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

23 June 2016

ADAM M. KUSMAK, GS-13, USAF
Chief, Installation Management Flight (49 CES/CEI)
49th Civil Engineer Squadron (49 CES)
Holloman Air Force Base, NM

Mr. John E. Kieling
Chief, Hazardous Waste Bureau
New Mexico Environment Department
2905 Rodeo Park Drive East Bldg. 1
Santa Fe NM 87505-6063

Dear Mr. Kieling,

Holloman AFB is pleased to submit the Work Plan for Additional Investigation at 20,000-Pound Open Detonation Unit at Holloman Air Force Base, NM 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 regarding this submittal, please contact me at (575) 572-6675.

Sincerely,

Digitally signed by
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DN: c=US, o=U.S. Government, ou=DoD,
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ADAM M. KUSMAK, GS-13, USAF

Attachment (hard copy and CD):
Work Plan for Additional Investigation 20,000-Pound Open Detonation Unit, Holloman Air Force Base, NM.

cc:

(w/Atch)	(w/CD)	(w/o Atch)
Mr. David Strasser	Mr. Chuck Hendrickson	Mr. Cornelius Amindyas
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Albuquerque NM 87102-3400	Dallas TX 75202-2733	Albuquerque NM 87102-3400

WORK PLAN FOR ADDITIONAL INVESTIGATION

OD20K 20,000-POUND OPEN DETONATION UNIT

HOLLOMAN AIR FORCE BASE
NEW MEXICO
RCRA PERMIT No. NM6572124422

Performance Based Remediation
Contract Number: FA8903-13-C-0008

Prepared for:

AIR FORCE CIVIL ENGINEER CENTER
2261 Hughes Ave., Suite 163
Joint Base San Antonio Lackland AFB, Texas 78236-9853

June 2016

Prepared by:

FPM Remediations, Inc.
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LIST OF ABBREVIATIONS AND ACRONYMS

AFB	Air Force Base
DGI	Data Gap Investigation
DOT	Department of Transportation
ft	feet
FPM	FPM Remediations, Inc.
GIS	Geographic Information System
HSA	Hollow-Stem Auger
HSTT	High Speed Test Track
IDW	Investigation Derived Waste
MCL	Maximum Contaminant Level
ug/kg	microgram per kilogram
ug/L	microgram per liter
mg/kg	milligram per kilogram
mg/L	milligram per liter
MS	Matrix Spike
MSD	Matrix Spike Duplicate
NEW	Net Explosive Weight
NMED	New Mexico Environment Department
NMHHS	New Mexico Human Health Standard
NMWQCC	New Mexico Water Quality Control Commission
NTU	Nephelometric Turbidity Units
OD	Open Detonation
PPE	Personal Protective Equipment
PVC	Polyvinyl Cloride
QA	Quality Assurance
QC	Quality Control
RSL	Regional Screening Level
SOP	Standard Operating Procedure
SSL	Soil Screening Level
SWMU	Solid Waste Management Unit
TDS	Total Dissolved Solids
UFP-QAPP	Uniform Federal Policy-Quality Assurance Project Plan
UTL	Upper Tolerance Limit
USEPA	United States Environmental Protection Agency
UXO	Unexploded Ordnance
WP	Work Plan
WSMR	White Sands Missile Range

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1.0 INTRODUCTION

This Work Plan (WP) describes the technical approach and work elements to conduct an additional investigation at the 20,000-Pound Open Detonation Unit (OD20K)/Solid Waste Management Unit (SWMU) 168 at Holloman Air Force Base (AFB). The investigation is necessary based on the results of previous closure groundwater and surface soil sampling performed in August 2012 and March 2015. The purpose of the investigation is to delineate the extent of the previously identified perchlorate contamination and elevated levels of nitrate in groundwater, to determine whether subsurface soil contamination is present at the site, to answer the NMED NODs (#11 to #14) dated December 31, 2015 regarding the Permit Renewal Application for OD20K, and to provide the path forward for the site.

1.1 Site Description and Regulatory Oversight

OD20K is a 6.2-acre site located in the northwestern portion of Holloman AFB approximately 2,900 feet (ft) north of the High Speed Test Track (HSTT) and on the border between Holloman AFB and White Sands Missile Range (WSMR) (**Figures 1** and **2**). The site was operated from 1996 through March 2011 under New Mexico Environment Department (NMED) Permit Number (No.) NM6572124422, issued in 1997, and updated in 1998 (NMED, 1998).

1.2 Operational History

The site was used for the destruction of conventional waste-ordnance, munitions, incendiaries, propellants, and rocket motors. The Net Explosive Weight (NEW) of solid propellant rocket motors that were treated in the trench was limited to 20,000 pounds (i.e., 20,000 pounds per treatment event). This total did not include the mass of the casings, other associated containment devices, and detonating charges. Although the precise number of treatment occurrences during any year is variable, the maximum amount of NEW treated at the unit per calendar year is 420,000 pounds.

The OD20K consists of a clear zone approximately 400 ft in diameter plus a buffer. Treatment of the wastes was accomplished by placing the explosive ordnance on top of the ground within a 100-foot diameter area at the center of the clear zone. The waste was then treated by detonation. The force of the explosion often created a depression in the ground, which was inspected to ensure that the waste was completely destroyed. Unexploded Ordnance (UXO) that may have been ejected from the depression was collected and returned to the depression and detonated again to treat the residual UXO. Casings and fragments that did not contain explosives were collected and containerized. Subsequent detonations were performed at locations surrounding the first depression within the 100-foot diameter detonation area. When the detonation area was covered with depressions, a bulldozer smoothed out the site, filling in the depressions. For post-detonation soil sampling, the last detonation depression was not filled in, nor was any dirt work conducted, until the soil samples had been collected.

A berm, with minimum height of 2 ft, exists at the south end of the OD20K to prevent carryover of fragments towards the HSTT area.

All waste that was treated at the OD20K was transported to the treatment area in the original product container or other appropriate packaging. Wastes to be treated were not stored at the treatment unit, but were delivered shortly before treatment. Receipt of the waste in the product container, combined with the fact that commonly used military propellants are compatible with

one another, ensured that incompatible wastes were not mixed. The reactive wastes treated at the OD20K were solid in nature and contained no free liquid.

1.2.1 Historic Sampling

Soil Sampling

Samples were collected from OD20K quarterly throughout the life of the unit. Samples were collected and analyzed for explosive compounds (HMX, RDX, 1,3,5-Trinitrobenzene, 1,3-Dinitrobenzene, Tetryl, Nitrobenzene, 2,4-Dinitrotoluene, 2,6-Dinitrotoluene, TNT (2,4,6-Trinitrotoluene), PETN (Pentaerythritol tetranitrate), 2-Amino-4,6-dinitrotoluene, 4-Amino-2,6-dinitrotoluene, 2-Nitrotoluene, 3-Nitrotoluene, 4-Nitrotoluene, and Nitroglycerin), metals (Antimony, Arsenic, Barium, Beryllium, Cadmium, Chromium, Copper, Lead, Mercury, Nickel, Selenium, and Silver) and soil moisture.

The comparison of historic quarterly data to the latest NMED Residential Soil Screening Levels (SSL) (NMED, 2015) shows exceedances for one explosive component only, nitroglycerin.

One nitroglycerin concentration (16 milligrams per kilogram [mg/kg] in April 2009) (**Figure 3**) exceeded the current SSL of 6.16 mg/kg, but did not exceed the SSL existing at that time (347 mg/kg). Therefore, no corrective actions, as required by the Permit, were required or taken.

One nitroglycerin exceedance (8 mg/kg) was identified in March 2011 (**Figure 3**). In accordance with the Permit, Attachment J, Data Evaluation, Page 33 and 34, the area was resampled after the exceedance was identified. The resampling result (18 mg/kg) confirmed an exceedance.

Quarterly data from the first quarter of 2003 through the first quarter of 2011 did not identify any exceedances of residential SSLs for any toxic metals or any other explosive compounds.

Groundwater sampling

Four groundwater monitoring wells were installed at OD20K in 1993 (Labat-Anderson, Inc., 1993). Well diagrams are provided as **Attachment 1** to this WP. One round of groundwater samples was obtained from all four wells in 1993. The groundwater samples underwent analyses for:

- Volatile Organics (SW846-8240),
- Base Neutral Acid (Semivolatiles) Extractables (SW846-8270),
- Pesticides/PCBs (SW846-8270),
- Herbicides (SW846-8270)01,
- Total and Dissolved Metals (SW846-6010/7000),
- Cyanide (EP A-335.3),
- Explosives (USATHAMA UW-35),
- Phosphates (EP A-365.2),
- Nitrates/Nitrites (EP A-353.3), and
- Total Dissolved Solids (TDS)/ Anions/ Alkalinity (EPA-160.1, 325.2, 340.2, 375.3, 305.1).

Chemical analysis of the groundwater showed the presence of several metals and cyanide. The metals in the groundwater were determined to most likely originate from metals found in the silty clay. It was speculated that the cyanide may have been the result of disposal activities, but was identified at levels of 0.01 and 0.02 ppm, which are near the method detection limits of (0.01 ppm) for cyanide (Labat-Anderson, Inc., 1993).

Since groundwater monitoring has not been required under the existing permit, the only additional sampling of these 4 wells prior to closure sampling in 2012 (described in Section 2.1) was performed in 2007 for determination of TDS values which ranged from 5,100 milligrams per liter (mg/L) (MW04) to 6500 mg/L (MW02).

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2.0 CLOSURE SAMPLING

This section summarizes closure groundwater and soil sampling results used to support the technical approach rationale for the additional investigation of OD20K addressed in this WP. The closure sampling was performed during two sampling events in August 2012 and March 2015. Detailed reports of these events including laboratory reports and data validation will be provided in other documents.

2.1 Closure Sampling August 2012

Closure sampling in August 2012 was performed in accordance with the NMED-approved Expanded Closure and Post-Closure Care Plan for OD20K (NationView, 2012). The sampling included:

(1) Surface soil (0-1 foot) sampling and

(2) Groundwater sampling of four existing monitoring wells.

Soil

Representative soil samples were collected from the surface interval (0-1 foot) and analyzed to determine the residual concentrations of:

- toxic metals,
- explosive compounds,
- perchlorate,
- nitrate and
- total phosphorus.

Because abundant data had been gathered during prior quarterly sampling events (from 2003 to 2011), and because it was important to verify that the entire area of the OD20K site was adequately sampled, a non-stratified sampling approach (geostatistical approach) was used to determine the placement and numbers of samples for closure.

August 2012 soil sample locations are shown in **Figure 4**. As shown in this figure, some samples were collected for analysis of all parameters listed above, while others were analyzed for perchlorate only, since perchlorate analysis were not conducted during the prior quarterly sampling (from 2003 to 2011). **Table 1** provides a summary of August 2012 soil sampling results and their comparison to NMED Residential SSLs (NMED, 2015) and United States Environmental Protection Agency (USEPA) Residential Regional Screening Levels (RSLs) (USEPA, 2015). As shown in this table and in **Figure 4**, concentrations of perchlorate in soils at four locations exceeded NMED Residential SSLs.

Groundwater

One set of groundwater samples was collected from the four existing monitoring wells in August 2012 (**Figure 5**) and analyzed for:

- metals,
- explosives,
- perchlorate,

- nitrate,
- total phosphorus and
- Total Dissolved Solids (TDS).

Groundwater samples were collected using low-flow sampling techniques with a peristaltic or submersible pump and new dedicated polyethylene tubing. The tubing was placed at mid-screen and purged until field parameters were stabilized. The groundwater samples were collected from mid-screen interval. **Table 2** provides the summary of August 2012 groundwater sampling results and their comparison to USEPA Maximum Contaminant Level (MCLs) (USEPA, 2015) (for drinking water) and New Mexico Water Quality Control Commission (NMWQCC) groundwater protection standards (NMWQCC, 2002). As shown in this table and in **Figure 5**, monitoring well MW02 had perchlorate and nitrate exceedances. Since standard (MCL) for perchlorate has not been established by USEPA, concentration of perchlorate was compared to interim health advisory level for perchlorate (15 μg/L). Nitrate concentration was above the NMQCC standard and the USEPA MCL for nitrate (both set at 10 mg/L).

In addition, TDS values at OD20K ranged from 5,000 mg/L at Monitoring Well MW01 to 6,600 at Monitoring Well MW02. Groundwater in the Tularosa Basin is of potable quality at the recharge areas in close proximity to the Sacramento Mountains and becomes increasingly mineralized toward the central portion of the basin and discharge areas. According to NMED Permit (NMED, 1998), the groundwater below the OD20K is designated as unfit for human consumption because it exceeds New Mexico Human Health Standard (NMHHS) for TDS, sulfate, and chloride.

2.2 Closure Sampling - Data Gap Investigation March 2015

Since soil and groundwater sampling events, performed in August 2012 resulted in closure standard exceedances, the Amended Expanded Closure Plan for OD20K (FPM, 2014) was developed to include a Data Gap Investigation (DGI) to confirm and delineate, if necessary, the identified soil and groundwater contamination.

DGI field activities were performed in March 2015 and included:

- Collecting background soil samples at 10 locations from the surface interval 0-6 inches for perchlorate analysis (data were collected from a 500- by 500-foot grid located approximately 1.3 miles southwest of OD20K [**Figure 6]**);
- Collecting soil samples from the surface interval (0-1 foot) at 20 locations at OD20K (four locations where the 2012 sampling event showed exceedances for perchlorate and four step-out locations in the vicinity of each of these four 2012 soil sampling locations [20 feet in north, east, south, and west direction with respect to the 2012 soil sampling location]) for perchlorate analysis; and
- Groundwater sampling at the four existing monitoring wells for perchlorate and nitrate analysis (one duplicate sample was collected at Monitoring Well MW02).

Results

Background Perchlorate Soil Concentrations - The USEPA ProUCL software was used to determine the upper tolerance limit (UTL) of background soil data. Based on this calculation the 95% UTL is 2.457 microgram per kilogram (ug/kg) (**Table 3**).

Perchlorate Soil Sampling Results - Detected concentrations of perchlorate in soil ranged from 0.0386 mg/kg to 22.500 mg/kg. As shown in **Table 4** and in **Figure 7**, all detected perchlorate concentrations were above the background reference value and below the NMED Residential SSL (NMED, 2015).

Perchlorate and Nitrate Groundwater Sampling Results – The DGI groundwater perchlorate and nitrate sampling results (**Table 5** and **Figure 8**) confirmed the 2012 results. Perchlorate in both samples collected at MW02 exceeded the USEPA interim health advisory level for perchlorate (15 µg/L). Nitrate concentrations in these two samples were also above the NMQCC standard and the USEPA MCL for nitrate (both set at 10 mg/L).

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3.0 ADDITIONAL INVESTIGATION

Since both August 2012 and March 2015 groundwater sampling events identified increased concentrations of perchlorate and nitrate in Monitoring Well MW02, an additional investigation is necessary to delineate the extent of groundwater contamination. This investigation will include installation of 6 new monitoring wells as shown in **Figure 9**. Based on the established groundwater flow direction towards the west-southwest, three monitoring wells will be located cross-gradient of the existing well MW02 (two to the north-northwest and one to the south-southeast), one monitoring well will be placed downgradient to the west-southwest, and one monitoring well will be located upgradient to the east-northeast of the monitoring well MW02 close to the eastern OD20K boundary. The sixth well will be located near the center of OD20K, since this location represents the most probable location of an actual source of contamination based on the operational history described in **Section 1.2** (i.e., the location where most of the detonations occurred during the active life of the unit).

In addition, since previous soil sampling included collecting samples from the surface interval 0-1 foot only, the additional investigation will also include subsurface soil sampling within the borehole located at the center of the site down to water table to identify potential subsurface soil contamination.

All activities described in the following sections will be conducted in accordance with the corresponding FPM Standard Operating Procedures (SOPs) which are provided in Appendix A of Appendix D (Uniform Federal Policy-Quality Assurance Project Plan [UFP-QAPP]) of the Amended Expanded Closure Plan for OD20K (FPM, 2014).

3.1 Monitoring Well Installation and Development

3.1.1 Monitoring Well Installation

Well-drilling activities will be performed by an individual with a current and valid well driller license issued by the State of New Mexico. Monitoring wells will be installed using the Hollow-Stem Auger (HSA) drilling technique in accordance with NMED Ground Water Quality Bureau Monitoring Well Construction and Abandonment Guidelines (NMED, 2011). All wells will be installed in accordance with FPM SOP No. 10, Monitoring Well Installation and Development, (FPM, 2014).

The boreholes will be advanced into the water table using the HSA such that the borehole diameter will be at least 4 inches larger than the outside diameter of the well casing to allow for proper placement of the filter pack and bentonite seal. Care will be taken so that the completed monitoring wells are sufficiently straight and plumb to allow passage of measuring and sampling devices. During drilling, an FPM Geologist will document the following information for each boring:

- Project name and number
- Drilling company name
- Driller's name
- Date drilling started and finished
- Type of drill rig

- Type of bit and size
- Boring number
- Casing sizes and depths
- Well completion details
- Geologist's name
- Surface elevation (initially estimated pending survey)
- Sample depths and times
- Sample characteristics with depth, such as lithology, grain size, sorting, texture, structure, bedding, color, moisture content, and the Unified Soil Classification (if in unconsolidated geologic materials)
- Water levels
- Geophysical or video log run (if any)
- Drilling observations
- Other pertinent information

Well installation equipment will be decontaminated according to the specifications of the FPM SOP No. 4, Equipment and Personnel Decontamination, (FPM, 2014).

Well borings will be advanced approximately 8 ft into the water table and completed such that the well screen intersects the water table. The wells will be constructed of 2-inch diameter Schedule 40 polyvinyl chloride (PVC) riser and screen. The screened section of the wells will consist of 10 ft of 0.010-inch slotted screen (or other field-determined slot size). A silica sand filter pack will be placed around the screen to approximately 2 ft above the top of the screen. A 2-ft thick bentonite seal will be placed above the filter pack. The remaining annular space will be grouted with neat cement.

Monitoring wells will be completed as "flush-mounted" and will be constructed with water-tight well vaults that are rated to withstand traffic loads and fitted with locking, expandable well plugs. Concrete pads (2-ft minimum radius, 4-inch minimum thickness) will be poured around the well vaults. Vault covers will be secured with bolts. Additionally, the vault cover will indicate that the wellhead of a monitoring well is contained within the vault. The concrete and surrounding soil will be sloped to direct rainfall and runoff away from the well vault.

To document specific details of the monitoring well installations, the FPM Geologist will prepare drilling logs and as-built well construction diagrams in the field as the activity is taking place in accordance with FPM SOP No. 2, Sample Handling, Documentation, and Tracking, (FPM, 2014).

3.1.2 Surveying

The locations and elevations of existing and new monitoring wells will be surveyed by a surveyor licensed in the State of New Mexico. At a minimum, the horizontal location of the well will be surveyed to the nearest one foot, the elevation of the ground surface next to the protective casing will be surveyed to the nearest 0.10-foot, and the elevation of the measuring point on the

well riser will be surveyed to the nearest 0.01-foot. Surveying data will be provided in a spreadsheet format for import into the Geographic Information System (GIS).

3.1.3 Monitoring Well Development

The newly installed monitoring wells will be developed to create an effective filter pack around the well screen, remove fine particles from the formation near the borehole, and assist in restoring the natural water quality of the aquifer in the vicinity of the well. All newly installed monitoring wells will be developed no sooner than 48 hours after installation to allow for grout curing. Well development will consist of removing a minimum of five well casing volumes of water during repeated surging and well evacuation episodes. Monitoring wells will be developed in accordance with FPM SOP No. 10, Monitoring Well Installation and Development (FPM, 2014) and will be performed using surge blocks, bailers, or pumps to achieve effective well development. Before development begins, the development equipment will be decontaminated according to the procedures described in FPM SOP No. 4, Equipment and Personnel Decontamination, (FPM, 2014). Equipment coming in contact with the well will also be decontaminated between the wells.

During well development, documentation of the activity will take place in accordance with FPM SOPs No. 7, Equipment Calibration and SOP No. 10 Monitoring Well Installation and Development (FPM, 2014) and will include recording of water level and depth-to-bottom measurements, water quality parameters, discharge water color, water volume, and time period. Well development will continue until the following criteria are met:

- Water that has been removed from the well is visually clear, and the turbidity measures less than or equal to 10 Nephelometric Turbidity Units (NTUs); and
- The pH, temperature, and specific conductance parameters have stabilized (less than 10 percent variation for three successive readings).

In the event that fine-grained deposits are present in the subsurface, it may be difficult to achieve turbidity of 10 NTUs during well development. This is primarily a concern when a well has been screened in a formation that contains a high level of fine material (silt and clay). Silt and clay can occasionally travel through filter packs on properly constructed wells, resulting in turbid water. While selection of proper filter pack and screen materials minimizes turbidity, fine grained particles may still flow through. Proper well construction and development procedures will be followed to reduce measured turbidity in monitoring wells. If turbidity remains greater than 10 NTUs after 4 hours of continuous well development, well development will cease. If the well is pumped dry, it will be allowed to recharge and be re-pumped as much as practical within the 4-hour time limit.

3.2 Groundwater Sampling

Groundwater samples will be collected from new monitoring wells in accordance with the procedures provided in FPM SOP No. 9, Groundwater Sampling, (FPM, 2014). Groundwater sampling will occur no sooner than 2 days following monitoring well development at any monitoring well. Groundwater monitoring wells will be purged and samples will be collected using low-flow sampling techniques. Field parameters (e.g., temperature, conductivity, dissolved oxygen, pH, and turbidity) will be measured initially and during purging, at a minimum of one set of readings per well casing volume purged. The purge will be considered adequate when three to five well volumes have been removed and the parameters have stabilized.

Stabilization will have occurred when the following conditions have been met for three consecutive readings:

- pH remains constant within 0.1 pH unit.
- Specific conductance varies no more than 5%.
- Turbidity has stabilized or turbidity readings are below 10 NTUs
- Dissolved oxygen may also be used as a purge adequacy parameter. Normal goals for dissolved oxygen are 0.2 mg/L or 10% saturation, whichever is greater.
- If the parameters have not stabilized after three well volumes have been removed, additional well volumes will be removed up to five well volumes. If the parameters have not stabilized after five well volumes have been removed, it is up to the discretion of the project leader whether or not to collect a sample or to continue purging. If, after five well volumes, pH and conductivity have stabilized and the turbidity is still decreasing and approaching an acceptable level, additional purging should be considered to obtain the best sample possible, with respect to turbidity.
- If the well is purged dry, this generally constitutes an adequate purge and the well can be sampled following sufficient recovery (enough volume to allow filling all of the sample containers).

Groundwater samples collected from monitoring wells will be sent to SGS Accutest - Orlando for analysis of the following parameters:

1. Metals by USEPA Method 6010C, unless otherwise noted:

   Antimony,
   Arsenic,
   Barium,
   Beryllium,
   Cadmium,
   Chromium,
   Copper,
   Lead,
   Mercury (Method 7471B),
   Nickel,
   Selenium, and
   Silver.

2. Explosive Compounds by USEPA Method 8330 (except NDMA by USEPA Method 8270C-SIM):

   HMX (cyclotetramethylenetetranitramine; octahydro-1,3,5,7-tetranitro-1,3,5,7-tetrazocine),
   RDX (cyclotrimethylenenitramine; Hexahydro-1,3,5-trinitro-1,3,5-triazine),
   1,3,5-Trinitrobenzene,
   1,3-Dinitrobenzene,
   Tetryl,

Nitrobenzene,
2,4-Dinitrotoluene,
2,6-Dinitrotoluene,
TNT (2,4,6-Trinitrotoluene),
PETN (Pentaerythritol tetranitrate),
2-Amino-4,6-dinitrotoluene,
4-Amino-2,6-dinitrotoluene,
2-Nitrotoluene,
3-Nitrotoluene,
4-Nitrotoluene, and
Nitroglycerin.

3. Perchlorate by USEPA Method 6850
4. Nitrate by USEPA Method 9056A, and
5. TDS by Method 2540C.

Groundwater sampling results for perchlorate and nitrate will be compared to USEPA MCLs, if available (USEPA, 2015) (for drinking water) and NMWQCC groundwater protection standards (NMWQCC, 2002) for corresponding parameters. Since a standard for perchlorate is not available, perchlorate concentrations will be compared to the USEPA interim Health Advisory level of 15 ug/L (USEPA, 2008). Laboratory specific detection quantitation limits are provided in **Table 6**. Groundwater sample containers, preservatives, and holding times for the analytes specific to the sampling in this additional investigation are shown in **Table 7.**

3.3 Subsurface Soil Sampling

A low permeability silt/silty clay unit was encountered between 10 to 12 feet at Monitoring Wells MW01, MW02, and MW03 and between 10 and 16 feet at Monitoring Well MW02 (Table G-2, Generalized Geologic [Soil Boring] Log from NMED Permit is provided as an **Attachment 2** (NMED, 1998). This low permeability unit acts as a barrier preventing or minimizing any potential vertical hazardous waste contaminant migration. In addition, the depth to the top of the uppermost saturated zone beneath OD20K ranges from 27 to 32 feet below ground surface (groundwater elevation measurements from March, 2015). The annual precipitation at HAFB averages 7.9 inches. The mean annual evapotranspiration rate averages an estimated 67 inches per year, resulting in a net annual precipitation rate for the area of approximately -59 inches per year. Therefore, the low precipitation rate for the area results in a negligible driving force for hazardous waste contaminant migration (NMED, 1998). As a result, the subsurface soil sampling within the borehole located at the center of OD20K will be performed as follows:

- 5 soil samples will be collected from split-spoons during advancement of the well boring from 0 to 2 feet, 2 to 4 feet, etc. within the initial 10 feet.
- 3 additional soil samples will be collected from split-spoons during advancement of well boring at the 0-2 feet intervals at three depths: 18 feet. 24 feet, and at the water table.

Subsurface soil sampling will be performed in accordance with FPM SOP No. 2 (FPM, 2014). The samples will be analyzed for the list of metals and explosive compounds listed in **Section 3.2** as well as for perchlorate and nitrate. The samples will be analyzed using the same USEPA methods as those listed in **Section 3.2**. The soil analytical results will be compared to the

corresponding NMED Residential SSLs established in NMED's Risk Assessment Guidance for Site Investigations and Remediation (NMED, 2015), and USEPA RSLs (USEPA, 2015). The lower of the available standards will be used. Laboratory specific detection quantitation limits are provided in **Table 8**. Soil sample containers, preservatives, and holding times for the analytes specific to the sampling in this additional investigation are shown in **Table 9.**

3.4 Quality Assurance/Quality Control Samples

Quality Assurance (QA)/Quality Control (QC) samples will be collected for the appropriate contaminant of concern so that sample results can be properly validated and eventually used as confirmation samples. Field QA/QC samples are designed to help identify potential sources of external sample contamination and evaluate potential error introduced by sample collection and handling. All QA/QC samples are labeled with QA/QC identification numbers and sent to the laboratory in the same batch as the normal samples for analyses. The QA/QC samples will be collected at the following frequencies, per matrix:

- Total numbers of Field Duplicate Samples will meet project goal of 10%.
- Total Matrix Spike (MS)/ Matrix Spike Duplicate (MSD) Samples will meet project goal of 5%.
- Trip blank samples are not required for coolers containing explosives, metals, anions (nitrate), or perchlorate samples.
- Equipment blanks will be collected from non-disposable decontaminated sampling devices at a rate of 1 per day of fieldwork. Dedicated/disposable equipment is anticipated to be used for groundwater sampling.

3.5 Laboratory Reporting

The laboratory will provide Level IV laboratory deliverables which consist of an analytical report with results and QA/QC summaries. Internal QC results, not included as part of the Level II package, will be retained on file at the offsite laboratory.

Standard turnaround time of 14 business days will be expected for all results.

3.6 Investigation Derived Waste

Waste management options in order of preference are reuse, recycling, treatment, and disposal. Waste may be classified as non-investigative waste or investigative waste:

- Non-investigative waste, such as trash and office garbage, will be collected on an as needed basis to maintain the site in a clean and orderly manner. This waste will be accumulated in plastic garbage bags and disposed of on site at a trash receptacle or dumpster identified by Installation personnel.
- Investigation Derived Waste (IDW) generated during this additional investigation will be segregated into the following categories:
    - Suspected contaminated soil.
    - Concrete or asphalt rubble.
    - Decontamination, well development, seepage water in excavations, and purge water.
    - Personnel Protective Equipment (PPE), sampling debris, and plastic sheeting.

The IDW will be properly containerized and temporarily stored at a location specified by Holloman AFB prior to disposal. Depending on the COCs, fencing or other special marking may be required. Acceptable waste containers include sealed, Department of Transportation (DOT)-approved, steel 55-gallon drums; small dumping bins with lids; or roll-off boxes with liners and covers. The containers will be transported in such a manner as to prevent spillage or particulate loss to the atmosphere. The IDW will be segregated at the site according to the specified categories. Each waste container will be properly labeled with Installation identification, site identification, type of IDW, boring number, date of accumulation, and name and phone of Installation contact.

3.6.1 Determination of Disposal

All IDW that is determined to not be disposable on-Base will be properly disposed of at a licensed off-Base facility. The analytical results from the field sampling activities will be used to indicate the contamination levels of IDW to determine an appropriate disposal facility. If analytical results indicate none or minimal contamination, IDW will disposed of offsite or at a location on base identified by the Restoration Project Manager.

If results indicate that IDW from the site may be characteristically hazardous, a sample of containerized IDW will be collected and analyzed for the appropriate waste characteristic using the TCLP. Analytical test results will be compared to TCLP threshold criteria to determine if the material is characteristically hazardous. Characteristically hazardous IDW will be properly manifested and shipped to a licensed off-Base Subtitle C disposal facility. A representative of the Installation will sign all manifests for IDW shipped off site.

3.7 Project Schedule

The project schedule is provided in **Table 10**.

3.8 Reporting

All results from the DGI (i.e., March 2015 soil and groundwater sampling) and from groundwater and subsurface soil sampling described in this WP will be included in a DGI Report that will be submitted to NMED for review/approval. Based on the results of this additional investigation, the DGI Report may also include a recommendation for corrective action (e.g., in situ bioremediation of contaminated groundwater and/or excavation of contaminated subsurface soil, if any is identified). The technical approach, work elements and all other necessary details for these activities would be provided in the Corrective Action Work Plan.

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4.0 REFERENCES

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FIGURES

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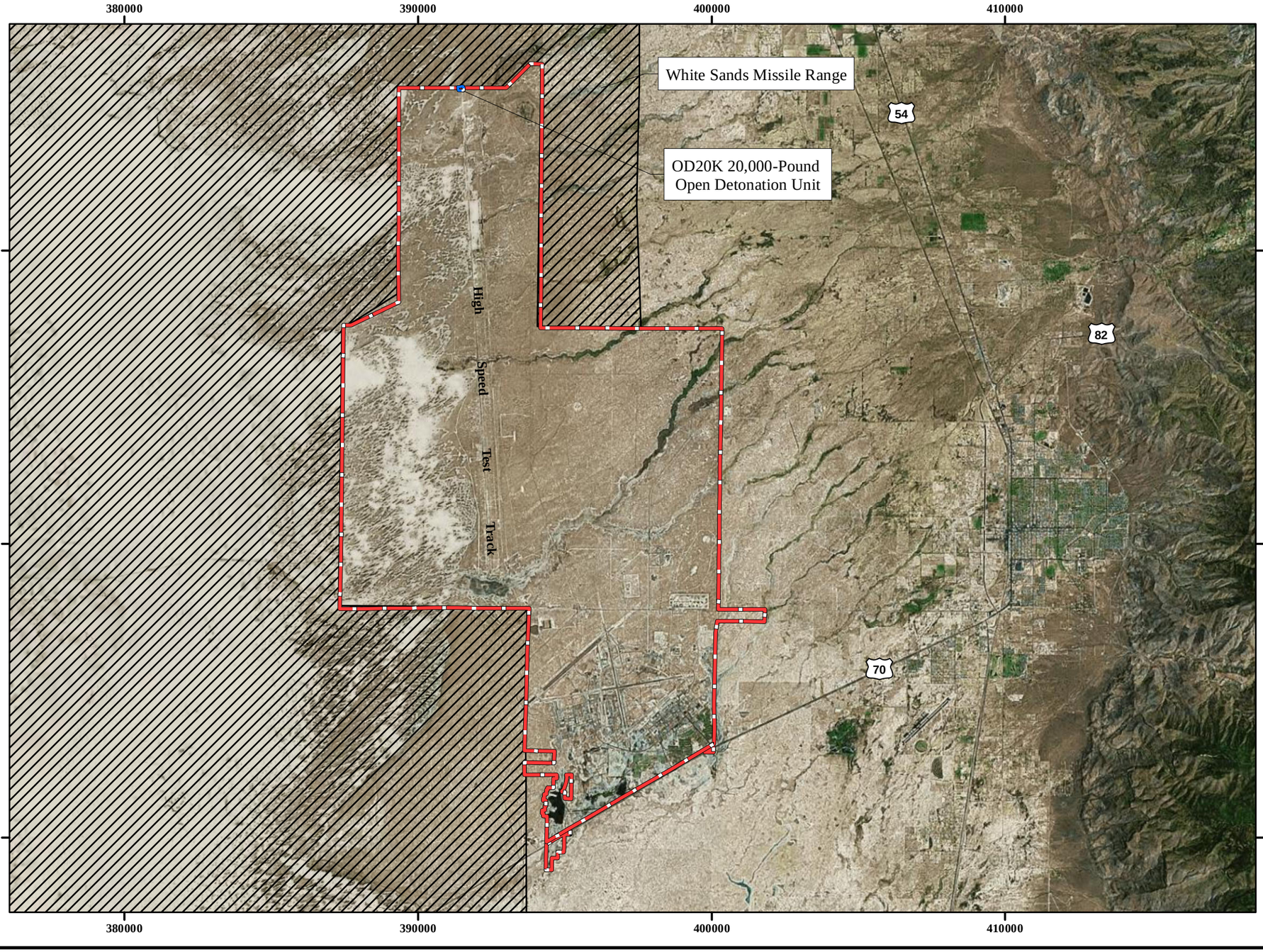

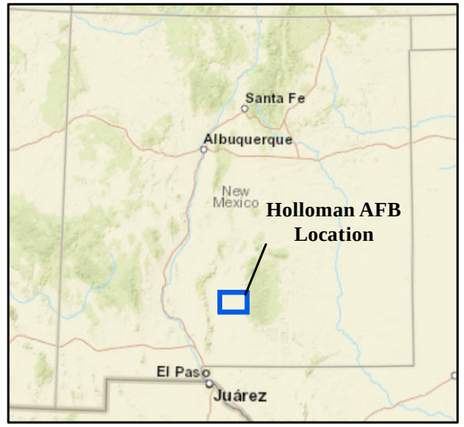

Legend

Installation Boundary

NOTES:

Revision Date: 3/28/2016

Coordinate System:NAD 1983 UTM Zone 13N
Projection: Transverse Mercator — Horizontal Datum: North American 1983
False Easting: 500,000.0000 — False Northing: 0.0000
Central Meridian: -105.0000 — Scale Factor: 0.9996
Latitude Of Origin: 0.0000 — Units: Meter
Base Map Date: (c) 2010 Microsoft Corporation and its data suppliers
Base Map Source: ESRI Online Bing Data Source

1 inch = 12,000 feet

0 1,850 3,700 Meters

0 6,000 12,000 Feet

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Holloman Air Force Base
Alamogordo, NM

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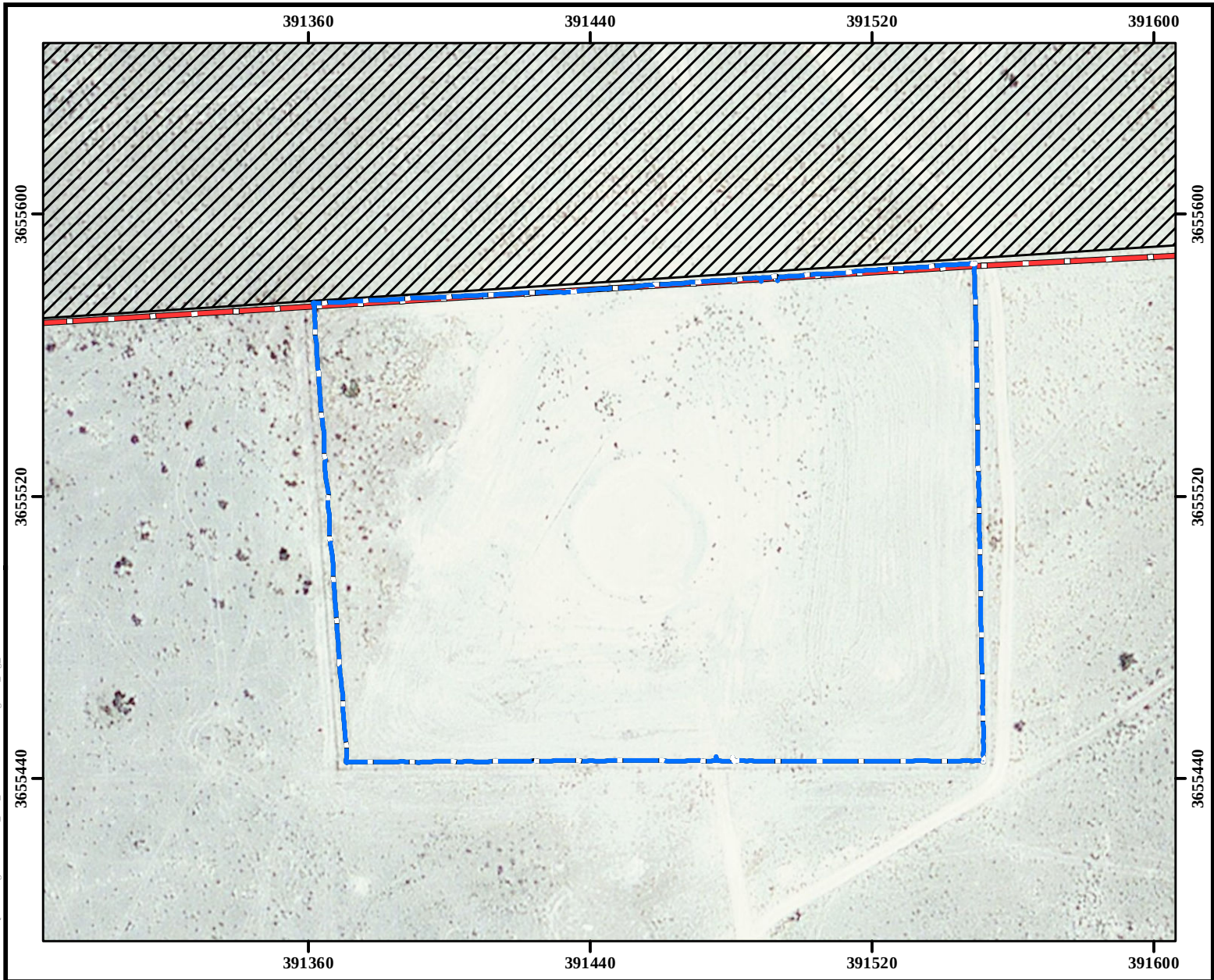
FIGURE 1

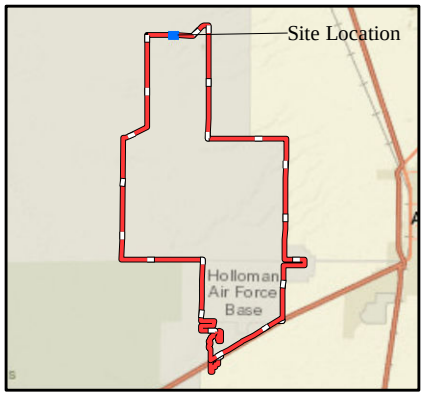
Holloman Air Force Base Location

FPM Remediations, Inc.

2016

Path: C:\Projects\New Mexico\GIS\OD20K UFP-QUAPP Figures\OD20K_WP_ForAdditionalInvestigation_Fig_1.mxd





Legend

- OD20K 20,000-Pound Open Detonation Unit Boundary (6.2 acres)
- WSMR
- Installation Boundary

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Alamogordo, NM

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FIGURE 2

OD20K 20,000-Pound
Open Detonation Unit

FPM Remediations, Inc.

2016

NOTES:
Revision Date: 3/21/2016

Coordinate System:NAD 1983 UTM Zone 13N
Projection: Transverse Mercator
Horizontal Datum: North American 1983
False Easting: 500,000.0000
False Northing: 0.0000
Central Meridian: -105.0000
Scale Factor: 0.9996
Latitude Of Origin: 0.0000
Units: Meter
Base Map Date: (c) 2010 Microsoft Corporation and its data suppliers
Base Map Source: ESRI Online Bing Data Source

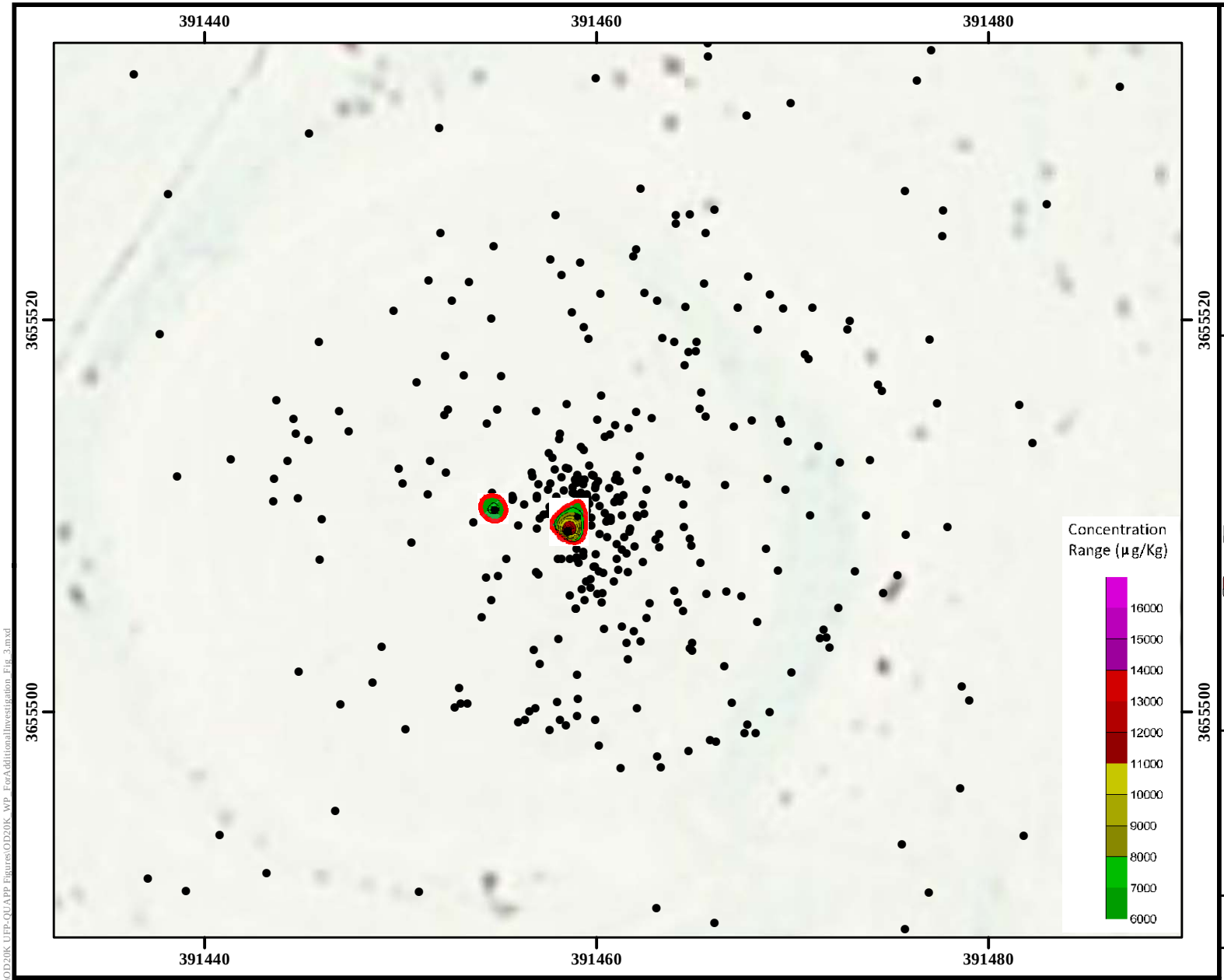
1 inch = 140 feet

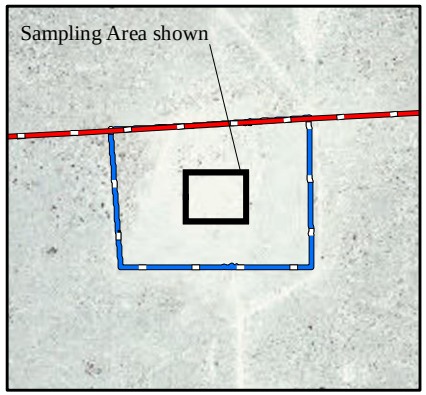
0 21 42
Meters

0 70 140
Feet

N
W E
S

Path: C:\Projects\New Mexico\GIS\OD20K UFP-QUAPP Figures\OD20K_WP_ForAdditionalInvestigation_Fig_2.mxd





Legend

- Sampling Location
- Concentrations Exceeding NMED SSL (April 2009 and March 2011)
- OD20K 20,000-Pound Open Detonation Unit Boundary (6.2 acres)
- Installation Boundary

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Alamogordo, NM

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FIGURE 3

Historic Nitroglycerin Sampling Locations and Concentrations Exceeding SSLs at OD20K

FPM Remediations, Inc.

2016

NOTES: Adapted from Expanded Closure and Post-Closure Care Plan 20,000-Pound Open Detonation Unit (NationView, 2012)

Revision Date: 3/28/2016

Coordinate System: NAD 1983 UTM Zone 13N
Projection: Transverse Mercator — Horizontal Datum: North American 1983
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Central Meridian: -105.0000 — Scale Factor: 0.9996
Latitude Of Origin: 0.0000 — Units: Meter
Base Map Date: (c) 2010 Microsoft Corporation and its data suppliers
Base Map Source: ESRI Online Bing Data Source

1 inch = 25 feet

0 4 8 Meters

0 12.5 25 Feet

N W E S

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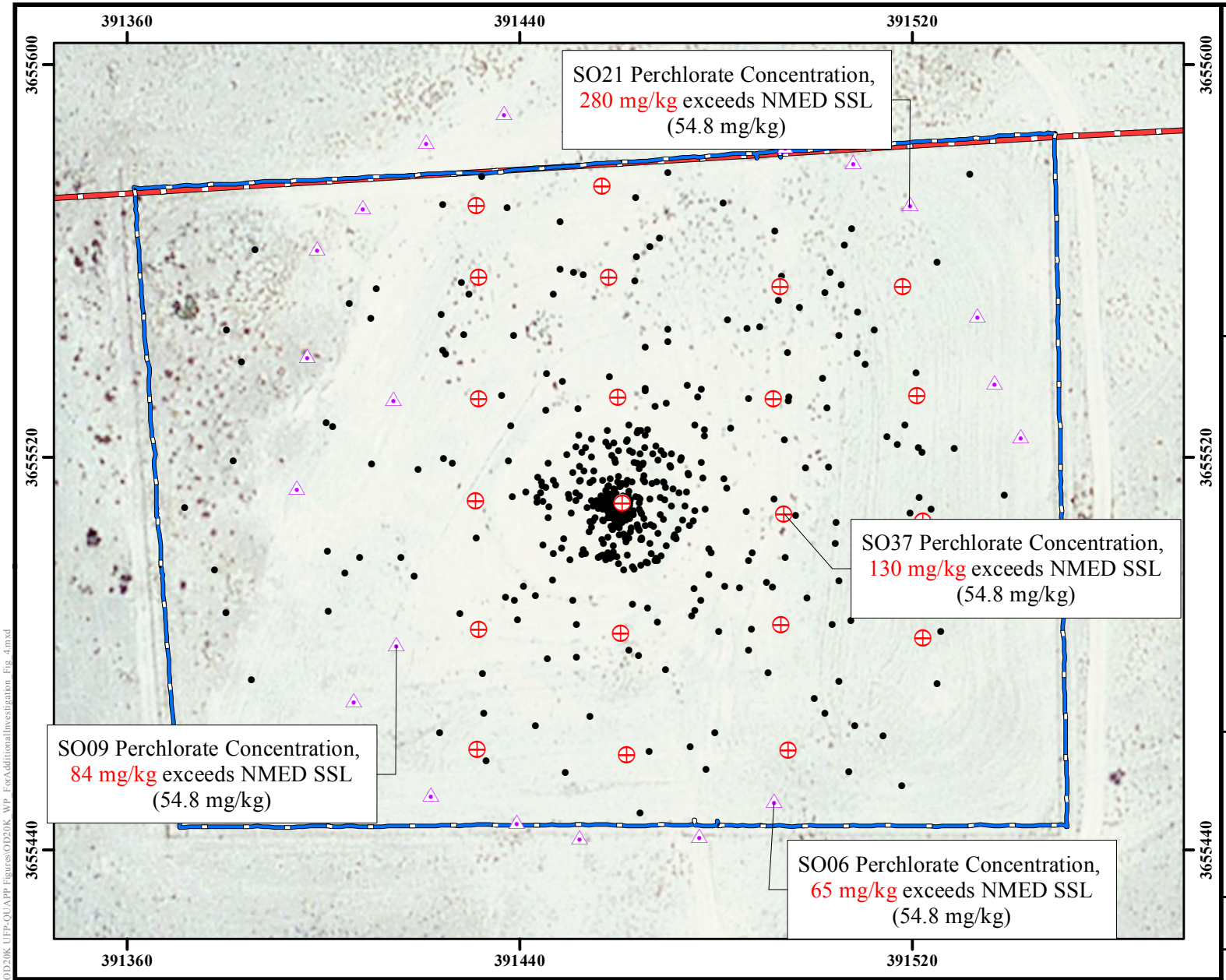

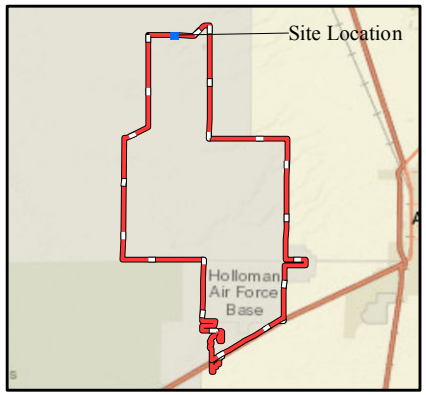

Legend

- 2012 Sampling Location - Perchlorate Only
- 2012 Sampling Location - All Parameters
- Historic Sampling Location
- OD20K 20,000-Pound Open Detonation Unit Boundary (6.2 acres)
- Installation Boundary

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Alamogordo, NM

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FIGURE 4

August 2012 Soil Sample Locations and Perchlorate Values Above Action Levels OD20K

FPM Remediations, Inc.

2016

NOTES: Adapted from Expanded Closure and Post-Closure Care Plan 20,000-Pound Open Detonation Unit (NationView, 2012)

Revision Date: 3/28/2016

Coordinate System: NAD 1983 UTM Zone 13N
Projection: Transverse Mercator
Horizontal Datum: North American 1983
False Easting: 500,000.0000
False Northing: 0.0000
Central Meridian: -105.0000
Scale Factor: 0.9996
Latitude Of Origin: 0.0000
Units: Meter
Base Map Date: (c) 2010 Microsoft Corporation and its data suppliers
Base Map Source: ESRI Online Bing Data Source

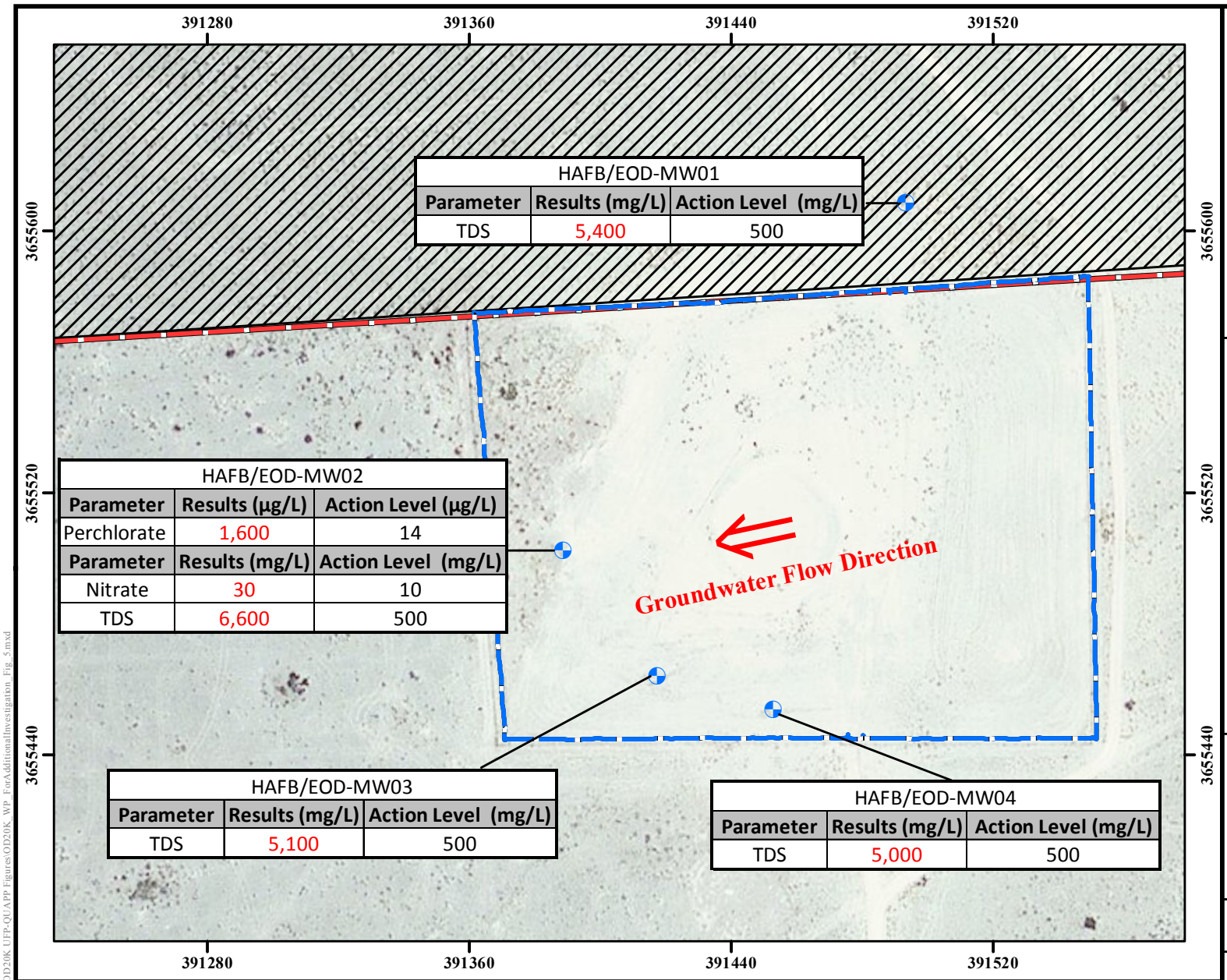
1 inch = 100 feet

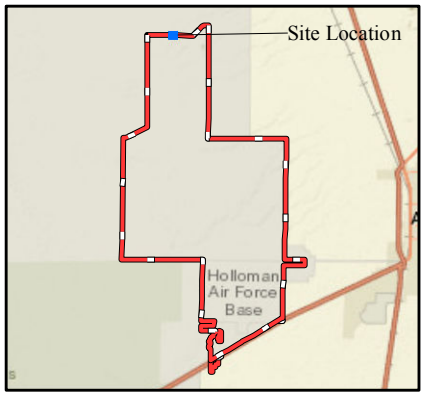
0 15 30 Meters

0 50 100 Feet

N W E S

Path: C:\Projects\New Mexico\GIS\OD20K 1UFP-QUAPP Figures\OD20K_WP_ForAdditionalInvestigation_Fig_4.mxd





Legend

- Existing Groundwater Monitoring Well Location
- OD20K 20,000-Pound Open Detonation Unit Boundary (6.2 acres)
- WSMR
- Installation Boundary

Performance Based Remediation
New Mexico-Arizona
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Alamogordo, NM

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FIGURE 5

August 2012 Groundwater Sampling Analytical Results Above Action Levels OD20K

NOTES:

Revision Date: 3/25/2016

Coordinate System:NAD 1983 UTM Zone 13N
Projection: Transverse Mercator
Horizontal Datum: North American 1983
False Easting: 500,000.0000
False Northing: 0.0000
Central Meridian: -105.0000
Scale Factor: 0.9996
Latitude Of Origin: 0.0000
Units: Meter
Base Map Date: (c) 2010 Microsoft Corporation and its data suppliers
Base Map Source: ESRI Online Bing Data Source

1 inch = 150 feet

0 22.5 45 Meters

0 75 150 Feet

N W E S

FPM Remediations, Inc.

2016

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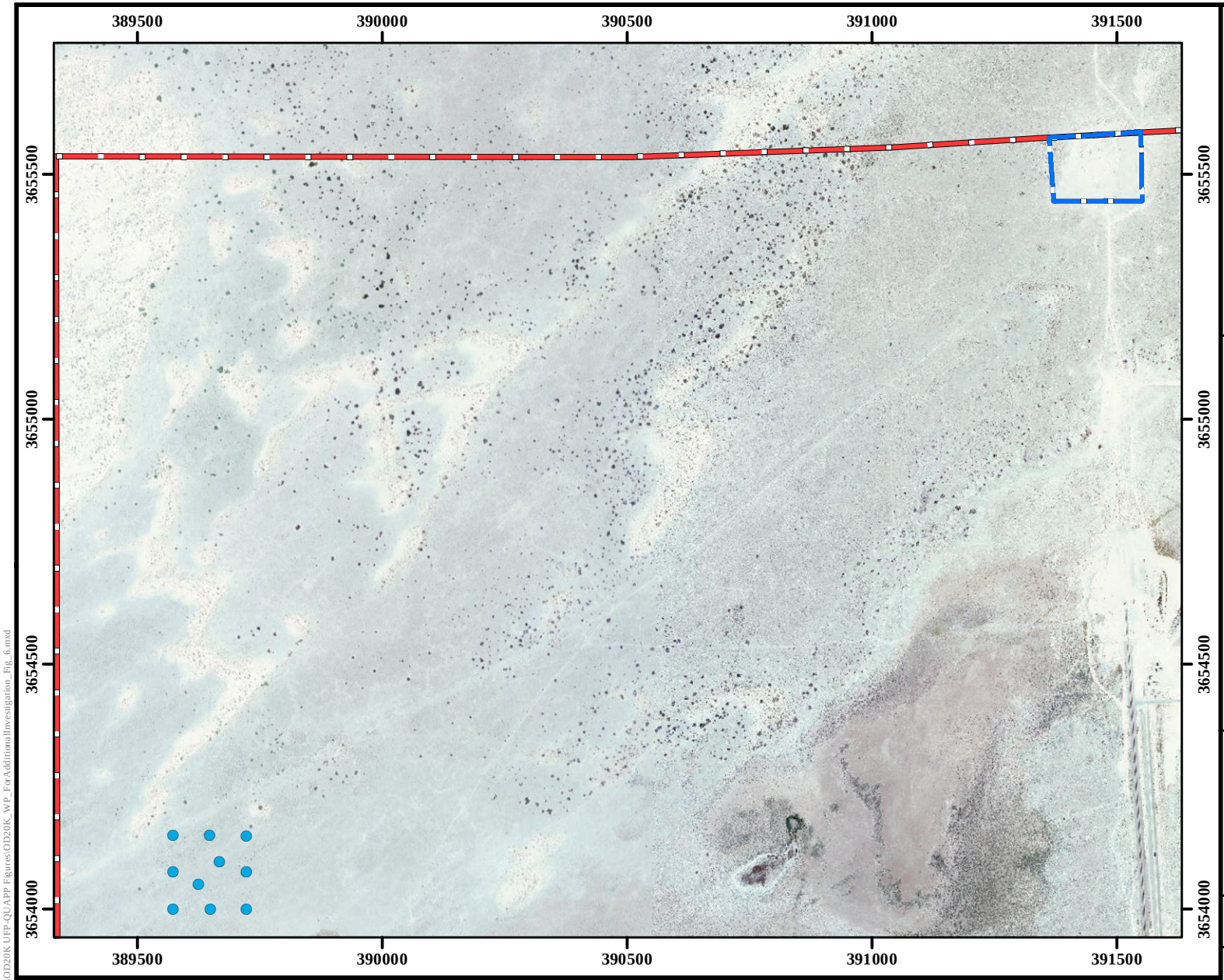

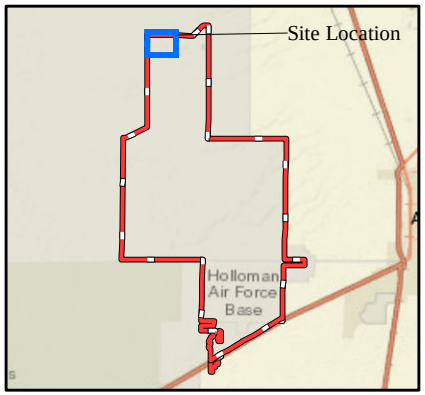

Legend

- Background Soil Sampling Locations
- OD20K 20,000-Pound Open Detonation Unit Boundary (6.2 acres)
- Installation Boundary

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FIGURE 6

March 2015 DGI Background Soil Sampling Locations for Perchlorate Analysis

FPM Remediations, Inc.

2016

NOTES:
Revision Date: 3/22/2016

Coordinate System:NAD 1983 UTM Zone 13N
Projection: Transverse Mercator
Horizontal Datum: North American 1983
False Easting: 500,000.0000
False Northing: 0.0000
Central Meridian: -105.0000
Scale Factor: 0.9996
Latitude Of Origin: 0.0000
Units: Meter
Base Map Date: (c) 2010 Microsoft Corporation and its data suppliers
Base Map Source: ESRI Online Bing Data Source

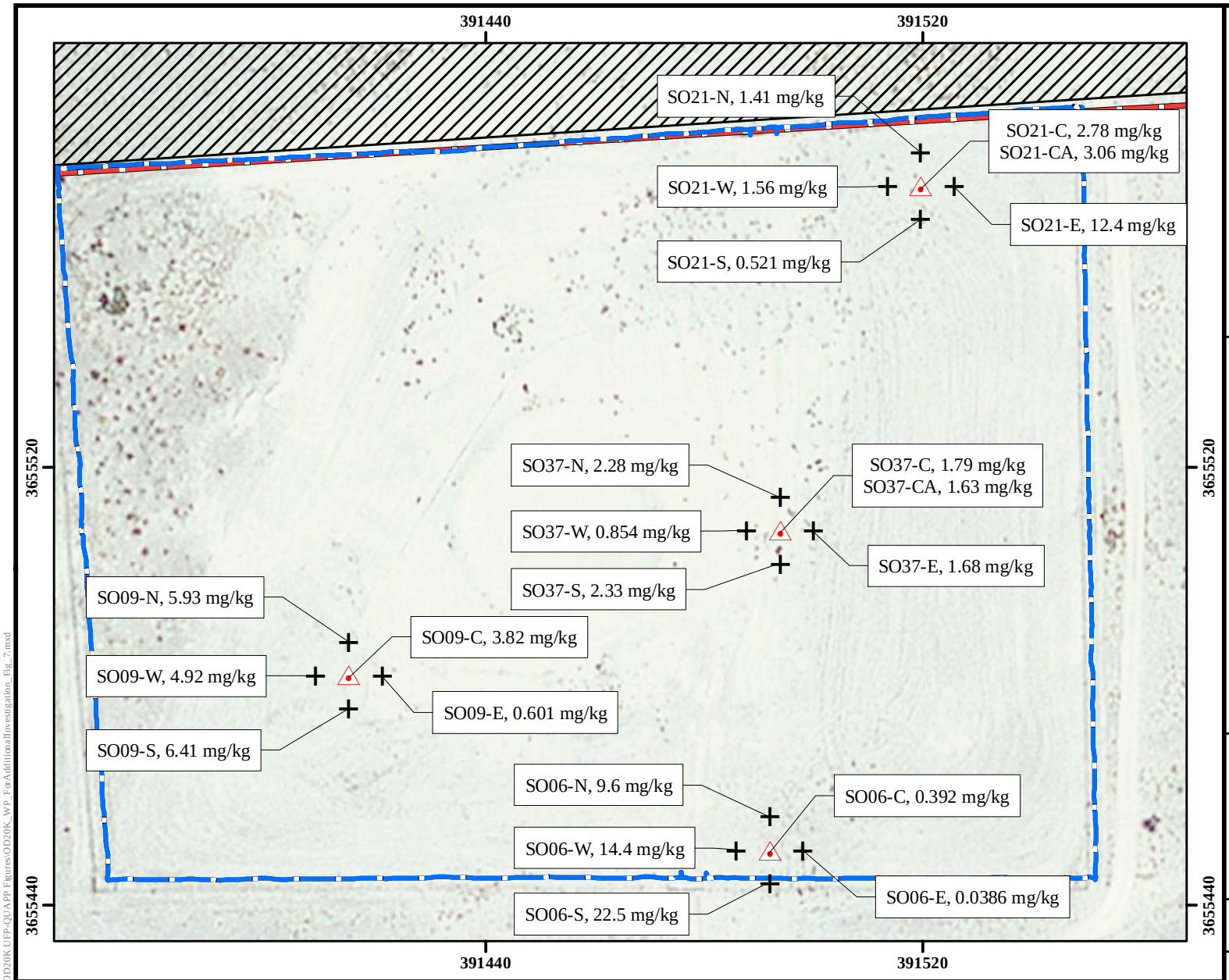
1 inch = 1,000 feet

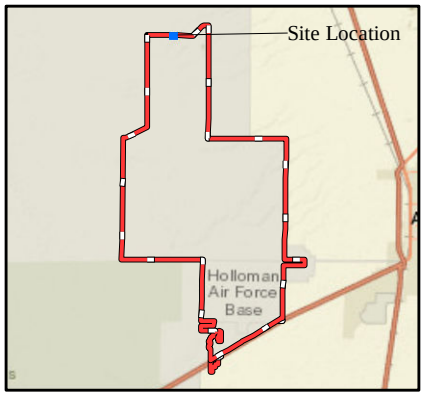
0 150 300 Meters

0 500 1,000 Feet

N W E S

Path: C:\Projects\New Mexico\GIS\OD20K UFP-QUAPP Figures\OD20K_WP_For Additional Investigation_Fig_6.mxd





Legend

- March 2015 DGI Soil Sampling Location for Perchlorate Analysis (20 feet step-out)
- March 2015 Soil Sampling Locations (the same as 2012 event locations where perchlorate concentrations were above the NMED SSL)
- OD20K 20,000-Pound Open Detonation Unit Boundary (6.2 acres)
- WSMR
- Installation Boundary

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Alamogordo, NM

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FIGURE 7

March 2015 DGI Soil Sampling Locations for Perchlorate Analysis OD20K

FPM Remediations, Inc.

2016

NOTES:
Revision Date: 3/22/2016

Coordinate System:NAD 1983 UTM Zone 13N
Projection: Transverse Mercator
Horizontal Datum: North American 1983
False Easting: 500,000.0000
False Northing: 0.0000
Central Meridian: -105.0000
Scale Factor: 0.9996
Latitude Of Origin: 0.0000
Units: Meter
Base Map Date: (c) 2010 Microsoft Corporation and its data suppliers
Base Map Source: ESRI Online Bing Data Source

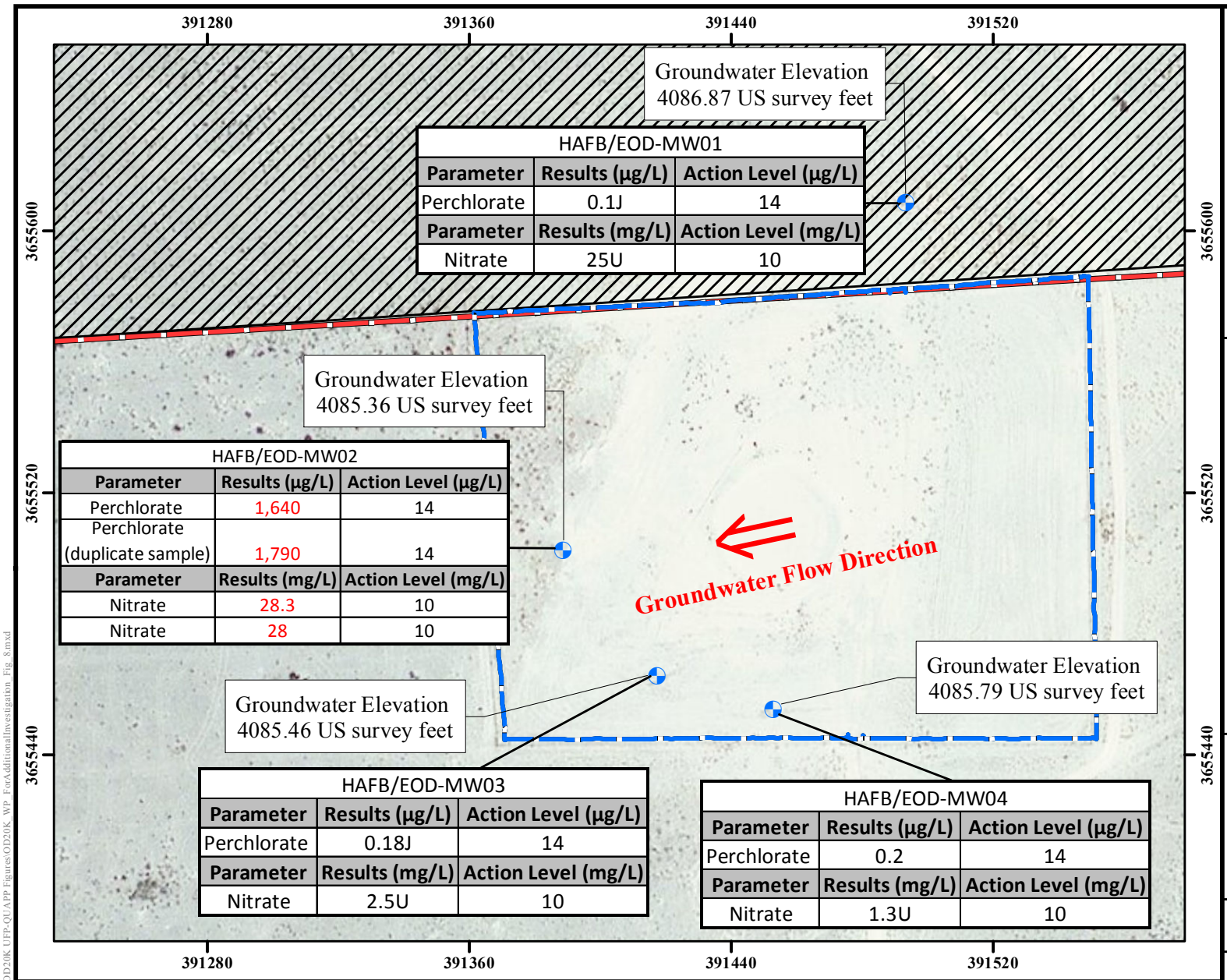
1 inch = 90 feet

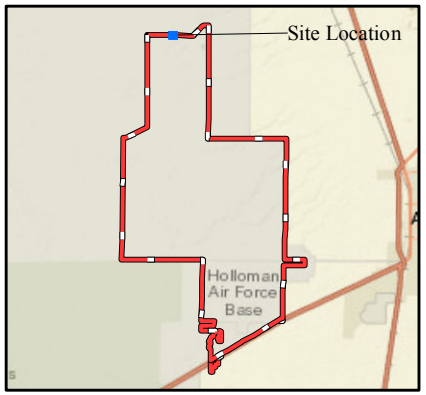
0 15 30 Meters

0 45 90 Feet

N W E S

Path: C:\Projects\New Mexico\GIS\OD20K UFP-QAPP Figures\OD20K_WP_For Additional Investigation_Fig_7.mxd





Legend

- Existing Groundwater Monitoring Well Location
- OD20K 20,000-Pound Open Detonation Unit Boundary (6.2 acres)
- WSMR
- Installation Boundary

NOTES:

Coordinate System:NAD 1983 UTM Zone 13N
Projection: Transverse Mercator
Horizontal Datum: North American 1983
False Easting: 500,000.0000
False Northing: 0.0000
Central Meridian: -105.0000
Scale Factor: 0.9996
Latitude Of Origin: 0.0000
Units: Meter
Base Map Date: (c) 2010 Microsoft Corporation and its data suppliers
Base Map Source: ESRI Online Bing Data Source

1 inch = 150 feet

0 22.5 45 Meters

0 75 150 Feet

N W E S

Revision Date: 3/28/2016

Path: C:\Projects\New Mexico\GIS\OD20K 1IFP-QUAPP Figures\OD20K_WP_ForAdditionalInvestigation_Fig_8.mxd

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New Mexico-Arizona
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Alamogordo, NM

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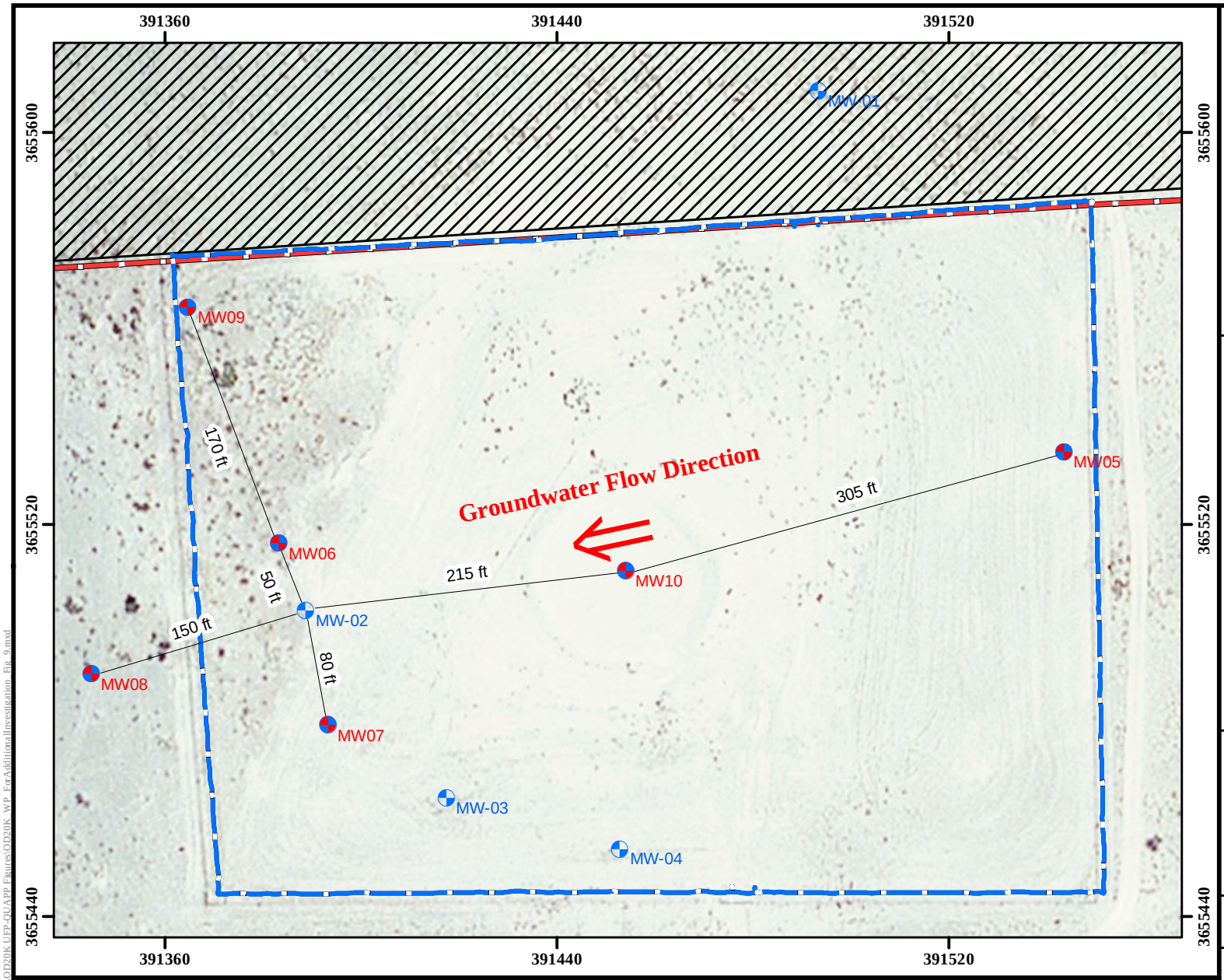
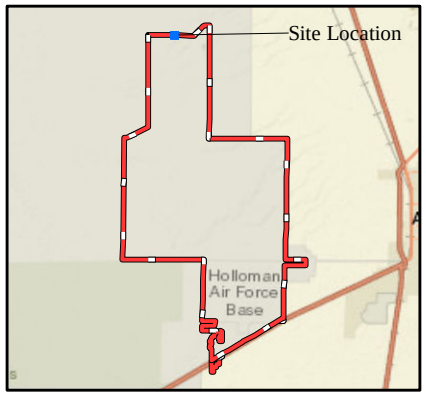
FIGURE 8

March 2015
Groundwater Sampling OD20K

FPM Remediations, Inc.

2016





Legend

- Additional Groundwater Monitoring Well Location
- Existing Groundwater Monitoring Well Location
- OD20K 20,000-Pound Open Detonation Unit Boundary (6.2 acres)
- Installation Boundary
- WSMR

Performance Based Remediation
New Mexico-Arizona
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Alamogordo, NM

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FIGURE 9

Additional Groundwater Monitoring Well Locations OD20K

FPM Remediations, Inc.

2016

NOTES:
Revision Date: 3/22/2016

Coordinate System:NAD 1983 UTM Zone 13N
Projection: Transverse Mercator
Horizontal Datum: North American 1983
False Easting: 500,000.0000
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Base Map Date: (c) 2010 Microsoft Corporation and its data suppliers
Base Map Source: ESRI Online Bing Data Source

1 inch = 100 feet

0 15 30 Meters

0 50 100 Feet

N W E S

Path: C:\Projects\New Mexico\GIS\OD20K UFP-QAPP Figures\OD20K_WP_ForAdditionalInvestigation_Fig_9.mxd

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TABLES

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Table 1 August 2012 Soil Sampling Results OD20K

Client Sample Identification:	Holloman AFB Soil Background Levels[1]	Soil Screening Levels	20KOD-SO1		20KOD-SO02		20KOD-SO3		20KOD-SO4		20KOD-SO05	
Lab Sample Identification:		NMED Residential[2]	280-31980-1		280-32055-1		280-31980-2		280-31980-3		280-32055-2	
Date Sampled:			8/8/2012		8/10/2012		8/8/2012		8/8/2012		8/10/2012	
Analyte			Result [3]	Q	Result [3]	Q	Result [3]	Q	Result [3]	Q	Result [3]	Q
Metals	**mg/kg**	**mg/kg**	**mg/kg**		**mg/kg**		**mg/kg**		**mg/kg**		**mg/kg**	
Antimony	1.6	31.3	0.42	U	0.91	J	0.38	U	0.42	U	0.45	U
Arsenic	3.7	4.25	0.73	U	1.2	J	0.89	J	1.7	J	0.79	U
Barium	169.3	15,600	28	B	37		40	B	57	B	36	
Beryllium	1.6	156	0.037	U	0.073	J	0.052	J	0.20	J	0.06	J
Cadmium	0.3	70.5	0.045	U	0.049	U	0.11	J	0.045	U	0.049	U
Chromium	25	117,000	2.1		5.3		5.4		6.0		3.0	
Copper	13	3,130	2.4		3.5		75		5.3		3.0	
Lead	10.9	400	0.3	U	1.1		4.3		2.8		0.42	J
Nickel	17.4	1,560	1.8	J	3.2	J	4.0		4.7		2.6	J
Selenium	1.4	391	2.0		1.7		0.87	U	0.95	U	1	U
Silver	1.1	391	0.18	U	0.19	U	0.54	J	0.18	U	0.19	U
Strontium	NV	46,900	2,300	B	1,500	B	1,000	B	860	B	1,500	B
Mercury	10.8	23.8	0.0082	U	0.0059	U	0.0063	U	0.0081	U	0.0077	U
Explosives	**mg/kg**	**mg/kg**	**mg/kg**		**mg/kg**		**mg/kg**		**mg/kg**		**mg/kg**	
1,3,5-Trinitrobenzene	NV	2,200 [4]	0.07	U	0.069	U	0.069	U	0.067	U	0.065	U
1,3-Dinitrobenzene	NV	6.3 [4]	0.06	U	0.059	U	0.059	U	0.058	U	0.056	U
2,4,6-Trinitrotoluene	NV	36	0.057	U	0.056	U	0.056	U	0.055	U	0.053	U
2,4-Dinitrotoluene	NV	17.1	0.049	U	0.048	U	0.048	U	0.047	U	0.045	U
2,6-Dinitrotoluene	NV	3.56	0.053	U	0.053	U	0.052	U	0.051	U	0.049	U
2-Amino-4,6-dinitrotoluene	NV	150 [4]	0.045	U	0.044	U	0.044	U	0.043	U	0.041	U
2-Nitrotoluene	NV	31.6	0.083	U	0.082	U	0.081	U	0.079	U	0.076	U
3-Nitrotoluene	NV	6.16	0.054	U	0.053	U	0.053	U	0.052	U	0.05	U
4-Amino-2,6-dinitrotoluene	NV	150 [4]	0.039	U	0.038	U	0.038	U	0.037	U	0.036	U
4-Nitrotoluene	NV	247	0.11	U	0.11	U	0.11	U	0.1	U	0.099	U
HMX	NV	3,850	0.076	U	0.075	U	0.23	J	0.073	U	0.071	U
Nitrobenzene	NV	60.4	0.06	U	0.06	U	0.059	U	0.058	U	0.056	U
Nitroglycerin	NV	6.16	0.77	U	0.76	U	0.75	U	0.74	U	0.71	U
PETN	NV	130 [4]	0.86	U	0.85	U	0.84	U	0.82	U	0.79	U
RDX	NV	60.4	0.37		0.083	U	3.7		0.081	U	0.078	U
Tetryl	NV	160 [4]	0.054	U	0.053	U	0.053	U	0.052	U	0.05	U
	ng/kg	**ng/kg**	**ng/kg**		**ng/kg**		**ng/kg**		**ng/kg**		**ng/kg**	
N-Nitrosodimethylamine	NV	23,400	3,000	U	2,900	U	2,600	U	2,800	U	2,900	U
Perchlorate	**µg/kg**	**µg/kg**	**µg/kg**		**µg/kg**		**µg/kg**		**µg/kg**		**µg/kg**	
Perchlorate	NV	54,800	29,000		21,000		5,700		15,000		26,000	
Nitrate / Phosphorus	**mg/kg**	**mg/kg**	**mg/kg**		**mg/kg**		**mg/kg**		**mg/kg**		**mg/kg**	
Nitrate as N	NV	125,000	37		55		14		150		120	
Total Phosphorus	NV	NV [5]	60		170		130		13		76	
General Chemistry	**%**	**%**	**%**		**%**		**%**		**%**		**%**	
Percent Moisture	NV	NV [5]	21		19		13		17		19	

Table 1 August 2012 Soil Sampling Results OD20K (continued)

Client Sample Identification:	Holloman AFB Soil Background Levels[1]	Soil Screening Levels	20KOD-SO6		20KOD-SO7		20KOD-SO8		20KOD-SO09		20KOD-SO10	
Lab Sample Identification:		NMED Residential[2]	280-32108-1		280-31980-4		280-31980-5		280-32055-3		280-32055-4	
Date Sampled:			8/13/2012		8/8/2012		8/8/2012		8/10/2012		8/10/2012	
Analyte			**Result [3]**	**Q**	**Result [3]**	**Q**	**Result [3]**	**Q**	**Result [3]**	**Q**	**Result [3]**	**Q**
Metals	**mg/kg**	**mg/kg**	**mg/kg**		**mg/kg**		**mg/kg**		**mg/kg**		**mg/kg**	
Antimony	1.6	31.3	0.46	U	0.39	U	0.44	U	0.44	U	0.4	U
Arsenic	3.7	4.25	1.0	J	0.89	J	1.2	J	0.77	U	0.69	U
Barium	169.3	15,600	33		34	B	49	B	29		23	
Beryllium	1.6	156	0.091	J	0.078	J	0.14	J	0.043	J	0.034	U
Cadmium	0.3	70.5	0.092	J	0.043	U	0.44	J	0.048	U	0.043	U
Chromium	25	117,000	3.2		3.3		5.5		2.7		1.7	
Copper	13	3,130	3.1		3.4		8.5		2.8		1.2	J
Lead	10.9	400	0.33	U	0.98		4.3		0.46	J	0.51	J
Nickel	17.4	1,560	2.7	J	2.9	J	7.6		2.4	J	1.3	J
Selenium	1.4	391	5.2	U	1.2	J	1.4	J	1.3	J	0.89	U
Silver	1.1	391	0.19	U	0.17	U	0.19	U	0.19	U	0.17	U
Strontium	NV	46,900	2,400		1,500	B	1,300	B	1,800	B	650	B
Mercury	10.8	23.8	0.0074	U	0.0075	U	0.006	U	0.007	U	0.0058	U
Explosives	**mg/kg**	**mg/kg**	**mg/kg**		**mg/kg**		**mg/kg**		**mg/kg**		**mg/kg**	
1,3,5-Trinitrobenzene	NV	2,200 [4]	0.066	U	0.067	U	0.071	U	0.067	U	0.066	U
1,3-Dinitrobenzene	NV	6.3 [4]	0.057	U	0.057	U	0.061	U	0.057	U	0.056	U
2,4,6-Trinitrotoluene	NV	36	0.054	U	0.054	U	0.058	U	0.054	U	0.053	U
2,4-Dinitrotoluene	NV	17.1	0.046	U	0.047	U	0.05	U	0.047	U	0.046	U
2,6-Dinitrotoluene	NV	3.56	0.05	U	0.051	U	0.054	U	0.051	U	0.05	U
2-Amino-4,6-dinitrotoluene	NV	150 [4]	0.042	U	0.043	U	0.045	U	0.043	U	0.042	U
2-Nitrotoluene	NV	31.6	0.078	U	0.079	U	0.084	U	0.079	U	0.078	U
3-Nitrotoluene	NV	6.16	0.051	U	0.051	U	0.055	U	0.051	U	0.051	U
4-Amino-2,6-dinitrotoluene	NV	150 [4]	0.036	U	0.037	U	0.039	U	0.037	U	0.036	U
4-Nitrotoluene	NV	247	0.1	U	0.1	U	0.11	U	0.1	U	0.1	U
HMX	NV	3,850	0.072	U	0.073	U	0.077	U	0.073	U	0.072	U
Nitrobenzene	NV	60.4	0.057	U	0.058	U	0.061	U	0.058	U	0.057	U
Nitroglycerin	NV	6.16	0.73	U	0.73	U	0.78	U	0.73	U	0.72	U
PETN	NV	130 [4]	0.81	U	0.82	U	0.87	U	0.82	U	0.8	U
RDX	NV	60.4	0.079	U	0.08	U	0.33		0.08	U	0.16	J
Tetryl	NV	160 [4]	0.051	U	0.051	U	0.055	U	0.051	U	0.051	U
	ng/kg	**ng/kg**	**ng/kg**		**ng/kg**		**ng/kg**		**ng/kg**		**ng/kg**	
N-Nitrosodimethylamine	NV	23,400	3,000	U	2,700	U	2,800	U	2,900	U	2,800	U
Perchlorate	**µg/kg**	**µg/kg**	**µg/kg**		**µg/kg**		**µg/kg**		**µg/kg**		**µg/kg**	
Perchlorate	NV	54,800	**65,000**		26,000		26,000		**84,000**		1,500	
Nitrate / Phosphorus	**mg/kg**	**mg/kg**	**mg/kg**		**mg/kg**		**mg/kg**		**mg/kg**		**mg/kg**	
Nitrate as N	NV	125,000	77		35		110		70		2.1	J
Total Phosphorus	NV	NV [5]	63		1.2	J	220		52		53	
General Chemistry	**%**	**%**	**%**		**%**		**%**		**%**		**%**	
Percent Moisture	NV	NV [5]	20		15		14		20		16	

Table 1 August 2012 Soil Sampling Results OD20K (continued)

Client Sample Identification:	Holloman AFB Soil Background Levels[1]	Soil Screening Levels	20KOD-SO11		20KOD-SO12		20KOD-SO13		20KOD-SO14		20KOD-SO15	
Lab Sample Identification:		NMED Residential[2]	280-32108-2		280-32055-5		280-32055-6		280-31980-6		280-32055-7	
Date Sampled:			8/13/2012		8/10/2012		8/10/2012		8/8/2012		8/10/2012	
Analyte			Result [3]	Q	Result [3]	Q	Result [3]	Q	Result [3]	Q	Result [3]	Q
Metals	**mg/kg**	**mg/kg**	**mg/kg**		**mg/kg**		**mg/kg**		**mg/kg**		**mg/kg**	
Antimony	1.6	31.3	0.41	U	2.1	U	0.42	U	0.58	U	0.47	U
Arsenic	3.7	4.25	0.71	U	3.7	U	0.96	J	1	U	0.81	U
Barium	169.3	15,600	48		33		25		29	B	37	
Beryllium	1.6	156	0.19	J	0.18	U	0.037	J	0.05	U	0.048	J
Cadmium	0.3	70.5	0.13	J	0.23	U	0.045	U	0.062	U	0.05	U
Chromium	25	117,000	6.0		2.9	J	2.7		2.3		2.8	
Copper	13	3,130	3.9		2.6	J	2.0	J	2.7	J	3.6	
Lead	10.9	400	1.8		1.5	U	0.37	J	0.41	U	1.0	
Nickel	17.4	1,560	4.2	J	2.5	J	2.1	J	1.9	J	2.5	J
Selenium	1.4	391	4.6	U	4.8	U	0.94	U	1.6	J	1.8	
Silver	1.1	391	0.17	U	0.89	U	0.18	U	0.24	U	0.2	U
Strontium	NV	46,900	1,700		1,200	B	920	B	1,600	B	1,600	B
Mercury	10.8	23.8	0.0076	U	0.0077	U	0.0073	U	0.0079	U	0.0071	U
Explosives	**mg/kg**	**mg/kg**	**mg/kg**		**mg/kg**		**mg/kg**		**mg/kg**		**mg/kg**	
1,3,5-Trinitrobenzene	NV	2,200 [4]	0.065	U	0.066	U	0.066	U	0.065	U	0.07	U
1,3-Dinitrobenzene	NV	6.3 [4]	0.056	U	0.057	U	0.057	U	0.056	U	0.06	U
2,4,6-Trinitrotoluene	NV	36	0.053	U	0.054	U	0.054	U	0.053	U	0.057	U
2,4-Dinitrotoluene	NV	17.1	0.045	U	0.046	U	0.046	U	0.045	U	0.049	U
2,6-Dinitrotoluene	NV	3.56	0.049	U	0.05	U	0.05	U	0.049	U	0.053	U
2-Amino-4,6-dinitrotoluene	NV	150 [4]	0.041	U	0.042	U	0.042	U	0.042	U	0.045	U
2-Nitrotoluene	NV	31.6	0.076	U	0.078	U	0.078	U	0.077	U	0.083	U
3-Nitrotoluene	NV	6.16	0.05	U	0.051	U	0.051	U	0.05	U	0.054	U
4-Amino-2,6-dinitrotoluene	NV	150 [4]	0.036	U	0.036	U	0.036	U	0.036	U	0.039	U
4-Nitrotoluene	NV	247	0.099	U	0.1	U	0.1	U	0.1	U	0.11	U
HMX	NV	3,850	0.088	J	0.072	U	0.072	U	0.27		0.076	U
Nitrobenzene	NV	60.4	0.056	U	0.057	U	0.057	U	0.056	U	0.06	U
Nitroglycerin	NV	6.16	0.71	U	0.73	U	0.73	U	0.71	U	0.77	U
PETN	NV	130 [4]	0.79	U	0.81	U	0.81	U	0.8	U	0.86	U
RDX	NV	60.4	0.47		0.079	U	0.079	U	0.90		0.084	U
Tetryl	NV	160 [4]	0.05	U	0.051	U	0.051	U	0.05	U	0.054	U
	ng/kg	**ng/kg**	**ng/kg**		**ng/kg**		**ng/kg**		**ng/kg**		**ng/kg**	
N-Nitrosodimethylamine	NV	23,400	2,800	U	2,900	U	2,700	U	3,600	U	3,000	U
Perchlorate	**µg/kg**	**µg/kg**	**µg/kg**		**µg/kg**		**µg/kg**		**µg/kg**		**µg/kg**	
Perchlorate	NV	54,800	12,000		17,000		210		19,000		9,400	
Nitrate / Phosphorus	**mg/kg**	**mg/kg**	**mg/kg**		**mg/kg**		**mg/kg**		**mg/kg**		**mg/kg**	
Nitrate as N	NV	125,000	39		39		0.74	J	32		38	
Total Phosphorus	NV	NV [5]	66		11		73		1.5	J	80	
General Chemistry	**%**	**%**	**%**		**%**		**%**		**%**		**%**	
Percent Moisture	NV	NV [5]	20		23		16		36		21	

Table 1 August 2012 Soil Sampling Results OD20K (continued)

Client Sample Identification:	Holloman AFB Soil Background Levels[1]	Soil Screening Levels	20KOD-SO16		20KOD-SO17		20KOD-SO18		20KOD-SO19		20KOD-SO20	
Lab Sample Identification:		NMED Residential[2]	280-31980-7		280-32055-8		280-32108-3		280-31980-8		280-32108-4	
Date Sampled:			8/8/2012		8/10/2012		8/13/2012		8/8/2012		8/13/2012	
Analyte			Result [3]	Q	Result [3]	Q	Result [3]	Q	Result [3]	Q	Result [3]	Q
Metals	**mg/kg**	**mg/kg**	**mg/kg**		**mg/kg**		**mg/kg**		**mg/kg**		**mg/kg**	
Antimony	1.6	31.3	0.48	U	0.46	U	0.44	U	0.43	U	0.43	U
Arsenic	3.7	4.25	0.84	U	0.79	U	0.76	U	0.75	U	0.75	U
Barium	169.3	15,600	46	B	25		27		33	B	32	
Beryllium	1.6	156	0.10	J	0.04	U	0.057	J	0.050	J	0.087	J
Cadmium	0.3	70.5	0.052	U	0.049	U	0.047	U	0.047	U	0.11	J
Chromium	25	117,000	3.9		1.3	J	2.4		3.0		3.1	
Copper	13	3,130	4.2		2.0	J	2.3		3.9		2.8	
Lead	10.9	400	1.1		0.32	U	0.31	U	1.2		0.45	J
Nickel	17.4	1,560	3.0	J	1.4	J	1.7	J	3.0	J	2.3	J
Selenium	1.4	391	1.1	U	1.3	J	5	U	1.0	J	4.9	U
Silver	1.1	391	0.2	U	0.19	U	0.19	U	0.18	U	0.18	U
Strontium	NV	46,900	1,300	B	1,800	B	1,300		1,400	B	2,300	
Mercury	10.8	23.8	0.0072	U	0.0083	U	0.0075	U	0.0073	U	0.0078	U
Explosives	**mg/kg**	**mg/kg**	**mg/kg**		**mg/kg**		**mg/kg**		**mg/kg**		**mg/kg**	
1,3,5-Trinitrobenzene	NV	2,200 [4]	0.065	U	0.067	U	0.067	U	0.067	U	0.067	U
1,3-Dinitrobenzene	NV	6.3 [4]	0.056	U	0.057	U	0.058	U	0.058	U	0.057	U
2,4,6-Trinitrotoluene	NV	36	0.053	U	0.054	U	0.055	U	0.055	U	0.054	U
2,4-Dinitrotoluene	NV	17.1	0.045	U	0.047	U	0.047	U	0.047	U	0.047	U
2,6-Dinitrotoluene	NV	3.56	0.049	U	0.051	U	0.051	U	0.051	U	0.051	U
2-Amino-4,6-dinitrotoluene	NV	150 [4]	0.041	U	0.043	U	0.043	U	0.043	U	0.043	U
2-Nitrotoluene	NV	31.6	0.076	U	0.079	U	0.079	U	0.079	U	0.079	U
3-Nitrotoluene	NV	6.16	0.05	U	0.051	U	0.052	U	0.052	U	0.051	U
4-Amino-2,6-dinitrotoluene	NV	150 [4]	0.036	U	0.037	U	0.037	U	0.037	U	0.037	U
4-Nitrotoluene	NV	247	0.099	U	0.1	U	0.1	U	0.1	U	0.1	U
HMX	NV	3,850	0.071	U	0.16	J	0.073	U	0.073	U	0.073	U
Nitrobenzene	NV	60.4	0.056	U	0.057	U	0.058	U	0.058	U	0.058	U
Nitroglycerin	NV	6.16	0.71	U	0.73	U	0.74	U	0.74	U	0.73	U
PETN	NV	130 [4]	0.79	U	0.82	U	0.82	U	0.82	U	0.82	U
RDX	NV	60.4	0.078	U	0.11	J	0.081	U	0.12	J	0.13	J
Tetryl	NV	160 [4]	0.05	U	0.051	U	0.052	U	0.052	U	0.051	U
	ng/kg	**ng/kg**	**ng/kg**		**ng/kg**		**ng/kg**		**ng/kg**		**ng/kg**	
N-Nitrosodimethylamine	NV	23,400	3,400	U	3,000	U	2,700	U	2,800	U	2,700	U
Perchlorate	**µg/kg**	**µg/kg**	**µg/kg**		**µg/kg**		**µg/kg**		**µg/kg**		**µg/kg**	
Perchlorate	NV	54,800	2,500		250		20,000		29,000		19,000	
Nitrate / Phosphorus	**mg/kg**	**mg/kg**	**mg/kg**		**mg/kg**		**mg/kg**		**mg/kg**		**mg/kg**	
Nitrate as N	NV	125,000	7.4		1.3	J	1.3	J	37		16	
Total Phosphorus	NV	NV [5]	130		42		56		42		79	
General Chemistry	**%**	**%**	**%**		**%**		**%**		**%**		**%**	
Percent Moisture	NV	NV [5]	31		21		19		17		18	

Table 1 August 2012 Soil Sampling Results OD20K (continued)

Client Sample Identification:	Holloman AFB Soil Background Levels[1]	Soil Screening Levels	20KOD-SO21		20KOD-SO22		20KOD-SO23		20KOD-SO24		20KOD-SO25	
Lab Sample Identification:		NMED Residential[2]	280-31980-9		280-32108-5		280-31980-10		280-32055-9		280-32055-10	
Date Sampled:			8/8/2012		8/13/2012		8/8/2012		8/10/2012		8/10/2012	
Analyte			Result [3]	Q	Result [3]	Q	Result [3]	Q	Result [3]	Q	Result [3]	Q
Metals	**mg/kg**	**mg/kg**	**mg/kg**		**mg/kg**		**mg/kg**		**mg/kg**		**mg/kg**	
Antimony	1.6	31.3	0.43	U	0.51	J	0.39	U	2.3	U	NS	
Arsenic	3.7	4.25	1.6	J	0.82	U	0.67	U	4.1	U	NS	
Barium	169.3	15,600	75	B	28		33	B	34		NS	
Beryllium	1.6	156	0.34	J	0.057	J	0.051	J	0.2	U	NS	
Cadmium	0.3	70.5	0.064	J	0.093	J	0.042	U	0.25	U	NS	
Chromium	25	117,000	8.8		2.7		2.8		3.0	J	NS	
Copper	13	3,130	7.4		2.1	J	2.4		3.1	J	NS	
Lead	10.9	400	4.2		0.34	U	0.46	J	1.7	U	NS	
Nickel	17.4	1,560	6.6		1.9	J	2.2	J	2.4	J	NS	
Selenium	1.4	391	2.1		5.3	U	2.0		5.3	U	NS	
Silver	1.1	391	0.18	U	0.2	U	0.16	U	0.99	U	NS	
Strontium	NV	46,900	1,100	B	2,300		1,500	B	2,400	B	NS	
Mercury	10.8	23.8	0.0069	U	0.0079	U	0.0062	U	0.0077	U	NS	
Explosives	**mg/kg**	**mg/kg**	**mg/kg**		**mg/kg**		**mg/kg**		**mg/kg**		**mg/kg**	
1,3,5-Trinitrobenzene	NV	2,200 [4]	0.067	U	0.07	U	0.067	U	0.069	U	NS	
1,3-Dinitrobenzene	NV	6.3 [4]	0.058	U	0.06	U	0.057	U	0.059	U	NS	
2,4,6-Trinitrotoluene	NV	36	0.055	U	0.057	U	0.054	U	0.056	U	NS	
2,4-Dinitrotoluene	NV	17.1	0.047	U	0.049	U	0.047	U	0.048	U	NS	
2,6-Dinitrotoluene	NV	3.56	0.051	U	0.054	U	0.051	U	0.052	U	NS	
2-Amino-4,6-dinitrotoluene	NV	150 [4]	0.043	U	0.045	U	0.043	U	0.044	U	NS	
2-Nitrotoluene	NV	31.6	0.08	U	0.083	U	0.079	U	0.081	U	NS	
3-Nitrotoluene	NV	6.16	0.052	U	0.054	U	0.051	U	0.053	U	NS	
4-Amino-2,6-dinitrotoluene	NV	150 [4]	0.037	U	0.039	U	0.037	U	0.038	U	NS	
4-Nitrotoluene	NV	247	0.1	U	0.11	U	0.1	U	0.11	U	NS	
HMX	NV	3,850	0.10	J	0.077	U	0.12	J	0.075	U	NS	
Nitrobenzene	NV	60.4	0.058	U	0.061	U	0.057	U	0.059	U	NS	
Nitroglycerin	NV	6.16	0.74	U	0.77	U	0.73	U	0.75	U	NS	
PETN	NV	130 [4]	0.83	U	0.86	U	0.82	U	0.84	U	NS	
RDX	NV	60.4	0.35		0.085	U	0.17	J	0.083	U	NS	
Tetryl	NV	160 [4]	0.052	U	0.054	U	0.051	U	0.053	U	NS	
	ng/kg	**ng/kg**	**ng/kg**		**ng/kg**		**ng/kg**		**ng/kg**		**ng/kg**	
N-Nitrosodimethylamine	NV	23,400	2,800	U	3,000	U	2,700	U	2,900	U	NS	
Perchlorate	**µg/kg**	**µg/kg**	**µg/kg**		**µg/kg**		**µg/kg**		**µg/kg**		**µg/kg**	
Perchlorate	NV	54,800	**280,000**		3,400		1,000		14,000		6,400	
Nitrate / Phosphorus	**mg/kg**	**mg/kg**	**mg/kg**		**mg/kg**		**mg/kg**		**mg/kg**		**mg/kg**	
Nitrate as N	NV	125,000	60		22		2.3	J	30		7.1	
Total Phosphorus	NV	NV [5]	340		54		88		64		76	
General Chemistry	**%**	**%**	**%**		**%**		**%**		**%**		**%**	
Percent Moisture	NV	NV [5]	15		21		14		19		18	

Table 1 August 2012 Soil Sampling Results OD20K (continued)

Client Sample Identification:	Holloman AFB Soil Background Levels[1]	Soil Screening Levels	20KOD-SO26		20KOD-SO27		20KOD-SO28		20KOD-SO29		20KOD-SO30	
Lab Sample Identification:		NMED Residential[2]	280-32055-11		280-32055-12		280-32055-13		280-31980-11		280-31980-12	
Date Sampled:			8/10/2012		8/10/2012		8/10/2012		8/8/2012		8/8/2012	
Analyte			Result [3]	Q	Result [3]	Q	Result [3]	Q	Result [3]	Q	Result [3]	Q
Metals	**mg/kg**	**mg/kg**	**mg/kg**		**mg/kg**		**mg/kg**		**mg/kg**		**mg/kg**	
Antimony	1.6	31.3	NS		NS		NS		NS		NS	
Arsenic	3.7	4.25	NS		NS		NS		NS		NS	
Barium	169.3	15,600	NS		NS		NS		NS		NS	
Beryllium	1.6	156	NS		NS		NS		NS		NS	
Cadmium	0.3	70.5	NS		NS		NS		NS		NS	
Chromium	25	117,000	NS		NS		NS		NS		NS	
Copper	13	3,130	NS		NS		NS		NS		NS	
Lead	10.9	400	NS		NS		NS		NS		NS	
Nickel	17.4	1,560	NS		NS		NS		NS		NS	
Selenium	1.4	391	NS		NS		NS		NS		NS	
Silver	1.1	391	NS		NS		NS		NS		NS	
Strontium	NV	46,900	NS		NS		NS		NS		NS	
Mercury	10.8	23.8	NS		NS		NS		NS		NS	
Explosives	**mg/kg**	**mg/kg**	**mg/kg**		**mg/kg**		**mg/kg**		**mg/kg**		**mg/kg**	
1,3,5-Trinitrobenzene	NV	2,200 [4]	NS		NS		NS		NS		NS	
1,3-Dinitrobenzene	NV	6.3 [4]	NS		NS		NS		NS		NS	
2,4,6-Trinitrotoluene	NV	36	NS		NS		NS		NS		NS	
2,4-Dinitrotoluene	NV	17.1	NS		NS		NS		NS		NS	
2,6-Dinitrotoluene	NV	3.56	NS		NS		NS		NS		NS	
2-Amino-4,6-dinitrotoluene	NV	150 [4]	NS		NS		NS		NS		NS	
2-Nitrotoluene	NV	31.6	NS		NS		NS		NS		NS	
3-Nitrotoluene	NV	6.16	NS		NS		NS		NS		NS	
4-Amino-2,6-dinitrotoluene	NV	150 [4]	NS		NS		NS		NS		NS	
4-Nitrotoluene	NV	247	NS		NS		NS		NS		NS	
HMX	NV	3,850	NS		NS		NS		NS		NS	
Nitrobenzene	NV	60.4	NS		NS		NS		NS		NS	
Nitroglycerin	NV	6.16	NS		NS		NS		NS		NS	
PETN	NV	130 [4]	NS		NS		NS		NS		NS	
RDX	NV	60.4	NS		NS		NS		NS		NS	
Tetryl	NV	160 [4]	NS		NS		NS		NS		NS	
	ng/kg	**ng/kg**	**ng/kg**		**ng/kg**		**ng/kg**		**ng/kg**		**ng/kg**	
N-Nitrosodimethylamine	NV	23,400	NS		NS		NS		NS		NS	
Perchlorate	**µg/kg**	**µg/kg**	**µg/kg**		**µg/kg**		**µg/kg**		**µg/kg**		**µg/kg**	
Perchlorate	NV	54,800	30,000		22,000		2,500		200		37,000	
Nitrate / Phosphorus	**mg/kg**	**mg/kg**	**mg/kg**		**mg/kg**		**mg/kg**		**mg/kg**		**mg/kg**	
Nitrate as N	NV	125,000	29		14		2.0	J	2.7	J	21	
Total Phosphorus	NV	NV [5]	83		130		39		56		0.97	J
General Chemistry	**%**	**%**	**%**		**%**		**%**		**%**		**%**	
Percent Moisture	NV	NV [5]	32		17		18		22		15	

Table 1 August 2012 Soil Sampling Results OD20K (continued)

Client Sample Identification:	Holloman AFB Soil Background Levels[1]	Soil Screening Levels	20KOD-SO31		20KOD-SO32		20KOD-SO33		20KOD-SO34		20KOD-SO35	
Lab Sample Identification:		NMED Residential[2]	280-31980-13		280-31980-14		280-31980-15		280-31980-16		280-32055-14	
Date Sampled:			8/8/2012		8/8/2012		8/8/2012		8/8/2012		8/10/2012	
Analyte			**Result [3]**	**Q**	**Result [3]**	**Q**	**Result [3]**	**Q**	**Result [3]**	**Q**	**Result [3]**	**Q**
Metals	**mg/kg**	**mg/kg**	**mg/kg**		**mg/kg**		**mg/kg**		**mg/kg**		**mg/kg**	
Antimony	1.6	31.3	NS		NS		NS		NS		NS	
Arsenic	3.7	4.25	NS		NS		NS		NS		NS	
Barium	169.3	15,600	NS		NS		NS		NS		NS	
Beryllium	1.6	156	NS		NS		NS		NS		NS	
Cadmium	0.3	70.5	NS		NS		NS		NS		NS	
Chromium	25	117,000	NS		NS		NS		NS		NS	
Copper	13	3,130	NS		NS		NS		NS		NS	
Lead	10.9	400	NS		NS		NS		NS		NS	
Nickel	17.4	1,560	NS		NS		NS		NS		NS	
Selenium	1.4	391	NS		NS		NS		NS		NS	
Silver	1.1	391	NS		NS		NS		NS		NS	
Strontium	NV	46,900	NS		NS		NS		NS		NS	
Mercury	10.8	23.8	NS		NS		NS		NS		NS	
Explosives	**mg/kg**	**mg/kg**	**mg/kg**		**mg/kg**		**mg/kg**		**mg/kg**		**mg/kg**	
1,3,5-Trinitrobenzene	NV	2,200 [4]	NS		NS		NS		NS		NS	
1,3-Dinitrobenzene	NV	6.3 [4]	NS		NS		NS		NS		NS	
2,4,6-Trinitrotoluene	NV	36	NS		NS		NS		NS		NS	
2,4-Dinitrotoluene	NV	17.1	NS		NS		NS		NS		NS	
2,6-Dinitrotoluene	NV	3.56	NS		NS		NS		NS		NS	
2-Amino-4,6-dinitrotoluene	NV	150 [4]	NS		NS		NS		NS		NS	
2-Nitrotoluene	NV	31.6	NS		NS		NS		NS		NS	
3-Nitrotoluene	NV	6.16	NS		NS		NS		NS		NS	
4-Amino-2,6-dinitrotoluene	NV	150 [4]	NS		NS		NS		NS		NS	
4-Nitrotoluene	NV	247	NS		NS		NS		NS		NS	
HMX	NV	3,850	NS		NS		NS		NS		NS	
Nitrobenzene	NV	60.4	NS		NS		NS		NS		NS	
Nitroglycerin	NV	6.16	NS		NS		NS		NS		NS	
PETN	NV	130 [4]	NS		NS		NS		NS		NS	
RDX	NV	60.4	NS		NS		NS		NS		NS	
Tetryl	NV	160 [4]	NS		NS		NS		NS		NS	
	ng/kg	**ng/kg**	**ng/kg**		**ng/kg**		**ng/kg**		**ng/kg**		**ng/kg**	
N-Nitrosodimethylamine	NV	23,400	NS		NS		NS		NS		NS	
Perchlorate	**µg/kg**	**µg/kg**	**µg/kg**		**µg/kg**		**µg/kg**		**µg/kg**		**µg/kg**	
Perchlorate	NV	54,800	21,000		8,400		22,000		1,700		25,000	
Nitrate / Phosphorus	**mg/kg**	**mg/kg**	**mg/kg**		**mg/kg**		**mg/kg**		**mg/kg**		**mg/kg**	
Nitrate as N	NV	125,000	5.6	J	17		26		1.6	J	3.1	J
Total Phosphorus	NV	NV [5]	99		80		350		56		76	
General Chemistry	**%**	**%**	**%**		**%**		**%**		**%**		**%**	
Percent Moisture	NV	NV [5]	15		18		11		29		24	

Table 1 August 2012 Soil Sampling Results OD20K (continued)

Client Sample Identification:	Holloman AFB Soil Background Levels[1]	Soil Screening Levels	20KOD-SO36		20KOD-SO37		20KOD-SO38		20KOD-SO39		20KOD-SO40	
Lab Sample Identification:		NMED Residential[2]	280-32055-15		280-32055-16		280-32055-17		280-32055-18		280-32055-19	
Date Sampled:			8/10/2012		8/10/2012		8/10/2012		8/10/2012		8/10/2012	
Analyte			**Result [3]**	**Q**	**Result [3]**	**Q**	**Result [3]**	**Q**	**Result [3]**	**Q**	**Result [3]**	**Q**
Metals	**mg/kg**	**mg/kg**	**mg/kg**		**mg/kg**		**mg/kg**		**mg/kg**		**mg/kg**	
Antimony	1.6	31.3	NS		NS		NS		NS		NS	
Arsenic	3.7	4.25	NS		NS		NS		NS		NS	
Barium	169.3	15,600	NS		NS		NS		NS		NS	
Beryllium	1.6	156	NS		NS		NS		NS		NS	
Cadmium	0.3	70.5	NS		NS		NS		NS		NS	
Chromium	25	117,000	NS		NS		NS		NS		NS	
Copper	13	3,130	NS		NS		NS		NS		NS	
Lead	10.9	400	NS		NS		NS		NS		NS	
Nickel	17.4	1,560	NS		NS		NS		NS		NS	
Selenium	1.4	391	NS		NS		NS		NS		NS	
Silver	1.1	391	NS		NS		NS		NS		NS	
Strontium	NV	46,900	NS		NS		NS		NS		NS	
Mercury	10.8	23.8	NS		NS		NS		NS		NS	
Explosives	**mg/kg**	**mg/kg**	**mg/kg**		**mg/kg**		**mg/kg**		**mg/kg**		**mg/kg**	
1,3,5-Trinitrobenzene	NV	2,200 [4]	NS		NS		NS		NS		NS	
1,3-Dinitrobenzene	NV	6.3 [4]	NS		NS		NS		NS		NS	
2,4,6-Trinitrotoluene	NV	36	NS		NS		NS		NS		NS	
2,4-Dinitrotoluene	NV	17.1	NS		NS		NS		NS		NS	
2,6-Dinitrotoluene	NV	3.56	NS		NS		NS		NS		NS	
2-Amino-4,6-dinitrotoluene	NV	150 [4]	NS		NS		NS		NS		NS	
2-Nitrotoluene	NV	31.6	NS		NS		NS		NS		NS	
3-Nitrotoluene	NV	6.16	NS		NS		NS		NS		NS	
4-Amino-2,6-dinitrotoluene	NV	150 [4]	NS		NS		NS		NS		NS	
4-Nitrotoluene	NV	247	NS		NS		NS		NS		NS	
HMX	NV	3,850	NS		NS		NS		NS		NS	
Nitrobenzene	NV	60.4	NS		NS		NS		NS		NS	
Nitroglycerin	NV	6.16	NS		NS		NS		NS		NS	
PETN	NV	130 [4]	NS		NS		NS		NS		NS	
RDX	NV	60.4	NS		NS		NS		NS		NS	
Tetryl	NV	160 [4]	NS		NS		NS		NS		NS	
	ng/kg	**ng/kg**	**ng/kg**		**ng/kg**		**ng/kg**		**ng/kg**		**ng/kg**	
N-Nitrosodimethylamine	NV	23,400	NS		NS		NS		NS		NS	
Perchlorate	**µg/kg**	**µg/kg**	**µg/kg**		**µg/kg**		**µg/kg**		**µg/kg**		**µg/kg**	
Perchlorate	NV	54,800	1,600		**130,000**		12,000		29,000		23,000	
Nitrate / Phosphorus	**mg/kg**	**mg/kg**	**mg/kg**		**mg/kg**		**mg/kg**		**mg/kg**		**mg/kg**	
Nitrate as N	NV	125,000	2.8	J	3.2	J	64		62		2.5	J
Total Phosphorus	NV	NV [5]	92		160		84		98		59	
General Chemistry	**%**	**%**	**%**		**%**		**%**		**%**		**%**	
Percent Moisture	NV	NV [5]	31		15		18		18		31	

Table 1 August 2012 Soil Sampling Results OD20K (continued)

Client Sample Identification:	Holloman AFB Soil Background Levels[1]	Soil Screening Levels	20KOD-SO41		20KOD-SO42		20KOD-SO43		20KOD-SO44		20KOD-SO45	
Lab Sample Identification:		NMED Residential[2]	280-32055-20		280-32055-21		280-32108-6		280-32108-7		280-32055-22	
Date Sampled:			8/10/2012		8/8/2012		8/13/2012		8/13/2012		8/8/2012	
Analyte			Result [3]	Q	Result [3]	Q	Result [3]	Q	Result [3]	Q	Result [3]	Q
Metals	**mg/kg**	**mg/kg**	**mg/kg**		**mg/kg**		**mg/kg**		**mg/kg**		**mg/kg**	
Antimony	1.6	31.3	NS		NS		NS		NS		NS	
Arsenic	3.7	4.25	NS		NS		NS		NS		NS	
Barium	169.3	15,600	NS		NS		NS		NS		NS	
Beryllium	1.6	156	NS		NS		NS		NS		NS	
Cadmium	0.3	70.5	NS		NS		NS		NS		NS	
Chromium	25	117,000	NS		NS		NS		NS		NS	
Copper	13	3,130	NS		NS		NS		NS		NS	
Lead	10.9	400	NS		NS		NS		NS		NS	
Nickel	17.4	1,560	NS		NS		NS		NS		NS	
Selenium	1.4	391	NS		NS		NS		NS		NS	
Silver	1.1	391	NS		NS		NS		NS		NS	
Strontium	NV	46,900	NS		NS		NS		NS		NS	
Mercury	10.8	23.8	NS		NS		NS		NS		NS	
Explosives	**mg/kg**	**mg/kg**	**mg/kg**		**mg/kg**		**mg/kg**		**mg/kg**		**mg/kg**	
1,3,5-Trinitrobenzene	NV	2,200 [4]	NS		NS		NS		NS		NS	
1,3-Dinitrobenzene	NV	6.3 [4]	NS		NS		NS		NS		NS	
2,4,6-Trinitrotoluene	NV	36	NS		NS		NS		NS		NS	
2,4-Dinitrotoluene	NV	17.1	NS		NS		NS		NS		NS	
2,6-Dinitrotoluene	NV	3.56	NS		NS		NS		NS		NS	
2-Amino-4,6-dinitrotoluene	NV	150 [4]	NS		NS		NS		NS		NS	
2-Nitrotoluene	NV	31.6	NS		NS		NS		NS		NS	
3-Nitrotoluene	NV	6.16	NS		NS		NS		NS		NS	
4-Amino-2,6-dinitrotoluene	NV	150 [4]	NS		NS		NS		NS		NS	
4-Nitrotoluene	NV	247	NS		NS		NS		NS		NS	
HMX	NV	3,850	NS		NS		NS		NS		NS	
Nitrobenzene	NV	60.4	NS		NS		NS		NS		NS	
Nitroglycerin	NV	6.16	NS		NS		NS		NS		NS	
PETN	NV	130 [4]	NS		NS		NS		NS		NS	
RDX	NV	60.4	NS		NS		NS		NS		NS	
Tetryl	NV	160 [4]	NS		NS		NS		NS		NS	
	ng/kg	**ng/kg**	**ng/kg**		**ng/kg**		**ng/kg**		**ng/kg**		**ng/kg**	
N-Nitrosodimethylamine	NV	23,400	NS		NS		NS		NS		NS	
Perchlorate	**µg/kg**	**µg/kg**	**µg/kg**		**µg/kg**		**µg/kg**		**µg/kg**		**µg/kg**	
Perchlorate	NV	54,800	670		33,000		190		22		21,000	
Nitrate / Phosphorus	**mg/kg**	**mg/kg**	**mg/kg**		**mg/kg**		**mg/kg**		**mg/kg**		**mg/kg**	
Nitrate as N	NV	125,000	0.98	J	54		4.6	J	1.1	J	74	
Total Phosphorus	NV	NV [5]	70		62		89		110		70	
General Chemistry	**%**	**%**	**%**		**%**		**%**		**%**		**%**	
Percent Moisture	NV	NV [5]	16		21		23		35		36	

Notes:

NMED = New Mexico Environmental Department
µg/kg = micrograms per kilogram
mg/kg = milligrams per kilogram
% = percent
NV = No Value
NS = Not Sampled
Q = Qualifier

Qualifiers

U = Not Detected
J = Indicates an estimated value
B = Indicates the analyte was detected in the associated Method Blank

1 Final Approval Letter, Basewide Background Levels, Basewide Background Study Report, Holloman Air Force Base, New Mexico (NMED, March 2012)
2 Table A-1, NMED Soil Screening Levels (SSLs). Risk Assessment Guidance for Site Investigations and Remediation (July, 2015)
3 If results are not detected (U) then the value is set at the Method Detection Limit (MDL)
4 USEPA Region 3, 6, and 9 Regional Screening Levels (RSLs) (November, 2015)
5 No Value established for NMED Residential SSL (July, 2015) and USEPA RSL (November, 2015)
Bold value indicates analytes above NMED SSLs (July, 2015)

Table 2 August 2012 Groundwater Sampling Results OD20K

Client Sample Identification:	Holloman AFB Groundwater Background Levels[1]	Groundwater Screening Levels		HAFB-EOD-MW01			HAFB-EOD-MW02			HAFB-EOD-MW03			HAFB-EOD-MW04		
Lab Sample Identification:		NMWQCC[2]	USEPA MCL[3]	280-31846-1			280-31846-2			280-31846-3			280-31846-4		
Date Sampled:				8/6/2012			8/6/2012			8/6/2012			8/6/2012		
Analyte				**Result[4]**	**Q**	**Q 1**	**Result[4]**	**Q**	**Q 1**	**Result[4]**	**Q**	**Q 1**	**Result [5]**	**Q**	**Q 1**
Dissolved Metals	**µg/L**	**µg/L**	**µg/L**	**µg/L**			**µg/L**			**µg/L**			**µg/L**		
Antimony	6	NV	NV	3.2	J		3.1	U		3.1	U		3.1	U	
Arsenic	10	100	NV	4.4	U		6.3	J		4.4	U		4.4	U	
Barium	30.2	1,000	NV	11			11			11			9.5	J	
Beryllium	1	NV	NV	0.47	U		0.47	U		0.47	U		0.47	U	
Cadmium	2.5	10	NV	0.95	J		1.3	J		0.87	J		0.88	J	
Chromium	2.5	50	NV	3.1	J		3	J		2.6	J		2.5	J	
Copper	22	1,000	NV	1.4	U		1.4	U		1.4	U		1.4	U	
Lead	9	50	NV	2.6	U		2.6	U		2.6	U		2.6	U	
Nickel	15.9	200	NV	1.3	U		1.6	J		1.3	J		1.3	U	
Selenium	25.3	50	NV	8	J		4.9	U		5.9	J		8	J	
Silver	10	50	NV	0.93	U		0.93	U		0.93	U		0.93	U	
Strontium	NV	NV	NV	10,000			12,000			9,800			9,800		
Mercury	0.2	NV	NV	0.027	U		0.027	U		0.027	U		0.027	U	
Total Metals	**µg/L**	**µg/L**	**µg/L**	**µg/L**			**µg/L**			**µg/L**			**µg/L**		
Antimony	6	NV	6	3.1	U		3.1	U		3.1	U		3.1	U	
Arsenic	10	NV	10	5.3	J		4.4	U		4.4	U		4.4	U	
Barium	38	NV	2,000	9.9	J		13			13			17		
Beryllium	4	NV	4	0.47	U		0.47	U		0.47	U		0.47	U	
Cadmium	5	NV	5	0.86	J		0.71	J		0.71	J		0.81	J	
Chromium	12	NV	100	4.4	J		11			9	J		3.8	J	
Copper	9.8	NV	1,300	1.4	U		1.4	U		1.4	U		1.4	U	
Lead	9	NV	15	2.6	U		2.6	U		2.6	U		2.6	U	
Nickel	22	NV	NV	2	J		5.6	J		3.5	J		1.7	J	
Selenium	50	NV	50	4.9	U		6	J		4.9	U		4.9	U	
Silver	10	NV	NV	1.5	J B	10 U	0.93	U		0.93	U		1.1	J B	10 U
Strontium	NV	NV	NV	9,800			11,000			9,400			9,400		
Mercury	0.5	2	2	0.027	U		0.027	U		0.027	U		0.027	U	

Table 2 August 2012 Groundwater Sampling Results OD20K(continued)

Client Sample Identification:	**Holloman AFB Groundwater Background Levels[1]**	**Groundwater Screening Levels**		HAFB-EOD-MW01			HAFB-EOD-MW02			HAFB-EOD-MW03			HAFB-EOD-MW04		
Lab Sample Identification:		**NMWQCC[2]**	**USEPA MCL[3]**	280-31846-1			280-31846-2			280-31846-3			280-31846-4		
Date Sampled:				8/6/2012			8/6/2012			8/6/2012			8/6/2012		
Analyte				**Result[4]**	**Q**	**Q 1**	**Result[4]**	**Q**	**Q 1**	**Result[4]**	**Q**	**Q 1**	**Result [5]**	**Q**	**Q 1**
Explosives	**µg/L**	**µg/L**	**µg/L**	**µg/L**			**µg/L**			**µg/L**			**µg/L**		
1,3,5-Trinitrobenzene	NV	NV	NV	0.05	U		0.054	U		0.053	U		0.053	U	
1,3-Dinitrobenzene	NV	NV	NV	0.057	U		0.062	U		0.06	U		0.06	U	
2,4,6-Trinitrotoluene	NV	NV	NV	0.088	U		0.095	U		0.092	U		0.093	U	
2,4-Dinitrotoluene	NV	NV	NV	0.083	U		0.09	U		0.087	U		0.088	U	
2,6-Dinitrotoluene	NV	NV	NV	0.064	U		0.069	U		0.067	U		0.068	U	
2-Amino-4,6-dinitrotoluene	NV	NV	NV	0.087	U		0.18	J p	J	0.091	U		0.092	U	
2-Nitrotoluene	NV	NV	NV	0.083	U		0.089	U		0.086	U		0.087	U	
3-Nitrotoluene	NV	NV	NV	0.09	U		0.097	U		0.094	U		0.095	U	
4-Amino-2,6-dinitrotoluene	NV	NV	NV	0.91	U		0.99	U		0.96	U		0.96	U	
4-Nitrotoluene	NV	NV	NV	0.072	U		0.078	U		0.075	U		0.076	U	
HMX	NV	NV	NV	0.085	U		0.092	U		0.089	U		0.09	U	
Nitrobenzene	NV	NV	NV	0.2	U		0.21	U		0.21	U		0.21	U	
Nitroglycerin	NV	NV	NV	0.052	U		2			0.16	J	J	0.11	J	
PETN	NV	NV	NV	0.079	U		0.085	U		0.082	U		0.083	U	
RDX	NV	NV	NV	0.2	U		0.21	U		0.21	U		0.21	U	
Tetryl	NV	NV	NV	0.41	U *		0.45	U *		0.43	U *		0.44	U *	
	µg/L	**µg/L**	**µg/L**	**ng/L**			**ng/L**			**ng/L**			**ng/L**		
N-Nitrosodimethylamine	NV	NV	NV	140	U		140	U		150	U		140	U	
Perchlorate	**µg/L**	**µg/L**	**µg/L**	**µg/L**			**µg/L**			**µg/L**			**µg/L**		
Perchlorate	NV	NV	15[5]	0.31			**1,600**			0.48			0.15		
Nitrate / Phosphorus	**mg/L**	**mg/L**	**mg/L**	**mg/L**			**mg/L**			**mg/L**			**mg/L**		
Nitrate as N	NV	10	10	0.82	J		**30**			0.81	J		0.74	J	
Total Phosphorus	NV	NV	NV	0.019	J		0.0079	J		0.007	J		0.005	U	
General Chemistry	**mg/L**	**mg/L**	**mg/L**	**mg/L**			**mg/L**			**mg/L**			**mg/L**		
Total Dissolved Solids	NV	1,000	500[5]	**5,400**		J	**6,600**			**5,100**		J	**5,000**		J

Notes:

NMWQCC = New Mexico Water Quality Control Commission
USEPA = United States Environmetal Protection Agency
NMED = New Mexico Environmental Department
MCL = Maximum Contaminant Level
LCS = Laboratory Control Sample
LCSD = Laboratory Control Sample Duplicate
%RPD = Percent Relative Percent Difference
µg/L = micrograms per liter
mg/L = milligrams per liter
ng/L = nanograms per liter
NV = No Value
Q = Laboratory Qualifier
Q1 = Validating Chemist Qualifier

Qualifiers
U = Not Detected
* = LCS or LCSD exceeded the control limits
J = Indicates an estimated value
p = %RPD between the primary and confirmation column/detector is >40%. The lower value has been reported.
B = Indicates the analyte was detected in the associated Method Blank

1 Final Approval Letter, Basewide Background Levels, Basewide Background Study Report, Holloman Air Force Base, New Mexico (NMED, March 2012)
2 Standards for Groundwater, if 10,000 mg/l TDS Concentration or Less, New Mexico Administrative Code 20.6.2.3103
3 USEPA National Primary Drinking Water Regulations MCLs (816-F-09-004, May 2009)
4 If results are not detected (U) then the value is set at the Method Detection Limit (MDL)
5 USEPA, Interim Drinking Water Health Advisory, for exposure to Perchlorate in water (December 2008)
Bold value indicates analytes above the New Mexico Groundwater Quality Standards or the USEPA MCLs
Indicates analytical results above the New Mexico Groundwater Quality Standard, or USEPA MCL, but below the NMED Approved Background Level
Indicates analytical results above the NMED Approved Background Level, but below the New Mexico Groundwater Quality Standard and USEPA MCL

Table 3 March 2015 Background Perchlorate Concentrations OD20K

Soil Screening Level NMED Residential[1] (µg/kg)	Client Sample Identification:	Lab Sample Identification:	Date Sampled:	Result[2] (µg/kg)	Q
54,800	OD20K-BKG-1	FA23257-12	3/28/2015	0.91	J
	OD20K-BKG-1A	FA23257-13	3/28/2015	0.60	J
	OD20K-BKG-2	FA23257-14	3/28/2015	1.40	J
	OD20K-BKG-3	FA23257-15	3/28/2015	1.50	J
	OD20K-BKG-4	FA23257-16	3/28/2015	1.20	J
	OD20K-BKG-5	FA23257-17	3/28/2015	0.57	J
	OD20K-BKG-6	FA23257-18	3/28/2015	0.88	U
	OD20K-BKG-7	FA23257-19	3/28/2015	1.20	J
	OD20K-BKG-8	FA23257-20	3/28/2015	0.53	J
	OD20K-BKG-9	FA23257-21	3/28/2015	2.40	
	OD20K-BKG-10	FA23257-22	3/28/2015	0.80	J
OD20K Background Reference Value UTL[3] (µg/kg)				**2.457**	

Notes:

NMED = New Mexico Environment Department
UTL = Upper Tolerance Limit
µg/kg = micrograms per kilogram
USEPA = United States Environmental Protection Agency
Q = Qualifier

Qualifiers

U = Not detected
J = Indicates an estimated value

1 Table A-1, NMED Soil Screening Levels. Risk Assessment Guidance for Site Investigations and Remediation (July, 2015)
2 If results are not detected (U) then the value is set at the Method Detection Limit
3 Background Perchlorate soil concentration, 95% UTL, calculated from the March 2015 background soil sampling results using the USEPA ProUCL software

Table 4 March 2015 Perchlorate Concentrations in Soil OD20K

Soil Screening Level		Client Sample Identification:	Lab Sample Identification:	Date Sampled:	Result[2] (mg/kg)	Q
NMED Residential[1] (mg/kg)	OD20K Background Reference Value UTL[3] (mg/kg)					
54.8	0.002	OD20K-SO21-C	FA23091-2	3/25/2015	2.780	
		OD20K-SO21-CA	FA23091-3	3/25/2015	3.060	
		OD20K-SO21-N	FA23091-4R	3/25/2015	1.410	
		OD20K-SO21-E	FA23091-5R	3/25/2015	12.400	
		OD20K-SO21-S	FA23091-6R	3/25/2015	0.521	
		OD20K-SO21-W	FA23091-8R	3/25/2015	1.560	
		OD20K-SO09-C	FA23091-9	3/25/2015	3.820	
		OD20K-SO09-N	FA23091-10R	3/25/2015	5.930	
		OD20K-SO09-E	FA23091-13R	3/25/2015	0.601	
		OD20K-SO09-S	FA23091-14R	3/25/2015	6.410	
		OD20K-SO09-W	FA23091-15R	3/25/2015	4.920	
		OD20K-SO37-C	FA23257-1	3/28/2015	1.790	
		OD20K-SO37-CA	FA23257-2	3/28/2015	1.630	
		OD20K-SO37-N	FA23257-3R	3/28/2015	2.280	
		OD20K-SO37-E	FA23257-4R	3/28/2015	1.680	
		OD20K-SO37-S	FA23257-5R	3/28/2015	2.330	
		OD20K-SO37-W	FA23257-6R	3/28/2015	0.854	
		OD20K-SO06-C	FA23257-7	3/28/2015	0.392	
		OD20K-SO06-N	FA23257-8R	3/28/2015	9.600	
		OD20K-SO06-E	FA23257-9R	3/28/2015	0.0386	
		OD20K-SO06-S	FA23257-10R	3/28/2015	22.500	
		OD20K-SO06-W	FA23257-11R	3/28/2015	14.400	

Notes:

NMED = New Mexico Environment Department
UTL = Upper Tolerance Limit
µg/kg = micrograms per kilogram
USEPA = United States Environmental Protection Agency
Q = Qualifier

Qualifiers

U = Not detected
J = Indicates an estimated value

1 Table A-1, NMED Soil Screening Levels. Risk Assessment Guidance for Site Investigations and Remediation (July, 2015)
2 If results are not detected (U) then the value is set at the Method Detection Limit
3 Background Perchlorate soil concentration, 95% UTL, calculated from the March 2015 background soil sampling results using the USEPA ProUCL software

Table 5 March 2015 Groundwater Sampling Results OD20K

Client Sample Identification:	Holloman AFB Groundwater Background Levels[1]	Groundwater Screening Levels		OD20K-MW01		OD20K-MW02		OD20K-MW02A		OD20K-MW03		OD20K-MW04	
Lab Sample Identification:		NMWQCC[2]	USEPA MCL[3]	FA23091-1		FA23091-11		FA23091-12		FA23058-3		FA23058-1	
Date Sampled:				3/25/2015		3/25/2015		3/25/2015		3/24/2015		3/24/2015	
Analyte				Result[4]	Q	Result[4]	Q	Result[4]	Q	Result[4]	Q	Result[4]	Q
Perchlorate	**µg/L**	**µg/L**	**µg/L**	**µg/L**		**µg/L**		**µg/L**		**µg/L**		**µg/L**	
Perchlorate	NV	NV	15[5]	0.10	J	1,640		1,790		0.18	J	0.20	
Nitrate	**mg/L**	**mg/L**	**mg/L**	**mg/L**		**mg/L**		**mg/L**		**mg/L**		**mg/L**	
Nitrate as N	NV	10	10	2.5	U	28.3		28.0		2.5	U	1.3	U

Notes:

NMWQCC = New Mexico Water Quality Control Commission
USEPA = United States Environmetal Protection Agency
NMED = New Mexico Environmental Department
MCL = Maximum Contaminant Level
µg/L = micrograms per liter
mg/L = milligrams per liter
NV = No Value
Q = Laboratory Qualifier

Qualifiers
U = Not Detected
J = Indicates an estimated value
1 Final Approval Letter, Basewide Background Levels, Basewide Background Study Report, Holloman Air Force Base, New Mexico (NMED, March 2012)
2 Standards for Groundwater, if 10,000 mg/l TDS Concentration or Less, New Mexico Administrative Code 20.6.2.3103
3 USEPA National Primary Drinking Water Regulations MCLs (816-F-09-004, May 2009)
4 If results are not detected (U) then the value is set at the Method Detection Limit (MDL)
5 USEPA, Interim Drinking Water Health Advisory, for exposure to Perchlorate in water (December 2008)
Bold value indicates analytes above the New Mexico Groundwater Quality Standards or the USEPA MCLs
Indicates analytical results above the New Mexico Groundwater Quality Standard, or USEPA MCL, but below the NMED Approved Background Level
Indicates analytical results above the NMED Approved Background Level, but below the New Mexico Groundwater Quality Standard and USEPA MCL

Table 6 Laboratory-Specific Detection/Quantitation Limits for Groundwater Samples (explosive compounds)

Compound	CAS No.	LOQ	LOD	MDL	Units	MS/MSD	RPD	BS	DUP
HMX	2691-41-0	0.2	0.1	0.08	ug/l	65-135	30	65-135	30
RDX	121-82-4	0.2	0.1	0.08	ug/l	68-130	30	68-130	30
3,5-Dinitroaniline	618-87-1	0.2	0.1	0.08	ug/l	71-117	30	71-117	30
1,3-Dinitrobenzene	99-65-0	0.2	0.1	0.08	ug/l	78-120	30	78-120	30
2,6-Dinitrotoluene	606-20-2	0.2	0.1	0.08	ug/l	77-127	30	77-127	30
2,4-Dinitrotoluene	121-14-2	0.2	0.1	0.08	ug/l	78-120	30	78-120	30
2-amino-4,6-Dinitrotoluene	35572-78-2	0.2	0.1	0.08	ug/l	79-120	30	79-120	30
4-amino-2,6-Dinitrotoluene	19406-51-0	0.2	0.1	0.08	ug/l	76-125	30	76-125	30
Nitrobenzene	98-95-3	0.2	0.1	0.08	ug/l	65-134	30	65-134	30
o-Nitrotoluene	88-72-2	0.2	0.1	0.08	ug/l	70-127	30	70-127	30
m-Nitrotoluene	99-08-1	0.2	0.1	0.08	ug/l	73-125	30	73-125	30
p-Nitrotoluene	99-99-0	0.2	0.1	0.08	ug/l	71-127	30	71-127	30
Tetryl	479-45-8	0.2	0.1	0.08	ug/l	64-128	30	64-128	30
1,3,5-Trinitrobenzene	99-35-4	0.2	0.1	0.08	ug/l	73-125	30	73-125	30
2,4,6-Trinitrotoluene	118-96-7	0.2	0.1	0.08	ug/l	71-123	30	71-123	30
Nitroglycerine	55-63-0	2	1	0.5	ug/l	74-127	30	74-127	30
PETN	78-11-5	2	1	0.6	ug/l	73-127	30	73-127	30

Table 6 Laboratory-Specific Detection/Quantitation Limits for Groundwater Samples (metals)

	Units	DL	LOD	LOQ
Aluminum	ug/l	14.0	25.0	200
Antimony	ug/l	1.0	5.0	6.0
Arsenic	ug/l	1.3	5.0	10.0
Barium	ug/l	1.0	5.0	200
Beryllium	ug/l	0.2	1.0	4.0
Cadmium	ug/l	0.2	1.0	5.0
Calcium	ug/l	50	100	1000
Chromium	ug/l	1.0	5.0	10.0
Cobalt	ug/l	0.2	1.0	50.0
Copper	ug/l	1.0	2.0	25.0
Iron	ug/l	17.0	50.0	300
Lead	ug/l	1.1	2.0	5.0
Magnesium	ug/l	35	100	5000
Manganese	ug/l	1.0	2.0	15.0
Molybdenum	ug/l	0.3	2.0	50.0
Nickel	ug/l	0.4	1.0	40.0
Potassium	ug/l	200	500	10000
Selenium	ug/l	2.9	5.0	10.0
Silver	ug/l	0.7	2.0	10.0
Sodium	ug/l	500	2000	10000
Strontium	ug/l	0.5	1.0	10.0
Sulfur	ug/l	10.0	25.0	50.0
Thallium	ug/l	1.4	2.0	10.0
Tin	ug/l	1.0	2.0	50.0
Titanium	ug/l	1.0	2.0	10.0
Vanadium	ug/l	0.6	2.0	50.0
Zinc	ug/l	4.4	5.0	20.0
Mercury	ug/l	0.03	0.1	0.5

Table 6 Laboratory-Specific Detection/Quantitation Limits for Groundwater Samples (TDS, nitrate, and perchlorate)

Analyte	LOQ (ug/l)	LOD (ug/l)	MDL (ug/l)
TDS	25000	25000	25000
Nitrate	100	50	50
Perchlorate	0.2	0.1	0.06

Notes:
DL Detection Limit
LOD Limit of Detection
LOQ Limit of Quantitation
MDL Method Detection Limit
MS Matrix Spike
MSD Matrix spike duplicate
RPD Relative Percent Difference

Table 7 Sample Containers, Preservation, and Hold Times for Groundwater Samples

Matrix	Analytical Group	Concentration Level	Analytical and Preparation Method / SOP Reference[2]	Sample Size	Containers (number, size, and type)[1]	Preservation Requirements (chemical, temperature, light protected)	Maximum Holding Time (preparation / analysis)
Aqueous	Metals– ICP/CVAA	Low	SW-846 3010A 6010C/ SOP #MET 103/MET100 SW-846 7470A/ MET106	1000 mls	(1)-1 liter nalgene bottle	1:1 HNO_3, ambient	6 months/28 days for Hg
Aqueous	Perchlorate	Low	SW-846 6850/ SOP#MS013	10 mls	125-ml nalgene bottle, filled 2/3 full	Cool 4°	28 days
Aqueous	Nitroaromatics	Low	SW-846 8330B/SOP# OP047/GC034	1 liter	(2)-1 liter amber bottle	Cool 4°	7 days to extraction / 40 days for analysis
Aqueous	TDS	Low	SM 2540C-11/SOP # GN135	100 ml	1000 ml nalgene	Cool 4°	7 days
Aqueous	Nitrate	Low	EPA 9056A/SOP#GN228	5 ml	500 ml nalgene	Cool 4°	48 hours

[1] Sample size is a minimum, the containers listed will be filled to compensate for any required re-analysis or re-extractions. For samples requiring Matrix Spike(MS)/Matrix Spike Duplicate(MSD) containers listed should be tripled.

[2]Laboratory Standard Operating Procedures are subject to revision and updates during duration of the project, lab will use the most current revision of the SOP at the time of analysis.

Table 8 Laboratory-Specific Detection/Quantitation Limits for Soil Samples (explosive compounds)

Compound	Cas. No.	LOQ	LOD	MDL	Units	MS/MSD	RPD	BS	DUP
HMX	2691-41-0	100	50	40	ug/kg	74-124	20	74-124	20
RDX	121-82-4	100	50	40	ug/kg	67-129	20	67-129	20
3,5-Dinitroaniline	618-87-1	100	50	40	ug/kg	86-118	20	86-118	20
1,3-Dinitrobenzene	99-65-0	100	50	40	ug/kg	73-119	20	73-119	20
2,6-Dinitrotoluene	606-20-2	100	50	40	ug/kg	79-117	20	79-117	20
2,4-Dinitrotoluene	121-14-2	100	50	40	ug/kg	75-121	20	75-121	20
2-amino-4,6-Dinitrotoluene	35572-78-2	100	50	40	ug/kg	71-123	20	71-123	20
4-amino-2,6-Dinitrotoluene	19406-51-0	100	50	40	ug/kg	64-127	20	64-127	20
Nitrobenzene	98-95-3	100	50	40	ug/kg	67-129	20	67-129	20
o-Nitrotoluene	88-72-2	100	50	40	ug/kg	70-124	20	70-124	20
m-Nitrotoluene	99-08-1	100	50	40	ug/kg	67-129	20	67-129	20
p-Nitrotoluene	99-99-0	100	50	40	ug/kg	71-124	20	71-124	20
Tetryl	479-45-8	100	50	40	ug/kg	68-135	20	68-135	20
1,3,5-Trinitrobenzene	99-35-4	100	50	40	ug/kg	80-116	20	80-116	20
2,4,6-Trinitrotoluene	118-96-7	100	50	40	ug/kg	71-120	20	71-120	20
Nitroglycerine	55-63-0	1000	500	250	ug/kg	73-124	20	73-124	20
PETN	78-11-5	1000	500	250	ug/kg	72-128	20	72-128	20

Table 8 Laboratory-Specific Detection/Quantitation Limits for Soil Samples (metals)

	Units	DL	LOD	LOQ
Aluminum	mg/kg	1.75	2.5	10
Antimony	mg/kg	0.065	0.25	1
Arsenic	mg/kg	0.1	0.25	0.5
Barium	mg/kg	0.05	0.1	10
Beryllium	mg/kg	0.025	0.05	0.25
Cadmium	mg/kg	0.025	0.05	0.2
Calcium	mg/kg	2.5	5	250
Chromium	mg/kg	0.05	0.1	0.5
Cobalt	mg/kg	0.025	0.05	2.5
Copper	mg/kg	0.05	0.1	1.25
Iron	mg/kg	0.85	2.5	15
Lead	mg/kg	0.05	0.2	1
Magnesium	mg/kg	1.8	5	250
Manganese	mg/kg	0.025	0.05	0.75
Molybdenum	mg/kg	0.025	0.05	2.5
Nickel	mg/kg	0.025	0.05	2
Potassium	mg/kg	10	25	500
Selenium	mg/kg	0.12	0.25	1
Silver	mg/kg	0.041	0.1	0.5
Sodium	mg/kg	25	100	500
Strontium	mg/kg	0.025	0.05	0.5
Sulfur	mg/kg	0.5	1.25	2.5
Thallium	mg/kg	0.055	0.25	0.5
Tin	mg/kg	0.045	0.05	2.5
Titanium	mg/kg	0.025	0.1	0.5
Vanadium	mg/kg	0.025	0.05	2.5
Zinc	mg/kg	0.15	0.25	1
Mercury	mg/kg	0.0042	0.017	0.042

Table 8 Laboratory-Specific Detection/Quantitation Limits for Soil Samples (perchlorate and nitrate)

Analyte	LOQ (ug/kg)	LOD (ug/kg)	MDL (ug/kg)
Nitrate	1000	500	500
Perchlorate	2	1	0.4

Notes:
DL Detection Limit
LOD Limit of Detection
LOQ Limit of Quantitation
MDL Method Detection Limit
MS Matrix Spike
MSD Matrix spike duplicate
RPD Relative Percent Difference

Table 9 Sample Containers, Preservation, and Hold Times for Soil Samples

Matrix	Analytical Group	Concentration Level	Analytical and Preparation Method / SOP Reference[2]	Sample Size	Containers (number, size, and type)[1]	Preservation Requirements (chemical, temperature, light protected)	Maximum Holding Time (preparation / analysis)
Soil	Metals–ICP/CVAA	Low	SW-846 3050B 6010C/ SOP #MET104/MET100 SW-846 7471B/ MET105	5 grams	(2) 8-oz glass jars	Cool 4°	6 months/28 days for Hg
Soil	Perchlorate	Low	SW-846 6850/ SOP#MS013	1 gram			28 days
Soil	Nitroaromatics	Low	SW-846 8330B/SOP# OP046/GC034	2 grams			14 days to extraction / 40 days for analysis
Soil	Nitrate	Low	EPA 9056A/SOP#GN228	1 gram			48 hours for aqueous leachate

[1] Sample size is a minimum, the containers listed will be filled to compensate for any required re-analysis or re-extractions. For samples requiring Matrix Spike(MS)/Matrix Spike Duplicate(MSD) containers listed should be tripled.

[2]Laboratory Standard Operating Procedures are subject to revision and updates during duration of the project, lab will use the most current revision of the SOP at the time of analysis.

Table 10 Project Schedule

Activity	Date
WP for Additional Investigation submitted to NMED	April 2016
NMED review period	April to May 2016
WP for Additional Investigation submitted to NMED for approval (revised to address NMED comments)	May 2016
NMED approval	June 2016
Fieldwork	June 2016
Data Gap Investigation Report submitted to NMED (to include results from March 2015 sampling and results from additional investigation [installation and sampling of 6 new monitoring wells and subsurface soil sampling in the center of the site])	July 2016
NMED review period	July through August 2016
DGI Report submitted to NMED for approval (revised to address NMED comments)	September 2016
NMED approval of DGI Report	September 2016

ATTACHMENT 1

OD20K Well Diagrams (Wells MW01 through MW04)

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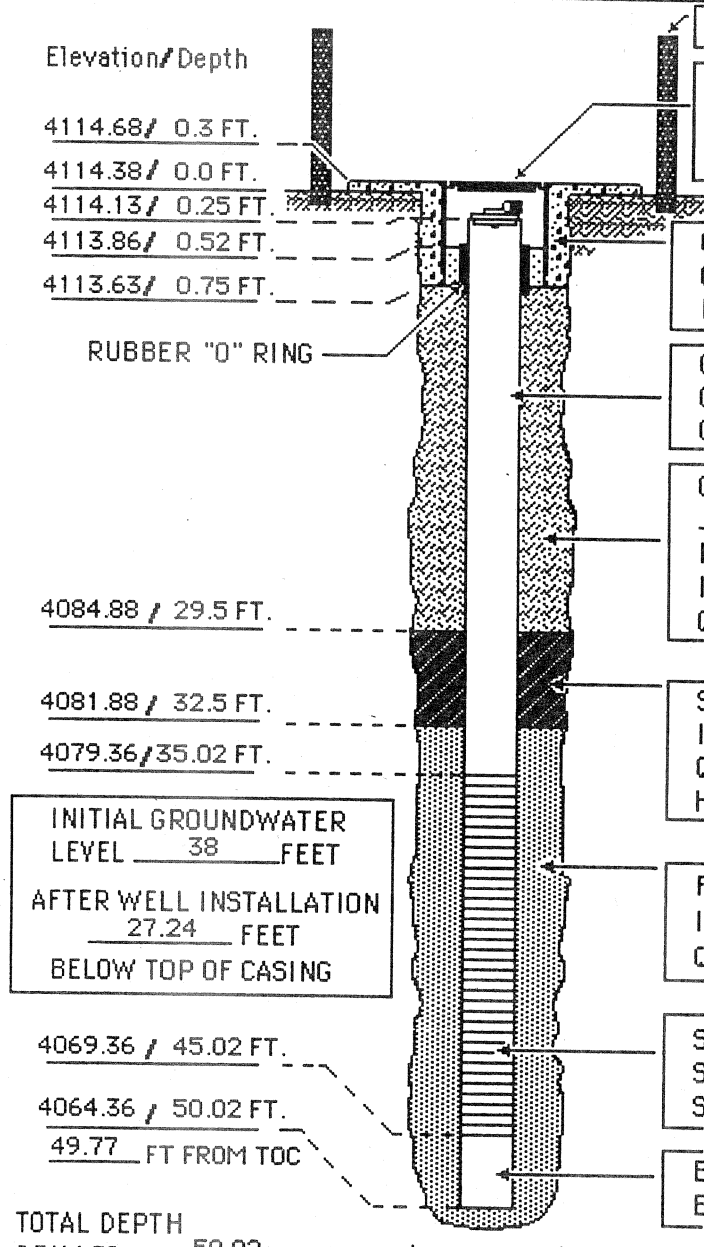
PROJECT 20,000# EOD FACILITY **JOB NO.** 04271-004-00
LOCATION Holloman Air Force Base, NM (1) **WELL NO.** HAFB/EOD-MW01
DRILLING COMPANY Precision Engineering Inc.
DRILLING METHOD Hollow Stem Auger (CME 75)
DATE STARTED May 17, 1993 **DATE COMPLETED** May 18, 1993 (2)
FIELD SUPERVISOR Robert J. Melvin, CPG (ICF Kaiser Engineers)



BOLLARDS 3, 3.5-foot stickups, several feet from pad

FLUSH MOUNT (Campbell Monoflex) Cover diameter 0.81 feet with three 9/16 inch bolts; annulus opening 0.61 feet
WITH J-Type LOCKING CAP

GROUND SURFACE

CONCRETE MIXTURE (Sackrete) Concrete mix
QUANTITY INSTALLED Not Measured
PAD SIZE 4 feet X 3.75 feet THICKNESS 0.3 feet

CASING LENGTH 34.77 FEET
CASING MATERIAL Schedule 40 PVC (Campbell Monoflex)
CASING INSIDE DIAMETER 2.0 inches (0.17 feet)

GROUT DESCRIPTION Mixture of 16-40 Colorado Sand and Powdered Bentonite (Baroid - Mud Gel)
MIX RATIOS 1:1
INSTALLATION METHOD Poured down annulus
QUANTITY INSTALLED 8-50 lb. bags of sand and 8-50 lb. bags of bentonite

SEAL DESCRIPTION 3/8 inch Bentonite Pellets (Baroid)
INSTALLATION METHOD Poured down annulus
QUANTITY INSTALLED 100 lbs. (2-50 lb. buckets)
HYDRATION TIME 14.5 hours (2.5 gallons)

FILTER DESCRIPTION 16-40 Colorado Quartz Sand
INSTALLATION METHOD Poured down annulus
QUANTITY INSTALLED 12-50 lb. bags

SCREEN LENGTH 10.0 FEET
SCREEN MATERIAL Schedule 40 PVC (Campbell Monoflex)
SCREEN SLOT SIZE 0.010 inch slot opening (10 slot)

BLANK LENGTH 5 feet (Silt Trap)
BLANK MATERIAL Schedule 40 PVC (Campbell Monoflex)

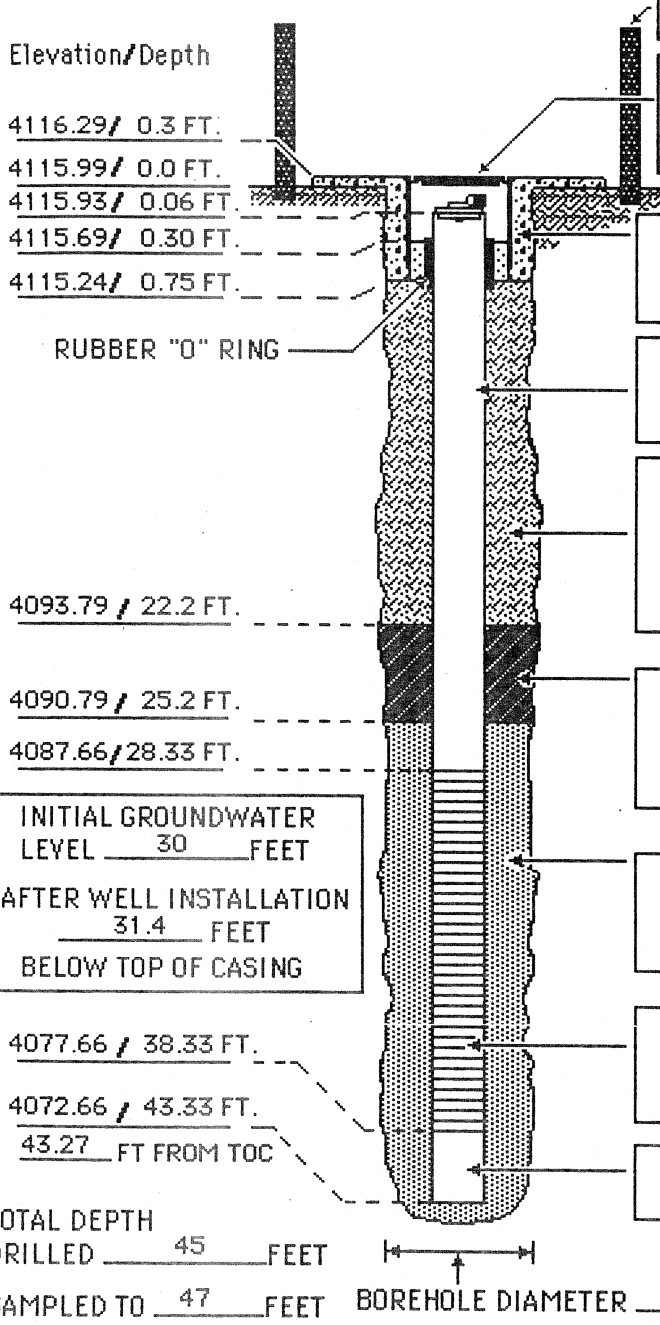
NOT TO SCALE

SURVEY MONUMENT (was) ~~was not~~ INSTALLED ON CONCRETE PAD. LOCATION Northeast corner of concrete pad (3)

DEVELOPMENT METHOD 2 inch Grundfos Submersible Pump AMOUNT PURGED 49 gallons

COMMENTS (1) WSTM 415406.8 North 552694.5 East
(2) Pads were constructed and bollards were installed on May 21, 1993.
(3) WSTM 415408.73 North 552695.8 East (Elevation 4,114.53 feet)

PROJECT 20,000# EOD FACILITY **JOB NO.** 04271-004-00
LOCATION Holloman Air Force Base, NM (1) **WELL NO.** HAFB/EOD-MW02
DRILLING COMPANY Precision Engineering Inc.
DRILLING METHOD Hollow Stem Auger (CME 75)
DATE STARTED May 18, 1993 **DATE COMPLETED** May 18, 1993 (2)
FIELD SUPERVISOR Robert J. Melvin, CPG (ICF Kaiser Engineers)



BOLLARDS 3, 3.5-foot stickups, several feet from pad

FLUSH MOUNT (Campbell Monoflex) Cover diameter 0.81 feet with three 9/16 inch bolts; annulus opening 0.61 feet
WITH J-Type LOCKING CAP

GROUND SURFACE

CONCRETE MIXTURE (Sackrete) Concrete mix
QUANTITY INSTALLED Not Measured
PAD SIZE 4 feet X 3.75 feet THICKNESS 0.3 feet

CASING LENGTH 28.27 FEET
CASING MATERIAL Schedule 40 PVC (Campbell Monoflex)
CASING INSIDE DIAMETER 2.0 inches (0.17 feet)

GROUT DESCRIPTION Mixture of 16-40 Colorado Sand and Powdered Bentonite (Baroid - Mud Gel)
MIX RATIOS 1 : 1
INSTALLATION METHOD Poured down annulus
QUANTITY INSTALLED 6-50 lb. bags of sand and 6-50 lb. bags of bentonite

SEAL DESCRIPTION 3/8 inch Bentonite Pellets (Baroid)
INSTALLATION METHOD Poured down annulus
QUANTITY INSTALLED 100 lbs. (2-50 lb. buckets)
HYDRATION TIME 1.25 hours (2.5 gallons)

FILTER DESCRIPTION 16-40 Colorado Quartz Sand
INSTALLATION METHOD Poured down annulus
QUANTITY INSTALLED 13-50 lb. bags

SCREEN LENGTH 10.0 FEET
SCREEN MATERIAL Schedule 40 PVC (Campbell Monoflex)
SCREEN SLOT SIZE 0.010 inch slot opening (10 slot)

BLANK LENGTH 5 feet (Silt Trap)
BLANK MATERIAL Schedule 40 PVC (Campbell Monoflex)

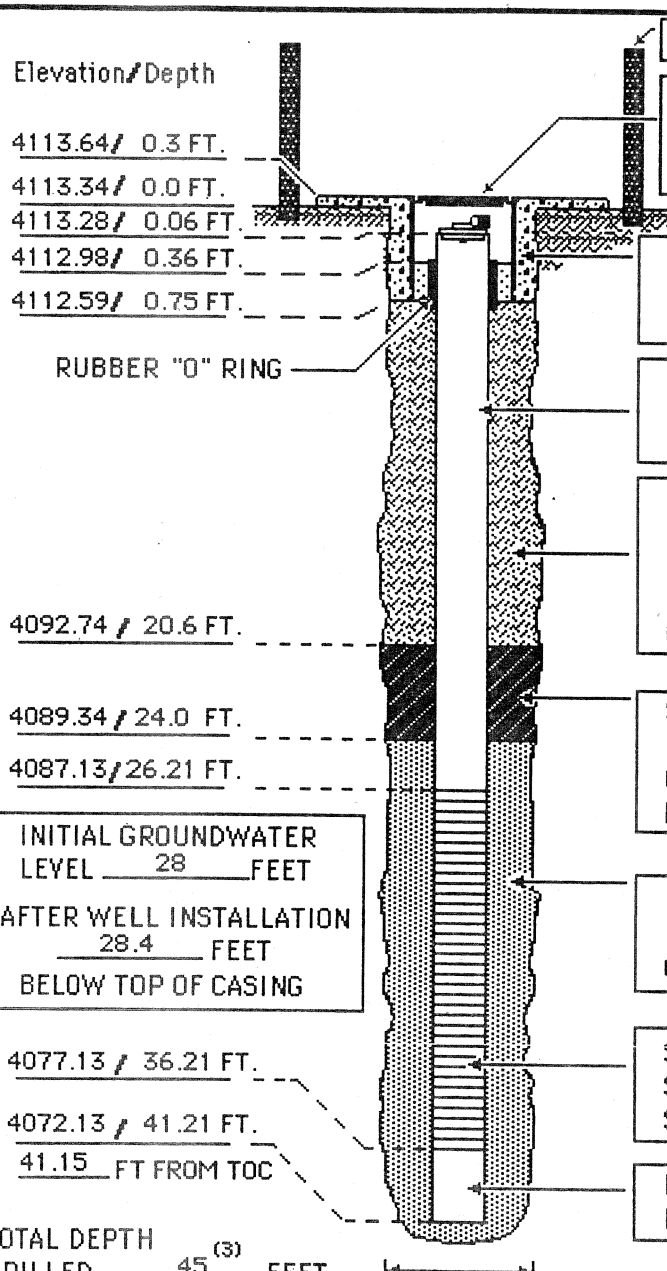
NOT TO SCALE

SURVEY MONUMENT (was) ~~was not~~ INSTALLED ON CONCRETE PAD. LOCATION Northeast corner of concrete pad (3)

DEVELOPMENT METHOD 2 inch Grundfos Submersible Pump AMOUNT PURGED 50 gallons

COMMENTS (1) WSTM 415054.0 North 552355.4 East
(2) Pads were constructed and bollards were installed on May 21, 1993.
(3) WSTM 415055.17 North 552356.95 East (Elevation 4,116.25 feet)

PROJECT 20,000# EOD FACILITY **JOB NO.** 04271-004-00
LOCATION Holloman Air Force Base, NM (1) **WELL NO.** HAFB/EOD-MW03
DRILLING COMPANY Precision Engineering Inc.
DRILLING METHOD Hollow Stem Auger (CME 75)
DATE STARTED May 19, 1993 **DATE COMPLETED** May 19, 1993 (2)
FIELD SUPERVISOR Robert J. Melvin, CPG (ICF Kaiser Engineers)



BOLLARDS 3, 3.5-foot stickups, several feet from pad

FLUSH MOUNT (Campbell Monoflex) Cover diameter 0.81 feet with three 9/16 inch bolts; annulus opening 0.61 feet
WITH J-Type LOCKING CAP

GROUND SURFACE

CONCRETE MIXTURE (Sackrete) Concrete mix
QUANTITY INSTALLED Not Measured
PAD SIZE 4 feet X 3.72 feet THICKNESS 0.3 feet

CASING LENGTH 26.15 FEET
CASING MATERIAL Schedule 40 PVC (Campbell Monoflex)
CASING INSIDE DIAMETER 2.0 inches (0.17 feet)

GROUT DESCRIPTION Mixture of 16-40 Colorado Sand and Powdered Bentonite (Baroid - Mud Gel)
MIX RATIOS 1:1
INSTALLATION METHOD Poured down annulus
QUANTITY INSTALLED 6-50 lb. bags of sand and 6-50 lb. bags of bentonite

SEAL DESCRIPTION 3/8 inch Bentonite Pellets (Baroid)
INSTALLATION METHOD Poured down annulus
QUANTITY INSTALLED 100 lbs. (2-50 lb. buckets)
HYDRATION TIME 2 hours (2.5 gallons)

FILTER DESCRIPTION 16-40 Colorado Quartz Sand
INSTALLATION METHOD Poured down annulus
QUANTITY INSTALLED 9-50 lb. bags

SCREEN LENGTH 10.0 FEET
SCREEN MATERIAL Schedule 40 PVC (Campbell Monoflex)
SCREEN SLOT SIZE 0.010 inch slot opening (10 slot)

BLANK LENGTH 5 feet (Silt Trap)
BLANK MATERIAL Schedule 40 PVC (Campbell Monoflex)

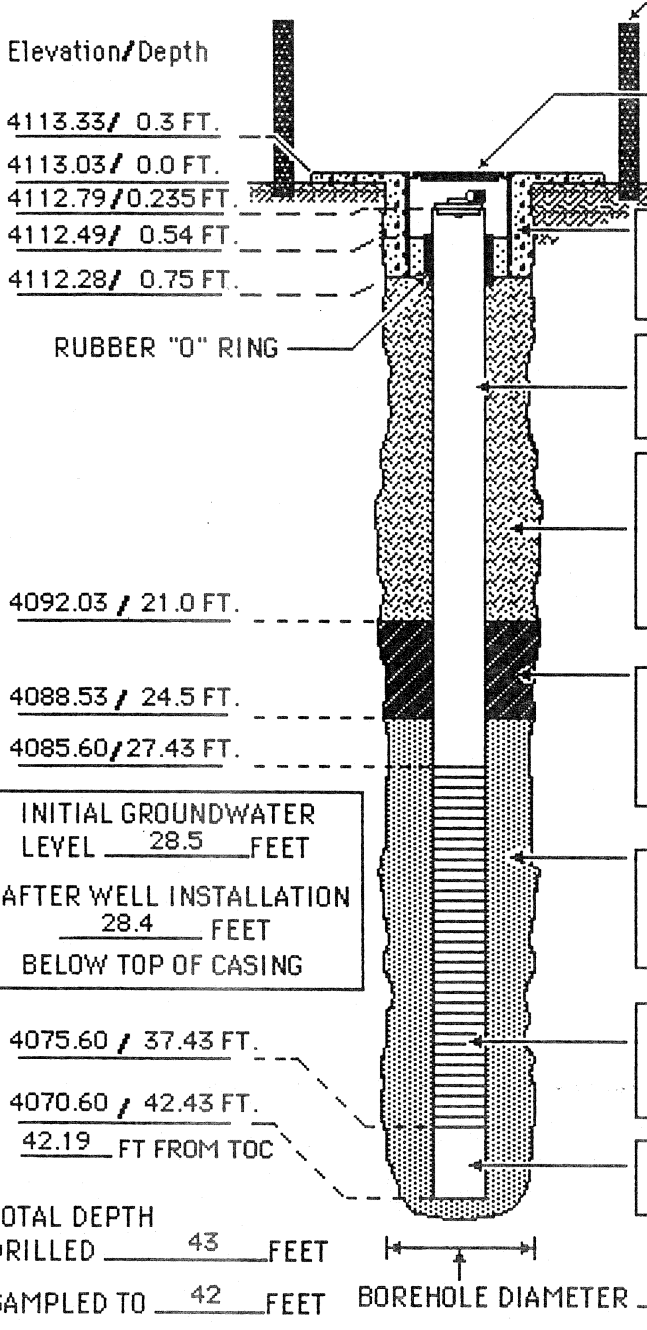
NOT TO SCALE

SURVEY MONUMENT ~~was~~/(was not) INSTALLED ON CONCRETE PAD. LOCATION Not Applicable

DEVELOPMENT METHOD 2 inch Grundfos Submersible Pump AMOUNT PURGED 16.5 gallons (4)

COMMENTS (1) WSTM 414929.6 North 552451.3 East
(2) Pads were constructed and bollards were installed on May 21, 1993. (3) Flowing sands encountered at 42 feet.
(4) Well went dry during well development and purging.

PROJECT 20,000# EOD FACILITY **JOB NO.** 04271-004-00
LOCATION Holloman Air Force Base, NM(1) **WELL NO.** HAFB/EOD-MW04
DRILLING COMPANY Precision Engineering Inc.
DRILLING METHOD Hollow Stem Auger (CME 75)
DATE STARTED May 20, 1993 **DATE COMPLETED** May 20, 1993(2)
FIELD SUPERVISOR Robert J. Melvin, CPG (ICF Kaiser Engineers)



BOLLARDS 3, 3.5-foot stickups, several feet from pad

FLUSH MOUNT (Campbell Monoflex) Cover diameter 0.81 feet with three 9/16 inch bolts; annulus opening 0.61 feet
WITH J-Type LOCKING CAP

GROUND SURFACE

CONCRETE MIXTURE (Sackrete) Concrete mix
QUANTITY INSTALLED Not Measured
PAD SIZE 4 feet X 3.75 feet THICKNESS 0.3 feet

CASING LENGTH 27.20 FEET
CASING MATERIAL Schedule 40 PVC (Campbell Monoflex)
CASING INSIDE DIAMETER 2.0 inches (0.17 feet)

GROUT DESCRIPTION Mixture of 16-40 Colorado Sand and Powdered Bentonite (Baroid - Mud Gel)
MIX RATIOS 1 : 1
INSTALLATION METHOD Poured down annulus
QUANTITY INSTALLED 6.5-50 lb. bags of sand and 6.5-50 lb. bags of bentonite

SEAL DESCRIPTION 3/8 inch Bentonite Pellets (Baroid)
INSTALLATION METHOD Poured down annulus
QUANTITY INSTALLED 100 lbs. (2-50 lb. buckets)
HYDRATION TIME 1.5 hours (2.5 gallons)

FILTER DESCRIPTION 16-40 Colorado Quartz Sand
INSTALLATION METHOD Poured down annulus
QUANTITY INSTALLED 10.5-50 lb. bags

SCREEN LENGTH 10.0 FEET
SCREEN MATERIAL Schedule 40 PVC (Campbell Monoflex)
SCREEN SLOT SIZE 0.010 inch slot opening (10 slot)

BLANK LENGTH 5 feet (Silt Trap)
BLANK MATERIAL Schedule 40 PVC (Campbell Monoflex)

NOT TO SCALE

SURVEY MONUMENT ~~was~~/(was not) INSTALLED ON CONCRETE PAD. LOCATION Not Applicable

DEVELOPMENT METHOD 2 inch Grundfos Submersible Pump AMOUNT PURGED 51 gallons

COMMENTS (1) WSTM 414897.0 North 552568.1 East
(2) Pads were constructed and bollards were installed on May 21, 1993.

ATTACHMENT 2

Table G-2, OD20K Generalized Geologic (Soil Boring) Log from NMED Permit

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TABLE G-2
Generalized Geologic (Soil Boring) Log[1]

Depth	Generalized Description
0 and 10 feet	**SAND** - Light tan, yellowish tan and light brown fine grained well sorted sand with layers of silt-sand, porous, loose to slightly firm and dry to trace moisture present. This upper zone represents eolian type deposits. The sands are most likely dunes and the silt-sand represent an interdune sequence.
10 to 12 feet (Extends to 16 feet at HAFB/EOD-MW02)	**SILT to SILTY CLAY** - Reddish brown (HAFB/EOD-MW02 also had alternating layers of gray green and light gray to white), slightly firm, low to moderately plastic and dry to trace moisture. Most likely represents a small playa at the site [2,3]
12 to 30 feet (Extends to 40 feet at HAFB/EOD-MW02)	**SAND** - Light tan, yellowish tan and light brown with reddish brown and brown layers, predominantly a fine grained, well sorted sand and with occasional layers of medium to coarse grained sands slightly firm to firm and trace moisture present.
30 to 50 (HAFB/EOD-MW02 starts at 40 feet)	**SILTY CLAY with interbedded SAND** - A gradational change of depositional environments can be observed in the logs. Reddish brown silty clay representing playa/lacustrine deposits[2] with dune and interdunal deposits merge in and out of the clay, or back and forth across the playa. The occasional thin layers of sand in the larger clay units may represent wind blown particulate across the playa or an occasional sheet flood that are common in this type of environment. The clay deposits are thickest at HAFB/EOD-MW01. These deposits are reddish brown silty clay with light gray or green gray mottling[4] in the upper 2 feet, moderate to high plasticity, slightly firm to firm, ranging in moisture from trace to wet. At 50 feet, 1 to 2 mm gypsum crystals were found. Sands found below 30 feet are fine to medium grained, medium grain predominant. At HAFB/EOD-MW02 flowing sands were encountered at 42 feet.

[1] Modified from ICF Kaiser and Labat-Anderson, 1993.

[2] The reddish brown color associated with the playas are common and suggest an oxidizing environment of the iron present in the sediments. The coloration may also imply well drained soils.

[3] Poorly drained soils which are saturated most of the time are generally gray in color, because the iron has been reduced or removed. This is true for humid climates, however, not always true in arid environments.

[4] A mottled gray and reddish brown color suggests the subsoils are subjected to alternating or seasonal periods of saturation.

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