



Sandia National Laboratories / New Mexico

**PROPOSAL FOR NO FURTHER ACTION
ENVIRONMENTAL RESTORATION PROJECT
SITE 64, GUN SITE (MADERA CANYON)
OPERABLE UNIT 1333**

FY 1995

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**Environmental
Restoration
Project**



**United States Department of Energy
Albuquerque Operations Office**

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**Site 64, Gun Site (Madera Canyon)
OU 1333**

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. 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 64, Gun Site, Operable Unit (OU) 1333. ER Site 64 is listed 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 August 1992).

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 (PIP) (SNL/NM February 1995). 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 64, 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 (RFA) Guidance (EPA October 1986):

- Criterion A: The unit has never contained constituents of concern (COCs).
- 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 64 is being proposed for an administrative NFA decision because the site clearly has not released hazardous waste or constituents into the environment (Criterion C).

1.3 Local Setting

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

ER Site 64 (Figure 1-1) occupies DOE land withdrawn from the USFS (SNL/NM July 1994). This inactive site (64-14) is located near the northern boundary of KAFB in northern Madera Canyon. ER Site 64 is accessible by an unnamed road that diverges from No Sweat Boulevard to the northwest (Figure 1-1). The site lies on approximately 1.5 acres at a mean elevation of 6,500 feet above sea level (SNL/NM April 1995). Immediate topographic relief around the site is greater than 1,000 feet.

ER Site 64 is located in Madera Canyon on a bedrock hillslope overlain with thin deposits of alluvium correlated to the Tesajo-Millett stony sandy loams (USDA June 1977), which are underlain by igneous and metamorphic Precambrian rocks (IT May 1994). Measured permeabilities in the Tesajo-Millett unit range from 0.2 to 20 inches per hour (USDA June 1977). The composition and thickness of the alluvial deposits at the site are not well defined (IT April 1993). Seismic surveys conducted in Lurance Canyon, approximately 2 miles south of the site, indicate alluvium thickness ranging from 60 feet to 142 feet (BGA October 1994) (Figure 1-1). However, alluvium thickness is highly variable and is expected to vary rapidly within the canyon floors because of changes in shallow bedrock lithology or erosional irregularities along the bedrock/alluvium interface.

Depth to ground water at ER Site 64 is not known. The nearest monitoring wells are the TSA-1 and the Burn Site well, located approximately 2.5 miles southwest and 2 miles south of the site, respectively (Figure 1-1). The TSA-1 well encountered permeable, saturated fractures in Precambrian rocks at a depth of 180 feet below ground surface (bgs). The Burn Site well also encountered permeable water-bearing fractures in the Precambrian bedrock at a depth of 230 to 350 feet bgs (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).

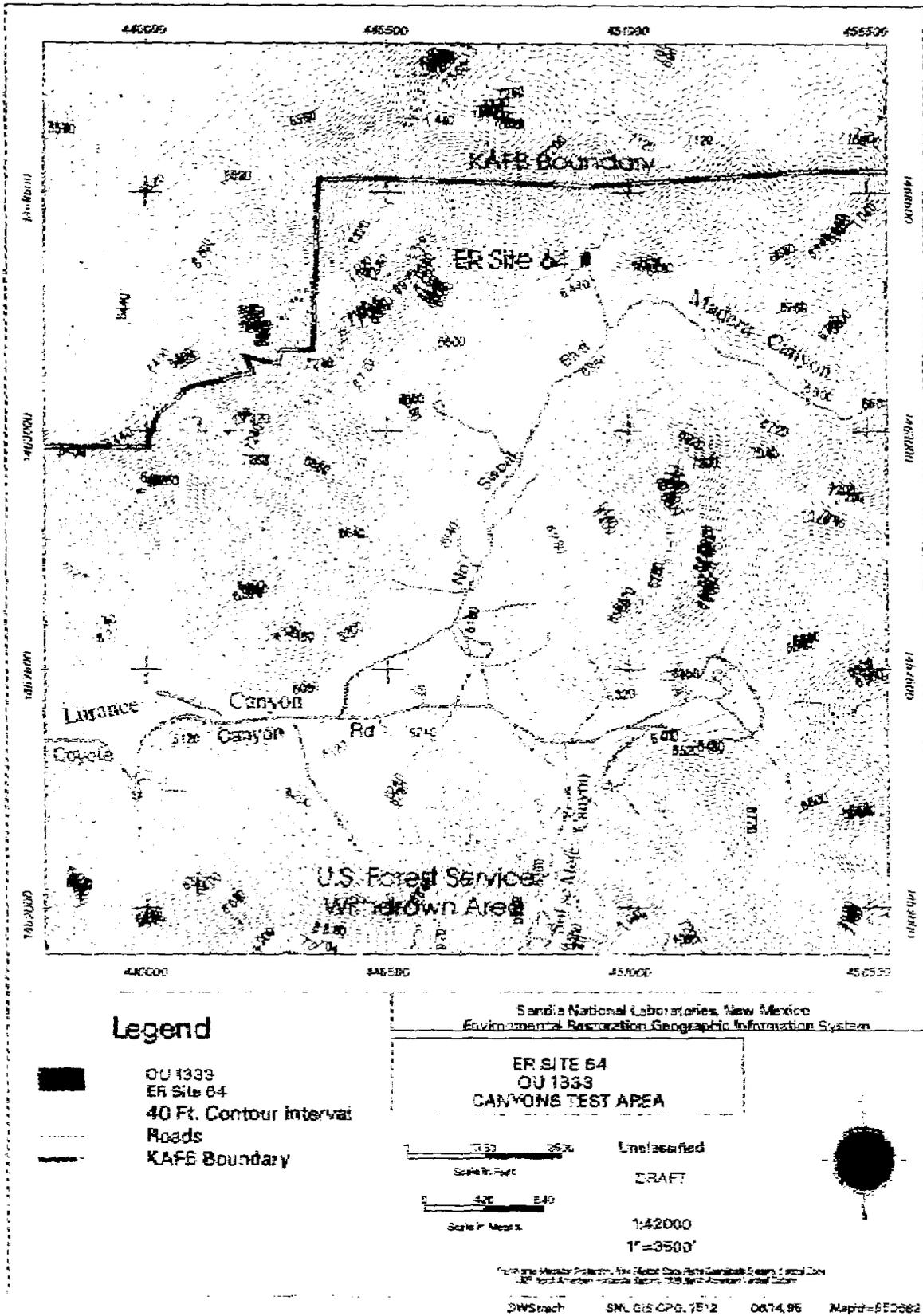


Figure 1-1
Location of ER Site 64, Gun Site

2. HISTORY OF THE SWMU

2.1 Sources of Supporting Information

In preparing to request an administrative NFA decision for ER Site 64, a background study was conducted to collect available and relevant site information. Background information sources included existing records and reports of site activity. Interviews were conducted with the 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 information sources, hierarchically listed with respect to assigned validity, were available for use in the evaluation of ER Site 64:

- Three preliminary survey reports, including data from two radiation surveys and one unexploded ordnance (UXO)/high explosive (HE) survey
- Five historical aerial photographs spanning 25 years (1967 to 1992)
- Two interviews with four current and retired SNL/NM personnel
- Miscellaneous information sources, including the SNL/NM Geographic Information System and SNL/NM personnel correspondence (memoranda, letters, and notes) regarding ER Site 64
- Photographs and field notes from numerous site inspections conducted by SNL/NM staff
- The Comprehensive Environmental Assessment and Response Program (CEARP) Phase I report (DOE September 1987) and CEARP records contained in the Environmental Operations Record Center
- The RFA report (EPA April 1987)

Using this information, a brief history of ER Site 64 and a discussion of all relevant evidence regarding past practices and releases at the site have been prepared and are presented in this proposal for an administrative NFA decision.

2.2 Previous Audits, Inspections, and Findings

ER Site 64 was first listed as a potential release site based on information obtained from the CEARP interviews in 1985 (DOE September 1987). The CEARP report identified neither hazardous materials, nor RCRA-regulated hazardous waste associated with tests conducted at the site. The Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) finding was uncertain for Federal Facility Site Discovery and Identification Findings, Preliminary Assessment, and Preliminary Site Inspection. Sufficient information was unavailable to calculate a Hazard Ranking System score. Therefore, no further action was planned for this site under the CEARP.

Subsequent to the CEARP inspection, the United States Environmental Protection Agency (EPA) conducted an RFA (EPA April 1987). The RFA report identified some shrapnel at ER Site 64. However, shrapnel has not been located during recent site inspections.

2.3 Historical Operations

ER Site 64 was used by the Department of Defense (DoD) to conduct tests on classified weapons components packaged in 155-millimeter (mm) shells that were fired from a portable gun (64-24, 64-28). The site was also used to launch rockets toward suspended targets at ER Site 81 (New Aerial Cable Site) (64-28). ER Site 64 consists of a concrete inclined structure, a portable shed, four metal velocity-screen towers, six electrical outlet posts, three concrete pads, and an access road that loops around the site (Figures 2-1 and 2-2).

The inclined structure consists of two concrete slabs. One slab (approximately 10 feet by 10 feet) is positioned upright at a 90-degree angle to the ground surface, and a second slab (approximately 10 feet by 15 feet) is inclined against the first at approximately 60 degrees to the ground surface, forming an angled surface that faces south (Figure 2-2a). This inclined concrete surface probably served as the blast shield during gun firing activities. Instrumentation boxes, which were probably the control point for gun-firing experiments, are located on the north side of the upright slab. Soil is mounded against the lower portion of the inclined face. A portable shed that housed electrical equipment is adjacent to the concrete structure.

The metal velocity-screen towers are approximately 5 feet wide by 30 feet tall and are mounted at the northeast and southwest ends of two of the three concrete pads. These pads are elongated northeast to southwest and measure approximately 6 feet by 25 feet (64-15) (Figure 2-1) and are spaced approximately 25 feet apart. The third concrete pad (approximately 6 feet by 20 feet), lies to the west of the tower pads (64-15) (Figure 2-1). Six electrical outlet posts are arrayed directly northeast of the towers (Figure 2-1).

Based on information derived from historical aerial photographs, ER Site 64 was constructed between October 1967 and June 1971 (SNL/NM August 1994). In consensus with this interpretation, archival records report that the site was active in the late 1960s (64-6, DOE September 1987). Several pieces of equipment are identifiable in a 1971 historical aerial photograph (USGS June 1971). By 1983, portions of the site were covered with vegetation, but the access and loop roads around ER Site 64 appear well-traveled (USGS June 1983). The site roads and general area are periodically used by KAFB operations for war-game activities.

2.3.1 155-mm Portable Gun Activities

ER Site 64 was used in the late 1960s to conduct tests on classified weapons components that were packaged inside projectiles and fired from a portable 155-mm gun (64-5, 64-6, 64-24, DOE September 1987). The gun was located just southwest of the inclined concrete structure and fired projectiles to the southwest (64-24) (Figures 2-1 and 2-3). The

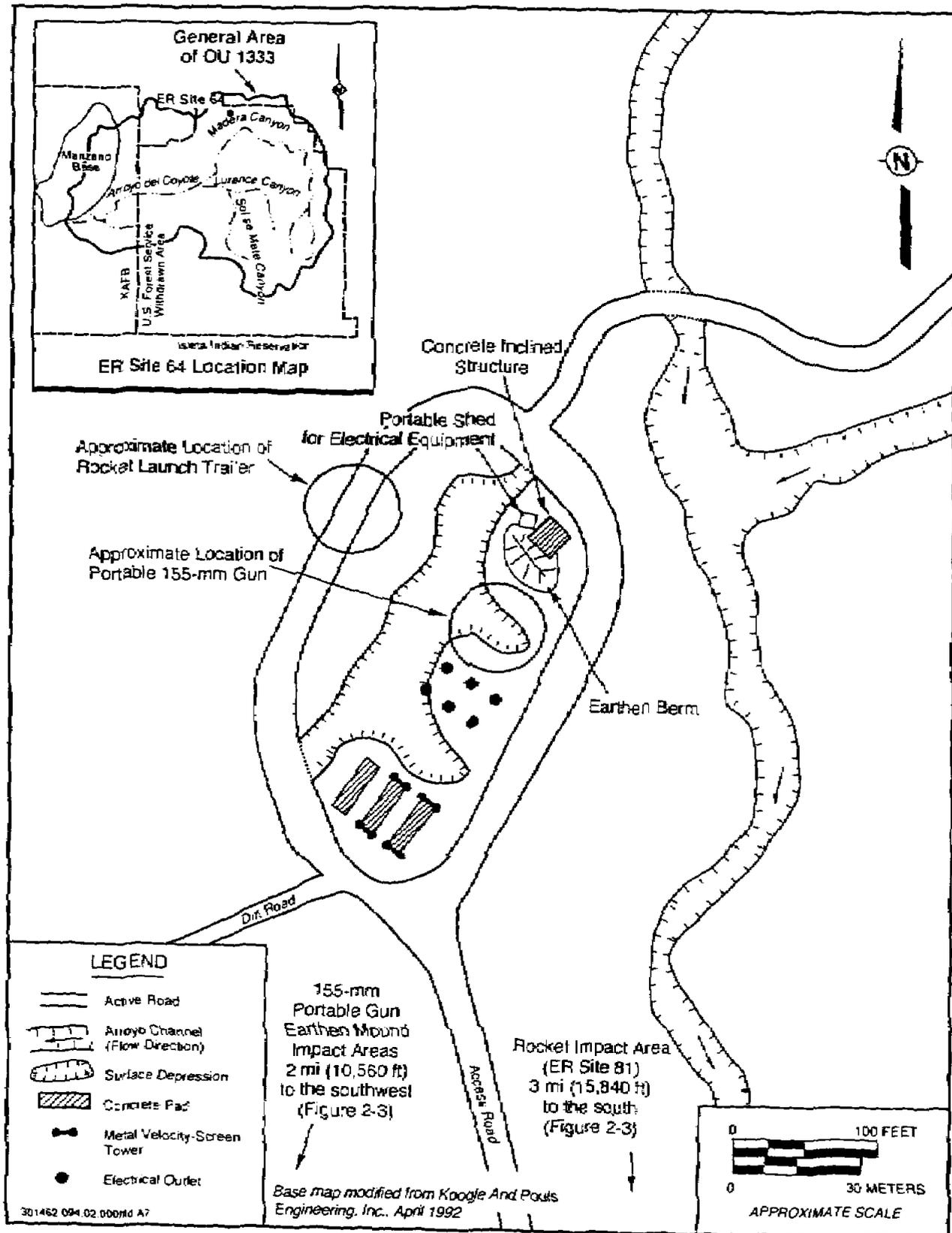


Figure 2-1
Site Map of ER Site 64, Gun Site

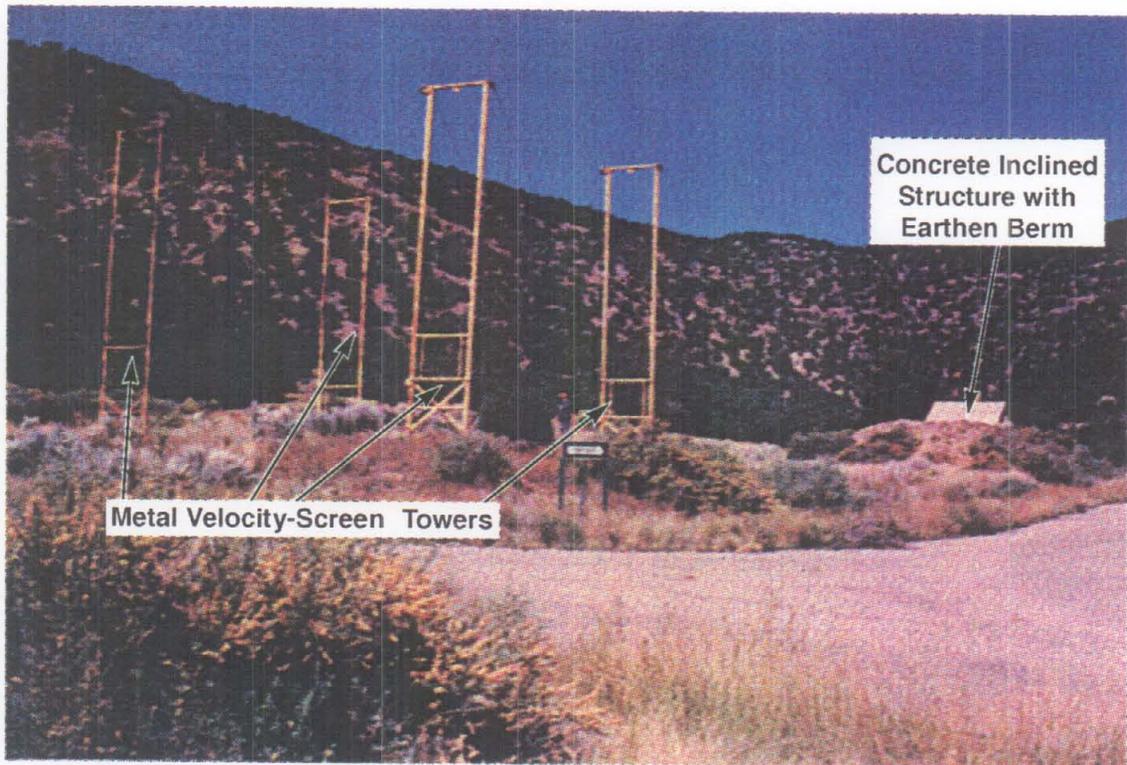


Figure 2-2a. Photograph of ER Site 64 taken in September 1992. The metal velocity-screen towers and concrete inclined structure with an earthen berm are visible. View is to the northwest.

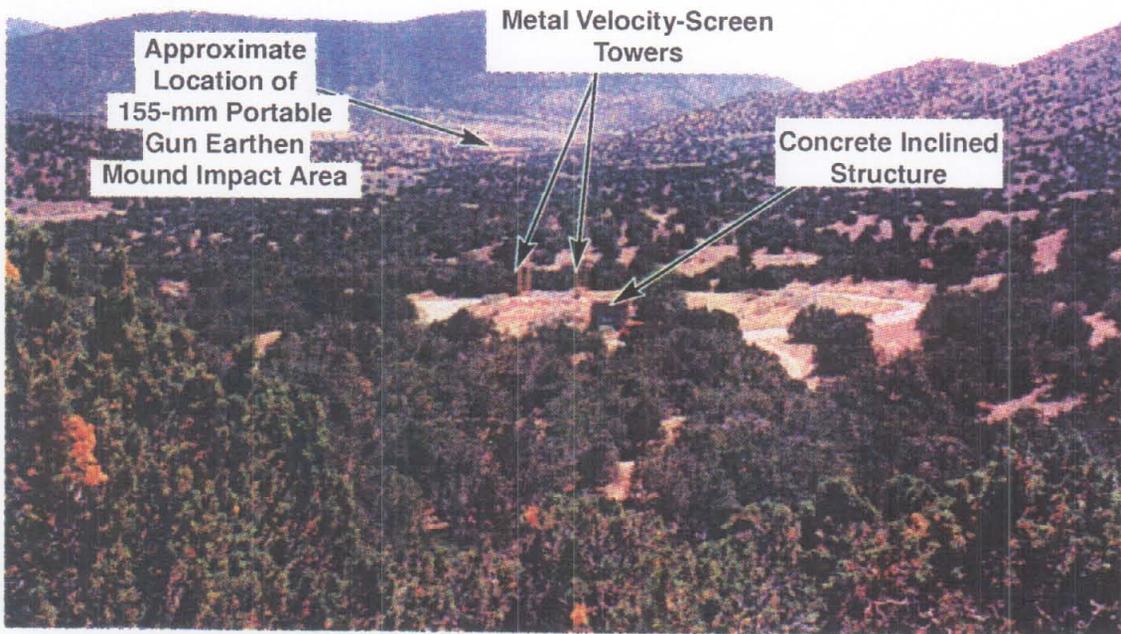


Figure 2-2b. Photograph of ER Site 64 taken in summer 1994. The metal velocity-screen towers and concrete inclined structure with an earthen berm are visible. View is to the south.

Figure 2-2
ER Site 64 Photographs

components were withdrawn from the projectile by a parachute prior to impact so that they could be recovered and examined after the tests. Double-based gun propellant, which frequently contains trace amounts of lead compounds as burn rate modifiers (64-24), was used in the tests.

The projectile flight trajectory was to the southwest through the space between the four metal velocity-screen towers (Figure 2-2b) toward targets located approximately 2 miles away. Instrumentation was positioned on the metal velocity-screen towers for the purpose of recording the flight time of the projectile as it passed from the first set of towers to the second set of towers (64-7, SNL/NM August 1994). The flight time and distance between the towers was used to calculate the velocity of the projectile.

Initially, the projectiles impacted on the slope below the western cable anchor for ER Site 81 (New Aerial Cable Site) (64-24) (Figure 2-3). However, after a component was lost on the slope due to failure of the parachute-ejection system, an earthen-mound impact area was built to the northeast of the initial impact area to catch the 155-mm projectiles (64-4, 64-7, 64-24) (Figure 2-3). The earthen-mound impact area is proposed ER Site 239.

Radioactive tracers containing short half-life radionuclides were reportedly used in the projectiles (64-9, 64-10, DOE September 1987). Two shells may have been lost during testing at ER Site 64. However, because of the short half-life of the radionuclide tracer, any radionuclides that may have been dispersed by the shells are now below detection limits (64-10). In April 1980, SNL/NM Health Physics personnel conducted a radioactive survey of proposed ER Site 239 and found no radioactivity above background (64-9, 64-13).

2.3.2 Portable Rocket Launcher Activities

ER Site 64 was also used to launch Chaparral, HVAR, and Zuni (64-28) rockets from a portable rocket launch trailer on the west side of the loop road around ER Site 64 (64-24) (Figure 2-1). The rockets were fired at targets suspended from the aerial cable at ER Site 81 (64-24, 64-28) toward an impact area in the southeastern corner of ER Site 81 (Figure 2-3). In March and April of 1982, three Chaparral rockets were fired from ER Site 64 toward ER Site 81 (64-28). According to one interviewee, HVARs were probably fired during a similar test in October 1983 (64-28). A comparable series of guided missile tests was conducted at ER Site 64 between October 1 and December 18, 1985 (64-28).

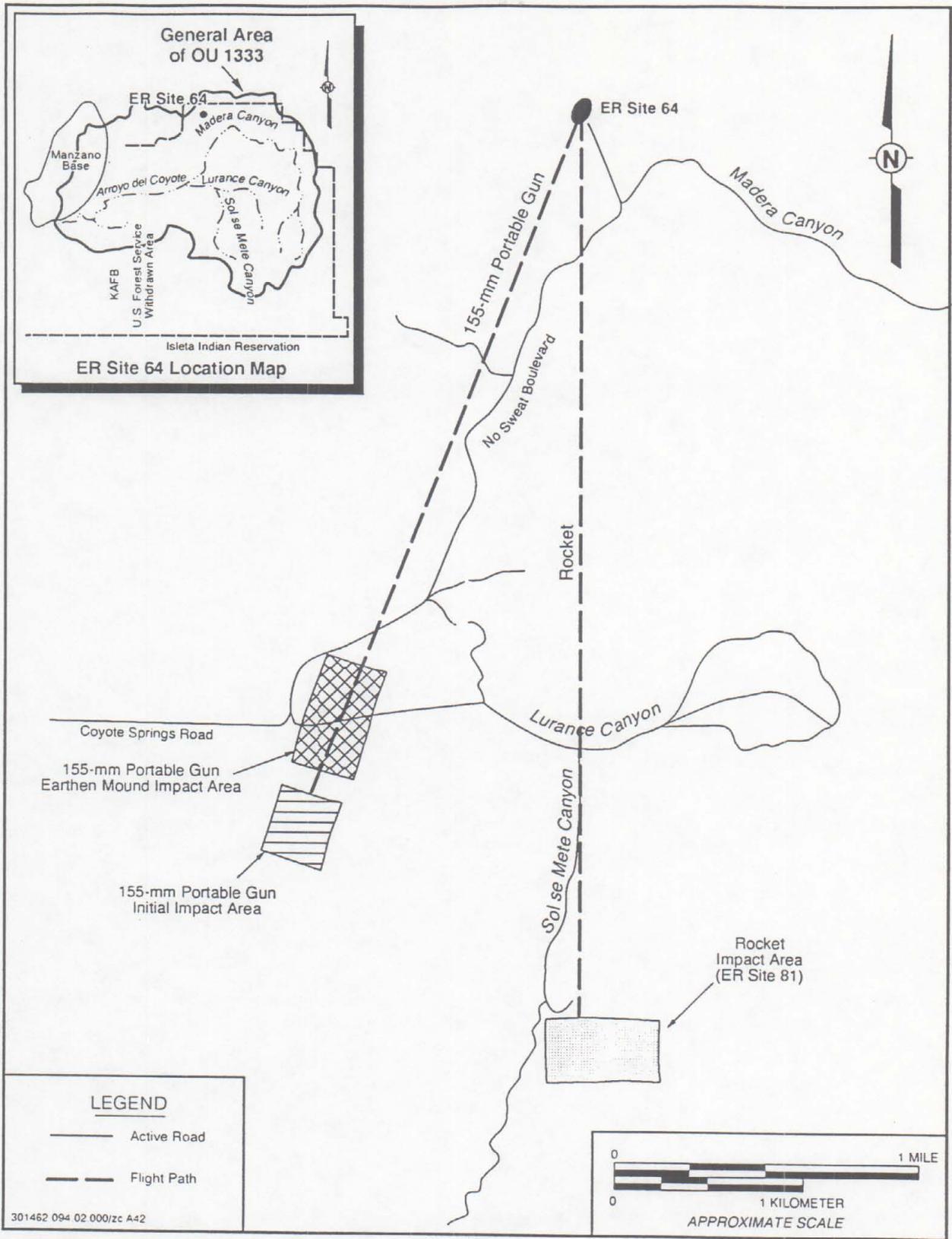


Figure 2-3
Location of ER Site 64 and Impact Areas

3. EVALUATION OF RELEVANT EVIDENCE

3.1 Unit Characteristics

ER Site 64 consists of a concrete inclined structure, a portable shed, four metal velocity-screen towers, six electrical outlet posts, three concrete pads, and an access road that loops around the site (Figures 2-1 and 2-2). The 155-mm gun was placed southwest of the concrete structure and the rocket launch trailer was positioned near the northwest corner of the loop road (Figure 2-1). The 155-mm portable gun activities at the site used a double-based gun propellant containing a trace amount of lead (64-24). The portable rocket launcher activities at the site used HVAR rocket propellant which also contained a trace amount of lead (DOE September 1992). Projectiles fired from the 155-mm gun were reported to have contained a short half-life radionuclide tracer. However, the short half-life of the radionuclide tracer implies that any radionuclides that may have been dispersed would no longer be present at detectable levels (64-9, 64-10, DOE September 1987).

3.2 Operating Practices

ER Site 64 was used to conduct firing tests on classified weapons components using a portable 155-mm gun (SNL/NM August 1994). The site was also used to launch Chaparral, HVAR, and Zuni rockets (64-28). The only potential COC at the site would be a trace amount of lead derived from both gun propellant exhaust (64-24), and HVAR and Chaparral rocket propellant exhaust (64-33, DOE September 1992).

Exhaust components from typical rocket motors used at ER Site 64 are listed in Table 3-1. The components of rocket exhaust are primarily carbon dioxide, carbon monoxide, water, hydrogen, nitrogen, hydrochloric acid, and aluminum oxide (64-27), with a trace amount of lead (0.07 weight percent (wt. %)) in the HVAR rocket exhaust. Most of the combustion products would disperse as gases and aerosols (64-27), with some particulate possibly remaining in the launch area. Because one of the trace exhaust components in the HVAR rocket is lead, small releases of lead may have occurred when HVAR rockets were fired. Exhaust components from the Chaparral rockets are currently classified (64-31), but it is known that the Chaparral rocket propellant contains less than 1% lead (64-33). The amount of lead released in the rocket launch area by gun and rocket propellant exhaust is believed to be insignificant based on analytical results from soil samples collected at ER Site 83, the Technical Area III (TA-III) rocket sled track (DOE September 1992).

HVAR rockets are used frequently at ER Site 83, and soil samples adjacent to the track contain lead concentrations of 11 to 18 milligrams per kilogram (mg/kg) (DOE September 1992), which is within the reported range of 1 to 20 mg/kg for background lead concentrations at ER Site 83 (IT October 1994). The soil surrounding ER Site 83 is a worst-case scenario for potential lead accumulation from rocket propellant exhaust, as the rockets remain in a horizontal trajectory near the ground surface over the entire sled-track path. At ER Site 64, the rockets did not remain near the ground when fired, and the exhaust dispersed over a very large area relative to exhaust dispersion at ER Site 83. Therefore, lead is not

**Table 3-1
Exhaust Components From Typical Rocket Motors^a**

Rocket Motor	Components Expressed as Weight Percent							
	Carbon dioxide	Carbon monoxide	Water	Hydrogen gas	Nitrogen gas	Hydrochloric acid	Aluminum oxide	Other
Zuni	11.6	42.0	21.2	13.2	11.9	NR	NR	0.1 Unspecified
HVAR	7.3	44.7	14.1	23.5	23.5	NR	NR	0.7 Potassium oxide
								0.68 Sulfur dioxide
								0.07 Lead
Chaparral	Classified (64-31)							

^aModified from Table 2 in 64-29 and Table 12 in DOE September 1992.

NR = No reported information for indicated component.

expected to be present at ER Site 64 at concentrations above background. There are no other COCs in the particulate derived from the gun and rocket propellant exhaust.

Exhaust compositions for gun propellant are unavailable, but the trace amount of lead in the exhaust would not exceed 1% (64-32). Therefore, it is expected that lead in the gun-firing area will be at or below background concentrations.

3.3 Presence or Absence of Visual Evidence

ER Site 64 currently consists of the concrete structure, a portable shed, four metal velocity-screen towers, six electrical outlet posts, three concrete pads, and an access road that loops around the site (Figures 2-1 and 2-2). Based on historical photographs, those features that are no longer at the site include the portable 155-mm gun, the rocket launcher trailer, and support instrumentation (SNL/NM August 1994).

3.4 Results of Previous Sampling/Surveys

3.4.1 UXO/HE Survey

In October 1993, KAFB Explosives Ordnance Disposal (EOD) conducted a visual survey for UXO/HE on the ground surface of ER Site 64 (64-23). No live UXO/HE or significant UXO/HE debris was found (64-23).

3.4.2 Gamma Radiation Survey

No radioactivity was detected at ER Site 64 during a 1980 surface-radiation survey performed by SNL/NM using a mobile radiation measurement laboratory (64-13).

3.5 Assessment of Gaps in Information

There is an absence of records regarding waste release or disposal at ER Site 64. The only potential COC at this site would have been a trace amount of lead produced by the gun and rocket propellant exhaust (64-27). However, lead is not expected to be present at ER Site 64 at concentrations above background levels (see Section 3.2).

3.6 Rationale for Pursuing an Administrative NFA Decision

SNL/NM is proposing an administrative NFA decision for ER Site 64 because the site clearly has not released significant amounts of hazardous waste or constituents into the environment (Criterion C). The site was used to conduct firing tests that used a 155-mm portable gun (64-24, 64-28) and a portable rocket launcher trailer (64-28). A trace amount of lead contained in gun and rocket propellant is the only potential COC at this site. Because lead is one of the trace exhaust components from the gun propellant and HVAR and Chaparral rocket propellant, Criterion C is not strictly met. However, the amount of lead at ER Site 64 is believed to be insignificant, based on analytical results from soil samples collected around ER Site 83 (DOE September 1992). No additional COCs are possible at the subunit, because the gun and rocket propellant completely burned and the primary exhaust components are not hazardous.

In October 1993, KAFB EOD conducted a visual survey for UXO/HE on the ground surface of ER Site 64. No live UXO/HE or significant UXO/HE debris was found (64-23). No radioactivity was detected at ER Site 64 during a 1980 SNL/NM surface radiation survey (64-13).

4. CONCLUSION

Based upon the evidence presented, no potential exists for a release of hazardous waste (including hazardous constituents) that may pose a threat to human health or the environment. Therefore, ER Site 64 is recommended for an NFA determination.

5. REFERENCES

5.1 ER Site References

Section 5.1 contains a comprehensive bibliographical list of the documents relating to ER Site 64. This list is arranged numerically by the numbers assigned to each document.

ER Site
Reference
Number

Reference

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