bhate associates
ENGINEERING, SCIENCE AND CONSTRUCTION
RESPONSIVENESS – INTEGRITY - TEAMWORK

445 Union Blvd, Suite 129, Lakewood, CO 80228
303-597-2450 main 303-597-2449 fax www.bhate.com

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RECEIVED
JUL 2008
NMED Hazardous Waste Bureau

July 9, 2008

New Mexico Environment Department
Hazardous Waste Bureau
2905 Rodeo Park Drive East, Building 1
Santa Fe, NM 87505-6303

Attention: Mr. James P. Bearzi
Chief, Hazardous Waste Bureau

Subject: Response to 30 January 2008 Notice of Disapproval: RCRA Facility Investigation (RFI) Work Plan, Chemical Agent Disposal Site (DP-64), October 2007, Holloman AFB, NM6572124422 HWB-HAFB-07-010

Dear Mr. Bearzi,

Enclosed please find one (1) hard copy of the revised work plan text with strikethrough edits and associated revised figures and tables that incorporate all the responses to the Notice of Disapproval (NOD). Holloman Air Force Base provided transmittal of the matrix (comment response table) in a letter dated April 15, 2008, which is attached for reference. One (1) hard copy of the revisions is also being provided to M. David Strasser by this transmittal.

If you have any questions, please feel free to call me at 303-597-2450.

Sincerely,
Bhate Environmental Associates, Inc.

Frank Gardner

Frank Gardner, PG
Program Manager

cc:

(w/Atch)	(w/o Atch)	(w/o Atch)
Mr. David Strasser	Mr. Will Moats	David Scruggs
Hazardous Waste Bureau	Hazardous Waste Bureau	49 CES/CD
5500 San Antonio Dr. NE	5500 San Antonio Dr. NE	550 Tabosa Ave
Albuquerque, NM 87109	Albuquerque, NM 87109	Holloman AFB, NM 88330

DEPARTMENT OF THE AIR FORCE
HEADQUARTERS 49TH FIGHTER WING (ACC)
HOLLOMAN AIR FORCE BASE, NEW MEXICO

MEMORANDUM FOR NEW MEXICO ENVIRONMENT DEPARTMENT
Attn: Mr. James Bearzi
Hazardous Waste Bureau
2905 Rodeo Park Drive East
Santa Fe NM 87105-6303

APR 15 2008

FROM: 49 CES/CD
550 Tabosa Ave
Holloman AFB NM 88330-8458

Subject: Response to 30 Jan 2008 Notice of Disapproval: RCRA Facility Investigation (RFI) Work Plan, Chemical Agent Disposal Site (DP-64), October 2007 Holloman AFB, NM6572124422 HWB-HAFB-07-010

1. The subject response is hereby submitted to NMED for review and approval.

2. I certify under penalty of law that this document and all attachments were prepared under my direction or supervision according to a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.

3. If you have any questions, please feel free to contact Mr. David Scruggs at (575) 572-5395.

A. DAVID BUDAK
Deputy Base Civil Engineer

Attachement:
RFI Work Plan

cc:

(w/Atch)	(w/o Atch)	(w/o Atch)
Mr. David Strasser	Mr. Will Moats	Ms. Laurie King
Hazardous Waste Bureau	Hazardous Waste Bureau	USEPA, Region 6 (6PD-F)
5500 San Antonio Dr. NE	5500 San Antonio Dr. NE	1445 Ross Ave., Ste 1200
Albuquerque, NM 87109	Albuquerque, NM 87109	Dallas, TX 75202-2733

7007 1490 0000 7439 0807

Response to Comments Voluntary Corrective Measure Report for DP-64 (AOC 1), June 2005, Holloman AFB, NM				
Comment No.	**Section**	**Page**	**Comment**	**Response**
Author	**James P. Bearzi**		**Date of Comments: April 14, 2006, Notice of Deficiency HWB-HAFB-05-009**	**Date of Response: March 21, 2008**
1	2.7.3	2-7	The geophysical prove-out procedure determined that the use of the MTADS EM-61 electromagnetic system was the most effective method of detecting anomalies at the subject site. It was therefore the only method employed to conduct the site-wide geophysical investigation. Section 2.7.3 states the following: "Items such as individual glass ampoules cannot be detected using DGM (digital geophysical mapping). However, if disposal of the ampoules occurred in the same location as metallic debris or in an area of ground disturbance large enough to be detected, then the geophysical survey may indicate where intrusive remediation should be considered." NMED has concerns about whether the EM-61 geophysical survey was able to locate all of the subsurface glass ampoules that were potentially disposed of at this site, particularly those that were not associated with metal debris or large area of ground disturbance. According to Figure B-5, at least one glass ampoule was found outside of the 10 foot by 60 foot area. The Permittee is required to provide a discussion of the efficacy of the geophysical survey performed at the site to locate all subsurface glass ampoules. In addition, there is no clear discussion of the maximum depth that the EM-61 electromagnetic system was able to detect anomalies at this site. The Permittee is required to provide a discussion on this issue.	<u>Response Provided by Jason Blair of the US Army Corps of Engineers:</u> There is guidance from 1948 that outlines the proper disposal procedure for pigs (tin canisters used to dispose of the CAIS kits or glass ampoules). In summary, a trench/pit was excavated and lined at the bottom with wood. The glass ampoules were then positioned on the wood and burned with diesel fuel. The following instruments were utilized to collect data over seeded test plots: MTADS EM61, MTADS MAG, EM 31, and GPR. Based on evaluation of the geophysical data collected over the geophysical prove-out grids, a decision was made by Zapata Engineering and US Army Corps of Engineers Huntsville project personnel that the MTADS EM 61 instrument yielded the most repeatable results when compared to the other geophysical instruments tested. Additionally, project personnel believed that if individual pigs or tin canisters that held the ampoules could be geophysically located, then the EM61 would be the most useful tool in delineating the potential disposal areas. Project personnel surmised that the pigs or the tin cans were disposed of at the same time as the glass ampoules. Zapata Engineering personnel in conjunction with the US Army Corps of Engineering Huntsville personnel evaluated the MTADS EM61 data from the geophysical prove out constructed for site evaluation at DP-64 (AOC 1), Holloman Air Force Base, EPA ID#NM6572124422 HWB-HAFB-05-009 and determined that a 17 mV threshold was optimal for target picking. Based on review of Table 13 from Appendix C of the Final Site Specific Final Report for Ordnance and Explosive Removal Action at Holloman Air Force Base New Mexico, Volume 1, a threshold of 17 mV would be suitable to detect munitions/simulants of a similar size to seed item SC#379 buried at a depth of 48". A depth of 48" is a typical clearance depth for land use conditions for the following activities: public access, farming agricultural, surface recreational, parking, and surface supply storage. With all that said, it is possible that glass ampoules remain at the site since the EM61 is a metal detector.
2	2.11	2-9	This Section indicates that soil samples were collected at locations where the glass ampoules were	Concur. Please see the attached figure (Soil Sampling Location Map DP-64), table (Table for Response to Comment #2), and laboratory analytical

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Author	**James P. Bearzi**		**Date of Comments: April 14, 2006, Notice of Deficiency HWB-HAFB-05-009**	**Date of Response: March 21, 2008**
			found. Based upon the quality control reports, there appears to have been six (6) soil samples collected (DP64-01 through DP64-06); these were only analyzed for chemical agents (i.e. ABP, mustard, Lewisite). This Section indicates only that the results were negative for chemical agents and agent breakdown products. The locations of these samples were not shown on any figures nor were the results tabulated or laboratory reports provided. The Permittee is required to provide a figure showing the locations of sample collection, a tabulation of the results (including analytes and test methods, method detection limits, sample depths, and dates), and the laboratory reports.	data (Environmental Monitoring Laboratory Clearance Report). Please note that Bhate was unable to determine the location of sample DP6406 collected on July 14, 2004. The locations of the other samples were determined based on information provided in the text, daily quality control reports, maps, dig sheet records, and soil & sediment sample logs.
3	2.11		According to the Dig Sheets and other field documentation provided in this report, ordnance and explosive (OE) material and scrap was discovered in several "burn pits" at the site. These appear to be target ID numbers 104, 105, 109, 112, and 137. The Section on soil sampling makes no mention of any soil samples being collected at the "burn pit" locations. Therefore, the Permittee is required to submit a work plan to collect a minimum of one soil sample from the bottom of the "burn pits" and analyze the soils for RCRA metals, volatile organic compounds (VOCs), semi-volatile compounds (SVOCs), and explosives.	Concur. A Work Plan including soil sampling for RCRA metals, VOCs, SVOCs, and explosives was submitted to NMED in October 2007.
4	Appendix B	Figures B-5 and B-6	These figures show the locations of the anomalies discovered during the geophysical survey and subsequent intrusive investigation. However, these figures do not show the target ID numbers. Therefore, the Permittee is required to resubmit these figures with the target ID numbers shown.	Concur. Please see the revised Figures B-5&B-6 attached.
5	Appendix D	Figure 3	Figure 3 shows the results of the geophysical survey. However, most of the target ID numbers are not	Concur. Please see the attached Figure No. 3 – MTADS EM61 Geophysical Survey.

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			readable as they bleed into the background of the figure. Therefore, the Permittee is required to revise and resubmit this figure with readable target ID numbers.	

Response to Comments RCRA Facility Investigation (RFI) Work Plan, Chemical Agent Disposal Site (DP-64), October 2007, Holloman Air Force Base, NM6572124422 HWB-HAFB-07-010				
Comment No.	**Section**	**Page**	**Comment**	**Response**
Author	**James P. Bearzi**		**Date of Comments: January 30, 2008 Notice of Disapproval HWB-HAFB-07-010**	**Date of Response: March 21, 2008**
1(b)			The RFI Work Plan, as submitted, does not provide an adequate response to the agorementrioned Notice of Deficiency for the ordnance removal action, dated April 14, 2006. In particular, the Permittee did not provide responses to comment numbers 1, 2, 4, or 5. Comment number 3, which required that the Permittee submit a work plan to conduct sampling activities at the burn pit sites, was the only comment responded to. NMED can not finalize review the subject Work Plan until the remaining comments are responded to. The Permittee must revise the subject Work Plan to respond to all of the Notice of Deficiency comments.	See the response above for comments 1, 2, 4, and 5.

Response to Comments RCRA Facility Investigation (RFI) Work Plan, Chemical Agent Disposal Site (DP-64), October 2007, Holloman Air Force Base, NM6572124422 HWB-HAFB-07-010				
Comment No.	**Section**	**Page**	**Comment**	**Response**
Author	**James P. Bearzi**		**Date of Comments: January 30, 2008 Notice of Disapproval HWB-HAFB-07-010**	**Date of Response: March 21, 2008**
2 (b)	3	3-1	This sentence states that "…if results from the soil samples do not indicate concentration above the reporting limit, additional sampling will not be conducted and the RFI Report will be prepared." This appears to exclude any groundwater sampling. The Permittee is required to install a minimum of three groundwater monitoring wells (of the proposed six) and sample the groundwater for VOCs, SVOCs, RCRA Metals, explosives and TDS. This activitiy must occur regardless of the soil sampling results. The three remaining monitoring wells, including the deep well, will also be installed and sampled as proposed in the Work Plan if conditions warrant. The Permittee must revise the subject Work Plan to reflect this requirement.	Concur. The Work Plan will be revised to reflect that groundwater sampling will occur regardless of the soil sampling results.
3 (b)	3.3.2	3-4	This paragraph provides a list of proposed groundwater analytes. In addition to the proposed analytes, the Permittee is required to revise the subject Work Plan to include nitrate/nitrite in the list of analytes.	Concur. The Work Plan will be revised to include nitrate/nitrite to the list of proposed analytes.
4 (b)	4.2	4-1	This section indicates that "Metals detected in soil will be evaluated against the current NMED residential risk-based soil screening levels (SSLs)". The Permittee is required to revise the subject Work Plan to include evaluating metals detected in soils above the reporting limit against the soon-to-be established base-wide concentrations, as well as the SSLs. The maximum detected concentration for each contaminant that is detected above the reporting limit must be used. These comparisons will then be used to determine the site hazard index, which must be less than 1.0. Any contaminant concentrations above the SSLs can not be screened out.	Concur. The Work Plan will be revised to include the evaluation of metals against the soon-to-be established base-wide concentrations, as well as the SSLs.

RCRA FACILITY INVESTIGATION (RFI) WORK PLAN CHEMICAL AGENT DISPOSAL SITE (DP-64) HOLLOMAN AIR FORCE BASE, NEW MEXICO

Subcontract No.: 5020S.01

Under Prime Contract No.: W9128F-04-D-0017

Bhate Project Number: 9070127 01.02

Prepared For:

U.S. Army Corps of Engineers
Omaha District
Omaha, Nebraska

Prepared By:

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

Under contract to:

North Wind, Inc.
1425 Higham Street
Idaho Falls, Idaho 83402

~~October 2007~~July 2008

RCRA FACILITY INVESTIGATION (RFI) WORK PLAN CHEMICAL AGENT DISPOSAL SITE (DP-64) HOLLOMAN AIR FORCE BASE, NEW MEXICO

REVIEW SHEET

This Work Plan has been reviewed and approved by:

John Hymer Bhate Site Manager	Signature	Date
Katherine T. Thompson Bhate Field Team Leader/Geologist	Signature	Date
Doug Jorgensen NWI Project Manager	Signature	Date
Frank Gardner, P.G. Bhate Program Manager	Signature	Date

RCRA FACILITY INVESTIGATION (RFI) WORK PLAN
CHEMICAL AGENT DISPOSAL SITE (DP-64)
HOLLOMAN AIR FORCE BASE,
NEW MEXICO
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ACRONYMS AND ABBREVIATIONS CONTINUED

PPE	Personal protective equipment
PVC	Polyvinyl chloride
QA/QC	Quality Assurance/Quality Control
QAPP	Quality Assurance Project Plan
QSM	Quality Systems Manual
RCRA	Resource Conservation and Recovery Act
RCWM	Recovered Chemical Warfare Material
RFI	RCRA Facility Investigation
SCH	Schedule
SOP	Standard Operating Procedure
SSFR	Site Specific Final Report
SSL	Soil Screening Level
SVOC	Semi-volatile organic compound
SWRI	Southwest Research Institute
TDS	Total dissolved solids
USACE	United States Corps of Engineers
USCS	Unified Soil Classification System
UTL	Upper Tolerance Limit
VOC	Volatile organic compound
WRCC	Western Regional Climate Center
WSMR	White Sands Missile Range
WWTP	Wastewater treatment plant
Zapata	Zapata Engineering, P.A.

1 INTRODUCTION

Bhate Environmental Associates, Inc. (Bhate), is working under Subcontract No. 5020S.01 to North Wind, Inc. (NWI), who has been retained by the U.S. Army Corps of Engineers (USACE), under contract W9128F-04-D-0017, to conduct a Resource Conservation and Recovery (RCRA) Facility Investigation (RFI) at the Chemical Agent Disposal Site (DP-64) at Holloman Air Force Base (HAFB), New Mexico. The RFI includes tasks as outlined in the USACE Scope of Services dated October 25, 2006. This document is to provide a work plan that will serve as the primary working document for the field activities at DP-64.

The RFI Work Plan provides the relevant site specific information and requirements as outlined in the Scope of Services for remedial activities at DP-64. The primary objective of this RFI is to characterize the quantity, concentration, and extent of contamination, if any, and to determine if there is any threat to human health and environment using the Triad approach. During this process, required data will be collected to support the closure of the site based on guidance from the New Mexico Environment Department (NMED). The ultimate objective is to achieve No Further Action (NFA) approval for site closure from NMED.

This document has been written to outline the procedures by which the RFI will be completed in order to provide relevant information on the geologic, hydrologic, and other environmental conditions for HAFB and DP-64. Information is provided for HAFB and its surrounding environment as well as DP-64. This RFI Work Plan includes the process by which soil and groundwater sampling activities are to be conducted.

1.1 HAFB Site Description

HAFB is located in southeastern New Mexico in Otero County, New Mexico, approximately 100 miles north-northeast of El Paso, Texas and six miles west of Alamogordo, New Mexico (Figure 1-1). HAFB was first established in 1942 as Alamogordo Army Air Field (AAF). From 1942 through 1945, Alamogordo AAF served as the training grounds for over 20 different flight groups, flying primarily B-17s, B-24s, and B-29s. After World War II, most operations had ceased at the base. In 1947, Air Material Command announced the air field would be its primary site for the testing and development of un-manned aircraft, guided missiles, and other research programs. On January 13, 1948, the Alamogordo installation was renamed Holloman Air Force Base, in honor of the late Col. George V. Holloman; a pioneer in guided missile research. In 1968, the 49th Tactical Fighter Wing arrived at HAFB and has remained since. Today, HAFB also serves as the training center for the German Air Force's Tactical Training Center.

The DP-64 site is located in the northeastern portion of HAFB on the north side and adjacent to the former Main Base Landfill (LF-01) (Figure 1-2). The total area of the DP-64 site is approximately 5.5 acres (Figure 1-3).

the central basin. Because the Tularosa Basin is a closed system, water that enters the area only leaves either through evaporation or percolation. This elevated amount of percolation results in a fairly high water table. Beneath HAFB, groundwater ranges from 5 to 50 feet. Flow for the Base is generally towards the southwest with localized influences from the variations in the topography of the Base. Near the arroyos, groundwater flows directly toward the surface drainage feature.

The approximate depth to the water table at DP-64 has not been clearly defined, however, the water table at LF-01, located adjacent to the south of DP-64 is reported at approximately 31.5 feet below ground surface (ft bgs) with groundwater flow direction to the southwest.

1.5 Climate

As a whole, New Mexico has a mild, arid to semi-arid continental climate characterized by light precipitation totals, abundant sunshine, relatively low humidity, and relatively large annual and diurnal temperature range (Western Regional Climate Center [WRCC], 2003). The climate of the Central Closed Basins varies with elevation. The Base is found in the low areas and is characterized by warm temperatures and dry air. Daytime temperatures often exceed 100 degrees Fahrenheit (°F) in the summer months and are in the middle 50s in the winter. A preponderance of clear skies and relatively low humidity permits rapid night time cooling resulting in average diurnal temperature ranges of 25 to 35°F. Potential evapotranspiration, at 67 inches per year, significantly exceeds annual precipitation, usually less than 10 inches. The very low rainfall amounts resulting in the arid conditions, which with the topographically induced wind patterns combining with the sparse vegetation, tend to cause localized "dust devils". Much of the precipitation falls during the mid-summer monsoonal period (July and August) as brief, yet frequent, intense thunderstorms culminating to 30 – 40% of the annual total rainfall.

1.6 Geology

The sedimentary rocks which make up the adjacent mountain ranges are between 500 and 250 million years old (White Sands Missile Range [WSMR], 2003). During the period when the area was submerged under the shallow intra-continental sea, the layers of limestone, shale, gypsum, and sandstone were deposited. In time, these layers were pushed upward through various tectonic forces forming a large bulge on the surface. Approximately 10 million years ago the center began to subside resulting in a vertical drop of thousands of feet leaving the edges still standing (the present day Sacramento and San Andres mountain ranges). In the millions of years following, rainfall, snowmelt, and wind eroded the mountain sediments depositing them in the valley (i.e. Tularosa Basin). Water carrying eroded gypsum, gravel, and other matter continues to flow into the basin.

As the Tularosa Basin is a bolson, which is a basin with no surface drainage outlet, sediments carried by surface water into a closed basin are bolson deposits. The overlying alluvium generally consists of unconsolidated gravels, sands, and clays. Soils in the basin are derived from the adjacent ranges as erosional deposits of limestone, dolomite, and gypsum. A fining sequence from the ranges towards the basin's center characterizes the area with the near surface

2 HISTORICAL DATA REVIEW

On February 9, 2000, several broken vials and two intact vials filled with a clear to yellowish liquid were discovered by a pedestrian walking north of the closed Main Base Landfill (LF-01) site. During a re-vegetation project at the LF-01 site, the topsoil associated with the landfill had been turned and the pedestrian reported their findings to the 49th Environmental Flight. The 49th Environmental Flight in conjunction with Foster Wheeler Environmental Corporation (FWEC) responded by locating, recovering, and transporting the two intact vials to a laboratory at Brooks AFB, Texas, which was later transferred to the Southwest Research Institute (SWRI) for analysis. The vials were analyzed for chemical warfare agents and three industrial chemical agents. The results of the analyses indicated one vial contained 5 percent distilled mustard (HD) in chloroform and the second vial contained 5 percent Lewisite in chloroform (Zapata Engineering, P.A. [Zapata], June 2005). In addition to the ampoules, three burn areas, remnants of incendiary devices (M69X or M74), and broken glass ampoules were identified across the site during their surface clearance and debris removal activities.

FWEC prepared the Chemical Safety Submission (CSS) for the USACE in October 2003, which was then supplemented by the *Ordnance and Explosive Recovered Chemical Warfare Material Removal Action Work Plan* in April 2004 and the SSFR submitted in June 2005 by Zapata.

The Final SSFR field activities included a detailed search of the surface area of DP-64 and subsurface excavations associated with 123 anomalies. These anomalies were investigated based on the results of the Geophysical Prove Out using an electromagnetic system, magnetometer system, electromagnetic ground conductivity system, and a ground penetrating radar system. Detailed procedures and results were provided in Appendix D of the Final SSFR (Zapata, 2005). Zapata collected soil samples from the excavation site and from two areas where Recovered Chemical Warfare Material (RCWM) was found during the investigation of the surface area. These samples were analyzed for chemical agents. During these activities, Zapata removed all surface debris encountered, which included scrap metal, blasting caps, smoke pot components, and M69 incendiary bomb components. According to the Final SSFR, a total of 15 chemical agent identification set (CAIS) kit components were recovered, packaged, and stored. CAISs were used by military personnel to identify chemical agents. During the 1950s, the Chemical Test Squadron at Edgewood Maryland flew missions to HAFB. However, no documentation has been found to indicate that testing or disposal of any testing items occurred at DP-64.

In a Notice of Deficiency Letter, provided by the NMED, dated April 14, 2006, the NMED, in part, requested additional sampling to be conducted at DP-64. NMED has requested additional soil sampling at five anomalies (104, 105, 109, 112, and 137) associated with previous "burn pit" locations (Figures, tables, and dig sheets from the SSFR are provided in Appendix A of this Work Plan). The NMED is requiring one soil sample from the bottom of the "burn pits" and analysis of the soils for Resource Conservation and Recovery Action (RCRA) metals, volatile organic compounds (VOCs), semi-volatile organic compounds (SVOCs), and explosives.

3 INVESTIGATION ACTIVITIES

There are five areas of concern (Anomalies 104, 105, 109, 112, and 137) located at DP-64 which require further investigation. These locations were identified during the field activities as described in the Final SSFR submitted by Zapata in June 2005. These anomalies were described as burn pits and debris locations, all detected within two feet of the surface. According to the Final SSFR, all chemical agents were removed from the site.

Work conducted under this RFI Work Plan will be conducted in a TRIAD-like approach. This TRIAD-like approach will utilize dynamic work strategies in order to determine the vertical and horizontal extent of contamination. These strategies include rapid turns on laboratory analytical data and on-site determination of additional soil boring and/or monitoring well locations. This approach is beneficial due to an accelerated site investigation with only one large-scale mobilization. A flow chart for the TRIAD RFI Dynamic Decision Logic is provided as Figure 3-1. All field activities, including soil boring/monitoring well installation, groundwater sampling, and surveying, are to be completed within three weeks.

The first phase of field activities is to collect soil samples, including surface samples to a maximum depth of 2 ft bgs and subsurface samples to a maximum depth of 50 feet, in the five areas of concern shown on Figure 3-2 (Anomalies 104, 105, 109, 112, and 137). In addition, one geotechnical sample will be collected in order to conduct a Risk-Based Evaluation for ecological and human health, if warranted.

A minimum of three groundwater monitoring wells will be installed and sampled for VOCs, SVOCs, RCRA Metals, explosives, nitrite/nitrate, and total dissolved solids (TDS). Once this has been completed, if results from the soil and groundwater samples do not indicate concentrations above the reporting limit, additional soil and groundwater sampling will not be conducted and the RFI Report will be prepared. However, if either soil or groundwater sampling results indicate concentrations greater than the reporting limit, additional borings and/or monitoring wells will be installed for further delineation. ~~Upon receipt of the additional soil sampling, locations for groundwater monitoring wells will be determined on site and sampled for the appropriate analytes.~~

Field activities for DP-64 have been designed as a TRIAD-like approach as outlined in Figure 3-1. The following list of activities may be performed.

- Advance 5 soil borings (1 from each area) from the 5 areas of concern (anomalies 104, 105, 109, 112, and 137) to determine the presence of contamination, if any (Figure 3-3)
- Collect 3 soil samples from each boring including one surface soil sample (0 to 2 feet bgs) and two subsurface samples with the highest headspace reading from each boring
- Analyze the soil samples for VOCs, SVOCs, RCRA metals, and explosives

Site Manager or other authorized project personnel will complete a site walk-through confirming the dig permit authorizations and make any required changes.

3.1.3 Pre-Drilling Screening Activities

Prior to any drilling activities, the surface soil at the soil boring locations and monitoring well locations will be screened for ordnance and munitions as a precautionary measure due to the historical nature of the site. The surface soils will be visually checked for debris, followed by the use of a magnetometer in order to detect any metal debris which may not be visually apparent. If any anomalies are detected, the soil borings/monitoring well location will be shifted to avoid this area. No other screening process for ordnance/munitions will be conducted during this investigation as the site should be cleared based on the SSFR.

3.2 Soil Assessment

The field work for the RFI will be conducted in accordance with HAFB Standard Operating Procedures (SOPs) provided in the *Basewide Quality Assurance Project Plan* (QAPP) (Bhate, November 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.

A minimum of 5 and a maximum of 10 soil borings will be advanced at the site to the depth where groundwater is encountered using conventional hollow stem auger (HSA) techniques with a 2-foot stainless steel split spoon sampler. Continuous soil samples will be collected from these borings with lithologic descriptions per HAFB SOP No. 7. A maximum of 37 soil samples, including up to three field duplicate samples and four matrix spike (MS)/matrix spike duplicates (MSD), may be submitted to the laboratory for analysis of VOCs (Method 8260B), SVOCs (Method 8370C), RCRA metals (Method 6010B/7471A), and explosives (Method 8330A). The samples will be placed on ice and shipped under strict chain-of-custody to the laboratory for a 24-hour turn around time. In addition, one geotechnical sample will be collected from the most upgradient soil boring above groundwater. This sample will be analyzed for moisture content by Method 160.3M, specific gravity by American Society for Testing and Materials (ASTM) Method D1429, fractional organic carbon by ASTM Method 2974, and dry bulk density by ASTM Method D2937.

Soils collected from above the water table will be field screened in accordance with HAFB SOP No. 6 using an organic vapor analyzer (OVA) to perform soil-headspace screening techniques. Notation will also be made of any visual (discoloration) and/or aromatic indicative of potential contamination.

Based on headspace screening results, two soil samples from each soil boring with the highest OVA readings and one surface sample (0 to 2 feet, bgs) will be selected for laboratory analyses. Should the screening not identify one or more intervals in which to select, then the lower most interval at the soil-water interface and a mid-range shall be retained for laboratory analysis.

sampled. ~~Groundwater samples will be collected from the six newly installed wells, as well as existing monitoring well 1W1, associated with the adjacent ERP site LF-01.~~ One field duplicate and a matrix spike/matrix spike duplicate (MS/MSD) will be collected along with the samples and submitted to the laboratory for analysis. The samples will be placed on ice and shipped under strict chain-of-custody to the laboratory.

Groundwater samples will be collected using the low-flow sampling techniques with the use of either a peristaltic or submersible pump and polyethylene tubing. The tubing will be placed at mid-screen and purged until field parameters are stabilized. The samples will be collected from mid-screen and analyzed for: VOCs (EPA Method 8260B), SVOCs (EPA Method 8370C), RCRA metals (EPA Method 6010B/7470A), explosives (EPA Method 8330A SW846), nitrate and nitrite (EPA Method 353.2), and TDS (EPA Method 160.1).

3.4 Laboratory Analysis

During this investigation, a maximum of 37 soil samples (including the field duplicates and MS/MSD) and a maximum of 10 groundwater samples (including the field duplicate and MS/MSD) will be analyzed for VOCs by Method 8260B, SVOCs by Method 8270C, RCRA metals by Method 6010B/7471A (soil)/7470A (groundwater), explosives by Method 8330A SW846, nitrate and nitrite by Method 353.2 (groundwater only), and TDS (groundwater only) by Method 160.1. Each soil and groundwater sample, including the quality control samples, will be analyzed for their respective analytes in accordance with Table 3-1.

Soil samples will be submitted to the laboratory for a 24-hour turn around time to accelerate field activities in order to complete the installation of all soil borings and monitoring wells, if applicable, within one mobilization.

Appendix B details the method detection limits by method for chemical constituents indicated for DP-64.

3.5 Surveying

The five permanent monitoring well locations will be surveyed in accordance with methods described in the Basewide QAPP (Bhate, November 2003). Horizontal locations will be relative to the State Plane Coordinate System, New Mexico Central and surveyed to an accuracy of +/- 1.0 ft. Vertical elevations will be referenced to North American Datum (NAD) 1983. The top of casing (vertical control) will be used to determine the depth and elevation of the groundwater and surveyed to an accuracy of +/-0.01 ft. All DP-64 site maps will include a coordinate system (e.g., latitude/longitude) with the site and pertinent features.

3.6 Groundwater Elevations

During the sampling of monitoring wells under this Work Plan, groundwater elevations will be measured. The water level in each well will be gauged to the nearest 0.01 feet using an electronic water level indicator prior to sampling. The depth to water information will be used to

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4 RISK BASED CLEAN-UP APPROACH

The objective of this investigation is to determine the presence and quantity of contamination and to determine if there is any threat to human health and the environment. The results from the soil and groundwater sampling activities at the site will be evaluated to determine whether further investigation activities are warranted or if there is an acceptable risk given possible exposure at the site. If the completed Risk-Based Evaluation indicates an acceptable risk, then no further investigation activities will be required and the site can be considered for closure with no further action.

4.1 Evaluation of VOCs and SVOCs

For any VOCs or SVOCs that are detected in soil, the concentration will be evaluated against the Soil Screening Levels (SSLs) provided in Appendix A of the revised NMED guidance document *Technical Background Document for Development of Soil Screening Levels, Revision 4.0*, June 2006 (NMED, 2006). The laboratory data for each collected soil sample will be compared to these SSLs.

For VOCs and SVOCs detected in groundwater, the results will be compared to the New Mexico Water Quality Control Commission (NMWQCC) published groundwater quality standards. The NMWQCC are standards for aquifers with TDS concentrations less than or equal to 10,000 milligrams per liter (mg/L) [20.6.2.3101 New Mexico Administrative Code (NMAC)]. The TDS concentration is a direct measure of the presence of total ions in the aquifer and is one of the primary criteria for classifying the aquifer based on its use as a potential drinking water source. Under the NMWQCC regulations, if TDS in groundwater is more than 10,000 mg/L, the aquifer is classified as non-potable and results will be compared to the EPA maximum contaminant levels (MCLs).

4.2 Evaluation of Metals

Metals detected in soil will be evaluated against the current NMED residential risk-based soil screening levels (NMED, 2006)~~.~~ as well as the basewide background levels (to be established). Groundwater metals concentrations will be compared to the NMWQCC standards~~.~~ and the basewide background levels (to be established). Comparisons will be based on the highest detected concentration for each contaminant and used to determine the site hazard index.

4.3 Evaluation of Explosives

For any explosives that are detected in soil, the concentration will be evaluated against the screening levels provided in Appendix A of the revised NMED guidance document *Technical Background Document for Development of Soil Screening Levels, Revision 4.0*, June 2006 (NMED, 2006). The laboratory data for each collected soil sample will be compared to these SSLs.

5 INVESTIGATION DERIVED WASTE MANAGEMENT

Investigation derived waste (IDW) will be managed and characterized according to HAFB SOP No. 9. Whenever possible, waste minimization techniques will be used to reduce the amount of IDW. IDW generated by advancing soil borings, installing the new monitoring wells, and subsequent groundwater sampling activities will be managed and characterized according to the following guidelines. All soil cuttings will be placed in appropriate 55-gallon steel drums and screened with an OVA for the presence of organic vapors. Results from the soil sampling analysis will determine whether the soil can be spread on the ground surrounding the well or if it will need to be placed in the FT-31 Landfarm at HAFB. Purged groundwater will be containerized and maintained by HAFB until disposal, pending laboratory analysis. Other liquid wastes, such as decontamination rinses, are anticipated to be non-hazardous and as such, can be disposed of through the HAFB wastewater treatment plant (WWTP). Personal protective equipment (PPE) and other site non-hazardous debris/waste shall be disposed in standard trash receptacle.

5.1 General Decontamination Procedures

All equipment, both small hand tools and large machinery (such as augers, etc.) will require some level of decontamination dependant upon its contact with the contaminated subsurface. Small hand tools can be decontaminated in five-gallon buckets at the site in accordance with the *Bhate Standard Operating Procedures* (Bhate, 2002) and the Basewide QAPP (Bhate, November 2003).

5.2 Personal Protective Equipment

Prior to disposal, used PPE, disposable items, and the decontamination pad liner will be rinsed clean with tap water and diluted detergent solution. Cleaned PPE and presumed clean, based upon non-contact with contaminated soils, water or equipment, and other disposable clean items will be contained in trash bags and disposed of at the applicable receptacle.

6 PROJECT QUALITY ASSURANCE

The laboratory performing the chemical sample analysis will follow the *Basewide Quality Assurance Project Plan* (Bhate, November 2003) and the Quality Assurance Project Plan Addendum (Appendix B of this Work Plan).

6.1 Standard Operating Procedures

Applicable HAFB SOPs for completing this investigation are located in Appendix A of the *Basewide QAPP* (Bhate, November 2003).

6.2 Sample Identification

Each environmental sample collected will be identified on the sample label and chain-of-custody records. Table 3-1 provides the sample collection information inclusive of the quantity for the soil and groundwater samples that will be collected during this investigation. Sample documentation, handling, and shipping will be in accordance with HAFB SOP No. 1. The field duplicate samples will appear in sequence with the regular samples.

An example of the sample identification nomenclature for groundwater samples collected from monitoring wells will be as follows:

DP64-MW01-a

Site alpha-numeric identifier: DP64 = Chemical Agent Disposal Site

Sample type identifier: MW = monitoring well

Monitoring well number: 01, 02, etc.

Reserved for quality assurance (QA) sample identifiers: a = field duplicate, TB = trip blank, MS = matrix spike, MSD = matrix spike duplicate

6.3 Project Documentation

The following subsections present the procedures for documenting information that will be collected in the field during this investigation.

6.3.1 Sample Documentation

Sample documentation, identification, and tracking will adhere to the prescribed methods found in the *Basewide QAPP*. All sampling activities will include documentation of significant activities, potential environmental influences during sampling, field variances, and sample identification information. At a minimum, field logbooks will be utilized to record dates and times, sampling protocols, project numbers, and sampler's name. Daily Quality Assurance Reports will be completed and submitted weekly to the HAFB Project Manager. Other pertinent information will include chain-of-custody numbers and air-bill tracking number. Chain-of-

site will be screened for VOCs in the field at the time of sample collection utilizing an OVA. If a high humidity condition exists at the time of sample collecting, a flame ionization detector (FID) is recommended since a photo-ionization detector (PID) is not a completely reliable screening instrument under these conditions. The field screening data will be recorded in the field logbook.

6.3.4 Data Reporting

Soil and groundwater data obtained during this investigation will be reported according to the *Basewide QAPP* (Bhate, November 2003). In accordance with Department of Defense (DOD) Quality Systems Manual (QSM) version 3, the investigative data is classified as definitive data. The data will be generated using rigorous, analyte-specific analytical methods where analyte identifiers and quantitations are confirmed and Quality Assurance/Quality Control (QA/QC) requirements have been satisfied. For this project, regular, field duplicate, and MS/MSD samples are to be collected concurrently. The data will meet the objectives of the project for level of accuracy and precision required, intended use of the data, analytical methods, time constraints, and allowable decision errors. Sampling results will be tabulated and summarized in the RFI Report for the site.

7 HEALTH AND SAFETY REQUIREMENTS

Project Health and Safety practices will adhere to the *Basewide Health and Safety Plan* (HASP) (Bhate, December 2003) and the Site Specific Addendum to the *Basewide HASP*, as included in Appendix B of this Work Plan, for the field investigation activities at DP-64. All work will be conducted in accordance with the USACE *Safety and Health Requirements Manual, EM 385-1-1,* 3 November 2003. It is anticipated that no greater than modified level D PPE will be required to complete the site inspection and sampling activities. This includes: Occupational Safety and Health Administration (OSHA) approved safety shoes, American National Standards Institute (ANSI) approved safety glasses (Z87.1) and hard hat (Z89.1-1997: Type I), sleeved shirt and long pants, and as required, hearing protection, leather work gloves, and/or nitrile gloves during sampling.

Site security is part of safety at the site for the investigation. Items of concern include the proper designation and demarcation of the investigation boundaries (i.e., Support Zone, Contaminant Reduction Zone, and Exclusion Zone) as appropriate. Likewise, compliance with any intrusive work requirements, posting of potential hazards, and control of un-authorized site personnel will be completed. This is discussed in the *Basewide HASP*.

At a minimum, the site will be secured with caution tape surrounding the perimeter of the site delineating the outer boundary of the Support Zone. This is essential in the utility clearance process and it serves as the demarcation of the site for both project and non-project persons. A Contaminant Reduction Zone and/or Exclusion Zone will be established as guided by the HASP and site prevailing conditions.

8 ORGANIZATION AND SCHEDULE

During the field activities at DP-64, Mr. Doug Jorgensen from NWI and Ms. Katherine Thompson from Bhate will serve as the Project Manager and the Field Team Leader, respectively, overseeing and directing all investigation sampling activities. Ms. Thompson will also provide on-site management of any sub-contractors for the project. Mr. Frank Gardner is the Bhate Program Manager and will ensure required project documents, permits, contractual agreements, and other program tasks are completed. Key project personnel and their responsibilities are listed in Table 8-1. A project schedule is provided as Figure 8-1.

Mr. Doug Jorgensen and Ms. Katherine Thompson will be on-site during field activities. All decisions regarding placement of soil borings and monitoring wells will be determined by the key personnel listed in Table 8-1.

9 REFERENCES

Bhate Environmental Associates, Inc. August 2002. *Bhate Standard Operating Procedures*.

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White Sands Missile Range. 2003. Public Affairs Office, Site Informational Web Page, http://www.wsmr.army.mil/paopage/Pages/WU%2360.htm.

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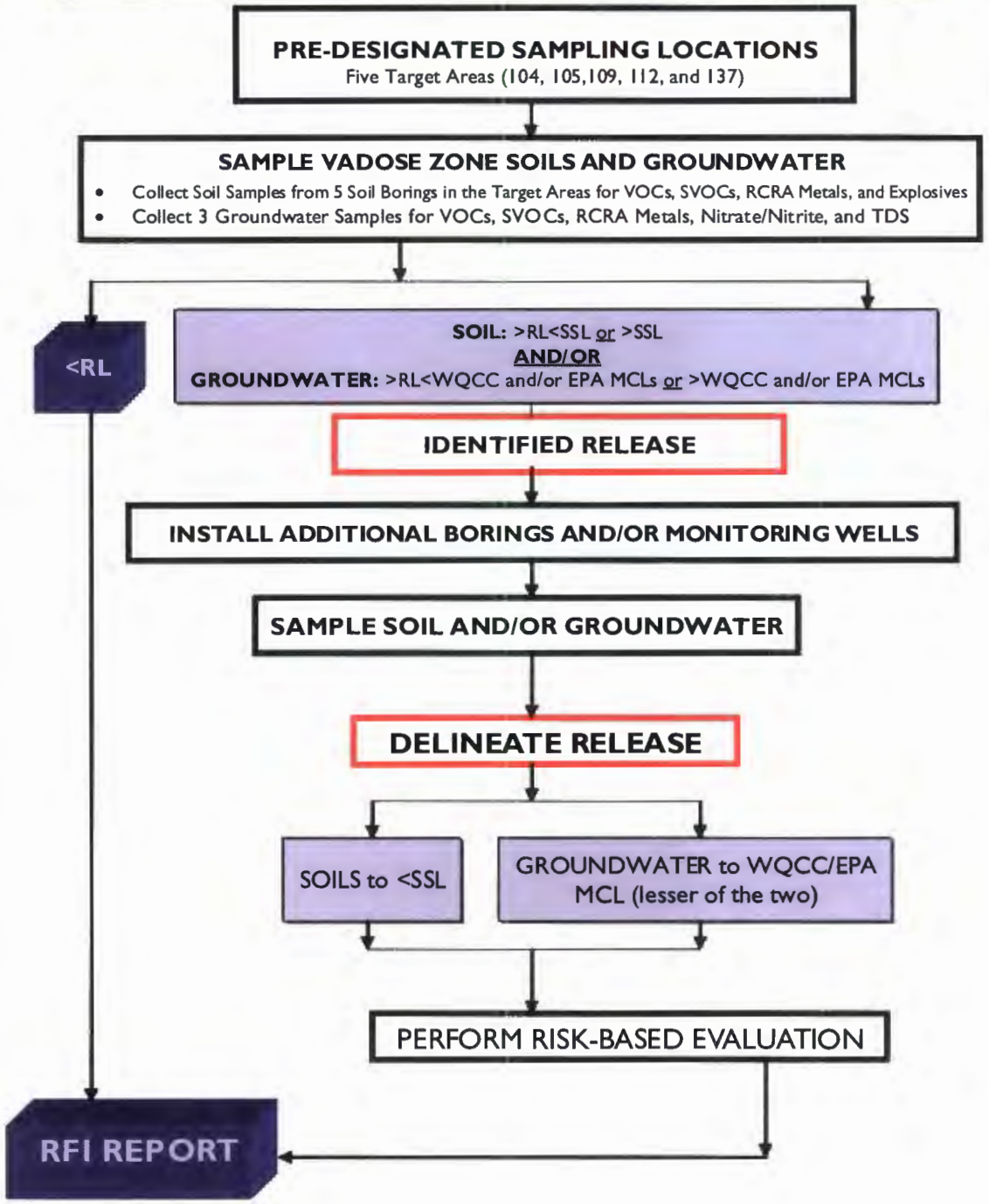
TABLES

FIGURES

DP-64 TRIAD RFI DYNAMIC DECISION LOGIC CHART



LEGEND
VOCs = Volatile Organic Compounds RL = Reporting Limit
SVOCs = Semi-Volatile Organic Compounds SSL = Soil Screening Level
RCRA = Resource Conservation and Recovery Act WQCC = Water Quality Control Commission Standards
EPA MCL = Environmental Protection Agency Maximum Contaminant Level
RFI = Resource Conservation and Recovery Act Facility Investigation

bhate associates
ENGINEERING, SCIENCE AND CONSTRUCTION

DP-64 TRIAD RFI Dynamic Decision Logic Chart

PROJECT NO.	SCALE	DATE	DRAWN BY: cm
9070127	NTS	7/10/08	DRAWING NO: 3-1

DP-64
RFI Work Plan
Holloman Air Force Base, New Mexico

Figure 3-1

APPENDIX A

HISTORICAL DATA FROM PREVIOUS INVESTIGATIONS

APPENDIX B

QUALITY ASSURANCE PROJECT PLAN ADDENDUM

Table 3-2
Summary of Definitive Data

Parameter	Matrix	Prepatory Method	Testing Method
Volatile Organic Compounds (VOCs)	Soil	USEPA SW-846 Method 5035B	USEPA SW-846 Method 8260B
Semivolatile Organic Compounds (SVOCs)	Soil	USEPA SW-846 Method 3550B	USEPA SW-846 Method 8270C
RCRA Metals	Soil	USEPA SW-846 Method 3050B	USEPA SW-846 Methods 6010B and 7471A
Explosives	Soil	USEPA SW-846 Method 8330A*	USEPA SW-846 Method 8330A
Volatile Organic Compounds (VOCs)	Groundwater	USEPA SW-846 Method 5030B	USEPA SW-846 Method 8260B
Semivolatile Organic Compounds (SVOCs)	Groundwater	USEPA SW-846 Method 3510C	USEPA SW-846 Method 8270C
RCRA Metals	Groundwater	USEPA SW-846 Method 3010A	USEPA SW-846 Methods 6010B and 7470A
Nitrate and Nitrite	Groundwater	NA	USEPA Method 353.2
Explosives	Groundwater	USEPA SW-846 Method 8330A*	USEPA SW-846 Method 8330A
TDS	Groundwater	USEPA Method 160.1*	USEPA Method 160.1

Notes:
USEPA = United States Environmental Protection Agency
TDS = Total Dissolved Solids
RCRA = Resource Conservation and Recovery Act
NA = Not Applicable
* Preparatory Method is included in Testing Method write-up

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	30	0	8	3	0	2	2	45
	SVOCs per EPA Method 8270C	30	0	0	3	0	2	2	37
	RCRA Metals by EPA 6010B/7471A	30	0	0	3	0	2	2	37
	Explosives by EPA 8330A	30	0	0	3	0	2	2	37
Groundwater	VOCs per EPA Method 8260B	7	0	2	1	0	1	1	12
	SVOCs per EPA Method 8270C	7	0	0	1	0	1	1	10
	RCRA Metals by EPA 6010B/7470A	7	0	0	1	0	1	1	10
	Nitrate and Nitrite by EPA 353.2	7	0	0		0	1		10
	Explosives by EPA 8330A	7	0	0	1	0	1	1	10
	Total Disolved solids by EPA 160.1	7	0	0	1	0	1	1	10

Notes:
EPA = Environmental Protection Agency
VOCs = Volatile Organic Compounds
SVOCs = Semi-volatile Organic Compounds
RCRA = Resource Conservation and Recovery Act
*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	µg/L	µg/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
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

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
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	**µg/L**	**µg/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	128	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
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

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
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	**µg/L**	**mg/kg**	**%**	**%**	**%**	**%**	**%**	**%**	**%**	**%**	**%**	**%**
Arsenic	5	0.25	80	120	80	120	75	125	20	75	125	20
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
Nitrate and Nitrite by EPA Method 353.2	**mg/L**	**mg/kg**	**%**	**%**	**%**	**%**	**%**	**%**	**%**	**%**	**%**	**%**
Nitrate and Nitrite as Nitrogen (N)	TBD	--	TBD	TBD	--	--	--	--	--	--	--	--
Total Dissolved Solids by EPA Method 160.1	**mg/L**	**mg/kg**	**%**	**%**	**%**	**%**	**%**	**%**	**%**	**%**	**%**	**%**
TDS	6	--	90	110	--	--	--	--	--	--	--	--
Explosives by EPA Method 8330A	**µg/L**	**µg/kg**	**%**	**%**	**%**	**%**	**%**	**%**	**%**	**%**	**%**	**%**
HMX	0.075	100	79	119	74	131	73	123	13	67	138	24
RDX	0.075	100	73	119	77	125	65	126	13	59	146	23
1,3-Dinitrobenzene	0.05	100	77	117	80	124	77	117	12	71	134	17
2,6-Dinitrotoluene	0.05	130	77	123	83	125	77	122	16	65	146	18
2,4-Dinitrotoluene	0.05	100	74	119	79	129	72	121	15	62	145	18
2-amino-4,6-Dinitrotoluene	0.05	100	77	121	88	122	68	128	17	70	137	22
4-amino-2,6-Dinitrotoluene	0.05	100	76	121	81	132	67	127	16	63	145	23
Nitrobenzene	0.05	100	66	122	78	132	73	121	15	71	140	17
o-Nitrotoluene	0.06	100	68	120	64	131	75	119	17	75	142	18
m-Nitrotoluene	0.05	100	69	120	84	132	66	129	16	76	139	19
p-Nitrotoluene	0.05	100	75	118	83	131	75	122	18	71	146	21
Tetryl	0.075	100	63	122	63	128	42	135	15	39	143	26
1,3,5-Trinitrobenzene	0.05	100	77	115	80	122	72	116	12	61	136	18
2,4,6-Trinitrotoluene	0.05	100	76	113	79	121	70	117	14	59	138	27
3,4-Dinitrotoluene (surr)	--	--	61	124	71	130	--	--	--	--	--	--

Notes:

µg/kg = Micrograms per kilogram
µg/L = Micrograms per liter
EPA = Environmental Protection Agency
LCL = Lower Control Limit
LCS = Laboratory Control Sample
MDL = Method Detection Limit
mg/kg = Milligrams per kilogram
mg/L = Milligrams per liter
MSD = Matrix Spike Duplicate
RPD = Relative Percent Difference
surr = Surrogate
UCL = Upper Control Limit
VOC = Volatile Organic Compounds
SVOC = Semi-volatile Organic Compounds

APPENDIX C

SITE-SPECIFIC ADDENDUM TO THE BASEWIDE HEALTH AND SAFETY PLAN