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

ENTERED

MAY 2009

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New Mexico Environment Department
Attn: Mr. James Bearzi
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Dear New Mexico Environment Department

Holloman AFB is pleased to submit the April 2008-January 2009 Long Term Monitoring Report DP-30/SD-33, SS-39, and OT-16 for your review.

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.

If you have any questions, please contact Mr. David Scruggs of our Asset Management Flight at (575) 572-5395.

Sincerely

Michael A. Porter

for A. DAVID BUDAK, YF-3, DAFC

Attachment:
April 2008-January 2009 Long Term Monitoring Report

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FINAL
APRIL 2008 – JANUARY 2009 LONG-TERM MONITORING REPORT
DP-30/SD-33 (SWMU 113B)
SS-39 (SWMUs 165, 167, 177, 179, AND 181) AND
OT-16 (SWMUs 118 AND 132 AND AOC 32)
HOLLOMAN AIR FORCE BASE, NEW MEXICO
EPA ID# NM6572124422

Prepared for:

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AIR COMBAT COMMAND

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Contract No. FA4890-06-D-0009
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ACRONYMS

µg/L	micrograms per liter
A	alpha
ACC	Air Combat Command
AMC	Air Materiel Command
AOC	Area of Concern
bgs	below ground surface
BHC	benzene hexachloride
CA	Cost Analysis
CMS	Corrective Measures Study
CRDL	contract required detection limit
DQO	data quality objective
EE/CA	Engineering Evaluation/Cost Analysis
ERP	Environmental Restoration Program
FEC	Foothills Engineering Consultants, Inc.
GPS	global positioning system
ft	foot (or feet)
HAFB	Holloman Air Force Base
HGL	HydroGeoLogic, Inc.
in.	inch(es)
IRP	Installation Restoration Program
JP	jet propellant
LTM	long-term monitoring
MCL	maximum contaminant level
mg/L	milligrams per liter
NMAC	New Mexico Administrative Code
NMED	New Mexico Environment Department
NMWQCC	New Mexico Water Quality Control Commission
PCB	polychlorinated biphenyl
PVC	polyvinyl chloride
RCRA	Resource Conservation and Recovery Act
RI	Remedial Investigation
RFI	RCRA Facility Investigation
SVOCs	semivolatile organic compounds
SWMU	Solid Waste Management Unit
TAL	target analyte list
TCE	trichloroethene
TDS	total dissolved solids
Tetra Tech	Tetra Tech, Inc.
TPH	total petroleum hydrocarbons
Radian	Radian Corporation
UDMH	unsymmetrical dimethylhydrazine
USACE	U.S. Army Corps of Engineers
USAF	U.S. Air Force
EPA	U.S. Environmental Protection Agency
VOC	volatile organic compound

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1.0 INTRODUCTION

This Long-Term Monitoring (LTM) Report was prepared by Tetra Tech, Inc. (Tetra Tech) on behalf of Holloman Air Force Base (HAFB) for the Environmental Restoration Program (ERP) sites DP-30/SD-33 – Grease Trap Disposal Pits and Cooking Grease Disposal Trench [Solid Waste Management Unit (SWMU) 113B], SS-39 – Missile Fuel Spill Area (SWMUs 165, 167, 177, 179, and 181), OT-16 – the Former Entomology Shop Area [SWMUs 118 and 132 and Area of Concern (AOC) 32]. Tetra Tech has prepared this document under contract to the U.S. Air Force Center for Engineering and the Environment, Contract No. FA4890-06-D-0009, Task Order Number 5002, in accordance with the New Mexico Environment Department (NMED) Hazardous and Radioactive Materials Bureau position paper on *General Reporting Requirements for Routine Groundwater Monitoring at RCRA Sites* (NMED, 2003).

This report presents the results from the semi-annual groundwater sampling events (July 2008 and January 2009) conducted at sites DP-30/SD33 and SS-39 as well as quarterly groundwater sampling events (April, July, and August 2008; and January 2009) conducted at site OT-16.

1.1 BASIS FOR LONG-TERM MONITORING

Remedial Investigations (RIs) were conducted in 1992 at DP-30/SD-33, SS-39, and OT-16 followed by biennial LTM. A Decision Document was submitted to NMED for site OT-16; however, this document was rejected. Based upon historical groundwater sampling results, NMED stated that further characterization is required at these sites to examine the risk to human health and the environment in order to determine if further monitoring and/or remedial action is needed or whether risk based closure can be obtained.

1.2 PURPOSE

This report is part of the on-going effort to further characterize groundwater quality at sites DP-30/SD-33, SS-39, and OT-16 to ensure that degradation to groundwater quality is not occurring and that the sites are not acting as continuing sources for groundwater contamination. The overall objective of this LTM Program is to obtain risk based closure for these four sites.

1.3 FACILITY BACKGROUND

1.3.1 Location

HAFB is situated in south-central New Mexico, in the northwest-central part of Otero County. HAFB is located approximately 75 miles northeast of El Paso, Texas, and seven miles west of Alamogordo, New Mexico. HAFB occupies about 50,000 acres in the northeast quarter of section Township 17 South, Range 8 East. Additional land extending northward is occupied by the White Sands Missile Range testing facilities. An installation location map is included as Figure 1-1. The locations of DP-30/SD-33, SS-39, and OT-16 with respect to the surrounding area, are shown on Figure 1-2.

1.3.2 History

HAFB, formally Alamogordo Army Airfield, was initiated as a temporary facility during World War II, with construction commencing on February 6, 1942. Its status, mission, and Command have periodically changed over the years. Today, HAFB is under the Air Combat Command (ACC).

Prior to 1942, the property occupied by HAFB was undeveloped rangeland. The Alamogordo Army Airfield was established in 1942 and was deactivated in 1945. The facility was again reactivated in 1945 and was operated by the Air Materiel Command (AMC) until 1951. AMC tested pilot-less aircraft, guided missiles, and other equipment. The facility mission remained largely unchanged until 1971, although the facility identification changed several times during the 20-year span: Air Force Missile Test Center (1951-1952), Holloman Air Development Center (1952-1957), and Air Force Missile Test Center (1957-1971). The Tactical Air Command operated the facility from 1972 to 1992 and housed the 49th Tactical Fighter Wing, 479th Tactical Training Wing, 833rd Air Division, and 4449th Mobile Support Squadron. In 1992, HAFB was realigned under the ACC where it operates today.

1.4 REPORT ORGANIZATION

This 2008-2009 LTM report presents groundwater sampling procedures, site-specific background information, and analytical results. The document contains the following sections:

- Section 1 – Introduction
- Section 2 – Site-Specific Background
- Section 3 – Sampling Procedures
- Section 4 – Groundwater Monitoring Results
- Section 5 – Summary
- Section 6 – References

The tables and figures referenced in this LTM report are included following Section 6. This report also includes three appendices. Appendix A provides the laboratory data review checklists. Appendix B contains laboratory analytical data, which is provided on the attached CD-ROM. Appendix C presents the field data forms.

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2.0 BACKGROUND

The following sections present an overview of the site characteristics and history at sites DP-30/SD-33, SS-39, and OT-16.

2.1 DP-30/SD-33 – GREASE TRAP DISPOSAL PITS AND COOKING GREASE DISPOSAL TRENCH

The Grease Trap Disposal Pits (DP-30) and the Cooking Grease Disposal Trench (SD-33) (SWMU 113B) are located in the southeastern portion of HAFB, northwest of the airfield and Sabre Road and west of the Fire Protection Training Area. DP-30 and SD-33 are located on opposite sides of an unpaved and unnamed service road, approximately 15 ft apart. The unnamed service road connects the two sites to Sabre Road and provides vehicle access. The area north of DP-30/SD-33 is restricted. Several highly restricted buildings are located near the two sites; consequently, unauthorized access to the DP-30/SD-33 area is prohibited.

DP-30 and SD-33 are currently unpaved, undeveloped, and moderately vegetated with shrubs, grasses, and cacti. A site map of the two sites is presented as Figure 2-1. DP-30 is located immediately north of the unpaved service road and encompasses approximately 0.76 acres. Several linear depressions, most likely remnants of former disposal and site investigation trenches, cross the site in primarily northwest-southeast and secondary northeast-southwest orientations. SD-33 is located south of the unpaved service road and encompasses approximately 0.17 acres. A semi-circular shaped soil berm, approximately 4 ft high and 50 ft long and composed primarily of reworked native soil, is located along the northern edge of SD-33. Several metal signs indicate the area was a former disposal unit. As with site DP-30, several linear depressions, most likely remnants of former disposal and site investigation trenches, cross the site in a northwest-southeast orientation. The trenches/pits cover an area of approximately 2 acres. Initially the sites were separate; however, over time the sites were enlarged so that their boundaries appear to have merged.

The waste pits consisted of elongated excavations approximately 40 to 50 ft long and 2 to 3 ft wide. Drilling and trenching activities indicated that the depths of the disposal pits ranged from 2.5 to 9 ft below ground surface (bgs). The pits reportedly received wastes from HAFB grease traps, oil/water separators, and grit from the wastewater treatment system. Occasionally, the pits would accept sludge from vacuum trucks used to unclog sewer lines at the Primate Research Laboratory (Radian, 1992). One interviewee indicated that quantities of various pesticides were also disposed of in the pits; however, this could not be verified.

Soil and groundwater samples were collected from the Grease Trap Disposal Pits during an RI conducted by the Radian Corporation (Radian) (Radian 1992). Soil and waste sludge samples contained volatile organic compounds (VOCs), metals, oils and grease, and pesticides. Four groundwater monitoring wells (MW30&33-01, MW30&33-02, MW30&33-03, and MW30&33-04) were installed during the RI. Analytes reported above the contract required detection limit (CRDL) include metals (antimony, beryllium, cadmium, chromium, copper, nickel, zinc, lead, and selenium) and toluene.

Based on several soil analytes exceeding action levels, the risk screen performed in the RI indicated that unacceptable risk for sites DP-30/SD-33. Therefore, it was recommended that a feasibility study and corrective measures study be conducted, and if necessary, the implementation of an Installation Restoration Program (IRP) remedial action/Resource Conservation and Recovery Act (RCRA) corrective action remedy.

The corrective measure study (CMS) prepared by Radian included an Engineering Evaluation/Cost Analysis (EE/CA) to determine the appropriate remedial alternative to the removal of buried waste and achieve site closure. A subsequent Decision Document was signed by NMED and the Base Commander in September 1995 and recommended no further action for groundwater. LTM began in 1995. In 2005, a Supplemental RCRA Facility Investigation (RFI) Work Plan was completed by HydroGeoLogic, Inc. (HGL) and submitted to NMED to address additional characterization requirements at these sites. Upon review of the Supplemental RFI Work Plan, NMED recommended that semi-annual groundwater monitoring would be required at DP-30/SD-33.

2.2 SS-39 – MISSLE FUEL SPILL AREA

The Missile Fuel Spill Area [SS-39 (SWMUs 165, 167, 177, 179, and 181)], is located in the central portion of HAFB at the Test Sled Launch Area, at Building 1176, and along the northern slope of the Lost River drainage basin. A site map is provided as Figure 2-2. The site consists of two outfall areas located downgradient of the oxidizer and propellant spill drain pipes and drainage troughs and sumps located near Building 1176.

The central portion of the slope to the Lost River is moderately hummocky in topography. Steeply incised rills and drainage swales are present throughout the area, trending in a north-south orientation toward the Lost River. Vegetation consisting of salt cedars, shrubs, grasses, and cacti are present throughout this area with a vegetation line running along the edge of the basin. Relief decreases near the base of the slope until nearly flat with an overall southerly dip toward the center of the drainage basin.

The edge of the basin typically marks the high water level during and immediately after heavy rainstorms. An unpaved service road parallels the basin edge providing access to the lower portion of the site.

Facilities at SS-39 were involved with the fueling, detanking, and routine maintenance of test sleds. The launch pad at the south end of the sled test track was constructed with a concrete collection basin (SWMU 167) and a water deluge system. Spilled oxidizers and fuels were delivered to separate drains, diluted with water, and flushed into the Lost River. In 1975, catch basins were installed to collect the spilled liquid fuels (Discharge Box, SWMU 179). Oxidizer vent lines from the engines were also installed and designed to discharge into the catch basins. Fuels used at the track included unsymmetrical dimethylhydrazine (UDMH), aniline, jet propellant (JP)-4, inhibited red fuming nitric acid, inhibited white fuming acid, liquid oxygen, JPX, and solid rocket propellants. Solvents such as trichloroethene (TCE) were commonly used in sled maintenance activities (FEC, 1997). Since 1975, no propellants have been intentionally released to the open drains.

SS-39 was identified as a potential contaminant source during a 1983 IRP records search. An RI was completed in 1992 (Radian, 1992) revealing arsenic, beryllium, lead, and TCE in soils near Building 1176. Additionally, TCE, carbon tetrachloride, and lead were detected in groundwater. The RI concluded that additional field investigation was warranted. Additional fieldwork at SS-39 was performed by Radian in 1993. Groundwater samples were collected from 15 temporary groundwater sampling locations using direct push methods, and screened in the field for chlorinated compounds. Eight groundwater samples were submitted to the laboratory for confirmation analysis. Results of these analyses indicated that TCE was present above the New Mexico Water Quality Control Commission (NMWQCC) Standards and the U.S. Environmental Protection Agency (EPA) maximum contaminant levels (MCL) at four locations, and above the EPA MCL at two additional locations.

An ecological risk assessment was conducted in which surface soil samples; vegetation samples; jackrabbit tissue, blood, and urine samples were collected in the area. Additionally, surface water samples were collected from the Lost River drainage basin. The assessment concluded that there was no unacceptable risk to ecological receptors. An October 1994 Phase I RFI report proposed a no further action determination for the site and a Decision Document was submitted in September 1995, but was not signed by NMED. Conditional closure of SS-39 required LTM for VOCs and total dissolved solids (TDS) biennially for 10 years. The site was added to the LTM program in 1997.

2.3 OT-16 – EXISTING ENTOMOLOGY SHOP AREA

The Existing Entomology Shop Area [OT-16 (SWMUs 118 and 132 and AOC 32)] was located at former Building 21 in the southeastern portion of the Main Base Area and is approximately one-half acre in size. A site map is provided as Figure 2-3. OT-16 encompasses former Building 21, a former transformer pad (AOC A), a former truck washrack (SWMU 79), a former pesticide plastic holding tank (SWMU 118), and a former disposal pit (SWMU 132). All concrete structures and features were demolished and removed in the mid-1990s. The site currently consists of a gravel and concrete-paved vehicle parking area and a large concrete pad used by the Honor Guard for training. Four monitoring wells (MW16-01 through MW16-04) are currently present on-site.

Prior to its conversion into an entomology shop in 1977, Building 21 was a power plant that contained six diesel generators and several transformers for power generation. After its conversion, Building 21 was utilized as the Base herbicide and pesticide storage facility. The weighing and mixing of the chemicals prior to application was conducted within the shop. From 1977 to 1980, rinse water from washing pesticide mixing equipment was discharged to a septic tank drain field located on the northwest side of the building (CH2M Hill, 1983). After 1980, the rinse water along with unused pesticides were collected in a 12-gallon plastic above-ground holding tank (SWMU 118). Activities within the Entomology Shop ceased in 1992.

OT-16 was identified as a potential contaminant source during an IRP records search conducted in 1983. A Phase I RI was conducted in 1992 by Radian (Radian, 1992). Based on the baseline risk assessment for OT-16, the RI concluded that no action was necessary, but recommended additional site characterization. A Phase II RFI conducted in 1994 included additional sampling and recommended a conditional no further action determination based on the remediation of total petroleum hydrocarbons (TPH)-contaminated soils that were discovered during the Phase II RFI. In 1996, approximately 107 tons of TPH-contaminated soil and 111 tons of polychlorinated biphenyls (PCB)-contaminated soil were excavated and removed from the site. After remediation activities were completed, a conditional no further action determination was made with groundwater LTM recommended to assess the effectiveness of the remedial action.

3.0 SAMPLING PROCEDURES

Approved LTM Program protocol for HAFB was first established for the 1995 baseline sampling and was implemented for the 2006 and 2007 events. The 2008 and 2009 sampling events applied the same sampling methods and procedures followed during the previous sampling events. All analytical procedures followed SW-846 methods with the groundwater samples being analyzed as follows:

- VOCs by EPA Method 8260B
- Semivolatile organic compounds (SVOCs) by EPA Method 8270C
- Metals by EPA Method 6010B/6020 and 7470A
- Perchlorate by Method DEN-LC-0024
- TDS by Method SM19 2540C
- UDMH by SOP No. DV-WC-0077, Rev.1
- Gamma – benzene hexachloride (BHC) and Alpha – BHC by EPA Method 8081A
- Pesticides (dieldrin) by EPA Method 8081A

Groundwater monitoring and sampling activities conducted during April, July, and October 2008; and January 2009 were conducted in accordance with the specific work plans of DP-30/SD33 and SS-39 (USACE, 2003), and OT-16 (HGL, 2006). Variations from the specified procedures are discussed in the following section.

3.1 VARIATIONS FROM THE WORK PLAN

The sampling procedures and analytical protocol presented in the LTM Work Plan (USACE, 2003; HGL, 2006) were followed; however, deviations did occur based on the issues presented below:

- During the July 2008 sampling event, the low flow peristaltic pump malfunctioned; therefore, the wells at sites DP-30/SD-33 and SS-39 were purged using 2-in. diameter disposable bailers. However, the use of disposable bailers was considered acceptable since the use of bailers is consistent with previous LTM sampling methods employed at DP-30/SD-33 and SS-39.

- Vegetation was previously encountered within Monitoring Well MW39-03. Due to its compromised condition Monitoring Well MW39-03 was not sampled.

- Monitoring Well MW39-04 was dry during water level collection and thus was not sampled.

3.2 DATA EVALUATION

Analytical results from the 2008 and 2009 sampling events were reviewed and compared with the results of the previous LTM events in order to determine whether further action or additional investigation at any site is warranted. Although historical data dates back to 1989 for some of these sites, semi-annual and quarterly sampling to support site closure commenced in 2006 (DP-30/SD-33 and SS-39) and 2008 (OT-16). Thus, the sampling events corresponding to this LTM Program will be used to determine site closure.

Natural TDS levels in the plume areas of DP-30/SD-33 and SS-39 are above 10,000 mg/L, and are thus above the threshold at which groundwater is not considered a potential domestic or agricultural water supply. MCLs and NMWQCC Standards are used for comparison purposes only in the data tables to identify constituents that are potential contaminants that require evaluation, in order to ascertain whether plume stabilization/reduction is occurring.

3.3 PROJECT REPORTING

This LTM report summarizes contamination and provides a comparison of results from semi-annual and quarterly sampling events conducted from 2006 to the present at each site. Potentiometric surface maps were prepared for each site based on the water level measurements taken during each sampling event and are included following Section 15 (behind the Figures tab). When possible, information was tabulated similar to prior LTM reports to provide easy comparison between sampling rounds.

3.4 DATA VALIDATION

Detailed information regarding laboratory methods and data quality is provided in the data review checklists included in Appendix A. The laboratory data deliverable packages are included on a CD-ROM as Appendix B. In summary, data completeness of the laboratory analyses for all samples collected at sites DP-30/SD-33, SS-39, and OT-16 was determined to be 100 percent during each sampling event, which meet the project data quality objective (DQO) of 95 percent. Based on the data review and validation, the analytical data were determined to be acceptable, representative, comparable, and useable for its intended purpose.

3.5 SS-39 PRE-PACK WELL INSTALLATION

In support of RFI activities, NMED required the installation of several monitoring wells within the Lost River drainage basin to define the southern extent of the TCE plume. The Lost River drainage basin is subject to periodic flooding after large rain events, and repeated flooding would most likely compromise the long-term structural integrity of any monitoring wells installed within the basin. In addition, the U.S. Air Force (USAF) and U.S. Army Corps of Engineers (USACE) do not permit permanent structures to be constructed within the Lost River drainage basin (Livingston, 2006). Therefore, five pre-pack monitoring wells, designated MW39-08 through MW39-12, are utilized to collect groundwater samples from within the Lost River drainage basin. Survey stakes and a global positioning system (GPS) are used to locate the pre-pack well locations for repeated sampling events. The pre-pack monitoring wells are constructed of a 2-in. diameter, 5-ft long, 0.010-slotted Schedule 40 polyvinyl chloride (PVC) well screen wrapped with a stainless steel wire mesh containing a 0.25 in. thick filter pack. The screen is capped with a flush-jointed well cap and attached to a 2-in. diameter, 5-ft long Schedule 40 PVC riser pipe. The pre-pack wells are installed through an open borehole drilled using a 3-in. decontaminated stainless steel hand auger. The hand auger borings are completed to maximum depths ranging between 5 to 10 ft bgs. After installation, the pre-pack wells are allowed to sit undisturbed for a minimum of 12 hours prior to groundwater sampling. Once groundwater sampling activities are completed, the pre-pack wells are removed from the subsurface, decontaminated, and placed in dedicated storage containers. The abandoned boreholes are backfilled with the sediment removed during borehole advancement.

3.6 WATER LEVEL MEASUREMENTS

Prior to initiating groundwater sampling activities, static water levels are obtained from the five permanent monitoring wells (i.e., MW30&33-01 through MW30&33-05) at DP-30/SD-33, the eight permanent monitoring wells (i.e., MW39-01 through MW39-07 and MW39-06D) and the five pre-pack monitoring wells (i.e., MW39-08 through MW39-12) at SS-39, and the four permanent monitoring wells (MW16-01 through MW16-04) at OT-16. Monitoring well construction and survey information for the monitoring wells at DP-30/SD-33, SS-39, and OT-16 are summarized in Table 3-1. Water level measurements were collected by lowering an audible sounding probe attached to a graduated tape into the well until the alarm sounded, indicating the air/water boundary in the well. The corresponding value on the tape, measured to the nearest 0.01 foot from the top of the PVC casing, was then recorded as "Depth to Water." The alarm was then turned off, and the probe was lowered to the bottom of the well. The corresponding measurement, to the nearest 0.01 ft, was recorded as "Total Well Depth." The probe and tape were then removed from the well and decontaminated. This process was repeated for all of the monitored wells. MW39-04 was determined to be dry during water level collection, consistent with historical conditions. Vegetation was encountered within well MW39-03 during RFI activities and due to its compromised condition it is not sampled.

3.7 GROUNDWATER PURGING AND SAMPLING

The wells within OT-16 require quarterly monitoring and were sampled in April, July, and October 2008; and January 2009. The wells at OT-16 are purged of three casing volumes prior to sampling using 2-inch diameter disposable bailers. The wells within DP-30/SD-33 and SS-39 are monitored semi-annually and were sampled in July 2008 and January 2009. The wells at these sites were purged using a peristaltic pump fitted with disposable tubing and employing low-flow purging and sampling methods. During the purging process, water quality parameters (pH, specific conductance, temperature, oxidation-reduction potential, turbidity, and salinity) were measured using a water quality meter. Well purging was considered complete when stabilization of the water quality parameters was achieved in accordance with the work plan (USACE, 2003 and HGL 2006). In general, water quality parameter stabilization was achieved after purging approximately 1 to 2 groundwater casing volumes from each well. After achieving stabilization, the appropriate sample containers were filled using direct fill sampling techniques. Variations to this procedure were conducted during the July 2008 sampling event and are described in Section 3.1.

The groundwater samples collected from DP-30/SD-33 were submitted to an offsite laboratory for volatile organic compound (VOC) analysis, target analyte list (TAL) total and dissolved metals, and TDS. In July 2008, groundwater samples were collected at SS-39 and analyzed by an off-site laboratory for VOCs, RCRA 8 total and dissolved metals, perchlorate, and TDS. During the January 2009 sampling event, groundwater samples were also analyzed for UDMH and aniline along with the original set of analytes from the July 2008 sampling event. For samples collected at OT-16, groundwater samples were submitted to an offsite laboratory for analysis of dieldrin, Gamma-BHC, Alpha-BHC, and TDS.

4.0 GROUNDWATER MONITORING RESULTS

The following sections present a summary of the findings from the field work conducted as part of the LTM conducted at sites DP-30/SD-33, SS-39, and OT-16.

4.1 DP-30/SD-33 – GREASE TRAP DISPOSAL PIT AND COOKING GREASE DISPOSAL TRENCH

4.1.1 Hydrogeology

A summary of the groundwater measurements and calculated groundwater elevations for the July 2008 and January 2009 events is provided as Table 4-1. Water quality parameters were collected during the purging of the wells and are summarized on Table 4-2. Water level and total well depth measurements were recorded on the individual sample data sheets included in Appendix C. The results of the water level measurements were used to prepare the July 2008 and January 2009 groundwater potentiometric surface maps (Figures 4-1 and 4-2, respectively). As shown on Figures 4-1 and 4-2, the groundwater potentiometric surface at DP-30/SD-33 is nearly flat, with an overall slight gradient to the south-southeast during both sampling events.

No field observations or conditions that would influence the results of groundwater monitoring were noted.

4.1.2 Groundwater Sampling Results

Groundwater was sampled from the five permanent monitoring wells (MW30&33-01 through MW30&33-05) at the site in July 2008 and January 2009 and analyzed for VOCs, total and dissolved TAL metals, and TDS. The groundwater sample data sheets for both events have been included in Appendix C.

DP-30/SD-33 groundwater analytical positive results from the July 2008 and January 2009 events are summarized in Table 4-3. Historical groundwater analytical data from the previous four semi-annual events conducted in July 2006, January 2007, July 2007, and January 2008 are summarized in Table 4-4. EPA MCLs and NMWQCC Standards are also included in these tables for comparison purposes. The location of sample exceedances and the concentration observed are shown on Figure 4-3. A summary of the results is presented in the following paragraphs.

TDS groundwater concentrations at DP-30/SD-33 exceeded the NMWQCC Groundwater Standard (1,000 mg/L) at all five wells and ranged from 22,500 mg/L (MW30&33-05) to 31,900 mg/L (MW30&33-03) in July 2008 and 18,900 mg/L (MW30&33-01) to 31,700 mg/L (MW30&33-02) in January 2009. The TDS results for both events are consistent with historic results.

None of the VOCs detected in the groundwater were above NMWQCC Standards. TCE was the only VOC detected above EPA MCLs during either sampling event. In July 2008, TCE exceeded the U.S. EPA MCL of 5 μg/L at MW30&33-02 (7 μg/L), MW30&33-03 (6 μg/L), MW30&33-04 (10 μg/L), MW30&33-05 (43 μg/L), and MW30&33-05(DUP) (42 μg/L). In January 2009, TCE exceeded EPA MCLs in MW30&33-03 (14 μg/L), MW30&33-04 (8 μg/L), MW30&33-05 (35 μg/L), and MW30&33-05(DUP) (32 μg/L). The July 2008 and January 2009 TCE concentrations at wells MW30&33-04 and -05 are similar to that observed in January 2008. Monitoring well MW30&33-03 exhibited slightly higher TCE concentrations than samples collected in January 2008; however, the concentrations at MW30&33-03 were lower than the January 2007 concentration (21.1 μg/L). TCE concentrations have continued to decrease since semi-annual monitoring activities began during the July 2006 sampling event with the exception of MW30&33-03 which has exhibited slight increases during the July 2008 and January 2009 sample collection.

Groundwater samples analyzed for dissolved metals show an EPA MCL exceedance of thallium. In January 2009, thallium exceeded the NMWQCC Groundwater Standard of 2 μg/L at MW30&33-03 (19 μg/L). Thallium concentrations have decreased significantly since monitoring activities began in July 2006.

Sample analysis for total metals show NMWQCC exceedances of aluminum and zinc; and EPA MCL exceedances of arsenic, lead, and thallium. In July 2008, aluminum exceeded the NMWQCC Groundwater Standard in MW30&33-01 (18,700 μg/L), MW30&33-05 (26,900 μg/L), and MW30&33-05(DUP) (19,900 μg/L). Arsenic exceeded the EPA MCL at MW30&33-04 (29 μg/L), MW30&33-05 (23 μg/L), and MW30&33-05(DUP) (31 μg/L). Lead the exceeded the EPA MCL at MW30&33-01 (22 μg/L), MW30&33-05 (22 μg/L), and MW30&33-05(DUP) (20 μg/L). Thallium exceeded the EPA MCL at MW30&33-03 (19 μg/L) and MW30&33-04 (20 μg/L). Zinc exceeded the NMWQCC Standard at MW30&33-05 (112 μg/L) and MW30&33-05(DUP) (81 μg/L). In January 2009, only thallium exceeded action levels. Thallium exceeded the NMWQCC Groundwater Standard at MW30&33-02 (15 μg/L) and MW30&33-05 (17 μg/L). Analytical data results are provided in Table 4-3. The metals exceedances have been sporadic since monitoring began at the site, and occur sometimes in the upgradient well. Based on the sporadic detections and overall exceedance distribution, these detections appear to be related to the high groundwater TDS.

4.1.3 Recommendations

According to sampling results, only TCE is a site-related groundwater contaminant. Observed metal exceedances of the NMWQCC Standards and EPA MCLs are attributed to high TDS concentrations. The TDS concentrations in all of the monitoring wells were above 10,000 mg/L, which is the point where groundwater is no longer considered a potential domestic or agricultural water supply (NMAC, 20.6.2.3101). Although TCE was detected above the NMWQCC Standard and the EPA MCL, concentrations have been steadily decreasing since 2006. The data show that the plume has stabilized and is decreasing, indicating that DP-30/SD-33 is not acting as a continuing source of groundwater contamination. Historically, TCE has been detected in the waste material present in three former disposal trenches located in the south-central portion of DP-30 and immediately north of MW30&33-05. The continual decrease of TCE concentrations in the groundwater at MW30&33-05 demonstrates that the residual material is not acting as a continuous source of groundwater contamination. Groundwater water level measurements collected during LTM events indicate that groundwater flow is primarily in a southeastern direction along a very low hydraulic gradient. Both the southerly flow direction and low hydraulic gradient explains the minimal migration of TCE beyond the extent of SD-33.

Based upon the above information, it is recommended that LTM be discontinued and a site closure determination be made for DP-30/SD-33.

4.2 SS-39 – MISSILE FUEL SPILL AREA

4.2.1 Hydrogeology

The groundwater level data collected during the July 2008 and January 2009 sampling events and associated calculated groundwater elevations are summarized in Table 4-5. Water level and total well depth measurements were recorded on the individual sample data sheets included in Appendix C. The results of the static water level measurements were used to prepare the July 2008 and January 2009 groundwater potentiometric surface maps (Figures 4-4 and 4-5, respectively). As shown on the figures, groundwater flow at SS-39 is primarily to the south-southwest, consistent with previous events.

Groundwater parameter measurements obtained during the purging process were recorded on groundwater field sampling data sheets, which have been included in Appendix C. Table 4-6 summarizes the groundwater quality parameters recorded for this and previous semi-annual events, which are shown to be consistent throughout the period.

No field observations or conditions that would influence the results of groundwater monitoring were noted.

4.2.2 Groundwater Sampling Results

Groundwater samples were collected from 10 (MW39-02, -05, 06, 06D, and -07 through -12) of the 12 monitoring wells at the site in July 2008 and analyzed for total and dissolved RCRA metals, perchlorate, VOCs, and TDS; and in January 2009 for analysis of the previously referenced analytes plus UDMH and aniline. MW39-03 was not sampled due to previous observations of vegetation within the well. MW39-04 was not sampled because it was dry during water level measurements. The groundwater sample data sheets for both events have been included in Appendix C.

SS-39 groundwater analytical results from the July 2008 and January 2009 events are summarized in Table 4-7. Historical groundwater analytical data from the previous four semi-annual events conducted in July 2006, January 2007, July 2007, and January 2008 are summarized in Table 4-8. EPA MCLs and NMWQCC Standards are also included in these tables for comparison purposes. The location of sample exceedances and the concentration observed are shown on Figure 4-6. A summary of the results per analyte is present in the following paragraphs:

TDS concentrations at SS-39 ranged from 16,900 mg/L (MW39-02) to 137,000 mg/L (MW39-11) in July 2008 and from 15,800 mg/L (MW39-02) to 143,000 mg/L (MW39-12) in January 2009. The TDS results for both events are consistent with historic results.

TCE and methylene chloride were the only VOCs that were detected in concentrations above NMWQCC Standards or EPA MCLs during either event. The exceedances of methylene chloride were not observed in the 2006 and 2007 sampling results. In July 2008, TCE exceeded the NMWQCC Standard (100 μg/L) at MW39-06D (355 μg/L) and MW39-06D(DUP) (332 μg/L); and exceeded the EPA MCLs (5 μg/L) at MW39-02 (13.3 μg/L), MW39-05 (9.5 μg/L), MW39-06 (94.4 μg/L), MW39-08 (20.4 μg/L), and MW39-11 (10.3 μg/L). In January 2009, TCE exceeded the NMWQCC Standard at MW39-06 (158 μg/L), MW39-06D (464 μg/L), and MW06D(DUP) (477 μg/L); and exceeded EPA MCL at MW39-02 (28.9 μg/L), MW39-05 (19.1 μg/L), MW39-08 (17.3 μg/L), and MW39-11 (11.4 μg/L). Also during the January 2009 sampling event, methylene chloride exceeded the EPA MCL (5 μg/L) at MW39-06 (7.7 μg/L), MW39-06D (27.5 μg/L), and MW39-06D(DUP) (13.5 μg/L). TCE concentrations at MW39-02 and -05 are similar to the 2006 and 2007 results. At wells MW39-06, -08, and -11, results indicated a steady decreasing trend since 2006. TCE is not stable or decreasing only in well MW39-06D. Concentrations of TCE at MW39-06D are fluctuating and range from 92 to 477 µg/L. This could be due to continued migration of TCE through the soil.

Perchlorate was detected above the NMWQCC Standard (24.5 µg/L) during both sampling events. In July 2008, perchlorate concentrations exceeded the screening value at MW39-06 (29 µg/L), MW39-06D (31 µg/L), MW39-06D (DUP) (32 µg/L), MW39-07 (66 µg/L), MW39-08 (83 µg/L), MW39-09 (150 µg/L), MW39-10 (150 µg/L), MW39-11 (110 µg/L), and MW39-12 (78 µg/L). In January 2009, perchlorate exceedances were detected at MW39-05 (27 µg/L), MW39-06 (38 µg/L), MW39-06D (33 µg/L), MW39-06D (DUP) (31 µg/L), MW39-07 (63 µg/L), MW39-08 (81 µg/L), MW39-09 (150 µg/L), MW39-10 (140 µg/L), MW39-11 (95 µg/L), and MW39-12 (93 µg/L). July 2008 and January 2009 perchlorate analytical concentrations are similar to historic results with slightly lower concentrations at MW39-07 and -11. As previously reported in the SS-39 RFI (HGL, 2007), perchlorate concentrations increase closer to the Lost River drainage basin; indicating the source of the perchlorate in this area appears to be the Lost River drainage basin and not SS-39.

Dissolved arsenic, cadmium, and selenium were detected in several of the monitoring wells at concentrations exceeding both the NMWQCC Standards and the EPA MCLs. Dissolved lead exceeded the EPA MCL. In July 2008, selenium exceeded sample standards at MW39-05, -06D, -09, -11, and -12 with concentrations ranging from 68 to 120 µg/L. Cadmium exceeded sample standards at MW39-06D (20 µg/L) and MW39-12 (30.5 µg/L). Arsenic and lead exceeded sample standards at MW39-06D (DUP) (110 µg/L and 40 µg/L respectively). In January 2009, selenium exceeded sample standard at MW39-05, -06D, -10, -11, and -12 with concentrations ranging from 74.2 to 118 µg/L. No other metals exceeded sample standards during the January 2009 sampling event.

Total metals analysis identified arsenic, cadmium, lead, and selenium at concentrations that exceeded either NMWQCC Standards or EPA MCLs. In July 2008, selenium exceeded both the NMWQCC Standard (50 µg/L) and the EPA MCL at MW39-06, -08, -09, -10, and -12 with a concentration ranging from 54.9 to 186 µg/L. Cadmium also exceeded both standards at MW39-12 with a concentration of 38.2 µg/L. Lead exceeded the EPA MCL (15 µg/L) at MW39-06 and -07 with a concentration of 22.4 µg/L and 38.4 µg/L respectively. Arsenic exceeded the EPA MCL (10 µg/L) at MW39-02 with a concentration of 12.6 10 µg/L. In January 2009, selenium exceeded both standards at MW39-05, -06D, -11, and -12 with concentrations ranging from 88 to 104 µg/L. Arsenic exceeded the EPA MCL (10 µg/L) at MW39-02 with a concentration of 15 µg/L.

When detected above screening criteria, metals were generally detected at similar concentrations in dissolved and total metals sample results. All of the metal exceedances occurred in monitoring wells with high TDS concentrations and all of the exceedances are within the same order of magnitude. Furthermore, exceedances are not consistent from round to round or with the highest TCE concentrations. This suggests that the elevated metals concentrations are unrelated to the site but are likely related to high TDS concentrations.

Neither aniline nor UDMH were detected in the groundwater samples during the January 2009 semi-annual event. The lack of aniline and UDMH in the site groundwater is consistent with the historic results.

4.2.3 Recommendations

It is proposed that UDMH, aniline, and RCRA 8 metals (total and dissolved) be eliminated from the list of analytes at SS-39. Both UDMH and aniline have not been detected in any groundwater samples since the LTM Program began in 2006. According to sampling results, TCE is the only site-related groundwater contaminant. Observed metal exceedances of the NMWQCC Standards and EPA MCLs are attributed to high TDS concentrations. The TDS concentrations in all of the monitoring wells were above 10,000 mg/L, which is the point where groundwater is no longer considered a potential domestic or agricultural water supply (NMAC, 20.6.2.3101). As previously reported in the SS-39 RFI (HGL, 2007), perchlorate concentrations increase closer to the Lost River drainage basin; indicating the source of the perchlorate in this area appears to be the Lost River drainage basin and not SS-39.

4.3 OT-16 – EXISTING ENTOMOLOGY SHOP AREA

4.3.1 Hydrogeology

The groundwater level data collected during the April, July, and October 2008; and January 2009 sampling events and associated calculated groundwater elevations are summarized in Table 4-9. Water level and total well depth measurements were recorded on the individual sample data sheets included in Appendix C. The results of the static water level measurements were used to prepare the April, July, October 2008; and January 2009 groundwater potentiometric surface maps (Figures 4-7, 4-8, 4-9, and 4-10; respectively). As shown on the figures, groundwater flow at OT-16 is primarily to the south-southwest.

Groundwater parameter measurements obtained during the purging process were recorded on groundwater field sampling data sheets, which have been included in Appendix C. Table 4-10 summarizes the groundwater quality parameters recorded for this and previous semi-annual events, which are shown to be consistent throughout the period.

No field observations or conditions that would influence the results of groundwater monitoring were noted.

4.3.2 Groundwater Sampling Results

Groundwater was sampled from the four on-site monitoring wells (MW16-01, -02, -03, and -04) in April, July, and October 2008; and January 2009 and analyzed for pesticides (Gamma-BHC, Alpha-BHC, and dieldrin) and TDS. The groundwater sample data sheets for both events have been included in Appendix C.

OT-16 groundwater analytical results from the four sampling events are summarized in Table 4-11. EPA MCLs and NMWQCC Standards are also included in the table for comparison purposes. The location of sample exceedances and the concentration observed are shown on Figure 4-11. A summary of the results per analyte is present in the following paragraphs:

TDS concentrations at OT-16 ranged from 3,010 mg/L (MW16-01) to 5,010 mg/L (MW16-02) in April 2008, from 3,420 mg/L (MW16-01) to 4,230 mg/L (MW16-04) in July 2008, from 3,210 mg/L (MW16-01) to 4,440 (MW16-02) in October 2008, and from 3,130 mg/L (MW16-01) to 14,000 mg/L (MW16-04) in January 2009. All of the samples collected exceeded the NMWQCC Standard for TDS (1,000 mg/L).

None of the pesticides were found at concentrations that exceeded the available standards.

4.3.3 Recommendations

During the four sampling events at OT-16, only one pesticide has been detected and the concentration observed does not exceed any available NMED or EPA water quality standards. The data shows that OT-16 is not acting as a source area for pesticides and no longer poses a threat to groundwater quality. Further characterization of groundwater contamination is no longer necessary, and; therefore, it is recommended that LTM at site OT-16 be discontinued. Additionally, it is recommended that site closure be completed for OT-16.

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5.0 SUMMARY

This 2008-2009 LTM report concludes the fifth and sixth sampling events for SD-30/SD-33 and SS-39; and four sampling events for OT-16. Groundwater samples were submitted for site-specific chemical analysis and analytical results were evaluated and compared with historical results. Results were generally consistent with previous sampling events. Site-specific summaries and recommendations are included in the sections below:

5.1 DP-30/SD-33 (SWMU 113B)

According to sampling results, TCE is the only site-related groundwater contaminant. Observed metal exceedances of the NMWQCC Standards and EPA MCLs are attributed to high TDS concentrations. TDS concentrations in all of the monitoring wells were above 10,000 mg/L, which is the point where groundwater is no longer considered a potential domestic or agricultural water supply (NMAC, 20.6.2.3101). Although TCE was detected above the EPA MCL, it is recommended that LTM cease and a site closure determination be made for DP-30/SD-33 for the following reasons:

- TCE has not exceeded NMWQCC Standards since LTM began in 1995 (HGL, 2008 and Bhate, 2006)
- TCE concentrations have been decreasing in wells MW30-&33-03 and -05 since 2006, decreased in well MW30&33-04 since 1995, and have remained stable in MW30&33-02 since 1995. Well MW30&33-01 is the upgradient well and no detections of TCE were observed during sampling activities.
- The data indicates that TCE concentration are stable and decreasing, indicating that DP-30/SD-33 is not acting as a continued source of TCE contamination.

5.2 SS-39 (SWMUS 165, 167, 177, 179, 181)

It is proposed that UDMH, aniline, and RCRA 8 metals (total and dissolved) be eliminated from the list of analytes at SS-39. Neither UDMH or aniline have been detected in any groundwater samples since the LTM Program began in 2006. According to sampling results, TCE is the only site-related groundwater contaminant. Observed metal exceedances of the NMWQCC Standards and EPA MCLs are attributed to high TDS concentrations. TDS concentrations in all of the monitoring wells were above 10,000 mg/L, which is the point where groundwater is no longer considered a potential domestic or agricultural water supply (NMAC, 20.6.2.3101). As previously reported in the SS-39 RFI (HGL, 2007), perchlorate concentrations increase closer to the Lost River drainage basin; indicating the source of the perchlorate in this area appears to be the Lost River drainage basin and not SS-39.

5.3 OT-16 (SWMUS 118 AND 132 AND AOC 32)

During the four sampling events at OT-16, only one pesticide has been detected and the concentration observed does not exceed any available NMED or EPA water quality standards. The data shows that OT-16 is not acting as a source area for pesticides and no longer poses a threat to groundwater quality. Further characterization of groundwater contamination is no longer necessary, and; therefore, it is recommended that LTM at site OT-16 be discontinued. Additionally, it is recommended that site closure be completed for OT-16.

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TABLES

Table 4-1
Groundwater Level Measurements
DP-30/SD-33 (SWMU 113B) - Grease Trap Disposal Pits and Cooking Grease Disposal Trench
Holloman AFB, New Mexico

	Water Level Data											
	Jul-06		Jan-07		Jul-07		Jan-08		Jul-08		Jan-09	
Well	Depth to Water (ft bgs)	Groundwater Elevation (ft amsl)	Depth to Water (ft bgs)	Groundwater Elevation (ft amsl)	Depth to Water (ft bgs)	Groundwater Elevation (ft amsl)	Depth to Water (ft bgs)	Groundwater Elevation (ft amsl)	Depth to Water (ft bgs)	Groundwater Elevation (ft amsl)	Depth to Water (ft bgs)	Groundwater Elevation (ft amsl)
MW30&33-01	23.10	4083.42	22.26	4084.26	22.18	4084.34	22.19	4084.33	22.59	4084.45	22.05	4084.99
MW30&33-02	23.10	4082.99	22.31	4083.78	22.07	4084.02	22.18	4083.91	22.52	4083.80	21.98	4084.34
MW30&33-03	22.03	4083.12	22.29	4082.86	21.01	4084.14	20.95	4084.20	21.44	4083.91	21.92	4083.23
MW30&33-04	21.10	4083.31	20.32	4084.09	20.13	4084.28	20.15	4084.26	20.49	4084.01	19.99	4084.51
MW30&33-05	22.86	4083.57	22.05	4084.38	21.90	4084.53	21.95	4084.48	22.32	4084.04	21.78	4084.58

Notes:
amsl - above mean sea level
bgs - below ground surface
ft - feet