SITE INSPECTION REPORT
Former Atlas Missile Silo Site 4
Roswell, New Mexico
FUDS Project ID No. K06NM0482

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Acronyms and Abbreviations

bgs	below ground surface
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
DERP	Defense Environmental Restoration Program
DOD	U.S. Department of Defense
EPA	U.S. Environmental Protection Agency
°F	Degrees Fahrenheit
FUDS	Formerly Used Defense Site
GSA	General Services Administration
GPS	Global Positioning System
ID	Identification
IDW	investigation-derived waste
LCC	Launch Control Center
MDL	method detection limit
µg/kg	microgram(s) per kilogram
mg/kg	milligram(s) per kilogram
NAD	North American Datum
NMED	New Mexico Environment Department
NMOSE	New Mexico Office of the State Engineer
PAH	polynuclear aromatic hydrocarbons
PCB	polychlorinated biphenyl
SARA	Superfund Amendments and Reauthorization Act
Shaw	Shaw Environmental, Inc.
SI	Site Inspection
SPCS	State Plane Coordinate System
SVOC	semivolatile organic compound
TAL	Target Analyte List
TCLP	Toxicity Characteristic Leaching Procedure
TIC	tentatively identified compound
USACE	U.S. Army Corps of Engineers
UST	underground storage tank
VOC	volatile organic compound

1.0 Introduction

1.1 Purpose

This report describes the activities and presents the detailed results of the Site Inspection (SI) performed by Shaw Environmental, Inc. (Shaw) at Former Atlas Missile Silo Site 4, located near Roswell, New Mexico (Figure 1-1). The SI was conducted for the U.S. Army Corps of Engineers (USACE), Albuquerque District, under Contract Number DACW05-96-D-0011, Contract Task Order 15, Work Authorization Directive 2 to the Sacramento Total Environmental Restoration Contract II. The SI followed specifications in the *Final Work Plan, Environmental Site Investigation, Former Atlas Missile Silo Sites 3, 4 and 6, Roswell, New Mexico, Formerly Used Defense Site (FUDS) Project ID Nos K06NM0481 (Site 3), K06NM0482 (Site 4), and K06NM0484 (Site 6)* (Shaw, 2005) and approved field work variances. This SI was conducted to determine whether an immediate or potential threat to human health and the environment exists as a result of the U.S. Department of Defense (DOD) activities at the site and whether further action is warranted. The scope of work, performed between March 14 and June 7, 2005, included surveys of site features and collection of surface and subsurface soil samples.

The SI performed at Silo Site 4 was accomplished in accordance with the Superfund Amendments and Reauthorization Act (SARA) of 1986, which amended the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) of 1980. Upon the passage of SARA, the Defense Environmental Restoration Program (DERP) was established (EPA, 2002). The DERP assigns the Secretary of Defense the responsibility to carry out response actions at FUDS. The DOD's executing agent for implementation of the FUDS program is the USACE. In general, regulatory oversight of FUDS activities is delegated by respective U.S. Environmental Protection Agency (EPA) regions to states within those regions. For this investigation, the New Mexico Environment Department (NMED) is the lead regulatory agency for oversight of the SIs at the Former Atlas Missile Silo Sites.

As required by CERCLA, a preliminary assessment has been completed at Silo Site 4 (HGL, 2005). Consistent with the CERCLA process, the SI at Silo Site 4 was conducted to gather information necessary to determine the need for further action.

Both a description of the site and its operational history as well as a summary of previous investigations for Silo Site 4 are provided in Chapter 2.0 of this report. Chapter 3.0 provides details of the source characterization and other activities performed during this SI and presents

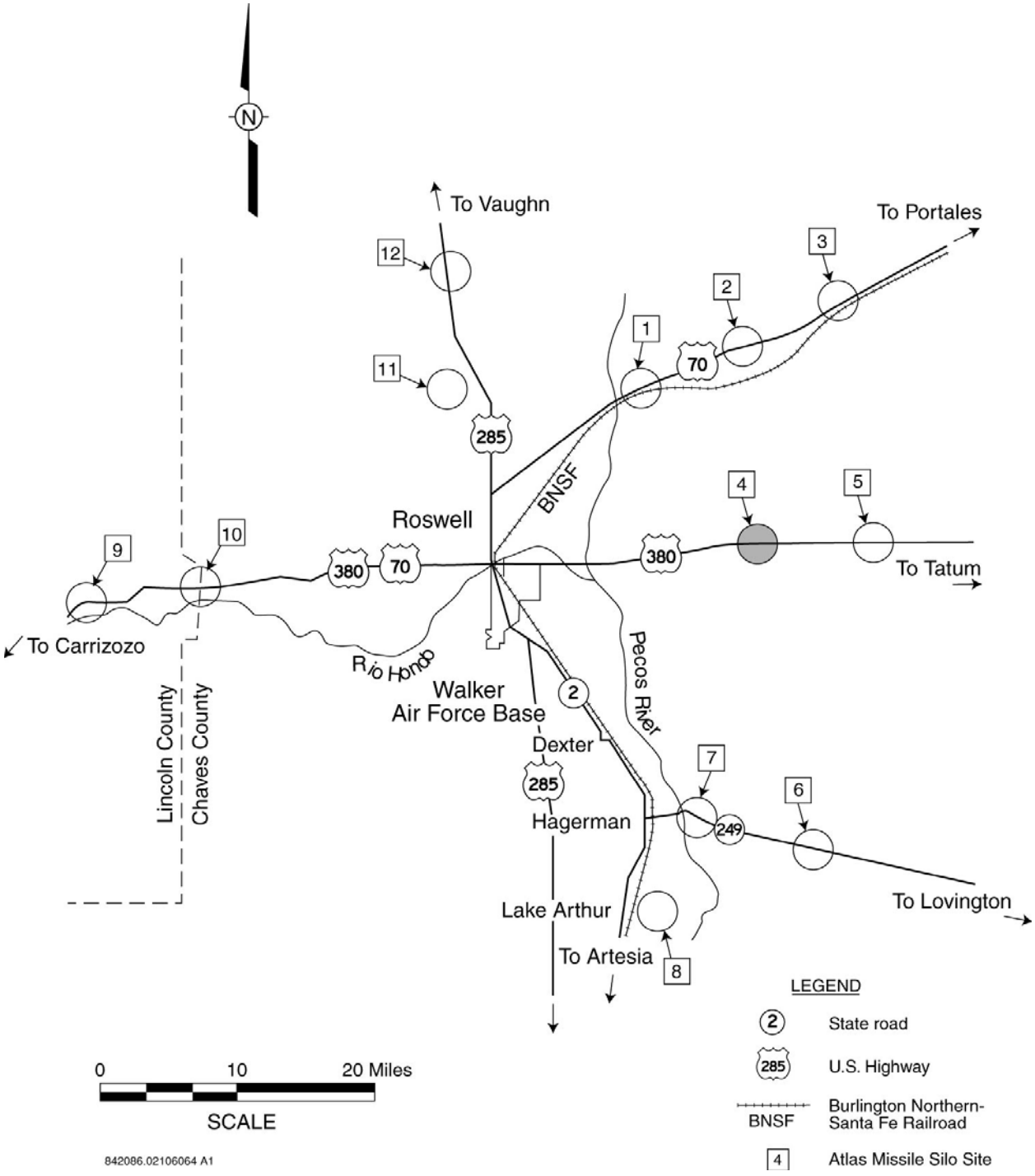


Figure 1-1
Site Location Map, Former Atlas Missile Silo Site 4
Roswell, New Mexico

results of soil assessment sampling. The potential groundwater pathways, surface water pathways, and soil exposure and air pathways are discussed in Chapters 4.0, 5.0, and 6.0, respectively. Chapter 7.0 summarizes the investigation findings and provides recommendations. References are listed in Chapter 8.0. Included at the end of this report are the following appendices:

- Appendix A, Field Documentation
- Appendix B, Analytical Result Tables
- Appendix C, Soil Boring Log
- Appendix D, Survey Data
- Appendix E, Quality Assurance/Quality Control Report
- Appendix F, Laboratory Data Reports
- Appendix G, Automated Data Review
- Appendix H, Environmental Data Management System
- Appendix I, Geochemical Evaluation of Metal Concentrations in Silo Site 4 Soil Samples

1.2 Sampling Objectives

The following sampling objectives for the SI at the Former Atlas Missile Silo Site 4 are based upon Data Quality Objectives developed by stakeholders present during the Technical Project Planning (TPP) meeting held on April 15, 2004:

- Determine whether or not previous DOD activities at Former Atlas Missile Silo Site 4 resulted in the presence of chemicals at concentrations that may impact human health and the environment.
- Identify potentially hazardous constituents that may have migrated from Former Atlas Missile Silo Site 4 to the surrounding soil and/or groundwater, and determine whether any detectable constituents present at concentrations above evaluation criteria can be attributed to past DOD activities.
- Determine the presence of potentially hazardous constituents at possible source areas within the silo site study boundary, which extends laterally to encompass all of the original DOD site features and vertically to a depth of 250 feet below ground surface (bgs). Potential contaminant source areas at Silo Site 4 include the former underground storage tank (UST) area and the outfall area for silo sump discharge.

These objectives are consistent with the Work Plan developed for the SI at Former Atlas Missile Silo Sites 3, 4 and 6 (Shaw, 2005).

1.3 Scope

The following activities were included in the scope presented in the Silo Site 4 Work Plan (Shaw, 2005) and were based upon the objectives developed during the TPP meeting held on April 15, 2004. Scope activities were intended to be variable based upon the field conditions encountered during the execution of the SI.

- Survey surface features at Silo Site 4 using a global positioning system (GPS) to generate a present-day, site-specific layout.
- Advance one deep borehole in the former UST area and collect subsurface soil samples for analysis of specific hazardous constituents.
- If applicable, install a BARCAD™ monitoring well in the UST deep borehole and in two additional boreholes, then collect groundwater samples for analysis of specific hazardous constituents.
- Collect surface and shallow subsurface soil samples from the sump outfall area for analysis of specific hazardous constituents.
- Collect surface soil samples from background locations within the original site fence line.
- Abandon existing Monitoring Well MW-4 to eliminate a potential migration pathway.
- Conduct a civil survey to accurately locate soil borings and surface soil sample points.

2.0 Site Background

2.1 Location

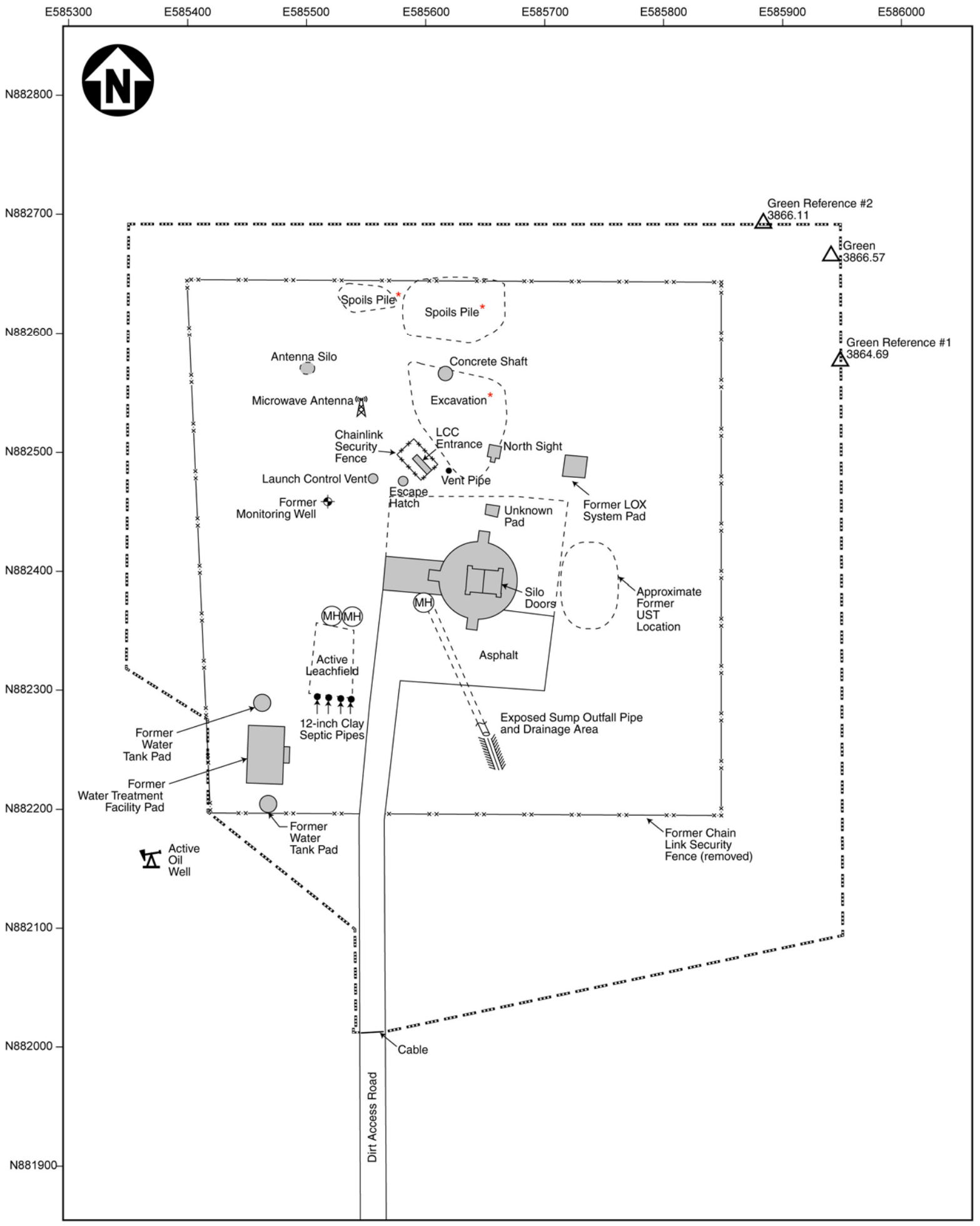
Former Atlas Missile Silo Site 4 is located in central Chaves County, New Mexico, Township 10 South, Range 27 East, Section 22. The site is approximately 20 miles east of Roswell, New Mexico on U.S. Highway 380 and sits at an average elevation of 3,855 feet above mean sea level. The approximate geographical coordinates for the center of the site are E 585,680 and N 882,400 (New Mexico State Plane Coordinates System [SPCS], East Zone, North American Datum [NAD] 1983). The land use surrounding the site includes active oil and natural gas production and livestock grazing.

2.2 Physical Description

In the early 1960s, the DOD constructed a complex of 12 Atlas "F" missile launching facilities within an approximate 50-mile radius of Roswell, New Mexico. Each site consisted of an underground missile silo and launch control center (LCC). The sites also included typical features such as a septic system and associated leachfield, a silo sump pump system, one or two Quonset-style buildings, underground fuel and water storage tanks, water treatment system, and a nearby evaporation pond. Aboveground water-treatment facilities included a diesel generator cooling tower, filtration shed, well pump house shed, and small water storage tanks.

The original construction and layout of the silo sites are similar among each site; however, many of the original site features no longer exist due to salvage of usable equipment and material upon decommission of the sites. Modifications by subsequent property owners, vandalism, and weathering have uniquely altered the features at each silo site.

Current features of Silo Site 4 are presented in Figure 2-1. Of the approximately 250 acres acquired by the DOD for the development of Silo Site 4, the actual missile facility occupied 12.5 acres including a road easement and evaporation ponds (Shaw, 2005). The septic system and associated leachfield are intact, operational and currently in use. The silo sump outfall pipe and drainage swale were unearthed by the site owner during soil grading activities. Although the current property owner has graded the soil and cleared most of the vegetation surrounding the silo pad and LCC area, some sparse to moderate vegetation remains within the site boundaries. A large excavation, approximately 30 feet across and 15 feet deep, exists north of the silo pad and northeast of the LCC entrance; however, the property owner is currently in the process of filling in the excavation with soil from the spoils pile located north of the excavation. Monitoring Well MW-4, which had been vandalized, existed northwest of the silo, but was abandoned by Shaw on March 14, 2005.



LEGEND

- Existing barbed wire fence
- Approximated boundary
- Former fence line
- Shaded areas are concrete features
- Former Monitoring Well
- Oil Well
- Green 3866.57 — Survey benchmark with elevation (feet above mean sea level)
- (MH) — Manhole cover
- LCC — Launch Control Center
- LOX — Liquid Oxygen
- UST — Underground Storage Tank
- * — Temporary site features present as of April 2005

Note: Some small feature symbols not to scale.

Basis of Coordinates: New Mexico State Planar Coordinates, East Zone, U.S. Survey Feet, North American Datum, 1983

0 100 200FT

SCALE

Figure 2-1
Site Features Map, Former Atlas Missile Silo Site 4
Roswell, New Mexico

The original 70-foot-diameter concrete silo pad at Silo Site 4 remains intact while the surrounding 170-foot-square asphalt area has been heavily weathered. Concrete foundations from the former water treatment facility, including a pump house and two water tanks, are located southwest of the silo pad; however, there is no remaining evidence of the evaporation ponds. The stairwell entrance to the LCC and underground structures, located northwest of the silo pad, has been restored to near original conditions. The LCC and tunnel into the silo are currently being restored by the property owner.

2.3 Operational History

The following historical information was obtained by HydroGeoLogic, Inc. through interviews with former crewmen and maintenance personnel as well as other investigation sources. The full account of the historical information is provided in the Preliminary Assessment for Silo Site 4 (HGL, 2005).

The DOD acquired the site property in 1960 as one of 12 locations in the vicinity of Walker Air Force Base in Roswell, New Mexico, to construct Atlas "F" missile launching facilities. A joint venture consisting of Macco Corporation, Raymond International, Inc., The Kaiser Co., and Puget Sound Bridge and Dry Dock Co. was awarded the contract to build the missile launching facilities. Construction on the site began in June 1960 and was completed on December 5, 1961.

The Atlas "F" missile, an advanced version of the Atlas intercontinental ballistic missile, was stored vertically in the underground concrete and steel silo. The missiles were fueled with RP-1 (kerosene) liquid fuel when placed on alert and then with liquid oxygen if a decision was made to launch.

During active operations, the silo was continuously occupied by a missile crew, whose mission was to maintain missile launch readiness. Their activities predominantly consisted of instrument and equipment inspections and readiness training exercises. Liquid oxygen, one of the fuel sources for the missile, was stored in large amounts in a tank inside the silo. The liquid oxygen was loaded into the missile during launch or propellant loading exercises, and vented off the missile into the atmosphere after the exercise. RP-1, a high-grade form of kerosene, was stored in a fuel tank on the missile. The RP-1 remained on the missile after training exercises and did not need to be replenished. Silo operations relied upon diesel generator power during normal operations, but commercial power was also available. The silo's two diesel generators were totally relied upon during missile exercises. Diesel fuel was pumped from the UST into a "day tank" inside the silo, which contained a day's worth of diesel to operate the generators.

Equipment maintenance was performed by another crew on a daily basis. Very little material was stored at the silo itself. The maintenance crew brought materials required to conduct repairs or perform maintenance checks. The maintenance squadron was also responsible for monthly

delivery of diesel fuel and, as needed, delivery of hydraulic fluid to the silo. Spills or leaks in the silo primarily consisted of hydraulic fluid, diesel, and occasionally lubricating oil, typically involving seepage and large spills. If a larger leak of diesel occurred, it usually resulted from personnel forgetting to turn off the switch when filling the "day tank" on the generator. Because the hydraulic fluid used to operate the silo doors, crib locks, and elevators was under great pressure, it had to be occasionally refilled due to leaks. Water frequently leaked into the silo and collected in the sump at the bottom of the silo. Hydraulic oil that had leaked would occasionally flow into the sump as well.

The site obtained its water via pipeline from the city of Roswell, which was treated in the water treatment building prior to being used. A cooling tower for the diesel generators in the silo was also located aboveground. Wastewater from the LCC sump was pumped to a septic tank and leachfield located southwest of the silo. Water and other fluids collected from a sump located at the bottom of the silo may have been discharged through a 6-inch pipe into an outfall ditch located south of the silo. According to operational manuals, when fluid reached a certain level in the sump, the sump pumps were activated.

On May 16, 1964, the DOD announced that the Atlas "F" missile program was to be phased out, and on February 4, 1965, the last Atlas "F" missile was removed from alert readiness. On June 25, 1965, the site was declared excess to the General Services Administration (GSA). General dismantling began after July 31, 1965. On June 24, 1966, the easements expired following nonuse for a period exceeding one year as stipulated in the acquisition documents. On June 21, 1967, the GSA conveyed the 12.5 acres fee to W.L. Pennington and Cliff C. Henderson. The current owners of the property are George E. Baker and Frances L. Baker (HGL, 2005)

2.4 Previous Investigations

Silo Site 4 was included in SIs conducted by the USACE between 1994 and 1997, during which time Monitoring Well MW-4 was completed to 200 feet bgs and screened from 180 to 200 feet bgs. Groundwater was encountered at 183.75 feet bgs during drilling activities. Upper water bearing zones encountered during drilling were sealed off prior to installation of the monitoring well in the regional aquifer. The data collected during the SIs were compiled into an Environmental Site Investigation Report (IT, 2001). However, the analytical laboratory contracted for the investigation became involved in potentially fraudulent practices, which compromised the data. The USACE considers the previous analytical results unusable; therefore, the data cannot be used to determine the potential impact of DOD activities on the environment.

3.0 Source Characterization and Investigation Activities

3.1 Soil Characterization

Assessment activities at Silo Site 4 were designed to investigate potential releases of hazardous constituents from two potential source areas, the former UST area and the silo sump outfall. The septic system leachfield area has been considered a potential source area during previous silo site inspections; however, the septic system at Silo Site 4 was not sampled because the septic system has been backflushed and is currently operational. Descriptions of sampling activities, methods, and analytical results follow. A summary of soil samples collected during the SI at Silo Site 4 is presented in Table 3-1.

3.1.1 Former UST Area

3.1.1.1 Methods

Between April 14 and 16, 2005, a deep borehole (BH4-1) was advanced with Stratex® drilling methods to 250 feet bgs through the former UST area (Photo 1). Soil samples from 35 and 65 feet bgs were collected directly from the cyclone due to split-spoon refusal. The remaining soil samples, from 125 and 250 feet bgs, were collected from 2-inch, stainless-steel, split spoons driven ahead of the drill string (Table 3-1) (Photo 2). No organic vapors were detected during field-screening of the soil samples.

Groundwater was not encountered during the drilling of BH4-1 to 250 feet bgs, which is the vertical study boundary identified for this SI. The borehole was not completed as a BARCAD™ monitoring well; therefore, groundwater samples were not collected at Silo Site 4.

Borehole BH4-1 was abandoned by pressure-grouting with a cement-bentonite mixture through a tremie pipe from total borehole depth to ground surface.

3.1.1.2 Analytical Results

Analytical procedures from EPA SW-846 (EPA, 1986) were followed to perform chemical analysis of the soil samples collected during the Silo Site 4 SI. Deep borehole soil samples were analyzed for volatile organic compounds (VOC), semivolatile organic compounds (SVOC), polynuclear aromatic hydrocarbons (PAH), and Target Analyte List (TAL) metals by the methods listed in Table 3-1.

The analytical laboratory performed mass-spectra library searches during all VOC and SVOC analyses in an attempt to identify nontarget compounds that may be present in the samples. Nontarget compounds referred to as tentatively identified compounds (TIC) were identified in order to assess the presence of unanticipated, unknown, or exotic compounds in the soil at Silo

Table 3-1
Soil Sample Summary
Site Inspection: Former Atlas Missile Silo Site 4
Roswell, New Mexico

Location ID	Sample Number	Sample Date	Sample Type	Sample Depth (ft bgs)	Analytical Methods[a]
Deep Borehole Samples					
BH4-1	BH4-1-1	4/14/2005	Environmental Soil	35	VOC (EPA 8260B) SVOC (EPA 8270C) PAH (EPA 8270C-Modified for Low Level PAH)[c] TAL Metals (EPA 6010B/6020/7470A/7471A)
	BH4-1-2	4/14/2005	Environmental Soil	65–66	
	DBD-4-1	4/14/2005	Duplicate Soil of BH4-1-2	65–66	
	DBD-4-1	4/14/2005	MS/MSD Soil	65–66	
	DBT-4-1	4/14/2005	USACE Split of BH4-1-2 Soil[b]	65–66	
	BH4-1-3	4/15/2005	Environmental Soil	125–127	
	EBD4-1	4/15/2005	Equipment Rinsate after BH4-1-3	N/A	
	BH4-1-4	4/16/2005	Environmental Soil	250	
Sump Outfall Samples					
OFT4	OFT4-1	3/14/2005	Environmental Soil	0–0.5[d]	VOC (EPA 8260B) SVOC (EPA 8270C) PAH (EPA 8270C-Modified for Low Level PAH)[c] TAL Metals (EPA 6010B/6020/7471A) PCB (EPA 8082)
	OFT4-2	3/14/2005	Environmental Soil	0–0.5[d]	
	OFT4-3	3/14/2005	Environmental Soil	0–0.5[d]	
	OFT4-4	3/14/2005	Environmental Soil	0–0.5[d]	
	OFT4-5	3/14/2005	Environmental Soil	2.0[d]	
	OFD4-1	3/14/2005	Duplicate Soil of OFT4-5	2.0[d]	
	OFD4-1	3/14/2005	MS/MSD Soil	2.0[d]	

Table 3-1 (Continued)
Soil Sample Summary
Site Inspection: Former Atlas Missile Silo Site 4
Roswell, New Mexico

Location ID	Sample Number	Sample Date	Sample Type	Sample Depth (ft bgs)	Analytical Methods[a]
Sump Outfall Samples (Continued)					
OFT4 (Continued)	OFTT4-1	3/14/2005	USACE Split of OFT4-5 Soil[b]	2.0[d]	VOC (EPA 8260B) SVOC (EPA 8270C) PAH (EPA 8270C-Modified for Low Level PAH)[c] TAL Metals (EPA 6010B/6020/7471A) PCB (EPA 8082)
	OFT4-6	3/14/2005	Environmental Soil	2.0[d]	
	OFT4-7	3/14/2005	Environmental Soil	2.0[d]	
	OFT4-8	3/14/2005	Environmental Soil	2.0[d]	
Background Samples					
S4-BK1	S4-SS-BK-1	3/14/2005	Background Surface Soil	0–0.5	TAL Metals (EPA 6010B/6020/7471A)
	BKD4-1	3/14/2005	Duplicate Soil of S4-SS-BK-1	0–0.5	
	BKD4-1	3/14/2005	MS/MSD Soil	0–0.5	
	BKT4-1	3/14/2005	USACE Split of S4-SS-BK-1 Soil[b]	0–0.5	
S4-BK2	S4-SS-BK-2	3/14/2005	Background Surface Soil	0–0.5	
S4-BK3	S4-SS-BK-3	3/14/2005	Background Surface Soil	0–0.5	
Investigation-Derived Waste Sample					
BH4-1	IDW-4-1	4/15/2005	Investigation-Derived Waste (Composite from Borehole Cuttings)	0–250	TCLP VOC (EPA 1311/8260B) TCLP SVOC (EPA 1311/8270C) TCLP Metals (EPA 1311/6010B/7470A)

[a]U.S. Environmental Protection Agency (EPA), 1986, "Test Methods for Evaluating Solid Waste, Physical/Chemical Methods," SW-846, 3rd ed., U.S. Environmental Protection Agency, Washington, D.C.

[b]USACE Split Samples shipped to the U.S. Army Corps of Engineers Omaha Laboratory, Omaha, Nebraska.

[c]Kemron Environmental Services, 2003, "Standard Operating Procedure for the Analysis of Organic Analytes, Method 8270C for Low Level PAHs, SOP MSS03," Kemron Environmental Services, Marietta, Ohio.

[d]Sample depth is referenced to feet below the bottom of the sump outfall pipe.

Table 3-1 (Continued)
Soil Sample Summary
Site Inspection: Former Atlas Missile Silo Site 4
Roswell, New Mexico

bgs = *Below ground surface.*
EPA = *U.S. Environmental Protection Agency.*
ft = *Foot (feet).*
ID = *Identification.*
MS/MSD = *Matrix spike/matrix spike duplicate.*
N/A = *Not applicable.*
PAH = *Polynuclear aromatic hydrocarbons.*
PCB = *Polychlorinated biphenyl.*
SVOC = *Semivolatile organic compound.*
TAL = *Target Analyte List.*
TCLP = *Toxicity Characteristic Leaching Procedure.*
USACE = *U.S. Army Corps of Engineers.*
VOC = *Volatile organic compound.*

Site 4 in accordance with Section 3.2 and Table 3-1 of the Quality Assurance Project Plan (Shaw, 2005).

To aid in the identification of potential hazardous constituents, soil sample results were compared to previously determined evaluation criteria. The evaluation criteria were chosen as the most conservative of either the NMED Soil Screening Levels (NMED, 2004), or the EPA Region 6 Human Health Medium-Specific Screening Levels for residential exposure (EPA, 2003). The evaluation criteria for soil samples are presented in Appendix B1.

As presented in Table 3-2, iron was detected above evaluation criteria (23,000 milligrams per kilogram [mg/kg]) in the sample collected from 35 feet bgs, at a concentration of 26,900 mg/kg. No other analytes were detected above evaluation criteria in soil samples from the former UST area.

TICs were identified in three deep borehole soil samples at Silo Site 4. The estimated TIC concentrations from the deep borehole samples ranged from 5.63 to 654 µg/kg. Standard chemical reference volumes were consulted to determine the possible sources for the TICs. Possible TIC sources, with references footnoted, are also shown in Table 3-3. No evaluation criteria for the TICs are established; therefore, comparison against the TICs estimated concentrations could not be made. In accordance with decision rules established in Table 3-1 of the Quality Assurance Project Plan (Shaw, 2005), no further action regarding the TICs is necessary.

3.1.2 Sump Outfall

3.1.2.1 Methods

The terminus of the clay outfall pipe for the Silo Site 4 sump system was located approximately 80 feet south of the silo (Figure 3-1). On March 14, 2005, a backhoe was used to remove sloughed material from the outfall ditch to the level of the bottom of the sump outfall pipe (Photo 3). Four soil samples were collected from this soil horizon. One (OFT4-1) was collected from directly beneath the edge of the outfall pipe, and three more (OFT4-2, OFT4-3, and OFT4-4) along a line that progressed farther down the ditch at approximate distances of 5, 10, and 15 feet from the edge of the outfall pipe. The bottom of the outfall ditch was then excavated to a hard caliche layer at approximately 2 to 3 feet bgs (Photo 4). Four more samples (OFT4-5, OFT4-6, OFT4-7, and OFT4-8) were collected from the sidewall of the excavation, just above the hard caliche layer, and at the same distances from the outfall as mentioned above (Figure 3-2). No organic vapors were detected at outfall soil sample locations.

Table 3-2
Soil Analytical Results Exceeding Evaluation Criteria
Site Inspection: Former Atlas Missile Silo Site 4
Roswell, New Mexico

Sample Number	Sample Depth (ft bgs)	Analytical Method[a]	Analyte	Result	Units	Final Qualifier	Evaluation Criteria[b]	Reporting Limit	Method Detection Limit
Deep Borehole Samples									
BH4-1-1	35	6010B	Iron	26900	mg/kg		23000	10.6	5.31
Sump Outfall Samples									
OFT4-1	0–0.5[c]	8082	Aroclor-1260	994	µg/kg		220	376	188
	0–0.5[c]	827-PAHL	Benzo(a)pyrene	72.4	µg/kg		62	56.6	28.8
OFT4-2	0–0.5[c]	8082	Aroclor-1260	912	µg/kg		220	365	183
OFT4-3	0–0.5[c]	8082	Aroclor-1260	485	µg/kg		220	350	175
OFT4-5	2.0[c]	8082	Aroclor-1260	315	µg/kg		220	189	94.5
OFD4-1 (Duplicate of OFT4-5)	2.0[c]	8082	Aroclor-1260	462	µg/kg		220	374	187

[a]U.S. Environmental Protection Agency (EPA), 1986, "Test Methods for Evaluating Solid Waste, Physical/Chemical Methods," SW-846, 3rd ed., U.S. Environmental Protection Agency, Washington, D.C.

[b]Evaluation criteria are found in Appendix B1. Evaluation criteria were selected from either 1) New Mexico Environment Department (NMED), 2004, "Technical Background Document for Development of Soil Screening Levels," Revision 2.0, Hazardous Waste Bureau, New Mexico Environment Department, Santa Fe, New Mexico, or 2) U.S. Environmental Protection Agency (EPA), 2003, "EPA Region 6 Human Health Medium-Specific Screening Levels," electronic database maintained by Region 6, U.S. Environmental Protection Agency, Dallas, Texas.

[c]Sample depth is referenced to feet below the bottom of the sump outfall pipe.

bgs = Below ground surface.

ft = Foot (feet).

µg/kg = Microgram(s) per kilogram.

mg/kg = Milligram(s) per kilogram.

PAHL = Polynuclear aromatic hydrocarbons low-level.

Table 3-3
Tentatively Identified Compounds in Soil Samples
Site Inspection: Former Atlas Missile Silo Site 4
Roswell, New Mexico

Sample Number	Analytical Method[a]	CAS Number	Tentatively Identified Compound	Estimated Concentration (µg/kg)	Chromatograph Retention Time (minutes)	Possible Source
Deep Borehole Samples						
BH4-1-2	8270C	112-79-8	9-OCTADECENOIC ACID, (E)-	371	16.85	Wetting agent used in herbicides and biocides.[b]
DBD4-1 (Duplicate of BH4-1-2)	8260B	124-19-6	NONANAL	42.3	18.59	Degradation product of nonane, component of gasoline and diesel fuel.[c]
BH4-1-3	8260B	66-25-1	HEXANAL	5.63	11.38	Degradation product of hexane, component of gasoline and diesel fuel.[c]
		124-13-0	OCTANAL	8.15	14.81	Degradation product of octane, component of gasoline and diesel fuel.[c]
		124-19-6	NONANAL	26.3	16.29	Degradation product of nonane, component of gasoline and diesel fuel.[c]
	8270C	57-10-3	N-HEXADECANOIC ACID	238	16.1	Used in the manufacture of soaps, lubricating oils and waterproofing materials. Occurs as a major component of many natural fats and oils in the form of a glyceryl ester, e.g. palm oil, and in most commercial- grade stearic acid.[d]
		112-79-8	9-OCTADECENOIC ACID, (E)-	472	16.84	Wetting agent used in herbicides and biocides.[b]

Table 3-3 (Continued)
Tentatively Identified Compounds in Soil Samples
Site Inspection: Former Atlas Missile Silo Site 4
Roswell, New Mexico

Sample Number	Analytical Method[a]	CAS Number	Tentatively Identified Compound	Estimated Concentration (µg/kg)	Chromatograph Retention Time (minutes)	Possible Source
Deep Borehole Samples (Continued)						
BH4-1-3 (Continued)	8270C	57-11-4	OCTADECANOIC ACID	226	16.91	Wetting agent used in herbicides and biocides.[b]
		112-95-8	EICOSANE	284	17.43	Component of diesel fuel.[c]
		1928-30-9	TRICOSANE, 2-METHYL-	418	17.78	Naturally occurring plant compound.[e]
		630-02-4	OCTACOSANE	429	18.16	Degradation product of diesel component.[c]
		593-49-7	HEPTACOSANE	420	19.05	
		7098-22-8	TETRATETRACONTANE	419	19.59	Component of hydrocarbon fuel.[f]
		7098-22-8	TETRATETRACONTANE	654	20.22	
		112-95-8	EICOSANE	446	20.96	Component of diesel fuel.[c]
		7098-22-8	TETRATETRACONTANE	309	21.84	Component of hydrocarbon fuel.[f]
BH4-1-4	8270C	124-19-6	NONANAL	236	10.78	Degradation product of nonane, component of gasoline and diesel fuel.[c]
Sump Outfall Samples						
OFT4-1	8270C	3179-47-3	2-PROPENOIC ACID, 2-METHYL-, DECYL	1910	14.62	Used in the manufacture of resins and plastics, also a degradation product of propenoic acid-based pesticides such as Bensamacril and Methacrifos.[g,h]
		142-90-5	2-PROPENOIC ACID, 2-METHYL-, DODEC	1820	15.66	
		142-90-5	2-PROPENOIC ACID, 2-METHYL-, DODEC	1110	16.55	

Table 3-3 (Continued)
Tentatively Identified Compounds in Soil Samples
Site Inspection: Former Atlas Missile Silo Site 4
Roswell, New Mexico

Sample Number	Analytical Method[a]	CAS Number	Tentatively Identified Compound	Estimated Concentration (µg/kg)	Chromatograph Retention Time (minutes)	Possible Source
Sump Outfall Samples (Continued)						
OFT4-1 (Continued)	8270C	544-76-3	HEXADECANE	1230	20.18	Component of diesel fuel.[c]
		544-76-3	HEXADECANE	3440	21.46	
OFT4-2	8270C	112-95-8	EICOSANE	1490	21.46	
OFT4-3	8270C	544-76-3	HEXADECANE	341	21.47	
OFT4-5	8270C	3179-47-3	2-PROPENOIC ACID, 2-METHYL-, DECYL	744	13.35	Used in the manufacture of resins and plastics, also a degradation product of propenoic acid-based pesticides such as Bensamacril and Methacrifos.[g,h]
		3179-47-3	2-PROPENOIC ACID, 2-METHYL-, DECYL	1520	14.62	
		142-90-5	2-PROPENOIC ACID, 2-METHYL-, DODEC	1470	15.66	
		142-90-5	2-PROPENOIC ACID, 2-METHYL-, DODEC	806	16.55	
		629-78-7	HEPTADECANE	298	21.47	Component of diesel fuel.[c]
OFD4-1 (Duplicate of OFT4-5)	8270C	3179-47-3	2-PROPENOIC ACID, 2-METHYL-, DECYL	1710	14.62	Used in the manufacture of resins and plastics, also a degradation product of propenoic acid-based pesticides such as Bensamacril and Methacrifos.[g,h]
		142-90-5	2-PROPENOIC ACID, 2-METHYL-, DODEC	1600	15.66	
		142-90-5	2-PROPENOIC ACID, 2-METHYL-, DODEC	881	16.56	
OFT4-8	8270C	7616-22-0	.GAMMA.-TOCOPHEROL	1220	21.27	A form of vitamin E. Naturally present in vegetable oils, and used as a preservative.

[a]*U.S. Environmental Protection Agency (EPA), 1986, "Test Methods for Evaluating Solid Waste, Physical/Chemical Methods," SW-846, 3rd ed., U.S. Environmental Protection Agency, Washington, D.C.*

[b]*Orme, S. and S. Kegley, 2004, PAN Pesticide Database, Pesticide Action Network, San Francisco, CA. <http:www.pesticideinfo.org>.*

[c]*Murphy, B. L. and R. D. Morrison, 2002, Introduction to Environmental Forensics, Academic Press, New York.*

Table 3-3 (Continued)
Tentatively Identified Compounds in Soil Samples
Site Inspection: Former Atlas Missile Silo Site 4
Roswell, New Mexico

[d]Katz, G.V., et al. Aliphatic carboxylic acids. In: Patty's Industrial Hygiene and Toxicology. Edited by G.D. Clayton et al. 4th edition. Volume II. Toxicology. Part E. John Wiley and Sons, 1994. p. 3523-3526, 3566- 3567, 3646-3671.

[e]Phytochemical Database, USDA - ARS - NGRL, Beltsville Agricultural Research Center, Beltsville, Maryland.

[f]EPA, 2003, July, 2003, "Characteristics of Spilled Oils, Fuels, and Petroleum Products:1. Composition and Properties of Selected Oils," EPA/600/R-03/072, U.S. Environmental Protection Agency.

[g]Oxford Dictionary of Chemistry 3rd Edition; Oxford University Press, 1996.

[h]Montgomery, J. H., 1991, Groundwater Chemicals Desk Reference Volume 2, Lewis Publishers, Chelsea, Michigan.

CAS = Chemical Abstracts Service.

µg/kg = Microgram(s) per kilogram.

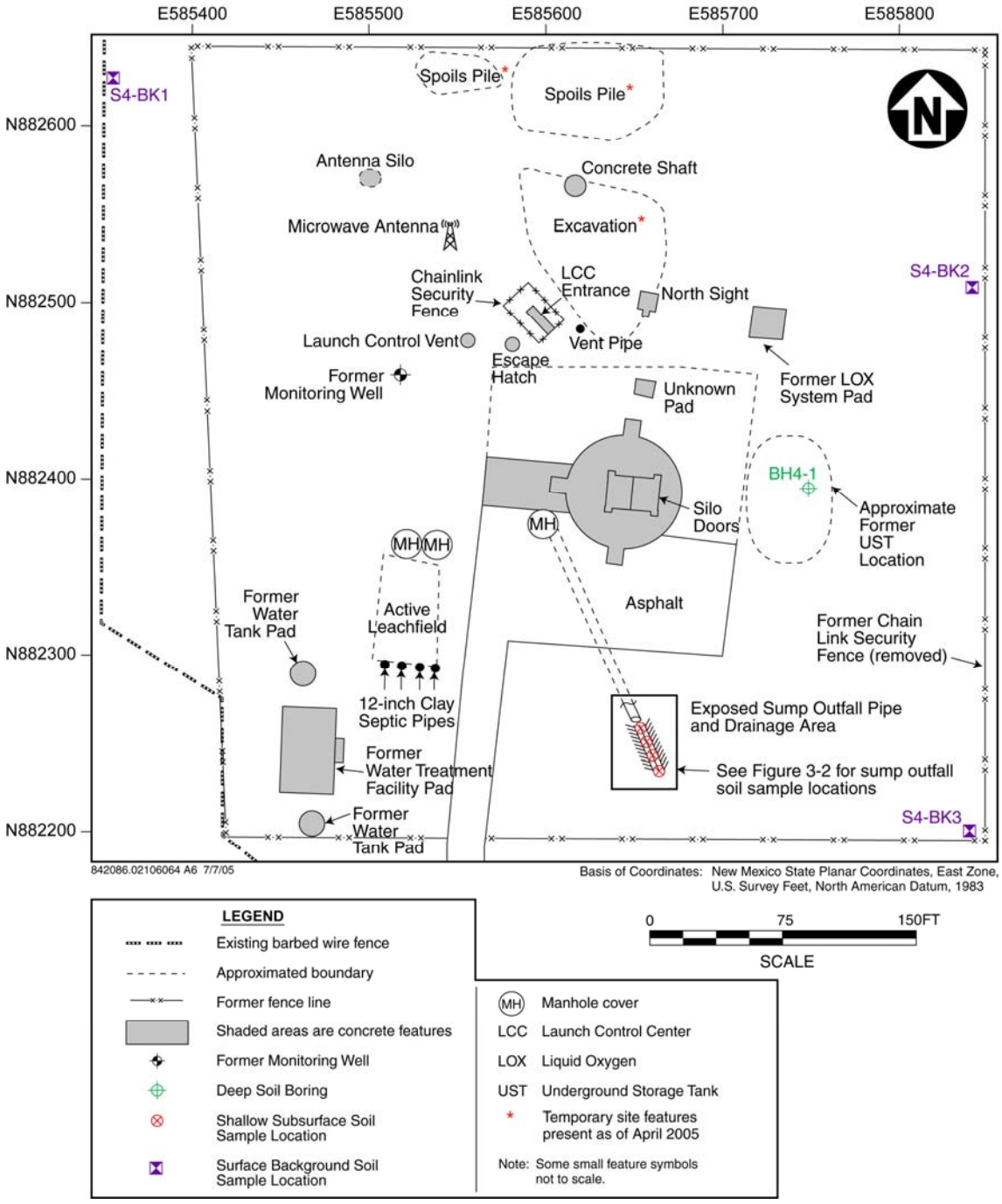


Figure 3-1
Soil Boring and Soil Sample Location Map, Former Atlas Missile Silo Site 4
Roswell, New Mexico

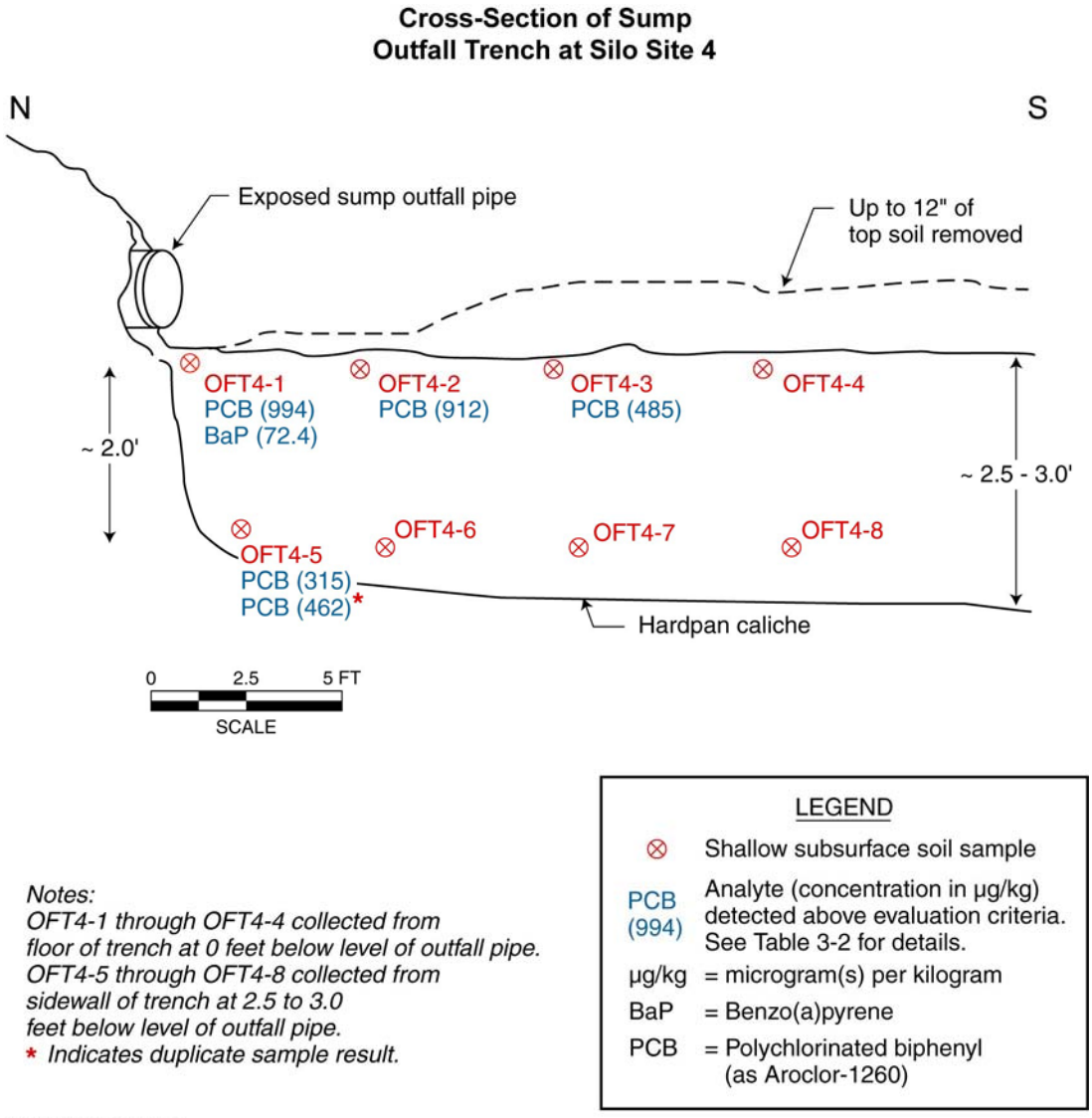


Figure 3-2
Sump Outfall Soil Sample Locations, Former Atlas Missile Silo Site 4
Roswell, New Mexico

3.1.2.2 Analytical Results

Soil samples collected from the sump outfall were analyzed for VOCs, SVOCs, PAHs, TAL metals, and polychlorinated biphenyls (PCB) by the methods listed in Table 3-1.

Results of analytes that exceed evaluation criteria are presented in Table 3-2 and included on Figure 3-2. The PCB Aroclor-1260 was detected above the evaluation criteria of 220 micrograms per kilogram (µg/kg) in samples located at the bottom lip of the outfall pipe (OFT4-1), horizontally at 5 and 10 feet away from the pipe (OFT4-2 and OFT4-3), and at two feet directly below the outfall pipe (OFT4-5). Detected concentrations of Aroclor-1260 ranged from 315 to 994 µg/kg. The PAH benzo(a)pyrene was detected at a concentration of 72.4 µg/kg, which is above the evaluation criteria of 62 µg/kg, in the shallow sample directly below the outfall pipe. No other analytes were detected above evaluation criteria in the outfall soil samples.

TICs were identified in five sump outfall soil samples at Silo Site 4. Estimated TIC concentrations from the sump outfall samples ranged from 298 to 3440 µg/kg. Standard chemical reference volumes were consulted to determine the possible sources for the TICs. Possible TIC sources, with references footnoted, are also shown in Table 3-3. No evaluation criteria for the TICs are established; therefore, comparison against the TICs estimated concentrations could not be made. In accordance with decision rules established in Table 3-1 of the Quality Assurance Project Plan (Shaw, 2005), no further action regarding the TICs is necessary.

Appendix B2 presents the concentrations of all constituents detected in soil samples collected during the SI, as well as laboratory reporting detection limits, method detection limits (MDL), and laboratory and final data validation qualifiers. Complete soil sample analytical results are available within the laboratory data reports in Appendix F.

3.1.3 Background Soil Sampling

Background soil samples were collected for trace metal analysis to support geochemical evaluations of metals in soil. Specifically, background soil samples were used for geochemical modeling to aid in determining whether a detected trace metal is a contaminant or a naturally occurring constituent. Background soil sample results have been incorporated into the geochemical evaluation of metals in soil samples located in Appendix I.

Background soil samples were collected within the boundary of the silo site away from any of the potential contaminant source areas. The three sample locations (S4-BK1, S4-BK2, and S4-BK3) are shown in Figure 3-1. At each sample location, a composite sample was collected that consisted of five grab samples within an approximate 4-foot-square area. Each grab sample was collected from 0 to 6 inches bgs (Table 3-1). At each location the composite sample was

homogenized in a stainless-steel bowl, the course material removed, and then sample material transferred into a 4-ounce jar.

3.2 Survey Activities

3.2.1 GPS Survey

Two levels of surveying were conducted at Silo Site 4. An overall site survey was conducted prior to commencement of drilling and sampling activities in order to locate and identify site features as they currently exist. Locations of site features, such as small concrete structures or debris, were mapped as point coordinates. Linear data were mapped for features such as the circular water tank pads, the rough outline of the former UST excavation depression, and fence lines. Point coordinates and linear definitions of site features were surveyed with a Tripod Data System, running on Solo Geographical Information System software that recorded horizontal coordinates in the SPCS New Mexico East Zone, referenced to the NAD of 1983. Horizontal and vertical data were corrected in three-dimensional real time, at the time of mapping from base station correction signals. Results of the GPS survey are presented in Figures 2-1 and 3-1.

3.2.2 Civil Survey

Upon completion of sample collection activities, a civil survey was conducted on June 7, 2005, by Landmark Surveying, a licensed New Mexico surveyor, to accurately locate soil borings and soil sample locations. The civil survey was performed with a Rascal® 8-Channel Real Time Kinematic Surveying System and a Zeiss® Automatic Level. Horizontal coordinates were recorded in the SPCS New Mexico, East Zone, referenced to the NAD 83. Vertical elevations were referenced to the U.S. Coast and Geodetic Survey's 1988 National Geodetic Vertical Datum. Surveyed points were tied to a known benchmark at the silo site. Civil survey data for the deep borehole and soil sample locations are incorporated in Figure 3-1 and the survey report is provided in Appendix D.

3.3 Site Restoration Activities

3.3.1 Monitoring Well Abandonment

During the previous site inspection in June 1997, a monitoring well (MW-4) was completed to 200 feet bgs northwest of the silo pad at Silo Site 4. The monitoring well was subsequently vandalized. The locking cap had been broken and debris consisting of rocks and bottles were dropped down the riser pipe causing an obstruction at approximately 3 feet bgs.

The monitoring well was abandoned and the entire well surface completion was removed on March 14, 2005. A backhoe was used to remove the bollards and the steel casing and concrete collar assembly (Photo 5). The cable wench on the drill rig was attached to the polyvinyl chloride riser pipe in an attempt to pull out the obstructed portion of the casing assembly; however, the riser pipe snapped at the first threaded joint located at ground surface. Rocks were

removed from the casing by hand and the obstruction was dislodged. The well was then abandoned by pressure-grouting with a cement-bentonite grout mixture. The cement-bentonite grout mixture consisted of approximately 94 pounds of cement to 7 gallons of water and 3 percent bentonite powder. The cement-bentonite grout mixture was pumped into the well casing using a tremie pipe assembly consisting of 1-inch-diameter poly tubing installed to within 10 feet of the bottom of the well to ensure bridging did not occur. The tremie pipe assembly was slowly retracted as the grout was placed to ensure continuous placement; however, it became lodged within the well casing. The tremie pipe assembly broke during attempts to remove it, and the remaining poly tubing was grouted in place within the casing. The well was checked for grout settlement, and additional grout was added as necessary. Upon completion of the pressure grouting, the immediate area was graded to conform to the surrounding ground surface.

Prior to grouting, a water level meter was used to gauge the water in the well at 182.83 feet bgs and the total well depth at 199.80 bgs.

3.3.2 Reseeding

The current silo owner had cleared most of the native vegetation at Silo Site 4; therefore, very little native vegetation was disturbed at the site in preparation for drilling and sampling. At the request of the silo owner, no reseeding activities were performed following completion of SI field activities.

3.4 Disposition of Investigation-Derived Waste

Investigation-derived waste (IDW), in the form of soil cuttings from deep borehole BH4-1, was temporarily stored in a 20-cubic-yard, steel, roll-off bin rented from a local waste hauler. The composite IDW sample was continually collected as the deep borehole was advanced from ground surface to completion depth (0-250 feet bgs). Upon completion of the borehole, the composite soil sample associated with the roll-off bin (IDW4-1) was collected and shipped for Toxicity Characteristic Leaching Procedure (TCLP) analysis of VOCs, SVOCs, and TAL metals. The results of IDW analyses are presented in Appendix B3. Based upon the laboratory TCLP analytical results, the soil was determined to be nonhazardous waste. The soil cuttings were transported by Southwest Disposal, Inc. to the Roswell municipal landfill for use as landfill cover material.

4.0 Groundwater Pathways

4.1 Hydrogeologic Setting

Silo Site 4 is located within the west-central edge of the Great Plains Physiological Province east of the Roswell Basin Aquifer System (USGS, 2001). Groundwater in the east-central part of New Mexico is typically encountered in solution-altered permeable zones within the underlying Permian rock units such as the Slaughter Zone, which is a porous and permeable zone within the lower member of the San Andres Formation. The Slaughter Zone, which occurs at approximately 1200 feet bgs in the vicinity of Silo Site 4, is the principal hydrocarbon producing unit throughout southeast New Mexico and has the potential to yield saline groundwater in some areas (Havenor, 1968 and Kelly, 1971).

A drilling log for one well, drilled during the construction of the site, was obtained from the New Mexico Office of the State Engineer (NMOSE). The log listed a groundwater zone (salty, sulphur water) at 445 feet, with a pumping rate of 2 gallons per minute, and indicated that there are approximately 160 feet of very low permeability strata between the ground surface and the groundwater zone. Construction of the well was not completed (HGL, 2005)

4.2 Groundwater Targets

Based on information from the NMOSE W.A.T.E.R.S. database, no municipal wells and only one registered domestic well are located within a 4-mile radius of Silo Site 4. The domestic well is located within 2 to 3 miles of the site. The number of people using the domestic well is estimated to be less than three (HGL, 2005).

5.0 Surface Water Pathways

5.1 Surface Hydrology Setting

Silo Site 4 lies in the Pecos River Basin. The site is located approximately 0.8 miles north of an unnamed tributary to the Long Arroyo Draw, which is the only potential source of surface water within a 2-mile radius of the site. Based on information from the NMOSE, the unnamed tributary and the Long Arroyo Draw are both ephemeral, having running water only during major flooding events (HGL, 2005).

5.2 Surface Water Targets

Silo Site 4 is located in an area of minimal flooding, outside of any 100-year floodplain zones. No wetlands are present within a 4-mile radius of the site (HGL, 2005).

6.0 Soil Exposure and Air Pathways

6.1 Physical Setting

6.1.1 Regional and Site-Specific Geology

Silo Site 4 is situated approximately 14 miles to the east of the Pecos River within the west-central edge of the Great Plains Physiological Province. The Quaternary surface deposits east of the Pecos River consist of terrace and pediment gravels, caliche soils, and aeolian sands. The Quaternary deposits unconformably overlie rocks of Permian age associated with the Great Permian Barrier Reef Complex to the south. These deposits are collectively referred to as the Artesia Group, which consist of, in descending chronological order, the Tansil Formation, Yates Formation, Seven Rivers Formation, Queen Formation, and Grayburg Formation. The Artesia Group ranges in thickness from 1,200 to greater than 2,000 feet depending upon location within the Reef Complex. The lithology of the Artesia Group includes carbonate, evaporite, and clastic facies. The Artesia Group members undergo significant facies changes from the southern limits within the Barrier Reef complex toward the north. Alternating layers of gypsum, limestone, sandstone, siltstone, and shale are present within these facies (USGS, 2001).

Stratigraphically deeper, the Artesia Group overlies the San Andres Formation, which is approximately 1,200 to 1,260 feet in thickness east of the Pecos River. The San Andres Formation is principally composed of limestone and dolomite. In the area east of the Pecos River, the San Andres Formation can be divided into an upper, nonpermeable unit and lower permeable and porous unit from which oil production occurs immediately northeast of Roswell, New Mexico. The Glorieta Sandstone, which is 100 to 200 feet in thickness, is present near the base of the San Andres Formation. The Yeso Formation forms the base of the Permian in the area east of the Pecos River and is comprised of sandstone, siltstone, dolomite, and evaporate deposits (Kelley, 1971).

Site-specific geology at Silo Site 4 is based upon the soil and rock encountered during drilling of deep borehole BH4-1. Shallow subsurface geology at the former UST area of Silo Site 4 consists of unconsolidated, dark-brown, silty sand with gravel from ground surface to a depth of approximately 10 feet bgs. Underlying the unconsolidated material is silty sandstone, ranging in color from light yellowish brown to red, with occasional clay lenses and gravel beds to approximately 107 feet bgs. The upper 20 feet of the sandstone was damp to slightly damp, then dry from 30 feet bgs and below. Below 107 to 168.5 feet bgs lie thin alternating layers of dry silty sandy clay and silty sandstone ranging in color from dark reddish brown to yellowish red. Occasional alteration of clay was noted by the greenish grey color observed.

Gypsum/anhydrite occurred as relatively thin alternating beds within the silty sandstone and clay from 168.5 to 185 feet bgs. From 185 feet bgs to total borehole depth at 250 feet bgs, the gypsum/anhydrite occurred as more massive units containing thin alternating beds of dry sandstone and clay. The deep borehole log for BH4-1 is included in Appendix C.

Vegetation at the site primarily consists of salt cedar, yucca, and native grasses.

6.1.2 Meteorology

The regional temperate climate generally has four seasons. During the summer, from June through September, rather frequent showers and thunderstorms deliver more than half of the annual precipitation, which averaged 13.1 inches for the years 1920 to 2004 (HGL, 2005) The relative humidity ranges from 70 percent in the early morning to 30 percent in the mid-afternoon. Temperatures can be quite warm with readings of 100 degrees Fahrenheit (°F) or higher on an average of 10 days per year. In July, temperatures range from 63 to 96°F. Conditions in the fall consist of decreased rainfall, slight winds, and mostly clear skies. Cool nights turn into warm days and the relative humidity is low. In October, temperatures range from 41 to 75°F. Winter is marked by cold nights and temperate days. Zero or lower temperatures occur only one day during an average winter. The average total annual snowfall from 1920 to 2004 is 12.0 inches, with most of the snowfall occurring from November through February (HGL, 2005). In January, temperatures range from 21 to 57°F. The spring is the driest season of the year with respect to relative humidity. Winds increase in the spring, particularly from the plateau areas of the west. On average, there are 60 days per year when wind speed averages 25 miles per hour or more; the majority of these days occur from February to May. In April, temperatures range from 40 to 79°F (NWS, 1998).

6.2 Soil and Air Targets

Roswell is the largest city in the vicinity of Silo Site 4, at a distance of approximately 20 miles to the west. According to the 2000 U.S. Census (Census, 2000), 45,293 people reside in the City of Roswell, comprising approximately 2.5 percent of New Mexico's population. Roswell is the county seat of Chaves County, which has 61,382 residents according to the 2000 U.S. Census. The City of Roswell accounts for 74 percent of the county's population. Land use adjacent to the City of Roswell consists of dairy farming, cattle ranching, and agricultural production (Census, 2000).

The closest residence to Silo Site 4 is approximately 3.2 miles southeast of the site. No schools or daycare centers are located within 200 feet of the site. Terrestrial habitat may exist near the site for the Sand Dune Lizard (sceloporus arenicolus), a New Mexico Wildlife Conservation Act threatened species (HGL, 2005).

7.0 Summary and Recommendations

The objectives of the SI are as follows:

- Determine whether or not previous DOD activities at Former Atlas Missile Silo Site 4 resulted in the presence of chemicals at concentrations that may impact human health and the environment

- Identify potentially hazardous constituents that may have migrated from Former Atlas Missile Silo Site 4 to the surrounding soil and/or groundwater, and determine whether any detectable constituents present at concentrations above evaluation criteria can be attributed to past DOD activities.

- Determine the presence of potentially hazardous constituents at possible source areas within the silo site study boundary, which extends laterally to encompass all of the original DOD site features and vertically to a depth of 250 feet bgs. Potential contaminant source areas at Silo Site 4 include the former UST area and the outfall area for silo sump discharge.

To accomplish these objectives, soil samples were collected and analyzed for potentially hazardous constituents. This section presents a summary of the soil assessment and provides recommendations based upon these findings.

7.1 Summary

The soil assessment investigated potential releases of hazardous constituents to surface and subsurface soil from the former UST area and the sump outfall.

Iron concentrations at 26,900 mg/kg exceeded evaluation criteria of 23,000 mg/kg in one sample collected from deep borehole BH4-1 (35 feet bgs). To demonstrate that iron levels detected during the SI are naturally occurring, a geochemical evaluation was performed on soil samples collected at Silo Site 4. The geochemical evaluation of metals in soil involved correlation of certain metal concentrations such as iron and aluminum. Deep borehole sample BH4-1-1 that had an iron concentration above evaluation criteria also contained correspondingly higher aluminum concentrations, indicating naturally occurring conditions. Appendix I discusses iron and other metals found in the Silo Site 4 soil and the geochemical methods used in the evaluation.

The SVOC benzo(a)pyrene and the PCB Aroclor-1260 were detected in soil samples from the sump outfall area. Benzo(a)pyrene was detected at a concentration of 72.4 μg/kg, exceeding the evaluation criteria of 62 μg/kg, in the soil sample collected immediately below the outlet of the sump outfall pipe. Aroclor-1260 was detected above the evaluation criteria of 220 μg/kg in three

samples along the path of the outfall trench, and in a deeper sample (2-3 feet bgs) at the sump outfall. No other VOCs, SVOCs, or PAH, were detected at concentrations exceeding evaluation criteria in soil samples collected during the SI at Silo Site 4.

7.2 Recommendations

Based upon the results of field activities and a review of the SI analytical data, the following recommendations are proposed for Silo Site 4.

Metals detected in soil samples at concentrations exceeding evaluation criteria were determined to be naturally occurring and not indicative of contamination. However, the PCB Aroclor-1260 and the SVOC benzo(a)pyrene are contaminants of concern in shallow soil samples from the sump outfall. Therefore, excavation and disposal of impacted soil is recommended for the Silo Site 4 sump outfall area.

8.0 References

Census, see U.S. Bureau of Census.

EPA, see U.S. Environmental Protection Agency.

IT, see IT Corporation.

IT Corporation (IT), 2001, *Final Environmental Site Investigation Report, Atlas Missile Silo Nos. 2, 3, 4, 5, 6, 8, 9, 10, 11, and 12, Roswell, New Mexico*, IT Corporation, Albuquerque, New Mexico.

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HydroGeologic, Inc., 2005, "Draft Preliminary Assessment Report, Former Walker Air Force Base, Atlas "F" Missile Silo 4, Chaves County, New Mexico, Property No. K06NM0482," prepared for the U.S. Army Corps of Engineers, Albuquerque District, HydroGeologic, Inc., Phoenix, Arizona.

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USGS, see U.S. Geological Survey.

Photos

Photo 1
Former Atlas Missile Silo Site 4
Drilling set-up for Borehole BH4-1, Drill rig, cyclone, and collection hopper.

Photo 2
Former Atlas Missile Silo Site 4
Typical split-spoon recovery during drilling of Borehole BH4-1. Sandy clay with gypsum/anhydrite.

Photo 3
Former Atlas Missile Silo Site 4
Trenching along the drainage axis of the sump outfall.

Photo 4
Former Atlas Missile Silo Site 4
Completed sump outfall trench with total depth of 2-3 feet below exposed outfall pipe. Sample locations indicated and exposed outfall pipe shown at top of trench.

Photo 5
Former Atlas Missile Silo Site 4
Abandonment of Monitoring Well MW-4, from previous site inspection.

Appendices

Appendix A
Field Documentation
(See Appendices folder on this disc)

Appendix A1
Field Activity Daily Logs
(See Appendices folder on this disc)

Appendix A2
Soil Sample Collection Logs and Calibration Logs
(See Appendices folder on this disc)

Appendix A3
Chain of Custody Forms
(See Appendices folder on this disc)

Appendix B
Analytical Result Tables

Appendix B1
Evaluation Criteria

Table B1
Evaluation Criteria
Site Inspection, Former Atlas Missile Silo Site 4
Roswell, New Mexico

Analyte	Regulatory Standard				Evaluation Criteria	
	Soil		Groundwater			
	NMED SSL[a] Residential (mg/kg)	EPA Region 6[b] Residential (mg/kg)	NMWQCC Groundwater Standards[c] (mg/L)	EPA MCL[d] (mg/L)	Soil (mg/kg)	Water (mg/L)
Applicable to Soil and Groundwater Samples Analyses						
VOC (EPA 8260B)[e]						
1,1,1,2-Tetrachloroethane	39.3	3.0	NE	NE	3.0	NE
1,1,1-Trichloroethane	551	1,300	0.06	0.2	551	0.06
1,1,2,2-Tetrachloroethane	5.2	0.38	0.01	NE	0.38	0.01
1,1,2-Trichloroethane	10.7	0.84	0.01	0.005	0.84	0.005
1,1-Dichloroethane	820	590	0.025	NE	590	0.025
1,1-Dichloroethene	182	280	0.005 (0.7)[f]	0.007	182	0.005
1,1-Dichloropropene	NE	NE	tox	NE	NE	NE
1,2,3-Trichlorobenzene	NE	NE	NE	NE	NE	NE
1,2,3-Trichloropropane	3.2	0.0014	NE	NE	0.0014	NE
1,2,4-Trichlorobenzene	651	650	NE	0.07	650	0.07
1,2,4-Trimethylbenzene	52.2	52	NE	NE	52	NE
1,2-Dibromo-3-chloropropane	3.64	0.45	NE	0.0002	0.45	0.0002

Table B1 (Continued)
Evaluation Criteria
Site Inspection, Former Atlas Missile Silo Site 4
Roswell, New Mexico

Analyte	Regulatory Standard				Evaluation Criteria	
	Soil		Groundwater			
	NMED SSL[a] Residential (mg/kg)	EPA Region 6[b] Residential (mg/kg)	NMWQCC Groundwater Standards[c] (mg/L)	EPA MCL[d] (mg/L)	Soil (mg/kg)	Water (mg/L)
VOC (EPA 8260B)[e] (Continued)						
1,2-Dibromoethane	0.0714	0.0069	0.0001	0.00005	0.0069	0.00005
1,2-Dichlorobenzene	116	150	tox	0.6	116	0.6
1,2-Dichloroethane	5.07	0.35	0.01 (0.5)[f]	0.005	0.35	0.005
1,2-Dichloropropane	10	0.35	NE	0.005	0.35	0.005
1,3,5-Trimethylbenzene	22.3	21	NE	NE	21	NE
1,3-Dichlorobenzene	70.4	44	tox	NE	44	NE
1,3-Dichloropropane	NE	NE	NE	NE	NE	NE
1,4-Dichlorobenzene	36	3.2	tox (7.5)[f]	0.075	3.2	0.075
2,2-Dichloropropane	NE	NE	NE	NE	NE	NE
2-Butanone	573	14,000	NE (200)[f]	NE	573	NE
2-Chloroethyl vinyl ether	NE	NE	NE	NE	NE	NE
2-Chlorotoluene	NE	NE	NE	NE	NE	NE
2-Hexanone	NE	NE	NE	NE	NE	NE
4-Chlorotoluene	NE	NE	NE	NE	NE	NE

Table B1 (Continued)
Evaluation Criteria
Site Inspection, Former Atlas Missile Silo Site 4
Roswell, New Mexico

Analyte	Regulatory Standard				Evaluation Criteria	
	Soil		Groundwater			
	NMED SSL[a] Residential (mg/kg)	EPA Region 6[b] Residential (mg/kg)	NMWQCC Groundwater Standards[c] (mg/L)	EPA MCL[d] (mg/L)	Soil (mg/kg)	Water (mg/L)
VOC (EPA 8260B)[e] (Continued)						
4-Methyl-2-pentanone	NE	790	NE	NE	790	NE
Acetone	70,400	1,600	NE	NE	1,600	NE
Benzene	27	0.66	0.01 (0.5)[f]	0.005	0.66	0.005
Bromobenzene	33.2	73	NE	NE	33.2	NE
Bromochloromethane	NE	NE	NE	NE	NE	NE
Bromodichloromethane	103	1.0	tox	NE	1.0	NE
Bromoform	NE	62	tox	NE	62	NE
Bromomethane	7.62	3.9	tox	NE	3.9	NE
Carbon disulfide	3,760	720	NE	NE	720	NE
Carbon tetrachloride	3.13	0.24	0.01 (0.5)[f]	0.005	0.24	0.005
Chlorobenzene	176	320	tox (100)[f]	0.1	176	0.1
Chloroethane	1,380	3.0	0.001 (0.2)[f]	0.002	3.0	0.001
Chloroform	3.56	0.24	0.1 (6.0)[f]	NE	0.24	0.1
Chloromethane	19.5	1.2	tox	NE	1.2	NE

Table B1 (Continued)
Evaluation Criteria
Site Inspection, Former Atlas Missile Silo Site 4
Roswell, New Mexico

Analyte	Regulatory Standard				Evaluation Criteria	
	Soil		Groundwater			
	NMED SSL[a] Residential (mg/kg)	EPA Region 6[b] Residential (mg/kg)	NMWQCC Groundwater Standards[c] (mg/L)	EPA MCL[d] (mg/L)	Soil (mg/kg)	Water (mg/L)
VOC (EPA 8260B)[e] (Continued)						
cis-1,2-Dichloroethene	782	43	tox	0.07	43	0.07
cis-1,3-Dichloropropene	NE	NE	NE	NE	NE	NE
Dibromochloromethane	76.2	1.0	NE	NE	1.0	NE
Dibromomethane	NE	140	NE	NE	140	NE
Dichlorodifluoromethane	144	94	tox	NE	94	NE
Ethylbenzene	10,600	230	0.75	0.7	230	0.7
Hexachlorobutadiene	12	6.2	tox (0.5)[f]	NE	6.2	NE
Isopropylbenzene	700	370	NE	NE	370	NE
Methylene chloride	165	8.9	0.1	0.005	8.9	0.005
m-Xylene	80[g]	210	0.62	10	80[g]	0.62
Naphthalene	71.9	120	tox	NE	71.9	NE
n-Butylbenzene	62	140	NE	NE	62	NE
n-Propylbenzene	53.2	140	NE	NE	53.2	NE
o-Xylene	98.6[g]	280	0.62	10	98.6[g]	0.62

Table B1 (Continued)
Evaluation Criteria
Site Inspection, Former Atlas Missile Silo Site 4
Roswell, New Mexico

Analyte	Regulatory Standard				Evaluation Criteria	
	Soil		Groundwater			
	NMED SSL[a] Residential (mg/kg)	EPA Region 6[b] Residential (mg/kg)	NMWQCC Groundwater Standards[c] (mg/L)	EPA MCL[d] (mg/L)	Soil (mg/kg)	Water (mg/L)
VOC (EPA 8260B)[e] (Continued)						
p-Isopropyltoluene	NE	NE	NE	NE	NE	NE
p-Xylene	124[g]	370	0.62	10	124[g]	0.62
sec-Butylbenzene	60.5	110	NE	NE	60.5	NE
Styrene	419	1,700	NE	0.1	419	0.1
tert-Butylbenzene	106	130	NE	NE	106	NE
Tetrachloroethene	9.83	1.5	0.02 (0.7)[f]	0.005	1.5	0.005
Toluene	248	520	0.75	1	248	0.75
trans-1,2-Dichloroethene	1,560	63	tox	0.1	63	0.1
trans-1,3-Dichloropropene	NE	NE	NE	NE	NE	NE
Trichloroethene	0.648	0.043	0.1 (0.5)[f]	0.005	0.043	0.005
Trichlorofluoromethane	528	390	tox	NE	390	NE
Vinyl acetate	953	430	NE	NE	430	NE
Vinyl chloride	0.349	0.15	0.001	0.002	0.15	0.001

Table B1 (Continued)
Evaluation Criteria
Site Inspection, Former Atlas Missile Silo Site 4
Roswell, New Mexico

Analyte	Regulatory Standard				Evaluation Criteria	
	Soil		Groundwater			
	NMED SSL[a] Residential (mg/kg)	EPA Region 6[b] Residential (mg/kg)	NMWQCC Groundwater Standards[c] (mg/L)	EPA MCL[d] (mg/L)	Soil (mg/kg)	Water (mg/L)
SVOC and Low-Level PAH (EPA 8270C)[e]						
1,2,4-Trichlorobenzene	651	650	NE	0.07	650	0.07
1,2-Dichlorobenzene	116	150	tox	0.6	116	0.6
1,3-Dichlorobenzene	70.4	44	tox	NE	44	NE
1,4-Dichlorobenzene	36	3.2	tox	0.075	3.2	0.075
2,4,5-Trichlorophenol	6,000	6,100	tox (400)[f]	NE	6,000	NE
2,4,6-Trichlorophenol	6	44	tox (2.0)[f]	NE	6	NE
2,4-Dichlorophenol	180	180	tox	NE	180	NE
2,4-Dimethylphenol	1,200	1,200	NE	NE	1,200	NE
2,4-Dinitrophenol	120	120	tox	NE	120	NE
2,4-Dinitrotoluene	120	120	tox (0.13)[f]	NE	120	NE
2,6-Dinitrotoluene	NE	NE	NE	NE	NE	NE
2-Chloronaphthalene	NE	3,900	NE	NE	3,900	NE
2-Chlorophenol	391	64	NE	NE	64	NE
2-Methyl-4,6-dinitrophenol	NE	NE	NE	NE	NE	NE

Table B1 (Continued)
Evaluation Criteria
Site Inspection, Former Atlas Missile Silo Site 4
Roswell, New Mexico

Analyte	Regulatory Standard				Evaluation Criteria	
	Soil		Groundwater			
	NMED SSL[a] Residential (mg/kg)	EPA Region 6[b] Residential (mg/kg)	NMWQCC Groundwater Standards[c] (mg/L)	EPA MCL[d] (mg/L)	Soil (mg/kg)	Water (mg/L)
SVOC and Low-Level PAH (EPA 8270C)[e] (Continued)						
2-Methylnaphthalene	NE	NE	NE	NE	NE	NE
2-Methylphenol	NE	3,100	NE (200)[f]	NE	3,100	NE
2-Nitroaniline	NE	3.7	NE	NE	3.7	NE
2-Nitrophenol	NE	NE	NE	NE	NE	NE
3,3'-Dichlorobenzidine	10.8	1.1	NE	NE	1.1	NE
3-Methylphenol	NE	3100	NE (200)[f]	NE	3100	NE
3-Nitroaniline	NE	NE	NE	NE	NE	NE
4-Bromophenyl phenyl ether	NE	NE	NE	NE	NE	NE
4-Chloro-3-methylphenol	NE	NE	NE	NE	NE	NE
4-Chlorobenzenamine	NE	240	NE	NE	240	NE
4-Chlorophenyl phenyl ether	NE	NE	NE	NE	NE	NE
4-Methylphenol	NE	310	NE (200)[f]	NE	310	NE
4-Nitroaniline	NE	NE	NE	NE	NE	NE
4-Nitrophenol	NE	490	NE	NE	490	NE

Table B1 (Continued)
Evaluation Criteria
Site Inspection, Former Atlas Missile Silo Site 4
Roswell, New Mexico

Analyte	Regulatory Standard				Evaluation Criteria	
	Soil		Groundwater			
	NMED SSL[a] Residential (mg/kg)	EPA Region 6[b] Residential (mg/kg)	NMWQCC Groundwater Standards[c] (mg/L)	EPA MCL[d] (mg/L)	Soil (mg/kg)	Water (mg/L)
SVOC and Low-Level PAH (EPA 8270C)[e] (Continued)						
Acenaphthene	4,690	3,700	NE	NE	3,700	NE
Acenaphthylene	NE	NE	NE	NE	NE	NE
Anthracene	23,500	22,000	tox	NE	22,000	NE
Benzo(a)anthracene	6.21	0.62	NE	0.0001	0.62	0.0001
Benzo(a)pyrene	0.621	0.062	0.0007	0.0002	0.062	0.0002
Benzo(b)fluoranthene	6.21	0.62	NE	0.0002	0.62	0.0002
Benzo(g,h,i)perylene	NE	NE	NE	NE	NE	NE
Benzo(k)fluoranthene	62.1	6.2	tox	0.0002	6.2	0.0002
Benzoic acid	NE	100,000	NE	NE	100,000	NE
Benzyl alcohol	NE	18,000	NE	NE	18,000	NE
Bis(2-chloroethoxy)methane	NE	NE	NE	NE	NE	NE
Bis(2-chloroethyl)ether	2.04	0.21	tox	NE	0.21	NE
Bis(2-chloroisopropyl)ether	3,130	NE	tox	NE	3,130	NE
Bis(2-ethylhexyl)phthalate	347	35	tox	0.006	35	0.006

Table B1 (Continued)
Evaluation Criteria
Site Inspection, Former Atlas Missile Silo Site 4
Roswell, New Mexico

Analyte	Regulatory Standard				Evaluation Criteria	
	Soil		Groundwater			
	NMED SSL[a] Residential (mg/kg)	EPA Region 6[b] Residential (mg/kg)	NMWQCC Groundwater Standards[c] (mg/L)	EPA MCL[d] (mg/L)	Soil (mg/kg)	Water (mg/L)
SVOC and Low-Level PAH (EPA 8270C)[e] (Continued)						
Butylbenzyl phthalate	NE	240	NE	NE	240	NE
Chrysene	621	62	NE	0.0002	62	0.0002
Dibenzo(a,h)anthracene	0.62	0.062	NE	0.0003	0.062	0.0003
Dibenzofuran	313	290	NE	NE	290	NE
Diethyl phthalate	48,000	49,000	tox	NE	48,000	NE
Dimethyl phthalate	100,000	100,000	tox	NE	100,000	NE
Di-n-butyl phthalate	6,000	6,100	tox	NE	6,000	NE
Di-n-octyl phthalate	NE	1,200	NE	NE	1,200	NE
Fluoranthene	2,250	2,300	tox	NE	2,250	NE
Fluorene	3,130	2,600	tox	NE	2,600	NE
Hexachlorobenzene	3.04	0.3	tox (0.13)[f]	0.001	0.3	0.001
Hexachlorobutadiene	12	6.2	tox (0.5)[f]	NE	6.2	NE
Hexachlorocyclopentadiene	125	370	tox	0.05	125	0.05
Hexachloroethane	60	35	tox (3.0)[f]	NE	35	NE

Table B1 (Continued)
Evaluation Criteria
Site Inspection, Former Atlas Missile Silo Site 4
Roswell, New Mexico

Analyte	Regulatory Standard				Evaluation Criteria	
	Soil		Groundwater			
	NMED SSL[a] Residential (mg/kg)	EPA Region 6[b] Residential (mg/kg)	NMWQCC Groundwater Standards[c] (mg/L)	EPA MCL[d] (mg/L)	Soil (mg/kg)	Water (mg/L)
SVOC and Low-Level PAH (EPA 8270C)[e] (Continued)						
Indeno(1,2,3-cd)pyrene	6.21	0.62	NE	0.0004	0.62	0.0004
Isophorone	5,120	510	tox	NE	510	NE
Naphthalene	71.9	120	tox	NE	71.9	NE
Nitrobenzene	21.8	20	tox (2.0)[f]	NE	20	NE
N-Nitroso-di-n-propylamine	NE	0.07	NE	NE	0.07	NE
N-Nitrosodiphenylamine	993	99	tox	NE	99	NE
Pentachlorophenol	29.8	3	tox (100)[f]	0.001	3	0.001
Phenanthrene	1,800	NE	tox	NE	1,800	NE
Phenol	18,000	18,000	tox	NE	18,000	NE
Pyrene	2,300	2,300	tox	NE	2,300	NE
PCB (EPA 8082)[e]						
Aroclor-1016	2.22	3.9	0.001	NE	2.22	0.001
Aroclor-1221	2.22	0.22	0.001	NE	0.22	0.001
Aroclor-1232	2.22	0.22	0.001	NE	0.22	0.001

Table B1 (Continued)
Evaluation Criteria
Site Inspection, Former Atlas Missile Silo Site 4
Roswell, New Mexico

Analyte	Regulatory Standard				Evaluation Criteria	
	Soil		Groundwater			
	NMED SSL[a] Residential (mg/kg)	EPA Region 6[b] Residential (mg/kg)	NMWQCC Groundwater Standards[c] (mg/L)	EPA MCL[d] (mg/L)	Soil (mg/kg)	Water (mg/L)
PCB (EPA 8082)[e] (Continued)						
Aroclor-1242	2.22	0.22	0.001	NE	0.22	0.001
Aroclor-1248	2.22	0.22	0.001	NE	0.22	0.001
Aroclor-1254	1.11	0.22	0.001	NE	0.22	0.001
Aroclor-1260	2.22	0.22	0.001	NE	0.22	0.001
TAL Metals (EPA 6010B/6020/7470A/7471A)[e]						
Aluminum	77,800	76,000	5.0	0.05–0.2	76,000	0.05–0.2
Antimony	31.3	31	NE	0.006	31	0.006
Arsenic	3.9	22	0.1 (5.0)[f]	0.05	3.9	0.05
Barium	5,450	5,500	1.0 (100)[f]	2.0	5,450	1.0
Beryllium	156	150	NE	0.004	150	0.004
Cadmium	74.1	39	0.01 (1.0)[f]	0.005	39	0.005
Calcium	NE	NE	NE	NE	NE	NE
Chromium III	100,000	210	0.05 (5.0)[f]	0.1	210	0.05
Cobalt	1,520	900	0.05	NE	900	0.05

Table B1 (Continued)
Evaluation Criteria
Site Inspection, Former Atlas Missile Silo Site 4
Roswell, New Mexico

Analyte	Regulatory Standard				Evaluation Criteria	
	Soil		Groundwater			
	NMED SSL[a] Residential (mg/kg)	EPA Region 6[b] Residential (mg/kg)	NMWQCC Groundwater Standards[c] (mg/L)	EPA MCL[d] (mg/L)	Soil (mg/kg)	Water (mg/L)
TAL Metals (EPA 6010B/6020/7470A/7471A)[e] (Continued)						
Copper	3,130	2,900	NE	1.3[h]	2,900	1.3[h]
Iron	23,500	23,000	1.0	0.3	23,000	0.3
Lead	400	400	0.05 (5.0)[f]	0.015[h]	400	0.015[h]
Magnesium	NE	NE	NE	NE	NE	NE
Manganese	1,550	3,200	0.2	0.05	1,550	0.05
Mercury (elemental)	23.5	23	0.002 (0.2)[f]	0.002	23	0.002
Nickel	1,560	1,600	0.2	0.1	1,560	0.1
Potassium	NE	NE	NE	NE	NE	NE
Selenium	391	390	0.05 (1.0)[f]	0.05	390	0.05
Silver	391	390	0.05 (5.0)[f]	0.05	390	0.05
Sodium	NE	NE	NE	NE	NE	NE
Thallium	5.16	NE	NE	0.002	5.16	0.002
Vanadium	548	550	NE	NE	548	NE
Zinc	23,500	23,000	10	5	23,000	5

Table B1 (Continued)
Evaluation Criteria
Site Inspection, Former Atlas Missile Silo Site 4
Roswell, New Mexico

[a]New Mexico Environment Department, 2004, "Technical Background Document for Development of Soil Screening Levels," Revision 2.0, Hazardous Waste Bureau, New Mexico Environment Department, Santa Fe, New Mexico.

[b]U.S. Environmental Protection Agency, 2003, "EPA Region 6 Human Health Medium-Specific Screening Levels," electronic database maintained by Region 6, U.S. Environmental Protection Agency, Dallas, Texas.

[c]New Mexico Water Quality Control Commission, 2002, "New Mexico Water Quality Control Commission Regulation," Section 20.6.2 of the New Mexico Administrative Code, New Mexico Water Quality Control Commission, Santa Fe, New Mexico.

[d]U.S. Environmental Protection Agency, 2001, National Primary Drinking Water Regulations (40 CFR 141), Office of Water, U.S. Environmental Protection Agency, Washington, D.C.

[e]U.S. Environmental Protection Agency, 1986, "Test Methods for Evaluating Solid Waste, Physical/Chemical Methods," SW-846, 3rd ed., U.S. Environmental Protection Agency, Washington, D.C.

[f]Toxicity Characteristic Hazardous Waste Limit (40 CFR 261.24) in parentheses.

[g]Total xylene.

[h]Action Level that, if exceeded, requires water treatment.

CFR = Code of Federal Regulations.
EPA = U.S. Environmental Protection Agency.
MCL = Maximum contaminant level.
mg/kg = Milligram(s) per kilogram.
mg/L = Milligram(s) per liter.
NE = Not established.
NMED = New Mexico Environment Department.
NMWQCC = New Mexico Water Quality Control Commission.
PAH = Polynuclear aromatic hydrocarbons.
PCB = Polychlorinated biphenyl.
SSL = Soil screening level.
SVOC = Semivolatile organic compound.
TAL = Target Analyte List.
tox = A numerical standard has not been established, but the contaminant is listed in a narrative standard of "toxic pollutant" defined in NMWQCC regulations.
VOC = Volatile organic compound.

Appendix B2
Detected Analytes in Soil Samples

Table B2
Detected Analytes in Soil Samples
Site Inspection: Former Atlas Missile Silo Site 4
Roswell, New Mexico

Deep Borehole Samples							
Sample Number	Analyte	Result	Units	Final Qualifier	Evaluation Criteria[a]	Reporting Limit	Method Detection Limit
PAH (EPA 8270C-MOD)[b,c]							
BH4-1-4	2-Methylnaphthalene	6.40	µg/kg		NE	5.66	2.83
	Naphthalene	7.88	µg/kg		71,900	5.66	2.83
TAL Metals (EPA 6010B/6020/7471A)[b]							
BH4-1-1	Aluminum	16,900	mg/kg		76,000	21.2	10.6
	Arsenic	2.09	mg/kg		3.9	0.511	0.255
	Barium	31.4	mg/kg		5450	0.531	0.106
	Beryllium	0.807	mg/kg		150	0.531	0.0127
	Cadmium	0.537	mg/kg		39	0.531	0.0531
	Calcium	52,900	mg/kg		NE	53.1	26.6
	Chromium	21.9	mg/kg		210	1.06	0.127
	Cobalt	9.63	mg/kg		900	1.06	0.127
	Copper	22.1	mg/kg		2900	1.06	0.531
	Iron	26,900	mg/kg		23,000	10.6	5.31
	Lead	9.99	mg/kg		400	0.511	0.255
	Magnesium	9720	mg/kg		NE	26.6	12.7
	Manganese	367	mg/kg		1550	0.531	0.106
	Nickel	23.5	mg/kg		1560	2.12	0.531

Table B2 (Continued)
Detected Analytes in Soil Samples
Site Inspection: Former Atlas Missile Silo Site 4
Roswell, New Mexico

Deep Borehole Samples							
Sample Number	Analyte	Result	Units	Final Qualifier	Evaluation Criteria[a]	Reporting Limit	Method Detection Limit
TAL Metals (EPA 6010B/6020/7471A)[b] (Continued)							
BH4-1-1 (Continued)	Potassium	3970	mg/kg		NE	53.1	26.6
	Sodium	177	mg/kg		NE	26.6	5.31
	Thallium	0.112	mg/kg		5.16	0.102	0.0511
	Vanadium	32.1	mg/kg		548	0.531	0.266
	Zinc	65.1	mg/kg		23,000	1.06	0.531
BH4-1-2	Aluminum	12,100	mg/kg		76,000	20.2	10.1
	Arsenic	0.996	mg/kg		3.9	0.501	0.250
	Barium	57.0	mg/kg		5450	0.506	0.101
	Calcium	7080	mg/kg		NE	10.1	5.06
	Chromium	24.8	mg/kg		210	1.01	0.121
	Cobalt	7.84	mg/kg		900	1.01	0.121
	Copper	6.78	mg/kg		2900	1.01	0.506
	Iron	17,300	mg/kg		23,000	2.02	1.01
	Lead	8.79	mg/kg		400	0.501	0.250
	Magnesium	9330	mg/kg		NE	25.3	12.1
	Manganese	219	mg/kg		1550	0.506	0.101
	Nickel	16.0	mg/kg		1560	2.02	0.506

Table B2 (Continued)
Detected Analytes in Soil Samples
Site Inspection: Former Atlas Missile Silo Site 4
Roswell, New Mexico

Deep Borehole Samples							
Sample Number	Analyte	Result	Units	Final Qualifier	Evaluation Criteria[a]	Reporting Limit	Method Detection Limit
TAL Metals (EPA 6010B/6020/7471A)[b] (Continued)							
BH4-1-2 (Continued)	Potassium	1530	mg/kg		NE	50.6	25.3
	Sodium	99.6	mg/kg		NE	25.3	5.06
	Vanadium	31.4	mg/kg		548	0.506	0.253
	Zinc	37.8	mg/kg		23,000	1.01	0.506
DBD4-1 (Duplicate Soil of BH4-1-2, MS/MSD)	Aluminum	11,900	mg/kg		76,000	20.4	10.2
	Arsenic	0.975	mg/kg		3.9	0.510	0.255
	Barium	47.0	mg/kg	J+	5450	0.510	0.102
	Calcium	7050	mg/kg		NE	10.2	5.10
	Chromium	25.8	mg/kg		210	1.02	0.122
	Cobalt	7.53	mg/kg		900	1.02	0.122
	Copper	6.31	mg/kg		2900	1.02	0.510
	Iron	16,900	mg/kg		23,000	2.04	1.02
	Lead	9.38	mg/kg		400	0.510	0.255
	Magnesium	9290	mg/kg		NE	25.5	12.2
	Manganese	211	mg/kg		1550	0.510	0.102
	Nickel	15.5	mg/kg		1560	2.04	0.510

Table B2 (Continued)
Detected Analytes in Soil Samples
Site Inspection: Former Atlas Missile Silo Site 4
Roswell, New Mexico

Deep Borehole Samples							
Sample Number	Analyte	Result	Units	Final Qualifier	Evaluation Criteria[a]	Reporting Limit	Method Detection Limit
TAL Metals (EPA 6010B/6020/7471A)[b] (Continued)							
DBD4-1 (Duplicate Soil of BH4-1-2, MS/MSD) (Continued)	Potassium	1430	mg/kg	J+	NE	51.0	25.5
	Sodium	96.4	mg/kg		NE	25.5	5.10
	Vanadium	31.1	mg/kg		548	0.510	0.255
	Zinc	35.5	mg/kg		23,000	1.02	0.510
BH4-1-3	Aluminum	11,200	mg/kg		76,000	19.7	9.83
	Barium	75.9	mg/kg		5450	0.492	0.0983
	Calcium	10,200	mg/kg		NE	9.83	4.92
	Chromium	15.6	mg/kg		210	0.983	0.118
	Cobalt	6.53	mg/kg		900	0.983	0.118
	Copper	6.88	mg/kg		2900	0.983	0.492
	Iron	14,100	mg/kg		23,000	1.97	0.983
	Lead	6.79	mg/kg		400	0.516	0.258
	Magnesium	11,000	mg/kg		NE	24.6	11.8
	Manganese	298	mg/kg		1550	0.492	0.0983
	Nickel	14.0	mg/kg		1560	1.97	0.492
	Potassium	1480	mg/kg		NE	49.2	24.6

Table B2 (Continued)
Detected Analytes in Soil Samples
Site Inspection: Former Atlas Missile Silo Site 4
Roswell, New Mexico

Deep Borehole Samples							
Sample Number	Analyte	Result	Units	Final Qualifier	Evaluation Criteria[a]	Reporting Limit	Method Detection Limit
TAL Metals (EPA 6010B/6020/7471A)[b] (Continued)							
BH4-1-3 (Continued)	Sodium	475	mg/kg		NE	24.6	4.92
	Vanadium	20.0	mg/kg		548	0.492	0.246
	Zinc	34.6	mg/kg		23,000	0.983	0.492
BH4-1-4	Aluminum	13,600	mg/kg		76,000	22.5	11.2
	Arsenic	3.10	mg/kg		3.9	0.562	0.281
	Barium	76.8	mg/kg		5450	0.562	0.112
	Calcium	24,000	mg/kg		NE	11.2	5.62
	Chromium	15.7	mg/kg		210	1.12	0.135
	Cobalt	4.65	mg/kg		900	1.12	0.135
	Copper	7.14	mg/kg		2900	1.12	0.562
	Iron	11,100	mg/kg		23,000	2.25	1.12
	Lead	2.40	mg/kg		400	0.562	0.281
	Magnesium	50,400	mg/kg		NE	28.1	13.5
	Manganese	173	mg/kg		1550	0.562	0.112
	Nickel	12.6	mg/kg		1560	2.25	0.562
	Potassium	1670	mg/kg		NE	56.2	28.1

Table B2 (Continued)
Detected Analytes in Soil Samples
Site Inspection: Former Atlas Missile Silo Site 4
Roswell, New Mexico

Deep Borehole Samples							
Sample Number	Analyte	Result	Units	Final Qualifier	Evaluation Criteria[a]	Reporting Limit	Method Detection Limit
TAL Metals (EPA 6010B/6020/7471A)[b] (Continued)							
BH4-1-4 (Continued)	Sodium	2700	mg/kg		NE	28.1	5.62
	Vanadium	15.5	mg/kg		548	0.562	0.281
	Zinc	18.8	mg/kg		23,000	1.12	0.562

Table B2 (Continued)
Detected Analytes in Soil Samples
Site Inspection: Former Atlas Missile Silo Site 4
Roswell, New Mexico

Sump Outfall Samples							
Sample Number	Analyte	Result	Units	Final Qualifier	Evaluation Criteria[a]	Reporting Limit	Method Detection Limit
SVOC (EPA 8270C)[b]							
OFD4-1 (Duplicate Soil of OFT4-5, MS/MSD)	bis(2-ethylhexyl)phthalate	252	µg/kg	J+	35,000	187	93.6
PAH (EPA 8270C-MOD)[b,c]							
OFT4-1	Benzo(a)anthracene	127	µg/kg		620	56.6	28.3
	Benzo(a)pyrene	72.4	µg/kg		62	56.6	28.3
	Benzo(b)fluoranthene	125	µg/kg		620	56.6	28.3
	Chrysene	140	µg/kg		62,000	56.6	28.3
	Fluoranthene	246	µg/kg		2,250,000	56.6	28.3
	Phenanthrene	98.4	µg/kg		1,800,000	56.6	28.3
	Pyrene	256	µg/kg		2,300,000	56.6	28.3
OFT4-2	Fluoranthene	75.7	µg/kg		2,250,000	56.0	28.0
	Pyrene	69.2	µg/kg		2,300,000	56.0	28.0
OFT4-4	Pyrene	6.18	µg/kg		2,300,000	5.41	2.71

Table B2 (Continued)
Detected Analytes in Soil Samples
Site Inspection: Former Atlas Missile Silo Site 4
Roswell, New Mexico

Sump Outfall Samples							
Sample Number	Analyte	Result	Units	Final Qualifier	Evaluation Criteria[a]	Reporting Limit	Method Detection Limit
PAH (EPA 8270C-MOD)[b,c] (Continued)							
OFD4-1 (Duplicate Soil of OFT4-5, MS/MSD)	Fluoranthene	76.9	µg/kg	J-	2,250,000	56.7	28.4
	Pyrene	73.4	µg/kg		2,300,000	56.7	28.4
TAL Metals (EPA 6010B/6020/7471A)[b]							
OFT4-1	Aluminum	9090	mg/kg		76,000	22.7	11.3
	Arsenic	2.30	mg/kg		3.9	0.572	0.286
	Barium	251	mg/kg		5450	0.566	0.113
	Beryllium	0.587	mg/kg		150	0.566	0.0136
	Cadmium	1.85	mg/kg		39	0.566	0.0566
	Calcium	45,800	mg/kg		NE	1130	566
	Chromium	13.7	mg/kg		210	1.13	0.136
	Cobalt	4.39	mg/kg		900	1.13	0.136
	Copper	28.9	mg/kg		2900	1.13	0.566
	Iron	11,900	mg/kg		23,000	2.27	1.13
	Lead	91.4	mg/kg		400	5.72	2.86
	Magnesium	5770	mg/kg		NE	28.3	13.6
	Manganese	301	mg/kg		1550	0.566	0.113

Table B2 (Continued)
Detected Analytes in Soil Samples
Site Inspection: Former Atlas Missile Silo Site 4
Roswell, New Mexico

Sump Outfall Samples							
Sample Number	Analyte	Result	Units	Final Qualifier	Evaluation Criteria[a]	Reporting Limit	Method Detection Limit
TAL Metals (EPA 6010B/6020/7471A)[b] (Continued)							
OFT4-1 (Continued)	Nickel	10.4	mg/kg		1560	2.27	0.566
	Potassium	2660	mg/kg		NE	56.6	28.3
	Sodium	164	mg/kg		NE	28.3	5.66
	Vanadium	20.1	mg/kg		548	0.566	0.283
	Zinc	186	mg/kg		23,000	1.13	0.566
OFT4-2	Aluminum	12,900	mg/kg		76,000	22.8	11.4
	Arsenic	0.270	mg/kg		3.9	0.143	0.0713
	Barium	260	mg/kg		5450	0.570	0.114
	Beryllium	0.796	mg/kg		150	0.570	0.0137
	Cadmium	2.51	mg/kg		39	0.570	0.0570
	Calcium	66,000	mg/kg		NE	1140	570
	Chromium	20.3	mg/kg		210	1.14	0.137
	Cobalt	6.09	mg/kg		900	1.14	0.137
	Copper	49.4	mg/kg		2900	1.14	0.570
	Iron	15,000	mg/kg		23,000	2.28	1.14
	Lead	14.4	mg/kg		400	1.43	0.713
	Magnesium	7900	mg/kg		NE	28.5	13.7

Table B2 (Continued)
Detected Analytes in Soil Samples
Site Inspection: Former Atlas Missile Silo Site 4
Roswell, New Mexico

Sump Outfall Samples							
Sample Number	Analyte	Result	Units	Final Qualifier	Evaluation Criteria[a]	Reporting Limit	Method Detection Limit
TAL Metals (EPA 6010B/6020/7471A)[b] (Continued)							
OFT4-2 (Continued)	Manganese	347	mg/kg		1550	0.570	0.114
	Nickel	14.2	mg/kg		1560	2.28	0.570
	Potassium	3870	mg/kg		NE	57.0	28.5
	Sodium	134	mg/kg		NE	28.5	5.70
	Vanadium	26.3	mg/kg		548	0.570	0.285
	Zinc	307	mg/kg		23,000	1.14	0.570
OFT4-3	Aluminum	9560	mg/kg		76,000	20.6	10.3
	Arsenic	1.67	mg/kg		3.9	0.542	0.271
	Barium	69.3	mg/kg		5450	0.516	0.103
	Beryllium	0.542	mg/kg		150	0.516	0.0124
	Calcium	10,800	mg/kg		NE	10.3	5.16
	Chromium	10.6	mg/kg		210	1.03	0.124
	Cobalt	3.01	mg/kg		900	1.03	0.124
	Copper	9.44	mg/kg		2900	1.03	0.516
	Iron	8960	mg/kg		23,000	2.06	1.03
	Lead	42.9	mg/kg		400	0.542	0.271
	Magnesium	3190	mg/kg		NE	25.8	12.4

Table B2 (Continued)
Detected Analytes in Soil Samples
Site Inspection: Former Atlas Missile Silo Site 4
Roswell, New Mexico

Sump Outfall Samples							
Sample Number	Analyte	Result	Units	Final Qualifier	Evaluation Criteria[a]	Reporting Limit	Method Detection Limit
TAL Metals (EPA 6010B/6020/7471A)[b] (Continued)							
OFT4-3 (Continued)	Manganese	114	mg/kg		1550	0.516	0.103
	Nickel	7.58	mg/kg		1560	2.06	0.516
	Potassium	2230	mg/kg		NE	51.6	25.8
	Sodium	52.5	mg/kg		NE	25.8	5.16
	Vanadium	16.9	mg/kg		548	0.516	0.258
	Zinc	52.6	mg/kg		23,000	1.03	0.516
OFT4-4	Aluminum	10,800	mg/kg		76,000	21.5	10.8
	Arsenic	1.50	mg/kg		3.9	0.560	0.280
	Barium	88.9	mg/kg		5450	0.538	0.108
	Beryllium	0.667	mg/kg		150	0.538	0.0129
	Calcium	19,300	mg/kg		NE	10.8	5.38
	Chromium	11.9	mg/kg		210	1.08	0.129
	Cobalt	4.05	mg/kg		900	1.08	0.129
	Copper	14.0	mg/kg		2900	1.08	0.538
	Iron	10,600	mg/kg		23,000	2.15	1.08
	Lead	9.24	mg/kg		400	0.560	0.280
	Magnesium	3910	mg/kg		NE	26.9	12.9

Table B2 (Continued)
Detected Analytes in Soil Samples
Site Inspection: Former Atlas Missile Silo Site 4
Roswell, New Mexico

Sump Outfall Samples							
Sample Number	Analyte	Result	Units	Final Qualifier	Evaluation Criteria[a]	Reporting Limit	Method Detection Limit
TAL Metals (EPA 6010B/6020/7471A)[b] (Continued)							
OFT4-4 (Continued)	Manganese	182	mg/kg		1550	0.538	0.108
	Nickel	10.6	mg/kg		1560	2.15	0.538
	Potassium	2800	mg/kg		NE	53.8	26.9
	Sodium	55.0	mg/kg		NE	26.9	5.38
	Vanadium	16.5	mg/kg		548	0.538	0.269
	Zinc	44.0	mg/kg		23,000	1.08	0.538
OFT4-5	Aluminum	12,900	mg/kg		76,000	22.5	11.3
	Arsenic	2.82	mg/kg		3.9	0.575	0.287
	Barium	196	mg/kg		5450	0.564	0.113
	Beryllium	0.840	mg/kg		150	0.564	0.0135
	Cadmium	1.49	mg/kg		39	0.564	0.0564
	Calcium	58,100	mg/kg		NE	1130	564
	Chromium	15.7	mg/kg		210	1.13	0.135
	Cobalt	7.23	mg/kg		900	1.13	0.135
	Copper	43.0	mg/kg		2900	1.13	0.564
	Iron	16,500	mg/kg		23,000	2.25	1.13
	Lead	73.6	mg/kg		400	5.75	2.87

Table B2 (Continued)
Detected Analytes in Soil Samples
Site Inspection: Former Atlas Missile Silo Site 4
Roswell, New Mexico

Sump Outfall Samples							
Sample Number	Analyte	Result	Units	Final Qualifier	Evaluation Criteria[a]	Reporting Limit	Method Detection Limit
TAL Metals (EPA 6010B/6020/7471A)[b] (Continued)							
OFT4-5 (Continued)	Magnesium	6650	mg/kg		NE	28.2	13.5
	Manganese	319	mg/kg		1550	0.564	0.113
	Nickel	14.5	mg/kg		1560	2.25	0.564
	Potassium	3430	mg/kg		NE	56.4	28.2
	Sodium	104	mg/kg		NE	28.2	5.64
	Vanadium	30.8	mg/kg		548	0.564	0.282
	Zinc	270	mg/kg		23,000	1.13	0.564
OFD4-1 (Duplicate Soil of OFT4-5, MS/MSD)	Aluminum	14,700	mg/kg		76,000	22.7	11.4
	Arsenic	0.394	mg/kg	J	3.9	0.142	0.0710
	Barium	200	mg/kg		5450	0.568	0.114
	Beryllium	0.905	mg/kg		150	0.568	0.0136
	Cadmium	1.92	mg/kg		39	0.568	0.0568
	Calcium	64,200	mg/kg		NE	1140	568
	Chromium	18.3	mg/kg	J+	210	1.14	0.136
	Cobalt	7.68	mg/kg		900	1.14	0.136
	Copper	45.8	mg/kg		2900	1.14	0.568
	Iron	17,500	mg/kg		23,000	2.27	1.14

Table B2 (Continued)
Detected Analytes in Soil Samples
Site Inspection: Former Atlas Missile Silo Site 4
Roswell, New Mexico

Sump Outfall Samples							
Sample Number	Analyte	Result	Units	Final Qualifier	Evaluation Criteria[a]	Reporting Limit	Method Detection Limit
TAL Metals (EPA 6010B/6020/7471A)[b] (Continued)							
OFD4-1 (Duplicate Soil of OFT4-5, MS/MSD) (Continued)	Lead	8.85	mg/kg	J	400	1.42	0.710
	Magnesium	8030	mg/kg		NE	28.4	13.6
	Manganese	351	mg/kg		1550	0.568	0.114
	Nickel	15.9	mg/kg		1560	2.27	0.568
	Potassium	4230	mg/kg	J+	NE	56.8	28.4
	Sodium	120	mg/kg		NE	28.4	5.68
	Vanadium	31.9	mg/kg		548	0.568	0.284
	Zinc	351	mg/kg		23,000	1.14	0.568
OFT4-6	Aluminum	10,300	mg/kg		76,000	21.9	10.9
	Arsenic	1.74	mg/kg		3.9	0.547	0.273
	Barium	90.5	mg/kg		5450	0.547	0.109
	Beryllium	0.577	mg/kg		150	0.547	0.0131
	Calcium	44,100	mg/kg		NE	1090	547
	Chromium	9.69	mg/kg		210	1.09	0.131
	Cobalt	3.12	mg/kg		900	1.09	0.131
	Copper	7.25	mg/kg		2900	1.09	0.547
	Iron	8450	mg/kg		23,000	2.19	1.09

Table B2 (Continued)
Detected Analytes in Soil Samples
Site Inspection: Former Atlas Missile Silo Site 4
Roswell, New Mexico

Sump Outfall Samples							
Sample Number	Analyte	Result	Units	Final Qualifier	Evaluation Criteria[a]	Reporting Limit	Method Detection Limit
TAL Metals (EPA 6010B/6020/7471A)[b] (Continued)							
OFT4-6 (Continued)	Lead	5.09	mg/kg		400	0.547	0.273
	Magnesium	3020	mg/kg		NE	27.3	13.1
	Manganese	147	mg/kg		1550	0.547	0.109
	Nickel	8.28	mg/kg		1560	2.19	0.547
	Potassium	2390	mg/kg		NE	54.7	27.3
	Sodium	50.3	mg/kg		NE	27.3	5.47
	Vanadium	14.6	mg/kg		548	0.547	0.273
	Zinc	22.7	mg/kg		23,000	1.09	0.547
OFT4-7	Aluminum	10,600	mg/kg		76,000	21.5	10.8
	Arsenic	1.90	mg/kg		3.9	0.577	0.288
	Barium	82.7	mg/kg		5450	0.538	0.108
	Beryllium	0.581	mg/kg		150	0.538	0.0129
	Calcium	21,500	mg/kg		NE	10.8	5.38
	Chromium	10.3	mg/kg		210	1.08	0.129
	Cobalt	3.10	mg/kg		900	1.08	0.129
	Copper	10.2	mg/kg		2900	1.08	0.538
	Iron	8510	mg/kg		23,000	2.15	1.08

Table B2 (Continued)
Detected Analytes in Soil Samples
Site Inspection: Former Atlas Missile Silo Site 4
Roswell, New Mexico

Sump Outfall Samples							
Sample Number	Analyte	Result	Units	Final Qualifier	Evaluation Criteria[a]	Reporting Limit	Method Detection Limit
TAL Metals (EPA 6010B/6020/7471A)[b] (Continued)							
OFT4-7 (Continued)	Lead	4.81	mg/kg		400	0.577	0.288
	Magnesium	2930	mg/kg		NE	26.9	12.9
	Manganese	148	mg/kg		1550	0.538	0.108
	Nickel	8.14	mg/kg		1560	2.15	0.538
	Potassium	2430	mg/kg		NE	53.8	26.9
	Sodium	42.6	mg/kg		NE	26.9	5.38
	Vanadium	16.0	mg/kg		548	0.538	0.269
	Zinc	23.7	mg/kg		23,000	1.08	0.538
OFT4-8	Aluminum	10,400	mg/kg		76,000	21.8	10.9
	Arsenic	2.07	mg/kg		3.9	0.585	0.292
	Barium	90.4	mg/kg		5450	0.545	0.109
	Beryllium	0.569	mg/kg		150	0.545	0.0131
	Calcium	31,900	mg/kg		NE	1090	545
	Chromium	9.92	mg/kg		210	1.09	0.131
	Cobalt	3.14	mg/kg		900	1.09	0.131
	Copper	8.55	mg/kg		2900	1.09	0.545
	Iron	8170	mg/kg		23,000	2.18	1.09

Table B2 (Continued)
Detected Analytes in Soil Samples
Site Inspection: Former Atlas Missile Silo Site 4
Roswell, New Mexico

Sump Outfall Samples							
Sample Number	Analyte	Result	Units	Final Qualifier	Evaluation Criteria[a]	Reporting Limit	Method Detection Limit
TAL Metals (EPA 6010B/6020/7471A)[b] (Continued)							
OFT4-8 (Continued)	Lead	4.55	mg/kg		400	0.585	0.292
	Magnesium	2980	mg/kg		NE	27.3	13.1
	Manganese	155	mg/kg		1550	0.545	0.109
	Nickel	8.01	mg/kg		1560	2.18	0.545
	Potassium	2410	mg/kg		NE	54.5	27.3
	Sodium	44.3	mg/kg		NE	27.3	5.45
	Vanadium	16.3	mg/kg		548	0.545	0.273
	Zinc	22.6	mg/kg		23,000	1.09	0.545
PCB (EPA 8082)[b]							
OFT4-1	Aroclor-1260	994	µg/kg		220	376	188
OFT4-2	Aroclor-1260	912	µg/kg		220	365	183
OFT4-3	Aroclor-1260	485	µg/kg		220	350	175
OFT4-5	Aroclor-1260	315	µg/kg		220	189	94.5
OFD4-1 (Duplicate Soil of OFT4-5, MS/MSD)	Aroclor-1260	462	µg/kg		220	374	187

Table B2 (Continued)
Detected Analytes in Soil Samples
Site Inspection: Former Atlas Missile Silo Site 4
Roswell, New Mexico

[a]Evaluation criteria were selected from either 1) New Mexico Environment Department, 2004, "Technical Background Document for Development of Soil Screening Levels," Revision 2.0, Hazardous Waste Bureau, New Mexico Environment Department, Santa Fe, New Mexico, or 2) U.S. Environmental Protection Agency, 2003, "EPA Region 6 Human Health Medium-Specific Screening Levels," electronic database maintained by Region 6, U.S. Environmental Protection Agency, Dallas, Texas.

[b]U.S. Environmental Protection Agency (EPA), 1986, "Test Methods for Evaluating Solid Waste, Physical/Chemical Methods," SW-846, 3rd ed., U.S. Environmental Protection Agency, Washington, D.C.

[c]Modified for Low Level PAH.

EPA = U.S. Environmental Protection Agency.

J = The result is either an estimated quantity less than the reporting limit but greater than the method detection limit or considered an estimate because of some problem with associated quality control measures. The result is still usable.

J+ = The estimate is likely biased high.

J- = The estimate is likely biased low.

MS = Matrix spike.

MSD = Matrix spike duplicate

µg/kg = Microgram(s) per kilogram.

mg/kg = Milligram(s) per kilogram.

NE = Not established.

PAH = Polynuclear aromatic hydrocarbons.

PCB = Polychlorinated biphenyl.

SVOC = Semivolatile organic compound.

TAL = Target Analyte List.

Appendix B3
Complete Investigation-Derived Waste Analytical Results

Table B3
Complete Investigation-Derived Waste Analytical Results
Site Inspection: Former Atlas Missile Silo Site 4
Roswell, New Mexico

Analytical Method[a]	Analyte	Result	Units	Final Qualifier	Reporting Limit	Method Detection Limit
			IDW-4-1			
1311/6010B/7470A	Arsenic	1.00	mg/L	U	1.00	0.100
	Barium	5.00	mg/L	U	5.00	0.0250
	Cadmium	0.100	mg/L	U	0.100	0.0250
	Chromium	0.200	mg/L	U	0.200	0.0250
	Lead	1.00	mg/L	U	1.00	0.100
	Mercury	0.00500	mg/L	U	0.00500	0.00100
	Selenium	0.800	mg/L	U	0.800	0.500
	Silver	0.100	mg/L	U	0.100	0.0500
1311/8260B	1,1-Dichloroethene	50.0	µg/L	U	50.0	5.00
	1,2-Dichloroethane	50.0	µg/L	U	50.0	2.50
	Benzene	50.0	µg/L	U	50.0	1.25
	Carbon tetrachloride	50.0	µg/L	U	50.0	2.50
	Chlorobenzene	50.0	µg/L	U	50.0	1.25
	Chloroform	50.0	µg/L	U	50.0	1.25
	Methyl Ethyl Ketone	1000	µg/L	U	1000	25.0
	Tetrachloroethene	50.0	µg/L	U	50.0	2.50
	Trichloroethene	50.0	µg/L	U	50.0	2.50
	Vinyl chloride	100	µg/L	U	100	2.50
1311/8270C	1,4-Dichlorobenzene	50.0	µg/L	U	50.0	25.0
	2,4,5-Trichlorophenol	250	µg/L	U	250	25.0
	2,4,6-Trichlorophenol	50.0	µg/L	U	50.0	25.0
	2,4-Dinitrotoluene	50.0	µg/L	U	50.0	25.0
	Hexachlorobenzene	50.0	µg/L	U	50.0	25.0
	Hexachlorobutadiene	50.0	µg/L	U	50.0	25.0
	Hexachloroethane	50.0	µg/L	U	50.0	25.0
	m-,p-Cresol	50.0	µg/L	U	50.0	25.0

Table B3 (Continued)
Complete Investigation-Derived Waste Analytical Results
Site Inspection: Former Atlas Missile Silo Site 4
Roswell, New Mexico

Analytical Method[a]	Analyte	Result	Units	Final Qualifier	Reporting Limit	Method Detection Limit
IDW-4-1 (Continued)						
1311/8270C (Continued)	Nitrobenzene	50.0	µg/L	U	50.0	25.0
	o-Cresol	50.0	µg/L	U	50.0	25.0
	Pentachlorophenol	250	µg/L	U	250	25.0
	Pyridine	500	µg/L	UJ	500	250

[a]*U.S. Environmental Protection Agency (EPA), 1986, "Test Methods for Evaluating Solid Waste, Physical/Chemical Methods," SW-846, 3rd ed., U.S. Environmental Protection Agency, Washington, D.C.*

IDW = Investigation-derived waste.

µg/L = Microgram(s) per liter.

mg/L = Milligram(s) per liter.

U = The parameter was analyzed for but was not detected above the method detection limit.

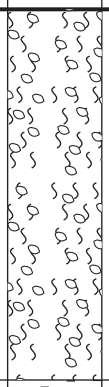
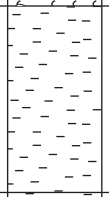
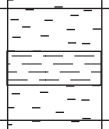
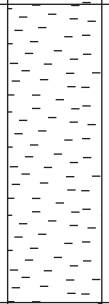
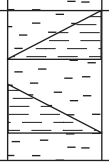
UJ = The parameter was analyzed for but was not detected. The associated value may be inaccurate or imprecise because of some problem with associated quality control.

Appendix B4
Complete Soil Sample Analytical Results
(See Appendices folder on this disc)

Appendix C
Soil Boring Log

VISUAL CLASSIFICATION OF ROCK

PROJECT NUMBER: 842086.02	PROJECT NAME: USACE SACTERC CTO15 SILO 4	
BORING NUMBER: BH4-1	COORDINATES: Northing: 882394.32 Easting: 585748.85	DATE: 4/14/05
ELEVATION: 3852.97 ft amsl	GWL: Depth: NA Date/Time:	DATE STARTED: 4/14/05
ENGINEER/GEOLOGIST: S. Melof	Depth: Date/Time:	DATE COMPLETED: 4/15/05
DRILLING METHODS: 9 5/8" Steel Casing, Stratex		PAGE: 1 of 9

DEPTH (feet) bgs	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER (6")	RECOVERY (%)	DESCRIPTION	LITHOLOGIC SYMBOL	REMARKS
0	NA	NA	NA	Silty Sand with fine gravel (SM), strong brown (7.5YR 4/6), dry, loose, gravel 5%, silt 20%, sand 75%, subangular gravel		likely UST fill material
10	NA	NA	NA	SILTY SANDSTONE Silty Sand, light yellowish brown (2.5Y 6/3), slightly damp, loose, fine, silt 20%, sand 80%		
15	NA	NA	NA	SILTY SANDSTONE Silty Sand with clay, yellowish red (5YR 4/6), consolidated chunks (<1cm), slightly damp, loose (may have been consolidated), fine, clay 5%, silt 20%, sand 75%		consolidated lens of clay
20	NA	NA	0%	SILTY SANDSTONE Silty Sand, light reddish brown (2.5YR 6/3), fine, slightly damp, loose, silt 20%, sand 80%		
25	NA	NA	NA	SILTY SANDSTONE Silty Sand with clay, red (2.5YR 4/6), small consolidated chunks, slightly damp to dry, loose (may have been consolidated), clay 5%, silt 25%, sand 70%		
30						

NOTES:
Drilling Contractor: WDC
Drilling Equipment: Speedstar 50K-CH (GEFCo)
Driller: Mike Daniels
ft amsl = feet above mean sea level

VISUAL CLASSIFICATION OF ROCK

PROJECT NUMBER: 842086.02	PROJECT NAME: USACE SACTERC CTO15 SILO 4	
BORING NUMBER: BH4-1	COORDINATES: Northing: 882394.32 Easting: 585748.85	DATE: 4/14/05
ELEVATION: 3852.97 ft amsl	GWL: Depth: NA Date/Time:	DATE STARTED: 4/14/05
ENGINEER/GEOLOGIST: S. Melof	Depth: Date/Time:	DATE COMPLETED: 4/15/05
DRILLING METHODS: 9 5/8" Steel Casing, Stratex		PAGE: 2 of 9

DEPTH (feet) bgs	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER (6")	RECOVERY (%)	DESCRIPTION	LITHOLOGIC SYMBOL	REMARKS
30	NA	NA	NA	SANDSTONE and GRAVEL Gravel with sand (gravel < 2.5 cm), Sand: light reddish brown (5YR 6/3), Gravel: light grey (10YR 7/1), coarse, dry, loose, subangular; silt 5%, sand 20%, gravel 75%		
35	BH4-1-1	NA	0	SILTY SANDSTONE Silty Sand with clay, light reddish brown (2.5YR 6/4), small consolidated chunks, dry, loose, clay 5%, silt 15%, sand 80%		PID = 0 No recovery, sample collected from cyclone
40						
45						
50						
55						
60						

NOTES:
Drilling Contractor: WDC
Drilling Equipment: Speedstar 50K-CH (GEFCo)
Driller: Mike Daniels
ft amsl = feet above mean sea level

VISUAL CLASSIFICATION OF ROCK

PROJECT NUMBER: 842086.02	PROJECT NAME: USACE SACTERC CTO15 SILO 4	
BORING NUMBER: BH4-1	COORDINATES: Northing: 882394.32 Easting: 585748.85	DATE: 4/14/05
ELEVATION: 3852.97 ft amsl	GWL: Depth: NA Date/Time:	DATE STARTED: 4/14/05
ENGINEER/GEOLOGIST: S. Melof	Depth: Date/Time:	DATE COMPLETED: 4/15/05
DRILLING METHODS: 9 5/8" Steel Casing, Stratex		PAGE: 3 of 9

DEPTH (feet) bgs	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER (6")	RECOVERY (%)	DESCRIPTION	LITHOLOGIC SYMBOL	REMARKS
60	NA	NA	NA	SILTY SANDSTONE Silty Sand with clay, light reddish brown (2.5YR 6/4), small consolidated chunks, dry, loose, clay 5%, silt 15%, sand 80%		
65	BH4-1-2 DBD4-1 DBT4-1	NA	0	SILTY SANDSTONE Silty Sand with clay (small gravel < 1 cm), reddish brown (2.5YR 5/4), dry, loose, gravel < 5%, clay < 5%, silt 20%, sand 75%		No recovery, samples collected from cyclone
70						
75						
80						
85	NA	NA	NA	SILTY SANDSTONE Silty Sand, light reddish brown (2.5YR 6/4), very fine, dry, loose, silt 40%, sand 60%		
90						

NOTES:
Drilling Contractor: WDC
Drilling Equipment: Speedstar 50K-CH (GEFCo)
Driller: Mike Daniels
ft amsl = feet above mean sea level

VISUAL CLASSIFICATION OF ROCK

PROJECT NUMBER: 842086.02	PROJECT NAME: USACE SACTERC CTO15 SILO 4	
BORING NUMBER: BH4-1	COORDINATES: Northing: 882394.32 Easting: 585748.85	DATE: 4/14/05
ELEVATION: 3852.97 ft amsl	GWL: Depth: NA Date/Time:	DATE STARTED: 4/14/05
ENGINEER/GEOLOGIST: S. Melof	Depth: Date/Time:	DATE COMPLETED: 4/15/05
DRILLING METHODS: 9 5/8" Steel Casing, Stratex		PAGE: 4 of 9

DEPTH (feet) bgs	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER (6")	RECOVERY (%)	DESCRIPTION	LITHOLOGIC SYMBOL	REMARKS
90	NA	NA	NA	SILTY SANDSTONE Silty Sand with clay, light reddish brown (2.5YR 6/4), small consolidated chunks, dry, loose, clay 5%, silt 15%, sand 80%		consolidated lenses
95	NA	NA	NA	SILTY SANDSTONE Silty Sand, light reddish brown (2.5YR 6/4), very fine, dry, loose, silt 40%, sand 60%, small (< 1 cm) consolidated chunks of larger grained sand, crumbles easy		
100	NA	NA	NA	SILTY SANDSTONE Silty Sand with gravel (~ 1/2 cm), light reddish brown (2.5YR 6/4), fine, dry, loose, gravel < 5%, silt 25%, sand 70%		
105	NA	NA	NA	SILTY SANDSTONE Silty Sand with clay (small tabular chunks, 1 mm x 1 cm, break easy), reddish brown (5YR 5/4), sand is dry and loose (~slightly damp), clay 10%, silt 20%, sand 70%		clay chunks cool, slightly damp/moist, some have a layer on one side of greenish altered mateial
110	NA	NA	NA	Ⓐ SILTY SANDY MUDSTONE (tabular chunks) Outer: reddish brown (5YR 5/3), Inside: dark reddish brown (5YR 3/3), some chunks have greenish gray alteration. Mostly dry, loose, silt 10%, sand 30%, clay 60%		clay lenses
115	NA	NA	NA	Ⓑ SILTY SANDSTONE Silty Sand (gravel < 1/2 cm), reddish brown (2.5YR 5/4), very fine, dry, loose, cool to touch, gravel < 5%, silt 30%, sand 65%		thin alternating layers of Ⓐ and Ⓑ between 85' and 160' bgs
120						

NOTES:
Drilling Contractor: WDC
Drilling Equipment: Speedstar 50K-CH (GEFCo)
Driller: Mike Daniels
ft amsl = feet above mean sea level

VISUAL CLASSIFICATION OF ROCK

PROJECT NUMBER: 842086.02	PROJECT NAME: USACE SACTERC CTO15 SILO 4	
BORING NUMBER: BH4-1	COORDINATES: Northing: 882394.32 Easting: 585748.85	DATE: 4/15/05
ELEVATION: 3852.97 ft amsl	GWL: Depth: NA Date/Time:	DATE STARTED: 4/14/05
ENGINEER/GEOLOGIST: S. Melof	Depth: Date/Time:	DATE COMPLETED: 4/15/05
DRILLING METHODS: 9 5/8" Steel Casing, Stratex		PAGE: 5 of 9

DEPTH (feet) bgs	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER (6")	RECOVERY (%)	DESCRIPTION	LITHOLOGIC SYMBOL	REMARKS
120				interbedded layers of SILTY SANDY MUDSTONE (A) and SILTY SANDSTONE (B)		
125	BH4-1-3	NA	25	SILTY SANDSTONE Silty Sand with clay (in chunks) reddish brown (5YR 5/4), dry, some loose, some chunks, clay <5%, silt 15%, sand 80%		PID = 0 2" split spoon
130						
135						
140				interbedded layers of SILTY SANDY MUDSTONE(A) AND SILTY SANDSTONE(B)		
145						
150						

NOTES:
Drilling Contractor: WDC
Drilling Equipment: Speedstar 50K-CH (GEFCo)
Driller: Mike Daniels
ft amsl = feet above mean sea level

VISUAL CLASSIFICATION OF ROCK

PROJECT NUMBER: 842086.02	PROJECT NAME: USACE SACTERC CTO15 SILO 4	
BORING NUMBER: BH4-1	COORDINATES: Northing: 882394.32 Easting: 585748.85	DATE: 4/15/05
ELEVATION: 3852.97 ft amsl	GWL: Depth: NA Date/Time:	DATE STARTED: 4/14/05
ENGINEER/GEOLOGIST: S. Melof	Depth: Date/Time:	DATE COMPLETED: 4/15/05
DRILLING METHODS: 9 5/8" Steel Casing, Stratex		PAGE: 6 of 9

DEPTH (feet) bgs	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER (6")	RECOVERY (%)	DESCRIPTION	LITHOLOGIC SYMBOL	REMARKS
150						
155	NA	NA	NA	interbedded layers of SILTY SANDY MUDSTONE(A) and SILTY SANDSTONE(B)		
160						
165	NA	NA	NA	SILTY SANDY MUDSTONE, yellowish red (5YR 4/6), dry, loose, in small chunks, silt 10%, sand 20%, clay 70%		
	NA	NA	NA	small lens of GYPSUM/ANHYDRITE		
170						
175	NA	NA	NA	SITLY SANDSTONE with CLAY and GYPSUM/ANHYDRITE, Silty Sand with clay and gypsum, light reddish brown (5YR 6/4), gypsum crystaline, dry, loose, cool to touch, silt 10%, clay 10%, gypsum 20%, sand 60%		
180						

NOTES:
Drilling Contractor: WDC
Drilling Equipment: Speedstar 50K-CH (GEFCo)
Driller: Mike Daniels
ft amsl = feet above mean sea level

VISUAL CLASSIFICATION OF ROCK

PROJECT NUMBER: 842086.02	PROJECT NAME: USACE SACTERC CTO15 SILO 4	
BORING NUMBER: BH4-1	COORDINATES: Northing: 882394.32 Easting: 585748.85	DATE: 4/15/05
ELEVATION: 3852.97 ft amsl	GWL: Depth: NA Date/Time:	DATE STARTED: 4/14/05
ENGINEER/GEOLOGIST: S. Melof	Depth: Date/Time:	DATE COMPLETED: 4/15/05
DRILLING METHODS: 9 5/8" Steel Casing, Stratex		PAGE: 7 of 9

DEPTH (feet) bgs	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER (6")	RECOVERY (%)	DESCRIPTION	LITHOLOGIC SYMBOL	REMARKS
180	NA	NA	NA	SITLY SANDSTONE with CLAY and GYPSUM/ANHYDRITE, Silty Sand with clay and gypsum, light reddish brown (5YR 6/4), gypsum crystaline, dry, loose, cool to touch, silt 10%, clay 10%, gypsum 20%, sand 60%		
185				GYPSUM interbedded with SANDSTONE and CLAY from 185' to 250' bgs.		
190						
195						
200						
205						
210						

NOTES:
Drilling Contractor: WDC
Drilling Equipment: Speedstar 50K-CH (GEFCo)
Driller: Mike Daniels
ft amsl = feet above mean sea level

VISUAL CLASSIFICATION OF ROCK

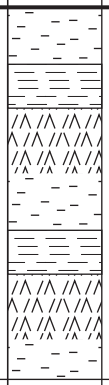
PROJECT NUMBER: 842086.02	PROJECT NAME: USACE SACTERC CTO15 SILO 4	
BORING NUMBER: BH4-1	COORDINATES: Northing: 882394.32 Easting: 585748.85	DATE: 4/15/05
ELEVATION: 3852.97 ft amsl	GWL: Depth: NA Date/Time:	DATE STARTED: 4/14/05
ENGINEER/GEOLOGIST: S. Melof	Depth: Date/Time:	DATE COMPLETED: 4/15/05
DRILLING METHODS: 9 5/8" Steel Casing, Stratex		PAGE: 8 of 9

DEPTH (feet) bgs	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER (6")	RECOVERY (%)	DESCRIPTION	LITHOLOGIC SYMBOL	REMARKS
210	NA	NA	NA	GYPSUM interbedded with SANDSTONE and CLAY		
215						
220						
225						
230						
235						
240						

NOTES:
Drilling Contractor: WDC
Drilling Equipment: Speedstar 50K-CH (GEFCo)
Driller: Mike Daniels
ft amsl = feet above mean sea level

VISUAL CLASSIFICATION OF ROCK

PROJECT NUMBER: 842086.02	PROJECT NAME: USACE SACTERC CTO15 SILO 4	
BORING NUMBER: BH4-1	COORDINATES: Northing: 882394.32 Easting: 585748.85	DATE: 4/15/05
ELEVATION: 3852.97 ft amsl	GWL: Depth: NA Date/Time:	DATE STARTED: 4/14/05
ENGINEER/GEOLOGIST: S. Melof	Depth: Date/Time:	DATE COMPLETED: 4/15/05
DRILLING METHODS: 9 5/8" Steel Casing, Stratex		PAGE: 9 of 9

DEPTH (feet) bgs	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER (6")	RECOVERY (%)	DESCRIPTION	LITHOLOGIC SYMBOL	REMARKS
240	NA	NA	NA	GYPSUM interbedded with SANDSTONE and CLAY		
245						
250	BH4-1-4	NA	25	TD		2" split spoon
255						
260						
265						
270						

NOTES:
Drilling Contractor: WDC
Drilling Equipment: Speedstar 50K-CH (GEFCo)
Driller: Mike Daniels
ft amsl = feet above mean sea level

Appendix D
Survey Data
(See Appendices folder on this disc)

Appendix E
Quality Assurance/Quality Control Report

Laboratory Quality Control

Kemron Environmental Services Laboratory, Marietta, Ohio, performed the measurement quality objectives (MQO) specified for each analytical method. Quality control (QC) measurements are typically made on laboratory-prepared, standard materials and samples to monitor MQO for accuracy and precision. The laboratory QC checks included the following:

- Instrument tuning checks
- Calibration checks
- Reporting limits
- Laboratory control samples
- Surrogate spiked samples
- Matrix spike samples
- Duplicate samples
- Method blank samples

Data Evaluation

Analytical data reporting for the site inspection included electronic data deliverables (EDD) in the Automated Data Review (ADR) file format for data review and evaluation as specified in Section 7.2.2 of the Sampling and Analysis Plan – Quality Assurance Program Plan (QAPP) (Shaw, 2005). Kemron Laboratory also provided complete analytical data reports with supporting instrument and bench sheets in hardcopy and in electronic computer-readable portable document format (PDF) files.

Data validation was performed on each Kemron Laboratory provided EDD using the ADR software. Once the EDD was uploaded and electronically checked for errors, the software automatically compared instrument calibration and QC measurements for each analytical method, matrix, and analyte against acceptance criteria in the project-specific library.

A data validation report, compiled from ADR output, is included on a compact disc (CD) in Appendix G. The validation reports include sample listings, analytical results tables, outlier reports, data qualifiers and definitions, any manually-changed qualifiers, and bias indicators. Also included on the CD in Appendix G are the validated EDD text files exported using the ADR software, and the project-specific analytical methods library constructed for the Atlas Missile Silos 3, 4, and 6 site inspections.

Following data validation with the ADR software system, the validated EDD files were uploaded to the Environmental Data Management System (EDMS), a database application running on Microsoft® Access. The EDMS was used to query data for preparation of this report, to

automatically compare analytical results against evaluation criteria, and generate QC summary tables.

Data Usability

All analytical results data generated from sample analyses during the site inspection are usable for the purposes intended with minor exceptions. Analysis results for antimony in three soil samples, selenium in two soil samples, and thallium also in two soil samples were reported as not detected above the MDL and qualified unusable because of low percent recoveries in matrix spike or matrix spike duplicate samples. Only the parent samples analysis results were qualified based upon matrix spike results. Low percent recoveries for antimony are common to most laboratories when using the specified sample digestion method for metals analyzed using Inductively-Coupled Plasma Mass Spectroscopy.

QC measurements outside of acceptance criteria resulted in the qualification of some data, which generally were flagged as estimated values ("J" qualifier) with positive or negative bias, indicators. Qualified data are considered to be usable in the site inspection.

Completeness, calculated in accordance with Section 8.4 of the Sampling and Analysis Plan - QAPP (Shaw, 2005), was 97.7 percent analytical completeness and 99.7 percent technical completeness. Analytical completeness is the percentage of unqualified results, while technical completeness is the percentage of usable analysis results.

Field Quality Control Sample

Field duplicate samples were collected for each analytical test at a frequency of 10 percent, or less. There were 15 primary field soil samples and three field duplicate samples collected. The duplicate soil samples were co-located with the original soil sample and split from soil homogenized in a stainless steel bowl for all but VOC analyses. When possible, parent and duplicate samples for VOC analyses were co-located and collected from the split spoon using EnCore™ samplers. Field duplicate soil samples were packaged and shipped according to procedures identical to those used for the parent soil sample.

One aqueous equipment rinse blank sample was collected during soil sampling activities. Equipment rinse blank samples were collected from the decontaminated split-spoon sampler and stainless-steel sampling bowl.

Field Duplicate Sample Results

Analysis results for field duplicate samples are included in the summary tables of detected analytes in soil and groundwater, as appropriate, and in the complete analytical results tables found in Appendix B. Relative percent differences (RPD) for parameters detected above the laboratory reporting limits in both the original and field duplicate soil samples are presented in

Table E1. Field duplicate results were generally comparable with the original parent sample results. Out of three field duplicate soil samples there were 52 parameters, mostly metals, for which RPD was calculated. The average RPD for analytical parameter pairs in soil samples was 15 RPD with one standard deviation of 30 RPD. RPD values ranged from 0 to 157 percent. Field duplicate results exceeding the established MQO for precision were noted during data validation.

Equipment Rinse Blank Sample Results

Analytes detected in equipment rinsate blank samples are presented in Table E2. The analytical results of the equipment rinsate blank samples showed only low levels of iron and sodium concentrations greater than laboratory reporting limits. All other analytes were either not detected or detected as estimated concentrations less than the laboratory reporting limits but greater than the method detection limits. Equipment blank sample results indicate that sampling equipment decontamination was effective and the probability for sample cross-contamination from inadequately cleaned sampling equipment was low.

Variance and Deficiency Management

Two Field Work Variances (FWV) were prepared during the performance of the site inspection at former Atlas Missile Silo Site 4 to document clarifications to the specifications identified in the work plan. A summary of these FWVs is contained in Table E3. The first clarification described the method of collecting subsurface soil samples based upon the soil recovery within the borehole. The second FWV clarified that no BARCAD^{TM} monitoring wells would be installed at Silo Site 4 if groundwater was not encountered during drilling operations to the study boundary of 250 feet below ground surface, and that no additional deep borings would be drilled. Details of each FWV are provided at the end of this appendix.

No deficiencies were identified during the performance of the site inspection at former Atlas Missile Silo Site 4.

Tables

Table E1
Relative Percent Differences for Field Duplicate Soil Sample Results
Site Inspection: Former Atlas Missile Silo Site 4
Roswell, New Mexico

Primary Sample Number	Field Duplicate Sample Number	Analyte	Original Result and Final Qualifier		Field Duplicate Result and Final Qualifier		Units	Relative Percent Difference
Deep Borehole Samples								
BH4-1-2	DBD4-1	Aluminum	12100		11900		mg/kg	1.67
BH4-1-2	DBD4-1	Arsenic	0.996		0.975		mg/kg	2.13
BH4-1-2	DBD4-1	Barium	57.0		47.0	J+	mg/kg	19.23
BH4-1-2	DBD4-1	Calcium	7080		7050		mg/kg	0.42
BH4-1-2	DBD4-1	Chromium	24.8		25.8		mg/kg	3.95
BH4-1-2	DBD4-1	Cobalt	7.84		7.53		mg/kg	4.03
BH4-1-2	DBD4-1	Copper	6.78		6.31		mg/kg	7.18
BH4-1-2	DBD4-1	Iron	17300		16900		mg/kg	2.34
BH4-1-2	DBD4-1	Lead	8.79		9.38		mg/kg	6.49
BH4-1-2	DBD4-1	Magnesium	9330		9290		mg/kg	0.43
BH4-1-2	DBD4-1	Manganese	219		211		mg/kg	3.72
BH4-1-2	DBD4-1	Nickel	16.0		15.5		mg/kg	3.17
BH4-1-2	DBD4-1	Potassium	1530		1430	J+	mg/kg	6.76
BH4-1-2	DBD4-1	Sodium	99.6		96.4		mg/kg	3.27
BH4-1-2	DBD4-1	Vanadium	31.4		31.1		mg/kg	0.96
BH4-1-2	DBD4-1	Zinc	37.8		35.5		mg/kg	6.28
Sump Outfall Samples								
OFT4-5	OFD4-1	Aluminum	12900		14700		mg/kg	13.04
OFT4-5	OFD4-1	Barium	196		200		mg/kg	2.02
OFT4-5	OFD4-1	Beryllium	0.840		0.905		mg/kg	7.45
OFT4-5	OFD4-1	Cadmium	1.49		1.92		mg/kg	25.22
OFT4-5	OFD4-1	Calcium	58100		64200		mg/kg	9.98
OFT4-5	OFD4-1	Chromium	15.7		18.3	J+	mg/kg	15.29
OFT4-5	OFD4-1	Cobalt	7.23		7.68		mg/kg	6.04

Table E1 (Continued)
Relative Percent Differences for Field Duplicate Soil Sample Results
Site Inspection: Former Atlas Missile Silo Site 4
Roswell, New Mexico

Primary Sample Number	Field Duplicate Sample Number	Analyte	Original Result and Final Qualifier		Field Duplicate Result and Final Qualifier		Units	Relative Percent Difference
Sump Outfall Samples (Continued)								
OFT4-5	OFD4-1	Arsenic	2.82		0.394	J	mg/kg	150.96
OFT4-5	OFD4-1	Copper	43.0		45.8		mg/kg	6.31
OFT4-5	OFD4-1	Iron	16500		17500		mg/kg	5.88
OFT4-5	OFD4-1	Lead	73.6		8.85	J	mg/kg	157.06
OFT4-5	OFD4-1	Magnesium	6650		8030		mg/kg	18.80
OFT4-5	OFD4-1	Manganese	319		351		mg/kg	9.55
OFT4-5	OFD4-1	Nickel	14.5		15.9		mg/kg	9.21
OFT4-5	OFD4-1	Potassium	3430		4230	J+	mg/kg	20.89
OFT4-5	OFD4-1	Sodium	104		120		mg/kg	14.29
OFT4-5	OFD4-1	Vanadium	30.8		31.9		mg/kg	3.51
OFT4-5	OFD4-1	Zinc	270		351		mg/kg	26.09
OFT4-5	OFD4-1	Aroclor-1260	315		462		µg/kg	37.84
Background Samples								
S4-SS-BK-1	BKD4-1	Aluminum	10300		9860		mg/kg	4.37
S4-SS-BK-1	BKD4-1	Arsenic	0.932		1.23	J	mg/kg	27.57
S4-SS-BK-1	BKD4-1	Barium	85.6		89.0	J+	mg/kg	3.89
S4-SS-BK-1	BKD4-1	Beryllium	0.583		0.556	J+	mg/kg	4.74
S4-SS-BK-1	BKD4-1	Calcium	17900		26000		mg/kg	36.90
S4-SS-BK-1	BKD4-1	Chromium	10.4		9.87	J+	mg/kg	5.23
S4-SS-BK-1	BKD4-1	Cobalt	3.25		3.13		mg/kg	3.76
S4-SS-BK-1	BKD4-1	Copper	7.04		6.60	J+	mg/kg	6.45
S4-SS-BK-1	BKD4-1	Iron	8950		8980		mg/kg	0.33
S4-SS-BK-1	BKD4-1	Lead	5.17		7.73	J	mg/kg	39.69
S4-SS-BK-1	BKD4-1	Magnesium	3240		3180		mg/kg	1.87
S4-SS-BK-1	BKD4-1	Manganese	184		180		mg/kg	2.20
S4-SS-BK-1	BKD4-1	Nickel	8.14		7.61		mg/kg	6.73

Table E1 (Continued)
Relative Percent Differences for Field Duplicate Soil Sample Results
Site Inspection: Former Atlas Missile Silo Site 4
Roswell, New Mexico

Primary Sample Number	Field Duplicate Sample Number	Analyte	Original Result and Final Qualifier		Field Duplicate Result and Final Qualifier		Units	Relative Percent Difference
Background Samples (Continued)								
S4-SS-BK-1	BKD4-1	Potassium	2740		2600	J+	mg/kg	5.24
S4-SS-BK-1	BKD4-1	Sodium	30.9		30.8		mg/kg	0.32
S4-SS-BK-1	BKD4-1	Vanadium	13.4		13.4	J+	mg/kg	0.00
S4-SS-BK-1	BKD4-1	Zinc	28.1		26.5	J+	mg/kg	5.86

J = *The result is either an estimated quantity less than the reporting limit but greater than the method detection limit or considered an estimate because of some problem with associated quality control measures. The result is still usable.*

J+ = *The estimate is likely biased high.*

µg/kg = *Microgram(s) per kilogram.*

mg/kg = *Milligram(s) per kilogram.*

Table E2
Detected Analytes in Equipment Rinsate Samples
Site Inspection: Former Atlas Missile Silo Site 4
Roswell, New Mexico

Sample Number	Analytical Method[a]	Analyte	Result	Units	Final Qualifier	Reporting Limit	Method Detection Limit
After Deep Borehole Sample Collection							
EBD4-1	6010B	Iron	0.0505	mg/L		0.0400	0.0200
		Sodium	10.5	mg/L		0.500	0.250

[a]U.S. Environmental Protection Agency (EPA), 1986, "Test Methods for Evaluating Solid Waste, Physical/Chemical Methods," SW-846, 3rd ed., U.S. Environmental Protection Agency, Washington, D.C.

mg/L = Milligram(s) per liter.

Table E3
Field Work Variances
Site Inspection: Former Atlas Missile Silo Site 4
Roswell, New Mexico

Field Work Variance Number	Date Initiated	Field Work Variance Description	Affected Documents	Review Code
15-002-017	3/31/05	Clarification for grab soil sample collection from drill rig cyclone when there is no recovery from split-spoon sampler	Field Sampling Plan Section 5.3	Clarification
15-002-018	4/16/05	Clarification to not install BARCAD™ monitoring wells at Silo Site 4 if groundwater is not encountered during drilling	Work Plan, Section 1.2 Field Sampling Plan Sections 3.1 and 5.3	Clarification

Field Work Variances

Shaw® Shaw Environmental, Inc.

Field Work Variance No. **15-002-017**

Page **1** of **2**

FIELD WORK VARIANCE

Project Name/Number	**842086.02**	CTO/WAD	**CTO15 WAD2**
Applicable Document	**Work Plan (including Sampling and Analysis Plan, Site Safety and Health Plan, and Contractor Quality Control Plan) (ACE15-066-S, Rev. 1)**	Date	**3/31/05**

Problem Description: **See attached continuation sheet**

Recommended solution: **See attached continuation sheet**

Impact on present and completed work:

Minimal impact to time / costs of present or completed work.

Requested by: **Mark Phaneuf**

Recommended solution disposition: **Recommended solution was enacted on 3/31/05.**

Clarification ☒ Minor Change ☐ Major Change ☐

Signature _____ Date 4/15/05
Technical Reviewer

Shaw Environmental, Inc. Approvals: *If Major Change:*

Signature _____ Date 4/19/05 Signature _____ Date 4/19/05
Project Task Manager *Sr. Project Manager*

Signature _____ Date 4/15/05
Project QC System Manager

USACE Approval: *If Major Change:*

Approved ☒ Rejected ☐ Signature _____ Date 19 Apr 05
USACE PM or COR

Final Description Samples collected from cyclone when split-spoon refusal

Signature _____ Date 5/29/05

Shaw® Shaw Environmental, Inc.

Field Work Variance No. **15-002-017**

Page **2** of **2**

FIELD WORK VARIANCE CONTINUATION SHEET

Continue FWV discussions below by noting section title(s) to be continued (i.e., Problem Description, Solution/disposition, Final Disposition, etc). Use additional continuation sheets as needed.

PROBLEM DESCRIPTION:

Section 5.3 of the Field Sampling Plan (ACE15-066-S) calls for soil samples to be collected by split spoon from deep soil borings at approximately 35 feet bgs, 75 feet bgs, 125 feet bgs, and total depth. The Plan also states "If a sample cannot be obtained using the split spoon, then the sample may be collected from a less consolidated geologic unit below the limestone bed. If limestone bedrock or other consolidated unit is encountered to the study boundary then no soil sample will be collected." Consolidated geologic units were encountered at the final depth of BH6-1 at Silo 6 (study boundary). Although a sample could not be obtained using a split spoon sampler, it was determined that a sample should be collected from this depth if possible.

RECOMMENDED SOLUTION:

A grab sample will be collected from the drill cuttings at prescribed depth when a split spoon sample cannot be collected due to consolidated geologic material or lack of recovery in the split spoon. Soil samples will be submitted to the laboratory from this grab sample for the same parameters as any other deep soil boring soil sample (e.g. VOC, SVOC, PAH, TAL metals). The sampling collection method will be documented on the sample collection log.

Shaw® Shaw Environmental, Inc.

Field Work Variance No. **15-002-018**

Page **1** of **2**

FIELD WORK VARIANCE

Project Name/Number	**842086.02**	CTO/WAD	**CTO15 WAD2**
Applicable Document	**Work Plan (including Sampling and Analysis Plan, Site Safety and Health Plan, and Contractor Quality Control Plan) (ACE15-066-S, Rev. 1)**	Date	**4/16/05**

Problem Description: **See attached continuation sheet**

Recommended solution: **See attached continuation sheet**

Impact on present and completed work:
Reduction in work required (cost and time).

Requested by: **Dale Flores**

Recommended solution disposition: **Recommended solution was enacted on 4/16/05.**

Clarification ☒ Minor Change ☐ Major Change ☐

Signature _____ Date 4/19/05
Technical Reviewer

Shaw Environmental Inc, Approvals: *If Major Change:*

Signature _____ Date 4/19/05 Signature _____ Date 4/19/05
Project Task Manager *Sr. Project Manager*

Signature _____ Date 4/19/05
Project QC System Manager

USACE Approval: *If Major Change:*

Approved ☒ Rejected ☐ Signature _____ Date 19 Apr 05
USACE PM or COR

Final Description No additional borings were drilled at Silo 4 – no borcad was installed.

Signature _____ Date 7/29/05

Shaw® Shaw Environmental, Inc.

Field Work Variance No. **15-002-018**

Page **2** of **2**

FIELD WORK VARIANCE CONTINUATION SHEET

Continue FWV discussions below by noting section title(s) to be continued (i.e., Problem Description, Solution/disposition, Final Disposition, etc). Use additional continuation sheets as needed.

PROBLEM DESCRIPTION:

Section 5.3 of the Field Sampling Plan (ACE15-066-S) discusses three deep soil borings and the construction of three BARCAD™ monitoring wells at Silo Site 4: "Plans are to complete three deep soil borings at Silo Site 4 as monitoring wells with the BARCAD™ sampling system." Groundwater, though originally expected to be encountered between 180 and 200 feet bgs, was not encountered in the first deep soil boring at Silo Site 4 to the study boundary (250 feet bgs).

RECOMMENDED SOLUTION:

Section 1.2 of the Work Plan ("Project Objectives") and Section 3.1 of the Field Sampling Plan ("Task Descriptions") states: "If groundwater is encountered, complete the soil boring as a BARCAD™ monitoring well placed within the regional groundwater table, advance two additional soil borings, complete as BARCAD™ monitoring wells, and collect groundwater samples from the installed BARCAD™ monitoring wells for analysis of specific hazardous constituents." Since groundwater was not encountered in the deep soil boring at Silo Site 4 to the study boundary depth of 250 feet bgs, a BARCAD™ monitoring well will not be constructed in the borehole and no additional deep soil borings will be drilled.

Appendix F
Laboratory Data Reports
(See Appendices folder on this disc)

Appendix F1
Soil Sample Data Reports
(See Appendices folder on this disc)

Appendix F2
Investigation-Derived Waste Data Reports
(See Appendices folder on this disc)

Appendix G
Automated Data Review
(See Appendices folder on this disc)

Appendix H
Environmental Data Management System
(See Appendices folder on this disc)

Appendix I
Geochemical Evaluation of Metals Concentrations in Silo Site 4 Soil Samples

Geochemical Evaluation of Metals Concentrations in Silo Site 4 Soil Samples

This appendix provides a geochemical evaluation of the concentrations of 23 elements in a set of 18 soil samples that were taken in the vicinity of Silo Site 4. Three different types of soil samples were collected at the site as follows:

- **Deep Borehole Samples.** Five samples were obtained from a borehole that was advanced to a depth of 250 feet below ground surface (bgs). Samples were obtained from the borehole at depths of 35, 65, 125, and 250 feet bgs, and one duplicate was obtained at 65 feet bgs.
- **Sump Outfall Trench Samples.** Nine soil samples (including one duplicate) were collected from eight locations within the silo sump outfall trench.
- **Local Surface Soil Background Samples.** Four surface soil samples (including one duplicate) were obtained from three undisturbed locations at 0 to 0.5 feet bgs in the vicinity of the silo. These samples are considered to be representative of natural local surface soil background composition.

The first step in the evaluation was to compare the maximum concentrations of the 23 analyzed elements in 18 samples to applicable evaluation criteria. The only exceedance noted was the iron concentration of 26,900 mg/kg in the borehole sample BH4-1-1 obtained at 35 feet bgs. This iron concentration slightly exceeds the NMED residential soil screening level of 23,500 mg/kg, but is below the industrial/occupational and construction worker screening levels.

Evaluation criteria do not consider natural background variations in element concentrations; therefore, exceeding a standard does not necessarily imply that contamination is present. To determine whether these exceedances are natural or are due to contamination, a geochemical evaluation was performed. The methodology employed in the geochemical evaluation is provided in the next section, followed by evaluation results and conclusions.

Methodology

In the absence of a suitable background data set (especially for iron), a geochemical approach was used to determine whether the regulatory exceedance for iron represents a naturally high background concentration or indicates potential contamination.

Trace elements naturally associate with specific soil-forming minerals, and geochemical evaluations are predicated on these known associations (Barclift, *et al*., 2000; U.S. Navy, 2002; Myers and Thorbjornsen, 2004). For example, in most uncontaminated oxic soil, vanadium exhibits an almost exclusive association with iron oxide minerals. (Schiff and Weisberg, 1997). Vanadium exists in oxic soil pore fluid as oxyanions, such as HVO_4^{-2} and $H_2VO_4^{-}$ (Brookins,

1988), and these negatively charged species have a strong affinity to adsorb on iron oxides, which tend to maintain a net positive surface charge (Electric Power Research Institute [EPRI], 1984). (In this report the term "iron oxide" encompasses oxides, hydroxides, oxyhydroxides, and hydrous oxides of iron.) This association is expressed as a positive correlation between vanadium concentrations and iron concentrations for uncontaminated samples: soil samples with a low percentage of iron oxides will contain proportionally lower vanadium concentrations, and soil samples that are enriched in iron oxides will contain proportionally higher vanadium concentrations. Although there is variability in the absolute concentrations of vanadium and iron in soil at a site, the V/Fe ratios in the samples will be relatively constant if no contamination is present (Daskalakis and O'Connor, 1995). Samples that contain excess vanadium from a contaminant source will exhibit anomalously high V/Fe ratios compared to the uncontaminated samples.

Iron is also correlated in most soils with aluminum and manganese as a result of physical rather than chemical processes. Iron oxides, manganese oxides, and aluminum-bearing clay minerals tend to have finer grain sizes, whereas other common soil forming minerals, such as quartz and calcite, tend to be coarser, and do not contain appreciable amounts of iron, aluminum, or manganese. Samples containing finer grained material will thus be enriched in these three metals, and coarse-grained samples will be depleted in them. However, in the absence of iron contamination, all of the samples should have relatively constant Fe/Al and Fe/Mn ratios.

To perform the geochemical evaluation, correlation plots are constructed to explore the elemental associations and identify potentially contaminated samples. The detected concentrations of the trace element of interest (dependent variable) are plotted against the detected concentrations of the reference element (independent variable), which represents the mineral to which the element of interest may be chemically adsorbed or physically associated. In the case of iron, the iron concentrations for a given set of samples would be plotted on the y-axis and the corresponding reference element (aluminum, manganese, or vanadium) concentrations would be plotted on the x-axis. If no contamination is present, then the samples will exhibit a generally linear trend and the samples with the highest iron concentrations will lie on this trend. This indicates that the elevated iron is due to the preferential enrichment of iron oxides in those samples, and that the iron has a natural source. If, however, the samples with high iron concentrations have low or moderate reference element concentrations, then they will lie above the linear trend established by the other samples. This would indicate that the anomalous samples contain excess iron beyond that which can be explained by the natural iron oxide content, and such samples may contain a component of contamination.

Samples with an element present as a contaminant will exhibit anomalously high element ratios compared to uncontaminated samples. These elevated ratios may not always be apparent in log-log correlation plots, especially at the upper range of concentrations. Therefore, ratio plots,

which depict concentrations of the element of interest on the y-axis and interest element/reference element ratios on the x-axis, are employed in conjunction with correlation plots in those cases where it is not immediately apparent which site samples have anomalously high elemental ratios on the correlation plots. The ratio plots permit easy identification of samples with anomalously high elemental ratios relative to uncontaminated samples, and they have high resolution over the entire concentration range.

Results

Results are provided in this section for iron, which was the only metallic element that exceeded the evaluation criteria for soil.

Iron. Iron is the second most abundant of the 23 elements analyzed (after aluminum), with a mean concentration of 12,367 mg/kg (1.2 weight percent). Iron oxides are common soil-forming minerals, and they occur as discrete mineral grains or as coatings on silicate minerals (Cornell and Schwertmann, 2003).

The correlation between iron and manganese is shown in Figure I-1. The linearity of the trend indicates that all of the samples have similar Fe/Mn ratios. An alternative view of the same data is provided in Figure I-2, which shows iron concentrations versus Fe/Mn ratios. This figure confirms the observation that the Fe/Mn ratios are fairly constant, and that the sample with the maximum iron concentration has a Fe/Mn ratio that is within the range of the other samples.

The correlation between iron and aluminum is shown in Figure I-3, and the correlation between iron and vanadium is shown in Figure I-4. The linearity of these trends, and the position of the maximum iron concentration on these trends, provides independent confirmation that the maximum iron concentration is part of the naturally background distribution. No iron contamination is present in these samples.

References

Barclift, D., J. Heath, and A. Drucker, 2000, "Focus on Environmental Background Data Analysis," *Soil Sediment & Groundwater*, August/September, pp. 10-17.

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Electric Power Research Institute (EPRI), 1984, *Chemical Attenuation Rates, Coefficients, and Constants in Leachate Migration Volume 1: A Critical Review*, EPRI EA-3356, Electric Power Research Institute, Palo Alto, California.

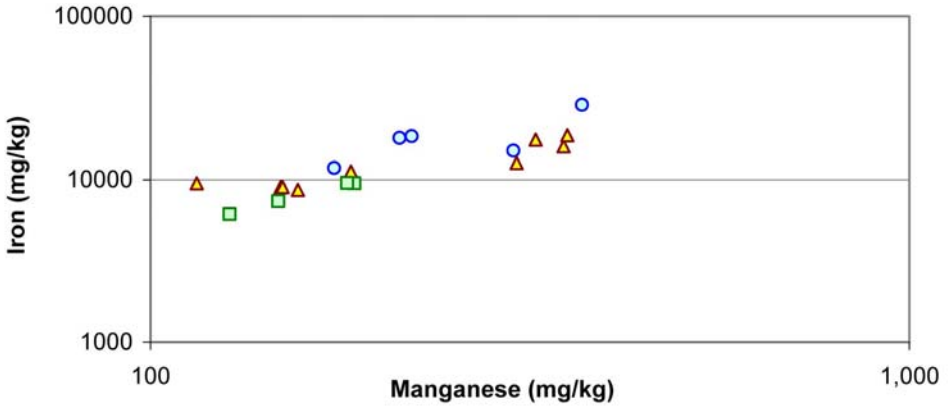
EPRI, see Electric Power Research Institute

Myers, J. and K. Thorbjornsen, 2004, "Identifying Metals Contamination in Soil: A Geochemical Approach," *Soil & Sediment Contamination*, Vol. 13, No. 1, pp. 1-16.

Schiff, K. and S.B. Weisberg, 1997, "Iron as a Reference Element for Determining Trace Metal Enrichment in California Coastal Shelf Sediments," *in*: S. Weisberg, C. Francisco, and D. Hallock (editors), *Southern California Coastal Water Research Project Annual Report 1995-96*, pp. 68-78.

U.S. Navy, 2002, *Guidance for Environmental Background Analysis, Volume I: Soil*, NFESC User's Guide UG-2049-ENV, Naval Facilities Engineering Command, Washington, D.C., April.

Figures

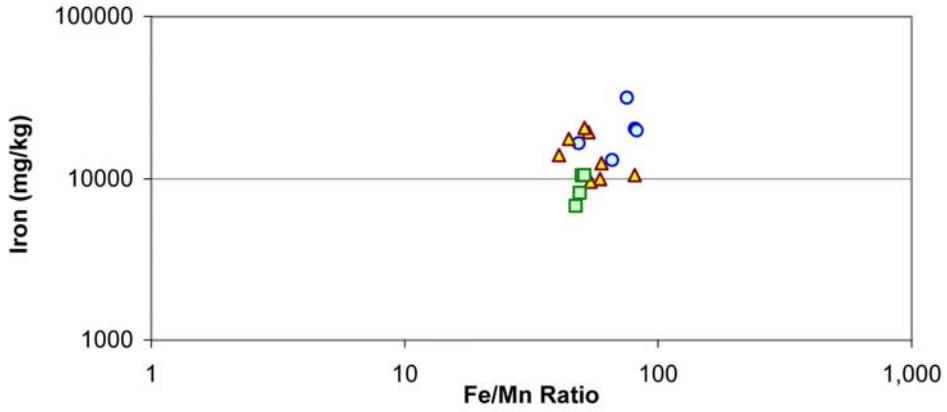


842086.02106064 A2

[a]Background soil collected during the Silo Site 4 Site Inspection
mg/kg - milligrams per kilogram
vs - versus

LEGEND
Borehole BH4-1
Outfall Trench
Local Background[a]

Figure I-1
Iron vs. Manganese



842086.02106064 A3

[a]Background soil collected during the Silo Site 4 Site Inspection
mg/kg - milligrams per kilogram
vs - versus
Fe - Iron
Mn - Manganese

LEGEND
Borehole BH4-1
Outfall Trench
Local Background[a]

Figure I-2
Iron vs. Fe/Mn Ratios

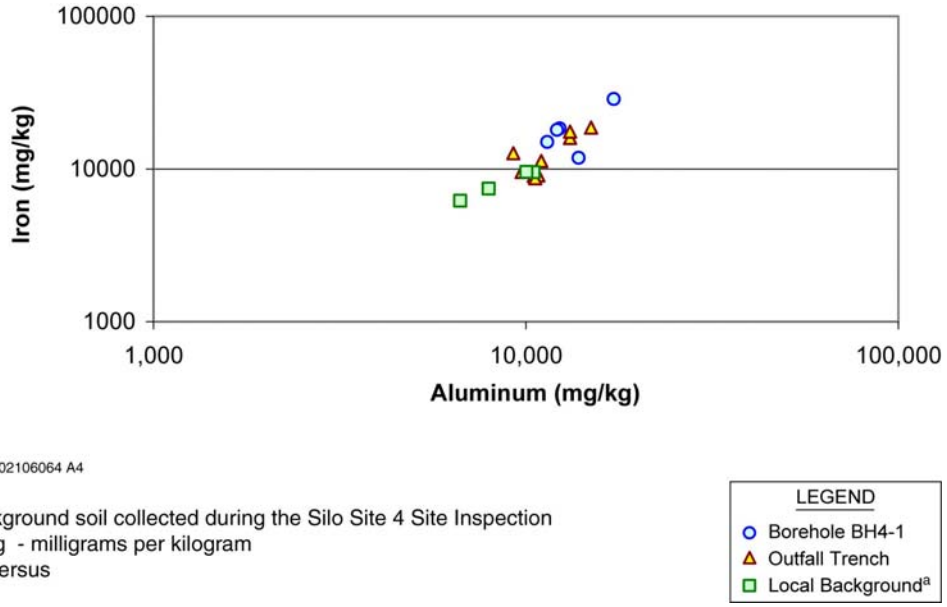


Figure I-3
Iron vs. Aluminum

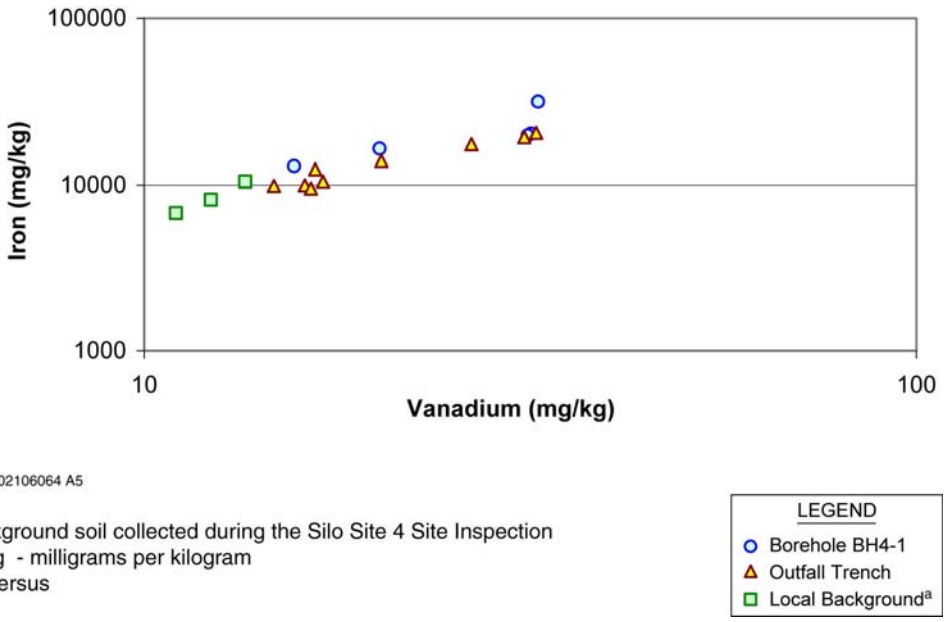


Figure I-4
Iron vs. Vanadium

SITE INSPECTION REPORT ADDENDUM
Former Atlas Missile Silo Site 4 Sump Outfall
Roswell, New Mexico
FUDS Project ID No. K06NM0482

Contract No. DACW05-96-D-0011
CTO-15, WAD 7

Document Control Number ACE15-158-S
Revision C

Draft Final—February 2006

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Table of Contents

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Acronyms and Abbreviations

ADR	Automated Data Review
CD	compact disc
COC	constituent of concern
Diamondback	Diamondback Disposal Services, Inc.
EDD	electronic data deliverables
EDMS	Environmental Data Management System
EPA	U.S. Environmental Protection Agency
Kemron	Kemron Environmental Services, Inc.
MQO	measurement quality objective
µg/kg	microgram(s) per kilogram
PCB	polychlorinated biphenyl
QAPP	Quality Assurance Project Plan
QC	quality control
Shaw	Shaw Environmental, Inc.
SI	Site Inspection
USACE	U.S. Army Corps of Engineers
yd^3	cubic yard(s)

1.0 Introduction

This Site Inspection (SI) Report Addendum describes the activities and presents the results of the supplemental SI performed by Shaw Environmental, Inc. (Shaw) between September 7 and October 21, 2005, at Former Atlas Missile Silo Site 4, located near Roswell, New Mexico (Figure 1). Shaw conducted the supplemental SI activities for the U.S. Army Corps of Engineers (USACE), Albuquerque District, under Contract Number DACW05-96-D-0011, Contract Task Order 15, Work Authorization Directive 7 (Atlas Missile Silo SI Phase II) to the Sacramento Total Environmental Restoration Contract II. The supplemental SI activities followed specifications in the *Final Work Plan, Environmental Site Investigation, Former Atlas Missile Silo Sites 3, 4, and 6, Roswell, New Mexico, FUDS [Formerly Used Defense Site] Project Identification Nos. K06NM0481 (Site 3), K06NM0482 (Site 4), and K06NM0484 (Site 6)* (Shaw, 2005a) and approved Field Work Variances.

2.0 Scope and Objectives

An SI performed at Silo Site 4 between March 14 and June 7, 2005, focused on constituents of concern (COC) that may have been released from potential source areas. SI activities included surface and subsurface soil sample collection and analysis for hazardous constituents. With the exception of soil from the sump outfall drainage area, no COCs exceeding evaluation criteria were detected in SI soil samples. The polychlorinated biphenyl (PCB), Aroclor-1260, exceeded the established evaluation criterion (220 micrograms per kilogram [µg/kg]) in soil samples collected from the sump outfall drainage area at Silo Site 4 at a maximum concentration of 994 µg/kg (Shaw, 2005b). However, all detected PCB concentrations in the sump outfall drainage area were below the regulatory limit (50,000 µg/kg) for remediation waste.

As a result of the SI performed at Silo Site 4, the USACE has voluntarily undertaken a removal action in order to mitigate potential exposure risks from PCBs in soil. The removal action involved the excavation, transportation, and disposal of PCB-impacted soil from the Silo Site 4 sump outfall drainage area. Confirmation soil samples were collected to verify that PCB-impacted soil exceeding evaluation criteria had been removed. The excavation was backfilled with clean soil to complete the removal action. This SI Report Addendum provides detailed results related to the PCB removal action at the Silo Site 4 sump outfall.

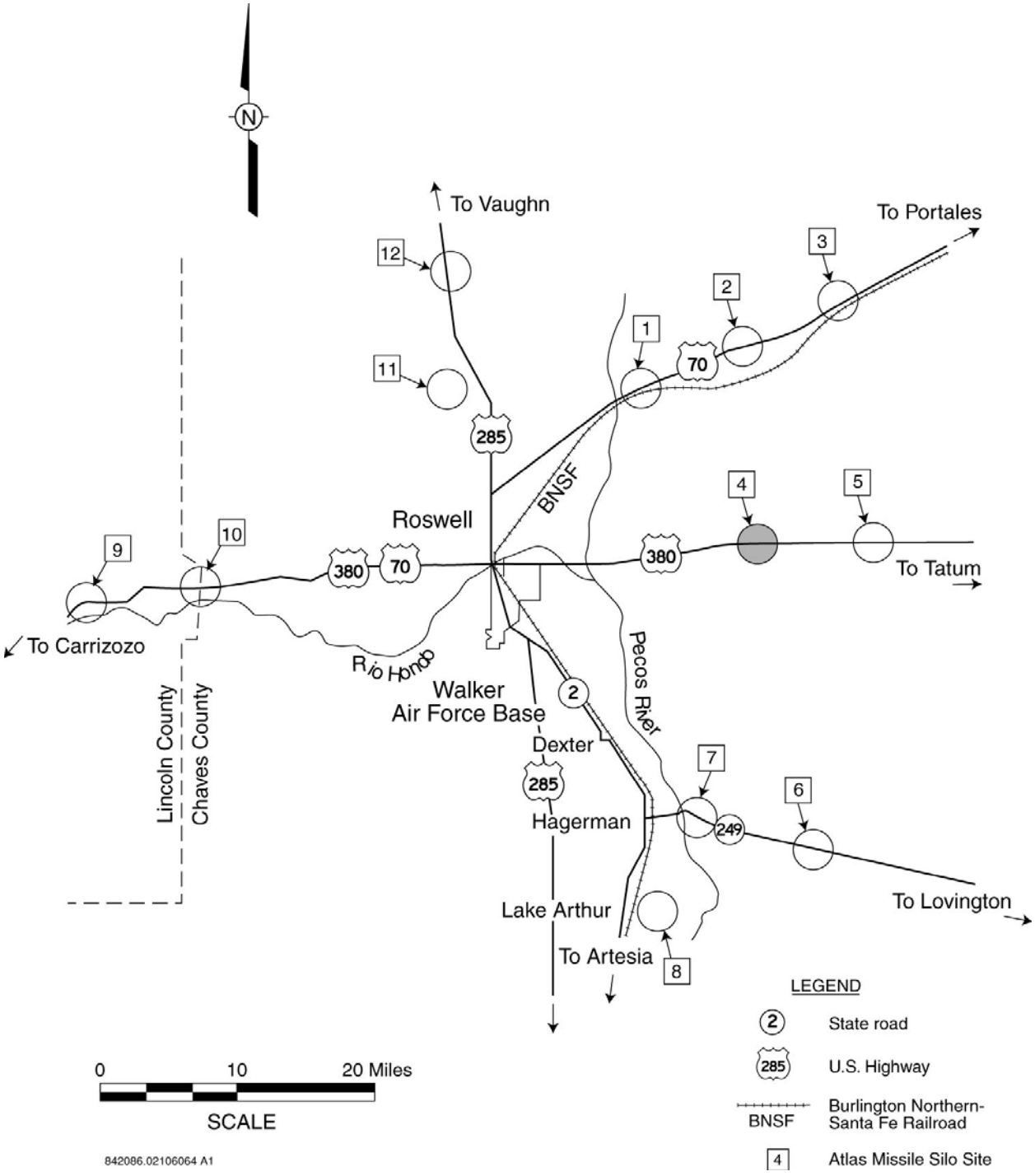

Figure 1
Site Location Map, Former Atlas Missile Silo Site 4
Roswell, New Mexico

3.0 Field Procedures

3.1 Waste Profile Soil Sampling

Waste profile soil sampling activities were conducted at Silo Site 4 within the outfall drainage area prior to the commencement of transportation and disposal activities. One composite soil sample was collected from within the outfall drainage area at depths ranging from 0.5 to 1.0 foot below ground surface at three locations approximately 1, 3, and 5 feet from the end of the outfall pipe. The soil sample was analyzed for total petroleum hydrocarbons using U.S. Environmental Protection Agency (EPA) Method 418.1 by Kemron Environmental Services, Inc. (Kemron). These analytical data results and existing PCB data from previous SI activities (Shaw, 2005b) were sent to Diamondback Disposal Services, Inc. (Diamondback) for required waste profiling. The PCB concentrations in the outfall drainage area were below the regulatory limit for remediation waste; therefore, the soil was transported and disposed of as special waste.

3.2 Excavation and Confirmation Soil Sampling

The outfall pipe and drainage area are located approximately 100 feet south of the silo pad (Figure 2). Based upon the previous SI sample locations, the drainage area downgradient of the clay outfall pipe was delineated with flags prior to excavation (Figure 3). The drainage area was excavated to the dimensions and depth necessary to ensure removal of PCB-impacted soil with concentrations exceeding evaluation criteria. Figure 3 shows the lateral and vertical dimensions of the excavation. The outfall drainage area was excavated using a backhoe, and the soil was stockpiled adjacent to the excavation.

Following completion of excavation, confirmation soil samples were collected to ensure that soil containing PCB concentrations that exceed evaluation criteria had been removed. Five confirmation soil samples were collected from the excavation, four from the walls of the excavation and one from the floor (Figure 3). The confirmation soil samples were shipped to Kemron, located in Marietta, Ohio, for analysis of PCBs by EPA Method 8082.

In addition to the five confirmation soil samples, one quality control (QC) blind duplicate sample with matrix spike/matrix spike duplicate was collected, and one QC split soil sample was collected and shipped to the USACE Omaha Laboratory. These QC samples were co-located with Sample OFT4-5PR (Figure 3). Due to the hard pan caliche floor of the excavation, the floor soil sample (OFT4-5PR) was collected close to the south end of the trench excavation at the base of the side wall. The soil sample summary and geographic locations of the confirmation soil samples are presented in Table 1. Appendix A provides complete field documentation.

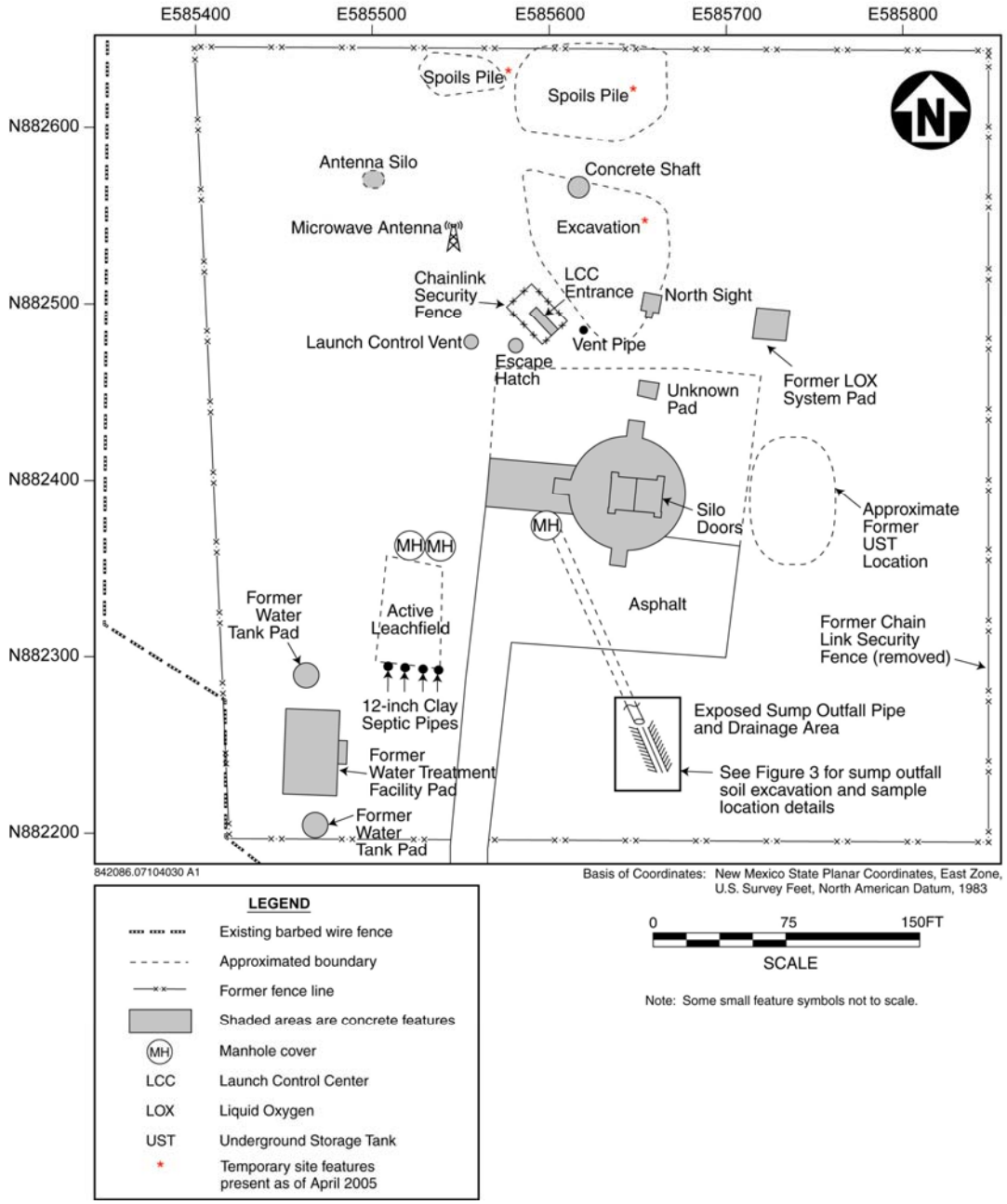

Figure 2
Site Map, Former Atlas Missile Silo Site 4
Roswell, New Mexico

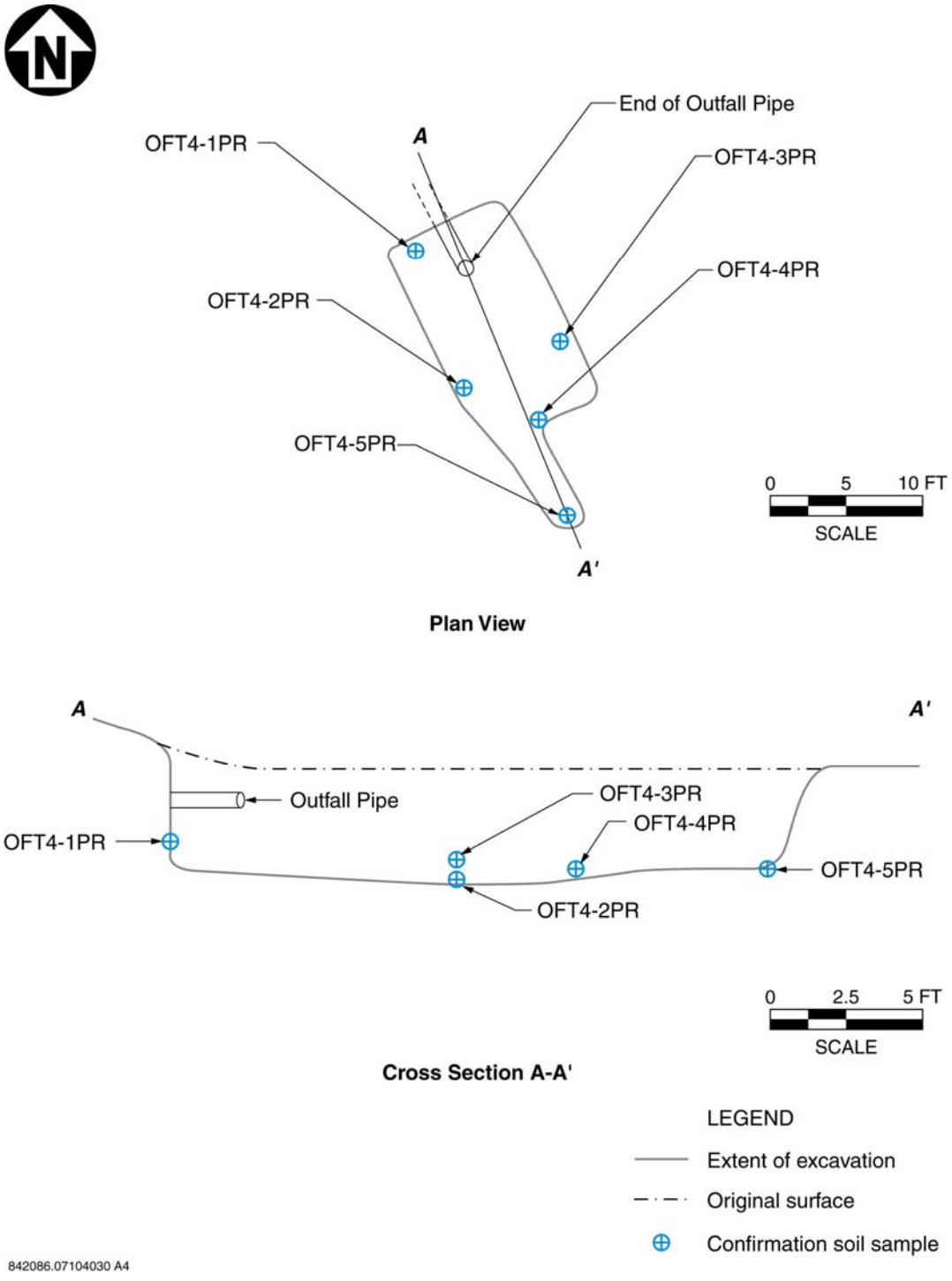

Figure 3
Sump Outfall Soil Excavation and Sample Location Details,
Former Atlas Missile Silo Site 4
Roswell, New Mexico

Table 1
Confirmation Soil Sample Summary
Sump Outfall Drainage Area
Former Atlas Missile Silo Site 4, Roswell, New Mexico

Sample Number	Sample Date	Sample Type	Sample Depth Below Top of Outfall Pipe[a] (ft)	Sample Distance from End of Outfall Pipe[a] (ft)	Coordinate Location	
					Northing	Easting
OFT4-1PR	10/17/2005	Environmental Soil	1.5	-2.5	882266.03	585646.66
OFT4-2PR	10/17/2005	Environmental Soil	2.5	7.0	882257.03	585649.84
OFT4-3PR	10/17/2005	Environmental Soil	1.5	7.0	882260.04	585656.16
OFT4-4PR	10/17/2005	Environmental Soil	2	11.0	882254.92	585654.72
OFT4-5PR	10/17/2005	Environmental Soil	2	17.5	882248.62	585656.62
OFD4-PR	10/17/2005	Duplicate of OFT4-5PR, MS/MSD Soil	2	17.5	882248.62	585656.62
OFS4-PR	10/17/2005	USACE Split of OFT4-5PR	2	17.5	882248.62	585656.62

[a]*See Figure 3 for sample locations.*

ft = Foot (feet).

MS/MSD = Matrix spike/matrix spike duplicate.

USACE = U.S. Army Corps of Engineers.

3.3 Transportation and Disposal

Diamondback, a New Mexico Environment Department-approved solid waste hauler, was subcontracted to provide transportation services for the excavated soil. The stockpiled soil was loaded by Shaw into transport trucks provided by Diamondback. The soil was transported to the Diamondback disposal facility located 8 miles east of Hobbs, New Mexico. Prior to leaving the silo site, a waste manifest was completed for each load and signed by the USACE on-site representative. The total volume of soil from Silo Site 4 transported and disposed of at the Diamondback facility was 20 cubic yards (yd^3). Copies of the executed waste manifests are provided in Appendix B.

4.0 Confirmation Soil Sampling Results

Concentrations of PCBs in confirmation soil samples did not exceed evaluation criteria. Table 2 provides sample numbers, sample dates, sample results, data qualifiers, and evaluation criteria for the confirmation soil samples.

5.0 Quality Control Summary

The QC summary, including laboratory and field QC sample discussions, is based upon the combined set of QC samples from the supplemental SIs performed at Silo Sites 3, 4, 6, and 8.

5.1 Laboratory Quality Control

Kemron performed the measurement quality objectives (MQO) specified for each analytical method. QC measurements are typically made on laboratory-prepared, standard materials and samples to monitor MQOs for accuracy and precision. The laboratory QC checks included the following:

- Calibration checks
- Method blank samples
- Laboratory control samples
- Surrogate spiked samples
- Matrix spike samples
- Duplicate samples

Table 2
Confirmation Soil Sampling Results
Sump Outfall Drainage Area
Former Atlas Missile Silo Site 4, Roswell, New Mexico

Sample Number	Sample Date	Sample Type	Depth Below Top of Outfall Pipe (ft)	PCB Analyte Name	Final Result (µg/kg)	Final Qualifier	Reporting Limit (µg/kg)	Method Detection Limit (µg/kg)	Evaluation Criteria[a] (µg/kg)
OFT4-1PR	10/17/2005	Environmental	1.5	Aroclor-1016	ND (8.58)	U	17.2	8.58	2220
				Aroclor-1221	ND (8.58)	U	17.2	8.58	220
				Aroclor-1232	ND (8.58)	U	17.2	8.58	220
				Aroclor-1242	ND (8.58)	U	17.2	8.58	220
				Aroclor-1248	ND (8.58)	U	17.2	8.58	220
				Aroclor-1254	ND (8.58)	U	17.2	8.58	220
				Aroclor-1260	ND (8.58)	U	17.2	8.58	220
OFT4-2PR	10/17/2005	Environmental	2.5	Aroclor-1016	ND (9.27)	U	18.5	9.27	2220
				Aroclor-1221	ND (9.27)	U	18.5	9.27	220
				Aroclor-1232	ND (9.27)	U	18.5	9.27	220
				Aroclor-1242	ND (9.27)	U	18.5	9.27	220
				Aroclor-1248	ND (9.27)	U	18.5	9.27	220
				Aroclor-1254	ND (9.27)	U	18.5	9.27	220
				Aroclor-1260	ND (9.27)	U	18.5	9.27	220

Table 2 (Continued)
Confirmation Soil Sampling Results
Sump Outfall Drainage Area
Former Atlas Missile Silo Site 4, Roswell, New Mexico

Sample Number	Sample Date	Sample Type	Depth Below Top of Outfall Pipe (ft)	PCB Analyte Name	Final Result (µg/kg)	Final Qualifier	Reporting Limit (µg/kg)	Method Detection Limit (µg/kg)	Evaluation Criteria[a] (µg/kg)
OFT4-3PR	10/17/2005	Environmental	1.5	Aroclor-1016	ND (8.42)	U	16.8	8.42	2220
				Aroclor-1221	ND (8.42)	U	16.8	8.42	220
				Aroclor-1232	ND (8.42)	U	16.8	8.42	220
				Aroclor-1242	ND (8.42)	U	16.8	8.42	220
				Aroclor-1248	ND (8.42)	U	16.8	8.42	220
				Aroclor-1254	ND (8.42)	U	16.8	8.42	220
				Aroclor-1260	ND (8.42)	U	16.8	8.42	220
OFT4-4PR	10/17/2005	Environmental	2	Aroclor-1016	ND (8.63)	U	17.3	8.63	2220
				Aroclor-1221	ND (8.63)	U	17.3	8.63	220
				Aroclor-1232	ND (8.63)	U	17.3	8.63	220
				Aroclor-1242	ND (8.63)	U	17.3	8.63	220
				Aroclor-1248	ND (8.63)	U	17.3	8.63	220
				Aroclor-1254	ND (8.63)	U	17.3	8.63	220
				Aroclor-1260	ND (8.63)	U	17.3	8.63	220

Table 2 (Continued)
Confirmation Soil Sampling Results
Sump Outfall Drainage Area
Former Atlas Missile Silo Site 4, Roswell, New Mexico

Sample Number	Sample Date	Sample Type	Depth Below Top of Outfall Pipe (ft)	PCB Analyte Name	Final Result (µg/kg)	Final Qualifier	Reporting Limit (µg/kg)	Method Detection Limit (µg/kg)	Evaluation Criteria[a] (µg/kg)
OFT4-5PR	10/17/2005	Environmental	2	Aroclor-1016	ND (9.12)	U	18.2	9.12	2220
				Aroclor-1221	ND (9.12)	U	18.2	9.12	220
				Aroclor-1232	ND (9.12)	U	18.2	9.12	220
				Aroclor-1242	ND (9.12)	U	18.2	9.12	220
				Aroclor-1248	ND (9.12)	U	18.2	9.12	220
				Aroclor-1254	ND (9.12)	U	18.2	9.12	220
				Aroclor-1260	55.4	J+	18.2	9.12	220
OFD4-PR	10/17/2005	Field Duplicate of OFT4-5PR	2	Aroclor-1016	ND (9.22)	U	18.4	9.22	2220
				Aroclor-1221	ND (9.22)	U	18.4	9.22	220
				Aroclor-1232	ND (9.22)	U	18.4	9.22	220
				Aroclor-1242	ND (9.22)	U	18.4	9.22	220
				Aroclor-1248	ND (9.22)	U	18.4	9.22	220
				Aroclor-1254	ND (9.22)	U	18.4	9.22	220
				Aroclor-1260	30.0		18.4	9.22	220

[a]Evaluation criteria were selected from either 1) New Mexico Environment Department, 2004, "Technical Background Document for Development of Soil Screening Levels," Revision 2.0, Hazardous Waste Bureau, New Mexico Environment Department, Santa Fe, New Mexico, or 2) U.S. Environmental Protection Agency, 2003, "EPA Region 6 Human Health Medium-Specific Screening Levels," electronic database maintained by Region 6, U.S. Environmental Protection Agency, Dallas, Texas.

ft = Foot (feet).

J+ = Estimated concentration less than the reporting limit but greater than the method detection limit. Estimate likely biased high.

Table 2 (Continued)
Confirmation Soil Sampling Results
Sump Outfall Drainage Area
Former Atlas Missile Silo Site 4, Roswell, New Mexico

µg/kg = Microgram(s) per kilogram.
ND = Not detected above laboratory method detection limit shown in parentheses.
PCB = Polychlorinated biphenyl.
U = Not detected above laboratory method detection limit.

5.1.1 Data Evaluation

Analytical data reporting for this supplemental SI includes electronic data deliverables (EDD) in the Automated Data Review (ADR) file format for data review and evaluation as specified in Section 7.2.2 of the Sampling and Analysis Plan – Quality Assurance Project Plan (QAPP) (Shaw, 2005a). Kemron also provided complete analytical data reports with supporting instrument and bench sheets in both hard copy and electronic computer-readable portable document format files (Appendix C).

Data validation was performed on each Kemron-provided EDD using the ADR software. Once the EDD was uploaded and electronically checked for errors, the software automatically compared instrument calibration and QC measurements for each analytical method, matrix, and analyte against acceptance criteria in the project-specific library.

A data validation report, compiled from ADR output, is included on a compact disc (CD) in Appendix D. The validation report includes sample listings, analytical results tables, outlier reports, data qualifiers and definitions, any manually-changed qualifiers, and bias indicators. Also included on the CD in Appendix D are the validated EDD text files exported using the ADR software and the project-specific analytical methods library constructed for the Atlas Missile Silo Sites 3, 4, and 6 SIs.

Following data validation with the ADR software system, the validated EDD files were uploaded to the Environmental Data Management System (EDMS), a database application running on Microsoft® Access. The EDMS was used to query the database for preparation of this report, to automatically compare analytical results against evaluation criteria, and to generate QC summary tables.

5.1.2 Data Usability

All analytical results generated from sample analyses during the supplemental SIs are usable for the purposes intended. No analytical data were rejected for QC failures.

QC measurements outside of acceptance criteria resulted in the qualification of some data, which generally were flagged as estimated values ("J" qualifier) with positive or negative bias indicators. Qualified data are considered to be usable in the SI.

Completeness, calculated in accordance with Section 8.4 of the Sampling and Analysis Plan – QAPP (Shaw, 2005a) was 90-percent analytical completeness and 100-percent technical completeness. Analytical completeness is the percentage of unqualified results while technical completeness is the percentage of usable analysis results. The QC summary report is included in Appendix D.

5.2 Field Quality Control Samples

Field duplicate samples were collected for PCB analyses at each silo outfall where soil was removed during the supplemental SI. Field duplicate samples were collected more frequently than 1 duplicate per 10 field samples, or 10 percent. Twenty-two primary field soil samples and four field duplicate soil samples were collected during the supplemental SIs.

The duplicate soil samples were co-located with the original soil sample and split from soil homogenized in a stainless steel bowl. Field duplicate soil samples were packaged and shipped according to procedures identical to those used for the parent soil sample. With the exception of Aroclor-1260, no PCB aroclors were detected above laboratory method detection limits in the original and field duplicate. Aroclor-1260 was detected in both the original and field duplicate and a relative percent difference of 59.5 percent was calculated for the pair.

6.0 Site Restoration Activities

Upon completion of all supplemental SI field activities, surface restoration was performed in order to return the investigated site areas to their pre-disturbed conditions. Site restoration efforts at Silo Site 4 consisted of backfilling the sump outfall area. The PCB-impacted soil was removed from the sump outfall area, as discussed in Section 3.2, and the excavation was backfilled with 20 yd^3 of clean fill material and compacted with the backhoe/loader.

7.0 Summary and Recommendations

The objective of these supplemental SI activities was to remove PCB-impacted soil exceeding evaluation criteria near the Silo Site 4 sump outfall. To accomplish this objective, soil from the outfall drainage area was excavated, transported, and disposed of at a licensed disposal facility. The extent of the excavation was determined from the analytical results of previous SI sampling activities performed on March 14, 2005 (Shaw, 2005b). Confirmation soil samples were collected from the four walls and the floor of the excavation to verify removal of PCB-impacted soil exceeding evaluation criteria. Confirmation soil samples did not contain PCB concentrations that exceeded evaluation criteria.

No further SI activities are recommended for Silo Site 4.

8.0 References

Shaw, see Shaw Environmental, Inc.

Shaw Environmental, Inc. (Shaw), 2005a, *Final Work Plan, Environmental Site Investigation, Former Atlas Missile Silo Sites 3, 4, and 6, Roswell, New Mexico, FUDS Project ID Nos. K06NM0481 (Site 3), K06NM0482 (Site 4), and K06NM0484 (Site 6)*, Revision 1, Shaw Environmental, Inc., Albuquerque, New Mexico, February 2005.

Shaw Environmental, Inc. (Shaw), 2005b, *Site Inspection Report, Former Atlas Missile Silo Site 4, Roswell, New Mexico, FUDS Project ID No. K06NM0482, Final Report*, Revision 0, Shaw Environmental, Inc., Albuquerque, New Mexico, November 2005.

Appendix A
Field Documentation

Appendix A1
Field Activity Daily Logs

Shaw™ Shaw E & I, Inc.

FIELD ACTIVITY DAILY LOG

DAILY LOG	DATE	9	7	05
	NO.			
	SHEET	1	OF	2

PROJECT NAME: USACE SACTERC CTO15 WAD 7 | PROJECT NO.: 842086.07

FIELD ACTIVITY SUBJECT: TPH sampling @ outfall Drainage Areas, Silo Sites 4, 6, and 8

DESCRIPTION OF DAILY ACTIVITIES AND EVENTS:

0740 M. Phaneuf performs vehicle safety inspection of Shaw truck 83640 All safety equipment, 1st Aid Kit, Bloodborne pathogen kit, Fire Extinguisher, & Flashlight present and inspected on 9-6-05.
0830 Stones Phaneuf depart Albuquerque for Roswell
1133 Arrive @ UFO Storage to load up supplies for sampling.
1135 Conduct tailgate Safety meeting, see tailgate form for details. Government property ID # for 300 gallon tank : 002058
1145 Depart storage.
1220 Arrive @ 5,600 gallon tank to get government property ID #: 002059
Depart for Silo 6
1315 Arrive @ Silo 6 to collect TPH profile sample from outfall drainage Area.
Begin Hand digging 3 holes to ~1' bgs in line w/ outfall pipe @ ~1', 3' and 5' from end of pipe to composite Soil for 4oz jar for ~~PCP~~ TPH analysis (418.1)
1330 Collect Sample OF6-TC See collection log for details
holes filled back in, clean up
1340 Depart Silo 6 for Silo 8
1420 Arrive @ Silo 8, Spoke w/ Mr. John Jackson, informed him that Shaw arrived to collect soil sample, and that they would be back in October for soil removal.
Begin set up to collect Soil Sample for TPH @ outfall drainage area
1430 Hand dig 3 holes ~1', 3', +5' from end of outfall pipe to 1' bgs to composite soil in stainless steel bowls for TPH analysis (418.1)
1435 Collect Sample OF8-TC See collection log for details

VISITORS ON SITE:

— None —

CHANGES FROM PLANS AND SPECIFICATIONS, AND OTHER SPECIAL ORDERS AND IMPORTANT DECISIONS:

— None —

WEATHER CONDITIONS:

AM 70's mostly cloudy
PM Mid 80's partly cloudy

IMPORTANT TELEPHONE CALLS:

— None —

SHAW E & I PERSONNEL ON SITE: Phaneuf, Stone

SIGNATURE: [signature] DATE: 9/7/05

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Shaw® Shaw Environmental, Inc.

FIELD ACTIVITY DAILY LOG CONTINUATION SHEET

DAILY LOG	DATE	9	7	05
	NO.			
	SHEET	2 OF 2		

PROJECT NAME: USACE SACTERC CTO15 WAD 7 | PROJECT NO.: 842086.07

FIELD ACTIVITY SUBJECT: TPH sampling @ outfall Drainage Areas Silo Sites 4, 6 & 8

DESCRIPTION OF DAILY ACTIVITIES AND EVENTS:

1500 Depart Silo 8 after cleaning up and packing samples.
NOTE: All samples stored on ice under shaw custody.
Leave for storage to drop off equip and supplies
1630 Arrive @ Motel to check in.
End of Day

9-7-05

HRS: 8 each

Shaw™ Shaw E & I, Inc.

FIELD ACTIVITY DAILY LOG

DAILY LOG				
	DATE	9	8	05
	NO.			
	SHEET 1 OF 1			

PROJECT NAME: USACE SACTERC CTO15 WAD7 | PROJECT NO.: 842086.07

FIELD ACTIVITY SUBJECT: TPH Sampling @ Outfall Drainage Areas, Silo Sites 4, 6, and 8

DESCRIPTION OF DAILY ACTIVITIES AND EVENTS:

0720 Depart hotel for Silo 4, conduct daily tailgate H&S briefing
0810 Arrive @ Silo 4, waiting for Silo Owner to arrive onsite and unlock gate
1015 Getting set up to collect TPH (418.1) sample from outfall drainage area. See collection log for details.
1050 Collect TPH sample OF4-TC (418.1)
Fill holes in, clean-up pack vehicle, head to storage, locked Silo 4 Gate.
1130 Arrive @ gas station, purchase more ice and gas for vehicle
1140 Arrive @ Storage, complete Forms II Lite pack samples for shipment via Fed Ex, unload vehicle
1220 Depart Storage for Fed Ex
1240 Drop one cooler off with OF4-TC, OF6-TC, and OF8-TC samples for priority overnight shipment to Kemron.
1300 Depart Roswell for Albuquerque.
1605 Arrive @ office, complete partial demob of equipment and supplies by 1620.

HRS: 9 each

9-8-05

VISITORS ON SITE:	CHANGES FROM PLANS AND SPECIFICATIONS, AND OTHER SPECIAL ORDERS AND IMPORTANT DECISIONS:
None	- None -
WEATHER CONDITIONS: AM - mid 70's, partly cloudy, hazy PM - Mid 80's, hazy, humid	IMPORTANT TELEPHONE CALLS: - None -

SHAW E & I PERSONNEL ON SITE: Stone, Pheneuf

SIGNATURE: | DATE: 9-8-05

327D-6-02

Shaw™ Shaw E & I, Inc.

FIELD ACTIVITY DAILY LOG

DAILY LOG	DATE	10	17	05
	NO.			
	SHEET	1 OF 2		

PROJECT NAME: USACE SACTERC CTO15 WAD 7 | PROJECT NO.: 842086.07

FIELD ACTIVITY SUBJECT: PCB Trenching/Sampling

DESCRIPTION OF DAILY ACTIVITIES AND EVENTS:

0615 Depart hotel for supplies and fuel
0710 Arrive @ Storage
0740 Departing Storage for Silo 3, Call to SW Disposal confirming they will pick up Roll off bin. Agreed they will be @ Silo 3 by 11am
0825 Arrive @ Silo 3 waiting outside Gate for Silo 3 owner to open gate. B. Jorden (USACE) arrives on site.
Begin fueling dump truck w/ diesel from shaw truck tank.
0836 Barbara Villa arrives @ site to unlock gates.
0840 Tailgate Safety briefing
0900 Larry Ring begins trenching @ Silo 3.
0910 End of clay outfall pipe exposed. B. Jorden Leaves Site
1015 Trench completed to desired extents.
Begin prep. for soil sampling.
All samples collected, Note Roll off bin Removed from site by SW disposal
1200 Depart Silo 3 for Silo 4
1310 Arrive @ Silo 4, gates locked. Called Mr. Baker left message that we arrived, informed him that Gate code had not changed and we let ourselves in and for him to call
1330 Decon bucket of backhoe
1345 Mark out trench extents to be excavated
1400 Locate what appears to be 6" well, but not typical monitoring well.
1415 Collect Rinse blank sample off of bucket & SS. bowl EB-1PR
See Collection Log
1430 Begin excavating trench Silo 4

VISITORS ON SITE:
Barbara Villa Site 3

CHANGES FROM PLANS AND SPECIFICATIONS, AND OTHER SPECIAL ORDERS AND IMPORTANT DECISIONS:

WEATHER CONDITIONS:
AM Sunny low 60's
PM Sunny low 80's
light breeze

IMPORTANT TELEPHONE CALLS:
See Notes

SHAW E & I PERSONNEL ON SITE: Givens, Phaneuf, Ring

SIGNATURE: Mike Phaneuf DATE: 10-17-05

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FIELD ACTIVITY DAILY LOG CONTINUATION SHEET

DAILY LOG	DATE	10	17	05
	NO.			
	SHEET	2 OF 2		

PROJECT NAME: USACE SACTERC CTO15 WA07 | PROJECT NO.: 842086.07

FIELD ACTIVITY SUBJECT: PCB Trenching/Sampling

DESCRIPTION OF DAILY ACTIVITIES AND EVENTS:

1500 Cancel Avis Car Rental directly @ Avis counter in Roswell via. phone.
1545 Begin collecting samples @ Silo 4 trench.
See collection logs for details
Finish Trenching Extents.
1630 GPS having trouble w/ obtaining signal.
Measured all locations referenced to end of outfall pipe.
NOTE: Some event occurred @ Silo 3 w/ measuring locations and extent w/ measure tape.
1700 Depart Site, call from G. Baker. Confirm all is OK.
heading out to Storage unit
1740 Arrive @ Storage load up w/ supplies
1815 Arrive @ Hotel

10-17-05

HRS: 12.0 Field
+ 1hr Forms 2 Lite etc. @ hotel

13.0

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FIELD ACTIVITY DAILY LOG

DAILY LOG	DATE	10	17	05
	NO.			
	SHEET	1	OF 2	

PROJECT NAME: SacTERC CTO 15 WAD 7 | PROJECT NO.: 842086.07

FIELD ACTIVITY SUBJECT: PCB Contaminated soil removal

DESCRIPTION OF DAILY ACTIVITIES AND EVENTS:

0615 Leave motel for supplies / Fuel
0710 Arrive storage
0740 Call Ronnie at SW Disposal - remind to pick up roll-off this AM at Silo 3
0740 Leave storage
0825 Arrive Silo Site 3 - Brian Jordan USACE arrives site
0835 Owner's representatives CHE arrives at site
Barb. Villa and
0910 Begin excavating outfall - ~~dd~~ground wire exposed / broken - unknown source.
0936 Check location of outfall pipe - B. Jordan leaves site
1025 Complete excavation at Silo 3 - Begin sampling
~~105~~ See Sample collection logs for details
1050 SW Disposal arrives to pick up roll-off
Discuss with Ronnie at SW Disposal about other trash in the roll-off - will need to be disposed as solid waste
1150 Sampling complete. sample locations measured and GPS'd. - Load up truck
1200 Leave Silo Site 3
1310 Arrive Silo Site 4 - C. Baker is not on site.
- Open gate and proceed with outfall excavation
1340 Flag out excavation area - unload backhoe
1400 Identify location of well to be abandoned at Silo 4. Photos taken. well casing is steel with large steel bars welded at surface & Heavily damaged.

VISITORS ON SITE:
SW Disposal
Owner's Reps.

CHANGES FROM PLANS AND SPECIFICATIONS, AND OTHER SPECIAL ORDERS AND IMPORTANT DECISIONS:
None

WEATHER CONDITIONS: Sunny - light breeze
AM - 60s
PM - low 80s Sunny

IMPORTANT TELEPHONE CALLS:
See text

SHAW E & I PERSONNEL ON SITE: M. Phaneuf, L. Ring, C. Evens

SIGNATURE: [signature] DATE: 10/17/05

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FIELD ACTIVITY DAILY LOG CONTINUATION SHEET

DAILY LOG	DATE	10	17	05
	NO.			
	SHEET 2 OF 2			

PROJECT NAME: SacTERC CTO 15 WAD 07 | PROJECT NO.: 842086.07

FIELD ACTIVITY SUBJECT: PCB Contaminated Soil Removal.

DESCRIPTION OF DAILY ACTIVITIES AND EVENTS:

1405 Begin excavating at Silo 4 outfall.
1545 Begin sampling - see sample collection logs
1640 Doc (USACE) 328-5842) - Brian Jordan called with Doc Holiday's number.
1655 Complete sample collection logs and GPS/measure sample locations - leave pin flags at sample locations. - Clean up site - Leave Backhoe & dumptruck at Silo Site 4
1700 Leave Silo 4 for Roswell
1740 Arrive storage
1755 Leave storage
1815 Arrive motel
END OF DAY

CJB
10/17/05

Shaw™ Shaw E & I, Inc.

FIELD ACTIVITY DAILY LOG

DAILY LOG	DATE	10	18	05
	NO.			
	SHEET 1 OF 2			

PROJECT NAME: USACE SACTERC CTO15 WAD7 | PROJECT NO.: 842086.07

FIELD ACTIVITY SUBJECT: PCB Trench Sampling Well Abandonment

DESCRIPTION OF DAILY ACTIVITIES AND EVENTS:

0655 Depart hotel w/ Doc Holladay (USACE) for Silo 4.
0728 Arrive @ Silo 4. Will wait for soil truck and WDC.
0800 Soil truck arrives with clean backfill material.
Driver unloads clean fill and gives Manifests to D. Holladay to sign. Tailgate H&S Meeting
0815 L. Ring begins loading PCB soil into Drivers truck.
Manifest Signed by USACE.
0850 Soil Truck Full, but some excavated PCB soil remains in a pile near trench. Will have to have soil truck return to silo 4 to pick up remaining left over soil.
informed truck driver that he will be meeting us @ silo 3 around 12 noon today.
* Call From Carlos Sanchez, informed us that alternator went out on his truck @ WAFB where he was filling w/ water. Shaw left message with Rob Helton (WDC) to inform him of his driller's truck situation.
0900 Larry Ring begins loading clean fill into trench.
* Craig Givens collected composite sample of clean backfill to be later composited with clean backfill
1010 Trench filled in w/ clean fill. Restored trench to near original condition.
* Loading Equipment onto trailer. (Note: Still need to return w/ soil truck to pick up remnant soil that did not fit in truck.
1040 Depart Silo 4 for Silo 3 via. Ponderosa Road
See Givens FADL for details on contacting Forrest Tires. Need trailer tire replaced.

VISITORS ON SITE:

CHANGES FROM PLANS AND SPECIFICATIONS, AND OTHER SPECIAL ORDERS AND IMPORTANT DECISIONS:

WEATHER CONDITIONS:
AM Sunny Low 60's
PM Sunny Low 80's

IMPORTANT TELEPHONE CALLS:
See notes

SHAW E & I PERSONNEL ON SITE: Phaneuf, Ring, Givens

SIGNATURE: [signature] DATE: 10-18-05

Shaw® Shaw Environmental, Inc.

FIELD ACTIVITY DAILY LOG CONTINUATION SHEET

DAILY LOG	DATE	10	18	05
	NO.	3		
	SHEET	2 OF 2		

PROJECT NAME: USACE SACTERC CTO 15 WAD 7 | PROJECT NO.: 842086.07

FIELD ACTIVITY SUBJECT: PCB Trenching/Sampling and Well Abandonment.

DESCRIPTION OF DAILY ACTIVITIES AND EVENTS:

1130 Arrive @ Silo 3, waiting outside gate for owner to arrive.

1205 Scott O'steen arrives on site to unlock gate
Waiting for Soil truck arrive, Also waiting for tire repair to Arrive.

1330 Forrest Tire arrives to fix flat on trailer
Diemond back arrives w/clean fill, unloads, Ring Loads PCB Soil into Truck. Trench backfilled mostly, Diemond to Return 8am on 10/19 w/more soil and Remove Remaining soil that did not fit in Soil truck

1455 Depart silo 3 for Hotel. Leave Dump truck + backhoe on site.
Scott Osteen locks gates as Shaw and USACE Depart. Agree to Meet 8am on 10/19/a

1530 Arrive @ hotel.

1630 Call from Karen Corn indicating she needed to speak With Brian Jordan regarding a letter she sent to USACE a few weeks ago. I provided her with B. Jordan's cell phone #'s. Karen will likely be Meeting Shaw @ 8AM @ her silo. She is upset that we will be @ her site on 10/19 to finish loading Soil and fill in trench. She also mentioned concern of a bare copper wire (historical) encountered in trench. Issue will be discussed @ the site 3 on 10/19.

Drillers Rig is repaired (Alternator on 2003 Ford went bad). Drillers will be mobilizing w/ one shaw member to Silo 6 on 10/19 to begin abandonment of BARCADs.

10/18/05

Field HRS ~9
Documentation, F2 Like ~1
~10 hrs

Shaw™ Shaw E & I, Inc.

FIELD ACTIVITY DAILY LOG

DAILY LOG	DATE	10	18	05
	NO.			
	SHEET	1	OF	2

PROJECT NAME: Sac TERC CTO 15 WAD 07 | PROJECT NO.: 842086.07

FIELD ACTIVITY SUBJECT: PCB Contaminated Soil Removal

DESCRIPTION OF DAILY ACTIVITIES AND EVENTS:

0655 Leave motel
0730 Arrive Silo 4.
0800 Soil truck arrives at Silo 4 - Begin loading soil
0830 Sample 1st half on clean fill confirmation sample - 4 location composite - placed in 4 oz jar & labeled - placed on ice
0900 Truck (Diamond Back) leaves site. Begin backfilling excavation
1000 Finish filling in trench excavation, contour drainage from outfall pipe.
1010 Load backhoe on trailer
1040 Leave Silo Site 4 for Silo 3
1050 Attempting to contact Hertz Rental to schedule tire service at Silo 3 for flat tire on Backhoe trailer
1125 Contacted Forrest Tire for service on trailer. Shawn
1130 Arrive Silo Site 3
1210 Silo 3 owner's representative arrives at site
1330 Forrest Tire arrives.
1335 Diamond Back arrives, dumps clean fill
1410 DiamondBack leaves site / Forrest Tire leaves site (New tire required for trailer)
Truck full, approx 5 yd³ remain. - Also need more fill. Diamond Back will return on Wednesday with another

ST 235-85-R16 - 1

VISITORS ON SITE:
Doc Holladay (USACE)

CHANGES FROM PLANS AND SPECIFICATIONS, AND OTHER SPECIAL ORDERS AND IMPORTANT DECISIONS:
Soil Removal will require additional truck - Additional fill material needed.

WEATHER CONDITIONS:
AM - Clear Sunny high 60s to 70s

IMPORTANT TELEPHONE CALLS:
Hertz
Forrest Tire - Shawn - tire repair

SHAW E & I PERSONNEL ON SITE: L. Ring, C. Givens, M. Phaneuf

SIGNATURE: Craig Givens DATE: 10/18/05

327D-6-02

Shaw® Shaw Environmental, Inc.

FIELD ACTIVITY DAILY LOG CONTINUATION SHEET

DAILY LOG	DATE	10	18	05
	NO.			
	SHEET 2 OF 2			

PROJECT NAME: Sac TERC CTO 15 WAD 07 PROJECT NO.: 842086.07

FIELD ACTIVITY SUBJECT: PCB Contaminated Soil Removal

DESCRIPTION OF DAILY ACTIVITIES AND EVENTS:

1410 (Cont.) load of fill material. Remainder of contaminated soil and ~~and~~ are from Silos 3 & 4 will be loaded first thing on Wednesday morning.

1455 Leave Bilo Site 3

1530 Arrive Motel - End of Day

8.5 hours

CMB 10/18/05

Shaw™ Shaw E & I, Inc.

FIELD ACTIVITY DAILY LOG

DAILY LOG	DATE	10	19	05
	NO.			
	SHEET	1	OF	2

PROJECT NAME: USACE SACTERC CT015 WAD7 | PROJECT NO.: 842086.07

FIELD ACTIVITY SUBJECT: Backfilling, soil truck loading, trenching, well abandonment

DESCRIPTION OF DAILY ACTIVITIES AND EVENTS:

0645 Tailgate H&S meeting @ hotel w/ WDC, and USACE
Begin transferring equipment between vehicles
0700 L. Ring & M. Phaneuf depart hotel for Silo 3
0741 Arrive @ Silo 3 @ gate to await owner to unlock gate.
USACE (Holladay) arrives onsite.
0815 Scott Osteen arrives to unlock gate.
0820 Soil truck arrives
explain to Scott that shaw will splice the bare copper wire back together in trench
0825 Soil truck unloads clean backfill. L. Ring exposes bare copper wire will splice back together.
L. Ring loading PCB soil into soil truck
0840 L. Ring begins filling in trench, compacting w/ weight of backhoe and leveling ground surface
0920 Soil truck leaves site 3 for Site 4, he will wait for us to arrive at site 4 to load dirt.
0940 Loading backhoe onto trailer, all earthwork completed @ Silo 3. Checked w/ Scott O'Steen regarding satisfaction of work. Scott indicated he is very happy with the work completed. Shaw inserted wooden stake above clay outfall pipe for future reference.
0950 Depart Silo 3, Scott follows behind and locks gate
1025 Arrive @ Silo 4 to load soil into truck.
1035 L. Ring begins loading soil @ Silo 4.
1045 All PCB soil loaded into soil truck. USACE filling out Manifest for 3 & 4 Soil

VISITORS ON SITE:

CHANGES FROM PLANS AND SPECIFICATIONS, AND OTHER SPECIAL ORDERS AND IMPORTANT DECISIONS:

WEATHER CONDITIONS:
Am. Foggy upper 50's.
PM Sunny, breezy, high 70's

IMPORTANT TELEPHONE CALLS:
See NOTES

SHAW E & I PERSONNEL ON SITE: Phaneuf, Givens, Ring, Vigerust

SIGNATURE: [signature] DATE: 10-19-05

327D-6-02

Shaw® Shaw Environmental, Inc.

FIELD ACTIVITY DAILY LOG CONTINUATION SHEET

DAILY LOG	DATE	10	19	05
	NO.			
	SHEET	2 OF 2		

PROJECT NAME: USACE SACTERC CTO 15 WAD 7 | PROJECT NO.: 842086.07

FIELD ACTIVITY SUBJECT: Backfilling, Soil truck loading, trenching, sampling, Bored Abandonment

DESCRIPTION OF DAILY ACTIVITIES AND EVENTS:

1106 Depart Silo 4, locked combo gate behind us leaving the site
1220 Arrive @ Silo 6, WDC, Givens and Vigerust are on site working with well Abandonment.
Will set up to trench the outfall area.
1310 L. Ring begins trenching outfall @ Silo 6
1430 WDC completes abandonment of all 4 wells @ Silo 6
L. Ring completes trench @ Silo 6. setting up to collect samples.
L. Ring - J. Vigerust begin removing surface casings @ wells.
1510 L. Ring completes well casing removal activities
1515 End sampling @ trench See collection logs for details.
1521 GPS Complete of sample locations and trench extent.
Measure out trench & sample locations w/ tape measure
1535 L. Ring departs w/ backhoe/dump truck for Hotel
Vigerust departs to American O2 for tanks.
M. Phenevf departs to Silo 8 to assist givens w/ abandonment.
1615 Arrive @ Silo 8 to assist Givens
1755 Depart Silo 8
1833 Arrive @ Storage load equip and supplies
1915 Arrive @ hotel.

NOTE: Vigerust on site @ Silo 6 for H&S Audit.

HRS: 12.5
+ 1.5 FzLife, contacts, samples etc.....

14

10-19-05

Shaw™ Shaw E & I, Inc.

FIELD ACTIVITY DAILY LOG

DAILY LOG				
	DATE	10	19	05
	NO.			
	SHEET	1 OF	1	

PROJECT NAME: SacTERC, CTO 15 WAD 07 | PROJECT NO.: 842086.07

FIELD ACTIVITY SUBJECT: Barcad well abandonment

DESCRIPTION OF DAILY ACTIVITIES AND EVENTS:

0710 Leave motel with R. Helton (WDC)
0830 Arrive Silo 6
0910 Removed caps, sand, & covers from all wells WDC setting up mixer and pump regulator manifold
1030 Begin grouting ~~MW6 + cap~~ Silo 6 - MW1 (J. Vigerost arrives @ ≈1100)
1145 Begin grouting Silo 6 - MW4 - run tubing from MW1 over to MW4 for grouting
1230 Begin grouting Silo 6 - MW3
1300 Begin grouting S6 - MW2
1330 Complete grouting - begin clean up
1445 Leave Silo 6
1455 Receive phone call from M. Goodrich
1515 Receive phone call from Reseeders - want to look over Silo site 6 in prep. for next week
1525 Arrive Silo 8 - begin set up. - begin mixing grout
1600 Start grouting S8-MW4A & S8-MW4B
1640 Start grouting S8-MW1A & S8-MW1B
1700 Complete grouting - Begin clean up
1745 Complete clean up & trailer hook-up - move trailer to S8-MW2 / S8-MW3
1755 Leave Silo 8
1830 Arrive storage
1915 Arrive motel

VISITORS ON SITE:
None
Contractors: Rob Helton, Carlos Sanchez WDC

CHANGES FROM PLANS AND SPECIFICATIONS, AND OTHER SPECIAL ORDERS AND IMPORTANT DECISIONS:
Additional soil transported from Silos 3 and 4, old ground wire (lightening ground) repaired at Silo 3.

WEATHER CONDITIONS:
Clear - AM low 60s

IMPORTANT TELEPHONE CALLS:
None.

SHAW E & I PERSONNEL ON SITE: M. Phaneuf, L. Ring, J. Vigerost

SIGNATURE: [signature] DATE: 10/19/05

327D-6-02

Shaw™ Shaw E & I, Inc.

FIELD ACTIVITY DAILY LOG

DAILY LOG	DATE	10	20	05
	NO.			
	SHEET 1	OF	2	

PROJECT NAME: USACE SACTERC CT015 WAD 7 | PROJECT NO.: 842086.07

FIELD ACTIVITY SUBJECT: BRACAD Abandonment, Well Abandonment, Trenching, soil sampling and loading

DESCRIPTION OF DAILY ACTIVITIES AND EVENTS:

0620 Tailgate H&S meeting @ hotel w/ USACE & WDC
0640 Loading equipment from J. Vigerust's truck into M. Phenefs' truck
0700 L. Ring Departs hotel for Silo 6, J. Vigerust departs for Albuquerque
M. Phenef Departs hotel for Reel Valley Equip. pick up funnel & hydraulic oil.
0820 Arrive @ Silo 6, USACE and L. Ring on site unloading backhoe
Soil trucks will be late, diamond back called, indicated they may be as late as 930am. L. Ring will load up well surface casing and concrete debris into dump truck prior to soil truck arriving
0910 All 4 well locations have casing and concrete removed.
Sites smoothed over.
S6-MW1 - ~10' of PVC pipe pulled out
S6-MW2 ~ ~10' of PVC pipe pulled out
S6-MW3 ~ 15' of PVC Pipe pulled out
S6-MW4 ~ 10' of PVC Pipe pulled out
0930 Diamond back arrives @ Silo 6 to dump clean fill
w/ belly dump, 14/12-14 yd dump truck
CMI load king NM 4180 FT plate
0950 Collect clean Fill material from Silo 6. Composite sample from 5 locations in Clean fill. This sample will be composited later today with soil to be delivered @ Silo 8
1005 Soil trucks depart site w/ PCB soil
L. Ring Fills and compacts trench. L. Ring Repairs muddy Road
1040 Loads Backhoe on trailer
1050 Depart Silo 6 for Silo 8, locked closed gate @ Silo 6. (MTP)
1130 Arrive @ Silo 8, unload backhoe, begin searching to expose outfall pipe
1155 Outfall pipe exposed, trenching begins

VISITORS ON SITE:	CHANGES FROM PLANS AND SPECIFICATIONS, AND OTHER SPECIAL ORDERS AND IMPORTANT DECISIONS:
— NA —	—
WEATHER CONDITIONS: AM - Sunny low 60's PM Sunny low 80's	**IMPORTANT TELEPHONE CALLS:** See NOTES

SHAW E & I PERSONNEL ON SITE: Phenef, Givens, Ring

SIGNATURE: [signature] DATE: 10/20/05

327D-6-02

Shaw Environmental, Inc.

FIELD ACTIVITY DAILY LOG CONTINUATION SHEET

DAILY LOG	DATE	10	20	05
	NO.			
	SHEET	2 OF 2		

PROJECT NAME: USACE SACTERC CTO15 WAD7 | PROJECT NO.: 842086.07

FIELD ACTIVITY SUBJECT: BARCAD ABANDONMENT, WELL ABAND., Trenching, Soil Sampling and loading

DESCRIPTION OF DAILY ACTIVITIES AND EVENTS:

1325 Trench extent limits completed, soil stockpiled, will begin collecting samples.
1335 Begin collecting soil samples in trench. See Sample collection logs for details.
1350 Larry Ring Pulling surface casings @ each of the wells.
1430 Diamondback arrives with two truckloads of clean fill. 1 belly dump, 1 backdump
★ 1445 L. Ring filling in trench. Collect backfill sample OF-2BF from 5 locations within fill. Composite with sample from Silo 6.
1545 L. Ring ends leveling trench area. Hole dug to 3.5' bgs @ MW4A+B. Ring goes over Safety for Hot Work. Permit filled out.
1555 Ring begins cutting torch on well casing approx. 2.8' bgs
NOTE: Soil trucks leave site w/ PCB soil around 1515.
1615 Cut 2.2' casing off - 2.4' bgs.
SB-MW1A ~ 5' of PVC pipe removed
SB-MW1B ~ 5' of PVC pipe removed
SB MW2 ~ 5' of PVC pipe removed
SB MW 3 ~ 5' of PVC pipe removed
SB MW 4-A ~ 10' of PVC pipe removed
SB MW4B ~ 10' of PVC pipe removed
1650 All Ground surfaces restored to near original conditions.
1705 Depart site for hotel
1815 Arrive @ hotel

HRS 12.0 field
1.5 Fz Lite, Sample Mgmt. etc.

13.5

10/20/05

Shaw™ Shaw E & I, Inc.

FIELD ACTIVITY DAILY LOG

DAILY LOG	DATE	10	20	05
	NO.			
	SHEET	1	OF	1

PROJECT NAME: SacTERC CTO 15 WAD 07 | PROJECT NO.: 842086.07

FIELD ACTIVITY SUBJECT: BarCad & Well Abandonment

DESCRIPTION OF DAILY ACTIVITIES AND EVENTS:

0630 Tailgate Safety
0650 Leave motel
0740 Arrive Silo Site 8 - Start setting up
0800 Find plastic cap stuck in 2in hose
0835 Remove cap.
0900 Start grouting S8-MW3
0910 Start grouting S8-MW2
0915 Complete grouting - start clean up
0955 Leave Silo 8 - No water available at Silo 8 (pumps off) - checked S8-MW1A&B and S8-MW4A&B - groot level at top or within 1 ft of top of riser
1030 Arrive RIAC Maint. Yard for water
1120 Leave RIAC with water -
1155 Arrive Silo 4 to grout well - measure well casing - 8 inches inside diameter instead of 6" as expected. Attempted to tag bottom (owner had indicated ≈185ft deep) Ran tape to 650ft did not find bottom. Called M. Phaneuf to inform. Called D. Flores to inform. Decided to not grout well - insufficient material ~~and~~ SAS
1330 Start clean up of drom & trailer (drained water tank)
1405 Leave Silo 4 site
1435 Arrive motel - complete paper work with Carlos Sanchez
1515 Carlos leaves for ABQ - End of Field Day

VISITORS ON SITE:
Carlos Sanchez - WDC

CHANGES FROM PLANS AND SPECIFICATIONS, AND OTHER SPECIAL ORDERS AND IMPORTANT DECISIONS:
Did not abandon the 6inch well at Silo 4 - See notes above.

WEATHER CONDITIONS: AM - clear, sunny mid 60s to mid 70s
PM - clear, sunny, light breeze 70s

IMPORTANT TELEPHONE CALLS:
D. Flores - Status of Silo 4 well
B. Nydoske WDC - Status of Silo 4 well.

SHAW E & I PERSONNEL ON SITE: C. Givens

SIGNATURE: Craig Givens DATE: 10/20/05

327D-6-02

Shaw™ Shaw E & I, Inc.

FIELD ACTIVITY DAILY LOG

DAILY LOG	DATE	10	21	05
	NO.			
	SHEET	1	OF	1

PROJECT NAME: SacTERC CTO15 WAD'07 | PROJECT NO.: 842086.07

FIELD ACTIVITY SUBJECT: PCB Contaminated Soil Removal & Well Abandonment

DESCRIPTION OF DAILY ACTIVITIES AND EVENTS:

0655 Tailgate Safety
0700 Fuel truck and leave motel
0725 Arrive storage to pack samples for shipping and load equipment in truck
0855 Leave storage
0910 Arrive American Oxygen - return oxygen & Acetylene
0920 Leave Am. Oxygen.
0925 Arrive Fed Ex - Drop samples
0930 Leave Fed Ex
0935 Arrive motel to check out
0950 Leave motel - Begin fueling truck and filling diesel tank
1010 Leaving Roswell for ABQ via 380
1450 Arrive Hertz - fuel up dump truck and pick up Larry Ring.
1500 Leave Hertz
1505 Arrive Holmans to return GPS unit
1540 Arrive office - begin unloading truck - leave truck in warehouse - will finish clean up on Monday
1600 Complete unloading of personal equipment - END of Day.

VISITORS ON SITE:
None

CHANGES FROM PLANS AND SPECIFICATIONS, AND OTHER SPECIAL ORDERS AND IMPORTANT DECISIONS:
None

WEATHER CONDITIONS:
AM - Sunny - Low 60's

IMPORTANT TELEPHONE CALLS:
None

SHAW E & I PERSONNEL ON SITE: L. Ring, M. Phaneuf, C. Givens

SIGNATURE: Craig Givens DATE: 10/21/05

327D-6-02

Shaw™ Shaw E & I, Inc.

FIELD ACTIVITY DAILY LOG

DAILY LOG	DATE	10	24	05
	NO.			
	SHEET	1	OF	1

PROJECT NAME: USACE Silo 6 Site Re-seed | PROJECT NO.: 842086

FIELD ACTIVITY SUBJECT: Re-seed Silo 6

DESCRIPTION OF DAILY ACTIVITIES AND EVENTS:

0530 Left Albuq. for Silo 6 Site to meet Sub @ 10am
0950 Arrived on site – subcontractor had just arrived.
1010 F Kenny conducted tailgate safety meeting.
1025 Walked through site with Tye Curtis of Curtis & Curtis (Sub) to go over areas to be re-seeded.
1045 F Kenny took pictures of areas to be re-seeded prior to work.
1050 Subcontractor finished unloading equipment and began prepping/digging soil for reseed.
1120 F Kenny walked site to inspect soil prep areas.
1135 F Kenny examined seed mix against work plan – received seed certifications & tags from Sub.
1145 Sub began re-seeding site.
1215 Sub finishing site seeding – started to spread hay over seed areas.
1225 F Kenny walked site to inspect seeded areas – took pictures of seeded areas before & after hay spreading.
1300 Sub finished spreading hay & began to crimp the seeded areas, final step of seeding process.
1330 Site seeding finished, sub began loading equipment.
1335 F Kenny walked thru & inspected site & took final pictures of seeded areas. Received extra seed bag from Sub.
1425 Sub off site. Gate closed. F Kenny off site, headed for ABQ.
1900 F Kenny back in Albuquerque and returned car rental.

VISITORS ON SITE: Curtis & Curtis – Subcontractor Tye Curtis, Blake Curtis, Darryl Boud, Chad Taylor.

CHANGES FROM PLANS AND SPECIFICATIONS, AND OTHER SPECIAL ORDERS AND IMPORTANT DECISIONS:

WEATHER CONDITIONS:
AM – Sunny, 50° – slight breeze
PM – Sunny, 65 – " "

IMPORTANT TELEPHONE CALLS:

SHAW E & I PERSONNEL ON SITE: Forrest Kenny

SIGNATURE: [signature] DATE: 10/24/05

327D-6-02

Appendix A2
Sample Collection Logs

Shaw™ Shaw Environmental, Inc.

Soil Sample Collection Log

USACE SACTERC-II, CTO-15, WAD 7
PCB SOIL REMOVAL FIELD WORK VARIANCE
Former Atlas Missile Silo Sites 3, 4, 6, and 8

Chain of Custody Number 102005-0001

Sample Number OFT4-1PR *Collection Date* 10-17-05

Location/ID Silo 4 outfall *Collection Time* 1545

___ *Waste Profile* X *Outfall Trench* ___ *Backfill Source Material*

Sampling Depth 15ft below top of outfall pipe (3ft below surface)

Sample Type X *Field Sample* ___ *Blind Duplicate* ___ *USACE Triplicate/Split*
___ *MS/MSD* ___ *Rinse Blank*

Sampling Method
___ *Encore* X *Disposable Scoop/Stainless Steel Bowl* ___ *other:* ___

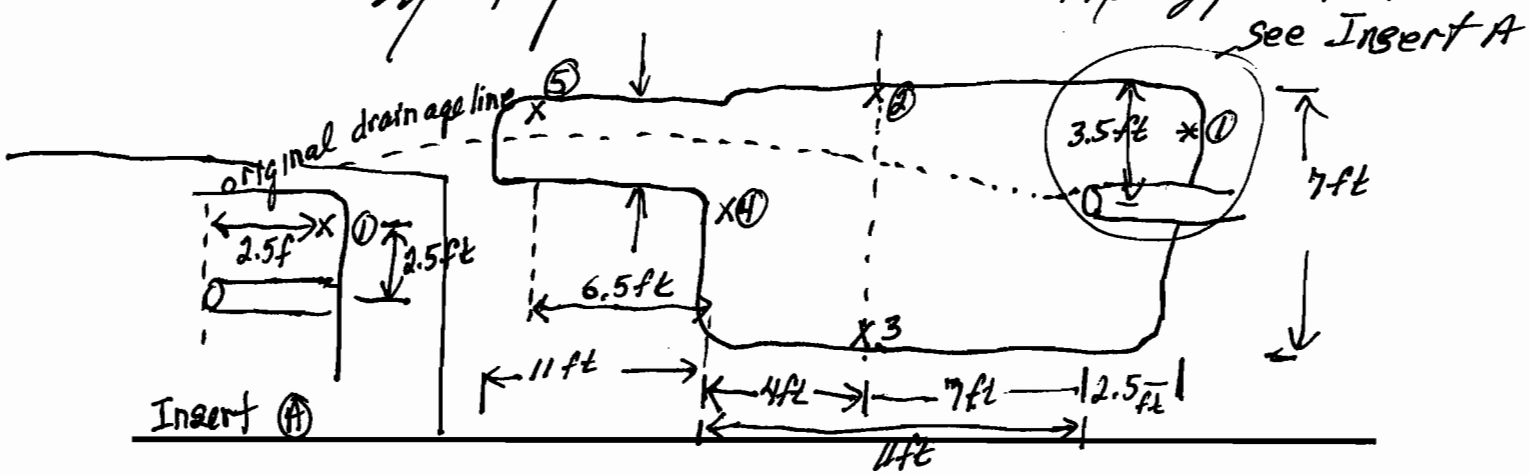
Sampling Team Members Phaneuf, Givens

QC Sample Associations ___

Collected	QTY	SIZE	TYPE/Preservation	PARAMETER	METHOD
	1	4 oz	glass/4°C	TPH	418.1
✓	1	4 oz	glass/4°C	PCB	8082
Rinse Blank					
	2	1L	glass/4°C	PCB	8082

Comments/Descriptions: ___

Logged By / Date: Mike Phaneuf 10-17-05 ***Reviewed By /Date:*** Mark Lyon 10/24/05



Shaw™ Shaw Environmental, Inc.

Soil Sample Collection Log

USACE SACTERC-II, CTO-15, WAD 7
PCB SOIL REMOVAL FIELD WORK VARIANCE
Former Atlas Missile Silo Sites 3, 4, 6, and 8

Chain of Custody Number 102005-0001

Sample Number OFT4-2PR *Collection Date* 10-17-05

Location/ID Silo 4 outfall *Collection Time* 1549

___ *Waste Profile* X *Outfall Trench* ___ *Backfill Source Material*

Sampling Depth 2.5 feet below top of outfall pipe (4ft below surface

Sample Type X *Field Sample* ___ *Blind Duplicate* ___ *USACE Triplicate/Split*
___ *MS/MSD* ___ *Rinse Blank*

Sampling Method
___ *Encore* X *Disposable Scoop/Stainless Steel Bowl* ___ *other:* ___

Sampling Team Members Pheneuf, Givens

QC Sample Associations ___

Collected	QTY	SIZE	TYPE/Preservation	PARAMETER	METHOD
	1	4 oz	glass/4°C	TPH	418.1
✓	1	4 oz	glass/4°C	PCB	8082
Rinse Blank					
	2	1L	glass/4°C	PCB	8082

Comments/Descriptions: West side wall
See Figure on OFT4-1PR

Logged By / Date: 10-17-05 ***Reviewed By /Date:*** 10/24/05

Shaw™ Shaw Environmental, Inc.

Soil Sample Collection Log

USACE SACTERC-II, CTO-15, WAD 7
PCB SOIL REMOVAL FIELD WORK VARIANCE
Former Atlas Missile Silo Sites 3, 4, 6, and 8

Chain of Custody Number 102005-0001

Sample Number OFT4-3PR *Collection Date* 10-17-05

Location/ID Silo 4 Outfall *Collection Time* 1553

___ *Waste Profile* X *Outfall Trench* ___ *Backfill Source Material*

Sampling Depth 1.5 feet below top of outfall pipe (3.5 feet below surface)

Sample Type X *Field Sample* ___ *Blind Duplicate* ___ *USACE Triplicate/Split*
___ *MS/MSD* ___ *Rinse Blank*

Sampling Method
___ *Encore* X *Disposable Scoop/Stainless Steel Bowl* ___ *other:* ___

Sampling Team Members Phaneuf, Givens

QC Sample Associations ___ ___ ___

Collected	QTY	SIZE	TYPE/Preservation	PARAMETER	METHOD
	1	4 oz	glass/4°C	TPH	418.1
✓	1	4 oz	glass/4°C	PCB	8082
Rinse Blank					
	2	1L	glass/4°C	PCB	8082

Comments/Descriptions: East wall of trench
See Figure on OFT4-1PR

Logged By / Date: 10-17-05 ***Reviewed By /Date:*** 10/24/05

Shaw™ Shaw Environmental, Inc.

Soil Sample Collection Log

USACE SACTERC-II, CTO-15, WAD 7
PCB SOIL REMOVAL FIELD WORK VARIANCE
Former Atlas Missile Silo Sites 3, 4, 6, and 8

Chain of Custody Number 102005-0001

Sample Number OFT4-4PR *Collection Date* 10-17-05

Location/ID Silo 4 outfall *Collection Time* 1556

___ *Waste Profile* ✓ *Outfall Trench* ___ *Backfill Source Material*

Sampling Depth 3.5 feet below surface elevation

Sample Type ✓ *Field Sample* ___ *Blind Duplicate* ___ *USACE Triplicate/Split*
___ *MS/MSD* ___ *Rinse Blank*

Sampling Method
___ *Encore* X *Disposable Scoop/Stainless Steel Bowl* ___ *other:* ___

Sampling Team Members Phaneuf, Givens

QC Sample Associations ___ ___ ___

Collected	QTY	SIZE	TYPE/Preservation	PARAMETER	METHOD
	1	4 oz	glass/4°C	TPH	418.1
✓	1	4 oz	glass/4°C	PCB	8082
Rinse Blank					
	2	1L	glass/4°C	PCB	8082

Comments/Descriptions: South end of ~~larger~~ CAC trench at base of wall - See figure on OFT4-1PR

Logged By / Date: MHP 10-17-05 ***Reviewed By /Date:*** Mark Lyon 10/24/05

Shaw™ Shaw Environmental, Inc.

Soil Sample Collection Log

USACE SACTERC-II, CTO-15, WAD 7
PCB SOIL REMOVAL FIELD WORK VARIANCE
Former Atlas Missile Silo Sites 3, 4, 6, and 8

Chain of Custody Number 102005-0001

Sample Number OFT4-5PR *Collection Date* 10-17-05

Location/ID Silo 4 outfall *Collection Time* 1600

___ *Waste Profile* X *Outfall Trench* ___ *Backfill Source Material*

Sampling Depth 3.5 ft below surface

Sample Type X *Field Sample* ___ *Blind Duplicate* ___ *USACE Triplicate/Split*
___ *MS/MSD* ___ *Rinse Blank*

Sampling Method
___ *Encore* X *Disposable Scoop/Stainless Steel Bowl* ___ *other:* ___

Sampling Team Members Pheneuf, Givens (MJP)

QC Sample Associations OFD4-PR ~~OFS~~ + OFS4-PR

Collected	QTY	SIZE	TYPE/Preservation	PARAMETER	METHOD
	1	4 oz	glass/4°C	TPH	418.1
✓	1	4 oz	glass/4°C	PCB	8082
Rinse Blank					
	2	1L	glass/4°C	PCB	8082

Comments/Descriptions: South end of larger trench at base of end wall See Figure on OFT4-1PR Floor of trench is hard pan caliche - unable to sample from floor.

Logged By / Date: MJP 10-17-05 **Reviewed By /Date:** Mark Lyon 10/24/05

Field duplicate and USACE split samples collected here.

Shaw™ Shaw Environmental, Inc.

Soil Sample Collection Log

USACE SACTERC-II, CTO-15, WAD 7
PCB SOIL REMOVAL FIELD WORK VARIANCE
Former Atlas Missile Silo Sites 3, 4, 6, and 8

Chain of Custody Number 102005-0001

Sample Number OFD4-PR *Collection Date* 10-17-05

Location/ID Silo 4 Outfall *Collection Time* 1600

___ *Waste Profile* X *Outfall Trench* ___ *Backfill Source Material*

Sampling Depth 3.5ft below surface

Sample Type ___ *Field Sample* X *Blind Duplicate* ___ *USACE Triplicate/Split*
X *MS/MSD* ___ *Rinse Blank*

Sampling Method
___ *Encore* ___ *Disposable Scoop/Stainless Steel Bowl* ___ *other:* ___

Sampling Team Members Phaneuf, Givens

QC Sample Associations OFS4-PR

Collected	QTY	SIZE	TYPE/Preservation	PARAMETER	METHOD
	1	4 oz	glass/4°C	TPH	418.1
✓	1	4 oz	glass/4°C	PCB	8082
Rinse Blank					
	2	1L	glass/4°C	PCB	8082

Comments/Descriptions: South end of larger trench at base of end wall See fig. ~~4~~ 5 on OFT4-1PR -See notes on OFT4-4PR (colocated with OFT4-4PR)

Logged By / Date: [signature] 10-17-05 **Reviewed By /Date:** MJP [signature] 10/24/05

Shaw™ Shaw Environmental, Inc.

Soil Sample Collection Log

USACE SACTERC-II, CTO-15, WAD 7
PCB SOIL REMOVAL FIELD WORK VARIANCE
Former Atlas Missile Silo Sites 3, 4, 6, and 8

Chain of Custody Number 102005-0002

Sample Number OFS4-PR *Collection Date* 10-17-05

Location/ID Silo 4 outfall *Collection Time* 1600

___ *Waste Profile* X *Outfall Trench* ___ *Backfill Source Material*

Sampling Depth 3.5ft below surface

Sample Type ___ *Field Sample* ___ *Blind Duplicate* X *USACE Triplicate/Split*
___ *MS/MSD* ___ *Rinse Blank*

Sampling Method
___ *Encore* X *Disposable Scoop/Stainless Steel Bowl* ___ *other:* ___

Sampling Team Members Pheneuf, Givens

QC Sample Associations OFD4-PR

Collected	QTY	SIZE	TYPE/Preservation	PARAMETER	METHOD
	1	4 oz	glass/4°C	TPH	418.1
✓	1	4 oz	glass/4°C	PCB	8082
Rinse Blank					
	2	1L	glass/4°C	PCB	8082

Comments/Descriptions: Colocated with OFT4-PR - See fig on OFT4-1PR 5 (MJP)

Logged By / Date: 10-17-05 ***Reviewed By /Date:*** 10/24/05

Shaw™ Shaw Environmental, Inc.

Soil Sample Collection Log

USACE SACTERC-II, CTO-15, WAD 7
PCB SOIL REMOVAL FIELD WORK VARIANCE
Former Atlas Missile Silo Sites 3, 4, 6, and 8

4 (MJP)

Chain of Custody Number 842086-245797214-090805-0001

Sample Number OF6-TC *Collection Date* 9-8-05

Location/ID Silo X Outfall Drainage Area *Collection Time* 1050

X *Waste Profile* 4 (MJP) *Outfall Trench* ___ *Backfill Source Material*

Sampling Depth 0.5'-1.0'

Sample Type X *Field Sample* ___ *Blind Duplicate* ___ *USACE Triplicate/Split*
___ *MS/MSD* ___ *Rinse Blank*

Sampling Method
___ *Encore* X *Disposable Scoop/Stainless Steel Bowl* ___ *other:* ___

Sampling Team Members Phaneuf, Stone

QC Sample Associations NA — —

Collected	QTY	SIZE	TYPE/Preservation	PARAMETER	METHOD
✓	1	4 oz	glass/4°C	TPH	418.1
—	1	4 oz	glass/4°C	PCB	8082
Rinse Blank					
—	2	1L	glass/4°C	PCB	8082

Comments/Descriptions: Soil (composite) from 3 holes hand dug to 1' bgs in a stainless steel bowl. Holes located approx 1', 3', and 5' from end of outfall pipe

Logged By / Date: 9-8-05 ***Reviewed By /Date:*** 9/9/05

PN: 842086.07103010

Appendix A3
Chain-of-Custody Forms

SHAW ENVIRONMENTAL, INC. -- USACE SAC TERC
Former Atlas Missile Silos
Generic Chain of Custody

Field Copy

Reference Case
Client No: 07103070
SDG No:
L

Date Shipped:	9/8/2005
Carrier Name:	FedEx
Airbill:	8520 7303 0063
Shipped to:	Kemron Environmental Services, Inc. 156 Starlite Drive Marietta OH 45750 (800) 373-4071

Chain of Custody Record

Relinquished By	(Date / Time)	Received By	(Date / Time)
1			
2			
3			
4			

Sampler Signature:

For Lab Use Only
Lab Contract No:
Unit Price:
Transfer To:
Lab Contract No:
Unit Price:

SAMPLE No.	MATRIX/ SAMPLER	CONC/ TYPE	ANALYSIS/ TURNAROUND	TAG No./ PRESERVATIVE/ Bottles	STATION LOCATION	SAMPLE COLLECT DATE/TIME		FOR LAB USE ONLY Sample Condition On Receipt
OF4-TC	Soil/ Mark Phaneuf	/G	418.1 (21)	112 (Ice Only) (1)	OF4-TC	S: 9/8/2005	10:50	
OF6-TC	Soil/ Mark Phaneuf	/G	418.1 (21)	120 (Ice Only) (1)	OF6-TC	S: 9/7/2005	13:30	
OF8-TC	Soil/ Shaundra Stone	/G	418.1 (21)	128 (Ice Only) (1)	OF8-TC	S: 9/7/2005	14:35	

Shipment for Case Complete?N	Sample(s) to be used for laboratory QC:	Additional Sampler Signature(s):	Cooler Temperature Upon Receipt:	Chain of Custody Seal Number:
Analysis Key: 418.1 = TPH	Concentration: L = Low, M = Low/Medium, H = High	Type/Designate: Composite = C, Grab = G		Custody Seal Intact? ___ Shipment Iced? ___

TR Number: 842086-245797214-090805-0001

PR provides preliminary results. Requests for preliminary results will increase analytical costs.
Send Copy to: Shaw Environmental, Inc., Attn: Mark Lyon, 5301 Central Ave. NE, Ste. 700, Albuquerque, NM 87108
(505) 262-8020 phone (505) 262-8855 fax

LABORATORY COPY

SHAW ENVIRONMENTAL, INC. -- USACE SAC TERC
Former Atlas Missile Silos
Generic Chain of Custody

Reference Case
Client No: 07103070
SDG No:
L

Date Shipped:	10/21/2005
Carrier Name:	FedEx
Airbill:	8520 7303 0052
Shipped to:	Kemron Environmental Services, Inc. 156 Starlite Drive Marietta OH 45750 (800) 373-4071

Chain of Custody Record

Relinquished By	(Date / Time)	Sampler Signature: Received By	(Date / Time)
1			
2			
3			
4			

For Lab Use Only
Lab Contract No:
Unit Price:
Transfer To:
Lab Contract No:
Unit Price:

SAMPLE No.	MATRIX/ SAMPLER	CONC/ TYPE	ANALYSIS/ TURNAROUND	TAG No./ PRESERVATIVE/ Bottles	STATION LOCATION	SAMPLE COLLECT DATE/TIME		FOR LAB USE ONLY Sample Condition On Receipt
EB-1PR	Field QC/ Craig Givens	/G	EPA 8082 (21)	103 (Ice Only), 104 (Ice Only) (2)	EB-1PR	S: 10/17/2005	14:15	
OF-1BF	Soil/ Craig Givens	/G	418.1 (21), EPA 8082 (21)	101 (Ice Only) (~~2~~) 1 MM 10-24-05	OF-1BF	S: 10/18/2005	14:20	
OF-2BF	Soil/ Mark Phaneuf	/G	418.1 (21), EPA 8082 (21)	102 (Ice Only) (~~2~~) 1	OF-2BF	S: 10/20/2005	14:45	
OFD3-PR	Soil/ Mark Phaneuf	/G	EPA 8082 (21)	105 (Ice Only) (1)	OFD3-PR	S: 10/17/2005	10:33	
OFD4-PR	Soil/ Mark Phaneuf	/G	EPA 8082 (21)	113 (Ice Only) (1)	OFD4-PR	S: 10/17/2005	16:00	
OFD6-PR	Soil/ Mark Phaneuf	/G	EPA 8082 (21)	121 (Ice Only) (1)	OFD6-PR	S: 10/19/2005	14:35	
OFD8-PR	Soil/ Mark Phaneuf	/G	EPA 8082 (21)	129 (Ice Only) (1)	OFD8-PR	S: 10/20/2005	13:40	
OFT3-1PR	Soil/ Mark Phaneuf	/G	EPA 8082 (21)	107 (Ice Only) (1)	OFT3-1PR	S: 10/17/2005	10:25	
OFT3-2PR	Soil/ Mark Phaneuf	/G	EPA 8082 (21)	108 (Ice Only) (1)	OFT3-2PR	S: 10/17/2005	10:28	
OFT3-3PR	Soil/ Mark Phaneuf	/G	EPA 8082 (21)	109 (Ice Only) (1)	OFT3-3PR	S: 10/17/2005	10:30	

Field copy

Shipment for Case Complete? Y	Sample(s) to be used for laboratory QC: OFD3-PR, OFD4-PR, OFD6-PR, OFD8-PR	Additional Sampler Signature(s):	Cooler Temperature Upon Receipt:	Chain of Custody Seal Number:
Analysis Key:	Concentration: L = Low, M = Low/Medium, H = High	Type/Designate: Composite = C, Grab = G		Custody Seal Intact? ___ Shipment Iced? ___

418.1 = TPH, EPA 8082 = PCB Aroclors

TR Number: 842086-245797214-102005-0001

PR provides preliminary results. Requests for preliminary results will increase analytical costs.
Send Copy to: Shaw Environmental, Inc., Attn: Mark Lyon, 5301 Central Ave. NE, Ste. 700, Albuquerque, NM 87108
(505) 262-8020 phone (505) 262-8855 fax

LABORATORY COPY

SHAW ENVIRONMENTAL, INC. -- USACE SAC TERC
Former Atlas Missile Silos
Generic Chain of Custody

Reference Case
Client No: 07103070
SDG No:
L

Date Shipped:	10/21/2005
Carrier Name:	FedEx
Airbill:	8520 7303 0052
Shipped to:	Kemron Environmental Services, Inc. 156 Starlite Drive Marietta OH 45750 (800) 373-4071

Chain of Custody Record

Relinquished By	(Date / Time)	Sampler Signature: Received By	(Date / Time)
1			
2			
3			
4			

For Lab Use Only
Lab Contract No:
Unit Price:
Transfer To:
Lab Contract No:
Unit Price:

SAMPLE No.	MATRIX/ SAMPLER	CONC/ TYPE	ANALYSIS/ TURNAROUND	TAG No./ PRESERVATIVE/ Bottles	STATION LOCATION	SAMPLE COLLECT DATE/TIME		FOR LAB USE ONLY Sample Condition On Receipt
OFT3-4PR	Soil/ Mark Phaneuf	/G	EPA 8082 (21)	110 (Ice Only) (1)	OFT3-4PR	S: 10/17/2005	10:33	
OFT3-5PR	Soil/ Mark Phaneuf	/G	EPA 8082 (21)	111 (Ice Only) (1)	OFT3-5PR	S: 10/17/2005	10:35	
OFT4-1PR	Soil/ Mark Phaneuf	/G	EPA 8082 (21)	115 (Ice Only) (1)	OFT4-1PR	S: 10/17/2005	15:45	
OFT4-2PR	Soil/ Mark Phaneuf	/G	EPA 8082 (21)	116 (Ice Only) (1)	OFT4-2PR	S: 10/17/2005	15:49	
OFT4-3PR	Soil/ Mark Phaneuf	/G	EPA 8082 (21)	117 (Ice Only) (1)	OFT4-3PR	S: 10/17/2005	15:53	
OFT4-4PR	Soil/ Mark Phaneuf	/G	EPA 8082 (21)	118 (Ice Only) (1)	OFT4-4PR	S: 10/17/2005	15:56	
OFT4-5PR	Soil/ Mark Phaneuf	/G	EPA 8082 (21)	119 (Ice Only) (1)	OFT4-5PR	S: 10/17/2005	16:00	
OFT6-1PR	Soil/ Mark Phaneuf	/G	EPA 8082 (21)	123 (Ice Only) (1)	OFT6-1PR	S: 10/19/2005	14:35	
OFT6-2PR	Soil/ Mark Phaneuf	/G	EPA 8082 (21)	124 (Ice Only) (1)	OFT6-2PR	S: 10/19/2005	14:39	
OFT6-3PR	Soil/ Mark Phaneuf	/G	EPA 8082 (21)	125 (Ice Only) (1)	OFT6-3PR	S: 10/19/2005	14:45	

Field Copy

Shipment for Case Complete? Y	Sample(s) to be used for laboratory QC:	Additional Sampler Signature(s):	Cooler Temperature Upon Receipt:	Chain of Custody Seal Number:
	OFD3-PR, OFD4-PR, OFD6-PR, OFD8-PR			

Analysis Key: **Concentration:** L = Low, M = Low/Medium, H = High **Type/Designate:** Composite = C, Grab = G
Custody Seal Intact? ___ Shipment Iced? ___

418.1 = TPH, EPA 8082 = PCB Aroclors

TR Number: 842086-245797214-102005-0001

PR provides preliminary results. Requests for preliminary results will increase analytical costs.
Send Copy to: Shaw Environmental, Inc., Attn: Mark Lyon, 5301 Central Ave. NE, Ste. 700, Albuquerque, NM 87108
(505) 262-8020 phone (505) 262-8855 fax

LABORATORY COPY

SHAW ENVIRONMENTAL, INC. -- USACE SAC TERC
Former Atlas Missile Silos
Generic Chain of Custody

Reference Case
Client No: 07103070
SDG No:

L

Date Shipped:	10/21/2005
Carrier Name:	FedEx
Airbill:	8520 7303 0052
Shipped to:	Kemron Environmental Services, Inc. 156 Starlite Drive Marietta OH 45750 (800) 373-4071

Chain of Custody Record

Relinquished By	(Date / Time)	Received By	(Date / Time)
1			
2			
3			
4			

Sampler Signature:

For Lab Use Only

Lab Contract No:
Unit Price:
Transfer To:
Lab Contract No:
Unit Price:

SAMPLE No.	MATRIX/ SAMPLER	CONC/ TYPE	ANALYSIS/ TURNAROUND	TAG No./ PRESERVATIVE/ Bottles	STATION LOCATION	SAMPLE COLLECT DATE/TIME		FOR LAB USE ONLY Sample Condition On Receipt
OFT6-4PR	Soil/ Mark Phaneuf	/G	EPA 8082 (21)	126 (Ice Only) (1)	OFT6-4PR	S: 10/19/2005	14:50	
OFT6-5PR	Soil/ Mark Phaneuf	/G	EPA 8082 (21)	127 (Ice Only) (1)	OFT6-5PR	S: 10/19/2005	14:55	
OFT8-1PR	Soil/ Mark Phaneuf	/G	EPA 8082 (21)	131 (Ice Only) (1)	OFT8-1PR	S: 10/20/2005	13:35	
OFT8-2PR	Soil/ Mark Phaneuf	/G	EPA 8082 (21)	132 (Ice Only) (1)	OFT8-2PR	S: 10/20/2005	13:40	
OFT8-3PR	Soil/ Mark Phaneuf	/G	EPA 8082 (21)	133 (Ice Only) (1)	OFT8-3PR	S: 10/20/2005	13:45	
OFT8-4PR	Soil/ Mark Phaneuf	/G	EPA 8082 (21)	134 (Ice Only) (1)	OFT8-4PR	S: 10/20/2005	13:49	
OFT8-5PR	Soil/ Mark Phaneuf	/G	EPA 8082 (21)	135 (Ice Only) (1)	OFT8-5PR	S: 10/20/2005	13:52	

Field Copy

Shipment for Case Complete? Y	Sample(s) to be used for laboratory QC:	Additional Sampler Signature(s):	Cooler Temperature Upon Receipt:	Chain of Custody Seal Number:
	OFD3-PR, OFD4-PR, OFD6-PR, OFD8-PR			

Analysis Key: **Concentration:** L = Low, M = Low/Medium, H = High **Type/Designate:** Composite = C, Grab = G

Custody Seal Intact? ___ Shipment Iced? ___

418.1 = TPH, EPA 8082 = PCB Aroclors

TR Number: 842086-245797214-102005-0001

PR provides preliminary results. Requests for preliminary results will increase analytical costs.
Send Copy to: Shaw Environmental, Inc., Attn: Mark Lyon, 5301 Central Ave. NE, Ste. 700, Albuquerque, NM 87108
(505) 262-8020 phone (505) 262-8855 fax

LABORATORY COPY

EPA

SHAW ENVIRONMENTAL, INC. -- USACE SAC TERC
Former Atlas Missile Silos
Generic Chain of Custody

Reference Case
Client No: 07103070
SDG No:

L

Date Shipped:	10/21/2005
Carrier Name:	FedEx
Airbill:	851753212005
Shipped to:	USACE Omaha Laboratory 420 South 18th Street Attn.: Sample Receiving, LIMS # Omaha NE 68102 (402) 444-4313

Chain of Custody Record

Relinquished By	(Date / Time)	Received By	(Date / Time)
1			
2			
3			
4			

Sampler Signature:

For Lab Use Only

Lab Contract No:
Unit Price:
Transfer To:
Lab Contract No:
Unit Price:

SAMPLE No.	MATRIX/ SAMPLER	CONC/ TYPE	ANALYSIS/ TURNAROUND	TAG No./ PRESERVATIVE/ Bottles	STATION LOCATION	SAMPLE COLLECT DATE/TIME		FOR LAB USE ONLY Sample Condition On Receipt
OFS3-PR	Soil/ Mark Phaneuf	/G	EPA 8082 (21)	106 (Ice Only) (1)	OFS3-PR	S: 10/17/2005	10:33	
OFS4-PR	Soil/ Mark Phaneuf	/G	EPA 8082 (21)	114 (Ice Only) (1)	OFS4-PR	S: 10/17/2005	16:00	
OFS6-PR	Soil/ Mark Phaneuf	/G	EPA 8082 (21)	122 (Ice Only) (1)	OFS6-PR	S: 10/19/2005	14:35	
OFS8-PR	Soil/ Mark Phaneuf	/G	EPA 8082 (21)	130 (Ice Only) (1)	OFS8-PR	S: 10/20/2005	13:40	

Field Copy

Shipment for Case Complete? Y	Sample(s) to be used for laboratory QC:	Additional Sampler Signature(s):	Cooler Temperature Upon Receipt:	Chain of Custody Seal Number:
Analysis Key:	Concentration: L = Low, M = Low/Medium, H = High	Type/Designate: Composite = C, Grab = G		Custody Seal Intact? ___ Shipment Iced? ___

EPA 8082 = PCB Aroclors

TR Number: 842086-245797214-102005-0002

PR provides preliminary results. Requests for preliminary results will increase analytical costs.
Send Copy to: Shaw Environmental, Inc., Attn: Mark Lyon, 5301 Central Ave. NE, Ste. 700, Albuquerque, NM 87108
(505) 262-8020 phone (505) 262-8855 fax

LABORATORY COPY

Appendix B
Waste Manifests

Please print or type
(Form designed for use on elite (12-pitch) typewriter.)

NON-HAZARDOUS WASTE MANIFEST

1. Generator's US EPA ID No. | Manifest Doc. No. | 2. Page 1 of

GENERATOR

3. Generator's Name and Mailing Address: U.S. Army Corps of Engineers, 4101 Jefferson Plaza NE, Albuquerque, NM 87109-3435
4. Generator's Phone ( )

Former Atlas Missile Silo #3 (36 mi NE Roswell US Hwy 70)

5. Transporter 1 Company Name: Diamondback Disposal Services
6. US EPA ID Number
A. Transporter's Phone: (505) 392-9996

7. Transporter 2 Company Name
8. US EPA ID Number
B. Transporter's Phone

9. Designated Facility Name and Site Address: DP619 - 8 miles South of Hobbs on Hwy. 18, Lea County, N.M.
10. US EPA ID Number
C. Facility's Phone: (505) 392-9996

11. Waste Shipping Name and Description	12. Containers No.	Type	13. Total Quantity	14. Unit Wt/Vol
a. Hydrocarbon Impacted Soils	1	Belly	20 yds	CY
b. Clean fill	1	Belly	20 yds	CY
c.				
d.				

D. Additional Descriptions for Materials Listed Above: NON-Hazardous

E. Handling Codes for Wastes Listed Above

15. Special Handling Instructions and Additional Information
#5 Address: PO Box 2491, Hobbs, NM 88241

16. **GENERATOR'S CERTIFICATION:** I certify the materials described above on this manifest are not subject to federal regulations for reporting proper disposal of Hazardous Waste.

Printed/Typed Name	Signature	Month	Day	Year
DAVID L. HOLLADAY	David L Holladay	10	19	05

TRANSPORTER

17. Transporter 1 Acknowledgement of Receipt of Materials

Printed/Typed Name	Signature	Month	Day	Year
Michael Bigbee	Michael Bigbee	10	19	05

18. Transporter 2 Acknowledgement of Receipt of Materials

Printed/Typed Name	Signature	Month	Day	Year

FACILITY

19. Discrepancy Indication Space

20. Facility Owner or Operator: Certification of receipt of waste materials covered by this manifest except as noted in Item 19.

Printed/Typed Name	Signature	Month	Day	Year
Justin Roberts	Justin R	10	19	05

Printed by J.J. KELLER & ASSOCIATES, INC.
Neenah, WI 54957-0368

ORIGINAL – RETURN TO GENERATOR

12-BLS-C5 Rev. 12/98

Please print or type
(Form designed for use on elite (12-pitch) typewriter.)

NON-HAZARDOUS WASTE MANIFEST

1. Generator's US EPA ID No. | Manifest Doc. No. | 2. Page 1 of

GENERATOR

3. Generator's Name and Mailing Address: U.S. Army Corps of Engineers, 4101 Jefferson Plaza N.E., Albuquerque, NM 87109-3435

4. Generator's Phone ( )

Former Atlas Missile Silo 3 (36 mi NE Roswell, Hwy 70)

5. Transporter 1 Company Name: Diamondback Disposal Services | 6. US EPA ID Number | A. Transporter's Phone: (505) 392-9996

7. Transporter 2 Company Name | 8. US EPA ID Number | B. Transporter's Phone

9. Designated Facility Name and Site Address: DP619 - 8 miles South of Hobbs on Hwy. 18, Lea County, N.M. | 10. US EPA ID Number | C. Facility's Phone: (505) 392-9996

11. Waste Shipping Name and Description	12. Containers No.	12. Containers Type	13. Total Quantity	14. Unit Wt/Vol
a. Hydrocarbon Impacted Soil	1	Belly	20	CY
b. CLEAN FILL	1	Belly	20	CY
c.				
d.				

D. Additional Descriptions for Materials Listed Above: NON-Hazardous

E. Handling Codes for Wastes Listed Above

15. Special Handling Instructions and Additional Information
#5 Address - PO Box 2491, Hobbs, NM 88241

16. **GENERATOR'S CERTIFICATION:** I certify the materials described above on this manifest are not subject to federal regulations for reporting proper disposal of Hazardous Waste.

Printed/Typed Name: DAVID L. HOLLADAY | Signature: David L Holladay | Month 10 | Day 18 | Year 05

TRANSPORTER

17. Transporter 1 Acknowledgement of Receipt of Materials

Printed/Typed Name: Michael Bigbee | Signature: Michael Bigbee | Month 10 | Day 18 | Year 05

18. Transporter 2 Acknowledgement of Receipt of Materials

Printed/Typed Name | Signature | Month | Day | Year

FACILITY

19. Discrepancy Indication Space

20. Facility Owner or Operator: Certification of receipt of waste materials covered by this manifest except as noted in Item 19.

Printed/Typed Name: Justin Roberts | Signature: Justin Roberts | Month 10 | Day 18 | Year 05

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ORIGINAL – RETURN TO GENERATOR

Please print or type.
(Form designed for use on elite (12-pitch) typewriter.)

NON-HAZARDOUS WASTE MANIFEST

1. Generator's US EPA ID No. | Manifest Doc. No. | 2. Page 1 of

GENERATOR

3. Generator's Name and Mailing Address: U.S. Army Corps. of Engineers, 4101 Jefferson Plaza NE. Albuquerque, NM 87109-3435
4. Generator's Phone ( )

Former Atlas Missile Silo 4, 20 mi E Roswell, Hwy 380

5. Transporter 1 Company Name: Diamondback Disposal Services
6. US EPA ID Number
A. Transporter's Phone: (505) 392-9996

7. Transporter 2 Company Name
8. US EPA ID Number
B. Transporter's Phone

9. Designated Facility Name and Site Address: DP619 - 8 mile S. of Hobbs. on Hwy 18 - Lea County, N.M.
10. US EPA ID Number
C. Facility's Phone: (505) 392-9996

11. Waste Shipping Name and Description	12. Containers No.	Type	13. Total Quantity	14. Unit Wt/Vol
a. Hydrocarbon impacted Soils	1	Belly	20	CY
b. CLEAN Backfill	1	Belly	20	CY
c.				
d.				

D. Additional Descriptions for Materials Listed Above: Non-Hazardous

E. Handling Codes for Wastes Listed Above

15. Special Handling Instructions and Additional Information
#5 Address - PO BOX 2491 Hobbs, NM 88241

16. **GENERATOR'S CERTIFICATION:** I certify the materials described above on this manifest are not subject to federal regulations for reporting proper disposal of Hazardous Waste.

Printed/Typed Name	Signature	Month	Day	Year
DAVID L. HOLLADAY	David L Holladay	10	18	05

TRANSPORTER

17. Transporter 1 Acknowledgement of Receipt of Materials

Printed/Typed Name	Signature	Month	Day	Year
Michael Bigbee	Michael Bigbee	10	18	05

18. Transporter 2 Acknowledgement of Receipt of Materials

Printed/Typed Name	Signature	Month	Day	Year

FACILITY

19. Discrepancy Indication Space

20. Facility Owner or Operator: Certification of receipt of waste materials covered by this manifest except as noted in Item 19.

Printed/Typed Name	Signature	Month	Day	Year
Justin Roberts	Justin Roberts	10	18	05

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ORIGINAL – RETURN TO GENERATOR

Please print or type.
(Form designed for use on elite (12-pitch) typewriter.)

NON-HAZARDOUS WASTE MANIFEST

1. Generator's US EPA ID No. | Manifest Doc. No. | 2. Page 1 of

GENERATOR

3. Generator's Name and Mailing Address: U.S. Army Corps of Engineers, 4101 Jefferson Plaza NE., Albuquerque, NM 87109-3435
4. Generator's Phone ( )

Former Atlas Missile Silo 6, 30 mi E. Hagerman Hwy 249

5. Transporter 1 Company Name: Diamondback Disposal Services | 6. US EPA ID Number | A. Transporter's Phone: (505) 392-9996
7. Transporter 2 Company Name | 8. US EPA ID Number | B. Transporter's Phone
9. Designated Facility Name and Site Address: DP619 - 8 miles South of Hobbs a Hwy 18. Lea County, NM | 10. US EPA ID Number | C. Facility's Phone: (505) 392-9996

11. Waste Shipping Name and Description	12. Containers No.	Type	13. Total Quantity	14. Unit Wt/Vol
a. Hydrocarbon impacted Soils	1	Belly	20	CY
b. CLEAN BACKFILL	1	Belly	20	CY
c.				
d.				

D. Additional Descriptions for Materials Listed Above: Non-Hazardous

E. Handling Codes for Wastes Listed Above

15. Special Handling Instructions and Additional Information: #5 Address - PO Box 2491, Hobbs, NM 88241

TRANSPORTER

16. **GENERATOR'S CERTIFICATION:** I certify the materials described above on this manifest are not subject to federal regulations for reporting proper disposal of Hazardous Waste.

Printed/Typed Name	Signature	Month	Day	Year
DAVID L. HOLLADAY	David L Holladay	10	20	05

17. Transporter 1 Acknowledgement of Receipt of Materials

Printed/Typed Name	Signature	Month	Day	Year
Michael Bigbee	Michael Bigbee	10	20	05

18. Transporter 2 Acknowledgement of Receipt of Materials

Printed/Typed Name	Signature	Month	Day	Year

FACILITY

19. Discrepancy Indication Space

20. Facility Owner or Operator: Certification of receipt of waste materials covered by this manifest except as noted in Item 19.

Printed/Typed Name	Signature	Month	Day	Year
Justin Roberts		10	20	05

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ORIGINAL – RETURN TO GENERATOR

12-BLS-C5 Rev. 12/98

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(Form designed for use on elite (12-pitch) typewriter.)

NON-HAZARDOUS WASTE MANIFEST

1. Generator's US EPA ID No. | Manifest Doc. No. | 2. Page 1 of

GENERATOR

3. Generator's Name and Mailing Address: U.S. Army Corps of Engineers, 4101 Jefferson Plaza NE, Albuquerque, NM 87109-3435

4. Generator's Phone ( )

Former Atlas Missile Silo #6 30 mi East of Hagerman on Hwy 249

TRANSPORTER

5. Transporter 1 Company Name: Diamondback Disposal Services | 6. US EPA ID Number | A. Transporter's Phone: (505) 392-9996

7. Transporter 2 Company Name | 8. US EPA ID Number | B. Transporter's Phone

FACILITY

9. Designated Facility Name and Site Address: DP619 - 8 miles South of Hobbs on Hwy 18. Lea County, NM | 10. US EPA ID Number | C. Facility's Phone: (505) 392-9996

11. Waste Shipping Name and Description	12. Containers No.	12. Containers Type	13. Total Quantity	14. Unit Wt/Vol
a. Hydrocarbon impacted soil	1	End	12	CY
b. Clean Backfill	1	End	12	CY
c.				
d.				

D. Additional Descriptions for Materials Listed Above: Non-Hazardous

E. Handling Codes for Wastes Listed Above

15. Special Handling Instructions and Additional Information
#5 Address: PO Box 2491, Hobbs, NM 88241

16. **GENERATOR'S CERTIFICATION:** I certify the materials described above on this manifest are not subject to federal regulations for reporting proper disposal of Hazardous Waste.

Printed/Typed Name	Signature	Month	Day	Year
David L. Holladay	David L Holladay	10	20	05

17. Transporter 1 Acknowledgement of Receipt of Materials

Printed/Typed Name	Signature	Month	Day	Year
Rudy Calderon	Rudy Calderon	10	19	05

18. Transporter 2 Acknowledgement of Receipt of Materials

Printed/Typed Name	Signature	Month	Day	Year
Rudy Calderon	Rudy Calderon	10	19	05

19. Discrepancy Indication Space

20. Facility Owner or Operator: Certification of receipt of waste materials covered by this manifest except as noted in Item 19.

Printed/Typed Name	Signature	Month	Day	Year
Justin Roberts		10	19	05

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ORIGINAL – RETURN TO GENERATOR

Please print or type.
(Form designed for use on elite (12-pitch) typewriter.)

NON-HAZARDOUS WASTE MANIFEST

1. Generator's US EPA ID No. | Manifest Doc. No. | 2. Page 1 of

3. Generator's Name and Mailing Address: U.S. Army Corps of Engineers, 4101 Jefferson Plaza NE, Albuquerque, NM 87109-3435
4. Generator's Phone ( )

Former Atlas Missile Silo 8, .5 mile E. lake Arthur Hwy

5. Transporter 1 Company Name: Diamondback Disposal Services | 6. US EPA ID Number | A. Transporter's Phone: (505) 392-9996
7. Transporter 2 Company Name | 8. US EPA ID Number | B. Transporter's Phone

9. Designated Facility Name and Site Address: DP619 - 8 mile S. of Hobbs on Hwy 18 - Lea County, NM. | 10. US EPA ID Number | C. Facility's Phone: (505) 392-9996

11. Waste Shipping Name and Description	12. Containers No.	Type	13. Total Quantity	14. Unit Wt/Vol
a. Hydrocarbon Impacted Soils	1	Belly	20	Y
b. CLEAN BACKFILL	1	Belly	20	Y
c.				
d.				

D. Additional Descriptions for Materials Listed Above: Non Hazardous

E. Handling Codes for Wastes Listed Above

15. Special Handling Instructions and Additional Information: #5 Address - PO Box 2491, Hobbs, NM 88241

16. **GENERATOR'S CERTIFICATION:** I certify the materials described above on this manifest are not subject to federal regulations for reporting proper disposal of Hazardous Waste.

Printed/Typed Name: DAVID L. HOLLADAY | Signature | Month 10 Day 20 Year 05

17. Transporter 1 Acknowledgement of Receipt of Materials

Printed/Typed Name: Michael Bigbee | Signature: Michael Bigbee | Month 10 Day 20 Year 05

18. Transporter 2 Acknowledgement of Receipt of Materials

Printed/Typed Name | Signature | Month | Day | Year

19. Discrepancy Indication Space

20. Facility Owner or Operator: Certification of receipt of waste materials covered by this manifest except as noted in Item 19.

Printed/Typed Name: Justin Roberts | Signature | Month 10 Day 20 Year 05

GENERATOR — TRANSPORTER — FACILITY

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Neenah, WI 54957-0368

ORIGINAL – RETURN TO GENERATOR

Please print or type.
(Form designed for use on elite (12-pitch) typewriter)

NON-HAZARDOUS WASTE MANIFEST

1. Generator's US EPA ID No. | Manifest Doc. No. | 2. Page 1 of

GENERATOR

3. Generator's Name and Mailing Address: U.S. Army Corps of Engineers, 4101 Jefferson Plaza NE, Albuquerque, NM 87109-3435
4. Generator's Phone ( )

FORMER ATLAS MISSILE Silo #8 .5mile EAST of LAKE ARTHUR on Hwy 2

5. Transporter 1 Company Name: DIAMONDBACK Disposal Services | 6. US EPA ID Number | A. Transporter's Phone: (505) 392-9996
7. Transporter 2 Company Name | 8. US EPA ID Number | B. Transporter's Phone
9. Designated Facility Name and Site Address: DP619- 8 miles South of Hobbs on Hwy 18. Lea County, NM | 10. US EPA ID Number | C. Facility's Phone: (505) 392-9996

11. Waste Shipping Name and Description	12. Containers No.	Type	13. Total Quantity	14. Unit Wt/Vol
a. Hydrocarbon impacted Soil	1	End	12	CY
b. Clean Backfill	1	End	12	CY
c.				
d.				

D. Additional Descriptions for Materials Listed Above: NON-Hazardous

E. Handling Codes for Wastes Listed Above

15. Special Handling Instructions and Additional Information
#5 Address: PO Box 2491, Hobbs, NM 88241

16. **GENERATOR'S CERTIFICATION:** I certify the materials described above on this manifest are not subject to federal regulations for reporting proper disposal of Hazardous Waste.

Printed/Typed Name: DAVID L. HOLLADAY | Signature: David L Holladay | Month 10 | Day 20 | Year 05

TRANSPORTER

17. Transporter 1 Acknowledgement of Receipt of Materials
Printed/Typed Name: Rudy CALDERON | Signature: Rudy Calderon | Month 10 | Day 20 | Year 05

18. Transporter 2 Acknowledgement of Receipt of Materials
Printed/Typed Name: Rudy CALDERON | Signature: Rudy Calderon | Month 10 | Day 20 | Year 05

FACILITY

19. Discrepancy Indication Space

20. Facility Owner or Operator: Certification of receipt of waste materials covered by this manifest except as noted in Item 19.

Printed/Typed Name: Justin Roberts | Signature: Justin Roberts | Month 10 | Day 20 | Year 05

Printed by J.J. KELLER & ASSOCIATES, INC.
Neenah, WI 54957-0368

ORIGINAL – RETURN TO GENERATOR

12 BLS-C5 Rev. 12/98

Appendix C
Laboratory Data Reports
(see "Appendices" folder on this disc)

Appendix D
Automated Data Review
(see "Appendices" folder on this disc)