APPENDIX A

Summary of SVE System Operation, Maintenance, Repair, and Hydrocarbon Recovery Calculations January – March 2011

A-1. SVE and Treatment System Maintenance Repair and Downtime Summary

A-2. SVE and Treatment System Hydrocarbon Recovery Calculations

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ACRONYMS AND ABBREVIATIONS

C CO CO ₂	vapor concentration carbon monoxide carbon dioxide
K KAFB kg kg/m ³	Kelvin Kirtland Air Force Base kilogram kilograms per cubic meter
m ³ /hr	cubic meters per hour
O ₂	oxygen
ppmv	parts per million by volume
SVE	soil-vapor extraction

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A-1. SVE and Treatment System Maintenance Repair and Downtime Summary

The primary maintenance interval for the soil-vapor extraction (SVE) and treatment systems is every 360 hours (approximately 2 weeks), as recommended by the system manufacturer. Routine biweekly maintenance includes checking and changing the oil, filters, spark plugs and spark plug wires; checking the coolant level and adding coolant as needed; cleaning the air filter; and checking all belts, hose connections, battery connections and emergency contact switches. Monthly maintenance includes all bi-weekly maintenance, and includes replacing distributer caps, rotors, polyvinyl chloride valves and cleaning the radiators. All bi-weekly and monthly maintenance requires each unit being serviced, to be shut down for approximately 4 hours.

During the reporting period, biweekly maintenance was performed on the SVE and treatment systems on the following dates:

- January 10, 2011
- January 11, 2011
- January 24, 2011
- January 25, 2011
- February 7, 2011
- February 8, 2011
- February 21, 2011
- February 22, 2011
- March 8, 2011
- March 9, 2011
- March 21, 2011
- March 22, 2011

During the reporting period, monthly maintenance was performed on the SVE and treatment systems on

the following dates:

- January 24, 2011
- January 25, 2011
- February 21, 2011

- February 22, 2011
- March 21, 2011
- March 22, 2011

During this reporting period, in addition to the standard biweekly and monthly planned maintenance activities, the following maintenance or repairs were performed for the various SVE and treatment systems that are operating at the Bulk Fuels Facility.

For the ST-106, Former Fuel Offloading Rack SVE and treatment system associated with the Stage 2 abatement action the following maintenance and repair activities were conducted during the first quarter of 2011:

• January 11, 2011 – Changed E1 carburetor.

For the KAFB-1065 SVE and treatment system operating as an interim remedial action for SS-111, the following maintenance and repair activities were conducted during the first quarter of 2011:

- January 23, 2011 Changed E2 crankshaft pulley.
- February 22, 2011 Changed E2 carburetor.
- February 28, 2011 Changed E1 carburetor.

For the KAFB-1066 SVE and treatment system operating as an interim remedial action for SS-111, the

following maintenance and repair activities were conducted during the first quarter of 2011:

- January 22, 2011 Changed E2 catalytic converter.
- February 19, 2011 Changed E2 starter and starter solenoids.
- March 30, 2011 Changed E1 catalytic converter.

For the KAFB-1068 SVE and treatment system operating as an interim remedial action for SS-111, the

following maintenance and repair activities were conducted during the first quarter of 2011:

- February 19, 2011 Changed E2 starter and starter solenoids.
- February 26, 2011 Changed E2 catalytic converter.
- March 27, 2011 Changed E2 catalytic converter.
- March 24, 2011 Changed E2 water pump.
- March 25-27, 2011 KAFB-1068 down for E2 engine change out (approximately 72 hours).

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A-2. SVE and Treatment System Hydrocarbon Recovery Calculations

As part of the ongoing Stage 2 abatement action for ST-106 and the interim remedial actions for SS-111, vapor samples from the SVE and treatment systems' inlets and exhausts are regularly analyzed on site using a Horiba Mexa 554J emissions analyzer for petroleum hydrocarbon concentration in parts per million by volume (ppmv) and for percent oxygen (O₂), carbon monoxide (CO), and carbon dioxide (CO₂). The hydrocarbon concentrations from the SVE system influent as measured in the field with the Horiba instrument are used in the hydrocarbon recovery calculations. The paragraphs below describe the basic equations and constants that are used, along with the Horiba field measurements, to calculate total hydrocarbon recovery volumes.

For the SVE and treatment system associated with the Stage 2 abatement action at ST-106, the Horibameasured influent hydrocarbon vapor concentration is used along with the molecular weight of the influent vapor stream, the gas constant, and the standard temperature to calculate the vapor concentration (C) in kilogram per cubic meter (kg/m³). Vapor stream concentrations are measured by the Horiba instrument in parts per million by volume (ppmv), which can be converted into kg/m³ for use in the following equation:

$$C = \frac{(conc)(MW)}{RT}$$

Where:

Conc	=	vapor concentration (Horiba ppmv reading x 10^{-6})
MW	=	molecular weight of the vapor (98)
R	=	gas constant (0.0821) (L·atm/mol·K)
Т	=	temperature (Kelvin [K]) (290)

The measured well gas inlet flow rate (cubic meters per hour $[m^3/hr]$) and hours of operation are then used to calculate recovered mass. Mass removal is estimated using the following conversion:

$$M = CQT$$

Where:

M = cumulative mass removed (kilogram [kg]) C = vapor concentration (kg/m³) Q = extraction flow rate (m³/hr) T = operational period (hour)

The recovered mass is then converted to equivalent gallons. The hydrocarbon recovery is calculated for each engine, and cumulatively summed over the operational period. As an example, the mass (kg) of recovered hydrocarbons for engine E1 during a given period can be calculated using the measured influent vapor concentration from a measurement date in that period (such as 32,400 ppmv), the well-gas inlet flow rate (such as 74.8 m3/hr), the engine E1 operational hours during the period (539.9 hours), and the constants defined above as follows:

 $C = \frac{(32,400 \times 10^{-6}) \times 980.0821 \times 290}{M} = (0.075) (74.9) (539.9) = 3,058 \text{ kg}$

The gallons of equivalent hydrocarbon recovery are calculated using a mass to volume conversion of 6 pounds per gallon of hydrocarbon product and a conversion factor of 1 kg equals 2.205 pounds:

Volume (gallons) =
$$(3,058 \text{ kg}) \times \frac{(2.205 \text{ pounds})}{1 \text{ kg}} \times \frac{1 \text{ gallon}}{6 \text{ pounds}} = 1,124 \text{ gallons}$$

The SVE and treatment systems at wells KAFB-1065, KAFB-1066, and KAFB-1068 have on-board telemetry that allows remote downloads of the SVE system data. The data that can be downloaded include the systems' running calculation of hydrocarbon recovery volumes that are made using the same basic equations outlined above.

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APPENDIX B

Data Quality Evaluation Report and Analytical Data January – March 2011

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ACRONYMS AND ABBREVIATIONS

Kirtland AFB BFF	May 20
SDG	sample delivery groups
SM	Standard Method
SVOC	semivolatile organic compound
RPD	relative percent difference
RRF	relative response factor
QAPjP QC QSM quarterly report	BFF Spill site-specific quality assurance/quality control plan quality control Quality Systems Manual Quarterly Pre-Remedy Monitoring and Site Investigation Report for January – March 2011, Bulk Fuels Facility, Solid Waste Management Units ST-106 and SS-111
PAH	polycyclic aromatic hydrocarbon
ppb	parts per billion
ppm	parts per million
OSRTI	Office of Superfund Remediation and Technology Innovation
OSWER	Office of Solid Waste and Emergency Response
MDL	method detection limit
MS	matrix spike
MSD	matrix spike duplicate
LCS	laboratory control sample
LCSD	laboratory control sample duplicate
LOD	limit of detection
LOQ	limit of quantitation
ICP	inductively coupled plasma
ICS	interference check sample
ICV	initial calibration verification
Hg	mercury
EDB	1,2-dibromoethane/ethylene dibromide
EPA	U.S. Environmental Protection Agency
DoD	U.S. Department of Defense
CCV CN	continuing calibration verification cyanide
BFF	Bulk Fuels Facility
%	percent
%D	percent difference

ACRONYMS AND ABBREVIATIONS (concluded)

TPH	total petroleum hydrocarbon
USACE USEPA	U.S. Army Corps of Engineers U.S. Environmental Protection Agency
VOC	volatile organic compound

DATA QUALITY EVALUATION REPORTS & ANALYTICAL DATA, JANUARY – MARCH 2011

1.1 Laboratory Data Quality Summary

This laboratory data quality summary describes the findings of the review of data from the first-quarter 2011 groundwater monitoring event and is provided to document the quality of the analytical data used in the *Quarterly Pre-Remedy Monitoring and Site Investigation Report for January – March 2011, Bulk Fuels Facility, Solid Waste Management Units ST-106 and SS-111* (quarterly report). Sampling procedures and overall quality control (QC) and quality assurance protocols for the first-quarter 2011 groundwater monitoring event are presented in the draft *Quality Assurance Project Plan (QAPjP), Bulk Fuels Facility Spill, Solid Waste Management Units ST-106 and SS-111, Kirtland Air Force Base, Albuquerque, New Mexico* (U.S. Army Corps of Engineers [USACE], 2011).

Thirty-eight groundwater samples, two field duplicates, two equipment rinse blanks, two ambient blanks, and twenty trip blanks were collected during the period from January 25 through March 9, 2011, and sent to Empirical Laboratories LLC, Nashville, Tennessee for analyses. The laboratory holds a current U.S. Department of Defense (DoD) Environmental Laboratory Accreditation Program certification to perform the listed analyses.

Groundwater samples were analyzed for the following list of parameters:

- Volatile organic compounds (VOCs) SW8260B;
- 1,2-dibromoethane (EDB) SW8011;
- Semivolatile organic compounds (SVOCs) SW8270C (new wells only);
- Polynuclear aromatic hydrocarbons (PAHs) SW8270C low-level (VA-2 well only);
- Total petroleum hydrocarbons (TPH) as gasoline (C6-C10) SW8015B;
- TPH as diesel (C10-C28) SW8015B;
- Total and dissolved metals SW6010B;
- Anions U.S. Environmental Protection Agency (EPA) 300.0;
- Ammonia as nitrogen Standard Method (SM) 4500 NH3BG;
- Sulfide SM 4500 S2CF; and
- Carbonate and bicarbonate alkalinity SM2320B.

All analytical results obtained from the first-quarter 2011 groundwater monitoring vent were submitted in sample deliverable groups Kirtland-001 through Kirtland-006. An EPA Level III data review was performed on analytical results for the six sample delivery groups (SDGs). The review was performed in accordance with the guidelines and control criteria specified in the following documents:

- The site-specific Bulk Fuels Facility (BFF) Spill QAPjP (USACE, 2011);
- DoD Quality Systems Manual for Environmental Laboratories, Version 4.2 (DoD, 2010);
- USEPA Contract Laboratory Program, Test Methods for Evaluating Solid Waste, Physical/Chemical Methods (2006) (SW-846, 2006 and updates);
- American Public Health Association et al., *Standard Methods for the Examination of Water and Wastewater (21st Edition) (2005);*
- USACE 200-1-10, Environmental Quality Guidance for Evaluating Performance-Based Chemical Data (2005);
- USEPA Contract Laboratory Program, National Functional Guidelines for Superfund Organic Methods Data Review (June 2008); and
- EPA Contract Laboratory Program, *National Functional Guidelines for Inorganic Superfund Data Review*, Final (January 2010).

The following QC elements were included in the EPA Level III data review:

- Sample preservation and sample extraction and analysis holding times;
- Laboratory method blanks;
- Initial and continuing calibration blanks (metals, anions, and ammonia analysis only);
- Surrogate recoveries (organic analyses);
- Laboratory control sample (LCS)/laboratory control sample duplicate (LCSD) recoveries;
- Matrix spike (MS)/matrix spike duplicate (MSD) recoveries;
- Relative percent differences (RPDs);
- Initial calibration and verifications;
- Continuing calibration verifications;
- Inductively coupled plasma (ICP) interference check samples (metal analysis only);
- ICP serial dilution (metal analysis only);
- Sample confirmation (EDB analysis only);
- Field blanks; and
- Field duplicates.

Analytical data were reviewed in terms of precision, bias, representativeness, comparability, and

completeness as follows:

- *Bias* is demonstrated by recovery of target analytes from fortified blank and sample matrices, LCS/LCSD, and MS/MSD, respectively. For organic methods, bias is also demonstrated through recovery of surrogates from each field and QC sample. The recovery of target analytes from fortified samples is compared to the acceptance criteria defined in the QAPjP and DoD Quality Systems Manual (QSM) (DoD, 2010). When the acceptance criteria are not available in the DoD QSM, results are compared to the laboratory in-house control limits. When these criteria are not met, the data are flagged accordingly.
- *Precision* is expressed as the RPD between the results of replicate sample analyses: sample duplicates, LCSDs, and MSDs. When analyte RPDs exceed the acceptance criteria, the data are flagged accordingly.
- *Representativeness* of the samples submitted for analysis is ensured by adherence to standard sampling techniques and protocols.
- *Comparability* of sample results is ensured through the use of approved sampling and analysis methods.
- *Completeness* is expressed as a ratio of the number of usable data to total of analytical data results.

The following presents EPA Level III data review findings. The discussion summarizes data quality exceedances and their potential impact on the data quality and usability of analytical results. Table 1 (at the end of this report) presents definitions of data qualification and reason codes applied to the analytical results.

1.2 Sample Preservation, Sample Extraction and Analysis Holding Times (Reason Code H)

The sample coolers and samples received within were received intact at the laboratory and were within the required 0-6 degrees Celsius, and in compliance with EPA and Standard Method preservation requirements.

Sample holding times were evaluated by comparing the sample collection dates to the sample extraction

dates and analysis dates. Extraction and analysis holding times were reviewed for all samples to

determine the validity of the sample results. Holding time exceedances were noted in SW8270C and SW8011 Methods and EPA Method 300.0 and listed below:

Analytical Method	Holding Time Outliers	Holding Time Requirement	Qualifier
SW8270C	14 days for extraction	7 days for extraction	UJ for all non-detected SVOCs in GW0034
SW8270C, Low Level	8 days for extraction	7 days for extraction	UJ for all non-detected PAHs in GW0037
SW8270C, Low Level	8 days for extraction	7 days for extraction	UJ for all non-detected PAHs in GW0036
EPA 300.0, Nitrate	53 hours for analysis	48 hours	UJ for non-detected nitrate in GW0038
EPA 300.0, Nitrate	52 hours for analysis	48 hours	UJ for non-detected nitrate in GW0037
EPA 300.0, Nitrate	52 hours for analysis	48 hours	UJ for non-detected nitrate in GW0036
EPA 300.0, Nitrate	4 days for analysis	48 hours	J- for detected nitrate in GW0033
SW8011	17 days for analysis	14 days	UJ for non-detected EDB in GW0016
SW8011	16 days for analysis	14 days	J- for detected EDB in GW0018

A request for SVOC analysis for one sample (GW0034) and PAH analysis for two samples (GW0036 and GW0037) was made after the 7-day extraction holding time had expired. The affected samples were extracted as soon as the request was received and were analyzed within the 40-day analysis holding time. SVOCs and PAHs were not detected in the mentioned samples, and their limits of quantitation (LOQs) were qualified as estimated (UJ) as a result of the extraction holding time violations. During the first-quarter 2011 groundwater monitoring event, SVOCs, including PAHs, were analyzed in order to determine TPH fuel related contamination in groundwater. A review of VOCs and TPH gasoline and diesel in the same three samples indicated that TPH gasoline in sample GW0034 was detected slightly above the detection limit and therefore the detected level is considered estimated. TPH-related VOCs and TPH diesel were not detected in sample GW0034, and further TPH-related VOCs, and TPH gasoline and diesel were not present in samples GW0036 and GW0037. Based on the analytical results of the VOC and TPH analyses, it appears that the non-detected SVOCs and PAHs results in the three samples were consistent with the associated VOCs and TPH data, and that significant low biased SVOCs and PAH results were not reported as a result of additional sample storage.

Sample GW0033 for nitrate analysis was collected on February 4, 2011 and shipped to the laboratory on the same day. However, due to weather issues on the East Coast, samples were received by the laboratory on February 8, 2011, which was after the required 48-hour analysis holding time had expired for nitrate analysis. The sample was analyzed for nitrate on the same day that the sample was received. Although the analysis holding time was exceeded by two times the requirement, the analyte was still detected and was qualified as estimated (J-) with a potential low bias.

Nitrate in three additional samples was also analyzed outside the holding time requirement. Three samples (GW0036, 0037 and 0038) were collected and shipped to the laboratory on the same day, and were received by the laboratory on the following day. As a result of laboratory oversight, the 48- hour analysis holding time for nitrate in these samples was missed by 4 to 5 hours. Nitrate was not detected in the samples, and the LOQ was qualified as estimated (UJ). Since the degree of holding time exceedance was minor, the data usability of the sample results is not affected.

Due to an instrument malfunction, two EDB samples were analyzed 2 to 3 days outside the 14-day analysis holding time requirement. Due to the analysis holding time outliers, the detected result and nondetected LOQ for the analyte were qualified as estimated (J-) and (UJ), respectively. During the first-quarter 2011 groundwater monitoring event, the same samples were also analyzed for VOCs by SW8260B Method within the holding time requirement. The EDB results from the two methods were compared and found to be comparable.

1.3 Laboratory Method Blanks (Reason Code B1)

The field sample results were evaluated with respect to the laboratory method blank prepared and analyzed for each analytical batch and for each analytical method. Positive results in the laboratory method blanks for SW8260B and SW8270C Methods were observed and are summarized below:

Analytical Method	Laboratory QC Batch #	Contaminant	Contaminant Level (ppb)	LOQ (ppb)	Qualifier
SW8260B	IB09001	Hexachlorobutadiene	0.471	1.0	U for the analyte in GW8004-TB
SW8260B	IB15004	Hexachlorobutadiene	0.754	1.0	U for the analyte in GW0026
SW8260B	IB17009	Acetone	3.62	10	U for the analyte in GW0020
SW8260B	IB24021	Hexachlorobutadiene	0.317	1.0	U for the analyte in GW8018-TB
SW8270C	IB18006	1-Methylnaphthalene	0.0749	0.187	U for the analyte in GW0039-R
SW8270C	IB18006	2-Methylnaphthalene	0.259	0.187	U for the analyte in GW0039-R
SW8270C	IB18006	Naphthalene	0.184	0.187	U for the analyte in GW0039-R

Based on the DoD QSM requirements, laboratory method blank levels are considered acceptable when contaminant levels in the blank are less than one-half the LOQ for target analytes and less than the LOQ for common laboratory contaminants, such as acetone and methylene chloride. Except for batch IB15004 for hexachlorobutadiene and batch IB18006 for 2-methylnaphthalene and naphthalene, the listed laboratory method blank levels met the blank acceptance criteria. As a result of the blank detections, the detected results for hexachlorobutadiene, 1-methylnaphthalene, 2-methylnaphthalene, and naphthalene in the associated samples were qualified as non-detected (U) at their respective LOQs as the detected in the blank. The detected result for acetone was also qualified as non-detected (U) at the LOQ when the detected sample result was less than ten times the blank level. The blank qualification has no impact on the data usability.

In addition to the above, hexachlorobutadiene was reported at trace levels below the LOQ in 11 other laboratory method blanks. Because the analyte was not detected in any samples processed with those laboratory method blanks, the sample results were not affected by the blank detections. Chloride was also reported at a level below the LOQ in one laboratory method blank. The detected chloride results in all associated samples exceeded five times the blank level, and thus the results were not affected by the blank detection. No data qualification was applied to the sample results because of the hexachlorobutadiene and chloride detections. All laboratory method blanks were free of EDB, TPH gasoline and diesel, metals, sulfide, and alkalinity.

1.4 Initial and Continuing Calibration Blanks (Reason Code B2)

In addition to the laboratory method blank for metals, anions, and ammonia analyses, initial and continuing calibration blank results were reviewed to ensure that the instrument was free of contamination prior to the analyses. Positive results in calibration blanks were observed for EPA Method 300.0 and SW6010B Method and are shown below:

Analytical Method	Laboratory QC Batch #	Contaminant	Contaminant Level (ppm)	LOQ (ppm)	Qualifier
EPA 300.0	IB04712-CCB3	Chloride	0.578	1.0	None
EPA 300.0	IB03813-CCB1	Chloride	0.354	1.0	None
EPA 300.0	IB03813-CCB3	Chloride	0.366	1.0	None
EPA 300.0	IB04809-CCB2	Chloride	0.207	1.0	None
SW6010B	IB03704-CCB1	Iron	39.8	LOD: 60	None

Except for batch (IB04712-CCB3) for chloride, the chloride detections in all other calibration blanks were below one-half the LOQ, and the iron detection in one calibration blank was less than the limit of detection (LOD), and thus met the calibration blank acceptance criteria. All listed calibration blank detections did not affect the quality of the sample results as the detected chloride results in the associated samples were greater than five times the level reported in the continuing calibration blank, and iron was not detected in any associated samples. No data qualification was warranted because of the calibration blank detections. All initial and continuing calibration blanks were free of ammonia as nitrogen.

1.5 Surrogate Recoveries (Reason Code S)

Surrogate standards are organic compounds added to field and laboratory QC samples for organic analysis to evaluate matrix effect and method performance on an individual sample basis. Biased surrogate recoveries were noted for SW8260B and SW8015B Methods as summarized below:

Analytical Method	Sample	Surrogate Recovery Outlier (%)	Control Limit (%)	Qualifier
SW8260B	GW0038	Dibromofluoromethane: 116%	85-115%	None
SW8015B TPH Diesel (C10-C28)	GW005	o-Terphenyl: diluted out	30-140%	None
SW8015B TPH Diesel (C10-C28)	GW006	o-Terphenyl: diluted out	30-140%	None

In sample GW0038, the surrogate dibromofluoromethane was recovered slightly above the upper control limit, however the recoveries of the remaining surrogates bromofluorobenzene, 1,2-dichloroethane-d4, and toluene-d8 in the same sample were within the control range. Since no VOCs were detected in the sample, the high biased surrogate recovery of dibromofluoromethane did not affect the sample results. In samples GW005 and GW006 for TPH diesel analysis, elevated TPH diesel concentrations were observed and exceeded the instrument upper calibration range. In order to bring the sample results within the range, samples GW005 and GW006 were diluted at 100 and 200 dilution factors, respectively, and consequently, the surrogate o-terphenyl was diluted out. Data qualification was not applied to the TPH diesel results because of the dilutions.

Except where noted, surrogate recoveries in other samples analyzed for VOCs, SVOCs, TPH gasoline, and TPH diesel met the acceptance criteria. No surrogates were spiked into any samples analyzed for EDB before purging. The bias of the EDB analysis was assessed through LCS/LCSD and MS/MSD analyses.

1.6 Laboratory Control Sample/Laboratory Control Sample Duplicate Recoveries (Reason Code L)

The LCS is an aliquot of analyte-free matrix spiked with target analytes and is prepared with each analytical batch for each analytical method. The recovery of target analytes from the LCS analysis is a measurement of method performance in an interference-free sample matrix. LCS recovery biases were reported for SW8260B and SW8270C Methods as presented below:

Analytical Method	Laboratory QC Batch #	LCS Recovery Outliers (%)	Control Limit (%)	Qualifier
SW8260B	IB09001	2,2-Dichloropropane: 68%	70-135%	UJ for non-detected analyte in GW0034, GW8004-TB
SW8260B	IB14003	2,2-Dichloropropane: 84/65.5%	70-135%	UJ for non-detected analyte in GW0025, GW0027, GW8001-AB, GW8001-RB, GW8001-TB
SW8260B	IC12006	Isopropylbenzene: 127%	75-125%	J+ for detected analyte in GW0018
SW8270C	IB11003	Caprolactam: 18/17%	20-110%	UJ for non-detected analyte in GW0033 and GW0034
SW8270C	IB11003	Hexachlorobudatiene: 19/28%	25-105%	UJ for non-detected analyte in GW0033 and GW0034
SW8270C	IB11003	Hexachloroethane: 17/21%	30-100%	UJ for non-detected analyte in GW0033 and GW0034

Due to the low LCS/LCSD recovery biases, the LOQs for the non-detected results 2,2-dichloropropane, caprolactam, hexachlorobutadiene, and hexachloroethane were qualified as estimated (UJ). As a result of the high LCS/LCSD recovery bias, the detected result for isopropylbenzene was qualified as estimated (J+). This data qualification was applied to all samples in the non-compliant batches. As shown above, the reported LCS recovery biases did not significantly deviate from their respective lower or upper control limit, and therefore the data usability is not affected. As discussed above, surrogate recoveries in the qualified samples met the accuracy (bias) requirements and demonstrated acceptable laboratory method performance on a sample basis.

In addition to the above, high LCS recovery biases were noted for other VOCs and SVOCs in several batches. The non-compliant analytes included bromodichloromethane, dichlorodifluoromethane,

1,1,1,2-tetrachloroethane, 1,2-dichloroethane, bromomethane, and bromoform analyzed by SW8260B Method, and butylbenzylphthalate and 4-nitroaniline analyzed by SW8270C Method. Because these analytes were not detected in any samples, the sample results were not affected by the high LCS recovery biases and no data qualification was warranted.

The LCS bias and precision results met the acceptance criteria for EDB, TPH gasoline and diesel, metals, ammonia, anions, sulfide, and alkalinity analyses.

1.7 Matrix Spike/Matrix Spike Duplicate Recoveries (Reason Code M)

The MS and MSD samples are a portion of a field sample spiked with target analytes and are prepared with each analytical batch. The MS/MSD results are used to evaluate any bias introduced to the method due to matrix interference, and to measure bias and precision for each analytical batch.

In accordance with the QAPjP requirements (Shaw, 2011), the MS/MSD samples are to be collected at a rate of one per 20 groundwater samples. During the first-quarter 2011 groundwater monitoring event, two MS/MSD samples were collected from locations KAFB-10610 and KAFB-10624, and therefore met the MS/MSD sample frequency requirement. The laboratory performed additional MS/MSD analyses on Kirtland site-specific groundwater samples to verify presence of a matrix effect and its potential impact on the precision and bias of the analytical results.

The following Kirtland site-specific groundwater samples were spiked for MS/MSD analysis:

Well Location	Sample Number	MS/MSD Analysis
KAFB10610	GW0011	VOCs, EDB, TPH gasoline and diesel, metals, anions, ammonia as
		nitrogen, sulfide, and alkalinity
KAFB10624	GW0026	VOCs, EDB, TPH gasoline and diesel, metals, anions, ammonia as
		nitrogen, sulfide, and alkalinity
KAFB1064	GW0004	Metals, TPH gasoline, and metals
KAFB3411	GW0032	Ammonia as nitrogen and alkalinity
KAFB1062	GW0002	Anions

Well Location	Sample Number	MS/MSD Analysis
KAFB10623	GW0025	Anions
KAFB10645	GW0034	TPH gasoline and anions
KAFB10612	GW0013	Alkalinity
KAFB10644	GW0033	Alkalinity

The RPDs between the MS and MSD recoveries met the precision acceptance criteria for all the listed analyses, however MS recovery biases were observed for alkalinity, anions, sulfide, metals, EDB, TPH gasoline and diesel, and VOCs analyses, as summarized below:

Analytical	Spiked		Control Limit	0
Method	Sample	MS Recovery Outliers (%)	(%)	Qualifier
SM2300B	GW0032	Alkalinity: 149/148%	80-120%	J+ for detected analyte in GW0032
EPA 300.0	GW0034	Chloride: 108/125%	80-120%	J+ for detected analyte in GW0034
SW8260B	GW0011	Bromodichloromethane: 145/129%	75-120%	None
SW8260B	GW0011	Dichlorodifluoromethane: 185/175%	30-155%	None
SW8260B	GW0011	1,2-Dichloroethane: 131/117%	70-130%	None
SW8260B	GW0011	1,1,1,2-Tetrachloroethane: 134/122%	80-130%	None
SW8260B	GW0011	1,1,1-Trichloroethane: 133/122%	65-130%	None
SW8260B	GW0011	Trichlorofluoromethane: 146/125%	60-145%	None
SW8260B	GW0011	Toluene: 88/74%	75-120%	J- for detected analyte in GW0011
SW8015B	GW0011	TPH gasoline: -1555/-1280%	50-150%	None
SW8015B	GW0011	TPH diesel: -343/292%	50-150%	None
SW8011	GW0011	EDB: 4660/4700%	70-130%	None
SM4500S2CF	GW0011	Sulfide: 71/67%	75-125%	UJ for non-detected analyte in GW0011
SM4500S2CF	GW0026	Sulfide: 60.7/60.7%	75-125%	UJ for non-detected analyte in GW0026
SM2320B	GW0033	Alkalinity: 127/126%	75-125%	J+ for detected analyte in GW0033
SW6010B	GW0026	Calcium: 49/43%	80-120%	None
SW6010B	GW0026	Sodium: 57/65%	80-120%	None
SW8260B	GW0026	Bromodichloromethane: 127/132%	75-120%	None
SW8260B	GW0026	Dichlorodifluoromethane: 167/169%	30-155%	None

As a result of the MS recovery biases, the LOQ for the non-detected result sulfide and the detected results for alkalinity, chloride, and toluene in the spiked samples were qualified as estimated UJ and J+/J-, respectively. There is no impact on the data usability because of the minor MS/MSD recovery biases. The

associated LCS recoveries for sulfide, alkalinity, anions, and VOCs analyses met the acceptance criteria indicating acceptable laboratory method performance for all the samples in the batch.

In addition, high MS/MSD recovery biases were reported for EDB; while low MS/MSD recovery biases were observed for TPH gasoline, diesel, and metals analyses as listed above. In those spiked samples, concentrations for TPH gasoline and diesel, EDB, and metals well exceeded four times their spike levels. These elevated sample concentrations produced a matrix effect which led to the MS/MSD recovery biases. Since sample concentrations were greater than four times the spike levels, no data qualification was applied to the TPH gasoline, diesel, EDB, and metals results.

The analytes bromodichloromethane, dichlorodifluoromethane, 1,2-dichloroethane,

1,1,1,2-tetrachloroethane, 1,1,1-trichloroethane, and trichlorofluoromethane were not detected in the spiked samples, and thus the sample results were not affected by the high MS/MSD recovery biases and no data qualification was necessary.

Except where noted, the MS precision and bias results were acceptable for all other analyses.

1.8 Initial Calibration (Reason Code G)

Instrument calibration is performed for VOCs, PAHs, SVOCs, EDB, TPH gasoline and diesel, metals, anions, and ammonia analyses according to the EPA method requirements. The linear analytical range is established for each method by analysis of standards prepared at increasing concentrations that cover the expected sample concentrations. The acceptability of the initial calibration is determined by calculation of a percent relative standard deviation or coefficient. The initial calibration results were acceptable for all the listed methods.

Immediately after the initial calibration for each method, an initial calibration verification (ICV) was conducted at the mid-point of instrument calibration range by using a second source calibration standard to verify the accuracy of the initial calibration. A percent difference (%D) between the reported concentration and expected concentration for VOC analysis exceeded the acceptance criteria as summarized below:

Analytical Method	Instrument#	ICV Outliers (%)	Control Limit (%)	Qualifier	
SW8260B	MSVOA3	Dichlorodifluoromethane: +43%	<20%	None	

Because the analyte dichlorodifluoromethane was not detected in any associated samples, the high biased %D did not affect the sample results and no data qualification was warranted. Except where noted, the ICV results met the acceptance criteria for all other analyses.

1.9 Continuing Calibration Verification (Reason Code C)

Routinely during sample analysis, the stability of the analytical system is monitored by analysis of continuing calibration standards at concentrations near the mid-point of the linear range. Percent differences between the relative response factor (RRF) in the initial calibration and the RRF in the continuing calibration exceeded the acceptance criteria for VOCs, SVOCs, TPH diesel, and anions analyses. The continuing calibration outliers that resulted in data qualification are summarized below:

Analytical Method	Calibration ID	CCV Outlier (%)	Control Limit (%)	Qualifier
SW8260B	IB03303-CCV1	Bromomethane: -41.4%	<20%	UJ for non-detected analyte in GW0002, GW0003, GW0004, and GW8003-TB
SW8260B	IB03303-CCV1	Chloromethane: -24.2%	<20%	UJ for non-detected analyte in GW0002, GW0003, GW0004, and GW8003-TB
SW8260B	IB03303-CCV1	Dichlorodifluoromethane: -21.4%	<20%	UJ for non-detected analyte in GW0002, GW0003, GW0004, and GW8003-TB
SW8260B	IB03305-CCV1	Bromomethane: -40.7%	<20%	UJ for non-detected analyte in GW0001, GW0017, GW0032,

Analytical			Control	
Method	Calibration ID	CCV Outlier (%)	Limit (%)	Qualifier
				GW8001-TB, and GW8002-TB
SW8260B	IB03305-CCV1	Chloromethane: -20.5%	<20%	UJ for non-detected analyte in GW0001, GW0017, GW0032, GW8001-TB, and GW8002-TB
SW8260B	IB05006-CCV1	Bromomethane: -43%	<20%	UJ for non-detected analyte in GW0020, GW0021, and GW8013-TB
SW8260B	IB05006-CCV2	Acetone: +29.4%	<20%	J+ for detected analyte in GW0019
SW8260B	IB05006-CCV2	Bromomethane: -39.9%	<20%	UJ for non-detected analyte in GW0019
SW8260B	IB050401-CCV1	Acetone: +39%	<20%	J+ for detected analyte in GW0011 and GW0031
SW8260B	IB050401-CCV1	Bromomethane: -28.8%	<20%	UJ for the analyte in GW0011 and GW0031
SW8260B	IB050401-CCV1	2-Butanone: +35.6%	<20%	J+ for detected analyte in GW0011
SW8260B	IB050401-CCV1	4-Methyl-2-Pentanone: +47.2%	<20%	J+ for detected analyte in GW0011 and GW0031
SW8260B	IB05611-CCV1	Acetone: +52.6%	<20%	J+ for detected analyte in GW0009
SW8260B	IB05611-CCV1	2-Butanone: +23.2%	<20%	J+ for detected analyte in GW0009
SW8260B	IB05611-CCV1	2-Hexanone: +23.2%	<20%	J+ for detected analyte in GW0009
SW8260B	IB05611-CCV1	4-Methyl-2-Pentanone: +35.5%	<20%	J+ for detected analyte in GW0009
SW8260B	IB05612-CCV1	Acetone: +55%	<20%	J+ for detected analyte in GW0015, GW0005, GW0006, and GW0007
SW8260B	IB05612-CCV1	2-Butanone: +30.4%	<20%	J+ for detected analyte in GW0015, GW0005, GW0006
SW8270C	IB04714-CCV1	Benzaldehyde: - 40.8%	<20%	UJ for non-detected analyte GW0033 and GW0034
SW8270C	IB04714-CCV1	Benzidine: - 54.5%	<20%	UJ for non-detected analyte GW0033 and GW0034
SW8015B	IC06012-CCV2	TPH diesel: +40.7%	<20%	J+ for detected analyte in GW0005, GW0006, and GW0007
EPA 300.0	IB03813-CCV1	Sulfate: +11%	<10%	J+ for detected analyte GW0001

As a result of the low biased percent differences, the LOQs for the non-detected results bromomethane, chloromethane, and dichlorodifluoromethane analyzed by SW8260B Method, and benzaldehyde and benzidine analyzed by SW8270C Method were qualified as estimated (UJ) in all samples associated with the non-compliant continuing calibrations. The high biased percent differences led to qualification of the detected results for acetone, 2-butanone, 2-hexanone, 4-methyl-2-pentanone, TPH diesel, and sulfate as estimated (J+) in the affected samples. There is no impact on the data usability because of the continuing calibration outliers.

Additionally, high biased percent differences were reported for other VOCs and SVOCs. Because these analytes were not detected in samples associated with the calibration outliers, the high biased percent differences did not affect the sample results and therefore did not lead to any data qualification.

Except where noted above, the continuing calibration results were acceptable for all other analyses.

1.10 Interference Check Samples (Reason Code O)

The ICP interference check sample (ICS) verifies the interelement and background correction factors. An ICS was analyzed at the beginning and end of each analytical sequence. All ICS results were within the established control limit.

1.11 ICP Serial Dilution (Reason Code A)

The ICP serial dilution determines whether significant physical or chemical interferences exist due to sample matrix. An ICP serial dilution was performed on two project samples GW0011 and GW0026. The ICP serial dilution results were acceptable for both samples.

1.12 Sample Confirmation

As required by the DoD and EPA, when samples are analyzed by either a gas chromatography or highperformance liquid chromatography method, all positive results with the exception of TPH gasoline and diesel, must be confirmed by a second column or a different detector. As indicated in all six SDGs for the sampling event, all positive EDB results for SW8011 method were confirmed by a second column, and the precision results between the primary and secondary columns were within the precision control limit for all the detected samples. In all cases, the higher detection from either the primary or secondary column was reported.

1.13 Ambient Blanks (Reason Code K2)

Ambient blanks serve as a check on environmental contamination from contaminants in air at a sampling location. The ambient blank is prepared by pouring distilled water into a clean sample container in the field, and exposing this blank in the field at the time of sample collection and at a particular well location.

During the first-quarter 2011 groundwater monitoring event, one ambient blank sample (GW8001-AB) was collected on February 8, 2011 from location KAFB-10623 and a second ambient blank (GW8002-AB) was collected on February 15, 2011 from location KAFB-10620. Both ambient blanks were submitted to the laboratory for VOC analysis. One positive result in the blank is reported and summarized below:

Analytical Method	Well Location	Contaminant	Contaminant Level (ppb)	LOQ (ppb)	Qualifier
SW8260B	KAFB-10620	Acetone	9.75	1.0	U for the analyte in GW0022

On February 15, a groundwater sample GW0022 was collected from well KAFB-10620 where the ambient blank (GW8002-AB) was collected. Acetone was reported at 3.26 ppb and 9.75 ppb in the groundwater sample and the ambient blank, respectively. Although acetone is a common laboratory contaminant, the analyte in the laboratory method blank processed with the groundwater and ambient blank samples was not detected. Due to the ambient blank detection, the detected result for acetone in sample GW0022 was qualified as non-detected (U) at the LOQ. There is no impact on the data usability because of the blank qualification. Except for acetone, no other VOCs were detected in the ambient blank (GW8002-AB). The second ambient blank was free of any VOCs.

1.14 Trip Blanks (Reason Code K3)

Trip blanks were prepared by the laboratory and stored with the groundwater samples collected for VOC analysis. Samples for VOC analysis were maintained in as few coolers as possible to minimize the number of required trip blanks. One trip blank was submitted with VOC samples collected on each day from January 25 through March 9, 2011, which resulted in a total of 20 trip blanks for the entire sampling event. Positive results in the trip blanks are summarized below:

Analytical Method	Trip Blank	Contaminant	Contaminant Level (ppb)	LOQ (ppb)	Qualifier
SW8260B	GW8001-TB	lsopropylbenzene	0.701	1.0	U for the analyte in GW0001
SW8260B	GW8002-TB	Isopropylbenzene	0.706	1.0	U for the analyte in GW0017, GW0032
SW8260B	GW8004-TB	Hexachlorobutadiene	0.373	1.0	None
SW8260B	GW8005-TB	Hexachlorobutadiene	0.453	1.0	None
SW8260B	GW8011-TB	Hexachlorobutadiene	0.349	1.0	None
SW8260B	GW8014-TB	Hexachlorobutadiene	0.279	1.0	None
SW8260B	GW8014-TB	Methylene Chloride	1.52	10	None
SW8260B	GW8015-TB	Trichloroethene	0.265	1.0	None
SW8260B	GW8017-TB	Trichloroethene	0.298	1.0	None
SW8260B	GW80013-TB	Hexachlorobutadiene	0.352	1.0	none
SW8260B	GW8020-TB	Methylene Chloride	0.567	10	None

As indicated above, the majority of the trip blank levels were less than one-half the LOQs for target analytes and less than the LOQ for laboratory common contaminants, such as methylene chloride. Therefore these blank levels met the blank acceptance criteria. Due to the trip blank detections, the detected results for isoproplybenzene in three samples shipped with the trip blanks were qualified as nondetected (U). Although hexachlorobudadiene, methylene chloride, and trichloroethene were also reported in the trip blanks, these analytes were not detected in any associated groundwater samples, and therefore the sample results were not affected by the trip blank detections. The remaining 10 trip blanks were free of any VOCs. Overall, the trip blank results were acceptable, indicating good sample storage and shipping procedures.

1.15 Equipment Rinse Blanks (Reason Code K1)

Equipment rinse blanks are designed to check for contamination from sampling equipment and the results of the equipment rinse blanks are used for evaluating the efficiency of equipment decontamination procedures.

During the first-quarter 2011 groundwater monitoring event, two equipment rinse blanks (GW8001-RB and GW8002-RB) were collected on February 8 and 15, respectively when non-dedicated sampling equipment was used to collect groundwater samples. These two equipment rinse blank samples were prepared by rinsing the decontaminated pump with the distilled water obtained from the laboratory and then collecting the final rinse into appropriate sample containers. Both equipment rinse blank samples were analyzed for VOCs, TPH gasoline and diesel, and metals.

Analytical Method	Equipment Rinse Blank	Contaminant	Contaminant Level (ppb)	LOQ (ppb)	Qualifier
SW8260B	GW8001-RB	Benzene	0.6	1.0	None
SW8260B	GW8001-RB	Ethylbenzene	0.332	1.0	None
SW8260B	GW8001-RB	Toluene	2.52	1.0	U for the analyte in GW0025 and GW0027
SW8260B	GW8001-RB	m,p-xylene	0.751	2.0	None
SW8260B	GW8002-RB	Acetone	14.3	10	U for the analyte in GW0022
SW8260B	GW8002-RB	Toluene	3.84	1.0	U for the analyte in GW0022
SW6010B	GW8002-RB	Iron	36.0	100	None
SW6010B	GW8002-RB	Manganese	6.84	15	U for the analyte in GW0022

Positive results observed in the equipment rinse blanks are presented below:

As noted by the sampling team, the equipment rinse blank detections may be attributed to vehicle exhaust from vehicles in the areas of sampling. As a result of the blank detections, the detected results for acetone, toluene, and manganese in the associated groundwater samples were qualified as non-detected (U) at their reported value. There is no impact on the data usability because of the blank qualification. Since benzene, ethylbenzene, m,p-xylene, and iron were not detected in the associated samples, the blank detections did not affect the sample results. Both equipment rinse blanks were free of TPH gasoline and diesel.

A portable pump was used to collect a majority of the groundwater samples for the first-quarter 2011 groundwater monitoring event; however, no additional equipment rinse blanks were collected to verify equipment decontamination procedure.

1.16 Field Duplicates

In accordance with the site-specific BFF Spill QAPjP (Shaw, 2011) requirements, field duplicate samples are to be collected at a minimum rate of 10 percent of the total number of groundwater samples. Field duplicate samples are evaluated by calculating the RPD between the sample and its duplicate. The RPD is calculated using the following equation:

$$RPD = \frac{(S-D)}{[(S+D)/2]} \times 100$$

where:

S = sample result D = duplicate result

Acceptable precision control criteria are established at less than or equal 35 percent for water samples.

The RPD is calculated between pairs of field duplicate samples when both results are reported above the

LOQ.

Two duplicate pairs were collected for the first-quarter 2011 groundwater monitoring event. Therefore, the 10 percent field duplicate frequency requirement was missed. The duplicate pairs were collected from locations KAFB-10626 and KAFB-10618 and analyzed for VOCs, EDB, TPH gasoline and diesel, metals, anions, sulfide, ammonia, and alkalinity. The field duplicate results are presented below:

Analytical Method	Analyte	KAFB10626 Sample ID: GW0028 and Concentration	KAFB10626 Duplicate ID: GW0029 and Concentration	RPD%	Control Limit
SW8260B	Toluene, ppb	5.10	4.98	2.4%	<35%
SW6010B	Calcium, ppb	77,100	76.500	0.8%	<35%
SW6010B	Magnesium, ppb	10,600	10,400	1.9%	<35%
SW6010B	Sodium, ppb	38,800	36,700	5.6%	<35%
SM2320B	Alkalinity, ppm	86.2	86.6	0.5%	<35%
EPA 300.0	Chloride, ppm	96.8	96.9	0.1%	<35%
EPA 300.0	Nitrate, ppm	4.52	4.52	0%	<35%
EPA 300.0	Sulfate, ppm	83.9	84.1	0.2%	<35%
Analytical Method	Analyte	KAFB-10618 Sample ID: GW0019 and Concentration	KAFB-10618 Duplicate ID: GW0020 and Concentration	RPD%	Control Limit
SW8260B	1,2-Dichloroethane, ppb	2.29	2.03	12%	<35%
SW8260B	1,2,4-Trimethylbenzene, ppb	30.6	29.5	3.7%	<35%
SW8260B	1,3,5-Trimethylbenzene, ppb	10.4	10.4	0.0%	<35%
SW8260B	4-Methyl-2-Pentanone, ppb	9.79	8.35	15.9%	<35%
SW8260B	Benzene, ppb	34.9	26.8	26.3%	<35%
SW8260B	Isopropylbenzene, ppb	17.4	12.1	35.9%	<35%
SW8260B	Naphthalene, ppb	1.33	1.24	7.0%	<35%
SW8260B	Toluene, ppb	12.7	9.74	26.4%	<35%
SW8260B	m,p-Xylene, ppb	65.7	62.9	4.4%	<35%
SW8260B	n-Propylbenzene, ppb	4.04	2.33	53.7%	<35%

Analytical Method	Analyte	KAFB10626 Sample ID: GW0028 and Concentration	KAFB10626 Duplicate ID: GW0029 and Concentration	RPD%	Control Limit
SW8260B	o-Xylene, ppb	5.22	4.66	11.3%	<35%
SW8260B	sec-Butylbenzene, ppb	1.87	1.42	27.4%	<35%
SW8260B	tert-butylbenzene, ppb	1.11	1.06	4.6%	<35%
SW8015B	TPH-gasoline, ppm	1.02	1.03	1.0%	<35%
SW8015B	TPH-diesel, ppm	4.48	4.05	10.1%	<35%
SW8011	EDB, ppb	0.864	0.95	9.5%	<35%
SW6010B	Calcium, ppb	42,000	44,6000	6.0%	<35%
SW6010B	Magnesium, ppb	5,990	6,380	6.3%	<35%
SW6010B	Sodium, ppb	24,700	26,600	7.4%	<35%
SW6010B	Iron, ppb	120	125	4.1%	<35%
SW6010B	Manganese, ppb	844	844	0.0%	<35%
EPA 300.0	Chloride, ppm	18.3	18.6	1.6%	<35%
EPA 300.0	Sulfate, ppm	39.2	39.9	1.8%	<35%
SM2300B	Alkalinity, ppm	129	129	0.0%	<35%

Except for isopropylbenzene and n-propylbenzene at location KAFB-10618, the RPDs for all other listed parameters were between 0 and 27.4 percent, well within the 35 percent field duplicate precision goal. The RPDs for isopropylbenzene and n-propylbenzene were 35.9 and 53.7 percent, respectively, exceeding the field duplicate precision limit. Approximately 94 percent of the field duplicate results were within the field duplicate precision limit, indicating overall acceptable field and analytical procedures.

1.17 Completeness

The following sections present a discussion of contractual, analytical, and technical completeness for the first-quarter 2011 groundwater monitoring event. Completeness calculations were performed only for the groundwater samples that were used for project decisions.

1.17.1 Contractual Completeness

Contractual completeness is a quantitative expression of how closely the laboratory adhered to the project requirements. The contractual completeness goal is 95 percent. Contractual completeness is calculated as follows:

% Contractual Completeness <u>Number of Unqualified Results</u> = Total Number of Results X 100

Contractual completeness is based on data qualified for QC outliers that are related to method performance and laboratory procedures only. These include data qualified for calibration or preparation blank contamination, missed holding times, and non-compliant LCS recovery and/or precision.

For the first-quarter 2011 groundwater monitoring event, the contractual completeness was 100 percent for TPH gasoline and diesel, metals, sulfide, ammonia as nitrogen, and alkalinity analyses. The 95-percent contractual completeness goal was also met for VOCs (99.8 percent), EDB (95 percent), and anions (96.7 percent). The contractual completeness goal was missed for SVOCs (47.8 percent) and PAHs (27.8 percent). As discussed previously, one SVOC sample and two PAH samples were extracted outside the 7-day extraction holding time requirement. Additional SVOCs and PAHs were qualified as non-detected or estimated due to laboratory method blank contamination and non-compliant LCS recoveries. The data usability is not affected because of these data quality issues.

1.17.2 Analytical Completeness

Analytical completeness is a quantitative expression of how closely the results adhered to all QC requirements based on the number of data points qualified for any reason. The analytical completeness goal is 90 percent. Analytical completeness is calculated as follows:

% Analytical Completeness =
$$\frac{\text{Number of Unqualified Results}}{\text{Total Number of Results}}$$
 X 100

Analytical completeness is based on samples qualified for any reason and includes all target analytes.

For the first-quarter 2011 groundwater monitoring event, the analytical completeness was 100 percent for TPH gasoline and ammonia as nitrogen analyses. The 90-percent analytical completeness objective was achieved for VOCs (98 percent), TPH diesel (92.5 percent), EDB (95 percent), metals (99.6 percent), sulfide and anions (95 percent), and alkalinity (97.5 percent). The 90-percent analytical completeness goal was not met for SVOCs (46.3 percent) and PAHs (27.8 percent) due to a combination of holding time exceedances, laboratory blank contamination, and calibration and LCS recovery outliers.

1.17.3 Technical Completeness

Technical completeness is a quantitative expression of the data usability based on the number of rejected data. For this project, the technical completeness for each method is established at equal to or greater than 95 percent. The technical completeness calculation considers all data that is not rejected to be usable and technical completeness is calculated as follows:

The technical completeness was 100 percent for all methods for the first-quarter 2011 groundwater monitoring event. Sufficient acceptable results were obtained to meet the project objectives.

1.18 Summary

The analytical data reported for this event have been reviewed for completeness, bias, and precision. Data quality issues observed consisted of holding time violations, biased surrogate, LCS/LCSD, MS/MSD recoveries, initial and continuing calibration outliers, and laboratory and field blank contamination. The

affected data was qualified as estimated or non detected. The 95-percent technical completeness goal was exceeded for all methods. All data are usable for their intended purposes.

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Table 1. Data Qualification Flags and Reason Codes

Data Qualifier Definitions for Organic Data Review

Qualifier	Definition		
	No Qualifier indicates that the data are acceptable both qualitatively and quantitatively.		
U	The analyte was analyzed for but was not detected above the reported sample quantitation limit.		
J	The analyte was analyzed for and was positively identified, but the reported numerical value may not be consistent with the amount actually present in the environmental sample. Results are estimated although the data are considered usable and may be used as appropriate to meet project objectives. Results are qualitatively acceptable and quantitatively uncertain.		
J-	The analyte was positively identified; associated numerical value is its approximate concentration with a low bias in the sample.		
J+	The analyte was positively identified; associated numerical value is its approximate concentration with a high bias in the sample.		
N	The analysis indicates the presence of an analyte for which there is presumptive evidence to make a "tentative identification."		
NJ	The analysis indicates the presence of an analyte that has been "tentatively identified" and the associated value represents its approximate concentration.		
UJ	The analyte was not detected above the reported sample quantitation limit. However, the reported quantitation limit is approximate and may or may not represent the actual limit of quantitation necessary to accurately and precisely measure the analyte in the sample.		
R	The analyte was analyzed for, but the presence <u>or</u> absence of the analyte has not been verified. Resampling and reanalysis may be necessary to confirm or deny the presence of the analyte. Results are rejected and data are <u>unusable</u> for any purposes.		

Data Qualifier Definitions For Inorganic Data Review

Qualifier	Definition
	No Qualifier indicates that the data are acceptable both qualitatively and quantitatively.
U	The analyte was analyzed for but was not detected above the level of the reported value. The reported value is the instrument detection limit for waters and the method detection limit (MDL) for soils for all the analytes except cyanide (CN) and mercury (Hg). For CN and Hg, the reported value is the contract-required detection limit.
J	The analyte was analyzed for and was positively identified, but the reported numerical value may not be consistent with the amount actually present in the environmental sample. Results are estimated although the data are considered usable and may be used as appropriate to meet project objectives. Results are qualitatively acceptable and quantitatively uncertain.
J-	The analyte was positively identified; associated numerical value is its approximate concentration with a low bias in the sample.
J+	The analyte was positively identified; associated numerical value is its approximate concentration with a high bias in the sample.
UJ	The analyte was analyzed for but was not detected above the reported value. The reported value may not accurately or precisely represent the sample reporting limit.
R	The analyte was analyzed for, but the presence <u>or</u> absence of the analyte has not been verified. Resampling and reanalysis may be necessary to confirm or deny the presence of the analyte. Results are rejected and data are <u>unusable</u> for any purposes.

Table 1. Data Qualification Flags and Reason Codes (concluded)

Reason Code	Description
A	Serial dilution outside criteria (Level IV).
B1	Method blank contaminants above reporting limit.
B2	Calibration blank contaminants above reporting limit.
B2, Bias Flag "-"	Calibration blank indicates negative interference, false negatives may be present.
С	Calibration outside control limits.
D1	Sample duplicate RPD outside control limit.
D2	Matrix duplicate RPD outside control limit.
E	The sample results exceed the linear calibration range of the instrument.
F	Hydrocarbon pattern does not match hydrocarbon pattern in the standard.
G1	Initial calibration relative standard deviation outside control limit.
G2	Initial continuing calibration RRF outside control limit.
G3	Continuing calibration RRF outside control limit.
Н	Holding time exceeded.
	Internal standard recovery outside control limit.
K1	Equipment rinsate contamination.
K2	Ambient blank contamination.
K3	Trip blank contamination.
L	LCS outside control limits.
M	MS outside control limits.
0	Interference check sample outside acceptance criteria.
P	Analyte qualified based on the professional judgement of the reviewer.
S	Surrogate recovery outside control limit.
Τ	Temperature outside acceptance criteria.
Tr	Value reported detected between the MDL and practical quantitation limit.
W	Pesticide breakdown outside criteria (Level IV).
Х	Raised reporting limit due to matrix interference or high analyte concentration.
Y	Analyte was not confirmed by a second column.
Y1	Primary and confirmation sample duplicate RPD outside control limit.

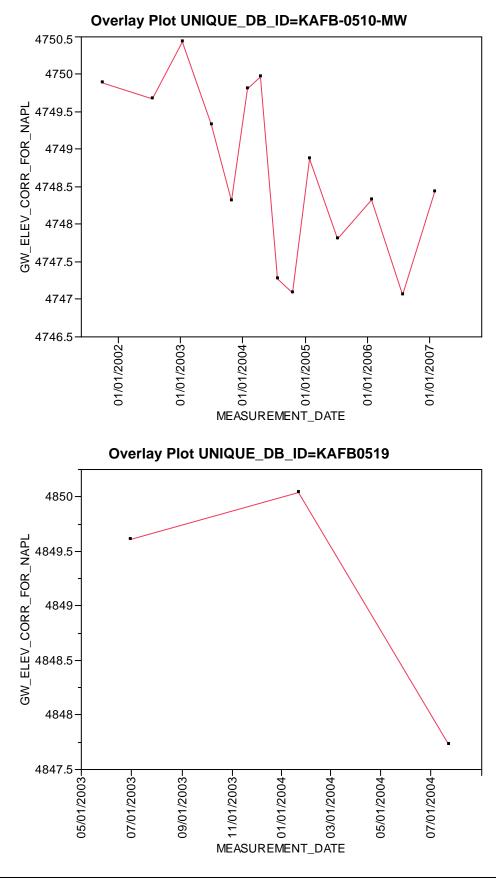
Reason Codes for Data Review and Validation

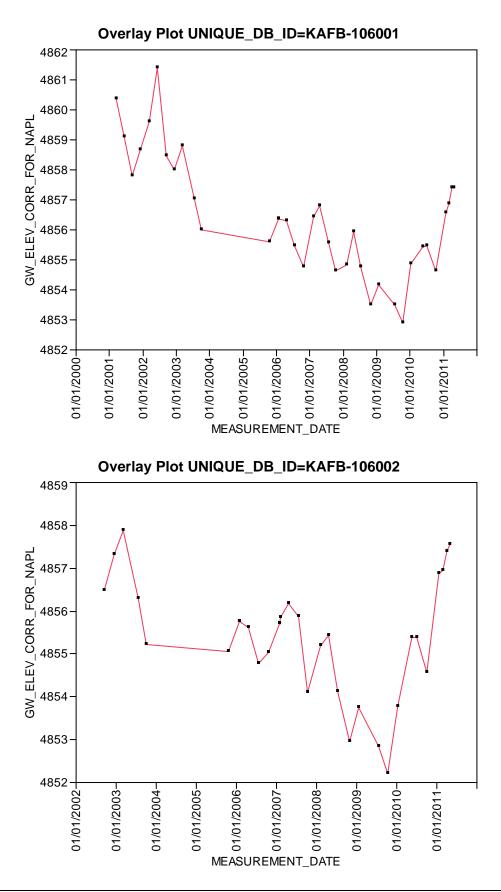
APPENDIX F

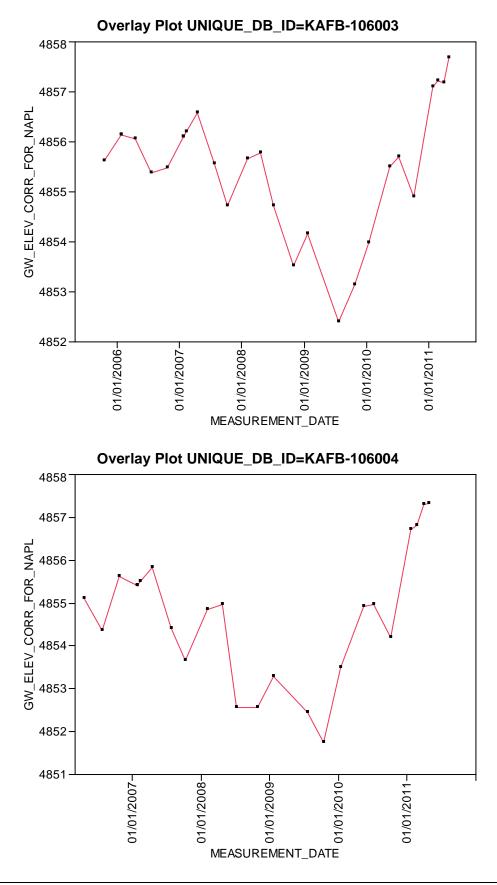
Hydrographs January – March 2011

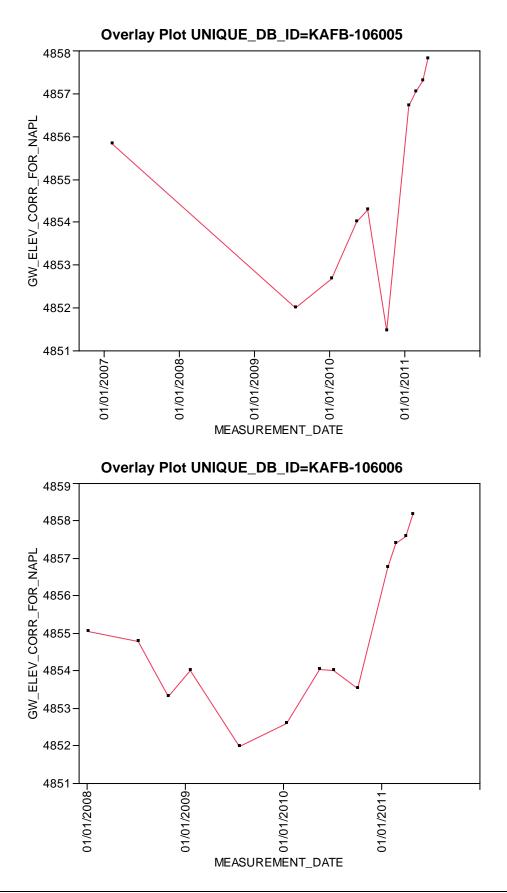
APPENDIX F-1

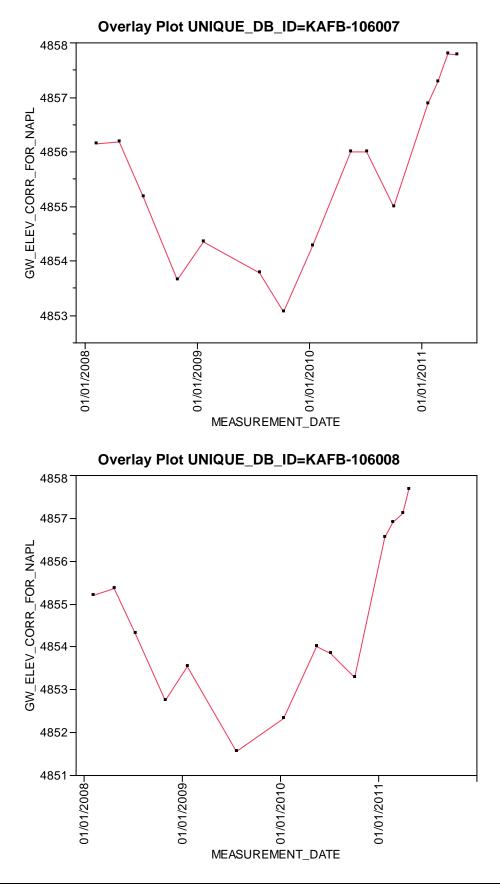
Water-Level Hydrographs January – March 2011

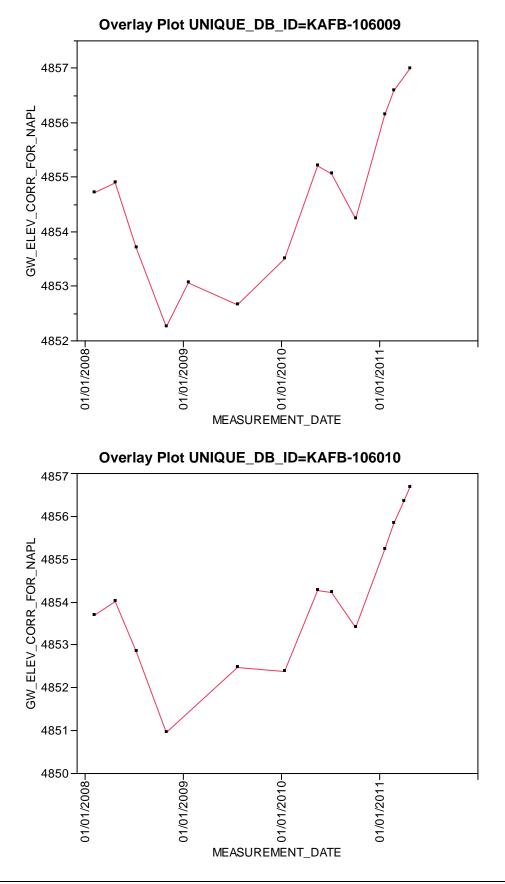


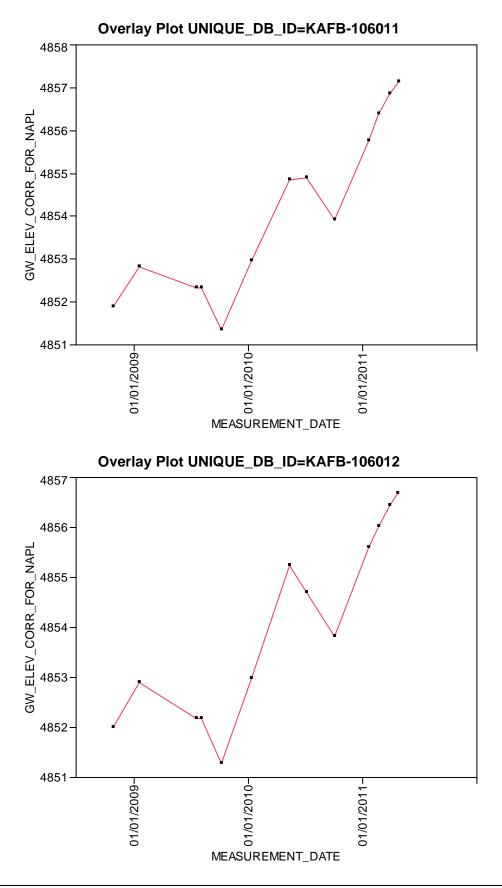


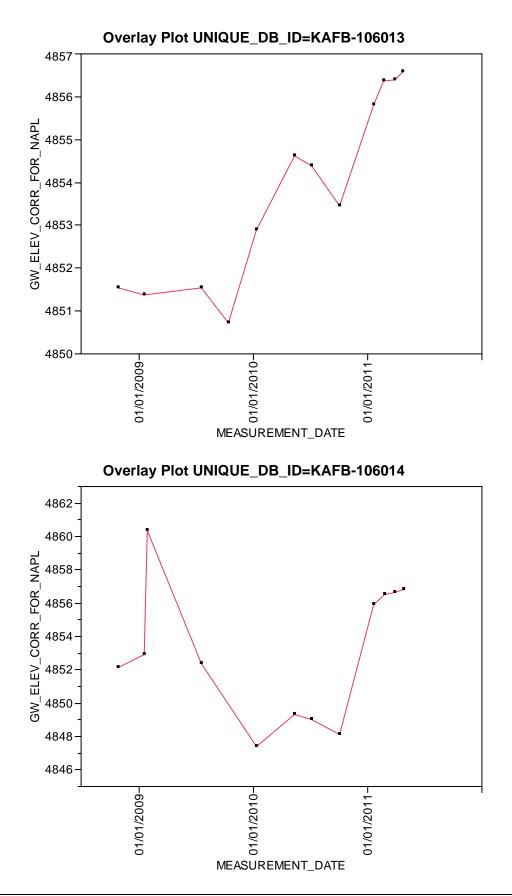


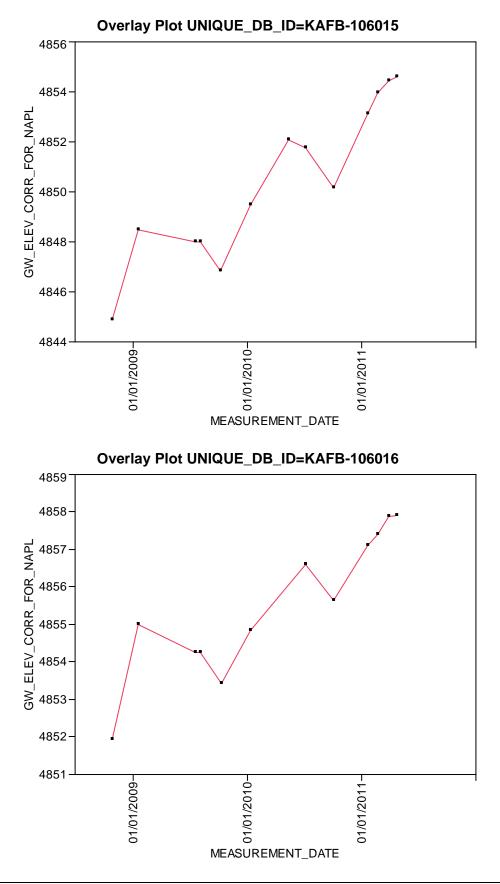


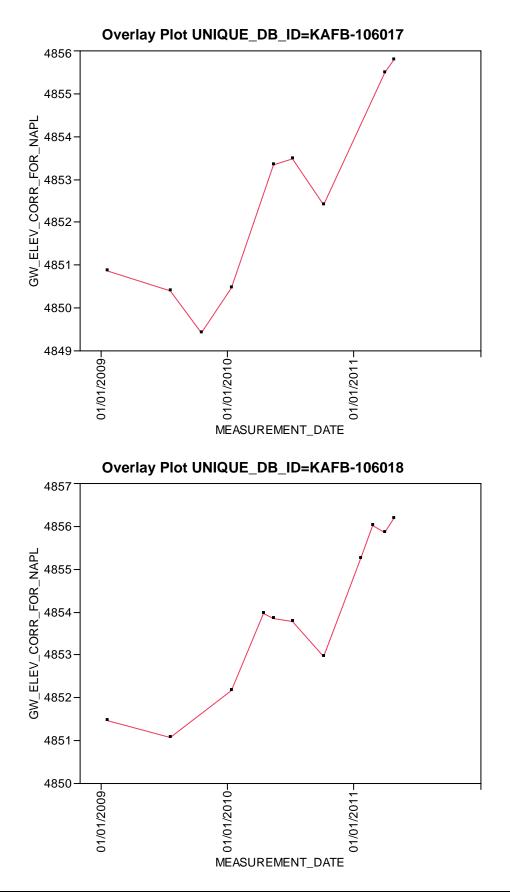


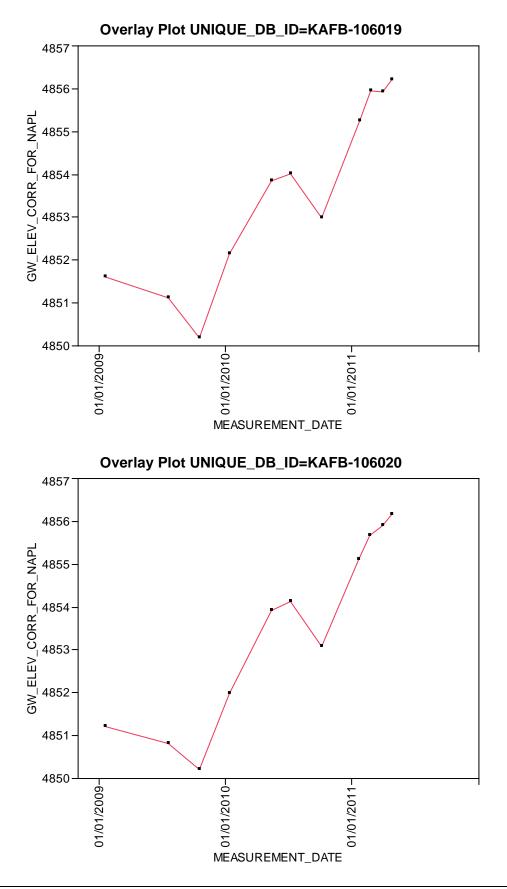


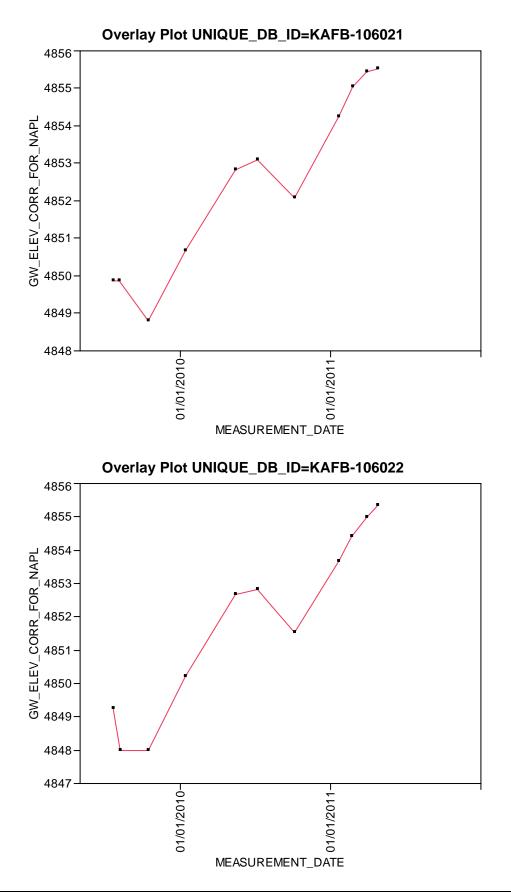


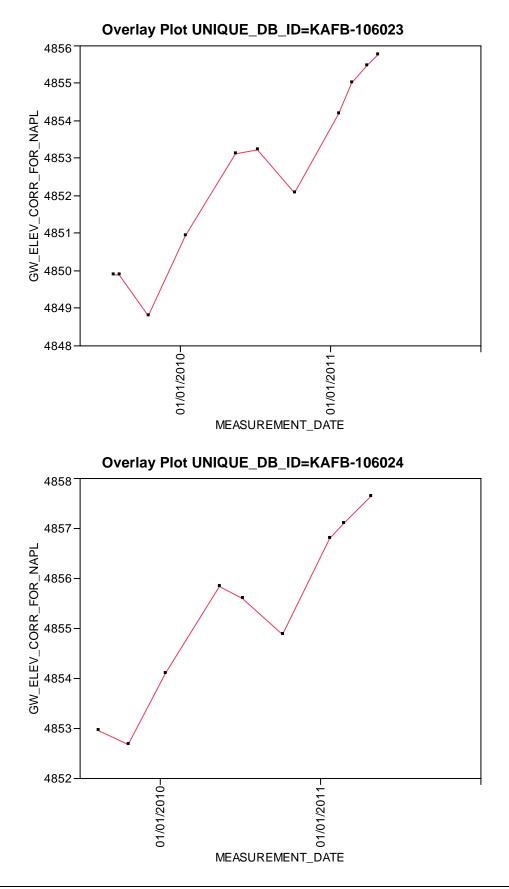


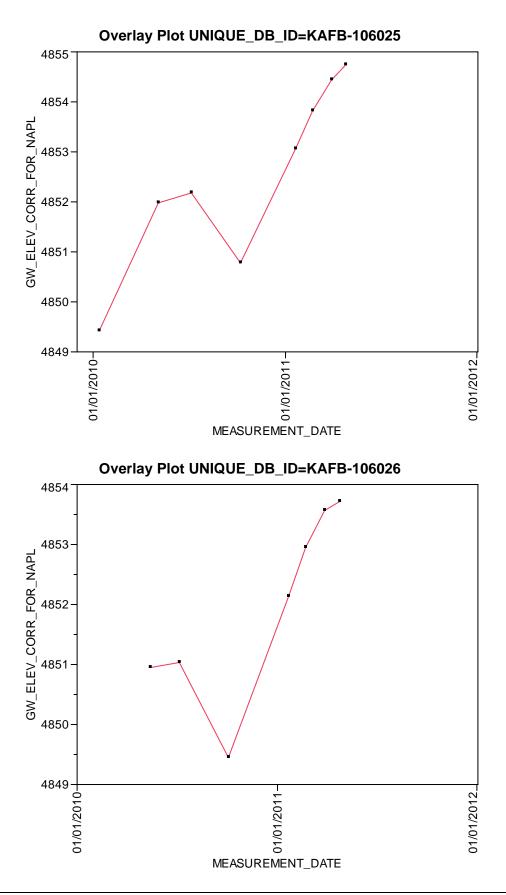


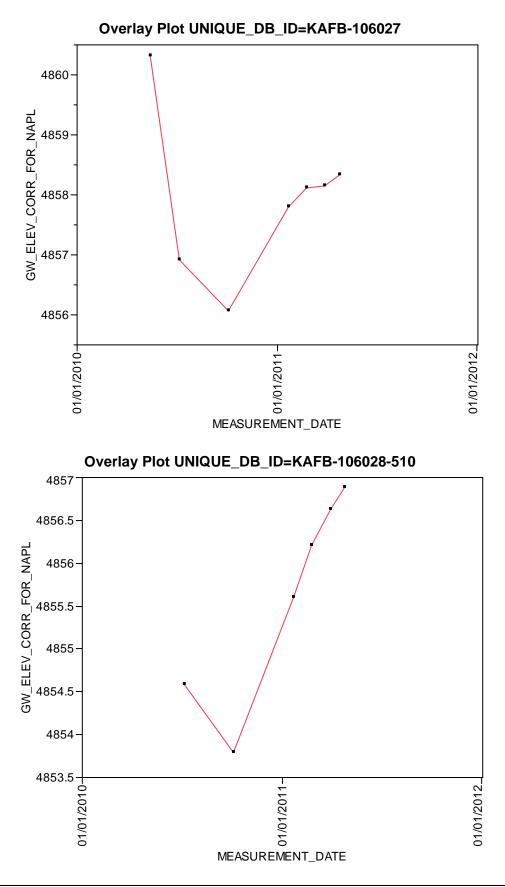


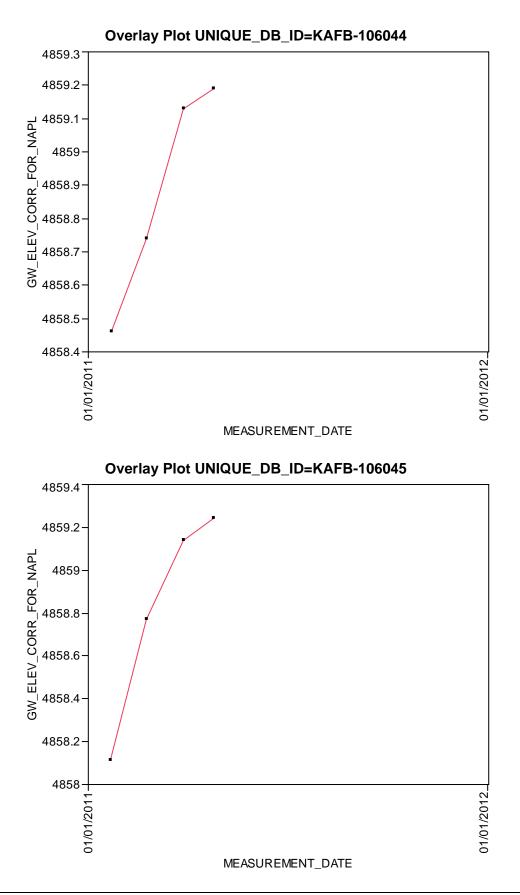


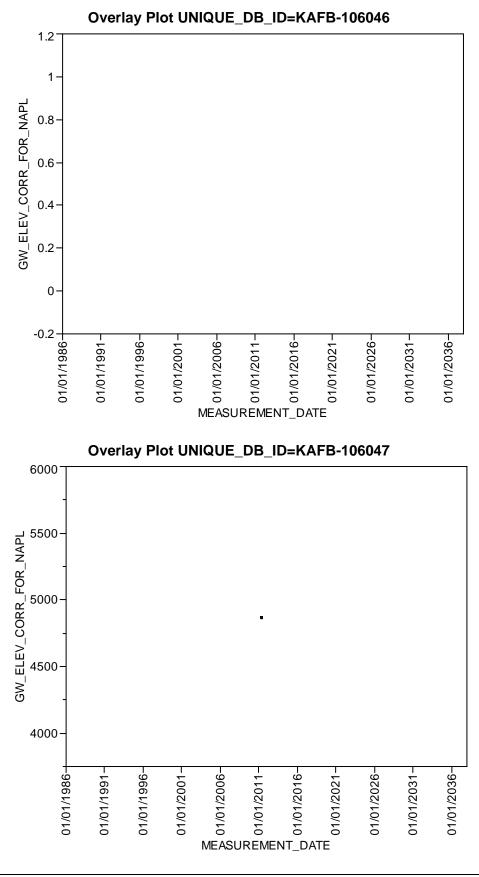


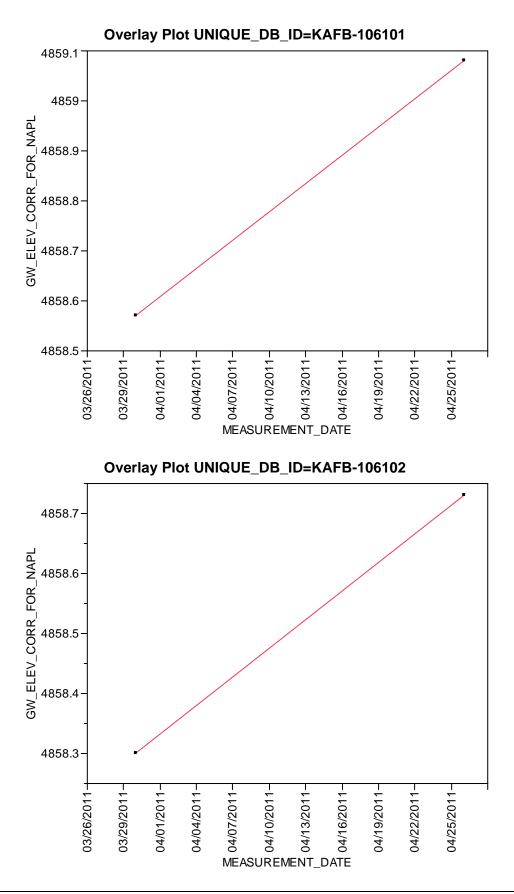


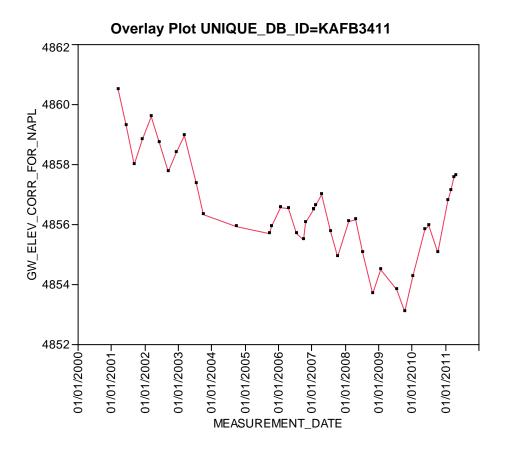






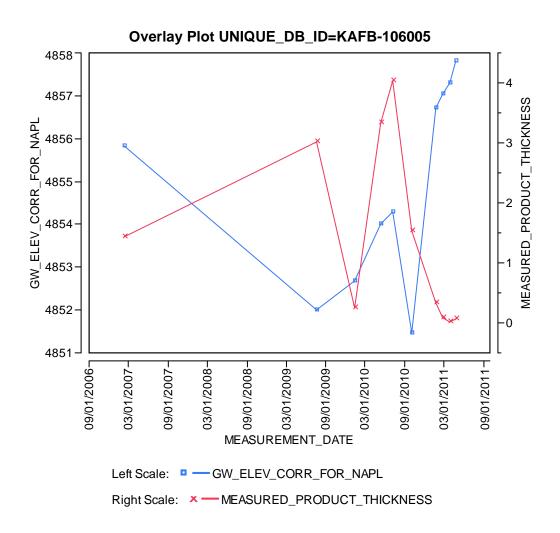


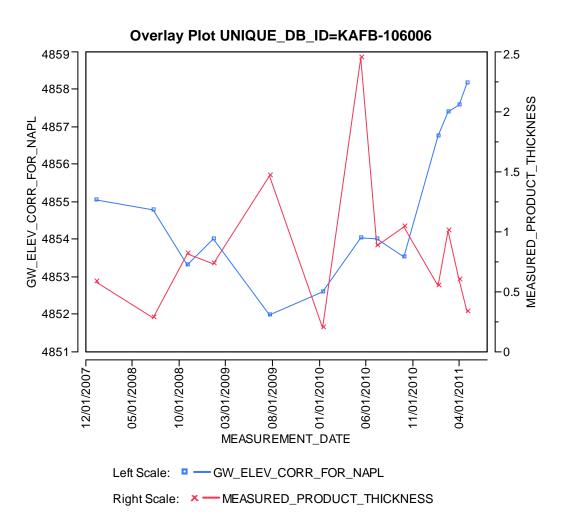


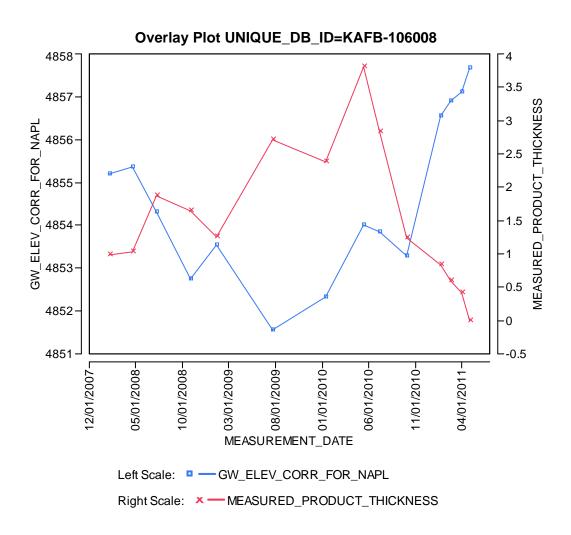


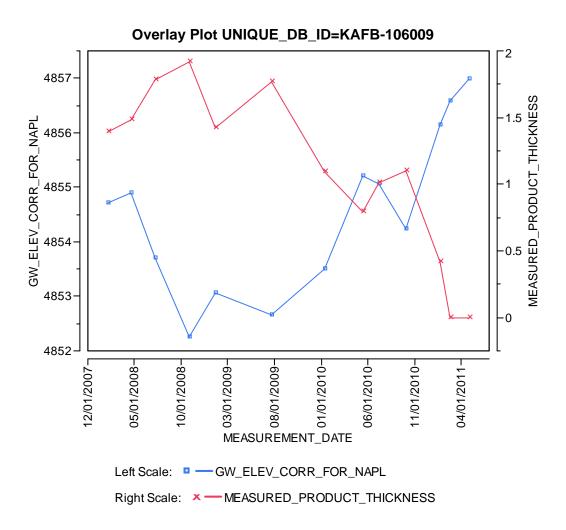
APPENDIX F-2

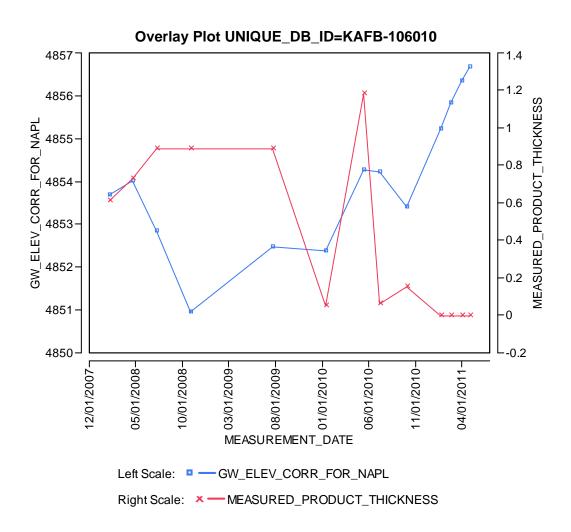
NAPL Measurements January – March 2011

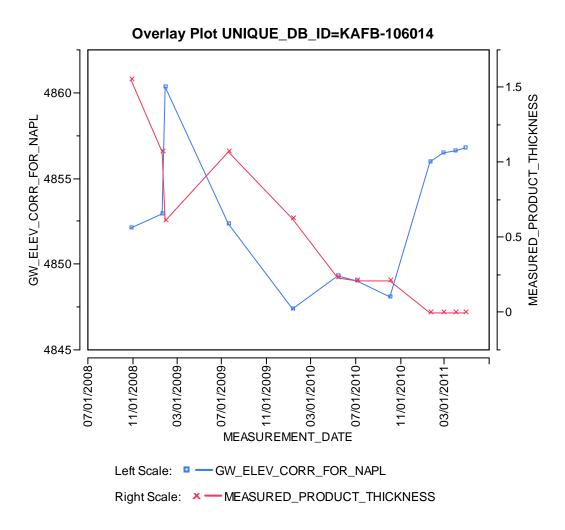


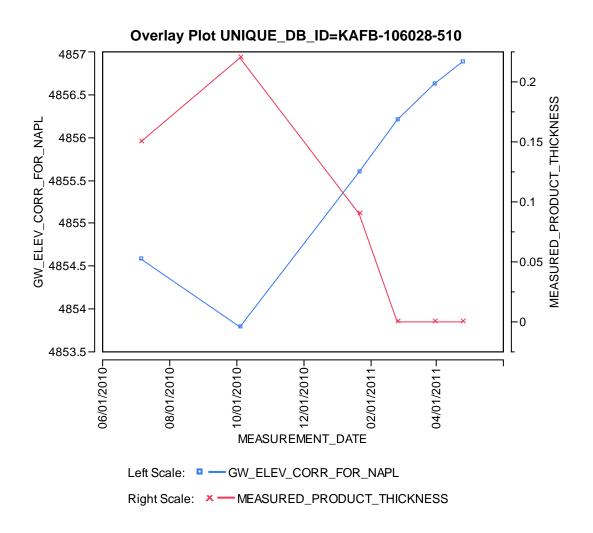












APPENDIX D-2

Shallow Soil Boring Logs

S		T [®]				Bor	Borehole ID: KAFB-106143			
Pro Pro	ject L ject N	oca Iam	ation: e: K	: KA (AFE	rps of Engineers AFB, Albuquerque, NM 3 BFF SWMU ST-106 and SS-111	Hole Di	Hole Diameter Upper (in.): 2 Hole Diameter Lower (in.): 2 Surface Completion Type:			
Dat Dat	-	rted Rea	l: 2/ [,] acheo	17/2) d: 2		⊥ At ▼ At I	Time o [.] End of	Levels BGS (ft): f Drilling: N/A Drilling: N/A ng: N/A		
YC	oordi	nate	e: 14	1728	ISL (ft): 5345.1 320.46 550.46	Drillling Drilling	Contra Metho	actor: JR Drilling d: Direct Push (Geopr Dale Flores	obe) Page 1 of 1	
 Depth (ft) 							U.S.C.S.	Well Diagram	Remarks	
-	106 ²	143- 0/	0.0		Poorly graded SAND with Silt pinkish white; (7.5YR 8/2); dry loose; 90% very fine sand to 0 rounded; 10% silt; no odor.	; very	SP- SM		Description from hand auger cuttings.	
-	106 ⁴ 0	143-	0.0		Silty SAND (SM); reddish yello 6/6); dry; very loose; 80% very subrounded; 5% fine gravel to subrounded; 15% silt; no odor	y fine sand; 5mm;	SM			
10	106 ⁻ 1	143- 0	0.0		Same as above (5 ft).					
-					SILT (ML); strong brown (7.5Y dry; firm; non plastic; 90% silt; fine sand to 0.2mm; no odor.	/R 4/6); 10% very				
	106 ⁻ 1		0.0		Same as above (12 ft).		ML			
	106 ⁻ 2	143- 0	0.0							
20									Total depth = 20 ft.	
25										
-										
30										

Shaw		Borehole ID: KAFB-106144			
	B, Albuquerque, NM BFF SWMU ST-106 and SS-111	Hole Diameter Upper (in.): 2 Hole Diameter Lower (in.): 2 Surface Completion Type:			
Project Number: 1407 Date Started: 2/16/201 Date TD Reached: 2/1 Date Completed: 2/16/	1 6/2011	∑ At T ▼ At E	ime of Ind of	Levels BGS (ft): f Drilling: N/A Drilling: N/A ng: N/A	
Ground Elevation AMS Y Coordinate: 147280 X Coordinate: 1542320	L (ft): 5344.1 7.25	Drillling Drilling	Contra Metho	actor: JR Drilling d: Direct Push (Geopr Dale Flores	obe) Page 1 of 1
 Depth (ft) Sample Type Number Headspace PID Lithologic Log 	Material Description		U.S.C.S.	Well Diagram	Remarks
	Poorly graded SAND with Silt (Sl pinkish white (7.5YR 8/2); dry; ve loose; 90% very fine sand to 0.2r subrounded; 10% silt; no odor.	ery	SP- SM		Description from hand auger cuttings.
5 - 106144- 05 - 0.0	Silty SAND (SM); reddish yellow 6/6); dry; very loose; 80% very fir subrounded; 5% fine gravel to 5r subrounded; 15% silt; no odor.	ne sand;			
- 106144- 0.0 10 10	Same as above (5 ft).		SM		
	SILT (ML); light brown (7.5YR 6/ soft; non plastic; 90% silt; 10% v sand to 0.08mm; no odor.				
- - 106144- 20 - 20			ML		
					Total depth = 20 ft.
25					

KAFB_BOREHOLE_LOG - SHAW_DRILLING.GDT - 4/27/11 14:52 - Z\KAFB BFFIGINTIKAFB_PROJECTIKAFB_BFF.GPJ

S	Cha					Borehole ID: KAFB-106145				
Pro Pro	ojeo ojeo	ct Loca	ation: ie: K	: KA (AFB	ps of Engineers FB, Albuquerque, NM BFF SWMU ST-106 and SS-111 1705	Hole Diameter Upper (in.): 2 Hole Diameter Lower (in.): 2 Surface Completion Type:				
Da Da	te s te	Starteo TD Rea	l: 2/ ache	16/20 d: 2		∑ At ¯ ▼ At I	Time o [.] End of	Levels BGS (ft): f Drilling: N/A Drilling: N/A ing: N/A		
YC	Coc	nd Elev ordinate ordinate	e: 14	4727		Drilling	Metho	actor: JR Drilling d: Direct Push (Geopre Dale Flores	obe) Page 1 of 1	
O Depth (ft)	Sample Type	Number	Headspace PID	Lithologic	Material Description		U.S.C.S.	Well Diagram	Remarks	
-		106145- \00/	0.0		Poorly graded SAND with Silt (pinkish white (7.5YR 8/2); dry; v loose; 90% very fine sand to 0. subrounded; 10% silt; slight odd	/ery 2mm;	SP- SM		Description from hand auger cuttings.	
5		106145- 05	3.2		Silty SAND (SM); reddish yellov 6/6); moist; loose; 60% very fine 0.2mm; subrounded; 40% silt; s odor.	e sand to				
<u> 10</u> 		106145- 10	0.7		Same as above (5 ft).		SM			
15		106145- 15	NR		Same as above (5 ft).					
-	_				SILT (ML); strong brown (7.5YF dry; firm; low plasticity; 90% silt very fine sand to 0.2mm; no od	; 10%	ML			
20	-	106145- 20	1.7						Total depth = 20 ft.	
- - - 25										
30										

S	L					Borehole ID: KAFB-106146			
Clie Pro Pro	ent: ojec	t US t Loca t Nam	ation: ie: K	: KÁ (AFB	os of Engineers FB, Albuquerque, NM BFF SWMU ST-106 and SS-111	Hole Diameter Upper (in.): 2 Hole Diameter Lower (in.): 2 Surface Completion Type:			
Dat Dat	te S te T		l: 2/ ache	16/20 d: 2/		∑ At⊺ ▼ At E	Fime o [.] End of	Levels BGS (ft): f Drilling: N/A Drilling: N/A ing: N/A	
Ground Elevation AMSL (ft): 5342.8 Y Coordinate: 1472951.78 X Coordinate: 1542082.71							Metho	actor: JR Drilling d: Direct Push (Geopr Dale Flores	obe) Page 1 of 1
Depth (ft)	O Depth (II) Sample Type Headspace PID PID PiD PiD Naterial Description						U.S.C.S.	Well Diagram	Remarks
-	1	106146- 00 /	0.6		Poorly graded SAND with Silt (S pinkish white (7.5YR 8/2); dry; va loose; 90% very fine sand to 0.2 subrounded; 10% silt; no odor.	ery	SP- SM		Description from hand auger cuttings.
5	1	106146- 05	0.0		Silty SAND (SM); reddish yellow 6/6); dry; very loose; 80% very fi subrounded; 5% fine gravel to 5 subrounded; 15% silt; no odor.	ne sand;			
10	1	106146- 10	0.0		Same as above (5 ft).		SM		
15	1	106146- 15	0.0		SILT (ML); strong brown (7.5YR dry; firm; non plastic; 90% silt; 10 fine sand to 0.2mm; no odor.				
20	1	106146- 20	0.0				ML		
-									Total depth = 20 ft.
25									
30									

Shaw		Bore	eho	le ID: KAFB-	106147
Client: US Army Corp Project Location: KAR Project Name: KAFB	B, Albuquerque, NM BFF SWMU ST-106 and SS-111	Hole Diameter Upper (in.): 2 Hole Diameter Lower (in.): 2 Surface Completion Type:			
Project Number: 1407 Date Started: 2/16/20 Date TD Reached: 2/17 Date Completed: 2/17	11 17/2011	∑ At T ▼ At E	ime of Ind of	Levels BGS (ft): f Drilling: N/A Drilling: N/A ng: N/A	
Ground Elevation AMS Y Coordinate: 147285 X Coordinate: 154195	i0.62	Drillling Drilling I	Contra Metho	actor: JR Drilling d: Direct Push (Geopi Dale Flores	robe) Page 1 of 1
 Depth (ft) Sample Type Number Headspace PID Lithologic Log 	Material Description		U.S.C.S.	Well Diagram	Remarks
	Poorly graded SAND with Silt (S pinkish white (7.5YR 8/2); dry; ve loose; 90% very fine sand to 0.2 subrounded; 10% silt; slight odor	ery mm;	SP- SM		Description from hand auger cuttings.
- 106147- 450.0 - -	Silty SAND (SM); reddish yellow 6/6); dry; very loose; 60% very fi to 0.5mm; subrounded; 40% silt; odor.	ne sand			
	Same as above (5 ft).		SM		
15 106147- 4.6 4.6 - 106147- 20 20	SILT (ML); reddish yellow (5YR hard; low plasticity; 90% silt; 5% fine sand to 0.08mm; 5% white c slight odor.	very			Very hard drilling from 14 to 17 ft due to caliche cementation.
25					Total depth = 20 ft.
30					

KAFB_BOREHOLE_LOG - SHAW_DRILLING.GDT - 4/27/11 14:56 - Z:\KAFB BFF\GINT\KAFB_PROJECT\KAFB_BFF.GPJ

APPENDIX D

Well Installation Forms January – March 2011

D-1. Well Borehole Logs, Completion Diagrams, and Development Records

D-2. Shallow Soil Boring Logs

APPENDIX D-1

Well Borehole Logs, Completion Diagrams, and Development Records

APPENDIX D-1

KAFB-106044 Final Well Report



Project Number: 140705

Date TD Reached: 1/7/2011 Date Completed: 1/17/2011

Y Coordinate: 1472371.83

Ground Elevation AMSL (ft): 5345.6

Date Started: 1/5/2011

Project Name: KAFB BFF SWMU ST-106 and SS-111

Borehole ID: KAFB-106044

Hole Diameter Upper (in.): 11-3/4 Hole Diameter Lower (in.): 9-5/8 Surface Completion Type: Stick-up

Groundwater Levels BGS (ft): \searrow At Time of Drilling: 497.00 \checkmark At End of Drilling: 489.24 I After Drilling: 488.26

Drilling Contractor: WDC Drilling Drilling Method: Air Rotary Casing Hammer Logged By: Jason Tarbert

			e: 14723 e: 15414			Jason Ta	Rotary Casing H arbert	Page 1 of 19
Oepth (ft)		Number	Headspace PID Lithologic Loo	Material Description	U.S.C.S.	W	ell Diagram	Remarks
	-			Silty SAND (SM); pink (7.5YR 7/4); dry; very loose; 85% very fine sand to 0.07mm; rounded; 15% silt.				Hand augered. ***Note: No headspace
5				Same as above (0 ft).			- Concrete Seal	requirement at this location*** Began drilling @ 0915 on 1/5/11.
10	-			Silty SAND (SM); brown (7.5YR 5/4); dry; very loose; 75% fine sand; 10% fine gravel to 1cm; rounded; 15% silt.	SM			
15				Same as above (10 ft).			•	
20	-			to 2cm; 10% fine sand; angular.	GP		•	
20	-			Silty SAND with Gravel (SM); brown (7.5YR 5/4); dry; very loose; 70% fine sand; 15% fine gravel to 8mm; subrounded; 15% silt.	-		- High Solids Bentonite Grout	
25				Same as above (20 ft).	SM		•	
30	-						• • •	



Hole Diameter Upper (in.): 11-3/4 Hole Diameter Lower (in.): 9-5/8 Surface Completion Type: Stick-up

Groundwater Levels BGS (ft): \square At Time of Drilling: 497.00 \blacksquare At End of Drilling: 489.24 \blacksquare After Drilling: 488.26

Drilling Contractor: WDC Drilling Drilling Method: Air Rotary Casing Hammer Logged By: Jason Tarbert

Page 2 of 19

Х	Coc	ordinat	:e: 1	54144	7.86 Logged	Logged By: Jason Tarbert Page 2 of 19					
ی Depth (ft)	Sample Type	Num	Headspace PID	Lithologic Log	Material Description	U.S.C.S.		Well Diagram	Remarks		
3!	-				Poorly graded SAND with Silt (SP-SM); brown (7.5YR 4/4); dry; very loose; 90% very fine sand to 0.01mm; rounded; 10% silt.	SP- SM		• • • • • • • • • • • • • • • • • •			
	-				Poorly graded SAND (SP); brown (7.5YR 5/4); dry; very loose; 95% fine sand; 5% coarse sand to 0.2mm; subrounded.		- 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	• • • • • • • • • • • • • • • • • •			
40	<u>)</u> - -				Same as above (35 ft).	SP		• • • • • • • • • • • • • • • • • •			
4	5				Same as above (35 ft).			- High Solids Bentonite Grout			
_5() - -			C 0	Same as above (35 ft).			• • • • • • • • • • • • • • • •			
5!	5				Poorly graded GRAVEL (GP); light reddish brown (5YR 6/3); dry; very loose; 90% fine gravel to 5mm; 10% coarse sand; subangular.	GP					
					Poorly graded SAND (SP); dry; very loose; 75% very fine sand; 25% coarse sand to 0.5mm; subangular.	SP	• • • • • • • • • • • • • • • • • • • • • • • •				
60	כ						••	••			

Project Number: 140705 Date Started: 1/5/2011 Date TD Reached: 1/7/2011 Date Completed: 1/17/2011

Ground Elevation AMSL (ft): 5345.6 Y Coordinate: 1472371.83 X Coordinate: 1541447.86

Project Name: KAFB BFF SWMU ST-106 and SS-111



Client: US Army Corps of Engineers Project Location: KAFB, Albuquerque, NM Project Name: KAFB BFF SWMU ST-106 and SS-111 Project Number: 140705

Date Started: 1/5/2011 Date TD Reached: 1/7/2011 Date Completed: 1/17/2011

Ground Elevation AMSL (ft): 5345.6 Y Coordinate: 1472371.83 X Coordinate: 1541447.86 Hole Diameter Upper (in.): 11-3/4 Hole Diameter Lower (in.): 9-5/8 Surface Completion Type: Stick-up

Groundwater Levels BGS (ft): \square At Time of Drilling: 497.00 \blacksquare At End of Drilling: 489.24 \blacksquare After Drilling: 488.26

Drilling Contractor: WDC Drilling Drilling Method: Air Rotary Casing Hammer Logged By: Jason Tarbert

Page 3 of 19

Х	Coo	ordinat	te: 1	54144	.86 Logged By: Jason Tarbert Page 3 of					
9 Depth (ft)	Sample Type	Number	Headspace PID	Lithologic Log	Material Description	U.S.C.S.	Well Diagr	ram Remarks		
	-				Silty SAND (SM); brown (7.5YR 5/4); dry; very loose; 75% fine sand, 10% coarse sand to 4mm; subrounded; 15% silt.					
65	-				Same as above (60 ft).	SM				
75	-				Poorly graded SAND with Gravel (SP); brown (7.5YR 4/4); dry; very loose; 70% fine sand; 30% fine gravel to 5mm; rounded; trace fines.	SP				
	-				Silty SAND (SM); brown (7.5YR 4/4); dry; very loose; 80% fine sand; 5% coarse sand to 4mm; rounded; 15% silt.		- High S Bentor Grout			
80	-				Silty SAND (SM); brown (7.5YR 5/4); dry; very loose; 85% very fine sand; trace gravel to 2.5cm; rounded; 15% silt.	SM				
85					Silty SAND (SM); brown (7.5YR 4/3); dry; very loose; 75% very fine sand to 0.1mm; rounded; 15% silt; 10% clay nodules.					
90							• • • • • • • • • • • •			



Client: US Army Corps of Engineers

Ground Elevation AMSL (ft): 5345.6

Project Number: 140705

Date TD Reached: 1/7/2011 Date Completed: 1/17/2011

Y Coordinate: 1472371.83

Date Started: 1/5/2011

Project Location: KAFB, Albuquerque, NM

Project Name: KAFB BFF SWMU ST-106 and SS-111

Borehole ID: KAFB-106044

Hole Diameter Upper (in.): 11-3/4 Hole Diameter Lower (in.): 9-5/8 Surface Completion Type: Stick-up

Groundwater Levels BGS (ft): \square At Time of Drilling: 497.00 \blacksquare At End of Drilling: 489.24 \blacksquare After Drilling: 488.26

Drilling Contractor: WDC Drilling Drilling Method: Air Rotary Casing Hammer Logged By: Jason Tarbert

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X	Coo	ordinat	:e: 1	54144	17.86 Logged	Logged By: Jason Tarbert				
g Depth (ft)	Sample Type	Numl	Headspace PID	Lithologic Log	Material Description	U.S.C.S.	,	Well Diagram	Remarks	
95	-				Poorly graded SAND with Silt (SP-SM); reddish brown (5YR 5/4); dry; very loose; 85% fine sand; 5% fine gravel to 1cm; rounded; 10% silt.	SP- SM				
	-				Poorly graded SAND (SP); brown (7.5YR 4/4); dry; very loose; 95% medium sand; 5% coarse sand to 1mm; subangular.		- 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	 • •<		
<u>100</u>	-				Same as above (95 ft); trace gravel to 3cm.			• • • • • • • • • • • • • • • •		
<u>105</u>	-				Poorly graded SAND (SP); light brown (7.5YR 6/4); dry; very loose; 90% very fine sand; 10% coarse sand; trace gravel to 2 cm; rounded.	SP	 • •<	- High Solids Bentonite Grout		
<u>110</u>	-				Poorly graded SAND (SP); brown (7.5YR 5/4); dry; very loose; 85% very fine sand; 10% fine gravel to 1.5cm; rounded; 5% clay nodules.			• • • • • • • • • • • • • • • • • •		
<u>115</u>	-				Same as above (110 ft); brown (10YR 5/3).					
120							••	••		



Client:US Army Corps of EngineersHeProject Location:KAFB, Albuquerque, NMHeProject Name:KAFB BFF SWMU ST-106 and SS-111SiProject Number:140705

Date Started: 1/5/2011 Date TD Reached: 1/7/2011 Date Completed: 1/17/2011

Ground Elevation AMSL (ft): 5345.6 Y Coordinate: 1472371.83 X Coordinate: 1541447.86 Hole Diameter Upper (in.): 11-3/4 Hole Diameter Lower (in.): 9-5/8 Surface Completion Type: Stick-up

Groundwater Levels BGS (ft): ☑ At Time of Drilling: 497.00 ▼ At End of Drilling: 489.24 ▼ After Drilling: 488.26

Drilling Contractor: WDC Drilling Drilling Method: Air Rotary Casing Hammer Logged By: Jason Tarbert

Sample Type Headspace PID Lithologic Log Depth (ft) Number Ś S.C. Material Description Remarks Well Diagram Ľ, 120 Poorly graded SAND with Silt (SP-SM); . brown (7.5YR 4/4); dry; very loose; 90% • very fine sand to 0.1mm; rounded; 10% SPsilt; trace clay nodules. • SM • • 125 Sandy fat CLAY (CH); brown (7.5YR • 4/4); moist; soft; 65% clay, 35% very fine sand to 0.001mm. • CH • 130 • Silty SAND (SM); reddish brown (5YR 5/4); moist; loose; 85% fine sand to 0.1mm; subangular; 15% silt. SM • 135 High Solids Clayey SAND (SC); light brown (7.5YR Bentonite • 6/4), moist, loose, 85% fine sand to Grout 0.1mm; subrounded; 15% clay. SC • 140 Poorly graded SAND (SP); brown (7.5YR 5/2); dry; loose; 100% medium • sand; trace coarse to 1mm; subangular. • • 145 • • • • • SP Same as above (140 ft); slightly coarser. • • • . • 150

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Client: US Army Corps of Engineers Project Location: KAFB, Albuquerque, NM Project Name: KAFB BFF SWMU ST-106 and SS-111 Project Number: 140705

Date Started: 1/5/2011 Date TD Reached: 1/7/2011 Date Completed: 1/17/2011

Ground Elevation AMSL (ft): 5345.6 Y Coordinate: 1472371.83 X Coordinate: 1541447.86 Hole Diameter Upper (in.): 11-3/4 Hole Diameter Lower (in.): 9-5/8 Surface Completion Type: Stick-up

Groundwater Levels BGS (ft): \square At Time of Drilling: 497.00 \blacksquare At End of Drilling: 489.24 \blacksquare After Drilling: 488.26

Drilling Contractor: WDC Drilling Drilling Method: Air Rotary Casing Hammer Logged By: Jason Tarbert

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X	Coc	ordinat	te: 1	54144	17.86 Logged	By: 、	Jason Tarbert	Page 6 of 19
10 Depth (ft)	Sample Type	Number	Headspace PID	Lithologic Log	Material Description	U.S.C.S.	Well Diagram	Remarks
155					Well graded SAND (SW); brown (7.5YR 5/2); dry; very loose; 90% medium to coarse sand; 10% fine gravel to 1cm; rounded.	SW		
	-				Poorly graded SAND (SP); brown (7.5YR 4/3); dry; loose; 90% fine sand; 5% medium gravel to 2cm; well rounded; 5% silt.			
<u>160</u>	-				Poorly graded SAND (SP); brown (7.5YR 4/2); dry; loose; 100% fine to medium sand to 0.3mm; subangular.			
<u>165</u>					Same as above (160 ft); medium to coarse sand to 3mm.	SP	- High Solids Bentonite Grout	
170)				Poorly graded SAND (SP); brown (7.5YR 5/2); dry; loose; 100% medium to coarse sand to 3mm; rounded.			
<u>175</u>	-				Same as above (170 ft); 5% fine gravel.			
180							• • • • • • • • • • • •	



Client: US Army Corps of Engineers Project Location: KAFB, Albuquerque, NM Hole Diameter Upper (in.): 11-3/4 Hole Diameter Lower (in.): 9-5/8 Project Name: KAFB BFF SWMU ST-106 and SS-111 Surface Completion Type: Stick-up

Date Started: 1/5/2011 Date TD Reached: 1/7/2011 Date Completed: 1/17/2011

Project Number: 140705

Ground Elevation AMSL (ft): 5345.6 Y Coordinate: 1472371.83 X Coordinate: 1541447.86

Groundwater Levels BGS (ft): \searrow At Time of Drilling: 497.00 \checkmark At End of Drilling: 489.24 I After Drilling: 488.26

Drilling Contractor: WDC Drilling Drilling Method: Air Rotary Casing Hammer Logged By: Jason Tarbert

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08 Depth (ft)	Sample Type	Number	Headspace PID	Lithologic Log	Material Description	U.S.C.S.	Well Diagram	Remarks
	-				Poorly graded SAND (SP); brown (7.5YR 5/2); dry; loose; 100% medium to coarse sand to 3mm; rounded.			
<u>185</u>	-				Poorly graded SAND (SP); brown (7.5YR 5/2); dry; loose; 100% medium to coarse sand to 3mm; rounded.			
<u>190</u>	-				Same as above (185 ft); slightly finer sand.	SP	• • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • •	
<u>195</u> 200	-				Poorly graded SAND (SP); reddish brown (5YR 4/4); dry; very loose; 90% medium to coarse sand, 10% fine gravel to 1cm; rounded.		- High Solids Bentonite Grout	
200	-				Well graded SAND (SW); brown (7.5YR 4/4); moist; very loose, 80% fine to medium sand; 20% coarse sand to 3mm; rounded.			
205					Same as above (200 ft); dry; 80% fine to medium sand; 15% coarse sand; 5% fine gravel.	SW		
210								



Client: US Army Corps of Engineers Project Location: KAFB, Albuquerque, NM Project Name: KAFB BFF SWMU ST-106 and SS-111 Project Number: 140705

Date Started: 1/5/2011 Date TD Reached: 1/7/2011 Date Completed: 1/17/2011

Ground Elevation AMSL (ft): 5345.6 Y Coordinate: 1472371.83 X Coordinate: 1541447.86 Hole Diameter Upper (in.): 11-3/4 Hole Diameter Lower (in.): 9-5/8 Surface Completion Type: Stick-up

Groundwater Levels BGS (ft): \square At Time of Drilling: 497.00 \blacksquare At End of Drilling: 489.24 \blacksquare After Drilling: 488.26

Drilling Contractor: WDC Drilling Drilling Method: Air Rotary Casing Hammer Logged By: Jason Tarbert

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0 Depth (ft)	Sample Type	Number	Headspace PID	Lithologic Log	Material Description	U.S.C.S.	Well Diagram	Remarks
215	-				Well graded SAND (SW); brown (7.5YR 4/4); moist; very loose, 80% fine to medium sand; 20% coarse sand to 3mm; rounded.	SW		
	-				Poorly graded SAND (SP); brown (7.5YR 4/4); moist; very loose; 100% fine to medium sand to 2mm; subrounded; trace clay.			
220	-				Poorly graded SAND with Gravel (SP); dark brown (7.5YR 3/3); dry; very loose; 80% fine sand; 20% fine to medium gravel to 3cm; rounded.	SP		
225	-				Poorly graded SAND (SP); brown (10YR 4/3); dry; very loose; 100% medium sand to 0.5mm; subrounded		- High Solids Bentonite Grout	
230	-				Well graded SAND (SW); very pale brown (10YR 7/3); dry; loose; 35% fine sand; 30% medium sand; 30% coarse sand; 5% fine gravel to 1.5cm; well rounded.	sw		
235					Poorly graded SAND (SP); brown (10YR 5/3); moist; loose; 98% medium sand; 2% coarse sand to 2mm; subangular.	SP		



Client: US Army Corps of Engineers

Ground Elevation AMSL (ft): 5345.6

Project Number: 140705

Date TD Reached: 1/7/2011 Date Completed: 1/17/2011

Y Coordinate: 1472371.83

Date Started: 1/5/2011

Project Location: KAFB, Albuquerque, NM

Project Name: KAFB BFF SWMU ST-106 and SS-111

Borehole ID: KAFB-106044

Hole Diameter Upper (in.): 11-3/4 Hole Diameter Lower (in.): 9-5/8 Surface Completion Type: Stick-up

Groundwater Levels BGS (ft): \square At Time of Drilling: 497.00 \blacksquare At End of Drilling: 489.24 \blacksquare After Drilling: 488.26

Drilling Contractor: WDC Drilling Drilling Method: Air Rotary Casing Hammer Logged By: Jason Tarbert

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	X Coordinate: 1541447.86 Logged By: Jason T								Page 9 of 19		
05 Depth (ft)	Sample Type	Number	Headspace PID	Lithologic Log	Material Description	U.S.C.S.	v	Vell Diagram	Remarks		
245	-				Well graded SAND with Gravel (SW); pinkish white (7.5YR 6/2); moist; very loose; 85% medium to very coarse sand; 15% fine gravel to 2cm; rounded.	sw					
					Poorly graded SAND (SP); dark yellowish brown (10YR 4/4); moist; very loose; 99% medium sand; 1% coarse sand to 0.4mm; subangular.						
250	-				Same as above (245 ft).	SP					
255					Well graded SAND (SW); brown (10YR 5/3); damp; loose; 60% medium sand; 35% coarse sand; 5% fine gravel to 2cm; subrounded	sw		- High Solids Bentonite Grout			
260					Poorly graded SAND (SP); dark yellowish brown (10YR 4/4); moist; loose; 95% medium sand to 0.4mm; angular; 5% silt.						
265	-						Same as above (260 ft); yellowish brown (10YR 5/4); damp; trace gravel to 2cm.	SP			



Client: US Army Corps of Engineers Project Location: KAFB, Albuquerque, NM Project Name: KAFB BFF SWMU ST-106 and SS-111 Project Number: 140705

Date Started: 1/5/2011 Date TD Reached: 1/7/2011 Date Completed: 1/17/2011

Ground Elevation AMSL (ft): 5345.6 Y Coordinate: 1472371.83 X Coordinate: 1541447.86 Hole Diameter Upper (in.): 11-3/4 Hole Diameter Lower (in.): 9-5/8 Surface Completion Type: Stick-up

Groundwater Levels BGS (ft): \square At Time of Drilling: 497.00 \blacksquare At End of Drilling: 489.24 \blacksquare After Drilling: 488.26

Drilling Contractor: WDC Drilling Drilling Method: Air Rotary Casing Hammer Logged By: Jason Tarbert

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20 Depth (ft)	Sample Type	Number	Headspace PID	Lithologic Log	Material Description	U.S.C.S.	w	√ell Diagram	Remarks
	-				Poorly graded SAND (SP); dark yellowish brown (10YR 4/4); moist; loose; 95% medium sand to 0.4mm; angular; 5% silt.				
<u>275</u>	-				Same as above (270 ft); damp.				
280	-				Same as above (270 ft); 1% fine gravel to 1cm.				
<u>285</u>	-				Poorly graded SAND (SP); dark yellowish brown (10YR 4/4); damp; loose; 90% medium sand; 5% coarse sand; 5% fine gravel to 1.5cm; rounded.	SP		- High Solids Bentonite Grout	
290	-				Same as above (285 ft); 10% coarse sand; trace fine gravel.				
295	-				Poorly graded SAND(SP); dark yellowish brown (10YR 3/4); damp; loose; 80% medium sand; 15% coarse sand; 5% fine gravel to 2.5cm; rounded.				
300							••	•	



Client: US Army Corps of Engineers Project Location: KAFB, Albuquerque, NM Project Name: KAFB BFF SWMU ST-106 and SS-111 Project Number: 140705

Date Started: 1/5/2011 Date TD Reached: 1/7/2011 Date Completed: 1/17/2011

Ground Elevation AMSL (ft): 5345.6 Y Coordinate: 1472371.83 X Coordinate: 1541447.86

Borehole ID: KAFB-106044

Hole Diameter Upper (in.): 11-3/4 Hole Diameter Lower (in.): 9-5/8 Surface Completion Type: Stick-up

Groundwater Levels BGS (ft): \square At Time of Drilling: 497.00 \blacksquare At End of Drilling: 489.24 \blacksquare After Drilling: 488.26

Drilling Contractor: WDC Drilling Drilling Method: Air Rotary Casing Hammer Logged By: Jason Tarbert

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ର Depth (ft)	Sample Type	Number	Headspace PID	Lithologic Log	Material Description	U.S.C.S.	Well Diagram	Remarks
305	-				Poorly graded SAND (SP); dark yellowish brown (10YR 3/4); damp; loose; 98% medium sand; 2% coarse sand; trace gravel to 3cm; rounded.	SP		Hammer hose blew. Needs repair before continuing.
310	-				Well graded SAND (SW); dark yellowish brown (10YR 4/4); dry; very loose; 40% fine sand; 30% medium sand; 20% coarse sand; 10% fine gravel to 1cm; well rounded.	sw		
315	-				Poorly graded GRAVEL (GP); grey (5YR 6/1); dry; very loose; 90% medium gravel to 4cm; 10% coarse sand; well rounded.	GP		
	-				Well graded SAND with Gravel (SW); brown (7.5YR 5/3); dry; very loose; 30% fine sand; 30% medium sand; 25% coarse sand; 15% fine gravel to 2cm.	SW	- High Solids Bentonite Grout	
320	-				Well graded GRAVEL with Sand (GW); brown (7.5 YR 4/3); dry; very loose; 60% fine to medium gravel to 3.8cm; 40% coarse sand; rounded.	GW		End of 1/6/11.
<u>325</u> 330					Well graded SAND (SW); dark yellowish brown (10YR 4/4); dry; very loose; 90% fine to coarse sand; 10% fine gravel to 2.7cm; subangular.	sw		Resumed drilling @ 0755 on 1/7/11.



Client: US Army Corps of Engineers

Ground Elevation AMSL (ft): 5345.6

Project Number: 140705

Date TD Reached: 1/7/2011 Date Completed: 1/17/2011

Date Started: 1/5/2011

Project Location: KAFB, Albuquerque, NM

Project Name: KAFB BFF SWMU ST-106 and SS-111

Borehole ID: KAFB-106044

Hole Diameter Upper (in.): 11-3/4 Hole Diameter Lower (in.): 9-5/8 Surface Completion Type: Stick-up

Groundwater Levels BGS (ft): $\begin{array}{c} \bigtriangledown \\ \hline \\ \blacksquare \end{array} \begin{array}{c} At \text{ Time of Drilling: } 497.00 \\ \hline \\ \blacksquare \end{array} \begin{array}{c} 489.24 \end{array}$ I After Drilling: 488.26

Drilling Contractor: WDC Drilling Drilling Method: Air Rotary Casing Hammer Logged By: Jason Tarbert

YC	coorc	dinate	e: 14	47237 54144	'1.8́3´ [Drilling Contractor: WDC Drilling Drilling Method: Air Rotary Casing Hammer Logged By: Jason Tarbert Page 12 of 19									
00 Depth (ft)	Sample Type	Number	Headspace PID	Lithologic Log	Material Description		U.S.C.S.	w	/ell Diagram	Remarks					
335					Well graded SAND (SW); dark yell brown (10YR 4/4); dry; very loose; fine to coarse sand; 2% fine grave 2.7cm; subangular.	98% I to 5	SW		•						
- - 340	-									Poorly graded SAND (SP); yellowis brown (10YR 5/4); moist; loose; 90 medium sand; 8% fine sand; 2% fi gravel to 1cm; subangular.)% ne	SP		• • • • •	
					Well graded SAND (SW); light yell brown (10YR 6/4); dry; very loose; fine to coarse sand; 5% fine grave 1.5cm; subangular.	95% I to	SW		•	Approximately 15 minutes for 20 ft of casing.					
-					Poorly graded SAND (SP); brown 4/3); moist; loose; 98% medium sa 2% fine gravel to 1cm; subrounded	and;			 Bentonite 	6 minutes to load new casing.					
<u>350</u> - - -					Same as above (345 ft); 95% med sand; 5% fine gravel.		SP		•	No sample in chip tray 345-355 ft.					
355				₀ ∪ (Same as above (345 ft). Poorly graded GRAVEL (GP); light	taray			•						
- 360				000	(7.5YR 7/1); dry; very loose; 98% f medium gravel to 3cm; 2% mediur sand; rounded.	ine to	GP SP		• • • •						



Client: US Army Corps of Engineers

Ground Elevation AMSL (ft): 5345.6

Project Number: 140705

Date TD Reached: 1/7/2011 Date Completed: 1/17/2011

Y Coordinate: 1472371.83

Date Started: 1/5/2011

Borehole ID: KAFB-106044

Hole Diameter Upper (in.): 11-3/4 Project Location: KAFB, Albuquerque, NM Hole Diameter Lower (in.): 9-5/8 Project Name: KAFB BFF SWMU ST-106 and SS-111 Surface Completion Type: Stick-up

> Groundwater Levels BGS (ft): \searrow At Time of Drilling: 497.00 \checkmark At End of Drilling: 489.24 I After Drilling: 488.26

Drilling Contractor: WDC Drilling Drilling Method: Air Rotary Casing Hammer Logged By: Jason Tarbert

				47237 54144	0		Jason Tarbert	Page 13 of 19
8 Depth (ft)	Sample Type	Number	Headspace PID	Lithologic Log	Material Description	U.S.C.S.	Well Diagra	am Remarks
365	_				Poorly graded SAND (SP); brown (10YR 5/3); dry to moist; loose; 90% medium sand; 5% coarse sand; 5% fine gravel to 2cm; rounded. Same as above (360 ft); 98% medium sand; 2% fine gravel to 1.5cm.	SP		
<u>370</u> 375	-				Well graded SAND (SW); yellowish brown (10YR 5/4); dry; very loose; 100% fine to coarse sand to 4mm; subangular; trace fines.	sw		
380	-				Poorly graded SAND (SP); dark yellowish brown (10YR 4/4); moist; loose; 90% medium sand; 10% fine gravel to 2cm; subangular.	SP	- High Sc Bentoni Grout	
385	-				Well graded SAND (SW); yellowish brown (10YR 5/4); dry; very loose; 100% fine to coarse sand to 4mm; subangular; trace fines. Same as above (380 ft); 95% fine to	SW		
390	-				coarse sand; 5% fine gravel.			



Date TD Reached: 1/7/2011 Date Completed: 1/17/2011

Ground Elevation AMSL (ft): 5345.6

Date Started: 1/5/2011

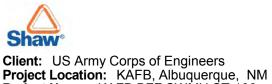
Borehole ID: KAFB-106044

Hole Diameter Upper (in.): 11-3/4 Hole Diameter Lower (in.): 9-5/8 Project Name: KAFB BFF SWMU ST-106 and SS-111 Surface Completion Type: Stick-up

> Groundwater Levels BGS (ft): \checkmark At Time of Drilling: 497.00 \checkmark At End of Drilling: 489.24 I After Drilling: 488.26

Drilling Contractor: WDC Drilling Drilling Method: Air Rotary Casing Hammer Logged By: Jason Tarbert

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66 Depth (ft)	Sample Type	Number	Headspace PID	Lithologic Log	Material Description		U.S.C.S.	W	/ell Diagram	Remarks
	-				Poorly graded SAND (SP); dark yellowish brown (10YR 4/4); dam loose; 95% medium sand; 5% fin- to 1.5cm; rounded.	ıp; e gravel			•	
395	-				Same as above (390 ft); more da gravel.	mp; no				
400					Same as above (390 ft); dry.					
405	-				Poorly graded SAND (SP); dark yellowish brown (10YR 4/4); mois loose; 95% medium sand; 5% co sand to 0.5cm; rounded.	st; arse	SP		- High Solids Bentonite Grout	
410	-				Same as above (405 ft); damp.					
415	-				Poorly graded SAND (SP); pinkis (7.5YR 6/2); damp; loose; 100% i sand to 0.4mm; rounded.	h gray medium				
420					Fat CLAY with Sand (CH); reddis	h	СН		• • •	



Date TD Reached: 1/7/2011 Date Completed: 1/17/2011

Y Coordinate: 1472371.83

X Coordinate: 1541447.86

Ground Elevation AMSL (ft): 5345.6

Date Started: 1/5/2011

Project Name: KAFB BFF SWMU ST-106 and SS-111

Borehole ID: KAFB-106044

Hole Diameter Upper (in.): 11-3/4 Hole Diameter Lower (in.): 9-5/8 Surface Completion Type: Stick-up

Groundwater Levels BGS (ft): \square At Time of Drilling: 497.00 \blacksquare At End of Drilling: 489.24 \blacksquare After Drilling: 488.26

Drilling Contractor: WDC Drilling Drilling Method: Air Rotary Casing Hammer Logged By: Jason Tarbert

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50 Depth (ft)	Sample Type	Number	Headspace PID	Lithologic Log	Material Description	U.S.C.S.	Well Diagram	Remarks
- - 425					brown (5YR 5/3); dry to moist; firm; medium plasticity; 60% clay, 25% silt; 15% fine sand to 0.02mm.	СН		
-					Poorly graded SAND (SP); brown (10YR 5/3); moist; loose; 85% medium sand; 10% coarse sand; 5% fine gravel to 1.3mm, subrounded.			
<u>430</u> - -					Poorly graded SAND (SP); dark yellowish brown (10YR 4/4); moist; loose; 95% medium sand; 5% coarse sand to 2mm; subrounded.	SP		
<u>435</u> - -	-				Same as above (430 ft); 90% medium sand; 10% coarse sand.		- High Solids Bentonite Grout	
- 440 - -	-				Sandy SILT (ML); brown (7.5YR 5/3); moist; soft; low plasticity; 60% silt; 40% fine sand to 0.05mm.	ML		
445 - -					Poorly graded SAND (SP); brown (7.5YR 4/3); damp; loose; 95% fine sand to 0.2mm; rounded; 5% silt.	SP		
450								



Client: US Army Corps of Engineers Project Location: KAFB, Albuquerque, NM Hole Diameter Upper (in.): 11-3/4 Hole Diameter Lower (in.): 9-5/8 Project Name: KAFB BFF SWMU ST-106 and SS-111 Surface Completion Type: Stick-up

Date Started: 1/5/2011 Date TD Reached: 1/7/2011 Date Completed: 1/17/2011

Project Number: 140705

Ground Elevation AMSL (ft): 5345.6 Y Coordinate: 1472371.83 X Coordinate: 1541447.86

Groundwater Levels BGS (ft): \searrow At Time of Drilling: 497.00 \checkmark At End of Drilling: 489.24 I After Drilling: 488.26

Drilling Contractor: WDC Drilling Drilling Method: Air Rotary Casing Hammer Logged By: Jason Tarbert

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5 Depth (ft)	Sample Type	Number	Headspace PID	Lithologic Log	Material Description	U.S.C.S.	,	Well Diagram	Remarks
455	_				Poorly graded SAND (SP); brown (7.5YR 4/3); damp; loose; 95% fine sand to 0.2mm; rounded; 5% silt.	SP		• • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • •	
<u>160</u>	_				Well graded SAND (SW); dark yellowish brown (10YR 4/4); moist; loose; 100% fine to coarse sand to 7mm; subrounded.	sw		 High Solids Bentonite Grout 	
<u>+00</u>	_				Well graded SAND with Silt and Gravel (SW-SM); dark yellowish brown (10YR 4/4); damp; loose; 60% medium sand; 15% coarse sand; 15% fine gravel to 1.2cm; well rounded; 10% silt.	SW- SM		 • •<	
	_				Poorly graded SAND (SP); dark yellowish brown (10YR 4/4); damp; loose; 99% medium sand; 1% fine gravel to 2cm; well rounded.	SP		• • Top of Bentonite Seal	
470	-				Well graded SAND (SW); reddish brown (5YR 5/3); dry; very loose; 90% medium to very coarse sand; 10% fine gravel to 1cm; rounded.	SW			
475					Well graded GRAVEL with Sand (GW); brown (7.5YR 4/4); dry; very loose; 70% fine to medium gravel to 2.6cm; 30% medium to coarse sand; well rounded.	GW			
					Poorly graded SAND (SP); brown (10YR 4/3); moist; loose; 98% medium sand; 2% coarse sand; trace gravel to 1cm; subangular.	SP			
480					· · · · · · · · · · · · · · · · · · ·	SW			



Date TD Reached: 1/7/2011 Date Completed: 1/17/2011

Y Coordinate: 1472371.83

Ground Elevation AMSL (ft): 5345.6

Date Started: 1/5/2011

Project Name: KAFB BFF SWMU ST-106 and SS-111

Borehole ID: KAFB-106044

Hole Diameter Upper (in.): 11-3/4 Hole Diameter Lower (in.): 9-5/8 Surface Completion Type: Stick-up

Groundwater Levels BGS (ft): \searrow At Time of Drilling: 497.00 \checkmark At End of Drilling: 489.24 I After Drilling: 488.26

Drilling Contractor: WDC Drilling Drilling Method: Air Rotary Casing Hammer Logged By: Jason Tarbert

		te: 14723			lason Tarbert	Page 17 of 19
B Depth (ft) Sample Type	Number	Headspace PID Lithologic Loq	Material Description	U.S.C.S.	Well Diagram	Remarks
485			 Well graded SAND with Gravel (SW); yellowish brown (10YR 5/4); dry; very loose; 70% fine to coarse sand; 30% fine gravel to 1.5 cm; well rounded. Same as above (480 ft); increasing moisture content. 	SW	- Betonite Seal	Casing coupler stuck. Cu with torch to remove coupler. Added new casing and resumed drilling.
495			Poorly graded SAND (SP); brown (10YR 5/3); damp; loose; 80% medium sand; 20% fine sand; trace fine gravel to 1.3cm; subrounded. Same as above (490 ft). ∑ Same as above (490 ft); wet.		- 5" Schedule 80 PVC Riser	
500			Same as above (490 ft); 5% fine gravel; 15% fine sand.	SP	- Top of 10/20 Sand	
505			Poorly graded SAND (SP); brown (7.5YR 5/4); wet; loose; 90% coarse sand; 10% fine to medium gravel to 5.3cm; well rounded.		- Top of Schedule 80 PVC 0.010 Slot Screen	

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Date TD Reached: 1/7/2011 Date Completed: 1/17/2011

Ground Elevation AMSL (ft): 5345.6

Date Started: 1/5/2011

Client: US Army Corps of Engineers Project Location: KAFB, Albuquerque, NM

Project Name: KAFB BFF SWMU ST-106 and SS-111

Borehole ID: KAFB-106044

Hole Diameter Upper (in.): 11-3/4 Hole Diameter Lower (in.): 9-5/8 Surface Completion Type: Stick-up

Groundwater Levels BGS (ft): I After Drilling: 488.26

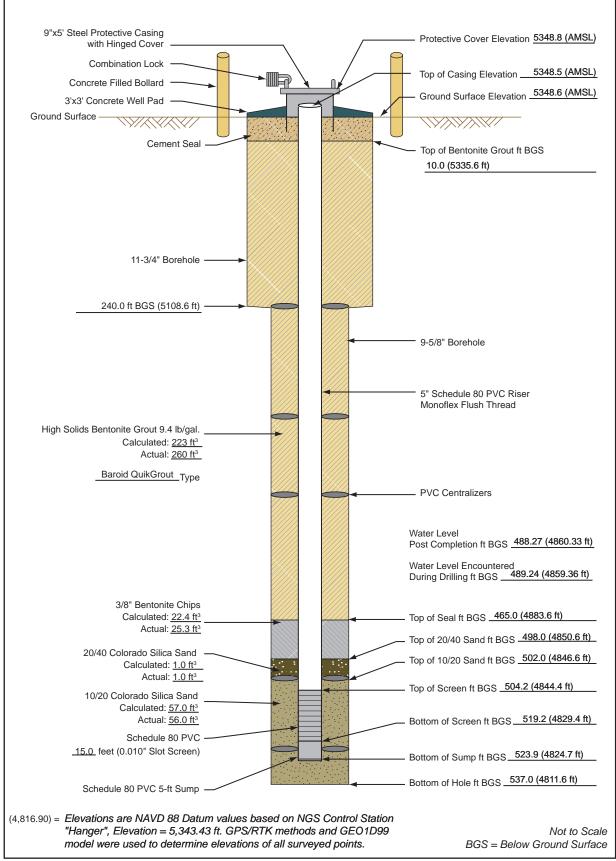
Drilling Contractor: WDC Drilling Drilling Method: Air Rotary Casing Hammer

YC	oordir	nate:	on AMS 147237 154144	71.83´ C	Drillling Contractor: WDC Drilling Drilling Method: Air Rotary Casing Harr Logged By: Jason Tarbert			
0 Depth (ft)	Sample Type	Headspace	PID Lithologic Log	Material Description		Ś	Well Diagram	Remarks
515				Poorly graded SAND with Silt (SP-3 brown (7.5YR 4/3); wet; loose; 80% coarse sand; 10% fine gravel to 1.4 subrounded; 10% silt.	6			
-				Poorly graded SAND (SP); brown (7.5YR 5/4); wet; loose; 100% coar very coarse sand; trace fine gravel 8mm; subrounded.			- Bottom of	
520				Same as above (515 ft); 90% coars sand; 10% fine gravel to 1.4cm.	se		-Sump	
- 525 - - -				Same as above (515 ft).	s	Ρ	- Bottom of Sump	
530				Same as above (515 ft); 90% medi sand; 10% coarse sand.	ium			
535				Poorly graded SAND (SP); brown (7.5YR 5/3); wet; loose; 90% coars very coarse sand; 10% fine gravel 1.2cm; subrounded.	e to to		-Bottom of Filter Pack	fill
540								

S	L					Borehole ID: KAFB-106044				
Pro Pro	ojec ojec	t Loca Nam	ation e: K	: KÁF (AFB E	s of Engineers ˈB, Albuquerque, NM BFF SWMU ST-106 and SS-111	Hole Diameter Upper (in.): 11-3/4 Hole Diameter Lower (in.): 9-5/8 Surface Completion Type: Stick-up				
Project Number: 140705 Date Started: 1/5/2011 Date TD Reached: 1/7/2011 Date Completed: 1/17/2011						⊥ At T I At E	Time of End of	Levels BGS (ft): f Drilling: 497.00 Drilling: 489.24 ng: 488.26		
Ground Elevation AMSL (ft): 5345.6 Y Coordinate: 1472371.83 X Coordinate: 1541447.86						Drilling	Metho	actor: WDC Drilling d: Air Rotary Casing H ason Tarbert	ammer Page 19 of 19	
5 Depth (ft)	Sample Type	Number	Headspace PID	Lithologic Log	Material Description		U.S.C.S.	Well Diagram	Remarks	
-	_				Poorly graded SAND (SP); brown (7.5YR 4/3); wet; loose; 80% coa sand; 15% very coarse sand; 5% gravel to 8mm; subrounded.	arse	SP		Total depth = 540 ft. Reached @ 1345 on 1/7/11.	
545	-								Water added during drilling (gallons) = 0	
-	-								Water added after drilling (gallons) = 1,048	
550	-								Water added during construction (gallons) = Not Recorded	
	-									
<u>555</u>	-									
560	-									
	-									
565	-									
- - - -	-									
570										

Monitoring Well Completion Diagram KAFB-106044

Installation Start Date/Time: <u>1/7/2011 @ 15:40</u> Installation End Date/Time: <u>1/17/2011 @ 14:00</u>



140705.CB010040_MW_KAFB_106044



Project Name: KAFB BFF		
Location: BFF		Well/Piez. No.: 106044
Personnel: G. Peacock		Date Installed: 1/17/11
Date: 1/23/11		Csg. Diameter (I.D.): <u>.42</u>
Samplers: G. Peacock		Total Depth (ft. BGL): <u>523.9</u>
Method of Development: X Surging	X Bailing	X Pumping
X Original Development	Redevelopment	Other
Development Date: 1/23/11-1/24	ł/11	
Depth to Water Before Develop	ing Well (ft. BGL): 490.3	
Height of Water Column: 33.6		gal. * 1 = 44.7
$V = (B + r_c + L_c + 7.4)$ Depth Purging From: <u>502</u> fe	, , , , , , , , , ,	8)+(H ₂ O added during drilling/installation) = <u>44.7</u> gallons Time Purging Begins: <u>0820, 1/24/11</u>
	<u>et</u>	
Weather: Partly Cloudy, 40's Equipment Nos.: pH Meter:	 VSI 6920 122447	Screened Interval (ft BGL): 504.23-519.23 EC Meter: YSI 6820 1234AZ Turbidity Meter: HACH 2100
	1010020 123472	
Equipment Decontaminated Pr	ior to Development: Y <u>X</u>	N
Describe: Steam Cleaned		
Collected Sample of Water Add Describe: N/A	ed to Well: YN	_X
Comment: N/A		

Well Development Record

Pg 1 of 2

Date	Time	Water Level (ft. Below TOC)	Volume Removed (gal.)	Temp.°C	pН	EC (ms/cm)	Turbidity N.T.U.	Comments
	-			-	•			
1/23/2011	1120	490.30	0.1	18.30	8.03	0.368	1000+	Begin Initial Bail
1/23/2011	1200		36	18.93	7.63	0.320	1000+	Continue Bailing
1/23/2011	1220		64	18.37	7.77	0.299	1000+	Continue Bailing
1/23/2011	1225							Begin Swabbing
1/23/2011	1315							Resume Swabbing
1/23/2011	1335							Resume Bailing
1/23/2011	1400		108	17.72	7.94	0.308	1000+	Continue Bailing
1/23/2011	1420							Switch to Swabbing
1/23/2011	1435							Resume Bailing
1/24/2011	0820	491.71	262	16.51	6.81	0.292	55.6	Begin Pumping

Notes:

* Water Levels - Reported to the nearest 0.01 foot

* pH - Reading rounded to 0.1 pH units

* Water temperature - Reported to nearest 0.1C * Turbidity report in NTV nearest whole #

Where:

B=3.14

 $\emptyset_{\rm s}$ = porosity of the sand pack

 $\omega_{\rm s}$ = porosity or the sana pack $r_{\rm c}$ = radius of the well casing and screen in feet $L_{\rm s}$ = length of water column inside the casing and screen in feet $r_{\rm w}$ = radius of the well bore in feet $L_{\rm s}$ = length of saturated portion of the sand pack in feet

7.48 gallons/cubic foot= conversion from cubic feet to gallons

Pg 2 of 2



Well Development Record

Project: KAFB BFF

Project Number: 140705

Date: 1/23/11

Well No: 106044

Samplers: G. Peacock

23/11

Time Start: 1120, 1/23/11

Checked By:

Time Finish: 1215, 1/24/11

Field Chemistry (cont'd)

	sity (contu)							
Date	Time	Water Level (ft. Below TOC)	Volume Removed (gal.)	Temp.°C	рН	EC (ms/cm)	Turbidity N.T.U.	Comments
1/24/2011	0840	491.75	362	9.11	7.92	0.307	9.95	Continue Pumping
1/24/2011	1035	491.80	462	18.63	7.92	0.307	3.6	Continue Pumping
1/24/2011	1055	491.80	562	19.14	7.95	0.308	3.9	Continue Pumping
1/24/2011	1110	491.82	662	19.40	7.95	0.308	9.5	Continue Pumping
1/24/2011	1130	491.85	762	19.51	7.96	0.306	5.87	Continue Pumping
1/24/2011	1150	491.87	862	20.04	7.94	0.306	5.04	Continue Pumping
1/24/2011	1205	491.87	962	19.93	7.97	0.305	11	Continue Pumping
1/24/2011	1215	491.87	1000	19.27	8.00	0.308	11.2	Stop Pumping
1/24/2011	1215	491.87	1000	19.27	8.00	0.308	11.2	Total Removed

Was well sampled after development? YES NO X

Sample Method: N/A

Sample Name: N/A

Analyses: N/A

APPENDIX D-1

KAFB-106045 Final Well Report

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Date Started: 12/16/2010

Y Coordinate: 1472400.50

Date TD Reached: 12/17/2010 Date Completed: 1/7/2011

Ground Elevation AMSL (ft): 5345.2

Project Name: KAFB BFF SWMU ST-106 and SS-111

Borehole ID: KAFB-106045

Hole Diameter Upper (in.): 11-3/4 Hole Diameter Lower (in.): 9-5/8 Surface Completion Type: Stick-up

Groundwater Levels BGS (ft): ✓ At Time of Drilling: Not Recorded
 ✓ At End of Drilling: 512.70 TAfter Drilling: 488.17

Drilling Contractor: WDC Drilling Drilling Method: Air Rotary Casing Hammer Logged By: Jason Tarbert

		ordinat					Jason Tarbert	Page 1 of 19
Depth (ft)	Sample Type	Number	Headspace PID	Lithologic Log	Material Description	U.S.C.S.	Well Diagram	Remarks
	5				SILT (ML); pink (5YR 7/3); dry; soft; low plasticity; 90% silt; 10% very fine sand to 0.1mm.		- Concrete Seal	Hand augered. ***Note: No headspace requirement at this location, groundwater level at time of drilling not recorded due to added
1(- - - D				Same as above (0 ft); reddish brown (5YR 5/4). SILT (ML); reddish brown (2.5 YR 4/4);			water***
1	- - - 5				moist; soft; low plasticity; 90% silt; 10% fine gravel.	ML	- High Solids	
20	- - - D				Same as above (10 ft); light reddish brown (5YR 6/4).		Bentonite Grout	
	-				Poorly Graded GRAVEL with Sand (GP); grey (5YR 5/1); dry; very loose; 90% fine gravel to 1mm; subangular; 10% fine to very fine sand.			
3	-				Same as above (21 ft); gravel to 2mm; angular.	GP		



Client: US Army Corps of Engineers Project Location: KAFB, Albuquerque, NM Project Name: KAFB BFF SWMU ST-106 and SS-111 Project Number: 140705

Date Started: 12/16/2010 Date TD Reached: 12/17/2010 Date Completed: 1/7/2011

Ground Elevation AMSL (ft): 5345.2 Y Coordinate: 1472400.50 X Coordinate: 1541418.00 Hole Diameter Upper (in.): 11-3/4 Hole Diameter Lower (in.): 9-5/8 Surface Completion Type: Stick-up

Groundwater Levels BGS (ft): \square At Time of Drilling: Not Recorded \blacksquare At End of Drilling: 512.70 \blacksquare After Drilling: 488.17

Drilling Contractor: WDC Drilling Drilling Method: Air Rotary Casing Hammer Logged By: Jason Tarbert

Page 2 of 19

				J4 I4	18.00 Logged By: Jason Tarbert			
ର Depth (ft)	Sample Type	Number	Headspace PID	Lithologic Log	Material Description	U.S.C.S.	Well Diagram	Remarks
	-				SILT (ML); reddish brown (5YR 4/4); very soft; moist; non to low plasticity; 95% silt with clay; 5% very fine sand.			
35	-				Same as above (30 ft).			
40					Same as above (30 ft).			
45					Same as above (30 ft); 10% fine to very fine sand.	ML	- High Solids Bentonite Grout	
50	-				Same as above (30 ft).			
55	-				Same as above (30 ft).			
60								



Client: US Army Corps of Engineers Project Location: KAFB, Albuquerque, NM Project Name: KAFB BFF SWMU ST-106 and SS-111 Project Number: 140705

Date Started: 12/16/2010 Date TD Reached: 12/17/2010 Date Completed: 1/7/2011

Ground Elevation AMSL (ft): 5345.2 Y Coordinate: 1472400.50 X Coordinate: 1541418.00 Hole Diameter Upper (in.): 11-3/4 Hole Diameter Lower (in.): 9-5/8 Surface Completion Type: Stick-up

Groundwater Levels BGS (ft): \square At Time of Drilling: Not Recorded \blacksquare At End of Drilling: 512.70 \blacksquare After Drilling: 488.17

Drilling Contractor: WDC Drilling Drilling Method: Air Rotary Casing Hammer Logged By: Jason Tarbert

Page 3 of 19

				C. IC		10.00 Logged	<u> </u>			
0 Danth (#)	O Deput (II) Samala Tvino	odiliple lype	Number	Headspace PID	Lithologic Log	Material Description	U.S.C.S.		Well Diagram	Remarks
	-					Silty GRAVEL with Sand (GM); pinkish grey (5YR 6/2); dry; loose; 50% gravel to 20mm; angular; 20% fine to very fine	GM		• • • • • •	
_6	5					sand; 30% silt with clay. Silty SAND (SM); brown (7.5YR 5/4); moist; loose; 80% fine to very fine sand; rounded; 20% silt with clay.				
_7	- - 0 -					Same as above (62 ft).			0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	
_7	5					Same as above (62 ft).	SM		- High Solids Bentonite Grout	
8	0					Same as above (62 ft).			 a b b b b b c b c <lic< li=""> c c c c c<!--</td--><td></td></lic<>	
8	5					Same as above (62 ft).			 • •<	
9	0							• • • • • •	• • • • • •	



Client:US Army Corps of EngineersHoleProject Location:KAFB, Albuquerque, NMHoleProject Name:KAFB BFF SWMU ST-106 and SS-111SurfaProject Number:140705

Date Started: 12/16/2010 Date TD Reached: 12/17/2010 Date Completed: 1/7/2011

Ground Elevation AMSL (ft): 5345.2 Y Coordinate: 1472400.50 X Coordinate: 1541418.00 Hole Diameter Upper (in.): 11-3/4 Hole Diameter Lower (in.): 9-5/8 Surface Completion Type: Stick-up

Groundwater Levels BGS (ft): \square At Time of Drilling: Not Recorded \blacksquare At End of Drilling: 512.70 \blacksquare After Drilling: 488.17

Drilling Contractor: WDC Drilling Drilling Method: Air Rotary Casing Hammer Logged By: Jason Tarbert

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~ ~ ~	X Coordinate: 1541418.00 Logged By: Jason Tarbert								
g Depth (ft)	Sample Type	Number	Headspace PID	Lithologic Log	Material Description	U.S.C.S.	Well Diagram	Remarks	
95	-				Silty SAND (SM); brown (7.5YR 5/4); moist; loose; 80% fine to very fine sand; rounded; 20% silt with clay.	SM			
	-				Poorly Graded SAND (SP); brown (7.5YR 5/4); moist; 95% fine to very fine sand; well sorted; 5% fines.				
100	-				Same as above (95 ft); light brown (7.5YR 6/3).				
105	-				Same as above (95 ft).	SP	- High Solids Bentonite Grout		
110	-				Same as above (95 ft).				
115	-				Same as above (95 ft).				
120									



Client: US Army Corps of Engineers Project Location: KAFB, Albuquerque, NM Project Name: KAFB BFF SWMU ST-106 and SS-111 Project Number: 140705

Date Started: 12/16/2010 Date TD Reached: 12/17/2010 Date Completed: 1/7/2011

Ground Elevation AMSL (ft): 5345.2 Y Coordinate: 1472400.50 X Coordinate: 1541418.00 Hole Diameter Upper (in.): 11-3/4 Hole Diameter Lower (in.): 9-5/8 Surface Completion Type: Stick-up

Groundwater Levels BGS (ft): \square At Time of Drilling: Not Recorded \blacksquare At End of Drilling: 512.70 \blacksquare After Drilling: 488.17

Drilling Contractor: WDC Drilling Drilling Method: Air Rotary Casing Hammer Logged By: Jason Tarbert

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		numat	.e. 1:	5414	Io.00 Logged	Бу. с		
12 Depth (ft)	Sample Type	Number	Headspace PID	Lithologic Log	Material Description	U.S.C.S.	Well Diagram	Remarks
	-				Lean CLAY with Sand (CL); brown (7.5YR 5/4); moist; firm; low to medium plasticity; 80% clay; 20% fine to very fine sand; thinly bedded.	CL		
125	-				Silty SAND (SM); brown (7.5YR 5/4); moist; loose to medium density; 80% fine to very fine sand; rounded; 20% silt with clay.			
130	-				Same as above (125 ft).	SM		
135	-				Same as above (125 ft).		- High Solids Bentonite Grout	
140	-				Poorly Graded SAND (SP); pinkish grey (7.5YR 6/2); dry to moist; very loose; 95% well sorted sand to 0.2mm; subrounded; 5% fines.			
145	-				Same as above (145 ft).	SP		
150	-							



Date Started: 12/16/2010

Y Coordinate: 1472400.50

Date TD Reached: 12/17/2010 Date Completed: 1/7/2011

Ground Elevation AMSL (ft): 5345.2

Borehole ID: KAFB-106045

Client:US Army Corps of EngineersHole Diameter Upper (in.):11-3/4Project Location:KAFB, Albuquerque, NMHole Diameter Lower (in.):9-5/8Project Name:KAFB BFF SWMU ST-106 and SS-111Surface Completion Type:Stick-up

Groundwater Levels BGS (ft): \square At Time of Drilling: Not Recorded \blacksquare At End of Drilling: 512.70 \blacksquare After Drilling: 488.17

Drilling Contractor: WDC Drilling Drilling Method: Air Rotary Casing Hammer Logged By: Jason Tarbert

XC		dinat	e: 1	54141		Logged By: Jason Tarbert Page 6 of 19					
15 Depth (ft)	Sample Type	Number	Headspace PID	Lithologic Log	Material Description	U.S.C.S.	\ \	Well Diagram	Remarks		
155				00000000000000000000000000000000000000	Poorly Graded GRAVEL with Silt and Sand (GP-GM); pinkish grey (7.5YR 6/2); dry; very loose; 70% fine gravel to 10mm; subrounded; 20% fine to medium sand; trace granite clasts; 10% silt.	GP- GM					
<u>160</u>	-				Reddish brown sand lense. Poorly Graded GRAVEL with Silt and Sand (GP-GM); pinkish grey (7.5YR 6/2); dry; very loose; 70% fine gravel to 10mm; subrounded; 20% fine to medium sand; trace granite clasts; 10% silt.	SM GP- GM	- • • - • • - • • - • • • • • • • • • •	• • • • • • • • • • • • • • • • • • •			
170	-				Poorly Graded SAND with Gravel (SP); pinkish grey (7.5YR 6/2); dry to slightly moist; very loose; 85% medium sand; 20% fine to coarse gravel to 3cm; subangular; 5% silt. Same as above (165 ft).		- • • • • • • • • • • • • • • • • • • •	- High Solids Bentonite Grout			
175	-				Same as above (165 ft); gravel content decreasing.	SP	• •	• • • •			



Client: US Army Corps of Engineers

Project Number: 140705

Date Started: 12/16/2010

Y Coordinate: 1472400.50

Date TD Reached: 12/17/2010 Date Completed: 1/7/2011

Ground Elevation AMSL (ft): 5345.2

Project Location: KAFB, Albuquerque, NM

Project Name: KAFB BFF SWMU ST-106 and SS-111

Borehole ID: KAFB-106045

Hole Diameter Upper (in.): 11-3/4 Hole Diameter Lower (in.): 9-5/8 Surface Completion Type: Stick-up

Groundwater Levels BGS (ft): \square At Time of Drilling: Not Recorded \blacksquare At End of Drilling: 512.70 \blacksquare After Drilling: 488.17

Drilling Contractor: WDC Drilling Drilling Method: Air Rotary Casing Hammer Logged By: Jason Tarbert

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XC	Coo	rdinat	e: 18	5414 ⁻	18.00 Logged	By: 、	Jason	Tarbert	Page 7 of 19
8 Depth (ft)	Sample Type	Number	Headspace PID	Lithologic Log		U.S.C.S.	\ \	Well Diagram	Remarks
- - 185	-				Poorly Graded SAND with Gravel (SP); pinkish grey (7.5YR 6/2); dry to slightly moist; very loose; 75% medium sand; 20% fine to coarse gravel to 3cm; subangular; 5% silt.				
-	-				Poorly Graded SAND (SP); pinkish grey (7.5YR 6/2); dry to slightly moist; very loose; 95% medium sand to 0.2mm; little to no fines.			 • •<	Drilling very fast.
<u>190</u> - -					Same as above (185 ft).			 • •<	
<u>195</u> - -	-				Same as above (185 ft).	SP		 High Solids Bentonite Grout 	
<u>200</u> - -	-				Same as above (185 ft).			• • • • • • • • • • • • • • • •	
<u>205</u> - -	-				Same as above (185 ft).			 • •<	
_ 210							•••	• • • •	



Client: US Army Corps of Engineers Project Location: KAFB, Albuquerque, NM Project Name: KAFB BFF SWMU ST-106 and SS-111 Project Number: 140705

Date Started: 12/16/2010 Date TD Reached: 12/17/2010 Date Completed: 1/7/2011

Ground Elevation AMSL (ft): 5345.2 Y Coordinate: 1472400.50 X Coordinate: 1541418.00 Hole Diameter Upper (in.): 11-3/4 Hole Diameter Lower (in.): 9-5/8 Surface Completion Type: Stick-up

Groundwater Levels BGS (ft): ☑ At Time of Drilling: Not Recorded ▼ At End of Drilling: 512.70 ▼ After Drilling: 488.17

Drilling Contractor: WDC Drilling Drilling Method: Air Rotary Casing Hammer Logged By: Jason Tarbert

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Sample Type Headspace PID Lithologic Log Depth (ft) Number Ś S.C. Material Description Remarks Well Diagram 5 210 Poorly Graded SAND (SP); light reddish . brown (5YR 6/3); dry to slightly moist; very loose; 95% medium sand; sand size 0.2mm; little to no fines. 215 SP Same as above (210 ft). • • 220 • No cuttings returned. Drill string plugged, no cuttings returned. Added 5 gallons of water. • 225 **High Solids** Same as above (210 ft). Bentonite • Grout . • • 230 Same as above (210 ft). • • • • SP • • 235 • • • • • Same as above (210 ft). • • • • . • 240



Date Started: 12/16/2010

Y Coordinate: 1472400.50

Date TD Reached: 12/17/2010 Date Completed: 1/7/2011

Ground Elevation AMSL (ft): 5345.2

Project Name: KAFB BFF SWMU ST-106 and SS-111

Borehole ID: KAFB-106045

Hole Diameter Upper (in.): 11-3/4 Hole Diameter Lower (in.): 9-5/8 Surface Completion Type: Stick-up

Groundwater Levels BGS (ft): ✓ At Time of Drilling: Not Recorded
 ✓ At End of Drilling: 512.70 TAfter Drilling: 488.17

Drilling Contractor: WDC Drilling Drilling Method: Air Rotary Casing Hammer Logged By: Jason Tarbert

X Coordinate: 1472 X Coordinate: 1547		Drilling Method: Air Rotary Casing Hammer Logged By: Jason Tarbert Page 9 of 19					
000 Depth (ft) Sample Type Number Headspace PID Lithologic	Material Description	U.S.C.S.	Well Diagram	Remarks			
	Poorly Graded SAND (SP); light reddish brown (5YR 6/3); dry to slightly moist; very loose; 95% medium sand; sand size 0.2mm; little to no fines.			11-3/4" drive casing advanced to 240 ft bgs. Began advancing 9-5/8" drive casing.			
<u>245</u> _ _ _	Same as above (240 ft); moist; percent gravel alternates between 0% and 5% between 245 and 270 ft bgs.						
250	Same as above (245 ft).						
255	Same as above (245 ft).	SP	- High Solids Bentonite Grout				
260	Same as above (245 ft).			Drilling very fast.			
265	Same as above (245 ft).						
270							



Client: US Army Corps of EngineersHoleProject Location: KAFB, Albuquerque, NMHoleProject Name: KAFB BFF SWMU ST-106 and SS-111SurfaProject Number: 140705One

Date Started: 12/16/2010 Date TD Reached: 12/17/2010 Date Completed: 1/7/2011

Ground Elevation AMSL (ft): 5345.2 Y Coordinate: 1472400.50 X Coordinate: 1541418.00 Hole Diameter Upper (in.): 11-3/4 Hole Diameter Lower (in.): 9-5/8 Surface Completion Type: Stick-up

Groundwater Levels BGS (ft): \square At Time of Drilling: Not Recorded \blacksquare At End of Drilling: 512.70 \blacksquare After Drilling: 488.17

Drilling Contractor: WDC Drilling Drilling Method: Air Rotary Casing Hammer Logged By: Jason Tarbert

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Sample Type Headspace PID Lithologic Log Depth (ft) Number Ś S.C. Material Description Remarks Well Diagram 5 270 Drilling fast. Poorly Graded SAND (SP); pinkish grey . (7.5YR 7/2); moist; very loose; 95% medium sand to 0.5mm; subangular; • well sorted; 5% fines. 275 Same as above (270 ft). • • • • 280 • Same as above (270 ft); gravel content alternating between 0% and 10% ••••• through interval 270 - 299 ft. SP 285 High Solids Same as above (280 ft). Bentonite Grout • 290 Same as above (280 ft). • • • 295 • Same as above (280 ft). • • • • • . • • GP ٠ 300



Date Started: 12/16/2010

Y Coordinate: 1472400.50

Date TD Reached: 12/17/2010 Date Completed: 1/7/2011

Ground Elevation AMSL (ft): 5345.2

Borehole ID: KAFB-106045

Client:US Army Corps of EngineersHole Diameter Upper (in.):11-3/4Project Location:KAFB, Albuquerque, NMHole Diameter Lower (in.):9-5/8Project Name:KAFB BFF SWMU ST-106 and SS-111Surface Completion Type:Stick-up

Groundwater Levels BGS (ft): \square At Time of Drilling: Not Recorded \blacksquare At End of Drilling: 512.70 \blacksquare After Drilling: 488.17

Drilling Contractor: WDC Drilling Drilling Method: Air Rotary Casing Hammer Logged By: Jason Tarbert

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X	Coo	ordinat	e: 1	54141	B.00 Logged By: Jason Tarbert Page 11 of 1					
00 Depth (ft)	Sample Type	Number	-		Material Description	U.S.C.S.		Well Diagram	Remarks	
	-				5% fines; occurs as a lense.	GP	• • • • • • • • • • • • • • • •			
305	- 5 - -				Poorly Graded SAND (SP); reddish yellow (7.5YR 6/6); very loose; subangular; 95% medium sand; 5% fine gravel to 1cm; little to no fines.			• • • • • • • • • • • • • • • •		
<u>310</u>	- - - -				Same as above (303 ft).	SP		 • •<		
<u>315</u>	-				Same as above (303 ft).			- High Solids Bentonite Grout		
320)				Poorly Graded GRAVEL (GP); light grey (7.5YR 7/1); dry; 95% gravel to 4cm; subangular to rounded; 5% fines.	GP	· · · · · · · · · · · · · · · · · · ·	• • • • • •		
325	-				Poorly Graded SAND (SP); reddish yellow (7.5YR 6/6); very loose; 95% medium sand; 5% fine gravel to 1cm; subangular; little to no fines. Same as above (320 ft).	SP		 • •<		
330	- - -)						• • • • • •	• • • • • • • •		



Client: US Army Corps of Engineers Project Location: KAFB, Albuquerque, NM Hole Diameter Upper (in.): 11-3/4 Hole Diameter Lower (in.): 9-5/8 Project Name: KAFB BFF SWMU ST-106 and SS-111

Date Started: 12/16/2010 Date TD Reached: 12/17/2010 Date Completed: 1/7/2011

Project Number: 140705

Ground Elevation AMSL (ft): 5345.2 Y Coordinate: 1472400.50 X Coordinate: 1541418.00

Surface Completion Type: Stick-up Groundwater Levels BGS (ft): ✓ At Time of Drilling: Not Recorded
 ✓ At End of Drilling: 512.70

TAfter Drilling: 488.17

Drilling Contractor: WDC Drilling Drilling Method: Air Rotary Casing Hammer Logged By: Jason Tarbert

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X	000	numai	.e. 1	54141	8.00 Logger	Logged By: Jason Tarbert				
05 Depth (ft)	Sample Type	Number	Headspace PID	Lithologic Log	Material Description	U.S.C.S.	,	Well Diagram	Remarks	
335	-				Poorly Graded SAND (SP); reddish yellow (7.5YR 6/6); very loose; 95% medium sands; 5% fine gravel to 1cm; subangular; little to no fines. Same as above (330 ft).					
<u>340</u>	-				Same as above (330 ft).		 • •<	 • •<	Drilling rate: 1 ft/min from 340 ft to 360 ft.	
<u>345</u>	-				Same as above (330 ft).	SP	 • •<	- High Solids Bentonite Grout		
350	-				Same as above (330 ft); thinly bedded clay lense.		 • •<	• • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • •		
355	-				Same as above (330 ft).			• • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • •		
360							• • • • • •	• • • •		



Client: US Army Corps of Engineers Project Location: KAFB, Albuquerque, NM Project Name: KAFB BFF SWMU ST-106 and SS-111 Project Number: 140705

Date Started: 12/16/2010 Date TD Reached: 12/17/2010 Date Completed: 1/7/2011

Ground Elevation AMSL (ft): 5345.2 Y Coordinate: 1472400.50 X Coordinate: 1541418.00 Hole Diameter Upper (in.): 11-3/4 Hole Diameter Lower (in.): 9-5/8 Surface Completion Type: Stick-up

Groundwater Levels BGS (ft): \square At Time of Drilling: Not Recorded \blacksquare At End of Drilling: 512.70 \blacksquare After Drilling: 488.17

Drilling Contractor: WDC Drilling Drilling Method: Air Rotary Casing Hammer Logged By: Jason Tarbert

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~ ~ ~	X Coordinate: 1541418.00 Logged By: Jason Tarbert								
8 Depth (ft)	Sample Type	Number	Headspace PID	Lithologic Log	Material Description	U.S.C.S.	Well Diagram	Remarks	
	-				Poorly Graded SAND (SP); reddish yellow (7.5YR 6/6); very loose; 95% medium sands; 5% fine gravel to 1cm; subangular; little to no fines.	SP			
365	-				Well Graded SAND with Gravel (SW); brown (7.5YR 5/2); moist; very loose; 60% medium to coarse sand; 40% gravel to 2cm; rounded; trace fines.	sw			
370	-				Poorly Graded SAND with Gravel (SP); brown (7.5YR 5/2); moist; very loose; 85% coarse sand; 15% gravel to 1cm; subrounded; trace fines.				
375	-				Same as above (369 ft).	SP	- High Solids Bentonite Grout		
<u>380</u>	-				Same as above (369 ft).		• • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • •		
<u>385</u> 385 390	-			0 0	6 inch gravel lense up to 2cm in diameter. Poorly Graded SAND with Gravel (SP); brown (7.5YR 5/2); moist; very loose; 85% coarse sand; 15% gravel to 1cm; subrounded; trace fines.	SP	0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0		



Client: US Army Corps of Engineers Project Location: KAFB, Albuquerque, NM Project Name: KAFB BFF SWMU ST-106 and SS-111 Project Number: 140705

Date Started: 12/16/2010 Date TD Reached: 12/17/2010 Date Completed: 1/7/2011

Ground Elevation AMSL (ft): 5345.2 Y Coordinate: 1472400.50 X Coordinate: 1541418.00 Hole Diameter Upper (in.): 11-3/4 Hole Diameter Lower (in.): 9-5/8 Surface Completion Type: Stick-up

Groundwater Levels BGS (ft): \square At Time of Drilling: Not Recorded \blacksquare At End of Drilling: 512.70 \blacksquare After Drilling: 488.17

Drilling Contractor: WDC Drilling Drilling Method: Air Rotary Casing Hammer Logged By: Jason Tarbert

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66 Depth (ft)	Sample Type	Number	Headspace PID	Lithologic Log	Material Description	U.S.C.S.	Well Diagram	Remarks
	-				Poorly Graded SAND with Gravel (SP); brown (7.5YR 5/2); moist; very loose; 85% coarse sand; 15% gravel to 1cm; subrounded; trace fines.			
395	-				Same as above (390 ft).			
400	-				Same as above (390 ft).			
<u>405</u>	-				Same as above (390 ft); moisture content increasing.	SP	- High Solids Bentonite Grout	
<u>410</u>	-				Same as above (390 ft).			
<u>415</u>	-				Same as above (390 ft).			
420	-							



Client: US Army Corps of Engineers Project Location: KAFB, Albuquerque, NM Project Name: KAFB BFF SWMU ST-106 and SS-111 Project Number: 140705

Date Started: 12/16/2010 Date TD Reached: 12/17/2010 Date Completed: 1/7/2011

Ground Elevation AMSL (ft): 5345.2 Y Coordinate: 1472400.50 X Coordinate: 1541418.00 Hole Diameter Upper (in.): 11-3/4 Hole Diameter Lower (in.): 9-5/8 Surface Completion Type: Stick-up

Groundwater Levels BGS (ft): \square At Time of Drilling: Not Recorded \blacksquare At End of Drilling: 512.70 \blacksquare After Drilling: 488.17

Drilling Contractor: WDC Drilling Drilling Method: Air Rotary Casing Hammer Logged By: Jason Tarbert

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		iunat	<u>.</u>		10.00 209900	<u> </u>		
05 Depth (ft)	Sample Type	Number	Headspace PID	Lithologic Log	Material Description	U.S.C.S.	Well Diagram	Remarks
	-				Poorly Graded SAND with Gravel (SP); brown (7.5YR 5/2); moist; very loose; 90% coarse sand; 10% gravel to 1.5cm; subrounded; trace fines.			
<u>425</u>	-				Same as above (420 ft); no gravel.			
<u>430</u>	-				Same as above (420 ft); moist; 5% gravel.	SP		
435	-				Same as above (420 ft); dry; no gravel.		- High Solids Bentonite Grout	
440	-				Silty SAND (SM); red brown (5YR 5/4); moist; loose; 85% fine sand to 0.04mm; subrounded; 15% silt; clay nodules.	SM		
<u>445</u> 450	_				Poorly Graded SAND (SP); brown (7.5YR 5/4); moist; very loose; 100% medium sand to 0.3mm; subrounded; trace fines.	SP		



Client: US Army Corps of Engineers

Project Number: 140705

Date Started: 12/16/2010

Date TD Reached: 12/17/2010 Date Completed: 1/7/2011

Ground Elevation AMSL (ft): 5345.2

Project Location: KAFB, Albuquerque, NM

Borehole ID: KAFB-106045

Hole Diameter Upper (in.): 11-3/4 Hole Diameter Lower (in.): 9-5/8 Project Name: KAFB BFF SWMU ST-106 and SS-111 Surface Completion Type: Stick-up

> Groundwater Levels BGS (ft): ✓ At Time of Drilling: Not Recorded
> ✓ At End of Drilling: 512.70 TAfter Drilling: 488.17

Drilling Contractor: WDC Drilling Drilling Method: Air Rotary Casing Hammer Logged By: Jason Tarbert

Y	Coo	rdinat	e: 14	4724(Drilling Contractor: WDC Drilling Drilling Method: Air Rotary Casing Hammer Logged By: Jason Tarbert Page 16 of 19				
65 Depth (ft)	Sample Type	Number	Headspace PID	Lithologic Log	Material Description		j j	Well Diagram	Remarks	
455	-				Poorly Graded SAND (SP); browr (7.5YR 5/4); moist; very loose; 10 medium sand to 0.3mm; subround trace fines. Same as above (450 ft); trace gra	0% ded;	Ρ		Started adding water, ~10 gallons.	
<u>460</u> 465	-				Well Graded SAND with Gravel (dark brown (7.5YR 3/3); moist; ve loose; 60% very coarse sand; 40 ^o gravel to 1.5cm; subrounded; trac Same as above (460 ft).	ery %	N	- High Solids Bentonite	Added ~30 gallons of water.	
470	-				Poorly Graded SAND (SP); dark t (7.5 YR 3/3); moist; very loose; 10 medium to coarse sand to 0.5 mn subrounded; trace fines.	00%	 P	Grout	Added ~50 gallons of water.	
<u>475</u> 480	-				Well Graded SAND with Gravel (dark brown (7.5YR 3/3); moist; ve loose; 60% very coarse sand; 409 gravel to 1.5cm; subrounded; trac	SW); ery %		- Top of Bentonite Seal		



Client: US Army Corps of Engineers Project Location: KAFB, Albuquerque, NM Project Name: KAFB BFF SWMU ST-106 and SS-111 Project Number: 140705

Date Started: 12/16/2010 Date TD Reached: 12/17/2010 Date Completed: 1/7/2011

Ground Elevation AMSL (ft): 5345.2 Y Coordinate: 1472400.50 X Coordinate: 1541418.00

Borehole ID: KAFB-106045

Hole Diameter Upper (in.): 11-3/4 Hole Diameter Lower (in.): 9-5/8 Surface Completion Type: Stick-up

Groundwater Levels BGS (ft): \square At Time of Drilling: Not Recorded \blacksquare At End of Drilling: 512.70 \blacksquare After Drilling: 488.17

Drilling Contractor: WDC Drilling Drilling Method: Air Rotary Casing Hammer Logged By: Jason Tarbert

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8 Depth (ft)	Sample Type	Number	Headspace PID	Lithologic Loa	Material Description	U.S.C.S.	Well Diagram	Remarks
485					Well Graded SAND with Gravel (SW); dark brown (7.5YR 3/3); moist; very loose; 60% very coarse sand; 40% gravel to 1.5cm; subrounded; trace fines.	sw		Added ~10 gallons of water.
490					Silty SAND (SM); reddish brown (5YR 4/3); damp; loose; 75% medium to coarse sand to 3mm; rounded; 25% silt.	SM		
495					Well Graded SAND with Gravel (SW); dark brown (7.5YR 3/3); moist; very loose; 60% very coarse sand; 40% gravel to 1.5cm; subrounded; trace fines.	sw		Added ~50 gallons of water, not sure when water table was encountered due to saturation.
-					Silty SAND (SM); reddish brown (5YR 4/3); saturated; loose; 75% medium to coarse sand to 3mm; rounded; 25% silt.		- Native Backfill	Difficult to determine fines content due to saturation.
<u>500</u> - -					Same as above (495 ft).	SM		
<u>505</u> - -					Same as above (495 ft).			
510								



Date Started: 12/16/2010

Date TD Reached: 12/17/2010 Date Completed: 1/7/2011

Ground Elevation AMSL (ft): 5345.2

Borehole ID: KAFB-106045

Client: US Army Corps of Engineers Project Location: KAFB, Albuquerque, NM Project Name: KAFB BFF SWMU ST-106 and SS-111 Hole Diameter Upper (in.): 11-3/4 Hole Diameter Lower (in.): 9-5/8 Surface Completion Type: Stick-up

> Groundwater Levels BGS (ft): ✓ At Time of Drilling: Not Recorded
> ✓ At End of Drilling: 512.70 TAfter Drilling: 488.17

Drilling Contractor: WDC Drilling Drilling Method: Air Rotary Casing Hammer Logged By: Jason Tarbert

Y (X (Cool Cool	rdinat rdinat	e: 14	17240	SL (ft): 5345.2 00.50 18.00	Drilling Logged	Metho	d: Air F	Rotary Casing H arbert	lammer Page 18 of 19
10 Depth (ft)	Sample Type	Number	Headspace PID	Lithologic Log	Material Description		U.S.C.S.	Well Diagram		Remarks
515	-				Poorly Graded SAND (SP); reddi brown (5YR 5/3); wet; very loose coarse sand to 0.1mm; subround <u></u> trace fines.	; 100%	SP		-5" PVC Schedule 80 Riser	Driller added ten gallons of water. Producing water from aquifer.
520	-			<u></u>	No cuttings returned.				- Bentonite Seal - Top of 20/40	
525	-				No cuttings returned.				- Top of 10/20 Sand	
530	-				Poorly Graded SAND with Silt (S brown (7.5YR 4/3); wet; very loos medium to coarse sand to 0.5mn silt; trace gravel; subangular; gra 3cm.	se; 90% n; 10%			- Top of Schedule 80 PVC 0.010 Slot Screen	
535	_				Same as above (525 ft).		SP- SM			
540	-				Same as above (525 ft); <5% silt becoming coarser.	; sand				



Client:US Army Corps of EngineersHProject Location:KAFB, Albuquerque, NMHProject Name:KAFB BFF SWMU ST-106 and SS-111SProject Number:140705

Date Started: 12/16/2010 Date TD Reached: 12/17/2010 Date Completed: 1/7/2011

Ground Elevation AMSL (ft): 5345.2 Y Coordinate: 1472400.50 X Coordinate: 1541418.00 Hole Diameter Upper (in.): 11-3/4 Hole Diameter Lower (in.): 9-5/8 Surface Completion Type: Stick-up

Groundwater Levels BGS (ft): \square At Time of Drilling: Not Recorded \blacksquare At End of Drilling: 512.70 \blacksquare After Drilling: 488.17

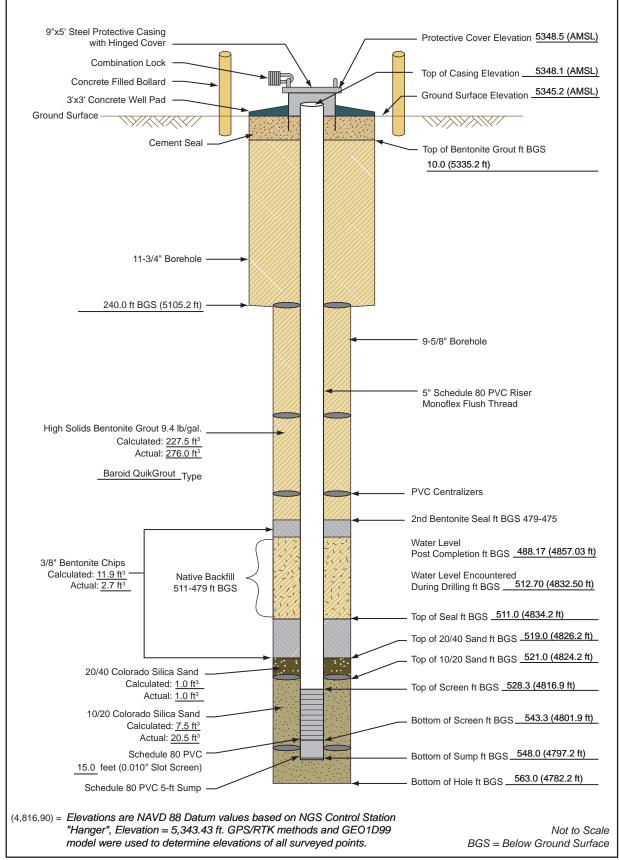
Drilling Contractor: WDC Drilling Drilling Method: Air Rotary Casing Hammer Logged By: Jason Tarbert

Page 19 of 19

X	Coo	ordinat	e: 1	5414	18.00 Logged	By: 、	lason Tarbert	Page 19 of 19
5 Depth (ft)	Sample Type	Number	Headspace PID	Lithologic Log		U.S.C.S.	Well Diagram	Remarks
	-				Poorly Graded SAND with Silt (SP-SM); brown (7.5YR 4/3); wet; very loose; 90% medium to coarse sand to 0.5mm; 10% silt; trace gravel to 3cm; subangular.		- Bottom of Screen	
<u>545</u>	-				Same as above (540 ft).		- Sump	
<u>550</u>	-				Same as above (540 ft).	SP- SM	- Bottom of Sump	
<u>555</u>	-				Same as above (540 ft).			
<u>560</u>	-				Silty SAND (SM); reddish brown (5YR 5/3); wet; very loose; 85% medium sand to 1mm; subrounded; 15% silt.	SM		_ Total depth = 563 ft.
<u>565</u>	-							Reached @ 1530 on 12/17/11. Water added during drilling (gallons) = 160.
570	-							Water added during construction (gallons) = 1700.

Monitoring Well Completion Diagram KAFB-106045

Installation Start Date/Time: <u>12/20/2010 @ 10:48</u> Installation End Date/Time: <u>1/8/2011 @ 17:38</u>



140705.CB010040_MW_KAFB_106045



Project Name: KAFB BFF							
Location: BFF		Well/Piez. No.: 106044					
Personnel: G. Peacock		Date Installed: 1/17/11					
Date: 1/23/11		Csg. Diameter (I.D.): <u>.42'</u>					
Samplers: G. Peacock		Total Depth (ft. BGL): <u>523.9</u>					
Method of Development: X Surging	X Bailing	X Pumping					
X Original Development	Redevelopment	Other					
Development Date: 1/23/11-1/24	ł/11						
Depth to Water Before Develop	ing Well (ft. BGL): 490.3						
Height of Water Column: <u>33.6</u>		gal. * 1 = 44.7					
V=(B * r _c * · L _c * 7.46 Depth Purging From: <u>502</u> fe	, , , , , , , , , , , , , , , , , , , ,	48)+(H ₂ O added during drilling/installation) = <u>44.7 gallons</u> Time Purging Begins: <u>0820, 1/24/11</u>					
	<u>et</u>						
Weather: Partly Cloudy, 40's Equipment Nos.: pH Meter:	 VSI 6920 122447	Screened Interval (ft BGL): 504.23-519.23 EC Meter: YSI 6820 1234AZ Turbidity Meter: HACH 2100					
	1010020 123472						
Equipment Decontaminated Pr	ior to Development: Y <u>X</u>	<u>(N</u>					
Describe: Steam Cleaned							
Collected Sample of Water Add Describe: N/A	led to Well: YN	X					
Comment: N/A							

Well Development Record

Pg 1 of 2

Date	Time	Water Level (ft. Below TOC)	Volume Removed (gal.)	Temp.°C	pН	EC (ms/cm)	Turbidity N.T.U.	Comments
				-	•			
1/23/2011	1120	490.30	0.1	18.30	8.03	0.368	1000+	Begin Initial Bail
1/23/2011	1200		36	18.93	7.63	0.320	1000+	Continue Bailing
1/23/2011	1220		64	18.37	7.77	0.299	1000+	Continue Bailing
1/23/2011	1225							Begin Swabbing
1/23/2011	1315							Resume Swabbing
1/23/2011	1335							Resume Bailing
1/23/2011	1400		108	17.72	7.94	0.308	1000+	Continue Bailing
1/23/2011	1420							Switch to Swabbing
1/23/2011	1435							Resume Bailing
1/24/2011	0820	491.71	262	16.51	6.81	0.292	55.6	Begin Pumping

Notes:

* Water Levels - Reported to the nearest 0.01 foot

* pH - Reading rounded to 0.1 pH units

* Water temperature - Reported to nearest 0.1C * Turbidity report in NTV nearest whole #

Where:

B=3.14

 $\emptyset_{\rm s}$ = porosity of the sand pack

 $\omega_{\rm s}$ = porosity or the sana pack $r_{\rm c}$ = radius of the well casing and screen in feet $L_{\rm s}$ = length of water column inside the casing and screen in feet $r_{\rm w}$ = radius of the well bore in feet $L_{\rm s}$ = length of saturated portion of the sand pack in feet

7.48 gallons/cubic foot= conversion from cubic feet to gallons

Pg 2 of 2



Well Development Record

Project: KAFB BFF

Project Number: 140705

Date: 1/23/11

Well No: 106044

Samplers: G. Peacock

23/11

Time Start: 1120, 1/23/11

Checked By:

Time Finish: 1215, 1/24/11

Field Chemistry (cont'd)

Date	Time	Water Level (ft. Below TOC)	Volume Removed (gal.)	Temp.°C	рН	EC (ms/cm)	Turbidity N.T.U.	Comments	
1/24/2011	0840	491.75	362	9.11	7.92	0.307	9.95	Continue Pumping	
1/24/2011	1035	491.80	462	18.63	7.92	0.307	3.6	Continue Pumping	
1/24/2011	1055	491.80	562	19.14	7.95	0.308	3.9	Continue Pumping	
1/24/2011	1110	491.82	662	19.40	7.95	0.308	9.5	Continue Pumping	
1/24/2011	1130	491.85	762	19.51	7.96	0.306	5.87	Continue Pumping	
1/24/2011	1150	491.87	862	20.04	7.94	0.306	5.04	Continue Pumping	
1/24/2011	1205	491.87	962	19.93	7.97	0.305	11	Continue Pumping	
1/24/2011	1215	491.87	1000	19.27	8.00	0.308	11.2	Stop Pumping	
1/24/2011	1215	491.87	1000	19.27	8.00	0.308	11.2	Total Removed	

Was well sampled after development? YES NO X

Sample Method: N/A

Sample Name: N/A

Analyses: N/A

APPENDIX D-1

KAFB-106101 Final Well Report

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Date Started: 2/15/2011

Date TD Reached: 2/19/2011 Date Completed: 2/21/2011

Y Coordinate: 1474038.62

Ground Elevation AMSL (ft): 5337.2

Project Name: KAFB BFF SWMU ST-106 and SS-111

Borehole ID: KAFB-106101

Hole Diameter Upper (in.): 11-3/4 Hole Diameter Lower (in.): 9-5/8 Surface Completion Type: Stick-up

Groundwater Levels BGS (ft): \searrow At Time of Drilling: 485.00 \checkmark At End of Drilling: 480.45 TAfter Drilling: 482.40

Drilling Contractor: WDC Drilling Drilling Method: Air Rotary Casing Hammer Logged By: Brian Lucero

ХC	oor	dinat		54043			Brian Lucero	Page 1 of 18
Oepth (ft)	Sample Type	Number	Headspace PID	Lithologic Log	Material Description	U.S.C.S.	Well Diagrar	n Remarks
-					SILT (ML); red (2.5YR 5/6); dry to moist; very stiff to hard; 65% silt; 30% clay; 5% very fine to fine sand; no odor.			Hand augered. ***Note: No headspace requirement at this location.***
5					Same as above (0 ft); no odor.	ML		Began drilling @ 1443 on 02/15/2011. Injected water into cyclone for dust suppression.
<u>10</u>					Same as above (0 ft); trace coarse sand; subangular; no odor.		- Cement S	Seal
<u>15</u> - - -					Lean CLAY with Sand (CL); light reddish brown (2.5YR 6/4); dry to moist; very stiff; 70% clay; 15% silt; 15% very fine to fine sand; trace medium to coarse sand; subangular to subrounded; no odor.			
20					Same as above (15 ft); light reddish brown (2.5YR 7/4); no odor.	CL		Kelly down @ 1530. New connection @ 1539. Resumed drilling @ 1540.
25					SILT with Sand (ML); light reddish brown (2.5YR 6/4); dry; very stiff; 85% silt with minor clay; 15% fine sand; no odor.			

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Date Started: 2/15/2011 Date TD Reached: 2/19/2011 Date Completed: 2/21/2011

Ground Elevation AMSL (ft): 5337.2 Y Coordinate: 1474038.62 X Coordinate: 1540432.85

Borehole ID: KAFB-106101

Hole Diameter Upper (in.): 11-3/4 Hole Diameter Lower (in.): 9-5/8 Surface Completion Type: Stick-up

Groundwater Levels BGS (ft): \square At Time of Drilling: 485.00 \blacksquare At End of Drilling: 480.45 \blacksquare After Drilling: 482.40

Drilling Contractor: WDC Drilling Drilling Method: Air Rotary Casing Hammer Logged By: Brian Lucero

Page 2 of 18

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ର Depth (ft)	Sample Type	Number	Headspace PID	Lithologic Log	Material Description	U.S.C.S.	Well Diagram	Remarks
35	-				SILT (ML); light reddish brown (2.5YR 6/4); dry to moist; very stiff; 65% silt; 30% clay; 5% fine sand; trace medium to coarse sand; subrounded; no odor.			No cuttings returned past 32', still have circulation. Regained cuttings at 34'.
	-				SILT with Sand (ML); reddish brown (2.5YR 5/4); dry to moist; very stiff; 85% silt with trace clay; 15% fine to medium sand; trace coarse sand; subangular to subrounded; no odor.	ML	- Cement Seal	
40	-				Silty SAND (SM); pale red (2.5YR 6/2); dry; dense to very dense; 85% very fine to coarse sand; angular to subangular; 15% silt; no odor.	SM		Kelly down @ 1559. New connection @ 1611. Resumed drilling @ 1613.
45	-				Silty SAND with Gravel (SM); reddish brown (2.5YR 5/4, based on fines); moist; dense to very dense; 70% coarse sand; trace fine to medium sand; angular; 15% fine gravel to 5mm; angular to subangular; 15% silt with minor clay; coarse sand and gravel		- Top of High Solids Bentonite Grout	Rig chatter @ 45'.
50	-				dominantly granitic composition; no odor. SILT (ML); red (2.5YR 5/8); dry to moist; very stiff; 90% silt with minor clay; 10% very fine to fine sand; no odor.	ML		
55	-				SILT with Sand (ML); red (2.5YR 5/8); dry to moist; very stiff; 85% silt with minor clay; 15% very fine to fine sand; trace medium to coarse sand; subangular; no odor.			
60								



Date Started: 2/15/2011

Date TD Reached: 2/19/2011 Date Completed: 2/21/2011

Y Coordinate: 1474038.62

Ground Elevation AMSL (ft): 5337.2

Project Name: KAFB BFF SWMU ST-106 and SS-111

Borehole ID: KAFB-106101

Hole Diameter Upper (in.): 11-3/4 Hole Diameter Lower (in.): 9-5/8 Surface Completion Type: Stick-up

Groundwater Levels BGS (ft): \searrow At Time of Drilling: 485.00 \checkmark At End of Drilling: 480.45 TAfter Drilling: 482.40

Drilling Contractor: WDC Drilling Drilling Method: Air Rotary Casing Hammer Logged By: Brian Lucero

		rdinat		47403 54043			Lucero	Page 3 of 18
g Depth (ft)	Sample Type	Number	Headspace PID	Lithologic Log	Material Description	U.S.C.S.	Well Diagram	Remarks
- 65 - 70 - 75					Lean CLAY (CL); red (2.5YR 5/8); dry; very stiff; medium plasticity; 95% clay with minor silt; 5% very fine to fine sand; no odor. Lean CLAY (CL); reddish brown (2.5YR 5/3); dry; very stiff; low plasticity; 70% clay; 30% silt; trace very fine to fine sand; no odor. Same as above (65 ft); clay mainly as nodules; no odor.	CL	- High Solids	Kelly down @ 1629. New connection @ 1639. Resumed drilling @ 1641.
-					SILT with Sand (ML); light reddish brown (2.5YR 6/4); dry; very stiff; 75% silt with trace clay; 25% very fine to fine sand; trace medium to coarse sand; subangular to subrounded; no odor.	ML	Bentonite Grout	
80 - - 85					Poorly graded SAND (SP); light gray (5YR 7/1); moist; dense to very dense; 95% very fine to fine sand; 5% silt; no odor. Same as above (79 ft); no odor.	SP	 • •<	Kelly down @ 1706. End of 02/15/11. New connection @ 0759 on 02/16/11. Resumed drilling @ 0800 on 02/16/11. Driller injected water for dust suppression.
90							<pre>v • • • • • • • • • • • • • • • • • • •</pre>	

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Date Started: 2/15/2011

Date TD Reached: 2/19/2011 Date Completed: 2/21/2011

Y Coordinate: 1474038.62

Ground Elevation AMSL (ft): 5337.2

Client: US Army Corps of Engineers Project Location: KAFB, Albuquerque, NM

Project Name: KAFB BFF SWMU ST-106 and SS-111

Borehole ID: KAFB-106101

Hole Diameter Upper (in.): 11-3/4 Hole Diameter Lower (in.): 9-5/8 Surface Completion Type: Stick-up

Groundwater Levels BGS (ft): \searrow At Time of Drilling: 485.00 \checkmark At End of Drilling: 480.45 TAfter Drilling: 482.40

Drilling Contractor: WDC Drilling Drilling Method: Air Rotary Casing Hammer Logged By: Brian Lucero

		ordinat		47403 54043				Lucero	Page 4 of 18
ର Depth (ft)	Sample Type	Number	Headspace PID	Lithologic Log	Material Description	U.S.C.S.		Well Diagram	Remarks
					Poorly graded SAND (SP); pinkish gray (5YR 6/2); dry to moist; dense to very	SP	••	•••	
95	-				dense; 95% fine to medium sand; subrounded; 5% silt; pumice present; no odor. SILT with Sand (ML); yellowish red (5YR 5/6); moist; very stiff; 80% silt; 5% clay; 15% fine sand; no odor.	ML			Rig chatter below 90', breif discharge of fine to coarse gravel; angular to subangular.
	-				Lean CLAY (CL); reddish brown (2.5YR $\sqrt{5/4}$); moist; very stiff; low to medium $\sqrt{2}$	CL	••	••	
100	-				plasticity; 95% clay; 5% very fine to fine sand; no odor. SILT (ML); yellowish red (5YR 5/6); moist; stiff to very stiff; 90% silt; 5% clay; 5% very fine to fine sand; no odor.	ML		• • • • <td>Kelly down @ 0817. New connection @ 0832. Resumed drilling @ 0835. Stopped advancing @ 0845 due to minor mechanical problems. Resumed drilling @</td>	Kelly down @ 0817. New connection @ 0832. Resumed drilling @ 0835. Stopped advancing @ 0845 due to minor mechanical problems. Resumed drilling @
	-				Sandy lean CLAY (CL); yellowish red (5YR 5/6); moist; very stiff; low plasticity; 55% clay; 15% silt; 30% very fine to fine sand; trace medium sand; subangular to subrounded.			- High Solids Bentonite Grout	0915.
<u>110</u>	-				Same as above (105 ft); no odor.	CL			
115	-				Same as above (105 ft); no odor.				
120	-				Poorly graded SAND with Clay (SP-SC); pale red (2.5YR 6/2); dry to moist; dense to very dense; 90% very fine to fine sand; trace medium sand; subangular;	SP- SC			



Date Started: 2/15/2011 Date TD Reached: 2/19/2011 Date Completed: 2/21/2011

Ground Elevation AMSL (ft): 5337.2 Y Coordinate: 1474038.62 X Coordinate: 1540432.85

Borehole ID: KAFB-106101

Hole Diameter Upper (in.): 11-3/4 Hole Diameter Lower (in.): 9-5/8 Surface Completion Type: Stick-up

Groundwater Levels BGS (ft): \Box At Time of Drilling: 485.00 \blacksquare At End of Drilling: 480.45 \blacksquare After Drilling: 482.40

Drilling Contractor: WDC Drilling Drilling Method: Air Rotary Casing Hammer Logged By: Brian Lucero

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Sample Type Headspace PID Lithologic Log Depth (ft) Number *i* Ö Material Description Remarks Well Diagram ю. ⊃. 120 10% clay as nodules; no odor. Note: Kelly down @ 0944. New likely top of Santa Fe Group. Sand was connection @ 1006. Resumed drilling @ proceeded by a thin lense of light brown SP-(7.5YR 6/3) lean clay; appeared as 1009. SC nodules. 125 Poorly graded SAND (SP); pale red (2.5YR 6/2); dry; dense; 95% very fine to medium sand; subangular to subrounded; 5% silt; no odor. • 130 Same as above (125 ft); 95% very fine to fine sand; 5% silt; no odor. SP • 135 **High Solids** Same as above (125 ft); 95% fine to Bentonite medium sand: subrounded to Grout subangular; 5% silt; no odor. Well graded SAND with Clay and Gravel (SW-SC); brown (7.5YR 6/3); moist; • dense; 75% very fine to coarse sand; • 140 SWsubrounded to subangular; 15% fine to SC Kelly down @ 1029. New ••••• coarse gravel to 3cm; angular to connection @ 1045. subangular; 10% clay; no odor. Resumed drilling @ Well graded SAND (SW); pale red 1049. (2.5YR 6/2); dry to moist; dense; 85% SW very fine to coarse sand; subangular to subrounded; 10% fine to coarse gravel; 145 angular to subangular; 5% silt with minor • • clay; no odor. Poorly graded SAND (SP); pale red (2.5YR 6/2); dry to moist; dense; 95% SP very fine to fine sand; 5% silt; no odor. ••• • . 150



Date Started: 2/15/2011

Date TD Reached: 2/19/2011 Date Completed: 2/21/2011

Y Coordinate: 1474038.62

Ground Elevation AMSL (ft): 5337.2

Project Name: KAFB BFF SWMU ST-106 and SS-111

Borehole ID: KAFB-106101

Hole Diameter Upper (in.): 11-3/4 Hole Diameter Lower (in.): 9-5/8 Surface Completion Type: Stick-up

Groundwater Levels BGS (ft): \searrow At Time of Drilling: 485.00 \checkmark At End of Drilling: 480.45 TAfter Drilling: 482.40

Drilling Contractor: WDC Drilling Drilling Method: Air Rotary Casing Hammer Logged By: Brian Lucero

				47403		By:	Brian	Ir Rotary Casing H Lucero	Page 6 of 18
05 Depth (ft)	Sample Type	Number	Headspace PID	Lithologic Log	Material Description	U.S.C.S.		Well Diagram	Remarks
155	-				Poorly graded SAND (SP); pale red (2.5YR 6/2); dry to moist; dense; 100% fine to medium sand; subangular to subrounded; no odor; sand dominantly intermediate to mafic composition with some quartz and feldspar; minor pumice fragments. Same as above (150 ft); no odor.	SP		• •	
160					Silty SAND (SM); brown (7.5YR 5/4); moist; dense; 80% very fine to medium sand; trace coarse sand; subrounded to subangular; 20% silt with trace clay; no odor.				Kelly down @ 1122. New connection @ 1432. Resumed drilling @ 1434.
165	-				Silty SAND (SM); light reddish brown (5YR 6/3); moist; dense to very dense; 80% very fine to fine sand; trace medium sand; subrounded; 20% silt; no odor.	SM		- High Solids Bentonite Grout	
170	-				Well graded SAND (SW); light reddish brown (5YR 6/3); moist; dense to very dense; 100% fine to coarse sand; subrounded to subangular; trace fine gravel to 12mm; no odor.				
175					Same as above (170 ft); no gravel; no odor.	SW			
180					Clayey SAND with Gravel (SC); reddish	SC	••	••	



Date Started: 2/15/2011 Date TD Reached: 2/19/2011 Date Completed: 2/21/2011

Ground Elevation AMSL (ft): 5337.2 Y Coordinate: 1474038.62 X Coordinate: 1540432.85

Borehole ID: KAFB-106101

Hole Diameter Upper (in.): 11-3/4 Hole Diameter Lower (in.): 9-5/8 Surface Completion Type: Stick-up

Groundwater Levels BGS (ft): \square At Time of Drilling: 485.00 \blacksquare At End of Drilling: 480.45 \blacksquare After Drilling: 482.40

Drilling Contractor: WDC Drilling Drilling Method: Air Rotary Casing Hammer Logged By: Brian Lucero

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08 Depth (ft)	Sample Type	Number	Headspace PID	Lithologic Log	Material Description	U.S.C.S.	Well Diagram	Remarks
	-				brown (5YR 4/3); moist; dense to very dense; 65% fine to coarse sand; subrounded to subangular; 15% fine	SC		Kelly down @ 1502. New connection @ 1520. Resumed drilling @
185	-				gravel to 12mm; subrounded to subangular; 20% clay as nodules and as coating on gravel; low plasticity; no odor. Poorly graded SAND (SP); light reddish gray (2.5YR 7/1); moist; very dense; 100% fine sand; no odor.	SP		1522. Lost cutting returns at 188'; driller stopped
190	-				Well graded SAND (SW); light reddish gray (2.5YR 7/1); moist; very dense; 100% fine to coarse sand; subangular to subrounded; no odor.			advancing to clean hole and discharge hose. Discharge was clayey sand to clayey gravel, but could not determine if cuttings are representative due to collection in discharge
195	-				Same as above (190 ft); slightly finer; no odor.	SW	- High Solids Bentonite Grout	hose.
200	-				Same as above (190 ft); slightly coarser; no odor.			Kelly down @ 1435. Total depth of 11-3/4" casing. End of 02/16/11. New connection @ 1238 on 02/17/11. Resumed drilling @ 1239 on 02/17/11.
205	-				Poorly graded SAND (SP); weak red (2.5YR 5/2); moist; medium dense; 95% very fine to fine sand; 5% silt; no odor.	SP		02/17/11.
210								



Date Started: 2/15/2011 Date TD Reached: 2/19/2011 Date Completed: 2/21/2011

Ground Elevation AMSL (ft): 5337.2 Y Coordinate: 1474038.62 X Coordinate: 1540432.85

Borehole ID: KAFB-106101

Hole Diameter Upper (in.): 11-3/4 Hole Diameter Lower (in.): 9-5/8 Surface Completion Type: Stick-up

Groundwater Levels BGS (ft): \square At Time of Drilling: 485.00 \blacksquare At End of Drilling: 480.45 \blacksquare After Drilling: 482.40

Drilling Contractor: WDC Drilling Drilling Method: Air Rotary Casing Hammer Logged By: Brian Lucero

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01 Depth (ft)	Sample Type	Number	Headspace PID	Lithologic Log	Material Description	U.S.C.S.	Well Diagram	Remarks
215	-				Poorly graded SAND (SP); weak red (2.5YR 5/2); moist; medium dense; 100% very fine to medium sand; subrounded to subangular; no odor. Same as above (210 ft); 95% very fine to fine sand; trace medium sand; subrounded to subangular; 5% silt; no odor.	SP		
220 - - - - - - - - - - - - - - - - - -					Silty SAND (SM); reddish brown (5YR 5/4); moist; medium dense; 75% very fine to coarse sand; subrounded to subangular; 5% fine gravel to 15mm; subrounded; 20% silt with trace clay; silty/clayey coating on gravel; no odor. Same as above (218 ft); no odor.	SM	- High Solids Bentonite Grout	Kelly down @ 1246. New connection @ 1254. Resumed drilling @ 1255. Did not have to hammer casing 200-225'. Began driving casing below 225'.
- 230 - - -	-				Well graded SAND with Silt (SW-SM); pale red (2.5YR 7/2); dry to moist; dense; 90% very fine to coarse sand; subrounded to subangular; 10% silt with trace clay; no odor.	SW- SM	• • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • •	
<u>235</u> - - 240	-				Silty SAND (SM); pale red (2.5YR 7/2); dry to moist; dense; 85% very fine to medium sand; trace coarse sand; subrounded to subangular; 15% silt with trace clay; no odor.	SM	• • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • •	

S	L					Bore	eho	le l	D: KAFB	106101
Pro Pro	ojec ojec	t Loca Nam	ation ne: K	: KÁI (AFB	s of Engineers FB, Albuquerque, NM BFF SWMU ST-106 and SS-111	Hole Di	amete	r Low	oer (in.): 11-3/4 ver (in.): 9-5/8 n Type: Stick-up	
Da Da	ite S ite T		d: 2/ ache	15/20 d: 2/		∑ At⊺ ▼ At E	Time of End of	f Drill Drilliı	ls BGS (ft): ling: 485.00 ng: 480.45 482.40	
YO	Coo	d Elev rdinate rdinate	e: 14	47403		Drillling Drilling Logged	Metho	d: A	: WDC Drilling ir Rotary Casing Lucero	Hammer Page 9 of 18
05 Depth (ft)	Sample Type	Number	Headspace PID	Lithologic Log	Material Description		U.S.C.S.		Well Diagram	Remarks
					Silty SAND (SM); pale red (2.5Yl dry to moist; dense; 85% very fin medium sand; trace coarse san	e to l;	SM	• • • • • • • •	• • • • • • • •	Kelly down @ 1305. New connection @ 1316. Resumed drilling @
245	-				subrounded to subangular; 15% trace clay; no odor. Lean CLAY (CL); reddish brown 5/3); moist; very stiff to hard; me plasticity; 95% clay; 5% silt; no o	(5YR dium	CL			1320.
250	-				Silty SAND (SM); reddish brown 5/3); moist; dense to very dense; very fine to medium sand; subro 15% silt with minor clay; no odor	85% unded;	SM			
	-				Poorly graded SAND with Silt (S reddish brown (5YR 5/3); moist; very dense; 90% very fine to fine subrounded; 10% silt; no odor.	dense to				
255	-				Same as above (250 ft); no odor		SP- SM		- High Solids Bentonite Grout	
260	-				Well graded SAND with Silt (SW reddish brown (5YR 5/3); moist; very dense; 90% very fine to coa sand; subrounded; 10% silt; no c	dense to irse	SW- SM			Kelly down @ 1334. New connection @ 1343. Resumed drilling @ 1344.
270	-				Well graded SAND with Gravel (reddish brown (5YR 5/3); moist; 80% fine to coarse sand; subrou subangular; 15% fine to coarse g 2.5cm; subrounded; 5% silt with clay; no odor.	dense; nded to gravel to	sw			



Date Started: 2/15/2011 Date TD Reached: 2/19/2011 Date Completed: 2/21/2011

Ground Elevation AMSL (ft): 5337.2 Y Coordinate: 1474038.62 X Coordinate: 1540432.85

Borehole ID: KAFB-106101

Hole Diameter Upper (in.): 11-3/4 Hole Diameter Lower (in.): 9-5/8 Surface Completion Type: Stick-up

Groundwater Levels BGS (ft): \square At Time of Drilling: 485.00 \blacksquare At End of Drilling: 480.45 \blacksquare After Drilling: 482.40

Drilling Contractor: WDC Drilling Drilling Method: Air Rotary Casing Hammer Logged By: Brian Lucero

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02 Depth (ft)		Number	Headspace	Lithologic Log	Material Description	U.S.C.S.	Well Diagram	Remarks
275	-				Poorly graded SAND (SP); reddish brown (5YR 5/3); moist; dense to very dense; 95% very fine to fine sand; trace medium sand; subrounded; 5% silt; no odor. Note: cobbles to 10cm noted from discharge at 274'.	SP		
280	-				Silty SAND (SM); reddish brown (5YR 5/3); moist; dense to very dense; 80% very fine to fine sand; 20% silt; no odor.	SM		
	-				GRAVEL (GW); lense.	GW		Kelly down @ 1356. New connection @ 1407.
285	-				Well graded SAND (SW); pale red (2.5YR 7/2); moist; dense; 90% very fine to coarse sand; subrounded to subangular; 5% fine gravel to 12mm; subrounded; 5% silt; no odor.	SW	- High Solids Bentonite Grout	Resumed drilling @ 1407.
<u>290</u>					Lean CLAY (CL); brown (7.5YR 5/3); moist; stiff; medium plasticity; 95% clay; 5% fine to medium sand; subrounded to subangular; no odor.	CL		
295					Clayey SAND with Gravel (SC); brown (7.5YR 5/3); moist; dense to very dense; 70% very fine to coarse sand; subangular to subrounded; 15% fine gravel to 15mm; subangular to subrounded; 15% clay with minor silt; no	SC		
300	- -)				odor. Sandy lean CLAY (CL); reddish brown (7.5YR 4/3); moist; stiff; low plasticity; 70% clay with trace silt; 30% very fine to	CL		



Date Started: 2/15/2011 Date TD Reached: 2/19/2011 Date Completed: 2/21/2011

Ground Elevation AMSL (ft): 5337.2 Y Coordinate: 1474038.62 X Coordinate: 1540432.85

Borehole ID: KAFB-106101

Hole Diameter Upper (in.): 11-3/4 Hole Diameter Lower (in.): 9-5/8 Surface Completion Type: Stick-up

Groundwater Levels BGS (ft): \square At Time of Drilling: 485.00 \blacksquare At End of Drilling: 480.45 \blacksquare After Drilling: 482.40

Drilling Contractor: WDC Drilling Drilling Method: Air Rotary Casing Hammer Logged By: Brian Lucero

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S Depth (ft)	Sample Type	Number	Headspace PID	Lithologic Log	Material Description	U.S.C.S.	Well Diagram	Remarks
305	-				fine sand; no odor. Poorly graded SAND (SP); pale red (2.5YR 7/2); dry to moist; dense; 95% very fine to medium sand; subangular to subrounded; 5% silt; no odor.	SP		Kelly down @ 1417. New connection @ 1426. Resumed drilling @ 1426.
	-				Well graded SAND (SW); pale red (2.5YR 7/2); dry to moist; dense; 100% fine to coarse sand; subangular to subrounded; no odor.			
310					Same as above (305 ft); 100% very fine to coarse sand; subangular to subrounded; no odor.	SW		
315	-				Same as above (305 ft); 95% very fine to coarse sand; subangular to subrounded; 5% silt; no odor.		- High Solids Bentonite Grout	
320					Well graded GRAVEL (GW); pale red (2.5YR 7/2); dry; dense; 95% fine to	GW	- • • • • • • • • • • • • • • • • • • •	
325	-				 coarse gravel; angular to subrounded; 5% coarse sand; angular to subrounded; no odor. Well graded SAND with Gravel (SW); pinkish gray (5YR 7/2); dry to moist; dense; 80% very fine to coarse sand; subrounded to subangular; 15% fine to coarse gravel to 5cm; subrounded; 5% clay with minor silt, mainly as coating on coarse sand and gravel; no odor. 	SW		Kelly down @ 1438. New connection @ 1449. Resumed drilling @ 1452.
330				*`*`*`* ****				



Date Started: 2/15/2011 Date TD Reached: 2/19/2011 Date Completed: 2/21/2011

Ground Elevation AMSL (ft): 5337.2 Y Coordinate: 1474038.62 X Coordinate: 1540432.85

Borehole ID: KAFB-106101

Hole Diameter Upper (in.): 11-3/4 Hole Diameter Lower (in.): 9-5/8 Surface Completion Type: Stick-up

Groundwater Levels BGS (ft): \square At Time of Drilling: 485.00 \blacksquare At End of Drilling: 480.45 \blacksquare After Drilling: 482.40

Drilling Contractor: WDC Drilling Drilling Method: Air Rotary Casing Hammer Logged By: Brian Lucero

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S Depth (ft)		Number	Headspace PID	Lithologic Log	Material Description	U.S.C.S.	w	/ell Diagram	Remarks
335	-				Well graded SAND with Gravel (SW); pinkish gray (5YR 7/2); dry to moist; dense; 80% very fine to coarse sand; subrounded to subangular; 15% fine gravel to 18mm; subrounded; 5% fines; no odor. Well graded SAND (SW); pale red (2.5YR 7/2); dry to moist; dense; 95% very fine to coarse sand; subrounded to	SW		•	
340	-				subangular; 5% fine gravel to 15mm; subrounded; no odor. Poorly graded SAND with Gravel (SP); pale red (2.5YR 7/2); dry; dense; 85% medium to coarse sand; subangular to	SP		•	Sand/gravel discharge preceeded by heavy dust.
345					medium to coarse sand; subangular to subrounded; 15% fine gravel to 12mm; subrounded to subangular; no odor. Silty SAND with Gravel (SM); reddish brown (5YR 4/3); moist; dense to very dense; 65% very fine to medium sand; trace coarse sand; subrounded to subangular; 15% coarse gravel to 7.5cm; subrounded; 20% silt with trace clay; no odor. Same as above (340 ft); fine gravel to 15mm; subrounded; no odor.	SM		- High Solids Bentonite Grout	Kelly down @ 1506. New conection @ 1515. Resumed drilling @ 1516. Stopped drilling @ 1524 due to hammer not firing. Resumed drilling @ 1529.
350	-				Well graded SAND (SW); pale red (2.5YR 7/2); dry; dense; 95% very fine to coarse sand; subangular; 5% silt; no odor.	SW		•	
355	-				Well graded SAND with Silt (SW-SM); reddish brown (5YR 4/3); moist; dense; 90% very fine to coarse sand; subangular to subrounded; 10% silt with trace clay; no odor.	SW- SM		•	Kelly down @ 1529 End
360				•`• ` • ••••• •••••				•	Kelly down @ 1538. End of 2/17/11.



Client: US Army Corps of Engineers

Ground Elevation AMSL (ft): 5337.2

Project Number: 140705

Date Started: 2/15/2011

Date TD Reached: 2/19/2011 Date Completed: 2/21/2011

Y Coordinate: 1474038.62

X Coordinate: 1540432.85

Project Location: KAFB, Albuquerque, NM

Project Name: KAFB BFF SWMU ST-106 and SS-111

Borehole ID: KAFB-106101

Hole Diameter Upper (in.): 11-3/4 Hole Diameter Lower (in.): 9-5/8 Surface Completion Type: Stick-up

Groundwater Levels BGS (ft): \square At Time of Drilling: 485.00 \blacksquare At End of Drilling: 480.45 \blacksquare After Drilling: 482.40

Drilling Contractor: WDC Drilling Drilling Method: Air Rotary Casing Hammer Logged By: Brian Lucero

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g Depth (ft)	Sample Type	Number	Headspace PID	Lithologic Log	Material Description	U.S.C.S.	Well Diagram	Remarks
365	-				Well graded SAND with Silt (SW-SM); strong brown (7.5YR 5/8); moist; dense; 90% very fine to coarse sand; subangular to subrounded; 10% silt with trace clay; no disernable odor; appears hydrocarbon stained.	SW- SM		New connection @ 1117 on 2/18/11. Resumed drilling @ 1150 on 2/18/11. No PID readings at either discharge or well head. Sample leaves slight oily residue on
					Well graded SAND (SW); brown (7.5YR 4/3); moist; very dense; 100% very fine to coarse sand; subrounded to subangular; no odor; less hydrocarbon staining.	sw		hands.
370	-				Same as above (365 ft); less coarse fraction; no odor; apppears hydrocarbon stained.			
375	-				Silty SAND (SM); brown (7.5YR 5/3); dry to moist; very dense; 80% very fine to fine sand; trace medium to coarse sand; subrounded to subangular; 20% silt; no odor; appears hydrocarbon stained (minor).	SM	- High Solids Bentonite Grout	
<u>380</u> 385	-				Poorly graded SAND (SP); light reddish brown (5YR 6/3); moist; very dense; 95% very fine to fine sand; 5% silt; no odor; no visible hydrocarbon staining.	SP		Kelly down @ 1211. New connection @ 1224. Resumed drilling @ 1224.
390					Well graded SAND (SW); light reddish brown (5YR 6/3); moist; very dense; 95% very fine to coarse sand; subangular to subrounded; 5% silt; no odor.	sw		



Date Started: 2/15/2011

Date TD Reached: 2/19/2011 Date Completed: 2/21/2011

Y Coordinate: 1474038.62

Ground Elevation AMSL (ft): 5337.2

Project Name: KAFB BFF SWMU ST-106 and SS-111

Borehole ID: KAFB-106101

Hole Diameter Upper (in.): 11-3/4 Hole Diameter Lower (in.): 9-5/8 Surface Completion Type: Stick-up

Groundwater Levels BGS (ft): \searrow At Time of Drilling: 485.00 \checkmark At End of Drilling: 480.45 TAfter Drilling: 482.40

Drilling Contractor: WDC Drilling Drilling Method: Air Rotary Casing Hammer Logged By: Brian Lucero

		rdinate: 14/4038.62 Drilling Method: Air Rotary Casing Hammer rdinate: 1540432.85 Logged By: Brian Lucero Page 14 of 18								
66 06 Depth (ft)	Sample Type	Number	Headspace PID Lithologic	Material Description	ທ່ ບັ ທ່ ⊃		ell Diagram	Remarks		
395	_			Well graded SAND (SW); light reddish brown (5YR 6/3); dry to moist; very dense; 95% very fine to coarse sand; subangular to subrounded; 5% silt; no odor.	sw					
400				Silty GRAVEL (GM); reddish brown (5YR 4/3); dry to moist; dense; 80% fine to coarse gravel to 5cm; subrounded to subangular; 5% very fine to coarse sand; subrounded to subangular; 15% silt with minor clay as coating on gravel; no odor.				Kelly down @ 1238. New connection @ 1247. Resumed drilling @ 1248. Driller injected water into cyclone for dust suppression.		
405	-			Well graded SAND with Silt (SW-SM); weak red (2.5YR 5/2); moist; very dense; 90% very fine to coarse sand; subrounded; 10% silt; no odor.	SW- SM		- High Solids Bentonite Grout			
<u>410</u> 415	-			Silty SAND (SM); weak red (2.5YR 5/2); moist; very dense; 70% very fine to fine sand; 30% silt with trace clay; no odor.	SM					
420	_			Well graded SAND (SW); pale red (2.5R 5/2); dry to moist; very dense; 95% very fine to coarse sand; subangular; 5% silt; no odor.	sw					



Borehole ID: KAFB-106101

Client:US Army Corps of EngineersHole DiaProject Location:KAFB, Albuquerque, NMHole DiaProject Name:KAFB BFF SWMU ST-106 and SS-111SurfaceProject Number:140705

Date Started: 2/15/2011 Date TD Reached: 2/19/2011 Date Completed: 2/21/2011

Ground Elevation AMSL (ft): 5337.2 Y Coordinate: 1474038.62 X Coordinate: 1540432.85 Hole Diameter Upper (in.): 11-3/4 Hole Diameter Lower (in.): 9-5/8 Surface Completion Type: Stick-up

Groundwater Levels BGS (ft): \square At Time of Drilling: 485.00 \blacksquare At End of Drilling: 480.45 \blacksquare After Drilling: 482.40

Drilling Contractor: WDC Drilling Drilling Method: Air Rotary Casing Hammer Logged By: Brian Lucero

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5 Depth (ft)	Sample Type	Number	Headspace PID	Lithologic Log	Material Description	U.S.C.S.	Well Diagram	Remarks
	-				Poorly graded SAND (SP); reddish brown (5YR 5/3); moist; dense to very dense; 95% very fine to fine sand; 5% silt; no odor.			Kelly down @ 1305. New connection @ 1312. Resumed drilling @ 1312.
425					Same as above (420 ft); no odor.	SP	0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	
430	-				Well graded SAND (SW); reddish brown (5YR 5/3); moist; dense to very dense; 95% very fine to coarse sand; subrounded to subangular; 5% silt; no odor.	sw		
435	-				Poorly graded SAND (SP); reddish brown (5YR 5/3); dry to moist; dense to very dense; 95% very fine to fine sand; trace medium sand; subrounded to subangular; 5% silt; no odor.		- High Solids Bentonite Grout	
440					Same as above (435 ft); trace medium to coarse sand; subangular to subrounded; trace fine to coarse gravel to 3cm; subrounded; no odor.	SP		Kelly down @ 1328. New connection @ 1338. Resumed drilling @ 1343.
445					Same as above (435 ft); no odor.			
450								



Date Started: 2/15/2011 Date TD Reached: 2/19/2011 Date Completed: 2/21/2011

Ground Elevation AMSL (ft): 5337.2 Y Coordinate: 1474038.62 X Coordinate: 1540432.85

Borehole ID: KAFB-106101

Hole Diameter Upper (in.): 11-3/4 Hole Diameter Lower (in.): 9-5/8 Surface Completion Type: Stick-up

Groundwater Levels BGS (ft): \square At Time of Drilling: 485.00 \blacksquare At End of Drilling: 480.45 \blacksquare After Drilling: 482.40

Drilling Contractor: WDC Drilling Drilling Method: Air Rotary Casing Hammer Logged By: Brian Lucero

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5 Depth (ft)	Sample Type	Number	Headspace PID	Lithologic Log	Material Description	U.S.C.S.	Well Diagram	Remarks
455	-				Well graded SAND (SW); reddish brown (5YR 5/3); dry to moist; dense; 90% very fine to coarse sand; subangular to subrounded; 5% fine to coarse gravel to 3cm; subrounded; 5% silt; no odor. Same as above (450 ft); no odor.		 High Solids Bentonite Grout Top of Bentonite Seal 	
- - - - - - - - - - - - - - - - - - -					Same as above (450 ft); slight decrease in medium to coarse sand; no odor.	SW		Kelly down @ 1358. New connection @ 1404. Resumed drilling @ 1405.
<u>465</u>	-				Poorly graded SAND (SP); reddish brown (5YR 5/3); dry to moist; dense; 100% fine to medium sand; trace coarse sand; subangular to subrounded; no odor.		-	Very dusty discharge, majority of fines being blown out.
470 - -	-				Same as above (465 ft); no odor.	SP		
475					Well graded SAND (SW); reddish brown (5YR 5/3); dry to moist; dense; 100% fine to coarse sand; subangular; no odor.	sw		
480								

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	US Army	

Date Started: 2/15/2011 Date TD Reached: 2/19/2011 Date Completed: 2/21/2011

Ground Elevation AMSL (ft): 5337.2 Y Coordinate: 1474038.62 X Coordinate: 1540432.85

Borehole ID: KAFB-106101

Hole Diameter Upper (in.): 11-3/4 Hole Diameter Lower (in.): 9-5/8 Surface Completion Type: Stick-up

Groundwater Levels BGS (ft): \square At Time of Drilling: 485.00 \blacksquare At End of Drilling: 480.45 \blacksquare After Drilling: 482.40

Drilling Contractor: WDC Drilling Drilling Method: Air Rotary Casing Hammer Logged By: Brian Lucero

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	-00		.e. 15404	-02.00 E09900	<u> </u>		
8 Depth (ft)	Sample Type	Number	Headspace PID Lithologic	Material Description	U.S.C.S.	Well Diagram	Remarks
	-			 ✓Well graded SAND (SW); reddish brown (5YR 5/3); dry to moist; dense; 100% fine to coarse sand; subangular; no ✓odor. 	SW	- Bentonite Seal	Kelly down @ 1423. New connection @ 1443. Resumed drilling @ 1443.
485	-			Sandy lean CLAY (CL); brown (7.5YR 5/3); dry to moist; stiff; low to medium ∑plasticity; 70% clay as nodules, some desicated with waxy texture; 30% very	CL	- 5" Schedule 80 PVC Riser	Water encountered
	-			fine to fine sand; no odor. SILT (ML); reddish brown (5YR 4/4); dry to moist; stiff; 90% silt with trace clay; 10% very fine to fine sand; no odor.	ML		during drilling = 485.0'.
490	-			Poorly graded SAND (SP); pale red (2.5YR 6/2); dry; dense; 95% very fine to fine sand; 5% silt; no odor.		- Top of 20/40 Sand - Top of 10/20 Sand	
495	-			Same as above (490 ft); light reddish brown (2.5YR 6/3); moist; no odor.	SP	- Top of 5" Schedule 80 PVC 0.010" Slot Screen	Initial heavy discharge of water and wet cuttings when air was turned on at 495'. Once casing storage was evacuated, cuttings were very moist to nearly saturated. No
500	-			Well graded SAND (SW); reddish brown (2.5YR 6/3); wet; dense; 95% very fine to coarse sand; angular to subangular; 5% fine gravel to 15mm; angular to subangular; no odor.	sw		free water is being discharged. Kelly down @ 1506 on 02/18/11. New connection @ 0908 on 02/19/11. Resumed drilling @ 0913 on 02/19/11.
505				Same as above (500 ft); moist to wet; no odor.			
510				Poorly graded SAND (SP); reddish brown (2.5YR 6/3); moist to wet; dense; 100% fine to medium sand; trace very fine and coarse sand; subangular; no	SP		



Date Started: 2/15/2011 Date TD Reached: 2/19/2011 Date Completed: 2/21/2011

Ground Elevation AMSL (ft): 5337.2 Y Coordinate: 1474038.62 X Coordinate: 1540432.85

Borehole ID: KAFB-106101

Hole Diameter Upper (in.): 11-3/4 Hole Diameter Lower (in.): 9-5/8 Surface Completion Type: Stick-up

Groundwater Levels BGS (ft): \square At Time of Drilling: 485.00 \blacksquare At End of Drilling: 480.45 \blacksquare After Drilling: 482.40

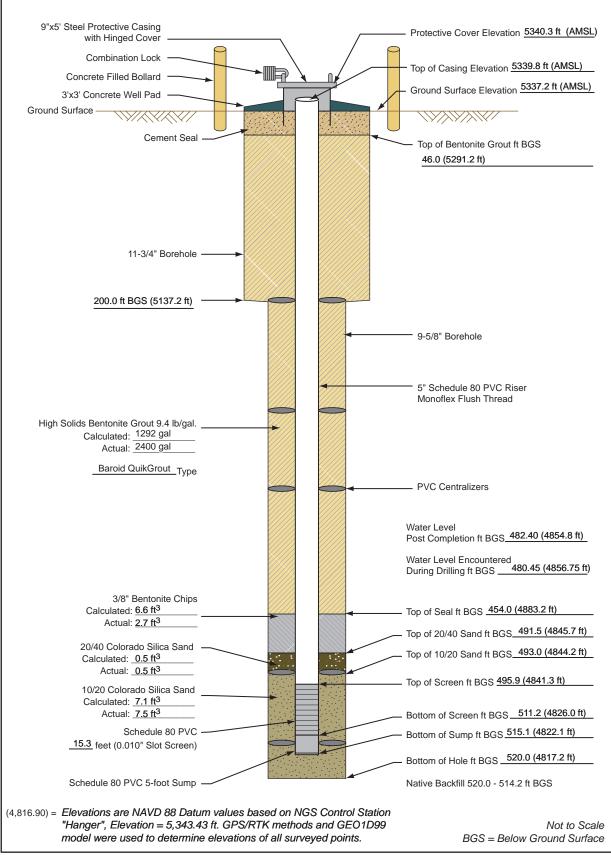
Drilling Contractor: WDC Drilling Drilling Method: Air Rotary Casing Hammer Logged By: Brian Lucero

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(t) t (t) t		inate. 154043	209904	<u> </u>		
	a L	Number Headspace PID Lithologic Log	Material Description		Well Diagram	Remarks
510 odor. - - - - 515 - - Well graded SAND (SW); reddish brown (2.5YR 6/3); moist to wet; dense; 100% fine to coarse sand; trace very fine sand; SW	510 - - 515 - 520 - 520 - - - - - - - - - - - - - - - - - - -		Well graded SAND (SW); reddish brown (2.5YR 6/3); moist to wet; dense; 100% fine to coarse sand; trace very fine sand; subangular to subrounded; trace fine gravel to 10mm; subangular to subrounded; no odor. Well graded SAND with Gravel (SW); reddish brown (2.5YR 6/3); wet; dense; 85% very fine to coarse sand; subangular to subrounded; 15% fine to coarse gravel to 3cm; subrounded; no odor. Same as above (516 ft); 15% fine gravel to 19mm; subrounded to subangular; no	SW	Screen - Sump - Bottom of Sump	heavy fines. Kelly down @ 0942. New 5' connection @ 0954. Resumed drilling @ 0956. Total depth = 520 ft. Reached @ 1007 on 02/19/11. Water added during drilling (gallons) = 0 Water added during construction (gallons) = 900 Kelly down: TD the joint and ready to make new

Monitoring Well Completion Diagram KAFB-106101

Installation Start Date/Time: <u>2/19/2011 @ 9:00</u> Installation End Date/Time: <u>2/21/2011 @ 14:34</u>



140705.CB010040_MW_KAFB_106101



Location: BFF		Well/Piez. No.: 106101							
Personnel: D. Flores, A. Trujillo		Date Installed: 2/21/11							
Date: 3/16/11		Csg. Diameter (I.D.): <u>5"</u>							
Samplers: D. Flores, A. Trujillo		Total Depth (ft. BGL): <u>520.0</u>							
Method of Development: X Surging	X Bailing	X Pumping							
X Original Development	Redevelopment	Other							
Development Date: 3/16/11-3/17	/11								
Depth to Water Before Developi	ng Well (ft. BGL): <u>482.</u>	19							
Vol. (V) Purge Factor Volume to Purge Height of Water Column: <u>37.81 feet = 941.6 gal. * 1 = 941.6</u> $V=(B * r_c^2 * L_c * 7.48)+(B * (r_w-r_c)^2 * L_s * Ø_s * 7.48)+(H_2O added during drilling/installation) = 941.6 gallons$									
V=(B * r _c ² * L _c * 7.48									
V=(B * r _c ² * L _c * 7.48 Depth Purging From: <u>506 feet</u>)+(B * (r _w -r _c)² * L _s * Ø _s *								
)+(B * (r _w -r _c)² * L _s * Ø _s *	7.48)+(H ₂ O added during drilling/installation) = <u>941.6</u> gallons							
Depth Purging From: 506 feet)+(B * (r _w -r _c) ² * L _s * Ø _s * 	7.48)+(H ₂ O added during drilling/installation) = <u>941.6</u> gallons Time Purging Begins: <u>1028, 3/17/11</u>							
Depth Purging From: <u>506 feet</u> Weather: <u>Sunny</u>)+(B * (r _w -r _c) ² * L _s * Ø _s * / <u>SI 100258</u>	7.48)+(H ₂ O added during drilling/installation) = <u>941.6 gallons</u> Time Purging Begins: <u>1028, 3/17/11</u> Screened Interval (ft BGL): <u>495.9-511.12</u> EC Meter: <u>YSI 100258</u> Turbidity Meter: <u>LVE 2818</u>							
Depth Purging From: 506 feet Weather: Sunny Equipment Nos.: pH Meter:)+(B * (r _w -r _c) ² * L _s * Ø _s * / <u>SI 100258</u>	7.48)+(H ₂ O added during drilling/installation) = <u>941.6 gallons</u> Time Purging Begins: <u>1028, 3/17/11</u> Screened Interval (ft BGL): <u>495.9-511.12</u> EC Meter: <u>YSI 100258</u> Turbidity Meter: <u>LVE 2818</u>							
Depth Purging From: 506 feet Weather: <u>Sunny</u> Equipment Nos.: pH Meter: Equipment Decontaminated Pric Describe: <u>Steam Cleaned</u> Collected Sample of Water Adde)+(B * (r _w -r _c) ² * L _s * Ø _s * /SI 100258 pr to Development: Y _	7.48)+(H ₂ O added during drilling/installation) = <u>941.6 gallons</u> Time Purging Begins: <u>1028, 3/17/11</u> Screened Interval (ft BGL): <u>495.9-511.12</u> EC Meter: <u>YSI 100258</u> X N N X							

Well Development Record

		Water Level (ft. Below	Volume Removed				Turbidity	
Date	Time	TOC)	(gal.)	Temp.°C	рН	EC (ms/cm)	N.T.U.	Comments
3/16/2011	1508		5	22.11	7.66	0.645	>2000	Begin Bailing/Initial Reading
3/16/2011	1524		25	19.89	7.65	0.785	>2000	Dark and Muddy
3/16/2011	1534		45	19.35	7.68	0.813	>2000	Dark and Muddy
3/16/2011	1539		55	19.12	7.71	0.823	>2000	Continue Bailing, Muddy
3/16/2011	1600						>2000	Begin Surging
3/16/2011	1620		60	19.98	7.97	0.441	>2000	Muddy
3/16/2011	1632		80	19.60	7.89	0.823	>2000	Light Brown
3/17/2011	1028	483.50						Begin Pumping, 5 GPM
3/17/2011	1037	484.15	95	20.20	7.59	0.737	9.99	Continue Pumping, Cloudy
3/17/2011	1047	481.27	145	20.68	7.59	0.693	6.70	Continue Pumping, Clear

Notes:

* Water Levels - Reported to the nearest 0.01 foot

* pH - Reading rounded to 0.1 pH units

* Water temperature - Reported to nearest 0.1C * Turbidity report in NTV nearest whole #

Where:

B=3.14

 $\emptyset_{\rm s}$ = porosity of the sand pack

 $\omega_{\rm s}$ = porosity or the sana pack $r_{\rm c}$ = radius of the well casing and screen in feet $L_{\rm s}$ = length of water column inside the casing and screen in feet $r_{\rm w}$ = radius of the well bore in feet $L_{\rm s}$ = length of saturated portion of the sand pack in feet

7.48 gallons/cubic foot= conversion from cubic feet to gallons



Well Development Record

Project: KAFB BFF

Project Number: 140705

Date: 3/17/11

Time Start: 1508, 3/16/11

Well No: 106101

Samplers: D. Flores, A. Trujillo

Checked By: _____

Time Finish: 1327, 3/17/11

Field Chemistry (cont'd)

		Water Level (ft. Below	Volume Removed				Turbidity	
Date	Time	TOC)	(gal.)	Temp.°C	рН	EC (ms/cm)	N.T.U.	Comments
3/17/2011	1057	484.27	195	20.70	7.60	0.682	2.8	Continue Purging
3/17/2011	1107	484.25	245	20.68	7.61	0.685	2.2	Continue Purging, Clear
3/17/2011	1117	484.25	295	20.71	7.61	0.685	1.9	Continue Purging, Clear
3/17/2011	1127	484.25	345	20.78	7.60	0.683	2.0	Continue Purging, Clear
3/17/2011	1137	484.25	395	20.81	7.62	0.685	1.6	Continue Purging, Clear
3/17/2011	1147	484.25	445	20.80	7.62	0.686	1.1	Continue Purging, Clear
3/17/2011	1157	484.25	495	20.84	7.59	0.683	1.1	Continue Purging, Clear
3/17/2011	1207	484.25	545	20.81	7.63	0.684	1.0	Continue Purging, Clear
3/17/2011	1217	484.25	595	20.84	7.63	0.679	1.1	Continue Purging, Clear
3/17/2011	1227	484.25	645	20.90	7.62	0.681	1.3	Continue Purging, Clear
3/17/2011	1237	484.22	695	20.73	7.63	0.678	1.9	Continue Purging, Clear
3/17/2011	1247	484.22	745	20.84	7.63	0.676	0.8	Continue Purging, Clear
3/17/2011	1257	484.22	795	20.71	7.63	0.676	0.9	Continue Purging, Clear
3/17/2011	1307	484.23	845	20.71	7.65	0.674	1.0	Continue Purging, Clear
3/17/2011	1317	484.23	895	20.72	7.63	0.673	1.0	Continue Purging, Clear
3/17/2011	1327	484.23	945	20.70	7.65	0.676	0.9	Stop Purging
3/17/2011	1327	484.23	945	20.70	7.65	0.676	0.9	Total Removed

Was well sampled after development? YES NO X

Sample Method: N/A

Sample Name: N/A

Analyses: N/A

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APPENDIX D-1

KAFB-106102 Final Well Report

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Date Started: 2/22/2011

Date TD Reached: 3/1/2011 Date Completed: 3/3/2011

Ground Elevation AMSL (ft): 5337.3

Client: US Army Corps of Engineers Project Location: KAFB, Albuquerque, NM

Project Name: KAFB BFF SWMU ST-106 and SS-111

Borehole ID: KAFB-106102

Hole Diameter Upper (in.): 11-3/4 Hole Diameter Lower (in.): 9-5/8 Surface Completion Type: Stick-up

Groundwater Levels BGS (ft): ✓ At Time of Drilling: 480.30
 ✓ At End of Drilling: Not Recorded ▼ After Drilling: 482.55

Drilling Contractor: WDC Drilling Drilling Method: Air Rotary Casing Hammer Logged By: Brian Lucero

YC	oordir	ate: 7	n AMS 147403 15404(39. 8 5	Drilling Contractor: WDC Drilling Drilling Method: Air Rotary Casing Hammer Logged By: Brian Lucero Page 1 of 19					
Oepth (ft)	Sample Type Number	Headspace	Lithologic Log	Material Description		U.S.C.S.	We	ell Diagram	Remarks	
5				Clayey SAND (SC); light reddish b (2.5YR 7/3); dry; medium dense to dense; 60% very fine to fine sand; clay; 15% silt; trace caliche nodule odor. Same as above (0 ft); light reddish brown (2.5YR 6/3); no odor.	o ; 25% es; no	SC			Hand augered. ***Note: no headspace requirement at this location*** Spud @ 1307 on 2/22/11.	
15				Sandy lean CLAY (CL); red (2.5YF dry; medium stiff to stiff; medium plasticity; 70% clay with minor silt; very fine to fine sand; trace mediu coarse sand; subangular; no odor.	30% m to			- Cement Seal	Driller began injecting potable water into	
 				Lean CLAY (CL); red (2.5YR 4/6); stiff; medium plasticity; 95% clay; very fine to fine sand; no odor. Same as above (16 ft); no odor.		CL			kelly down @ 1323. New connection @ 1331. Resumed drilling @ 1332.	
25				SILT (ML); red (2.5YR 5/6); dry to stiff; 90% silt with trace clay; 10% fine to fine sand; trace medium to sand; subangular; no odor.	very coarse	ML				
30				Lean CLAY (CL); red (2.5YR 5/6); moist; stiff; medium plasticity; 90% 10% very fine to fine sand; no odo	6 clay; 📗	CL				

Shaw [®]
Client: US Army Corps of Engineers
Project Location: KAFB, Albuquerque, NM
Project Name: KAFB BFF SWMU ST-106 and SS-111
Client: US Army Corps of Engineers

Date Started: 2/22/2011

Date TD Reached: 3/1/2011 Date Completed: 3/3/2011

Ground Elevation AMSL (ft): 5337.3

Borehole ID: KAFB-106102

Hole Diameter Upper (in.): 11-3/4 Hole Diameter Lower (in.): 9-5/8 Surface Completion Type: Stick-up

Groundwater Levels BGS (ft): ☑ At Time of Drilling: 480.30
 ☑ At End of Drilling: Not Recorded $\bar{\Psi}$ After Drilling: 482.55

Drilling Contractor: WDC Drilling Drilling Method: Air Rotary Casing Hammer

Y Co	und Elev pordinat pordinat	e: 147	403	9.85 D	Drilling Contractor: WDC Drilling Drilling Method: Air Rotary Casing Hammer Logged By: Brian Lucero Page 2 of 19					
& Depth (ft) Somulo Tuno	Number	Headspace PID		Material Description		U.S.C.S.		Well Diagram	Remarks	
-				Sandy lean CLAY (CL); red (2.5YR dry to moist; stiff; low plasticity; 70% clay; 30% very fine to coarse sand; subangular; no odor.				- Cement Seal		
35				Same as above (30 ft); no odor.		CL		 - Top of High Solids Bentonite Grout 	Bit packing off.	
40				Same as above (30 ft); no odor.				• • • • • • • • • • • • • • • • • •	Kelly down @ 1356. New connection @ 1405. Resumed drilling @1405.	
45				SILT with Sand (ML); light reddish t (2.5YR 6/4); dry; stiff to very stiff; 85 silt; 15% very fine to fine sand; no c	5%	ML		 • •<		
50				No cuttings returned.					Discharge clogged, attempted to clear @ 1420. Discharge cleared,	
55				Sandy SILT (ML); light red (2.5YR 6 dry; stiff to very stiff; 70% silt; 30% v fine to coarse sand; subangular; no odor. SILT (ML); red (2.5YR 4/6); moist; v stiff; 70% silt; 30% clay; no odor.	very	ML			resumed advancing @ 1425. No cuttings returned without surging air. Regained returns at 52'.	
60				Lean CLAY (CL); red (2.5YR 4/6); n very stiff; low plasticity; 70% clay; 3 silt; no odor.	noist; 0%	CL				



Date Started: 2/22/2011

Date TD Reached: 3/1/2011 Date Completed: 3/3/2011

Y Coordinate: 1474039.85

Ground Elevation AMSL (ft): 5337.3

Borehole ID: KAFB-106102

Client: US Army Corps of Engineers Project Location: KAFB, Albuquerque, NM Project Name: KAFB BFF SWMU ST-106 and SS-111 Hole Diameter Upper (in.): 11-3/4 Hole Diameter Lower (in.): 9-5/8 Surface Completion Type: Stick-up

> Groundwater Levels BGS (ft): ✓ At Time of Drilling: 480.30
> ✓ At End of Drilling: Not Recorded ▼ After Drilling: 482.55

Drilling Contractor: WDC Drilling Drilling Method: Air Rotary Casing Hammer Logged By: Brian Lucero

				47403 54040		Logged By: Brian Lucero				
영 Depth (ft)	Sample Type	Number	Headspace PID	Lithologic Log	Material Description	U.S.C.S.		Well Diagram	Remarks	
	_				SILT (ML); red (2.5YR 4/6); dry to moist; stiff to very stiff; 95% silt; 5% very fine to fine sand; no odor.			• • • • • • • • • • • • • • • •	Kelly down @ 1439. New connection @ 1449. Resumed drilling @ 1450.	
65	-				Same as above (60 ft); no odor. SILT with Sand (ML); red (2.5YR 4/6); dry; stiff to very stiff; 80% silt; 20% very fine to fine sand; trace coarse sand;	ML	• • • • • • • • • • • • • • • • • •	· · · · · · · · · · · · · · · · · · ·		
70	-				Subangular; no odor.			· · · · · · · · · · · · · · · · · · ·		
75	-				Lean CLAY (CL); reddish brown (2.5YR 4/4); moist; very stiff; medium plasticity; 95% clay; 5% very fine to fine sand; no odor.			 High Solids Bentonite Grout 		
80 85	-				Same as above (73 ft); low to medium plasticity; 90% clay with minor silt; 10% very fine to fine sand; no odor.	CL		· · · · · · · · · · · · · · · · · · ·	Kelly down @ 1517. New connection @ 1613. Resumed drilling @ 1616. Stopped advancing due to plugged discharge hose @ 1623. Resumed drilling @ 1643.	
90	-				Same as above (73 ft); 90% clay with minor silt; 10% very fine to fine sand; trace medium to coarse sand; subangular to subrounded; no odor. SILT with Sand (ML); light reddish brown (2.5YR 6/4); dry to moist; very stiff; 75% silt with trace clay; 25% very fine to	ML			End of 2/22/11 @ 1712.	



Date Started: 2/22/2011

Date TD Reached: 3/1/2011 Date Completed: 3/3/2011

Y Coordinate: 1474039.85

X Coordinate: 1540401.91

Ground Elevation AMSL (ft): 5337.3

Project Name: KAFB BFF SWMU ST-106 and SS-111

Borehole ID: KAFB-106102

Hole Diameter Upper (in.): 11-3/4 Hole Diameter Lower (in.): 9-5/8 Surface Completion Type: Stick-up

Groundwater Levels BGS (ft): \Box At Time of Drilling: 480.30 \blacksquare At End of Drilling: Not Recorded \blacksquare After Drilling: 482.55

Drilling Contractor: WDC Drilling Drilling Method: Air Rotary Casing Hammer Logged By: Brian Lucero

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g Depth (ft)		Number	Headspace PID	Lithologic Log	Material Description	U.S.C.S.		Well Diagram	Remarks
	_				medium sand; subangular to subrounded; no odor.	ML			Resumed driling @ 0825 on 2/23/11. Driller added water to cyclone for dust suppression.
95	-				No cuttings returned.			0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	Discharge may be clogged.
105	-				Lean CLAY (CL); reddish brown (2.5YR 5/3); dry to moist; very stiff; low plasticity; 65% clay; 30% silt; 5% very fine to fine sand; no odor. Note: may not be representative - high % of clay may be from inside discharge.	CL	- · · · · · · · · · · · · · · · · · · ·		Kelly down @ 0839. New connection @ 0947. Resumed drilling @ 0948. Stopped advancing @ 0952, clearing cyclone and discharge hose. Discharge hose cleared @ 1026. Resumed
	-				SILT (ML); reddish brown (2.5YR 5/3); dry to moist; very stiff; 95% silt with trace clay; 5% very fine to fine sand.	ML		- High Solids Bentonite Grout	advancing.
110	_				Lean CLAY (CL); reddish brown (2.5YR 5/3); dry to moist; very stiff; low plasticity; 65% clay nodules; 30% silt; 5% very fine to fine sand; no odor.	CL	 • •<	• • • •	
115	5				Same as above (109 ft); no odor.				Likelyten of Ocate Fr
120)				Poorly graded SAND (SP); pale red (2.5YR 7/2); dry; dense to very dense; 95% very fine to fine sand; trace medium to coarse sand; subangular to	SP			Likely top of Sante Fe Group.



Client: US Army Corps of Engineers

Ground Elevation AMSL (ft): 5337.3

Project Number: 140705

Date Started: 2/22/2011

Date TD Reached: 3/1/2011 Date Completed: 3/3/2011

Y Coordinate: 1474039.85

X Coordinate: 1540401.91

Project Location: KAFB, Albuquerque, NM

Project Name: KAFB BFF SWMU ST-106 and SS-111

Borehole ID: KAFB-106102

Hole Diameter Upper (in.): 11-3/4 Hole Diameter Lower (in.): 9-5/8 Surface Completion Type: Stick-up

Groundwater Levels BGS (ft): ✓ At Time of Drilling: 480.30
 ✓ At End of Drilling: Not Recorded ✓ After Drilling: 482.55

Drilling Contractor: WDC Drilling Drilling Method: Air Rotary Casing Hammer Logged By: Brian Lucero

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	500	numat				Dy.			_
05 Depth (ft)	Sample Type	Number	Headspace PID	Lithologic Log	Material Description	U.S.C.S.	w	ell Diagram	Remarks
- - - - - - - - - - -	-				subrounded; 5% silt; no odor. Poorly graded SAND (SP); pale red (2.5YR 7/2); dry; very dense; 95% fine to medium sand; trace coarse sand; subangular to subrounded; 5% silt; no odor. Same as above (120 ft); 95% very fine to fine sand; trace medium sand; subangular to subrounded; 5% silt; no odor.	SP		• • • • • • • • • • • • • • • • • • •	Kelly down @ 1049. New connection @ 1058. Resumed drilling @ 1102.
130				777	Clayey SAND (SC); reddish brown (5YR	SC		•	
-	-				4/3); dry to moist; very dense; 75% very- fine to coarse sand; subangular; 25% clay with minor silt; no odor. SILT (ML); light reddish brown (2.5YR	ML		•	
<u>135</u>	-				4/3); dry to moist; very stiff; 85% silt; 15% clay; no odor. Poorly graded SAND (SP); pale red (2.5YR 7/2); dry; very dense; 95% very fine to fine sand; 5% silt; no odor.			- High Solids Bentonite Grout	
- 140 -	-				Same as above (133 ft); 95% very fine to medium sand; subangular to subrounded; 5% silt; no odor.	SP		•	Kelly down @ 1122. New connection @ 1133. Resumed drilling @ 1133.
- 145 - -	-				Same as above (133 ft); trace pumice clasts; rounded; no odor.			•	

12 13 13

KAFB_BOREHOLE_LOG - SHAW_DRILLING.GDT - 4/21/11 15:00 - Z\XAFB BFFIGINTIKAFB_PROJECTIKAFB_BFF.GPJ

150



Borehole ID: KAFB-106102

Client: US Army Corps of Engineers Project Location: KAFB, Albuquerque, NM Project Name: KAFB BFF SWMU ST-106 and SS-111 Project Number: 140705

Date Started: 2/22/2011 Date TD Reached: 3/1/2011 Date Completed: 3/3/2011

Ground Elevation AMSL (ft): 5337.3 Y Coordinate: 1474039.85 X Coordinate: 1540401.91 Hole Diameter Upper (in.): 11-3/4 Hole Diameter Lower (in.): 9-5/8 Surface Completion Type: Stick-up

Groundwater Levels BGS (ft): \Box At Time of Drilling: 480.30 \blacksquare At End of Drilling: Not Recorded \blacksquare After Drilling: 482.55

Drilling Contractor: WDC Drilling Drilling Method: Air Rotary Casing Hammer Logged By: Brian Lucero

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	200	ordinat	te: 18	54040	.91 Logged By: Brian Lucero Page 6 of 19					
10 Depth (ft)	Sample Type	Number	Headspace PID	Lithologic Log	Material Description	U.S.C.S.	Well Diagram	Remarks		
	_				Poorly graded SAND (SP); pale red (2.5YR 7/2); dry; very dense; 95% very fine to fine sand; 5% silt; trace pumice; no odor.					
155	-				Same as above (150 ft); 100% fine sand; trace medium to coarse sand; subangular to subrounded; trace pumice; no odor.	SP	• • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • •			
160	-				Well graded SAND (SW); pale red (2.5YR 7/2); dry; very dense; 100% very fine to coarse sand; subangular to subrounded; no odor.			Kelly down @ 1152. New connection @ 1204. Resumed drilling @ 1239.		
165	-				Same as above (160 ft); 95% sand; 5% fine gravel to 15mm; subangular to subrounded; higher abundance of pumice fragments than 155'; oxidized and abraded; no odor.	SW	- High Solids Bentonite Grout			
170	-				Poorly graded SAND (SP); pale red (2.5YR 7/2); dry; dense to very dense; 100% fine to medium sand; subangular	SP				
<u>175</u>					to subrounded; higher abundance of pumice fragments than 155'; oxidized and abraded; no odor. Silty SAND (SM); brown (7.5YR 5/3); dry to moist; dense; 75% very fine to medium sand; trace coarse; subangular to subrounded; 25% silt with minor clay; no odor.	SM				
180	$\left \right $				Poorly graded SAND (SP); pale red	SP				



Date Started: 2/22/2011

Date TD Reached: 3/1/2011 Date Completed: 3/3/2011

Y Coordinate: 1474039.85

Ground Elevation AMSL (ft): 5337.3

Project Name: KAFB BFF SWMU ST-106 and SS-111

Borehole ID: KAFB-106102

Hole Diameter Upper (in.): 11-3/4 Hole Diameter Lower (in.): 9-5/8 Surface Completion Type: Stick-up

Groundwater Levels BGS (ft): ✓ At Time of Drilling: 480.30
 ✓ At End of Drilling: Not Recorded ▼ After Drilling: 482.55

Drilling Contractor: WDC Drilling Drilling Method: Air Rotary Casing Hammer Logged By: Brian Lucero

				47403 54040			Lucero	Page 7 of 19
8 Depth (ft)	Sample Type	Number	Headspace PID	Lithologic Log	Material Description	U.S.C.S.	Well Diagram	Remarks
	-				(2.5YR 7/2); dry; dense to very dense; 100% very fine to fine sand; trace medium sand; subangular to subrounded; no odor.			Kelly down @ 1253. New connection @ 1311. Resumed drilling @ 1311.
185	-				Same as above (179 ft); 95% very fine to fine sand; 5% silt; no odor.	SP		
<u>190</u>	-				Same as above (179 ft); no odor.			
<u>195</u>	-				Well graded SAND (SW); pale red (2.5YR 7/2); dry to moist; dense to very dense; 90% very fine to coarse sand; subrounded; 5% fine gravel to 10mm; 5% silt; no odor.	sw	- High Solids Bentonite Grout	
200	-				SILT (ML); brown (7.5YR 5/3); dry to moist; stiff to very stiff; 75% silt; 25% clay; no odor.	ML		Kelly down @ 1328. New 5' connection @ 1338. Resumed drilling @ 1342.
<u>205</u> 210	-				Lean CLAY (CL); brown (7.5YR 5/3); dry to moist; stiff; low plasticity; 70% clay; 30% silt; trace very fine to fine sand; no odor. Same as above (205 ft); medium plasticity; 95% clay; 5% silt; no odor.	CL		Kelly down @ 1345, TD 11-3/4" casing. Switched to 9-5/8" casing, new connection @ 1718. Resumed drilling @ 0743 on 2/24/11.



Borehole ID: KAFB-106102

Client:US Army Corps of EngineersHolProject Location:KAFB, Albuquerque, NMHolProject Name:KAFB BFF SWMU ST-106 and SS-111SurProject Number:140705Creation

Date Started: 2/22/2011 Date TD Reached: 3/1/2011 Date Completed: 3/3/2011

Ground Elevation AMSL (ft): 5337.3 Y Coordinate: 1474039.85 X Coordinate: 1540401.91 Hole Diameter Upper (in.): 11-3/4 Hole Diameter Lower (in.): 9-5/8 Surface Completion Type: Stick-up

Groundwater Levels BGS (ft): \Box At Time of Drilling: 480.30 \blacksquare At End of Drilling: Not Recorded \blacksquare After Drilling: 482.55

Drilling Contractor: WDC Drilling Drilling Method: Air Rotary Casing Hammer Logged By: Brian Lucero

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0 Depth (ft)	Sample Type	Number	Headspace PID	Lithologic Log	Material Description	U.S.C.S.	Well	Diagram	Remarks
-	-				Silty SAND (SM); pale red (2.5YR 7/2); dry; dense; 75% very fine to fine sand; trace medium sand; subrounded; 25% silt; no odor.				Casing followed bit without using hammer.
215	-				Silty SAND with Gravel (SM); reddish brown (5YR 4/3); moist; dense; 70% very fine to coarse sand; subangular to subrounded; 15% fine gravel to 15mm; subrounded; 15% silt with minor clay as coating on gravel and coarse sand; no odor.	SM			
220	-				Poorly graded SAND (SP); pale red (2.5YR 7/2); dry; dense; 90% very fine to fine sand; 5% fine to coarse gravel to 3cm; subrounded; 5% silt with trace clay as coating on gravel; no odor.	SP			Kelly down @ 0807. New connection @ 0816. Resumed drilling.
<u>225</u> - -	-				Well graded SAND (SW); pale red (2.5YR 7/2); dry; dense; 95% very fine to coarse sand; subangular to subrounded; 5% silt; trace coarse gravel with clay coating; no odor.	SW	•• • E	High Solids Bentonite Grout	Driller began injecting water into cyclone for
230	-				Poorly graded SAND (SP); pale red (2.5YR 7/2); dry; dense; 95% very fine to fine sand; 5% silt; no odor.	SP			dust suppression.
235					Poorly graded SAND with Silt (SP-SM); pale red (2.5YR 7/2); dry; dense; 90% very fine sand; trace fine sand; 10% silt; no odor.	SP- SM			



Client: US Army Corps of Engineers

Ground Elevation AMSL (ft): 5337.3

Project Number: 140705

Date Started: 2/22/2011

Date TD Reached: 3/1/2011

Date Completed: 3/3/2011

Project Location: KAFB, Albuquerque, NM

Borehole ID: KAFB-106102

Hole Diameter Upper (in.): 11-3/4 Hole Diameter Lower (in.): 9-5/8 Project Name: KAFB BFF SWMU ST-106 and SS-111 Surface Completion Type: Stick-up

> Groundwater Levels BGS (ft): \square At Time of Drilling: 480.30 TAt End of Drilling: Not Recorded ✓ After Drilling: 482.55

Drilling Contractor: WDC Drilling Drilling Method: Air Rotary Casing Hammer

Y Coordinate: 1474039.85 Page 9 of 19 X Coordinate: 1540401.91 Logged By: Brian Lucero Sample Type Headspace PID Lithologic Log Depth (ft) Number *i* Ö Material Description Remarks Well Diagram ю. ⊃. 240 Kelly down @ 0831. New SILT (ML); reddish brown (2.5YR 5/4); dry to moist; stiff to very stiff; 70% silt; connection @ 0837. ML 30% clay; trace very fine to fine sand; no Resumed drilling @ 0838. odor. Silty SAND (SM); light reddish brown (2.5YR 6/3); dry to moist; dense to very dense; 75% very fine to fine sand; 25% • 245 silt; no odor. Began driving casing • below 245'. SM • • 250 • Well graded SAND (SW); pale red (2.5YR 7/2); dry; dense to very dense; 95% very fine to coarse sand; subangular to subrounded; 5% silt; no odor. • 255 SW High Solids Same as above (250 ft); no odor. Bentonite Grout • 260 Poorly graded SAND (SP); reddish Kelly down @ 0901. New . brown (5YR 4/4); dry to moist; dense to connection @ 0913. • very dense; 100% fine to medium sand; Resumed drilling @ trace very fine sand; subrounded; no 0914. • odor. • • • • • • • 265 SP Same as above (260 ft); 95% sand; 5% fine gravel to 10mm; subrounded; no odor. • • • • . 270



Date Started: 2/22/2011

Date TD Reached: 3/1/2011 Date Completed: 3/3/2011

Y Coordinate: 1474039.85

Ground Elevation AMSL (ft): 5337.3

Borehole ID: KAFB-106102

Hole Diameter Upper (in.): 11-3/4 Hole Diameter Lower (in.): 9-5/8 Project Name: KAFB BFF SWMU ST-106 and SS-111 Surface Completion Type: Stick-up

> Groundwater Levels BGS (ft): ✓ At Time of Drilling: 480.30
> ✓ At End of Drilling: Not Recorded ▼ After Drilling: 482.55

Drilling Contractor: WDC Drilling Drilling Method: Air Rotary Casing Hammer Logged By: Brian Lucero

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02 Depth (ft) Sample Type	Number	Headspace PID	Lithologic Log	Material Description	U.S.C.S.	V	Vell Diagram	Remarks		
275				Poorly graded SAND with Gravel (SP); pale red (2.5YR 7/2); dry; dense to very dense; 80% very fine to fine sand; trace medium to coarse sand; subangular to subrounded; 15% fine to coarse gravel to 3cm; subrounded; 5% silt with clay as coating on gravel; no odor. Same as above (270 ft); no odor.	SP		 • •<			
280 - - - - - - - - - - - - - - - - - - -				Well graded SAND (SW); pale red (2.5YR 7/2); dry; dense to very dense; 95% very fine to coarse sand; subrounded; trace fine gravel to 10mm; subrounded; 5% silt; no odor.	sw	 ••• ••• ••• •• ••<td>- High Solids</td><td>Kelly down @ 0927. New connection @ 0933. Resumed drilling @ 0934.</td>	- High Solids	Kelly down @ 0927. New connection @ 0933. Resumed drilling @ 0934.		
- - - 290 - - -				odor. Poorly graded SAND (SP); pale red (2.5YR 7/2); dry; dense to very dense; 95% medium to coarse sand; subangular to subrounded; trace very fine to fine sand; 5% fine gravel to 15mm; subrounded; no odor. Poorly graded SAND with Gravel (SP); pale red (2.5YR 7/2); dry; dense to very dense; 85% very fine to fine sand; 15% fine to coarse gravel to 2cm; subangular to subrounded; no odor.	SP		Bentonite Grout			
<u>295</u> - - - 300				Clayey SAND (SC); brown (7.5YR 5/3); moist; very dense; 80% very fine to fine sand; trace medium to coarse sand; subangular to subrounded; 5% fine to coarse gravel to 3cm; subrounded; 15% clay with minor silt; no odor.	SC		- 7 - 7 - 7 - 7 - 7 - 7 - 7 - 7			



Borehole ID: KAFB-106102

Hole Diameter Upper (in.): 11-3/4 Hole Diameter Lower (in.): 9-5/8 Surface Completion Type: Stick-up

Groundwater Levels BGS (ft): \Box At Time of Drilling: 480.30 \blacksquare At End of Drilling: Not Recorded \blacksquare After Drilling: 482.55

Drilling Contractor: WDC Drilling Drilling Method: Air Rotary Casing Hammer Logged By: Brian Lucero

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00 Depth (ft)	Sample Type	Number	Headspace PID	Lithologic Log	Material Description	U.S.C.S.		Well Diagram	Remarks
305	_				Well graded SAND (SW); reddish brown (5YR 4/4); dry to moist; very dense; 95% very fine to coarse sand; subangular to subrounded; 5% silt; no odor.	sw		• • • • • • • • • • • • • • • •	Kelly down @ 0950. New connection @ 1000. Resumed drilling @ 1005.
310	-				Poorly graded SAND (SP); reddish brown (2.5YR 5/4); dry to moist; very dense; 95% very fine to fine sand; trace medium to coarse sand; subrounded; 5% silt; no odor.	SP		· · · · · · · · · · · · · · · · · · ·	
	-				Well graded SAND (SW); pale red (2.5YR 7/2); dry; very dense; 95% very fine to coarse sand; subangular to subrounded; 5% silt; no odor.				
315	-				Well graded SAND with Gravel (SW); pale red (2.5YR 7/2); dry to moist; very dense; 80% very fine to coarse sand; subangular to subrounded; 15% fine to coarse gravel to 2cm; subangular to subrounded; 5% silt with clay as coating on gravel; no odor	sw		- High Solids Bentonite Grout	
325	-				Same as above (315 ft); no odor. Well graded SAND (SW); pale red (2.5YR 7/2); dry; very dense; 95% very fine to coarse sand; subangular to subrounded; 5% silt; no odor.	500			Kelly down @ 1021. New connection and resumed drilling.
330							• • • • • •	• • • • • •	

Date TD Reached: 3/1/2011 Date Completed: 3/3/2011 Ground Elevation AMSL (ft): 5337.3 Y Coordinate: 1474039 85

Project Number: 140705

Date Started: 2/22/2011

Y Coordinate: 1474039.85 X Coordinate: 1540401.91

Project Name: KAFB BFF SWMU ST-106 and SS-111

S	Shaw Borehole ID: KAFB-106102										
Pro Pro	ojec ojec	t Loca	ation: ne: K	: KAI AFB	s of Engineers ^F B, Albuquerque, NM BFF SWMU ST-106 and SS-111	Hole Diameter Upper (in.): 11-3/4 Hole Diameter Lower (in.): 9-5/8 Surface Completion Type: Stick-up					
Da Da	te S te T	Started	d: 2/2 acheo	22/20 d: 3/~	11 1/2011		Time o End of	f Dril Drilli	ling: ng:	480.30 Not Recorded	
YC	Cool	d Elev rdinat rdinat	e: 14	17403			Metho	d: A	ir Ro	DC Drilling tary Casing H ero	ammer Page 12 of 19
05 Depth (ft)	Sample Type	Number	Headspace PID	Lithologic Log	Material Description		U.S.C.S.		Well	Diagram	Remarks
335	-				Well graded GRAVEL with Sand pale red (2.5YR 7/2); dry; dense dense; 80% fine to coarse grave 2.5cm; subangular to subrounder very fine to coarse sand; subang subrounded; 5% silt with clay as on gravel; no odor.	to very to d; 15% ular to	GW				
340	-				Well graded SAND (SW); pale re (2.5YR 7/2); dry; dense to very de 95% very fine to coarse sand; subangular to subrounded; 5% s odor. Note: brief discharge of gravel at interval.	ense; ilt; no	sw	· ·			
-	-				Poorly graded SAND (SP); pale r (2.5YR 7/2); dry; dense to very d 95% very fine to fine sand; 5% si odor.	ense;					Kelly down @ 1053. New connection @ 1102. Resumed drilling @ 1102.
345	-				Same as above (340 ft); 95% ver fine sand; trace medium to coars subrounded; 5% silt; no odor.		SP			High Solids Bentonite Grout	Stopped drilling to reconnect air hose to casing hammer @1118. Resumed drilling @ 1152.
350					Well graded SAND (SW); pale re (2.5YR 7/2); dry to moist; dense i dense; 90% very fine to coarse s subangular to subrounded; 5% fi gravel to 15mm; subrounded; 5% odor.	to very and; ne	L				
355 - - - - - - - - - - - - - - - - - -	-				Same as above (350 ft); no odor		SW	• • • •	 • •<		



Borehole ID: KAFB-106102

Client:US Army Corps of EngineersHoProject Location:KAFB, Albuquerque, NMHoProject Name:KAFB BFF SWMU ST-106 and SS-111SuProject Number:140705Cr

Date Started: 2/22/2011 Date TD Reached: 3/1/2011 Date Completed: 3/3/2011

Ground Elevation AMSL (ft): 5337.3 Y Coordinate: 1474039.85 X Coordinate: 1540401.91 Hole Diameter Upper (in.): 11-3/4 Hole Diameter Lower (in.): 9-5/8 Surface Completion Type: Stick-up

Groundwater Levels BGS (ft): \Box At Time of Drilling: 480.30 \blacksquare At End of Drilling: Not Recorded \blacksquare After Drilling: 482.55

Drilling Contractor: WDC Drilling Drilling Method: Air Rotary Casing Hammer Logged By: Brian Lucero

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00 Depth (ft)	Sample Type	Numt	Headspace PID	Lithologic Log	Material Description	U.S.C.S.	Well Diagram	Remarks
365	-				Silty SAND (SM); light reddish brown (2.5YR 6/3); dry to moist; dense; 85% very fine to fine sand; 15% silt; no odor.	SM		Kelly down @ 1200. New connection @ 1211. Resumed drillling @ 1214.
370					Poorly graded SAND (SP); light reddish brown (2.5YR 6/3); dry to moist; dense to very dense; 100% fine to medium sand; trace very fine sand; subrounded; no odor.	SP		
	-				Well graded SAND (SW); light reddish brown (2.5YR 6/3); moist; dense to very dense; 100% very fine to coarse sand; subangular to subrounded; no odor.			
375	-				Same as above (370 ft); pale red (2.5YR 7/2); dry to moist.	SW	- High Solids Bentonite Grout	
<u>380</u>) - -				Same as above (370 ft); no odor.		• • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • •	Kelly down @ 1232. New connection @ 1239. Resumed drilling @ 1242.
385	5				Same as above (370 ft); increasing abundance of medium to coarse sand; /			
390	- - -)				no odor. Poorly graded SAND (SP); pale red (2.5YR 7/2); dry; very dense; 100% very fine to medium sand; trace coarse sand; subangular to subrounded; no odor.	SP	• • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • •	



Borehole ID: KAFB-106102

Client: US Army Corps of Engineers Project Location: KAFB, Albuquerque, NM Project Name: KAFB BFF SWMU ST-106 and SS-111 Project Number: 140705

Date Started: 2/22/2011 Date TD Reached: 3/1/2011 Date Completed: 3/3/2011

Ground Elevation AMSL (ft): 5337.3 Y Coordinate: 1474039.85 X Coordinate: 1540401.91 Hole Diameter Upper (in.): 11-3/4 Hole Diameter Lower (in.): 9-5/8 Surface Completion Type: Stick-up

Groundwater Levels BGS (ft): \Box At Time of Drilling: 480.30 \blacksquare At End of Drilling: Not Recorded \blacksquare After Drilling: 482.55

Drilling Contractor: WDC Drilling Drilling Method: Air Rotary Casing Hammer Logged By: Brian Lucero

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ଞ Depth (ft)	Sample Type Number Headspace PID Lithologic Log		Lithologic Log	Material Description	ທີ່ ວິ ທີ່ Well Diagram ລິ		Remarks	
395	-				Poorly graded SAND (SP); pale red (2.5YR 7/2); dry; very dense; 100% very fine to medium sand; trace coarse sand; subangular to subrounded; no odor.	SP		
	-				Well graded SAND (SW); pale red (2.5YR 7/2); dry; very dense; 95% very fine to coarse sand; subangular to subrounded; 5% silt; no odor.			
<u>400</u>	-				Same as above (395 ft); no odor.	SW		Kelly down @ 1312. New connection @ 1315. Resumed drilling @ 1316.
405	-				Poorly graded SAND (SP); pale red (2.5YR 7/2); dry to moist; very dense; 100% very fine to fine sand; no odor.	SP	- High Solids Bentonite Grout	
410	-				Well graded SAND (SW); pale red (2.5YR 7/2); dry; very dense; 100% very fine to coarse sand; subangular to subrounded; trace fine gravel to 15mm; subangular; no odor.			
415	-				Same as above (410 ft); no odor. Silty SAND (SM); pale red (2.5YR 7/2);			
420					moist; very dense; 80% very fine to fine sand; 20% silt; no odor.	SM		



Project Number: 140705

Date Started: 2/22/2011

Date TD Reached: 3/1/2011 Date Completed: 3/3/2011

Y Coordinate: 1474039.85

Ground Elevation AMSL (ft): 5337.3

Borehole ID: KAFB-106102

Client: US Army Corps of Engineers Project Location: KAFB, Albuquerque, NM Project Name: KAFB BFF SWMU ST-106 and SS-111 Hole Diameter Upper (in.): 11-3/4 Hole Diameter Lower (in.): 9-5/8 Surface Completion Type: Stick-up

> Groundwater Levels BGS (ft): ✓ At Time of Drilling: 480.30
> ✓ At End of Drilling: Not Recorded ▼ After Drilling: 482.55

Drilling Contractor: WDC Drilling Drilling Method: Air Rotary Casing Hammer Logged By: Brian Lucero

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5 Depth (ft)	Sample Type	Number	Headspace PID	Lithologic Log	Material Description	ທີ່ O. ທີ່ D. Well Diagram			Remarks
425					Silty SAND (SM); pale red (2.5YR 7/2); dry to moist; very dense; 80% very fine to fine sand; 20% silt; no odor.	SM			Kelly down @ 1351. New connection @ 1358. Resumed drilling @ 1359.
430					Poorly graded SAND (SP); pale red (2.5YR 7/2); dry to moist; very dense; 95% very fine to fine sand; 5% silt; no odor. Brief discharge of fine to coarse gravel to 5cm; subrounded. Same as above (425 ft); dry; 95% very fine to medium sand; subangular to				
435					subrounded; 5% silt; no odor. Poorly graded SAND (SP); pale red (2.5YR 7/2); dry; very dense; 95% medium to coarse sand; subangular to subrounded; trace very fine to fine sand; 5% fine gravel to 15mm; no odor.	SP		- High Solids Bentonite Grout	
440					Poorly graded SAND with Silt (SP-SM); pinkish gray (5YR 6/2); dry; very dense; 90% very fine to fine sand; 10% silt; trace limestone fragments; no odor.	SP- SM			Kelly down @ 1437. New connection @ 1445. Resumed drilling @ 1448.
- - - 450					Poorly graded SAND (SP); pale red (2.5YR 7/2); dry; very dense; 95% very fine to fine sand; 5% silt; no odor.	SP			



Borehole ID: KAFB-106102

Client: US Army Corps of Engineers Project Location: KAFB, Albuquerque, NM Project Name: KAFB BFF SWMU ST-106 and SS-111 Project Number: 140705

Date Started: 2/22/2011 Date TD Reached: 3/1/2011 Date Completed: 3/3/2011

Ground Elevation AMSL (ft): 5337.3 Y Coordinate: 1474039.85 X Coordinate: 1540401.91 Hole Diameter Upper (in.): 11-3/4 Hole Diameter Lower (in.): 9-5/8 Surface Completion Type: Stick-up

Groundwater Levels BGS (ft): \Box At Time of Drilling: 480.30 \blacksquare At End of Drilling: Not Recorded \blacksquare After Drilling: 482.55

Drilling Contractor: WDC Drilling Drilling Method: Air Rotary Casing Hammer Logged By: Brian Lucero

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5 Depth (ft)			Lithologic Log	Material Description		Well Diagram	Remarks	
455	-				Poorly graded SAND (SP); pale red (2.5YR 7/2); dry; very dense; 95% very fine to fine sand; trace medium sand; subrounded; 5% silt; no odor.			
460	-				Same as above (450 ft); no odor.	SP		Kelly down @ 1516 on
465	-				Same as above (450 ft); 100% fine to medium sand; trace coarse sand; subangular to subrounded; no odor.		- High Solids	2/24/11. New connection @ 0821 on 3/1/11. Resumed drilling @ 0833 on 3/1/11. Driller began injecting water into cyclone for dust suppression.
470	-				Same as above (450 ft); trace fine gravel to 5mm; subrounded; no odor. Well graded GRAVEL with Sand (GW); pale red (2.5YR 7/2); moist; very dense; 70% fine to coarse gravel to 7.5cm;	GW	Bentonite Grout	
				SU SU PC (2 95 sa	subrounded; 30% fine to coarse sand; subangular to subrounded; no odor. Poorly graded SAND (SP); pale red (2.5YR 7/2); moist; dense to very dense; 95% fine to medium sand; trace coarse sand; subangular to subrounded; 5% fine gravel to 10mm; subrounded; no	SP		Resumed drilling @ 0833 on 3/1/11. Driller began injecting water into cyclone for dust
475	-				odor. Well graded SAND (SW); pale red (2.5YR 7/2); dry; dense to very dense; 90% very fine to coarse sand; subangular to subrounded; 10% fine to coarse gravel to 2cm; subangular to subrounded; no odor.	SW		

9	C Sha					Bore	eho	le ID: KAFB-	106102
Pr Pr	ojec ojec	t Loca	ation: ne: K	: KÁI (AFB	os of Engineers FB, Albuquerque, NM BFF SWMU ST-106 and SS-111	Hole Dia	amete	r Upper (in.): 11-3/4 r Lower (in.): 9-5/8 bletion Type: Stick-up	
Da Da	ate S ate T	tartec	d: 2/2 acheo	22/20 d: 3/	11 1/2011	⊥ At T I At E	Time o End of	Levels BGS (ft): f Drilling: 480.30 Drilling: Not Recorded ng: 482.55	
Y	Cooi	d Elev rdinate rdinate	e: 14	47403		Drillling Drilling	Contra Metho	actor: WDC Drilling d: Air Rotary Casing H Brian Lucero	ammer Page 17 of 19
B Depth (ft)	Sample Type	Number	Headspace PID	Lithologic Log	Material Description		U.S.C.S.	Well Diagram	Remarks
-00	-				✓Well graded SAND (SW); pale re (2.5YR 7/2); dry; dense to very d 95% very fine to coarse sand; ▼subangular to subrounded; 5% fi	ense;	SW		Kelly down @ 0902. New connection @ 0911. Resumed drilling @ 0912.
485	-				coarse gravel to 3cm; subangula subrounded; no odor. Poorly graded SAND (SP); pale (2.5YR 7/2); moist; very dense; 1	red	SP		
	-				very fine to fine sand; no odor. N sandy clay; dark brown (7.5YR 3 clay nodules at 484'. Well graded SAND (SW); pale re (2.5YR 7/2); dry to moist; very de	lote: / /4) wirh / ed	SW		Dusty dry discharge from 480-497'. Kelly down.
490					95% very fine to coarse sand; $\sqrt{35\%}$ subangular to subrounded; 5% fi	ne to /	ML		
495	-				coarse gravel to 5cm; subrounde odor. SILT with Sand (ML); light reddis (5YR 6/4); dry to moist; very den silt; 20% very fine to fine sand; n Silty SAND (SM); light reddish br (5YR 6/4); dry to moist; very den very fine to fine sand; trace medi	h brown se; 80% o odor. rown se; 70%	SM		
500	- - - -) -				coarse sand; subangular to subro 10% fine to coarse gravel to 7.50 subrounded; 20% silt; no odor. Poorly graded SAND (SP); pale ((2.5YR 7/2); dry to moist; very de 90% very fine to medium sand; to coarse sand; subangular to subro 5% fine to coarse gravel to 5cm; subrounded; 5% silt; no odor. Same as above (495 ft); wet; no	cm; red ense; race ounded;	SP		Kelly down @ 0941. New connection @ 1107. Resumed drilling @
505									1146.
505					Well graded SAND (SW); weak r (2.5YR 5/2); moist; very dense; 9 very fine to coarse sand; subang fine gravel to 18mm; subangular subrounded; no odor.	95% ular; 5%	sw		
510)								

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Date Started: 2/22/2011 Date TD Reached: 3/1/2011 Date Completed: 3/3/2011

Ground Elevation AMSL (ft): 5337.3 Y Coordinate: 1474039.85 X Coordinate: 1540401.91

Borehole ID: KAFB-106102

Hole Diameter Upper (in.): 11-3/4 Hole Diameter Lower (in.): 9-5/8 Surface Completion Type: Stick-up

Groundwater Levels BGS (ft): \square At Time of Drilling: 480.30 \blacksquare At End of Drilling: Not Recorded \blacksquare After Drilling: 482.55

Drilling Contractor: WDC Drilling Drilling Method: Air Rotary Casing Hammer Logged By: Brian Lucero

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	X Coordinate: 1540401.91 Logg						ged By: Brian Lucero			
0 Depth (ft)	Sample Type	Number	Headspace PID	Lithologic Log	Material Description	scription ທີ່ ເດີ ທີ່ ວັ				
515	-				Poorly graded SAND (SP); weak red (2.5YR 5/2); wet; very dense; 95% very fine to medium sand; subangular to subrounded; 5% fine to coarse gravel to 5cm; subangular to subrounded; no odor.	SP	- Bentonite Seal			
520	-				Well graded SAND (SW); weak red (2.5YR 5/2); moist; very dense; 95% fine to coarse sand; subangular to subrounded; trace very fine sand; 5% fine to coarse gravel to 7.5cm; subangular to subrounded; trace cobbles to 15cm; no odor.	sw	- 5" Schedule 80 PVC Riser - Top of 20/40 Sand - Top of 10/20 Sand			
525	-				Poorly graded SAND (SP); weak red (2.5YR 5/2); wet; very dense; 95% fine to medium sand; trace very fine and coarse sand; subangular to subrounded; 5% fine to coarse gravel to 5cm; subangular to subrounded; no odor. Same as above (520 ft); moist; 100% very fine to fine sand; no odor.	SP	- Top of 5" Schedule 80 PVC 0.010" Slot Screen	Kelly down @ 1214. New connection @ 1246. Resumed drilling @ 1252.		
530	-				Same as above (520 ft); 100% very fine to medium sand; trace coarse sand; subangular to subrounded; trace fine gravel to 12mm; subangular to subrounded; no odor.					
535	-				Well graded SAND (SW); weak red (2.5YR 5/2); wet; very dense; 95% very fine to coarse sand; subangular to subrounded; 5% fine gravel to 12mm; subrounded; no odor.	sw	- Bottom of Screen - Sump			
540										

	\wedge
Sh	aw

Client: US Army Corps of Engineers

Ground Elevation AMSL (ft): 5337.3

Project Number: 140705

Date Started: 2/22/2011

Date TD Reached: 3/1/2011 Date Completed: 3/3/2011

Y Coordinate: 1474039.85

X Coordinate: 1540401.91

Project Location: KAFB, Albuquerque, NM

Project Name: KAFB BFF SWMU ST-106 and SS-111

Borehole ID: KAFB-106102

Hole Diameter Upper (in.): 11-3/4 Hole Diameter Lower (in.): 9-5/8 Surface Completion Type: Stick-up

Groundwater Levels BGS (ft): \square At Time of Drilling: 480.30 \blacksquare At End of Drilling: Not Recorded \blacksquare After Drilling: 482.55

Drilling Contractor: WDC Drilling Drilling Method: Air Rotary Casing Hammer Logged By: Brian Lucero

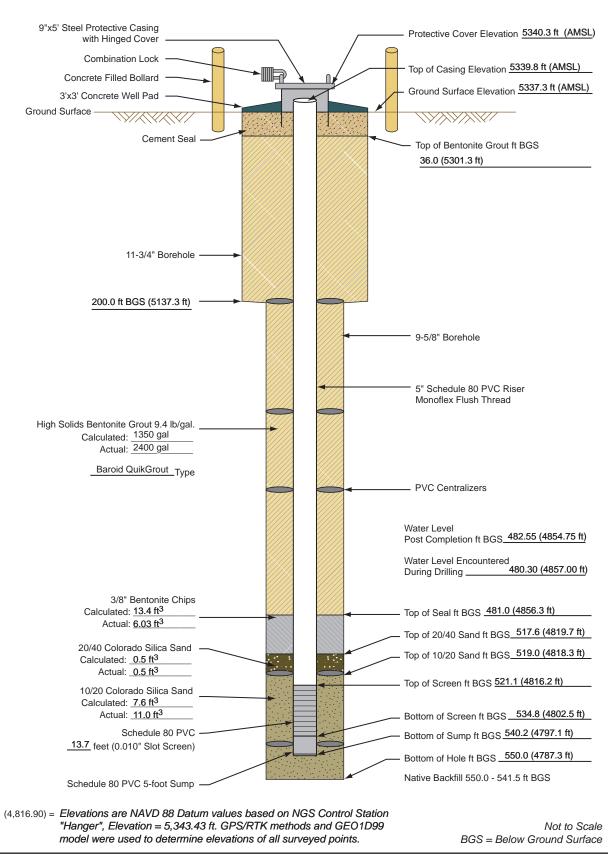
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G Depth (ft)	Sample Type	Number	Headspace PID	Lithologic Log	Material Description	U.S.C.S.	Well Diagram	Remarks
- - 545 - - -					Poorly graded SAND with Gravel (SP); weak red (2.5YR 5/2); wet; very dense; 85% medium to coarse sand; angular to subangular; trace very fine to fine sand; 15% fine to coarse gravel to 5cm; subangular; no odor. Poorly graded SAND (SP); weak red (2.5YR 5/2); wet; very dense; 100% very fine to medium sand; subangular to subrounded; no odor.	SP	- Bottom of Sump Bottom of Filter Pack	Kelly down @ 1328. New connection @ 1340. Resumed drilling @ 1343. Heavy discharge of water when air was turned on after connection. Heavy discharge likely washed fine-grained material out of sample at 540'.
550							60262	Total Depth = 550 ft. Reached @ 1418 on 3/1/11.
555								Water added during drilling (gallons) = 0
-								Water added after drilling (gallons) = 1,000
								Water added during construction (gallons) = Not Recorded
-								Spud: started drilling from surface.
<u>565</u>								Kelly down: TD the joint and ready to make new connection.
570								

Monitoring Well Completion Diagram KAFB-106102

 Installation Start Date/Time:
 3/22/2011 @ 7:59

 Installation End Date/Time:
 3/3/2011 @ 17:20



140705.CB010040_MW_KAFB_106102



Well/Piez. No.: 106102							
Date Installed: 3/3/11							
Csg. Diameter (I.D.): <u>5"</u>							
Total Depth (ft. BGL): <u>541.50</u>							
X Pumping							
Other							
482.52							
Vol. (V) Purge Factor Volume to Purge							
1064.95 gal. * 1 = 1064.95 * Ø _s * 7.48)+(H ₂ O added during drilling/installation) = <u>1064.95</u> gallons							
Time Purging Begins: <u>1027, 3/19/11</u>							
Screened Interval (ft BGL): 521.08-534.84							
EC Meter: <u>YSI 100258</u> Turbidity Meter: <u>LVE 2818</u>							
t: Y <u>X N</u>							
<u>N X</u>							

Well Development Record

		Water Level (ft. Below	Volume Removed				Turbidity	
Date	Time	TOC)	(gal.)	Temp.°C	рН	EC (ms/cm)	N.T.U.	Comments
3/16/2011	1000		10					Begin Bailing
3/16/2011	1009		20	19.74	8.10	0.412	>2000	Initial Reading
3/16/2011	1042		30	19.87	7.98	0.365	>2000	Continue Bailing, Muddy
3/16/2011	1100							Bailer Came Up Sandy
3/19/2011	1423		40					Sandy, Muddy brown
3/19/2011	0903	482.96	50					Continue Bailing, Muddy
3/19/2011	1027	483.58	50					Begin Pumping, 10 GPM
3/19/2011	1035	484.20	70	19.57	7.81	0.392	1000+	Continue Pumping
3/19/2011	1100	484.13	170	24.45	7.91	0.382	119	Continue Pumping
3/19/2011	1120	484.11	270	24.09	7.97	0.384	53	Continue Pumping

Notes:

* Water Levels - Reported to the nearest 0.01 foot

* pH - Reading rounded to 0.1 pH units

* Water temperature - Reported to nearest 0.1C * Turbidity report in NTV nearest whole #

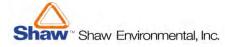
Where:

B=3.14

 $\emptyset_{\rm s}$ = porosity of the sand pack

 $\omega_a = \text{porcestly of the send pack}$ $r_c = \text{radius of the well casing and screen in feet}$ $L_c = \text{length of water column inside the casing and screen in feet}$ $r_w = \text{radius of the well bore in feet}$ $L_a = \text{length of saturated portion of the sand pack in feet}$

7.48 gallons/cubic foot= conversion from cubic feet to gallons



Well Development Record

Project: KAFB BFF

Project Number: 140705

Date: 3/19/11

Well No: 106102

Samplers: D. Flores, A. Trujillo

Checked By: _____

Time Start: 1000, 3/16/11

Time Finish: 1415, 3/19/11

Field Chemistry (cont'd)

		Water Level (ft. Below	Volume Removed				Turbidity	
Date	Time	TOC)	(gal.)	Temp.°C	рН	EC (ms/cm)	N.T.U.	Comments
3/19/2011	1140	484.10	370	24.01	8.01	0.394	35	Continue Pumping
3/19/2011	1200	484.07	470	24.21	7.99	0.379	29	Continue Pumping
3/19/2011	1220	484.06	570	23.07	7.98	0.361	31	Continue Pumping
3/19/2011	1240	484.08	670	22.73	8.00	0.353	14	Continue Pumping
3/19/2011	1300	484.07	770	21.54	8.04	0.347	13	Continue Pumping
3/19/2011	1325	484.05	870	22.72	8.01	0.349	11	Continue Pumping
3/19/2011	1350	484.04	970	23.12	8.01	0.344	7	Continue Pumping
3/19/2011	1415	484.01	1070	22.91	8.00	0.347	6	Stop Pumping
3/19/2011	1415	484.01	1070	22.91	8.00	0.347	6	Total Removed

Was well sampled after development? YES NO X

Sample Method: N/A

Sample Name: N/A

Analyses: N/A

APPENDIX D-1

KAFB-106108 Final Well Report

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Date Started: 2/15/2011 Date TD Reached: 2/16/2011 Date Completed: 2/18/2011

Ground Elevation AMSL (ft): 5341.9 Y Coordinate: 1473731.62 X Coordinate: 1541083.91

Borehole ID: KAFB-106108

Hole Diameter Upper (in.): 11-3/4 Hole Diameter Lower (in.): 9-5/8 Surface Completion Type: Flush mount

Groundwater Levels BGS (ft): \square At Time of Drilling: N/A \blacksquare At End of Drilling: N/A \square After Drilling: N/A

Drilling Contractor: WDC Drilling Drilling Method: Air Rotary Casing Hammer Logged By: Patrick Ostrye

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Oepth (ft)	Sample Type	Number	Headspace PID	Lithologic Log	Material Description	U.S.C.S.	Well Diagram	Remarks
5	-				No description recorded; disturbed; dirt road.		- Concrete Seal	Hand augered.
	-				Sandy SILT (ML); light reddish brown (5YR 5/4); dry; very soft; 50% silt; 40% fine to medium sand; 10% gravel to 4mm; angular to subangular.			Began drilling @ 0915 on 2/15/11.
10		SB0001	0.0		Sandy SILT (ML); reddish brown (2.5YR 5/4); dry; firm; 50% silt; 45% fine to medium sand; 5% gravel to 4mm; subangular.		- Bentonite Seal	Blow counts (8-9.5'): Not Recorded (cable at an angle).
15	-				Sandy SILT (ML); red (2.5YR 5/6); dry; soft; low plasticity; 30% silt; 20% clay; 45% very fine to medium sand; 5% gravel to 8mm; subangular.	ML	- Top of Filter Pack - Top of 3/4" Schedule 80 PVC 0.050 Slot Screen	
20		SB0002 SB0002- MS SB0002- MSD	0.0		Silty SAND (SM); red (2.5YR 5/6); dry; dense; 60% very fine to fine sand; 40% silt.			Blow counts (18-19.5'): 26/50. Blow counts (19.5-21'): 50/Not Recorded. Blow counts (21-22.5'): Not Recorded.
25	-				Same as above (18 ft).	SM	- Bottom of Screen	Added 10' of casing @ 1045.
30		SB0003	0.0		Silty SAND (SM); yellowish red (5YR 5/6); moist; dense; 60% very fine to fine sand; 20% silt; 20% clay; low plasticity.		- Bentonite Seal	Blow counts (28-29.5'): 16/45/50.



Date Started: 2/15/2011 Date TD Reached: 2/16/2011 Date Completed: 2/18/2011

Ground Elevation AMSL (ft): 5341.9 Y Coordinate: 1473731.62 X Coordinate: 1541083.91

Borehole ID: KAFB-106108

Hole Diameter Upper (in.): 11-3/4 Hole Diameter Lower (in.): 9-5/8 Surface Completion Type: Flush mount

Groundwater Levels BGS (ft): \square At Time of Drilling: N/A \blacksquare At End of Drilling: N/A \blacksquare After Drilling: N/A

Drilling Contractor: WDC Drilling Drilling Method: Air Rotary Casing Hammer Logged By: Patrick Ostrye

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ର Depth (ft)	Sample Type	Number	Headspace PID	Lithologic Log	Material Description	U.S.C.S.	Well Diagram	Remarks
35	-				Silty SAND (SM); yellowish red (5YR 5/6); moist; dense; 60% very fine to fine sand; 20% silt; 20% clay; low plasticity. Silty SAND (SM); red (2.5YR 4/6); moist; loose; 80% fine to medum sand; 5% gravel to 4mm; 15% silt.	SM	- Bentonite Seal	Added 10' of casing @ 1110. Resumed drilling @ 1115.
40		SB0004 SB0004 SB0004			Silty SAND (SM); red (2.5YR 4/6); moist; dense; 80% fine to medium sand; 5% gravel to 4mm; 15% silt; mottled through out; calcite to 3mm; mica flakes.		- Top of Filter Pack - Top of 3/4" Schedule 80 PVC 0.050 Slot Screen	Blow counts (38-39.5'): 50/Not Recorded. Blow counts (39.5-41'): 50/Not Recorded. Blow counts (41-42.5'): Not Recorded. Added 10' of casing @ 1140.
45	-				Poorly graded SAND with Gravel (SP); yellowish red (5YR 4/6); dry; very loose; 70% fine and coarse to very coarse sand; 30% gravel to 15mm; angular to subrounded; gravel is composed of granite.			
50	7/ \I	SB0005 SB0006	0.0		Poorly graded SAND (SP); yellowish red (5YR 4/6); 95% very fine to fine sand; 5% silt.	SP	- Bottom of Screen	Blow counts (48-49.5'): 38/40/43. Added 10' of casing @ 1230.
55	-				Same as above (48 ft).		- Bentonite Seal	
60	_				Poorly graded SAND with Gravel (SP); yellowish red (5YR 4/6); dry; very loose; 70% very fine to fine sand; 30% gravel to 8mm; angular to subangular; gravel is			



Date Started: 2/15/2011 Date TD Reached: 2/16/2011 Date Completed: 2/18/2011

Ground Elevation AMSL (ft): 5341.9 Y Coordinate: 1473731.62 X Coordinate: 1541083.91

Borehole ID: KAFB-106108

Hole Diameter Upper (in.): 11-3/4 Hole Diameter Lower (in.): 9-5/8 Surface Completion Type: Flush mount

Groundwater Levels BGS (ft): \square At Time of Drilling: N/A \blacksquare At End of Drilling: N/A \blacksquare After Drilling: N/A

Drilling Contractor: WDC Drilling Drilling Method: Air Rotary Casing Hammer Logged By: Patrick Ostrye

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0 Danth (ft)	Sample Type	Number	Headspace PID	Lithologic Log	Material Description	U.S.C.S.	Well Diagram	Remarks
6	5				composed of granite.			Added 20' of casing @ 1245. Resumed drilling @ 1250.
7	-				Poorly graded SAND (SP); yellowish red (5YR 5/6); dry; loose; 95% very fine to fine sand; 5% silt.			
	5				Poorly graded SAND (SP); reddish brown (5YR 5/4); dry; loose; 95% very fine sand; 5% silt.			
					Same as above (70 ft).	SP	- Bentonite Seal	
8					Poorly graded SAND (SP); yellowish red (5YR 5/6); dry; loose; 95% medium to coarse sand; 5% silt; coarse grains are composed of granite.			Added 20' of casing @ 1255. Resumed drilling @ 1305.
8					Poorly graded SAND with Gravel (SP); light gray (5YR 7/1); dry; very loose; 85% medium to coarse sand; 15% gravel to 21mm; angular to subrounded; some sand is cemented.			
9	0							



Date Started: 2/15/2011 Date TD Reached: 2/16/2011 Date Completed: 2/18/2011

Ground Elevation AMSL (ft): 5341.9 Y Coordinate: 1473731.62 X Coordinate: 1541083.91

Borehole ID: KAFB-106108

Hole Diameter Upper (in.): 11-3/4 Hole Diameter Lower (in.): 9-5/8 Surface Completion Type: Flush mount

Groundwater Levels BGS (ft): \square At Time of Drilling: N/A \blacksquare At End of Drilling: N/A \blacksquare After Drilling: N/A

Drilling Contractor: WDC Drilling Drilling Method: Air Rotary Casing Hammer Logged By: Patrick Ostrye

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g Depth (ft)	Sample Type	Number	Headspace PID	Lithologic Log	Material Description	U.S.C.S.	Well Diagram	Remarks
	-				Poorly graded SAND (SP); light gray (5YR 7/1); dry; very loose; 100% medium to very coarse sand; some coarse sand is volcanic tuff.			
95	-				Same as above (90 ft).	SP		
<u>100</u>		SB0007 SB0007	0.0		Poorly graded SAND (SP); light gray (5YR 7/1); dry; medium dense; 100% very fine to medium sand.			Blow counts (98-99.5'): 23/28/38. Blow counts (99.5-101'): 20/26/38.
105	-				Silty SAND (SM); brown (7.5YR 4/4); moist; loose; 60% very fine to fine sand; 40% silt.		- - Bentonite Seal	
<u>110</u>	-				Same as above (103 ft).	SM		
115					Same as above (103 ft).			
120	-							

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Date Started: 2/15/2011 Date TD Reached: 2/16/2011 Date Completed: 2/18/2011

Ground Elevation AMSL (ft): 5341.9 Y Coordinate: 1473731.62 X Coordinate: 1541083.91

Borehole ID: KAFB-106108

Hole Diameter Upper (in.): 11-3/4 Hole Diameter Lower (in.): 9-5/8 Surface Completion Type: Flush mount

Groundwater Levels BGS (ft): \square At Time of Drilling: N/A \blacksquare At End of Drilling: N/A \blacksquare After Drilling: N/A

Drilling Contractor: WDC Drilling Drilling Method: Air Rotary Casing Hammer Logged By: Patrick Ostrye

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05 Depth (ft)	Sample Type	Number	Headspace PID	Lithologic Log	Material Description	U.S.C.S.	w	/ell Diagram	Remarks
	_				Silty SAND (SM); brown (7.5YR 4/4); moist; loose; 60% very fine to fine sand; 40% silt.	SM			Added 5' of casing @ 1350 and drove flush with surface. Tripped out drill pipe @ 1405.
125	-				Poorly graded SAND with Gravel (SP); light gray (5YR 7/1); dry; very loose; 85% medium to coarse sand; 15% gravel to 8mm; angular to subrounded.				Resumed drilling @ 0755 on 02/16/2011.
125					Same as above (122 ft).				
130	-				Same as above (122 ft).			- Bentonite Seal	
	-								
135	-				Same as above (122 ft).	SP			
	-							□ - Top of Filter	
140	-				Poorly graded SAND with Gravel (SP); light gray (5YR 7/1); dry; very loose; 80%			Pack - Top of 3/4" Schedule 80 PVC 0.050	Added 10' of casing @ 0805. Resumed drilling
					medium to coarse sand; 20% gravel to 30mm; angular to subrounded.			Slot Screen	@ 0830.
145					Poorly graded SAND (SP); pinkish gray (5YR 6/2); dry; very loose; 95% fine to medium sand; 5% gravel to 7mm; subangular to subrounded.				
150	1/ \	SB0008	0.0		Poorly graded SAND with Gravel (SP); pinkish gray (5YR 6/2); dry; very dense; 70% medium to very coarse sand; 30%				Blow counts (148-149.5'): 6/50. Blow counts (149.5-151'): 50/Not



Date Started: 2/15/2011 Date TD Reached: 2/16/2011 Date Completed: 2/18/2011

Ground Elevation AMSL (ft): 5341.9 Y Coordinate: 1473731.62 X Coordinate: 1541083.91

Borehole ID: KAFB-106108

Hole Diameter Upper (in.): 11-3/4 Hole Diameter Lower (in.): 9-5/8 Surface Completion Type: Flush mount

Groundwater Levels BGS (ft): \square At Time of Drilling: N/A \blacksquare At End of Drilling: N/A \square After Drilling: N/A

Drilling Contractor: WDC Drilling Drilling Method: Air Rotary Casing Hammer Logged By: Patrick Ostrye

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15 Depth (ft)	Sample Type	Numt	Headspace PID	Lithologic Log	Material Description	U.S.C.S.	Well Diagram	Remarks
15		SB0008			gravel to 15mm; angular to subrounded. Poorly graded SAND (SP); reddish brown (5YR 5/4); dry; very loose; 95% fine to medium sand; 5% gravel to 10mm; angular to subrounded.		- Bottom of Screen	Recorded. Added 10' of casing @ 0850. Resumed drilling @ 0855.
<u>16</u>	- _ _ _ _		- - - - - - - - - - - - - - - - - - -		Poorly graded SAND with Gravel (SP); light reddish brown (5YR 6/3); dry; loose; 60% medium to coarse sand; 40% gravel to 10mm; subrounded to rounded; gravel is dominantly pumice/tuff.			
16	-		-		Same as above (158 ft).	SP	- Bentonite Seal	
170)		-		Poorly graded SAND with Gravel (SP); 55% meduim to very coarse sand; 45% gravel to 12mm; subangular to subrounded.			
17	-				Same as above (170 ft).			
18	<u>ן</u>							



Date Started: 2/15/2011 Date TD Reached: 2/16/2011 Date Completed: 2/18/2011

Ground Elevation AMSL (ft): 5341.9 Y Coordinate: 1473731.62 X Coordinate: 1541083.91

Borehole ID: KAFB-106108

Hole Diameter Upper (in.): 11-3/4 Hole Diameter Lower (in.): 9-5/8 Surface Completion Type: Flush mount

Groundwater Levels BGS (ft): \square At Time of Drilling: N/A \blacksquare At End of Drilling: N/A \blacksquare After Drilling: N/A

Drilling Contractor: WDC Drilling Drilling Method: Air Rotary Casing Hammer Logged By: Patrick Ostrye

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08 Depth (ft)	Sample Type	Number	Headspace PID	Lithologic Log	Material Description	U.S.C.S.	Well Diagram	Remarks
<u>185</u>	-				Poorly graded SAND with Gravel (SP); 55% meduim to very coarse sand; 45% gravel to 12mm; subangular to subrounded. Poorly graded SAND (SP); light reddish brown (5YR 6/4); moist; very loose; 100% medium to coarse sand. Same as above (182 ft). Poorly graded SAND (SP); pinkish gray (5YR 6/2); moist; loose; 100% fine to medium sand.			
<u>195</u> 200		SB0009 SB0009	0.5		Same as above (189 ft). Poorly graded SAND with Gravel (SP); pinkish gray (5YR 6/2); 55% medium to very coarse sand; 45% gravel to 40mm; subrounded to rounded; coarse gravel is	SP	- Bentonite Seal	Blow counts (198-199.5'): 38/50. Blow counts (199.5-201'): 40/50. Blow counts (201-202.5'):
<u>205</u>		SB0009			dominantly rounded.			38/50.
210	-							

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Date Started: 2/15/2011 Date TD Reached: 2/16/2011 Date Completed: 2/18/2011

Ground Elevation AMSL (ft): 5341.9 Y Coordinate: 1473731.62 X Coordinate: 1541083.91

Borehole ID: KAFB-106108

Hole Diameter Upper (in.): 11-3/4 Hole Diameter Lower (in.): 9-5/8 Surface Completion Type: Flush mount

Groundwater Levels BGS (ft): \square At Time of Drilling: N/A \blacksquare At End of Drilling: N/A \blacksquare After Drilling: N/A

Drilling Contractor: WDC Drilling Drilling Method: Air Rotary Casing Hammer Logged By: Patrick Ostrye

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01 Depth (ft)	Sample Type	Number	Headspace PID	Lithologic Log	Material Description	U.S.C.S.	Well Diagram	Remarks
-					Poorly graded SAND with Gravel (SP); pinkish gray (5YR 6/2); moist; very loose; 80% medium to very coarse sand; 20% gravel to 22mm; subrounded to rounded.	SP		
- 215 - -	-				Silty SAND (SM); reddish brown (2.5YR 4/3); moist; loose; 60% fine to medium sand; 30% silt; 10% clay.	SM		
_ 220 _					Same as above (213 ft); 35% silt; 5% clay.			
- 	-				Poorly graded SAND (SP); pinkish gray (5YR 6/2); moist; loose; 100% fine to medium sand.		- Bentonite Seal	
- 230 - - -					Same as above (223 ft).	SP		
- 235 - - -	-				Poorly graded SAND (SP); pinkish gray (5YR 6/2); moist; loose; 100% medium to coarse sand.			
_ 240							- Top of Filter Pack	



Date Started: 2/15/2011 Date TD Reached: 2/16/2011 Date Completed: 2/18/2011

Ground Elevation AMSL (ft): 5341.9 Y Coordinate: 1473731.62 X Coordinate: 1541083.91

Borehole ID: KAFB-106108

Hole Diameter Upper (in.): 11-3/4 Hole Diameter Lower (in.): 9-5/8 Surface Completion Type: Flush mount

Groundwater Levels BGS (ft): \square At Time of Drilling: N/A \blacksquare At End of Drilling: N/A \square After Drilling: N/A

Drilling Contractor: WDC Drilling Drilling Method: Air Rotary Casing Hammer Logged By: Patrick Ostrye

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05 Depth (ft)	Sample Type	Number	Headspace PID	Lithologic Log	Material Description	U.S.C.S.	Well Diagram	Remarks
-	-				Poorly graded SAND (SP); pinkish gray (5YR 6/2); 95% medium to coarse sand; 5% clay.		- Top of 3/4" Schedule 80 PVC 0.050 Slot Screen	Added 10' of casing @ 1005. Resumed drilling @ 1010.
<u>245</u> - -	-				Poorly graded SAND (SP); pinkish gray (5YR 6/2); moist; loose; 95% medium to very coarse sand; 5% gravel to 5mm; subrounded to rounded.	SP		
<u>250</u>	X	SB0010 SB0010	4.0		Poorly graded SAND (SP); pinkish gray (5YR 6/2); moist; very dense; 100% medium to coarse sand.		- Bottom of Screen	Blow counts (248-249.5'): 38/50. Blow counts (249.5-251'): Not Recorded. Added 10' of casing @ 1130. Resumed drilling
255	-				Poorly graded SAND with Silt (SP-SM); reddish brown (5YR 5/4); moist; loose; 90% fine to medium sand; 10% silt. Same as above (252 ft).			@ 1135.
- - 260 - - -	-				Same as above (252 ft); finer.	SP- SM	- Bentonite Seal	Added 20' of casing @ 1140. Resumed drilling @ 1145.
<u>265</u> -	-				Well graded SAND with Gravel (SW); pinkish gray (5YR 6/2); dry; loose; 70% sand; 30% gravel to 15mm; angular to rounded.	sw		
270					Silty SAND (SM); reddish brown (5YR 4/4); moist; medium dense; 60% fine sand; 20% silt; 20% clay.	SM		



Date Started: 2/15/2011 Date TD Reached: 2/16/2011 Date Completed: 2/18/2011

Ground Elevation AMSL (ft): 5341.9 Y Coordinate: 1473731.62 X Coordinate: 1541083.91

Borehole ID: KAFB-106108

Hole Diameter Upper (in.): 11-3/4 Hole Diameter Lower (in.): 9-5/8 Surface Completion Type: Flush mount

Groundwater Levels BGS (ft): \square At Time of Drilling: N/A \blacksquare At End of Drilling: N/A \blacksquare After Drilling: N/A

Drilling Contractor: WDC Drilling Drilling Method: Air Rotary Casing Hammer Logged By: Patrick Ostrye

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				74100				
02 Depth (ft)	Sample Type	Number	Headspace PID	Lithologic Log	Material Description	U.S.C.S.	Well Diagram	Remarks
	-				Silty SAND (SM); reddish brown (5YR 4/4); moist; medium dense; 60% fine sand; 20% silt; 20% clay. Silty SAND (SM); moist; medium dense; 60% very fine to fine sand; 30% silt; 10% clay.	SM		
-	-				Poorly graded SAND with Silt (SP-SM); reddish brown (2.5YR 5/3); moist; loose; 90% fine to medium sand; 10% silt.			
<u>280</u> - -	-				Same as above (275 ft).	SP- SM		Added 20' of casing @ 1155.
- <u>285</u> - -	-				Same as above (275 ft).		- Bentonite Seal	
<u>290</u> - -	-				Poorly graded SAND (SP); pinkish gray (5YR 6/2); moist; loose; 90% medium to coarse sand; 10% gravel to 7mm; subangular to rounded.			
<u>295</u> -	-				Same as above (290 ft).	SP		
300	X	SB0011	0.3		Poorly graded SAND with Gravel (SP); pinkish gray (5YR 6/2); dry; dense; 70% medium to coarse sand; 30% gravel to			Blow counts (298-299.5') 38/50.



Date Started: 2/15/2011 Date TD Reached: 2/16/2011 Date Completed: 2/18/2011

Ground Elevation AMSL (ft): 5341.9 Y Coordinate: 1473731.62 X Coordinate: 1541083.91

Borehole ID: KAFB-106108

Hole Diameter Upper (in.): 11-3/4 Hole Diameter Lower (in.): 9-5/8 Surface Completion Type: Flush mount

Groundwater Levels BGS (ft): \square At Time of Drilling: N/A \blacksquare At End of Drilling: N/A \blacksquare After Drilling: N/A

Drilling Contractor: WDC Drilling Drilling Method: Air Rotary Casing Hammer Logged By: Patrick Ostrye

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		Tuniat				,		
S Depth (ft)	Sample Type	Number	Headspace PID	Lithologic Log	Material Description	U.S.C.S.	Well Diagram	Remarks
000					25mm; subangular to subrounded.	SP		Added 20' of casing @
<u>305</u>	-				Poorly graded GRAVEL with Clay and Sand (GP-GC); dry; loose; 60% gravel to 30mm; subangular to subrounded; 30% medium to coarse sand; 5% silt; 5% clay. Same as above (301 ft).	GP- GC		1230. Resumed drilling @ 1235.
<u>310</u>	_				Poorly graded SAND with Gravel (SP); dry; loose; 80% fine to coarse sand; 20% gravel to 8mm; angular to rounded. Same as above (307 ft).	SP		
315	_				Well graded SAND (SW); dry; very loose; 100% sand.	sw	- Bentonite Seal	
320	-				Poorly graded SAND (SP); light reddish brown (5YR 6/3); dry; very loose; 95% very fine to medium sand; 5% silt.	SP		
<u>325</u> 330	-				Poorly graded GRAVEL with Sand (GP); dry; loose; 70% gravel to 12mm; subrounded to rounded; 30% fine to coarse sand; well graded.	GP		



Date Started: 2/15/2011 Date TD Reached: 2/16/2011 Date Completed: 2/18/2011

Ground Elevation AMSL (ft): 5341.9 Y Coordinate: 1473731.62 X Coordinate: 1541083.91

Borehole ID: KAFB-106108

Hole Diameter Upper (in.): 11-3/4 Hole Diameter Lower (in.): 9-5/8 Surface Completion Type: Flush mount

Groundwater Levels BGS (ft): \square At Time of Drilling: N/A \blacksquare At End of Drilling: N/A \blacksquare After Drilling: N/A

Drilling Contractor: WDC Drilling Drilling Method: Air Rotary Casing Hammer Logged By: Patrick Ostrye

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CE Depth (ft) Sample Type Number Headspace	PID Lithologic Log	Material Description	U.S.C.S.	Well Diagram	Remarks
335		Well graded SAND with Silt and Gravel (SW-SM); brown (7.5YR 4/3); dry; loose; 75% sand; 15% gravel to 15mm; subrounded to rounded; 10% silt.	SW- SM	- Bentonite Seal	
		Poorly graded SAND (SP); reddish brown (5YR 5/3); moist; loose; 95% medium to coarse sand; 5% gravel to 12mm; rounded.		r - Top of Filter Pack	
<u>340</u> - - 345		Same as above (335 ft).	SP	- Top of 3/4" Schedule 80 PVC 0.050 Slot Screen	
-		Poorly graded GRAVEL (GP); dry; loose; 95% gravel to 8mm; subangular to subrounded; 5% coarse to very coarse sand.	GP		
350 		Well graded SAND with Gravel (SW); light reddish brown (5YR 6/3); 85% sand; 15% gravel to 10mm; angular to rounded.	sw	- Bottom of Screen	Blow counts (348-349.5'): 50/Not Recorded. Added 10' of casing @ 1345. Resumed drilling @ 1350.
355		Poorly graded SAND with Gravel (SP); reddish gray (5YR 5/2); dry; loose; 85% medium to very coarse sand; 15% gravel to 18mm; subrounded to rounded.	SP	- Bentonite Seal	



Date Started: 2/15/2011 Date TD Reached: 2/16/2011 Date Completed: 2/18/2011

Ground Elevation AMSL (ft): 5341.9 Y Coordinate: 1473731.62 X Coordinate: 1541083.91

Borehole ID: KAFB-106108

Hole Diameter Upper (in.): 11-3/4 Hole Diameter Lower (in.): 9-5/8 Surface Completion Type: Flush mount

Groundwater Levels BGS (ft): \square At Time of Drilling: N/A \blacksquare At End of Drilling: N/A \blacksquare After Drilling: N/A

Drilling Contractor: WDC Drilling Drilling Method: Air Rotary Casing Hammer Logged By: Patrick Ostrye

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90 Depth (ft)	Sample Type	Number	Headspace PID	Lithologic Log	Material Description	U.S.C.S.	Well Diagram	Remarks
					Poorly graded SAND (SP); reddish gray (5YR 5/2); dry; loose; 90% medium to very coarse sand; 10% gravel to 20mm; angular to subrounded.	SP		Added 20' of casing @ 1355. Resumed drilling @ 1400.
365	-				Well graded SAND with Gravel (SW); brown (7.5YR 4/4); dry; very loose; 85% sand; 15% gravel to 10mm; subangular to rounded.			
370 - - -	-				Well graded SAND with Gravel (SW); brown (7.5YR 4/4); moist; loose; 60% sand; 40% gravel to 10mm; subangular to rounded.	SW		
375 - -					Poorly graded SAND with Gravel (SP); brown (7.5YR 4/4); moist; very loose; 70% medium to coarse sand; 30% gravel to 7mm; subrounded to rounded.		- Bentonite Seal	
380					Poorly graded SAND (SP); brown (7.5YR 5/4); moist; very loose; 100% fine sand.	SP		
- <u>385</u> - -					Well graded SAND (SW); light brown (7.5YR 6/3); dry; loose; 95% sand; 5% gravel to 4mm; subrounded to rounded.	sw		
390								



Date Started: 2/15/2011 Date TD Reached: 2/16/2011 Date Completed: 2/18/2011

Ground Elevation AMSL (ft): 5341.9 Y Coordinate: 1473731.62 X Coordinate: 1541083.91

Borehole ID: KAFB-106108

Hole Diameter Upper (in.): 11-3/4 Hole Diameter Lower (in.): 9-5/8 Surface Completion Type: Flush mount

Groundwater Levels BGS (ft): \square At Time of Drilling: N/A \blacksquare At End of Drilling: N/A \blacksquare After Drilling: N/A

Drilling Contractor: WDC Drilling Drilling Method: Air Rotary Casing Hammer Logged By: Patrick Ostrye

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06 Depth (ft)	Sample Type	Number	Headspace PID	Lithologic Log	Material Description	U.S.C.S.	We	ell Diagram	Remarks
-					Poorly graded SAND (SP); light reddish brown (5YR 6/3); dry; loose; 95% fine to medium sand; 5% gravel to 3mm; subrounded.				
<u>395</u> - -					Poorly graded SAND (SP); light reddish brown (5YR 6/3); moist; loose; 100% fine to coarse sand.				
- _ 400		SB0013 SB0013	0.0		Poorly graded SAND (SP); light reddish brown (5YR 6/3); moist; dense; 100% medium to coarse sand.				Blow counts (398-399.5'): 6/27/50. Blow counts (399.5-401'): 11/14/50. Added 20' of casing @ 1440.
- - <u>405</u> - -	-				Same as above (398 ft).	SP		- Bentonite Seal	
- <u>+10</u> - -					Poorly graded SAND (SP); light reddish brown (5YR 6/3); moist; loose; 97% medium to coarse sand; 3% gravel to 15mm; subrounded to rounded.				
415 - -					Well graded SAND (SW); light reddish brown (5YR 6/4); moist; loose; 95% sand; 5% gravel to 3mm; subangular.	sw			
420									



Date Started: 2/15/2011 Date TD Reached: 2/16/2011 Date Completed: 2/18/2011

Ground Elevation AMSL (ft): 5341.9 Y Coordinate: 1473731.62 X Coordinate: 1541083.91

Borehole ID: KAFB-106108

Hole Diameter Upper (in.): 11-3/4 Hole Diameter Lower (in.): 9-5/8 Surface Completion Type: Flush mount

Groundwater Levels BGS (ft): \square At Time of Drilling: N/A \blacksquare At End of Drilling: N/A \blacksquare After Drilling: N/A

Drilling Contractor: WDC Drilling Drilling Method: Air Rotary Casing Hammer Logged By: Patrick Ostrye

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05 Depth (ft)	Sample Type	Number	Headspace PID	Lithologic Log	Material Description	U.S.C.S.	We	ell Diagram	Remarks
	_				Poorly graded SAND (SP); reddish brown (5YR 5/4); moist; loose; 100% fine to coarse sand.	SP			Resumed drilling @ 1500.
425	_				Silty SAND with Gravel (SM); light reddish brown (5YR 4/4); moist; loose; 50% fine to medium sand; 30% gravel to 30mm; rounded; 20% silt.			- Bentonite Seal	
430	-				Silty SAND (SM); light reddish brown (5YR 4/4); moist; loose; 79% very fine to medium sand; 1% gravel to 40mm; rounded; 20% silt; some obsidian (30-40mm).	SM			
435	-				Poorly graded SAND (SP); reddish brown (5YR 4/3); moist; loose; 100% very fine to medium sand.			- Top of Filter Pack	
440	-				Same as above (435 ft).	SP		- Top of 3" Schedule 80 PVC 0.050 Slot Screen	
445	_				Silty SAND (SM); light reddish brown (5YR 4/4); moist; medium dense; 70% fine to medium sand; 30% silt.	SM			
450	7/ \I	SB0014	0.0		Poorly graded SAND with Gravel (SP); reddish brown (5YR 4/3); moist; dense; 75% fine to coarse sand; 20% gravel to	SP			Blow counts (448-449.5'): 16/50. Blow counts (449.5-451'): Not



Date Started: 2/15/2011 Date TD Reached: 2/16/2011 Date Completed: 2/18/2011

Ground Elevation AMSL (ft): 5341.9 Y Coordinate: 1473731.62 X Coordinate: 1541083.91

Borehole ID: KAFB-106108

Hole Diameter Upper (in.): 11-3/4 Hole Diameter Lower (in.): 9-5/8 Surface Completion Type: Flush mount

Groundwater Levels BGS (ft): \square At Time of Drilling: N/A \blacksquare At End of Drilling: N/A \blacksquare After Drilling: N/A

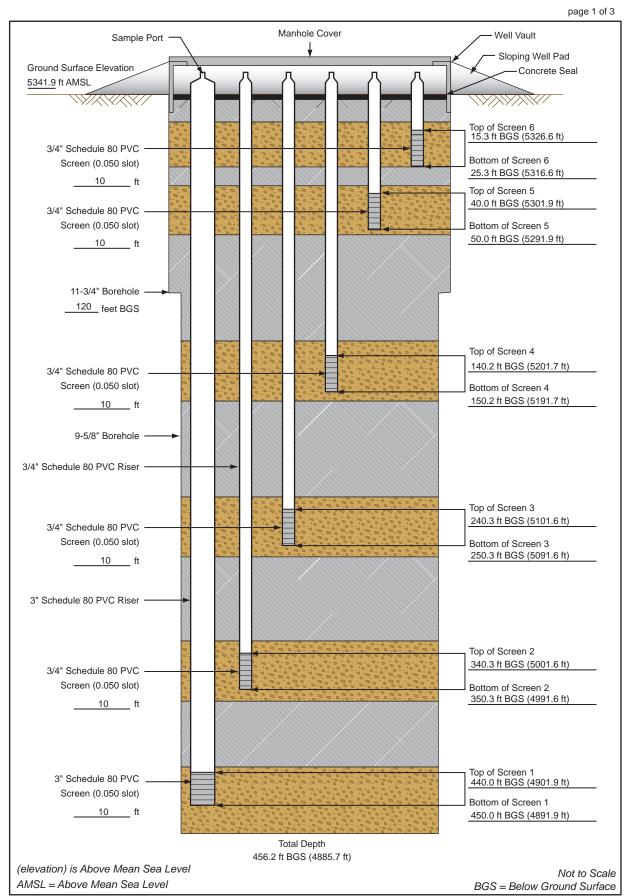
Drilling Contractor: WDC Drilling Drilling Method: Air Rotary Casing Hammer Logged By: Patrick Ostrye

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	A Coordinate: 1541083.91 Logged By. Patrick Ostrye									
5 Depth (ft)	Sample Type	Number	_	Lithologic Log		U.S.C.S.	Well Diagram	Remarks		
	X	SB0014			15mm; subrounded to rounded; 5% silt.	SP	Bottom of Screen	Recorded.		
455					Well graded SAND with Gravel (SW); reddish brown (5YR 5/3); moist; medium dense; 85% sand; 15% gravel to 4mm; subangular to rounded. Same as above (452 ft).	sw	- Native Backfill			
460	-			<u>• • • •</u>				Total depth = 458 ft. Reached @ 1600 on 02/16/11.		
	-							Water added during drilling (gallons) = 0		
465	-							Water added during construction (gallons) = Not Recorded		
470	-									
	-									
475	-									
480	-									

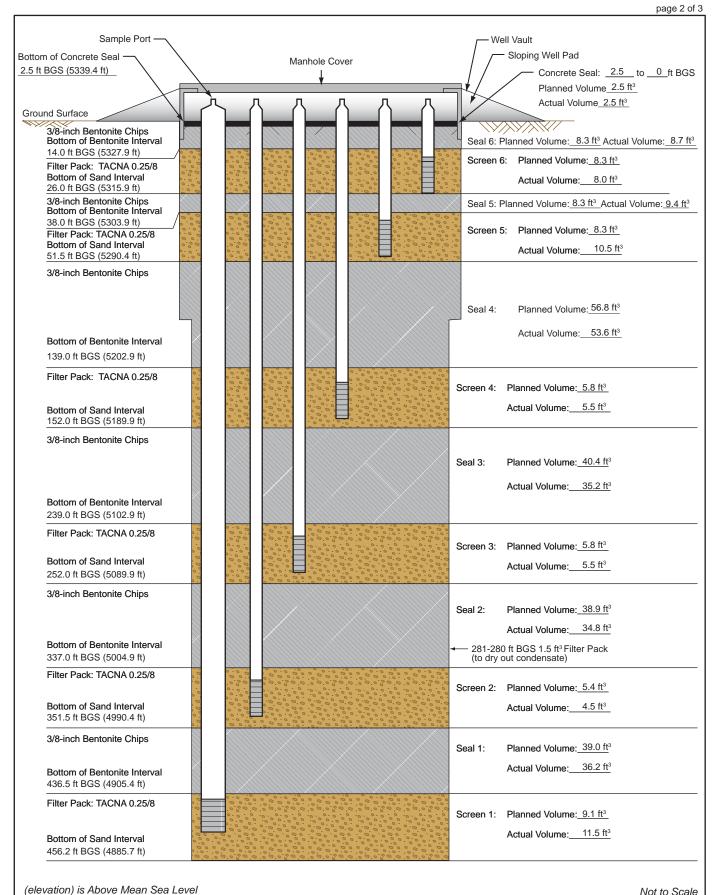
Nested Soil Vapor Well Completion Diagram for KAFB-106108

Installation Start Date/Time: 2/17/2011 @ 10:40 Installation End Date/Time: 2/18/2011 @ 17:15



140705_CA010020_SV_KAFB.106108 (a)

Nested Soil Vapor Well Completion Diagram for KAFB-106108

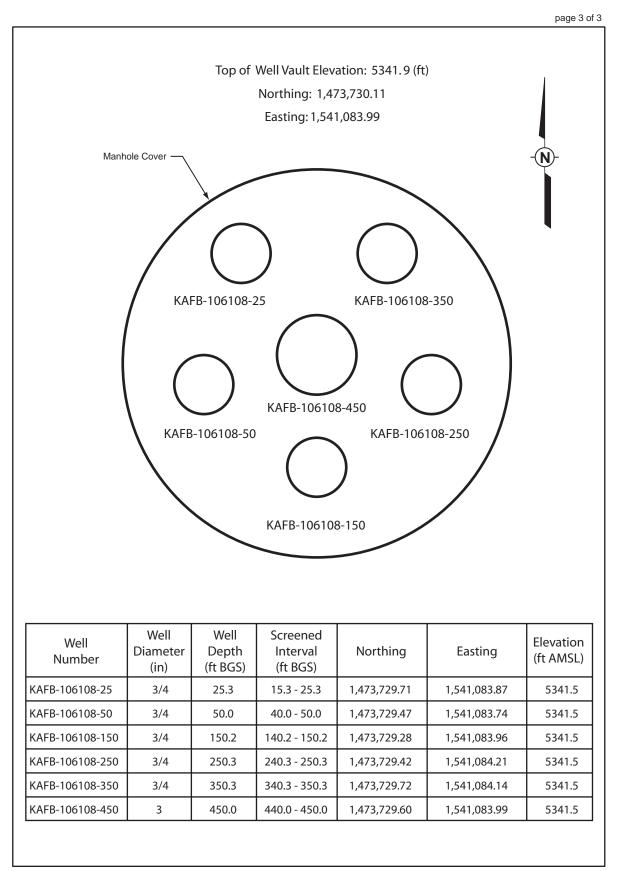


140705_CA010020_SV_KAFB.106108 (b)

All Materials Placed with Tremie Pipe

Not to Scale BGS = Below Ground Surface

Nested Soil Vapor Well Completion Diagram Map View for KAFB-106108



140705_CA010020_SV_Map View_106108

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APPENDIX D-1

KAFB-106109 Final Well Report

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Date Started: 1/21/2011 Date TD Reached: 2/4/2011 Date Completed: 2/9/2011

Ground Elevation AMSL (ft): 5338.7 Y Coordinate: 1473479.95 X Coordinate: 1540803.52

Borehole ID: KAFB-106109

Hole Diameter Upper (in.): 11-3/4 Hole Diameter Lower (in.): 9-5/8 Surface Completion Type: Flush mount

Groundwater Levels BGS (ft): \square At Time of Drilling: N/A \blacksquare At End of Drilling: N/A \blacksquare After Drilling: N/A

Drilling Contractor: WDC Drilling Drilling Method: Air Rotary Casing Hammer Logged By: Patrick Ostrye

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		Junat						
o Depth (ft)	Sample Type	Number	Headspace PID	Lithologic Log	Material Description	U.S.C.S.	Well Diagram	Remarks
5		SB0015	9.4		No description recorded; disturbed		- Bentonite Seal	Hand augered. Began drilling @ 1255 on 1/21/11. Blow counts (7-8.5'): 7/38.
15	-				Silty SAND with Gravel (SM); reddish brown (5YR 5/4); dry; loose; 60% very fine to medium sand; 15% gravel to 7mm; subrounded; 15% silt; low plasticity. Silty SAND with Gravel (SM); red (5YR 5/6); dry; loose; 55% fine to coarse sand; 15% gravel to 10mm; subrounded; 15% silt; low plasticity.	SM	- Top of Filter Pack - Top of 3/4" Schedule 80 PVC 0.050 Slot Screen	Blow counts (18.5-20'):
20 25		SB0016	5.3		Silty SAND with Gravel (SM); red (5YR 5/6); dry; loose; 70% very fine to medium sand; 15% gravel to 7mm; 15% silt; low plasticity.		- Bottom of	7/12/38.
30		SB0017	6.8		5/4); moist; loose; 80% fine to medium sand; 20% clay; low to medium plasticity.	SC	- Bentonite Seal	Blow counts (27-28.5'): Not Recorded.



Date Started: 1/21/2011 Date TD Reached: 2/4/2011 Date Completed: 2/9/2011

Ground Elevation AMSL (ft): 5338.7 Y Coordinate: 1473479.95 X Coordinate: 1540803.52

Borehole ID: KAFB-106109

Hole Diameter Upper (in.): 11-3/4 Hole Diameter Lower (in.): 9-5/8 Surface Completion Type: Flush mount

Groundwater Levels BGS (ft): \square At Time of Drilling: N/A \blacksquare At End of Drilling: N/A \blacksquare After Drilling: N/A

Drilling Contractor: WDC Drilling Drilling Method: Air Rotary Casing Hammer Logged By: Patrick Ostrye

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ల్ల Depth (ft)	Sample Type	Number	Headspace PID	Lithologic Log	Material Description	U.S.C.S.	Well Diagram	Remarks
3:	-	SB0018	12.9		Silty SAND with Gravel (SM); reddish brown (5YR 4/3); moist; loose; 70% fine to medium sand; 15% gravel to 20mm; subangular to subrounded; 15% silt; low plasticity. Silty SAND with Gravel (SM); yellowish red (5YR 5/6); moist; very loose; 80% fine to medium sand; 15% fine gravel to 4mm; angular to subangular; 15% silt; low plasticity.		- Bentonite Seal	Sand line stuck. Stopped @ 37'. Cut and repaired line. Resumed drilling @ 0915 on 01/22/11. Blow counts (37-38.5'): 12/15/30.
4() - -				Same as above (35 ft).	SM	- Top of 3/4" Schedule 80 PVC 0.050 Slot Screen	12/10/00.
4		SB0019	2.0		Silty SAND with Gravel (SM); yellowish red (5YR 5/6); moist; very loose; 60% fine to medium sand; 15% gravel to 6mm; angular to rounded; 15% silt; low plasticity. Note: coarse gravel @ 47-48'.			Blow counts (47-48.5'): 12/15/36.
5	<u>)</u> - -				Well graded SAND with Silt and Gravel (SW-SM); reddish brown (5YR 4/4); dry; very loose; 75% sand; 15% fine gravel to 8mm; angular to subrounded; 10% silt; nonplastic.	SW- SM	- Bottom of Screen	
5	_				Silty SAND (SM); strong brown (7.5YR 5/6); moist; loose; 75% fine to medium sand; 10% gravel to 7mm; angular to subrounded; 15% silt; nonplastic.	SM	- Bentonite Seal	



Date Started: 1/21/2011 Date TD Reached: 2/4/2011 Date Completed: 2/9/2011

Ground Elevation AMSL (ft): 5338.7 Y Coordinate: 1473479.95 X Coordinate: 1540803.52

Borehole ID: KAFB-106109

Hole Diameter Upper (in.): 11-3/4 Hole Diameter Lower (in.): 9-5/8 Surface Completion Type: Flush mount

Groundwater Levels BGS (ft): \square At Time of Drilling: N/A \blacksquare At End of Drilling: N/A \blacksquare After Drilling: N/A

Drilling Contractor: WDC Drilling Drilling Method: Air Rotary Casing Hammer Logged By: Patrick Ostrye

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g Depth (ft)	Sample Type	Number	Headspace PID	Lithologic Log	Material Description	U.S.C.S.	Well Diagram	Remarks	
65	-				Silty SAND (SM); light brown (7.5YR 6/4); moist; very loose; 75% fine to medium sand; 10% gravel; angular to subangular; 15% silt; low plasticity. Silty SAND (SM); reddish brown (5YR 5/4); moist; loose; 80% fine to medium sand; 5% gravel to 40mm; subrounded; 15% silt; low plasticity.	SM			
70	-				Clayey SAND (SC); reddish brown (5YR 4/4); moist; loose; 60% fine to medium sand; 40% clay; low to medium plasticity. Silty SAND (SM); light reddish brown (5YR 6/4); moist; loose; 60% very fine to	SC			
75					fine sand; 5% gravel; 35% silt; low plasticity. Same as above (70 ft).	SM	- Bentonite Seal		
80	-				Silty SAND (SM); yellowish red (5YR 5/6); moist; loose; 70% fine to medium sand; 30% silt; low plasticity. Poorly graded SAND (SP); light reddish brown (5YR 6/4); moist; very loose; 95% medium to coarse sand; 5% fines.				
85 90	-				Same as above (82 ft).	SP			



Date Started: 1/21/2011 Date TD Reached: 2/4/2011 Date Completed: 2/9/2011

Ground Elevation AMSL (ft): 5338.7 Y Coordinate: 1473479.95 X Coordinate: 1540803.52

Borehole ID: KAFB-106109

Hole Diameter Upper (in.): 11-3/4 Hole Diameter Lower (in.): 9-5/8 Surface Completion Type: Flush mount

Groundwater Levels BGS (ft): \square At Time of Drilling: N/A \blacksquare At End of Drilling: N/A \blacksquare After Drilling: N/A

Drilling Contractor: WDC Drilling Drilling Method: Air Rotary Casing Hammer Logged By: Patrick Ostrye

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g Depth (ft)	Sample Type	Number	Headspace PID	Lithologic Log	Material Description	U.S.C.S.	Well Diagram	Remarks
					Poorly graded SAND (SP); light reddish brown (5YR 6/4); moist; very loose; 95% medium to coarse sand; 5% fines. Silty SAND (SM); reddish brown (5YR 5/4); moist; loose; 60% fine to medium sand; 10% gravel; 30% silt; low	SP 		
95		SB0020	1.0		plasticity. Same as above (92 ft); 70% fine to medium sand; 30% silt.	SM		Blow counts (97-98.5'): 12/12/31.
<u>100</u>	-				Silty SAND (SM); brown (7.5YR 5/4); moist; very loose; 60% very fine to fine sand; 40% silt; low plasticity. No cuttings returned.			Sand line eyelet came off. Stopped drilling. Resumed drilling @ 1130. Cyclone plugged with silt @ 1145. Stopped drilling. Resumed drilling @ 1310.
<u>105</u>	-				No cuttings returned.		- Bentonite S	No soil classification due to large chunks of silt
<u>110</u>	-				No cuttings returned.			
115	-				Lean CLAY with Sand (CL); brown			Visually clean soil from cyclone.
	-				(7.5YR 5/4); moist; loose; medium plasticity; 85% clay; 15% very fine sand. Poorly graded SAND (SP); brown (7.5YR 5/4); moist; very loose; 95% fine to medium sand; 5% fines.	CL SP		
120								

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Date Started: 1/21/2011 Date TD Reached: 2/4/2011 Date Completed: 2/9/2011

Ground Elevation AMSL (ft): 5338.7 Y Coordinate: 1473479.95 X Coordinate: 1540803.52

Borehole ID: KAFB-106109

Hole Diameter Upper (in.): 11-3/4 Hole Diameter Lower (in.): 9-5/8 Surface Completion Type: Flush mount

Groundwater Levels BGS (ft): \square At Time of Drilling: N/A \blacksquare At End of Drilling: N/A \blacksquare After Drilling: N/A

Drilling Contractor: WDC Drilling Drilling Method: Air Rotary Casing Hammer Logged By: Patrick Ostrye

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15 Depth (ft)	Sample Type	Number	Headspace PID	Lithologic Log	Material Description	U.S.C.S.	Wel	l Diagram	Remarks
125	-				Poorly graded SAND (SP); brown (7.5YR 5/4); moist; very loose; 95% fine to medium sand; 5% fines. Poorly graded SAND with Gravel (SP); reddish brown (5YR 5/4); moist; very loose; 85% medium to coarse sand; 15% gravel to 11mm; subangular to subrounded; 5% fines.			- Bentonite Seal	Resumed drilling @ 0845 on 1/23/11.
130	-				Same as above (122 ft).				
135	-				Same as above (122 ft); 15% gravel to 10mm; subangular to subrounded.	SP			
<u>140</u>	-				Poorly graded SAND wth Gravel (SP); moist; very loose; 80% medium to coarse sand; 20% gravel to 9mm; subangular to subrounded; 5% fines.			- Top of Filter Pack - Top of 3/4" Schedule 80 PVC 0.050 Slot Screen	
145	-				Same as above (138 ft); 70% sand; 30% gravel.				
150		SB0021	0.0		Clayey SAND with Gravel (SC); brown (7.5YR 5/4); moist; medium dense; 60% medium to coarse sand; 15% gravel; subangular to subrounded; 15% clay; /	SC SP			Blow counts (147-148.5'): 12/12/31.



Date Started: 1/21/2011 Date TD Reached: 2/4/2011 Date Completed: 2/9/2011

Ground Elevation AMSL (ft): 5338.7 Y Coordinate: 1473479.95 X Coordinate: 1540803.52

Borehole ID: KAFB-106109

Hole Diameter Upper (in.): 11-3/4 Hole Diameter Lower (in.): 9-5/8 Surface Completion Type: Flush mount

Groundwater Levels BGS (ft): \square At Time of Drilling: N/A \blacksquare At End of Drilling: N/A \blacksquare After Drilling: N/A

Drilling Contractor: WDC Drilling Drilling Method: Air Rotary Casing Hammer Logged By: Patrick Ostrye

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05 Depth (ft)	Sample Type	Number	Headspace PID	Lithologic Log	Material Description	U.S.C.S.	Well Diagram	Remarks
- - - - - - -	-				Volume of the second se		Bottom of Screen	
- 160 - -	-				Poorly graded SAND (SP); light brown (7.5YR 6/4); moist; very loose; 95% fine to medium sand; 5% fines.	SP		
- <u>165</u> - -	-				Same as above (160 ft).		- Bentonite Seal	
- 170 - -	-				Well graded SAND with Gravel (SW); reddish gray (5YR 5/2); dry; very loose; 75% sand; 20% gravel to 20mm; subangular to rounded; 5% fines.			
175 - -					Well graded SAND (SW); reddish gray (5YR 5/2); moist; very loose; 90% sand; 10% fine gravel; angular to subrounded.	sw		
180								

	1	
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21	12	W

Date Started: 1/21/2011 Date TD Reached: 2/4/2011 Date Completed: 2/9/2011

Ground Elevation AMSL (ft): 5338.7 Y Coordinate: 1473479.95 X Coordinate: 1540803.52

Borehole ID: KAFB-106109

Hole Diameter Upper (in.): 11-3/4 Hole Diameter Lower (in.): 9-5/8 Surface Completion Type: Flush mount

Groundwater Levels BGS (ft): \square At Time of Drilling: N/A \blacksquare At End of Drilling: N/A \blacksquare After Drilling: N/A

Drilling Contractor: WDC Drilling Drilling Method: Air Rotary Casing Hammer Logged By: Patrick Ostrye

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	orumat							
8 Depth (ft) Sample Type	Number	Headspace PID	Lithologic Log	Material Description	U.S.C.S.	Well Diagram	Remarks	
-				Well graded SAND with Gravel (SW); reddish gray (5YR 5/2); moist; very loose; 70% sand; 30% gravel to 12mm; subangular to subrounded; 5% fines.	SW			
185				Poorly graded SAND (SP); reddish brown (5YR 5/3); 95% medium to coarse sand; 5% gravel to 5mm; 5% fines.	SP			
- - - 190				Well graded SAND with Gravel (SW); light brown (7.5YR 6/3); moist; very loose; 85% sand; 15% gravel; subrounded to rounded; 5% fines; clasts of volcanic tuff.	sw			
-				Poorly graded SAND with Gravel (SP); brown (10YR 5/3); moist; very loose; 70% medium to coarse sand; 30% gravel to 20mm; subangular to rounded; 5% fines.				
95				Poorly graded SAND (SP); light brown (2.5YR 6/4); moist; very loose; 95% medium to coarse sand; 5% fines.	SP	- Bentonite Seal		
-2	SB0022	6.1	-				Blow counts (197-198.5 5/30/refusal.	
200	SB0023	6.1		Silty SAND (SM); brown (7.5YR 5/4); moist; very loose; 85% very fine to			Blow counts (198.5-200 Not Recorded. Blow	
-2	SB0023			medium sand; 15% silt; low to medium plasticity.	SM		counts (200-201.5'): No Recorded.	
205				Clayey SAND (SC); reddish brown (5YR 5/4); moist; loose; 75% very fine to fine sand; 25% clay; low plasticity.	sc			
				Silty SAND (SM); reddish brown (5YR 5/3); 80% sand; 20% silt.	SM			



Borehole ID: KAFB-106109

Client:US Army Corps of EngineersHole Diameter Upper (in.):11-3/4Project Location:KAFB, Albuquerque, NMHole Diameter Lower (in.):9-5/8Project Name:KAFB BFF SWMU ST-106 and SS-111Surface Completion Type:Flush mount

Groundwater Levels BGS (ft): \square At Time of Drilling: N/A \blacksquare At End of Drilling: N/A \blacksquare After Drilling: N/A

Drilling Contractor: WDC Drilling Drilling Method: Air Rotary Casing Hammer Logged By: Patrick Ostrye

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X Coordina	te: 154080	03.52 Logged	Logged By: Patrick Ostrye			
017 Depth (ft) Sample Type Number	Headspace PID Lithologic Log	Material Description	U.S.C.S.	Well Diagram	Remarks	
-		Silty SAND (SM); reddish brown (5YR 5/3); 80% sand; 20% silt.	SM			
215		Well graded SAND with Gravel (SW); reddish brown (5YR 5/4); moist; very loose; 85% sand; 15% gravel to 6mm; rounded; 5% fines.	sw			
-		Well graded GRAVEL with Sand (GW); pinkish gray (7.5YR 6/2); moist; very loose; 70% gravel to 15mm; subangular to well rounded; 30% medium to coarse sand; 5% fines.	GW	- Bentonite Seal		
225		Poorly graded SAND (SP); light brown (7.5YR 6/3); moist; very loose; 90% medium to coarse sand; 10% gravel to 11mm.	SP	Dentonite Sea		
230		Well graded SAND (SW); pinkish gray (5YR 6/2); moist; very loose; 95% sand; 5% gravel.	sw			
		Same as above (230 ft).				
240		(5YR 6/3); moist; loose; 50% very fine to fine sand; 50% clay; medium plasticity.	SC	Pack		

Y Coordinate: 1473479.95 X Coordinate: 1540803.52

Project Number: 140705

Date Started: 1/21/2011

Date TD Reached: 2/4/2011 Date Completed: 2/9/2011

Ground Elevation AMSL (ft): 5338.7



Date Started: 1/21/2011 Date TD Reached: 2/4/2011 Date Completed: 2/9/2011

Ground Elevation AMSL (ft): 5338.7 Y Coordinate: 1473479.95 X Coordinate: 1540803.52

Borehole ID: KAFB-106109

Hole Diameter Upper (in.): 11-3/4 Hole Diameter Lower (in.): 9-5/8 Surface Completion Type: Flush mount

Groundwater Levels BGS (ft): \square At Time of Drilling: N/A \blacksquare At End of Drilling: N/A \blacksquare After Drilling: N/A

Drilling Contractor: WDC Drilling Drilling Method: Air Rotary Casing Hammer Logged By: Patrick Ostrye

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7.00	pordinat	e. 104	1000		ed By: Patrick Ostrye				
00 Depth (ft)	Sample Type Number	Headspace PID	Log	Material Description	U.S.C.S.	We	ell Diagram	Remarks	
-				Poorly graded SAND (SP); pinkish gray (7.5YR 7/2); moist; very loose; 85% fine sand; 15% fines.	SP		- Top of 3/4" Schedule 80 PVC 0.050 Slot Screen		
245	X SB0024	2.4		Same as above (240 ft); medium to coarse sand. Well graded SAND with Gravel (SW); light brown (7.5YR 6/3); moist; very	SW			Blow counts (247-248.5') 7/23/42. Description from	
250 - - -				13mm; subrounded to rounded; 10% fines. Silty SAND (SM); reddish brown (5YR 5/3); moist; firm; 75% very fine to fine sand; 25% silt; low plasticity. Poorly graded SAND (SP); light reddish brown (5YR 6/3); moist; very loose; 95% fine to medium sand; 5% fines.	SM		- Bottom of Screen	split spoon sample.	
255				Same as above (250 ft).			- Bentonite Seal		
260				Poorly graded SAND with Gravel (SP); reddish brown (5YR 5/4); moist; very loose; 80% medium to coarse sand; 15% fine gravel; angular to rounded.	SP		- Dentonite Sea		
_ 265 _ _ _ _				Same as above (258 ft).			- Native Backfill		

Sh	aw

Date Started: 1/21/2011 Date TD Reached: 2/4/2011 Date Completed: 2/9/2011

Ground Elevation AMSL (ft): 5338.7 Y Coordinate: 1473479.95 X Coordinate: 1540803.52

Borehole ID: KAFB-106109

Hole Diameter Upper (in.): 11-3/4 Hole Diameter Lower (in.): 9-5/8 Surface Completion Type: Flush mount

Groundwater Levels BGS (ft): \square At Time of Drilling: N/A \blacksquare At End of Drilling: N/A \blacksquare After Drilling: N/A

Drilling Contractor: WDC Drilling Drilling Method: Air Rotary Casing Hammer Logged By: Patrick Ostrye

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^	Logged By: Patrick Ostrye								
22 Depth (ft)		Number	Headspace PID	Lithologic Log	Material Description	U.S.C.S.	Well Diagram	Remarks	
27	-				Poorly graded SAND with Gravel (SP); reddish brown (5YR 5/4); moist; very loose; 80% medium to coarse sand; 15% fine gravel; angular to rounded.	SP			
	-				Poorly graded GRAVEL with Sand (GP); reddish brown (5YR 5/3); moist; very loose; 60% gravel to 10mm; subrounded to rounded; 40% medium to coarse sand.	GP	A Contraction of the sector of		
280	0				Well graded SAND with Gravel (SW); reddish brown (5YR 5/4); dry; very loose; 70% sand; 30% gravel to 13mm.	SW	- Filter Pack		
28	5				Poorly graded SAND (SP); reddish brown (5YR 5/4); moist; very loose; 95% fine to coarse sand; 5% gravel.	SP			
<u>29(</u>	- - - - 0 -				Well graded SAND with Gravel (SW); reddish brown (5YR 5/4); dry; very loose; 70% sand; 30% gravel to 25mm.	sw	- - Bentonite Seal		
29	5				Poorly graded SAND (SP); light brown (5YR 6/3); moist; very loose; 90% fine to coarse sand; 10% gravel to 25mm.	SP			
300		SB0025 SB0025			Poorly graded SAND (SP); brown (5YR 4/4); moist; very loose; 95% medium to coarse sand.			Blow counts (297-298.5'): 17/48/refusal. Blow counts (298.5-300'): Not Recorded.	



Project Number: 140705

Date Started: 1/21/2011

Date TD Reached: 2/4/2011 Date Completed: 2/9/2011

Y Coordinate: 1473479.95

Ground Elevation AMSL (ft): 5338.7

Project Name: KAFB BFF SWMU ST-106 and SS-111

Borehole ID: KAFB-106109

Hole Diameter Upper (in.): 11-3/4 Hole Diameter Lower (in.): 9-5/8 Surface Completion Type: Flush mount

Groundwater Levels BGS (ft): \bigtriangledown At Time of Drilling: N/A At End of Drilling: N/A ▼ After Drilling: N/A

Drilling Contractor: WDC Drilling Drilling Method: Air Rotary Casing Hammer Logged By: Patrick Ostrve

		rdinat		54080		ed By: Patrick Ostrye Page 11		
00 Depth (ft)	Sample Type	Number	Headspace PID	Lithologic Log	Material Description	U.S.C.S.	Well Diagram	Remarks
-	-				Poorly graded SAND with Gravel (SP); light brown (5YR 5/3); dry; very loose; 70% medium to coarse sand; 30% gravel to 7mm; subangular to rounded.			
<u>305</u> -	-				Same as above (300 ft).			
- 310 -	-				Poorly graded SAND with Gravel (SP); light brown (5YR 5/3); dry; very loose; 85% medium to coarse sand; 15% gravel to 30mm; subrounded to rounded			
- 315 -	-				Same as above (308 ft).	SP	- Bentonite Seal	
- - 320 - -	-				Poorly graded SAND (SP); light reddish brown (5YR 6/3); dry; very loose; 95% fine to medium sand; 5% gravel. Same as above (317 ft).			
325 					Poorly graded SAND with Gravel (SP); reddish brown (5YR 5/4); moist; very loose; 60% medium to coarse sand; 40% gravel to 10mm; subrounded to rounded.			

S	l					Borehole ID: KAFB-106109				
Pro Pro	ojeo ojeo	t Loca	ition: e: K	KA AFB	os of Engineers FB, Albuquerque, NM BFF SWMU ST-106 and SS-111 705	Hole Diameter Upper (in.): 11-3/4 Hole Diameter Lower (in.): 9-5/8 Surface Completion Type: Flush mount				
Da Da	te S te T	Started	: 1/2 acheo	21/20 d: 2/-	11 4/2011	∑ At⊺ ▼ At E	Time of End of	Levels E f Drilling Drilling: ng: N/A	N/A	
YO	Coo	ordinate	e: 14	17347			Metho	d: Air F	VDC Drilling Rotary Casing H Ostrye	ammer Page 12 of 16
65 Depth (ft)							U.S.C.S.	We	ell Diagram	Remarks
335	-				Poorly graded SAND with Gravel reddish brown (5YR 5/4); moist; v loose; 60% medium to coarse sa 40% gravel to 10mm; subrounde rounded. Poorly graded SAND with Gravel reddish brown (5YR 5/4); dry; ver 60% medium to very coarse sand gravel to 30mm; subangular to subrounded. Poorly graded SAND with Gravel reddish brown (5YR 4/3); 80% m to very coarse sand; 20% gravel 8mm; subrounded to rounded. No cuttings returned.	very nd; d to (SP); ry loose; d; 40% (SP); edium ₂ -	SP		- Bentonite Seal - Top of Filter Pack - Top of 3/4" Schedule 80 PVC 0.050 Slot Screen	No recovery. Blockage in drill system.
350	\mathbb{H}	SB0026 SB0026	0.0		Well graded SAND with Gravel (light reddish brown (5YR 6/3); dr loose; 80% sand; 20% gravel to Well graded GRAVEL with Sand dry; very loose; 70% gravel to 15 angular to subrounded; 30% med very coarse sand.	y; very 9mm. (GW); mm;	SW		- Bottom of Screen	Blow counts (347-348.5'): 7/12/23. Blow counts (348.5-350'): Not Recorded.
360	-				Poorly graded SAND (SP); pinkis (7.5YR 6/2); dry; very loose; 95% medium sand; 5% fines.		SP			



Date Started: 1/21/2011 Date TD Reached: 2/4/2011 Date Completed: 2/9/2011

Ground Elevation AMSL (ft): 5338.7 Y Coordinate: 1473479.95 X Coordinate: 1540803.52

Borehole ID: KAFB-106109

Hole Diameter Upper (in.): 11-3/4 Hole Diameter Lower (in.): 9-5/8 Surface Completion Type: Flush mount

Groundwater Levels BGS (ft): \Box At Time of Drilling: N/A \mathbf{I} At End of Drilling: N/A \mathbf{I} After Drilling: N/A

Drilling Contractor: WDC Drilling Drilling Method: Air Rotary Casing Hammer Logged By: Patrick Ostrye

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				54000		- ,	attick Ostrye	
95 Depth (ft)	Sample Type	Number	Headspace PID	Lithologic Log	Material Description	U.S.C.S.	Well Diagram	Remarks
-	_				Poorly graded SAND (SP); pinkish gray (7.5YR 6/2); dry; very loose; 95% fine to medium sand; 5% fines.			Resumed drilling @ 0820 on 1/24/11.
<u>365</u>					Poorly graded SAND (SP); moist; loose; no gravel.			"Stop Work" called by Shaw and WDC @ 0945
<u>370</u>	-				Same as above (365 ft).	SP		
<u>375</u>	-				Same as above (365 ft).		- Bentonite Seal	Samples placed in chip tray but not described. Samples placed in IDW sample bag. "Stop Work called by Shaw/WDC.
<u>380</u>	-				Well graded SAND with Gravel (SW); light reddish brown (5YR 6/3); dry; very loose; 85% sand; 15% gravel to 11mm; subangular to subrounded.	sw		Resumed drilling @ 094 on 02/04/11.
<u>385</u>					Poorly graded GRAVEL with Sand (GP); light reddish brown (5YR 6/3); dry; very loose; 70% gravel to 26mm; angular to subrounded; 30% medium to very coarse sand.	GP		
390				200				



Date Started: 1/21/2011 Date TD Reached: 2/4/2011 Date Completed: 2/9/2011

Ground Elevation AMSL (ft): 5338.7 Y Coordinate: 1473479.95 X Coordinate: 1540803.52

Borehole ID: KAFB-106109

Hole Diameter Upper (in.): 11-3/4 Hole Diameter Lower (in.): 9-5/8 Surface Completion Type: Flush mount

Groundwater Levels BGS (ft): \square At Time of Drilling: N/A \blacksquare At End of Drilling: N/A \blacksquare After Drilling: N/A

Drilling Contractor: WDC Drilling Drilling Method: Air Rotary Casing Hammer Logged By: Patrick Ostrye

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66 Depth (ft)	Sample Type	Number	Headspace PID	Lithologic Log	Material Description	U.S.C.S.	Well Diagram	Remarks
	-				Poorly graded SAND with Gravel; brown (7.5YR 5/4); dry; very loose; 85% medium to coarse sand; 15% gravel to 7mm; subangular to subrounded.			
395	-	SB0027	NR		Poorly graded SAND (SP); reddish brown (5YR 5/4); dry; very loose; 95% medium sand.			Could not obtain accurate
400	-	SB0027			Same as above (395 ft).	SP		blow counts from 397-400'. Insufficient volume for headspace measurement.
405	-				Same as above (395 ft).		- Bentonite Seal	
410	-				Well graded SAND with Gravel (SW); reddish brown (5YR 5/4); dry; very loose; 60% sand; 40% gravel to 20mm; subangular to subrounded.			
415	-				Same as above (410 ft).	SW		
420	-				Poorly graded SAND with Silt (SP-SM); light brown (7.5YR 5/4); moist; very loose; 90% very fine to fine sand; 10% silt; nonplastic.	SP- SM		



Date Started: 1/21/2011 Date TD Reached: 2/4/2011 Date Completed: 2/9/2011

Ground Elevation AMSL (ft): 5338.7 Y Coordinate: 1473479.95 X Coordinate: 1540803.52

Borehole ID: KAFB-106109

Hole Diameter Upper (in.): 11-3/4 Hole Diameter Lower (in.): 9-5/8 Surface Completion Type: Flush mount

Groundwater Levels BGS (ft): \Box At Time of Drilling: N/A \blacksquare At End of Drilling: N/A \blacksquare After Drilling: N/A

Drilling Contractor: WDC Drilling Drilling Method: Air Rotary Casing Hammer Logged By: Patrick Ostrye

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	,001	luinate	e. 10	94000	Logged By: Patrick Ostrye					
5 Depth (ft)	Sample Type	Number	Headspace PID	Lithologic Log	Material Description	U.S.C.S.	We	II Diagram	Remarks	
425					Well graded SAND (SW); reddish brown (5YR 5/4); dry; very loose; 95% sand; 5% fines.	sw				
-					Poorly graded SAND (SP); reddish brown (5YR 5/4); moist; very loose; 95% fine to medium sand.			- Bentonite Seal		
<u>430</u> - -					Same as above (425 ft); very fine to fine sand.					
<u>435</u> - -					Same as above (425 ft); fine to medium sand; 5% gravel to 11mm; subrounded.	SP		- Top of Filter Pack		
440 - -					Poorly graded SAND (SP); reddish brown (5YR 5/4); dry; very loose; 90% fine to medium sand; 10% gravel to 22mm; angular to subrounded.			- Top of 3" Schedule 80 PVC 0.050 Slot Screen		
445 - -	$\left\{ \right\}$	SB0028			Well graded SAND with Gravel (SW); light gray (7.5YR 7/1); dry; very loose; 60% very fine to coarse sand; 40% gravel to 20mm; angular to subrounded.	sw			Blow counts (447- 448.5'): could not obtain accurate count. Blow counts (448.5-450'): Not	

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Client: US Army Corps of Engineers

Ground Elevation AMSL (ft): 5338.7

Project Number: 140705

Date Started: 1/21/2011

Date TD Reached: 2/4/2011 Date Completed: 2/9/2011

Y Coordinate: 1473479.95

Project Location: KAFB, Albuquerque, NM

Project Name: KAFB BFF SWMU ST-106 and SS-111

Borehole ID: KAFB-106109

Hole Diameter Upper (in.): 11-3/4 Hole Diameter Lower (in.): 9-5/8 Surface Completion Type: Flush mount

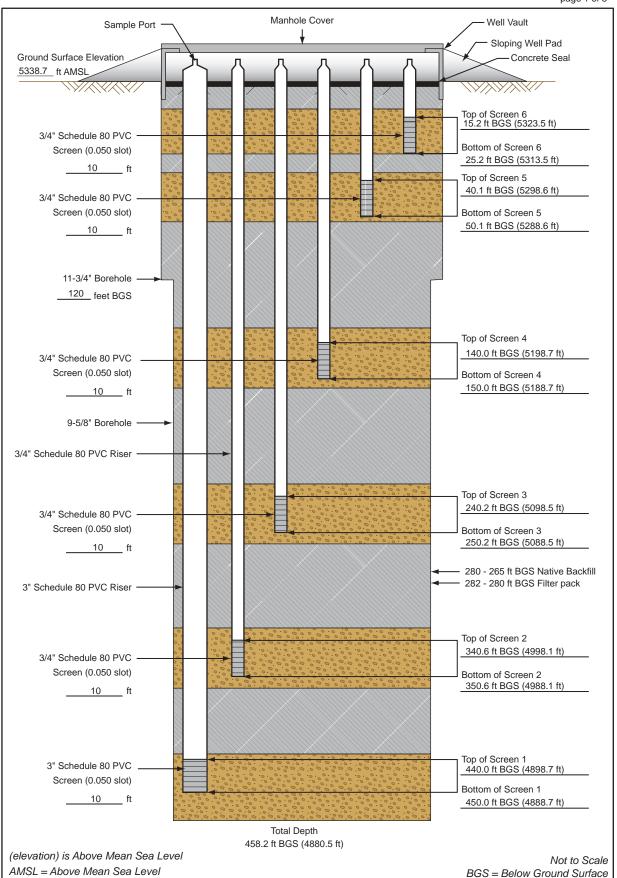
Groundwater Levels BGS (ft): ▼ After Drilling: N/A

Drilling Contractor: WDC Drilling Drilling Method: Air Rotary Casing Hammer Logged By: Patrick Ostrye

				47347 54080		Logged By: Patrick Ostrye Page 16 of 1				
05 Depth (ft	Sample Type	Number	Headspace PID	Lithologic Log	Material Description	U.S.C.S.	Well Diagram	Remarks		
					Well graded SAND with Gravel (SW); reddish brown (5YR 5/4); moist; very loose; 85% sand; 15% gravel to 16mm subangular to subrounded.	; sw	Bottom of Screen	Recorded. Insufficient volume for headspace measurement.		
455					Silty SAND (SM); reddish brown (5YR 5/3); moist; loose; 70% very fine to fine sand; 30% silt; nonplastic.	SM				
					Poorly graded SAND (SP); reddish brown (5YR 5/3); moist; very loose; 95° very fine to medium sand; 5% fines.	% SP				
460				<u></u>				Total depth = 458.2 ft. Reached @ 1630 on 2/4/11.		
								Water added during drilling (gallons) = 0		
465	-							Water added during construction (gallons) = Not Recorded		
470	-									
475										
480										

Nested Soil Vapor Well Completion Diagram for KAFB-106109

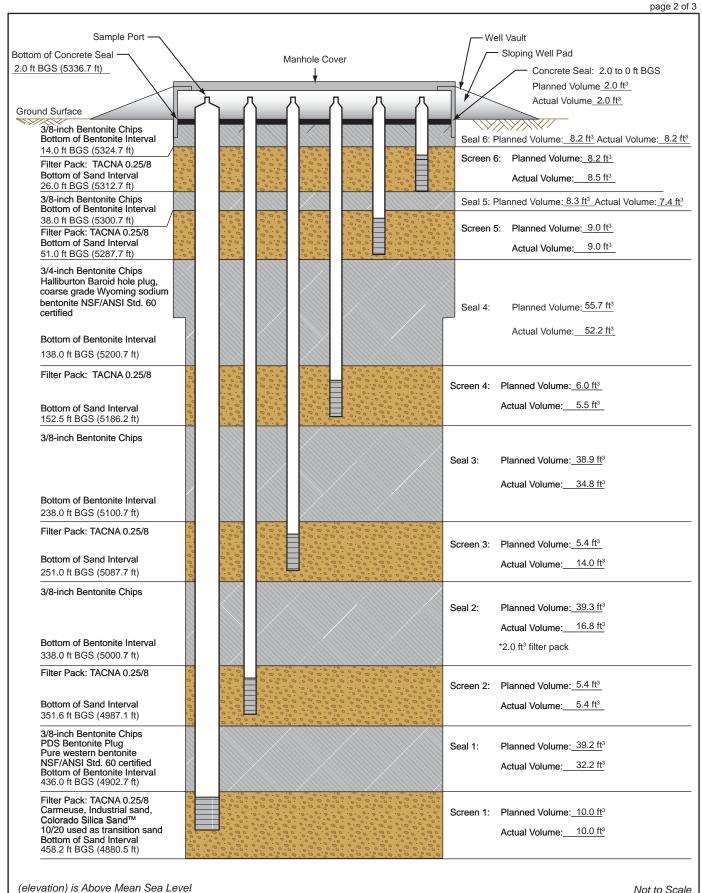
Installation Start Date/Time: <u>2/7/2011 @ 08:05</u> Installation End Date/Time: <u>2/9/2011 @ 15:00</u>



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140705_CA010020_SV_KAFB.106109 (a)

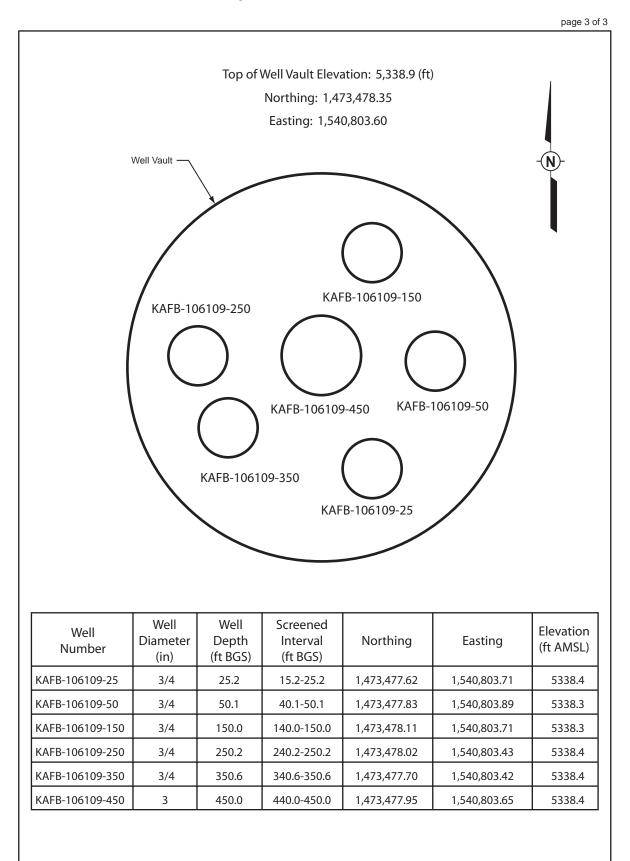
Nested Soil Vapor Well Completion Diagram for KAFB-106109



All Materials Placed with Tremie Pipe

Not to Scale BGS = Below Ground Surface

Nested Soil Vapor Well Completion Diagram Map View for KAFB-106109



140705_CA010020_SV_Map View_106109

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APPENDIX D-1

KAFB-106110 Final Well Report

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Date Started: 2/19/2011 Date TD Reached: 2/22/2011 Date Completed: 2/24/2011

Ground Elevation AMSL (ft): 5340.4 Y Coordinate: 1473285.26 X Coordinate: 1541121.79

Borehole ID: KAFB-106110

Hole Diameter Upper (in.): 11-3/4 Hole Diameter Lower (in.): 9-5/8 Surface Completion Type: Flush mount

Groundwater Levels BGS (ft): \square At Time of Drilling: N/A \blacksquare At End of Drilling: N/A \blacksquare After Drilling: N/A

Drilling Contractor: WDC Drilling Drilling Method: Air Rotary Casing Hammer Logged By: Patrick Ostrye

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Oepth (ft)	Sample Type	Number	Headspace PID	Lithologic Log	Material Description	U.S.C.S.	Well Diagram	Remarks
5	-				No description recorded; disturbed.		Concrete Seal	Hand augered.
	-				Silty SAND (SM): light reddish brown (5YR 6/4); 60% very fine to fine sand; 40% silt.			Began drilling @ 1435 on 2/19/11.
_10		SB0029	0.0		Silty SAND (SM): light reddish brown (5YR 6/4); dry; very dense; 60% very fine to fine sand; 40% silt.		- Bentonite Seal	Blow counts (8.0-9.5'): 50/Not Recorded.
15	-				Silty SAND (SM); reddish brown (2.5YR 5/4); dry; loose; 65% very fine and coarse sand; 5% gravel to 12mm; subrounded to rouded; 30% silt.	SM	- Top of Filter Pack - Top of 3/4" Schedule 80 PVC 0.050 Slot Screen	
20	-	SB0030	0.0		Silty SAND (SM); red (2.5YR 5/6); dry; very dense; 70% very fine to medium sand; 30% silt; mottling throughout.			Blow counts (18-19.5'): 50/Not Recorded.
25	-				Silty SAND (SM); reddish brown (2.5YR 5/3); dry; loose; 55% very fine to fine sand; 45% silt.		- Bottom of Screen	
30		SB0031	0.0		Silty SAND (SM); reddish brown (2.5YR 5/3); dry; very dense; 55% very fine to fine sand; 45% silt.		- Bentonite Seal	Blow counts (28-29.5'): 50/Not Recorded. Blow counts (29.5-31'): 50/Not



Date Started: 2/19/2011 Date TD Reached: 2/22/2011 Date Completed: 2/24/2011

Ground Elevation AMSL (ft): 5340.4 Y Coordinate: 1473285.26 X Coordinate: 1541121.79

Borehole ID: KAFB-106110

Hole Diameter Upper (in.): 11-3/4 Hole Diameter Lower (in.): 9-5/8 Surface Completion Type: Flush mount

Groundwater Levels BGS (ft): \square At Time of Drilling: N/A \blacksquare At End of Drilling: N/A \blacksquare After Drilling: N/A

Drilling Contractor: WDC Drilling Drilling Method: Air Rotary Casing Hammer Logged By: Patrick Ostrye

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S Depth (ft)	1.72	Number	Headspace PID	Lithologic Log	Material Description	U.S.C.S.	Well	Diagram	Remarks	
		SB0031 SB0032	0.0		Silty SAND (SM); reddish brown (2.5YR 5/3); dry; very dense; 55% very fine to fine sand; 45% silt.	SM		Bentonite Seal	Recorded. Blow counts (31-32.5'): 50/Not Recorded. End of 2/19/11. Resumed drilling @ 0810 on 2/20/11.	
35	5				Silty SAND (SM); red (2.5YR 5/6); dry; loose; 50% very fine to fine sand; 5% gravel to 8mm; subangular to subrounded; 45% silt.					
40		SB0033 SB0033	0.0		Silty GRAVEL with Sand (GM): red (2.5YR 5/6); dry; very dense; 40% gravel to 15mm; angular to subrounded; 40% very fine to fine and coarse sand; 20% silt; gravel is coated with caliche.	GM		Top of Filter Pack Top of 3/4" Schedule 80 PVC 0.050 Slot Screen	Blow counts (38-39.5'): 50/Not Recorded. Blow counts (39.5-41'): 50/Not Recorded. Blow counts (41-42.5'): Not Recorded.	
45		SB0033			Silty SAND (SM); red (2.5YR 5/6); dry; loose; 40% very fine to fine sand; 10% very coarse sand; 5% gravel to 8mm; rounded; 45% silt.					
50		SB0034 SB0034	0.0		Same as above (42 ft). Silty SAND (SM); reddish brown (5YR 5/4); dry; very dense; 55% very fine to fine sand; 45% silt.	SM	1 IF IF IF IF I	Bottom of Screen	Blow counts (48-49.5'): 50/Not Recorded. Blow counts (49.5-51'): 50/Not Recorded. New 10' connection @ 0920. Resumed drilling @ 0925.	
55	-				Silty SAND (SM); reddish brown (5YR 5/4); dry; loose; 55% very fine to fine sand; 45% silt.		- F	Bentonite Seal	e 0020.	
60)									



Date Started: 2/19/2011 Date TD Reached: 2/22/2011 Date Completed: 2/24/2011

Ground Elevation AMSL (ft): 5340.4 Y Coordinate: 1473285.26 X Coordinate: 1541121.79

Borehole ID: KAFB-106110

Hole Diameter Upper (in.): 11-3/4 Hole Diameter Lower (in.): 9-5/8 Surface Completion Type: Flush mount

Groundwater Levels BGS (ft): \square At Time of Drilling: N/A \blacksquare At End of Drilling: N/A \blacksquare After Drilling: N/A

Drilling Contractor: WDC Drilling Drilling Method: Air Rotary Casing Hammer Logged By: Patrick Ostrye

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@ Depth (ft)	Sample Type	Number	Headspace PID	Lithologic Log	Material Description	U.S.C.S.	Well Diagram	Remarks
	_				Silty SAND (SM); reddish brown (5YR 4/4); dry; loose; 55% very fine to fine sand; 45% silt.			New 10' connection @ 0930. Resumed drilling @ 0950.
6	5				Silty SAND (SM); reddish brown (5YR 4/4); dry; loose; 52% very fine to fine sand; 3% gravel to 10mm; subrounded to rounded; 45% silt.			New 20' connection @ 0955.
70	<u>)</u> - -				Silty SAND (SM); reddish brown (5YR 5/4); dry; loose; 55% very fine to fine sand; 45% silt.			
7!	5				Same as above (70 ft).	SM	- Bentonite Seal	
80	_ _ _ _				Silty SAND (SM); reddish brown (5YR 5/4); dry; loose; 70% fine to coarse sand; 30% silt.			Resumed drilling @ 1010.
8	5				Silty SAND (SM); reddish brown (5YR 5/4); dry; loose; 60% very fine to fine sand; 40% silt.			
9(ו							



Date Started: 2/19/2011 Date TD Reached: 2/22/2011 Date Completed: 2/24/2011

Ground Elevation AMSL (ft): 5340.4 Y Coordinate: 1473285.26 X Coordinate: 1541121.79

Borehole ID: KAFB-106110

Hole Diameter Upper (in.): 11-3/4 Hole Diameter Lower (in.): 9-5/8 Surface Completion Type: Flush mount

Groundwater Levels BGS (ft): \square At Time of Drilling: N/A \blacksquare At End of Drilling: N/A \blacksquare After Drilling: N/A

Drilling Contractor: WDC Drilling Drilling Method: Air Rotary Casing Hammer Logged By: Patrick Ostrye

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ଞ Depth (ft)	Sample Type	Number Number Headspace PID Lithologic			Material Description	U.S.C.S.	Well Diagram	Remarks
-					Silty SAND (SM); light reddish brown (5YR 6/3); dry; loose; 60% very fine to fine sand; 10% coarse sand; 30% silt.	SM		
95					Poorly graded SAND with Silt (SP-SM); pinkish gray (5YR 7/2); dry; loose; 85% medium to very coarse sand; 5% gravel to 12mm; angular to subrounded; 10% silt.	SP-		
- 100 -		SB0035, SB0035- <u>MS</u> / SB0035- MSD			Poorly graded SAND with Silt (SP-SM); pinkish gray (5YR 7/2); dry; dense; 85% medium to very coarse sand; 5% gravel to 10mm; angular to subrounded; 10% silt; some mottling.	SM		Blow counts (98-99.5'): 38/49/50. Blow counts (99.5-101'): 40/50. New 20' connection @ 1110. Resumed drilling @ 1120.
- 105 -					Silty SAND (SM); reddish brown (5YR 5/4); moist; loose; 55% very fine sand; 45% silt. Same as above (102 ft).		- Bentonite Seal	
- - 110 - - -					Same as above (102 ft).	SM		
<u>115</u> - -					Silty SAND (SM); reddish brown (5YR 4/4); moist; loose; 70% fine to medium sand; 30% silt.			
120								



Date Started: 2/19/2011 Date TD Reached: 2/22/2011 Date Completed: 2/24/2011

Ground Elevation AMSL (ft): 5340.4 Y Coordinate: 1473285.26 X Coordinate: 1541121.79

Borehole ID: KAFB-106110

Hole Diameter Upper (in.): 11-3/4 Hole Diameter Lower (in.): 9-5/8 Surface Completion Type: Flush mount

Groundwater Levels BGS (ft): \square At Time of Drilling: N/A \blacksquare At End of Drilling: N/A \blacksquare After Drilling: N/A

Drilling Contractor: WDC Drilling Drilling Method: Air Rotary Casing Hammer Logged By: Patrick Ostrye

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05 Depth (ft)	Sample Type	Number	Headspace PID	Lithologic Log	Material Description	U.S.C.S.	w	ell Diagram	Remarks
-	-				Clayey SAND (SC); yellowish red (5YR 4/6); moist; loose; 50% very fine to medium sand; 40% clay; 10% silt.	SC			New 20' connection @ 1135. Prepared for 9 5/8" casing. Resumed drilling @ 1545.
125	-				No cuttings returned.				9 5/8" casing fell through strata too fast.
-	-							- Bentonite Seal	
<u>130</u> - - 135	-				Poory graded SAND with Gravel (SP); light reddish brown (2.5YR 6/3); dry; very loose; 80% very fine to coarse sand; 20% gravel to 30mm; angular to rounded.	SP			
-	-				No cuttings returned.				9 5/8" casing fell through strata too fast.
-								- Top of Filter Pack	
140					Silty SAND (SM); yellowish red (5YR 4/6); moist; loose; 70% fine to medium sand; 30% silt.	SM		- Top of 3/4" Schedule 80 PVC 0.050 Slot Screen	
- - 145 - -	-				Poorly graded SAND with Silt (SP-SM); pinkish gray (5YR 7/2); moist; very loose; 85% fine to coarse sand; 5% gravel to 20mm; subangular to subrounded; 10% silt.	SP- SM			
- 150		SB0036	0.0		Silty SAND with Gravel (SM); yellowish red (5YR 4/6); dry; very dense; 65% fine to coarse sand; 15% gravel to 10mm;	SM			Blow counts (148-149.5'): 100/75.



Date Started: 2/19/2011 Date TD Reached: 2/22/2011 Date Completed: 2/24/2011

Ground Elevation AMSL (ft): 5340.4 Y Coordinate: 1473285.26 X Coordinate: 1541121.79

Borehole ID: KAFB-106110

Hole Diameter Upper (in.): 11-3/4 Hole Diameter Lower (in.): 9-5/8 Surface Completion Type: Flush mount

Groundwater Levels BGS (ft): ☑ At Time of Drilling: N/A ▼ At End of Drilling: N/A ▼ After Drilling: N/A

Drilling Contractor: WDC Drilling Drilling Method: Air Rotary Casing Hammer Logged By: Patrick Ostrye

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15 Depth (ft)		Number	Headspace PID	Lithologic Log	Material Description	U.S.C.S.	Well Diagram	Remarks
	-				subangular to subrounded; 20% silt.	SM	Bottom of Screen	New 10' connection @ 1625. Resumed drilling @ 1635.
15	5				Poorly graded SAND (SP); dry; loose; 100% medium to very coarse sand.	SP		
1.64					Poorly graded SAND with Silt (SP-SM); dry; loose; 90% fine to medium sand; 10% silt.	·		
160	-				Same as above (156 ft).	SP- SM		New 20' connection @ 1635. Resumed drilling @ 1655.
16	5				Same as above (156 ft).		- Bentonite Seal	
17()				Well graded SAND with Silt and Gravel (SW-SM); pinkish gray (5YR 6/2); dry; loose; 70% sand; 20% gravel to 7mm; subangular to subrounded; 10% silt.	SW- SM		
<u>17</u> !	5				Poorly graded SAND (SP); yellowish red (5YR 5/6); 95% fine to medium sand; 5% silt.	SP		
180	5							End of 2/20/11.



Date Started: 2/19/2011 Date TD Reached: 2/22/2011 Date Completed: 2/24/2011

Ground Elevation AMSL (ft): 5340.4 Y Coordinate: 1473285.26 X Coordinate: 1541121.79

Borehole ID: KAFB-106110

Hole Diameter Upper (in.): 11-3/4 Hole Diameter Lower (in.): 9-5/8 Surface Completion Type: Flush mount

Groundwater Levels BGS (ft): \square At Time of Drilling: N/A \blacksquare At End of Drilling: N/A \square After Drilling: N/A

Drilling Contractor: WDC Drilling Drilling Method: Air Rotary Casing Hammer Logged By: Patrick Ostrye

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08 Depth (ft)	Sample Type	Number	Headspace PID	Lithologic Log		Ś		
-		ŀ	He	Litho	Material Description	U.S.C.	Well Diagram	Remarks
185					Well graded SAND with Silt and Gravel (SW-SM); pinkish gray (7.5YR 6/2); dry; loose; 75% sand; 15% gravel to 15mm; subangular to rounded; 10% silt.	SW- SM		Resumed drilling @ 0800 on 2/21/11.
					Poorly graded SAND (SP); pinkish gray (5YR 6/2); moist; very loose; 95% medium to coarse sand; 5% gravel to 10mm; subangular to rounded.	SP		
-					Poorly graded SAND with Silt (SP-SM); light reddish brown (5YR 6/3); moist; very loose; 90% very fine to medium sand; 10% silt; trace 1mm pumice.			
195	X SB	30037	0.3		Poorly graded SAND with Silt (SP-SM); light reddish brown (5YR 6/3); moist; very loose; 90% very fine to fine sand; 10% silt; trace 2-3mm pumice. Poorly graded SAND with Silt (SP-SM); light reddish brown (5YR 6/3); moist;	SP- SM	- Bentonite Seal	Blow counts (198-199.5'): 35/50.
200					dense; 90% very fine to fine sand; 10% silt; trace 2-3mm pumice.			New 20' connection @ 0820. Resumed drilling @ 0840.
205					Poorly graded SAND (SP); light reddish brown (5YR 6/3); moist; very loose; 90% fine to coarse sand; 10% gravel to 13mm; subangular to rounded.	SP		



Client: US Army Corps of Engineers

Ground Elevation AMSL (ft): 5340.4

Project Number: 140705

Date Started: 2/19/2011

Date TD Reached: 2/22/2011 Date Completed: 2/24/2011

Y Coordinate: 1473285.26

Project Location: KAFB, Albuquerque, NM

Project Name: KAFB BFF SWMU ST-106 and SS-111

Borehole ID: KAFB-106110

Hole Diameter Upper (in.): 11-3/4 Hole Diameter Lower (in.): 9-5/8 Surface Completion Type: Flush mount

Groundwater Levels BGS (ft): \square At Time of Drilling: N/A \blacksquare At End of Drilling: N/A \blacksquare After Drilling: N/A

Drilling Contractor: WDC Drilling Drilling Method: Air Rotary Casing Hammer Logged By: Patrick Ostrye

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01 Depth (ft)	Sample Type	Number	Headspace PID	Lithologic Log	Material Description			Vell Diagram	Remarks
	-				Poorly graded SAND with Gravel (SP) pinkish gray (5YR 7/2); moist; very loose; 70% medium to coarse sand; 30% gravel to 5mm; subrounded to rounded.);			
215	-				Poorly graded SAND (SP); light reddis brown (5YR 6/4); moist; very loose; 100% medium to fine sand.	sh			
220	-				Poorly graded SAND (SP); light reddis brown (5YR 6/4); moist; very loose; 100% fine to very coarse sand.	sh		- Bentonite Seal	
225	-				Same as above (220 ft).	SI	þ		
230	-				Same as above (220 ft); fine to coarse sand.	9			
<u>235</u> 240					Poorly graded SAND with Gravel (SP) reddish brown (5YR 5/3); moist; very loose; 85% very fine to medium sand; 15% gravel to 33mm; subrounded to rounded.			- Top of Filter Pack	



Date Started: 2/19/2011 Date TD Reached: 2/22/2011 Date Completed: 2/24/2011

Ground Elevation AMSL (ft): 5340.4 Y Coordinate: 1473285.26 X Coordinate: 1541121.79

Borehole ID: KAFB-106110

Hole Diameter Upper (in.): 11-3/4 Hole Diameter Lower (in.): 9-5/8 Surface Completion Type: Flush mount

Groundwater Levels BGS (ft): \square At Time of Drilling: N/A \blacksquare At End of Drilling: N/A \blacksquare After Drilling: N/A

Drilling Contractor: WDC Drilling Drilling Method: Air Rotary Casing Hammer Logged By: Patrick Ostrye

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05 Depth (ft)	Sample Type	Number	Headspace PID	Lithologic Log	Material Description	U.S.C.S.	We	ell Diagram	Remarks
	-				Poorly graded SAND (SP); light reddish brown (5YR 6/4); moist; very loose; 100% fine to coarse sand.			Schedule 80 PVC 0.050 Slot Screen	New 10' connection @ 0905. Resumed drilling @ 0915.
245	-				Same as above (240 ft).				
<u>250</u>		SB0038	0.0		Poorly graded SAND (SP); light reddish brown (5YR 6/4); moist; dense; 100% very fine to medium sand; coarse fraction is quatrz and pumice.	SP		- Bottom of Screen	Blow counts (248-249.5'): 15/35/50. Stopped drilling @ 1045. Top hammer seal stuck to drill pipe. End of 2/21/11. Resumed drilling @ 0840 on 2/22/11.
<u>255</u>					Poorly graded SAND (SP); light reddish brown (5YR 6/3); moist; loose; 95% very fine to medium sand; 5% coarse sand.				
260) - -				Same as above (255 ft).			- Bentonite Seal	New 20' connection @ 0850. Resumed drilling @ 0900.
<u>265</u> 270	-				Clayey SAND (SC); brown (7.5YR 5/4); moist; loose; 50% fine to medium sand; 30% clay; 20% silt; nonplastic.	sc			



Date Started: 2/19/2011 Date TD Reached: 2/22/2011 Date Completed: 2/24/2011

Ground Elevation AMSL (ft): 5340.4 Y Coordinate: 1473285.26 X Coordinate: 1541121.79

Borehole ID: KAFB-106110

Hole Diameter Upper (in.): 11-3/4 Hole Diameter Lower (in.): 9-5/8 Surface Completion Type: Flush mount

Groundwater Levels BGS (ft): \square At Time of Drilling: N/A \blacksquare At End of Drilling: N/A \blacksquare After Drilling: N/A

Drilling Contractor: WDC Drilling Drilling Method: Air Rotary Casing Hammer Logged By: Patrick Ostrye

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02 Depth (ft)	Sample Type	Number	Headspace PID	Lithologic Log	Material Description	U.S.C.S.	Well Diagram	Remarks
	-				Silty SAND (SM); strong brown (7.5YR 4/6); moist; loose; 80% fine to medium sand; 20% silt.	SM		
-	-				Poorly graded SAND with Gravel (SP); light reddish brown (5YR 6/3); moist; loose; 70% fine to coarse sand; 30% gravel to 8mm; subangular to subrounded.			
<u>280</u> - -	-				Poorly graded SAND with Gravel (SP); light reddish brown (5YR 6/3); moist; loose; 85% fine to medium sand; 15% gravel to 4mm; subrounded to rounded.	SP		
<u>285</u> - - -	-				Poorly graded GRAVEL with Sand (GP); moist; very loose; 70% gravel to 35mm; subangular to subrounded; 30% fine to coarse sand.	GP	- Bentonite Seal	
<u>290</u> - - -	-				Poorly graded SAND with Gravel (SP); pinkish gray (7.5YR 6/2); moist; very loose; 60% medium to coarse sand; 40% gravel to 15mm.	SP		
<u>295</u> - -	-				Well graded SAND with Gravel (SW); pinkish gray (7.5YR 6/2); moist; very loose; 85% sand; 15% gravel to 7mm; subangular to rounded.	sw		
300	X	SB0039	0.0		Poorly graded SAND with Gravel (SP); dry; dense; 70% fine to coarse sand; 30% gravel to 40mm; subangular to	SP		Blow counts (298-299.5') 50/25. Blow counts (299.5-301'): 50/31.



Date Started: 2/19/2011 Date TD Reached: 2/22/2011 Date Completed: 2/24/2011

Ground Elevation AMSL (ft): 5340.4 Y Coordinate: 1473285.26 X Coordinate: 1541121.79

Borehole ID: KAFB-106110

Hole Diameter Upper (in.): 11-3/4 Hole Diameter Lower (in.): 9-5/8 Surface Completion Type: Flush mount

Groundwater Levels BGS (ft): \square At Time of Drilling: N/A \blacksquare At End of Drilling: N/A \blacksquare After Drilling: N/A

Drilling Contractor: WDC Drilling Drilling Method: Air Rotary Casing Hammer Logged By: Patrick Ostrye

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g Depth (ft)	Sample Type	Number	Headspace PID	Lithologic Log	Material Description	U.S.C.S.	Well Diagram	Remarks
305		SB0039			rounded.	SP		New 20' connection @ 0945.
310	-				Poorly graded GRAVEL with Sand (GP); reddish brown (5YR 5/4); moist; medium dense; 55% gravel to 35mm; subangular to rounded; 40% medium to coarse sand; 5% silt.	GP		
315	-				Poorly graded SAND with Gravel (SP); reddish brown (5YR 5/4); moist; medium dense; 60% medium to very coarse sand; 40% gravel to 15mm; subangular to rounded.	SP		
320	-				Poorly graded GRAVEL with Sand (GP); reddish brown (5YR 5/4); moist; medium dense; 70% gravel to 35mm; subrounded to rounded; 30% medium to coarse sand.	GP	- Bentonite Seal	
-	-				Poorly graded SAND (SP); reddish brown (5YR 5/4); moist; loose; 95% medium to coarse sand; 5% gravel to 15mm; subrounded to rounded.	SP		Resumed drilling @ 1015.
325	-				Well graded SAND with Gravel (SW); reddish brown (5YR 5/4); dry; loose; 80% sand; 20% gravel to 10mm; subangular to rounded.	SW		



Date Started: 2/19/2011 Date TD Reached: 2/22/2011 Date Completed: 2/24/2011

Ground Elevation AMSL (ft): 5340.4 Y Coordinate: 1473285.26 X Coordinate: 1541121.79

Borehole ID: KAFB-106110

Hole Diameter Upper (in.): 11-3/4 Hole Diameter Lower (in.): 9-5/8 Surface Completion Type: Flush mount

Groundwater Levels BGS (ft): \square At Time of Drilling: N/A \blacksquare At End of Drilling: N/A \blacksquare After Drilling: N/A

Drilling Contractor: WDC Drilling Drilling Method: Air Rotary Casing Hammer Logged By: Patrick Ostrye

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65 Depth (ft)	Sample Type	Number	Headspace PID	Lithologic Log	Material Description	U.S.C.S.	We	ell Diagram	Remarks
335	-				Silty SAND (SM); brown (7.5YR 5/4); moist; medium dense; 60% medium to coarse sand; 30% silt; 10% clay; nonplastic.	SM		- Bentonite Seal	
	-				Poorly graded SAND with Silt (SP-SM); reddish yellow (7.5YR 6/6); moist; loose; 90% very fine to medium sand; 10% silt.	SP- SM		- Top of Filter Pack	
-	-				Poorly graded SAND with Gravel (SP); reddish brown (5YR 5/4); moist; loose; 85% fine to coarse sand; 15% gravel to 5mm; angular to subrounded.	SP		- Top of 3/4" Schedule 80 PVC 0.050 Slot Screen	
345	-				Poorly graded SAND with Gravel (SP); reddish brown (5YR 5/4); dry; loose; 60% medium to very coarse sand; 40% gravel to 20mm; subrounded to rounded.				
350		SB0040 SB0040			Poorly graded GRAVEL with Sand (GP); dry; medium dense; 85% gravel to 40mm; subrounded to rounded; 15% coarse to very coarse sand.			- Bottom of Screen	Blow counts (348-349.5'): 15/30/50. Blow counts (349.5-351'): Not Recorded. New 10' connection @ 1115.
- 355 - - -	-				Poorly graded GRAVEL with Sand (GP); dry; loose; 60% gravel to 20mm; angular to rounded; 40% medium to very coarse sand.	GP		- Bentonite Seal	



Date Started: 2/19/2011 Date TD Reached: 2/22/2011 Date Completed: 2/24/2011

Ground Elevation AMSL (ft): 5340.4 Y Coordinate: 1473285.26 X Coordinate: 1541121.79

Borehole ID: KAFB-106110

Hole Diameter Upper (in.): 11-3/4 Hole Diameter Lower (in.): 9-5/8 Surface Completion Type: Flush mount

Groundwater Levels BGS (ft): \square At Time of Drilling: N/A \blacksquare At End of Drilling: N/A \blacksquare After Drilling: N/A

Drilling Contractor: WDC Drilling Drilling Method: Air Rotary Casing Hammer Logged By: Patrick Ostrye

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0 Denth (ft)	Sample Type		Number	Headspace PID	Lithologic Log	Material Description	U.S.C.S.	Well Diagram	Remarks
	-					Poorly graded SAND with Gravel (SP); reddish brown (5YR 4/4); moist; loose; 85% fine to coarse sand; 15% gravel to 12mm; subangular to subrounded.			New 20' connection @ 1140. Resumed drilling @ 1145.
<u>36</u>	5					Poorly graded SAND (SP); light reddish brown (5YR 6/4); moist; loose; 95% medium to coarse sand; 5% gravel to 5mm; subangular to rounded.			
<u>37</u>	0					Poorly graded SAND with Gravel (SP); light reddish brown (5YR 6/4); moist; loose; 70% fine to very coarse sand; 30% gravel to 20mm; subangular to rounded.			
<u>37</u>	5					Poorly graded SAND with Gravel (SP); light reddish brown (5YR 6/3); moist; loose; 55% fine to very coarse sand; 45% gravel to 15mm; subangular to subrounded.	SP	- Bentonite Seal	
<u>38</u>	<u>0</u> - -					Poorly graded SAND (SP); light reddish brown (5YR 6/3); moist; loose; 90% medium to coarse sand; 10% gravel to 5mm; subrounded to rounded.			New 20' connection @ 1200. Resumed drilling @ 1205.
<u>38</u>	5					Poorly graded SAND (SP); light reddish brown (5YR 6/3); moist; loose; 95% fine to coarse sand; 5% gravel to 12mm; subrounded to rounded.			
39	0								



Date Started: 2/19/2011 Date TD Reached: 2/22/2011 Date Completed: 2/24/2011

Ground Elevation AMSL (ft): 5340.4 Y Coordinate: 1473285.26 X Coordinate: 1541121.79

Borehole ID: KAFB-106110

Hole Diameter Upper (in.): 11-3/4 Hole Diameter Lower (in.): 9-5/8 Surface Completion Type: Flush mount

Groundwater Levels BGS (ft): \Box At Time of Drilling: N/A \mathbf{I} At End of Drilling: N/A \mathbf{I} After Drilling: N/A

Drilling Contractor: WDC Drilling Drilling Method: Air Rotary Casing Hammer Logged By: Patrick Ostrye

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06 Depth (ft)	Sample Type	Number	Headspace PID	Lithologic Log	Material Description	U.S.C.S.	We	ell Diagram	Remarks
-	-				Well graded SAND (SW); reddish brown (5YR 3/3); moist; loose; 100% sand.				
<u>395</u> - -	-				Same as above (390 ft); increase in coarse fraction.	SW			
-	X	SB0041	0.0		Well graded SAND (SW); reddish brown (5YR 5/3); moist; dense; 100% sand.				Blow counts (398-399.5'): 50/20. Blow counts (399.5-401'): 50/30
400	X	SB0041			Same as above (398 ft).				New 20' connection @ 1235. Resumed drilling @ 1245.
- - 405	-				Poorly graded SAND (SP); reddish gray (5YR 5/2); dry; very loose; 100% very fine to fine sand.	SP		- Bentonite Seal	W 1240.
-	-				Well graded SAND (SW); reddish brown (5YR 5/3); dry; loose; 100% sand.				
<u>410</u> -	-				Same as above (406 ft).				
- 415 -	-				Well graded SAND with Gravel (SW); reddish brown (5YR 5/4); moist; medium dense; 80% sand; 20% gravel to 20mm; subangular to rounded.	SW			
420									



Date Started: 2/19/2011 Date TD Reached: 2/22/2011 Date Completed: 2/24/2011

Ground Elevation AMSL (ft): 5340.4 Y Coordinate: 1473285.26 X Coordinate: 1541121.79

Borehole ID: KAFB-106110

Hole Diameter Upper (in.): 11-3/4 Hole Diameter Lower (in.): 9-5/8 Surface Completion Type: Flush mount

Groundwater Levels BGS (ft): \square At Time of Drilling: N/A \blacksquare At End of Drilling: N/A \blacksquare After Drilling: N/A

Drilling Contractor: WDC Drilling Drilling Method: Air Rotary Casing Hammer Logged By: Patrick Ostrye

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65 Depth (ft) Sample Type	Number	Headspace PID	Lithologic Log	Material Description	U.S.C.S.	We	ell Diagram	Remarks
-				Poorly graded SAND (SP); light reddish brown (5YR 6/3); moist; loose; 100% fine to medium sand.	SP			New 20' connection @ 1250. Resumed drilling @ 1305.
425				Silty SAND (SM); reddish brown (5YR 5/4); moist; loose; 85% very fine to fine sand; 15% silt.	SM		- Bentonite Seal	
430				Silty SAND (SM); reddish brown (5YR 4/4); moist; medium dense; 55% very fine to fine sand; 30% silt; 15% clay; nonplastic.		_		
435				brown (5YR 6/3); moist; loose; 100% medium sand; trace fine sand. Same as above (432 ft).			- Top of Filter Pack	
- 440 - -				Poorly graded SAND (SP); light reddish brown (5YR 6/3); moist; medium dense; 100% fine to coarse sand.	SP		- Top of 3" Schedule 80 PVC 0.050 Slot Screen	
445				Poorly graded SAND (SP); reddish brown (5YR 5/4); moist; medium dense; 100% fine to very coarse sand.				
450	30042	0.0		Poorly graded SAND (SP); reddish brown (5YR 4/4); moist; dense; 90% medium to very coarse sand; 10% gravel				Blow counts (448-449.5) 50/20.



Date Started: 2/19/2011 Date TD Reached: 2/22/2011 Date Completed: 2/24/2011

Ground Elevation AMSL (ft): 5340.4 Y Coordinate: 1473285.26 X Coordinate: 1541121.79

Borehole ID: KAFB-106110

Hole Diameter Upper (in.): 11-3/4 Hole Diameter Lower (in.): 9-5/8 Surface Completion Type: Flush mount

Groundwater Levels BGS (ft): \square At Time of Drilling: N/A \blacksquare At End of Drilling: N/A \blacksquare After Drilling: N/A

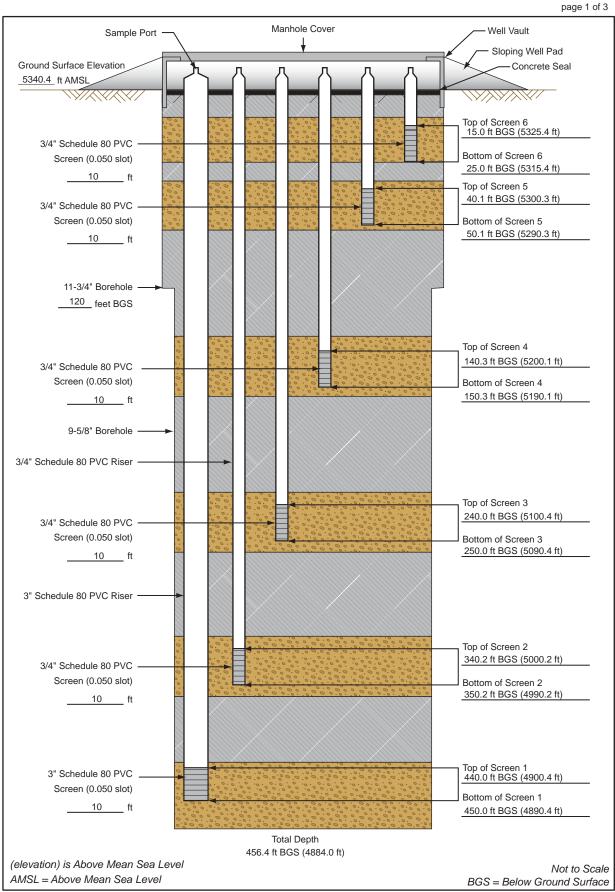
Drilling Contractor: WDC Drilling Drilling Method: Air Rotary Casing Hammer Logged By: Patrick Ostrye

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			e: 1	54112	1.79 Logged	IBy: I	Patrick Ostrye	Page 16 of 16
5 Depth (ft)	Sample Type	Number	Headspace PID	Lithologic Log	Material Description	U.S.C.S.	Well Diagram	Remarks
455	-				to 10mm; rounded. Poorly graded SAND (SP); reddish brown (5YR 4/4); moist; medium dense; 100% fine to coarse sand.	SP	Bottom of Screen	
460	-			<u></u>				Total Depth = 456.4 ft. Reached @ 1355 on 2/22/11. Water added during drilling (gallons) = 0
465	-							Water added during construction (gallons) = Not Recorded
470	-							
475								
480								

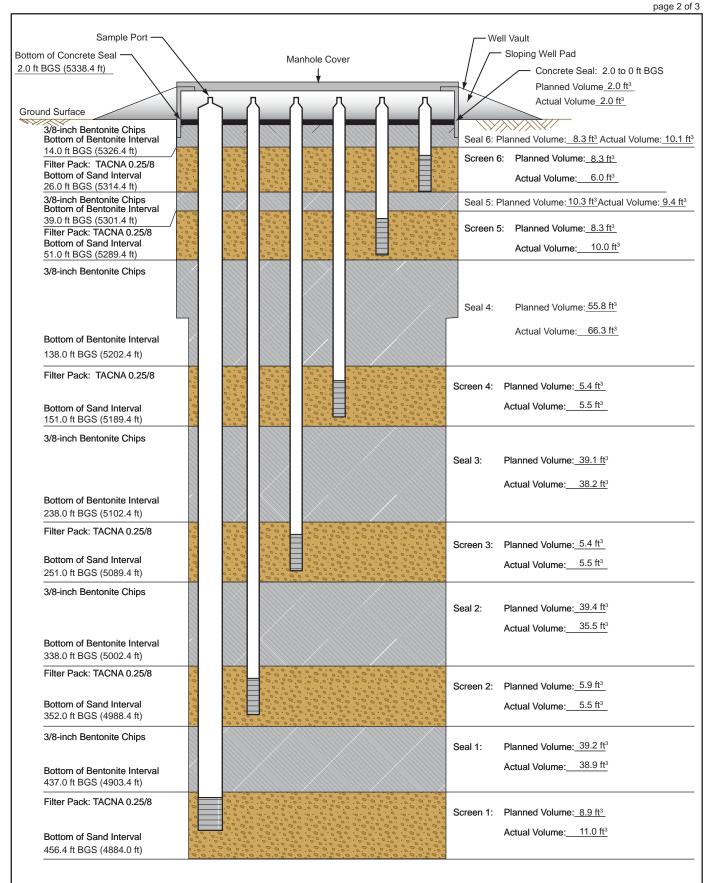
Nested Soil Vapor Well Completion Diagram for KAFB-106110

Installation Start Date/Time: 2/23/2011 @ 08:25 Installation End Date/Time: 2/24/2011 @ 14:50



140705_CA010020_SV_KAFB.106110 (a)

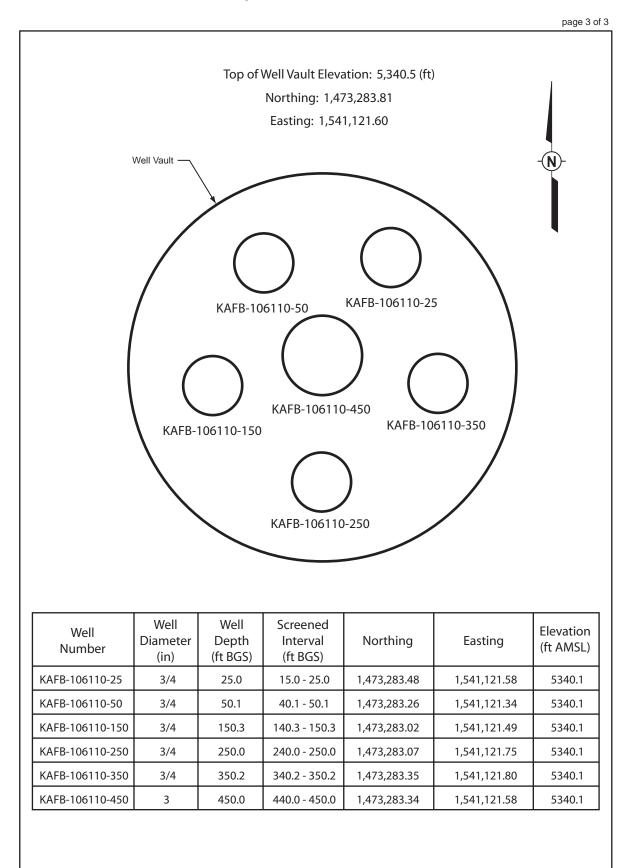
Nested Soil Vapor Well Completion Diagram for KAFB-106110



(elevation) is Above Mean Sea Level All Materials Placed with Tremie Pipe Not to Scale BGS = Below Ground Surface

140705_CA010020_SV_KAFB.106110 (b)

Nested Soil Vapor Well Completion Diagram Map View for KAFB-106110



140705_CA010020_SV_Map View_106110

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APPENDIX D-1

KAFB-106111 Final Well Report

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Date Started: 3/1/2011 Date TD Reached: 3/3/2011 Date Completed: 3/4/2011

Ground Elevation AMSL (ft): 5341.3 Y Coordinate: 1473288.69 X Coordinate: 1541336.23

Borehole ID: KAFB-106111

Hole Diameter Upper (in.): 11-3/4 Hole Diameter Lower (in.): 9-5/8 Surface Completion Type: Flush mount

Groundwater Levels BGS (ft): \square At Time of Drilling: N/A \blacksquare At End of Drilling: N/A \square After Drilling: N/A

Drilling Contractor: WDC Drilling Drilling Method: Air Rotary Casing Hammer Logged By: Patrick Ostrye

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_ Denth (ft)	Sample Type	Number	Headspace PID	Lithologic Log	Material Description	U.S.C.S.	Well Diagram Remarks
	-				No description recorded; disturbed.		Hand augered.
1		SB0043 SB0044 SB0044			Silty SAND (SM); light reddish brown (2.5YR 6/4); dry; loose; 55% very fine to fine sand; 5% very coarse sand; 10% gravel to 4mm; subrounded; 30% silt. Silty SAND (SM); reddish brown (2.5YR 4/4); dry; very dense; 55% very fine to fine sand; 5% gravel to 4mm; subrounded to rounded; 40% silt; mottling throughout. Note: small piece of wood (10mm) in split spoon sample.		 Began drilling @ 1220 o 3/1/11. Blow counts (7-8.5'): 75/Not Recorded. Blow counts (8.5-10'): 100/No Recorded. Blow counts (10-11.5'): Not Recorded
2		SB0045	0.0		Silty SAND (SM); reddish brown (2.5YR 4/4); dry; medium dense; 50% very fine to fine sand; 5% coarse sand; 45% silt. Silty SAND (SM); light reddish brown (2.5YR 7/3); dry; very dense; 55% very fine to fine sand; 5% very coarse sand; 40% silt; very mottled throughout.	SM	 Top of Filter Pack Top of 3/4" Schedule 80 PVC 0.050 Slot Screen Blow counts (17-18.5'): 100/Not Recorded. Blow counts (18.5-20'): 100/Not Recorded. Petroleum odor @ 18'.
2:		SB0046 SB0046- MS / SB0046-			Silty SAND (SM); reddish brown (2.5YR 4/3); moist; medium dense; 55% very fine to fine sand; 45% silt.		-Bentonite Seal Blow counts (27-28.5'): 50/35/20. Blow counts (28.5-30'): 50/25/15.



Date Started: 3/1/2011 Date TD Reached: 3/3/2011 Date Completed: 3/4/2011

Ground Elevation AMSL (ft): 5341.3 Y Coordinate: 1473288.69 X Coordinate: 1541336.23

Borehole ID: KAFB-106111

Hole Diameter Upper (in.): 11-3/4 Hole Diameter Lower (in.): 9-5/8 Surface Completion Type: Flush mount

Groundwater Levels BGS (ft): \square At Time of Drilling: N/A \blacksquare At End of Drilling: N/A \blacksquare After Drilling: N/A

Drilling Contractor: WDC Drilling Drilling Method: Air Rotary Casing Hammer Logged By: Patrick Ostrye

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ଞ Depth (ft)	Sample Type	Number	Headspace PID	Lithologic Log	Material Description	U.S.C.S.	w	ell Diagram	Remarks
	_				Silty SAND (SM); reddish brown (2.5YR 4/3); moist; medium dense; 55% very fine to fine sand; 45% silt.			- Bentonite Seal	New 10' connection @ 1440. Resumed drilling @ 1448.
35		SB0047	0.0		Silty SAND (SM); reddish brown (2.5YR 5/4); moist; medium dense; 55% very fine to fine sand; trace gravel; 35% silt; 10% clay; nonplastic; some mottling. Silty SAND (SM); reddish brown (2.5YR				Blow counts (37-38.5'): 20/30/50.
40					5/4); dry; medium dense; 60% very fine to fine sand; trace gravel to 4mm; rounded; 40% silt; mottling throughout.			- Top of Filter Pack - Top of 3/4" Schedule 80 PVC 0.050 Slot Screen	New 10' connection @ 1505. Resumed drilling @ 1515.
45		SB0048	0.0		Silty SAND (SM); reddish brown (2.5YR 4/4); moist; medium dense; 65% very fine to fine and coarse sand; 5% gravel to 3mm; rounded; 30% silt; mica flakes throughout. Silty SAND (SM); reddish brown (2.5YR 4/4); moist; medium dense; 70% very	SM			Blow counts (47-48.5'): 20/30/50.
50	_				fine to fine sand; trace gravel; 30% silt.			- Bottom of Screen	New 10' connection @ 1530. Resumed drilling @ 1540.
55					Silty SAND with Gravel (SM); reddish brown (2.5YR 4/3); moist; loose; 60% very fine to fine sand; 15% gravel to 15mm; subangular to subrounded; 25% silt.			-Bentonite Seal	
60									



Date Started: 3/1/2011 Date TD Reached: 3/3/2011 Date Completed: 3/4/2011

Ground Elevation AMSL (ft): 5341.3 Y Coordinate: 1473288.69 X Coordinate: 1541336.23

Borehole ID: KAFB-106111

Hole Diameter Upper (in.): 11-3/4 Hole Diameter Lower (in.): 9-5/8 Surface Completion Type: Flush mount

Groundwater Levels BGS (ft): \square At Time of Drilling: N/A \blacksquare At End of Drilling: N/A \blacksquare After Drilling: N/A

Drilling Contractor: WDC Drilling Drilling Method: Air Rotary Casing Hammer Logged By: Patrick Ostrye

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g Depth (ft)	Sample Type	Number	Headspace PID	Lithologic Log	Material Description	U.S.C.S.	Well Diagram	Remarks
	-				Silty SAND (SM); reddish brown (2.5YR 4/3); moist; loose; 60% very fine to fine sand; 40% silt.			New 20' connection @ 1545. Resumed drilling @ 1550.
65	-				Same as above (60 ft).			
70	-				Same as above (60 ft).			
75					Silty SAND (SM); reddish brown (2.5YR 5/4); moist; loose; 85% fine sand; 15% silt.	SM	- Bentonite Seal	
80	-				Silty SAND (SM); yellowish red (5YR 5/6); moist; loose; 85% very fine to fine sand; 15% silt.			New 20' connection @ 1605.
85					Silty SAND (SM); yellowish red (5YR 5/6); moist; loose; 80% fine sand; 3% gravel to 20mm; subrounded to rounded; 17% silt.			
90								

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Date Started: 3/1/2011 Date TD Reached: 3/3/2011 Date Completed: 3/4/2011

Ground Elevation AMSL (ft): 5341.3 Y Coordinate: 1473288.69 X Coordinate: 1541336.23

Borehole ID: KAFB-106111

Hole Diameter Upper (in.): 11-3/4 Hole Diameter Lower (in.): 9-5/8 Surface Completion Type: Flush mount

Groundwater Levels BGS (ft): \square At Time of Drilling: N/A \blacksquare At End of Drilling: N/A \blacksquare After Drilling: N/A

Drilling Contractor: WDC Drilling Drilling Method: Air Rotary Casing Hammer Logged By: Patrick Ostrye

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© Depth (ft)	Sample Type	Num	Headspace PID	Lithologic Log	Material Description	U.S.C.S.	Well Diagram	Remarks
95		SB0049	0.9		 Poorly graded SAND (SP); reddish brown (5YR 5/4); moist; loose; 97% fine to medium sand; 3% gravel to 15mm; subrounded to rounded. Poorly graded SAND (SP); pinkish gray (5YR 7/2); dry; loose; 100% very fine to medium sand. Poorly graded SAND (SP); pinkish gray (5YR 7/2); dry; dense; 100% very fine to medium sand. Note: split spoon contained 2" section of cemented sand. 			Blow counts (97-98.5'): 30/50. Resumed drilling @ 1645.
<u>10</u> 5	-				Poorly graded SAND (SP); pinkish gray (5YR 7/2); dry; loose; 100% very fine to medium sand. Note: fragments of cemented very fine sand and silt.	SP	- Bentonite Seal	
110)				Poorly graded SAND with Gravel (SP); moist; loose; 60% fine and coarse to very coarse sand; 40% gravel to 20mm; angular to subrounded.			
115					Poorly graded SAND (SP); moist; loose; 100% very fine to fine sand.			
120)							



Date Started: 3/1/2011 Date TD Reached: 3/3/2011 Date Completed: 3/4/2011

Ground Elevation AMSL (ft): 5341.3 Y Coordinate: 1473288.69 X Coordinate: 1541336.23

Borehole ID: KAFB-106111

Hole Diameter Upper (in.): 11-3/4 Hole Diameter Lower (in.): 9-5/8 Surface Completion Type: Flush mount

Groundwater Levels BGS (ft): \Box At Time of Drilling: N/A \mathbf{I} At End of Drilling: N/A \mathbf{I} After Drilling: N/A

Drilling Contractor: WDC Drilling Drilling Method: Air Rotary Casing Hammer Logged By: Patrick Ostrye

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55 Depth (ft)		Number	Headspace PID	Lithologic Log	Material Description	U.S.C.S.	We	ell Diagram	Remarks
	-				Silty SAND (SM); reddish brown (2.5YR 4/3); moist; loose; 60% very fine to fine sand; 40% silt.	SM			End of 3/1/11 @ 1645. Resumed drilling @ 1010 on 3/2/11, advancing with 9-5/8" casing.
125	5				Silty SAND (SM); reddish brown (5YR 5/3); moist; loose; 55% very fine to fine sand; 35% silt; 10% clay; nonplastic.	3111			
<u>130</u>) 				Poorly graded SAND (SP); reddish brown (5YR 5/4); moist; very loose; 100% medium to coarse sand.			- Bentonite Seal	
135					Poorly graded SAND (SP); light reddish brown (5YR 6/4); moist; very loose; 100% medium to very coarse sand.	SP		- Top of Filter Pack	
140	<u>)</u> - -				Poorly graded SAND with Gravel (SP); light reddish brown (5YR 6/4); moist; very loose; 85% fine to coarse sand; 15% gravel to 4mm; subrounded.			- Top of 3/4" Schedule 80 PVC 0.050 Slot Screen	New 10' connection @ 1020.
145	5				Poorly graded SAND (SP); light reddish brown (5YR 6/4); moist; very loose; 100% fine to coarse sand.				
150		SB0050 SB0050			Poorly graded SAND with Gravel (SP); pinkish gray (5YR 6/2); moist; dense; 85% medium to very coarse sand; 15%				Blow counts (147-148.5'): 50/30/20. Blow counts (148.5-150'): Not Recorded.



Date Started: 3/1/2011 Date TD Reached: 3/3/2011 Date Completed: 3/4/2011

Ground Elevation AMSL (ft): 5341.3 Y Coordinate: 1473288.69 X Coordinate: 1541336.23

Borehole ID: KAFB-106111

Hole Diameter Upper (in.): 11-3/4 Hole Diameter Lower (in.): 9-5/8 Surface Completion Type: Flush mount

Groundwater Levels BGS (ft): \square At Time of Drilling: N/A \blacksquare At End of Drilling: N/A \blacksquare After Drilling: N/A

Drilling Contractor: WDC Drilling Drilling Method: Air Rotary Casing Hammer Logged By: Patrick Ostrye

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15 Depth (ft)	Sample Type	Number	Headspace PID	Lithologic Log	Material Description	U.S.C.S.	Well Diagram	Remarks
	-				gravel to 10mm; angular to rounded. Note: split spoon contained cemented fragments to 45mm.	SP	Bottom of Screen	
155	-				Poorly graded GRAVEL with Sand (GP); moist; very loose; 70% gravel to 35mm; subrounded to rounded; 30% medium to very coarse sand.	GP		
	-				Poorly graded SAND (SP); pinkish gray (5YR 7/2); moist; very loose; 90% medium to very coarse sand; 10% gravel to 10mm; subrounded to rounded.			
160					Same as above (156 ft).			New 20' connection @ 1105.
165					Poorly graded SAND (SP); light reddish brown (5YR 6/3); moist; very loose; 95% fine to medium sand; 5% gravel to 4mm; subangular to subrounded.	SP	-Bentonite Seal	
170					Poorly graded SAND (SP); reddish brown (5YR 5/4); moist; very loose; 90% fine to coarse sand; 10% gravel to 4mm; subrounded.			
175	-				Poorly graded SAND (SP); reddish brown (5YR 5/4); moist; very loose; 90% fine to medium sand; 10% gravel to 4mm; subrounded.			
180								



Date Started: 3/1/2011 Date TD Reached: 3/3/2011 Date Completed: 3/4/2011

Ground Elevation AMSL (ft): 5341.3 Y Coordinate: 1473288.69 X Coordinate: 1541336.23

Borehole ID: KAFB-106111

Hole Diameter Upper (in.): 11-3/4 Hole Diameter Lower (in.): 9-5/8 Surface Completion Type: Flush mount

Groundwater Levels BGS (ft): \square At Time of Drilling: N/A \blacksquare At End of Drilling: N/A \blacksquare After Drilling: N/A

Drilling Contractor: WDC Drilling Drilling Method: Air Rotary Casing Hammer Logged By: Patrick Ostrye

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8 Depth (ft)	Sample Type	Number	Headspace PID	Lithologic Log	Material Description	U.S.C.S.	Well Diagram	Remarks
185	_				Poorly graded SAND with Gravel (SP); reddish brown (5YR 5/4); moist; very loose; 85% fine to medium sand; 15% gravel to 10mm; subangular to subrounded. Poorly graded SAND with Gravel (SP); reddish brown (5YR 5/4); moist; very	SP		New 20' connection @ 1120. Resumed drilling @ 1125.
190	-				loose; 80% medium to very coarse sand; 20% gravel to 10mm; subangular to rounded. No cuttings returned; casing fell too fast to collect sample.			
195		000054			Poorly graded SAND with Gravel (SP); reddish brown (5YR 5/4); moist; very loose; 60% medium to very coarse sand; 40% gravel to 7mm; subangular to	 SP	- Bentonite Seal	Blow counts (197-198.5'):
200		SB0051	0.0		Poorly graded GRAVEL with Sand (GP); moist; very dense; 60% gravel to 30mm; subrounded to rounded; 40% medium to coarse sand.	GP		50/50. New 20' connection @ 1140. Resumed drilling @ 1220.
<u>205</u> 210	-				Clayey SAND (SC); light yellowish brown (2.5YR 6/3); moist; medium dense; 80% fine to medium sand; 15% clay; 5% silt.	SC		



Date Started: 3/1/2011 Date TD Reached: 3/3/2011 Date Completed: 3/4/2011

Ground Elevation AMSL (ft): 5341.3 Y Coordinate: 1473288.69 X Coordinate: 1541336.23

Borehole ID: KAFB-106111

Hole Diameter Upper (in.): 11-3/4 Hole Diameter Lower (in.): 9-5/8 Surface Completion Type: Flush mount

Groundwater Levels BGS (ft): \square At Time of Drilling: N/A \blacksquare At End of Drilling: N/A \blacksquare After Drilling: N/A

Drilling Contractor: WDC Drilling Drilling Method: Air Rotary Casing Hammer Logged By: Patrick Ostrye

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Number	Headspace	Lithologic Log	Material Description Poorly graded SAND with Gravel (SP); yellowish brown (10YR 5/4); moist; very loose; 85% fine to coarse sand; 15% gravel to 20mm; subrounded to rounded. Poorly graded SAND with Gravel (SP); light brownish gray (10YR 6/2); moist; very loose; 70% sand; 30% gravel to 15mm; subangular.	U.S.C.S.	Well Diagram	Remarks
			yellowish brown (10YR 5/4); moist; very loose; 85% fine to coarse sand; 15% gravel to 20mm; subrounded to rounded. Poorly graded SAND with Gravel (SP); light brownish gray (10YR 6/2); moist; very loose; 70% sand; 30% gravel to			
			light brownish gray (10YR 6/2); moist; very loose; 70% sand; 30% gravel to			
			Poorly graded SAND with Gravel (SP); light brownish gray (10YR 6/2); moist; very loose; 85% fine to coarse sand; 15% gravel to 4mm; subangular to rounded; gravel is pumice.	SP	- Bentonite Se	New 20' connection @ 1225. Resumed drilling @ 1235.
			Poorly graded SAND with Gravel (SP); light brownish gray (10YR 6/2); moist; very loose; 85% fine to coarse sand; 15% gravel to 15mm; angular to subrounded; gravel is pumice.			
			Well graded SAND with Gravel (SW); light gray (7.5YR 7/1); moist; very loose; 60% sand; 40% gravel to 20mm; subangular to subrounded.			
			Well graded SAND with Gravel (SW); light brownish gray (10YR 6/2); moist; very loose; 60% sand; 40% gravel to 20mm; subangular to rounded.	SW	- Top of Filter Pack	
				light brownish gray (10YR 6/2); moist; very loose; 85% fine to coarse sand; 15% gravel to 15mm; angular to subrounded; gravel is pumice. Well graded SAND with Gravel (SW); light gray (7.5YR 7/1); moist; very loose; 60% sand; 40% gravel to 20mm; subangular to subrounded. Well graded SAND with Gravel (SW); light brownish gray (10YR 6/2); moist; very loose; 60% sand; 40% gravel to	light brownish gray (10YR 6/2); moist; very loose; 85% fine to coarse sand; 15% gravel to 15mm; angular to subrounded; gravel is pumice. Well graded SAND with Gravel (SW); light gray (7.5YR 7/1); moist; very loose; 60% sand; 40% gravel to 20mm; subangular to subrounded. Well graded SAND with Gravel (SW); light brownish gray (10YR 6/2); moist; very loose; 60% sand; 40% gravel to	light brownish gray (10YR 6/2); moist; very loose; 85% fine to coarse sand; 15% gravel to 15mm; angular to subrounded; gravel is pumice. Well graded SAND with Gravel (SW); light gray (7.5YR 7/1); moist; very loose; 60% sand; 40% gravel to 20mm; subangular to subrounded. Well graded SAND with Gravel (SW); light brownish gray (10YR 6/2); moist; very loose; 60% sand; 40% gravel to 20mm; subangular to rounded.



Date Started: 3/1/2011 Date TD Reached: 3/3/2011 Date Completed: 3/4/2011

Ground Elevation AMSL (ft): 5341.3 Y Coordinate: 1473288.69 X Coordinate: 1541336.23

Borehole ID: KAFB-106111

Hole Diameter Upper (in.): 11-3/4 Hole Diameter Lower (in.): 9-5/8 Surface Completion Type: Flush mount

Groundwater Levels BGS (ft): \square At Time of Drilling: N/A \blacksquare At End of Drilling: N/A \square After Drilling: N/A

Drilling Contractor: WDC Drilling Drilling Method: Air Rotary Casing Hammer Logged By: Patrick Ostrye

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5 Depth (ft)	Sample Type	Number	Headspace PID	Lithologic Log	Material Description	U.S.C.S.	We	ell Diagram	Remarks
-	_				Well graded SAND with Gravel (SW); light brownish gray (10YR 6/2); dry; very loose; 75% sand; 25% gravel to 15mm; subangular to rounded.	SW		- Top of 3/4" Schedule 80 PVC 0.050 Slot Screen	New 10' connection @ 1240. Resumed drilling @ 1250.
245		SB0052	0.7		Well graded SAND with Gravel (SW); pinkish gray (7.5YR 6/2); dry; very loose; 80% sand; 20% gravel to 7mm; subangular to rounded; pumice present.				Blow counts (247-248.5'): 50/Not Recorded. Blow
250		SB0052			Poorly graded SAND (SP); pinkish gray (5YR 6/2); moist; very dense; 100% very fine to medium sand; trace gravel.			- Bottom of Screen	counts (248.5-250'): 60/Not Recorded. New 10' connection @ 1315.
255	_				Poorly graded SAND (SP); pinkish gray (7.5YR 6/2); moist; very loose; 100% fine to medium sand; coarse pumice fragments.	SP			
<u>260</u>	-				Silty SAND (SM); reddish brown (5YR 5/4); moist; medium dense; 60% very fine to medium sand; 40% silt.			- Bentonite Seal	New 20' connection @ 1335. Resumed drilling @ 1340.
<u>265</u>	-				Same as above (258 ft).	SM			
270	-								



Date Started: 3/1/2011 Date TD Reached: 3/3/2011 Date Completed: 3/4/2011

Ground Elevation AMSL (ft): 5341.3 Y Coordinate: 1473288.69 X Coordinate: 1541336.23

Borehole ID: KAFB-106111

Hole Diameter Upper (in.): 11-3/4 Hole Diameter Lower (in.): 9-5/8 Surface Completion Type: Flush mount

Groundwater Levels BGS (ft): \Box At Time of Drilling: N/A \mathbf{I} At End of Drilling: N/A \mathbf{I} After Drilling: N/A

Drilling Contractor: WDC Drilling Drilling Method: Air Rotary Casing Hammer Logged By: Patrick Ostrye

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02 Depth (ft)	Sample Type	Number	Headspace PID	Lithologic Log	Material Description	U.S.C.S.	Well Diagram	Remarks
-	_				Clayey SAND (SC); brown (7.5YR 4/4); moist; medium dense; 60% fine to medium sand; 20% clay; 20% silt; nonplastic.	SC		
275					Poorly graded SAND (SP); pale brown (10YR 6/3); moist; loose; 100% medium to very coarse sand.	SP		
280	-				Well graded SAND (SW); dry; loose; 95% sand; 5% gravel to 5mm; subangular to rounded.	sw		New 20' connection @ 1350. Resumed drilling @ 1400.
-	-				Poorly graded GRAVEL with Sand (GP); dry; medium dense; 60% gravel to 15mm; subangular to subrounded; 40% medium to very coarse sand.		- Bentonite Seal	
<u>290</u>	-				Poorly graded GRAVEL with Sand (GP); dry; medium dense; 50% gravel to 15mm; subangular to subrounded; 45% fine to very coarse sand; 5% silt.	GP		
295		SB0053	0.0		Well graded SAND with Gravel (SW); moist; medium dense; 60% sand; 40% gravel to 35mm; subrounded to rounded.	sw		Blow counts (297-298.5')
300	\mathbb{H}	SB0053			Poorly graded GRAVEL (GP); dry; very dense; 90% gravel to 25mm; angular to rounded; 10% medium to very coarse	GP		60/Not Recorded. Blow counts (298.5-300'): 67/Not Recorded.



Date Started: 3/1/2011 Date TD Reached: 3/3/2011 Date Completed: 3/4/2011

Ground Elevation AMSL (ft): 5341.3 Y Coordinate: 1473288.69 X Coordinate: 1541336.23

Borehole ID: KAFB-106111

Hole Diameter Upper (in.): 11-3/4 Hole Diameter Lower (in.): 9-5/8 Surface Completion Type: Flush mount

Groundwater Levels BGS (ft): \square At Time of Drilling: N/A \blacksquare At End of Drilling: N/A \blacksquare After Drilling: N/A

Drilling Contractor: WDC Drilling Drilling Method: Air Rotary Casing Hammer Logged By: Patrick Ostrye

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00 Depth (ft)	Sample Type	Number	Headspace PID	Lithologic Log	Material Description	U.S.C.S.	Well Diagram	Remarks
<u>305</u> 310	-				sand. Poorly graded GRAVEL with Sand (GP); dry; medium dense; 55% gravel to 25mm; subangular to rounded; 45% coarse to very coarse sand.	GP		New 20' connection @ 1430. Resumed drilling @ 1435.
315	-				Well graded SAND with Gravel (SW); light reddish brown (5YR 6/4); moist; medium dense; 60% sand; 40% gravel to 12mm; subrounded to rounded.	SW		
320	-				Poorly graded GRAVEL with Sand (GP); pale brown (10YR 6/3); moist; medium dense; 70% gravel to 30mm; subrounded to rounded; 30% medium to coarse sand.	GP	- Bentonite Seal	
325	-				Well graded SAND with Gravel (SW); pale brown (10YR 6/3); moist; medium dense; 80% sand; 20% gravel to 10mm; subangular to subrounded.	SW		New 20' connection @ 1445. Resumed drilling @ 1450.
330	-				Poorly graded SAND (SP); pinkish gray (5YR 6/2); dry; loose; 95% medium to coarse sand; 5% gravel to 4mm; subangular to subrounded.	SP		

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Sh	aw	

Date Started: 3/1/2011 Date TD Reached: 3/3/2011 Date Completed: 3/4/2011

Ground Elevation AMSL (ft): 5341.3 Y Coordinate: 1473288.69 X Coordinate: 1541336.23

Borehole ID: KAFB-106111

Hole Diameter Upper (in.): 11-3/4 Hole Diameter Lower (in.): 9-5/8 Surface Completion Type: Flush mount

Groundwater Levels BGS (ft): \square At Time of Drilling: N/A \blacksquare At End of Drilling: N/A \blacksquare After Drilling: N/A

Drilling Contractor: WDC Drilling Drilling Method: Air Rotary Casing Hammer Logged By: Patrick Ostrye

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	2001	rdinate	e: 18	54133	6.23 Logged	ву: н	atrick Os	strye	Fage 12 01 10
65 Depth (ft)	Sample Type	Number	Headspace PID	Lithologic Log	Material Description	U.S.C.S.	Well	Diagram	Remarks
- - - 335					Well graded SAND with Gravel (SW); light brown (7.5YR 6/3); moist; loose; 80% sand; 20% gravel to 4mm; angular to subrounded.	SW	-	Bentonite Seal	
					Well graded SAND with Clay and Gravel (SW-SC); brown (7.5YR 5/3); moist; loose; 70% sand; 20% gravel to 35mm; angular to rounded; 10% clay.	SW- SC		Top of Filter Pack	
-				• • ř•⁄ •	Poorly graded SAND (SP); brown (7.5YR 5/3); moist; loose; 95% fine to medium sand; 5% gravel to 10mm;	 SP		Top of 3/4" Schedule 80 PVC 0.050 Slot Screen	New 10' connection @ 1455. Resumed drilling @ 1505.
- - <u>345</u> -					Subangular to rounded. Well graded SAND with Gravel (SW); light brown (7.5YR 6/3); moist; medium dense; 60% sand; 40% gravel to 20mm; angular to rounded.	SW			Diaw counto (247.249.5)
-	<u> </u>	SB0054	0.0		Poorly graded SAND with Gravel (SP); dry; dense; 85% medium to coarse sand;				Blow counts (347-348.5' 50/Not Recorded.
<u>350</u> - -					15% gravel to 20mm; angular to rounded.	SP		Bottom of Screen	New 10' connection @ 1525.
- <u>355</u> - -					Well graded SAND with Gravel (SW); pinkish gray (7.5YR 6/2); moist; loose; 85% sand; 15% gravel to 30mm; angular to rounded.			Bentonite Seal	
- _ <u>360</u>						300			



Date Started: 3/1/2011 Date TD Reached: 3/3/2011 Date Completed: 3/4/2011

Ground Elevation AMSL (ft): 5341.3 Y Coordinate: 1473288.69 X Coordinate: 1541336.23

Borehole ID: KAFB-106111

Hole Diameter Upper (in.): 11-3/4 Hole Diameter Lower (in.): 9-5/8 Surface Completion Type: Flush mount

Groundwater Levels BGS (ft): \square At Time of Drilling: N/A \blacksquare At End of Drilling: N/A \blacksquare After Drilling: N/A

Drilling Contractor: WDC Drilling Drilling Method: Air Rotary Casing Hammer Logged By: Patrick Ostrye

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96 Depth (ft)	1.0	Number	Headspace PID	Lithologic Log	Material Description	U.S.C.S.	Well Diagram	Remarks
	_				Poorly graded SAND with Gravel (SP); light brown (7.5YR 6/3); moist; loose; 85% fine to very coarse sand; 15% gravel to 25mm; angular to rounded.	SP		New 20' connection @ 1525. Resumed drilling @ 1545.
<u>365</u>	_				Well graded SAND (SW); pinkish gray (5YR 6/2); dry; loose; 95% sand; 5% gravel to 15mm; subangular to rounded.			
370	_				Well graded SAND with Gravel (SW); pinkish gray (5YR 6/2); moist; loose; 85% sand; 15% gravel to 50mm; subangular to rounded.			
<u>375</u>	_				Well graded SAND (SW); pinkish gray (5YR 6/2); moist; loose; 95% sand; 5% gravel to 15mm; subangular to rounded.	SW	- Bentonite Seal	
380	<u>)</u> - - -				Well graded SAND with Gravel (SW); pinkish gray (7.5YR 6/2); moist; loose; 70% sand; 30% gravel to 20mm; subangular to rounded.			New 20' connection @ 1550. Resumed drilling @ 1600.
<u>385</u>	_				Well graded SAND with Gravel (SW); dry; dense; 85% sand; 15% gravel to 10mm; angular to rounded.			
390)							



Date Started: 3/1/2011 Date TD Reached: 3/3/2011 Date Completed: 3/4/2011

Ground Elevation AMSL (ft): 5341.3 Y Coordinate: 1473288.69 X Coordinate: 1541336.23

Borehole ID: KAFB-106111

Hole Diameter Upper (in.): 11-3/4 Hole Diameter Lower (in.): 9-5/8 Surface Completion Type: Flush mount

Groundwater Levels BGS (ft): \square At Time of Drilling: N/A \blacksquare At End of Drilling: N/A \blacksquare After Drilling: N/A

Drilling Contractor: WDC Drilling Drilling Method: Air Rotary Casing Hammer Logged By: Patrick Ostrye

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ର Depth (ft)	Sample Type	Number	Headspace PID	Lithologic Log	Material Description	U.S.C.S.	Well Diagram	Remarks
-					Poorly graded SAND (SP); light brown (7.5YR 6/4); moist; dense; 100% medium sand.	SP		
395					Silty SAND (SM); light brown (7.5YR 6/4); dry; dense; 50% very fine to medium sand; 5% gravel to 5mm; subrounded to rounded; 35% silt; 10% clay; nonplastic.	SM		
-					Clayey SAND (SC); light gray (10YR 7/1); moist; dense; 55% very fine to fine sand; 35% clay; 10% silt; low plasticity.	SC		Blow counts (397-398.5'):
400	X	SB0055 SB0056			Poorly graded SAND (SP); light reddish brown (5YR 6/4); dry; dense; 100% fine to coarse sand.			50/40. Blow counts (398.5-400'): 50/40. Resumed drilling @
- - <u>405</u> - -					Same as above (398 ft).		- Bentonite Seal	1650.
_ 410 _ -					Same as above (398 ft).	SP		
- 415 - -					Same as above (398 ft).			
420								



Date Started: 3/1/2011 Date TD Reached: 3/3/2011 Date Completed: 3/4/2011

Ground Elevation AMSL (ft): 5341.3 Y Coordinate: 1473288.69 X Coordinate: 1541336.23

Borehole ID: KAFB-106111

Hole Diameter Upper (in.): 11-3/4 Hole Diameter Lower (in.): 9-5/8 Surface Completion Type: Flush mount

Groundwater Levels BGS (ft): \square At Time of Drilling: N/A \blacksquare At End of Drilling: N/A \blacksquare After Drilling: N/A

Drilling Contractor: WDC Drilling Drilling Method: Air Rotary Casing Hammer Logged By: Patrick Ostrye

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5 Depth (ft)	Sample Type	Number	Headspace PID	Lithologic Log	Material Description	U.S.C.S.	We	ell Diagram	Remarks
	_				Silty SAND (SM); brown (7.5YR 5/4); moist; medium dense; 60% very fine to medium sand; 40% silt.				New 20' connection @ 1655.
425					Silty SAND (SM); brown (7.5YR 5/4); moist; loose; 60% very fine to medium sand; 40% silt.	SM		- Bentonite Seal	
430					Silty SAND (SM); brown (7.5YR 5/4); moist; loose; 60% very fine to medium sand; trace gravel to 40mm; 25% silt; 15% clay; nonplastic.				
435	-				Poorly graded SAND (SP); light reddish brown (5YR 6/3); moist; loose; 95% very fine to medium sand; trace gravel to 30mm; 5% silt.			- Top of Filter Pack	
440	-				Same as above (435 ft).	SP		- Top of 3" Schedule 80 PVC 0.050 Slot Screen	
445					Poorly graded SAND (SP); light reddish brown (5YR 6/3); moist; loose; 100% very fine to medium sand.				End of 3/2/11. Resumed drilling @ 0755 on 3/3/11. Blow count (447-448.5'):
450		SB0057	0.0		Poorly graded SAND (SP); pinkish gray (7.5YR 6/2); moist; dense; 100% fine to medium sand.				50/45.



Date Started: 3/1/2011 Date TD Reached: 3/3/2011 Date Completed: 3/4/2011

Ground Elevation AMSL (ft): 5341.3 Y Coordinate: 1473288.69 X Coordinate: 1541336.23

Borehole ID: KAFB-106111

Hole Diameter Upper (in.): 11-3/4 Hole Diameter Lower (in.): 9-5/8 Surface Completion Type: Flush mount

Groundwater Levels BGS (ft): \square At Time of Drilling: N/A \blacksquare At End of Drilling: N/A \blacksquare After Drilling: N/A

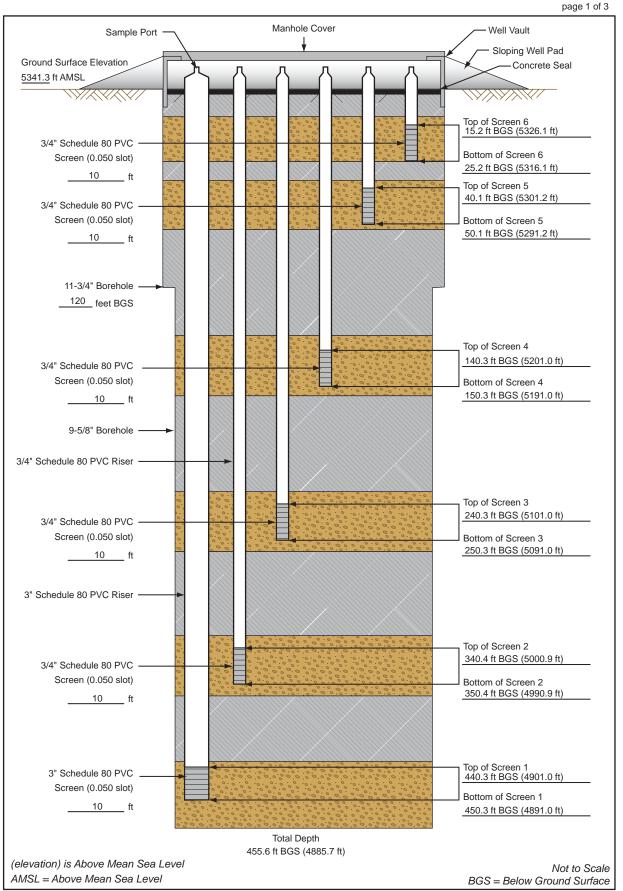
Drilling Contractor: WDC Drilling Drilling Method: Air Rotary Casing Hammer Logged By: Patrick Ostrye

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05 Depth (ft)		Number	Headspace PID	Lithologic Loa	Material Description	U.S.C.S.	Well Diagram	Remarks
	-				Poorly graded SAND (SP); pinkish gray (7.5YR 6/2); moist; dense; 100% fine to medium sand.		- Bottom of Screen	New 10' connection @ 0810. Resumed drilling @ 0815.
455					Same as above (450 ft).	SP	- Bottom of Filter Pack	
					Well graded SAND (SW); brown (7.5YF 4/3); moist; medium dense; 100% sand	SW		
460) - -				1			Total depth = 460 ft. Reached @ 0820 on 3/3/11.
465	-							Water added during drilling (gallons) = 0
	-							Water added during construction (gallons) = 320
<u>470</u>								
475	-							
480								

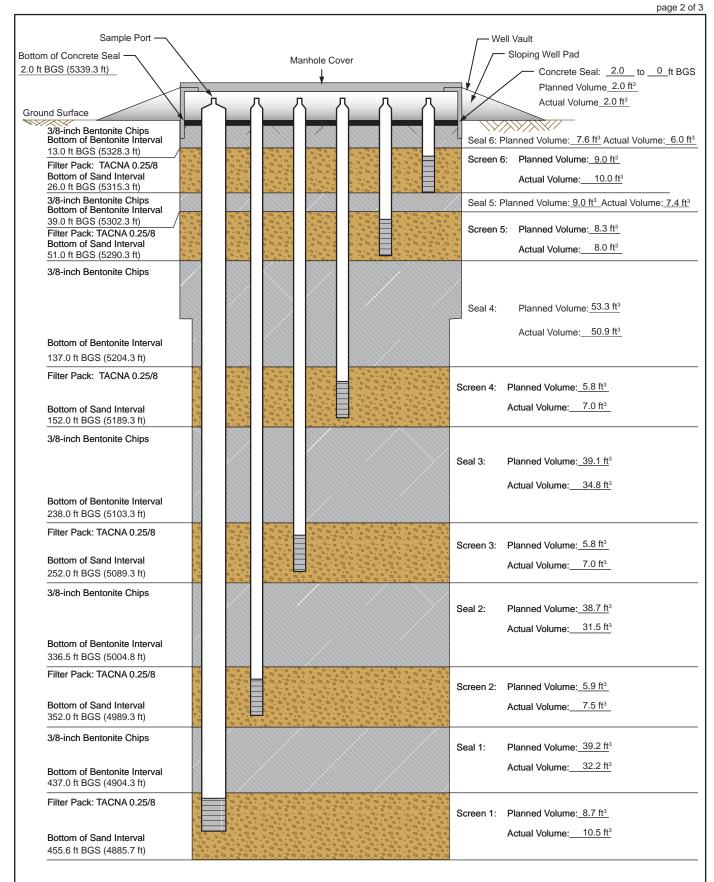
Nested Soil Vapor Well Completion Diagram for KAFB-106111

Installation Start Date/Time: <u>3/3/2011 @ 10:35</u> Installation End Date/Time: <u>3/4/2011 @ 16:25</u>



140705_CA010020_SV_KAFB.106111 (a)

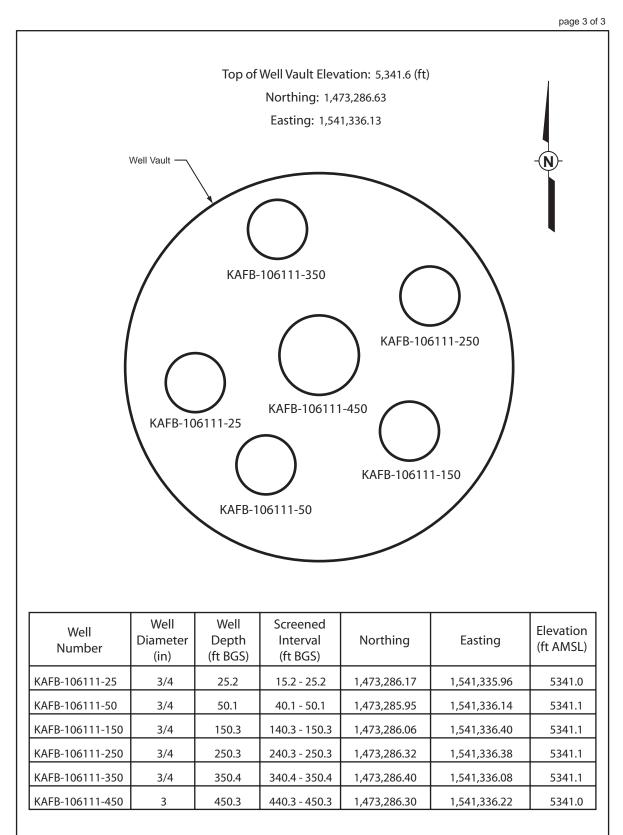
Nested Soil Vapor Well Completion Diagram for KAFB-106111



(elevation) is Above Mean Sea Level All Materials Placed with Tremie Pipe Not to Scale BGS = Below Ground Surface

140705_CA010020_SV_KAFB.106111 (b)

Nested Soil Vapor Well Completion Diagram Map View for KAFB-106111



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APPENDIX D-1

KAFB-106112 Final Well Report

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Date Started: 2/22/2011 Date TD Reached: 2/24/2011 Date Completed: 3/2/2011

Ground Elevation AMSL (ft): 5347.6 Y Coordinate: 1473505.07 X Coordinate: 1541936.76

Borehole ID: KAFB-106112

Hole Diameter Upper (in.): 11-3/4 Hole Diameter Lower (in.): 9-5/8 Surface Completion Type: Flush mount

Groundwater Levels BGS (ft): \square At Time of Drilling: N/A \blacksquare At End of Drilling: N/A \blacksquare After Drilling: N/A

Drilling Contractor: WDC Drilling Drilling Method: Air Rotary Casing Hammer Logged By: Jason Tarbert

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Oepth (ft)	Sample Type	Number	Headspace PID	Lithologic Log	Material Description	U.S.C.S.	Well Diagram	Remarks
	-				Sandy SILT (ML); brown (7.5YR 5/4); dry; very loose; low plasticity; 70% silt; 30% very fine to medium sand; trace fine gravel to 8mm.		- Concrete Seal	Hand augered.
5	-				Same as above (0 ft); 60% silt; 40% very fine to coarse sand; trace fine gravel to 4mm.			Began drilling @ 1517 on 2/22/11.
10		SB0058	0.0		Same as above (0 ft); reddish brown (5YR 5/4); stiff; trace gravel to 8mm; angular.	ML	- Bentonite Seal	Blow counts (8.5-10'): 5/6. Kelly down @ 1522. Resumed drilling @ 1535.
15	_				SILT with Sand (ML); reddish brown (2.5YR 4/4); dry; stiff; nonplastic; 85% silt; 15% very fine to medium sand to 1mm.		Pack - Top of 3/4" Schedule 80 PVC 0.050 Slot Screen	
20	-	SB0059	0.0		Lean CLAY (CL); brown (7.5YR 5/4); dry; hard; low plasticity; 70% clay; 30% silt.	CL		Blow counts (18.5-20'): 16/30. Kelly down @ 1543. Resumed drilling @ 1553.
25	-				Sandy SILT (ML); strong brown (7.5YR 5/6); dry; stiff; nonplastic; 60% silt; 35% very fine to very coarse sand; 5% fine gravel to 1cm.		- Bottom of Screen	
30		SB0060	0.0				- Bentonite Seal	Blow counts (28.5-30'): 9/12.



Date Started: 2/22/2011 Date TD Reached: 2/24/2011 Date Completed: 3/2/2011

Ground Elevation AMSL (ft): 5347.6 Y Coordinate: 1473505.07 X Coordinate: 1541936.76

Borehole ID: KAFB-106112

Hole Diameter Upper (in.): 11-3/4 Hole Diameter Lower (in.): 9-5/8 Surface Completion Type: Flush mount

Groundwater Levels BGS (ft): \square At Time of Drilling: N/A \blacksquare At End of Drilling: N/A \blacksquare After Drilling: N/A

Drilling Contractor: WDC Drilling Drilling Method: Air Rotary Casing Hammer Logged By: Jason Tarbert

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S Depth (ft)	Sample Type	Number	Headspace PID	Lithologic Log	Material Description	U.S.C.S.	We	ell Diagram	Remarks
35	-				SILT with Sand (ML); strong brown (7.5YR 4/6); dry; very stiff; low plasticity; 70% silt; 15% clay; 15% very fine sand to 0.1mm. Same as above (30 ft); 85% silt; 15% very fine to coarse sand; trace fine			- Bentonite Seal	Resumed drilling @ 1615.
4(SB0061	0.0		gravel to 6mm. Sandy SILT (ML); brown (7.5YR 5/4); dry; very stiff; low plasticity; 60% silt;			- Top of Filter Pack - Top of 3/4" Schedule 80 PVC 0.050	Blow counts (38.5-40'): 8/15. Kelly down @ 1622. Resumed drilling @
45	-				40% very fine to very coarse sand; trace fine gravel to 7mm. Same as above (40 ft); trace clay	ML		Slot Screen	1633.
50		SB0062 SB0063			nodules. Same as above (40 ft); very stiff.			- Bottom of Screen	Blow counts (48.5-50'): 12/22. Blow counts (50-51.5'): 12/23. Kelly down @ 1638.
55		360003	0.0		Same as above (40 ft).			- Bentonite Seal	Resumed drilling @ 1655.
60	- - - -)								

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Project Number: 140705

Date Started: 2/22/2011

Date TD Reached: 2/24/2011 Date Completed: 3/2/2011

Y Coordinate: 1473505.07

Ground Elevation AMSL (ft): 5347.6

Client: US Army Corps of Engineers Project Location: KAFB, Albuquerque, NM

Project Name: KAFB BFF SWMU ST-106 and SS-111

Borehole ID: KAFB-106112

Hole Diameter Upper (in.): 11-3/4 Hole Diameter Lower (in.): 9-5/8 Surface Completion Type: Flush mount

Groundwater Levels BGS (ft): ▼ After Drilling: N/A

Drilling Contractor: WDC Drilling Drilling Method: Air Rotary Casing Hammer Logged By: Jason Tarbert

		e: 1473 e: 1541			a: Air Rotary Casing F lason Tarbert	Page 3 of 16
9 Depth (ft) Sample Type	Number	Headspace PID Lithologic	Material Description	U.S.C.S.	Well Diagram	Remarks
-			SILT with Sand (ML); brown (7.5YR 5 dry; very stiff; low plasticity; 80% silt; 20% very fine to medium sand; trace gravel to 1.5cm.	5/4);		Driller forgot to remove 10' drill rod, drilled to 70' open hole and then hammered in casing.
65			Same as above (60 ft).			
70 - - -			Same as above (60 ft); trace gravel to 2.3cm.	5		Kelly down @ 1702. New connection, pushed to 70' @ 1713. End of 2/22/11. Resumed drilling @ 0745 on 2/23/11.
75			Same as above (60 ft); 80% silt; 20% very fine to medium sand; trace clay nodules.	ML	- Bentonite Seal	
 80 			SILT with Sand (ML); strong brown (7.5YR 5/6); dry; hard; nonplastic; 85' silt; 15% very fine to coarse sand to 3mm.	%		Kelly down @ 0752. Resumed drilling @ 0758.
85 - -			Same as above (80 ft); trace fine gravito 5mm.	vel		
90						



Borehole ID: KAFB-106112

Client: US Army Corps of Engineers Project Location: KAFB, Albuquerque, NM Project Name: KAFB BFF SWMU ST-106 and SS-111 Project Number: 140705

Date Started: 2/22/2011 Date TD Reached: 2/24/2011 Date Completed: 3/2/2011

Ground Elevation AMSL (ft): 5347.6 Y Coordinate: 1473505.07 X Coordinate: 1541936.76 Hole Diameter Upper (in.): 11-3/4 Hole Diameter Lower (in.): 9-5/8 Surface Completion Type: Flush mount

Groundwater Levels BGS (ft): \square At Time of Drilling: N/A \blacksquare At End of Drilling: N/A \blacksquare After Drilling: N/A

Drilling Contractor: WDC Drilling Drilling Method: Air Rotary Casing Hammer Logged By: Jason Tarbert

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		Junat				- j · ·			
© Denth (ft)	Sample Type	Numt	Headspace PID	Lithologic Log	Material Description	U.S.C.S.	Wel	l Diagram	Remarks
	_				SILT with Sand (ML); strong brown (7.5YR 5/6); dry; hard; nonplastic; 85% silt; 15% very fine to coarse sand to 3mm.				
9	5				Same as above (90 ft).	ML			
<u>10</u>		SB0064	0.0		Silty SAND (SM); yellowish brown (10YR 5/4); dry; very dense; 70% fine sand to 0.2mm; rounded; 30% silt.	SM		- Bentonite Seal	Blow counts (98.5-100'): 30/50. Kelly down @ 0810. Resumed drilling @ 0826.
10	5				Poorly graded SAND (SP); brown (10YR 5/3); dry; loose; 90% medium sand; 5% coarse sand; trace gravel to 6mm; rounded; 5% silt.	SP	-		
11	<u> </u>				Well graded SAND with Silt (SW-SM); brown (10YR 5/3); dry; loose; 85% very fine to very coarse sand; 5% fine gravel to 1cm; subrounded; 10% silt.	SW- SM			
<u>11</u>	5				SILT with Sand (ML); brown (7.5YR 5/4); dry; very stiff; nonplastic; 75% silt; 25% very fine to coarse sand to 4mm.	ML		- Native Backfill	
12								-Bentonite Seal	



Borehole ID: KAFB-106112

Client: US Army Corps of Engineers Project Location: KAFB, Albuquerque, NM Project Name: KAFB BFF SWMU ST-106 and SS-111 Project Number: 140705

Date Started: 2/22/2011 Date TD Reached: 2/24/2011 Date Completed: 3/2/2011

Ground Elevation AMSL (ft): 5347.6 Y Coordinate: 1473505.07 X Coordinate: 1541936.76 Hole Diameter Upper (in.): 11-3/4 Hole Diameter Lower (in.): 9-5/8 Surface Completion Type: Flush mount

Groundwater Levels BGS (ft): \square At Time of Drilling: N/A \blacksquare At End of Drilling: N/A \blacksquare After Drilling: N/A

Drilling Contractor: WDC Drilling Drilling Method: Air Rotary Casing Hammer Logged By: Jason Tarbert

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12 Depth (ft)	Sample Type	Number	Headspace PID	Lithologic Log	Material Description	U.S.C.S.	We	ell Diagram	Remarks
	-				SILT with Sand (ML); brown (7.5YR 5/4); dry; very stiff; nonplastic; 85% silt; 15% very fine to fine sand to 0.5mm.				Kelly down @ 0835. Total depth with 11-3/4" casing reached. Resumed drilling @ 1230.
125	-				Same as above (120 ft).			- Bentonite Seal	
<u>130</u>	-				SILT with Sand (ML); brown (7.5YR 5/4); moist; very stiff; low plasticity; 60% silt; 25% clay; 15% fine to medium sand to 1mm.	ML			
135	-				SILT with Sand (ML); brown (7.5YR 5/4); dry; very stiff; low plasticity; 85% silt; _15% very fine to medium sand to 1mm. _Lean CLAY (CL).		-	- Top of Filter	
	$\left \right $					CL		Pack	
140	-				Well graded SAND with Silt (SW-SM); brown (10YR 4/3); dry; very loose; 90% very fine to medium sand to 2mm; subrounded; 10% silt with clay nodules.	SW- SM		- Top of 3/4" Schedule 80 PVC 0.050 Slot Screen	Kelly down @ 1242. Resumed drilling @ 1247.
<u>145</u> 150		SB0065	0.0		Well graded SAND (SW); brown (10YR 4/3); dry; loose; 95% very fine to very coarse sand; trace gravel to 6mm; subangular; 5% silt.	sw			Blow counts (147-148.5'): 11/15.



Date Started: 2/22/2011 Date TD Reached: 2/24/2011 Date Completed: 3/2/2011

Ground Elevation AMSL (ft): 5347.6 Y Coordinate: 1473505.07 X Coordinate: 1541936.76

Borehole ID: KAFB-106112

Hole Diameter Upper (in.): 11-3/4 Hole Diameter Lower (in.): 9-5/8 Surface Completion Type: Flush mount

Groundwater Levels BGS (ft): \square At Time of Drilling: N/A \blacksquare At End of Drilling: N/A \blacksquare After Drilling: N/A

Drilling Contractor: WDC Drilling Drilling Method: Air Rotary Casing Hammer Logged By: Jason Tarbert

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		Logged Dy. Jason Tablet								
05 Depth (ft)	Sample Type	Number	Headspace PID	Lithologic Log	Material Description	U.S.C.S.	Well Diagram	Remarks		
	-				Well graded SAND (SW); brown (10YR 4/3); dry; medium dense; 95% very fine to very coarse sand; trace gravel to 6mm; subangular; 5% silt; medium to coarse sand is predominantly pumice.	SW	Screen	Kelly down @ 1250. Resumed drilling @ 1302.		
155	-				SILT with Sand (ML); brown (7.5YR 5/4); dry; very stiff; nonplastic; 80% silt; 20% very fine to medium sand to 2mm.					
<u>160</u> 165	-				Well graded SAND with Silt (SW-SM); brown (10YR 5/3); dry; medium dense; 90% very fine to coarse sand to 3mm; subrounded; 10% silt.	SW- SM		Kelly down @ 1306. Resumed drilling @ 1311.		
170	-			<u>• • • • Þ</u>	SILT with Sand (ML); brown (7.5YR 5/4); dry; very stiff; nonplastic; 85% silt; 15% very fine sand to 0.1mm.	ML	- Bentonite Seal			
	-				Well graded SAND with Silt (SW-SM); light brown (7.5YR 6/4); dry; loose; 80% very fine to very coarse sand; 10% fine gravel to 1.3cm; well rounded; 10% silt; predominantly pumice.					
175	-				Same as above (170 ft); 90% very fine to very coarse sand; trace fine gravel; 10% silt.	SW- SM				
180										



Date Started: 2/22/2011 Date TD Reached: 2/24/2011 Date Completed: 3/2/2011

Ground Elevation AMSL (ft): 5347.6 Y Coordinate: 1473505.07 X Coordinate: 1541936.76

Borehole ID: KAFB-106112

Hole Diameter Upper (in.): 11-3/4 Hole Diameter Lower (in.): 9-5/8 Surface Completion Type: Flush mount

Groundwater Levels BGS (ft): \square At Time of Drilling: N/A \blacksquare At End of Drilling: N/A \blacksquare After Drilling: N/A

Drilling Contractor: WDC Drilling Drilling Method: Air Rotary Casing Hammer Logged By: Jason Tarbert

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~ ~ ~	Coordinate: 1541550.70 Logged by: Sason Taibert								
8 Depth (ft)	Sample Type	Number	Headspace PID	Lithologic Log	Material Description	U.S.C.S.	Well Diagram	Remarks	
	_				Poorly graded SAND (SP); brown (10YR 5/3); dry; very loose; 95% medium sand to 1mm; subrounded; 5% silt.	SP		Kelly down @ 1317. Resumed drilling @ 1324.	
185	-			••••	Well graded SAND (SW); brown (10YR				
•	-				4/3); dry; very loose; 95% very fine to very coarse sand; trace fine gravel to 1.1cm; rounded; 5% silt.				
<u>190</u>	-				Same as above (185 ft); finer.				
195	-				Same as above (185 ft); finer.	SW	- Bentonite Seal		
	-	SB0066	0.0					Blow counts (197-198.5') 17/12.	
200	-				Same as above (185 ft); medium dense.			Resumed drilling @ 1342.	
205	-				Silty SAND (SM); brown (10YR 4/3); dry; medium dense; 70% fine sand to 0.5mm; rounded; 30% silt.	 SM			
210	-				Well graded SAND (SW); brown (10YR 4/3); dry; dense; 90% very fine to very coarse sand; 5% fine gravel to 1.8cm;	SW			



Date Started: 2/22/2011 Date TD Reached: 2/24/2011 Date Completed: 3/2/2011

Ground Elevation AMSL (ft): 5347.6 Y Coordinate: 1473505.07 X Coordinate: 1541936.76

Borehole ID: KAFB-106112

Hole Diameter Upper (in.): 11-3/4 Hole Diameter Lower (in.): 9-5/8 Surface Completion Type: Flush mount

Groundwater Levels BGS (ft): \square At Time of Drilling: N/A \blacksquare At End of Drilling: N/A \blacksquare After Drilling: N/A

Drilling Contractor: WDC Drilling Drilling Method: Air Rotary Casing Hammer Logged By: Jason Tarbert

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01 Depth (ft)	Sample Type	Number	Headspace PID	Lithologic Log	Material Description	U.S.C.S.	Well Diagram	Remarks
215	-				rounded; 5% silt.	SW		
220	-				SILT with Sand (ML); dark yellowish brown (10YR 4/4); moist; very stiff; low plasticity; 60% silt; 25% clay; 15% very fine to fine sand; trace gravel to 3cm; well rounded.	ML		
220					Silty SAND (SM); brown (10YR 5/3); moist; loose; 75% very fine to very coarse sand; 5% fine gravel to 1.5cm; rounded; 20% silt.		- Bentonite Seal	Kelly down @ 1349. Resumed drilling @ 1357.
<u>225</u> 230	-				Same as above (220 ft); coarser gravel to 3cm.	SM		
	-				Well graded SAND (SW); dark grayish brown (10YR 4/2); dry; loose; 90% very fine to very coarse sand; 5% fine gravel to 1.5cm; rounded; 5% silt; predominantly lithics.			
235					Same as above (230 ft); grayish brown (10YR 5/2); predominantly pumice.	SW	- Top of Filter Pack	
240								



Date Started: 2/22/2011 Date TD Reached: 2/24/2011 Date Completed: 3/2/2011

Ground Elevation AMSL (ft): 5347.6 Y Coordinate: 1473505.07 X Coordinate: 1541936.76

Borehole ID: KAFB-106112

Hole Diameter Upper (in.): 11-3/4 Hole Diameter Lower (in.): 9-5/8 Surface Completion Type: Flush mount

Groundwater Levels BGS (ft): \square At Time of Drilling: N/A \blacksquare At End of Drilling: N/A \square After Drilling: N/A

Drilling Contractor: WDC Drilling Drilling Method: Air Rotary Casing Hammer Logged By: Jason Tarbert

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B Depth (ft) Sample Type	Number	Headspace PID	Lithologic Log	Material Description	U.S.C.S.	We	ell Diagram	Remarks
-				Well graded SAND (SW); dark grayish brown (10YR 4/2); dry; very loose; 90% very fine to very coarse sand; 5% fine gravel to 1.5cm; rounded; 5% silt; mix of pumice and lithics.			Schedule 80 PVC 0.050 Slot Screen	Kelly down @ 1401.
245	SB0067	3.4		Same as above (240 ft); loose; predominantly lithics.	SW			Blow counts (247-248.5') 12/43.
2 <u>50</u>				Lean CLAY (CL); brown (7.5YR 5/3); dry; hard; low plasticity; 100% clay.	CL		-Bottom of Screen	Kelly down @ 1410.
2 <u>255</u>				SILT (ML); brown (7.5YR 5/3); moist; hard; low plasticity; 60% silt; 40% clay. Same as above (252 ft).				
- 260 - - -				Same as above (252 ft); 90% silt; 10% very fine to medium sand.	ML		- Bentonite Seal	Kelly down @ 1429. Resumed drilling @ 1435.
265				Silty SAND (SM); yellowish brown (10YR 5/4); moist; loose; 60% very fine to medium sand to 1mm; rounded; 40% silt.	SM			

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Project Number: 140705

Date Started: 2/22/2011

Date TD Reached: 2/24/2011 Date Completed: 3/2/2011

Y Coordinate: 1473505.07

Ground Elevation AMSL (ft): 5347.6

Client: US Army Corps of Engineers Project Location: KAFB, Albuquerque, NM

Borehole ID: KAFB-106112

Hole Diameter Upper (in.): 11-3/4 Hole Diameter Lower (in.): 9-5/8 Project Name: KAFB BFF SWMU ST-106 and SS-111 Surface Completion Type: Flush mount

> Groundwater Levels BGS (ft): ▼ After Drilling: N/A

Drilling Contractor: WDC Drilling Drilling Method: Air Rotary Casing Hammer Logged By: Jason Tarbert

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05 Depth (ft)	Sample Type	Number	Headspace PID	Lithologic Log	Material Description	U.S.C.S.	w	ell Diagram	Remarks
-	-				Poorly graded SAND (SP); brown (10Y 5/3); dry; very loose; 90% fine to mediu sand; 10% coarse sand to 2mm; subrounded; trace fines.	R im			
275	-				Same as above (270 ft); 90% fine sand 10% medium sand.	I; SP			
- 280 -	-				Same as above (270 ft).				Kelly down @ 1440.
285 	-				Silty SAND (SM); brown (7.5YR 4/3); moist; loose; 70% very fine to medium sand to 1mm; rounded; 30% silt.	SM	-	- Bentonite Seal	
<u>290</u>	-				Well graded SAND (SW); brown (7.5Y) 5/2); dry; loose; 95% very fine to very coarse sand; 5% fine gravel to 8mm; subrounded.	ج sw	-		
295		SB0068	0.5		Poorly graded SAND (SP); brown (10Y 5/3); dry; very loose; 85% medium san to 2mm; 15% very fine to fine sand; rounded.		-		Blow counts (297-298.5'): 3/Not recorded (for 18").
300									



Borehole ID: KAFB-106112

Client: US Army Corps of Engineers Project Location: KAFB, Albuquerque, NM Project Name: KAFB BFF SWMU ST-106 and SS-111 Project Number: 140705

Date Started: 2/22/2011 Date TD Reached: 2/24/2011 Date Completed: 3/2/2011

Ground Elevation AMSL (ft): 5347.6 Y Coordinate: 1473505.07 X Coordinate: 1541936.76 Hole Diameter Upper (in.): 11-3/4 Hole Diameter Lower (in.): 9-5/8 Surface Completion Type: Flush mount

Groundwater Levels BGS (ft): \square At Time of Drilling: N/A \blacksquare At End of Drilling: N/A \blacksquare After Drilling: N/A

Drilling Contractor: WDC Drilling Drilling Method: Air Rotary Casing Hammer Logged By: Jason Tarbert

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60 Depth (ft)	Sample Type	Number	Headspace PID	Lithologic Log	Material Description	U.S.C.S.	Well Diagram	Remarks
	-				Well graded SAND (SW); grayish brown (10YR 5/2); dry; loose; 95% very fine to very coarse sand; 5% fine gravel to 9mm; subrounded to rounded.			Resumed drilling @ 1511.
<u>305</u>	-				Same as above (300 ft).			
<u>310</u>	-				Same as above (300 ft); gravel to 2.6cm.			
315	-				Same as above (300 ft); 90% very fine to very coarse sand; 10% fine gravel.	SW	- Bentonite Seal	
<u>320</u>	-				Well graded SAND with Gravel (SW); 70% very fine to very coarse sand; 30% fine gravel.			Kelly down @ 1521. Resumed drilling @ 1528.
325	-				Well graded SAND (SW); yellowish brown (10YR 5/4); dry; loose; 100% very fine to very coarse sand; trace fine gravel to 7mm; subrounded; trace fines.			
330								



Date Started: 2/22/2011 Date TD Reached: 2/24/2011 Date Completed: 3/2/2011

Ground Elevation AMSL (ft): 5347.6 Y Coordinate: 1473505.07 X Coordinate: 1541936.76

Borehole ID: KAFB-106112

Hole Diameter Upper (in.): 11-3/4 Hole Diameter Lower (in.): 9-5/8 Surface Completion Type: Flush mount

Groundwater Levels BGS (ft): \square At Time of Drilling: N/A \blacksquare At End of Drilling: N/A \blacksquare After Drilling: N/A

Drilling Contractor: WDC Drilling Drilling Method: Air Rotary Casing Hammer Logged By: Jason Tarbert

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00 Depth (ft) Sample Type	Number	Headspace PID	Lithologic Log	Material Description	U.S.C.S.	We	ell Diagram	Remarks
-				Well graded SAND (SW); yellowish brown (10YR 5/4); dry; loose; 100% very fine to very coarse sand; trace fine gravel to 7mm; subrounded; trace fines; coarser than 325'.			- Bentonite Seal	
335				Same as above (330 ft); finer.	SW		- Top of Filter Pack	
<u>340</u>				Same as above (330 ft); finer.			- Top of 3/4" Schedule 80 PVC 0.050 Slot Screen	Kelly down @ 1542. Resumed drilling @ 1551.
				Lean CLAY (CL); lense. Well graded SAND (SW); yellowish brown (10YR 5/4); dry; loose; 100% very	CL			
345				fine to coarse sand to 4mm; rounded.	sw			Blow counts (347-348.5'
-/_ 350	SB0069	0.5					- Bottom of Screen	26/50.
-				Well graded SAND with Silt (SW-SM); yellowish brown (10YR 5/4); dry; very dense; 85% very fine to very coarse sand; 5% fine gravel to 1cm; rounded; 10% silt.	SW- SM			Kelly down @ 1605. Crew had trouble making connection. Used a different 10' section. Resumed drilling @ 1637.
<u>355</u> - - -				Well graded SAND (SW); brown (10YR 5/3); dry; very dense; 95% very fine to very coarse sand to 4mm; subrounded; 5% silt.	sw		- Bentonite Seal	Rate of penetration very slow.
360								



Date Started: 2/22/2011 Date TD Reached: 2/24/2011 Date Completed: 3/2/2011

Ground Elevation AMSL (ft): 5347.6 Y Coordinate: 1473505.07 X Coordinate: 1541936.76

Borehole ID: KAFB-106112

Hole Diameter Upper (in.): 11-3/4 Hole Diameter Lower (in.): 9-5/8 Surface Completion Type: Flush mount

Groundwater Levels BGS (ft): \square At Time of Drilling: N/A \blacksquare At End of Drilling: N/A \blacksquare After Drilling: N/A

Drilling Contractor: WDC Drilling Drilling Method: Air Rotary Casing Hammer Logged By: Jason Tarbert

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g Depth (ft)	Sample Type	Number	Headspace PID	Lithologic Log	Material Description	U.S.C.S.	We	ell Diagram	Remarks
365	-				Well graded SAND (SW); brown (10YR 5/3); dry; very dense; 95% very fine to very coarse sand to 4mm; subrounded; 5% silt; coarser than 355'.	SW			Kelly down @ 1650.
	-				Poorly graded SAND (SP); brown (10YR 5/3); dry; very dense; 90% medium sand; 5% coarse sand to 2.5mm; rounded; 5% fines.				Bit packed off @ 1708. Resumed drilling @
<u>370</u>	-				Same as above (365 ft); trace fine gravel to 6mm.	SP			1709. End of day @ 1714 on 2/23/11. Resumed drilling @ 0738 on 2/24/11.
<u>375</u>	-				Well graded SAND (SW); dark yellowish brown (10YR 4/4); dry; dense; 100% very fine to coarse sand to 3mm; subangular to rounded; trace fines.			- Bentonite Seal	
<u>380</u>	-				Same as above (375 ft); coarser.	SW			Kelly down @ 0746. Resumed drilling @ 0752.
<u>385</u>	-				Same as above (375 ft).				
390									



Date Started: 2/22/2011 Date TD Reached: 2/24/2011 Date Completed: 3/2/2011

Ground Elevation AMSL (ft): 5347.6 Y Coordinate: 1473505.07 X Coordinate: 1541936.76

Borehole ID: KAFB-106112

Hole Diameter Upper (in.): 11-3/4 Hole Diameter Lower (in.): 9-5/8 Surface Completion Type: Flush mount

Groundwater Levels BGS (ft): \square At Time of Drilling: N/A \blacksquare At End of Drilling: N/A \blacksquare After Drilling: N/A

Drilling Contractor: WDC Drilling Drilling Method: Air Rotary Casing Hammer Logged By: Jason Tarbert

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66 Depth (ft)	Sample Type	Number	Headspace PID	Lithologic Log	Material Description	U.S.C.S.	We	ell Diagram	Remarks
	-				Well graded SAND (SW); dark yellowish brown (10YR 4/4); dry; dense; 100% very fine to coarse sand to 3mm; subangular to rounded; trace gravel to 2.5cm; trace fines.				
-					Same as above (390 ft); trace gravel to 1.1cm.				Blow counts (397-398.5'):
400	\mathbb{H}	SB0070 SB1742			Same as above (390 ft); no gravel.				6/Not Recorded. Blow counts (398.5-400'): 2/35. Kelly down @ 0813. Replaced flange from cyclone hose to hammer @ 0830. Resumed drilling @ 1004.
405	-				Same as above (390 ft); no gravel; grading finer.	SW		- Bentonite Seal	
410	-				Same as above (390 ft); no gravel; grading coarser.				
415	-				Same as above (390 ft); no gravel; grading coarser than 410'.				
420									

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Project Number: 140705

Date Started: 2/22/2011

Date TD Reached: 2/24/2011 Date Completed: 3/2/2011

Y Coordinate: 1473505.07

X Coordinate: 1541936.76

Ground Elevation AMSL (ft): 5347.6

Client: US Army Corps of Engineers Project Location: KAFB, Albuquerque, NM

Project Name: KAFB BFF SWMU ST-106 and SS-111

Borehole ID: KAFB-106112

Hole Diameter Upper (in.): 11-3/4 Hole Diameter Lower (in.): 9-5/8 Surface Completion Type: Flush mount

Groundwater Levels BGS (ft): \Box At Time of Drilling: N/A \blacksquare At End of Drilling: N/A \blacksquare After Drilling: N/A

Drilling Contractor: WDC Drilling Drilling Method: Air Rotary Casing Hammer Logged By: Jason Tarbert

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5 Depth (ft)	Sample Type	Number	Headspace PID	Lithologic Log	Material Description	U.S.C.S.	We	ell Diagram	Remarks
	-				Well graded SAND (SW); dark yellowish brown (10YR 4/4); dry; very dense; 100% very fine to very coarse sand; trace fine gravel to 8mm; subangular to rounded; trace fines.				Kelly down @ 1021. Resumed drilling @ 1027.
425	-				Same as above (420 ft); grading coarser.			- Bentonite Seal	
430	-				Same as above (420 ft); 95% very fine to very coarse sand; 5% fine gravel to 2cm.	SW			
435	-				Same as above (420 ft); grading finer; very fine to coarse sand to 3mm; no gravel.		in incluse i	- Top of Filter	
440	-				Well graded SAND with Gravel (SW); brown (10YR 5/3); dry; very dense; 80% very fine to very coarse sand; 20% fine gravel to 1.5cm; subrounded.			Pack Top of 3" Schedule 80 PVC 0.050 Slot Screen	Kelly down @ 1103. Resumed drilling @ 1108.
445		SB0071	25.3		Poorly graded SAND (SP); brown (10YR 4/3); moist; very dense; 95% fine sand; 5% medium sand; trace fine gravel to 1.6cm; rounded.	SP		- Bottom of	Blow counts (447-478.5') 33/50.

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Project Number: 140705

Date Started: 2/22/2011

Date TD Reached: 2/24/2011 Date Completed: 3/2/2011

Ground Elevation AMSL (ft): 5347.6

Client: US Army Corps of Engineers Project Location: KAFB, Albuquerque, NM

Project Name: KAFB BFF SWMU ST-106 and SS-111

Borehole ID: KAFB-106112

Hole Diameter Upper (in.): 11-3/4 Hole Diameter Lower (in.): 9-5/8 Surface Completion Type: Flush mount

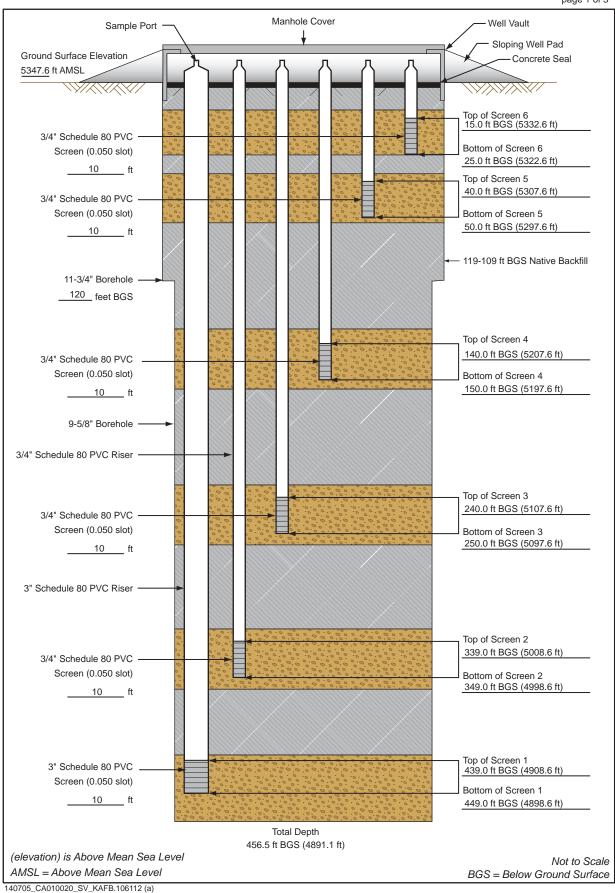
Groundwater Levels BGS (ft): \bigtriangledown At Time of Drilling: N/A At End of Drilling: N/A ▼ After Drilling: N/A

Drilling Contractor: WDC Drilling Drilling Method: Air Rotary Casing Hammer

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B Depth (ft) Sample Type	Number	Headspace PID	Lithologic Log	Material Description	U.S.C.S.		Well Diagram	Remarks
455				Silty SAND (SM); brown (7.5YR 4/4); moist; very dense; 80% medium sand 1mm; rounded; 20% silt.	SM			Kelly down @ 1123. Resumed drilling @ 1139. Drillers noted a strong odor from hole and cuttings.
			• • • •	Poorly graded SAND (SP); brown (10) 5/3); dry; very dense; 100% very fine to medium sand to 1mm; subrounded.	o SP	žQ.	- Bottom of	
				Well graded SAND (SW); brown (10YI 5/3); dry; very dense; 100% very fine to very coarse sand to 4mm; rounded.	o SW		A Native Backfill	
460								Total depth @ 460 ft. Reached @ 1200 on 2/24/11.
465								Water added during drilling (gallons) = 0
								Water added during construction (gallons) = 230
470								Kelly down: TD the joint and ready to make new connection.
475								
480								

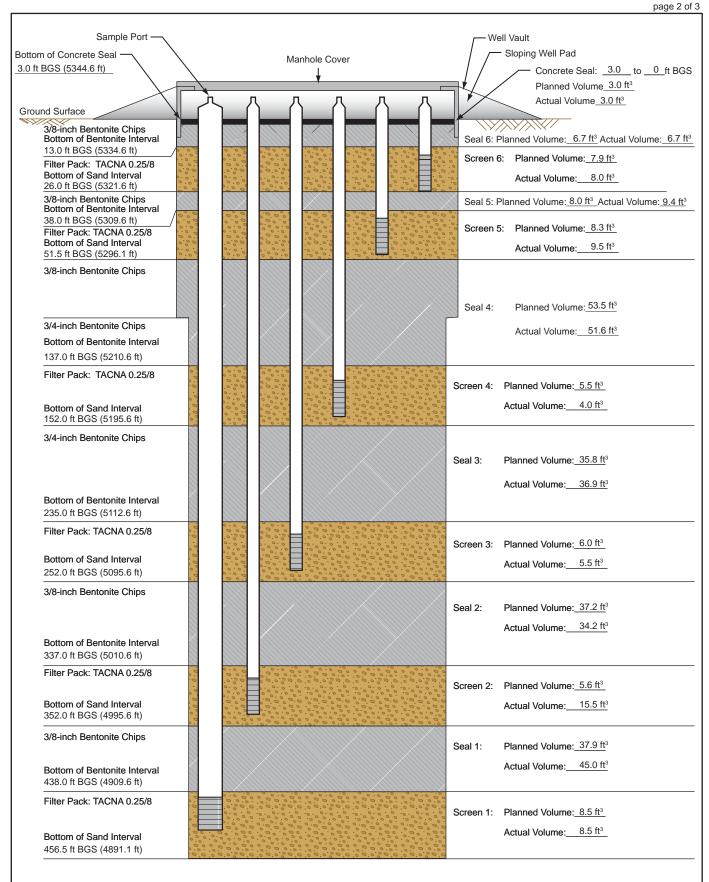
Nested Soil Vapor Well Completion Diagram for KAFB-106112

Installation Start Date/Time: 3/1/2011 @ 8:00 Installation End Date/Time: 3/2/2011 @ 16:45



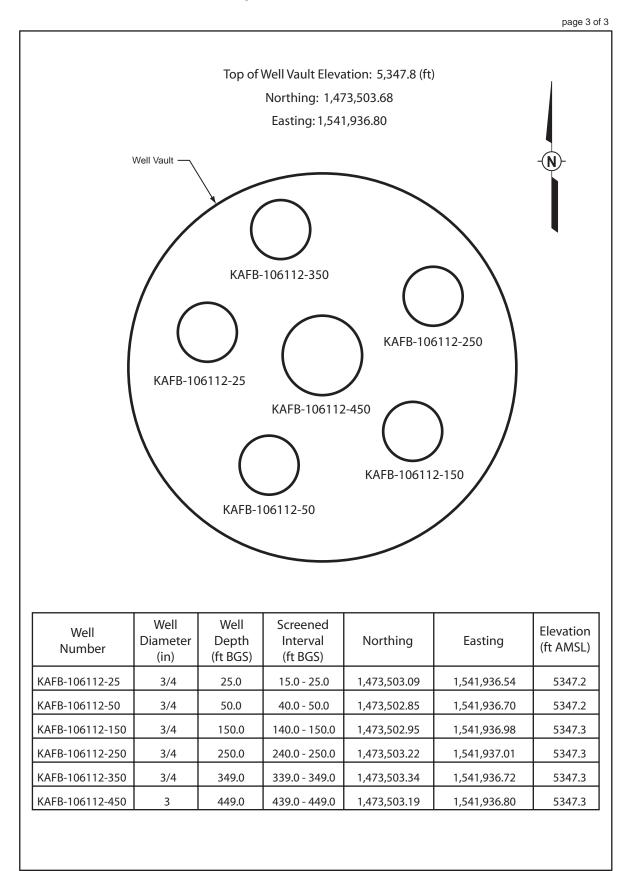
page 1 of 3

Nested Soil Vapor Well Completion Diagram for KAFB-106112



(elevation) is Above Mean Sea Level All Materials Placed with Tremie Pipe Not to Scale BGS = Below Ground Surface

Nested Soil Vapor Well Completion Diagram Map View for KAFB-106112



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APPENDIX D-1

KAFB-106113 Final Well Report

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Date Started: 1/18/2011 Date TD Reached: 2/5/2011 Date Completed: 2/8/2011

Ground Elevation AMSL (ft): 5345.8 Y Coordinate: 1473064.22 X Coordinate: 1542004.39

Borehole ID: KAFB-106113

Hole Diameter Upper (in.): 11-3/4 Hole Diameter Lower (in.): 9-5/8 Surface Completion Type: Flush mount

Groundwater Levels BGS (ft): \square At Time of Drilling: N/A \blacksquare At End of Drilling: N/A \blacksquare After Drilling: N/A

Drilling Contractor: WDC Drilling Drilling Method: Air Rotary Casing Hammer Logged By: Brian Lucero

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Oepth (ft)	Sample Type	Number	Headspace PID	Lithologic Log	Material Description	U.S.C.S.	Well Diagram	Remarks
5	_				Clayey SAND (SC); reddish brown (5YR 4/4); moist; medium dense; 60% fine to coarse sand; subrounded to subangular; trace gravel to 1cm; 40% clay with minor silt; no odor. Same as above (0 ft); no odor.	SC	- Bentonite Seal	Hand augered. Spud @ 1454 on 01/18/11.
10		SB0072 SB0080			Poorly graded SAND with Silt (SP-SM); red (2.5YR 5/6); moist; very dense; 90% fine sand; 10% silt with minor clay; no odor. Same as above (10 ft); no odor.	SP- SM	Pack - Top of 3/4" Schedule 80 PVC 0.050 Slot Screen	New connection @ 1540. Resumed drilling @ 1544. Blow counts (10-11.5'): 48/50. Blow counts (11.5-13'): Not Recorded. Hard to drive casing ~14-15 ft.
20		SB0073 SB0073			Clayey SAND (SC); reddish brown (5YR 4/4); moist; very dense; 60% fine sand; 40% clay with minor silt; no odor.		- Bottom of Screen	Kelly down @ 1551. New connection @ 1628 Resumed drilling @1634 Blow counts (20-21.5'): 50/Not Recorded. Blow counts (21.5-23'): 50 Not Recorded.
25 30	_				Same as above (20 ft); no odor.	SC	- Bentonite Seal	Kelly down @ 1640. New connection @ 1716. End of 01/18/11.



Date Started: 1/18/2011 Date TD Reached: 2/5/2011 Date Completed: 2/8/2011

Ground Elevation AMSL (ft): 5345.8 Y Coordinate: 1473064.22 X Coordinate: 1542004.39

Borehole ID: KAFB-106113

Hole Diameter Upper (in.): 11-3/4 Hole Diameter Lower (in.): 9-5/8 Surface Completion Type: Flush mount

Groundwater Levels BGS (ft): \square At Time of Drilling: N/A \blacksquare At End of Drilling: N/A \blacksquare After Drilling: N/A

Drilling Contractor: WDC Drilling Drilling Method: Air Rotary Casing Hammer Logged By: Brian Lucero

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	coordinate	e: 1	54200	4.39 Logged	srian Lucero		
ଝ Depth (ft)	Sample Type Number	Headspace PID	Lithologic Log	Material Description	U.S.C.S.	Well Diagrar	m Remarks
35	SB0074	0.0		Clayey SAND (SC); reddish brown (5YR 4/4); moist; very dense (based on blow counts); 60% fine sand; 40% clay with minor silt; no odor.	SC	- Bentonite	Resumed drilling @ 0747 on 01/19/11. Blow counts (30-31.5'): 48/50.
				Clayey SAND with Silt (SC-SM); reddish brown (5YR 4/4); moist; very dense; 75% fine sand; 25% clay and silt; no odor.	SC- SM	- Top of Fil Pack	Kelly down @ 0755.
	SB0075	0.0		Clayey SAND (SC); reddish brown (5YR 4/4); moist; very dense (based on blow counts); 70% fine sand; 30% clay with minor silt; no odor.		- Top of 3/4 Schedule PVC 0.05 Slot Scre	Resumed drilling @
-				Same as above (40 ft); no odor.	SC		Hard to drive casing ~45'-47'. Kelly down @ 0840.
50	SB0076			Sandy lean CLAY (CL); reddish brown (5YR 4/4); moist; hard; low to medium plasticity; 70% clay with silt; 30% fine sand; no odor.	CL	Bottom of Screen	
<u>55</u> - -				Clayey SAND (SC); reddish brown (5YR 4/4); moist; dense; 70% fine to medium sand; 30% clay with minor silt; no odor.	sc	- Bentonite	e Seal
60							Kelly down @ 0922.



Date Started: 1/18/2011 Date TD Reached: 2/5/2011 Date Completed: 2/8/2011

Ground Elevation AMSL (ft): 5345.8 Y Coordinate: 1473064.22 X Coordinate: 1542004.39

Borehole ID: KAFB-106113

Hole Diameter Upper (in.): 11-3/4 Hole Diameter Lower (in.): 9-5/8 Surface Completion Type: Flush mount

Groundwater Levels BGS (ft): \square At Time of Drilling: N/A \blacksquare At End of Drilling: N/A \blacksquare After Drilling: N/A

Drilling Contractor: WDC Drilling Drilling Method: Air Rotary Casing Hammer Logged By: Brian Lucero

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	500	aniai	<u>.</u>	54200				
영 Depth (ft)	Sample Type	Number	Headspace PID	Lithologic Log	Material Description	U.S.C.S.	Well Diagram	Remarks
	-				Silty SAND (SM); reddish brown (5YR 4/4); moist; very dense; 80% fine to medium sand; subangular; trace gravel to 1.5cm; 20% silt with minor clay; no odor.	SM		New connection @ 0959. Resumed drilling @ 1000.
65	-				SILT with Sand (ML); reddish brown (2.5YR 5/4); moist; very dense; 75% silt with minor clay; 25% fine sand; no odor.			
70					Same as above (65 ft); 25% fine to coarse sand; subrounded; no odor.	ML		
75	-				Same as above (65 ft); with trace gravel to 1cm; no odor.		- Bentonite Seal	
80	-				Sandy lean CLAY (CL); red (2.5YR 4/6); moist; medium stiff; medium plasticity; 70% clay with minor silt; 30% fine sand; no odor.	CL		Kelly down @ 1006. New connection @ 1021. Resumed drilling @ 1023.
85					SILT with Sand (ML); red (2.5YR 4/6); moist; stiff; 75% silt with minor clay; 25% fine sand; no odor.			
90	1							



Date Started: 1/18/2011 Date TD Reached: 2/5/2011 Date Completed: 2/8/2011

Ground Elevation AMSL (ft): 5345.8 Y Coordinate: 1473064.22 X Coordinate: 1542004.39

Borehole ID: KAFB-106113

Hole Diameter Upper (in.): 11-3/4 Hole Diameter Lower (in.): 9-5/8 Surface Completion Type: Flush mount

Groundwater Levels BGS (ft): \square At Time of Drilling: N/A \blacksquare At End of Drilling: N/A \blacksquare After Drilling: N/A

Drilling Contractor: WDC Drilling Drilling Method: Air Rotary Casing Hammer Logged By: Brian Lucero

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g Depth (ft)	Sample Type	Number	Headspace PID	Lithologic Log	Material Description	U.S.C.S.	Well Diagram	Remarks
95	-				SILT with Sand (ML); red (2.5YR 4/6); moist; stiff; 80% silt with minor clay; 20% fine sand; no odor. Same as above (90 ft); slight increase in clay; no odor.	ML		
100		SB0077 SB0077			Silty SAND (SM); yellowish red (5YR 4/6); moist; stiff; 70% fine sand; 30% silt with trace clay; no odor. Note: large gravel up to 3cm in split spoon @ 102'.	SM		Blow counts (98.5-100'): 14/50. Blow counts (100-101.5'): 17/50. Kelly down @ 1031 on 01/19/11. New connection @ 1108
105					Well graded SAND (SW); light reddish brown (2.5YR 6/3); moist; medium dense to dense; 100% fine to coarse sand; subrounded to subangular; no odor.		- Bentonite Seal	on 01/20/11. Resumed drilling @ 1111.
110					Same as above (103 ft); no odor.	SW		
115					Poorly graded SAND (SP); light reddish brown (2.5YR 6/3); moist; medium dense; 95% fine sand; 5% silt and clay (clay as nodules); no odor.	SP		Did not have to hammer entire joint.
120								Kelly down @ 1120.



Borehole ID: KAFB-106113

Client: US Army Corps of Engineers Project Location: KAFB, Albuquerque, NM Project Name: KAFB BFF SWMU ST-106 and SS-111 Project Number: 140705

Date Started: 1/18/2011 Date TD Reached: 2/5/2011 Date Completed: 2/8/2011

Ground Elevation AMSL (ft): 5345.8 Y Coordinate: 1473064.22 X Coordinate: 1542004.39 Hole Diameter Upper (in.): 11-3/4 Hole Diameter Lower (in.): 9-5/8 Surface Completion Type: Flush mount

Groundwater Levels BGS (ft): \square At Time of Drilling: N/A \blacksquare At End of Drilling: N/A \blacksquare After Drilling: N/A

Drilling Contractor: WDC Drilling Drilling Method: Air Rotary Casing Hammer Logged By: Brian Lucero

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12 Depth (ft)	Sample Type	Number	Headspace PID	Lithologic Log	Material Description	U.S.C.S.	W	ell Diagram	Remarks
	-				SILT with Sand (ML); red (2.5YR 4/6); moist; 75% silt with minor clay (clay as nodules); 25% fine sand; no odor.				
125	-				Same as above (120 ft); no odor.	ML		-Bentonite Seal	
130	-				Same as above (120 ft); no odor.				
135	-				Lean CLAY (CL); red (2.5YR 4/6); moist; stiff; medium plasticity; 95% clay with minor silt; 5% fine sand; no odor.	CL			
140	-				Same as above (133 ft); no odor.			- Top of Filter Pack - Top of 3/4" Schedule 80 PVC 0.050	Kelly down @ 1211. New connection @ 1218.
145	-				Poorly graded SAND (SP); light reddish gray (2.5YR 7/1); dry; 95% fine sand; 5% silt; no odor.			Slot Screen	Resumed drilling @ 1220. Likely top of Santa Fe Group.
					Same as above (141 ft); no odor.	SP			Blow counts (148.5-150'):
150		SB0078	0.0		Well graded SAND (SW); light reddish	SW			9/24. Kelly down @1232. End



Date Started: 1/18/2011 Date TD Reached: 2/5/2011 Date Completed: 2/8/2011

Ground Elevation AMSL (ft): 5345.8 Y Coordinate: 1473064.22 X Coordinate: 1542004.39

Borehole ID: KAFB-106113

Hole Diameter Upper (in.): 11-3/4 Hole Diameter Lower (in.): 9-5/8 Surface Completion Type: Flush mount

Groundwater Levels BGS (ft): \Box At Time of Drilling: N/A \mathbf{I} At End of Drilling: N/A \mathbf{I} After Drilling: N/A

Drilling Contractor: WDC Drilling Drilling Method: Air Rotary Casing Hammer Logged By: Brian Lucero

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05 Depth (ft)	Sample Type	Number	Headspace PID	Lithologic Log	Material Description	U.S.C.S.	Well Diagram	Remarks
-	$\left(\right)$	SB0078- MS SB0078-			gray (2.5YR 7/1); dry; loose; 95% fine to coarse sand; subrounded; trace fine gravel to 1cm; subrounded; 5% silt; no odor.	CL	Screen	of 01/20/11. New connection @ 0819 on 01/21/11. Resumed drilling @ 0820. Blow
- 155 - - -		MSD			Sandy lean CLAY (CL); reddish brown (5YR 5/4); moist; stiff; low plasticity; 60% clay with minor silt; 40% fine sand; no odor. SILT with Sand (ML); red (2.5YR 4/6); dry to moist; stiff; 85% silt; 15% fine sand; no odor.	ML		counts (150-151.5'): 13/50. Blow counts (151.5-153'): 18/50.
- 160 -	-				Poorly graded SAND with Silt (SP-SM); light reddish gray (2.5YR 7/1); dry to			Kelly down @ 0827. New connection @ 0841. Resumed drilling @
-	-				moist; loose; 90% fine sand; 10% silt; no odor.			0842.
165					Same as above (160 ft); minor gravel from discharge at 167 ft; no odor.		- Bentonite Seal	
- <u>170</u> -					Same as above (160 ft); no odor.	SP- SM		
- <u>175</u> - -					Same as above (160 ft); reddish brown (2.5YR 5/4); no odor.			
180	-							Kelly down @ 0853.



Date Started: 1/18/2011 Date TD Reached: 2/5/2011 Date Completed: 2/8/2011

Ground Elevation AMSL (ft): 5345.8 Y Coordinate: 1473064.22 X Coordinate: 1542004.39

Borehole ID: KAFB-106113

Hole Diameter Upper (in.): 11-3/4 Hole Diameter Lower (in.): 9-5/8 Surface Completion Type: Flush mount

Groundwater Levels BGS (ft): \square At Time of Drilling: N/A \blacksquare At End of Drilling: N/A \blacksquare After Drilling: N/A

Drilling Contractor: WDC Drilling Drilling Method: Air Rotary Casing Hammer Logged By: Brian Lucero

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	Coordinate. 1942004.59 Logged By. Dhan Eddero									
8 Depth (ft)	Sample Type	Number	Headspace PID	Lithologic Log	Material Description	U.S.C.S.	Well Diagra	am Remarks		
	-				Poorly graded SAND (SP); light reddish gray (2.5YR 7/1); dry to moist; loose; 100% fine to medium sand; trace coarse sand; subrounded; no odor.			New connection @ 0907. Resumed drilling @ 0908.		
185					Same as above (180 ft); no odor.	SP				
<u>190</u>	-				Well graded SAND (SW); light reddish gray (2.5YR 7/1); dry to moist; 95% fine to coarse sand; subrounded to subangular; 5% fine gravel to 1cm; subrounded; no odor.					
<u>195</u>	-				Same as above (190 ft); no odor.		- Bentoni	te Seal		
		SB0079	0.0		Same as above (190 ft); no odor. Note: very dense based on blow counts, high blow counts to this depth may have been due to hydraulic problem with the rig.	SW		Blow counts (198.5-200') 48/50. Had to drive entire 20 ft joint of casing. Kelly down @ 0821. New connection @ 1110. Resumed drilling @ 1112.		
205					Same as above (190 ft); no odor.					
210										

S	L					Bore	eho	le IC): KAFB-	106113
Pro Pro	ojec Djec	t Loca	ation ne: k	: KÁI (AFB	os of Engineers FB, Albuquerque, NM BFF SWMU ST-106 and SS-111	Hole Diameter Upper (in.): 11-3/4 Hole Diameter Lower (in.): 9-5/8 Surface Completion Type: Flush mount				
Da [:] Da	te S te T	Started	d: 1/ ache	18/20 d: 2/	11 5/2011	∑ At⊺ ▼ At I	Time of End of			
YC	Cool	d Elev rdinat rdinat	e: 14	47306			Metho	d: Air I	WDC Drilling Rotary Casing H ucero	ammer Page 8 of 16
0 Depth (ft)	Sample Type	Number	Headspace PID	Lithologic Log	Material Description		U.S.C.S.	W	'ell Diagram	Remarks
	-				Well graded SAND (SW); light re brown (2.5YR 6/3); dry to moist; 90% fine to coarse sand; subrou subangular; 10% fine gravel to 1 subrounded; no odor. Pumice	loose; nded to	SW			
- 215 - - - 220 - - - - - - - - - - - - - - -					Clasts/fragments at ~211 ft. Well graded GRAVEL with Sand light reddish brown (2.5YR 6/3); moist; loose; 85% fine to coarse to 4cm; subrounded; 15% fine to sand; subrounded; no odor. Same as above (213 ft); no odor	dry to gravel coarse	GW		- Bentonite Seal	Color change may be HC staining. Kelly down @ 1127. New connection @ 1219. Resumed drilling @ 1220.
230					Well graded SAND (SW); light re gray (2.5YR 7/1); dry to moist; lo 100% fine to coarse sand; subro to subangular; trace fine gravel to no odor. Pumice noted. Same as above (225 ft); no odor Same as above (225 ft); no odor	ose; unded o 1cm;	SW		- Top of Filter Pack	
										Kelly down @ 1241.

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Date Started: 1/18/2011 Date TD Reached: 2/5/2011 Date Completed: 2/8/2011

Ground Elevation AMSL (ft): 5345.8 Y Coordinate: 1473064.22 X Coordinate: 1542004.39

Borehole ID: KAFB-106113

Hole Diameter Upper (in.): 11-3/4 Hole Diameter Lower (in.): 9-5/8 Surface Completion Type: Flush mount

Groundwater Levels BGS (ft): \square At Time of Drilling: N/A \blacksquare At End of Drilling: N/A \square After Drilling: N/A

Drilling Contractor: WDC Drilling Drilling Method: Air Rotary Casing Hammer Logged By: Brian Lucero

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5 Depth (ft)	Sample Type	Number	Headspace PID	Lithologic Log	Material Description	U.S.C.S.	We	ell Diagram	Remarks
- - - 245 -					Well graded SAND (SW); light reddish gray (2.5YR 7/1); dry; loose; 95% fine to coarse sand; subrounded to subangular; 5% fine to coarse gravel to 3cm; subrounded to subangular; no odor. Well graded SAND with Gravel (SW); light reddish gray (2.5YR 7/1); dry; loose;	SW		Schedule 80 PVC 0.050 Slot Screen	New connection @1250. Resumed drilling @ 1251.
- - <u>250</u> - -	X	SB0081	214.0		80% fine to coarse sand; subrounded to subangular; 20% fine to coarse gravel to 4cm; subrounded; no odor. Same as above (245 ft); no odor. SILT (ML); reddish brown (5YR 4/3); dry to moist; stiff; 100% silt; no odor.			- Bottom of Screen	Blow counts (248.5-250'): 27/50. Kelly down @1304 on 01/21/11. New connection @1143 on 01/22/11. Resumed drilling @1144.
- 255 - -					Same as above (251 ft); no odor. SILT (ML) reddish brown (5YR 4/3); dry	ML			unning @1144.
- <u>260</u> -					to moist; stiff; 80% silt; 20% clay; no odor. Same as above (257 ft); no odor.			- Bentonite Seal	Kelly down @ 1155. New connection @ 1205. Resumed drilling @ 1208. Casing driving very slowly below 260 ft.
- 265 - -					Poorly graded SAND with Silt (SP-SM); pale red (2.5YR 6/2); dry to moist; loose; 90% fine sand; 10% silt; no odor.	SP- SM			



Date Started: 1/18/2011 Date TD Reached: 2/5/2011 Date Completed: 2/8/2011

Ground Elevation AMSL (ft): 5345.8 Y Coordinate: 1473064.22 X Coordinate: 1542004.39

Borehole ID: KAFB-106113

Hole Diameter Upper (in.): 11-3/4 Hole Diameter Lower (in.): 9-5/8 Surface Completion Type: Flush mount

Groundwater Levels BGS (ft): \Box At Time of Drilling: N/A \blacksquare At End of Drilling: N/A \blacksquare After Drilling: N/A

Drilling Contractor: WDC Drilling Drilling Method: Air Rotary Casing Hammer Logged By: Brian Lucero

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05 Depth (ft)	Sample Type	Number	Headspace PID	Lithologic Log	Material Description	U.S.C.S.	Well Diagram	n Remarks
275	-				Poorly graded SAND with Silt (SP-SM); pale red (2.5YR 6/2); dry to moist; loose; 90% fine sand; 10% silt; no odor.	SP- SM		
	-				Silty SAND (SM); pale red (2.5YR 6/2); dry to moist; loose; 80% very fine to fine sand; 20% silt; no odor.	SM		Casing driving very slowly to 280 ft. Kelly down @ 1239.
280	$\left \right $				Poorly graded SAND (SP); light reddish	SP		New connection @ 1247.
	-				gray (2.5YR 7/1); dry; loose; 95% fine /- sand; trace medium to coarse sand; / angular to subangular; 5% silt; no odor. Well graded SAND (SW); light reddish	SW		Resumed drilling @ 1251.
285					gray (2.5YR 7/1); dry; loose; 95% fine to coarse sand; angular to subrounded; 5% silt; no odor.	GM	- Bentonite S	Casing won't drive below Seal 285 ft.
290	-				Silty GRAVEL with Sand (GM); reddish brown (5YR 5/4); dry to moist; loose; 70% fine to medium gravel to 3cm; subrounded to subangular; 15% fine to coarse sand; subrounded to subangular; 15% silt; no odor. Lean CLAY (CL); light reddish brown (5YR 6/3); dry; very stiff; 90% clay (as nodules); 10% silt; no odor.	CL		Below 285 ft, clay discharged as large, abraded nodules.
295	-				No cuttings returned; only heavy dust (fines).			
300		SB0082	0.0					Blow count (298.5-300'): 19/50. Kelly down @ 1347. End of 01/22/11.



Date Started: 1/18/2011 Date TD Reached: 2/5/2011 Date Completed: 2/8/2011

Ground Elevation AMSL (ft): 5345.8 Y Coordinate: 1473064.22 X Coordinate: 1542004.39

Borehole ID: KAFB-106113

Hole Diameter Upper (in.): 11-3/4 Hole Diameter Lower (in.): 9-5/8 Surface Completion Type: Flush mount

Groundwater Levels BGS (ft): \Box At Time of Drilling: N/A \blacksquare At End of Drilling: N/A \blacksquare After Drilling: N/A

Drilling Contractor: WDC Drilling Drilling Method: Air Rotary Casing Hammer Logged By: Brian Lucero

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00 Depth (ft)	Sample Type	Number	Headspace PID	Lithologic Log	Material Description	U.S.C.S.	Well Diagram	Remarks
305		SB0082 SB0082			Poorly graded SAND with Gravel (SP); light reddish gray (2.5YR 7/1); dry; loose; 85% coarse sand; trace fine to medium sand; subangular to subrounded; 15% fine gravel; trace medium gravel to 3cm; no odor. Note: sample in split spoon is well graded sand with gravel (SW);	SP		Began 01/23/11. Fmn. is weakly consolidated to unconsolidated - could not collect sample with out sand catcher. Blow counts (300-301.5'): 12/50. Blow counts (201.5, 2021): 27/50.
-	-				 blowing fines out during slow drilling. Well graded SAND with Gravel (SW); light reddish gray (2.5YR 7/1); dry; loose; 80% fine to coarse sand; subrounded; 20% fine to medium gravel to 2cm; subrounded to subangular; no odor. Heavy coarse gravel at 308 ft. 			(301.5-303'): 27/50. New connection @ 1049 Resumed drilling @1058
<u>310</u>					Same as above (305 ft); no odor.	SW		
<u>315</u>	-				Well graded GRAVEL with Sand (GW); light reddish gray (2.5YR 7/1); dry; loose; 85% fine to coarse gravel to 5cm; subrounded to subangular; 15% coarse sand; subrounded to subangular; no odor; gravel consists of lithics and		- Bentonite Seal	
<u>320</u>	-				mineral clasts (granite, dacite, feldspar, quartzite). Same as above (315 ft); sand is fine to coarse; no odor. Well graded SAND (SW); reddish brown (5YR 5/4); dry to moist; loose; 95% fine			Kelly down @ 1116. New connection @ 1126 Resumed drilling @1127
325	-				to coarse sand; subangular; 5% silt; no odor. Same as above (322 ft); trace gravel to 3cm; no odor.	SW		
330								



Date Started: 1/18/2011 Date TD Reached: 2/5/2011 Date Completed: 2/8/2011

Ground Elevation AMSL (ft): 5345.8 Y Coordinate: 1473064.22 X Coordinate: 1542004.39

Borehole ID: KAFB-106113

Hole Diameter Upper (in.): 11-3/4 Hole Diameter Lower (in.): 9-5/8 Surface Completion Type: Flush mount

Groundwater Levels BGS (ft): \square At Time of Drilling: N/A \blacksquare At End of Drilling: N/A \blacksquare After Drilling: N/A

Drilling Contractor: WDC Drilling Drilling Method: Air Rotary Casing Hammer Logged By: Brian Lucero

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00 Depth (ft)	Sample Type	Number	Headspace PID	Lithologic Loa	Material Description	U.S.C.S.	Well [Diagram	Remarks
-					Well graded SAND (SW); light reddish gray (2.5YR 7/1); dry; loose; 90% fine to coarse sand; subangular to subrounded; 10% fine to coarse gravel to 5cm; subrounded; no odor.		- В	Bentonite Seal	
335 - -					Same as above (330 ft); no odor.	SW		op of Filter Pack	
- <u>340</u> - - -					Same as above (330 ft); 95% sand; 5% gravel; no odor; higher percentage of fine to medium sand.		S	op of 3/4" Schedule 80 PVC 0.050 Slot Screen	Kelly down @ 1147. New connection @ 1157. Resumed drilling @ 1158.
<u>345</u> - -					Poorly graded SAND (SP); light reddish gray (2.5YR 7/1); dry; loose; 95% fine sand; some medium sand; subrounded to subangular; 5% silt; no odor.	SP			Blow counts (348.5-350'):
<u>350</u> - -	$\left(\right)$	SB0083 SB0083	0.1		Poorly graded SAND with Silt (SP-SM); light reddish brown (5YR 6/4); dry to moist; loose; 90% very fine to fine sand; trace medium sand; 10% silt; no odor.		Fig. 19 and the HILL	Bottom of Screen	21/50. Blow counts: (350-351.5'): 27/50. Kelly down @ 1216. New connection @ 1242. Resumed drilling @1243.
355					Same as above (350 ft); minor medium to coarse sand; subrounded to subangular; trace fine gravel to 1.5cm; subrounded; no odor.	SP- SM	- В	Bentonite Seal	Hammer stopped firing @ 1301, stopped advancing. Resumed advancing @ 1325. Stopped at ~357 ft @ 1335. Resumed
360					- - - -				attempting to advance @



Date Started: 1/18/2011 Date TD Reached: 2/5/2011 Date Completed: 2/8/2011

Ground Elevation AMSL (ft): 5345.8 Y Coordinate: 1473064.22 X Coordinate: 1542004.39

Borehole ID: KAFB-106113

Hole Diameter Upper (in.): 11-3/4 Hole Diameter Lower (in.): 9-5/8 Surface Completion Type: Flush mount

Groundwater Levels BGS (ft): \square At Time of Drilling: N/A \blacksquare At End of Drilling: N/A \blacksquare After Drilling: N/A

Drilling Contractor: WDC Drilling Drilling Method: Air Rotary Casing Hammer Logged By: Brian Lucero

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8 Depth (ft)	Sample Type	Number	Headspace PID	Lithologic Log	Material Description	U.S.C.S.	Well Diagram	Remarks
365	-				Poorly graded SAND (SP); light reddish gray (2.5YR 7/1); dry; loose; 95% very fine to fine sand; 5% silt; no odor. Same as above (360 ft); trace medium to coarse sand; subangular; no odor.	SP		1412. Kelly down @ 1425. End of 01/23/11. Began 02/05/11 - Tripped out all 9-5/8" casing between 01/23/11 and 02/03/11. Had slough to 139 ft bgs with casing out of hole (likely base of younger alluvium). New connection @ 0911. Resumed drilling @ 0912.
<u>370</u>	-				Well graded SAND (SW); light reddish gray (2.5 YR 7/1); dry; loose; 95% fine to coarse sand; subangular to subrounded; 5% silt; no odor.			
<u>375</u> 380	-				Same as above (370 ft); no odor; gravel from discharge below 375 ft; chert gravel noted.	SW	- Bentonite Seal	Kelly down @ 0930.
385	-				Well graded SAND (SW); light reddish gray (2.5YR 7/1); dry to moist; loose; 90% fine to coarse sand; subangular to subrounded; 5% fine to coarse gravel; subangular to subrounded; 5% silt; no odor.			New connection @ 0943. Resumed drilling @ 0944.
390	-				Poorly graded SAND (SP); light reddish gray (2.5YR 7/1); dry; loose; 95% fine to medium sand; trace coarse sand; subangular to subrounded; 5% silt; no odor.	SP		



Date Started: 1/18/2011 Date TD Reached: 2/5/2011 Date Completed: 2/8/2011

Ground Elevation AMSL (ft): 5345.8 Y Coordinate: 1473064.22 X Coordinate: 1542004.39

Borehole ID: KAFB-106113

Hole Diameter Upper (in.): 11-3/4 Hole Diameter Lower (in.): 9-5/8 Surface Completion Type: Flush mount

Groundwater Levels BGS (ft): \square At Time of Drilling: N/A \blacksquare At End of Drilling: N/A \blacksquare After Drilling: N/A

Drilling Contractor: WDC Drilling Drilling Method: Air Rotary Casing Hammer Logged By: Brian Lucero

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ΧC	X Coordinate: 1542004.39 Logged By. Bhan Lucero								
66 Depth (ft)	Sample Type	Number	Headspace PID Lithologic Log Material Descript		Material Description	ທ່ O. ທ່ D. Well Diagram		Remarks	
- - - 395					Poorly graded SAND (SP); light reddish gray (2.5YR 7/1); dry; loose; 95% fine to medium sand; trace coarse sand; subangular to subrounded; 5% silt; no odor.	SP			
- - -					Well graded SAND (SW); light reddish gray (2.5YR 7/1); dry; loose; 100% fine to coarse sand; subangular to subrounded; trace fine gravel to 0.5cm; subrounded.			Blow counts (398.5-400'):	
<u>400</u> - -		SB0084 SB0084	9.9		Same as above (395 ft); no odor.	SW		6/NR. Blow counts: (400-401.5'): 9/50. Kelly down @ 1002. New connection @ 1327. Resumed drilling @ 1335.	
- 405 - -					Same as above (395 ft); no odor.		- Bentonite Seal		
- <u>+10</u> - -					Poorly graded SAND (SP); light reddish gray (2.5YR 7/1); dry to moist; loose; 95% fine sand; trace medium to coarse sand; angular to subrounded; 5% silt; no odor.				
4 <u>15</u> - -					Same as above (410 ft); 95% very fine to fine sand; trace medium to coarse sand; subangular to subrounded; 5% silt; no odor.	SP			
- 420								Kelly down @ 1356.	



Date Started: 1/18/2011 Date TD Reached: 2/5/2011 Date Completed: 2/8/2011

Ground Elevation AMSL (ft): 5345.8 Y Coordinate: 1473064.22 X Coordinate: 1542004.39

Borehole ID: KAFB-106113

Hole Diameter Upper (in.): 11-3/4 Hole Diameter Lower (in.): 9-5/8 Surface Completion Type: Flush mount

Groundwater Levels BGS (ft): \square At Time of Drilling: N/A \blacksquare At End of Drilling: N/A \blacksquare After Drilling: N/A

Drilling Contractor: WDC Drilling Drilling Method: Air Rotary Casing Hammer Logged By: Brian Lucero

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	Coordinate: 1542004.39 Logged By. Bhan Lucero								
5 Depth (ft)	Sample Type	Sample Type Number Headspace PID		Lithologic Log	Material Description		Well Diagram		Remarks
425					Poorly graded SAND with Silt (SP-SM); light reddish brown (2.5YR 7/1); dry to moist; loose; 90% very fine to fine sand; trace medium sand; 10% silt; no odor.	SP- SM			New connection @ 1403 Resumed drilling @ 1403.
430					Poorly graded SAND (SP); light reddish brown (2.5YR 7/1); dry to moist; loose; 95% fine sand; trace medium sand; 5% silt; no odor.	SP		- Bentonite Seal	The interval from 425 ft to 435 ft consists of interbedded fine to coarse sands and fine to coarse gravels.
-					Well graded SAND (SW); light reddish gray (2.5YR 7/1); dry to moist; loose; 100% fine to coarse sand; subangular to subrounded; trace fine gravel to 12cm; subrounded; no odor.				
<u>435</u> - -	-				Same as above (430 ft); no odor.			- Top of Filter Pack	
<u>440</u> - -					Same as above (430 ft); no gravel; no odor.	SW		- Top of 3" Schedule 80 PVC 0.050 Slot Screen	Kelly down @ 1423. New connection @ 1430 Resumed drilling @ 1431.
- <u>445</u> - -					Same as above (430 ft); no odor; gravel lense at 447 ft.				
450	X	SB0085	3.2	••••••					Blow counts (448.5-450') 37/50.



Borehole ID: KAFB-106113

Client: US Army Corps of Engineers Project Location: KAFB, Albuquerque, NM Project Name: KAFB BFF SWMU ST-106 and SS-111 Project Number: 140705

Date Started: 1/18/2011 Date TD Reached: 2/5/2011 Date Completed: 2/8/2011

Ground Elevation AMSL (ft): 5345.8 Y Coordinate: 1473064.22 X Coordinate: 1542004.39 Hole Diameter Upper (in.): 11-3/4 Hole Diameter Lower (in.): 9-5/8 Surface Completion Type: Flush mount

Groundwater Levels BGS (ft): \Box At Time of Drilling: N/A \blacksquare At End of Drilling: N/A \blacksquare After Drilling: N/A

Drilling Contractor: WDC Drilling Drilling Method: Air Rotary Casing Hammer Logged By: Brian Lucero

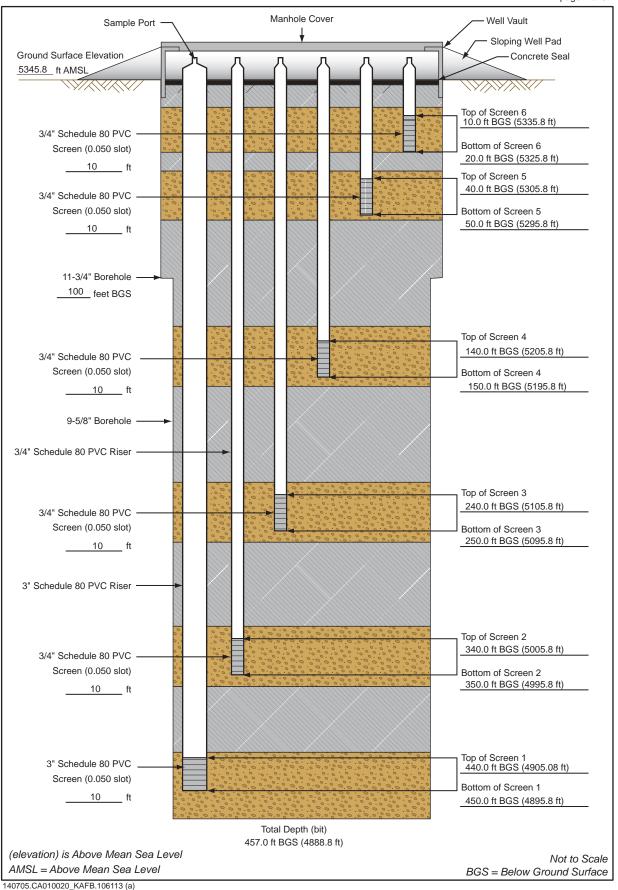
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~ ~ ~	Coordinate: 1542004.39 Logged By. Bhan Lucero							
5 Depth (ft)	Sample Type	Number	Headspace PID	Lithologic Log	Material Description	U.S.C.S.	Well Diagram	Remarks
455	ΝΛ	SB0085			Well graded SAND (SW); light reddish gray (2.5YR 7/1); dry to moist; loose; 100%fine to coarse sand subangular to subrounded; large gravel and cobbles noted in sample; no odor; slight odor from headspace sample.	sw	Screen	Blow counts (450-451.5): 48/50.
460	-			<u>.**.1</u>				Total depth = 457 ft. Reached @ 1540 on 2/8/11. Water added during drilling = 0
465	-							Water added during construction = Not Recorded Spud: started drilling from surface.
470	-							Kelly down: TD the joint and ready to make new connection.
475	-							
480	-							

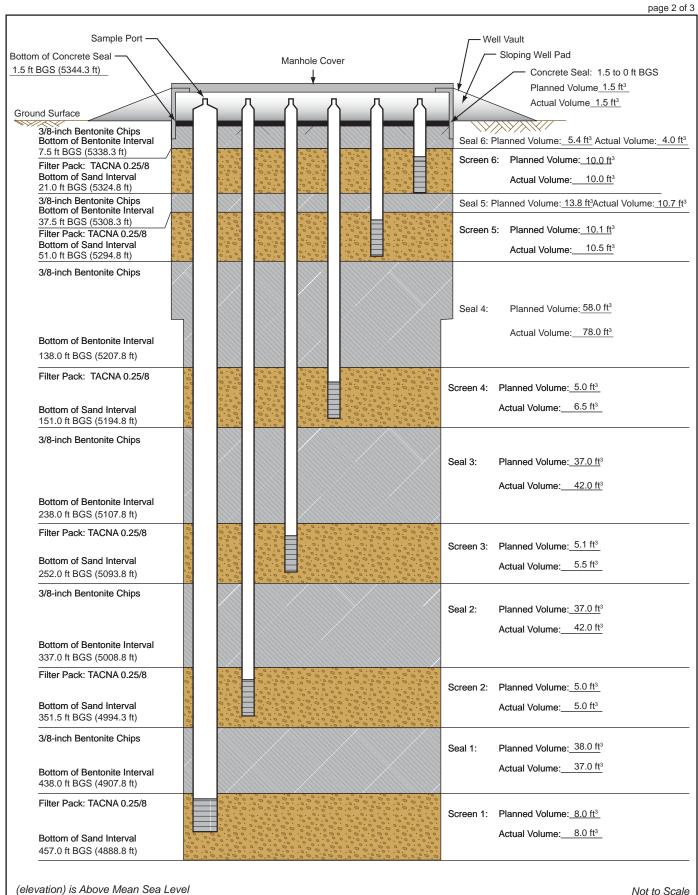
Nested Soil Vapor Well Completion Diagram for KAFB-106113

Installation Start Date/Time: 2/5/2011 @ 08:08 Installation End Date/Time: 2/8/2011 @ 10:51





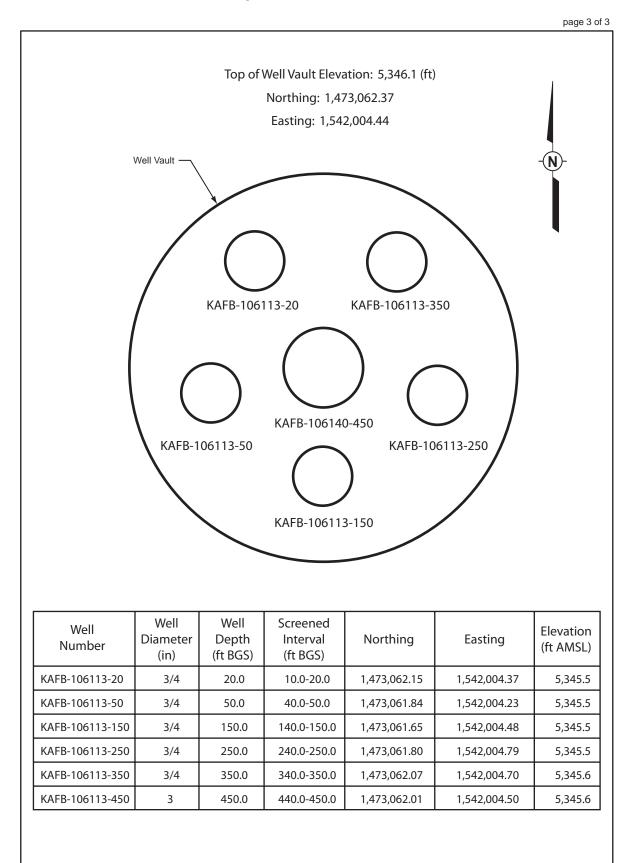
Nested Soil Vapor Well Completion Diagram for KAFB-106113



All Materials Placed with Tremie Pipe

Not to Scale BGS = Below Ground Surface

Nested Soil Vapor Well Completion Diagram Map View for KAFB-106113



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APPENDIX D-1

KAFB-106114 Final Well Report

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Date Started: 2/20/2011 Date TD Reached: 2/23/2011 Date Completed: 3/1/2011

Ground Elevation AMSL (ft): 5344.8 Y Coordinate: 1473064.09 X Coordinate: 1541796.70

Borehole ID: KAFB-106114

Hole Diameter Upper (in.): 11-3/4 Hole Diameter Lower (in.): 9-5/8 Surface Completion Type: Flush mount

Groundwater Levels BGS (ft): \square At Time of Drilling: N/A \blacksquare At End of Drilling: N/A \blacksquare After Drilling: N/A

Drilling Contractor: WDC Drilling Drilling Method: Air Rotary Casing Hammer Logged By: Allen Willmore

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		Junat	C. IV		Logged	- Dy. 7		
⊖ Depth (ft)	Sample Type	Number	Headspace PID	Lithologic Log	Material Description	U.S.C.S.	Well Diagram	Remarks
-					SILT with Sand (ML); red (2.5YR 5/6); moist; 80% silt with clay; 20% very fine to fine sand; subrounded to subangular.		- Concrete Seal	Hand augered.
5					Same as above (0 ft); no odor.		Derterite Geel	Began drilling @ 1415 on 2/20/11.
 	X	SB0086	0.1		Same as above (0 ft); hard; gravel lense 12-13'.	ML	- Bentonite Seal	Blow counts (9-10.5'): 12/19/23. New 10' connection @ 1440.
- 15 - -					Same as above (0 ft); red (2.5YR 4/8); no odor.		- Top of Filter Pack - Top of 3/4" Schedule 80 PVC 0.050 Slot Screen	
 		SB0087	0.1		Lean CLAY (CL); red (2.5YR 5/6); dry; firm; low plasticity; 60% clay; 30% silt; 10% sand; no odor.			Blow counts (19-20.5'): 13/27/34. New connection @ 1505.
 					Same as above (20 ft); less clay; more silt; no odor.	CL	- Bottom of Screen	
30		SB0088	0.2				- Bentonite Seal	Blow counts (29-30.5'):



Date Started: 2/20/2011 Date TD Reached: 2/23/2011 Date Completed: 3/1/2011

Ground Elevation AMSL (ft): 5344.8 Y Coordinate: 1473064.09 X Coordinate: 1541796.70

Borehole ID: KAFB-106114

Hole Diameter Upper (in.): 11-3/4 Hole Diameter Lower (in.): 9-5/8 Surface Completion Type: Flush mount

Groundwater Levels BGS (ft): \square At Time of Drilling: N/A \blacksquare At End of Drilling: N/A \blacksquare After Drilling: N/A

Drilling Contractor: WDC Drilling Drilling Method: Air Rotary Casing Hammer Logged By: Allen Willmore

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	Sooruma			Logged	,	-		
ଟି Depth (ft)	Sample Type Number	Headspace PID	Lithologic Log	Material Description	U.S.C.S.	We	ell Diagram	Remarks
	SB0089	0.2		SILT with Sand (ML); reddish brown (5YR 5/4); moist; soft; 55% silt; 20% clay; 25% sand; no odor.	ML		- Bentonite Seal	12/18/32. Blow counts (30.5-32'): Not Recorded. New 10' connection @ 1525.
35	-			Lean CLAY with Sand (CL); red (2.5YR 5/6); dry; firm; 80% clay; 15% sand; 5% gravel; no odor.			- Top of Filter	
40	SB0090	0.3		Sandy Lean CLAY (CL); red (2.5YR 4/6); dry; stiff; 65% clay; 30% sand; 5% gravel.			Pack - Top of 3/4" Schedule 80 PVC 0.050 Slot Screen	Blow counts (39-40.5'): 7/14/26. New 10' connection @ 1545.
45	-			Same as above (40 ft); reddish brown (2.5YR 4/4).	CL			
50	SB0091	0.3		Same as above (40 ft).			- Bottom of Screen	Blow counts (49-50.5'): 11/14/21. New 10' connection @ 1605.
55	-			Poorly graded SAND with Silt and Gravel (SP-SM); reddish brown (5YR 5/4); dry; loose to medium dense; 60% coarse sand; 30% gravel; angular to subrounded; 10% silt; no odor.	SP- SM		- Bentonite Seal	



Borehole ID: KAFB-106114

Client: US Army Corps of Engineers Project Location: KAFB, Albuquerque, NM Project Name: KAFB BFF SWMU ST-106 and SS-111 Project Number: 140705

Date Started: 2/20/2011 Date TD Reached: 2/23/2011 Date Completed: 3/1/2011

Ground Elevation AMSL (ft): 5344.8 Y Coordinate: 1473064.09 X Coordinate: 1541796.70 Hole Diameter Upper (in.): 11-3/4 Hole Diameter Lower (in.): 9-5/8 Surface Completion Type: Flush mount

Groundwater Levels BGS (ft): \square At Time of Drilling: N/A \blacksquare At End of Drilling: N/A \blacksquare After Drilling: N/A

Drilling Contractor: WDC Drilling Drilling Method: Air Rotary Casing Hammer Logged By: Allen Willmore

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						Solution Cogged By. Aller Willindle					
0 Denth (ft)	Sample Type	Number		Headspace PID	Lithologic Log	Material Description	U.S.C.S.	Well Diagram	Remarks		
6	<u>5</u> <u>0</u> <u>55</u>					SILT (ML); red (2.5YR 4/8); moist; soft; 70% silt; 30% clay. Same as above (60 ft). Same as above (60 ft); gravel fragments at 72'.	ML	- Bentonite Seal	New 10' connection @ 1625. New 20' connection @ 1645.		
8	5					Lean CLAY (CL); yellowish red (5YR 5/6); dry; stiff; non to low plasticity; 55% clay; 40% silt; 5% sand; no odor. Same as above (75 ft). Same as above (75 ft); reddish brown (5YR 4/3); hard.	CL				



Borehole ID: KAFB-106114

Client: US Army Corps of Engineers Project Location: KAFB, Albuquerque, NM Project Name: KAFB BFF SWMU ST-106 and SS-111 Project Number: 140705

Date Started: 2/20/2011 Date TD Reached: 2/23/2011 Date Completed: 3/1/2011

Ground Elevation AMSL (ft): 5344.8 Y Coordinate: 1473064.09 X Coordinate: 1541796.70 Hole Diameter Upper (in.): 11-3/4 Hole Diameter Lower (in.): 9-5/8 Surface Completion Type: Flush mount

Groundwater Levels BGS (ft): \square At Time of Drilling: N/A \blacksquare At End of Drilling: N/A \blacksquare After Drilling: N/A

Drilling Contractor: WDC Drilling Drilling Method: Air Rotary Casing Hammer Logged By: Allen Willmore

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	500	ordinate	J. I.	54173	16.70 Logged			
ଞ Depth (ft)	Sample Type	Number	Headspace PID	Lithologic Log	Material Description	U.S.C.S.	Well Diagram	Remarks
95					Sandy lean CLAY (CL); yellowish brown (10YR 5/4); dry; stiff; medium plasticity; no odor.	CL		New 10' connection.
					Silty SAND (SM); pale brown (10YR 6/3); moist; medium dense to dense; 80% fine sand; 20% silt.			Blow counts (99-100.5'):
100		SB0092	0.0		Same as above (95 ft); some gravel fragments.	SM		15/26/35. New 20' connection @ 0805 on 2/21/11.
105					Same as above (95 ft).		- Bentonite Seal	
110					Well graded GRAVEL (GW); reddish yellow (10YR 6/6); dry; 90% gravel; 10% coarse sand; subrounded; no odor.	GW		
115					SILT (ML); yellowish red; moist; non to low plasticity; 90% silt; 10% clay; no odor.	ML		
120								



Date Started: 2/20/2011 Date TD Reached: 2/23/2011 Date Completed: 3/1/2011

Ground Elevation AMSL (ft): 5344.8 Y Coordinate: 1473064.09 X Coordinate: 1541796.70

Borehole ID: KAFB-106114

Hole Diameter Upper (in.): 11-3/4 Hole Diameter Lower (in.): 9-5/8 Surface Completion Type: Flush mount

Groundwater Levels BGS (ft): \square At Time of Drilling: N/A \blacksquare At End of Drilling: N/A \blacksquare After Drilling: N/A

Drilling Contractor: WDC Drilling Drilling Method: Air Rotary Casing Hammer Logged By: Allen Willmore

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		ordinat		94178	6.70 Logged By: Allen Willmore				
05 Depth (ft)	Sample Type	Number	Headspace PID	Lithologic Log	Material Description	U.S.C.S.	Well Diagram	Remarks	
	-				Lean CLAY (CL); light brown (7.5YR 6/4); dry; hard; low plasticity; 75% clay; 25% silt; some angular gravel fragments; no odor.			New 20' connection @ 1320.	
125	-				Same as above (120 ft).	CL			
<u>130</u>	-				Same as above (120 ft); yellowish red (5YR 5/6); no gravel.		- Bentonite Seal		
135	-				Poorly graded SAND with Silt (SP-SM); light brown (7.5YR 6/3); moist; medium dense; 85% fine sand; 5% gravel; 10% silt; no odor.		- - Top of Filter Pack		
140	-				Same as above (135); no gravel.	SP- SM	- Top of 3/4" Schedule 80 PVC 0.050 Slot Screen	New 10' connection @ 1700.	
145	-				Same as above (135 ft); reddish yellow (7.5YR 6/6).				
150		SB0093	0.1					Blow counts (149-150.5'):	



Date Started: 2/20/2011 Date TD Reached: 2/23/2011 Date Completed: 3/1/2011

Ground Elevation AMSL (ft): 5344.8 Y Coordinate: 1473064.09 X Coordinate: 1541796.70

Borehole ID: KAFB-106114

Hole Diameter Upper (in.): 11-3/4 Hole Diameter Lower (in.): 9-5/8 Surface Completion Type: Flush mount

Groundwater Levels BGS (ft): \Box At Time of Drilling: N/A \blacksquare At End of Drilling: N/A \blacksquare After Drilling: N/A

Drilling Contractor: WDC Drilling Drilling Method: Air Rotary Casing Hammer Logged By: Allen Willmore

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15 Denth (ft)	Sample Type	Numk	Headspace PID	Lithologic Log	Material Description	U.S.C.S.	We	ll Diagram	Remarks
	-				Poorly graded SAND with Silt (SP-SM); light brown (7.5YR 6/3); moist; medium dense; 85% fine sand; 5% gravel; 10% silt; no odor.	SP- SM		Bottom of Screen	19/17/26. New 10' connection @ 0815 on 2/22/11.
15	5				Well graded SAND (SW); light brown (7.5YR 6/3); dry to moist; dense; 90% fine to coarse sand; 10% gravel; angular to subrounded; no odor.				
16	- - - - 0								
	-				Same as above (153 ft); no gravel; more fine grained; moderately sorted.				New 10' connection @ 0900.
16	5				Same as above (153 ft); becomes poorly graded.	SW		- Bentonite Seal	
17	<u>-</u> - - -				Same as above (153 ft).				New 10' connection @ 0915.
<u>17</u>	5				Same as above (153 ft); small gravel.				
18	5								



Date Started: 2/20/2011 Date TD Reached: 2/23/2011 Date Completed: 3/1/2011

Ground Elevation AMSL (ft): 5344.8 Y Coordinate: 1473064.09 X Coordinate: 1541796.70

Borehole ID: KAFB-106114

Hole Diameter Upper (in.): 11-3/4 Hole Diameter Lower (in.): 9-5/8 Surface Completion Type: Flush mount

Groundwater Levels BGS (ft): \square At Time of Drilling: N/A \blacksquare At End of Drilling: N/A \blacksquare After Drilling: N/A

Drilling Contractor: WDC Drilling Drilling Method: Air Rotary Casing Hammer Logged By: Allen Willmore

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08 Depth (ft)	Sample Type	Number	Headspace PID	Lithologic Log	Material Description	U.S.C.S.	Well Diagram	Remarks
	-				Well graded SAND (SW); light brown (7.5YR 6/3); dry to moist; dense; 90% fine to coarse sand; 10% gravel; angular to subrounded; no odor.			New 20' connection @ 0925.
185	-				Well graded SAND with Gravel (SW); light brown (7.5YR 6/3); dry; 80% sand; 20% coarse gravel; subangular to subrounded.			
<u>190</u>	-				Same as above (185 ft).	SW		
195	-				Same as above (185 ft).		- Bentonite Seal	
200	\mathbb{H}	SB0094 SB0094- <u>MS</u> / SB0094- MSD			Poorly graded SAND (SP); light brown (7.5YR 6/3); moist; 95% fine sand; 5% gravel; no odor.			Blow counts (199-200.5'): 12/19/37. Blow counts (200.5-202'): 6/12/28. New 20' connection @ 1015.
205	-				Same as above (200 ft).	SP		
210	-							



Date Started: 2/20/2011 Date TD Reached: 2/23/2011 Date Completed: 3/1/2011

Ground Elevation AMSL (ft): 5344.8 Y Coordinate: 1473064.09 X Coordinate: 1541796.70

Borehole ID: KAFB-106114

Hole Diameter Upper (in.): 11-3/4 Hole Diameter Lower (in.): 9-5/8 Surface Completion Type: Flush mount

Groundwater Levels BGS (ft): \square At Time of Drilling: N/A \blacksquare At End of Drilling: N/A \blacksquare After Drilling: N/A

Drilling Contractor: WDC Drilling Drilling Method: Air Rotary Casing Hammer Logged By: Allen Willmore

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01 Depth (ft)	Sample Type	Number	Headspace PID	Lithologic Log	Material Description	U.S.C.S.	Well Diagram	Remarks
215	-				Poorly graded SAND with Gravel (SP); light brown (7.5YR 6/3); moist; 60% sand; 40% gravel to 1.5cm.	SP		
213	-				Well graded SAND with Gravel (SW); light brown (7.5YR 6/3); dry; loose; gravel to 2cm; subangular to subrounded; no odor.			
220	-				Well graded SAND (SW); light brown (7.5YR 6/4); moist; medium dense; 90% sand; 10% coarse gravel; subangular to subrounded; no odor.	SW	- Bentonite Seal	New 20' connection @ 1025.
225	-				Poorly graded SAND (SP); light brown (7.5YR 6/4); moist; dense; 95% fine sand; 5% fines; no odor.			
230	-				Poorly graded SAND (SP); light brown (7.5YR 6/4); moist; dense to medium dense; 95% sand; 5% gravel and fines.	SP	Top of Filter Pack	
235					Same as above (230 ft).		- Top of 3/4" Schedule 80 PVC 0.050 Slot Screen	
240	1							

S	L					Borehole ID: KAFB-106114				
Pro Pro	ojec ojec	t Loca	tion e: K	: KÁI (AFB	os of Engineers FB, Albuquerque, NM BFF SWMU ST-106 and SS-111 705	Hole Diameter Upper (in.): 11-3/4 Hole Diameter Lower (in.): 9-5/8 Surface Completion Type: Flush mount				
Da Da	te S te T	Started	l: 2/2 ache	20/20 d: 2/2	11 23/2011	∑ At T ▼ At E	Time of End of	Levels E f Drilling Drilling: ng: N//	N/A	
YO	Coo	d Elev ordinate ordinate	e: 14	47306			Metho	d: Air F	NDC Drilling Rotary Casing H Ilmore	ammer Page 9 of 16
05 Depth (ft)	Sample Type	Number	Headspace PID	Lithologic Log	Material Description		U.S.C.S.	W	ell Diagram	Remarks
245	-				Well graded GRAVEL with Sand pinkish gray (7.5YR 4/2); dry; loo gravel; 40% coarse sand; subang angular; no odor.	se; 60%	GW			New 10' connection @ 1100.
2-10	-				Lean CLAY (CL); reddish brown 5/3); dry to moist; soft to firm; no plasticity; no odor.				Screen	
250	-	SB0095	0.7		Same as above (245 ft); stiff.		CL			Blow counts (249-250.5'): 27/36/50. New 10' connection @ 1155.
255	-				Same as above (245 ft).				- Bentonite Seal	
260					Well graded SAND with Clay and (SW-SC); brown (7.5YR 4/4); mc medium dense to dense; 60% sa 30% coarse gravel; 10% clay and odor.	oist; ind;	SW- SC			New 20' connection @ 1205.
265 270					Poorly graded SAND with Clay (light brown (7.5YR 6/4); moist; de 90% coarse sand; 10% clay and odor.	ense;	SP- SC			



Date Started: 2/20/2011 Date TD Reached: 2/23/2011 Date Completed: 3/1/2011

Ground Elevation AMSL (ft): 5344.8 Y Coordinate: 1473064.09 X Coordinate: 1541796.70

Borehole ID: KAFB-106114

Hole Diameter Upper (in.): 11-3/4 Hole Diameter Lower (in.): 9-5/8 Surface Completion Type: Flush mount

Groundwater Levels BGS (ft): \square At Time of Drilling: N/A \blacksquare At End of Drilling: N/A \blacksquare After Drilling: N/A

Drilling Contractor: WDC Drilling Drilling Method: Air Rotary Casing Hammer Logged By: Allen Willmore

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	-00	rainat	e: it	94179	16.70 Logged	Allen Willmore		
02 Depth (ft)	Sample Type	Number Number Headspace PID Lithologic Logic			Material Description			Remarks
					Poorly graded SAND with Clay (SP-SC); light brown (7.5YR 6/4); moist; dense; 90% coarse sand; 10% clay and silt; no odor.			
					Same as above (270); slight odor.	SP- SC		
-					Same as above (270 ft); slight odor. Lean CLAY (CL); light brown (7.5YR			New 20' connection @ 1315.
-					6/3); dry; hard; nonplastic; 90% clay with silt; 10% sand; no odor.			
285					Same as above (281 ft).	CL	- Bentonite Seal	
<u>290</u> - -					Poorly graded SAND with Gravel (SP); light brown (7.5YR 6/3); moist; medium dense; 70% sand; 30% gravel to 1cm; angular to subrounded; no odor.			
<u>295</u> - -					Same as above (290 ft); more gravel.	SP		
300		SB0096	1.1					Blow counts (299-300.5'):

Shaw	
Client: US Army Corps of Engineers Project Location: KAFB, Albuquerque,	NM

Project Number: 140705

Date Started: 2/20/2011

Date TD Reached: 2/23/2011 Date Completed: 3/1/2011

Y Coordinate: 1473064.09

X Coordinate: 1541796.70

Ground Elevation AMSL (ft): 5344.8

Project Name: KAFB BFF SWMU ST-106 and SS-111

Borehole ID: KAFB-106114

Hole Diameter Upper (in.): 11-3/4 Hole Diameter Lower (in.): 9-5/8 Surface Completion Type: Flush mount

Groundwater Levels BGS (ft): \square At Time of Drilling: N/A \blacksquare At End of Drilling: N/A \blacksquare After Drilling: N/A

Drilling Contractor: WDC Drilling Drilling Method: Air Rotary Casing Hammer Logged By: Allen Willmore

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00 Depth (ft)	10	Number	Headspace PID	Lithologic Log	Material Description	U.S.C.S.	Well Diagram	Remarks
-	\mathbb{A}^{-}	31743	1.1		Well graded GRAVEL (GW); brown (7.5YR 5/3); dry; loose; 90% gravel to 5cm; 10% coarse sand; subangular to rounded; no odor.			8/16/27. Blow counts (300.5-302') 7/14/26. New 20' connection @ 1645.
<u>305</u> - -					Same as above (300 ft); gravel to 0.5cm; more sand; finer.	GW		
310					Well graded SAND with Gravel (SW); light brown (7.5YR 6/4); dry; loose; 85% sand; 15% fine gravel to 0.5cm; no odor.			
315					Same as above (310 ft); some gravel; finer.		- Bentonite Seal	
<u>320</u>					Same as above (310 ft).	SW		New connection @ 0800 on 2/23/11.
<u>325</u>					Same as above (310 ft); finer.			
330	-							



Date Started: 2/20/2011 Date TD Reached: 2/23/2011 Date Completed: 3/1/2011

Ground Elevation AMSL (ft): 5344.8 Y Coordinate: 1473064.09 X Coordinate: 1541796.70

Borehole ID: KAFB-106114

Hole Diameter Upper (in.): 11-3/4 Hole Diameter Lower (in.): 9-5/8 Surface Completion Type: Flush mount

Groundwater Levels BGS (ft): \square At Time of Drilling: N/A \blacksquare At End of Drilling: N/A \blacksquare After Drilling: N/A

Drilling Contractor: WDC Drilling Drilling Method: Air Rotary Casing Hammer Logged By: Allen Willmore

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(ft) Type ber	υ				
05 Depth (ft) Sample Type Number	Headspace PID Lithologic Log	Material Description	U.S.C.S.	Well Diagram	Remarks
-		Well graded SAND with Gravel (SW); light brown (7.5YR 6/4); dry; loose; 85% sand; 15% fine gravel to 0.5cm; no odor.		Destacite Occi	
335		Same as above (330 ft).	SW	- Bentonite Seal	New 10' connection @ 0910.
340	· • • • • • • • • • • • • • • • • • • •	Well graded GRAVEL with Sand (GW); pinkish gray (7.5YR 7/2); dry; loose; 70% gravel to 1cm; 30% coarse sand; subrounded to subangular; no odor.	GW	- Top of 3/4" Schedule 80 PVC 0.050 Slot Screen	
350 SB0097	0.3	Well graded SAND (SW); light brown (7.5YR 6/3); dry; loose; 100% sand; no odor.			Blow counts (349-350.5'):
		Well graded SAND with Gravel (SW); light brown (7.5YR 6/3); dry; loose; 70% sand; 30% gravel to 3cm; subangular to rounded; no odor.	SW	Bottom of Screen	11/49/50. New 10' connection @1025.
355		Well graded SAND with Gravel (SW); brown (7.5YR 5/4); moist; medium dense; 60% sand; 40% gravel to 2cm; angular to subrounded; no odor.		- Bentonite Seal	



Date Started: 2/20/2011 Date TD Reached: 2/23/2011 Date Completed: 3/1/2011

Ground Elevation AMSL (ft): 5344.8 Y Coordinate: 1473064.09 X Coordinate: 1541796.70

Borehole ID: KAFB-106114

Hole Diameter Upper (in.): 11-3/4 Hole Diameter Lower (in.): 9-5/8 Surface Completion Type: Flush mount

Groundwater Levels BGS (ft): \square At Time of Drilling: N/A \blacksquare At End of Drilling: N/A \blacksquare After Drilling: N/A

Drilling Contractor: WDC Drilling Drilling Method: Air Rotary Casing Hammer Logged By: Allen Willmore

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95 Depth (ft)	Sample Type	Number	Headspace PID	Lithologic Log	Material Description	U.S.C.S.	Well Diagram	Remarks
					Well graded SAND (SW); brown (7.5YR 5/4); moist; medium dense; 100% sand; angular to subrounded; no odor.	SW		New 20' connection @ 1040.
365					Same as above (360 ft).			
					Poorly graded SAND (SP); pinkish gray (7.5YR 6/2); dry; loose; 100% sand; no odor.			
370	-				Same as above (367 ft).	SP		
375	-				Well graded SAND with Gravel (SW); pinkish gray (7.5YR 6/2); dry; loose to medium dense; 55% sand; 45% gravel to 0.8cm; no odor.		- Bentonite Seal	
380					Same as above (375 ft).	SW		New 20' connection.
	-				Poorly graded SAND (SP); dry; sand lense.	SP		
385					Well graded SAND with Gravel (SW); pinkish gray (7.5YR 6/2); dry; loose to medium dense; 55% sand; 45% gravel; no odor.	sw		
390								



Date Started: 2/20/2011 Date TD Reached: 2/23/2011 Date Completed: 3/1/2011

Ground Elevation AMSL (ft): 5344.8 Y Coordinate: 1473064.09 X Coordinate: 1541796.70

Borehole ID: KAFB-106114

Hole Diameter Upper (in.): 11-3/4 Hole Diameter Lower (in.): 9-5/8 Surface Completion Type: Flush mount

Groundwater Levels BGS (ft): \square At Time of Drilling: N/A \blacksquare At End of Drilling: N/A \blacksquare After Drilling: N/A

Drilling Contractor: WDC Drilling Drilling Method: Air Rotary Casing Hammer Logged By: Allen Willmore

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66 Depth (ft)	Sample Type	Number	Headspace PID	Lithologic Log	Material Description	U.S.C.S.	Well Diagram	Remarks
	_				Well graded SAND with Gravel (SW); pinkish gray (7.5YR 6/2); dry; loose to medium dense; 80% sand; 20% gravel; no odor.			
<u>395</u>	-				Same as above (390 ft); brown (7.5YR 5/4); moist; finer.	SW		
400		SB0098	1.2		Well graded GRAVEL with Sand (GW); light reddish brown (7.5YR 6/3); dry to moist; loose to medium dense; 55% gravel to 3cm; 45% sand; no odor.	GW		Blow counts (399-400.5'): 10/11/26. New 20' connection @ 1400.
405	-				Well graded SAND (SW); light brown (7.5YR 6/4); dry; loose; 100% sand; no odor.		- Bentonite Seal	
<u>410</u>	-				Well graded SAND with Gravel (SW); light brown (7.5YR 6/4); dry; loose; 55% sand; 45% gravel to 0.6cm; angular to subangular; no odor.	SW		
415					Same as above (410 ft); 70% sand; 30% gravel; finer.			
420					Poorly graded SAND (SP); light brown (7.5YR 6/3); dry; 90% fine sand; 10% coarse sand; no odor.	SP		

S	Cha					Bore	eho	le ID	: KAFB-′	106114	
Pro Pro	ojec ojec	t Loca Nam	ation: ie: K	KAF AFB	s of Engineers FB, Albuquerque, NM BFF SWMU ST-106 and SS-111	Hole Diameter Upper (in.): 11-3/4 Hole Diameter Lower (in.): 9-5/8 Surface Completion Type: Flush mount					
Da Da	Project Number: 140705 Date Started: 2/20/2011 Date TD Reached: 2/23/2011 Date Completed: 3/1/2011						Time o End of	Levels B f Drilling Drilling: ng: N/A	: N/À N/A		
Y	Coo	d Elev rdinate rdinate	e: 14	17306		Drillling Drilling	Contra Metho	actor: V	VDC Drilling otary Casing H	ammer Page 15 of 16	
5 Depth (ft)	Sample Type	Number	Headspace PID	Lithologic Log	Material Description		U.S.C.S.	We	ll Diagram	Remarks	
425	_				Well graded GRAVEL with Sand pinkish gray (7.5YR 7/2); dry; loo gravel to 2.3cm; 20% fine sand; i to subrounded; no odor.	se; 80%	GW			New 20' connection @ 1440.	
430	-				Well graded SAND with Gravel (brown (7.5YR 5/4); moist; loose; sand; 40% gravel to 1.2cm; subr to rounded.	60%	SW		- Bentonite Seal		
430	-				Poorly graded SAND (SP); pinkis (7.5YR 7/2); dry; loose; 100% co sand; angular to subangular.		SP				
	-				Well graded SAND with Gravel (pinkish gray (7.5YR 7/2); dry; loo sand; 20% gravel; angular to subangular.		sw		- Top of Filter Pack - Top of 3"		
440	-				Same as above (435 ft); finer.				Schedule 80 PVC 0.050 Slot Screen	New 10' and 5' connection @ 1520.	
445	-				Poorly graded SAND with Gravel brown (7.5YR 5/4); moist; 70% s 30% gravel to 2cm; subangular t subrounded; petroleum odor.	and;	SP				
450		SB0099	2.1		Poorly graded SAND (SP); brown (7.5YR 5/4); moist; dense; 100% petroleum odor.				- Bottom of	Blow counts (448.5-450'): 12/26/49.	



Borehole ID: KAFB-106114

Client: US Army Corps of Engineers Project Location: KAFB, Albuquerque, NM Project Name: KAFB BFF SWMU ST-106 and SS-111 Project Number: 140705

Date Started: 2/20/2011 Date TD Reached: 2/23/2011 Date Completed: 3/1/2011

Ground Elevation AMSL (ft): 5344.8 Y Coordinate: 1473064.09 X Coordinate: 1541796.70 Hole Diameter Upper (in.): 11-3/4 Hole Diameter Lower (in.): 9-5/8 Surface Completion Type: Flush mount

Groundwater Levels BGS (ft): ∑ At Time of Drilling: N/A ▼ At End of Drilling: N/A ▼ After Drilling: N/A

Drilling Contractor: WDC Drilling Drilling Method: Air Rotary Casing Hammer Logged By: Allen Willmore

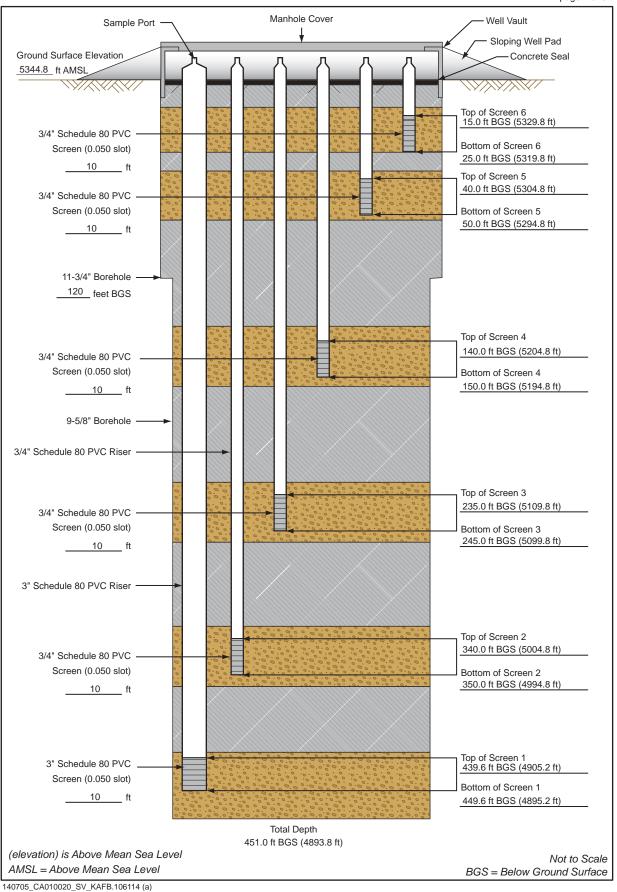
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					0.70 Eligide			
5 Depth (ft)	Sample Type	Number	Headspace PID	Lithologic Log	Material Description	U.S.C.S.	Well Diagram	Remarks
	-					SP	Screen	Total depth = 451 ft. Reached on 2/23/11.
455	-							Water added during drilling (gallons) = 0
	-							Water added during construction (gallons) = 176
460	-							
465	-							
	-							
470								
475	-							
480	-							

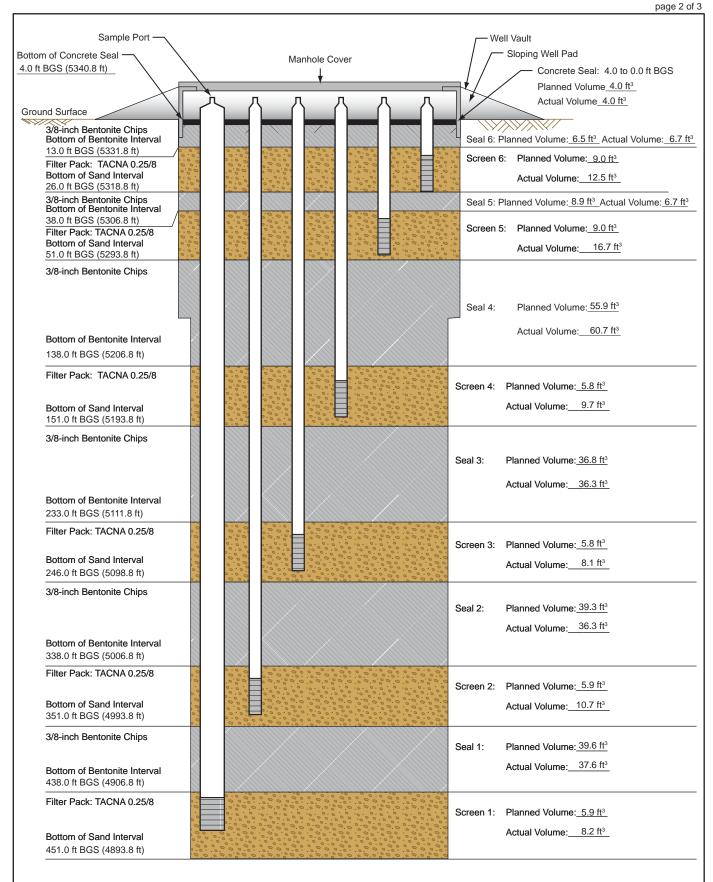
Nested Soil Vapor Well Completion Diagram for KAFB-106114

Installation Start Date/Time: 2/23/2011 @ 16:10 Installation End Date/Time: 3/1/2011 @ 17:00

page 1 of 3

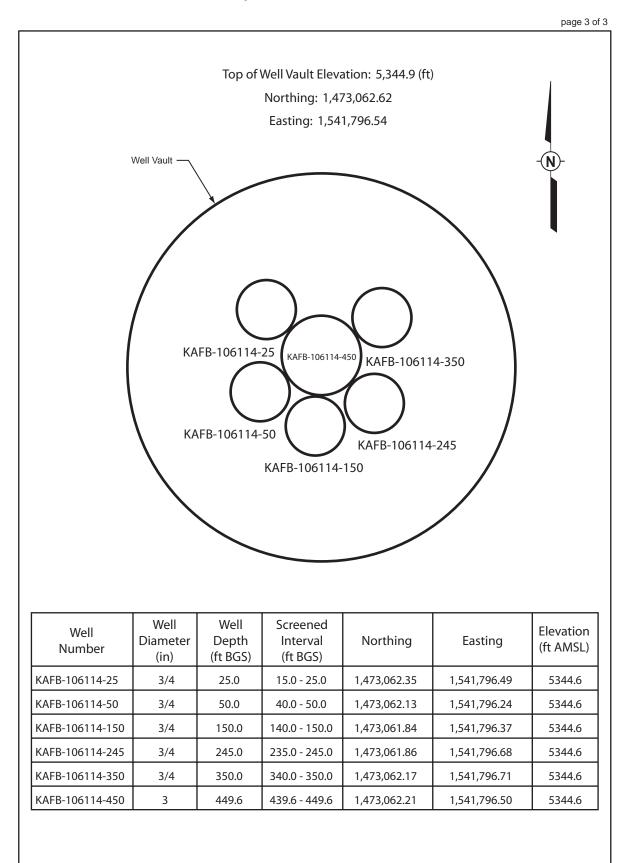


Nested Soil Vapor Well Completion Diagram for KAFB-106114



(elevation) is Above Mean Sea Level All Materials Placed with Tremie Pipe Not to Scale BGS = Below Ground Surface

Nested Soil Vapor Well Completion Diagram Map View for KAFB-106114



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APPENDIX D-1

KAFB-106115 Final Well Report

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Date Started: 2/9/2011 Date TD Reached: 2/17/2011 Date Completed: 2/20/2011

Ground Elevation AMSL (ft): 5347.9 Y Coordinate: 1473056.65 X Coordinate: 1542375.40

Borehole ID: KAFB-106115

Hole Diameter Upper (in.): 11-3/4 Hole Diameter Lower (in.): 9-5/8 Surface Completion Type: Flush mount

Groundwater Levels BGS (ft): \square At Time of Drilling: N/A \blacksquare At End of Drilling: N/A \blacksquare After Drilling: N/A

Drilling Contractor: WDC Drilling Drilling Method: Air Rotary Casing Hammer Logged By: Brian Lucero / Allen Willmore

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						,		
Oepth (ft)	Sample Type	Number	Headspace PID	Lithologic Log	Material Description	U.S.C.S.	Well Diagram	Remarks
5	-				SILT with Sand (ML); red (2.5YR 5/6); moist; very stiff; 80% silt with minor clay; 20% very fine to fine sand; trace medium to coarse sand; subangular to subrounded; trace fine to coarse gravel to 5cm; subrounded. Same as above (0 ft); no odor.		- Concrete Seal	Hand augered. Began drilling @ 0744 on 2/9/11.
10		SB0100 SB0101			SILT (ML); red (2.5YR 5/6); moist; very stiff to hard; 95% silt with clay; 5% very fine to fine sand; trace coarse sand; subrounded; no odor. Note: gravel lense at 12ft.	ML	- Bentonite Seal	Kelly down @ 0752. Blow counts (9-10.5'): 12/16. Blow counts (10.5-12'): 17/39. New connection @ 0822. Resumed drilling @ 0823.
15	-	SB0102			SILT with Sand (ML); red (2.5YR 4/8); moist; hard; 55% silt; 30% clay; 15% fine to coarse sand; subangular to subrounded; no odor. Note: clay predominantly as clay nodules.		- Top of 3/4" Schedule 80 PVC 0.050 Slot Screen	Kelly down @ 0830. Blow counts (19-20.5'): 19/31.
20	- - - -	SB0102	0.0		Sandy lean CLAY (CL); red (2.5YR 4/8); moist; hard; low to medium plasticity; 55% clay; 15% silt; 30% very fine to fine sand; no odor. Same as above (20 ft); no odor.	CL	- Bottom of Screen	New connection @ 0844. Resumed drilling @ 0845.
30		SB0103	0.0				- Bentonite Seal	Kelly down @ 0850. Blow counts (29-30.5'): 19/25.



Borehole ID: KAFB-106115

Client: US Army Corps of Engineers Project Location: KAFB, Albuquerque, NM Project Name: KAFB BFF SWMU ST-106 and SS-111 Project Number: 140705

Date Started: 2/9/2011 Date TD Reached: 2/17/2011 Date Completed: 2/20/2011

Ground Elevation AMSL (ft): 5347.9 Y Coordinate: 1473056.65 X Coordinate: 1542375.40 Hole Diameter Upper (in.): 11-3/4 Hole Diameter Lower (in.): 9-5/8 Surface Completion Type: Flush mount

Groundwater Levels BGS (ft): \square At Time of Drilling: N/A \blacksquare At End of Drilling: N/A \blacksquare After Drilling: N/A

Drilling Contractor: WDC Drilling Drilling Method: Air Rotary Casing Hammer Logged By: Brian Lucero / Allen Willmore

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ଟି Depth (ft)	Sample Type	Number	Headspace PID	Lithologic Log	Material Description	U.S.C.S.	Well Diagram	Remarks
	-				SILT (ML); red (2.5YR 5/6); moist; hard; 80% silt; 20% clay; no odor.			New connection @ 0905. Resumed drilling @ 0906.
35	-				Same as above (30 ft); 85% silt; 15% clay; no odor.	ML	- Bentonite Seal	
40		SB0104 SB0104 SB0104	0.0		Sandy lean CLAY (CL); red (2.5YR 5/6); moist; hard; low plasticity; 70% clay with minor silt; 30% fine sand; no odor.		Pack - Top of 3/4" Schedule 80 PVC 0.050 Slot Screen	Kelly down @ 0914. Blow counts (39-40.5'): 36/41. Blow counts (40.5-42'): 50/Not Recorded. Blow counts (42-43.5'): 36/64. Blow counts (43.5-45'): 17/50.
45		SB0104			Same as above (40 ft); no odor.			New connection @ 0950. Resumed drilling @ 0951.
50		SB0105	0.0		Same as above (40 ft); no odor.	CL	- Bottom of Screen	Kelly down @ 1003. Blow counts (49-50.5'): 30/46. New connection @ 1016. Resumed drilling @ 1017.
55	-				Same as above (40 ft); 65% clay with silt; 35% very fine to fine sand; no odor.		- Bentonite Seal	
60	-							Kelly down @ 1027.



Date Started: 2/9/2011 Date TD Reached: 2/17/2011 Date Completed: 2/20/2011

Ground Elevation AMSL (ft): 5347.9 Y Coordinate: 1473056.65 X Coordinate: 1542375.40

Borehole ID: KAFB-106115

Hole Diameter Upper (in.): 11-3/4 Hole Diameter Lower (in.): 9-5/8 Surface Completion Type: Flush mount

Groundwater Levels BGS (ft): ♀ At Time of Drilling: N/A ♥ At End of Drilling: N/A ♥ After Drilling: N/A

Drilling Contractor: WDC Drilling Drilling Method: Air Rotary Casing Hammer Logged By: Brian Lucero / Allen Willmore

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0 Denth (ft)		Number	Headspace	L ithologic	Log	Material Description	U.S.C.S.	Well Diagram	Remarks
_6	0 - - 5 - - - - - - - - - - - - - - - -					SILT (ML); red (2.5YR 4/8); moist; hard; 70% silt; 30% clay; trace very fine to fine sand; no odor. Sandy SILT (ML); red (2.5YR 4/8); moist; hard; 70% silt with minor clay; 30% fine to coarse sand; subangular to subrounded; trace fine gravel to 1.5cm; no odor. SILT (ML); red (2.5YR 4/8); moist; hard; 90% silt with minor clay; 10% fine to coarse sand; subangular; no odor.	ML	- Bentonite Seal	New connection @ 1046. Resumed drilling @ 1054.
8	- - - 0					SILT (ML); red (2.5YR 4/8); moist; stiff to very stiff; 95% silt with minor clay; 5% fine to medium sand; trace coarse sand; angular to subangular; no odor.			Casing advanced without hammer last ~5ft. Kelly down @ 1058.
	-					Lean CLAY (CL); red (2.5YR 4/8); moist; very stiff to hard; low to medium plasticity; 90% clay with silt; 10% fine sand; trace medium to coarse sand; subangular; no odor.			New connection @ 1112. Resumed drilling @ 1114.
8	-					Same as above (80 ft); 95% clay with minor silt; 5% fine sand; no odor.	CL		



Date Started: 2/9/2011 Date TD Reached: 2/17/2011 Date Completed: 2/20/2011

Ground Elevation AMSL (ft): 5347.9 Y Coordinate: 1473056.65 X Coordinate: 1542375.40

Borehole ID: KAFB-106115

Hole Diameter Upper (in.): 11-3/4 Hole Diameter Lower (in.): 9-5/8 Surface Completion Type: Flush mount

Groundwater Levels BGS (ft): \square At Time of Drilling: N/A \blacksquare At End of Drilling: N/A \blacksquare After Drilling: N/A

Drilling Contractor: WDC Drilling Drilling Method: Air Rotary Casing Hammer Logged By: Brian Lucero / Allen Willmore

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ଟ Depth (ft)	Sample Type	Number	Headspace PID	Lithologic Loa	Material Description	U.S.C.S.	Well Diagram	Remarks
					Lean CLAY (CL); red (2.5YR 5/6); moist; very stiff; low plasticity; 70% clay; 30% silt; trace very fine to fine sand; no odor.	CL		No hammer, entire joint.
95	-				SILT (ML); reddish brown (2.5YR 5/4); moist; very stiff to hard; 85% silt; 15% clay; trace very fine to fine sand; no odor.			Kelly down @ 1118. Blow
<u>100</u>		SB0106	0.0		Sandy SILT (ML); reddish brown (2.5YR 5/4); moist; stiff to very stiff; 70% silt with trace clay; 30% fine sand; no odor.	ML		counts (99-100.5'): 36/50. New connection @ 1211. Resumed drilling @ 1212.
<u>105</u>	-				Silty SAND (SM); reddish brown (5YR 5/4); moist; loose to medium dense; 70% fine sand; trace medium to coarse sand; subangular; 30% silt with trace clay; no odor.		- Bentonite Seal	No hammer, entire joint.
<u>110</u>	-				Same as above (105 ft); 85% fine to coarse sand; subangular to subrounded; 15% silt with trace clay; no odor.	SM		
<u>115</u> 120	-				Well graded SAND with Silt and Gravel (SW-SM); reddish brown (5YR 5/4); moist; loose to medium dense; 75% fine to coarse sand; subangular to subrounded; 15% fine to coarse gravel to 3cm; subrounded; 10% silt with trace clay; no odor.	SW- SM		Kelly down @ 1215. TD 11-3/4" casing at 120'.



Borehole ID: KAFB-106115

Client: US Army Corps of Engineers Project Location: KAFB, Albuquerque, NM Project Name: KAFB BFF SWMU ST-106 and SS-111 Project Number: 140705

Date Started: 2/9/2011 Date TD Reached: 2/17/2011 Date Completed: 2/20/2011

Ground Elevation AMSL (ft): 5347.9 Y Coordinate: 1473056.65 X Coordinate: 1542375.40 Hole Diameter Upper (in.): 11-3/4 Hole Diameter Lower (in.): 9-5/8 Surface Completion Type: Flush mount

Groundwater Levels BGS (ft): \square At Time of Drilling: N/A \blacksquare At End of Drilling: N/A \blacksquare After Drilling: N/A

Drilling Contractor: WDC Drilling Drilling Method: Air Rotary Casing Hammer Logged By: Brian Lucero / Allen Willmore

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15 Depth (ft)	Sample Type	Number	Headspace PID	Lithologic Log	Material Description	U.S.C.S.	We	ell Diagram	Remarks
	_				Lean CLAY (CL); red (2.5YR 4/6); moist; hard; low to medium plasticity; 65% clay; 35% silt; no odor.				New connection @ 1541. Resumed drilling @ 1544.
125	-				Same as above (120 ft).	CL			
130	-				SILT (ML); red (2.5YR 5/6); moist; very stiff to hard; 70% silt; 30% clay; no odor.	ML		- Bentonite Seal	
135	-				Lean CLAY (CL); red (2.5YR 5/6); moist; hard; low to medium plasticity; 70% clay; 30% silt; no odor.				
140	-				Same as above (135 ft); no odor.	CL			Kelly down @ 1557. New connection @ 1650. Resumed drilling @ 0749 on 2/10/11.
145	-				Silty SAND (SM); pale red (2.5YR 7/2); moist; medium dense; 85% fine sand; 15% silt; no odor.	SM		- Top of Filter Pack - Top of 3/4" Schedule 80 PVC 0.050 Slot Screen	Top of Santa Fe Group.
150		SB0107	0.0					- - - - - - - -	Kelly down @ 0813. Blow counts (149-150.5'): 46/50.

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Date Started: 2/9/2011 Date TD Reached: 2/17/2011 Date Completed: 2/20/2011

Ground Elevation AMSL (ft): 5347.9 Y Coordinate: 1473056.65 X Coordinate: 1542375.40

Borehole ID: KAFB-106115

Hole Diameter Upper (in.): 11-3/4 Hole Diameter Lower (in.): 9-5/8 Surface Completion Type: Flush mount

Groundwater Levels BGS (ft): \Box At Time of Drilling: N/A \blacksquare At End of Drilling: N/A \blacksquare After Drilling: N/A

Drilling Contractor: WDC Drilling Drilling Method: Air Rotary Casing Hammer Logged By: Brian Lucero / Allen Willmore

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		-						
05 Depth (ft)	Sample Type Number	Headspace PID	Lithologic Log	Material Description	U.S.C.S.	w	ell Diagram	Remarks
155	SB0107- MS SB0107- MSD			Silty SAND (SM); pale red (2.5YR 7/2); dry to moist; very dense (based on blow counts); 80% very fine to fine sand; 20% silt; no odor.	SM		- Bottom of	Blow counts (100.5-102'): 26/49. Blow counts (102-103.5'): 36/50. New connection @ 0935. Resumed drilling @ 0938. Stopped drilling @ 0944, due to plugged diasberge Decumed
160				Sandy SILT (ML); red (2.5YR 5/6); moist; very stiff to hard; 70% silt with minor clay; 30% very fine to fine sand; trace medium to coarse sand; subrounded; no odor.	ML		Screen	discharge. Resumed drilling @ 1015. Kelly down @ 1022.
-				Poorly graded SAND (SP); pale red (2.5YR 7/2); dry to moist; very dense; 95% very fine to fine sand; 5% silt; no odor.	SP			New connection @ 1033. Resumed drilling @ 1034.
<u>165</u> - - 170				Well graded SAND (SW); pale red (2.5YR 7/2); dry to moist; very dense; 90% very fine to coarse sand; subangular to subrounded; 10% fine to coarse gravel to 3cm; subrounded; no odor.			- Bentonite Seal	
-				Same as above (165 ft); 100% sand; trace fine gravel to 1.5cm; subrounded; no odor.	SW			
175				Same as above (165 ft).				
180				Poorly graded SAND (SP); pale red (2.5YR 7/2); dry to moist; very dense; 95% fine sand; 5% silt; no odor.	SP			Kelly down @ 1048.



Date Started: 2/9/2011 Date TD Reached: 2/17/2011 Date Completed: 2/20/2011

Ground Elevation AMSL (ft): 5347.9 Y Coordinate: 1473056.65 X Coordinate: 1542375.40

Borehole ID: KAFB-106115

Hole Diameter Upper (in.): 11-3/4 Hole Diameter Lower (in.): 9-5/8 Surface Completion Type: Flush mount

Groundwater Levels BGS (ft): \square At Time of Drilling: N/A \blacksquare At End of Drilling: N/A \blacksquare After Drilling: N/A

Drilling Contractor: WDC Drilling Drilling Method: Air Rotary Casing Hammer Logged By: Brian Lucero / Allen Willmore

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8 Depth (ft)	Sample Type	Number	Headspace PID	Lithologic Log	Material Description	U.S.C.S.	Well Diagram	Remarks
	_				Poorly graded SAND (SP); pale red (2.5YR 7/2); dry to moist; very dense; 95% fine sand; 5% silt; no odor.			New connection @ 1057. Resumed drilling @ 1058.
185	-				Same as above (180 ft); no odor.	00		
190	-				Poorly graded SAND (SP); pale red	SP		Kelly down @ 1104. New connection @ 1138.
					(2.5YR 7/2); dry to moist; very dense; 95% very fine to medium sand; subangular to subrounded; 5% silt; no odor; pumice clasts/fragments.			Resumed drilling @ 1138.
195					Poorly graded SAND with Silt (SP-SM); light reddish brown (2.5YR 7/3); dry to moist; very dense; 90% fine to medium sand; subangular to subrounded; 10% silt with trace clay; no odor. Note: large,	SP-	- Bentonite Seal	
200		SB0108	0.0		rounded, vitric pumice clasts with quartz phenocrysts; altered and unaltered. Poorly graded SAND with Silt (SP-SM); pale red (2.5YR 7/2); dry to moist; very	SM		Kelly down @ 1145. Blow counts (199-200.5'): 37/50. New connection @ 1205. Resumed drilling @
					dense; 90% fine to medium sand; subrounded; 10% silt with clay; no odor. Note: 3-4in of lean clay in split spoon; light brown (7.5YR 6/3); high plasticity;	CL		1206.
205					Moist; black carbonaceous material. Lean CLAY (CL); light brown (7.5YR 6/3); moist; hard; high plasticity; 100% clay; black, carbonaceous dendritic material; no odor. Poorly graded SAND with Silt (SP-SM);	SP- SM		
210					light brown (7.5YR 6/3); moist; very dense; 90% very fine to fine sand; 10% silt with clay; no odor.			

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Date Started: 2/9/2011 Date TD Reached: 2/17/2011 Date Completed: 2/20/2011

Ground Elevation AMSL (ft): 5347.9 Y Coordinate: 1473056.65 X Coordinate: 1542375.40

Borehole ID: KAFB-106115

Hole Diameter Upper (in.): 11-3/4 Hole Diameter Lower (in.): 9-5/8 Surface Completion Type: Flush mount

Groundwater Levels BGS (ft): \Box At Time of Drilling: N/A \blacksquare At End of Drilling: N/A \blacksquare After Drilling: N/A

Drilling Contractor: WDC Drilling Drilling Method: Air Rotary Casing Hammer Logged By: Brian Lucero / Allen Willmore

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15 Denth (ft)	1.0	Number	Headspace PID	Lithologic Log	Material Description	U.S.C.S.	Well Diagram	Remarks
	-				Poorly graded SAND with Silt (SP-SM); light brown (7.5YR 6/3); dry to moist; very dense; 90% fine sand; 10% silt with minor clay; no odor. Note: pumice present with no alteration/oxidation.			
21	5				Same as above (210 ft); pale red (2.5YR 7/2); 90% fine to medium sand; trace coarse sand; subangular to subrounded; 10% silt with minor clay; no odor.	SP- SM		Kelly down @ 1225.
22	0				Poorly graded SAND (SP); pale red (2.5YR 7/2); dry to moist; very dense; 95% fine to medium sand; trace coarse sand; subrounded to subangular; 5% silt;			New connection @ 1250. Resumed drilling @ 1251.
22	5				No odor. Note: very small pumice clasts. Well graded SAND (SW); light reddish gray (2.5YR 7/1); dry; very dense; 100%		- Bentonite Seal	
	-				very fine to coarse sand; subangular; trace silt; no odor.	SW		
23	0				Poorly graded SAND (SP); light reddish gray (2.5YR 7/1); dry; very dense; 95% fine to medium sand; subrounded; 5% silt; no odor. Grades into 100% medium to coarse	SP		
23	5				Silty SAND with Gravel (SM); pinkish gray (5YR 6/2); moist; very dense to hard; 70% very fine to fine sand; trace medium sand; subangular to subrounded; 15% coarse gravel to 3cm; subrounded; trace cobbles to 5cm; 15%	SM		Silt and minor clay at 233' likely represent a perched layer - sample has high moisture content, but is not "wet".
24	0				silt with minor clay; no odor.		- Top of Filter Pack - Top of 3/4"	Kelly down @ 1330.



Date Started: 2/9/2011 Date TD Reached: 2/17/2011 Date Completed: 2/20/2011

Ground Elevation AMSL (ft): 5347.9 Y Coordinate: 1473056.65 X Coordinate: 1542375.40

Borehole ID: KAFB-106115

Hole Diameter Upper (in.): 11-3/4 Hole Diameter Lower (in.): 9-5/8 Surface Completion Type: Flush mount

Groundwater Levels BGS (ft): \square At Time of Drilling: N/A \blacksquare At End of Drilling: N/A \blacksquare After Drilling: N/A

Drilling Contractor: WDC Drilling Drilling Method: Air Rotary Casing Hammer Logged By: Brian Lucero / Allen Willmore

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5 Depth (ft)	Sample Type	Number	Headspace PID	Lithologic Log	Material Description	U.S.C.S.	W	ell Diagram	Remarks
	-				Poorly graded SAND (SP); pale red (2.5YR 7/2); dry to moist; very dense; 95% very fine to medium sand; trace coarse sand; subangular to subrounded; 5% silt; no odor.			Schedule 80 PVC 0.050 Slot Screen	New connection @ 0909 Resumed drilling @ 0910. Experienced problems with casing, hammered below 242 ft.
<u>245</u>	-				Poorly graded SAND (SP); pinkish gray (5YR 7/2); moist; very dense; 100% fine to medium sand; subrounded to rounded; no odor. Note: sample is primarily volcanic ash with minor lithic fragments; altered.				
<u>250</u>		SB0109	1.0		Poorly graded SAND (SP); pale red (2.5YR 7/2); dry to moist; very dense; 95% very fine to medium sand; trace coarse sand; subangular to subrounded; 5% silt; no odor.	SP	на н	- Bottom of Screen	Kelly down @ 1007. Blov counts (249-250.5'): 48/50.
<u>255</u> - -	-				Same as above (250 ft); finer than above; no odor.				Kelly down @ 1056.
2 <u>60</u> - -	_				Lean CLAY with Sand (CL); pinkish gray (5YR 6/2); moist; hard; low plasticity; 85% clay with minor silt; 15% fine sand; no odor.	CL		-Bentonite Seal	New connection @ 1105 Resumed drilling @ 1106.
2 <u>65</u> -					Sandy SILT (ML); pinkish gray (5YR 6/2); moist; very hard to hard; 70% silt with trace clay; 30% very fine to fine sand; no odor.				
270									



Date Started: 2/9/2011 Date TD Reached: 2/17/2011 Date Completed: 2/20/2011

Ground Elevation AMSL (ft): 5347.9 Y Coordinate: 1473056.65 X Coordinate: 1542375.40

Borehole ID: KAFB-106115

Hole Diameter Upper (in.): 11-3/4 Hole Diameter Lower (in.): 9-5/8 Surface Completion Type: Flush mount

Groundwater Levels BGS (ft): \square At Time of Drilling: N/A \blacksquare At End of Drilling: N/A \blacksquare After Drilling: N/A

Drilling Contractor: WDC Drilling Drilling Method: Air Rotary Casing Hammer Logged By: Brian Lucero / Allen Willmore

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27 Danth (ft)		Number	Headspace PID	Lithologic Log	Material Description	U.S.C.S.	Well Diagram	Remarks
	-				Sandy SILT (ML); pinkish gray (5YR 6/2); moist; very hard to hard; 70% silt with minor clay; 30% very fine to fine sand; no odor.	ML		Stopped advancing to empty hopper @ 1132. Resumed drilling @1135. Added water to cyclone
27	5							for dust supression.
28					Silty SAND (SM); pinkish gray (5YR 6/2); moist; very dense to dense; 60% very fine to fine sand; 40% silt with trace clay; no odor.	SM		Kelly down @ 1159.
	-				Poorly graded SAND (SP); light reddish gray (2.5YR 7/1); dry; very dense; 100% very fine to fine sand; some medium sand; subangular to subrounded; no odor.	SP		New connection @ 1207. Resumed drilling @ 1208.
28	5				Well graded GRAVEL (GW); pinkish gray (5YR 7/2); dry; loose; 95% coarse gravel; subangular to angular; 5% clay; no odor.	GW	- Bentonite Seal	Hammer driving slowly. Resumed drilling @ 1640. A. Willmore (geologist) started logging.
<u>29</u>	0 - -				CLAY (CL); reddish brown (5YR 5/4); dry; soft; medium plasticity; 80% clay; 20% silt; no odor.			
<u>29</u>	5				Same as above (290 ft); pinkish gray (5YR 6/2).	CL		
30	o X	SB0110	0.8					Blow counts (299-300.5'):

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Borehole ID: KAFB-106115

Client: US Army Corps of Engineers Project Location: KAFB, Albuquerque, NM Project Name: KAFB BFF SWMU ST-106 and SS-111 Project Number: 140705

Date Started: 2/9/2011 Date TD Reached: 2/17/2011 Date Completed: 2/20/2011

Ground Elevation AMSL (ft): 5347.9 Y Coordinate: 1473056.65 X Coordinate: 1542375.40 Hole Diameter Upper (in.): 11-3/4 Hole Diameter Lower (in.): 9-5/8 Surface Completion Type: Flush mount

Groundwater Levels BGS (ft): \Box At Time of Drilling: N/A \blacksquare At End of Drilling: N/A \blacksquare After Drilling: N/A

Drilling Contractor: WDC Drilling Drilling Method: Air Rotary Casing Hammer Logged By: Brian Lucero / Allen Willmore

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00 Depth (ft)	Sample Type	Number	Headspace PID	Lithologic Log	Material Description	U.S.C.S.	Well Diagram	Remarks
-	X	\$B0110			Well graded GRAVEL (GW); pinkish gray (5YR 6/2); dry; loose; 65% coarse gravel; angular to subrounded; 35% clay; no odor.	GW		14/36/50. Blow counts (300.5-302'): 16/48/50. New connection @ 1300. Began tripping out. Resumed drilling @ 1305.
<u>305</u> - - - - -	-				Well graded SAND with Gravel (SW); light brown (7.5YR 6/3); dry; loose; 75% sand; 25% coarse gravel; subangular to subrounded; no odor.	sw		
315	-				Poorly graded SAND (SP); very pale brown (10YR 7/3); dry; loose; 95% sand; 5% fine gravel; no odor.	SP		
-	-				Well graded SAND with Gravel (SW); light brown (7.5YR 6/3); dry; loose; 60% sand; 40% coarse gravel; subangular to subrounded. Note: coarser gravel than 305 ft.		- Bentonite Seal	
320	-				Same as above (315 ft); finer gravel.	sw		New connection @ 1355.
<u>325</u> - -					Same as above (315 ft).			New connection @ 1415.
330								



Date Started: 2/9/2011 Date TD Reached: 2/17/2011 Date Completed: 2/20/2011

Ground Elevation AMSL (ft): 5347.9 Y Coordinate: 1473056.65 X Coordinate: 1542375.40

Borehole ID: KAFB-106115

Hole Diameter Upper (in.): 11-3/4 Hole Diameter Lower (in.): 9-5/8 Surface Completion Type: Flush mount

Groundwater Levels BGS (ft): \square At Time of Drilling: N/A \blacksquare At End of Drilling: N/A \blacksquare After Drilling: N/A

Drilling Contractor: WDC Drilling Drilling Method: Air Rotary Casing Hammer Logged By: Brian Lucero / Allen Willmore

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85 Depth (ft)	Sample Type	Number	Headspace PID	Lithologic Log	Material Description	U.S.C.S.	We	ll Diagram	Remarks
 - -	-				Well graded SAND with Gravel (SW); light brown (7.5YR 6/3); dry; loose; 55% sand; 45% coarse gravel; subangular to subrounded.				
335	-				Same as above (330 ft); 75% sand; 25% gravel.			- Bentonite Seal	New connection @ 1445
<u>340</u>	-				Same as above (330 ft)	sw		- Top of Filter Pack - Top of 3/4" Schedule 80 PVC 0.050 Slot Screen	
<u>345</u>	-				Same as above (330 ft); 55% sand; 45% gravel.				Began tripping out to attach spilt spoon sampler @ 1510.
350		SB0111	0.8	•	Well graded GRAVEL with Sand (GW);			-Bottom of Screen	Blow counts (349-350.5' 14/39/50.
-					reddish gray (5YR 5/2); dry; loose; 65% gravel; 35% coarse sand; subangular to to subrounded; no odor.	GW			New 10' connection @ 1615.
355 - -	-				Poorly graded SAND with Silt (SP-SM); light reddish brown (5YR 6/4); moist; medium dense; 90% fine sand; 10% silt; no odor.	SP- SM		- Bentonite Seal	
360									



Date Started: 2/9/2011 Date TD Reached: 2/17/2011 Date Completed: 2/20/2011

Ground Elevation AMSL (ft): 5347.9 Y Coordinate: 1473056.65 X Coordinate: 1542375.40

Borehole ID: KAFB-106115

Hole Diameter Upper (in.): 11-3/4 Hole Diameter Lower (in.): 9-5/8 Surface Completion Type: Flush mount

Groundwater Levels BGS (ft): ♀ At Time of Drilling: N/A ♥ At End of Drilling: N/A ♥ After Drilling: N/A

Drilling Contractor: WDC Drilling Drilling Method: Air Rotary Casing Hammer Logged By: Brian Lucero / Allen Willmore

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96 Depth (ft)	1.0	Number	Headspace PID	Lithologic Log	Material Description	U.S.C.S.	Well Diagram	Remarks
365	-				Poorly graded SAND with Silt (SP-SM); light reddish brown (5YR 6/4); moist; medium dense; 90% fine sand; 10% silt; no odor.	SP- SM		New 20' connection @ 1640.
370					Well graded SAND (SW); reddish gray (5YR 5/2); moist; medium dense to loose; 95% coarse sand; subangular to subrounded; 5% silt; no odor.	sw		
375					Well graded GRAVEL (GW); reddish gray (5YR 5/2); dry; loose; 90% gravel; 10% coarse sand; angular to subrounded; no odor.	GW		
					Well graded SAND with Gravel (SW); reddish gray (5YR 5/2); dry; loose; 60% sand; 40% coarse gravel; angular to subrounded; no odor.		- Bentonite Seal	
380) - - -				Same as above (375 ft); finer gravel.	sw		New connection @ 0755 on 2/17/11.
385					Well graded SAND (SW); reddish gray (5YR 5/2); dry; loose; 90% sand; 10% gravel; angular to subrounded; no odor.			
390)				L			



Date Started: 2/9/2011 Date TD Reached: 2/17/2011 Date Completed: 2/20/2011

Ground Elevation AMSL (ft): 5347.9 Y Coordinate: 1473056.65 X Coordinate: 1542375.40

Borehole ID: KAFB-106115

Hole Diameter Upper (in.): 11-3/4 Hole Diameter Lower (in.): 9-5/8 Surface Completion Type: Flush mount

Groundwater Levels BGS (ft): \square At Time of Drilling: N/A \blacksquare At End of Drilling: N/A \blacksquare After Drilling: N/A

Drilling Contractor: WDC Drilling Drilling Method: Air Rotary Casing Hammer Logged By: Brian Lucero / Allen Willmore

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~ (X Coordinate: 1542375.40 Logged By: E							ay: Brian Lucero / Allen Willmore				
66 Depth (ft)	Sample Type	Number	Headspace PID	Lithologic Log	Material Description	U.S.C.S.	We	ell Diagram	Remarks			
	-				Well graded SAND with Gravel (SW); reddish gray (5YR 5/2); dry; loose; 60% sand; 40% gravel; angular to subrounded; no odor.	SW						
- - - 400		SB0112	0.3		Same as above (390 ft).			300			Began tripping out to collect spilt spoon samples @ 0835. Blow counts (399-400.5'): 11/16/12. Blow counts (400.5, 402'):	
- - 405		SB0113	0.3		Well graded GRAVEL with Sand (GW); reddish gray (5YR 5/2); dry; loose; 70% gravel; 30% coarse sand; subangular to rounded; no odor.	GW			samples @ 0835. Blow counts (399-400.5'):			
410	-				Well graded SAND (SW); pinkish gray (5YR 6/2); moist; loose; 90% sand; 10% coarse gravel; angular to subrounded; no odor.			- Bentonite Seal				
-	-				Same as above (405 ft).	SW						
415	-				Well graded SAND with Gravel (SW); pinkish gray (5YR 6/2); moist; loose; 75% sand; 25% coarse gravel; subangular to subrounded; no odor.							
420												



Date Started: 2/9/2011 Date TD Reached: 2/17/2011 Date Completed: 2/20/2011

Ground Elevation AMSL (ft): 5347.9 Y Coordinate: 1473056.65 X Coordinate: 1542375.40

Borehole ID: KAFB-106115

Hole Diameter Upper (in.): 11-3/4 Hole Diameter Lower (in.): 9-5/8 Surface Completion Type: Flush mount

Groundwater Levels BGS (ft): \Box At Time of Drilling: N/A \blacksquare At End of Drilling: N/A \blacksquare After Drilling: N/A

Drilling Contractor: WDC Drilling Drilling Method: Air Rotary Casing Hammer Logged By: Brian Lucero / Allen Willmore

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5 Depth (ft)	Sample Type	Number	Headspace PID	Lithologic Log	Material Description	U.S.C.S.	Wel	ll Diagram	Remarks
425	-				Well graded SAND with Gravel (SW); pinkish gray (5YR 6/2); moist; loose; 75% sand; 25% coarse gravel; subangular to subrounded; no odor. Note: gravel finer than 415'.				New connection @ 1120.
430	-				Same as above (420 ft); coarse sand; less gravel.	SW		-Bentonite Seal	
435	-				Same as above (420 ft); pinkish gray (7.5YR 7/2); finer sand; less graded; coarser gravel; subangular to subrounded.				Hammer stuck @ 1148. Began hammering @ 1300.
440	-				Poorly graded SAND (SP); pinkish gray (7.5YR 7/2); moist; loose; 95% fine sand; subangular to subrounded; 5% silt; no odor.	SP		- Top of Filter Pack - Top of 3"	
	-				Well graded SAND with Gravel (SW); pinkish gray (5YR 6/2); dry; loose; 60% sand; 40% coarse gravel; subangular to subrounded; no odor.			Schedule 80 PVC 0.050 Slot Screen	Hammer locked @ 1320. New 10' connection @ 1320. Resumed drilling @ 1340.
445	-	SB0114	0.6		Same as above (440 ft); finer sand; less gravel.	SW		- Bottom of	Blow counts (448.5-450'):12/21/33.



Borehole ID: KAFB-106115

Client: US Army Corps of Engineers Project Location: KAFB, Albuquerque, NM Project Name: KAFB BFF SWMU ST-106 and SS-111 Project Number: 140705

Date Started: 2/9/2011 Date TD Reached: 2/17/2011 Date Completed: 2/20/2011

Ground Elevation AMSL (ft): 5347.9 Y Coordinate: 1473056.65 X Coordinate: 1542375.40 Hole Diameter Upper (in.): 11-3/4 Hole Diameter Lower (in.): 9-5/8 Surface Completion Type: Flush mount

Groundwater Levels BGS (ft): \square At Time of Drilling: N/A \blacksquare At End of Drilling: N/A \blacksquare After Drilling: N/A

Drilling Contractor: WDC Drilling Drilling Method: Air Rotary Casing Hammer Logged By: Brian Lucero / Allen Willmore

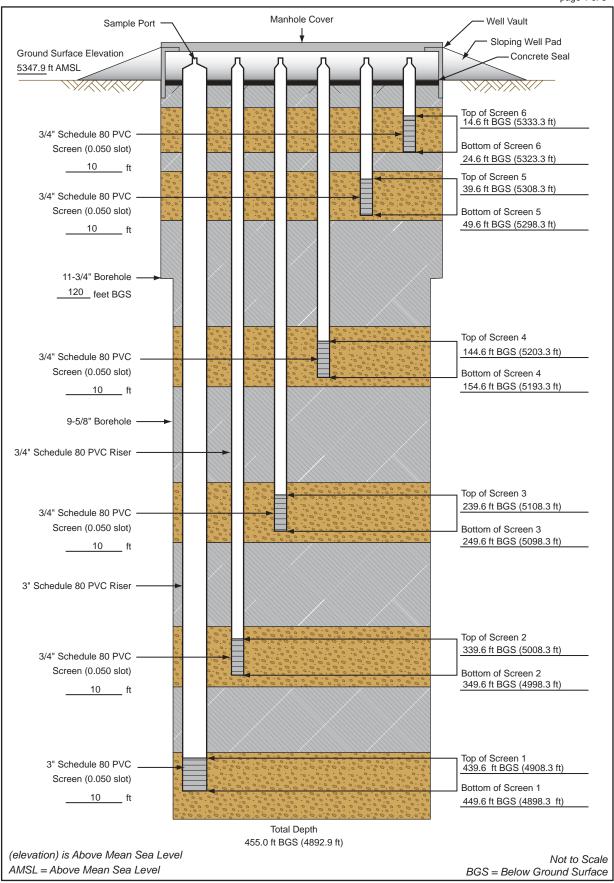
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					5.40	Logged Dy. 1	Shan Lucero / Allen Will	
5 Depth (ft)		Number	Headspace PID	Lithologic Log	Material Description	U.S.C.S.	Well Diagram	Remarks
455	_				No description recorded.		Screen	Total Dopth = 455 ft
	-							Total Depth = 455 ft. Reached @ 1510 on 2/17/11. Water added during drilling (gallons) = 0
460	-							Water added during
<u>465</u>	-							 construction (gallons) = Not Recorded Kelly down: TD the joint and ready to make new connection
<u>470</u>	-							
<u>475</u>	-							
480	-							

Nested Soil Vapor Well Completion Diagram for KAFB-106115

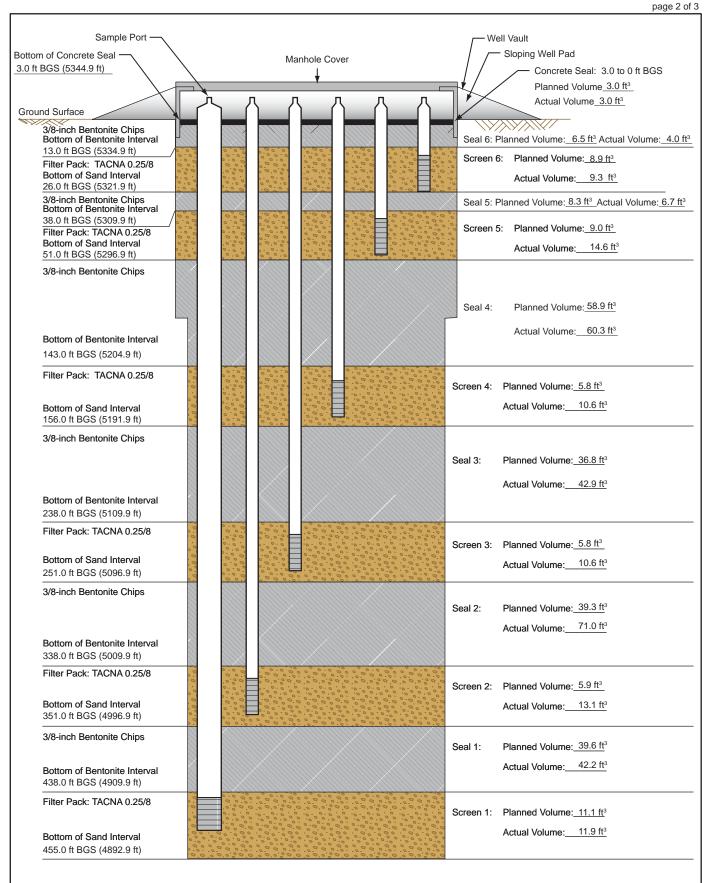
Installation Start Date/Time: 2/18/2011 @ 08:15 Installation End Date/Time: 2/20/2011 @ 9:20

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¹⁴⁰⁷⁰⁵_CA010020_SV_KAFB.106115 (a)

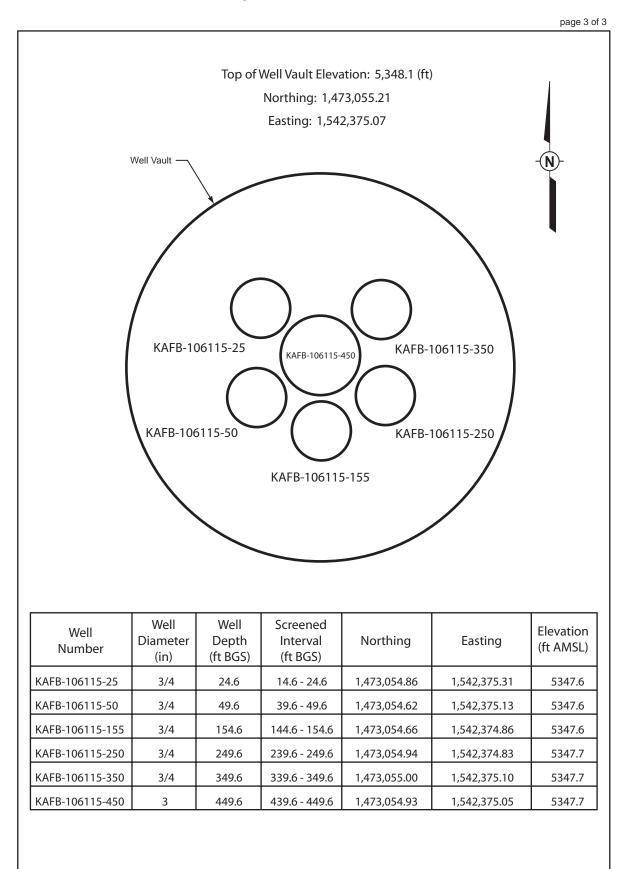
Nested Soil Vapor Well Completion Diagram for KAFB-106115



(elevation) is Above Mean Sea Level All Materials Placed with Tremie Pipe Not to Scale BGS = Below Ground Surface

140705_CA010020_SV_KAFB.106115 (b)

Nested Soil Vapor Well Completion Diagram Map View for KAFB-106115



140705_CA010020_SV_Map View_106115

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APPENDIX D-1

KAFB-106118 Final Well Report

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Date Started: 2/24/2011 Date TD Reached: 3/3/2011 Date Completed: 3/7/2011

Ground Elevation AMSL (ft): 5345.8 Y Coordinate: 1473742.98 X Coordinate: 1541791.33

Borehole ID: KAFB-106118

Hole Diameter Upper (in.): 11-3/4 Hole Diameter Lower (in.): 9-5/8 Surface Completion Type: Flush mount

Groundwater Levels BGS (ft): \square At Time of Drilling: N/A \blacksquare At End of Drilling: N/A \blacksquare After Drilling: N/A

Drilling Contractor: WDC Drilling Drilling Method: Air Rotary Casing Hammer Logged By: Greg Peacock

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Oepth (ft)	Sample Type	Number	Headspace PID	Lithologic Log	Material Description	U.S.C.S.	Well Diagram	Remarks
	-				SILT (ML); brown (7.5YR 5/2); dry; stiff; nonplastic; 95% silt; 5% fine gravel; rounded; no odor.		- Concrete Seal	Hand augered.
5		SB0143	0.4		Same as above (0 ft).			Began drilling @ 1127 on 2/24/11. Blow counts (7-8.5'): 7/8.
10	- <u>/</u> - - -	SBU 143	0.4		Same as above (0 ft); 90% silt; 10% fine to coarse sand; subrounded.		- Bentonite Seal	
15		SB0144	0.0		Same as above (0 ft); non to low plasticity.	ML	- Top of Filter Pack - Top of 3/4" Schedule 80 PVC 0.050 Slot Screen	Kelly down @ 1150. New connection @ 1254. Resumed drilling @ 1256.
20		SB0144			Same as above (0 ft).			Blow counts (17-18.5'): 16/15. Bow counts (18.5-20'): 16/15.
25	-				SILT (ML); brown (7.5YR 5/2); dry; firm to stiff; low plasticity; 85% silt; 10% clay; 5% gravel; silt nodules to 1.5cm; no		- Bottom of Screen	Kelly down @ 1304.
30		SB0145 SB0146			odor.		- Bentonite Seal	Blow counts (27-28.5'): 6/12. Blow counts (28.5-30'): 14/20. New connection @ 1325.



Date Started: 2/24/2011 Date TD Reached: 3/3/2011 Date Completed: 3/7/2011

Ground Elevation AMSL (ft): 5345.8 Y Coordinate: 1473742.98 X Coordinate: 1541791.33

Borehole ID: KAFB-106118

Hole Diameter Upper (in.): 11-3/4 Hole Diameter Lower (in.): 9-5/8 Surface Completion Type: Flush mount

Groundwater Levels BGS (ft): \Box At Time of Drilling: N/A \mathbf{I} At End of Drilling: N/A \mathbf{I} After Drilling: N/A

Drilling Contractor: WDC Drilling Drilling Method: Air Rotary Casing Hammer Logged By: Greg Peacock

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	Sample Type			Material Description	S.C.S.	ell Diagram	Remarks
صّ 30	San	Z	He	SILT (ML); brown (7.5YR 5/2); dry; firm; non to low plasticity; 100% silt with clay			Resumed drilling @ 1325.
35	-			nodules to 1cm; no odor. Same as above (30 ft); 90% silt; 10% clay nodules.		- Bentonite Seal	Kelly down @ 1335.
40		SB0147	0.0	Same as above (30 ft).	ML	- Top of Filter Pack	Blow counts (37-38.5'): 7/11. New connection @ 1347. Resumed drilling @ 1347.
45	-					Schedule 80 PVC 0.050 Slot Screen	
-		SB0148	0.0	Same as above (30 ft); very stiff.			Kelly down @ 1353. Blow counts (47-48.5'): 23/27. Blow counts (48.5 50): 47/50. Blow
50		SB0148 SB0148		Silty SAND (SM); brown (7.5YR 5/4); dry; dense; 75% fine to coarse sand; rounded; 10% gravel; rounded; 15% silt;		- Bottom of Screen	(48.5-50'): 47/50. Blow counts (50-51.5'): 42/50 New connection @ 141' Resumed drilling @ 1418.
55	-			no odor. Same as above (50 ft); 80% fine to coarse sand; 5% gravel; 15% silt.	SM	- Bentonite Seal	Kelly down @ 1420. Ne connection @ 1430. Resumed drilling @ 1431.
60	-						1401.



bs of Engineers Hole Diameter Upper (in.): 11-3/4

Client: US Army Corps of Engineers Project Location: KAFB, Albuquerque, NM Project Name: KAFB BFF SWMU ST-106 and SS-111 Project Number: 140705

Date Started: 2/24/2011 Date TD Reached: 3/3/2011 Date Completed: 3/7/2011

Ground Elevation AMSL (ft): 5345.8 Y Coordinate: 1473742.98 X Coordinate: 1541791.33 Hole Diameter Upper (in.): 11-3/4 Hole Diameter Lower (in.): 9-5/8 Surface Completion Type: Flush mount

Groundwater Levels BGS (ft): \Box At Time of Drilling: N/A \blacksquare At End of Drilling: N/A \blacksquare After Drilling: N/A

Drilling Contractor: WDC Drilling Drilling Method: Air Rotary Casing Hammer Logged By: Greg Peacock

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g Depth (ft)	Sample Type	Number	Headspace PID	Lithologic Log	Material Description	U.S.C.S.	Well Diagram	Remarks
-	-				SILT (ML); brown (7.5YR 5/2); dry; firm; nonplastic; 100% silt; no odor.	ML		
65	-				Well graded SAND with Silt (SW-SM); brown (7.5YR 4/3); dry; dense; 85% fine to coarse sand; subangular to angular; 5% gravel to 1cm; subangular; 10% silt; no odor.	SW- SM		
	-				SILT (ML); brown (7.5YR 4/3); very dry; stiff to very stiff; nonplastic; 100% silt; trace gravel to 2cm; no odor.			
75	-				Same as above (70 ft).		- Bentonite Seal	Kelly down @ 1436. New connection @ 1447. Resumed drilling @ 1447.
80	-				Same as above (70 ft); 90% silt; 10% fine to coarse sand; siltstone fragments to 2cm.	ML		
85	-				Same as above (70 ft).			
90								



Date Started: 2/24/2011 Date TD Reached: 3/3/2011 Date Completed: 3/7/2011

Ground Elevation AMSL (ft): 5345.8 Y Coordinate: 1473742.98 X Coordinate: 1541791.33

Borehole ID: KAFB-106118

Hole Diameter Upper (in.): 11-3/4 Hole Diameter Lower (in.): 9-5/8 Surface Completion Type: Flush mount

Groundwater Levels BGS (ft): \Box At Time of Drilling: N/A \blacksquare At End of Drilling: N/A \blacksquare After Drilling: N/A

Drilling Contractor: WDC Drilling Drilling Method: Air Rotary Casing Hammer Logged By: Greg Peacock

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g Depth (ft)	Sample Type	Number	Headspace PID	Lithologic Log	Material Description	U.S.C.S.	Well Diagram	Remarks
-	-				SILT with Sand (ML); brown (7.5YR 4/4); dry; stiff to firm; nonplastic; 75% silt; 25% fine sand; rounded; no odor.	ML		
95		SB0149	0.0		Well graded SAND (SW); grayish brown (10YR 5/2); dry; dense; 100% fine to coarse sand; rounded; large quantity of lapilli tuff; rounded; no odor.	sw		Kelly down @ 1500. Blow counts (97-98.5'): 16/28. New connection @ 1516. Resumed drilling @ 1517.
100	-				Same as above (95 ft). SILT (ML); brown (7.5YR 5/3); dry; stiff; nonplastic; 95% silt; 5% fine to coarse sand; no odor.			
-	-						- Bentonite Seal	
<u>110</u> - - -	-				Same as above (103 ft).	ML		
115	-				Same as above (103 ft).			Kelly down @ 1527. Tripped in 9 5/8" casing. End of 2/24/11. New connection @ 0950 on 3/1/11. Resumed drilling @ 0953.



Borehole ID: KAFB-106118

Client: US Army Corps of Engineers Project Location: KAFB, Albuquerque, NM Project Name: KAFB BFF SWMU ST-106 and SS-111 Project Number: 140705

Date Started: 2/24/2011 Date TD Reached: 3/3/2011 Date Completed: 3/7/2011

Ground Elevation AMSL (ft): 5345.8 Y Coordinate: 1473742.98 X Coordinate: 1541791.33 Hole Diameter Upper (in.): 11-3/4 Hole Diameter Lower (in.): 9-5/8 Surface Completion Type: Flush mount

Groundwater Levels BGS (ft): \square At Time of Drilling: N/A \blacksquare At End of Drilling: N/A \blacksquare After Drilling: N/A

Drilling Contractor: WDC Drilling Drilling Method: Air Rotary Casing Hammer Logged By: Greg Peacock

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05 Depth (ft)	Sample Type	Number	Headspace PID	Lithologic Log	Material Description	U.S.C.S.	Well Diagram	Remarks
-	-				Lean CLAY (CL); brown (7.5YR 4/3); dry; stiff to very stiff; medium plasticity; 100% clay; no odor.			
<u>125</u>	-				Same as above (120 ft); brown (7.5YR 5/3).	CL		
<u>130</u>	-				Same as above (120 ft); low to medium plasticity.		- Bentonite Seal	
<u>135</u> -	-				Poorly graded SAND (SP); brown (10YR 4/3); dry; dense; 95% fine to medium sand; rounded; 5% fines; trace mica flakes; no odor.			Kelly down @ 1007. New connection @ 1014. Resumed drilling @ 1015.
<u>140</u> -	-				Same as above (134 ft); trace coarse sand.	SP		
145	-				SILT (ML); brown (10YR 4/3); dry; stiff to very stiff; low plasticity; 95% silt; 5% gravel to 2cm; rounded; no odor.			Kelly down @ 1020.
- - 150		SB0150	0.4			ML	- Top of Filter Pack	Blow counts (147-148.5'): 12/50. New connection @ 1040. Resumed drilling @ 1042.



Date Started: 2/24/2011 Date TD Reached: 3/3/2011 Date Completed: 3/7/2011

Ground Elevation AMSL (ft): 5345.8 Y Coordinate: 1473742.98 X Coordinate: 1541791.33

Borehole ID: KAFB-106118

Hole Diameter Upper (in.): 11-3/4 Hole Diameter Lower (in.): 9-5/8 Surface Completion Type: Flush mount

Groundwater Levels BGS (ft): \square At Time of Drilling: N/A \blacksquare At End of Drilling: N/A \blacksquare After Drilling: N/A

Drilling Contractor: WDC Drilling Drilling Method: Air Rotary Casing Hammer Logged By: Greg Peacock

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05 Depth (ft)	Sample Type	Number	Headspace PID	Lithologic Log	Material Description	U.S.C.S.	We	ell Diagram	Remarks
-	-				Poorly graded SAND (SP); dark yellowish brown (10YR 4/4); dry; dense; 95% fine to medium sand; rounded; trace coarse sand; 5% fines; no odor.			Top of 3/4" Schedule 80 PVC 0.050 Slot Screen	Approximate top of Santa Fe Group.
<u>155</u>	-				Same as above (150 ft); 85% fine to medium sand; trace coarse sand; 10% gravel to 1cm; rounded; 5% fines.	SP			Kelly down @ 1045. New connection @ 1052. Resumed drilling @ 1055.
<u>160</u> - -	-				Well graded SAND (SW); dark yellowish brown (10YR 4/4); dry; dense; 100% fine to coarse sand; rounded; trace gravel; rounded; no odor.			- Bottom of Screen	
165	-				Same as above (160 ft); dominantly fine sand.	SW			
- <u>170</u> - -	-				Same as above (160 ft).			- Bentonite Seal	
175 - - - - 180					Poorly graded SAND (SP); brown (10YR 5/3); dry; dense; 100% fine to medium sand; rounded; no odor.	SP	-		Kelly down @ 1059. New connection @ 1111. Resumed drilling @ 1111.



Date Started: 2/24/2011 Date TD Reached: 3/3/2011 Date Completed: 3/7/2011

Ground Elevation AMSL (ft): 5345.8 Y Coordinate: 1473742.98 X Coordinate: 1541791.33

Borehole ID: KAFB-106118

Hole Diameter Upper (in.): 11-3/4 Hole Diameter Lower (in.): 9-5/8 Surface Completion Type: Flush mount

Groundwater Levels BGS (ft): \square At Time of Drilling: N/A \blacksquare At End of Drilling: N/A \blacksquare After Drilling: N/A

Drilling Contractor: WDC Drilling Drilling Method: Air Rotary Casing Hammer Logged By: Greg Peacock

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08 Depth (ft)	Sample Type	Number	Headspace PID	Lithologic Log	Material Description	U.S.C.S.	Well Diagram	Remarks
-	-				Poorly graded SAND (SP); brown (10YR 5/3); dry; dense; 100% fine to medium sand; rounded; no odor.	SP		
<u>185</u> - -	-				Well graded SAND (SW); brown (10YR 5/3); 95% fine to coarse sand; evenly distributed; rounded; 5% gravel to 1cm; rounded; no odor.			
190	-				Same as above (185 ft); 35% of coarse fraction of sand is lapilli tuff.	SW		
<u>195</u>		SB0151	0.1		Poorly graded SAND (SP); brown (10YR 4/3); dry; dense; 100% fine to medium sand; rounded; no odor. Note: 3cm clay nodule in split spoon sample.		- Bentonite Seal	Kelly down @ 1129. Blow counts (197-198.5'): 9/50. New connection @
_ 200 _	-				Same as above (195 ft); 100% fine sand.	SP		1322. Resumed drilling @ 1327.
205 -	-				Well graded SAND (SW); dark yellowish brown (10YR 4/4); dry; dense; 100% fine to coarse sand; rounded; volcanic in composition; no odor.	sw		
210	-							

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Date Started: 2/24/2011 Date TD Reached: 3/3/2011 Date Completed: 3/7/2011

Ground Elevation AMSL (ft): 5345.8 Y Coordinate: 1473742.98 X Coordinate: 1541791.33

Borehole ID: KAFB-106118

Hole Diameter Upper (in.): 11-3/4 Hole Diameter Lower (in.): 9-5/8 Surface Completion Type: Flush mount

Groundwater Levels BGS (ft): \square At Time of Drilling: N/A \blacksquare At End of Drilling: N/A \blacksquare After Drilling: N/A

Drilling Contractor: WDC Drilling Drilling Method: Air Rotary Casing Hammer Logged By: Greg Peacock

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01 Depth (ft) Sample Tvpe	Number	Headspace PID	Lithologic Log	Material Description	U.S.C.S.	Well Diagram	Remarks
215				Well graded SAND (SW); dark yellowish brown (10YR 4/4); dry; dense; 95% fine to coarse sand; rounded; volcanic in composition; 5% gravel to 2cm; rounded; no odor.	SW		
220				Same as above (210 ft); 90% fine to coarse sand; 10% gravel to 2.5cm; rounded.	300		Kelly down @ 1333. New connection @ 1340. Resumed drilling @ 1341.
225				Poorly graded GRAVEL (GP); dark yellowish brown (10YR 4/4); dry; dense; 90% fine gravel to 3cm; rounded; 10% fine to coarse sand; rounded; no odor.	GP		
230				Poorly graded SAND (SP); dark yellowish brown (10YR 4/4); dry; dense; 95% fine to medium sand; rounded; 5% coarse sand; rounded; trace gravel to 2cm; no odor.	SP	- Bentonite Seal	
235				Poorly graded GRAVEL with Sand (GP); dark yellowish brown (10YR 4/6); moist; 60% fine gravel to 1.5cm; rounded; 40% fine to coarse sand; rounded; no odor.	GP		
235			00	Poorly graded SAND (SP); dark yellowish brown (10YR 4/4); dry; dense; 95% fine to medium sand; rounded; 5% gravel; rounded; no odor.	SP		Kelly down @ 1349. New connection @ 1355. Resumed drilling @ 1355.

S	L						Borehole ID: KAFB-106118				
Pro Pro	ojec ojec	ct Loca	tion: e: K	: ł (Af	≺AF =B I	s of Engineers ⁻ B, Albuquerque, NM 3FF SWMU ST-106 and SS-111 ⁷ 05	Hole Dia Surface	amete Comp	r Lower pletion 7	(in.): 11-3/4 (in.): 9-5/8 Type: Flush mo	unt
Da Da	te S te T	Started TD Rea Comple	: 2/2 ache	24/ d:	/20 [/] 3/3	11 3/2011	∑ At 1 ▼ At E	Time o End of	Levels I f Drilling Drilling ng: N//	N/A	
YC	Coo	nd Elev ordinate ordinate	e: 14	473	374			Metho	d: Air F	NDC Drilling Rotary Casing H acock	ammer Page 9 of 16
5 Depth (ft)	Sample Type	Number	Headspace PID	Lithologic	Log	Material Description		U.S.C.S.	w	ell Diagram	Remarks
-	-					Poorly graded GRAVEL with Sar dark grayish brown (10YR 4/2); o dense; 65% gravel to 2cm; round 35% fine to coarse sand; rounde odor.	lry; led;	GP			
245	-					SILT (ML); brown (10YR 4/3); dr nonplastic; 100% silt; no odor.	y; stiff;			- Bentonite Seal	Kelly down @ 1358.
250		SB0152	2.9			Same as above (243 ft).		ML		- Top of Filter Pack	Blow counts (247-248.5'): 26/50. New connection @ 1415. Resumed drilling @ 1416.
255 - - -	-					Poorly graded SAND (SP); light yellowish brown (10YR 6/4); dry; 95% very fine to fine sand; round fines; no odor.	dense; led; 5%	SP		- Top of 3/4" Schedule 80 PVC 0.050 Slot Screen	Kelly down @ 1420. New connection @ 1428. Resumed drilling @ 1429.
<u>260</u>						Well graded SAND (SW); brown 4/3); dry; dense; 100% fine to co sand; rounded; trace gravel to 1. rounded.	arse				
265	-					Same as above (260 ft).		SW		- Bottom of Screen - Bentonite Seal	
270											



Date Started: 2/24/2011 Date TD Reached: 3/3/2011 Date Completed: 3/7/2011

Ground Elevation AMSL (ft): 5345.8 Y Coordinate: 1473742.98 X Coordinate: 1541791.33

Borehole ID: KAFB-106118

Hole Diameter Upper (in.): 11-3/4 Hole Diameter Lower (in.): 9-5/8 Surface Completion Type: Flush mount

Groundwater Levels BGS (ft): \square At Time of Drilling: N/A \blacksquare At End of Drilling: N/A \blacksquare After Drilling: N/A

Drilling Contractor: WDC Drilling Drilling Method: Air Rotary Casing Hammer Logged By: Greg Peacock

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02 Depth (ft)	Sample Type	Number	Headspace PID	Lithologic Log	Material Description	U.S.C.S.	Well Diagram	Remarks
-	-				Well graded SAND (SW); brown (10YR 4/3); dry; dense; 100% fine to coarse sand; rounded; trace gravel to 1.5cm; rounded.	sw		
<u>275</u>	-				SILT (ML); brown (7.5YR 5/2); dry; stiff to very stiff; nonplastic; 100% silt; trace clay nodules to 2cm; no odor.			Kelly down @ 1437. New connection @ 1443. Resumed drilling @ 1446.
<u>280</u>	-				Sandy SILT (ML); brown (7.5YR 5/2); dry; stiff; nonplastic; 60% silt; 40% fine sand; rounded; no odor.	ML		
- 285 - -	-				Well graded SAND (SW); brown (10YR 4/3); dry; dense; 100% fine to coarse sand; rounded; no odor.		- Bentonite Seal	
<u>290</u>	-				Same as above (285 ft).	SW		
- 295 -	-				Same as above (285 ft); medium dense; 90% fine to coarse sand; rounded; 10% gravel to 1.5cm; rounded.			Kelly down @ 1454.
300		SB0153	0.0					Blow counts (297-298.5') 9/11. New connection @ 1510. Resumed drilling @ 1510.



Date Started: 2/24/2011 Date TD Reached: 3/3/2011 Date Completed: 3/7/2011

Ground Elevation AMSL (ft): 5345.8 Y Coordinate: 1473742.98 X Coordinate: 1541791.33

Borehole ID: KAFB-106118

Hole Diameter Upper (in.): 11-3/4 Hole Diameter Lower (in.): 9-5/8 Surface Completion Type: Flush mount

Groundwater Levels BGS (ft): \square At Time of Drilling: N/A \blacksquare At End of Drilling: N/A \blacksquare After Drilling: N/A

Drilling Contractor: WDC Drilling Drilling Method: Air Rotary Casing Hammer Logged By: Greg Peacock

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320 (10YŘ 4/3); dry; dense; 90% gravel to 2cm; rounded; 10% fine to coarse sand; subrounded; no odor. GP connection @ 1527 Resumed drilling @ 1528. 320 Poorly graded SAND (SP); grayish brown (10YR 5/2); dry; dense to medium dense; 100% fine sand; rounded; trace medium sand; no odor. GP	× C001		. 15	- 17 C		<i>р</i> у. С	Sley Feacuck	
305 Well graded SAND (SW); brown (TOYR 4/3); dry; dense; 95% fine to coarse sand; rounded; 5% gravel to 1.5cm; rounded; no odor. 305 Well graded SAND with Gravel (SW); brown (10YR 4/3); dry; dense; 65% fine to coarse sand; rounded; 35% gravel to 1.5cm; rounded; no odor. 310 Same as above (305 ft). 315 Poorly graded GRAVEL (GP); brown (10YR 4/3); dry; dense; 90% gravel to 2cm; rounded; no odor. 320 Poorly graded GRAVEL (GP); brown (10YR 4/3); dry; dense; 90% gravel to 2cm; rounded; no odor. 320 Poorly graded GRAVEL (GP); brown (10YR 4/3); dry; dense; 90% gravel to 2cm; rounded; no odor. 320 Poorly graded SAND (SP); gravish brown (10YR 5/2); dry; dense to medium dense; 100% fine sand; rounded; trace medium sand; no odor.	Sample Type	Number	Headspace	Lithologic Log	Material Description	U.S.C.S.	Well Diagram	Remarks
310 brown (10YR 4/3); dry; dense; 65% fine to coarse sand; rounded; 35% gravel to 1.5cm; rounded; no odor. SW 310 Same as above (305 ft). SW 315 Poorly graded GRAVEL (GP); brown (10YR 4/3); dry; dense; 90% gravel to 2cm; rounded; 10% fine to coarse sand; subrounded; no odor. Bentonite Seal 320 Poorly graded GRAVEL (GP); brown (10YR 4/3); dry; dense; 90% gravel to 2cm; rounded; no odor. GP 320 Poorly graded SAND (SP); grayish brown (10YR 5/2); dry; dense to medium dense; 100% fine sand; rounded; trace medium sand; no odor. GP	-		4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4		4/3); dry; dense; 95% fine to coarse sand; rounded; 5% gravel to 1.5cm; rounded; no odor.			
315 Poorly graded GRAVEL (GP); brown (10YR 4/3); dry; dense; 90% gravel to 2cm; rounded; 10% fine to coarse sand; subrounded; no odor. Bentonite Seal Kelly down @ 1520; connection @ 1527; Resumed drilling @ 1528. 320 Poorly graded SAND (SP); gravish brown (10YR 5/2); dry; dense to medium dense; 100% fine sand; rounded; trace medium sand; no odor. GP	310				brown (10YR 4/3); dry; dense; 65% fine to coarse sand; rounded; 35% gravel to 1.5cm; rounded; no odor.	SW		
320 Poorly graded GRAVEL (GP); brown (10YR 4/3); dry; dense; 90% gravel to 2cm; rounded; 10% fine to coarse sand; subrounded; no odor. GP Resumed drilling @ 1528. 320 Poorly graded SAND (SP); grayish brown (10YR 5/2); dry; dense to medium dense; 100% fine sand; rounded; trace medium sand; no odor. GP	315						- Roptonito Soci	
Poorly graded SAND (SP); grayish brown (10YR 5/2); dry; dense to medium dense; 100% fine sand; rounded; trace medium sand; no odor.	320		- ()		(10YR 4/3); dry; dense; 90% gravel to 2cm; rounded; 10% fine to coarse sand;	GP	Bentonite Sear	Kelly down @ 1520. Ne connection @ 1527. Resumed drilling @ 1528.
	-				brown (10YR 5/2); dry; dense to medium dense; 100% fine sand; rounded; trace			
Same as above (320 ft); 100% fine to medium sand; rounded.	-				Same as above (320 ft); 100% fine to medium sand; rounded.	SP		



Date Started: 2/24/2011 Date TD Reached: 3/3/2011 Date Completed: 3/7/2011

Ground Elevation AMSL (ft): 5345.8 Y Coordinate: 1473742.98 X Coordinate: 1541791.33

Borehole ID: KAFB-106118

Hole Diameter Upper (in.): 11-3/4 Hole Diameter Lower (in.): 9-5/8 Surface Completion Type: Flush mount

Groundwater Levels BGS (ft): \Box At Time of Drilling: N/A \blacksquare At End of Drilling: N/A \blacksquare After Drilling: N/A

Drilling Contractor: WDC Drilling Drilling Method: Air Rotary Casing Hammer Logged By: Greg Peacock

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g Depth (ft)	Sample Type	Number	Headspace PID	Lithologic Log	Material Description	U.S.C.S.	Well Diagi	ram Remarks	
335					Poorly graded SAND (SP); grayish brown (10YR 5/2); dry; dense; 95% fine to medium sand; 5% coarse sand; rounded; no odor.	SP	- Bentor	nite Seal	
340					Well graded SAND (SW); brown (10YR 4/3); dry; dense; 100% fine to coarse sand; subangular to subrounded; trace gravel to 1cm; rounded; no odor.	sw	- Top of Pack	Filter Kelly down @ 1539. N connection @ 1610. Resumed drilling @ 1611.	ew
-					Poorly graded SAND (SP); grayish brown (10YR 5/2); dry; dense; 100% very fine to fine sand; rounded; no odor.	SP	- Top of Sched PVC 0 Slot Sc	lule 80).050	
345		SB0154	0.3		Well graded SAND (SW); brown (10YR 4/3); dry; medium dense; 90% fine to coarse sand; rounded; 10% fine gravel to 1.5cm; rounded; no odor.			Kelly down @ 1622. Blow counts (347-348. 5/11. Blow counts (348.5-350'): 9/17. New	ŕ
350		SB0154			Same as above (345 ft).	SW	- Bottom Screer	n of Resumed drilling @	
<u>355</u>					Poorly graded GRAVEL (GP); brown (10YR 4/3); dry; dense; 95% fine gravel to 3cm; rounded; 5% fine to coarse sand; rounded; no odor.	GP	- Bentor	nite Seal of 3/1/11. New connection @ 0828 on 3/2/11. Resumed drillir @ 0834.	ı
360					Well graded SAND (SW); brown (10YR 4/3); dry; medium dense; 100% fine to coarse sand; subrounded to rounded; no	sw			



Date Started: 2/24/2011 Date TD Reached: 3/3/2011 Date Completed: 3/7/2011

Ground Elevation AMSL (ft): 5345.8 Y Coordinate: 1473742.98 X Coordinate: 1541791.33

Borehole ID: KAFB-106118

Hole Diameter Upper (in.): 11-3/4 Hole Diameter Lower (in.): 9-5/8 Surface Completion Type: Flush mount

Groundwater Levels BGS (ft): \square At Time of Drilling: N/A \blacksquare At End of Drilling: N/A \blacksquare After Drilling: N/A

Drilling Contractor: WDC Drilling Drilling Method: Air Rotary Casing Hammer Logged By: Greg Peacock

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90 Depth (ft) Sample Type Number	Headspace PID Lithologic Log	Material Description	U.S.C.S.	Well Diagram	Remarks
365 370 370 375 380 385 385		odor. Same as above (358 ft); trace gravel; rounded. Same as above (358 ft); subangular to subrounded. Well graded SAND with Gravel (SW); brown (10YR 4/3); dry; medium dense; 80% fine to coarse sand; subrounded to rounded; 20% fine gravel to 1cm; no odor. Well graded SAND (SW); brown (10YR 4/3); dry; dense; 100% fine to coarse sand; rounded; trace gravel; rounded; no odor. Same as above (380 ft); dominantly fine sand.	SW	- Bentonite Seal	Kelly down @ 0926. Casing refusal, pulled 120' of casing and redrilled. End of 3/2/11. New connection @ 1126 on 3/3/11. Resumed drilling @ 1128.



Date Started: 2/24/2011 Date TD Reached: 3/3/2011 Date Completed: 3/7/2011

Ground Elevation AMSL (ft): 5345.8 Y Coordinate: 1473742.98 X Coordinate: 1541791.33

Borehole ID: KAFB-106118

Hole Diameter Upper (in.): 11-3/4 Hole Diameter Lower (in.): 9-5/8 Surface Completion Type: Flush mount

Groundwater Levels BGS (ft): \square At Time of Drilling: N/A \blacksquare At End of Drilling: N/A \blacksquare After Drilling: N/A

Drilling Contractor: WDC Drilling Drilling Method: Air Rotary Casing Hammer Logged By: Greg Peacock

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g Depth (ft)	Sample Type	Number	Headspace PID	Lithologic Log	Material Description	U.S.C.S.	Well Diagram	Remarks
-	-				Poorly graded SAND (SP); brown (10YR 4/3); dry; loose; 100% fine to medium sand; dominantly fine sand; rounded; abundant mica flakes; no odor.			
<u>395</u>	-				Same as above (390 ft); trace coarse sand.	SP		Kelly down @ 1204.
-	X	SB0155	19.1		Note: 4cm gravel fragment in spilt spoon sample.			Blow counts (397-398.5') 3/5. Blow counts (398.5-400'): 3/5. New
<u>400</u> - - - - - - - - - - - - - - - - - -		SB0155			Well graded SAND (SW); brown (10YR 4/3); dry; loose to medium dense; 100% fine to coarse sand; subangular to rounded; trace gravel; no odor. Same as above (400 ft).	SW	- Bentonite Seal	connection @ 1310. Resumed drilling @ 1313.
-	-				Poorly graded SAND (SP); brown (10YR 4/3); dry; loose to medium dense; 100% fine to medium sand; rounded; trace coarse sand; rounded; no odor.	SP		
<u>415</u> - - -	-				Well graded SAND with Gravel (SW); brown (10YR 4/3); dry; medium dense; 75% fine to coarse sand; rounded; 25% fine gravel; subrounded; no odor.	sw		Kelly down @ 1346. New connection @ 1422. Resumed drilling @ 1423.
420								



Date Started: 2/24/2011 Date TD Reached: 3/3/2011 Date Completed: 3/7/2011

Ground Elevation AMSL (ft): 5345.8 Y Coordinate: 1473742.98 X Coordinate: 1541791.33

Borehole ID: KAFB-106118

Hole Diameter Upper (in.): 11-3/4 Hole Diameter Lower (in.): 9-5/8 Surface Completion Type: Flush mount

Groundwater Levels BGS (ft): \square At Time of Drilling: N/A \blacksquare At End of Drilling: N/A \blacksquare After Drilling: N/A

Drilling Contractor: WDC Drilling Drilling Method: Air Rotary Casing Hammer Logged By: Greg Peacock

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5 Depth (ft)	Sample Type	Number	Headspace PID	Lithologic Log	Material Description	U.S.C.S.	We	II Diagram	Remarks
425					Well graded SAND (SW); brown (10YR 4/3); dry; loose; 85% fine to coarse sand; rounded; 10% fine gravel; rounded; 5% clay nodules; no odor.	SW			
430			- - - - - - - - - - - - - - - - - - -		Poorly graded SAND (SP); brown (10YR 4/3); dry; loose to medium dense; 95% fine to medium sand; rounded; 5% coarse sand; rounded; trace gravel; rounded; no odor.	SP		- Bentonite Seal	
435			:		Well graded SAND (SW); brown (10YR 4/3); dry; medium dense; 100% fine to coarse sand; subrounded to rounded; no odor.	SW			
440					Poorly graded GRAVEL with Sand (GP); brown (10YR 4/3); dry; medium dense; 60% fine gravel to 1.5cm; subangular to subrounded; 40% fine to coarse sand; rounded; no odor.	GP		- Top of Filter Pack	Kelly down @ 1509. New connection @ 1517. Resumed drilling @ 1520.
445	-				Poorly graded SAND with Gravel (SP); brown (10YR 4/3); dry; medium dense; 60% fine to medium sand; rounded; 40% fine gravel to 2cm; rounded; trace clay nodules; no odor.	SP		- Top of 3" Schedule 80 PVC 0.050 Slot Screen	
440		SB0156	0.0		SILT with Sand (ML); brown (10YR 5/3); slightly moist; firm; nonplastic; 80% silt; 20% very fine sand; no odor.	ML			Kelly down @ 1537. Blow counts (447-448.5'): 12/11. Blow counts
450	$\left \right\rangle$	SB0156			Poorly graded SAND (SP); brown (10YR	SP			(448.5-450'): 15/12. New connection @ 1605.



Borehole ID: KAFB-106118

Client: US Army Corps of Engineers Project Location: KAFB, Albuquerque, NM Project Name: KAFB BFF SWMU ST-106 and SS-111 Project Number: 140705

Date Started: 2/24/2011 Date TD Reached: 3/3/2011 Date Completed: 3/7/2011

Ground Elevation AMSL (ft): 5345.8 Y Coordinate: 1473742.98 X Coordinate: 1541791.33 Hole Diameter Upper (in.): 11-3/4 Hole Diameter Lower (in.): 9-5/8 Surface Completion Type: Flush mount

Groundwater Levels BGS (ft): \square At Time of Drilling: N/A \blacksquare At End of Drilling: N/A \blacksquare After Drilling: N/A

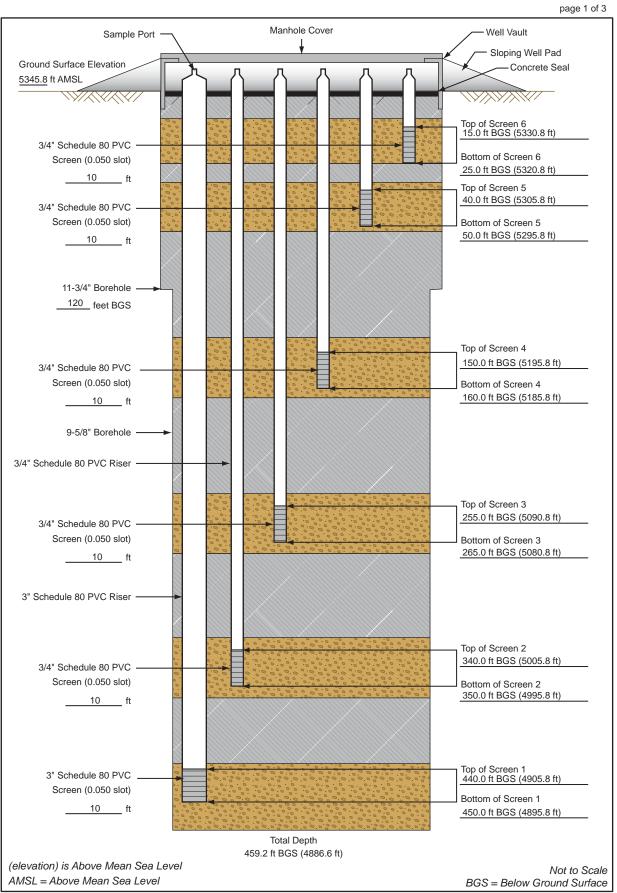
Drilling Contractor: WDC Drilling Drilling Method: Air Rotary Casing Hammer Logged By: Greg Peacock

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5 Depth (ft)	Sample Type	Number	Headspace PID	Lithologic Log	Material Description	U.S.C.S.	Well Diagram	Remarks
					4/3); dry; medium dense; 95% fine to medium sand; rounded; 5% coarse sand; rounded; no odor.	SP	Screen	Resumed drilling @ 1606.
<u>45</u> 8	5				Same as above (449 ft).			
	-				SILT (ML); brown (10YR 5/3); dry; firm; nonplastic; 100% silt; no odor.	ML		
460) -							Total depth = 459.2 ft. Reached @ 1626 on 3/3/11.
4.01	-							Water added during drilling (gallons): 0
46	<u>></u>							Water added during construction (gallons): 423.3
47(- -)							Kelly down: TD the joint and ready to make new connection.
	-							
47	5							
	-							
480)							

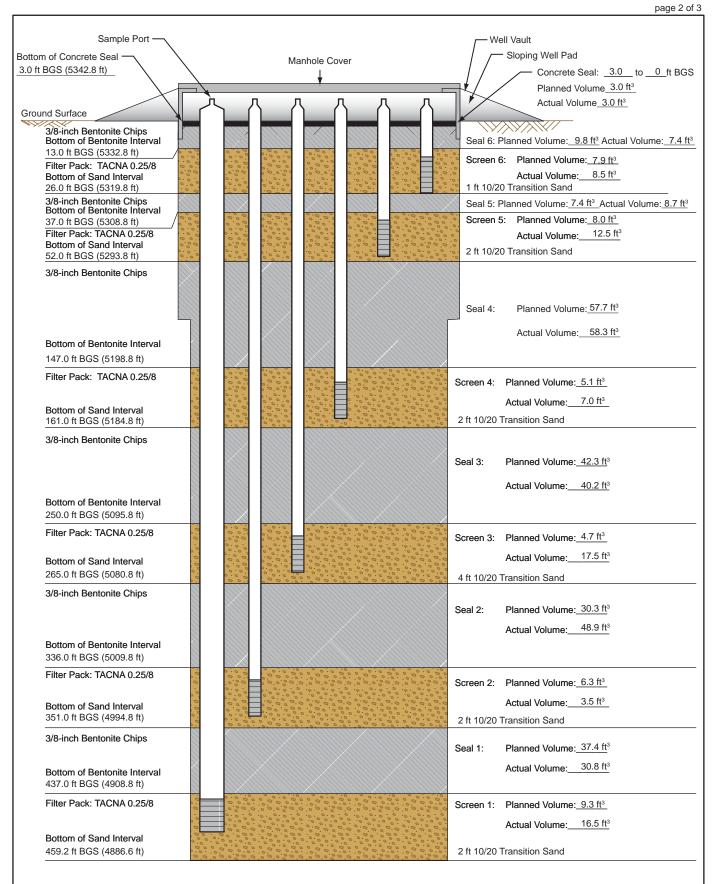
Nested Soil Vapor Well Completion Diagram for KAFB-106118

Installation Start Date/Time: <u>3/4/2011 @ 09:20</u> Installation End Date/Time: <u>3/7/2011 @ 10:25</u>



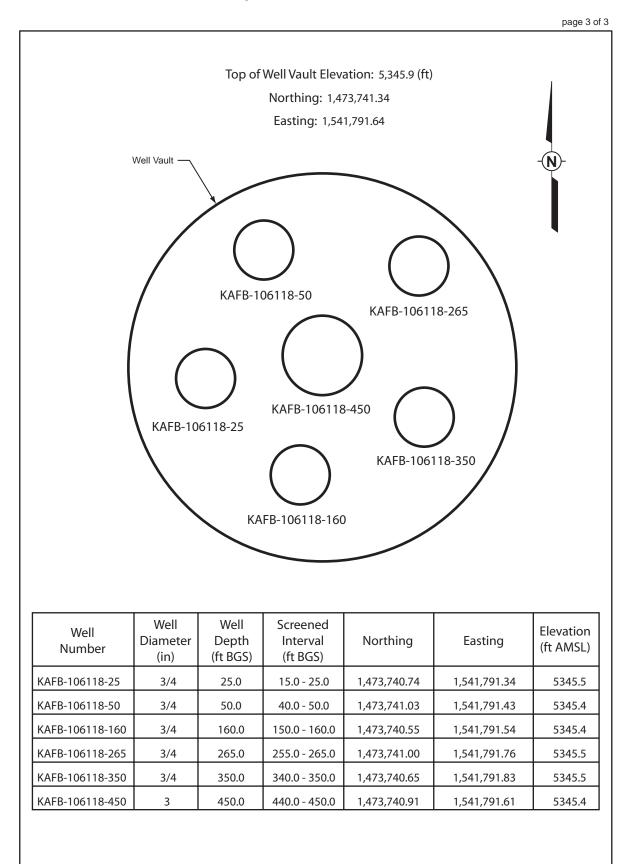
¹⁴⁰⁷⁰⁵_CA010020_SV_KAFB.106118 (a)

Nested Soil Vapor Well Completion Diagram for KAFB-106118



(elevation) is Above Mean Sea Level All Materials Placed with Tremie Pipe Not to Scale BGS = Below Ground Surface

Nested Soil Vapor Well Completion Diagram Map View for KAFB-106118



140705_CA010020_SV_Map View_106118.ai

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APPENDIX D-1

KAFB-106119 Final Well Report

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Date Started: 3/3/2011 Date TD Reached: 3/4/2011 Date Completed: 3/6/2011

Ground Elevation AMSL (ft): 5343.5 Y Coordinate: 1473521.57 X Coordinate: 1541613.14

Borehole ID: KAFB-106119

Hole Diameter Upper (in.): 11-3/4 Hole Diameter Lower (in.): 9-5/8 Surface Completion Type: Flush mount

Groundwater Levels BGS (ft): \square At Time of Drilling: N/A \blacksquare At End of Drilling: N/A \blacksquare After Drilling: N/A

Drilling Contractor: WDC Drilling Drilling Method: Air Rotary Casing Hammer Logged By: Jason Tarbert

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 Depth (ft) 	Sample Type	Number	Headspace PID	Lithologic Log	Material Description	U.S.C.S.	Well Diagram	Remarks
	_				Sandy SILT (ML); brown (7.5YR 5/3); moist; loose; low plasticity; 65% silt; 35% very fine to medium sand to 2mm.		- Concrete Seal	Hand augered.
5	-			_	Same as above (0 ft).			Began drilling @ 1448 or 3/3/11. Blow counts (7-8.5'):
10	-X	SB0157 SB0158	0.1	-	Same as above (0 ft); reddish brown		- Bentonite Seal	14/15. Resumed drilling @
	-				(5YR 5/4); very stiff; 60% silt; 5% clay; 35% very fine to meduim sand.		Top of Filter Pack	1504.
15	-				Same as above (0 ft); reddish brown (5YR 4/4).	ML	- Top of 3/4" Schedule 80 PVC 0.050 Slot Screen	Bottom of casing @ 1510. Blow counts (17-18.5'):
20	-X	SB0159	0.0	-	Sandy SILT (ML); brown (7.5YR 5/4);			14/23. Resumed drilling @ 1521.
	-				moist; hard; low plasticity; 60% silt; 40% very fine to coarse sand; trace fine gravel to 1cm.			
25	-				Same as above (20 ft); 40% very fine to medium sand to 2mm; no gravel.		- Bottom of Screen	Bottom of casing @ 1525.
30		SB0160 SB0160- MS SB0160- SB0160- MSD					- Bentonite Seal	Blow counts (27-28.5'): 8/13. Blow counts (28.5-30'): Not Recorded Resumed drilling @



Date Started: 3/3/2011 Date TD Reached: 3/4/2011 Date Completed: 3/6/2011

Ground Elevation AMSL (ft): 5343.5 Y Coordinate: 1473521.57 X Coordinate: 1541613.14

Borehole ID: KAFB-106119

Hole Diameter Upper (in.): 11-3/4 Hole Diameter Lower (in.): 9-5/8 Surface Completion Type: Flush mount

Groundwater Levels BGS (ft): \square At Time of Drilling: N/A \blacksquare At End of Drilling: N/A \blacksquare After Drilling: N/A

Drilling Contractor: WDC Drilling Drilling Method: Air Rotary Casing Hammer Logged By: Jason Tarbert

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S Depth (ft)	1.72	Number	Headspace PID	Lithologic Log	Material Description	U.S.C.S.	Well Diagram	Remarks
35	-				Sandy SILT (ML); brown (7.5YR 5/4); moist; very stiff; low plasticity; 60% silt; trace clay nodules; 40% very fine to coarse sand; trace fine gravel to 1cm. Same as above (30 ft); hard; 70% silt;	ML	- Bentonite Seal	1541.
40		SB0161	0.0		30% very fine to coarse sand to 4.5mm; no clay. Lean CLAY with Sand (CL); reddish brown (5YR 5/4); dry; hard; medium plasticity; 70% clay; 15% silt; 15% very fine to medium sand to 1mm. No cuttings returned.		- Top of Filter Pack - Top of 3/4"	Blow counts (37-38.5'): 11/23. Bottom of casing @
45	-				Sandy SILT (ML); brown (7.5YR 5/4);		Schedule 80 PVC 0.050 Slot Screen	1546. Resumed drilling @ 1554.
50		SB0162	0.0		dry; hard; low plasticity; 70% silt; 30% very fine to coarse sand; trace fine gravel to 9mm. Silty SAND (SM); brown (7.5YR 5/4); dry; dense; 60% very fine to very coarse sand; 5% fine gravel to 2cm; subrounded; 35% silt.	ML	- Bottom of	Blow counts (47-48.5'): 16/32. Bottom of casing @
55	-					SM	Screen	1559. Resumed drilling @ 1616.
60	- - - -)				Sandy SILT (ML); brown (7.5YR 4/4); dry; hard; low plasticity; 60% silt; 10% clay; 30% very fine to medium sand to 3mm.	ML	- Bentonite Seal	



Date Started: 3/3/2011 Date TD Reached: 3/4/2011 Date Completed: 3/6/2011

Ground Elevation AMSL (ft): 5343.5 Y Coordinate: 1473521.57 X Coordinate: 1541613.14

Borehole ID: KAFB-106119

Hole Diameter Upper (in.): 11-3/4 Hole Diameter Lower (in.): 9-5/8 Surface Completion Type: Flush mount

Groundwater Levels BGS (ft): \square At Time of Drilling: N/A \blacksquare At End of Drilling: N/A \blacksquare After Drilling: N/A

Drilling Contractor: WDC Drilling Drilling Method: Air Rotary Casing Hammer Logged By: Jason Tarbert

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@ Denth (ft)	Sample Type	Number	Headspace PID	Lithologic	Log	Material Description	U.S.C.S.	Well Diagram		Remarks
	-					Sandy SILT (ML); brown (7.5YR 4/4); dry; hard; low plasticity; 60% silt; 10% clay; 30% very fine to coarse sand to 4mm.				Resumed drilling @ 1628.
6	5					Same as above (60 ft); 60% silt; 40% very fine to coarse sand.	ML			
7	<u> </u>					Same as above (60 ft); 50% silt; 20% clay; 30% very fine to fine sand.				
7	-			 <td></td><td>Well graded SAND with Silt (SW-SM); brown (7.5YR 5/3); moist; medium dense; 90% very fine to very coarse sand; trace gravel to 1.4cm; subangular; 10% silt with clay.</td><td>SW- SM</td><td>- Be</td><td>ntonite Seal</td><td>Bottom of casing @ 1635.</td>		Well graded SAND with Silt (SW-SM); brown (7.5YR 5/3); moist; medium dense; 90% very fine to very coarse sand; trace gravel to 1.4cm; subangular; 10% silt with clay.	SW- SM	- Be	ntonite Seal	Bottom of casing @ 1635.
8	2					SILT with Sand (ML); brown (7.5YR 5/4); dry; very stiff; low plasticity; 80% silt; 20% very fine to medium sand to 1mm.				
8	5					Same as above (80 ft).	ML			
9	2 D									



Date Started: 3/3/2011 Date TD Reached: 3/4/2011 Date Completed: 3/6/2011

Ground Elevation AMSL (ft): 5343.5 Y Coordinate: 1473521.57 X Coordinate: 1541613.14

Borehole ID: KAFB-106119

Hole Diameter Upper (in.): 11-3/4 Hole Diameter Lower (in.): 9-5/8 Surface Completion Type: Flush mount

Groundwater Levels BGS (ft): \square At Time of Drilling: N/A \blacksquare At End of Drilling: N/A \blacksquare After Drilling: N/A

Drilling Contractor: WDC Drilling Drilling Method: Air Rotary Casing Hammer Logged By: Jason Tarbert

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ଞ Depth (ft)	Sample Type	Number	Headspace PID	Lithologic Log	Material Description	U.S.C.S.	Well Diagram	Remarks
<u>95</u> 100		SB0163	4.9		No cuttings returned. SILT with Sand (ML); brown (7.5YR 5/4); dry; very stiff; low plasticity; 75% silt; 5% clay nodules; 20% very fine to medium sand to 1mm. Lean CLAY (CL); lense. Poorly graded SAND (SP); brown (10YR 5/3); damp; loose; 100% medium sand to 0.5mm; rounded; trace clay nodules. Same as above (99 ft); 95% medium sand; 5% silt.	ML CL SP	- Bentonite Seal	Blow counts (97-98.5'): 5/23. Bottom of casing @ 1652. Resumed drilling @ 1704.
<u>110</u> <u>115</u> <u>120</u>					Lean CLAY (CL); brown (10YR 5/3); damp; hard; medium plasticity; 100% lean clay; trace silt (likely from cyclone). SILT (ML); brown (7.5YR 5/4); moist; hard; low plasticity; 85% silt; 5% clay; 10% very fine sand. Same as above (112 ft).	CL 		



Borehole ID: KAFB-106119

Client: US Army Corps of Engineers Project Location: KAFB, Albuquerque, NM Project Name: KAFB BFF SWMU ST-106 and SS-111 Project Number: 140705

Date Started: 3/3/2011 Date TD Reached: 3/4/2011 Date Completed: 3/6/2011

Ground Elevation AMSL (ft): 5343.5 Y Coordinate: 1473521.57 X Coordinate: 1541613.14 Hole Diameter Upper (in.): 11-3/4 Hole Diameter Lower (in.): 9-5/8 Surface Completion Type: Flush mount

Groundwater Levels BGS (ft): \square At Time of Drilling: N/A \blacksquare At End of Drilling: N/A \square After Drilling: N/A

Drilling Contractor: WDC Drilling Drilling Method: Air Rotary Casing Hammer Logged By: Jason Tarbert

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Sample Type Headspace PID Lithologic Log Depth (ft) Number Ś Ö Material Description Remarks Well Diagram ю. 5 120 No cuttings returned. Bottom of casing @ 1709 on 3/3/11. Resumed drilling @ 1105 on 3/4/11. 125 No cuttings returned. Bentonite Seal 130 No cuttings returned. Poorly graded SAND (SP); brown (10YR 135 5/3); moist; very dense; 100% medium sand to 0.5mm; rounded. SP Top of Filter Bottom of casing @ Pack 1117. Resumed drilling @ 1124. 140 Top of 3/4" Well graded SAND (SW); brown (10YR Schedule 80 4/3); damp; medium dense; 100% fine to PVC 0.050 coarse sand to 3mm; rounded. Slot Screen 145 SW Same as above (140 ft); very dense. Blow counts (147-148.5'): SB0164 0.0 23/50. Bottom of casing @ 1128. 150



Date Started: 3/3/2011 Date TD Reached: 3/4/2011 Date Completed: 3/6/2011

Ground Elevation AMSL (ft): 5343.5 Y Coordinate: 1473521.57 X Coordinate: 1541613.14

Borehole ID: KAFB-106119

Hole Diameter Upper (in.): 11-3/4 Hole Diameter Lower (in.): 9-5/8 Surface Completion Type: Flush mount

Groundwater Levels BGS (ft): \square At Time of Drilling: N/A \blacksquare At End of Drilling: N/A \blacksquare After Drilling: N/A

Drilling Contractor: WDC Drilling Drilling Method: Air Rotary Casing Hammer Logged By: Jason Tarbert

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05 Depth (ft)	Sample Type	Number	Headspace PID	Lithologic Log	Material Description	U.S.C.S.	Well Diagram	Remarks
	-				Well graded SAND (SW); brown (10YR 4/3); damp; medium dense; 100% fine to coarse sand to 3mm; rounded.		Screen	Resumed drilling @ 1142.
155	-				Same as above (150 ft); 95% very fine to very coarse sand; 5% fine gravel to 1.1cm.			Bottom of casing @
160	-				Same as above (150 ft); 95% very fine to very coarse sand; 5% fine gravel to 1.1cm.			1145. Resumed drilling @ 1151.
165	-				Same as above (150 ft); grading finer; no gravel.	SW	- Bentonite Seal	
<u>170</u>	-				Same as above (150 ft); grading finer; some pumice.			
175					Same as above (150 ft).			Bottom of casing @
180								1156.



Project Number: 140705

Date TD Reached: 3/4/2011 Date Completed: 3/6/2011

Y Coordinate: 1473521.57

Ground Elevation AMSL (ft): 5343.5

Date Started: 3/3/2011

Project Name: KAFB BFF SWMU ST-106 and SS-111

Borehole ID: KAFB-106119

Hole Diameter Upper (in.): 11-3/4 Hole Diameter Lower (in.): 9-5/8 Surface Completion Type: Flush mount

Groundwater Levels BGS (ft): ▼ After Drilling: N/A

Drilling Contractor: WDC Drilling Drilling Method: Air Rotary Casing Hammer Logged By: Jason Tarbert

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08 Depth (ft)	Sample Type		Headspace PID	Lithologic Log	Material Description	U.S.C.S.	We	ell Diagram	Remarks
- - - - - - - - - -	-				Well graded SAND (SW); brown (10YR 5/3); moist; loose; 95% very fine to very coarse sand; trace fine gravel to 9mm; subrounded to rounded; 5% silt with clay nodules. Same as above (180 ft).				Resumed drilling @ 1237.
- <u>190</u> -					Same as above (180 ft).				
<u>195</u>	- - -	0165	0.0		Same as above (180 ft).	SW		- Bentonite Seal	Blow counts (197-198.5'):
<u>200</u>					Same as above (180 ft); fine gravel to 2cm.				4/4. Bottom of casing @ 1242. Resumed drilling @ 1255.
 205					Same as above (180 ft); 90% very fine to very coarse sand; 5% fine gravel; 5% fines.				
210					Lean CLAY (CL); brown (10YR 5/3);	CL			

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Date Started: 3/3/2011 Date TD Reached: 3/4/2011 Date Completed: 3/6/2011

Ground Elevation AMSL (ft): 5343.5 Y Coordinate: 1473521.57 X Coordinate: 1541613.14

Borehole ID: KAFB-106119

Hole Diameter Upper (in.): 11-3/4 Hole Diameter Lower (in.): 9-5/8 Surface Completion Type: Flush mount

Groundwater Levels BGS (ft): \square At Time of Drilling: N/A \blacksquare At End of Drilling: N/A \blacksquare After Drilling: N/A

Drilling Contractor: WDC Drilling Drilling Method: Air Rotary Casing Hammer Logged By: Jason Tarbert

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10 Depth (ft)	Sample Type	Number	Headspace PID	Lithologic Log	Material Description	U.S.C.S.	We	ll Diagram	Remarks
	-				damp; very stiff; medium plasticity; 100% clay with minor silt; trace fine gravel to 1.9cm; rounded.	CL			
215	-				Well graded SAND with Silt (SW-SM); brown (10YR 5/3); moist; loose; 90% very fine to very coarse sand; trace fine gravel to 1.5cm; rounded; 10% silt with minor clay nodules.	SW- SM			
220	-				Well graded SAND (SW); brown (10YR 4/3); moist; medium dense; 100% very fine to very coarse sand; trace fine gravel to 1cm; rounded. Same as above (217 ft).				Resumed drilling @ 1308.
225	-				Same as above (217 ft); predominantly			- Bentonite Seal	
<u>230</u>	-				pumice. Same as above (217 ft); pumice and lithics.	SW			
<u>235</u>	-				Same as above (217 ft); trace fine gravel to 2.7cm.				
240	-							- Top of Filter Pack	Bottom of casing @ 1312. Resumed drilling @ 1319.

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Date Started: 3/3/2011 Date TD Reached: 3/4/2011 Date Completed: 3/6/2011

Ground Elevation AMSL (ft): 5343.5 Y Coordinate: 1473521.57 X Coordinate: 1541613.14

Borehole ID: KAFB-106119

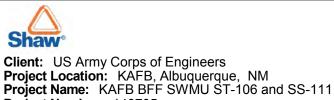
Hole Diameter Upper (in.): 11-3/4 Hole Diameter Lower (in.): 9-5/8 Surface Completion Type: Flush mount

Groundwater Levels BGS (ft): \square At Time of Drilling: N/A \blacksquare At End of Drilling: N/A \blacksquare After Drilling: N/A

Drilling Contractor: WDC Drilling Drilling Method: Air Rotary Casing Hammer Logged By: Jason Tarbert

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5 Depth (ft)	Sample Type	Number	Headspace PID	Lithologic Log	Material Description	U.S.C.S.	W	ell Diagram	Remarks
-	-				Well graded SAND (SW); brown (10YR 4/3); dry; medium dense; 100% very fine to very coarse sand; trace fine gravel to 1cm; rounded; grading coarser than 235'.	SW		Schedule 80 PVC 0.050 Slot Screen	
245 -					Poorly graded SAND (SP); brown (10YR 5/3); dry; medium dense; 85% medium sand; 15% fine sand; trace fine gravel to 1.5cm; rounded.				Plant counts (247, 248, 5')
- 250 - -		SB0166	2.7		Same as above (244 ft); dense; 85% coarse sand; 15% fine to medium sand.	SP		- Bottom of Screen	Blow counts (247-248.5') 14/23.
- 255_ - -	-				Same as above (244 ft); 85% coarse sand; 15% fine to medium sand.				
260								-Bentonite Seal	Resumed drilling @ 1345.
-	-				Well graded SAND (SW); brown (10YR 5/3); dry; medium dense; 100% very fine to very coarse sand to 5mm; subrounded.	SW		Demonite Seal	
<u>265</u> - - - 270					Well graded SAND with Silt (SW-SM); dark yellowish brown (10YR 4/4); moist; dense; 90% fine to coarse sand to 3mm; rounded; 10% silt.	SW- SM			



Project Number: 140705

Date TD Reached: 3/4/2011 Date Completed: 3/6/2011

Y Coordinate: 1473521.57

Ground Elevation AMSL (ft): 5343.5

Date Started: 3/3/2011

Borehole ID: KAFB-106119

Hole Diameter Upper (in.): 11-3/4 Hole Diameter Lower (in.): 9-5/8 Surface Completion Type: Flush mount

Groundwater Levels BGS (ft): \bigtriangledown At Time of Drilling: N/A At End of Drilling: N/A ▼ After Drilling: N/A

Drilling Contractor: WDC Drilling Drilling Method: Air Rotary Casing Hammer Logged By: Jason Tarbert

		rdinat				Drilling Method: Air Rotary Casing Hammer Logged By: Jason Tarbert Page 10 of 16					
05 Depth (ft)	Sample Type Number Headspace		Headspace PID	Lithologic Log	Material Description	U.S.C.S.	w	ell Diagram	Remarks		
-	-				Well graded SAND (SW); brown (10YR 4/3); dry; dense; 100% very fine to very coarse sand; trace fine gravel to 6mm; subrounded.						
<u>275</u>	-				Lean CLAY (CL); brown (10YR 5/3); moist; very stiff; medium plasticity; 95% clay; 5% silt.				Bottom of casing @ 1352.		
280	-				Same as above (275 ft).	CL					
285	-				Lean CLAY with Sand (CL); brown (10YR 5/3); moist; very stiff; medium plasticity; 75% clay; 25% very fine to medium sand to 1mm.			- Bentonite Seal			
290	-				Well graded SAND (SW); dark yellowisi brown (10YR 4/4); dry; dense; 100% very fine to very coarse sand; trace fine gravel to 1.3cm; rounded.						
295		SB0167	5.5		Well graded SAND with Gravel (SW); dry; dense; 80% very fine to very coarse sand; 20% fine gravel to 3cm.	SW			Blow counts (297-298.5'): 12/27. Bottom of casing		
300									@ 1408. Resumed drilling @ 1424.		



Borehole ID: KAFB-106119

Client: US Army Corps of Engineers Project Location: KAFB, Albuquerque, NM Project Name: KAFB BFF SWMU ST-106 and SS-111 Project Number: 140705 Hole Diameter U Hole Diameter U Surface Completer Completer States of the s

Date Started: 3/3/2011 Date TD Reached: 3/4/2011 Date Completed: 3/6/2011

Ground Elevation AMSL (ft): 5343.5 Y Coordinate: 1473521.57 X Coordinate: 1541613.14 Hole Diameter Upper (in.): 11-3/4 Hole Diameter Lower (in.): 9-5/8 Surface Completion Type: Flush mount

Groundwater Levels BGS (ft): \square At Time of Drilling: N/A \blacksquare At End of Drilling: N/A \blacksquare After Drilling: N/A

Drilling Contractor: WDC Drilling Drilling Method: Air Rotary Casing Hammer Logged By: Jason Tarbert

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00 Depth (ft)	Sample Type	Number	Headspace PID	Lithologic Log	Material Description	U.S.C.S.	Well Diagram	Remarks	
305	-				Silty SAND (SM); dark yellowish brown (10YR 4/4); moist; dense; 80% very fine to very coarse sand to 4mm; rounded; 20% silt.	SM			
	-				Well graded SAND (SW); brown (10YR 4/3); dry; dense; 90% very fine to very coarse sand; 5% fine gravel to 1.3cm; rounded; 5% silt.				
310	-				Same as above (305 ft).	SW			
315	-				Same as above (305 ft).		- Bentonite Seal	Resumed drilling @ 1433.	
320	-				Poorly graded SAND (SP); dark yellowish brown (10YR 4/4); dry; loose; 90% medium sand; 10% fine gravel to 3.5 cm; well rounded.				
325					Same as above (320 ft); no gravel.	SP			
330									



Date Started: 3/3/2011 Date TD Reached: 3/4/2011 Date Completed: 3/6/2011

Ground Elevation AMSL (ft): 5343.5 Y Coordinate: 1473521.57 X Coordinate: 1541613.14

Borehole ID: KAFB-106119

Hole Diameter Upper (in.): 11-3/4 Hole Diameter Lower (in.): 9-5/8 Surface Completion Type: Flush mount

Groundwater Levels BGS (ft): \Box At Time of Drilling: N/A \blacksquare At End of Drilling: N/A \blacksquare After Drilling: N/A

Drilling Contractor: WDC Drilling Drilling Method: Air Rotary Casing Hammer Logged By: Jason Tarbert

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05 Depth (ft)	Sample Type	Number	Headspace PID	Lithologic Log	Material Description	U.S.C.S.	We	ell Diagram	Remarks
-					Poorly graded SAND (SP); dark yellowish brown (10YR 4/4); dry; loose; 100% fine to medium sand.				
- <u>335</u> -					Same as above (330 ft); 100% medium sand.	SP		- Bentonite Seal	
- _ 340	-							- Top of Filter Pack	Resumed drilling @ 1452.
-					Well graded SAND (SW); brown (10YR 4/3); dry; loose; 95% very fine to very coarse sand; trace fine gravel to 2cm; rounded; 5% silt.	<u> </u>		- Top of 3/4" Schedule 80 PVC 0.050 Slot Screen	
<u>345</u> -					Same as above (340 ft); grading coarser.				
-	X	SB0168	2.9						Blow counts (347-348.5'): 5/10. Resumed drilling @ 1509.
<u>350</u> - -					Same as above (340 ft); medium dense; coarser.	SW		- Bottom of Screen	
_ <u>355</u> _ _					Same as above (340 ft); grading finer.			- Bentonite Seal	
- _ 360	-								Bottom of casing @ 1513.



ShawHole DiClient: US Army Corps of EngineersHole DiProject Location: KAFB, Albuquerque, NMHole DiProject Name: KAFB BFF SWMU ST-106 and SS-111Surface

Date Started: 3/3/2011 Date TD Reached: 3/4/2011 Date Completed: 3/6/2011

Project Number: 140705

Ground Elevation AMSL (ft): 5343.5 Y Coordinate: 1473521.57 X Coordinate: 1541613.14

Hole Diameter Upper (in.): 11-3/4 Hole Diameter Lower (in.): 9-5/8 Surface Completion Type: Flush mount

Borehole ID: KAFB-106119

Groundwater Levels BGS (ft): \square At Time of Drilling: N/A \blacksquare At End of Drilling: N/A \blacksquare After Drilling: N/A

Drilling Contractor: WDC Drilling Drilling Method: Air Rotary Casing Hammer Logged By: Jason Tarbert

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00 Depth (ft)	Sample Type	Number	Headspace PID	Lithologic Log	Material Description	U.S.C.S.	We	ll Diagram	Remarks
-					Well graded SAND (SW); brown (10YR 4/3); dry; loose; 95% very fine to very coarse sand; trace fine gravel to 2cm; rounded; 5% silt.				Resumed drilling @ 1519.
<u>365</u>					Same as above (360 ft).				
- 370 -					Same as above (360 ft); grading finer.	SW		- Bentonite Seal	
<u>375</u>					Poorly graded SAND (SP); brown (10YR 4/3); moist; loose; 90% medium sand;		-		
-					10% coarse sand; trace fine gravel to 1.4 cm; rounded.				Bottom of casing @ 1523. Resumed drilling @ 1530.
<u>380</u> - -					Same as above (375 ft); trace fine gravel to 3cm.	SP			
- <u>385</u> - -					Same as above (375 ft).			- Native Backfill	
390									



Date Started: 3/3/2011 Date TD Reached: 3/4/2011 Date Completed: 3/6/2011

Ground Elevation AMSL (ft): 5343.5 Y Coordinate: 1473521.57 X Coordinate: 1541613.14

Borehole ID: KAFB-106119

Hole Diameter Upper (in.): 11-3/4 Hole Diameter Lower (in.): 9-5/8 Surface Completion Type: Flush mount

Groundwater Levels BGS (ft): \square At Time of Drilling: N/A \blacksquare At End of Drilling: N/A \blacksquare After Drilling: N/A

Drilling Contractor: WDC Drilling Drilling Method: Air Rotary Casing Hammer Logged By: Jason Tarbert

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66 Depth (ft)	Sample Type	Number	Headspace PID	Lithologic Log	Material Description	U.S.C.S.	Well Diagram	Remarks
-					Poorly graded SAND (SP); brown (10YR 4/3); moist; loose; 85% medium sand; 15% coarse sand; trace fine gravel to 1.4 cm; rounded.	SP		
<u>395</u>	-				Same as above (390 ft); 90% medium sand; 10% coarse sand.			
- - 400		SB0169 SB0170			Well graded SAND (SW); brown (10YR 4/3); dry; loose; 100% very fine to very coarse sand to 4.5mm; subrounded.			Bottom of casing @ 1535. Blow counts (397-398.5'): 5/Not Recorded. Blow counts
-	-				Same as above (397 ft).			(398.5-400'): Not Recorded. Resumed drilling @ 1556.
405	-				Same as above (397 ft); grading finer.	SW	- Bentonite Seal	
<u>410</u> - -	-				Same as above (397 ft); grading finer.			
415	-				Same as above (397 ft); grading coarser.			Bottom of casing @ 1602.
420	-							



Project Number: 140705

Date TD Reached: 3/4/2011 Date Completed: 3/6/2011

Y Coordinate: 1473521.57

Ground Elevation AMSL (ft): 5343.5

Date Started: 3/3/2011

Project Name: KAFB BFF SWMU ST-106 and SS-111

Borehole ID: KAFB-106119

Hole Diameter Upper (in.): 11-3/4 Hole Diameter Lower (in.): 9-5/8 Surface Completion Type: Flush mount

Groundwater Levels BGS (ft): ▼ After Drilling: N/A

Drilling Contractor: WDC Drilling Drilling Method: Air Rotary Casing Hammer Logged By: Jason Tarbert

		ordinate				Logged By:			rbert	Page 15 of 16
5 Depth (ft)	Sample Type	Number	Headspace PID	Lithologic Log	Material Description	U.S.C.S.		We	II Diagram	Remarks
-	-				Poorly graded SAND (SP); brown 5/3); dry; dense; 100% medium to coarse sand to 2mm; rounded.	(10YR				
425	-				Same as above (420 ft).	SF	D			
- 430 - -	-				Same as above (420 ft).	J.			- Bentonite Seal	
435	-				Well graded SAND (SW); dark ye brown (10YR 4/4); moist; dense; S very fine to very coarse sand; trac vgravel to 1.5cm; rounded; 5% silt.	95% /				Resumed drilling @
- 440 -	-				Lean CLAY (CL); lense. Poorly graded SAND (SP); brown 5/3); moist; dense; 100% fine san 0.2mm; rounded. Note: strong odor from cuttings.				- Top of Filter Pack - Top of 3" Schedule 80 PVC 0.050 Slot Screen	1626.
445	-				Same as above (437 ft); 100% me sand.	edium)			
450		SB0171	0.3							Bottom of casing @ 1631. Blow counts (447-448.5'): 10/15. Resumed drilling @



Borehole ID: KAFB-106119

Client: US Army Corps of Engineers Project Location: KAFB, Albuquerque, NM Project Name: KAFB BFF SWMU ST-106 and SS-111 Project Number: 140705

Date Started: 3/3/2011 Date TD Reached: 3/4/2011 Date Completed: 3/6/2011

Ground Elevation AMSL (ft): 5343.5 Y Coordinate: 1473521.57 X Coordinate: 1541613.14 Hole Diameter Upper (in.): 11-3/4 Hole Diameter Lower (in.): 9-5/8 Surface Completion Type: Flush mount

Groundwater Levels BGS (ft): \square At Time of Drilling: N/A \blacksquare At End of Drilling: N/A \blacksquare After Drilling: N/A

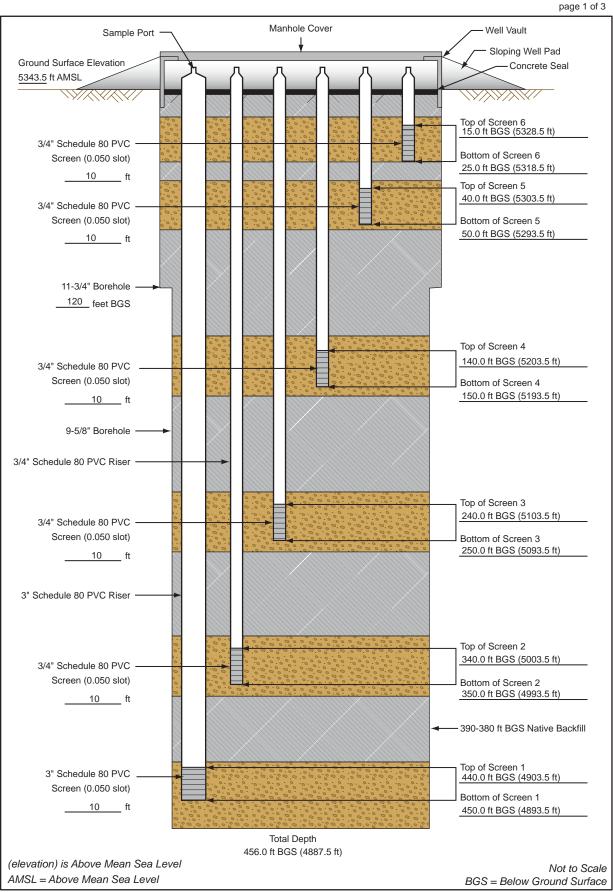
Drilling Contractor: WDC Drilling Drilling Method: Air Rotary Casing Hammer Logged By: Jason Tarbert

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		ordinat	e: 1	54161	Logged	ву: с	lason larbert	Fage 16 01 16
5 Depth (ft)	Sample Type	Number	Headspace PID	Lithologic Log	Material Description	U.S.C.S.	Well Diagram	Remarks
	-				Poorly graded SAND (SP); brown (10YR 5/3); moist; dense; 100% fine sand to 0.2mm; rounded.		Screen	1646.
45	5				Same as above (450 ft).	SP	- Bottom of Filter Pack	
460	- -) -						- Native Backfill	Total depth = 460 ft. Reached @ 1650 on
46	-							3/4/11. Water added during drilling (gallons) = 0
	-							Water added during construction (gallons) = 320
47(-) -							Bottom of casing: TD the joint and ready to make new connection.
47	5							
	-							
480	וו		1					

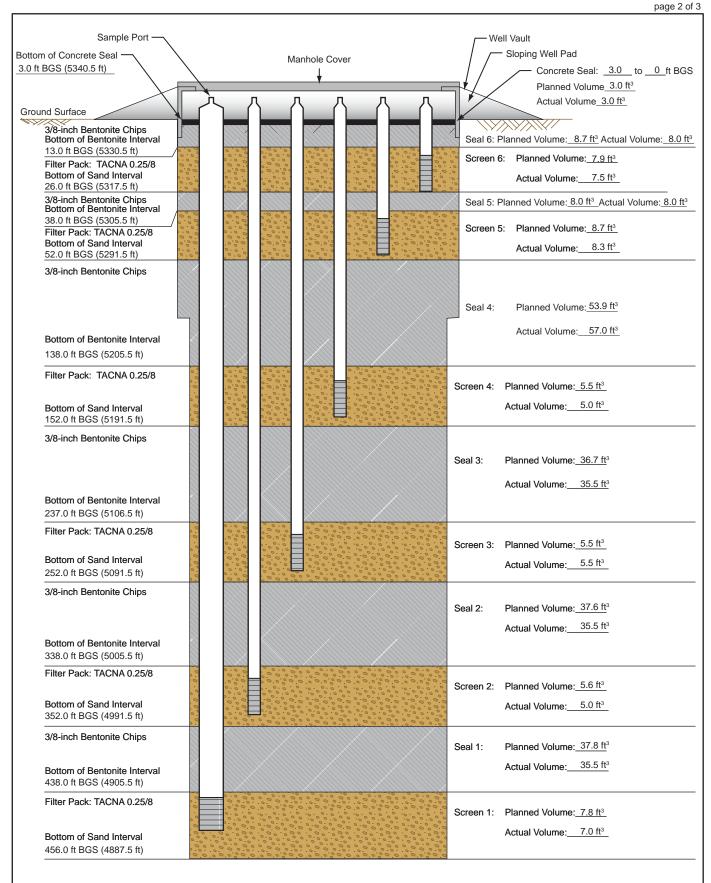
Nested Soil Vapor Well Completion Diagram for KAFB-106119

Installation Start Date/Time: 3/5/2011 @ 8:00 Installation End Date/Time: 3/6/2011 @ 15:00



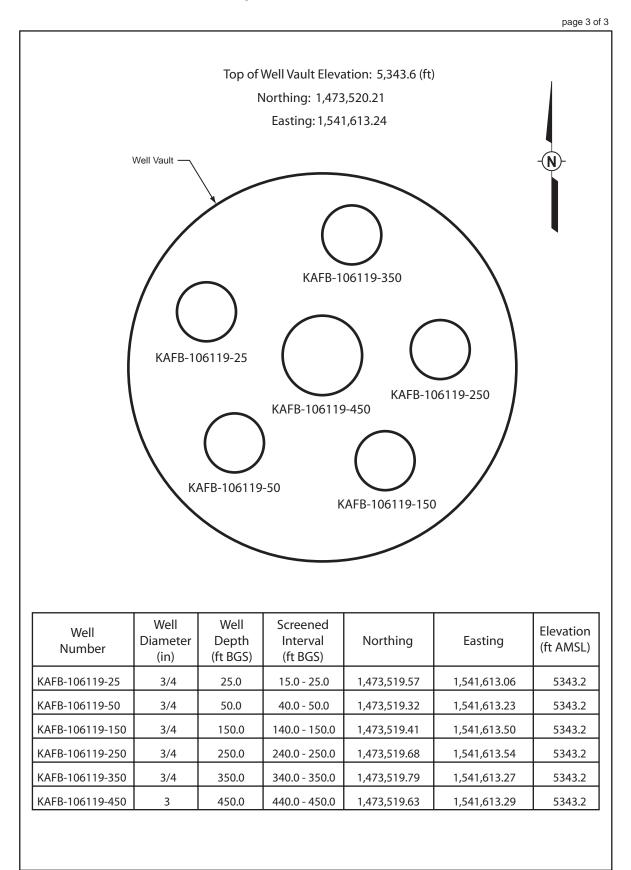
140705_CA010020_SV_KAFB.106119 (a)

Nested Soil Vapor Well Completion Diagram for KAFB-106119



(elevation) is Above Mean Sea Level All Materials Placed with Tremie Pipe Not to Scale BGS = Below Ground Surface

Nested Soil Vapor Well Completion Diagram Map View for KAFB-106119



140705_CA010020_SV_Map View_106119

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APPENDIX D-1

KAFB-106129 Final Well Report

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Date Started: 3/1/2011 Date TD Reached: 3/3/2011 Date Completed: 3/6/2011

Ground Elevation AMSL (ft): 5348.4 Y Coordinate: 1473262.72 X Coordinate: 1542130.45

Borehole ID: KAFB-106129

Hole Diameter Upper (in.): 11-3/4 Hole Diameter Lower (in.): 9-5/8 Surface Completion Type: Flush mount

Groundwater Levels BGS (ft): \square At Time of Drilling: N/A \blacksquare At End of Drilling: N/A \square After Drilling: N/A

Drilling Contractor: WDC Drilling Drilling Method: Air Rotary Casing Hammer Logged By: William Werner

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			· · · ·					
Oepth (ft)		Number	Headspace PID	Lithologic Log	Material Description	U.S.C.S.	Well Diagram	Remarks
5	-				No description recorded; disturbed.		222222 - Concrete Seal	Hand augered.
		SB0300	0.0		Silty SAND (SM); light reddish brown (5YR 6/3); dry; loose; 60% very fine to fine sand; 10% fine gravel; 30% silt; trace clay.		- Bentonite Seal	Began drilling @ 1145 on 3/1/11. Blow counts (7-8.5'): 9/11.
10					Same as above (5 ft).	SM	Top of Filter Pack	Stopped drilling @ 1200. Resumed drilling @ 1315.
15		SB0301	0.0		Silty SAND (SM); reddish brown (5YR 5/3); moist; loose; 60% very fine to fine sand; subrounded; trace fine gravel; 30% silt; 10% clay.		- Top of 3/4" Schedule 80 PVC 0.050 Slot Screen	Kelly down @ 1329. Resumed drilling @ 1351. Blow counts (18-19.5'): 11/16.
20					Clayey SAND (SC); reddish brown (5YR 5/3); moist; medium dense; 70% fine sand; subrounded; trace fine to coarse gravel; 30% clay; medium plasticity; trace carbonate.			
25					Same as above (20 ft).	SC	- Bottom of Screen	
30		SB0302	0.0		Poorly graded SAND with Silt (SP-SM); light reddish brown (5YR 6/3); dry; loose; 90% very fine to fine sand; trace gravel;	SP- SM	- Bentonite Seal	Blow counts (28-29.5'): 11/22. Kelly down @ 1409. Resumed drilling



Date Started: 3/1/2011 Date TD Reached: 3/3/2011 Date Completed: 3/6/2011

Ground Elevation AMSL (ft): 5348.4 Y Coordinate: 1473262.72 X Coordinate: 1542130.45

Borehole ID: KAFB-106129

Hole Diameter Upper (in.): 11-3/4 Hole Diameter Lower (in.): 9-5/8 Surface Completion Type: Flush mount

Groundwater Levels BGS (ft): \square At Time of Drilling: N/A \blacksquare At End of Drilling: N/A \blacksquare After Drilling: N/A

Drilling Contractor: WDC Drilling Drilling Method: Air Rotary Casing Hammer Logged By: William Werner

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		aniat	J. I.	7210	50.45 Logged					
ଝ Depth (ft)	Sample Type	Number	Headspace PID	Material Description O. O. Well Diagram				Remarks		
	-				10% silt and clay. Poorly graded SAND with Silt (SP-SM); light reddish brown (5YR 6/4); moist; medium dense; 90% very fine to fine sand; rounded to subrounded; 10% silt. Same as above (31 ft); trace clay; mica flakes.			- Bentonite Seal	@ 1420.	
- - - - - -		SB0303	0.0		Same as above (31 ft); dry; trace caliche. Same as above (31 ft); 5% coarse sand.	SP- SM		- Top of Filter Pack - Top of 3/4" Schedule 80 PVC 0.050 Slot Screen	Blow counts (38-39.5'): 17/24. Kelly down @ 1435. Resumed drilling @ 1450.	
<u>45</u> - - 50	\mathbb{H}	SB0304 SB0304	0.0		Silty SAND (SM); yellowish red (5YR 5/6); dry; medium dense; 75% very fine to fine sand; subangular to subrounded; trace fine gravel; 20% silt; 5% clay. Same as above (45 ft).			- Bottom of Screen	Blow counts (48-49.5'): 50/Not Recorded. Blow counts (49.5-51'): Not Recorded. Kelly down @ 1503. Resumed drilling	
- - - - - - - - - - - - - - - - - - -	-				Well graded GRAVEL with Silt (GW-GM); light brown (7.5YR 6/3); 80%- fine to coarse gravel; angular to subangular; 10% fine sand; 10% silt. Silty SAND (SM); yellowish red (5YR 5/6); dry; medium dense; 75% very fine to fine sand; subangular to subrounded;	¯G₩- ∖ <u>G</u> M∠ SM		- Bentonite Seal	@ 1526.	



Date Started: 3/1/2011 Date TD Reached: 3/3/2011 Date Completed: 3/6/2011

Ground Elevation AMSL (ft): 5348.4 Y Coordinate: 1473262.72 X Coordinate: 1542130.45

Borehole ID: KAFB-106129

Hole Diameter Upper (in.): 11-3/4 Hole Diameter Lower (in.): 9-5/8 Surface Completion Type: Flush mount

Groundwater Levels BGS (ft): \square At Time of Drilling: N/A \blacksquare At End of Drilling: N/A \blacksquare After Drilling: N/A

Drilling Contractor: WDC Drilling Drilling Method: Air Rotary Casing Hammer Logged By: William Werner

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g Depth (ft)	Sample Type	Number	Headspace PID	Lithologic Log	Material Description	U.S.C.S.	Well Diagram	Remarks
	-				trace fine gravel; 20% silt; 5% clay. Poorly graded SAND (SP); light brown (7.5YR 6/4); dry; loose; 100% very fine to fine sand; trace coarse sand; trace silt.			
65	-				Same as above (60 ft); 5% coarse sand; 5% fine gravel.	SP		
70	-				Same as above (60 ft); reddish yellow (7.5YR 6/6).			
75	_				Well graded SAND with Gravel (SW); yellowish brown (10YR 5/4); dry; medium dense; 60% fine to coarse sand; 35% fine gravel; 5% fines.	SW	- Bentonite Seal	
80	-				Poorly graded SAND (SP); light reddish brown (5YR 6/4); dry; loose; 85% fine sand; 15% medium to coarse sand; rounded to subrounded.			
85					Same as above (80 ft); trace gravel.	SP		
90								



Date Started: 3/1/2011 Date TD Reached: 3/3/2011 Date Completed: 3/6/2011

Ground Elevation AMSL (ft): 5348.4 Y Coordinate: 1473262.72 X Coordinate: 1542130.45

Borehole ID: KAFB-106129

Hole Diameter Upper (in.): 11-3/4 Hole Diameter Lower (in.): 9-5/8 Surface Completion Type: Flush mount

Groundwater Levels BGS (ft): \square At Time of Drilling: N/A \blacksquare At End of Drilling: N/A \blacksquare After Drilling: N/A

Drilling Contractor: WDC Drilling Drilling Method: Air Rotary Casing Hammer Logged By: William Werner

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ଞ Depth (ft)	Sample Type	Number	Headspace PID	Lithologic Log	Material Description	U.S.C.S.	Well Diagrar	m Remarks	
<u>95</u> 100		SB0305	0.0		Poorly graded SAND (SP); light reddish brown (5YR 6/4); dry; medium dense; 85% fine sand; 15% medium to coarse sand; rounded to subrounded; partially cemented. Same as above (90 ft); loose; trace fine gravel. Poorly graded SAND (SP); pale brown (10YR 6/3); dry; medium dense; 100% fine to medium sand; subangular to subrounded; primarily quartz.	SP		Blow counts (98-99.5'): 14/23. Kelly down @ 1620. End of 3/1/11. Resumed drilling @ 0856 on 3/2/11.	
110	-				Well graded SAND with Gravel (SW); very pale brown (10YR 8/2); dry; medium dense; 85% fine to coarse sand; subangular to subrounded; 15% fine gravel; subangular. Same as above (105 ft); yellowish brown (10YR 5/4).		- Bentonite	Seal	
<u>115</u>	-				Same as above (105 ft); light yellowish brown (10YR 6/4).	SW			

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Project Number: 140705

Y Coordinate: 1473262.72

Date Started: 3/1/2011 Date TD Reached: 3/3/2011 Date Completed: 3/6/2011

Client: US Army Corps of Engineers Project Location: KAFB, Albuquerque, NM

Ground Elevation AMSL (ft): 5348.4

Project Name: KAFB BFF SWMU ST-106 and SS-111

Borehole ID: KAFB-106129

Hole Diameter Upper (in.): 11-3/4 Hole Diameter Lower (in.): 9-5/8 Surface Completion Type: Flush mount

Groundwater Levels BGS (ft): \square At Time of Drilling: N/A \blacksquare At End of Drilling: N/A \blacksquare After Drilling: N/A

Drilling Contractor: WDC Drilling Drilling Method: Air Rotary Casing Hammer Logged By: William Werner

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05 Depth (ft)	Sample Type	Number	Headspace PID	Lithologic Log	Material Description	U.S.C.S.	w	ell Diagram	Remarks
125					Clayey SAND (SC); brown (7.5YR 5/4); slightly moist; medium dense; 85% very fine sand; trace coarse sand; 15% clay and silt; trace mica.	SC			Started making 9-5/8" connection @ 1204.
130					Poorly graded SAND with Clay (SP-SC); brown (7.5YR 5/4); slightly moist; loose; 90% very fine to fine sand; subrounded; 10% clay.	SP- SC		- Bentonite Seal	
-					Clayey SAND (SC); brown (7.5YR 5/4); slightly moist; medium dense; 85% very fine sand; trace coarse sand; 15% clay and silt; trace mica.	sc			
135					Sandy lean CLAY (CL); brown (7.5YR 5/4); moist; firm; low plasticity; 60% clay; 40% fine sand; subrounded.			- Top of Filter Pack	
<u>140</u> - -					Same as above (135 ft); light brown (7.5YR 6/3); dry.	CL		- Top of 3/4" Schedule 80 PVC 0.050 Slot Screen	
<u>145</u> -					Poorly graded SAND (SP); very pale brown (10YR 7/4); dry; medium dense; 80% fine sand; 15% medium sand; 5% coarse sand; subrounded.	SP			
150	X	SB0306	2.0		GRAVEL (GP); lense.	GP			Blow counts (148-149.5'): 13/23. Kelly down @ 1420. Resumed drilling



Date Started: 3/1/2011 Date TD Reached: 3/3/2011 Date Completed: 3/6/2011

Ground Elevation AMSL (ft): 5348.4 Y Coordinate: 1473262.72 X Coordinate: 1542130.45

Borehole ID: KAFB-106129

Hole Diameter Upper (in.): 11-3/4 Hole Diameter Lower (in.): 9-5/8 Surface Completion Type: Flush mount

Groundwater Levels BGS (ft): \Box At Time of Drilling: N/A \blacksquare At End of Drilling: N/A \blacksquare After Drilling: N/A

Drilling Contractor: WDC Drilling Drilling Method: Air Rotary Casing Hammer Logged By: William Werner

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05 Depth (ft)	Sample Type	Number	Headspace PID	Lithologic Log	Material Description	U.S.C.S.	Well Diagram	Remarks
	_				Poorly graded SAND (SP); very pale brown (10YR 7/4); dry; medium dense; 80% fine sand; 15% medium sand; 5% coarse sand; subrounded.	SP	Screen	@ 1434.
155	-				Clayey SAND (SC); brown (7.5YR 5/4); slightly moist; medium dense; 80% fine sand; subrounded; 20% clay.	SC		
165	-				Poorly graded SAND (SP); light yellowish brown (10YR 6/4); slightly moist; loose; 100% fine to medium sand; trace coarse sand; subrounded; trace silt.	SP		Kelly down @ 1440. Resumed drilling @ 1448.
170					Clayey SAND (SC); brown (7.5YR 5/4); slightly moist; medium dense; 80% fine sand; subrounded; 20% clay.	SC	- Bentonite Seal	
	-				Poorly graded SAND (SP); pale brown (10YR 6/3); slightly moist; loose; 95% fine to medium sand; subrounded; 5% fine to coarse gravel to 20mm.			
175					Same as above (170 ft); finer sand.	SP		
180								



Date Started: 3/1/2011 Date TD Reached: 3/3/2011 Date Completed: 3/6/2011

Ground Elevation AMSL (ft): 5348.4 Y Coordinate: 1473262.72 X Coordinate: 1542130.45

Borehole ID: KAFB-106129

Hole Diameter Upper (in.): 11-3/4 Hole Diameter Lower (in.): 9-5/8 Surface Completion Type: Flush mount

Groundwater Levels BGS (ft): \square At Time of Drilling: N/A \blacksquare At End of Drilling: N/A \blacksquare After Drilling: N/A

Drilling Contractor: WDC Drilling Drilling Method: Air Rotary Casing Hammer Logged By: William Werner

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8 Depth (ft)	Sample Type	Number	Headspace PID	Lithologic Log	Material Description	U.S.C.S.	Well Diagram	Remarks
-					Well graded SAND (SW); yellowish brown (10YR 5/4); moist; loose; 100% fine to coarse sand; subrounded; trace coarse gravel.			Kelly down @ 1505.
<u>185</u> - -					Same as above (180 ft); more fine and medium sand.	sw		
- <u>190</u> - -					Same as above (180 ft).			
- 195 - -					Well graded GRAVEL (GW); dark grayish brown; moist; loose; 95% fine to coarse gravel; subangular to subrounded; 5% medium to coarse sand.	GW	- Bentonite Seal	
- _ 200	X	SB0307	1.5		Sanu.			Blow counts (198-199.5' 21/32. Blow counts (199.5-201'): 35/40. Kell
 		SB0308	1.5		Poorly graded SAND (SP); light gray (10YR 7/2); slightly moist; dense; 95% fine to medium sand; subangular to subrounded; 5% fine to coarse gravel.			down @ 1525. Resumed drilling @ 1545.
205 					Same as above (200 ft).	SP		
- - 210								



Date Started: 3/1/2011 Date TD Reached: 3/3/2011 Date Completed: 3/6/2011

Ground Elevation AMSL (ft): 5348.4 Y Coordinate: 1473262.72 X Coordinate: 1542130.45

Borehole ID: KAFB-106129

Hole Diameter Upper (in.): 11-3/4 Hole Diameter Lower (in.): 9-5/8 Surface Completion Type: Flush mount

Groundwater Levels BGS (ft): \square At Time of Drilling: N/A \blacksquare At End of Drilling: N/A \blacksquare After Drilling: N/A

Drilling Contractor: WDC Drilling Drilling Method: Air Rotary Casing Hammer Logged By: William Werner

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Depth (ft)	Sample Type	Number	Headspace PID	Lithologic Log	Material Description	U.S.C.S.	Well Diagram	Remarks
215					Well graded SAND with Gravel (SW).	SW		
					Poorly graded SAND (SP); light brownish gray (10YR 6/2); 95% medium to coarse sand; 5% coarse gravel.	SP		
					Well graded SAND with Gravel (SW); light brownish gray (10YR 6/2); slightly moist; loose; 60% fine to coarse sand; 40% fine to coarse gravel.		- Bentonite Seal	Kelly down @ 1600. Resumed drilling @ 1608.
-					Well graded SAND with Gravel (SW); light grayish brown (10YR 6/2); slightly moist; loose; 80% fine to coarse sand; 20% fine to coarse gravel.	SW		
230					Same as above (225 ft).			
235					Poorly graded SAND (SP); light grayish brown (10YR 6/2); slightly moist; loose; 80% fine to medium sand; subrounded; 20% coarse sand; rounded; trace gravel to 50mm.	SP	- Top of Filter Pack	



Date Started: 3/1/2011 Date TD Reached: 3/3/2011 Date Completed: 3/6/2011

Ground Elevation AMSL (ft): 5348.4 Y Coordinate: 1473262.72 X Coordinate: 1542130.45

Borehole ID: KAFB-106129

Hole Diameter Upper (in.): 11-3/4 Hole Diameter Lower (in.): 9-5/8 Surface Completion Type: Flush mount

Groundwater Levels BGS (ft): \Box At Time of Drilling: N/A \blacksquare At End of Drilling: N/A \blacksquare After Drilling: N/A

Drilling Contractor: WDC Drilling Drilling Method: Air Rotary Casing Hammer Logged By: William Werner

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5 Depth (ft)	Sample Type	Number	Headspace PID	Lithologic Log	Material Description	U.S.C.S.	Well Di	iagram	Remarks
	_				Poorly graded SAND (SP); light grayish brown (10YR 6/2); slightly moist; loose; 95% fine sand; subrounded; 5% coarse sand; rounded; trace gravel to 50mm.	SP	Sci PV	p of 3/4" hedule 80 ′C 0.050 ot Screen	Kelly down @ 1620. Resumed drilling @ 1630.
245		SB0309	0.7		Well graded SAND with Gravel (SW); grayish brown (10YR 5/2); 70% fine to medium sand; subangular; 30% coarse gravel to 60mm.	sw			Blow counts (248.5-250'): 27/35. Kelly down @
	-				Poorly graded SAND with Gravel (SW); grayish brown (10YR 5/2); 70% fine to medium sand; subangular; 30% coarse gravel to 60mm.			ttom of reen	1635.
255					Same as above (250 ft).	SP			
<u>260</u>					Clayey SAND (SC); light brownish gray (10YR 6/2); dry; dense; 70% fine sand; 30% clay.		Be	ntonite Seal	End of 3/2/11. Resumed drilling @ 0750 on 3/3/11.
265					Same as above (260 ft).	sc			
270									



Date Started: 3/1/2011 Date TD Reached: 3/3/2011 Date Completed: 3/6/2011

Ground Elevation AMSL (ft): 5348.4 Y Coordinate: 1473262.72 X Coordinate: 1542130.45

Borehole ID: KAFB-106129

Hole Diameter Upper (in.): 11-3/4 Hole Diameter Lower (in.): 9-5/8 Surface Completion Type: Flush mount

Groundwater Levels BGS (ft): \square At Time of Drilling: N/A \blacksquare At End of Drilling: N/A \blacksquare After Drilling: N/A

Drilling Contractor: WDC Drilling Drilling Method: Air Rotary Casing Hammer Logged By: William Werner

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05 Depth (ft)	Sample Type	Sample Lype Number Headspace PID Lithologic			Material Description	U.S.C.S.	Well Diagram	Remarks
-					Poorly graded SAND (SP); pale brown (10YR 6/2); slightly moist; medium dense; 95% fine sand; 5% medium sand; trace silt.			
- 275 - -					Same as above (270 ft); yellowish brown (10YR 5/4); 70% fine sand; 30% medium sand.	SP		
- <u>280</u> - -					Same as above (270 ft).			
- 2 <u>85</u> -					Sandy SILT (ML); brown (10YR 5/3); slightly moist; firm; 70% silt; 30% fine sand.		- Bentonite Seal	
- - 2 <u>90</u> - -					Poorly graded SAND (SP); yellowish brown (10YR 5/4); slightly moist; medium dense; 90% fine sand; 5% medium sand; 5% coarse sand;			
- 295 -					subangular to subrounded. Same as above (290 ft).	SP		Blow counts (297-298.5
- - 300		SB0310	0.0					18/27. Kelly down @ 0820. Resumed drilling @ 0843.



Date Started: 3/1/2011 Date TD Reached: 3/3/2011 Date Completed: 3/6/2011

Ground Elevation AMSL (ft): 5348.4 Y Coordinate: 1473262.72 X Coordinate: 1542130.45

# Borehole ID: KAFB-106129

Hole Diameter Upper (in.): 11-3/4 Hole Diameter Lower (in.): 9-5/8 Surface Completion Type: Flush mount

Groundwater Levels BGS (ft):  $\square$  At Time of Drilling: N/A  $\blacksquare$  At End of Drilling: N/A  $\blacksquare$  After Drilling: N/A

Drilling Contractor: WDC Drilling Drilling Method: Air Rotary Casing Hammer Logged By: William Werner

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60 Depth (ft)	Sample Type	Number	Headspace PID	Lithologic Log	Material Description	U.S.C.S.	Well Diagram	Remarks
305	-				Poorly graded SAND (SP); yellowish brown (10YR 5/4); slightly moist; medium dense; 90% fine sand; 5% medium sand; 5% coarse sand; subangular to subrounded. Poorly graded SAND (SP); yellowish brown (10YR 5/6); slightly moist; medium dense; 70% fine sand; 10% medium sand; 10% coarse sand; subrounded; 10% fine gravel to 7mm;			
310	-				Same as above (305 ft); 5% gravel.	SP		
315	-				Same as above (305 ft); 5% coarse gravel to 40mm.		- Bentonite Seal	
320	-				Well graded SAND (SW); yellowish brown (10YR 5/6); slightly moist; medium dense; 50% fine sand; 20% medium sand; 20% coarse sand; 10% fine to coarse gravel to 30mm.			Kelly down @ 0847.
<u>325</u> 330					Same as above (320 ft).	SW		



Date Started: 3/1/2011 Date TD Reached: 3/3/2011 Date Completed: 3/6/2011

Ground Elevation AMSL (ft): 5348.4 Y Coordinate: 1473262.72 X Coordinate: 1542130.45

# Borehole ID: KAFB-106129

Hole Diameter Upper (in.): 11-3/4 Hole Diameter Lower (in.): 9-5/8 Surface Completion Type: Flush mount

Groundwater Levels BGS (ft):  $\square$  At Time of Drilling: N/A  $\blacksquare$  At End of Drilling: N/A  $\blacksquare$  After Drilling: N/A

Drilling Contractor: WDC Drilling Drilling Method: Air Rotary Casing Hammer Logged By: William Werner

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S Depth (ft)	Sample Type	Number	Headspace PID	Lithologic Log	Material Description	U.S.C.S.	We	ell Diagram	Remarks
- - 335					Well graded SAND (SW); dark grayish brown (10YR 4/2); slightly moist; medium dense; 35% coarse sand; 30% medium sand; 30% fine sand; subrounded; trace gravel. Same as above (330 ft); 5% gravel to 50mm.			- Bentonite Seal - Top of Filter Pack	
- - <u>340</u> - -					Same as above (330 ft); 40% coarse sand; 25% medium sand; 25% fine sand; rounded to subrounded; 10% gravel to 40mm.	SW		- Top of 3/4" Schedule 80 PVC 0.050 Slot Screen	Kelly down @ 0920. Resumed drilling @ 0928.
- 345 - -		SB0311	17.3		Poorly graded SAND (SP); dark grayish brown (10YR 4/2); slightly moist; medium dense; 50% medium sand; 40% fine sand; 10% coarse sand.	 SP		- Bottom of Screen	Blow counts (347-348.5'): Not Recorded.
350 - - -					Silty SAND (SM); brown (7.5YR 5/3); slightly moist; medium dense; 80% fine sand; 20% silt.	SM		Scieen	Kelly down @ 0937. Resumed drilling @ 0956.
- <u>355</u> - - -					Well graded SAND (SW); brown (10YR 5/3); slightly moist; dense; 30% fine sand; 30% medium sand; 30% coarse sand; 10% gravel; subangular to subrounded.	sw		- Bentonite Seal	
360									



# Corps of Engineers Hole Diameter Upper (in.): 11-3/4

Client: US Army Corps of Engineers Project Location: KAFB, Albuquerque, NM Project Name: KAFB BFF SWMU ST-106 and SS-111 Project Number: 140705

Date Started: 3/1/2011 Date TD Reached: 3/3/2011 Date Completed: 3/6/2011

Ground Elevation AMSL (ft): 5348.4 Y Coordinate: 1473262.72 X Coordinate: 1542130.45 Hole Diameter Upper (in.): 11-3/4 Hole Diameter Lower (in.): 9-5/8 Surface Completion Type: Flush mount

Groundwater Levels BGS (ft):  $\square$  At Time of Drilling: N/A  $\blacksquare$  At End of Drilling: N/A  $\blacksquare$  After Drilling: N/A

Drilling Contractor: WDC Drilling Drilling Method: Air Rotary Casing Hammer Logged By: William Werner

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8 Depth (ft)	Sample Type	Number	Headspace PID	Lithologic Log	Material Description	U.S.C.S.	Well Diagram	Remarks	
-	-				Well graded SAND (SW); brown (10YR 5/3); slightly moist; dense; 40% fine sand; 30% medium sand; 25% coarse sand; 5% gravel; subangular to subrounded.			Kelly down @ 1008. Resumed drilling @ 1015.	
<u>365</u> - -	-				Same as above (360 ft); 30% fine sand; 30% medium sand; 30% coarse sand; 10% gravel.	SW			
- 370 - -	-				Same as above (360 ft); 30% fine sand; 30% medium sand; 30% coarse sand; 10% gravel.				
<u>375</u> - - -	-				Clayey SAND (SC); dark brown (7.5YR 3/4); slightly moist; medium dense; 60% fine to medium sand; 10% coarse sand; 10% fine to coarse gravel; 20% clay; low plasticity.	sc	- Bentonite Seal		
<u>380</u> - -	-				Well graded SAND (SW); yellowish brown (10YR 5/4); slightly moist; dense; 30% fine sand; 30% medium sand; 30% coarse sand; 10% gravel; subangular to subrounded.			Kelly down @ 1025. Resumed drilling @ 1041.	
385					Same as above (380 ft).	SW			
390									



Date Started: 3/1/2011 Date TD Reached: 3/3/2011 Date Completed: 3/6/2011

Ground Elevation AMSL (ft): 5348.4 Y Coordinate: 1473262.72 X Coordinate: 1542130.45

### Borehole ID: KAFB-106129

Hole Diameter Upper (in.): 11-3/4 Hole Diameter Lower (in.): 9-5/8 Surface Completion Type: Flush mount

Groundwater Levels BGS (ft):  $\square$  At Time of Drilling: N/A  $\blacksquare$  At End of Drilling: N/A  $\blacksquare$  After Drilling: N/A

Drilling Contractor: WDC Drilling Drilling Method: Air Rotary Casing Hammer Logged By: William Werner

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~ ~ ~		Junat	J. 1.	04210	LUYYEU	Dy. v	viniani v	Verner	-
66 Depth (ft)	Sample Type	Number	Number Headspace PID Lithologic Log		Material Description		ທີ່ O. ທີ່ Diagram		Remarks
	-				Poorly graded SAND (SP); yellowish brown (10YR 5/4); slightly moist; medium dense; 80% medium sand; 10% coarse sand; 10% fine sand.	SP			
<u>395</u> - - - 400		SB0312	1.7		Well graded SAND (SW); yellowish brown (10YR 5/4); slightly moist; medium dense; 100% fine to coarse sand.	sw			Blow counts (397-398.5'): 21/29. Kelly down @ 1055. Resumed drilling @ 1115.
	-				Poorly graded SAND (SW); yellowish brown (10YR 5/4); slightly moist; medium dense; 45% fine sand; 45% medium sand; 10% coarse sand; subangular to subrounded.				
<u>405</u> - -	-				Same as above (400 ft); trace coarse sand.	SP		- Bentonite Seal	
410	-				Same as above (400 ft).				
<u>415</u> - -	-				Well graded SAND (SW); dark grayish brown (10YR 4/2); slightly moist; medium dense; 100% fine to coarse sand.	sw			
420									



Date Started: 3/1/2011 Date TD Reached: 3/3/2011 Date Completed: 3/6/2011

Ground Elevation AMSL (ft): 5348.4 Y Coordinate: 1473262.72 X Coordinate: 1542130.45

## Borehole ID: KAFB-106129

Hole Diameter Upper (in.): 11-3/4 Hole Diameter Lower (in.): 9-5/8 Surface Completion Type: Flush mount

Groundwater Levels BGS (ft):  $\square$  At Time of Drilling: N/A  $\blacksquare$  At End of Drilling: N/A  $\blacksquare$  After Drilling: N/A

Drilling Contractor: WDC Drilling Drilling Method: Air Rotary Casing Hammer Logged By: William Werner

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5 Depth (ft)	Sample Type	Number	Headspace PID	Lithologic Log	Material Description	U.S.C.S.	We	ell Diagram	Remarks
-	-				Well graded SAND (SW); dark grayish brown (10YR 4/2); slightly moist; medium dense; 100% fine to coarse sand; trace fine gravel.				Kelly down @ 1130.
425 - -	-				Same as above (420 ft); 50% fine sand; 25% medium sand; 25% coarse sand; no gravel.	SW		- Bentonite Seal	
430	-				Clayey SAND (SC); brown (10YR 5/3); moist; medium dense; 85% fine to coarse sand; subangular to subrounded; 15% clay.	sc	-		Kelly down @ 1143. Resumed drilling @ 1248.
<u>435</u>	-				Poorly graded SAND (SP); brown (10YR 4/3); moist; medium dense; 50% fine sand; 40% medium sand; 10% coarse sand.	SP		- Top of Filter Pack	
445	-				Well graded SAND (SW); yellowish brown (10YR 5/4); moist; medium dense; 30% fine sand; 30% medium sand; 30% coarse sand; 10% fine gravel.	sw		- Top of 3" Schedule 80 PVC 0.050 Slot Screen	Kelly down @ 1255. Resumed drilling @ 1302.
450		SB0313	1.1		Poorly graded SAND (SP); brown (10YR 5/3); moist; medium dense; 80% fine sand; 10% medium sand; 10% coarse sand; trace fine to coarse gravel to 30mm.	SP			Blow counts (447-448.5'): 17/24.

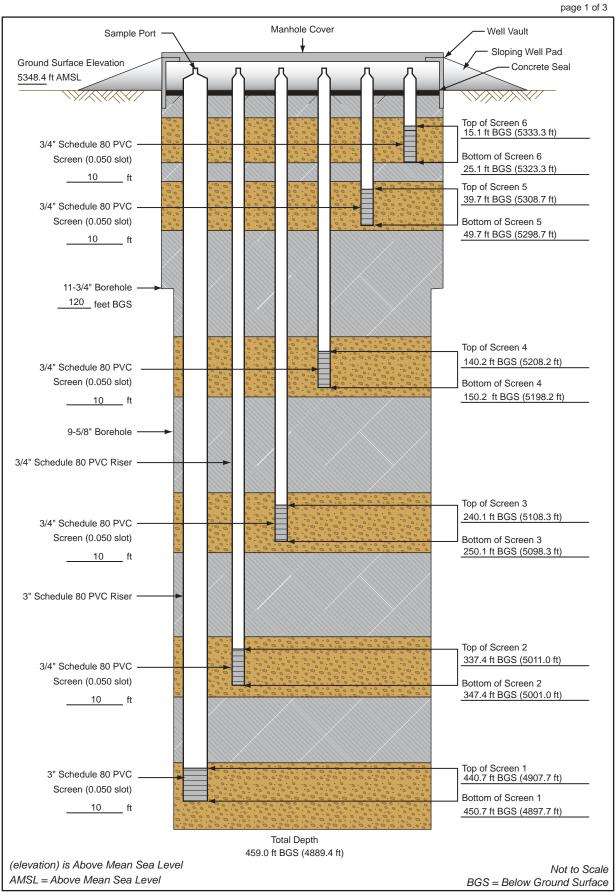
Shaw											
Projec	t Loca Nam	ation ie: K	: KA (AFB	os of Engineers FB, Albuquerque, NM BFF SWMU ST-106 and SS-111 705	Hole Diameter Upper (in.): 11-3/4 Hole Diameter Lower (in.): 9-5/8 Surface Completion Type: Flush mount						
Date S	Started	l: 3/ ache	1/201 d: 3/	1 3/2011	Groundwater Levels BGS (ft):						
Groun Y Coo X Coo	rdinate	e: 14	17326		Drilling Contractor: WDC Drilling Drilling Method: Air Rotary Casing Hammer Logged By: William Werner Page 16 of 16						
65 Depth (ft) Sample Type	Number	Headspace PID	Lithologic Log	Material Description		U.S.C.S.	Well Diagram	Remarks			
-				Poorly graded SAND (SP); brow 5/3); moist; medium dense; 80% sand; 10% medium sand; 10% c sand; trace coarse gravel to 30m	fine oarse	SP	- Bottom of Screen				
455				Lean CLAY with Sand (CL); gray brown (10YR 5/2); moist; firm; 7( 15% silt; 15% fine sand; trace cc sand and gravel.	0% clay; barse	CL					
460				Poorly graded SAND (SP); brow 5/3); moist; medium dense; 80% sand; 10% medium sand; 10% c sand; trace coarse gravel to 30m slight petroleum odor.	fine coarse nm;	SP SW	- Native Backfill	Total depth = 460 ft. Reached @ 1348 on			
-				Well graded SAND (SW); yellow brown (10YR 5/4); moist; mediur 40% fine sand; 30% medium sar coarse sand; 5% fine to coarse g 25mm.	n dense; nd; 25%			3/3/11. Water added druing drilling (gallons) = 0			
465								Water added during construction (gallons) = Not Recorded			
470								Kelly down: TD the joint and ready to make new connection.			
475											
-											
480											

Borehole ID: KAFB-106129

KAFB_BOREHOLE_LOG - SHAW_DRILLING.GDT - 4/26/11 13:08 - Z:\KAFB BFFIGINTIKAFB_PROJECTIKAFB_BFF.GPJ

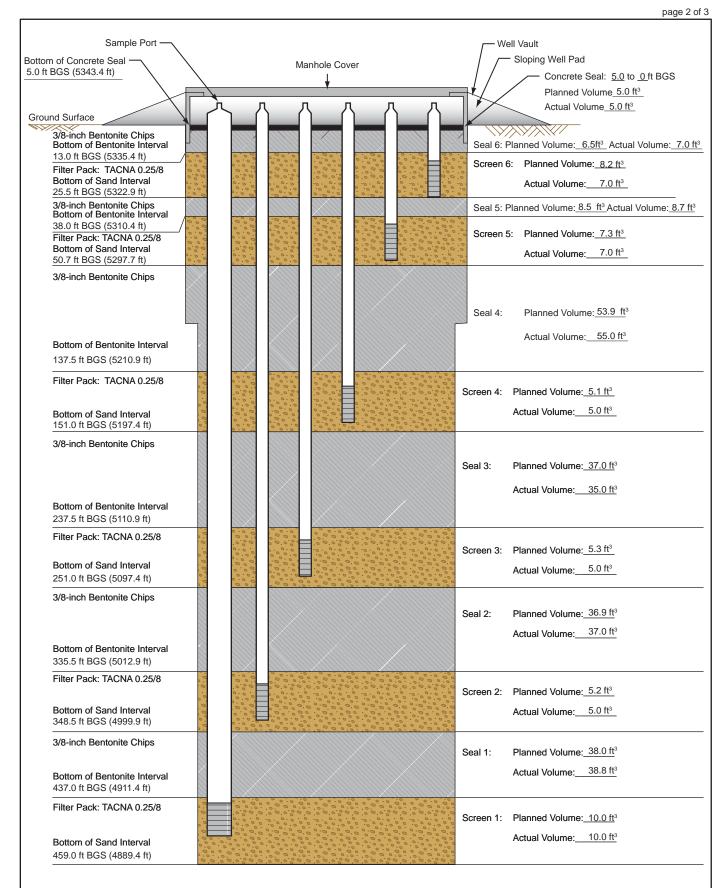
#### Nested Soil Vapor Well Completion Diagram for KAFB-106129

Installation Start Date/Time: <u>3/3/2011 @ 16:40</u> Installation End Date/Time: <u>3/6/2011 @ 14:30</u>



140705_CA010020_SV_KAFB.106129 (a)

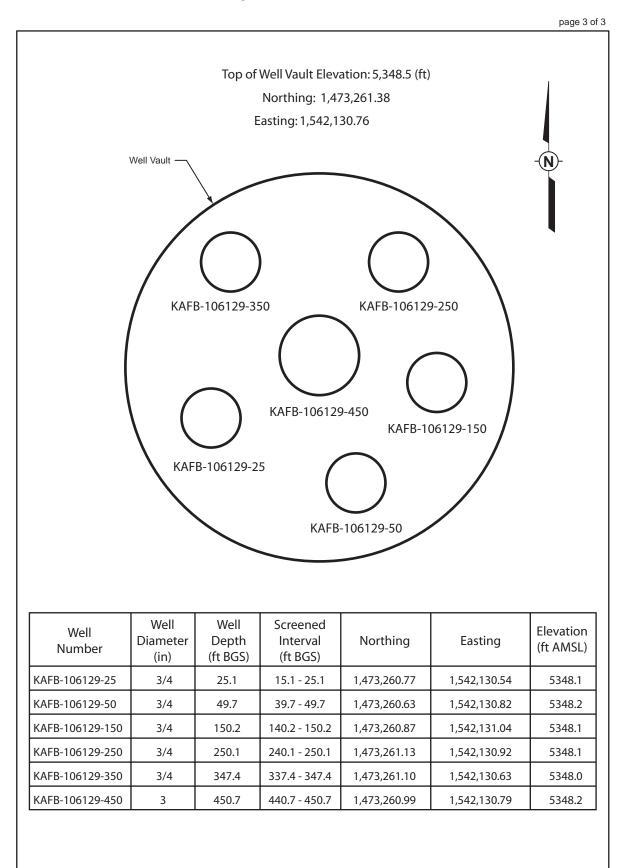
#### Nested Soil Vapor Well Completion Diagram for KAFB-106129



(elevation) is Above Mean Sea Level All Materials Placed with Tremie Pipe

Not to Scale BGS = Below Ground Surface

#### Nested Soil Vapor Well Completion Diagram Map View for KAFB-106129



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### **APPENDIX D-1**

KAFB-106130 Final Well Report

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Date Started: 2/17/2011 Date TD Reached: 2/19/2011 Date Completed: 2/21/2011

Ground Elevation AMSL (ft): 5349.0 Y Coordinate: 1473567.70 X Coordinate: 1542131.09

## Borehole ID: KAFB-106130

Hole Diameter Upper (in.): 11-3/4 Hole Diameter Lower (in.): 9-5/8 Surface Completion Type: Flush mount

Groundwater Levels BGS (ft):  $\square$  At Time of Drilling: N/A  $\blacksquare$  At End of Drilling: N/A  $\blacksquare$  After Drilling: N/A

Drilling Contractor: WDC Drilling Drilling Method: Air Rotary Casing Hammer Logged By: Jason Tarbert

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Logged By. Jason Tarbert								
⊖ Depth (ft)	Sample Type	Number	Headspace PID	Lithologic Log	Material Description	U.S.C.S.	Well Diagram	Remarks
-	-				Sandy SILT (ML); brown (10YR 4/3); dry; very stiff; low plasticity; 60% silt; 40% very fine to medium sand; trace fine gravel to 1.2cm.		- Concrete Seal	Hand augered.
5	-				Same as above (0 ft).			Began drilling @ 1515 or 2/17/11.
10	-	SB0314	0.0		Sandy SILT (ML); brown (7.5YR 5/4); dry; very stiff; low plasticity; 70% silt;		- Bentonite Seal	Blow counts (8.5-10'): 8/15.
-	-				25% fine sand; 5% fine gravel to 8mm.		- Top of Filter Pack	
<u>15</u>	-				Same as above (10 ft).	ML	- Top of 3/4" Schedule 80 PVC 0.050 Slot Screen	
20		SB0315	0.0					Blow counts (18.5-20'): 10/15.
	-				Sandy SILT (ML); reddish brown (5YR 4/4); moist; very stiff; low plasticity; 60% silt; 30% very fine sand; 10% coarse sand; trace fine gravel to 1cm; subangular.			Resumed drilling @ 1556.
25					SILT with Sand (ML); reddish brown (5YR 4/4); dry; nonplastic; 85% silt; 15% very fine sand.		- Bottom of Screen	
30		SB0316, SB0316-					- Bentonite Seal	Blow counts (28.5-30'): 13/37.



Date Started: 2/17/2011 Date TD Reached: 2/19/2011 Date Completed: 2/21/2011

Ground Elevation AMSL (ft): 5349.0 Y Coordinate: 1473567.70 X Coordinate: 1542131.09

# Borehole ID: KAFB-106130

Hole Diameter Upper (in.): 11-3/4 Hole Diameter Lower (in.): 9-5/8 Surface Completion Type: Flush mount

Groundwater Levels BGS (ft):  $\square$  At Time of Drilling: N/A  $\blacksquare$  At End of Drilling: N/A  $\blacksquare$  After Drilling: N/A

Drilling Contractor: WDC Drilling Drilling Method: Air Rotary Casing Hammer Logged By: Jason Tarbert

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					Dy. 0		
සි Depth (ft)	Sample Type Number	Headspace	Lithologic	Material Description	U.S.C.S.	Well Diagram	Remarks
-	SB03 MS	16- 0.0		SILT with Sand (ML); reddish brown (5YR 4/4); dry; hard; nonplastic; 85% silt; 15% very fine sand.		- Bentonite Seal	Blow counts (30-31.5'): Not Recorded. Resumed drilling @ 1639.
35				Same as above (30 ft); 75% silt; 10% clay; 15% very fine sand.	ML		
40	SB03	17 0.0	-	Same as above (30 ft).		Pack - Top of 3/4" Schedule 80 PVC 0.050 Slot Screen	Blow counts (38.5-40'): 12/44. Kelly down @ 1653. Resumed drilling @ 1705. Cyclone hose detached from cyclone @ 1709. Reattached cyclone hose and resumed drilling @ 1711.
 	SB03	18 0.8		Lean CLAY (CL); brown (7.5YR 5/4); dry; hard; low plasticity; 60% clay; 40% silt; trace coarse sand to 4mm; subangular.	CL		Blow counts (48.5-50'): 17/50. Kelly down @
-				SILT (ML); light reddish brown (5YR 6/4); dry; hard; low plasticity; 90% silt; 10% fine sand; trace fine gravel to 8cm; rounded.		• Pottom of Screen	1709. End of 02/17/11. Resume drilling @ 0815 on 02/18/11.
<u>55</u> - - - -				SILT with Sand (ML); light reddish brown (5YR 6/4); dry; hard; low plasticity; 85% silt; 10% fine sand; 5% coarse sand to 2mm; rounded.	ML	- Bentonite Seal	



Date Started: 2/17/2011 Date TD Reached: 2/19/2011 Date Completed: 2/21/2011

Ground Elevation AMSL (ft): 5349.0 Y Coordinate: 1473567.70 X Coordinate: 1542131.09

## Borehole ID: KAFB-106130

Hole Diameter Upper (in.): 11-3/4 Hole Diameter Lower (in.): 9-5/8 Surface Completion Type: Flush mount

Groundwater Levels BGS (ft):  $\square$  At Time of Drilling: N/A  $\blacksquare$  At End of Drilling: N/A  $\blacksquare$  After Drilling: N/A

Drilling Contractor: WDC Drilling Drilling Method: Air Rotary Casing Hammer Logged By: Jason Tarbert

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8 Depth (ft)	Sample Type	Number	Headspace PID	Lithologic Log	Material Description	U.S.C.S.	Well Diagram	Remarks
	-				Sandy SILT (ML); brown (7.5YR 5/3); dry; hard; nonplastic; 60% silt; 35% very fine to fine sand; 5% coarse sand; trace fine gravel to 2cm; rounded.			Resumed drilling @ 0842.
65					SILT with Sand (ML); brown (7.5YR 5/4); dry; hard; low plasticity; 85% silt; 15% very fine sand to 0.08mm.	ML		
70	-				Poorly graded SAND (SP); brown (7.5YR 5/4); dry; loose; 100% very fine to fine sand to 0.2mm; rounded.	SP		
	-				Sandy SILT (ML); strong bown (7.5YR 4/6); dry; hard; low plasticity; 70% silt; 30% very fine to coarse sand; trace fine gravel to 5mm; subangular.		- Bentonite Seal	
80	-				SILT with Sand (ML); strong brown (7.5YR 4/6); dry; hard; low plasticity; 85% silt; 15% very fine sand to 0.08mm.	ML		Kelly down @ 0850. Blew cuttings out of cyclone @ 0851. Resumed drilling @ 0907.
85	-				Same as above (80 ft); trace coarse sand to 3mm; subangular.			
90								



Date Started: 2/17/2011 Date TD Reached: 2/19/2011 Date Completed: 2/21/2011

Ground Elevation AMSL (ft): 5349.0 Y Coordinate: 1473567.70 X Coordinate: 1542131.09

# Borehole ID: KAFB-106130

Hole Diameter Upper (in.): 11-3/4 Hole Diameter Lower (in.): 9-5/8 Surface Completion Type: Flush mount

Groundwater Levels BGS (ft):  $\Box$  At Time of Drilling: N/A  $\blacksquare$  At End of Drilling: N/A  $\blacksquare$  After Drilling: N/A

Drilling Contractor: WDC Drilling Drilling Method: Air Rotary Casing Hammer Logged By: Jason Tarbert

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		Junau	· · ·			· · ·		
ଞ Depth (ft)	Sample Type	Number	Headspace PID	Lithologic Log	Material Description	U.S.C.S.	Well Diagram	Remarks
	-				SILT with Sand (ML); strong brown (7.5YR 4/6); moist; hard; low plasticity; 85% silt; 15% very fine sand to 0.08mm.			
95	-				Same as above (90 ft); dry.			
100		SB0319	0.7		Same as above (90 ft); dry; very stiff; trace clay nodules.	ML		Blow counts (98.5-100'): 5/15. Kelly down @ 0925. Resumed drilling @ 0942. Cyclone hose blew off, stuck with sediment @ 0943. Flange replaced and cyclone reattached
<u>105</u>	-				Silty SAND (SM); yellowish brown (10YR 5/4); dry; loose; 85% very fine to fine sand; trace gravel to 3.2cm; rounded; 15% silt.	SM	- Bentonite Seal	@ 1134. Resumed drilling @ 1143.
<u>110</u>	-				Lean CLAY (CL); brown (10YR 5/3); moist; hard; low plasticity; 70% clay; 30% silt.	CL		
115					Well graded SAND (SW); dark yellowish brown (10YR 4/4); moist; very loose; 95% very fine to coarse sand; trace gravel to 6mm; rounded; 5% silt. Same as above (112 ft).	SW		
120								



Date Started: 2/17/2011 Date TD Reached: 2/19/2011 Date Completed: 2/21/2011

Ground Elevation AMSL (ft): 5349.0 Y Coordinate: 1473567.70 X Coordinate: 1542131.09

## Borehole ID: KAFB-106130

Hole Diameter Upper (in.): 11-3/4 Hole Diameter Lower (in.): 9-5/8 Surface Completion Type: Flush mount

Groundwater Levels BGS (ft):  $\square$  At Time of Drilling: N/A  $\blacksquare$  At End of Drilling: N/A  $\blacksquare$  After Drilling: N/A

Drilling Contractor: WDC Drilling Drilling Method: Air Rotary Casing Hammer Logged By: Jason Tarbert

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05 Depth (ft)	Sample Type	Number	Headspace PID	Lithologic Log	Material Description	U.S.C.S.	We	ell Diagram	Remarks
-					Silty SAND (SM); brown (7.5YR 4/3); moist; very loose; 60% very fine to coarse sand; trace fine gravel to 1.5cm; rounded; 40% silt.	SM			Kelly down @ 1155. Reached total depth with 11-3/4" casing. Resumed drilling @ 1556 with 9-5/8" casing.
<u>125</u> - -					SILT (ML); brown (7.5YR 5/4); moist; hard; low plasticity; 80% silt; 10% clay; 10% very fine sand to 0.1mm.				
<u>130</u>					Same as above (125 ft); trace coarse sand to 3mm; rounded.				
- - 135					Lean CLAY (CL); brown (7.5YR 5/4); moist; hard; low plasticity; 80% clay; 20% silt.	CL		- Bentonite Seal	
-					SILT with Sand (ML); brown (7.5YR 5/4); dry; hard; low plasticity; 85% silt; 15% very fine to coarse sand to 4mm.	 			
-						ML			
<u>140</u>					Same as above (135); 75% silt; 10% clay; 15% very fine sand.				Resumed drilling @ 1619.
- - -					Lean CLAY (CL); brown (7.5YR 5/3); moist; hard; low plasticity; 90% clay; 10% silt.				
<u>145</u> -					Same as above (142 ft).	CL		- Top of Filter	
- - 150		SB0320	0.5		Well graded SAND (SW); grayish brown (10YR 5/2); dry; very dense; 100% very fine to very coarse sand to 5mm;	SW		Pack	Blow counts (148.5-150') 29/50.



Date Started: 2/17/2011 Date TD Reached: 2/19/2011 Date Completed: 2/21/2011

Ground Elevation AMSL (ft): 5349.0 Y Coordinate: 1473567.70 X Coordinate: 1542131.09

## Borehole ID: KAFB-106130

Hole Diameter Upper (in.): 11-3/4 Hole Diameter Lower (in.): 9-5/8 Surface Completion Type: Flush mount

Groundwater Levels BGS (ft):  $\square$  At Time of Drilling: N/A  $\blacksquare$  At End of Drilling: N/A  $\square$  After Drilling: N/A

Drilling Contractor: WDC Drilling Drilling Method: Air Rotary Casing Hammer Logged By: Jason Tarbert

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05 Depth (ft) Sample Type		Number	Headspace PID	Lithologic Log		Ś			
	_		He	Litho	Material Description	U.S.C.	We	ll Diagram	Remarks
155					subrounded.	SW		Top of 3/4" Schedule 80 PVC 0.050 Slot Screen	Resumed drilling @ 1640.
160					SILT with Sand (ML); brown (7.5YR 5/4); moist; hard; 70% silt; 5% clay; 15% very fine to coarse sand; 10% fine gravel to 2cm; well rounded.				
-					Well graded SAND with Silt (SW-SM); brown (10YR 5/3); dry; dense; 80% very fine to very coarse sand; 10% fine gravel to 2cm; subrounded; 10% silt.	SW- SM		- Bottom of Screen	Resumed drilling @ 1655.
165					Lean CLAY (CL); brown (10YR 5/3); moist; hard; low plasticity; 80% clay; 20% silt.	CL			
<u>170</u> - - -					Sandy SILT (ML); brown (10YR 5/3); moist; hard; nonplastic; 70% silt; 30% very fine to very coarse sand to 4mm.			- Bentonite Seal	
175					Poorly graded SAND (SP); brown (10YR 5/3); dry; very loose; 100% fine to medium sand to 0.5mm; subrounded.	SP			



Project Number: 140705

Date TD Reached: 2/19/2011 Date Completed: 2/21/2011

Y Coordinate: 1473567.70

Ground Elevation AMSL (ft): 5349.0

Date Started: 2/17/2011

Project Name: KAFB BFF SWMU ST-106 and SS-111

## Borehole ID: KAFB-106130

Hole Diameter Upper (in.): 11-3/4 Hole Diameter Lower (in.): 9-5/8 Surface Completion Type: Flush mount

Groundwater Levels BGS (ft): ▼ After Drilling: N/A

Drilling Contractor: WDC Drilling Drilling Method: Air Rotary Casing Hammer Logged By: Jason Tarbert

		ordinat				Iling Method: Air Rotary Casing Hammer gged By: Jason Tarbert Page 7 of 16				
08 Depth (ft)	Sample Type	Number	Headspace PID	Lithologic Log	Material Description	U.S.C.S.	We	ell Diagram	Remarks	
	-				Well graded SAND (SW); brown (10YR 5/3); damp; very loose; 95% fine to very coarse sand; trace fine gravel to 8mm; rounded; 5% fines.				Kelly down @ 1710. Resumed drilling @ 0900.	
185	-				Same as above (180 ft); finer sand; trace clay nodules.	SW				
190	-				Same as above (180 ft); finer sand.					
195	-				Well graded SAND with Silt (SW-SM); brown (10YR 5/3); damp; very loose; 90% very fine to coarse sand to 4mm; rounded; 10% silt with clay nodules.	SW- SM		-Bentonite Seal		
200	-	SB0321	0.3		Well graded SAND (SW); grayish brown (10YR 5/2); moist; very dense; 100% fine to very coarse sand; trace fine gravel to 1cm; subrounded.	sw			Blow counts (198.5-200'): 12/50. Kelly down @ 0906.	
205	-				Poorly graded SAND (SP); brown (10YR 5/3); moist; dense; 100% fine sand; rounded; trace fines.	SP				



Date Started: 2/17/2011 Date TD Reached: 2/19/2011 Date Completed: 2/21/2011

Ground Elevation AMSL (ft): 5349.0 Y Coordinate: 1473567.70 X Coordinate: 1542131.09

## Borehole ID: KAFB-106130

Hole Diameter Upper (in.): 11-3/4 Hole Diameter Lower (in.): 9-5/8 Surface Completion Type: Flush mount

Groundwater Levels BGS (ft):  $\square$  At Time of Drilling: N/A  $\blacksquare$  At End of Drilling: N/A  $\blacksquare$  After Drilling: N/A

Drilling Contractor: WDC Drilling Drilling Method: Air Rotary Casing Hammer Logged By: Jason Tarbert

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	X Coordinate: 1542131.09 Logged By: Jason Tarbert Page o of 16							
0 Depth (ft)	Sample Type	Number	Headspace PID	Lithologic Log	Material Description	U.S.C.S.	Well Diagram	Remarks
215	_				Poorly graded SAND (SP); brown (10YR 5/3); damp; dense; 85% fine sand; 15% medium to coarse sand; rounded; trace fines.	SP		
	-				Well graded SAND (SW); brown (10YR 5/3); moist; dense; 100% very fine to coarse sand to 3mm; rounded.	SW		
220					Lean CLAY (CL); dark yellowish brown (10YR 4/4); damp; low plasticity; 60% clay; 40% silt.	CL		Kelly down @ 0931. Resumed drilling @
225	-				Silty SAND with Gravel (SM): brown (10YR 5/3); damp; dense; 60% fine to very coarse sand; 20% fine gravel to 2cm; well rounded; 20% silt. Same as above (221 ft).	SM	- Bentonite Seal	0941.
230	-				Well graded SAND (SW); grayish brown (10YR 5/2); damp; dense; 100% very fine to coarse sand to 4mm; subrounded.			
235					Same as above (228 ft); trace fine gravel to 1.2cm.	SW	Top of Filter Pack	



Date Started: 2/17/2011 Date TD Reached: 2/19/2011 Date Completed: 2/21/2011

Ground Elevation AMSL (ft): 5349.0 Y Coordinate: 1473567.70 X Coordinate: 1542131.09

## Borehole ID: KAFB-106130

Hole Diameter Upper (in.): 11-3/4 Hole Diameter Lower (in.): 9-5/8 Surface Completion Type: Flush mount

Groundwater Levels BGS (ft): ☑ At Time of Drilling: N/A ▼ At End of Drilling: N/A ▼ After Drilling: N/A

Drilling Contractor: WDC Drilling Drilling Method: Air Rotary Casing Hammer Logged By: Jason Tarbert

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	500	Junate	5. IX	J42 I J	Logged	<i>Б</i> у. с	Jason Taiben	
05 Depth (ft)	Sample Type	Number	Headspace PID	Lithologic Log	Material Description	U.S.C.S.	Well Diagram	Remarks
-	_				Well graded SAND (SW); grayish brown (10YR 5/2); damp; dense; 95% very fine to very coarse sand; 5% gravel to 1.5cm; subrounded; pumice dominant.		Schedule 80 PVC 0.050 Slot Screen	Kelly down @ 0949. Resumed drilling @ 0957. Bit packed off.
<u>245</u>	_				Well graded SAND (SW); grayish brown (10YR 5/2); damp; dense; 100% very fine to coarse sand to 4mm; subrounded.			
250		SB0322	0.7		Same as above (245 ft); coarser; trace gravel to 1.8cm.	SW	- Bottom of Screen	Blow counts (248.5-250'): 6/12/50. Resumed drilling @ 1023.
	_				Same as above (245 ft); grading finer.			
<u>260</u> -	-				Lean CLAY (CL); brown (10YR 5/3); moist; hard; 80% clay; 20% silt.	CL	- - Bentonite Seal	Kelly down @ 1027. Resumed drilling @ 1033.
265	_				Well graded SAND (SW); pale brown (10YR 6/3); dry; dense; 95% very fine to coarse sand to 3mm; rounded; 5% fines.	sw		
270								



Date Started: 2/17/2011 Date TD Reached: 2/19/2011 Date Completed: 2/21/2011

Ground Elevation AMSL (ft): 5349.0 Y Coordinate: 1473567.70 X Coordinate: 1542131.09

## Borehole ID: KAFB-106130

Hole Diameter Upper (in.): 11-3/4 Hole Diameter Lower (in.): 9-5/8 Surface Completion Type: Flush mount

Groundwater Levels BGS (ft):  $\square$  At Time of Drilling: N/A  $\blacksquare$  At End of Drilling: N/A  $\blacksquare$  After Drilling: N/A

Drilling Contractor: WDC Drilling Drilling Method: Air Rotary Casing Hammer Logged By: Jason Tarbert

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		unat	C. I.	54215		Dy. 0		
25 Depth (ft)	Sample Type	Number	Headspace PID	Lithologic Log	Material Description	U.S.C.S.	Well Diagram	Remarks
-	-				SILT with Sand (ML); brown (10YR 5/3); damp; hard; 70% silt; 10% clay; 20% very fine to medium sand to 0.5mm.	ML		
275	-				Silty SAND (SM); brown (10YR 4/3); moist; dense; 70% very fine to medium sand; 30% silt.	SM		
280	-				Well graded SAND (SW); brown (10YR 4/3); dry; dense; 95% very fine to coarse sand to 4mm; subrounded; 5% fines.	sw		Kelly down @ 1040. Resumed drilling @ 1048.
285	-				Same as above (280 ft). Lean CLAY (CL); brown (7.5YR 4/4); moist; hard; low plasticity; 70% clay;	 CL	- Bentonite Seal	
<u>290</u>					30% silt. Clayey SAND (SC); dark yellowish brown (10YR 4/4); moist; very dense; 80% very fine to very coarse sand; 20% clay with silt.	sc		
295					Well graded SAND (SW); brown (10YR 5/3); dry; very dense; 90% very fine to very coarse sand; 5% fine gravel to 2.2cm; subrounded; 5% silt.	sw		Blow counts (298.5-300'):
300	1//	SB0323	0.9					31/50.



Date Started: 2/17/2011 Date TD Reached: 2/19/2011 Date Completed: 2/21/2011

Ground Elevation AMSL (ft): 5349.0 Y Coordinate: 1473567.70 X Coordinate: 1542131.09

## Borehole ID: KAFB-106130

Hole Diameter Upper (in.): 11-3/4 Hole Diameter Lower (in.): 9-5/8 Surface Completion Type: Flush mount

Groundwater Levels BGS (ft):  $\square$  At Time of Drilling: N/A  $\blacksquare$  At End of Drilling: N/A  $\blacksquare$  After Drilling: N/A

Drilling Contractor: WDC Drilling Drilling Method: Air Rotary Casing Hammer Logged By: Jason Tarbert

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		lanat	-			,		
S Depth (ft)	Sample Type	Number	Headspace PID	Lithologic Log	Material Description	U.S.C.S.	Well Diagram	Remarks
	N /	SB0324	0.9		Well graded SAND (SW); brown (10YR 5/3); dry; very dense; 90% very fine to very coarse sand; 5% fine gravel to 2.2cm; subrounded; 5% silt.	SW		Blow counts (300-301.5'): Not Recorded. Kelly down @ 1055. Resumed drilling @ 1119.
305	-			• • • • • • • • • • • • • • • • • • • •	No cuttings returned.			
<u>310</u>	-				Well graded SAND (SW); brown (10YR 5/3); dry; very dense; 85% very fine to very coarse sand; 10% fine gravel to 3.5cm; subrounded; 5% silt.			
315	-				Well graded SAND (SW); brown (10YR 5/3); dry; very dense; 90% very fine to very coarse sand; 5% fine gravel to 2.2cm; subrounded; 5% silt.		- Bentonite Seal	
320	-				Same as above (315 ft).	sw		Kelly down @ 1126. Resumed drilling @ 1133.
<u>325</u>	-				Well graded SAND with Gravel (SW); grayish brown (10YR 5/2); dry; very dense; 75% fine to very coarse sand; 25% fine gravel to 2.3cm; well rounded.			
330								

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Date Started: 2/17/2011 Date TD Reached: 2/19/2011 Date Completed: 2/21/2011

Ground Elevation AMSL (ft): 5349.0 Y Coordinate: 1473567.70 X Coordinate: 1542131.09

## Borehole ID: KAFB-106130

Hole Diameter Upper (in.): 11-3/4 Hole Diameter Lower (in.): 9-5/8 Surface Completion Type: Flush mount

Groundwater Levels BGS (ft):  $\square$  At Time of Drilling: N/A  $\blacksquare$  At End of Drilling: N/A  $\blacksquare$  After Drilling: N/A

Drilling Contractor: WDC Drilling Drilling Method: Air Rotary Casing Hammer Logged By: Jason Tarbert

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XU	:00	rdinate	e: 1	54213	1.09 Logged	BA: 1	lason l'arbert	Fage 12 01 10
ଝ Depth (ft)	Sample Type	Number	Headspace PID	Lithologic Log	Material Description	U.S.C.S.	Well Diagram	Remarks
-	-				Well graded SAND with Gravel (SW); grayish brown (10YR 5/2); dry; very dense; 60% fine to very coarse sand; 35% fine gravel to 2.3cm; well rounded; 5% silt.		- Bentonite Seal	
335	-				Same as above (330 ft); 85% very fine to very coarse sand; 15% fine gravel to 2.4cm.	SW	Top of Filter Pack	
<u>340</u>	-				Silty SAND (SM); brown (10YR 4/3); moist; very dense; 85% very fine to coarse sand; trace fine gravel to 6mm; subrounded; 15% silt with clay nodules.	 SM	- Top of 3/4" Schedule 80 PVC 0.050 Slot Screen	Kelly down @ 1140. Resumed drilling @ 1230.
- <u>345</u> -	-				Well graded SAND (SW); brown (10YR 4/3); dry; very dense; 90% very fine to very coarse sand; subangular; 5% fine gravel to 1.6cm; well rounded; 5% silt.			
350 - -		SB0325	0.6		Same as above (343 ft); medium dense; trace clay nodules.	SW	- Bottom of Screen	Blow counts (348.5-350') 10/12. Resumed drilling @ 1251.
355 - -					Poorly graded SAND (SP); dark grayish brown (10YR 4/2); dry; medium dense; 100% fine to medium sand; trace coarse sand to 4mm; rounded.	 SP	- - Bentonite Seal	
- 360	-							



Date Started: 2/17/2011 Date TD Reached: 2/19/2011 Date Completed: 2/21/2011

Ground Elevation AMSL (ft): 5349.0 Y Coordinate: 1473567.70 X Coordinate: 1542131.09

## Borehole ID: KAFB-106130

Hole Diameter Upper (in.): 11-3/4 Hole Diameter Lower (in.): 9-5/8 Surface Completion Type: Flush mount

Groundwater Levels BGS (ft):  $\square$  At Time of Drilling: N/A  $\blacksquare$  At End of Drilling: N/A  $\blacksquare$  After Drilling: N/A

Drilling Contractor: WDC Drilling Drilling Method: Air Rotary Casing Hammer Logged By: Jason Tarbert

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90 Depth (ft)	Sample Type	Number	Headspace PID	Lithologic Log	Material Description	U.S.C.S.	Well Diagram	Remarks
	-				Poorly graded SAND (SP); dark grayish brown (10YR 4/2); dry; medium dense; 100% fine to medium sand; trace coarse sand to 4mm; rounded.	SP		Kelly down @ 1254. Resumed drilling @ 1301.
<u>365</u> <u>370</u>	-				Well graded SAND (SW); brown (10YR 5/3); dry; dense; 95% very fine to very coarse sand; trace fine gravel to 7mm; rounded; 5% silt. Well graded SAND with Gravel (SW); brown (10YR 5/3); dry; dense; 85% very fine to very coarse sand; 15% fine gravel			
<u>375</u>					Well graded SAND (SW); brown (10YR 5/3); dry; dense; 95% very fine to very coarse sand; trace fine gravel to 7mm; rounded; 5% silt.	SW	- Bentonite Sea	
<u>380</u>	-				Same as above (375 ft); moist; trace clay nodules.			Kelly down @ 1306. Resumed drilling @ 1315.
<u>385</u> 390	-				Same as above (375 ft); trace clay nodules.			



Date Started: 2/17/2011 Date TD Reached: 2/19/2011 Date Completed: 2/21/2011

Ground Elevation AMSL (ft): 5349.0 Y Coordinate: 1473567.70 X Coordinate: 1542131.09

## Borehole ID: KAFB-106130

Hole Diameter Upper (in.): 11-3/4 Hole Diameter Lower (in.): 9-5/8 Surface Completion Type: Flush mount

Groundwater Levels BGS (ft):  $\square$  At Time of Drilling: N/A  $\blacksquare$  At End of Drilling: N/A  $\blacksquare$  After Drilling: N/A

Drilling Contractor: WDC Drilling Drilling Method: Air Rotary Casing Hammer Logged By: Jason Tarbert

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		Junat			209904	- )		
66 Depth (ft)	Sample Type	Number	Headspace PID	Lithologic Log	Material Description	U.S.C.S.	Well Diagram	Remarks
-	-				Well graded SAND (SW); dark grayish brown (10YR 4/2); dry; dense; 95% very fine to very coarse sand; 5% fine gravel to 1cm; rounded; trace fines.	SW		
<u>395</u>	-				Poorly graded GRAVEL with Sand (GP); brown (10YR 4/3); dry; dense; 85% fine gravel to 2.2cm; subangular to rounded; 15% very fine to very coarse sand; rounded; trace fines.			Plaw counts (208 5 400')
<u>400</u>		SB0326	0.6		Well graded SAND (SW); brown (10YR 5/3); moist; very dense; 95% very fine to very coarse sand; 5% fine gravel to 1.1cm; subrounded.			Blow counts (398.5-400') 15/50. Kelly down @ 1321. Resumed drilling @ 1340.
405	-				Same as above (398 ft); no gravel.		- Bentonite Seal	
410	-				Same as above (398 ft); grading finer.	SW		
<u>415</u>	-				Same as above (398 ft); finer.			
420								



Date Started: 2/17/2011 Date TD Reached: 2/19/2011 Date Completed: 2/21/2011

Ground Elevation AMSL (ft): 5349.0 Y Coordinate: 1473567.70 X Coordinate: 1542131.09

## Borehole ID: KAFB-106130

Hole Diameter Upper (in.): 11-3/4 Hole Diameter Lower (in.): 9-5/8 Surface Completion Type: Flush mount

Groundwater Levels BGS (ft):  $\square$  At Time of Drilling: N/A  $\blacksquare$  At End of Drilling: N/A  $\blacksquare$  After Drilling: N/A

Drilling Contractor: WDC Drilling Drilling Method: Air Rotary Casing Hammer Logged By: Jason Tarbert

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5 Depth (ft)	Sample Type	Number	Headspace PID	Lithologic Log	Material Description	U.S.C.S.	We	ell Diagram	Remarks
-	_				Well graded SAND (SW); brown (10YR 5/3); moist; very dense; 95% very fine to very coarse sand; 5% fine gravel to 1.1cm; subrounded.				Kelly down @ 1348. Resumed drilling @ 1359.
425	-				Same as above (420 ft); finer.			- Bentonite Seal	
430	-				Same as above (420 ft); coarser.	SW			
<u>435</u>	-				Well graded SAND (SW); brown (10YR 5/3); moist; very dense; 95% very fine to very coarse sand to 4mm; rounded; 5% fines.			- Top of Filter Pack	
440	-				Same as above (435 ft); coarser.			- Top of 3" Schedule 80 PVC 0.050 Slot Screen	Kelly down @ 1409. Resumed drilling @ 1420.
445 - -					Poorly graded SAND (SP); brown (10YR 5/3); moist; very dense; 100% very fine to medium sand to 1mm; rounded; trace fines.	SP			
450		SB0327	1.3						Blow counts (448.5-450'): 50/50.



Date Started: 2/17/2011 Date TD Reached: 2/19/2011 Date Completed: 2/21/2011

Ground Elevation AMSL (ft): 5349.0 Y Coordinate: 1473567.70 X Coordinate: 1542131.09

# Borehole ID: KAFB-106130

Hole Diameter Upper (in.): 11-3/4 Hole Diameter Lower (in.): 9-5/8 Surface Completion Type: Flush mount

Groundwater Levels BGS (ft):  $\square$  At Time of Drilling: N/A  $\blacksquare$  At End of Drilling: N/A  $\square$  After Drilling: N/A

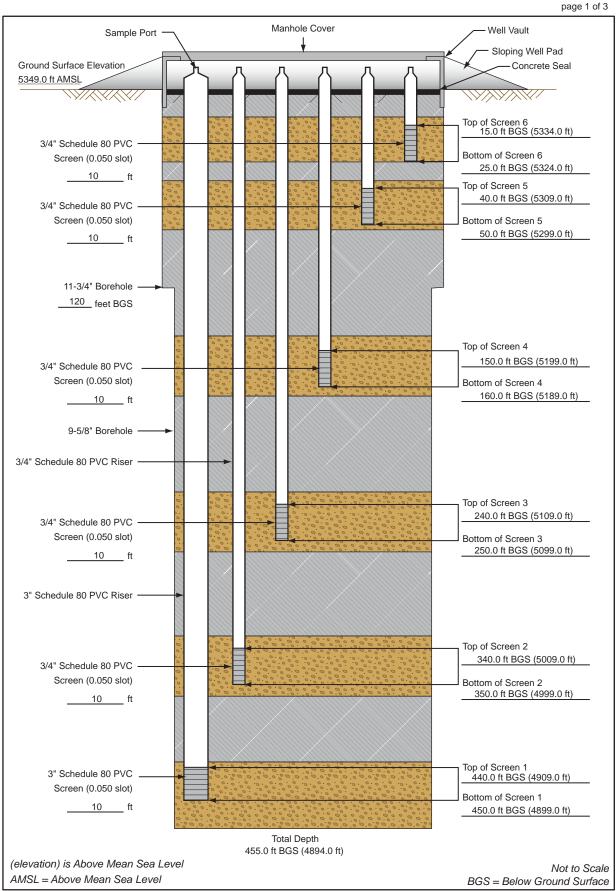
Drilling Contractor: WDC Drilling Drilling Method: Air Rotary Casing Hammer Logged By: Jason Tarbert

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5 Depth (ft)	Sample Type	Number	Headspace PID	Lithologic Log	Material Description	U.S.C.S.	Well Diagram	Remarks
455		SB0327 SB0327			Well graded SAND (SW); brown (10YR 4/3); dry; very dense; 100% very fine to very coarse sand; trace gravel to 2.5cm; subrounded.	SW	Screen	Blow counts (450-451.5'): Not Recorded. Blow counts (451.5-453'): Not Recorded. Resumed drilling @ 1500. Bit packed off @ 1503. Resumed drilling @ 1506.
-	-			<u> </u>				Total depth = 455 ft. Reached @ 1512 on 02/19/2011.
<u>460</u>	-							Water added during drilling (gallons) = 0 Water added during
465	-							construction (gallons) = Not Recorded Kelly down: TD the joint
	-							and ready to make new connection
470	-							
	-							
<u>475</u>								
480	-							

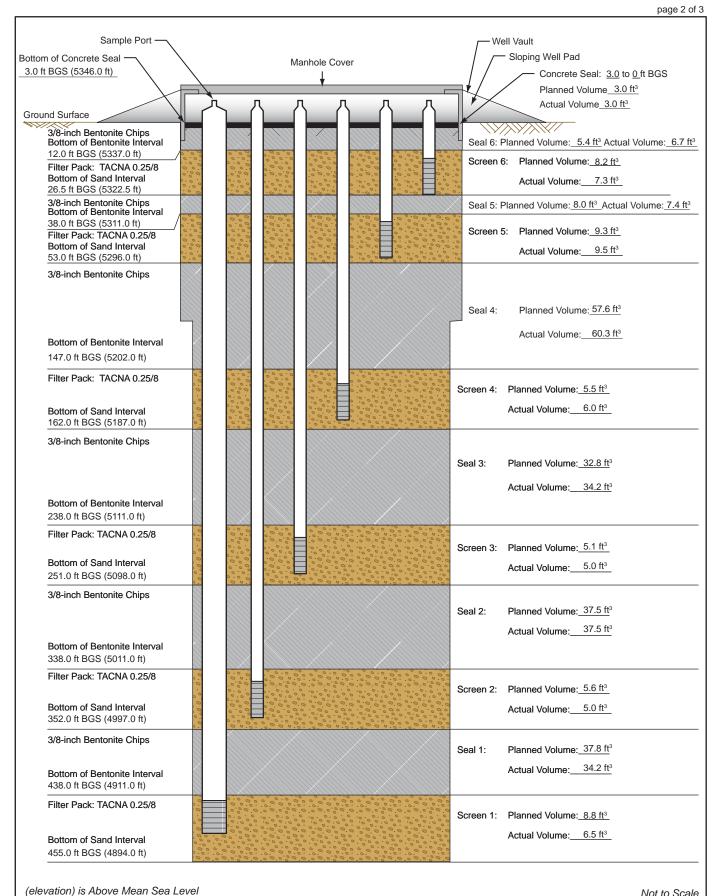
### Nested Soil Vapor Well Completion Diagram for KAFB-106130

Installation Start Date/Time: <u>2/20/2011 @ 09:22</u> Installation End Date/Time: <u>2/21/2011 @ 16:45</u>



140705_CA010020_SV_KAFB.106130 (a)

### Nested Soil Vapor Well Completion Diagram for KAFB-106130

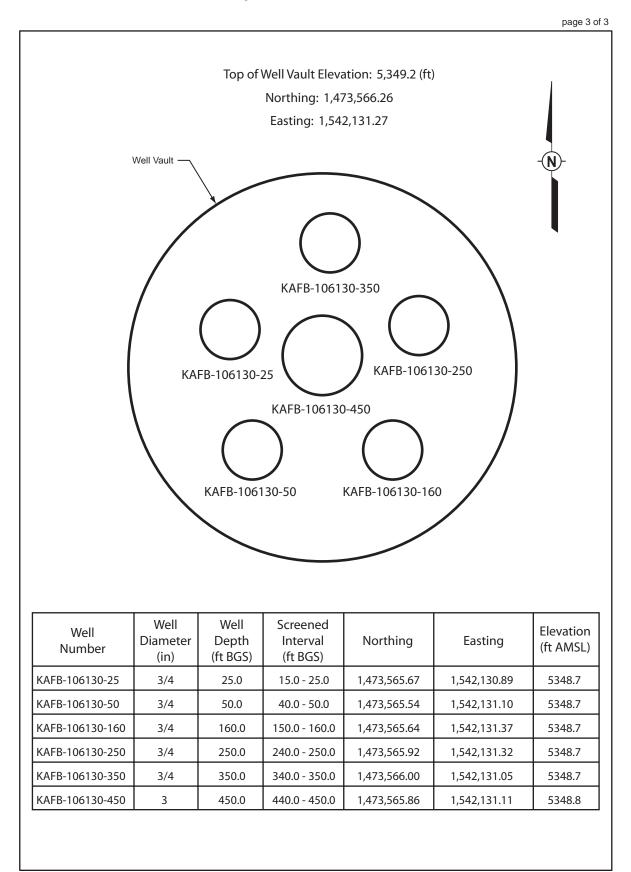


All Materials Placed with Tremie Pipe

Not to Scale BGS = Below Ground Surface

140705_CA010020_SV_KAFB.106130 (b)

### Nested Soil Vapor Well Completion Diagram Map View for KAFB-106130



140705_CA010020_SV_Map View_106130

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### **APPENDIX D-1**

KAFB-106131 Final Well Report

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Date Started: 3/2/2011 Date TD Reached: 3/5/2011 Date Completed: 3/7/2011

Ground Elevation AMSL (ft): 5344.4 Y Coordinate: 1472929.18 X Coordinate: 1541690.65

# Borehole ID: KAFB-106131

Hole Diameter Upper (in.): 11-3/4 Hole Diameter Lower (in.): 9-5/8 Surface Completion Type: Flush mount

Groundwater Levels BGS (ft):  $\square$  At Time of Drilling: N/A  $\blacksquare$  At End of Drilling: N/A  $\blacksquare$  After Drilling: N/A

Drilling Contractor: WDC Drilling Drilling Method: Air Rotary Casing Hammer Logged By: Allen Willmore

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~ ~ ~	-00	Juliat			logged		-	
Oepth (ft)	Sample Type	Number	Headspace PID	Lithologic Log	Material Description	U.S.C.S.	Well Diagram	Remarks
	_				Sandy SILT (ML); red (2.5YR 5/6); moist; firm; 70% silt; 30% very fine to fine sand; trace fine to coarse gravel to 5cm; no odor.		- Concrete Seal	Hand augered.
5	_				Same as above (0 ft); more gravel.	ML		Began drilling @ 1225 on 3/2/11.
10		SB0328	0.1		Lean CLAY (CL); light reddish brown		- Bentonite Seal	Blow counts (8.5-10'): 11/22/26. New 10' connection @
	_				(5YR 6/4); moist; soft; low to medium plasticity; 95% clay; 5% sand; no odor.		Pack	1245.
15	-				Same as above (10 ft).	CL	- Top of 3/4" Schedule 80 PVC 0.050 Slot Screen	
20		SB0329	0.0		Same as above (10 ft).			Blow counts (18.5-20'): 17/25/27. New 10' connection @ 1310.
25	-				Silty GRAVEL (GM); reddish brown (5YR 5/4); moist; 70% gravel; angular to subrounded; 30% silt; no odor.	GM		
					Lean CLAY (CL); yellowish red (5YR 4/6); moist; soft; low plasticity; 70% clay; 20% silt; 10% gravel; angular to subrounded; no odor.	CL	Bertavita Cool	
30		SB0330	0.0				- Bentonite Seal	Blow counts (28.5-30'): 11/22/31. Blow counts

Shaw			Bore	eho	le ID	: KAFB-	106131
Project Loc	ation: KA ne: KAFB	os of Engineers FB, Albuquerque, NM BFF SWMU ST-106 and SS-111 705	Hole Dia	ametei	Lower	(in.): 11-3/4 (in.): 9-5/8 ype: Flush mo	unt
Date Starte Date TD Re Date Comp	d: 3/2/201 eached: 3/	1 5/2011	👤 At E	Time of End of	Levels E f Drilling Drilling: ng: N/A	: N/A N/A	
	vation AMS te: 147292	GL (ft): 5344.4 29.18	Drillling	Contra Metho	actor: V d: Air R	VDC Drilling Rotary Casing H	ammer Page 2 of 16
ତ Depth (ft) Sample Type Number	Headspace PID Lithologic Log	Material Description		U.S.C.S.	We	ell Diagram	Remarks
SB0337	1 0.0	Lean CLAY (CL); yellowish red ( 4/6); moist; hard; low plasticity; 7 clay; 20% silt; 10% gravel; angul subrounded; no odor.	'0%	CL			(30-31.5'): 12/26/50. New 10' connection @ 1345.
		GRAVEL (GW); lense.		GW			
35		Lean CLAY with Gravel (CL); pir 7/4); moist; medium plasticity; 80 20% gravel to 0.75cm; no odor.				- Bentonite Seal	
40 SB0332	2 0.0	Lean CLAY with Sand (CL); yello red (5YR 5/6); moist; firm; non to plasticity; 80% clay; 20% sand; r	low	CL		- Top of Filter Pack	Blow counts (38.5-40'): 16/28/46. New 10' connection @ 1405.
45		Same as above (40 ft).				- Top of 3/4" Schedule 80 PVC 0.050 Slot Screen	
	3 0.0						Blow counts (48.5-50'): 9/15/46. Blow counts
50 SB0333	3	Well graded SAND with Gravel ( pink (5YR 7/4); dry to moist; 70% 30% coarse gravel to 2cm; suba no odor.	sand;	SW			(50-51.5'): 11/42/50. New 10' connection @ 1435.
    60		Lean CLAY with Sand (CL); yello red (5YR 5/6); moist; firm; non to plasticity; 80% clay; 20% sand; r	low	CL		- Bottom of Screen	



Date Started: 3/2/2011 Date TD Reached: 3/5/2011 Date Completed: 3/7/2011

Ground Elevation AMSL (ft): 5344.4 Y Coordinate: 1472929.18 X Coordinate: 1541690.65

## Borehole ID: KAFB-106131

Hole Diameter Upper (in.): 11-3/4 Hole Diameter Lower (in.): 9-5/8 Surface Completion Type: Flush mount

Groundwater Levels BGS (ft):  $\square$  At Time of Drilling: N/A  $\blacksquare$  At End of Drilling: N/A  $\blacksquare$  After Drilling: N/A

Drilling Contractor: WDC Drilling Drilling Method: Air Rotary Casing Hammer Logged By: Allen Willmore

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A coordinate: 1341030.05									
0 Danth (#)		Number	5	Headspace PID	Lithologic Log	Material Description	U.S.C.S.	Well Diagram	Remarks
	-					Gravelly SILT (ML); reddish yellow (5YR 6/6); moist; soft; 55% silt; 45% gravel to 1cm; rounded; no odor.			New 20' connection @ 1445.
6	5					Same as above (60 ft); 70% silt; 30% gravel.			
7	0					Same as above (60 ft).			
7	5					SILT (ML); reddish yellow (5YR 6/6); moist; soft; 70% silt; 25% clay; 5% gravel to 2cm; rounded.	ML	- Bentonite Seal	
8	- 0 - - -					SILT (ML); reddish yellow (5YR 6/6); dry; soft; low plasticity; 65% silt; 30% clay; 5% gravel; no odor.			New 20' connection @ 1500.
8	5					Same as above (80 ft); 10% gravel.			
9	0								



Date Started: 3/2/2011 Date TD Reached: 3/5/2011 Date Completed: 3/7/2011

Ground Elevation AMSL (ft): 5344.4 Y Coordinate: 1472929.18 X Coordinate: 1541690.65

## Borehole ID: KAFB-106131

Hole Diameter Upper (in.): 11-3/4 Hole Diameter Lower (in.): 9-5/8 Surface Completion Type: Flush mount

Groundwater Levels BGS (ft):  $\Box$  At Time of Drilling: N/A  $\blacksquare$  At End of Drilling: N/A  $\blacksquare$  After Drilling: N/A

Drilling Contractor: WDC Drilling Drilling Method: Air Rotary Casing Hammer Logged By: Allen Willmore

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ଓ Depth (ft)	Sample Type	Number	Headspace PID	Lithologic Log	Material Description	U.S.C.S.	Well Diagram	Remarks
	-				Lean CLAY (CL); light brown (7.5YR 6/4); dry; hard; non to low plasticity; 85% clay; 15% silt; no odor.	CL		
		SB0334	0.0		Silty SAND (SM); light brown (7.5YR 6/4); moist; loose to dense; 75% sand; 25% silt with clay; no odor.	SM		Blow counts (98.5-100'): 6/8/12. Blow counts
		SB0334			Clayey SAND with Gravel (SC); light brown (7.5YR 6/3); dry; loose to dense; 40% sand; 25% fine to coarse gravel; 35% clay; no odor.	sc		(100-101.5'): 16/19/22. New 20' connection @ 1530.
	-				Poorly graded SAND (SP); light brown (7.5YR 6/3); dry; loose; 100% fine to coarse sand; no odor.	SP	- Bentonite Seal	
-	-			<u></u>	SILT (ML); reddish yellow (5YR 6/6); moist; hard; low plasticity; 65% silt; 30% clay; 5% gravel; no odor.			
<u>115</u> - -	-				Same as above (110 ft).	ML		
120								End of 3/2/11.



Date Started: 3/2/2011 Date TD Reached: 3/5/2011 Date Completed: 3/7/2011

Ground Elevation AMSL (ft): 5344.4 Y Coordinate: 1472929.18 X Coordinate: 1541690.65

## Borehole ID: KAFB-106131

Hole Diameter Upper (in.): 11-3/4 Hole Diameter Lower (in.): 9-5/8 Surface Completion Type: Flush mount

Groundwater Levels BGS (ft):  $\square$  At Time of Drilling: N/A  $\blacksquare$  At End of Drilling: N/A  $\blacksquare$  After Drilling: N/A

Drilling Contractor: WDC Drilling Drilling Method: Air Rotary Casing Hammer Logged By: Allen Willmore

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05 Depth (ft)	Sample Type	Number	Headspace PID	Lithologic Log	Material Description	U.S.C.S.	W	ell Diagram	Remarks
-	-				SILT (ML); reddish yellow (5YR 6/6); moist; hard; low plasticity; 65% silt; 30% clay; 5% gravel; no odor.	ML			New 20' connection @ 0855 on 3/3/11.
<u>125</u>	-				Lean CLAY (CL); brown (7.5YR 5/4); moist; soft; medium to high plasticity; 95% clay with silt; 5% gravel to 2cm; no odor.				
130	-				Same as above (125 ft).	CL		- Bentonite Seal	
<u>135</u>	-				Same as above (125 ft).			T (51)	
140 - -	-				Well graded SAND (SW); light brown (7.5YR 6/4); moist; dense to medium dense; 100% sand; subangular; no odor.			- Top of Filter Pack - Top of 3/4" Schedule 80 PVC 0.050 Slot Screen	New 10' connection @ 0920.
145	-				Same as above (140 ft); brown (7.5YR 5/3).	SW			
150		SB0335 SB0335-	0.0						Blow counts (148.5-150 24/27/54. Blow counts



Date Started: 3/2/2011 Date TD Reached: 3/5/2011 Date Completed: 3/7/2011

Ground Elevation AMSL (ft): 5344.4 Y Coordinate: 1472929.18 X Coordinate: 1541690.65

## Borehole ID: KAFB-106131

Hole Diameter Upper (in.): 11-3/4 Hole Diameter Lower (in.): 9-5/8 Surface Completion Type: Flush mount

Groundwater Levels BGS (ft):  $\square$  At Time of Drilling: N/A  $\blacksquare$  At End of Drilling: N/A  $\blacksquare$  After Drilling: N/A

Drilling Contractor: WDC Drilling Drilling Method: Air Rotary Casing Hammer Logged By: Allen Willmore

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05 Depth (ft)	Sample Type Number	Headspace PID Lithologic Log	Material Description	U.S.C.S.	Well Diagram	Remarks
-	MSD	5- 0.0	SILT (ML): reddish yellow (5YR 6/6); moist; hard; non to low plasticity; 95% silt with clay; 5% sand; no odor.	ML	Screen	(150-151.5'): 15/26/42. New 10' connection @ 0955.
<u>155</u> - -			Poorly graded SAND (SP); light brown (7.5YR 6/4); moist; dense to medium dense; 95% sand; 5% fine gravel to 1cm; no odor.			
<u>160</u>	-		Same as above (155 ft).			New 20' connection @ 1005.
<u>165</u>			Same as above (155 ft); 10% gravel to 0.5cm; coarsens downward.	SP	- Bentonite Seal	
<u>170</u>	-		Same as above (155 ft).			
175			Well graded SAND with Gravel (SW); light brown (7.5YR 6/3); moist; medium dense; 65% sand; 35% coarse gravel to 0.75cm; subrounded to subangular; no odor.	sw		
180						



Date Started: 3/2/2011 Date TD Reached: 3/5/2011 Date Completed: 3/7/2011

Ground Elevation AMSL (ft): 5344.4 Y Coordinate: 1472929.18 X Coordinate: 1541690.65

Borehole ID: KAFB-106131

Hole Diameter Upper (in.): 11-3/4 Hole Diameter Lower (in.): 9-5/8 Surface Completion Type: Flush mount

Groundwater Levels BGS (ft): \square At Time of Drilling: N/A \blacksquare At End of Drilling: N/A \blacksquare After Drilling: N/A

Drilling Contractor: WDC Drilling Drilling Method: Air Rotary Casing Hammer Logged By: Allen Willmore

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08 Depth (ft)	Sample Type	Number	Headspace PID	Lithologic Log	Material Description	U.S.C.S.	Well Diagram	Remarks
185	-				Poorly graded SAND (SP); light brown (7.5YR 6/4); moist; dense; 95% sand; 5% fine gravel; no odor.	SP		New 20' connection @ 1025.
	-				Well graded SAND with Gravel (SW); light brown (7.5YR 6/3); moist; 80% sand; 15% gravel; 5% silt and clay; no odor.			
<u>190</u> 195	-				Same as above (185 ft).	SW	Destacite Occi	
	-				SILT (ML); brown (7.5YR 5/3); moist; soft; 90% silt with clay; 10% gravel to 2.5cm; subrounded; no odor.	ML	- Bentonite Seal	Blow counts (198.5-200'):
200	-	SB0336	0.0		Lean CLAY (CL); brown (7.5YR 5/4); dry; hard; non to low plasticity; 95% clay with silt; 5% sand; no odor.	CL		16/32/41. New 20' connection @ 1110.
<u>205</u> 210	-				Well graded SAND (SW); brown (7.5YR 5/3); dry; loose to medium dense; 100% sand; no odor.	sw		



Date Started: 3/2/2011 Date TD Reached: 3/5/2011 Date Completed: 3/7/2011

Ground Elevation AMSL (ft): 5344.4 Y Coordinate: 1472929.18 X Coordinate: 1541690.65

Borehole ID: KAFB-106131

Hole Diameter Upper (in.): 11-3/4 Hole Diameter Lower (in.): 9-5/8 Surface Completion Type: Flush mount

Groundwater Levels BGS (ft): \square At Time of Drilling: N/A \blacksquare At End of Drilling: N/A \blacksquare After Drilling: N/A

Drilling Contractor: WDC Drilling Drilling Method: Air Rotary Casing Hammer Logged By: Allen Willmore

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0 Depth (ft)	Sample Type	Number	Headspace PID	Lithologic Log	Material Description	U.S.C.S.	Well Diagram	Remarks
- - 215					Gravelly lean CLAY (CL); light brown (7.5YR 6/4); dry; hard; medium to high plasticity; 70% clay with silt; 30% gravel to 5cm; rounded to well rounded; no odor. Same as above (210 ft).	CL		
-					Poorly graded SAND (SP); lense.	SP		
220					Gravelly lean CLAY (CL); light brown (7.5YR 6/4); dry; hard; medium to high plasticity; 70% clay with silt; 30% gravel to 5cm; rounded to well rounded; no odor. Well graded SAND with Gravel (SW); light brown (7.5YR 6/3); moist; 85% sand; 15% coarse gravel to 0.5cm; no	SW	- - Bentonite Seal	
225	-				Poorly graded SAND (SP); light brown (7.5YR 6/3); dry to moist; 90% sand; 10% coarse gravel; no odor.			
- 230 - -	-				Same as above (224 ft).	SP	Top of Filler	
- 235 - -	-				Well graded GRAVEL with Clay and Sand (GW-GC); brown (7.5YR 5/4); moist; loose to medium dense; 60% gravel to 3cm; subangular to rounded; 30% sand; 10% clay and silt; no odor.	GW- GC	- Top of Filter Pack - Top of 3/4" Schedule 80 PVC 0.050 Slot Screen	
240								

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Shaw
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Date Started: 3/2/2011 Date TD Reached: 3/5/2011 Date Completed: 3/7/2011

Ground Elevation AMSL (ft): 5344.4 Y Coordinate: 1472929.18 X Coordinate: 1541690.65

Borehole ID: KAFB-106131

Hole Diameter Upper (in.): 11-3/4 Hole Diameter Lower (in.): 9-5/8 Surface Completion Type: Flush mount

Groundwater Levels BGS (ft): \square At Time of Drilling: N/A \blacksquare At End of Drilling: N/A \blacksquare After Drilling: N/A

Drilling Contractor: WDC Drilling Drilling Method: Air Rotary Casing Hammer Logged By: Allen Willmore

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					55	,		
5 Depth (ft)	Sample Type	Number	Headspace PID	Lithologic Log	Material Description	U.S.C.S.	Well Diagram	Remarks
-					Well graded GRAVEL with Clay (GW-GC); brown (7.5YR 5/4); moist; loose to medium dense; 85% gravel to 3cm; subangular to rounded; 5% sand; 10% clay and silt; no odor.	GW- GC		New 10' connection @ 1235.
<u>245</u> - -					Lean CLAY (CL); light brown (7.5YR 6/4); dry; hard; medium to high plasticity; clay with silt; gravel; no odor.		- Bottom of Screen	
<u>250</u> - -		SB0337	0.0		Same as above (245 ft); nonplastic; no gravel.	CL		Blow counts (248.5-250'): 19/46/50. New 10' connection @ 1310.
255	-				Well graded SAND with Gravel (SW); light brown (7.5YR 6/3); dry to moist; medium dense to loose; sand; gravel to 1cm; rounded; silt; no odor.	sw	- Bentonite Seal	
<u>260</u> - - -	-				Lean CLAY (CL); brown (7.5YR 5/4); moist; hard; medium plasticity; clay with silt; no odor.			New 20' connection @ 1505.
<u>265</u> - - -					Lean CLAY with Gravel (CL); brown (7.5YR 5/4); moist; hard; medium plasticity; 85% clay with silt; 15% gravel to 4cm; subrounded to subangular; no odor.	CL		
270								



Date Started: 3/2/2011 Date TD Reached: 3/5/2011 Date Completed: 3/7/2011

Ground Elevation AMSL (ft): 5344.4 Y Coordinate: 1472929.18 X Coordinate: 1541690.65

Borehole ID: KAFB-106131

Hole Diameter Upper (in.): 11-3/4 Hole Diameter Lower (in.): 9-5/8 Surface Completion Type: Flush mount

Groundwater Levels BGS (ft): \square At Time of Drilling: N/A \blacksquare At End of Drilling: N/A \blacksquare After Drilling: N/A

Drilling Contractor: WDC Drilling Drilling Method: Air Rotary Casing Hammer Logged By: Allen Willmore

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5 Depth (ft)	Sample Type	Number	Headspace PID	Lithologic Log	Material Description	U.S.C.S.	Well Diagram	Remarks
-					Lean CLAY (CL); brown (7.5YR 5/4); moist; hard; medium plasticity; 100% clay with silt; no odor.			
_ 275 _ -					Same as above (270 ft).	CL		
- <u>280</u> - -	-				Well graded SAND with Gravel (SW); pink (7.5YR 7/3); dry; loose; 85% sand; 15% coarse gravel; no odor.			New 20' connection @ 1550.
- _ _ _ _ _					Same as above (278 ft); 40% gravel; angular to subrounded.	sw	- Bentonite Seal	
_ <u>290</u> _ _					Poorly graded SAND (SP); very coarse; angular to subangular.			
- <u>295</u> - -	-				Same as above (290 ft); fines downward.	SP		
- _ 300	X	SB0338	0.0	000	GRAVEL (GP); lense; gravel to 2cm;	GP		Blow counts (298.5-300'): 10/26/41.



Date Started: 3/2/2011 Date TD Reached: 3/5/2011 Date Completed: 3/7/2011

Ground Elevation AMSL (ft): 5344.4 Y Coordinate: 1472929.18 X Coordinate: 1541690.65

Borehole ID: KAFB-106131

Hole Diameter Upper (in.): 11-3/4 Hole Diameter Lower (in.): 9-5/8 Surface Completion Type: Flush mount

Groundwater Levels BGS (ft): \square At Time of Drilling: N/A \blacksquare At End of Drilling: N/A \blacksquare After Drilling: N/A

Drilling Contractor: WDC Drilling Drilling Method: Air Rotary Casing Hammer Logged By: Allen Willmore

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00 Depth (ft)	Sample Type	Number	Headspace PID	Lithologic Log	Material Description	U.S.C.S.	Well Diagram	Remarks
	-				rounded. Gravelly SILT (ML); reddish yellow (7.5YR 7/6); dry to damp; 70% silt; 30% gravel to 3cm; subangular to subrounded; no odor.	ML		End of 3/3/11. New 20' connection @ 0805 on 3/4/11.
305	-				Well graded SAND with Gravel (SW); pink (7.5YR 7/3); dry; loose; 70% sand; 30% coarse gravel to 5cm; subangular to rounded; no odor.			
<u>310</u>	-				Same as above (305 ft); 45% gravel.	SW		
315	-				Same as above (305 ft); more angular gravel.		- Bentonite Seal	
320	-				Well graded GRAVEL with Sand (GW); dry; 80% gravel; angular to subrounded; 20% coarse sand; no odor. Well graded SAND with Gravel (SW);	GW		New 20' connection @
	-				pink (7.5YR 7/3); dry; loose; 60% sand; 40% gravel to 5cm; subangular to rounded; no odor.			1045.
325	-				Well graded SAND (SW); pink (7.5YR 7/3); dry; loose; 90% sand; 10% gravel to 1cm; subangular to rounded; no odor.	SW		
330	-							



Date Started: 3/2/2011 Date TD Reached: 3/5/2011 Date Completed: 3/7/2011

Ground Elevation AMSL (ft): 5344.4 Y Coordinate: 1472929.18 X Coordinate: 1541690.65

Borehole ID: KAFB-106131

Hole Diameter Upper (in.): 11-3/4 Hole Diameter Lower (in.): 9-5/8 Surface Completion Type: Flush mount

Groundwater Levels BGS (ft): \square At Time of Drilling: N/A \blacksquare At End of Drilling: N/A \blacksquare After Drilling: N/A

Drilling Contractor: WDC Drilling Drilling Method: Air Rotary Casing Hammer Logged By: Allen Willmore

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05 Depth (ft)	Sample Type	Number	Headspace PID	Lithologic Log	Material Description	U.S.C.S.	We	ell Diagram	Remarks
-					Poorly graded SAND (SP); pink (7.5YR 7/3); dry; 80% fine sand; 20% medium to coarse sand; no odor.	SP			
- 335 -					Well graded GRAVEL with Sand (GW); pink (7.5YR 7/3); dry; loose; 80% gravel to 2.5cm; angular to subrounded; 20% coarse sand; no odor.	GW		- Bentonite Seal	
- - 340	-				Well graded SAND with Gravel (SW); pink (7.5YR 7/3); dry to damp; loose; 60% sand; 45% coarse gravel to 1cm; subangular to subrounded; no odor.	SW		- Top of Filter Pack	
- - -					Poorly graded SAND (SP); pink (7.5YR 7/3); dry; 80% fine sand; 20% medium to coarse sand; no odor.			- Top of 3/4" Schedule 80 PVC 0.050 Slot Screen	New 10' connection @ 1150.
<u>345</u> - -					Same as above (340 ft); light brown (7.5YR 6/4); moist; trace gravel to 2cm; rounded to subangular.	SP			
350	Д	SB0339	0.0					•	Blow counts (348-349.5 9/35/50. Blow counts
- - -		SB0339			Well graded GRAVEL (GW); pink (7.5YR 7/3); dry; 90% gravel to 7cm; subangular to rounded; 10% coarse sand; no odor.	GW		- Bottom of Screen	(349.5-351'): 49/50. New 10' connection @ 1255.
- 355 - -					Well graded SAND with Gravel (SW); light brown (7.5YR 6/3); moist; loose to medium dense; 70% sand; 30% gravel to 1cm; subangular to subrounded; no odor.	SW		- Bentonite Seal	
- 360									



Date Started: 3/2/2011 Date TD Reached: 3/5/2011 Date Completed: 3/7/2011

Ground Elevation AMSL (ft): 5344.4 Y Coordinate: 1472929.18 X Coordinate: 1541690.65

Borehole ID: KAFB-106131

Hole Diameter Upper (in.): 11-3/4 Hole Diameter Lower (in.): 9-5/8 Surface Completion Type: Flush mount

Groundwater Levels BGS (ft): \square At Time of Drilling: N/A \blacksquare At End of Drilling: N/A \blacksquare After Drilling: N/A

Drilling Contractor: WDC Drilling Drilling Method: Air Rotary Casing Hammer Logged By: Allen Willmore

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	X Coordinate: 1541690.65 Logged By: Allen Willimore									
90 Depth (ft)	Sample Type	Number	Headspace PID	Lithologic Log	Material Description	U.S.C.S.	Well Diagram	Remarks		
365	-				Well graded SAND with Gravel (SW); light brown (7.5YR 6/3); moist; loose to medium dense; 70% sand; 30% gravel to 3cm; subangular to subrounded; no odor.	sw		New 20' connection @ 1440.		
	-				Poorly graded SAND with Gravel (SP); light brown (7.5YR 6/4); dry; 80% very fine to fine sand; 20% gravel to 4cm; rounded to subangular; no odor.					
370	-				Same as above (365 ft); coarser.					
375	-				Same as above (365 ft); finer.	0.0	- Bentonite Seal			
380						SP		New 20' connection @ 1615.		
205					Poorly graded SAND with Gravel (SP); pink (7.5YR 7/3); dry; loose; 65% coarse sand; 35% gravel to 0.25cm; angular to subrounded; no odor.					
385	-				Same as above (381 ft); moist. Poorly graded SAND (SP); light brown (7.5YR 6/3); moist; loose; 100% fine					
390					sand; no odor.			End of 3/4/11.		



Date Started: 3/2/2011 Date TD Reached: 3/5/2011 Date Completed: 3/7/2011

Ground Elevation AMSL (ft): 5344.4 Y Coordinate: 1472929.18 X Coordinate: 1541690.65

Borehole ID: KAFB-106131

Hole Diameter Upper (in.): 11-3/4 Hole Diameter Lower (in.): 9-5/8 Surface Completion Type: Flush mount

Groundwater Levels BGS (ft): \square At Time of Drilling: N/A \blacksquare At End of Drilling: N/A \blacksquare After Drilling: N/A

Drilling Contractor: WDC Drilling Drilling Method: Air Rotary Casing Hammer Logged By: Allen Willmore

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g Depth (ft)	Sample Type	Number	Headspace PID	Lithologic Log	Material Description	U.S.C.S.	We	ell Diagram	Remarks
-					Poorly graded SAND (SP); light brown (7.5YR 6/3); moist; loose; 100% fine sand; no odor.	SP			
395_	-				Silty SAND (SM); strong brown (7.5YR 5/6); moist; dense; 60% sand; 10% gravel; 30% silt; no odor.				
-		SB0340 SB1749	0.0		Same as above (393 ft); dry.	SM			Blow counts (398-399.5') 16/37/43.
<u>400</u>					Same as above (393 ft); light brown (7.5YR 6/4).				New 20' connection @ 1215 on 3/5/11.
-					Well graded SAND (SW); dry; lense.	SW			
405	-				Silty SAND (SM); light brown (7.5YR 6/4); moist; dense; 60% sand; 10% gravel; 30% silt; no odor.	SM		- Bentonite Seal	
- - - - 410					Poorly graded SAND (SP); light brown (7.5YR 6/3); dry; loose; 90% very fine to fine sand; 10% gravel to 2cm; angular; no odor.	SP		- Dentonite Sea	
-					Well graded SAND (SW); pinkish gray (7.5YR 7/2); damp; loose; 100% sand to 0.3cm; no odor.	sw			
<u>415</u>					Poorly graded SAND (SP); light brown (7.5YR 6/3); dry; loose; 100% sand; no odor.	SP			
420									



Borehole ID: KAFB-106131

Client: US Army Corps of Engineers Project Location: KAFB, Albuquerque, NM Project Name: KAFB BFF SWMU ST-106 and SS-111 Project Number: 140705

Date Started: 3/2/2011 Date TD Reached: 3/5/2011 Date Completed: 3/7/2011

Ground Elevation AMSL (ft): 5344.4 Y Coordinate: 1472929.18 X Coordinate: 1541690.65 Hole Diameter Upper (in.): 11-3/4 Hole Diameter Lower (in.): 9-5/8 Surface Completion Type: Flush mount

Groundwater Levels BGS (ft): \square At Time of Drilling: N/A \blacksquare At End of Drilling: N/A \blacksquare After Drilling: N/A

Drilling Contractor: WDC Drilling Drilling Method: Air Rotary Casing Hammer Logged By: Allen Willmore

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55 Depth (ft)		Number	Headspace PID	Lithologic Log	Material Description	U.S.C.S.	We	ell Diagram	Remarks
	-				Poorly graded SAND (SP); light brown (7.5YR 6/3); dry; loose; 100% sand; no odor.				New 20' connection @ 1400.
42	5				Same as above (420 ft); coarser.	SP		- Bentonite Seal	
43(- - -				Same as above (420 ft); finer.	54		- Top of Filter Pack - Top of 3" Schedule 80	
43								PVC 0.050 Slot Screen	
	-				Well graded SAND (SW); pinkish gray (7.5YR 7/2); dry; loose; 100% very fine to coarse sand; no odor.	SW			
44(ן ר			, KĊ	Silty GRAVEL (GM); light brown (7.5YR	GM			
<u> </u>					6/4); moist. SILT with Sand (ML); light brown (7.5YR	ML	[₿	- Bottom of Screen	New 10' connection @
					6/4); moist; hard; 85% silt with clay; 15% sand; no odor.	CL			1500.
44	5				Lean CLAY (CL); brown (7.5YR 5/6); dry; hard to stiff; medium plasticity; 90% clay; 10% sand; no odor. SILT with Sand (ML); light brown (7.5YR	ML			
					6/4); moist; hard; 85% silt with clay; 15% sand; no odor. Poorly graded SAND (SP); light brown (7.5YR 6/4); dry; loose; 100% very fine sand; no odor.	SP			
450	s∜	SB0341	0.0						Blow counts (448.5-450'): 15/34/43.



Project Number: 140705

Date TD Reached: 3/5/2011 Date Completed: 3/7/2011

Y Coordinate: 1472929.18

Ground Elevation AMSL (ft): 5344.4

Date Started: 3/2/2011

Borehole ID: KAFB-106131

Hole Diameter Upper (in.): 11-3/4 Hole Diameter Lower (in.): 9-5/8 Project Name: KAFB BFF SWMU ST-106 and SS-111 Surface Completion Type: Flush mount

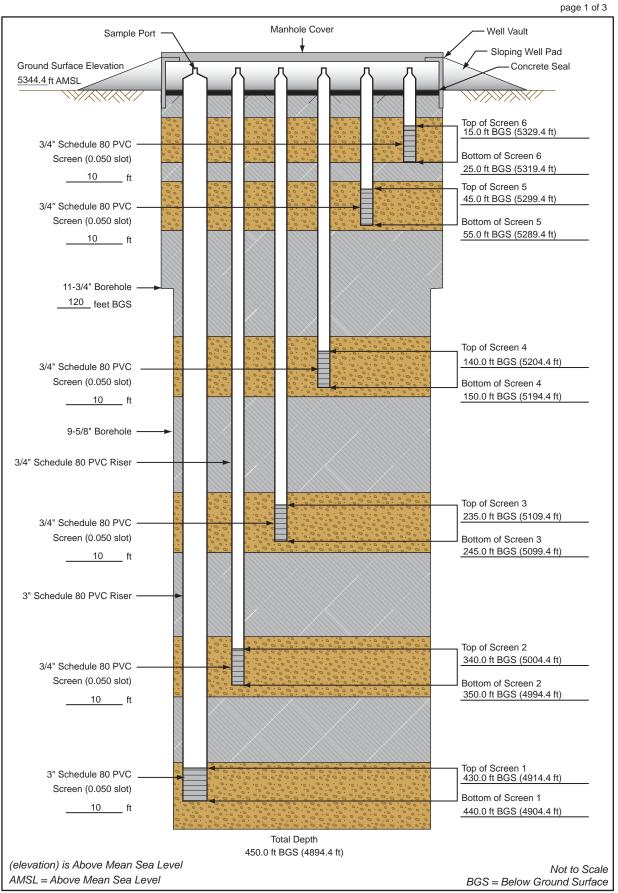
> Groundwater Levels BGS (ft): ▼ After Drilling: N/A

Drilling Contractor: WDC Drilling Drilling Method: Air Rotary Casing Hammer Logged By: Allen Willmore

				541690.65		Logged By: Allen Willmore Page 16 of 16				
5 Depth (ft)	Sample Type	Number	Headspace PID	Lithologic Log	Material Description		U.S.C.S.	Well Diagram	Remarks	
-	-								Total depth = 450 ft. Reached @ 1515 on 3/5/11.	
455	-								Water added during drilling (gallons) = 0	
-	-								Water added during construction (gallons) = 187.5	
460 -	-									
-	-									
465	-									
-	-									
<u>470</u> -	-									
- - 475	-									
- - 480										

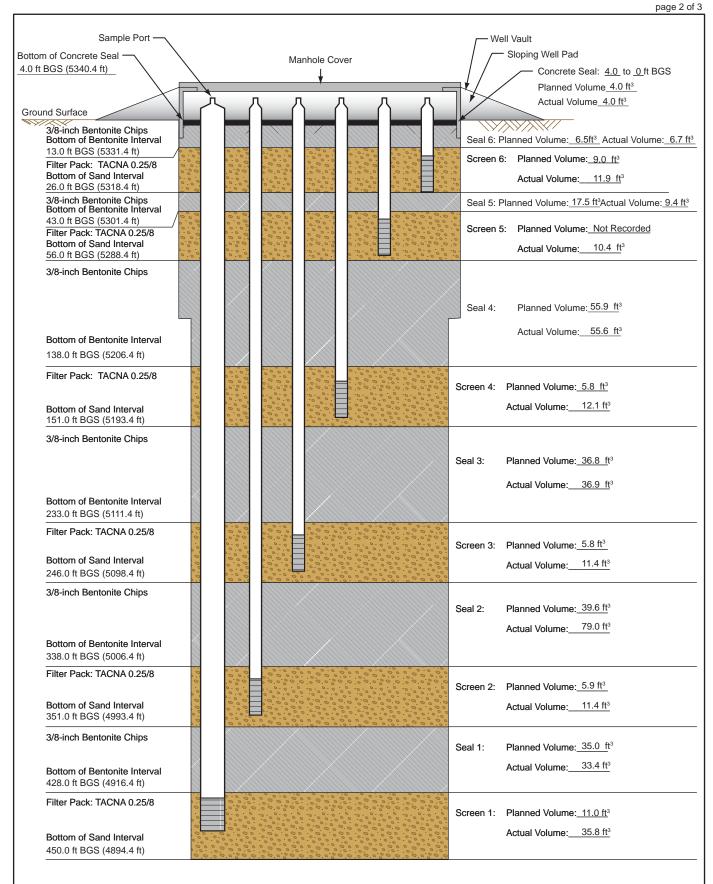
Nested Soil Vapor Well Completion Diagram for KAFB-106131

Installation Start Date/Time: <u>3/6/2011 @ 07:40</u> Installation End Date/Time: <u>3/7/2011 @ 16:00</u>



¹⁴⁰⁷⁰⁵_CA010020_SV_KAFB.106131 (a)

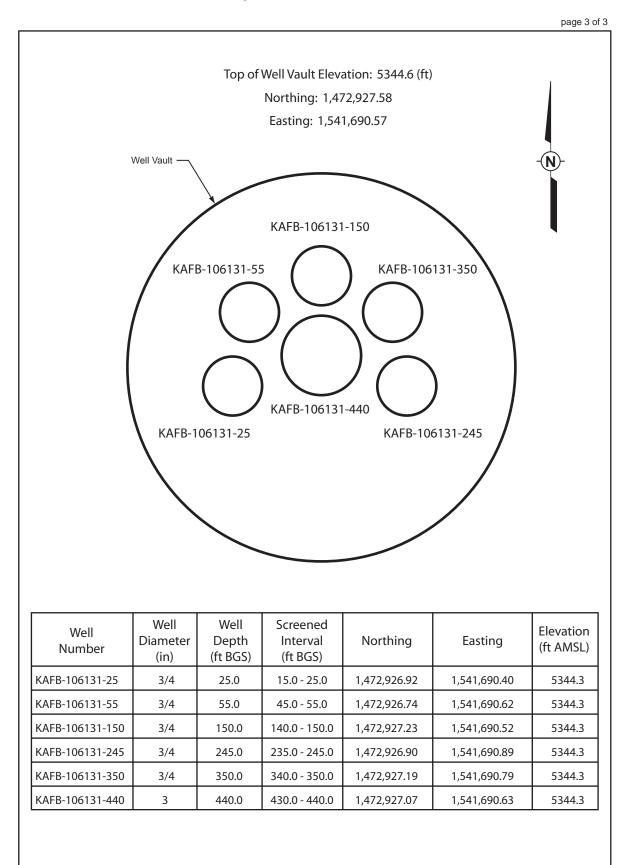
Nested Soil Vapor Well Completion Diagram for KAFB-106131



(elevation) is Above Mean Sea Level All Materials Placed with Tremie Pipe

Not to Scale BGS = Below Ground Surface

Nested Soil Vapor Well Completion Diagram Map View for KAFB-106131



140705_CA010020_SV_Map View_106131

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APPENDIX D-1

KAFB-106132 Final Well Report

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Date Started: 2/6/2011 Date TD Reached: 2/9/2011 Date Completed: 2/17/2011

Ground Elevation AMSL (ft): 5353.0 Y Coordinate: 1473593.29 X Coordinate: 1542804.16

Borehole ID: KAFB-106132

Hole Diameter Upper (in.): 11-3/4 Hole Diameter Lower (in.): 9-5/8 Surface Completion Type: Flush mount

Groundwater Levels BGS (ft): \square At Time of Drilling: N/A \blacksquare At End of Drilling: N/A \blacksquare After Drilling: N/A

Drilling Contractor: WDC Drilling Drilling Method: Air Rotary Casing Hammer Logged By: Greg Peacock

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O Depth (ft)	Sample Type	Number	Headspace PID	Lithologic Log	Material Description	U.S.C.S.	Well Diagram	Remarks
	_				Sandy SILT (ML); light reddish brown (5YR 6/3); dry; stiff; nonplastic; 60% silt; 40% fine sand; subrounded; no odor.		Concrete Seal	Hand augered.
5	-				Same as above (0 ft); brown (5YR 5/3); dry; trace coarse sand.			Began drilling @ 1550 on 2/6/11.
10		SB0342	0.0		Same as above (0 ft); 70% silt; 30% fine sand; trace gravel.		- Bentonite Seal	Drilling delayed @ 10 ft. Sampled for ~20 min. Blow counts (8.5-10'): 17/24.
15	-				SILT (ML); reddish brown (5YR 5/4); damp; stiff; low to nonplastic; 90% silt; 10% fine sand; trace coarse sand; no odor.	ML	- Top of Filter Pack - Top of 3/4" Schedule 80 PVC 0.050 Slot Screen	
20		SB0343	0.0		SILT (ML); reddish brown (5YR 5/4); dry to damp; stiff; low plasticity; 95% silt; 5% fine sand; low dry strength; no odor.			Kelly down @ 1640. Blow counts (18.5-20'): 17/50. New connection @ 1641. Resumed drilling @ 0825 on 02/07/11.
25		SB0344	0.0		Same as above (20 ft); reddish brown (2.5YR 4/4).		- Bottom of Screen	Blow counts (25.5-27'): 17/50.
30		SB0344 SB0344					- Bentonite Seal	Blow counts (27-28.5'): 50/3. Blow counts (28.5-30'): 50/5.



Date Started: 2/6/2011 Date TD Reached: 2/9/2011 Date Completed: 2/17/2011

Ground Elevation AMSL (ft): 5353.0 Y Coordinate: 1473593.29 X Coordinate: 1542804.16

Borehole ID: KAFB-106132

Hole Diameter Upper (in.): 11-3/4 Hole Diameter Lower (in.): 9-5/8 Surface Completion Type: Flush mount

Groundwater Levels BGS (ft): \square At Time of Drilling: N/A \blacksquare At End of Drilling: N/A \blacksquare After Drilling: N/A

Drilling Contractor: WDC Drilling Drilling Method: Air Rotary Casing Hammer Logged By: Greg Peacock

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පි Depth (ft)	Sample Type	Number	Headspace PID	Lithologic Log	Material Description	U.S.C.S.	Well Diagra	am Remarks		
-					SILT (ML); reddish brown (5YR 4/4); dry; stiff; low plasticity; 90% silt; 5% fine sand; 5% coarse sand; low dry strength; no odor.		- Bentoni	Kelly down @ 0833. New connection @ 0930. Resumed drilling @ 0940. te Seal		
35					Same as above (30 ft); 90% silt; 5% gravel; 5% coarse sand.	ML				
40	X	SB0345	0.0				Pack	Filter Kelly down @ 0945. Blow counts (37-38.5'): 12/23.		
<u>+0</u> - - - - 45					Sandy lean CLAY (CL); red (2.5YR 4/6); moist; hard (based on blow counts above); medium plasticity; 70% clay with minor silt; 30% very fine to fine sand; no odor.	CL	- Top of 3 Schedu PVC 0.1 Slot Sch	Resumed drilling @		
-	∇				SILT with Sand (ML); red (2.5YR 4/6); moist; medium stiff to stiff; 80% silt with minor clay; 20% very fine to medium sand; trace coarse sand; subrounded to			Kelly down @ 1015. Blow counts (47-48.5'):		
-	$\left(\right)$	SB0346			subangular; no odor.			18/32. Blow counts (48.5-50'):		
50	$\left(\right)$	SB0346 SB0347			Same as above (45 ft); no odor.		- Bottom Screen	of Blow counts (50-51.5'):		
-	Δ					ML		27/32. New connection @ 1054 Resumed drilling @ 1058.		
55					SILT (ML); red (2.5YR 4/6); moist; medium stiff to stiff; 95% silt with clay; 5% very fine to fine sand; trace medium to coarse sand; subrounded; no odor.		- Bentoni			
60								Kelly down @ 1103.		



Date Started: 2/6/2011 Date TD Reached: 2/9/2011 Date Completed: 2/17/2011

Ground Elevation AMSL (ft): 5353.0 Y Coordinate: 1473593.29 X Coordinate: 1542804.16

Borehole ID: KAFB-106132

Hole Diameter Upper (in.): 11-3/4 Hole Diameter Lower (in.): 9-5/8 Surface Completion Type: Flush mount

Groundwater Levels BGS (ft): \square At Time of Drilling: N/A \blacksquare At End of Drilling: N/A \blacksquare After Drilling: N/A

Drilling Contractor: WDC Drilling Drilling Method: Air Rotary Casing Hammer Logged By: Greg Peacock

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g Depth (ft)	Sample Type	Number	Headspace PID	Lithologic Log	Material Description	U.S.C.S.	Well Diagram	Remarks
					SILT (ML); red (2.5YR 4/6); moist; medium stiff to stiff; 95% silt with clay; 5% very fine to fine sand; trace medium to coarse sand; subrounded to subangular; no odor.			New connection @ 1112. Resumed drilling @ 1113.
65					SILT (ML); red (2.5YR 5/6); dry to moist; medium stiff; 100% silt with trace clay; trace fine sand; no odor.			
70	-				Same as above (65 ft); no odor.	ML		
75	-				SILT (ML); red (2.5YR 5/6); dry to moist; medium stiff; 95% silt with trace clay; 5% fine to coarse sand; angular to subangular; no odor. Note: predominately sharp, dark, lithic fragments.		- Bentonite Seal	Kelly down @ 1118.
80	-				Well graded SAND with Silt (SW-SM); light reddish brown (2.5YR 7/4); dry to moist; loose; 90% fine to coarse sand; subangular to subrounded; 10% silt; no odor.	SW- SM		New connection @ 1140 Resumed drilling @1141
85					SILT (ML); red (2.5YR 4/6); dry to moist; medium stiff to stiff; 85% silt; 15% clay; no odor.			
90								



Date Started: 2/6/2011 Date TD Reached: 2/9/2011 Date Completed: 2/17/2011

Ground Elevation AMSL (ft): 5353.0 Y Coordinate: 1473593.29 X Coordinate: 1542804.16

Borehole ID: KAFB-106132

Hole Diameter Upper (in.): 11-3/4 Hole Diameter Lower (in.): 9-5/8 Surface Completion Type: Flush mount

Groundwater Levels BGS (ft): \square At Time of Drilling: N/A \blacksquare At End of Drilling: N/A \blacksquare After Drilling: N/A

Drilling Contractor: WDC Drilling Drilling Method: Air Rotary Casing Hammer Logged By: Greg Peacock

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6 Depth (ft)	Sample Type	Numt	Headspace PID	Lithologic Log	Material Description	U.S.C.S.	Well Diagram	Remarks
	-				SILT (ML); red (2.5YR 4/6); dry to moist; medium stiff to stiff; 85% silt; 15% clay; no odor.			
95		SB0348	0.0		SILT (ML); red (2.5YR 5/6); dry to moist; medium stiff; 75% silt; 15% clay; 10% fine to coarse sand; subangular to subrounded; no odor.			Kelly down @ 1146. Rate of penetration = 4ft/min. Blow counts (97-98.5'): 28/60.
100	-				Same as above (95 ft); no odor.			New connection @ 1217. Resumed drilling @ 1242.
105	-				SILT with Sand (ML); red (2.5YR 5/6); dry to moist; medium stiff; 75% silt with minor clay; 25% fine sand; trace medium to coarse sand; subangular; no odor.	ML	- Bentonite Seal	
110	-				Same as above (105 ft); 85% silt with minor clay; 15% fine sand; trace medium to coarse sand; subangular; no odor.			
115	-				Sandy SILT (ML); light reddish brown (2.5YR 7/4); dry to moist; soft to medium stiff; 65% silt with trace clay; 35% very fine to coarse sand; subangular to subrounded; no odor.			Kelly down @ 1254.
120								



Date Started: 2/6/2011 Date TD Reached: 2/9/2011 Date Completed: 2/17/2011

Ground Elevation AMSL (ft): 5353.0 Y Coordinate: 1473593.29 X Coordinate: 1542804.16

Borehole ID: KAFB-106132

Hole Diameter Upper (in.): 11-3/4 Hole Diameter Lower (in.): 9-5/8 Surface Completion Type: Flush mount

Groundwater Levels BGS (ft): \square At Time of Drilling: N/A \blacksquare At End of Drilling: N/A \blacksquare After Drilling: N/A

Drilling Contractor: WDC Drilling Drilling Method: Air Rotary Casing Hammer Logged By: Greg Peacock

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5 Depth (ft)	Sample Type	Number	Headspace PID	Lithologic Log	Material Description	U.S.C.S.	Well Diagram	Remarks
-	-				SILT with Sand (ML); red (2.5YR 5/6); dry to moist; medium stiff to stiff; 80% silt with trace clay; 20% very fine to coarse sand; subangular to subrounded; no odor.			New connection @ 1304. Resumed drilling @ 1306. Kelly down @ 1309. TD of 11-3/4" casing at 120' bgs.
<u>125</u> - -	-				Sandy SILT (ML); red (2.5YR 5/6); dry; stiff; non to low plasticity; 65% silt; 25% coarse sand; angular; 10% gravel; subangular to subrounded; no odor.			New connection @ 0820 on 2/8/11. Resumed drilling @ 0827.
130 	-				SILT (ML); brown (7.5YR 5/4); low plasticity; 95% silt; 5% fine sand; no odor.	ML		
- 135 -	-				Same as above (130 ft).		- Bentonite Seal	
- - - - -	-				SILT (ML); brown (7.5YR 4/4); dry; stiff; low plasticity; 90% silt; 10% clay; slight clay nodules; no odor.			Kelly down @ 0835. New connection @ 0850. Resumed drilling @ 0900.
<u>145</u> -	-				Lean CLAY (CL); brown (7.5YR 4/4); dry to damp; very stiff; medium to high plasticity; 100% clay; no odor.			
150		SB0349	0.0					Blow counts (148.5-150'): 30/50.



Date Started: 2/6/2011 Date TD Reached: 2/9/2011 Date Completed: 2/17/2011

Ground Elevation AMSL (ft): 5353.0 Y Coordinate: 1473593.29 X Coordinate: 1542804.16

Borehole ID: KAFB-106132

Hole Diameter Upper (in.): 11-3/4 Hole Diameter Lower (in.): 9-5/8 Surface Completion Type: Flush mount

Groundwater Levels BGS (ft): \square At Time of Drilling: N/A \blacksquare At End of Drilling: N/A \blacksquare After Drilling: N/A

Drilling Contractor: WDC Drilling Drilling Method: Air Rotary Casing Hammer Logged By: Greg Peacock

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10 Depth (ft)	Sample Type	Num	Headspace PID	Lithologic Log	Material Description	U.S.C.S.	W	ell Diagram	Remarks
	-				Lean CLAY (CL); brown (7.5YR 4/4); dry to damp; very stiff; medium to high plasticity; 100% clay; no odor.	CL			Kelly down @ 0912. New connection @ 0931. Resumed drilling @ 0935. Paused drilling to clear cyclone of fines @ 0937.
155	-				SILT (ML); brown (7.5YR 4/4); dry; stiff; low plasticity; 100% silt; trace coarse sand; rounded to subrounded; no odor.			- Bentonite Seal	Resumed drilling @ 1002.
160	-				Same as above (155 ft).				Kelly down @ 1007. New connection @ 1015. Resumed drilling @ 1016.
165					SILT with Sand (ML); brown (7.5YR 4/4); dry; stiff; low plasticity; 75% silt; 25% fine sand; subangular; no odor.	ML		- Top of Filter Pack - Top of 3/4" Schedule 80 PVC 0.050 Slot Screen	Paused drilling @ 1027, drill string stuck. Resumed drilling @ 1121.
170	-				Well graded SAND (SW); light brownish gray (2.5Y 6/2); dry; loose; 60% fine sand; 30% medium sand; 10% coarse sand; subrounded; trace gravel; rounded; no odor.				
175					Same as above (170 ft); 50% fine sand; 30% medium sand; 20% coarse sand.	SW		- Bottom of Screen	
180	-								Kelly down @ 1124.



Date Started: 2/6/2011 Date TD Reached: 2/9/2011 Date Completed: 2/17/2011

Ground Elevation AMSL (ft): 5353.0 Y Coordinate: 1473593.29 X Coordinate: 1542804.16

Borehole ID: KAFB-106132

Hole Diameter Upper (in.): 11-3/4 Hole Diameter Lower (in.): 9-5/8 Surface Completion Type: Flush mount

Groundwater Levels BGS (ft): \square At Time of Drilling: N/A \blacksquare At End of Drilling: N/A \blacksquare After Drilling: N/A

Drilling Contractor: WDC Drilling Drilling Method: Air Rotary Casing Hammer Logged By: Greg Peacock

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08 Depth (ft)	Sample Type	Number	Headspace PID	Lithologic Log	Material Description	U.S.C.S.	Well Diagram	Remarks
185	-				Well graded SAND with Gravel (SW); light olive brown (2.5Y 5/3); dry; loose; 40% fine sand; 20% medium sand; 20% coarse sand; 20% gravel; rounded; no odor. Same as above (180 ft).	SW	- Filter Pack	New connection @ 1137. Resumed drilling @ 1138.
<u>190</u>	-				Poorly graded SAND (SP); dark grayish brown (2.5Y 4/2); dry; loose; 80% fine sand; 20% medium sand; trace coarse sand; rounded; no odor. Same as above (190 ft); trace fines.		- Bentonite Seal	
200		SB0350	0.0		Same as above (190 ft).	SP		Kelly down @ 1145. Blow counts (198.5-200'): 28/50. New connection @ 1207. Resumed drilling @ 1207.
<u>205</u> 210	-				Well graded SAND (SW); dark grayish brown (2.5Y 4/2); dry; dense; 40% fine sand; 30% medium sand; 30% coarse sand; trace gravel; rounded to subrounded; no odor.	sw		



Date Started: 2/6/2011 Date TD Reached: 2/9/2011 Date Completed: 2/17/2011

Ground Elevation AMSL (ft): 5353.0 Y Coordinate: 1473593.29 X Coordinate: 1542804.16

Borehole ID: KAFB-106132

Hole Diameter Upper (in.): 11-3/4 Hole Diameter Lower (in.): 9-5/8 Surface Completion Type: Flush mount

Groundwater Levels BGS (ft): \square At Time of Drilling: N/A \blacksquare At End of Drilling: N/A \blacksquare After Drilling: N/A

Drilling Contractor: WDC Drilling Drilling Method: Air Rotary Casing Hammer Logged By: Greg Peacock

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0 Depth (ft)	Sample Type	Number	Headspace PID	Lithologic Log	Material Description	U.S.C.S.	Well Diagram	Remarks
	-				Poorly graded SAND (SP); grayish brown (2.5Y 5/2); dry; dense; 85% fine sand; 15% medium sand; subrounded; no odor.	SP		
215	-				Well graded SAND (SW); dark grayish brown (2.5Y 4/2); dry; dense; 40% fine sand; 30% medium sand; 30% coarse sand; trace gravel; rounded to subrounded; no odor.	sw		Kelly down @ 1214.
	-			<u></u>	SILT (ML); olive brown (2.5Y 4/4); dry; stiff; nonplastic; 90% silt; 10% fine sand; no odor.		- Bentonite Seal	New connection @ 1227. Resumed drilling @1228.
225	-				SILT with Sand (ML); olive brown (2.5Y 4/4); dry; stiff; nonplastic; 75% silt; 25% fine sand; no odor.	ML		
230	-				Well graded SAND (SW); light olive brown (2.5Y 5/3); dry; dense; 60% fine sand; 20% medium sand; 20% coarse sand; subrounded to subangular; no odor.			
235	-				Well graded SAND with Gravel (SW); light olive brown (2.5Y 5/3); dry; dense; 35% fine sand; 20% medium sand; 20% coarse sand; rounded; 25% gravel; rounded; no odor.	SW	Top of Filter Pack	Kelly down @ 1240.
240								



Date Started: 2/6/2011 Date TD Reached: 2/9/2011 Date Completed: 2/17/2011

Ground Elevation AMSL (ft): 5353.0 Y Coordinate: 1473593.29 X Coordinate: 1542804.16

Borehole ID: KAFB-106132

Hole Diameter Upper (in.): 11-3/4 Hole Diameter Lower (in.): 9-5/8 Surface Completion Type: Flush mount

Groundwater Levels BGS (ft): ☑ At Time of Drilling: N/A ▼ At End of Drilling: N/A ▼ After Drilling: N/A

Drilling Contractor: WDC Drilling Drilling Method: Air Rotary Casing Hammer Logged By: Greg Peacock

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	Coordinate. 1942804.10 Logged By. Greg Featock								
05 Depth (ft)	Sample Type	Number	Headspace PID	Lithologic Log	Material Description	U.S.C.S.	We	ell Diagram	Remarks
-	-				Poorly graded SAND (SP); light olive brown (2.5Y 5/3); dry; dense; 80% fine sand; 15% medium sand; rounded; 5% gravel; rounded; no odor.	SP		Schedule 80 PVC 0.050 Slot Screen	New connection @ 1324. Resumed drilling @ 1325.
245					Well graded SAND (SW); grayish brown (2.5Y 5/2); dry; dense; 55% fine sand; 30% medium sand; 15% coarse sand; subrounded to subangular; trace gravel; no odor.				Kelly down @ 1331. Blow
250 - - -		SB0351	0.1		Same as above (245 ft); 20% fine sand; 40% medium sand; 40% coarse sand; trace gravel; trace clay nodules.	SW		- Bottom of Screen	counts (248.5-250'): 37/50. New connection @ 1353. Resumed drilling @ 1354.
<u>255</u> - -	-				Poorly graded SAND (SP); olive brown (2.5Y 4/3); dry; dense; 70% fine sand; 30% medium sand; angular to subangular; no odor.				Kelly down @ 1357.
<u>260</u> - -	-				Same as above (255 ft); trace gravel.	SP		- Bentonite Seal	New connection @ 1404. Resumed drilling @ 1404.
265	-				Same as above (255 ft); mica flakes to 3mm.				
270									

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Date Started: 2/6/2011 Date TD Reached: 2/9/2011 Date Completed: 2/17/2011

Ground Elevation AMSL (ft): 5353.0 Y Coordinate: 1473593.29 X Coordinate: 1542804.16

Borehole ID: KAFB-106132

Hole Diameter Upper (in.): 11-3/4 Hole Diameter Lower (in.): 9-5/8 Surface Completion Type: Flush mount

Groundwater Levels BGS (ft): \square At Time of Drilling: N/A \blacksquare At End of Drilling: N/A \blacksquare After Drilling: N/A

Drilling Contractor: WDC Drilling Drilling Method: Air Rotary Casing Hammer Logged By: Greg Peacock

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02 Depth (ft)			Headspace PID	Lithologic Log	Material Description	U.S.C.S.	Well Diagram	Remarks
275	_				Silty SAND (SM); olive brown (2.5Y 4/3); dry; dense; 45% fine sand; 15% medium sand; 10% coarse sand; rounded to subrounded; 30% silt and clay nodules; no odor.	SM		
-	-				Poorly graded SAND (SP); light olive brown (2.5Y 5/3); dry; dense; 80% fine sand; 10% medium sand; 10% coarse sand; rounded; no odor.			Kelly down @ 1415.
<u>280</u> - -	-				Same as above (275 ft).	SP		New connection @ 1435. Resumed drilling @ 1436.
<u>285</u> - - -	-				Well graded SAND (SW); olive brown (2.5Y 4/4); dry; dense; 55% fine sand; 30% medium sand; 15% coarse sand; rounded; no odor.	sw	- Bentonite Seal	
<u>290</u> - -	-				Poorly graded SAND (SP); light olive brown (2.5Y 5/4); dry; dense; 70% fine sand; 30% medium sand; trace coarse sand; subrounded to subangular; no odor.			
<u>295</u>	-				Same as above (290 ft).	SP		Kelly down @ 1446.
- 300		SB0352	0.4					Blow counts (298.5-300') 27/50.



Date Started: 2/6/2011 Date TD Reached: 2/9/2011 Date Completed: 2/17/2011

Ground Elevation AMSL (ft): 5353.0 Y Coordinate: 1473593.29 X Coordinate: 1542804.16

Borehole ID: KAFB-106132

Hole Diameter Upper (in.): 11-3/4 Hole Diameter Lower (in.): 9-5/8 Surface Completion Type: Flush mount

Groundwater Levels BGS (ft): \square At Time of Drilling: N/A \blacksquare At End of Drilling: N/A \blacksquare After Drilling: N/A

Drilling Contractor: WDC Drilling Drilling Method: Air Rotary Casing Hammer Logged By: Greg Peacock

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60 Depth (ft)	Sample Type	Number	Headspace PID	Lithologic Log	Material Description	U.S.C.S.	Well Diagram	Remarks		
-	-				Well graded SAND (SW); olive brown (2.5Y 4/4); dry; dense; 35% coarse sand; 35% medium sand; 30% fine sand; trace gravel; trace clay nodules; no odor.	SW		New connection @ 1510. Resumed drilling @ 1514.		
<u>305</u> - - - 310	-				Lean CLAY (CL); olive brown (2.5Y 4/4); dry to moist; stiff; medium to high plasticity; 100% clay; no odor.	CL				
-	-				Well graded SAND (SW); light olive brown (2.5Y 5/3); 65% fine sand; 20% medium sand; 10% coarse sand; subangular; 5% clay nodules; no odor.					
<u>315</u> - -	-				Same as above (310 ft); 65% fine sand; 20% medium sand; 15% coarse sand; subangular; trace gravel; subrounded; no clay nodules.		- Bentonite Seal	Kelly down @ 1531.		
<u>320</u>	-				Same as above (310 ft).	SW		New connection @ 1541. Resumed drilling @ 1542.		
325	-				Well graded SAND (SW); grayish brown (2.5Y 5/2); dry; dense; 65% fine sand; 20% medium sand; 10% coarse sand; subrounded; 5% gravel to 3cm; well rounded; no odor.					
330										



Date Started: 2/6/2011 Date TD Reached: 2/9/2011 Date Completed: 2/17/2011

Ground Elevation AMSL (ft): 5353.0 Y Coordinate: 1473593.29 X Coordinate: 1542804.16

Borehole ID: KAFB-106132

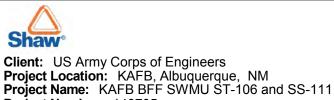
Hole Diameter Upper (in.): 11-3/4 Hole Diameter Lower (in.): 9-5/8 Surface Completion Type: Flush mount

Groundwater Levels BGS (ft): \square At Time of Drilling: N/A \blacksquare At End of Drilling: N/A \blacksquare After Drilling: N/A

Drilling Contractor: WDC Drilling Drilling Method: Air Rotary Casing Hammer Logged By: Greg Peacock

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00 Depth (ft)	Sample Type	Number	Headspace PID	Lithologic Log	Material Description	U.S.C.S.	Well Diagram	Remarks
-					Poorly graded SAND (SP); olive brown (2.5Y 4/3); dry; dense; 100% fine sand; rounded; trace gravel; no odor.	SP	- Bentonite Seal	
335 - - -					Well graded SAND (SW); olive brown (2.5Y 4/3); dry; dense; 50% fine sand; 20% medium sand; 20% coarse sand; 10% gravel; well rounded; no odor.		- Top of Filter Pack	Kelly down @ 1551.
340 - - - 345					Well graded SAND with Gravel (SW); olive brown (2.5Y 4/3); dry; dense; 35% fine sand; 15% medium sand; 15% coarse sand; subrounded; 35% gravel; rounded; no odor.	SW	- Top of 3/4" Schedule 80 PVC 0.050 Slot Screen	New connection @ 1600. Resumed drilling @ 1601.
-					Poorly graded GRAVEL with Sand (GP); olive brown (2.5Y 4/3); dry; dense; 70% gravel to 2cm; rounded; 30% fine to coarse sand; rounded; no odor.	GP		Kelly down @ 1606. Blow
<u>350</u> - - -		SB0353	0.0		Well graded SAND with Gravel (SW); olive brown (2.5Y 4/3); dry; dense; 40% fine sand; 30% medium sand; 15% coarse sand; subrounded; 15% gravel; no odor.	sw	- Bottom of Screen	count (348.5-350'): 7/28. New connection @ 1634. Resumed drilling @ 1635.
<u>355</u> - -					Poorly graded SAND (SP); olive brown (2.5Y 4/3); dry; dense; 100% fine sand; rounded; no odor.	SP	- Bentonite Seal	
360								



Project Number: 140705

Date TD Reached: 2/9/2011 Date Completed: 2/17/2011

Y Coordinate: 1473593.29

X Coordinate: 1542804.16

Ground Elevation AMSL (ft): 5353.0

Date Started: 2/6/2011

Borehole ID: KAFB-106132

Hole Diameter Upper (in.): 11-3/4 Hole Diameter Lower (in.): 9-5/8 Surface Completion Type: Flush mount

Groundwater Levels BGS (ft): \square At Time of Drilling: N/A \blacksquare At End of Drilling: N/A \blacksquare After Drilling: N/A

Drilling Contractor: WDC Drilling Drilling Method: Air Rotary Casing Hammer Logged By: Greg Peacock

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g Depth (ft)	Sample Type	Number	Headspace PID	Lithologic Log	Material Description	U.S.C.S.	Well Diagram	Remarks
-	-				Poorly graded SAND (SP); olive brown (2.5Y 4/3); dry; dense; 100% fine sand; rounded; no odor.			Kelly down @ 1641. New connection @ 1650. Resumed drilling @ 0750 on 2/9/11.
365	-				Same as above (360 ft); 70% fine sand; 30% medium sand; rounded.			
370	-				Same as above (360 ft).	SP	-Bentonite Seal	
375	-				Same as above (360 ft).			
								Kelly down @ 0805.
380					Well graded SAND (SW); olive brown (2.5Y 4/3); dry; dense; 55% fine sand; 25% medium sand; 20% coarse sand; rounded; trace gravel; rounded; trace fines; no odor.			New connection @ 0817. Resumed drilling @ 0818.
385					Well graded SAND with Gravel (SW); olive brown (2.5Y 4/3); dry; dense; 30% fine sand; 30% medium sand; 20% coarse sand; rounded; 20% gravel; rounded; no odor.	sw	- Native Backfill	



Date Started: 2/6/2011 Date TD Reached: 2/9/2011 Date Completed: 2/17/2011

Ground Elevation AMSL (ft): 5353.0 Y Coordinate: 1473593.29 X Coordinate: 1542804.16

Borehole ID: KAFB-106132

Hole Diameter Upper (in.): 11-3/4 Hole Diameter Lower (in.): 9-5/8 Surface Completion Type: Flush mount

Groundwater Levels BGS (ft): \Box At Time of Drilling: N/A \blacksquare At End of Drilling: N/A \blacksquare After Drilling: N/A

Drilling Contractor: WDC Drilling Drilling Method: Air Rotary Casing Hammer Logged By: Greg Peacock

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XC	Coc	ordinate	e: 1	54280	04.16 Logged	ged By: Greg Peacock			Page 14 of 16	
66 Depth (ft)	Sample Type	Number	Headspace PID	Lithologic Log	Material Description	U.S.C.S.	W	ell Diagram	Remarks	
-	-				Well graded SAND (SW); olive brown (2.5Y 4/3); dry; dense; 60% fine sand; 30% medium sand; 10% coarse sand; subrounded; no odor.					
395	-				Same as above (390 ft); 30% fine sand; 35% medium sand; 35% coarse sand.			- Native Backfill		
400 - -		SB0354	0.1		Same as above (390 ft); 30% fine sand; 30% medium sand; 30% coarse sand; rounded; 10% gravel to 1.5cm; rounded.				Kelly down @ 0834. Blo counts (398.5-400'): 12/28. New connection @ 100 Resumed drilling @ 1009.	
- 405 - -	-				Well graded SAND with Gravel (SW); olive brown (2.5Y 4/3); dry; dense; 55% fine sand; 20% medium sand; 10% coarse sand; rounded; 15% gravel; rounded; no odor.	sw				
<u>410</u> -	-				Same as above (405 ft); 50% fine sand; 15% coarse sand.			-Bentonite Seal		
415	-				Same as above (405 ft); 35% fine sand; 20% medium sand; 20% coarse sand; 25% gravel.					
420									Kelly down @ 1022.	



Date Started: 2/6/2011 Date TD Reached: 2/9/2011 Date Completed: 2/17/2011

Ground Elevation AMSL (ft): 5353.0 Y Coordinate: 1473593.29 X Coordinate: 1542804.16

Borehole ID: KAFB-106132

Hole Diameter Upper (in.): 11-3/4 Hole Diameter Lower (in.): 9-5/8 Surface Completion Type: Flush mount

Groundwater Levels BGS (ft): \square At Time of Drilling: N/A \blacksquare At End of Drilling: N/A \blacksquare After Drilling: N/A

Drilling Contractor: WDC Drilling Drilling Method: Air Rotary Casing Hammer Logged By: Greg Peacock

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	500	numate	J. IN	J4200	14.10 Logged	By. Greg Feacock			_
5 Depth (ft)	Sample Type	Number	Headspace PID	Lithologic Log	Material Description	U.S.C.S.	We	ell Diagram	Remarks
-	-				Poorly graded SAND (SP); light yellowish brown (2.5Y 6/4); dry; dense; 100% fine sand; rounded; trace fines; no odor.				New connection @ 1029. Resumed drilling @ 1030.
425 -	-				Same as above (420 ft); 85% fine sand; 10% medium sand; rounded; 5% gravel; rounded; clay nodules to 1cm.			- Bentonite Seal	
430	-				Same as above (420 ft); 95% fine sand; 5% fines; trace mica flakes to 2mm.	SP			
<u>435</u>	-				Same as above (420 ft); trace gravel.			-Top of Filter Pack	
-	-								Kelly down @ 1105.
440	-				Well graded SAND (SW); light olive brown (2.5Y 5/3); dry; dense; 50% fine sand; 25% medium sand; 25% coarse sand; rounded to subrounded; trace clay nodules; no odor.	sw		- Top of 3" Schedule 80 PVC 0.050 Slot Screen	New connection @ 1200. Resumed drilling @ 1204.
445	-				Poorly graded SAND (SP); olive brown (2.5Y 4/3); dry; dense; 75% fine sand; 25% medium sand; rounded; no odor.	SP			Kelly down @ 1215.
450		SB0355	2.0						Blow counts (448.5-450'): 7/50.



Borehole ID: KAFB-106132

Client: US Army Corps of Engineers Project Location: KAFB, Albuquerque, NM Project Name: KAFB BFF SWMU ST-106 and SS-111 Project Number: 140705

Date Started: 2/6/2011 Date TD Reached: 2/9/2011 Date Completed: 2/17/2011

Ground Elevation AMSL (ft): 5353.0 Y Coordinate: 1473593.29 X Coordinate: 1542804.16 Hole Diameter Upper (in.): 11-3/4 Hole Diameter Lower (in.): 9-5/8 Surface Completion Type: Flush mount

Groundwater Levels BGS (ft): \square At Time of Drilling: N/A \blacksquare At End of Drilling: N/A \blacksquare After Drilling: N/A

Drilling Contractor: WDC Drilling Drilling Method: Air Rotary Casing Hammer Logged By: Greg Peacock

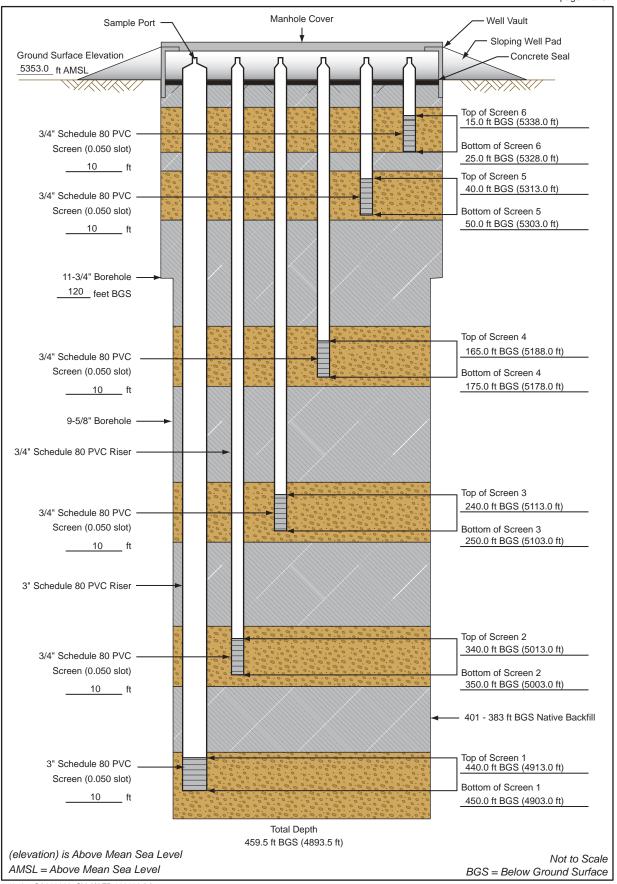
Page 16 of 16

			e: I:	54280	Greg Peacock	Fage 10 01 10		
(ft) 50 Depth (ft)	Sample Type	Number	Headspace PID	Lithologic Log	Material Description	U.S.C.S.	Well Diagram	Remarks
455					Poorly graded SAND (SP); olive brown (2.5Y 4/3); dry; dense; 75% fine sand; 25% medium sand; rounded; no odor.	SP	Bottom of Screen	
460	-			<u></u>		-		Total Depth = 459.5 ft. Reached @ 1545 on 2/9/11. Water added during drilling (gallons) = 0
465	-							Water added during construction (gallons) = Not Recorded Kelly down: TD the joint
470	-							and ready to make new connection.
475	-							
480								

Nested Soil Vapor Well Completion Diagram for KAFB-106132

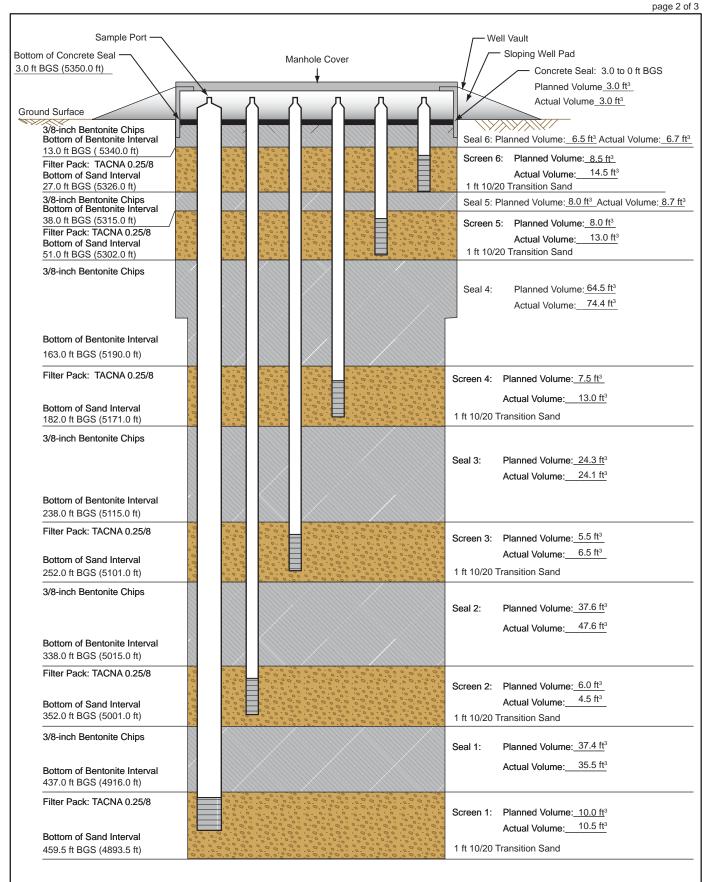
Installation Start Date/Time: 2/10/2011 @ 07:40 Installation End Date/Time: 2/17/2011 @ 08:25

page 1 of 3



140705_CA010020_SV_KAFB.106132 (a)

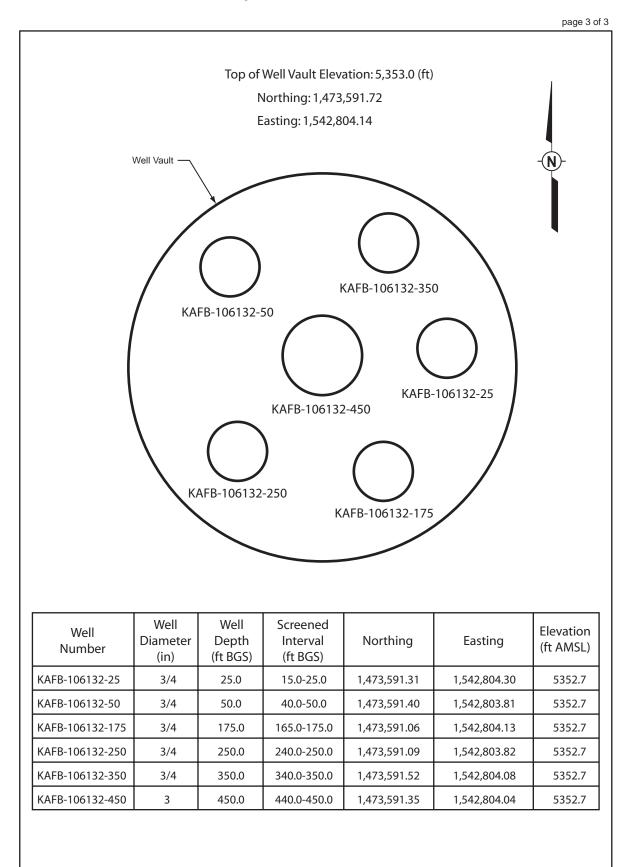
Nested Soil Vapor Well Completion Diagram for KAFB-106132



(elevation) is Above Mean Sea Level All Materials Placed with Tremie Pipe Not to Scale BGS = Below Ground Surface

140705_CA010020_SV_KAFB.106132 (b)

Nested Soil Vapor Well Completion Diagram Map View for KAFB-106132



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APPENDIX D-1

KAFB-106133 Final Well Report

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Date Started: 2/7/2011 Date TD Reached: 2/10/2011 Date Completed: 2/16/2011

Ground Elevation AMSL (ft): 5352.0 Y Coordinate: 1473504.01 X Coordinate: 1542416.28

Borehole ID: KAFB-106133

Hole Diameter Upper (in.): 11-3/4 Hole Diameter Lower (in.): 9-5/8 Surface Completion Type: Flush mount

Groundwater Levels BGS (ft): \square At Time of Drilling: N/A \blacksquare At End of Drilling: N/A \blacksquare After Drilling: N/A

Drilling Contractor: WDC Drilling Drilling Method: Air Rotary Casing Hammer Logged By: Jason Tarbert

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Oepth (ft)	Sample Type	Number	Headspace PID	Lithologic Log	Material Description	U.S.C.S.	Well Diagram	Remarks
-	-				Sandy SILT (ML); brown (7.5YR 4/4); dry; very soft; nonplastic; 50% silt; 40% medium sand; 10% fine gravel to 5mm.		- Concrete Seal	Hand augered. Began drilling @ 1021 on 2/7/11. Sediments stuck
5	-				Same as above (0 ft); light brown (7.5YR 6/3).	ML		in hose. Resumed drilling @ 1030. Sand line spool jumped @ 1050, needs repair. Resumed operations @ 1310.
10		SB0356	0.4				-Bentonite Seal	Resumed drilling @ 1330. Kelly down @
-	X	SB0356			Silty SAND (SM); brown (7.5YR 4/3); dry; very dense; 60% fine sand; 15% coarse sand to 3mm; subrounded; 25% silt.	SM	nnnnnnn - Top of Filter	1335. Blow counts (8.5-10'): Not Recorded. Blow counts (10-11.5'): 32/50.
15							Pack	
-	-				Sandy SILT (ML); brown (7.5YR 5/4); moist; hard; 55% silt; 40% very fine sand; 5% gravel to 1.5cm; trace clay nodules.		Schedule 80 PVC 0.050 Slot Screen	
20	X	SB0357	0.1					Blow counts (18.5-20'): 27/50.
-	X	SB0357			Same as above (15 ft); hard.			Blow counts (20-21.5'): 27/50.
25	-				Sandy SILT (ML); reddish brown (5YR 4/4); moist; hard; 60% silt; 10% clay	ML	- Bottom of Screen	10' drill string won't fit through hammer @ 1357, need new one. Resumed drilling @ 1414.
30		SB0358	0.6		nodules; 30% fine sand; trace fine gravel to 1cm.		- Bentonite Seal	Blow counts (28-29.5'): 25/50. Blow counts (29.5-31'): Not Recorded.



Date Started: 2/7/2011 Date TD Reached: 2/10/2011 Date Completed: 2/16/2011

Ground Elevation AMSL (ft): 5352.0 Y Coordinate: 1473504.01 X Coordinate: 1542416.28

Borehole ID: KAFB-106133

Hole Diameter Upper (in.): 11-3/4 Hole Diameter Lower (in.): 9-5/8 Surface Completion Type: Flush mount

Groundwater Levels BGS (ft): \square At Time of Drilling: N/A \blacksquare At End of Drilling: N/A \blacksquare After Drilling: N/A

Drilling Contractor: WDC Drilling Drilling Method: Air Rotary Casing Hammer Logged By: Jason Tarbert

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සි Depth (ft)	Sample Type Number	Headspace PID	Lithologic Loa	Material Description	U.S.C.S.	We	ell Diagram	Remarks
-	SB0358		-	SILT with Sand (ML); reddish brown (5YR 5/4); dry; hard; low plasticity; 60% silt; 20% clay; 15% very fine sand; 5% fine gravel to 1.2 cm.	ML		- Bentonite Seal	Blow counts (31-32.5'): Not Recorded.
<u>35</u> - -				Lean Clay (CL); brown (7.5YR 4/4); moist; hard; medium plasticity; 60% clay; 40% silt.	CL		- Top of Filter	
40	SB0359	0.0		SILT (ML); brown (7.5YR 4/4); moist; hard; 70% silt; 20% clay; 10% very fine sand to 0.08mm.			Pack - Top of 3/4" Schedule 80 PVC 0.050 Slot Screen	Blow counts (38.5-40'): 27/50.
<u>45</u> -	SB0360	, 0.0	-	SILT with Sand (ML); brown (7.5YR 4/4); moist; hard; 60% silt; 20% clay; 10% very fine sand; 10% fine gravel to 1cm.	ML			Blow counts (47-48.5'): 30/36.
50	MS SB0360- MSD	0.0		Same as above (45 ft).			- Bottom of Screen	Blow counts (48.5-50'): 22/40. String too large diameter @ 1545. Kelly down @ 1557.
55				Sandy SILT with Gravel (ML); brown (7.5YR 4/4); moist; soft; low plasticity; 60% silt with trace clay; 25% fine to coarse sand; 15% fine gravel to 1.2cm.				
-				Lean CLAY (CL); brown (7.5YR 4/4); moist; soft; medium plasticity; 60% clay; 30% silt; 10% fine to very coarse sand to 4mm.	CL		- Bentonite Seal	
60								



Date Started: 2/7/2011 Date TD Reached: 2/10/2011 Date Completed: 2/16/2011

Ground Elevation AMSL (ft): 5352.0 Y Coordinate: 1473504.01 X Coordinate: 1542416.28

Borehole ID: KAFB-106133

Hole Diameter Upper (in.): 11-3/4 Hole Diameter Lower (in.): 9-5/8 Surface Completion Type: Flush mount

Groundwater Levels BGS (ft): \square At Time of Drilling: N/A \blacksquare At End of Drilling: N/A \blacksquare After Drilling: N/A

Drilling Contractor: WDC Drilling Drilling Method: Air Rotary Casing Hammer Logged By: Jason Tarbert

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				<u>)424</u>	10.20 LOgged	Dy. J		•
8 Depth (ft)	Sample Type	Number	Headspace PID	Lithologic Log	Material Description	U.S.C.S.	Well Diagram	Remarks
	-				Lean CLAY with Sand (CL); brown (7.5YR 4/4); moist; soft; medium plasticity; 50% clay; 30% silt; 20% fine to very coarse sand.	CL		
65	-				Sandy SILT (ML); brown (7.5YR 4/3); dry; soft; low plasticity; 60% silt; 40% fine to coarse sand to 4mm.			
70	-				Same as above (65 ft); trace fine gravel to 1cm.	ML		
75	-				SILT with SAND (ML); brown (7.5YR 5/4); dry; soft; low plasticity; 80% silt; 20% very fine sand; trace fine gravel to		- Bentonite Seal	
80	-				Poorly graded SAND (SP); brown (7.5YR 5/4); dry; very loose; 100% very fine sand to 0.1mm; rounded.	SP		
	-				Silty SAND (SM); brown (7.5YR 5/4); dry; very loose; 60% fine to coarse sand to 4mm; rounded; 40% silt.	SM		
85	-				SILT with Sand (ML); brown (7.5YR 5/4); dry; firm; 80% silt; 5% clay; 15% very fine sand to 0.08mm.			
90	-							



Project Number: 140705

Date TD Reached: 2/10/2011 Date Completed: 2/16/2011

Y Coordinate: 1473504.01

Ground Elevation AMSL (ft): 5352.0

Date Started: 2/7/2011

Project Name: KAFB BFF SWMU ST-106 and SS-111

Borehole ID: KAFB-106133

Hole Diameter Upper (in.): 11-3/4 Hole Diameter Lower (in.): 9-5/8 Surface Completion Type: Flush mount

Groundwater Levels BGS (ft): ▼ After Drilling: N/A

Drilling Contractor: WDC Drilling Drilling Method: Air Rotary Casing Hammer Logged By: Jason Tarbert

		ordinate				Logged By: Jason Tarbert Page 4 of 1		
ଓ Depth (ft)	Sample Type	Number	Headspace PID	Lithologic Log	Material Description	U.S.C.S.	Well Diagram	Remarks
-	-				SILT with Sand (ML); brown (7.5YR 5/4); dry; firm; 80% silt; 5% clay; 15% very fine sand to 0.08mm.			
95	-				Same as above (90 ft).			Kelly down @ 1645.
- 100 - -		SB0361 SB0361	0.0	-	Same as above (90 ft); hard.	ML		Blow counts (98.5-100'): 50/50. End of 2/7/11. Began sampling at 100' @ 0837 on 2/8/11. Blow counts (100-101.5'): 50/50.
<u>105</u>	-				Lean CLAY (CL), brown (7.5YR 5/4); moist; hard; medium plasticity; 70% clay; 30% silt; trace gravel to 7mm.	CL	- Bentonite Seal	New connection @ 0844. Resumed drilling @ 0846. Cuttings stuck in cyclone hose. Unstuck @ 0851.
110	-				Poorly graded SAND (SP); dark yellowish brown (10YR 4/4); moist; very loose; 100% fine sand; trace coarse sand to 2mm; subrounded.	SP		
-	-				Lean CLAY (CL); brown (10YR 4/3); moist; hard; medium plasticity; 70% clay; 30% silt.	CL		
<u>115</u>					Poorly graded SAND (SP); dark yellowish brown (10YR 4/4); dry; very loose; 60% coarse sand to 2mm; subangular; 40% medium sand.	SP		
120								Kelly down @ 0907



Date Started: 2/7/2011 Date TD Reached: 2/10/2011 Date Completed: 2/16/2011

Ground Elevation AMSL (ft): 5352.0 Y Coordinate: 1473504.01 X Coordinate: 1542416.28

Borehole ID: KAFB-106133

Hole Diameter Upper (in.): 11-3/4 Hole Diameter Lower (in.): 9-5/8 Surface Completion Type: Flush mount

Groundwater Levels BGS (ft): \square At Time of Drilling: N/A \blacksquare At End of Drilling: N/A \blacksquare After Drilling: N/A

Drilling Contractor: WDC Drilling Drilling Method: Air Rotary Casing Hammer Logged By: Jason Tarbert

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05 Depth (ft)	Sample Type	Number	Headspace PID	Lithologic Log	Material Description	U.S.C.S.	Well Diagram	Remarks
	-				Sandy SILT (ML); brown (7.5YR 4/4); moist; very soft; low plasticity; 70% silt; trace clay nodules; 30% fine sand to 0.5mm.			TD with 11 3/4" casing @ 0907.
<u>125</u>	-				SILT (ML); brown (7.5YR 5/4); moist; soft; medium plasticity; 60% silt; 40% clay.	ML		New connection @ 1619 Resumed drilling @ 1620.
<u>130</u>	-				Sandy SILT (ML); brown (10YR 5/3); moist; very soft; low plasticity; 70% silt; 30% very fine to medium sand to 1mm.			
135	-				Lean CLAY (CL); yellowish brown (10YR 5/4); moist; firm; medium plasticity; 60% clay; 30% silt; 10% very fine sand to 0.08mm.	CL	- Bentonite Seal	
<u>140</u>	-				SILT (ML); yellowish brown (10YR 5/4); moist; firm; low plasticity; 70% silt; 20% clay; 10% fine sand to 0.5mm.			Kelly down @ 1629. New 10' connection @ 1639. Resumed drilling @ 1640. Kelly down @ 1650. End of 2/8/11.
<u>145</u>	-				Lean CLAY (CL); yellowish brown (10YR 5/4); moist; firm; low plasticity; 60% clay; 40% silt; trace fine sand to 0.2mm.	CL		Began sampling @ 0802 on 2/9/11. Sampler line too slow, poor recovery.
150		SB0362	0.0					Blow counts (148.5-150') 50/50. Blow counts

Sh	aw

Date Started: 2/7/2011 Date TD Reached: 2/10/2011 Date Completed: 2/16/2011

Ground Elevation AMSL (ft): 5352.0 Y Coordinate: 1473504.01 X Coordinate: 1542416.28

Borehole ID: KAFB-106133

Hole Diameter Upper (in.): 11-3/4 Hole Diameter Lower (in.): 9-5/8 Surface Completion Type: Flush mount

Groundwater Levels BGS (ft): \Box At Time of Drilling: N/A \blacksquare At End of Drilling: N/A \blacksquare After Drilling: N/A

Drilling Contractor: WDC Drilling Drilling Method: Air Rotary Casing Hammer Logged By: Jason Tarbert

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X	200	ordinate	e: 1	54241	I6.28 Logged	ву:	Jason I	arbert	Page 6 01 16
05 Depth (ft)	Sample Type	Number	Headspace PID	Lithologic Log	Material Description	U.S.C.S.	w	/ell Diagram	Remarks
155	-	SB0362			Lean CLAY (CL); yellowish brown (10YR 5/4); moist; hard; low plasticity; 60% clay; 40% silt; trace fine sand to 0.2mm.	CL		- Bentonite Seal	(150-151.5'): 50/50. New 10' connection @ 0825. Resumed drilling @ 0826.
					SILT with Sand (ML); brown (7.5YR 5/4); moist; soft; nonplastic; 80% silt; 5% clay; 15% very fine sand to 0.08mm.			- Top of Filter Pack	Cuttings stuck in cyclone @ 0834. Cuttings unstuck @ 0843. Resumed drilling.
<u>160</u>	-				SILT (ML); brown (7.5YR 5/4); moist; firm; low plasticity; 80% silt; 20% clay.	ML		- Top of 3/4" Schedule 80 PVC 0.050 Slot Screen	Kelly down @ 0855. New 20' connection @ 0905. Resumed drilling @ 0906.
165	-				Same as above (160ft); trace fine sand to 0.5mm.				Hose plugged @ 0915. Resumed drilling @ 1047.
170	-				Poorly graded SAND (SP); yellowish brown (10YR 5/4); moist; very loose; 80% fine sand; 20% medium sand to 1mm; subangular.	SP			
	-				Well graded SAND with Silt (SW-SM); dark yellowish brown (10YR 4/4); moist, very loose; 90% fine to coarse sand to 4mm; rounded; 10% silt.	SW- SM		Screen	
175					Well graded SAND (SW); dark yellowish brown (10YR 4/4); moist; very loose; 100% very fine to coarse sand to 5mm; rounded.	sw	-	- Bentonite Seal	
180									



Date Started: 2/7/2011 Date TD Reached: 2/10/2011 Date Completed: 2/16/2011

Ground Elevation AMSL (ft): 5352.0 Y Coordinate: 1473504.01 X Coordinate: 1542416.28

Borehole ID: KAFB-106133

Hole Diameter Upper (in.): 11-3/4 Hole Diameter Lower (in.): 9-5/8 Surface Completion Type: Flush mount

Groundwater Levels BGS (ft): \square At Time of Drilling: N/A \blacksquare At End of Drilling: N/A \blacksquare After Drilling: N/A

Drilling Contractor: WDC Drilling Drilling Method: Air Rotary Casing Hammer Logged By: Jason Tarbert

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					10.20 209900	-)		
08 Depth (ft)	Sample Type	Number	Headspace PID	Lithologic Log	Material Description	U.S.C.S.	Well Diagram	Remarks
-	-				Well graded SAND (SW); dark yellowish brown (10YR 4/4); moist; very loose; 100% very fine to coarse sand to 5mm; rounded; trace fine gravel to 1cm.			Kelly down @ 1100. Resumed drilling @ 1109.
<u>185</u>	-				Same as above (180 ft); trace fine gravel to 1.8cm.	SW		
- 190 -	-				Same as above (180 ft).			
- <u>195</u> -					Poorly graded SAND (SP); brown (10YR 5/3); moist; very loose; 100% fine sand; trace fine gravel to 1cm; trace fines.		- Bentonite Seal	
- 200 - -		SB0363	0.0		Same as above (195 ft); very dense; 100% medium sand.	SP		Kelly down @ 1118. Blo counts (198.5-200'): 27/50. Resumed drilling @ 1145.
205 - -					Well graded SAND (SW); dark yellowish brown (10YR 4/4); moist; very dense; 100% fine to very coarse sand; trace fine gravel to 1cm; subrounded; trace clay nodules.	sw		
210								



Date Started: 2/7/2011 Date TD Reached: 2/10/2011 Date Completed: 2/16/2011

Ground Elevation AMSL (ft): 5352.0 Y Coordinate: 1473504.01 X Coordinate: 1542416.28

Borehole ID: KAFB-106133

Hole Diameter Upper (in.): 11-3/4 Hole Diameter Lower (in.): 9-5/8 Surface Completion Type: Flush mount

Groundwater Levels BGS (ft): \square At Time of Drilling: N/A \blacksquare At End of Drilling: N/A \blacksquare After Drilling: N/A

Drilling Contractor: WDC Drilling Drilling Method: Air Rotary Casing Hammer Logged By: Jason Tarbert

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0 Depth (ft)	Sample Type	Number	Headspace PID	Lithologic Log	Material Description	U.S.C.S.	Well Diagram	Remarks
-	-				Poorly graded SAND (SP); brown (10YR 4/3); moist; very loose; 95% medium sand; 5% coarse sand to 4mm; rounded.			
- 215 - - -	-				Same as above (210 ft); 100% fine sand to 0.2mm.	SP		
- 220 - - -	-				Well graded SAND with Silt (SW-SM); brown (10YR 5/3); moist; loose; 80% fine to very coarse sand; 10% fine gravel to 1.5cm; rounded; 10% silt with clay nodules.	SW- SM		Kelly down @ 1154. New connection @ 1205. Resumed drilling @ 1205.
225	-				Same as above (220 ft).		- Bentonite Seal	
-				·•	GRAVEL (GP); lense; gravel to 1.5 cm. Lean CLAY (CL); lense.	_GP		
- 230	-				Well graded SAND with Silt (SW-SM); brown (10YR 5/3); moist; loose; 90% fine to very coarse sand; trace gravel to 1.9cm; rounded; 10% silt with clay.	CL SW-		
- - 235	-					SM		
-	-				Well graded SAND (SW); brown (10YR 5/3); moist; very loose; 100% very fine to coarse sand; trace fine gravel to 1.7cm; subrounded.	sw	Top of Filter Pack	
240								



Date Started: 2/7/2011 Date TD Reached: 2/10/2011 Date Completed: 2/16/2011

Ground Elevation AMSL (ft): 5352.0 Y Coordinate: 1473504.01 X Coordinate: 1542416.28

Borehole ID: KAFB-106133

Hole Diameter Upper (in.): 11-3/4 Hole Diameter Lower (in.): 9-5/8 Surface Completion Type: Flush mount

Groundwater Levels BGS (ft): \square At Time of Drilling: N/A \blacksquare At End of Drilling: N/A \blacksquare After Drilling: N/A

Drilling Contractor: WDC Drilling Drilling Method: Air Rotary Casing Hammer Logged By: Jason Tarbert

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05 Depth (ft)	Sample Type	Number	Headspace PID	Lithologic Log	Material Description	U.S.C.S.	W	ell Diagram	Remarks
	_				Well graded SAND (SW); brown (10YR 5/3); moist; very loose; 100% very fine to coarse sand; trace fine gravel to 1.7cm; subrounded.			Schedule 80 PVC 0.050 Slot Screen	Kelly down @ 1214. New 10' connection @ 1221. Resumed drilling @ 1223.
245	_				Same as above (240 ft).				
250		SB0364 SB0364	0.0		Same as above (240 ft); damp; very dense; 10% fine gravel to 3cm.	SW		- Bottom of Screen	Kelly down @ 1228. Blow counts (248.5-250'): 47/50. Blow counts (250-251.5'): 50. Resumed drilling @ 1308.
255	-				Same as above (240 ft); damp; very dense; 10% fine gravel to 3cm.				
260	-				Same as above (240 ft); damp; very dense; 10% fine gravel to 3cm. Lean CLAY (CL); light brown (7.5YR		_	- Bentonite Seal	Kelly down @ 1310. New 20' connection @ 1318. Resumed drilling @ 1318.
<u>265</u>	-				6/3); moist; firm; low plasticity; 60% clay; 40% silt. Same as above (262 ft); brown (10YR 5/3).	CL			
270	-								



Date Started: 2/7/2011 Date TD Reached: 2/10/2011 Date Completed: 2/16/2011

Ground Elevation AMSL (ft): 5352.0 Y Coordinate: 1473504.01 X Coordinate: 1542416.28

Borehole ID: KAFB-106133

Hole Diameter Upper (in.): 11-3/4 Hole Diameter Lower (in.): 9-5/8 Surface Completion Type: Flush mount

Groundwater Levels BGS (ft): \square At Time of Drilling: N/A \blacksquare At End of Drilling: N/A \blacksquare After Drilling: N/A

Drilling Contractor: WDC Drilling Drilling Method: Air Rotary Casing Hammer Logged By: Jason Tarbert

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02 Depth (ft)	Sample Type	Number	Headspace PID	Lithologic Log	Material Description	U.S.C.S.	Well Diagram	Remarks
-					Lean CLAY (CL); light brown (7.5YR 6/3); moist; firm; low plasticity; 60% clay; 40% silt.	CL		
275 - - -					Poorly graded SAND (SP); yellowish brown (10YR 5/4); moist; very loose; 100% fine to medium sand to 0.5mm; subrounded; trace fines.			
2 <u>80</u> - - -					Same as above (275 ft); slightly finer.	SP		Kelly down @ 1329. Resumed drilling @ 1338.
2 <u>85</u> - - -					Well graded SAND (SW); brown (10YR 5/3); moist; very loose; 100% very fine to coarse sand to 4.8mm; rounded.	sw	- Bentonite Seal	
2 <u>90</u>					Same as above (285 ft).			
- 295 -					SILT (ML); brown (7.5YR 4/3); moist; hard; low plasticity; 70% silt; 20% clay; 10% very fine sand to 0.08mm. Same as above (292 ft); 60% silt; 30% clay; 10% very fine sand.	ML		
300		SB0365	0.0					Kelly down @ 1346. Blo counts (298-299.5'): 12/24.



Borehole ID: KAFB-106133

Client: US Army Corps of Engineers Project Location: KAFB, Albuquerque, NM Project Name: KAFB BFF SWMU ST-106 and SS-111 Project Number: 140705

Date Started: 2/7/2011 Date TD Reached: 2/10/2011 Date Completed: 2/16/2011

Ground Elevation AMSL (ft): 5352.0 Y Coordinate: 1473504.01 X Coordinate: 1542416.28 Hole Diameter Upper (in.): 11-3/4 Hole Diameter Lower (in.): 9-5/8 Surface Completion Type: Flush mount

Groundwater Levels BGS (ft): \square At Time of Drilling: N/A \blacksquare At End of Drilling: N/A \blacksquare After Drilling: N/A

Drilling Contractor: WDC Drilling Drilling Method: Air Rotary Casing Hammer Logged By: Jason Tarbert

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60 Depth (ft)	Sample Type	Number	Headspace PID	Lithologic Log	Material Description	U.S.C.S.	Well Diagram	Remarks
-		SB0365			Silty SAND (SM); brown (7.5YR 5/3); moist; dense; 85% fine to medium sand to 0.5mm; subrounded; 15% silt.	SM		Blow counts (299.5-301'): Not Recorded. Resumed drilling.
305	-				Same as above (300 ft).			
310	-				Well graded SAND (SW); brown (10YR 4/3); moist; loose; 95% very fine to very coarse sand; 5% fine gravel to 7mm; subangular. Same as above (307 ft); no gravel.			
315 					Well graded SAND with Gravel (SW); dark yellowish brown (10YR 4/4); moist; very loose; 85% fine to very coarse sand; 15% fine gravel to 3.5cm; well rounded.	sw	- Bentonite Seal	
<u>320</u>	-				Same as above (315 ft); 80% fine to very coarse sand; 20% fine gravel to 1.3cm.			Kelly down @ 1430. Resumed drilling @ 1438.
325	-				Well graded SAND (SW); dark yellowish brown (10YR 4/4); dry; very loose; 90% fine to very coarse sand; 5% fine gravel to 1cm; rounded; 5% silt.			
330				*****				

S	l					Bore	eho	le ID	: KAFB-	106133
Pro Pro	ojeo ojeo	ct Loca	ation e: K	: KÁI (AFB	os of Engineers FB, Albuquerque, NM BFF SWMU ST-106 and SS-111 705	Hole Dia	ametei	Lower	(in.): 11-3/4 (in.): 9-5/8 ype: Flush mo	unt
Da Da	te S te T	Started	l: 2/ ache	7/201 d: 2/*	1 10/2011	∑ At 1 ▼ At E	Time of End of	Levels E f Drilling Drilling: ng: N/A	N/A	
YC	Coo	nd Elev ordinate ordinate	e: 14	47350			Metho	d: Air F	VDC Drilling Rotary Casing H arbert	ammer Page 12 of 16
05 Depth (ft)	Sample Type	Number	Headspace PID	Lithologic Log	Material Description		U.S.C.S.	We	ell Diagram	Remarks
-	-				Well graded SAND with Gravel (dark yellowish brown (10YR 4/4) very loose; 85% fine to very coar sand; 15% fine gravel to 2.1cm; rounded.	; dry; se /	SW			
335	-			· · · · · · · · · · · · · · · · · · ·	Poorly graded SAND (SP); brown 5/3); dry; very loose; 100% fine s 0.02mm; subrounded; trace fines	and to	SP 		- Bentonite Seal	
-	-				Well graded SAND (SW); dark ye brown (10YR 4/4); moist; very loo 95% very fine to very coarse san fine gravel to 8mm; rounded.	ose;			- Top of Filter Pack	
340	-				Same as above (335 ft); trace gr	avel.			Top of 3/4" Schedule 80 PVC 0.050 Slot Screen	Kelly down @ 1445. Resumed drilling @ 1454.
<u>345</u>	-				Same as above (335 ft); no grave	el.	SW			Drill bit is packed off @ 1500. Unstuck @ 1504.
350		SB0366	0.1		Same as above (335 ft); dense; r gravel.	no			- Bottom of Screen	Blow counts (348.5-350'): 19/27. Kelly down @ 1507. Rig down to lengthen sand line. Completed sand line
355					Silty SAND (SM); brown (7.5YR dry; dense; 85% very fine to fine 0.1mm; rounded; 15% silt; low pl	sand to				attachment @ 1550 and sampled at 350'. Compressor would not start @ 1620. End of 2/9/11.
360	-				Same as above (352 ft).		SM		- Bentonite Seal	Resumed drilling @ 0824 on 2/10/11.

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Date Started: 2/7/2011 Date TD Reached: 2/10/2011 Date Completed: 2/16/2011

Ground Elevation AMSL (ft): 5352.0 Y Coordinate: 1473504.01 X Coordinate: 1542416.28

Borehole ID: KAFB-106133

Hole Diameter Upper (in.): 11-3/4 Hole Diameter Lower (in.): 9-5/8 Surface Completion Type: Flush mount

Groundwater Levels BGS (ft): \square At Time of Drilling: N/A \blacksquare At End of Drilling: N/A \blacksquare After Drilling: N/A

Drilling Contractor: WDC Drilling Drilling Method: Air Rotary Casing Hammer Logged By: Jason Tarbert

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00 Depth (ft)	Sample Type	Number	Headspace PID	Lithologic Log	Material Description	U.S.C.S.	Well Diagram	Remarks
	-				Silty SAND (SM); brown (7.5YR 5/4); dry; dense; 85% very fine to fine sand to 0.1mm; rounded; 15% silt; low plasticity.	SM		Kelly down @ 0831. Resumed drilling @ 0842.
365	-				Well graded SAND (SW); brown (10YR 5/3); moist; dense; 100% very fine to coarse sand; trace gravel to 1 cm; subrounded.			
370					Same as above (363 ft).			
<u>375</u>	-				Same as above (363 ft); slighty coarser; trace fines.	sw	- Bentonite Seal	
380	-				Well graded SAND with Gravel (SW); brown (10YR 4/3); dry; dense; 70% very fine to very coarse sand; 30% fine to medium gravel to 5cm; rounded.			Kelly down @ 0852. Resumed drilling @ 0900.
385					Well graded SAND (SW); yellowish brown (10YR 5/4); moist; dense; 95% very fine to very coarse sand; trace gravel to 1.3cm; subrounded; 5% silt.			
390								



Date Started: 2/7/2011 Date TD Reached: 2/10/2011 Date Completed: 2/16/2011

Ground Elevation AMSL (ft): 5352.0 Y Coordinate: 1473504.01 X Coordinate: 1542416.28

Borehole ID: KAFB-106133

Hole Diameter Upper (in.): 11-3/4 Hole Diameter Lower (in.): 9-5/8 Surface Completion Type: Flush mount

Groundwater Levels BGS (ft): \square At Time of Drilling: N/A \blacksquare At End of Drilling: N/A \blacksquare After Drilling: N/A

Drilling Contractor: WDC Drilling Drilling Method: Air Rotary Casing Hammer Logged By: Jason Tarbert

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66 Depth (ft)	Sample Type	Number	Headspace PID	Lithologic Log	Material Description	U.S.C.S.	We	ll Diagram	Remarks
395	-				Well graded SAND (SW); yellowish brown (10YR 5/4); dry; dense; 95% very fine to very coarse sand; trace gravel to 1.3cm; subrounded; 5% silt. Same as above (390 ft); moist; finer.				
<u>400</u>		SB0367	0.3		Well graded SAND (SW); yellowish brown (10YR 5/4); moist; very dense; 95% very fine to very coarse sand; trace gravel to 1.3cm; subrounded; 5% silt;	SW			Kelly down @ 0911. Blow counts (398.5-400'): 30/50. Resumed drilling @ 0943.
405	-				trace clay nodules. Well graded SAND (SW); grayish brown (10YR 5/2); dry; very dense; 95% fine to very coarse sand; 5% fine gravel to 1cm; subangular; trace fines.			- Bentonite Seal	
<u>410</u>	-				Poorly graded SAND (SP); brown (10YR 5/3); dry; dense; 100% medium sand to 0.5mm; subrounded; trace fines.	SP			
<u>415</u> 420	-				Well graded SAND (SW); brown (10YR 5/3); moist; very dense; 95% very fine to very coarse sand to 3mm; subrounded; 5% silt.	sw			



Date Started: 2/7/2011 Date TD Reached: 2/10/2011 Date Completed: 2/16/2011

Ground Elevation AMSL (ft): 5352.0 Y Coordinate: 1473504.01 X Coordinate: 1542416.28

Borehole ID: KAFB-106133

Hole Diameter Upper (in.): 11-3/4 Hole Diameter Lower (in.): 9-5/8 Surface Completion Type: Flush mount

Groundwater Levels BGS (ft): \square At Time of Drilling: N/A \blacksquare At End of Drilling: N/A \blacksquare After Drilling: N/A

Drilling Contractor: WDC Drilling Drilling Method: Air Rotary Casing Hammer Logged By: Jason Tarbert

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5 Depth (ft)	Sample Type	Number	Headspace PID	Lithologic Log	Material Description	U.S.C.S.	We	ll Diagram	Remarks
425	-				Silty SAND (SM); brown (7.5YR 4/3); moist; very dense; 80% very fine to very coarse sand; 5% fine gravel to 1.4cm; subangular; 10% silt; 5% clay nodules.	SM			Resumed drilling @ 1008.
-	-				Poorly graded SAND (SP); brown (10YR 4/3); dry; dense; 100% medium sand to 0.5mm; subrounded.	SP		- Bentonite Seal	
<u>430</u> -	-				Well graded SAND (SW); brown (10YR 4/3); dry; very dense; 95% very fine to very coarse sand to 4mm; subangular to				
4 <u>35</u>					Younded; 5% silt. Poorly graded SAND (SP); brown (10YR 4/3); dry; very dense; 100% medium sand to 1mm; rounded; trace fines. Same as above (432 ft); 100% coarse sand; trace fines.	SP		- Top of Filter Pack - Top of 3"	
<u>440</u> - -	-				Well graded SAND with Gravel (SW); dark yellowish brown (10YR 4/4); dry; very dense; 85% very fine to very coarse sand; 15% fine gravel to 1.3cm; rounded.	sw		Schedule 80 PVC 0.050 Slot Screen	Kelly down @ 1020. Unwrapped and wrapped sand line. Resumed drilling @ 1036.
<u>445</u> - - 450		SB0368	0.6		Well graded SAND with Silt (SW-SM); dark yellowish brown (10YR 4/4); moist; very dense; 90% very fine to coarse sand to 4mm; subrounded; 10% silt.	SW- SM		- Bottom of Screen	Kelly down @ 1045. Blov counts (448.5-450'): 40/70.



Client: US Army Corps of Engineers

Ground Elevation AMSL (ft): 5352.0

Project Number: 140705

Date TD Reached: 2/10/2011

Date Completed: 2/16/2011

Y Coordinate: 1473504.01

Date Started: 2/7/2011

Project Location: KAFB, Albuquerque, NM

Project Name: KAFB BFF SWMU ST-106 and SS-111

Borehole ID: KAFB-106133

Hole Diameter Upper (in.): 11-3/4 Hole Diameter Lower (in.): 9-5/8 Surface Completion Type: Flush mount

Groundwater Levels BGS (ft): \square At Time of Drilling: N/A TAt End of Drilling: N/A ✓ After Drilling: N/A

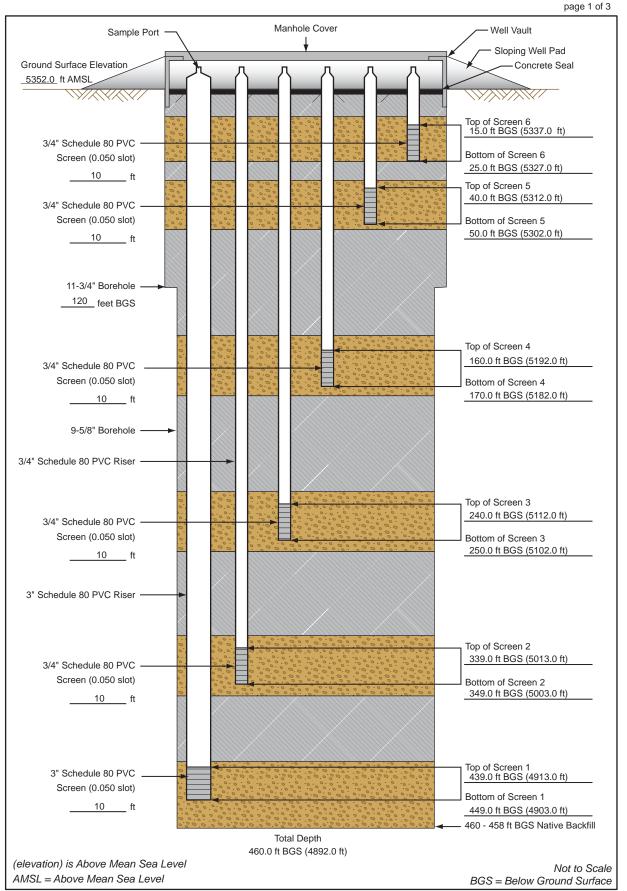
Drilling Contractor: WDC Drilling Drilling Method: Air Rotary Casing Hammer Logged By: Jason Tarbert

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X Coordinate: 1542416.28 Sample Type Headspace PID Lithologic Log Depth (ft) Number Ś S.C. Material Description Remarks Well Diagram 5 450 Well graded SAND (SW); brown (10YR Resumed drilling @ 5/3); dry; 95% very fine to coarse sand 1130. to 3mm; subrounded; 5% silt. 455 SW Same as above (450 ft). Bottom of Filter Pack Native Backfill 460 Total Depth = 460 ft.Reached @ 1140 on 2/10/11. Water added during drilling (gallons) = $\tilde{0}$ 465 Water added during construction (gallons) = Not Recorded Kelly down: TD the joint 470 and ready to make new connection. 475 480

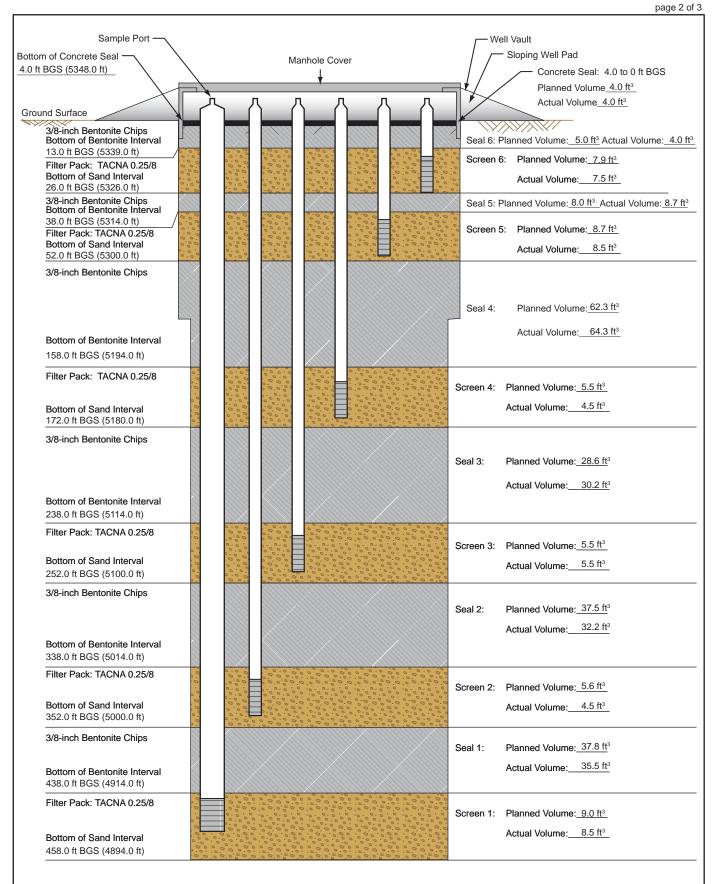
Nested Soil Vapor Well Completion Diagram for KAFB-106133

Installation Start Date/Time: <u>2/15/2011 @ 08:34</u> Installation End Date/Time: <u>2/16/2011 @ 16:29</u>



¹⁴⁰⁷⁰⁵_CA010020_SV_KAFB.106133 (a)

Nested Soil Vapor Well Completion Diagram for KAFB-106133

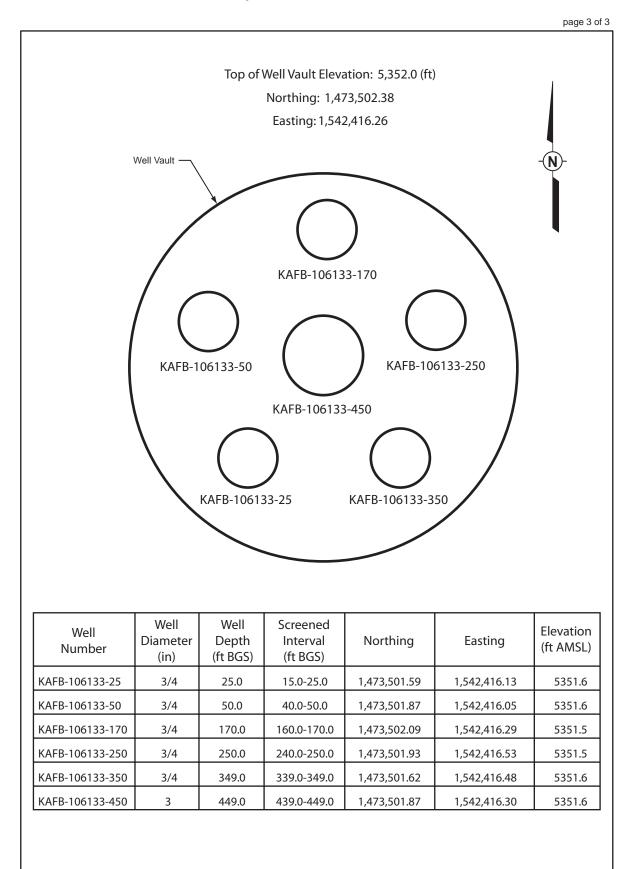


(elevation) is Above Mean Sea Level All Materials Placed with Tremie Pipe

140705_CA010020_SV_KAFB.106133 (b)

Not to Scale BGS = Below Ground Surface

Nested Soil Vapor Well Completion Diagram Map View for KAFB-106133



140705_CA010020_SV_Map View_106133

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APPENDIX D-1

KAFB-106134 Final Well Report

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Date Started: 2/18/2011 Date TD Reached: 2/20/2011 Date Completed: 2/23/2011

Ground Elevation AMSL (ft): 5347.6 Y Coordinate: 1473812.20 X Coordinate: 1542371.29

Borehole ID: KAFB-106134

Hole Diameter Upper (in.): 11-3/4 Hole Diameter Lower (in.): 9-5/8 Surface Completion Type: Flush mount

Groundwater Levels BGS (ft): \square At Time of Drilling: N/A \blacksquare At End of Drilling: N/A \blacksquare After Drilling: N/A

Drilling Contractor: WDC Drilling Drilling Method: Air Rotary Casing Hammer Logged By: Greg Peacock

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Oepth (ft)	Sample Type	Number	Headspace PID	Lithologic Log	Material Description	U.S.C.S.	Well Diagram	Remarks
-					SILT with Sand (ML); brown (7.5YR 5/4); dry; firm; nonplastic; 85% silt; 15% fine to coarse sand; rounded; caliche on sand; no odor.		Concrete Seal	Hand augered.
5					Same as above (0 ft); low plasticity; clay nodules.			Began drilling @ 1232 on 2/18/11.
- _ 10	X	SB0369	0.0				- Bentonite Seal	Blow counts (7.5-9'): 15/7.
-					SILT (ML); strong brown (7.5YR 5/6); dry; firm; medium plasticity; 60% silt; 35% clay; 5% medium to coarse sand; no odor.		Top of Filter	
		SB0370	0.0	-	SILT with Gravel (ML); strong brown (7.5YR 5/6); dry; firm; non to low plasticity; 70% silt; 10% clay; 15% fine to coarse gravel; 5% coarse sand; no odor.	ML	- Top of 3/4" Schedule 80 PVC 0.050 Slot Screen	Kelly down @ 1250. Blow
20	$\left(\right)$	SB0371			SILT (ML); strong brown (7.5YR 5/6); dry; firm; medium plasticity; 100% silt; trace gravel to 1cm; rounded; no odor.			counts (17.5-19'): 8/10. Blow counts (19-20.5'): Not Recorded. New connection @ 1305. Resumed drilling @ 1306.
25		00070	0.0		SILT (ML); brown (7.5YR 5/4); dry; firm; nonplastic; 100% silt with weakly indurated clay nodules to 1cm; no odor.		- Bottom of Screen	Kelly down @ 1308. Blow counts (27-28.5'): 22/50. New connection @ 1350.
30	\triangle	SB0372	0.0				- Bentonite Seal	Resumed drilling @ 1352.



Date Started: 2/18/2011 Date TD Reached: 2/20/2011 Date Completed: 2/23/2011

Ground Elevation AMSL (ft): 5347.6 Y Coordinate: 1473812.20 X Coordinate: 1542371.29

Borehole ID: KAFB-106134

Hole Diameter Upper (in.): 11-3/4 Hole Diameter Lower (in.): 9-5/8 Surface Completion Type: Flush mount

Groundwater Levels BGS (ft): \square At Time of Drilling: N/A \blacksquare At End of Drilling: N/A \blacksquare After Drilling: N/A

Drilling Contractor: WDC Drilling Drilling Method: Air Rotary Casing Hammer Logged By: Greg Peacock

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ଟ୍ଟ Depth (ft)	Sample Type	Number	Headspace PID	Lithologic Log	Material Description	U.S.C.S.	Well Diagram	Remarks
35		SB0373 SB0373	0.0		Sandy SILT (ML); light yellowish brown (10YR 6/4); dry; soft; nonplastic; 60% silt; 35% fine to coarse sand; angular to subangular; 5% gravel; angular; no odor. SILT (ML); yellowish brown (10YR 5/4); dry; soft; non to low plasticity; 100% silt; no odor; caliche at 37'. Same as above (35 ft); reddish brown (5YR 5/4).		- Bentonite Seal - Top of Filter Pack - Top of 3/4" Schedule 80 PVC 0.050 Slot Screen	Kelly down @ 1358. Blow counts (37-38.5'): 50/Not Recorded. Blow counts (38.5-40'): 50/Not Recorded. New connection @ 1430. Resumed drilling @ 1430.
<u>45</u> 50		SB0374	0.0		Same as above (35 ft); light reddish brown (5YR 6/4); 75% silt; 20% clay; 5% medium to fine sand; subrounded; trace gravel; no odor. SILT with Sand (ML); brown (10YR 5/3); dry; firm; nonplastic; 75% silt; trace clay nodules; 25% fine to coarse sand; subangular to subrounded; abundant mica; no odor.	ML	- Bottom of Screen	Kelly down @ 1439. Blow counts (47-48.5'): 12/25. New connection @ 1455. Resumed drilling @ 1456.
60	-				SILT (ML); brown (10YR 4/3); dry; soft; nonplastic; 85% silt; 15% clay; no odor.		- Bentonite Seal	



Date Started: 2/18/2011 Date TD Reached: 2/20/2011 Date Completed: 2/23/2011

Ground Elevation AMSL (ft): 5347.6 Y Coordinate: 1473812.20 X Coordinate: 1542371.29

Borehole ID: KAFB-106134

Hole Diameter Upper (in.): 11-3/4 Hole Diameter Lower (in.): 9-5/8 Surface Completion Type: Flush mount

Groundwater Levels BGS (ft): \square At Time of Drilling: N/A \blacksquare At End of Drilling: N/A \blacksquare After Drilling: N/A

Drilling Contractor: WDC Drilling Drilling Method: Air Rotary Casing Hammer Logged By: Greg Peacock

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@ Denth (ft)	Sample Type	Number	Headspace PID	Lithologic Log	Material Description	U.S.C.S.	Well Diagram	Remarks
	_				SILT with Sand (ML); yellowish brown (10YR 5/4); dry; soft; nonplastic; 75% silt; 25% fine to coarse sand; subrounded to rounded; no odor.			Kelly down @ 1457. New connection @ 1510. Resumed drilling.
6	5				Sandy SILT (ML); yellowish brown (10YR 5/4); dry; soft; nonplastic; 55% silt; 45% fine to coarse sand; rounded; trace gravel; mica flakes; no odor.			
7	<u>-</u>				SILT (ML); yellowish brown (10YR 5/4); nonplastic; 100% silt; trace gravel; no odor.			
7	5				Same as above (70 ft); nonplastic; 85% silt; 15% clay; no gravel.	ML	- Bentonite Seal	Kelly down @ 1518. New
8	- - -				Same as above (70 ft); clay nodules to 2cm; slightly indurated.			connection @ 1525. Resumed drilling @ 1525.
8	5				Same as above (70 ft); clay nodules to 1cm; trace sand.			
9	2 0							



Date Started: 2/18/2011 Date TD Reached: 2/20/2011 Date Completed: 2/23/2011

Ground Elevation AMSL (ft): 5347.6 Y Coordinate: 1473812.20 X Coordinate: 1542371.29

Borehole ID: KAFB-106134

Hole Diameter Upper (in.): 11-3/4 Hole Diameter Lower (in.): 9-5/8 Surface Completion Type: Flush mount

Groundwater Levels BGS (ft): \square At Time of Drilling: N/A \blacksquare At End of Drilling: N/A \blacksquare After Drilling: N/A

Drilling Contractor: WDC Drilling Drilling Method: Air Rotary Casing Hammer Logged By: Greg Peacock

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g Depth (ft)		Number	Headspace PID	Lithologic Log	Material Description	U.S.C.S.	Well Diagram	Remarks
	-				SILT (ML); yellowish brown (10YR 5/4); dry; soft; non to low plasticity; 90% silt; 10% fine to medium sand; no odor.			
95		SB0375	0.0		Sandy SILT (ML); yellowish brown (10YR 5/4); dry; soft; nonplastic; 65% silt with clay nodules to 1.5cm; 35% very fine sand; no odor.	ML		Kelly down @ 1533. Blow counts (97-98.5'): 18/27. New connection @ 1550. Resumed drilling @
100	_				Well graded SAND (SW); dark grayish brown (10YR 4/2); dry; loose; 55% fine sand; 30% medium sand; 15% coarse sand; rounded to subangular; trace gravel; no odor.	sw		1551.
	-				SILT (ML); brown (10YR 4/3); dry; soft to stiff; low to medium plasticity; 70% silt; 30% clay; no odor.		- Bentonite Seal	
<u>110</u>) - -				Same as above (105 ft).	ML		
<u>115</u>	-				Same as above (105 ft); yellowish brown (10YR 5/4); no odor.			Kelly down @ 1558. New connection @ 1607. Resumed drilling @ 1608.
120)							



Borehole ID: KAFB-106134

Client: US Army Corps of Engineers Project Location: KAFB, Albuquerque, NM Project Name: KAFB BFF SWMU ST-106 and SS-111 Project Number: 140705

Date Started: 2/18/2011 Date TD Reached: 2/20/2011 Date Completed: 2/23/2011

Ground Elevation AMSL (ft): 5347.6 Y Coordinate: 1473812.20 X Coordinate: 1542371.29 Hole Diameter Upper (in.): 11-3/4 Hole Diameter Lower (in.): 9-5/8 Surface Completion Type: Flush mount

Groundwater Levels BGS (ft): \square At Time of Drilling: N/A \blacksquare At End of Drilling: N/A \blacksquare After Drilling: N/A

Drilling Contractor: WDC Drilling Drilling Method: Air Rotary Casing Hammer Logged By: Greg Peacock

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05 Depth (ft)	Sample Type	Number	Headspace PID	Lithologic Log	Material Description	U.S.C.S.	Well Diagram	Remarks
-	-				SILT (ML); yellowish brown (10YR 5/4); dry; soft to stiff; low to medium plasticity; 70% silt; 30% clay; no odor.			Kelly down @ 1610 on 2/18/11. Switched to 9-5/8" casing. New connection @ 1105 on 2/19/11. Resumed drilling
<u>125</u>	-				Same as above (120 ft).	ML		@ 1109 on 2/19/11.
- <u>130</u> -	-				SILT (ML); brown (7.5YR 5/3); dry; firm; nonplastic; 95% silt; 5% fine to medium sand; subangular; no odor.			
- <u>135</u> - -	-			· · · · · · · · · · · · · · · · · · ·	Well graded SAND (SW); dark grayish brown (10YR 4/2); 95% fine to coarse sand; subangular to subrounded; trace gravel; rounded; 5% fines; no odor.	sw	- Bentonite Seal	Kelly down @ 1116. New connection @ 1127. Resumed drilling @ 1128.
<u>140</u> -	-				SILT (ML); brown (7.5YR 5/3); dry; soft to firm; non to low plasticity; 90% silt; 10% clay; trace coarse sand; rounded; no odor.			
<u>145</u>	-				Same as above (140 ft).	ML		
150	X	SB0376	0.4					Kelly down @ 1131. Blow counts (147.5-149'): 15/28. New connection @ 1146. Resumed



Date Started: 2/18/2011 Date TD Reached: 2/20/2011 Date Completed: 2/23/2011

Ground Elevation AMSL (ft): 5347.6 Y Coordinate: 1473812.20 X Coordinate: 1542371.29

Borehole ID: KAFB-106134

Hole Diameter Upper (in.): 11-3/4 Hole Diameter Lower (in.): 9-5/8 Surface Completion Type: Flush mount

Groundwater Levels BGS (ft): \square At Time of Drilling: N/A \blacksquare At End of Drilling: N/A \blacksquare After Drilling: N/A

Drilling Contractor: WDC Drilling Drilling Method: Air Rotary Casing Hammer Logged By: Greg Peacock

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05 Depth (ft)	Sample Type	Number	Headspace PID	Lithologic Log	Material Description	U.S.C.S.	We	II Diagram	Remarks
-	-				SILT (ML); dark yellowish brown (10YR 4/4); dry; soft to firm; low plasticity; 80% silt; 20% clay; no odor.			- Bentonite Seal	drilling @ 1147.
<u>155</u>	-				Same as above (150 ft); yellowish brown (10YR 5/4); 90% silt; 10% fine sand; rounded to subrounded.	ML		- Top of Filter Pack	Kelly down @ 1150. New connection @ 1158. Resumed drilling @ 1203.
<u>160</u>	-				Silty SAND (SM); dark grayish brown (10YR 4/2); dry; dense; 80% fine to coarse sand; rounded; trace gravel to 1cm; 20% silt; no odor.	SM		- Top of 3/4" Schedule 80 PVC 0.050 Slot Screen	Approximate top of Santa Fe Group.
<u>165</u> - - -	-				SILT (ML); dark yellowish brown (10YR 4/4); dry; soft; nonplastic; 95% silt; 5% fine sand; no odor.	ML			
<u>170</u> - -	-				Poorly graded SAND (SP); dark grayish brown (10YR 4/2); dry; loose to dense; 95% fine to medium sand; 5% coarse sand; rounded; no odor.	SP		- Bottom of Screen	
<u>175</u>	-				Well graded SAND (SW); dark grayish brown (10YR 4/2); dry; loose to dense; 100% fine to coarse sand; rounded; trace gravel; rounded; rounded lapilli tuff sand; no odor.	sw		- Bentonite Seal	Kelly down @ 1208. New connection @ 1246. Resumed drilling @ 1247.
180									



Date Started: 2/18/2011 Date TD Reached: 2/20/2011 Date Completed: 2/23/2011

Ground Elevation AMSL (ft): 5347.6 Y Coordinate: 1473812.20 X Coordinate: 1542371.29

Borehole ID: KAFB-106134

Hole Diameter Upper (in.): 11-3/4 Hole Diameter Lower (in.): 9-5/8 Surface Completion Type: Flush mount

Groundwater Levels BGS (ft): \square At Time of Drilling: N/A \blacksquare At End of Drilling: N/A \blacksquare After Drilling: N/A

Drilling Contractor: WDC Drilling Drilling Method: Air Rotary Casing Hammer Logged By: Greg Peacock

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08 Depth (ft)	Sample Type	Number	Headspace PID	Lithologic Log	Material Description	U.S.C.S.	Well Diagram	Remarks
-					Well graded SAND (SW); dark grayish brown (10YR 4/2); dry; loose; 100% fine to coarse sand; rounded; no odor.			
- <u>185</u> - -					Same as above (180 ft); clay nodules.			
190 -	-				Same as above (180 ft).	SW		
<u>195</u> - -	-				Same as above (180 ft); dense; 90% fine to coarse sand; rounded; 10% gravel to 1.5cm; rounded.		- Bentonite Seal	Kelly down @ 1253. Blow counts (197.5-199'):
_ 200 _ _ _	-				Poorly graded SAND (SP); dark grayish brown (10YR 4/2); 100% fine to meduim sand; trace coarse sand; rounded; dominantly quartz grains; no odor.			25/31. Blow counts (199-200.5'): 20/29. Note: No recovery from split spoons at 200 ft. Sample was collected at 217.5 ft. New connection @ 1314. Resumed drilling @
_ 205 _ _ _					Same as above (200 ft); 90% fine sand; 10% medium sand.	SP		1320.
_ 210								



Date Started: 2/18/2011 Date TD Reached: 2/20/2011 Date Completed: 2/23/2011

Ground Elevation AMSL (ft): 5347.6 Y Coordinate: 1473812.20 X Coordinate: 1542371.29

Borehole ID: KAFB-106134

Hole Diameter Upper (in.): 11-3/4 Hole Diameter Lower (in.): 9-5/8 Surface Completion Type: Flush mount

Groundwater Levels BGS (ft): \square At Time of Drilling: N/A \blacksquare At End of Drilling: N/A \blacksquare After Drilling: N/A

Drilling Contractor: WDC Drilling Drilling Method: Air Rotary Casing Hammer Logged By: Greg Peacock

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	500	ordinate	e. r	04237	Logged	Logged By: Greg Peacock				
Depth (ft)	Sample Type	Number	Headspace PID	Lithologic Log	Material Description	U.S.C.S.	Well Diagram	Remarks		
215	-		0.1		Well graded SAND (SW); dark grayish brown (10YR 4/2); dry; dense; 100% fine to coarse sand; rounded; coarse sand dominantly volcanic tuff. Same as above (210 ft); trace gravel; rounded; less volcanic tuff sand.			Kelly down @ 1327. Blow counts (217.5-219'):		
220	-	SB0377	0.1		Well graded SAND with Gravel (SW); dark grayish brown (10YR 4/2); dry; dense; 85% fine to coarse sand; rounded; 15% gravel to 1.5cm; rounded; no odor.		- Bentonite Seal	12/15. New connection @ 1401. Resumed drilling.		
225	-				Well graded SAND (SW); dark grayish bown (10YR 4/2); dry; dense; 90% fine to coarse sand; rounded; 10% gravel to 2cm; rounded; no odor.	SW				
230	-				Same as above (225 ft); 95% fine to coarse sand; 5% gravel.					
235	-				Same as above (225 ft).		Top of Filter Pack	Kelly down @ 1410. New connection @ 1419. Resumed drilling @ 1420.		



Date Started: 2/18/2011 Date TD Reached: 2/20/2011 Date Completed: 2/23/2011

Ground Elevation AMSL (ft): 5347.6 Y Coordinate: 1473812.20 X Coordinate: 1542371.29

Borehole ID: KAFB-106134

Hole Diameter Upper (in.): 11-3/4 Hole Diameter Lower (in.): 9-5/8 Surface Completion Type: Flush mount

Groundwater Levels BGS (ft): \square At Time of Drilling: N/A \blacksquare At End of Drilling: N/A \blacksquare After Drilling: N/A

Drilling Contractor: WDC Drilling Drilling Method: Air Rotary Casing Hammer Logged By: Greg Peacock

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5 Depth (ft)	Sample Type	Number	Headspace PID	Lithologic Log	Material Description	U.S.C.S.	Well Diagrar	m Remarks
-	-				Well graded SAND (SW); dark grayish brown (10YR 4/2); dry; dense; 90% fine to coarse sand; rounded; 10% gravel; rounded; no odor.		Top of 3/4 Schedule PVC 0.05 Slot Scre	80
245	-			· · · · · · · · · · · · · · · · · · ·	Same as above (240 ft).	SW		Kelly down @ 1424.
250	\mathbb{H}	SB0378, SB0378- <u>MS</u> / SB0378-					- Bottom of	Blow counts (247.5-249'): 27/37. Blow counts (249-250.5'): 38/50. New connection @ 1445.
- - - 255	-	MSD			Poorly graded SAND (SP); dark grayish brown (10YR 4/2); dry; medium dense; 95% fine to medium sand; rounded; 5% coarse sand; rounded; trace gravel; rounded; no odor.	SP	Screen	Resumed drilling @ 1446.
-	-				SILT (ML); dark yellowish brown (10YR 4/4); dry; firm to stiff; nonplastic; 100% silt; no odor.			Kelly down @ 1452. New connection @ 1500. Resumed drilling @ 1501.
<u>260</u> - -	-				SILT (ML); dark yellowish brown (10YR 4/4); dry; stiff; medium plasticity; 65% silt; 35% clay; no odor.	ML	- Bentonite	Seal
265	-				Same as above (260 ft); 95% fines; 5% fine to coarse sand.			
- 270	-							



Date Started: 2/18/2011 Date TD Reached: 2/20/2011 Date Completed: 2/23/2011

Ground Elevation AMSL (ft): 5347.6 Y Coordinate: 1473812.20 X Coordinate: 1542371.29

Borehole ID: KAFB-106134

Hole Diameter Upper (in.): 11-3/4 Hole Diameter Lower (in.): 9-5/8 Surface Completion Type: Flush mount

Groundwater Levels BGS (ft): \square At Time of Drilling: N/A \blacksquare At End of Drilling: N/A \blacksquare After Drilling: N/A

Drilling Contractor: WDC Drilling Drilling Method: Air Rotary Casing Hammer Logged By: Greg Peacock

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02 Depth (ft)	Sample Type	Number	Headspace PID	Lithologic Log	Material Description	U.S.C.S.	Well Diagram	Remarks
	-				SILT (ML); dark yellowish brown (10YR 4/4); dry; stiff; medium plasticity; 95% silt with clay; 5% fine to coarse sand; rounded; no odor.			
- 275 - -	-				SILT (ML); yellowish brown (10YR 5/4); dry; stiff; nonplastic; 95% silt; 5% clay.			Kelly down @ 1511 on 2/19/11. New connection @ 0807 on 2/20/11. Resumed drilling @ 0809 on 2/20/11.
- <u>280</u> - -	-				SILT (ML); brown (7.5YR 4/3); dry; stiff; low to medium plasticity; 75% silt; 25% clay nodules; trace sand; rounded; no odor.	ML		
- 285 - -	-				Same as above (280 ft).		- Bentonite Seal	
- 290								
-	-				Poorly graded SAND (SP); dark grayish brown (10YR 4/2); dry; dense; 100% fine to medium sand; subrounded; trace coarse sand; no odor.	SP		
295	-				Poorly graded SAND with Silt (SP-SM); dark grayish brown (10YR 4/2); dry;			Kelly down @ 0836.
- - 300		SB0379	0.0		dense; 90% fine sand; rounded; 10% silt; nonplastic; no odor.	SP- SM		Blow counts (297-298.5') 17/38. New connection @ 0954. Resumed drilling @ 0954.



Date Started: 2/18/2011 Date TD Reached: 2/20/2011 Date Completed: 2/23/2011

Ground Elevation AMSL (ft): 5347.6 Y Coordinate: 1473812.20 X Coordinate: 1542371.29

Borehole ID: KAFB-106134

Hole Diameter Upper (in.): 11-3/4 Hole Diameter Lower (in.): 9-5/8 Surface Completion Type: Flush mount

Groundwater Levels BGS (ft): \Box At Time of Drilling: N/A \blacksquare At End of Drilling: N/A \blacksquare After Drilling: N/A

Drilling Contractor: WDC Drilling Drilling Method: Air Rotary Casing Hammer Logged By: Greg Peacock

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00 Depth (ft)	Sample Type	Number	Headspace PID	Lithologic Log	Material Description	U.S.C.S.	Well Diagram	Remarks
	-				Well graded SAND (SW); dark grayish brown (10YR 4/2); dry; dense; 95% fine to coarse sand; rounded to subrounded; 5% gravel; rounded; no odor.	SW		
305	-				Poorly graded SAND (SP); dark grayish brown (10YR 4/2); dry; dense; 100% fine to medium sand; subangular to subrounded; trace coarse sand; no odor.	<i>_</i> _		
<u>310</u>	-				Same as above (305 ft); 100% fine sand; trace medium sand; rounded; trace gravel; rounded.			
315	-				Same as above (305 ft); 85% fine sand; 10% medium sand; rounded; 5% gravel to 3cm; rounded	SP	- Bentonite Seal	Kelly down @ 1010. New connection @ 1017. Resumed drilling @ 1017.
<u>320</u>	-				Same as above (305 ft).			
<u>325</u>	-				Poorly graded GRAVEL with Sand (GP); dark grayish brown (10YR 4/2); dry; dense; 55% fine to medium gravel; rounded; 45% fine to coarse sand; rounded; no odor.	GP		
330				'° 0° 200				



Date Started: 2/18/2011 Date TD Reached: 2/20/2011 Date Completed: 2/23/2011

Ground Elevation AMSL (ft): 5347.6 Y Coordinate: 1473812.20 X Coordinate: 1542371.29

Borehole ID: KAFB-106134

Hole Diameter Upper (in.): 11-3/4 Hole Diameter Lower (in.): 9-5/8 Surface Completion Type: Flush mount

Groundwater Levels BGS (ft): \Box At Time of Drilling: N/A \blacksquare At End of Drilling: N/A \blacksquare After Drilling: N/A

Drilling Contractor: WDC Drilling Drilling Method: Air Rotary Casing Hammer Logged By: Greg Peacock

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00 Depth (ft)	Sample Type	Number	Headspace PID		Material Description	U.S.C.S.	We	ell Diagram	Remarks
- - 335					Poorly graded GRAVEL (GP); dark grayish bown (10YR 4/2); dry; dense; 90% fine to medium gravel; rounded; 10% coarse sand; rounded; no odor.	GP		- Bentonite Seal	
					Poorly graded SAND (SP); dark grayish brown (10YR 4/2); dry; dense; 100% fine to medium sand; subrounded to subangular; trace gravel; no odor.	SP		- Top of Filter Pack	Kelly down @ 1031. New connection @ 1042. Resumed drilling @ 1042.
-	-				Well graded SAND (SW); dark grayish brown (10YR 4/2); dry; dense; 100% fine to coarse sand; rounded; no odor.			- Top of 3/4" Schedule 80 PVC 0.050 Slot Screen	
<u>345</u> - -	X	SB0380	0.0		Same as above (340 ft); 90% fine to coarse sand; 10% gravel to 2cm; rounded.				Kelly down @ 1052. Blow counts (347-348.5'): 26/50. Blow counts
- 350 - -		SB0380			Well graded SAND with Gravel (SW); dark grayish brown (10YR 4/2); dry; dense; 75% fine to coarse sand; rounded; 25% fine gravel to 1.5cm; rounded; no odor.	sw		- Bottom of Screen	(348.5-350'): 21/28. New connection @ 1120. Resumed drilling @ 1121.
355 - - -					Same as above (350 ft).			- Bentonite Seal	Kelly down @ 1127. New connection @ 1133. Resumed drilling @ 1134.
360 -									



Date Started: 2/18/2011 Date TD Reached: 2/20/2011 Date Completed: 2/23/2011

Ground Elevation AMSL (ft): 5347.6 Y Coordinate: 1473812.20 X Coordinate: 1542371.29

Borehole ID: KAFB-106134

Hole Diameter Upper (in.): 11-3/4 Hole Diameter Lower (in.): 9-5/8 Surface Completion Type: Flush mount

Groundwater Levels BGS (ft): \square At Time of Drilling: N/A \blacksquare At End of Drilling: N/A \blacksquare After Drilling: N/A

Drilling Contractor: WDC Drilling Drilling Method: Air Rotary Casing Hammer Logged By: Greg Peacock

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00 Depth (ft)	Sample Type	Number	Headspace PID	Lithologic Log	Material Description	U.S.C.S.	Well Diagram	Remarks
-					Well graded SAND (SW); dark grayish brown (10YR 4/2); dry; dense; 90% fine to coarse sand; rounded; 10% gravel to 2cm; rounded; no odor.			
					Same as above (360 ft); 95% fine to coarse sand; 5% gravel.			
<u>370</u> - - -					Well graded SAND with Gravel (SW); dark grayish brown (10YR 4/2); dry; dense; 65% fine to coarse sand; rounded; 35% fine to medium gravel; rounded; no odor.	sw		
375					Well graded SAND with Gravel (SW); dark grayish brown (10YR 4/2); dry; dense; 85% fine to coarse sand; rounded; 15% gravel to 2.5cm; rounded; no odor.		- Bentonite Seal	Kelly down @ 1143. New connection @ 1148. Resumed drilling @ 1150.
380					Well graded SAND with Gravel (SW); dark grayish brown (10YR 4/2); dry; dense; 55% fine to coarse sand; rounded; 45% fine to medium gravel; rounded; no odor.			
<u>385</u> - - -					Poorly graded SAND (SP); dark grayish brown (10YR 4/2); dry; dense; 95% fine to medium sand; subrounded; 5% coarse sand; rounded; trace gravel; rounded; no odor.	SP		
390 -								



Date Started: 2/18/2011 Date TD Reached: 2/20/2011 Date Completed: 2/23/2011

Ground Elevation AMSL (ft): 5347.6 Y Coordinate: 1473812.20 X Coordinate: 1542371.29

Borehole ID: KAFB-106134

Hole Diameter Upper (in.): 11-3/4 Hole Diameter Lower (in.): 9-5/8 Surface Completion Type: Flush mount

Groundwater Levels BGS (ft): \square At Time of Drilling: N/A \blacksquare At End of Drilling: N/A \blacksquare After Drilling: N/A

Drilling Contractor: WDC Drilling Drilling Method: Air Rotary Casing Hammer Logged By: Greg Peacock

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66 Depth (ft)	Sample Type	Number	Headspace PID	Lithologic Log	Material Description	U.S.C.S.	Well Diagram	Remarks
-	-				Poorly graded SAND (SP); dark grayish brown (10YR 4/2); dry; dense; 100% fine sand; rounded; trace medium sand; rounded; no odor.			
<u>395</u>	-				Same as above (390 ft); 100% fine to medium sand; rounded to subrounded.	SP		Kelly down @ 1158. Blow counts (397-398.5') 29/47. New connection @1220. Resumed drilling @ 1258.
- - 400		SB0381	0.1					
-	-				Well graded SAND (SW); dark grayish brown (10YR 4/2); dry; dense; 100% fine to coarse sand; rounded; trace gravel; no odor.	SW		
<u>405</u> - -					Poorly graded SAND (SP); dark grayish brown (10YR 4/2); dry; dense; 100% fine to medium sand; rounded to subrounded; trace fines; no odor.		- Bentonite Seal	
<u>410</u> - -	_				Same as above (405 ft); trace coarse sand; rounded.	SP		
<u>415</u>	_				Same as above (405 ft).			Kelly down @ 1307. New connection @ 1319. Resumed drilling @ 1320.
420								



Date Started: 2/18/2011 Date TD Reached: 2/20/2011 Date Completed: 2/23/2011

Ground Elevation AMSL (ft): 5347.6 Y Coordinate: 1473812.20 X Coordinate: 1542371.29

Borehole ID: KAFB-106134

Hole Diameter Upper (in.): 11-3/4 Hole Diameter Lower (in.): 9-5/8 Surface Completion Type: Flush mount

Groundwater Levels BGS (ft): \square At Time of Drilling: N/A \blacksquare At End of Drilling: N/A \blacksquare After Drilling: N/A

Drilling Contractor: WDC Drilling Drilling Method: Air Rotary Casing Hammer Logged By: Greg Peacock

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55 Depth (ft)	Sample Type	Number	Headspace PID	Lithologic Log	Material Description	U.S.C.S.	We	ell Diagram	Remarks
425	-				Well graded SAND (SW); dark grayish brown (10YR 4/2); dry; dense; 100% fine to coarse sand; rounded; trace gravel to 1cm; rounded; no odor.	SW			
430	-				Poorly graded SAND (SP); dark grayish brown (10YR 4/2); dry; dense; 100% fine to medium sand; rounded; trace coarse sand; trace fines; no odor.	SP	-	- Bentonite Seal	
<u>430</u> - -	-				Well graded SAND (SW); dark grayish brown (10YR 4/2); dry; dense; 100% fine to coarse sand; subrounded to subangular; no odor.		-		
<u>435</u> - -	-				Same as above (430 ft); 90% fine to coarse sand; 10% gravel to 1cm; rounded.			- Top of Filter Pack	Kelly down @ 1332. New connection @ 1340. Resumed drilling @ 1341.
- - - -	-				Same as above (430 ft); 95% fine to coarse sand; rounded; 5% gravel; rounded.	SW		- Top of 3" Schedule 80 PVC 0.050 Slot Screen	
445 -		SB0382	NR		Same as above (430 ft); 100% fine to coarse sand; rounded to angular; evenly distributed.				Kelly down @ 1347. Blow counts (447-448.5')
- 450									50/NA. Blow counts (448.5-450'): 50/NA. No recovery. Note:



Date Started: 2/18/2011 Date TD Reached: 2/20/2011 Date Completed: 2/23/2011

Ground Elevation AMSL (ft): 5347.6 Y Coordinate: 1473812.20 X Coordinate: 1542371.29

Borehole ID: KAFB-106134

Hole Diameter Upper (in.): 11-3/4 Hole Diameter Lower (in.): 9-5/8 Surface Completion Type: Flush mount

Groundwater Levels BGS (ft): \square At Time of Drilling: N/A \blacksquare At End of Drilling: N/A \blacksquare After Drilling: N/A

Drilling Contractor: WDC Drilling Drilling Method: Air Rotary Casing Hammer Logged By: Greg Peacock

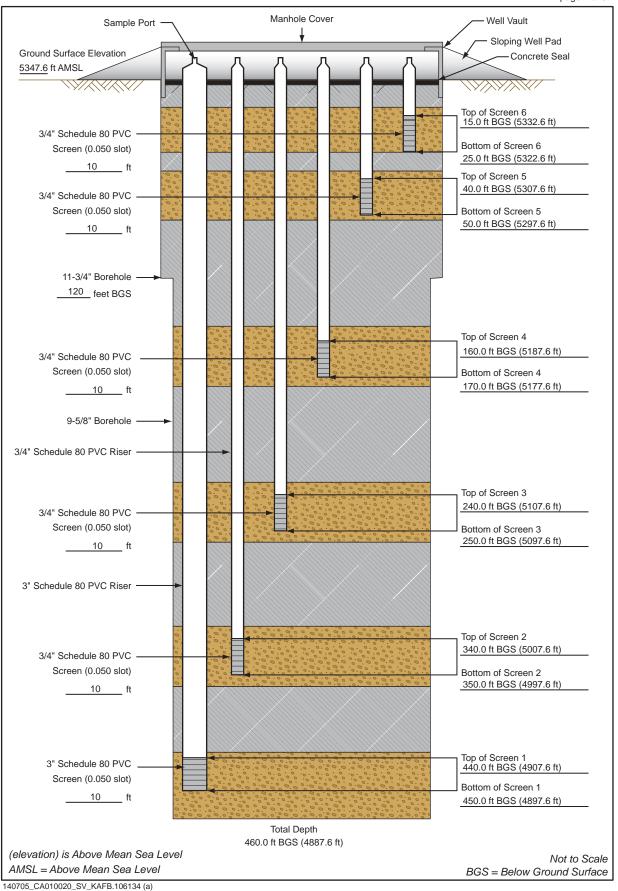
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5 Depth (ft)	Sample Type	Number	Headspace PID	Lithologic Log	Material Description	U.S.C.S.	Well Diagram	Remarks
455	-				Well graded SAND (SW); dark grayish brown (10YR 4/2); dry; dense; 95% fine to coarse sand; rounded; 5% fine gravel to 1.5cm; rounded; no odor.		Screen	insufficient volume for headspace meausrement. New connection @ 1414. Resumed drilling @ 1415.
	-				Same as above (450 ft); 95% fine to coarse sand; 5% clay nodules to 3mm.	SW		Kelly down @ 1525.
460	-							Attempted to collect additional spilt spoon sample, but no recovery. Blow counts (457-458.5'): 50/Not Recorded.
-	-		-	<u></u>	Poorly graded SAND (SP); grayish brown (10YR 5/2); dry; dense; 95% fine sand; rounded; 5% gravel to 2.5cm; rounded; no odor.	SP		Total depth = 460 ft. Reached @ 1445 on 2/20/11.
465	-							Water added during drilling (gallons) = 0
-	-							Water added during construction (gallons) = Not Recorded
<u>470</u>	-							Kelly down: TD the joint and ready to make new connection
475 -								
480	-							

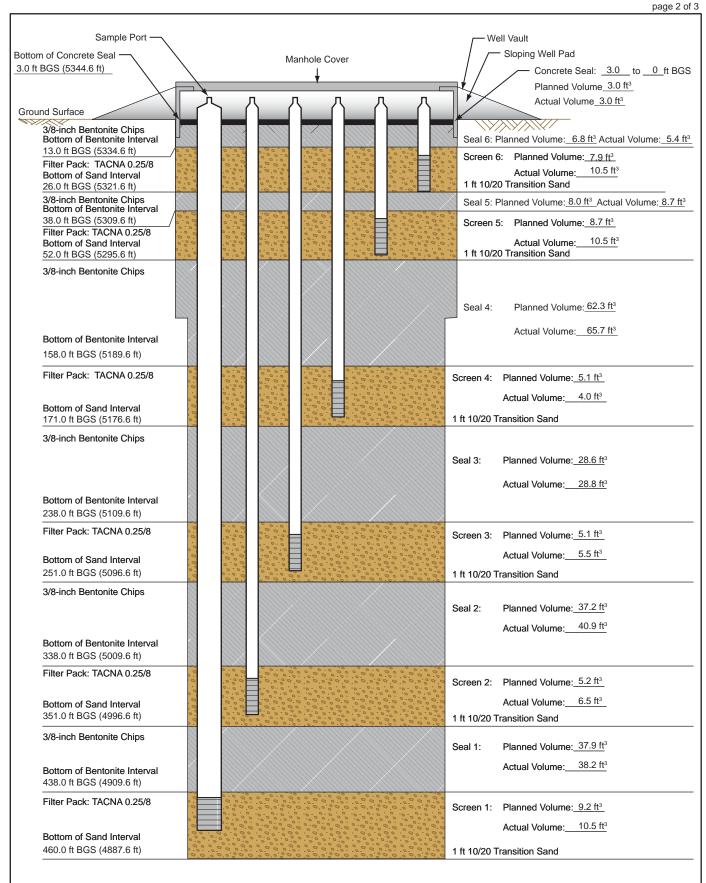
Nested Soil Vapor Well Completion Diagram for KAFB-106134

Installation Start Date/Time: 2/21/2011 @ 08:10 Installation End Date/Time: 2/23/2011 @ 12:00

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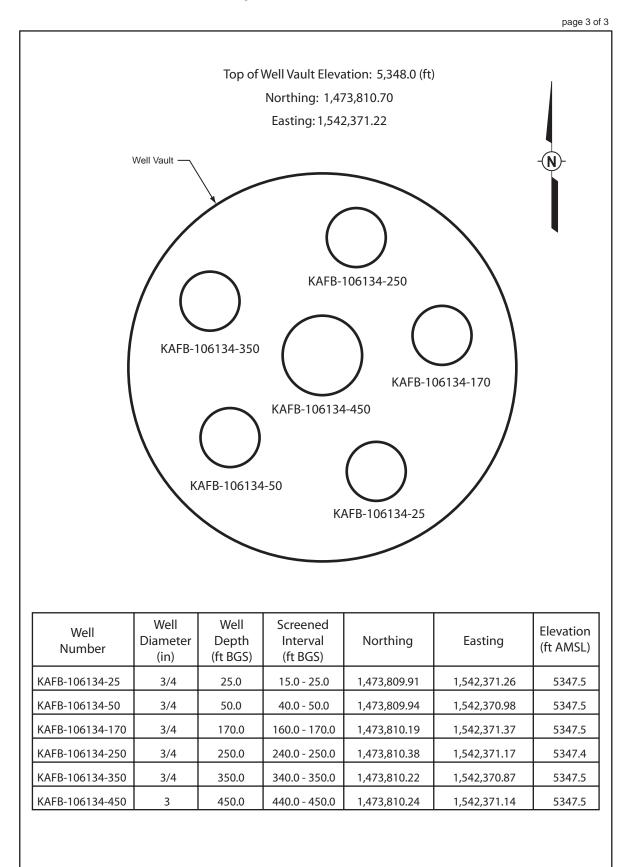


Nested Soil Vapor Well Completion Diagram for KAFB-106134



(elevation) is Above Mean Sea Level All Materials Placed with Tremie Pipe Not to Scale BGS = Below Ground Surface

Nested Soil Vapor Well Completion Diagram Map View for KAFB-106134



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APPENDIX D-1

KAFB-106135 Final Well Report

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Date Started: 1/23/2011 Date TD Reached: 1/23/2011 Date Completed: 2/5/2011

Ground Elevation AMSL (ft): 5351.1 Y Coordinate: 1474070.68 X Coordinate: 1542905.14

Borehole ID: KAFB-106135

Hole Diameter Upper (in.): 11-3/4 Hole Diameter Lower (in.): 9-5/8 Surface Completion Type: Flush mount

Groundwater Levels BGS (ft): \square At Time of Drilling: N/A \blacksquare At End of Drilling: N/A \blacksquare After Drilling: N/A

Drilling Contractor: WDC Drilling Drilling Method: Air Rotary Casing Hammer Logged By: Jason Tarbert

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Denth (ft)	Sample Type	Number	Headspace	Lithologic Log	Material Description	U.S.C.S.	Well Diagram	Remarks
	-				No description recorded.		- Concrete Seal	Hand augered. ***Note: no headspace requirement at this location***
	5				Sandy SILT (ML); light brown (7.5YR 6/4); dry; very soft; low plasticity; 70% silt; 25% very fine sand; 5% medium sand to 0.4mm.		- - Bentonite Seal	Began drilling @ 0755 on 1/23/11.
1	0				Sandy SILT (ML); brown (7.5YR 5/4); moist; very soft; low plasticity; 70% silt; trace clay nodules; 25% very fine sand; 5% medium sand to 0.4mm.		- Top of Filter Pack	
1	5				Same as above (10 ft); trace fine gravel to 7mm.	ML	- Top of 3/4" Schedule 80 PVC 0.050 Slot Screen	
2	- 0				Same as above (10 ft); dry.			
2	5				Same as above (10 ft); dry; no clay.		- Bottom of Screen	
3	0						- Bentonite Seal	



Borehole ID: KAFB-106135

Client: US Army Corps of Engineers Project Location: KAFB, Albuquerque, NM Project Name: KAFB BFF SWMU ST-106 and SS-111 Project Number: 140705

Date Started: 1/23/2011 Date TD Reached: 1/23/2011 Date Completed: 2/5/2011

Ground Elevation AMSL (ft): 5351.1 Y Coordinate: 1474070.68 X Coordinate: 1542905.14 Hole Diameter Upper (in.): 11-3/4 Hole Diameter Lower (in.): 9-5/8 Surface Completion Type: Flush mount

Groundwater Levels BGS (ft): \square At Time of Drilling: N/A \blacksquare At End of Drilling: N/A \blacksquare After Drilling: N/A

Drilling Contractor: WDC Drilling Drilling Method: Air Rotary Casing Hammer Logged By: Jason Tarbert

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& Depth (ft)	Sample Type	Number	Headspace PID	Lithologic Log	Material Description	U.S.C.S.	Well Diagram	Remarks
· · · ·	-				Sandy SILT (ML); brown (7.5YR 5/4); moist; very soft; low plasticity; 70% silt; 25% very fine sand; 5% medium sand to 0.4mm.		- Bentonite Seal	
35	-				Same as above (30 ft); trace clay nodules.		Top of Filter	
40	-				Same as above (30 ft); trace clay nodules.		Pack - Top of 3/4" Schedule 80 PVC 0.050 Slot Screen	
45	-				SILT with Sand (ML); brown (7.5YR 5/4); dry; very soft; low plasticity; 80% silt; 10% coarse sand; 10% fine gravel to 7mm.	ML		
50	-				SILT with Sand (ML); reddish brown (5YR 5/4); dry; very soft; low plasticity; 80% silt; 5% clay; 15% very fine sand to 0.2mm.		- Bottom of Screen	
55	-				SILT (ML); reddish brown (5YR 5/4); dry; very soft; low plasticity; 80% silt; 10% lean clay; 10% very coarse sand.		- Bentonite Seal	
60								

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Project Number: 140705

Date Started: 1/23/2011 Date TD Reached: 1/23/2011 Date Completed: 2/5/2011

Y Coordinate: 1474070.68

Ground Elevation AMSL (ft): 5351.1

Client: US Army Corps of Engineers Project Location: KAFB, Albuquerque, NM

Project Name: KAFB BFF SWMU ST-106 and SS-111

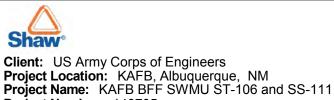
Borehole ID: KAFB-106135

Hole Diameter Upper (in.): 11-3/4 Hole Diameter Lower (in.): 9-5/8 Surface Completion Type: Flush mount

Groundwater Levels BGS (ft): \square At Time of Drilling: N/A \blacksquare At End of Drilling: N/A ▼ After Drilling: N/A

Drilling Contractor: WDC Drilling Drilling Method: Air Rotary Casing Hammer

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පී Depth (ft)	Sample Type	Number	Headspace PID	Lithologic Log	Material Description	U.S.C.S.	Well Diagram	Remarks
-	-				SILT with Sand (ML); brown (7.5YR 5/4) dry; very soft; low plasticity; 80% silt; 15% very fine sand; 5% fine gravel to 4mm.	,		
 					Same as above (60 ft).			
	-				Same as above (60 ft); trace clay nodules.			
 	-				Same as above (60 ft); no gravel.	ML	- Bentonite Seal	
- 80 - -	-				Sandy SILT (ML); strong brown (7.5YR 4/6); dry; soft; low plasticity; 60% silt; 30% medium sand; 10% fine gravel to 5mm.			
85 - -					Sandy SILT (ML); strong brown (7.5YR 4/6); dry; soft; low plasticity; 60% silt; trace clay nodules; 40% fine sand to 0.1mm.			
90								



Project Number: 140705

Date Started: 1/23/2011

Date TD Reached: 1/23/2011 Date Completed: 2/5/2011

Ground Elevation AMSL (ft): 5351.1

Borehole ID: KAFB-106135

Hole Diameter Upper (in.): 11-3/4 Hole Diameter Lower (in.): 9-5/8 Surface Completion Type: Flush mount

Groundwater Levels BGS (ft): \bigtriangledown At Time of Drilling: N/A At End of Drilling: N/A ▼ After Drilling: N/A

Drilling Contractor: WDC Drilling Drilling Method: Air Rotary Casing Hammer

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ଓ Depth (ft)	Sample Type	Number	Headspace PID	Lithologic Log	Material Description		U.S.C.S.	We	ell Diagram	Remarks
-					Sandy SILT (ML); brown (7.5YR a dry; soft; low plasticity; 60% silt; 4 fine sand to 0.1mm.					
95					Same as above (90 ft); 60% silt; very fine sand.	40%				
<u>100</u> - -					SILT with Sand (ML); brown (7.5' dry; soft; medium plasticity; 70% 15% clay; 15% very fine sand to 0.07mm.	YR 5/4); silt;				
<u>105</u> - -					Same as above (100 ft); 70% silt clay; 15% very fine sand.	; 10%	ML		- Bentonite Seal	
<u>110</u> - -					Sandy SILT (ML); brown (7.5YR dry; soft; low plasticity; 70% silt; 3 very fine to medium sand to 0.4m trace clay nodules.	30%				
<u>115</u> - - -					Same as above (110 ft).					
120										



Date Started: 1/23/2011 Date TD Reached: 1/23/2011 Date Completed: 2/5/2011

Ground Elevation AMSL (ft): 5351.1 Y Coordinate: 1474070.68 X Coordinate: 1542905.14

Borehole ID: KAFB-106135

Hole Diameter Upper (in.): 11-3/4 Hole Diameter Lower (in.): 9-5/8 Surface Completion Type: Flush mount

Groundwater Levels BGS (ft): \square At Time of Drilling: N/A \blacksquare At End of Drilling: N/A \blacksquare After Drilling: N/A

Drilling Contractor: WDC Drilling Drilling Method: Air Rotary Casing Hammer Logged By: Jason Tarbert

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05 Depth (ft)	Sample Type	Number	Headspace PID	Lithologic Log	Material Description	U.S.C.S.	We	ell Diagram	Remarks
-	-				SILT (ML); brown (7.5YR 5/4); dry; soft; medium plasticity; 80% silt; 10% clay; 10% very fine sand to 0.06mm.				Pulled drill string and began installing 9-5/8" casing @ 0930.
125	-				SILT with Sand (ML); brown (7.5YR 4/4); moist; soft; low plasticity; 70% silt; 5% clay; 25% very fine sand.	ML		- Bentonite Seal	Began drilling 9-5/8" casing @ 1110.
<u>130</u>	-				Same as above (125 ft); trace fine gravel to 8mm.				
135	-				Silty SAND (SM); brown (7.5YR 4/4); dry; very loose; 80% fine sand to 0.1mm; rounded; 20% silt.				
- 140 - -	-				Same as above (135 ft); trace medium sand.	SM		- Top of Filter Pack - Top of 3/4" Schedule 80 PVC 0.050 Slot Screen	
145	-				Sandy SILT (ML); brown (7.5YR 5/4); dry; very soft; 70% silt; 30% very fine to fine sand to 0.2mm.				
150									



Borehole ID: KAFB-106135

Client: US Army Corps of Engineers Project Location: KAFB, Albuquerque, NM Project Name: KAFB BFF SWMU ST-106 and SS-111 Project Number: 140705

Date Started: 1/23/2011 Date TD Reached: 1/23/2011 Date Completed: 2/5/2011

Ground Elevation AMSL (ft): 5351.1 Y Coordinate: 1474070.68 X Coordinate: 1542905.14 Hole Diameter Upper (in.): 11-3/4 Hole Diameter Lower (in.): 9-5/8 Surface Completion Type: Flush mount

Groundwater Levels BGS (ft): \Box At Time of Drilling: N/A \blacksquare At End of Drilling: N/A \blacksquare After Drilling: N/A

Drilling Contractor: WDC Drilling Drilling Method: Air Rotary Casing Hammer Logged By: Jason Tarbert

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15 Depth (ft)	Sample Type	Number	Headspace PID	Lithologic Log	Material Description	U.S.C.S.	Well Diagram	Remarks
	-				Sandy SILT (ML); brown (7.5YR 5/4); dry; very soft; 70% silt; 30% very fine to fine sand to 0.2mm.		Screen	
155	-				Same as above (150 ft); brown (7.5YR 4/3).			
<u>160</u>	-				Same as above (150 ft); moist; trace fine gravel to 4mm.	ML		
165	-				Sandy SILT (ML); brown (7.5YR 5/4); dry; very soft; low plasticity; 60% silt; 30% fine sand; 10% medium sand; trace fine gravel to 5mm.		- Bentonite Seal	
170								
	-				Poorly graded SAND (SP); brown (10YR 4/3); dry; very loose; 80% medium sand; 15% fine sand; 5% coarse sand; trace gravel to 1cm; subrounded.	SP		
175	-				Well graded SAND (SW); brown (10YR 4/3); dry; very loose; 85% very fine to very coarse sand; 10% fine gravel to 1.6cm; subrounded; 5% silt.	sw		
180	$\left \right $							



Date Started: 1/23/2011 Date TD Reached: 1/23/2011 Date Completed: 2/5/2011

Ground Elevation AMSL (ft): 5351.1 Y Coordinate: 1474070.68 X Coordinate: 1542905.14

Borehole ID: KAFB-106135

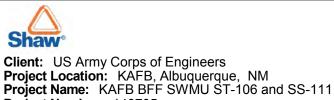
Hole Diameter Upper (in.): 11-3/4 Hole Diameter Lower (in.): 9-5/8 Surface Completion Type: Flush mount

Groundwater Levels BGS (ft): \Box At Time of Drilling: N/A \mathbf{I} At End of Drilling: N/A \mathbf{I} After Drilling: N/A

Drilling Contractor: WDC Drilling Drilling Method: Air Rotary Casing Hammer Logged By: Jason Tarbert

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08 Depth (ft)	Sample Type	Number	Headspace PID	Lithologic Log	Material Description	U.S.C.S.	Well I	Diagram	Remarks
185	-				Lean Clay (CL); brown (10YR 5/3); damp; soft; high plasticity; 60% clay; 30% silt; 10% fine sand to 0.08mm.	CL			
185	-				Well graded SAND with Silt (SW-SM); grayish brown (10YR 5/2); dry; very loose; 80% very fine to coarse sand; 5% very fine gravel to 5mm; subrounded; 10% silt.	SW- SM			
195	-				Silty SAND (SM); yellowish brown (10YR 5/4); moist; very loose; 75% very fine to very coarse sand; 10% fine gravel to 4mm; rounded; 15% silt; trace clay nodules.	SM	E	3entonite Seal	
200	-				Well graded SAND with Silt (SW-SM); brown (10YR 5/3); dry; very loose; 90% very fine to coarse sand; trace fine gravel to 1cm; rounded; 10% silt.	SW- SM			
-	-				Well graded SAND (SW); brown (10YR 4/3); dry; very loose; 95% very fine to coarse sand; trace gravel to 8mm; subangular; 5% silt.	sw			
205					Poorly graded SAND (SP); brown (10YR 5/3); dry; very loose; 95% medium sand to 0.4mm; subrounded; 5% silt.	SP		Native Backfill Bentonite Seal	
210									



Project Number: 140705

Date Started: 1/23/2011

Date TD Reached: 1/23/2011 Date Completed: 2/5/2011

Ground Elevation AMSL (ft): 5351.1

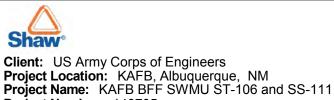
Borehole ID: KAFB-106135

Hole Diameter Upper (in.): 11-3/4 Hole Diameter Lower (in.): 9-5/8 Surface Completion Type: Flush mount

Groundwater Levels BGS (ft): \bigtriangledown At Time of Drilling: N/A At End of Drilling: N/A ▼ After Drilling: N/A

Drilling Contractor: WDC Drilling Drilling Method: Air Rotary Casing Hammer

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0 Depth (ft)	Sample Type	Number	Headspace PID Lithologic Log	Material Description	U.S.C.S.		Well Diagram	Remarks
215	-			Well graded SAND (SW); brown (4/3); moist; loose; 95% very fine to coarse sand; trace gravel to 8mm; subangular; 5% silt.)	/		
-	-		<u>* * * * * *</u>	Sandy SILT (ML); brown (10YR 5/3 moist; soft; low plasticity; 60% silt; very fine sand to 0.08mm.	3); 40% ML			
<u>220</u> - -				Well graded SAND (SW); brown (7 5/3); moist; loose; 90% very fine to coarse sand; 10% fine gravel to 10 subrounded.	very		- Bentonite Seal	
<u>225</u> - -	-			Same as above (220 ft); 15% grav 3cm.	el to			
<u>230</u> - -	-			Same as above (220 ft).	SM	/		
_ 235 _ _ _				Same as above (220 ft).			Top of Filter	
_ 240	-						Pack	



Project Number: 140705

Date Started: 1/23/2011

Date TD Reached: 1/23/2011 Date Completed: 2/5/2011

Y Coordinate: 1474070.68

Ground Elevation AMSL (ft): 5351.1

Borehole ID: KAFB-106135

Hole Diameter Upper (in.): 11-3/4 Hole Diameter Lower (in.): 9-5/8 Surface Completion Type: Flush mount

Groundwater Levels BGS (ft): \square At Time of Drilling: N/A \blacksquare At End of Drilling: N/A \blacksquare After Drilling: N/A

Drilling Contractor: WDC Drilling Drilling Method: Air Rotary Casing Hammer Logged By: Jason Tarbert

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X Coordina	ite: 154290		d By:	lason Tarbert	Page 9 of 16
05 Depth (ft) Sample Type Number	Headspace PID Lithologic Log	Material Description	U.S.C.S.	Well Diagram	Remarks
-		Well graded SAND (SW); brown (10YR 5/3); moist; loose; 90% very fine to very coarse sand; 10% fine gravel to 1cm; subrounded.		Top of 3/4" Schedule 80 PVC 0.050 Slot Screen	
245		Same as above (240 ft).			
250		Same as above (240 ft).		- Bottom of Screen	
255		Same as above (240 ft).	sw		
260		Same as above (240 ft).		- Bentonite Seal	
265		Same as above (240 ft).			
270					



Borehole ID: KAFB-106135

Client: US Army Corps of Engineers Project Location: KAFB, Albuquerque, NM Project Name: KAFB BFF SWMU ST-106 and SS-111 Project Number: 140705

Date Started: 1/23/2011 Date TD Reached: 1/23/2011 Date Completed: 2/5/2011

Ground Elevation AMSL (ft): 5351.1 Y Coordinate: 1474070.68 X Coordinate: 1542905.14 Hole Diameter Upper (in.): 11-3/4 Hole Diameter Lower (in.): 9-5/8 Surface Completion Type: Flush mount

Groundwater Levels BGS (ft): \square At Time of Drilling: N/A \blacksquare At End of Drilling: N/A \blacksquare After Drilling: N/A

Drilling Contractor: WDC Drilling Drilling Method: Air Rotary Casing Hammer Logged By: Jason Tarbert

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5 Depth (ft)	Sample Type	Number	Headspace PID	Lithologic Log	Material Description	U.S.C.S.	Well Diagram	Remarks
275	-				Lean Clay (CL); brown (10YR 5/3); moist; soft; low plasticity; 90% clay; 10% silt to 0.01mm.	CL		
- - -	-				Well graded SAND with Silt (SW-SM); grayish brown (10YR 5/2); moist; loose; 90% very fine to very coarse sand; trace gravel to 4mm; subrounded; 10% silt.			
<u>280</u> - - -	-				Same as above (275 ft).	SW- SM		
<u>285</u> - - -	-				Poorly graded SAND (SP); yellowish brown (10YR 5/4); moist; loose; 95% very fine sand to 0.04mm; rounded; 5% silt.		- Bentonite Seal	
<u>290</u> - - -	-				Poorly graded SAND (SP); dark yellowish brown (10YR 4/4); dry; very loose; 70% medium sand; 30% fine sand; trace fine gravel to 5mm; rounded; trace fines.	SP		
<u>295</u> - - -	-				Well graded SAND (SW); brown (10YR 4/3); moist; very loose; 100% very fine to very coarse sand; trace fine gravel to 8mm; subrounded; trace fines.	sw		
300								



Date Started: 1/23/2011 Date TD Reached: 1/23/2011 Date Completed: 2/5/2011

Ground Elevation AMSL (ft): 5351.1 Y Coordinate: 1474070.68 X Coordinate: 1542905.14

Borehole ID: KAFB-106135

Hole Diameter Upper (in.): 11-3/4 Hole Diameter Lower (in.): 9-5/8 Surface Completion Type: Flush mount

Groundwater Levels BGS (ft): \Box At Time of Drilling: N/A \blacksquare At End of Drilling: N/A \blacksquare After Drilling: N/A

Drilling Contractor: WDC Drilling Drilling Method: Air Rotary Casing Hammer Logged By: Jason Tarbert

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00 Depth (ft)	Sample Type	Number	Headspace PID	Lithologic Log	Material Description	U.S.C.S.	Well Diagram	Remarks
-	-				Silty SAND (SM); brown (10YR 4/3); damp; loose; 70% fine sand to 0.08mm; subrounded; 20% silt; 10% clay.	SM		
<u>305</u> - -					Lean CLAY (CL); brown (10YR 5/3); moist; soft; medium plasticity; 70% clay; 30% silt to 0.01mm.	CL		
<u>310</u> - -	-				Poorly graded SAND (SP); brown (10YR 4/3); dry; very loose; 90% medium sand; 10% coarse sand to 3mm; subrounded.			
- 315 -	-				Same as above (310 ft); trace clay nodules.		- Bentonite Seal	
- <u>320</u> - -	-				Same as above (310 ft); moist; 5% gravel to 6mm.	SP		
- <u>325</u> - -	-				Same as above (310 ft); 90% coarse sand; gravel to 1.4cm.			
- 330	-							

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Date Started: 1/23/2011 Date TD Reached: 1/23/2011 Date Completed: 2/5/2011

Ground Elevation AMSL (ft): 5351.1 Y Coordinate: 1474070.68 X Coordinate: 1542905.14

Borehole ID: KAFB-106135

Hole Diameter Upper (in.): 11-3/4 Hole Diameter Lower (in.): 9-5/8 Surface Completion Type: Flush mount

Groundwater Levels BGS (ft): \square At Time of Drilling: N/A \blacksquare At End of Drilling: N/A \blacksquare After Drilling: N/A

Drilling Contractor: WDC Drilling Drilling Method: Air Rotary Casing Hammer Logged By: Jason Tarbert

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05 Depth (ft)	Sample Type	Number	Headspace PID	Lithologic Log	Material Description	U.S.C.S.	Well Diagram	Remarks
-	-				Poorly graded SAND (SP); brown (10YR 4/3); dry; very loose; 90% medium sand; 10% coarse sand to 3mm; subrounded.		- Bentonite Seal	
<u>335</u> - -	-				Poorly graded SAND with Gravel (SP); dark yellowish brown (10YR 4/4); moist; loose; 80% fine sand; 15% fine gravel to 7mm; subangular; 5% fines.	SP	Top of Filter	
<u>340</u> -	-				Poorly graded SAND (SP); dark yellowish brown (10YR 4/4); dry; very loose; 90% coarse sand; 10% fine gravel to 8mm; subrounded.		- Top of 3/4" Schedule 80 PVC 0.050 Slot Screen	
- <u>345</u> -	-				Poorly graded GRAVEL with Sand (GP); yellowish brown (10YR 5/4); dry; loose; \ 80% fine to medium gravel to 3.5cm; / well rounded; 20% medium to coarse / sand. Poorly graded SAND (SP); dark yellowish brown (10YR 4/4); damp;	GP SP		Driller added ~10 gallons H2O.
- 350_ -	-				loose; 100% coarse sand to 2mm; rounded; trace fines. No cuttings returned.		- Bottom of Screen	
- 355_ -	-				Poorly graded SAND (SP); dark yellowish brown (10YR 4/4); damp; loose; 100% coarse sand to 2mm;		- - Bentonite Seal	
- - 360	-				rounded; trace gravel to 9mm; trace fines;	SP		

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Date Started: 1/23/2011 Date TD Reached: 1/23/2011 Date Completed: 2/5/2011

Ground Elevation AMSL (ft): 5351.1 Y Coordinate: 1474070.68 X Coordinate: 1542905.14

Borehole ID: KAFB-106135

Hole Diameter Upper (in.): 11-3/4 Hole Diameter Lower (in.): 9-5/8 Surface Completion Type: Flush mount

Groundwater Levels BGS (ft): \square At Time of Drilling: N/A \blacksquare At End of Drilling: N/A \blacksquare After Drilling: N/A

Drilling Contractor: WDC Drilling Drilling Method: Air Rotary Casing Hammer Logged By: Jason Tarbert

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90 Depth (ft)	Sample Type	Number	Headspace PID	Lithologic Log	Material Description	U.S.C.S.	Well Diagram	Remarks
365	-				Poorly graded SAND (SP); dark yellowish brown (10YR 4/4); damp; loose; 100% coarse sand to 2mm; rounded; trace fines. Same as above (360 ft); 100% medium	SP		
370	- - - - - - -				Well graded SAND with Gravel (SW); dark yellowish brown (10YR 4/4); moist;			
375	- - 5				very loose; 85% very fine to coarse sand; 15% fine gravel to 5mm; well rounded. Well graded SAND (SW); dark yellowish brown (10YR 4/4); moist; very loose; 95% very fine to coarse sand; 5% fine		- Bentonite Seal	
380	- - - - - -				gravel to 5mm; well rounded. Same as above (375 ft).	SW		Driller added ~10 gallons H2O.
385	- 5 - -				Poorly graded SAND with Gravel (SP); dark yellowish brown (10YR 4/4); dry; loose; 85% medium sand; 15% fine gravel to 2cm; subrounded.	 SP		
390	5							



Date Started: 1/23/2011 Date TD Reached: 1/23/2011 Date Completed: 2/5/2011

Ground Elevation AMSL (ft): 5351.1 Y Coordinate: 1474070.68 X Coordinate: 1542905.14

Borehole ID: KAFB-106135

Hole Diameter Upper (in.): 11-3/4 Hole Diameter Lower (in.): 9-5/8 Surface Completion Type: Flush mount

Groundwater Levels BGS (ft): \square At Time of Drilling: N/A \blacksquare At End of Drilling: N/A \blacksquare After Drilling: N/A

Drilling Contractor: WDC Drilling Drilling Method: Air Rotary Casing Hammer Logged By: Jason Tarbert

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66 Depth (ft)	Sample Type	Number	Headspace PID	Lithologic Log	Material Description	U.S.C.S.	Well Diagram	Remarks
	-				Poorly graded SAND (SP); dark yellowish brown (10YR 4/4); damp; loose; 95% coarse to very coarse sand; 5% fine gravel to 1.6cm; rounded.			
395	-				Same as above (390 ft); no gravel.			Driller added ~10 gallons H2O.
400	-				Same as above (390 ft); no gravel.	SP		
405	-				As above (390 ft); 95% medium sand; 5% coarse sand; no gravel.		- Bentonite Seal	
<u>410</u>	-				As above (390 ft); 95% medium sand; 5% coarse sand; no gravel.			
<u>415</u> 420	-				Well graded SAND (SW); dark yellowish brown (10YR 4/4); damp; very loose; 100% fine to very coarse sand to 3mm; subangular; trace fines.	sw		

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Date Started: 1/23/2011 Date TD Reached: 1/23/2011 Date Completed: 2/5/2011

Ground Elevation AMSL (ft): 5351.1 Y Coordinate: 1474070.68 X Coordinate: 1542905.14

Borehole ID: KAFB-106135

Hole Diameter Upper (in.): 11-3/4 Hole Diameter Lower (in.): 9-5/8 Surface Completion Type: Flush mount

Groundwater Levels BGS (ft): \square At Time of Drilling: N/A \blacksquare At End of Drilling: N/A \blacksquare After Drilling: N/A

Drilling Contractor: WDC Drilling Drilling Method: Air Rotary Casing Hammer Logged By: Jason Tarbert

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55 Depth (ft)			Number	Headspace PID	Lithologic Log	Material Description	U.S.C.S.	We	ell Diagram	Remarks
42	-					Well graded SAND (SW); dark yellowish brown (10YR 4/4); damp; very loose; 100% fine to very coarse sand to 3mm; subangular; trace fines.	sw			
	-					Poorly graded SAND (SP); yellowish brown (10YR 5/4); moist; very loose; 100% medium sand; trace gravel to 8mm.			- Bentonite Seal	Driller added ~10 gallons H2O.
430						Same as above (425 ft); 5% fine gravel to 1 cm.				
<u>43</u>	5					Same as above (425 ft); 100% coarse sand; trace clay nodules.	SP		- Top of Filter Pack	
44(2 - -					Same as above (425 ft); no gravel.			- Top of 3" Schedule 80 PVC 0.050 Slot Screen	
44	5					Same as above (425 ft); no gravel.				
45	_ _ 0								· · ·	



Date Started: 1/23/2011 Date TD Reached: 1/23/2011 Date Completed: 2/5/2011

Ground Elevation AMSL (ft): 5351.1 Y Coordinate: 1474070.68 X Coordinate: 1542905.14

Borehole ID: KAFB-106135

Hole Diameter Upper (in.): 11-3/4 Hole Diameter Lower (in.): 9-5/8 Surface Completion Type: Flush mount

Groundwater Levels BGS (ft): \square At Time of Drilling: N/A \blacksquare At End of Drilling: N/A \blacksquare After Drilling: N/A

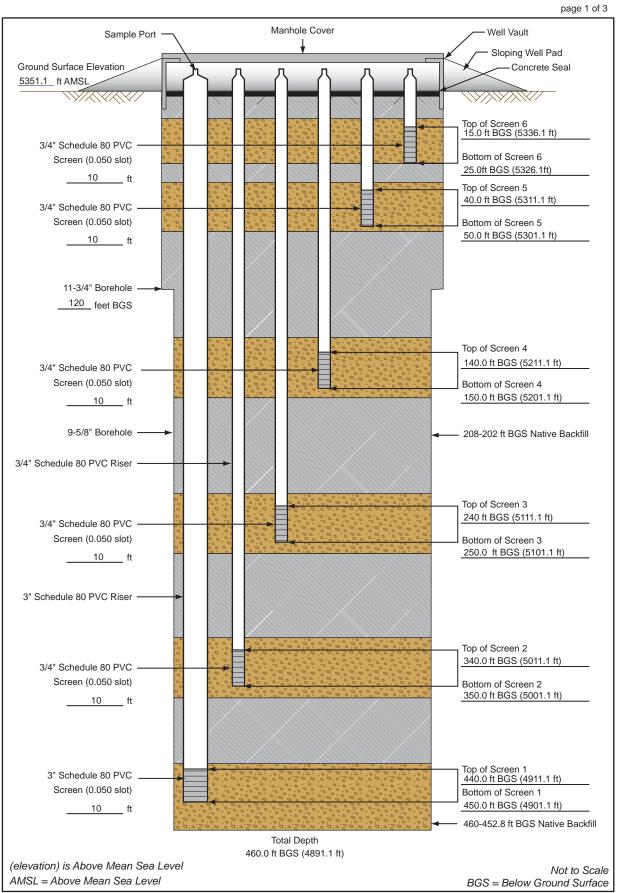
Drilling Contractor: WDC Drilling Drilling Method: Air Rotary Casing Hammer Logged By: Jason Tarbert

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05 Depth (ft)	Sample Type	Number	Headspace PID	Lithologic Log	Material Description	U.S.C.S.	Well Diagram	Remarks
455					Poorly graded SAND (SP); yellowish brown (10YR 5/4); moist; very loose; 100% medium sand; no gravel. Poorly graded SAND (SP); yellowish brown (10YR 5/4); moist; very loose; 85% medium sand; 10% coarse sand to 1.2mm; subrounded; 5% fines.	SP	Bottom of Screen	
460	-			* * * * * * * * * * * * * * * * * * *	very fine to very coarse sand; 5% fine gravel to 4mm; subangular. Poorly graded SAND (SP); yellowish brown (10YR 5/4); dry; very loose; 90% medium sand to 0.7mm; 10% fine sand; subangular.	SP		Total depth = 460 ft. Reached @ 1550 on 1/23/11.
465	-							Water added during drilling (gallons) = 40 Water added during construction (gallons) =
470	-							Not Recorded
475	-							
480								

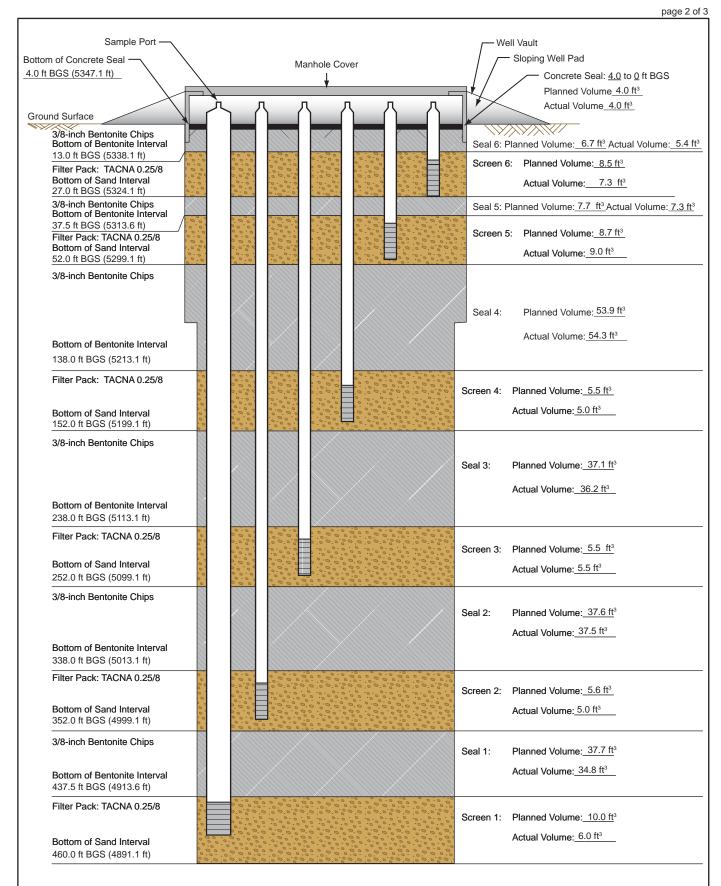
Nested Soil Vapor Well Completion Diagram for KAFB-106135

Installation Start Date/Time: 2/3/2011 @ 12:30 Installation End Date/Time: 2/5/2011 @ 16:45



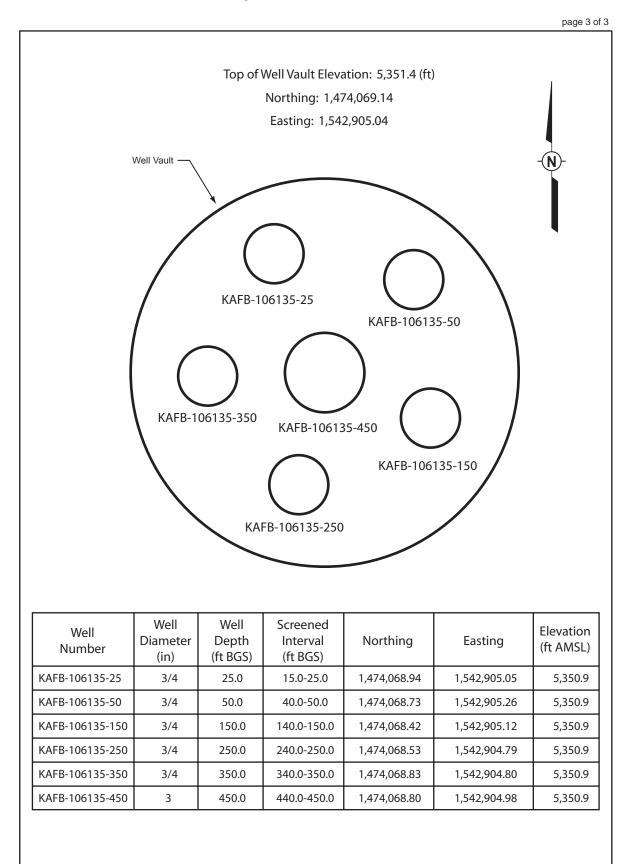
140705_CA010020_SV_KAFB.106135 (a)

Nested Soil Vapor Well Completion Diagram for KAFB-106135



(elevation) is Above Mean Sea Level All Materials Placed with Tremie Pipe Not to Scale BGS = Below Ground Surface

Nested Soil Vapor Well Completion Diagram Map View for KAFB-106135



140705_CA010020_SV_Map View_106135

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APPENDIX D-1

KAFB-106137 Final Well Report

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Date Started: 1/18/2011 Date TD Reached: 1/19/2011 Date Completed: 1/25/2011

Ground Elevation AMSL (ft): 5347.3 Y Coordinate: 1474079.39 X Coordinate: 1542321.46

Borehole ID: KAFB-106137

Hole Diameter Upper (in.): 11-3/4 Hole Diameter Lower (in.): 9-5/8 Surface Completion Type: Flush mount

Groundwater Levels BGS (ft): \square At Time of Drilling: N/A \blacksquare At End of Drilling: N/A \blacksquare After Drilling: N/A

Drilling Contractor: WDC Drilling Drilling Method: Air Rotary Casing Hammer Logged By: Jason Tarbert

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o Depth (ft)	Sample Type	Number	Headspace PID	Lithologic Log	Material Description	U.S.C.S.	Well Diagram	Remarks
5	-				No description recorded.		- Concrete Seal	Hand augered. ***Note: no headspace requirement at this location***
-	-				SILT with Sand (ML); brown (7.5YR 5/4); dry; very soft; low plasticity; 80% silt; 15% fine sand; 5% fine gravel to 1.4cm.		- Bentonite Seal	Began drilling @ 1212 on 1/18/11.
10	-				Same as above (5 ft).		Top of Filter Pack	
<u>15</u>	-				Same as above (5 ft); 7% gravel.	ML	- Top of 3/4" Schedule 80 PVC 0.050 Slot Screen	
20	-				Same as above (15 ft).			
25	-				Same as above (15 ft).		- Bottom of Screen - Bentonite Seal	
30								



Date Started: 1/18/2011 Date TD Reached: 1/19/2011 Date Completed: 1/25/2011

Ground Elevation AMSL (ft): 5347.3 Y Coordinate: 1474079.39 X Coordinate: 1542321.46

Borehole ID: KAFB-106137

Hole Diameter Upper (in.): 11-3/4 Hole Diameter Lower (in.): 9-5/8 Surface Completion Type: Flush mount

Groundwater Levels BGS (ft): \square At Time of Drilling: N/A \blacksquare At End of Drilling: N/A \blacksquare After Drilling: N/A

Drilling Contractor: WDC Drilling Drilling Method: Air Rotary Casing Hammer Logged By: Jason Tarbert

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ତ Depth (ft)	Sample Type	Number	Headspace PID	Lithologic Log	Material Description	U.S.C.S.	Well Diagram	Remarks
	-				SILT with Sand (ML); brown (7.5YR 4/4); dry; very soft; low plasticity; 85% silt; 10% very fine sand; 5% coarse sand to 4mm.		- Bentonite Seal	
35	-				Same as above (30 ft); no coarse sand; trace fine gravel to 1.5cm; trace clay nodules.		Top of Filter	
40	-				Same as above (30 ft).		- Top of 3/4" Schedule 80 PVC 0.050 Slot Screen	
45	-				Same as above (30 ft).	ML		
50	-				Gravelly SILT (ML); brown (7.5YR 5/4); dry; very soft; nonplastic; 70% silt; 30% fine gravel to 1.2 cm.		- Bottom of Screen	
55					Same as above (50 ft).		- Bentonite Seal	
60	-							



Date Started: 1/18/2011 Date TD Reached: 1/19/2011 Date Completed: 1/25/2011

Ground Elevation AMSL (ft): 5347.3 Y Coordinate: 1474079.39 X Coordinate: 1542321.46

Borehole ID: KAFB-106137

Hole Diameter Upper (in.): 11-3/4 Hole Diameter Lower (in.): 9-5/8 Surface Completion Type: Flush mount

Groundwater Levels BGS (ft): \square At Time of Drilling: N/A \blacksquare At End of Drilling: N/A \blacksquare After Drilling: N/A

Drilling Contractor: WDC Drilling Drilling Method: Air Rotary Casing Hammer Logged By: Jason Tarbert

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9 Depth (ft)	Sample Type	Number	Headspace PID	Lithologic Log	Material Description	U.S.C.S.	Well Diagram	Remarks
	-				SILT with Sand (ML); brown (7.5YR 4/4); dry; very soft; low plasticity; 85% silt; 10% very fine sand; 5% coarse sand to 4mm.			
65	-				Same as above (60 ft).			
70					Same as above (60 ft); trace fine gravel to 8 mm.			
75	-				Same as above (60 ft); 80% silt; 10% very fine sand; 10% coarse sand; trace gravel to 9mm.	ML	- Bentonite Seal	
80					SILT (ML); brown (7.5YR 4/4); dry; soft; medium plasticity; 80% silt; 15% clay; 5% very fine sand; trace coarse sand to 2mm.			
85					SILT with Sand (ML); brown (7.5YR 5/4); dry; very soft; low plasticity; 70% silt; 5% clay nodules; 15% very fine sand; 10% coarse sand to 3mm.			
90								



Date Started: 1/18/2011 Date TD Reached: 1/19/2011 Date Completed: 1/25/2011

Ground Elevation AMSL (ft): 5347.3 Y Coordinate: 1474079.39 X Coordinate: 1542321.46

Borehole ID: KAFB-106137

Hole Diameter Upper (in.): 11-3/4 Hole Diameter Lower (in.): 9-5/8 Surface Completion Type: Flush mount

Groundwater Levels BGS (ft): \Box At Time of Drilling: N/A \blacksquare At End of Drilling: N/A \blacksquare After Drilling: N/A

Drilling Contractor: WDC Drilling Drilling Method: Air Rotary Casing Hammer Logged By: Jason Tarbert

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g Depth (ft)	Sample Type	Number	Headspace PID	Lithologic Log	Material Description	U.S.C.S.	Well Diagram	Remarks
	-				SILT with Sand (ML); brown (7.5YR 5/4); dry; very soft; low plasticity; 75% silt; 15% very fine sand; 10% coarse sand to 3mm.		- Bentonite Seal	
95	-				Same as above (90 ft).	ML		
100	-				SILT with Sand (ML); brown (7.5YR 4/4); moist; soft; medium plasticity; 65% silt; 10% clay; 20% very fine sand; 5% coarse sand to 3mm.			
105	-				Poorly graded SAND (SP); brown (10YR 5/3); dry; very loose; 90% medium sand; 5% coarse sand to 2mm; subangular; 5% fine sand.		Native Backfill	
<u>110</u>	-				Same as above (105 ft); trace gravel to 1.7cm.	SP		
<u>115</u>	-				Sandy SILT (ML); brown (7.5YR 4/4); dry; very soft; low plasticity; 70% silt; 25% fine sand; 5% coarse sand to 5mm.	 ML	- Bentonite Seal	
120								



Date Started: 1/18/2011 Date TD Reached: 1/19/2011 Date Completed: 1/25/2011

Ground Elevation AMSL (ft): 5347.3 Y Coordinate: 1474079.39 X Coordinate: 1542321.46

Borehole ID: KAFB-106137

Hole Diameter Upper (in.): 11-3/4 Hole Diameter Lower (in.): 9-5/8 Surface Completion Type: Flush mount

Groundwater Levels BGS (ft): \square At Time of Drilling: N/A \blacksquare At End of Drilling: N/A \blacksquare After Drilling: N/A

Drilling Contractor: WDC Drilling Drilling Method: Air Rotary Casing Hammer Logged By: Jason Tarbert

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PID Lithologic Lithologic Log	Material Description SILT with Sand (ML); brown (7.5YR 5/4); moist; soft; medium plasticity; 60% silt; 20% clay; 15% very fine sand; 5% coarse sand to 5mm. Silty SAND (SM); brown (7.5YR 5/4); moist; loose; 60% very fine sand to 0.04mm; rounded; 40% silt; trace clay nodules. Sandy SILT (ML); brown (7.5YR 4/4); moist; soft; low plasticity; 70% silt; 20% very fine sand; 10% medium sand; trace coarse sand to 4mm.	ML SM		ell Diagram	Remarks Reached 120' with 11-3/4" casing @1346. Began drilling on 1/19/11 @ 1000.
	moist; soft; medium plasticity; 60% silt; 20% clay; 15% very fine sand; 5% coarse sand to 5mm. Silty SAND (SM); brown (7.5YR 5/4); moist; loose; 60% very fine sand to 0.04mm; rounded; 40% silt; trace clay nodules. Sandy SILT (ML); brown (7.5YR 4/4); moist; soft; low plasticity; 70% silt; 20% very fine sand; 10% medium sand; trace			- Bentonite Seal	11-3/4" casing @1346. Began drilling on 1/19/11
	moist; loose; 60% very fine sand to 0.04mm; rounded; 40% silt; trace clay nodules. Sandy SILT (ML); brown (7.5YR 4/4); moist; soft; low plasticity; 70% silt; 20% very fine sand; 10% medium sand; trace	SM		- Bentonite Seal	
	moist; soft; low plasticity; 70% silt; 20% very fine sand; 10% medium sand; trace				
		ML			
	Well graded SAND (SW); brown (10YR 5/3); dry; very loose; 100% very fine to coarse sand to 5mm; subangular.	sw		- Top of Filter Pack	
<u>******</u> .	SILT (ML); pale brown (10YR 6/3); moist; firm; medium plasticity; 60% silt; 35% clay; 5% very fine sand to 0.04mm.			- Top of 3/4" Schedule 80 PVC 0.050 Slot Screen	
	SILT with Sand (ML); yellowish brown (10YR 5/4); dry; very soft; low plasticity; 85% silt; 10% very fine sand; 5% coarse sand to 3mm.	ML			
		SILT (ML); pale brown (10YR 6/3); moist; firm; medium plasticity; 60% silt; 35% clay; 5% very fine sand to 0.04mm. SILT with Sand (ML); yellowish brown (10YR 5/4); dry; very soft; low plasticity; 85% silt; 10% very fine sand; 5% coarse	SILT (ML); pale brown (10YR 6/3); SW SILT (ML); pale brown (10YR 6/3); SW SILT (ML); pale brown (10YR 6/3); ML SILT with Sand (ML); yellowish brown ML (10YR 5/4); dry; very soft; low plasticity; ML 85% silt; 10% very fine sand; 5% coarse ML	SILT (ML); pale brown (10YR 6/3); moist; firm; medium plasticity; 60% silt; 35% clay; 5% very fine sand to 0.04mm. ML SILT with Sand (ML); yellowish brown (10YR 5/4); dry; very soft; low plasticity; 85% silt; 10% very fine sand; 5% coarse ML	coarse sand to 5mm; subangular. SW SILT (ML); pale brown (10YR 6/3); moist; firm; medium plasticity; 60% silt; 35% clay; 5% very fine sand to 0.04mm. - Top of 3/4" Schedule 80 PVC 0.050 Slot Screen SILT with Sand (ML); yellowish brown (10YR 5/4); dry; very soft; low plasticity; 85% silt; 10% very fine sand; 5% coarse ML



Date Started: 1/18/2011 Date TD Reached: 1/19/2011 Date Completed: 1/25/2011

Ground Elevation AMSL (ft): 5347.3 Y Coordinate: 1474079.39 X Coordinate: 1542321.46

Borehole ID: KAFB-106137

Hole Diameter Upper (in.): 11-3/4 Hole Diameter Lower (in.): 9-5/8 Surface Completion Type: Flush mount

Groundwater Levels BGS (ft): \square At Time of Drilling: N/A \blacksquare At End of Drilling: N/A \blacksquare After Drilling: N/A

Drilling Contractor: WDC Drilling Drilling Method: Air Rotary Casing Hammer Logged By: Jason Tarbert

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05 Depth (ft)	Sample Type	Number	Headspace PID	Lithologic Log	Material Description	U.S.C.S.	Well Diagram	Remarks
	_				SILT with Sand (ML); yellowish brown (10YR 5/4); moist; very soft; low plasticity; 85% silt; 10% very fine sand; 5% coarse sand to 3mm.		Screen	
155	-				SILT (ML); brown (7.5YR 5/4); moist; soft; medium plasticity; 70% silt; 25% clay; 5% very fine sand to 0.04mm.	ML		
<u>160</u>	-				Silty SAND (SM); dark yellowish brown; dry; very loose; 80% medium sand to 0.4mm; subangular; 20% silt.	SM		
165	-				Well graded SAND with Silt (SW-SM); brown (10YR 5/3); moist; very loose; 80% fine to coarse sand; 10% fine gravel to 1cm; subrounded; 10% silt.	SW- SM	- Bentonite Seal	
<u>170</u>	-				Well graded SAND (SW); yellowish brown (10YR 5/4); dry; very loose; 90% fine to medium sand; 10% coarse sand to 2mm; subrounded.			
<u>175</u>					Same as above (170 ft); moist.	sw		
180								



Project Number: 140705

Date Started: 1/18/2011 Date TD Reached: 1/19/2011 Date Completed: 1/25/2011

Ground Elevation AMSL (ft): 5347.3

Project Name: KAFB BFF SWMU ST-106 and SS-111

Borehole ID: KAFB-106137

Hole Diameter Upper (in.): 11-3/4 Hole Diameter Lower (in.): 9-5/8 Surface Completion Type: Flush mount

Groundwater Levels BGS (ft): \square At Time of Drilling: N/A \blacksquare At End of Drilling: N/A ▼ After Drilling: N/A

Drilling Contractor: WDC Drilling Drilling Method: Air Rotary Casing Hammer

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08 Depth (ft)	Sample Type	Number	Headspace PID	Log	Material Description		U.S.C.S.	Well Diagram	Remarks
-					Well graded SAND (SW); yellowis brown (10YR 5/4); dry; very loose fine to medium sand; 10% coarse to 2mm; subrounded.	; 90%			
- 185 - -					Well graded SAND (SW); brown (5/3); moist; loose; 90% fine to me sand; 10% coarse sand to 2mm; rounded.	(10YR dium			
<u>190</u> -					Same as above (185 ft); 15% coa sand; trace fine gravel to 1.1cm.	rse	SW		
<u>195</u>					Same as above (185 ft).			- Bentonite Seal	
- 200 -	-				Same as above (185 ft).				
- 205 - -					Poorly graded SAND (SP); brown 4/3); moist; very loose; 70% medi sand; 20% fine sand; 10% coarse to 3mm; rounded.	um	SP		
_ 210									

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Date Started: 1/18/2011 Date TD Reached: 1/19/2011 Date Completed: 1/25/2011

Ground Elevation AMSL (ft): 5347.3 Y Coordinate: 1474079.39 X Coordinate: 1542321.46

Borehole ID: KAFB-106137

Hole Diameter Upper (in.): 11-3/4 Hole Diameter Lower (in.): 9-5/8 Surface Completion Type: Flush mount

Groundwater Levels BGS (ft): \Box At Time of Drilling: N/A \blacksquare At End of Drilling: N/A \blacksquare After Drilling: N/A

Drilling Contractor: WDC Drilling Drilling Method: Air Rotary Casing Hammer Logged By: Jason Tarbert

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Depth (ft)	Sample Type	Number	Headspace PID	Lithologic Log	Material Description	U.S.C.S.	Well Diagram	Remarks
	-				Poorly graded SAND (SP); brown (10YR 4/3); moist; very loose; 70% medium sand; 20% fine sand; 10% coarse sand to 3mm; rounded.			
215	-				Same as above (210 ft); dry; 70% medium sand; 30% very fine sand.	SP		
<u>220</u>	-				Same as above (210 ft).		- Bentonite Seal	
225	-				Well graded SAND (SW); grayish brown (10YR 5/2); moist; loose; 95% very fine to very coarse sand; 5% fine gravel to			
230	-				1.3cm; rounded. Same as above (225 ft); 10% fine gravel.			
235	-				Same as above (225 ft).	SW		
240	-						Pack	



Date Started: 1/18/2011 Date TD Reached: 1/19/2011 Date Completed: 1/25/2011

Ground Elevation AMSL (ft): 5347.3 Y Coordinate: 1474079.39 X Coordinate: 1542321.46

Borehole ID: KAFB-106137

Hole Diameter Upper (in.): 11-3/4 Hole Diameter Lower (in.): 9-5/8 Surface Completion Type: Flush mount

Groundwater Levels BGS (ft): \square At Time of Drilling: N/A \blacksquare At End of Drilling: N/A \square After Drilling: N/A

Drilling Contractor: WDC Drilling Drilling Method: Air Rotary Casing Hammer Logged By: Jason Tarbert

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Sample Type Headspace PID ithologic Log Depth (ft) Number *i* Ö Material Description Well Diagram Remarks ю. ⊃. 240 Top of 3/4" Well graded SAND (SW); grayish brown Schedule 80 (10YR 5/2); moist; loose; 95% very fine PVC 0.050 to very coarse sand; 5% fine gravel to Slot Screen 1.3cm; rounded; less coarse sand. 245 Well graded SAND (SW); grayish brown (10YR 5/2); moist; loose; 90% very fine to coarse sand; 10% fine gravel to 1.3cm; rounded. 250 SW Bottom of Well graded SAND with Gravel (SW); Screen dark yellowish brown (10YR 4/4); moist; loose; 85% fine to very coarse sand; 15% fine gravel to 2.3cm; well rounded. 255 Well graded SAND (SW); brown (10YR 4/3); moist; loose; 90% fine to very coarse sand; 5% fine gravel to 1.8cm; well rounded. 260 Bentonite Seal SILT (ML); brown (10YR 5/3); damp; soft; medium plasticity; 60% silt; 30% clay; 10% very fine sand; trace medium gravel to 3.5cm. ML 265 Silty SAND (SM); brown (10YR 5/3); moist; loose; 80% fine sand; 20% silt; trace fine gravel to 8mm; rounded; 20% silt. SM 270



Date Started: 1/18/2011 Date TD Reached: 1/19/2011 Date Completed: 1/25/2011

Ground Elevation AMSL (ft): 5347.3 Y Coordinate: 1474079.39 X Coordinate: 1542321.46

Borehole ID: KAFB-106137

Hole Diameter Upper (in.): 11-3/4 Hole Diameter Lower (in.): 9-5/8 Surface Completion Type: Flush mount

Groundwater Levels BGS (ft): \Box At Time of Drilling: N/A \mathbf{I} At End of Drilling: N/A \mathbf{I} After Drilling: N/A

Drilling Contractor: WDC Drilling Drilling Method: Air Rotary Casing Hammer Logged By: Jason Tarbert

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05 Depth (ft)	Sample Type	Number	Headspace PID	Lithologic	Material Description	U.S.C.S.	Well Diagram	Remarks
-	-				SILT (ML); brown (10YR 4/3); dry to moist; soft; medium plasticity; 60% silt; 40% clay.			
<u>275</u> - -	-				SILT (ML); yellowish brown (10YR 5/4); moist; soft; medium plasticity; 80% silt; 10% clay; 10% coarse sand to 1mm.	ML		
280 	-				SILT (ML); brown (10YR 4/3); dry to moist; soft; medium plasticity; 60% silt; 40% clay.			
-					Silty SAND (SM); dark yellowish brown (10YR 4/4); moist; very loose; 80% very	SM		
- 285 - - -	-				fine to very coarse sand to 4mm; subrounded; 15% silt; 5% clay nodules. Poorly graded SAND (SP); yellowish brown (10YR 5/4); moist; loose; 95% fin sand to 0.04mm; rounded; 5% silt.		- Bentonite Seal	
- <u>290</u> - -	-				Same as above (284 ft); slightly coarser	SP		
- <u>295</u> - -					Same as above (284 ft); dry to moist.			
300								



Date Started: 1/18/2011 Date TD Reached: 1/19/2011 Date Completed: 1/25/2011

Ground Elevation AMSL (ft): 5347.3 Y Coordinate: 1474079.39 X Coordinate: 1542321.46

### Borehole ID: KAFB-106137

Hole Diameter Upper (in.): 11-3/4 Hole Diameter Lower (in.): 9-5/8 Surface Completion Type: Flush mount

Groundwater Levels BGS (ft):  $\square$  At Time of Drilling: N/A  $\blacksquare$  At End of Drilling: N/A  $\blacksquare$  After Drilling: N/A

Drilling Contractor: WDC Drilling Drilling Method: Air Rotary Casing Hammer Logged By: Jason Tarbert

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00 Depth (ft)	Sample Type	Number	Headspace PID	Lithologic Log	Material Description	U.S.C.S.	Well Diagram	Remarks
	-				Poorly graded SAND (SP); yellowish brown (10YR 5/4); moist; loose; 95% medium sand to 0.04mm; rounded; 5% silt.	SP		
<u>305</u> - -	-				Well graded SAND (SW); brown (10YR 4/3); dry; very loose; 100% fine to very coarse sand; trace fine gravel to 7mm; subrounded.			
<u>310</u>	-				Same as above (305 ft).	SW		
3 <u>15</u> - -	-				Well graded SAND with Gravel (SW); brown (10YR 4/3); dry; very loose; 85% fine to very coarse sand; 15% fine gravel; subrounded.		- Bentonite Seal	
<u>320</u>	-				Well graded SAND with Silt and Gravel (SW-SM); dark yellowish brown (10YR 4/6); dry; very loose; 70% fine to very coarse sand; 20% fine to medium gravel to 3.2cm; well rounded; 10% silt.			
<u>325</u>	-				Same as above (320 ft).	SW- SM		
330								

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Pro Pro	ojec ojec	t Loca t Nan	ation ne: k	: KÁF	s of Engineers FB, Albuquerque, NM BFF SWMU ST-106 and SS-111	Hole Dia	amete	r Lower	(in.): 11-3/4 (in.): 9-5/8 ype: Flush mo	unt
Da Da	ite S ite T	Starteo D Re	d: 1/ ache	18/20 d: 1/′		∑ At T ▼ At E	Time of End of	Levels B f Drilling Drilling: ng: N/A	: N/À N/A	
Y	Coo	rdinat	e: 14	n AMS 47407 54232		Drilling	Metho		VDC Drilling otary Casing H rbert	ammer Page 12 of 16
05 Depth (ft)	Sample Type	Number	Headspace PID	Lithologic Log	Material Description		U.S.C.S.	We	Il Diagram	Remarks
335	-				Poorly graded GRAVEL with San dark yellowish brown (10YR 4/4) very loose; 80% fine to medium of 4cm; 20% medium to coarse san rounded.	; dry; gravel to	GP		- Bentonite Seal	
				200	No cuttings returned.				- Top of Filter Pack	Driller added ~20 gallons of water. No cuttings returned @ 335 ft.
340	-				Poorly graded SAND with Gravel dark yellow brown (10YR 4/4); dr loose; 70% medium to very coars 30% fine gravel to 8mm; rounded	y; very se sand;	SP		- Top of 3/4" Schedule 80 PVC 0.050 Slot Screen	Stopped to fix rubber on top of hammer to keep cuttings from blowing out @ 1300. Resumed drilling @ 1332.
345	-				Poorly graded SAND with Silt (SF brown (10YR 4/3); wet; loose; 90 medium sand to 0.4mm; rounded silt.	%				
350					Same as above (345 ft); dry to m	oist.	SP- SM		- Bottom of Screen	
<u>355</u> 360	-				Poorly graded SAND (SP); grayis brown (10YR 5/2); dry; very loose medium sand; 10% coarse sand 2mm; subrounded; trace fines.	e; 90%	SP		- Bentonite Seal	

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Date Started: 1/18/2011 Date TD Reached: 1/19/2011 Date Completed: 1/25/2011

Ground Elevation AMSL (ft): 5347.3 Y Coordinate: 1474079.39 X Coordinate: 1542321.46

# Borehole ID: KAFB-106137

Hole Diameter Upper (in.): 11-3/4 Hole Diameter Lower (in.): 9-5/8 Surface Completion Type: Flush mount

Groundwater Levels BGS (ft):  $\square$  At Time of Drilling: N/A  $\blacksquare$  At End of Drilling: N/A  $\blacksquare$  After Drilling: N/A

Drilling Contractor: WDC Drilling Drilling Method: Air Rotary Casing Hammer Logged By: Jason Tarbert

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90 Depth (ft)	Sample Type	Number	Headspace PID	Lithologic Log	Material Description	U.S.C.S.	Well Diagram	Remarks
-					Well graded SAND (SW); brown (10YR 4/3); dry; very loose; 95% fine to very coarse sand to 3mm; subrounded; 5% silt.		- Bentonite Seal	
365					Same as above (360 ft); 5% fine gravel to 1cm; overall slightly coarser.	sw	Native Backfill	
370 -					Same as above (360 ft).			
375					Poorly graded SAND with Gravel (SP);		- Bentonite Seal	
-					dark yellowish brown (10YR 4/4); moist; very loose; 80% medium sand; 5% fine sand; 15% fine gravel to 1.7cm; well rounded.			
<u>380</u> - -					Same as above (375 ft); 90% medium sand; 5% gravel.	SP	Native Backfill	
385					Well graded SAND with Gravel (SW); dark yellowish brown (10YR 4/4); moist; very loose; 85% fine to very coarse			
390					sand; 15% fine gravel to 1cm; subrounded.	SW	-Bentonite Seal	



Date Started: 1/18/2011 Date TD Reached: 1/19/2011 Date Completed: 1/25/2011

Ground Elevation AMSL (ft): 5347.3 Y Coordinate: 1474079.39 X Coordinate: 1542321.46

# Borehole ID: KAFB-106137

Hole Diameter Upper (in.): 11-3/4 Hole Diameter Lower (in.): 9-5/8 Surface Completion Type: Flush mount

Groundwater Levels BGS (ft):  $\square$  At Time of Drilling: N/A  $\blacksquare$  At End of Drilling: N/A  $\blacksquare$  After Drilling: N/A

Drilling Contractor: WDC Drilling Drilling Method: Air Rotary Casing Hammer Logged By: Jason Tarbert

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66 Depth (ft)	Sample Type	Number	Headspace PID	Lithologic Log	Material Description	U.S.C.S.	Well Diagram	Remarks
-	-				Well graded SAND (SW); dark yellowish brown (10YR 4/4); moist; very loose; 100% fine to very coarse sand; subrounded.		- Bentonite Seal	
395 	-				Same as above (390 ft); trace gravel.	SW		
400 - - -	-				Same as above (390 ft); trace gravel.	300		
- 405 - -	-				Poorly graded SAND (SP); yellowish brown (10YR 5/4); moist; very loose; 90% medium sand; 5% fine sand; 5% coarse sand; trace fine gravel to 8mm; subangular.		- Native Backfill	
410	-				Same as above (405 ft); dry.	0.5		
- 415 -	-				Same as above (405 ft); dry.	SP	- Bentonite Seal	
420								



Date Started: 1/18/2011 Date TD Reached: 1/19/2011 Date Completed: 1/25/2011

Ground Elevation AMSL (ft): 5347.3 Y Coordinate: 1474079.39 X Coordinate: 1542321.46

## Borehole ID: KAFB-106137

Hole Diameter Upper (in.): 11-3/4 Hole Diameter Lower (in.): 9-5/8 Surface Completion Type: Flush mount

Groundwater Levels BGS (ft):  $\square$  At Time of Drilling: N/A  $\blacksquare$  At End of Drilling: N/A  $\blacksquare$  After Drilling: N/A

Drilling Contractor: WDC Drilling Drilling Method: Air Rotary Casing Hammer Logged By: Jason Tarbert

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	X Coordinate: 1542321.46 Logged By. Jason Tarbert							
5 Depth (ft)	Sample Type	Number	Headspace PID	Lithologic Log	Material Description	U.S.C.S.	Well Diagram	Remarks
425	-				Poorly graded SAND with Silt (SP-SM); yellowish brown (10YR 5/4); moist; loose; 80% medium sand; 10% fine gravel to 2cm; rounded; 10% silt.	SP- SM		
	-				Poorly graded SAND (SP); brown (10YR 5/3); dry; very loose; 95% medium sand to 0.4mm; rounded; 5% fines.		- Bentonite Seal	
430	-				Same as above (425 ft).	SP		
435	-				Well graded SAND (SW); brown (10YR 5/3); dry; very loose; 95% fine to very coarse sand; 5% fine gravel to 1.1cm; subangular.		- Top of Filter Pack	
440	-				Same as above (435 ft).	SW	- Top of 3" Schedule 80 PVC 0.050 Slot Screen	
445	-				Same as above (435 ft); slightly coarser.			
450								

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Date Started: 1/18/2011 Date TD Reached: 1/19/2011 Date Completed: 1/25/2011

Ground Elevation AMSL (ft): 5347.3 Y Coordinate: 1474079.39 X Coordinate: 1542321.46

# Borehole ID: KAFB-106137

Hole Diameter Upper (in.): 11-3/4 Hole Diameter Lower (in.): 9-5/8 Surface Completion Type: Flush mount

Groundwater Levels BGS (ft):  $\square$  At Time of Drilling: N/A  $\blacksquare$  At End of Drilling: N/A  $\blacksquare$  After Drilling: N/A

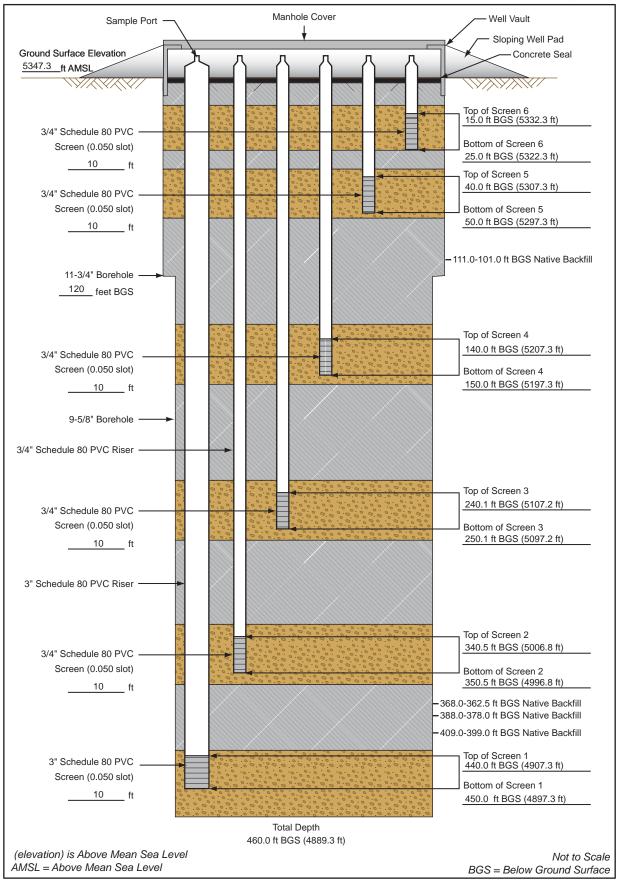
Drilling Contractor: WDC Drilling Drilling Method: Air Rotary Casing Hammer Logged By: Jason Tarbert

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05 Depth (ft)	Sample Type	Number	Headspace PID	Lithologic Log	Material Description	U.S.C.S.	Well Diagram	Remarks
455					Well graded SAND (SW); brown (10YR 5/3); dry; very loose; 95% fine to very coarse sand; 5% fine gravel to 1.1cm; subangular.	SW	Screen	
-					Well graded GRAVEL with Silt and Sand (GW-GM); yellowish brown (10YR 5/4); moist; very loose; 60% fine gravel to 2.6cm; well rounded; 30% medium to coarse sand; 10% silt; trace clay nodules.	GW- GM		
460					Poorly graded SAND (SP); brown (10YR 5/3); moist; loose; 70% medium sand; / 20% coarse sand to 1mm; rounded; / 10% fine sand.	SP 		Total Depth = 460 ft. Reached @ 1510 on 1/25/11.
465								Water added during drilling (gallons) = 20 Water added during
- - 470 -								construction (gallons) = Not Recorded
475								
480								

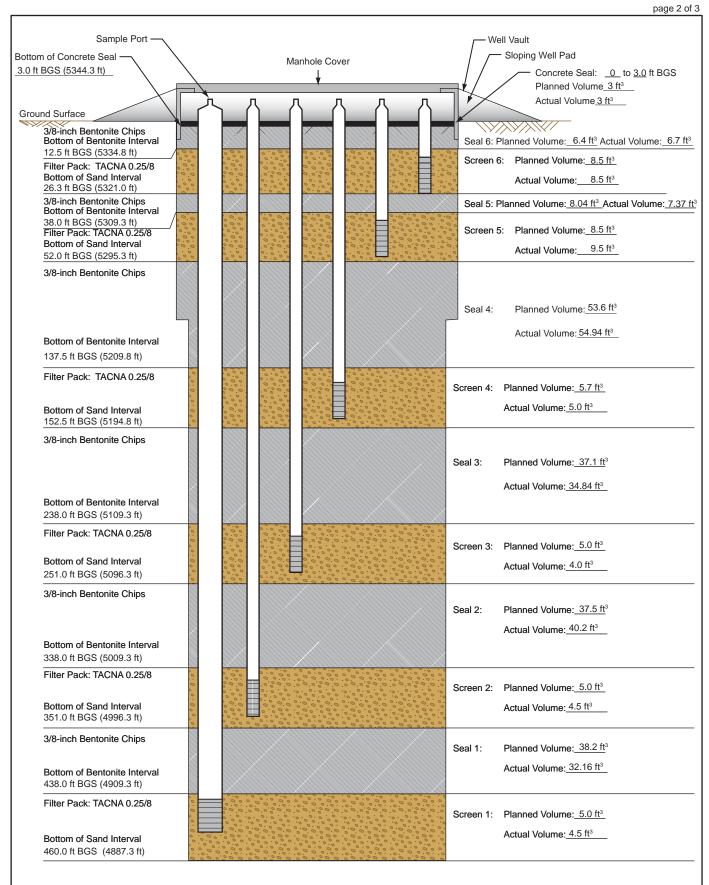
Installation Start Date/Time: <u>1/20/2011 @ 08:00</u> Installation End Date/Time: <u>1/22/2011 @ 11:37</u>

page 1 of 3



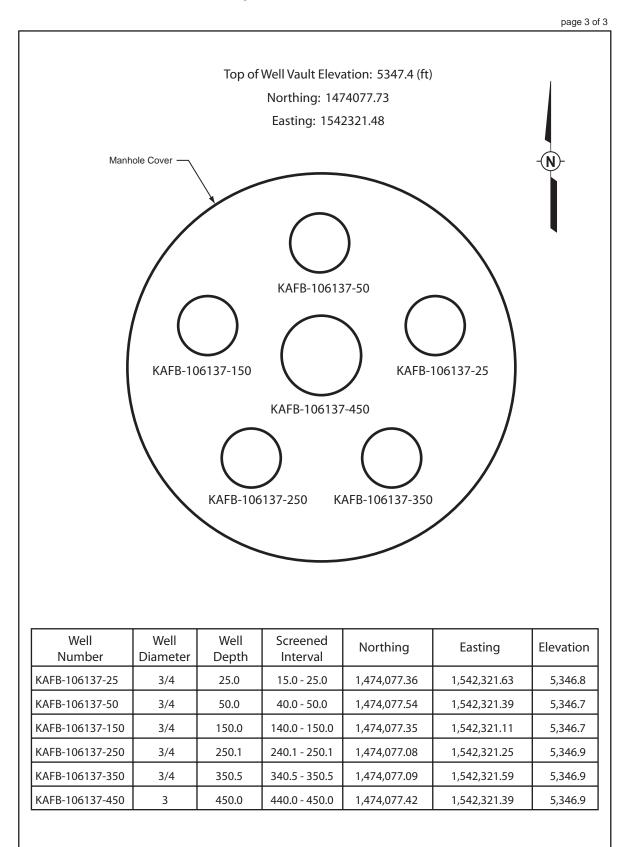
¹⁴⁰⁷⁰⁵_CA010020_SV_KAFB.106137 (a)

### Nested Soil Vapor Well Completion Diagram for KAFB-106137



(elevation) is Above Mean Sea Level All Materials Placed with Tremie Pipe Not to Scale BGS = Below Ground Surface

### Nested Soil Vapor Well Completion Diagram Map View for KAFB-106137



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### **APPENDIX D-1**

KAFB-106139 Final Well Report

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Date Started: 1/5/2011 Date TD Reached: 1/8/2011 Date Completed: 1/8/2011

Ground Elevation AMSL (ft): 5341.3 Y Coordinate: 1474051.40 X Coordinate: 1541248.76

# Borehole ID: KAFB-106139

Hole Diameter Upper (in.): 11-3/4 Hole Diameter Lower (in.): 9-5/8 Surface Completion Type: Flush mount

Groundwater Levels BGS (ft):  $\square$  At Time of Drilling: N/A  $\blacksquare$  At End of Drilling: N/A  $\blacksquare$  After Drilling: N/A

Drilling Contractor: WDC Drilling Drilling Method: Air Rotary Casing Hammer Logged By: Brian Lucero

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Oepth (ft)	Sample Type	Number	Headspace PID	Lithologic Log	Material Description	U.S.C.S.	Well Diagram	Remarks
	-				Silty SAND (SM); light reddish brown (2.5YR 7/4); dry; loose; 60% fine sand; trace medium to coarse sand; 10% fine to coarse gravel to 3cm; subangular; 30% silt with clay.	SM	- Concrete Seal	Hand augered. ***Note: No headspace requirement at this location***
5	-			<u></u>	Sandy SILT (ML); yellowish red (5YR 5/6); dry; soft; 65% silt with clay; 35% fine sand.			Began drilling 11-3/4" borehole @ 1600 on 1/5/11.
10	-				Same as above (5 ft); yellowish red (5YR 4/6).		- Bentonite Seal	
15	-				Same as above (5 ft).		- Top of Filter Pack - Top of 3/4" Schedule 80 PVC 0.050	
20	-				SILT with Gravel (ML); light reddish brown (5YR 6/4); dry; soft; 75% silt with clay; 25% fine gravel to 1cm.	ML	Slot Screen	
20	-				SILT with Sand (ML); reddish brown (5YR 5/4); dry; soft; 80% silt with minor clay; 20% fine to coarse sand; subrounded.			New connection @ 1637.
25	-				Same as above (20 ft); reddish brown (2.5YR 4/4).		- Bottom of Screen	
30	-						-Bentonite Seal	



Date Started: 1/5/2011 Date TD Reached: 1/8/2011 Date Completed: 1/8/2011

Ground Elevation AMSL (ft): 5341.3 Y Coordinate: 1474051.40 X Coordinate: 1541248.76

# Borehole ID: KAFB-106139

Hole Diameter Upper (in.): 11-3/4 Hole Diameter Lower (in.): 9-5/8 Surface Completion Type: Flush mount

Groundwater Levels BGS (ft):  $\square$  At Time of Drilling: N/A  $\blacksquare$  At End of Drilling: N/A  $\blacksquare$  After Drilling: N/A

Drilling Contractor: WDC Drilling Drilling Method: Air Rotary Casing Hammer Logged By: Brian Lucero

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W Danth (#)	Sample Type	Niumbor		Headspace PID	Lithologic	Material Description	U.S.C.S.	Well Diagram	n Remarks
	-					Sandy SILT (ML); reddish brown (2.5YR 4/4); dry; soft; 70% silt with minor clay; 25% fine to coarse sand; 5% fine gravel to 1.5cm; subangular.		- Bentonite :	Seal
3	5					Same as above (30 ft).	ML		
4	.0							Pack	End of 1/5/11.
	-					Silty SAND with Gravel (SM); reddish brown (2.5YR 4/4); dry; loose; 60% fine to coarse sand; subrounded; 20% fine gravel to 1cm; subrounded; 20% silt with clay.		Schedule 4 PVC 0.050 Slot Scree	1/6/11. New connection
4	- - -					Silty SAND (SM); red (2.5YR 4/6); dry; loose; 60% fine sand; 10% fine gravel to 1cm; subangular; 30% silt and clay.			
_5	50 					Same as above (45 ft).	SM	- Bottom of Screen	
5	- 5 <u>5</u> -					Same as above (45 ft).		- Bentonite s	Seal
6	0								



Date Started: 1/5/2011 Date TD Reached: 1/8/2011 Date Completed: 1/8/2011

Ground Elevation AMSL (ft): 5341.3 Y Coordinate: 1474051.40 X Coordinate: 1541248.76

# Borehole ID: KAFB-106139

Hole Diameter Upper (in.): 11-3/4 Hole Diameter Lower (in.): 9-5/8 Surface Completion Type: Flush mount

Groundwater Levels BGS (ft):  $\square$  At Time of Drilling: N/A  $\blacksquare$  At End of Drilling: N/A  $\blacksquare$  After Drilling: N/A

Drilling Contractor: WDC Drilling Drilling Method: Air Rotary Casing Hammer Logged By: Brian Lucero

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g Depth (ft)	Sample Type	Number	Headspace PID	Lithologic Log	Material Description	U.S.C.S.	Well Diagram	Remarks		
	-				SILT with Sand (ML); red (10R 4/6); dry; soft; 75% silt with minor clay; 25% fine to coarse sand; subangular to subrounded.			New connection @ 0837. Resumed drilling @0840.		
65	-				SILT (ML); red (2.5YR 4/6); dry; soft; 90% silt with minor clay; 10% fine sand.			Rate of penetration slowed past 65'.		
70	-				SILT with Sand (ML); red (2.5YR 4/6); dry; soft; 80% silt with minor clay; 20% fine to coarse sand; subangular to subrounded.	ML				
75	-				Same as above (70 ft); red (2.5YR 5/6); 85% silt with minor clay; 15% sand.		- Bentonite Seal	Rig chatter past 75'.		
80	-				Sandy SILT (ML); reddish brown (2.5YR 5/4); dry; moderate cementation; 70% silt; 25% fine to coarse sand; subrounded; 5% fine gravel to 1cm; subangular.			New connection @ 0917. Resumed drilling @ 0921. Rig chatter past 80', trouble driving casing. Bit stuck below below 80'.		
85	-				Well graded SAND with Gravel (SW); weak red (2.5YR 5/2); dry; loose; 80% fine to coarse sand; 20% fine gravel to 1cm; subrounded.	sw		Bit free @ 0935, drove casing easily.		
90	1									

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Client: US Army Corps of Engineers

Ground Elevation AMSL (ft): 5341.3

Project Number: 140705

Date TD Reached: 1/8/2011 Date Completed: 1/8/2011

Y Coordinate: 1474051.40

Date Started: 1/5/2011

Project Location: KAFB, Albuquerque, NM

Project Name: KAFB BFF SWMU ST-106 and SS-111

### Borehole ID: KAFB-106139

Hole Diameter Upper (in.): 11-3/4 Hole Diameter Lower (in.): 9-5/8 Surface Completion Type: Flush mount

Groundwater Levels BGS (ft): ▼ After Drilling: N/A

Drilling Contractor: WDC Drilling Drilling Method: Air Rotary Casing Hammer Logged By: Brian Lucero

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ଞ Depth (ft)	Sample Type	Number	Headspace PID	Lithologic Log	Material Description		U.S.C.S.	W	ell Diagram	Remarks
95 - - - - - - - - - - - - - - - - - - -					Well graded SAND (SW); weak r (2.4YR 5/2); dry; loose; 95% fine coarse sand; subangular to subro 5% fine gravel to 1cm; subrounde gravel consists of lithic fragments (granite, some volcanics) and tra feldspars. Same as above (90 ft).	to ounded; ed; s	sw			
-					Poorly graded SAND (SP); weak (2.5YR 5/2); dry; loose; 100% find					New connection @ 0954. Resumed drilling @ 0959.
105					Same as above (100 ft).		SP		- Bentonite Seal	
110					Poorly graded SAND with Silt (SF weak red (2.5YR 5/2); dry; loose; fine sand; 10% silt.	90%	SP- SM			
<u>115</u> - - - 120					SILT (ML); reddish brown (2.5YR moist; soft; low plasticity; 90% sil clay; 10% fine sand. Same as above (113 ft).		ML			



Date Started: 1/5/2011 Date TD Reached: 1/8/2011 Date Completed: 1/8/2011

Ground Elevation AMSL (ft): 5341.3 Y Coordinate: 1474051.40 X Coordinate: 1541248.76

# Borehole ID: KAFB-106139

Hole Diameter Upper (in.): 11-3/4 Hole Diameter Lower (in.): 9-5/8 Surface Completion Type: Flush mount

Groundwater Levels BGS (ft):  $\square$  At Time of Drilling: N/A  $\blacksquare$  At End of Drilling: N/A  $\blacksquare$  After Drilling: N/A

Drilling Contractor: WDC Drilling Drilling Method: Air Rotary Casing Hammer Logged By: Brian Lucero

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(tt) 125 130	Number	Lithologic Log	Material Description Lean CLAY (CL); reddish brown (2.5YR 4/4); moist; firm; medium plasticity; 90% silty clay; 10% fine sand. Silty SAND (SM); weak red (2.5YR 5/2); dry; loose; 70% fine sand; 30% silt and clay nodules.	CL	We	ell Diagram	Remarks New connection @ 1103. Began driving to TD 11-3/4" @1105. Stopped drilling @ 120' at 1110. Bit packed off @ TD. Bit free @ 1131, began
- - - - - - - - -			4/4); moist; firm; medium plasticity; 90% silty clay; 10% fine sand. Silty SAND (SM); weak red (2.5YR 5/2); dry; loose; 70% fine sand; 30% silt and				Began driving to TD 11-3/4" @1105. Stopped drilling @ 120' at 1110. Bit packed off @ TD.
			dry; loose; 70% fine sand; 30% silt and	 SM			Bit free @ 1131, began
130						- Bentonite Seal	tripping out. 9-5/8" to TD, new connection made (140'
-			Well graded SAND with Silt (SW-SM); weak red (2.5YR 5/2); dry; loose; 90% fine to coarse sand; subangular to subrounded; 10% silt and trace clay.	SW- SM			total). Resumed drilling @ 1604. Resumed @ 1615.
135			Poorly graded SAND with Silt (SP-SM); reddish brown (2.5YR 5/3); dry; loose; 90% fine sand; 10% silt.			- Top of Filter Pack	
140			Same as above (135 ft); 5% fine gravel to 1.5cm; rounded.	SP- SM		- Top of 3/4" Schedule 80 PVC 0.050 Slot Screen	New connection @ 1658. Resumed drilling @ 1700.
<u>145</u> - - -			Well graded SAND with Clay and Gravel (SW-SC); weak red (2.5YR 5/2); dry; loose; 75% fine to coarse sand; subangular to subrounded; 15% gravel to 2cm; subangular; 10% clay nodules.	SW- SC			



Date Started: 1/5/2011 Date TD Reached: 1/8/2011 Date Completed: 1/8/2011

Ground Elevation AMSL (ft): 5341.3 Y Coordinate: 1474051.40 X Coordinate: 1541248.76

# Borehole ID: KAFB-106139

Hole Diameter Upper (in.): 11-3/4 Hole Diameter Lower (in.): 9-5/8 Surface Completion Type: Flush mount

Groundwater Levels BGS (ft):  $\square$  At Time of Drilling: N/A  $\blacksquare$  At End of Drilling: N/A  $\blacksquare$  After Drilling: N/A

Drilling Contractor: WDC Drilling Drilling Method: Air Rotary Casing Hammer Logged By: Brian Lucero

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10 Depth (ft)	Sample Type	Number	Headspace PID	Lithologic Log	Material Description	U.S.C.S.	Well Diagram	Remarks
	_				Poorly graded SAND (SP); weak red (2.5YR 5/2); dry; loose; 90% fine to medium sand; 10% fine gravel to 1cm; subangular.		Screen	
155	-				Same as above (150 ft).			End of 1/6/11.
160	-				Same as above (150 ft).	SP		New connection @ 0938 on 1/7/11. Resumed drilling @ 0940.
165	-				Same as above (150 ft); coarser sand; sand is predominantly quartz, feldspars, and lithic fragments.		- Bentonite Seal	
170	-				Poorly graded SAND (SP); weak red (2.5YR 5/2); dry; loose; 100% fine to medium sand; subrounded.			
175	-				Well graded SAND (SW); weak red (2.5YR 5/2); dry; loose; 100% fine to coarse sand; subrounded; trace fine gravel to 1cm; subrounded.	sw		
180								



Date Started: 1/5/2011 Date TD Reached: 1/8/2011 Date Completed: 1/8/2011

Ground Elevation AMSL (ft): 5341.3 Y Coordinate: 1474051.40 X Coordinate: 1541248.76

# Borehole ID: KAFB-106139

Hole Diameter Upper (in.): 11-3/4 Hole Diameter Lower (in.): 9-5/8 Surface Completion Type: Flush mount

Groundwater Levels BGS (ft):  $\square$  At Time of Drilling: N/A  $\blacksquare$  At End of Drilling: N/A  $\blacksquare$  After Drilling: N/A

Drilling Contractor: WDC Drilling Drilling Method: Air Rotary Casing Hammer Logged By: Brian Lucero

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08 Depth (ft)	Sample Type	Number	Headspace PID	Lithologic Log	Material Description	U.S.C.S.	Well Diagram	Remarks
-					Well graded SAND with Gravel (SW); weak red (2.5YR 5/2); dry; loose; 85% fine to coarse sand; subrounded; 15% fine to coarse gravel to 3cm; subrounded.	SW		New connection @ 0958. Resumed drilling @ 1000. 200' total in drill string.
<u>185</u> - - -					Well graded SAND with Silt and Gravel (SW-SM); reddish gray (5YR 5/2); dry; loose; 70% fine to coarse sand; subrounded; 20% fine to coarse gravel to 2cm; subrounded; 10% silt.			Pumice clasts noted
<u>190</u> - -					Same as above (185 ft); 75% sand; 15% gravel; 10% silt.			
<u>195</u>					Same as above (185 ft); quartizite gravel.	SW- SM	- Bentonite Seal	Stopped drilling @ 1010. New connection @ 1046. Resumed drilling @ 1048.
- 200 - -					Same as above (185 ft); 70% sand; 20% gravel; 10% silt.			2nd compressor online.
205					Silty SAND with Gravel (SM); reddish gray (5YR 5/2); moist; loose; 65% fine to coarse sand; 20% gravel to 4cm; subrounded; 15% silt with minor clay.	SM		
_ 210								



Date Started: 1/5/2011 Date TD Reached: 1/8/2011 Date Completed: 1/8/2011

Ground Elevation AMSL (ft): 5341.3 Y Coordinate: 1474051.40 X Coordinate: 1541248.76

# Borehole ID: KAFB-106139

Hole Diameter Upper (in.): 11-3/4 Hole Diameter Lower (in.): 9-5/8 Surface Completion Type: Flush mount

Groundwater Levels BGS (ft):  $\Box$  At Time of Drilling: N/A  $\mathbf{I}$  At End of Drilling: N/A  $\mathbf{I}$  After Drilling: N/A

Drilling Contractor: WDC Drilling Drilling Method: Air Rotary Casing Hammer Logged By: Brian Lucero

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01 Depth (ft)	Sample Type	Number	Headspace PID	Lithologic Log	Material Description	U.S.C.S.	Well Diagram	Remarks
215	_				Poorly graded SAND with Silt (SP-SM); reddish gray (5YR 5/2); dry; loose; 90% fine sand; trace fine gravel to 1cm; 10% silt.	SP- SM		
220	-				Silty SAND (SM); reddish gray (5YR 5/2); dry; loose; 80% fine sand; 20% silt.	SM		
	-				Well graded SAND (SW); reddish grey (5YR 5/2); dry; loose; 95% fine to coarse sand; subangular to subrounded; 5% fine gravel to 1.5cm; subrounded.		- Bentonite Seal	New connection @ 1139. Resumed drilling @ 1141.
225	-				Same as above (220 ft).	sw		
230	-				Well graded SAND with Gravel (SW); reddish gray (5YR 5/2); dry; loose; 85% fine to coarse sand; subangular to subrounded; 15% gravel to 4cm; subangular to subrounded.			
235	-				Poorly graded SAND (SP); reddish gray (5YR 5/2); dry; loose; 100% fine sand; some medium; trace silt.	SP	- Top of Filter Pack	Stopped drilling @ 1157.
240								



Date Started: 1/5/2011 Date TD Reached: 1/8/2011 Date Completed: 1/8/2011

Ground Elevation AMSL (ft): 5341.3 Y Coordinate: 1474051.40 X Coordinate: 1541248.76

# Borehole ID: KAFB-106139

Hole Diameter Upper (in.): 11-3/4 Hole Diameter Lower (in.): 9-5/8 Surface Completion Type: Flush mount

Groundwater Levels BGS (ft):  $\square$  At Time of Drilling: N/A  $\blacksquare$  At End of Drilling: N/A  $\blacksquare$  After Drilling: N/A

Drilling Contractor: WDC Drilling Drilling Method: Air Rotary Casing Hammer Logged By: Brian Lucero

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05 Depth (ft)	Sample Type	Number	Headspace PID	Lithologic Log	Material Description	U.S.C.S.	Well Diagram	Remarks
-	-				Poorly graded SAND (SP); reddish gray (5YR 5/2); dry; loose; 100% fine sand; some medium; trace silt.	SP	Schedule 80 PVC 0.050 Slot Screen	New connection @1209. Resumed drilling @ 1210.
245	-				Poorly graded SAND with Silt (SP-SM); reddish gray (5YR 5/2); dry to moist; loose; 90% sand; 10% silt.			Rate of penetration slowed below 235' bgs.
250	-				Same as above (245 ft).	SP- SM	- Bottom of Screen	
255	-				Same as above (245 ft).			Stopped drillng @ 1238. End of 1/7/11.
<u>260</u>	-				Silty SAND (SM); brown (7.5YR 4/3); dry to moist; loose; 80% fine sand; 20% silt.	 SM	- Bentonite Seal	New connection @ 1000 on 1/8/11. Resumed drilling @ 1006.
265					Well graded SAND (SW); weak red (2.5YR 5/2); dry to moist; loose; 95% fine to coarse sand; subangular to subrounded; 5% fine gravel to 1cm; subangular.	sw		
270								



Date Started: 1/5/2011 Date TD Reached: 1/8/2011 Date Completed: 1/8/2011

Ground Elevation AMSL (ft): 5341.3 Y Coordinate: 1474051.40 X Coordinate: 1541248.76

## Borehole ID: KAFB-106139

Hole Diameter Upper (in.): 11-3/4 Hole Diameter Lower (in.): 9-5/8 Surface Completion Type: Flush mount

Groundwater Levels BGS (ft):  $\square$  At Time of Drilling: N/A  $\blacksquare$  At End of Drilling: N/A  $\blacksquare$  After Drilling: N/A

Drilling Contractor: WDC Drilling Drilling Method: Air Rotary Casing Hammer Logged By: Brian Lucero

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02 Depth (ft)	Sample Type	Number	Headspace PID	Lithologic Log	Material Description	U.S.C.S.	Well Diagram	Remarks
	_				Well graded SAND (SW); weak red (2.5YR 5/2); dry to moist; loose; 95% fine to coarse sand; subangular to subrounded; 5% fine to medium gravel to 3cm; subrounded.	SW		Rate of penetration increased.
275	-				Silty GRAVEL with Sand (GM); brown (7.5YR 4/4); moist; loose; 60% fine to coarse gravel to 5cm; subrounded to subangular; 25% fine to coarse sand; subrounded; 15% silt and clay.	GM		
280	-				Poorly graded SAND with Silt (SP-SM); weak red (2.5YR 4/2); dry; loose; 90% fine sand with minor medium sand; 10% silt.			Stopped drilling @ 1010. New connection @ 1022.
285	-				Same as above (280 ft); trace coarse sand; subrounded to subangular.	SP- SM	- Bentonite Seal	
290	-				Poorly graded SAND (SP); weak red (2.5YR 5/2); dry; loose; 95% fine sand; 5% silt.			
<u>295</u>	-				Same as above (290 ft).	SP		Stopped drilling @ 1036.
300	-							



Date Started: 1/5/2011 Date TD Reached: 1/8/2011 Date Completed: 1/8/2011

Ground Elevation AMSL (ft): 5341.3 Y Coordinate: 1474051.40 X Coordinate: 1541248.76

## Borehole ID: KAFB-106139

Hole Diameter Upper (in.): 11-3/4 Hole Diameter Lower (in.): 9-5/8 Surface Completion Type: Flush mount

Groundwater Levels BGS (ft):  $\square$  At Time of Drilling: N/A  $\blacksquare$  At End of Drilling: N/A  $\blacksquare$  After Drilling: N/A

Drilling Contractor: WDC Drilling Drilling Method: Air Rotary Casing Hammer Logged By: Brian Lucero

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00 Depth (ft)	Sample Type	Number	Headspace PID	Lithologic Log	Material Description	U.S.C.S.	Well Diagram	Remarks
					Well graded SAND with Gravel (SW); reddish gray (2.5YR 6/1); dry; loose; 85% fine to coarse sand; subrounded; 15% fine to coarse gravel to 7cm; subrounded; with trace cobbles to 8cm; rounded.	SW		New connection @ 1046. Resumed drilling @1047.
310					Poorly graded SAND with Silt (SP-SM); brown (7.5YR 4/3); dry to moist; loose; 90% fine sand; trace medium to coarse sand; 10% silt.	SP- SM		
-					Poorly graded SAND (SP); dark reddish gray (5YR 4/2); dry; loose; 95% fine sand; 5% silt.			Rate of penetration slowed down.
<u>315</u> - -					Same as above (310 ft).	SP	- Bentonite Seal	
<u>320</u> - -					Well graded SAND (SW); dark reddish gray (5YR 4/2); dry; loose; 95% fine to coarse sand; subangular to subrounded; 5% fine gravel to 1cm; subangular.			Stopped drilling @ 1102. New connection @ 1155. Resumed drilling @ 1157.
<u>325</u> - -					Same as above (320 ft).	SW		
330								



Date Started: 1/5/2011 Date TD Reached: 1/8/2011 Date Completed: 1/8/2011

Ground Elevation AMSL (ft): 5341.3 Y Coordinate: 1474051.40 X Coordinate: 1541248.76

## Borehole ID: KAFB-106139

Hole Diameter Upper (in.): 11-3/4 Hole Diameter Lower (in.): 9-5/8 Surface Completion Type: Flush mount

Groundwater Levels BGS (ft):  $\square$  At Time of Drilling: N/A  $\blacksquare$  At End of Drilling: N/A  $\blacksquare$  After Drilling: N/A

Drilling Contractor: WDC Drilling Drilling Method: Air Rotary Casing Hammer Logged By: Brian Lucero

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66 Depth (ft)	Sample Type	Number	Headspace PID	Lithologic Log	Material Description	U.S.C.S.	We	ell Diagram	Remarks
335	-				Poorly graded SAND (SP); weak red (2.5YR 5/2); dry; loose; 95% fine sand; minor medium to coarse sand; subrounded; 5% silt. Same as above (330 ft); 95% fine sand;	SP		- Bentonite Seal	Rig chatter around 335'.
340	-				5% silt.			- Top of Filter Pack	
345	-				Well graded SAND (SW); weak red (2.5YR 5/2); dry; loose; 95% fine to coarse sand; trace fine gravel to 1cm; subrounded; 5% silt.			- Top of 3/4" Schedule 80 PVC 0.050 Slot Screen	Stopped drilling @ 1208. New connection @ 1223. Resumed drilling @ 1225.
-	-				Well graded SAND with Gravel (SW); weak red (2.5YR 5/2); dry; loose; 80% fine to coarse sand; subrounded; 15% fine to coarse gravel to 4cm; subrounded to rounded; 5% silt.				
350	-				Well graded SAND (SW); weak red (2.5YR 5/2); dry to moist; loose; 95% fine to coarse sand; subrounded to subangular; trace fine gravel to 1cm; 5% silt.	SW		- Bottom of Screen	
<u>355</u>	-				Same as above (350 ft).			- Bentonite Seal	Stopped drilling @ 1238.
360									



Date Started: 1/5/2011 Date TD Reached: 1/8/2011 Date Completed: 1/8/2011

Ground Elevation AMSL (ft): 5341.3 Y Coordinate: 1474051.40 X Coordinate: 1541248.76

# Borehole ID: KAFB-106139

Hole Diameter Upper (in.): 11-3/4 Hole Diameter Lower (in.): 9-5/8 Surface Completion Type: Flush mount

Groundwater Levels BGS (ft):  $\square$  At Time of Drilling: N/A  $\blacksquare$  At End of Drilling: N/A  $\blacksquare$  After Drilling: N/A

Drilling Contractor: WDC Drilling Drilling Method: Air Rotary Casing Hammer Logged By: Brian Lucero

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90 Depth (ft)	Sample Type	Number	Headspace PID	Lithologic Log	Material Description	U.S.C.S.	Well Diagram	Remarks
	-				Poorly graded SAND with Silt (SP-SM); weak red (2.5YR 5/2); dry; loose; 90% fine sand; 10% silt.			New connection @ 1247. Resumed drilling @ 1249.
365	-				Same as above (360 ft); brown (7.5YR 4/3); dry to moist; color change possibly due to oxidation (weathering surface?).	SP- SM		
370	-				Well graded SAND (SW); weak red (2.5YR 5/2); dry; loose; 95% fine to coarse sand; subangular; 5% silt; sand grains consistant of lithics (granite, volcanics), quartz and quartzite, and feldspars (including weathered).	sw		
380	-				Silty SAND (SM); brown (7.5YR 4/3); dry to moist; loose; 85% fine sand; minor medium to coarse sand; subangular; 15% silt.	SM	- Bentonite Seal	
-	-				Well graded SAND (SW); brown (7.5YR 4/3); dry to moist; loose; 95% fine to coarse sand; subangular to angular; 5% silt.	sw		Stopped drilling @ 1305. New connection @ 1321. Resumed drilling @ 1323.
385	-				Poorly graded SAND (SP); weak red (2.5YR 5/2); dry; loose; 95% fine sand; minor medium sand; 5% silt.	SP		
390								



Date Started: 1/5/2011 Date TD Reached: 1/8/2011 Date Completed: 1/8/2011

Ground Elevation AMSL (ft): 5341.3 Y Coordinate: 1474051.40 X Coordinate: 1541248.76

# Borehole ID: KAFB-106139

Hole Diameter Upper (in.): 11-3/4 Hole Diameter Lower (in.): 9-5/8 Surface Completion Type: Flush mount

Groundwater Levels BGS (ft):  $\square$  At Time of Drilling: N/A  $\blacksquare$  At End of Drilling: N/A  $\blacksquare$  After Drilling: N/A

Drilling Contractor: WDC Drilling Drilling Method: Air Rotary Casing Hammer Logged By: Brian Lucero

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66 Depth (ft)	Sample Type	Number	Headspace PID	Lithologic Log	Material Description	U.S.C.S.	Well Diagram	Remarks
	-				Poorly graded SAND (SP); weak red (2.5YR 5/2); dry; loose; 95% fine sand; minor medium sand; 5% silt.			
<u>395</u>	-				Same as above (390 ft); 95% very fine to fine sand; 5% silt.			
400	-				Poorly graded SAND (SP); weak red (2.5YR 5/2); dry; loose; 95% fine sand; minor medium sand; 5% silt.			Stopped drilling @ 1338. New connection @ 1345. Resumed drilling @ 1346.
405	-				Same as above (400 ft); 95% fine sand; 5% silt.	SP	- Bentonite Seal	
410	-				Poorly graded SAND (SP); weak red (2.5YR 5/2); dry; loose; 95% fine to medium sand; subangular to subrounded; 5% silt.			
<u>415</u>	-				Same as above (410 ft); 95% fine sand, 5% silt.			Stopped drilling @ 1407.
420								



Date Started: 1/5/2011 Date TD Reached: 1/8/2011 Date Completed: 1/8/2011

Ground Elevation AMSL (ft): 5341.3 Y Coordinate: 1474051.40 X Coordinate: 1541248.76

## Borehole ID: KAFB-106139

Hole Diameter Upper (in.): 11-3/4 Hole Diameter Lower (in.): 9-5/8 Surface Completion Type: Flush mount

Groundwater Levels BGS (ft):  $\square$  At Time of Drilling: N/A  $\blacksquare$  At End of Drilling: N/A  $\blacksquare$  After Drilling: N/A

Drilling Contractor: WDC Drilling Drilling Method: Air Rotary Casing Hammer Logged By: Brian Lucero

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Depth (ft) Sample Type Number	Headspace PID Lithologic Log	Material Description	U.S.C.S.	Well Diagram	Remarks
-		Well graded SAND (SW); weak red (2.5YR 5/2); dry; loose; 95% fine to coarse sand; subangular to subrounded; 5% silt.	SW		
425		Sandy SILT (ML); brown (7.5YR 4/4); moist; soft; 60% silt with minor clay; 40% fine sand; trace medium to coarse sand.		- Bentonite Seal	
<u>430</u> - - -		Silty SAND (SM); brown (7.5YR 5/3); dry to moist; loose; 75% fine sand; 25% silt with trace clay.			
<u>435</u> - - 440		Same as above (430 ft); moist.	SM	- Top of Filter Pack	
-		Sandy SILT (ML); brown (7.5YR 4/4); moist; soft to firm; 60% silt with minor clay; 40% fine sand.		- Top of 3" Schedule 80 PVC 0.050 Slot Screen	Poor recovery. Poor to no cuttings returned. Stopped drilling @ 1436. New connection @ 1449. Resumed drilling @ 1450.
<u>445</u> - - -		Silty SAND (SM); brown (7.5YR 5/3); dry to moist; 75% very fine to fine sand; 25% silt with trace clay. Same as above (445 ft); sand becoming coarser; fine to coarse sand.	SM		



Client: US Army Corps of Engineers

Ground Elevation AMSL (ft): 5341.3

Project Number: 140705

Date TD Reached: 1/8/2011 Date Completed: 1/8/2011

Y Coordinate: 1474051.40

Date Started: 1/5/2011

Project Location: KAFB, Albuquerque, NM

Project Name: KAFB BFF SWMU ST-106 and SS-111

### Borehole ID: KAFB-106139

Hole Diameter Upper (in.): 11-3/4 Hole Diameter Lower (in.): 9-5/8 Surface Completion Type: Flush mount

Groundwater Levels BGS (ft):  $\Box$  At Time of Drilling: N/A  $\blacksquare$  At End of Drilling: N/A  $\blacksquare$  After Drilling: N/A

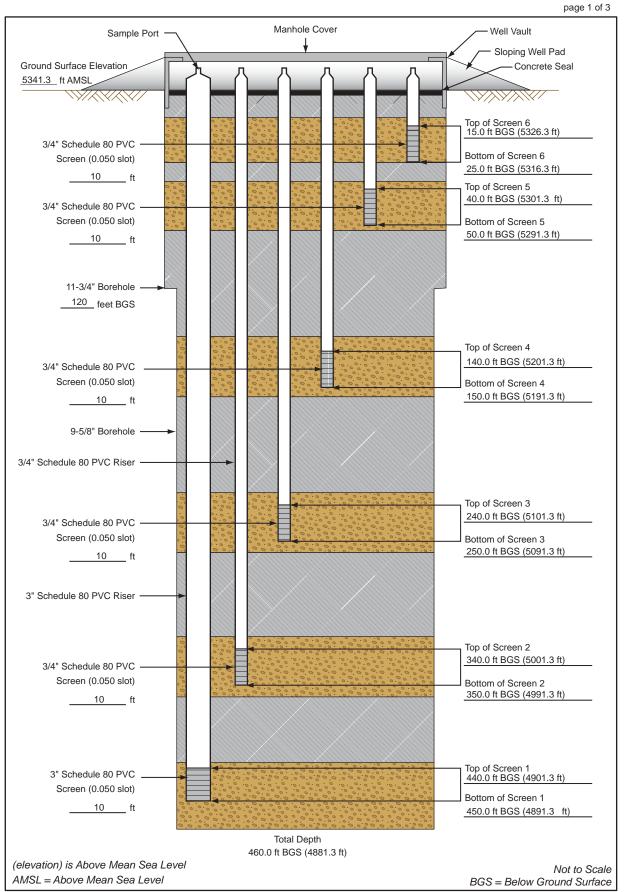
Drilling Contractor: WDC Drilling Drilling Method: Air Rotary Casing Hammer Logged By: Brian Lucero

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5 Depth (ft)	Sample Type	Number	Headspace PID	Lithologic Log		U.S.C.S.	Well Diagram	Remarks
	-				Well graded SAND with Silt (SW-SM); brown (7.5YR 5/3); moist; loose; 90% fine to coarse sand; subrounded; 10% silt with trace clay.	SW- SM	Screen	
<u>455</u>	_				Silty SAND (SM); weak red (2.5YR 5/2); dry; loose; 70% fine sand; 30% silt.	SM		
<u>460</u>	-			<u> : 193</u>				Total depth = 460 ft. Reached @1511 on 1/8/2011.
465								Water added during drilling (gallons) = 0
								Water added during construction (gallons) = Not Recorded
<u>470</u>	-							
<u>475</u>								
480								

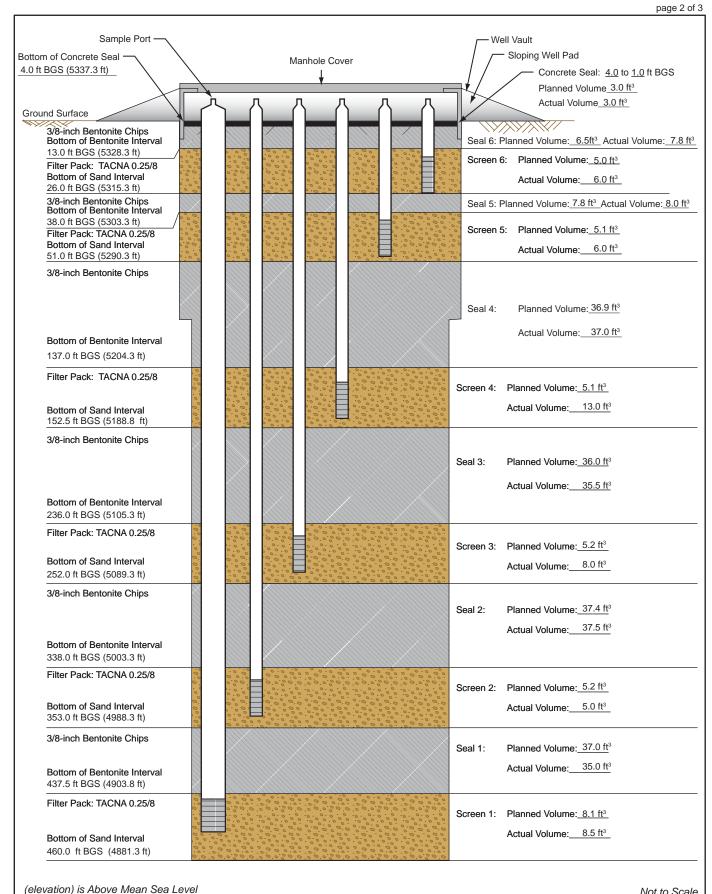
### Nested Soil Vapor Well Completion Diagram for KAFB-106139

Installation Start Date/Time: <u>1/11/2011 @ 11:26</u> Installation End Date/Time: <u>1/14/2011 @ 15:00</u>



140705_CA010020_SV_KAFB.106139 (a)

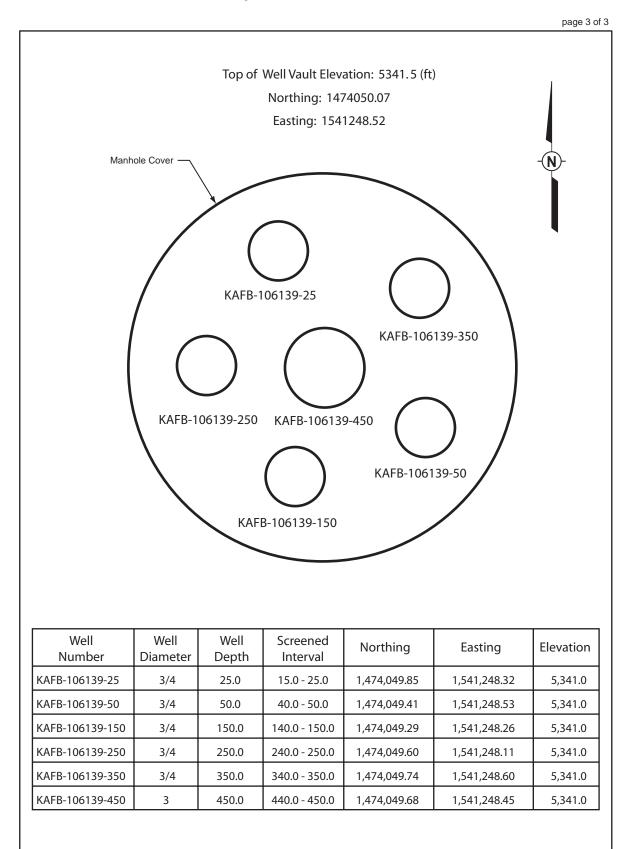
### Nested Soil Vapor Well Completion Diagram for KAFB-106139



All Materials Placed with Tremie Pipe

Not to Scale BGS = Below Ground Surface

### Nested Soil Vapor Well Completion Diagram Map View for KAFB-106139



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### **APPENDIX D-1**

KAFB-106140 Final Well Report

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Date Started: 1/10/2011 Date TD Reached: 1/12/2011 Date Completed: 1/20/2011

Ground Elevation AMSL (ft): 5345.3 Y Coordinate: 1472634.47 X Coordinate: 1542237.30

# Borehole ID: KAFB-106140

Hole Diameter Upper (in.): 11-3/4 Hole Diameter Lower (in.): 9-5/8 Surface Completion Type: Flush mount

Groundwater Levels BGS (ft):  $\square$  At Time of Drilling: N/A  $\blacksquare$  At End of Drilling: N/A  $\blacksquare$  After Drilling: N/A

Drilling Contractor: WDC Drilling Drilling Method: Air Rotary Casing Hammer Logged By: Jason Tarbert

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Denth (ft)	Sample Type	Number	Headspace PID	Lithologic Log	Material Description	U.S.C.S.	Well Diagram	Remarks
	-				No description recorded.		Concrete S	Hand augered. ***Note: no headspace requirement at this location***
	-				Sandy SILT (ML); light reddish brown (5YR 6/3); moist; soft; low plasticity; 70% silt; 30% fine sand; trace gravel to 7mm.		- - Bentonite S	Began drilling @1600 on 1/10/11. Seal
1	-				Same as above (5ft); reddish brown (5YR 3/4); increasing gravel to 1.5cm.		Top of Filte Pack	er
1	5				Same as above (10ft); trace clay nodules; less gravel.	ML	- Top of 3/4' Schedule & PVC 0.050 Slot Scree	30
2	<u>-</u> - -				Same as above (10ft); increasing clay nodules.			
2	5				SILT (ML); reddish brown (5YR 5/4); moist; soft; low plasticity; 70% silt; 20% lean clay; 10% fine sand to 0.1mm.		- Bottom of Screen	
3	 D						- Bentonite s	



Date Started: 1/10/2011 Date TD Reached: 1/12/2011 Date Completed: 1/20/2011

Ground Elevation AMSL (ft): 5345.3 Y Coordinate: 1472634.47 X Coordinate: 1542237.30

# Borehole ID: KAFB-106140

Hole Diameter Upper (in.): 11-3/4 Hole Diameter Lower (in.): 9-5/8 Surface Completion Type: Flush mount

Groundwater Levels BGS (ft):  $\square$  At Time of Drilling: N/A  $\blacksquare$  At End of Drilling: N/A  $\blacksquare$  After Drilling: N/A

Drilling Contractor: WDC Drilling Drilling Method: Air Rotary Casing Hammer Logged By: Jason Tarbert

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සි Depth (ft)	Sample Type	Number	Headspace PID	Lithologic Log	Material Description	U.S.C.S.	Well Diagram	Remarks
	_				SILT (ML); reddish brown (5YR 5/4); moist; soft; low plasticity; 70% silt; 20% lean clay; 10% fine sand to 0.1mm.		-Bentonite Seal	
35	-				Same as above (30 ft).			
							Pack	
40	-				SILT with Sand (ML); reddish brown (2.5YR 5/3); moist; soft; low plasticity; 80% silt and clay; 15% fine sand; 5% fine gravel to 1cm.		- Top of 3/4" Schedule 80 PVC 0.050 Slot Screen	
45	-				SILT with Sand (ML); yellowish red (5YR 4/6); dry; very soft; 80% silt; 15% medium sand; 5% fine gravel to 7mm; trace clay nodules.	ML		
50	-				SILT with Sand and Gravel (ML); reddish brown (5YR 5/4); dry; very soft; 60% silt; 20% medium to very coarse sand; 20% fine gravel to 1.5cm.		- Bottom of Screen	
55					Same as above (50 ft); soft; 70% silt; 20% coarse sand; 10% fine gravel to 2cm.		- Bentonite Seal	
60								



Date Started: 1/10/2011 Date TD Reached: 1/12/2011 Date Completed: 1/20/2011

Ground Elevation AMSL (ft): 5345.3 Y Coordinate: 1472634.47 X Coordinate: 1542237.30

# Borehole ID: KAFB-106140

Hole Diameter Upper (in.): 11-3/4 Hole Diameter Lower (in.): 9-5/8 Surface Completion Type: Flush mount

Groundwater Levels BGS (ft):  $\Box$  At Time of Drilling: N/A  $\mathbf{I}$  At End of Drilling: N/A  $\mathbf{I}$  After Drilling: N/A

Drilling Contractor: WDC Drilling Drilling Method: Air Rotary Casing Hammer Logged By: Jason Tarbert

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8 Depth (ft)	Sample Type	Number	Headspace PID	Lithologic Log	Material Description	U.S.C.S.	Well Diagram	Remarks
-					SILT with Sand and Gravel (ML); reddish brown (5YR 5/4); dry; very soft; 60% silt; 20% medium to very coarse sand; 20% fine gravel to 1.5cm.	ML		End of 1/10/11 @ 1715.
65					Silty SAND with Gravel (SM); reddish brown (5YR 4/4); dry; very loose; 60% fine to very fine sand; 20% gravel to 1.5cm; subangular to subrounded; granitic clasts; 20% silt.	SM		Beginning of 1/11/11 @ 0915. P. Ostrye (Geologist) began logging.
70					Sandy lean CLAY (CL); reddish brown (5YR 4/4); dry; very soft; medium plasticity; 60% clay; 40% fine to very fine sand; no gravel.			Cylcone hose popped off of casing hammer @ 0930. Resumed drilling @ 1055.
75					Same as above (70 ft); 5% very coarse sand; subangular.		- Bentonite Seal	
80					Well graded SAND (SW); light reddish brown (2.5YR 6/3); dry; very loose; 95% very coarse to very fine sand; 5% gravel	SW		
-					to 6mm; angular to subangular. Silty SAND (SM); reddish brown (5YR 4/4); dry; very loose; 80% fine to very fine sand; 20% silt.	SM		Stopped drilling to clean out cyclone @ 1115. Casing collar stuck.
85					Poorly graded SAND (SP); yellowish red (5YR 5/6); dry; very loose; 95% very fine to fine sand; 5% silt.	SP		Resumed drilling @ 1320.
90								



Date Started: 1/10/2011 Date TD Reached: 1/12/2011 Date Completed: 1/20/2011

Ground Elevation AMSL (ft): 5345.3 Y Coordinate: 1472634.47 X Coordinate: 1542237.30

# Borehole ID: KAFB-106140

Hole Diameter Upper (in.): 11-3/4 Hole Diameter Lower (in.): 9-5/8 Surface Completion Type: Flush mount

Groundwater Levels BGS (ft):  $\square$  At Time of Drilling: N/A  $\blacksquare$  At End of Drilling: N/A  $\blacksquare$  After Drilling: N/A

Drilling Contractor: WDC Drilling Drilling Method: Air Rotary Casing Hammer Logged By: Jason Tarbert

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ଞ Depth (ft)	Sample Type	Number	Headspace PID	Lithologic Log	Material Description	U.S.C.S.	Well Diagram	Remarks
	-				Poorly graded SAND (SP); yellowish red (5YR 5/6); dry; very loose; 95% very fine to fine sand; 5% silt.	SP		Resumed drilling @ 1320.
<u>95</u> 100	-				Clayey SAND (SC); reddish brown (5YR 5/4); dry; very loose; 70% well graded very fine to coarse sand; 5% gravel to 10mm; angular to subrounded; 20% clay and silt.	sc		
100	-				Lean CLAY with Sand (CL); reddish brown (5YR 4/3); dry; firm; high plasticity; 80% clay; 20% fine to very fine sand.			
105	-				Lean CLAY with Sand (CL); reddish brown (5YR 4/3); dry; firm; medium to high plasticity; 75% clay; 25% medium to very fine sand. Lean CLAY with Sand (CL); reddish	CL	- Bentonite Seal	
<u>110</u>	-				brown (5YR 4/3); dry; soft; high plasticity; 85% clay; 15% very fine sand. Poorly graded SAND (SP); pinkish gray (7.5YR 7/2); dry; very loose; 95% medium to very fine sand; angular to subrounded; 5% fines.			Air hammer hose blew off @1410. End of 1/11/11.
115	-				Same as above (110 ft).	SP		Beginning of 1/12/11.
120	-			· · · · · · · · · · · · · · · · · · ·		SW		

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Date Started: 1/10/2011 Date TD Reached: 1/12/2011 Date Completed: 1/20/2011

Ground Elevation AMSL (ft): 5345.3 Y Coordinate: 1472634.47 X Coordinate: 1542237.30

# Borehole ID: KAFB-106140

Hole Diameter Upper (in.): 11-3/4 Hole Diameter Lower (in.): 9-5/8 Surface Completion Type: Flush mount

Groundwater Levels BGS (ft):  $\square$  At Time of Drilling: N/A  $\blacksquare$  At End of Drilling: N/A  $\blacksquare$  After Drilling: N/A

Drilling Contractor: WDC Drilling Drilling Method: Air Rotary Casing Hammer Logged By: Jason Tarbert

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05 Depth (ft)	Sample Type	Number	Headspace PID	Lithologic Log	Material Description	U.S.C.S.	w	/ell Diagram	Remarks
125	-				Well graded SAND (SW); light reddish brown (5YR 5/3); dry; loose; 90% very coarse to very fine sand; 5% gravel to 10mm; subrounded; tuft clasts; 5% fines. Well graded SAND with Gravel (SW); light reddish brown (5YR 5/3); 80% very coarse to very fine sand; 15% gravel to 20mm; 5% fines.	sw			Telescope to 9-5/8". Stopped drilling @ 0820. Resumed drilling @ 1155.
	-				Clayey SAND (SC); brown (7.5YR 4/4); moist; loose; 60% fine to very fine sand; 40% clay.			- Bentonite Seal	
-	-				Clayey SAND (SC); strong brown (7.5YR 5/6); moist; loose; 60% medium to very fine sand; 40% clay.	SC			
<u>135</u>	-				Clayey SAND (SC); brown (7.5YR 4/4); moist; loose; 60% fine to very fine sand; 40% clay.			] - Top of Filter	
	-				Poorly graded SAND (SP); pinkish gray (5YR 6/2); dry; very loose; 95% coarse to fine sands; 5% fines.	SP		Pack	
145					Well graded SAND with Gravel (SW); pinkish gray (7.5YR 6/2); 80% sand; 15% gravel to 2.5cm; angular to subrounded; 5% fines.	SW		Slot Screen	
- 150	-				Clayey SAND (SC); brown (7.5YR 4/4); moist; loose; 60% medium to very fine sand; 40% clay.	SC			



Date Started: 1/10/2011 Date TD Reached: 1/12/2011 Date Completed: 1/20/2011

Ground Elevation AMSL (ft): 5345.3 Y Coordinate: 1472634.47 X Coordinate: 1542237.30

# Borehole ID: KAFB-106140

Hole Diameter Upper (in.): 11-3/4 Hole Diameter Lower (in.): 9-5/8 Surface Completion Type: Flush mount

Groundwater Levels BGS (ft):  $\square$  At Time of Drilling: N/A  $\blacksquare$  At End of Drilling: N/A  $\blacksquare$  After Drilling: N/A

Drilling Contractor: WDC Drilling Drilling Method: Air Rotary Casing Hammer Logged By: Jason Tarbert

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05 Depth (ft)	Sample Type	Number	Headspace PID	Lithologic Log	Material Description	U.S.C.S.	Well Diagram	Remarks
155	-				Silty SAND (SM); brown (7.5YR 5/4); moist; loose; 70% sand to 3mm; 30% silt.	SM	- Bottom of Screen	
160	-				Poorly graded SAND with Silt (SP-SM); light brown (7.5YR 6/3); moist; very loose; 90% medium to very fine sand; 10% silt.	SP- SM		
-	-				Well graded SAND with Gravel (SW); gray (5YR 6/1); dry; very loose; 60% sand; 40% gravel to 30mm; angular to subrounded.			
<u>165</u> - -	-				Well graded SAND with Gravel (SW); gray (5YR 6/1); moist; very loose; 85% sand; 15% fine gravel to 9mm; subangular to subrounded.	SW	- Bentonite Seal	
<u>170</u> - -	-				Silty SAND with Gravel (SM); reddish brown (5YR 4/4); moist; loose; 70% well graded sand; 15% gravel; some tuft clasts; 15% silt.	 SM		
<u>175</u>	-				Well graded SAND with Gravel (SW); brown (7.5YR 4/4); 80% sand; 20% gravel to 7mm; rounded; tuft clasts.	sw		
180								



Date Started: 1/10/2011 Date TD Reached: 1/12/2011 Date Completed: 1/20/2011

Ground Elevation AMSL (ft): 5345.3 Y Coordinate: 1472634.47 X Coordinate: 1542237.30

# Borehole ID: KAFB-106140

Hole Diameter Upper (in.): 11-3/4 Hole Diameter Lower (in.): 9-5/8 Surface Completion Type: Flush mount

Groundwater Levels BGS (ft):  $\square$  At Time of Drilling: N/A  $\blacksquare$  At End of Drilling: N/A  $\blacksquare$  After Drilling: N/A

Drilling Contractor: WDC Drilling Drilling Method: Air Rotary Casing Hammer Logged By: Jason Tarbert

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08 Depth (ft)	Sample Type	Number	Headspace PID	Lithologic Log	Material Description	U.S.C.S.	Well Diagram	Remarks
-	_				Poorly graded SAND (SP); pinkish gray (7.5YR 7/2); moist; very loose; 95% coarse to fine sand; 5% fines.	SP	- Bentonite Seal	
<u>185</u>	-				Well graded SAND (SW); light gray (2.5YR 7/1); dry to moist; 90% sand; 5% gravel to 11mm; subangular to subrounded; 5% fines. Well graded SAND (SW); light brownish gray (2.5Y 6/2); moist; very loose; 90% sand; 10% gravel to 12mm; trace fines.	sw	- Native Backfill	
<u>195</u>					Poorly graded SAND (SP); pinkish gray (5YR 7/2); dry; very loose; 95% coarse to fine sand; 5% fines.	SP	- - Bentonite Seal	
200	_				Well graded SAND (SW); light brown (7.5YR 6/3); dry; very loose; 95% sand; 5% fines.	sw	- A the second s	
205	-				Poorly graded SAND (SP); light reddish brown (5YR 6/4); dry; very loose; 95% fine to very fine sand; 5% fines.	SP		

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Date Started: 1/10/2011 Date TD Reached: 1/12/2011 Date Completed: 1/20/2011

Ground Elevation AMSL (ft): 5345.3 Y Coordinate: 1472634.47 X Coordinate: 1542237.30

# Borehole ID: KAFB-106140

Hole Diameter Upper (in.): 11-3/4 Hole Diameter Lower (in.): 9-5/8 Surface Completion Type: Flush mount

Groundwater Levels BGS (ft):  $\square$  At Time of Drilling: N/A  $\blacksquare$  At End of Drilling: N/A  $\blacksquare$  After Drilling: N/A

Drilling Contractor: WDC Drilling Drilling Method: Air Rotary Casing Hammer Logged By: Jason Tarbert

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01 Depth (ft)	Sample Type	Number	Headspace PID	Lithologic Log	Material Description	U.S.C.S.	Well Diagram	Remarks	
-					Well graded SAND (SW); light gray (5YR 6/1); moist; very loose; 90% sand; 5% gravel to 17mm; subrounded to rounded; 5% fines.				
2 <u>15</u> - - -					Well graded SAND with Gravel (SW); gray (5YR 6/1); 85% sand; 15% gravel to 17mm; angular to subrounded; trace fines.	SW	A A A A A A A A A A A A A A A A A A A		
220					Poorly graded SAND with Gravel (SP); reddish gray (2.5YR 5/1); dry to moist; loose; 80% very coarse to coarse sand; 20% gravel to 30mm; subangular to subrounded.	SP	- - Bentonite Seal		
2 <u>25</u> - - - 230					Well graded SAND (SW); gray (5YR 5/1); dry; very loose; 100% sand to 5mm.	SW	CONTRACTOR		
-					Poorly graded SAND (SP); pink (5YR 7/3); damp; very loose; 95% coarse to fine sand; 5% fines.	SP			
2 <u>35</u>					Well graded SAND with Gravel (SW); pinkish gray (7.5YR 7/2); dry; very loose; 80% sand; 15% gravel to 22mm; angular to rounded; mostly tuft clasts; 5% fines. Poorly graded SAND (SP); pink (5YR 7/3); 95% coarse to fine sand; 5% gravel		- Bentonite Seal		
- - 240					to 5mm; subrounded.	SP	- Top of Filter Pack		

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Project Number: 140705

Date Started: 1/10/2011 Date TD Reached: 1/12/2011 Date Completed: 1/20/2011

Client: US Army Corps of Engineers Project Location: KAFB, Albuquerque, NM

Ground Elevation AMSL (ft): 5345.3

Project Name: KAFB BFF SWMU ST-106 and SS-111

## Borehole ID: KAFB-106140

Hole Diameter Upper (in.): 11-3/4 Hole Diameter Lower (in.): 9-5/8 Surface Completion Type: Flush mount

Groundwater Levels BGS (ft):  $\square$  At Time of Drilling: N/A  $\blacksquare$  At End of Drilling: N/A ▼ After Drilling: N/A

Drilling Contractor: WDC Drilling Drilling Method: Air Rotary Casing Hammer

YC	Coor	dinat	e: 14 e: 15	7263	4.47 Dr	Drilling Method: Air Rotary Casing Hammer Logged By: Jason Tarbert				ammer Page 9 of 16
05 Depth (ft)	Sample Type	Number	Headspace PID	Lithologic Log	Material Description		U.S.C.S.	We	ell Diagram	Remarks
<u>- 10</u> - 245 - - - 250					Well graded SAND with Gravel (SW light gray (5YR 7/1); dry; very loose; sand; 15% gravel to 10mm; subang to subrounded. Well graded SAND with Gravel (SW light gray (5YR 7/1); dry; very loose; sand; 40% gravel to 15mm; angular rounded.	; 85% ular /); ; 60% to	SW		Top of 3/4" Schedule 80 PVC 0.050 Slot Screen	
255					Silty SAND (SM); light brown (7.5YR 6/4); moist; loose; 60% medium to v fine sand; 5% gravel to 40mm; subangular to subrounded; 35% silt.	very			- Bottom of Screen	
- - 260					Silty SAND (SM); light brown (7.5YR 6/4); moist; loose; 70% medium to v fine sand; 30% silt.	very	SM			
- 265					Same as above (255 ft); 80% mediu very fine sand; 20% silt.	um to	SIVI		- Bentonite Seal	
					Poorly graded SAND with Silt (SP); brown (7.5YR 7/3); moist; loose; 909 medium to very coarse sand; trace gravel to 7mm; 10% silt.	%				



Date Started: 1/10/2011 Date TD Reached: 1/12/2011 Date Completed: 1/20/2011

Ground Elevation AMSL (ft): 5345.3 Y Coordinate: 1472634.47 X Coordinate: 1542237.30

# Borehole ID: KAFB-106140

Hole Diameter Upper (in.): 11-3/4 Hole Diameter Lower (in.): 9-5/8 Surface Completion Type: Flush mount

Groundwater Levels BGS (ft):  $\square$  At Time of Drilling: N/A  $\blacksquare$  At End of Drilling: N/A  $\blacksquare$  After Drilling: N/A

Drilling Contractor: WDC Drilling Drilling Method: Air Rotary Casing Hammer Logged By: Jason Tarbert

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				J7220		<b>j</b>		
05 Depth (ft)	Sample Type	Number	Headspace PID	Lithologic Log	Material Description	U.S.C.S.	Well Diagram	Remarks
-	-				Poorly graded SAND (SP); pinkish gray (7.5YR 7/2); moist; very loose; 95% coarse to fine sand; 5% fines.			
- 275 - -	-				Same as above (270 ft).	SP		
- <u>280</u> - -	-				Poorly graded SAND (SP); pinkish gray (5YR 6/2); moist; very loose; 95% very coarse to medium sand; 5% fines.			
2 <u>85</u> - - 290	-				Well graded SAND with Silt (SW-SM); pinkish gray (5YR 7/2); moist; loose; 85% sand; 5% gravel; angular to subrounded; 10% silt.	SW- SM	- Bentonite Seal	
-	-				Poorly graded SAND with Silt (SP-SM); light brown (7.5YR 6/4); 90% coarse to fine sand; 10% silt.	SP- SM		
<u>295</u> - -					Clayey SAND (SC); reddish brown (7.5YR 6/6); 80% fine sand; 20% clay.	sc		
300								



Date Started: 1/10/2011 Date TD Reached: 1/12/2011 Date Completed: 1/20/2011

Ground Elevation AMSL (ft): 5345.3 Y Coordinate: 1472634.47 X Coordinate: 1542237.30

# Borehole ID: KAFB-106140

Hole Diameter Upper (in.): 11-3/4 Hole Diameter Lower (in.): 9-5/8 Surface Completion Type: Flush mount

Groundwater Levels BGS (ft):  $\square$  At Time of Drilling: N/A  $\blacksquare$  At End of Drilling: N/A  $\blacksquare$  After Drilling: N/A

Drilling Contractor: WDC Drilling Drilling Method: Air Rotary Casing Hammer Logged By: Jason Tarbert

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00 Depth (ft)	Sample Type	Number	Headspace PID	Lithologic Log	Material Description	U.S.C.S.	Well Diagram	Remarks
-	-				Well graded SAND with Gravel (SW); brownish yellow (10YR 6/6); moist; very loose; 80% sand; 15% gravel to 20mm; subangular to subrounded; 5% fines.			
305	-				Well graded SAND (SW); very pale brown (10YR 7/3); moist; very loose; 95% sand; 5% gravel; subrounded.	SW		
310	-				Well graded GRAVEL with Sand (GW); pinkish gray (7.5YR 6/2); moist; very loose; 55% gravel to 45mm; 40% sand; angular to subrounded; 5% fines.	GW		
<u>315</u>	-				Well graded SAND with Gravel (SW); pinkish gray (7.5YR 6/2); dry; very loose; 80% sand; 20% gravel to 20mm; subangular to subrounded.	sw	- Bentonite Seal	
<u>-</u>	-				Poorly graded SAND (SP); pink (7.5YR 7/3); 95% coarse to medium sand; 5% fines.			
325	-				Poorly graded SAND with Gravel (SP); light pinkish brown gray (10YR 6/2); dry; loose; 80% coarse to fine sand; 15% gravel to 11mm; angular to rounded; 5% fines.	SP		
330								



Date Started: 1/10/2011 Date TD Reached: 1/12/2011 Date Completed: 1/20/2011

Ground Elevation AMSL (ft): 5345.3 Y Coordinate: 1472634.47 X Coordinate: 1542237.30

# Borehole ID: KAFB-106140

Hole Diameter Upper (in.): 11-3/4 Hole Diameter Lower (in.): 9-5/8 Surface Completion Type: Flush mount

Groundwater Levels BGS (ft):  $\square$  At Time of Drilling: N/A  $\blacksquare$  At End of Drilling: N/A  $\blacksquare$  After Drilling: N/A

Drilling Contractor: WDC Drilling Drilling Method: Air Rotary Casing Hammer Logged By: Jason Tarbert

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	X Coordinate: 1542237.30 Log						lason Ta	IDEIL	
05 Depth (ft)	Sample Type	Sample Type Number Headspace PID Lithologic Log		Lithologic Log	Material Description	U.S.C.S.	We	ll Diagram	Remarks
335	-				Well graded SAND with Gravel (SW); light brown (7.5YR 6/3); dry; very loose; 80% sand; 20% gravel to 35mm; angular to subrounded.	sw		- Bentonite Seal	
-	-				Poorly graded SAND (SP); pale brown (10YR 6/3); moist; very loose; 95% medium to very fine sand; 5% gravel to 12mm.			- Top of Filter Pack	
<u>340</u> - -	-				Same as above (335 ft).			- Top of 3/4" Schedule 80 PVC 0.050 Slot Screen	
345	-				Poorly graded SAND (SP); brown (7.5YR 5/4); dry; very loose; 95% medium to very fine sand; 5% gravel.	SP			
350	-				Poorly graded SAND with Gravel (SP); pinkish gray (7.5YR 6/2); dry; very loose; 80% fine to coarse sand; 20% gravel to 12mm; angular to subrounded.			- Bottom of Screen	Asked driller to slow down @ 1440.
355	-				Poorly graded SAND (SP); pinkish gray (7.5YR 7/2); dry; very loose; 95% medium to fine sand; 5% fines.			- Bentonite Seal	
360									



Date Started: 1/10/2011 Date TD Reached: 1/12/2011 Date Completed: 1/20/2011

Ground Elevation AMSL (ft): 5345.3 Y Coordinate: 1472634.47 X Coordinate: 1542237.30

# Borehole ID: KAFB-106140

Hole Diameter Upper (in.): 11-3/4 Hole Diameter Lower (in.): 9-5/8 Surface Completion Type: Flush mount

Groundwater Levels BGS (ft):  $\square$  At Time of Drilling: N/A  $\blacksquare$  At End of Drilling: N/A  $\blacksquare$  After Drilling: N/A

Drilling Contractor: WDC Drilling Drilling Method: Air Rotary Casing Hammer Logged By: Jason Tarbert

Page 13 of 16

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g Depth (ft)	Sample Type	Number	Headspace PID	Lithologic Log	Material Description	U.S.C.S.	Well Diagram	Remarks
	-				Poorly graded SAND (SP); brown (10YR 5/3); dry; very loose; 95% coarse to medium sand; 5% fines.			
- <u>365</u> - -					Same as above (360 ft); 95% medium to fine sand.	SP		
- 370 - - -					Poorly graded SAND with Silt (SP-SM); light brown (7.5YR 6/3); moist; very loose; 90% coarse to medium sand; 10% silt.	SP- SM		
<u>875</u> - -					Well graded SAND (SW); brown (7.5YR 5/3); dry; loose; 95% sand; 5% fines.		- Bentonite Seal	
- <u>-</u> - -					Well graded SAND with Gravel (SW); reddish brown (5YR 5/3); moist; very loose; 80% sand; 15% gravel to 10mm; subangular to subrounded; 5% fines.	SW		
<u>385</u> - -					Poorly graded SAND (SP); brown (7.5YR 5/3); dry to moist; very loose; 95% coarse to fine sand; 5% fines.	SP		
390								



Date Started: 1/10/2011 Date TD Reached: 1/12/2011 Date Completed: 1/20/2011

Ground Elevation AMSL (ft): 5345.3 Y Coordinate: 1472634.47 X Coordinate: 1542237.30

# Borehole ID: KAFB-106140

Hole Diameter Upper (in.): 11-3/4 Hole Diameter Lower (in.): 9-5/8 Surface Completion Type: Flush mount

Groundwater Levels BGS (ft):  $\square$  At Time of Drilling: N/A  $\blacksquare$  At End of Drilling: N/A  $\blacksquare$  After Drilling: N/A

Drilling Contractor: WDC Drilling Drilling Method: Air Rotary Casing Hammer Logged By: Jason Tarbert

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g Depth (ft)	Sample Type	Number	Headspace PID	Lithologic Log	Material Description	U.S.C.S.	Well Diagram	Remarks			
-	-				Poorly graded SAND with Gravel (SP); reddish brown (5YR 4/3); moist; loose; 80% coarse to fine sand; 15% gravel to 11mm; angular to subrounded; 5% fines.						
- <u>395</u> - -	-				Poorly Graded SAND (SP); light reddish brown (5YR 6/3); moist; very loose; 95% medium to very fine sand; 5% fines.	SP					
- 400 -	-				Same as above (395 ft); fine to medium sand.						
- 405 - - -	-				Well graded SAND (SW); brown (5YR 5/3); moist; very loose; 95% sand; 5% fines.	sw	- Bentonite Seal				
<u>410</u> - -	-				Poorly graded SAND (SP); light reddish brown (5YR 6/3); moist; very loose; 95% fine to medium sand; 5% fines.						
- 415 - -	-				Poorly graded SAND (SP); pinkish gray (5YR 7/2); moist; very loose; 95% fine to medium sand; 5% fines.	SP					
420											



Date Started: 1/10/2011 Date TD Reached: 1/12/2011 Date Completed: 1/20/2011

Ground Elevation AMSL (ft): 5345.3 Y Coordinate: 1472634.47 X Coordinate: 1542237.30

# Borehole ID: KAFB-106140

Hole Diameter Upper (in.): 11-3/4 Hole Diameter Lower (in.): 9-5/8 Surface Completion Type: Flush mount

Groundwater Levels BGS (ft):  $\square$  At Time of Drilling: N/A  $\blacksquare$  At End of Drilling: N/A  $\blacksquare$  After Drilling: N/A

Drilling Contractor: WDC Drilling Drilling Method: Air Rotary Casing Hammer Logged By: Jason Tarbert

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55 Depth (ft)	Sample Type	Number	Headspace PID	Lithologic Log	Material Description	U.S.C.S.	We	ll Diagram	Remarks
-	-				Poorly graded SAND (SP); pinkish gray (5YR 7/2); moist; very loose; 95% fine to medium sand; 5% fines.				
425	-				Poorly graded SAND (SP); pink (7.5YR 7/3); moist; very loose; 95% coarse to medium sand; 5% fines.			- Bentonite Seal	
<u>430</u>	-				Poorly graded SAND (SP); pink (7.5YR 7/3); moist; very loose; 95% very coarse to fine sand; 5% fines.				
4 <u>35</u> - -	-				Poorly graded SAND (SP); light brown (7.5YR 6/3); moist; very loose; 95% very coarse to medium sand; 5% fines.	SP		- Top of Filter Pack	
440	-				Same as above (435 ft).			- Top of 3" Schedule 80 PVC 0.050 Slot Screen	
445					Same as above (435 ft).				
450									



Date Started: 1/10/2011 Date TD Reached: 1/12/2011 Date Completed: 1/20/2011

Ground Elevation AMSL (ft): 5345.3 Y Coordinate: 1472634.47 X Coordinate: 1542237.30

# Borehole ID: KAFB-106140

Hole Diameter Upper (in.): 11-3/4 Hole Diameter Lower (in.): 9-5/8 Surface Completion Type: Flush mount

Groundwater Levels BGS (ft):  $\square$  At Time of Drilling: N/A  $\blacksquare$  At End of Drilling: N/A  $\blacksquare$  After Drilling: N/A

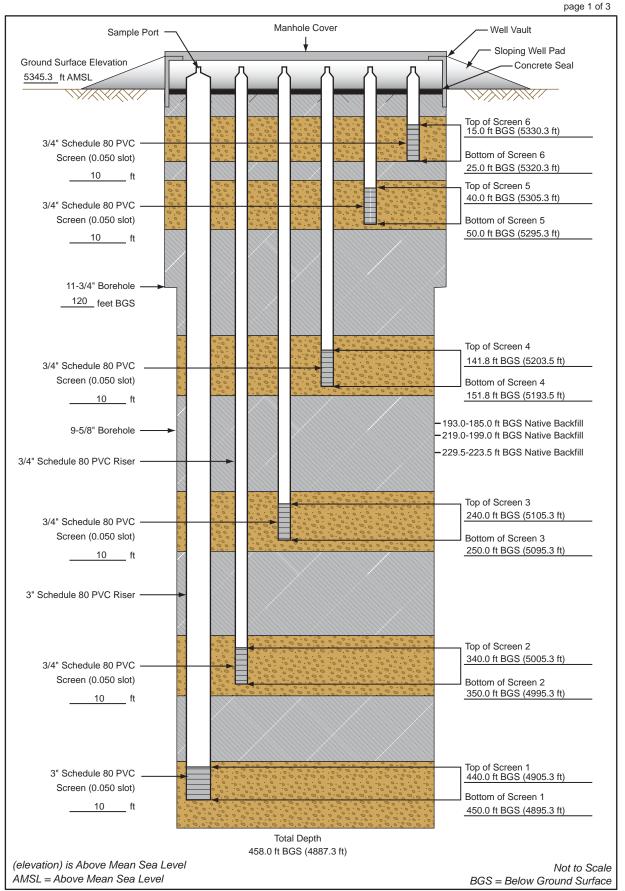
Drilling Contractor: WDC Drilling Drilling Method: Air Rotary Casing Hammer Logged By: Jason Tarbert

Page 16 of 16

						Dy. 0		- go to the
65 Depth (ft)	Sample Type	Number	Headspace PID	Lithologic Log	Material Description	U.S.C.S.	Well Diagram	Remarks
	-				Poorly graded SAND (SP); light brown (7.5YR 6/3); moist; very loose; 95% very coarse to medium sand; 5% fines.	SP	Bottom of Screen	
455	-				Lean CLAY (CL); moist; firm; high plasticity; 90% clay; 10% sand.			
	-				Poorly graded SAND (SP); dry, very loose; 95% medium to fine sand; 5%	SP		Total depth = 458 ft.
460	-							Reached @1630 on 1/12/11.
	-							Water added during drilling (gallons) = 0
465	-							Water added during construction (gallons) = Not Recorded
	-							
470	-							
	-							
475	-							
	-							
480								

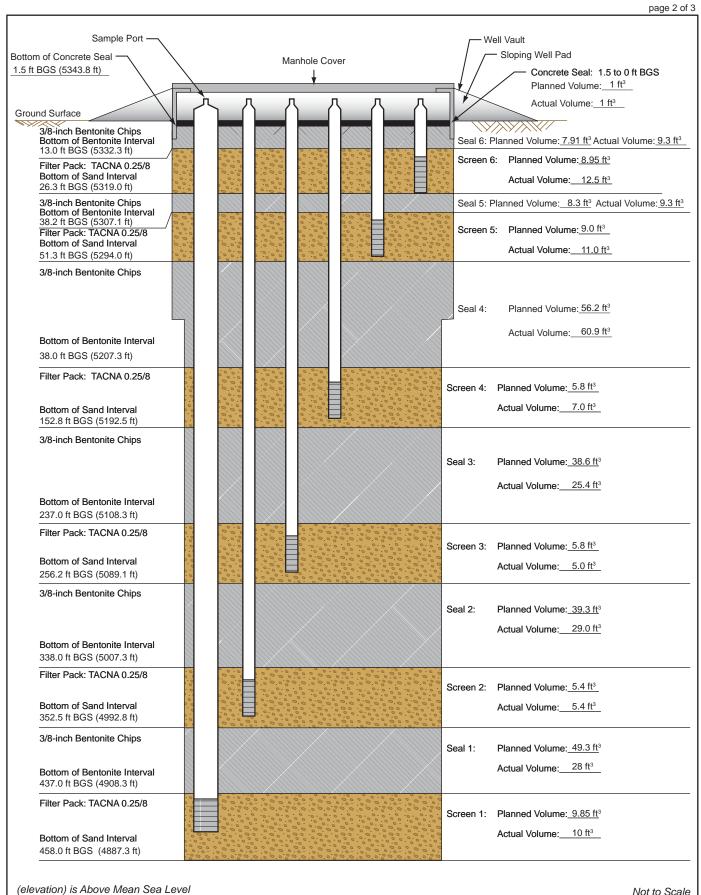
### Nested Soil Vapor Well Completion Diagram for KAFB-106140

Installation Start Date/Time: <u>1/13/2011 @ 09:10</u> Installation End Date/Time: <u>1/20/2011 @ 13:05</u>



140705_CA010020_SV_KAFB.106140 (a)

### Nested Soil Vapor Well Completion Diagram for KAFB-106140

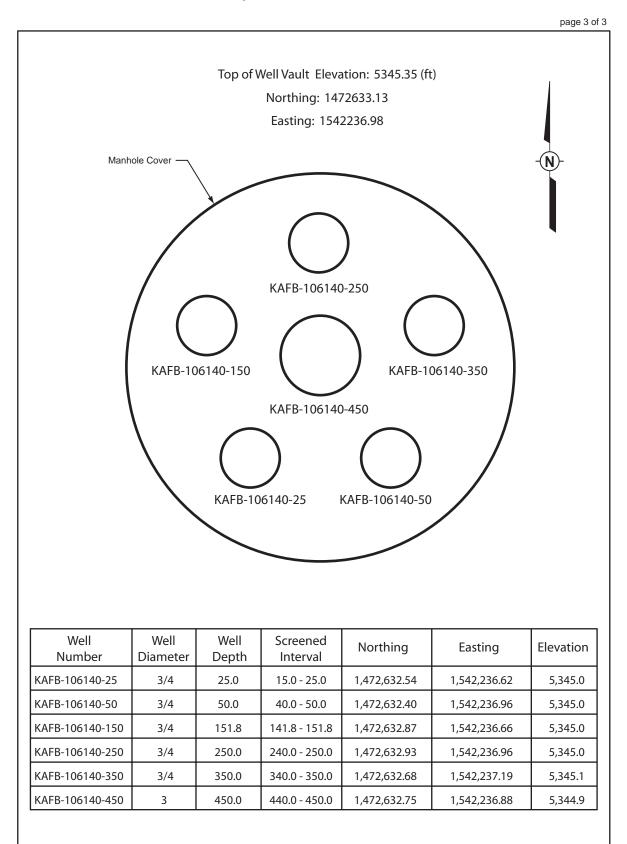


All Materials Placed with Tremie Pipe

Not to Scale BGS = Below Ground Surface

140705_CA010020_SV_KAFB.106140 (b)

### Nested Soil Vapor Well Completion Diagram Map View for KAFB-106140



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## **APPENDIX C**

### Waste Disposal Documentation

C-1. IDW Soil Disposal

C-2. Off-Site Waste Disposal Manifest

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## **APPENDIX C-1**

### **IDW Soil Disposal**

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### **DEPARTMENT OF THE AIR FORCE** 377th Civil Engineer Division (AFMC)



13 January, 2011

### MEMORANDUM FOR: 377 MSG/CEANR

### FROM: 377 MSG/CEANC (Solid Waste Program Manager)

### SUBJECT: Landfill Disposal

Reference: Shaw Environmental Ltr. dated: 12 January, 2011 USACE Contract No. W912DY-10-D-0014 / Task Order No. 0002

1. Authorization is granted to Shaw Environmental to dispose of soil drill cuttings and debris in support of continued monitoring of Bulk Fuels Facility from the installation of 1 each monitoring wells, KAFB-106045 at the Kirtland AFB construction and demolition landfill. Debris will be delivered by Rhino Waste in 2 each, Rinchem roll-offs, S/N 20B-28; and 104053 to the landfill. Debris will consist of drill cuttings and plastic liners from roll-offs. Lab results are on file in the Solid Waste Management office. Shaw shall be issued a Kirtland AFB landfill pass for this disposal action. A copy of this letter will accompany each roll-off and be left with the gate keeper at the landfill.

2. Please direct questions to me at 846-9014.

VEN C. KITT

Solid Waste Program Manager Environmental Management Shaw Environmental & Infrastructure, Inc.

A World of Solutions

January 12, 2011 KAFB-011-0001

Mr. Steve Kitt 377 MSG/CEANC 2050 Wyoming Blvd NE Albuquerque, NM 87117-5270

### Subject: Disposal of Soil Drill Cuttings from the Installation of Groundwater Monitoring Well KAFB-106045 Kirtland AFB, New Mexico

Dear Mr. Kitt:

Shaw Environmental and Infrastructure (Shaw E&I) is requesting permission to dispose of nonhazardous soil drill cuttings from monitoring well installation and the associated plastic liners from the rolloff containers, to the Kirtland Air Force Base (Kirtland AFB) Construction and Demolition (C&D) debris landfill. The generation of and analyses performed on the drill cuttings are discussed below.

During December 2010, Shaw E&I directed the installation of groundwater monitoring well KAFB-106045 at the Kirtland AFB Bulk Fuels Facility (BFF). The well is located in the southwestern corner of the BFF area outside of the known fuel plume. The monitoring well was drilled using air rotary casing hammer (ARCH) and the drill cuttings were containerized in three plastic lined steel rolloffs pending laboratory analysis for waste characterization. Approximately 35 cubic yards of soil drill cuttings were generated and stored in three 20-cubic yard rolloff containers at the well location. Two of the rolloffs contained dry soil drilling cuttings and were sampled on 28 December 2010. The third rolloff contains saturated cuttings and will be sampled and submitted for disposal at a later date.

A composite sample was collected from each of the two rolloff containers (Nos. 20B-28 and 104053) and sent to Hall Environmental Analysis Laboratory for testing. The samples were analyzed for the required parameters per the Kirtland AFB Landfill Acceptance Memorandum (January 2009). The analytical results for the two composite samples confirm that the drill cuttings are not considered to be hazardous waste and meet the requirements for disposal at the Kirtland C&D landfill.

Shaw E&I requests your review of the attached analytical data and determination for disposal at the Kirtland AFB C&D landfill. Upon receiving notification of acceptance for disposal, Shaw E&I will coordinate transport of the rolloffs and disposal of the waste with Rhino.

If you have any questions regarding this request, please contact me at (720) 554-8163. Thank you for your assistance.

Sincerely,

Thomas Cooper, PG Project Manager

Attachment

Hall Environmental Analysis Laboratory Report No. 1012939 - Analytical Results for Drill Cuttings from Groundwater Monitoring Well KAFB-106045



### COVER LETTER

Tuesday, January 11, 2011

Pam Moss Shaw Environmental, Inc. 2440 Louisiana Blvd NE Suite 300 Albuquerque, NM 87110

TEL: (505) 262-8920 FAX

RE: Kirtland AFB

Dear Pam Moss:

Order No.: 1012939

Hall Environmental Analysis Laboratory, Inc. received 2 sample(s) on 12/28/2010 for the analyses presented in the following report.

These were analyzed according to EPA procedures or equivalent. Below is a list of our accreditations. To access our accredited tests please go to www.hallenvironmental.com or the state specific web sites.

Reporting limits are determined by EPA methodology.

Please do not hesitate to contact HEAL for any additional information or clarifications.

Sincerely,

Andy Freeman, Laboratory Manager

NM Lab # NM9425 NM0901 AZ license # AZ0682 ORELAP Lab # NM100001 Texas Lab# T104704424-08-TX



4901 Hawkins NE ■ Suite D ■ Albuquerque, NM 87109 505.345.3975 ■ Fax 505.345.4107 www.hallenvironmental.com

## **NON-HAZARDOUS WASTE MANIFEST**

NON-HAZARDOUS WASTE MANIFEST	e (12 pitch) typewriter) 1. Generator's US EPA I Š	D No. MG970024423		Manifest Document No.		2. Page 1 of
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4. Generator's Phone(1905)) 846-386 5. Transporter 1 Company Name		3. US EPA ID Number		A. State Transpo	attorie ID	
	l			B. Transporter 1		
ी सम्राट में स्वार टेटर सम्राट 7. Transporter 2 Company Name	i	NM XXX 208677 3. US EPA ID Number		C. State Transp	1.111.11.11.11.1	582) (S
		·		D. Transporter 2	Phone	
9. Designated Facility Name and Site Address		10. US EPA ID Number		E. State Facility	s ID	
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IS BENERATOR'S CERTIFICATION: I hereby on In proper condition for transport. The materials		shipment are fully and accurately describ re not subject to federal hazardous waste	ed and are ir regulations.	n all respects		
		shipment are fully and accurately describ re not subject to federal hazardous waste	ed and are ir regulations.	n all respects	<u></u>	Date
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NON-HAZARDOUS WASTE

## NON-HAZARDOUS WASTE MANIFEST

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# PROHIBITED OR UNACCEPTABLE MATERIALS FOR LANDFILL DISPOSAL

- POWER POLES (TREATED WITH CREOSOTE)
- WOOD (TREATED WITH CREOSOTE)
- FLUORESCENT BULBS
- ELECTRONIC BALLASTS
- EMPTY OIL CONTAINERS
- MATTRESSES & BOXSPRINGS
- WHOLE TIRES
- CONTAMINATED SOIL
- COMPUTER COMPONENTS AND ACCESSORIES
- APPLIANCE
  - TV'S

# **RECYCLING**

# METAL AND CARDBOARD WILL BE SEPARATED AND RECYCLED <u>BY CUSTOMER</u>

IF YOU HAVE ANY QUESTIONS PLEASE FEEL FREE TO CALL THE LANDFILL 505-846-5994



## DEPARTMENT OF THE AIR FORCE

377th Civil Engineer Division (AFMC)

21 January, 2011

### MEMORANDUM FOR: 377 MSG/CEANR

FROM: 377 MSG/CEANC (Solid Waste Program Manager)

SUBJECT: Landfill Disposal

Reference: Shaw Environmental Ltr. dated: 20 January, 2011 USACE Contract No. W912DY-10-D-0014 / Task Order No. 0002

1. Authorization is granted to Shaw Environmental to dispose of soil drill cuttings and debris in support of continued monitoring of Bulk Fuels Facility from the installation of 2 each monitoring wells, KAFB-106044 & KAFB-106045 and 1 each soil vapor monitoring well, KAFB-106139 at the Kirtland AFB construction and demolition landfill. Debris will be delivered by Rhino Waste in 3 each, Rinchem rolloffs, S/N 20B-001, 20B-27 and 104056 to the landfill. Debris will consist of drill cuttings and plastic liners from roll-offs. Lab results are on file in the Solid Waste Management office. Shaw shall be issued a Kirtland AFB landfill pass for this disposal action. A copy of this letter will accompany each roll-off and be left with the gate keeper at the landfill.

2. Please direct questions to me at 846-9014.

STEVEN C. KITT Solid Waste Program Manager Environmental Management



A World of Solutions"

January 20, 2011

Project No. 140705 KAFB-011-0003

Mr. Steve Kitt 377 MSG/CEANC 2050 Wyoming Blvd NE Albuquerque, NM 87117-5270

Reference: USACE Contract No. W912DY-10-D-0014, Delivery Order 0002

Subject: Disposal of Soil Drill Cuttings from the Installation of Groundwater Monitoring Wells KAFB-106044, KAFB-106139, and KAFB-106045 Kirtland AFB. New Mexico

Dear Mr. Kitt:

Shaw Environmental and Infrastructure (Shaw E&I) is requesting permission to dispose of nonhazardous soil drill cuttings and plastic liners used in our rolloff containers to the Kirtland Air Force Base (Kirtland AFB) Construction and Demolition (C&D) debris landfill. The generation of and analyses performed on the soil drill cutting are discussed below.

During January 2011, Shaw E&I installed two groundwater monitoring wells (KAFB-106044 and KAFB-106045) and one soil vapor monitoring well (KAFB-106139) at the Kirtland AFB Bulk Fuels Facility (BFF). The KAFB-106044 and KAFB-106045 wells are located in the southwestern corner of the BFF area, which is outside of the known fuel plume on the groundwater. The KAFB-106139 well is located along Randolph Ave SE. The monitoring wells were drilled using air rotary casing hammer (ARCH) and the drill cuttings were containerized in plastic lined steel rolloffs pending laboratory analysis for waste characterization. Approximately 30 to 35 cubic yards of soil drill cuttings were generated for each 40-cubic yard rolloff container and one rolloff each is stored at the three well locations.

A composite sample was collected from the rolloff containers (20B001, 20B-27, and 104056) and sent to Hall Environmental Analysis Laboratory for testing. Rolloff containers are hauled and owned by Rhino Environmental SVCS, Inc. The samples were analyzed for the required parameters per the Kirtland AFB Landfill Acceptance Memorandum (January 2009). The analytical results for the composite samples confirm that the drill cuttings are not considered to be hazardous waste and meet the requirements for disposal at the Kirtland C&D landfill.

Shaw E & I requests your review of the attached analytical data and determination for disposal at Kirtland AFB C&D landfill. The rolloff containers are owned by Rhino with rolloff numbers 20B001, 20B-27, and 104056.

Mr. Steve Kitt

Upon receiving notification of Kirtland AFB's acceptance of the soil and plastic, Shaw E&I will coordinate transport of the rolloffs and disposal of the waste with Rhino.

If you have any questions regarding this request, please contact me at (720) 554-8163. Thank you for your assistance.

Sincerely,

Thomas Cooper Project Manager

Enclosures:

Hall Environmental Analysis Laboratory Report No. 1101216 and No. 1101168 – Analytical Results for Drill Cuttings from Groundwater Monitoring Well KAFB-106044, KAFB-106045, and KAFB-106139

2



### COVER LETTER

Wednesday, January 19, 2011

Pamela Moss Shaw Environmental, Inc. 7604 Technology Way, Suite 300 Denver, CO 80237

TEL: (720) 554-8252 FAX

RE: KAFB FF 654194

Dear Pamela Moss:

### Order No.: 1101216

Hall Environmental Analysis Laboratory, Inc. received 2 sample(s) on 1/6/2011 for the analyses presented in the following report.

These were analyzed according to EPA procedures or equivalent. Below is a list of our accreditations. To access our accredited tests please go to www.hallenvironmental.com or the state specific web sites.

Reporting limits are determined by EPA methodology.

Please do not hesitate to contact HEAL for any additional information or clarifications.

Sincerely,

Andy Freeman, Laboratory Manager

NM Lab # NM9425 NM0901 AZ license # AZ0682 ORELAP Lab # NM100001 Texas Lab# T104704424-08-TX



4901 Hawkins NE ■ Suite D ■ Albuquerque, NM 87109 505.345.3975 ■ Fax 505.345.4107 www.hallenvironmental.com

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#### DEPARTMENT OF THE AIR FORCE 377th Civil Engineer Division (AFMC)



25 January, 2011

#### MEMORANDUM FOR: 377 MSG/CEANR

FROM: 377 MSG/CEANC (Solid Waste Program Manager)

SUBJECT: Landfill Disposal

Reference: Shaw Environmental Ltr. dated: 20 January, 2011 USACE Contract No. W912DY-10-D-0014 / Task Order No. 0003

Disposal of Soil Drill Cuttings from the Installation of Groundwater Monitoring Wells KAFB-106044, KAFB-106139, and KAFB-106140 on Kirtland AFB as part of Base Fuels Facility Site Investigation

1. Authorization is granted to Shaw Environmental to dispose of soil drill cuttings and debris in support of continued monitoring of Bulk Fuels Facility from the installation of 2 each monitoring wells, KAFB-106040; KAFB-106044 & KAFB-106139 at the Kirtland AFB construction and demolition landfill. Debris will be delivered by Rhino Waste in 3 each, Rhino roll-offs, S/N 104052, 104057, 104050, 104051 and 20B-29 to the landfill. Debris will consist of drill cuttings and plastic liners from roll-offs. Lab results are on file in the Solid Waste Management office. Shaw shall be issued a Kirtland AFB landfill pass for this disposal action. A copy of this letter will accompany each roll-off and be left with the gate keeper at the landfill.

2. Please direct questions to me at 846-9014.

STEVEN C. KITT Solid Waste Program Manager Environmental Management



A World of Solutions"

January 24, 2011

Project No. 140705 KAFB-011-0004

Mr. Steve Kitt 377 MSG/CEANC 2050 Wyoming Blvd NE Albuquerque, NM 87117-5270

Reference: USACE Contract No. W912DY-10-D-0014, Delivery Order 0003

Subject: Disposal of Soil Drill Cuttings from the Installation of Groundwater Monitoring Wells KAFB-106044, KAFB-106139, and KAFB-106140 Kirtland AFB, New Mexico

Dear Mr. Kitt:

Shaw Environmental and Infrastructure (Shaw E&I) is requesting permission to dispose of nonhazardous soil drill cuttings and plastic liners used in our rolloff containers to the Kirtland Air Force Base (Kirtland AFB) Construction and Demolition (C&D) debris landfill. The generation of and analyses performed on the soil drill cutting are discussed below.

During January 2011, Shaw E&l installed one groundwater monitoring well (KAFB-106044) and two soil vapor monitoring wells (KAFB-106139 and KAFB-106140) at the Kirtland AFB Bulk Fuels Facility (BFF). The KAFB-106044 well is located in the southwestern corner of the BFF area and the KAFB-106140 well is located along the southern perimeter of the BFF area, both of which are outside of the known fuel plume on the groundwater. The KAFB-106139 well is located along Randolph Ave SE. The monitoring wells were drilled using air rotary casing hammer (ARCH) and the drill cuttings were containerized in plastic lined steel rolloffs pending laboratory analysis for waste characterization. Approximately 10 to 15 cubic yards of soil drill cuttings were generated for each 20-cubic yard rolloff container and one rolloff each is stored at the three well locations.

A composite sample was collected from the rolloff containers (104052, 104057, 104050, 104051, and 20B-29) and sent to Hall Environmental Analysis Laboratory for testing. The samples were analyzed for the required parameters per the Kirtland AFB Landfill Acceptance Memorandum (January 2009). The analytical results for the composite samples confirm that the drill cuttings are not considered to be hazardous waste and meet the requirements for disposal at the Kirtland C&D landfill.

Shaw E & I requests your review of the attached analytical data and determination for disposal at Kirtland AFB C&D landfill. The rolloff containers are owned by Rhino Environmental SVCS, Inc. and the numbers on the containers for disposal include - 104052, 104057, 104050, 104051, and 20B-29. Upon receiving notification of

Mr. Steve Kitt

Kirtland AFB's acceptance of the soil and plastic, Shaw E&I will coordinate transport of the rolloffs and disposal of the waste with Rhino.

If you have any questions regarding this request, please contact me at (720) 554-8163. Thank you for your assistance.

Sincerely,  $\langle$ Thomas Cooper

Project Manager

Enclosures:

Hall Environmental Analysis Laboratory Report No. 1101264 and No. 1101390 – Analytical Results for Drill Cuttings from Groundwater Monitoring Well KAFB-106044, KAFB-106139, and KAFB-106140

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*RETURN COMPLETED BOL TO ROB GOFF*

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### DEPARTMENT OF THE AIR FORCE

377th Civil Engineer Division (AFMC)



9 February, 2011

## MEMORANDUM FOR: 377 MSG/CEANR

FROM: 377 MSG/CEANC (Solid Waste Program Manager)

SUBJECT: Landfill Disposal

Reference: Shaw Environmental Ltr. dated: 8 February, 2011 USACE Contract No. W912DY-10-D-0014 / Delivery Order No. 002

Disposal of Soil Drill Cuttings from the Installation of Groundwater Monitoring Wells KAFB-106044, KAFB-106139, and KAFB-106140 on Kirtland AFB as part of Base Fuels Facility Site Investigation

1. Authorization is granted to Shaw Environmental to dispose of soil drill cuttings and debris in support of continued monitoring of Bulk Fuels Facility from the installation of 4 each monitoring wells, KAFB-106109; KAFB-106113; KAFB-106135 & KAFB-106137 at the Kirtland AFB construction and demolition landfill. Debris will be delivered by Rhino Waste in 6 each, Rhino roll-offs, S/N 104058; 20B008; 20B001;104056; A20-67; and 20B-25 to the landfill. Debris will consist of drill cuttings and plastic liners from roll-offs. Lab results are on file in the Solid Waste Management office. Shaw shall be issued a Kirtland AFB landfill pass for this disposal action. A copy of this letter will accompany each roll-off and be left with the gate keeper at the landfill.

2. Please direct questions to me at 846-9014.

STEVEN C. KITT Solid Waste Program Manager Environmental Management



A World of Solutions"

February 8, 2011

Project No. 140705 KAFB-011-0006

Mr. Steve Kitt 377 MSG/CEANC 2050 Wyoming Blvd NE Albuquerque, NM 87117-5270

Reference: USACE Contract No. W912DY-10-D-0014, Delivery Order 002

Subject: Disposal of Soil Drill Cuttings from the Installation of Soil Vapor Monitoring Wells KAFB-106109, KAFB-106113, KAFB-106135, and KAFB-106137 Kirtland AFB, New Mexico

Dear Mr. Kitt:

Shaw Environmental and Infrastructure (Shaw E&I) is requesting permission to dispose of nonhazardous soil drill cuttings and plastic liners used in our rolloff containers to the Kirtland Air Force Base (Kirtland AFB) Construction and Demolition (C&D) debris landfill. The generation of and analyses performed on the soil drill cutting are discussed below.

During January 2011, Shaw E&1 installed four soil vapor monitoring wells (KAFB-106109, KAFB-106113, KAFB-106135, and KAFB-106137) at the Kirtland AFB Bulk Fuels Facility (BFF). The KAFB-106109 well is located 300 feet east of building 1029. The KAFB-106113 well is located in the BFF area approximately 200 feet north of tank 2420. The KAFB-106135 and KAFB-106137 wells are located along the north side of Randolph Ave SE across from the BFF. The monitoring wells were drilled using air rotary casing hammer (ARCH) and the drill cuttings were containerized in plastic lined steel rolloffs pending laboratory analysis for waste characterization. Approximately 10 to 15 cubic yards of soil drill cuttings were generated for each 20-cubic yard rolloff container. One rolloff is stored at KAFB-106109, one rolloff is stored at KAFB-106113, two rolloffs are stored at KAFB-106137.

A composite sample was collected from each of the rolloff containers and sent to Hall Environmental Analysis Laboratory for testing. The samples were analyzed for the required parameters per the Kirtland AFB Landfill Acceptance Memorandum (January 2009). The analytical results for the composite samples confirm that the drill cuttings are not considered to be hazardous waste and meet the requirements for disposal at the Kirtland C&D landfill.

Shaw E & I requests your review of the attached analytical data and determination for disposal at Kirtland AFB C&D landfill. The rolloff containers are owned by Rhino Environmental SVCS, Inc. and the numbers on the

containers for disposal include - 104058, 20B008, 20B001, 104056, A20-67 and 20B-25. Upon receiving notification of Kirtland AFB's acceptance of the soil and plastic, Shaw E&I will coordinate transport of the rolloffs and disposal of the waste with Rhino.

If you have any questions regarding this request, please contact me at (720) 554-8163. Thank you for your assistance.

Sincerely,

Thomas Cooper/ Project Manager

Enclosures:

Hall Environmental Analysis Laboratory Report No. 1101584, No. 1101635, No. 1101697 and No. 1101714 – Analytical Results for Drill Cuttings from SVM Wells KAFB-106109, KAFB-106113, KAFB-106135, and KAFB-106137

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# NON-HAZARDOUS WASTE MANIFEST

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# NON-HAZARDOUS WASTE MANIFEST

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#### **DEPARTMENT OF THE AIR FORCE**

377th Civil Engineer Division (AFMC)



22 February, 2011

#### MEMORANDUM FOR: 377 MSG/CEANR

FROM: 377 MSG/CEANC (Solid Waste Program Manager)

SUBJECT: Landfill Disposal

Reference: Shaw Environmental Ltr. dated: 22 February, 2011 USACE Contract No. W912DY-10-D-0014 / Delivery Order No. 0002

Disposal of Soil Drill Cuttings from the Installation of Soil Vapor Monitoring Wells KAFB-106109 and KAFB-106113 on Kirtland AFB as part of Base Fuels Facility Site Investigation

1. Authorization is granted to Shaw Environmental to dispose of soil drill cuttings and debris in support of continued monitoring of Bulk Fuels Facility from the installation of 2 each monitoring wells, KAFB-106109 and KAFB-106113 at the Kirtland AFB construction and demolition landfill. Debris will be delivered by Rhino Waste in 2 each, Rhino roll-offs, S/N A20-081and A20-043 to the landfill. Debris will consist of drill cuttings and plastic liners from roll-offs. Lab results are on file in the Solid Waste Management office. Shaw shall be issued a Kirtland AFB landfill pass for this disposal action. A copy of this letter will accompany each roll-off and be left with the gate keeper at the landfill.

2. Please direct questions to me at 846-9014.

STEVEN C. KITT Solid Waste Program Manager Environmental Management

Shaw Environmental & Infrastructure, Inc.

### A World of Solutions"

February 22, 2011

Project No. 140705 KAFB-011-0007

Mr. Steve Kitt 377 MSG/CEANC 2050 Wyoming Blvd NE Albuquerque, NM 87117-5270

Reference: USACE Contract No. W912DY-10-D-0014, Delivery Order 0002

Subject: Disposal of Soil Drill Cuttings from the Installation of Soil Vapor Monitoring Well KAFB-106109 and KAFB-106113 Kirtland AFB. New Mexico

Dear Mr. Kitt:

Shaw Environmental and Infrastructure (Shaw E&I) is requesting permission to dispose of nonhazardous soil drill cuttings and plastic liners used in rolloff containers to the Kirtland Air Force Base (Kirtland AFB) Construction and Demolition (C&D) debris landfill. The generation of and analyses performed on the soil drill cuttings are discussed below.

During February 2011, Shaw E&I installed two soil vapor monitoring wells (KAFB-106109 and KAFB-106113) at the Kirtland AFB Bulk Fuels Facility (BFF). The KAFB-106109 well is located 300 feet east of building 1029. The KAFB-106113 well is located in the BFF area approximately 200 feet north of tank 2420. The monitoring wells were drilled using air rotary casing hammer (ARCH) and the drill cuttings were containerized in plastic lined steel rolloffs pending laboratory analysis for waste characterization. Approximately 10 to 15 cubic yards of soil drill cuttings were generated for each 20-cubic yard rolloff container. One rolloff is stored at KAFB-106109 and one rolloff is stored at KAFB-106113.

A composite sample was collected from each of the rolloff containers and sent to Hall Environmental Analysis Laboratory for testing. The samples were analyzed for the required parameters per the Kirtland AFB Landfill Acceptance Memorandum (January 2009). The analytical results for the composite samples confirm that the drill cuttings are not considered to be hazardous waste and meet the requirements for disposal at the Kirtland C&D landfill.

Shaw E & I requests your review of the attached analytical data and determination for disposal at Kirtland AFB C&D landfill. The rolloff containers are owned by Rhino Environmental SVCS, Inc. and the numbers on the containers for disposal include – A20-081 and A20-043. Upon receiving notification of Kirtland AFB's

acceptance of the soil and plastic, Shaw E&I will coordinate transport of the rolloffs and disposal of the waste with Rhino.

If you have any questions regarding this request, please contact me at (720) 554-8163. Thank you for your assistance.

Sincerely,

Thomas Cooper

Project Manager

Enclosures:

Hall Environmental Analysis Laboratory Report No. 1102163 – Analytical Results for Drill Cuttings from SVM Wells KAFB-106109 and KAFB-106113



### COVER LETTER

Monday, February 21, 2011

Pamela Moss Shaw Environmental, Inc. 7604 Technology Way, Suite 300 Denver, CO 80237

TEL: (720) 554-8252 FAX

RE: KAFB BFF

Dear Pamela Moss:

Order No.: 1102163

Hall Environmental Analysis Laboratory, Inc. received 5 sample(s) on 2/7/2011 for the analyses presented in the following report.

These were analyzed according to EPA procedures or equivalent. Below is a list of our accreditations. To access our accredited tests please go to www.hallenvironmental.com or the state specific web sites.

Reporting limits are determined by EPA methodology.

Please do not hesitate to contact HEAL for any additional information or clarifications.

Sincerely,

Andy Freeman, Laboratory Manager

NM Lab # NM9425 NM0901 AZ license # AZ0682[.] ORELAP Lab # NM100001 Texas Lab# T104704424-08-TX



4981 Hawkins NE ■ Suite D ■ Albuquerque, NM 87109 505.345.3975 ■ Fax 505.345.4107 www.hallenvironmental.com

# **NON-HAZARDOUS WASTE MANIFEST**

	NON-HAZARDOUS WASTE MANIFEST	1. Generator's US	SEPAID NO. NM9570024423		Manifest Document No.	•	2. Page 1 of 1
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	4. Generator's Phone ( 505 ) ~ 846-852 5. Transporter 1 Company Name	16	6. US EPA ID Number		A. State Transp	orter's ID	
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	7. Transporter 2 Company Name		8. US EPA ID Number		C. State Transp		353
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	9. Designated Facility Name and Site Address KIRTLAND AIRFORCE BASE	LANDFILL	10. US EPA ID Number		E. State Facility	's ID	-
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# NON-HAZARDOUS WASTE MANIFEST

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	5. Transporter 1 Company Name RINCHEM CO INC.	6. US EP/ I NMD002	A ID Number		A. State Transpor	76765 346 3	CKK
<u>.</u>					B. Transporter 1 P		
	7. Transporter 2 Company Name	8. US EP/	A ID Number	ŀ	C. State Transpor		
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	9. Designated Facility Name and Site Address KIRTLAND AIRFORCE BASE LAN	DFILL			L. Otale I dointy o		
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	ALBUQUERQUE, NM 87117				(5	05)-846-9014	
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	G. Additional Descriptions for Materials Listed Above 3 BIN#				H. Handling Code	s for Wastes Listed Abc	ve .
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KAFB, ALBUQUERQUE, NM

RINCHEM COMPANY, INC 6133 EDITH NE ALBUQUERQUE, NM 87107

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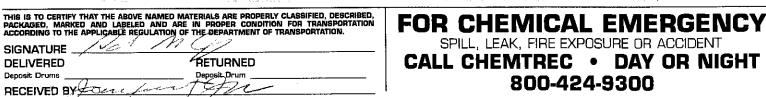
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# NON-HAZARDOUS WASTE MANIFEST

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# NON-HAZARDOUS WASTE MANIFEST

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NON-HAZARDOUS WASTE

### DEPARTMENT OF THE AIR FORCE

377th Civil Engineer Division (AFMC)

28 February, 2011

#### MEMORANDUM FOR: 377 MSG/CEANR

FROM: 377 MSG/CEANC (Solid Waste Program Manager)

SUBJECT: Landfill Disposal

Reference: Shaw Environmental Ltr. dated: 25 February, 2011 USACE Contract No. W912DY-10-D-0014 / Delivery Order No. 0002

Disposal of Soil Drill Cuttings from the Installation of Soil Vapor Monitoring Wells KAFB-106132 and KAFB-106133 on Kirtland AFB as part of Base Fuels Facility Site Investigation

1. Authorization is granted to Shaw Environmental to dispose of soil drill cuttings and debris in support of continued monitoring of Bulk Fuels Facility from the installation of 2 each monitoring wells, KAFB-106132 and KAFB-106133 at the Kirtland AFB construction and demolition landfill. Debris will be delivered by Rhino Waste in 3 each, Rhino roll-offs, S/N 104054, 104055 and 104052 to the landfill. Debris will consist of drill cuttings and plastic liners from roll-offs. Lab results are on file in the Solid Waste Management office. Shaw shall be issued a Kirtland AFB landfill pass for this disposal action. A copy of this letter will accompany each roll-off and be left with the gate keeper at the landfill.

2. Please direct questions to me at 846-9014.

Solid Waste Program Manager Environmental Management



A World of Solutions"

February 25, 2011

Project No. 140705 KAFB-011-0008

.

Mr. Steve Kitt 377 MSG/CEANC 2050 Wyoming Blvd NE Albuquerque, NM 87117-5270

Reference: USACE Contract No. W912DY-10-D-0014, Delivery Order 0002

Subject: Disposal of Soil Drill Cuttings from the Installation of Soil Vapor Monitoring Well KAFB-106132 and KAFB-106133 Kirtland AFB, New Mexico

Dear Mr. Kitt:

Shaw Environmental and Infrastructure (Shaw E&I) is requesting permission to dispose of nonhazardous soil drill cuttings and plastic liners used in rolloff containers to the Kirtland Air Force Base (Kirtland AFB) Construction and Demolition (C&D) debris landfill. The generation of and analyses performed on the soil drill cuttings are discussed below.

During February 2011, Shaw E&I installed two soil vapor monitoring wells (KAFB-106132 and KAFB-106133) at the Kirtland AFB Bulk Fuels Facility (BFF). The KAFB-106132 well is located in the parking lot north of KAFB building 1044. The KAFB-106133 well is located immediately west of KAFB building 1055. The monitoring wells were drilled using air rotary casing hammer (ARCH) and the drill cuttings were containerized in plastic lined steel rolloffs pending laboratory analysis for waste characterization. Approximately 10 to 15 cubic yards of soil drill cuttings were generated for each 20-cubic yard rolloff container. Two rolloffs are stored at KAFB-106132 and one rolloff is stored at KAFB-106133.

A composite sample was collected from each of the rolloff containers and sent to Hall Environmental Analysis Laboratory for testing. The samples were analyzed for the required parameters per the Kirtland AFB Landfill Acceptance Memorandum (January 2009). The analytical results for the composite samples confirm that the drill cuttings are not considered to be hazardous waste and meet the requirements for disposal at the Kirtland C&D landfill.

Shaw E & I requests your review of the attached analytical data and determination for disposal at Kirtland AFB C&D landfill. The rolloff containers are owned by Rhino Environmental SVCS, Inc. and the numbers on the containers for disposal include -104054, 104055, and 104052. Upon receiving notification of Kirtland AFB's

Mr. Steve Kitt

acceptance of the soil and plastic, Shaw E&I will coordinate transport of the rolloffs and disposal of the waste with Rhino.

If you have any questions regarding this request, please contact me at (720) 554-8163. Thank you for your assistance.

Sincerely,

Thomas Cooper Project Manager

Enclosures:

Hall Environmental Analysis Laboratory Report No. 1102257 – Analytical Results for Drill Cuttings from SVM Wells KAFB-106132 and KAFB-106133



### COVER LETTER

Thursday, February 24, 2011

Pamela Moss Shaw Environmental, Inc. 7604 Technology Way, Suite 300 Deriver, CO 80237

TEL: (720) 554-8252 FAX

RE: KAFB BFF

Dear Pamela Moss:

Order No.: 1102257

Hall Environmental Analysis Laboratory, Inc. received 3 sample(s) on 2/9/2011 for the analyses presented in the following report.

These were analyzed according to EPA procedures or equivalent. Below is a list of our accreditations. To access our accredited tests please go to www.hallenvironmental.com or the state specific web sites.

Reporting limits are determined by EPA methodology.

Please do not hesitate to contact HEAL for any additional information or clarifications.

Sincerely

Andy Freeman, Laboratory Manager

NM Lab # NM9425 NM0901 AZ license # AZ0682 ORELAP Lab # NM100001 Texas Lab# T104704424-08-TX



4901 Hawkins NE ■ Suite D ■ Albuquerque, NM 87109 505.345.3975 # Fax 505.345.4107 www.hallenvironmental.com

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### **DEPARTMENT OF THE AIR FORCE** 377th Civil Engineer Division (AFMC)

3 March, 2011

### MEMORANDUM FOR: 377 MSG/CEANR

FROM: 377 MSG/CEANC (Solid Waste Program Manager)

SUBJECT: Landfill Disposal

Reference: Shaw Environmental Ltr. dated: 1 March, 2011 USACE Contract No. W912DY-10-D-0014 / Delivery Order No. 0002

Disposal of Soil Drill Cuttings from the Installation of Soil Vapor Monitoring Wells KAFB-106115 and KAFB-106133 on Kirtland AFB as part of Base Fuels Facility Site Investigation

1. Authorization is granted to Shaw Environmental to dispose of soil drill cuttings and debris in support of continued monitoring of Bulk Fuels Facility from the installation of 2 each monitoring wells, KAFB-106115 and KAFB-106133 at the Kirtland AFB construction and demolition landfill. Debris will be delivered by Rhino Waste in 2 each, Rhino roll-offs, S/N 104053, and 104057 to the landfill. Debris will consist of drill cuttings and plastic liners from roll-offs. Lab results are on file in the Solid Waste Management office. Shaw shall be issued a Kirtland AFB landfill pass for this disposal action. A copy of this letter will accompany each roll-off and be left with the gate keeper at the landfill.

2. Please direct questions to me at 846-9014.

VEN C. KI

Solid Waste Program Manager Environmental Management

Shaw Environmental & Infrastructure, Inc.

A World of Solutions™

March 1, 2011

Project No. 140705 KAFB-011-0009

Mr. Steve Kitt 377 MSG/CEANC 2050 Wyoming Blvd NE Albuquerque, NM 87117-5270

Reference: USACE Contract No. W912DY-10-D-0014, Delivery Order 0002

Subject: Disposal of Soil Drill Cuttings from the Installation of Soil Vapor Monitoring Well KAFB-106115 and KAFB-106133 Kirtland AFB, New Mexico

Dear Mr. Kitt:

Shaw Environmental and Infrastructure (Shaw E&I) is requesting permission to dispose of nonhazardous soil drill cuttings and plastic liners used in rolloff containers to the Kirtland Air Force Base (Kirtland AFB) Construction and Demolition (C&D) debris landfill. The generation of and analyses performed on the soil drill cuttings are discussed below.

During February 2011, Shaw E&I installed two soil vapor monitoring wells (KAFB-106115 and KAFB-106133) at the Kirtland AFB Bulk Fuels Facility (BFF). The KAFB-106115 well is located approximately 150 feet north of tank 2422. The KAFB-106133 well is located immediately west of KAFB building 1055. The monitoring wells were drilled using air rotary casing hammer (ARCH) and the drill cuttings were containerized in plastic lined steel rolloffs pending laboratory analysis for waste characterization. Approximately 10 to 15 cubic yards of soil drill cuttings were generated for each 20-cubic yard rolloff container. One rolloff is stored at KAFB-106115 and one rolloff is stored at KAFB-106133.

A composite sample was collected from each of the rolloff containers and sent to Hall Environmental Analysis Laboratory for testing. The samples were analyzed for the required parameters per the Kirtland AFB Landfill Acceptance Memorandum (January 2009). The analytical results for the composite samples confirm that the drill cuttings are not considered to be hazardous waste and meet the requirements for disposal at the Kirtland C&D landfill.

Shaw E & I requests your review of the attached analytical data and determination for disposal at Kirtland AFB C&D landfill. The rolloff containers are owned by Rhino Environmental SVCS, Inc. and the numbers on the containers for disposal include – 104053 and 104057. Upon receiving notification of Kirtland AFB's acceptance of the soil and plastic, Shaw E&I will coordinate transport of the rolloffs and disposal of the waste with Rhino.

Mr. Steve Kitt

If you have any questions regarding this request, please contact me at (720) 554-8163. Thank you for your assistance.

Sincerely,

Thomas Cooper

Project Manager

Enclosures:

Hall Environmental Analysis Laboratory Report No. 1102293 – Analytical Results for Drill Cuttings from SVM Wells KAFB-106115 and KAFB-106133



### COVER LETTER

Friday, February 25, 2011

Pamela Moss Shaw Environmental, Inc. 7604 Technology Way, Suite 300 Denver, CO 80237

TEL: (720) 554-8252 FAX

RE: KAFB BFF

Dear Pamela Moss:

Order No.: 1102293

Hall Environmental Analysis Laboratory, Inc. received 2 sample(s) on 2/10/2011 for the analyses presented in the following report.

This report is a revised report and it replaces the original report issued February 24, 2011.

No determination of compounds below these (denoted by the ND or < sign) has been made.

Reporting limits are determined by EPA methodology.

Please don't hesitate to contact HEAL for any additional information or clarifications.

Sincerely,

Andy Freeman, Laboratory Manager

NM Lab # NM9425 AZ license # AZ0682 ORELAP Lab # NM100001 Texas Lab# T104704424-08-TX



4901 Hawkins NE ■ Suite D ■ Albuquerque, NM 87109 505.345.3975 = Fax 505.345.4107 www.hallenvironmental.com

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COMPANY, INC. 6133 EDITH BOULEVARD NE ALBUQUERQUE, N.M. 87107 PHONE (505) 345-3655

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RINCHEM COMPANY., INC Carrier

# RHINO – KAFB / SHAW

Deposit Drums

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### KAFB, ALBUQUERQUE, NM

RINCHEM COMPANY, INC 6133 EDITH NE ALBUQUERQUE, NM 87107

800-424-9300

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#### **DEPARTMENT OF THE AIR FORCE** 377th Civil Engineer Division (AFMC)

3 March, 2011

### MEMORANDUM FOR: 377 MSG/CEANR

FROM: 377 MSG/CEANC (Solid Waste Program Manager)

SUBJECT: Landfill Disposal

Reference: Shaw Environmental Ltr. dated: 3 March, 2011 USACE Contract No. W912DY-10-D-0014 / Delivery Order No. 0002

Disposal of Soil Drill Cuttings from the Installation of Soil Vapor Monitoring Wells KAFB-106115, KAFB-106101 and KAFB-106108 on Kirtland AFB as part of Base Fuels Facility Site Investigation

1. Authorization is granted to Shaw Environmental to dispose of soil drill cuttings and debris in support of continued monitoring of Bulk Fuels Facility from the installation of 3 each monitoring wells, KAFB-106115, KAFB-106101 and KAFB-106108 at the Kirtland AFB construction and demolition landfill. Debris will be delivered by Rhino Waste in 3 each, Rhino roll-offs, S/N 104050, A20-088, 20B-027 and 20B-028 to the landfill. Debris will consist of drill cuttings and plastic liners from roll-offs. Lab results are on file in the Solid Waste Management office. Shaw shall be issued a Kirtland AFB landfill pass for this disposal action. A copy of this letter will accompany each roll-off and be left with the gate keeper at the landfill.

2. Please direct questions to me at 846-9014.

STEVEN C. KITT Solid Waste Program Manager Environmental Management



A World of Solutions™

March 3, 2011

Project No. 140705 KAFB-011-0010

Mr. Steve Kitt 377 MSG/CEANC 2050 Wyoming Blvd NE Albuquerque, NM 87117-5270

Reference: USACE Contract No. W912DY-10-D-0014, Delivery Order 0002

Subject: Disposal of Soil Drill Cuttings from the Installation of Soil Vapor Monitoring Well KAFB-106115, KAFB-106101 and KAFB-106108 Kirtland AFB, New Mexico

Dear Mr. Kitt:

Shaw Environmental and Infrastructure (Shaw E&I) is requesting permission to dispose of nonhazardous soil drill cuttings and plastic liners used in rolloff containers to the Kirtlaud Air Force Base (Kirtlaud AFB) Construction and Demolition (C&D) debris landfill. The generation of and analyses performed on the soil drill cuttings are discussed below.

During February 2011, Shaw E&I installed three soil vapor monitoring wells (KAFB-106115, KAFB-106101 and KAFB-106108) at the Kirtland AFB Bulk Fuels Facility (BFF). The KAFB-106115 well is located approximately 150 feet north of tank 2422. The KAFB-106101 well is located at the northwest corner of the intersection of Randolph Ave SE and Ventura Ave SE. The KAFB-106108 well is located directly south of KAFB building 1025. The monitoring wells were drilled using air rotary casing hammer (ARCH) and the drill cuttings were containerized in plastic lined steel rolloffs pending laboratory analysis for waste characterization. Approximately 10 to 15 cubic yards of soil drill cuttings were generated for each 20-cubic yard rolloff container. One rolloff is stored at KAFB-106101, and two rolloffs are stored at KAFB-106108.

A composite sample was collected from each of the rolloff containers and sent to Hall Environmental Analysis Laboratory for testing. The samples were analyzed for the required parameters per the Kirtland AFB Landfill Acceptance Memorandum (January 2009). The analytical results for the composite samples confirm that the drill cuttings are not considered to be hazardous waste and meet the requirements for disposal at the Kirtland C&D landfill.

Shaw E & I requests your review of the attached analytical data and determination for disposal at Kirtland AFB C&D landfill. The rolloff containers are owned by Rhino Environmental SVCS, Inc. and the numbers on the containers for disposal include – 104050, A20-088, 20B-27 and 20B-028. Upon receiving notification of Kirtland

AFB's acceptance of the soil and plastic, Shaw E&I will coordinate transport of the rolloffs and disposal of the waste with Rhino.

If you have any questions regarding this request, please contact me at (720) 554-8163. Thank you for your assistance.

Sincerely,

Equew for Tom Cooper Que Thomas Cooper

Project Manager

Enclosures:

Hall Environmental Analysis Laboratory Reports No. 1102634 and 1102584 – Analytical Results for Drill Cuttings from SVM Wells KAFB-106115, KAFB-106101 and KAFB-106108



### COVER LETTER

Monday, February 28, 2011

Pamela Moss Shaw Environmental, Inc. 7604 Technology Way, Suite 300 Denver, CO 80237

TEL: (720) 554-8252 FAX

RE: KAFB BFF

Dear Pamela Moss:

Order No.: 1102584

Hall Environmental Analysis Laboratory, Inc. received 5 sample(s) on 2/17/2011 for the analyses presented in the following report.

These were analyzed according to EPA procedures or equivalent. Below is a list of our accreditations. To access our accredited tests please go to www.hallenvironmental.com or the state specific web sites.

Reporting limits are determined by EPA methodology.

Please do not hesitate to contact HEAL for any additional information or clarifications.

Sincerely,

Andy Freeman, Laboratory Manager

NM Lab # NM9425 NM0901 AZ license # AZ0682 ORELAP Lab # NM100001 Texas Lab# T104704424-08-TX



4901 Hawkins NE ■ Suite D ■ Albuquerque, NM 87109 505.345.3975 Fax 505.345.4107 www.hallenvironmental.com



# COVER LETTER

Tuesday, March 01, 2011

Pamela Moss Shaw Environmental, Inc. 7604 Technology Way, Suite 300 Denver, CO 80237

TEL: (720) 554-8252 FAX

RE: KAFB BFF

Dear Pamela Moss:

Order No.: 1102634

Hall Environmental Analysis Laboratory, Inc. received 3 sample(s) on 2/18/2011 for the analyses presented in the following report.

These were analyzed according to EPA procedures or equivalent. Below is a list of our accreditations. To access our accredited tests please go to www.hallenvironmental.com or the state specific web sites.

Reporting limits are determined by EPA methodology.

Please do not hesitate to contact HEAL for any additional information or clarifications.

Sincerely,

Andy Freeman, Laboratory Manager

NM Lab # NM9425 NM0901 AZ license # AZ0682 ORELAP Lab # NM100001 Texas Lab# T104704424-08-TX



4901 Hawkins NE ■ Suite D ■ Albuquerque, NM 87109 505.345.3975 ■ Fax 505.345.4107 www.hallenvironmental.com

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#### DEPARTMENT OF THE AIR FORCE

377th Civil Engineer Division (AFMC)



9 March, 2011

#### MEMORANDUM FOR: 377 MSG/CEANR

FROM: 377 MSG/CEANC (Solid Waste Program Manager)

SUBJECT: Landfill Disposal

Reference: Shaw Environmental Ltr. dated: 8 March, 2011 USACE Contract No. W912DY-10-D-0014 / Delivery Order No. 0002

Disposal of Soil Drill Cuttings from the Installation of Soil Vapor Monitoring Wells KAFB-106130 and KAFB-106134 and Groundwater Monitoring Well KAFB-106101 on Kirtland AFB as part of Base Fuels Facility Site Investigation

1. Authorization is granted to Shaw Environmental to dispose of soil drill cuttings and debris in support of continued monitoring of Bulk Fuels Facility from the installation of 3 each monitoring wells, KAFB-106130, KAFB-106134 and KAFB-106101 at the Kirtland AFB construction and demolition landfill. Debris will be delivered by Rhino Waste in 6 each, Rhino roll-offs, S/N 20B-001, 104056, 104058, 20B-008, 104051 and 20B-029 to the landfill. Debris will consist of drill cuttings and plastic liners from rolloffs. Lab results are on file in the Solid Waste Management office. Shaw shall be issued a Kirtland AFB landfill pass for this disposal action. A copy of this letter will accompany each roll-off and be left with the gate keeper at the landfill.

2. Please direct questions to me at 846-9014.

STEVEN C. KITT

Solid Waste Program Manager Environmental Management

Shaw[®] Shaw Environmental & Infrastructure, Inc.

A World of Solutions**

March 8, 2011

Project No. 140705 KAFB-011-011

Mr. Steve Kitt 377 MSG/CEANC 2050 Wyoming Blvd NE Albuquerque, NM 87117-5270

Reference: USACE Contract No. W912DY-10-D-0014, Delivery Order 0002

Subject: Disposal of Soil Drill Cuttings from the Installation of Soil Vapor Monitoring Wells KAFB-106130 and 106134 and Groundwater Monitoring Well KAFB-106101 Kirtland AFB, New Mexico

Dear Mr. Kitt:

Shaw Environmental and Infrastructure (Shaw E&I) is requesting permission to dispose of nonhazardous soil drill cuttings and plastic liners used in rolloff containers to the Kirtland Air Force Base (Kirtland AFB) Construction and Demolition (C&D) debris landfill. The generation of and analyses performed on the soil drill cuttings are discussed below.

During February 2011, Shaw E&I installed two soil vapor monitoring wells (KAFB-106130 and KAFB-106134) and one groundwater monitoring well (KAFB-106101) at the Kirtland AFB Bulk Fuels Facility (BFF). The KAFB-106130 well is located approximately 300 feet west of KAFB building 1055. The KAFB-106134 well is located along the south side of Randolph Ave SE, 300 feet east of KAFB building 1024. The KAFB-106101 well is located at the northwest corner of the intersection of Randolph Ave SE and Ventura Ave SE. The monitoring wells were drilled using air rotary casing hammer (ARCH) and the drill cuttings were containerized in plastic lined steel rolloffs pending laboratory analysis for waste characterization. Approximately 10 to 15 cubic yards of soil drill cuttings were generated for each 20-cubic yard rolloff container. Two rolloffs are stored at KAFB-106130, two rolloffs are stored at KAFB-106101, and two rolloffs are stored at KAFB-106134.

A composite sample was collected from each of the rolloff containers and sent to Hall Environmental Analysis Laboratory for testing. The samples were analyzed for the required parameters per the Kirtland AFB Landfill Acceptance Memorandum (January 2009). The analytical results for the composite samples confirm that the drill cuttings are not considered to be hazardous waste and meet the requirements for disposal at the Kirtland C&D landfill.

Shaw E & I requests your review of the attached analytical data and determination for disposal at Kirtland AFB C&D landfill. The rolloff containers are owned by Rhino Environmental SVCS, Inc. and the numbers on the

Mr. Steve Kitt

containers for disposal include – 20B-001, 104056, 104058, 20B-008, 104051 and 20B-029. Upon receiving notification of Kirtland AFB's acceptance of the soil and plastic, Shaw E&I will coordinate transport of the rolloffs and disposal of the waste with Rhino.

If you have any questions regarding this request, please contact me at (720) 554-8163. Thank you for your assistance.

Sincerely,

per for Jon Cooper

Thomas Cooper Project Manager

Enclosures:

Hall Environmental Analysis Laboratory Reports No. 1102662– Analytical Results for Drill Cuttings from SVM Wells KAFB-106130 and KAFB-106134 and groundwater monitoring well KAFB-106101



## COVER LETTER

Monday, March 07, 2011

Pamela Moss Shaw Environmental, Inc. 7604 Technology Way, Suite 300 Denver, CO 80237

TEL: (720) 554-8252 FAX

RE: KAFB BFF

Dear Pamela Moss:

Order No.: 1102662

Hall Environmental Analysis Laboratory, Inc. received 8 sample(s) on 2/21/2011 for the analyses presented in the following report.

These were analyzed according to EPA procedures or equivalent. Below is a list of our accreditations. To access our accredited tests please go to www.hallenvironmental.com or the state specific web sites.

Reporting limits are determined by EPA methodology.

Please do not hesitate to contact HEAL for any additional information or clarifications.

Sincerely,

Andy Freeman, Laboratory Manager

NM Lab # NM9425 NM0901 AZ license # AZ0682 ORELAP Lab # NM100001 Texas Lab# T104704424-08-TX



4901 Hawkins NE ■ Suite D ■ Albuquerque, NM 87109 505.345.3975 ■ Fax 505.345.4107 www.hallenvironmental.com

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**COMPANY, INC.** 6133 EDITH BOULEVARD NE ALBUQUERQUE, N.M. 87107 PHONE (505) 345-3655

BOL#

RINCHEM COMPANY., INC

03/07 /2011

RHINO – KAFB / SHAW KAFB, ALBUQUERQUE, NM RINCHEM COMPANY, INC 6133 EDITH NE ALBUQUERQUE, NM 87107

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· 	DELIVERY OF EMPTY ROLL-OFF BIN		
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	DELIVERY OF ROLL-OFF LINERS		
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	DELAVERY OF IARP		
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COMPANY, INC. 6133 EDITH BOULEVARD NE ALBUQUERQUE, N.M. 87107 PHONE (505) 345-3655

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RHINO - KAFB / SHAW

KAFB, ALBUQUERQUE, NM

RINCHEM COMPANY, INC 6133 EDITH NE ALBUQUERQUE, NM 87107

 $\left[ X \right]$ 

LANDFILL TRANSPORTATION

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DELIVERY OF ROLL-OFF LINERS

DELIVERY OF _____ TARP(S)

TIME ON SITE: ______ TIME RELEASED: _____

THE TRANSPORT TO LANDFILL NEEDS ALL THREE LINES COMPLETED, MEANING THE BIN# BEING MOVED, THE LOCATION NUMBER IT WAS PULLED FROM AND THE LOCATION NUMBER IT IS PLACED AFTER DUMPING AT THE LANDFILL <u>OR</u> IF BOX IS MOVED TO ANOTHER LOCATION. ANY QUESTIONS REGARDING THIS FORM PLEASE CONTACT ROB GOFF AT 998-4140 OR 681-4984 (CEIL).

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COMPANY, INC. 6133 EDITH BOÚLEVARD NE ALBUQUERQUE, N.M. 87107 PHONE (505) 345-3655

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RINCHEM COMPANY., INC Cartier

RHINO ~ KAFB / SHAW EAFB, ALBUQUERQUE, NM RINCHEM COMPANY, INC 6133 EDITH NE

ALBUQUEROUE, NM 87107

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## *RETURN COMPLETED BOL TO ROB GOFF*

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# DEPARTMENT OF THE AIR FORCE

377th Civil Engineer Division (AFMC)



## 17 March, 2011

# MEMORANDUM FOR: 377 MSG/CEANR

FROM: 377 MSG/CEANC (Solid Waste Program Manager)

SUBJECT: Landfill Disposal

Reference: Shaw Environmental Ltr. dated: 15 March, 2011 USACE Contract No. W912DY-10-D-0014 / Delivery Order No. 0002

Disposal of Soil Drill Cuttings from the Installation of Soil Vapor Monitoring Wells KAFB-106110 and KAFB-106114 on Kirtland AFB as part of Base Fuels Facility Site Investigation

1. Authorization is granted to Shaw Environmental to dispose of soil drill cuttings and debris in support of continued monitoring of Bulk Fuels Facility from the installation of 2 each monitoring wells, KAFB-106110 and KAFB-106114 at the Kirtland AFB construction and demolition landfill. Debris will be delivered by Rhino Waste in 4 each, Rhino roll-offs, S/N 20B-030, SD1102.20, 20B-25, and A20-067 to the landfill. Debris will consist of drill cuttings and plastic liners from roll-offs. Lab results are on file in the Solid Waste Management office. Shaw shall be issued a Kirtland AFB landfill pass for this disposal action. A copy of this letter will accompany each roll-off and be left with the gate keeper at the landfill.

2. Please direct questions to me at 846-9014.

STEVEN C. KITT Solid Waste Program Manager Environmental Management

Shaw [®] Shaw Environmental & Infrastructure, Inc.

A World of Solutions"

March 15, 2011

Project No. 140705 KAFB-011-012

Mr. Steve Kitt 377 MSG/CEANC 2050 Wyoming Blvd NE Albuquerque, NM 87117-5270

Reference: USACE Contract No. W912DY-10-D-0014, Delivery Order 0002

Subject: Disposal of Soil Drill Cuttings from the Installation of Soil Vapor Monitoring Wells KAFB-106110 and 106114 Kirtland AFB, New Mexico

Dear Mr. Kitt:

Shaw Environmental and Infrastructure (Shaw E&I) is requesting permission to dispose of nonhazardous soil drill cuttings and plastic liners used in rolloff containers to the Kirtland Air Force Base (Kirtland AFB) Construction and Demolition (C&D) debris landfill. The generation of and analyses performed on the soil drill cuttings are discussed below.

During February 2011, Shaw E&I installed two soil vapor monitoring wells (KAFB-106110 and KAFB-106114) at the Kirtland AFB Bulk Fuels Facility (BFF). The KAFB-106110 well is located approximately 350 feet west of KAFB building 1033. The KAFB-106114 well is located 300 feet northeast of KAFB tank 2526. The monitoring wells were drilled using air rotary casing hammer (ARCH) and the drill cuttings were containerized in plastic lined steel rolloffs pending laboratory analysis for waste characterization. Approximately 10 to 15 cubic yards of soil drill cuttings were generated for each 20-cubic yard rolloff container. Two rolloffs are stored at KAFB-106110.

A composite sample was collected from each of the rolloff containers and sent to Hall Environmental Analysis Laboratory for testing. The samples were analyzed for the required parameters per the Kirtland AFB Landfill Acceptance Memorandum (January 2009). The analytical results for the composite samples confirm that the drill cuttings are not considered to be hazardous waste and meet the requirements for disposal at the Kirtland C&D landfill.

Shaw E & I requests your review of the attached analytical data and determination for disposal at Kirtland AFB C&D landfill. The rolloff containers are owned by Rhino Environmental SVCS, Inc. and the numbers on the containers for disposal include – 20B-030, SD1102.20, 20B-25, and A20-067. Upon receiving notification of

Mr. Steve Kitt

Kirtland AFB's acceptance of the soil and plastic, Shaw E&I will coordinate transport of the rolloffs and disposal of the waste with Rhino.

If you have any questions regarding this request, please contact me at (720) 554-8163. Thank you for your assistance.

Sincerely,

for Tom Cooper

Thomas Cooper Project Manager

Enclosures:

Hall Environmental Analysis Laboratory Reports No. 1102748– Analytical Results for Drill Cuttings from SVM Wells KAFB-106110 and KAFB-106114



#### COVER LETTER

Thursday, March 10, 2011

Pamela Moss Shaw Environmental, Inc. 7604 Technology Way, Suite 300 Denver, CO 80237

TEL: (720) 554-8252 FAX

RE: KAFB BFF

Dear Pamela Moss:

Order No.: 1102748

Hall Environmental Analysis Laboratory, Inc. received 4 sample(s) on 2/23/2011 for the analyses presented in the following report.

These were analyzed according to EPA procedures or equivalent. Below is a list of our accreditations. To access our accredited tests please go to www.hallenvironmental.com or the state specific web sites.

Reporting limits are determined by EPA methodology.

Please do not hesitate to contact HEAL for any additional information or clarifications.

Sincerely,

Andy Freeman, Laboratory Manager

NM Lab # NM9425 NM0901 AZ license # AZ0682 ORELAP Lab # NM100001 Texas Lab# T104704424-08-TX



4901 Hawkins NE ■ Suite D ■ Albuquerque, NM 87109 505.345.3975 ■ Fax 505.345.4107 www.hallenvironmental.com

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City ALBUQ	UERQ	UE NM	Zip Code 87117	24 hr. Emergency Co	ontact Tel. No	800-424	4-9300	
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COMPANY, INC. 6133 EDITH BOULEVARD NE ALBUQUERQUE, N.M. 87107 PHONE (505) 345-3655

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RINCHEM COMPANY., INC Cartier

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KAFB, ALBUQUERQUE, NM

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RINCHEM COMPANY, INC 6133 EDITH NE ALBUQUERQUE, NM 87107

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#### DEPARTMENT OF THE AIR FORCE HEADQUARTERS 377TH AIR BASE WING (AFMC)

Copy

20110318

MEMORANDUM FOR: Whom it May Concern

FROM: 377 MSG/CEAN

SUBJECT: Approval of Disposal of Investigative Derived Waste inot the KAFB Construction Debris Landfill

To Whom it May Concern, 377 MSG/CEAN, John S. Pike, Director Environmental Management, has reviewed the analytical data for the soil contained in roll-off containers SD0605.20, SD0606.20, SD0608.20, 20B-004, and 104059 and finds the soil contained to be suitable for deposition into the landfill.

If you have any questions concerning this authorization, please contact me at (505) 264-9546.

JOHN S. PIKE

Chief, Environmental Management Kirtland AFB Civil Engineer Division notification of Kirtland AFB's acceptance of the soil and plastic, Shaw E&I will coordinate transport of the rolloffs and disposal of the waste with Rhino.

If you have any questions regarding this request, please contact me at (720) 554-8163. Thank you for your assistance.

Sincerely,

Thomas Cooper Project Manager

Dale Jothn for Tom Cooper

Enclosures:

Hall Environmental Analysis Laboratory Reports No. 1103060-- Analytical Results for Drill Cuttings from Groundwater Monitoring Well KAFB-106102 and SVM Well KAFB-1061142



### COVER LETTER

Thursday, March 17, 2011

Pamela Moss Shaw Environmental, Inc. 7604 Technology Way, Suite 300 Denver, CO 80237

TEL: (720) 554-8252 FAX

RE: KAFB BFF

Dear Pamela Moss:

Order No.: 1103060

Hall Environmental Analysis Laboratory, Inc. received 5 sample(s) on 3/1/2011 for the analyses presented in the following report.

This report is a revised report and it replaces the original report issued March 16, 2011.

No determination of compounds below these (denoted by the ND or < sign) has been made.

Reporting limits are determined by EPA methodology.

Please don't hesitate to contact HEAL for any additional information or clarifications.

Sincerely,

Andy Freeman, Laboratory Manager

NM Lab # NM9425 AZ license # AZ0682 ORELAP Lab # NM100001 Texas Lab# T104704424-08-TX



4901 Hawkins NE = Suite D = Albuquerque, NM 87109 505.345.3975 = Fax 505.345.4107 www.hallenvironmental.com



COMPANY, INC. 6133 EDITH BOULEVARD NE ALBUQUERQUE, N.M. B7107 PHONE (505) 345-3655

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RHINO - KAFB / SHAW

KAFB, ALBUQUERQUE, NM

RINCHEM COMPANY, INC 6133 EDITH NE ALBUQUERQUE, NM 87107

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# DEPARTMENT OF THE AIR FORCE

377th Civil Engineer Division (AFMC)



22 March, 2011

#### MEMORANDUM FOR: 377 MSG/CEANR

FROM: 377 MSG/CEANC (Solid Waste Program Manager)

SUBJECT: Landfill Disposal

Reference: Shaw Environmental Ltr. dated: 22 March, 2011 USACE Contract No. W912DY-10-D-0014 / Delivery Order No. 0002

Disposal of Soil Drill Cuttings from the Installation of Soil Vapor Monitoring Wells KAFB-106111, KAFB-106118, KAFB-106129 and KAFB-106131 on Kirtland AFB as part of Base Fuels Facility Site Investigation

1. Authorization is granted to Shaw Environmental to dispose of soil drill cuttings and debris in support of continued monitoring of Bulk Fuels Facility from the installation of 4 each Soil Vapor Monitoring Wells; KAFB-106111, KAFB-106118, KAFB-106129 and KAFB-106131 at the Kirtland AFB construction and demolition landfill. Debris will be delivered by Rhino Waste in 6 each, Rhino roll-offs, S/N SD1103.20; 104054; SD1101.20; A20-043; 104055 and 104052 to the landfill. Debris will consist of drill cuttings and plastic liners from roll-offs. Lab results are on file in the Solid Waste Management office. Shaw shall be issued a Kirtland AFB landfill pass for this disposal action. A copy of this letter will accompany each roll-off and be left with the gate keeper at the landfill.

2. Please direct questions to me at 846-9014.

STEVEN C. KITT Solid Waste Program Manager Environmental Management



A World of Solutions™

March 22, 2011

Project No. 140705 KAFB-011-015

Mr. Steve Kitt 377 MSG/CEANC 2050 Wyoming Blvd NE Albuquerque, NM 87117-5270

Reference: USACE Contract No. W912DY-10-D-0014, Delivery Order 0002

Subject: Disposal of Soil Drill Cuttings from the Installation of Soil Vapor Monitoring Wells KAFB-106111, KAFB-106118, KAFB-106129, and KAFB-106131 Kirtland AFB, New Mexico

Dear Mr. Kitt:

Shaw Environmental and Infrastructure (Shaw E&I) is requesting permission to dispose of nonhazardous soil drill cuttings and plastic liners used in rolloff containers to the Kirtland Air Force Base (Kirtland AFB) Construction and Demolition (C&D) debris landfill. The generation of and analyses performed on the soil drill cuttings are discussed below.

During March 2011, Shaw E&I installed four soil vapor monitoring wells (KAFB-106111, KAFB-106118, KAFB-106129, and KAFB-106131) at the Kirtland AFB Bulk Fuels Facility (BFF). The KAFB-106111 well is located 100 feet southwest of KAFB building 1033. The KAFB-106118 well is located 200 feet southwest of KAFB building 1048. The KAFB-106129 well is located 125 feet southeast of KAFB building 1041. The KAFB-106131 well is located 50 feet northeast of KAFB tank 2526. The monitoring wells were drilled using air rotary casing hammer (ARCH) and the drill cuttings were containerized in plastic lined steel rolloffs pending laboratory analysis for waste characterization. Approximately 10 to 15 cubic yards of soil drill cuttings were generated for each 20-cubic yard rolloff container. Two rolloffs are stored at KAFB-106111, one rolloff is stored at KAFB-106118, two rolloffs are stored at KAFB-106129, and one rolloff is stored at KAFB-106131.

A composite sample was collected from each of the rolloff containers and sent to Hall Environmental Analysis Laboratory for testing. The samples were analyzed for the required parameters per the Kirtland AFB Landfill Acceptance Memorandum (January 2009). The analytical results for the composite samples confirm that the drill cuttings are not considered to be hazardous waste and meet the requirements for disposal at the Kirtland C&D landfill.

Shaw E & I requests your review of the attached analytical data and determination for disposal at Kirtland AFB C&D landfill. The rolloff containers are owned by Rhino Environmental SVCS, Inc. and the numbers on the

Mr. Steve Kitt

containers for disposal include – SD1103.20, 104054, SD1101.20, A20-043, 104055, and 104052. Upon receiving notification of Kirtland AFB's acceptance of the soil and plastic, Shaw E&I will coordinate transport of the rolloffs and disposal of the waste with Rhino.

2

If you have any questions regarding this request, please contact me at (720) 554-8163. Thank you for your assistance.

Sincerely,

Agnew for Tim Cooper

Thomas Cooper Project Manager

Enclosures:

Hall Environmental Analysis Laboratory Reports No. 1103173– Analytical Results for Drill Cuttings from SVM Wells KAFB-106111, KAFB-106118, KAFB-106129, and KAFB-106131



## COVER LETTER

Monday, March 21, 2011

Pamela Moss Shaw Environmental, Inc. 7604 Technology Way, Suite 300 Denver, CO 80237

TEL: (720) 554-8252 FAX

RE: KAFB BFF

Order No.: 1103173

Dear Pamela Moss:

Hall Environmental Analysis Laboratory, Inc. received 7 sample(s) on 3/3/2011 for the analyses presented in the following report.

These were analyzed according to EPA procedures or equivalent. Below is a list of our accreditations. To access our accredited tests please go to www.hallenvironmental.com or the state specific web sites.

Reporting limits are determined by EPA methodology.

Please do not hesitate to contact HEAL for any additional information or clarifications.

Sincerely,

Andy Freeman, Laboratory Manager

NM Lab # NM9425 NM0901 AZ license # AZ0682 ORELAP Lab # NM100001 Texas Lab# T104704424-08-TX



4901 Hawkins NE ■ Suite D ■ Albuquerque, NM 87109 505,345,3975 ■ Fax 505,345,4107 www.hallenvironmental.com



COMPANY, INC. 6133 EDITH BOULEVARD NE ALBUQUERQUE, N.M. 87107 PHONE (505) 345-3655

BOL#

27/2011

RINCHEM COMPANY., INC

RETURNED

Deposit Drum

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RHINO - KAFB / SHAW

KAFB, ALBUQUERQUE, NM

RINCHEM COMPANY, INC 6133 EDITH NE ALBUQUERQUE, NM 87107

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800-424-9300

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FOR CHEMICAL SPILL, LEAK, FIRE EXPOSURE OR ACCIDENT CALL CHENTREG • DAY OR NIGHT 800-424-9300

#### **DEPARTMENT OF THE AIR FORCE**

377th Civil Engineer Division (AFMC)



24 March, 2011

# MEMORANDUM FOR: 377 MSG/CEANR

FROM: 377 MSG/CEANC (Solid Waste Program Manager)

SUBJECT: Landfill Disposal

Reference: Shaw Environmental Ltr. dated: 24 March, 2011 USACE Contract No. W912DY-10-D-0014 / Delivery Order No. 0002

Disposal of Soil Drill Cuttings from the Installation of Soil Vapor Monitoring Wells KAFB-106116, KAFB-106118, and KAFB-106119 on Kirtland AFB as part of Base Fuels Facility Site Investigation

1. Authorization is granted to Shaw Environmental to dispose of soil drill cuttings and debris in support of continued monitoring of Bulk Fuels Facility from the installation of 4 each Soil Vapor Monitoring Wells; KAFB-106116, KAFB-106118, and KAFB-106119 at the Kirtland AFB construction and demolition landfill. Debris will be delivered by Rhino Waste in 8 each, Rhino roll-offs, S/N SD0607.20; 22027; A20-081; 22025; 22026; 20B-27; A20-088 and 22023 to the landfill. Debris will consist of drill cuttings and plastic liners from roll-offs. Lab results are on file in the Solid Waste Management office. Shaw shall be issued a Kirtland AFB landfill pass for this disposal action. A copy of this letter will accompany each roll-off and be left with the gate keeper at the landfill.

2. Please direct questions to me at 846-9014.

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STEVEN C. KITT Solid Waste Program Manager Environmental Management



#### A World of Solutions"

March 24, 2011

Project No. 140705 KAFB-011-016

Mr. Steve Kitt 377 MSG/CEANC 2050 Wyoming Blvd NE Albuquerque, NM 87117-5270

Reference: USACE Contract No. W912DY-10-D-0014, Delivery Order 0002

Subject: Disposal of Soil Drill Cuttings from the Installation of Soil Vapor Monitoring Wells KAFB-106116, KAFB-106118, KAFB-106119, KAFB-106128, and KAFB-106131 Kirtland AFB, New Mexico

Dear Mr. Kitt:

Shaw Environmental and Infrastructure (Shaw E&I) is requesting permission to dispose of nonhazardous soil drill cuttings and plastic liners used in rolloff containers to the Kirtland Air Force Base (Kirtland AFB) Construction and Demolition (C&D) debris landfill. The generation of and analyses performed on the soil drill cuttings are discussed below.

During March 2011, Shaw E&I installed five soil vapor monitoring wells (KAFB-106116, KAFB-106118, KAFB-106119, KAFB-106128, and KAFB-106131) at the Kirtland AFB Bulk Fuels Facility (BFF). The KAFB-106116 well is located 50 feet southwest of KAFB building 2401. The KAFB-106118 well is located 200 feet southwest of KAFB building 1048. The KAFB-106119 well is located 150 feet northwest of KAFB building 1026. The KAFB-106128 well is located 100 feet southwest of KAFB building 1032. The KAFB-106131 well is located 50 feet northeast of KAFB tank 2526. The monitoring wells were drilled using air rotary casing hammer (ARCH) and the drill cuttings were containerized in plastic lined steel rolloffs pending laboratory analysis for waste characterization. Approximately 10 to 15 cubic yards of soil drill cuttings were generated for each 20-cubic yard rolloff container. Two rolloffs are stored at KAFB-106116, one rolloff is stored at KAFB-106118, two rolloffs are stored at KAFB-106119, two rolloffs are stored at KAFB-106128, and one rolloff is stored at KAFB-106131.

A composite sample was collected from each of the rolloff containers and sent to Hall Environmental Analysis Laboratory for testing. The samples were analyzed for the required parameters per the Kirtland AFB Landfill Acceptance Memorandum (January 2009). The analytical results for the composite samples confirm that the drill cuttings are not considered to be hazardous waste and meet the requirements for disposal at the Kirtland C&D landfill. Mr. Steve Kitt

Shaw E & I requests your review of the attached analytical data and determination for disposal at Kirtland AFB C&D landfill. The rolloff containers are owned by Rhino Environmental SVCS, Inc. and the numbers on the containers for disposal include – SD0607.20, 22027, A20-081, 22025, 22026, 20B-27, A20-088, and 22023. Upon receiving notification of Kirtland AFB's acceptance of the soil and plastic, Shaw E&I will coordinate transport of the rolloffs and disposal of the waste with Rhino.

2

If you have any questions regarding this request, please contact me at (720) 554-8163. Thank you for your assistance.

Sincerely,

Thomas Cooper

new for Tom Cooper

Project Manager

Enclosures:

Hall Environmental Analysis Laboratory Reports No. 1103222 and 1103296– Analytical Results for Drill Cuttings from SVM Wells KAFB-106116, KAFB-106118, KAFB-106119, KAFB-106128, and KAFB-106131

Waste Disposal Letter 106118, March 24, 2011



#### COVER LETTER

Wednesday, March 23, 2011

Pamela Moss Shaw Environmental, Inc. 7604 Technology Way, Suite 300 Denver, CO 80237

TEL: (720) 554-8252 FAX

RE: KAFB BFF

Dear Pamela Moss:

Order No.: 1103222

Hall Environmental Analysis Laboratory, Inc. received 1 sample(s) on 3/4/2011 for the analyses presented in the following report.

These were analyzed according to EPA procedures or equivalent. Below is a list of our accreditations. To access our accredited tests please go to www.hallenvironmental.com or the state specific web sites.

Reporting limits are determined by EPA methodology.

Please do not hesitate to contact HEAL for any additional information or clarifications.

Sincerely,

Andy Freeman, Laboratory Manager

NM Lab # NM9425 NM0901 AZ license # AZ0682 ORELAP Lab # NM100001 Texas Lab# T104704424-08-TX



4901 Hawkins NE ■ Suite D ■ Albuquerque, NM 87109 505.345.3975 ■ Fax 505.345.41D7 www.hallenvironmental.com

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6133 EDITH BOULEVARD NE ALBUQUERQUE, N.M. 87107 PHONE (505) 345-3655

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/ /2011

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RHINO - KAFB / SHAW

KAFB, ALBUQUERQUE, NM

RINCHEM COMPANY, INC 6133 EDITH NE

ALBUQUERQUE, NM 87107

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2011

RINCHEM COMPANY., INC

RHINO – KAFB / SHAW

KAFB, ALBUQUERQUE, NM

RINCHEM COMPANY, INC 6133 EDITH NE

ALBUQUERQUE, NM 87107

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#### **DEPARTMENT OF THE AIR FORCE** 377th Civil Engineer Division (AFMC)



4 April, 2011

#### MEMORANDUM FOR: 377 MSG/CEANR

FROM: 377 MSG/CEANC (Solid Waste Program Manager)

SUBJECT: Landfill Disposal

Reference: Shaw Environmental Ltr. dated: 31 March, 2011 USACE Contract No. W912DY-10-D-0014 / Delivery Order No. 0002

Disposal of Soil Drill Cuttings from the Installation of Soil Vapor Monitoring Wells KAFB-106117, and Groundwater Monitoring Wells KAFB-106062, and KAFB-106076 on Kirtland AFB as part of Base Fuels Facility Site Investigation

1. Authorization is granted to Shaw Environmental to dispose of soil drill cuttings and debris in support of continued monitoring of Bulk Fuels Facility from the installation of 3each Monitoring Wells; Soil Vapor Monitoring Well KAFB-106117, and Groundwater Monitoring Wells KAFB-106062, and KAFB-106076 at the Kirtland AFB construction and demolition landfill. Debris will be delivered by Rhino Waste in 8 each, Rhino roll-offs, S/N 104050, 104053, 104057 and A20-028 to the landfill. Debris will consist of drill cuttings and plastic liners from roll-offs. Lab results are on file in the Solid Waste Management office. Shaw shall be issued a Kirtland AFB landfill pass for this disposal action. A copy of this letter will accompany each roll-off and be left with the gate keeper at the landfill.

2. Please direct questions to me at 846-9014.

STEVEN C. KITT Solid Waste Program Manager Environmental Management

Shaw[®] Shaw Environmental & Infrastructure, Inc.

A World of Solutions™

March 31, 2011

Project No. 140705 KAFB-011-023

Mr. Steve Kitt 377 MSG/CEANC 2050 Wyoming Blvd NE Albuquerque, NM 87117-5270

Reference: USACE Contract No. W912DY-10-D-0014, Delivery Order 0002

Subject: Disposal of Soil Drill Cuttings from the Installation of Soil Vapor Monitoring Well KAFB-106117 and Groundwater Monitoring Wells KAFB-106062 and KAFB-106076 Kirtland AFB, New Mexico

Dear Mr. Kitt:

Shaw Environmental and Infrastructure (Shaw E&I) is requesting permission to dispose of nonhazardous soil drill cuttings and plastic liners used in rolloff containers to the Kirtland Air Force Base (Kirtland AFB) Construction and Demolition (C&D) debris landfill. The generation of and analyses performed on the soil drill cuttings are discussed below.

During March 2011, Shaw E&I installed one soil vapor monitoring well (KAFB-106117) and two groundwater monitoring wells (KAFB-106062 and KAFB-106076) at the Kirtland AFB Bulk Fuels Facility (BFF). The KAFB-106117 well is located just south of KAFB building 1026. The KAFB-106062 well is located 400 feet east of KAFB building 1024. The KAFB-106076 well is located just southeast of KAFB building 1032. The monitoring wells were drilled using air rotary casing hammer (ARCH) and the drill cuttings were containerized in plastic lined steel rolloffs pending laboratory analysis for waste characterization. Approximately 10 to 15 cubic yards of soil drill cuttings were generated for each 20-cubic yard rolloff container. Two rolloffs are stored at KAFB-106117, one rolloff is stored at KAFB-106062, and one rolloff is stored at KAFB-106076.

A composite sample was collected from each of the rolloff containers and sent to Hall Environmental Analysis Laboratory for testing. The samples were analyzed for the required parameters per the Kirtland AFB Landfill Acceptance Memorandum (January 2009). The analytical results for the composite samples confirm that the drill cuttings are not considered to be hazardous waste and meet the requirements for disposal at the Kirtland C&D landfill.

Shaw E & I requests your review of the attached analytical data and determination for disposal at Kirtland AFB C&D landfill. The rolloff containers are owned by Rhino Environmental SVCS, Inc. and the numbers on the containers for disposal include – 104050, 104053, 104057, and A20-028. Upon receiving notification of Kirtland

Mr. Steve Kitt

AFB's acceptance of the soil and plastic, Shaw E&I will coordinate transport of the rolloffs and disposal of the waste with Rhino.

If you have any questions regarding this request, please contact me at (720) 554-8163. Thank you for your assistance.

Sincerely,

Agrew for Tom Cooper

Thomas Cooper Project Manager

Enclosures:

Hall Environmental Analysis Laboratory Report No. 1103421 – Analytical Results for Drill Cuttings from SVM Well KAFB-106117 and Groundwater Monitoring Wells KAFB-106062 and KAFB-106076



#### COVER LETTER

Friday, March 25, 2011

Pamela Moss Shaw Environmental, Inc. 7604 Technology Way, Suite 300 Denver, CO 80237

TEL: (720) 554-8252 FAX

RE: KAFB BFF

Dear Pamela Moss:

Order No.: 1103421

Hall Environmental Analysis Laboratory, Inc. received 7 sample(s) on 3/9/2011 for the analyses presented in the following report.

These were analyzed according to EPA procedures or equivalent. Below is a list of our accreditations. To access our accredited tests please go to www.hallenvironmental.com or the state specific web sites.

Reporting limits are determined by EPA methodology.

Please do not hesitate to contact HEAL for any additional information or clarifications.

Sincerely,

Andy Freeman, Laboratory Manager

NM Lab # NM9425 NM0901 AZ license # AZ0682 ORELAP Lab # NM100001 Texas Lab# T104704424-08-TX



4901 Hawkins NE ■ Suite D ■ Albuquerque, NM 87109 505.345.3975 ■ Fax 505.345.4107 www.hallenvironmental.com

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# **APPENDIX C-2**

**Off-Site Disposal Waste Manifest** 

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	aciiity's Phone: (505)345-36	Rinchem Company 6133 Edith Blvd NI	Ε			U.S. EPA ID	Number			
5	9b. U.S. DOT Description (inclusion	Proper Shipping Name, Hazard Class, ID Numbe	5/10/			NM	D002	22086	27	
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E E	18c. S	ignature of Alten	nate Facility (or	r Generator)					<u>L</u>		Month	Day Year	-
Š	19 Ha	zardous Waste F	Report Manage	mont Mothed	Codes (i.e. and a finite state of the state								
DESIGNATED FACILITY	1.		port manage	Sinch Method	Codes (i.e., codes for hazardous waste t 2.	reatment, disposal, 3.	and recycling systems)						]
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	20. De	signated Facility	Owner or Ope	rator: Certifica	tion of receipt of hazardous materials co	vered by the manife	est except as noted in iter	m 18a	I	·			-
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▼ PA	Form	8700-22 (Rev.	3-05) Previo	ous editione				· ·					
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