



Sandia National Laboratories

**PROPOSAL FOR ADMINISTRATIVE
NO FURTHER ACTION
ENVIRONMENTAL RESTORATION
SITE 47, UNMANNED SEISMIC
OBSERVATORY
OPERABLE UNIT 1334**

August 1994

Environmental
Restoration
Project



United States Department of Energy
Albuquerque Operations Office

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

Prepared for the
United States Department of Energy

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1.0 INTRODUCTION

1.1 ER Site Identification Number and Name

Sandia National Laboratories/New Mexico (SNL/NM) is proposing an administrative no further action (NFA) decision for Environmental Restoration (ER) Site 47, Unmanned Seismic Observatory, Operable Unit (OU) 1334. ER Site 47, formerly included in OU 1293, was identified as the "Doomed Bunker Outfall" in the Hazardous and Solid Waste Amendment (HSWA) Module IV (EPA August 1993) of the SNL/NM Resource Conservation and Recovery Act (RCRA) Hazardous Waste Management Facility Permit (NM5890110518) (EPA 1992). SNL/NM is proposing that the name be changed in the HSWA Module IV to the "Unmanned Seismic Observatory" to reflect newly obtained historical information presented in this proposal.

1.2 SNL/NM Administrative NFA Process

This proposal for a determination of an administrative NFA decision has been prepared using the criteria presented in Section 4.5.3. of the SNL/NM Program Implementation Plan (SNL/NM February 1994). Specifically, this proposal will "contain information demonstrating that there are no releases of hazardous waste (including hazardous constituents) from solid waste management units (SWMU) at the facility that may pose a threat to human health or the environment" (as proposed in the Code of Federal Regulations (CFR) Section 40 Part 264.51[a] [2]) (EPA July 1990). The HSWA Module IV contains the same requirements for an NFA demonstration:

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

In requesting an administrative NFA decision for ER Site 47, Unmanned Seismic Observatory, this proposal is using existing administrative/archival information to satisfy the permit requirements. This unit is eligible for an administrative NFA proposal based on one or more of the following criteria taken from the RCRA Facility Assessment Guidance (EPA October 1986):

Criterion A: The unit has never contained constituents of concern

Criterion B: The unit has design and/or operating characteristics that effectively prevent releases to the environment

Criterion C: The unit clearly has not released hazardous waste or constituents into the environment

Specifically, ER Site 47 is being proposed for an administrative NFA decision because the SWMU never contained hazardous waste or constituents (Criterion A).

1.3 Local Setting

SNL/NM occupies 2,829 acres (ac) of land owned by the Department of Energy (DOE) with an additional 14,920 ac of land provided by land-use permits with Kirtland Air Force Base (KAFB), the United States Forest Service (USFS), the State of New Mexico, and the Isleta Indian Reservation. Sandia Corporation (a subsidiary of AT&T) operated SNL/NM for DOE from the time of its opening in 1945 until September 1993, when Martin Marietta Corporation undertook operation. SNL/NM has been involved in nuclear weapons research, component development, assembly, testing, and other nuclear activities since 1945.

ER Site 47 (Figure 1-1) is owned by KAFB (unassigned) and located on SNL/NM in the USFS withdrawn area of the Cibola National Forest, near the southern boundary of KAFB between the United States Geological Survey (USGS) Albuquerque Seismological Laboratory to the south and the SNL/NM Facility for Acceptance, Calibration, and Testing (FACT site) for National Seismic Stations to the north. The site lies on 1.02 ac of land at a mean elevation of 5,980 feet (ft) above sea level (SNL/NM April 1994).

This inactive site lies between two small unnamed arroyo channels that discharge to the west and is located on alluvial deposits correlated with the Ildefonso soil unit (IT May 1994b), with permeabilities ranging from 2.0 to 6.0 inches per hour (USDA 1977). The geologic and hydrologic conditions at ER Site 47 are expected to be similar to those measured at the Starfire Optical Range well (approximately 1 mile north), because both locations lie to the east of Coyote Fault and its associated splays. Geologic information obtained from the lithologic log compiled for the Starfire Optical Range well indicates that the local area is covered with 20 to 40 ft of proximal to mid-fan alluvial deposits underlain by Precambrian granite. When the Starfire Optical Range well was completed in 1987, the depth to groundwater was measured at 150 ft (IT May 1994b). Depth to groundwater at ER Site 47 is estimated to be 145 ft (DOE July 1994).

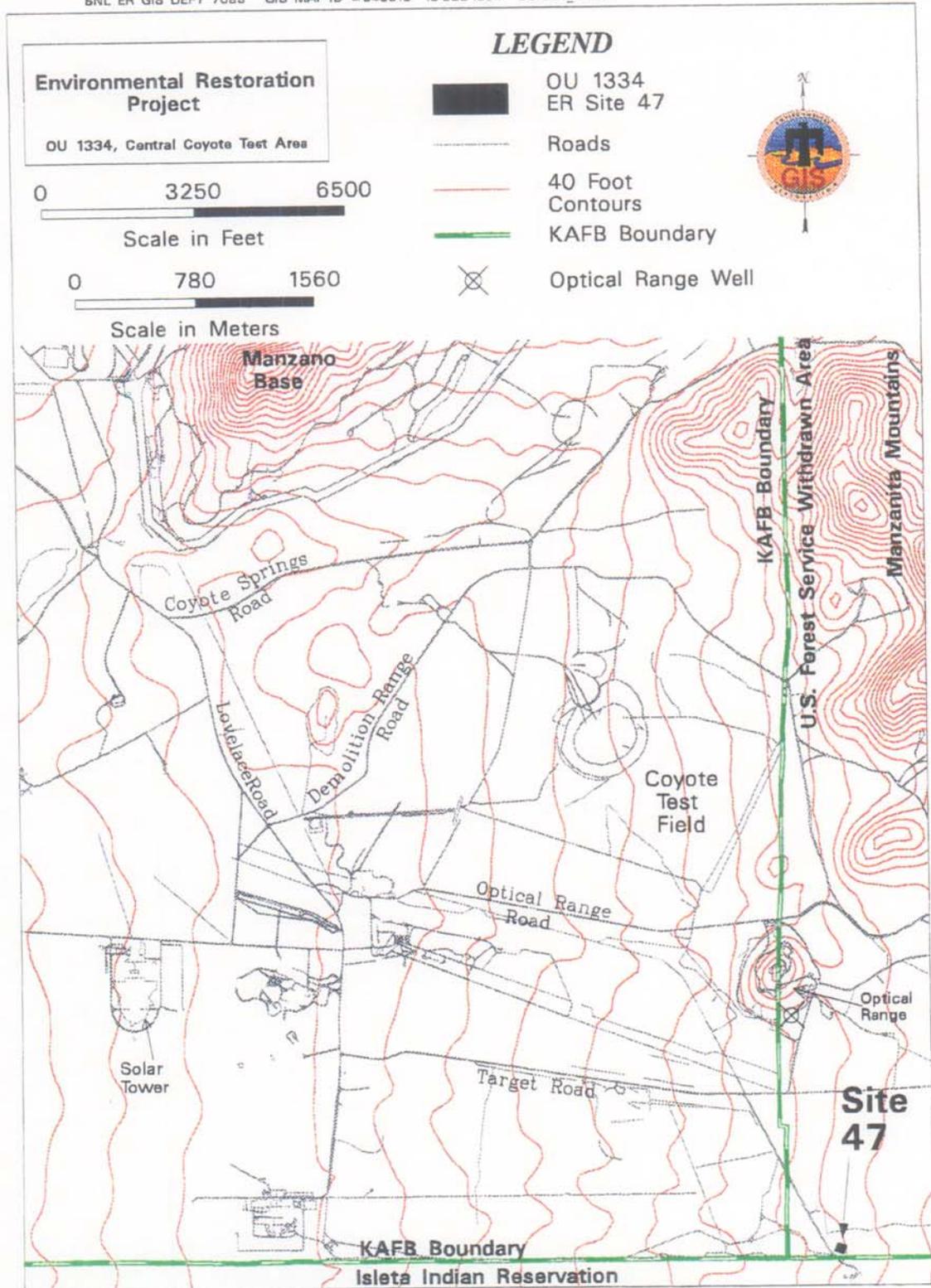


Figure 1-1
Location of ER Site 47, Unmanned Seismic Observatory

2.0 HISTORY OF THE SWMU

2.1 Previous Audits, Inspections, and Findings

ER Site 47 was first listed as a potential release site based on the Comprehensive Environmental Assessment and Response Program (CEARP) interviews in 1985 (DOE September 1987), which noted the presence of a suspected discharge pipe. The regulatory disposition of the SWMU remained uncertain, however, because of a lack of information regarding the nature of discharges from this suspected outfall. Insufficient information also prevented calculating a Hazard Ranking System score for the SWMU.

Subsequent to the CEARP inspection, the Environmental Protection Agency (EPA) conducted a RCRA Facility Assessment (RFA). Again, the protruding pipe was considered to have been used for discharging liquid effluent (EPA April 1987), but the report did not identify the SNL/NM personnel supposedly providing the information. The RFA report stated that "the potential for release to all pathways cannot be determined due to lack of information regarding wastes managed" and that "it is likely that liquid wastes have been discharged to the arroyo channel according to SNL/NM personnel" (EPA April 1987). These statements are not supported by available records or physical evidence of discharge, such as erosion or staining. Available records state the pipe entered Bunker B2 midway up the side of the wall to serve as an electrical conduit, and this physical arrangement could not be used to drain liquids from the bunker.

However, as a result of the findings in the CEARP report, the site was one of five sites identified to have limited sampling conducted by the DOE-Albuquerque Office Environment and Health Division, ER Program Project Group (47-2 and 47-3). This sampling was completed in September 1987 (47-10); results are discussed in Section 3.4.1.

2.2 Historical Operations

ER Site 47 (Figure 2-1) is enclosed within a barbed-wire fence and contains two earthen-covered bunkers (designated as Bunkers B1 and B2) used as vaults for seismic equipment (47-25, 47-34, 47-39). An electrical box with two associated cables lies northwest of Bunker B1, and two pits lie along the east side of the site. A steel casing that extends approximately 1 ft above the ground surface and 13 ft below the surface is located in the center of the site. This site was initially designated as a SWMU because of the presence of a presumed waste water outfall on the north side of Bunker B2 (47-8).

Bunker B1, located in the north-central area of the site, is approximately 5.0 ft high and is constructed of an empty water tank set into the ground. Soil is mounded around the bunker. The entrance for this bunker is covered with an orange metal cover, which is approximately 4.5 ft in diameter. Under the orange metal cover is a second metal cover with a combination lock that seals the bunker. A 12-inch [in.]-diameter covered casing that contains a pressure gauge is adjacent to the west side of the entrance. In addition, an electrical box is located

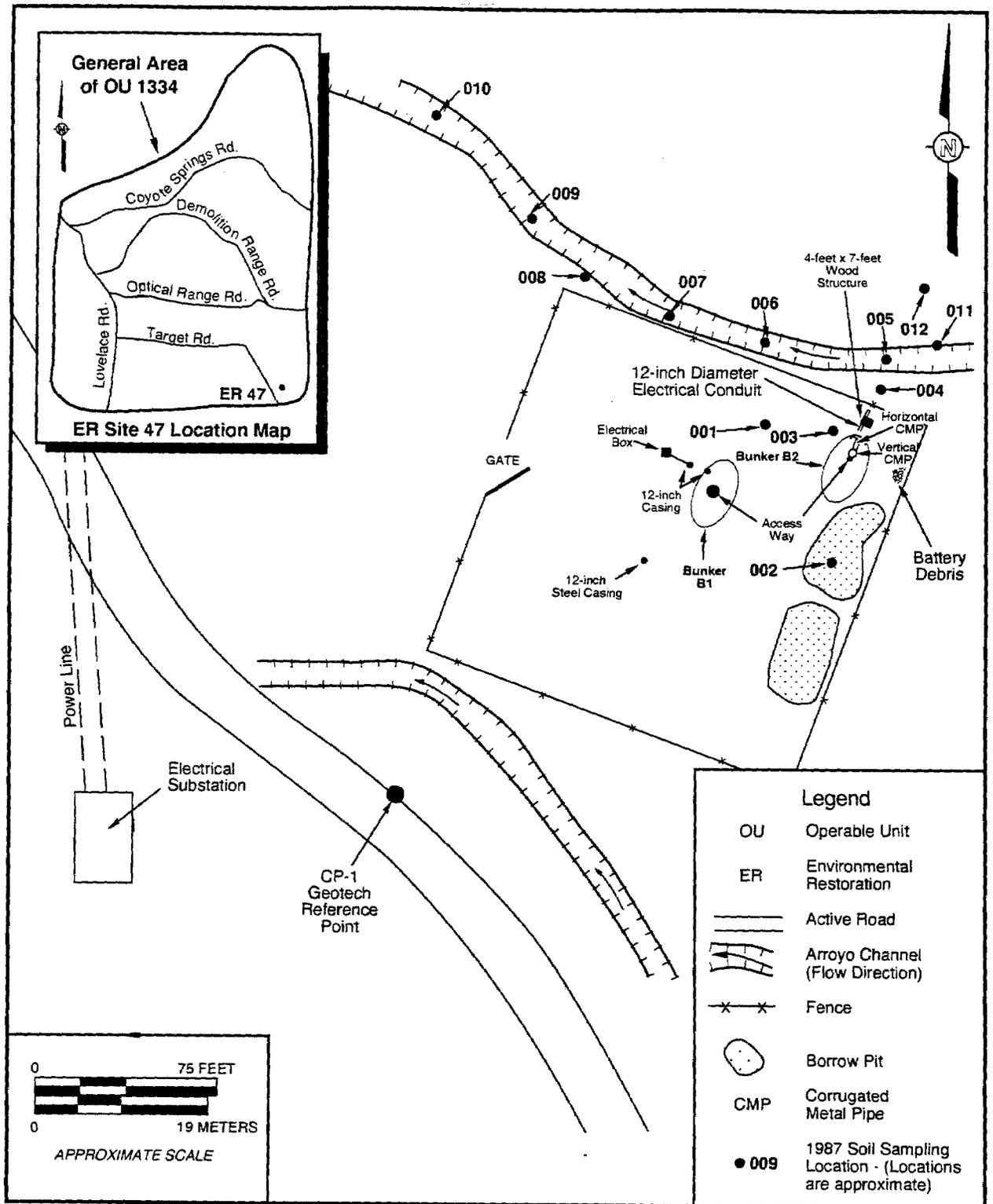


Figure 2-1
Site Map and 1987 Sample Locations for
ER Site 47, Unmanned Seismic Observatory

west of the entrance. A pair of signal cables extends from the box southward on the ground toward the USGS laboratory (47-18). Another 12-in.- diameter casing is located between the electrical box and the entrance at the northwest base of the bunker. This pipe has a metal oversized cap on the top that is believed to be a ventilation duct for the bunker. An electrical cable at the base of this pipe leads to the electrical box.

Bunker B2, located near the northeast corner of the site, is approximately 10 ft high and is constructed of a 15-ft-long by 3.5-ft-diameter metal cylinder set vertically into the ground, with soil mounded around the cylinder (Figure 2-2a). The entrance to this bunker is sealed with a 3.5-ft-diameter metal cover and a combination lock. An L-shaped piece of 4.0-ft-diameter corrugated metal pipe is attached to the north side of this bunker. A metal barricade, or retaining wall, is located above the north end of the corrugated metal pipe. North of the metal barricade near the arroyo channel lies a smaller diameter (12-in.) rusted metal pipe (Figure 2-2b). A 4-ft by 7-ft wooden bench-like structure is located over the end of this pipe (47-18). This pipe was identified as a wastewater outfall in the CEARP and RFA, but current information indicates that the pipe served as a conduit for electrical cables (47-40). In addition, the pipe reportedly enters the bunker midway up a sidewall, making it impossible to drain water from the bunker. Finally, physical evidence of erosion or soil staining are absent between the pipe and the arroyo channel, indicating wastewater discharges did not take place at this site.

No historical records documenting the use of this SWMU have been located. USGS personnel interviewed indicate that this facility was constructed by SNL/NM in the late 1960s or early 1970s as a seismic-monitoring facility (47-16). Aerial photographs support this statement, because ER Site 47 is not present in a 1961 aerial photograph (USGS 1961) but is present in essentially its current configuration in a 1971 aerial photograph (USGS 1971). The bunkers were used by SNL/NM as seismic vaults for approximately one year. The seismic vaults were subsequently offered to the USGS and they installed their own seismic-monitoring equipment. The USGS only used this facility for about four to six months, because the vaults would get too warm and cause the electrical equipment to overheat and cease operation (47-16). After the unsuccessful USGS effort, the bunkers were not used again. USGS personnel interviewed indicated that no hazardous materials or chemicals were used at the site (47-18).

A current SNL/NM employee was told by a former employee that there is a 40- to 50-ft-deep borehole in each of the bunkers, used to suspend instrumentation (47-39). This has not been confirmed, although a borehole appears to be present in a CEARP photo of the bottom of Bunker B2. The exact depth of the borehole has not been determined.

Two pits are located on the east side of the fenced area. No waste or debris is present in the pits, which appear to be borrow pits used for obtaining soil to cover the bunkers (47-18).

Approximately 35 ft southwest of Bunker B1 is a 12-in.-diameter steel casing. The casing extends 1 ft above the ground surface. A steel plate lying on the steel casing is weld-marked "#2." The casing is sealed with cement at a depth of approximately 13 ft below the ground

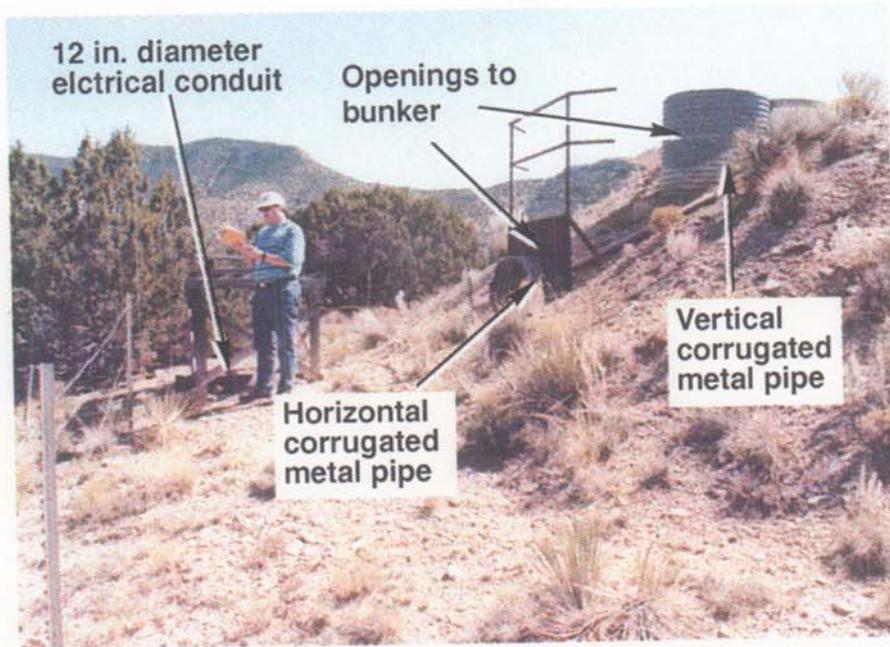


Figure 2-2a. Unmanned seismic observatory Bunker B2, ER Site 47. View to the east.

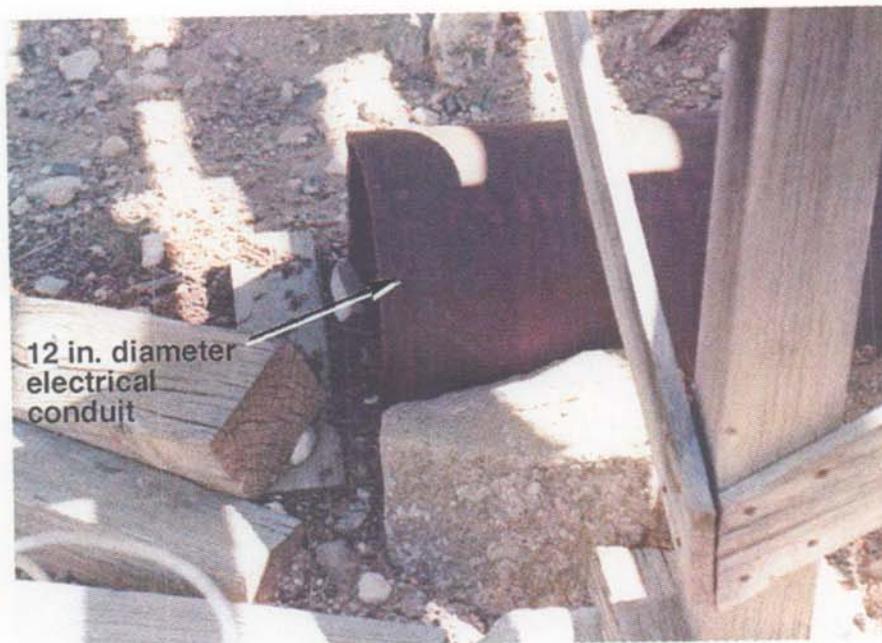


Figure 2-2b. Twelve-inch diameter electrical conduit from Bunker B2, ER Site 47.

**Figure 2-2
ER Site 47 Photographs**

2.3 Discussion of Information Conflicts

The RFA report (EPA April 1987) noted that a few partially buried drums were present at the site. Recent site visits have shown that a rusted empty drum and some metal debris are present on the surface. There are no other information conflicts present in the records for ER Site 21.

3.0 EVALUATION OF RELEVANT EVIDENCE

3.1 Unit Characteristics

ER Site 21 contains a single rusted 55-gal drum and some metal debris. According to aerial photographs and ER Project interviews, the site has never been associated with historical disposal operations.

3.2 Operating Practices

Hazardous materials were not managed or contained at ER Site 21.

3.3 Presence or Absence of Visual Evidence

Recent site inspections found an empty rusted 55-gal drum and some scrap metal on the ground. However, there is no visual evidence to suggest the drum ever contained hazardous materials or that a release occurred at the site. Interviews with current and former SNL/NM personnel revealed no information concerning waste management activities (21-20 through 21-23, 21-25). This is supported by aerial photographs (USGS 1951, USGS 1961, USGS 1967, USGS 1971, and USGS 1991) that show a farm house and associated structures prior to 1971 and an absence of structures at the time of the 1971 photograph. None of the aerial photographs show cultural features that suggest the site was used to dispose of hazardous constituents.

3.4 Results of Previous Sampling/Surveys

3.4.1 Unexploded Ordnance/High Explosive Survey

In November 1993, KAFB Explosive Ordnance Disposal conducted a surface unexploded ordnance (UXO)/high explosives (HE) survey at this site that was completed in conjunction with ER Sites 62 and 88. Expended ordnance collected and removed during this survey included ten smoke grenades, two 40-millimeter white star cartridges, one booby trap simulator, and numerous rifle shells and casings. No UXO or HE was found (21-34). It is unlikely the ordnance collected was related to ER Site 21 activities because many groups—including the Defender Challenge, civil engineering, the KAFB hospital, and the KAFB security police—use the Coyote Springs area as a training/bivouac area (21-14, 21-18). The ordnance collected during this survey was probably the remnant of training exercises conducted by one or more of these groups.

3.4.2 Gamma Radiation Survey

In February 1994, RUST Geotech Inc. conducted a surface radiation survey at the site in conjunction with ER Sites 62 and 88. The survey used a scintillometer containing a sodium-iodide detector to measure gamma radiation and no detections were found above the background readings of 10 to 13 microrentgen per hour (RUST Geotech Inc. July 1994).

3.5 Assessment of Gaps in Information

There are no records that state hazardous waste or constituents were contained at ER Site 21. However, the potential data gap arising from incomplete archival records on the operation of the site has been addressed by ER Project interviews, aerial photographs, site visits, and UXO/HE and surface gamma radiation survey results. This new information indicates that the site never contained hazardous waste or constituents.

3.6 Rationale for Pursuing An Administrative NFA Decision

SNL/NM is proposing an administrative NFA decision for ER Site 21 because the SWMU never contained hazardous waste or constituents (Criterion A). There is no knowledge of any waste management activities at this site and no visual evidence of buried or stored hazardous waste or constituents.

An inspection conducted under the CEARP verified the presence of one empty, unlabeled 55-gal drum and some partially buried pieces of metal on the ground (DOE September 1987). Interviews with current and former SNL/NM personnel revealed no information concerning waste management activities (21-20 through 21-23, 21-25). Aerial photographs reveal no features associated with waste management practices (USGS 1951, USGS 1961, USGS 1967, USGS 1971, and USGS 1991). Site visits show a single rusted drum and metal scrap debris, which will be removed under a voluntary correction measure.

Subsequent to the CEARP inspection, the EPA conducted a RFA (EPA April 1987) and reported that several partially buried 55-gal drums were at the site. However, recent site inspections found one empty, rusted 55-gal drum and some scrap metal lying on the ground. SNL/NM is proposing to remove the drum and metal scrap from the site as nonhazardous solid waste under a voluntary corrective measure.

In November 1993, a UXO/HE survey conducted by KAFB in conjunction with ER Sites 62 and 88 found no live UXO/HE or significant UXO/HE debris at the site (21-34). In February 1994, a surface gamma radiation survey of the site was done in conjunction with ER Sites 62 and 88. No detections were found above the background levels (RUST Geotech Inc. 1994, in preparation). Therefore, based on recent surveys and newly obtained historical information, ER Site 21 is recommended for an administrative NFA decision because the SWMU never contained hazardous waste or constituents (Criterion A).

4.0 CONCLUSION

Based upon the evidence cited above, no potential remains for a release of hazardous waste (including hazardous constituents) which may pose a threat to human health or the environment.

5.0 REFERENCES

5.1 ER Site References

Section 5.1 contains a comprehensive bibliographical list of the documents relating to ER Site 21. This list is arranged numerically by the numbers assigned to each document.

ER Site Reference Number	Reference
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- | | |
|--------|--|
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| 21-2. | Sandia National Laboratories, November 1993. "Environmental Restoration Program Information Sheet: Metal Scrap (Coyote Springs)," Sandia National Laboratories, Albuquerque, New Mexico. |
| 21-3. | Sandia National Laboratories/New Mexico, April 1985, Environmental Operations Records Center Record Number ER/1334 021/INT/94-001. |
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| 21-5. | Sandia National Laboratories, [n.d.], draft. RCRA Facility Assessment SWMU 73, Coyote Springs Burial Area, ER Site #73, Sandia National Laboratories, Albuquerque, New Mexico. |
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| 21-7. | Sandia National Laboratories/New Mexico, October 1989, Environmental Operations Records Center Record Number ER/1334 021/INT/94-003. |
| 21-8. | Sandia National Laboratories/New Mexico, October 1989, Environmental Operations Records Center Record Number ER/1334 021/INT/94-004. |
| 21-9. | Sandia National Laboratories/New Mexico, October 1989, Environmental Operations Records Center Record Number ER/1334 021/INT/94-005. |
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| 21-11. | Sandia National Laboratories/New Mexico, November 1989, Environmental Operations Records Center Record Number ER/1334 021/INT/94-007. |

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- 21-17. Lojek, C., and M. Young. Field Activity Daily Log, Schoolhouse Mesa RFI, Tour of North and South Coyote Test Field, Sandia National Laboratories, Albuquerque, New Mexico. January 27, 1993.
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- 21-20. Sandia National Laboratories/New Mexico, January 1993, Environmental Operations Records Center Record Number ER/1334 021/INT/94-008.
- 21-21. Sandia National Laboratories/New Mexico, January 1993, Environmental Operations Records Center Record Number ER/1334 021/INT/94-009.
- 21-22. Sandia National Laboratories/New Mexico, January 1993, Environmental Operations Records Center Record Number ER/1334 021/INT/94-010.
- 21-23. Sandia National Laboratories/New Mexico, September 1985, Environmental Operations Records Center Record Number ER/1334 021/INT/94-011.
- 21-24. Sandia National Laboratories/New Mexico, October 1985, Environmental Operations Records Center Record Number ER/1334 021/INT/94-012.
- 21-25. Sandia National Laboratories/New Mexico, September 1985, Environmental Operations Records Center Record Number ER/1334 021/INT/94-013.
- 21-26. Reference removed/not applicable to site.

- 21-27. Sandia National Laboratories/New Mexico, December 1992, Environmental Operations Records Center Record Number ER/1334 021/INT/94-014.
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- 21-30. Sandia National Laboratories/New Mexico, October 1993, Environmental Operations Records Center Record Number ER/1334 021/INT/94-016.
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- 21-32. Sandia National Laboratories/New Mexico, February 1994, Environmental Operations Records Center Record Number ER/1334 021/INT/94-018.
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Department of Energy (DOE), Albuquerque Operations Office, Environmental Safety and Health Division, Environmental Program Branch, September 1987, draft. "Comprehensive Environmental Assessment and Response Program (CEARP) Phase I: Installation Assessment, Sandia National Laboratories, Albuquerque," Department of Energy, Albuquerque Operations Office, Albuquerque, New Mexico.

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U.S. Environmental Protection Agency (EPA), April 1987. "Final RCRA Facility Assessment Report of Solid Waste Management Units at Sandia National Laboratories, Albuquerque, New Mexico," Contract No. 68-01-7038, EPA Region 6.

U.S. Environmental Protection Agency (EPA), October 1986. "RCRA Facility Assessment Guidance," EPA/530-86-053, PB87-107769, Washington, D.C.

USDA, see U.S. Department of Agriculture.

U.S. Department of Agriculture (USDA), 1977, "Soil Survey of Bernalillo County and Parts of Sandoval and Valencia Counties, New Mexico," Soil Conservation Service, U.S. Department of Agriculture.

5.3 Aerial Photographs

United States Geological Survey (USGS), 1991. Aerial Photograph, NAPP-3534-183, Albuquerque, New Mexico.

United States Geological Survey (USGS), 1971. Aerial Photograph, EXG-2-277, Albuquerque, New Mexico.

United States Geological Survey (USGS), 1967. Aerial Photograph, VBUG (Mt)-2-85, Albuquerque, New Mexico.

United States Geological Survey (USGS), 1961. Aerial Photograph, EJA-2-134, Albuquerque, New Mexico.

United States Geological Survey (USGS), 1951. Aerial Photograph, RU-1-98, Albuquerque, New Mexico.

USGS, see United States Geological Survey.

surface. An SNL/NM employee involved in the CEARP investigation reported that this was a geotechnical test boring used for calibration of geophysical logging instruments (47-18).

Approximately 13 batteries are lying on the ground along the fence on the east side of Bunker B2 (47-18) (Figure 2-1). USGS personnel stated that small sealed batteries were used to power the seismic instruments (47-17), and these batteries may be the battery debris found along the east fence. The batteries will be removed under a voluntary corrective measure, and confirmatory sampling will be conducted to demonstrate the absence of hazardous constituents. No waste or other debris appears to have been buried at the site.

2.3 Discussion of Information Conflicts

The original CEARP (DOE September 1987) and RFA (EPA April 1987) interpretation of the pipe extending from Bunker B2 suggested that it was a wastewater outfall. This interpretation was based on the observation that the pipe was protruding from Bunker B2 and on information obtained in an uncorroborated CEARP interview (47-9). However, recent ER Project interviews (47-40), the absence of erosion and staining below the pipe, and analyses of soil samples (47-10) indicate the pipe was a conduit for electric cable connected to the seismic instruments in Bunker B2 and not a wastewater discharge point.

3.0 EVALUATION OF RELEVANT EVIDENCE

3.1 Unit Characteristics

The two bunkers at ER Site 47 were designed to hold seismic equipment to monitor worldwide nuclear testing. The two bunkers at ER Site 47 contained only seismic-monitoring equipment that was operated in an unmanned mode. A pipe exiting Bunker B2 was thought to be a wastewater discharge outfall, but recent information has demonstrated that the pipe was an electrical conduit that enters the bunker midway up the sidewall (47-40).

3.2 Operating Practices

Hazardous materials were not managed or contained at ER Site 47, except for the discarded battery packs which will be removed under a voluntary corrective measure.

3.3 Presence or Absence of Visual Evidence

There is no physical or documented evidence to suggest that the pipe extending from Bunker B2 was ever a wastewater outfall that discharged to the adjacent arroyo channel. Surficial evidence of discharge is absent (i.e., there is no evidence of erosion or staining), and the location of the pipe several feet up the wall of the vault precludes its use as an outfall. Additionally, an ER interview confirmed that the pipe served as a conduit for electrical cables (47-40).

3.4 Results of Previous Sampling/Surveys

3.4.1 Surface-Soil Sampling

Surface-soil samples were collected and analyzed from ER Site 47 in September 1987 to support an NFA decision. Five grab soil samples and two composite soil samples were collected from one of the pits, below the misidentified outfall pipe, and from the northern arroyo channel down gradient from Bunker B2 (Figure 2-1). A description of the sampling activities does not include the depths at which the samples were collected, but it is assumed that they were surface samples because stainless steel spoons rather than ring samplers were used to collect the samples. Results of radiation screening conducted during sampling were consistent with background (10 to 16 microrentgen per hour). Organic vapor screening yielded results of 0 to 1 part per million. However, the sampling team was unable to calibrate the instrument because of an apparent lack of proper calibration equipment. Windy site conditions also decreased the reliability of the organic vapor survey results. However, arid climate and dry soil conditions preclude any potential for the presence of volatile organic compounds in surface soils.

3.4.1.1 Sample Descriptions

Figure 2-1 shows the approximate sample locations at the site, and Table 3-1 correlates the sample location and number.

**Table 3-1
Soil Samples Collected at ER Site 47 in 1987**

Sample Number	Location
SNA 47-001	North of Bunker B1, west of Bunker B2 (001)
SNA 47-002	Within the reported northern borrow pit (002)
SNA 47-003	North/northwest corner of Bunker B2 (003)
SNA 47-004	Composite sample of locations 004 and 005
SNA 47-006	Composite sample of locations 006, 007, 008, 009 and 010
SNA 47-011	Background Sample (011)
SNA 47-012	Background Sample (012)

3.4.1.2 Analytical Results

Requested analyses included Toxicity Characteristic Leaching Procedure (TCLP) metals and SVOCs; extraction procedure (EP) toxicity metals; pesticides/polychlorinated biphenyls (PCBs) and herbicides (TCLP and EP toxicity); Hazardous Substance List (HSL) metals; 2,4,6-trinitrotoluene (TNT); uranium (total and isotopic); and three additional metals—titanium, cerium, and zirconium. Analytical results obtained from this sampling event are reported in the draft document "Reconnaissance Data Report," January 1989 (47-10). Results for TCLP, EP toxicity, HSL, and uranium are tabulated and briefly discussed below. Analytical results for SVOCs, pesticides/PCBs, herbicides, and TNT were all below the detection limit of the analytical method.

TCLP Metals

TCLP metals were analyzed after extraction (EPA Method 1311) for arsenic, barium, cadmium, chromium, lead, mercury, selenium, and silver. Table 3-2 summarizes the analytical methods and results. All sample locations showed detectable levels of barium, ranging from 1,160 to 2,300 micrograms per liter ($\mu\text{g/L}$). Barium is found as a trace-to-minor element in the Pennsylvanian carbonate rocks and Precambrian metamorphic rocks that are present as weathered rock fragments in the soil samples (i.e., all samples have barium concentrations similar to the background sample concentrations of 1,680 and 1,360 $\mu\text{g/L}$). There were no detectable levels of the other TCLP metals.

**Table 3-2
TCLP Metals Extracted from ER Site 47 Soil Samples**

Analytes	Method of Analysis	Background Range (µg/L)		Sample Range (µg/L)				
		SNA 47-011	SNA 47-012	SNA 47-001	SNA 47-002	SNA 47-003	SNA 47-004	SNA 47-006
Arsenic	EPA 206.2	< 500	< 500	< 500	< 500	< 500	< 500	< 500
Barium	EPA 200.7	1,680	1,360	1,160	2,120	2,300	1,930	1,930
Cadmium	EPA 200.7	< 100	< 100	< 100	< 100	< 100	< 100	< 100
Chromium	EPA 200.7	< 500	< 500	< 500	< 500	< 500	< 500	< 500
Lead	EPA 239.2	< 500	< 500	< 500	< 500	< 500	< 500	< 500
Mercury	EPA 245.1	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2
Selenium	EPA 270.2	< 100	< 100	< 100	< 100	< 100	< 100	< 100
Silver	EPA 200.7	< 500	< 500	< 500	< 500	< 500	< 500	< 500

µg/L = Micrograms per liter.

EP Toxicity Metals

Table 3-3 lists the EP toxicity metals analyzed after extraction (EPA Method EP) by the same methods listed for TCLP (47-10). Consistent with the TCLP data, all sample locations, except SNA 47-001, showed detectable levels of barium ranging from 1,300 to 2,510 µg/L. There were no detectable levels of other EP toxicity metals.

HSL Metals and Cerium, Titanium, and Zirconium

Table 3-4 presents methods and analytical results for data obtained from the HSL inorganic analysis of soil samples (EPA Method 6010) (47-10). The samples were also analyzed for cerium, titanium, and zirconium, although it is unknown why these elements were selected for analysis. All of the sampling locations had detectable levels of aluminum, barium, calcium, chromium, iron, potassium, magnesium, manganese, lead, titanium, vanadium, and zinc that are similar to concentrations reported for background samples SNA 47-011 and SNA 47-012. The most abundant metal observed in the samples was calcium, reflecting the high percentage of Pennsylvania carbonate rock fragments in the soil samples. Arsenic concentrations in SNA 47-003 and -004 are 2.2 and 2.1 µg/g, respectively; slightly above the detection limit values reported for background samples. The concentration range of copper varied from 4.6 to 10.8 µg/g in samples SNA 47-001, -002, -003, -004, and -006, and these values are similar to the background value of 6.8 µg/g (SNA 47-011). Samples SNA 47-002, -003, -004, and -006 had detectable levels of nickel, ranging from 7.8 to 13.2 µg/gram (g), which is similar to the value reported for background sample 011 (10 µg/g).

**Table 3-3
EP Toxicity Metals Extracted from ER Site 47 Soil Samples**

Analytes	Method of Analysis	Background Range (µg/L)		Sample Range (µg/L)				
		SNA 47-011	SNA 47-012	SNA 47-001	SNA 47-002	SNA 47-003	SNA 47-004	SNA 47-006
Arsenic	EPA 206.2	< 500	< 500	< 500	< 500	< 500	< 500	< 500
Barium	EPA 200.7	1,850	1,300	<1,000	1,940	2,510	2,130	2,500
Cadmium	EPA 200.7	< 100	< 100	< 100	< 100	< 100	< 100	< 100
Chromium	EPA 200.7	< 500	< 500	< 500	< 500	< 500	< 500	< 500
Lead	EPA 239.2	< 500	< 500	< 500	< 500	< 500	< 500	< 500
Mercury	EPA 245.1	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2
Selenium	EPA 270.2	< 100	< 100	< 100	< 100	< 100	< 100	< 100
Silver	EPA 200.7	< 500	< 500	< 500	< 500	< 500	< 500	< 500

µg/L = Micrograms per liter.

Samples SNA 47-001, -002, -003, -004, and -006 had detectable levels of cerium, ranging from 23.0 to 49.7 µg/g. Cerium was not detected in background samples SNA 47-011 and SNA 47-012. Cerium is a rare earth element present in the common minerals apatite, zircon, and hornblende at concentrations that may vary from 400 (amphibole) to 5,600 (apatite) µg/g (Deer et al., 1978). These minerals are found in the granitic rocks and alluvial sediments that are present in the Coyote Canyon test area, and soil samples that contain a naturally high distribution of these minerals would be expected to have elevated cerium concentrations. There is no documented use of cerium at ER Site 47.

Total and Isotopic Uranium

Total uranium concentrations were analyzed by fluorometry, with results ranging from 0.51 µg/g at SNA 47-004 to 1.4 µg/g at SNA 47-001 (Table 3-5). Isotopic uranium results, obtained by alpha spectrometry (Table 3-5), show that the uranium-234/uranium-238 activity ratio is approximately equal to one, which indicates that the uranium is in secular equilibrium and naturally occurring (i.e., the uranium is not derived from process waste or explosive tests conducted with depleted uranium).

Pesticides/PCBs and Herbicides

Pesticides/PCBs and herbicides (EPA 509B) were reported along with metals in the EP toxicity and TCLP suites (47-10). The samples contained no detectable concentration of pesticides/PCBs or herbicides.

Table 3-4
HSL Metals and Cerium, Titanium, and Zirconium in ER Site 47 Soil Samples

Analytes	Method of Analysis	Background Range (µg/g)		Sample Range (µg/g)				
		SNA 47-011	SNA 47-012	SNA 47-001	SNA 47-002	SNA 47-003	SNA 47-004	SNA 47-006
Aluminum	EPA 6010 ICP	5,190	3,240	5,280	11,800	6,780	8,970	5,430
Antimony	EPA 7041 AAF	< 11.1	< 11.5	< 11.4	< 11.4	< 11.8	< 11.2	< 10.4
Arsenic	EPA 7060 AAF	< 1.9	< 1.8	< 1.9	< 2.0	2.2	2.1	< 2.0
Barium	EPA 6010 ICP	100	76.7	59.6	150	147	119	111
Beryllium	EPA 6010 ICP	< 0.93	< 0.96	< 0.95	< 0.95	< 0.98	< 0.93	< 0.86
Calcium	EPA 6010 ICP	89,300	74,000	4,730	25,200	39,800	51,900	70,600
Cadmium	EPA 6010 ICP	< 0.93	< 0.96	< 0.95	< 0.95	< 0.98	< 0.93	< 0.86
Cerium	EPA 6010 ICP	< 18.5	< 19.1	49.7	24.6	30.8	24.9	23.0
Cobalt	EPA 6010 ICP	< 9.3	< 9.6	< 9.5	< 9.5	< 9.8	< 9.3	< 8.6
Chromium	EPA 6010 ICP	10.8	3.3	24.0	14.9	9.9	12.4	8.1
Copper	EPA 6010 ICP	6.8	< 4.8	7.1	10.8	7.8	9.7	4.6
Iron	EPA 6010 ICP	8,190	3,580	11,700	12,600	7,310	10,800	6,490
Lead	EPA 7421 AAF	20.8	12.1	22.9	13.3	14.3	14.3	14.3
Magnesium	EPA 6010 ICP	3,440	1,660	2,750	4,050	3,450	4,040	2,950
Manganese	EPA 6010 ICP	236	162	292	315	273	257	180
Mercury	EPA 7471 CV	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Nickel	EPA 6010 ICP	10.0	< 7.7	< 7.6	13.2	11.3	11.5	7.8
Potassium	EPA 6010 FE	1,100	956	2,540	2,240	1,640	1,800	1,030
Selenium	EPA 7741 AAF	< 0.95	< 0.91	< 0.94	< 0.98	< 0.98	< 0.98	< 0.99
Silver	EPA 6010 ICP	< 1.9	< 1.9	< 1.9	< 1.9	< 2.0	< 1.9	< 1.7
Sodium	EPA 6010 FE	< 927	< 956	< 948	< 946	< 979	< 930	< 864
Thallium	EPA 7841 AAF	< 1.9	< 1.8	< 1.9	< 2.0	< 2.0	< 2.0	< 2.0
Titanium	EPA 6010 ICP	240	87.1	312	257	269	264	155
Vanadium	EPA 6010 ICP	18.6	< 9.6	12.7	24.7	18.0	23.3	14.3
Zinc	EPA 6010 ICP	24.8	17.2	37.0	33.1	84.9	83.3	19.6
Zirconium	EPA 6010 ICP	< 18.5	< 19.1	< 19.0	< 18.9	< 19.6	< 18.6	< 17.3

ICP = Inductively coupled plasma emission.

AAF = Atomic absorption by furnace.

FE = Flame emission.

CV = Cold vapor.

µg/g = Micrograms per gram.

**Table 3-5
Isotopic Uranium Activities and Total Uranium Concentration in ER Site 47 Soil Samples**

Analytes	Method of Analysis	Units	Background Range		Sample Range				
			SNA 47-011	SNA 47-012	SNA 47-001	SNA 47-002	SNA 47-003	SNA 47-004	SNA 47-006
Uranium-234	alpha spec.	pCi/g	0.5±0.1	0.2±0.1	0.7±0.2	0.5±0.1	0.7±0.1	0.4±0.1	0.5±0.1
Uranium-235	alpha spec.	pCi/g	0.00±0.05	0.00±0.03	0.00±0.10	0.00±0.02	0.05±0.03	0.00±0.03	0.00±0.03
Uranium-238	alpha spec.	pCi/g	0.4±0.1	0.3±0.1	0.8±0.2	0.5±0.1	0.7±0.1	0.4±0.1	0.4±0.1
Total Uranium	fluorometry	µg/g	0.77	1.0	1.4	0.77	1.2	0.51	0.64

pCi/g = Picocuries per gram.
µg/g = Micrograms per gram.

TCLP SVOCs

TCLP SVOCs were analyzed using the EPA Contract Laboratory Program procedures (47-10). The samples contained no detectable concentrations of TCLP SVOCs.

TNT

Soil samples were analyzed for 2,4,6-TNT by the USATHAMA LW02 method (47-10). The samples contained no detectable concentration of TNT.

3.4.1.3 Analytical Quality Assurance/Quality Control

There were no detectable contaminants in any of the method blanks analyzed with ER Site 47 samples. Laboratory quality assurance/quality control (QA/QC) data reported in Appendix C of the Reconnaissance Data Report for SNA 47 (47-10) indicate that all analytes in spiked samples have a percent recovery outside of acceptable ranges for the established protocol. An introductory narrative notes that spike samples were prepared by adding a known amount of contaminant to reagent-grade water or to a soil matrix. If spikes were added to a soil matrix, the poor recoveries may be the result of surface chemistry reactions (i.e., adsorption/desorption) between the spike solution and the soil matrix. An additional problem associated with recovery of spike from a soil matrix is the heterogeneity of the soil matrix. There is a high percentage of difference in duplicate analyses run on these soil splits, ranging from 22

percent for calcium to 32 percent for zinc. This implies that the spike added to a duplicate soil sample may contain a large error associated with the heterogeneity of the soil matrix.

In summary, QA/QC support data for these soil samples indicate that the samples do not meet Level III or Level IV criteria. However, the relative comparison between background and potentially contaminated samples indicates that there is no significant difference between the reported analytical results.

3.4.2 Unexploded Ordnance/High Explosives Survey

In December 1993, KAFB Explosive Ordnance Disposal conducted a surface unexploded ordnance (UXO)/high explosives (HE) survey at the site. No live UXO/HE or significant UXO/HE debris was found during the survey (47-47).

3.4.3 Gamma Radiation Survey

In January 1994, RUST Geotech Inc. conducted a surface radiation survey at the site. The survey used a scintillometer containing a sodium-iodide detector to measure gamma radiation. The entire fenced area and the arroyo channel north of the site were surveyed, and no detections were found above the background readings of 10 to 13 microRoentgen per hour (RUST Geotech, Inc. July 1994).

3.5 Assessment of Gaps in Information

There are no data gaps in establishing the absence of hazardous waste or constituents at ER Site 47. The lack of physical evidence for liquid discharge (e.g., erosion and staining), recent ER Project interviews, negative results for the UXO/HE and gamma radiation surveys, and the laboratory analyses of surface-soil samples indicate the site never contained hazardous waste or constituents.

3.6 Rationale for Pursuing an Administrative NFA Decision

SNL/NM is proposing an administrative NFA decision for ER Site 47 because the SWMU never contained hazardous waste or constituents (Criterion A). The site consists of two bunkers constructed and used by SNL/NM in the late 1960s as vaults for seismic instruments. SNL/NM turned the bunkers over to the USGS in the late 1960s or early 1970s, and they were again used as seismic vaults for a period of four to six months. The seismic equipment placed in the vaults was used to monitor worldwide nuclear weapons tests. There are no historical records or visual evidence to tie the site to hazardous material operations.

Fifteen to twenty years after the site was abandoned, an inspection conducted under the CEARP reported that a pipe protruding from Bunker B2 was an outfall (DOE September 1987). Subsequent to the CEARP inspection, the EPA conducted a RFA. Again, the pipe

was considered to have been used for discharging liquid effluent (EPA April 1987). Samples were collected during the CEARP field investigation from the soil where the pipe would have discharged effluent (47-10). These samples contained no detectable concentrations of SVOCs or TNT, and detectable concentrations of hazardous metals were consistent with background samples (47-10).

Recently, SNL/NM personnel who had been involved with the work conducted at ER Site 47 were interviewed, and new information was obtained regarding the site and the use of the pipe at the bunker. These interviews state that ER Site 47 contained only seismic-monitoring equipment (47-10, 47-16, 47-17, 47-39) and that the pipe served as a conduit for electrical cables linking the seismic equipment to the USGS Facility (47-40). Additionally, the pipe was reportedly attached midway up the side wall of Bunker B2 (47-40), and this physical arrangement would preclude discharge of wastewater from the bottom of the bunker.

In December 1993, a UXO/HE survey conducted by KAFB found no live UXO/HE or significant UXO/HE debris at the site (47-47). A gamma radiation survey of surface soils was performed by RUST Geotech Inc. in January 1994 and no readings above background levels were recorded (47-46). Battery debris discarded near the east fence will be removed under a voluntary corrective measure, and confirmatory sampling and analysis of soil under the batteries will be conducted to demonstrate that no release of hazardous constituents occurred. Therefore, based on recent surveys and newly obtained historical information, ER Site 47 is recommended for an administrative NFA decision because the SWMU never contained hazardous waste or constituents (Criterion A).

4.0 CONCLUSION

Based upon the evidence cited above, no potential remains for a release of hazardous waste (including hazardous constituents) which may pose a threat to human health or the environment.

5.0 REFERENCES

5.1 ER Site References

Section 5.1 contains a comprehensive bibliographical list of the documents relating to ER Site 47. This list is arranged numerically by the numbers assigned to each document.

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