

FINAL
RCRA FACILITY INVESTIGATION
Summary Report of Historical Information
PARCEL 16

FORT WINGATE DEPOT ACTIVITY
McKinley County, New Mexico

January 10, 2011

Contract No. W9126G-10-C-0088

Prepared for:

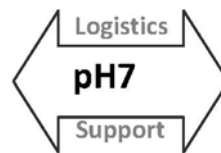


United States Army Corps of Engineers
Fort Worth District
P.O. Box 17300
Fort Worth, Texas 76102

Prepared by:



Toeroek Associates, Inc.
300 Union Boulevard, Suite 520
Lakewood, CO 80228



pH7 Logistics & Support
7189 E. Peakview Place
Centennial, CO 80111

Distribution List

Final	Hard Copies	PDF (CD)
Mark Patterson (FWDA BEC)	0	1
Micki Gonzales (FWDA)	1	2
Bill O'Donnell (BRACD)	0	1
Ft. Worth District POC (USACE SWF)	0	2
Albuquerque District (USACE SPA) Steve Carpenter	0	1
Regional Support Center (USACE SPK) Neal Navarro	0	1
Mike Kipp (USAEC)	0	1
Pat Ryan (Web manager)	0	1
Sharlene Begay-Platero (NN)	1	7
Edward Wemytewa (POZ)	1	8
Clayton Seoutewa (BIA Zuni)	1	1
Rose Duwyenie. (BIA-NR)	1	2
Totals	5	28

- BIA = Bureau of Indian Affairs
- BRACD = U. S. Army Base Realignment and Closure Division
- FWDA = Fort Wingate Depot Activity
- FWDA BEC = Fort Wingate Depot Activity Base Realignment and Closure Environmental Coordinator
- NN = Navajo Nation
- POZ = Pueblo Zuni
- USACE = U.S. Army Corps of Engineers
- USAEC = U.S. Army Environmental Command

This page left blank

TABLE OF CONTENTS

1.0	INTRODUCTION	1-1
1.1	Purpose and Objective	1-1
2.0	BACKGROUND	2-1
2.1	Description of Ft. Wingate	2-1
2.2	Summary of General Historical Information	2-4
3.0	SOLID WASTE MANAGEMENT UNIT 16 – FUNCTIONAL TEST RANGE 2/3	3-1
3.1	Location, Description, and Operational History	3-1
3.2	Previous Investigations	3-1
3.2.1	Installation Assessment, 1980	3-1
3.2.2	Environmental Survey, 1981	3-6
3.2.3	Enhanced Preliminary Assessment, March 1990	3-6
3.2.4	RCRA Facility Assessment, September 1990	3-6
3.2.5	Master Environmental Plan, December 1990	3-6
3.2.6	CERFA Report, 1994	3-6
3.2.7	Unexploded Ordnance Survey FTR 2/3, 1994	3-11
3.2.8	Archive Search Report, 1995	3-11
3.2.9	Remedial Investigation / Feasibility Study, 1997	3-11
3.2.10	UXO Removal Action FTR 2/3, 1998	3-19
3.2.11	Reuse Plan for Fort Wingate Depot Activity, 2005	3-19
3.2.12	Aerial Photographic Analysis Report, 2006	3-19
3.2.13	Airborne Geophysical Survey, 2009	3-19
3.2.14	Final Soil Background Study, 2010	3-28
3.3	Historical Drawing Review Analysis	3-28
4.0	AREA OF CONCERN 41 – K BLOCK IGLOOS	4-1
4.1	Location, Description, and Operational History	4-1
4.2	Previous Investigations	4-1
4.2.1	The Installation Assessment, 1980	4-1
4.2.2	The Environmental Survey, 1981	4-1
4.2.3	The Enhanced Preliminary Assessment Report, 1990	4-1
4.2.4	The RCRA Facility Assessment Report, 1990	4-5
4.2.5	The Master Environmental Plan	4-5
4.2.6	CERFA Report, 1994	4-5
4.2.7	Remedial Investigation/Feasibility Study, 1997	4-5
4.2.8	Historical Aerial Photograph Analysis	4-7
4.2.9	Historical Plate Drawing Review	4-7
5.0	WWI MAGAZINE SITES AND OTHER AREAS OF USE	5-1
6.0	SUMMARY AND CONCLUSIONS FOR PARCEL 16	6-1
6.1	Findings	6-1
6.2	Data Gaps	6-2
7.0	REFERENCES	7-1

LIST OF FIGURES

Figure 2-1. Installation Location	2-2
Figure 2-2. Historical Land Use and Reuse Parcel Boundaries	2-3
Figure 2-3. Parcel 16	2-5
Figure 3-1. 1980 Facility Layout Showing FTR 2, FTR3, and K Block	3-5
Figure 3-2. 1981 Facility Layout Indicating Areas of Potential Contamination	3-7
Figure 3-3. 1990 Facility Layout Showing Magazine Areas	3-8
Figure 3-4. 1990 Facility Layout With Labeled Magazine Areas A-G, J, and K	3-9
Figure 3-5. 1990 Functional Test Ranges 2 and 3 Locations	3-10
Figure 3-6. 1994 UXO Survey Areas and UXO Areas of Concern	3-13
Figure 3-7. 1994 GPS Survey of Remaining UXO Areas of Concern	3-14
Figure 3-8. 1994 Sample Locations for Functional Test Ranges 2 and 3	3-15
Figure 3-9. 1994 Sample Locations for Functional Test Ranges 2 and 3	3-17
Figure 3-10. 1998 Grid Map for OE Sampling and Removal Action	3-21
Figure 3-11. 2009 Airborne Geophysical Survey Areas, Aerial View	3-25
Figure 3-12. 2009 Airborne Geophysical Survey Analytic Signal Map of FTR 2/3	3-26
Figure 3-13. 2009 Airborne Geophysical Survey Vertical Magnetic Gradient of FTR 2/3	3-27
Figure 4-1. 1997 Sampled Igloos and Revetments	4-6
Figure 4-2. 1997 Typical Igloo Sample Locations	4-8
Figure 5-1. Historical Land Use	5-3

LIST OF TABLES

Table 3-1. Document Summary Table	3-3
Table 3-2. Aerial Photograph Review Summary	3-23
Table 3-3. Historical Drawing Review Summary	3-29
Table 4-1. AOC 41 Document Summary Table	4-3

LIST OF APPENDICES

Appendix A – Photographs
Appendix B – Excerpts from Historical Documents
Appendix C – Aerial Photographs
Appendix D – Historical Drawings

LIST OF ACRONYMS

%	percent
AOC	Area of Concern
BRAC	Base Realignment and Closure
BRACD	BRAC Division
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CERFA	Community Environmental Response Facilitation Act
COR	Contracting Officer's Representative
DOI	Department of the Interior
EA	Environmental Assessment
Ft	foot
FTR	Functional Test Range
FWDA	Fort Wingate Depot Activity
GPS	Global Positioning System
HE	High Explosive
HTW	Hazardous and Toxic Waste
HWB	Hazardous Waste Bureau
HWMU	Hazardous Waste Management Unit
in	inch
mi	mile
NEPA	National Environmental Policy Act
NMED	New Mexico Environment Department
OB/OD	Open Burning/Open Detonation
OE	Ordnance and Explosive
RCRA	Resource Conservation and Recovery Act
RFI	RCRA Facility Investigation
RI/FS	Remedial Investigation/Feasibility Study
SVOC	Semi Volatile Organic Compound
SRHI	Summary Report of Historical Information
SWMU	Solid Waste Management Unit
TAL	Target Analyte List
TEAD	Tooele Army Depot
TCL	Target Compound List
µg/cm ²	micrograms/square centimeter
µg/g	microgram/gram
USACE	U.S. Army Corps of Engineers
USATHAMA	U.S. Army Toxic and Hazardous Material Agency
USEPA	U.S. Environmental Protection Agency
UXO	Unexploded Ordnance
VOC	Volatile Organic Compound
WSMR	White Sands Missile Range
Yds	yards

This page left blank

Parcel 16

1.0 Introduction

This Summary Report of Historical Information (SRHI) for Parcel 16 at Fort Wingate Depot Activity (FWDA) summarizes previous investigations and historical records for Parcel 16. This report summarizes historical information for the Solid Waste Management Unit (SWMU) and Area of Concern (AOC) located in Parcel 16.

This document was prepared by Toeroek Associates, Inc. and pH7 Logistics and Support in partial fulfillment of the requirements of Contract Number W9126G-10-C-0088. The Contracting Officer's Representative (COR) and technical oversight responsibilities for the tasks described in this document were provided by the U.S. Army Corps of Engineers (USACE), Fort Worth District. This document has been prepared for submission to the New Mexico Environment Department (NMED) Hazardous Waste Bureau (HWB), as outlined in Section VIII.A.1.a of the Resource Conservation and Recovery Act (RCRA) Permit (hereinafter referred to as "the Permit") for FWDA. The Permit (NM 6213820974) was finalized in December 2005 and became effective 31 December 2005. This document has been prepared as a companion report to both the RCRA Facility Investigation (RFI) Work Plan and Release Assessment Report for Parcel 16.

1.1 Purpose and Objective

The purpose of this SRHI is to summarize historical information and previous environmental investigation and restoration activities for all Parcel 16 SWMUs and AOCs.

This page left blank

2.0 Background

2.1 Description of Ft. Wingate

FWDA is a closed U.S. Army depot whose former mission was to receive, store, maintain, and ship assigned materials (primarily explosives and military munitions), and to dispose of obsolete or deteriorated explosives and military munitions. In 1975, the installation was placed under the administrative command of Tooele Army Depot (TEAD), located near Salt Lake City, Utah. TEAD retained command and control responsibilities, and continued to provide support services to FWDA until January 31, 2008. On January 31, 2008, command and control and support functions were transferred to White Sands Missile Range (WSMR). The active mission of FWDA ceased and the installation closed in January 1993, as a result of the Defense Authorization Amendments and Base Realignment and Closure (BRAC) Act of 1988. In 2002, the Army reassigned many functions at FWDA to the BRAC Division (BRACD), including property disposal, caretaker duties, management of caretaker staff, and performance of environmental restoration and compliance activities.

FWDA currently occupies approximately 24 square miles (approximately 15,277 acres) of land in northwestern New Mexico, in McKinley County. The installation is located eight miles east of Gallup on U.S. Route 66 and approximately 130 miles west of Albuquerque on Interstate 40 (Figure 2-1).

FWDA contains facilities formerly used to operate a reserve storage activity providing for the care, preservation, and maintenance of assigned commodities, primarily conventional military munitions. The installation mission included the disassembly and demilitarization of unserviceable and obsolete military munitions.

- The installation is divided into areas based upon location and historical land use (Figure 2-2). These major land-use areas include:
 - Administration Areas,
 - Workshop Area,
 - Magazine (Igloo) Area (former munitions storage areas including Igloo Blocks A through H, J and K),
 - protection and buffer areas, and
 - Open Burning/Open Detonation (OB/OD) areas.
- Parcel 16 is located in the northeastern portion of FWDA east of the Workshop area.

The environmental restoration process at FWDA had been underway for 30 years. With the exception of the OB/OD Area, environmental restoration activities at FWDA began in 1980 under the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) guidelines, with the U.S. Environmental Protection Agency (USEPA) Region VI as the lead regulatory agency. Since that time, NMED has become the lead regulatory agency. In 2002, NMED determined that the pathway would be a RCRA permit for post-closure care of the OB/OD Area, with a RCRA corrective action module attached to address requirements for other sites. The Permit was finalized in December 2005 and became effective 31 December 2005.



Figure 2-1. Installation Location

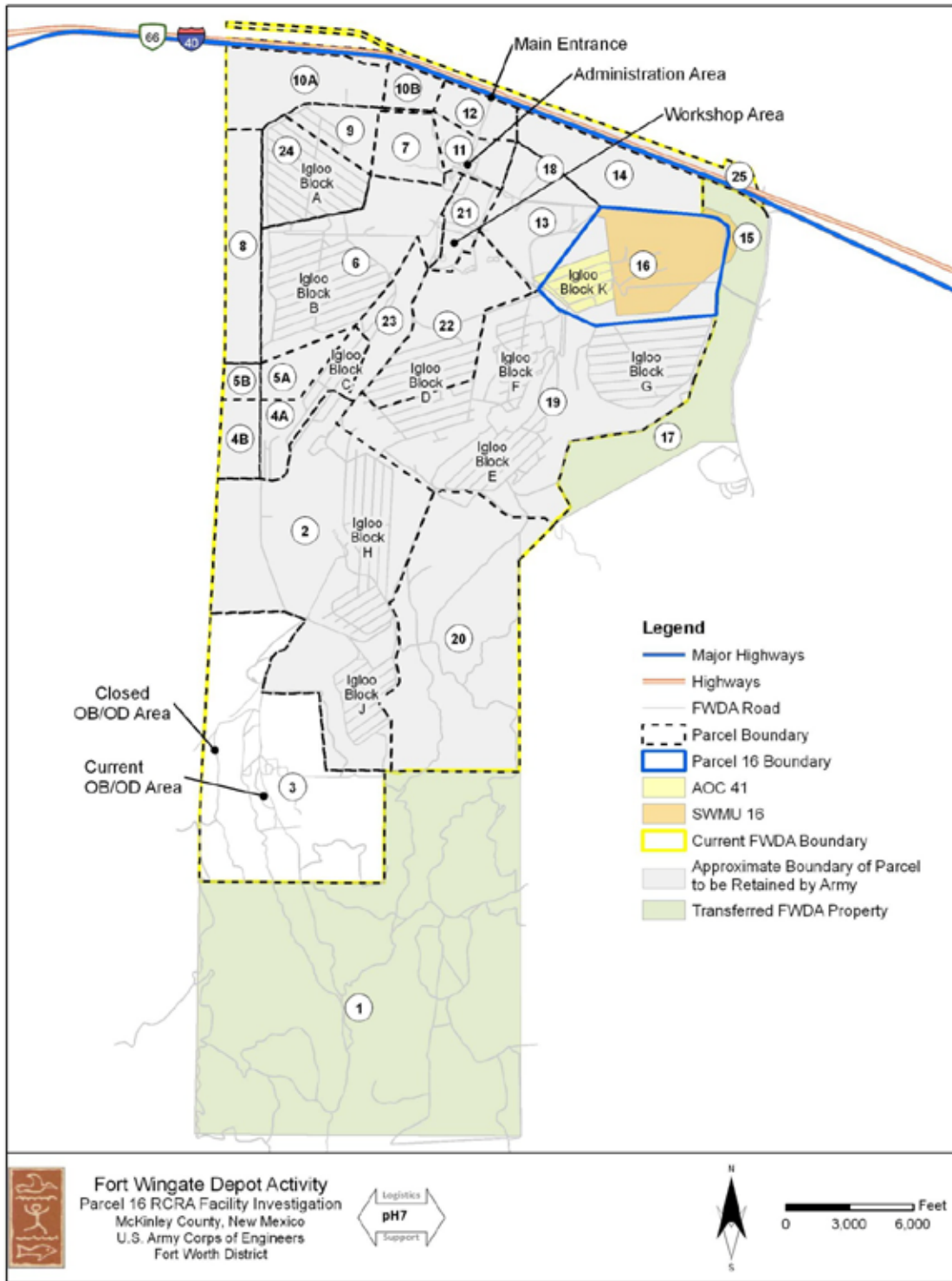


Figure 2-2. Historical Land Use and Reuse Parcel Boundaries

FWDA has been undergoing final environmental restoration prior to property transfer/reuse. As part of the planned property transfer to the Department of the Interior (DOI), the installation has been divided into reuse parcels (Figure 2-2). Parcels transferred to date consist of Parcels 1, 15, and 17. According to the most recent reuse planning document (DOI, 2005), the planned reuse for Parcel 16 is Mixed Commercial/Institutional/Office.

The Permit lists one (1) SWMU within Parcel 16, (Figure 2-3):

- SWMU 16 Functional Test Range (FTR) 2/3, which is an area approximately one mile long and about two-thirds of a mile across in eastern part of Parcel 16.

In addition to SWMU 16, Parcel 16 contains one (1) AOC (Figure 2-3):

- AOC 41 Igloo Block K which contains 27 munitions storage igloos, nineteen open storage areas with revetments, and 23 pre-World War II storage areas.

In late July 2010, as part of this historical review, a brief site walk of SWMU 16 and AOC 41 was conducted. SWMU 16 is open space, well vegetated and the only indication of previous use was a single utility pole and a wooden fence in the general area designated on figures as the “firing point”. The AOC 41 area containing the igloos and revetments were also walked; igloos, drains and drainage patterns were identified and noted. Photographs taken during this site walk are Appendix A.

2.2 Summary of General Historical Information

A number of record searches and document reviews relating to FWDA operations in general as well as the Parcel 16 SWMUs and AOCs in particular were performed since the environmental restoration program began in 1980.

Available records pertaining to operations at Parcel 16, the SWMU and the AOC were reviewed in preparation of this SRHI.

- Records reviewed included:
- Historical records obtained from the USACE;
- An historical aerial photograph analysis for FWDA;
- Historical maps, drawings, and records located at FWDA; and
- Other historical documents contained in the FWDA Information Repository.

Historical information regarding operations and environmental characterization has been incorporated into the sections for SWMU 16 and AOC 41. Each section contains a narrative description of the relevant historical documents and data they provide for the SWMU or AOC. In addition to the narrative, summary tables provide a more concise summary of historical records. In addition to the narrative, summary tables provide a more concise summary of historical records. The full text versions of historical documents are available in the FWDA Administrative Record.

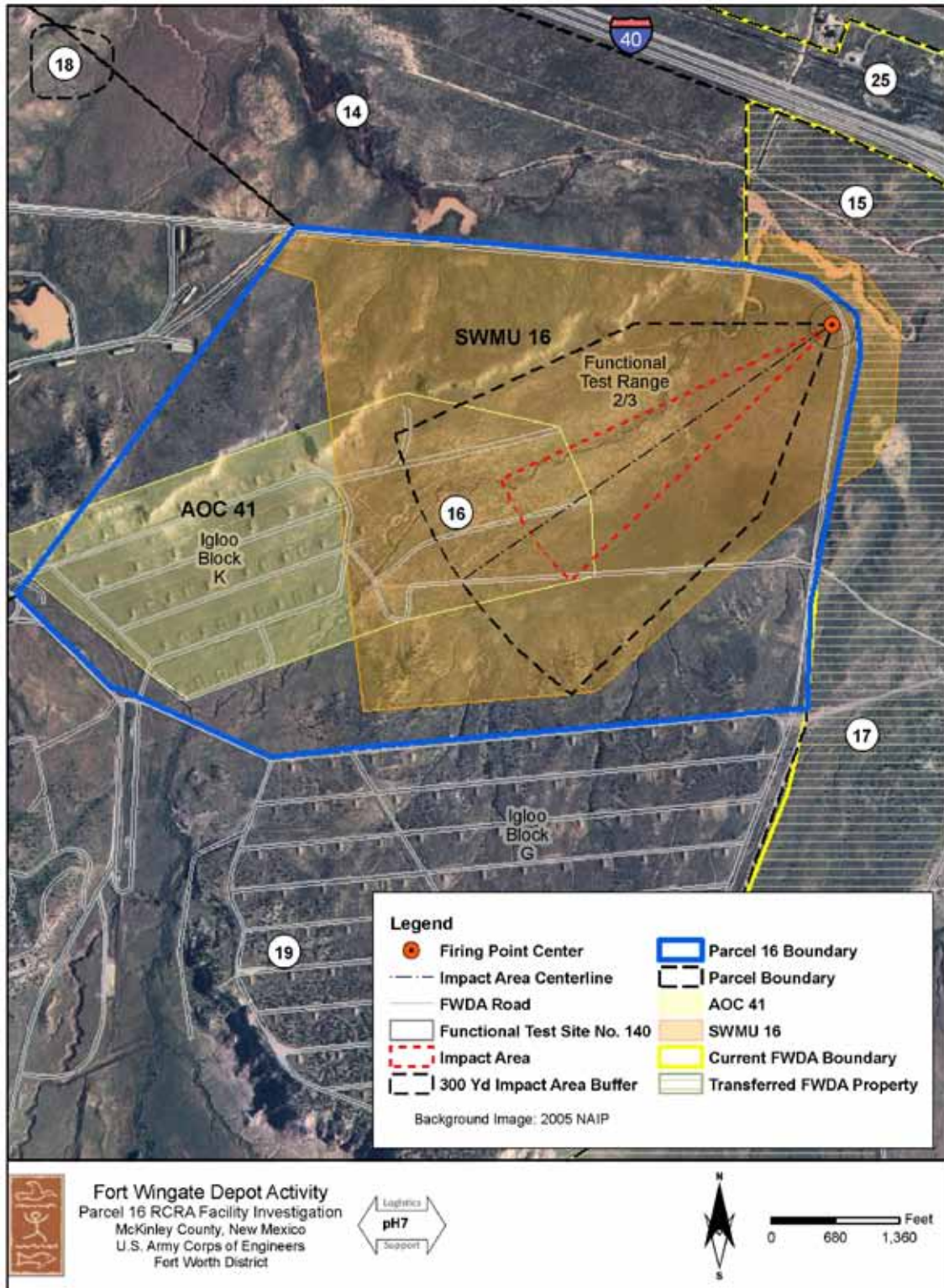


Figure 2-3. Parcel 16

This page left blank

3.0 Solid Waste Management Unit 16 – Functional Test Range 2/3

3.1 Location, Description, and Operational History

FTR 2 and 3 (FTR 2/3) are located in the northeast corner of FWDA, to the north of Igloo Block G and to the east of Igloo Block K (Figure 2-3). These two ranges are located adjacent to each other and for investigation, sampling and analysis purposes are treated as one area. FTR 2/3 covers an area of approximately 555 acres in the north east corner of Parcel 16. Range 2, was reportedly used for high explosives testing during the 1960s. This area was depicted in early reports as a small area just west of FTR 3. Range 3 is depicted as a much larger area to the east of FTR 2 reportedly used between 1960 and 1967 to test a variety of weapons including 3.5-in. rockets and 4.2-in. mortar rounds. Beginning in 1990, FWDA documents stopped depicting FTR 2 and FTR 3 as separate areas and started referring to the combined area as FTR 2/3. The only visible indications of its former use are a standing utility pole and a fenced area near the northeast corner of the site.

3.2 Previous Investigations

There were two types of investigations conducted within Parcel 16: environmental assessments / investigations and unexploded ordnance (UXO) survey/clearances. Twelve (12) environmental assessment or investigation reports were reviewed that were dated from January 1980 to March 2010. Two (2) UXO investigations and remediation reports were reviewed that were dated 1994 and 1998. The following sections provide a summary of the scope of these investigations. Table 3-1 provides a detailed summary of each report, its findings, and recommendations.

FWDA was recommended for closure in December 1988 by the Defense Secretary's Report on Base Realignment and Closure. The U.S. Army Toxic and Hazardous Material Agency (USATHAMA) was assigned the responsibility for centrally managing the Base Realignment and Closure Environmental Restoration Program. In line with this program, USATHAMA has conducted environmental studies to evaluate the installation from the perspective of property transfer and, in general, indicate which areas of the installation may be releasable without any further work.

3.2.1 Installation Assessment, 1980

In response to the National Environmental Policy Act (NEPA) of 1969 and Army regulation 200-2 that implemented the NEPA, an Environmental Assessment (EA) was prepared for the FWDA installation in August 1982. The EA provides a summary of all facets of the FWDA which may have environmental significance. It was prepared for the US Army Toxic and Hazardous Materials Agency. The report was intended to ensure that resources in and around the depot were identified and that potential impacts of these activities on resources both on and off the base were evaluated. Actions to minimize or eliminate adverse impacts were identified in order that mitigation or planning for mitigation could proceed. The specific references to FTR 2/3 are shown on Figure 3-1, and the document excerpts in Appendix B.

This page left blank

Table 3-1. Document Summary Table

Environmental Assessment/Investigation Reports

Document	Summary of Report	Recommendations
Final Report Installation Assessment of Fort Wingate Depot Activity, Gallup, New Mexico, Report No. 136, 1980	Review of historical use of FTR, figure shows two range configuration, and shows FTR 2 (1960s), FTR 3, 3.5-inch rocket test 1965/67.	None
Final Report Environmental Survey of Ft. Wingate Depot Activity, Gallup New Mexico, 1981	Review of historical use of FTR, figure shows two range configurations, and shows FTR 2 (1960s), FTR 3, 3.5-inch rocket test 1965/67.	None
Enhanced Preliminary Assessment Report: Fort Wingate Depot Activity, Gallup, New Mexico 1990	Review of historical use and historical reports of FTR, this report adds limited physical conditions about the site. "approximately 1 mi x 0.5 mi in size,... flat and appears clean"	None
Fort Wingate Depot Activity, NM6213820974, Gallup, New Mexico. RCRA Facility Assessment Report, 1990	Review of historical use and historical reports of FTR, amends the historical use for FTR, "the third area near the northeast boundary....(presumed FTR 2) was used in the 1960's to test high explosives".	All three FTR are potentially contaminated with UXO Locate and remove UXO Perform soil testing for explosives residues and heavy metals.
Master Environmental Plan: Fort Wingate Depot Activity, Gallup, New Mexico 1990	Review of historical use and historical documents of FTR, this report depicts the two ranges as one area, yet the report seems to have ranges backwards; this plan states FTR 2 used for rocket and mortar, FTR 3 used to test high explosives. Findings: FTR 2 Northeast end (presumed firing point) was less vegetated, FTR 2/3 - 1962 aerial shows area dotted with craters...area covers 0.5 mi x 1 mi	FTR 2 & 3 - Visual reconnaissance survey to delineate boundaries of past activities. FTR 2 & 3 - Using geophysical methods that are available, the Army should also conduct an ordnance reconnaissance to recover UXO. FTR 2 - At least one sediment sample should be taken from each wash in the northern part of the site and five sediment samples from the drainage in the southern part of the site. The suggested depth of each sample is 1 ft. All samples should be analyzed for metals and explosives. FTR 3 - Surficial soil samples should be collected in the craters created by past explosives testing. The locations of the craters can be identified from the 1962 aerial photograph. FTR 3 - Sampling of the drainage north of this site can be integrated with the sampling plan in Functional Test Range 2. The suggested depth of each sample is 1 ft. All samples should be analyzed for metals and explosives.
Final Community Environmental Response Facilitation Act (CERFA) Report, 1994	Review of historical use and historical documents of FTR, document does reference sampling conducted by "ongoing RI/FS" ...Results indicate presence of UXO throughout this area	None
Document number F.W. 95-5, Archives Search Report, Fort Wingate, US Army Corp of Engineers, 1995.	This document is a FWDA-wide archive search. The references to FTR was summary information about the FTR taken from previous reports, and the team trip report of a site walk that identified "rocket tail fins located in the north central area of FTR 2/3"	None
Fort Wingate Depot Activity, Gallup, New Mexico, Final Remedial Investigation/Feasibility Study & RCRA Corrective Action Program Document, 1997	FWDA-wide RI/FS; FTR data gathering activity and results were: - 10 surface soil samples collected and analyzed for explosives, nitrate/nitrite, and total phosphorus. No detections above background for explosives or nitrates/nitrites. One sample analysis for total phosphorus exceeded background. - 4 sediments samples collected and analyzed for TCL VOCs, TCL SVOCs, explosives, pesticides, TAL metals, nitrate/nitrite, and total phosphorus. One sample exceeded background for Lead and one sample exceeded background for Barium.	None – Baseline Risk assessment summary: no samples exceeded screening levels; no secondary factors for further evaluation and no reason to proceed to Human Health Risk assessment.

Table 3-1. Document Summary Table

Environmental Assessment/Investigation Reports

Document	Summary of Report	Recommendations
<i>Reuse Plan for Fort Wingate Depot Activity.</i> U.S. Department of the Interior, August 31, 2005.	This report provides the future land use plans for various areas of the Ft. Wingate. In summary, the lands will revert to the Navajo Nation and the Pueblo of Zuni. Parcel 16 is to be used for "Mixed Commercial / Institutional /Office".	None
Aerial Photographic Site Analysis, Fort Wingate Depot Activity, 2006	12 aerial photographs of FWDA; the photographs show the use of FWDA between from 1935 to 1997. These photographs were reviewed; analysis and findings are presented on each photograph.	None
Final Report on Airborne Geophysical Survey at Fort Wingate Depot Activity, McKinley County, New Mexico, 2009	A low-level aerial geophysics survey of FTR was conducted. Figures within this report provide the geophysical findings.	The figures of the FTR show four areas of interest. A serpentine shape area of detection in the northern central area; a circular formation near the center, and two areas in the western edge of the area at the southern end of the area.
Soil Background Study and Data Evaluation Report, Fort Wingate Depot Activity, Gallup New Mexico, 2010	Sampling and analysis across the site. Background Study will be used to make a statistical determination on the nature and occurrence of inorganic constituents in soil at the FWDA based on site-to-background comparisons.	None

Unexploded Ordnance Survey Reports

Document	Summary of Report	Recommendations
Final Report Fort Wingate Depot Activity Unexploded Ordnance (UXO) Survey Report, 1994	UXO survey and removal of UXO for 555 acres in FTR 2/3. No live ordnances were discovered.	Surface debris be removed in the areas of heavy surface contamination and a subsurface investigation performed.
Final Removal Report, OE Sampling and Removal Action, Ft. Wingate, New Mexico, 1998	Surface clearance of 611 acres, subsurface clearance of 5 acres, and subsurface investigation sampling of 11.5 acres. Conclusion: "after performing a 100% surface clearance but less than 1% subsurface clearance, it remains inconclusive the level of subsurface OE contamination possibly remaining at Site 4" (FTR 2/3)."	HTW exist in grid BDI 5 based upon the visible stains remaining on the ground after the work force recovered loose explosives in the grid.

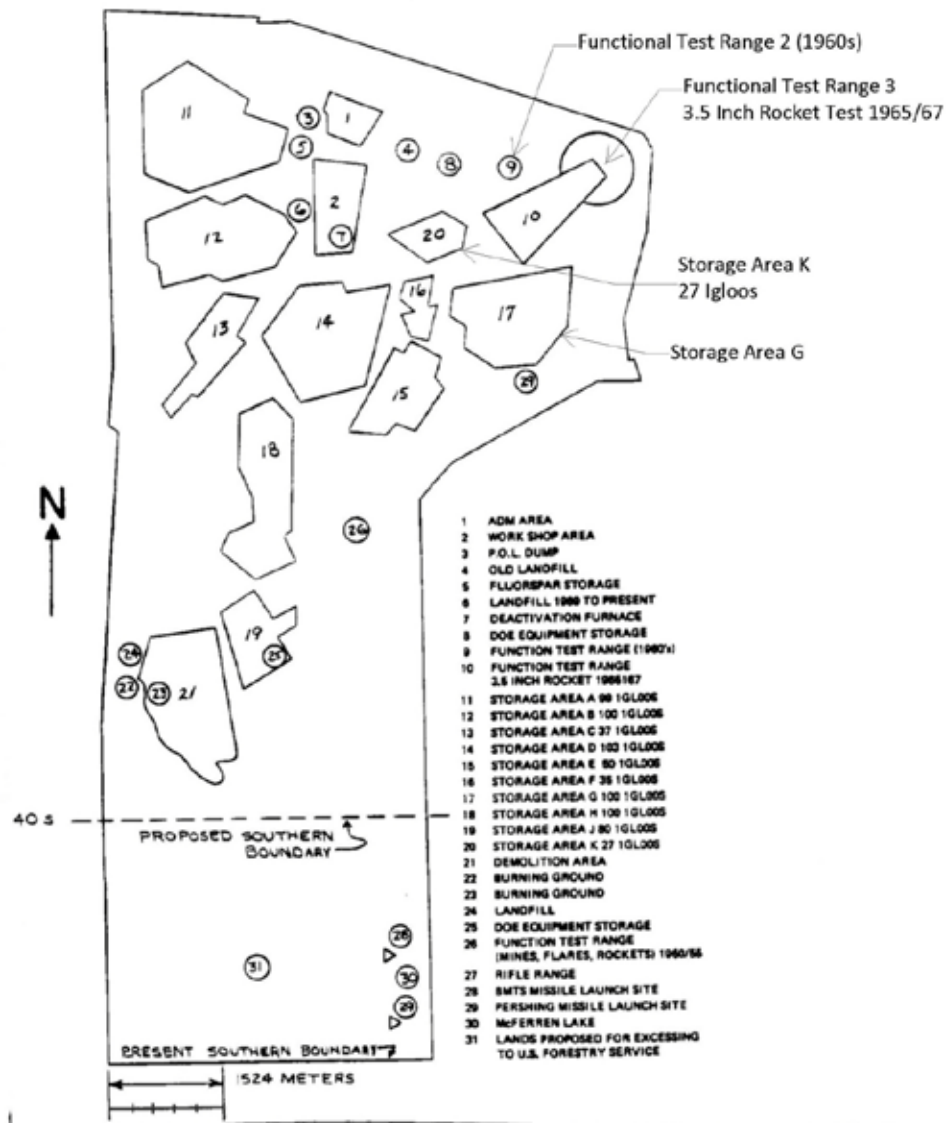


Figure 8. General Layout and Areas of Potential Contamination (FWDA)

Figure 3-1. 1980 Facility Layout Showing FTR 2, FTR3, and K Block

Source: 1980, January. Document No. 80-1, Final Report Installation Assessment of Fort Wingate Depot Activity, Gallup, New Mexico, Report No. 136, US Army Toxic and Hazardous Materials Agency.

3.2.2 Environmental Survey, 1981

As with the 1980 assessment, the authors of this survey only address these areas in the General Site Layout figure which is shown in Figure 3-2. The primary difference in the figures of the Installation Assessment of 1980 and this 1981 Environmental Survey is that in the legend of the figures some of the Areas are denoted as “potentially contaminated sites”. The document excerpts are shown in Appendix B.

3.2.3 Enhanced Preliminary Assessment, March 1990

As with the previous assessment and survey, the primary focus of this assessment is on the location and historical use of the FTR. This assessment provides an area estimate of the ranges “approximately 1 mi x 0.5 mi in size”, and provides a brief report on the current site conditions; “...area is flat and appears clean; the only visible indications of its former use is a small area at the extreme northeast end and that has noticeably less vegetation than the surrounding areas”. The specific references to FTR 2/3 are shown on Figure 3-3 and the document excerpts are shown in Appendix B.

3.2.4 RCRA Facility Assessment, September 1990

In this assessment the authors stated, “All three Functional Test Areas are potentially contaminated with UXO. The extent of the contamination with UXO is not known, nor is it known whether the soils were contaminated with other hazardous constituents, such as explosive residues and heavy metals. The specific references to FTR 2/3 are shown on Figure 3-4 and the document excerpts are shown in Appendix B.

3.2.5 Master Environmental Plan, December 1990

These two ranges were investigated and reported as individual areas; however in this report, Figure 3-5 is the first depiction of the two ranges joined or configured together and the report’s findings recommends integrating the sampling requirements of the two ranges. The report’s findings about the ranges are summarized as “The major concerns on this site are UXO and potential explosives and metal contamination. This conclusion is based on known past activities at the site. As there are no chemical data on the soil on the site, the seriousness of metal contamination is not clear. Also, UXO was not marked and reported in the past. It is difficult to evaluate the potential UXO problem. From the 1962 aerial photograph, the site may have covered quite a large area”. The specific references to FTR 2/3 are shown on Figure 3-5 and the document excerpts are shown in Appendix B.

3.2.6 CERFA Report, 1994

As with previous assessments the authors only reported some brief historical use information and location information. However, the report mentions that data were collected for evaluation of the use impacts. “Soil sampling and surface screening for the presence of unexploded ordnance (UXO) was conducted in FTR 2/3 as part of the ongoing RI/FS. The results were made available for regulatory review on 28 January 1994. Results indicate the presence of UXO scattered throughout this area.” The document excerpts are shown in Appendix B.

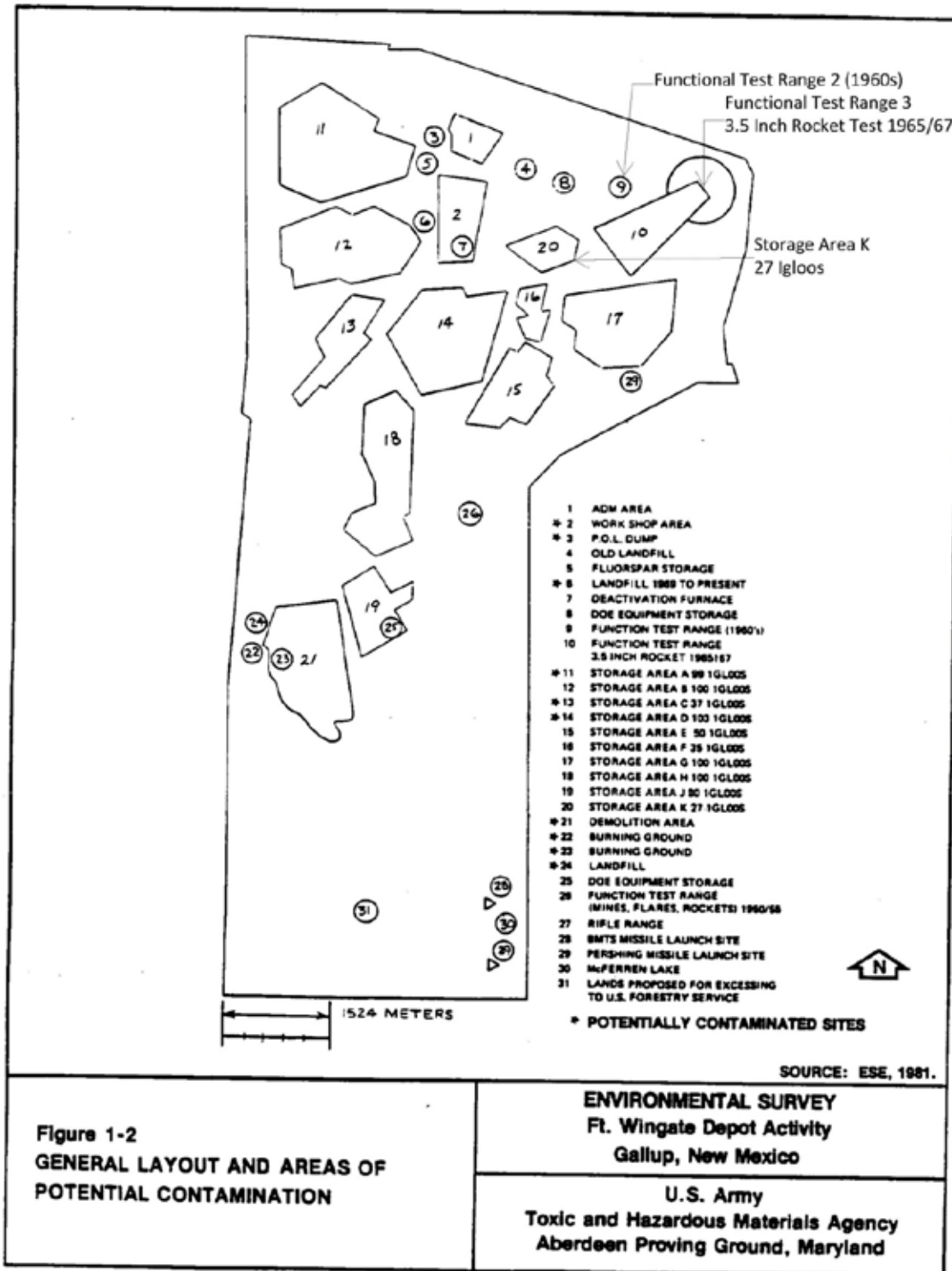


Figure 1-2
GENERAL LAYOUT AND AREAS OF
POTENTIAL CONTAMINATION

ENVIRONMENTAL SURVEY
Ft. Wingate Depot Activity
Gallup, New Mexico

U.S. Army
Toxic and Hazardous Materials Agency
Aberdeen Proving Ground, Maryland

Figure 3-2. 1981 Facility Layout Indicating Areas of Potential Contamination
Source: 1981, September, Document No. 80-3 (FW81-1), *Final Report Environmental Survey of Ft. Wingate Depot Activity, Gallup New Mexico*. Environmental Science and Engineering, Inc. (ESE).

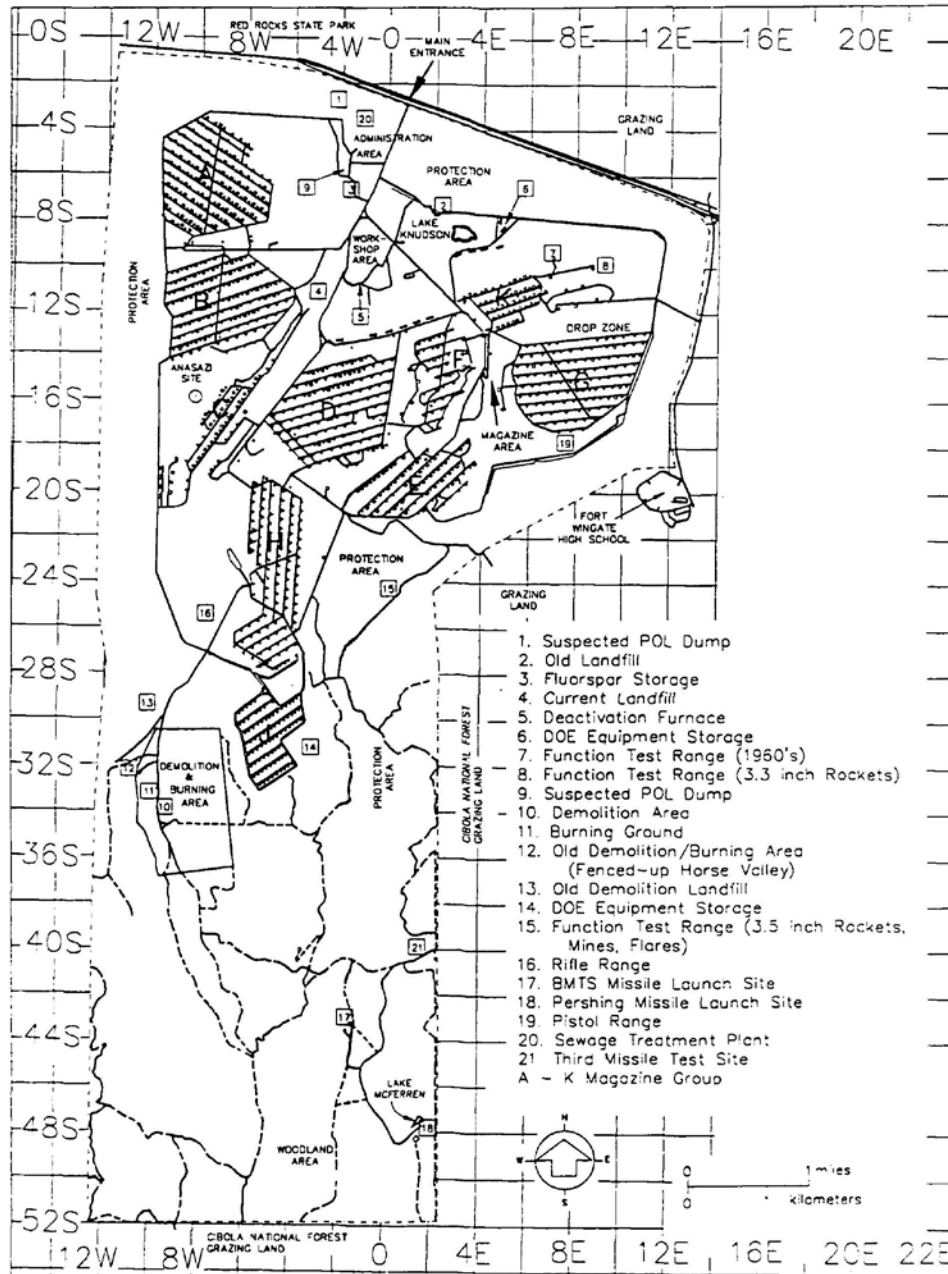


FIGURE 2.4 Magazine Group (10 irregularly shaped clusters, shown as lined areas with letter designations) and Other FWDA Facilities and Sites

Figure 3-3. 1990 Facility Layout Showing Magazine Areas

Source: 1990, March. Enhanced Preliminary Assessment Report: Fort Wingate Depot Activity, Gallup, New Mexico, US Army Toxic and Hazardous Materials Agency.

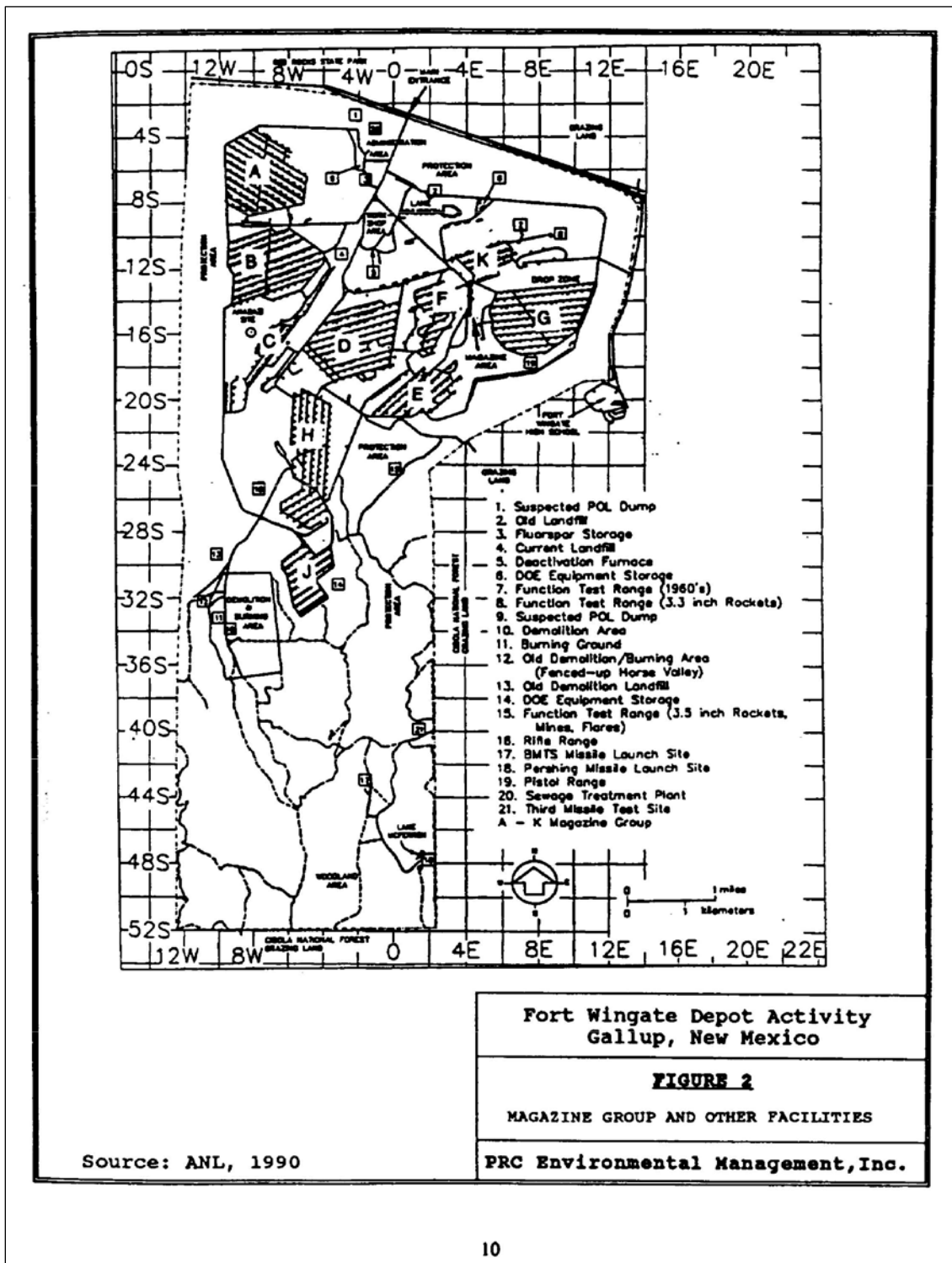


Figure 3-4. 1990 Facility Layout With Labeled Magazine Areas A-G, J, and K
 Source: 1990, September. Document No. 90-3 (FW 90-5), Fort Wingate Depot Activity,
 NM6213820974, Gallup, New Mexico. RCRA Facility Assessment Report,
 PRC Environmental Management, Inc.

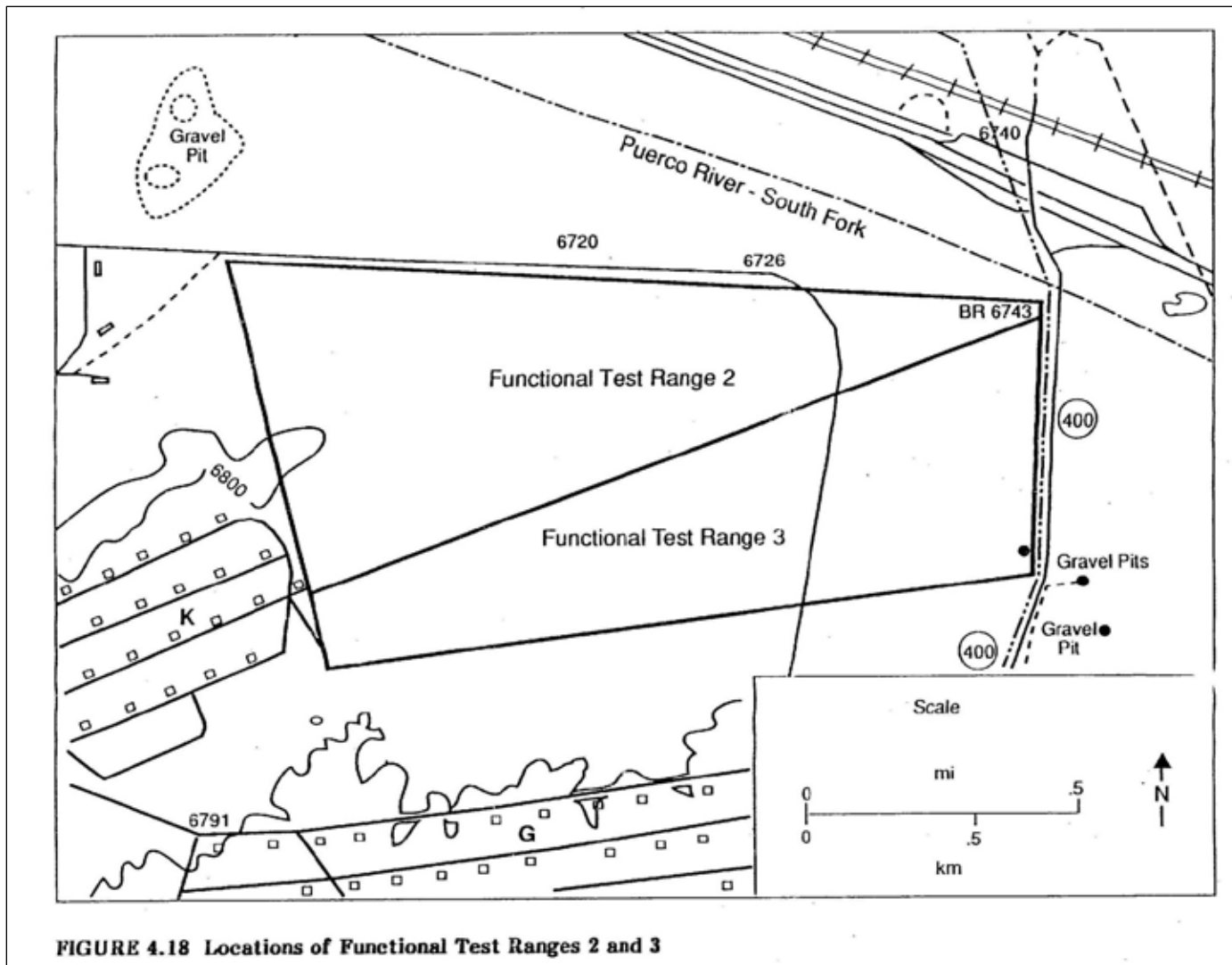


FIGURE 4.18 Locations of Functional Test Ranges 2 and 3

Figure 3-5. 1990 Functional Test Ranges 2 and 3 Locations

Source: 1990, December. Master Environmental Plan: Fort Wingate Depot Activity, Gallup, New Mexico. Environmental Assessment and information Science Division, Argonne National Laboratory.

3.2.7 Unexploded Ordnance Survey FTR 2/3, 1994

This survey was to evaluate the UXO contamination as a result of the historic use of this area. The UXO survey of FTR 2/3 covered an area of 555 acres. The technical approach of this survey was to use handheld geophysical equipment and survey the surface to six inches deep; however, if necessary, items encountered deeper would be investigated. During the surface survey no live ordnance was found on FTR 2/3. Fifteen contacts were detected at depths below six inches. These contacts were excavated and determined to be caused by non-ordnance related items. However, during the survey, areas of heavy ordnance debris contamination were marked and the boundaries surveyed using a global positioning system (GPS). The specific references to FTR 2/3 are shown on Figures 3-6 and 3-7 and the document excerpts are shown in Appendix B.

3.2.8 Archive Search Report, 1995

This report was a comprehensive Ft. Wingate-wide archive search of data files, records, interviews, and site walk. The FTRs were mentioned and the previous reports were summarized; the FTRs were used to test munitions and explosive, and the report provided some location information. Text excerpts about FTR 2/3 from the report are in Appendix B.

3.2.9 Remedial Investigation / Feasibility Study, 1997

The FTRs were investigated as "other Areas of Concern" during the site-wide RI/FS. As part of the site-wide RI/FS ten (10) surface soil samples and five (5) sediment samples were collected in the FTR area. Below is a summary of the sampling and analysis of those samples. The specific locations in FTR 2/3 are shown on Figure 3-8 and 3-9 and the document excerpts are shown in Appendix B.

- *Surface Soil Samples* Ten surface soil samples (FTR23SO01 through FTR23SO10) were collected from within FTR 2/3 (Figure 3-8). These samples were located to provide reasonable coverage of FTR 2/3. The samples were analyzed for explosives, nitrate/nitrite, and total phosphorus.
- *Surface Soil Sample Explosives Results.* No explosives were detected in the surface soil samples.
- *Surface Soil Sample Nitrate/Nitrite Results.* Nitrate/nitrite was not detected above the background level of 30.0 µg/g in the surface soil samples; and
- *Surface Soil Sample Total Phosphorus Results.* Total phosphorus was not detected above the background level of 659 µg/g in the surface soil samples.

The background data used for comparison of these samples are no longer relevant.

Five sediment samples were collected from surface water drainage pathways within FTR 2/3 (ESEO1 through ESEO13). These samples were identified as part of the Eastern Drainage Area, and are discussed in Section 7.8.1 of the referenced report. Figure 3-9 shows the sampling locations. The samples were analyzed for TCL VOCs, TCL SVOCs, explosives, pesticides, TAL metals, nitrate/nitrite, and total phosphorus.

This page left blank

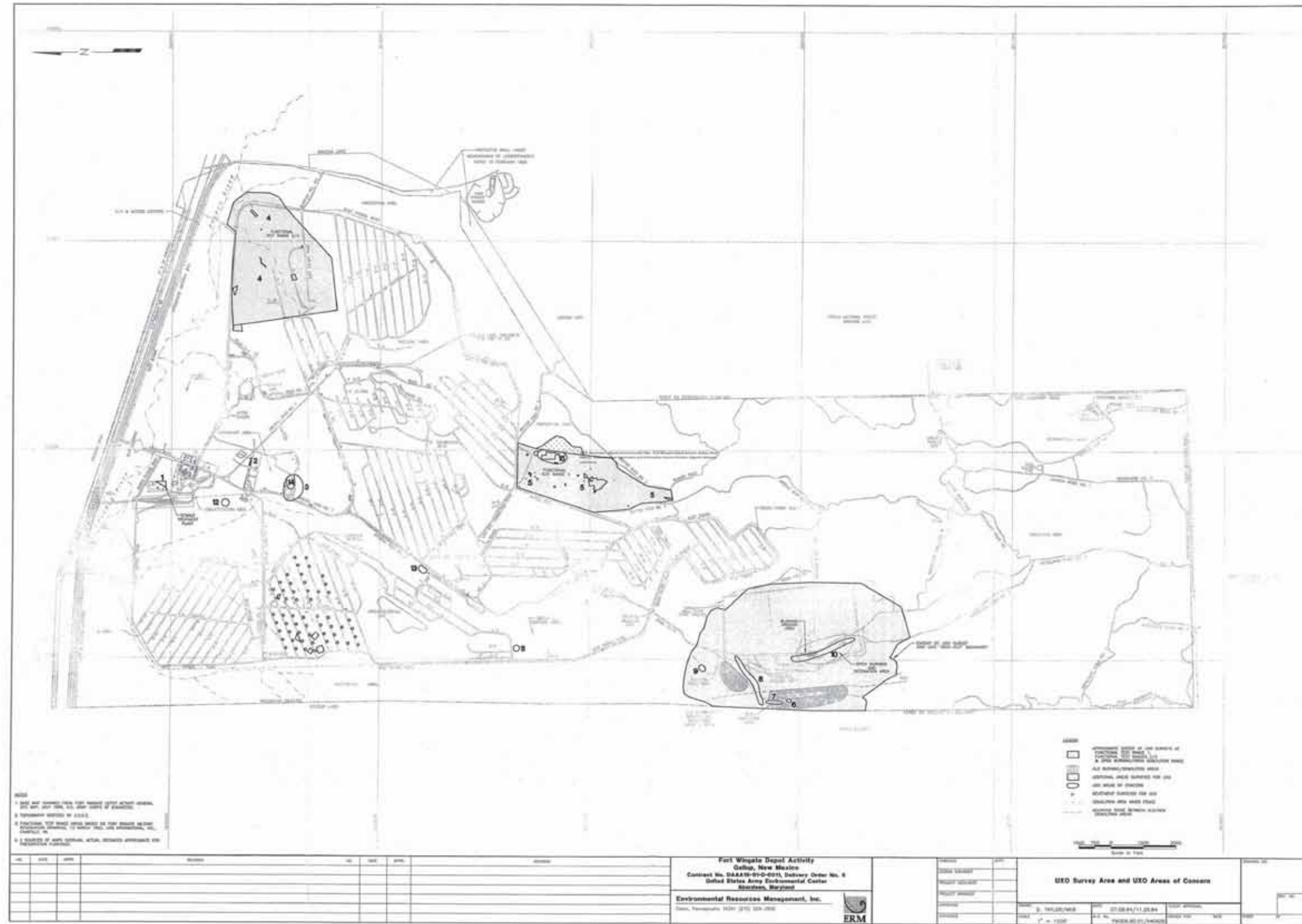


Figure 3-6. 1994 UXO Survey Areas and UXO Areas of Concern

Source: 1994, December. Document No. 94-5 (FW94-9), Final Report Fort Wingate Depot Activity Unexploded Ordnance (UXO) Survey Report, Environmental Resources Management (ERM).

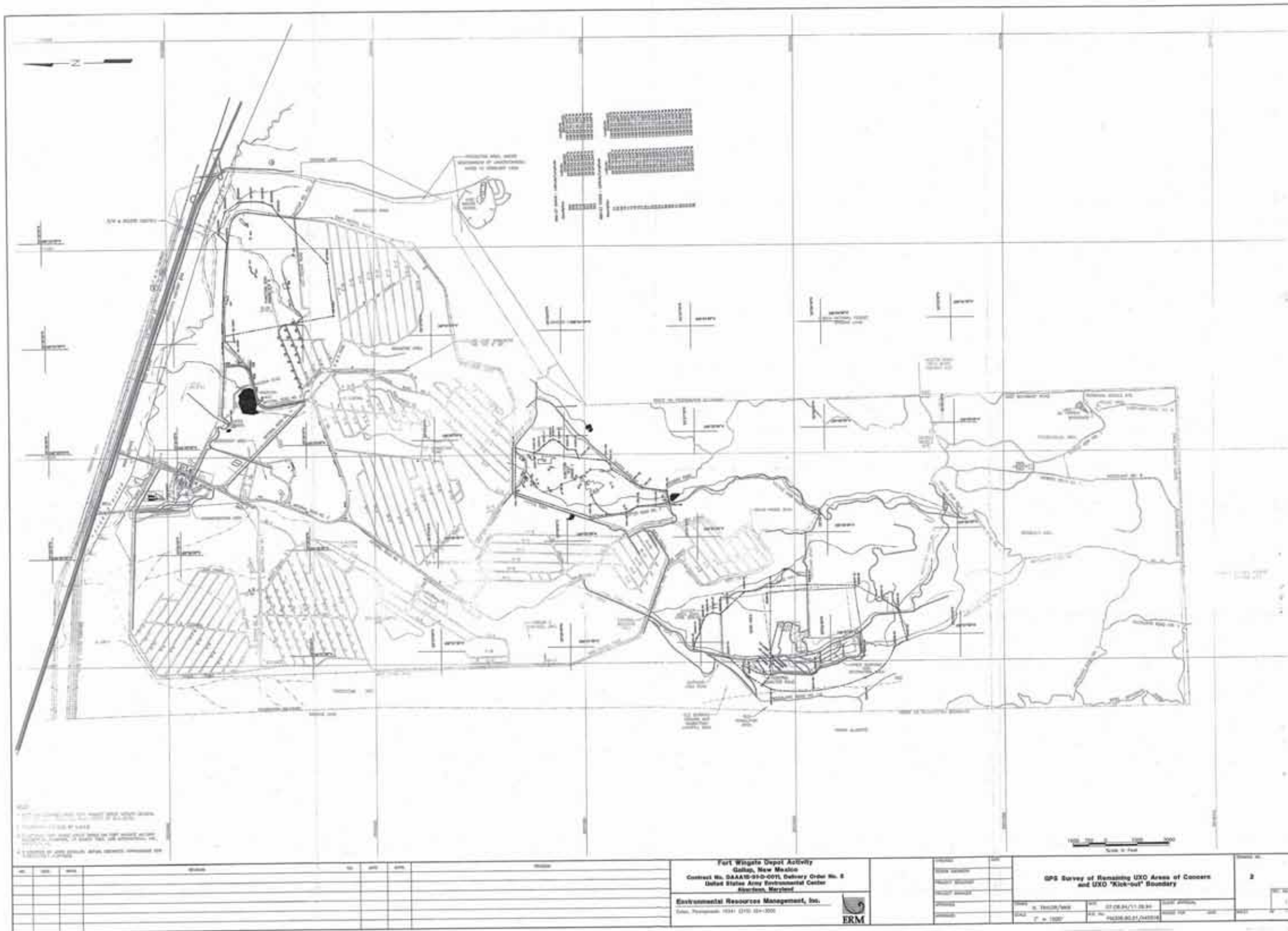
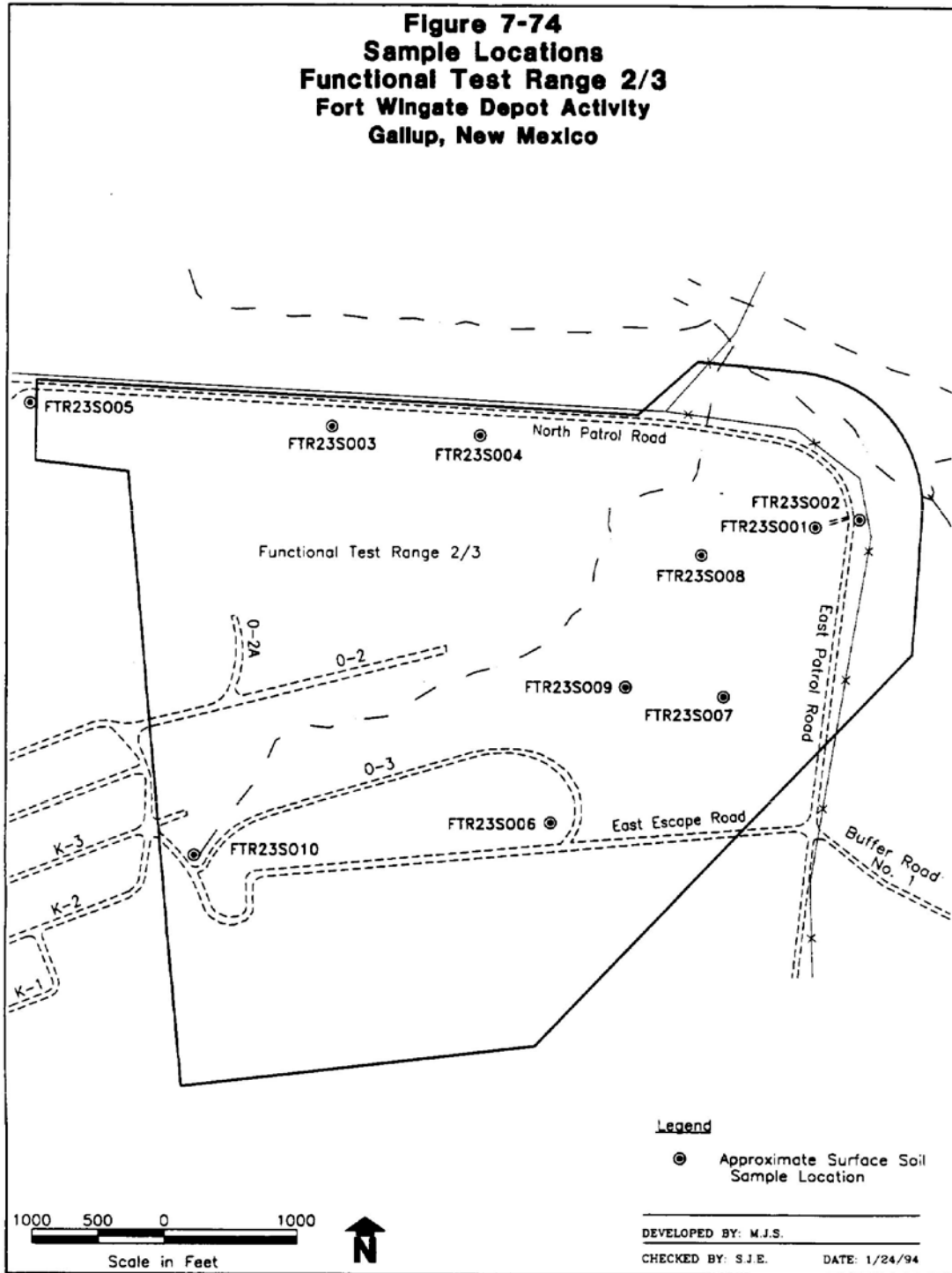


Figure 3-7. 1994 GPS Survey of Remaining UXO Areas of Concern

Source: 1994, December. Document No. 94-5 (FW94-9), Final Report Fort Wingate Depot Activity Unexploded Ordnance (UXO) Survey Report, Environmental Resources Management (ERM).

Figure 7-74
Sample Locations
Functional Test Range 2/3
Fort Wingate Depot Activity
Gallup, New Mexico



ERM PMC

PM306.80.01/07 19.93-MKB/11 05.97-DST/1132-1A

Figure 3-8. 1994 Sample Locations for Functional Test Ranges 2 and 3
 Source: 1997, November. Document No. 97-5 (FW97-8). Fort Wingate Depot Activity, Gallup, New Mexico, Final Remedial Investigation/Feasibility Study & RCRA Corrective Action Program Document, ERM Program Management Company (ERM).

This page left blank

This page left blank

Sediment Sample Analytical Results.

- No VOCs, SVOCs, explosives, or pesticides were detected, and no nitrate/nitrite or total phosphorus was detected above background levels in the sediment samples.
- Barium was detected in ESE11 (868 µg/g) in exceedance of the background level (484 µg/g).
- Lead was detected in ESE09 (16.8 µg/g) in exceedance of the background level (16.4 µg/g).

The background data used for comparison of these samples are no longer relevant.

3.2.10 UXO Removal Action FTR 2/3, 1998

From 1996 through 1998 a contractor conducted a UXO removal action at FTR 2/3. This removal action had three components:

- 100% surface clearance of 611 acres;
- Subsurface clearance of approximately five (5) acres, and
- Subsurface sampling of 11.5 acres.

The contractor removed five (5) OE items during the surface clearance. No UXO or OE items were found during the subsurface clearance or the subsurface sampling. The subsurface sampling was a statistically based investigation to randomly identify areas for 100% subsurface investigation, and then based on the findings of that random sample, make determinations of future investigations/clearances. The specific grid and survey data in FTR 2/3 are shown on Figure 3-10 and the document excerpts are shown in Appendix B.

3.2.11 Reuse Plan for Fort Wingate Depot Activity, 2005

This report provides the future land use plans for various areas of the FWDA. The lands will revert to the Navajo Nation and the Pueblo of Zuni. Parcel 16 is to be used for "Mixed Commercial / Institutional /Office".

3.2.12 Aerial Photographic Analysis Report, 2006

Table 3-2 contains detailed analysis of the aerial photographs reviewed. Appendix B contains the document excerpts of the aerial analysis, and the aerial photographs used for this review are in Appendix C.

3.2.13 Airborne Geophysical Survey, 2009

In January 2009 a low-altitude geophysical survey was conducted over FTR 2/3. The objective of the airborne geophysical survey was to acquire vertical magnetic gradient data to provide an indication of the level of UXO contamination and areas of pits and trenches, and to localize potential sources with sufficient positional accuracy (a few tens of cm) to permit ground-based reacquisition of targets. The airborne geophysical data are shown Figures 3-11, 3-12, and 3-13 and the document excerpts are in Appendix B.

This page left blank

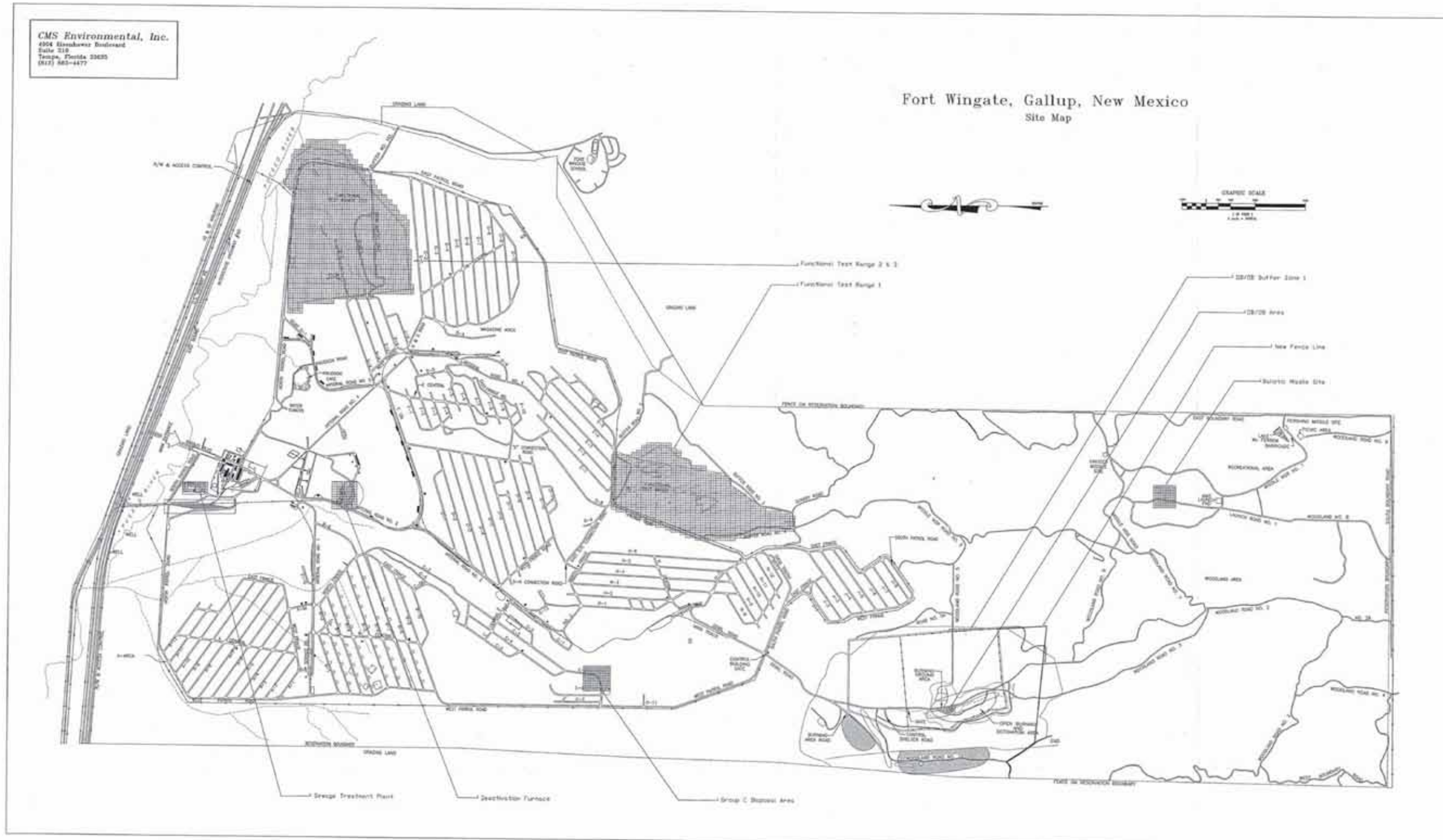


Figure 3-10. 1998 Grid Map for OE Sampling and Removal Action
 Grid Map Source: 1998, December 18. Final Removal Report, OE Sampling and Removal Action, Ft. Wingate, New Mexico.
 (Contract #DACA87-94-D-0030, Task Order 0004), Volume I and II, CMS Environmental, Inc.

This page left blank

Table 3-2. Aerial Photograph Review Summary

Year	Summary Analysis Findings	Specific Details of Analysis of SWMU 16
1935	No significant findings	"Trenches", outside Parcel 16
1948	Three areas of stacked materials or structures are present in the northern portion of the site. A graded area is present to the east. Two stained probable burn areas are present. An area of ground scarring is also present.	<ul style="list-style-type: none"> - Northern road - Graded area, near western end SWMU, "stacked material/Structures" - Out crop - northern end "stacked material/structure" - Out crop South end of FTR - Stained areas, south end of FTR - Eastern Road "graded area"
1952	Four rectangular graded areas are visible in the northern portion of the site.	<ul style="list-style-type: none"> -Northern road - Graded area, near western end SWMU, same area as 1948 "stacked material/Structures" - Outcrop – northern end is "graded area" - as area 1948 "stacked material/structure" - Outcrop – southern end "debris" area Eastern Road "graded area" – same as 1948
1958	Mounded material has been added to the previously cleared area located in the northwestern portion of the site. A cleared area is present in the eastern portion of the site. Graded areas remain.	<ul style="list-style-type: none"> Northern road - Graded area, near western end SWMU (same area as 1948, 1952) Outcrop - northern end is "graded area" – same as 1952 "graded area" and same areas as 1948 "stacked material/structure" , Outcrop – central area "cleared area" Outcrop – southern end "cleared area/Probable debris". Same area as 1952 "debris" area Eastern Road "graded area" – same as 1948 Northeast end of FTR, near northern road, bermed or depressed area appears, depicted and identified as FTR 2 in 1980 & 1981 document figures.
1962	Medium-toned mounded material is present in the northwestern portion of the site. Graded areas and cleared areas are present in the central and eastern portions of the site.	<ul style="list-style-type: none"> -Northern road - Graded area, near western end SWMU (same area as 1948, 1952, & 1958) - Outcrop - northern end is "graded area" - as areas as 1952, 1958 & 1948 "stacked material/structure" - Outcrop – central area "cleared area", same area as 1958 - Outcrop – southern end "cleared area/Probable debris. Same area as 1952 "debris" area & 1958 "cleared area/Probable debris". -Northeast end of FTR, near northern road, appears bermed or depression area. Appears to be same area as depicted and identified as FTR 2 in 1980 & 1981 document figures. -Also appears a "road, or centerline" of FTR area. -South central area of FTR possible impact area of FTR 3
1966	Medium-toned mounded material is present in the northwestern portion of the site. Graded areas and cleared areas are present in the central and eastern portions of the site.	<ul style="list-style-type: none"> Northern road - Graded area, near western end SWMU (same area as 1948, 1952, 1958, 1962) Outcrop - northern end is "graded area" - as areas as 1948, 1952, 1962 and in 1958 "stacked material/structure" Outcrop – central area "cleared area", same area as 1958 and 1962 Outcrop –southern end, "cleared area", same as 1962 "cleared area/Probable debris. Same area as 1952 "debris" area & 1958 "cleared area/Probable debris".
1973	Graded areas remain on site. Debris or objects are located within the easternmost graded area. Dark-toned objects or debris are present south of the graded areas. A stained or burned area and a bermed pit are present near the center of the site. Several other dark-toned areas are located within and near the southern portion of the site.	<ul style="list-style-type: none"> -Northern road - Graded area, near western end SWMU (same area as 1948, 1952, 1958, 1962, 1966) - Outcrop - northern end is "graded area" on north and south sides are "debris/objects" – same as areas as 1948, 1952, 1962, 1966 and in 1958 "stacked material/structure" - Outcrop –southern end, "staining/Burn" area. Same area as 1966 "cleared area", same as 1962 "cleared area/Probable debris. Same as area 1952 "debris" & 1958 "cleared area/Probable debris". - Outcrop south of central– serpentine line of "objects/equipment" -Southwest end of FTR, southeast of K block, two "dark" areas -Eastern road – "graded area". - South end near road, "dark material, probably debris" - Southern road, south side "dark" area. -Northeast end of FTR, near northern road, appears bermed or depression area. Appears to be same area as depicted and identified as FTR 2 in 1980 & 1981 document figures. Also seen in 1962.

Table 3-2. Aerial Photograph Review Summary

Year	Summary Analysis Findings	Specific Details of Analysis of SWMU 16
1978	Graded areas remain although appear inactive. Probable debris or dark objects are visible with a drainage ditch in the eastern portion of the site. An impoundment or pond is present in the southern portion of the site. Disturbed ground and a graded area are visible southeast of the site.	<ul style="list-style-type: none"> -Northern road - Graded area, near western end of SWMU (same area as 1948, 1952, 1958, 1962, 1966, 1973) - Outcrop - northern end is "graded area"- same area as 1973 "graded area" on north and south sides and "debris/objects" are same as areas as 1948, 1952, 1962, 1966 and in 1958 "stacked material/structure" -South of central Outcrop – "objects/debris" – same areas as 1973 serpentine line of "objects/equipment" -East of K-block – "disturbed ground" -Eastern road – "graded area" same as 1973 and 1948 -Northeast end of FTR, near northern road, appears bermed or depression area. Appears to be same area as depicted and identified as FTR 2 in 1980 & 1981 document figures. Also seen in 1962, 1958.
Year	Summary Analysis Findings	Specific Details of Analysis of SWMU 16
1985	The dark-toned objects or debris remain. The impoundment or pond remains to the south.	<ul style="list-style-type: none"> -South of central Outcrop – "objects/debris" – same areas as 1978, 1973 serpentine line of "objects/equipment" - Northeast end of FTR, near northern road, appears bermed area configured, depicted and identified as FTR 2 in 1980 & 1981 document figures; same as 1973, 1962, 1958. -South central area of FTR possible impact area of FTR 3, same area as 1962
1991	Graded areas remain; however, appear inactive. Dark-toned objects or materials and the impoundment or pond remain.	<ul style="list-style-type: none"> -Northern road - Graded area, near western end SWMU (same area as 1948, 1952, 1958, 1962, 1966, 1973, 1978) -South of central Outcrop – "objects/debris" – same areas as 1985, 1978, 1973 serpentine line of "objects/equipment" - East of K-block – "disturbed ground", same area as 1978
1993	The dark-toned objects or equipment remains in the northern portion of the site. The impoundment or pond remains to the south.	<ul style="list-style-type: none"> -South of central Outcrop – "objects/debris" – same areas as 1991, 1985, 1978, 1973 serpentine line of "objects/equipment" -Northeast end of FTR, near northern road, appears bermed or depression area appears to be same area as depicted and identified as FTR 2 in 1980 & 1981 document figures. Also seen in 1962, 1958 and 1973. -Eastern road – "graded area" same as 1973 and 1948, is apparent but not noted.
1997	The impoundment or pond remains	

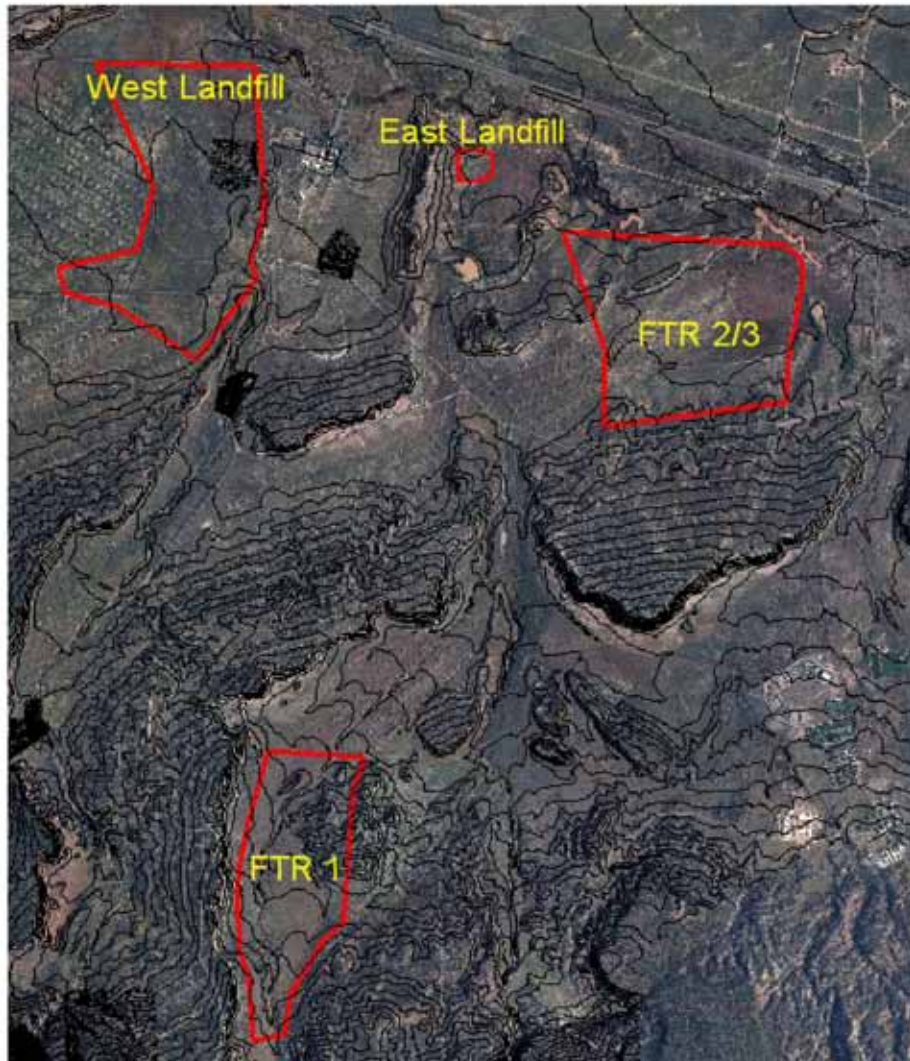


Figure 1.1. Aerial photo of the northern survey blocks with topographic contours.

Figure 3-11. 2009 Airborne Geophysical Survey Areas, Aerial View

Source: 2009, January. Final Report on Airborne Geophysical Survey at Fort Wingate Depot Activity, McKinley County, New Mexico. Battelle-Oak Ridge Operations.

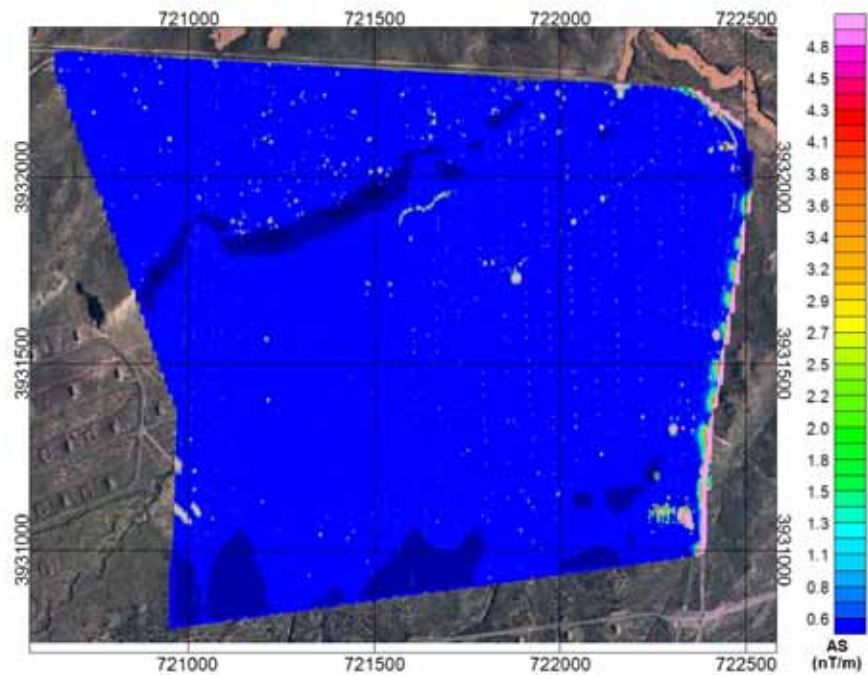


Figure 5.8. Analytic Signal map of the FTR 2/3 site. The lightly and darkly shaded areas indicate where the flight altitude was more than 5 and 10 meters respectively.

Figure 3-12. 2009 Airborne Geophysical Survey Analytic Signal Map of FTR 2/3

Source: 2009, January. Final Report on Airborne Geophysical Survey at Fort Wingate Depot Activity, McKinley County, New Mexico. Battelle-Oak Ridge Operations.

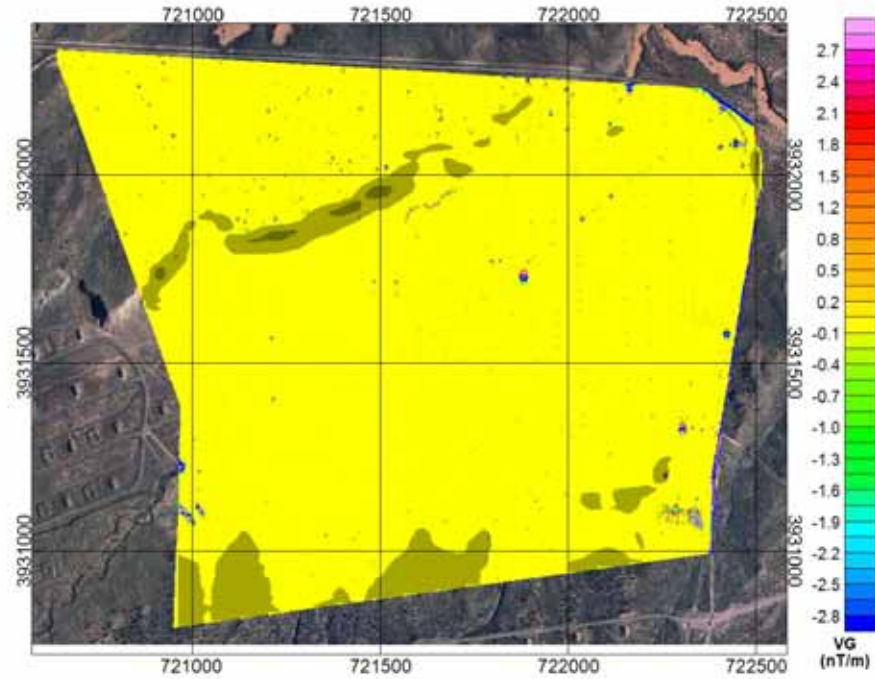


Figure 5.7. Vertical magnetic gradient of FTR 2/3 area. The lightly and darkly shaded areas indicate where the flight altitude was more than 5 and 10 meters respectively.

Figure 3-13. 2009 Airborne Geophysical Survey Vertical Magnetic Gradient of FTR 2/3
 Source: 2009, January. Final Report on Airborne Geophysical Survey at Fort Wingate Depot Activity, McKinley County, New Mexico. Battelle-Oak Ridge Operations.

3.2.14 Final Soil Background Study, 2010

The Background Study was performed for the USACE, Albuquerque District, under Contract Number W912BV-07-D-2004, Delivery Order DM01. This Background Study included advancing soil borings, collecting and analyzing surface and subsurface soil samples from each soil boring, surveying each soil boring location using a hand-held GPS, and performing soil boring abandonment. The activities described in this report provided representative soil samples of sufficient quantity and quality to determine background concentrations of the 23-element Target Analyte List (TAL) metals in soil at the FWDA. The results from the Background Study will be used to make a statistical determination on the nature and occurrence of inorganic constituents in soil at the FWDA based on site-to-background comparisons. The document excerpts are in Appendix B.

3.3 Historical Drawing Review Analysis

The FWDA historical drawing files from the 1940s through 1996 were reviewed to define the historical area, use or dimensional information contained in the drawings. Pre-1960 General Site Maps do not depict a firing test range in the area. The most useful information was found on the General Site Maps from the early to mid-1960s in which the FTRs are depicted and the drawings show various dimensional and location information. Table 3-3 contains a detailed analysis of the historical drawings that were reviewed and showed changes to the use of Parcel 16 over time.

Table 3-3. Historical Drawing Review Summary

Drawing and Date	FTR	Area "K"
A-1-12, General Layout Plan, 1943	Nothing shown in the northeast corner of FWDA	Depicts 27 Igloos (numbered I-1524 to I-1550), and a Safety shelter (numbered 224) located in the center of the area between I-1538 and I-1539
C-8-9, Land Use Map, 1947	Shows six (6) X-sites around the outer perimeter for open storage; four (4) correspond to Z-sites on C-10-4, but X-6 and X-3 do not correspond to Z sites.	Same as above
C-9-30, General Site and Building Use Map, 1963	Shows the FTR 2/3, northeast corner of FWDA identified as "functional test Site No. 140" -depicts a 1200' Firing point area -Impact area center line from the firing point to the southwest and depicts a firing fan -shows a 300' area beyond the firing fan to the northwest, southeast and southwest.	Shows Area "K", identifies three types of structures - 27 Underground igloos (numbered 1524 to 1550) with concrete fork lift truck loading aprons in asphalt surface aprons. -19 four-sided barricaded outside storage sites numbered Y1524 to Y1549) with unimproved loading apron. -5 four-sided barricaded outside storage sites (numbered Y-K1 to Y-K5) in igloo magazine area with gravel surfaced loading aprons. These are located to the south of Area "K" - 8 four-sided barricaded outside storage sites (numbered Y-K1A to Y-K10; Y-K3A and Y-K7A are not shown) in igloo magazine area with gravel surfaced loading aprons. These structures extend in the firing fan and buffer area of FTR 2/3.
C-10-4, Index & Open Storage Plan, 1966	Shows the FTR 2/3, northeast corner of FWDA -depicts Firing Point Center Service Magazine and 2 observer sites -Impact area center "target line" from the firing point to the southwest 1300 yds and depicts a firing fan. -shows a 300' area beyond the firing fan to the northwest, southeast and southwest.	Shows Area "K", identifies three types of structures - 27 Buildings or structures, Permanent. (numbered K-1524 to K-1550) -19 Buildings or structures, Temporary (numbered Y1524 to Y1549). -5 Buildings or structures, Temporary (numbered Y-K1 to Y-K5) These are located to the south of Area "K" - 8 Buildings or structures, Temporary (numbered Y-K1A to Y-K10, Y-K3A and 7A are not shown) These structures extend into the firing fan and buffer area of FTR 2/3 -14 Open storage sites (numbered Z-120 – Z-123; Z126 – Z128, and Z133 to Z139)
A-2-7, General Site Map, 1986	Northeast corner of FTR depicts "A.P.C. Monitoring Station #3" – East Patrol road at the start of turning south. Appears same spot as RI/FS surface soil	Depicts 27 Underground magazines (numbered I-1524 to I-1550), -19 Buildings or structures, Temporary (numbered Y1524 to Y1549). -8 Buildings or structures, Temporary (numbered Y-K1A to Y-K10, Y-K3A and 7A are not shown) These structures extend in the firing fan and buffer area of FTR 2/3
C-10-15 Master Building and Structure Numbering Plan, 1970 (Same drawing as 1963 above, amended in 1970)	Same as C-9-30 above	Same as above, with text added "K 1524 – K1550 Igloos" Legend – K1524 – K1550 Northeast 60' igloo magazines.

This page left blank

4.0 Area of Concern 41 – K Block Igloos

4.1 Location, Description, and Operational History

Most of the central portion of FWDA property is occupied by magazine facilities for storing ammunition. The area containing FWDA's magazine/igloos (igloo) is approximately 7,400 acres or about 1/3 of the installation's land. Figure 2-3 shows the location of the igloo areas.

FWDA contains 731 earth-covered concrete igloos in ten clusters (areas) across FWDA, designated A – H, J and K. The igloos vary in size; however, each is a concrete structure with a door and is earth covered. The igloo areas are served by a network of roads and railroads. Block K has 27 earth covered igloos reported to be 60 feet long and originally covered with two feet of rock and soil. The igloo construction is concrete floor, walls, and vaulted ceilings. The original construction included interior floor drains sloped to drain to outlets in the head wall on each side of the door. The igloos were vented and had a grounding system for lightning strikes.

Explosives stored in the igloos were containerized. No information has been found to suggest that other types of hazardous materials were stored in these facilities. No records were found to indicate that loose powder has ever been stored in the Magazine/ Igloo Area or that any of the individual magazine units have had explosions or releases of explosives to the environment. Table 4-1 provides a listing of the reports reviewed that had information pertaining to Area K Igloos and a summary of the results of that review.

4.2 Previous Investigations

4.2.1 The Installation Assessment, 1980

The report provides a summary of the igloos' use, "presently stored at the installation are 62,143 kilograms of high explosives in 731 igloo type magazines." This report shows that Area K was used to store "mines, 155mm and 8-inch HE projectiles." This report also states, "There are no records of manufacture, storage or use of chemical, biological, or radiological agents at FWDA." Figure 3-2 shows the approximate location of the Igloo Areas and Appendix B contains the pertinent excerpts from the document.

4.2.2 The Environmental Survey, 1981

This report mentions the igloo areas and presents results of groundwater sampling data of samples collected in other igloo areas. There is no information pertinent to Area K igloos. Figure 3-2 shows the approximate location of the Igloo Areas and Appendix B contains the pertinent excerpts from the document.

4.2.3 The Enhanced Preliminary Assessment Report, 1990

This survey acknowledges material handling and storage practices and acknowledges "there is no evidence of substantial releases" ...it is suspected that most of the magazines contain explosive-contaminated dusts produced over 40 years". Figure 3-2 shows the approximate location of the Igloo Areas.

This page left blank

Table 4-1. AOC 41 Document Summary Table

Document	Summary of Report	Recommendations
Final Report Installation Assessment of Fort Wingate Depot Activity, Gallup, New Mexico, Report No. 136, 1980	This reports states: "presently stored at the installation are 62,143 kilograms of high explosives in 731 igloo type magazines". This report shows that Area K was used to store "mines, 155mm and 8-inch HE projectiles. This report also states, "There are no records of manufacture, storage or use of chemical, biological, or radiological agents at FWDA."	None
<i>Final Report Environmental Survey of Ft. Wingate Depot Activity, Gallup New Mexico, 1981</i>	Mentions the igloos in reference to groundwater sampling; however, no mention of Area K igloos.	None
<i>Enhanced Preliminary Assessment Report: Fort Wingate Depot Activity, Gallup, New Mexico 1990</i>	Identifies the area within FWDA that contains "igloos" in 10-clusters (designated A-H, J, and K) and that the structures were used to store high-explosive ordnance and other munitions.	Appropriate investigations and decontamination of dust-containing magazines prior to release of the igloos and associated property.
<i>Fort Wingate Depot Activity, NM6213820974, Gallup, New Mexico. RCRA Facility Assessment Report, 1990</i>	Magazine Area: sprawls across center of FWDA, consists of 731 earth-covered concrete igloos for storing ammunition.	None
<i>Master Environmental Plan: Fort Wingate Depot Activity, Gallup, New Mexico 1990</i>	Provides Igloo use and area information. This reports a potential that the interiors contain fugitive dust comprised of explosive material.	Prior to release for other uses; thoroughly sample chip samples from floors. Surface soil sampling (6 -12 inches deep) from stained areas. Analysis for explosives. If results show elevated readings, in-depth sampling should be implemented; soil borings, concrete borings, analyzed for explosives.
<i>Final Community Environmental Response Facilitation Act (CERFA) Report, 1994</i>	Munitions stored for 40 years. Presumed explosive residue on interior and exterior because of spillage or drainage from igloos. Interior wipe and exterior sampling was conducted during the RI/FS, and results indicated the presence of explosive compounds on interior surfaces and in adjacent soils.	None
<i>Fort Wingate Depot Activity, Gallup, New Mexico, Final Remedial Investigation/Feasibility Study & RCRA Corrective Action Program Document, 1997</i>	AOC 41 data gathering activity and results were: - 6 wipe samples were collected from the interior of K block igloos and analyzed for explosives; one sample was detected for explosives. - 6 surface soil samples were collected in K block, analyzed for explosives, nitrate/nitrite, and total phosphorus. Two explosives results detected above screening levels in one sample; another sample detected nitrate/nitrite above background. The background data used for comparison of these samples are no longer relevant	None – Baseline Risk assessment summary: Samples exceed background – Yes Samples exceed screening levels – Yes Site proceed to Human Health Risk Assessment – Yes The risk assessment summary of the K-block interior states "EPA recommends using 1×10^{-5} as a lower bound; therefore, further action is recommended at this time for igloo interiors from a human health perspective.

Table 4-1. AOC 41 Document Summary Table

Document	Summary of Report	Recommendations
<i>Aerial Photographic Site Analysis, Fort Wingate Depot Activity, 2006</i>	12 aerial photographs of FWDA; the photographs show the use of FWDA between from 1935 to 1997. These photographs were reviewed; analysis and findings are presented on each photograph. -Igloo configuration unchanged; number varied over the years -Older structures to the northeast and south of K Block igloos appear in 1935 aerial photograph in the Parcel 16 area.	None

Unexploded Ordnance Survey Reports

Document	Summary of Report	Recommendations
<i>Final Report Fort Wingate Depot Activity Unexploded Ordnance (UXO) Survey Report, 1994</i>	UXO survey and removal of UXO for 555 acres in FTR 2/3. No live ordnances were discovered.	Surface debris be removed in the areas of heavy surface contamination, and a subsurface investigation performed.
<i>Final Removal Report, OE Sampling and Removal Action, Ft. Wingate, New Mexico, 1998</i>	Surface clearance of 611 acres, subsurface clearance of 5 acres, and subsurface sampling of 11.5 acres. Conclusion: "after performing a 100% surface clearance but less than 1% subsurface clearance, it remains inconclusive the level of subsurface OE contamination possibly remaining at Site 4" (FTR 2/3).	HTW exists in grid BDI 5 based upon the visible stains remaining on the ground after the work force recovered loose explosives in the grid.

4.2.4 The RCRA Facility Assessment Report, 1990

This report contains no information or discussion about the Magazine/Igloo areas at FWDA.

4.2.5 The Master Environmental Plan

This report is a continuation report of the previous assessments and surveys. The report repeats the historic use information, and recommends sampling of exterior soils and interior for fugitive dust. Table 4-1 contains the recommended sampling.

4.2.6 CERFA Report, 1994

This report provides general information about all the magazine/igloo areas size, historical use. In section 20 of this report, it states, "Interior wipe and exterior soil sampling was conducted as part of the ongoing RI/FS. The results were made available for regulatory review on 28 January 1994. Results indicate the presence of explosive compounds on the interior surfaces and in soils adjacent to selected igloos.

4.2.7 Remedial Investigation/Feasibility Study, 1997

The RI/FS included sampling and analysis of surface soil and interior wipe samples of igloo areas. Igloo locations that were sampled are shown on Figure 4-1.

Surface Soil Sampling

153 surface soil samples were collected in the Areas D, E, F, G, H, J and K and analyzed for explosives, nitrate/nitrite, and total phosphorus. Six samples were collected in Area K at igloos K1537 and K1540.

Surface Soil Sample Explosives Results

No explosives were detected in surface soil samples from igloos located in Blocks D, E, F, G, H, or J. In Block K, however, one sample (K1540SO01) contained three explosive compounds, two at concentrations above screening levels. The compounds detected were 2,4-DNT at 510 µg/g; 2,6-dinitrotoluene (2,6-DNT) at 20.5 µg/g; and 2,4,6-TNT at 1.78 µg/g.

Surface Soil Sample Nitrate/nitrite Results

Nitrate was found at a concentration (110 µg/g) above the background level of 30.0 µg/g in one surface sample (K1540SO02) in Igloo Block K. The background data used for comparison of these samples is no longer relevant

Wipe Samples

129 wipe samples were collected from interior walls of igloos in Blocks D, E, F, G, H, J, and K; six wipe samples were collected in Block K. One explosive was detected in samples from Igloo Block K. 2,4,6-TNT was detected in Igloo K1537 (K1537-I at 0.020 µg/cm²); no other explosives were detected in Block K.

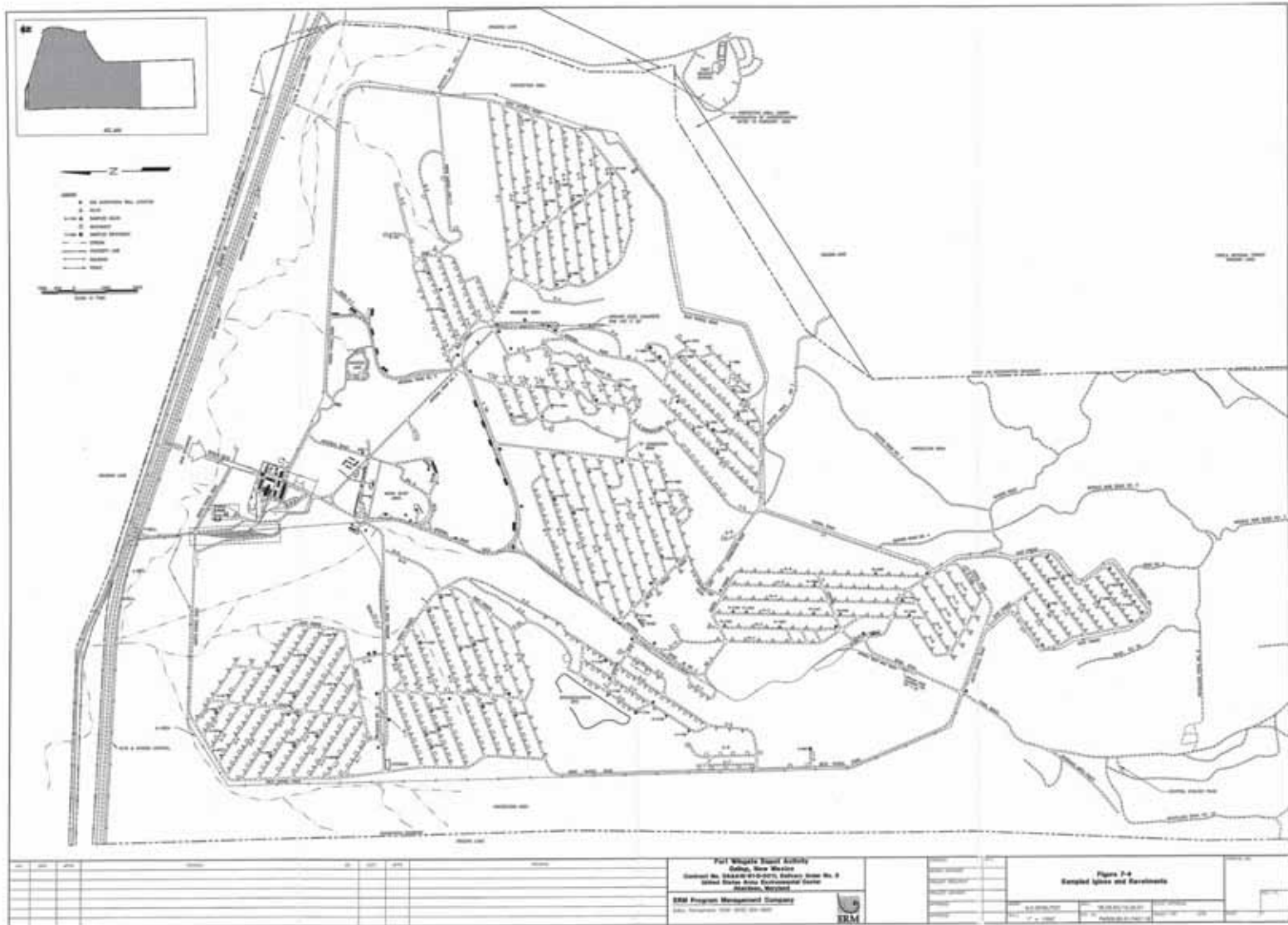


Figure 4-1. 1997 Sampled Igloos and Revetments
 1997, November. Document No. 97-5 (FW97-8). Fort Wingate Depot Activity, Gallup, New Mexico,
 Final Remedial Investigation/Feasibility Study & RCRA Corrective Action Program Document, ERM Program Management Company (ERM).

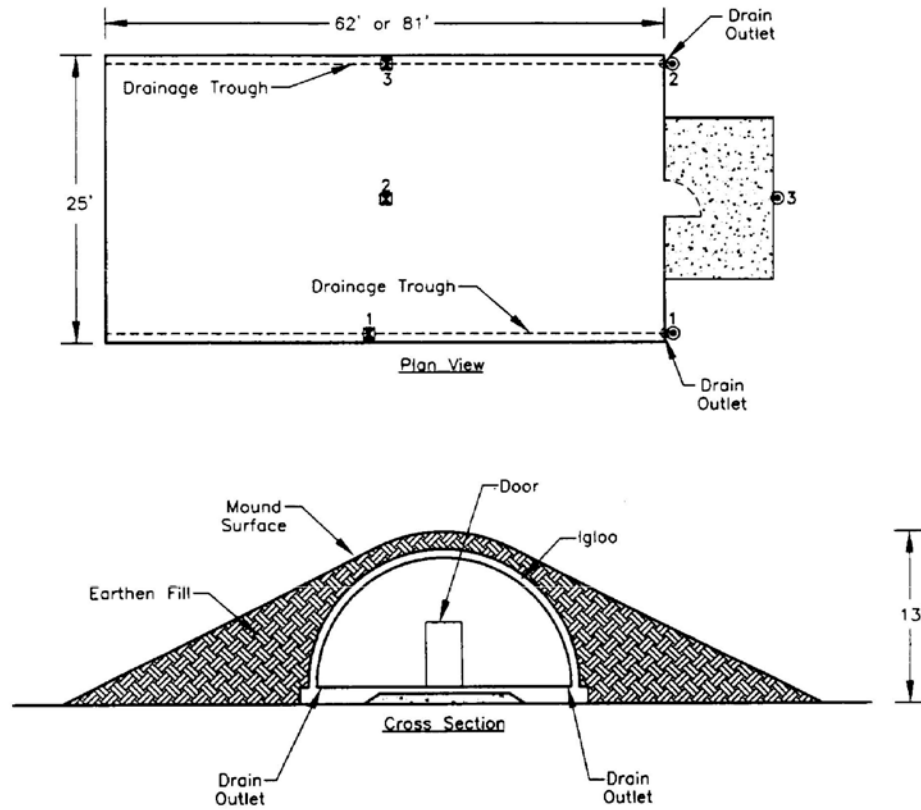
4.2.8 Historical Aerial Photograph Analysis

A comparison of the photographs taken in 1935 and 1948 shows that K Block was built within that time frame. However, the 1935 aerial shows the presence of open storage areas in the Parcel 16 area. In general, the review of the photo history revealed no unusual notes or activity within Area K Block. Appendix C contains the aerial photographs that were reviewed.

4.2.9 Historical Plate Drawing Review

The FWDA historical drawing files from 1950s through 1996 were reviewed to define the historical area, use or dimensional information contained in the drawings. The historical drawings all depict the Igloo K block unchanged, and all of the figures show the historical storage areas or structures that pre-date the Area K igloos. Figure 4-2 shows the typical igloo construction and layout.

**Figure 7-5
Typical Igloo Sample Locations
Fort Wingate Depot Activity
Gallup, New Mexico**



Legend

- Wipe Sample Location
- ⊙ Surface Soil Sample Location
- Concrete Pad

Schematic, Not to Scale
All dimensions are approximate.

DEVELOPED BY: M.J.S.
CHECKED BY: S.J.E. DATE: 1/24/84

ERM PMC

PM306.80.01/07.19.93-MKB/10.17.97-DST/1113

Figure 4-2. 1997 Typical Igloo Sample Locations
November. Document No. 97-5 (FW97-8). Fort Wingate Depot Activity, Gallup, New Mexico, Final Remedial Investigation/Feasibility Study & RCRA Corrective Action Program Document, ERM Program Management Company (ERM).

5.0 WWI Magazine Sites and Other Areas of Use

No information was found regarding the WWI Magazine Sites referred to in the contract's statement of work.

Other areas of use in Parcel 16 are areas that are not identified in the details of the historical environmental survey or investigation documents, but were identified through a review of the historical drawings and aerial photographs. All of these areas are shown on Figure 5-1.

The historical drawing of 1966 showed 14 "open storage sites" in and around Parcel 16 surrounding the FTR 2/3, and the 1935 aerial photograph showed 21 pre-World War II munitions storage areas. These areas and structures were located in both Area K Block Igloos and into the central part of FTR 2/3, but most, if not all of these sites, are no longer evident in more recent drawings and aerial photographs. The combined aerial photograph analysis shows 23 areas in and around Parcel 16 that were used for material storage or handling or depict some form of use.

This page left blank

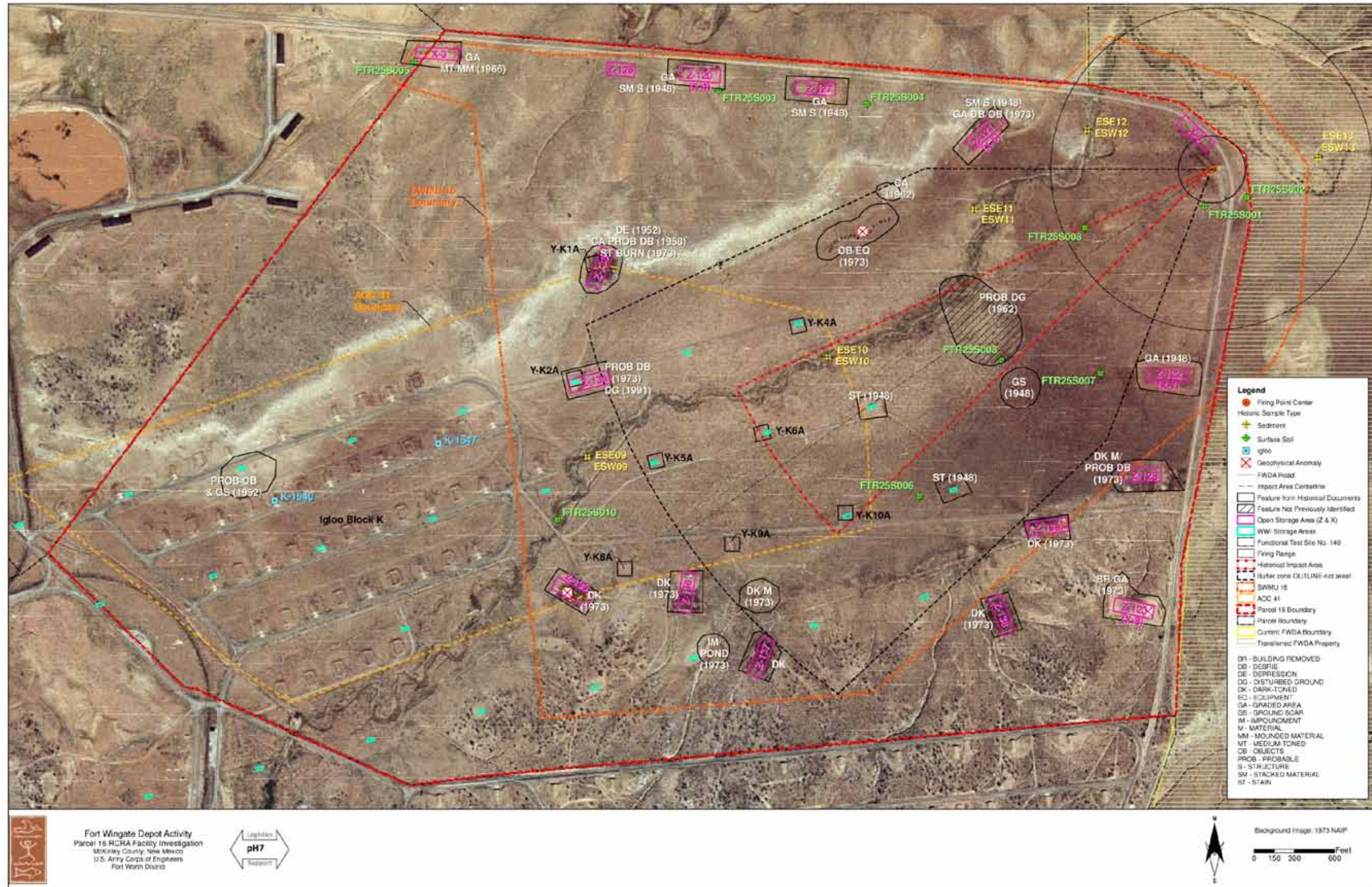


Figure 5-1. Historical Land Use

This page left blank

6.0 Summary and Conclusions for Parcel 16

6.1 Findings

FTR Area. The FTR 2/3 area is the most heavily reported upon area in Parcel 16. The location of the area is consistent through the documented history. Early documents represent FTR 2 as a smaller area near the North Boundary road, but the 1990 Master Environmental Plan joins the two ranges that is now called FTR 2/3. The literature and documents remain consistent that the use of the ranges has been to test explosives, 3.5-inch rockets and 4.2-inch mortars. FTR 2/3 has three areas based on use: (1) the northeastern-most end of the FTR, which has historically been designated as the "firing point" for the ranges; (2) the cone-shaped impact area where shells and rounds were most likely to land; and (3) a surrounding buffer zone where off-target munitions could land.

Area K Block Igloos. The K Block igloos are mentioned in each of the historic reports as being part of the munitions storage area. Area K Block Igloos consists of 25 concrete earth-covered munitions storage magazines and 19 bermed uncovered revetment areas used for temporary storage of munitions. Area K Blocks were used to store mines, 155 mm and 8-inch high explosive projectiles. There is no record of Area K Block igloos being used to manufacture, store or use chemical, biological, or radiological agents.

WWI Magazine Sites. No information was found about the WWI Magazine sites.

The samples collected during the RI/FS were partially consistent with the Master Environmental Plan, which called for sediment sampling of the drainages, and surface samples of the impact crater area.

Five (5) sediment samples were collected from the arroyo, which is the primary drainage for this end of FWDA. The samples were analyzed for explosives and metal as recommended; the results were below screening levels along the arroyo.

Ten (10) discrete surface samples were collected and analyzed for explosives and metals. The sampling locations shown on Figure 4-1 are discrete samples collected at mostly perimeter locations with two samples collected in the area that may be the impact area for the range. The samples were analyzed for explosives and metal as recommended; the results were below screening levels. The background data used for comparison of these samples are no longer relevant.

Six (6) surface soil samples were collected in and around the drains of K Block igloos K1537 and K1540 and analyzed for explosives, nitrate/nitrite, and total phosphorus. Explosive compounds 2,4-DNT and 2,6-DNT were detected above screening levels in one sample, and nitrate was detected above background in one sample. Six wipe samples were collected from K Block igloos K1537 and K1540; one of these samples detected a low level of 2,4,6-TNT.

The aerial geophysical survey conducted in 2010 showed four areas of high metallic content. During a site walk, the metallic anomaly located in the north central area of FTR 2/3 was determined to be a live stock water tank; as a result that anomaly will not be investigated. There were three (3) areas of interest: two (2) areas southwest of FTR 2/3 and one (1) area south of the outcrop in central Parcel 16. The aerial photographs show that each of these areas has been used for many years as materials storage areas and each is shown with surface discoloration as a result of that use.

6.2 Data Gaps

- The ten (10) discrete surface soil samples collected during the RI/FS do not provide adequate lateral or vertical site characterization data.
- The igloo sampling in the RI/FS confirmed the release of explosives to both the interior surface of the igloo and the drainage; however, the lateral extent of that release is not known.
- The geophysical survey indicated four areas of higher metallic anomalies that are also shown in aerial photographs as discolored areas. One of these was identified as a stock tank, but the other three have not been characterized.
- The aerial photographs depict discoloration of certain areas, but specific details of what caused the discoloration cannot be determined from the document review.

7.0 References

- 1980, January. Document No. 80-1, *Final Report Installation Assessment of Fort Wingate Depot Activity, Gallup, New Mexico*, Report No. 136, US Army Toxic and Hazardous Materials Agency.
- 1981, September. Document No. 80-3 (FW81-1), *Final Report Environmental Survey of Ft. Wingate Depot Activity, Gallup New Mexico*. Environmental Science and Engineering, Inc. (ESE).
- 1990, March. Enhanced Preliminary Assessment Report: Fort Wingate Depot Activity, Gallup, New Mexico, US Army Toxic and Hazardous Materials Agency.
- 1990, September. Document No. 90-3 (FW 90-5), *Fort Wingate Depot Activity, NM6213820974, Gallup, New Mexico*. RCRA Facility Assessment Report, PRC Environmental Management, Inc.
- 1990, December. *Master Environmental Plan: Fort Wingate Depot Activity, Gallup, New Mexico*. Environmental Assessment and information Science Division, Argonne National Laboratory.
- 1992, *Final Technical Plan for the Environmental Investigation at Fort Wingate Depot Activity*. Metcalf & Eddy, Inc., November 6, 1992. FWDA Information Repository Document Number FW 92-4.
- 1994, April 11. *Final Community Environmental Response Facilitation Act (CERFA) Report*, Fort Wingate Depot Activity, Gallup, New Mexico. Environmental Resources Management, Inc. (ERM).
- 1994, December. Document No. 94-5 (FW94-9), *Final Report Fort Wingate Depot Activity Unexploded Ordnance (UXO) Survey Report*, Environmental Resources Management (ERM).
- 1995, July. Document number F.W. 95-5, *Archives Search Report*, Fort Wingate, US Army Corp of Engineers.
- 1997, November. Document No. 97-5 (FW97-8). Fort Wingate Depot Activity, Gallup, New Mexico, Final Remedial Investigation/Feasibility Study & RCRA Corrective Action Program Document, ERM Program Management Company (ERM).
- 1998, December 18. *Final Removal Report, OE Sampling and Removal Action, Ft. Wingate, New Mexico*. (Contract #DACA87-94-D-0030, Task Order 0004), Volume I and II, CMS Environmental, Inc.
- 2006, September. *Aerial Photographic Site Analysis*, Fort Wingate Depot Activity, Fort Wingate, New Mexico. Environmental Research, Inc.
- 2005, USDA, Natural Resources Conservation Service, Soil Survey of McKinley County Area, New Mexico, McKinley County and Parts of Cibola and San Juan Counties.
- 2005, *Reuse Plan for Fort Wingate Depot Activity*. U.S. Department of the Interior, August 31, 2005.
- 2009, January. Final Report on Airborne Geophysical Survey at Fort Wingate Depot Activity, McKinley County, New Mexico. Battelle-Oak Ridge Operations.
- 2010, March. Soil Background Study and Data Evaluation Report, Fort Wingate Depot Activity, Gallup New Mexico. Shaw Environmental, Inc.