HAFB2003

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NOV 2003

November 12, 2003

Ms. Sandra Martin
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Subject: Final Phase II RCRA Facility Investigation Work Plan, ERP Site No. DP-62 Rita's Draw, Holloman AFB, New Mexico
USACE - Omaha District, Contract No. DACA45-02-D-0012, DO No. 5

Dear Ms. Martin:

Enclosed please find one (1) copy of the above-referenced document for your review.

Cordially,

Frank Gardner, P.G.
Program Manager

cc w/ enclosures: Cornelius Amindyas (NMED)
Steve Jetter (NMED)
James Harris (USEPA)

LIBRARY COPY

FINAL
PHASE II RCRA FACILITY INVESTIGATION WORK PLAN
ERP SITE No. DP-62 RITAS DRAW

49TH CES/CEV
HOLLOMAN AIR FORCE BASE, NEW MEXICO

Holloman Air Force Base
New Mexico

November 2003

Contract No. DACA45-02-D-0012

Headquarters, Air Combat Command
Langley Air Force Base, Virginia

49 CES/CEV
Holloman Air Force Base, New Mexico

FINAL
PHASE II RCRA FACILITY INVESTIGATION WORK PLAN
ERP SITE NO. DP-62, RITAS DRAW
HOLLOMAN AIR FORCE BASE (HAFB) NEW MEXICO

Prepared for:

49CES/CEV
Holloman Air Force Base
New Mexico

Under Contract To:

U.S. Army Corps of Engineers
Omaha, NE
Under Contract No. DACA45-03-D-0012
Delivery Order No. 05, WAD 03

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NOVEMBER 2003

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FINAL
PHASE II RCRA FACILITY INVESTIGATION WORK PLAN
ERP SITE NO. DP-62, RITAS DRAW

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LIST OF ACRONYMS AND ABBREVIATIONS

µg/kg	micrograms per kilogram
AOC	Area of Concern
bgs	below ground surface
Bhate	Bhate Environmental Associates, Inc.
DO	Delivery Order
DPT	Direct Push Technology
EPA	United States Environmental Protection Agency
ERP	Environmental Restoration Program
ft	feet
HAFB	Holloman Air Force Base
HASP	Health and Safety Plan
JP-4	Jet Fuel
JP-X	Combination of JP-4 and UDMH
mg/kg	milligrams per kilogram
mg/l	milligrams per liter
MSL	Mean Sea Level
NFA	No Further Action
NMED	New Mexico Environment Department
PA	Preliminary Assessment
PID	Photo Ionization Detector
QAPP	Quality Assurance Project Plan
RCRA	Resource Conservation and Recovery Act
RFI	RCRA Facility Investigation
SI	Site Inspection
SOP	Standard Operating Procedures
SVOC	Semi-Volatile Organic Compound
SWMU	Solid Waste Management Unit
TDS	Total Dissolved Solids
TPH	Total Petroleum Hydrocarbons
UDMH	Unsymmetrical Dimethylhydrazine
USACE	U.S. Army Corps of Engineers
VOC	Volatile Organic Compound

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1 INTRODUCTION

The U.S. Army Corps of Engineers, Omaha District (USACE) has retained Bhate Environmental Associates, Inc. (Bhate) to prepare this Phase II Resource Conservation and Recovery Act (RCRA) Facility Investigation (RFI) Work Plan on behalf of Holloman Air Force Base (HAFB) Environmental Restoration Program (ERP) for the New Mexico Environment Department (NMED). This Phase II RFI addresses site DP-62 (Ritas Draw) at Holloman Air Force Base (HAFB), New Mexico. Bhate prepared this document on behalf of HAFB ERP under the Service Contract with the USACE (Contract No. DACA-45-02-D-0012, Delivery Order (DO) No. 5).

The purpose of this Phase II RFI Work Plan is to address verbal comments made by the NMED during a March 4, 2003 site visit to DP-62 and from the review of the HAFB request for No Further Action (NFA) status and site close out of DP-62. NMED comments from the site visit were recorded in the meeting minutes and are the primary basis for the scope of work described within this document.

The request for NFA was based on the original Preliminary Assessment (PA)/Site Inspection (SI) conducted in 1998 (Foster-Wheeler Environmental Corporation and Groundwater Technology, Inc., 1998). The PA/SI was submitted to NMED by HAFB in 1999. Section 3 of this document summarizes the original PA/SI conducted for the site.

1.1 Objectives

The primary objective of the Phase II RFI is to describe the acquisition of additional data derived from soil samples as requested by NMED, to further support the HAFB request for NFA at DP-62. Results derived from the activities described in this Work Plan will be presented under a separate cover once RFI activities are complete and all data has been compiled and analyzed. The objective of this Work Plan is to describe the scope of work, tasks, and methodologies associated with collecting this additional data. The results of the Phase II RFI will be used to prepare a revised recommendation for NFA at DP-62 and/or address any additional concerns. Section 4 of this document details planned RFI activities.

1.2 Approach

The approach adopted to meet the stated primary objective consists of a field investigation to determine if contamination is present in subsurface soil immediately adjacent to partially buried drums located on the sloped edge of an arroyo which intermittently drains into Ritas Draw. Appendix A contains photographs that illustrate some of the drums and additional area features. Soil samples will be collected using direct push technology (DPT) or hand auger boring if the slope does not permit safe egress by DPT equipment. The Phase II RFI at DP-62 will include the following activities:

- Advancement of 4 DPT or hand auger soil borings and collection of soil samples.
- Analyze soil samples for Volatile Organic Compounds (VOCs), Semi-Volatile Organic Compounds (SVOCs), Total Petroleum Hydrocarbons (TPH), and RCRA metals.

A detailed description of the scope of work, which will guide the fieldwork, is presented in Section 4.0.

1.3 Document Organization

Section 2.0 of the document contains a detailed description of the site background. A summary of analytical results from the original PA/SI conducted in 1998 is presented in Section 3.0 (Foster Wheeler Environmental Corporation and Groundwater Technology, Inc. 1998). The Phase II RFI activities are described in Section 4.0. Section 5.0 explains how this effort will be integrated with the Basewide Quality Assurance Project Plan (QAPP). Section 6.0 relates this work plan to the Basewide Health and Safety Plan (HASP). References are contained in Section 7.0.

2 BACKGROUND AND HISTORY

HAFB is situated in south central New Mexico, in the northwest central part of Otero County (Figure 1). HAFB has a population of 6,000 and occupies about 50,000 acres in the northeast quarter of Section 1 Township 17 South, Range 8 East. The White Sands Missile Range testing facilities occupy additional land extending northward from the Base. Private and public owned lands border the remainder of HAFB. The major highway servicing HAFB is Highway 70, which runs southwest from the town of Alamogordo and separates HAFB from publicly owned lands. The nearest town of appreciable size is Alamogordo which has a population of approximately 35,000. Alamogordo is located approximately 7 miles east of the base.

2.1 Physiography

HAFB is located in the Tularosa Basin which is bounded by the San Andreas Mountains to the west and the Sacramento Mountains to the east. The basin's interior plain has low relief, with altitudes ranging from about 4,000 feet (ft) above mean sea level (MSL) in the southwest to approximately 4,400 ft above MSL in the northeast. The bordering mountains rise abruptly to altitudes of 7,000 to 12,000 ft above MSL.

The climate in the Tularosa Basin is arid with annual precipitation averaging 7.9 inches. Most of the precipitation falls as rain from May to October. The winter period is characterized by clear skies with light and intermittent snowfall. March through May is characterized by strong winds with extensive periods of blowing sand and dust. The mean annual evaporation rate in the basin is 67 inches per year. This evaporation rate results in a net annual precipitation rate of minus 59 inches per year which results in a net loss of groundwater due to evapotranspiration (Radian Corporation, 1993).

2.2 Geologic Setting

The Tularosa Basin is a bolson, or a basin with no surface drainage outlet. The sediments of the basin are carried in by water that does not escape. Sediments in the basin are derived from the limestone, dolomite and gypsum deposits found in the surrounding mountains. Coarse and heterogeneous alluvial materials are present along the boundary of the basin and the mountains. Fine-grained and fluvial sediments derived from the mountains are located in the center part of the basin. The near surface sediments are alluvial, eolian and playa or lacustrine in origin. In many locations, wind and water have reworked the sediments into discontinuous layers of silt, sand and clay. These fine-grained sediments contain gypsum crystals (Radian Corporation, 1993).

2.3 Surface Water

The Tularosa Basin is a closed basin with no surface water outlet. Surface water is lost from the basin by evaporation, transpiration, or groundwater infiltration. A small amount of water

collects in Lake Lucero located approximately 20 miles southwest of HAFB. Several southwest trending arroyos cross the Base including Malone Draw, Ritas Draw, and Dillard Draw. Malone Draw and Ritas Draw join the Lost River in the center of the Base property. The Lost River is the largest arroyo and trends southwest towards the White Sands installation. Dillard Draw, however, empties into Lake Holloman and Lake Stinky located immediately southwest of the Base property line. Surface water on the base is diverted to drains and ditches that connect with these southwest trending arroyos.

2.4 Groundwater

Groundwater occurs in unconfined conditions within the unconsolidated bolson deposits beneath HAFB. The primary source of recharge is stream runoff from the western side of the Sacramento Mountains. Water migrates through these alluvial deposits into the finer grained sediments of the center of the basin. The depth to water beneath the base ranges from less than 5 feet to 50 feet below the ground surface (bgs). Basewide, groundwater flow direction is influenced by the surface water flow along southwest trending arroyos. In general, groundwater flow direction is west and southwest depending upon the immediate proximity of these drainage features.

Groundwater quality in the Tularosa Basin is of potable quality at the recharge areas in close proximity to the Sacramento Mountains and becomes increasingly mineralized toward the central portion of the basin and discharge areas (Radian Corporation, 1993). At several Solid Waste Management Units (SWMUs) located across the base, monitoring wells contain water with greater than 10,000 milligrams per liter (mg/L) total dissolved solids (TDS); (Foster Wheeler, 2002). There are no potable water wells on HAFB. Potable water for the base and the city of Alamogordo is derived from the nearby Sacramento Mountains. The only production water well, used for livestock irrigation, is located 13 miles southwest of DP-62. At present, a basewide study of groundwater quality, particularly TDS, is being performed. The purpose of the study is to further document the characteristics and quality of groundwater.

2.5 Site Characterization and Setting

DP-62 (formerly identified as Area of Concern (AOC) - Ritas Draw) is located in a remote portion of the North Base Area, approximately 300 feet northwest of ERP Site OT-04 (Acid Trailer Burial Site - SWMU 102). DP-62 is one of many smaller arroyos that terminate into Ritas Draw. Surface features, illustrated in the photographs presented in Appendix A, indicate a dendritic drainage pattern across the DP-62 site with a terminus at Ritas Draw. A change in elevation of approximately 30 feet exists from south to north across DP-62. The site terrain generally slopes downward to the north and is near vertical in some locations.

During the initial field reconnaissance in the area of AOC-Ritas Draw, two partially buried drums were discovered. These drums were believed to be related to early missile testing that occurred on HAFB during the 1950s. The drums are empty, no soil staining is evident, and the

original contents of the drums are unknown. The site is currently inactive (Foster Wheeler Environmental Corporation and Groundwater Technology, Inc., 1998).

At the Acid Trailer Burial Site (OT-04, SWMU 102), waste materials were dumped and buried on a one-half acre tract of land along the banks of the DP-62 arroyo. The waste materials appear to have been placed in three drainages of a side channel to Ritas Draw and were subsequently covered with soil from the surrounding area. The majority of the waste at OT-04 may have originated from the former Unconventional Fuels Storage Area, which is located approximately ½-mile to the south. The Unconventional Fuels Storage Area housed propellants, oxidizers, and other fuel components that were used by the 6585th Test Group for rocket and sled tests conducted at HAFB. Compounds typically stored at the facility included, but were not limited to, the following: JP-4 (jet fuel), unsymmetrical dimethylhydrazine (UDMH), aniline, inhibited red fuming nitric acid, inhibited white fuming nitric acid, liquid oxygen, JPX (a combination of JP-4 and UDMH), dyes and other like compounds (Foster Wheeler & Groundwater Technology, 1998).

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3 SUMMARY OF PREVIOUS INVESTIGATIONS

In 1998, a PA/SI was performed at DP-62 which was known as AOC-Ritas Draw (Foster Wheeler and Groundwater Technology, 1998). The PA portion of the investigation did not conclusively identify a source for the operational material debris present at the site. However, given the proximity to OT-04 (Acid Trailer Burial Site), it was speculated that similar materials were most likely present at DP-62. The SI field investigation activities at DP-62 consisted of a geophysical survey followed by the installation of DPT soil borings and DPT groundwater monitoring points.

A geophysical survey utilizing a Geometrics G858G gradiometer (magnetometer) was performed on a grid pattern across the site. Figure 2 is a color-contoured map prepared from the results of the survey. The survey identified approximately five areas of high magnetic response which are assumed to be the result of buried metal objects such as drums or debris. Also, the survey map illustrates the location of each drum exposed on the surface.

Based on the geophysical survey results, four (4) soil borings were installed at DP-62 in locations suspected to contain buried debris (Figure 3). Copies of the Drilling/Boring Logs extracted from the PA/SI Inspection Report for AOC-Ritas Draw can be found in Appendix B. One should note that the second page of the logs for RITA-02 and RITA-04 do not include sheet references. However, they have been ordered in such a way that each Drill Log is made up of 2 sheets. Three DPT borings (RITA-1, RITA-2 and RITA-4) were advanced in the immediate proximity of areas of high magnetic response and visible surface disturbance. DPT boring RITA-3 was installed at the confluence of drainage to determine if contamination was present down slope of the debris. DPT borings RITA-1 and RITA-2 were dry and encountered refusal at 10 feet and 14 feet, respectively. DPT borings RITA-3 and RITA-4 were converted into groundwater monitoring points. Based upon screening criteria, two soil samples from each boring were submitted for laboratory analysis. The soil samples were analyzed for VOCs by EPA SW-846 Method 8260A, SVOCs by EPA SW-846 Method 8270B, explosives (Nitroaromatics and Nitramines) by EPA SW-846 Method 8330, and TAL Metals by EPA SW-846 Method 6010/7471A.

The DPT borings encountered interbedded layers of silt, fine-grained sand, and clay to a depth of 20 feet. SVOCs and explosives were not detected in the soil samples. No VOCs were detected except acetone at 20 μg/kg (micrograms per kilogram) and 25 μg/kg in samples from 12 and 18 feet bgs at boring RITA-2. Acetone was also detected in the laboratory blanks and was presumed to be a laboratory artifact in the samples. Results from the analysis of metals in soil samples were compared to United States Environmental Protection Agency (EPA) Region 6 Media Specific Screening levels. Only arsenic exceeded the risk based screening level in samples RITA-1 (9 ft bgs) at 2.0 mg/kg (milligrams per kilogram) , RITA-2 (12 ft bgs) at 17.4 mg/kg and duplicate sample RITA-2-DUP (12 ft bgs) at 9.1 mg/kg (Foster-Wheeler Environmental Corporation and Groundwater Technology, Inc., 1998).

Table 1 is a copy of the Soil Analytical Results extracted from the PA/SI Inspection Report for AOC-Ritas Draw.

Groundwater samples were analyzed for VOCs by EPA SW-846 Method 8260A, SVOCs by EPA SW-846 Method 8270B, explosives (Nitroaromatics and Nitramines) by EPA SW-846 Method 8330, and TAL Metals by EPA SW-846 Method 6010/7470A. No VOCs, SVOCs, or explosives were detected in groundwater samples (Foster-Wheeler Environmental Corporation and Groundwater Technology, Inc., 1998). Metals detected in one or more samples included arsenic (0.029 mg/L (milligrams per liter) to 0.032 mg/L), antimony (0.032 mg/L to 0.036 mg/L), calcium (799 mg/L to 828 mg/L), iron (0.63 mg/L), potassium (54.6 mg/L to 63.8 mg/L), magnesium (1,660 mg/L to 1840 mg/L), manganese (0.11 mg/L to 0.36 mg/L), and sodium (9490 mg/L to 11,600 mg/L).

Table 2 is a copy of the Groundwater Analytical Results table extracted from the PA/SI Report for AOC-Ritas Draw.

Table 3 is a copy of the Screening for Chemicals of Potential Concern table extracted from the PA/SI Report for AOC-Ritas Draw.

4 PHASE II INVESTIGATION ACTIVITIES DATA

Phase II RFI sampling activities for DP-62 have been designed to augment information from the original site PA/SI and address NMED comments. The scope was developed during discussions between representatives of HAFB and NMED on March 4, 2003. The following activities will be performed:

- Collect soil samples to characterize the presence of any hazardous constituents on the steeply sloped portion of the site in direct proximity of the exposed drums.
- Analyze the soil samples for VOCs, SVOCs, Total Petroleum Hydrocarbons (TPH) and RCRA metals.

The following subsections provide detailed descriptions for completing each activity.

4.1 DPT Soil Assessment

The field work for the Phase II RFI will be conducted in accordance with HAFB Standard Operating Procedures (SOPs) provided in the Basewide Quality Assurance Project Plan (QAPP) (Bhate‡, 2003). These SOPs outline methodologies for soil boring advancement, soil sampling, soil sample description, field screening, sample management, equipment decontamination, and chain-of-custody procedures.

Prior to boring advancement, all necessary HAFB utility clearance permits (digging permits), flightline and security permits will be obtained. Four DPT or hand augured soil borings (Figure 3) will be advanced at the site to an anticipated depth of 5-ft bgs. Continuous soil samples will be collected from these borings whether they are installed with a DPT unit or hand auger. A fraction of each sample will be screened in the field for volatile organic compounds using a photo ionization detector (PID). Based on headspace screening results or other relevant observations (such as staining, odor or soil type), one soil sample from each soil boring will be selected for laboratory analyses. The sample obtained from the bottom of the boring will be selected if the screening fails to identify an appropriate interval. A total of 5 soil samples, including one field duplicate sample, will be submitted to the laboratory for analysis. The samples will be placed on ice and shipped under strict chain-of-custody to Associated Laboratories located in Orange, California. The location of each boring and exposed drum will be surveyed using the HAFB GPS system.

4.2 Laboratory Analysis

Five soil samples (including the field duplicate) will be analyzed for VOCs by EPA SW-846 Method 8260B; SVOCs by Method 8270C, Total Petroleum Hydrocarbons by EPA SW-846 Method 8015B, and RCRA metals (arsenic, barium, chromium, cadmium, lead, mercury, selenium and silver). The RCRA metals will be analyzed by Method 6010B with the exception

of mercury, which will be analyzed by EPA SW-846 Method 7471A. The field duplicate sample associated with the sampling event will be analyzed for VOCs only.

4.3 Drum Removal

If the soil analytical results do not identify the presence of hazardous constituents, then the drums exposed on the surface will be removed and recycled as scrap metal.

5 QAPP ADDENDUM

The laboratory performing the chemical sample analysis will follow the Final Quality Assurance Project Plan Addendum provided as Appendix C to this work plan.

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6 BASEWIDE HEALTH AND SAFETY PLAN

All work will be conducted in accordance with *Basewide Health and Safety Plan Holloman Air Force* (Bhate†, 2003). All personnel involved in on-site work will read and understand the Basewide HASP.

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7 REFERENCES

Bhate Environmental Associates, Inc.†, *Basewide Health and Safety Plan Holloman Air Force Base*, 2003.

Bhate Environmental Associates, Inc.‡, *Basewide Quality Assurance Project Plan Holloman Air Force Base*, 2003.

Foster Wheeler Environmental Corporation and Groundwater Technology, Inc., *Preliminary Assessment Site Investigation AOC-Ritas Draw*, 1998.

Foster Wheeler Corporation, *Long Term Groundwater Monitoring Report, Holloman Air Force Base*, 2002.

Radian Corporation, *Preliminary Assessment and Site Investigation Report, Investigation of Four Waste Sites, Holloman Air Force Base, New Mexico*, 1993.

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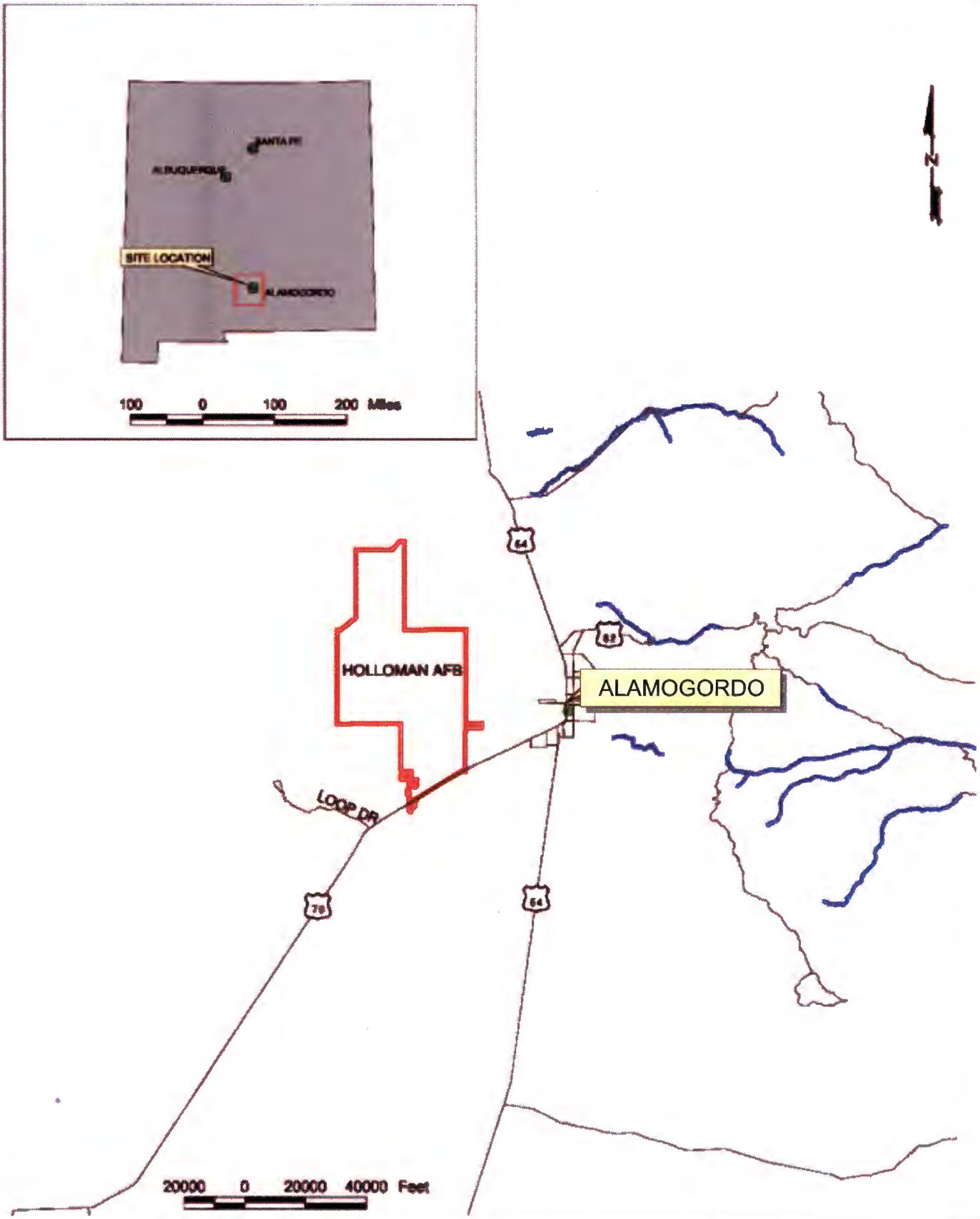
FIGURES



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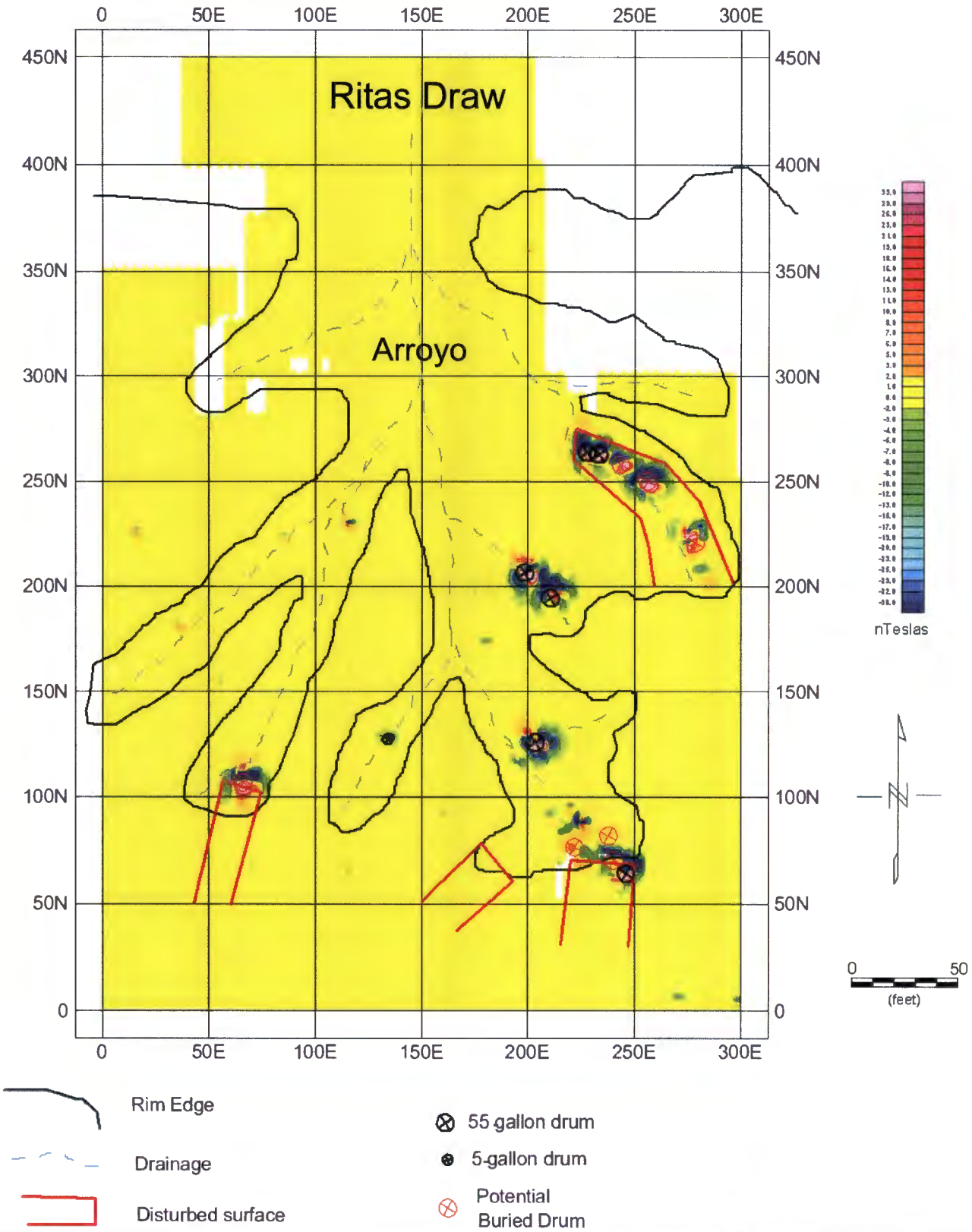
SITE LOCATION MAP
DP62 Ritas Draw

PROJECT NO.	SCALE:	DATE:	DRAWN BY:
9030024	AS SHOWN	08/18/03	SRH
			FILE: HAFBDP62Fig1.cdr

Figure 1
Holloman AFB
New Mexico



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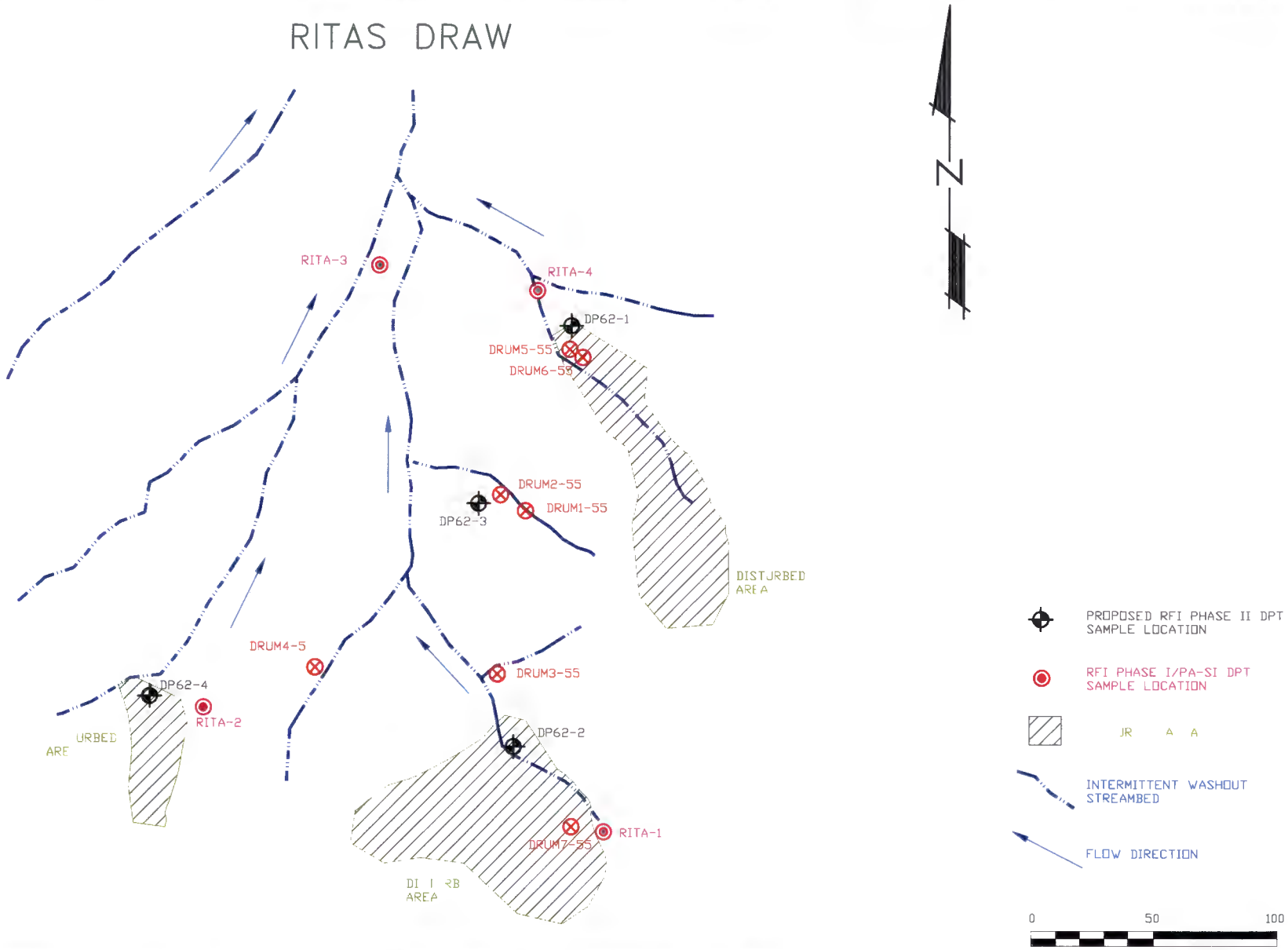
PA/SI Magnetic Geophysical Survey Map of DP-62

PROJECT NO.:	SCALE:	DATE:	DRAWN BY:
9030024	NTS	08/18/03	SRH
			FILE: HAFBDP62Fig2

Figure 2

Holloman AFB
New Mexico



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SITE PLAN

DP62 RITAS DRAW

PROJECT NO.	SCALE	DATE	DRAWN BY:	CHECKED BY:
9030024	AS SHOWN	08/18/03	SRH	–

DRAWING NO: HAFBDP62Fig3.dwg

Figure 3

Holloman Air Force Base
New Mexico

TABLES

TABLE 1
SOIL ANALYTICAL RESULTS
AOC-RITAS DRAW
HOLLOMAN AFB, NEW MEXICO
MAY 21, 1998

Sample ID	RITA-1-2	RITA-1-9	RITA-1-15	RITA-1-20	RITA-2-2	RITA-2-5	RITA-2-12	RITA-2-12-DUP	RITA-2-18	RITA-3-2	RITA-4-2	RITA-4-8
Depth (ft)	2	9	15	20	2	5	12	12	18	2	2	8
VOCs-EPA SW-846 Method 8260A (μg/kg)												
Acetone	15J,BL	16J	13J	10J	17J	11J	20	23	25	12J	16J	18J
Methylene Chloride	4.7J,BL	ND<5.0	ND<5.0	ND<5.0	ND<5.0	ND<5.0	ND<5.0	ND<5.0	ND<5.0	ND<5.0	ND<5.0	ND<5.0
2-Butanone (MEK)	ND<20	ND<20	ND<20	ND<20	ND<20	ND<20	ND<20	ND<20	ND<20	ND<20	ND<20	8.4J
All others	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
SVOCS-EPA SW-846 Method 8270B (μg/kg)												
All analytes	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Nitroaromatics and Nitramines-EPA SW-845 Method 8330 (μg/g)												
All analytes	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
TAL Metals-EPA SW-846 Methods 6010B/7471A (mg/kg)												
Arsenic	1.8B	2.0	1.5B	1.2B	ND<5.0	ND<1.0	17.4	9.1	1.1B	0.98B	0.80B	1.4B
Cadmium	ND<1.0	0.37B	0.39B	ND<1.0	ND<2.5	0.084B	0.17B	0.16B	0.13B	ND<1.0	0.17B	0.15B
Lead	1.9	5.1	5.3	0.39B	ND<1.5	0.71	0.79	ND<0.60	0.89	0.48B	2.0	1.2
Antimony	1.8B	1.5B	1.7B	1.9B	2.6B	ND<1.0	1.7B	1.6B	1.6B	1.6B	0.90B	1.7B
Selenium	ND<1.0	1.3	ND<1.0	ND<1.0	ND<2.5	ND<0.50	0.56B	0.53B	ND<1.0	ND<1.0	0.61	ND<1.0
Thallium	ND<2.0	1.1B	ND<2.0	ND<2.0	1.9B	ND<1.0	ND<2.0	ND<2.0	ND<2.0	ND<2.0	ND<1.0	ND<2.0
Silver	ND<2.0	ND<2.0	ND<2.0	ND<2.0	ND<2.0	ND<1.0	ND<2.0	0.75B	ND<2.0	ND<2.0	ND<1.0	ND<2.0
Aluminum	2,270	11,800	12,600	1,390	478	1,680	944	979	2,350	994	3,540	2,220
Barium	26.6	79.3	29.0	27.3	10.7	15.4	9.3	9.2	22.0	10.9	10.2	4.4
Beryllium	ND<0.40	0.61	0.67	ND<0.40	ND<0.40	0.11B	ND<0.40	ND<0.40	ND<0.40	ND<0.40	0.25	ND<0.40
Calcium	164,000	154,000	179,000	146,000	199,000	15,400	168,000	164,000	136,000	146,000	67,600	136,000

TABLE 1 (Concluded)
SOIL ANALYTICAL RESULTS
AOC-RITAS DRAW
HOLLOMAN AFB, NEW MEXICO
MAY 21, 1998

Sample ID	RITA-1-2	RITA-1-9	RITA-1-15	RITA-1-20	RITA-2-2	RITA-2-5	RITA-2-12	RITA-2-12-DUP	RITA-2-18	RITA-3-2	RITA-4-2	RITA-4-8
Depth (ft)	2	9	15	20	2	5	12	12	18	2	2	8
TAL Metals-EPA SW-846 Methods 6010B/7471A (mg/kg) (continued)												
Cobalt	0.91B	3.5	4.1	ND<2.0	ND<2.0	0.46B	0.64B	1.3B	ND<2.0	ND<2.0	1.4	1.3B
Chromium	3.1	14.8	14.5	4.2	ND<2.0	3.9	1.8B	2.4	1.8B	1.5B	4.5	1.9B
Copper	1.4B	5.0	4.7	ND<4.0	ND<4.0	0.49B	0.78B	1.2B	ND<4.0	ND<4.0	1.9B	1.8B
Iron	326	2,240	6,680	1,190	888	1,160	3,940	5,200	1,480	569	3,960	2,500
Potassium	484B	3,150	3,280	325B	ND<1,000	388B	259B	355B	479B	208B	955	540B
Magnesium	2,830	7,290	5,600	735	611	764	468	471	1,090	718	2,530	2,600
Manganese	47.7	99.3	232	12.9	5.3	17.1	9.6	11.1	16.7	15.7	80.8	23.8
Sodium	ND<1,000	798B	1,560	ND<1,000	ND<1,000	ND<500	ND<1,000	ND<1,000	ND<1,000	480B	920	1,310
Nickel	2.4B	11.0	11.5	2.9B	ND<8.0	1.8B	ND<8.0	1.6B	1.5B	1.2B	3.9B	2.5B
Vanadium	8.5	21.0	17.5	2.4	1.1B	3.0	22.8	16.9	3.6	2.1	7.0	5.2
Zinc	6.2	25.8	28.4	3.8B	1.3B	3.1	2.6B	3.3B	4.9	3.3B	9.0	7.5
Mercury	ND<0.033	ND<0.033	ND<0.033	ND<0.033	ND<0.033	ND<0.033	ND<0.033	ND<0.033	ND<0.033	ND<0.033	ND<0.033	ND<0.033

<	Indicates compound not detected at or above the RL.
B	Estimated result; result is less than RL.
BL	Method blank contamination. The associated method blank contains the target analyte at a reportable level.
ft	Feet
J	Estimated result; result is less than RL.
mg/kg	Milligrams per kilogram
ND	Not detected
RL	Reporting limit
SVOCs	Semivolatile organic compounds
TAL	Target Analyte List
µg/kg	Micrograms per kilogram
VOCs	Volatile organic compounds

TABLE 2
GROUNDWATER ANALYTICAL RESULTS
AOC-RITAS DRAW
HOLLOMAN AFB, NEW MEXICO
MAY 21, 1998

Sample ID	RITA-3-GW-7	RITA-3-GWDP-7	RITA-4-GW-8
VOCs-EPA SW-846 Method 8260A (µg/L)			
Benzene	ND<1.0	ND<1.0	0.27J
Ethylbenzene	ND<1.0	ND<1.0	0.22J
2-Butanone (MEK)	ND<5.0	ND<5.0	1.2J
4-Methyl-2-pentanone	ND<5.0	ND<5.0	0.72J
Toluene	ND<1.0	ND<1.0	0.29J
Xylenes (total)	ND<1.0	ND<1.0	0.88J
All others	ND	ND	ND
SVOCS-EPA SW-846 Method 8270B (g/L)			
All analytes	ND	ND	ND
Nitroaromatics and Nitramines-EPA SW-846 Method 8330 (µg/L)			
All analytes	ND	ND	ND
TAL Metals-EPA SW-846 Methods 6010B/7470A (mg/L)			
Arsenic	0.032	0.029	0.017B
Cadmium	ND<0.010	0.0012B	ND<0.010
Lead	ND<0.014G	ND<0.015G	ND<0.014G
Antimony	0.034	0.036	0.032
Selenium	ND<0.026G	ND<0.023G	ND<0.017G
Thallium	ND<0.020	ND<0.020	ND<0.020
Silver	ND<0.10	ND<0.10	ND<0.050
Aluminum	ND<1.0	ND<1.0	ND<0.50
Barium	ND<0.10	ND<0.10	ND<0.050
Beryllium	ND<0.020	ND<0.020	ND<0.010
Calcium	828	823	799
Cobalt	ND<0.10	ND<0.10	ND<0.050
Chromium	ND<0.10	ND<0.10	ND<0.050
Copper	ND<0.20	ND<0.20	0.014B
Iron	ND<1.0	ND<1.0	0.63
Potassium	63.2	63.8	54.6
Magnesium	1,840	1,830	1,660
Manganese	0.13	0.11	0.36
Sodium	11,600	11,600	9,490

TABLE 2 (Concluded)
GROUNDWATER ANALYTICAL RESULTS
AOC-RITAS DRAW
HOLLOMAN AFB, NEW MEXICO
MAY 21, 1998

Sample ID	RITA-3-GW-7	RITA-3-GWDP-7	RITA-4-GW-8
TAL Metals-EPA SW-846 Methods 6010B/7470A (mg/L) (continued)			
Nickel	ND<0.40	ND<0.40	ND<0.20
Vanadium	ND<0.10	0.042B	ND<0.050
Zinc	ND<0.20	ND<0.20	ND<0.10
Mercury	ND<0.00020	ND<0.00020	ND<0.00020

<	Indicates compound not detected at or above the RL.
B	Estimated result; result is less than RL.
G	Elevated reporting limit. The reporting limit is elevated due to matrix interference.
J	Estimated result; result is less than RL.
mg/L	Milligrams per liter
ND	Not detected
RL	Reporting limit
SVOCs	Semivolatile organic compounds
TAL	Target Analyte List
µg/L	Micrograms per liter
VOCs	Volatile organic compounds

TABLE 3
SCREENING FOR CHEMICALS OF POTENTIAL CONCERN
AOC-RITAS DRAW PA/SI
HOLLOMAN AFB, NEW MEXICO

SOIL								
				Media-Specific Screening Levels [a]				
Sample ID	Rita-1-9	Rita-2-12	Rita-2-13-Dup	Industrial Soil	Transfer from soil	UTL[b]	Other	
Depth (ft)	9	12	12	(mg/kg)	to GW (mg/kg)	(mg/kg)	(mg/kg)	
Arsenic	2.0 mg/kg	17.4 mg/kg	9.1 mg/kg	(noncancer) 610 NI	20	6.883	<0.10-97[e]	
				(carcinogen) 2.0 C	20			
GROUNDWATER								
				Media-Specific Screening Levels [a]				
Sample ID	Rita-3-GW-7	Rita-3-GWDP-7	Rita-4-GW-8	Drinking Water	Tap Water	NMWQCC [d]	UTL [b]	Other
				(MCL)[c] (µg/L)	(µg/L)	(µg/L)	(µg/L)	(µg/L)
Arsenic	32 µg/L	29 µg/L	-	(noncancer) 50	2.2 NI	100	35.4	-
				(carcinogen) -	0.04C			
Antimony	34 µg/L	36 µg/L	32 µg/L	6	15	--	87.1	-
Manganese	-	-	360 µg/L	--	180	200	NE	<1-1,000[f]

a Human Health Media-Specific Screening Levels. United States Environmental Protection Agency; Region 6, 1445 Ross Avenue, Dallas, Texas 75202, October 30, 1996.
b "Phase I – Groundwater Assessment Monitoring Report for Holloman Air Force Base" (Radian, 1993).
c Federal Drinking Water Standards Maximum Contaminant Level (MCL), Office of Drinking Water, USEPA.
d NMWQCC Standards for Ground Water of 10,000 mg/L TDS concentration or less, Section 3103, 1995.
e Observed range for Western United States (USGS, 1984).
f Typical range for manganese in groundwater for natural elemental concentrations (Dragun, 1988).

C Carcinogen
Ft Feet
GW Groundwater
I Ingestion route only
MCL Maximum Contaminant Level
mg/kg Milligrams per kilogram
N Non-carcinogenic effects
NE Not established
NMWQCC New Mexico Water Quality Control Commission
µg/L Micrograms per liter
UTL Upper Tolerance Limit

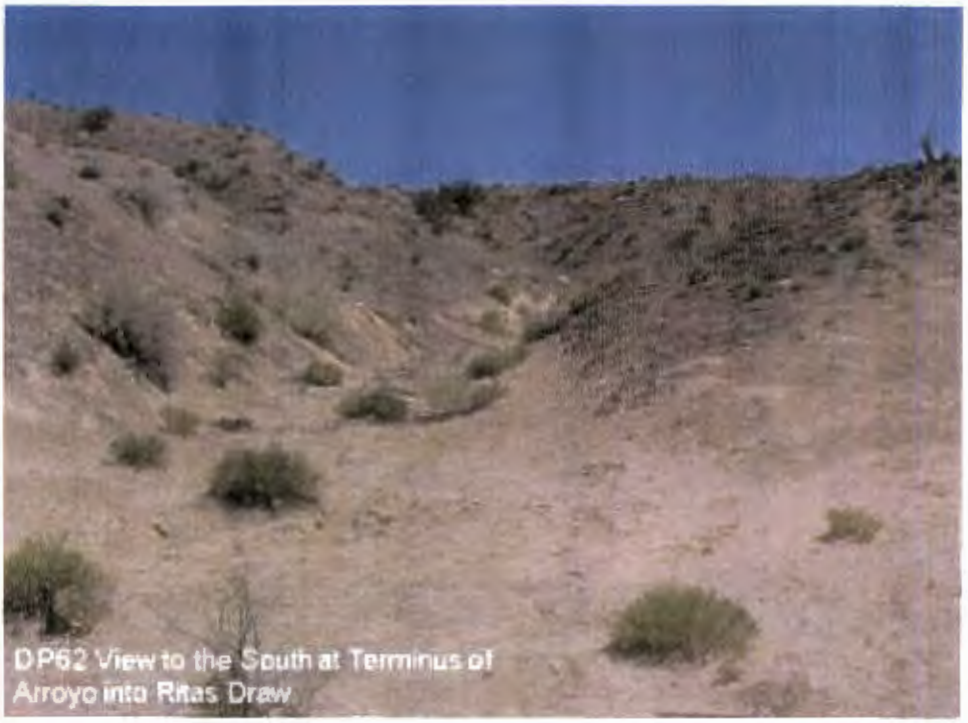
APPENDIX A
DP62 PHOTOGRAPHS

DP62 View to the Northwest into a Drainage Ditch Containing 2 Drums

DP62 View to the West into a Drainage Ditch Containing a Drum

DP62 View to the West Northwest from the Southeast Arroyo Rim into Ritas Draw

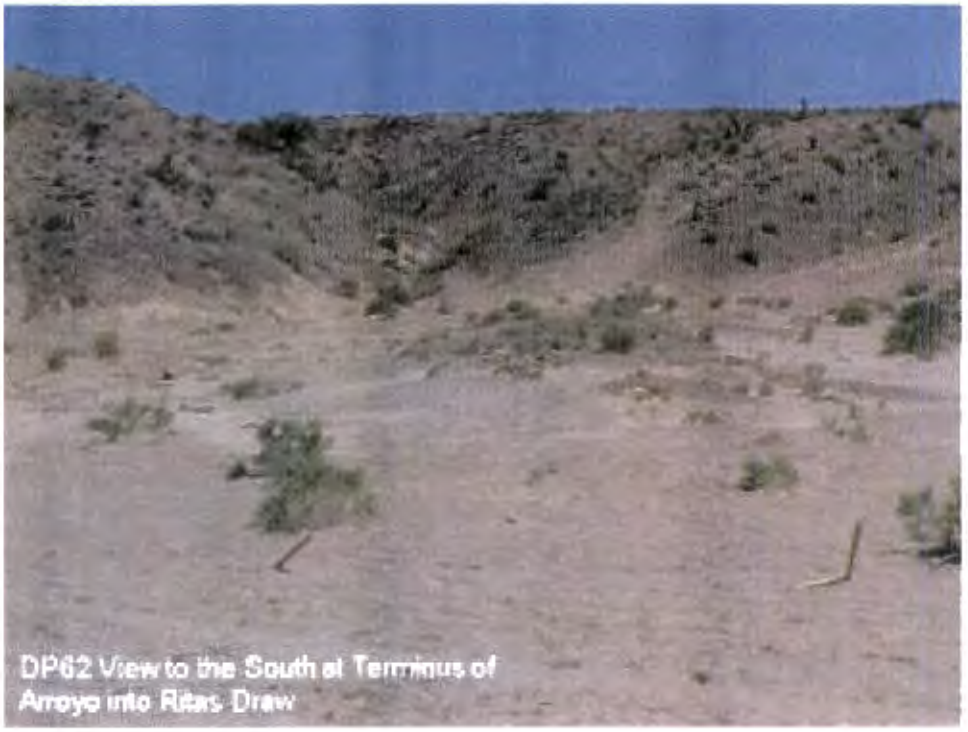
DP62 View to the Northwest from the Southeast Arroyo Rim into Ritas Draw



DP62 View to the South at Terminus of Arroyo into Ritas Draw

Arroyo at DP62 View to the Southwest

DP62 View to the Southeast at Terminus of Arroyo into Ritas Draw



DP62 View to the South at Terminus of Arroyo into Ritas Draw

DP62 View to the Southeast at Terminus of Arroyo into Ritas Draw

Ritas Draw View to the East at End of the DP62 Washout directly to the right (South) in this Photograph

DP62 View to the Southeast into a Drainage Ditch Containing 2 Drums

Arroyo at DP62 View to the Southeast

DRUM
Arroyo at DP62 View to the Northwest

APPENDIX B
PA/SI DPT DRILLING LOGS

HTRW DRILLING LOG

DISTRICT		HOLE NUMBER: RITA-01
1. COMPANY NAME: FLUOR DANIEL GTI	2. DRILL SUBCONTRACTOR: TEG	SHEET 1 OF 2 SHEETS
3. PROJECT: AOC-RITA'S DRAW	4. LOCATION: HOLLOMAN AFB, NM	
5. NAME OF DRILLER: Karis Vandehey	6. MANUFACTURER'S DESIGNATION OF DRILL: STRATA PROBE	
7. SIZES AND TYPES OF DRILLING AND SAMPLING EQUIPMENT: 3"x3' SS Split Spoons; 6" SS sleeves	8. HOLE LOCATION: See Map.	
PID 10.6 eV	9. SURFACE ELEVATION	
	10. DATE STARTED: 21 MAY 1998	11. DATE COMPLETED: 21 MAY 1998
12. OVERBURDEN THICKNESS: NA	15. DEPTH GROUNDWATER ENCOUNTERED: NONE @ TD	
13. DEPTH DRILLED INTO ROCK: NA	16. DEPTH TO WATER AND ELAPSED TIME AFTER DRILLING COMPLETED: —	
14. TOTAL DEPTH OF HOLE: 20'	17. OTHER WATER LEVEL MEASUREMENTS (SPECIFY): —	

18. GEOTECHNICAL SAMPLES	DISTURBED	UNDISTURBED	19. TOTAL NUMBER OF CORE BOXES
NONE	—	—	—

20. SAMPLES FOR CHEMICAL ANALYSIS	VOC	METALS	OTHER (SPECIFY)	OTHER (SPECIFY)	OTHER (SPECIFY)	21. TOTAL CORE RECOVERY %
	✓	✓	SemiVols	Expl.		3/4

22. DISPOSITION OF HOLE	BACKFILLED	MONITORING WELL	OTHER (SPECIFY)	23. SIGNATURE OF INSPECTOR
ABANDONED	bentonite	—	—	Lee Scott Swenson

LOCATION SKETCH/COMMENTS

SCALE:

PROJECT	HOLE NO.
AOC-RITA'S DRAW	RITA-01

ENG FORM 5056-R, AUG 94

(Proponent: CECW-EG)

HTRW DRILLING LOG (CONTINUATION SHEET)

HOLE NUMBER: RITA-01

PROJECT: AOC-RITA'S DRAW

INSPECTOR: L. S. STEVENSON

SHEET 2 OF 2 SHEETS

ELEV. (a)	DEPTH (b)	DESCRIPTION OF MATERIALS (c)	FIELD SCREENING RESULTS (d) ppm	GEOTECH SAMPLE OR CORE BOX NO. (e)	ANALYTICAL SAMPLE NO. (f)	BLOW COUNT (g)	REMARKS (h)
		SILT, tan (5YR 8/2), dry, mod. firm ML					
	1		0				
	2		0		RITA-1-2		
	3		0				
	4		0				
	5	SILT, pink (5YR 7/3), dry, hard, cemented w/ gyp. ML	0				
	6		0				
	7	SILT, white (10YR 8/1), dry, loose ML	0				
	8	SILT, red (5YR 6/6), dry, hard, gyp. cemented, sl. plastic ML	0				
	9	SILT, gray (2.5Y 7/2), dry, firm ML	0		RITA-1-9		
	10	SILT, brown/pink mottled (5YR 6/6, 5YR 8/4), dry, firm to hard ML	0				
	11	SILT, brown (5YR 6/4), dry, firm ML	0				
	12	SILT w/ tr. clay, brown (5YR 6/4), tr. moisture, firm, sl. plastic. ML	0				
	13		0				
	14		0				
	15	V. fine SAND, brown (5YR 6/4), dry, firm SP	0		RITA-1-15		
	16	CLAY, brown (5YR 4/6) moist, firm, mod. plastic CL	0				
	17		0				1" clayey SAND lens @ ~17', gray/green
	18	SILT, white (10YR 8/1), dry, soft ML	0				
	19	V. fine SAND, pink (5YR 8/4), dry, hard SP	0				
	20		0		RITA-1-20		

PROJECT: AOC-RITA'S DRAW

HOLE NO. RITA-01

ENG FORM 5056A-R, AUG 94

(Proponent: CECW-EG)

HTRW DRILLING LOG

DISTRICT	
HOLE NUMBER	RITA-02
1. COMPANY NAME	FLUOR DANIEL GTI
2. DRILL SUBCONTRACTOR	TEG
SHEET / SHEETS	1 OF 2
3. PROJECT	AOC-RITA'S DRAW
4. LOCATION	HOLLOMAN AFB, NM
5. NAME OF DRILLER	Karis Vandehey
6. MANUFACTURER'S DESIGNATION OF DRILL	STRATA PROBE
7. SIZES AND TYPES OF DRILLING AND SAMPLING EQUIPMENT	2"x3' SS split spoons; 6" SS sleeves
8. HOLE LOCATION	SEE MAP
	PID - 10.6 eV
9. SURFACE ELEVATION	
10. DATE STARTED	21 MAY 1998
11. DATE COMPLETED	21 MAY 1998
12. OVERBURDEN THICKNESS	NA
15. DEPTH GROUNDWATER ENCOUNTERED	NONE @ TD
13. DEPTH DRILLED INTO ROCK	NA
16. DEPTH TO WATER AND ELAPSED TIME AFTER DRILLING COMPLETED	—
14. TOTAL DEPTH OF HOLE	18'
17. OTHER WATER LEVEL MEASUREMENTS (SPECIFY)	—

18. GEOTECHNICAL SAMPLES	DISTURBED	UNDISTURBED	19. TOTAL NUMBER OF CORE BOXES
NONE	—	—	—

20. SAMPLES FOR CHEMICAL ANALYSIS	VOC	METALS	OTHER (SPECIFY)	OTHER (SPECIFY)	OTHER (SPECIFY)	21. TOTAL CORE RECOVERY %
SOIL	✓	✓	Semi VOCs	Expl.	—	28/36

22. DISPOSITION OF HOLE	BACKFILLED	MONITORING WELL	OTHER (SPECIFY)	23. SIGNATURE OF INSPECTOR
ABANDONED	bentonite	—	—	Lee Scott Stevenson

LOCATION SKETCH/COMMENTS SCALE:

PROJECT	HOLE NO.
AOC-RITA'S DRAW	RITA-02

ENG FORM 5056-R, AUG 94 (Proponent: CECW-EG)

HTRW DRILLING LOG (CONTINUATION SHEET)

HOLE NUMBER: RITA-02

PROJECT: AOC- RITA'S DRAW

INSPECTOR: L. S. STEVENSON

SHEET ___ OF ___ SHEETS

ELEV. (a)	DEPTH (b)	DESCRIPTION OF MATERIALS (c)	FIELD SCREENING RESULTS (d)	GEOTECH SAMPLE OR CORE BOX NO. (e)	ANALYTICAL SAMPLE NO. (f)	BLOW COUNT (g)	REMARKS (h)
	1	SILT, white-pink (5YR8/2), dry, firm ML	0				
	2		0		RITA22		
	3		0				
	4	SAND, tan (5Y 8/6), dry, firm SM	0				
	5	SILT, white (2.5Y 8/1), dry, firm ML	0		RITA-2-5		
	6		0				
	7		0				
	8		0				
	9		0				
	10	silty v fine SAND, orange (10 YR 7/8), dry, hard SM	0				
	11		0				
	12	SAND, gray (10 YR 7/2), dry, hard SP	0		RITA-2-12		
	13		0				
	14		0				
	15	SILT, pink (5YR 8/3), dry, hard ML	0				
	16		0				
	17		0				
	18		0		RITA2-18		Refusal @ 18'. tr. sand in shoe at last sample (~17.9')

PROJECT: AOC- RITA'S DRAW

HOLE NO. RITA-02

ENG FORM 5056A-R, AUG 94

(Proponent: CECW-EG)

HTRW DRILLING LOG

DISTRICT	
HOLE NUMBER	RITA-03
SHEET / SHEETS	1 OF 2
1. COMPANY NAME	FLUOR DANIEL GTI
2. DRILL SUBCONTRACTOR	TEG
3. PROJECT	AOC-RITA'S DRAW
4. LOCATION	HOLLOMAN AFB, NM
5. NAME OF DRILLER	Karis Vandehey
6. MANUFACTURER'S DESIGNATION OF DRILL	STRATAPROBE
7. SIZES AND TYPES OF DRILLING AND SAMPLING EQUIPMENT	2"x3' SS split spoons w/ 6" SS sleeves; PID-10.6 eV; peristaltic pump w/ 3'x1"x0.006 SS sample screen
8. HOLE LOCATION	SEE MAP
9. SURFACE ELEVATION	
10. DATE STARTED	21 MAY 1998
11. DATE COMPLETED	21 MAY 1998
12. OVERBURDEN THICKNESS	NA
13. DEPTH DRILLED INTO ROCK	NA
14. TOTAL DEPTH OF HOLE	9'
15. DEPTH GROUNDWATER ENCOUNTERED	6.5'
16. DEPTH TO WATER AND ELAPSED TIME AFTER DRILLING COMPLETED	—
17. OTHER WATER LEVEL MEASUREMENTS (SPECIFY)	—
18. GEOTECHNICAL SAMPLES	NONE
DISTURBED	—
UNDISTURBED	—
19. TOTAL NUMBER OF CORE BOXES	—

20. SAMPLES FOR CHEMICAL ANALYSIS	VOC	METALS	OTHER (SPECIFY)	OTHER (SPECIFY)	OTHER (SPECIFY)	21. TOTAL CORE RECOVERY
soil / water	✓	✓	Semi Vols	Expl.		100 %

22. DISPOSITION OF HOLE	BACKFILLED	MONITORING WELL	OTHER (SPECIFY)	23. SIGNATURE OF INSPECTOR
ABANDONED	bentonite	—	—	Lee Scott Adamson

LOCATION SKETCH/COMMENTS

SCALE:

PROJECT	HOLE NO.
AOC-RITA'S DRAW	RITA-03

ENG FORM 5056-R, AUG 94

(Proponent: CECW-EG)

HTRW DRILLING LOG (CONTINUATION SHEET)

HOLE NUMBER: RITA-03

PROJECT: AOC-RITA'S DRAW

INSPECTOR: L. S. STEVENSON

SHEET 2 OF 2 SHEETS

ELEV. (a)	DEPTH (b)	DESCRIPTION OF MATERIALS (c)	FIELD SCREENING RESULTS (d)	GEOTECH SAMPLE OR CORE BOX NO. (e)	ANALYTICAL SAMPLE NO. (f)	BLOW COUNT (g)	REMARKS (h)
	1	clayey SAND, brown (5YR 5/6), moist, hard, sl. plastic SC					
	2		0		RITA-3-2		
	3	fine SAND, white (10YR 8/1) tr. moisture, hard SP					
	4						
	5	silty CLAY, brown (5YR 5/6) tr. moisture, v. hard, gyp. cemented CL	0				
	6	SILT, gray/white (5YR 8/1), moist, very hard ML					▽ water @ ~6.5'
	7				RITA-3-GW7		Sample screen 6' to 9'
	8	clayey SILT, gray (5YR 7/1), wet, very soft ML					
	9	SAND w/ silt, orange (5YR 7/6), wet, hard (brittle), cemented SM					

PROJECT: AOC-RITA'S DRAW

HOLE NO. RITA-03

ENG FORM 5056A-R, AUG 94

(Proponent: CECW-EG)

HTRW DRILLING LOG

DISTRICT	
HOLE NUMBER	RITA-04
SHEET / SHEETS	1 OF 2
1. COMPANY NAME	FLUOR DANIEL GTI
2. DRILL SUBCONTRACTOR	TEG
3. PROJECT	AOC- RITA'S DRAW
4. LOCATION	HOLLOMAN AFB,
5. NAME OF DRILLER	Karis Vandehey
6. MANUFACTURER'S DESIGNATION OF DRILL	STRATAPROBE
7. SIZES AND TYPES OF DRILLING AND SAMPLING EQUIPMENT	2"x3' SS split spoons; 6" SS sleeves; ~~2"x1"x 2'~~ 1"x0.010 PVC screen
8. HOLE LOCATION	SEE MAP
9. SURFACE ELEVATION	
10. DATE STARTED	21 MAY 1998
11. DATE COMPLETED	21 MAY 1998
12. OVERBURDEN THICKNESS	NA
13. DEPTH DRILLED INTO ROCK	NA
14. TOTAL DEPTH OF HOLE	10'
15. DEPTH GROUNDWATER ENCOUNTERED	7.5'
16. DEPTH TO WATER AND ELAPSED TIME AFTER DRILLING COMPLETED	—
17. OTHER WATER LEVEL MEASUREMENTS (SPECIFY)	—

18. GEOTECHNICAL SAMPLES	DISTURBED	UNDISTURBED	19. TOTAL NUMBER OF CORE BOXES
None	—	—	—

20. SAMPLES FOR CHEMICAL ANALYSES	VOC	METALS	OTHER (SPECIFY)	OTHER (SPECIFY)	OTHER (SPECIFY)	21. TOTAL CORE RECOVERY
water, soil	✓	✓	Sem. Vols	Expl.		% 7/12

22. DISPOSITION OF HOLE	BACKFILLED	MONITORING WELL	OTHER (SPECIFY)	23. SIGNATURE OF INSPECTOR
ABANDONED	bentonite	—	—	Lee Scott Stevenson

LOCATION SKETCH/COMMENTS

SCALE:

PROJECT	HOLE NO.
AOC-RITA'S DRAW	RITA-04

ENG FORM 5056-R, AUG 94

(Proponent: CECW-EG)

HTRW DRILLING LOG (CONTINUATION SHEET)

HOLE NUMBER: RITA-04

PROJECT: AOC-RITA'S DRAW

INSPECTOR: L.S. STEVENSON

SHEET ___ OF ___ SHEETS

ELEV. (a)	DEPTH (b)	DESCRIPTION OF MATERIALS (c)	FIELD SCREENING RESULTS (d)	GEOTECH SAMPLE OR CORE BOX NO. (e)	ANALYTICAL SAMPLE NO. (f)	BLOW COUNT (g)	REMARKS (h)
		Loose windblown & alluvial materials					2/6 recovery
	1						
	2	SILT, brown (5YR5/6) moist, hard, w/ gyp crystals, mod plastic ML			RITA-4-2		
	3		0				
	4	CLAY w/ silt, brown (5YR6/6), moist, hard, mod plastic. CL					
	5	fine SAND, white-pink (5YR 8/2), dry, very hard, v. uniform grain. SP	0				
	6		0				
	7	SILT, brown (5YR 6/6), moist, firm ML					▽ water @ 7.5'
	8	SAND, SILT, CLAY mix, gray, brown (5YR 6/2) wet, firm, sl. plastic ML	0		RITA-4-8 + RITA-4-8 comp		screen 5'-10'
	9	fine SAND, brown (5YR6/4) wet, hard SP					
	10						

PROJECT: AOC-RITA'S DRAW

HOLE NO. RITA-04

ENG FORM 5056A-R, AUG 94 (Proponent: CECW-EG)

APPENDIX C
QUALITY ASSURANCE PROJECT PLAN

FINAL

QUALITY ASSURANCE PROJECT PLAN ADDENDUM

ERP SITE NO. DP-62, RITAS DRAW

PHASE II RCRA FACILITY INVESTIGATION
HOLLOMAN AIR FORCE BASE
NEW MEXICO

Prepared for:

49CES/CEV
Holloman Air Force Base
New Mexico

Under Contract To:

U.S. Army Corps of Engineers
Omaha, NE
Under Contract No. DACA45-03-D-0012
Delivery Order No. 05, WAD 03

Prepared by:

Bhate Environmental Associates, Inc.
1608 13th Avenue South, Suite 300
Birmingham, Alabama 35205

Bhate Project No. 9030024.03

NOVEMBER 2003

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FINAL

QUALITY ASSURANCE PROJECT PLAN ADDENDUM

ERP SITE NO. DP-62, RITAS DRAW

PHASE II RCRA FACILITY INVESTIGATION
HOLLOMAN AIR FORCE BASE
NEW MEXICO

REVIEW SHEET

COMMITMENT TO IMPLEMENT THIS BASEWIDE QUALITY ASSURANCE PROJECT PLAN

Mike D'Auben	[signature]	11/10/03
Project Chemist	Signature	Date
Frank Gardner	[signature] for	11/10/03
Project Manager	Signature	Date
Jerry Pelfrey	Jerry Pelfrey/sc	11/10/03
Site Manager	Signature	Date

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FINAL

QUALITY ASSURANCE PROJECT PLAN ADDENDUM

ERP SITE NO. DP-62, RITAS DRAW

PHASE II RCRA FACILITY INVESTIGATION
HOLLOMAN AIR FORCE BASE

NEW MEXICO

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3-2 Summary of Definitive Data

4-1 Summary of Field QC Requirements

4-2 Summary of Laboratory QC Limits

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LIST OF ACRONYMS

DO	Dissolved Oxygen
DQOs	Data Quality Objectives
DRO	Diesel Range Organics
ERPIMS	Environmental Resources Program Information Management System
FS	Feasibility Study
GRO	Gasoline Range Organics
HAFB	Holloman Air Force Base
LCL	Lower Control Limit
LCS	Laboratory Control Sample
MDL	Method Detection Limit
mg/kg	milligrams per kilogram
mg/L	milligrams per liter
MS/MSD	Matrix Spike/Matrix Spike Duplicate
NELAC	National Environmental Laboratory Accreditation Conference
NFA	No Further Action
ng/L	nanogram per liter
ORO	Oil Range Organics
ORP	Oxidation Reduction Potential
QA	Quality Assurance
QAM	Quality Assurance Manual
QAPP	Quality Assurance Project Plan
QC	Quality Control
RCRA	Resource Conservation and Recovery Act
RPD	Relative Percent Difference
SOPs	Standard Operating Procedures
SVOC	Semivolatile Organic Compounds
TOC	Total Organic Carbon
UCL	Upper Control Limit
ug/kg	micrograms per kilogram
ug/L	micrograms per liter
USACE	United States Army Corps of Engineers
USEPA	United States Environmental Protection Agency
VOA	Volatile Organic Analysis
VOC	Volatile Organic Compound
WP	Work Plan

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QUALITY ASSURANCE PROJECT PLAN ADDENDUM

This Quality Assurance Project Plan Addendum (QAPP Addendum) has been developed to assure that sample collection, analyses, and evaluations are legally and scientifically defensible for ERP Site No. DP-62, Ritas Draw (DP-62) at Holloman Air Force Base (HAFB). This document is an addendum to the *Basewide Quality Assurance Project Plan, Holloman Air Force Base, New Mexico* (Bhate, November 2003) (Basewide QAPP) and must be used in conjunction with that document. This document contains the site specific information for the work at DP-62 outlined in the *Phase II RCRA Facility Investigation Work Plan, ERP Site No. DP-62, Ritas Draw, Holloman Air Force Base, New Mexico* (Bhate, November 2003) (DP-62 Work Plan).

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1 INTRODUCTION

The U.S. Army Corps of Engineers, Omaha District (USACE) has retained Bhate Environmental Associates, Inc. (Bhate) to perform a Phase II Resource Conservation and Recovery Act (RCRA) Facility Investigation (RFI) on behalf of Holloman Air Force Base (HAFB) Environmental Restoration Program (ERP) for the New Mexico Environment Department (NMED). This Phase II RFI addresses site DP-62 (Ritas Draw) at Holloman Air Force Base (HAFB), New Mexico. Bhate is performing this work on behalf of HAFB ERP under the Service Contract with the USACE (Contract No. DACA-45-02-D-0012, Delivery Order (DO) No. 5).

See the Basewide QAPP and DP-62 Work Plan for additional information on HAFB and DP-62

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2 PROJECT LABORATORY

The analytical work for this project will be preformed by ELAB of Tennessee, 227 French Landing Drive, Nashville, TN 37228. The laboratory personnel who will be involved with this project include:

Rick Davis, ELAB Vice President of Operations, (615) 345-1115

Marcia McGinnity, ELAB Project Manager, (615) 345-1115

Doris Curry, ELAB Quality Assurance Manager, (615) 345-1115

ELAB is certified by both the National Environmental Laboratory Accreditation Council (NELAC) and the USACE and has extensive previous experience in working on USACE projects. The ELAB Laboratory Quality Assurance Manual (QAM) and Standard Operating Procedures (SOPs) have been reviewed by Bhate and found to meet all the requirements for this project. The QAM and SOPs are available for further review if required.

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3 DATA CATEGORIES

The data use determines the required levels of data quality. The two levels of data quality established by the USACE are screening and definitive. Under this QAPP Addendum, the data to be generated under each level in this investigation are presented in Table 3-1 (Screening) and Table 3-2 (Definitive). There will be no screening data generated as part of this project. The Definitive data generated by the laboratory will be presented with limited data deliverables (i.e. Level II data packages), using a 21 day turn-around-time. All definitive data produced by the laboratory will also be presented in an Environmental Resources Program Information Management System (ERPIMS) format electronic data deliverable (EDD).

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4 DATA QUALITY ASSURANCE AND QUALITY CONTROL

The general data QA and QC requirements for HAFB are presented in the Basewide QAPP. The field QC requirements for this project are presented in Table 4-1. The project specific laboratory QC limits are listed in Table 4-2.

All final definitive data will be reviewed and validated by the Bhate Senior Chemist, Michael J. D'Auben, based on the guidelines of the USEPA National Functional Guidelines for Data Validation and the site specific laboratory QC limits.

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5 REFERENCES

Bhate, November 2003. Final Basewide Quality Assurance Project Plan, Holloman Air Force Base, New Mexico.

Bhate, November 2003. Phase II RCRA Facility Investigation Work Plan, ERP Site No. DP-62, Ritas Draw, Holloman Air Force Base, New Mexico.

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TABLES

Table 3-1
Summary of Screening Data

Parameter	Matrix	Testing Method
None	--	--

Table 3-2
Summary of Definitive Data

Parameter	Matrix	Testing Method
Volatile Organic Compounds (VOCs)	Soil	USEPA SW-846 Method 8260B
Semivolatile Organic Compounds (SVOCs)	Soil	USEPA SW-846 Method 8270C
RCRA Metals	Soil	USEPA SW-846 Methods 6010B and 7471A
Total Petroleum Hydrocarbons (TPH)	Soil	USEPA SW-846 Method 8015

Table 4-1
Summary of Field QC Samples

Matrix	Analysis	Number of Field Samples	Equipment Blanks	Trip Blanks*	Field Duplicates	Field Splits	MS/MSD	Total
Soil	VOCs per EPA Method 8260B	4	0	1	1	0	1	7
	SVOCs per EPA Method 8270C	4	0	0	0	0	1	5
	RCRA Metals by EPA 6010B/7471A	4	0	0	0	0	1	5
	TPH by EPA Method 8015	4	0	1	0	0	1	6

*Estimated, one trip blank will accompany every shipment of volatile samples

Table 4-2
Summary of Laboratory QC Limits

Parameter	MDL		LCS				Matrix Spike Water			Matrix Spike Soil		
			Water		Soil		Recovery		MSD	Recovery		MSD
	Water	Soil	LCL	UCL	LCL	UCL	LCL	UCL	RPD	LCL	UCL	RPD
VOCs per EPA Method 8260B	ug/L	ug/kg	%	%	%	%	%	%	%	%	%	%
Acetone	5	5	51	157	50	150	51	157	20	50	150	20
Benzene	1	1	70	125	71	123	70	125	20	71	123	20
Bromodichloromethane	1	1	70	130	71	130	70	130	20	71	130	20
Bromoform	2	1	72	136	62	141	72	136	20	62	141	20
Bromomethane	2	2	35	153	57	153	35	153	20	57	153	20
2-Butanone (MEK)	10	10	45	150	50	150	45	150	20	50	150	20
Carbon disulfide	1	1	74	123	64	123	74	123	20	64	123	20
Carbon tetrachloride	1	1	71	132	69	132	71	132	20	69	132	20
Chlorobenzene	1	1	78	114	69	118	78	114	20	69	118	20
Chloroethane	2	3	72	129	62	140	72	129	20	62	140	20
Chloroform	1	1	74	127	75	132	74	127	20	75	132	20
Chloromethane	2	2	58	135	50	150	58	135	20	50	150	20
Dibromochloromethane	1	1	74	145	61	147	74	145	20	61	147	20
1,2-Dichlorobenzene	1	1	73	120	75	132	73	120	20	75	132	20
1,3-Dichlorobenzene	1	1	73	120	75	122	73	120	20	75	122	20
1,4-Dichlorobenzene	1	1	74	123	74	126	74	123	20	74	126	20
1,1-Dichloroethane	1	1	75	133	80	126	75	133	20	80	126	20
1,2-Dichloroethane	1	1	67	132	75	121	67	132	20	75	121	20
1,1-Dichloroethene	1	1	74	133	57	142	74	133	20	57	142	20
cis-1,2-Dichloroethene	1	1	73	133	70	129	73	133	20	70	129	20
trans-1,2-Dichloroethen	1	1	75	134	75	123	75	134	20	75	123	20
1,2-Dichloropropane	1	1	75	133	72	124	75	133	20	72	124	20
cis-1,3-Dichloropropene	1	1	73	132	72	132	73	132	20	72	132	20
trans-1,3-Dichloroprope	1	1	74	131	69	131	74	131	20	69	131	20
Ethylbenzene	1	1	75	120	75	120	75	120	20	75	120	20
2-Hexanone	3	2	53	139	55	144	53	139	20	55	144	20
Methylene chloride	2	3	69	118	66	131	69	118	20	66	131	20
4-Methyl-2-pentanone	2	2	59	150	50	150	59	150	20	50	150	20
Styrene	1	1	75	130	75	130	75	130	20	75	130	20
1,1,2,2-Tetrachloroetha	1	1	68	129	68	144	68	129	20	68	144	20
Tetrachloroethene	1	1	75	129	75	129	75	129	20	75	129	20
Toluene	1	1	73	119	63	128	73	119	20	63	128	20
1,2,4-Trichlorobenzene	2	1	75	130	69	139	75	130	20	69	139	20
1,1,1-Trichloroethane	1	1	70	127	75	133	70	127	20	75	133	20
1,1,2-Trichloroethane	1	1	75	136	71	129	75	136	20	71	129	20
Trichloroethene	1	1	74	118	69	120	74	118	20	69	120	20
Vinyl chloride	2	2	73	134	75	134	73	134	20	75	134	20

Table 4-2
Summary of Laboratory QC Limits

Parameter	MDL		LCS				Matrix Spike Water			Matrix Spike Soil		
			Water		Soil		Recovery		MSD	Recovery		MSD
	Water	Soil	LCL	UCL	LCL	UCL	LCL	UCL	RPD	LCL	UCL	RPD
Xylene (total)	1	1	75	122	75	125	75	122	20	75	125	20
1,2,4-Trimethylbenzene	2	2	75	125	75	125	75	125	20	75	125	20
1,3,5-Trimethylbenzene	2	2	75	125	75	125	75	125	20	75	125	20
1,2-Dichloroethane-d4 (surr)	--	--	74	131	70	125	--	--	--	--	--	--
4-Bromofluorobenzene (surr)	--	--	76	128	75	116	--	--	--	--	--	--
Dibromofluoromethane (surr)	--	--	80	129	64	131	--	--	--	--	--	--
Toluene-d8 (surr)	--	--	85	115	70	123	--	--	--	--	--	--
SVOCs by EPA Method 8270C	**ug/L**	**ug/kg**	**%**	**%**	**%**	**%**	**%**	**%**	**%**	**%**	**%**	**%**
Acenaphthene	2	100	40	112	27	116	40	112	20	27	116	20
Acenaphthylene	2	100	37	115	33	120	37	115	20	33	120	20
Anthracene	2	100	45	118	35	122	45	118	20	35	122	20
Benzoic acid	2	100	30	136	30	160	30	136	20	30	160	20
Benzo(a)anthracene	2	100	43	138	33	139	43	138	20	33	139	20
Benzo(b)fluoranthene	2	100	31	146	30	140	31	146	20	30	140	20
Benzo(k)fluoranthene	2	100	40	127	30	150	40	127	20	30	150	20
Benzo(g,h,i)perylene	2	100	35	129	30	146	35	129	20	30	146	20
Benzo(a)pyrene	2	100	38	144	30	144	38	144	20	30	144	20
bis(2-Chloroethoxy)meth	1	100	30	115	30	126	30	115	20	30	126	20
bis(2-Chloroethyl)ether	2	100	30	115	30	121	30	115	20	30	121	20
bis(2-Chloroisopropyl)e	1	100	50	150	30	131	50	150	20	30	131	20
Bis(2-ethylhexyl)phthal	2	1300	30	154	34	149	30	154	20	34	149	20
4-Bromophenyl-phenyleth	2	100	43	118	34	120	43	118	20	34	120	20
Butylbenzylphthalate	2	100	37	136	30	153	37	136	20	30	153	20
4-Chloroaniline	1	100	30	115	30	110	30	115	20	30	110	20
4-Chloro-3-methylphenol	2	100	32	110	18	111	32	110	20	18	111	20
2-Chloronaphthalene	2	100	35	115	32	115	35	115	20	32	115	20
2-Chlorophenol	2	100	29	110	10	110	29	110	20	10	110	20
4-Chlorophenyl-phenylet	2	100	40	115	33	118	40	115	20	33	118	20
Chrysene	1	100	42	142	33	142	42	142	20	33	142	20
Dibenz(a,h)anthracene	2	100	38	130	34	148	38	130	20	34	148	20
Dibenzofuran	2	100	40	115	30	110	40	115	20	30	110	20
3,3'-Dichlorobenzidine	2	500	30	160	31	137	30	160	20	31	137	20
2,4-Dichlorophenol	2	100	34	115	32	121	34	115	20	32	121	20
Diethylphthalate	1	100	43	132	32	126	43	132	20	32	126	20
2,4-Dimethylphenol	2	100	31	120	33	119	31	120	20	33	119	20
Dimethylphthalate	2	100	42	116	36	124	42	116	20	36	124	20
Di-n-butylphthalate	2	100	46	123	36	135	46	123	20	36	135	20
4,6-Dinitro-2-methylphe	4	100	42	144	30	160	42	144	20	30	160	20

Table 4-2
Summary of Laboratory QC Limits

Parameter	MDL		LCS				Matrix Spike Water			Matrix Spike Soil		
			Water		Soil		Recovery		MSD	Recovery		MSD
	Water	Soil	LCL	UCL	LCL	UCL	LCL	UCL	RPD	LCL	UCL	RPD
2,4-Dinitrophenol	7	700	29	146	34	160	29	146	20	34	160	20
2,4-Dinitrotoluene	2	100	46	122	34	110	46	122	20	34	110	20
2,6-Dinitrotoluene	1	100	43	122	32	133	43	122	20	32	133	20
Di-n-octylphthalate	2	100	36	151	50	160	36	151	20	50	160	20
Fluoranthene	2	100	47	132	32	122	47	132	20	32	122	20
Fluorene	1	100	41	115	32	127	41	115	20	32	127	20
Hexachlorobenzene	2	100	42	123	32	127	42	123	20	32	127	20
Hexachlorobutadiene	2	100	30	120	30	118	30	120	20	30	118	20
Hexachlorocyclopentadiene	1	100	30	115	30	123	30	115	20	30	123	20
Hexachloroethane	1	100	30	120	30	115	30	120	20	30	115	20
Indeno(1,2,3-cd)pyrene	2	100	37	130	34	147	37	130	20	34	147	20
Isophorone	2	100	33	115	34	115	33	115	20	34	115	20
2-Methylnaphthalene	2	100	32	115	30	120	32	115	20	30	120	20
2-Methylphenol	2	100	30	116	30	123	30	116	20	30	123	20
4-Methylphenol	4	100	31	115	30	127	31	115	20	30	127	20
Naphthalene	2	100	30	119	30	115	30	119	20	30	115	20
2-Nitroaniline	2	100	30	115	30	148	30	115	20	30	148	20
3-Nitroaniline	2	100	30	115	30	110	30	115	20	30	110	20
4-Nitroaniline	2	100	30	115	30	110	30	115	20	30	110	20
Nitrobenzene	1	100	31	115	30	115	31	115	20	30	115	20
2-Nitrophenol	1	100	33	115	30	126	33	115	20	30	126	20
4-Nitrophenol	3	100	21	110	24	120	21	110	20	24	120	20
N-Nitrosodiphenylamine	2	100	35	124	50	134	35	124	20	50	134	20
N-Nitroso-di-n-propylamine	2	100	39	110	24	112	39	110	20	24	112	20
Pentachlorophenol	5	500	32	133	10	114	32	133	20	10	114	20
Phenanthrene	2	100	45	117	35	119	45	117	20	35	119	20
Phenol	1	100	10	110	10	110	10	110	20	10	110	20
Pyrene	2	100	51	137	33	150	51	137	20	33	150	20
2,4,5-Trichlorophenol	2	100	36	135	34	128	36	135	20	34	128	20
2,4,6-Trichlorophenol	2	100	39	115	35	120	39	115	20	35	120	20
2,4,6-Tribromophenol (surr)	--	--	34	129	38	121	--	--	--	--	--	--
2-Fluorobiphenyl (surr)	--	--	30	103	31	100	--	--	--	--	--	--
2-Fluorophenol (surr)	--	--	14	100	21	100	--	--	--	--	--	--
Nitrobenzene-d5 (surr)	--	--	32	107	27	100	--	--	--	--	--	--
Phenol-d5 (surr)	--	--	15	100	19	106	--	--	--	--	--	--
Terphenyl-d14 (surr)	--	--	28	154	35	123	--	--	--	--	--	--
RCRA Metals by EPA Method 6010B/7470A/7471A	**ug/L**	**mg/kg**										
Arsenic	5	0.25	80	120	80	120	75	125	20	75	125	20

Table 4-2
Summary of Laboratory QC Limits

Parameter	MDL		LCS				Matrix Spike Water			Matrix Spike Soil		
			Water		Soil		Recovery		MSD	Recovery		MSD
	Water	Soil	LCL	UCL	LCL	UCL	LCL	UCL	RPD	LCL	UCL	RPD
Barrium	5	0.25	80	120	80	120	75	125	20	75	125	20
Chromium	5	0.25	80	120	80	120	75	125	20	75	125	20
Cadmium	1	0.05	80	120	80	120	75	125	20	75	125	20
Lead	50	2.5	80	120	80	120	75	125	20	75	125	20
Mercury	0.2	0.05	80	120	80	120	75	125	20	75	125	20
Selenium	5	0.25	80	120	80	120	75	125	20	75	125	20
Silver	1	0.05	80	120	80	120	75	125	20	75	125	20
Total Petroleum Hydrocarbons by EPA Method 8015	**ug/L**	**ug/kg**	**%**	**%**	**%**	**%**	**%**	**%**	**%**	**%**	**%**	**%**
C6-C10 (GRO)	50	5000	50	150	50	150	50	150	20	50	150	20
Bromofluorobenzene (surr)	--	--	50	150	50	150	--	--	--	--	--	--
C10-C22 (DRO)	50	2000	50	150	50	150	50	150	25	50	150	25
C22-C36 (ORO)	50	2000	50	150	50	150	50	150	25	50	150	25
Ortho-terphenyl (surr)	--	--	50	150	50	150	--	--	--	--	--	--