RCRA FACILITY INVESTIGATION
WORK PLAN
PARCELS 12, 14 AND 25
FINAL

FORT WINGATE DEPOT ACTIVITY
McKinley County, New Mexico

27 June 2008

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Prepared for:

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LIST OF ACRONYMS

°F	degrees Fahrenheit
ADA	air defense artillery
AOC	Area of Concern
BEC	BRAC Environmental Coordinator
bgs	below ground surface
BIA	Bureau of Indian Affairs
BLM	Bureau of Land Management
BRAC	Base Realignment and Closure
BRACD	BRAC Office
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CFR	Code of Federal Regulations
CLP	Contract Laboratory Program
DOD	Department of Defense
DOI	Department of the Interior
DOT	Department of Transportation
DQO	Data Quality Objective
DRO	Diesel Range Organic Compounds
EIMS	Environmental Information Management System
FWDA	Fort Wingate Depot Activity
GPS	Global Positioning System
HWB	Hazardous Waste Bureau
HWMU	Hazardous Waste Management Unit
ID	Identification
IDW	Investigation Derived Waste
LDR	Land Disposal Restriction
MD	munitions debris
MI	Multi-Incremental
mm	millimeter
MS	Matrix Spike
MSD	Matrix Spike Duplicate
MSL	mean sea level
NAD	North American Datum
NELAP	National Environmental Laboratory Accreditation Program
NMED	New Mexico Environment Department
NRCS	Natural Resources Conservation Service
OB/OD	Open Burning/Open Detonation
OVM	Organic Vapor Monitor
PA	Programmatic Agreement
PCB	Polychlorinated Biphenyl
PPE	Personal Protective Equipment
QA	Quality Assurance
QA/QC	Quality Assurance/Quality Control
QC	Quality Control
QSM	Quality Systems Manual

LIST OF ACRONYMS (CONTINUED)

RCRA	Resource Conservation and Recovery Act
RFI	RCRA Facility Investigation
SRHI	Summary Report of Historical Information
SSHP	Site Safety and Health Plan
SUXOS	Senior Unexploded Ordnance Supervisor
SVOC	Semi-volatile Organic Compound
SWMU	Solid Waste Management Unit
TCL	Target Compound List
TCP	Traditional Cultural Property
TEAD	Tooele Army Depot
TSD	treatment, storage, and disposal
USACE	U.S. Army Corps of Engineers
USEPA	U.S. Environmental Protection Agency
USGS	U.S. Geological Survey
VOC	Volatile Organic Compound
WSMR	White Sands Missile Range

ES.0 EXECUTIVE SUMMARY

This Resource Conservation and Recovery Act (RCRA) Facility Investigation (RFI) Work Plan for Parcels 12, 14 and 25 at Fort Wingate Depot Activity (FWDA) describes the proposed investigations to be conducted as part of the environmental restoration program at FWDA. This document has been prepared for submission to the New Mexico Environment Department (NMED) Hazardous Waste Bureau (HWB), as required by Section VII.H.1 of RCRA Permit No. NM 6213820974.

This RFI Work Plan has been revised to address review comments provided by NMED HWB in an Approval with Direction letter dated 9 January 2007 (NMED, 2007). NMED comments and FWDA responses are provided in Appendix A. Confirmation and summary of the Tribal consultation process are provided in Appendix G.

ES.1 PURPOSE

The purpose of this Work Plan is to summarize previous investigation and restoration activities at Areas of Concern (AOCs) located within Parcels 12, 14 and 25, and propose additional investigations necessary to determine a course of action for these AOCs.

As required by the Permit, this document was prepared in conjunction with and is submitted as a companion to the Release Assessment Report (TPMC, 2007a).

This Work Plan contains information for two AOCs in Parcels 12, 14 and 25, as follows.

AOC 93 Bivouac and Tank Training Area; and

AOC 75 Former electrical transformer locations within Parcels 12, 14 and 25.

ES.2 PROPOSED INVESTIGATIONS

Based on the information presented in this Work Plan and referenced historical documents, additional RFI activities are proposed as follows.

AOC 93

The debris and empty rocket motor tubes observed within the AOC 93 will be removed and disposed, or recycled, as part of a future housekeeping action; no removal will take place as part of the RFI activities described in this Work Plan. Removed materials generated by future actions will be disposed or recycled off-site in accordance with all federal, state, and local requirements.

Soil sampling will not be performed at the gravel pits in Parcel 14. Soil sampling will be completed at the borrow pit, debris piles and ground scar (former trench

locations) in Parcel 12 to determine if a release of hazardous constituents has occurred. As shown in Figure 3-3, discrete soil samples will be collected from the low points within each pit or debris pile. This sampling strategy results in the collection of a total of 13 soil samples.

Post removal sampling will be completed, as a separate contract action, after the demolition debris has been removed to determine if a release of hazardous constituents has occurred to the underlying soils. The removal of debris will not take place as part of the RFI activities described in this Work Plan.

Each discrete soil sample will be analyzed for Target Compound List (TCL) volatile organic compounds (VOCs), TCL semi-volatile organic compounds (SVOCs), TCL polychlorinated biphenyls (PCBs), diesel range organic compounds (DRO), metals, and asbestos.

The sampling data derived from this effort will be used to evaluate the possibility of a release of hazardous constituents in previously unevaluated trenches, pits and other disturbed ground within AOC 93 and to assess if a potential release represents an unacceptable risk to human receptors.

AOC 75

Based on the findings described in Section 4.0, there is no evidence to suggest that the AOC 75 location in Parcel 12 poses a threat to human health or the environment. No further characterization is proposed at this time.

1.0 INTRODUCTION

This Resource Conservation and Recovery Act (RCRA) Facility Investigation (RFI) Work Plan for Parcels 12, 14 and 25 at Fort Wingate Depot Activity (FWDA) describes the proposed investigations to be conducted as part of the environmental restoration program at FWDA. This document was prepared by TerranearPMC, LLC of Exton, Pennsylvania, in partial fulfillment of the requirements of Task Order No. 0005 under Contract W9126G-06-D-0016. Contracting Officer's Representative 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 required by Section VII.H.1 of the 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 RFI Work Plan has been revised to address review comments provided by NMED HWB in an Approval with Direction letter dated 9 January 2007 (NMED, 2007). NMED comments and FWDA responses are provided in Appendix A.

In accordance with Permit Condition VIII.B.1 - Prior Consultation Requirements, FWDA has consulted with the Pueblo of Zuni and the Navajo Nation as part of the preparation process for this Work Plan. Confirmation and summation of the Tribal consultation process are provided in the Appendix G.

1.1 PURPOSE/OBJECTIVE

The purpose of this Work Plan is to summarize previous investigation and restoration activities at Areas of Concern (AOCs) located within Parcels 12, 14 and 25 and propose additional investigations necessary to determine a course of action for these AOCs.

A companion Release Assessment Report for Parcels 11, 12, 14 and 25 provides additional detail on previous investigation and restoration activities for the AOCs located in Parcels 12, 14 and 25.

2.0 BACKGROUND

2.1 GENERAL DESCRIPTION

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. Since 1975, the installation has been under the administrative command of Tooele Army Depot (TEAD), located near Salt Lake City, Utah. 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. 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).

FWDA currently occupies approximately 24 square miles (approximately 15,277 acres) of land in northwestern New Mexico, in McKinley County. The installation is located 8 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 minor maintenance of assigned commodities, primarily conventional military munitions. The installation mission included the disassembly and demilitarization of unserviceable and obsolete military munitions. Ammunition maintenance facilities existed for the clipping, linking, and repackaging of small arms ammunition.

The installation is almost entirely surrounded by federally owned or administered lands, including both national forest and Tribal lands. The installation can be divided into several areas based upon location and historical land use. These major land-use areas include (Figure 2-2):

The Administration Area - located in the northern portion of the installation and encompassing approximately 800 acres; contains former office facilities, housing, equipment maintenance facilities, warehouse buildings, and utility support facilities;

The Workshop Area - located south of the Administration Area and encompassing approximately 700 acres; consisting of an industrial area containing former ammunition maintenance and renovation facilities, the former TNT washout facility, and the TNT Leaching Beds Area;

The Magazine (Igloo) Area - covering approximately 7,400 acres in the central portion of the installation and encompassing ten Igloo Blocks (A through H, J and K) consisting of 732 earth-covered igloos and 241 earthen revetments previously used for storage of munitions;

Protection and Buffer Areas - encompassing approximately 4,050 acres consisting of buffer zones surrounding the former magazine and demolition areas; these areas are located adjacent to the eastern, northern, and western boundaries of the installation; and

The Open Burning/Open Detonation (OB/OD) Area - located within the west central portion of the installation and encompassing approximately 1,800 acres; the OB/OD Area can be separated into two subareas based on period of operation, the Closed OB/OD Area and the Current OB/OD Area. The OB/OD Unit Hazardous Waste Management Unit (HWMU) is an area within the Current OB/OD Area.

FWDA operations in Parcels 12, 14 and 25 ended with the closure of FWDA in January 1993.

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.

Parcels 12, 14 and 25 are northern property buffer areas. According to the most recent reuse plan (DOI, 2005), Parcels 12 and 14 planned reuse is commercial, while Parcel 25 will remain as rights-of-way.

This Work Plan contains information for AOCs within Parcels 12, 14 and 25. The Permit lists a total of two AOCs within Parcels 12, 14 and 25, as follows (Figure 2-3). AOC 93 (Bivouac and Tank Training Area) is located in Parcels 11, 12 13, 14, 16, 18, and 25. AOC 75 includes one former electrical transformer location in Parcel 12.

Specific operations and investigations conducted at the AOCs located in Parcels 12, 14 and 25 are discussed in the section for each respective AOC (Sections 3.0 through 5.0).

2.2 SITE CONDITIONS

2.2.1 Climate

Northwestern New Mexico is characterized by a semiarid continental climate. Most precipitation occurs from May through October as localized and brief summer storms. Spring and fall droughts characterize the area.

Mean annual rainfall for the area ranges between 10 and 16 inches, while the recorded average annual precipitation for FWDA is 11 inches. Depending on local elevations, mean annual rainfall fluctuates between 8 and 20 inches. Most of the precipitation occurs as rain or hail in summer thunderstorms, and the remainder results from light winter snow accumulations (M&E, 1992).

The average seasonal temperatures for the area vary with elevation and topographic features. During winter, daily temperatures fluctuate as much as 50

to 70 degrees Fahrenheit (°F) in a 24-hour period. In summer, daily high temperatures are between 85°F and 95°F (M&E, 1992). Average temperatures in winter are about 27°F and in summer 70°F, while extreme temperatures are as low as -30°F in winter and as high as 100°F in summer. There are 100 to 150 frost-free days during the year from the middle of May to the middle of October (M&E, 1992).

The area has generally sunny weather, with the sun shining more than 3000 hours annually. Average relative humidity varies from 50 to 15 percent, during the wet season (fall) and the dry season (spring), respectively (M&E, 1992). During spring, the area experiences strong winds from the west and southwest, with an average wind speed of 12 miles per hour. Strong wind, high temperature, and low relative humidity in the area contribute to high evaporation rates (M&E, 1992).

2.2.2 Topography

Topography and watersheds facility-wide are shown in Figure 2-4. Topography and storm drainage culverts in and around Parcels 12, 14 and 25 are shown in Figure 2-3.

Topographically, FWDA may be divided into three areas: (1) the rugged north-to-south trending Hogback along the western and the southwestern boundaries; (2) the northern hill slopes of the Zuni Mountain Range in the southern portion; and (3) the alluvial plains marked by bedrock remnants in the northern portion of the installation. The Hogback area is formed by interbedded Mesozoic sedimentary rocks dipping sharply to the west and is dissected by northeastern-trending intermittent streams. During rainfall and snowmelt events, streams transport sediment to low-lying areas in the northern part of the installation, creating an extensive alluvial deposit among remnants of bedrock. The streams eventually discharge to the South Fork of the Rio Puerco near the northern boundary of FWDA.

The elevation of FWDA ranges from approximately 8,200 feet above mean sea level (MSL) in the south to 6,660 feet above MSL in the north. Main drainages, following the topography, flow from south to north and discharge to the South Fork of the Rio Puerco. However, many tributaries follow the regional trend, flowing from southwest to northeast. Because of the nature of precipitation in this semi-arid region, the surface drainage is relatively shallow near headwaters. Downward erosion intensifies as the stream moves downstream, resulting in a system of well-developed steep-walled arroyos. Arroyos form because of the erodibility of localized areas of silt- and clay-rich bedrock.

As shown in Figure 2-3, Parcels 12, 14 and 25 generally slope to the Rio Puerco valley. Surface runoff during rainfall /snowmelt events generally drains via overland flow and small channels to the Rio Puerco.

2.2.3 Vegetation/Habitat

The vegetation covertypes for Parcel 12, 14 and 25 include moderate grasslands and sagebrush.

2.2.4 Soils

The soils found on the installation are similar to those occurring in cool plateau and mountain regions of New Mexico. The major soil types at FWDA are variants/complexes of sands, loams, clays, and rocks. These soils are relatively thin, and the parent bedrock is either at or near the surface in more than a quarter of the installation. Natural Resources Conservation Service (NRCS) soils mapping for Parcels 12, 14 and 25 is shown in Figure 2-5. NRCS soils descriptions are included in Appendix B.

As shown in Figure 2-5 and Appendix B, the primary soil type in Parcel 12 is the Rehobeth silty clay loam (0 to 1 percent slopes). A small area of Mido loamy fine sand (1 to 6 percent slopes) is present in the extreme northeast corner of the parcel.

As shown in Figure 2-5 and Appendix B, two primary soil types are present in Parcel 14. The Rehobeth silty clay loam (0 to 1 percent slopes) is predominantly found near the Rio Puerco, while the Mido loamy fine sand (1 to 6 percent slopes) is present near the northern parcel boundary. A small area of Celavar-Atarque complex (1 to 8 percent slopes) is present near the southeast portion of the parcel, a small area of Rizno-Tekapo-Rock outcrop complex (2 to 45 percent slopes) is present in the southeastern corner of the parcel, and a small area of Bamac extremely gravelly sandy loam (5 to 50 percent slopes) is present near the southern parcel boundary.

As shown in Figure 2-5 and Appendix B, the primary soil type in the western portion of Parcel 25 is the Celavar-Atarque complex (1 to 8 percent slopes). The Rehobeth silty clay loam (0 to 1 percent slopes), with a small area of Rizno-Tekapo-Rock outcrop complex (2 to 45 percent slopes), is present in the western portion of the parcel. As shown in Figure 2-5 and Appendix B, the primary soil type in the eastern portion of Parcel 25 is the Mido loamy fine sand (1 to 6 percent slopes) with two small areas of Zia sandy loam (1 to 5 percent slopes) intermixed with the Mido.

2.2.5 Geology

In 1997, geologic mapping of portions of FWDA and a fracture trace analysis were conducted by the U.S. Geological Survey (USGS) located in Flagstaff, Arizona. Geologic units exposed at the ground surface throughout much of FWDA were identified. Results of this identification, combined with information from geologic literature, are presented below to provide a detailed description of the geologic and stratigraphic setting of the portion of FWDA in which Parcels 12, 14 and 25 are located.

2.2.5.1 Geologic Summary

FWDA is underlain primarily by Triassic mudstone and sandstone layers that are tilted gently to the northwest. In the western and southern portions of the installation; however, Jurassic and Cretaceous sandstone and claystone layers are exposed along the Nutria Monocline (the Hogback), which is a steeply west dipping, north trending monoclinal fold.

2.2.5.2 Stratigraphy

Recent alluvial sediments cover much of the land area in the Administration and TNT Leaching Beds Area. These sediments consist predominately of silts and clays, with discontinuous bodies of sand and occasionally gravel. To the north of the developed portion of the Administration Area, the near surface sediments are dominated by the substantially more sandy riverine deposits associated with the Rio Puerco.

According to U.S. Soil Conservation Service studies in 1981, four soil units occur on FWDA land: (1) Camborthids-Torriothents soils, which are shallow to deep loams and clays that occur on plains hillslopes (slopes of one to 12 percent) and occupy nearly the entire northeastern quarter of the installation; (2) Torriothents-Rock Outcrop soils, which are shallow, loamy soils and rock outcrop on the dissected plateaus, escarpments, and hillslopes (slopes three to 60 percent) on the north central-western quarter of FWDA; (3) Rock Outcrop-Haplustolls-Argiustolls soils, which are shallow, loamy, and clayey soils, rolling over steep hillsides and canyon walls (slopes of 30 to 70 percent), and are situated in the central (east-to-west) zone, and constitute less than half of the southern portion of the property; and (4) Eutrobocalfs-Argiborolls soils, which are shallow to moderately deep, loams and clays, and occur on slightly sloping to steep areas in the mountainous southeastern part of the installation.

Generally, the soils are loamy or loam/clay mixtures, and contain varying amounts of silt, sand, gravel, and rock fragments. All of these soils are fragile. Wind and water cause extensive soil erosion, especially where vegetative cover is absent.

The alluvial/riverine deposits of the area of investigation are underlain by the Triassic Petrified Forest Formation, which comprises greater than 75 percent of the bedrock exposed at the surface throughout FWDA (Figures 2-6 and 2-7). The Petrified Forest Formation consists primarily of mudstone, claystone, and minor amounts of muddy sandstone. A middle member consisting of a relatively thick, continuous sandstone layer (Sonsela Sandstone Member) separates the upper and lower members.

The Painted Desert Member is the upper member of the Petrified Forest Formation. This member consists of mudstone, siltstone, sandy-mudstone, and lenticular sandstone layers. Sandstone lenses within the Painted Desert Member are thin (generally less than 20 feet thick), laterally discontinuous, and contain high quantities of very fine, muddy matrix. As a result, the apparent permeability

of these lenses, and the Painted Desert Member as a whole, is very low. The Painted Desert Member is exposed at the ground surface on the areas of higher ground surface elevations located east, south, and southwest of the Administration and TNT Leaching Beds Areas (Figure 2-6).

The Sonsela Sandstone Member (middle member of the Petrified Forest Formation) is of variable thickness (20 to 80 feet thick) and is laterally continuous. This unit is a clean, well-sorted, quartzose sandstone that contains very small amounts of matrix and therefore has a high apparent permeability. Below the Sonsela Sandstone Member is the lower member of the Petrified Forest Formation, the Blue Mesa Member. The lithology and apparent permeability of the Blue Mesa Member is similar to that of the Painted Desert Member.

The Moenkopi Formation, the San Andres Limestone, and the Glorieta Sandstone underlie the Blue Mesa Member. The lower Petrified Forest Formation and the Moenkopi Formation consist of 250 to 300 feet of mudstones and sandstones with a relatively low apparent permeability. Below this is approximately 100 feet of the San Andres Limestone underlain by approximately 120 feet of the Glorieta Sandstone.

Younger Jurassic and Cretaceous sandstone and claystone layers have been eroded in the TNT Leaching Beds Area. These units are exposed from the Hogback to the western FWDA boundary. The Jurassic Entrada Sandstone, Zuni Sandstone, and Morrison Formation account for approximately 1,200 feet of section and consist of massive, cross-bedded sandstones with a high apparent permeability. Above these units is a series of Cretaceous claystones and sandstones including the Dakota Sandstone (approximately 200 feet thick), the Mancos Claystone (approximately 600 feet thick), and the Gallup Sandstone (approximately 200 feet thick).

2.2.5.3 Structural Geology

Bedrock underlying the majority of FWDA dips gently to the northwest at an angle of approximately 5 degrees. The structural orientation of the bedrock has a substantial effect upon the movement of ground water. Area-wide ground water flow generally follows the structural dip (i.e., to the north-northwest).

2.2.6 Hydrogeologic Conceptual Model

The hydrogeologic conceptual model developed for the northern portion of FWDA has been created based on the previous investigations for Solid Waste Management Unit (SWMU) 1 and the Administration Area and described in detail in a previous report (PMC, 2001). This conceptual model was developed based on data collected over various investigations performed over a 25-year period prior to issuance of the Permit; at the time of data collection and conceptual model development, the current system of parcels, SWMUs, and AOCs was not in place.

Generally, the previous investigations were attempting to characterize impacts to ground water on a wider basis, primarily those impacts associated with discharges at the TNT Leaching Beds (part of SWMU 1), and secondarily those impacts associated with releases from various locations within the Administration Area.

Because the current corrective action approach (i.e., proceeding parcel by parcel, SWMU by SWMU) had not been developed, the conceptual model uses the broader terminology to describe locations to which the model applies. Parcel 21 is included within the broader areas called "TNT Leaching Beds and the Administration Area" in this section.

A summary of the model is presented below.

2.2.6.1 Unconsolidated Materials

The unconsolidated materials consist of a series of interbedded silt, clay, and sand sediments ranging from near zero feet to almost 100 feet in thickness (Figure 2-8). These sediments form a wedge that increases in thickness from south to north through the TNT Leaching Beds and Administration Area study area. The thickest sediments are found near the Rio Puerco. Claystone bedrock generally underlies the unconsolidated materials.

Two water-bearing zones were identified within the unconsolidated materials (first unconsolidated water-bearing zone and second unconsolidated water-bearing zone) in the area of investigation. In the central portion of the study area (i.e., in the area between the TNT Leaching Beds and the Administration Area), a clay layer exists between two thin, well-sorted sand deposits. Ground water was typically encountered in each of these sand deposits. However, the sand deposits and/or the clay layer are not universally present throughout the area of investigation. Where the clay layer is absent, only the first unconsolidated water-bearing zone is present. In locations where the sand deposits are not present, ground water typically is not present in the equivalent depth interval. Wells Wingate89, Wingate90, Wingate91, SUPPLYWELL 54 (NTUA 16T-602), and SUPPLYWELL 55 (NTUA 16T-538UNC) are screened in the Rio Puerco sediments and are considered undifferentiated because they have most likely been screened across both water bearing zones, if both unconsolidated zones exist at those locations.

Ground water in the unconsolidated sediments is derived from the infiltration and percolation of rain/snow-melt water that moves downward through these sediments until it reaches the relatively low permeability claystone bedrock. The ground water accumulates on the claystone surface and moves slowly downgradient along the erosional surface of the claystone (i.e., generally to the north and northwest). Additionally, data indicate that the Rio Puerco is a losing stream that acts as a hydraulic barrier, inhibiting ground water movement from the TNT Leaching Beds and Administration Area to the north. Figures 2-9, 2-10, 2-11, and 2-12 present two different ground water flow scenarios based upon the data collected during the 2002 and 2003 ground water sampling events. Ground

water levels in the Rio Puerco sediments appear to deflect the north-northwestern flow of ground water from FWDA to the west-northwest, eventually causing the FWDA-derived ground water to merge into the westerly flow of ground water in the Rio Puerco sediments.

Based upon pre-existing data and the new data generated during the current investigation, the unconsolidated sediments found within the Administration and TNT Leaching Beds Areas appear limited in extent to both the south and the east by bedrock outcrops (i.e. ridges) of low permeability claystone. In all cases, where boreholes were completed near these outcrops/subcrops, shallow ground water tended to pinch out. Additionally, south to north trending bedrock ridge subcrops (Figure 2-13) appear to limit the extent of shallow ground water to the west of the Administration Area.

2.2.6.2 Bedrock Materials

Within the predominately claystone bedrock underlying the area of investigation, discrete layers of sandstone have been identified. These sandstone layers are discussed in the following paragraphs.

The third water-bearing zone was identified in four borings at depths ranging from 79 to 106 feet below ground surface (bgs) where it most often occurred in the first thin sandstone unit (first sandstone water-bearing zone) encountered within a thick interval of claystone. During the drilling process, the claystone was observed to be mostly dry, indicating that little vertical movement of water occurs under current conditions. Although moisture was detected in the sandstone unit at each of these four borings, free ground water was recorded in only one of these borings, at a location (monitoring well TMW02) immediately to the west of the TNT Leaching Beds. This sandstone unit was not identified in borings located in the southwest portion of the area of investigation. These data indicate that the first sandstone water-bearing zone is physically discontinuous to the southwest of the TNT Leaching Beds and does not contain quantities of ground water sufficient to recharge a well to the north, east, and far south of the TNT Leaching Beds. “Ground water” in these areas exists only as moisture within the sandstone matrix.

A fourth water-bearing zone (second sandstone water-bearing zone) was identified in a lower sandstone unit in areas to the south, east, and west of the TNT Leaching Beds at depths ranging from 35 to 217 feet. This lower sandstone unit stratigraphically lies beneath the first sandstone water-bearing zone and represents the second sandstone water-bearing zone within the thick claystone interval underlying the study area. As noted above, the claystone is largely dry, suggesting that little vertical movement of water occurs under current rainfall conditions.

Both sandstone units outcrop, or subcrop beneath a thin layer of sediment and/or soil in areas to the south of the TNT Leaching Beds. These outcrop/subcrop locations represent areas in which direct recharge to the sandstone units is possible under current conditions.

Based on the information summarized above, cross sections of the area of investigation were developed and are presented in Figure 2-14.

2.3 ENVIRONMENTAL INVESTIGATION AND RESTORATION ACTIVITIES

The environmental restoration process at FWDA had been underway for 25 years prior to Permit issuance. With the exception of the Open Burning/Open Detonation (OB/OD) Area, environmental restoration activities at FWDA began in 1980 under Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) guidelines, with the U.S. Environmental Protection Agency (USEPA) Region 6 as the lead regulatory agency.

Since that time, the NMED has become the lead regulatory agency, and the pathway for environmental restoration has been evolving for a number of years. 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 (NM 6213820974) was finalized in December 2005 and became effective 31 December 2005 (NMED, 2005).

2.3.1 Previous Investigations

Information from previous environmental investigations and restoration activities have been incorporated into the Work Plan discussion for each AOC in Parcels 12, 14 and 25. In addition, information from a recently completed analysis of historical aerial photographs (ERI, 2006) has been included (Appendix C). Because very little historical information was located for these AOCS, a separate stand alone Summary Report of Historical Information (SRHI) was not generated. The limited historical information found for these AOCs will be presented at the end of the relevant section for each AOC.

A site reconnaissance of the Parcels 12, 14 and 25 AOCs was conducted during the week of 23 October 2006. A team consisting of an environmental professional and a Senior Unexploded Ordnance Supervisor (SUXOS)-qualified professional performed the site reconnaissance. A handheld magnetometer (Schonstedt MAC-51Bx) was used to augment the visual reconnaissance conducted at the Parcel 12, 14 and 25 AOCs and to assist in the detection of any anomalies; munitions handling was not specifically suspected anywhere within these parcels.

2.3.2 Evaluation of Existing Environmental Characterization Data

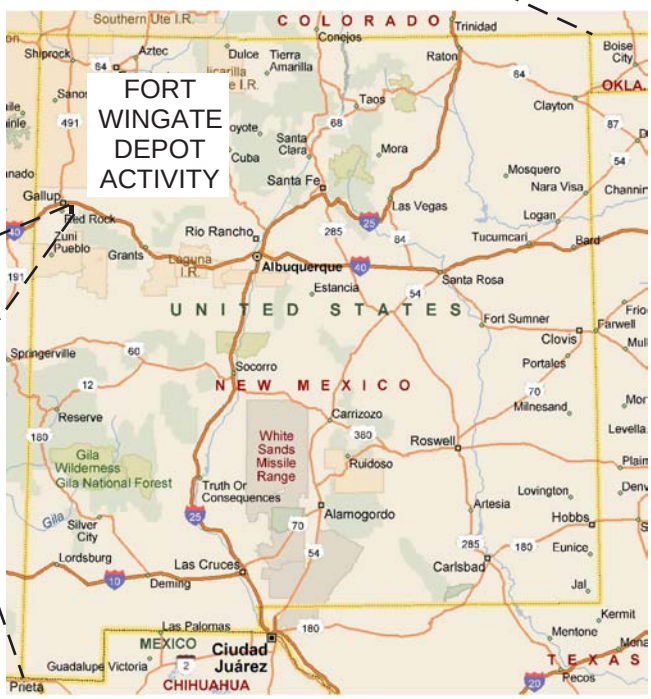
No environmental characterization data were available for the AOCs located in Parcels 12, 14 and 25.

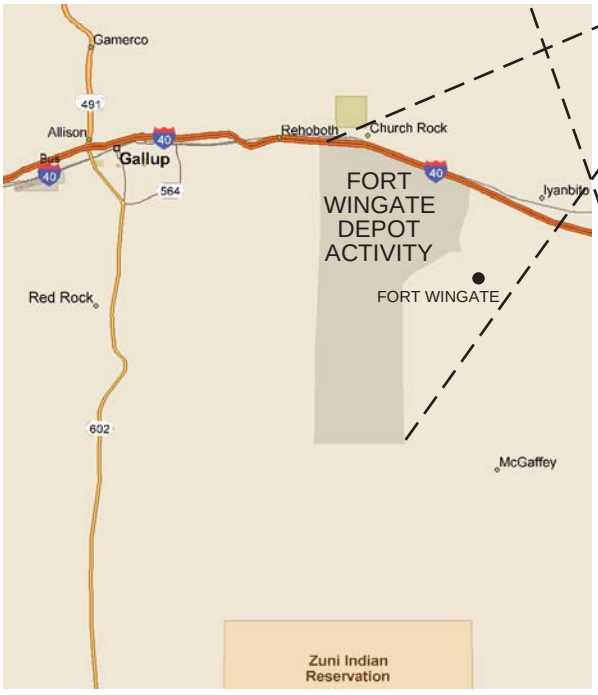
2.3.3 Planned Investigations

Because no environmental data exist for the AOCs in Parcels 12, 14 and 25, the need for additional investigations was evaluated based on perceived data gaps. Existing information is presented and evaluated for each AOC in Sections 3.0

through 5.0. A summary of proposed field investigations is included in Table 2-1. Proposed field investigations at each AOC are discussed in the section for each respective AOC (Sections 3.0 through 5.0).

Figure 2-1
Installation Location
Fort Wingate Depot Activity
McKinley County, New Mexico



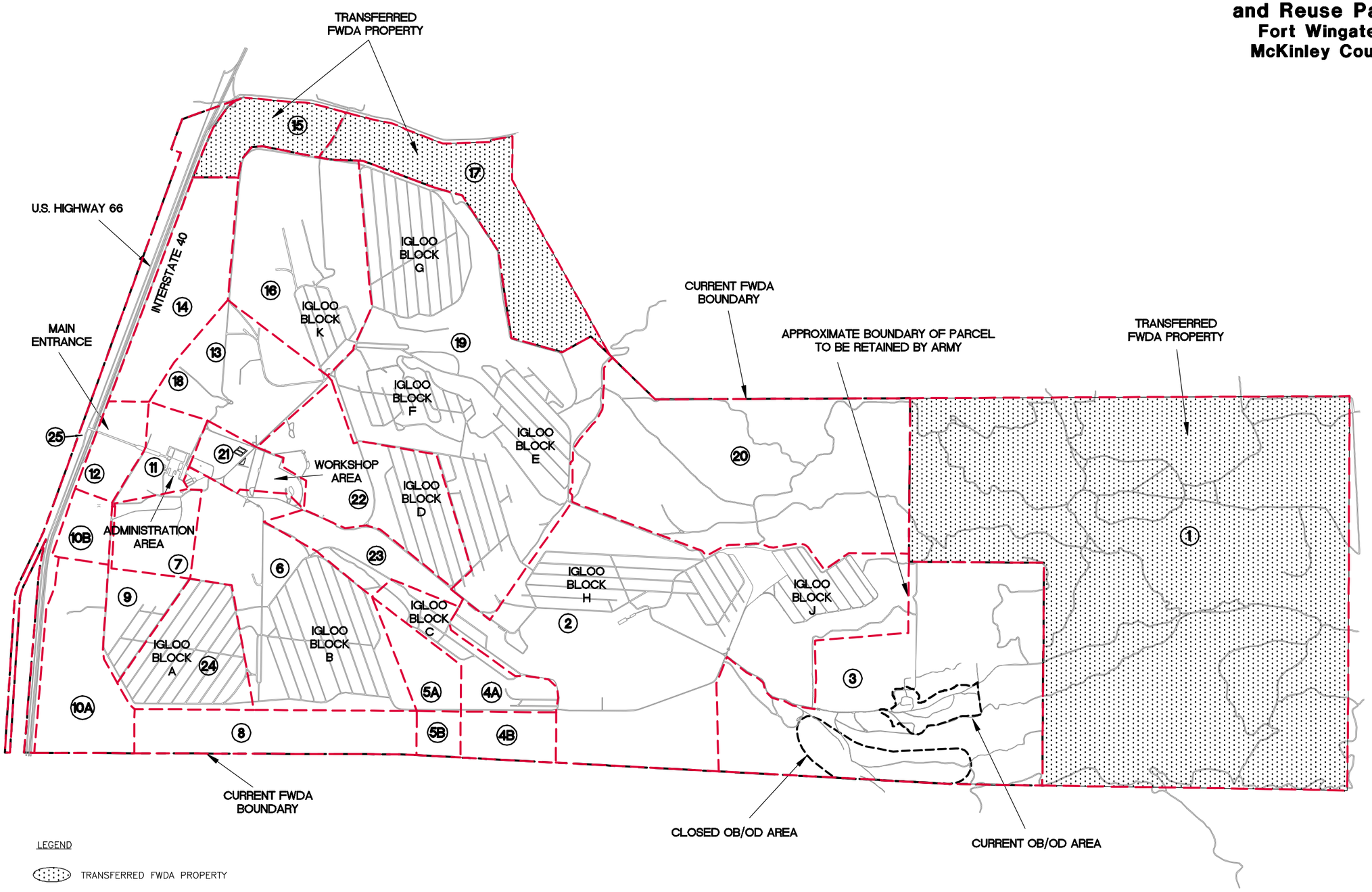


N

NOT TO SCALE

SOURCE: MICROSOFT STREETS & TRIPS, 2006.

Figure 2-2
Historical Land Use and Reuse Parcel Boundaries
Fort Wingate Depot Activity
McKinley County, New Mexico



TerranearPMC, LLC

33205.30/02.26.08–DST/A201 –1B

Figure 2-3
Parcels 12, 14, and 25
Fort Wingate Depot Activity
McKinley County, New Mexico

MAIN ENTRANCE

PART OF AOC 75
TRANSFORMER

AOC 93
BIVOUAC AND TANK
TRAINING AREA

U.S. HIGHWAY 66

INTERSTATE 40

NORTH PATROL ROAD

WEST PATROL ROAD

EAST PATROL ROAD

SERVICE ROAD NO. 1

SERVICE ROAD NO. 2

SERVICE ROAD NO. 3

SERVICE ROAD NO. 4

SERVICE ROAD NO. 5

SERVICE ROAD NO. 6

SERVICE ROAD NO. 7

ARTERIAL ROAD NO. 1

ARTERIAL ROAD NO. 2

ARTERIAL ROAD NO. 3

ARTERIAL ROAD NO. 4

ARTERIAL ROAD NO. 5

NAVAJO BLVD.

NORMAL MAIN AVE.

HUDSON ROAD

ROAD G-1

EAST ESCAPE ROAD

BUFFER ROAD NO. 1

G & C ROAD

WEST FRINGE

EAST FRINGE

NORTH FRINGE

SOUTH FRINGE

CENTRAL

LEGEND

- ARROYOS
- PROPERTY TRANSFER PARCEL BOUNDARY
- PARCELS 12, 14, AND 25 BOUNDARIES
- TRANSFERRED FWDA PROPERTY
- CULVERT

N

1800 900 0 1800

SCALE IN FEET

Figure 2-4
Watershed Map
Fort Wingate Depot Activity
McKinley County, New Mexico

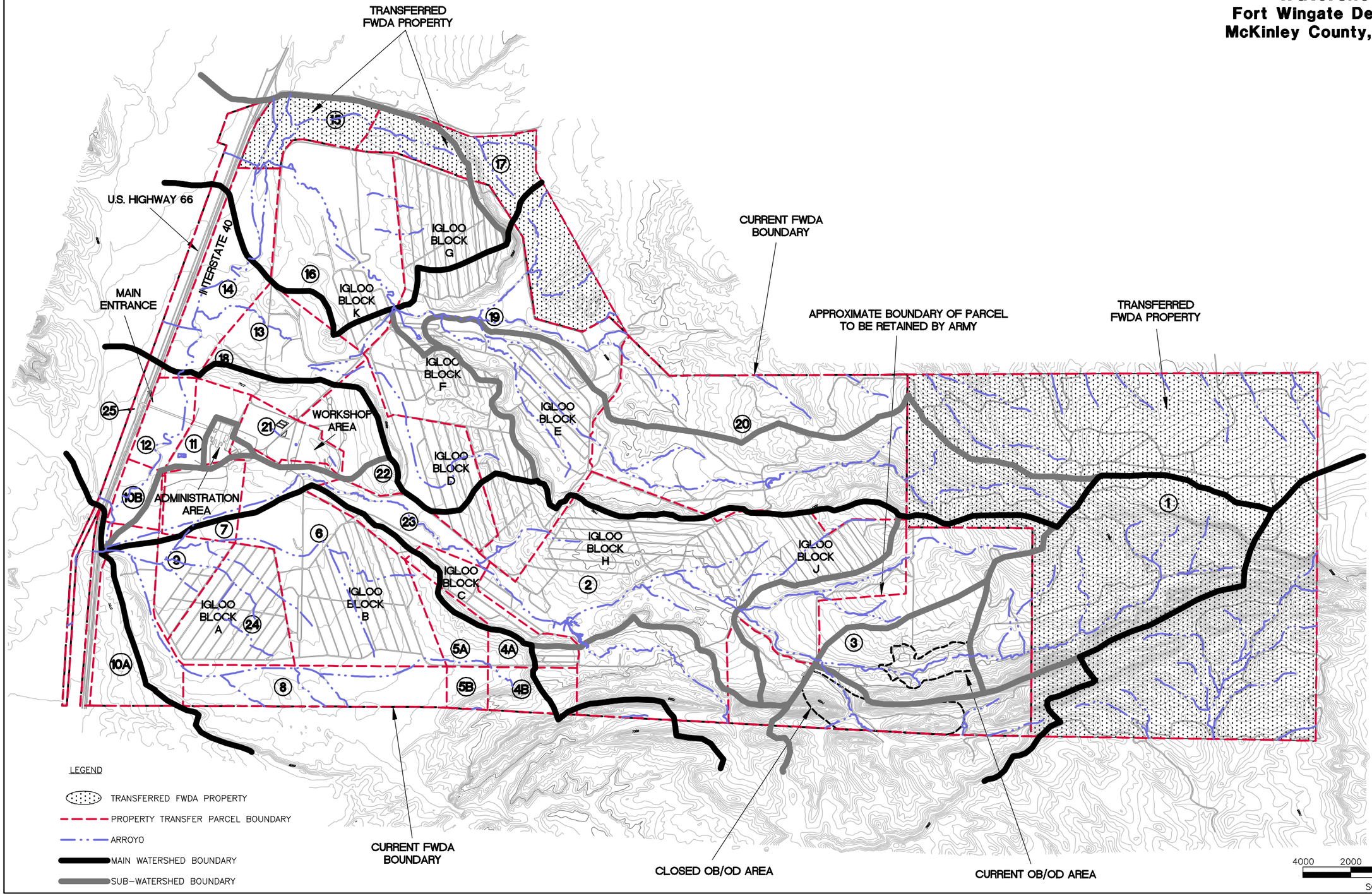


Figure 2-5
Parcels 12, 14, and 25
Soil Units
Fort Wingate Depot Activity
McKinley County, New Mexico

SOIL UNITS

212	REHOBETH SILTY CLAY LOAM
305	CELAVAR–ATARQUE COMPLEX
352	ZIA SANDY LOAM
353	MIDO LOAMY FINE SAND
355	ROCK OUTCROP–RIZNO–TEKAPO COMPLEX
566	BAMAC EXTREMELY GRAVELLY SAND/LOAM

MAIN ENTRANCE

PART OF AOC 75
TRANSFORMER

AOC 93
BIVOUAC AND TANK
TRAINING AREA

LEGEND

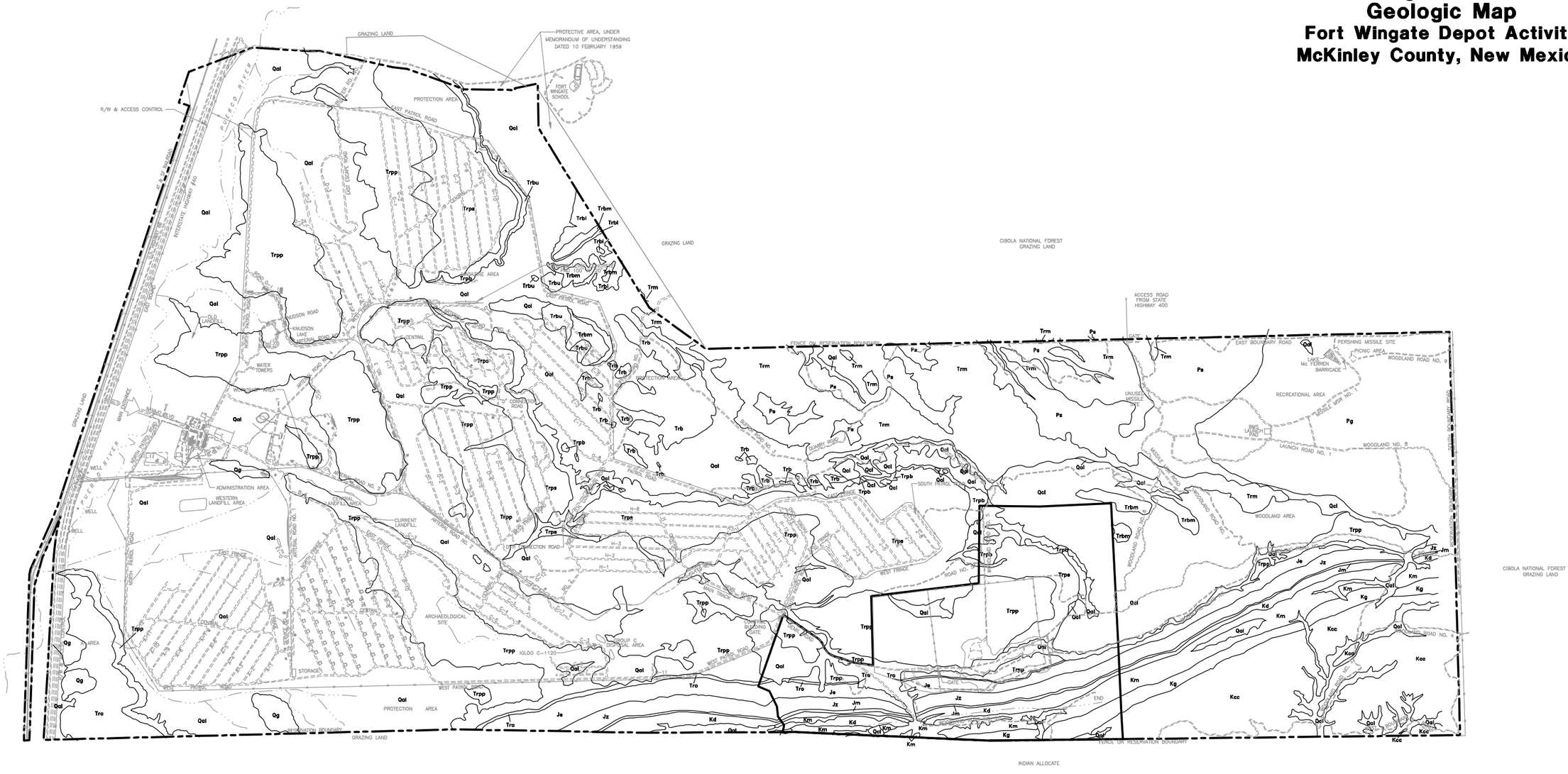
- ARROYOS
- PROPERTY TRANSFER PARCEL BOUNDARY
- PARCELS 12, 14, AND 25 BOUNDARIES
- TRANSFERRED FWDA PROPERTY
- CULVERT
- SOIL UNIT BOUNDARY

N

1800 900 0 1800

SCALE IN FEET

Figure 2-6
Geologic Map
Fort Wingate Depot Activity
McKinley County, New Mexico



LEGEND

	INSTALLATION BOUNDARY
	APPROXIMATE BOUNDARY OF OB/OD AREA TO BE RETAINED BY ARMY
Qal	QUATERNARY ALLUVIAL DEPOSITS
Qcl	QUATERNARY COLLUVIAL DEPOSITS
Qg	QUATERNARY GRAVEL
Kcc	CREVASSE CANYON FORMATION
Kg	GALLUP SANDSTONE
Km	MANCOS SHALE
Kd	DAKOTA SANDSTONE
Jm	MORRISON FORMATION
Jz	ZUNI SANDSTONE
Je	ENTRADA SANDSTONE
Tro	OWL ROCK FORMATION
Trpp	PETRIFIED FOREST FORMATION, PAINTED DESERT MEMBER
Trps	PETRIFIED FOREST FORMATION, SONSELA SANDSTONE MEMBER
Trpb	PETRIFIED FOREST FORMATION, BLUE MESA MEMBER
Trb	BLUEWATER CREEK FORMATION
Trbu	BLUEWATER CREEK FORMATION, UPPER MEMBER
Trbm	BLUEWATER CREEK FORMATION MCGAFFEY MEMBER
Trbl	BLUEWATER CREEK FORMATION LOWER MEMBER
Trm	SHINARUMP FORMATION AND MOENKOPI FORMATION DIVIDED
Psa	SAN ADREAS LIMESTONE
Pg	GLORIETA SANDSTONE

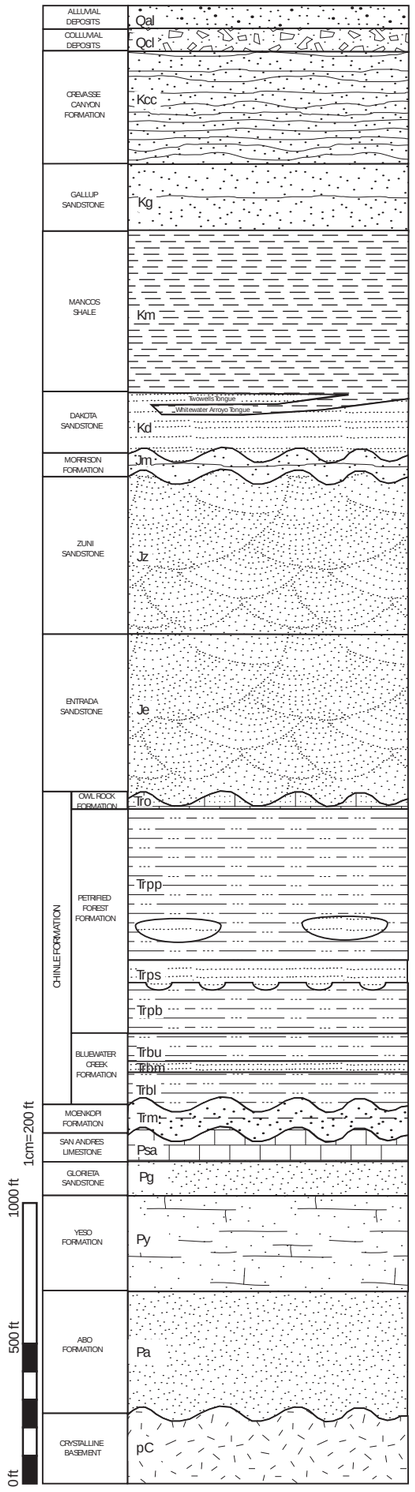
NOTES

1. BASE MAP SCANNED FROM FORT WINGATE DEPOT ACTIVITY GENERAL SITE MAP, JULY 1986, U.S. ARMY CORPS OF ENGINEERS.
2. 2 SOURCES OF MAPS OVERLAIN, ACTUAL DISTANCES APPROXIMATE FOR PRESENTATION PURPOSES.

4000 2000 0 4000

SCALE IN FEET

Figure 2-7
Stratigraphic Column
Fort Wingate Depot Activity
McKinley County, New Mexico



Description of Units

Qal - Alluvial deposits (Quaternary); sand, gravel, and clay in young valleys and drainages

Qcl - Colluvial deposits (Quaternary); land-slides, and cobble deposits in young valleys and on steep slopes

Kcc - Crevasse Canyon Formation (Upper Cretaceus, 88 Ma); mudstone, shale, very fine- to medium-grained sandstone, carbonaceous shale, and thin lenticular coal beds; outcrops in southwest corner only; <400 feet thick

Kg - Gallup Sandstone (Upper Cretaceus, 90 Ma); tan to pale-orange, medium-grained, well-sorted calcareous-sandstone, silty-sandstone, and coaly-carbonaceous layers; three prominent ridge forming sandstone layers (<20') are separated by silty, and carbonaceous intervals (<80'); sandstone layers have only minor amounts of cement and minimal matrix material resulting in high apparent permeability; <220 feet thick

Km - Mancos Shale (Upper Middle Cretaceus, 97-90 Ma); light- to dark-gray and mudstone, silty-mudstone, and shale; minor amounts of lenticular sandy-siltstone, limestone, and calcerous-sandstone present in upper portions; sandy layers have abundant cement and ultrafine matrix resulting in very low apparent-permeability; the Whitewater Arroyo Tongue of the Mancos Shale is intertounged with and underlies the Twowells Tongue of the Dakota Sandstone, abundant fossil corrals and cephalopods in Whitewater Arroyo Tongue; <600 feet thick excluding the Whitewater Arroyo Tongue which varies in thickness from 0-80 feet thick

Kd - Dakota Sandstone (Upper Middle Cretaceus, 97-90 Ma); tan to pale-yellow, fine- to medium-grained, sub-angular to well-rounded, grain-supported sandstone; small amounts of matrix and grain-support result in a very high apparent-permeability; Twowells Tongue of Dakota Sandstone is intertongued with and overlies the Whitewater Arroyo Tongue of the Mancos Shale; basal contact of Dakota Sandstone unconformably overlies an irregular erosional surface developed in the Morrison Formation; <230-310 feet thick including the Whitewater Arroyo Tongue

Jm - Morrison Formation (Upper Jurassic, 160-145 Ma); grayish-white to pale-orange, subangular to well rounded, fine- to coarse-grained sandstone and conglomeratic-sandstone; trough cross stratification locally; clay-rich fine-grained intervals present near upper contact; highly variable apparent-permeability; variable thickness possibly due to bedding-plane slip along monoclinal fold axis; <65 feet thick in northern part of base, thinning to <20 feet to the south

Jz - Zuni Sandstone (Middle Jurassic, 170-165 Ma); white, pink, and reddish-orange, well-rounded, clast-supported, fine- to very-fine-grained sandstone and silty-sandstone; horizontal color banding common; crossbedding in relatively thin sets (compared to Entrada Sandstone); siltier intervals correlate to shallow slopes and cleaner interval correlate to steep slopes; very-high apparent-permeability; <620 feet thick

Je - Entrada Sandstone (Middle Jurassic, 170-165 Ma); red, and pinkish-gray, moderately rounded, matrix supported, fine- to medium-grained sandstone; large-scale crossbedding; less competent than Zuni Sandstone; calcareous cement; very-high apparent-permeability; <650 feet thick

Tro - Owl Rock Formation (Upper Triassic, 225-210 Ma); white, grayish-pink, and orange, crystalline-limestone, sandy-limestone, and calcerous-sandstone; variable thickness possibly due to bedding-plane slip along monoclinal fold axis; <30 feet thick

Trpp - Petrified Forest Formation, Painted Desert Member (Middle Triassic, 225-210 Ma); purplish-red, orangish-red and rust colored, mudstone, siltstone, sandstone, and sandstone-conglomerate; sandstone intervals (<20') have tabular and trough cross beds, abundant ultrafine matrix, and are generally dirty resulting in low apparent-permeability; abundant 1-2cm greenish gray calcrete nodules present forming a distinctive mottled or speckled surface; shallow (<6') channel deposits with intraformational conglomerates containing mudstone and carbonate clasts; lenticular bodies of sandstone with similar lithology to the Sonsela Sandstone are laterally discontinuous; <600 feet thick

Trps - Petrified Forest Formation, Sonsela Sandstone Member (Middle Triassic, 225-210 Ma); yellow, tan, and olive-colored, well rounded, clast-supported, medium- to coarse-grained sandstone and conglomeratic sandstone; conglomeratic intervals containing intraformational (mudstone, carbonate) and extraformational (chert, quartzite) clasts; thin crossbedding common; minimal matrix and grain-support result in very-high apparent-permeability; <100 feet thick, highly variable thickness typical of large-scale channel deposits

Trpb - Petrified Forest Formation, Blue Mesa Member (Middle Triassic, 230-225 Ma); purple, and purplish-red, mudstone, and muddy-sandstone; mudstones are smectitic; light-gray sandy-smectitic-siltstone interval (<8') serves as marker bed for the base of the Petrified Forest Formation; high quantity of ultrafine matrix results in a very-low apparent-permeability; petrified wood very common in upper portions; <280 feet thick

Trbu - Bluewater Creek Formation, Upper Member (Upper Triassic, 230-225 Ma); pinkish-gray to reddish-brown siltstone and mudstone; calcrete nodules present locally; high silt and ultrafine matrix result in low apparent-permeability; <100 feet thick

Trbm - Bluewater Creek Formation, McGaffey Member (Upper Triassic, 230-225 Ma); white, pale-red and gray, medium-grained, ripple-laminated sandstone; color banding common; basal interval has carbonate-clast-conglomerate; calcareous cement; high apparent-permeability; <80 feet thick, highly variable thickness typical of large-scale channel deposits, locally not recognized

Trbl - Bluewater Creek Formation, Lower Member (Middle to Upper Triassic, 240-225 Ma); yellowish-gray, and reddish-brown mudstone and siltstone; calcrete nodules are present locally; low apparent-permeability; <115 feet thick

Trm - Shinarump Formation and Moenkopi Formation Undivided (Middle Triassic, 240-225 Ma); Shinarump Formation is purple and reddish-gray, motled chert- and quartzite-pebble-conglomerate and congloeratic-sandstone with reddish-brown matrix; Moenkopi is red, tan, and black calcareous-mottled-sandstone and calcareous-mudstone; massive to thinly-laminated and ripple-laminated siltstone and very fine-grained sandstones; 30-200 feet thick combined

Psa - San Andres Limestone (Middle Permian, 275-250 Ma); gray and white, fossiliferous, crystalline-limestone and dolomitic-limestone; locally absent due to karsting; <165 feet thick

Pg - Glorieta Sandstone (280-275 Ma); grayish-orange to orange, well-sorted, moderate- to well-rounded, fine- to medium-grained quartzose-sandstone; horizontal and low-angle crossbedding locally; <130 feet thick

Py - Yeso Formation (280-275 Ma); dark-orange to reddish-orange, very fine-grained gypsiferous-sandstone and silty-sandstone; three light-gray, dolomitic, carbonate beds (7') present in formation; <375 feet thick

Pa - Abo Formation (280-275 Ma); grayish-red, very fine-grained silty-sandstone; non-calcerous; flat-bedded; basal 3-12' are arkosic; <450 feet thick

pC - Precambrian Basement; typically granitic- to dioritic- igneous and metamorphic rocks

Reference: Thorstenson, D.J, and Beard, L.S., U.S. Geological Survey, 2000.

Figure 2-8
Unconsolidated Material Isopach Map
Fort Wingate Depot Activity
McKinley County, New Mexico

SUPPLY WELL 55
SUPPLY WELL 53 (ABANDONED)
SUPPLY WELL 54
WINGATE91
WINGATE90
WINGATE89
QG
TRO
TRPP
QAL
FW28
FW27
FW29
FW26
FW35
(98.34) TMW27
SMW01 (>49)
TMW28 (71.77)
TMW26 (64.08)
MW22S
MW22D (>65)
TMW10
(80.02) TMW08
(74.11) TMW24
MW18D
MW-2 (>47)
8A-15
8A-13 (61.50)
MW-1
MW20
(69.00) WELL 69
MW-3 (>53)
TMW25 (71.43)
(71.31) TMW23
(>75) TMW07
TMTD1 TMW06
(>55) TMTC4
TMTC3 (79.95)
TMTC5 (82.87)
TMW21 (70.82)
TMW22 (77.39)
(>57.5) TMTC2
(82.82) TMTB2
(>65) TMTB3
(80.08) TMTB4
(>60) (76.04)
(61.45) (>60) TMTA2 TMTA3 TMTA4
TMTA5 (75.04)
TMW20
TMW29
TMW20A (>69)
TMW03 (>70)
TMW04 (>70)
TNTB5 (43.96)
TMW18 (56.05)
(>60) TNTB1
(>60) TNTA1
(61.74)
TMW02
TNTA6 (65.02)
TMW19 (28.97)
TMW13
TNTU1 (>73.29)
(>72.5)
TNTU2 (>52)
TNTU4 (65.05)
(>80.7)
(>31.5)
TMW11
TMW15
FW10
TNTU3 (>37.5)
TMW16 (26.00)
TMW17 (73.04) (66.92)
(16.02)
TMW01 (59.53)
TNTU5 (51.54)
(34.93)
TNTU9 (34.98)
TNTU7
TMW05 (25.49)
TMW14A (27.01)
INTERSTATE HIGHWAY #40
U.S. HIGHWAY 66
NAVAJO BLVD
WEST PATROL ROAD
A/C CENTRAL
EAST FRINGE
WEST FRINGE
NORTH FRINGE
ARTERIAL ROAD NO. 1
KNUDSON ROAD
A-1 A-2 A-3 A-4 A-5 A-6 A-7 A-8 A-9 A-10 A-11
A-5Ab A-6 A-13
B-1 B-2 B-3 B-4 B-5 B-6
C-13

LEGEND

- FIRST UNCONSOLIDATED WATER BEARING ZONE MONITORING WELL LOCATION
- SECOND UNCONSOLIDATED WATER BEARING ZONE MONITORING WELL LOCATION
- FIRST SANDSTONE WATER BEARING ZONE MONITORING WELL LOCATION
- SECOND SANDSTONE WATER BEARING ZONE MONITORING WELL LOCATION
- UNDIFFERENTIATED UNCONSOLIDATED WATER BEARING ZONE MONITORING WELL LOCATION
- DRY MONITORING WELL LOCATION
- OFF SITE SUPPLY WELL LOCATION
- INSTALLATION SUPPLY WELL LOCATION
- BORING LOCATION
- UNCONSOLIDATED THICKNESS CONTOUR (INTERVAL 5 FEET) (DASHED WHERE INFERRED)
- (65.05) UNCONSOLIDATED THICKNESS IN FEET
- QAL QUARTERNARY ALLUVIAL DEPOSITS
- QG QUARTERNARY GRAVEL
- TRO OWL ROCK FORMATION
- TRPP PETRIFIED FOREST FORMATION, PAINTED DESERT MEMBER BEDROCK OUTCROP

N

1,200 600 0 1,200

SCALE IN FEET

Figure 2-9
Ground Water Elevation Map
October 2002
First Unconsolidated Water-Bearing Zone
Scenario 1
Fort Wingate Depot Activity
McKinley County, New Mexico

SUPPLY WELL 55
SUPPLY WELL 53 (ABANDONED)
SUPPLY WELL 54
WINGATE91 6636.61
WINGATE90 6643.84
WINGATE89 6645.55
TMW27 6639.38
SMW01 6639.78
TMW26 6651.06
TMW28 6671.86
MW22S 6644.76
MW22D
TMW10 6644.14
TMW08 6644.68
MW18D 6645.43
MW20 6644.05
MW-2 6647.85
MW-1 6646.01
MW-3 6644.76
TMW24 6638.25
TMW25 6632.77
TMW23 6641.55
TMW07
TMW06 6644.10
TMW21 6645.65
TMW22 6641.33
TMW29 6647.11
TMW03 6646.90
TMW04 6645.50
TMW18
TMW19
TMW13 6648.88
TMW11 6653.45
TMW15 6651.28
TMW16 6655
TMW17
TMW14A
TMW01 6680.51
TMW05
FW26
FW27
FW28
FW29
FW35
FW12
FW11
FW10 6662.74
FW08
FW0
WELL 53
QAL
QG
TRO
TRPP
NAVAJO BLVD
INTERSTATE HIGHWAY #40
U.S. HIGHWAY 66
KINDUSON ROAD
WEST PATROL ROAD
A CENTRAL
EAST FRINGE
WEST FRINGE
NORTH FRINGE
ARTERIAL ROAD NO. 1
A-11
A-10
A-9
A-8
A-7
A-6
A-5
A-4
A-3
A-2
A-1
A-5Ae
B-1
B-2
B-3
B-4
C-13

LEGEND

- FIRST UNCONSOLIDATED WATER BEARING ZONE MONITORING WELL LOCATION
- SECOND UNCONSOLIDATED WATER BEARING ZONE MONITORING WELL LOCATION
- FIRST SANDSTONE WATER BEARING ZONE MONITORING WELL LOCATION
- SECOND SANDSTONE WATER BEARING ZONE MONITORING WELL LOCATION
- UNDIFFERENTIATED UNCONSOLIDATED WATER BEARING ZONE MONITORING WELL LOCATION
- DRY MONITORING WELL LOCATION
- OFF SITE SUPPLY WELL LOCATION
- INSTALLATION SUPPLY WELL LOCATION
- GROUND WATER ELEVATION CONTOUR FIRST UNCONSOLIDATED WATER-BEARING ZONE (DASHED WHERE INFERRED)
- 6647.11 GROUND WATER ELEVATION
- QAL QUARTERNARY ALLUVIAL DEPOSITS
- QG QUARTERNARY GRAVEL
- TRO OWL ROCK FORMATION
- TRPP PETRIFIED FOREST FORMATION, PAINTED DESERT MEMBER BEDROCK OUTCROP

N

1,200 600 0 1,200
SCALE IN FEET

Figure 2-10
Ground Water Elevation Map
October 2002
First Unconsolidated Water-Bearing Zone
Scenario 2
Fort Wingate Depot Activity
McKinley County, New Mexico

SUPPLY WELL 55
SUPPLY WELL 53 (ABANDONED)
SUPPLY WELL 54
WINGATE91 6636.61
WINGATE90 6643.84
WINGATE89 6645.55
6640
6645
QG
TRO
TRPP
QAL
FW28
FW27
6640 6639.38
TMW27
6639.78
SMW01
FW29
NAVAJO BLVD
INTERSTATE HIGHWAY #40
U.S. HIGHWAY 66
TMW28 6671.86
6670
6665
6660
6655
6650
TMW26 6651.06
6644.76
MW22S
MW22D
TMW10
6644.14
6644.68
TMW08
MW18D 6645.43
6644.05
MW20
6646
6638.25
TMW24
MW-2 6647.85
MW-1 6646.01
MW-3 6644.76
FW26
WELL
TMW25 6632.77
6635
TMW07
TMW06 6644.10
TMW23 6641.55
TMW21 6645.65
6641.33
TMW22
6640
6642
6644
6646
6642
6644
6647.11
TMW29
6646.90
TMW03
TMW04 6645.50
6646
6648
FW13
FW12
FW02
TMW18
TMW19
6650
6648.88
TMW13
FW11
6650
6652
6655
6652
6653.45
TMW11
FW07
6660
6665
6670
6675
6680
TMW15 6651.28
FW10 6662.74
TMW16 6655
TMW17
FW08
TMW01 6680.51
TMW14A
TMW05
FW35
KNUDSON ROAD
WEST PATROL ROAD
A-CENTRAL
EAST FRINGE
WEST FRINGE
NORTH FRINGE
ARTERIAL ROAD NO. 1
A-11
A-10
A-9
A-8
A-7
A-6
A-5
A-4
A-3
A-2
A-1
A-5AB
B-13
B-1
B-2
B-3
B-4

LEGEND

- FIRST UNCONSOLIDATED WATER BEARING ZONE MONITORING WELL LOCATION
- SECOND UNCONSOLIDATED WATER BEARING ZONE MONITORING WELL LOCATION
- FIRST SANDSTONE WATER BEARING ZONE MONITORING WELL LOCATION
- SECOND SANDSTONE WATER BEARING ZONE MONITORING WELL LOCATION
- UNDIFFERENTIATED UNCONSOLIDATED WATER BEARING ZONE MONITORING WELL LOCATION
- DRY MONITORING WELL LOCATION
- OFF SITE SUPPLY WELL LOCATION
- INSTALLATION SUPPLY WELL LOCATION
- GROUND WATER ELEVATION CONTOUR FIRST UNCONSOLIDATED WATER-BEARING ZONE (DASHED WHERE INFERRED)
- 6647.11 GROUND WATER ELEVATION
- QAL QUARTERNARY ALLUVIAL DEPOSITS
- QG QUARTERNARY GRAVEL
- TRO OWL ROCK FORMATION
- TRPP PETRIFIED FOREST FORMATION, PAINTED DESERT MEMBER BEDROCK OUTCROP

N

1,200 600 0 1,200

SCALE IN FEET

Figure 2-11
Ground Water Elevation Map
April 2003
First Unconsolidated Water-Bearing Zone
Scenario 1
Fort Wingate Depot Activity
McKinley County, New Mexico

SUPPLY WELL 55
SUPPLY WELL 53 (ABANDONED)
SUPPLY WELL 54
WINGATE91 6641.79
WINGATE90 6644.08
WINGATE89 6648.97
6640
6645
6650
QG
TRO
TRPP
QAL
FW28
FW27
6639.82 TMW27
6640
6639.58 SMW01
FW29
6642
6645
TMW26 6657.45
6644.63 MW22S MW22D
TMW10 6644.47
6645.15 TMW08
6638.83 TMW24
MW18D 6645.49
6646
MW-2 6649.52
6644.10 MW20
MW-1 6646.81
MW-3 6645.57
FW26
6644
6635
TMW25 6632.84
6640
WELL 53
TMW07
TMW23 6641.76
TMW06 6644.36
6646
TMW21 6645.99
6642.56 TMW22
6642
6644
6647.19 TMW29
6646.36 TMW03
TMW04 6645.15
6646
6648
TMW18
FW12
FW03
TMW02
6648
TMW19
6650
6649.08 TMW13
FW11
6650
6652
6655
6658
6653.58 TMW11
FW10
6660.05
6660
6665
TMW15 6651.33
6670
6675
6680
TMW16
TMW17
FW08
TMW01 6680.19
TMW14A
TMW05
6640
6645
6650
6655
6660
6665
6670
TMW28 6672.53
INTERSTATE HIGHWAY #40
U.S. HIGHWAY 66
NAVAJO BLVD
KINNEAR ROAD
KWUDSON ROAD
FW35
WEST PATROL ROAD
A-CENTRAL
EAST FRINGE
WEST FRINGE
NORTH FRINGE
ARTERIAL ROAD NO. 1
A-11
A-10
A-9
A-8
A-7
A-6
A-5
A-4
A-3
A-2
A-1
A-5Ae
O-13
B-1
B-2
B-3
B-4

LEGEND

- FIRST UNCONSOLIDATED WATER BEARING ZONE MONITORING WELL LOCATION
- SECOND UNCONSOLIDATED WATER BEARING ZONE MONITORING WELL LOCATION
- FIRST SANDSTONE WATER BEARING ZONE MONITORING WELL LOCATION
- SECOND SANDSTONE WATER BEARING ZONE MONITORING WELL LOCATION
- UNDIFFERENTIATED UNCONSOLIDATED WATER BEARING ZONE MONITORING WELL LOCATION
- DRY MONITORING WELL LOCATION
- OFF SITE SUPPLY WELL LOCATION
- INSTALLATION SUPPLY WELL LOCATION
- GROUND WATER ELEVATION CONTOUR — — FIRST UNCONSOLIDATED WATER-BEARING ZONE (DASHED WHERE INFERRED)
- 6642.56 GROUND WATER ELEVATION
- QAL QUARTERNARY ALLUVIAL DEPOSITS
- QG QUARTERNARY GRAVEL
- TRO OWL ROCK FORMATION
- TRPP PETRIFIED FOREST FORMATION, PAINTED DESERT MEMBER BEDROCK OUTCROP

N

1,200 600 0 1,200
SCALE IN FEET

Figure 2-12
Ground Water Elevation Map
April 2003
First Unconsolidated Water-Bearing Zone
Scenario 2
Fort Wingate Depot Activity
McKinley County, New Mexico

SUPPLY WELL 55
SUPPLY WELL 53 (ABANDONED)
SUPPLY WELL 54
WINGATE91 6641.79
WINGATE90 6644.08
WINGATE89 6648.97
TMW27 6639.82
SMW01 6639.58
TMW26 6651.45
TMW28 6672.53
TMW10 6644.47
MW22S 6644.63
MW22D
TMW08 6645.15
MW18D 6645.49
MW20 6644.10
TMW24 6638.83
MW-2 6649.52
MW-1 6646.81
MW-3 6645.57
TMW25 6632.84
TMW07
TMW06 6644.36
TMW23 6641.76
TMW21 6645.99
TMW22 6642.56
TMW29 6647.19
TMW03 6646.36
TMW04 6645.15
TMW13 6649.08
TMW18
TMW19
TMW11 6653.58
TMW15 6651.33
TMW16 6655
TMW17
TMW01 6680.19
TMW14A
TMW05
FW26
FW27
FW28
FW29
FW35
FW12
FW11
FW10
FW08
FW07
QAL
QG
TRO
TRPP
A-11
A-10
A-9
A-8
A-7
A-6
A-5
A-4
A-3
A-2
A-1
B-1
B-2
B-3
B-4
A-5AB
B-13
WEST PATROL ROAD
A CENTRAL
EAST FRINGE
WEST FRINGE
NORTH FRINGE
ARTERIAL ROAD NO. 1
NAVAJO BLVD
KNUDSON ROAD
INTERSTATE HIGHWAY #40
U.S. HIGHWAY 66

LEGEND

- FIRST UNCONSOLIDATED WATER BEARING ZONE MONITORING WELL LOCATION
- SECOND UNCONSOLIDATED WATER BEARING ZONE MONITORING WELL LOCATION
- FIRST SANDSTONE WATER BEARING ZONE MONITORING WELL LOCATION
- SECOND SANDSTONE WATER BEARING ZONE MONITORING WELL LOCATION
- UNDIFFERENTIATED UNCONSOLIDATED WATER BEARING ZONE MONITORING WELL LOCATION
- DRY MONITORING WELL LOCATION
- OFF SITE SUPPLY WELL LOCATION
- INSTALLATION SUPPLY WELL LOCATION
- GROUND WATER ELEVATION CONTOUR — FIRST UNCONSOLIDATED WATER-BEARING ZONE (DASHED WHERE INFERRED)
- 6642.56 GROUND WATER ELEVATION
- QAL QUARTERNARY ALLUVIAL DEPOSITS
- QG QUARTERNARY GRAVEL
- TRO OWL ROCK FORMATION
- TRPP PETRIFIED FOREST FORMATION, PAINTED DESERT MEMBER BEDROCK OUTCROP

N

1,200 600 0 1,200

SCALE IN FEET

Figure 2-13
Bedrock Surface Elevation Map
Fort Wingate Depot Activity
McKinley County, New Mexico

SUPPLY WELL 55
SUPPLY WELL 53 (ABANDONED)
SUPPLY WELL 54
WINGATE91
WINGATE90
WINGATE89
QG
TRO
TRPP
QAL
FW28
FW27
FW29
FW26
FW35
FW10
FW11
FW08
(6568) TMW27
SMW01 <6618.6
TMW26 (6611.5)
(6816) TMW28
MW22S <6613.1
MW22D
TMW10
(6598.7) TMW08
(6605) TMW24
MW18D
BA-15
BA-13
MW-2 <6637.4
MW-1
MW20 <6615.5
(6624.0)
WELL 69 (6618.5)
MW-3 <6634.8
(6600) TMW25
<6614.1 TMW07
TNTD1 TMW06
TMW23 (6615)
<6634.9 TNTC4
TNTC3 (6608.8)
TNTC5 (6601.4)
TMW21 (6622.8)
TMW22 (6613.2)
<6640.0 TNTC2
(6613.5) TNTB2
<6629.3 TNTB3
(6615.0) TNTB4
<6638.4 (6623.0) TNTA3 TNTA4
<6640.6 TNTA2
(6637) TMW29
TMW20 (6644)
TMW20A
<6643.3 TNTB1
TMW03 <6631.3
TMW04
<6629.8
TNTB5 (6652.6)
TNTA5 (6622.1)
TMW18 (6675.4)
(6669.8) TMW19
<6642.0 TNTA1
TMW02 (6642.8)
TNTA6 (6634.2)
<6633.0 TMW13 TNTU1
<6633.5
TNTU2 <6654.7
(6638.7) TNTU4
<6636 TMW11
<6673.4
<6655.7
TMW15
TMW16 (6686.5)
TMW17 (6638.0) (6651.3)
<6673.8 TNTU3
(6656.8) TNTU5
TMW01 (6621.3)
(6692.0)
(6678.2) TNTU7
TNTU9 (6677.3)
TMW05 (6667.6)
TMW14A (6695.1)
WEST PATROL ROAD
A-CENTRAL
EAST FRINGE
WEST FRINGE
NORTH FRINGE
A-5AB
ARTERIAL ROAD NO. 1
MAVAJO BLVD.
KNUDSON ROAD
INTERSTATE HIGHWAY #40
U.S. HIGHWAY 66
A-11
A-10
A-9
A-8
A-7
A-6
A-5
A-4
A-3
A-2
A-1
B-1
B-2
B-3
B-4
O-13

LEGEND

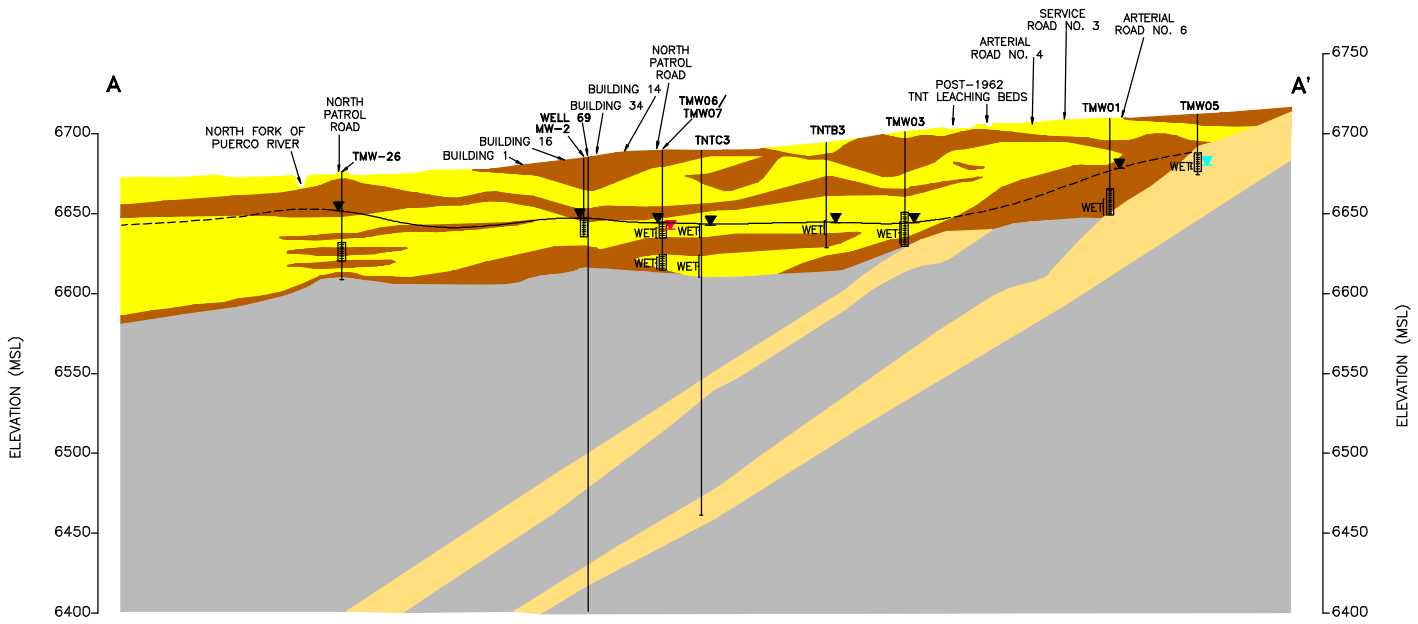
- FIRST UNCONSOLIDATED WATER BEARING ZONE MONITORING WELL LOCATION
- SECOND UNCONSOLIDATED WATER BEARING ZONE MONITORING WELL LOCATION
- FIRST SANDSTONE WATER BEARING ZONE MONITORING WELL LOCATION
- SECOND SANDSTONE WATER BEARING ZONE MONITORING WELL LOCATION
- UNDIFFERENTIATED UNCONSOLIDATED WATER BEARING ZONE MONITORING WELL LOCATION
- DRY MONITORING WELL LOCATION
- OFF SITE SUPPLY WELL LOCATION
- INSTALLATION SUPPLY WELL LOCATION
- BORING LOCATION
- BEDROCK SURFACE ELEVATION CONTOUR (INTERVAL 10 FEET) (DASHED WHERE INFERRED)
- (6568) BEDROCK SURFACE ELEVATION
- <6638.4 BEDROCK SURFACE NOT ENCOUNTERED
- QAL QUARTERNARY ALLUVIAL DEPOSITS
- QG QUARTERNARY GRAVEL
- TRO OWL ROCK FORMATION
- TRPP PETRIFIED FOREST FORMATION, PAINTED DESERT MEMBER BEDROCK OUTCROP

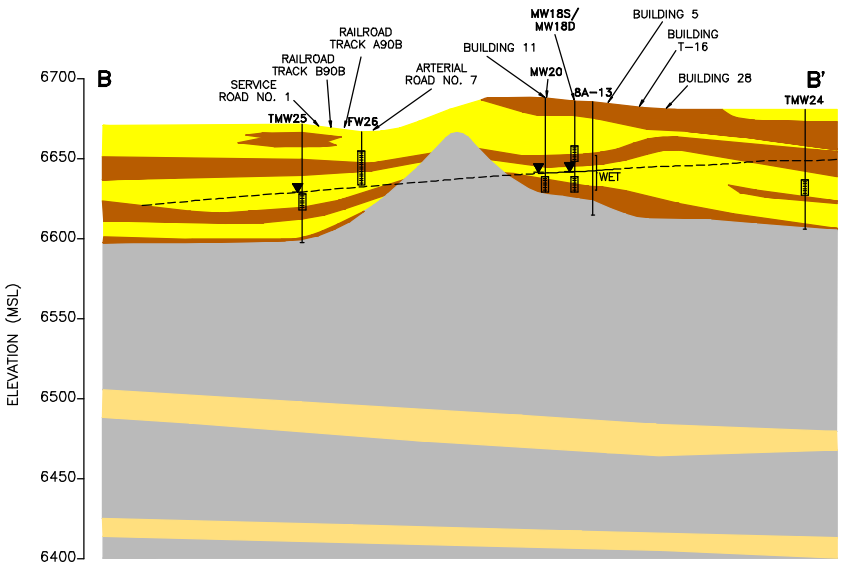
N

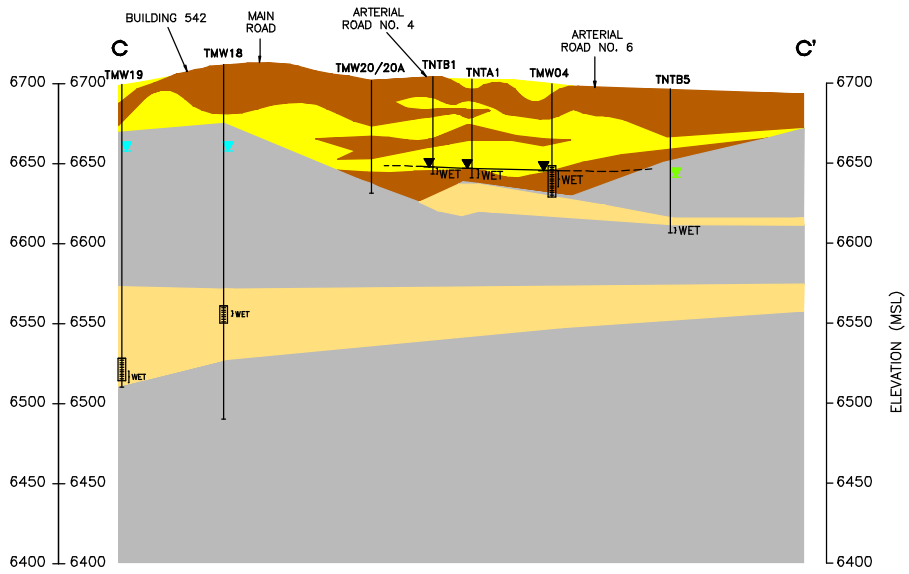
1,200 600 0 1,200

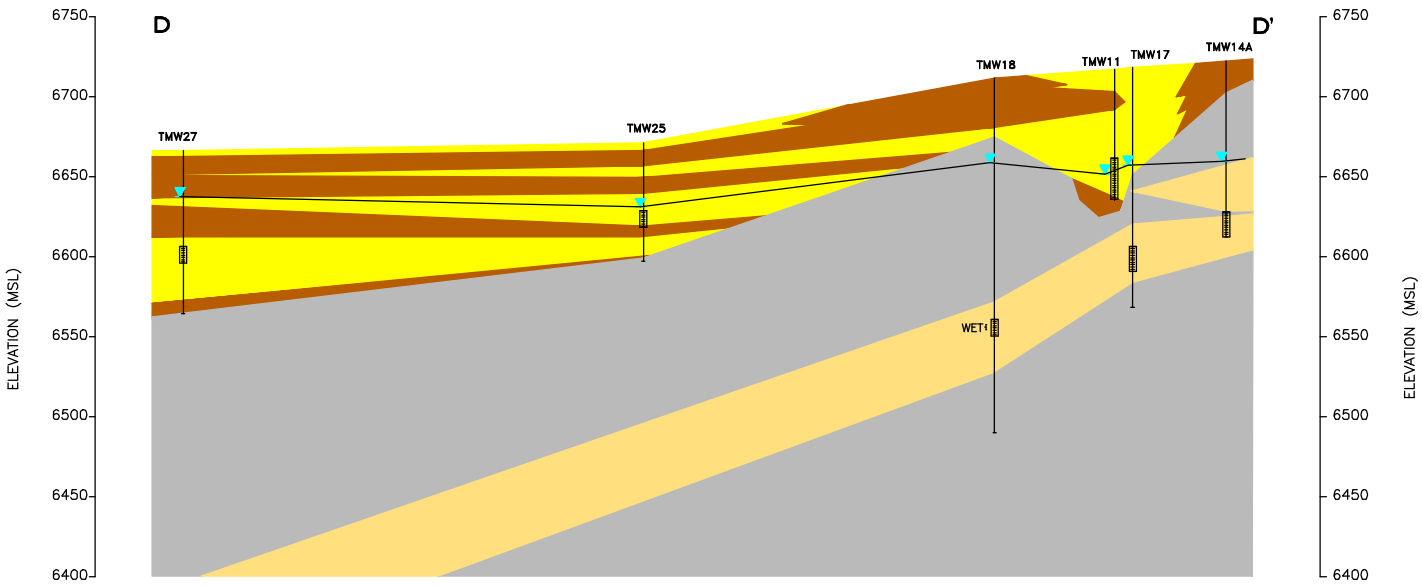
SCALE IN FEET

Figure 2-14
Cross Sections A-A', B-B', C-C', and D-D'
Fort Wingate Depot Activity
McKinley County, New Mexico





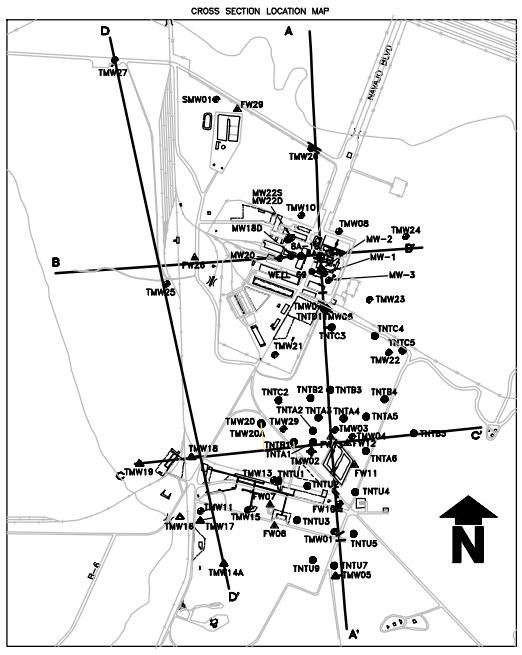




LEGEND

- FIRST UNCONSOLIDATED WATER BEARING ZONE MONITORING WELL LOCATION
- SECOND UNCONSOLIDATED WATER BEARING ZONE MONITORING WELL LOCATION
- FIRST SANDSTONE WATER BEARING ZONE MONITORING WELL LOCATION
- SECOND SANDSTONE WATER BEARING ZONE MONITORING WELL LOCATION
- UNDIFFERENTIATED UNCONSOLIDATED WATER BEARING ZONE MONITORING WELL LOCATION
- DRY MONITORING WELL LOCATION
- OFF SITE SUPPLY WELL LOCATION
- INSTALLATION SUPPLY WELL LOCATION
- BORING LOCATION

CROSS SECTION LOCATION MAP



LEGEND

- SAND (SILTY SAND, CLAYEY SAND, AND SAND)
- CLAY (SANDY CLAY, SILTY CLAY, CLAYEY SILT, AND SILT)
- SANDSTONE (SANDSTONE, SILTY SANDSTONE, AND CONGLOMERATE)
- CLAYSTONE (CLAYSTONE, MUDSTONE, AND SILTSTONE)
- STATIC WATER ELEVATION – 1ST UNCONSOLIDATED WATER–BEARING ZONE
- STATIC WATER ELEVATION – 2ND UNCONSOLIDATED WATER–BEARING ZONE
- STATIC WATER ELEVATION – 2ND SANDSTONE WATER–BEARING ZONE
- STATIC WATER ELEVATION – INTERMEDIATE SANDSTONE WATER–BEARING ZONE

VERTICAL EXAGGERATION = 10X

1200 600 0 1200

SCALE IN FEET

Table 2-1
Proposed Field Investigations
Parcels 12, 14, and 25 RFI Work Plan
Fort Wingate Depot Activity
McKinley County, New Mexico

Area of Concern	Activity	Number of Samples	Target Constituents
AOC 93			
• Parcel 14 Gravel Pits	No Sampling to be Performed.		
• Parcel 12 Borrow Pit	Collect 2 discrete surface soils samples from lowest points in pit, and 2 discrete subsurface soil samples.	4 discrete soil samples	Asbestos, metals, VOCs, SVOCs, DRO and PCBs
• Parcel 12 Demolition Debris	Collect 2 discrete surface soils samples from lowest points in debris area and 2 discrete subsurface soil samples.	4 discrete soil samples	Asbestos, metals, VOCs, SVOCs, DRO and PCBs
• Parcel 12 Ground Scar	Collect 6 discrete surface soils samples from lowest points in areas of former trenches (2 each per former trench) and 6 discrete subsurface soils samples (2 each per former trench).	12 discrete soil samples	Asbestos, metals, VOCs, SVOCs, DRO and PCBs
• Parcel 12 Debris Area, South Bank Rio Puerco	Collect 3 discrete surface soils samples from lowest points in debris area and 3 discrete subsurface soil samples.	6 discrete soil samples	Asbestos, metals, VOCs, SVOCs, DRO and PCBs
AOC 75			
• Parcel 12 Transformers	No activities are proposed for AOC 75 in Parcel 12	N/A	N/A

3.0 AOC 93 - BIVOUAC AND TANK TRAINING AREA

3.1 BACKGROUND

3.1.1 Location, Description, and Operational History

AOC 93 is listed in the Permit as a "Bivouac and Tank Training Area." Portions of AOC 93 were used by New Mexico National Guard units to conduct training exercises.

In their basis for listing this location as an AOC, NMED cited a document stating that "some firing of weapons took place during this activity."

As shown in historical records, the area available for training was approximately 650 acres along the northern border of FWDA. AOC 93 is shown in Figure 3-1.

3.1.2 Surface Conditions

AOC 93 is generally flat lying near the northern property boundary to steeply sloping in some southern portions. Generally the area is unimproved, with no significant structures present.

As shown in Figure 2-3, AOC 93 is generally bisected by the Rio Puerco. Surface runoff from rainfall/snowmelt events generally drains via overland flow and small channels to the north and south, to the Rio Puerco valley.

3.1.3 Subsurface Conditions

Subsurface conditions are described in Section 2.2.

3.2 PREVIOUS INVESTIGATIONS

3.2.1 Historical Aerial Photographs

A review of historical aerial photographs was completed for AOC 93. Historical aerial photos are provided in Appendix C.

As noted in the aerial photo analysis report (ERI, 2006, findings included in Appendix C), the findings for AOC 93 in Parcel 12 noted excavations and areas of rubble beginning in the 1948 photo. The 1948 photo shows three parallel trenches in this area, oriented approximately north-south. The westernmost trench was approximately 115 feet long by 20 feet wide; the central trench was approximately 1000 feet wide by 20 feet wide; the easternmost trench was approximately 75 feet long by 20 feet wide. These trenches do not appear in any of the subsequent photos, and are not discernable currently. The general area of these former trenches does appear as a disturbed area in the 1952 and later photos. –Activities in this area appear to be unrelated to New Mexico National Guard training exercises, as they pre-date that activity by at least 20 years and are most likely related to borrow areas for construction materials and attempts to control erosion along the Rio Puerco. Reviews of USGS topographical maps and

interviews with former FWDA employees confirmed the existence of borrow/gravel pits in Parcel 12.

As noted in the aerial photo analysis report (ERI, 2006, findings included in Appendix C), two trenches, both oriented approximately east-west, were noted on aerial photographs within Parcel 14, beginning in the 1948 photo and last seen in the 1962 photo. One trench was approximately 120 feet long and ten feet wide; the second trench was approximately 140 feet long and 10 feet wide. Because these trenches were created sometime between the 1935 and 1948 photo coverage, it is believed that they were gravel borrow pits used to generate materials for the construction of FWDA facilities in the 1940s. The 1966 photo shows significant ground disturbance (the trenches are no longer visible) and access roads leading to the newly constructed Interstate 40. Based on the timeframe and the presence of the access roads, it appears that the entire area was mined for gravel used in the construction of Interstate 40. Subsequent photos show the entire mined area (no trenches visible). The USGS map for this area has gravel pits clearly marked at the location of this disturbed area. A copy of the USGS map with the aerial photo trench locations superimposed is presented as Figure 3-2.

As noted in the aerial photo analysis report (ERI, 2006, findings included in Appendix C), structures and material stockpiles were noted in the extreme northeast portion of Parcel 25 beginning in the 1935 photo. Based on their proximity to Route 66/Interstate 40 and the railroad and the fact that there are no known FWDA structures or activities in the area, it is believed that the observed structures and stockpiles were related to railroad and/or highway operations.

The following additional specific features have been noted in the historic aerial photos:

- In the 1935 aerial photograph, silos, a tall structure, and light-toned material/liquid are identified.
- In the1948 aerial photograph, dark-toned material and light-toned material are identified on Parcel 25.
- In the 1978 aerial photograph, mounded material and probable coal are identified on Parcel 25.
- In the 1978 and 1997 aerial photographs, a vertical tank is identified on Parcel 25 (in the northeast comer of AOC 93).
- In the 1985 aerial photograph, a ground stain is identified in the northeast corner of Parcel 25.

These items appear to be associated with road and rail way construction activities (see Section 3.2.3). The Army does not have any additional information regarding the exact nature of these features. Currently, these specific features are not visible, although a vertical tank is present in this general area (see Section 3.2.3).

- In the 1991 aerial photograph, a light-toned material on Parcel 14.

The Army has reviewed the sequence of aerial photos thru time, especially 1962 and 1966 and has concluded that this light-toned material on Parcel 14 is related to the construction of I-40 and is most likely a borrow pit or a temporary pile of soil or gravel.

3.2.2 Historical Records Review

A review of historical documents was completed for AOC 93. Historical drawings are provided at the end of Section 3.0.

FWDA Drawing No. C-8-51 presents the land plot "leased" from FWDA by the National Guard for training purposes; the land available for training was approximately 650 acres in size, located in the buffer area on the northern edge of FWDA near Interstate 40 and east of the main entrance road. Although the lease included Parcel 25, which consists mainly of the Interstate 40 corridor, no training activities were conducted in that area because the highway was present.

From the reports and FWDA Drawing No. C-8-51, it appears as the lease of AOC 93 by the New Mexico National Guard initiated 23 August 1972. The lease appears to have spanned through 1980 based on the 1980 Installation Assessment (pertinent section provided at the end of Section 3.0), and was up for renewal around 1990 based on the 1990 Enhanced Preliminary Assessment Report (pertinent section provided at the end of Section 3.0). It is unknown if the lease was renewed past 1990.

The historical documents reviewed did not suggest that releases of hazardous wastes or hazardous constituents occurred from operations at this location. The documents did not identify this location as a potential SWMU or AOC.

Two historic reports (USATHAMA, 1980 and Inland Pacific, 1982; copies included at the end of Section 3.0) contained statements that weapons were not fired during National Guard training activities. Because the document (ANL, 1990; copy included at the end of Section 3.0) cited by NMED in their basis for listing the training area as an AOC references the two previous reports as the source for information on the training activities, it is assumed that the statement "some firing of weapons took place during this activity" is erroneous.

An interview was conducted in 2005 with Colonel James Morgan of the New Mexico National Guard. Colonel Morgan had served in the New Mexico National Guard for more than 35 years, and had firsthand knowledge of training conducted at FWDA. According to Colonel Morgan, training exercises at FWDA consisted of one battery of air defense artillery (ADA), the 3rd Battalion, 200th ADA from Gallup and Farmington. The battery was comprised of 148 personnel and 16 pieces of ADA equipment. Training exercises were conducted no more than three times per year at FWDA. The equipment (M42 Duster anti-aircraft tanks) was trucked from Gallup to FWDA. The M42 Duster was equipped with two 40 millimeter (mm) cannons and one .30 caliber machine gun. Ordnance for the Dusters was stored at Fort Bliss, and was not issued for training exercises

conducted at FWDA. Fuel (gasoline) for the exercises was transported in an M49 Fuel Tanker Truck (also known as a 6x6 or "deuce and a half"); equipment refueling was conducted over drip pans by a Military Occupational Specialty qualified, licensed Petroleum Supply Specialist. Battery training was limited to maneuver, tracking of aircraft, and overnight bivouac; no munitions were fired from the unit's equipment. If small arms training was to be conducted, it was conducted at the existing FWDA small arms range; no small arms were fired within AOC 93 as part of New Mexico National Guard training exercises. At the end of each training exercise, all equipment and any related materials were loaded onto trucks and returned to the 3rd Battalion, 200th ADA headquarters in Gallup. This battalion is no longer in existence; no specific records regarding the battalion's prior training activities are available.

On June 18, 2008, the Army contacted Tom Coke, New Mexico National Guard Public Affairs Officer. Mr. Coke indicated that he will provide the Army with a signed statement by the retired Lieutenant General commanding the NM National Guard during the period in question on FWDA stating that no ammunition was transported to or fired at FWDA. The Army will forward this statement to NMED upon receipt. The Army and the National Guard have no other records on this matter.

3.2.3 Site Reconnaissance

The portions of AOC 93 within Parcels 11 and 12 were inspected for indications of a release. Representative photographs are included at the end of Section 3.0, Photos 3-1 through 3-15. The area where trenches in Parcel 14 were identified by the aerial photo analysis report was also inspected for indications of a release. There is currently no evidence of the presence of trenches in this area. Other available information indicates that this area was a former gravel pit used for road and/or railway construction (see Section 3.2.1). Representative photographs are included as Photos 3-16 through 3-18.

A fiberglass tank was noted in Parcel 12, along the eastern side of Navajo Boulevard at the westernmost margin of AOC 93. This tank has been placed by a McKinley County conservation service organization to provide a source of water for wildlife.

No evidence of New Mexico National Guard training exercises was observed anywhere within AOC 93.

Debris consisting of concrete, tile, and brick was observed along the top of the south bank of the Rio Puerco valley (Photos 3-1 through 3-4). Because of the placement and the type of debris, it is assumed this debris was placed to prevent erosion of the south bank of the Rio Puerco channel (Figure 3-1). This is area is approximately 400 feet in length, and 100 feet wide at its widest point.

In the area immediately north of the former trenches identified in the 1962 photo, a large borrow pit and piles of demolition debris were observed in the central portion of the eastern half of Parcel 12 (Figure 3-1). The borrow pit consists of a

depression approximately 150 feet in diameter and approximately 15 feet deep at the deepest part (to the north and east). The piles of demolition debris are located to the west of the borrow pit and consist of concrete and asphalt pavement debris, cast iron pipe, wood, presumed asbestos cement pipe, plastic pipe, soil, and gravel. The borrow pit and debris piles are shown in Photos 3-5 through 3-11. According to the aerial photo analysis (ERI, 2006), the origin of the borrow pit appears to have occurred simultaneously with the construction the Interstate 40. The piles of debris appear to have originated from a construction project somewhere on FWDA.

A ground scar corresponding to the location of the former trenches identified on the 1948 aerial photograph was observed to the south and west of the borrow pit, extending to the Rio Puerco channel as shown in Photos 3-12 through 3-14. Only a few pieces of metal scrap (banding, wire, etc.) were observed at the ground scar area. As noted with the borrow pit, it is also thought this ground scar is the result of the construction of Interstate 40.

Ground scars, mature vegetation, and gravel were observed in the gravel pit locations in Parcel 14 (Photos 3-17 and 3-18). The site reconnaissance confirmed that the topographic peaks shown in USGS maps (provided at the end of Section 3.0) have been excavated and that there is no evidence of the trenches identified in the 1948 through 1962 aerial photos. There was no evidence of buried materials or waste; the area was clearly used as a gravel borrow area and was not backfilled or otherwise restored.

A site reconnaissance was conducted 13 February 2008 at the far northeast corner of Parcel 25. It was concluded that the operations at that area (noted in the historical aerial photograph analysis as structures and material stockpiles) were that of a former asphalt paving operations. A letter report was generated from the site reconnaissance, and is provided at the end of Section 3.0.

On 11 June 2008, the Army conducted an additional visual inspection at the northeast corner of Parcel 25. The vertical tank was located behind a security fence with danger and no trespassing signage posted and property identification, Western Gas Processors, Ltd., Kirtland, NM, 505-598-5601 and Denver, CO, 303-452-5603 [posted number no longer in service]. The Army met with the McKinley County Clerk's office on 11 June 2008 and county records indicate that the rights-of-way for I-40 and the BNSF Railroad do not belong to FWDA. The Army met with the BIA and BLM on 13 June 2008 to discuss the June 2001 BLM Cadastral Survey for Fractional Township 15 North, Range 16 West. The Cadastral Survey shows the land within Parcel 25 belonging to FWDA; however, the BLM indicated that the rights-of-way for the BNSF railroad and I-40 were taken by various acts generated by the Department of Commerce and by Congress. Therefore, there is conflicting information regarding the ownership of Parcel 25. The BLM and Army are currently researching records to determine proper ownership.

The Army contacted the Western Gas Processors on 18 June 2008 to verify ownership of the fenced property in the NE corner of Parcel 25. This firm

forwarded to the Army a copy of an Assignment Contract dated 18 October 1989 between the Atchison, Topeka and Santa Fe Railway Company, currently known as BNSF, and Western Gas Processors, Ltd., which indicates Western Gas Processors, Ltd. is leasing property from BNSF. This contract includes a map showing the railroad right-of-way matches the northeast corner of Parcel 25 which indicates BNSF owns the land north of the railroad lines. The Army is in the process of contacting BNSF to confirm property ownership. The Army e-mailed a scanned version of this contract to NMED on 19 June 2008 and will keep NMED informed of Army progress.

It is the Army's current understanding based on this information that Parcel 25 is not owned by the Army and thus proposes postponing sampling until ownership is verified. If it is determined that Parcel 25 does not belong to the Army, the Army will submit a Class I Permit Modification to remove it from the RCRA permit with no further action.

3.2.4 Soil Characterization

No soil characterization has been completed at AOC 93 to date.

3.2.5 Ground Water Characterization

No ground water characterization has been performed at AOC 93 to date.

3.3 EVALUATION OF DATA FROM PREVIOUS INVESTIGATIONS

Based on historical operations conducted at AOC 93 and the findings of the site reconnaissance, it is concluded that it is unlikely a release occurred during New Mexico National Guard training exercises in AOC 93. As noted, training exercises were limited to maneuver, aircraft tracking, and overnight bivouac of air defense artillery units. Refueling of equipment was performed by qualified personnel over drip pans. No weapons, either air defense artillery or small arms, were fired within AOC 93. Further, there is no evidence to suggest AOC 93 poses an unacceptable risk to human health or the environment. Two 3.25-inch rocket motor tubes (a metal tube, approximately 46 inches long, 2.5 inches in diameter, and threaded on each end) were observed on the ground near AOC 93, however, they appeared to be empty tubes used as a marker for a valve box. According to historical Standard Operating Procedures provided in the Release Assessment Report for Parcel 21, 3.25-inch target rockets were demilitarized during FWDA operations. After demilitarization, the motor tubes were classified as scrap metal to be salvaged. A number of these tubes were reused at various locations at FWDA as vertical marking posts for drainage culverts and walkways, and also as "decorative" fencing (one such fence, consisting of empty rocket motor tubes welded together, is present around the parking area at the Fire Training Ground (SWMU 7). Because they have been fully demilitarized and classified as scrap metal, the rocket motor tubes should not be considered munitions debris (MD).

The debris located near the south side of the Rio Puerco channel appears to have been deposited to control the erosion of the river channel. Based on the

type of debris, and the reason it was possibly placed in this area, it is unlikely it have caused a release of hazardous constituents to AOC 93.

A large borrow pit was observed in the central portion of the eastern half of Parcel 12 (Figure 3-1). The borrow pit consists of a depression approximately 150 feet in diameter and approximately 15 feet deep at the deepest part (to the north and east). The origin of the borrow pit appears to have occurred simultaneously with the construction the Interstate 40 and is thought to have been used as a source of construction materials.

A large amount of deposited demolition debris exists in the central portion of the eastern half of Parcel 12 (Figure 3-1). The source of this debris is unknown, however it is suspected to have been from FWDA construction activities. Other than the presumed asbestos cement pipe, none of the material is thought to have caused a release of hazardous constituents to AOC 93.

A ground scar was observed to the south and west of the borrow pit, extending to the Rio Puerco channel. This location corresponds to the area of the former trenches noted in the 1962 aerial photo. Only a few pieces of metal scrap (banding, wire, etc.) was observed at the ground scar area. As noted with the borrow pit, it is also thought this ground scar is the result of the construction of Interstate 40 and is thought to have been used as a source of construction materials.

The ground scars were observed in the gravel pit locations in Parcel 14. There was no evidence of buried materials or waste; the area was clearly used as a gravel borrow area and was not backfilled or otherwise restored.

Based on the site reconnaissance at the far northeast corner of Parcel 25, it was concluded that the operations at that area were that of a former asphalt paving operation.

3.4 SCOPE OF ACTIVITIES

The debris and empty rocket motor tubes observed within AOC 93 will be removed and disposed, or recycled, as part of a future housekeeping action; no removal of debris will take place as part of the proposed RFI activities within AOC93. For future actions, all removed materials will be disposed or recycled off-site in accordance with all federal, state, and local requirements.

In order to confirm the presence or absence of releases of hazardous constituents within the trenches, pits or other disturbed areas located in the portion of AOC 93 situated within Parcel 12, a number of shallow and subsurface discrete soil samples will be collected. No soil sampling will be performed at the former gravel pits within Parcel 14.

Discrete soil samples will be collected from the low points within each trench, pit or other disturbed ground area. This sampling strategy represents a conservative bias toward areas where liquid releases (such as fuel spills) would collect. In general, soil sampling sites have been distributed at a frequency of

one sample per 50 linear feet of trench or debris areas, with the specific sampling locations to be chosen at the low points within the lengths of trench (Figure 3-3). The trenches noted in earlier aerial photos are no longer visible on site. Therefore, specific sample locations will be determined in the field at the time of sampling using best professional judgement and the noted conservative bias. Based on existing information, this sampling strategy results in 2 sampling sites each from the debris pile and borrow pit located in Parcel 12 north of the Rio Puerco, 2 sampling sites each from the three former trench locations in Parcel 12 north of the Rio Puerco, and 3 sampling sites from the debris pile situated along the south bank of the Rio Puerco in Parcel 12 (Table 2-1).

If no debris is present in any of the trenches or pits, soil sampling will not be performed, as there would be no source of a potential release.

All soil sampling sites will consist of a sample collected from the surface (nominally 0 to 3 inch depth interval) and a sample collected from the subsurface (1.0 foot depth) with a decontaminated stainless steel spoon or disposable plastic trowel.

Field investigation methodologies are described in Section 5.0 of this Work Plan.

The sampling data derived from this effort will be used to evaluate the possibility of a release of hazardous constituents from these previously unevaluated debris areas and areas of disturbed ground and to assess if a potential release represents an unacceptable risk to human receptors.

The Army will follow guidance contained in Section 5 of the *Technical Background Document for Development of Soil Screening Levels* (NMED, 2006) to evaluate the effects of multiple constituents; this evaluation will be presented in a future document (e.g., the RFI Report for Parcels 12, 14 and 25).

3.5 ANALYTICAL PROGRAM

The proposed sampling at AOC 93 will result in 26 discrete soil samples (see Table 2-1 and Section 5.2). Each discrete sample will be analyzed for Target Compound List (TCL) volatile organic compounds (VOCs); TCL semi-volatile organic compounds (SVOCs), diesel range organic compounds (DRO), TCL polychlorinated biphenyls (PCBs), metals, and asbestos.

Target compound lists are provided in Appendix E, and QA samples will be collected as summarized in Table 6-1.

Figure 3-1
AOC 93
Fort Wingate Depot Activity
McKinley County, New Mexico

TWO 3.5" ROCKET MOTOR TUBES
DEBRIS PILES
PILE OF ASPHALT
BORROW PIT
PILE OF IRON PIPE
TRENCHES
DEBRIS PILE
FIBERGLASS TANK
NAVAJO BLVD.
AOC 93
BIVOUAC AND TANK
TRAINING AREA
U.S. HIGHWAY 66
INTERSTATE 40
TRENCH
TRENCH
NORTH PATROL ROAD
ARTERIAL ROAD
KNUDSON ROAD
ROAD A-1
ARTERIAL ROAD NO. 5
EAST FRINGE
EAST ESCAPE ROAD
6700
H-265
H-264
H-263
I-276
I-275
J-289
J-288
J-287
A-211
A-212
A-213
A-210
A-209
A-208
A-207
A-206
A-205
A-204
A-203
A-202
A-201
O-2A
O-2
O-3
K-5
K-4
K-3
B-219
B-218
B-217
B-216
B-215
B-214
C-230
C-231
11
12
13
14
15
16
18
21
25

LEGEND

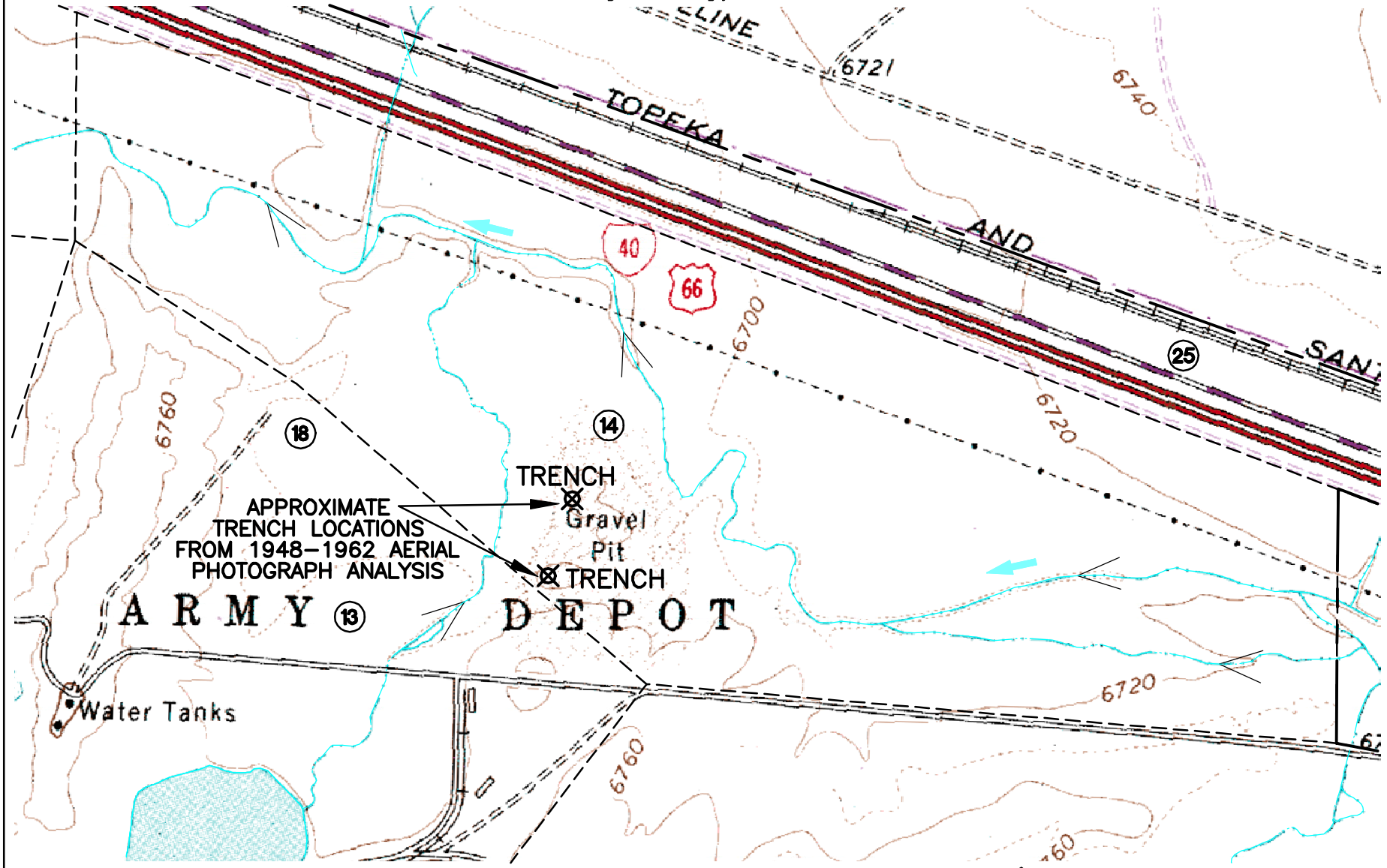
- ARROYOS
- PROPERTY TRANSFER PARCEL BOUNDARY
- TRANSFERRED FWDA PROPERTY
- OCTOBER 2006 SITE RECONNAISANCE FEATURE
- APPROXIMATE TRENCH LOCATION IDENTIFIED IN AERIAL PHOTOGRAPH ANALYSIS

1000 500 0 1000
SCALE IN FEET

N

TerranearPMC, LLC

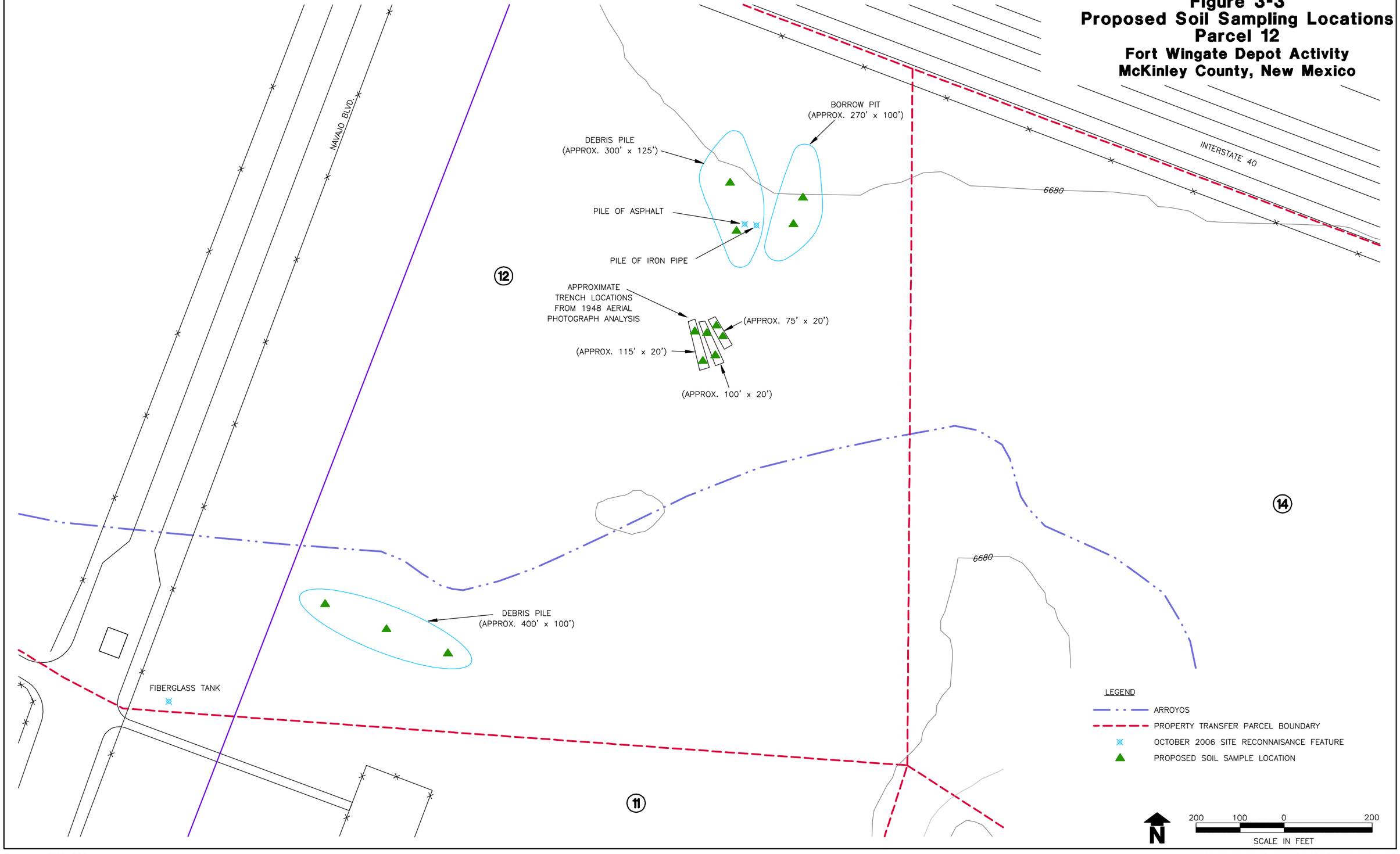
Figure 3-2
Trench Locations in Parcel 14
Fort Wingate Depot Activity
McKinley County, New Mexico



SOURCE: USGS 7.5 MINUTE SERIES (TOPOGRAPHIC) QUADRANGLES FOR MCKINLEY COUNTY, NEW MEXICO.

33205.50/02.12.07-DST/06.25.08-DST/1101

Figure 3-3
Proposed Soil Sampling Locations
Parcel 12
Fort Wingate Depot Activity
McKinley County, New Mexico



TerranearPMC, LLC

33205.30/03.06.08-DST/06.25.08-DST/1204 -1C

Photographs
Parcels 12, 14, and 25 RFI Workplan
Fort Wingate Depot Activity
McKinley County, New Mexico

Photo 3-1: AOC 93, Bivouac and Tank Training Area, showing concrete rubble on south bank of Puerco River.

Photo 3-2: AOC 93, Bivouac and Tank Training Area, showing brick rubble on south bank of Puerco River.

Photographs
Parcels 12, 14, and 24 RFI Workplan
Fort Wingate Depot Activity
McKinley County, New Mexico

Photo 3-3: AOC 93, Bivouac and Tank Training Area, showing concrete, brick, and tile rubble on south bank of Puerco River.

Photo 3-4: AOC 93, Bivouac and Tank Training Area, showing rubble as viewed from Puerco River.

Photographs
Parcels 12, 14, and 25 RFI Workplan
Fort Wingate Depot Activity
McKinley County, New Mexico

Photo 3-5: AOC 93, Bivouac and Tank Training Area, looking north at borrow pit.

Photo 3-6: AOC 93, Bivouac and Tank Training Area, showing debris.

Photographs
Parcels 12, 14, and 25 RFI Workplan
Fort Wingate Depot Activity
McKinley County, New Mexico

Photo 3-7: AOC 93, Bivouac and Tank Training Area, showing debris.

Photo 3-8: AOC 93, Bivouac and Tank Training Area, showing cast iron pipe.

Photographs
Parcels 12, 14, and 25 RFI Workplan
Fort Wingate Depot Activity
McKinley County, New Mexico

Photo 3-9: AOC 93, Bivouac and Tank Training Area, showing cast iron pipe and concrete.

Photo 3-10: AOC 93, Bivouac and Tank Training Area, showing possible asbestos pipe.

Photographs
Parcels 12, 14, and 25 RFI Workplan
Fort Wingate Depot Activity
McKinley County, New Mexico

Photo 3-11: AOC 93, Bivouac and Tank Training Area, showing cast iron pipe.

Photo 3-12: AOC 93, Bivouac and Tank Training Area, looking northwest at ground scar.

Photographs
Parcels 12, 14, and 25 RFI Workplan
Fort Wingate Depot Activity
McKinley County, New Mexico

Photo 3-13: AOC 93, Bivouac and Tank Training Area, looking west at ground scar.

Photo 3-14: AOC 93, Bivouac and Tank Training Area, looking north at ground scar.

Photographs
Parcels 12, 14, and 25 RFI Workplan
Fort Wingate Depot Activity
McKinley County, New Mexico

Photo 3-15: AOC 93, Bivouac and Tank Training Area, showing rocket motor bumper posts, east of Building 18.

Photographs
Parcels 12, 14, and 25 RFI Workplan
Fort Wingate Depot Activity
McKinley County, New Mexico

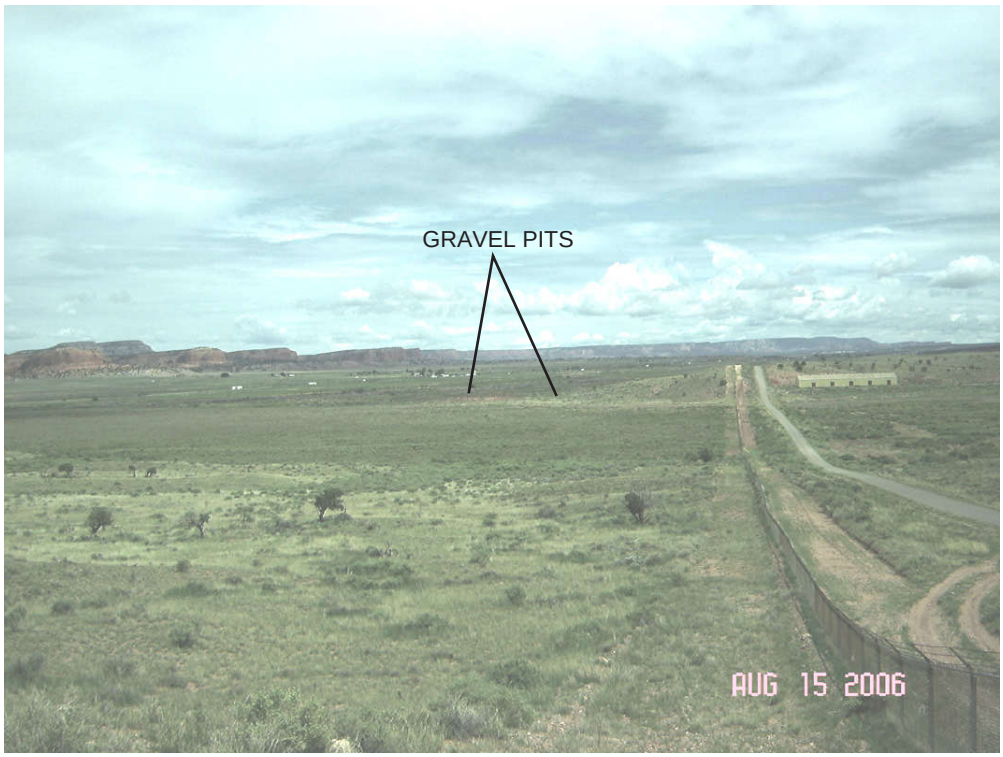


Photo 3-16: Gravel pit location in Parcel 14, looking east.

Photo 3-17: Gravel pit location in Parcel 14, looking southeast.

Photographs
Parcels 12, 14, and 25 RFI Workplan
Fort Wingate Depot Activity
McKinley County, New Mexico

Photo 3-18: Gravel pit location in Parcel 14, looking northeast.

LAND LOCATED IN THE NORTHEAST PORTION OF FORT WINGATE DEPOT ACTIVITY, GALLUP, NEW MEXICO PROPOSED FOR USE BY THE STATE OF NEW MEXICO NATIONAL GUARD CONTAINING 650 ACRES MORE OR LESS

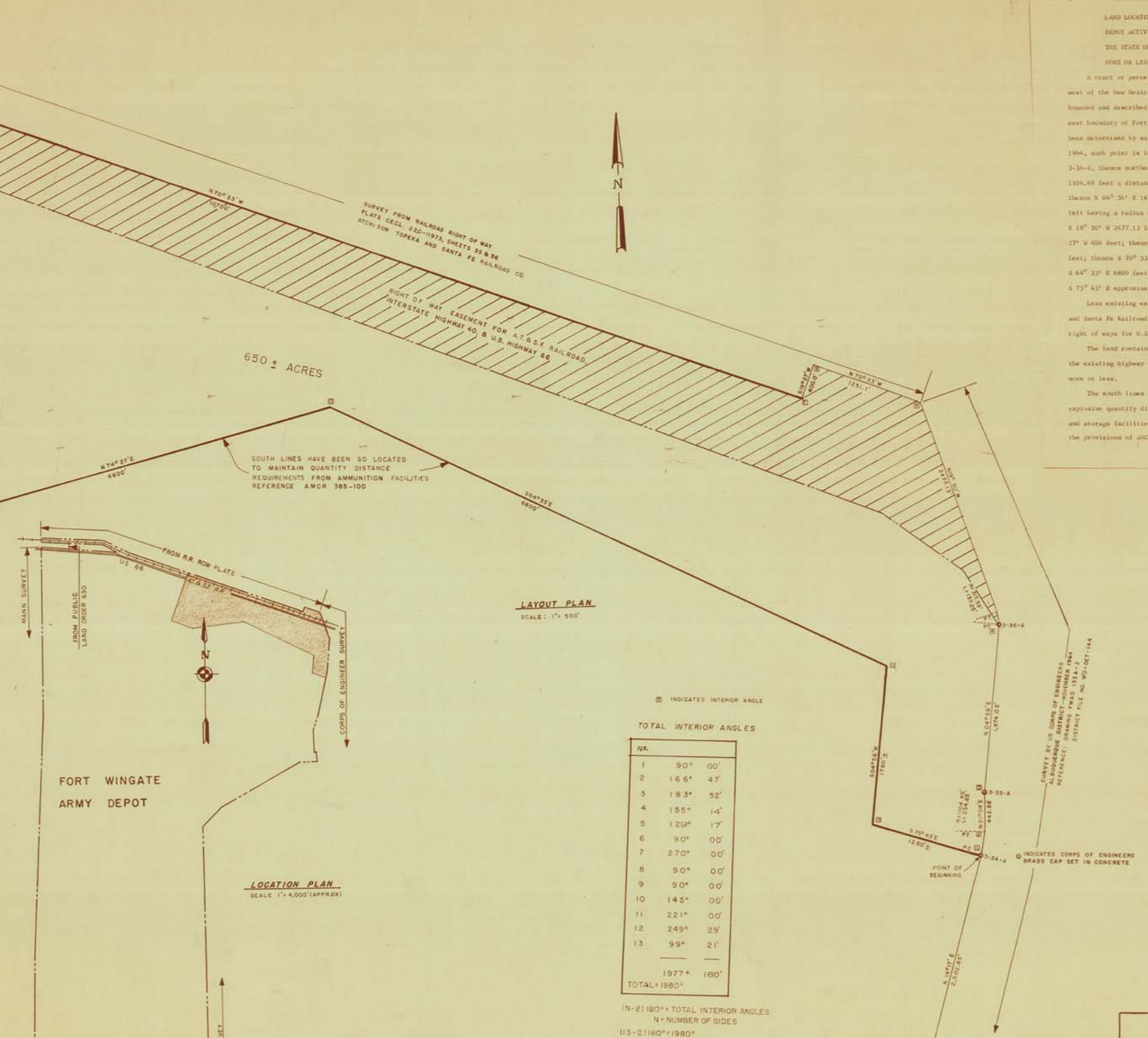
A tract or parcel of land in Township 15 North Ranges 16 and 17 west of the New Mexico Principal Meridian in New Mexico more particularly bounded and described as follows TO-WIT: Beginning at a point on the east boundary of Fort Wingate Army Depot, such boundary line having been determined by survey of U.S. Corp of Engineers Albuquerque District 1964, such point is identified by a brass cap set in concrete numbered 3-36-A, thence northeasterly on a curve to the left having a radius of 1104.49 feet a distance of 254.65 feet; thence S 01° 04' E 442.88 feet; thence N 04° 56' E 1874.02 feet; thence northeasterly on a curve to the left having a radius of 217.55 feet a distance of 137.25 feet; thence N 19° 50' W 2477.13 feet; thence N 70° 33' W 1251.10 feet; thence S 19° 27' W 400 feet; thence N 70° 33' W 10,700 feet; thence S 19° 27' W 4400 feet; thence S 70° 33' E 2000 feet; thence N 74° 27' E 4000 feet; thence S 64° 33' E 6800 feet; thence S 04° 56' W approximately 1760 feet thence S 75° 43' E approximately 1250 feet to the point of beginning.

Less existing easements, permits and grants given the Atchison, Topeka and Santa Fe Railroad Company and the U.S. Bureau of Public Roads for right of ways for U.S. Highways No. 66 and Interstate Highway No. 40.

The land contained within this described tract and lying south of the existing highway right of way fence contains approximately 650 acres more or less.

The south lines of the tract have been so located to preserve explosive quantity distance requirements from the ammunition magazines and storage facilities located adjacent to this area in accordance with the provisions of AMCR 385-100

23 August 1972



LAYOUT PLAN
SCALE: 1"= 500'

LOCATION PLAN
SCALE 1"= 4,000' (APPROX)

⊞ INDICATES INTERIOR ANGLE

TOTAL INTERIOR ANGLES

NO.		
1	90°	00'
2	166°	47'
3	183°	52'
4	155°	14'
5	128°	17'
6	90°	00'
7	270°	00'
8	90°	00'
9	90°	00'
10	145°	00'
11	221°	00'
12	249°	29'
13	99°	21'
	1977°	180'

TOTAL = 1980°

(N-2) 180° = TOTAL INTERIOR ANGLES
N = NUMBER OF SIDES
(13-2) 180° = 1980°

⊙ INDICATES CORPS OF ENGINEERS BRASS CAP SET IN CONCRETE

CONCURRENCE	TITLE	DATE

OFFICE OF THE POST ENGINEER
PUEBLO ARMY DEPOT
PUEBLO, COLORADO

DRAWN BY:
CHECKED BY: W.S.F.
ENGR: Mus
FIRE CHIEF:
SAFETY:
SECURITY:
POST REQUEST NO.

FORT WINGATE DEPOT ACTIVITY
LAND PROPOSED FOR USE BY
NEW MEXICO NATIONAL GUARD

SUBMITTED BY: Albert A. Holland
ALBERT A. HOLLAND, POST ENGINEER
DATE: 23 Aug 72
SCALE: As Shown
FILE:

William P. Hooker
WILLIAM P. HOOKER, COL, O.R.C. COMMANDING
DRWG. NO. WPE-3-1

C-8-51

INFORMATION FOR AOC 93 ; #645 FROM:

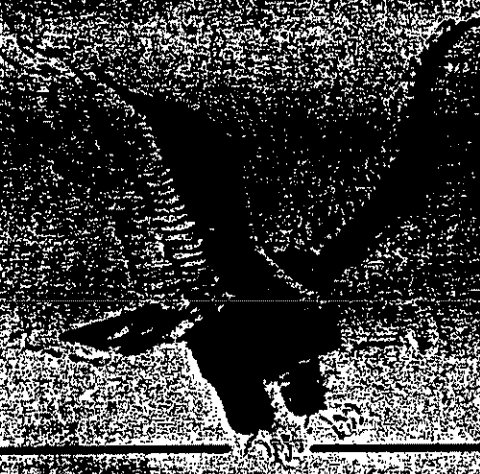
[illegible] INSTALLATION [illegible]

OF

FORT WINGATE ARMY DEPOT ACTIVITY

[illegible] REPORT NO. [illegible]

JANUARY 1980



U.S. ARMY

TOXIC AND HAZARDOUS MATERIALS AGENCY

ABERDEEN PROVING GROUND, MARYLAND 21010

II. PAST AND CURRENT ACTIVITY REVIEW

A. Installation Operations

1. Installation Industrial Operations[2-12]

With the exception of the demilitarization activities discussed in Section II.B.4. below, industrial activity at FWDA has consisted of the care, minor maintenance, and preservation of ammunition; minor maintenance of vehicles is also performed. Table I lists activities conducted in the past with their resultant possible contaminants.

2. Lessee Industrial Operations

No lessee industrial operations have been performed at the installation. As noted in Section I.F above, only a number of permits, licenses, and easements to nonindustrial users were issued in the past.

3. Laboratory Operations

There are no laboratory facilities at FWDA. A review of installation documentation and interviews with present and former employees did not reveal any laboratory operations being conducted in the past.

4. Materiel Proof and Surveillance Tests

Several areas on the installation were used for surveillance testing. The function test site (10, Figure 8)* in the northeast corner was used to test high explosive 2.75-inch rockets and 4.2-inch mortar rounds from 1960 to 1967. Flares and signal grenades were tested in the area in the center of the installation (26) during the late 1950's. In the southeast portion of the installation, two missile launch sites (28 and 29) were used to launch Sergeant and Pershing missiles for impact at White Sands Missile Range. From October 1963 to February 1964, 14 Pershing missiles were launched from this area.

5. Training Areas

a. The New Mexico National Guard conducts tank maneuvers on the installation, but no firing of guns or weapons takes place during this activity. No major spills were reported during these operations.

*Numbers in parentheses are keyed to Figure 8.

INFORMATION FOR AOC 93
FROM:

DEPARTMENT OF THE ARMY
HEADQUARTERS U. S. ARMY DEPOT SYSTEM COMMAND

INSTALLATION ENVIRONMENTAL ASSESSMENT

TOOELE ARMY DEPOT
FORT WINGATE DEPOT ACTIVITY
GALLUP, NEW MEXICO

December 1982

Prepared by:

Inland Pacific Engineering Company
Haworth and Anderson, Inc.
Spokane, Washington

Under the direction of:

District Engineer
U. S. Army Corps of Engineers
Sacramento, California

Approved by:

JERRY K. PATTERSON
Colonel, OrdC
Commanding

5. FWDA Tenants

5.1 Occupational Health Clinic

The health clinic employs one civilian, an occupational health nurse. The clinic's primary responsibility is providing emergency first aid and administering the occupational health program for Depot employees. The occupational health clinic provides instructional services to Depot employees in preventive medicine, first aid, and multimedia CPR. The clinic is assigned one ambulance.

Contaminated materials such as bandages and dressings, used needles, and test tubes are generated by the health clinic. To avoid contamination these materials are burned in the incinerator located near the sewage treatment plant.

5.2 U. S. Army Communications Command

USACC currently employs two civilian personnel. The Communications Command is responsible for all installation communication systems. It operates radio and telephone systems Monday through Friday, 8.5 hours per day. Communications personnel also perform minor maintenance on communications equipment.

5.3 National Guard

The New Mexico National Guard leases 600 acres of land for bivouac and maneuver training. Training occurs on one weekend per month. No firing of weapons takes place during this activity.

5.4 Bureau of Indian Affairs

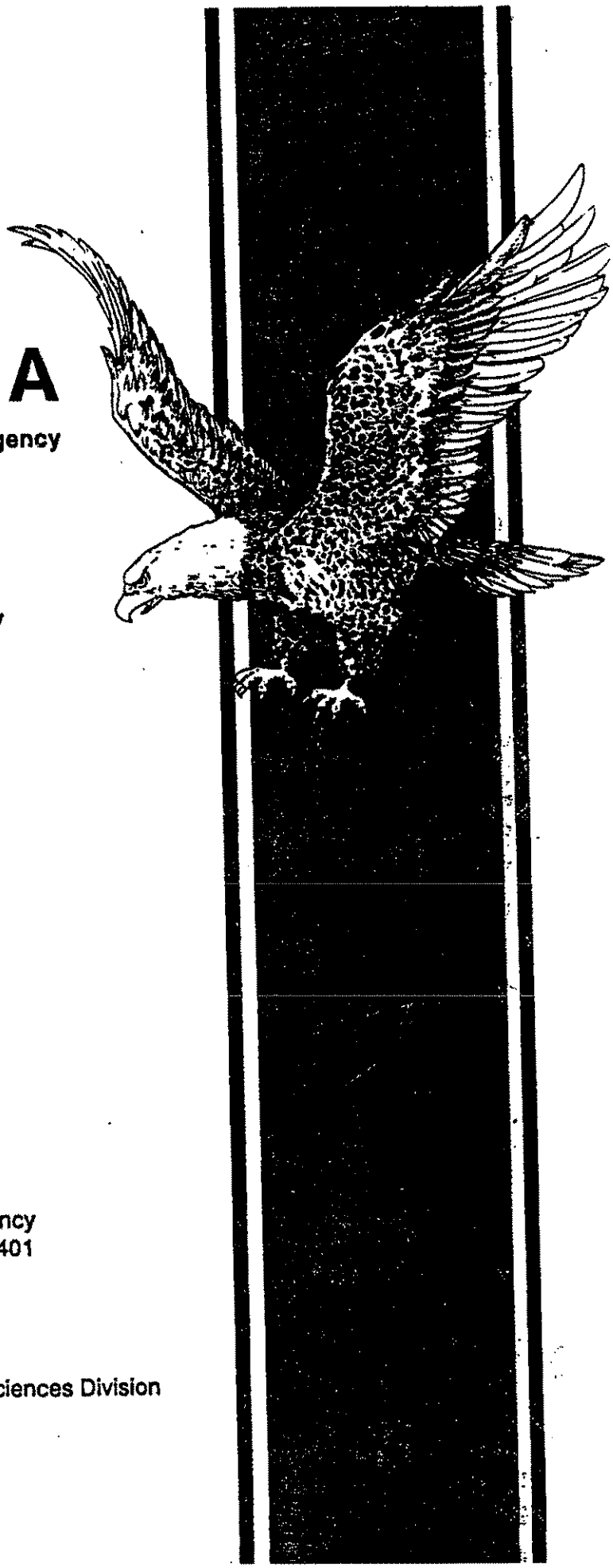
The BIA leases eight buildings and approximately 10 acres of land for the training of firefighters. These facilities are classified as dormitories (Buildings T-27, T-30, T-31, and T-44); a vocational shop (Building T-15); and administration space and a classroom (Building T-14). These facilities are used to provide training for approximately 100 firefighters each session. Training takes place during the summer months.

5.5 Department of Agriculture

In 1973 the United States Department of Agriculture reached an agreement with the Department of the Army concerning the use of two warehouse buildings (12 and 13) at FWDA. The Navajo Tribe has established a food distribution program through which the Department of Agriculture donates surplus food commodities. FWDA provides the two warehouses for storage of these food stuffs as well as the use of its rail system. The food for the Navajo Tribe in Arizona is shipped from FWDA to four satellite warehouses.

AOC 93

CETHA-BC-CR-90051



U S A T H A M A

U.S. Army Toxic and Hazardous Materials Agency

Enhanced Preliminary Assessment Report:

Fort Wingate Depot Activity Gallup, New Mexico

March 1990

prepared for

Commander
U.S. Army Toxic and Hazardous Materials Agency
Aberdeen Proving Ground, Maryland 21010-5401

prepared by

Environmental Assessment and Information Sciences Division
Argonne National Laboratory
Argonne, Illinois 60439

Contaminated materials such as bandages and dressings, used needles, and test tubes are generated by the clinic. Currently, these materials are removed from the site by the nurse, but in the past may have been burned in the incinerator located near the sewage treatment plant or elsewhere on site.

2.3.1.6 U.S. Army Information Systems Command[10,11]

U.S. Army Information Systems Command currently employs two civilian personnel and is responsible for all installation communication systems. It contracts out the telephone systems. Communications personnel also perform minor maintenance on communications equipment.

2.3.1.7 National Guard[10,11]

The New Mexico Army National Guard used to lease 600 acres of land for bivouac and maneuver training. Training occured on one weekend per month. Some firing of weapons took place during this activity. The 1980 lease is up for renewal and may not be renewed.[2]

2.3.1.8 U.S. Department of Energy[10]

The U.S. Department of Energy has had an agreement with FWDA for the storage of instrumentation and equipment associated with atmospheric measurements. The instrumentation and equipment did not contain radioactive or hazardous materials and were stored in magazines not currently used for explosives or munitions. The agreement was recently up for renewal and has not been renewed.[2]

2.3.1.9 U.S. Department of Agriculture[10,11]

The U.S. Department of Agriculture has an agreement with the Department of the Army concerning the use of two warehouse buildings (Bldgs. 12 and 13) at FWDA. The Navajo Tribe has established a food distribution program through which the Department of Agriculture provides surplus food commodities. The FWDA provides the two warehouses for storage of these food stuffs as well as the use of its rail system. The food for the Navajo Tribe in Arizona is shipped from FWDA to four satellite warehouses.

2.3.2 FWDA Facilities

The FWDA installation covers 22,120 acres. The land is used for the administration facilities, workshop activities, magazines, demolition and burning of explosives, and other activities. The open spaces can be characterized as woodland, recreational land, and protection and security buffer zone land. Land use and activity areas, as well as their acreage, are shown in Table 2.1.

REFERENCES

1. *Base Realignments and Closures*, Report of the Defense Secretary's Commission (Dec. 1988).

2. FWDA field notes of ANL investigators (Oct. 1989).

3. *Audit Report, Fort Wingate Army Depot Activity*, prepared by Planning Research Corporation Engineering, San Jose, Calif. for U.S. Army Corps of Engineers, Huntsville, Ala. (Sept. 1986).

4. *History of Fort Wingate Depot, Forts Fauntleroy and Lyon*, U.S. Army Development and Readiness Command (undated).

5. *Base Realignment/Closure Implementation Plan*, Tooele Army Depot Complex, Fort Wingate Depot Activity, Gallup, N.M. (July 11, 1989).

6. *Capability Analytical/Environmental Assessment Report, Fort Wingate Depot Activity*, prepared by Higginbotham & Associates, Colorado Springs, Colo., under the direction of Department of Army, Sacramento District Corps of Engineers, Sacramento, Calif. (Nov. 1979).

7. *Encyclopaedia Brittanica*, 15th Ed. (1979) articles: "North American Peoples and Culture" (Vol. 13, 213-22), "Anasazi Culture" (Vol. I, 341), "New Mexico" (Vol. 13, 2-6), "Navajo" (Vol. VII, 227), and "Zuni" (Vol. X, 900-1).

8. *Historic Properties Report, Fort Wingate Depot Activity, New Mexico*, prepared by Building Technology Inc., Silver Spring, Md., for U.S. Department of the Interior, National Park Service, Historic American Building Survey/Historic American Engineering Record (July 1984).

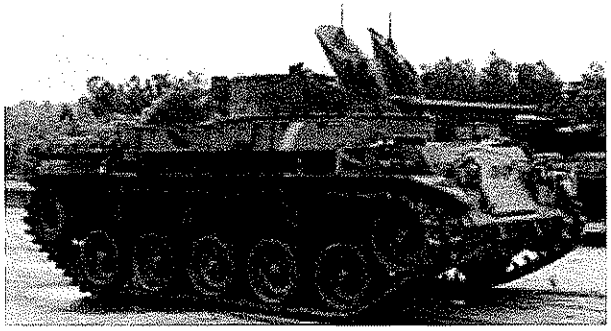
9. Unpublished information, U.S. Army Corps of Engineers, Albuquerque, N.M.

10. *Installation Assessment of Fort Wingate Army Depot Activity, Report No. 136*, U.S. Army Toxic and Hazardous Materials Agency, Aberdeen Proving Ground, Md. (Jan. 1980).

11. *Installation Environmental Assessment, Fort Wingate Depot Activity*, prepared by Inland Pacific Engineering Co. and Haworth and Anderson, Inc., Spokane, Wash., under the direction of U.S. Army Corps of Engineers, Sacramento, Calif. (June 1982).

12. *Air Pollution Abatement Program Study, Hazardous Waste Management Consultation, Fort Wingate Depot Activity, Gallup, New Mexico*, U.S. Environmental Hygiene Agency, Aberdeen Proving Ground, Md. (May 14-15, 1981).

Tank & Ordnance Past Pages



M42A1 Duster

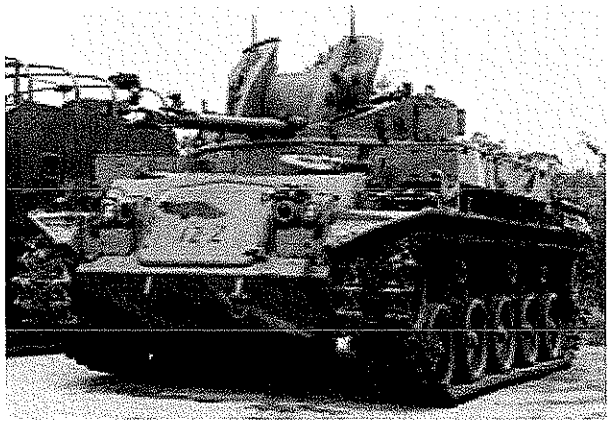
The M42A1 Duster was an improvement on the old M19 Twin 40mm Anti-Aircraft Tank of World War II. The Duster was built by Cadillac and American Car and Foundry, using the M41 Walker Bulldog chassis. To avoid major reconstruction, the twin-gun turret was designed to fit into the hull turret ring in place of the normal tank turret. Production began in 1952 and continuted until 1957. A total of 3,700 Dusters were built. Its main purpose was to escort tank columns and provide medium range air defense against aircraft and attack helicopters. Now obsolete, the duster is still used in Austria, Germany, Japan and several Middle Eastern countries.

6 49,500 lbs.

AOSI-895-5, horizontally opposed, air cooled, super charged, 895.9 C.I., 6 cylinder, gas

45 MPH 100 miles

Twin 40mm M2A1 Cannon
& one .30 cal. Browning M19A4 Flexible Machine Gun



A.A.F. Tank Museum
3401 U.S. Highway 29B
Danville, VA 24540
434-836-5323 Fax: 434-836-3532

FWDA North East Corner – NMDOT lease area

A site examination of the north east corner of Fort Wingate Army Depot was conducted on 13 February 2008 to investigate evidence of “dark material” as shown on the 1978 aerial photographs.
The following photographs and accompanying gps track log shows the results and extent of the examination. Due to snow cover and extremely soft conditions the area was limited to what was not covered in snow.

Photo	Description
169	Possible asphalt truck loading hopper foundation – note loose asphalt
170	Loose asphalt along railroad
171	Area covered by loose, uncompacted asphalt and road base material
172	Area covered by loose, uncompacted asphalt
173	Area covered by loose, uncompacted asphalt

Examination of the aerial photos shows an area of “dark material” beginning in 1973. The area increases until 1978 and then is degraded by subsequent operations up to present day. These operations and the “dark material” are consistent with asphalt paving material storage and paving operations in general. Evidence found at the site indicates the area was used for an asphalt plant and asphalt material storage area.

Michael G. Scoville
US Army Corps of Engineers, Fort Worth

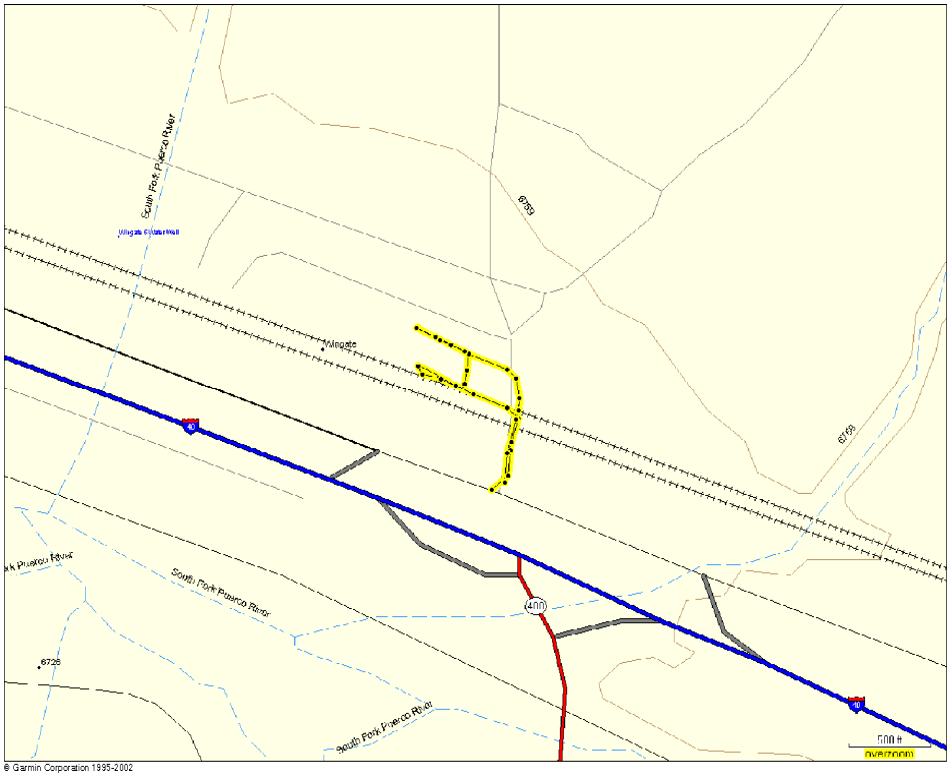
Photo 169

Photo 170

Photo 171

Photo 172

Photo 173



Track log 13 Feb 2008

4.0 AOC 75 –ELECTRICAL TRANSFORMER LOCATIONS

4.1 BACKGROUND

4.1.1 Location, Description, and Operational History

AOC 75 is listed in the Permit as "Electrical Transformers (at least 65 former or existing transformers)". FWDA records (included at the end of Section 4.0) show 65 transformers in 29 locations throughout FWDA.

As shown in Figure 4-1, a single former transformer is located in Parcel 12. No other electrical transformers are located in either Parcel 14 or 25.

4.1.2 Surface Conditions

The ground surface near the single former transformer (AOC 75) in Parcel 12 is generally flat, however, the berm of the road is steeply sloping to the east and west at this location.

As shown in Figure 2-3, surface runoff from rainfall/snowmelt events from the former Parcel 12 transformer (AOC 75) would enter the earthen ditches parallel to the roadway and discharge to the nearby Rio Puerco.

4.1.3 Subsurface Conditions

Subsurface conditions are described in Section 2.2.

4.2 PREVIOUS INVESTIGATIONS

4.2.1 Historical Records Review

A review of historical documents was completed for the AOC 75 locations. Historical drawings are provided at the end of Section 4.0.

One non-PCB transformer shown in the inventories as being located on a pole east of the main gate (Figure 4-1) was classified as non-PCB and was removed and manifested for off-site disposal in January 1993.

4.2.2 Site Reconnaissance Findings

The former electrical transformer location in Parcel 12 was inspected for stained surfaces and/or stained soil. No evidence of a release was observed at the former pole-mounted transformer location east of the main gate.

4.2.3 Soil Characterization

No soil characterization has been completed at the Parcel 12 AOC 75 location to date.

4.2.4 Ground Water Characterization

No ground water characterization has been performed at the Parcel 12 AOC 75 location to date.

4.3 EVALUATION OF DATA FROM PREVIOUS INVESTIGATIONS

Based on the findings described previously, there is no evidence to suggest that the AOC 75 location in Parcel 12 poses a threat to human health or the environment.

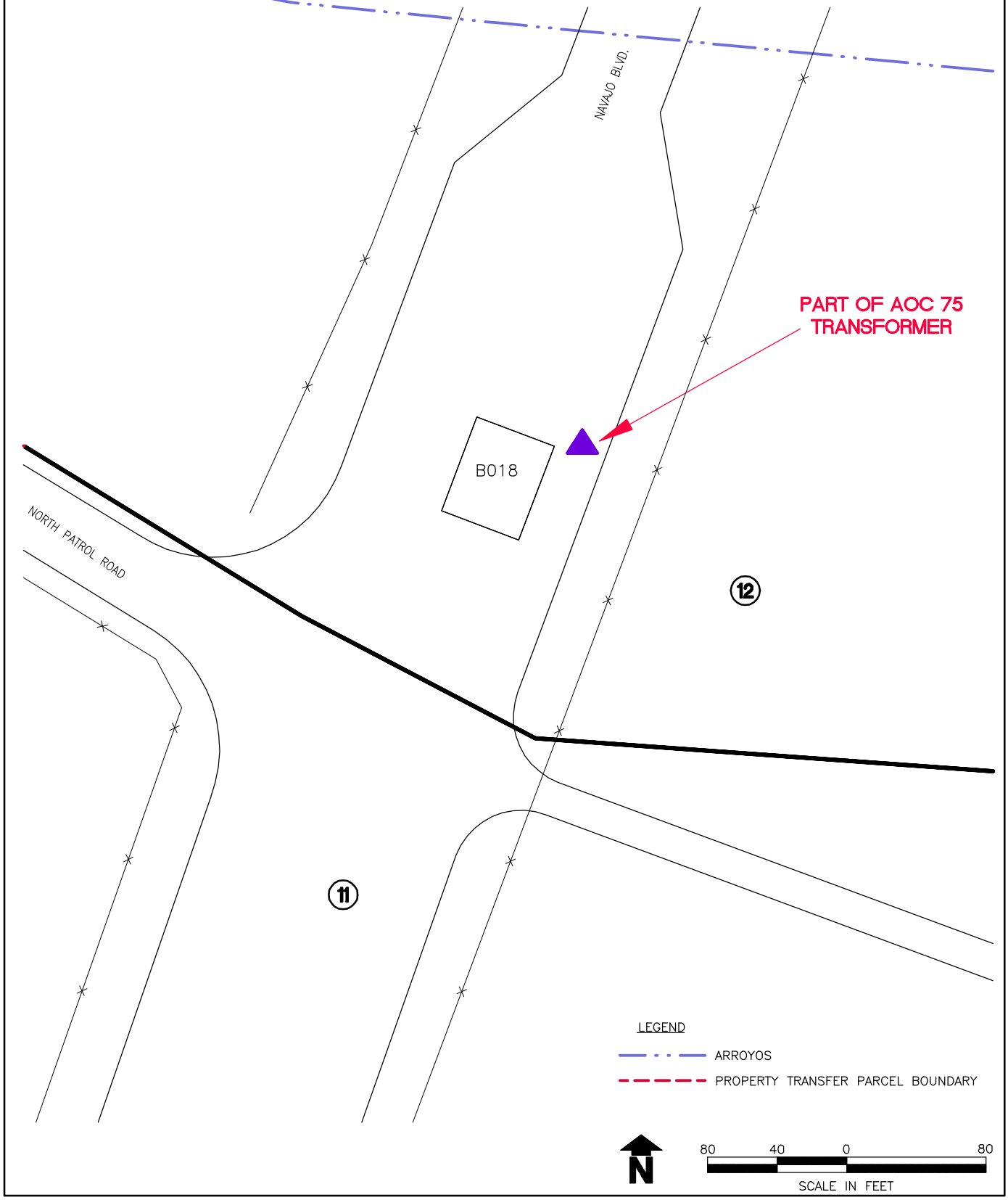
4.4 SCOPE OF ACTIVITIES

Based on the findings described previously, no additional characterizations are proposed.

4.5 ANALYTICAL PROGRAM

No characterization sampling is proposed for the former transformer (AOC 75) located at Parcel 12.

Figure 4-1
AOC 75
Fort Wingate Depot Activity
McKinley County, New Mexico



Ft. Wingate Transformer Inventory

TEAD #	ITEM	MAKE	S/N	DATE	BLDG	CONC (PPM)	LAB ID	MANIFEST #	MANIFEST DATE	NOTES
FTA 019	Transformer	General Electric	7096336	9/14/1990	N Water Tower	450	4099-33	FW 931	1/4/1993	
FTA 020	Transformer	General Electric	7221548	9/14/1990	N Water Tower	180	4099-01	FW 931	1/4/1993	Located @ E side C block (6/90)
FTA 021	Transformer	Allis Chalmers	2712966	9/14/1990	N Water Tower	<10	4099-32	FW 601	4/29/1996	Relocated to Bldg 22 prior to disposal (9/92)
FTA 022	Transformer	Westinghouse	54M7930	9/15/1990	Water Tank (52)	25	4099-27	FW 601	4/29/1996	
FTA 023	Transformer	General Electric	011467057P	9/15/1990	Water Tank (52)	53	4099-26	FW 931	1/4/1993	
FTA 024	Transformer	Westinghouse	54M7937	9/15/1990	Water Tank (52)	26	4099-28	FW 601	4/29/1996	
FTA 025	Transformer	Westinghouse	76ME0922	9/14/1990	Vlt B (34)	<10	4099-29			
FTA 026	Transformer	Westinghouse	76ME0921	9/14/1990	Vlt B (34)	<10	4099-30			
FTA 027	Transformer	Westinghouse	76ME0923	9/14/1990	Vlt B (34)	<10	4099-31			

Ft. Wingate Tran[illegible]rmer Inventory

TEAD #	ITEM	MAKE	S/N	DATE	BLDG	CONC (PPM)	LAB ID	MANIFEST #	MANIFEST DATE	NOTES
FTA 028	Transformer	General Electric	6912176	9/12/1990	SubStation	23	4099-39			
FTA 029	Voltage Regulator	Westinghouse	5791732	9/12/1990	SubStation	<10	4099-14			
FTA 030	Transformer	General Electric	6912175	9/12/1990	SubStation	29	4099-44			
FTA 031	Voltage Regulator	Westinghouse	5791726	9/12/1990	SubStation	<10	4099-42			
FTA 032	Transformer	General Electric	6912177	9/12/1990	SubStation	28	4099-43			
FTA 033	Voltage Regulator	Westinghouse	5791717	9/12/1990	SubStation	<10	4099-38			
FTA 034	Transformer	General Electric	6679036	9/12/1990	22	270	4099-36	FW 932	1/4/1993	Located @ Bldg 539 (6/90)
FTA 035	Transformer	General Electric	6824066	9/12/1990	22	210	4099-37	FW 931	1/4/1993	Located @ Bldg 539 (6/90)
FTA 036	Transformer	General Electric	B334090	9/14/1990	Vlt A (15)	85	4099-23	FW 931	1/4/1993	

Ft. Wingate Transformer Inventory

TEAD #	ITEM	MAKE	S/N	DATE	BLDG	CONC (PPM)	LAB ID	MANIFEST #	MANIFEST DATE	NOTES
FTA 037	Transformer	General Electric	6590114	9/14/1990	Vlt A (15)	280	4099-24	FW 931	1/4/1993	
FTA 038	Transformer	General Electric	5096500	9/14/1990	Vlt A (15)	58	4099-25	FW 931	1/4/1993	
FTA 039	Transformer	General Electric	6686905	9/14/1990	23	360	4099-17	FW 931	1/4/1993	
FTA 040	Transformer	General Electric	E508496-61Y	9/13/1990	48	<10	4099-15	FW 601	4/29/1996	Stored in Bldg 11 prior to disposal (9/92)
FTA 041	Transformer	RTE	1504994	9/15/1990	Vlt D (11)	<10	4099-34			
FTA 042	Transformer	RTE	1304982	9/15/1990	Vlt D (11)	<10	4099-35			
FTA 043	Transformer	General Electric	6810101	9/13/1990	29	240	4099-10	FW 931	1/4/1993	
FTA 044	Transformer	Moloney	710320	9/14/1990	33	<10	4099-22	FW 601	4/29/1996	
FTA 045	Transformer	Allis Chalmers	163020	9/14/1990	33	<10	4099-21	FW 601	4/29/1996	

Ft. Wingate Transformer Inventory

TEAD #	ITEM	MAKE	S/N	DATE	BLDG	CONC (PPM)	LAB ID	MANIFEST #	MANIFEST DATE	NOTES
FTA 046	Transformer	Allis Chalmers	2533635	9/14/1990	51	<10	4099-18	FW 601	4/29/1996	Relocated to Bldg 22 prior to disposal (9/92)
FTA 047	Transformer	Westinghouse	2836236	9/13/1990	542	16	4099-20			Relocated to N Water Tower (9/92)
FTA 048	Transformer	General Electric	6827642	9/14/1990	542	190	4099-19	FW 931	1/4/1993	
FTA 049	Transformer	General Electric	6691203	9/14/1990	536	770	4099-49	FW 931	1/4/1993	
FTA 050	Transformer	General Electric	6693287	9/14/1990	536	180	4099-46	FW 931	1/4/1993	
FTA 051	Transformer	General Electric	6691187	9/14/1990	536	270	4099-50	FW 931	1/4/1993	
FTA 052	Transformer	R. E. Uptegraff	37533	9/12/1990	537	<10	4099-45	FW 931	1/4/1993	
FTA 053	Transformer	R. E. Uptegraff	37644	9/12/1990	537	12	4099-46	FW 931	1/4/1993	Leaking (9/90)
FTA 054	Transformer	R. E. Uptegraff	37550	9/12/1990	537	<10	4099-47	FW 931	1/4/1993	

Ft. Wingate Transformer Inventory

TEAD #	ITEM	MAKE	S/N	DATE	BLDG	CONC (PPM)	LAB ID	MANIFEST #	MANIFEST DATE	NOTES
FTA 055	Transformer	Standard	119218	9/14/1990	527	<10	4099-03			Relocated to Vault A Bldg 15 (9/92)
FTA 056	Transformer	Standard	119217	9/14/1990	527	<10	4099-04			Relocated to Vault A Bldg 15 (9/92)
FTA 057	Transformer	Standard	119219	9/14/1990	527	<10	4099-02			Relocated to Vault A Bldg 15 (9/92)
FTA 058	Transformer	Standard	119306	9/13/1990	528	<10	4099-08	FW 931	1/4/1993	
FTA 059	Transformer	Standard	119305	9/13/1990	528	<10	4099-07	FW 931	1/4/1993	
FTA 060	Transformer	Standard	119307	9/13/1990	528	<10	4099-09	FW 931	1/4/1993	
FTA 061	Transformer	General Electric	6953213	9/13/1990	515	380	4099-11	FW 931	1/4/1993	
FTA 062	Transformer	Westinghouse	3177687	9/13/1990	515	33	4099-13	FW 931	1/4/1993	
FTA 063	Transformer	General Electric	6955678	9/13/1990	515	920	4099-12	FW 931	1/4/1993	

Ft. Wingate Transformer Inventory

TEAD #	ITEM	MAKE	S/N	DATE	BLDG	CONC (PPM)	LAB ID	MANIFEST #	MANIFEST DATE	NOTES
FTA 064	Transformer	Spirakore	B330797	9/12/1990	501	640	4099-41	FW 931	1/4/1993	
FTA 065	Transformer	Spirakore	B330775	9/12/1990	501	300	4099-40	FW 931	1/4/1993	
FTA 066	Transformer	Spirakore	8674779	9/12/1990	501	<10	4099-16	FW 931	1/4/1993	
FTA 067	Transformer	General Electric	6702788	9/13/1990	Between H & D Block	190	4099-05	FW 931	1/4/1993	
FTA 068	Transformer	General Electric	6827466	9/13/1990	Between H & D Block	290	4099-06	FW 931	1/4/1993	
FTA 069	Transformer	General Electric	6808948	9/13/1990	519	770,000	6808949-FW	FW 931	1/4/1993	Leaking (9/90) Stored in Bldg 15 prior to disposal (9/92)
FTA 070	Transformer	General Electric	6719412	9/13/1990	519	990,000	6719412-FW	FW 931	1/4/1993	Leaking (9/90) Stored in Bldg 15 prior to disposal (9/92)
	Transformer	General Electric	6719410	6/1/1990	22	<3	93-1763	FW 601	4/29/1996	
	Transformer	General Electric	6719411	6/1/1990	22	<3	93-1764	FW 601	4/29/1996	

Ft. Wingate Transformer Inventory

TEAD #	ITEM	MAKE	S/N	DATE	BLDG	CONC (PPM)	LAB ID	MANIFEST #	MANIFEST DATE	NOTES
	Transformer	General Electric	6831626	6/1/1990	23					
	Transformer	General Electric	6955634	6/1/1990	33					
	Transformer	General Electric	6955642	6/1/1990	33					
	Transformer	Allis Chalmers	4614252	6/1/1990	340 @ G & D blocks	4.6	92-000890	FW 931	1/4/1993	Stored in Bldg 15 prior to disposal (9/92)
	Transformer	Allis Chalmers	4614253	6/1/1990	340 @ G & D blocks	3.1	92-000890	FW 931	1/4/1993	Stored in Bldg 15 prior to disposal (9/92)
	Transformer	Allis Chalmers	4614254	6/1/1990	340 @ G & D blocks	<1.00	92-000890	FW 931	1/4/1993	Stored in Bldg 15 prior to disposal (9/92)
	Transformer	Rocky Mountain	L889576YMLA	6/1/1990	East of B block	<1.00	92-000890	FW 931	1/4/1993	Stored in Bldg 15 prior to disposal (9/92)
	Transformer	General Electric	L974231YGMA	6/1/1990	East of Main Gate	<1.00	92-00890	FW 931	1/4/1993	Stored in Bldg 15 prior to disposal (9/92)
	Transformer	General Electric	L975972YGMA	6/1/1990	NE corner prmtr fence	<1.00	92-000890	FW 931	1/4/1993	Stored in Bldg 15 prior to disposal (9/92)

Ft. Wingate Transformer Inventory

TEAD #	ITEM	MAKE	S/N	DATE	BLDG	CONC (PPM)	LAB ID	MANIFEST #	MANIFEST DATE	NOTES
	Transformer	General Electric	6580198	6/1/1990	Vlt C (2)			05687	1/31/1991	Leaking (6/90)
	Transformer	General Electric	6580457	6/1/1990	Vlt C (2)			05687	1/31/1991	Leaking (6/90)
	Transformer	General Electric	6580462	6/1/1990	Vlt C (2)			05687	1/31/1991	Leaking (6/90)
	Transformer	Rocky Mountain	88G19020101	9/5/1992	Water Tank (52)			FW 601	4/29/1996	
	Transformer	Westinghouse	60AF5992	9/5/1992		<1.00	92-000890	FW 931	1/4/1993	Stored in Bldg 15 prior to disposal (9/92)

5.0 INVESTIGATION METHODS

5.1 CULTURAL RESOURCES OVERSIGHT

Traditional Cultural Properties (TCPs) and other cultural resources have been documented within FWDA boundaries. Based on a review of available mapping (UNM OCA, 1994), it appears that there are a limited number of identified sites within Parcels 12, 14 and 25.

USACE Fort Worth has developed a Programmatic Agreement (PA) with both the Navajo Nation and the Pueblo of Zuni to specify procedures to be employed during environmental characterization and remediation activities to ensure the protection and preservation of cultural resources. If human remains or funerary items are inadvertently discovered during the conduct of environmental activities, the Army will follow the specific requirements of the Native American Graves Protection and Repatriation Act of 1990 (NAGPRA) to facilitate the protection of these cultural items. A copy of the PA has been included in Appendix F.

Maps showing the locations of TCPs relative to proposed investigation locations will not be included in this Work Plan, which will be a public document when final. Instead, the consultation process will include review by Tribal cultural resource personnel to confirm the presence or absence of identified cultural resources within the proposed investigation locations. If needed, Tribal cultural resource personnel will walk each proposed investigation location prior to the initiation of intrusive activities. Tribal cultural resource personnel will be available for consult during conduct of investigations, as described in the PA. .

5.2 SOIL INVESTIGATIONS

Soil sampling is proposed for one of the AOCs in Parcels 12, 14 and 25. A summary of the proposed field investigations is included in Table 2-1.

An Organic Vapor Monitor (OVM) or its equivalent will be used to field screen the samples.

Sample management will be conducted as described in Section 5.3 and sample locations will be surveyed as described in Section 5.8.

Decontamination of non-disposable sampling equipment and drilling equipment will be conducted as described in Section 5.9.

Investigation derived waste (IDW) generated during the investigation will be managed as described in Section 5.10.

5.2.1 Surface Soil Sampling

Discrete soil samples will be collected at the low points within each trench, pit or other depression as determined in the field at the time of sampling. Any debris present within these land features will be moved aside prior to sampling. If

debris is not present within the trench, pit or depression, soil sampling will not be performed.

5.2.1.1 Collection of Samples for VOC Analysis

This section describes procedures for sampling VOCs from soils collected during the Parcels 12, 14 and 25 RFI. VOCs will be collected soon after sample retrieval and before any other constituent group or field screening to prevent VOC loss to volatilization.

Sample containers will be prepared by the laboratory and shipped to the field location. The sample containers will be pre-weighed and pre-labeled by the supplying laboratory.

Three aliquots will be collected per sample location, one preserved with methanol for high level VOC analyses, a second preserved with sodium bisulfate for low level VOC analyses, and one unpreserved for moisture analyses. The sampling containers will be filled with the appropriate amount and type of preservative by the laboratory.

Just prior to sampling, a decontaminated stainless steel spoon or disposable trowel will be used to expose a fresh sampling surface. The samples will not be homogenized prior to collection and will be placed into the sample container soon after retrieval to prevent VOC loss from volatilization.

The samples will be comprised of 5.0 ± 0.5 grams of soil per aliquot collected using the laboratory-supplied syringe. The syringe will be inserted into the freshly exposed surface, a sufficient quantity of soil removed from the sample, the aliquot "injected" into the preserved sampling container, and the sampling container tightly sealed. This will be repeated for the remaining containers at the sample location.

Immediately upon collection, the sample container will be placed into a cooler with ice and cooled to 4ºC.

5.2.1.2 Collection of Samples for Other Analyses

Surface samples (nominally 0 to 3 inch depth interval) will be collected using either decontaminated stainless steel spoons or disposable plastic trowels.

Each discrete sample will be placed in laboratory-cleaned containers with moisture tight lids. Immediately upon collection, the sample containers will be placed into a cooler with ice and cooled to 4ºC.

5.2.2 Subsurface Soil Sampling

Shallow subsurface samples (nominally 10 to 14 inch depth interval) will be collected from the bottom of the borehole using a decontaminated hand auger.

Samples will be collected from the sampling device using a decontaminated stainless steel spoon or disposable plastic trowel.

5.2.2.1 Collection of Samples for VOC Analysis

Samples for VOC analysis will be collected from either the bottom of the shallow borehole or from the sampling device, following the procedure described in Section 5.2.1.1.

5.2.2.2 Collection of Samples for Other Analyses

Each discrete sample will be placed in laboratory-cleaned containers with moisture tight lids. Immediately upon collection, the sample containers will be placed into a cooler with ice and cooled to 4ºC.

5.3 SAMPLE IDENTIFICATION, CHAIN-OF-CUSTODY, AND PACKAGING/SHIPPING PROCEDURES

Sample identification, chain-of-custody and sample packaging/shipping procedures are discussed in the following sections.

5.3.1 Sample ID

Sample identification (ID) methodology may be changed in the field. Sample identification will be consistent with USACE requirements as well as the requirements of the Environmental Information Management System (EIMS) being developed for FWDA.

Examples of the proposed numbering system are provided below.

Example Soil Sample ID:

SWMU19SO00101

Where:

SWMU19 = SWMU19, Building 501

SO001 = soil sample and number

01 = sample depth interval, in feet below ground surface

Sample depth interval will be either SS for surface soil samples or the numerical bottom of the sample interval. For example SWMU19SO003SS would be a surface soil sample collected from surface to 3 inches bgs at location number 003 and SWMU19SO006001 would be a soil sample collected from 1 ft bgs at location number 006.

Quality Assurance/Quality Control (QA/QC) samples (as described in Section 21.0) will carry the same ID as the parent sample, however, each QA/QC sample will have a unique tracking number. Equipment rinsate blanks, trip blanks, and

field blanks will carry the designation RNSWXXX, TRIPXXX, or FBLKXXX (XXX representing the sequence number of the sample), respectively. Each blank will have a unique tracking number.

5.3.2 Chain-of-Custody

Chain-of-custody forms will be completed and will accompany each sample at all times. Data on the forms will include the sample ID, tracking number, depth interval, date sampled, time sampled, project name, project number, and signatures of those in possession of the sample. Forms will accompany those samples shipped to the designated laboratory so that sample possession information can be maintained. The field team will retain a separate copy of the chain-of-custody reports at the field office. Additionally, the sample ID; date and time collected; collection location; tracking number; and analysis will be documented in the field log book as discussed in Section 6.4.

5.3.3 Packaging and Shipping Procedures

All samples will be shipped daily by overnight air freight to the laboratory. Unless otherwise indicated, samples will be treated as environmental samples, shipped in heavy duty coolers, packed in materials to prevent breakage, and preserved with ice in sealed plastic bags. Each shipment will include the appropriate field QC samples (i.e., trip blanks, duplicates, field blanks, and rinsate blanks). Corresponding chain-of-custody forms will be placed in waterproof bags and taped to the inside of the coolers lids. Each cooler shipped from the laboratory containing aqueous sample bottles for VOC analyses will contain a trip blank. The trip blank will stay with the cooler until the cooler is returned to the analytical laboratory.

5.4 FIELD DOCUMENTATION

Sample control and tracking information will be recorded in bound field logbooks and will include the following information: sample number and location, date, sampling equipment, sampler's name, method of sampling, sample depth, soil sample physical description, ambient weather conditions, and miscellaneous observations. Also, field instrument calibrations will be recorded in a designated portion of the logbook at the time of the calibration. Adverse trends in instrument calibration behavior will be corrected. At the conclusion of each day in the field, the sampling team leader will review each page of the logbook for errors and omissions. He or she will then date and sign each reviewed page.

5.5 SURVEY OF POINTS

The appropriate instrumentation and procedures will be selected to obtain horizontal accuracy of less than 0.1 feet. Either a Trimble Total Station Global Positioning System (GPS) or a Trimble Static GPS will be utilized to collect the soil sample locations. A North American Datum (NAD) 1983 Northing and Easting in U.S. Survey Feet will be established for all surveyed points.

5.6 DECONTAMINATION PROCEDURES

Decontamination of reusable sampling equipment and personnel will be performed to ensure chemical analyses reflect actual concentrations at sampling locations by maintaining the quality of samples and preventing cross-contamination.

Sampling and field equipment cleaned in accordance with the following sections will meet the minimum requirements for definitive-level data collection.

General specifications for equipment and personnel decontamination are discussed in the following paragraphs.

5.6.1 Specifications for Cleaning Materials

Specifications for standard cleaning materials referred to in this section are as follows:

Soap will be a standard brand of phosphate-free laboratory detergent. Use of other detergent will be documented in the field logbooks and investigative reports. Soap will be obtained from a laboratory supply distributor.

Tap water will be obtained from the on-site water supply system (if operable) or from potable water purchased locally.

Analyte free water (deionized water) is water that has been treated by passing through a standard deionizing resin column. Analyte free water will be obtained from the contract laboratory as needed.

If a solvent rinse is required (at highly contaminated sites), the solvent will be pesticide-grade iso-propanol. Use of other solvents will be documented in field logbooks and investigation reports. Solvent will be obtained from the contract laboratory or a laboratory supply distributor.

Other solvents may be substituted for a particular purpose if required. The equipment will be subjected to the standard cleaning procedure after cleaning with a non-standard solvent. The equipment will be completely dry prior to use.

Solvents, laboratory detergent, and rinse waters used to clean equipment will not be reused during field decontamination.

5.6.2 Handling and Containers for Cleaning Solutions

Improperly handled cleaning solutions may easily become contaminated. Storage and application containers must be constructed of the proper materials to ensure their integrity. Following are acceptable materials used for containing the specified cleaning solutions:

Soap will be kept in clean plastic, metal, or glass containers until used. It will be poured directly from the container during use.

Solvent will be stored in the unopened original containers until used.

Tap water will be kept in clean tanks, hand-held sprayers, squeeze bottles, or applied directly from a hose.

Analyte free water will be stored in clean glass, stainless steel, or plastic containers that can be closed prior to use. It may be applied from plastic squeeze bottles.

Hand-held pump sprayers are not acceptable storage or application containers for the above materials (with the exception of tap water). This also applies to stainless steel sprayers. All sprayers have internal gaskets and seals that may contaminate the solutions.

5.6.3 Safety Procedures for Field Cleaning Operations

Some of the materials used to implement the cleaning procedures outlined in this section can be harmful if used improperly. Caution should be exercised by all field personnel and all applicable safety procedures should be followed. At a minimum, the following precautions will be observed in the field during decontamination operations:

Safety glasses with splash shields or goggles, and latex or nitrile gloves will be worn during all cleaning operations.

Solvent rinsing operations will be conducted in the open (never in a closed room or vehicle).

No eating, smoking, drinking, chewing, or any hand to mouth contact shall be permitted during cleaning operations.

5.6.4 Handling of Cleaned Equipment

After field cleaning, equipment will be handled only by personnel wearing clean gloves to prevent re-contamination. The equipment will be moved away from the cleaning area to prevent re-contamination. If the equipment is not to be immediately reused it will be covered with plastic sheeting or wrapped in aluminum foil to prevent re-contamination. The area where the equipment is stored prior to reuse must be free of contaminants.

5.7 INVESTIGATION-DERIVED WASTE CHARACTERIZATION AND DISPOSAL

Investigation derived waste will be managed in accordance with the Facility-Wide Investigation Derived Waste Management Plan (TPMC, 2006).

Two types of IDW will be generated during the sampling of environmental media: decontamination fluids, and disposable sampling equipment and personal protective equipment (PPE).

Used, non-decontaminated sampling equipment/PPE will be placed in polyethylene trash bags which will be placed in removable head drums. General refuse and decontaminated sampling equipment/PPE shall be placed in polyethylene trash bags or other suitable containers.

Volumes of decontamination fluids are anticipated to be small. These liquids will be containerized at the sample location in a clean 5-gallon bucket with a watertight lid. Depending upon the volumes generated, water from more than one sample location may be consolidated in the same bucket, or multiple buckets may be required for the same location. When filled or at the end of the sampling day, filled 5-gallon buckets will be emptied using a funnel into an open head 55-gallon steel drum conforming to United Nations Performance-Oriented Packaging standards and Department of Transportation (DOT) specifications in 49 Code of Federal Regulations (CFR) 178.

The 55-gallon drum(s) will be stored in the FWDA less than 90 day storage area located in Building 5. A label reading “Caution, This Drum/Container May Contain Hazardous Material” or similar will be affixed to each drum/container.

Each drum will be labeled with a unique ten-character identifier: The first two characters are "FW," the second two will be “GW” for ground water, the next four are the Julian date on which filling commenced, and the last two are the consecutive number of the container among all being filled on a given day.

Example Identifier:

FWGW**268**6**01** is:

FW Fort Wingate Depot Activity

GW Ground water purge and decontamination water

268 25 September

6 2006

01 Container 01

The label shall also indicate the contents (e.g., ground water and decontamination fluids), source (e.g., monitor well numbers), and the date on which filling is completed (90-day start date).

Inventory forms will be completed for all IDW containers placed at the less than 90-day holding area. Information on the form shall be verified with respect to container labeling. Copies of inventory forms will be provided to the FWDA BRAC Environmental Coordinator (BEC).

Representative samples will be collected for each container of decontamination fluids, consisting of a composite of the material, to characterize IDW for disposal as hazardous, special, or non-hazardous waste. Characterization results for

these media shall serve to classify associated sampling equipment and PPE for disposal, unless this PPE and equipment was decontaminated prior to disposal, in which case it will be handled as general refuse. Samples will be collected within five days of the date on which the drum is filled, and analytical results will be provided within 10 days of sampling.

The liquid IDW samples will be analyzed for the same parameters as the environmental samples where they were generated, plus appropriate RCRA parameters (e.g., ignitability, corrosivity, RCRA VOCs, SVOCs, pesticides, and metals).

Upon receipt of waste characterization results, copies will be provided to the FWDA BEC and USACE Technical Manager, and inventory forms at the 90-day holding area will be updated with IDW classifications and applicable USEPA waste codes.

IDW will be classified as hazardous waste if the material exhibits the characteristics of ignitibility, corrosivity, reactivity, or toxicity as listed by the USEPA in 40 CFR 261.20-24 (Subpart C).

IDW will be classified as non-hazardous waste if potential contaminants are not detected or are detected at concentrations less than applicable regulatory limits.

All IDW will be manifested and transported off site within the lesser of 30 days of receipt of characterization results or within 90 days of placement at the temporary holding area. No IDW containers will be stored beyond 90 days at the holding area unless the FWDA BEC grants an extension.

IDW classified as hazardous waste will be disposed of off-site at a RCRA Subtitle C permitted treatment, storage, and disposal (TSD) facility. Prior to transport, containers of shall be labeled according to DOT regulations in 49 CFR 172; additionally those containers with a capacity of 110 gallons or less shall be labeled as follows:

HAZARDOUS WASTE - Federal Law Prohibits Improper Disposal. If found, contact the nearest police or public safety authority or the U.S. Environmental Protection Agency.
Generator's Name and Address _____
Manifest Document Number _____

This labeling shall be displayed in accordance with DOT requirements in 49 CFR 172.304.

Manifests will be prepared according to USEPA requirements in 40 CFR 262.20, and acquisition, copies, and use of the manifest will be in accordance with USEPA requirements in 40 CFR 262.21-23. The FWDA BEC will sign the manifest as the generator. The transporter, who shall be fully licensed and

insured to transport hazardous waste, will then sign the manifest and a copy will be provided both the FWDA BEC and USACE Technical Manager. Inventory forms at the less than 90-day storage area shall be annotated with the transport date and manifest number.

Concurrent with the manifest, a Land Disposal Restriction (LDR) shall be prepared in accordance with USEPA requirements in 40 CFR 268.7 and submitted for review and signature by the FWDA BEC. The signed LDR shall accompany each shipment of hazardous waste and serve as notification to the receiving TSD facility of any requirements for treatment prior to land disposal.

Non-hazardous sampling equipment/PPE and general refuse may be disposed of in FWDA trash containers, or transported off-site for disposal as municipal waste if large quantities of material are generated. Liquid IDW classified as non-hazardous waste shall be transported off-site to a facility approved for disposal of such material.

6.0 QUALITY ASSURANCE/QUALITY CONTROL PROCEDURES AND REQUIREMENTS

This section outlines the overall QA/QC procedures and establishes the specific QA/QC requirements for the investigations conducted in Parcels 12, 14 and 25. The objective of this section is to describe project DQOs and institute guidelines for field sampling, documentation, laboratory analysis, overall QA/QC procedures, and reporting that will result in data of known quality.

Data collected during the investigation and analytical sampling at Parcels 12, 14 and 25 will be definitive-level data. Definitive-level data generally represent data derived from analysis by approved standard methods in a fixed-base laboratory. Definitive-level data are qualitative and quantitative in nature (i.e., identify detected constituents and their concentrations) and are used to definitively determine site closure compliance or response action necessity.

6.1 DATA QUALITY OBJECTIVES

Data quality objectives (DQOs) are quantitative and qualitative statements specified to ensure that data of known and appropriate quality are obtained during environmental investigation activities. To ensure that data generated during field activities are adequate to support decisions regarding the selection of appropriate corrective measures, the objectives and the method by which decisions will be made must be established in the project planning process and thoroughly discussed in the Work Plan. DQOs are selected based on the specific use of the data collected. The DQO statements derived from the output of each step of the DQO process shall:

- clarify the study objective,
- define the most appropriate type of data to collect,
- determine the most appropriate conditions from which to collect data, and
- specify acceptance levels of decision errors that will be used as the basis for establishing the quantity and quality of data needed to support the decision.

As such, DQOs are management tools used to develop a scientific and resource-effective sampling design. DQOs must strike a balance between time, money, and data quality; therefore, initiating the full DQO process for every site and investigation may not always be necessary. The DQO process must be initiated during project planning to produce investigations that result in data having a quantifiable degree of certainty. The end use of data to be collected, quality of data required, and cost to produce data will determine required DQOs.

6.1.1 Data Quality Objective Process

The DQO process consists of seven steps.

Step 1: State the Problem

The purpose of this step is to clearly define the problem that requires new environmental data so the study focus will be clear and unambiguous.

Step 2: Identify the Decision

The purpose of this step is to define the decision that will be resolved using data to address the problem.

Step 3: Identify Inputs to the Decision

The purpose of this step is to identify informational inputs required to resolve the decision and to determine which inputs require environmental measurements.

Step 4: Define Boundaries of the Study

The purpose of this step is to specify spatial and temporal circumstances covered by the decision.

Step 5: Develop a Decision Rule

The purpose of this step is to integrate outputs from previous steps into a single statement that describes the logical basis for choosing among alternative actions.

Step 6: Specify Limits on Decision Errors

The purpose of this step is to specify the decision maker's acceptance limits on decision errors. The limits are used to establish appropriate performance goals for limiting uncertainty in the data.

Step 7: Optimize the Design

The purpose of this step is to identify the most resource-effective sampling and analysis design for generating data expected to satisfy DQOs.

In most cases, each successive step derives information from the previous ones; thus, each step should be completed in the order shown above. The DQO process is iterative, however, so it may be useful to refine the outputs from previous steps. For more information on the DQO process, refer to *Data Quality Objectives Process for Hazardous Waste Site Investigations* (USEPA, 2000).

6.1.2 Parcels 12, 14 and 25 Environmental Data Quality Objectives

The objective of investigations in Parcels 12, 14 and 25 is to identify constituents exceeding cleanup levels in affected environmental media (e.g., soil).

In using the seven-step DQO process outlined above, the following DQOs for the sampling and analytical program for the investigations in Parcels 12, 14 and 25 were identified:

- NMED- and USEPA-approved sampling methods will be used to provide definitive-level quantitative analytical data that will meet the applicable or relevant and appropriate requirements specified in the Permit.

- Samples will be analyzed using NMED- and USEPA-approved methods currently approved by NMED.

- Laboratories performing the sample analyses will follow the most recent version of the USACE EM 200-1-3 for Appendix I, "Shell for Analytical Chemistry Requirements" and the most recent version of Department of Defense (DOD) "Quality Systems Manual" (QSM). Laboratories performing sample analyses will hold current National Environmental Laboratory Accreditation Program (NELAP) accreditation for all appropriate fields of testing. Laboratories will submit self-declarations forms (including supporting documentation) as well as information related to NELAP accreditation to the USACE Technical Manager.

- Analytical results will be validated in accordance with the most current versions of USEPA Contract Laboratory Program (CLP) National Functional Guidelines for Organic Data Review and USEPA CLP National Functional Guidelines for Inorganic Data Review to ensure the data are of sufficient quality for the intended use.

- Sample results will be compared to cleanup levels specified in the Permit to determine if action levels are exceeded.

In going through this DQO process, the questions of why this investigation is being conducted and what decisions are to be supported have been answered. In addition, conduct of the DQO process ensures that the data collected will have a quantifiable degree of certainty.

6.2 MEASUREMENT PARAMETERS OF INTEREST

6.2.1 Field Analyses and Measurements

Certain field activities do not require sample collection, but nonetheless involve measurements for which QA concerns are appropriate. Such activities include monitoring of breathing zones for organic vapors. The primary QA objective of these activities is to obtain reproducible measurements to a degree of accuracy consistent with the intended use of the measurements and to document measurement procedures. The objective of field sampling procedures is to obtain samples that represent the environmental matrix being investigated. This will be accomplished through the use of proper sampling techniques and equipment.

6.2.2 Laboratory Analyses

To obtain data quality sufficient to meet the project DQOs, the analytical methods listed in Table 6-1 will be employed. The laboratory will follow only those

methods referenced. Deviations from the prescribed methods may cause data rejection.

Laboratories performing the sample analyses will follow the most recent version of the USACE EM 200-1-3 for Appendix I, “Shell for Analytical Chemistry Requirements” and the most recent version of the DOD QSM. Laboratories performing sample analyses will hold current NELAP accreditation for all appropriate fields of testing. Laboratories will submit self-declarations forms (including supporting documentation) as well as information related to NELAP accreditation to the USACE Technical Manager.

6.3 FIELD EQUIPMENT CALIBRATION

Field instruments used during the RFI will be calibrated, operated, and maintained in accordance with the manufacturer’s instructions. Daily, on-site field instrument calibrations will be performed before and during each day’s use by trained technicians using certified gases and standards. Instrument calibrations will be recorded in bound logbooks and will include field instrument identification, date of calibration, standards used, and calibration results (as described in Section 6.4).

If an individual suspects an equipment malfunction, the meter will be removed from service and tagged so that it is not used inadvertently, and a substitute piece of equipment will be used. Additionally, equipment that fails calibration or becomes inoperable during use will be removed from service and tagged. Such equipment will be repaired and satisfactorily re-calibrated. The results of activities performed using equipment that has failed re-calibration will be evaluated. If the results are adversely affected, the outcome of the evaluation will be documented and the Project Manager will be notified.

Equipment that cannot be repaired will be replaced. Some backup equipment will be available in the field for use in case of a malfunction.

Preventative maintenance procedures for the field instruments will be carried out in accordance with procedures outlined by the manufacturer’s equipment manuals. All records of inspection and maintenance will be dated and documented in the field logbook. Critical spare parts field instruments will be included in the sampling kits to minimize downtime. In addition, backup meters will be available, if needed. Spare parts will be purchased from accepted vendors. Daily inspections of field equipment will be conducted to ensure that equipment is functioning properly. If inspection results indicate that a piece of field equipment is deemed faulty or not useable, replacement equipment will be cleaned, calibrated if necessary, and used in place of the faulty equipment. The faulty equipment will then be shipped back to the vendor for repair.

6.4 FIELD DATA QUALITY ASSURANCE

6.4.1 Sample Collection Quality Assurance

Several types of field quality control samples will be submitted to the analytical laboratory to assess the quality of the data resulting from the field sampling program. These samples may include field ambient blanks, equipment rinse blanks, matrix spike (MS) and matrix spike duplicate (MSD) samples, and field sample duplicates.

QA/QC samples are not typically collected from media sampled to provide disposal characterization. QA/QC control samples will be collected for environmental medium (e.g., soil) samples only.

Field duplicate and QA split samples will be collected at a frequency of one per 10 environmental samples for each medium sampled (e.g., soil). If reusable sampling equipment is used, equipment rinse blanks will be collected at a frequency of one rinse blank per 20 environmental samples. Additional volume will be collected at specified sample locations so that one MS/MSD pair will be submitted to the laboratory for every 20 environmental samples for each medium sampled.

6.4.2 Documentation Quality Assurance

Field documentation shall consist of one or more job- or area-specific field logbooks, field forms, sample Chains-of-Custody, and sample logs/labels. This format of documentation allows for detailed recording of information in various field logbooks and forms that are referenced in the site logbook. Requirements and procedures for maintaining the various types of documentation records are discussed in Section 6.4.2.1. Photographic documentation is required for all fieldwork as described in Section 6.4.4.2.

6.4.2.1 Logbooks

Site and field logbooks provide a daily handwritten record of all field activities at an investigation site. All logbooks will be permanently bound and have a hard cover. Logbooks will be ruled, or ruled and gridded, with sequentially numbered pages. All entries into field logbooks will be made with indelible ink. Field logbooks are detailed daily records that are kept in real time and are assigned to specific activities, positions, or areas within the site. Separate logbooks shall be used for each sampling and field team.

Documentation in field notebooks may include the following:

- Location
- Date and time
- Names of field crew

- Names of subcontractors
- Weather conditions during field activity
- Sample type and sampling method
- Location and depth of sample
- Sample identification number
- Sample description (such as color, odor, clarity)
- Amount of sample
- Field measurements
- Calibration results
- Adverse trends in instrument calibration behavior
- Equipment specifications
- Decontamination and health and safety procedures

If entries in the field notebooks need to be corrected or changed, corrections will be made by crossing out mistakes with a single line, writing the corrections, and initialing and dating the entry. The use of correction fluid is not permitted.

At the conclusion of each day in the field, the sampling team leader will review each page of the logbook for errors and omissions. He or she will then date and sign each reviewed page.

6.4.2.2 Field Photographs

Photographs will be taken to photo-document field activities. Photographs will either be taken using standard 35-millimeter film cameras (both reusable and disposable cameras are acceptable) or high-resolution digital cameras.

Photographs taken during field activities will be sequentially numbered and documented in the field logbook with location, direction, and description of the activity. After film is developed or printed, they will be numbered to correspond with the field logbook and placed into a binder with the location, direction, and description of the activity Included as either a caption or separate corresponding sheet.

There will be no minimum or maximum number of photographs to be taken at each location; however, a sufficient number to accurately represent the activity will be taken.

6.4.2.3 Field Data Record Forms

In addition to the field notebooks, forms will also be used to document field efforts. These forms will ensure that all required data and observations were recorded in a consistent manner. No blank spaces will be left; all non applicable items will be marked "N/A." Forms that will be used include Chain of Custody Forms.

6.4.2.4 Final Evidence File Documentation

All evidential file documentation will be maintained under an internal project file system. The Project Manager will ensure that all project documentation and QA/QC records are properly stored and retrievable.

6.5 DATA VERIFICATION/VALIDATION

Independent data validation of the results of all chemical analyses performed by the laboratory will be performed. This effort will consist of the following:

- Verification that the amount of data requested matches the amount of data received (i.e., completeness check);
- Verification of the procedures/methods used;
- Verification that documentation/deliverables are complete;
- Verification that hard copy and electronic versions of the data are identical;
- Verification that the data seem reasonable based on analytical methodologies;
- Evaluation and qualification of results based on sample receipt (sample temperature and preservation) and holding time compliance;
- Qualification of results based on method, field and rinse blank results;
- Evaluation and qualification of results based on MS/MSD analyses;
- Evaluation and qualification of results based on surrogate recoveries;
- Evaluation and qualification of results based on internal standard performance;
- Verification that the analytical instrument was calibrated in accordance with required instrument and method criteria;
- Evaluation and qualification of results based on initial and continuing instrument calibration verification check sample analyses, and initial and continuing instrument calibration blank results;
- Evaluation and qualification of results based on LCS analyses;

- Evaluation and qualification of results based on laboratory and field duplicate precision;
- Verification that the instrument was properly tuned before sample analyses; and,
- Verification that the analytical sequence included pertinent information required to track the analyses of all QA/QC and environmental samples.

For new data, the Army has specified Functional Guideline equivalent validation procedures, with 100% validation for blanks, duplicates, and holding times for all sample data generated for FWDA, with a lesser number (typically 10%) receiving full validation.

Standard USEPA data qualifiers shall be used to indicate: (1) blank contamination, (2) sample-analytical anomalies associated with a constituent, (3) analytical results which fall between the MDL and the PQL, (4) data qualified because of an exceedance of method-specific holding times, high cooler temperatures, or other significant QA/QC data deficiencies, and (5) data results which exceed the upper calibration curve limit for that constituent and associated analytical instrument.

A Data Validation Report will be prepared that will discuss the performance of the laboratory with respect to the factors presented above. As much as possible, data will be presented in tabular form. In addition, the Data Validation Report will discuss the following:

- Actual MDLs and/or PQLs, as applicable;
- Adequacy of the detection limit for the intended purpose;
- The possible influence(s) of matrix interferences, dilution factors, unusual shipping conditions, and any variance from the reference analytical methods;
- Usability of the data with respect to the project objectives; and
- Attainment of DQO process–derived decision statements with respect to chemical data quality.

An EDD will be provided in an Excel format compatible with USACE Fort Worth District and FWDA EIMS standards.

6.6 ENVIRONMENTAL DATA MANAGEMENT

Following review and approval, the data will be loaded into the EIMS being developed for FWDA. At this time, the EIMS is under development, and additional details regarding availability and access to data are not available. As noted in Section 6.4.1, the Parcels 12, 14 and 25 RFI Work Plan implementation SOW will contain the required information to ensure that the data generated

during efforts described in this RFI Work Plan are compatible with the FWDA EIMS.

6.7 DATA EVALUATION

As described in Section 2.3.3, environmental data generated during investigations in Parcels 12, 14 and 25 will be evaluated with respect to cleanup levels described in Permit Attachment 7 (NMED, 2005).

Table 6-1
Sample Summary Matrix
Parcels 12, 14, and 25 RFI Work Plan
Fort Wingate Depot Activity
McKinley County, New Mexico

Matrix	Environmental Samples	Analysis	Analytical Method[1]	Container and Preservation	Analytical Holding Time
Soil Samples (Environmental)	26	Metals Arsenic Barium Cadmium Chromium Lead Mercury Selenium Silver	SW846 6010C/7471B	1-4 oz. glass widemouth w/ Teflon-lined lid. Cool to 4 degrees C.	6 months; 28 days for Mercury.
	26	TCL PCBs	SW846 8082A	1- 4 oz. amber glass. Cool to 4 degrees C.	7days to extraction/40 days to analysis.
	26	TCL VOCs	SW846 8260C	3-5 g Encore samples or 3-40 ml. glass vials w/methanol and sodium bisulfate. Cool to 4 degrees C.	48 hours for preparation for Encore samplers, 7 Days for other. Analysis within 14 days.
	26	TCL SVOCs	SW846 8270D	1-4 oz. amber glass widemouth w/ Teflon-lined lid. Cool to 4 degrees C.	14 days until extraction. Analysis within 40 days of extract preparation.
	26	Asbestos	600	1-4 oz. glass widemouth w/ Teflon-lined lid.	6 months.
	26	TPH DRO	SW846 8015D	1-4 oz. amber glass widemouth w/ Teflon-lined lid. Cool to 4 degrees C.	14 days until extraction. Analysis within 40 days of extract preparation.

Frequency of QC Samples:

Field Duplicates: 1 duplicate for every 10 environmental samples.

Field Blanks: 1 field blank for every 20 environmental samples.

Rinse Blanks: 1 rinse blank for every 20 environmental samples.

MS/MSD: 1 MS/MSD set for every 20 environmental samples.

Trip Blanks: 1 trip blank for every cooler containing samples to be submitted for VOC analysis.

Notes:

1 : Will use latest EPA updated method

7.0 HEALTH AND SAFETY PROCEDURES

The Site Safety and Health Plan (SSHP) for this investigation is included in Appendix F.

8.0 SCHEDULE

Because there are multiple levels of review for this Work Plan, a detailed schedule for implementation of the work elements described herein has not been developed. A basic conceptual schedule is provided below.

Task	*Days*
Award task order for field work and report	90 calendar days after work plan is approved by NMED
30 day notification to NMED	30 days prior to mobilization
Field work and report	210 days after contract award
Army review	20 days after report submittal

9.0 CONSULTATION PROCESS RESULTS

The purpose of this section is to document the results of the consultation process for this RFI Work Plan, as required by Permit Section VIII.B.1.b.

A draft of the Parcels 11, 12, 14 and 25 Release Assessment Report was provided in March 2007 to designated representatives of the Navajo Nation and Pueblo of Zuni, for their review and comment. At the same time, copies were also provided to designated DOI, Bureau of Land Management (BLM), and Bureau of Indian Affairs (BIA) representatives, for their review and comment.

Comments from the consultation process and FWDA responses are included in Appendix G.

10.0 REFERENCES

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