway because of the lack of surface water at this site. The deer mouse was modeled under three dietary regimes: as an herbivore (100 percent of its diet as plant material), an omnivore (50 percent of its diet as plants and 50 percent as soil invertebrates), and an insectivore (100 percent of its diet as soil invertebrates). The burrowing owl was modeled as a strict predator on small mammals (100 percent of its diet as deer mice). Because the exposure in the burrowing owl from a diet consisting of equal parts of herbivorous, omnivorous, and insectivorous mice would be equivalent to the exposure consisting of only omnivorous mice, the diet of the burrowing owl was modeled with intake of omnivorous mice only. Both species were modeled with soil ingestion comprising 2 percent of the total dietary intake. Table 12 presents the species-specific factors used in modeling exposures in the wildlife receptors. Justification for use of the factors presented in this table is described in the ecological risk assessment methodology document (IT June 1998).

Although home range is also included in this table, exposures for this risk assessment were modeled using an area use factor of 1, implying that all food items and soil ingested are from the site being investigated. The maximum measured COPEC concentrations from surface soil samples were used to conservatively estimate potential exposures and risks to plants and wildlife at this site.

For the radiological dose rate calculations, the deer mouse was modeled as a herbivore (100 percent of its diet as plants), and the burrowing owl was modeled as a strict predator on small mammals (100 percent of its diet as deer mice). Both were modeled with soil ingestion comprising 2 percent of the total dietary intake. Receptors are exposed to radiation both internally and externally from Th-232 and Ra-228. Internal and external dose rates to the deer mouse and burrowing owl are approximated using modified dose rate models from the Hanford Site Risk Assessment Methodology (DOE 1995) as presented in the ecological risk assessment methodology document for the SNL/NM Environmental Restoration (ER) Program (IT June 1998). Radionuclide-dependent data for the dose rate calculations were obtained from Baker and Soldat (1992). The external dose rate model examines the total-body dose rate to a receptor residing in soil exposed to radionuclides. The soil surrounding the receptor is assumed to be an infinite medium uniformly contaminated with gamma-emitting radionuclides. The external dose rate model is the same for both the deer mouse and the burrowing owl. The internal total-body dose rate model assumes that a fraction of the radionuclide concentration ingested by a receptor is absorbed by the body and concentrated at the center of a spherical

Table 12
Exposure Factors for Ecological Receptors at SWMU 27

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

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

body shape. This provides for a conservative estimate for absorbed dose. This concentrated radiation source at the center of the body of the receptor is assumed to be a "point" source. Radiation emitted from this point source is absorbed by the body tissues to contribute to the absorbed dose. Alpha and beta emitters are assumed to transfer 100 percent of their energy to the receptor as they pass through tissues. Gamma-emitting radionuclides only transfer a fraction of their energy to the tissues because gamma rays interact less with matter than beta or alpha emitters. The external and internal dose rate results are summed to calculate a total dose rate due to exposure to radionuclides in soil.

Table 13 presents the transfer factors used in modeling the concentrations of COPECs through the food chain. Table 14 presents maximum concentrations in soil and derived tissue concentrations in various food-chain elements that are used to model dietary exposures for each of the wildlife receptors.

VII.3.3 Ecological Effects Evaluation

Benchmark toxicity values for plant and wildlife receptors are presented in Table 15. For plants, benchmark soil concentrations are based upon the lowest-observed-adverse-effect level (LOAEL). For wildlife, toxicity benchmarks are based upon the no-observed-adverse-effect level (NOAEL) for chronic oral exposure in a taxonomically similar test species. Insufficient toxicity information was found to estimate the LOAELs or NOAELs for some COPECs for terrestrial plant life and wildlife receptors, respectively.

The benchmark used for exposure of terrestrial receptors to radiation was 0.1 rad/day. This value has been recommended by the International Atomic Energy Agency (IAEA 1992) for the protection of terrestrial populations. Because plants and insects are less sensitive to radiation than vertebrates (Whicker and Schultz 1982), the dose of 0.1 rad/day should also offer sufficient protection to other components within the terrestrial habitat of SWMU 27.

VII.3.4 Risk Characterization

Maximum concentrations in soil and estimated dietary exposures were compared to plant and wildlife benchmark values, respectively. The results of these comparisons are presented in Table 16. HQs are used to quantify the comparison with the benchmarks for plants and wildlife exposure.

No ecological risk was predicted for plant life or the deer mouse; all HQs were below 1.0. Only one analyte, mercury (when assumed to be entirely in organic form), resulted in an HQ greater than 1.0 for the burrowing owl, although an HQ for the burrowing owl could not be determined for silver. As directed by the NMED, HIs were calculated for each of the receptors. The HI is the sum of chemical-specific HQs for all pathways for a given receptor. One receptor, the burrowing owl, had an HI greater than unity. All other receptors had HIs less than 1.0.

Tables 17 and 18 summarize the internal and external dose rate model results for the three radionuclides. The total radiation dose rate to the deer mouse was predicted to be 1.4E-4 rad/day. The total dose rate to the burrowing owl was predicted to be 3.0E-4 rad/day. The internal dose rate due to exposure to these radionuclides for both receptors is the primary

Table 13
Transfer Factors Used in Exposure Models for Constituents of Potential Ecological Concern at SWMU 27

Constituent of Potential Ecological Concern	Soil-to-Plant Transfer Factor	Soil-to-Invertebrate Transfer Factor	Food-to-Muscle Transfer Factor
Inorganic			
Mercury	1.0E+0[a]	1.0E+0[b]	2.5E-1[c]
Silver	1.0E+0[a]	2.5E-1[d]	5.0E-3[a]

[a]From NCRP (January 1989).
[b]Default value.
[c]From Baes et al. (1984).
[d]From Stafford et al. (1991).
NCRP = National Council on Radiation Protection and Measurements.
SWMU = Solid waste management unit.

Table 14
Media Concentrations[a] for Constituents of Potential Ecological Concern at SWMU 27

Constituent of Potential Ecological Concern	Soil (maximum)	Plant Foliage[b]	Soil Invertebrate[b]	Deer Mouse Tissues[c]
Inorganic				
Mercury	7.9E-2	7.9E-2	7.9E-2	6.3E-2
Silver	2.7E-1	2.7E-1	6.7E-2	2.7E-3

[a]In milligrams per kilogram. All are based upon dry weight of the media.
[b]Product of the soil concentration and the corresponding transfer factor.
[c]Based upon the deer mouse with an omnivorous diet. Product of the average concentration in food times the food-to-muscle transfer factor times the wet weight-dry weight conversion factor of 3.125 (from EPA 1993).
SWMU = Solid waste management unit.

Table 15
Toxicity Benchmarks for Ecological Receptors at SWMU 27

Constituent of Potential Ecological Concern	Plant Benchmark[a,b]	Mammalian NOAELs			Avian NOAELs		
		Mammalian Test Species[c,d]	Test Species NOAEL[d,e]	Deer Mouse NOAEL[e,f]	Avian Test Species[d]	Test Species NOAEL[d,e]	Burrowing Owl NOAEL[g]
Inorganic							
Mercury (inorganic)	0.3	mouse	13.2	14.0	Japanese quail	0.45	0.45
Mercury (organic)	0.3	rat	0.032	0.063	mallard	0.0064	0.0064
Silver	2	rat	17.8	34.8	---[h]	---	---

[a]In milligrams per kilogram soil.
[b]From Will and Suter (1995).
[c]Body weights (in kilograms) for the no-observed-adverse-effect level (NOAEL) conversion are as follows: lab mouse, 0.030; lab rat, 0.350.
[d]From Sample et al. (1996).
[e]In milligrams per kilogram body weight per day.
[f]Based upon NOAEL conversion methodology presented in Sample et al. (1996), using a deer mouse body weight of 0.0239 kilogram and a mammalian scaling factor of 0.25.
[g]Based upon NOAEL conversion methodology presented in Sample et al. (1996). The avian scaling factor of 0.0 was used, making the NOAEL independent of body weight.
[h]--- = Designates insufficient toxicity data.
NOAEL = No-observed-adverse-effect level.
SWMU = Solid waste management unit.

Table 16
Hazard Quotients for Ecological Receptors at SWMU 27

Constituent of Potential Ecological Concern	Plant HQ	Deer Mouse HQ (Herbivorous)	Deer Mouse HQ (Omnivorous)	Deer Mouse HQ (Insectivorous)	Burrowing Owl HQ[a]
Inorganic					
Mercury (inorganic)	2.6E-1	8.9E-4	8.9E-4	8.9E-4	1.6E-2
Mercury (organic)	2.6E-1	2.0E-1	2.0E-1	2.0E-1	**1.1E+0**
Silver	1.3E-1	1.2E-3	7.7E-4	3.2E-4	---[b]
HI[c]	3.9E-1	2.0E-1	2.0E-1	2.0E-1	**1.1E+0**

[a]Bold text indicates HQ or HI exceeds unity.
[b]--- designates insufficient toxicity data available for risk estimation purposes.
[c]The HI is the sum of individual HQs using the value for organic mercury as a conservative estimate of the HI.
HI = Hazard index.
HQ = Hazard quotient.
SWMU = Solid waste management unit.

Table 17
Internal and External Dose Rates for
Deer Mice Exposed to Radionuclides at SWMU 27

Radionuclide	Maximum Concentration (pCi/g)	Internal Dose (rad/day)	External Dose (rad/day)	Total Dose (rad/day)
Th-232	1.1E+0	5.6E-8	1.0E-7	1.6E-7
Ra-228	1.2E+0	1.4E-4	6.1E-13	1.4E-4
Total		1.4E-4	1.0E-7	1.4E-4

pCi/g = Picocurie(s) per gram.
SWMU = Solid waste management unit.

Table 18
Internal and External Dose Rates for
Burrowing Owls Exposed to Radionuclides at SWMU 27

Radionuclide	Maximum Concentration (pCi/g)	Internal Dose (rad/day)	External Dose (rad/day)	Total Dose (rad/day)
Th-232	1.1E+0	2.7E-7	1.0E-7	3.7E-7
Ra-228	1.2E+0	3.0E-4	6.1E-13	3.0E-4
Total		3.0E-4	1.0E-7	3.0E-4

pCi/g = Picocurie(s) per gram.
SWMU = Solid waste management unit.

contributor to the total dose rate. The dose rates for the deer mouse and the burrowing owl are considerably less than the benchmark of 0.1 rad/day.

VII.3.5 Uncertainty Assessment

Many uncertainties are associated with the characterization of ecological risks at SWMU 27. These uncertainties result in the use of assumptions in estimating risk that may lead to an overestimation or underestimation of the true risk presented at a site. For this risk assessment, assumptions are made that are more likely to overestimate exposures and risk rather than to underestimate them. These conservative assumptions are used to be more protective of the ecological resources potentially affected by the site. Conservatisms incorporated into this risk assessment include the use of maximum measured analyte concentrations in soil to evaluate risk, the use of wildlife toxicity benchmarks based upon NOAEL values, the incorporation of strict herbivorous and strict insectivorous diets for predicting the extreme HQ values for the deer mouse, and the use of 1.0 as the area use factor for wildlife receptors regardless of seasonal use or home range size. Each of these uncertainties, which are consistent among each of the SWMU-specific ecological risk assessments, is discussed in greater detail in the uncertainty section of the ecological risk assessment methodology document for the SNL/NM ER Program (IT June 1998).

Uncertainties associated with the estimation of risk to ecological receptors following exposure to U-235, Th-232, and Ra-228 are primarily related to those inherent in the radionuclide-specific data. Radionuclide-dependent data are measured values that have their associated errors, which are typically negligible. The dose rate models used for these calculations are based upon conservative estimates of receptor shape, radiation absorption by body tissues, and intake parameters. The goal is to provide a realistic, but conservative, estimate of a receptor's exposure to radionuclides in soil, both internally and externally.

One large uncertainty associated with the prediction of ecological risks at this site is the use of the maximum measured concentrations in soil to evaluate risk. Both situations result in a conservative exposure scenario that may not reflect actual site conditions.

In the estimation of ecological risk, background concentrations are included as a component of maximum on-site concentrations. Table 19 illustrates risk estimates associated with exposure of the receptors to background concentrations of the metal COPECs. No HQs were greater than 1.0 for any of the ecological receptors.

As illustrated above, consideration of site-specific exposure conditions results in a more realistic estimation of risk. Based upon the home range size of 35 acres for the burrowing owl and the size of the Building 9820 Animal Disposal Pit (0.009 acres), an area use factor of approximately 2.6E-4 could be applied to the HQs for this species. This would result in HQ estimates of less than unity for the burrowing owl, indicating little potential for adverse risks to the owl from exposure to COPECs at SWMU 27.

Based on this uncertainty analysis, ecological risks at SWMU 27 are expected to be very low. The HQ greater than unity initially predicted for mercury upon closer examination revealed an overestimation of risk primarily attributed to exposure concentration, toxicity characteristics, and site use factor.

Table 19
Hazard Quotients for Ecological Receptors Exposed to Background Concentrations for SWMU 27

Constituent of Potential Ecological Concern	Plant HQ	Deer Mouse HQ (Herbivorous)	Deer Mouse HQ (Omnivorous)	Deer Mouse HQ (Insectivorous)	Burrowing Owl HQ
Inorganic					
Mercury (inorganic)	1.8E-1	6.3E-4	6.3E-4	6.3E-4	1.1E-2
Mercury (organic)	1.8E-1	1.4E-1	1.4E-1	1.4E-1	7.8E-1
Silver	1.3E-1	1.1E-3	7.2E-4	3.0E-4	---[a]
HI[b]	3.1E-1	1.4E-1	1.4E-1	1.4E-1	7.8E-1

[a]--- designates insufficient toxicity data available for risk estimation purposes.
[b]The HI is the sum of individual HQs using the value for organic mercury as a conservative estimate of the HI.
HI = Hazard index.
HQ = Hazard quotient.

VII.3.6 Risk Interpretation

Ecological risks associated with SWMU 27 were estimated through a screening assessment that incorporates site-specific information when available. No ecological risk was predicted for plant life or the deer mouse. However, ecological risk was predicted for the burrowing owl. Potential risks associated with mercury were evaluated assuming total mercury occurred at the site entirely as either inorganic or organic mercury. The assumption of inorganic mercury did not result in a prediction of potential risk. However, the assumption of organic mercury was predicted to be potentially hazardous to the burrowing owl. If all detected mercury in soil is assumed to be in the organic form, the HQ for the burrowing owl is only slightly greater than 1.0 (HQ = 1.1). Because it is unlikely that all mercury at the site is in organic form and because the modeled exposure to mercury in the burrowing owl assumes an area use factor of 1.0 rather than a more realistic value of 2.6E–4, it is highly unlikely that mercury poses a risk to this receptor at this site. Based upon this final analysis, ecological risks associated with SWMU 27 are expected to be insignificant.

VII.3.7 Screening Assessment Scientific/Management Decision Point

Once potential ecological risks associated with the site have been assessed, a decision is made as whether the site should be recommended for NFA or additional data collected to more thoroughly assess actual ecological risk at the site. With respect to this site, ecological risks were predicted to be insignificant. The scientific/management decision is to recommend this site for NFA.

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APPENDIX 1
EXPOSURE PATHWAY DISCUSSION FOR CHEMICAL AND RADIONUCLIDE CONTAMINATION

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

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

At SNL/NM, all ER sites exist within the boundaries of the KAFB. Approximately 157 potential waste and release sites have been identified where hazardous, radiological, or mixed materials may have been released to the environment. Evaluation and characterization activities have occurred at all of these sites to varying degrees. Among other documents, the SNL/ER draft Environmental Assessment (DOE 1996) presents a summary of the hydrogeology of the sites, the biological resources present and proposed land use scenarios for the SNL/NM SWMUs. At this time, all SNL/NM SWMUs have been tentatively designated for either industrial or recreational future land use. The NMED has also requested that risk calculations be performed based upon a residential land use scenario. All three land use scenarios will be addressed in this document.

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

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

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

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

- Ingestion of contaminated fish and shell fish;
- Ingestion of contaminated fruits and vegetables;
- Ingestion of contaminated meat, eggs, and dairy products; and
- Ingestion of contaminated surface water while swimming.

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

For the residential land-use scenario, we will include ingestion of contaminated fruits and vegetables because of the potential for residential gardening.

Based upon this evaluation, for future risk assessments, the exposure routes that will be considered are shown in Table 1. Dermal contact is included as a potential exposure pathway in all land use scenarios. However, the potential for dermal exposure to inorganics is not considered significant and will not be included. In general, the dermal exposure pathway is generally considered to not be significant relative to water ingestion and soil ingestion pathways but will be considered for organic components. Because of the lack of toxicological parameter values for this pathway, the inclusion of this exposure pathway into risk assessment calculations may not be possible and may be part of the uncertainty analysis for a site where dermal contact is potentially applicable.

Equations and Default Parameter Values for Identified Exposure Routes

In general, SNL/NM expects that ingestion of compounds in drinking water and soil will be the more significant exposure routes for chemicals; external exposure to radiation may also be significant for radionuclides. All of the above routes will, however, be considered for their appropriate land use scenarios. The general equations for calculating potential intakes via these routes are shown below. The equations are from the Risk Assessment Guidance for Superfund (RAGS): Volume 1 (EPA 1989a and 1991). These general equations also apply to calculating potential intakes for radionuclides. A more in-depth discussion of the equations used in performing radiological pathway analyses with the RESRAD code may be found in the RESRAD Manual (ANL 1993). Also shown are the default values SNL/NM ER suggests for use in RME risk assessment calculations for industrial, recreational, and residential scenarios, based upon EPA and other governmental agency guidance. The pathways and values for

Table 1
Exposure Pathways Considered for Various Land Use Scenarios

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

chemical contaminants are discussed first, followed by those for radionuclide contaminants. RESRAD input parameters that are left as the default values provided with the code are not discussed. Further information relating to these parameters may be found in the RESRAD Manual (ANL 1993).

Generic Equation for Calculation of Risk Parameter Values

The equation used to calculate the risk parameter values (i.e., HQ/HI, excess cancer risk, or radiation TEDE) is similar for all exposure pathways and is given by:

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

$$= C \times (CR \times EFD/BW/AT) \times \text{Toxicity Effect} \quad (1)$$

where

C = contaminant concentration (site specific);
CR = contact rate for the exposure pathway;
EFD= exposure frequency and duration;
BW = body weight of average exposure individual;
AT = time over which exposure is averaged.

The total risk/dose (either cancer risk or HI) is the sum of the risks/doses for all of the site-specific exposure pathways and contaminants.

The evaluation of the carcinogenic health hazard produces a quantitative estimate for excess cancer risk resulting from the COCs present at the site. This estimate is evaluated for determination of further action by comparison of the quantitative estimate with the potentially acceptable risk range of 10^{-4} to 10^{-6}. The evaluation of the noncarcinogenic health hazard produces a quantitative estimate (i.e., the HI) for the toxicity resulting from the COCs present at the site. This estimate is evaluated for determination of further action by comparison of this

quantitative estimate with the EPA standard HI of unity (1). The evaluation of the health hazard due to radioactive compounds produces a quantitative estimate of doses resulting from the COCs present at the site.

The specific equations used for the individual exposure pathways can be found in RAGS (EPA 1989a) and the RESRAD Manual (ANL 1993). Table 2 shows the default parameter values suggested for used by SNL at SWMUs, based upon the selected land use scenario. References are given at the end of the table indicating the source for the chosen parameter values. The intention of SNL is to use default values that are consistent with regulatory guidance and consistent with the RME approach. Therefore, the values chosen will, in general, provide a conservative estimate of the actual risk parameter. These parameter values are suggested for use for the various exposure pathways based upon the assumption that a particular site has no unusual characteristics that contradict the default assumptions. For sites for which the assumptions are not valid, the parameter values will be modified and documented.

Summary

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

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Table 2
Default Parameter Values for Various Land Use Scenarios

Parameter	Industrial	Recreational	Residential
General Exposure Parameters			
Exposure frequency (d/y)	***	***	***
Exposure duration (y)	30[a,b]	30[a,b]	30[a,b]
Body weight (kg)	70[a,b]	56[a,b]	70 adult[a,b] 15 child
Averaging Time (days) for carcinogenic compounds (=70 y x 365 d/y) for noncarcinogenic compounds (=ED x 365 d/y)	25550[a] 10950	25550[a] 10950	25550[a] 10950
Soil Ingestion Pathway			
Ingestion rate	100 mg/d[c]	6.24 g/y[d]	114 mg-y kg-d[a]
Inhalation Pathway			
Inhalation rate (m^3/yr)	5000[a,b]	146[d]	5475[a,b,d]
Volatilization factor (m^3/kg)	chemical specific	chemical specific	chemical specific
Particulate emission factor (m^3/kg)	1.32E9[f]	1.32E9[f]	1.32E9[f]
Water Ingestion Pathway			
Ingestion rate (L/d)	2[a,b]	2[a,b]	2[a,b]
Food Ingestion Pathway			
Ingestion rate (kg/yr)	NA	NA	138[b,d]
Fraction ingested	NA	NA	0.25[b,d]
Dermal Pathway			
Surface area in water (m^2)	2[b,e]	2[b,e]	2[b,e]
Surface area in soil (m^2)	0.53[b,e]	0.53[b,e]	0.53[b,e]
Permeability coefficient	chemical specific	chemical specific	chemical specific

*** The exposure frequencies for the land use scenarios are often integrated into the overall contact rate for specific exposure pathways. When not included, the exposure frequency for the industrial land use scenario is 8 h/d for 250 d/y; for the recreational land use, a value of 2 hr/wk for 52 wk/y is used (EPA 1989b); for a residential land use, all contact rates are given per day for 350 d/y.
[a]RAGS, Vol. 1, Part B (EPA 1991).
[b]Exposure Factors Handbook (EPA 1989b)
[c]EPA Region VI guidance.
[d]For radionuclides, RESRAD (ANL 1993) is used for human health risk calculations; default parameters are consistent with RESRAD guidance.
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