Sandia National Laboratories/New Mexico

PROPOSAL FOR CONFIRMATORY SAMPLING NO FURTHER ACTION ENVIRONMENTAL RESTORATION SITE 63A BALLOON TEST AREA: PLUTONIUM DISPERSAL STUDIES PROJECT SITE OPERABLE UNIT 1333

September 1997

Environmental
Restoration
Project

United States Department of Energy
Albuquerque Operations Office

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Prepared for
the U. S. Department of Energy

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ACRONYMS AND ABBREVIATIONS

bgl	below ground level
CEARP	Comprehensive Environmental Assessment and Response Program
DOE	U.S. Department of Energy
DOU	Document of Understanding
DU	depleted uranium
EPA	U.S. Environmental Protection Agency
ER	Environmental Restoration
ft	foot (feet)
HE	high explosive(s)
HSWA	Hazardous and Solid Waste Amendment
kg	kilogram(s)
mi	mile(s)
mg/kg	milligram(s) per kilogram
NFA	no further action
NMED	New Mexico Environment Department
OU	operable unit
PDSP	Plutonium Dispersal Studies Project
RCRA	Resource Conservation and Recovery Act
SNL/NM	Sandia National Laboratories/New Mexico
UXO	unexploded ordnance
μR/hr	microroentgen(s) per hour

1.0 INTRODUCTION

Sandia National Laboratories/New Mexico (SNL/NM) is proposing a no further action (NFA) decision for Environmental Restoration (ER) Site 63A, Balloon Test Area: Plutonium Dispersal Studies Project (PDSP) Site, Operable Unit (OU) 1333, based upon confirmatory sampling (NFA Criterion 3 [NMED April 1996]). ER Site 63 is listed in the Hazardous and Solid Waste Amendment (HSWA) Module IV (EPA August 1993) (hereinafter referred to as the HSWA Module IV) of the SNL/NM Resource Conservation and Recovery Act (RCRA) Hazardous Waste Management Facility Permit (NM5890110518) (EPA August 1992). The site was administratively split into two subunits, 63A and 63B, to facilitate site investigation. ER Site 63A was originally petitioned for an administrative NFA decision in 1995 (SNL/NM August 1995). The New Mexico Environment Department (NMED) issued a notice of deficiency requesting that screening soil sampling be conducted to further corroborate the interview and site history information (NMED April 28, 1997). This proposal summarizes the analytical results of the requested soil samples.

1.1 Description of ER Site 63A

ER Site 63A (Figure 1-1) is located on land controlled by the U.S. Department of Energy (DOE) and the U.S. Air Force that has been withdrawn from the Bureau of Land Management and permitted to the DOE (SNL/NM July 1994a). Coyote Springs Road provides access to the site (Figure 1-1). ER Site 63A lies on approximately 5.3 acres at a mean elevation of 6,165 feet (ft) above sea level (SNL/NM April 1995). Immediate topographic relief around the site is less than 100 ft.

ER Site 63A is located on alluvial deposits on a broad flood plain between the confluence of the Lurance and the Madera Canyons (Figure 1-1). The composition and thickness of the alluvial deposits at the site are not well-defined (IT April 1993). Seismic surveys conducted in the Lurance Canyon approximately 1 mile (mi) upgradient and downgradient of the site indicated alluvium thicknesses ranging from 60 to 142 ft, respectively (BGA October 1994). However, alluvium thickness is highly variable and is, therefore, expected to fluctuate significantly within the canyon floors because of changes in shallow bedrock lithology or erosional irregularities along the bedrock/alluvium interface. At ER Site 63A, these alluvial deposits form gentle slopes comprised of Tesajo-Millett stony sandy loams that are underlain by igneous and metamorphic Precambrian rocks (USDA June 1977). Measured permeabilities in the Tesajo-Millett unit range from 0.2 to 20 inches per hour (USDA June 1977). Precambrian metamorphic rocks (metarhyolite) are exposed in the low hill slopes adjacent to and beneath the alluvium at this site (IT April 1993).

Sediments observed in the lower Lurance Canyon channel downstream of the site consist of coarse-grained sands, gravels, and cobbles originating from depositional processes in the Sol se Mete, the Madera, and the Lurance Canyons. Alluvium encountered during drilling at the TSA-1 well, which is located approximately 0.75 mi west of ER Site 63A (Figure 1-1), consists of 57 ft of very coarse sands, pebbles, and cobbles, with minor amounts of clayey sand beds

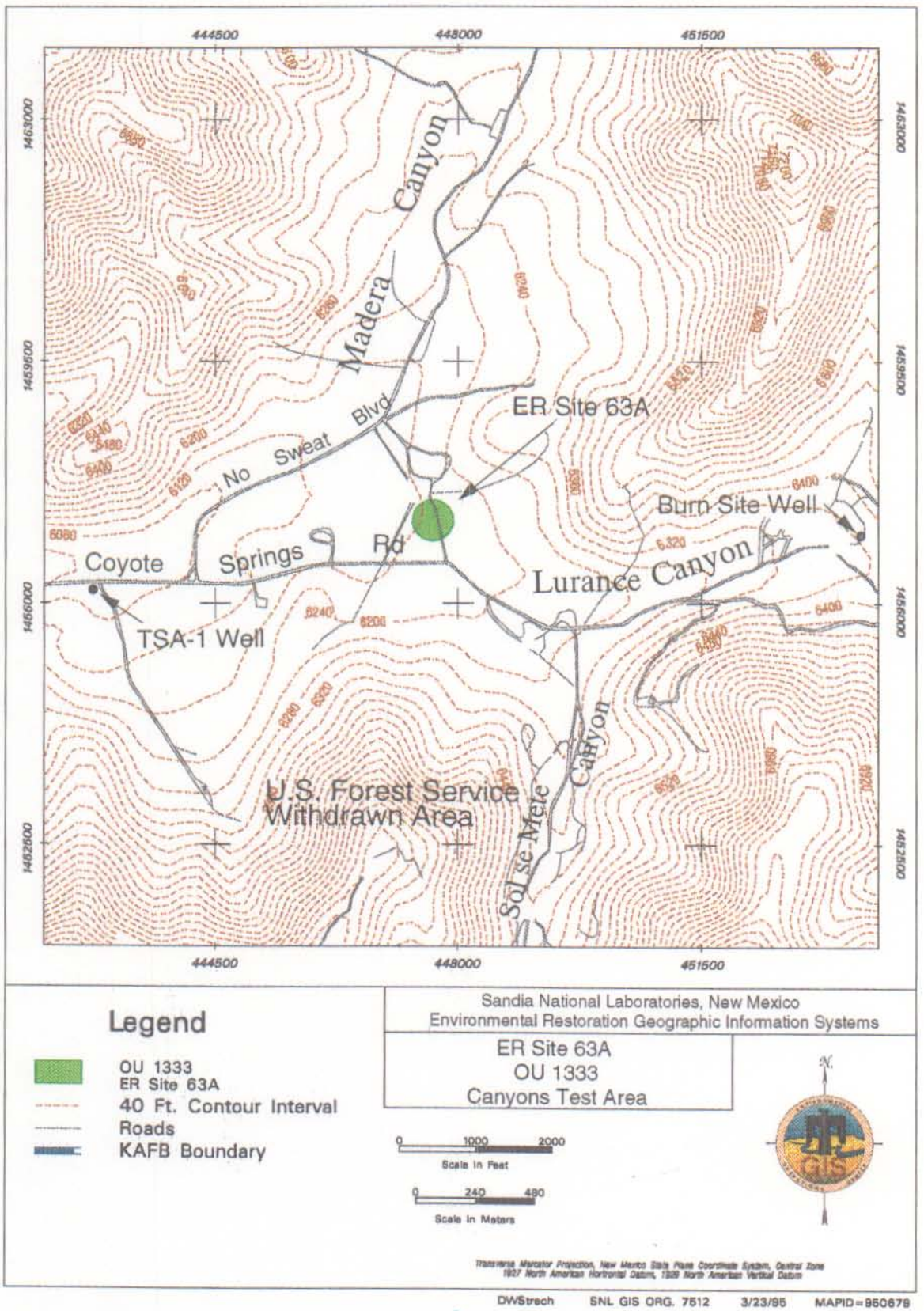


Figure 1-1
Location of ER Site 63A, Balloon Test Area: PDSP Site

underlain by fractured Precambrian metamorphic rocks (IT May 1994). Depth to ground water in the fractured Precambrian rocks that are believed to underlie the alluvial deposits at ER Site 63A is not known. The TSA-1 well encountered permeable saturated fractures in Precambrian rocks at a depth of 180 ft below ground level (bgl). The Burn Site well, located approximately 1 mi east of ER Site 63A, also encountered permeable water-bearing fractures in the Precambrian bedrock at a depth of 230 to 350 ft bgl (Figure 1-1) (IT May 1994). Drilling logs from the wells suggest that the first saturated ground-water conditions are encountered in fractured Precambrian bedrock under confined to semiconfined hydraulic conditions. Local ground-water flow may be complicated because of abundant fractures and faults in the area. The local hydraulic gradient between the Burn Site and TSA-1 wells indicates that ground-water flow direction in the Precambrian bedrock is westward (IT May 1994).

For a detailed discussion regarding the local setting of ER Site 63A, refer to Chapter 3.0 of the RCRA Facility Investigation work plan for OU 1333 (SNL/NM September 1995).

1.2 No Further Action Basis

This proposal for a determination of a confirmatory sampling NFA decision was prepared using the criteria presented in Annex B of the ER Document of Understanding (DOU) (NMED April 1996) and is consistent with the HSWA Module IV. Specifically, this proposal presents "information demonstrating that there are no releases of hazardous waste (including hazardous constituents) from solid waste management units . . . at the facility that pose a threat to human health or the environment" (as proposed in the Code of Federal Regulations, Title 40, Part 264.51[a][2] [EPA July 1990]).

This request for an NFA decision for ER Site 63A is based primarily upon archival and survey information and upon confirmatory soil analytical results collected in July 1997 to satisfy the HSWA Module IV requirements.

Review and analysis of all relevant data for ER Site 63A indicates that concentration levels of contaminants of concern at this site are less than SNL/NM background concentration limits. Therefore, ER Site 63A is proposed for an NFA decision based upon NFA Criterion 3 of the ER DOU (NMED April 1996) supported by confirmatory sampling data demonstrating that no release to the environment has occurred.

2.0 HISTORY OF ER SITE 63A

2.1 Historical Operations

Because different test programs were conducted in separate areas of the site, ER Site 63 was divided into two subunits for the purpose of preparing NFA proposals: (1) ER Site 63A, Balloon Test Area: PDSP Site and (2) ER Site 63B, Balloon Test Area: Balloon/Helicopter Site (includes tethered-rocket tests). ER Site 63A was used for tests conducted for the PDSP. Table 2-1 presents a summary of testing events at ER Site 63A. Information summarizing ER Site 63B and the tests conducted at the site are contained in a separate NFA proposal.

Table 2-1
Testing Activities at ER Site 63A

Dates	Test Activity	References
1985–1986	PDSP Tests	Taylor and Grady October 1987, SNL/NM EORC 1995, DOE September 1987

Figures 2-1 and 2-2 show the location of ER Site 63A. According to interviewees, ten PDSP tests were conducted at ER Site 63A (Taylor and Grady October 1987) between 1983 and 1986 (SNL/NM [n.d.] [Ref. 63-1], SNL/NM EORC 1995, DOE September 1987). However, the 1985-to-1986 time frame agrees with dates reported by the PDSP test engineer and test report (SNL/NM EORC 1995, Taylor and Grady October 1987).

ER Site 63A is defined as a 500-ft-diameter circle centered on the location reported to have been ground zero for PDSP tests (Figures 2-1 and 2-2) (Taylor and Grady October 1987, DOE September 1987). This ground-zero area is located approximately 100 ft west of the north-south road leading into the site and approximately 100 ft northwest of two 6- by 6-ft concrete pads (SNL/NM EORC 1995) (Figure 2-1). The site boundary is conservatively designated by the perimeter of a circle with a radius of 250 ft centered on the ground-zero area, although the PDSP test report states that the potential area affected by the dispersed depleted uranium (DU) was primarily within a 100-ft radius of the ground-zero area (Taylor and Grady October 1987). Based upon review of available historical aerial photographs, the area in which PDSP tests were conducted was revegetated by 1987. No physical features associated with the PDSP tests remain at ER Site 63A.

PDSP tests at ER Site 63A involved single-point detonations of high explosives (HE) (plastic bonded HE PBX-9501) surrounding hollow spheres of DU (SNL/NM EORC 1995, Taylor and Grady October 1987). The amount of DU and HE used in these tests varied from 0.042 to 2 kilograms (kg) and 0.042 to 7 kg, respectively (SNL/NM EORC 1995). Test devices were suspended 3.3 ft above the ground by a 2- to 3-point stand and were detonated to determine how finely the DU could be fragmented in the generated aerosol (Taylor and Grady

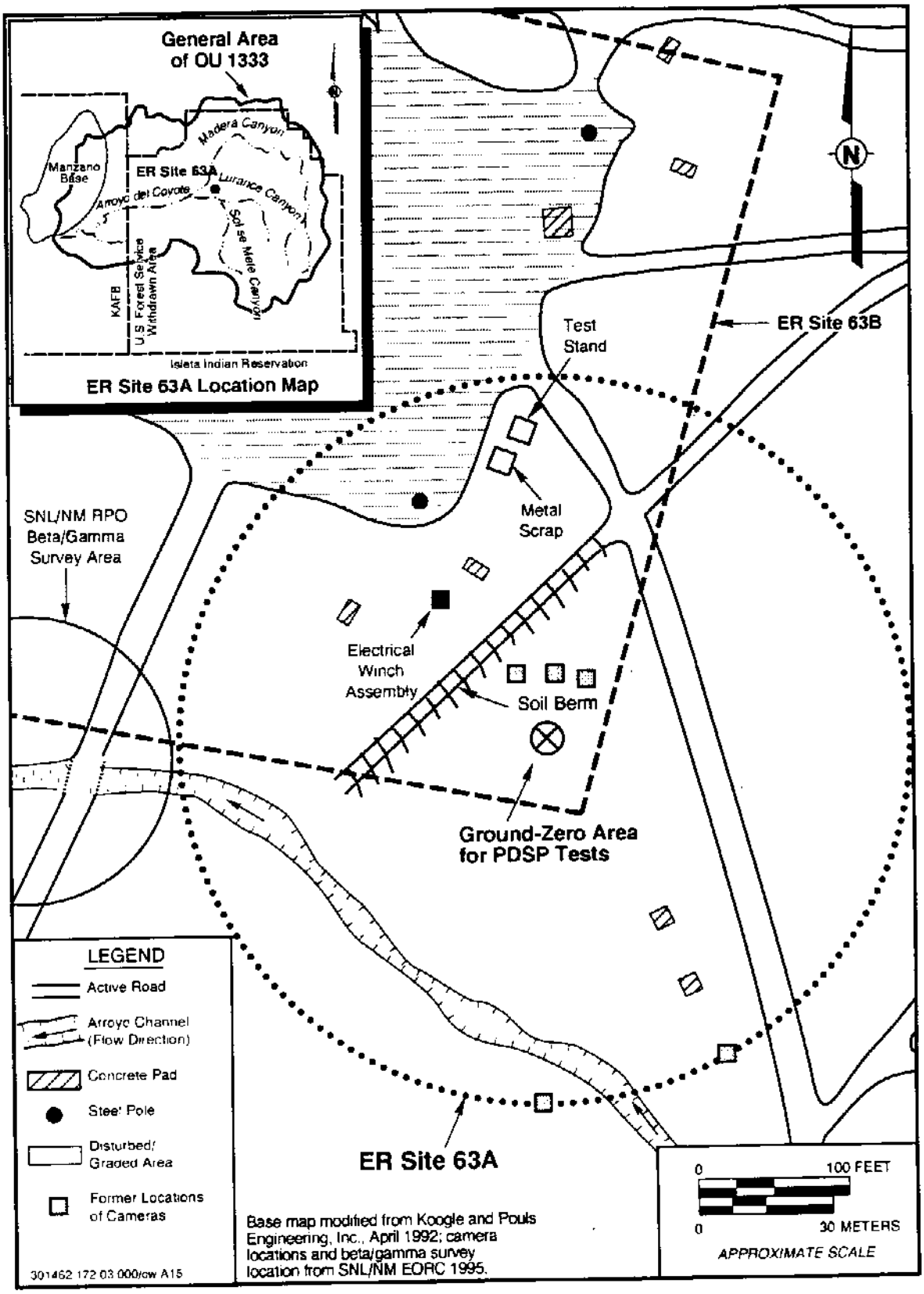


Figure 2-1
Site Map of ER Site 63A, Balloon Test Area: PDSP Site

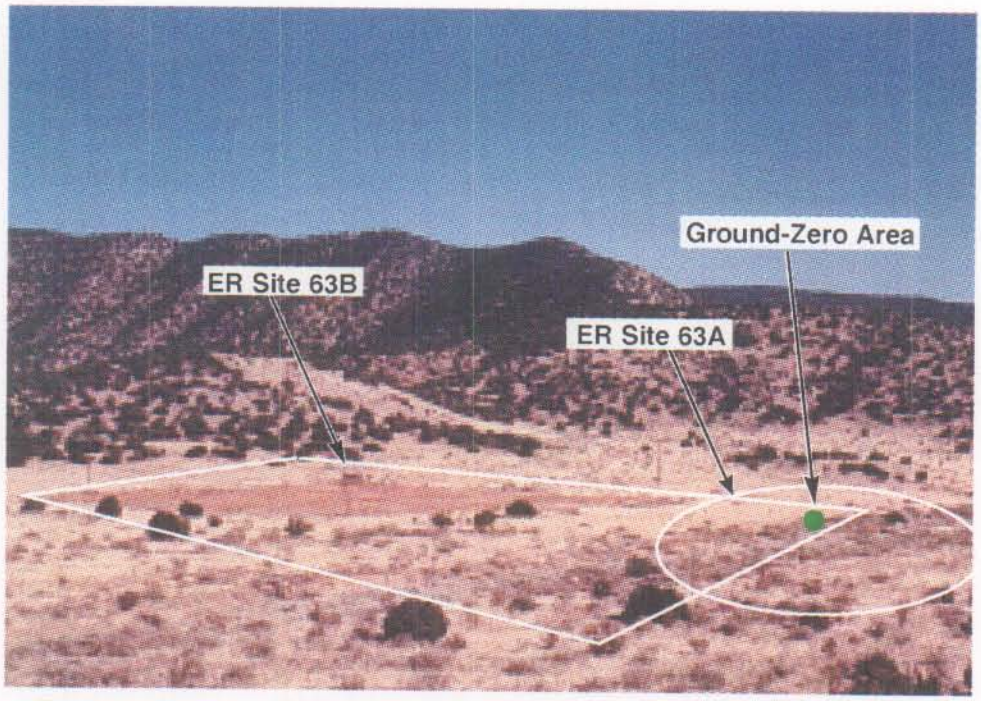


Figure 2-2a. Photograph of ER Sites 63A and 63B in December 1994. ER Site 63A was used to conduct PDSP tests. Balloon/ helicopter tests were conducted at ER Site 63B. View is to the east-northeast.

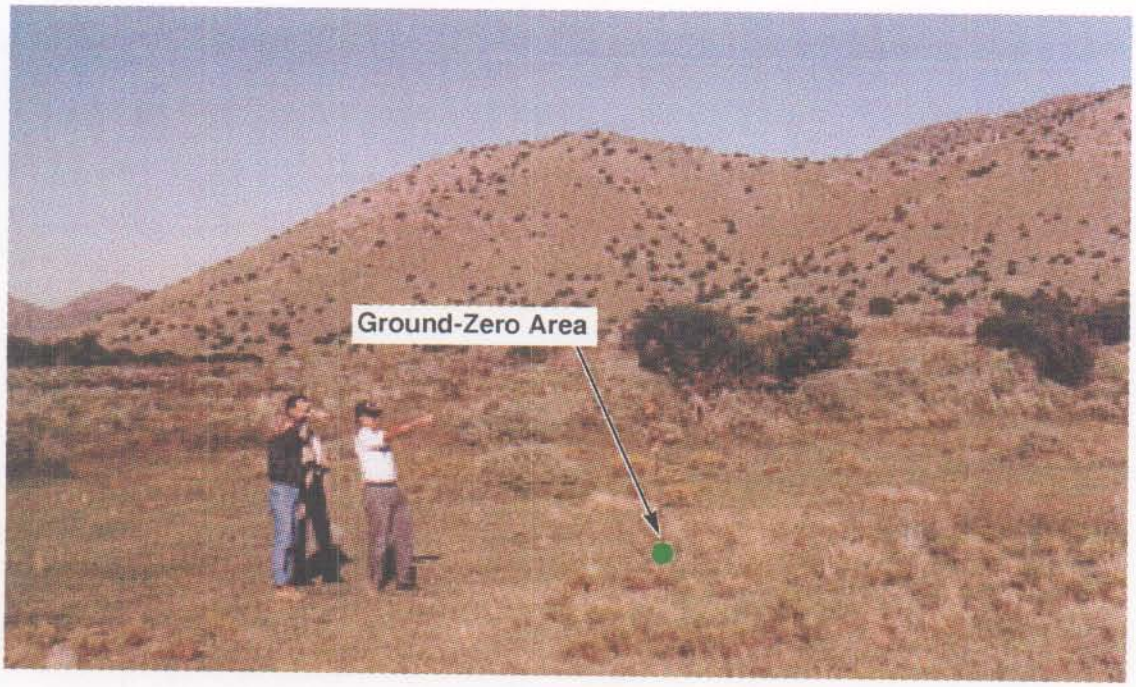


Figure 2-2b. Photograph of ER Site 63A in September 1993. Ground-zero area for PDSP tests is identified. View is to the southeast. (63-21)

Figure 2-2
ER Site 63A Photographs

October 1987, SNL/NM [n.d.] [Ref. 63-2], SNL/NM EORC 1995,). All tests were recorded by high- and low-speed cameras placed at the approximate locations indicated on Figure 2-1. The control point for the tests was stated as being a bunker on the high ground to the west. However, the bunker and its location have not been identified.

A declassified excerpt from a classified 1987 SNL/NM report states that ten tests were conducted at ER Site 63A and five were conducted at ER Site 81 (New Aerial Cable Site). The ten test units detonated at ER Site 63A resulted in the cumulative release of approximately 4.5 kg of DU to the environment within the ER Site 63A polygon. The total mass of explosives used in all 15 tests was 27.6 kg (Taylor and Grady October 1987). Because HE is consumed in high-order detonations, it would not have been released to the environment during these tests (SNL/NM EORC 1995).

The generated DU aerosol and particles ranged in size from less than 1 to 10 millimeters and were not large enough to retrieve from the ground surface. Although the exact locations of collection devices were not identified, the particles were collected by sample plates located over a distance of 239.5 ft from the ground-zero area and by air sample stations located over a distance of 88.59 ft above the ground surface. Two of the ten tests resulted in the deposition of particles of up to 0.2 micron in size at a distance of 239.5 ft. The other eight tests had no detectable DU particles on the sample plates placed at 239.5 ft. No misfires are known to have occurred during the PDSP tests, but several small grass fires were inadvertently started within a 100-ft radius of the ground-zero area by ejected particles of burning DU (DOE September 1987, Taylor and Grady October 1987, SNL/NM [n.d.] [Ref. 63-2], SNL/NM EORC 1995).

Some current features within the perimeter of ER Site 63A are related to ER Site 63B activities. These include a test stand, metal scrap, the concrete pads in the southeast quadrant of ER Site 63B, and a soil berm (Figure 2-1). The remaining metal test stand and metal scrap do not fit the description of the 2- to 3-point stand arrangement used to set up the PDSP tests (SNL/NM [n.d.] [Ref. 63-2]), and it is presumed that the detonation would have destroyed such a stand. Two concrete pads in the southeastern quadrant of ER Site 63A are associated with former sheds that housed optical instruments, which were used in the mid-1980s to detect the fly-by of various guided missiles (Figure 2-1) (SNL/NM EORC 1995). Grading ER Site 63A was not required prior to conducting the PDSP tests (SNL/NM August 1994). Therefore, the soil berm north of the ground-zero area probably originated from grading activities associated with ER Site 63B (Figure 2-1) (SNL/NM August 1994).

2.2 Previous Audits, Inspections, and Findings

ER Site 63 was identified during investigations conducted under the Comprehensive Environmental Assessment and Response Program (CEARP) (DOE September 1987). The CEARP report noted that site operations involved dropping test units from a hot-air balloon, but no residues are expected to exist from these operations. The CEARP report also stated that the balloon test area was used for studying metallic particulate clouds. These studies, which were conducted under the PDSP, used HE to produce fine particles of aluminum, iron, DU, and cerium. The Comprehensive Environmental Response, Compensation, and Liability Act finding was uncertain for Federal Facility Site Discovery and Identification Findings, Preliminary Assessment, and Preliminary Site Inspection; and insufficient information precluded calculating a Hazard Ranking System score.

3.0 EVALUATION OF RELEVANT EVIDENCE

3.1 Unit Characteristics and Operating Practices

There is no physical evidence remaining of activities associated with ER Site 63A. Because grading was not required to perform the PDSP tests at the site, there is no evidence of PDSP tests in historical aerial photographs (USGS June 1983, USGS September 1984, USGS June 1987).

3.2 Results of SNL/NM ER Project Sampling/Surveys

3.2.1 Summary of Prior Investigations

In preparing to request a confirmatory sampling NFA decision for ER Site 63A, a background study was conducted to collect available and relevant site information. Background information sources included existing records and reports of site activity. Classified technical reports were examined and pertinent material was extracted through a declassification process. In addition, interviews were conducted with SNL/NM staff as well as with contractors familiar with site operational history. The study was completely documented and has provided traceable references that sustain the integrity of this proposal.

The following sources of information, presented in chronological order, were used to evaluate ER Site 63A:

- Three SNL/NM technical reports, including declassified and unclassified documents, of past site activities (Taylor and Grady October 1987, Shinn March 1988, and SNL/NM EORC 1995)
- One preliminary radiological survey conducted in 1993 (SNL/NM EORC 1995)
- Review of six historical aerial photographs spanning 17 years (1975–1992) (SNL/NM August 1994)
- An unexploded ordnance (UXO)/HE surface survey (SNL/NM September 1994)
- Surface radiological surveys (RUST Geotech Inc. December 1994)
- Ten interviews with six current and retired facility personnel (SNL/NM EORC 1995)
- Photographs and field notes from numerous site inspections conducted by SNL/NM staff (SNL/NM EORC 1995)
- Scoping soil sampling conducted in October 1995

- An archaeological/cultural resources survey and a sensitive species survey (IT February 1995, SNL/NM March 1996)

- Confirmatory soil sampling conducted in July 1997

3.2.2 UXO/HE Survey of ER Site 63A

In October 1993, KAFB Explosive Ordnance Disposal conducted a visual surface survey for UXO/HE on the ground surface of ER Sites 63A and 63B. Among ordnance debris found were one expended igniter and three expended Redeye or SA-7 missile launch motors (SNL/NM September 1994). These items are associated with KAFB war-game activities rather than ER Site 63A activities.

3.2.3 Summary of Radiological Surveys of ER Site 63A

A 1993 surface gamma radiation survey conducted by the SNL/NM Radiation Protection Office covered part of the western access road and part of the arroyo channel immediately west of ER Site 63A (Figure 2-1). The beta/gamma survey was conducted at the site prior to entry of Sitewide Hydrologic Characterization Project personnel conducting arroyo characterization studies at the location. At the time of the arroyo studies (1993), the information available concerning previous testing at ER Site 63A and upgradient from the area surveyed was not as complete as currently available information. All gamma activity was within the background range concentration levels of 8 to 12 microroentgens per hour (μR/hr) (SNL/NM EORC 1995).

In December 1993, RUST Geotech Inc. conducted a surface gamma radiation survey of ER Sites 63A and 63B. No areas of gamma activity greater than 30 percent above natural background concentration levels (9 to 13 μR/hr) were measured (RUST Geotech Inc. December 1994).

3.2.4 Summary of Cultural Resources Survey of ER Site 63A

A survey of cultural resources was conducted in 1994 in support of the Sitewide Environmental Assessment. ER Site 63A contains one site comprised of Coalition Period artifacts scatter (SNL/NM March 1996).

3.2.5 Summary of Sensitive Species Survey of ER Site 63A

A sensitive species survey was conducted at ER Site 63A on June 21, 1994. The site partially overlaps ER Site 63B and is comprised of grassland dominated by blue grama. No sensitive species were found during the survey of ER Site 63A (IT February 1995).

3.2.6 Summary of Confirmatory Sampling of ER Site 63A

Confirmatory soil sampling was conducted at 12 locations at ER Site 63A in July 1997, in accordance with the sampling plan reviewed by the NMED DOE Oversight Bureau (SNL/NM July 1997, NMED DOE OB July 1997a) with the following variances:

- Two of the samples (CY-63A-SS-003 and CY-63A-SS-008) were located approximately 300 and 225 ft south of the approved plan, respectively (Figure 3-1), as a result of the proximity of cultural resource LA-81740 (SNL/NM March 1996).
- One sample (CY-63A-SS-010) was collected approximately 75 ft due west of the ER site boundary and its proposed location. Dense, brushy vegetation discouraged a closer approach to the originally proposed sample location.

Ten surface samples (CY-63A-SS-001 through CY-63A-SS-010) were collected across the ER site to test for the possible release of DU and were analyzed at an off-site laboratory for total uranium using U.S. Environmental Protection Agency (EPA) Methods 6020/3050 (EPA November 1986). Two additional samples (CY-63A-SS-011 and CY-63A-SS-012) were collected at the ground-zero area (Figure 3-1) and analyzed for HE using EPA Method 8330 (EPA November 1986). All samples were collected at a depth interval of 0 to 0.5 ft using the spade-and-scoop method (SNL/NM January 1995).

Total uranium concentrations from across the 500-ft-diameter test area range from 0.463 to 0.701 milligram per kilogram (mg/kg), far below the Upper Canyons' Study Background Soil suggested maximum concentration of 2.3 mg/kg (NMED DOE OB July 1997b). No HE compounds were detected in either ground-zero area sample. Table 3-1 summarizes all analytical data for ER Site 63A.

Gamma spectroscopy analyses were performed on two composite samples CY-63A-SS-006-009 and CY-63A-SS-010-012. All uranium series radionuclides were at concentration levels less than those of the local background activity levels presented for the Canyons' Background study area.

Quality Assurance/Quality Control Results

As part of the ER Site 63A confirmatory sampling effort, several quality assurance/quality control samples were collected and analyzed at the off-site laboratory. All data were reviewed and verified/validated according to "Data Verification/Validation Level 2—DV-2" in Attachment B of Technical Operating Procedure 94-03, Rev. 0 (SNL/NM July 1994b). The equipment rinsate blanks (CY-63A-SS-001-EB and CY-63A-SS-012-EB) that check the sampling equipment decontamination procedures were also analyzed for total uranium using EPA Methods 6020/3050 and high explosives using EPA Method 8330. The method blank results for high explosive were undetected and a J value of 0.0000860 milligrams per liter (mg/L) was reported for uranium. The J qualifier was below the reporting limit but equal to or greater than the effective detection limit for the analysis. Based on this analysis, the equipment decontamination was conducted appropriately.

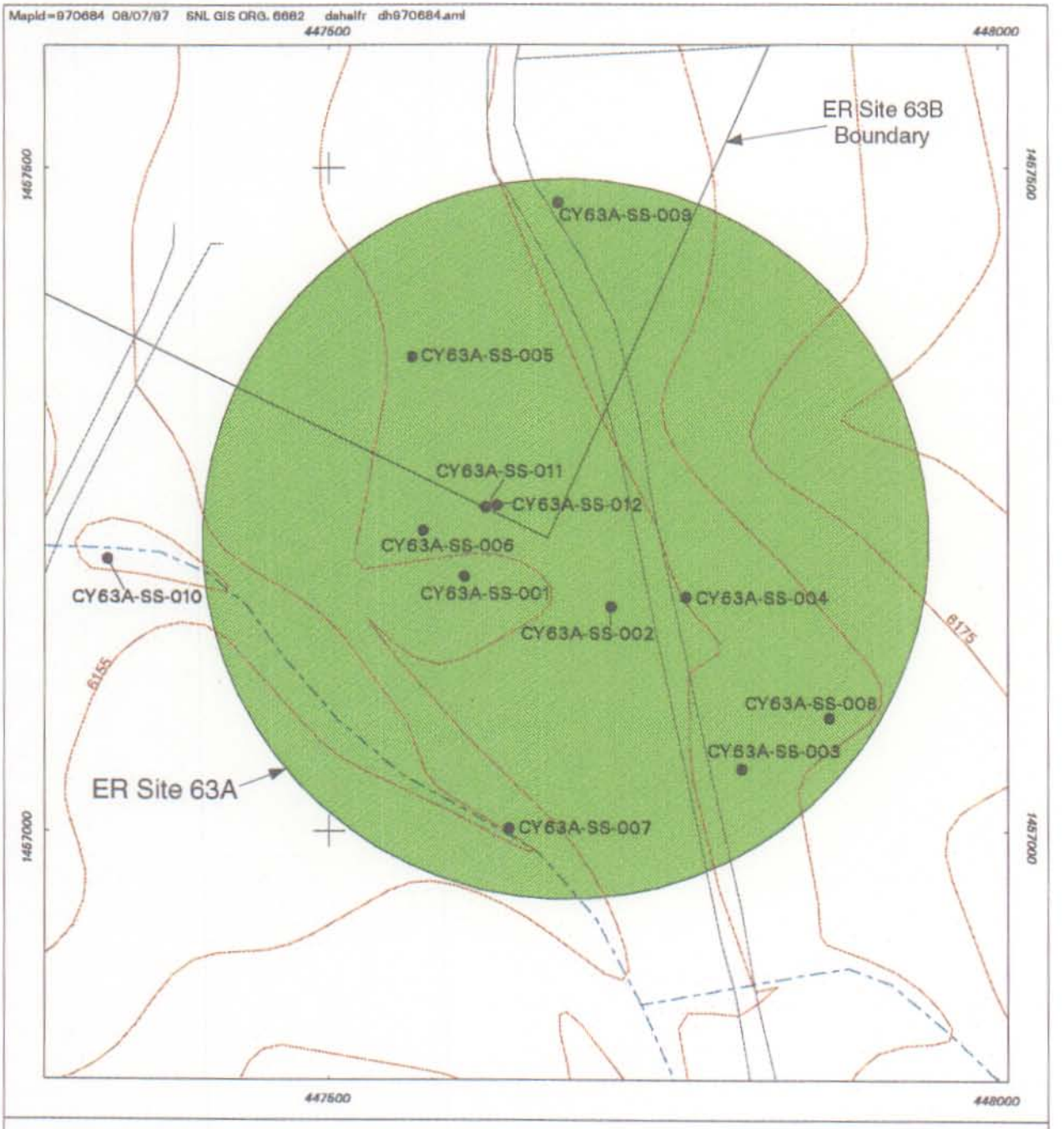
Table 3-1
Summary of Site 63A Confirmatory Soil Sample High Explosives and Total Uranium Analytical Results, July 1997

Sample Attributes			High Explosives (EPA Method 8330[a]) (mg/kg)		Total Uranium (EPA Methods 6020/3050[a]) (mg/kg)	
Sample Number	ER Sample ID	Depth (ft)	Result	Reporting Limit	Result	Reporting Limit
033871	CY-63A-SS-001	0–0.5			0.490	0.0971
033874	CY-63A-SS-002	0–0.5			0.522	0.0980
033875	CY-63A-SS-003	0–0.5			0.481	0.0971
033876	CY-63A-SS-004	0–0.5			0.531	0.0962
033877	CY-63A-SS-005	0–0.5			0.463	0.0971
033878	CY-63A-SS-006	0–0.5			0.485	0.0962
030093	CY-63A-SS-007	0–0.5			0.559	0.0971
030094	CY-63A-SS-008	0–0.5			0.534	0.100
030095	CY-63A-SS-009	0–0.5			0.484	0.0980
030096	CY-63A-SS-010	0–0.5			0.701	0.0962
030097	CY-63A-SS-011	0–0.5	ND U	0.188–0.750		
030098	CY-63A-SS-012	0–0.5	ND U	0.188–0.750		
Quality Assurance/Quality Control Samples—Soil (mg/kg)						
033872	CY-63A-SS-001 (duplicate)	0–0.5			0.494	0.0971
033873	CY-63A-SS-001 (MS/MSD)	0–0.5			0.484	0.0962
030099	CY-63A-SS-012 (duplicate)	0–0.5	ND U	0.188–0.750		
Upper Canyons Study Background Soil—Suggested Maximum Concentrations (mg/kg)[b]					2.3	
Quality Assurance/Quality Control Samples—Water (all in mg/L)						
030100	CY-63A-SS-001-EB (equipment blank)	NA			0.0000860J	0.000200
030101	CY-63A-SS-012-EB equipment blank)	NA	ND U	0.0000974		

[a]EPA November 1986.

[b]NMED DOE OB July 1997b.

EPA - U.S. Environmental Protection Agency.
J - The concentration in the sample was below the reporting limit but equal to or above the effective detection limit.
mg/kg - Milligram(s) per kilogram.
mg/L - Milligram(s) per liter.
MS/MSD - Matrix spike/matrix spike duplicate.
NA - Not available.
ND - Not detected at the detection limit.
U - The concentration in the sample was below the effective detection limit.



Legend

- Environmental Sample
- Road
- 5 Foot Contour
- Surface Drainage
- OU 1333 ER Site 63A

Figure 3-1
Soil Sampling Locations at ER Site 63A

0 60 120
Scale in Feet

0 14.4 28.8
Scale in Meters

Sandia National Laboratories, New Mexico
Environmental Geographic Information System

Laboratory quality control results concurrently analyzed with the samples included laboratory control samples, method blanks, and matrix spikes. Measures for accuracy and precision were within laboratory control limits for all parameters. The method blanks were nondetectable at detection limits listed in the attached analytical report. QC results were in control and are viewed as acceptable.

3.3 Gaps in Information

There are no records that indicate that hazardous waste was released from or disposed of at ER Site 63A. A 1987 SNL/NM test report noted that 4.5 kg of non-RCRA-regulated DU was released from ER Site 63A into the air in particles less than 10 mm in size from the PDSP tests (Taylor and Grady October 1987). The HE used in the testing should have been completely expended by the high-order detonations (SNL/NM EORC 1995). The confirmatory sampling investigation was developed to address whether any residual HE remains at the ground-zero area and whether residual DU is present in the soil following dispersal testing. No additional data gaps remain that might affect an NFA decision.

4.0 RATIONALE FOR A NO FURTHER ACTION DECISION

Based upon process knowledge and field investigation data, an NFA decision is being recommended for ER Site 63A for the following reasons:

- Operational history of the site is well-documented.
- No radionuclides were detected during the field-screening program.
- Gamma spectroscopy results were within background concentration levels.
- Total uranium concentrations were not detected above SNL/NM background concentration levels.
- No HE were detected at the site.

Based upon the evidence provided above, ER Site 63A is proposed for an NFA decision in conformance with Criterion 3 of the DOU (NMED April 1996), which states that no release to the environment has occurred.

5.0 REFERENCES

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6.0 ANNEXES

6.1 Gamma Spectroscopy Results and Review

Section 6.1
Gamma Spectroscopy Results and Review

Sandia National Laboratories
Operated for the U.S. Department of Energy by
Sandia Corporation

Albuquerque, New Mexico 87185-1132

date: August 8, 1997

to: Devon Jercinovic, MS-1147 (6682)

from: Craig D. Brown (Environmental Dimensions Inc.), MS-1148 (7527)

subject: Review of Radiological Data for ER Site 63A

I have reviewed the gamma spectroscopy data associated with AR/COC 06832. The data consisted of three samples (sample numbers 033878-002, 030096-002, 030100-002) that were taken for site characterization.

Based on the above review, and assuming that the samples adequately characterize the site, it appears that site characterization samples are representative of background radionuclide concentrations and that no radioactive contamination exists on site. All uranium and thorium series radionuclides, as well as Cs-137, were less than the local background values presented for the Canyons background study area.

Please let me know if you have any questions.

Copy to:

MS1147 Sharissa Young (6682)
Correspondence File: 97037.doc

Sandia National Laboratories
Radiation Protection Sample Diagnostics Program [881 Laboratory]
7-24-97 6:08:58 PM

Analyzed by: 7/25/97 Reviewed by: 7/25/97

Customer : S.YOUNG/MAC (6621/SMO)
Customer Sample ID : 033878-002
Lab Sample ID : 70128901

Sample Description : MARINELLI SOIL SAMPLE
Sample Quantity : 779.000 gram
Sample Date/Time : 7-23-97 11:22:00 AM
Acquire Start Date/Time : 7-24-97 4:22:39 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	8.19E-01	9.66E-01	1.73E+00
TH-234	1.24E+00	3.85E-01	4.93E-01
RA-226	1.97E+00	5.50E-01	5.23E-01
PB-214	8.40E-01	1.68E-01	5.04E-02
BI-214	7.94E-01	5.24E-01	5.25E-02
TH-232	9.09E-01	4.53E-01	1.71E-01
RA-228	9.24E-01	6.30E-01	1.71E-01
AC-228	9.21E-01	2.65E-01	1.09E-01
TH-228	7.97E-01	3.98E-01	5.09E-01
RA-224	1.05E+00	4.04E-01	7.19E-02
PB-212	9.66E-01	1.67E-01	4.44E-02
BI-212	Not Detected	---------	3.68E-01
TL-208	8.56E-01	1.74E-01	7.02E-02
U-235	Not Detected	---------	2.19E-01
TH-231	Not Detected	---------	9.28E+00
PA-231	Not Detected	---------	1.54E+00
TH-227	Not Detected	---------	3.99E-01
RA-223	~~8.92E-02~~	~~5.82E-02~~	~~7~~.88E-02 not detected 7/25/97
RN-219	Not Detected	---------	4.37E-01
PB-211	Not Detected	---------	9.70E-01
TL-207	Not Detected	---------	1.60E+01
AM-241	Not Detected	---------	1.99E-01
PU-239	Not Detected	---------	3.82E+02
NP-237	Not Detected	---------	3.06E-01
PA-233	Not Detected	---------	5.92E-02
TH-229	Not Detected	---------	2.09E-01

[Summary Report] - Sample ID: : 70128901

Nuclide Name	Activity (pCi/gram)	2-sigma Error	MDA (pCi/gram)
AG-108m	Not Detected	---------	4.87E-02
AG-110m	Not Detected	---------	5.08E-02
BA-133	Not Detected	---------	6.16E-02
BE-7	Not Detected	---------	3.07E-01
BI-207	Not Detected	---------	3.36E-02
CD-109	~~1.48E+00~~	~~4.82E-01~~	8.57E-01 Not detected 7/25/97
CD-115	Not Detected	---------	1.03E-01
CE-139	Not Detected	---------	2.78E-02
CE-141	Not Detected	---------	4.93E-02
CE-144	Not Detected	---------	2.06E-01
CO-56	Not Detected	---------	4.42E-02
CO-57	Not Detected	---------	2.59E-02
CO-58	Not Detected	---------	3.59E-02
CO-60	Not Detected	---------	4.30E-02
CR-51	Not Detected	---------	2.56E-01
CS-134	Not Detected	---------	4.58E-02
CS-137	1.92E-01	4.47E-02	2.69E-02
EU-152	Not Detected	---------	7.73E-02
EU-154	Not Detected	---------	2.26E-01
EU-155	Not Detected	---------	1.20E-01
FE-59	Not Detected	---------	8.38E-02
GD-153	Not Detected	---------	8.71E-02
HG-203	Not Detected	---------	3.34E-02
I-131	Not Detected	---------	3.35E-02
IR-192	Not Detected	---------	3.03E-02
K-40	1.60E+01	2.54E+00	2.93E-01
MN-52	Not Detected	---------	4.31E-02
MN-54	Not Detected	---------	4.09E-02
MO-99	Not Detected	---------	3.53E-01
NA-22	Not Detected	---------	4.88E-02
NA-24	Not Detected	---------	1.36E-01
NB-95	Not Detected	---------	2.09E-01
ND-147	Not Detected	---------	2.52E-01
NI-57	Not Detected	---------	9.48E-02
PB-210	Not Detected	---------	8.17E+00
RU-103	Not Detected	---------	3.33E-02
RU-106	Not Detected	---------	3.19E-01
SB-122	Not Detected	---------	6.22E-02
SB-124	Not Detected	---------	3.24E-02
SB-125	Not Detected	---------	9.86E-02
SN-113	Not Detected	---------	4.14E-02
SR-85	Not Detected	---------	4.23E-02
TA-182	Not Detected	---------	1.83E-01
TA-183	Not Detected	---------	1.99E-01
TC-99m	Not Detected	---------	7.35E-01
TL-201	Not Detected	---------	1.51E-01
XE-133	Not Detected	---------	7.65E-02
Y-88	Not Detected	---------	3.16E-02
ZN-65	Not Detected	---------	1.25E-01
ZR-95	Not Detected	---------	6.54E-02

[illegible] SANDIA/KSDI TO [illegible] P.03

Sandia National Laboratories
Radiation Protection Sample Diagnostics Program [881 Laboratory]
7-24-97 7:54:18 PM

Analyzed by: [signature] 7/25/97 Reviewed by: [signature] 7/25/97

Customer : S.YOUNG/MAC (6621/SMO)
Customer Sample ID : 030096-002
Lab Sample ID : 70128902

Sample Description : MARINELLI SOIL SAMPLE
Sample Quantity : 772.000 gram
Sample Date/Time : 7-23-97 11:34:00 AM
Acquire Start Date/Time : 7-24-97 6:11:38 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	---------	1.67E+00	
TH-234	1.52E+00	4.30E-01	5.02E-01	
RA-226	2.29E+00	9.29E-01	5.63E-01	
PB-214	8.84E-01	1.67E-01	5.23E-02	
BI-214	8.11E-01	1.61E-01	5.50E-02	
TH-232	9.50E-01	4.71E-01	1.70E-01	
RA-228	8.47E-01	2.45E-01	1.79E-01	
AC-228	1.01E+00	2.33E-01	1.06E-01	
TH-228	9.59E-01	4.52E-01	5.57E-01	
RA-224	9.69E-01	3.22E-01	8.97E-02	
PB-212	9.50E-01	1.66E-01	4.76E-02	
BI-212	1.13E+00	5.86E-01	3.80E-01	
TL-208	8.64E-01	1.70E-01	8.37E-02	
U-235	~~1.50E-01~~	~~1.64E-01~~	2.29E-01	not detected [signature] 7/25/97
TH-231	Not Detected	---------	9.56E+00	
PA-231	Not Detected	---------	1.47E+00	
TH-227	Not Detected	---------	4.06E-01	
RA-223	Not Detected	---------	1.60E-01	
RN-219	~~4.18E-01~~	~~3.62E-01~~	4.54E-01	not detected [signature] 7/25/[illegible]
PB-211	Not Detected	---------	1.02E+00	
TL-207	Not Detected	---------	1.58E+01	
AM-241	Not Detected	---------	2.04E-01	
PU-239	Not Detected	---------	3.85E+02	
NP-237	~~6.01E-01~~	~~1.72E-01~~	2.14E-01	not detected [signature] 7/25
PA-233	Not Detected	---------	6.08E-02	
TH-229	Not Detected	---------	2.14E-01	

Nuclide Name	Activity (pCi/gram)	2-sigma Error	MDA (pCi/gram)
AG-108m	Not Detected	---------	4.93E-02
AG-110m	Not Detected	---------	5.17E-02
BA-133	Not Detected	---------	6.49E-02
BE-7	1.74E-01	1.88E-01	1.75E-01
BI-207	Not Detected	---------	3.24E-02
CD-109	Not Detected	---------	1.06E+00
CD-115	Not Detected	---------	1.11E-01
CE-139	Not Detected	---------	2.83E-02
CE-141	Not Detected	---------	5.11E-02
CE-144	Not Detected	---------	2.00E-01
CO-56	Not Detected	---------	3.84E-02
CO-57	Not Detected	---------	2.67E-02
CO-58	Not Detected	---------	4.02E-02
CO-60	Not Detected	---------	4.10E-02
CR-51	Not Detected	---------	2.48E-01
CS-134	Not Detected	---------	4.84E-02
CS-137	2.06E-01	4.57E-02	2.59E-02
EU-152	Not Detected	---------	7.96E-02
EU-154	Not Detected	---------	2.28E-01
EU-155	Not Detected	---------	1.21E-01
FE-59	Not Detected	---------	8.65E-02
GD-153	Not Detected	---------	8.69E-02
HG-203	Not Detected	---------	3.36E-02
I-131	Not Detected	---------	3.48E-02
IR-192	Not Detected	---------	2.98E-02
K-40	1.59E+01	2.57E+00	3.03E-01
MN-52	Not Detected	---------	4.11E-02
MN-54	Not Detected	---------	4.01E-02
MO-99	Not Detected	---------	3.84E-01
NA-22	Not Detected	---------	4.66E-02
NA-24	Not Detected	---------	1.63E-01
NB-95	Not Detected	---------	2.15E-01
ND-147	Not Detected	---------	2.53E-01
NI-57	Not Detected	---------	1.01E-01
PB-210	Not Detected	---------	8.63E+00
RU-103	Not Detected	---------	3.33E-02
RU-106	Not Detected	---------	3.19E-01
SB-122	Not Detected	---------	6.12E-02
SB-124	Not Detected	---------	3.54E-02
SB-125	Not Detected	---------	9.92E-02
SN-113	Not Detected	---------	4.21E-02
SR-85	Not Detected	---------	4.30E-02
TA-182	Not Detected	---------	1.85E-01
TA-183	Not Detected	---------	2.07E-01
TC-99m	Not Detected	---------	8.82E-01
TL-201	Not Detected	---------	1.57E-01
XE-133	Not Detected	---------	1.56E-01
Y-88	Not Detected	---------	3.37E-02
ZN-65	Not Detected	---------	1.27E-01
ZR-95	Not Detected	---------	6.67E-02

Sandia National Laboratories
Radiation Protection Sample Diagnostics Program [881 Laboratory]
7-24-97 9:39:24 PM

* Analyzed by: 7/25/97 Reviewed by: 7/28/97

Customer : S.YOUNG/MAC (6621/SMO)
Customer Sample ID : 030100-002
Lab Sample ID : 70128903

Sample Description : MARINELLI SOIL SAMPLE
Sample Quantity : 774.000 gram
Sample Date/Time : 7-23-97 12:30:00 PM
Acquire Start Date/Time : 7-24-97 7:56:45 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	---------	1.52E+00
TH-234	1.06E+00	3.36E-01	4.60E-01
RA-226	1.38E+00	4.66E-01	5.17E-01
PB-214	7.40E-01	1.43E-01	4.93E-02
BI-214	6.96E-01	1.40E-01	4.71E-02
TH-232	8.35E-01	4.06E-01	1.47E-01
RA-228	Not Detected	---------	1.73E-01
AC-228	7.32E-01	1.94E-01	1.06E-01
TH-228	4.67E-01	3.28E-01	4.80E-01
RA-224	7.54E-01	2.55E-01	8.11E-02
PB-212	8.10E-01	2.91E-01	4.39E-02
BI-212	8.64E-01	6.90E-01	3.69E-01
TL-208	7.40E-01	1.30E-01	7.71E-02
U-235	Not Detected	---------	2.07E-01
TH-231	Not Detected	---------	8.58E+00
PA-231	Not Detected	---------	1.37E+00
TH-227	Not Detected	---------	3.72E-01
RA-223	Not Detected	---------	1.46E-01
RN-219	Not Detected	---------	4.02E-01
PB-211	Not Detected	---------	9.35E-01
TL-207	Not Detected	---------	1.47E+01
AM-241	Not Detected	---------	1.87E-01
PU-239	Not Detected	---------	3.39E+02
NP-237	~~1.40E-01~~	~~1.39E-01~~	2.10E-01 Not detected 7/25/97
PA-233	Not Detected	---------	5.80E-02
TH-229	Not Detected	---------	1.92E-01

[Summary Report] - Sample ID: : 70128903

Nuclide Name	Activity (pCi/gram)	2-sigma Error	MDA (pCi/gram)
AG-108m	Not Detected	---------	4.48E-02
AG-110m	Not Detected	---------	3.45E-02
BA-133	Not Detected	---------	5.94E-02
BE-7	1.90E-01	1.37E-01	1.78E-01
BI-207	Not Detected	---------	1.96E-02
CD-109	Not Detected	---------	9.65E-01
CD-115	Not Detected	---------	1.04E-01
CE-139	Not Detected	---------	2.51E-02
CE-141	Not Detected	---------	4.59E-02
CE-144	Not Detected	---------	1.87E-01
CO-56	Not Detected	---------	3.96E-02
CO-57	Not Detected	---------	2.42E-02
CO-58	Not Detected	---------	3.54E-02
CO-60	Not Detected	---------	4.17E-02
CR-51	Not Detected	---------	2.43E-01
CS-134	Not Detected	---------	4.20E-02
CS-137	2.14E-02	2.23E-02	2.48E-02
EU-152	Not Detected	---------	7.22E-02
EU-154	Not Detected	---------	2.10E-01
EU-155	Not Detected	---------	1.11E-01
FE-59	Not Detected	---------	8.38E-02
GD-153	Not Detected	---------	7.90E-02
HG-203	Not Detected	---------	3.14E-02
I-131	Not Detected	---------	3.43E-02
IR-192	Not Detected	---------	2.82E-02
K-40	1.37E+01	2.29E+00	2.76E-01
MN-52	Not Detected	---------	3.92E-02
MN-54	Not Detected	---------	3.69E-02
MO-99	Not Detected	---------	3.62E-01
NA-22	Not Detected	---------	4.67E-02
NA-24	Not Detected	---------	1.54E-01
NB-95	Not Detected	---------	2.00E-01
ND-147	Not Detected	---------	2.36E-01
NI-57	Not Detected	---------	9.64E-02
PB-210	Not Detected	---------	7.67E+00
RU-103	Not Detected	---------	3.05E-02
RU-106	Not Detected	---------	3.17E-01
SB-122	Not Detected	---------	5.62E-02
SB-124	Not Detected	---------	2.97E-02
SB-125	Not Detected	---------	8.70E-02
SN-113	Not Detected	---------	3.87E-02
SR-85	Not Detected	---------	3.99E-02
TA-182	Not Detected	---------	1.74E-01
TA-183	Not Detected	---------	1.90E-01
TC-99m	Not Detected	---------	9.07E-01
TL-201	Not Detected	---------	1.43E-01
XE-133	Not Detected	---------	1.41E-01
Y-88	Not Detected	---------	3.18E-02
ZN-65	Not Detected	---------	1.19E-01
ZR-95	Not Detected	---------	6.51E-02

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*****************************************************************************
*                    Sandia National Laboratories                           *
*    Radiation Protection Sample Diagnostics Program [881 Laboratory]       *
*                        7-25-97  7:34:25 AM                                *
*****************************************************************************
*                                                                           *
* Analyzed by:  7/25/97      Reviewed by: 7/25/97                           *
*****************************************************************************
Customer                  : S.YOUNG (6621)
Customer Sample ID        : LAB CONTROL SAMPLE USING CG134
Lab Sample ID             : 70128904

Sample Description        : MIXED_GAMMA_STANDARD_CG134
Sample Quantity           :     1.000  Each
Sample Date/Time          : 11-01-90  12:00:00 PM
Acquire Start Date/Time   :  7-25-97   7:22:25 AM
Detector Name             : LAB01
Elapsed Live/Real Time    :    600 /    605 seconds

Comments:
*****************************************************************************
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Nuclide Name	Activity (pCi/Each)	2-sigma Error	MDA (pCi/Each)
U-238	Not Detected	---------	8.55E+03
TH-234	Not Detected	---------	3.39E+03
RA-226	Not Detected	---------	5.98E+03
PB-214	Not Detected	---------	7.72E+02
BI-214	Not Detected	---------	7.12E+02
TH-232	Not Detected	---------	2.32E+03
RA-228	Not Detected	---------	3.34E+03
AC-228	Not Detected	---------	2.02E+03
TH-228	Not Detected	---------	8.15E+04
RA-224	Not Detected	---------	3.26E+03
PB-212	Not Detected	---------	6.10E+03
BI-212	Not Detected	---------	6.18E+04
TL-208	Not Detected	---------	1.27E+04
U-235	Not Detected	---------	1.60E+03
TH-231	Not Detected	---------	5.60E+04
PA-231	Not Detected	---------	1.54E+04
TH-227	Not Detected	---------	2.59E+03
RA-223	Not Detected	---------	1.00E+26
RN-219	Not Detected	---------	6.52E+03
PB-211	Not Detected	---------	1.51E+04
TL-207	Not Detected	---------	2.75E+05
AM-241	8.37E+04	1.42E+04	1.44E+03
PU-239	Not Detected	---------	2.54E+06
NP-237	Not Detected	---------	1.83E+03
PA-233	Not Detected	---------	6.50E+02
TH-229	Not Detected	---------	1.42E+03

[Summary Report] - Sample ID: : 70128904

Nuclide Name	Activity (pCi/Each)	2-sigma Error	MDA (pCi/Each)
AG-108m	Not Detected	---------	4.13E+02
AG-110m	Not Detected	---------	1.63E+06
BA-133	Not Detected	---------	7.50E+02
BE-7	Not Detected	---------	2.91E+17
BI-207	Not Detected	---------	3.94E+02
CD-109	3.80E+05	6.62E+05	1.59E+05
CD-115	Not Detected	---------	1.00E+26
CE-139	Not Detected	---------	4.96E+07
CE-141	Not Detected	---------	1.00E+26
CE-144	Not Detected	---------	5.79E+05
CO-56	Not Detected	---------	1.83E+12
CO-57	Not Detected	---------	1.00E+05
CO-58	Not Detected	---------	1.17E+13
CO-60	7.88E+04	1.10E+04	5.20E+02
CR-51	Not Detected	---------	1.00E+26
CS-134	Not Detected	---------	3.18E+03
CS-137	6.87E+04	9.25E+03	2.80E+02
EU-152	Not Detected	---------	8.10E+02
EU-154	Not Detected	---------	3.15E+03
EU-155	Not Detected	---------	2.20E+03
FE-59	Not Detected	---------	4.45E+19
GD-153	Not Detected	---------	6.66E+05
HG-203	Not Detected	---------	2.34E+18
I-131	Not Detected	---------	1.00E+26
IR-192	Not Detected	---------	3.22E+12
K-40	Not Detected	---------	1.76E+03
MN-52	Not Detected	---------	1.00E+26
MN-54	Not Detected	---------	1.06E+05
MO-99	Not Detected	---------	1.00E+26
NA-22	Not Detected	---------	1.56E+03
NA-24	Not Detected	---------	1.00E+26
NB-95	Not Detected	---------	1.00E+26
ND-147	Not Detected	---------	1.00E+26
NI-57	Not Detected	---------	1.00E+26
PB-210	Not Detected	---------	6.99E+04
RU-103	Not Detected	---------	2.88E+21
RU-106	Not Detected	---------	3.59E+05
SB-122	Not Detected	---------	1.00E+26
SB-124	Not Detected	---------	6.49E+14
SB-125	Not Detected	---------	7.24E+03
SN-113	Not Detected	---------	1.31E+09
SR-85	Not Detected	---------	1.08E+14
TA-182	Not Detected	---------	4.12E+09
TA-183	Not Detected	---------	1.00E+26
TC-99m	Not Detected	---------	1.00E+26
TL-201	Not Detected	---------	1.00E+26
XE-133	Not Detected	---------	1.00E+26
Y-88	Not Detected	---------	1.46E+09
ZN-65	Not Detected	---------	1.24E+06
ZR-95	Not Detected	---------	2.50E+14

```
*****************************************************************************
*                    Sandia National Laboratories                           *
*              Radiation Protection Sample Diagnostics Program              *
*                     Quality Assurance Report                              *
*****************************************************************************
```

Report Date	:	7-25-97 7:35:00 AM
QA File	:	C:\GENIEPC\CAMFILES\LCS1.QAF
Analyst	:	GM
Sample ID	:	70128904
Sample Quantity	:	1.00 Each
Sample Date	:	11-01-90 12:00:00 PM
Measurement Date	:	7-25-97 7:22:25 AM
Elapsed Live Time	:	600 seconds
Elapsed Real Time	:	605 seconds

Parameter	Mean	1S Error	New Value	< LU : SD : UD : BS >
AM-241 Activity	8.745E-02	2.716E-03	8.367E-02	< :In : : >
CS-137 Activity	6.888E-02	1.657E-03	6.874E-02	< : : : >
CO-60 Activity	7.590E-02	2.983E-03	7.802E-02	< : : >

OK 7/25/97

Flags Key:
LU = Boundary Test (Ab = Above , Be = Below)
SD = Sample Driven N-Sigma Test (In = Investigate, Ac = Action)
UD = User Driven N-Sigma Test (In = Investigate, Ac = Action)
BS = Measurement Bias Test (In = Investigate, Ac = Action)

Reviewed by: 7/25/97