FW 98-2

FINAL DRAFT
MINIMUM SITE ASSESSMENT REPORT

FORT WINGATE ARMY DEPOT ACTIVITY
FORT WINGATE, NEW MEXICO

Prepared for

Tooele Army Depot
Tooele, Utah 84074-5000

Prepared by

U.S. Army Corps of Engineers
Albuquerque District
4101 Jefferson Plaza, NE
Albuquerque, New Mexico 87109-3435

February 1998

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Table of Contents

List of Tables

List of Figures

Appendices

EXECUTIVE SUMMARY

This report covers the activities and findings of the Minimum Site Assessment (MSA) that was proposed and completed by the U.S. Army Corps of Engineers, Albuquerque District, (Corps) on behalf of the Tooele Army Depot Activity (TEAD), Tooele Utah. This MSA was performed in accordance with the New Mexico Environment Department (NMED), Underground Storage Tank Regulations, §1205 and 1206, after petroleum contamination was detected in the soil during removal of a UST near building 46 adjacent to the Firehouse located at the Fort Wingate Army Depot (FWDA), Gallup, New Mexico. The 250-gallon UST had been used to store gasoline to fuel an electric generator housed inside the building. Analytical results from the initial soil sample taken from approximately two feet below the bottom of the UST showed concentrations of BTEX and TPH at 447 ppm and 7,600 ppm, respectively.

The MSA was initiated in November of 1996 with the installation of six soil borings and three shallow monitor wells at the site to determine the vertical and horizontal extent of the petroleum contamination. Data from the analysis of groundwater samples collected during this investigation indicate that there has been no significant impact to the groundwater beneath the area of investigation. Based on these data, additional investigation or remedial action are not warranted, and the Corps recommends site-closure for the FWDA Firehouse UST site.

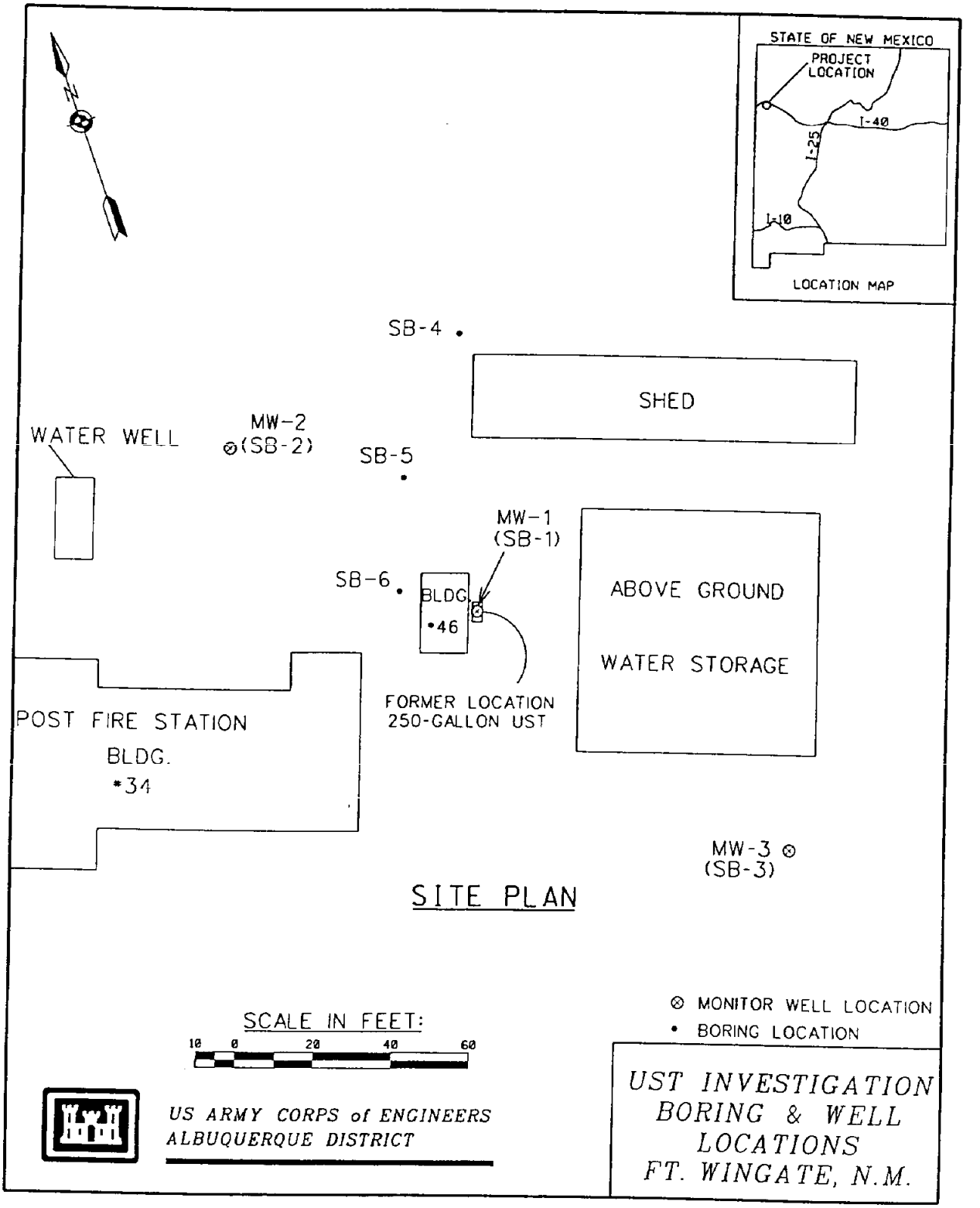

STATE OF NEW MEXICO
PROJECT LOCATION
I-40
I-25
I-10
LOCATION MAP
N
SB-4
SHED
WATER WELL
MW-2
(SB-2)
SB-5
MW-1
(SB-1)
SB-6
BLDG.
*46
ABOVE GROUND
WATER STORAGE
FORMER LOCATION
250-GALLON UST
POST FIRE STATION
BLDG.
*34
MW-3
(SB-3)
SITE PLAN
SCALE IN FEET:
10 0 20 40 60
MONITOR WELL LOCATION
BORING LOCATION
US ARMY CORPS of ENGINEERS
ALBUQUERQUE DISTRICT
UST INVESTIGATION
BORING & WELL
LOCATIONS
FT. WINGATE, N.M.

FIGURE 1

1.0 INTRODUCTION

1.1 Purpose

This report provides a summary of the actions taken by U.S. Army Corps of Engineers, Albuquerque District (Corps), on behalf of Tooele Army Depot (TEAD), to identify the horizontal and vertical extent of soil contamination, and to determine whether the release has impacted the groundwater at an underground storage tank (UST) removal site adjacent to Building 46, Fort Wingate Depot Activity (FWDA) near Gallup, New Mexico. The investigation and report were completed in compliance with the New Mexico Environment Department (NMED), UST Regulations, §s 1205 and 1206.

1.2 Site Location

Fort Wingate Depot Activity (FWDA) is a federally owned and operated facility under the United States Army command and occupies 22,120 acres of land in McKinley County, New Mexico. FWDA was closed in January of 1993 and is currently managed by TEAD in Tooele, Utah. Fort Wingate's primary mission was the production, storage and decommissioning of Department of Defense munitions.

1.3 Site Geology

The near surface geology in the vicinity of Building 46 is composed of alluvial deposits to at least 55 feet below ground surface (bgs). The alluvial deposits consist of sediment deposited by outwash from the Zuni Mountains to the south and west. The alluvium was deposited by braided streams yielding soil types and grain sizes typical of this type of deposit ranging from clays to gravels. Alluvial material is reported to be as thick as 150 feet within the FWDA boundaries.

Depths to the perched aquifer in the alluvium range from 30 to 40 feet bgs and fluctuates seasonally. The geology beneath the alluvium is primarily Claystone from the Chinle formation which is a rock unit of low hydraulic conductivity. A deeper aquifer commonly used for water supply in the region, is located in the San Andres-Glorieta sandstone aquifer at depths of approximately 1,000 feet bgs.

1.4 UST Removal

On February 15, 1995, the Corps removed a single 250-gallon steel UST buried outside and adjacent to Building 46 at FWDA as shown in Figure 1. Building 46 housed a gasoline powered generator and the decommissioned UST stored the fuel. The removal and disposal of this UST were done by contract with RHC Inc., Peralta, New Mexico. Following removal of the UST, Corps and NMED personnel observed holes in the bottom of the tank, probably from corrosion, and stained soil in the tank excavation pit. There were no inventory records available for use in predicting the amount of fuel loss.

Petroleum hydrocarbons were detected by a head-space analysis in soils from the sidewalls and from the bottom of the excavated area. Laboratory analyses confirmed the presence of

petroleum hydrocarbons consistent with gasoline. The summary below shows results of the EPA Methods 8020 and 8015 analysis of the initial soil sample taken from beneath the UST.

Analyte	Concentration (ppm)
Benzene	7.3
Toluene	140
Ethyl Benzene	60
Xylenes	240
TPH	7600

After reviewing these data the Corps then initiated plans for a MSA commencing with the requisite Seven-Day Report. A copy of the Seven Day Report and proposal for the MSA are provided in Appendix A.

2.0 MINIMUM SITE ASSESSMENT

2.1 Description of Field Work

Field work for this MSA was initiated in November 1996 and included drilling of six soil borings, (SB-1 through SB-6), installation of three monitor wells, (MW-1 through MW-3) and the collection of groundwater samples for chemical analysis. The six borings were placed around the former UST site in locations that best serve to characterize the site with respect to fuel contamination within the soil or underlying groundwater. Soil boring 1 was located in the footprint of the former UST. To determine if migration of fuel contamination had occurred, the down-gradient soil borings/wells, were placed within 50 feet of the former UST and the single up-gradient boring/well was placed approximately 200 feet southeast of the known soil contamination (Figure 1). Monitor wells were installed in three of the deepened borings that included SB-1. All work was conducted under the supervision of a Corps geologist.

2.1a Drilling. Borings were advanced using a hollow-stem auger of nominal 10-1/2 inch outer diameter and nominal 7 inch inside diameter, in conjunction with a 5-foot continuous split barrel sampler. Drilling was conducted dry with no petroleum hydrocarbon lubrication added to the drilling equipment. All augers and drilling equipment were decontaminated prior to and between the drilling of each soil boring. The sampling equipment was also decontaminated and double rinsed with distilled water after sample retrieval. The continuous soil core was logged by a Corps geologist using the Unified Soil Classification System (USCS ASTM D2482-66T) method for field sample identification.

2.1b Field Analysis - Heated Head-Space Method. Soil samples were extracted from the continuous split barrel sampler and tested for ionizable hydrocarbons, by the heated headspace method. A photoionization detector (PID) was used to measure aromatic hydrocarbons within the soil. The PID used for this field work is capable of sensing ionizable hydrocarbons in concentrations as low as 1.0 ppm. At least one soil sample was extracted for field screening from each 5-foot soil core. A summary of the results of the

field headspace samples are shown on Table 1.

TABLE 1
SUMMARY OF FIELD HEADSPACE SCREENING RESULTS

Boring No.	Sample Depth (feet)	PID Reading (detection units)	USCS (soil description)
SB-1	0-5	3.6	CL
	5-10	17.6	CL
	10-15	143	SC
	15-20	2202	SC
	20-25	886	SC
SB-1	25-30	97	SC
	30-35	104	SP
	35-40	4.8	SP
	40-45	25.2	CL/CH
	45-50	3.6	SP
SB-2	0-5	0.0	CL
	5-10	0.0	CL
	10-15	0.0	CL
	15-20	0.0	CL
	20-25	0.0	SC
	25-30	0.0	SC
	30-35	0.0	CH
	35-40	0.0	CH
	40-45	0.0	SC
SB-3	0-5	0.0	CL
	5-10	0.0	SC
	10-15	0.0	CL
	15-20	0.0	CL
	20-25	0.0	CL
	25-30	0.0	SP-SM

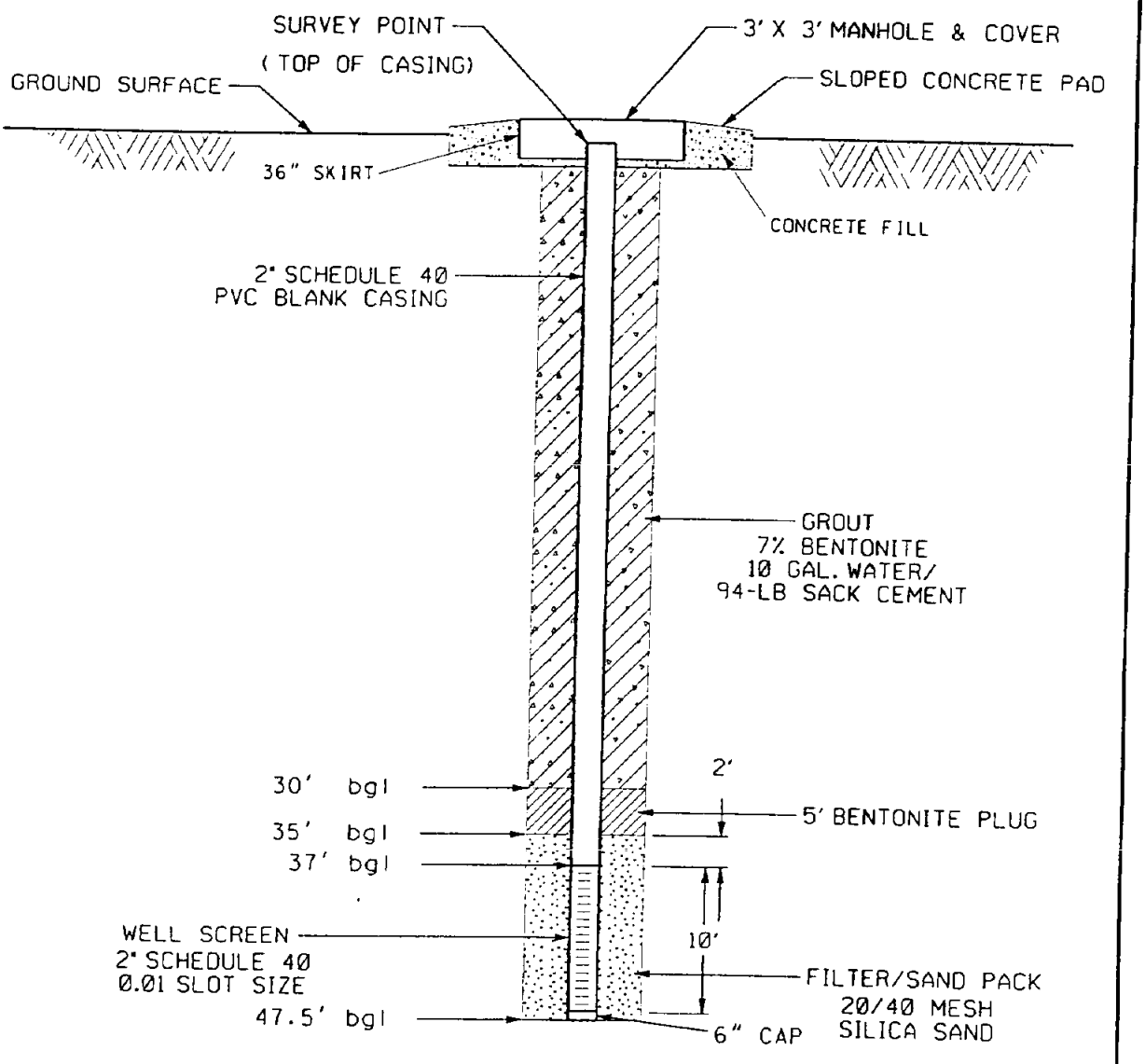
TABLE 1 SUMMARY OF FIELD HEADSPACE SCREENING RESULTS			
Boring No.	**Sample Depth (feet)**	**PID Reading (detection units)**	**USCS (soil description)**
	30-35	0.0	CL
SB-3	35-40	0.0	SC
	40-45	0.0	CH
	45-50	0.0	SM-SC
	50-53	0.0	SM-SC
SB-4	0-5	0.0	SC
	5-10	0.0	CL
	10-15	0.0	CL
SB-4	15-20	0.0	CL
	20-25	0.0	SP
	25-30	0.0	CL
	30-35	0.0	CL
SB-5	0-5	0.0	SP-SM
	5-10	0.0	CH
	10-15	0.0	CH
	15-20	0.0	CH
	20-25	0.0	SP
	25-30	0.0	SP
	30-35	0.0	CH
SB-6	0-5	0.0	SM-SC
	5-10	0.0	CL
	10-15	2.5	CH
	15-20	14.7	CH
	20-25	0.0	SC
	25-30	0.0	SC
	30-35	0.0	CH-CL

TABLE 1 SUMMARY OF FIELD HEADSPACE SCREENING RESULTS			
Boring No.	**Sample Depth (feet)**	**PID Reading (detection units)**	**USCS (soil description)**
NMED USTB ACTION LEVEL 100 ppm			

The field headspace results as shown in Table 1 indicate that only SB-1 has substantial soil contamination to the extent that head-space readings exceed NMEDUSTB action levels.

2.1c Monitor Wells, Installation and Development. Monitor wells were installed as extensions of soil borings 1, 2 and 3. These soil borings were deepened into the first significant water bearing zone. Monitor wells consisted of 10 feet of schedule 40 Poly Vinyl Chloride (PVC) 0.010 slot screen and 40 to 50 feet of blank PVC casing. The top of each screen extended approximately four feet above the water bearing zone. Silica sand (10/20 gradation) was placed from two feet below the bottom of the screened section to approximately two feet above the top of the screen. The annulus around the well casing was sealed by placement of a two foot bentonite seal above the silica sand section. The remainder of the boring was cemented to the surface using a mixture of 5% bentonite, cement and water. The well casing, screen and sand filter were installed through the 7 inch i.d., hollow stem auger. During placement of the filter packs in the well annulus, the wells were surged to ensure a tighter, more homogeneous filter. Well completion logs are shown as Appendix B. After the wells were installed the ground surface was completed with a water tight protective cover 8 inches in diameter. The annulus between the exterior of the PVC casing and the inside of the protective cover skirting was filled with concrete and a 2 inch PVC locking water tight plug was installed at the top of the casing. Locks were installed on all wells. A typical well schematic is shown as Figure 2. All monitor wells were measured for fluid levels and at least 5 well volumes of water were removed from the wells or until water was clear. Monitor wells were developed according to US Army Corps of Engineers EM 1110-1-4000, 31 August 1994.

2.1d Groundwater Sampling.
Prior to collection of groundwater samples, each monitor well was purged of three well volumes to remove standing or stagnant water and ensure that aqueous samples were representative of formation water. Disposable bailers were used for both purging and collection of groundwater samples. Water samples were then collected to determine, by laboratory analysis, if dissolved phase petroleum hydrocarbons were present. During purging all wells were visually inspected for the presence of phase separated hydrocarbons. None of the water samples collected from these wells exhibited odor, sheen, or other indications of phase separated hydrocarbons. Well completion logs for the three monitor wells are shown in Appendix C. Groundwater samples, including a rinsate and a blank, were placed in laboratory-supplied, clean, glass containers, placed in a hard sided cooler with ice and shipped by overnight delivery to Analytica Environmental Laboratories in Broomfield, Colorado. The groundwater samples were analyzed according to EPA method



NOT TO SCALE

MSA INVESTIGATION
MW-2
FT. WINGATE

US ARMY CORPS of ENGINEERS
ALBUQUERQUE DISTRICT

FIGURE 2

8020. A summary of Benzene, Toluene, Ethylbenzene, and Total Xylenes analytical results are presented in Table 3 below.

2.2 Analytical Results

Copies of the analytical results and chain of custody records are provided in Appendix D. Analytical results from aqueous samples collected from the three monitor wells during this investigation, indicate that there are no appreciable concentrations of petroleum hydrocarbon contamination in the shallow aquifer beneath the UST site.

TABLE 2
SUMMARY OF BTEX ANALYTICAL RESULTS

Monitor Well Number	BENZENE µg/l	TOLUENE µg/l	ETHYL-BENZENE µg/l	TOTAL XYLENES µg/l
1	4.5	ND	ND	ND
2	ND	ND	ND	ND
3	ND	ND	ND	ND

ND - below detection limit

As shown in the summary table above, benzene is the only BTEX constituent present in any of the groundwater samples and is found in but the single well located in the foot print of the former UST.

2.3 Water Supply Impacts

Pursuant to Section 1203 of the NMED USTB Regulations, the Corps conducted a survey to determine the location of private wells within a 1,000 foot radius of the site, and public wells within one mile radius of the site. Data from the historical real estate files and visual surveys indicate that no private water supply wells are located within a 1,000 foot radius of the site. FWDA is supplied water from a single deep well installed in 1970 and rehabilitated in 1991. This well is screened from 1,100 to 1,350 feet bgs. There are no other known public supply or private wells within 1/4 miles of the subject site.

3.0 CONCLUSIONS

As an agent for TEAD, the Corps completed a MSA of a site with a confirmed petroleum release associated with a single 250 gallon UST removed from FWDA in February 1995. The Corps augered six soil borings and installed three monitor wells to determine if substantial soil and or groundwater contamination persisted at this site. Data generated during this MSA indicate that hydrocarbon contamination in the soil is limited to a very

small area evidenced by detection in a single soil boring and extending vertically to less than 40 feet bgs. Chemical characterization of underlying groundwater indicates minimal impact, with benzene reported from MW-1 at 4.5 ppm. BTEX was not detected in groundwater samples from either the down-gradient well MW-2 or the up-gradient well MW-3 both located within 60 feet of the leaking UST.

3.1 Recommendations

The Corps recommends that this report be accepted by the NMED pursuant the NMED USTB Regulations. Based on data generated during this MSA, there is no evidence of persistent or significant petroleum hydrocarbon contamination in either the soil or groundwater associated with the UST at Building 46 on FWDA near the Firehouse. Contaminant levels found in both soil and groundwater are below NMED action levels and Safe Drinking Water Standards. No additional investigation is warranted at the site and the Corps recommends site closure for Building 46 at FWDA.

APPENDIX A

SEVEN DAY REPORT
and
MSA PROPOSAL

DEPARTMENT OF THE ARMY
ALBUQUERQUE DISTRICT, CORPS OF ENGINEERS
P.O. BOX 1580
ALBUQUERQUE, NEW MEXICO 87103-1580
FAX (505) 766-2770

REPLY TO
ATTENTION OF:

October 26, 1995

Engineering and Planning Division
Planning Branch

Ms. Anna Richards
New Mexico Environment Department
Underground Storage Tank Bureau
P.O. Box 26110
Santa Fe, New Mexico 87502

Dear Ms. Richards:

Enclosed is a proposal for the on-site investigation at Ft. Wingate Depot Activity including monitoring well schematic, site map showing the former location of the underground storage tank, and a copy of the analytical test results for the soil sample collected beneath the tank.

Please direct questions and comments on this plan to Mr. David Gregory of my staff at (505) 766-1773 or FAX at (505) 766-8733.

Sincerely,

James A. White
Chief, Planning Branch

Enclosures

US Army Corps of Engineers
Albuquerque District
Engineering and Planning Division
Geotechnical Branch

New Mexico Environment Department
Underground Storage Tank Bureau
Harold Runnels Building
1190 St. Francis Dr./P.O. Box 26110
Santa Fe, New Mexico 87502

Seven Day Report
for
Confirmed Fuel Release
Ft. Wingate, New Mexico

22 February 1995

Background. Soil contamination was detected on 15 Feb. 1995 during the removal of an out of service 250-gallon UST. The tank was being removed at the request of Ft. Wingate Depot Activity (FWDA). Contaminated soil was discovered at a depth of approximately six (6) feet below ground surface. The New Mexico Environment Department (NMED) was notified of the release and a plan for additional investigation will be prepared. Ft. Wingate Army Depot has been the property of the Department of Defense for more than 100 years. Any environmental hazards resulting from a release or spill at the facility are presumably the responsibility of the U.S. Government. Records show that this UST contained leaded gasoline.

1. Water Supply Impacts. This site is part of an area currently under investigation by the U.S. Army Corps of Engineers. Consequently, there are several monitoring wells in the immediate vicinity. These wells have been installed as part of an investigation for previously removed USTs and contaminants detected in water samples taken are presumed to be from those USTs. A single well is currently being used to provide water at the facility is approximately 110 feet West of the site. Although this well is sampled periodically, detectable levels of TPH have not been found during laboratory analysis of water samples. Well logs for the water well are attached. Also attached is a site map showing the location of the monitoring wells, the water well, and the former location of the UST.

2. Petroleum Vapors. There were no vapors detected by Photo-Ionization Detector (PID) or Combustible Gas Indicator (CGI) in the breathing zone at the site before excavation. A CGI was used to monitor the atmosphere of the tank and showed a Lower Explosive Limit (LEL) of less than 1%. During excavation a PID was used to monitor the breathing zone. No levels above five ppm. were detected. After closing the excavation readings returned to zero.

3. A proposal to expand this investigation is being prepared. Laboratory results on samples taken are enclosed.

Sincerely,

Gary L. Gamel, P.E.
Chief, Engineering and Planning Division

Proposal
for
On-Site Investigation
of
Fuel Release
Ft. Wingate, New Mexico

October 25, 1995

Purpose:

The purpose of this investigation is to define the vertical and horizontal extent of petroleum contamination in the soil associated with a former Underground Storage Tank (UST) at Ft. Wingate Depot Activity (FDA) near Gallup, N.M..

Background:

Soil contamination was detected on 15 February 1995 during the removal of an out-of-service 250-gallon UST near building No. 46. The tank was being removed at the request of FWDA. Inspection of the tank after removal revealed several corrosion perforations in the tank; however, the tank was dry. Contamination was detected in soil beneath the tank during head space screening by a Photo Ionization Detector (PID) at a depth of approximately six feet below ground surface. Laboratory testing for BTEX/TPH (Mod 8020/ Mod 8015 Gas Range) performed on the soil sample taken beneath the tank showed that petroleum contamination is above action levels (see attached test results). Records show that this UST contained leaded gasoline during the 30-year period from approximately 1950 to 1980.

Field Activity:

To learn the horizontal and vertical extent of soil contamination, a total of six borings are proposed. Two borings will be located in the area of known soil contamination, and additional borings will be placed at locations likely to intercept an advancing fuel plume or provide background information on soil chemistry. Borings will be advanced to groundwater or until consecutive 5-foot sample intervals show PID head space readings less than 100 ppm. As shown on the site map, the strategy for placement of sample points is to detect an advancing fuel plume and to provide baseline information of endemic soil conditions in the immediate area around the former tank location.

Soil Borings:

Soil borings will be advanced at 5-foot intervals until two consecutive head space readings from sample cores have TPH concentrations less than 100 ppm, or until groundwater is reached. Confirmatory soil samples will be taken at the final depth in each boring and from the zone where contamination levels fall below NMED action levels. Analysis and data from these samples should most

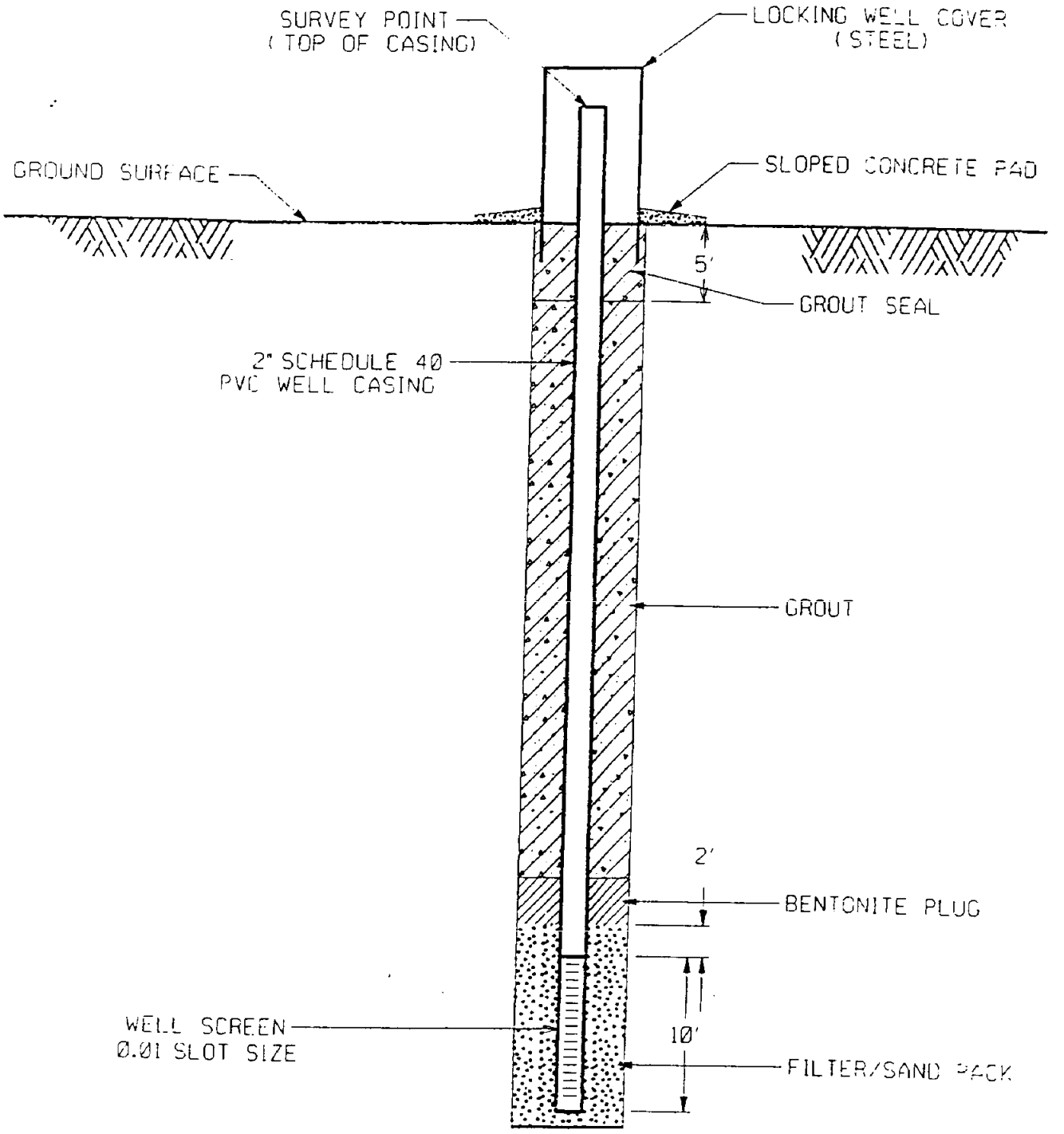
accurately depict the extent of vertical contamination. Samples will be analyzed for TPH, BTEX, and Pb through methods EPA 8015, EPA 8020, and EPA 6010, respectively.

Soil Sampling:

Soil samples will be collected using hollow stem augers in conjunction with a continuous split barrel sampler. Soil cores will be field classified and logged while soil cores will be field screened at 2-foot intervals for head space analysis by PID. Screening and sampling procedures will be followed in accordance with State of New Mexico UST Regulations.

Monitoring Well Installation:

Three ground water monitoring wells will be installed at the site. One well will be placed as an extension of a soil boring in the area of highest contamination and no fewer than two wells will be installed down gradient from the first well. All well installation procedures will meet State of New Mexico UST Regulations.

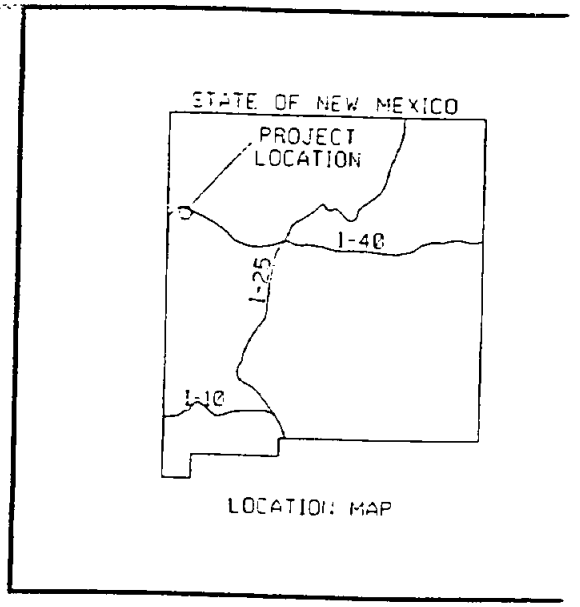


TYPICAL MONITORING WELL SCHEMATIC

(NOT TO SCALE)

UST INVESTIGATION
FT. WINGATE, N.M.

US ARMY CORPS of ENGINEERS
ALBUQUERQUE DISTRICT



LOCATION MAP

WATER WELL

NAVAJO BLVD.

BLDG. *46

FORMER LOCATION 250-GALLON UST

POST FIRE STATION BLDG. *34

SITE PLAN and UST LOCATION

SCALE IN FEET:

10 0 20 40 60

• PROPOSED BORING LOCATION

US ARMY CORPS of ENGINEERS
ALBUQUERQUE DISTRICT

UST REMOVAL LOCATION and SITE MAP FT. WINGATE, N.M.

Client Name: RHC, Inc.
Submission #: 9502000166
Project Name: FT. WINGATE
Report Date: 02/20/95

Client Sample #: WIN #1
Laboratory ID #: *43456* *Matrix:* *Soil*
Sample Container: *2x4oz EPA Approved Glass Jar\White lid*
Sampling Location: *FT. WINGATE, NM*
Sampling Date : *02/15/95*
Temperature (Celcius):4

BTEX/TPH (MOD 8020/MOD 8015 GAS RANGE)

Analyte	Results	Det.Limit
Benzene	7.3	0.40
Toluene	140	0.50
Ethyl Benzene	60	0.50
Xylenes	240	0.50
TPH	7600	10

BTEX results are reported in parts per million (ppm) in soil and parts per billion (ppb) in water and air. TPH results are reported in parts per million (ppm) in soil, air, and water.

FORT WINGATE ARMY DEPOT
FORT WINGATE, NEW MEXICO

PROJECT NO: 92279 JANUARY 1993

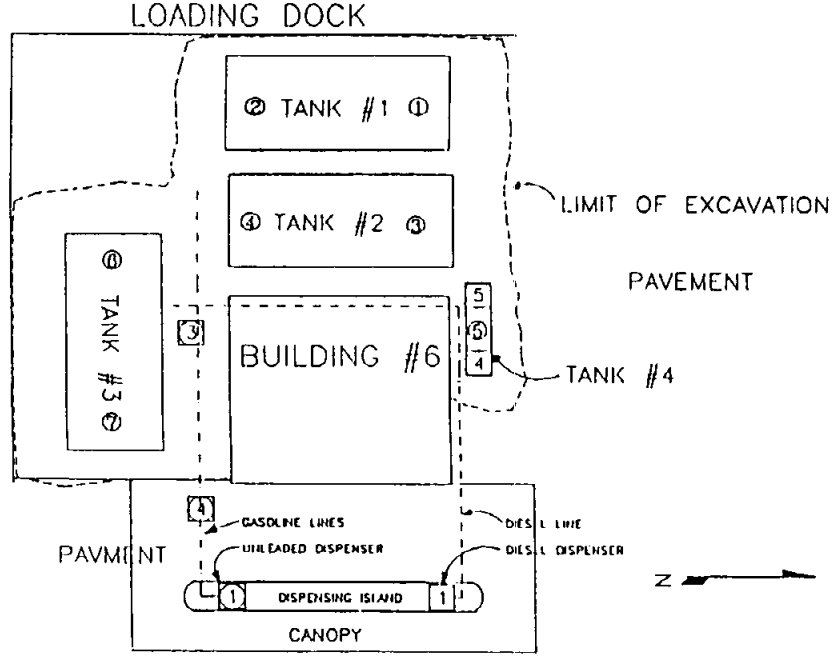
ENVIROTECH INC.

ENVIRONMENTAL SCIENTISTS & ENGINEERS
5796 U.S. HIGHWAY 64-3014
FARMINGTON, NEW MEXICO 87401
PHONE: (505) 632-0615

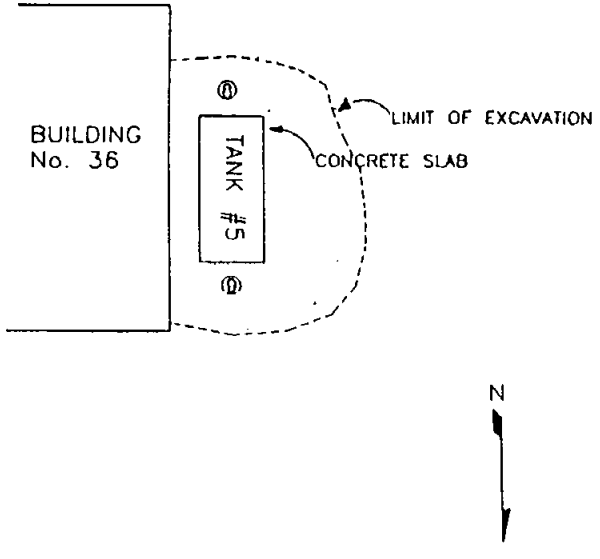
SITE PLAN

SHEET 2

SITE ONE



SITE TWO



LOCATION OF EXCAVATIONS & SAMPLE POINTS WERE DETERMINED BY PACING AND SIGHTING FROM EXISTING TOPOGRAPHIC FEATURES AND BUILDINGS. THE EXCAVATION LOCATIONS SHOULD BE CONSIDERED ACCURATE ONLY TO THE DEGREE IMPLIED BY THE MEASUREMENT METHOD USED.

SCALE

0 10' 20' 40'

OVM SAMPLE POINT

TPH SAMPLE POINT

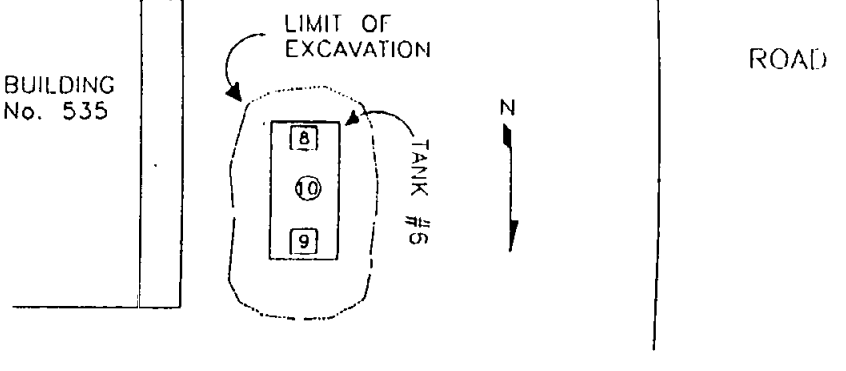
TPH & BTEX SAMPLE POINT

SAMPLE POINT KEY

TPH

TPH & BTEX

SITE THREE



APPENDIX B

SOIL LOGS

HTRW DRILLING LOG

PROJECT	INSPECTOR	HOLE NUMBER	SHEET	SHEETS
Ft. Wingate Pumphouse	Jeffery E. Firebaugh	MW-1 (SB-1)	1	OF 1

DATE (a)	DEPTH (b)	DESCRIPTION OF MATERIALS (c)	FIELD SCREENING RESULTS (d)	Time of Day (e)	ANALYTICAL SAMPLE NO. (f)	BLOW COUNT (g)	REMARKS (h)
11-20-96	0	Clay, sandy (CL), red brn., med. pl., moist, fill material					Field screening was performed using a PID and results are in meter units
	5		3.6	0933	1		
		black staining					
	10		17.6	0945	2		
		very moist stringers					
	15	Sand (SC), clayey, brn. to dark brn., v. fn. gr., l. pl., moist to wet	143	0955	3		
	20		2202	1007	4		
	25		886	1015	5		
	30	Sand (SP), brn., fn. to med. gr., moist to very moist	97	1100	6		
	35	thin clay layers < 1" thick	104	1130	7		
11-21-96 11-22-96	40	v. moist to wet 2" layer of sand	4.8	1140	8		
		Clay (CL-CH), red brn., med. to l. pl.					
	45	Sand (SP), very moist to wet	25.2	1150	9		
		moist					
	50		3.6	1200	10		
	55	TD=55'					
	60						
	65						

PROJECT Ft. Wingate Pumphouse HOLE NO. MW-1 (SB-1)

ENG FORM 5056A-R, NOV 95

(Proponent: CESWA-ED-PT)

HTRW DRILLING LOG

PROJECT	INSPECTOR	HOLE NUMBER	SHEET	SHEETS
Ft. Wingate Pumphouse	Jeffery E. Firebaugh	MW-2 (SB-2)	1	1

DATE (a)	DEPTH (b)	DESCRIPTION OF MATERIALS (c)	FIELD SCREENING RESULTS (d)	Time of Day (e)	ANALYTICAL SAMPLE NO. (f)	BLOW COUNT (g)	REMARKS (h)
11-25-96	0	Clay, sandy (CL), drk. brn. to red brn., l. to med. pl.	0.0	1315	1		Field screening was performed using a PID and results are in meter units
	5						
	10		0.0	1322	2		PID calibrated at 1300 hrs, reading 101 ppm
	15		0.0	1330	3		
	20	1" wet seam	0.0	1340	4		
		Sand, clayey (SC), fn. to v. fn. gr., drk. brn. to red. brn, moist to v. moist					
	25		0.0	1354	5		
	30	Sand (SP), fn. to med. gr., moist to very moist	0.0	1404	6		
	35	Clay (CH), red brn., med. pl., moist	0.0	1424	7		
	40	3" layer of wet sand	0.0	1436	8		
		Sand, clayey (SC), v. fn. to fn. gr., red brn., wet					
	45		0.0	1452	9		
		TD=48'					
	50						
	55						
	60						
	65						

PROJECT Ft. Wingate Pumphouse HOLE NO MW-2 (SB-2)

ENG FORM 5056A-R, NOV 95

(Proponent: CESWA-ED-PT)

HTRW DRILLING LOG

PROJECT	INSPECTOR	HOLE NUMBER	SHEET	SHEETS
Ft. Wingate Pumphouse	Jeffery E. Firebaugh	MW-3 (SB-3)	1	1

DATE (a)	DEPTH (b)	DESCRIPTION OF MATERIALS (c)	FIELD SCREENING RESULTS (d)	Time of Day (e)	ANALYTICAL SAMPLE NO. (f)	BLOW COUNT (g)	REMARKS (h)
11-26-96	0	Clay, sandy (CL), drk. brn. to red brn., moist to sl. moist, med. pl.	0.0	1155	1		Field screening was performed using a PID and results are in meter units
	5	Sand, clayey (SC), drk. brn., fn. to med. gr., l. pl., sl. moist					
	10	Clay, sandy (CL), drk. brn., moist, med. pl.	0.0	1203	2		
	15	← w/ 3" layers of SP matl. moist to very moist	0.0	1212	3		
	20	← very moist	0.0	1220	4		
	25	Sand (SP-SM), fn. to v. fn. gr., brn. to red brn. moist					
	30	Clay (CL), sandy, silty, drk. brn., med. pl., moist	0.0	1230	5		
	35		0.0	1240	6		
	40	Sand, clayey (SC), drk. brn., med. pl., moist to v. moist	0.0	1356	7		
	45	Clay (CH), red. brn., med. pl., moist	0.0	1406	8		
	50	Sand (SM-SC), silty, clayey, red brn., v. fn. to fn. gr., wet at 46'					
	55	TD=53'					
	60						
	65						

PROJECT Ft. Wingate Pumphouse HOLE NO MW-3 (SB-3)

ENG FORM 5056A-R, NOV 95

(Proponent: CESWA-ED-PT)

HTRW DRILLING LOG

PROJECT	INSPECTOR	HOLE NUMBER	SHEET	SHEETS
Ft. Wingate Pumphouse	Jeffery E. Firebaugh	SB-4	1	1

DATE (a)	DEPTH (b)	DESCRIPTION OF MATERIALS (c)	FIELD SCREENING RESULTS (d)	Time of Day (e)	ANALYTICAL SAMPLE NO. (f)	BLOW COUNT (g)	REMARKS (h)
11-27-96		Sand, clayey (SC), red brn., v. fn. to fn. gr., moist, med. to l. plasticity					Field screening was performed using a PID and results are in meter units
	5	Clay, sandy (CL), red brn., med. to l.pl., v. moist, wet @ 8'	0.0	0856	1		
	10		0.0	0905	2		
	15	v. moist to wet at 15'	0.0	0910	3		
	20	lenses of wet sand (SP) at 20'	0.0	0915	4		
	25		0.0	0925	5		
	30		0.0	0935	6		
	35	Clay (CH), red brn., trace of sand, moist, medium plasticity TD=35'	0.0	0945	7		
	40						
	45						
	50						
	55						
	60						
	65						

PROJECT Ft. Wingate Pumphouse HOLE NO. SB-4

ENG FORM 5056A-R, NOV 85

(Proponent: CESWA-ED-PT)

HTRW DRILLING LOG

PROJECT	INSPECTOR	HOLE NUMBER	SHEET	SHEETS
Ft. Wingate Pumphouse	Jeffery E. Firebaugh	SB-5	1	1

DATE (a)	DEPTH (b)	DESCRIPTION OF MATERIALS (c)	FIELD SCREENING RESULTS (d)	Time of Day (e)	ANALYTICAL SAMPLE NO. (f)	BLOW COUNT (g)	REMARKS (h)
11-27-96	0	Sand, silty (SP-SM), red brn., med. to fn. gr., moist	0.0	1030	1		Field screening was performed using a PID and results are in meter units
	5	Clay (CH), red brn., med. to l. pl., moist to wet	0.0	1037	2		
	10		0.0	1045	3		
	15		0.0	1110	4		
	20	Sand (SP), fn. to med. gr., brown, wet	0.0	1110	5		
	25		0.0	1120	6		
	30	Clay (CH), red brn., med. pl., moist	0.0	1135	7		
	35	TD=35'					
	40						
	45						
	50						
	55						
	60						
	65						

PROJECT Ft. Wingate Pumphouse HOLE NO. SB-5

ENG FORM 5056A-R, NOV 95

(Proponent: CESWA-ED-PT)

HTRW DRILLING LOG

PROJECT	INSPECTOR	HOLE NUMBER	SHEET	SHEETS
Ft. Wingate Pumphouse	Jeffery E. Firebaugh	SB-6	1	1

DATE (a)	DEPTH (b)	DESCRIPTION OF MATERIALS (c)	FIELD SCREENING RESULTS (d)	Time of Day (e)	ANALYTICAL SAMPLE NO. (f)	BLOW COUNT (g)	REMARKS (h)
11-27-96		Sand, silty-clayey (SM-SC), red brn., med. to fn. gr., moist					Field screening was performed using a PID and results are in meter units
	5	Clay (CL), sandy, red brn., moist to very moist, med. to l. pl.	0.0	1330	1		
	10	stained @ 10'	0.0	1340	2		
	15	Clay (CH), red brn., with lenses of CL and SP, moist to very moist	2.5	1352	3		
	20	Sand (SP), brn., med. to fn. grained, wet	14.7	1315	4		
	25	Sand, clayey (SC), brn. to red brn., moist to very moist	0.0	1330	5		
	30		0.0	1335	6		
	35	Clay (CH-CL), brn. to red brn., med. plasticity, moist	0.0	1352	7		
		TD=35'					
	40						
	45						
	50						
	55						
	60						
	65						

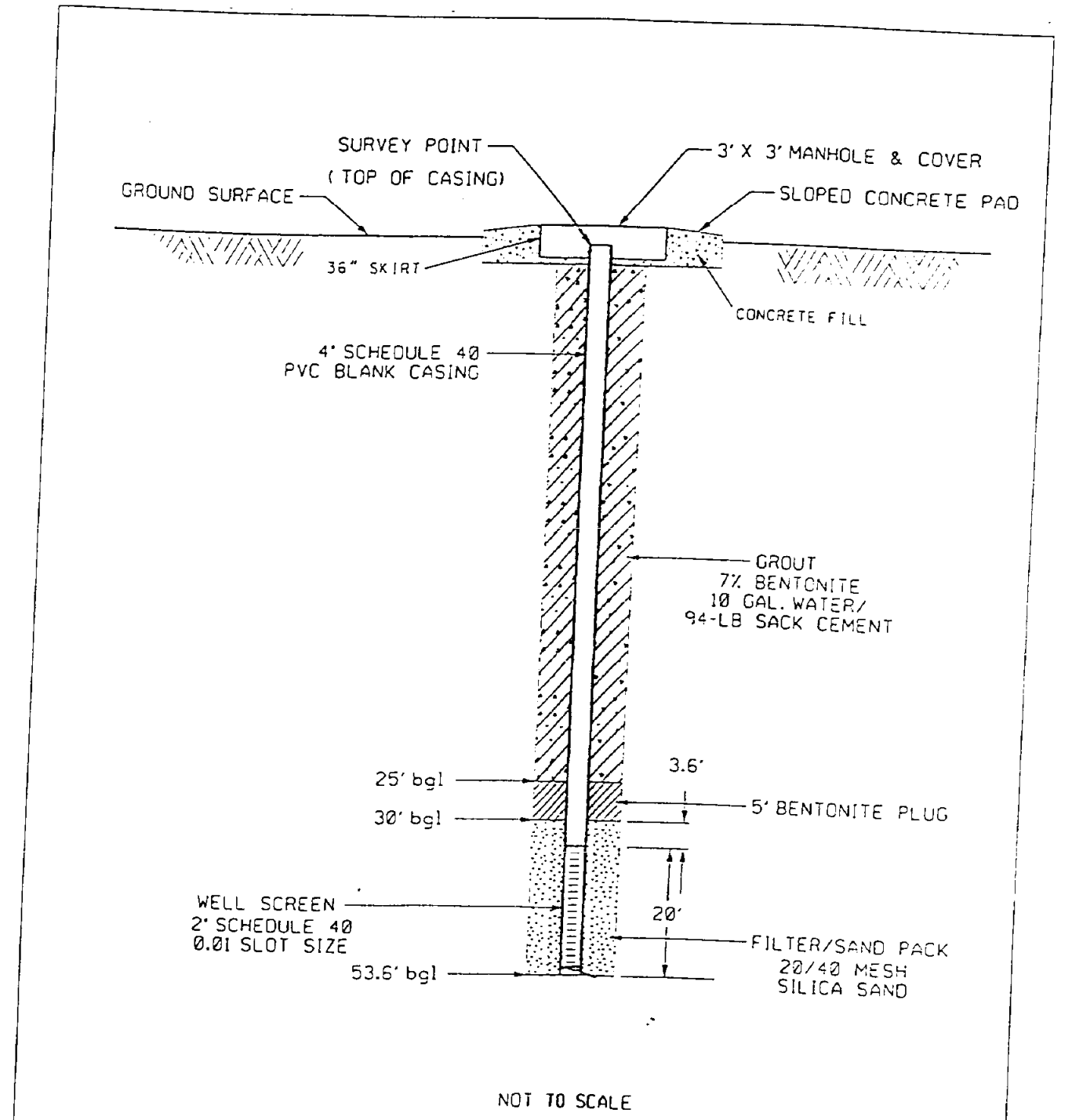
PROJECT Ft. Wingate Pumphouse HOLE NO. SB-6

ENG FORM 5056A-R, NOV 95

(Proponent: CESWA-ED-PT)

APPENDIX C

WELL COMPLETION LOGS



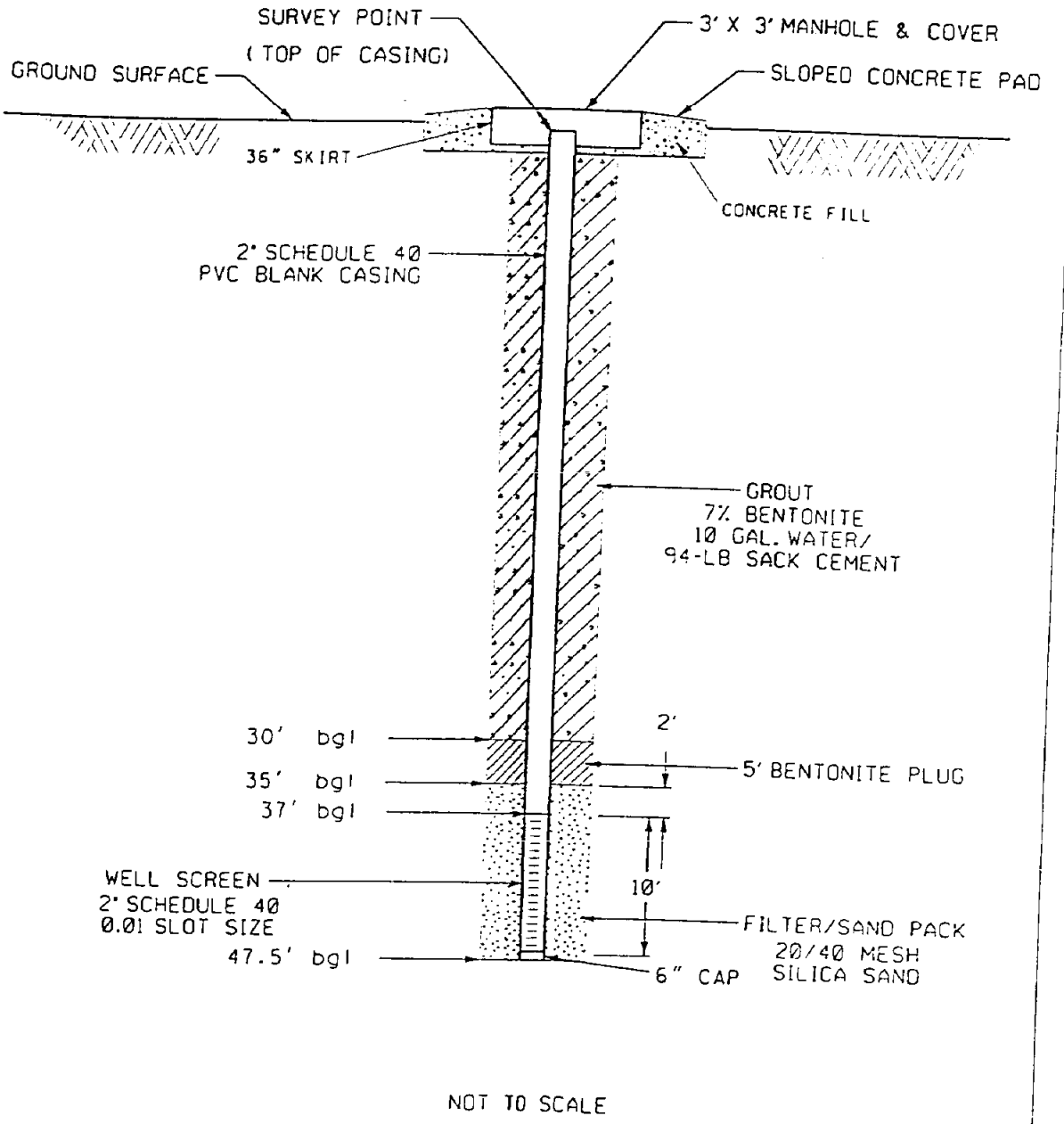
NOT TO SCALE

MSA INVESTIGATION

MW-1

FT. WINGATE

US ARMY CORPS of ENGINEERS
ALBUQUERQUE DISTRICT



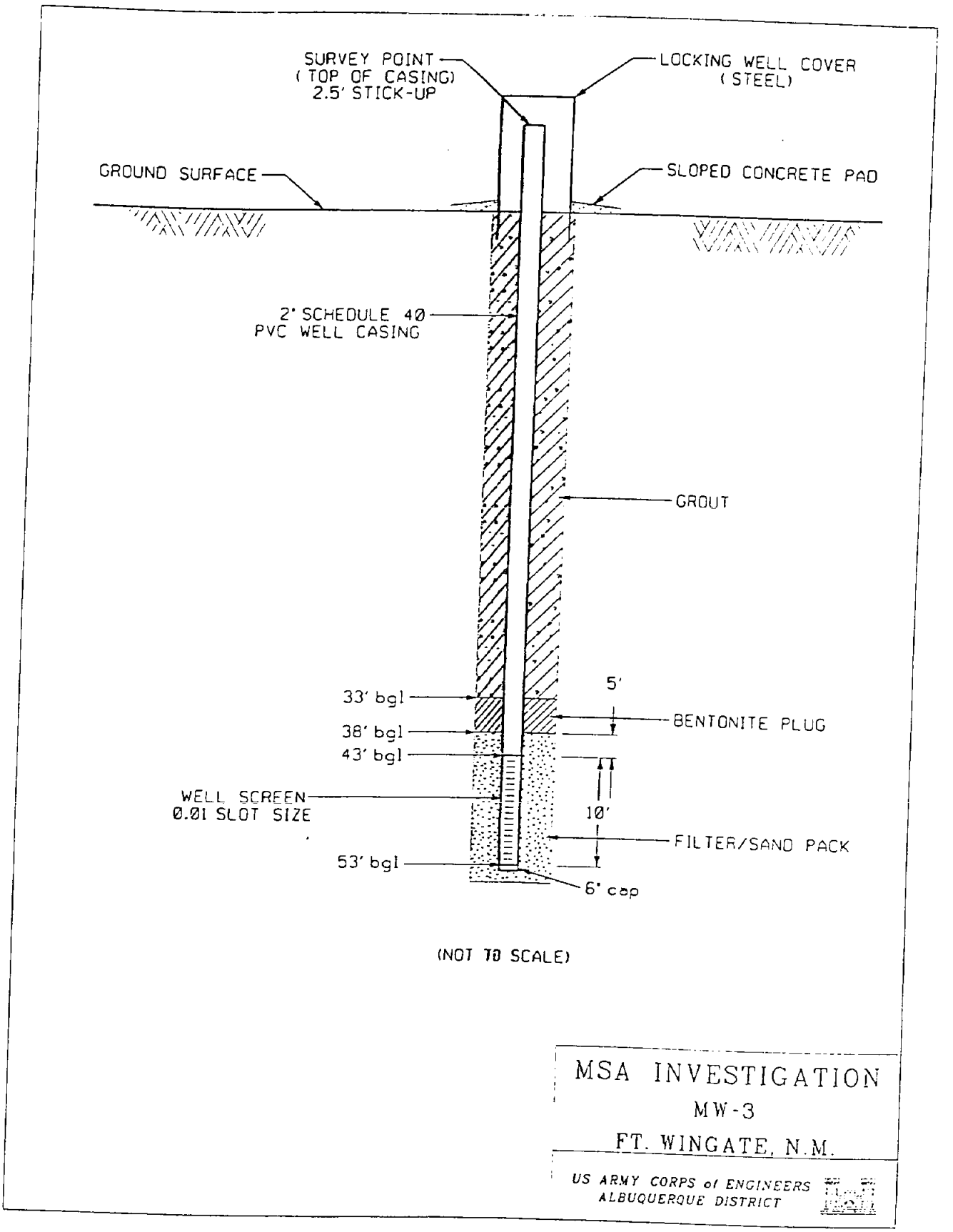
NOT TO SCALE

MSA INVESTIGATION

MW-2

FT. WINGATE

US ARMY CORPS of ENGINEERS
ALBUQUERQUE DISTRICT



MSA INVESTIGATION

MW-3

FT. WINGATE, N.M.

US ARMY CORPS of ENGINEERS
ALBUQUERQUE DISTRICT

APPENDIX D

ANALYTICAL RESULTS

ANALYTICA
ENVIRONMENTAL
LABORATORIES
an Analytica Group company

325 Interlocken Parkway
Suite 200
Broomfield, CO 80021
(303) 469-2868
(800) 873-8707
FAX: (303) 469-5284

USAED, Albuquerque
Attn: ENGR-PLNG Division
4101 Jefferson Plaza NE.
Albuquerque, NM 87109-3435
Attn: Brian Jordan

Order #: 97-02-008
Date: 02/25/97 15:07
Work ID: DACA47-97-P-0074
Date Received: 02/01/97
Date Completed: 02/25/97

SAMPLE IDENTIFICATION

Sample Number	Client Description
01	FW45/MW3-001-1515-013097
02	FW45/MW3-002-1520-013097
03	FW45/MW1-1445-013097
04	FW45/MW2-1415-013097
05	Trip Blank

Enclosed are the analytical results for the submitted sample(s). Please review the CASE NARRATIVE for a discussion of any data and/or quality control issues. A listing of data qualifiers and analytical codes is located on the TEST METHODOLOGIES page at the end of the report.

If you have any questions regarding the analyses, please feel free to call.

Sincerely,

J. D. Robinson
Project Manager

Samples were prepared and analyzed according to methods outlined in the following references:

- Test Methods for Evaluating Solid Waste, Physical/Chemical Methods, EPA Publications SW-846 [Third Edition (September, 1986), as amended by Revision 3 (January, 1995)]

All analyses meet quality assurance objectives.

Sample: 01A **FW45/MW3-001-1515-013097** Collected: 01/30/97 Matrix: WATER

Test Description	Method	Result	Q	Limit	Units	Analyzed
BTEX	EPA 8020					
Benzene		ND		1.0	ug/L	02/12/97
Toluene		ND		1.0	ug/L	02/12/97
Ethylbenzene		ND		1.0	ug/L	02/12/97
Xylenes, Total		ND		2.0	ug/L	02/12/97
SURROGATES, % Recovery						
p-Bromofluorobenzene		96.7		Min: 76		Max: 112

Sample: 01C **FW45/MW3-001-1515-013097** Collected: 01/30/97 Matrix: WATER

Test Description	Method	Result	Q	Limit	Units	Analyzed
ICP Metals, Total	SW 6010					
Lead		ND		0.050	mg/L	02/13/97

Sample: 01D **FW45/MW3-001-1515-013097** Collected: 01/30/97 Matrix: WATER

Test Description	Method	Result	Q	Limit	Units	Analyzed
Explosives in H2O by HPLC	EPA 8330					
Octahydro-1,3,5,7-tetranitro-1,3,5,7-tetrazocine		ND		1.0	ug/L	02/20/97
Hexahydro-1,3,5-trinitro-1,3,5-triazune		ND		0.84	ug/L	02/20/97
1,3,5-Trinitrobenzene		ND		0.26	ug/L	02/20/97
1,3-Dinitrobenzene		ND		0.25	ug/L	02/20/97
Tetryl (Methyl-2,4,6-trinitrophenylnitramine		ND		1.0	ug/L	02/20/97
Nitrobenzene		ND		1.0	ug/L	02/20/97
2,4,6-Trinitrotoluene		ND		0.25	ug/L	02/20/97
4-Amino-2,6-DNT		ND		0.25	ug/L	02/20/97
2-Amino-4,6-DNT		ND		0.25	ug/L	02/20/97
2,6-Dinitrotoluene		ND		0.25	ug/L	02/20/97
2,4-Dinitrotoluene		ND		0.25	ug/L	02/20/97
o-Nitrotoluene		ND		1.0	ug/L	02/20/97
p-Nitrotoluene		ND		1.0	ug/L	02/20/97
m-Nitrotoluene		ND		1.0	ug/L	02/20/97
SURROGATES, % Recovery						
1,2-Dinitrobenzene		48		Min: 30		Max: 123

Sample: 02A FW45/MW3-002-1520-013097 Collected: 01/30/97 Matrix: WATER

Test Description	Method	Result	Q	Limit	Units	Analyzed
BTEX	EPA 8020					
Benzene		ND		1.0	ug/L	02/12/97
Toluene		ND		1.0	ug/L	02/12/97
Ethylbenzene		ND		1.0	ug/L	02/12/97
Xylenes, Total		ND		2.0	ug/L	02/12/97
SURROGATES, % Recovery						
p-Bromofluorobenzene		103		Min: 76		Max: 112

Sample: 02C FW45/MW3-002-1520-013097 Collected: 01/30/97 Matrix: WATER

Test Description	Method	Result	Q	Limit	Units	Analyzed
ICP Metals, Total	SW 6010					
Lead		ND		0.050	mg/L	02/13/97

Sample: 03A FW45/MW1-1445-013097 Collected: 01/30/97 Matrix: WATER

Test Description	Method	Result	Q	Limit	Units	Analyzed
BTEX	EPA 8020					
Benzene		4.5		1.0	ug/L	02/12/97
Toluene		ND		1.0	ug/L	02/12/97
Ethylbenzene		ND		1.0	ug/L	02/12/97
Xylenes, Total		ND		2.0	ug/L	02/12/97
SURROGATES, % Recovery						
p-Bromofluorobenzene		100		Min: 76		Max: 112

Sample: 03C FW45/MW1-1445-013097 Collected: 01/30/97 Matrix: WATER

Test Description	Method	Result	Q	Limit	Units	Analyzed
ICP Metals, Total	SW 6010					
Lead		ND		0.050	mg/L	02/13/97

Sample: 04A FW45/MW2-1415-013097 Collected: 01/30/97 Matrix: WATER

Test Description	Method	Result	Q	Limit	Units	Analyzed
BTEX	EPA 8020					
Benzene		ND		1.0	ug/L	02/12/97
Toluene		ND		1.0	ug/L	02/12/97
Ethylbenzene		ND		1.0	ug/L	02/12/97
Xylenes, Total		ND		2.0	ug/L	02/12/97
SURROGATES, % Recovery						
p-Bromofluorobenzene		96.7		Min: 76	Max: 112	

Sample: 04C FW45/MW2-1415-013097 Collected: 01/30/97 Matrix: WATER

Test Description	Method	Result	Q	Limit	Units	Analyzed
ICP Metals, Total	SW 6010					
Lead		ND		0.050	mg/L	02/13/97

Sample: 05A Trip Blank Collected: 01/30/97 Matrix: WATER

Test Description	Method	Result	Q	Limit	Units		Analyzed
BTEX	EPA 8020						
Benzene		ND		1.0	ug/L		02/12/97
Toluene		ND		1.0	ug/L		02/12/97
Ethylbenzene		ND		1.0	ug/L		02/12/97
Xylenes, Total		ND		2.0	ug/L		02/12/97
SURROGATES, % Recovery							
p-Bromofluorobenzene		100		Min:	76	Max:	112

THE FOLLOWING CODES APPLY TO THE ANALYTICAL REPORT

RESULT field...
- ND = not detected at the reported limit
- NA = analyte not applicable (see case narrative/methods for discussion)

Q (qualifier) field...

GENERAL:
- * = Recovery or %RPD outside method specifications
- H = value is estimated due to analysis run outside EPA holding times
- E = reported concentration is above the instrument calibration range
- D = analyte was diluted to bring within instrument calibration range or to remove matrix interferences

ORGANIC ANALYSIS DATA QUALIFIERS:
- B = analyte was detected in the laboratory method blank
- J = analyte was detected above the instrument detection limit (IDL) but below the analytical reporting limit (CRDL)

INORGANIC ANALYSIS DATA QUALIFIERS:
- B = analyte was detected above the instrument detection limit (IDL) but below the analytical reporting limit (CRDL)
- A = post digestion spike did not meet criteria (70-130%), therefore the reporting limit was raised by a factor of two to reflect spike failure
- S = reported value determined by the Method of Standard Additions

BTEX_W:	BTEX (GCPID)	METHOD: 8020
ICPTW	Acid Digestion of Aqueous Samples and Extracts for Total Metals for Analysis by Flame Atomic Absorption (FAA) or Inductively Coupled Plasma (ICP) Spectroscopy according to SW-846.0	METHOD: 3010A
ICP_TW:	METALS, Total (ICP)	METHOD: 3010/6010
8330_W:	NITROAROMATICS AND NITRAMINES	METHOD 8330

Samples were subcontracted to:
Paragon Analytics, Inc.
225 Commerce Drive
Fort Collins, CO 80524
(970) 490-1511

Sample: 01A FW45/MW3-001-1515-013097 Matrix: WATER

Analysis	Method	Collected	Received	TCLP date	Extracted	Analyzed
BTEX	EPA 8020	01/30/97	02/01/97	NA		02/12/97

Sample: 01C FW45/MW3-001-1515-013097 Matrix: WATER

Analysis	Method	Collected	Received	TCLP date	Extracted	Analyzed
ICP Metals, Total	SW 6010	01/30/97	02/01/97	NA	02/10/96	02/13/97

Sample: 01D FW45/MW3-001-1515-013097 Matrix: WATER

Analysis	Method	Collected	Received	TCLP date	Extracted	Analyzed
Explosives in H2O by HPLC	EPA 8330	01/30/97	02/01/97	NA	02/06/97	02/20/97

Sample: 02A FW45/MW3-002-1520-013097 Matrix: WATER

Analysis	Method	Collected	Received	TCLP date	Extracted	Analyzed
BTEX	EPA 8020	01/30/97	02/01/97	NA		02/12/97

Sample: 02C FW45/MW3-002-1520-013097 Matrix: WATER

Analysis	Method	Collected	Received	TCLP date	Extracted	Analyzed
ICP Metals, Total	SW 6010	01/30/97	02/01/97	NA	02/10/96	02/13/97

Sample: 03A FW45/MW1-1445-013097 Matrix: WATER

Analysis	Method	Collected	Received	TCLP date	Extracted	Analyzed
BTEX	EPA 8020	01/30/97	02/01/97	NA		02/12/97

Sample: 03C FW45/MW1-1445-013097 Matrix: WATER

Analysis	Method	Collected	Received	TCLP date	Extracted	Analyzed
ICP Metals, Total	SW 6010	01/30/97	02/01/97	NA	02/10/96	02/13/97

Sample: 04A FW45/MW2-1415-013097 Matrix: WATER

Analysis	Method	Collected	Received	TCLP date	Extracted	Analyzed
BTEX	EPA 8020	01/30/97	02/01/97	NA		02/12/97

Sample: 04C FW45/MW2-1415-013097 Matrix: WATER

Analysis	Method	Collected	Received	TCLP date	Extracted	Analyzed
ICP Metals, Total	SW 6010	01/30/97	02/01/97	NA	02/10/96	02/13/97

Sample: 05A Trip Blank Matrix: WATER

Analysis	Method	Collected	Received	TCLP date	Extracted	Analyzed
BTEX	EPA 8020	01/30/97	02/01/97	NA		02/12/97

QA/QC REPORT

METHOD BLANK SUMMARY

02/25/97

CLIENT: USACE_NM

PAGE: 1

ORDER#: 9702008

SAMPLE ID	ANALYTE	UNITS	PREP DATE	RESULT	LIMIT	SPIKE	%REC	FLAG	QC SPECS LOW	QC SPECS UPPER
Method Blank	BTEX	ug/L	02/12/97							
	Benzene			ND	1.0					
	Toluene			ND	1.0					
	Ethylbenzene			ND	1.0					
	Xylenes, Total			ND	2.0					
	p-Bromofluorobenzene			31		30	103		76	112
Method Blank	ICP METALS, Total	mg/L	02/10/96							
	Lead			ND	0.050					

METHOD BLANK SPIKE SUMMARY

SAMPLE ID	ANALYTE	UNITS	PREP DATE	RESULT	LIMIT	SPIKE	REF VAL	%REC	FLAG	QC SPECS LOW	QC SPECS UPPER
Blank Spike	BTEX	ug/L	02/12/97								
	Benzene			11	1.0	11	ND	100		70	130
	Toluene			48	1.0	44	ND	109		70	130
	Ethylbenzene			11	1.0	9.2	ND	120		70	130
	Xylenes, Total			62	2.0	53	ND	117		70	130
	p-Bromofluorobenzene			31		30	31	103		76	112
Blank Spike	ICP METALS, Total	mg/L	02/10/96								
	Lead			0.50	0.050	0.50	ND	100		80	120

QA/QC REPORT

MATRIX SPIKE SUMMARY

02/25/97

CLIENT: USACE_NM

ORDER#: 9702008

SAMPLE ID	ANALYTE	UNITS	PREP DATE	RESULT	LIMIT	SPIKE	REF VAL	%REC	FLAG	QC SPECS LOW	QC SPECS UPPER
9702008-01A	BTEX	ug/L	02/12/97								
	Benzene			9.8	1.0	11	ND	89.1		70	130
	Toluene			45	1.0	44	ND	102		70	130
	Ethylbenzene			10	1.0	9.2	ND	109		70	130
	Xylenes, Total			58	2.0	53	ND	109		70	130
	p-Bromofluorobenzene			30		30	29	100		76	112
9702046-03A	ICP METALS, Total	mg/L	02/10/96								
	Lead			0.49	0.050	0.50	ND	98.0		70	130

SPIKE DUPLICATE SUMMARY

SAMPLE ID	ANALYTE	UNITS	PREP DATE	RESULT	LIMIT	SPIKE	REF VAL	%REC	FL	%RPD	QC SPECS LOW	QC SPECS UPPER
9702008-01A	BTEX	ug/L	02/12/97									
	Benzene			9.2	1.0	11	ND	83.6		6.37	70	130
	Toluene			41	1.0	44	ND	93.2		9.02	70	130
	Ethylbenzene			9.6	1.0	9.2	ND	104		4.69	70	130
	Xylenes, Total			54	2.0	53	ND	102		6.64	70	130
	p-Bromofluorobenzene			30		30	29	100		0.0	76	112

SAMPLE DUPLICATE SUMMARY

SAMPLE ID	ANALYTE	UNITS	PREP DATE	RESULT	LIMIT	REF VAL	%RPD	QC SPECS UPPER
9702046-03A	ICP METALS, Total	mg/L	02/10/96					
	Lead			ND	0.050	ND	0.0	20

ORD# 97-02-008
CSN# 701241
CLI USACE_NM

ANALYTICA, INC.
CLIENT INVOICE

INVOICE# 110085
DATE 02/25/97
PAGE 1

INVOICE TO
USAED, FT. Worth
Attn: RM-FE
P.O BOX 17300
FT. Worth, TX 76102
ATTEN Brian Jordan

REMIT TO
Analytica Environmental Labs
325 Interlocken Parkway
Suite 200
Broomfield, Colorado 80021
ATTEN Accounts Receivable
PHONE (303) 469-8868

WORK ID DACA47-97-P-0074
P.O. # .

RECEIVED 02/01/97 REPORTED 02/25/97
REPORT USAED, Albuquerque
ATTEN Brian Jordan

	ID	CODE	DESCRIPTION	REMARK	PRICE	QTY	DISCOUNT	AMOUNT
TESTS		8330_W	Explosives in H2O by HPLC		247.00	1		247.00
		BTEX_W	BTEX		52.00	4		208.00
		ICP_TW	ICP Metals, Total	Lead	30.00	4		120.00

SUBTOTAL $575.00

TOTAL INVOICE AMOUNT $575.00

All invoices are due and payable upon receipt. Outstanding balances over 30 days are subject to a finance charge of 1.5% per month.

ANALYTICA
ENVIRONMENTAL
LABORATORIES

325 Interlocken Parkway, Suite 200
Broomfield, Colorado 80021
(303) 469-8868 or 1-800-873-8707
FAX: (303) 469-5254

CHAIN OF CUSTODY RECORD

CLIENT NAME: USACE
CLIENT CONTACT: BRIAN JORDAN
CLIENT ADDRESS: 4101 Jefferson Pl. NE
PROJECT ID/DESCRIPTION: Ft. Wingate - Firehouse
TELEPHONE: 505-342-3472
FAX: 505-342-3199
P. O. NO.:

ANALYTICA USE ONLY: NE 003639
CSN: 901241
LGN: 97-02-008
LOC: VOA / 13-3
QC: 3
PM: T. Ridgway
DUE: 2-17-97

Sample Matrix (circle one)
WATER SOIL OIL SLUDGE
OTHER (specify)
(NOTE: use one Chain of Custody per matrix)

DATE	TIME	CLIENT ID	NO. OF BOTTLES	TESTS REQUESTED: BTEX 8021	Pb-ICP	8330
31Jan97	1515	FW45/MW3-001-1515-013097	5	2	1	2
"	1520	FW45/MW3-002-1520-013097	3	2	1	
"	1445	FW45/MW1-1445-013097	3	2	1	
"	1415	FW45/MW2-1415-013097	3	2	1	

COMMENTS

MEANS OF DELIVERY: FDX

RELINQUISHED BY	DATE/TIME	RECEIVED BY	DATE/TIME	RELINQUISHED BY	DATE/TIME	RECEIVED BY	DATE/TIME
BRIAN JORDAN	31Jan97/200	FedEx					2/1/97 11:45

003-0294