

#### **TECHNICAL MEMORANDUM**

To: Ms. Diane Agnew, Albuquerque Bernalillo County Water Utility Authority

From: INTERA Incorporated

Date: November 19, 2021

Re: Proposed Monitoring Well Location and Screened Interval for the Water Authority Data Gap Well

#### 1.0 Introduction

This Technical Memorandum (Tech Memo) describes the data and processes used to identify candidate locations for the proposed Albuquerque Bernalillo County Water Utility Authority (Water Authority) Data Gap Well within the area of interest (AOI). The Data Gap Well is intended to provide groundwater quality data that will constrain the vertical distribution of ethylene dibromide (EDB) contamination in the distal (i.e., north) end of the Kirtland Airforce Base (KAFB) Bulk Fuel Facility's (BFF) groundwater plume. KAFB installed monitoring wells to delineate the extent of the >1-mile-long EDB plume emanating from the BFF source area. Having raised questions about the relatively poor vertical delineation of the EDB plume numerous times in the past, the Water Authority is concerned that the current BFF monitoring well network has not been sufficient to discern the limits of EDB in groundwater either laterally or vertically.

The potential for there to be a data gap was identified in the INTERA (2017) Technical Memorandum that provided review comments on the latest version of the Resource Conservation and Recovery Act (RCRA) Facilities Investigation (RFI) report. INTERA (2017) identified intervals within the aquifer where EDB could potentially escape detection in the existing well network, leading to EDB migration downgradient toward Water Authority groundwater supply wells (e.g., Ridgecrest 5) and KAFB supply well KAFB-003. The AOI (**Figure 1**), within which the Data Gap Well will be installed, was previously defined by the Water Authority in Request for Bid (RFB) P202200002 (Water Authority, 2021) and was based on the Water Authority RFI Review. Based on the RFI review, published geologic literature, local monitoring well lithologic logs, screen interval data, and EDB analytical data, INTERA proposes a recommended location and completion depth for the Data Gap Well.

The following sections of this Tech Memo describe the background geology and hydrogeology, sitespecific geology, hydrogeology, and historical EDB concentration distributions. Finally, this document presents a recommendation for the location and screened interval depth for the Data Gap Well.

#### 2.0 Background Geology and Hydrogeology

The following geologic summary is primarily from the early works by Hawley and Hasse (1992); extensive studies by Connell et al. (2004); Connell (2006); Grauch and Connell (2013); and Powell and McKean, (2014); and most recently work of the United States Geological Survey (USGS) publication of Meyers and Friesz (2019). INTERA has found these publications to be the most detailed hydrogeologic works in the

Albuquerque Basin. Figure 2 from the Meyers and Friesz (2019) paper has been modified and included as **Figure 2** in this Tech Memo to provide geologic and hydrogeologic context.

The project site is in the Albuquerque Basin, and the subsurface sediments consist of unconsolidated sand, silt, clay, and occasional gravel zones in the Santa Fe Group of Oligocene to Pleistocene age. The Santa Fe Group has been divided into lower, middle, and upper lithostratigraphic units based on lithology and age. The upper Santa Fe group is of most significance to the Data Gap Well and consists of the Ceja and Sierra Ladrones Formations. The Ceja Formation (older) is interpreted to have been deposited by fluvial processes sourced from west of the basin. The Sierra Ladrones Formation (younger) consists of ancestral Rio Grande axial-fluvial sediments transported from the north and piedmont-slope deposits derived from mountains to the east. Hawley and Hasse (1992) identify the fluvial deposits as the major hydrostratigraphic units: "Coarse-grained channel deposits of the upper Santa Fe (USF-w) and river alluvium (RA) hydrostratigraphic units." These deposits form a preferential groundwater flow corridor, as described by Meyers and Friesz (2019), who also reference Powell and McKean (2014):

"The axial-fluvial deposits form an important geologic feature that greatly influences groundwater flow. The axial-fluvial sediments, deposited by the ancestral Rio Grande, form a north-northeast to south-southwest trending corridor of deposits (between the western and eastern limits of axial-fluvial sediments) with relatively higher conductivities. Given the same hydraulic gradients and effective porosities, groundwater within this corridor of higher hydraulic conductivity will flow at a faster volumetric rate than groundwater outside the corridor where hydraulic conductivities are lower. The axial-fluvial sediments, then, form a preferred corridor of flow, within which groundwater near the EDB plume flowed toward the northeast towards a large area of groundwater-level drawdown (Powell and McKean, 2014)."

The axial-fluvial sediments of the Sierra Ladrones Formation interfinger with sediments of the Ceja Formation in the central part of the basin and with the piedmont-slope deposits on the eastern side of the basin. As the channel of the ancestral Rio Grande shifted from the eastern side of the basin towards its present-day position near the center of the basin, piedmont-slope sediments overtopped axial-fluvial sediments and prograded westward as the river retreated. Fault movements on the east side of the basin caused the ancestral Rio Grande to shift to the east side of the basin, resulting in a stacked sequence of braided river-channel sediments in the eastern Middle Rio Grande Basin (Connell, 2004; Grauch and Connell, 2013). The axial-fluvial sediments have been characterized as braided river deposits consisting of coarse channel fill and bar sediments interbedded with silts and clays deposited in overbank and incipient floodplain environments (Agnew et al., 2016).

The result of these processes is a layer of piedmont-slope deposits that are up to approximately 200 feet (ft) thick, underlain by a sequence of fluvial-axial sediments that can be over 1,500 ft thick (Connell, 2006, cross section C-C', Plate 2). Based on a set of select wells chosen by INTERA that are within and proximal to the AOI for the Data Gap Well (Figure 1), the historical minimum and maximum depth to groundwater ranged from 433 to 493 ft below ground surface (bgs) (Table 1). This indicates that the wells within and proximal to the AOI are completed in the fluvial-axial sediments of the Sierra Ladrones Formation.



Within the Sierra Ladrones Formation are two lithologic units characterized by abundant silt and clay layers, named A1 (lower) and A2 (upper). These units represent periods of lower energy deposition within the basin, and lower hydraulic conductivities, as compared to higher energy deposition of the fluvial-axial sand and gravel deposits, which have higher relative hydraulic conductivities. The elevations of the top and base of these units have been mapped by the USGS, providing structural contours within the study area. Notably, these fine-grained units are absent east of the Eubank Fault (**Figure 2**). The top of the A2 unit is approximately 800 to 900 ft bgs in the study area. These two units are recognized as influencing groundwater flow in the basin, but monitoring wells within and proximal to the AOI are screened above these units.

Interbedded silt and clay deposits are present within the Sierra Ladrones Formation and at depths that are pertinent to the Data Gap Well; however, there is little likelihood that these fine-grained layers are laterally continuous. These fine-grained beds are within the braided axial-fluvial sediments of the ancestral Rio Grande. These types of deposits are well known in the geologic literature and are described by Selley (1982) as "shoestring" silts or clays and are derived from the small amount of silt and/or clay that gets deposited in abandoned channels of braided alluvium. The geometry of these types of deposits tends to be linear and not laterally continuous.

Faults that dip west have been mapped in the study area (Figure 2). These faults trend approximately north to south and are spaced approximately 1 mile apart from near the front of the Sandia Mountains to the west side of the basin near Rio Rancho, New Mexico. Many of the water supply wells that are northeast of the KAFB BFF EDB plume (e.g., RC-3, RC-4, and RC-5) are east of the Coronado-Alameda Fault (Figure 2), which has approximately 70 ft of displacement (Meyers et al., 2019). Although these faults are well documented in the geologic literature (e.g., Connell, 2006), their possible influence on groundwater flow in the study area is not well known.

In summary, the geologic and hydrogeologic framework of the site vicinity and at the relevant depths for the Data Gap Well consist of braided ancestral Rio Grande axial-fluvial sediments of the Sierra Ladrones Formation of the Santa Fe Group, consisting of unconsolidated sand, silt, clay, and gravel layers, with medium- to coarse-grained sand being the dominant sediment type.

#### 3.0 Site-Specific Geology and Hydrogeology

For this Tech Memo, AECOM's (2015) regional-scale and plume-scale cross sections, and other site-specific data were evaluated. A discussion of hydrogeologic data from these sources and their relevance for selecting the Data Gap Well location and screened interval completion depth is provided below. AECOM's (2015) T1 cross section was especially useful for this evaluation since it is aligned along the EDB plume's longitudinal axis, crosses the AOI, and was used in INTERA's 2017 review of the RFI to illustrate the gap in delineation of the vertical extent of the EDB plume. Regarding this gap, the figure used to support INTERA's RFI review findings is provided in this Tech Memo as **Figure 3**. **Figure 1** provides the line of section for this cross section. The wells in **Figure 3** are in line from southwest to northeast through the AOI, except for well 106232, which is northwest of the line of section approximately 500 ft and is projected onto the section.



To further aid in the evaluation of the site-specific geology and hydrogeology, INTERA tabulated a list of select wells within and near the AOI and compiled their lithologic logs and historical depth to water (DTW) measurements (Table 1). As shown by the highlighted wells on Table 1, five wells (106215, 106221, 106224, 106227, and 106230) were drilled by a combination of air rotary casing hammer (ARCH) method (to a depth of approximately 450 ft bgs, which is near the water table) and the roto-sonic method to total depth. A sixth well (106234), which is also highlighted on Table 1, was cored while being drilled by mud rotary methods. Other wells included in Table 1 were drilled entirely by ARCH methods. The sonic- and core-drilled intervals delivered continuous sediment core samples, as compared with the drill cuttings produced and logged from the ARCH drilling method. The lithologic logs from the sonic and mud rotary core resulted in more detailed delineation of all sediment types, but especially the relatively thin fine-grained layers, which are more easily missed in ARCH samples. The bore logs for these select wells are included with this Tech Memo as Attachment 1.

Upon inspection of the lithology provided in the cross section presented in **Figure 3**, a gravelly unit (indicated as orange and red) was identified that generally correlates across the cross section in the interval identified by INTERA (2017) as being a EDB data gap. A review of the boring logs for wells on the **Figure 3** cross section and boring logs for nearby wells drilled to depths between 500 and 600 ft bgs support that correlation (**Figure 4**). This coarse-grained unit is likely one of the channel deposits within the ancestral Rio Grande braided deposits that are referenced above. As indicated on the **Figure 3** and **Figure 4** cross section, these units typically have relatively high hydraulic conductivity and transmit large volumes of groundwater and, consequently, are a target interval for the screen of the Data Gap Well.

Descriptions of this unit in the boring logs generated for wells drilled by the ARCH method depict this coarse-grained unit as a fairly homogenous unit of well graded and poorly graded sand with interbedded layers of up to 35% gravel (with no silt or clay logged below 183 ft bgs to total depth of 625 ft bgs). In contrast, the boring logs generated from cores produced by sonic methods show a more heterogeneous mixture that, in addition to the thick sequences of coarse-grained sediments, includes interbeds of finer-grained materials. For example, well 106227 is logged as having eight layers of clay or clayey sand between 484 and 570 ft, averaging about 1 ft thick. Descriptions of this interval for **Figure 3** wells (and their drilling method and screen interval) are as follows:

- KAFB-106037 (ARCH, screened from 507 522 ft bgs,): predominantly sand and gravel from 480 to 520 ft bgs.
- KAFB-106058 (ARCH, screened from 511.8 526.8 ft bgs): predominantly sand and gravel from 495 to 524 ft bgs.
- KAFB-106227 (ARCH and Sonic, screened from 548 563 ft bgs): gravel generally present from 495 to 568 ft bgs with interbeds of clay and clayey sand from 561 to 566, well graded sand with clay and gravel at 566; lean clay at 570; etc.
- KAFB-106226 (ARCH, screened from 480 495 ft bgs): above the target depth for the Data Gap Well.
- KAFB-106225 (ARCH, screened from 450 480 ft bgs): above the target depth for the Data Gap Well.



- KAFB-106234 (Mud rotary and core, screened from 439.7 539.7 ft bgs): predominantly sand and gravel from 490 to 556 ft bgs with silt/fine sand layers at 502.7, 520.1, and 525.6 and multiple intervals that were not recovered during the coring.
- KAFB-106206 (ARCH, screened from 593.5 608.2 ft bgs): predominantly sand and gravel from 520 to 570 ft bgs.
- KAFB-106232 (ARCH, screened from 503 518 ft bgs): predominately sand and gravel from 508 to 555 ft bgs.

Within the intervals cored for these six wells, confidence in the lithologic descriptions may be considered higher as compared to the ARCH-drilled lithologic logs. However, even in these wells, fine-grained layers are scarce and generally very thin. For example, in well 106227, a fine-grained unit is shown on the cross section (T1) from approximately 520 to 525 ft bgs, but the log in this interval shows a 1-ft-thick clay from 519 to 520 ft bgs. Although the cross section may overstate the thickness of this clay, the fact that it is identified in the sonic core lithologic log suggests that the sonic-drilled lithologic logs are the most reliable.

Although **Figure 3** shows fine-grained units correlated between some wells, many of these facies may be "shoestring" deposits (e.g., Selley, 1982) and may not be laterally continuous. During Q4 2020, groundwater elevations ranged from 4,873.94 to 4,871.29 ft above mean sea level (amsl) for monitoring wells located in and proximal to the AOI and screened in multiple zones of the aquifer (**Table 1**). The essentially identical water levels that exist in wells screened at different intervals (i.e., the shallow, middle, and deep screened intervals of a monitoring well cluster) suggest that fine-grained units within the aquifer do not create confined or semi-confined aquifer conditions.

The water table has been on a long-term rising trend as it has recovered from historical drawdown since implementation of the San Juan Chama Drinking Water Project around 2008. Fluctuations of tens of feet in response to regional groundwater pumping may occur, which may vary significantly from year to year as a function of conjunctive management of surface water and groundwater supplies. Locally, extraction wells have been operated since about December 2015 in an attempt to capture the EDB plume.

The Q4 2020 and historical maximum and minimum water levels for wells along the AECOM (2016) cross section have been projected onto **Figure 4**. A key monitoring well in the area, well 106206, had a DTW of 460.55 ft bgs when measured in Q4 2020 (EA, 2021), and the Data Gap Well is expected to have a similar DTW.

#### 4.0 EDB Distribution

The BFF plume of detectable EDB is approximately 6,600 ft long, perhaps 2,000 ft or more in width, and tens of feet thick. The Air Force has previously estimated 40 ft in thickness, and historical maximum concentrations on **Figure 4** suggest at least that much vertical extent of contamination below the current water table. The plume delineation is uncertain due to spatial distribution of existing wells and dynamic water table conditions.



Since the RFI Review (INTERA, 2017), continued monitoring of existing wells and installation of additional data gap wells and sentinel wells have added to the knowledge base for the site; however, the horizontal and vertical extent of the distal EDB plume remain uncertain. **Figure 4** updates the AECOM (2016) cross section and was modified by INTERA (2017) to illustrate information gathered through early 2021 and the remaining uncertainty in the area of the proposed Data Gap Well. Maximum concentrations of EDB in monitoring wells in the AOI over the period of record are listed in **Table 1** and posted on **Figure 4** to indicate EDB detections over time. The most downgradient extraction well within the EDB plume, well 106234, reportedly began interim-measure extraction in December 2015 (EA, 2021). Since then, the regional gradient in the unconfined aquifer containing the EDB plume and the distribution of the EDB within the plume have likely been affected by the pumping from nearby extraction wells 106228, 106233, and 106234. As an example, for calendar year 2020, well 106234 reportedly pumped 170 gallons per minute (gpm), with 97.1% run time, and potentiometric surface maps clearly illustrate cones of depression nearby (EA, 2021). While the effect of the extraction wells is significant, it is limited in the downgradient direction, as discussed in Section 6. Therefore, there remains potential for EDB to have migrated downgradient from well 106234 at vertical intervals that are unmonitored by existing well screens.

Over much of the EDB plume area, the highest concentrations appear to correspond to the water table, but this may not be the case at the distal end of the plume. Contours indicating the approximate horizontal extent of EDB within the top 10 ft below the water table in Q4 2020 are shown on **Figure 5**. The outermost contour level of 0.01 micrograms per liter ( $\mu$ g/L) is on the order of typical detection limits; hence its precise location is uncertain, but it is intended to more fully delineate the area of historical EDB migration than contours showing only EDB above the Maximum Concentration Limit (MCL) of 0.05  $\mu$ g/L, e.g., those in **Figure 2**.

The deepest EDB was detected at monitoring wells 106037 and 106058 for a number of years, with concentrations that were historically up to 19 and 17 times the MCL, respectively. A single detection of EDB of 0.041 µg/L occurred in 2017 in the deeper, downgradient well, 106227, but has not been repeated since then. Another deep well further downgradient, well 106206, has consistently had non-detections for EDB, as have the deep sentinel wells at more distant locations. As noted in the RFI Review (INTERA, 2017), the wells with the deepest screened intervals may be isolated from EDB migration by silt-dominated intervals as shown in **Figure 3** and **Figure 4**, provided that the deep, silt-dominated intervals are in fact continuous.

Historical maximum EDB concentrations at clustered wells in the downgradient end of the plume appear to have been highest in wells screened at intermediate depths (**Figure 4**). For example, EDB has never been detected at shallow well 106204 (screened 462.5 to 492.5 ft bgs) nor at deep well 106206 (screened 593.5 to 608.2 ft bgs), whereas intermediate well 106205 (screened 492.5 to 507.5 ft bgs) has had multiple detections, reaching a peak of 0.043  $\mu$ g/L (87% of the MCL) in January 2018. This suggests the horizontal extent of EDB has been greater (migrated further downgradient) at intermediate depths than at the water table, e.g., beyond the contours shown in **Figure 6**. Recent concentrations in well 106205 have oscillated above and below detection limits – the last available result was a detection of 0.014  $\mu$ g/L in January 2021. Similarly, the maximum EDB concentration at intermediate well 106226 (screened 480 to 495 ft bgs) was 1.34  $\mu$ g/L (27 times the MCL) in Q4 2015, when concentrations were an order of magnitude lower in shallow well 106225 (screened 450 to 480 ft bgs) and non-detectable in deep well 106227 (screened 555 to 570 ft bgs). The maximum EDB concentration at well 106226 was also higher than historical maximum



concentrations in well 106225 and 106227, as shown in **Table 1**. There is not an intrinsic property of dilute EDB plumes that would cause them to dive, but it is possible there may downward migration due to hydrostratigraphic effects and tortuosity caused by fine-grained lenses or layers.

Finally, the gap remains in vertical coverage between the screens of the intermediate wells and deep wells discussed above, so INTERA cannot rule out the possibility of a pathway to locations downgradient from well 106234 at depths between roughly 510 and 590 ft bgs (Figure 3 and Figure 4), as discussed further in the following section.

#### 5.0 Vertical EDB Data Gap Summary and Interpretations

The RFI Review cross section (**Figure 3**) depicts the EDB plume traveling north through the screened zones in wells 106037 and 106058 at a depth of approximately 507 to 526 ft bgs (green arrows). If the EDB plume continues north past these wells within this interval, it is not detected in well 106227 because that depth is not screened in well 106227. The next well in line at this depth is the extraction well, 106234. EDB has been detected in this well with concentrations gradually decreasing since the initial measurement of 0.112  $\mu$ g/L in January 2016. Note that the EDB concentrations identified in well 106234 are likely diluted due to extraction across the 100-ft-long screened interval.

As described above, a significant proportion of gravel is logged in well 106234 from 502 to 556 ft bgs, making this interval a zone of high transmissivity. A gravel zone is also identified in well 106206 from 518 to 555 ft bgs, with up to 35% gravel at 555 ft bgs and lower gravel percentages below that depth. This suggests that the 555 ft depth in these wells may be the base of a braided river-channel deposit. Such a channel might be the locus of preferential EDB flow and transport.

In summary, an EDB data gap exists within the current monitoring well network due to the absence of a well or wells screened in the interval of approximately 518 to 555 ft bgs. This is most visually recognizable between wells 106206 and 106205, where the screened intervals are 593 to 608 ft bgs and 492.5 to 507.5 ft bgs, respectively, leaving a nearly 90-ft interval (data gap) that remains untested (**Figure 4**). This interval overlaps with the gravel layer in the wells described above from 518 to 555 ft bgs (37 ft) and possibly correlating with the gravel zones logged to the south in well 106234.

These lithostratigraphic relationships along with maximum historical EDB concentrations are shown on the revised cross section, **Figure 4** of this Tech Memo.

#### 6.0 Extraction Well KAFB-106234 Capture Zone

Extraction well 106234 was designed to capture EDB in groundwater at the distal end of the BFF plume from the upper approximately 80 ft of the aquifer. Well 106234 is screened from approximately 440 ft to 540 ft bgs; the depth to the water table at this location was approximately measured at 453.5 ft bgs in late 2020 (EA, 2021). Assuming a pumping rate of 150 gpm, a horizontal hydraulic conductivity (Kh) of 150 ft/day, a Kz to Kh ratio of 0.01, effective porosity of 0.2, and a regional hydraulic gradient of 0.0005 in a direction 11 degrees east of north, extraction well 106234's 6-year capture zone is predicted to extend approximately 600 ft from the extraction well in a direction downgradient to ambient groundwater flow and 900 ft in a direction transverse to ambient groundwater flow. This area is illustrated on **Figure 6** and



is considered conservative since groundwater pumping rates from well 106234 are likely less than what was used in the prediction. Groundwater containing EDB that currently exists (and historically existed) beyond this area and below the bottom of the extraction well screen will continue to flow towards the Ridgecrest Well Field and go undetected if within the unmonitored vertical zone identified above. This area beyond the capture zone of well 106234 presents the greatest risk to the Ridgecrest Well Field and should be considered for the location of the Water Authority's Data Gap Well.

# 7.0 Recommendation for Data Gap Well Location and Screened Interval Depth

The analysis of regional and plume-scale hydrogeologic conditions, the extent and distribution of EDB in the distal end of the BFF plume, and pumping effects of KAFB-106234 revealed the following relative to the location and screen interval depth of the Water Authority Data Gap Well:

- A laterally extensive, high hydraulic conductivity braided stream-channel deposit unit exists in the distal end of the EDB plume within the depth interval not being monitored for EDB; the depth interval in which this unit exists is illustrated in **Figure 4**.
- Roto-Sonic drilling and sampling methods are more likely than ARCH methods to provide the geologic data necessary to identify interbedded fine-grained units that may compartmentalize the transport of EDB. The use of Roto-Sonic drilling and sampling methods are recommended for the coring and installation of the Data Gap Well so that the identification of these finegrained units during coring can be accomplished.
- An EDB data gap exists within the current monitoring well network. This is most visually recognizable between wells 106206 and 106205, where the screened intervals are 593 to 608 ft bgs and 492.5 to 507.5 ft bgs, respectively, leaving a nearly 90-ft interval that remains unmonitored (Figure 4). This interval, which overlaps with the channel deposit highlighted in this same Figure, should be considered for the screen interval of the Water Authority's Data Gap Well. Field methods, such as geophysical logging and discrete interval groundwater sampling, should be used to inform the final design of the Water Authority Data Gap Well. Nested well screens should be considered if these data do not identify a specific 15- to 20-ft interval that the Water Authority Data Gap Well should be screened across.
- The area beyond the predicted capture zone of well 106234, illustrated on **Figure 6**, presents the greatest risk to the Ridgecrest Well Field and should be considered for the location of the Water Authority's Data Gap Well. Two possible areas are illustrated that are located near existing BFF wells are provided on **Figure 6** for the Water Authority's consideration. INTERA's recommended selection is the location within Indiana Street, immediately south of Kathryn Avenue. This location is closest to the well 106234 capture zone without being within it, preliminary utility locate information indicates that subsurface utilities should not be an issue, and overhead utilities and/or trees are not present in this area. This location is also



downgradient of BFF deep monitoring wells in the area of interest that have historically identified elevated concentrations of EDB in groundwater.

• Access limitations caused by underground and aboveground utilities, general property access, and business, residential, and traffic nuisances caused by the drilling operations should be factored into the final decision on the location of the Water Authority Data Gap Well.



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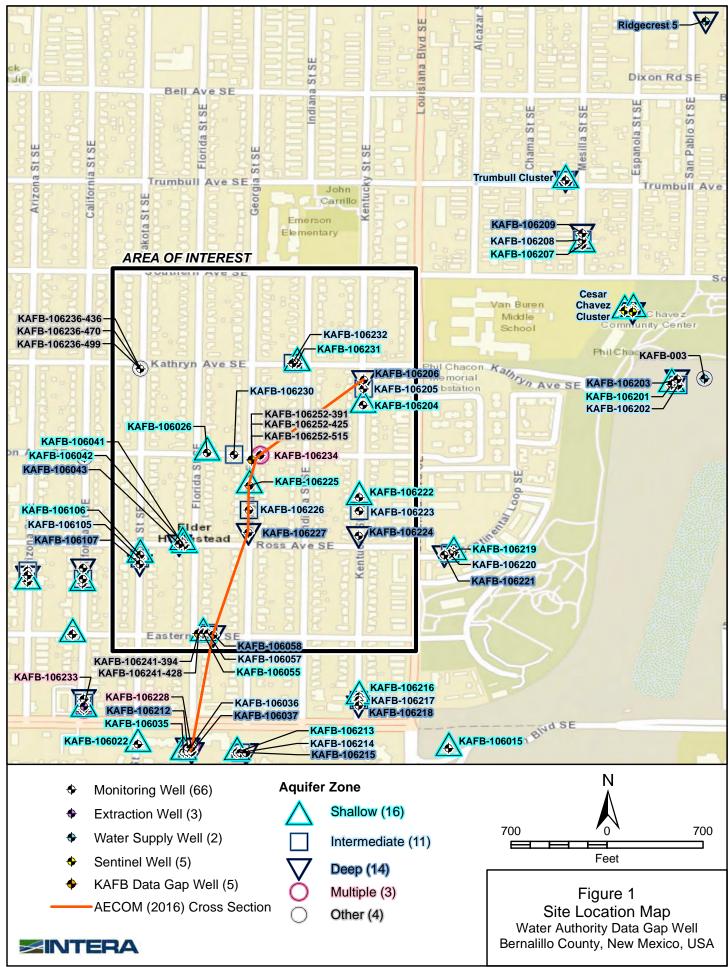
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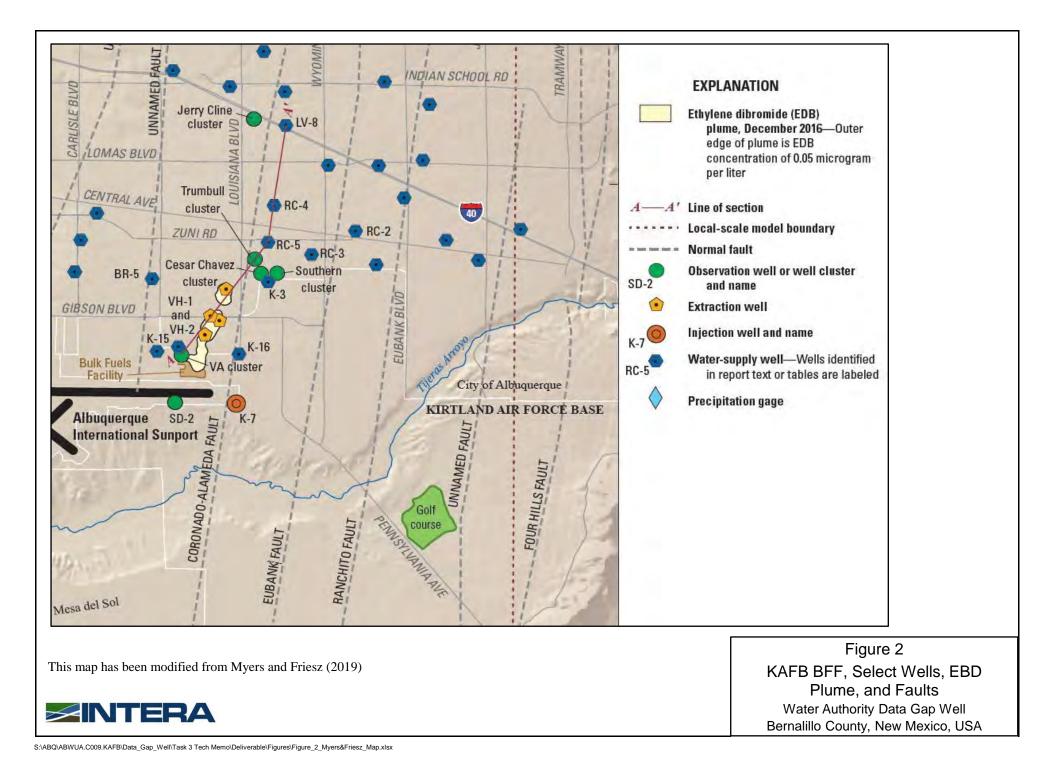


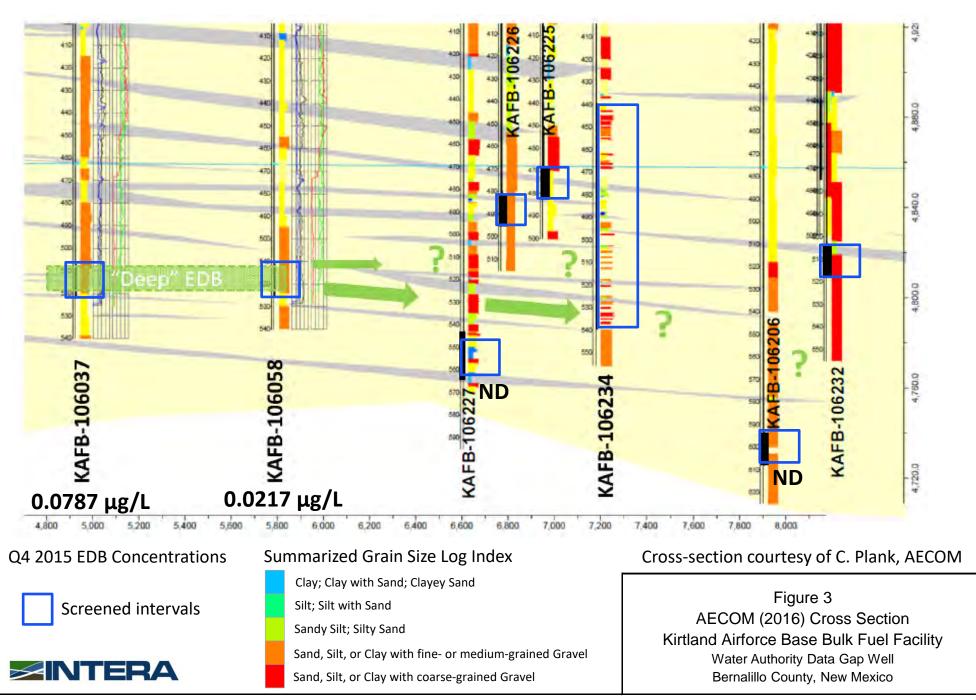
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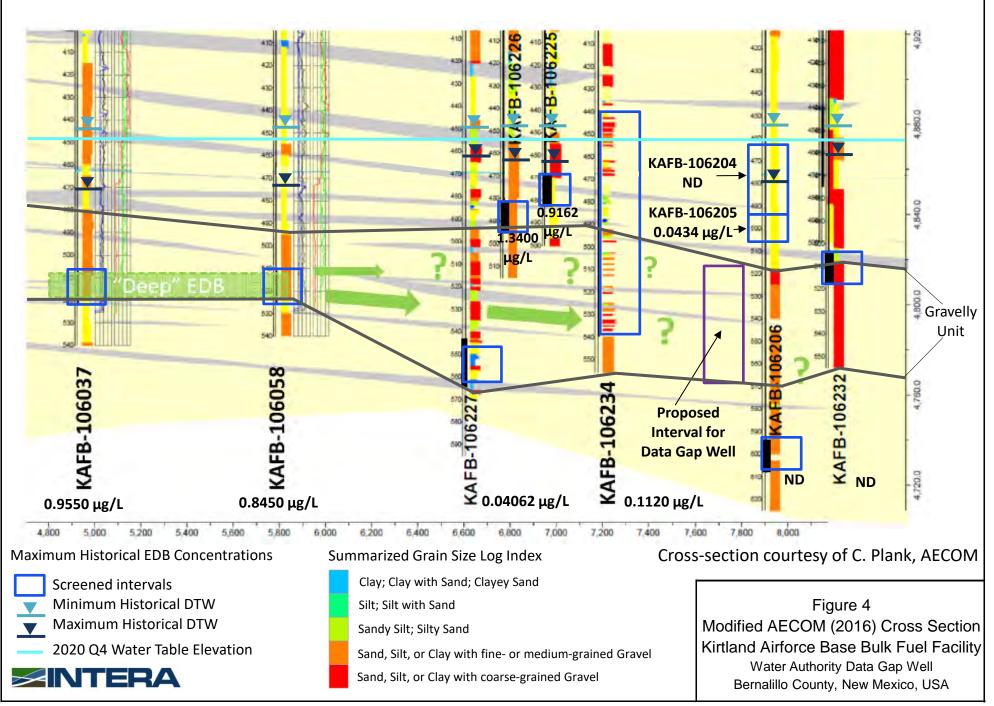


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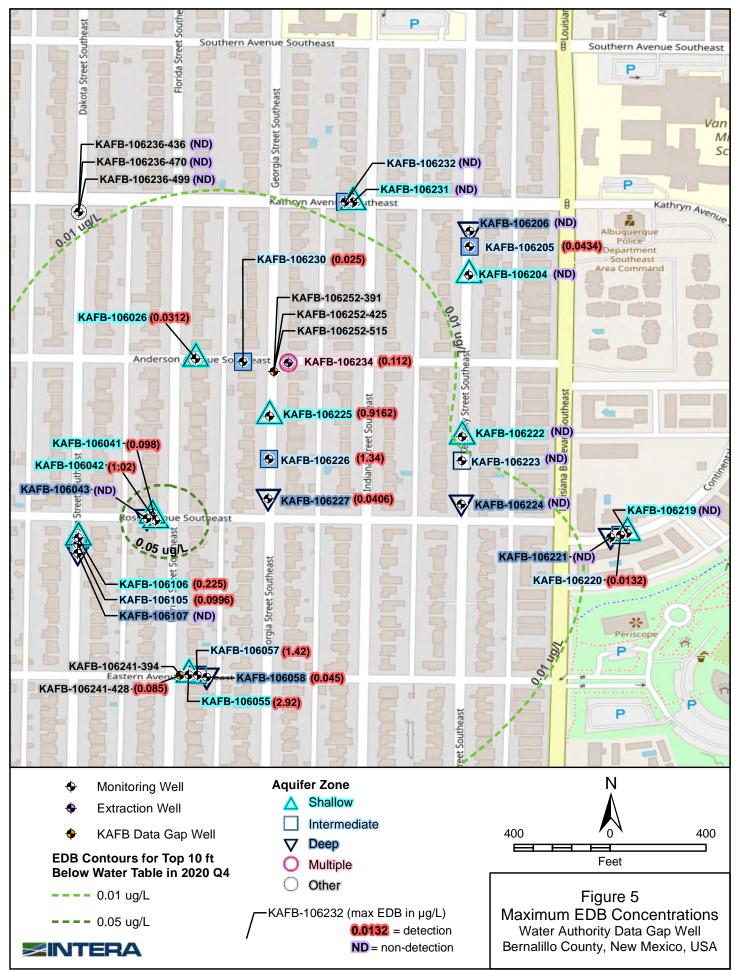




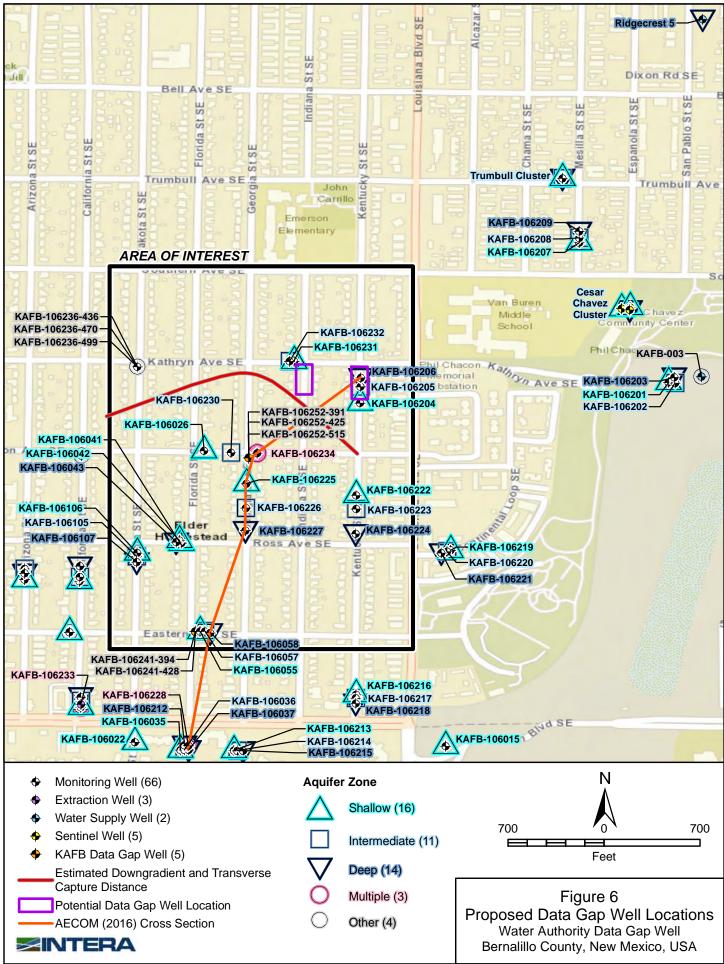
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TABLE



#### TABLE 1 Select Monitoring Well Information and Data

Kirtland Airforce Base Bulk Fuel Facility Water Authority Data Gap Well, Bernalillo County, New Mexico, USA

		Ground	Top of	Base of	Q4 2020	Minimum	Date of	Maximum	Q4 2020 EDB	Maximum EDB	Date of
Well ID*	Aquifer Zone	Surface Elevation (ft amsl)	Screen (ft bgs)	Screen (ft bgs)	Groundwater Elevaion (ft amsl)	Groundwater Elevation (ft amsl)	Minimum Groundwater Elevation	Groundwater Elevation (ft amsl)**	Concentration (µg/L)	Concentration (µg/L)	Maximum EDB Concentration
KAFB-106035	Shallow	5321.45	452.0	482.0	4873.70	4852.96	Aug 2011	4888.90	0.06	1.42	Jan 2014
KAFB-106036	Intermediate	5321.76	481.8	496.8	4873.50	4853.20	Aug 2011	4877.17	0.12	0.601	Apr 2014
KAFB-106037	Deep	5322.05	507.0	522.0	4873.10	4853.09	Aug 2011	4876.79	0.09	0.955	Sep 2015
KAFB-106055	Shallow	5325.08	465.8	485.8	4873.87	4852.28	Jul 2011	4878.22	<0.019	2.92	Jan 2013
KAFB-106057	Intermediate	5325.46	484.9	499.9	4873.87	4852.48	Jul 2011	4878.24	<0.019	1.42	Aug 2011
KAFB-106058	Deep	5326.04	511.8	526.8	4873.88	4852.06	Jul 2011	4878.26	<0.019	0.845	Aug 2011
KAFB-106204	Shallow	5332.85	462.5	492.5	4872.92	4854.04	Oct 2012	4878.76	<0.019	ND	-
KAFB-106205	Intermediate	5333.29	492.5	507.5	4872.90	4853.53	Oct 2012	4878.82	<0.019	0.04338	Jan 2018
KAFB-106206	Deep	5333.46	593.5	608.2	4872.91	4853.57	Oct 2012	4878.85	<0.019	ND	-
KAFB-106207	Shallow	5344.25	473.0	503.0	4871.34	4851.82	Oct 2012	4879.35	<0.019	ND	-
KAFB-106208	Intermediate	5343.87	503.0	518.0	4871.29	4851.92	Oct 2012	4879.29	<0.019	ND	-
KAFB-106209	Deep	5343.41	603.0	617.0	4871.51	4851.56	Oct 2012	4879.48	<0.019	ND	-
KAFB-106213	Shallow	5325.28	448.0	478.0	4873.75	4864.00	Apr 2015	4877.55	<0.019	ND	-
KAFB-106214	Intermediate	5325.43	478.2	492.7	4873.87	4863.69	Apr 2015	4877.69	<0.019	ND	-
KAFB-106215 <sup>a</sup>	Deep	5325.78	547.0	562.0	4873.94	4863.98	Jun 2015	4877.78	<0.019	ND	-
KAFB-106219	Shallow	5340.41	462.7	492.7	4872.82	4863.27	Apr 2015	4878.34	<0.019	ND	-
KAFB-106220	Intermediate	5340.34	493.0	508.0	4872.84	4863.13	Apr 2015	4878.34	<0.019	0.01324	Jan 2016
KAFB-106221 <sup>a</sup>	Deep	5340.09	561.0	576.0	4872.85	4863.85	Jun 2015	4878.30	<0.019	ND	-
KAFB-106222	Shallow	5333.24	457.8	487.8	4872.86	4862.49	Feb 2015	4878.37	<0.019	ND	-
KAFB-106223	Intermediate	5333.95	487.8	502.8	4872.95	4863.89	Apr 2015	4878.50	<0.019	ND	-
KAFB-106224 <sup>a</sup>	Deep	5335.07	555.0	570.0	4873.02	4863.97	Jun 2015	4878.47	<0.019	ND	-
KAFB-106225	Shallow	5326.35	450.0	480.0	4873.11	4862.16	Feb 2015	4878.12	0.021	0.91621	Apr 2017
KAFB-106226	Intermediate	5327.30	480.0	495.0	4873.48	4862.84	Mar 2015	4878.46	<0.019	1.34	Oct 2015
KAFB-106227 <sup>a</sup>	Deep	5328.08	548.0	563.0	4873.56	4864.30	Jun 2015	4878.47	<0.019	0.04062	Apr 2017
KAFB-106230 <sup>a</sup>	Intermediate	5324.51	501.0	516.0	4873.51	4864.58	Oct 2015	4878.43	<0.019	0.025	Nov 2015
KAFB-106231	Shallow	5327.56	440.0	475.0	4873.37	4864.40	Oct 2015	4878.90	<0.019	ND	-
KAFB-106232	Intermediate	5327.19	503.0	518.0	4873.47	4864.98	Oct 2015	4878.98	<0.019	ND	-
KAFB-106234 <sup>b</sup>	Extraction	5325.64	439.7	539.7	-	-	-	-	-	0.112	Jan 2016

#### Notes:

ft = feet, amsl = above mean sea level, bgs = below ground surface, ND = no detect.

\* All borings were drillied via Air Rotary Casing Hammer (ARCH) unless noted otherwise.

\*\* All maximum groundwater elevations occurred in Jan 2021

<sup>a</sup> Boring was drilled by ARCH from 0-450 ft bgs and by sonic from 450 ft bgs to total depth.

<sup>b</sup> Boring was drilled mud rotary from 0-435 ft bgs and cored from 435-556 ft bgs.





APPENDIX A Bore Logs for Select Wells



# KAFB 106035



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

Date Started: 8/5/2011 Date TD Reached: 8/6/2011 Date Completed: 8/9/2011

Project Number: 140705

Ground Elevation AMSL (ft): 5321.5 Y Coordinate: 1476441.87 X Coordinate: 1543635.94

Client: US Army Corps of Engineers

Project Location: KAFB, Albuquerque, NM

Groundwater Levels BGS (ft):  $\Sigma$  At Time of Drilling: 465.00 ▼ At End of Drilling: Not Recorded ▼ After Drilling: 467.00

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

Logged By: Jason Tarbert

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	Sample Type	Number	Headspace PID	Lithologic Loa	Material Description	U.S.C.S.	Well Diagram	Remarks
	5				Sandy SILT (ML); strong brown (7.5YR 4/6); dry; very soft; non to low plasticity; 60% silt; 35% very fine to very coarse sand; 5% fine gravel to 1cm. SILT with Sand (ML); strong brown			Hand augered. ***Note: no headspace requirement at this location.*** Began drilling @ 1126 on
_1					(7.5YR 4/6); dry; very soft; non to low plasticity; 75% silt; 25% very fine to very coarse sand. Sandy SILT (ML); strong brown (7.5YR	ML		8/5/11.
1	5				4/6); dry; very soft; non to low plasticity; 60% silt; trace clay; 35% very fine to very coarse sand; 5% fine gravel to 1cm.		- Cement Seal	
2					Silty SAND (SM); dark yellowish brown (10YR 4/4); moist; very loose; 75% very fine to very coarse sand; 5% fine gravel to 2cm; subangular to subrounded; 20% silt.	SM		New 20' connection @ 1138. Resumed drilling @ 1144.
	25				Well graded SAND with Silt (SW-SM); brown (10YR 5/3); dry; very loose; 80% very fine to very coarse sand; 10% fine gravel to 3cm; 10% silt.	SW- SM		
	-				Poorly graded SAND (SP); strong brown (7.5YR 5/6); moist; very loose; 100% very fine sand; trace medium to very coarse sand; trace fine gravel to 1cm; rounded.	SP		
3	80							



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: 8/5/2011 Date TD Reached: 8/6/2011 Date Completed: 8/9/2011

Ground Elevation AMSL (ft): 5321.5 Y Coordinate: 1476441.87 X Coordinate: 1543635.94 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: 465.00 ¥ At End of Drilling: Not Recorded

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 ⊃. 30 Top of High Well graded SAND with Silt (SW-SM); Solids brown (10YR 5/3); dry; very loose; 80% ....... Bentonite very fine to very coarse sand; 10% fine Grout SWgravel to 4cm; 10% silt. SM 35 Poorly graded SAND (SP); strong brown New 20' connection @ (7.5YR 5/6); moist; very loose; 95% very 1154. Resumed drilling fine sand; 5% medium to coarse sand; @ 1253. trace fine gravel to 5cm; rounded. SP 40 Sandy lean CLAY (CL); brown (7.5YR 4/4): moist: soft: low to medium plasticity; 70% clay with minor silt; 25% very fine to very coarse sand; 5% fine CL gravel to 2.2cm. • ••••• 45 Sandy SILT (ML); strong brown (7.5YR 4/6); moist; soft; low plasticity; 70% silt with minor clay; 25% fine to very coarse sand: 5% fine gravel to 2.3cm. ML 50 Well graded SAND with Silt (SW-SM); yellowish brown (10YR 5/4); dry; very loose; 90% very fine to very coarse SWsand: trace fine gravel to 9mm; • SM subrounded; 10% silt. • 55 SILT with Sand (ML); strong brown New 20' connection @ (7.5YR 5/8); dry; soft; low plasticity; 85% 1302. Resumed drilling silt; trace clay; 15% very fine to medium @ 1307. • • • • sand to 1mm. ML ••• 60

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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: 8/5/2011 Date TD Reached: 8/6/2011 Date Completed: 8/9/2011

Ground Elevation AMSL (ft): 5321.5 Y Coordinate: 1476441.87 X Coordinate: 1543635.94 Hole Diameter Upper (in.): 11-3/4 Hole Diameter Lower (in.): 9-5/8 Surface Completion Type: Flush mount

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 Well Diagram Remarks ⊃. 60 SILT with Sand (ML); strong brown • (7.5YR 5/8); dry; soft; low plasticity; 85% . . . . . . . . . . silt; trace clay; 15% very fine to medium sand; trace fine gravel to 1.3cm. 65 Same as above (60 ft); no gravel. 70 Same as above (60 ft); no gravel. . . . . . . . . . . . . . 75 ML High Solids Same as above (60 ft); no gravel; some New 20' connection @ Bentonite 1321. Resumed drilling caliche. Grout @ 1327. 80 Same as above (60 ft); no gravel. . . . . . . . . . . . . . . 85 .
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.< SILT with Sand (ML); strong brown Began adding water to (7.5YR 4/6); moist; stiff; low to medium stop clogging. plasticity; 75% silt; 10% lean clay; 15% very fine sand. • 90

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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: 8/5/2011 Date TD Reached: 8/6/2011 Date Completed: 8/9/2011

Ground Elevation AMSL (ft): 5321.5 Y Coordinate: 1476441.87 X Coordinate: 1543635.94 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: 465.00 ▼ At End of Drilling: Not Recorded

After Drilling: 467.00

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. Well Diagram Material Description Remarks ⊃. 90 Lean CLAY (CL); light yellowish brown (10YR 6/4); wet; very stiff; medium to high plasticity; 100% clay. 95 CL Lean CLAY with Sand (CL); light Added 50 gallons of yellowish brown (10YR 6/4); wet; very water. New 20' stiff; medium to high plasticity; 75% clay; connection @ 1339. 20% fine to very coarse sand; 5% fine Resumed drilling @ gravel to 1cm. 1345. 100 Gravelly SILT (ML); light yellowish brown (10YR 6/4); wet; very stiff; nonplastic; 70% silt with clay; 30% fine gravel to 3.7cm. ML . . . . . . . . . . . . . 105 High Solids Lean CLAY with Sand (CL); light Bentonite vellowish brown (10YR 6/4); wet: verv Grout stiff; 85% clay; 15% fine to medium sand to 2mm. CL 110 Well graded SAND (SW); pale brown ••••• (10YR 6/3); wet; dense; 95% very fine to very coarse sand; 5% fine gravel to 1cm; subrounded. 115 SW Added 90 gallons of Same as above (110 ft); trace lean clay. water. New 20' connection @ 1356. Resumed drilling @ 1402. • 120

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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: 8/5/2011 Date TD Reached: 8/6/2011 Date Completed: 8/9/2011

Ground Elevation AMSL (ft): 5321.5 Y Coordinate: 1476441.87 X Coordinate: 1543635.94 Hole Diameter Upper (in.): 11-3/4 Hole Diameter Lower (in.): 9-5/8 Surface Completion Type: Flush mount

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 Well Diagram Remarks ⊃. 120 SILT with Sand (ML); strong brown Total depth with 11-3/4" (7.5YR 5/8); moist; soft; low plasticity; casing @ 1406. 85% silt; 15% very fine sand to 0.1mm. Resumed drilling with 9-5/8" casing @ 1635. 125 Same as above (120 ft). 130 ML Same as above (120 ft); 80% silt; 5% clay. • . . . . . . . . . . 135 High Solids Same as above (120 ft); some caliche. Bentonite Grout 140 Poorly graded SAND (SP); yellowish Approximate top of Santa brown (10YR 5/4); moist; loose; 100% Fe Group. New 20' SP very fine to medium sand to 2mm; connection @ 1643. subrounded. Resumed drilling @ 1648. Well graded SAND (SW); yellowish brown (10YR 5/4); moist; loose; 95% very fine to very coarse sand; 5% fine 145 ....... gravel to 2.3cm; rounded. SW • 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: 8/5/2011 Date TD Reached: 8/6/2011 Date Completed: 8/9/2011

Ground Elevation AMSL (ft): 5321.5 Y Coordinate: 1476441.87 X Coordinate: 1543635.94 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: 465.00 ▼ At End of Drilling: Not Recorded

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
155	-				Well graded SAND (SW); yellowish brown (10YR 5/4); moist; loose; 95% very fine to very coarse sand; 5% fine gravel to 2.3cm; rounded.	SW		•	
	-				Poorly graded SAND (SP); brown (10YR 5/3); moist; loose; 100% fine to medium sand; trace fine gravel to 2.1cm; rounded.			•	New 20' connection @ 1654. End of 8/5/11. Resumed drilling @ 0813 on 8/6/11.
160	-				Same as above (155 ft).	SP		•	
165					Well graded SAND (SW); yellowish brown (10YR 5/4); moist; loose; 100% very fine to very coarse sand; trace fine gravel to 1.5cm; rounded.			- High Solids Bentonite Grout	
170	-				Same as above (165 ft); 5% fine gravel.	SW		•	
175	-				Same as above (165 ft); trace clay nodules.			•	New 20' connection @ 0822. Resumed drilling @ 0827.
180							•• ••	•	



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: 8/5/2011 Date TD Reached: 8/6/2011 Date Completed: 8/9/2011

Ground Elevation AMSL (ft): 5321.5 Y Coordinate: 1476441.87 X Coordinate: 1543635.94 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: 465.00 ▼ At End of Drilling: Not Recorded

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 Well Diagram Remarks ⊃. 180 Poorly graded SAND (SP); brown (10YR . 5/3); moist; loose; 100% medium sand to ..... 1mm; subrounded. 185 Same as above (180 ft); trace clay nodules; trace coarse sand to 4mm. 190 Same as above (180 ft); grading finer. SP • . . . . . . . . . . 195 High Solids Same as above (180 ft); yellowish brown Possibly stained. New 20' Bentonite connection @ 0835. (10YR 5/4); no odor. Grout Resumed drilling @ 0841. 200 Same as above (180 ft). • . . . . . . . . . . . . 205 Well graded SAND (SW); brown (10YR • 5/3); moist; loose; 95% very fine to very coarse sand; 5% fine gravel to 1.4cm; rounded. SW . . . • 210

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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: 8/5/2011 Date TD Reached: 8/6/2011 Date Completed: 8/9/2011

Ground Elevation AMSL (ft): 5321.5 Y Coordinate: 1476441.87 X Coordinate: 1543635.94 Hole Diameter Upper (in.): 11-3/4 Hole Diameter Lower (in.): 9-5/8 Surface Completion Type: Flush mount

▼ After Drilling: 467.00

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); brown (10YR 5/3); moist; loose; 95% very fine to very coarse sand; 5% fine gravel to 1.4cm; rounded.			
215	-				Same as above (210 ft); grading finer.	SW	•       •       •       •         •       •       •       •         •       •       •       •         •       •       •       •         •       •       •       •         •       •       •       •         •       •       •       •         •       •       •       •         •       •       •       •         •       •       •       •         •       •       •       •         •       •       •       •         •       •       •       •         •       •       •       •         •       •       •       •         •       •       •       •         •       •       •       •	New 20' connection @ 0849. Resumed drilling @ 0853.
<u>220</u>	-				Lean CLAY (CL); brown (10YR 5/3); moist; very stiff; medium plasticity; 100% clay.			
225	-				Same as above (220 ft); 5% fine gravel to 2cm.		- High Solids Bentonite Grout	
<u>230</u>	-				Sandy lean CLAY (CL); brown (10YR 5/3); moist; very stiff; low plasticity; 60% clay; 40% very fine to very coarse sand; trace fine gravel to 1cm.	CL		
<u>235</u>	-				Sandy lean CLAY with Gravel (CL); brown (10YR 5/3); moist; very stiff; low plasticity; 60% clay; 20% very fine to very coarse sand; 20% fine gravel to 1cm.			New 20' connection @ 0913. Resumed drilling @ 0917.
240							•     •     •       •     •     •       •     •     •       •     •     •	



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: 8/5/2011 Date TD Reached: 8/6/2011 Date Completed: 8/9/2011

Ground Elevation AMSL (ft): 5321.5 Y Coordinate: 1476441.87 X Coordinate: 1543635.94 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: 465.00 ▼ At End of Drilling: Not Recorded

▼ After Drilling: 467.00

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.	\ \	Vell Diagram	Remarks
245	-				Sandy lean CLAY (CL); brown (10YR 5/3); moist; very stiff; low plasticity; 60% – clay; 40% very fine to very coarse sand; trace fine gravel to 1cm. Poorly graded SAND (SP); brown (10YR 5/3); moist; medium dense; 100% fine to medium sand; trace coarse sand to . 3mm; rounded.	SP		• • • • • • • • • • • • • • • •	
250	-				Well graded SAND (SW); brown (10YR 5/3); moist; medium dense; 100% very fine to very coarse sand; trace fine gravel to 1cm; subrounded.			<ul> <li>.</li> <li>.&lt;</li></ul>	
	-				Same as above (245 ft); 5% fine gravel to 2cm; grading finer.	SW			
255	-				Same as above (245 ft); 5% fine gravel.			- High Solids Bentonite Grout	New 20' connection @ 0929. Resumed drilling @ 0934.
<u>260</u>	-				Poorly graded SAND (SP); brown (10YR 5/3); moist; medium dense; 100% fine to medium sand to 1mm; subrounded.			• • • • • • • • • • • •	
265					Same as above (260 ft); grading coarser.	SP		• • • • • • • • • • • •	
270							••	• • • • • •	



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

Date Started: 8/5/2011 Date TD Reached: 8/6/2011 Date Completed: 8/9/2011

Project Number: 140705

Ground Elevation AMSL (ft): 5321.5 Y Coordinate: 1476441.87 X Coordinate: 1543635.94

Client: US Army Corps of Engineers

Project Location: KAFB, Albuquerque, NM

Groundwater Levels BGS (ft):  $\Sigma$  At Time of Drilling: 465.00 ▼ At End of Drilling: Not Recorded ▼ After Drilling: 467.00

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

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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); moist; stiff; low plasticity; 75% silt; 5% clay; 20% fine to medium sand to 2mm; subrounded.	ML		
275	-				Sandy lean CLAY (CL); brown (10YR 5/3); moist; very stiff; low to medium plasticity; 70% clay; 30% very fine to very coarse sand to 4.8mm; rounded.	CL		New 20' connection @ 0945. Resumed drilling @ 0950.
	-				Well graded SAND (SW); brown (10YR 5/3); moist; medium dense; 95% fine to very coarse sand; 5% fine gravel to 2cm; subrounded.			
285	-				Same as above (280 ft).		- High Solids Bentonite Grout	
<u>290</u>	-				Same as above (280 ft); dry.	SW	•       •       •         •       •       •         •       •       •         •       •       •         •       •       •         •       •       •         •       •       •         •       •       •         •       •       •         •       •       •         •       •       •         •       •       •         •       •       •         •       •       •         •       •       •	
<u>295</u> 300	-				Same as above (280 ft).		•       •       •         •       •       •         •       •       •         •       •       •         •       •       •         •       •       •         •       •       •         •       •       •         •       •       •         •       •       •         •       •       •         •       •       •         •       •       •         •       •       •         •       •       •         •       •       •         •       •       •         •       •       •	New 20' connection @ 0959. Replaced bolt at flange. Resumed drilling @ 1007.



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: 8/5/2011 Date TD Reached: 8/6/2011 Date Completed: 8/9/2011

Ground Elevation AMSL (ft): 5321.5 Y Coordinate: 1476441.87 X Coordinate: 1543635.94 Hole Diameter Upper (in.): 11-3/4 Hole Diameter Lower (in.): 9-5/8 Surface Completion Type: Flush mount

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

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~ `	500	ordinat	.e. 1	larbert	Fage 11 01 10				
60 Depth (ft)	Sample Type	Number	Headspace PID	Lithologic Log	Material Description	U.S.C.S.		Well Diagram	Remarks
305 310 315 320					<ul> <li>Well graded SAND (SW); brown (10YR 5/3); moist; medium dense; 95% fine to very coarse sand; 5% fine gravel to 2cm; subrounded.</li> <li>Well graded SAND with Gravel (SW); brown (10YR 5/3); moist; medium dense; 85% fine to very coarse sand; 15% fine gravel to 2.1cm; subrounded.</li> <li>Well graded SAND (SW); brown (10YR 5/3); moist; medium dense; 95% fine to very coarse sand; 5% fine gravel to 2cm; subrounded.</li> <li>Same as above (310 ft).</li> </ul>	sw		- High Solids Bentonite Grout	New 20' connection @ 1021. Resumed drilling @ 1026.
<u>325</u> 330	_				Poorly graded SAND (SP); brown (10YR 5/3); dry; medium dense; 100% fine to medium sand; trace coarse sand to 3mm; rounded. Same as above (320 ft).	SP		<ul> <li>•</li> <li>•&lt;</li></ul>	



## Borehole ID: KAFB-106035

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: 8/5/2011 Date TD Reached: 8/6/2011 Date Completed: 8/9/2011

Ground Elevation AMSL (ft): 5321.5 Y Coordinate: 1476441.87 X Coordinate: 1543635.94

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: 465.00 ♥ At End of Drilling: Not Recorded

 $\bar{\Psi}$  After Drilling: 467.00

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 5/3); moist; medium dense; 90% fine to very coarse sand; 10% fine gravel to 1.7cm; subrounded.			
335	-				Same as above (330 ft); dry.	SW		New 20' connection @ 1037. Resumed drilling @ 1042.
340	-				Poorly graded SAND (SP); brown (10YR 5/3); moist; medium dense; 100% very fine to medium sand to 2mm; subrounded.			
345					Same as above (340 ft); trace coarse sand to 3mm.	SP	- High Solids Bentonite Grout	
350	-				Well graded SAND (SW); yellowish brown (10YR 5/4); moist; medium dense; 95% very fine to coarse sand; 5% fine gravel to 1.2cm; rounded.	SW		
355					Poorly graded SAND (SP); brown (10YR 5/3); moist; medium dense; 100% very fine to medium sand to 1mm; rounded.	SP		New 20' connection @ 1049. Stopped to fix hammer latch. Resumed drilling @ 1057.
360								

KAFB\_BOREHOLE\_LOG - SHAW\_DRILLING.GDT - 10/4/11 15:34 - X:\KAFB BFF\GINT\KAFB\_PROJECT\KAFB\_BFF.GPJ



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: 8/5/2011 Date TD Reached: 8/6/2011 Date Completed: 8/9/2011

Ground Elevation AMSL (ft): 5321.5 Y Coordinate: 1476441.87 X Coordinate: 1543635.94 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: 465.00 ▼ At End of Drilling: Not Recorded

After Drilling: 467.00

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. Well Diagram Material Description Remarks ⊃. 360 Poorly graded SAND (SP); brown (10YR 5/3); moist; medium dense; 100% very fine to medium sand to 1mm; rounded. SP • 365 Well graded SAND (SW); brown (10YR 5/3); moist; medium dense; 100% very fine to coarse sand; trace fine gravel to 6mm; subrounded. 370 Same as above (365 ft); grading coarser. SW • . . . . . . . . . . 375 High Solids Well graded SAND with Gravel (SW); New 20' connection @ Bentonite brown (10YR 5/3); moist: medium dense; 1104. Resumed drilling Grout 60% very fine to coarse sand; 40% fine @ 1109. gravel to 2.3cm; subrounded. Poorly graded SAND (SP); pale brown (10YR 6/3); dry; medium dense; 100% very fine to fine sand to 0.5mm; 380 rounded. SP 385 Same as above (378 ft); 100% fine to medium sand to 2mm. • 390

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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: Flush mount

Date Started: 8/5/2011 Date TD Reached: 8/6/2011 Date Completed: 8/9/2011

Project Number: 140705

Ground Elevation AMSL (ft): 5321.5 Y Coordinate: 1476441.87 X Coordinate: 1543635.94

Client: US Army Corps of Engineers

Groundwater Levels BGS (ft):  $\Sigma$  At Time of Drilling: 465.00 ▼ At End of Drilling: Not Recorded

▼ After Drilling: 467.00

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.	We	ll Diagram	Remarks
395	-				Well graded SAND (SW); brown (10YR 5/3); dry; medium dense; 95% very fine to very coarse sand; 5% fine gravel to 9mm; subrounded. Same as above (390 ft).	SW			New 20' connection @ 1120. Resumed drilling @ 1323.
400					Poorly graded SAND (SP); pale brown (10YR 6/3); dry; medium dense; 100%	SP			
405					fine sand to 0.5mm; rounded. Clayey SAND (SC); brown (10YR 5/3); moist; dense; 80% very fine to medium sand to 2mm; subrounded; 20% clay. Same as above (402 ft).	sc		- High Solids Bentonite Grout	
<u>410</u>	-				Poorly graded SAND (SP); yellowish brown (10YR 5/4); moist; dense; 100% very fine to fine sand to 0.5mm; rounded.				
<u>415</u>					Same as above (410 ft).	SP		- Top of	New 20' connection @ 1333. Resumed drilling @ 1338.
420	_							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: 8/5/2011 Date TD Reached: 8/6/2011 Date Completed: 8/9/2011

Ground Elevation AMSL (ft): 5321.5 Y Coordinate: 1476441.87 X Coordinate: 1543635.94 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: 465.00 ♥ At End of Drilling: Not Recorded

▼ After Drilling: 467.00

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 5 420 Poorly graded SAND (SP); yellowish brown (10YR 5/4); moist; dense; 100% fine to medium sand to 1mm; rounded. SP 425 Well graded SAND (SW); brown (10YR 5/3); moist; dense; 100% very fine to very coarse sand; trace fine gravel to 6mm; rounded. SW Bentonite Seal 430 Poorly graded SAND (SP); yellowish brown (10YR 5/4): moist: dense: 100% fine to medium sand to 1mm; rounded. SP 435 Well graded SAND (SW); brown (10YR New 20' connection @ 5/3); moist; dense; 95% very fine to very 1346. Resumed drilling coarse sand; 5% fine gravel to 1.5cm; @ 1353. subrounded. SW 5" Schedule 80 PVC Riser 440 Poorly graded SAND (SP); brown (10YR 5/3); dry; medium dense; 100% very fine to medium sand to 2mm; rounded. 445 SP Same as above (440 ft). Top of 20/40 Sand 450



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: 8/5/2011 Date TD Reached: 8/6/2011 Date Completed: 8/9/2011

Ground Elevation AMSL (ft): 5321.5 Y Coordinate: 1476441.87 X Coordinate: 1543635.94 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: 465.00 ▼ At End of Drilling: Not Recorded

After Drilling: 467.00

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. Well Diagram Material Description Remarks 5 450 Top of 10/20 Poorly graded SAND (SP); brown (10YR Sand 5/3); dry; medium dense; 100% very fine to medium sand to 2mm; rounded. Top of 5" SP Schedule 80 PVC 0.010" Slot Screen 455 Well graded SAND (SW); brown (10YR New 20' connection @ 5/3); moist; medium dense; 100% very 1400. Resumed drilling fine to coarse sand to 4mm; @ 1405. subrounded; trace silt and clay. SW 460 Poorly graded SAND (SP); pale brown (10YR 6/3): moist: dense: 100% fine sand to 0.5mm; rounded. 465 Same as above (460 ft); damp; 100% fine to medium sand to 1mm. V 470 SP Same as above (460 ft); damp; 100% Began adding water. fine to medium sand to 1mm. 475 Same as above (460 ft); damp; 100% Added 90 gallons of fine to medium sand to 1mm. water. New 20' connection @ 1420. Resumed drilling @ 1427. 480



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: 8/5/2011 Date TD Reached: 8/6/2011 Date Completed: 8/9/2011

Ground Elevation AMSL (ft): 5321.5 Y Coordinate: 1476441.87 X Coordinate: 1543635.94 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: 465.00 ▼ At End of Drilling: Not Recorded

After Drilling: 467.00

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

Sample Type Headspace PID Lithologic Log Depth (ft) Number Ś Ö Material Description Remarks Well Diagram ю. 5 480 Well graded SAND with Gravel (SW); brown (10YR 5/3); wet; dense; 80% fine to very coarse sand; 20% fine gravel to Bottom of 7mm; subrounded. Screen Sump 485 Same as above (480 ft). Bottom of Sump 490 SW Same as above (480 ft); 60% sand; 40% fine gravel. Native Backfill 495 Same as above (480 ft); 85% sand; 15% Added 100 gallons of fine gravel. water. 500 Well graded SAND (SW); brown (10YR Total depth = 500 ft. 5/3); wet; dense; 90% fine to very coarse Reached @ 1440 on sand; 10% fine gravel to 7mm; 8/6/11. subrounded. Water added during drilling (gallons) = 330505 Water added after drilling (gallons) = 1300 Water added during 510

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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: 8/5/2011 Date TD Reached: 8/6/2011 Date Completed: 8/9/2011

Ground Elevation AMSL (ft): 5321.5 Y Coordinate: 1476441.87 X Coordinate: 1543635.94 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: 465.00 ▼ At End of Drilling: Not Recorded

After Drilling: 467.00

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

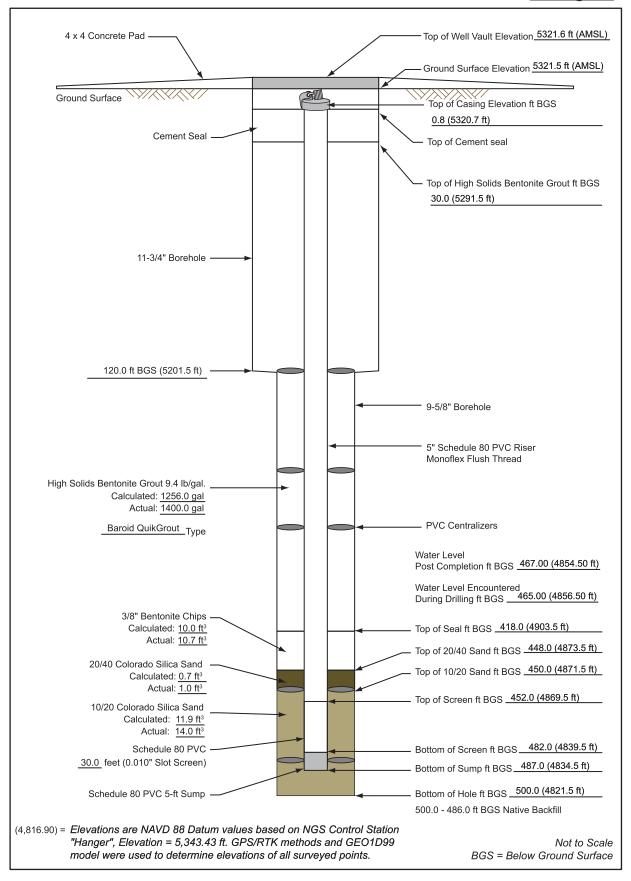
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Sample Type Headspace PID Lithologic Log Depth (ft) Number Ś S.C. Material Description Well Diagram Remarks ⊃. 510 construction (gallons) = 40 515 520 525 530 535 540

#### Monitoring Well Completion Diagram KAFB-106035

 Installation Start Date/Time:
 8/8/2011 @ 09:20

 Installation End Date/Time:
 8/9/2011 @ 16:24





Pg 1 of 2

#### Well Development Record

Project Name: KAFB BFF		
Location: <u>GW-3</u>		Well/Piez. No.: 106035
Personnel: P. Ostrye		Date Installed: 8/9/11
Date: 8/16/11		Csg. Diameter (I.D.): 5"
Samplers: P. Ostrye		Total Depth (ft. BGL): <u>487</u>
Method of Development: X Surging	X Bailing	X Pumping
X Original Development	Redevelopment	Other
Development Date: 8/16/11 - 8	3/17/11	
Depth to Water Before Develo	ping Well (ft. BGL): 467.5	7
Height of Water Column: <u>19</u> . V=(B * $r_c^2$ * $L_c$ * 7.4 Depth Purging From: 475 fee	48)+(B * (r <sub>w</sub> <sup>2</sup> - r <sub>c</sub> <sup>2</sup> ) * L <sub>s</sub> * Ø <sub>s</sub> '	38 gal. * 1 = 1545.38 7.48)+(H <sub>2</sub> O added during drilling/installation) = <u>1545.38 gallons</u> Time Purging Begins: 1135, 8/17/11
Weather: Sunny, Warm		Screened Interval (ft BGL): 452 - 482
Equipment Nos.: pH M	Meter: YSI 36952	EC Meter: YSI 36952 Turbidity Meter: LVE 002384
Equipment Decontaminated F Describe: <u>Steam Cleaned</u> Collected Sample of Water Ad Describe: <u>N/A</u>		<u>X N</u>
Comment: 1490 gallons of wat	er introduced during drilling	/well installation activities
Wa	ater	

		Water Level (ft.	Volume					
Date	Time	Below TOC)	Removed (gal.)	Temp.°C	рН	EC (ms/cm)	Turbidity N.T.U.	Comments
8/16/2011	1035							Begin Bailing
8/16/2011	1115		10					Continue Bailing
8/16/2011	1300		50					Bailed
8/16/2011	1312		100					Continue Bailing
8/16/2011	1326		140					Continue Bailing
8/16/2011	1410		275					Bailed
8/17/2011	1135							Begin Pumping at 5 GPM
8/17/2011	1205	469.30	425	21.23	7.77	0.405	2.08	Continue Pumping
8/17/2011	1235	469.27	575	21.30	7.81	0.407	0.83	Continue Pumping
8/17/2011	1305	469.25	725	21.46	7.83	0.410	0.84	Continue Pumping

Notes:

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 \* Turbidly report in NTV nearest whole # GPM = Gallons Per Minute

Where: B=3.14  $Ø_a$ = porosity of the sand pack  $r_c$ = radius of the well casing and screen in feet  $L_c$ = length of water column inside the casing and screen in feet  $r_w$ = radius of the well bore in feet  $L_a$ = length of saturated portion of the sand pack in feet 7.48 nallons/cubic foot= conversion from cubic feet to gallons



#### Well Development Record

Project: KAFB BFF

Project Number: 140705

Date: 8/17/11

Time Start: 1035, 8/16/11

Well No: 106035

Samplers: P. Ostrye

Checked By: \_\_\_\_\_

Time Finish: 1615, 8/17/11

Field Chemistry (cont'd)

Date	Time	Water Level (ft. Below TOC)	Volume Removed (gal.)	Temp.°C	pН	EC (ms/cm)	Turbidity N.T.U.	Comments
8/17/2011	1335	469.25		•	•			Continue Pumping
8/17/2011	1405		1025	21.26	7.81	0.414		Continue Pumping
8/17/2011	1435		1175	20.89	7.80	0.416		Continue Pumping
8/17/2011	1505		1325	20.66	7.77	0.414		Continue Pumping
8/17/2011	1535	469.27	1475	20.78	7.76	0.419	0.81	Continue Pumping
8/17/2011	1545	469.27	1525	20.81	7.75	0.419	0.75	Continue Pumping
8/17/2011	1600	469.27	1575	20.82	7.72	0.419	0.53	Continue Pumping
8/17/2011	1615		1625	20.80	7.71	0.419	0.53	Stop Pumping; Clear; Total Removed

Was well sampled after development? YES NO X

\_\_\_\_\_

Sample Method: N/A

Sample Name: N/A

Analyses: N/A

# KAFB 106036



Client: US Army Corps of Engineers

Ground Elevation AMSL (ft): 5321.9

Project Number: 140705

Date Started: 7/20/2011

Date TD Reached: 7/23/2011

Date Completed: 8/5/2011

Y Coordinate: 1476442.74

X Coordinate: 1543660.33

Project Location: KAFB, Albuquerque, NM

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

## Borehole ID: KAFB-106036

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

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 Ś Ö Material Description Remarks Well Diagram ю. Ľ, 0 Sandy SILT (ML); brown (7.5YR 4/4); Hand augered. dry; very soft; low plasticity; 60% silt; 35% very fine to very coarse sand; 5% fine gravel to 8mm. \*\*\*Note: no headspace requirement at this location. \*\*\* 5 Same as above (0 ft); 70% silt; 30% Began drilling @ 1038 on sand; no gravel. 7/20/11 10 MI Same as above (0 ft); 70% silt; 30% sand; no gravel. 15 Cement Seal Same as above (0 ft); gravel to 1.8cm. New 20' connection @ 1051. Stopped to tie hoses back in mast and retrieve air compressor. Resumed drilling @ 1121. 20 Silty SAND (SM); brown (7.5YR 5/4); dry; very loose; 70% very fine to very coarse sand; 5% fine gravel to 2.4cm; subrounded; 25% silt. SM 25 Sandy SILT (ML); strong brown (7.5YR 5/8); dry; very soft; low plasticity; 60% ML silt; 40% very fine to very coarse sand; trace fine gravel to 1.7cm. Well graded SAND with Silt (SW-SM); SWbrown (7.5YR 5/4); dry; very loose; 85% SM very fine to very coarse sand; 5% fine 30



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: 7/20/2011 Date TD Reached: 7/23/2011 Date Completed: 8/5/2011

Ground Elevation AMSL (ft): 5321.9 Y Coordinate: 1476442.74 X Coordinate: 1543660.33 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: 470.00 ↓ At End of Drilling: Not Recorded ↓ After Drilling: 467.00

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

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65 Depth (ft)	Sample Type	Number	Headspace PID	Lithologic Log		U.S.C.S.	We	II Diagram	Remarks
35	_				gravel to 1.8cm; subangular to subrounded; 10% silt.	SW- SM			
	-				Sandy SILT (ML); strong brown (7.5YR 5/6); moist; very soft; low plasticity; 70% silt; 25% very fine to very coarse sand; 5% fine gravel to 1.9cm.			- Cement Seal	New 20' connection @ 1136. Resumed drilling @ 1142.
40	-				Same as above (35 ft); 70% silt; 30% sand.				
45	-				Same as above (35 ft); 60% silt; 40% sand.	ML		- Top of High Solids Bentonite Grout	
50	-				Same as above (35 ft); 60% silt; 30% sand; 10% fine gravel.				
55	-				SILT with Sand (ML); strong brown (7.5YR 4/6); moist; very soft; low plasticity; 80% silt; 5% clay; 15% very fine to very coarse sand; trace fine gravel to 1.2cm.				New 20' connection @ 1154. Resumed drilling @ 1253.
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: 7/20/2011 Date TD Reached: 7/23/2011 Date Completed: 8/5/2011

Ground Elevation AMSL (ft): 5321.9 Y Coordinate: 1476442.74 X Coordinate: 1543660.33 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: 470.00 ↓ At End of Drilling: Not Recorded ↓ After Drilling: 467.00

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 Well Diagram Remarks 5 60 No cuttings returned. Added water to prevent . clogging. ..... • • • 65 No cuttings returned. • • • . . . . . . . . . . 70 Sandy lean CLAY (CL); light yellowish ٠ brown (10YR 6/4); wet; stiff; low to • medium plasticity; 70% clay; 30% very fine to medium sand to 2mm. • . . . . . . . . . . 75 **High Solids** Same as above (70 ft). Added 150 gallons of Bentonite water. New 20' Grout connection @ 1309. Resumed drilling @ 1316. • 80 CL Same as above (70 ft). ••••• • • 85 • • • • • Same as above (70 ft); trace fine gravel to 2.7cm. • • • • • • . • 90

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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: 7/20/2011 Date TD Reached: 7/23/2011 Date Completed: 8/5/2011

Ground Elevation AMSL (ft): 5321.9 Y Coordinate: 1476442.74 X Coordinate: 1543660.33 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: 470.00 ↓ At End of Drilling: Not Recorded ↓ After Drilling: 467.00

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

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^		Julia		04300	Logged	Logged By: Jason Larbert				
g Depth (ft)	Sample Type	Numt	Number Headspace PID Lithologic Log		Material Description		ທ່ O. ທ່ ⊃		Remarks	
	-				Lean CLAY with Sand (CL); light yellowish brown (10YR 6/4); wet; stiff; low to medium plasticity; 85% clay; 15% very fine to medium sand to 2mm.			•     •       •     •       •     •       •     •       •     •       •     •       •     •       •     •       •     •       •     •       •     •       •     •       •     •       •     •       •     •		
95					Sandy lean CLAY (CL); light yellowish brown (10YR 6/4); wet; stiff; low to medium plasticity; 70% clay; 30% very fine to medium sand to 2mm.	CL		<ul> <li>•</li> <li>•&lt;</li></ul>	Added 70 gallons of water. New 20' connection @ 1325. Resumed drilling@ 1414.	
105					Sandy SILT (ML); light yellowish brown (10YR 6/4); wet; stiff; low plasticity; 70% silt; 25% very fine to very coarse sand; 5% fine gravel to 2cm.	ML		<ul> <li>•</li> <li>•&lt;</li></ul>		
	-				Lean CLAY with Sand (CL); light yellowish brown (10YR 6/4); wet; stiff; medium plasticity; 85% clay; 15% fine to medium sand to 2mm.			<ul> <li>High Solids</li> <li>Bentonite</li> <li>Grout</li> </ul>		
<u>110</u>					Same as above (105 ft).	CL		<ul> <li>•</li> <li>•&lt;</li></ul>		
115					Same as above (105 ft).			<ul> <li>•</li> <li>•&lt;</li></ul>	Added 70 gallons of water. New 20' connection @ 1424. Resumed drilling @ 1430.	
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: 7/20/2011 Date TD Reached: 7/23/2011 Date Completed: 8/5/2011

Ground Elevation AMSL (ft): 5321.9 Y Coordinate: 1476442.74 X Coordinate: 1543660.33 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: 470.00 ↓ At End of Drilling: Not Recorded ↓ After Drilling: 467.00

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

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		Sample Lype	Number	Headspace PID	Lithologic Log	Material Description	U.S.C.S.	Well Diagram	Remarks
12	-					Sandy SILT with Gravel (ML); light yellowish brown (10YR 6/4); wet; stiff; non to low plasticity; 65% silt; 20% fine to very coarse sand; 15% fine gravel to 2cm.	ML		
12	.5					Poorly graded GRAVEL (GP); lense.	GP		
13						SILT with Sand (ML); light yellowish brown (10YR 6/4); wet; stiff; low plasticity; 85% silt; 15% very fine to medium sand; trace fine gravel to 2cm.	·		
	-					Same as above (126 ft).	ML		
13	-					Sandy lean CLAY (CL); light yellowish brown (10YR 6/4); wet; stiff; medium to high plasticity; 70% clay; 30% fine to very coarse sand to 4mm.	CL	- High Solids Bentonite Grout	Added 80 gallons of water. New 5' connection @ 1439. Resumed drilling@ 1446.
14	<u>+0</u> _ _ _					Well graded SAND with Silt and Gravel (SW-SM); light yellowish brown (10YR 6/4); wet; medium dense; 75% very fine to very coarse sand; 15% fine gravel to 4cm; subangular; 10% silt with minor clay.	SW- SM		Added 30 gallons of water. Total depth with 11-3/4" casing @ 1451. End of 7/20/11. Resumed drilling with 9-5/8" casing @ 0926 on 7/21/11.
14	_					Well graded SAND (SW); brown (10YR 5/3); damp; loose; 95% fine to very coarse sand; 5% fine gravel to 1.8cm; rounded.	sw		Approximate top of Santa Fe Group.



Client: US Army Corps of Engineers 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: Flush mount

Date Started: 7/20/2011 Date TD Reached: 7/23/2011 Date Completed: 8/5/2011

Project Number: 140705

Ground Elevation AMSL (ft): 5321.9 Y Coordinate: 1476442.74 X Coordinate: 1543660.33

Groundwater Levels BGS (ft):  $\Sigma$  At Time of Drilling: 470.00 ▼ At End of Drilling: Not Recorded

▼ After Drilling: 467.00

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

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); damp; loose; 95% fine to very coarse sand; 5% fine gravel to 1.8cm; rounded.			
155	-				Same as above (150 ft); 10% fine gravel.	SW	•       •       •         •       •       •         •       •       •         •       •       •         •       •       •         •       •       •         •       •       •         •       •       •         •       •       •         •       •       •         •       •       •         •       •       •         •       •       •         •       •       •         •       •       •         •       •       •         •       •       •         •       •       •	New 20' connection @ 0936. Resumed drilling @ 0945.
160	-				Poorly graded SAND (SP); yellowish brown (10YR 3/4); moist; loose; 95% fine to medium sand; 5% fine gravel to 3.5cm; subrounded.	SP		
<u>165</u>	-				Well graded SAND (SW); brown (10YR 5/3); moist; loose; 100% very fine to very coarse sand; trace fine gravel to 1.6cm; subrounded.		<ul> <li>High Solids</li> <li>Bentonite</li> <li>Grout</li> </ul>	
<u>170</u>	-				Same as above (165 ft); trace clay nodules.	SW	•       •       •         •       •       •         •       •       •         •       •       •         •       •       •         •       •       •         •       •       •         •       •       •         •       •       •         •       •       •         •       •       •         •       •       •         •       •       •         •       •       •         •       •       •	
<u>175</u>	-				Same as above (165 ft); grading finer.		•       •       •         •       •       •         •       •       •         •       •       •         •       •       •         •       •       •         •       •       •         •       •       •         •       •       •         •       •       •         •       •       •         •       •       •         •       •       •         •       •       •         •       •       •         •       •       •	New 20' connection @ 0950. Resumed drilling @ 0955.
180							• • • •	

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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: 7/20/2011 Date TD Reached: 7/23/2011 Date Completed: 8/5/2011

Ground Elevation AMSL (ft): 5321.9 Y Coordinate: 1476442.74 X Coordinate: 1543660.33 Hole Diameter Upper (in.): 11-3/4 Hole Diameter Lower (in.): 9-5/8 Surface Completion Type: Flush mount

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

Sample Type Headspace PID ithologic Log Depth (ft) Number Ś Ö Material Description Remarks Well Diagram ю. 5 180 Well graded SAND (SW); brown (10YR 5/3); moist; loose; 100% very fine to very coarse sand; trace fine gravel to 1.6cm; subrounded. 185 Same as above (180 ft). 190 SW Same as above (180 ft); grading finer. • . . . . . . . 195 **High Solids** Same as above (180 ft); 5% fine gravel. New 20' connection @ Bentonite 1000. Resumed drilling Grout @ 1009. 200 Poorly graded SAND (SP); yellowish brown (10YR 5/4); moist; loose; 100% SP fine sand; trace fine gravel to 2.2cm; rounded. • Well graded SAND (SW); brown (10YR • 5/3); moist; loose; 95% very fine to very coarse sand; 5% fine gravel to 3.5cm; 205 rounded. SW . 210

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Client: US Army Corps of Engineers

Ground Elevation AMSL (ft): 5321.9

Project Number: 140705

Date TD Reached: 7/23/2011

Date Completed: 8/5/2011

Y Coordinate: 1476442.74

X Coordinate: 1543660.33

Date Started: 7/20/2011

Project Location: KAFB, Albuquerque, NM

## Borehole ID: KAFB-106036

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):  $\Sigma$  At Time of Drilling: 470.00 TAt End of Drilling: Not Recorded ▼ After Drilling: 467.00

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

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Depth (ft)	Sample Type	Numl	Headspace PID	Lithologic Log	Material Description	U.S.C.S.	Well Diagram	Remarks
215	-				Well graded SAND (SW); brown (10YR 5/3); moist; loose; 95% very fine to very coarse sand; 5% fine gravel to 3.5cm; rounded.			
220	-				Same as above (210 ft); 10% fine gravel; abundant pumice grains.	SW		New 20' connection @ 1015. Resumed drilling @ 1021.
225	-				Lean CLAY (CL); brown (10YR 5/3); moist; stiff; medium to high plasticity; 100% clay.			
-	-				Same as above (220 ft).	CL	- High Solids Bentonite Grout	
230	-				Same as above (220 ft); 10% fine gravel to 3.2cm.			
235					Well graded SAND with Clay and Gravel (SW-SC); brown (10YR 5/3); moist; medium dense; 70% fine to very coarse sand; 20% fine gravel to 1.7cm; subrounded; 10% clay.	SW- SC		New 20' connection @ 1031. Resumed drilling @ 1038.
240					Poorly graded SAND (SP); yellowish brown (10YR 5/4); moist; loose; 100%	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: 7/20/2011 Date TD Reached: 7/23/2011 Date Completed: 8/5/2011

Ground Elevation AMSL (ft): 5321.9 Y Coordinate: 1476442.74 X Coordinate: 1543660.33 Hole Diameter Upper (in.): 11-3/4 Hole Diameter Lower (in.): 9-5/8 Surface Completion Type: Flush mount

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

Sample Type Headspace PID Lithologic Log Depth (ft) Number *i* Ö Material Description Remarks Well Diagram ю. 5 240 very fine to medium sand to 1mm; rounded; trace clay nodules. • • • • 245 • Same as above (238 ft). • • • • • SP Same as above (238 ft); dark yellowish Possibly stained. • brown (10YR 4/6); damp; no odor. 250 Same as above (238 ft). • . . . . . . . . . . 255 **High Solids** Well graded SAND (SW); brown (10YR New 20' connection @ Bentonite • 1044. Stopped to fix 5/3); moist; medium dense; 90% very Grout . bushing cable. Resumed fine to very coarse sand; 10% fine gravel to 1.2cm; rounded. drilling @ 1121. 260 Same as above (255 ft); no gravel; grading finer. SW • • 265 Same as above (255 ft); no gravel. • • • . • 270

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S	L					Borehole ID: KAFB-106036					
Pro Pro	ojec ojec	t Loca Nam	ation ie: K	: KÁ (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 <sup>:</sup> Da	te S te T	<b>t Num</b> Startec D Rea Comple	l: 7/2 ache	20/20 d: 7/	11 23/2011	👳 At T	ime of Ind of I	f Drillin Drilling	BGS (ft): g: 470.00 g: Not Recorded		
YC	Coo	rdinate	e: 14	47644		Drilling	Contra Methoo	actor: d: Air	WDC Drilling Rotary Casing Ha	ammer Page 10 of 18	
02 Depth (ft)							U.S.C.S.	v	Vell Diagram	Remarks	
	-				Well graded SAND (SW); brown 5/3); moist; medium dense; 90% fine to very coarse sand; 10% fir	very	SW		•		
- 275 - - - - - - - - - - - - - - - - - - -					to 1.2cm; rounded. Lean CLAY (CL); brown (10YR 5 moist; stiff; medium plasticity; 95 5% very fine sand to 0.2mm. Same as above (272 ft). Same as above (272 ft). Well graded SAND (SW); brown 5/3); moist; medium dense; 1000 fine to very coarse sand; trace fi gravel to 7mm; subrounded.	<u>(10</u> YR % very	CL		- High Solids Bentonite Grout	New 20' connection @ 1128. Resumed drilling @ 1134.	
- 290 - - - 295	-				Sandy lean CLAY (CL); brown (7 5/3); moist; stiff; medium plastici clay; 20% fine to very coarse sat fine gravel to 1.5cm. Well graded SAND with Clay (SV	ty; 70% nd; 10%				New 20' connection @	
- - - 300	-				brown (10YR 5/3); moist; mediur 85% fine to very coarse sand; 59 gravel to 1.4cm; subrounded; 10	m dense; % fine	SW- SC			(@ 1334.	



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: 7/20/2011 Date TD Reached: 7/23/2011 Date Completed: 8/5/2011

Ground Elevation AMSL (ft): 5321.9 Y Coordinate: 1476442.74 X Coordinate: 1543660.33 Hole Diameter Upper (in.): 11-3/4 Hole Diameter Lower (in.): 9-5/8 Surface Completion Type: Flush mount

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 *i* Ö Material Description Remarks Well Diagram ю. Ľ 300 Poorly graded SAND (SP); yellowish brown (10YR 5/4); moist; medium dense; 100% fine to medium sand; trace coarse • sand to 3mm; rounded; trace clay SP nodules. • 305 Well graded SAND (SW); yellowish brown (10YR 5/4); moist; medium dense; 90% very fine to very coarse sand; 10% fine gravel to 2.1cm; subrounded. 310 SW Same as above (305 ft); 5% fine gravel. • . . . . . . . 315 **High Solids** Sandy lean CLAY (CL); lense. New 20' connection @ CL Bentonite 1348. Resumed drilling Grout Well graded SAND (SW); yellowish @ 1356. brown (10YR 5/4); moist; medium dense; • 95% very fine to very coarse sand; 5% • fine gravel to 2.1cm; subrounded. 320 Same as above (316 ft); 10% fine gravel. SW 325 Poorly graded SAND (SP); brown (10YR • . 5/3); moist; medium dense; 100% • medium sand; trace fine gravel to 4cm; rounded. • SP ٠ • 330



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: 7/20/2011 Date TD Reached: 7/23/2011 Date Completed: 8/5/2011

Ground Elevation AMSL (ft): 5321.9 Y Coordinate: 1476442.74 X Coordinate: 1543660.33 Hole Diameter Upper (in.): 11-3/4 Hole Diameter Lower (in.): 9-5/8 Surface Completion Type: Flush mount

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

Sample Type Headspace PID Lithologic Log Depth (ft) Number *i* Ö Material Description Remarks Well Diagram ю. ⊃. 330 Poorly graded SAND (SP); brown (10YR 5/3); moist; medium dense; 100% • medium sand. • • • 335 SP Same as above (330 ft); trace coarse New 20' connection @ • 1407. Resumed drilling sand; trace fine gravel to 4cm; rounded. @ 1412. • 340 • Well graded SAND (SW); brown (10YR 5/3); moist; medium dense; 95% very fine to very coarse sand; 5% fine gravel • to 2cm; rounded. • . . . . . . . . 345 SW High Solids Same as above (340 ft). Bentonite Grout • • 350 Poorly graded SAND (SP); yellowish • brown (10YR 5/4); moist; medium dense; 100% fine to medium sand to 1mm; rounded; trace clay nodules. SP • • 355 • • • • • Well graded SAND (SW); brown (10YR New 20' connection @ ••• 5/3); dry; medium dense; 95% very fine 1424. End of 7/21/11. to very coarse sand; 5% fine gravel to Resumed drilling @ 0831 on 7/23/11. 1.3cm; subrounded. • SW . ••• • ٠ 360

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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: 7/20/2011 Date TD Reached: 7/23/2011 Date Completed: 8/5/2011

Ground Elevation AMSL (ft): 5321.9 Y Coordinate: 1476442.74 X Coordinate: 1543660.33 Hole Diameter Upper (in.): 11-3/4 Hole Diameter Lower (in.): 9-5/8 Surface Completion Type: Flush mount

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 5 360 Poorly graded SAND (SP); dark vellowish brown (10YR 4/4); damp; dense; 100% medium sand; trace fine • • • gravel to 2.5cm; rounded. SP • • 365 Well graded SAND with Gravel (SW); • dark yellowish brown (10YR 4/4); moist; dense; 85% fine to very coarse sand; 15% fine gravel to 2.8cm; subrounded. • 370 Same as above (365 ft); 20% fine gravel. SW • . . . . . . . . . 375 **High Solids** Well graded SAND (SW); dark yellowish New 20' connection @ Bentonite brown (10YR 4/4); moist; dense; 95% 0848. Resumed drilling Grout fine to very coarse sand; 5% fine gravel @ 0855. to 2.8cm; subrounded. Poorly graded SAND (SP); yellowish brown (10YR 5/4); moist; dense; 100% fine to medium sand to 0.5mm. 380 • • SP 385 Same as above (378 ft); sand to 1mm. . • ٠ . 390

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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: 7/20/2011 Date TD Reached: 7/23/2011 Date Completed: 8/5/2011

Ground Elevation AMSL (ft): 5321.9 Y Coordinate: 1476442.74 X Coordinate: 1543660.33

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

Groundwater Levels BGS (ft):  $\Sigma$  At Time of Drilling: 470.00 ▼ At End of Drilling: Not Recorded ▼ After Drilling: 467.00

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
	-				Poorly graded SAND (SP); yellowish brown (10YR 5/4); moist; dense; 100% fine to medium sand to 2mm.	SP			
-	-				Well graded SAND (SW); brown (10YR 5/3); moist; dense; 100% fine to very coarse sand; trace fine gravel to 2mm; subangular to subrounded.	SW		•	New 20' connection @ 0909. Resumed drilling @ 0919.
400	-				Poorly graded SAND (SP); brown (10YR 5/3); dry; dense; 100% medium sand to 1mm; rounded.	SP			
405	-				Lean CLAY with Sand (CL); brown (10YR 4/3); moist; very stiff; medium plasticity; 85% clay; 15% very fine to medium sand to 1mm. Poorly graded SAND (SP); brown	CL		- High Solids Bentonite Grout	
- 410 -	-				(7.5YR 5/4); moist; dense; 100% fine sand to 0.5mm; rounded. Same as above (407 ft); yellowish brown (10YR 5/4); sand to 1mm.				
415					Same as above (407 ft); yellowish brown (10YR 5/4); sand to 1mm.	SP			New 20' connection @ 0933. Resumed drilling @ 0938.



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: 7/20/2011 Date TD Reached: 7/23/2011 Date Completed: 8/5/2011

Ground Elevation AMSL (ft): 5321.9 Y Coordinate: 1476442.74 X Coordinate: 1543660.33 Hole Diameter Upper (in.): 11-3/4 Hole Diameter Lower (in.): 9-5/8 Surface Completion Type: Flush mount

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

Sample Type Headspace PID ithologic Log Depth (ft) Number Ś Ö Material Description Remarks Well Diagram ю. 5 420 Well graded SAND (SW); brown (10YR 5/3); moist; dense; 100% very fine to coarse sand to 4mm; subrounded. 425 Same as above (420 ft). SW 430 Same as above (420 ft). • • High Solids . . . . . . . Bentonite Grout 435 Poorly graded SAND (SP); brown (10YR New 20' connection @ 5/3); dry; dense; 100% very fine to 0948. Resumed drilling meidum sand to 1mm; subrounded; @ 0954. trace silt and clay. SP 440 Well graded SAND (SW); brown (10YR 5/3); damp; dense; 100% fine to very coarse sand; trace fine gravel to 1.6cm; rounded. 445 SW Same as above (440 ft); 10% fine gravel . to 3.6cm. Top of Bentonite Seal 450

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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: 7/20/2011 Date TD Reached: 7/23/2011 Date Completed: 8/5/2011

Ground Elevation AMSL (ft): 5321.9 Y Coordinate: 1476442.74 X Coordinate: 1543660.33 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: 470.00 ↓ At End of Drilling: Not Recorded ↓ After Drilling: 467.00

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

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					- 55		· · · · · · · · · · · · · · · · · · ·	
45 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); damp; dense; 100% fine to very coarse sand; trace fine gravel to 1.6cm; rounded.	SW		
455	-				Poorly graded SAND (SP); brown (10YR 5/3); moist; dense; 95% fine to medium sand; 5% fine gravel to 2.6cm; rounded.			New 20' connection @ 1006. Resumed drilling @ 1012.
<u>460</u>	-				Same as above (455 ft); trace coarse sand to 4mm; no gravel.		- Bentonite Seal	
465	-				Same as above (455 ft); no gravel. ⊈	SP	-5" Schedule 80 PVC Riser	
470	-				$\overline{\Sigma}$ Same as above (455 ft); damp; no gravel.			
475					Same as above (455 ft); damp; no gravel.		- Top of 20/40 Sand	New 20' connection @ 1024. Resumed drilling @ 1030.
480	-						- Top of 10/20 Sand	

KAFB\_BOREHOLE\_LOG - SHAW\_DRILLING.GDT - 10/26/11 08:44 - Z:\KAFB BFF\GINT\KAFB\_PROJECT\KAFB\_BFF.GPJ



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

Date Started: 7/20/2011 Date TD Reached: 7/23/2011 Date Completed: 8/5/2011

Project Location: KAFB, Albuquerque, NM

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

Ground Elevation AMSL (ft): 5321.9 Y Coordinate: 1476442.74 X Coordinate: 1543660.33

Client: US Army Corps of Engineers

Project Number: 140705

Groundwater Levels BGS (ft): ↓ At Time of Drilling: 470.00 ↓ At End of Drilling: Not Recorded ↓ After Drilling: 467.00

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
	-				Well graded SAND (SW); brown (10YR 5/3); wet; dense; 100% fine to coarse sand; trace fine gravel to 3cm; rounded.		- Top of 5" Schedule 80 PVC 0.010" Slot Screen	
485	-				Well graded SAND with Gravel (SW); brown (10YR 5/3); wet; dense; 80% fine to coarse sand; 20% fine gravel to 3cm; rounded.			
490	-				Well graded SAND (SW); brown (10YR 5/3); wet; dense; 95% fine to coarse sand; 5% fine gravel to 3cm; rounded.			
495	-				Same as above (490 ft); trace fine gravel.	SW	-Bottom of Screen	New 20' connection @ 1046. Resumed drilling @ 1125.
500	-				Well graded SAND with Gravel (SW); brown (10YR 5/3); wet; dense; 60% fine to coarse sand; 40% fine gravel to 3cm; rounded.		- Sump - Bottom of Sump	
505					Well graded SAND (SW); brown (10YR 5/3); wet; dense; 100% fine to coarse sand; trace fine gravel to 3cm; rounded.			
510							-Bottom of Filter Pack	

	1	1
CI		
	191	WW

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

Date Started: 7/20/2011 Date TD Reached: 7/23/2011 Date Completed: 8/5/2011

Project Number: 140705

Ground Elevation AMSL (ft): 5321.9 Y Coordinate: 1476442.74 X Coordinate: 1543660.33

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

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

Groundwater Levels BGS (ft): ↓ At Time of Drilling: 470.00 ↓ At End of Drilling: Not Recorded ↓ After Drilling: 467.00

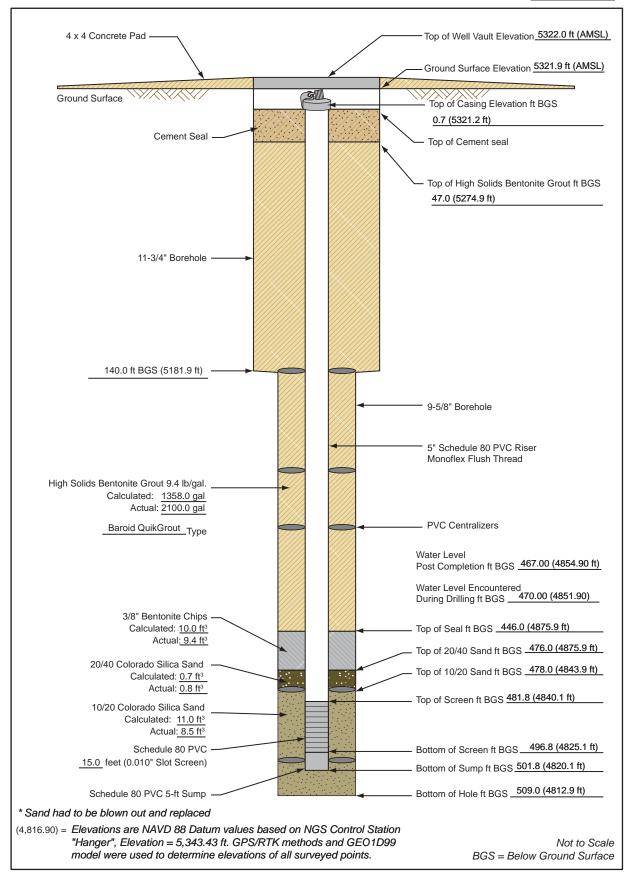
Drilling Contractor: WDC Drilling Drilling Method: Air Rotary Casing Hammer Logged By: Jason Tarbert

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01 Depth (ft)	Sample Type	Number	Headspace PID	Lithologic Log	Material Description	U.S.C.S.	Well Diagram	Remarks
515	-				Well graded SAND with Gravel (SW); brown (10YR 5/3); wet; dense; 80% fine to coarse sand; 20% fine gravel to 3cm; rounded. Well graded SAND (SW); brown (10YR 5/3); wet; dense; 100% fine to coarse sand; trace fine gravel to 3cm; rounded.	SW	- Native Backfill	
520	-			<u>•.ْ•.ْ•</u> .			<u>8080</u> 2	Total depth = 520 ft. Reached @ 1143 on 7/23/11.
525	-							Water added during drilling (gallons) = 1700
-	-							Water added after drilling (gallons) = 1160
530	-							Water added during construction (gallons) = 40
535	-							
540	-							

#### Monitoring Well Completion Diagram KAFB-106036

Installation Start Date/Time: <u>8/3/2011 @ 10:14</u> Installation End Date/Time: <u>8/5/2011 @ 08:00</u>





Pg1of2

#### Well Development Record

Project Name: KAFB BFF			
Location: GW-3		Well/Piez. No.: 106036	
Personnel: P. Ostrye		Date Installed: 8/5/11	
Date: 8/15/11		Csg. Diameter (I.D.): 5"	
Samplers: P. Ostrye		Total Depth (ft. BGL): <u>501.8</u>	
Method of Development: X Surging	X Bailing	X Pumping	
X Original Development	Redevelopment	Other	
Development Date: 8/15/11 - 8/	16/11		
Depth to Water Before Develop	ing Well (ft. BGL): 46	67.74	
		Vol. (V) Purge Factor Volume to Purge	
Height of Water Column: <u>34.0</u> V=(B * $r_c^2$ * $L_c$ * 7.4 Depth Purging From: 490 feet	3)+(B * (r <sub>w</sub> <sup>2</sup> - r <sub>c</sub> <sup>2</sup> ) * L <sub>s</sub> *	517.95 gal. * 1 = 2617.95 \$\vec{\phi}_s * 7.48\+(H_2O added during drilling/installation) = 2617.95 gallons Time Purging Begins: 1630, 8/15/11	
Weather: Sunny, Warm		Screened Interval (ft BGL): 481.8 - 496.8	
Equipment Nos.: pH M	eter: YSI 36952		VE 002384
Equipment Decontaminated Pr	ior to Development:	Y <u>X</u> N	
Describe: Steam Cleaned			
Collected Sample of Water Add Describe: <u>N/A</u>	led to Well: Y	<u>N X</u>	
Comment: 2560 gallons of wate	r added during drilling,	/well installation activities	
Wat	er		

		Water Level (ft. Below	Volume Removed				Turbidity	
Date	Time	TOC)	(gal.)	Temp.°C	рН	EC (ms/cm)		Comments
8/15/2011	1345		10					Begin Bailing
8/15/2011	1358		50					Bailed
8/15/2011	1432		100					Bailed
8/15/2011	1600	469.17						Begin Pumping at 5.3 GPM
8/15/2011	1630	469.17	259	21.14	5.47	0.544	2.07	Stop Pumping for the Day
8/16/2011	0850	469.27	418	20.75	7.17	0.528	0.63	Begin Pumping
8/16/2011	0920	469.27	577	20.83	7.44	0.532	0.49	Continue Pumping
8/16/2011	0950	469.27	736	20.82	7.49	0.533	0.40	Continue Pumping
8/16/2011	1020	469.30	895	21.02	7.49	0.530	0.30	Continue Pumping
8/16/2011	1050	469.31	1054	20.96	7.56	0.536	0.31	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 # GPM = Gallons Per Minute

Where: B=3.14  $O_{s=}$  portosity of the sand pack  $r_{e}$  radius of the well casing and screen in feet  $L_{e}$  length of water column inside the casing and screen in feet  $r_{w}$  radius of the well bore in feet  $L_{e}$  length of saturated portion of the sand pack in feet 2.49 cellucacidation and comparison form on the fact to a cellucat

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



\_\_\_\_\_

#### Well Development Record

Project: KAFB BFF

Project Number: 140705

Date: 8/16/11

Time Start: 1345, 8/15/11

Well No: 106036

Samplers: P. Ostrye

Checked By:

Time Finish: 1620, 8/16/11

Field Chemistry (cont'd)

		Water Level (ft.	Volume					
Date	Time	Below TOC)	Removed (gal.)	Temp.°C	pН	EC (ms/cm)	Turbidity N.T.U.	Comments
8/16/2011	1120							Call to D. Flores about 106035
8/16/2011	1150	469.30	1372	21.19	7.61	0.534	0.27	Continue Pumping
8/16/2011	1220	469.29	1531	21.20	7.63	0.533	0.26	Continue Pumping
8/16/2011	1250	469.29	1690	21.30	7.67	0.533	0.26	Continue Pumping
8/16/2011	1320	469.30	1849	21.14	7.70	0.536	0.26	Continue Pumping
8/16/2011	1350	469.30	2008	21.40	7.73	0.533	0.47	Continue Pumping; Recalibrate HACH
8/16/2011	1420	469.30	2167	21.35	7.76	0.537	0.56	Continue Pumping
8/16/2011	1450	469.30	2326	21.15	7.77	0.533	0.35	Continue Pumping
8/16/2011	1520	469.30	2485	21.68	7.77	0.535	0.44	Continue Pumping
8/16/2011	1540		2591	21.72	7.77	0.535		30 Minute Shut-Down Due to Lightning
8/16/2011	1600	469.30	2697	21.78	7.78	0.535	0.44	Continue Pumping
8/16/2011	1620	469.30	2803	21.43	7.80	0.537	0.30	Stop Pumping; Clear; Total Removed

Was well sampled after development? YES NO X

Sample Method: N/A

Sample Name: N/A

Analyses: N/A

# KAFB 106037

CI	
Sn	aw

Client: US Army Corps of Engineers

Ground Elevation AMSL (ft): 5322.0

Project Number: 140705

Date TD Reached: 7/11/2011

Date Completed: 7/14/2011

Y Coordinate: 1476442.28

X Coordinate: 1543685.62

Date Started: 7/8/2011

Project Location: KAFB, Albuquerque, NM

#### Borehole ID: KAFB-106037

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):  $\mathbf{\nabla}$  At Time of Drilling: 467.10 ▼ At End of Drilling: Not Recorded

▼ After Drilling: 466.80

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); strong brown (7.5YR 5/8); dry; very soft; low plasticity; 70% silt; 30% very fine to medium sand to 2mm; rounded.			Hand augered. ***Note: no headspace requirement at this
5						Same as above (0 ft); trace fine gravel to 9mm; rounded.			location.*** Began drilling @ 1242 on 7/8/11.
 						Same as above (0 ft).	ML		
						Same as above (0 ft); 60% silt; 40% very fine to coarse sand; subrounded.		- Cement Seal	New 20' connection @ 1250. Resumed drilling @ 1258.
_20				••••		Well graded SAND (SW); brown (7.5YR 5/3); dry; loose; 90% very fine to very coarse sand; 10% fine gravel to 2.2cm; subangular.	sw		
					<u> </u>	SILT with Sand (ML); strong brown (7.5YR 5/8); moist; very soft; low plasticity; 80% silt; 20% very fine to medium sand; trace fine gravel to 1.3cm; rounded.			

ML

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30

Shaw <sup>°</sup>		Bore	ho	e ID:	KAFB-1	06037	
Client: US Army Corps of Project Location: KAFB Project Name: KAFB BF Project Number: 140705	B, Albuquerque, NM FF 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					
Date Started: 7/8/2011 Date TD Reached: 7/11 Date Completed: 7/14/2	/2011	⊻ At Ti ▼ At Ei	ime of nd of l	Levels BG <sup>•</sup> Drilling: Drilling: N ng: 466.8	467.10 Not Recorded		
Ground Elevation AMSL Y Coordinate: 1476442. X Coordinate: 1543685.	.28	Drilling M	lethoo		DC Drilling ary Casing Ha pert	ammer Page 2 of 19	
65 Depth (ft) Sample Type Number Headspace PID Lithologic Log	Material Description		U.S.C.S.	Well	Diagram	Remarks	
	Silty SAND (SM); strong brown ( 5/6); dry; very loose; 70% very fil very coarse sand; 10% fine grav	ne to	SM				
	2.5cm; 20% silt. SILT with Sand (ML); strong brow (7.5YR 5/8); moist; soft; low plas 80% silt; 20% very fine to coarse 4.8mm.	ticity;				New 20' connection @ 1309. Resumed drilling	
40	Same as above (32 ft).		ML		Cement Seal	@ 1321.	
	Silty SAND (SM); strong brown ( 5/6); moist; loose; 60% very fine coarse sand; 10% fine gravel to subangular to subrounded; 30%	to very 2.8cm;	SM				
	Same as above (45 ft); 65% san fine gravel; 30% silt.	d; 5%	-				
	SILT with Sand (ML); strong brow (7.5YR 4/6); moist; stiff; low to m plasticity; 80% silt; 5% clay; 15% fine sand to 0.2mm.	edium	ML	••	Top of High Solids Bentonite Grout	New 20' connection @ 1330. Resumed drilling @ 1336.	
60							

KAFB\_BOREHOLE\_LOG - SHAW\_DRILLING.GDT - 10/10/11 11:22 - X::KAFB BFFIGINTIKAFB\_PROJECTIKAFB\_BFF.GPJ



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: 7/8/2011 Date TD Reached: 7/11/2011 Date Completed: 7/14/2011

Ground Elevation AMSL (ft): 5322.0 Y Coordinate: 1476442.28 X Coordinate: 1543685.62 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: 467.10 ↓ At End of Drilling: Not Recorded ↓ After Drilling: 466.80

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

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	A COOluliale. 1545065.02 Logge						ason rarben	
g Depth (ft)	Sample Type	Number	Headspace PID	Lithologic Log	Material Description	U.S.C.S.	Well Diagram	Remarks
		Nur	Head	Litho	<ul> <li>SILT with Sand (ML); strong brown (7.5YR 4/6); moist; stiff; low to medium plasticity; 85% silt; 15% very fine to medium sand to 2mm; trace clay.</li> <li>SILT with Sand (ML); brown (7.5YR 5/4); moist; stiff; low to medium plasticity; 80% silt; 5% clay; 15% very fine sand to 0.2mm.</li> <li>Same as above (65 ft); strong brown (7.5YR 4/6); clay nodules.</li> <li>Same as above (65 ft); strong brown (7.5YR 4/6); trace fine gravel to 1cm; caliche.</li> <li>SILT with Sand (ML); strong brown (7.5YR 5/6); dry; medium stiff; low plasticity; 75% silt; 25% very fine to coarse sand; trace fine gravel to 8mm.</li> <li>Same as above (80 ft); moist.</li> </ul>	SI	- High Solids Bentonite Grout	New 20' connection @ 1349. Resumed drilling @ 1355.
90								



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: 7/8/2011 Date TD Reached: 7/11/2011 Date Completed: 7/14/2011

Ground Elevation AMSL (ft): 5322.0 Y Coordinate: 1476442.28 X Coordinate: 1543685.62 Hole Diameter Upper (in.): 11-3/4 Hole Diameter Lower (in.): 9-5/8 Surface Completion Type: Flush mount

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. ⊃. 90 SILT (ML); strong brown (7.5YR 4/6); • moist; medium stiff; low to medium • • • • • • • • • • ......... plasticity; 90% silt; 10% clay. 95 Sandy SILT (ML); yellowish brown New 20' connection @ • (10YR 5/6); moist; medium stiff; low 1403. Resumed drilling plasticity; 70% silt; 30% very fine to @ 1408. coarse sand; trace fine gravel to 1cm. . . . . . . ML 100 SILT with Sand (ML); strong brown (7.5YR 5/6); dry; medium stiff; low plasticity; 80% silt; 5% clay; 15% very fine sand to 0.2mm. • 105 High Solids Same as above (100 ft). Bentonite Grout Lean CLAY (CL); brown (7.5YR 4/4); moist; stiff; medium plasticity; 100% clay. • . . . . . . 110 CL Sandy SILT (ML); brown (7.5YR 5/4); • dry; medium stiff; low plasticity; 70% silt; 30% very fine to medium sand to 2mm. 115 New 20' connection @ Same as above (112 ft). 1419. Resumed drilling ML @ 1429. ••• • . • 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: 7/8/2011 Date TD Reached: 7/11/2011 Date Completed: 7/14/2011

Ground Elevation AMSL (ft): 5322.0 Y Coordinate: 1476442.28 X Coordinate: 1543685.62 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: 467.10 ↓ At End of Drilling: Not Recorded ↓ After Drilling: 466.80

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		U.S.C.S.	Well Diagram	Remarks
	-				Sandy SILT (ML); brown (7.5YR 5/4); dry; medium stiff; low plasticity; 70% silt; 30% very fine to coarse sand. Note: some caliche grains.			
125	-				Sandy SILT (ML); yellowish brown (10YR 5/6); dry; medium stiff; low plasticity; 60% silt; 40% very fine sand to 0.2mm.	ML	•       •       •       •         •       •       •       •         •       •       •       •         •       •       •       •         •       •       •       •         •       •       •       •         •       •       •       •         •       •       •       •         •       •       •       •         •       •       •       •         •       •       •       •         •       •       •       •         •       •       •       •         •       •       •       •         •       •       •       •         •       •       •       •         •       •       •       •	
<u>130</u>	-				Same as above (125 ft); trace caliche grains to 1cm.			
135	-				Lean CLAY (CL); yellowish brown (10YR 5/6); moist; stiff; low to medium plasticity; 80% clay; 20% silt; trace caliche grains to 1.5cm.	CL	- High Solids Bentonite Grout	New 5' connection @ 1437. Resumed drilling @ 1444.
140	-				Silty SAND (SM); light yellowish brown (10YR 6/4); dry; medium dense; 80% very fine to very coarse sand to 4.8mm; subrounded; 20% silt.	SM		Total depth with 11-3/4" casing @ 1448. End of 7/8/11. Resumed drilling with 9-5/8" casing @ 0906 on 7/9/11.
<u>145</u>	-				Poorly graded SAND (SP); yellowish brown (10YR 5/4); moist; medium dense; 95% very fine to medium sand; 5% coarse sand; trace fine gravel to 1.4cm; rounded.	SP		
150								



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: 7/8/2011 Date TD Reached: 7/11/2011 Date Completed: 7/14/2011

Ground Elevation AMSL (ft): 5322.0 Y Coordinate: 1476442.28 X Coordinate: 1543685.62 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: 467.10 ↓ At End of Drilling: Not Recorded ↓ After Drilling: 466.80

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

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X	Coo	ordinat	e: 1:	54368	35.62 Logged	By: J	ason Ia	Page 6 of 19	
150 Depth (ft)		Number	Headspace PID	Lithologic Log	Material Description	U.S.C.S.	We	ell Diagram	Remarks
155	-				Clayey SAND (SC); dark yellowish brown (10YR 4/4); moist; dense; 65% very fine to very coarse sand; 5% fine gravel to 1.9cm; subrounded to rounded; 30% clay.	SC			
	-				Well graded SAND (SW); yellowish brown (10YR 5/4); moist; medium dense; 100% very fine to very coarse sand; trace fine gravel to 1.7cm; subrounded.				New 20' connection @ 0916. Paused drilling to clean cyclone and hose. Resumed drilling @ 0948.
160	) - - -				Same as above (155 ft); 95% sand; 5% silt. Note: abundant pumice grains.				
165	-				Same as above (155 ft); 95% sand; 5% silt. Note: abundant pumice grains.	SW		- High Solids Bentonite Grout	
170	- - -				Same as above (155 ft).				
175	-				Same as above (155 ft); 90% sand; 10% fine gravel to 1.8cm.				New 20' connection @ 0953. Resumed drilling @ 0958.
180	)							•	



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: 7/8/2011 Date TD Reached: 7/11/2011 Date Completed: 7/14/2011

Ground Elevation AMSL (ft): 5322.0 Y Coordinate: 1476442.28 X Coordinate: 1543685.62 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: 467.10 ↓ At End of Drilling: Not Recorded ↓ After Drilling: 466.80

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

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(2.5Y 5/4); moist; loose; 75% very fine to	X	хc	-00	ordinat	e: 15	94366	5.62 Logged	By: J	ason Tarbert	Fage 7 of 19
185       Well graded SAND (SW); yellowish brown (10YR 5/4); moist; medium dense; 100% very fine to very coarse sand; trace fine gravel to 1.7cm; subrounded.         185       Same as above (180 ft); 5% fine gravel to 1.7cm; trace clay nodules.         190       Same as above (180 ft); 5% fine gravel to 1.7cm; trace clay nodules.         190       Same as above (180 ft); 5% fine gravel to 1.7cm; trace clay nodules.         190       Same as above (180 ft); 5% fine gravel to 1.7cm; trace clay nodules.         191       Same as above (180 ft); 5% fine gravel to 2.5cm; subrounded; 20% clay with some nodules; no odor.         192       Clayey SAND (SC); light olive brown (2.5Y 5/4); moist; loose; 75% very fine to very coarse sand; 5% fine gravel to 2.5cm; subrounded; 20% clay with some nodules; no odor.         200       Well graded SAND with Gravel (SW); yellowish brown (10YR 5/4); damp; loose; 85% very fine to very coarse sand; 15% fine gravel to 2.8cm; rounded.		Depth	ample	Numl	Headspace PID	Lithologic Log	Material Description	U.S.C.S.	Well Diagram	Remarks
Clayey SAND (SC); light olive brown (2.5Y 5/4); moist; loose; 75% very fine to very coarse sand; 5% fine gravel to 2.5cm; subrounded; 20% clay with some nodules; no odor.       SC         Well graded SAND with Gravel (SW); yellowish brown (10YR 5/4); damp; loose; 85% very fine to very coarse sand; 15% fine gravel to 2.8cm; rounded.       Image: Clayey Solids Bentonite Grout	18	- - <u>185</u> - -					brown (10YR 5/4); moist; medium dense; 100% very fine to very coarse sand; trace fine gravel to 1.7cm; subrounded. Same as above (180 ft); 5% fine gravel to 1.7cm; trace clay nodules. Same as above (180 ft); 5% fine gravel			
200       Well graded SAND with Gravel (SW);         yellowish brown (10YR 5/4); damp;         loose; 85% very fine to very coarse         sand; 15% fine gravel to 2.8cm;         rounded.	<u>19</u>	<u>195</u> - -	-				(2.5Y 5/4); moist; loose; 75% very fine to very coarse sand; 5% fine gravel to 2.5cm; subrounded; 20% clay with some	SC	Bentonite	Appears stained. New 20' connection and resumed drilling @ 1008.
	200	- 200 - -	-				Well graded SAND with Gravel (SW); yellowish brown (10YR 5/4); damp; loose; 85% very fine to very coarse sand; 15% fine gravel to 2.8cm;			
205   Same as above (198 ft); olive brown (2.5Y 4/6).     210		-	-				Same as above (198 ft); olive brown (2.5Y 4/6).	SW		



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: 7/8/2011 Date TD Reached: 7/11/2011 Date Completed: 7/14/2011

Ground Elevation AMSL (ft): 5322.0 Y Coordinate: 1476442.28 X Coordinate: 1543685.62 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: 467.10 ↓ At End of Drilling: Not Recorded ↓ After Drilling: 466.80

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); yellowish brown (10YR 5/4); damp; loose; 100% very fine to coarse sand; trace fine gravel. Same as above (210 ft); 5% fine gravel; pumice grains.	sw		New 20' connection @ 1014. Resumed drilling
- - 220	-				Lean CLAY (CL); dark yellowish brown (10YR 4/4); damp; stiff; medium to high plasticity; 100% clay; trace very fine sand to 0.2mm.			@ 1018.
- 225 -	-				sand to 0.2mm. Same as above (219 ft); brown (10YR 5/3).	CL	- High Solids Bentonite Grout	
230					Same as above (219 ft); 5% fine gravel to 3.5cm; well rounded.		0       0         0       0	
235	-				Well graded SAND (SW); yellowish brown (10YR 5/4); moist; loose; 100% very fine to very coarse sand; trace fine gravel to 9mm; rounded.	sw	-       -       -       -         -       <	New 20' connection @ 1025. Resumed drilling @ 1032.



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: 7/8/2011 Date TD Reached: 7/11/2011 Date Completed: 7/14/2011

Ground Elevation AMSL (ft): 5322.0 Y Coordinate: 1476442.28 X Coordinate: 1543685.62 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: 467.10 ↓ At End of Drilling: Not Recorded

▼ After Drilling: 466.80

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

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				54300	55.62 Logged	Dy. 0	uson	Tubblit	
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 5/3); moist; medium dense; 100% fine to medium sand to 1mm; subrounded.	SP		•       •       •       •       •       •       •       •       •       •       •       •       •       •       •       •       •       •	
245					Lean CLAY (CL); lense.	CL	••	••	
250					Poorly graded SAND (SP); brown (10YR 5/3); moist; medium dense; 100% fine to medium sand to 1mm; trace coarse sand; subrounded.	SP	- • • • • • • • • • • • • • • • • • • •	•       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •	
255	-				Well graded SAND (SW); dark yellowish brown (10YR 4/4); moist; medium dense; 95% very fine to very coarse sand; 5% fine gravel to 1.5cm; rounded; trace clay. Same as above (250 ft); no gravel.	SW		- High Solids Bentonite Grout	New 20' connection @ 1037. Resumed drilling @ 1042.
<u>260</u> <u>265</u> 270	-				Poorly graded SAND (SP); dark yellowish brown (10YR 4/4); moist; medium dense; 100% medium sand to 2mm; rounded; trace clay nodules. Same as above (260 ft).	SP		<ul> <li>•</li> <li>•&lt;</li></ul>	



Client: US Army Corps of Engineers 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

Date Started: 7/8/2011 Date TD Reached: 7/11/2011 Date Completed: 7/14/2011

Project Number: 140705

Ground Elevation AMSL (ft): 5322.0 Y Coordinate: 1476442.28 X Coordinate: 1543685.62

Surface Completion Type: Flush mount Groundwater Levels BGS (ft):

 $\nabla$  At Time of Drilling: 467.10 ▼ At End of Drilling: Not Recorded

▼ After Drilling: 466.80

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

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; medium dense; 95% very fine to very coarse sand; 5% fine gravel to 1.5cm; rounded.	SW		
275	-				Lean CLAY (CL); dark yellowish brown (10YR 4/4); moist; stiff; medium plasticity; 100% clay; trace medium sand to 2mm.			New 20' connection @ 1051. Resumed drilling @ 1057.
280					Lean CLAY with Sand (CL); dark yellowish brown (10YR 4/4); moist; stiff; medium plasticity; 80% clay; 20% very fine to medium sand to 2mm.	CL	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	
285	-				Same as above (273 ft).		- High Solids Bentonite Grout	
<u>290</u>	-				Poorly graded SAND (SP); brown (10YR 5/3); dry; medium dense; 100% medium sand to 2mm; subrounded; trace silt.			
295	-				Same as above (288 ft); 5% coarse sand.	SP	•       •       •         •       •       •         •       •       •         •       •       •         •       •       •         •       •       •         •       •       •         •       •       •         •       •       •         •       •       •         •       •       •         •       •       •         •       •       •         •       •       •         •       •       •         •       •       •         •       •       •         •       •       •	Cyclone hose came off hammer @ 1112. Resumed drilling @ 1448.
300								

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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: 7/8/2011 Date TD Reached: 7/11/2011 Date Completed: 7/14/2011

Ground Elevation AMSL (ft): 5322.0 Y Coordinate: 1476442.28 X Coordinate: 1543685.62 Hole Diameter Upper (in.): 11-3/4 Hole Diameter Lower (in.): 9-5/8 Surface Completion Type: Flush mount

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 *i* Ö Material Description Remarks Well Diagram ю. ⊃. 300 Poorly graded SAND (SP); brown (10YR . 5/3); dry; medium dense; 100% medium • sand to 2mm; subrounded; trace silt. • • • 305 SP Same as above (300 ft); trace coarse Paused drilling to clean • out cyclone hose @ sand to 4mm. 1500. Resumed drilling @ 1516. • 310 • Well graded SAND with Gravel (SW); dark yellowish brown (10YR 4/4); moist; medium dense; 75% very fine to very • coarse sand; 25% fine gravel to 2cm. • . . . . . . . . . 315 **High Solids** Same as above (310 ft); gravel to 3cm. New 20' connection @ Bentonite 1526. Resumed drilling Grout @ 1532. SW • 320 Well graded SAND (SW); dark yellowish brown (10YR 4/4); moist; medium dense; • 90% very fine to very coarse sand; 10% fine gravel to 2cm. • • 325 • • • • • Poorly graded SAND (SP); yellowish ••• brown (10YR 5/4); moist; dense; 100% very fine to medium sand; trace fine gravel to 3cm; rounded. • SP • • . 330



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: 7/8/2011 Date TD Reached: 7/11/2011 Date Completed: 7/14/2011

Ground Elevation AMSL (ft): 5322.0 Y Coordinate: 1476442.28 X Coordinate: 1543685.62 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: 467.10 ↓ At End of Drilling: Not Recorded

 $\bar{\Psi}$  After Drilling: 466.80

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

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ଝ Depth (ft)	Sample Type	Num	Headspace PID	Lithologic Log	Material Description	U.S.C.S.		Well Diagram	Remarks
335 340 345					Poorly graded SAND (SP); yellowish brown (10YR 5/4); moist; dense; 100% very fine to medium sand. Well graded SAND with Gravel (SW); brown (10YR 4/3); moist; dense; 80% very fine to very coarse sand; 20% fine gravel to 1.8cm; subrounded to rounded. Same as above (332 ft); gravel to 3.2cm. Well graded SAND (SW); brown (10YR	SP		- High Solids	New 20' connection @ 1542. Resumed drilling @ 1552.
<u>350</u> <u>355</u> <u>360</u>	-				Well graded SAND (SW); brown (10YR 4/3); moist; dense; 100% very fine to very coarse sand; trace fine gravel; subrounded to rounded. Poorly graded SAND (SP); brown (10YR 5/3); moist; medium dense; 100% fine to medium sand; trace coarse sand; trace fine gravel to 1cm; rounded. Same as above (350 ft).	SP		Bentonite Grout	New 20' connection @ 1603. Resumed drilling @ 1612.



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: 7/8/2011 Date TD Reached: 7/11/2011 Date Completed: 7/14/2011

Ground Elevation AMSL (ft): 5322.0 Y Coordinate: 1476442.28 X Coordinate: 1543685.62 Hole Diameter Upper (in.): 11-3/4 Hole Diameter Lower (in.): 9-5/8 Surface Completion Type: Flush mount

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 *i* Ö Material Description Remarks Well Diagram ю. ⊃. 360 Poorly graded SAND (SP); brown (10YR 5/3); moist; medium dense; 100% fine to • medium sand; trace coarse sand; trace • fine gravel to 1cm; rounded. • • 365 • SP Same as above (360 ft); 5% coarse • sand. • 370 • Well graded SAND with Gravel (SW); dark yellowish brown (10YR 4/4); moist; . dense; 75% very fine to very coarse • sand; 25% fine gravel to 1.7cm; subrounded. • . . . . . . . . . . 375 **High Solids** Well graded SAND (SW); dark vellowish New 20' connection @ Bentonite brown (10YR 4/4); moist; dense; 90% 1621. Resumed drilling Grout very fine to very coarse sand; 10% fine @ 1628. gravel to 1.7cm; subrounded. SW 380 Same as above (375 ft). • • 385 • • • • • Poorly graded SAND (SP); brown (10YR ••• 5/3); moist; dense; 95% medium sand; 5% coarse sand to 4.8mm; subrounded. • SP • • ٠ 390



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: 7/8/2011 Date TD Reached: 7/11/2011 Date Completed: 7/14/2011

Ground Elevation AMSL (ft): 5322.0 Y Coordinate: 1476442.28 X Coordinate: 1543685.62 Hole Diameter Upper (in.): 11-3/4 Hole Diameter Lower (in.): 9-5/8 Surface Completion Type: Flush mount

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 Ś Ö Material Description Remarks Well Diagram ю. ⊃. 390 Well graded SAND (SW); brown (10YR 5/3); dry; dense; 95% very fine to very coarse sand; 5% fine gravel to 1.3cm; . subrounded. • • 395 Same as above (390 ft); 10% fine gravel. End of 7/9/11. New 20' connection and resumed SW drilling @ 0843 on 7/11/11. 400 Same as above (390 ft); no gravel. Sandy lean CLAY (CL); lense. CL • Poorly graded SAND (SP); brown (7.5YR 5/4); moist; medium dense;  $\bullet \bullet \bullet \bullet \bullet \bullet \bullet \bullet$ 100% very fine sand to 0.2mm; rounded. 405 **High Solids** Bentonite Grout • SP 410 Same as above (403 ft). • • 415 • • • • • Well graded SAND (SW); yellowish New 20' connection and . brown (10YR 5/4); moist; medium dense; resumed drilling @ 0919. 100% very fine to very coarse sand; trace fine gravel to 6mm; subrounded. • SW . • • . • 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: 7/8/2011 Date TD Reached: 7/11/2011 Date Completed: 7/14/2011

Ground Elevation AMSL (ft): 5322.0 Y Coordinate: 1476442.28 X Coordinate: 1543685.62 Hole Diameter Upper (in.): 11-3/4 Hole Diameter Lower (in.): 9-5/8 Surface Completion Type: Flush mount

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

Sample Type Headspace PID ithologic Log Depth (ft) Number Ś Ö Material Description Remarks Well Diagram ю. Ľ 420 Well graded SAND (SW); yellowish brown (10YR 5/4); moist; medium dense; 95% very fine to very coarse sand; 5% . fine gravel to 6mm; subrounded. • • 425 Same as above (420 ft); trace fine gravel. SW • 430 Same as above (420 ft); trace fine gravel to 1.7cm. • . . . . . . . . . . 435 **High Solids** Poorly graded SAND (SP); brown (10YR New 20' connection @ Bentonite • 5/3); dry; dense; 100% very fine to 0935. Resumed drilling Grout . medium sand; trace coarse sand; trace @ 0943. fine gravel to 8mm. 440 SP Same as above (435 ft); 5% coarse sand. • 445 Well graded SAND (SW); brown (10YR • . 5/3); dry; dense; 95% very fine to very • coarse sand; 5% fine gravel to 1.7cm. • SW • . ٠ • 450

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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: 7/8/2011 Date TD Reached: 7/11/2011 Date Completed: 7/14/2011

Ground Elevation AMSL (ft): 5322.0 Y Coordinate: 1476442.28 X Coordinate: 1543685.62 Hole Diameter Upper (in.): 11-3/4 Hole Diameter Lower (in.): 9-5/8 Surface Completion Type: Flush mount

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 Ś Ö Material Description Remarks Well Diagram ю. 5 450 Well graded SAND with Gravel (SW); . brown (10YR 5/3); dry; dense; 60% very ......... fine to very coarse sand; 40% fine gravel to 1.7cm. SW 455 Poorly graded SAND (SP); yellowish New 20' connection @ • brown (10YR 5/4); moist; dense; 100% 1001. Resumed drilling fine to medium sand; trace fine gravel to @ 1006. 2.6cm. • 460 . . . . . . . . Hiah Solids Same as above (455 ft); no gravel. Bentonite Grout • 465 • • Same as above (455 ft); gravel to 1.3cm. • Å •••• SP • 470 • Same as above (455 ft); no gravel. . • Top of Bentonite Seal 475 New 20' connection @ Same as above (455 ft); no gravel. 1023. Resumed drilling @ 1205. 480



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: 7/8/2011 Date TD Reached: 7/11/2011 Date Completed: 7/14/2011

Ground Elevation AMSL (ft): 5322.0 Y Coordinate: 1476442.28 X Coordinate: 1543685.62 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: 467.10 ↓ At End of Drilling: Not Recorded ↓ After Drilling: 466.80

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

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~ ~ ~	-00	rdinat	e: 15	4368	35.62 Logged	By: Ja	ason Tarbert	Page 17 of 19
08 Depth (ft)	Sample Type	Number	Headspace PID	Lithologic Log	Material Description	U.S.C.S.	Well Diagram	Remarks
485	-				Well graded SAND with Gravel (SW); yellowish brown (10YR 5/4); wet; dense; 70% fine to very coarse sand; 30% fine gravel to 1.6cm; subrounded; trace silt and clay.	SW		
					Poorly graded GRAVEL with Sand (GP); yellowish brown (10YR 5/4); wet; dense; 70% fine gravel to 4.4cm; rounded; 30% medium to very coarse sand. Note: gravel is composed of granite.	GP	- Bentonite Seal	
490	-				Poorly graded SAND (SP); brown (10YR 4/3); wet; dense; 90% medium to very coarse sand; 10% fine gravel to 1.7cm; subrounded.			
495	-				Poorly graded SAND with Gravel (SP); brown (10YR 4/3); wet; dense; 70% medium to very coarse sand; 30% fine gravel to 1.7cm; subrounded.	SP	- 5" Schedule 80 PVC Riser	New 20' connection @ 1221. Chain broke on hammer, paused drilling to repair. Resumed drilling @ 1311.
500	-				Well graded SAND (SW); yellowish brown (10YR 5/4); wet; dense; 95% fine to very coarse sand; 5% fine gravel to 2.5cm; subrounded.	sw	- Top of 20/40 Sand	
505	-				Poorly graded GRAVEL with Sand (GP); brown (10YR 4/3); wet; dense; 60% fine gravel to 4.5cm; 40% medium to very coarse sand; subrounded to rounded.	GP	- Top of 10/20 Sand - Top of 5" Schedule 80 PVC 0.010" Slot Screen	
510				~ ~	Poorly graded SAND (SP); brown (10YR	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: 7/8/2011 Date TD Reached: 7/11/2011 Date Completed: 7/14/2011

Ground Elevation AMSL (ft): 5322.0 Y Coordinate: 1476442.28 X Coordinate: 1543685.62 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: 467.10 ↓ At End of Drilling: Not Recorded ↓ After Drilling: 466.80

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

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X	Coo	rdinat	e: 1	54368	35.62 Logged	IBy: J	ason Tarbert	Page 18 of 19
01 Depth (ft)	Sample Type	Number	Headspace PID	Lithologic Log	Material Description	U.S.C.S.	Well Diagram	Remarks
	_				5/3); wet; dense; 100% medium sand; trace fine gravel to 7mm; rounded.			
515					Same as above (510 ft); 5% fine gravel.			New 20' connection @ 1330. Resumed drilling @ 1336.
520					Same as above (510 ft); very dense; 100% fine to medium sand.		- Bottom of Screen	Hole plugged. Resumed drilling @ 1400.
525					Same as above (510 ft); very dense; 100% fine to medium sand.	SP	- Sump - Bottom of Sump	Rate of penetration was very slow.
530					Same as above (510 ft); very dense; 100% fine to medium sand; grading coarser.		- Bottom of Filter Pack	
<u>535</u> 540	_				Same as above (510 ft); very dense; 100% fine to medium sand; grading coarser.		Native Backfill	

Sh	aw

Client: US Army Corps of Engineers

Ground Elevation AMSL (ft): 5322.0

Project Number: 140705

Date TD Reached: 7/11/2011 Date Completed: 7/14/2011

Y Coordinate: 1476442.28

Date Started: 7/8/2011

Project Location: KAFB, Albuquerque, NM

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

#### Borehole ID: KAFB-106037

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

Groundwater Levels BGS (ft):  $\nabla$  At Time of Drilling: 467.10 ▼ At End of Drilling: Not Recorded

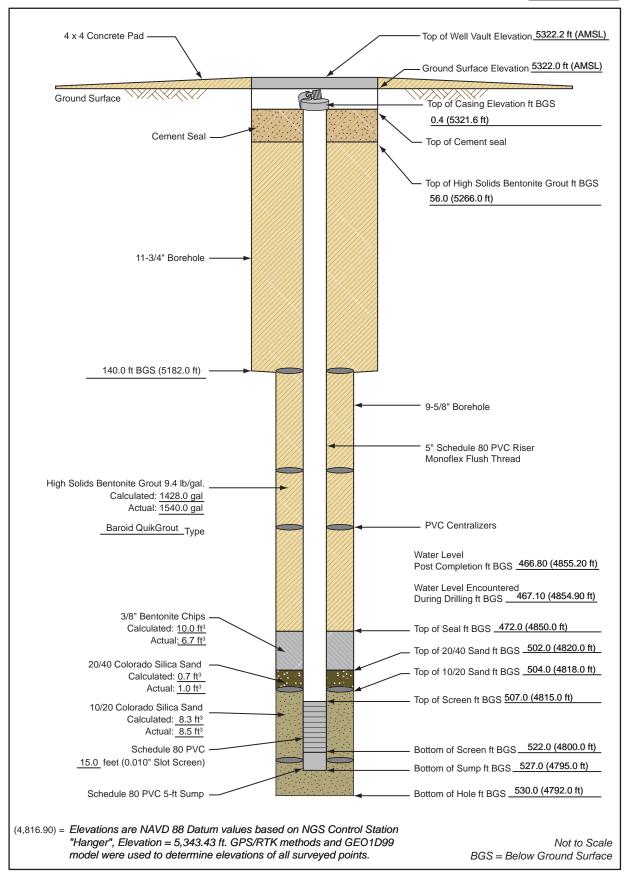
▼ After Drilling: 466.80

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

				476442 54368		Logged I	lethod 3y: Ja	: Air Rotary Casing H Ison 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
					Well graded SAND with Gravel ( brown (10YR 5/3); wet; very dens fine to very coarse sand; 20% fin to 2cm; subrounded.	se: 80%	SW		Total depth = 540 ft. Reached @ 1425 on 7/11/11.
545	-								Water added during drilling (gallons): 320
	-								Water added after drilling (gallons): 1600
550	-								Water added during construction (gallons): 0
555									
	-								
560	-								
565									
570									

#### Monitoring Well Completion Diagram KAFB-106037

Installation Start Date/Time: 7/12/2011 @ 09:22 Installation End Date/Time: 7/14/2011 @ 08:00





Pg1of3

#### Well Development Record

Project Nam	e: KAFB BF	F									
Location: G	W-3					Well/Piez. N	<b>o.</b> : <u>106037</u>				
Personnel:	P. Ostrye					Date Installe					
Date: 8/12/1	1					Csg. Diame					
Samplers:	P. Ostrye					Total Depth					
Method of D X Surging	evelopment	:	X Bailing		X Pumping						
X Original Develop	oment		Redevelopment			Other					
Developmer	nt Date: 8/12	2/11 and 8/1	5/11								
Depth to Wa	ater Before D	eveloping \	Nell (ft. BGL)	468.05							
				Vol. (V)	Purge F	actor Ve	olume to Purge				
Height of W	V=(B * r <sub>c</sub> ² * l	<sub>-c</sub> * 7.48)+(B	* (r <sub>w</sub> <sup>2</sup> - r <sub>c</sub> <sup>2</sup> ) * l	2002.97 -s * Øs * 7.48		ed during dril	002.97 Iling/installatio	n) = gallons			
Weather: Si			-				iL): 507 - 522				
Equipment		pH Meter:	YSI 36952	_		er: <u>YSI 369</u>		Turbidity Meter: _LVE 002384			
			o Developmei	nt: Y <u>X</u>	<u>N</u>						
Describe: S						-					
Collected Sa Describe: <u>N</u>		ter Added to	oWell: Y	<u>N X</u>		-					
Comment:	1920 gallons	of water add	led during drill	ing/well insta	llation activit	ies					
Date	Time	Water Level (ft. Below TOC)	Volume Removed (gal.)	Temp.°C	рН	EC (ms/cm)	Turbidity N.T.U.	Comments			

		Below	Removed				Turbiality	
Date	Time	TOC)	(gal.)	Temp.°C	рН	EC (ms/cm)	N.T.U.	Comments
8/12/2011	0852		10					Begin Bailing
8/12/2011	0908		50					Bailed; Begin Second Bail
8/12/2011	0946		100					Continue Bailing
8/12/2011	0948		110					Bailed
8/12/2011	1122	468.10						Begin Pumping at 5.3 GPM
8/12/2011	1137	468.55	136.5	21.87	5.84	0.351	180.00	Continue Pumping
8/12/2011	1200	468.53	258.4	21.85	5.49	0.350	86.80	Continue Pumping
8/12/2011	1220	468.49	364.4	21.83	5.66	0.348	78.10	Continue Pumping
8/12/2011	1240	468.50	470.4	21.57	5.65	0.347	73.20	Continue Pumping
8/12/2011	1300	468.50	576.4	21.75	6.42	0.346	58.30	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 # GPM = Gallons Per Minute

Where: B=3.14  $O_{s=}$  portosity of the sand pack  $r_{e}$  radius of the well casing and screen in feet  $L_{e}$  length of water column inside the casing and screen in feet  $r_{w}$  radius of the well bore in feet  $L_{e}$  length of saturated portion of the sand pack in feet 2.49 cellucacidation and comparison form on the fact to a cellucat

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



#### Well Development Record

Project: KAFB BFF

Project Number: 140705

Date: 8/12/11

Time Start: 0852, 8/12/11

Well No: 106037

Samplers: P. Ostrye

Checked By:

Time Finish: 1050, 8/15/11

Field Chemistry (cont'd)

Data	Time	Water Level (ft. Below	Volume Removed	Toma °C		FC (ma/am)	Turbidity	Commente
Date	Time	TOC)	(gal.)	Temp.°C	рН	EC (ms/cm)	N.T.U.	Comments
8/12/2011	1320	468.48	682.4	21.55	5.81	0.345	47.20	Continue Pumping
8/12/2011	1340	468.48	788.4	21.53	5.44	0.345	38.70	Continue Pumping
8/12/2011	1400	468.48	894.4	21.65	6.51	0.344	28.80	Continue Pumping
8/12/2011	1420	468.48	910.4	22.16	7.40	0.344	18.80	Continue Pumping
8/12/2011	1440	468.48	1016.4	21.77	7.01	0.343	10.00	Continue Pumping
8/12/2011	1500	468.46	1122.4	21.53	6.29	0.342	7.49	Continue Pumping
8/12/2011	1520	468.44	1228.4	21.49	5.97	0.342	6.05	Continue Pumping
8/12/2011	1540	468.44	1334.4	21.30	5.94	0.341	5.12	Continue Pumping
8/12/2011	1600	468.42	1440.4	21.40	7.31	0.340	4.75	Continue Pumping
8/12/2011	1620	468.42	1546.4	20.96	7.40	0.340	6.83	Stop Pumping for the Day
8/15/2011	0900	468.60	1625.9	20.47	6.42	0.427	2.77	Begin Pumping
8/15/2011	0920	468.60	1731.9	20.62	7.71	0.422	1.31	Continue Pumping
8/15/2011	0940	468.59	1837.9	20.67	7.21	0.421	1.31	Continue Pumping
8/15/2011	1000	468.58	1943.9	20.71	6.43	0.420	0.52	Continue Pumping
8/15/2011	1010	468.58	1996.9	20.73	6.93	0.420	0.49	Continue Pumping

.

Was well sampled after development? YES NO X

Sample Method: N/A

Sample Name: N/A

Analyses: N/A

Pg 2 of 3



#### Ν

Project: KAFB BFF

Project Number: 140705

Date: 8/15/11

Time Start: 0852, 8/12/11

Field Chemistry (cont'd)

Vell Development Reco	ord
-----------------------	-----

Well No: 106037

Samplers: P. Ostrye

Checked By: \_

Time Finish: 1050, 8/15/11

Date	Time	Water Level (ft. Below TOC)	Volume Removed (gal.)	Temp.°C	рН	EC (ms/cm)	Turbidity N.T.U.	Comments
8/15/2011	1020	468.58	2049.9	20.72	7.04	0.421	0.48	Continue Pumping
8/15/2011	1030	468.58	2102.9	20.71	7.00	0.420	0.59	Continue Pumping
8/15/2011	1040	468.58	2155.9	20.76	7.04	0.421	0.53	Continue Pumping
8/15/2011	1050	468.58	2208.9	20.79	7.06	0.421	0.40	Stop Pumping; Clear; Total Removed

Was well sampled after development? YES NO X

Sample Method: N/A

Sample Name	: N/A

Analyses: N/A

Pg 3 of 3

# KAFB 106055

	Sha					Bore	eho	le ID: KAFB	-106055
	Proje Proje	ct Loc	ation: ne: K	KÁF AFB I	s of Engineers FB, Albuquerque, NM BFF SWMU ST-106 and SS-111 705	Hole Dia	ameter	<sup>r</sup> Upper (in.): 11-3/4 <sup>r</sup> Lower (in.): 9-5/8 oletion Type: Flush m	ount
	Date : Date :	Starte	d: 6/2 acheo	20/20 <sup>-</sup> d: 6/2	11 22/2011	∑ AtT T_AtE	ime of Ind of	_evels BGS (ft): f Drilling: 470.82 Drilling: Not Recorde ng: 470.75	d
1	Y Coo	nd Elev ordinat ordinat	e: 14	7730		Drilling I	Method	actor: WDC Explorati d: Air Rotary Casing rian Lucero	
÷	O Ueptn (π) Sample Type	Number	Headspace PID	Lithologic Log	Material Description		U.S.C.S.	Well Diagram	Remarks
	-				Asphalt and fill; no description re Silty SAND (SM); reddish brown 5/4); dry; medium dense; 70% v to fine sand; 30% silt; trace clay; odor.	(5YR ery fine			Hand augered. ***Note: no headspace requirement at this location.***
	5				Same as above (0.5 ft); no odor.		SM		Spud @ 1330 on 6/20/11.
	- 10 -				Silty SAND (SM); reddish brown 5/3); dry; medium dense; 70% vo to fine sand; trace medium sand subangular; 30% silt with minor	ery fine			
	<u>15</u>				Sandy SILT (ML); reddish brown 4/4); dry to moist; stiff; 70% silt v 30% very fine to fine sand; trace to coarse sand; subangular; no o	vith clay; medium	ML	- Cement Seal	
_:	- 20 -				Same as above (13 ft). Well graded SAND with Gravel (	(SW) <sup>.</sup>			Kelly down @ 1346. New 20' connection @ 1356.
	25				light reddish brown (5YR 6/3); di dense; 85% very fine to coarse s subangular; 15% fine to coarse g 3.5cm; subangular; no odor. Not consists of felsic to intermediate red sandstone fragments, and tr	ry; sand; gravel to e: gravel lithics,			Resumed drilling @ 1357.
	- - 30				limestone.		SW		



#### 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: 6/20/2011 Date TD Reached: 6/22/2011 Date Completed: 6/24/2011

Ground Elevation AMSL (ft): 5325.1 Y Coordinate: 1477303.10 X Coordinate: 1543757.07

# Borehole ID: KAFB-106055

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

After Drilling: 470.75

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

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පි Depth (ft)	Sample Type	Number	Headspace PID Lithologic Log		U.S.C.S.	Well Diagram	Remarks
				Well graded SAND with Gravel (SW); light reddish brown (5YR 6/3); dry; dense; 85% very fine to coarse sand; subangular; 15% fine to coarse gravel to 2cm; subangular; no odor. Same as above (30 ft); no odor.		- Cement Seal	
- - - <u>40</u> -				Well graded SAND with Gravel (SW); reddish brown (5YR 5/3); 80% very fine to coarse sand; subangular; 15% fine gravel to 1cm; subangular; 5% silt with		- Top of High Solids Bentonite Grout	Kelly down @ 1420. New 20' connection @ 1426. Resumed drilling @ 1427.
- 				minor clay; no odor. Same as above (40 ft); no odor.	SW	•       •       •         •       •       •	
50				Well graded SAND (SW); reddish brown (5YR 5/3); dry; dense; 95% very fine to coarse sand; subangular; trace fine gravel to 1cm; subangular; 5% silt with minor clay; no odor.			
<u>55</u> - - - 60				Same as above (50 ft); 90% very fine to coarse sand; subangular; 5% fine to coarse gravel to 2.5cm; subangular; 5% silt with minor clay; no odor.		•       •       •       •         •       •       •       •         •       •       •       •         •       •       •       •         •       •       •       •         •       •       •       •         •       •       •       •         •       •       •       •         •       •       •       •         •       •       •       •         •       •       •       •         •       •       •       •         •       •       •       •         •       •       •       •         •       •       •       •         •       •       •       •         •       •       •       •         •       •       •       •	



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: 6/20/2011 Date TD Reached: 6/22/2011 Date Completed: 6/24/2011

Ground Elevation AMSL (ft): 5325.1 Y Coordinate: 1477303.10 X Coordinate: 1543757.07 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: 470.82 ♥ At End of Drilling: Not Recorded

After Drilling: 470.75

Drilling Contractor: WDC Exploration and Wells 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
65	-				Well graded SAND (SW); reddish brown (5YR 5/3); dry; dense; 90% very fine to coarse sand; subangular; 5% fine gravel to 1.2cm; subangular; 5% silt with minor clay; no odor.	SW		Kelly down @ 1444. New 20' connection @ 1448. Resumed drilling @ 1452.
-	-				Lean CLAY (CL); reddish brown (5YR 4/3); dry to moist; stiff; low plasticity; 95% clay with silt; 5% very fine to fine \ sand; trace medium to coarse sand;	CL		
	-				subangular; no odor. Well graded SAND (SW); reddish brown (5YR 5/3); dry; dense; 100% very fine to coarse sand; subangular.	SW		
75	-				Sandy SILT (ML); yellowish red (5YR 5/6); dry; stiff; 70% silt; trace clay; 30% very fine to fine sand; trace medium to coarse sand; subangular; no odor.	ML	- High Solids Bentonite Grout	Stopped drilling @ 1500. Drive head came out of casing top joint. End of 6/20/11. Resumed drilling @ 0820 on 06/21/11.
80	-				Well graded SAND (SW); reddish brown (5YR 5/3); dry; dense; 100% very fine to coarse sand; subangular to subrounded; no odor.			Kelly down @ 0825. New 20' connection @ 0838. Resumed drilling @ 0839.
85	-				Same as above (78 ft); 85% very fine to coarse sand; subangular; 10% fine to coarse gravel to 2.5cm; subangular; 5% silt; no odor.	SW	•       •       •         •       •       •	Paused drilling @ 0840. Drive head came out of casing top joint. Resumed drilling @ 0859.



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: 6/20/2011 Date TD Reached: 6/22/2011 Date Completed: 6/24/2011

Ground Elevation AMSL (ft): 5325.1 Y Coordinate: 1477303.10 X Coordinate: 1543757.07 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: 470.82 ♥ At End of Drilling: Not Recorded

After Drilling: 470.75

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

g Depth (ft)	Sample Type	Number	Headspace PID	Lithologic Log		U.S.C.S.	Well Di	agram	Remarks
95					<ul> <li>Well graded SAND (SW); reddish brown (5YR 5/3); dry; dense; 85% very fine to coarse sand; subangular; 10% fine to coarse gravel to 2cm; subangular to subrounded; 5% silt with minor clay; no odor.</li> <li>Well graded SAND (SW); reddish brown (5YR 5/3); dry; dense; 90% very fine to coarse sand; subangular; 5% fine gravel to 1.5cm; subangular to subrounded; 5% silt with minor clay; no odor.</li> </ul>	SW			
<u>100</u>	-				SILT with Sand (ML); reddish brown (5YR 5/4); dry; stiff; 85% silt; trace clay; 15% very fine to coarse sand; subangular; no odor. Same as above (99 ft); 75% silt; trace clay; 25% very fine to medium sand; trace coarse sand; subangular; no odor.			nh Solids ntonite out	Kelly down @ 0912. New 20' connection @ 0921. Resumed drilling @ 0922.
<u>110</u>	-				SILT (ML); yellowish red (5YR 4/6); dry; stiff; 95% silt; trace clay; 5% very fine to fine sand; trace medium to coarse sand; subangular; no odor.	ML			
<u>115</u>	-				Same as above (108 ft); no odor.				
120							• • • • • • • • • • • •		

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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: 6/20/2011 Date TD Reached: 6/22/2011 Date Completed: 6/24/2011

Ground Elevation AMSL (ft): 5325.1 Y Coordinate: 1477303.10 X Coordinate: 1543757.07 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: 470.82 ↓ At End of Drilling: Not Recorded ↓ After Drilling: 470.75

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

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			-		Logged	<u> </u>		
15 Depth (ft)	Sample Type	Number	Headspace PID	Lithologic Loa	Material Description	U.S.C.S.	Well Diagram	Remarks
-	_				SILT (ML); yellowish red (5YR 4/6); dry; stiff; 95% silt; trace clay; 5% very fine to fine sand; trace medium to coarse sand; subangular; no odor.			Kelly down @ 0931. New 20' connection @ 0939. Resumed drilling @ 0940.
<u>125</u> - -	-				Same as above (120 ft); no odor.			
<u>130</u> - -	-				Same as above (120 ft); 95% silt with minor clay; 5% very fine to fine sand; trace medium to coarse sand; subangular; no odor.	ML		
<u>135</u> - -	-				Same as above (120 ft); 90% silt; trace clay; 10% very fine to coarse sand; subangular; no odor.		- High Solids Bentonite Grout	
	-				SILT (ML); reddish brown (2.5YR 4/4); dry; stiff; 100% silt with minor clay; trace very fine to fine sand; no odor.		•       •       •         •       •       •         •       •       •         •       •       •         •       •       •         •       •       •         •       •       •         •       •       •         •       •       •         •       •       •         •       •       •         •       •       •         •       •       •         •       •       •         •       •       •	Kelly down @ 0947. New 20' connection @ 0958. Resumed drilling @ 0959.
<u>145</u> - -	-				Well graded SAND with Gravel (SW); reddish brown (5YR 5/3); dry; dense; 80% very fine to coarse sand; subangular; 20% fine to coarse gravel to 2cm; subangular; no odor.	sw		
150								



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: 6/20/2011 Date TD Reached: 6/22/2011 Date Completed: 6/24/2011

Ground Elevation AMSL (ft): 5325.1 Y Coordinate: 1477303.10 X Coordinate: 1543757.07 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: 470.82 ♥ At End of Drilling: Not Recorded

After Drilling: 470.75

Drilling Contractor: WDC Exploration and Wells 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
	_				Well graded SAND with Gravel (SW); reddish brown (5YR 5/3); dry; dense; 80% very fine to coarse sand; subangular; 20% fine gravel to 2cm; subangular; no odor.	SW		
155	-				Poorly graded SAND (SP); reddish brown (5YR 5/4); dry; dense; 100% very fine to medium sand; trace coarse sand; subrounded; no odor.		•       •       •         •       •       •         •       •       •         •       •       •         •       •       •         •       •       •         •       •       •         •       •       •         •       •       •         •       •       •         •       •       •         •       •       •         •       •       •         •       •       •         •       •       •	Approximate top of Santa Fe Group.
160	-				Same as above (154 ft); no odor.		•     •       •     •	Kelly down @ 1011. New 20' connection @ 1023. Resumed drilling @ 1024.
165	-				Same as above (154 ft); 100% very fine to fine sand; trace medium to coarse sand; subrounded; trace fine gravel to 1cm; subrounded; no odor.	SP	- High Solids Bentonite Grout	
170	-				Same as above (154 ft); no odor.			
175					Same as above (154 ft); no odor.			
180								



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: 6/20/2011 Date TD Reached: 6/22/2011 Date Completed: 6/24/2011

Ground Elevation AMSL (ft): 5325.1 Y Coordinate: 1477303.10 X Coordinate: 1543757.07 Hole Diameter Upper (in.): 11-3/4 Hole Diameter Lower (in.): 9-5/8 Surface Completion Type: Flush mount

▼ After Drilling: 470.75

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

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8 Depth (ft)	Sample Type	Number	Headspace	Lithologic Log	Material Description	U.S.C.S.	Well Diagram	Remarks
	-				Poorly graded SAND (SP); reddish brown (5YR 5/4); dry; dense; 100% very fine to fine sand; trace medium to coarse sand; subrounded; no odor.	SP		Kelly down @ 1032. Total depth with 11-3/4" casing. New 20' connection @ 1425. Resumed drilling with 9-5/8" casing @ 1426.
-	-				Well graded SAND (SW); reddish brown (5YR 5/4); dry; dense; 100% very fine to coarse sand; subrounded; no odor.			
190	-				Same as above (185 ft); slight decrease in medium to coarse sand content; no odor.	SW	•       •       •         •       •       •         •       •       •         •       •       •         •       •       •         •       •       •         •       •       •         •       •       •         •       •       •         •       •       •         •       •       •         •       •       •         •       •       •         •       •       •         •       •       •         •       •       •	
<u>195</u>	-				Poorly graded SAND (SP); reddish brown (5YR 5/4); dry; dense; 100% very fine to fine sand; trace medium to coarse sand; subrounded; trace fine gravel to 0.7cm; subrounded; no odor.		- High Solids Bentonite Grout	
200	-				Same as above (195 ft); 100% very fine sand; trace fine sand; no odor.	SP		Kelly down @ 1438. New 20' connection @ 1444. Resumed drilling @ 1445.
205	-				Sandy lean CLAY (CL); brown (10YR 4/3); dry to moist; stiff; low to medium plasticity; 70% clay; trace silt; 30% very fine to coarse sand; subrounded; no odor. Poorly graded SAND (SP); pinkish gray	CL		
210					(5YR 6/2); dry; dense; 100% very fine to			



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: 6/20/2011 Date TD Reached: 6/22/2011 Date Completed: 6/24/2011

Ground Elevation AMSL (ft): 5325.1 Y Coordinate: 1477303.10 X Coordinate: 1543757.07 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: 470.82 ♥ At End of Drilling: Not Recorded

▼ After Drilling: 470.75

Drilling Contractor: WDC Exploration and Wells 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
215	-				medium sand; trace coarse sand; subrounded; no odor.	SP		
-	-				Well graded SAND with Gravel (SW); reddish brown (5YR 5/3); dry; dense; 85% very fine to coarse sand; subrounded; 15% fine gravel to 1cm; subrounded; no odor.	sw		
220	-				Poorly graded SAND (SP); pinkish gray (5YR 6/2); dry; dense; 100% very fine to fine sand; no odor.	SP		Kelly down @ 1448. New 20' connection @ 1459. Resumed drilling @ 1500.
-	-				Well graded SAND (SW); pinkish gray (5YR 6/2); dry; dense; 100% very fine to coarse sand; subrounded; trace fine gravel to 1.5cm; subrounded; no odor.		- High Solids Bentonite Grout	
230	-				Same as above (225 ft); no gravel; no odor.	SW		
<u>235</u> - -					Same as above (225 ft); 95% very fine to coarse sand; subrounded; 5% fine gravel to 0.8cm; subrounded; no odor.			
240	1			- <b>^ ^ ^ </b>	Poorly graded SAND (SP); pinkish gray	SP		



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Date Started: 6/20/2011 Date TD Reached: 6/22/2011 Date Completed: 6/24/2011

Ground Elevation AMSL (ft): 5325.1 Y Coordinate: 1477303.10 X Coordinate: 1543757.07 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: 470.82 ↓ At End of Drilling: Not Recorded ↓ After Drilling: 470.75

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

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					99	- )		
05 Depth (ft)	Sample Type	Numl	Headspace PID	Lithologic Log	Material Description	U.S.C.S.	Well Diagram	Remarks
-	_				(5YR 6/2); dry; dense; 100% very fine to fine sand; trace medium sand; subrounded; no odor.			Kelly down @ 1509. New 20' connection.
<u>245</u>	-				Poorly graded SAND (SP); pinkish gray (5YR 6/2); dry; dense; 100% very fine to fine sand; trace medium sand; subrounded; no odor.		•       •       •       •         •       •       •       •         •       •       •       •         •       •       •       •         •       •       •       •         •       •       •       •         •       •       •       •         •       •       •       •         •       •       •       •         •       •       •       •         •       •       •       •         •       •       •       •         •       •       •       •         •       •       •       •         •       •       •       •	
250	_				Same as above (245 ft); 100% very fine to fine sand; trace medium to coarse sand; subrounded; no odor.	SP	•       •       •       •         •       •       •       •         •       •       •       •         •       •       •       •         •       •       •       •         •       •       •       •         •       •       •       •         •       •       •       •         •       •       •       •         •       •       •       •         •       •       •       •         •       •       •       •         •       •       •       •         •       •       •       •         •       •       •       •	
255	-				Same as above (245 ft) no odor.		- High Solids Bentonite Grout	
260	-				Lean CLAY (CL); reddish brown (5YR 4/3); dry to moist; stiff; low to medium plasticity; 95% clay; trace silt; 5% very	CL		
265	-				fine sand; trace fine sand; no odor. Poorly graded SAND (SP); reddish brown (5YR 5/4); dry; dense; 100% very fine to medium sand; trace coarse sand; subrounded; no odor. Same as above (261 ft); no odor.	SP		Kelly down @ 1524. New 20' connection @ 1534. Resumed drilling @ 1535.
270	_						•       •       •       •         •       •       •       •         •       •       •       •         •       •       •       •         •       •       •       •         •       •       •       •         •       •       •       •         •       •       •       •         •       •       •       •         •       •       •       •         •       •       •       •         •       •       •       •         •       •       •       •         •       •       •       •         •       •       •       •	



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: 6/20/2011 Date TD Reached: 6/22/2011 Date Completed: 6/24/2011

Ground Elevation AMSL (ft): 5325.1 Y Coordinate: 1477303.10 X Coordinate: 1543757.07 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: 470.82 ♥ At End of Drilling: Not Recorded

After Drilling: 470.75

Drilling Contractor: WDC Exploration and Wells Drilling Method: Air Rotary Casing Hammer Logged By: Brian Lucero Page 10 of 18

05 Depth (ft)	Sample Type	Number	Headspace PID	Lithologic Log	Material Description	U.S.C.S.	Well Diagram	Remarks
275	-				Poorly graded SAND (SP); light reddish brown (5YR 6/3); dry; dense; 100% very fine to fine sand; trace medium to coarse sand; subrounded; no odor. Same as above (270 ft); 95% very fine sand; trace fine sand; 5% silt; no odor.	SP	•       •       •         •       •       •	
280 285	-				Well graded SAND (SW); light reddish brown (5YR 6/3); dry; dense; 100% very fine to coarse sand; subrounded; no odor. Same as above (280 ft); no odor.	SW	- High Solids Bentonite Grout	Kelly down @ 1540. New 20' connection @ 1546. Resumed drilling @ 1547.
<u>290</u>	-				Clayey SAND (SC); reddish brown (5YR 4/3); dry; dense; 70% very fine to coarse sand; subrounded; 10% fine to coarse gravel to 2.2cm; subrounded; 20% clay with silt; no odor. Well graded SAND (SW); reddish brown (5YR 5/3); dry; dense; 100% very fine to coarse sand; subrounded; trace fine	SC		
<u>295</u> 300					gravel to 0.7cm; subrounded; no odor. Same as above (291 ft); no odor.	SW	•       •       •         •       •       •	



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: 6/20/2011 Date TD Reached: 6/22/2011 Date Completed: 6/24/2011

Ground Elevation AMSL (ft): 5325.1 Y Coordinate: 1477303.10 X Coordinate: 1543757.07 Hole Diameter Upper (in.): 11-3/4 Hole Diameter Lower (in.): 9-5/8 Surface Completion Type: Flush mount

▼ After Drilling: 470.75

Drilling Contractor: WDC Exploration and Wells Drilling Method: Air Rotary Casing Hammer Logged By: Brian Lucero Page 11 of 18

60 Depth (ft)	Sample Type	Number	Headspace PID	Lithologic Log		U.S.C.S.	Well Diagram	Remarks
	-				Poorly graded SAND (SP); reddish brown (5YR 5/3); dry; dense; 100% very fine to fine sand; trace medium sand; subrounded; trace fine to coarse gravel to 2cm; subrounded; no odor.			Kelly down @ 1552. New 20' connection @ 1607. Resumed drilling @ 1607.
305	-				Same as above (300 ft); no odor.	SP		
310	-				Same as above (300 ft); 100% very fine to fine sand; trace medium to coarse sand; subrounded; trace fine to coarse gravel to 2.5cm; subrounded; no odor.			
315	-				Well graded SAND (SW); reddish brown (5YR 5/3); dry; dense; 95% very fine to coarse sand; subrounded; 5% fine to coarse gravel to 2cm; subrounded; no odor.		- High Solids Bentonite Grout	
320	-				Same as above (315 ft); no odor.	SW		Kelly down @ 1614. New 20' connection @ 1620. Resumed drilling @ 1621.
325					Poorly graded SAND (SP); light reddish brown (5YR 6/3); dry; dense; 100% very fine to medium sand; trace coarse sand; subrounded; trace fine to coarse gravel to 2.5cm; subrounded; no odor.	SP		
330								



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: 6/20/2011 Date TD Reached: 6/22/2011 Date Completed: 6/24/2011

Ground Elevation AMSL (ft): 5325.1 Y Coordinate: 1477303.10 X Coordinate: 1543757.07 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: 470.82 ↓ At End of Drilling: Not Recorded

▼ After Drilling: 470.75

Drilling Contractor: WDC Exploration and Wells Drilling Method: Air Rotary Casing Hammer Logged By: Brian Lucero Page 12 of 18

					55	,		
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); dry dense; 100% very fine to fine sand; no odor.			
335	-				Same as above (330 ft); no odor.		•       •       •         •       •       •         •       •       •         •       •       •         •       •       •         •       •       •         •       •       •         •       •       •         •       •       •         •       •       •         •       •       •         •       •       •         •       •       •         •       •       •         •       •       •         •       •       •	
340	-				Same as above (330 ft); 100% very fine to medium sand; trace coarse sand; subrounded; no odor.	SP	•       •       •       •         •       •       •       •         •       •       •       •         •       •       •       •         •       •       •       •         •       •       •       •         •       •       •       •         •       •       •       •         •       •       •       •         •       •       •       •         •       •       •       •         •       •       •       •         •       •       •       •         •       •       •       •         •       •       •       •         •       •       •       •         •       •       •       •	Kelly down @ 1629. New 20' connection @ 1638. Resumed drilling @ 1639.
<u>345</u>	-				Same as above (330 ft); 100% very fine to medium sand; trace coarse sand; subrounded; trace fine to coarse gravel to 2cm; subrounded; no odor.		- High Solids Bentonite Grout	
350	-				Well graded SAND (SW); pinkish gray (5YR 6/2); dry; dense; 100% very fine to coarse sand; subrounded; no odor.			
355					Same as above (350 ft); 100% very fine to coarse sand; trace fine gravel to 1.5cm; subrounded; no odor.	sw		
360								

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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: 6/20/2011 Date TD Reached: 6/22/2011 Date Completed: 6/24/2011

Ground Elevation AMSL (ft): 5325.1 Y Coordinate: 1477303.10 X Coordinate: 1543757.07 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: 470.82 ♥ At End of Drilling: Not Recorded

After Drilling: 470.75

Drilling Contractor: WDC Exploration and Wells Drilling Method: Air Rotary Casing Hammer Logged By: Brian Lucero Page 13 of 18

90 Depth (ft)	Sample Type	Number	Headspace PID	Lithologic Log	Material Description	U.S.C.S.	Well Diagram	Remarks
-	-				Well graded SAND (SW); reddish brown (5YR 5/3); dry; dense; 95% very fine to coarse sand; subrounded; 5% fine gravel to 0.8cm; subrounded; no odor.	SW		Kelly down @ 1647. New 20' connection @ 1652. Resumed drilling @ 1652.
<u>365</u> - - 370	-				Poorly graded SAND (SP); reddish brown (5YR 5/3); dry; dense; 100% very fine to fine sand; trace fine to coarse gravel to 2.5cm; subrounded; no odor.	SP		
-	-				Well graded SAND (SW); reddish brown (5YR 5/3); dry; dense; 100% very fine to coarse sand; subrounded; trace fine gravel to 0.5cm; subrounded; no odor.			
375	-				Same as above (370 ft); no odor.		<ul> <li>High Solids</li> <li>Bentonite</li> <li>Grout</li> </ul>	
<u>380</u> - -	-				Same as above (370 ft); no odor.	SW	•     •       •     •	Kelly down @ 1659. New 20' connection @ 1705. End of 6/21/11. Resumed drilling @ 0928 on 6/22/11.
385	-				Same as above (370 ft); 100% very fine to coarse sand; subrounded; no gravel; no odor.		•       •       •         •       •       •         •       •       •         •       •       •         •       •       •         •       •       •         •       •       •         •       •       •         •       •       •         •       •       •         •       •       •         •       •       •         •       •       •         •       •       •         •       •       •         •       •       •	
390							• • • •	



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: 6/20/2011 Date TD Reached: 6/22/2011 Date Completed: 6/24/2011

Ground Elevation AMSL (ft): 5325.1 Y Coordinate: 1477303.10 X Coordinate: 1543757.07 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: 470.82 ↓ At End of Drilling: Not Recorded

▼ After Drilling: 470.75

Drilling Contractor: WDC Exploration and Wells Drilling Method: Air Rotary Casing Hammer Logged By: Brian Lucero Page 14 of 18

66 Depth (ft)	Sample Type	Numl	Headspace PID	Lithologic Log		U.S.C.S.	Well Diagram	Remarks
-	-				Well graded SAND (SW); reddish brown (5YR 5/3); dry; dense; 100% very fine to coarse sand; subrounded; no odor.			
395 	-				Same as above (390 ft); slight decrease in medium to coarse sand; no odor.			
400 	-				Same as above (390 ft); 100% very fine to coarse sand; subrounded; trace fine gravel to 1cm; subrounded; no odor.	SW	•       •       •       •         •       •       •       •         •       •       •       •         •       •       •       •         •       •       •       •         •       •       •       •         •       •       •       •         •       •       •       •         •       •       •       •         •       •       •       •         •       •       •       •         •       •       •       •         •       •       •       •         •       •       •       •         •       •       •       •         •       •       •       •         •       •       •       •	Kelly down @ 0938. New 20' connection @ 0947. Resumed drilling @ 0948.
405	-				Same as above (390 ft); no gravel; no odor.		- High Solids Bentonite Grout	
410	-				Lean CLAY (CL); dark reddish brown (5YR 3/3); moist; stiff; low to medium plasticity; 95% clay; trace silt; 5% very fine sand; trace fine sand; no odor.	CL		
415 	-				Same as above (409 ft); reddish brown (5YR 4/3); no odor.			
-	-				SILT (ML); reddish brown (5YR 5/4); dry to moist; stiff; 90% silt; 10% very fine sand; trace fine sand; no odor.	ML		
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: 6/20/2011 Date TD Reached: 6/22/2011 Date Completed: 6/24/2011

Ground Elevation AMSL (ft): 5325.1 Y Coordinate: 1477303.10 X Coordinate: 1543757.07

# Borehole ID: KAFB-106055

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: 470.82 ↓ At End of Drilling: Not Recorded

After Drilling: 470.75

Drilling Contractor: WDC Exploration and Wells Drilling Method: Air Rotary Casing Hammer Logged By: Brian Lucero Page 15 of 18

					Loggod	<u> </u>		_
5 Depth (ft)	Sample Type	Numk	Headspace PID	Lithologic Log	Material Description	U.S.C.S.	Well Diagram	Remarks
425	-				Poorly graded SAND (SP); reddish brown (5YR 5/3); dry; dense; 100% very fine to fine sand; trace medium to coarse sand; subrounded; no odor.		- High Solids Bentonite Grout	Kelly down @ 0958. New 20' connection @ 1003. Resumed drilling @ 1004.
	-				Same as above (420 ft); no odor.	SP	- Top of Bentonite Seal	
<u>430</u>	-				Well graded SAND (SW); reddish brown (5YR 5/3); dry; dense; 100% very fine to coarse sand; subrounded; trace fine gravel to 0.5cm; subrounded; no odor.			
<u>435</u>	-				Same as above (430 ft); slight decrease in medium to coarse sand content; no odor.	SW		
440	-				Poorly graded SAND (SP); reddish gray (5YR 5/2); dry; dense; 100% medium sand; trace fine and coarse sand; subangular to subrounded; no odor.			Kelly down @ 1016. New 20' connection @ 1021. Resumed drilling @ 1042.
445	-				Same as above (440 ft); no odor.	SP		Driller added water to control dust and aid rate of penetration. Note: added water may remove fine grained fraction from samples.
450	1							

CI	
Sn	aw

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: 6/20/2011 Date TD Reached: 6/22/2011 Date Completed: 6/24/2011

Ground Elevation AMSL (ft): 5325.1 Y Coordinate: 1477303.10 X Coordinate: 1543757.07 Hole Diameter Upper (in.): 11-3/4 Hole Diameter Lower (in.): 9-5/8 Surface Completion Type: Flush mount

▼ After Drilling: 470.75

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

						-		
5 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; dense; 100% medium sand; trace fine sand; subangular to subrounded; no odor.		- Top of 5" Schedule 80 PVC Riser	
455	-				Same as above (450 ft); 95% medium to coarse sand; trace fine sand; subangular to subrounded; 5% fine gravel to 1.2cm; subangular to subrounded; no odor.	SP	- Bentonite Seal	
<u>460</u>	-				Well graded SAND (SW); reddish brown (5YR 5/3); dry; dense; 90% very fine to coarse sand; subrounded; 10% fine to coarse gravel to 2cm; subrounded; no odor.	SW	- Top of 20/40 Sand - Top of 10/20 Sand	Kelly down @ 1056. New 20' connection @ 1104. Resumed drilling @ 1105.
465	-				Poorly graded SAND (SP); reddish brown (5YR 5/3); dry; dense; 100% very fine to fine sand; trace medium sand; subrounded; no odor.		- Top of 5" Schedule 80 PVC 0.010" Slot Screen	
470 - - -	-				■Same as above (464 ft); 100% very fine to fine sand; no odor.	SP		Encountered groundwater while drilling.
475	-				Same as above (464 ft); no odor.			
480								

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S	L					Bore	ehol	e ID: KAFB-	106055
Pro Pro	ojec ojec	t Loca Nam	ation: ne: K	: Káf (AFB I	s of Engineers FB, Albuquerque, NM BFF SWMU ST-106 and SS-111	Hole Dia	ameter	Upper (in.): 11-3/4 Lower (in.): 9-5/8 letion Type: Flush mo	punt
Da Da	te S te T	Starteo	d: 6/2 ache	1407 20/20 <i>1</i> d: 6/2 6/24	11 22/2011	∑ AtT T AtE	ime of nd of l	evels BGS (ft): Drilling: 470.82 Drilling: Not Recorded	1
YO	Coo	rdinate	e: 14	n AMS 47730 54375		Drilling Drilling N	Contra Aethoo	ictor: WDC Exploration 1: Air Rotary Casing F rian Lucero	on and Wells lammer Page 17 of 18
8 Depth (ft)	Sample Type	Number	Headspace PID	Lithologic Log	Material Description		U.S.C.S.	Well Diagram	Remarks
400	-				Well graded SAND (SW); reddis (5YR 5/3); moist; dense; 100% v to coarse sand; subrounded; trad gravel to 0.7cm; subrounded; no	very fine ce fine			Kelly down @ 1117. New 20' connection @ 1242. Resumed drilling @ 1245.
485	-				Same as above (480 ft); 95% ve coarse sand; subrounded; 5% fi coarse gravel to 2cm; subrounde odor.	ne to		- Bottom of Screen - Sump	
490	-				Well graded SAND with Gravel ( reddish gray (5YR 5/3); wet; den fine to coarse sand; subrounded fine to coarse gravel to 2cm; subrounded; no odor.	se; 80%	SW	- Bottom of Sump	
495	-				Same as above (490 ft); 85% fin coarse sand; subrounded; 15% f gravel to 1.2cm; subrounded; no	fine		- Bottom of Filter Pack	
500	-							1656659	Total depth = 500 ft. Reached @ 1305 on 6/22/11.
505	-								Water added during drilling (gallons) = 150
	-								Water added after drilling (gallons) = 150
510									Water added during



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: 6/20/2011 Date TD Reached: 6/22/2011 Date Completed: 6/24/2011

Ground Elevation AMSL (ft): 5325.1 Y Coordinate: 1477303.10 X Coordinate: 1543757.07 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: 470.82 ♥ At End of Drilling: Not Recorded

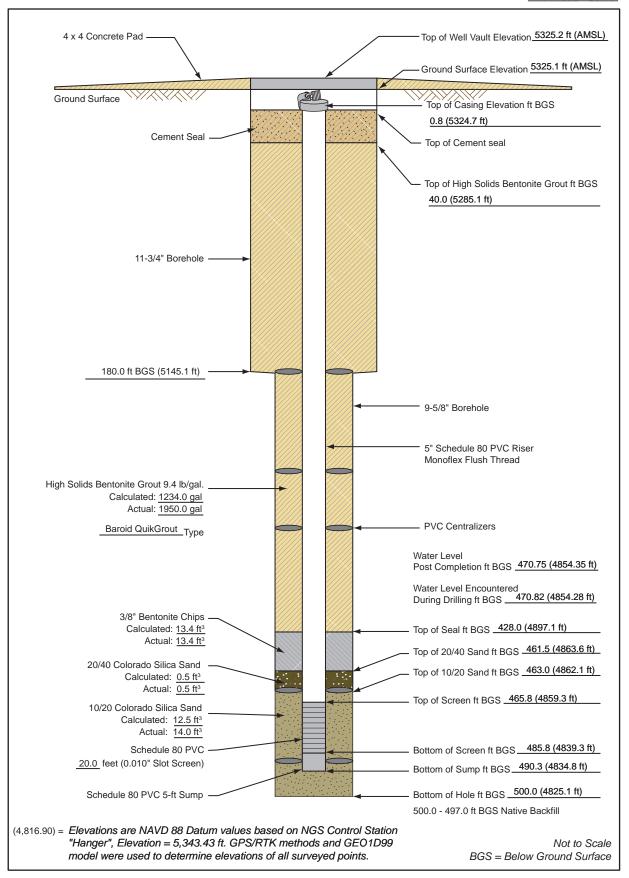
▼ After Drilling: 470.75

Drilling Contractor: WDC Exploration and Wells Drilling Method: Air Rotary Casing Hammer Logged By: Brian Lucero Page 18 of 18

5 Depth (ft)	Sample Type	Number	Headspace PID	Lithologic Log	Material Description	U.S.C.S.	Well Diagram	Remarks
								construction (gallons) = 40
								Spud: started drilling from surface.
515								Kelly down: TD the joint and ready to make new connection.
								connection.
520	-							
	-							
525	-							
525	-							
530								
535								
540								

#### Monitoring Well Completion Diagram KAFB-106055

Installation Start Date/Time: <u>6/22/2011 @ 15:15</u> Installation End Date/Time: <u>6/24/2011 @ 15:00</u>





Pg1of2

#### Well Development Record

Project Nan	ne: KAFB BFI	-									
Location: G	W-10					Well/Piez.	No.: 106055				
Personnel:	V. Bracht				Date Installed: 6/24/11						
Date:         8/8/11         Csg. Diameter (I.D.):         5"											
Samplers:	V. Bracht				Total Depth (ft. BGL): 490.26						
Method of E X Surging	Development		X Bailing			X Pumping					
X Original Develop	pment		Redevelopment			Other					
Developme	nt Date: 8/8/	11 - 8/9/11				_					
Depth to Wa	ater Before D	eveloping V	Vell (ft. BGL)	: 471.45, 47	0.91 (TOC)		_				
				Vol. (V)	Purge F	actor	Volume to Purge				
Height of W	ater Column	: 18.81	feet =	345.45	gal. * 1	= 3	45.45				
	V=(B * r <sub>c</sub> <sup>2</sup> * L	. <sub>c</sub> * 7.48)+(B	* (r <sub>w</sub> <sup>2</sup> - r <sub>c</sub> <sup>2</sup> ) * I	L <sub>s</sub> * Ø <sub>s</sub> * 7.48	s)+(H <sub>2</sub> O adde	d during d	rilling/installation	) = <u>345.45</u> gallons			
Depth Purg	ing From: 47	9.2 feet			Time Purgir	ng Begins:	0820, 8/9/11				
Weather: S	unny, Breezy	Warm			Screened In	terval (ft B	<b>GL)</b> : <u>465.82 - 484</u>	.82			
Equipment	Nos.: p	H Meter:	YSI 36952		EC Meter	: <u>YSI 36</u>	952	Turbidity Meter:	LVE 002384		
Equipment	Decontamina	ated Prior to	Developme	nt: Y <u>X</u>	N						
Describe: S	Steam Cleane	d									
Collected S Describe: <u>N</u>	ample of Wa	ter Added to	Well: Y	N X							
Comment:	300 gallons o	f water adde	d during drillir	ng/well install	ation activitie	S					
		Water Level (ft. Below	Volume Removed				Turbidity				

Time 1210 1220 1225	<b>TOC)</b> 470.91 	<b>(gal.)</b> 10 50	Temp.°C 21.65	<b>рН</b> 5.65	EC (ms/cm) 0.451		Comments Begin Bailing; Water is Brown
1220				5.65	0.451	756.00	Begin Bailing; Water is Brown
		50					
1225							Bailed
1225							Begin Swabbing
1235							Stop Swabbing; Begin Bailing
1255		100					Bailed
0820	470.97						Begin Pumping at 5 GPM
0825	471.88		18.93	5.41	0.426	235.00	Continue Pumping; Cloudy
0830	471.93	125	20.18	5.33	0.415	72.60	Continue Pumping; Cloudy
0835	471.96	150	20.44	5.21	0.417	23.30	Continue Pumping; Slightly Cloudy
0840	471.97	175	20.54	5.31	0.420	7.47	Continue Pumping; Clear
	1255 0820 0825 0830 0835	1255            0820         470.97           0825         471.88           0830         471.93           0835         471.96	1255          100           0820         470.97            0825         471.88            0830         471.93         125           0835         471.96         150	1255          100            0820         470.97             0825         471.88          18.93           0830         471.93         125         20.18           0835         471.96         150         20.44	1255          100             0820         470.97              0825         471.88          18.93         5.41           0830         471.93         125         20.18         5.33           0835         471.96         150         20.44         5.21	1255          100              0820         470.97                0825         471.88          18.93         5.41         0.426           0830         471.93         125         20.18         5.33         0.415           0835         471.96         150         20.44         5.21         0.417	1255          100                                 0820         470.97               0825         471.88          18.93         5.41         0.426         235.00         0830         0830         471.93         125         20.18         5.33         0.415         72.60         0835         471.96         150         20.44         5.21         0.417         23.30         23.30

Notes:

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 # GPM = Gallons Per Minute

Where: B=3.14  $O_{s=}$  portosity of the sand pack  $r_{e}$  radius of the well casing and screen in feet  $L_{e}$  length of water column inside the casing and screen in feet  $r_{w}$  radius of the well bore in feet  $L_{e}$  length of saturated portion of the sand pack in feet 2.49 cellucacy while fact - computing from which fact the celluca

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



### Well Development Record

Project: KAFB BFF

Project Number: 140705

Date: 8/9/11

Time Start: 1210, 8/8/11

Well No: 106055

Samplers: V. Bracht

Checked By: \_\_\_\_\_

Time Finish: 0915, 8/9/11

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
8/9/2011	0845	471.98	200	20.54	5.45	0.420	3.78	Continue Pumping; Clear
8/9/2011	0850	471.99	225	20.57	5.48	0.420	2.90	Continue Pumping; Clear
8/9/2011	0855	472.00	250	20.54	5.54	0.421	2.20	Continue Pumping; Clear
8/9/2011	0900	472.01	275	20.59	5.56	0.421	1.97	Continue Pumping; Clear
8/9/2011	0905	472.02	300	20.59	5.57	0.421	1.93	Continue Pumping; Clear
8/9/2011	0910	472.02	325	20.60	5.54	0.420	1.64	Continue Pumping; Clear
8/9/2011	0915	472.02	350	20.63	5.60	0.420	1.21	Stop Pumping; Clear; Total Removed

Was well sampled after development? YES NO X

\_\_\_\_\_

Sample Method: N/A

Sample Name: N/A

Analyses: N/A

# KAFB 106057

	Sha					Bore	eho	le ID	: KAFB-′	106057
P P	rojeo rojeo	ct Loc	ation: ne: K	KÁ 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				
D	ate S ate T	Starteo TD Re	d: 6/ <sup>,</sup> ache	15/20 d: 6/		🗴 At E	ime of	Drilling	: 471.80 Not Recorded	
Y	Coc	nd Elev ordinat ordinat	e: 14	17730			<b>Nethoo</b>	d: Air R	/DC Exploration otary Casing H ero	
Denth (ft)	Sample Type	Number	Headspace PID	Lithologic Log	Material Description		U.S.C.S.	We	ell Diagram	Remarks
	-				Asphalt and fill; no description re Silty SAND (SM); reddish brown 5/3); dry; medium dense; 75% v to medium sand; trace coarse sa subangular; 25% silt; trace clay;	(5YR ery fine and;				Hand augered. ***Note: no headspace requirement at this location.***
	5				Same as above (0.5 ft); reddish (5YR 4/3); 70% very fine to fine trace medium to coarse sand; 30 with minor clay; no odor.	sand;	SM			Spud @ 1437 on 6/15/11.
1	0				Same as above (0.5 ft); no odor					
1	5				Lean CLAY with Sand (CL); redo brown (5YR 4/3); dry to moist; st to medium plasticity; 75% clay a nodules; 25% very fine to coarse subangular; no odor.	tiff; low s			- Cement Seal	Brief discharge of gravel; gravel is predominantly limestone.
2	- 0 - - -				Same as above (13 ft); dark red brown (5YR 3/3); low plasticity; 8 with minor silt; 15% very fine to sand; no odor.	35% clay	CL			Kelly down @ 1456. New 20' connection @ 1533. Resumed drilling @1534.
2	5				Same as above (13 ft); no odor.					
3					Silty SAND (SM); dark reddish b (5YR 3/3); dry; dense; 80% very fine sand; trace medium to coars subangular; 20% silt; trace clay; Note: thin gravel lenses.	fine to se sand;	SM			

	$\wedge$
Sh	aw

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: 6/15/2011 Date TD Reached: 6/17/2011 Date Completed: 6/19/2011

Ground Elevation AMSL (ft): 5325.5 Y Coordinate: 1477302.04 X Coordinate: 1543786.27 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: 471.80 ▼ At End of Drilling: Not Recorded

After Drilling: 470.61

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

Sample Type Headspace PID Lithologic Log Depth (ft) Number *i* Ö Material Description Remarks Well Diagram ю. ⊃. 30 Silty SAND (SM); dark reddish brown (5YR 3/3); dry; dense; 80% very fine to fine sand; trace medium to coarse sand; Cement Seal subangular; 20% silt; trace clay; no odor. Top of High Solids 35 . . . . . . . SM Bentonite Silty SAND (SM); reddish brown (5YR Grout 4/3); dry; dense; 80% very fine to fine sand; trace medium to coarse sand; subangular; 20% silt; trace clay; no odor. • • • • • • 40 Well graded SAND (SW); reddish brown Kelly down @ 1555. New 20' connection @ 1607. (5YR 5/3); dry; dense; 95% very fine to • SW coarse sand; subangular; 5% silt; no Resumed drilling @1610. odor. • SILT with Sand (ML); reddish brown • (5YR 4/4); dry; stiff; 85% silt; trace clay; 15% very fine to fine sand; trace medium 45 • sand; subangular; no odor. ML • • • • • • Well graded SAND (SW); reddish brown 50 (5YR 4/3); dry; dense; 100% very fine to coarse sand; subangular; no odor. • SW • • • • • SILT (ML); reddish brown (5YR 5/4); dry; stiff; 90% silt; trace clay; 10% very fine • 55 sand; trace fine to medium sand; subangular; no odor. • • • • ML ٠ • • • • • 60

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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: 6/15/2011 Date TD Reached: 6/17/2011 Date Completed: 6/19/2011

Ground Elevation AMSL (ft): 5325.5 Y Coordinate: 1477302.04 X Coordinate: 1543786.27 Hole Diameter Upper (in.): 11-3/4 Hole Diameter Lower (in.): 9-5/8 Surface Completion Type: Flush mount

TAfter Drilling: 470.61

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

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	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; dense; 80% very fine to fine sand; trace medium to coarse sand; subangular; 20% silt; trace clay; no odor.			Kelly down @ 1633. New 20' connection @ 1637. Resumed drilling @1638.
<u>65</u> - -	-				Same as above (60 ft); 70% very fine to fine sand; 30% silt; no odor.	SM		
	-				Same as above (60 ft); 80% very fine to coarse sand; subangular; 20% silt with minor clay; no odor.			
-	-				SILT with Sand (ML); reddish brown (5YR 4/4); dry; stiff; 85% silt; trace clay; 15% very fine sand; trace fine to medium sand; subangular; no odor.	ML	- High Solids Bentonite Grout	
80	-				Poorly graded SAND (SP); reddish brown (5YR 4/4); dry; dense; 95% very fine to medium sand; trace coarse sand; subangular; 5% silt; no odor.	SP		Kelly down @ 1657. New 20' connection @ 1701. End of 6/15/11. Resumed drilling @ 0852 on 6/16/11.
85 - - - - 90					Well graded SAND (SW); reddish brown (5YR 4/4); dry; dense; 95% very fine to coarse sand; subangular to subrounded; 5% silt; no odor.	SW		



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: 6/15/2011 Date TD Reached: 6/17/2011 Date Completed: 6/19/2011

Ground Elevation AMSL (ft): 5325.5 Y Coordinate: 1477302.04 X Coordinate: 1543786.27 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: 471.80 ♥ At End of Drilling: Not Recorded

▼ After Drilling: 470.61

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

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				55			
ଞ Depth (ft)	Sample Type	Headspace PID	Lithologic Log		U.S.C.S.	Well Diagram	Remarks
-	-			Well graded SAND (SW); reddish brown (5YR 4/4); dry; dense; 95% very fine to coarse sand; subangular to subrounded; trace fine gravel to 0.5cm; subangular to subrounded; 5% silt; no odor.	SW		
95	-			Poorly graded SAND (SP); pinkish gray (5YR 6/2); dry; dense; 95% medium to coarse sand; trace very fine to fine sand; subangular to subrounded; 5% fine gravel to 1.2cm; subangular to subrounded; no odor.	SP	•       •       •         •       •       •         •       •       •         •       •       •         •       •       •         •       •       •         •       •       •         •       •       •         •       •       •         •       •       •         •       •       •         •       •       •         •       •       •         •       •       •         •       •       •         •       •       •	
<u>100</u> -	_			Clayey SAND (SC); yellowish red (5YR 4/6); dry to moist; dense; 80% very fine to coarse sand; subangular to subrounded; trace fine gravel to 1.5cm;	SC		Kelly down @ 0900. New 20' connection @ 0912. Resumed drilling @ 0913.
<u>105</u>	-			subrounded; 20% clay with minor silt; no odor. SILT (ML); yellowish red (5YR 4/6); dry to moist; stiff; 90% silt; trace clay; 10% very fine to medium sand; trace coarse sand; subangular; no odor.		- High Solids Bentonite Grout	
<u>110</u>	-			SILT with Sand (ML); yellowish red (5YR 4/6); dry to moist; stiff; 85% silt; trace clay; 15% very fine to medium sand; trace coarse sand; subangular; no odor.	ML		
<u>115</u>				Same as above (110 ft); no odor.			
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: 6/15/2011 Date TD Reached: 6/17/2011 Date Completed: 6/19/2011

Ground Elevation AMSL (ft): 5325.5 Y Coordinate: 1477302.04 X Coordinate: 1543786.27 Hole Diameter Upper (in.): 11-3/4 Hole Diameter Lower (in.): 9-5/8 Surface Completion Type: Flush mount

After Drilling: 470.61

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

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					E09900	<u> </u>		
05 Depth (ft)	Sample Type	Number	Headspace PID	Lithologic	Material Description	U.S.C.S.	Well Diagram	Remarks
	-				SILT with Sand (ML); yellowish red (5YR 4/6); dry to moist; stiff; 85% silt; trace clay; 15% very fine to medium sand; trace coarse sand; subangular; no odor. SILT (ML); yellowish red (5YR 4/6); dry to moist; stiff; 90% silt; trace clay; 10% very fine to fine sand; trace medium to coarse sand; subangular; no odor.			Kelly down @ 0918. New 20' connection @ 0941. Resumed drilling @ 0942.
<u>130</u> -	-				Same as above (125 ft); 95% silt with minor clay; 5% very fine to fine sand; trace medium sand; subangular; no odor.	ML		
135	-				Same as above (125 ft); no odor.		- High Solids Bentonite Grout	
140					Same as above (125 ft); no odor. Clayey SAND (SC); dark reddish brown (5YR 3/3); dry to moist; dense; 70% very fine to fine sand: trace medium sand;	sc		Kelly down @ 0950. New 20' connection @ 0958. Resumed drilling @ 0959.
145 -					subangular; 30% clay with minor silt; no odor. Poorly graded SAND with Silt (SP-SM); reddish brown (5YR 4/3); dry; dense; 90% very fine to fine sand; trace medium sand; subangular; 10% silt; no odor.	SP- SM		
150	-				Poorly graded SAND (SP); light reddish brown (5YR 6/3); dry; dense; 100% very fine to fine sand; trace medium;	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: 6/15/2011 Date TD Reached: 6/17/2011 Date Completed: 6/19/2011

Ground Elevation AMSL (ft): 5325.5 Y Coordinate: 1477302.04 X Coordinate: 1543786.27 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: 471.80 ↓ At End of Drilling: Not Recorded ↓ After Drilling: 470.61

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

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					209904	,		
10 Depth (ft)	Sample Type	Number	Headspace PID	Lithologic Log		U.S.C.S.	Well Diagram	Remarks
<u>155</u> <u>160</u>					subrounded; no odor. Poorly graded SAND (SP); light reddish brown (5YR 6/3); dry; dense; 100% very fine to fine sand; trace medium sand; subrounded; no odor. Same as above (155 ft); trace medium to coarse sand; subrounded; no odor.			Approximate top of Santa Fe Group. Kelly down @ 1007. New 20' connection @ 1013. Resumed drilling @ 1017.
170	_				Same as above (155 ft); no odor. Same as above (155 ft); no odor.	SP	- High Solids Bentonite Grout	
175	-				Same as above (155 ft); no odor.		•       •       •       •         •       <	



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Date Started: 6/15/2011 Date TD Reached: 6/17/2011 Date Completed: 6/19/2011

Ground Elevation AMSL (ft): 5325.5 Y Coordinate: 1477302.04 X Coordinate: 1543786.27 Hole Diameter Upper (in.): 11-3/4 Hole Diameter Lower (in.): 9-5/8 Surface Completion Type: Flush mount

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

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Sample Type Headspace PID Lithologic Log Depth (ft) Number Ś Ö Material Description Remarks Well Diagram ю. ⊃. 180 Poorly graded SAND (SP); light reddish Total depth with 11-3/4" . brown (5YR 6/3); dry; dense; 100% very casing @ 1032. New 20' • fine to fine sand; trace medium to coarse • • • • connection @ 1349. • Resumed drilling with sand; subrounded; no odor. • 9-5/8" casing @ 1350. • • 185 Same as above (180 ft); 100% medium • to coarse sand; trace very fine to fine sand; subrounded; no odor. • SP • 190 Same as above (180 ft); no odor. • . . . . . . . . . . . 195 High Solids Well graded SAND (SW); light reddish Bentonite • brown (5YR 6/3); dry; dense; 100% very Grout fine to coarse sand; subrounded; no odor. SW . ٠ • 200 Poorly graded SAND (SP); pinkish gray Kelly down @ 1400. New ••••• . (5YR 6/2); dry; dense; 100% very fine to 20' connection @ 1409. fine sand; trace medium to coarse sand; Resumed drilling @ subrounded; no odor. 1410. • ....... 205 SP Same as above (200 ft); 100% very fine sand; trace fine sand; no odor. • • • . 210



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Date Started: 6/15/2011 Date TD Reached: 6/17/2011 Date Completed: 6/19/2011

Ground Elevation AMSL (ft): 5325.5 Y Coordinate: 1477302.04 X Coordinate: 1543786.27 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: 471.80 ♥ At End of Drilling: Not Recorded

 $\mathbf{V}$  After Drilling: 470.61

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

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					55	<u> </u>		
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); light reddish brown (5YR 6/3); dry; dense; 80% very fine to fine sand; 20% fine gravel to 1cm; subrounded; no odor.	SP		
<u>215</u>	-				Clayey SAND with Gravel (SC); reddish brown (5YR 4/3); dry to moist; dense; 70% very fine to coarse sand; subrounded; 15% fine gravel to 1.5cm; subrounded; 15% clay with minor silt; no odor.	SC		
<u>220</u>					Well graded SAND (SW); reddish brown (5YR 5/3); dry; dense; 95% very fine to coarse sand; subrounded; 5% clay with silt; no odor.			Kelly down @ 1422. New 20' connection @ 1428. Resumed drilling @ 1429.
<u>225</u>	-				Same as above (217 ft); 100% sand; trace fine gravel to 1.2cm; subrounded; no odor.	SW	- High Solids Bentonite Grout	
230	-				Same as above (217 ft); no odor.		•       •       •         •       •       •         •       •       •         •       •       •         •       •       •         •       •       •         •       •       •         •       •       •         •       •       •         •       •       •         •       •       •         •       •       •         •       •       •         •       •       •         •       •       •	
235	-				Same as above (217 ft); no odor.			
240	1							



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Date Started: 6/15/2011 Date TD Reached: 6/17/2011 Date Completed: 6/19/2011

Ground Elevation AMSL (ft): 5325.5 Y Coordinate: 1477302.04 X Coordinate: 1543786.27 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: 471.80 ♥ At End of Drilling: Not Recorded

After Drilling: 470.61

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

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					209900	<u> </u>		
5 Depth (ft)	Sample Type	Number	Headspace PID	Lithologic Log	Material Description	U.S.C.S.	Well Diagram	Remarks
	-				Well graded SAND (SW); light reddish brown (5YR 6/3); dry; dense; 95% very fine to coarse sand; subrounded; 5% fine gravel to 0.5cm; subrounded; no odor.	SW		Kelly down @ 1434. New 20' connection @ 1441. Resumed drilling @ 1442.
245	-				Poorly graded SAND (SP); light reddish brown (5YR 6/3); dry; dense; 100% very fine to fine sand; trace medium sand; subrounded; trace coarse gravel to 2.5cm; subrounded; no odor.	SP	•     •     •       •     •     •       •     •     •       •     •     •       •     •     •       •     •     •       •     •     •       •     •     •       •     •     •       •     •     •       •     •     •       •     •     •       •     •     •       •     •     •       •     •     •       •     •     •       •     •     •       •     •     •       •     •     •	
<u>250</u> 255	-				Well graded SAND (SW); light reddish brown (5YR 6/3); dry; dense; 100% very fine to coarse sand; subrounded; trace coarse gravel to 3cm; subrounded; no odor. Same as above (250 ft); no odor.	sw	- High Solids	
<u>260</u>	-				Poorly graded SAND (SP); pinkish gray (5YR 5/2); dry; dense; 100% very fine to fine sand; no odor.		Bentonite Grout	Kelly down @ 1446. New 20' connection @ 1452.
<u>265</u>	-				Same as above (258 ft); 95% very fine sand; trace fine sand; 5% silt; 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         0       0       0         0       0       0	Resumed drilling @ 1456.
270	-						•     •     •       •     •     •       •     •     •       •     •     •       •     •     •       •     •     •	



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Date Started: 6/15/2011 Date TD Reached: 6/17/2011 Date Completed: 6/19/2011

Ground Elevation AMSL (ft): 5325.5 Y Coordinate: 1477302.04 X Coordinate: 1543786.27 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: 471.80 ♥ At End of Drilling: Not Recorded

▼ After Drilling: 470.61

Drilling Contractor: WDC Exploration and Wells Drilling Method: Air Rotary Casing Hammer Logged By: Brian Lucero Page 10 of 18

					88			
02 Depth (ft)	Sample Type	Number	Headspace PID	Lithologic Log	Material Description	U.S.C.S.	Well Diagram	Remarks
275	_				Poorly graded SAND (SP); pinkish gray (5YR 5/2); dry; dense; 100% very fine to fine sand; no odor. Same as above (270 ft); 100% very fine sand; trace fine sand; no odor.	SP		
280	-				Lean CLAY (CL); reddish brown (5YR 4/3); moist; stiff; low to medium plasticity; 95% clay; trace silt; 5% very fine sand; no odor.	CL		Kelly down @ 1505. New
285					SILT (ML); light reddish brown (5YR 6/3); dry; stiff; 95% silt; 5% very fine to fine sand; trace medium sand; subrounded; no odor. Same as above (281 ft); no odor.	ML	- High Solids Bentonite Grout	20' connection @ 1512. Resumed drilling @ 1513.
<u>290</u>	-				Same as above (281 ft); no odor.			
<u>295</u>					Clayey GRAVEL (GC); dark reddish brown (5YR 3/3); dry to moist; dense; 70% fine to coarse gravel to 2cm; subrounded; 10% very fine to coarse sand; subangular; 20% clay with minor silt; no odor.	GC		
300	-			ØVX2	Poorly graded SAND (SP); pinkish gray (5YR 6/2); dry; dense; 100% very fine to medium sand; trace coarse sand;	SP		



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Date Started: 6/15/2011 Date TD Reached: 6/17/2011 Date Completed: 6/19/2011

Ground Elevation AMSL (ft): 5325.5 Y Coordinate: 1477302.04 X Coordinate: 1543786.27 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: 471.80 ↓ At End of Drilling: Not Recorded ↓ After Drilling: 470.61

Drilling Contractor: WDC Exploration and Wells Drilling Method: Air Rotary Casing Hammer Logged By: Brian Lucero Page 11 of 18

			-		99	,		
00 Depth (ft)	Sample Type	Number	Headspace PID	Lithologic Log		U.S.C.S.	Well Diagram	Remarks
<u>305</u> <u>310</u> 315	-				subrounded; no odor. Poorly graded SAND (SP); pinkish gray (5YR 6/2); dry; dense; 100% very fine to medium sand; trace coarse sand; subrounded; no odor. Same as above (305 ft); no odor.	SP		Kelly down @ 1530. New 20' connection @ 1535. Resumed drilling @ 1536.
320	-				Same as above (305 ft); no odor. Well graded SAND (SW); dark reddish brown (5YR 3/3); dry to moist; dense; 95% very fine to coarse sand; subrounded; trace fine to coarse gravel to 2cm; subrounded; 5% clay; trace silt; no odor. Note: clay and silt coating on gravel. Same as above (317 ft); 100% very fine to coarse sand; subrounded; trace fine to coarse gravel to 2.5cm; subrounded; no odor.	SW	- High Solids Bentonite Grout	Kelly down @ 1544. New 20' connection @ 1552. Resumed drilling @ 1554.



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Ground Elevation AMSL (ft): 5325.5 Y Coordinate: 1477302.04 X Coordinate: 1543786.27 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: 471.80 ↓ At End of Drilling: Not Recorded

▼ After Drilling: 470.61

Drilling Contractor: WDC Exploration and Wells Drilling Method: Air Rotary Casing Hammer Logged By: Brian Lucero Page 12 of 18

					= =			
65 Depth (ft)	Sample Type	Number	Headspace PID	Lithologic Log		U.S.C.S.	Well Diagram	Remarks
335	-				Poorly graded SAND (SP); light reddish brown (5YR 6/3); dry; dense; 100% very fine to fine sand; trace medium to coarse sand; subrounded; no odor.			
-	-				Same as above (330 ft); no odor.	SP		
340	-				Well graded SAND (SW); light reddish brown (5YR 6/3); dry; dense; 100% very fine to coarse sand; subrounded; no odor.			Kelly down @ 1602. New 20' connection @ 1608. Resumed drilling.
<u>345</u> - -	-				Same as above (340 ft); no odor.		- High Solids Bentonite Grout	
350	-				Same as above (340 ft); slight decrease in medium to coarse sand content; no odor.	SW		
355					Same as above (340 ft); no odor.			
360								



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Date Started: 6/15/2011 Date TD Reached: 6/17/2011 Date Completed: 6/19/2011

Ground Elevation AMSL (ft): 5325.5 Y Coordinate: 1477302.04 X Coordinate: 1543786.27 Hole Diameter Upper (in.): 11-3/4 Hole Diameter Lower (in.): 9-5/8 Surface Completion Type: Flush mount

Drilling Contractor: WDC Exploration and Wells Drilling Method: Air Rotary Casing Hammer Logged By: Brian Lucero Page 13 of 18

95 Depth (ft)	Sample Type	Number	Headspace PID	Lithologic Log		U.S.C.S.	Well Diagram	Remarks
	_				Well graded SAND (SW); light reddish gray (5YR 6/3); dry; dense; 100% very fine to coarse sand; subrounded; no odor.			Kelly down @ 1615. New 20' connection @ 1621. Resumed drilling @ 1622.
<u>365</u> 370	_				Same as above (360 ft); slight decrease in medium to coarse sand content; no odor.	SW	•       •       •       •         •       •       •       •         •       •       •       •         •       •       •       •         •       •       •       •         •       •       •       •         •       •       •       •         •       •       •       •         •       •       •       •         •       •       •       •         •       •       •       •         •       •       •       •         •       •       •       •         •       •       •       •         •       •       •       •         •       •       •       •         •       •       •       •         •       •       •       •	
375	_				Poorly graded SAND (SP); light reddish brown (5YR 6/3); dry; dense; 100% very fine to fine sand; trace medium to coarse sand; subrounded; no odor.	SP		
	_				Well graded SAND (SW); light reddish brown (5YR 6/3); dry; dense; 100% very fine to coarse sand; subrounded; no odor.		- High Solids Bentonite Grout	
380	-				Same as above (375 ft); 90% very fine to coarse sand; subrounded; 10% fine gravel to 1cm; subrounded; no odor.	SW		Kelly down @ 1629. New 20' connection @ 1633. Resumed drilling @ 1634.
385	-				Same as above (375 ft); no odor.			
390								



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Date Started: 6/15/2011 Date TD Reached: 6/17/2011 Date Completed: 6/19/2011

Ground Elevation AMSL (ft): 5325.5 Y Coordinate: 1477302.04 X Coordinate: 1543786.27 Hole Diameter Upper (in.): 11-3/4 Hole Diameter Lower (in.): 9-5/8 Surface Completion Type: Flush mount

After Drilling: 470.61

Drilling Contractor: WDC Exploration and Wells Drilling Method: Air Rotary Casing Hammer Logged By: Brian Lucero Page 14 of 18

					Logged	- )			
6 Depth (ft)	Sample Type	Numt	Headspace PID	Lithologic Log	Material Description	U.S.C.S.	v	Vell Diagram	Remarks
395	_				Well graded SAND (SW); light reddish brown (5YR 6/3); dry; dense; 100% very fine to coarse sand; subrounded; no odor.	SW		• • • • • • • • • • • •	
-	-				Poorly graded SAND (SP); reddish brown (5YR 5/3); dry; dense; 100% very fine to medium sand; trace coarse sand; subrounded; no odor.		· · · · · · · · · · · · · · · · ·	· · · · · · · · · · · · · · · · · · ·	
400	-				Same as above (395 ft); 100% very fine to fine sand; trace medium sand; subrounded; no odor.	SP		· · · · · · · · · · · · · · · · · · ·	Kelly down @ 1642. End of 6/16/11. New 20' connection @ 0915 on 6/17/11. Resumed drilling @ 0916.
405					Same as above (395 ft); no odor.			- High Solids Bentonite Grout	
<u>410</u>	-				Sandy lean CLAY (CL); reddish brown (5YR 4/3); dry to moist; stiff; low to medium plasticity; 70% clay; trace silt; 30% very fine to fine sand; no odor. Poorly graded SAND (SP); light reddish	CL		• • • • • • • • • •	
415					brown (5YR 6/3); dry; dense; 95% very fine sand; trace fine sand; 5% silt; no odor. Same as above (411 ft).	SP		· · · · · · · · · · · · · · · · · · ·	
420							•••	••	



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Ground Elevation AMSL (ft): 5325.5 Y Coordinate: 1477302.04 X Coordinate: 1543786.27 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: 471.80 ↓ At End of Drilling: Not Recorded ↓ After Drilling: 470.61

Drilling Contractor: WDC Exploration and Wells Drilling Method: Air Rotary Casing Hammer Logged By: Brian Lucero Page 15 of 18

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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); light reddish brown (5YR 6/3); dry; dense; 100% very fine sand; trace fine sand; no odor.			Kelly down @ 0928. New 20' connection @ 0936. Resumed drilling @ 0937.
425	-				Same as above (420 ft); 100% very fine to fine sand; trace medium to coarse sand; subrounded; no odor.			
430	-				Same as above (420 ft); no odor.	SP	- High Solids Bentonite Grout	
<u>435</u>	-				Same as above (420 ft); 100% very fine to medium sand; trace coarse sand; subrounded; no odor.			
440	-				Well graded SAND (SW); light reddish brown (5YR 6/3); dry; dense; 100% very fine to coarse sand; subrounded; no odor.		- Top of Bentonite Seal	Kelly down @ 0950. New 20' connection @ 0956. Resumed drilling @ 0956.
445					Same as above (440 ft); 100% sand; trace fine gravel to 0.8cm; subrounded; no odor.	SW		
450								



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Date Started: 6/15/2011 Date TD Reached: 6/17/2011 Date Completed: 6/19/2011

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Groundwater Levels BGS (ft): ↓ At Time of Drilling: 471.80 ↓ At End of Drilling: Not Recorded

▼ After Drilling: 470.61

Drilling Contractor: WDC Exploration and Wells Drilling Method: Air Rotary Casing Hammer Logged By: Brian Lucero Page 16 of 18

Depth	Sample Type	Number	Headspace PID	Lithologic Log	Material Description	U.S.C.S.	Well Diagram	Remarks
-					Well graded SAND (SW); reddish brown (5YR 5/3); dry; dense; 95% very fine to coarse sand; subrounded; 5% fine to coarse gravel to 3cm; subrounded; no odor.			
455					Same as above (450 ft); no odor.	SW		
<u>460</u> - -					Poorly graded SAND (SP); light reddish brown (5YR 6/3); dry; dense; 95% very fine to fine sand; trace medium to coarse sand; subrounded; 5% fine gravel to 2cm; subrounded; no odor.			Kelly down @ 1019. New 20' connection @ 1028. Resumed drilling @ 1029.
<u>465</u> - -					Same as above (460 ft); 100% very fine to medium sand; trace coarse sand; subrounded; trace fine gravel to 0.5cm; subrounded; no odor.		- Bentonite Seal	
470 - - -						SP		Stopped drilling due to problems with hammer @ 1040. Hammer repaired; resumed drilling @ 1313.
475 - -					Same as above (460 ft); no odor.		- 5" Schedule 80 PVC Riser	
400								
480								



#### 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: 6/15/2011 Date TD Reached: 6/17/2011 Date Completed: 6/19/2011

Ground Elevation AMSL (ft): 5325.5 Y Coordinate: 1477302.04 X Coordinate: 1543786.27

## Borehole ID: KAFB-106057

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: 471.80 ♥ At End of Drilling: Not Recorded

After Drilling: 470.61

Drilling Contractor: WDC Exploration and Wells Drilling Method: Air Rotary Casing Hammer Logged By: Brian Lucero Page 17 of 18

8 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 6/3); moist; dense; 100% very fine to fine sand; trace medium sand; subrounded; no odor.	SP	- Bentonite Seal	Kelly down @ 1317. New 20' connection @ 1325. Resumed drilling @ 1326.
<u>485</u> - - -	-				Well graded SAND (SW); reddish brown (5YR 4/3); dry to moist; dense; 95% very fine to coarse sand; subrounded; 5% fine gravel to 0.8cm; subrounded; no odor.		Top of 5" Schedule 80 PVC 0.010" Slot Screen	
490	-				Same as above (485 ft); 90% very fine to coarse sand; subrounded; 10% fine gravel to 2.5cm; subrounded; no odor.			
<u>495</u> - -	-				Same as above (485 ft); 90% sand; 10% fine gravel to 1.5cm; subrounded; no odor.	SW		
500	-				Well graded SAND with Gravel (SW); reddish brown (5YR 4/3); moist; dense; 85% very fine to coarse sand; subrounded; 15% fine to coarse gravel to 2cm; subrounded; no odor.		- Bottom of Screen	Kelly down @ 1343. New 20' connection @ 1543. Resumed drilling @ 1548.
505	-				Same as above (500 ft); no odor.		- Bottom of Sump	
510								

Sha	
Snav	

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: 6/15/2011 Date TD Reached: 6/17/2011 Date Completed: 6/19/2011

Ground Elevation AMSL (ft): 5325.5 Y Coordinate: 1477302.04 X Coordinate: 1543786.27 Hole Diameter Upper (in.): 11-3/4 Hole Diameter Lower (in.): 9-5/8 Surface Completion Type: Flush mount

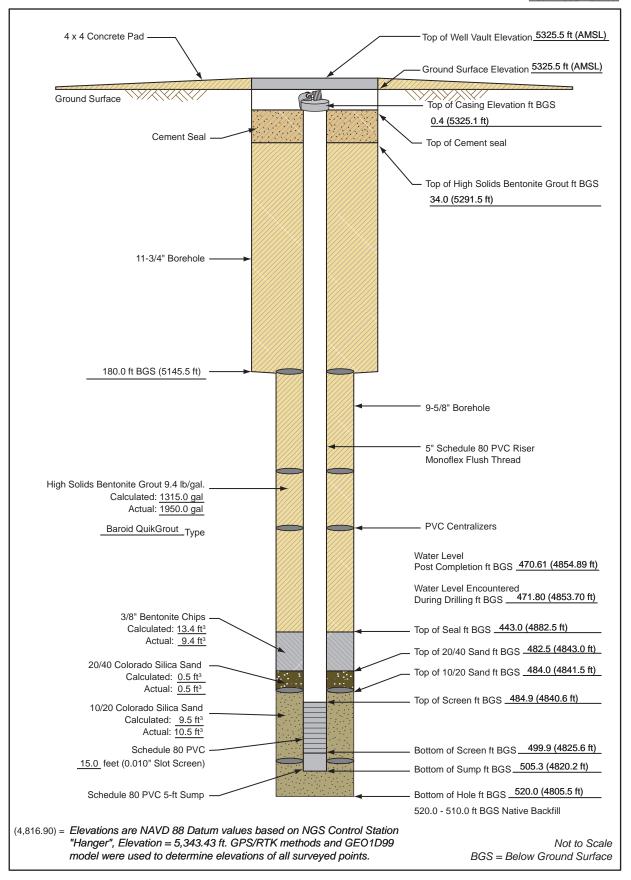
After Drilling: 470.61

Drilling Contractor: WDC Exploration and Wells Drilling Method: Air Rotary Casing Hammer Logged By: Brian Lucero Page 18 of 18

0 Depth (ft)	Sample Type	Number	Headspace PID	Lithologic Log	Material Description	U.S.C.S.	Well Diagram	Remarks
515	-				Well graded SAND with Gravel (SW); reddish brown (5YR 4/3); moist; dense; 85% very fine to coarse sand; subrounded; 15% fine to coarse gravel to 2.2cm; subrounded; no odor. Well graded SAND (SW); reddish brown (5YR 4/3); moist; dense; 90% very fine to coarse sand; subrounded; 10% fine gravel to 1cm; subrounded; no odor.	SW	Bottom of Filter Pack	
520				<u>*.*</u>			1004004	Total depth = 520 ft. Reached @ 1615 on
-								6/17/11.
525	-							Water added during drilling (gallons) = 200
-	-							Water added after drilling (gallons) = 200
<u>530</u>	-							Water added during construction (gallons) = 40
-	-							Spud: started drilling from surface.
535								Kelly down: TD the joint and ready to make new connection.
540								
0+0							1	

#### Monitoring Well Completion Diagram KAFB-106057

Installation Start Date/Time: <u>6/18/2011 @ 08:37</u> Installation End Date/Time: <u>6/19/2011 @ 16:15</u>





Pg1of2

#### Well Development Record

Project Name: KAFB BFF						
Location: GW-10			Well/Piez. N	lo.: 106057		
Personnel: V. Bracht			Date Installe	ed: 6/19/11		
Date: 8/2/11			Csg. Diame	ter (I.D.): 5"		
Samplers: V. Bracht			Total Depth	(ft. BGL): 505	5.34	_
Method of Development: X Surging	X Bailing	:	X Pumping			
X Original Development	Redevelopment	I	Other			
Development Date: 8/2/11			-			
Depth to Water Before Develop	ing Well (ft. BGL):	471.78, 471.36 (TOC)				
Height of Water Column: <u>33.5</u> V=(B * r <sub>c</sub> <sup>2</sup> * L <sub>c</sub> * 7.48		Vol. (V) Purge Fa 455.09 gal. * 1 .s * øs * 7.48)+(H <sub>2</sub> O added	= 45	olume to Purge		
Depth Purging From: 493.3 fee	t	Time Purgin	g Begins:_1	1505, 8/2/11		
Weather: Warm, Breezy, Partly	Cloudy	Screened In	terval (ft BG	<b>6L)</b> : <u>486.17 - 4</u> 9	99.94	
Equipment Nos.: pH Meter	YSI 36952	EC Meter:	YSI 3695	2	Turbidity Meter:	LVE 002384
Equipment Decontaminated Pri Describe: Steam Cleaned Collected Sample of Water Add Describe: N/A Comment: 400 gallons of water	ed to Well: Y	<u>N X</u>	5			
Wate	er					

		Level (ft. Below	Volume Removed				Turbidity	
Date	Time	TOC)	(gal.)	Temp.°C	рН	EC (ms/cm)	N.T.U.	Comments
8/2/2011	1245	471.36	10	23.62	6.08	0.399	193.00	Bailing; Water is Very Cloudy
8/2/2011	1255		50					Bailed; Muddy Brown
8/2/2011	1300							Begin Swabbing
8/2/2011	1320							Stop Swabbing
8/2/2011	1340		100					Bailed
8/2/2011	1510	472.50						Begin Pumping at 5 GPM
8/2/2011	1515	472.10	125	20.87	6.12	0.400	701.00	Continue Pumping; Very Cloudy
8/2/2011	1520	472.12	150	20.78	7.83	0.400	281.00	Continue Pumping; Cloudy
8/2/2011	1525	472.11	170	21.43	7.77	0.400	226.00	Continue Pumping; Cloudy
8/2/2011	1530	472.12	190	21.41	7.66	0.400	137.00	Continue Pumping; Cloudy

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 # GPM = Gallons Per Minute

Where: B=3.14  $O_{s=}$  portosity of the sand pack  $r_{e}$  radius of the well casing and screen in feet  $L_{e}$  length of water column inside the casing and screen in feet  $r_{w}$  radius of the well bore in feet  $L_{e}$  length of saturated portion of the sand pack in feet 2.49 cellucacidation and comparison form on the fact to a cellucat

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



\_\_\_\_\_

### Well Development Record

Project: KAFB BFF

Project Number: 140705

Date: 8/2/11

Time Start: 1245, 8/2/11

Well No: 106057

Samplers: V. Bracht

Checked By:

Time Finish: 1635, 8/2/11

Field Chemistry (cont'd)

		Water Level (ft.	Volume					
		Below	Removed				Turbidity	
Date	Time	TOC)	(gal.)	Temp.°C	рН	EC (ms/cm)	N.T.U.	Comments
8/2/2011	1535	472.12	210	21.41	7.59	0.401	180.00	Continue Pumping; Cloudy
8/2/2011	1540	472.11	240	21.30	7.56	0.401	101.00	Continue Pumping; Cloudy
8/2/2011	1545	472.11	260	21.23	7.57	0.401	76.80	Continue Pumping; Cloudy
8/2/2011	1550	472.11	280	21.26	7.44	0.402	67.50	Continue Pumping; Cloudy
8/2/2011	1555	472.11	310	21.33	7.33	0.401	52.80	Continue Pumping; Cloudy
8/2/2011	1600	472.12	335	21.31	7.31	0.401	42.80	Continue Pumping; Cloudy
8/2/2011	1605	472.11	360	21.32	7.21	0.401	35.10	Continue Pumping; Cloudy
8/2/2011	1610	472.11	385	21.27	7.27	0.401	30.00	Continue Pumping; Cloudy
8/2/2011	1615	472.11	410	21.43	7.08	0.401	18.80	Continue Pumping; Slightly Cloudy
8/2/2011	1620	472.11	435	21.43	7.01	0.401	12.50	Continue Pumping; Slightly Cloudy
8/2/2011	1625	472.11	460	21.45	6.99	0.400	7.23	Continue Pumping; Clear
8/2/2011	1630	472.11	485	21.34	6.93	0.401	4.75	Continue Pumping; Clear
8/2/2011	1635	472.10	510	21.36	7.00	0.400	4.38	Stop Pumping; Clear; Total Removed

Was well sampled after development? YES NO X

Sample Method: N/A

Sample Name: N/A

Analyses: N/A

# KAFB 106058

	ha	W®				Bore	eho	le ID	: <b>KAFB-</b> 1	106058
Client: US Army Corps of Engineers Project Location: KAFB, Albuquerque, NM Project Name: KAFB BFF SWMU ST-106 and SS-111 Project Number: 140705							ametei Comp	Lower Detion T	(in.): 11-3/4 (in.): 9-5/8 ype: Flush mou	unt
Da Da	ite S ite T	tarted D Rea	l: 6/6 acheo	6/201 d: 6/8		🕎 At T	ime of nd of	f Drilling Drilling:	3GS (ft): j: 471.17 Not Recorded 1.19	
Y	Cooi	d Elev rdinate rdinate	e: 14	17729			<b>Nethoo</b>	d: Air F	VDC Drilling Rotary Casing Ha cero	ammer Page 1 of 19
o Depth (ft)	Sample Type	Number	Headspace PID	Lithologic Log	Material Description		U.S.C.S.	w	ell Diagram	Remarks
 					Asphalt; no description recorded Sandy lean CLAY (CL); dark red brown (5YR 3/2); moist; stiff; low plasticity; 65% clay with silt; 30% fine to coarse sand; subangular; gravel to 5mm; subrounded; no Same as above (0.5 ft); no odor Same as above (0.5 ft); no odor Lean CLAY with Sand (CL); redd brown (5YR 4/4); dry to moist; st plasticity; 85% clay with silt; 15% fine to fine sand; no odor. Sandy lean CLAY (CL); reddish (5YR 4/4); dry to moist; stiff; low plasticity; 70% clay with silt; 30% fine to coarse sand; subangular; odor. Clayey SAND (SC); reddish brow 4/4); dry to moist; dense; 75% ve to fine sand; trace medium to co sand; subangular; 25% clay with odor. Poorly graded SAND (SP); redd brown (5YR 5/4); dry; dense; 95	Idish 6 very 5% fine odor. dish tiff; low 6 very brown 6 very mo wn (5YR ery fine parse n silt; ng ish	CL SC SP		- Cement Seal	Hand augered. ***Note: no headspace requirement at this location.*** Spud @ 1014 on 6/6/11. Spud @ 1014 on 6/6/11. Kelly down @ 1027. New 20' connection @ 1032. Resumed drilling @ 1037.



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: 6/6/2011 Date TD Reached: 6/8/2011 Date Completed: 6/14/2011

Ground Elevation AMSL (ft): 5326.1 Y Coordinate: 1477292.74 X Coordinate: 1543818.37 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: 471.17 ↓ At End of Drilling: Not Recorded ↓ After Drilling: 471.19

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
35	-					D	, i i i i i i i i i i i i i i i i i i i	
					fine to fine sand; trace medium to coarse sand; subangular to subrounded; 5% silt; no odor.	SP		
40					Well graded SAND (SW); reddish brown (5YR 5/4); dry; dense; 100% very fine to coarse sand; subangular; no odor.	SW	- Cement Seal	
40	-				Well graded SAND with Silt (SW-SM); reddish brown (5YR 5/4); dry; dense; 90% very fine to coarse sand; subangular; 10% silt with clay; no odor.	SW- SM	<ul> <li>Top of High</li> <li>Solids</li> <li>Bentonite</li> <li>Grout</li> </ul>	Kelly down @ 1057. New 20' connection @ 1108. Resumed drilling @ 1115.
	-				Well graded SAND (SW); reddish brown (5YR 5/4); dry; dense; 100% very fine to coarse sand; subangular; no odor.		•     •       •     •	Rig chatter @ 49'.
50	-				Same as above (45 ft); 100% fine to coarse sand; no odor. Note: minor silt and clay coating on sand.	SW		
<u>55</u>					SILT with Sand (ML); reddish brown (5YR 4/4); dry to moist; stiff; 80% silt with minor clay; 20% very fine to fine sand; trace medium to coarse sand; subangular; no odor.	ML		



Client: US Army Corps of Engineers

Ground Elevation AMSL (ft): 5326.1

Project Number: 140705

Date TD Reached: 6/8/2011

Date Completed: 6/14/2011

Y Coordinate: 1477292.74

Date Started: 6/6/2011

Project Location: KAFB, Albuquerque, NM

### Borehole ID: KAFB-106058

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):  $\checkmark$  At Time of Drilling: 471.17 ▼ At End of Drilling: Not Recorded ▼ After Drilling: 471.19

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.	M	Vell Diagram	Remarks
65	-				Well graded SAND (SW); reddish brown (5YR 4/3); dry to moist; dense; 95% very fine to coarse sand; subangular to subrounded; trace fine gravel to 5mm; subrounded; 5% clay with minor silt; no odor.	sw			Kelly down @ 1136. New 20' connection @ 1217. Resumed drilling @ 1222.
	-				Silty SAND (SM); reddish brown (5YR 4/3); dry to moist; dense; 65% very fine to coarse sand; subangular to subrounded; 35% silt with minor clay; no odor.	SM		• • • • • •	
70	-				SILT (ML); yellowish red (5YR 4/6); dry; stiff; 95% silt; trace clay; 5% very fine to fine sand; no odor.	ML			
80	-				Silty SAND (SM); yellowish red (5YR 4/6); dry; dense; 85% very fine to coarse sand; subangular; 15% silt; trace clay; no odor.	SM		- High Solids Bentonite Grout	
	-				Well graded SAND with Silt (SW-SM); reddish brown (5YR 4/4); dry; dense; 90% very fine to coarse sand; subangular; 10% silt; trace clay; no odor.	SW- SM			Kelly down @ 1235. New 20' connection @ 1242. Resumed drilling @ 1244.
85 90	-				Well graded SAND (SW); reddish brown (5YR 4/4); dry; dense; 95% very fine to coarse sand; subangular; trace fine gravel to 1cm; subangular; 5% silt; trace clay; no odor.	sw		>     >       >     >       >     >       >     >       >     >       >     >       >     >       >     >       >     >       >     >       >     >       >     >	



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: 6/6/2011 Date TD Reached: 6/8/2011 Date Completed: 6/14/2011

Ground Elevation AMSL (ft): 5326.1 Y Coordinate: 1477292.74 X Coordinate: 1543818.37 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: 471.17 ↓ At End of Drilling: Not Recorded ↓ After Drilling: 471.19

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

G Depth (ft)	Sample Type	Number	Headspace PID	Lithologic Log	Material Description	U.S.C.S.	Well Diagram	Remarks
95					Well graded SAND (SW); reddish brown (5YR 4/4); dry; dense; 95% very fine to coarse sand; subangular; 5% silt; trace clay; no odor. Same as above (90 ft); no odor.	SW		
<u>100</u>					SILT with Sand (ML); reddish brown (5YR 5/4); dry; stiff; 80% silt; trace clay; 20% very fine to coarse sand; subangular; trace fine to coarse gravel to 2cm; subangular to subrounded; no odor.		•     •     •       •     •     •	Kelly down @ 1258. New 20' connection @ 1310. Resumed drilling @ 1311.
<u>105</u>					Same as above (98 ft); 75% silt; trace clay; 25% sand; trace fine gravel to 1.2cm; subangular; no odor.	ML	- High Solids Bentonite Grout	
<u>110</u>					Same as above (98 ft); 80% silt; trace clay; 20% very fine to fine sand; trace medium to coarse sand; subangular; no odor.			
<u>115</u>	-				Same as above (98 ft); no odor.			
120					Lean CLAY (CL); reddish brown (5YR	CL		

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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: 6/6/2011 Date TD Reached: 6/8/2011 Date Completed: 6/14/2011

Ground Elevation AMSL (ft): 5326.1 Y Coordinate: 1477292.74 X Coordinate: 1543818.37

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: 471.17 ▼ At End of Drilling: Not Recorded ▼ After Drilling: 471.19

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 Ś S.C. Material Description Remarks Well Diagram Ľ, 120 Kelly down @ 1315. New 4/4); dry to moist; stiff; low to medium CL . . . . . . . . . . . plasticity; 95% clay with minor silt; 5% 20' connection @ 1325. . . . . . . . . . . . . . very fine to fine sand; no odor. Resumed drilling @ • Silty SAND (SM); reddish brown (5YR 1332. 5/4); dry; dense; 70% very fine to coarse sand; subangular; 30% silt; trace clay; no odor. 125 SM . . . . . . . . . . . . . . 130 SILT with Sand (ML); reddish brown ••• (5YR 5/4); dry; stiff; 75% silt; trace clay; 25% very fine to fine sand; trace medium to coarse sand; subangular; no odor. . . . . . . . . . . . . 135 ML High Solids SILT (ML); reddish brown (5YR 5/4); dry; Bentonite stiff; 90% silt with minor clay; 10% very Grout fine to fine sand; no odor. • 140 No cuttings returned. Kelly down @ 1346. New . 20' connection @ 1540. Resumed drilling @ 1541. • 145 .... No cuttings returned.

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Client: US Army Corps of Engineers

Ground Elevation AMSL (ft): 5326.1

Project Number: 140705

Date TD Reached: 6/8/2011

Date Completed: 6/14/2011

Y Coordinate: 1477292.74

Date Started: 6/6/2011

Project Location: KAFB, Albuquerque, NM

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

### Borehole ID: KAFB-106058

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: 471.17 ▼ At End of Drilling: Not Recorded ▼ After Drilling: 471.19

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

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X Coordinate: 1543818.37 Sample Type Headspace PID ithologic Log Depth (ft) Number *i* Ö Material Description Remarks Well Diagram ю. ⊃. 150 Well graded GRAVEL (GW); reddish brown (5YR 4/4); dry; dense; 90% fine to ....... coarse gravel to 2cm; angular to subangular; 5% coarse sand; GW subangular; 5% clay with minor silt as coating on gravel and sand; no odor. • 155 Sandy lean CLAY (CL); reddish brown Sample is from cleaning • (5YR 4/4); dry to moist; stiff; low discharge and is likely plasticity; 65% clay with silt; 30% very not representative. ••••• fine to fine sand; trace medium to coarse CL sand; subangular; 5% fine to coarse • gravel to 2.5cm; subangular; no odor. 160 .... Well graded SAND (SW); reddish gray Kelly down @ 1550. New (5YR 5/2); dry; dense; 100% very fine to 20' connection @ 1608. coarse sand; subangular to subrounded; Resumed drilling @ • no odor. 1609. Approximate top of SW Santa Fe Group. • . . . . . . . . . . 165 High Solids Poorly graded SAND (SP); pinkish gray Bentonite • (5YR 6/2); dry; dense; 100% very fine to Grout . fine sand: no odor. 170 Same as above (165 ft); 100% very fine • to fine sand; trace medium to coarse sand; subangular to subrounded; no odor. SP • • <u>1</u>75 Same as above (165 ft); no odor. • • ٠ 180



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: 6/6/2011 Date TD Reached: 6/8/2011 Date Completed: 6/14/2011

Ground Elevation AMSL (ft): 5326.1 Y Coordinate: 1477292.74 X Coordinate: 1543818.37 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: 471.17 ↓ At End of Drilling: Not Recorded ↓ After Drilling: 471.19

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
185	-				Poorly graded SAND (SP); pinkish gray (5YR 6/2); dry; dense; 100% very fine to fine sand; no odor.	SP		Kelly down @ 1612. Total depth with 11-3/4" casing. End of 6/6/11. New 20' connection with 9-5/8" casing @ 1001 on 6/7/11. Resumed drilling @ 1011.
190	-				Well graded SAND (SW); pinkish gray (5YR 6/2); dry; dense; 100% very fine to coarse sand; subrounded; no odor.			
	-				Same as above (185 ft); slight decrease in medium to coarse sand content; no odor.	sw		
195	-				Same as above (185 ft); 100% very fine to coarse sand; subrounded; trace fine gravel to 8mm; subrounded; no odor.		- High Solids Bentonite Grout	
200	-				Poorly graded SAND (SP); pinkish gray (5YR 6/2); dry; dense; 100% very fine to fine sand; no odor.			Kelly down @ 1016. New 20' connection @ 1023. Resumed drilling @ 1024.
205	-				Same as above (200 ft); 100% very fine to fine sand; trace medium to coarse sand; subrounded; no odor.	SP		
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: 6/6/2011 Date TD Reached: 6/8/2011 Date Completed: 6/14/2011

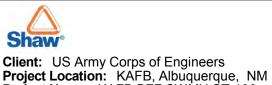
Ground Elevation AMSL (ft): 5326.1 Y Coordinate: 1477292.74 X Coordinate: 1543818.37 Hole Diameter Upper (in.): 11-3/4 Hole Diameter Lower (in.): 9-5/8 Surface Completion Type: Flush mount

Groundwater Levels BGS (ft): ↓ At Time of Drilling: 471.17 ↓ At End of Drilling: Not Recorded ↓ After Drilling: 471.19

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

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^ '	Coordinate: 1543818.37 Logged					By: Brian Lucero Page 8 of				
01 Depth (ft)	Sample Type	Number	Headspace PID	Lithologic Log	Material Description	U.S.C.S.	We	ll Diagram	Remarks	
215					Well graded SAND (SW); pinkish gray (5YR 6/2); dry; dense; 100% very fine to coarse sand; subrounded; trace fine to coarse gravel to 2cm; subrounded; no odor. Same as above (210 ft); 100% sand; slight decrease in medium to coarse sand content; no gravel; no odor.	SW				
<u>220</u>	-				Poorly graded SAND (SP); pinkish gray (5YR 6/2); dry; dense; 100% very fine to fine sand; trace medium to coarse sand; subrounded; no odor. Same as above (220 ft); 100% very fine to fine sand; trace medium sand; subrounded; no odor.	SP		- High Solids Bentonite Grout	Kelly down @ 1033. New 20' connection @ 1052. Resumed drilling @ 1055.	
<u>230</u>	-				Well graded SAND (SW); pinkish gray (5YR 6/2); dry; dense; 100% very fine to coarse sand; subrounded; no odor.					
<u>235</u> 240	-				Same as above (228 ft); reddish brown (5YR 5/3); 95% very fine to coarse sand; subangular to subrounded; 5% fine gravel to 1cm; subrounded; no odor.	SW				



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

Date Started: 6/6/2011 Date TD Reached: 6/8/2011 Date Completed: 6/14/2011

Project Number: 140705

Ground Elevation AMSL (ft): 5326.1 Y Coordinate: 1477292.74 X Coordinate: 1543818.37

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

Groundwater Levels BGS (ft): ∑ At Time of Drilling: 471.17 ▼ At End of Drilling: Not Recorded ▼ After Drilling: 471.19

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

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Page	э	o	19	

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8 Depth (ft)	Sample Type	Number	Headspace PID	Lithologic Log	Material Description	U.S.C.S.	Well	l Diagram	Remarks
245	-				Well graded SAND (SW); reddish brown (5YR 5/3); dry; dense; 90% very fine to coarse sand; subangular to subrounded; 10% fine to coarse gravel to 2cm; subrounded; no odor. Same as above (240 ft); 85% very fine to coarse sand; subangular to subrounded; 10% fine to coarse gravel to 2.5cm; subrounded; 5% clay with minor silt as coating on sand and gravel; no odor.	SW			Kelly down @ 1105. New 20' connection @ 1110. Resumed drilling @ 1115.
250	-				Poorly graded SAND (SP); light reddish brown (5YR 6/3); dry; dense; 100% very fine to fine sand; trace medium to coarse sand; subrounded; trace fine gravel to 1cm; subrounded; no odor.	SP			
255	-				Same as above (248 ft); no odor. SILT (ML); brown (10YR 4/3); dry to moist; stiff; 95% silt; trace clay; 5% very			High Solids Bentonite Grout	
260	-				fine to fine sand; no odor. Same as above (257 ft); no odor.	ML			Kelly down @ 1125. New 20' connection @ 1201. Resumed drilling @
<u>265</u> 270					Silty SAND (SM); light reddish brown (5YR 6/3); dry; dense; 70% very fine to medium sand; trace coarse sand; subangular to subrounded; 30% silt; trace clay; no odor.	SM			1202.



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

Date Started: 6/6/2011 Date TD Reached: 6/8/2011 Date Completed: 6/14/2011

Ground Elevation AMSL (ft): 5326.1 Y Coordinate: 1477292.74 X Coordinate: 1543818.37 Hole Diameter Upper (in.): 11-3/4 Hole Diameter Lower (in.): 9-5/8 Surface Completion Type: Flush mount

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. Ľ, 270 Silty SAND (SM); light reddish brown (5YR 6/3); dry; dense; 70% very fine to • coarse sand; subangular to subrounded; • • • • 30% silt; trace clay; no odor. • .... 275 SM Same as above (270 ft); no odor. 280 No cuttings returned. Discharge hose clogged. Kelly down @ 1210. New 20' connection @ 1213. Resumed drilling @ 1213. • . . . . . . . . . 285 **High Solids** No cuttings returned. Discharge hose clogged. Bentonite Grout • • 290 Clayey SAND (SC); reddish brown (5YR ••••• • 4/3); dry to moist; dense; 70% very fine to coarse sand; subangular to subrounded; 30% clay with minor silt as . . . . . . . . . . coating on sand and as nodules; low to SC medium plasticity; no odor. 295 Same as above (290 ft); no odor. • Well graded SAND (SW); pinkish gray (5YR 6/2); dry; dense; 100% very fine to • SW coarse sand; subrounded; no odor. . . • • 300



Client: US Army Corps of Engineers

Ground Elevation AMSL (ft): 5326.1

Project Number: 140705

Date TD Reached: 6/8/2011

Date Completed: 6/14/2011

Y Coordinate: 1477292.74

Date Started: 6/6/2011

### Borehole ID: KAFB-106058

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: Flush mount

> Groundwater Levels BGS (ft):  $\square$  At Time of Drilling: 471.17 ▼ At End of Drilling: Not Recorded ▼ After Drilling: 471.19

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

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X Coordinate: 1543818.37 Sample Type Headspace PID Lithologic Log Depth (ft) Number ю Ö Material Description Well Diagram Remarks ю. ⊃. 300 Well graded SAND (SW); pinkish gray Kelly down @ 1226. New 20' connection @ 1340. (5YR 6/2); dry; dense; 100% very fine to coarse sand; subrounded; no odor. Resumed drilling @ . 1341. • • • • • • • 305 SW Well graded SAND with Gravel (SW); reddish brown (5YR 5/3); dry; dense; 85% very fine to coarse sand; subrounded; 15% fine gravel to 7mm; subrounded; no odor. • 310 . . . . . . Poorly graded SAND (SP); pinkish gray (5YR 6/2); dry; dense; 100% very fine to fine sand; trace medium to coarse sand; subrounded; trace fine to coarse gravel SP to 2cm; subrounded; no odor. • . . . . . . . . . . . 315 High Solids Well graded SAND (SW); pinkish gray Bentonite • (5YR 6/2); dry; dense; 95% verv fine to Grout . coarse sand; subrounded; 5% fine to coarse gravel to 2.2cm; subrounded; no odor. SW ٠ • 320 Same as above (315 ft); 90% very fine to Kelly down @ 1350. New • coarse sand; subrounded; 10% fine to • 20' connection @ 1400. coarse gravel to 2cm; subrounded; no Resumed drilling @ odor. 1401. • Poorly graded SAND (SP); pinkish gray (5YR 6/2); dry; dense; 100% very fine to . . . . . . . . . . . fine sand; trace medium to coarse sand; 325 subrounded; trace fine to coarse gravel to 2cm; subrounded; no odor. SP • ٠ 330



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: 6/6/2011 Date TD Reached: 6/8/2011 Date Completed: 6/14/2011

Ground Elevation AMSL (ft): 5326.1 Y Coordinate: 1477292.74 X Coordinate: 1543818.37 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: 471.17 ↓ At End of Drilling: Not Recorded ↓ After Drilling: 471.19

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
335	-				Poorly graded SAND (SP); pinkish gray (5YR 6/2); dry; dense; 100% very fine to fine sand; trace medium to coarse sand; subrounded; trace fine to coarse gravel to 2cm; subrounded; no odor. Same as above (330 ft); no odor.			
<u>340</u> 345	-				Same as above (330 ft); 100% very fine to medium sand; trace coarse sand; subangular to subrounded; no gravel; no odor.	SP	- High Solids	Kelly down @ 1408. New 20' connection @ 1414. Resumed drilling @ 1415.
350	-				Same as above (330 ft); slight increase in coarse sand content; no odor. Well graded SAND (SW); light reddish brown (5YR 6/3); dry; dense; 95% very fine to coarse sand; subrounded; 5%		Grout	
355	-				fine gravel to 8mm; subrounded; no odor. Poorly graded SAND (SP); pinkish gray (5YR 6/2); dry; dense; 100% very fine to fine sand; trace medium to coarse sand;	SW		
360	-				subrounded; trace fine gravel to 5mm; subrounded; no odor.	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: 6/6/2011 Date TD Reached: 6/8/2011 Date Completed: 6/14/2011

Ground Elevation AMSL (ft): 5326.1 Y Coordinate: 1477292.74 X Coordinate: 1543818.37 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: 471.17 ↓ At End of Drilling: Not Recorded ↓ After Drilling: 471.19

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	-				Well graded SAND (SW); pinkish gray (5YR 6/2); dry; dense; 100% very fine to coarse sand; subrounded; trace fine to coarse gravel to 2.5cm; subrounded; no odor.	SW		Kelly down @ 1422. New 20' connection @ 1430. Resumed drilling @ 1431.
370	-				Poorly graded SAND (SP); pinkish gray (5YR 6/2); dry; dense; 100% very fine to fine sand; trace fine to coarse gravel to 3cm; subrounded; no odor.	SP		
375	-				Well graded SAND (SW); reddish brown (5YR 5/3); dry; dense; 100% very fine to coarse sand; subrounded; no odor.			
	-				Same as above (370 ft); no odor.		- High Solids Bentonite Grout	
380	-				Same as above (370 ft); no odor.	SW		Kelly down @ 1440. New 20' connection @ 1448. Resumed drilling @ 1448.
385	-				Same as above (370 ft); slight decrease in medium to coarse sand content; no odor.			
390								



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: 6/6/2011 Date TD Reached: 6/8/2011 Date Completed: 6/14/2011

Ground Elevation AMSL (ft): 5326.1 Y Coordinate: 1477292.74 X Coordinate: 1543818.37 Hole Diameter Upper (in.): 11-3/4 Hole Diameter Lower (in.): 9-5/8 Surface Completion Type: Flush mount

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. ⊃. 390 Poorly graded SAND (SP); pinkish gray . (5YR 6/2); dry; dense; 100% very fine to • • • • • • • • • • . . . . . . . . . . . . . fine sand; trace medium to coarse sand; subrounded; trace fine gravel to 1.2cm; subrounded; no odor. 395 Same as above (390 ft); slight increase in medium to coarse sand content; no odor. . . . . . . . . . . . . . . SP 400 Poorly graded SAND with Gravel (SP); Kelly down @ 1457. New pinkish gray (5YR 6/2); dry; dense; 85% 20' connection @ 1504. medium to coarse sand; trace very fine Resumed drilling @ to fine sand; angular to subangular; 15% 1505. fine to coarse gravel to 2cm; subangular; . . . . . . . . . . . . . . . . no odor. Poorly graded SAND (SP); pinkish gray 405 (5YR 6/2); dry; dense; 100% very fine to High Solids fine sand; trace medium to coarse sand; Bentonite Grout subrounded; no odor. Clayey SAND (SC); reddish brown (5YR 410 5/4); dry to moist; dense; 80% very fine ••••• SC to medium sand; trace coarse sand; subrounded; 20% clay; trace silt; no odor. Poorly graded SAND (SP); pinkish gray . . . . . . . . . . . . (5YR 7/2); dry; dense; 95% very fine sand; 5% silt; no odor. 415 Same as above (412 ft); no odor. SP • . • 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: 6/6/2011 Date TD Reached: 6/8/2011 Date Completed: 6/14/2011

Ground Elevation AMSL (ft): 5326.1 Y Coordinate: 1477292.74 X Coordinate: 1543818.37 Hole Diameter Upper (in.): 11-3/4 Hole Diameter Lower (in.): 9-5/8 Surface Completion Type: Flush mount

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 Ś Ö Material Description Remarks Well Diagram ю. 5 420 Kelly down @ 1517. New Poorly graded SAND (SP); pinkish gray . (5YR 6/2); dry; dense; 100% very fine to 20' connection @ 1524. • • • • • • • • • • ..... fine sand; no odor. Resumed drilling @ 1525. • • 425 Same as above (420 ft); no odor. • . . . . . . . . . . . . 430 SP Same as above (420 ft); 100% very fine to fine sand: trace medium sand: subrounded; no odor. • • . . . . . . . . . . . 435 **High Solids** Same as above (420 ft); no odor. Bentonite Grout • • 440 Well graded SAND (SW); pinkish gray Kelly down @ 1601. New • • • • (5YR 6/2); dry; dense; 100% very fine to 20' connection @ 1612. SW coarse sand; subrounded; no odor. Resumed drilling @ 1613. . . . . . . . . . . . . Poorly graded SAND (SP); pinkish gray (5YR 6/2); dry; dense; 100% very fine to fine sand; no odor. 445 SP • . • 450



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: 6/6/2011 Date TD Reached: 6/8/2011 Date Completed: 6/14/2011

Ground Elevation AMSL (ft): 5326.1 Y Coordinate: 1477292.74 X Coordinate: 1543818.37 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: 471.17 ↓ At End of Drilling: Not Recorded ↓ After Drilling: 471.19

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
	-				Well graded SAND (SW); pinkish gray (5YR 6/2); dry; dense; 100% very fine to coarse sand; subrounded; no odor.			
455	-				Same as above (450 ft); 100% very fine to coarse sand; subrounded; trace fine gravel to 7mm; subrounded; no odor.	SW		
460	-				Poorly graded SAND (SP); pinkish gray (5YR 6/2); dry; dense; 100% very fine to medium sand; trace coarse sand; subrounded; no odor.		- High Solids Bentonite Grout	Kelly down @ 1627. New 20' connection @ 1638. Resumed drilling @ 1638.
465	-				Same as above (460 ft); 100% very fine to fine sand; trace medium to coarse sand; subrounded; trace fine to coarse gravel to 2cm; subrounded; no odor.			
470	-				Same as above (460 ft); no odor. ${\underline{\Psi}}$	SP	- Top of Bentonite Seal	
475					Same as above (460 ft); no gravel; no odor.			
480								



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: 6/6/2011 Date TD Reached: 6/8/2011 Date Completed: 6/14/2011

Ground Elevation AMSL (ft): 5326.1 Y Coordinate: 1477292.74 X Coordinate: 1543818.37 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: 471.17 ↓ At End of Drilling: Not Recorded ↓ After Drilling: 471.19

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
	_				Poorly graded SAND (SP); pinkish gray (5YR 6/2); moist; dense; 100% very fine to fine sand; no odor.			Kelly down @ 1653. End of 6/7/11. New 20' connection @ 0842 on 6/8/11. Resumed drilling @ 0843.
48	5				Same as above (480 ft); no odor.	SP		
490	- - - - -				Same as above (480 ft); 100% very fine to medium sand; trace coarse sand; subrounded; no odor.		- Bentonite Seal	
49	5				Well graded SAND (SW); pinkish gray (5YR 6/2); moist; dense; 90% very fine to coarse sand; subrounded; 10% fine gravel to 1.5cm; subrounded; no odor.		- 5" Schedule 80 PVC Riser	
50	<u>C</u> - -				Same as above (495 ft); no odor.	SW		Kelly down @ 0907. New 20' connection @ 0931. Resumed drilling @ 0934.
50	5				Same as above (495 ft); no odor.			
51	- - 0						Sand -Top of 10/20 Sand	



### 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: 6/6/2011 Date TD Reached: 6/8/2011 Date Completed: 6/14/2011

Ground Elevation AMSL (ft): 5326.1 Y Coordinate: 1477292.74 X Coordinate: 1543818.37

## Borehole ID: KAFB-106058

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: 471.17 ↓ At End of Drilling: Not Recorded ↓ After Drilling: 471.19

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
	-				Well graded SAND with Gravel (SW); pinkish gray (5YR 6/2); wet; dense; 85% very fine to coarse sand; subrounded; 15% fine gravel to 1cm; subrounded; no odor.		- Top of 5" Schedule 80 PVC 0.010" Slot Screen	Stopped drilling to repair casing hammer @ 0956. Resumed drilling @ 1235.
<u>515</u>	-				Well graded SAND (SW); pinkish gray (5YR 6/2); wet; dense; 95% very fine to coarse sand; subrounded; 5% fine gravel to 8mm; subrounded; no odor.	sw		
520	-				Well graded SAND with Gravel (SW); pinkish gray (5YR 6/2); wet; dense; 80% very fine to coarse sand; subrounded; 20% fine to coarse gravel to 2.5cm; subrounded; no odor.			Kelly down @ 1243. New 20' connection @ 1253. Resumed drilling @ 1255. Fine grained fraction washed out by heavy discharge of water
525	-				Poorly graded SAND (SP); pinkish gray (5YR 6/3); wet; dense; 100% fine to medium sand; trace coarse sand; subrounded; no odor.	SP	-Bottom of Screen -Sump	below 520'.
<u>530</u>	-				Well graded SAND (SW); pinkish gray (5YR 6/2); wet; dense; 100% fine to coarse sand; subrounded; trace fine gravel to 1.5cm; subrounded; no odor.		-Bottom of Sump	
535	-				Same as above (530 ft); trace silt and clay coating on sand; no odor.	SW	- Bottom of Filter Pack	
540								



Client: US Army Corps of Engineers

Ground Elevation AMSL (ft): 5326.1

Project Number: 140705

Date TD Reached: 6/8/2011 Date Completed: 6/14/2011

Y Coordinate: 1477292.74

Date Started: 6/6/2011

Project Location: KAFB, Albuquerque, NM

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

### Borehole ID: KAFB-106058

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

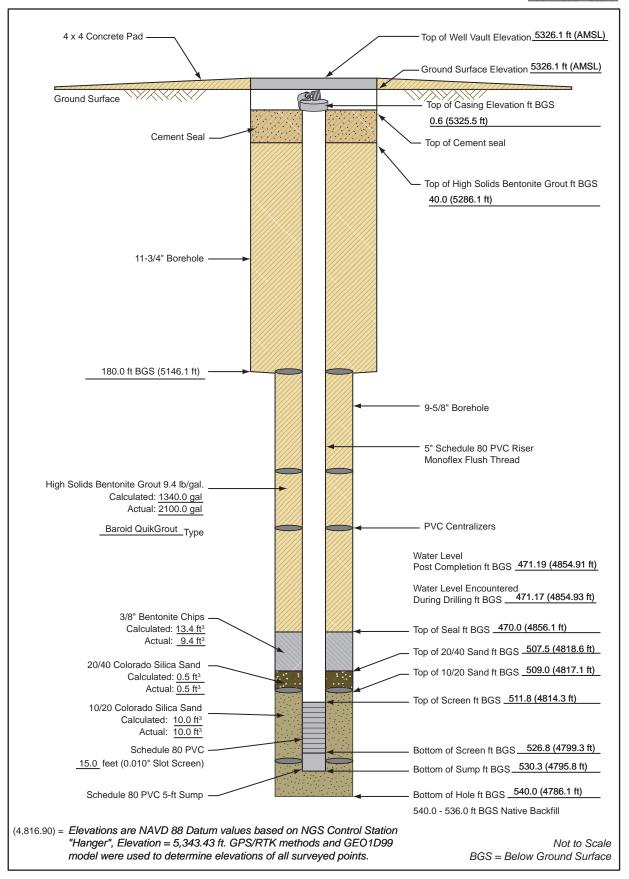
Groundwater Levels BGS (ft):  $\checkmark$  At Time of Drilling: 471.17 ▼ At End of Drilling: Not Recorded ▼ After Drilling: 471.19

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

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05 Depth (ft)	Sample Type	Number	Headspace PID	Lithologic Log	Material Description		U.S.C.S.	Well Diagram	Remarks
-									Total depth = 540 ft. Reached @ 1325 on 6/8/11.
545									Water added during drilling (gallons) = 300
-									Water added after drilling (gallons) = 300
_ <u>550</u>									Water added during construction (gallons) = 0
-									Spud: started drilling from surface.
555									Kelly down: TD the joint and ready to make new connection.
560									
565									
570									

### Monitoring Well Completion Diagram KAFB-106058

Installation Start Date/Time: <u>6/9/2011 @ 08:47</u> Installation End Date/Time: <u>6/14/2011 @ 17:00</u>





### Well Development Record

Project Name: KAFB BFF				
Location: GW-10		Well/Piez. No.: 106058		
Personnel: G. Peacock (7/18/11), V	. Bracht (8/4/11)	Date Installed: 6/14/11		
Date: 8/4/11		Csg. Diameter (I.D.): 5"		_
Samplers: V. Bracht		Total Depth (ft. BGL): 530.34	1	_
Method of Development: X Surging	X Bailing	X Pumping		
X Original Development	Redevelopment	Other		
Development Date: 7/18/11, 8/4/11 Depth to Water Before Developing	ı Well (ft. BGL) <u>: 471.9 (7/18/11), 472.</u>	45 (8/4/11), 471.80 (TOC)		
Height of Water Column: <u>57.89</u> V=(B * r <sub>c</sub> <sup>2</sup> * L <sub>c</sub> * 7.48)+(		e Factor Volume to Purge <u>1 = 680.29</u> dded during drilling/installation)	<u>= 680.29 gallons</u>	
Depth Purging From: 521.4 feet	Time Pu	rging Begins: 1020, 8/4/11		
Weather: Sunny, Breezy, Warm	Screene	d Interval (ft BGL): 511.17 - 524.	94	
Equipment Nos.: pH Meter:	<u>YSI 36952</u> EC Me	eter: <u>YSI 36952</u>	Turbidity Meter:	LVE 002384
Describe: Steam Cleaned Collected Sample of Water Added Describe: N/A	to Development: Y_X_N			
Water Level (ft.	Volume			

		Level (ft.	Volume				Truckislitur	
Date	Time	Below TOC)	Removed (gal.)	Temp.°C	рН	EC (ms/cm)	Turbidity N.T.U.	Comments
7/18/2011	NR	471.90	60					Bailed; Swabbed 20 min.
8/4/2011	0903	471.80	110	20.45	6.21	0.490	252.00	Bailing; Water Cloudy
8/4/2011	1020	471.91						Begin Pumping at 5 GPM
8/4/2011	1030	472.56		23.72	7.36	0.384	Out of Range	Continue Pumping; Light Brown
8/4/2011	1040	472.57	170	21.60	6.10	0.372	197.00	Continue Pumping; Cloudy
8/4/2011	1050	472.57	230	21.86	5.95	0.372	91.60	Continue Pumping; Cloudy
8/4/2011	1100	472.57	290	22.19	6.06	0.373	79.30	Continue Pumping; Cloudy
8/4/2011	1110	472.57	350	23.82	6.53	0.372	62.20	Continue Pumping; Cloudy
8/4/2011	1120	472.55	410	22.88	6.70	0.371	64.00	Continue Pumping; Cloudy
8/4/2011	1130	472.56	460	23.27	6.80	0.372	60.60	Continue Pumping; Cloudy

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 # GPM = Gallons Per Minute

Where: B=3.14  $O_{s=}$  portosity of the sand pack  $r_{e}$  radius of the well casing and screen in feet  $L_{e}$  length of water column inside the casing and screen in feet  $r_{w}$  radius of the well bore in feet  $L_{e}$  length of saturated portion of the sand pack in feet 2.49 cellucacidation and comparison form on the fact to a cellucat

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



### Well Development Record

Project: KAFB BFF

Project Number: 140705

Date: 8/4/11

Time Start: 0903, 8/4/11

Well No: 106058

Samplers: V. Bracht

Checked By:

Time Finish: 1330, 8/4/11

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
8/4/2011	1140	472.55	510	21.00	5.97	0.369	64.50	Continue Pumping; Cloudy
8/4/2011	1150	472.55	560	21.04	6.07	0.369	59.80	Continue Pumping; Cloudy
8/4/2011	1200	472.55	610	21.15	7.69	0.369	46.80	Continue Pumping; Cloudy
8/4/2011	1210	472.54	670	21.26	7.52	0.370	52.40	Continue Pumping; Cloudy
8/4/2011	1220	472.54	720	21.38	7.46	0.369	40.10	Continue Pumping; Cloudy
8/4/2011	1230	472.54	770	21.26	7.14	0.370	33.40	Continue Pumping; Slightly Cloudy
8/4/2011	1240	472.53	830	21.17	6.88	0.370	24.10	Continue Pumping; Slightly Cloudy
8/4/2011	1250	472.53	890	21.95	7.66	0.371	12.10	Continue Pumping; Fairly Clear
8/4/2011	1300	472.52	950	22.07	7.61	0.371	11.80	Continue Pumping; Fairly Clear
8/4/2011	1310	472.52	1010	21.96	7.31	0.372	10.10	Continue Pumping; Clear
8/4/2011	1320	472.52	1070	22.02	7.21	0.370	9.11	Continue Pumping; Clear
8/4/2011	1330	472.51	1130	21.98	7.00	0.370	8.13	Stop Pumping; Clear; Total Removed

Was well sampled after development? YES NO X

Sample Method: N/A

Sample Name: N/A

Analyses: N/A

KAFB 106204



Ground Elevation AMSL (ft): 5331.95 Y Coordinate: 1478960.18 X Coordinate: 1544920.21

### Borehole ID: KAFB-106204

Project Name: KAFB BFF SWMU ST-106 and SS-111 Project Number: 140705

Hole Diameter Upper (in.): 11-3/4" Hole Diameter Lower (in.) 9- 5/8" Groundwater Levels BGS (ft): ✓ At Time of Drilling: 477.15
 ✓ At End Of Drilling: N/A
 ✓ After Drilling: N/A
 ✓ Drilling Contractor: Yellow Jacket
 Drilling Method: Air Rotary Casing Hammer Logged By: Rachel Daly/P.Ostrye

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	1 1							
⊖ Depth (ft)	Sample Type	Number	Headspace	Lithologic Log	Material Description	U.S.C.S.	Well Diagram	Remarks
	-				No cuttings - disturbed.		- Top of Cement Seal	Begin drilling @ 0846.
5	-				Lean CLAY (CL); reddish brown (5YR 4/4); moist; firm; medium plasticity; 90% clay (with some silt); 10% fine to coarse sand; no odor.	CL		
10	-				SILT (ML); yellowish red (5YR 4/6); moist; soft; low to medium plasticity; 90% silt (with some clay);10% fine to medium sand; no odor.	ML		
20	-				Lean CLAY (CL); (reddish brown (5YR 4/4); moist; firm; medium plasticity; 90% clay (with some silt); 10% fine sand; no odor.	CL	- Cement Seal	Total depth casing @ 0905. Resume @ 0924.
-	-				SILT (ML); reddish brown (5YR 4/4); moist; soft; low plasticity; 90% silt; 10% coarse sand; no odor.			
25 - - - - -	-				Same as above (20 ft).	ML		



Ground Elevation AMSL (ft): 5331.95 Y Coordinate: 1478960.18 X Coordinate: 1544920.21

## Borehole ID: KAFB-106204

Project Name: KAFB BFF SWMU ST-106 and SS-111 Project Number: 140705

Hole Diameter Upper (in.): 11-3/4" Hole Diameter Lower (in.) 9- 5/8" Groundwater Levels BGS (ft): ✓ At Time of Drilling: 477.15
 ✓ At End Of Drilling: N/A
 ✓ After Drilling: N/A
 ✓ Drilling Contractor: Yellow Jacket
 Drilling Method: Air Rotary Casing Hammer Logged By: Rachel Daly/P.Ostrye

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© Depth (ft)	Sample Type	Headspace	Lithologic Loa	Material Description	U.S.C.S.	Well Diagram	Remarks
35				Sandy SILT (ML); reddish brown (5YR 5/4); dry; soft; low plasticity; 60% silt; 40% fine to very coarse sand; subrounded; trace gravel to 3.5 cm; no odor.	ML	- Cement Seal	
40				Silty SAND (SM); reddish brown (5YR 5/4); dry; loose; 70% fine to very coarse sand; 5% gravel to 2 cm; subangular; 25% silt; no odor.	SM		Total depth @ 0945. Resume @ 1010. Driller adding H2O for dust suppression.
45				Sandy SILT (ML); reddish brown (5YR 5/4); dry; soft; low plasticity; 60% silt; 40% fine to very coarse sand; subrounded; trace gravel to 3.5 cm; no odor.	ML	- Top of High Solids Bentonite Grout	
-				Silty SAND (SM); reddish brown (5YR 5/4); dry; loose; 70% fine to very coarse sand; 5% gravel to 2 cm; subangular; 25% silt; no odor.	SM		
50				Well graded SAND (SW); reddish brown (5YR 5/3); wet; loose; 90% fine to very coarse sand; subangular; 5% gravel to 1 cm; 5% silt; no odor.		- High Solids Bentonite Grout	
55				Same as above (48 ft).	SW		Total depth @ 1030. Resume @ 1045.
60							



Ground Elevation AMSL (ft): 5331.95 Y Coordinate: 1478960.18 X Coordinate: 1544920.21

### Borehole ID: KAFB-106204

Project Name: KAFB BFF SWMU ST-106 and SS-111 Project Number: 140705

Hole Diameter Upper (in.): 11-3/4" Hole Diameter Lower (in.) 9- 5/8" Groundwater Levels BGS (ft): ✓ At Time of Drilling: 477.15
 ✓ At End Of Drilling: N/A
 ✓ After Drilling: N/A
 ✓ Drilling Contractor: Yellow Jacket
 Drilling Method: Air Rotary Casing Hammer Logged By: Rachel Daly/P.Ostrye

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g Depth (ft)	Sample Lype	Number	Headspace PID	Lithologic Log	Material Description	U.S.C.S.	Well Diagram	Remarks
65					Well graded SAND with gravel (SW); pinkish gray (5YR 6/2); wet; loose; 80% medium to very coarse sand; 20% gravel to 1.5 cm; subangular; no odor.	SW		
70				<u>· · · · ·</u>	Silty SAND (ML); reddish brown (5YR 5/3); wet; loose; 70% fine to medium sand; subrounded; 30% silt; no odor.	ML		
70					SILT (ML); reddish brown (5YR 4/4); wet; soft; low plasticity; 90% silt; 10% fine to medium sand; no odor.	ML	- High Solids Bentonite Grout	
- - - 80					Well graded SAND with gravel; pinkish gray (5YR 6/2); 80% medium to very coarse sand; 20% gravel to 1.5 cm; subangular; no odor.	SW		Total depth casing @ 1115. Resume @ 1121.
85					Sandy lean CLAY (CL); reddish brown (5YR 4/4); wet; firm; 60% clay with minor silt; 40% fine to coarse sand; subrounded; no odor.	CL		
90					Same as above (80 ft). SILT (ML); reddish brown (5YR 5/3); soft; wet; low to medium plasticity; 95% silt with minor clay; 5% very fine sand; no odor.	 ML		



Ground Elevation AMSL (ft): 5331.95 Y Coordinate: 1478960.18 X Coordinate: 1544920.21

## Borehole ID: KAFB-106204

Project Name: KAFB BFF SWMU ST-106 and SS-111 Project Number: 140705

Hole Diameter Upper (in.): 11-3/4" Hole Diameter Lower (in.) 9- 5/8" Groundwater Levels BGS (ft): ✓ At Time of Drilling: 477.15
 ✓ At End Of Drilling: N/A
 ✓ After Drilling: N/A
 ✓ Drilling Contractor: Yellow Jacket
 Drilling Method: Air Rotary Casing Hammer Logged By: Rachel Daly/P.Ostrye

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g Depth (ft)	Sample Type	Number	Headspace PID	Lithologic Log		U.S.C.S.	Well Diagram	Remarks
					SILT (ML); reddish brown (5YR 5/3); wet; soft; low to medium plasticity ; 95% silt with minor clay; 5% very fine sand; no odor.			
95	-				Same as above (90 ft); significant clay content.		•       •       •       •         •       •       •       •         •       •       •       •         •       •       •       •         •       •       •       •         •       •       •       •         •       •       •       •         •       •       •       •         •       •       •       •         •       •       •       •         •       •       •       •         •       •       •       •         •       •       •       •	Total depth @ 1200. Resume @ 1320.
100					Same as above (90 ft).		- High Solids Bentonite Grout	
105					Same as above (90 ft).	ML	•       •       •         •       •       •         •       •       •         •       •       •         •       •       •         •       •       •         •       •       •         •       •       •         •       •       •         •       •       •         •       •       •         •       •       •         •       •       •         •       •       •         •       •       •	
<u>110</u>	-				Same as above (90 ft).			
115					Same as above (90 ft).		V       V       V       V         V       V       V       V         V       V       V       V         V       V       V       V         V       V       V       V         V       V       V       V         V       V       V       V         V       V       V       V         V       V       V       V         V       V       V       V         V       V       V       V         V       V       V       V         V       V       V       V         V       V       V       V         V       V       V       V	Total depth @ 1340. Resume @ 1345.
120								



Ground Elevation AMSL (ft): 5331.95 Y Coordinate: 1478960.18 X Coordinate: 1544920.21

## Borehole ID: KAFB-106204

Project Name: KAFB BFF SWMU ST-106 and SS-111 Project Number: 140705

Hole Diameter Upper (in.): 11-3/4" Hole Diameter Lower (in.) 9- 5/8" Groundwater Levels BGS (ft): ✓ At Time of Drilling: 477.15
 ✓ At End Of Drilling: N/A
 ✓ After Drilling: N/A
 ✓ Drilling Contractor: Yellow Jacket
 Drilling Method: Air Rotary Casing Hammer Logged By: Rachel Daly/P.Ostrye

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			••••••	01102					-
12 Depth (ft)	Sample Type	Number	Headspace PID	Lithologic Log	Material Description	U.S.C.S.	W	/ell Diagram	Remarks
125	-				Lean CLAY (CL); reddish brown (5YR 5/3); wet; firm; medium plasticity; 95% clay with minor silt; 5% fine sand; no odor. Sandy CLAY (CL); reddish brown (5YR 5/3); wet; firm; medium plasticity; 70% clay; 30% fine to coarse sand; subrounded; no odor.				
<u>130</u>	-				Same as above (125 ft).				
135					Same as above (125 ft).	CL		- High Solids Bentonite Grout	Total depth casing @ 1420. Resume @ 1435.
<u>140</u>	-				Lean CLAY (CL); reddish brown (5YR 5/3); wet; soft; low to medium plasticity; 95% clay with minor silt; 5% fine sand; no odor.				
145	-				Same as above (140 ft).				
150								• • • • • •	



Ground Elevation AMSL (ft): 5331.95 Y Coordinate: 1478960.18 X Coordinate: 1544920.21

## Borehole ID: KAFB-106204

Project Name: KAFB BFF SWMU ST-106 and SS-111 Project Number: 140705

Hole Diameter Upper (in.): 11-3/4" Hole Diameter Lower (in.) 9- 5/8" Groundwater Levels BGS (ft): ✓ At Time of Drilling: 477.15
 ✓ At End Of Drilling: N/A
 ✓ After Drilling: N/A
 ✓ Drilling Contractor: Yellow Jacket
 Drilling Method: Air Rotary Casing Hammer Logged By: Rachel Daly/P.Ostrye

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05 Depth (ft)	Sample Type	Number	Headspace	Lithologic Log	Material Description	U.S.C.S.	Well Diagram	Remarks
155	-				Lean CLAY (CL); reddish brown (5YR 5/3); soft; wet; low to medium plasticity; 95% clay and silt; 5% very fine sand; no odor. Same as above (150 ft).	CL	•       •       •         •       •       •	Total depth @ 1500. Resume @ 1520.
<u>160</u>	-				No cuttings returned.		<ul> <li>High Solids</li> <li>Bentonite</li> <li>Grout</li> </ul>	
<u>165</u>	-				Poorly graded SAND (SP); brown (10YR 5/3); wet; loose; 100% fine to medium sand; subrounded; no odor.			
170	-				Same as above (165 ft).	SP		
175	-				SILT (ML); reddish brown (5YR 5/3); soft; wet; low plasticity; 90% silt; 10% very fine sand; no odor.	ML		Total Depth @ 1615. Resume @ 1625.



Ground Elevation AMSL (ft): 5331.95 Y Coordinate: 1478960.18 X Coordinate: 1544920.21

## Borehole ID: KAFB-106204

Project Name: KAFB BFF SWMU ST-106 and SS-111 Project Number: 140705

Hole Diameter Upper (in.): 11-3/4" Hole Diameter Lower (in.) 9- 5/8" Groundwater Levels BGS (ft): ✓ At Time of Drilling: 477.15
 ✓ At End Of Drilling: N/A
 ✓ After Drilling: N/A
 ✓ Drilling Contractor: Yellow Jacket
 Drilling Method: Air Rotary Casing Hammer Logged By: Rachel Daly/P.Ostrye

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8 Depth (ft)	Sample Type	Number	Headspace	Lithologic Loa	Material Description	U.S.C.S.	Well Diagr	ram Remarks
	_				SILT (ML); reddish brown (5YR 4/4); soft; wet; low plasticity; 90% silt; 10% fine sand; subrounded; no odor.			
185	-				Same as above (180 ft).	ML		
190	-				Well graded SAND (SW); brown (10YR 4/3); wet; loose; 90% fine to very coarse sand; 5% gravel to 1.5 cm; subrounded; 5% silt.		- High S Bentor Grout	olids ite
195					Well graded SAND with gravel (SW); brown (10YR 5/3); wet; loose; 75% fine to very coarse sand; 25% gravel to 1.5 cm; subrounded; no odor.	SW		Total depth @ 1655. Resume @ 1325 on 8/23/12.
200					Same as above (195 ft).			Total Depth with 11 3/4" casing. Begin drilling with 9 5/8" casing.
205					Same as above (195 ft); 70% fine to coarse sand; 30% gravel to 1 cm; subrounded; trace clay nodules.			



Ground Elevation AMSL (ft): 5331.95 Y Coordinate: 1478960.18 X Coordinate: 1544920.21

### Borehole ID: KAFB-106204

Project Name: KAFB BFF SWMU ST-106 and SS-111 Project Number: 140705

Hole Diameter Upper (in.): 11-3/4" Hole Diameter Lower (in.) 9- 5/8" Groundwater Levels BGS (ft): ✓ At Time of Drilling: 477.15
 ✓ At End Of Drilling: N/A
 ✓ After Drilling: N/A
 ✓ Drilling Contractor: Yellow Jacket
 Drilling Method: Air Rotary Casing Hammer Logged By: Rachel Daly/P.Ostrye

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Depth (ft)	Sample Type	Num	Headspace PID	Lithologic Log	Material Description	U.S.C.S.	Well Diagram	Remarks
	_				Poorly graded SAND (SP); brown (10YR 5/3); moist; loose; 95% fine to medium sand; subrounded; 5% silt.	SP		
215	-				Same as above (210 ft).			Total depth @ 1535. Resume @ 1544.
220	-				Well graded SAND with gravel (SW); brown (10YR 4/3); wet; loose; 60% fine to coarse sand; 40% gravel to 3.5 cm; subrounded;no odor.	SW		
0.05	-				Poorly graded SAND (SP); brown (10YR 4/3); wet; loose; 100% fine to medium sand; subrounded; no odor.	SP	- High Solids - High Solids Bentonite Grout	
225	-				Well graded SAND with gravel (SW); brown (10YR 5/3); wet; loose; 70% fine to very coarse sand; 30% gravel to 2 cm; subrounded; no odor.		- • • • • • • • • • • • • • • • • • • •	
<u>230</u>	-				Same as above (225 ft); 75% fine to coarse sand; 25% gravel.	SW		Pumice present.
235	-				Well graded SAND (SW); brown (10YR 5/3); wet; loose; 95% fine to coarse sand; subrounded; 5% silt; no odor.			Total depth @ 1623. Resume @ 1615.
240								



Ground Elevation AMSL (ft): 5331.95 Y Coordinate: 1478960.18 X Coordinate: 1544920.21

## Borehole ID: KAFB-106204

Project Name: KAFB BFF SWMU ST-106 and SS-111 Project Number: 140705

Hole Diameter Upper (in.): 11-3/4" Hole Diameter Lower (in.) 9- 5/8" Groundwater Levels BGS (ft): ✓ At Time of Drilling: 477.15
 ✓ At End Of Drilling: N/A
 ✓ After Drilling: N/A
 ✓ Drilling Contractor: Yellow Jacket
 Drilling Method: Air Rotary Casing Hammer Logged By: Rachel Daly/P.Ostrye

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55 Depth (ft)	Sample Ty	Number	Headspac	Lithologic Log	Material Description	U.S.C.S.	Well Dia	gram	Remarks
	_				Well graded SAND (SW); brown (10YR 5/3); wet; loose; 100% fine to very coarse sand; trace gravel to 0.7 cm; subrounded; no odor.				
245	-				Same as above (240 ft).				
250	_				Same as above (240 ft).	SW			
255	-				Same as above (240 ft).		- High Bento Grout	Solids onite t	Total depth @ 1630. Resume @ 1635.
260	-				Same as above (240 ft).				
265					Poorly graded SAND (SP); brown (10YR 5/3); wet; loose; 100% fine to medium sand; subrounded; no odor.	SP			
270									



Ground Elevation AMSL (ft): 5331.95 Y Coordinate: 1478960.18 X Coordinate: 1544920.21

## Borehole ID: KAFB-106204

Project Name: KAFB BFF SWMU ST-106 and SS-111 Project Number: 140705

Hole Diameter Upper (in.): 11-3/4" Hole Diameter Lower (in.) 9- 5/8" Groundwater Levels BGS (ft): ✓ At Time of Drilling: 477.15
 ✓ At End Of Drilling: N/A
 ✓ After Drilling: N/A
 ✓ Drilling Contractor: Yellow Jacket
 Drilling Method: Air Rotary Casing Hammer Logged By: Rachel Daly/P.Ostrye

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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 with gravel (SW); brown (10YR 5/3); wet; loose; 70% fine to very coarse sand; 30% gravel to 2 cm, subrounded; no odor.			
275	_				Well graded SAND (SW); brown (10YR 5/3); wet; loose; 100% fine to coarse sand, subrounded; no odor.	SW	•       •       •       •         •       •       •       •         •       •       •       •         •       •       •       •         •       •       •       •         •       •       •       •         •       •       •       •         •       •       •       •         •       •       •       •         •       •       •       •         •       •       •       •         •       •       •       •         •       •       •       •         •       •       •       •         •       •       •       •	Total Depth @ 1700. Resume @ 0847 on 8/24/12.
280	-				Poorly graded SAND (SP); brown (10YR 5/3); wet; loose; 95% fine to medium sand, trace coarse sand, subrounded; 5% silt.		<ul> <li>High Solids</li> <li>Bentonite</li> <li>Grout</li> </ul>	
285	-				Same as above (280 ft).		•     •     •       •     •     •       •     •     •       •     •     •       •     •     •       •     •     •       •     •     •       •     •     •       •     •     •       •     •     •       •     •     •       •     •     •       •     •     •	
290	-				Same as above (280 ft).	SP	•     •     •       •     •     •       •     •     •       •     •     •       •     •     •       •     •     •       •     •     •       •     •     •       •     •     •       •     •     •       •     •     •       •     •     •       •     •     •       •     •     •       •     •     •       •     •     •       •     •     •	
295	-				Same as above (280 ft).		•       •       •       •         •       •       •       •         •       •       •       •         •       •       •       •         •       •       •       •         •       •       •       •         •       •       •       •         •       •       •       •         •       •       •       •         •       •       •       •         •       •       •       •         •       •       •       •         •       •       •       •         •       •       •       •         •       •       •       •         •       •       •       •         •       •       •       •	Total Depth @ 0910. Resume @ 0920.
300								



Ground Elevation AMSL (ft): 5331.95 Y Coordinate: 1478960.18 X Coordinate: 1544920.21

## Borehole ID: KAFB-106204

Project Name: KAFB BFF SWMU ST-106 and SS-111 Project Number: 140705

Hole Diameter Upper (in.): 11-3/4" Hole Diameter Lower (in.) 9- 5/8" Groundwater Levels BGS (ft): ✓ At Time of Drilling: 477.15
 ✓ At End Of Drilling: N/A
 ✓ After Drilling: N/A
 ✓ Drilling Contractor: Yellow Jacket
 Drilling Method: Air Rotary Casing Hammer Logged By: Rachel Daly/P.Ostrye

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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); brown (10YR 5/3); wet; loose; 100% fine to coarse sand, subangular; no odor	SW		
	-				Poorly graded SAND (SP); brown (10YR 4/3); wet; loose; 100% fine to medium sand; trace coarse sand, subrounded.	SP		
310	_				Well graded SAND (SW); brown (10YR 5/3); wet; loose; 95% fine to very coarse sand, subrounded; 5% gravel to 1.5 cm; no odor.		- High Solids Bentonite Grout	
315	_				Same as above (310 ft).		•       •       •         •       •       •         •       •       •         •       •       •         •       •       •         •       •       •         •       •       •         •       •       •         •       •       •         •       •       •         •       •       •         •       •       •         •       •       •         •       •       •         •       •       •         •       •       •	Total Depth @ 0944. Resume @ 0952.
320	_				Same as above (310 ft). 100% fine to coarse sand.	SW	•       •       •       •         •       •       •       •         •       •       •       •         •       •       •       •         •       •       •       •         •       •       •       •         •       •       •       •         •       •       •       •         •       •       •       •         •       •       •       •         •       •       •       •         •       •       •       •         •       •       •       •         •       •       •       •         •       •       •       •	
325					Same as above (320 ft).			
330	1							



Ground Elevation AMSL (ft): 5331.95 Y Coordinate: 1478960.18 X Coordinate: 1544920.21

## Borehole ID: KAFB-106204

Project Name: KAFB BFF SWMU ST-106 and SS-111 Project Number: 140705

Hole Diameter Upper (in.): 11-3/4" Hole Diameter Lower (in.) 9- 5/8" Groundwater Levels BGS (ft): ✓ At Time of Drilling: 477.15
 ✓ At End Of Drilling: N/A
 ✓ After Drilling: N/A
 ✓ Drilling Contractor: Yellow Jacket
 Drilling Method: Air Rotary Casing Hammer Logged By: Rachel Daly/P.Ostrye

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65 Depth (ft)	Sample Type	Number	Headspace PID	Lithologic Log	Material Description	U.S.C.S.	Well Diagr	ram Remarks
	_				Well graded SAND (SW); brown (10YR 4/3); wet; loose; 100% fine to coarse sand, subrounded; no odor.			
335	-				Well graded SAND with gravel (SW); brown (10YR 4/3); wet; loose; 60% fine to coarse sand; 40% gravel to 2.5 cm, subrounded; no odor			Total Depth @ 1011. Resume @ 1044.
340	-				Well graded SAND (SW); brown (10YR 4/3); wet; loose; 100% fine to coarse sand; trace gravel to 1 cm, subrounded; no odor.	SW	- High S Bentor Grout	olids lite
345	-				Same as above (340 ft).			
350	-				Poorly graded SAND (SP); brown (10YR 4/3); wet; loose; 100% fine to medium sand, subrounded; no odor.			
355 	-				Same as above (350 ft).	SP	•     •     •     •       •     •     •     •       •     •     •     •       •     •     •     •       •     •     •     •       •     •     •     •       •     •     •     •       •     •     •     •       •     •     •     •       •     •     •     •       •     •     •     •       •     •     •     •       •     •     •     •       •     •     •     •       •     •     •     •	Total Depth @ 1103. Resume @ 1111.
360								



Ground Elevation AMSL (ft): 5331.95 Y Coordinate: 1478960.18 X Coordinate: 1544920.21

## Borehole ID: KAFB-106204

Project Name: KAFB BFF SWMU ST-106 and SS-111 Project Number: 140705

Hole Diameter Upper (in.): 11-3/4" Hole Diameter Lower (in.) 9- 5/8" Groundwater Levels BGS (ft): ✓ At Time of Drilling: 477.15
 ✓ At End Of Drilling: N/A
 ✓ After Drilling: N/A
 ✓ Drilling Contractor: Yellow Jacket
 Drilling Method: Air Rotary Casing Hammer Logged By: Rachel Daly/P.Ostrye

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90 Depth (ft)	Sample Type	Number	Headspace PID	Lithologic Log	Material Description	U.S.C.S.	Well Diagram	Remarks
365	-				Well graded SAND (SW); brown (10YR 5/3); wet; loose; 100% fine to coarse sand, subrounded; no odor.			
- - 370	-				Same as above (360 ft). Same as above (360 ft).		•       •       •         •       •       •	
375	-				Well graded SAND with gravel (SW); brown (10YR 5/3); wet; loose; 70% fine to coarse sand; 30% gravel to 3 cm; subrounded; no odor.	sw	- High Solids Bentonite Grout	Total Depth @ 1135. Resume @ 1145.
- 380 -	-				Well graded SAND (SW); brown (10YR 5/3); wet; loose; 100% fine to very coarse sand, subrounded; no odor.		•       •       •       •         •       •       •       •         •       •       •       •         •       •       •       •         •       •       •       •         •       •       •       •         •       •       •       •         •       •       •       •         •       •       •       •         •       •       •       •         •       •       •       •         •       •       •       •         •       •       •       •         •       •       •       •         •       •       •       •         •       •       •       •         •       •       •       •         •       •       •       •	
385	-				Well graded GRAVEL with sand (GW); wet; loose; brown (10YR 5/3); 70% gravel to 1 cm; 30% coarse sand, subrounded.	GW		
390				; • ; ;			•     •     •       •     •     •       •     •     •       •     •     •	



Ground Elevation AMSL (ft): 5331.95 Y Coordinate: 1478960.18 X Coordinate: 1544920.21

### Borehole ID: KAFB-106204

Project Name: KAFB BFF SWMU ST-106 and SS-111 Project Number: 140705

Hole Diameter Upper (in.): 11-3/4" Hole Diameter Lower (in.) 9- 5/8" Groundwater Levels BGS (ft): ✓ At Time of Drilling: 477.15
 ✓ At End Of Drilling: N/A
 ✓ After Drilling: N/A
 ✓ Drilling Contractor: Yellow Jacket
 Drilling Method: Air Rotary Casing Hammer Logged By: Rachel Daly/P.Ostrye

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66 Depth (ft)	Sample Type	Num	Headspace PID	Lithologic Log	Material Description	U.S.C.S.	Well Diagram	Remarks
	_				Well graded SAND (SW); brown (10YR 5/3); wet; loose; 100% fine to coarse sand, subrounded; no odor.			
<u>395</u>	-				Same as above (390 ft); trace gravel to 1.5 cm.		•       •       •       •         •       •       •       •         •       •       •       •         •       •       •       •         •       •       •       •         •       •       •       •         •       •       •       •         •       •       •       •         •       •       •       •         •       •       •       •         •       •       •       •         •       •       •       •         •       •       •       •         •       •       •       •         •       •       •       •         •       •       •       •         •       •       •       •	Total Depth @ 1215. Resume @ 0832 on 8/27/12.
<u>400</u>	-				Well graded SAND (SW); very dark grayish brown (10YR 3/2); wet; loose; 100% very fine to very coarse sand; rounded; no odor.	SW	- High Solids Bentonite	
<u>405</u>	-				Same as above (400 ft); dark grayish brown (10YR 4/2); subangular.		Grout	
<u>410</u>	-				Poorly graded SAND (SP); grayish brown (10YR 5/2); dry; loose; 100% fine to medium sand, subrounded, no odor.			
<u>415</u>	-				Same as above (400 ft); trace gravel to 1 cm.	SP	Image: Second	Total depth @ 0910. Resume @ 0919.
420	-							



Ground Elevation AMSL (ft): 5331.95 Y Coordinate: 1478960.18 X Coordinate: 1544920.21

## Borehole ID: KAFB-106204

Project Name: KAFB BFF SWMU ST-106 and SS-111 Project Number: 140705

Hole Diameter Upper (in.): 11-3/4" Hole Diameter Lower (in.) 9- 5/8" Groundwater Levels BGS (ft): ✓ At Time of Drilling: 477.15
 ✓ At End Of Drilling: N/A
 ✓ After Drilling: N/A
 ✓ Drilling Contractor: Yellow Jacket
 Drilling Method: Air Rotary Casing Hammer Logged By: Rachel Daly/P.Ostrye

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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); grayish brown (10YR 5/2); dry; loose; 95% fine to medium sand, subrounded; 5% silt; no odor.	SP	S Top of Bentonite Seal	
425								
					Well graded SAND (SW); brown (10YR 5/3); dry; loose; 90% fine to coarse sand; 10% gravel to 1 cm, subrounded; no odor.	SW		
430	-				Lean CLAY (CL); reddish brown (5YR 4/4); dry; firm; medium plasticity; 90% clay; 10% coarse sand; subrounded; no odor.	CL		
	-				Poorly graded SAND (SP); yellowish brown (10YR 5/4); dry; loose; 95% fine to medium sand; 5% coarse sand; subrounded; no odor.			
435	-				Same as above (431 ft).	SP		Total Depth @ 0958. Resume @ 1018.
440					Same as above (431 ft).			
					SILT (ML); reddish brown (5YR 4/4); soft; moist; low plasticity; 90% silt; 10% very fine sand; subrounded; no odor.	ML		
445					Poorly graded SAND with silt (SP); dry; loose; 90% fine to medium sand; subrounded; 10% silt; no odor.	SP	- Bentonite Seal	
450								



Ground Elevation AMSL (ft): 5331.95 Y Coordinate: 1478960.18 X Coordinate: 1544920.21

## Borehole ID: KAFB-106204

Project Name: KAFB BFF SWMU ST-106 and SS-111 Project Number: 140705

Hole Diameter Upper (in.): 11-3/4" Hole Diameter Lower (in.) 9- 5/8" Groundwater Levels BGS (ft): ✓ At Time of Drilling: 477.15
 ✓ At End Of Drilling: N/A
 ✓ After Drilling: N/A
 ✓ Drilling Contractor: Yellow Jacket
 Drilling Method: Air Rotary Casing Hammer Logged By: Rachel Daly/P.Ostrye

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(ft) 50 Depth (ft)	Sample Type	Number	Headspace	Lithologic Log	Material Description		Well Diagram	Remarks
	-				Poorly graded SAND (SP); brown (10YR 5/3); dry; loose; 95% fine to medium sand, subrounded; 5% silt; no odor.			
455	-				Same as above (450 ft).	0.5	- Bentonite Seal - 5" Schedule 80 PVC Riser	Total Depth @ 1100. Resume @ 1230.
460	-				Poorly graded SAND (SP); brown (10YR 5/3); dry; loose; 100% fine to medium sand; trace coarse sand; subrounded; no odor.	SP	- Top of 20/40 Sand - Top of 10/20 Sand - Top of 5" Schedule 80 PVC 0.010"	
465	-				Well graded SAND (SW); grayish brown (10YR 5/2); dry; loose; 100% fine to coarse sand, subrounded; no odor.		Slot Screen	
470	-				Same as above (465 ft).			
475	-				Same as above (465 ft). ∑	SW		Total depth @ 1315. Resume @ 1325.
480	-							



Ground Elevation AMSL (ft): 5331.95 Y Coordinate: 1478960.18 X Coordinate: 1544920.21

## Borehole ID: KAFB-106204

Project Name: KAFB BFF SWMU ST-106 and SS-111 Project Number: 140705

Hole Diameter Upper (in.): 11-3/4" Hole Diameter Lower (in.) 9- 5/8" Groundwater Levels BGS (ft): ✓ At Time of Drilling: 477.15
 ✓ At End Of Drilling: N/A
 ✓ After Drilling: N/A
 ✓ Drilling Contractor: Yellow Jacket
 Drilling Method: Air Rotary Casing Hammer Logged By: Rachel Daly/P.Ostrye

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	000			01102	209900 23.	1.000		5
08 Depth (ft)	Sample Type	Number	Headspace PID	Lithologic Log	Material Description	U.S.C.S.	Well Diagram	Remarks
	-				Well graded SAND (SW); pale brown (10YR 6/3); dry; loose; 100% fine to very coarse sand, subrounded; trace gravel to 1 cm; no odor.			
485	-				Well graded SAND with gravel (SW); brown (10YR 5/3); dry; loose; 85% fine to very coarse sand; 15% gravel to 3 cm, subrounded; no odor.			
490	-				Well graded SAND (SW); pale brown (10YR 6/3); dry; loose; 100% fine to very coarse sand, subrounded; trace gravel to 1 cm; no odor.	SW	- Bottom of Screen	Driller not adding water. Moisture from water table.
495	-				Well graded SAND with gravel (SW); brown (10YR 5/3); moist; loose; 85% fine to very coarse sand; 15% gravel to 3 cm, subrounded; no odor.		- Sump - Bottom of Sump	Total Depth @ 1420. 1440 - P. Ostrye takes over as geologist. Begin advancing drive casing @ 1435.
500	-				No cuttings returned.		- Bottom of Filter Pack	
505	-				Poorly graded SAND (SP); brown (7.5YR 4/4); wet; medium dense; 95% fine to coarse sand, subangular to subrounded; 5% fines.	SP		Cuttings are sporadic. Driller adding ~ 20 gal/min of water @ 1520 to move cuttings to surface. 5 min ~ 100 gal.
510	-						- Native Backfil	Stop adding water.



Ground Elevation AMSL (ft): 5331.95 Y Coordinate: 1478960.18 X Coordinate: 1544920.21

## Borehole ID: KAFB-106204

Project Name: KAFB BFF SWMU ST-106 and SS-111 Project Number: 140705

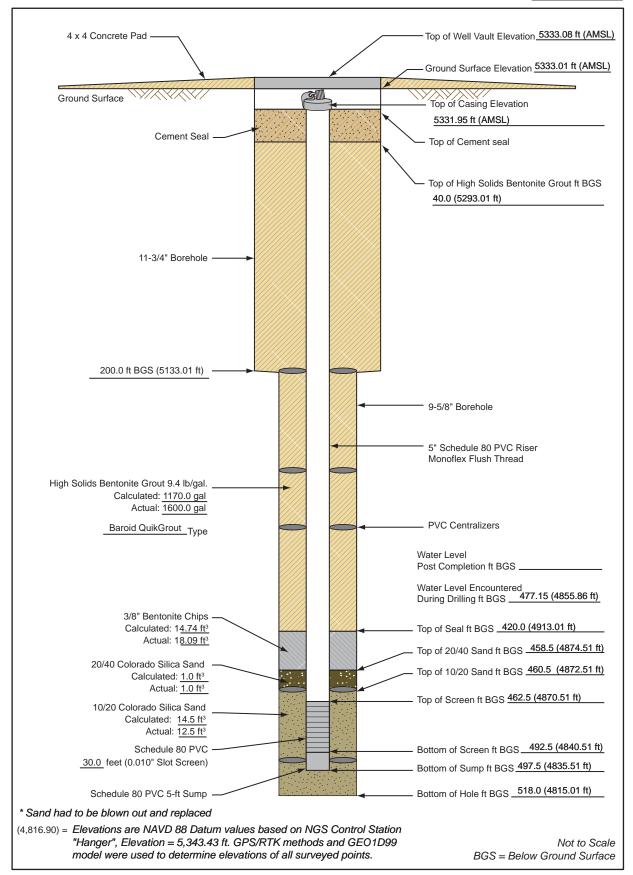
Hole Diameter Upper (in.): 11-3/4" Hole Diameter Lower (in.) 9- 5/8" Groundwater Levels BGS (ft): ✓ At Time of Drilling: 477.15
 ✓ At End Of Drilling: N/A
 ✓ After Drilling: N/A
 ✓ Drilling Contractor: Yellow Jacket
 Drilling Method: Air Rotary Casing Hammer Logged By: Rachel Daly/P.Ostrye

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L			 					
(#) (#) 51	Sample Type	Number	Headspace PID	Lithologic Log	Material Description	U.S.C.S.	Well Diagram	Remarks
51	-				Same as above (505 ft). Silty SAND (SM); brown (7.5YR 4/4); saturated; loose; 85% very fine to medium sand, angular to subrounded; 15% silt.	SP SM	- Native Backfill	1545 - Collect 4-1 L amber jars of saturated cuttings @ 513 ft bgs.
	_			1111 1111				Total depth of Borehole
<u>52</u>	0							<ul> <li>@ 518 ft. bgs.</li> <li>1555 - Begin adding ~ 30 gal/min of water. 1600 - used 250 gallons of water. Complete setting plug.</li> </ul>
<u>52</u>	5							
53	0							
	-							
<u>53</u>	5							
54	0							

### Monitoring Well Completion Diagram KAFB-106204

Installation Start Date/Time: <u>8/28/2012 @ 09:00</u> Installation End Date/Time: <u>8/29/2012 @ 16:15</u>





### Well Development Record

Pg 1 of 2

Project Nam	ne: KAFB BFI	F						
Location: Ke	entucky and k	Kathryn				204		
Personnel:	V. Bracht							
Date: 9/17/1	12					Csg. Diame	ter (I.D.): 5"	
Samplers: 1	N/A					Total Depth	(ft. BGL): 497	.5
Method of C X Surging	Development		X Bailing					
X Original Develo	pment		Redevelopmen	t		Other		
Developmer	nt Date: 9/17	7/12				_		
Depth to Wa	ater Before D	Developing V	Vell (ft. BGL)	: 477.69				
				Vol. (V)	Purge F	actor V	olume to Purge	9
Height of W	ater Column	:: <u>1</u>	feet = 36.	65 gal.	*	1 = 36	.65	
	V=(B * r <sub>c</sub> <sup>2</sup> * l	<sub>-c</sub> * 7.48)+(B	$(r_{w}^{2} - r_{c}^{2}) $	L <sub>s</sub> * Ø <sub>s</sub> * 7.48	B)+(H <sub>2</sub> O add	ed during dr	illing/installati	ion) = 886.65 gallons
Depth Purgi	ing From:	486 feet			Time Purgi	ng Begins: <u>C</u>	950, 9/17/12	
Weather: Pa	artly Cloudy,	Cool to Warn	n		Screened Ir	nterval (ft BG	i <b>L)</b> : <u>462.5 - 49</u>	2.5
Equipment	Nos.: pH Me	eter: LVE	002686		EC Meter:	LVE 0026	686	Turbidity Meter: LVE002384
Equipment	Decontamina	ated Prior to	Developme	nt:Y <u>X</u>	N			
	Steam Cleane							
Collected Sa Describe: N	ample of Wa ∦A	ter Added to	Well: Y	N >	<			
	850 gallons o	of water adde	ed during drilli	ng/well instal	lation activitie	es		
	•		*	*				
		Water Level (ft. Below	Volume Removed				Turbidity	
Date	Time	TOC)	(gal.)	Temp.°C	рН	EC (ms/cm)	N.T.U.	Comments
9/17/2012	0950	476.99	15	20.20	6.26	0.001*	>1000	Begin Bailing; Water is Muddy Brown
9/17/2012	1005		55	17.90	7.74	0.002*	>1000	Continue Bailing; Water is Brown
9/17/2012	1015		90	18.90	7.87	0.002*	>1000	Continue Bailing; Water is Brown
9/17/2012	1020		100					Bailed
9/17/2012	1125	476.98		21.70	7.67	1.280	>1000	Begin Pumping at 10 GPM
9/17/2012	1135	483.70	275	21.30	7.73	1.020	18.00	Water is Fairly Clear
9/17/2012	1145	484.50	375	20.80	7.73	1.000	25.10	Slow Pump Down to 9 GPM
9/17/2012	1155	483.45	475	21.40	7.71	1.030	2.50	Water is Clear
9/17/2012	1205	483.81	575	21.70	7.71	1.040	2.41	Water is Clear

Notes:

9/17/2012

\* Water Levels - Reported to the nearest 0.01 foot

1215

484.22

675

21.50

\* PH - Reading rounded to 0.1 pH units \* Water temperature - Reported to nearest 0.1C \* Turbidity report in NTV nearest whole # GPM = Gallons Per Minute

Where:

7.70

B=3.14

1.060

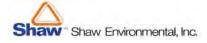
 $\mathcal{O}_{s}$ = porosity of the sand pack

8.10 Slow Pump Down to 8 GPM

 $r_{\rm s}$  = radius of the well casing and screen in feet  $L_c$  = length of water column inside the casing and screen in feet  $r_{\rm w}$ = radius of the well bore in feet

 $\mathbf{L}_{\mathbf{s}}\text{=}$  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: 9/17/12

Time Start: 0950, 9/17/12

Well No: KAFB-106204

Samplers: N/A

Checked By: N/A

Time Finish: 1245, 9/17/12

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
9/17/2012	1225	483.01	750	21.70	7.69	1.090	1.74	Water is Clear
9/17/2012	1235	483.15	825	21.60	7.69	1.090	1.84	Water is Clear
9/17/2012	1245	483.30	925	21.60	7.68	1.080	1.79	Water is Clear; Pump off; Total Removed

\* Due to sample cup design, the YSI Professional Plus does not accurately measure EC from the cup. Sample cup works well in a flow-through set-up, once pumping begins.

Was well sampled after development? YES NO X

Sample Method:	N/A

Sample Name: N/A

Analyses: N/A

Pg 2 of 2

# KAFB 106205



Ground Elevation AMSL (ft): 5333.4 Y Coordinate: 1479079.44 X Coordinate: 1544721.95

## Borehole ID: KAFB-106205

Project Name: KAFB BFF SWMU ST-106 and SS-111 Project Number: 140705

Hole Diameter Upper (in.): 11-3/4 Hole Diameter Lower (in.) 9 5/8 Groundwater Levels BGS (ft): 

 Image: Groundwater Levels BGS (n).

 Image: Weight of the second Logged By: Rachel Daly

Page 1 of 18

Oepth (ft)	Sample Type	Number	Headspace PID	Lithologic Log	Material Description	U.S.C.S.	Well Diagram	n Remarks
	-				disturbed; no description		- Top of Cer Seal	1147 Begin Drilling. ment
	-				SILT (ML); reddish brown (5YR 4/4); soft; dry; low plasticity; 90% silt (some clay); 10% fine sand; rounded; no odor. Same as above (5 ft).	ML		
	-				Lean CLAY (CL); reddish brown (5YR 4/4); soft; moist; medium plasticity; 90% clay with minor silt; 10% fine sand; rounded; no odor.	CL		
	-				SILT (ML); reddish brown (5YR 4/4); soft; moist; low plasticity; 90% silt; 10% fine sand; subrounded; no odor.		- Cement Si	<sup>eal</sup> Total depth casing @ 1155. Resume @ 1315.
20	-				SILT with sand (ML); yellowish red (5YR 4/6); soft; dry; low plasticity; 80% silt; 20% fine to coarse sand; subrounded; no odor.	ML		
25	-				SILT with sand (ML); yellowish red (5YR 4/6) soft; dry; low plasticity; 75% silt w/clay nodules; 20% fine to coarse sand; 5% gravel to 2 cm.			
30								



Ground Elevation AMSL (ft): 5333.4 Y Coordinate: 1479079.44 X Coordinate: 1544721.95

# Borehole ID: KAFB-106205

Project Name: KAFB BFF SWMU ST-106 and SS-111 Project Number: 140705

Hole Diameter Upper (in.): 11-3/4 Hole Diameter Lower (in.) 9 5/8 Groundwater Levels BGS (ft): 

 Image: Groundwater Levels BGS (n).

 Image: Weight of Markowski (Markowski (Mar Logged By: Rachel Daly

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			_					
ର Depth (ft)	Sample Type	Number	Headspace PID	Lithologic Log	Material Description	U.S.C.S.	Well Diagram	Remarks
-	_				Sandy SILT (ML); reddish brown (5YR 4/4); soft; non plastic; dry; 65% silt; 25% fine to very coarse sand; subrounded;	ML	Oregoing the second secon	Total donth assing @
35	-				10% gravel to 1.5 cm; no odor. Well graded SAND (SW); dark reddish gray (10YR 4/2); moist; loose; 95% fine to coarse sand; 5% gravel to 1.5 cm; subrounded. Same as above (32 ft).	SW	•       •       •         •       •       •	Total depth casing @ 1330. Resume @ 1347.
40	-				SILT (ML); reddish brown (5YR 4/4) soft; moist; low plasticity; 90% silt; 10% fine to coarse sand; no odor.			
45	-				Sandy SILT (ML); reddish gray (5YR 5/2) soft; moist; low plasticity; 70% silt; 30% fine to coarse sand; subrounded; no odor.	ML	•       •       •         •       •       •         •       •       •         •       •       •         •       •       •         •       •       •         •       •       •         •       •       •         •       •       •         •       •       •         •       •       •         •       •       •         •       •       •         •       •       •         •       •       •         •       •       •	
50	-				Same as above (45 ft).		- High Solids Bentonite Grout	
55					Lean CLAY (CL); reddish brown (5YR 4/3); firm, moist; medium plasticity; 90% clay; 10% medium to coarse sand; subangular; no odor.	CL		Total depth casing @ 1403. Resume @ 1415.



Ground Elevation AMSL (ft): 5333.4 Y Coordinate: 1479079.44 X Coordinate: 1544721.95

# Borehole ID: KAFB-106205

Project Name: KAFB BFF SWMU ST-106 and SS-111 Project Number: 140705

Hole Diameter Upper (in.): 11-3/4 Hole Diameter Lower (in.) 9 5/8 Groundwater Levels BGS (ft): 

 Image: Groundwater Levels BGS (n).

 Image: Weight of Markowski (Markowski (Mar Logged By: Rachel Daly

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1					66 ,		•	
g Depth (ft)	Sample Type	Number	Headspace PID	Lithologic Log	Material Description	U.S.C.S.	Well Diagram	Remarks
65	_				SILT (ML); yellowish red (5YR 4/6); soft; moist; low plasticity; 90% silt; 10% fine to medium sand; subrounded; no odor.	ML		
- 00	-				Same as above (60ft).			
70					Lean CLAY (CL); yellowish red (5YR 4/6); firm; moist, medium plasticity; 90% clay with minor silt; 10% fine to medium sand; subrounded; no odor.	CL		
75	-				SILT (ML); yellowish red (5YR 4/6); soft; moist; low plasticity; 90% silt; 10% fine to medium sand; subrounded; no odor.	ML	- High Solids Bentonite Grout	
80	-				Lean CLAY (CL); yellowish red (5YR 4/6); firm; moist; medium plasticity; 90% clay; 10% fine to coarse sand; subangular; no odor.	CL		Total depth casing @ 1433. Resume @ 0813 on 8/14/12.
-	-				SILT (ML); reddish brown (5YR 4/4); soft; moist; low to medium plasticity, 90% silt with minor clay; 10% fine to medium sand.			
85	-				Same as above (80 ft); significant amount of clay present.	ML		
90	-							



Ground Elevation AMSL (ft): 5333.4 Y Coordinate: 1479079.44 X Coordinate: 1544721.95

# Borehole ID: KAFB-106205

Project Name: KAFB BFF SWMU ST-106 and SS-111 Project Number: 140705

Hole Diameter Upper (in.): 11-3/4 Hole Diameter Lower (in.) 9 5/8 Groundwater Levels BGS (ft): ✓ At Time of Drilling: 477.15
 ✓ At End Of Drilling: N/A
 ✓ After Drilling: 477.05
 Drilling Contractor: Yellow Jacket
 Drilling Method: Air Rotary Casing Hammer Logged By: Rachel Daly

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© 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); soft; moist; low to medium plasticity; 90% silt with minor clay; 10% fine to medium sand; rounded; no odor; clay content increasing	ML		Driller adding water.
95				Lean CLAY (CL); reddish brown (5YR 4/4); firm; medium plasticity; 85% clay with minor silt; 15% medium to coarse sand; subrounded; no odor.	CL		Total depth casing @ 0855. Resume @ 0940.
-				No cuttings returned	_	- High Solids Bentonite Grout	
105				No cuttings returned			
110				No cuttings returned			
115				Lean CLAY (CL); reddish brown (5YR 4/4); firm; medium plasticity; 85% clay with minor silt; 15% medium to coarse sand; subrounded; no odor.	CL		Total depth @ 0953 Resume @ 1000.
120						• •     • •       • •     • •       • •     • •       • •     • •	



Ground Elevation AMSL (ft): 5333.4 Y Coordinate: 1479079.44 X Coordinate: 1544721.95

# Borehole ID: KAFB-106205

Project Name: KAFB BFF SWMU ST-106 and SS-111 Project Number: 140705

Hole Diameter Upper (in.): 11-3/4 Hole Diameter Lower (in.) 9 5/8 Groundwater Levels BGS (ft): 

 Image: Groundwater Levels BGS (n).

 Image: Weight of Markowski (Markowski (Mar Logged By: Rachel Daly

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0 Depth (ft)	Sample Type	Number	Headspace	Lithologic Log		U.S.C.S.	Well Diagram	Remarks
125	-				Lean CLAY (CL); reddish brown (5YR 4/4); firm; wet; medium plasticity; 95% clay; 5% medium to coarse sand; subangular; no odor. Same as above (120 ft)		•       •       •       •         •       •       •       •         •       •       •       •         •       •       •       •         •       •       •       •         •       •       •       •         •       •       •       •         •       •       •       •         •       •       •       •         •       •       •       •         •       •       •       •         •       •       •       •         •       •       •       •         •       •       •       •         •       •       •       •         •       •       •       •         •       •       •       •	
130 -					Same as above (120 ft)		•       •       •       •         •       •       •       •         •       •       •       •         •       •       •       •         •       •       •       •         •       •       •       •         •       •       •       •         •       •       •       •         •       •       •       •         •       •       •       •         •       •       •       •         •       •       •       •         •       •       •       •         •       •       •       •         •       •       •       •         •       •       •       •         •       •       •       •         •       •       •       •         •       •       •       •	
135					Same as above (120 ft)	CL	- High Solids Bentonite Grout	Total depth casing @ 1012. Resume @ 1022.
140 					Same as above (120 ft)		•       •       •       •         •       •       •       •         •       •       •       •         •       •       •       •         •       •       •       •         •       •       •       •         •       •       •       •         •       •       •       •         •       •       •       •         •       •       •       •         •       •       •       •         •       •       •       •         •       •       •       •         •       •       •       •         •       •       •       •         •       •       •       •         •       •       •       •         •       •       •       •	
<u>145</u>	-				No cuttings returned.		•     •     •       •     •     •       •     •     •       •     •     •       •     •     •       •     •     •       •     •     •       •     •     •       •     •     •       •     •     •       •     •     •       •     •     •       •     •     •       •     •     •       •     •     •       •     •     •       •     •     •       •     •     •       •     •     •	
150								



Ground Elevation AMSL (ft): 5333.4 Y Coordinate: 1479079.44 X Coordinate: 1544721.95

# Borehole ID: KAFB-106205

Project Name: KAFB BFF SWMU ST-106 and SS-111 Project Number: 140705

Hole Diameter Upper (in.): 11-3/4 Hole Diameter Lower (in.) 9 5/8 Groundwater Levels BGS (ft): 

 Image: Groundwater Levels BGS (n).

 Image: Weight of Markowski (Markowski (Mar Logged By: Rachel Daly

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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); reddish brown (5YR 5/4); soft; wet; low plasticity; 60% silt; 40% fine to very coarse sand; trace gravel to 2 cm; subangular; no odor.	ML		
<u>155</u>	-				No cuttings returned.	_		Total depth @ 1032. Resume @ 1038.
<u>160</u>	-				No cuttings returned.		- High Solids Bentonite Grout	
<u>165</u>	-				No cuttings returned.			
170	-				Sandy SILT (ML); reddish brown (5YR 5/4); soft; wet; low plasticity; 60% silt; 40% fine to very coarse sand; trace gravel to 2 cm; subangular; no odor.			
175					Same as above (170 ft).	ML		Total depth @ 1053.
180								



Ground Elevation AMSL (ft): 5333.4 Y Coordinate: 1479079.44 X Coordinate: 1544721.95

# Borehole ID: KAFB-106205

Project Name: KAFB BFF SWMU ST-106 and SS-111 Project Number: 140705

Hole Diameter Upper (in.): 11-3/4 Hole Diameter Lower (in.) 9 5/8 Groundwater Levels BGS (ft): 

 Image: Groundwater Levels BGS (n).

 Image: Weight of Markowski (Markowski (Mar Logged By: Rachel Daly

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8 Depth (ft)	Sample Type	Number	Headspace	Lithologic Log	Material Description	U.S.C.S.	Well Diagram	Remarks
-	-				Well graded SAND with gravel (SW); reddish brown (5YR 5/3); wet; loose; 80% fine to very coarse sand; subrounded; 20% gravel to 2 cm; no odor.	SW		
185	-			<u>******</u>	No cuttings returned.			
190 - - -					No cuttings returned.		- High Solids Bentonite Grout	
195	-				Well graded SAND with gravel (SW); reddish brown (5YR 5/3); wet; loose; 80% fine to very coarse sand; subrounded; 20% gravel to 2 cm; no odor.	SW	•       •       •         •       •       •         •       •       •         •       •       •         •       •       •         •       •       •         •       •       •         •       •       •         •       •       •         •       •       •         •       •       •         •       •       •         •       •       •         •       •       •         •       •       •         •       •       •         •       •       •         •       •       •	Total depth casing @ 1120. Resume @ 1640.
200	-				Poorly graded SAND (SP); brown (10YR 5/4); dry; loose; 100% medium to coarse sand; subrounded; no odor.		•     •       •     •       •     •       •     •       •     •       •     •       •     •       •     •       •     •       •     •       •     •       •     •       •     •       •     •       •     •       •     •       •     •       •     •       •     •       •     •	Total depth with 11 3/4" casing. Begin with 9 5/8" casing.
205	-				Same as above (200 ft).	SP		



Ground Elevation AMSL (ft): 5333.4 Y Coordinate: 1479079.44 X Coordinate: 1544721.95

# Borehole ID: KAFB-106205

Project Name: KAFB BFF SWMU ST-106 and SS-111 Project Number: 140705

Hole Diameter Upper (in.): 11-3/4 Hole Diameter Lower (in.) 9 5/8 Groundwater Levels BGS (ft): 

 Image: Groundwater Levels BGS (n).

 Image: Weight of Markowski (Markowski (Mar Logged By: Rachel Daly

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_			••••••	04472				•
01 Depth (ft)	Sample Type	Number	Headspace	Lithologic Log	Material Description	U.S.C.S.	Well Diagram	Remarks
-					Poorly graded SAND (SP); brown (10YR 5/3); dry; loose; 100% fine to medium sand; trace gravel to 2 cm; subrounded; no odor.			
<u>215</u> -					Same as above (210 ft).	SP	•       •       •       •         •       •       •       •         •       •       •       •         •       •       •       •         •       •       •       •         •       •       •       •         •       •       •       •         •       •       •       •         •       •       •       •         •       •       •       •         •       •       •       •         •       •       •       •         •       •       •       •	Total depth @ 1655. End 8/14/12. Resume @ 0831 on 8/15/12.
220					Same as above (210 ft).		- High Solids Bentonite Grout	
225					Well graded SAND (SW); brown (10YR 4/3); dry; loose; 95% very fine to very coarse sand; subrounded; 5% silt; no odor.	SW		
230					Poorly graded SAND (SP); brown (10YR 4/3); dry; loose; 100% fine to medium sand; subrounded; no odor.	SP		
235					Well graded SAND (SW); brown (10YR 4/3); dry; loose; 95% very fine to coarse sand; subrounded; 5% silt; no odor.	sw		Total depth @ 0825. Resume @ 0831.
240								



Ground Elevation AMSL (ft): 5333.4 Y Coordinate: 1479079.44 X Coordinate: 1544721.95

# Borehole ID: KAFB-106205

Project Name: KAFB BFF SWMU ST-106 and SS-111 Project Number: 140705

Hole Diameter Upper (in.): 11-3/4 Hole Diameter Lower (in.) 9 5/8 Groundwater Levels BGS (ft): 

 Image: Groundwater Levels BGS (n).

 Image: Weight of Markowski (Markowski (Mar Logged By: Rachel Daly

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							-	
5 Depth (ft)	Sample Type	Number	Headspace PID	Lithologic Log	Material Description	U.S.C.S.	Well Diagram	Remarks
245	-				Poorly graded SAND (SP); brown (10YR 4/3); dry; loose; 100% fine to medium sand; subrounded; no odor. As above (240 ft); trace coarse sand.	SP	•       •       •       •         •       •       •       •         •       •       •       •         •       •       •       •         •       •       •       •         •       •       •       •         •       •       •       •         •       •       •       •         •       •       •       •         •       •       •       •         •       •       •       •         •       •       •       •         •       •       •       •         •       •       •       •         •       •       •       •         •       •       •       •         •       •       •       •         •       •       •       •         •       •       •       •         •       •       •       •	
<u>250</u>	-				As above (240 ft).		•       •       •       •         •       •       •       •         •       •       •       •         •       •       •       •         •       •       •       •         •       •       •       •         •       •       •       •         •       •       •       •         •       •       •       •         •       •       •       •         •       •       •       •         •       •       •       •         •       •       •       •	
<u>255</u>	-				Well graded SAND with gravel (SW); brown (10YR 5/3); dry; loose; 80% very fine to very coarse sand; subrounded; 20% gravel to 3 cm; subrounded; no odor. Same as above (252 ft).		- High Solids Bentonite Grout	Total depth casing @ 0838. Resume @ 0843.
260	_				Well graded SAND (SW); brown (10YR 5/3); dry; loose; 10% fine to coarse sand; subrounded; no odor.	SW	•       •       •       •         •       •       •       •         •       •       •       •         •       •       •       •         •       •       •       •         •       •       •       •         •       •       •       •         •       •       •       •         •       •       •       •         •       •       •       •         •       •       •       •         •       •       •       •         •       •       •       •         •       •       •       •         •       •       •       •         •       •       •       •         •       •       •       •         •       •       •       •	
265	-				Same as above (260 ft).		•       •       •       •         •       •       •       •         •       •       •       •         •       •       •       •         •       •       •       •         •       •       •       •         •       •       •       •         •       •       •       •         •       •       •       •         •       •       •       •         •       •       •       •         •       •       •       •         •       •       •       •         •       •       •       •         •       •       •       •         •       •       •       •         •       •       •       •         •       •       •       •	
270	1							



Ground Elevation AMSL (ft): 5333.4 Y Coordinate: 1479079.44 X Coordinate: 1544721.95

# Borehole ID: KAFB-106205

Project Name: KAFB BFF SWMU ST-106 and SS-111 Project Number: 140705

Hole Diameter Upper (in.): 11-3/4 Hole Diameter Lower (in.) 9 5/8 Groundwater Levels BGS (ft): 

 Image: Groundwater Levels BGS (n).

 Image: Weight of Markowski (Markowski (Mar Logged By: Rachel Daly

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2 Depth (ft)	Sample Type	Number	Headspace PID	Lithologic Log		U.S.C.S.	M	/ell Diagram	Remarks
	-				Poorly graded SAND (SP); brown (10YR 4/3); dry; loose; 100% fine to medium sand; subrounded; no odor.		1 1 1		
275	-				Same as above (270 ft); trace gravel to 2 cm.				Total depth @ 0850. Resume @ 0857.
<u>280</u>	-				Same as above (270 ft).				
285	-				Same as above (270 ft).	SP			
<u>290</u>	-				Same as above (270 ft).			- High Solids Bentonite Grout	
<u>295</u>	-				Same as above (270 ft).				Total depth @ 0904. Resume @ 0912.
300								• • • • • •	



Ground Elevation AMSL (ft): 5333.4 Y Coordinate: 1479079.44 X Coordinate: 1544721.95

# Borehole ID: KAFB-106205

Project Name: KAFB BFF SWMU ST-106 and SS-111 Project Number: 140705

Hole Diameter Upper (in.): 11-3/4 Hole Diameter Lower (in.) 9 5/8 Groundwater Levels BGS (ft): 

 Image: Groundwater Levels BGS (n).

 Image: Weight of Markowski (Markowski (Mar Logged By: Rachel Daly

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00 Depth (ft)	Sample Type	Num	Headspace PID	Lithologic Log	Material Description	U.S.C.S.	Well Diagram	Remarks
305	_				Poorly graded SAND (SP); brown (10YR 4/3); dry; loose; 100% fine to medium sand; subrounded; no odor. Poorly graded SAND with gravel (SP); brown; (10YR 4/3); dry; loose; 85% fine to medium sand; 15% gravel to 1 cm; rounded.	SP		
<u>310</u> <u>315</u>	_				Well graded SAND w/gravel (SW); brown (10YR 4/3); dry; loose; 80% fine to very coarse sand; 20% gravel to 3 cm; subrounded; no odor. Same as above (307 ft). Well graded SAND (SW); brown (10YR 5/3); dry; loose; 100% fine to very coarse sand; subrounded; no odor.	SW		Total depth @ 0922. Resume @ 0928.
320	-				Well graded GRAVEL (GW); grayish brown (10YR 5/2;) dry; loose; 90% fine gravel to 4 cm; 10% coarse sand; subrounded; no odor. Well graded SAND w/gravel (SW); brown (10YR 4/3); dry; loose; 70% fine	GW	•     •     •       •     •     •       -     •     •       •     •     •       •     •     •       •     •     •       •     •     •       •     •     •       •     •     •       •     •     •       •     •     •       •     •     •       •     •     •       •     •     •       •     •     •       •     •     •       •     •     •       •     •     •       •     •     •	
325	_				to very coarse sand; 30% gravel to 1 cm; subrounded; no odor. Poorly graded SAND (SP); brown (10YR 4/3); dry; loose; 100% fine to medium sand; trace gravel to 3 cm; rounded; no odor.	SW  SP		
330	-						•     •     •       •     •     •       •     •     •       •     •     •       •     •     •       •     •     •       •     •     •	



Ground Elevation AMSL (ft): 5333.4 Y Coordinate: 1479079.44 X Coordinate: 1544721.95

# Borehole ID: KAFB-106205

Project Name: KAFB BFF SWMU ST-106 and SS-111 Project Number: 140705

Hole Diameter Upper (in.): 11-3/4 Hole Diameter Lower (in.) 9 5/8 Groundwater Levels BGS (ft): 

 Image: Groundwater Levels BGS (n).

 Image: Weight of Markowski (Markowski (Mar Logged By: Rachel Daly

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	· · ·			· · ·				
g Depth (ft)	Sample Type	Number	Headspace	Lithologic Log		U.S.C.S.	Well Diagram	Remarks
-	_				Well graded SAND w/gravel (SW); brown (10YR 5/3); dry; loose; 60% fine to very coarse sand; 40% gravel to 3 cm; subrounded; no odor.			
335	-				As above (330 ft); 75% fine to coarse sand; 25% gravel to 3 cm.	SW	•       •       •         •       •       •         •       •       •         •       •       •         •       •       •         •       •       •         •       •       •         •       •       •         •       •       •         •       •       •         •       •       •         •       •       •         •       •       •         •       •       •         •       •       •         •       •       •         •       •       •         •       •       •	Total depth @ 0940. Resume @ 0951.
340	-				Poorly graded SAND (SP); brown (10YR 5/3); dry; loose; 100% fine to medium sand; subrounded; no odor.	SP	- High Solids Bentonite Grout	
350	-				Poorly graded SAND with silt (SP-SM); brown (10YR 5/3); dry; loose; 90% fine sand; subrounded; 10% silt, no odor.	SP- SM		
-	-				Poorly graded SAND (SP); brown (10YR 5/3); dry; loose; 100% fine to medium sand; subrounded; no odor.			
355	-				Same as above (350 ft).	SP		Total depth @ 1003. Resume @ 1011.
360								



Ground Elevation AMSL (ft): 5333.4 Y Coordinate: 1479079.44 X Coordinate: 1544721.95

# Borehole ID: KAFB-106205

Project Name: KAFB BFF SWMU ST-106 and SS-111 Project Number: 140705

Hole Diameter Upper (in.): 11-3/4 Hole Diameter Lower (in.) 9 5/8 Groundwater Levels BGS (ft): 

 Image: Groundwater Levels BGS (n).

 Image: Weight of Markowski (Markowski (Mar Logged By: Rachel Daly

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00 Depth (ft)	Sample Type	Number	Headspace	Lithologic Log		U.S.C.S.	Well Diagram	Remarks
-	-				Well graded SAND (SW); brown (10YR 5/3); dry; loose; 100% fine to very coarse sand; subangular; no odor.			
<u>365</u>	-				Same as above (360 ft).		•       •       •       •         •       •       •       •         •       •       •       •         •       •       •       •         •       •       •       •         •       •       •       •         •       •       •       •         •       •       •       •         •       •       •       •         •       •       •       •         •       •       •       •         •       •       •       •         •       •       •       •         •       •       •       •         •       •       •       •	
370	-				Well graded SAND with gravel (SW); brown (10YR 4/3); dry; loose; 70% fine to very coarse sand; 30% gravel to 2 cm; no odor.		•       •       •         •       •       •         •       •       •         •       •       •         •       •       •         •       •       •         •       •       •         •       •       •         •       •       •         •       •       •         •       •       •         •       •       •         •       •       •         •       •       •         •       •       •         •       •       •         •       •       •         •       •       •	
375					Same as above (370 ft).	SW	- High Solids Bentonite Grout	Total depth @ 1025. Resume @ 1034.
380	-				Same as above (370 ft).		•     •     •       •     •     •       •     •     •       •     •     •       •     •     •       •     •     •       •     •     •       •     •     •       •     •     •       •     •     •       •     •     •       •     •     •       •     •     •       •     •     •       •     •     •       •     •     •	
385	-				Well graded SAND (SW); brown (10YR 4/3); dry; loose; 100% fine to coarse sand; no odor.		•       •       •       •         •       •       •       •         •       •       •       •         •       •       •       •         •       •       •       •         •       •       •       •         •       •       •       •         •       •       •       •         •       •       •       •         •       •       •       •         •       •       •       •         •       •       •       •         •       •       •       •         •       •       •       •         •       •       •       •         •       •       •       •         •       •       •       •         •       •       •       •	
390								



Ground Elevation AMSL (ft): 5333.4 Y Coordinate: 1479079.44 X Coordinate: 1544721.95

# Borehole ID: KAFB-106205

Project Name: KAFB BFF SWMU ST-106 and SS-111 Project Number: 140705

Hole Diameter Upper (in.): 11-3/4 Hole Diameter Lower (in.) 9 5/8 Groundwater Levels BGS (ft): 

 Image: Groundwater Levels BGS (n).

 Image: Weight of Markowski (Markowski (Mar Logged By: Rachel Daly

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					00 ,		,	
66 Depth (ft)	Sample Type	Numt	Headspace	Lithologic Log	Material Description	U.S.C.S.	Well Diagram	Remarks
	-				Well graded SAND (SW); brown (10YR 5/3); dry; loose; 100% fine to very coarse sand; subrounded; no odor.	SW		
<u>395</u> 400	_				Gravelly SILT (ML); reddish brown (5YR 5/4); soft; dry; low plasticity; 60% silt; 40% gravel to 6 cm; rounded; no odor.	ML		Total depth @ 1044. Resume @ 1250.
-00	-				Silty SAND (SM); brown (10YR 5/3); dry; loose; 80% fine sand; subrounded; 20% silt; no odor.	SM		
405	_				Well graded SAND (SW); brown (10YR 4/3); dry; loose; 95% fine to coarse sand; 5% gravel to 1 cm; subrounded; no odor.	SW		
410					Poorly graded SAND (SP); brown (10YR 4/3); dry; loose; 100% fine to medium sand: no odor.	SP	- High Solids Bentonite Grout	
<u>415</u> 420	-				Well graded SAND (SW); brown (10YR 4/3); dry; loose; 100% fine to coarse sand; trace gravel to 1 cm; subrounded; no odor.	sw	•     •     •     •       •     •     •     •	Total depth @ 1305. Resume @ 1317.



Ground Elevation AMSL (ft): 5333.4 Y Coordinate: 1479079.44 X Coordinate: 1544721.95

# Borehole ID: KAFB-106205

Project Name: KAFB BFF SWMU ST-106 and SS-111 Project Number: 140705

Hole Diameter Upper (in.): 11-3/4 Hole Diameter Lower (in.) 9 5/8 Groundwater Levels BGS (ft): 

 Image: Groundwater Levels BGS (n).

 Image: Weight of Markowski (Markowski (Mar Logged By: Rachel Daly

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					209900 23		-	
65 Depth (ft)	Sample Type	Number	Headspace PID	Lithologic Log	Material Description	U.S.C.S.	Well Diagram	Remarks
425	-				Well graded SAND (SW); brown (10YR 4/3); dry; loose; 100% fine to coarse sand; subrounded; no odor. Same as above (420 ft).	SW		
<u>430</u>	-				Poorly graded SAND (SP); brown (10YR 5/3); dry; loose; 95% fine to medium sand; trace coarse sand; 5% silt; no odor. Same as above (427 ft).		- High Solids Bentonite	
<u>435</u>	_				Same as above (427 ft).	SP	Grout	Total depth @ 1335. Resume @ 1345.
440	-				SILT (ML); reddish brown (5YR 5/4); dry; soft; low plasticity; 90% silt; 10% fine sand; subrounded; trace clay nodules; no odor.	ML		
<u>445</u>	-				Silty SAND (SM); brown (10YR 5/3); dry; loose; 75% fine to medium sand; 25% silt; no odor. Same as above (443 ft).	SM		



Ground Elevation AMSL (ft): 5333.4 Y Coordinate: 1479079.44 X Coordinate: 1544721.95

# Borehole ID: KAFB-106205

Project Name: KAFB BFF SWMU ST-106 and SS-111 Project Number: 140705

Hole Diameter Upper (in.): 11-3/4 Hole Diameter Lower (in.) 9 5/8 Groundwater Levels BGS (ft): 

 Image: Groundwater Levels BGS (n).

 Image: Weight of Markowski (Markowski (Mar Logged By: Rachel Daly

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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 with silt (SP-SM); brown (10YR 5/3); dry; loose; 90% fine to medium sand; subrounded; 10% silt; no odor.	SP- SM	- Top of Bentonite Seal	
455	_				Poorly graded SAND (SP); brown (10YR 5/3); dry; loose; 100% fine to medium sand; subrounded; no odor.	SP		Total depth @ 1400. Resume @ 1408.
460	_				Well graded SAND (SW); brown (10YR 5/3); dry; loose; 100% fine to very coarse sand; subrounded; no odor.	SW	-5" Schedule 80 PVC Riser	
405	_				Poorly graded SAND (SP); brown (10YR 5/3); dry; loose; 100% fine to medium sand; subrounded; no odor.	SP		
475	_				Well graded SAND (SW); brown (10YR 5/3); dry; loose; 100% fine to very coarse sand; subrounded; no odor. Well graded SAND with GRAVEL (SW); brown (10YR 5/3); dry: loose; 80% fine to very coarse sand; 20% gravel to 2 cm; subrounded; no odor.	SW		Tatal darith @ 4424
480	_				Poorly graded SAND (SP); brown (10YR 5/3); moist; loose; 100% fine to medium sand; subrounded; no odor.	SP		Total depth @ 1424. Resume 1432. Water level @ 477.15' bgs. Water level after drilling.



Ground Elevation AMSL (ft): 5333.4 Y Coordinate: 1479079.44 X Coordinate: 1544721.95

# Borehole ID: KAFB-106205

Project Name: KAFB BFF SWMU ST-106 and SS-111 Project Number: 140705

Hole Diameter Upper (in.): 11-3/4 Hole Diameter Lower (in.) 9 5/8 Groundwater Levels BGS (ft): ✓ At Time of Drilling: 477.15
 ✓ At End Of Drilling: N/A
 ✓ After Drilling: 477.05
 Drilling Contractor: Yellow Jacket
 Drilling Method: Air Rotary Casing Hammer Logged By: Rachel Daly

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8 Depth (ft)	Sample Type	Number	Headspace PID	Lithologic Log		U.S.C.S.	Well Diagram	Remarks
	_				Poorly graded SAND (SP); brown (10YR 4/3); moist; loose; 95% fine to medium sand; 5% gravel to 2 cm; subrounded; no odor.			
485	-				Same as above (480 ft); damp.		- Top of 20/40 Sand	
490	-				Same as above (480 ft); damp; 90% sand; 10% gravel to 3 cm.		- Top of 10/20 Sand	
<u>495</u>	-				Same as above (480 ft); damp.	SP	- Top of 5" Schedule 80 PVC 0.010" Slot Screen	Total depth @ 1453. Resume @ 1501.
500	-				Same as above (480 ft); 100% fine to medium sand.			
505	_				Same as above (500 ft).		- Bottom of	
510	-						Screen - Sump	



Ground Elevation AMSL (ft): 5333.4 Y Coordinate: 1479079.44 X Coordinate: 1544721.95

# Borehole ID: KAFB-106205

Project Name: KAFB BFF SWMU ST-106 and SS-111 Project Number: 140705

Hole Diameter Upper (in.): 11-3/4 Hole Diameter Lower (in.) 9 5/8 Groundwater Levels BGS (ft): 

 Image: Groundwater Levels BGS (n).

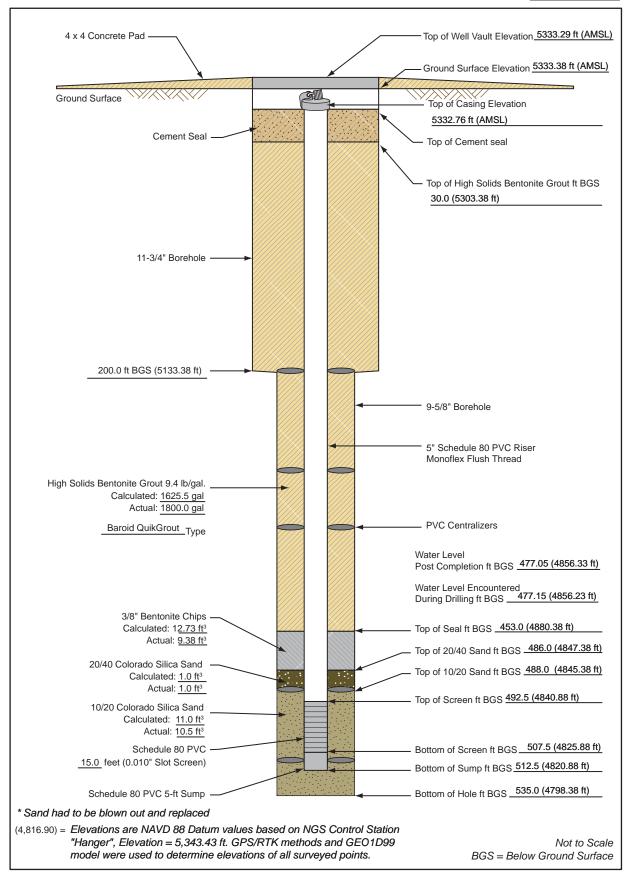
 Image: Weight of Markowski (Markowski (Mar Logged By: Rachel Daly

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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 (SP); brown (10YR 4/3); damp; loose; 100% fine to medium sand; subrounded; no odor.		-Bottom of Sump	
515	-				Same as above (510 ft).	SP	- Bottom of Filter Pack	Total Depth @ 1517. Resume @ 1525.
525	-				Well graded SAND w/gravel (SW); brown (10YR 4/3); wet; loose; 70% medium to very coarse sand; 30% gravel to 2.5 cm; subrounded.	SW		
530	-				Poorly graded SAND (SP); brown (10YR 5/3); wet; loose; 100% fine to medium sand; subrounded; no odor.	SP	- Native Backfill	
550	-				No recovery.			
535	-							Total depth of boring @ 1540.
540								

## Monitoring Well Completion Diagram KAFB-106205

Installation Start Date/Time: <u>8/16/2012 @ 13:00</u> Installation End Date/Time: <u>8/21/2012 @ 11:00</u>





## Well Development Record

Project Nam	ne: KAFB BFI	=						
Location: Ke	entucky and k	Kathryn				Well/Piez. N	o.: KAFB-106	205
Personnel:	V. Bracht					Date Installe	ed: 8/21/12	
Date: 9/14/1	12					Csg. Diamet	er (I.D.): 5"	
Samplers: 1	N/A					Total Depth	(ft. BGL): <u>512</u>	.5
Method of C X Surging	Development		X Bailing			X Pumping		
X Original Develo	pment		Redevelopment	t		Other		
Developmer	nt Date: 9/14	/12				_		
Depth to Wa	ater Before D	eveloping V	Vell (ft. BGL)	: 478.52				
				Vol. (V)	Purge F	actor V	olume to Purge	9
Height of W	ater Column	:1	feet = 51.	21 gal.	* ·	1 = 51.	.21	
	V (D + - 2 + 1	* 7 40\ · (D	* (- 2 - 2) *					
			^ (r <sub>w</sub> r <sub>c</sub> -) ^	L <sub>s</sub> ^ Ø <sub>s</sub> ^ 7.48				on) = 801.21 gallons
	ing From: <u></u>		_		•	ng Begins: 0		
	artly Cloudy,						L): <u>492.5 - 50</u>	
Equipment	Nos.: pH Me	ter: LVE	002686	I	EC Meter:	LVE 00268	0	Turbidity Meter: LVE002384
Equipment	Decontamina	ated Prior to	Developme	nt∵V X	N			
• •	Steam Cleane		Developine	nt. 1 <u> </u>	<u> </u>			
	ample of Wa		Well: Y	N	ĸ			
Describe: N								
Comment:	750 gallons o	of water adde	ed during drilli	ng/well instal	lation activitie	es		
		14/						
		Water Level (ft.	Volume					
Data	Time	Below	Removed	T 80		FC (ma (am)	Turbidity	Commente
Date	Time	TOC)	(gal.)	Temp.°C	рН	EC (ms/cm)	N.T.U.	Comments
9/14/2012	0855	477.72	20	17.90	6.52	NR*	>1000	Begin Bailing; Water is Muddy Brown
9/14/2012	0908		55	18.20	7.65	NR*	>1000	Continue Bailing; Water is Muddy Brown
9/14/2012	0923		100	17.80	7.79	NR*	>1000	Continue Bailing; Water is Brown
9/14/2012	1032	477.74		19.40	7.54	0.434	>1000	Begin Pumping at 10 GPM
1		411.14		10110			21000	
9/14/2012	1035	479.95	175	19.90	7.64	0.432		Water is Fairly Clear

Notes:

9/14/2012

9/14/2012

9/14/2012

9/14/2012

\* Water Levels - Reported to the nearest 0.01 foot

1055

1105

1115

1125

480.02

480.05

479.99

480.05

375

475

575

675

20.30

20.50

20.60

20.60

\* PH - Reading rounded to 0.1 pH units \* Water temperature - Reported to nearest 0.1C \* Turbidity report in NTV nearest whole # GPM = Gallons Per Minute

Where:

7.72

7.72

7.72

7.72

B=3.14

0.420

0.420

0.418

0.416

 $\mathcal{O}_{s}$ = porosity of the sand 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

19.70 Water is Fairly Clear

18.30 Water is Fairly Clear

9.74 Water is Clear

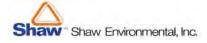
5.77 Water is Clear

 $\mathbf{r}_{\mathbf{w}}\!\!=\!\mathbf{radius}$  of the well bore in feet

 $\mathbf{L}_{\mathbf{s}}\text{=}$  length of saturated portion of the sand pack in feet

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

Pg 1 of 2



## Well Development Record

Project: KAFB BFF

Project Number: 140705

Date: 9/14/12

Time Start: 0855, 9/14/12

Well No: KAFB-106205

Samplers: N/A

Checked By: N/A

Time Finish: 1145, 9/14/12

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
9/14/2012		480.10		20.50				Water is Clear
9/14/2012	1145	480.11	875	20.50	7.75	0.429	3.38	Water is Clear; Pump off; Total Removed

\* Due to sample cup design, the YSI Professional Plus does not accurately measure EC from the cup. Sample cup works well in a flow-through set-up, once pumping begins.

Was well sampled after development? YES NO X

Sample Method: N/A

Sample Name: N/A

Analyses: N/A

# KAFB 106206



Ground Elevation AMSL (ft): 5333.7 Y Coordinate: 1479144.25 X Coordinate: 1544723.57

# Borehole ID: KAFB-106206

Project Name: KAFB BFF SWMU ST-106 and SS-111 Project Number: 140705

Hole Diameter Upper (in.): 11-3/4 Hole Diameter Lower (in.) 9- 5/8 Groundwater Levels BGS (ft): 

 Image: Groundwater Levels BGS (n).

 Image: Contractor of Contractor:

 Image: Contractor of Contractor:

 Image: Contractor of Contractor o Logged By: Rachel Daly

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o Depth (ft)	Sample Type	Number	Headspace PID	Lithologic Log		U.S.C.S.	Well Diagram	Remarks
	-				Disturbed from potholing		- Top of Cement Seal	1542 Begin drilling.
-	-				SILT with sand (ML); yellowish red (5YR 5/6); soft, dry, low plasticity; 80% silt; 20%very fine to coarse sand; no odor.			
<u>10</u> - -	-				Same as above (5 ft); 75% silt; 25% fine to coarse sand.	ML		
15	-				Same as above (5 ft); trace gravel to 2 cm		- Cement Seal	Total Depth Casing @ 1600.
20	-				Well graded SAND (SW); light reddish brown (5YR 6/3); dry; soft; no plasticity; 95% fine to very coarse sand, 5% silt; no odor.	SW		
<u>25</u> - - - -					Well graded SAND with silt (SW-SM); reddish brown (5YR 5/4); dry; loose; 90% very fine to very coarse sand; trace gravel to 2 cm; 10% silt; no odor.	SW- SM		



Ground Elevation AMSL (ft): 5333.7 Y Coordinate: 1479144.25 X Coordinate: 1544723.57

# Borehole ID: KAFB-106206

Project Name: KAFB BFF SWMU ST-106 and SS-111 Project Number: 140705

Hole Diameter Upper (in.): 11-3/4 Hole Diameter Lower (in.) 9- 5/8 Groundwater Levels BGS (ft): 

 Image: Groundwater Levels BGS (n).

 Image: Weight of the second Logged By: Rachel Daly

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(1)       10       10       10       10       Material Description       0; <t< th=""><th>ks</th></t<>	ks
35       Well graded SAND with gravel (SW); dry; loose; 80% very fine to very coarse sand; 20% gravel to 2.5 cm.       - Cement Seal         35       Same as above (30 ft).       - Top of High Solids Bentonite Grout       Total Depth Cas 1630. Resume Drilling on 7/17/12.         40       SILT (ML); yellowish red (5YR 4/6) soft; dry; low plasticity; 90% silt; 10% fine to very coarse sand; trace gravel to 1.5 cm.       - Top of High Solids       Total Depth Cas 1630. Resume Drilling on 7/17/12.	
40       Siller (ML); yellowish red (5YR 4/6) soft; dry; low plasticity; 90% silt; 10% fine to very coarse sand; trace gravel to 1.5 cm.       Siller (ML); solution is the second secon	
SILT (ML); yellowish red (5YR 4/6) soft; dry; low plasticity; 90% silt; 10% fine to very coarse sand; trace gravel to 1.5 cm.	
45 Well graded SAND (SW); yellowish red (5YR 4/6); dry; loose; 95% fine to very coarse sand; 5% gravel to 1 cm; no odor.	
50       Same as above (45 ft); 90% medium to very coarse sand; 10% gravel to 2 cm.       - High Solids Bentonite Grout         Lean CLAY (CL); yellowish red (5YR       - High Solids Court	
4/6); firm, moist; medium plasticity; 95%         55         Clay; 5%; fine to medium sand; no odor.	
SILT (ML); yellowish red (5YR 5/6); soft; moist; low plasticity; 95% silt; 5% very fine sand; no odor.       Total Depth Cas 0835. ML         60       ML	



Ground Elevation AMSL (ft): 5333.7 Y Coordinate: 1479144.25 X Coordinate: 1544723.57

# Borehole ID: KAFB-106206

Project Name: KAFB BFF SWMU ST-106 and SS-111 Project Number: 140705

Hole Diameter Upper (in.): 11-3/4 Hole Diameter Lower (in.) 9- 5/8 Groundwater Levels BGS (ft): 

 Image: Groundwater Levels BGS (n).

 Image: Weight of the second Logged By: Rachel Daly

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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 (ML); reddish brown (5YR 4/4); soft; dry; low plasticity; 80% silt; 20% fine to medium sand; no odor.			
65	-			SILT (ML); reddish brown (5YR 5/4); soft; moist; low plasticity; 95% silt; 5% very fine sand; no odor.		•       •       •         •       •       •         •       •       •         •       •       •         •       •       •         •       •       •         •       •       •         •       •       •         •       •       •         •       •       •         •       •       •         •       •       •         •       •       •         •       •       •         •       •       •	
	-			Same as above (65 ft).		- High Solids Bentonite	
75	-			Same as above (65 ft); 90% silt with minor clay; 10% fine to medium sand.	ML	Grout	Total Depth @ 0920 Resume @ 0926.
- 80 - -	-			Same as above (75 ft).		•       •       •         •       •       •         •       •       •         •       •       •         •       •       •         •       •       •         •       •       •         •       •       •         •       •       •         •       •       •         •       •       •         •       •       •         •       •       •         •       •       •         •       •       •	
85	-			Same as above (75 ft).		•       •       •         •       •       •         •       •       •         •       •       •         •       •       •         •       •       •         •       •       •         •       •       •         •       •       •         •       •       •         •       •       •         •       •       •         •       •       •         •       •       •         •       •       •         •       •       •	
90							



Ground Elevation AMSL (ft): 5333.7 Y Coordinate: 1479144.25 X Coordinate: 1544723.57

# Borehole ID: KAFB-106206

Project Name: KAFB BFF SWMU ST-106 and SS-111 Project Number: 140705

Hole Diameter Upper (in.): 11-3/4 Hole Diameter Lower (in.) 9- 5/8 Groundwater Levels BGS (ft): 

 Image: Groundwater Levels BGS (n).

 Image: Weight of the second Logged By: Rachel Daly

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ଓ 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); soft; dry; low plasticity, 90% silt; 10% fine to medium sand; trace coarse sand to 0.5 cm; no odor.			
95	-				Same as above (90 ft).		•       •       •       •         •       •       •       •         •       •       •       •         •       •       •       •         •       •       •       •         •       •       •       •         •       •       •       •         •       •       •       •         •       •       •       •         •       •       •       •         •       •       •       •         •       •       •       •         •       •       •       •	Total Depth @ 0955 Resume @ 1051.
<u>100</u>	-				Sandy SILT (ML); reddish brown (5YR 4/4); soft; dry; low plasticity; 70% silt; 30% fine to coarse sand; no odor.		- High Solids Bentonite Grout	
105					SILT (ML); yellowish red (5YR 4/6); soft; dry; low plasticity; 90% silt; 10% fine sand; no odor.	ML	•       •       •         •       •       •	
110					Same as above (105 ft); 10% fine to medium sand.			
115					Same as above (105 ft); 95% silt; 5% very fine sand.			Total Depth @ 1109 Resume @ 1118.
120								



Ground Elevation AMSL (ft): 5333.7 Y Coordinate: 1479144.25 X Coordinate: 1544723.57

# Borehole ID: KAFB-106206

Project Name: KAFB BFF SWMU ST-106 and SS-111 Project Number: 140705

Hole Diameter Upper (in.): 11-3/4 Hole Diameter Lower (in.) 9- 5/8 Groundwater Levels BGS (ft): 

 Image: Groundwater Levels BGS (n).

 Image: Weight of the second Logged By: Rachel Daly

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				0-1-12				-
05 Depth (ft)	Sample Type	Number	Headspace PID	Lithologic Log		U.S.C.S.	Well Diagram	Remarks
- - 125					No cuttings returned. Sandy SILT (ML); light reddish brown			Driller begins adding
- - 130					(5YR 6/4); soft; (wet/saturated) low to medium plasticity; 70% silt with minor clay; 30% fine to coarse sand. SILT ( ML); light reddish brown (5YR		•       •       •       •         •       •       •       •         •       •       •       •         •       •       •       •         •       •       •       •         •       •       •       •         •       •       •       •         •       •       •       •         •       •       •       •         •       •       •       •         •       •       •       •         •       •       •       •         •       •       •       •         •       •       •       •         •       •       •       •         •       •       •       •         •       •       •       •         •       •       •       •	water. Cuttings saturated.
- - 135					6/4); soft; low plasticity; 90% silt; 10% fine sand; no odor. Same as above (130 ft).		- High Solids Bentonite Grout	Total Depth@1140. End 7/17/12.
- - 140 -					SILT with sand (ML); light reddish brown (5YR 6/4); soft; saturated; low to medium plasticity; 75% silt with minor clay; 25%	ML	•       •       •       •         •       •       •       •         •       •       •       •         •       •       •       •         •       •       •       •         •       •       •       •         •       •       •       •         •       •       •       •         •       •       •       •         •       •       •       •         •       •       •       •         •       •       •       •         •       •       •       •         •       •       •       •         •       •       •       •         •       •       •       •         •       •       •       •	Resume @ 1230 on 7/18/12. Driller adding water. Cuttings saturated. Extremely difficult to log
- - 145 -					SILT (ML); light reddish brown (5YR 6/4); soft; low plasticity; 95% silt; 5% fine sand.		•       •       •         •       •       •         •       •       •         •       •       •         •       •       •         •       •       •         •       •       •         •       •       •         •       •       •         •       •       •         •       •       •         •       •       •         •       •       •         •       •       •         •       •       •         •       •       •         •       •       •         •       •       •	accurately.
150							•     •     •       •     •     •       •     •     •       •     •     •       •     •     •       •     •     •       •     •     •       •     •     •       •     •     •       •     •     •       •     •     •       •     •     •	



Ground Elevation AMSL (ft): 5333.7 Y Coordinate: 1479144.25 X Coordinate: 1544723.57

# Borehole ID: KAFB-106206

Project Name: KAFB BFF SWMU ST-106 and SS-111 Project Number: 140705

Hole Diameter Upper (in.): 11-3/4 Hole Diameter Lower (in.) 9- 5/8 Groundwater Levels BGS (ft): 

 Image: Groundwater Levels BGS (n).

 Image: Weight of the second Logged By: Rachel Daly

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15 Depth (ft)	Sample Type	Number	Headspace PID	Lithologic Log	Material Description	U.S.C.S.	Well Diagram	Remarks
	_				SILT (ML); light reddish brown (5YR 6/4); soft; low plasticity; 95% silt; 5% very fine sand; no odor.			Cuttings saturated.
155	-				Same as above (150 ft).	ML		Total Depth @ 1245. Resume @ 1355.
160	-				No cuttings returned.		- High Solids Bentonite	
165					No cuttings returned.		Grout	
170					Poorly graded SAND (SP); light yellowish brown (10YR 6/4); loose; 90% fine to medium sand; 5% silt; no odor.			
175					Same as above (170 ft).	SP		Total Depth @ 1315. Resume @ 1325.
180								



Ground Elevation AMSL (ft): 5333.7 Y Coordinate: 1479144.25 X Coordinate: 1544723.57

# Borehole ID: KAFB-106206

Project Name: KAFB BFF SWMU ST-106 and SS-111 Project Number: 140705

Hole Diameter Upper (in.): 11-3/4 Hole Diameter Lower (in.) 9- 5/8 Groundwater Levels BGS (ft): 

 Image: Groundwater Levels BGS (n).

 Image: Weight of the second Logged By: Rachel Daly

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08 Depth (ft)	Sample Type	Number	Headspace PID	Lithologic Log	Material Description	U.S.C.S.	Well Diagram	Remarks
	-				Lean CLAY with sand (CL); dark yellowish brown (10YR 4/4); firm; medium plasticity; 80% clay with minor silt; 20% medium to coarse sand; no odor.	CL		
185	-				Well graded SAND (SW); yellowish brown (10YR 5/4); loose; 90% fine to coarse sand; 10% silt. Same as above (183 ft).			
<u>190</u>	-				Well graded SAND with gravel (SW); brown (10YR 5/3); loose; 70% sand; medium to very coarse gravel to 3 cm; no odor.	SW	- High Solids Bentonite Grout	
195	-				Poorly graded SAND (SP); yellowish brown (10YR 5/4); loose; 95% fine to medium sand; 5% silt; no odor.	SP		Total depth @ 1345.
200	_				Well graded SAND (SW); brown (10YR 5/3); loose; 90% fine to very coarse sand; 10% gravel to 2 cm; no odor.			@200ft switch to 9 5/8" casing.
205	-				Same as above (200 ft); 100% fine to coarse sand.	SW		Resume drilling 7-23-12 @ 1435.
210							••• ••	



Ground Elevation AMSL (ft): 5333.7 Y Coordinate: 1479144.25 X Coordinate: 1544723.57

# Borehole ID: KAFB-106206

Project Name: KAFB BFF SWMU ST-106 and SS-111 Project Number: 140705

Hole Diameter Upper (in.): 11-3/4 Hole Diameter Lower (in.) 9- 5/8 Groundwater Levels BGS (ft): 

 Image: Groundwater Levels BGS (n).

 Image: Weight of the second Logged By: Rachel Daly

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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 yellowish brown (10YR 4/4); moist; loose; 100% very fine to coarse sand; no odor.			
215	-				Same as above (210 ft); 100% very fine to medium sand; trace coarse sands.			Total Depth casing @ 14:50. Resume drilling @ 1500.
220	-				Same as above (210 ft); dry; 95% fine to very coarse sand; 5% gravel to 3 cm.	SW		
225	-				Same as above (210 ft); 90% fine to medium sand; 10% coarse sands.		<ul> <li>High Solids</li> <li>Bentonite</li> <li>Grout</li> </ul>	
230	-				Same as above (210 ft).			
235					Poorly graded SAND (SP); pale brown (10YR 6/2); dry; loose; 100% very fine to medium sand; no odor.	SP		Total Depth casing @ 1515. Resume drilling @ 1520.
240								



Ground Elevation AMSL (ft): 5333.7 Y Coordinate: 1479144.25 X Coordinate: 1544723.57

# Borehole ID: KAFB-106206

Project Name: KAFB BFF SWMU ST-106 and SS-111 Project Number: 140705

Hole Diameter Upper (in.): 11-3/4 Hole Diameter Lower (in.) 9- 5/8 Groundwater Levels BGS (ft): 

 Image: Groundwater Levels BGS (n).

 Image: Weight of the second Logged By: Rachel Daly

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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 5/3); loose; dry; 95% fine to medium sand; 5% silt; no odor.	SP		
245					Well graded SAND (SW); brown (10YR 5/3); dry; loose; 100% fine to coarse sand; no odor.	sw		
					Poorly graded SAND (SP); brown (10YR 5/3); loose; dry; 95% fine to medium sand; 5% silt; no odor.	SP		
255	-				Well graded SAND with gravel (SW); grayish brown (10YR 5/2); dry; loose; 85% fine to very coarse sand; 15% gravel to 1 cm; no odor.		- High Solids Bentonite Grout	Total Depth casing @ 1530. Resume @ 1537.
260	-				As above (254 ft).	SW	•       •       •       •         •       •       •       •         •       •       •       •         •       •       •       •         •       •       •       •         •       •       •       •         •       •       •       •         •       •       •       •         •       •       •       •         •       •       •       •         •       •       •       •         •       •       •       •         •       •       •       •         •       •       •       •         •       •       •       •	
265					Poorly graded SAND (SP); light yellowish brown (10YR 6/4); dry; loose; 95% fine to medium sand; 5% silt; no odor.	SP	•       •       •       •         •       •       •       •         •       •       •       •         •       •       •       •         •       •       •       •         •       •       •       •         •       •       •       •         •       •       •       •         •       •       •       •         •       •       •       •         •       •       •       •         •       •       •       •         •       •       •       •         •       •       •       •         •       •       •       •         •       •       •       •         •       •       •       •         •       •       •       •	
270								



Ground Elevation AMSL (ft): 5333.7 Y Coordinate: 1479144.25 X Coordinate: 1544723.57

# Borehole ID: KAFB-106206

Project Name: KAFB BFF SWMU ST-106 and SS-111 Project Number: 140705

Hole Diameter Upper (in.): 11-3/4 Hole Diameter Lower (in.) 9- 5/8 Groundwater Levels BGS (ft): 

 Image: Groundwater Levels BGS (n).

 Image: Weight of the second Logged By: Rachel Daly

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02 Depth (ft)	Sample Type	Number	Headspace PID	Lithologic Log	Material Description	U.S.C.S.	Well Diagram	Remarks
	-				Poorly graded SAND (SP) pale brown (10YR 6/3) dry; loose; 95% fine to medium sand; 5% silt; no odor.			
275	-				Same as above (270 ft).			Total Depth casing @ 1550. Resume @ 1558.
280	-				Same as above (270 ft).	SP		
285	-				Same as above (270 ft); large (5 to 6 cm) chunks of lean clay entrained; trace gravel to 1.5 cm.		•       •       •       •         •       •       •       •         •       •       •       •         •       •       •       •         •       •       •       •         •       •       •       •         •       •       •       •         •       •       •       •         •       •       •       •         •       •       •       •         •       •       •       •         •       •       •       •         •       •       •       •         •       •       •       •         •       •       •       •         •       •       •       •         •       •       •       •         •       •       •       •         •       •       •       •	
<u>290</u>	-				Well graded SAND (SW); yellowish brown (10YR 5/4); dry; loose; 100% fine to coarse sand; no odor.		- High Solids Bentonite Grout	
295	-				Same as above (291 ft).	sw	•       •       •       •         •       •       •       •         •       •       •       •         •       •       •       •         •       •       •       •         •       •       •       •         •       •       •       •         •       •       •       •         •       •       •       •         •       •       •       •         •       •       •       •         •       •       •       •         •       •       •       •         •       •       •       •         •       •       •       •         •       •       •       •         •       •       •       •	Total Depth casing @ 1610. Resume @ 1620.
300								



Ground Elevation AMSL (ft): 5333.7 Y Coordinate: 1479144.25 X Coordinate: 1544723.57

# Borehole ID: KAFB-106206

Project Name: KAFB BFF SWMU ST-106 and SS-111 Project Number: 140705

Hole Diameter Upper (in.): 11-3/4 Hole Diameter Lower (in.) 9- 5/8 Groundwater Levels BGS (ft): 

 Image: Groundwater Levels BGS (n).

 Image: Weight of the second Logged By: Rachel Daly

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Image: Second State       Image: Second State<								,	
305       Well graded SAND (SW); brown (10YR 5/3; dry; loose; 100% fine to coarse sand; no odor.         305       Same as above (300 ft).         310       Same as above (300 ft).         315       Same as above (300 ft); trace gravel to 2 cm.         320       Well graded SAND with gravel (SW); gravish brown (10YR 5/2); dry; loose; 70% fine to very coarse sand; 30% gravel to 4 cm.         325       Poorly graded SAND (SP); yellowish brown (10YR 5/3); dry; loose; 90% fine to medium sand; 10% gravel to 2 cm.		ample	Number	Headspace PID	Lithologic Log	Material Description	U.S.C.S.	Well Diagram	Remarks
310       Same as above (300 ft).         311       Same as above (300 ft).         315       Same as above (300 ft); trace gravel to 2 cm.         316       Same as above (300 ft); trace gravel to 2 cm.         317       Same as above (300 ft); trace gravel to 2 cm.         318       Same as above (300 ft); trace gravel to 2 cm.         320       Well graded SAND with gravel (SW); gravish brown (10YR 5/2); dry; loose; 70% fine to very coarse sand; 30% gravel to 4 cm.         325       Poorty graded SAND (SP); yellowish brown (10YR 5/3); dry; loose; 90% fine to medium sand; 10% gravel to 2 cm.	-	-				5/3); dry; loose; 100% fine to coarse			
315       Same as above (300 ft).         315       Same as above (300 ft); trace gravel to 2 cm.         320       Well graded SAND with gravel (SW); grayish brown (10YR 5/2); dry; loose; 70% fine to very coarse sand; 30% gravel to 4 cm.         325       Poorly graded SAND (SP); yellowish brown (10YR 5/3); dry; loose; 90% fine to medium sand; 10% gravel to 2 cm.	305	-				Same as above (300 ft).			
320       Same as above (300 ft); trace gravel to 2 cm.       1630 shut down for lightning. Resume @ 0830 on 7-24-12.         320       Well graded SAND with gravel (SW); gravish brown (10YR 5/2); dry; loose; 70% fine to very coarse sand; 30% gravel to 4 cm.       Image: Comparison of C	<u>310</u>	-				Same as above (300 ft).	SW	Bentonite	
325       gravel to 4 cm.         Image: state of the st	315	-							lightning. Resume @ 0830 on
325       brown (10YR 5/3); dry; loose; 90% fine to medium sand; 10% gravel to 2 cm.	<u>320</u>	-				gravel to 4 cm.			
	325	-				brown (10YR 5/3); dry; loose; 90% fine	SP		
	330	1							



Ground Elevation AMSL (ft): 5333.7 Y Coordinate: 1479144.25 X Coordinate: 1544723.57

# Borehole ID: KAFB-106206

Project Name: KAFB BFF SWMU ST-106 and SS-111 Project Number: 140705

Hole Diameter Upper (in.): 11-3/4 Hole Diameter Lower (in.) 9- 5/8 Groundwater Levels BGS (ft): 

 Image: Groundwater Levels BGS (n).

 Image: Weight of the second Logged By: Rachel Daly

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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	_				Well graded SAND (SW); grayish brown (10YR 5/2); dry; loose; 90% very fine to very coarse sand; 10% gravel to 1 cm; no odor.				
-	-				Same as above (330 ft); 95% fine to very coarse sand; 5% gravel to 0.8 cm.	SW			Total Depth casing @ 0845. Resume @ 0850.
340	-				Same as above (330 ft); 70% fine to medium sand; 30% coarse sands; trace gravel to 1.5 cm; no odor. Well graded GRAVEL (GW); brown			- High Solids Bentonite	
345	-				(10YR 5/3); dry; loose; 90% gravel to 3 cm; 10% medium sand; no odor. Poorly graded SAND (SP); yellowish brown (10YR 5/4); dry; loose; 100% fine to medium sand; trace gravel to 7 cm.	GW 		Grout	
350	-				Same as above (345 ft); 95% fine to medium sand; 5% silt; no odor.	SP			
<u>355</u> - -	-				Well graded SAND (SW); brown (10YR 5/3); dry; loose; 95% fine to coarse sand; 5% gravel to 1 cm; no odor.	SW			Total Depth casing @ 0905. Resume @ 0915.
360								•	



Ground Elevation AMSL (ft): 5333.7 Y Coordinate: 1479144.25 X Coordinate: 1544723.57

# Borehole ID: KAFB-106206

Project Name: KAFB BFF SWMU ST-106 and SS-111 Project Number: 140705

Hole Diameter Upper (in.): 11-3/4 Hole Diameter Lower (in.) 9- 5/8 Groundwater Levels BGS (ft): 

 Image: Groundwater Levels BGS (n).

 Image: Weight of the second Logged By: Rachel Daly

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90 Depth (ft)	Sample Type	Number	Headspace	Lithologic Log	Material Description	U.S.C.S.	Well Diagram	Remarks
365	_				Poorly graded SAND (SP); brown (10YR 5/3); dry; loose; 100% fine to medium sand; trace coarse sand; no odor. Same as above (360 ft).	SP		
370	_				Well graded SAND (SW); brown (10YR 4/3); moist; loose; 95% fine to very coarse sand; 5% gravel to 0.8 cm; no odor. Same as above (367 ft).	SW		
<u>375</u> 380	_				Poorly graded SAND (SP); brown (10YR 4/3); moist; loose; 100% fine to medium sand; no odor.	SP	- High Solids Bentonite Grout	Total Depth casing @ 0930. Resume @ 0940.
385	_				Same as above (374 ft).		•     •     •       •     •     •       •     •     •       •     •     •       •     •     •       •     •     •       •     •     •       •     •     •       •     •     •       •     •     •       •     •     •       •     •     •       •     •     •       •     •     •       •     •     •       •     •     •       •     •     •       •     •     •       •     •     •	
390	_				Well graded SAND (SW); brown (10YR 4/3); dry; loose; 100% fine to very coarse sand; trace gravel to 1 cm; no odor	SW	•       •       •         •       •       •         •       •       •         •       •       •         •       •       •         •       •       •         •       •       •         •       •       •         •       •       •         •       •       •         •       •       •         •       •       •         •       •       •         •       •       •         •       •       •         •       •       •         •       •       •         •       •       •         •       •       •	



Ground Elevation AMSL (ft): 5333.7 Y Coordinate: 1479144.25 X Coordinate: 1544723.57

# Borehole ID: KAFB-106206

Project Name: KAFB BFF SWMU ST-106 and SS-111 Project Number: 140705

Hole Diameter Upper (in.): 11-3/4 Hole Diameter Lower (in.) 9- 5/8 Groundwater Levels BGS (ft): 

 Image: Groundwater Levels BGS (n).

 Image: Weight of the second Logged By: Rachel Daly

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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); dry; loose; 95% fine to medium sand; 5% coarse sands; no odor.			
<u>395</u> - - 400	-				Same as above (390 ft).	SP	•       •       •       •         •       •       •       •         •       •       •       •         •       •       •       •         •       •       •       •         •       •       •       •         •       •       •       •         •       •       •       •         •       •       •       •         •       •       •       •         •       •       •       •         •       •       •       •         •       •       •       •         •       •       •       •         •       •       •       •         •       •       •       •         •       •       •       •         •       •       •       •	Total Depth casing @ 1010. Resume @ 1245.
	-				Well graded SAND (SW); brown (10YR 5/3); dry; loose 100% fine to very coarse sand; trace gravel to 1 cm; no odor.			
405	-				Same as above (400 ft).	SW		
<u>410</u> -	-				Same as above (400 ft); 95% fine to very coarse sand: 5% gravel to 3 cm; no odor.		- High Solids Bentonite Grout	
415	-				Poorly graded SAND (SP); yellowish brown (10YR 5/4); dry; loose; 100% fine to medium sand; trace coarse sands; no odor.	SP		Total Depth casing @ 1310. Resume @ 1320.
420								



KAFB\_BOREHOLE\_LOG - SHAW\_DRILLING.GDT - 10/16/12 12:28 - N:KAFB BFFIGINTKAFB\_PROJECTIKAFB\_BFF.GPJ

Client: **US Army Corps of Engineers** Project Location: KAFB, Albuquerque, NM Date Started: 7/16/2012 Date TD Reached: 7/16/2012 Date Completed: 7/16/2012

Ground Elevation AMSL (ft): 5333.7 Y Coordinate: 1479144.25 X Coordinate: 1544723.57

# Borehole ID: KAFB-106206

Project Name: KAFB BFF SWMU ST-106 and SS-111 Project Number: 140705

Hole Diameter Upper (in.): 11-3/4 Hole Diameter Lower (in.) 9- 5/8 Groundwater Levels BGS (ft): 

 Image: Groundwater Levels BGS (n).

 Image: Weight of the second Logged By: Rachel Daly

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5 Depth (ft)	Sample Type	Number	Headspace PID	Lithologic Log	Material Description	U.S.C.S.	Well Diagram	Remarks
425	-				Well graded SAND (SW); pale brown (10YR 6/3); dry; loose; 100% fine to coarse sand; no odor. Same as above (420 ft).	SW		
430	-				Poorly graded SAND (SP); pale brown (10YR 6/3); dry; loose; 100% fine to medium sand; trace coarse; no odor.		- High Solids Bentonite Grout	5
435	-				Same as above (430 ft); no coarse sand.	SP		Total Depth casing @ 1345. Resume @ 1351.
	-				Same as above (430 ft); 100% fine to medium sand. Same as above (440 ft).	J		
445	_							



Ground Elevation AMSL (ft): 5333.7 Y Coordinate: 1479144.25 X Coordinate: 1544723.57

### Borehole ID: KAFB-106206

Project Name: KAFB BFF SWMU ST-106 and SS-111 Project Number: 140705

Hole Diameter Upper (in.): 11-3/4 Hole Diameter Lower (in.) 9- 5/8 Groundwater Levels BGS (ft): 

 Image: Groundwater Levels BGS (n).

 Image: Weight of the second Logged By: Rachel Daly

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5 Depth (ft)	Sample Type	Number	Headspace PID	Lithologic Log		U.S.C.S.	Well Diagram	Remarks
	-				Poorly graded SAND (SP); brown (10YR 5/3); dry; loose; 95% fine to medium sand; 5% silt; no odor.		•       •       •       •         •       •       •       •         •       •       •       •         •       •       •       •         •       •       •       •         •       •       •       •         •       •       •       •         •       •       •       •         •       •       •       •         •       •       •       •         •       •       •       •         •       •       •       •         •       •       •       •         •       •       •       •         •       •       •       •	
455	-				Same as above (450 ft).	SP		Total Depth @ 1425. Resume @ 1438.
460	-				Same as above (450 ft).		-5" Schedule 80 PVC Riser	
465	-				Well graded SAND (SW); brown (10YR 5/3); dry; loose; 100% very fine to very coarse sand; no odor.			
	-				Same as above (450 ft).		- High Solids Bentonite Grout	
470	-				Same as above (450 ft).	SW		
475					Same as above (450 ft). ⊈		- Top of Bentonite Seal	Total Depth @ 1510. Resume @ 1520. Water level after drilling.
480					$\overline{\Delta}$			Water level at time of drilling.



Ground Elevation AMSL (ft): 5333.7 Y Coordinate: 1479144.25 X Coordinate: 1544723.57

### Borehole ID: KAFB-106206

Project Name: KAFB BFF SWMU ST-106 and SS-111 Project Number: 140705

Hole Diameter Upper (in.): 11-3/4 Hole Diameter Lower (in.) 9- 5/8 Groundwater Levels BGS (ft): 

 Image: Groundwater Levels BGS (n).

 Image: Weight of the second Logged By: Rachel Daly

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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); brown (10YR 5/3); dry; loose; 100% fine to medium sand; trace coarse sands; no odor.			
485	-				Same as above (480 ft).	SP		
490	-				Well graded SAND (SW); brown (10YR 5/3); moist; loose; 100% fine to very coarse sand; no odor.		- Bentonite Seal	
<u>495</u>	-				Same as above (490 ft); cuttings increasingly moist until damp at ~493 feet; at water table.			Total Depth casing @ 1605. Resume @ 1320 on 7/25/12.
500	-				Same as above (490 ft); damp.	SW		
505	-				Same as above (490 ft).			
510								



Ground Elevation AMSL (ft): 5333.7 Y Coordinate: 1479144.25 X Coordinate: 1544723.57

## Borehole ID: KAFB-106206

Project Name: KAFB BFF SWMU ST-106 and SS-111 Project Number: 140705

Hole Diameter Upper (in.): 11-3/4 Hole Diameter Lower (in.) 9- 5/8 Groundwater Levels BGS (ft): 

 Image: Groundwater Levels BGS (n).

 Image: Weight of the second Logged By: Rachel Daly

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					209900 2).			
01 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); damp; loose; 100% fine to very coarse sand; no odor.			
515	-				Same as above (510 ft).			Total Depth casing @ 1412. Resume @ 1445.
<u>520</u>	-				Well graded SAND with gravel (SW); brown (10YR 5/3); damp; loose; 80% fine to very coarse sand; 20% fine gravel to 5 cm; no odor.			
525	-				Same as above (520 ft); gravel to 1 cm; gravel decreasing in size.	SW		
530	-				Well graded SAND (SW); brown (10YR 5/3); damp; loose; 95% fine to coarse sand; 5% gravel to 0.8 cm; no odor.			
<u>535</u>	-				Well graded SAND with gravel (SW); brown (10YR 5/3); damp; loose; 85% fine to very coarse sand; 15% gravel to 1 cm; no odor.		- Bentonite Seal	Total Depth casing @ 1520. Resume @ 0925 on 7-26-12.
540								



Ground Elevation AMSL (ft): 5333.7 Y Coordinate: 1479144.25 X Coordinate: 1544723.57

### Borehole ID: KAFB-106206

Project Name: KAFB BFF SWMU ST-106 and SS-111 Project Number: 140705

Hole Diameter Upper (in.): 11-3/4 Hole Diameter Lower (in.) 9- 5/8 Groundwater Levels BGS (ft): 

 Image: Groundwater Levels BGS (n).

 Image: Weight of the second Logged By: Rachel Daly

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0 Depth (ft)	Sample Type	Number	Headspace PID	Lithologic Log	Material Description	U.S.C.S.	Well Diagram	Remarks
545	-				No cuttings returned. Well graded SAND (SW); grayish brown (10YR 5/2); damp; loose; 95% fine to very coarse sand; 5% gravel to 1.5 cm; no odor; subangular.			
550	-				Same as above (545 ft); wet.			
555	-				Well graded SAND with gravel (SW); dark grayish brown (10YR 4/2); wet; loose; 654 fine to coarse sand; 35%	SW		Total Depth casing @ 1033. Resume @ 1040.
560	-				gravel to 1.5 cm; subrounded; no odor. Same as above (556 ft); 15% gravel to 2 cm; subrounded; 85% fine to very coarse sand.		- Bentonite Seal	
565	-				Same as above (560 ft).			
570								



Ground Elevation AMSL (ft): 5333.7 Y Coordinate: 1479144.25 X Coordinate: 1544723.57

### Borehole ID: KAFB-106206

Project Name: KAFB BFF SWMU ST-106 and SS-111 Project Number: 140705

Hole Diameter Upper (in.): 11-3/4 Hole Diameter Lower (in.) 9- 5/8 Groundwater Levels BGS (ft): 

 Image: Groundwater Levels BGS (n).

 Image: Weight of the second Logged By: Rachel Daly

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5 Depth (ft)	Sample Type	Number	Headspace PID	Lithologic Log	Material Description	U.S.C.S.	Well Diagram	Remarks
575	-				Well graded SAND (SW); dark grayish brown (10YR 4/2); wet; loose; 95% fine to coarse sand; 5% gravel to 3 cm; subrounded; no odor. Same as above (570 ft).	SW	- Bentonite Seal	At 575 ft, Total Depth casing @ 1240. Resume @ 0855.
580	-			· · · · · ·	Poorly graded SAND (SP); dark grayish brown (10YR 4/2); wet; loose; 100% fine to medium sand; trace coarse sand; no odor; subrounded.	SP		
- - 585 -	-				Well graded SAND (SW); dark grayish brown (10YR 4/2); wet; loose; 95% medium to very coarse sand; 5% gravel to 2 cm; no odor; subangular. Same as above (580 ft).			
- 590 -					Same as above (580 ft); 95% fine to very coarse sand; 5% gravel to 2 cm.	sw	- Top of 20/40 Sand - Top of 10/20 Sand	
<u>595</u>	-				Same as above (580 ft); 100% fine to coarse sand; trace gravel.		- Top of 5" Schedule 80 PVC 0.010" Slot Screen	Total Depth casing @ 0935. Resume @ 1005.
600								



Ground Elevation AMSL (ft): 5333.7 Y Coordinate: 1479144.25 X Coordinate: 1544723.57

## Borehole ID: KAFB-106206

Project Name: KAFB BFF SWMU ST-106 and SS-111 Project Number: 140705

Hole Diameter Upper (in.): 11-3/4 Hole Diameter Lower (in.) 9- 5/8 Groundwater Levels BGS (ft): 

 Image: Groundwater Levels BGS (n).

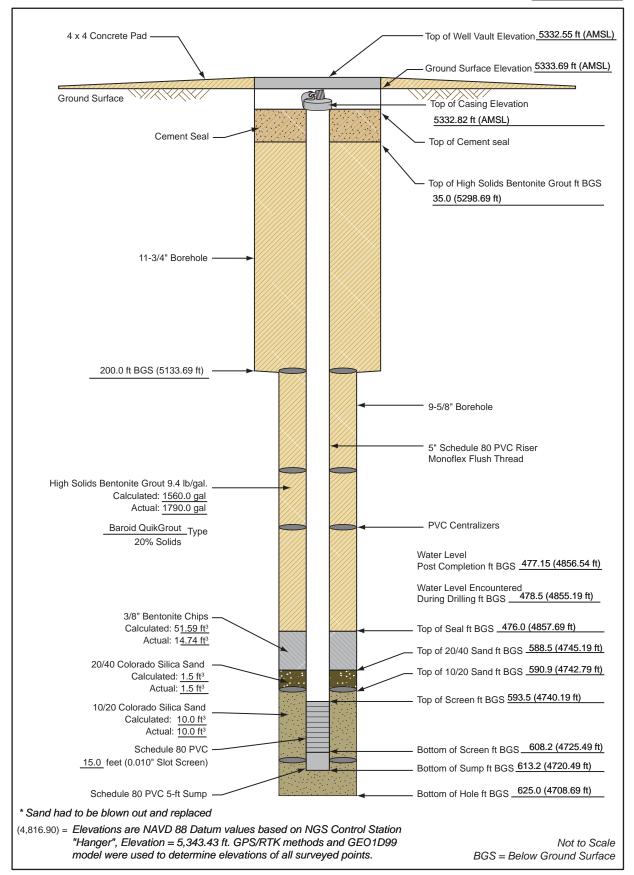
 Image: Weight of the second Logged By: Rachel Daly

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X Coor	unate.	10	94472	3.57 Logged By:	Rac	lei Daiy	Page 21 of 21
<ul> <li>Depth (ft)</li> <li>Sample Type</li> </ul>	Number Headspace	DIG	Lithologic Log	Material Description	U.S.C.S.	Well Diagram	Remarks
				No cuttings returned.			
- - 605 - -				Well graded SAND (SW); brown (10YR 4/3); wet; loose; 100% medium to very coarse sand; trace gravel to 2 cm; subrounded; no odor.			
<u>610</u> - -		· · · · · · · · · · · · · · · · · · ·		Same as above (603 ft); trace clay nodules.		- Bottom of Screen - Sump - Bottom of	
<u>615</u> _ _ _		• • • • • • • • • • • • • • • • • • •		Same as above (610 ft).	SW	Sump	Total Depth casing @ 1050. Resume @ 1148.
<u>620</u> _ _ _				Well graded SAND with gravel (SW); brown (10YR 4/3); wet; loose; 70% fine to very coarse sand; 30% gravel to 2 cm; no odor; subrounded.			
<u>625</u>		-		Same as above (620 ft).			Total Depth Borehole @ 1210.
630							

### Monitoring Well Completion Diagram KAFB-106206

Installation Start Date/Time: 7/31/2012 @ 12:00 Installation End Date/Time: 8/09/2012 @ 12:10





### Well Development Record

Pg 1 of 2

Project Nam	Ne: KAFB BFI	F						
Location: Ke	entucky St					Well/Piez. N	o.: KAFB-106	206
Personnel:	V. Bracht					Date Installe		
Date: 9/13/1	2					Csg. Diame	ter (I.D.): 5"	
Samplers: 1	N/A					Total Depth	(ft. BGL): 613	.2
Method of D X Surging	evelopment		X Bailing			X Pumping		
X Original Develo	pment		Redevelopment			Other		
Developmer	nt Date: 9/13	8/12				_		
Depth to Wa	ater Before D	Developing V	Vell (ft. BGL)	: 478.60				
				Vol. (V)	Purge F	actor V	olume to Purge	9
Height of W	ater Column	::f	eet = 153	3.84 gal	. *	1 = 1	53.84	
	V=(B * r <sub>c</sub> ² * l	<sub>c</sub> * 7.48)+(B	* $(r_w^2 - r_c^2)$ *	L <sub>s</sub> * Ø <sub>s</sub> * 7.48	8)+(H <sub>2</sub> O add	ed during dri	illing/installati	i <b>on) =</b> <u>1253.84 gallons</u>
Depth Purgi	ng From: 6	03 feet	_		Time Purgii	ng Begins: _0	855, 9/13/12	
Weather: C	loudy, Cool, F	Rain			Screened Ir	nterval (ft BG	i <b>L)</b> : <u>593 - 608</u>	
Equipment I	Nos.: pH Me	eter: LVE	002686		EC Meter:	LVE 0026	686	Turbidity Meter: LVE002384
Equipment I	Decontamina	ated Prior to	Developme	nt:Y <u>X</u>	Ν			
Describe: S	team Cleane	d						
Collected Sa Describe: N		ter Added to	Well: Y	NX	(			
		of water add	led during dril	ling/well insta	lation activit	tion		
comment.	1100 galloris		ieu uuring uni	iirig/weii iirista		1103		
Date	Time	Water Level (ft. Below TOC)	Volume Removed (gal.)	Temp.°C	pН	EC (ms/cm)	Turbidity N.T.U.	Comments
9/13/2012	0855	477.80	(gai.) 20	19.10	7.04			Begin Bailing; Water is Brown
9/13/2012	0855		55	19.10	7.04			Continue Bailing; Water is Brown
9/13/2012	0913		55 75	19.20				*
	0925		100		7.84			Continue Bailing; Water is Brown Continue Bailing; Water is Brown
9/13/2012 0933				18.90	7.89			* 
9/13/2012	1103	477.97		18.70	7.72	0.397	966.00	Begin Pumping

697.00 Water is Very Cloudy 9/13/2012 1105 480.07 175 19.70 7.70 0.426 1115 275 19.90 7.69 0.414 38.30 Water is Slightly Cloudy 9/13/2012 480.07 9/13/2012 1125 480.03 375 19.80 7.70 0.358 44.50 Water is Slightly Cloudy 9/13/2012 1135 480.03 475 20.10 7.70 0.437 32.70 Water is Slightly Cloudy 7.70 9/13/2012 1145 480.04 575 20.30 0.466 6.84 Water is 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 # GPM = Gallons Per Minute

Where:

B=3.14

 $\mathcal{O}_{s}$ = porosity of the sand 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

 $\mathbf{r}_{\mathbf{w}}\!\!=\!\mathbf{radius}$  of the well bore in feet  $\mathbf{L}_{\mathbf{s}}\text{=}$  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: 9/13/12

Time Start: 0855, 9/13/12

Well No: KAFB-106206

Samplers: N/A

Checked By: N/A

Time Finish: 1335, 9/13/12

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
9/13/2012	1155	480.04	675	20.30	7.70	0.436	10.60	Water is Clear
9/13/2012	1205	480.04	775	20.30	7.71	0.438	8.97	Water is Clear
9/13/2012	1215	480.03	875	20.30	7.71	0.424	7.57	Water is Clear
9/13/2012	1225	480.03	975	20.30	7.74	0.305	8.89	Water is Clear
9/13/2012	1230		1025					Shut off Pump to Offload Water
9/13/2012	1305	480.05	1050	20.40	7.69	0.496	370.00	Water is Clear
9/13/2012	1315	480.11	1150	20.80	7.73	0.483	8.21	Water is Clear
9/13/2012	1325	480.12	1250	21.00	7.73	0.493	7.45	Water is Clear
9/13/2012	1335	480.12	1350	21.00	7.71	0.490	6.40	Water is Clear; Pump off; Total Removed

\* Due to sample cup design, the YSI Professional Plus does not accurately measure EC from the cup. Sample cup works well in a flow-through set-up, once pumping begins.

Was well sampled after development? YES NO X

Sample Method: N/A

Sample Name: N/A

Analyses: N/A

KAFB 106207



Ground Elevation AMSL (ft): 5345.16 Y Coordinate: 1480123.29 X Coordinate: 1546033.69

## Borehole ID: KAFB-106207

Project Name: KAFB BFF SWMU ST-106 and SS-111 Project Number: 140705

Hole Diameter Upper (in.): 11-3/4 Hole Diameter Lower (in.) 9 5/8 Groundwater Levels BGS (ft): ✓ At Time of Drilling: 482.00
 ✓ At End Of Drilling: N/A
 ✓ After Drilling: 489.79
 Drilling Contractor: Yellow Jacket
 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
-	-				Well graded SAND (SW); brown (10YR 4/3); moist; very loose; 100% fine to coarse sand; trace fine gravel to 7 mm, rounded.		- Top of Cement Seal	Begin @ 1040. Fill material.
5	-				Same as above (0 ft); 10% fine gravel to 1.7 cm.	SW		Fill material.
-	-				SILT (ML); strong brown (7.5YR 5/6); dry; soft; 90% silt; 10% very fine sand; trace gravel to 3 cm, nonplastic.			Native.
<u>15</u>	-				Same as above (10 ft); 15% fine to coarse sand.	ML	- Cement Seal	Depth @ 1055. Resume @1102.
20	-				Well graded SAND with gravel (SW); brown (7.5YR 5/4); dry; loose; 60% very fine to very coarse sand; 40% fine gravel to 2.4 cm, subrounded.			
25	-				Well graded SAND (SW); brown (7.5YR 5/4); dry; very loose; 95% very fine to very coarse sand; 5% fine gravel to 1 cm, subrounded.	SW		



Ground Elevation AMSL (ft): 5345.16 Y Coordinate: 1480123.29 X Coordinate: 1546033.69

### Borehole ID: KAFB-106207

Project Name: KAFB BFF SWMU ST-106 and SS-111 Project Number: 140705

Hole Diameter Upper (in.): 11-3/4 Hole Diameter Lower (in.) 9 5/8 Groundwater Levels BGS (ft): ✓ At Time of Drilling: 482.00
 ✓ At End Of Drilling: N/A
 ✓ After Drilling: 489.79
 Drilling Contractor: Yellow Jacket
 Drilling Method: Air Rotary Casing Hammer Logged By: Jason Tarbert

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					- 55			
8 Depth (ft)	Sample Type	Number	Headspace PID	Lithologic Log		U.S.C.S.	Well Diagram	Remarks
35	-				Well graded SAND with gravel (SW); brown (7.5YR 5/4); dry; loose; 60% very fine to very coarse sand; 40% fine gravel to 2.4 cm, subrounded. Same as above (20 ft); 15% fine gravel; moist; strong brown 7.5YR 4/6.	SW	- Cement Seal	
40					Poorly graded SAND (SP); strong brown (7.5YR 4/6); moist; very loose; 95% very fine to medium sand; 2 mm, rounded; 5% silt.	SP		Depth @ 1119. Resume @ 1126.
45	-				Well graded SAND with silt (SW-SM); brown (7.5YR 4/4); moist; very loose; 10% silt; 80% very fine to very coarse sand; 10% fine gravel to 2.3 cm, subrounded.	SW- SM	- Top of High Solids Bentonite Grout	
50					Poorly graded SAND (SP); brown (7.5YR 5/4); moist; loose; 100% very fine to medium sand; 2 mm, subrounded; trace silt.	SP	- High Solids	
<u>55</u> 60	-				Well graded SAND (SW); brown 7.5YR 5/4; moist; loose; 100% very fine to very coarse sand; trace fine gravel to 1.3 cm, subrounded.	SW	Bentonite Grout Grout	Depth @ 1145.



Ground Elevation AMSL (ft): 5345.16 Y Coordinate: 1480123.29 X Coordinate: 1546033.69

## Borehole ID: KAFB-106207

Project Name: KAFB BFF SWMU ST-106 and SS-111 Project Number: 140705

Hole Diameter Upper (in.): 11-3/4 Hole Diameter Lower (in.) 9 5/8 Groundwater Levels BGS (ft): ✓ At Time of Drilling: 482.00
 ✓ At End Of Drilling: N/A
 ✓ After Drilling: 489.79
 Drilling Contractor: Yellow Jacket
 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
65	_				Poorly graded SAND (SP); strong brown (7.5YR 4/6); moist; loose;100% fine to medium sand; 2 mm, subrounded; trace silt.	SP		Resume @ 1236.
	-				Well graded SAND with gravel (SW); brown (7.5YR 4/4); moist; loose; 85% fine to very coarse sand; 15% fine gravel to 1.2 cm.	SW		
70	-				SILT (ML); strong brown (7.5YR 5/6); moist; soft; nonplastic; 85% silt; 15% very fine sand; trace fine gravel to 8 mm.			
75	-				Same as above (68 ft); sand fine to very coarse.		<ul> <li>High Solids</li> <li>Bentonite</li> <li>Grout</li> </ul>	Depth @ 1247. Resume @ 1252.
80	-				Same as above (68 ft); sandy silt (ML); 80% silt; 20% very fine to very coarse sand; trace fine gravel.	ML	•       •       •         •       •       •         •       •       •         •       •       •         •       •       •         •       •       •         •       •       •         •       •       •         •       •       •         •       •       •         •       •       •         •       •       •         •       •       •         •       •       •         •       •       •         •       •       •         •       •       •         •       •       •	
85					Same as above (80 ft).			
90								



Ground Elevation AMSL (ft): 5345.16 Y Coordinate: 1480123.29 X Coordinate: 1546033.69

## Borehole ID: KAFB-106207

Project Name: KAFB BFF SWMU ST-106 and SS-111 Project Number: 140705

Hole Diameter Upper (in.): 11-3/4 Hole Diameter Lower (in.) 9 5/8 Groundwater Levels BGS (ft): ✓ At Time of Drilling: 482.00
 ✓ At End Of Drilling: N/A
 ✓ After Drilling: 489.79
 Drilling Contractor: Yellow Jacket
 Drilling Method: Air Rotary Casing Hammer Logged By: Jason Tarbert

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			-		209904 2).			
g Depth (ft)		Number	Headspace PID	Lithologic Log	Material Description	U.S.C.S.	Well Diagram	Remarks
	-				SILT (ML); strong brown (7.5YR 4/6); moist; soft; low plasticity; 80% silt; 5% lean clay; 15% fine to coarse sand to 4.5 mm.			
95	-				Same as above (90 ft).			Depth @1304. Resume @ 1308.
100	-				Same as above (90 ft); trace fine gravel to 9mm.		•       •       •         •       •       •         •       •       •         •       •       •         •       •       •         •       •       •         •       •       •         •       •       •         •       •       •         •       •       •         •       •       •         •       •       •         •       •       •         •       •       •         •       •       •         •       •       •	
105	-				Same as above (90 ft); 70% silt; 15% lean clay.	ML	- High Solids Bentonite Grout	
<u>110</u>	-				Same as above (90 ft).		•     •       •     •       •     •       •     •       •     •       •     •       •     •       •     •       •     •       •     •       •     •       •     •       •     •       •     •       •     •       •     •       •     •       •     •       •     •	
115					Same as above (90 ft).			Depth @ 1324.
120	-						•     •       •     •       •     •       •     •       •     •       •     •	



Ground Elevation AMSL (ft): 5345.16 Y Coordinate: 1480123.29 X Coordinate: 1546033.69

# Borehole ID: KAFB-106207

Project Name: KAFB BFF SWMU ST-106 and SS-111 Project Number: 140705

Hole Diameter Upper (in.): 11-3/4 Hole Diameter Lower (in.) 9 5/8 Groundwater Levels BGS (ft): ✓ At Time of Drilling: 482.00
 ✓ At End Of Drilling: N/A
 ✓ After Drilling: 489.79
 Drilling Contractor: Yellow Jacket
 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 (ML); strong brown (7.5YR 5/6); dry; soft; nonplastic; 90% silt; 10% very fine to coarse sand; 4 mm.			Resume @ 1335.
125	-				Same as above (120 ft); trace lean clay.	ML	•       •       •         •       •       •	
130	-				Silty SAND (SM); brown (7.5YR 5/4); moist; loose; 70% very fine to very coarse sand; 30% silt; trace fine gravel to 7 mm, rounded.			
<u>135</u>	-				Same as above (130 ft).	SM	- High Solids Bentonite Grout	Depth @ 1351. Resume @ 1357.
<u>140</u>	-				Same as above (130 ft).		-       -       -         -       -       -	
145					Poorly graded GRAVEL (GP); brown (7.5YR 5/4); moist; loose; 85% fine gravel to 1.4 cm; 10% medium to coarse sand; subangular; 5% silt.	GP		Cyclone partially clogged. Stop to clean out. End 8/17/12 @ 1407. Resume 8/20/12 @ 0806. Stop to detach & unclog cyclone hose @ 0812. Resume @ 0920.
150							• • • • •	Adding water.



Ground Elevation AMSL (ft): 5345.16 Y Coordinate: 1480123.29 X Coordinate: 1546033.69

## Borehole ID: KAFB-106207

Project Name: KAFB BFF SWMU ST-106 and SS-111 Project Number: 140705

Hole Diameter Upper (in.): 11-3/4 Hole Diameter Lower (in.) 9 5/8 Groundwater Levels BGS (ft): 

 Image: Groundwater Levels BGS (n).

 Image: Weight of the second Logged By: Jason Tarbert

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			1					
05 Depth (ft)	Sample Type	Number	Headspace PID	Lithologic Log	Material Description	U.S.C.S.	Well Diagram	Remarks
-	-				SILT with gravel (ML); brown (7.5YR 5/4); moist; firm; medium plasticity; 85% silt with trace lean clay; 15% gravel to 2 cm, subrounded.			
155	-				Same as above (150 ft).			Depth @ 0930. Stop to change flange. Resume @ 1022.
<u>160</u> -	-				SILT (ML); light brown (7.5YR 6/4); wet; firm; low plasticity; 100% silt with trace lean clay nodules, < 0.8 mm.		- High Solids	
165	-				Same as above (160 ft).	ML	Bentonite Grout	
<u>170</u>	-				Same as above (160 ft).			
- 175 - -	-				Same as above (160 ft); trace gravel to 3 cm.			Depth @ 1037. Resume @ 1044.
180							• • • • • • • • • • • • • • •	



Ground Elevation AMSL (ft): 5345.16 Y Coordinate: 1480123.29 X Coordinate: 1546033.69

# Borehole ID: KAFB-106207

Project Name: KAFB BFF SWMU ST-106 and SS-111 Project Number: 140705

Hole Diameter Upper (in.): 11-3/4 Hole Diameter Lower (in.) 9 5/8 Groundwater Levels BGS (ft): 

 Image: Groundwater Levels BGS (n).

 Image: Weight of the second Logged By: Jason Tarbert

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08 Depth (ft)	Sample Type	Number	Headspace	Lithologic	Log	Material Description	U.S.C.S.		Well Diagram	Remarks
-	-					SILT (ML); light brown (7.5YR 6/4); wet; firm; low plasticity; 100% silt; trace lean clay nodules, < 0.08 mm.			<ul> <li>•</li> <li>•&lt;</li></ul>	
185	-					Same as above (160 ft).			•       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •	
<u>190</u> -	-					Same as above (160 ft); trace medium sand.	ML	• • • • • • • • • • • • • • • • • • • •	<ul> <li>High Solids</li> <li>Bentonite</li> <li>Grout</li> </ul>	
<u>195</u>	-					Same as above (160 ft); trace fine gravel to 1.3 cm.			•     •       •     •       •     •       •     •       •     •       •     •       •     •       •     •       •     •       •     •       •     •       •     •       •     •       •     •       •     •       •     •	Depth @ 1100. Resume @ 1108.
<u>200</u> - -	-					SILT with gravel (ML); brown (7.5YR 5/4); low plasticity; 75% silt; 25% fine gravel to 2 cm.			<ul> <li>.</li> <li>.&lt;</li></ul>	Depth @ 1115. Total depth with 11 3/4" casing. Resume with 9 5/8" @ 1520.
<u>205</u> - -	-			· · · · · · · · · · · · · · · · · · ·	· · · · · · · · · · · · · · · · · · ·	Well graded SAND (SW); yellowish brown (10YR 5/4); moist; very loose; 100% fine to very coarse sand; trace fine gravel to 1 cm, rounded.	SW		•       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •	
 210				•••				•••		



Ground Elevation AMSL (ft): 5345.16 Y Coordinate: 1480123.29 X Coordinate: 1546033.69

## Borehole ID: KAFB-106207

Project Name: KAFB BFF SWMU ST-106 and SS-111 Project Number: 140705

Hole Diameter Upper (in.): 11-3/4 Hole Diameter Lower (in.) 9 5/8 Groundwater Levels BGS (ft): 

 Image: Groundwater Levels BGS (n).

 Image: Weight of the second Logged By: Jason Tarbert

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Depth (ft)	Sample Type	Number	Headspace	Lithologic Log	Material Description	U.S.C.S.	Well Diagram	Remarks
	-				Well graded SAND (SW); yellowish brown (10YR 5/4); moist; very loose; 100% fine to very coarse sand; trace fine gravel to 1 cm, rounded.			
215	-				Same as above (205 ft).			Depth @ 1525. Resume @ 1531.
220	-				Same as above (205 ft).	SW	- High Solids Bentonite Grout	
<u>225</u>	-				Well graded SAND with gravel (SW); brown (10YR 5/3); moist; very loose; 85% very fine to very coarse sand; 15% fine gravel to 2 cm, rounded.			
<u>230</u>	-				Poorly graded SAND (SP); pale brown (10YR 6/3); moist; very loose; 90% very fine to medium sand; 10% coarse sand as pumice grains; trace clay nodules to 8 mm, rounded.			
235	-				Same as above (230 ft)	SP		Depth @ 1537.
240	-							



Ground Elevation AMSL (ft): 5345.16 Y Coordinate: 1480123.29 X Coordinate: 1546033.69

## Borehole ID: KAFB-106207

Project Name: KAFB BFF SWMU ST-106 and SS-111 Project Number: 140705

Hole Diameter Upper (in.): 11-3/4 Hole Diameter Lower (in.) 9 5/8 Groundwater Levels BGS (ft): ✓ At Time of Drilling: 482.00
 ✓ At End Of Drilling: N/A
 ✓ After Drilling: 489.79
 Drilling Contractor: Yellow Jacket
 Drilling Method: Air Rotary Casing Hammer Logged By: Jason Tarbert

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					66 <b>,</b>			
50 Depth (ft)	Sample Type	Number	Headspace PID	Lithologic Log	Material Description	U.S.C.S.	Well Diagram	Remarks
245	-				Poorly graded SAND (SP); pale brown (10YR 6/3); moist; very loose; 90% very fine to medium sand; 10% coarse sand as pumice grains; trace clay nodules to 8 mm, rounded.	SP		Resume @ 1541 Predominately pumice grains. 1600-king nipple separated from hammer End 8/20/12 Resume @0930 8/21/12.
	-				Well graded SAND with gravel (SW); brown (10YR 5/3); moist; very loose; 80% very fine to very coarse sand; 20% fine gravel to 2.1 cm, rounded. Note: grains are granite again.			
250	-				Same as above (245 ft).	SW	- High Solids Bentonite Grout	
255	-				Poorly graded SAND (SP); pale brown (10YR 6/3); moist; very loose; 90% fine to medium sand; 10% coarse sand; trace fine gravel to 1.9 cm, rounded		- C C C C C C C C C C C C C C C C C C C	Some pumice grains. Depth @ 0933. Resume @ 1000.
260	-				Same as above (255 ft).	SP	•       •       •       •         •       •       •       •         •       •       •       •         •       •       •       •         •       •       •       •         •       •       •       •         •       •       •       •         •       •       •       •         •       •       •       •         •       •       •       •         •       •       •       •         •       •       •       •         •       •       •       •         •       •       •       •	
265	_				Same as above (255 ft).			
270								



Ground Elevation AMSL (ft): 5345.16 Y Coordinate: 1480123.29 X Coordinate: 1546033.69

## Borehole ID: KAFB-106207

Project Name: KAFB BFF SWMU ST-106 and SS-111 Project Number: 140705

Hole Diameter Upper (in.): 11-3/4 Hole Diameter Lower (in.) 9 5/8 Groundwater Levels BGS (ft): ✓ At Time of Drilling: 482.00
 ✓ At End Of Drilling: N/A
 ✓ After Drilling: 489.79
 Drilling Contractor: Yellow Jacket
 Drilling Method: Air Rotary Casing Hammer Logged By: Jason Tarbert

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					00 ,			
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 5/3); moist; loose 90% very fine to very coarse sand; 10% fine gravel to 1.3 cm, rounded.			
275	-				Same as above (270 ft); 5% gravel.	SW	•       •       •         •       •       •         •       •       •         •       •       •         •       •       •         •       •       •         •       •       •         •       •       •         •       •       •         •       •       •         •       •       •         •       •       •         •       •       •         •       •       •         •       •       •	Depth @ 1007. Resume @ 1013.
280	_				Same as above (270 ft); trace gravel.		- High Solids Bentonite Grout	
285	_				Poorly graded SAND (SP); brown (10YR 5/3); moist; loose; 95% fine to medium sand; 5% coarse sand; trace fine gravel to 2.1 cm, rounded.	SP		
	-				Well graded SAND (SW); brown (10YR 5/3) moist; loose; 90% very fine to very coarse sand; 10% fine gravel to 1.1 cm, rounded.			
295	-				Same as above (290 ft); trace fine gravel.	SW		Depth @ 1021.
300								



Ground Elevation AMSL (ft): 5345.16 Y Coordinate: 1480123.29 X Coordinate: 1546033.69

## Borehole ID: KAFB-106207

Project Name: KAFB BFF SWMU ST-106 and SS-111 Project Number: 140705

Hole Diameter Upper (in.): 11-3/4 Hole Diameter Lower (in.) 9 5/8 Groundwater Levels BGS (ft): ✓ At Time of Drilling: 482.00
 ✓ At End Of Drilling: N/A
 ✓ After Drilling: 489.79
 Drilling Contractor: Yellow Jacket
 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
305	-				Well graded SAND (SW); brown (10YR 5/3) moist; loose; 90% very fine to very coarse sand; 10% fine gravel to 1.1 cm, rounded. Poorly graded SAND (SP); pale brown (10YR 6/3); moist; loose; 95% fine to medium sand; 5% coarse sand; trace fine gravel to 4 cm, rounded.	SW	•     •     •       •     •     •	Resume @ 1026.
<u>310</u> 315	_				Well graded SAND (SW); pale brown (10YR 6/3); dry; loose; 100% very fine to very coarse sand; trace fine gravel to 1.3 cm, rounded.	SW	- High Solids Bentonite Grout	
	-				Poorly graded SAND (SP); brown (10YR 5/3); moist; loose; 100% fine to medium sand; trace fine gravel to 2.7 mm, rounded.	SP		Depth @1036. Resume @ 1043.
320	-				Well graded SAND (SW); brown (10YR 5/3); moist; loose; 100% fine to very coarse sand; trace fine gravel to 9 mm, rounded.			
325	_				Same as above (320ft); 5% fine gravel.	SW	•     •     •     •       •     •     •     •       •     •     •     •       •     •     •     •       •     •     •     •       •     •     •     •       •     •     •     •       •     •     •     •       •     •     •     •       •     •     •     •       •     •     •     •       •     •     •     •       •     •     •     •       •     •     •     •       •     •     •     •	
330								



Ground Elevation AMSL (ft): 5345.16 Y Coordinate: 1480123.29 X Coordinate: 1546033.69

## Borehole ID: KAFB-106207

Project Name: KAFB BFF SWMU ST-106 and SS-111 Project Number: 140705

Hole Diameter Upper (in.): 11-3/4 Hole Diameter Lower (in.) 9 5/8 Groundwater Levels BGS (ft): ✓ At Time of Drilling: 482.00
 ✓ At End Of Drilling: N/A
 ✓ After Drilling: 489.79
 Drilling Contractor: Yellow Jacket
 Drilling Method: Air Rotary Casing Hammer Logged By: Jason Tarbert

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00 Depth (ft)	Sample Type	Number	Headspace	Lithologic Log	Material Description	U.S.C.S.	Well Diagram	Remarks
335					Well graded SAND (SW); brown (10YR 5/3); moist; loose; 90% fine to very coarse sand; 10% fine gravel to 9 mm, rounded. Note: 10% fine gravel at 333 ft, 5% medium gravel to 6 mm. Same as above (320 ft).			Depth @ 1055. Resume @ 1100.
<u>340</u>					Well graded SAND with gravel (SW); brown (10YR 5/3); moist; medium dense; 80% fine to very coarse sand; 20% fine gravel to 1.3 cm, rounded.	SW	- High Solids	
345	-				Well graded SAND (SW); brown (10YR 5/3); moist; medium dense; 95% very fine to coarse sand; 5% fine gravel to 1.1 cm, rounded.		Bentonite Grout	
<u>350</u>	_				Poorly graded SAND (SP); brown (10YR 5/3); dry; medium dense; 100% fine to medium sand; 2 mm, subrounded.	SP		
355					Well graded SAND (SW); brown (10YR 5/3); moist; medium dense; 95% very fine to coarse sand; 5% gravel to 2.8 cm.	SW	•     •     •     •       •     •     •     •	Depth @ 1111. Resume @ 1118.
360								



Ground Elevation AMSL (ft): 5345.16 Y Coordinate: 1480123.29 X Coordinate: 1546033.69

## Borehole ID: KAFB-106207

Project Name: KAFB BFF SWMU ST-106 and SS-111 Project Number: 140705

Hole Diameter Upper (in.): 11-3/4 Hole Diameter Lower (in.) 9 5/8 Groundwater Levels BGS (ft): ✓ At Time of Drilling: 482.00
 ✓ At End Of Drilling: N/A
 ✓ After Drilling: 489.79
 Drilling Contractor: Yellow Jacket
 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); brown (10YR 5/3); moist; medium dense; 95% very fine to coarse sand; 5% gravel to 2.8 cm.	SW		Depth @ 1111. Resume @ 1118.
365	-				Poorly graded GRAVEL with sand (GP); brown (10YR 5/3); moist; medium dense; 60% fine gravel to 2.6 cm; 40% fine to very coarse sand, rounded. Note: gravel is granitic.	GP		1126-flange broke off of hammer. Resume @ 1406.
370	-				Well graded SAND with gravel (SW); brown (10YR 5/3); dry; medium dense; 85% fine to very coarse sand; 15% fine gravel to 1.3 cm, subrounded.	SW		
010	-				Poorly graded SAND with gravel (SP); brown (10YR 5/3); moist; medium dense; 80% medium to very coarse sand; 20% fine gravel to 1.2 cm, subrounded.	SP		
375	-				Poorly graded GRAVEL with sand (GP); brown (10 YR 5/3); 80% fine gravel to 3.3 cm; 20% fine to very coarse sand, rounded. Note: granite fragments. Sand is medium to very coarse at 375 ft.	GP	- High Solids Bentonite Grout	Depth @ 1420. Resume @ 1431.
380	-				Well graded SAND (SW); brown (10YR 5/3); moist; medium dense; 100% fine to very coarse sand; trace fine gravel to 9 mm, rounded.			
<u>385</u>	-				Well graded SAND (SW); brown (10YR 5/3); moist; medium dense; 100% fine to very coarse sand; trace fine gravel to 9 mm, rounded.	SW		
390								



Ground Elevation AMSL (ft): 5345.16 Y Coordinate: 1480123.29 X Coordinate: 1546033.69

## Borehole ID: KAFB-106207

Project Name: KAFB BFF SWMU ST-106 and SS-111 Project Number: 140705

Hole Diameter Upper (in.): 11-3/4 Hole Diameter Lower (in.) 9 5/8 Groundwater Levels BGS (ft): ✓ At Time of Drilling: 482.00
 ✓ At End Of Drilling: N/A
 ✓ After Drilling: 489.79
 Drilling Contractor: Yellow Jacket
 Drilling Method: Air Rotary Casing Hammer Logged By: Jason Tarbert

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					209904 23			
66 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; medium dense; 95% fine to very coarse sand; 5% fine gravel to 9 mm, rounded.			
395	-				Well graded SAND with gravel (SW); brown (10YR 5/3); dry; dense; 85% fine to very coarse sand; 15% fine gravel to 1.7 cm, rounded.			Depth @ 1445. Resume @ 1452.
- 400 - -					Well graded SAND with gravel (SW); brown (10YR 5/3); moist; dense; 90% fine to very coarse sand; 10% fine gravel to 1 cm, rounded.	SW	- High Solids Bentonite Grout	
405	-				Same as above (400 ft); slightly coarser.			
410 -	-				Poorly graded SAND (SP); pale brown (10YR 6/3); moist; dense; 95% fine to medium sand; 5% coarse sand; 4 mm, rounded.	SP		
- 415 - -	-				Well graded SAND (SW); brown (10YR 5/3); moist; dense; 95% very fine to very coarse sand; 5% fine gravel to 1.8 cm, rounded.	sw		Depth @ 1511.
420	_							



Ground Elevation AMSL (ft): 5345.16 Y Coordinate: 1480123.29 X Coordinate: 1546033.69

## Borehole ID: KAFB-106207

Project Name: KAFB BFF SWMU ST-106 and SS-111 Project Number: 140705

Hole Diameter Upper (in.): 11-3/4 Hole Diameter Lower (in.) 9 5/8 Groundwater Levels BGS (ft): ✓ At Time of Drilling: 482.00
 ✓ At End Of Drilling: N/A
 ✓ After Drilling: 489.79
 Drilling Contractor: Yellow Jacket
 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
	-				Poorly graded SAND (SP); pale brown (10YR 6/3); dry; very dense; 90% medium to very coarse sand; 10% fine gravel to 1.8 cm, subangular to subrounded.			Resume @ 1521. Hammering down very slowly.
425	_				Same as above (420 ft); trace fine sand.	SP	- High Solids Bentonite Grout	
430	-				Poorly graded GRAVEL (GP); brown (10YR 5/3); dry; very dense; 90% fine gravel to 2.2 cm; 10% coarse sand, rounded. Note: granitic fragments.	GP		
	-				Poorly graded SAND with gravel (SP); brown (10YR 5/3); moist; very dense; 85% medium to coarse sand; 15% fine gravel to 1 cm, rounded.	SP	- Top of Bentonite Sea	Depth @ 1548. Casing stuck-end 8/21/12. Resume @ 0805 on 8/22/12.
440	-				Poorly graded GRAVEL with sand (GP); yellowish brown (10YR 5/4); moist; very dense; 60% fine gravel to 3.5 cm, rounded; 40% medium to coarse sand, rounded. Note: granitic fragements.	GP		Adding water to bring cuttings up.
445	-				Poorly graded SAND with gravel (SP); brown (10YR 5/3); moist; very dense; 70% medium to very coarse sand; 30% fine gravel to 2.7 cm, rounded.	SP	- Bentonite Sea	
450								



Ground Elevation AMSL (ft): 5345.16 Y Coordinate: 1480123.29 X Coordinate: 1546033.69

## Borehole ID: KAFB-106207

Project Name: KAFB BFF SWMU ST-106 and SS-111 Project Number: 140705

Hole Diameter Upper (in.): 11-3/4 Hole Diameter Lower (in.) 9 5/8 Groundwater Levels BGS (ft): ✓ At Time of Drilling: 482.00
 ✓ At End Of Drilling: N/A
 ✓ After Drilling: 489.79
 Drilling Contractor: Yellow Jacket
 Drilling Method: Air Rotary Casing Hammer Logged By: Jason Tarbert

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				04000	Eogged By:				-
25 Depth (ft)	1.0	Number	Headspace PID	Lithologic Log	Material Description	U.S.C.S.	Well Diagram		Remarks
	-				Poorly graded SAND (SP); brown (10YR 5/3); moist; very dense; 95% medium to very coarse sand; 5% fine gravel to 1.1 cm, subrounded.				
455	5				Poorly graded SAND with gravel (SP); brown (10YR 5/3) moist; very dense; 85% medium to very coarse sand; 15% fine gravel to 2 cm, rounded.	SP	-Be	entonite Seal	Added ~ 50gal. Depth @ 0837. Stopped to tighten bolts on flange.
460	 				Same as above (455 ft).				Resume @ 0903.
465	- - - -				Poorly graded GRAVEL with sand (GP); yellowish brown (10YR 5/4) moist; very dense; 60% fine gravel to 1.7 cm, rounded; 40% medium to very coarse; sand, subrounded.	GP	Sa	op of 20/40 and op of 10/20	Granitic fragments.
470	) - -			<u> </u>	Poorly graded SAND with gravel (SP); yellowish brown (10YR 5/4); moist; dense; 70% medium to very coarse sand, rounded; 30% fine gravel to 2 cm, rounded.		-To	pp of 5" hedule 80	Driving easier.
<u>475</u>	-				Same as above (470 ft); 85% sand; 15% fine gravel.	SP		/C 0.010" ot Screen	Depth @ 0921.
480	)					:			



Ground Elevation AMSL (ft): 5345.16 Y Coordinate: 1480123.29 X Coordinate: 1546033.69

## Borehole ID: KAFB-106207

Project Name: KAFB BFF SWMU ST-106 and SS-111 Project Number: 140705

Hole Diameter Upper (in.): 11-3/4 Hole Diameter Lower (in.) 9 5/8 Groundwater Levels BGS (ft): ✓ At Time of Drilling: 482.00
 ✓ At End Of Drilling: N/A
 ✓ After Drilling: 489.79
 Drilling Contractor: Yellow Jacket
 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.	Well Diagram	Remarks
	-				Poorly graded SAND with silt (SP-SM); brown (10YR 5/3); wet; dense; 90% fine ∑to medium sand; 10% silt; 2 mm, rounded.	SP- SM		Resume @ 0926. Water level @ 482'.
485	-				Silty SAND (SM); brown (10YR 5/3); wet; dense; 70% fine to medium sand; 30% silt to 1 mm, rounded.			
490	-				Same as above (485 ft).	SM		Water Level After Drilling.
495	-				Well graded SAND (SW); yellowish brown (10YR 5/4); wet; dense; 90% fine to very coarse sand; 10% fine gravel to 1.5 cm, rounded.			Depth @ 0950. Resume @ 0957.
500	-				Well graded SAND with gravel (SW); yellowish brown (10YR 5/4); wet; dense; 85% fine to very coarse sand; 15% fine gravel to 2 cm, rounded.	SW	- Bottom of 5" Schedule 80 PVC 0.010"	
505	-				Well graded SAND (SW); yellowish brown (10YR 5/4); wet; dense; 95% fine to very coarse sand; 5% fine gravel to 2 cm, rounded.		- Bottom of Sump	



Ground Elevation AMSL (ft): 5345.16 Y Coordinate: 1480123.29 X Coordinate: 1546033.69

## Borehole ID: KAFB-106207

Project Name: KAFB BFF SWMU ST-106 and SS-111 Project Number: 140705

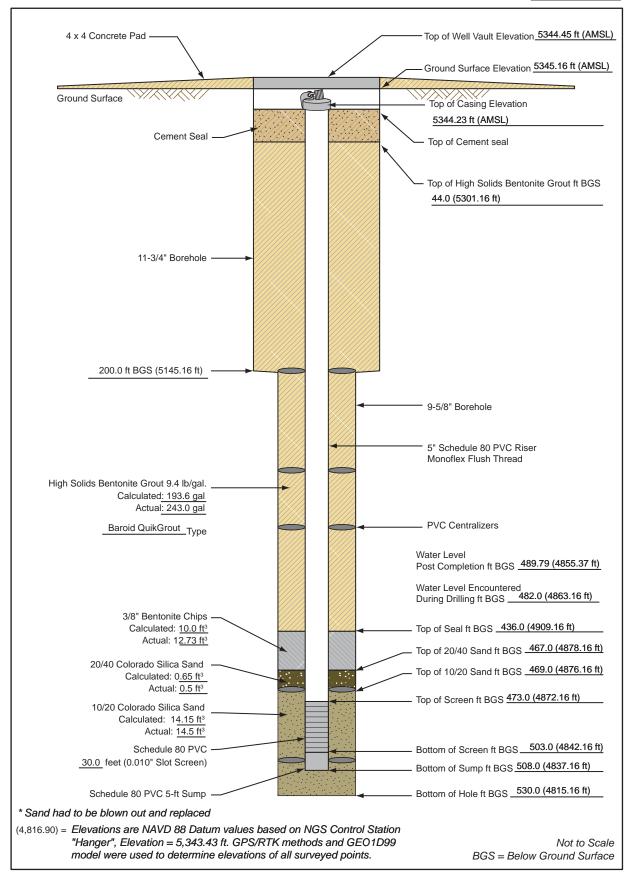
Hole Diameter Upper (in.): 11-3/4 Hole Diameter Lower (in.) 9 5/8 Groundwater Levels BGS (ft): ✓ At Time of Drilling: 482.00
 ✓ At End Of Drilling: N/A
 ✓ After Drilling: 489.79
 Drilling Contractor: Yellow Jacket
 Drilling Method: Air Rotary Casing Hammer Logged By: Jason Tarbert

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2 Depth (ft)	Sample Type	Num	Headspace PID	Lithologic Log	Material Description	U.S.C.S.	Well Diagram	Remarks
	-				Well graded SAND with gravel (SW); brown (10YR 5/3); wet; dense; 80% fine to very coarse sand; 20% fine gravel to 1.3 cm, rounded.			
51	- 5 - - -				Well graded SAND (SW); brown (10YR 5/3); wet; dense; 100% fine to very coarse sand; trace fine gravel to 1.3 cm, rounded.	SW		Depth @ 1016. Resume @ 1026.
520	_				Same as above (515 ft); 10% fine gravel			
52	_				Poorly graded GRAVEL with sand (GP); brown (10YR 5/3); wet; dense; 75% fine gravel to 2.1 cm, well rounded; 25% fine to very coarse sand, rounded; trace silt. Note: granitic fragments.	GP		
	-				No recovery.			Total depth @ 530' @ 1042. Added ~ 600 gallons water total.
53	<u>5</u> - -							
54	5							

### Monitoring Well Completion Diagram KAFB-106207

Installation Start Date/Time: <u>8/17/2012 @ 15:00</u> Installation End Date/Time: <u>8/22/2012 @ 11:30</u>





### Well Development Record

Project Nam	IE: KAFB BFI	=											
Location: M	esilla					207							
Personnel:	/. Bracht												
Date: 9/12/1	2					Csg. Diame	ter (I.D.) <u>: 5"</u>						
Samplers: 1	N/A					Total Depth	(ft. BGL): <u>508</u>						
Method of D X Surging	evelopment		X Bailing			X Pumping							
X Original Develo	pment		Redevelopment	t		Other							
Developmer	nt Date: 9/12	2/12											
	Development Date: <u>9/12/12</u> Depth to Water Before Developing Well (ft. BGL): 491.25												
•				Vol. (V)	Purge F	actor V	olume to Purge						
					-		-						
Height of W	ater Column	:1	feet = 30.	99 gal.	* 1	= 30.	99						
	V=(B * r <sub>c</sub> ² * I	<sub>-c</sub> * 7.48)+(B	$* (r_w^2 - r_c^2) *$	L <sub>s</sub> * Ø <sub>s</sub> * 7.48	B)+(H <sub>2</sub> O add	ed during dr	illing/installati	on) = <u>630.99 gallons</u>					
Depth Purgi	ng From: 4	96 feet	_		Time Purgii	ng Begins: (	0834, 9/12/12						
Weather: C	oudy, Cool, F	Rain			Screened Ir	nterval (ft BC	<b>SL)</b> : <u>473 - 503</u>						
Equipment I	Nos.: pH Me	ter: LVE	002686		EC Meter:	LVE 002	686	Turbidity Meter: LVE002384					
Equipment I	Decontamin	ated Prior to	Developme	nt: Y <u>X</u>	Ν								
Describe: S	team Cleane	d											
Collected Sa Describe: N		ter Added to	Well: Y	N	(	_							
Comment:	600 gallons o	of water adde	ed during drilli	ng/well instal	lation activitie	es							
		Water Level (ft. Below	Volume Removed				Turbidity						
Date	Time	TOC)	(gal.)	Temp.°C	рН	EC (ms/cm)	N.T.U.	Comments					
9/12/2012	0834	490.50	20	19.10	7.10	0.001*	>1000	Begin Bailing; Water is Muddy Brown					
9/12/2012	0856		60	19.70	7.91	0.001*	>1000	Continue Bailing; Water is Brown					
9/12/2012	0912		90	19.60	7.84	0.001*	841.00	Continue Bailing; Water is Brown					
9/12/2012	0918		100					Bailed					
9/12/2012	1149	490.52						Begin Pumping at 10 GPM					
9/12/2012	1150	493.10		19.80	7.59	0.443	58.70	Water is Cloudy					

Notes:

9/12/2012

9/12/2012

9/12/2012

9/12/2012

\* Water Levels - Reported to the nearest 0.01 foot

1155

1200

1205

1210

493.25

493.29

493.31

493.35

150

200

250

300

20.00

20.00

20.00

20.00

\* PH - Reading rounded to 0.1 pH units \* Water temperature - Reported to nearest 0.1C \* Turbidity report in NTV nearest whole # GPM = Gallons Per Minute

Where:

7.68

7.70

7.71

7.73

B=3.14

0.441

0.439

0.438

0.435

 $\mathcal{O}_{s}$ = porosity of the sand 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

10.10 Water is Clear

5.48 Water is Clear

3.61 Water is Clear

2.84 Water is Clear

 $\mathbf{r}_{\mathbf{w}}\!\!=\!\mathbf{radius}$  of the well bore in feet

 $\mathbf{L}_{\mathbf{s}}\text{=}$  length of saturated portion of the sand pack in feet

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

Pg 1 of 2



### Well Development Record

Project: KAFB BFF

Project Number: 140705

Date: 9/12/12

Time Start: 0834, 9/12/12

Well No: KAFB-106207

Samplers: N/A

Checked By: N/A

Time Finish: 1250, 9/12/12

Field Chemistry (cont'd)

Date	Time	Water Level (ft. Below TOC)	Volume Removed (gal.)	Temp °C	pН	EC (ms/cm)	Turbidity N.T.U.	Comments
9/12/2012	1215	,				· · · · · ·		Water is Clear
9/12/2012	1220	493.39	425	20.30	7.75	0.444	2.68	Water is Clear
9/12/2012	1225	493.41	475	20.20	7.75	0.444	2.17	Water is Clear
9/12/2012	1228		500					Pump off; Tank Full
9/12/2012	1235	493.33		21.30	7.82	0.450	1.95	Continue Pumping; Water is Clear
9/12/2012	1240	493.42	550	20.20	7.75	0.436	3.50	Water is Clear
9/12/2012	1245	493.52	600	20.20	7.77	0.434	1.86	Water is Clear
9/12/2012	1250	493.55	650	20.20	7.77	0.433	1.90	Water is Clear; Pump off; Total Removed

\* Due to sample cup design, the YSI Professional Plus does not accurately measure EC from the cup. Sample cup works well in a

flow-through set-up, once pumping begins.

Was well sampled after development? YES NO X

Sample Method: N/A

Sample Name: N/A

Analyses: N/A

# KAFB 106208



Ground Elevation AMSL (ft): 5344.18 Y Coordinate: 1480157.63 X Coordinate: 1546034.11

## Borehole ID: KAFB-106208

Project Name: KAFB BFF SWMU ST-106 and SS-111 Project Number: 140705

Hole Diameter Upper (in.): 11 3/4 Hole Diameter Lower (in.) 9 5/8 Groundwater Levels BGS (ft): ✓ At Time of Drilling: 496.00
 ✓ At End Of Drilling: N/A
 ✓ After Drilling: 488.85
 Drilling Contractor: Yellow Jacket
 Drilling Method: Air Rotary Casing Hammer Logged By: Jason Tarbert

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				54000	Logged Dy.			
⊖ Depth (ft)	Sample Type	Number	Headspace PID	Lithologic Log	Material Description	U.S.C.S.	Well Diagram	Remarks
5	-				Silty SAND (SM); brown (7.5YR 5/4); dry; very loose; 75% very fine to very coarse sand; 20% silt; 5% fine gravel to 2cm.	SM	- Top of Cement Seal	Begin @ 0908.
10	-				Same as above (0ft). SILT with gravel (ML); brown (7.5YR			
15	-				4/4); moist; stiff; medium plasticity; 70% silt; 5% lean clay; 25% gravel to 3.4cm.	ML	- Cement Seal	Depth @ 0926. Begin @ 0953.
20	-				moist; very soft; low plasticity; 85% silt; 15% very fine to medium sand; trace fine gravel to 8 mm.			
25	-				Silty SAND (SM); brown (7.5YR 5/4); moist; very loose; 85% very fine to very coarse sand; 15% silt; trace fine gravel to 3.5 cm, subrounded.	SM		
30	-				Poorly graded SAND (SP); brown (7.5YR 5/4); dry; very loose; 95% very fine to medium sand; 2 mm, subrounded; 5% silt.	SP		



Ground Elevation AMSL (ft): 5344.18 Y Coordinate: 1480157.63 X Coordinate: 1546034.11

## Borehole ID: KAFB-106208

Project Name: KAFB BFF SWMU ST-106 and SS-111 Project Number: 140705

Hole Diameter Upper (in.): 11 3/4 Hole Diameter Lower (in.) 9 5/8 Groundwater Levels BGS (ft): ✓ At Time of Drilling: 496.00
 ✓ At End Of Drilling: N/A
 ✓ After Drilling: 488.85
 Drilling Contractor: Yellow Jacket
 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
<u>35</u> <u>40</u>				Poorly graded SAND (SP); brown (7.5YR 5/4); dry; very loose; 85% very fine to medium sand; 2 mm, subrounded; 10% fine gravel to 2 cm, 5% silt. Same as above (25 ft); with gravel (SP); 70% sand; 25% gravel; 5% silt.	SP	<ul> <li>Top of High Solids Bentonite Grout</li> </ul>	Depth @ 0952. Resume @ 1001.
45				Well graded SAND (SW); brown (7.5YR 5/4);dry; very loose; 90% very fine to very coarse sand; 10% fine gravel to 1.5 cm, trace silt.	sw		
50				Silty SAND (SM); strong brown (7.5YR 4/6); moist; very loose; 80% very fine to coarse sand; trace fine gravel to 1.2 cm, subrounded; 20% silt. Poorly graded SAND (SP); brown (7.5YR 5/4); dry; very loose; 95% very	SM		Depth @ 1024.
55 - - - 60				fine to medium sand; 5% silt; trace fine gravel to 8mm, subrounded.	SP	- High Solids Bentonite Grout	



Ground Elevation AMSL (ft): 5344.18 Y Coordinate: 1480157.63 X Coordinate: 1546034.11

### Borehole ID: KAFB-106208

Project Name: KAFB BFF SWMU ST-106 and SS-111 Project Number: 140705

Hole Diameter Upper (in.): 11 3/4 Hole Diameter Lower (in.) 9 5/8 Groundwater Levels BGS (ft): ✓ At Time of Drilling: 496.00
 ✓ At End Of Drilling: N/A
 ✓ After Drilling: 488.85
 Drilling Contractor: Yellow Jacket
 Drilling Method: Air Rotary Casing Hammer Logged By: Jason Tarbert

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					209900 29.			
영 Depth (ft)	Sample Type	Number	Headspace PID	Lithologic Log	Material Description	U.S.C.S.	Well Diagram	Remarks
65	_				Well graded SAND (SW); brown (7.5YR 5/4); moist; loose; 90% very fine to very coarse sand; 5% fine gravel to 1.5 cm, rounded; 5% silt. Same as above (60 ft); well graded sand with gravel; 65% sand; 30% gravel; 5% silt.	SW		Resume @ 1030.
70	-			<u>~ ~ ~ ~ ~</u>	SILT (ML); strong brown (7.5YR 5/6); moist; soft; low plasticity; 85% silt; 15% very fine to medium sand; trace fine gravel to 1.4 cm. Same as above (67 ft)			
75	-				Same as above (67 ft)	ML	- High Solids Bentonite Grout	Depth @ 1047. Resume @ 1053.
80	-				Silty SAND (SM); brown (7.5YR 5/4); loose; dry; 75% very fine to very coarse sand; 5% fine gravel to 1 cm, subrounded; 20% silt.	SM	•     •     •       •     •     •	
85 90	-				SILT with sand (ML); brown (7.5YR 5/4); soft; moist; low plasticity; 80% silt; 20% very fine to very coarse sand; trace fine gravel to 1.3 cm.	ML	-     -     -     -     -     -       -     -     -     -     -     -       -     -     -     -     -     -       -     -     -     -     -     -       -     -     -     -     -     -       -     -     -     -     -     -       -     -     -     -     -     -       -     -     -     -     -     -       -     -     -     -     -     -       -     -     -     -     -     -       -     -     -     -     -     -       -     -     -     -     -     -       -     -     -     -     -     -       -     -     -     -     -     -       -     -     -     -     -     -       -     -     -     -     -     -       -     -     -     -     -     -       -     -     -     -     -     -       -     -     -     -     -     -       -     -     - <td></td>	



Ground Elevation AMSL (ft): 5344.18 Y Coordinate: 1480157.63 X Coordinate: 1546034.11

### Borehole ID: KAFB-106208

Project Name: KAFB BFF SWMU ST-106 and SS-111 Project Number: 140705

Hole Diameter Upper (in.): 11 3/4 Hole Diameter Lower (in.) 9 5/8 Groundwater Levels BGS (ft): ✓ At Time of Drilling: 496.00
 ✓ At End Of Drilling: N/A
 ✓ After Drilling: 488.85
 Drilling Contractor: Yellow Jacket
 Drilling Method: Air Rotary Casing Hammer Logged By: Jason Tarbert

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6 Depth (ft)	Sample Type	Number	Headspace PID	Lithologic Log		U.S.C.S.	Well Diagram	Remarks
-	-				SILT with sand (ML); brown (7.5YR 5/4); soft; moist; low plasticity; 80% silt; 15% very fine to very coarse sand; 5% lean clay; trace fine gravel to 1.3 cm.			
95	-				Same as above (85 ft).			Depth @ 1111. Resume @ 1118.
<u>100</u>	-				Same as above (85 ft).	ML		
<u>105</u>	-				Same as above (85 ft); trace lean clay.		- High Solids Bentonite Grout	
<u>110</u>	-				Same as above (85 ft); trace lean clay.			Very fine sediment coming out.
<u>115</u>	-				No recovery.			Depth @ 1200.
120								



Ground Elevation AMSL (ft): 5344.18 Y Coordinate: 1480157.63 X Coordinate: 1546034.11

### Borehole ID: KAFB-106208

Project Name: KAFB BFF SWMU ST-106 and SS-111 Project Number: 140705

Hole Diameter Upper (in.): 11 3/4 Hole Diameter Lower (in.) 9 5/8 Groundwater Levels BGS (ft): ✓ At Time of Drilling: 496.00
 ✓ At End Of Drilling: N/A
 ✓ After Drilling: 488.85
 Drilling Contractor: Yellow Jacket
 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
125					Poorly graded GRAVEL (GP); brown (7.5YR 5/3); moist; loose; 70% fine gravel to 1.2 cm, 30% medium to coarse sand; subrounded; trace silt. Note: gravel is granitic.	GP		Resume @ 1257. Adding water.
120	-				Silty GRAVEL with sand (GM); brown (7.5YR 4/4); wet; loose; 50% fine gravel to 1.7 cm, 25% medium to very coarse sand, subrounded; 25% silt; trace lean clay.	GM		
135	-				Poorly graded GRAVEL (GP); brown (7.5YR 5/3); moist; loose; 85% fine gravel; 2 cm, subrounded; 10% medium to very coarse sand; 5% silt. Note: gravel is granitic.	GP		Limited recovery.
-	-				Silty SAND (SM); brown (7.5YR 5/4); wet; medium dense; 60% fine to very coarse sand; 10% fine gravel to 1 cm, subrounded; 30% silt; trace lean clay.		- High Solids Bentonite Grout	Depth @ 1320. Resume 1327.
140	-				Same as above (135 ft); 5% gravel; 35% silt.	SM	•       •       •         •       •       •         •       •       •         •       •       •         •       •       •         •       •       •         •       •       •         •       •       •         •       •       •         •       •       •         •       •       •         •       •       •         •       •       •         •       •       •         •       •       •	
145	-				Same as above (135 ft); no gravel; 40% silt.			
150								



Ground Elevation AMSL (ft): 5344.18 Y Coordinate: 1480157.63 X Coordinate: 1546034.11

## Borehole ID: KAFB-106208

Project Name: KAFB BFF SWMU ST-106 and SS-111 Project Number: 140705

Hole Diameter Upper (in.): 11 3/4 Hole Diameter Lower (in.) 9 5/8 Groundwater Levels BGS (ft): ✓ At Time of Drilling: 496.00
 ✓ At End Of Drilling: N/A
 ✓ After Drilling: 488.85
 Drilling Contractor: Yellow Jacket
 Drilling Method: Air Rotary Casing Hammer Logged By: Jason Tarbert

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					209900 23			
15 Depth (ft)		Number	Headspace	Lithologic Log		U.S.C.S.	Well Diagram	Remarks
155	_				Sandy SILT (ML); brown (7.5YR 5/4); wet; soft; low plasticity; 60% silt; 30% fine to very coarse sand; 10% gravel to 3.8 cm. SILT (ML); brown (7.5YR 5/4); wet; soft;			Depth @ 1344.
160	-				low plasticity; 85% silt;15% fine to medium sand; 2 mm.		Image: Constraint of the second se	Resume @ 1355.
165	-				Same as above (155 ft); trace lean clay nodules.	ML	- High Solids Bentonite Grout	
170	_				Same as above (165 ft).			
175	_				Same as above (155 ft).			Depth @ 1416.
180	-							



Ground Elevation AMSL (ft): 5344.18 Y Coordinate: 1480157.63 X Coordinate: 1546034.11

## Borehole ID: KAFB-106208

Project Name: KAFB BFF SWMU ST-106 and SS-111 Project Number: 140705

Hole Diameter Upper (in.): 11 3/4 Hole Diameter Lower (in.) 9 5/8 Groundwater Levels BGS (ft): ✓ At Time of Drilling: 496.00
 ✓ At End Of Drilling: N/A
 ✓ After Drilling: 488.85
 Drilling Contractor: Yellow Jacket
 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
- - - - - - - - - - - -	-				No recovery. No recovery.			Resume @ 1424.
190	_				SILT (ML); 85% silt; wet; medium firm; trace lean clay nodules; 15% very fine to coarse sand.	ML	- High Solids Bentonite Grout	Impossible to tell what depth this came from.
200	_				No recovery.			Depth @ 1451. Resume @ 1506.
205	_				Sandy SILT (ML); pale brown (10YR 6/3); wet; firm; low plasticity; 60% silt with lean clay; 40% fine to medium sand; 2 mm, rounded.	ML		Total depth with 11 3/4" casing. Begin 9 5/8" casing. Depth @1512. End 8/8/12. Resume 8/9/12 @ 0959.
210	_				Well graded SAND (SW); yellowish brown (10YR 5/4); moist; very loose; 100% fine to very coarse sand; 4 mm, subangular.	SW	•       •       •         •       •       •	



Ground Elevation AMSL (ft): 5344.18 Y Coordinate: 1480157.63 X Coordinate: 1546034.11

## Borehole ID: KAFB-106208

Project Name: KAFB BFF SWMU ST-106 and SS-111 Project Number: 140705

Hole Diameter Upper (in.): 11 3/4 Hole Diameter Lower (in.) 9 5/8 Groundwater Levels BGS (ft): ✓ At Time of Drilling: 496.00
 ✓ At End Of Drilling: N/A
 ✓ After Drilling: 488.85
 Drilling Contractor: Yellow Jacket
 Drilling Method: Air Rotary Casing Hammer Logged By: Jason Tarbert

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0 Depth (ft)	Sample Type	Number	Headspace	Lithologic Log	Material Description	U.S.C.S.	Well Diagram	Remarks
	-				Poorly graded SAND (SP); yellowish brown (10YR 5/4); moist; loose; 100% very fine to medium sand; trace coarse sand, 3 mm, subrounded.			
215	-				Same as above (210 ft); slightly coarser.	SP		
220	-				Well graded SAND (SW); brown (10YR 5/3); moist; loose; 100% very fine to very coarse sand; trace fine gravel to 1 cm, subrounded.		- High Solids Bentonite	Depth @ 1008. Resume @ 1013.
225	-				Same as above (218 ft); 5% fine gravel to 2.1 cm.	SW	Grout	
230	-				Same as above (218 ft). Note: some pumice grains.		•       •         •       •	
235	-				Poorly graded SAND (SP); pale brown (10YR 6/3); moist; loose; 95% fine sand; 5% medium sand; 2 mm, rounded. Note: some pumice grains.	SP		Depth @ 1021.
240								



Ground Elevation AMSL (ft): 5344.18 Y Coordinate: 1480157.63 X Coordinate: 1546034.11

## Borehole ID: KAFB-106208

Project Name: KAFB BFF SWMU ST-106 and SS-111 Project Number: 140705

Hole Diameter Upper (in.): 11 3/4 Hole Diameter Lower (in.) 9 5/8 Groundwater Levels BGS (ft): 

 Image: Groundwater Levels BGS (n).

 Image: Contractor of the second se Logged By: Jason Tarbert

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5 Depth (ft)	Sample Type	Numl	Headspace	Lithologic Log	Material Description	U.S.C.S.	\	Vell Diagram	Remarks
	-				Poorly graded SAND (SP); pale brown (10YR 6/3); moist; loose; 90% fine to medium sand; 10% coarse sand as pumice grains; 2 mm, rounded.	SP	• • • • • • • • • •	• • • • • • • •	Resume.
245	-				Well graded SAND with gravel (SW); brown (10YR 5/3); moist; loose; 85% very fine to very coarse sand; 15% fine gravel to 1 cm, rounded. Note: grains are granitic.		· · · · · · · · · · · · · · · · · · ·	• • • • • • • • • • • • • • • •	
250	-				Same as above (243 ft); fine gravel to 2.8cm.	SW	<ul> <li>.</li> <li>.&lt;</li></ul>	- High Solids Bentonite Grout	
<u>255</u> 260	_				Poorly graded SAND (SP); brown (10YR 5/3); moist; loose; 100% fine to medium sand; 2 mm, subrounded.	SP		· · · · · · · · · · · · · · ·	Depth @ 1034. Resume @ 1041.
200	_				Well graded SAND (SW); pale brown (10YR 6/3); dry; loose; 95% fine to very coarse sand; 5% fine gravel to 1.5 cm, subrounded.			<ul> <li>.</li> <li>.&lt;</li></ul>	
265	-				Same as above (260 ft).	SW		<ul> <li>•</li> <li>•&lt;</li></ul>	
270							•••	• • • •	



Ground Elevation AMSL (ft): 5344.18 Y Coordinate: 1480157.63 X Coordinate: 1546034.11

## Borehole ID: KAFB-106208

Project Name: KAFB BFF SWMU ST-106 and SS-111 Project Number: 140705

Hole Diameter Upper (in.): 11 3/4 Hole Diameter Lower (in.) 9 5/8 Groundwater Levels BGS (ft): ✓ At Time of Drilling: 496.00
 ✓ At End Of Drilling: N/A
 ✓ After Drilling: 488.85
 Drilling Contractor: Yellow Jacket
 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
275	-				Poorly graded SAND (SP); brown (10YR 5/3); moist; loose; 95% fine to medium sand; 5% coarse sand; trace fine gravel to 1 cm, rounded. Same as above (270 ft); finer; no coarse sand or gravel.	SP		Depth @ 1045. Resume @ 1051.
- 280 - -	-				Well graded SAND (SW); brown (10YR 5/3); moist; loose; 100% very fine to very coarse sand; trace fine gravel to 1 cm, rounded.		- High Solids Bentonite Grout	
	-				Same as above (279 ft); slightly finer.			
<u>290</u>	-				Same as above (279 ft); 5% fine gravel.	SW		
<u>295</u>	-				Same as above (279 ft); 5% fine gravel.			Depth @ 1058.
300								



Ground Elevation AMSL (ft): 5344.18 Y Coordinate: 1480157.63 X Coordinate: 1546034.11

### Borehole ID: KAFB-106208

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Hole Diameter Upper (in.): 11 3/4 Hole Diameter Lower (in.) 9 5/8 Groundwater Levels BGS (ft): ✓ At Time of Drilling: 496.00
 ✓ At End Of Drilling: N/A
 ✓ After Drilling: 488.85
 Drilling Contractor: Yellow Jacket
 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 (SW); brown (10YR 5/3); moist; loose; 90% very fine to very coarse sand; 10% fine gravel to 1 cm, rounded.	SW		Resume @ 1105.
<u>305</u>	-				Poorly graded SAND (SP); pale brown (10YR 6/3); dry; loose; 100% very fine to medium sand; trace fine gravel to 4.7 cm, well rounded.		•     •       •     •	
<u>310</u>	-				Poorly graded SAND (SP); brown (7.5YR 5/4); moist; loose; 100% very fine sand; 1 mm rounded; trace silt.	SP	<ul> <li>High Solids</li> <li>Bentonite</li> <li>Grout</li> </ul>	
<u>315</u>	-				Same as above (310 ft); pale brown (10YR 6/3); fine to medium sand.		•       •       •         •       •       •         •       •       •         •       •       •         •       •       •         •       •       •         •       •       •         •       •       •         •       •       •         •       •       •         •       •       •         •       •       •         •       •       •         •       •       •         •       •       •	Depth @ 1115. Resume @ 1221.
<u>320</u>	-				Well graded SAND (SW); brown (10YR 5/3); moist; loose; 100% very fine to coarse sand; 4 mm, rounded.		•     •       •     •	
325	-				Same as above (320 ft).	SW		
330	-							



Ground Elevation AMSL (ft): 5344.18 Y Coordinate: 1480157.63 X Coordinate: 1546034.11

## Borehole ID: KAFB-106208

Project Name: KAFB BFF SWMU ST-106 and SS-111 Project Number: 140705

Hole Diameter Upper (in.): 11 3/4 Hole Diameter Lower (in.) 9 5/8 Groundwater Levels BGS (ft): ✓ At Time of Drilling: 496.00
 ✓ At End Of Drilling: N/A
 ✓ After Drilling: 488.85
 Drilling Contractor: Yellow Jacket
 Drilling Method: Air Rotary Casing Hammer Logged By: Jason Tarbert

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05 Depth (ft)	Sample Type	Number	Headspace	Lithologic Log	Material Description	U.S.C.S.	Well Diagram	Remarks
	-				Well graded SAND (SW); brown (10YR 5/3); moist; loose; 95% very fine to coarse sand; 5% fine gravel to 1.2 cm, rounded.			
335	-				Same as above (320 ft); trace fine gravel.			Depth @ 1231. Resume @ 1236.
<u>340</u>	-				Same as above (320 ft); 5% fine gravel.			
<u>345</u>	-				Same as above (340 ft).	SW	High Solids     Bentonite     Grout	
<u>350</u>	-				Same as above (320 ft); 10% fine gravel.			
355	-				Same as above (350 ft).			Depth @ 1246.
360								



Ground Elevation AMSL (ft): 5344.18 Y Coordinate: 1480157.63 X Coordinate: 1546034.11

### Borehole ID: KAFB-106208

Project Name: KAFB BFF SWMU ST-106 and SS-111 Project Number: 140705

Hole Diameter Upper (in.): 11 3/4 Hole Diameter Lower (in.) 9 5/8 Groundwater Levels BGS (ft): ✓ At Time of Drilling: 496.00
 ✓ At End Of Drilling: N/A
 ✓ After Drilling: 488.85
 Drilling Contractor: Yellow Jacket
 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
365	-				Well graded SAND (SW); brown (10YR 5/3); moist; loose; 100% very fine to coarse sand; 4 mm, rounded. Well graded SAND with gravel (SW); brown (10YR 5/3); moist; medium dense; 75% fine to very coarse sand; 25% gravel to 3.6 cm, subrounded.	SW		Resume @ 1252.
370	-				Poorly graded SAND with gravel (SP); brown (10YR 5/3); moist; medium dense; 85% fine to medium sand; 15% fine gravel to 3.7 cm, well rounded. Same as above (380 ft); poorly graded sand; no gravel.	SP	- High Solids Bentonite Grout	Depth @ 1303. Resume @ 1409.
<u>380</u> <u>385</u> 390	-				Well graded SAND (SW); brown (10YR 5/3); dry; medium dense; 100% very fine to coarse sand; trace fine gravel to 3.2 cm, rounded. Well graded SAND (SW); brown (10YR 5/3); dry; medium dense; 100% very fine to coarse sand; trace fine gravel to 3.2 cm, rounded. Coarser than above (380 ft).	SW	•       •       •       •         •       <	



Ground Elevation AMSL (ft): 5344.18 Y Coordinate: 1480157.63 X Coordinate: 1546034.11

### Borehole ID: KAFB-106208

Project Name: KAFB BFF SWMU ST-106 and SS-111 Project Number: 140705

Hole Diameter Upper (in.): 11 3/4 Hole Diameter Lower (in.) 9 5/8 Groundwater Levels BGS (ft): ✓ At Time of Drilling: 496.00
 ✓ At End Of Drilling: N/A
 ✓ After Drilling: 488.85
 Drilling Contractor: Yellow Jacket
 Drilling Method: Air Rotary Casing Hammer Logged By: Jason Tarbert

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					00 ,			
06 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); dry; medium dense; 100% very fine to coarse sand; trace fine gravel to 3.2 cm, rounded. Coarser than above (380 ft).			
<u>395</u>	-				Same as above (380 ft).	sw	•     •     •       •     •     •       •     •     •       •     •     •       •     •     •       •     •     •       •     •     •       •     •     •       •     •     •       •     •     •       •     •     •       •     •     •       •     •     •       •     •     •       •     •     •       •     •     •	Depth @ 1424. Resume @ 1435.
400	-				Same as above (380 ft).		- High Solids Bentonite Grout	
405	-				Poorly graded SAND (SP); brown (10YR 5/3); dry; medium dense; 100% fine to medium sand; trace fine gravel to 1.3 cm, rounded.	SP		
410	-				Well graded SAND (SW); brown (10YR 5/3); dry; medium dense; 100% fine to very coarse sand; 4 mm, rounded.			
415	-				Same as above (410 ft); 10% fine gravel to 2.3 cm.	SW		Depth @ 1453. Resume @ 1520.
420								



Ground Elevation AMSL (ft): 5344.18 Y Coordinate: 1480157.63 X Coordinate: 1546034.11

## Borehole ID: KAFB-106208

Project Name: KAFB BFF SWMU ST-106 and SS-111 Project Number: 140705

Hole Diameter Upper (in.): 11 3/4 Hole Diameter Lower (in.) 9 5/8 Groundwater Levels BGS (ft): ✓ At Time of Drilling: 496.00
 ✓ At End Of Drilling: N/A
 ✓ After Drilling: 488.85
 Drilling Contractor: Yellow Jacket
 Drilling Method: Air Rotary Casing Hammer Logged By: Jason Tarbert

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					50 J			
65 Depth (ft)	Sample Type	Num	Headspace PID	Lithologic Log	Material Description	U.S.C.S.	Well Diagram	Remarks
425	-				Poorly graded SAND (SP); yellowish brown (10YR 5/4); dry; medium dense; 100% very fine to medium sand; trace coarse sand to 3 mm, rounded.	SP		
	-				Well graded SAND (SW); brown (10YR 5/3); moist; medium dense; 100% fine to very coarse sand; trace fine gravel, 6 mm, rounded.		<ul> <li>High Solids</li> <li>Bentonite</li> <li>Grout</li> </ul>	
430	_				Same as above (425 ft); 5% fine gravel.		•       •       •         •       •       •         •       •       •         •       •       •         •       •       •         •       •       •         •       •       •         •       •       •         •       •       •         •       •       •         •       •       •         •       •       •         •       •       •         •       •       •         •       •       •	
435	-				Same as above (425 ft); 5% fine gravel.	SW	•       •       •         •       •       •         •       •       •         •       •       •         •       •       •         •       •       •         •       •       •         •       •       •         •       •       •         •       •       •         •       •       •         •       •       •         •       •       •         •       •       •         •       •       •         •       •       •	Depth @ 1537. Resume @ 1546.
440	-				Same as above (425 ft).		•       •       •         •       •       •         •       •       •         •       •       •         •       •       •         •       •       •         •       •       •         •       •       •         •       •       •         •       •       •         •       •       •         •       •       •         •       •       •         •       •       •         •       •       •	
445	-				Poorly graded SAND (SP); brown (10YR 5/3); moist; dense; 90% very fine to medium sand; 10% fine gravel to 2.5 cm, rounded.	SP		
450								



Ground Elevation AMSL (ft): 5344.18 Y Coordinate: 1480157.63 X Coordinate: 1546034.11

### Borehole ID: KAFB-106208

Project Name: KAFB BFF SWMU ST-106 and SS-111 Project Number: 140705

Hole Diameter Upper (in.): 11 3/4 Hole Diameter Lower (in.) 9 5/8 Groundwater Levels BGS (ft): ✓ At Time of Drilling: 496.00
 ✓ At End Of Drilling: N/A
 ✓ After Drilling: 488.85
 Drilling Contractor: Yellow Jacket
 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	_				Well graded SAND (SW); brown (10YR 5/3); moist; dense; 100% fine to very coarse sand; 4.5 mm, rounded.			
-	_				Same as above (450 ft); 5% fine gravel to 1 cm.	SW		Depth @ 1605. End 8/9/12. Begin @ 1025 on 8/10/12.
460					Poorly graded SAND (SP); brown (10YR 5/3); dry; medium dense; 100% fine to medium sand; 2 mm; rounded	SP	- High Solids Bentonite	
465					Well graded SAND (SW); yellowish brown (10YR 5/4); dry; medium dense; 100% fine to coarse sand; trace fine gravel to 7 mm, rounded.		Grout	
470	_				Same as above (463 ft); 10% fine gravel to 1.6 cm.	SW	•       •       •         •       •       •         •       •       •         •       •       •         •       •       •         •       •       •         •       •       •         •       •       •         •       •       •         •       •       •         •       •       •         •       •       •         •       •       •         •       •       •         •       •       •         •       •       •         •       •       •         •       •       •	
475					Same as above (463 ft).			Depth @ 1046.
480								



Ground Elevation AMSL (ft): 5344.18 Y Coordinate: 1480157.63 X Coordinate: 1546034.11

## Borehole ID: KAFB-106208

Project Name: KAFB BFF SWMU ST-106 and SS-111 Project Number: 140705

Hole Diameter Upper (in.): 11 3/4 Hole Diameter Lower (in.) 9 5/8 Groundwater Levels BGS (ft): ✓ At Time of Drilling: 496.00
 ✓ At End Of Drilling: N/A
 ✓ After Drilling: 488.85
 Drilling Contractor: Yellow Jacket
 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.	W	ell Diagram	Remarks
	-				SILT (ML); brown (7.5YR 5/4); moist; firm; non-plastic to low plasticity; 85% silt; 15% very fine to medium sand; 2 mm, rounded.	ML		•	Resume @ 1054.
485	-				Poorly graded SAND (SP); yellowish brown (10YR 5/4); moist; medium dense; 100% very fine to medium sand; 2 mm, rounded.			- Top of Bentonite Seal	
490	-				✓ Same as above (483 ft); trace coarse sand to 4mm.	SP		- 5" Schedule 80 PVC Riser	Water level after drilling.
495	-				∑ Same as above (483 ft); trace fine grave to 1.1 cm, overall coarser fine to medium.			- Top of 20/40 Sand - Top of 10/20 Sand	Water level during drilling. Depth @ 1109. Resume @1118.
500	-				Well graded SAND (SW); brown (10YR 4/3); wet; dense; 95% fine to very coarse sand; 5% fine gravel to 1.2 cm, rounded.				
505	-				Same as above (500 ft); gravel to 4.4 cm.	SW		- Top of 5" Schedule 80 PVC 0.010" Slot Screen	
510									<u> </u>



Ground Elevation AMSL (ft): 5344.18 Y Coordinate: 1480157.63 X Coordinate: 1546034.11

## Borehole ID: KAFB-106208

Project Name: KAFB BFF SWMU ST-106 and SS-111 Project Number: 140705

Hole Diameter Upper (in.): 11 3/4 Hole Diameter Lower (in.) 9 5/8 Groundwater Levels BGS (ft): ✓ At Time of Drilling: 496.00
 ✓ At End Of Drilling: N/A
 ✓ After Drilling: 488.85
 Drilling Contractor: Yellow Jacket
 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.	Well Diagram	Remarks
	_				Well graded SAND (SW); brown (10YR 4/3); wet; dense; 95% fine to very coarse sand; 5% fine gravel to 1.2 cm, rounded.			
<u>515</u>	_				Same as above (500 ft).			Added ~ 50 gal. water Depth @ 1133. Resume @ 1139.
<u>520</u>					Well graded SAND with gravel (SW); brown (10YR 5/3); wet; medium dense; 60% fine to very coarse sand; 40% fine gravel to 1.5 cm, rounded. Note: granitic fragments.		- Bottom of 5" Schedule 80 PVC 0.010" Slot Screen - Sump	
<u>525</u>					Same as above (520 ft); overall finer.	SW	Sump	
<u>530</u>	-				Well graded SAND (SW); brown (10YR 5/3); wet; medium dense; 95% fine to very coarse sand; 5% fine gravel to 8 mm; rounded.			
<u>535</u>	-				Same as above (530 ft); trace fine gravel.			
540	-						- Bottom of Filter Pack	



Ground Elevation AMSL (ft): 5344.18 Y Coordinate: 1480157.63 X Coordinate: 1546034.11

## Borehole ID: KAFB-106208

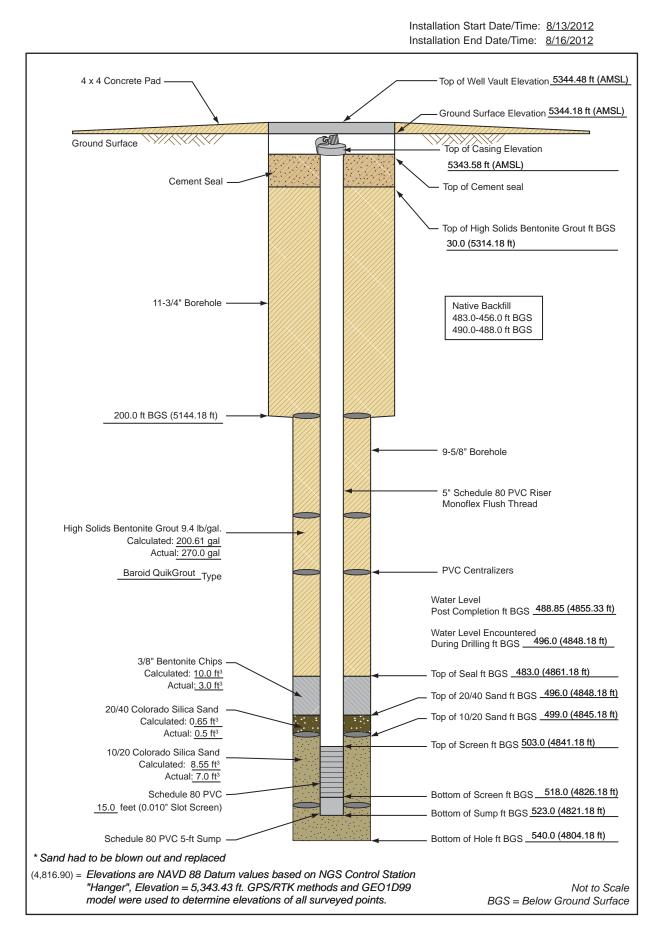
Project Name: KAFB BFF SWMU ST-106 and SS-111 Project Number: 140705

Hole Diameter Upper (in.): 11 3/4 Hole Diameter Lower (in.) 9 5/8 Groundwater Levels BGS (ft): ✓ At Time of Drilling: 496.00
 ✓ At End Of Drilling: N/A
 ✓ After Drilling: 488.85
 Drilling Contractor: Yellow Jacket
 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
	-				Well graded SAND (SW); brown (10YR 5/3); wet; medium dense; 95% fine to very coarse sand; 5% fine gravel to 8mm; rounded.	SW	- Native Backfill	Total Depth @ 1157. Added ~ 100 gal. during drilling. Added 500 gal. to flood hole. 600 gal. total.
54	5			••••••• ••••••				
55	) 							
55	5							
	-							
56	)							
56	5							
570	- - - )							

### Monitoring Well Completion Diagram KAFB-106208





### Well Development Record

Pg 1 of 2

Project Nan	ne: KAFB BFF	=						
Location: M	lesilla					Well/Piez. N	208	
Personnel:	V. Bracht					Date Installe		
Date: 9/11/1	12					Csg. Diamet		
Samplers:	N/A					Total Depth	(ft. BGL): <u>523</u>	
Method of E X Surging	Development		X Bailing					
X Original Develo	opment		Redevelopmen	t		Other		
Developme	nt Date: 9/11	/12						
Depth to Wa	ater Before D	eveloping V	Vell (ft. BGL)	: 490.93		_		
-				Vol. (V)	Purge F	actor V	olume to Purge	
					-		-	
Height of W	ater Column	:1	feet = 49.	70 gal.	* 1	= 49.70	0	
	V=(B * r <sub>c</sub> ² * L	<sub>-c</sub> * 7.48)+(B	$* (r_w^2 - r_c^2) *$	L <sub>s</sub> * Ø <sub>s</sub> * 7.48	B)+(H₂O add	ed during dri	illing/installati	on) = <u>649.7 gallons</u>
Depth Purgi	ing From: 5	06 feet	_		Time Purgii	ng Begins: 1	034, 9/11/12	
Weather: S	unny, Warm				Screened Ir	nterval (ft BG	<b>L)</b> : <u>503 - 518</u>	3
Equipment	Nos.: pH Me	ter: LVE	002686		EC Meter:	LVE 0026	86	Turbidity Meter: LVE002384
Equipment	Decontamina	ated Prior to	Developme	nt: Y <u>X</u>	Ν			
Describe: S	Steam Cleane	d				-		
Collected Sa Describe: N	ample of Wa	ter Added to	Well: Y	N X	(			
_	600 gallons o	of water adde	ed durina drilli	ng/well instal	lation activitie	- es		
			g					
Date	Time	Water Level (ft. Below TOC)	Volume Removed (gal.)	Temp.°C	рН	EC (ms/cm)	Turbidity N.T.U.	Comments
9/11/2012		490.13	(gai.) 10					
		490.13		21.30	6.91	0.000*		Begin Bailing; Water is Muddy Brown
9/11/2012			45	21.00	7.75			Continue Bailing; Water is Muddy Brown
9/11/2012	1100		75	20.80	7.87	0.003*		Continue Bailing: Water is Muddy Brown
							>1000	Continue Bailing; Water is Muddy Brown
9/11/2012 9/11/2012		490.05	100	21.60	7.54			Bailed Begin Pumping at 10 GPM

Notes:

9/11/2012

9/11/2012

9/11/2012

9/11/2012

9/11/2012

\* Water Levels - Reported to the nearest 0.01 foot

1245

1250

1255

1300

1305

492.00

492.27

492.29

492.31

492.33

200

275

300

350

400

20.50

20.60

20.50

20.60

20.60

\* pH - Reading rounded to 0.1 pH units \* Water temperature - Reported to nearest 0.1C

\* Turbidity report in NTV nearest whole # GPM = Gallons Per Minute

Where:

7.56

7.59

7.59

7.59

7.59

B=3.14

0.450

0.438

0.433

0.429

0.424

 $\mathcal{O}_{s}$ = porosity of the sand pack

 $r_{c}{=}$  radius of the well casing and screen in feet  $L_{c}{=}$  length of water column inside the casing and screen in feet

36.90 Water is Slightly Cloudy

14.90 Water is Fairly Clear

12.60 Water is Fairly Clear

10.40 Water is Fairly Clear

7.70 Water is Clear

 $\mathbf{r}_{\mathbf{w}}\!\!=\!\mathbf{radius}$  of the well bore in feet  $\mathbf{L}_{\mathbf{s}}\text{=}$  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: 9/11/12

Time Start: 1034, 9/11/12

Well No: KAFB-106208

Samplers: N/A

Checked By: N/A

Time Finish: 1330, 9/11/12

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
9/11/2012	1310	493.35	450	20.50	7.58	0.422	5.58	Water is Clear
9/11/2012	1315	493.37	500	20.40	7.64	0.419	4.11	Water is Clear
9/11/2012	1320	493.38	550	20.50	7.65	0.415	3.45	Water is Clear
9/11/2012	1325	493.40	600	20.60	7.64	0.413	2.81	Water is Clear
9/11/2012	1330	493.41	650	20.60	7.62	0.408	2.63	Water is Clear; Pump off; Total Removed

\* Due to sample cup design, the YSI Professional Plus does not accurately measure EC from the cup. Sample cup works well in a flow-through set-up, once pumping begins.

Was well sampled after development? YES NO X

Sample Method: N/A

Sample Name: N/A

Analyses: N/A

# KAFB 106209



Ground Elevation AMSL (ft): 5343.8 Y Coordinate: 1480204.26 X Coordinate: 1546034.28

## Borehole ID: KAFB-106209

Project Name: KAFB BFF SWMU ST-106 and SS-111 Project Number: 140705

Hole Diameter Upper (in.): 11-3/4 Hole Diameter Lower (in.) 9-5/8 Groundwater Levels BGS (ft): 

 Image: Groundwater Levels BGS (n).

 Image: Contract of Contra Logged By: Patrick Ostrye/Jason Tarbert

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Oepth (ft)	Sample Type	Number	Headspace PID	Lithologic Log	Material Description	U.S.C.S.	We	ell Diagram	Remarks
	-				Disturbed from air knife utilities check			- Top of Cement Seal	0833 begin; 0837 stop. see FADL; 7-18-2012 0815 begin.
10	-			1: 0 0, 5 0 0, 5 0 0, 0 0, 0 0, 0 0, 0 0,	Poorly graded GRAVEL with silt (GP/GM); reddish brown (5YR 5/4); damp; very loose; 70% gravel; 3 to 60 mm; angular to subrounded; 10% very fine to very coarse sand; 10% fines (silt).	GP- GM			Injecting water for dust control.
<u>15</u>	-				Silty SAND with gravel (SM); reddish brown (5YR 5/4); wet; very loose; 60% fine to coarse sand; 15% gravel; 3 to 10 mm; subangular to subrounded; max 10 mm; 15% fines (silt).			- Cement Seal	End @ 0832. Begin @ 0841.
20	-				Silty SAND (SM); yellowish red (5YR 5/6); wet; very loose; 60% fine to coarse sand; 5% gravel; 3 - 12 mm; angular to subangular; max 12 mm; 25% silt, 10% clay.	SM			0845. Pause - portable air compressor being added. Begin @ 0857.
25	-			<u> 158</u>	Unable to log 25 - 35 ft bgs.				Driller attempting to dry casing; cuttings retrieved are mixed with wet cuttings from above.



Ground Elevation AMSL (ft): 5343.8 Y Coordinate: 1480204.26 X Coordinate: 1546034.28

## Borehole ID: KAFB-106209

Project Name: KAFB BFF SWMU ST-106 and SS-111 Project Number: 140705

Hole Diameter Upper (in.): 11-3/4 Hole Diameter Lower (in.) 9-5/8 Groundwater Levels BGS (ft): 

 Image: Groundwater Levels BGS (n).

 Image: Weight of the second Logged By: Patrick Ostrye/Jason Tarbert

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Depth (ft)	Sample Type	Number	Headspace PID	Lithologic Log	Material Description	U.S.C.S.	Well Diagrar	n Remarks
30	-				Unable to log 25 - 35 ft bgs. See above		- Top of Hig Solids Bentonite Grout	
40	-				Well graded SAND (SW); reddish brown (5YR 4/3); moist; loose; 95% sand; 5% gravel; 3 - 5 mm, subangular to subrounded, max 5 mm.	sw		
50	-				Silty SAND (SM); reddish brown (5YR 5/3); moist; loose; no gravel; 80% fine to coarse sand; 20% fines (silt). see FADL 0945			
55	-				Silty SAND (SM); red (2.5YR 4/6); moist; loose; no gravel; 70% very fine to very coarse sand; 30% fines (silt).	SM	- High Solid Bentonite Grout	ds End @ 0958. Begin @ 1005.
60								



Ground Elevation AMSL (ft): 5343.8 Y Coordinate: 1480204.26 X Coordinate: 1546034.28

## Borehole ID: KAFB-106209

Project Name: KAFB BFF SWMU ST-106 and SS-111 Project Number: 140705

Hole Diameter Upper (in.): 11-3/4 Hole Diameter Lower (in.) 9-5/8 Groundwater Levels BGS (ft): 

 Image: Groundwater Levels BGS (n).

 Image: Contract of Contra Logged By: Patrick Ostrye/Jason Tarbert

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8 Depth (ft)	Sample Type	Number	Headspace PID	Lithologic Log	Material Description	U.S.C.S.	We	ell Diagram	Remarks
- - - - -	-				Silty SAND (SM); red (2.5YR 4/6); moist; loose; 69% very coarse to very fine sand; 1% gravel; 3 - 8 mm, subangular to subrounded; max 8 mm; 30% fines (silt). Silty SAND with gravel (SM); red (2.5YR 4/8); moist; loose; 45% very fine to				
70	-				coarse sand (well graded); 15% gravel; 3 - 10 mm, angular to subrounded; max 12 mm; 30% silt; 10% clay. Silty SAND (SM); red (2.5YR 4/8); moist; loose; 55% very fine to coarse sand; 5% gravel, 3 - 10 mm, angular to subangular; max 12 mm; 25% silt; 15%				
75	-				Silty SAND (SM); red (2.5YR 4/8); moist; loose; 54% very fine to medium sand; 5% very coarse to coarse sand; 1% gravel; 3 - 8 mm, angular; 25% silt; 15% clay.	SM		- High Solids Bentonite Grout	End @ 1025. Begin @ 1033.
80					Silty SAND (SM); red (2.5YR 4/8); moist; loose; 52% very fine to medium sand; 3% coarse to very coarse sand; 20% silt; 20% clay.				
85	-				Silty SAND (SM); red (2.5YR 4/6); moist; loose; 60% very fine to coarse sand, 3% very coarse sand; 30% silt; 10% clay.				



Ground Elevation AMSL (ft): 5343.8 Y Coordinate: 1480204.26 X Coordinate: 1546034.28

## Borehole ID: KAFB-106209

Project Name: KAFB BFF SWMU ST-106 and SS-111 Project Number: 140705

Hole Diameter Upper (in.): 11-3/4 Hole Diameter Lower (in.) 9-5/8 Groundwater Levels BGS (ft): 

 Image: Groundwater Levels BGS (n).

 Image: Contract of Contra Logged By: Patrick Ostrye/Jason Tarbert

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ଞ Depth (ft)	Sample Type	Number	Headspace PID	Lithologic Log		U.S.C.S.	Well Diagram	Remarks
-	_				Silty SAND (SM); red (2.5YR 4/6); moist; loose; no gravel; 55% very fine to medium sand; 3% very coarse to coarse sand; 45% fines (silt).			
95	-				Same as above	SM		End @ 1050. 7-19-2012. Begin @ 1230.
-	-				Clayey SAND (SC); yellowish red (5YR 4/6); moist; loose; no gravel; 75% fine to medium sand; 10% silt; 15% clay.	SC		
<u>105</u>	-				Silty SAND (SM); red (2.5 YR 4/6); moist; loose; no gravel; 60% fine to medium sand; 30% silt; 10% clay.		- High Solids Bentonite Grout	
<u>110</u>	-				Silty SAND (SM); red (2.5 YR 4/6); moist; loose; no gravel; 60% fine to medium sand; 10% very coarse to coarse sand; 35% silt; 5% clay.	SM		
<u>115</u>	-				Silty SAND (SM); yellowish red (5YR 4/6); moist; loose; no gravel; 85% very fine to coarse sand; 15% fines (silt).			End @ 1248. Adding water to clean out discharge. hose. Begin @ 1318.
120							••• •••	



Ground Elevation AMSL (ft): 5343.8 Y Coordinate: 1480204.26 X Coordinate: 1546034.28

## Borehole ID: KAFB-106209

Project Name: KAFB BFF SWMU ST-106 and SS-111 Project Number: 140705

Hole Diameter Upper (in.): 11-3/4 Hole Diameter Lower (in.) 9-5/8 Groundwater Levels BGS (ft): 

 Image: Groundwater Levels BGS (n).

 Image: Contract of Contra Logged By: Patrick Ostrye/Jason Tarbert

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							•	
12 Depth (ft)	Sample Type	Number	Headspace PID	Lithologic Log	Material Description	U.S.C.S.	Well Diagram	Remarks
125					No recovery Silty SAND (SM); no color; wet; loose; 50% very fine to medium sand; 30% silt; 20% clay.	SM		
135	-				Clayey SAND (SC); no color; wet; loose; 50% very fine to medium sand; 20% silt; 30% clay.	SC		
140	-				Silty SAND (SM); no color; wet; loose; 49% very fine to medium sand; 1% coarse to very coarse sand; 40% silt; 10% clay.		- High Solids Bentonite Grout	End @ 1354. Begin @ 1405.
145	-				Silty SAND (SM); no color; wet; loose; 65% very fine to very coarse sand; 25% silt; 10% clay.	SM		
150	-				Silty SAND (SM); no color; wet; loose; 40% very fine to medium sand; 15% coarse to very coarse sand; 10% gravel; 3 - 40 mm, subangular to rounded; max 50 mm; 30% silt; 5% clay.		•       •       •         •       •       •	



Ground Elevation AMSL (ft): 5343.8 Y Coordinate: 1480204.26 X Coordinate: 1546034.28

## Borehole ID: KAFB-106209

Project Name: KAFB BFF SWMU ST-106 and SS-111 Project Number: 140705

Hole Diameter Upper (in.): 11-3/4 Hole Diameter Lower (in.) 9-5/8 Groundwater Levels BGS (ft): 

 Image: Groundwater Levels BGS (n).

 Image: Contract of Contra Logged By: Patrick Ostrye/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
	-				Silty SAND (SM); no color; wet; loose; 60% very fine to medium sand; 30% silt; 10% clay. Silty SAND (SM); no color; wet; loose; 50% very fine to fine sand; 20% medium			•	End @ 1420. Begin @ 1432.
- - 160 -	-				Silty SAND (SM); no color; wet; loose; 50% very fine to fine sand; 50% fines (silt).	SM			Begin @ 1452.
- 165 -	-				Same as above			- High Solids Bentonite Grout	
- 170 -	-				Clayey SAND (SC); no color; wet; loose; 60% very fine to fine sand; 40% fines (clay); low to medium plasticity. Silty SAND (SM); no color; wet; loose; 50% very fine to fine sand; 50% fines	SC			End @ 1450. Begin @ 1505.
- 175 - - -	-				(silt).	SM		•	
180							•••	•	



Ground Elevation AMSL (ft): 5343.8 Y Coordinate: 1480204.26 X Coordinate: 1546034.28

## Borehole ID: KAFB-106209

Project Name: KAFB BFF SWMU ST-106 and SS-111 Project Number: 140705

Hole Diameter Upper (in.): 11-3/4 Hole Diameter Lower (in.) 9-5/8 Groundwater Levels BGS (ft): 

 Image: Groundwater Levels BGS (n).

 Image: Contract of Contra Logged By: Patrick Ostrye/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	
<u>185</u>					No recovery Clayey SAND (SC); no color; wet; loose; 59% very fine to medium sand; 1% gravel; 3 - 10 mm; subangular; max 10 mm; 30% clay; 10% silt. No recovery	SC		•       •         •		
195	-				Silty SAND (SM); no color; wet; loose; 75% very fine to coarse sand; 25% fines (silt).	SM	<ul> <li>•</li> <li>•&lt;</li></ul>	<ul> <li>- High Solids</li> <li>Bentonite</li> <li>Grout</li> </ul>	End @ 1528. Begin @ 1543. Pushing drive casing flush to ground surface 200 ft bgs.	
200	-				Poorly graded SAND (SP); yellowish red (5YR 4/6); moist; loose; 95% fine to coarse sand; 5% fines (coarse fraction is pumice).			<ul> <li>•</li> <li>•&lt;</li></ul>	7-20-12. Begin @ 1220.	
205	-				Poorly graded SAND (SP); yellowish red (5YR 4/6); moist; loose; 94% fine to coarse sand; 1% gravel; 3 - 10 mm; angular to subrounded; max 12 mm; 5% fines. Note: coarse fraction of sand is pumice.	SP		•       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •		
210							••	• • • •		



Ground Elevation AMSL (ft): 5343.8 Y Coordinate: 1480204.26 X Coordinate: 1546034.28

### Borehole ID: KAFB-106209

Project Name: KAFB BFF SWMU ST-106 and SS-111 Project Number: 140705

Hole Diameter Upper (in.): 11-3/4 Hole Diameter Lower (in.) 9-5/8 Groundwater Levels BGS (ft): 

 Image: Groundwater Levels BGS (n).

 Image: Contract of Contra Logged By: Patrick Ostrye/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); reddish brown (5YR 5/4); dry; loose; 95% very fine to medium sand; 5% fines.	SP		
<u>215</u>	-				Well graded SAND with gravel (SW); reddish brown (5YR 5/4); dry; loose; 85% sand; 15% gravel; 3 - 10 mm; angular to subrounded; max 10 mm.			End @ 1230. Begin @ 1236.
220	-				Well graded SAND with gravel (SW); reddish brown (5YR 4/4); dry; loose; 75% sand; 25% gravel; 3 - 10 mm; subangular to subrounded; max 10 mm.	SW	- High Solids Bentonite Grout	
225	-				Poorly graded SAND (SP); reddish brown (5YR 4/4); dry; loose; 95% very fine to medium sand; 5% fines.		•     •       •     •	
<u>230</u>	_				Poorly graded SAND (SP); reddish brown (5YR 4/4); moist; loose; 1% gravel; 3 - 5 mm; subangular; max 5 mm; 94% very fine to medium sand; 1% coarse to very coarse sand; 5% fines.	SP	•       •       •         •       •       •         •       •       •         •       •       •         •       •       •         •       •       •         •       •       •         •       •       •         •       •       •         •       •       •         •       •       •         •       •       •         •       •       •         •       •       •         •       •       •	
235	-				Poorly graded SAND with silt (SP-SM); reddish brown (5YR 4/3); moist; loose; 90% very fine to medium sand; 10% fines (silt).	SP- SM		End @ 1248. Begin @ 1254.
240								



Ground Elevation AMSL (ft): 5343.8 Y Coordinate: 1480204.26 X Coordinate: 1546034.28

## Borehole ID: KAFB-106209

Project Name: KAFB BFF SWMU ST-106 and SS-111 Project Number: 140705

Hole Diameter Upper (in.): 11-3/4 Hole Diameter Lower (in.) 9-5/8 Groundwater Levels BGS (ft): 

 Image: Groundwater Levels BGS (n).

 Image: Weight of the second Logged By: Patrick Ostrye/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 with silt (SP-SM); reddish brown (5YR 4/3); moist; loose; 90% very fine to medium sand; 10% fines (silt).	SP- SM		
245	_				Poorly graded GRAVEL with sand (GP); dry; loose; 70% gravel; 3 - 20 mm; angular to subrounded; max 22 mm; 30% fine to very coarse sand; Note; gravel contains quartzite; limestone; basalt and granitic clasts.	GP		
-	_			20 20	Poorly graded SAND (SP); reddish brown (5YR 5/4); moist; loose; 100% fine to coarse sand.		- High Solids	
255	-				Poorly graded SAND with gravel (SP); reddish brown (5YR 5/3); moist; loose; 85% fine to very coarse sand; 15% gravel; 3 - 8 mm; subangular to subrounded; max 8 mm; Note: pumice clasts throughout grain size.		Bentonite Grout	End @ 1306. Begin @ 1311.
260	-				Poorly graded SAND (SP); reddish brown (5YR 5/3); dry; loose; 85% very fine to medium sand; 10% coarse to very coarse sand; 5% fines. Note: coarse fraction is pumice.	SP	•       •       •       •         •       •       •       •         •       •       •       •         •       •       •       •         •       •       •       •         •       •       •       •         •       •       •       •         •       •       •       •         •       •       •       •         •       •       •       •         •       •       •       •         •       •       •       •         •       •       •       •         •       •       •       •         •       •       •       •         •       •       •       •         •       •       •       •         •       •       •       •	
<u>265</u>	-				Poorly graded SAND (SP); reddish brown (5YR 4/4); moist; loose; 92% very fine to coarse sand; 3% gravel; 3 - 5 mm; subrounded; max 5 mm; 5% fines.		•       •       •       •         •       •       •       •         •       •       •       •         •       •       •       •         •       •       •       •         •       •       •       •         •       •       •       •         •       •       •       •         •       •       •       •         •       •       •       •         •       •       •       •         •       •       •       •         •       •       •       •         •       •       •       •         •       •       •       •         •       •       •       •         •       •       •       •	
270								



Ground Elevation AMSL (ft): 5343.8 Y Coordinate: 1480204.26 X Coordinate: 1546034.28

### Borehole ID: KAFB-106209

Project Name: KAFB BFF SWMU ST-106 and SS-111 Project Number: 140705

Hole Diameter Upper (in.): 11-3/4 Hole Diameter Lower (in.) 9-5/8 Groundwater Levels BGS (ft): 

 Image: Groundwater Levels BGS (n).

 Image: Contract of Contra Logged By: Patrick Ostrye/Jason Tarbert

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					00 ,		<b>,</b>		
02 Depth (ft)	Sample Type	Number	Headspace PID	Lithologic Log	Material Description	U.S.C.S.	Well Dia	agram	Remarks
275	-				Well graded SAND (SW); reddish brown (5YR 5/4); moist; loose; 90% sand; 10% gravel; 3 - 8 mm; subangular to subrounded; max 8 mm; Note: pumice throughout.	SW			
-	-				Poorly graded SAND (SP); reddish brown (5YR 4/4); damp; loose; 95% fine to very coarse sand; 5% gravel; 3 - 5 mm; subangular to subrounded; max 8 mm.				End @ 1324. Begin @ 1332.
280	-				Poorly graded SAND (SP); brown (7.5YR 5/4); moist; loose; 100% fine to coarse sand.			n Solids tonite ut	
<u>285</u>	-				Poorly graded SAND with gravel (SP); reddish brown (5YR 5/4); moist; loose; 80% fine to very coarse sand; 20% gravel; 3 - 10 mm; subangular to rounded; max 10 mm.	SP	•     •     •       •     •     •       •     •     •       •     •     •       •     •     •       •     •     •       •     •     •       •     •     •       •     •     •       •     •     •       •     •     •       •     •     •       •     •     •       •     •     •       •     •     •       •     •     •		
<u>290</u> -	-				Poorly graded SAND (SP); reddish brown (5YR 5/4); moist; loose; 85% very fine to very coarse sand; 10% gravel; 3 - 10 mm; angular to subrounded; max 15 mm; 5% fines.				
295	-				Same as above (290 ft).		•     •     •       •     •     •       •     •     •       •     •     •       •     •     •       •     •     •       •     •     •       •     •     •       •     •     •       •     •     •       •     •     •       •     •     •       •     •     •       •     •     •       •     •     •       •     •     •		End @ 1343. Begin @ 1350.
300							• •         • •           • •         • •           • •         • •           • •         • •		



Ground Elevation AMSL (ft): 5343.8 Y Coordinate: 1480204.26 X Coordinate: 1546034.28

## Borehole ID: KAFB-106209

Project Name: KAFB BFF SWMU ST-106 and SS-111 Project Number: 140705

Hole Diameter Upper (in.): 11-3/4 Hole Diameter Lower (in.) 9-5/8 Groundwater Levels BGS (ft): 

 Image: Groundwater Levels BGS (n).

 Image: Contract of Contra Logged By: Patrick Ostrye/Jason Tarbert

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00 Depth (ft)	Sample Type	Num	Headspace PID	Lithologic Log	Material Description	U.S.C.S.	\	Well Diagram	Remarks
305	-				Poorly graded SAND with gravel (SP); reddish brown (5YR 5/4); moist; loose; 85% fine to very coarse sand; 15% gravel; 3 - 8 mm; subangular to subrounded; max 8 mm.	SP		• • • • • • • • • • • • • • • •	
	_				Poorly graded SAND with silt (SP-SM); brown (7.5YR 5/3); moist; loose; 90% very fine to very coarse sand; 10% fines (silt).		- • • • • • • • • • • • • • • • •	· · · · · · · · · · · · ·	
310	-				Poorly graded SAND with silt (SP-SM); brown (7.5YR 5/4); moist; loose; 90% very fine to medium sand; 10% fines (silt).	SP- SM	<ul> <li>•</li> <li>•&lt;</li></ul>	- High Solids Bentonite Grout	
315	-				Poorly graded SAND (SP); brown (7.5YR 5/4); moist; loose; 95% fine to coarse sand; 5% fines.			· · · · · · · · · · ·	End of day @ 1408. Begin 7-23-12 @ 0855. J. Tarbert logging.
320	-				Same as above (315 ft); trace fine gravel to 2 cm.	SP	• • • • • • • • • • • • • • • •	· · · · · · · · · · · · · · · · · · ·	
325	-				Same as above (315 ft).			· · · · · · · · · · · · ·	
330								••	



Ground Elevation AMSL (ft): 5343.8 Y Coordinate: 1480204.26 X Coordinate: 1546034.28

## Borehole ID: KAFB-106209

Project Name: KAFB BFF SWMU ST-106 and SS-111 Project Number: 140705

Hole Diameter Upper (in.): 11-3/4 Hole Diameter Lower (in.) 9-5/8 Groundwater Levels BGS (ft): 

 Image: Groundwater Levels BGS (n).

 Image: Weight of the second Logged By: Patrick Ostrye/Jason Tarbert

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65 Depth (ft)	Sample Type	Number	Headspace PID	Lithologic Log	Material Description	U.S.C.S.	We	ll Diagram	Remarks
· · · ·	_				Well graded SAND (SW); pale brown (10YR 6/3); moist; medium dense; 95% very fine to very coarse sand; 5% fine gravel to 1.3 cm; rounded				Adding water for dust control.
335	-				Same as above (330 ft); 10% fine gravel to 3.1 cm	SW			Depth @ 0921. Begin @ 0931.
340	-				Poorly graded SAND (SP); brown (7.5YR 4/4); moist; medium dense; 100% very fine to medium sand; 1 mm; rounded	SP		- High Solids Bentonite Grout	
345	-				Well graded SAND (SW); brown (10YR 5/3); dry; medium dense; 90% very fine to very coarse sand; 10% fine gravel to 1 cm; rounded.				
350	-				Same as above (345 ft); grading finer; 5% fine gravel	SW			
355					Same as above (350 ft).				Depth @ 0945.
360							••• •••		



Ground Elevation AMSL (ft): 5343.8 Y Coordinate: 1480204.26 X Coordinate: 1546034.28

## Borehole ID: KAFB-106209

Project Name: KAFB BFF SWMU ST-106 and SS-111 Project Number: 140705

Hole Diameter Upper (in.): 11-3/4 Hole Diameter Lower (in.) 9-5/8 Groundwater Levels BGS (ft): 

 Image: Groundwater Levels BGS (n).

 Image: Weight of the second Logged By: Patrick Ostrye/Jason Tarbert

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00 Depth (ft)	Sample Type	Num	Headspace PID	Lithologic Log	Material Description	U.S.C.S.	We	ll Diagram	Remarks
· · ·	-				Well graded SAND (SW); brown (10YR 5/3); dry; medium dense; 95% very fine to very coarse sand; 5% fine gravel to 1 cm, rounded.				Begin @ 0955.
365	-				Same as above (350 ft); 10% fine gravel to 4 cm.				
370	-				Well graded SAND with gravel (SW); brown (10YR 5/3); moist; medium dense; 70% very fine to very coarse sand; 30% fine gravel to 3.5 cm, well rounded.	SW		- High Solids Bentonite	
375	-				Same as above (370 ft).			Grout	Depth @ 1015. Begin @ 1030.
<u>380</u>	-				Poorly graded SAND (SP); brown (10YR 5/3); moist; loose; 100% very fine to medium sand; 1.5 mm, rounded.	SP			
385					Well graded SAND (SW); brown (10YR 5/3); moist; medium dense; 95% very fine to very coarse sand; 5% fine gravel to 1.2 cm; rounded.	SW			
390								, ,	



Ground Elevation AMSL (ft): 5343.8 Y Coordinate: 1480204.26 X Coordinate: 1546034.28

## Borehole ID: KAFB-106209

Project Name: KAFB BFF SWMU ST-106 and SS-111 Project Number: 140705

Hole Diameter Upper (in.): 11-3/4 Hole Diameter Lower (in.) 9-5/8 Groundwater Levels BGS (ft): 

 Image: Groundwater Levels BGS (n).

 Image: Weight of the second Logged By: Patrick Ostrye/Jason Tarbert

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66 Depth (ft)	Sample Type	Number	Headspace PID	Lithologic Log	Material Description	U.S.C.S.	Well Dia	gram	Remarks
<u>395</u>	-				Well graded SAND (SW); brown (10YR 5/3); moist; medium dense; 95% very fine to very coarse sand; 5% fine gravel to 1.2 cm; rounded. Same as above (385 ft); gravel to 4 cm.	SW			Depth @ 1052. Begin @ 1058.
400	-				Poorly graded SAND (SP); brown (10YR 5/3); moist; medium dense; 100% fine to medium sand; 2 mm, rounded.	SP	- High	Solids	Water for dust control.
405	-				Well graded SAND with gravel (SW); brown (10YR 4/3); moist; medium dense; 80% very fine to very coarse sand; 20% fine gravel to 1.3 cm; rounded.	SW	Grou		
410	-				No recovery.				
415	-				Same as above (403 ft); 15% fine gravel.	sw			Depth @ 1123.
420									



Ground Elevation AMSL (ft): 5343.8 Y Coordinate: 1480204.26 X Coordinate: 1546034.28

## Borehole ID: KAFB-106209

Project Name: KAFB BFF SWMU ST-106 and SS-111 Project Number: 140705

Hole Diameter Upper (in.): 11-3/4 Hole Diameter Lower (in.) 9-5/8 Groundwater Levels BGS (ft): 

 Image: Groundwater Levels BGS (n).

 Image: Weight of the second Logged By: Patrick Ostrye/Jason Tarbert

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C Depth (ft) Sample Type	sample lype	Number	Headspace PID	Lithologic Log	Material Description	U.S.C.S.	Well Diag	ram Remarks
-					Well graded SAND with gravel (SW); brown (10YR 4/3); moist; medium dense; 80% very fine to very coarse sand; 20% fine gravel to 1.3 cm; rounded.			Begin @ 1317.
<u>125</u>					Same as above (403 ft).		- High S Bentor	iolids nite
- <u>130</u> -					Same as above (403 ft).	SW	Grout	
- 135 - -					Same as above (403 ft); overall finer.		•       •       •         •       •       •         •       •       •         •       •       •         •       •       •         •       •       •         •       •       •         •       •       •         •       •       •         •       •       •         •       •       •         •       •       •         •       •       •         •       •       •         •       •       •         •       •       •         •       •       •         •       •       •	End @ 1343. Begin @ 1347.
- - - - -					Poorly graded SAND (SP); brown (10YR 5/3); moist; medium dense; 100% fine to medium sand; trace fine gravel to 8 mm, rounded.	SP		
<u>145</u>					Well graded SAND (SW); brown (10YR 5/3); moist; medium dense; 95% fine to			
-					very coarse sand; 5% fine gravel to 2.3 cm, rounded.	SW		



Ground Elevation AMSL (ft): 5343.8 Y Coordinate: 1480204.26 X Coordinate: 1546034.28

## Borehole ID: KAFB-106209

Project Name: KAFB BFF SWMU ST-106 and SS-111 Project Number: 140705

Hole Diameter Upper (in.): 11-3/4 Hole Diameter Lower (in.) 9-5/8 Groundwater Levels BGS (ft): 

 Image: Groundwater Levels BGS (n).

 Image: Contract of Contra Logged By: Patrick Ostrye/Jason Tarbert

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							·····	
65 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; medium dense; 95% fine to very coarse sand; 5% fine gravel to 2.3 cm, rounded.			
1 <u>55</u>	-				Same as above (445 ft); well graded SAND with gravel (SW); 80% sand; 20% gravel to 1.7 cm.			Depth @ 1414. Resume @ 1427.
160 -	-				Same as above (455 ft); 25% gravel.	SW		
- 165 -	-				Same as above (455 ft); 25% gravel.		- High Solids Bentonite Grout	
170	-							
-	-				No recovery			Air line likely clogged with sediment. Pause to clean cyclone.
475 -					No recovery			Depth @ 1453. Resume @ 1458.
480	-							



Ground Elevation AMSL (ft): 5343.8 Y Coordinate: 1480204.26 X Coordinate: 1546034.28

## Borehole ID: KAFB-106209

Project Name: KAFB BFF SWMU ST-106 and SS-111 Project Number: 140705

Hole Diameter Upper (in.): 11-3/4 Hole Diameter Lower (in.) 9-5/8 Groundwater Levels BGS (ft): 

 Image: Groundwater Levels BGS (n).

 Image: Contract of Contra Logged By: Patrick Ostrye/Jason Tarbert

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8 Depth (ft)	Sample Type	Number	Headspace PID	Lithologic Log	Material Description	U.S.C.S.	v	Vell Diagram	Remarks
	-				No recovery				Adding water to lift cuttings.
485	-				Well graded SAND (SW); brown (10YR 5/3); moist; medium dense; 95% very fine to very coarse sand; 5% fine gravel.	sw	· · · · · · · · · · · · · · · · · · · ·	- High Solids Bentonite Grout	1600 Hydraulic line to hammer broke, will have to replace. End 7-23-12. Begin 7-24-12 @ 0809. Water level encountered during drilling and after
490	-				Poorly graded SAND (SP); brown (10YR 5/3); moist; medium dense; 95% medium to coarse sand; 5% fine gravel to 2.8 cm, rounded.				drilling.
495	-				Same as above (490 ft).	SP	· · · · · · · · · · · · · · · · · ·		Depth @ 0824. Begin @ 1124.
500	-				Silty SAND (SM); brown (7.5YR 4/4); wet; medium dense; 85% fine to medium sand; 1 mm, rounded; 15% silt.			<ul> <li>Top of Bentonite Seal</li> </ul>	
505	-				Same as above (500 ft).	SM		- 5" Schedule 80 PVC Riser	
510									



Ground Elevation AMSL (ft): 5343.8 Y Coordinate: 1480204.26 X Coordinate: 1546034.28

# Borehole ID: KAFB-106209

Project Name: KAFB BFF SWMU ST-106 and SS-111 Project Number: 140705

Hole Diameter Upper (in.): 11-3/4 Hole Diameter Lower (in.) 9-5/8 Groundwater Levels BGS (ft): 

 Image: Groundwater Levels BGS (n).

 Image: Contract of Contra Logged By: Patrick Ostrye/Jason Tarbert

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10 Depth (ft)	Sample Type	Number	Headspace PID	Lithologic Log	Material Description	U.S.C.S.	Well Diagram	Remarks
	-				Silty SAND (SM); brown (7.5YR 4/4); wet; medium dense; 85% fine to medium sand; 1 mm, rounded; 15% silt.			
515	-				Same as above (500 ft).	SM		Depth @ 1146. Resume @ 1312.
520					Same as above (500 ft); coarser; fine to coarse sand.		- Bentonite Seal	
525	-				Well graded SAND (SW); brown (10YR 5/3); wet; medium dense; 95% fine to very coarse sand; 5% fine gravel to 1.3 cm; rounded. Note: gravel lense from 527 to 529 ft.	sw		
530	-				Silty SAND (SM); brown (10YR 5/3); wet; medium dense; 80% fine to medium sand; 2 mm; rounded; 20% silt.			
535	-				Same as above (530 ft); trace fine gravel to 3 cm.	SM		Depth @ 1341. Resume @ 1344.
540								



Ground Elevation AMSL (ft): 5343.8 Y Coordinate: 1480204.26 X Coordinate: 1546034.28

# Borehole ID: KAFB-106209

Project Name: KAFB BFF SWMU ST-106 and SS-111 Project Number: 140705

Hole Diameter Upper (in.): 11-3/4 Hole Diameter Lower (in.) 9-5/8 Groundwater Levels BGS (ft): 

 Image: Groundwater Levels BGS (n).

 Image: Contract of Contra Logged By: Patrick Ostrye/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
- - - 545 -	-				Silty SAND (SM); brown (10YR 5/3); wet; medium dense; 80% fine to medium sand; 2 mm; rounded; 20% silt. Poorly graded SAND with gravel (SP); brown (10YR 5/3); wet; dense; 60% medium to very coarse sand; 40% fine gravel to 2 cm, rounded.	SM SP		
550	-				Well graded SAND (SW); brown (10YR 5/3); wet; dense; 90% fine to very coarse sand; 10% fine gravel to 2.2 cm, rounded; trace lean clay nodules.	SW	- Bentonite Seal	Added ~100 gallons water.
<u>555</u>	-				Silty SAND (SM); brown (10YR 5/3); wet; dense; 70% fine to medium sand; 1 mm, rounded; 30% silt. Same as above (555 ft).	SM		Depth @ 1423. Begin @ 1435.
565	-				Well graded SAND with gravel (SW); pale brown (10YR 6/3); wet; dense; 85% fine to very coarse sand; 15% fine gravel to 1.7 cm, rounded.	SW		



Ground Elevation AMSL (ft): 5343.8 Y Coordinate: 1480204.26 X Coordinate: 1546034.28

# Borehole ID: KAFB-106209

Project Name: KAFB BFF SWMU ST-106 and SS-111 Project Number: 140705

Hole Diameter Upper (in.): 11-3/4 Hole Diameter Lower (in.) 9-5/8 Groundwater Levels BGS (ft): 

 Image: Groundwater Levels BGS (n).

 Image: Weight of the second Logged By: Patrick Ostrye/Jason Tarbert

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					66 <b>,</b>			
2 Depth (ft)	Sample Type	Number	Headspace PID	Lithologic Log	Material Description	U.S.C.S.	Well Diagram	Remarks
	_				Well graded SAND with gravel (SW); pale brown (10YR 6/3); wet; dense; 85% fine to very coarse sand; 15% fine gravel to 1.7 cm, rounded.			
575	_				Same as above (562 ft); trace silt.	SW		Depth @ 1513. Begin @ 1520.
580	_				Silty SAND (SM); brown (10YR 5/3); wet;		- Bentonite Seal	
	-				dense; 80% fine to medium sand; 1 mm, rounded; 20% silt.	SM		
585	-				Poorly graded SAND (SP); grayish brown (10YR 5/2); wet; dense; 95% fine to medium sand; 1 mm, rounded; 5% silt.	SP		
590	-				No recovery.			
595	-				Same as above (585 ft); 90% sand; 5% fine gravel to 2.2 cm; 5% silt.			Depth @ 1600. Begin @ 1608.
600	_					SP	- Top of 20/40 Sand - Top of 10/20 Sand	



Ground Elevation AMSL (ft): 5343.8 Y Coordinate: 1480204.26 X Coordinate: 1546034.28

# Borehole ID: KAFB-106209

Project Name: KAFB BFF SWMU ST-106 and SS-111 Project Number: 140705

Hole Diameter Upper (in.): 11-3/4 Hole Diameter Lower (in.) 9-5/8 Groundwater Levels BGS (ft): 

 Image: Groundwater Levels BGS (n).

 Image: Weight of the second Logged By: Patrick Ostrye/Jason Tarbert

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8 Depth (ft)	Sample Type	Number	Headspace PID	Lithologic Log	Material Description	U.S.C.S.	Well Diagra	am Remarks	
	-				Silty SAND (SM); grayish brown (10YR 5/2); wet; dense; 70% fine to medium sand; 2 mm, subrounded; 30% silt.	SM			
605	-				Well graded SAND with gravel (SW); brown (10YR 5/3); wet; dense; 80% fine to very coarse sand; 20% fine gravel to 4.5 cm, subrounded.		- Top of 5 Schedu PVC 0.0 Slot Scr	le 80 D10"	
<u>610</u>	-				Same as above (602 ft); 5% silt.	SW		Stopped 7-24-12 @ 1645.	
<u>615</u>	-				Well graded SAND with silt (SW-SM); grayish brown (10YR 5/2); wet; dense; 90% fine to coarse sand; 10% silt; trace			Resume 7-25-12 @ 0825. Depth @ 0900. Resume @ 1102.	
620	-				fine gravel to 1 cm, rounded. Same as above (615 ft).		- Bottom Schedu PVC 0.0 Slot Scr - Sump	le 80 D10"	
	-					SW- SM	- Bottom Sump	of	
625	-				Same as above (615 ft).				
630									



Ground Elevation AMSL (ft): 5343.8 Y Coordinate: 1480204.26 X Coordinate: 1546034.28

# Borehole ID: KAFB-106209

Project Name: KAFB BFF SWMU ST-106 and SS-111 Project Number: 140705

Hole Diameter Upper (in.): 11-3/4 Hole Diameter Lower (in.) 9-5/8 Groundwater Levels BGS (ft): 

 Image: Groundwater Levels BGS (n).

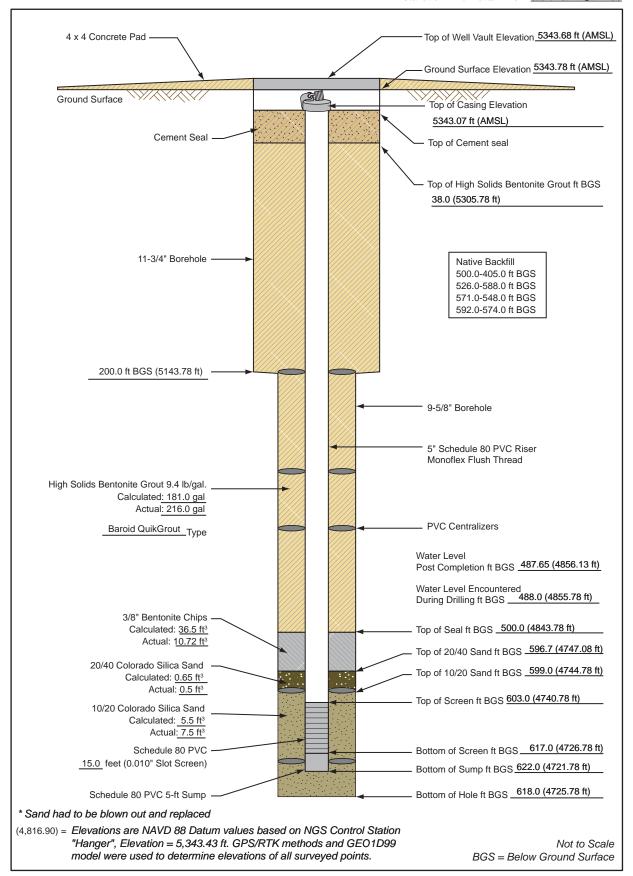
 Image: Weight of the second Logged By: Patrick Ostrye/Jason Tarbert

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	Logged by			
<ul> <li>Bepth (ft)</li> <li>Sample Type</li> <li>Number</li> <li>Headspace</li> <li>PID</li> <li>Lithologic</li> </ul>	Material Description	U.S.C.S.	Well Diagram	Remarks
635 640	<ul> <li>Well graded SAND with silt (SW-SM); grayish brown (10YR 5/2); wet; dense; 90% fine to coarse sand; trace fine gravel to 1 cm, rounded; 10% silt. Slightly coarser than at 615 ft.</li> <li>Same as above (615 ft).</li> </ul>	SW- SM		
645	Well graded SAND (SW); grayish brown (10YR 5/2); wet; dense; 95% fine to very coarse sand; 5% gravel to 4.5 cm, well rounded; trace silt.	sw		Depth @ 1135.
650				
<u>655</u>				
660				

## Monitoring Well Completion Diagram KAFB-106209

Installation Start Date/Time: 7/26/2012 @ 08:33 Installation End Date/Time: 8/07/2012 @ 12:30





Project Nam	ne: KAFB BFI	=						
Location: M	esilla and So	uthern				Well/Piez. N	209	
Personnel:	V. Bracht					Date Installe		
Date: 9/10/1	2					Csg. Diame		
Samplers: N	N/A					Total Depth	(ft. BGL): <u>622</u>	<u>.</u>
Method of D X Surging	evelopment		X Bailing			X Pumping		
X Original Develo	pment		Redevelopmen	t		Other		
Developmer	nt Date: 9/10	/12						
Depth to Wa			Vell (ft. BGL)	: 490.80		_		
			. ,	Vol. (V)	Purge F	actor V	olume to Purge	9
				( )	0		0	
Height of W	ater Column	: f	eet = 149	9.54 gal.	* 1	= 149	0.54	
U								
	V=(B * r <sub>c</sub> ² * I	<sub>-c</sub> * 7.48)+(B	* $(r_w^2 - r_c^2)$ *	L <sub>s</sub> * Ø <sub>s</sub> * 7.48	B)+(H₂O add	ed during dri	illing/installati	ion) = 1299.54 gallons
Depth Purgi	ng From: 6	03 feet	_		Time Purgi	ng Begins: 0	945, 9/10/12	
Weather: Cl	loudy, Cool				Screened Ir	nterval (ft BG	<b>L)</b> : <u>603 - 617</u>	
Equipment I	Nos.: pH Me	ter: LVE	002686		EC Meter:	LVE 0026	686	Turbidity Meter: LVE002384
Equipment I	Decontamin	ated Prior to	Developme	nt: Y <u>X</u>	N			
Describe: S	team Cleane	d				_		
Collected Sa Describe: N		ter Added to	Well: Y	N >	κ	_		
Comment:	1150 gallons	of water add	led during dri	lling/well insta	allation activit	ties		
		Water Level (ft. Below	Volume Removed				Turbidity	
Date	Time	TOC)	(gal.)	Temp.°C	рН	EC (ms/cm)	N.T.U.	Comments
9/10/2012	0945	490.15	15	22.30	7.35	0.005*	393.00	Begin Bailing; Water is Brown
9/10/2012	1012		55	21.30	7.90	0.005*	>1000	Continue Bailing; Water is Brown
9/10/2012	1025		90	21.00	7.90	0.005*	643.00	Continue Bailing; Water is Very Cloudy; Bubbles
9/10/2012	1030		100					Bailed
9/10/2012	1304	490.01						Pump Starts and Shuts off
9/10/2012	1344	491.02		23 10	7.61	0 313	69.70	Begin Pumping

Notes:

9/10/2012

9/10/2012

9/10/2012

9/10/2012

\* Water Levels - Reported to the nearest 0.01 foot

1355

1405

1415

1425

491.02

491.00

491.03

491.03

200

300

400

500

21.70

21.70

21.40

22.90

\* PH - Reading rounded to 0.1 pH units \* Water temperature - Reported to nearest 0.1C \* Turbidity report in NTV nearest whole # GPM = Gallons Per Minute

Where:

7.80

7.64

7.68

7.72

B=3.14

0.290

0.297

0.291

0.298

 $\mathcal{O}_{s}$ = porosity of the sand pack

27.80 Water is Cloudy

16.20 Water is Fairly Clear

19.20 Water is Fairly Clear 9.37 Water is Clear

 $r_{c}\text{=}$  radius of the well casing and screen in feet  $L_{c}\text{=}$  length of water column inside the casing and screen in feet

 $\mathbf{r}_{\mathbf{w}}\!\!=\!\mathbf{radius}$  of the well bore in feet

 $\mathbf{L}_{\mathbf{s}}\text{=}$  length of saturated portion of the sand pack in feet

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

Pg 1 of 2



Project: KAFB BFF

Project Number: 140705

Date: 9/10/12

Time Start: 0945, 9/10/12

Well No: KAFB-106209

Samplers: N/A

Checked By: N/A

Time Finish: 1535, 9/10/12

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
9/10/2012	1435	491.03	600	21.70	7.58	0.292	6.45	Water is Clear
9/10/2012	1445	491.02	725	21.40	7.61	0.287	6.14	Water is Clear
9/10/2012	1455	491.02	850	21.30	7.71	0.270	3.71	Water is Clear
9/10/2012	1510	490.95	1000	21.00	7.79	0.309	7.56	Water is Clear
9/10/2012	1518	491.01	1100	21.10	7.82	0.307	2.66	Water is Clear
9/10/2012	1525	491.00	1200	21.20	7.82	0.301	4.08	Water is Clear
9/10/2012	1535	491.00	1300	21.10	7.82	0.298	2.28	Water is Clear; Pump off; Total Remove

\* Due to sample cup design, the YSI Professional Plus does not accurately measure EC from the cup. Sample cup works well in a flow-through set-up, once pumping begins.

Was well sampled after development? YES NO X

Sample Method: N/A

Sample Name: N/A

Analyses: N/A

# KAFB 106213

Pr	ojec	ct Loc ct Nar	ne: h	: KA KAFB	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							
Da Da Da	Project Number: 140705 Date Started: 1/27/2015 Date TD Reached: 1/30/2015 Date Completed: 2/10/2015 Ground Elevation AMSL (ft): Not Recorded						Groundwater Levels BGS (ft): ↓ At Time of Drilling: 461.50 ↓ At End of Drilling: Not Recorded ↓ After Drilling: 461.29						
Y	Coo	ordina	te:			Drilling Contractor: Yellow Jacket Drilling Method: ARCH Logged By: M. Giles Page 1 of 17							
Oepth (ft)	Number Number Headspace PID Lithologic Log				Material Description		U.S.C.S.	1	Vell Diagram	Remarks			
					SILT (ML); strong brown (7.5YR dry; ~100% silt; trace coarse sa subangular. Note: unconsolidate	nd;			- Top of Casing/ Top of Cement Seal	Borehole was water knifed from 0' to 9' on 1/23/15.			
5	-				Same as above (0 ft).								
10	-				Same as above (0 ft); yellowish i 5/6).	red (5YR	ML			Began drilling with 11-3/4" casing @ 1305 on 1/27/15.			
15					Same as above (0 ft).				- Cement Seal				
20					Well-graded GRAVEL (GW); 859 coarse gravel; angular to subang trace coarse sand.		GW			Kelly down @ 1315. New 20' connection. Resume drilling @ 1332. Driller added water.			
25					Silty SAND with Gravel (SM); ligh (7.5YR 6/4); 60% coarse to very sand; subangular; 25% silt; 15% gravel 3/4" to 2"; subangular to subrounded;	coarse	SM						
30					Description on following page.	_	GW		×.				

KAFB\_BOREHOLE\_LOG - SHAW\_DRILLING.GDT - 3/6/15 12:28 - Z:KAFB BFFIGINTKAFB\_PROJECTIKAFB\_BFF.GPJ

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(	C	RI				Bore	ehol	e ID:	KAFB-	106213		
Pr Pr	rojec rojec	ct Loca ct Nam	ation: ne: K	: Káf (AFB I	s of Engineers B, Albuquerque, NM BFF SWMU ST-106 and SS-111	Hole Dia	Hole Diameter Upper (in.): 11-3/4 Hole Diameter Lower (in.): 9-5/8 Surface Completion Type: Flush					
Da Da	Date Started: 1/27/2015 Date TD Reached: 1/30/2015							evels BG Drilling: Drilling: N ng: 461.2	461.50 Not Recorded			
Y	Coo	nd Elev ordinat ordinat	e:	I AMS	L (ft): Not Recorded		<b>Nethoo</b>	: ARCH	low Jacket	Page 2 of 17		
S Depth (ft)		Number	Headspace PID	Lithologic Log	Material Description		U.S.C.S.	Well	Diagram	Remarks		
	-				Well-graded GRAVEL (GW); 60' gravel 3/8" to 1/2"; angular to subangular; 40% coarse gravel; subrounded to subangular.		GW	-	Cement Seal			
35	-				Poorly-graded GRAVEL with Sa 65% fine gravel 3/8" to 1/2"; sub to subrounded; 30% very coarse subangular to subrounded; 5% s gravel is black and red, and sand generally white or frosted quartz	angular e sand; silt. Note: d is	GP	•••	Top of High Solids Bentonite Grout	Kelly down @ 1348. New 20' connection. Resume drilling @ 1430.		
40	-				Well-graded GRAVEL with Silt (GW-GM); reddish yellow (7.5YF 80% fine to coarse gravel; angul subrounded; 10% coarse sand;	lar to	GW- GM					
50	-				Silty GRAVEL (GM); reddish yell (7.5YR 6/6); 60% fine to coarse subangular to subrounded; 10% sand; 30% silt.	gravel;	GM		High Solids Bentonite Grout			
	-				Lean CLAY with Gravel (CL); red yellow (7.5YR 7/6); medium plas soft; 80% clay; 15% fine gravel; subrounded; 5% fine sand.	ddish sticity;						
<u>55</u>	-				Lean CLAY (CL); reddish yellow 7/6); soft; medium plasticity; 90% 10% medium to coarse sand.		CL			Kelly down @ 1438. New 20' connection. Resume drilling @ 1447.		

	C	BI				Bore	eho	le l	D: KAFB-'	106213
Pro Pro	ojec ojec	ct Loc ct Nan	ation: ne: K	KÁ AFB	os of Engineers FB, Albuquerque, NM BFF SWMU ST-106 and SS-111	Diameter Upper (in.): 11-3/4 Diameter Lower (in.): 9-5/8 ce Completion Type: Flush				
Da Da	te S ite T		d: 1/2 acheo	27/20 d: 1/		🕎 At T	ime of	f Drill Drillir	s BGS (ft): ing: 461.50 ng: Not Recorded 161 29	
Gr Y (	oun Coo	•	vation e:		SL (ft): Not Recorded	-	Contra Method	actor: d: Al	Yellow Jacket RCH	Page 3 of 17
g Depth (ft)	Sample Type	Number	Headspace PID	Lithologic Log	Material Description		U.S.C.S.		Well Diagram	Remarks
					SILT (ML); strong brown (7.5YR 100% silt; low plasticity.	5/6);		• • • • • • • •	• • • • • • • •	Cuttings are partly saturated.
65					Same as above (60 ft).					Cuttings are partly saturated.
70					Same as above (60 ft).		ML			Cuttings are partly saturated.
75	_				Same as above (60 ft).				- High Solids Bentonite Grout	Kelly down @ 1507. New 20' connection. Resume drilling @ 1515.
80	-				Lean CLAY (CL); reddish yelllov 6/8); 100% clay; slightly firm; me plasticity.	v (7.5YR edium				Cuttings are partly saturated.
85	_				Same as above (80 ft).		CL			Cuttings are partly saturated.

	Borehole ID: KAFB-106213										
Pro Pro	ojec ojec	t Loca t Nam	ation ne: k	: KÁI (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					
Da Da	te S te T	Started D Rea	d: 1/ ache			🕎 At T	ime o nd of	f Drill Drillir	s BGS (ft): ng: 461.50 ng: Not Recorded 161.29		
YO	Cooi	d Elev rdinate rdinate	e:	ו AMS	SL (ft): Not Recorded	Drillling Drilling N Logged	<b>Netho</b>	d: AF		Page 4 of 17	
g Depth (ft)	Sample Type	Number	Headspace PID	Lithologic Log	Material Description		U.S.C.S.		Well Diagram	Remarks	
	_				Lean CLAY (CL); reddish yelllow 6/8); slightly firm; medium plastic ~100% clay; trace coarse sand a gravel.	city;		· · · · · · · · · · · · · · ·	•       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •	Cuttings are partly saturated. Note: unable to determine sand and gravel percentages.	
95	-				Same as above (90 ft).			•     •       •     •       •     •       •     •       •     •       •     •       •     •       •     •       •     •       •     •       •     •       •     •       •     •       •     •       •     •       •     •       •     •       •     •       •     •	<ul> <li>•</li> <li>•&lt;</li></ul>	Kelly down @ 1532. New 20' connection. Resume drilling @ 1543.	
<u>100</u>	-				Same as above (90 ft); trace fine angular. Note: unable to determ gravel percentage.	e gravel; ine			<ul> <li>•</li> <li>•&lt;</li></ul>	Cuttings are partly saturated.	
<u>105</u>	-				Same as above (100 ft).		CL		- High Solids Bentonite Grout	Cuttings are partly saturated.	
<u>110</u>	-				Same as above (100 ft).					Cuttings are partly saturated.	
115	-				Same as above (100 ft); occasic coarse gravel; Note: unable to d gravel percentages.				•       •         •       •	Kelly down @ 1557. New 20' connection. Resume drilling @ 1605.	

(	C	BI				Borehole ID: KAFB-106213					
Pr Pr	ojec ojec	t Loca t Nam	ation: ne: K	: KÁ (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					
Da Da	ite S ite T		d: 1/2 ache	27/20 d: 1/		🕎 At T	ime of	f Drill Drillir	s BGS (ft): ing: 461.50 ng: Not Recorded		
Y	Cool	d Elev rdinat rdinat	e:	n AMS	SL (ft): Not Recorded	-	Contra Aethoo	actor: d: Af	Yellow Jacket RCH	Page 5 of 17	
05 Depth (ft)	Sample Type	Number	Headspace PID	Lithologic Log	Material Description		U.S.C.S.		Well Diagram	Remarks	
120					SILT (ML); strong brown (7.5YR plasticity; 100% silt.	5/6); low		• • • • • • • •	• • • • • •	Cuttings are partly saturated.	
<u>125</u>					Same as above (120).				•       •         •       •	Cuttings are partly saturated.	
130	-				Same as above (120).			· · · · · · · · · · · · · · · · · ·		Cuttings are partly saturated.	
135	-				Same as above (120).		ML		- High Solids Bentonite Grout	Added 240 gallons of water. Kelly down @ 1620. End	
140	-				Same as above (120).					of 1/27/15. Resumed drilling @ 0847 on 1/28/15. Cuttings are partly saturated. Little recovery.	
145					Same as above (120).						
150									• • • • • • • •		

(	C	RI				Bore	ho	le IC	D: KAFB-1	106213
P P	rojeo rojeo	ct Loc ct Nan	ation: ne: K	: Káf (AFB I	s of Engineers FB, Albuquerque, NM BFF SWMU ST-106 and SS-111	Hole Dia	meter	Lowe	r (in.): 11-3/4 r (in.): 9-5/8 Type: Flush	
D D	ate s ate <sup>-</sup>	<b>ct Nun</b> Starteo TD Re Compl	d: 1/2 ache	27/20 <sup>7</sup> d: 1/3	15 30/2015	🕎 At T	ime of nd of l	f Drillin Drilling	BGS (ft): g: 461.50 ): Not Recorded	
Y	Coc	nd Elev ordinat ordinat	e:	I AMS	L (ft): Not Recorded		Contra /lethoo	actor: d: AR(	Yellow Jacket CH	Page 6 of 17
15 Depth (ft)		Number	Headspace PID	Lithologic Log	Material Description		U.S.C.S.	v	Vell Diagram	Remarks
	-				SILT (ML); strong brown (7.5YR plasticity; 100% silt.	5/6); low	ML			
15	5				Same as above (150 ft); trace fir gravel; subangular. Unable to de percentage of gravel.		IVIL			Kelly down @ 0908. New 20' connection. Resume
<u>160</u>	) - -				Poorly graded GRAVEL with Silt (GP-GM); light brown (7.5YR 6/4 fine gravel; subangular to subround 10% very coarse sand; subround 10% silt; trace coarse gravel; No gravel is black and red.	I); 80% unded; ded;	GP- GM			drilling @ 0918.
<u>16</u>	5				Well graded SAND with Silt and (SW-SM); light brown (7.5YR 6/4 very coarse to medium sand; subrounded; 30% fine to coarse subangular; 10% silt. Note: sand quartz and black feldspar.	4); 60% gravel;	SW- SM		- High Solids Bentonite Grout	
17(	)				Sandy SILT with Gravel (ML); lig brown (7.5YR 7/6); 50% silt; 30% medium sand; 20% coarse grave subangular.	6 fine to				
<u>17</u> !	5				Sandy SILT (ML); reddish yellow 7/6); 70% silt; 30% fine to mediu		ML			Kelly down @ 0936. New 20' connection. Resume drilling @ 0948.
18(	)								• •	

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	C	BI				Bore	eho	le I	D: KAFB-1	06213
Pro Pro	ojec ojec	ct Loc ct Nan	ation	: KÁI (AFB	s of Engineers FB, Albuquerque, NM BFF SWMU ST-106 and SS-111	Hole Dia	ameter	Low	er (in.): 11-3/4 er (in.): 9-5/8 1 Type: Flush	
Da Da	ite S ite T	Starte ID Re	d: 1/ eache			👳 At T	ime of Ind of	<sup>r</sup> Drilli Drillin	s BGS (ft): ng: 461.50 ig: Not Recorded i61.29	
Y (	Coo	id Ele ordinat ordinat	te:	n AMS	SL (ft): Not Recorded	Drilling Drilling I Logged	Method	d: AF		Page 7 of 17
8 Depth (ft)	Sample Type	Number	Headspace	Lithologic Log	Material Description		U.S.C.S.		Well Diagram	Remarks
	_				Gravelly SILT (ML); strong brow 4/6); 70% silt; 20% fine gravel; 1 to medium sand.	n (7.5YR 0% fine	ML		•       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •	
185	-				Well graded GRAVEL with Sand 70% fine gravel; subangular to subrounded; 25% medium to co sand; subrounded; 5% silt. Note is black mafics and milky quartz milky quartz.	arse : gravel			<ul> <li>•</li> <li>•&lt;</li></ul>	
<u>190</u>	_				Same as above (185 ft).		GW			
195	-				Same as above (185 ft).				- High Solids Bentonite Grout	
200	-				Poorly graded SAND (SP); yello brown (10YR 5/6); 100% fine sa subangular. Note: sand is clear frosted quartz and black mafics.	nd; and	SP			Total depth with 11-3/4" casing @ 1120. End of 1/28/15. Resume drilling @ 0940 on 1/29/15 with 9-5/8" casing.
205 210	-				Well graded GRAVEL with Sand reddish yellow (7.5YR 4/6); 50% coarse gravel to 2"; subrounded fine to coarse sand; subangular; Note: gravel is black and frosted sand is white, frosted, and clear with some mica.	fine to ; 45% 5% silt. I white;	GW	•     •       •     •       •     •       •     •       •     •       •     •       •     •       •     •       •     •       •     •       •     •       •     •       •     •       •     •       •     •       •     •       •     •       •     •       •     •	•       •         •       •	

(	C	BI				Bore	eho	le l	D: I	KAFB-1	106213
Pr Pr	ojeci ojeci	t Loca	ation: ie: K	KAF AFB I	s of Engineers FB, Albuquerque, NM 3FF SWMU ST-106 and SS-111 205	Hole Dia	ameter	Low	/er (in.	): 11-3/4 ): 9-5/8 e: Flush	
Da Da	ate S ate T	tarted D Rea	l: 1/2 acheo	27/20 <i>°</i> d: 1/3		Groundv ∑ At T ▼ At E ▼ Afte	ime of nd of	f Drill Drilliı	ling: 4 ng: No	161.50 ot Recorded	
Y	Coor	d Elev dinate	e:	AMS	L (ft): Not Recorded	Drillling Drilling I Logged	Nethod	d: A	RCH	ow Jacket	Page 8 of 17
Depth (ft)	Sample Type	Number	Headspace PID	Lithologic Log	Material Description		U.S.C.S.		Well [	Diagram	Remarks
<u>215</u>					Silty GRAVEL with Sand (GM); y brown (10YR 5/4); 70% fine to c gravel; subangular to subrounde fine to coarse sand; 15% silt; No gravel is mostly black mafics. Same as above (210 ft); 50% gr 30% fine sand; 20% silt.	oarse ed; 15% ote:	GM		•       •         •       •		Kelly down @ 0950. New 20' connection. Resume drilling @ 0957.
220					Well graded GRAVEL with Silt (GW-GM); brown (7.5YR 4/3); 8 to coarse gravel; subangular to subrounded; 10% fine to coarse 10% silt. Note: gravel is black m	sand;	GW- GM				
225					SILT (ML); greenish gray (GLEY medium plasticity; 100% silt; trac gravel to 3/5"; rounded.				• • B	ligh Solids Bentonite Grout	
230	-				Same as above (225 ft).		ML		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		
<u>235</u> 240	-				Silty SAND with Gravel (SM); lig (7.5YR 6/4); 60% coarse to very sand; subangular to subrounded fine gravel; subangular to subrou 20% silt. Note: gravel is black m with some white material.	coarse l; 20% unded;	SM				Kelly down @ 1008. New 20' connection. Resume drilling @ 1016.

	C	BI				Bore	eho	le I	D:	KAFB-1	106213
Pro Pro	ojec ojec	t Loca t Nam	ation: ne: K	KAF	s of Engineers B, Albuquerque, NM 3FF SWMU ST-106 and SS-111 05	Hole Dia	ameter	Low	er (i	n.): 11-3/4 n.): 9-5/8 pe: Flush	
Da Da	te S ate T	tarteo D Rea	d: 1/2 acheo	27/201	15 50/2015		ime of nd of	f Drilli Drillin	ng: g:	461.50 Not Recorded	
Y	Cooi	d Elev rdinate rdinate	e:	AMS	L (ft): Not Recorded	Drillling ( Drilling N Logged I	/lethoo	d: AF	RCH	llow Jacket	Page 9 of 17
24 Depth (ft)	Sample Type	Number	Headspace PID	Lithologic Log	Material Description		U.S.C.S.		Wel	ll Diagram	Remarks
	-				Poorly graded SAND (SP); yellor brown (10YR 5/6); 100% mediur trace coarse sand; angular to subrounded. Note: sand is clear frosted quartz and black mica.	n sand;			<ul> <li></li></ul>		
245	-				Same as above (240 ft); trace fir gravel.	ie	SP				
250	-				Well graded GRAVEL with Sand 80% fine to coarse gravel; subar subrounded; 15% coarse to very sand; subangular; 5% silt. Note: black material and red granite.	ngular to coarse					
255	-				Same as above (250 ft).		GW			- High Solids Bentonite Grout	Kelly down @ 1027. New 20' connection. Resume drilling @ 1035.
260	-				Poorly graded SAND (SP); yellor brown (10YR 5/4); 100% mediur trace of coarse sand; subangula subrounded. Note: sand is clear frosted quartz with black mica.	n with a r to			<ul> <li>•</li> <li>•&lt;</li></ul>		
265					Same as above (260 ft).		SP				
270								••	••		

	C	BI				Bore	eho	le I	D: Kafb-′	106213
Pro Pro	ojec ojec	t Loc t Nan	ation: ne: K	: KÁI (AFB	os of Engineers FB, Albuquerque, NM BFF SWMU ST-106 and SS-111	Hole Dia	ametei	r Low	er (in.): 11-3/4 er (in.): 9-5/8 ı Type: Flush	
Da Da	ite S ite T		d: 1/2 acheo	27/20 d: 1/3		👳 At T	ime of	f Drilli Drillin	s BGS (ft): ng: 461.50 g: Not Recorded 161 29	
Y	Coo	d Elev rdinat rdinat	e:	AMS	SL (ft): Not Recorded	-	Contra Method	actor: d: AF	Yellow Jacket RCH	Page 10 of 17
02 Depth (ft)	Sample Type	Number	Headspace PID	Lithologic Log	Material Description		U.S.C.S.		Well Diagram	Remarks
	-				Sandy SILT (ML); brown (7.5YR medium plasticity; 55% silt; 45% sand. Note: sand is clear quartz black mica.	fine		<ul> <li>•</li> <li>•&lt;</li></ul>		
275	-				Gravelly SILT (ML); brown (7.5Y medium plasticity; 60% silt; 40% gravel; subangular to angular. N gravel is black material.	fine	ML	•       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •	•       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •	Saturated cuttings in hopper. Kelly down @ 1046. New 20' connection. Resume drilling @ 1054.
280	-				SILT (ML); pale brown (10YR 6/ medium plasticity; 100% silt; occ flecks of mica or muscovite.			•       •         •       •	•       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •	
285	-				Silty GRAVEL (GM); pale brown 6/3); unable to determine percer coarse to fine gravel; subrounde 15% silt. Note: gravel is black m	ntages; ed; ~			- High Solids Bentonite Grout	Saturated cuttings in hopper.
290	-				Silty GRAVEL with Sand (GM); p brown (10YR 6/3); unable to det percentages; fine gravel; subang fine sand; ~ 15% silt. Note: grav black material.	ermine gular;	GМ			Saturated cuttings in hopper.
295	-				Silty GRAVEL (GM); unable to d percentages; fine to coarse grav subangular; flat; ~15% silt.					Saturated cuttings in hopper. Kelly down @ 1104. New
300	-				Description on following page.		GW	· · · · · · · · · · · · · · · · · · ·	<ul> <li>•</li> <li>•&lt;</li></ul>	20' connection. Resume drilling @ 1120.

(	C	BI				Bore	eho	le II	D:	KAFB-1	06213
Pi Pi	rojec rojec	t Loca	ation: ie: K	: Káf (AFB I	s of Engineers FB, Albuquerque, NM BFF SWMU ST-106 and SS-111 205	Hole Dia	ameter	Lowe	er (ir	n.): 11-3/4 n.): 9-5/8 be: Flush	
Da	ate S ate T	Starteo D Rea	l: 1/2 acheo	27/20 <sup>7</sup> d: 1/3		Groundv ∑ At T ▼ At E ▼ Afte	ime of nd of	<sup>f</sup> Drillir Drilling	ng: g: N	461.50 Not Recorded	
Y	Coo	d Elev rdinate rdinate	e:	AMS	L (ft): Not Recorded	Drilling Drilling I Logged	Nethod	1: AR	CH	low Jacket	Page 11 of 17
00 Depth (ft)	Sample Type	Number	Headspace PID	Lithologic Log	Material Description		U.S.C.S.	v	Vell	Diagram	Remarks
	-				Well graded GRAVEL (GW); red yellow (5YR 6/8); 85% fine to co- gravel to 2"; 10% fine sand; 5% Note: gravel is black mafics and granite; with some frosted quartz	arse silt. red		• • • • • • • • • • • • • •	<ul> <li>•</li> <li>•&lt;</li></ul>		
<u>305</u>	-				Silty GRAVEL (GM); reddish yell 6/8); 75% fine to coarse gravel to fine sand; 20% silt. Note: gravel mafics and red granite.	o 1"; 5%	GW	<ul> <li>.</li> <li>.&lt;</li></ul>			
310	) - - -				Poorly graded GRAVEL with Silt (GP-GM); reddish yellow (5YR 6 fine to coarse gravel; 5% fine sa silt. Note: gravel is black mafics reddish granite.	/8); 85% nd; 10%		· · · · · · · · · · · · · · · · · · ·			
315	5				Same as above (310 ft).		GP- GM	• • • • • • • • • • • • • • • •	•••	High Solids Bentonite Grout	Kelly down @ 1138. New 20' connection. Resume drilling @ 1246.
320	-				Poorly graded GRAVEL with Silt Sand (GP-GM); yellowish brown 5/6); 75% fine gravel; angular to subangular; 15% fine sand; 10% Note: gravel is black mafics and granite; sand is clear quartz and mica.	(10YR silt. red		· ·			
325	-				Well graded GRAVEL with Silt a (GW-GM); dark yellowish brown 4/4); 70% fine to coarse gravel; a to subrounded; 20% fine sand; 1 Note: gravel is black mafics and granite; sand is clear quartz and mica.	(10YR angular 0% silt. red	GW- GM				

(	C	BI				Bore	eho	le I	D: KAFB-1	106213
Pr Pr	ojec ojec	t Loca t Nam	ation ie: k	: KÁF (AFB I	s of Engineers FB, Albuquerque, NM BFF SWMU ST-106 and SS-111	Hole Dia	ameter	Low	ber (in.): 11-3/4 /er (in.): 9-5/8 n Type: Flush	
Da Da	te S ate T	tartec D Rea	l: 1/. ache	1407 27/20 d: 1/3 2/10	15 30/2015	🕎 At T	ime of nd of	<sup>r</sup> Drill Drillir	ls BGS (ft): ing: 461.50 ng: Not Recorded 461.29	
Y	Cooi	d Elev dinat	e:	n AMS	L (ft): Not Recorded		Contra Method	actor: d: Al	Yellow Jacket RCH	Page 12 of 17
05 Depth (ft)	Sample Type	Number	Headspace PID	Lithologic Log	Material Description		U.S.C.S.		Well Diagram	Remarks
335	-				Silty SAND (SM); yellow brown ( 5/4); 60% fine to medium sand; subangular to subrounded; 10% gravel; subrounded; 30% silt. No is black mica and quartz.	fine	SM	<ul> <li></li> <li></li></ul>	· · · · · · · · · · · · · · · · · · ·	
340	-				Well graded GRAVEL with Silt a (GW-GM); yellowish brown (10Y 70% fine to coarse gravel to 2"; medium to very coarse sand; 10 Note: gravel is black mafics and granite, somewhat frosted; sand quartz and black mafics.	'R 5/4); 20% % silt. red	GW- GM			Kelly down @ 1306. New 20' connection. Resume drilling @ 1323.
	-				Poorly graded SAND (SP); 100% to very coarse sand; trace fine g subangular to subrounded. Note is black material and red granite	ravel; : gravel	SP			
345	-				Well graded GRAVEL with Silt a (GW-GM); yellowish brown (10Y 70% fine to coarse gravel; angul subrounded; 20% medium to co sand; subangular to subrounded silt. Note: gravel is black and rec	'R 5/4); ar to arse l; 10%	GW- GM		- High Solids Bentonite Grout	
<u>350</u> 355	-				Silty SAND with Gravel (SM); ye brown (10YR 5/4); 50% fine to m sand; 20% fine gravel; subround silt. Note: sand is clear and frost quartz with some black mica.	nedium led; 30%	SM			
355	-				Silty GRAVEL with Sand (GM); y brown (10YR 5/4); 70% fine grav subangular to subrounded; 15% to coarse sand; subangular to subrounded; 15% silt. Note: grav frosted black and red mafics.	/el; medium	GM			Kelly down @ 1340. New 20' connection. Resume drilling @ 1405.

	C	BI				Bore	eho	le IC	D: KAFB-1	106213
P P	rojec rojec	t Loca	ation ne: K	: KÁF (AFB I	s of Engineers FB, Albuquerque, NM BFF SWMU ST-106 and SS-111 205	Hole Dia	ameter	Lowe	r (in.): 11-3/4 r (in.): 9-5/8 Type: Flush	
D D	ate S ate T	Starteo FD Re	d: 1/: ache	27/20 <sup>-</sup> d: 1/3		🕎 At T	ime of nd of	<sup>:</sup> Drillin Drilling	BGS (ft): ig: 461.50 j: Not Recorded 51.29	
Y	Coo	d Elev rdinat ordinat	e:	n AMS	L (ft): Not Recorded	Drillling Drilling I Logged	Nethod	1: AR		Page 13 of 17
90 Depth (ft)	Sample Type	Numl	Headspace PID	Lithologic Log	Material Description		U.S.C.S.	v	Vell Diagram	Remarks
365	-				Well graded GRAVEL with Sand yellowish brown (10YR 5/6); 80% coarse gravel to 2"; subangular to subrounded; 15% medium to coa sand; subangular to subrounded; Note: gravel is black, white, and mafics. Larger gravel is rounded subrounded. Same as above (360 ft).	6 fine to to arse 5% silt. red	GW			
370	- - - - - -				Same as above (360 ft).					
37	-				Poorly graded GRAVEL with Silt (GP-GM); yellowish brown (10YF 80% coarse gravel to 3"; subrou 10% coarse sand; 10% silt. Note is black and red mafics; sand is and frosted quartz.	R 5/6); nded; e: gravel	GP- GM		- High Solids Bentonite Grout	Kelly down @ 1425. New 20' connection. Resume drilling @ 1436.
	-				Poorly graded SAND with Grave 60% medium sand; subrounded fine sand; 40% gravel. Note: sar clear and frosted quartz with sor mica.	; trace nd is	SP	· ·		
38	-				Silty SAND (SM); yellowish brow 5/6); 80% medium sand; trace fi 15% silt; 5% gravel.		SM			

(	C	BI	N			Bore	eho	le l	D:	KAFB-1	06213
Pr Pr	ojec ojec	US t Loca t Nam t Num	ation ne: K	: KAF	s of Engineers <sup>-</sup> B, Albuquerque, NM BFF SWMU ST-106 and SS-111	Hole Dia	metei	Low	/er (in	n.): 11-3/4 n.): 9-5/8 be: Flush	
Da Da	ate S ate T	Started	d: 1/: ache	27/20 d: 1/3		Groundv ∑ At T ▼ At E ▼ After	ime of nd of	<sup>:</sup> Drill Drillir	ling: ng: N	461.50 Not Recorded	
Y		rdinat rdinat	e:	AMS	SL (ft): Not Recorded	-	Contra /lethoo	ictor: 1: Al	: Yell RCH	low Jacket	Page 14 of 17
06 Depth (ft)	Sample Type	Number	Headspace PID	Lithologic Log	Material Description		U.S.C.S.		Well	Diagram	Remarks
	-				Silty SAND (SM); brown (7.5YR 70% fine sand; subangular to subrounded; 30% silt. Note: sand quartz and black mica.	,		· · · · · · · · · · · · · · · · ·		High Solids Bentonite Grout	
395	-				Same as above (390 ft).		SM			Top of Bentonite Seal	Kelly down @ 1455. New 20' connection. Resume drilling @ 1510.
400					Well graded GRAVEL (GW); 100 to coarse gravel to 1"; subangula subrounded. Note: gravel is blac gray, and frosted mafics.	ar to					
405	-				Well graded GRAVEL with Sand 80% fine to coarse gravel to 1"; subangular to subrounded; 20% to very coarse sand; subrounded subangular.	coarse	GW				
<u>410</u>					Well graded SAND with Gravel ( 70% fine to coarse sand; 30% co gravel; subangular to subrounde very coarse sand. Note: gravel is mafics; sand is clear quartz with black mica.	barse d; trace s black				Bentonite Seal	
415	-				Well graded SAND (SW); 100% coarse sand; trace very coarse s subangular to subrounded. Note clear quartz with some black mic	and; : sand is	SW				Kelly down @ 1525. New 20' connection. Resume drilling @ 1628.

Γ

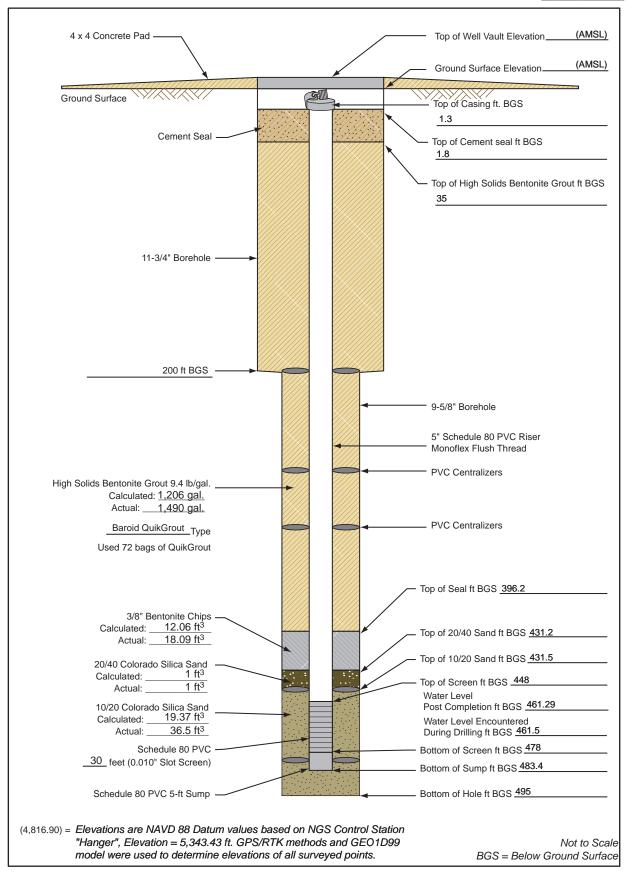
	C	BI				Bore	ehol	e ID: KAFB-′	106213
Pro Pro	ojec ojec	t Loca t Nam	ation: ne: K	: KAF	s of Engineers FB, Albuquerque, NM BFF SWMU ST-106 and SS-111	Hole Dia	meter	Upper (in.): 11-3/4 Lower (in.): 9-5/8 letion Type: Flush	
Da Da	te S te T	tarteo D Re	d: 1/2 ache			⊥ At T T At E	ime of nd of [	evels BGS (ft): Drilling: 461.50 Drilling: Not Recorded ng: 461.29	
Y (	Coor	d Elev dinat	e:	I AMS	L (ft): Not Recorded	Drillling ( Drilling N Logged I	/lethod	ctor: Yellow Jacket : ARCH . Giles	Page 15 of 17
5 Depth (ft)	Sample Type	Number	Headspace PID	Lithologic Log	Material Description		U.S.C.S.	Well Diagram	Remarks
	-				Silty SAND (SM); yellowish brow 5/4); 65% very fine to fine sand; rounded; 35% silt. Note: sand is sand."				Sand runs through strainer, collected sample with a shovel.
425					Same as above (420 ft).		SM	- Bentonite Seal	300 gallons of water added.
									End of 1/29/15 @ 1655. Resume drilling @ 0805 on 1/30/15.
430	-				Poorly graded SAND (SP); reddi yellow (7.5YR 6/6); 100% fine to sand; subangular to subrounded sand is clear and frosted quartz.	medium	SP	- Top of 20/40   Sand   Top of 10/20   Sand	
435	-				Sandy SILT (ML); strong brown (5/6); 60% silt; 40% fine to mediu	(7.5YR m sand.	ML		Kelly down @ 0848. New 20' connection. Resume drilling @ 0902.
440	-				Silty SAND (SM); strong brown ( 5/6); 60% fine to coarse sand; subangular; 40% silt.	7.5YR	SM		
445 450	-				Poorly graded GRAVEL (GP); st brown (7.5YR 5/6); 70% fine to c gravel to 1/2"; subangular to subrounded; 20% coarse gravel subangular; 10% very coarse sa Note: gravel is red granite and b mafics; sand is frosted quartz.	to 1"; nd.	GP	- Top of 5" Schedule 80 PVC 0.010" Slot Screen	

		BI				Bore	hol	e ID: KAFB-1	106213
Pro Pro	ojec ojec	t Loca Nam	ation ie: k	: KÁ (AFB	FB, Albuquerque, NM BFF SWMU ST-106 and SS-111	Hole Dia	meter	Upper (in.): 11-3/4 Lower (in.): 9-5/8 letion Type: Flush	
Da Da	te S te T		l: 1/: ache	27/20 d: 1/3		∑ At Ti ▼ At Er	me of 1d of [	evels BGS (ft): Drilling: 461.50 Drilling: Not Recorded ng: 461.29	
YO	Coo	d Elev rdinate rdinate	e:	n AMS	I	Drillling C	Contra lethod	ctor: Yellow Jacket	Page 16 of 17
05 Depth (ft)	Sample Type	Number	Headspace PID	Lithologic Log	Material Description		U.S.C.S.	Well Diagram	Remarks
455	-				Well graded GRAVEL with Sand ( 60% fine gravel; subangular to subrounded; 20% coarse gravel; subrounded to rounded; 20% very coarse sand; subangular. Note: gr black mafics and red granite with frosted quartz. Sand is black, red, frosted.	y ravel is some	GW		
460					Poorly graded GRAVEL with Sand 75% fine gravel; subangular to subrounded; trace coarse gravel; very coarse sand; subangular. No gravel is black and gray mafics wi some red granite and frosted qua Sand is frosted with red and black grains. Same as above (455 ft).	25% ote: ith rtz.	GP		Kelly down @ 0937. New 20' connection. Resume drilling @ 0950.
465	-				Poorly graded SAND with Gravel 60% very fine to fine sand; trace r sand; 40% fine gravel; subrounde Note: sand is clear and frosted qu Gravel is gray.	medium ed.	SP		
470	-				Clayey SAND (SC); yellowish bro (10YR 5/6); soft; medium plasticit very fine to fine sand; 25% clay. Same as above (465 ft).				
475	-				Same as above (465 ft).		SC		Added 250 gallons of water.
480	-				Poorly graded SAND (SP); brown (7.5YR 4/3); wet; dense; 100% fin medium sand; trace gravel to 2.20 rounded.	ne to	SP	- Bottom of Screen	Kelly down @ 1040. End of 1/30/15 for Mike Giles. Jason Tarbert resumes logging @ 1102.

	C	BI				Bore	ehol	e ID: KAFB-1	06213
Pro Pro	ojec ojec	t Loca t Nam	ation ie: k	: KÁF (AFB I	s of Engineers FB, Albuquerque, NM BFF SWMU ST-106 and SS-111	Hole Dia	ameter	Upper (in.): 11-3/4 Lower (in.): 9-5/8 letion Type: Flush	
Da	ite S ite T	tartec D Rea	l: 1/. ache	1407 27/20 <i>1</i> d: 1/3 2/10	15 30/2015	⊥ At T ▼ At E	ime of nd of I	evels BGS (ft): Drilling: 461.50 Drilling: Not Recorded ng: 461.29	
Y	Cooi	d Elev rdinate rdinate	e:	n AMS	L (ft): Not Recorded	Drilling	Contra /lethoc	ctor: Yellow Jacket	Page 17 of 17
8 Depth (ft)	Sample Type	Number	Headspace PID	Lithologic Log	Material Description		U.S.C.S.	Well Diagram	Remarks
	-			· · · · · ·	Poorly graded SAND (SP); brow (7.5YR 4/3); wet; dense; 100% fi medium sand; trace gravel to 2.2 rounded.	ine to	SP	- Sump	
485	-				Well graded SAND (SW); brown 5/3); wet; dense; 95% fine to ver sand; 5% fine gravel to 3cm; rou	y coarse	SW	-Bottom of Sump	
	-				Silty SAND (SM); brown (7.5YR wet; dense; 85% fine to medium trace fine gravel to 1.5cm; round silt.	sand;	014		Added 100 gallons of water for clean-out of boring.
490	-				Same as above (485 ft); 80% fin coarse sand; 5% gravel to 6cm;		SM		
495	-				Poorly graded GRAVEL with Sar brown (7.5YR 5/4); wet; dense; 6 gravel to 4.3cm; rounded; 40% c very coarse sand; subrounded. N gravel is granite.	50% fine coarse to	GP	- Bottom of Nilter Pack	Total depth = 495 ft. Reached @ 1155 on 1/30/15. Flood hole with 300 gallons of water in preparation for well installation.
500	-								
505									
510									

## Monitoring Well Completion Diagram KAFB-106213

Installation Start Date/Time: 2/2/2015 @ 1345 Installation End Date/Time: 2/10/2015 @ 1775





Well/Piez. No.: KAFB-106213
Date Installed: 2/10/15
Csg. Diameter (I.D.): 5 "
Total Depth (ft. bgs): 483.4
X Pumping
Other
461.29
(H <sub>2</sub> O added during drilling/installation) = <u>1,226.3</u> gallons

 Depth Purging From:
 478 feet
 Time Purging Begins:
 1054, 2/11/2015

 Weather:
 Cloudy
 Screened Interval (ft bgs):
 447 - 477

 Equipment Nos.:
 pH Meter:
 YSI 650 MDS
 EC Meter:
 YSI 650 MDS
 Turbidity Meter:
 HACH 21000Q

Equipment Decontaminated Prior to Development: Y X N

Describe: Steam Cleaned

Comment: Approximately 1,190 gallons of water added during drilling/well installation activities

Date	Time	Water Level (ft bTOC)	Volume Removed (gal.)	Temp. (°C)	pН	EC (mS/cm)	Turbidity (NTU)	Comments
2/10/2015	1243	461.29						Total depth tagged at 484.25 ft btoc.
2/10/2015	1305							Begin swabbing.
2/10/2015	1330							Finish swabbing.
2/10/2015	1336							Begin bailing. Water is brown.
2/10/2015	1412							Finish bailing. Water is light brown.
2/10/2015	1415		55					Begin swabbing.
2/10/2015	1427		55					Finish swabbing.
2/10/2015	1432		55					Begin bailing. Water is brown.
2/10/2015	1530		150					Finish bailing. Water is very light brown.
2/10/2015	1535		150					Driller finishes surface completion.

Notes:

Water Levels - Reported to the nearest 0.01 foot pH - Reading rounded to 0.1 pH units Water temperature - Reported to nearest 0.1 \*C \*C = Degree Celsius EC = Electric Conductivity ft bgs = Feet Below Ground Surface ft btoc = Feet Below Top of Casing gal. = Gallon GPM = Gallons Per Minute LD. = Inner Diameter N/A = Not Applicable NR = Not Recorded NTU = Nephelometric Turbidity Unit S'm = Seimens per Meter Where:

B=3.14

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

 $r_{c}$ = radius of the well casing and screen in feet  $L_{c}$ = length of water column inside the casing and screen in feet

 $r_{w}$ = radius of the well bore in feet

 $L_s$ = length of saturated portion of the sand pack in feet

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

Pg 1 of 5



Project: KAFB BFF

Project Number: 140705

Date: 2/10/15 - 2/12/15

Time Start: 1243, 2/10/2015

Field Chemistry (cont'd)

Well No: KAFB-106213

Samplers: N/A

Checked By:

Time Finish: <u>1105, 2/12/2015</u>

\_\_\_\_\_

Date	Time	Water Level (ft. Below TOC)	Volume Removed (gal.)	Temp. (°C)	рН	EC (mS/cm)	Turbidity (NTU)	Comments
2/11/2015	0945		150					Finish dropping pipe. Set pump at 478 ft.
2/11/2015	1054	462.10	150					Initial water level reading. Pump on.
2/11/2015	1114	477.50	200	18.56	7.02	389.4	>1000	Pumping at 10 GPM. Water is light brown.
2/11/2015	1124	477.22	300	18.75	7.08	392.0	322	Water is cloudy.
2/11/2015	1134	477.40	375	18.75	7.08	392.0	29.9	Water is slightly cloudy.
2/11/2015	1144	477.41	475	18.75	7.08	392.0	9.83	Water is clear.
2/11/2015	1147		525					Turn off pump.
2/11/2015	1224	471.23	525	11.30	7.80	410.0	33.5	Resume pumping. Water is clear; many tiny bubbles.
2/11/2015	1234	474.90	650	18.89	7.75	406.0	105	Water is cloudy.
2/11/2015	1244	475.42	725	19.10	7.78	415.2	133	Water is cloudy.
2/11/2015	1254	475.50	825	18.84	7.75	416.2	69.9	Water is slightly cloudy.
2/11/2015	1302	469.60	825					Pump raised to 470 ft. Let well recover; stop pump.
2/11/2015	1310	468.52	875	15.96	7.82	408.9	9.23	Resume pumping at 6 GPM. Water is clear.
2/11/2015	1320	NR	950	18.57	7.78	419.6	19.6	Water is clear.
2/11/2015	1330	470.16	1025	18.69	7.81	410.5	16.8	Water is clear.

Was well sampled after development? YES NO X

Sample Method: N/A

Sample Name: N/A

Analyses: N/A

Pg 2 of 5



Well No: KAFB-106213
Samplers: N/A

Date: 2/10/15 - 2/12/15

Project: KAFB BFF

Time Start: 1243, 2/10/2015

Project Number: 140705

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### Field Chemistry (cont'd)

Checked By:

Time Finish: 1105, 2/12/2015

Date	Time	Water Level (ft. Below TOC)	Volume Removed	Temp. (°C)	рH	EC (mS/cm)	Turbidity (NTU)	Comments
Dale	Time	100)	(gal.)	Temp. (C)	рп	EC (IIIS/CIII)	(NTO)	Comments
2/11/2015	1335		1050					Stop pumping.
2/11/2015	1415		1050	13.20	7.86	409.3	9.40	Resume pumping at 10 GPM. Water is clear.
2/11/2015	1424		1150					Stop pump. Water level meter tape is stuck.
2/11/2015	1433	463.25	1150					Freed water level meter tape.
2/11/2015	1435		1150	16.36	7.84	394.7	35	Resume pumping at 10 GPM. Tape is stuck again.
2/11/2015	1441	471.35	1200					Freed water level meter tape. Resume pumping.
2/11/2015	1445	474.76	1250	17.81	7.84	402.7	38.7	Water is slightly cloudy.
2/11/2015	1451		1300					Lower pumping rate to 6 GPM.
2/11/2015	1455	472.35	1350	19.14	7.81	404.5	117	Water is cloudy.
2/11/2015	1505	472.24	1400	18.59	7.82	408.5	30.8	Water is slightly cloudy.
2/11/2015	1515	472.40	1450	19.16	7.81	407.7	4.90	Water is clear.
2/11/2015	1525	472.49	1550	18.87	7.81	406.7	3.35	Water is clear.
2/11/2015	1531		1575					Stop pumping.
2/12/2015	0826	462.20	1575					Initial daily water reading.
2/12/2015	0827		1575					Start pumping at 6 GPM.

Was well sampled after development? YES NO X

Sample Method: N/A

Sample Name: N/A

Analyses: N/A

Pg 3 of 5



Project: KAFB BFF	Well No: KAFB-106213
Project Number: 140705	Samplers: N/A

Date: 2/10/15 - 2/12/15

Time Start: 1243, 2/10/2015

### Field Chemistry (cont'd)

Checked By:

Time Finish: 1105, 2/12/2015

Field Chemis		Water Level (ft.	Volume					
		Below	Removed				Turbidity	
Date	Time	TOC)	(gal.)	Temp. (°C)	рН	EC (mS/cm)	(NTU)	Comments
2/12/2015	0830		1575					Pump set at 470 ft.
2/12/2015	0831	469.31	1600	16.19	6.45	407.2	14.9	Water is clear.
2/12/2015	0841	469.90	1675	18.11	7.10	405.1	16.9	Water is clear.
2/12/2015	0851	469.99	1725	18.59	7.42	416.6	2.86	Water is clear.
2/12/2015	0901	470.53	1775	18.64	7.56	415.9	1.92	Water is clear.
2/12/2015	0911	470.75	1825	19.04	7.63	414.9	1.67	Water is clear.
2/12/2015	0912		1825					Lower pump to 478 ft at 10 GPM.
2/12/2015	0916	474.11	1875	18.81	7.66	413.7	1.76	Water is clear.
2/12/2015	0926	475.70	1975	18.65	7.69	408.2	35.5	Water is slightly cloudy.
2/12/2015	0936	476.30	2075	18.80	7.70	418.4	5.13	Water is clear.
2/12/2015	0939		2100					Stop pumping.
2/12/2015	1009	462.25	2100					Water level reading.
2/12/2015	1012		2100					Resume pumping at 478 ft at 10 GPM.
2/12/2015	1014	471.09	2125	18.34	7.73	421.3	2.74	Water is clear.
2/12/2015	1024	475.27	2200	19.16	7.75	397.0	26.4	Water is slightly cloudy.

Was well sampled after development? YES NO X

Sample Method: N/A

Sample Name: N/A

Analyses: N/A



Project: KAFB BFF	Well No: KAFB-106213
Project Number: 140705	Samplers: <u>N/A</u>
Date: 2/10/15 - 2/12/15	Checked By:
Time Start: 1243, 2/10/2015	Time Finish: <u>1105, 2/12/2015</u>
Field Chemistry (cont'd)	

Date	Time	Water Level (ft. Below TOC)	Volume Removed (gal.)	Temp. (°C)	рН	EC (mS/cm)	Turbidity (NTU)	Comments
2/12/2015	1034	475.35	2300	18.87	7.76	418.6	11.0	Water is clear.
2/12/2015	1044	476.80	2400	18.92	7.75	419.8	4.82	Water is clear.
2/12/2015	1054	475.71	2475	19.33	7.75	420.5	2.15	Water is clear.
2/12/2015	1104	475.69	2575	19.32	7.75	420.4	1.25	Water is clear.
2/12/2015	1105		2575					Complete well development. Pump off.

Was well sampled after development? YES NO X

Sample Method: N/A

Sample Name: N/A

Analyses: N/A

Pg 5 of 5

# KAFB 106214

(	2	RI				Bore	ehol	e I	D:	KAFB-	106214
Pro Pro Pro	Client: US Army Corps of Engineers Project Location: KAFB, Albuquerque, NM Project Name: KAFB BFF SWMU ST-106 and SS-111 Project Number: 140705						ameter Comp	Low	er (in Typ	n.): 11-3/4 n.): 9-5/8 pe: Flush SS (ft):	VIRGINIA BRACHT 8881903-2250
Da	te T	D Re	ache	24/20 d: 3/2 3/13	2/2015	☑ At T	ime of ind of I	Drilli Drillin	ng:	N/A Not Recorded	CHE OF HEAT
Y	Coo	d Elev rdinat rdinat	e:	n AMS	L (ft): Not Recorded	Drillling ( Drilling N Logged	<b>Method</b>	d: AF	RCH	llow Jacket	Page 1 of 18
Depth (ft)	Sample Type	Number	Headspace	Lithologic Log	Material Description		U.S.C.S.		Wel	l Diagram	Remarks
0	-				SILT with Gravel (ML); brown (7 5/4); dry; low plasticity; 60% silt clay; 15% fine gravel; angular to subangular. Note: gravel is blac pink granite, and some white gr	; 25% o ck mafics,				Top of Casing/Top of Cement Seal	Location was water jetted to 9' for utility clearance.
5					Same as above (0 ft).						
10					Same as above (0 ft).		ML				Began drilling @ 1200 on 2/24/15.
15	-				Same as above (0 ft).					-Cement Seal	
20	1 1 1 1				Poorly graded SAND (SP); light (7.5YR 6/3); dry; 95% very fine trace coarse sand; angular to subangular; 5% silt. Note: sand white, and pink grains. Same as above (17 ft); 90% ve sand; trace coarse sand; 5% fir to 3/8"; angular to subangular; Note: gravel is black mafics and granite.	sand; I is black, ery fine ne gravel 5% silt.	SP				Kelly down @ 1209. New 20' connection. Resumed drilling @ 1217.
30					Well graded SAND with Gravel pink (7.5YR 7/4); dry; 75% very very coarse sand; subangular t subrounded; 20% fine to coarse angular to subrounded; 5% silt, sand is mostly white grains with pink and black. Gravel is black	y fine to to e gravel; . Note: h some	sw				

KAFB\_BOREHOLE\_LOG - SHAW\_DRILLING.GDT - 3/23/15 12:15 - Z\WAFB BFFIGINTIKAFB\_PROJECTIKAFB\_BFF.GPJ

	C	BI				Bore	eho	le ID: KAFB-	106214		
P P	roje roje	ct Loc ct Nan	ation: ne: K	KÁ 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					
	Project Number: 140705 Date Started: 2/24/2015 Date TD Reached: 3/2/2015 Date Completed: 3/13/2015						ime of	Levels BGS (ft): f Drilling: N/A Drilling: Not Recorded ng: 461.60			
Y	Coc	nd Elev ordinat	e:	AMS	SL (ft): Not Recorded		Nethod	actor: Yellow Jacket d: ARCH 1. Giles	Page 2 of 18		
C Danth (#)		Numt	Headspace PID	Lithologic Log	Material Description		U.S.C.S.	Well Diagram	Remarks		
_3	5				pink granite, and white quartzite Poorly graded SAND with Grave pink (7.5YR 7/4); dry; 75% very sand; trace coarse sand; 20% fir gravel; trace coarse gravel; angu subrounded; 5% silt. Note: grave black and gray mafics, pink gran white quartzite. Poorly graded SAND (SP); brow yellow (10YR 6/8); dry; 90% very sand; trace coarse sand; 5% coa gravel to 1/2"; 5% silt. Note: grav black mafics. Same as above (35 ft).	I (SP); fine ular to el is nite, and mish y fine arse	SP	- Cement Seal	Kelly down @ 1235. New 20' connection. Resumed drilling @ 1310.		
4	5				Silty SAND (SM); reddish yellow 6/6); dry; 60% very fine sand; 10 to coarse gravel; subangular to subrounded; 30% silt. Note: grav black mafics.	)% fine		- Top of High Solids Bentonite Grout			
5	0				Same as above (45 ft); reddish y (5YR 6/8); 60% very fine sand; 4		SM	- High Solids			
5	5				Sandy SILT (ML); yellowish red 5/8); dry; firm; medium plasticity silt; 40% very fine sand; 10% cla	; 50%	ML	Bentonite Grout	Kelly down @ 1318. New 20' connection. Resumed drilling @ 1327.		

KAFB\_BOREHOLE\_LOG - SHAW\_DRILLING.GDT - 3/23/15 12:15 - Z\KAFB BFF\GINT\KAFB\_PROJECT\KAFB\_BFF.GPJ

Proje Proje Date Date Date Grou Y Co X Co	ect ect	US	•						D: KAFB-1		
Date Date Date Grou Y Co X Co		t Nam	ation ne: k	: KÁI (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					
Y Co X Co	e S e T	tartec D Rea	d: 2/. ache	24/20 d: 3/2		👳 At T	ime of	f Drill Drillir	s BGS (ft): ing: N/A ng: Not Recorded 461.60		
epth (ft)	oor	d Elev dinate rdinate	e:	ו AMS	L (ft): Not Recorded	-	Contra Method	actor: d: Af	Yellow Jacket RCH	Page 3 of 18	
	sample lype	Number	Headspace PID	Lithologic Log	Material Description		U.S.C.S.		Well Diagram	Remarks	
-					Sandy SILT (ML); yellowish red 5/8); dry; firm; medium plasticity silt; 40% very fine sand; 10% cla	; 50%	ML	• • • • • • • • • • • • • • • • • •			
65					Silty SAND (SM); reddish yellow 6/8); dry; 60% very fine sand; 40		SM				
75					Sandy lean CLAY (CL); brown (7 4/4); medium plasticity; 60% clay very fine sand.		CL				
-					Silty SAND (SM); brown (7.5YR dry; 85% very fine sand; 15% sil				- High Solids Bentonite Grout	Kelly down @ 1340. New 20' connection. Resumed drilling @ 1350.	
80					Same as above (75 ft); reddish y (7.5YR 6/6); 70% very fine sand coarse sand; 5% fine gravel to 3 subangular; 25% silt.	; trace	SM				
85					Clayey SAND with Gravel (SC); brown (7.5YR 5/8); dry; medium plasticity; 70% very fine sand; tra coarse sand; 15% fine gravel; subangular; 15% clay.	•	SC				

	2	BI				Bore	eho	le	ID: KAFB-1	106214
Pro Pro	ojec ojec	t Loca t Nam	ation: ie: K	: Káf (AFB I	s of Engineers FB, Albuquerque, NM BFF SWMU ST-106 and SS-111	Hole Dia	ametei	r Lov	oer (in.): 11-3/4 ver (in.): 9-5/8 n Type: Flush	
Da <sup>-</sup> Da	te S te T	Started D Rea	l: 2/2 acheo			🛛 At T	ime of	f Dril Drilli	ls BGS (ft): ling: N/A ng: Not Recorded 461.60	
Y C	Cooi Cooi	rdinate rdinate	e:	AMS	L (ft): Not Recorded	-	Contra Method	actor d: A	: Yellow Jacket RCH	Page 4 of 18
ଓ Depth (ft)	Sample Type	Number	Headspace PID	Lithologic Log	Material Description		U.S.C.S.		Well Diagram	Remarks
	-				Clayey SAND (SC); strong brown 5/8); dry; medium plasticity; 80% fine sand; 20% clay.			* * * * * * * * * * * * * * * *		
95	-				Same as above (90 ft).		SC	<ul> <li>*</li> <li>*&lt;</li></ul>	<ul> <li>•</li> <li>•&lt;</li></ul>	Kelly down @ 1402. New 20' connection. Resumed drilling @ 1408.
<u>100</u> - - 105	-				Poorly graded SAND with Silt (S reddish yellow (7.5YR 6/8); dry; s very fine sand; 10% silt.		SP- SM			
110	-				Poorly graded SAND with Clay ( strong brown (7.5YR 4/6); dry; m plasticity; 90% very fine sand; 10	nedium	SP- SC		<ul> <li>High Solids</li> <li>Bentonite</li> <li>Grout</li> </ul>	
-	-				Clayey SAND (SC); strong brown 4/6); dry; medium plasticity; 80% fine sand; 20% clay.	n (7.5YR 9 very			•     •       •     •	
115 - - - 120	-				Same as above (110 ft).		SC		<ul> <li>•</li> <li>•&lt;</li></ul>	Kelly down @ 1416. New 20' connection. Resumed drilling @ 1424.

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Pr Pr	ojec ojec	t Loca	ation: ie: K	: Kaf Afb	s of Engineers FB, Albuquerque, NM BFF SWMU ST-106 and SS-111 705	Hole Dia	ametei	r Lów	ber (in.): 11-3/4 ver (in.): 9-5/8 n Type: Flush	
Da	ate S ate T	Started	l: 2/2 acheo	24/20 d: 3/2		🕎 At T	ime of	f Drill Drillir	s BGS (ft): ing: N/A ng: Not Recorded 461.60	
Y	Coo	d Elev rdinate rdinate	e:	AMS	SL (ft): Not Recorded	Drillling Drilling I Logged	Metho	d: Al		Page 5 of 18
Depth (ft)	Sample Type	Number	Headspace PID	Lithologic Log	Material Description		U.S.C.S.		Well Diagram	Remarks
	-				Poorly graded SAND with Clay ( strong brown (7.5YR 5/6); dry; m plasticity; 90% very fine sand; tra gravel; 10% clay. Note: gravel is	nedium ace fine			· · · · · · · · · · · · · · · · · · ·	
125					Same as above (120 ft); no grav	el.				
130	-				Same as above (120 ft); strong l (7.5YR 4/6); no gravel.	orown	SP- SC			
135	-				Same as above (120 ft); strong l (7.5YR 4/6); no gravel.	orown			- High Solids Bentonite Grout	Kelly down @ 1438. New 20' connection. Driller cleared out block in
140	-				Sandy lean CLAY (CL); strong b (7.5YR 5/8); medium plasticity; 6 clay; 40% very fine sand; trace o sand. Note: sand is white.	60%			<ul> <li>.</li> <li>.&lt;</li></ul>	discharge hose. Resumed drilling @ 1629.
145	-				Same as above (140 ft).		CL			
150								•••	• • • • • •	

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Pro Pro	ojec ojec	t Loca Nam	ation: ne: K	: Káf (AFB I	s of Engineers FB, Albuquerque, NM 3FF SWMU ST-106 and SS-111	Hole Dia	ametei	r Low	ber (in.): 11-3/4 ver (in.): 9-5/8 n Type: Flush	
Da Da	ite S ite T	Started D Re	d: 2/2 ache	1407 24/20 d: 3/2 3/13	15 2/2015	🕎 At T	ime of	f Drill Drilliı	ls BGS (ft): ling: N/A ng: Not Recorded 461.60	
Y	Cool	d Elev rdinat rdinat	e:	AMS	L (ft): Not Recorded	Drillling Drilling I Logged	Nethod	d: A		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); stron (7.5YR 5/6); dry; medium plastic very fine sand; trace coarse san clay. Note: coarse sand is black white grains.	ty; 95%; d; 5%	SP		•       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •	
160	-				Poorly graded SAND with Clay ( strong brown (7.5YR 5/8); dry; so medium plasticity; 80% very fine trace medium to coarse sand; 10 to coarse gravel; subrounded; 10 Note: fine gravel is black mafics coarse gravel is pink granite.	oft; e sand; 0% fine 0% clay.	SP- SC		<ul> <li>•</li> <li>•&lt;</li></ul>	Kelly down @ 1640. New 20' connection. End of 2/24/15. Resumed drilling @ 0858 on 2/25/15.
-	-				Poorly graded SAND (SP); very brown (10YR 7/4); dry; 95% fine medium sand; trace coarse sand subangular to subrounded; 5% s sand is clear and frosted quartz.	to d; silt. Note:			<ul> <li>•</li> <li>•&lt;</li></ul>	
165	-				Same as above (160 ft).		SP		<ul> <li>High Solids</li> <li>Bentonite</li> <li>Grout</li> <li>•</li> <li>•&lt;</li></ul>	
<u>170</u>	-				Same as above (160 ft); very pa (10YR 8/4); 95% very fine sand;				<ul> <li>*</li> <li>*&lt;</li></ul>	
175	-				Well graded SAND (SW); pink ( 7/4); dry; 95% very fine to coarse 5% silt.		sw		<ul> <li>•</li> <li>•&lt;</li></ul>	Kelly down @ 0909. New 20' connection. Resumed drilling @ 0917.

		BI				Bore	eho	le I	D:	KAFB-1	06214
Pro Pro	ojec ojec	t Loca Nam	ation ne: k	: Káf (AFB I	s of Engineers FB, Albuquerque, NM BFF SWMU ST-106 and SS-111	Hole Dia	mete	r Low	/er (i	n.): 11-3/4 n.): 9-5/8 pe: Flush	
Da Da	te S te T	Started D Re	d: 2/ ache	1407 24/20 <sup>7</sup> d: 3/2 3/13	15 2/2015	Groundv ∑ At T ▼ At E ▼ At E	ime o <sup>.</sup> nd of	f Drill Drilliı	ling: ng:	N/À Not Recorded	
Y	Coo	d Elev rdinat rdinat	e:	n AMS	L (ft): Not Recorded	-	Contra /lethoo	actor: d: A	: Ye RCH	llow Jacket	Page 7 of 18
08 Depth (ft)	Sample Type	Number	Headspace PID	Lithologic Log	Material Description		U.S.C.S.		Wel	l Diagram	Remarks
185	-				Poorly graded SAND (SP); light yellowish brown (10YR 6/4); dry; fine sand; trace medium to coars subangular to subrounded; 5% s sand is clear and frosted quartz. Same as above (180 ft).	se sand; silt. Note:	SP				
190	-				Well graded SAND (SW); yellow brown (10YR 5/4); dry; 95% fine coarse sand; trace very coarse s subangular to subrounded; 5% s sand is clear and frosted quartz, quartzite, black mafics, and red microcline. Same as above (190 ft); 100% fi coarse sand; subangular to subr Note: sand is mostly clear quartz some frosted quartz, black mafic red microcline.	to sand; silt. Note: white ine to rounded. z with	SW			- High Solids Bentonite Grout	Kelly down @ 1012. Advance 11-3/4" casing to 200 ft. Set 9-5/8" casing at 197 ft @ 1635.
200	-				Well graded SAND with Clay an (SW-SC); yellowish brown (10YI dry; 70% fine to coarse sand; 20 gravel to 1/2"; subangular; 10% Note: gravel is black mafics.	R 5/6); 9% fine	SW- SC				End of 2/25/15. Resumed drilling with 9-5/8" casing @ 1045 on 2/26/15. No water added to date.
210	-				Clayey SAND with Gravel (SC); 50% fine to coarse sand; subary 35% fine to coarse gravel; subary subrounded; 15% clay. Note: sa clear and frosted quartz, microcl black mafics. Gravel is mostly bl mafics.	gular; ngular to nd is ine, and	SC				

		BI				Bore	eho	le l	D:	KAFB-1	106214
Pro Pro	oject oject	t Loca	ation: ie: K	: Káf (AFB	s of Engineers FB, Albuquerque, NM BFF SWMU ST-106 and SS-111 705	Hole Dia	ametei	Low	ver (in.	): 11-3/4 ): 9-5/8 e: Flush	
Da Da	te S te T	tarted D Rea	l: 2/2 acheo	24/20 <sup>-</sup> d: 3/2		Groundv ∑ At T ▼ At E ▼ Afte	ime of	<sup>f</sup> Drill Drilliı	ling: N ng: N	N/A´ ot Recorded	
Y	Coor	d Elev dinate rdinate	e:	AMS	L (ft): Not Recorded	Drillling Drilling I Logged	Nethod	d: A	RCH	ow Jacket	Page 8 of 18
Depth (ft)	Sample Type	Number	Headspace PID	Lithologic Log	Material Description		U.S.C.S.		Well	Diagram	Remarks
215					Well graded SAND (SW); light y brown (10YR 6/4); dry; 80% fine trace medium to coarse sand; subangular to subrounded; 15% gravel; subangular to subrounde silt. Note: sand is clear and frost quartz with some black mafics. ( black mafics.	sand; fine ed; 5% ed	SW				
					Sandy lean CLAY (CL); brown (7 5/4); slightly moist; soft; medium plasticity; 70% clay; 30% mediur	1	CL				Kelly down @ 1058. New 20' connection. Resumed drilling @ 1104.
220	-				SILT with Sand (ML); brown (7.5 slightly moist; soft; low plasticity; silt; 20% medium sand; subangu Note: sand is clear quartz.	80%					
225	-				Same as above (220 ft).		ML		- E	High Solids Bentonite Grout	
230					Poorly graded SAND (SP); light yellowish brown (10YR 6/4); 95% sand; trace medium sand; 5% si sand is clear and frosted quartz some black mafics.	It. Note:					
235	-				Same as above (230 ft).		SP				Kelly down @ 1112. New
240	-										20' connection. Resumed drilling @ 1120.

	C	B	0			Bore	eho	le I	D:	KAFB-1	106214
P P	roje roje	ect Lo ect Na	cation me:	: KAF	s of Engineers <sup>-</sup> B, Albuquerque, NM BFF SWMU ST-106 and SS-111	Hole Dia	ameter	Low	ver (ii	n.): 11-3/4 n.): 9-5/8 pe: Flush	
D	ate ate	Starte TD R	ed: 2/ eache	1407 24/20 d: 3/2 : 3/13	15 2/2015	Groundv ∑ At T ▼ At E ▼ At E	ime of Ind of	f Drill Drillir	ing: 1g: l	N/A Not Recorded	
Y	Со	ind Ele ordina ordina	ite:	n AMS	SL (ft): Not Recorded	-	Contra Method	actor: d: Al	Ye RCH	llow Jacket	Page 9 of 18
5 Depth (ft)		Number	Headspace	Lithologic Log	Material Description		U.S.C.S.		Wel	l Diagram	Remarks
24	-				Well graded GRAVEL with Silt a (GW-GM); strong brown (7.5YR dry; 50% fine gravel; trace coars gravel; subangular to subrounde fine to coarse sand; subangular; silt. Note: gravel is black mafics. clear quartz with some frosted q and black mafics.	5/6); se ed; 40% 10% Sand is	GW- GM				
0.5					Poorly graded SAND (SP); very brown (10YR 7/3); dry; 95% very fine sand; subangular to subrour 5% silt. Note: sand is clear and f quartz.	fine to nded;	SP				
<u>25</u> (	-				Well graded GRAVEL with Silt a (GW-GM); strong brown (7.5YR dry; 50% fine gravel; trace coars gravel; subangular to subrounde fine to coarse sand; subangular; silt. Note: gravel is black mafics. clear quartz with some frosted q and black mafics.	5/6); se ed; 40% 10% Sand is	GW- GM			- High Solids	
0.00					Poorly graded SAND (SP); yellor 7/6); dry; 95% very fine to fine sa silt.					Bentonite Grout	Kelly down @ 1127. New 20' connection. Resumed drilling @ 1135.
26	<u> </u>				Same as above (255 ft); very pa (10YR 7/3).	le brown	SP				
26	5				Same as above (255 ft); very pa (10YR 7/3).	le brown			<ul> <li>•</li> <li>•&lt;</li></ul>		
27	5							••	••		

	C	BI				Bore	eho	le II	D: KAFB-1	06214
Pr Pr	ojec ojec	t Loca t Nam	ation ne: k	: Káf (AFB I	s of Engineers FB, Albuquerque, NM BFF SWMU ST-106 and SS-111	Hole Dia	meter	Lowe	er (in.): 11-3/4 er (in.): 9-5/8 Type: Flush	
Da Da	ate S ate T	Starteo D Re	d: 2/ ache	1407 24/20 <sup>7</sup> d: 3/2 3/13	15 2/2015	👳 At T	ime of nd of	f Drillir Drilling	BGS (ft): ng: N/A g: Not Recorded 51.60	
Y	Cool	d Elev rdinat rdinat	e:	n AMS	L (ft): Not Recorded		Contra /lethoo	actor: d: AR	Yellow Jacket CH	Page 10 of 18
02 Depth (ft)	Sample Type	Number	Headspace PID	Lithologic Log	Material Description		U.S.C.S.	V	Vell Diagram	Remarks
275	_				Poorly graded SAND (SP); very brown (10YR 7/3); slightly moist; very fine to fine sand; 5% silt.		SP	· · · · · · · · · · · · · · · · · ·	• • • • • • • • • • • •	
213	-				Lean CLAY (CL); dark yellowish (10YR 4/4); medium plasticity; 9 5% fine gravel; subrounded. Not is black mafics.	5% clay;		· · · · · · · · · · · · · · · · · · ·		Kelly down @ 1147. New 20' connection. Resumed drilling @ 1158.
280	-				Sandy lean CLAY (CL); light bro (7.5YR 6/4); slightly moist; medi plasticity; 60% clay; 40% fine sa medium to coarse sand.	um	CL	· · · · · · · · · · · · · · · · · · ·		
285	-				Poorly graded SAND (SP); pink 7/4); dry; 95% very fine sand; 5% Note: sand is clear and frosted c	k silt.		• • • • • • • • • • • • • • • • • • • •	- High Solids Bentonite Grout	
290	-				Same as above (285 ft); 95% ve medium sand; subangular to subrounded; 5% silt. Note: fine s clear and frosted quartz. Mediun clear and frosted quartz with sor mafics and pink granite.	and is n sand is	SP			
<u>295</u> <u>300</u>	-				Same as above (285 ft); 95% ve medium sand; subangular to subrounded; 5% silt. Note: fine s clear and frosted quartz. Mediun clear and frosted quartz with sor mafics and pink granite.	and is n sand is				Kelly down @ 1211. New 20' connection. Resumed drilling @ 1327.

	C	BI				Bore	eho	le l	ID: KAFB-1	106214
Pro Pro	ojec ojec	t Loca t Nam	ation ne: K	: KÁF (AFB I	s of Engineers FB, Albuquerque, NM BFF SWMU ST-106 and SS-111	Hole Dia	amete	Low	ber (in.): 11-3/4 ver (in.): 9-5/8 n Type: Flush	
Da Da	ite S ite T	Started D Re	d: 2/2 ache			👳 At T	ime of	f Drill Drilliı	ls BGS (ft): ling: N/A ng: Not Recorded 461.60	
Y	Cool	d Elev rdinat rdinat	e:	n AMS	L (ft): Not Recorded	-	Contra Method	actor: d: A	: Yellow Jacket RCH	Page 11 of 18
00 Depth (ft)	Sample Type	Number	Headspace PID	Lithologic Log	Material Description		U.S.C.S.		Well Diagram	Remarks
	-				Poorly graded SAND with Silt (S brown (7.5YR 5/4); 90% fine to r sand; subangular to subrounded silt. Note: sand is clear and frost quartz.	nedium l; 10%	SP- SM		•       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •	Driller added water.
<u>305</u> <u>310</u>					Poorly graded GRAVEL with Sat light brown (7.5YR 6/4); 70% find trace coarse gravel; subangular subrounded; 25% fine to coarse subangular to subrounded; 5% s gravel is black mafics, red granit white quartzite. Sand is mostly of frosted quartz. Same as above (305 ft).	e gravel; to sand; silt. Note: te, and	GP		<ul> <li>•</li> <li>•&lt;</li></ul>	
315	-				Same as above (305 ft).		5		- High Solids Bentonite Grout	Kelly down @ 1352. New 20' connection. Resumed drilling @ 1402.
320	-			`• 0 • 2	Gravelly SILT with Sand (ML); b (7.5YR 5/3); soft; low plasticity; 5 35% fine gravel; subangular to subrounded; 15% medium sand	50% silt;				Saturated cuttings in hopper.
<u>325</u> 330					Same as above (320 ft).		ML		<ul> <li>•</li> <li>•&lt;</li></ul>	Saturated cuttings in hopper.

(	C	BI				Bore	eho	le I	D:	KAFB-1	06214
Pr Pr	ojec ojec	t Loca t Nan	ation: ne: K	: Káf (AFB I	s of Engineers FB, Albuquerque, NM BFF SWMU ST-106 and SS-111	Hole Dia	ametei	Low	er (i	n.): 11-3/4 n.): 9-5/8 pe: Flush	
Da Da	ate S ate T	Starteo FD Re	d: 2/2 ache			Groundv ∑ At T ▼ At E ▼ At E	ime of ind of	f Drill Drillir	ing: ng:	N/A Not Recorded	
Y	Coo	d Elev ordinat ordinat	e:	n AMS	L (ft): Not Recorded	Drillling Drilling I Logged	Nethod	l: Al	RCH	llow Jacket I	Page 12 of 18
05 Depth (ft)	Sample Type	Number	Headspace PID	Lithologic Log	Material Description		U.S.C.S.		We	ll Diagram	Remarks
335	-				Well graded GRAVEL (GW); bro (7.5YR 5/3); 90% fine to coarse subangular to subrounded; 5% r to coarse sand; 5% silt. Note: gr mostly black mafics with some re granite. Same as above (330 ft).	gravel; nedium avel is	GW				Kelly down @ 1407. New 20' connection. Resumed drilling @ 1417.
<u>340</u> <u>345</u>					Well graded GRAVEL with Silt (GW-GM); brown (7.5YR 5/3); 8 to coarse gravel; subangular to subrounded; 10% medium to ve coarse sand; subangular; 10% s gravel is black mafics and red gr with some white quartzite. Sand quartzite and black mafics. Same as above (340 ft).	ry silt. Note: ranite	GW- GM			- High Solids Bentonite Grout	
<u>350</u> 355	-				Silty SAND (SM); brown (7.5YR 80% fine to very coarse sand; 56 gravel; 15% silt. Same as above (350 ft).		SM				Kelly down. New 20'
360								••• ••• •••	• • • • • • • •		connection.

	C	BI				Bore	eho	le I	D:	KAFB-1	106214
Pro Pro	ojec ojec	t Loca t Nam	ation ne: k	: KÁI (AFB	s of Engineers FB, Albuquerque, NM BFF SWMU ST-106 and SS-111	Hole Dia	ametei	r Low	/er (i	n.): 11-3/4 n.): 9-5/8 pe: Flush	
Da Da	ite S ite T	tarteo D Rea	d: 2/ ache			Groundv ∑ At T ▼ At E ▼ Afte	ime of nd of	f Drill Drillir	ling: ng:	N/À Not Recorded	
Y	Coor	d Elev rdinate rdinate	e:	n AMS	SL (ft): Not Recorded	_	Contra Aethoo	actor: d: Al	Ye RCH	llow Jacket	Page 13 of 18
90 Depth (ft)	Sample Type	Number	Headspace PID	Lithologic Log	Material Description		U.S.C.S.		Wel	l Diagram	Remarks
365					Silty GRAVEL (GM); brownish ye (10YR 6/6); 60% fine to coarse of subangular to rounded; 10% me coarse sand; 30% silt. Note: gra black mafics. Gravel is predomin subangular. Same as above (360 ft).	gravel; dium to vel is	GM				
<u>370</u> 375					Silty GRAVEL with Sand (GM); I yellow (10YR 6/6); 50% fine to c gravel; subangular to subrounde medium to very coarse sand; subangular; 20% silt. Note: grav predominantly black mafics with red granite. Sand is clear quartz black mafics.	oarse ed; 30% el is some					
380	-				Well graded GRAVEL (GW); bro yellow (10YR 6/6); 95% fine to c gravel; subangular to rounded; 5 Note: gravel is black mafics, red and white quartzite.	oarse 5% silt.	GW			- High Solids Bentonite Grout	Kelly down @ 1437. New 20' connection. Resumed drilling @ 1457.
	-				Poorly graded GRAVEL (GP); by yellow (10YR 6/6); 95% fine grav 3/8"; 5% silt. Note: gravel is blac mafics, red granite, and white qu	vel to k	GP				
<u>385</u> <u>390</u>	-			20 20	Poorly graded SAND with Grave brownish yellow (10YR 6/6); 80% coarse sand; subangular to subr 20% fine gravel to 3/4"; subangu subrounded; trace silt. Note: sar black mafics, red granite, and w quartzite. Gravel is black mafics	% very ounded; ilar to id is hite	SP				

	C	BI				Bore	eho	le l	D:	KAFB-1	06214
Pro Pro	ojeci ojeci	t Loca t Nam	ation e: K	: Káf (AFB	s of Engineers FB, Albuquerque, NM BFF SWMU ST-106 and SS-111	Hole Dia	amete	r Low	er (in	.): 11-3/4 .): 9-5/8 e: Flush	
Da Da	te S te T	tarted D Rea	l: 2/2 ache			Groundv ∑ At T ▼ At E ▼ At E	ime o nd of	f Drilli Drillir	ing: ng: N	N/A lot Recorded	
Y	Coor	d Elev dinate rdinate	e:	AMS	L (ft): Not Recorded	-	Contra Aethoo	actor: d: AF	Yell RCH	ow Jacket	Page 14 of 18
66 Depth (ft)	Sample Type	Number	Headspace PID	Lithologic Log	Material Description		U.S.C.S.		Well	Diagram	Remarks
395					granite. Poorly graded SAND (SP); yellow brown (10YR 5/4); 95% very fine sand; subangular to subrounded Note: sand is clear and frosted of with some black mica. Same as above (395 ft).	to fine ; 5% silt.	SP				Kelly down @ 1510. New 20' connection. Resumed drilling @ 1518.
400	-				Silty GRAVEL with Sand (GM); t (7.5YR 5/4); 50% fine to coarse subangular to subrounded; 30% coarse sand; 20% silt. Note: gra black mafics, red granite, and wi quartzite. Sand is predominantly grained.	gravel; fine to vel is nite	GM				
410	-				Poorly graded SAND (SP); yello brown (10YR 5/4); 95% very fine sand; subangular to subrounded Note: sand is clear and frosted o	to fine ; 5% silt.	SP			High Solids Bentonite Grout	
415	-				Clayey SAND (SC); dark yellowi brown (10YR 4/4); 80% very fine sand; subangular; 20% clay. Not is clear and frosted quartz.	to fine		- • • • • • • • • • • • • • • • • • • •			
413	-				Same as above (410 ft).		SC			Top of Bentonite Seal	Kelly down @ 1535. New 20' conneciton. Resumed drilling @ 1545.

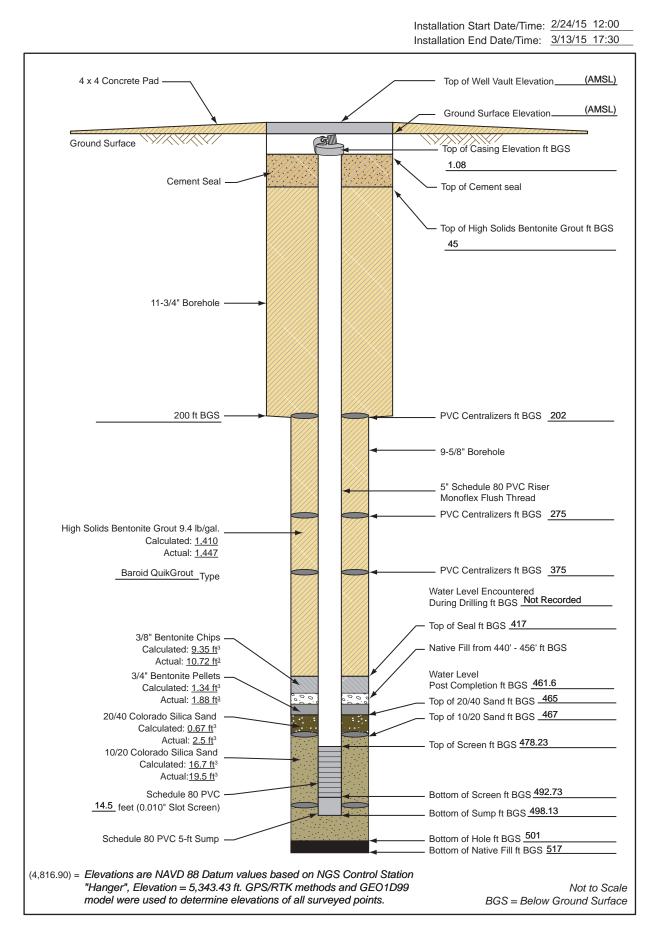
(	C	BI				Bore	ehol	e ID	: KAFB-1	106214
Pr Pr	ojec ojec	t Loca t Nam	ation ne: K	: Káf (AFB I	s of Engineers FB, Albuquerque, NM BFF SWMU ST-106 and SS-111	Hole Dia	meter	Lower (	in.): 11-3/4 in.): 9-5/8 /pe: Flush	
Da Da	ate S ate T	tarteo D Re	l: 2/: ache			Groundv ∑ At T ▼ At E ▼ At E	ime of nd of [	Drilling: Drilling:	N/A Not Recorded	
Y	Coor Coor	d Elev rdinat rdinat	e:	n AMS		-	Contra /lethod	ctor: Ye I: ARCI	ellow Jacket	Page 15 of 18
5 Depth (ft)	Sample Type	Number	Headspace PID	Lithologic Log	Material Description		U.S.C.S.	We	ell Diagram	Remarks
425	-				Clayey GRAVEL (GC); brown (7. 5/4); medium plasticity; 65% fine to 1/4"; subangular; 35% clay. No gravel is black mafics and white o	gravel ote:	GC			Saturated cuttings in hopper.
425	-				Lean CLAY with Sand (CL); brow (7.5YR 5/4); medium plasticity; 8 clay; 20% fine to medium sand.					Saturated cuttings in hopper.
<u>430</u>	-				Gravelly lean CLAY (CL); brown 5/4); medium plasticity; 60% clay fine gravel to 1/4"; subangular to subrounded; 10% coarse sand; subrounded. Note: gravel is black mafics.	r; 30%	CL		- 5" Schedule 80 PVC Riser	Saturated cuttings in hopper.
435	-				Same as above (430 ft).					Kelly down @ 1610. New 20' connection. Resumed drilling @ 1617.
440	-				Well graded GRAVEL with Clay (GW-GC); brown (7.5YR 5/4); 90 to coarse gravel; angular to subro 10% clay. Note: gravel is predom black mafics with red granite and of white quartzite.	ounded; hinantly	GW- GC		- Top of Native Backfill	Saturated cuttings in hopper.
445	-				Sandy lean CLAY (CL); brown (7 5/4); medium plasticity; 60% clay fine to medium sand.		CL		- Native Backfill	Saturated cuttings in hopper.

	C	BI				Borehole ID: KAFB-106214						
Pro Pro	ojec ojec	t Loca t Nam	ation: ne: K	KAF AFB I	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						
Da Da	te S te T	tartec D Rea	d: 2/2 acheo			Groundwater Levels BGS (ft):						
Y	Coor	d Elev dinate dinate	e:	AMS	L (ft): Not Recorded		Contra Method	actor: d: A	Ye RC⊦	ellow Jacket	Page 16 of 18	
5 Depth (ft)	Sample Type	Number	Headspace	Lithologic Log	Material Description		U.S.C.S.		We	ll Diagram	Remarks	
455	-				Well graded GRAVEL with Clay Sand (GW-GC); brown (7.5YR 5 fine to coarse gravel; subangular subrounded; 20% fine to coarse 10% clay. Note: gravel is black n red granite, frosted quartz, and v quartzite. Sand is predominantly mafics and frosted quartz. Same as above (450 ft).	/4); 70% r to sand; nafics, vhite	GW- GC			- Bottom of Native Backfill		
460					Well graded SAND with Gravel ( brown (7.5YR 4/4); 70% fine to c sand; subangular to subrounded fine gravel. Note: sand is predon frosted quartz and black mafics. Poorly graded SAND (SP); stron	coarse ; 30% ninantly	SW	-		-Bentonite Seal	Kelly down @ 1640. New 20' connection. End of 2/26/15. Resumed drilling @ 1337 on 2/27/15.	
465	-				(7.5YR 5/6); wet; 95% very fine t sand; subangular to subrounded Note: sand is predominantly fros clear quartz, with some black ma Sandy lean CLAY (CL); brown (7	to fine 1; 5% silt. 1:ted and 1:fics. 7.5YR	SP			- Top of 20/40 Sand		
170					4/4); wet; medium plasticity; 60% 40% fine to medium sand; subar Note: sand is clear and frosted q	ngular.				- Top of 10/20 Sand		
470	-				Gravelly lean CLAY (CL); brown 4/4); wet; medium plasticity; 60% 30% fine gravel; trace coarse grasubangular; 10% fine to medium Note: gravel is black mafics.	6 clay; avel;	CL					
475	-				Clayey SAND (SC); brown (7.5Y wet; low plasticity; 70% fine sand medium sand; subangular to subrounded; 30% clay.		SC			- Top of 5" Schedule 80 PVC 0.010" Slot Screen	Kelly down @ 1410. New 20' connection. Resumed drilling @ 1505. Broken bolt on hammer.	

	C	BI				Bore	eho	le ID:	KAFB-	106214
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 Upper (in.): 11-3/4 Hole Diameter Lower (in.): 9-5/8 Surface Completion Type: Flush										
Da Da	te S ite T	tarteo D Re	d: 2/2 ache	24/20 <sup>7</sup> d: 3/2		⊥ At T ▼ At E	ime of	Levels B f Drilling: Drilling: ng: 461.	N/A Not Recorded	
YO	Coor	d Elev dinat dinat	e:	AMS	L (ft): Not Recorded		Nethod	d: ARCH	ellow Jacket I	Page 17 of 18
8 Depth (ft)	Sample Type	Number	Headspace PID	Lithologic Log	Material Description		U.S.C.S.	We	ll Diagram	Remarks
	_				Silty SAND (SM); strong brown ( 5/6); wet; 85% fine to medium sa subangular to subrounded; 15% Note: sand is clear and frosted q	and; silt.	SM			
485	-				Same as above (480 ft); 70% fin medium sand; 30% silt.	e to				
490					Well graded SAND with Gravel ( strong brown (7.5YR 5/6); wet; 8 to very coarse sand; subangular subrounded; 15% fine gravel to subangular to subrounded; 5% s sand is clear and frosted quartz, mafics, and red microcline. Grav predominantly frosted quartz with mafics. @ 490 ft: Well graded SAND (SV strong brown (7.5YR 5/6); wet; 9	0% fine to 1/4"; bilt. Note: black rel is h black W);	SW		- Bottom of Screen	
495	-				to coarse sand; subangular to subrounded; 5% silt. Note: sand and frosted quartz, black mafics, microcline. Poorly graded GRAVEL with Silt Sand (GP-GM); strong brown (7.	is clear , and red and .5YR	GP-		- Sump - Bottom of	Kelly down @ 1545. New 20' connection. End of
500	-			$\begin{array}{c} 0 \\ 0 \\ 0 \\ 0 \\ 0 \\ 0 \\ 0 \\ 0 \\ 0 \\ 0 $	5/6); 70% fine gravel to 3/8"; sub to subrounded; 20% fine to coars subangular to subrounded; 10% Note: gravel is black mafics with red granite.	se sand; silt.	GM		-Bottom of Filter Pack	2/27/15. Resumed drilling @ 0904 on 3/2/15.
505	-				Silty SAND with Gravel (SM); gra (7.5YR 5/1); wet; 70% fine to me sand; subangular to subrounded coarse gravel; subrounded; 15% Note: sand is clear and frosted g	edium l; 15% silt.	SM			
510	-				with some red microcline and bla mica. Gravel is black mafics. Poorly graded GRAVEL with Silt (GP-GM); brown (7.5YR 4/2); 80 gravel to 3/4"; trace coarse grave angular to subrounded; 10% fine medium sand; subangular to	ack % fine el;	GP- GM		- Native Backfill	

	C	BI	5			Borehole ID: KAFB-106214						
Pro Pro	ojec ojec	t Loca t Nam	ation ne: k	: Káf (Afb i	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						
Da Da	te S ate T	Started D Re	d: 2/ ache	1407 24/20 <sup>7</sup> d: 3/2 3/13	15 2/2015	⊥ At T ▼ At E	ime of ind of l	evels BGS (ft): Drilling: N/A Drilling: Not Recorded				
Y	Cool	d Elev rdinat rdinat	e:	n AMS	L (ft): Not Recorded	Drillling	Contra Methoo	actor: Yellow Jacket d: ARCH	Page 18 of 18			
0 Depth (ft)	Sample Type	Number	Headspace PID	Lithologic Log	Material Description		U.S.C.S.	Well Diagram	Remarks			
515	_				subrounded; 10% silt. Note: grav black mafics with some red gran Sand is mostly clear quartz with red microcline. Well graded GRAVEL with Silt a (GW-GM); brown (7.5YR 4/3); 70 to coarse gravel; subangular to subrounded; 20% medium to ver coarse sand; subangular to subr	ite. some nd Sand 0% fine ry	GW- GM SM					
520	-				10% silt. Note: gravel is black m with some clear quartzite and re- granite. Sand is black mafic, whi quartzite, and red microcline. Silty SAND with Gravel (SM); bro (7.5YR 5/2); 70% fine to coarse subangular to subrounded; 15% gravel; trace coarse gravel; subr 15% silt. Note: sand is clear and quartz. Sand is predominantly m grained. Gravel is black mafics a	afics d ite own sand; fine ounded; frosted iedium			Total depth = 517 ft. Reached total depth @ 1022 on 3/2/15.			
525	-				frosted quartz.							
530	-											
<u>535</u>	-											
540												

#### Monitoring Well Completion Diagram KAFB-106214





Project Name: KAFB BFF		
Location: Church on Gibson		Well/Piez. No.: KAFB-106214
Personnel: M. Giles		Date Installed: 3/13/15
Date: 3/11/15 - 3/13/15		Csg. Diameter (I.D.): 5 "
Samplers: N/A		Total Depth (ft. bgs): 498.13
Method of Development: X Surging	X Bailing	X Pumping
X Original Development	Redevelopment	Other
Development Date: 3/11/2015 - 3/13	3/2015	

Depth to Water Before Developing Well (ft. btoc): 461.60

 $V=(B * r_c^2 * L_c * 7.48)+(B * (r_w^2 - r_c^2) * L_s * \phi_s * 7.48)+(H_2O added during drilling/installation) = 2,864.66 gallons$ 

Depth Purging From: 491 feet	Time Purging Begins: <u>1616, 3/11/2015</u>
Weather: Not Recorded	Screened Interval (ft bgs): 478.55 - 493.05
Equipment Nos.: pH Meter: YSI 650 MDS	EC Meter: YSI 650 MDS Turbidity Meter: HACH 21000Q

Equipment Decontaminated Prior to Development: Y X N

Describe: Steam Cleaned

Comment: Approximately 2,800 gallons of water added during drilling/well installation activities

Date	Time	Water Level (ft bTOC)	Volume Removed (gal.)	Temp. (°C)	pН	EC (µS/cm)	Turbidity (NTU)	Comments
Date	Time	5100)	(yai.)	Temp. (C)	рп		(110)	Comments
3/11/2015	0936	462.72	0					Begin bailing. Water is very cloudy.
3/11/2015	0950		20					Trace of very fine sand in bucket.
3/11/2015	1012		38					Trace of very fine sand in bucket.
3/11/2015	1017		38					Begin surging.
3/11/2015	1145		38					Finish surging.
3/11/2015	1240		38					Begin bailing.
3/11/2015	1305		58					Trace of very fine sand in bucket.
3/11/2015	1616	462.58	58					Begin pumping at 6.1 GPM.
3/11/2015	1626	463.69	119	20.11	7.17	0.534	430*	Pump set at 491 ft.
3/11/2015	1636	463.72	180	20.20	7.43	0.419	63.5*	

 $^{\ast}$  Turbidity readings were collected from YSI, not the turbidity meter.

<sup>1</sup> Urbidity readings were collected from YSI, not Notes: Water Levels - Reported to the nearest 0.01 foot pH - Reading rounded to 0.1 pH units Water temperature - Reported to nearest 0.1 °C °C = Degree Celsius EC = Electric Conductivity ft bgs = Feet Below Ground Surface ft btoc = Feet Below Top of Casing gal. = Gallon GPM = Gallons Per Minute I.D. = Inner Diameter NA = Not Applicable NR = Not Applicable NR = Not Applicable NTU = Nephelometric Turbidity Unit S/m = Seimens per Meter

#### Where:

B=3.14

Ø<sub>s</sub>= porosity of the sand pack

 $r_{\rm c}\text{=}$  radius of the well casing and screen in feet

 $L_{\rm c}\text{=}$  length of water column inside the casing and screen in feet

rw= radius of the well bore in feet

 $L_{s}$ = length of saturated portion of the sand pack in feet

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



Project: KAFB BFF

Project Number: 140705

Date: 3/11/15 - 3/13/15

Time Start: 0936, 3/11/2015

Field Chemistry (cont'd)

Well No: KAFB-106214

\_\_\_\_\_

Samplers: N/A

Checked By:

Time Finish: 1007, 3/13/2015

Date	Time	Water Level (ft. Below TOC)	Volume Removed (gal.)	Temp. (°C)	рН	EC (μS/cm)	Turbidity (NTU)	Comments
3/11/2015	1646	463.74	241	20.43	7.42	0.416	17.40	
3/11/2015	1656	463.75	302	20.17	7.08	0.416	18.10	End of day.
3/12/2015	0816	462.54	302					Resume pumping.
3/12/2015	0826	463.65	363	19.54	7.15	0.421	18.8	
3/12/2015	0836	463.65	424	19.67	7.94	0.421	2.10	
3/12/2015	0846	463.65	485	19.81	7.96	0.419	1.47	
3/12/2015	0849		503					Stop pumping. Poly container full.
3/12/2015	1009	462.55	503					Resume pumping.
3/12/2015	1019	463.69	564	20.07	7.62	0.421	2.03	
3/12/2015	1029	463.69	625	19.90	7.62	0.421	1.03	
3/12/2015	1039	463.65	686	20.07	7.68	0.422	1.12	
3/12/2015	1049	463.68	747	19.91	7.67	0.422	0.51	
3/12/2015	1059	463.68	808	19.92	7.74	0.423	0.77	
3/12/2015	1109	463.69	869	20.07	7.75	0.423	0.38	
3/12/2015	1119	463.69	930	20.13	7.77	0.422	0.41	

Was well sampled after development? YES NO X

Sample Method: N/A

Sample Name: N/A

Analyses: N/A

Pg 2 of 4



Project: KAFB BFF

Project Number: 140705

Date: 3/11/15 - 3/13/15

Time Start: 0936, 3/11/2015

Field Chemistry (cont'd)

Well No: KAFB-106214

\_\_\_\_\_

Samplers: N/A

Checked By:

Time Finish: 1007, 3/13/2015

Date	Time	Water Level (ft. Below TOC)	Volume Removed (gal.)	Temp. (°C)	рН	EC (μS/cm)	Turbidity (NTU)	Comments
3/12/2015	1129	463.68	991	19.96	7.76	0.422	0.51	
3/12/2015	1139	463.67	1052	19.99	7.77	0.422	0.75	
3/12/2015	1149	463.67	1113	19.94	7.78	0.423	0.71	
3/12/2015	1209	463.67	1174	20.23	7.78	0.423	1.00	Stop pumping.
3/12/2015	1325	462.61	1174					Raise pump to 480 ft.
3/12/2015	1335	462.61	1174					Resume pumping.
3/12/2015	1345	463.58	1235	20.18	7.58	0.428	31.9	
3/12/2015	1355	463.60	1296	19.98	7.59	0.426	16.7	
3/12/2015	1405	463.60	1357	19.94	7.60	0.424	4.08	
3/12/2015	1415	463.59	1418	20.29	7.64	0.424	0.61	
3/12/2015	1425	463.58	1479	20.30	7.66	0.426	0.38	
3/12/2015	1445	463.58	1601	20.19	7.68	0.425	0.54	
3/12/2015	1455	463.59	1662	20.28	7.70	0.426	0.54	
3/12/2015	1505	463.59	1723	20.40	7.71	0.425	0.61	
3/12/2015	1515	463.57	1784	20.36	7.73	0.420	0.41	

Was well sampled after development? YES NO X

Sample Method: N/A

Sample Name: N/A

Analyses: N/A

Pg 3 of 4



Project: KAFB BFF

Project Number: 140705

Date: 3/11/15 - 3/13/15

Time Start: 0936, 3/11/2015

Field Chemistry (cont'd)

Well No: KAFB-106214

\_\_\_\_\_

Samplers: N/A

Checked By:

Time Finish: 1007, 3/13/2015

		Water Level (ft.	Volume					
		Below	Removed				Turbidity	
Date	Time	TOC)	(gal.)	Temp. (°C)	рН	EC (µS/cm)	(NTU)	Comments
3/12/2015	1525	463.58	1845	19.96	7.73	0.425	0.46	
3/12/2015	1535	463.57	1906	19.92	7.73	0.425	0.51	Stop pumping. Lower pump to 485 ft.
3/12/2015	1617	462.35	1906					
3/12/2015	1627	463.49	1967	19.83	7.85	0.423	3.03	
3/12/2015	1637	463.53	2028	19.84	7.79	0.426	0.76	
3/12/2015	1647	463.57	2089	19.83	7.79	0.427	1.66	
3/12/2015	1700	463.58	2168	19.81	7.80	0.420	0.97	End of day.
3/13/2015	0810	463.57	2186	16.61	7.29	0.423	10.4	Begin pumping.
3/13/2015	0820	463.59	2247	18.88	8.01	0.422	0.80	
3/13/2015	0830	463.65	2308	19.17	8.05	0.424	0.74	
3/13/2015	0840	463.66	2369	19.21	8.05	0.423	0.63	
3/13/2015	0850	463.68	2430	19.34	8.03	0.423	0.49	
3/13/2015	0900	463.69	2491	19.26	8.01	0.422	0.90	
3/13/2015	0910	463.69	2552	19.26	8.00	0.423	1.34	Discharge line submerged.
3/13/2015	0920	463.69	2613	19.29	7.98	0.423	1.76	Discharge line submerged.
3/13/2015	0930	463.70	2674	19.34	7.96	0.422	1.21	Discharge line submerged.
3/13/2015	0940	463.71	2735	19.35	7.95	0.421	0.28	Discharge line submerged.
3/13/2015	0950	463.71	2796	19.39	7.92	0.421	0.28	Brought discharge line above.
3/13/2015	1000	463.71	2857	19.45	7.91	0.424	0.30	Water in tank.
3/13/2015	1007	463.71	2900	19.44	7.90	0.424	0.26	Complete well development. Stop pumping.

Was well sampled after development? YES NO X

Sample Method: N/A

Sample Name: N/A

Analyses: N/A



# KAFB 106215

Pro Pro Da Da Da Gro Y (	ojec ojec ojec te S te T te C oun	t Loc t Nan t Nun Started TD Re Compl	ation: ne: k nber: d: 4/ ache leted: vatior e:	: KA AFB 140 9/201 d: 4/ 4/2:		Borehole ID: KAFB-106215 Hole Diameter Upper (in.): 11-3/4 Hole Diameter Lower (in.): 9-5/8 Surface Completion Type: Flush Groundwater Levels BGS (ft): ☑ At Time of Drilling: 462.00 ☑ At End of Drilling: Not Recorded ☑ After Drilling: 461.35 Drilling Contractor: National Drilling Drilling Method: Air Rotary Casing Hammer Logged By: T. Richards Page 1 of 25						
Depth (ft)	ample Type	Number	Headspace	Lithologic Loa	Material Description		U.S.C.S.		ell Diagram	Remarks		
0	-				SILT with Gravel (ML); Brown (7 5/3); 70% silt; 15% clay; 15% gr angular to subangular; gravel is and pink granite.	avel;	<u>SPHA</u> I	T	Top of Casing/Top of Cement Seal	Borehole cleared with water jet to 10 feet bgs. Began drilling at 1000 on 4/9/15 with 11 3/4" drive casing.		
10	-				Well-Graded SAND with Silt (S Light Brown (7.5YR 6/3); dry; lo very fine to very coarse sand; 5 5% clay.	ose; 90%			- Cement Seal	PID = 0.0 ppm @ cyclone. 0.1 ppm @ breathing zone.		
20					Well-Graded SAND with Silt an (SW-SM); Light Brown (7.5YR ( very fine to very coarse sand; 2 gravel; gravel is mafic to white; subrounded to subangular; 5% clay.	6/3); 70% :0%	SW- SM			Kelly down @ 1003, new 20' connection. Resumed drilling @ 1010. PID = 0.0 ppm @ cyclone and breathing zone.		
25					Large boulder from 26 to 28 fee	et bgs. B(	DULD	R	- Top of High Solids Bentonite Grout	Hammering.		
30	-			0	Description on next page.		SW- SM			PID = 0.0 ppm @ cyclone and breathing zone.		

KAFB\_BOREHOLE\_LOG - SHAW\_DRILLING.GDT - 5/28/15 09:09 - N:KAFB BFFIGINTIKAFB\_PROJECTIKAFB\_BFF.GPJ

	C	BI				Borehole ID: KAFB-106215					
Pro Pro	ojec ojec	t Loca t Nam	ation: ne: K	KÁF AFB I	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					
Da Da	ite S ite T		d: 4/9 acheo	9/201: 1: 4/1		🕎 At T	ime o Ind of	f Drill Drillir	ls BGS (ft): ing: 462.00 ng: Not Recorded 61.35		
Y (	Cooi	d Elev rdinate rdinate	e:	AMS	L (ft): Not Recorded	Drillling	Contra Metho	actor: d: Ai	National Drilling r Rotary Casing Ha	ammer Page 2 of 25	
ଟି Depth (ft)	Sample Type	Number	Headspace PID	Lithologic Log	Material Description		U.S.C.S.		Well Diagram	Remarks	
35	-				Well-Graded SAND with Silt and (SW-SM); Light Brown (7.5YR 6 loose; 70% very fine to very coa sand; 20% gravel; rounded to subrounded; gravel is mafic; 5% clay.	/3); dry; rse					
40	-				Same as above (28 ft).		~~~			Kelly down @ 1037, new 20' connection. Resumed drilling @ 1042. PID = 0.0 ppm @ cyclone	
45	-						SW- SM			and breathing zone. No water added to this depth.	
50	-				Lean CLAY with Sand (CL); Yell				- High Solids	PID = 0.0 ppm @ cyclone and breathing zone.	
55					Red (5YR 5/6); moist; low plastic clay; 25% fine to coarse sand.	city; 75%	CL		Bentonite Grout	Hammering. Kelly down @ 1123, new 20' connection. Resumed drilling @ 1129.	

	~	RI				Bore	eho	le II	D: KAFB-1	106215	
Pro Pro	ojec ojec	t Loca t 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					
Da Da	te S te T		l: 4/9 acheo	9/201 d: 4/1		🕎 At T	ime o nd of	f Drillir Drilling	BGS (ft): ng: 462.00 g: Not Recorded 1.35		
Y (	Cool	d Elev rdinate rdinate	e:	AMS	EL (ft): Not Recorded		<b>Netho</b>	d: Air	National Drilling Rotary Casing Ha ards	ammer Page 3 of 25	
g Depth (ft)	Number Number PID PID Material Description						U.S.C.S.	\ \	Well Diagram	Remarks	
	_				Lean CLAY with Sand (CL); Yell Red (5YR 5/6); moist; low plastic clay; 25% fine to coarse sand.	owish city; 75%	CL		• • • • • • • • • • • • • •	PID = 0.0 ppm @ cyclone and breathing zone.	
65	-				Silty GRAVEL (GM); Yellowish F 5/6); moist; 70% gravel; subrour rounded; 10% fine to coarse san silt; 10% clay.	ided to			<ul> <li>•</li> <li>•&lt;</li></ul>	Hammering.	
70	-						GМ			PID = 0.0 ppm @ cyclone and breathing zone. No water added to this depth.	
75	-							• • • • • • • • • •	<ul> <li>High Solids</li> <li>Bentonite</li> <li>Grout</li> </ul>	Kelly down @ 1138, new 20' connection. Resumed drilling @ 1143.	
80					Poorly Graded GRAVEL with Sil Sand (GP-GM); Light Brown (7.5 70% gravel; angular to subangul very fine to coarse sand; 10% si	5YR 6/3); lar; 20%	GP- GM	· · · · · · · · · · · · · · · · · · ·	<ul> <li>.</li> <li>.&lt;</li></ul>	PID = 0.0 ppm @ cyclone and breathing zone.	
85	-				Well-Graded SAND with Silt (SV Strong Brown (7.5YR 5/6); 90% to coarse sand; 10% silt.	V-SM); very fine	SW- SM		· · · · · · · · · · · · · · ·		
90							SIVI	••• ••• •••	• • • • • •		

	C	BI				Bore	eho	le IC	): KAFB-1	06215
Pro Pro	ojec ojec	t Loca t Nam	ation: ne: K	: KÁF (AFB	s of Engineers FB, Albuquerque, NM BFF SWMU ST-106 and SS-111	Hole Dia	ametei	Lower	<sup>-</sup> (in.): 11-3/4 <sup>-</sup> (in.): 9-5/8 Гуре: Flush	
Da Da	ite S ite T		d: 4/9 ache	9/201 d: 4/ <i>1</i>		🕎 At T	ime of	f Drilling Drilling	BGS (ft): g: 462.00 : Not Recorded .35	
Y	Сооі	d Elev rdinate rdinate	e:	n AMS	SL (ft): Not Recorded	Drillling	Contra Aethoo	actor: I d: Air I	National Drilling Rotary Casing Ha	ammer Page 4 of 25
g Depth (ft)	Sample Type	Number	Headspace PID	Lithologic Log	Material Description		U.S.C.S.	M	/ell Diagram	Remarks
-	-				Well-Graded SAND with Silt (SV Strong Brown (7.5YR 5/6); 90% to coarse sand; 10% silt.				•	PID = 0.0 ppm @ cyclone and breathing zone. Hammering.
95	-				Same as above (90 ft).		SW- SM			Kelly down @ 1153, new 20' connection. Resumed drilling @ 1225.
105					Lean CLAY with Sand (CL); Yell Red (5YR 5/6); moist; low to mor plasticity; 80% clay; 20% fine to sand.	derate			- High Solids Bentonite Grout	PID = 0.1 ppm @ cyclone and 0.0 ppm @ breathing zone.
110					Same as above (102 ft).		CL		•	PID = 0.1 ppm @ cyclone and 0.0 ppm @ breathing zone. Hammering.
115	-								• • • • • • • • • • • • • • • • • • •	Kelly down @ 1233, new 20' connection. Resumed drilling @ 1242.

	C	BI				Bore	eho	le l	D: KAFB-	106215
Pr Pr	ojec ojec	t Loca	ation: e: K	KAF AFB I	s of Engineers FB, Albuquerque, NM BFF SWMU ST-106 and SS-111 205	Hole Dia	ametei	r Lów	ber (in.): 11-3/4 ver (in.): 9-5/8 n Type: Flush	
Da Da	te S ate T	Started D Rea	l: 4/9 acheo	9/201 d: 4/ <i>1</i>		🕎 At T	ime of	f Drill Drillir	ls BGS (ft): ling: 462.00 ng: Not Recorded 61.35	
Y	Cool	d Elev rdinate rdinate	e:	AMS	L (ft): Not Recorded		<b>Netho</b>	d: Ai	: National Drilling ir Rotary Casing H hards	ammer Page 5 of 25
05 Depth (ft)	Sample Type	Number	Headspace PID	Lithologic Log	Material Description		U.S.C.S.		Well Diagram	Remarks
	-				Lean CLAY with Sand (CL); Yell Red (5YR 5/6); moist; low to mo- plasticity; 80% clay; 20% fine to sand.	derate	CL	· · · · · · · · ·	• • • • • • • • • • • •	PID = 0.2 ppm @ cyclone and 0.0 ppm @ breathing zone. Added ~ 25 gallons of water.
<u>125</u>	-				Poorly Graded SAND (SP); Red Yellow (7.5YR 6/6); 95% very fin sand; 5% silt.	dish e to fine	SP		<ul> <li>.</li> <li>.&lt;</li></ul>	Added ~ 25 gallons of water.
130	-				Lean CLAY (CL) with Sand (CL)				· · · · · · · · · · · · · · · · · · ·	PID = 0.1 ppm @ cyclone and 0.0 ppm @ beathing zone.
<u>135</u>	_				Yellowish Red (5YR 5/6); low pla 80% clay; 20% very fine to coars	asticity;	CL		<ul> <li>High Solids</li> <li>Bentonite</li> <li>Grout</li> <li>*</li> </ul>	Kelly down @ 1255, new 20' connection. Resumed drilling @ 1259.
140	-				Same as above (132 ft).				· · · · · · · · · · · · · · · · · · ·	PID = 0.0 ppm @ cyclone and breathing zone.
<u>145</u>	-				Poorly Graded SAND (SP); Ligh (7.5YR 6/4); 100% very fine to fi	t Brown ne sand.	SP			
150								••	••	

(	C	BI				Bore	eho	le l	D: KAFB-1	06215
Pr Pr	ojec ojec	t Loca	ation: ne: K	: Káf (AFB	s of Engineers FB, Albuquerque, NM BFF SWMU ST-106 and SS-111 705	Hole Dia	ametei	r Low	ber (in.): 11-3/4 ver (in.): 9-5/8 n Type: Flush	
Da Da	ate S ate T	Starteo	d: 4/9 ache	9/201: d: 4/1		🕎 At T	ime of	f Drill Drillir	s BGS (ft): ing: 462.00 ng: Not Recorded 61.35	
Y	Coo	d Elev rdinat rdinat	e:	I AMS	EL (ft): Not Recorded		<b>Netho</b>	d: Ai	National Drilling r Rotary Casing Ha hards	ammer Page 6 of 25
Depth (ft)	Sample Type	Number	Headspace PID	Lithologic Log	Material Description		U.S.C.S.		Well Diagram	Remarks
	_				Poorly Graded SAND (SP); Ligh (7.5YR 6/4); 100% very fine to fit Poorly Graded SAND with Grave Brown (7.5YR 4/2); 80% very co sand; angular; 20% fine gravel; g mafics and sandstone.	ne sand. el (SP); arse		· · · · · · · · · · · · · · · · · · ·	· · · · · · · · · · · · · · · · · · ·	PID = 0.0 ppm @ cyclone and breathing zone. Added ~ 100 gallons of water. Hammering.
155	_							• • • • • • • • • • • • • • • • • • • •		Kelly down @ 1410, new 20' connection. Resumed drilling @ 1427. Clay causing problems in casing and discharge line.
160	-				Same as above (151 ft).					
165	-						SP		- High Solids Bentonite Grout	
170	-				Same as above (151 ft).					PID = 0.2 ppm @ cyclone and 0.0 ppm @ breathing zone.
175	_				Poorly Graded SAND (SP); Ligh (7.5YR 6/4); 100% fine to mediu	t Brown m sand.				Kelly down @ 1500. New 20' connection. Resumed drilling @ 1513.

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Pr Pr	ojec ojec	ct Loca	ation: ne: K	: Káf (Afb i	s of Engineers FB, Albuquerque, NM BFF SWMU ST-106 and SS-111	Hole Dia	imetei	Low	ver (ii	n.): 11-3/4 n.): 9-5/8 pe: Flush	
Da Da	ate S ate 1	<b>ct Num</b> Started TD Re Compl	d: 4/9 ache	9/2018 d: 4/1	5 16/2015	Groundv ∑ At T ▼ At E ▼ At E	ime of nd of	<sup>:</sup> Drill Drillir	ing: ng: l	462.00 Not Recorded	
Y	Coo	nd Elev ordinato ordinat	e:	n AMS	L (ft): Not Recorded	Drillling ( Drilling N Logged I	/lethoo	i: Ai	r Ro	tional Drilling tary Casing Ha s	ammer Page 7 of 25
8 Depth (ft)	Sample Type	Number	Headspace PID	Lithologic Log	Material Description		U.S.C.S.		Wel	l Diagram	Remarks
185	-				Poorly Graded SAND (SP); Ligh (7.5YR 6/4); 100% fine to mediu		SP				PID = 0.1 ppm @ cyclone and 0.0 ppm @ breathing zone. Added ~ 100 gallons water.
<u>190</u>					Well-Graded SAND (SW); Brow 5/3); loose; 90% fine to very coa sand; 10% fine gravel; well roun	irse		<ul> <li></li></ul>	<ul> <li>•</li> <li>•&lt;</li></ul>		PID = 0.1 ppm @ cyclone and 0.0 ppm @ breathing zone.
<u>195</u> 200	-				Same as above (188 ft).		SW	<ul> <li></li></ul>		- High Solids Bentonite Grout	Kelly down @ 1528, drill bit @ 200', trip out and change to 9 5/8" drive casing. Resumed drilling @ 0950 on 4/10/15.
<u>205</u>											
210								••	••		

KAFB\_BOREHOLE\_LOG - SHAW\_DRILLING.GDT - 5/28/15 09:09 - N:)KAFB BFF\GINTIKAFB\_PROJECTIKAFB\_BFF.GPJ

	C	BI				Bore	eho	le I	D: KAFB-1	06215	
Pro Pro	ojec ojec	t Loca t Nam	ation ne: k	: Káf (Afb i	s of Engineers FB, Albuquerque, NM BFF SWMU ST-106 and SS-111	Hole Dia	ametei	Low	er (in.): 11-3/4 er (in.): 9-5/8 1 Type: Flush		
Da Da	te S te T	Started D Re	d: 4/ ache			Groundwater Levels BGS (ft): ∑ At Time of Drilling: 462.00 ▼ At End of Drilling: Not Recorded ▼ After Drilling: 461.35					
Y (	Cool	d Elev rdinat rdinat	e:	n AMS	L (ft): Not Recorded	Drillling	Contra Aethoo	actor: d: Ai	National Drilling r Rotary Casing Ha	ammer Page 8 of 25	
0 Depth (ft)	Sample Type	Number	Headspace PID	Lithologic Log	Material Description		U.S.C.S.		Well Diagram	Remarks	
					Well-Graded SAND (SW); Brow 5/3); loose; 90% fine to very coa sand; 10% fine gravel; well roun	irse	SW	••• ••• •••	• • • • • •	PID = 0.0 ppm @ cyclone and breathing zone.	
<u>215</u> 220	-				Poorly Graded SAND (SP); Ligh (7.5YR 6/3); 100% very fine to fi Same as above (212 ft). 95% sa fine gravel; well rounded; gravel	t Brown ne sand. and; 5%	SP	•     •       •     •	•       •         •	No hammering. No water added. Kelly down @ 1000, new 20' connection. Resume drilling @ 1012. PID = 0.0 ppm @ cyclone and breathing zone.	
225					Well-Graded SAND with Gravel Light Brown (7.5YR 6/4); slightly	moist to			- High Solids Bentonite Grout	No Hammering. No water added.	
<u>230</u>	-				moist; 80% very fine to very coa sand; 20% fine gravel; rounded; mafic and white minerals.		SW		•       •         •		
240	-							<ul> <li>•</li> <li>•&lt;</li></ul>	•       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •	Kelly down @ 1027, new 20' connection. Resume drilling @ 1036.	

KAFB\_BOREHOLE\_LOG - SHAW\_DRILLING.GDT - 5/28/15 09:09 - N:)KAFB BFF\GINTIKAFB\_PROJECTIKAFB\_BFF.GPJ

	C	BI			Bore	eho	le l	D: KAFB-1	06215
Pro Pro	ojec ojec	t Loca t Nam	ation: KAI ne: KAFB	s of Engineers <sup>-</sup> B, Albuquerque, NM BFF SWMU ST-106 and SS-111	Hole Dia	amete	r Low	er (in.): 11-3/4 /er (in.): 9-5/8 n Type: Flush	
Da Da	ite S ite T	tarteo D Re	<b>1ber:</b> 1403 d: 4/9/201 ached: 4/ eted: 4/22	5 16/2015	🕎 At T	ime o nd of	f Drill Drillir	s BGS (ft): ing: 462.00 ig: Not Recorded 61.35	
Y	Сооі	d Elev rdinat rdinat	e:	SL (ft): Not Recorded	Drillling Drilling N Logged	<b>Netho</b>	d: Ai	National Drilling r Rotary Casing Ha hards	ammer Page 9 of 25
5 Depth (ft)	Sample Type	Number	Headspace PID Lithologic Log	Material Description		U.S.C.S.		Well Diagram	Remarks
	_			Well-Graded SAND with Gravel Light Brown (7.5YR 6/4); slightly moist; 80% very fine to very coa sand; 20% fine gravel; rounded; mafic and white minerals.	moist to				PID = 0.0 ppm @ cyclone and breathing zone.
<u>245</u> 250	-			Same as above (240 ft).		SW			No Hammering. No water added. PID = 0.0 ppm @ cyclone and breathing zone.
<u>255</u> 260				Same as above (240 ft).				- High Solids Bentonite Grout	Kelly down @ 1049, new 20' connection. Resume drilling @ 1059. PID = 0.0 ppm @ cyclone and breathing zone.
<u>265</u> 270	-			Poorly Graded SAND (SP); Ligh (7.5YR 6/4); moist; 100% very fi fine sand.	t Brown ne to	SP			Some hammering. No water added.

(	C	BI				Bore	eho	le ID	: KAFB-1	106215
Pr Pr	ojec ojec	t Loca t Nam	ation: ne: K	: Kaf (Afb i	s of Engineers FB, Albuquerque, NM BFF SWMU ST-106 and SS-111	Hole Dia	ametei	r Lower	(in.): 11-3/4 (in.): 9-5/8 Type: Flush	
Da Da	ate S ate T	Starteo D Re	d: 4/9 ache			🕎 At T	ime of nd of	f Drilling Drilling:	BGS (ft): g: 462.00 Not Recorded	
Y	Cool	d Elev rdinat rdinat	e:	AMS	L (ft): Not Recorded	Drillling	Contra Aethoo	actor: N d: Air F	National Drilling Rotary Casing Ha	ammer Page 10 of 25
2 Depth (ft)	Sample Type	Number	Headspace PID	Lithologic Log	Material Description		U.S.C.S.	w	ell Diagram	Remarks
	-				Poorly Graded SAND (SP); Light (7.5YR 6/4); moist; 100% very fin fine sand.				•	Hammering. PID = 0.0 ppm @ cylone and breathing zone.
<u>275</u> 280	-				Same as above (270 feet); 90% 10% fine gravel; rounded; grave and white minerals.		SP			Kelly down @ 1110, new 20' connection. Resumed drilling @ 1127.
285	-				Lean CLAY (CL); Reddish Brown 5/4); moist; non plastic; 100% cla				- High Solids Bentonite	PID = 0.0 ppm @ cyclone and breathing zone.
<u>290</u>	-						CL		Grout	PID = 0.1 ppm @ cylone and 0.0 ppm @ breathing zone.
295	-				Well-Graded SAND (SW); Stron (7.5YR 4/6); moist; 90% fine to v coarse sand; 10% fine gravel; gr mafic.	ery	SW			Kelly down @ 1135, new 20' connection. Resume drilling @ 1141.
300									•	

(	C	RI				Bore	eho	le I	D: KAFB-	106215
Pr Pr	ojec ojec	t Loca t Nam	ation: ne: K	: Kaf (Afb i	s of Engineers FB, Albuquerque, NM BFF SWMU ST-106 and SS-111	Hole Dia	ameter	· Low	er (in.): 11-3/4 er (in.): 9-5/8 n Type: Flush	
Da Da	ate S ate T	tarteo D Re	d: 4/9 ache			🕎 At T	ime of nd of	<sup>:</sup> Drill Drillir	s BGS (ft): ing: 462.00 ng: Not Recorded 61.35	
Y	Cool	d Elev rdinat rdinat	e:	AMS	L (ft): Not Recorded		Nethod	iA :t	National Drilling r Rotary Casing H nards	ammer Page 11 of 25
00 Depth (ft)	Sample Type	Number	Headspace PID	Lithologic Log	Material Description		U.S.C.S.		Well Diagram	Remarks
<u>305</u> <u>315</u> <u>325</u>					<ul> <li>Well-Graded SAND (SW); Stron (7.5YR 4/6); moist; 90% fine to v coarse sand; 10% fine gravel; g mafic.</li> <li>Well-Graded SAND with Gravel Strong Brown (7.5YR 4/6); mois fine to very coarse sand, 20% g 1".</li> <li>Same as above (310 ft).</li> </ul>	(SW); t; 80%	SW		- High Solids Bentonite Grout	<ul> <li>PID = 0.0 ppm @ cyclone and breathing zone.</li> <li>PID = 0.2 ppm @ cyclone and 0.0 ppm @ breathing zone.</li> <li>Kelly down @ 1150, new 20' connection. Resumed drilling @ 1225.</li> <li>PID= 0.1 ppm @ cylone and 0.0 ppm @ breathing zone.</li> <li>Hammering. No water added.</li> </ul>
330								•••	• • • • • •	

	C	BI				Bore	ehol	e I	D: KAFB-	106215
Pro Pro	ojec ojec	US t Loca t Nam t Num	ation: ne: K	KAF AFB I	s of Engineers FB, Albuquerque, NM BFF SWMU ST-106 and SS-111	Hole Dia	ameter	Low	er (in.): 11-3/4 er (in.): 9-5/8 ı Type: Flush	
Da Da	ate S ate T	Starteo D Rea	d: 4/9 acheo	9/201; d: 4/1		🕎 At T	ime of Ind of I	<sup>:</sup> Drilli Drillin	s BGS (ft): ng: 462.00 g: Not Recorded 31.35	
Y	Cool	d Elev rdinate rdinate	e:	AMS	L (ft): Not Recorded	Drillling	Contra Methoo	ictor: I: Aii	National Drilling Rotary Casing H	ammer Page 12 of 25
00 Depth (ft)	Sample Type	Number	Headspace PID	Lithologic Log	Material Description		U.S.C.S.	,	Well Diagram	Remarks
	-				Well-Graded SAND with Gravel Strong Brown (7.5YR 4/6); mois fine to very coarse sand, 20% gr 1".	t; 80%		• • • • • • • • • • • • • •	•       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •	PID = 0.2 ppm @ cyclone and 0.0 ppm @ breathing zone.
<u>335</u> <u>340</u> <u>345</u>					Same as above (330 ft).		SW		- High Solids	Kelly down @ 1234, new 20' connection. Resume drilling @ 1239. PID = 0.0 ppm @ cyclone and breathing zone. Dry cuttings.
<u>350</u> <u>355</u>	-				Same as above (330 ft).			•       •         •       •	Bentonite Grout	PID = 0.0 ppm @ cyclone and breathing zone.
360	-								•       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •	Kelly down @ 1250, new 20' connection. Resume drilling @ 1256.

	C	BI				Bore	eho	le I	D:	KAFB-	106215
Pro Pro	ojec ojec	t Loca t Nam	ation: ne: K	KAF AFB	s of Engineers <sup>-</sup> B, Albuquerque, NM BFF SWMU ST-106 and SS-111	Hole Dia	ameter	Low	er (ir	n.): 11-3/4 n.): 9-5/8 be: Flush	
Da Da	te S te T	tarteo D Re	d: 4/9 acheo				ime of Ind of	<sup>:</sup> Drilli Drillin	ng: ig: N	462.00 Not Recorded	1
Y (	Coor	d Elev rdinat rdinat	e:	AMS	SL (ft): Not Recorded	Drillling	Contra Method	actor: d: Ai	Nat r Rot	tional Drilling ary Casing F	
90 Depth (ft)	Sample Type	Number	Headspace PID	Lithologic Log	Material Description		U.S.C.S.		Well	Diagram	Remarks
	-				Well-Graded SAND with Gravel Strong Brown (7.5YR 4/6); mois fine to very coarse sand, 20% g 1".	t; 80%		• • • • • • • • • • • • • •			PID = 0.0 ppm @ cyclone and breathing zone. Hammering.
365	-								<ul> <li></li></ul>		No water added.
370	-				Same as above (360 ft).						PID= 0.1 ppm @ cylone and 0.0 ppm @ breathing zone.
375	-						SW			High Solids Bentonite Grout	Kelly down @ 1306, new 20' connection. Resume drilling @ 1310.
380	-				Same as above (360 ft).						PID = 0.0 ppm @ cyclone and breathing zone.
385	-										
390								••	••		

(	C	RI				Bore	eho	le I	D: KAFB-1	06215
Pr Pr	ojec ojec	ct Loc ct Nar	ation ne: K	: KAF	s of Engineers FB, Albuquerque, NM BFF SWMU ST-106 and SS-111 705	Hole Dia	ameter	Low	ber (in.): 11-3/4 /er (in.): 9-5/8 n Type: Flush	
Da Da	ate S ate 1	Starte TD Re	d: 4/seache	9/201	5 16/2015	🕎 At T	ime of nd of	<sup>:</sup> Drill Drillir	s BGS (ft): ing: 462.00 ng: Not Recorded 61.35	
Y	Coo	nd Ele ordina ordina	te:	ו AMS	L (ft): Not Recorded		Nethod	d: Ai	National Drilling r Rotary Casing Ha hards	ammer Page 14 of 25
06 Depth (ft)		Number	Headspace PID	Lithologic Log	Material Description		U.S.C.S.		Well Diagram	Remarks
395	-				Well-Graded SAND with Gravel Strong Brown (7.5YR 4/6); moist fine to very coarse sand, 20% gr 1".	; 80%	SW		<ul> <li>•</li> <li>•&lt;</li></ul>	PID = 0.2 ppm @ cyclone and 0.0 ppm @ breathing zone. Hammering. No water added.
400	- - )				Poorly Graded SAND (SP); Ligh (7.5YR 6/4); moist; 100% very fin fine sand.					Kelly down @ 1318, new 20' connection. Resume drilling @ 1323.
405	-				Same as above (397 ft).		SP		- High Solids Bentonite Grout	PID = 0.2 ppm @ cyclone and 0.0 ppm @ breathing zone.
<u>410</u>					Well-Graded SAND with Gravel Brown (7.5YR 5/3); moist; 80% f very coarse sand; 20% fine grav subrounded to rounded; gravel is and white quartz.	ine to el to 1";		<ul> <li>•••</li> <li>•••</li></ul>		PID = 0.0 ppm @ cyclone and breathing zone.
415					Same as above (408 ft).		SW			Kelly down @ 1332, new 20' connection. Resume drilling @ 1338.
420	)							•••	••	

	C	RI				Bore	ehol	le l	D: KAFB-1	06215
Pro Pro	ojec ojec	t Loca t Nam	ation: ie: K	: KÁI (AFB	s of Engineers FB, Albuquerque, NM BFF SWMU ST-106 and SS-111	Hole Dia	ameter	Low	ver (in.): 11-3/4 ver (in.): 9-5/8 n Type: Flush	
Da Da	ite S ite T		l: 4/9 ache	9/201 d: 4/		👳 At T	ime of ind of I	Drill Drillir	s BGS (ft): ing: 462.00 ng: Not Recorded 61.35	
Y (	Cooi	d Elev rdinate rdinate	e:	n AMS	SL (ft): Not Recorded	Drillling	Contra Methoo	ictor: I: Ai	National Drilling r Rotary Casing Ha	ammer Page 15 of 25
(ft) (ft) (ft)	Sample Type	Number	Headspace PID	Lithologic Log	Material Description		U.S.C.S.		Well Diagram	Remarks
					Well-Graded SAND with Gravel Brown (7.5YR 5/3); moist; 80% f very coarse sand; 20% fine grav	ine to el to 1";	SW	• • • • • •	• • • • • • • •	PID = 0.2 ppm @ cyclone and 0.0 ppm @ breathing zone.
<u>425</u>	-				subrounded to rounded; gravel is and white quartz. Poorly Graded SAND (SP); Ligh (7.5YR 6/3); moist; 100% fine sa	t Brown	SP		- Top of Bentonite Chip Seal	
430	-									PID = 0.0 ppm @ cyclone and breathing zone.
435	-				Well-Graded SAND (SW); moist (7.5YR 5/3); 90% very fine to ver coarse sand; 10% fine gravel; subrounded to rounded; gravel is and quartz.	ry				Kelly down @ 1349, new 20' connection. Resume drilling @ 1354.
440					Same as above (433 ft).		SW			PID = 0.1 ppm @ cyclone and 0.0 ppm breathing zone.
443	-									PID = 0.0 ppm @ cyclone an breathing zone. Kelly down @ 1359. End ARCH drilling @ 450 ft.

(	7	RI				Bore	ehol	e ID: KAFB-1	106215-Sonic
Pro Pro	oject oject	: Loca : Nam	ation: ne: K	KÁI AFB	os of Engineers FB, Albuquerque, NM BFF SWMU ST-106 and SS-111	Hole Dia	ameter	Upper (in.): 11-3/4 Lower (in.): 9-5/8 letion Type: Flush	
Dat Dat	Project Number: 140705 Date Started: 4/9/2015 Date TD Reached: 4/16/2015 Date Completed: 4/22/2015						ime of Ind of [	evels BGS (ft): Drilling: 462.00 Drilling: Not Recorded ng: 461.35	
YC	coor	d Elev dinate dinate	e:	AMS	SL (ft): Not Recorded		Nethod	ctor: National Drilling : Sonic Coring . Giles	Page 16 of 25
(ft) Depth (ft)	Sample Type	Number	Headspace PID	Lithologic Log	Material Description		U.S.C.S.	Well Diagram	Remarks
455					<ul> <li>@ 450 ft. Well-graded SAND (S Brown (7.5YR 4/4); 85% very fin medium sand; subangular to subrounded; 10% fine to coarse subrounded; 5% silt.</li> <li>@ 450.6 ft. Silty GRAVEL with S (GM); Brown (7.5YR 4/4); 60% ft coarse gravel; subangular to subrounded; 20% very fine to co sand; subangular; 20% silt.</li> <li>@ 456.3 ft. Silty SAND with Gra Brown (7.5YR 4/4); 40% very fin sand; trace medium and coarse subangular to subrounded; 30% coarse gravel; subangular to subrounded; 30% silt.</li> <li>@ 457.6 ft. Well-graded GRAVE Silt and Sand (GW-GM); Brown 4/4); 70% coarse gravel; trace fi gravel; subangular to subrounded; 10% silt.</li> <li>@ 459.4 ft. Silty SAND (SM); Br (7.5YR 4/4); 60% very fine to fin trace medium sand; subangular to subrounded; 30%</li> <li>@ 460.1 ft. Silty SAND with Gra Brown (7.5YR 4/4); 60% very fine to subrounded; 30%</li> </ul>	vel (SM); band ine to barse vel (SM); ie to fine fine to to cl. with (7.5YR ne ed; 20% to own e sand; to ace b silt. vel (SM); ie to rounded;	SW GM SM GW- GM	- Bentonite Chip Seal - Top of Bentonite Pellet Seal	<ul> <li>Begin Sonic coring at 450 feet bgs @ 1525 on 4/14/15. @ 450 ft, sand is mostly fine clear and frosted quartz. Gravel is black mafics and red granite.</li> <li>@ 450.6 ft gravel is black mafic, red granite, and quartzite; grain size decreasing with depth. Sand is clear quartz, red granite, and black biotite.</li> <li>@ 456.3 ft sand is clear quartz; gravel is black mafics.</li> <li>@ 457.2 ft core is moist.</li> <li>@ 457.6 ft gravel is black mafics and red granite.</li> <li>@ 458.4 ft core is wet.</li> <li>@ 459.4 ft sand is quartz.</li> <li>@ 460.1 ft sand is clear quartz. Sand coarseness decreases with depth. Gravel is black mafics</li> <li>@ 464.2 ft conglomerate cobble with quarzite, mafics, and granite.</li> </ul>
465					@ 464.4 ft. Poorly graded SANE (SP-SM); Brown (7.5YR 4/4); 90		SP- SM		@ 464.4 ft sand is clear and frosted quartz.

		BI				Bore	ehol	e ID: KAFB-1	06215-Sonic	
Pro Pro	ojec ojec	t Loca Nam	ation: ne: K	: KAF	s of Engineers <sup>-</sup> 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: Flush				
Da Da	te S te T		d: 4/9 ache	9/201 d: 4/ <i>1</i>		∑ At T T At E	ime of Ind of E	evels BGS (ft): Drilling: 462.00 Drilling: Not Recorded Ig: 461.35		
Y (	Ground Elevation AMSL (ft): Not Recorded Y Coordinate: X Coordinate:						Contra	ctor: National Drilling : Sonic Coring	Page 17 of 25	
5 Depth (ft)	Sample Type	Number	Headspace	Lithologic Log	Material Description		U.S.C.S.	Well Diagram	Remarks	
470	-				fine to fine sand; subangular to subrounded; 10% silt. No recovery from 465 to 465.9 ft @ 465.9 ft. Poorly graded SAND (SP-SM); Brown (7.5YR 4/4); 90 fine to fine sand; subangular to subrounded; 10% silt. @ 466.3 ft. Lean CLAY (CL); rec brown (2.5YR 4/4); very hard; me plasticity; 100% clay.	) with Silt % very	SP- SM	- Bentonite Pellet Seal	End coring @ 465 ft at 1602 on 4/14/15. Resume coring @ 465 ft at 0825 on 4/15/15. @ 465.9 ft sand is clear and frosted quartz. @ 466.3 clay has blocky structure. Some black and white sand pockets present. @ 467.8 - 468.2 ft some silt observed. @ 469 ft some silt observed. Trace blocky clay structure. @ 470 ft some black grains and grey patches.	
-	-				No recovery from 472 to 472.2 ft @ 472.2 ft. Clayey SAND (SC); I (10YR 4/3); 80% very fine to fine subangular; 20% clay.	Brown	SC		@ 472.2 ft sand is clear and frosted quartz.	
475	-				@ 473.5 ft. Poorly graded SAND Clay (SP-SC); Brown (10YR 4/3) very fine to fine sand; trace med sand; subrounded; 10% clay.	); 90%	SP- SC		@ 473.5 sand is clear and frosted quartz, black biotite, and red microcline.	
480	-				@ 475.6 ft. Poorly graded SAND (SP-SM); dark yellowish brown ( 4/4); 90% fine to medium sand; i medium; subangular to subround trace coarse gravel to 3/4"; subro 10% silt.	10YR mostly ded;	SP- SM		<ul> <li>@ 475.6 ft sand is clear and frosted quartz, black biotite, and red microcline. Gravel is quartzite.</li> <li>@ 477.5 to 478.2 ft some coarse sand observed.</li> <li>@ 479.6 ft layer of coarse, flat, black mafic gravel observed.</li> </ul>	

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(	C	RI			Bore	ehol	e ID: KAFB-1	06215-Sonic
Pro Pro	ojec ojec	t Loca t Nan	ation: KAF	s of Engineers FB, Albuquerque, NM BFF SWMU ST-106 and SS-111	Hole Dia	ameter	Upper (in.): 11-3/4 Lower (in.): 9-5/8 letion Type: Flush	
Da Da	ate S ate T	tarte D Re	n <b>ber:</b> 1407 d: 4/9/2019 ached: 4/ <i>1</i> leted: 4/22	5 16/2015	⊻ At T ▼ At E	ime of ind of [	evels BGS (ft): Drilling: 462.00 Drilling: Not Recorded ng: 461.35	
Y	Coor	d Elev rdinat rdinat	e:	L (ft): Not Recorded		<b>Nethod</b>	ctor: National Drilling : Sonic Coring . Giles	Page 18 of 25
8 Depth (ft)	Sample Type	Number	Headspace PID Lithologic Log	Material Description		U.S.C.S.	Well Diagram	Remarks
485	-			<ul> <li>@ 475.6 ft. Poorly graded SAND (SP-SM); dark yellowish brown ( 4/4); 90% fine to medium sand; i medium; subangular to subround trace coarse gravel to 3/4"; subra 10% silt.</li> <li>@ 480.5 ft. Lean CLAY with San yellowish brown (10YR 5/4); hard medium plasticity; 80% clay; 20% fine sand; subangular.</li> <li>@ 480.8 ft. Clayey SAND (SC); I (7.5YR 4/3); 70% very fine to fine subangular to subrounded; 30%</li> <li>@ 481.5 ft. Poorly graded SAND Clay (SP-SC); Brown (7.5YR 4/3) very fine to fine sand; trace med coarse sand; subangular to subr 5% fine to coarse gravel; subrou 10% clay.</li> <li>@ 483 ft. Poorly graded SAND v (SP-SM); Brown (7.5YR 4/3); 90 medium sand; subangular to subrounded; 10% silt.</li> <li>@ 484.3 ft. Poorly graded SAND Clay and Gravel (SP-SC); Browr 4/3); 50% fine to medium sand; subangular to subrounded; 40% gravel; trace fine gravel; subang subrounded; 10% clay.</li> <li>@ 485.7 ft. Silty SAND (SM); Bro (7.5YR 5/4); 80% very fine to fine trace medium sand; subangular subrounded; 5% coarse gravel to trace fine gravel; subrounded; 15%</li> </ul>	10YR mostly ded; ounded; ind (CL); d; % very Brown e sand; clay. 0 with 3); 85% ium and counded; inded; inded; with Silt % fine to 0 with n (7.5YR coarse ular to 0 with e sand; to 0 o 1"; 5% silt.	SP- SC SC SP- SC SP- SC SM SM	- Bentonite Pellet Seal	<ul> <li>@ 480.5 ft sand is clear and frosted quartz.</li> <li>@ 480.8 ft sand is clear and frosted quartz.</li> <li>@ 481.5 sand is clear and frosted quartz with some black biotite.</li> <li>Gravel is flat, black mafics.</li> <li>@ 483 ft sand is clear and frosted quartz with some microcline.</li> <li>@ 484.3 ft sand is clear and frosted quartz with some microcline. Gravel is black mafics and red granite.</li> <li>@ 485.7 ft sand is clear and frosted quartz with some black grains.</li> <li>Gravel is black mafics.</li> <li>@ 487.7 ft some sand is red microcline.</li> </ul>
	$\left  \right $			<ul> <li>@ 487.7 ft. Same as above (485 80% very fine to coarse sand.</li> <li>@ 491.1 ft. Poorly graded SAND Brown (7.5YR 5/4); 95% very fin</li> </ul>	) (SP);	SP		and frosted quartz. @ 492 ft sand is clear
495	-			<ul> <li>Blown (7.5 mc 3/4), 95 % very nin sand; trace medium sand; subar subrounded; 5% silt.</li> <li>@ 492 ft. Well-graded SAND (S' Brown (7.5YR 5/4); 95% fine to a sand; subangular to subrounded @ 492.9 ft. Poorly graded SAND Brown (7.5YR 5/4); 95% very fin</li> </ul>	mgular to W); coarse I; 5% silt. O (SP);	SW		and frosted quartz, black grains, and red microcline. One clast of coarse, rounded, red granite observed. @ 492.9 ft sand is clear and frosted quartz.

CBI		Boreho	le ID: KAFB-	106215-Sonic
Project Location:	Corps of Engineers KAFB, Albuquerque, NM AFB BFF SWMU ST-106 and SS-111	Hole Diamete	er Upper (in.): 11-3/4 er Lower (in.): 9-5/8 pletion Type: Flush	
Date Started: 4/9 Date TD Reached Date Completed:	)/2015 I: 4/16/2015	$ aggreen  ext{ }  eq  ext{At Time }  eq  ext{ }  eq  ext{At Time }  $	Levels BGS (ft): of Drilling: 462.00 Drilling: Not Recorded ing: 461.35	
Ground Elevation Y Coordinate: X Coordinate:	AMSL (ft): Not Recorded		actor: National Drilling d: Sonic Coring M. Giles	Page 19 of 25
65 Depth (ft) Sample Type Number Headspace	Material Description	U.S.C.S.	Well Diagram	Remarks
<u>495</u> 500 505 510	<ul> <li>sand; trace medium sand; subar subrounded; 5% silt.</li> <li>@ 494.5 ft. Poorly graded GRAV Clay and Sand (GP-GC); Dark B (7.5YR 3/4); 50% fine gravel; tra coarse gravel; subrounded; 40% coarse (mostly medium) sand; subangular to subrounded; 10%</li> <li>@ 495.7 ft. Lean CLAY (CL); Str Brown (7.5YR 5/6); hard; medium plasticity; 100% clay.</li> <li>@ 496.4 ft. Poorly graded GRAV Clay and Sand (GP-GC); Dark B (7.5YR 3/4); 50% fine gravel; tra coarse gravel; subrounded; 40% coarse sand; subangular to subr 10% clay.</li> <li>@ 497.1 ft. Well-graded SAND (Strong Brown (7.5YR 5/6); 95% to coarse sand; subangular to subr 10% clay.</li> <li>@ 499.3 ft. Well-graded SAND v and Gravel (SW-SC); dark yellow brown (10YR 4/4); 50% very fine coarse gravel; subrounded; 5% silt.</li> <li>@ 499.3 ft. Lean CLAY (CL); dark yellow brown (10YR 4/4); 50% fine coarse sand; subangular to subr 40% coarse gravel; subrounded; 5% silt.</li> <li>@ 500 ft. Lean CLAY (CL); dark yellow brown (10YR 4/4); med plasticity; 100% clay.</li> <li>@ 502.5 ft. Clayey SAND with G (SC); Brown (7.5YR 4/3); 50% fine coarse gravel; 15% clay.</li> <li>@ 503.1 ft. Clayey GRAVEL witt (GC); Brown (7.5YR 4/3); 50% fine coarse gravel to 2"; 30% fine to r sand; subangular to subrounded; 10% clay.</li> <li>@ 505.3 ft. Description on follow page.</li> </ul>	GC         /EL with ce         GP- fine to         ong m         SW         /EL with ong m         SW         /EL with frown ce         SW);         ounded;         SW);         very fine         CL         vith Clay         wish         e to         ounded;         GC         dium         SP- counded;         SC         ounded;         SC         owith         sc         owith         sc         owith         sc         owith         sc         owith         sc	- Bentonite Pellet Seal	<ul> <li>@ 494.5 ft gravel is black mafics, white quarzite, and red granite. Sand is mostly medium clear and frosted quartz, black grains, and red microcline.</li> <li>@ 496.4 ft gravel is black mafics, white quarzite, and red granite. Sand is mostly medium clear and frosted quartz, black grains, and red microcline.</li> <li>@ 497.1 ft sand is clear and frosted quartz, black and white grains, and red microcline.</li> <li>@ 498.0 - 498.2 ft trace fine to coarse gravel observed; subrounded. Gravel is black mafics.</li> <li>@ 499.3 ft sand is clear and frosted quartz, black grains, and red microcline.</li> <li>@ 498.0 - 498.2 ft trace fine to coarse gravel observed; subrounded. Gravel is black mafics.</li> <li>@ 499.3 ft sand is clear and frosted quartz, black grains, and red microcline. Gravel is black mafics and red granite.</li> <li>@ 500 ft occasional small patches of white clay.</li> <li>@ 502.5 ft sand is clear and frosted quartz. Gravel is black mafics, red granite, and white gravel is black mafics, red granite, and white quartzite.</li> <li>@ 503.1 ft gravel is black mafics and some red granite. Sand is clear and frosted quartz.</li> <li>@ 504.3 ft sand is clear and frosted quartz.</li> </ul>

	C	BI				Bore	ehol	e ID: KAFB-′	106215-Sonic	
Pr Pr	ojec ojec	t Loca t Nam	ation: ne: K	: Káf (AFB I	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				
Da Da	ate S ate T		d: 4/9 acheo	9/201; d: 4/1		⊥ At T ▼ At E	ime of nd of [	evels BGS (ft): Drilling: 462.00 Drilling: Not Recorded ig: 461.35		
Y	Coo	d Elev rdinat rdinat	e:	n AMS	L (ft): Not Recorded		/lethod	ctor: National Drilling : Sonic Coring . Giles	Page 20 of 25	
01 Depth (ft)	Sample Type	Number	Headspace PID	Lithologic Log	Material Description		U.S.C.S.	Well Diagram	Remarks	
	_				@ 505.3 ft. Clayey SAND with G (SC); Brown (7.5YR 4/3); 50% fi coarse sand; subangular to subr 30% fine to coarse gravel; subro 20% clay.	ne to rounded;	SC		@ 505.3 fine and medium sand is frosted and clear quartz. Coarse sand is white, black, and red microcline, and clear and frosted quartz. Gravel is black mafics, red granite, and clear and frosted quartzite.	
<u>515</u>	-				@ 513.2 ft. Well-graded SAND v (SW-SC); Brown (7.5YR 4/3); 80 to coarse sand; mostly medium coarse; subangular; 10% coarse to 2"; 10% clay.	)% fine and	SW- SC	- Bentonite Pellet Seal	Coarseness of gravel decreases with depth. @ 510.2 ft coarse gravel increases. @ 511 ft percent of coarse gravel increases. @ 513.2 ft sand is mostly medium and coarse clear and frosted quartz, black biotite, and red microcline. Gravel is black mafics and frosted quartzite. @ 515 ft, end coring at 1549 on 4/15/15. Resume coring at 0836	
<u>520</u>	_				@ 518 ft. Clayey SAND (SC); Br (7.4YR 4/4); 80% fine to medium subangular to subrounded; 20%	n sand;	SC		on 4/16/15. @ 518 ft sand is clear and frosted quartz. Occasional sandy clay patch.	
525	_				@ 522.4 ft. Poorly graded SANE (SP-SM); Strong Brown (7.5YR 80% coarse sand; trace fine san subangular to subrounded; 10% gravel; trace fine gravel; 10% sil	5/6); id; coarse	SP- SM		<ul> <li>@ 522.4 ft sand is clear and frosted quartz, black biotite, and red microcline. Gravel is black mafics and red granite.</li> <li>@ 523.2 one piece of coarse, flat, partially</li> </ul>	

(	C	BI				Bore	ehol	e ID: KAFB-′	106215-Sonic		
Pr Pr	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 Upper (in.): 11-3/4 Hole Diameter Lower (in.): 9-5/8 Surface Completion Type: Flush				
Da Da	Date Started: 4/9/2015 Date TD Reached: 4/16/2015 Date Completed: 4/22/2015						ime of Ind of D	evels BGS (ft): Drilling: 462.00 Drilling: Not Recorded g: 461.35			
Y	Coo	d Elev rdinat rdinat	e:	ו AMS	L (ft): Not Recorded		Vethod	ctor: National Drilling : Sonic Coring . Giles	Page 21 of 25		
55 Depth (ft)	Sample Type	Number	Headspace PID	Lithologic Log	Material Description		U.S.C.S.	Well Diagram	Remarks		
	-				@ 525.3 ft. Poorly graded SAND Strong Brown (7.5YR 5/6); 95% sand; trace medium sand; subro 5% silt.	coarse	SP		metamorphic sandstone observed. @ 525.3 ft sand is clear quartz, black biotite, and red microcline.		
	-				<ul> <li> <sup>(1)</sup> 526.4 ft. Well-graded SAND v (SW-SM); Strong Brown (7.5YR      </li> <li>             90% very fine to coarse sand; m         </li> <li>             fine to medium; subangular to         </li> <li>             subrounded; 10% silt.         </li> </ul>	5/6);			@ 526.4 ft sand is clear quartz, black biotite or mafics, and red microcline. Occasional lenses of <3" coarse sand. Occasional coarse 3/4" rounded gravel.		
530	-				Same as above (526.4 ft); very f medium sand; trace coarse sand		SW- SM	- Bentonite Pellet Seal	@ 533.5 ft sand is mostly clear quartz with some		
535	-				fine to coarse gravel.				black biotite and red granite.		
540	-				@ 538 ft. Silty SAND (SM); Brow (7.5YR 5/4); 80% very fine to fine trace medium and coarse sand; subangular to subrounded; 5% fi gravel; subrounded; 15% silt.	e sand;	SM		@ 538 ft sand is clear quartz, black biotite, and red microcline. Gravel is black mafics, red microcline, and white quartzite.		

		BI	N.			Borehole ID: KAFB-106215-Sonic				
Pro	ojec ojec	t Loca Nam	ation: ne: 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				
Da Da	te S te T		d: 4/9 ache	9/201 d: 4/	5 16/2015	👤 At E	ime of nd of I	Drilling	462.00 Not Recorded	
Y	Date Completed: 4/22/2015 Ground Elevation AMSL (ft): Not Recorded Y Coordinate: X Coordinate:						<b>Nethod</b>	ictor: N I: Sonic I. Giles	ational Drilling Coring	Page 22 of 25
5 Depth (ft)	Sample Type	Number	Headspace PID	Lithologic Log	Material Description		U.S.C.S.	We	ell Diagram	Remarks
	-				<ul> <li>@ 539.9 ft. Poorly graded SAND Brown (7.5YR 5/4); 85% fine to r sand; trace coarse sand; subang subrounded; 10% fine to coarse to 1"; subrounded to rounded; 5%</li> <li>@ 540.6 ft. Silty SAND (SM); Bro (7.5YR 5/4); 85% very fine to fine subangular to subrounded; 15%</li> </ul>	nedium jular to gravel % silt. own e sand;	SP		- Top of 20/40 Sand	<ul> <li>(2) 539.9 ft sand is quartz, black biotite, and red microcline. Gravel is black mafics and red granite.</li> <li>(2) 540.6 ft sand is clear quartz with some black biotite and clear specks. Occasional lenses of</li> </ul>
	_				@ 543 ft. Clayey SAND with Gra (SC); Brown (7.5YR 5/4); 65% ve to fine sand; trace medium and c sand; subangular to subrounded coarse gravel to 2"; subangular t	ery fine coarse ; 20%	SC		- Top of 10/20 Sand	clayey silt. @ 543 ft sand is clear quartz, red microcline, and black biotite. Gravel is black mafics and conglomorate
545	_				subrounded; 15% clay. @ 544.5 ft. Poorly graded SAND Clay (SP-SC); Brown (7.5YR 5/4 very fine to fine sand; trace medi sand; subangular to subrounded clay.	); 90% ium	SP- SC			conglomerate. @ 544.5 ft sand is clear quartz, red microcline, and black biotite. Occasional pieces of light brown (7.5YR 6/3) clay.
	-				@ 547.5 ft. Well-graded SAND v and Gravel (SW-SC); Brown (7.5 5/4); 50% very fine to medium sa	5YR	SW- SC		- Top of 5" Schedule 80 PVC 0.010" Slot Screen	@ 547.5 ft sand is clear and frosted quartz and black biotite. Gravel is
	-				trace coarse sand; subangular to subrounded; 40% coarse gravel; to subangular; 10% clay. @ 548.5 ft. Poorly graded SAND	angular	SP- SC			black mafics. @ 548.5 ft sand is clear and frosted quartz and black biotite.
550	-				<ul> <li>@ 548.5 ft. Foonly graded SAND Clay (SP-SC); Brown (7.5YR 5/4 very fine to fine sand; subangula subrounded; 10% clay.</li> <li>@ 549.7 ft. Poorly graded SAND Brown (7.5YR 5/4); 95% very fine sand; subangular to subrounded clay.</li> </ul>	); 90% ir to (SP); e to fine	SP			@ 549.7 ft sand is clear and frosted quartz.
					@ 552.5 ft. Lean CLAY (CL); Pin grey (7.5YR 6/2); hard; medium plasticity; 100% clay.	ikish	CL		· · ·	
555					@ 553.8 ft. Description is on the following page.		SP			

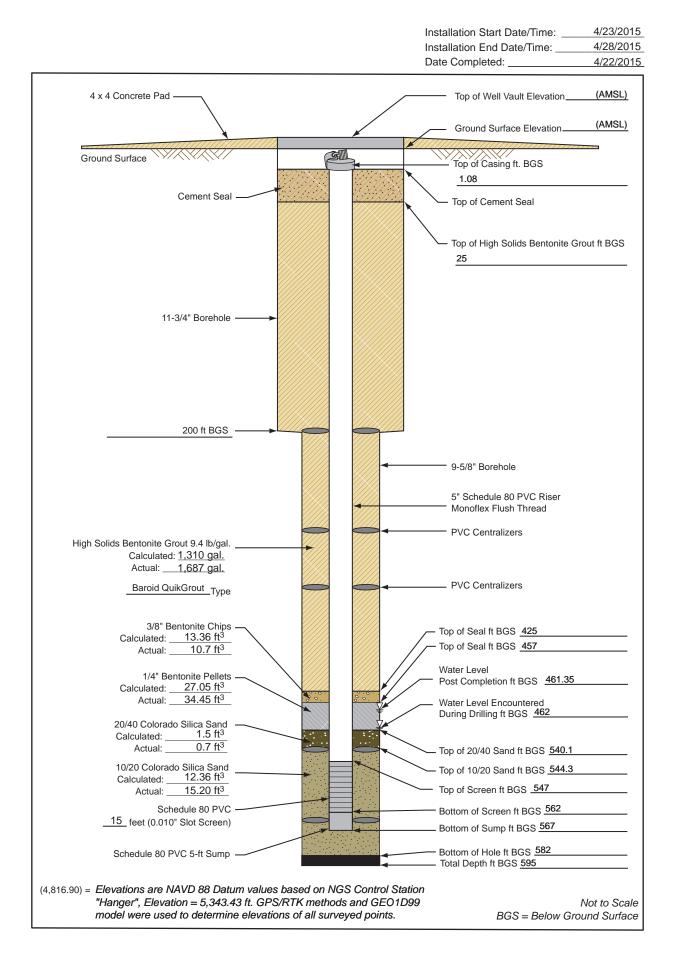
#### . . \_ . -

	C	RI				Bore	ehol	e ID:	KAFB-1	06215-Sonic
P P	Client: US Army Corps of Engineers Project Location: KAFB, Albuquerque, NM Project Name: KAFB BFF SWMU ST-106 and SS-111 Project Number: 140705						meter	Lower (i	n.): 11-3/4 n.): 9-5/8 pe: Flush	
D	ate s ate <sup>-</sup>	Started	d: 4/9 acheo	9/201; d: 4/1	5 16/2015	⊻ At T ▼ At E	ime of nd of l	evels BC Drilling: Drilling: ng: 461.	462.00 Not Recorded	
Y	Coc	nd Elev ordinat ordinat	e:	AMS	L (ft): Not Recorded	Drillling O Drilling N Logged	/lethoo	I: Sonic	ational Drilling Coring	Page 23 of 25
G Depth (ft)	Sample Type	Numt	Headspace PID	Lithologic Log	Material Description		U.S.C.S.	We	ll Diagram	Remarks
	_				@ 553.8 ft. Poorly graded SAND Strong Brown (7.5YR 5/6); 95% sand; trace very fine to fine sand subangular to subrounded; 5% c	medium I;				@ 553.8 ft sand is clear and frosted quartz, black biotite, and red microcline.
	-						SP			@ 556.5 occasional pockets of clay observed.
	_				@ 558.2 ft. Clayey SAND (SC); I (7.5YR 4/3); 75% very fine to me sand; subangular to subrounded gravel; 20% clay; medium plastic	edium ; 5% city.	SC			@ 558.2 sand is frosted and clear quartz and red microcline. Gravel is partially cemented
56	<u>)</u>				@ 559.6 ft. Lean CLAY (CL); yel red (5YR 4/6); firm; medium plas 100% clay.		CL			sandstone. @ 559.6 ft clay has semi blocky structure. @ 559.9 trace coarse
	_				@ 560.8 ft. Clayey SAND (SC); I (7.5YR 5/2); 80% very fine to me sand (mostly fine); subangular to subrounded; 20% clay.	dium	SC		- Bottom of Screen	gravel of partially cemented sandstone observed. @ 560.8 ft sand is frosted and clear quartz, black biotite, and red
	_				@ 562.9 ft. Poorly graded SAND Clay (SP-SC); Brown (7.5YR 5/2 medium sand; trace very fine to sand; subangular to subrounded clay.	:); 90% fine ; 10%	SP- SC/ SC			microcline. @ 562.9 ft sand is frosted and clear quartz. @ 563.2 ft sand is frosted and clear quartz, black biotite, and red
56	5				@ 563.2 ft. Clayey SAND (SC); I (7.5YR 5/2); 80% very fine to me sand; subangular to subrounded clay.	edium / 🖂	SP- SC			microcline. @ 564.5 ft sand is frosted and clear quartz.
	-				© 564.5 ft. Poorly graded SAND Clay (SP-SC); Brown (7.5YR 5/2 medium sand; trace very fine to sand; subangular to subrounded clay.	2); 90% fine	No		-Bottom of Sump	End collection of continuous coring at 565 feet bgs.
57	_				No core recovered from 565 to 5 Overdrill for heaving sand.	95 feet.	Core			

(	C	BI				Bore	eho	le ID: KAFB-	106215-Sonic	
Pr Pr	oje oje	ct Loc	ation ne: k	: Káf (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				
Da Da	ate s	Starteo TD Re	d: 4/ ache	9/201: d: 4/ <i>1</i>		⊥ At T ▼ At E	Time o <sup>.</sup> End of	Levels BGS (ft): f Drilling: 462.00 Drilling: Not Recordeo ng: 461.35	d	
Y	Ground Elevation AMSL (ft): Not Recorded Y Coordinate: X Coordinate:						Metho	actor: National Drilling d: Sonic Coring 1. Giles	Page 24 of 25	
270 Depth (ft)		Number	Headspace PID	Lithologic Log	Material Description		U.S.C.S.	Well Diagram	Remarks	
575					No core recovered from 565 to 5 Overdrill for heaving sand.	595 feet.	No Core	-Bottom of Filter Pack		

		Dal				DUIE			06215-Sonic	
Pro Pro	ojec ojec	t Loca Nam	ation: ne: K	: KÁI (AFB	s of Engineers <sup>-</sup> 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: Flush				
Da Da	ate S ate T		d: 4/9 acheo	9/201 d: 4/		⊻ At T ▼ At E	ime of ind of I	evels BGS (ft): Drilling: 462.00 Drilling: Not Recorded ng: 461.35		
Y	Coo	d Elev rdinat rdinat	e:	AMS	SL (ft): Not Recorded	Drillling	Contra Aethoo	ictor: National Drilling I: Sonic Coring	Page 25 of 25	
G Depth (ft)	Sample Type	Number	Headspace	Lithologic Log	Material Description		U.S.C.S.	Well Diagram	Remarks	
<u>590</u> 595	-				No core recovered from 565 to 5 Overdrill for heaving sand.	595 feet.	No Core	Bottom of Rat Nole		

## Monitoring Well Completion Diagram KAFB-106215





### Well Development Record

Project Name: KAFB BFF			
Location: Georgia and Gibson		Well/Piez. No.: KAFB-106215	
Personnel: R. Wortman		Date Installed: 4/22/15	
Date: 5/6/15 - 5/7/15		Csg. Diameter (I.D.): 5 "	
Samplers: N/A		Total Depth (ft. bgs): 582	
Method of Development: X Surging	X Bailing	X Pumping	
X Original Development	Redevelopment	Other	
Development Date: 5/6/2015	- 5/7/2015		
Depth to Water Before Develo	pping Well (ft. btoc): 461.35		

 $V=(B * r_c^2 * L_c * 7.48)+(B * (r_w^2 - r_c^2) * L_s * \phi_s * 7.48)+(H_2O added during drilling/installation) = \frac{460 \text{ gallons}}{1000 \text{ gallons}}$ 

Depth Purging From: 554.5 feet	Time Purging Begins: 0905, 5/7/2015
Weather: Clear, hot	Screened Interval (ft bgs): 547 - 562
Equipment Nos.: pH Meter: YSI 650 MDS	EC Meter: YSI 650 MDS Turbidity Meter: HACH 21000Q

Equipment Decontaminated Prior to Development: Y X N

Describe: Steam Cleaned

Collected Sample of Water Added to Well: Y N X Describe: N/A

Comment: Approximately 250 gallons of water added during drilling/well installation activities. Bubbles in YSI and turbidity samples throughout development.

		Water Level (ft	Volume Removed				Turbidity	
Date	Time	bTOC)	(gal.)	Temp. (°C)	рН	EC (mS/cm)	(NTU)	Comments
5/6/2015	1000	460.70	0					Begin bailing.
5/6/2015	1014		25				>1000	Finish bailing.
5/6/2015	1104		25					Begin swabbing from 562 - 557 feet bgs.
5/6/2015	1124		25					Continue swabbing from 557 - 552 feet bgs.
5/6/2015	1144		25					Continue swabbing from 552 - 547 feet bgs.
5/6/2015	1204		25					Finish swabbing.
5/6/2015	1211		25					Begin bailing.
5/6/2015	1245		190				>1000	Continue bailing.
5/6/2015	1256		195				>1000	Finish bailing. Set up pump.
5/6/2015	1315		195					Begin tripping in pipe.

\* Turbidity readings were collected from YSI, not the turbidity meter.

Notes: Water Levels - Reported to the nearest 0.01 foot pH - Reading rounded to 0.1 pH units Water temperature - Reported to nearest 0.1 °C °C = Degree Celsius EC = Electric Conductivity ft bgs = Feet Below Ground Surface ft btoc = Feet Below Top of Casing gal. = Gallon GPM = Gallons Per Minute I.D. = Inner Diameter N/A = Not Applicable NR = Not Recorded NTU = Nephelometric Turbidity Unit S/m = Seimens per Meter

Where:

B=3.14 Ø<sub>s</sub>= porosity of the sand 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

rw= radius of the well bore in feet

 $L_s$ = 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: 5/6/15 - 5/7/15

Time Start: 1000, 5/6/2015

# Well No: \_KAFB-106215 Samplers: \_N/A Checked By: \_\_\_\_\_\_ Time Finish: 1120, 5/7/2015

Field Chemis	try (cont'd)							
Date	Time	Water Level (ft. Below TOC)	Volume Removed (gal.)	Temp. (°C)	рН	EC (mS/cm)	Turbidity (NTU)	Comments
5/6/2015	1600		195					Pipe is ready for pumping tomorrow.
5/7/2015	0830		195					Set up pump at 561 feet bgs.
5/7/2015	0905	460.22	195					Start pumping from 561 feet bgs.
5/7/2015	0915	461.24	205	19.10	7.61	0.407	86.9	Pumping at 4.75 GPM.
5/7/2015	0925	461.24	255	19.49	8.04	0.412	20.20	Continue pumping from 561 feet bgs. Bubbles.
5/7/2015	0935	461.24	302	19.60	8.23	0.409	7.94	Continue pumping from 561 feet bgs. Bubbles.
5/7/2015	0945	461.24	349	19.66	8.28	0.406	5.11	Continue pumping from 561 feet bgs. Bubbles.
5/7/2015	0955	461.25	396	19.70	8.27	0.400	3.35	Continue pumping from 561 feet bgs. Bubbles.
5/7/2015	1005	461.30	443	19.72	8.29	0.429	18.7	Move pump up to 548 feet bgs. Bubbles.
5/7/2015	1015	461.32	490	19.79	8.33	0.394	1.9	Continue pumping from 548 feet bgs. Bubbles.
5/7/2015	1025	461.31	515	19.87	8.28	0.393	1.87	Continue pumping from 548 feet bgs. Bubbles.
5/7/2015	1035	461.32	535	19.86	8.24	0.391	2.02	Continue pumping from 548 feet bgs. Move pump down to 554.5 feet bgs.
5/7/2015	1045	461.29	555	19.86	8.19	0.384	1.70	Continue pumping from 554.5 feet bgs. Bubbles.
5/7/2015	1055	461.29	602	19.88	8.21	0.388	0.99	Continue pumping from 554.5 feet bgs. Bubbles.
5/7/2015	1105	461.28	649	19.91	8.22	0.388	0.99	Continue pumping from 554.5 feet bgs. Bubbles.
5/7/2015	1115	461.29	696	19.93	8.24	0.385	1.17	Continue pumping from 554.5 feet bgs. Bubbles.
5/7/2015	1120		715					Finish pumping. Well development complete.

Was well sampled after development? YES NO X

Sample Method: N/A

Sample Name: N/A

Analyses: N/A

Pg 2 of 2

## KAFB 106219

Proj Proj Proj Date Date Date	ect ect ect ect ect ect ect	Loc Nan Nur tarte D Re omp	ation ne: nber d: 2 eache leted vatio	n: KA KAFB 140 /18/20 ed: 2/ : 3/20		Hole Dia Hole Dia Surface Groundy ∑ At T ∑ At E ∑ Afte Drillling	amete Com water ime c ind of r Drill Contr	er Upp er Lov pletio Leve of Drill f Drilli ling: ractor	per (i wer (i on Ty els B( ling: ng: 476.	477.69 Not Recorded 75 ational Drilling	VIRGINIA BRACHT 8881903-2250
Comple Time 200				Lithologic Log	Material Description	Drilling N	Metho	d: A	ir Ro hnso	tary Casing H n/T. Richards I Diagram	Remarks
5					No lithology description (0.4 ft - 1 Poorly graded GRAVEL with Silt i Sand (GP-GM); strong brown (7.5 4/6); 50% fine gravel; subrounded fine to coarse sand; 10% silt.	and 5YR	GP- GM	T		Top of Casing/ Top of Cement	Location was water jetted to 8.8' for utility clearance. Began ARCH drilling @ 8.8' on 2/18/15.
20					Well graded SAND (SW); brown (5/3); 100% fine to coarse sand; tr fine gravel; subangular to subrour Silty GRAVEL with Sand (GM); br (7.5YR 4/3); 50% fine to coarse g subrounded; 30% fine to coarse s 20% silt.	race nded. rown ravel; sand;	SW			Cement Seal	PID - 0.0 ppm

KAFB\_BOREHOLE\_LOG - SHAW\_DRILLING.GDT - 3/27/15 09:31 - Z:KAFB BFFIGINTIKAFB\_PROJECTIKAFB\_BFF.GPJ

	C	BI				Bore	eho	le l	D: KAFB-1	106219
Pro Pro	ojec ojec	ct Loc ct Nan	ation: ne: K	: Káf (AFB	s of Engineers FB, Albuquerque, NM BFF SWMU ST-106 and SS-111	Hole Dia	ametei	r Lów	oer (in.): 11-3/4 /er (in.): 9-5/8 n Type: Flush	
Da Da	ite S ite T		d: 2/ ache	18/20 <sup>-</sup> d: 2/2		🛛 At T	Time of End of	f Drill Drillir	ls BGS (ft): ing: 477.69 ng: Not Recorded 476.75	
YO	Coo	d Elev ordinat	e:	AMS	L (ft): Not Recorded	Drillling Drilling I	Contra Method	actor: d: Ai	National Drilling ir Rotary Casing Ha nnson/T. Richards	ammer Page 2 of 18
ର Depth (ft)	Sample Type	Number	Headspace PID	Lithologic Log	Material Description		U.S.C.S.		Well Diagram	Remarks
	-				Well graded SAND with Silt and (SW-SM); brown (7.5YR 5/3); 75 to coarse sand; 15% fine gravel; subangular to subrounded; 10%	5% fine		· · · · · · · · · · · · · · · · · · ·	Orop of High     Solids     Bentonite     Grout	PID - 0.0 ppm
35	-				Same as above (30 ft).		SW- SM			Hard drilling.
40	-				Well graded SAND (SW); brown 5/3); 100% fine to coarse sand; subangular to subrounded.	i (7.5YR				
45	-				Same as above (40 ft); 95% fine coarse sand; 5% fine gravel; and subangular.		SW		- High Solids Bentonite Grout	
50	-				Well graded SAND with Gravel ( brown (7.5YR 5/3); 80% fine to c sand; 20% fine to coarse gravel; subangular to subrounded.	coarse				PID - 0.0 ppm
55	-				Silty SAND (SM); brown (7.5YR 60% fine to coarse sand; 40% si	4/4); ilt.	SM			
60								••	••	

	C	BI			Bore	eho	le I	D: KAFB-1	106219
Pro Pro	ojec ojec	ct Loc ct Nan	ation: k ne: KAF	orps of Engineers AFB, Albuquerque, NM B BFF SWMU ST-106 and SS-111	Hole Dia	ameter	r Low	er (in.): 11-3/4 er (in.): 9-5/8 ı Type: Flush	
Da Da	ite S ite T	Starteo TD Re			🕎 At T	ime of nd of	f Drilli Drillin	BGS (ft): ng: 477.69 g: Not Recorded .76.75	
YO	Coo	nd Elev ordinat ordinat	e:	/ISL (ft): Not Recorded	Drilling N	<b>Nethoo</b>	d: Air	National Drilling Rotary Casing Hanson/T. Richards	ammer Page 3 of 18
8 Depth (ft)	Sample Type	Number	Headspace PID Lithologic	Material Description		U.S.C.S.	,	Well Diagram	Remarks
-	_			Silty SAND (SM); brown (7.5YF 60% fine to coarse sand; 40%		SM		<ul> <li>•</li> <li>•&lt;</li></ul>	
65	_			Silty GRAVEL with Sand (GM); (7.5YR 4/3); 60% fine to coarse subangular to subrounded; 20% 20% silt.	e gravel;	GM		•       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •	
70	_			Poorly graded GRAVEL with Sale brown (7.5YR 5/3); 50% fine gr subangular to subrounded; 50% coarse sand.	avel;	GP		•       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •	PID - 0.0 ppm
80	-			Poorly graded SAND (SP); brov (7.5YR 5/3); 90% coarse sand; medium sand; 10% fine gravel;	trace	SP		<ul> <li>High Solids</li> <li>Bentonite</li> <li>Grout</li> <li>•</li> <li>•&lt;</li></ul>	
-	_			Well graded SAND (SW); brow 5/3); 100% fine to coarse sand to subrounded.				•       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •	PID - 0.0 ppm
85	-			Same as above (80 ft); brown ( 4/3); subrounded.	7.5YR	SW		•       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •	– FF

	C	BI	S			Bore	eho	le l	D: KAFB-′	106219
Pro Pro	ojec ojec	t Loca t Nam	ation ne: K	Corp KAF AFB I 1407	s of Engineers FB, Albuquerque, NM BFF SWMU ST-106 and SS-111	Hole Dia	ametei	r Low	er (in.): 11-3/4 er (in.): 9-5/8 n Type: Flush	
Da Da	ate S ate T	tarteo D Re	d: 2/ ache	18/20 <sup>7</sup> d: 2/2		🕎 At T	ime of	f Drill Drillir	s BGS (ft): ing: 477.69 ig: Not Recorded 176.75	
Y	Cool	d Elev rdinat rdinat	e:	AMS	L (ft): Not Recorded	Drilling I	Method	d: Ai	National Drilling r Rotary Casing Ha Inson/T. Richards	ammer Page 4 of 18
g Depth (ft)	Sample Type	Number	Headspace PID	Lithologic Log	Material Description		U.S.C.S.		Well Diagram	Remarks
	-				Well graded SAND (SW); brown 5/3); 100% fine to coarse sand; to subrounded.	n (7.5YR angular		· · · · · · · · · · · · ·	•       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •	
95	-				Same as above (90 ft); 90% fine coarse sand; 10% fine gravel; subrounded.	e to				PID - 0.0 ppm
100	-				Same as above (90 ft).		SW	· · · · · ·		
105	-				Same as above (90 ft); subangu subrounded.	ılar to			- High Solids Bentonite Grout	
110	-				Same as above (90 ft); subround	ded.				PID - 0.0 ppm
<u>115</u>	-				Poorly graded SAND (SP); 1009 medium to coarse sand; subang subrounded; trace fine gravel; a	jular to	SP			
120	-							••	• • • • • •	

C	BI				Bore	eho	le I	D: KAFB-′	106219
rojec rojec	t Loc Nan	ation: ne: K	: KAF (AFB e	B, Albuquerque, NM BFF SWMU ST-106 and SS-111	Hole Dia	ametei	Low	er (in.): 9-5/8	
ate S ate T	Starte	d: 2/ ache	18/201 d: 2/2	5 5/2015	⊥ At T ▼ At E	ime of nd of	<sup>f</sup> Drilli Drillin	ng: 477.69 g: Not Recorded	
Coo	rdinat	e:	I AMS	L (ft): Not Recorded	Drillling Drilling N	Contra Aethoo	actor: d: Ai	National Drilling r Rotary Casing Ha	ammer Page 5 of 18
ample	Number	Headspace PID	Lithologic Log	Material Description		U.S.C.S.		Well Diagram	Remarks
5						SW			Hard drilling. Some of the sand coming out of the cyclone appears to be broken cobbles.
- - - 0				boulder sized rocks. Note: rocks	are			<ul> <li>•</li> <li>•&lt;</li></ul>	Refusal @ 127.5 ft. Driller starts tripping out drill stem to change drill bit. Drill down approximately 5 ft to 133 ft. End of 2/19/15.
5				boulder sized rocks. Note: rocks	are			- High Solids Bentonite Grout	Drill a 6.5 ft hole to 140 ft to help retrieve Symmetrix system. Resumed drilling with 9 5/8" casing and Symmetrix system @ 1006 on 2/24/15. T. Richards takes over logging for M. Johnson. Drilled out of houlders @
<u>c</u>							• • • • • • • •	• • • • • •	Drilled out of boulders @ approximately 137 ft. Hammering.
5						SW			PID - 0.0 ppm @ cyclone and breathing zone. Windy.
				Elastic SILT (MH); strong brown 5/6); moist; 95% silt; 5% sand.	(7.5YR	MH		•       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •	
	rojec rojec rojec ate 1 ro un CO - - - - - - - - - - - - - - - - - -	roject Loc roject Nan roject Nan roject Nan ate Starter ate TD Re ate Complete round Elec Coordinat Coordi	roject Location roject Name: K roject Number: ate Started: 2/ ate TD Reacher ate Completed: round Elevation Coordinate: Coordinate: and and and and a second and and and a second and and a and	roject Location: KAFB roject Name: KAFB roject Number: 1407 ate Started: 2/18/201 ate TD Reached: 2/2 ate Completed: 3/200 round Elevation AMSI Coordinate: Coordi	Coordinate:         and any of the second of	Lient: US Army Corps of Engineers roject Location: KAFB, Albuquerque, NM roject Name: KAFB BFF SWMU ST-106 and SS-111 roject Number: 140705 ate Started: 2/18/2015 ate Completed: 3/20/2015 round Elevation AMSL (ft): Not Recorded Coordinate:	Norrecovery (127.5 ft - 142 ft): gravel to boulder sized rocks. Note: rocks are quartz, quartite, chert, granite, feldspar, plagioclase, and sandstone.       SW         No recovery (127.5 ft - 142 ft): gravel to boulder sized rocks. Note: rocks are quartz, quartite, chert, granite, feldspar, plagioclase, and sandstone.       SW         Surface Surfac	Well graded SAND (SW); reddish brown (5/2), for cocks are quart, quartice, centry gravel to boulder sized rocks. Note: rocks are quart, quartice, centry gravel.       SW	roject Location: KAFB AFL Abüquerque, NM roject Number: 140705 ate Started: 2/18/2015 ate Started: 2/18/2015 ate TD Reached: 2/25/2015 ate Completed: 3/20/2015 Coordinate: 2002015 Coordinate: 2002015 Coordinate

	C	RI				Bore	ehol	le ID	: KAFB-1	106219
Pro Pro	ojec ojec	t Loc t Nan	ation ne: k	: KÁF (AFB I	s of Engineers <sup>-</sup> B, Albuquerque, NM BFF SWMU ST-106 and SS-111	Hole Dia	ameter	Lower	(in.): 11-3/4 (in.): 9-5/8 ype: Flush	
Da Da	te S ate T	Starteo D Re	d: 2/ ache				ime of nd of l	<sup>:</sup> Drilling Drilling:	: 477.69 Not Recorded	
Y	Coo	d Elev rdinat rdinat	e:	n AMS	L (ft): Not Recorded	Drillling ( Drilling N	Contra /lethoo	ictor: N d: Air R	lational Drilling totary Casing Ha ton/T. Richards	ammer Page 6 of 18
05 Depth (ft)	Sample Type	Number	Headspace PID	Lithologic Log	Material Description		U.S.C.S.	w	ell Diagram	Remarks
	-				Elastic SILT (MH); strong brown 5/6); moist; 95% silt; 5% sand.	(7.5YR	MH		•	PID - 0.0 ppm @ cyclone and breathing zone. Windy. Kelly down @ 1019. New
<u>155</u>	-				Clayey SAND with Gravel (SC); (7.5YR 5/3); 70% fine to coarse 15% fine gravel; 15% clay. Same as above (155 ft).		SC		· · · · · · · · · ·	PID - 0.0 ppm @ cyclone and breathing zone. Windy.
<u>165</u>	-				Fat CLAY (CH); brown (7.5YR 5, clay; 10% very fine sand; 10% fi gravel.	/4); 80% ne			- High Solids Bentonite Grout	
170	-				Same as above (163 ft); moist; S clay; 10% sand.	90%	СН		•	PID - 0.0 ppm @ cyclone and breathing zone. Windy and snow. Kelly down @ 1039. New
<u>175</u> 180	-				Same as above (163 ft); moist; S clay; 10% sand.	90%				20' connection @ 1047. Snowing and windy.

(	C	BI	N			Bore	eho	le I	D: KAFB-1	06219
Pr Pr	ojec ojec	t Loca t Nan	ation ne: K	: KAF	s of Engineers FB, Albuquerque, NM BFF SWMU ST-106 and SS-111	Hole Dia	ameter	r Low	er (in.): 11-3/4 er (in.): 9-5/8 n Type: Flush	
Da Da	ate S ate T	Starteo D Re	d: 2/ ache	18/20 <sup>-</sup>	15 25/2015	🕎 At T	ime of nd of	f Drilli Drillir	s BGS (ft): ing: 477.69 ng: Not Recorded 476.75	
Y	Cool	d Elev rdinat rdinat	e:	n AMS	L (ft): Not Recorded	Drilling I	Nethod	d: Ai	National Drilling r Rotary Casing Ha nson/T. Richards	ammer Page 7 of 18
Depth (ft)	Sample Type	Number	Headspace PID	Lithologic Log	Material Description		U.S.C.S.		Well Diagram	Remarks
185	-				Fat CLAY (CH); brown (7.5YR 5 moist; 90% clay; 10% sand.	/4);	СН			PID - 0.0 ppm @ cyclone and breathing zone. Windy.
	-				Poorly graded SAND (SP); redd brown (5YR 5/4); 90% very fine sand; 5% fine gravel; subrounde silt.	to fine				
<u>190</u>					Same as above (185 ft).		SP			PID - 0.0 ppm @ cyclone and breathing zone. Windy.
195					Same as above (185 ft).				- High Solids Bentonite Grout	Kelly down @ 1107. New 20' connection @ 1202. Working pipe stuck.
200					Lean CLAY with Sand (CL); rede brown (5YR 4/3); moist; low to n plasticity; 80% clay; 20% fine to sand.	nedium	CL	<ul> <li>•</li> <li>•&lt;</li></ul>		PID - 0.0 ppm @ cyclone and breathing zone.
	-				Same as above (197 ft).		UL	<ul> <li>•</li> <li>•&lt;</li></ul>		Windy.
205					Well graded SAND with Silt (SW light reddish brown (5YR 6/4); m 90% very fine to coarse sand; 10	ioist;	SW- SM			
210								••	• • • •	

(	C	BI				Bore	eho	le I	D: KAFB-1	06219		
Pr Pr	ojec ojec	t Loca t Nan	ation: ne: K	KAF AFB I	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						
Da	ate S ate T		d: 2/² acheo	18/20 <sup>-</sup> d: 2/2		🕎 At T	Time of End of	<sup>r</sup> Drill Drillir	s BGS (ft): ing: 477.69 ng: Not Recorded 176.75			
Y	Coo	d Elev rdinat rdinat	e:	AMS	L (ft): Not Recorded	Drillling Drilling	Contra Method	actor: d: Ai	National Drilling r Rotary Casing Ha inson/T. Richards	ammer Page 8 of 18		
Depth (ft)	Sample Type	Number	Headspace PID	Lithologic Log	Material Description		U.S.C.S.		Well Diagram	Remarks		
	_				Well graded SAND with Silt (SW light reddish brown (5YR 6/4); m 90% very fine to coarse sand; 1	noist;		· · · · · · · · · · · · · · · · · · ·		PID - 0.0 ppm @ cyclone and breathing zone. Windy. Kelly down @ 1300. New		
<u>215</u>	-				Same as above (210 ft).			<ul> <li>•</li> <li>•&lt;</li></ul>	•       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •	20' connection. Experienced problems with drive casing and bit. End of 2/24/15. Resumed drilling @ 0848 on 2/25/15.		
220	- ) - -				Same as above (210 ft).			<ul> <li>•</li> <li>•&lt;</li></ul>		PID - 0.0 ppm @ cyclone and breathing zone.		
225	-				Same as above (210 ft).		SW- SM	<ul> <li>•</li> <li>•&lt;</li></ul>	- High Solids Bentonite Grout			
230	)				Same as above (210 ft).					PID - 0.0 ppm @ cyclone and breathing zone.		
235					Same as above (210 ft).					Kelly down @ 0915. New 20' connection @ 0922.		
240	)							••	••			

KAFB\_BOREHOLE\_LOG - SHAW\_DRILLING.GDT - 3/27/15 09:31 - Z\KAFB BFF\GINT\KAFB\_PROJECT\KAFB\_BFF.GPJ

	C	BI				Bore	eho	le I	D:	KAFB-1	06219
Pr Pr	ojec ojec	t Loca t Nan	ation: ne: K	: Káf (AFB	s of Engineers FB, Albuquerque, NM BFF SWMU ST-106 and SS-111	Hole Dia	ametei	Low	er (ir	n.): 11-3/4 n.): 9-5/8 be: Flush	
Da Da	ate S ate T	Started D Re	d: 2/ <sup>,</sup> acheo			Groundv ∑ At T ▼ At E ▼ At E	Time of End of	f Drilli Drillin	ing: ig: N	477.69 Not Recorded	
Y	Cool	d Elev rdinat rdinat	e:	AMS	SL (ft): Not Recorded	Drillling Drilling	Contra Method	actor: d: Ai	Nat r Rot	tional Drilling ary Casing Ha n/T. Richards	ammer Page 9 of 18
5 Depth (ft)	Sample Type	Number	Headspace PID	Lithologic Log	Material Description		U.S.C.S.		Well	Diagram	Remarks
	-				Well graded SAND with Silt (SW light reddish brown (5YR 6/4); m 90% very fine to coarse sand; 1	noist;		• • • • • • • • • • • • • •			PID - 0.2 ppm @ cyclone and 0.0 ppm @ breathing zone.
245	-				Same as above (240 ft).						No hammering.
250	-				Same as above (240 ft).						PID - 0.0 ppm @ cyclone and breathing zone.
<u>255</u>					Same as above (240 ft).		SW- SM	<ul> <li></li> <li></li></ul>		High Solids Bentonite Grout	Kelly down @ 0934. New 20' connection @ 0942.
<u>260</u>	-				Same as above (240 ft).						PID - 0.0 ppm @ cyclone and breathing zone.
<u>265</u>					Same as above (240 ft).						No hammering.
270	-							• • • • • • • •	• • • • • •		

(	C	RI				Bore	eho	e IC	D: KAFB-1	06219	
Pr Pr	ojec ojec	t Loca Nan	ation: ne: K	: KÁF (AFB	s of Engineers <sup>-</sup> 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: Flush					
Da Da	ate S ate T		d: 2/ ache	18/20 d: 2/2		🕎 At T	ime of Ind of I	Drillin Drilling	BGS (ft): ig: 477.69 j: Not Recorded 76.75		
Y	Coo	d Elev rdinat rdinat	e:	AMS	SL (ft): Not Recorded	Drillling Drilling	Contra Methoo	ictor: I: Air	National Drilling Rotary Casing Ha Ison/T. Richards	ammer Page 10 of 18	
2 Depth (ft)	Sample Type	Number	Headspace PID	Lithologic Log	Material Description		U.S.C.S.	v	Vell Diagram	Remarks	
	-				Well graded SAND with Silt (SW light reddish brown (5YR 6/4); m 90% very fine to coarse sand; 1	noist;				PID - 0.3 ppm @ cyclone and 0.0 ppm @ breathing zone.	
275	-				Same as above (270 ft).					Kelly down @ 0953. new 20' connection @ 1001.	
<u>280</u>					Same as above (270 ft).					PID - 0.1 ppm @ cyclone and 0.0 ppm @ breathing zone.	
285	-				Same as above (270 ft).		SW- SM		- High Solids Bentonite Grout	No hammering.	
<u>290</u>	-				Same as above (270 ft).						
<u>295</u>					Same as above (270 ft).					Kelly down @ 1036. New 20' connection @ 1147. Driller tripped out bit.	
300									• • • • • • • •		

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(	C	BI	<b>N</b>			Bore	eho	e I	D: KAFB-1	106219
Pr Pr	ojec ojec	t Loca Nan	ation: ne: K	: Káf (AFB I	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				
Da Da	Project Number: 140705 Date Started: 2/18/2015 Date TD Reached: 2/25/2015 Date Completed: 3/20/2015					🕎 At T	ime of Ind of	<sup>:</sup> Drilli Drillin	s BGS (ft): ng: 477.69 g: Not Recorded 76.75	
Y	Coo	d Elev rdinat rdinat	e:	I AMS	L (ft): Not Recorded	Drilling I	Method	l: Aiı	National Drilling Rotary Casing Hanson/T. Richards	ammer Page 11 of 18
60 Depth (ft)	Sample Type	Number	Headspace PID	Lithologic Log	Material Description		U.S.C.S.	,	Well Diagram	Remarks
	-				Well graded SAND (SW); light robrown (5YR 6/4); moist; 90% fin coarse sand; 5% gravel; 5% silt.	e to very				PID - 0.0 ppm @ cyclone and breathing zone.
305	-				Same as above (300 ft).					
310	-				Same as above (300 ft).			• • • • • • • • • • • • • • • • • •	<ul> <li>•</li> <li>•&lt;</li></ul>	PID - 0.0 ppm @ cyclone and breathing zone. Kelly down @ 1151. New
315	-				Same as above (300 ft).		SW		- High Solids Bentonite Grout	20' connection @ 1156.
320	-				Same as above (300 ft).					PID - 0.1 ppm @ cyclone and 0.0 ppm @ breathing zone.
325	-				Same as above (300 ft).					Hammering.
330								•••	• • • •	

(	C	RI	N.			Bore	eho	le I	D: KAFB-1	06219
Pr Pr	rojec rojec	t Loca t Nan	ation: ne: K	KAF AFB I	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				
Da Da	Project Number: 140705 Date Started: 2/18/2015 Date TD Reached: 2/25/2015 Date Completed: 3/20/2015						ime of	<sup>f</sup> Drilli Drillin	s BGS (ft): ng: 477.69 g: Not Recorded .76.75	
Y	Coo	d Elev rdinat rdinat	e:	AMS	L (ft): Not Recorded	Drilling N	Nethod	d: Air	National Drilling Rotary Casing Hanson/T. Richards	ammer Page 12 of 18
80 Depth (ft)	Mumber PID Page PID Material Description						U.S.C.S.		Well Diagram	Remarks
	-				Well graded SAND (SW); light re brown (5YR 6/4); moist; 90% fine coarse sand; 5% gravel; 5% silt.	e to very			•     •       •     •       •     •       •     •       •     •       •     •       •     •       •     •       •     •       •     •	PID - 0.0 ppm @ cyclone and breathing zone. Kelly down @ 1200. New
335	-				Same as above (330 ft).				•       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •	20' connection @ 1206.
340					Same as above (330 ft).				•       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •	PID - 0.0 ppm @ cyclone and breathing zone.
345	-				Same as above (330 ft).		SW		- High Solids Bentonite Grout	Hammering.
350					Same as above (330 ft).				•     •       •     •       •     •       •     •       •     •       •     •       •     •       •     •       •     •	PID - 0.0 ppm @ cyclone and breathing zone.
355					Same as above (330 ft).				•       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •	Kelly down @ 1210. New 20' connection @ 1219.
360								•••	• • • • • •	

	0	BI	S			Bore	eho	le l	D: KAFB-′	106219	
Pro Pro	ojec ojec	t Loca t Nan	ation ne: k	: KÁF (AFB I	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					
Da Da	te S te T	Starteo D Re	d: 2/ ache			🛛 At T	ime of	f Drill Drillir	ls BGS (ft): ing: 477.69 ng: Not Recorded 476.75		
Y (	Cool	d Elev rdinat rdinat	e:	n AMS	L (ft): Not Recorded	Drillling Drilling I	Contra Method	actor: d: Ai	National Drilling ir Rotary Casing Ha nnson/T. Richards	ammer Page 13 of 18	
g Depth (ft)	Sample Type	A Number Lithologic Log Waterial Description					U.S.C.S.		Well Diagram	Remarks	
-	-				Well graded SAND with Gravel ( light brown (7.5YR 6/3); moist; 7 to very coarse sand; 20% gravel subrounded to rounded; 5% silt. gravel is quartz and mafics.	75% fine I to 1";		• • • • • • • • • • • • • • • • • •	•       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •		
365	-				Same as above (360 ft).				· · · · · · · · · · · · · · · · · · ·		
370	-				Same as above (360 ft).					Kelly down @ 1222. New	
375					Same as above (360 ft).		SW		- High Solids Bentonite Grout	20' connection @ 1358. Driller mobs to equipment laydown yard for more pipe.	
380	-				Same as above (360 ft).				· · · · · · · · · · · · · · · · · · ·	PID - 0.0 ppm @ cyclone and breathing zone.	
385	-				Same as above (360 ft).				· · · · · · · · · · · · · · · · · · ·	Hammering. No water added.	
390								• • • • • •	• • • • • •		

	C	RI				Bore	ehol	e I	D: KAFB-1	06219	
Pr Pr	ojec ojec	t Loc t Nan	ation ne: K	: KÁF (AFB I	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					
Da Da	Project Number: 140705 Date Started: 2/18/2015 Date TD Reached: 2/25/2015 Date Completed: 3/20/2015						ime of	Drilli Drillin	BGS (ft): ng: 477.69 g: Not Recorded 76.75		
Y	Cool	d Elev rdinat rdinat	e:	n AMS	L (ft): Not Recorded	Drilling I	Method	l: Air	National Drilling Rotary Casing Hanson/T. Richards	ammer Page 14 of 18	
66 Depth (ft)	Sample Type	Number	Headspace PID	Lithologic Log	Material Description		U.S.C.S.	,	Well Diagram	Remarks	
	-				Well graded SAND with Gravel light brown (7.5YR 6/3); moist; 7 to very coarse sand; 20% grave subrounded to rounded; 5% silt. gravel is quartz and mafics.	75% fine I to 1";		• • • • • • • • • • • •	• • • • • • • • • •	PID - 0.2 ppm @ cyclone and 0.0 ppm @ breathing zone. Windy.	
<u>395</u>	-				Same as above (390 ft).			<ul> <li>•</li> <li>•&lt;</li></ul>	• • • • • • • • • • • •	Kelly down @ 1404. New 20' connection @ 1409.	
400	-				Same as above (390 ft).			<ul> <li>•</li> <li>•&lt;</li></ul>	•       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •	PID - 0.0 ppm @ cyclone and breathing zone. Windy.	
405	-				Same as above (390 ft).		SW	<ul> <li>•</li> <li>•&lt;</li></ul>	<ul> <li>High Solids</li> <li>Bentonite</li> <li>Grout</li> </ul>		
<u>410</u>	-				Same as above (390 ft).			<ul> <li></li></ul>	<ul> <li>•</li> <li>•&lt;</li></ul>	PID - 0.0 ppm @ cyclone and breathing zone.	
415	-				Same as above (390 ft).				•       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •	Kelly down @ 1415. New 20' connection @ 1422.	
420	-							• • • • • • • •	• • • • • • • •		

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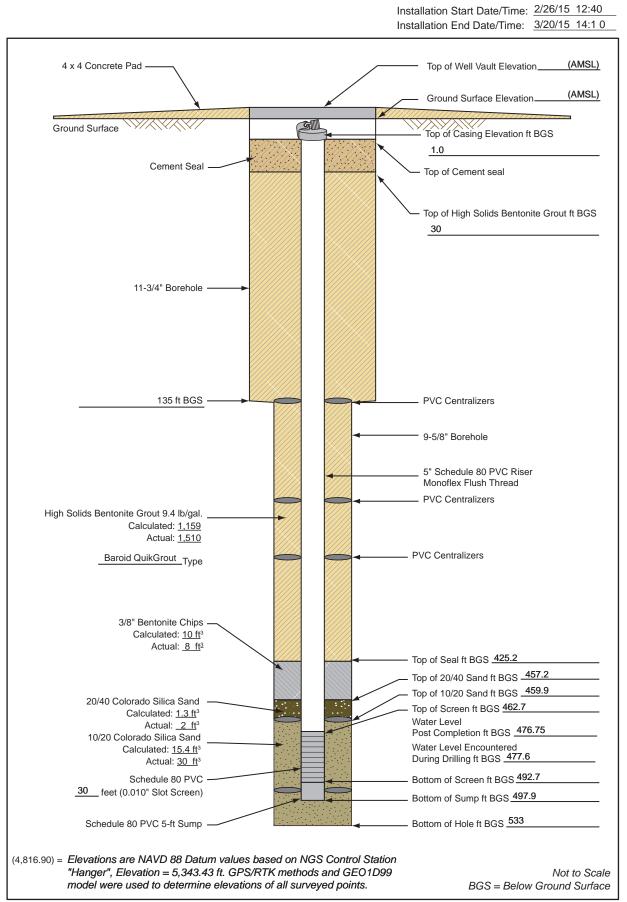
	C	BI				Bore	eho	e I	D: KAFB-1	06219	
Pi Pi	rojec rojec	t Loc Nan	ation ne: k	: KÁF (AFB I	s of Engineers FB, Albuquerque, NM BFF SWMU ST-106 and SS-111	Hole Diameter Upper (in.): 11-3/4 Hole Diameter Lower (in.): 9-5/8 Surface Completion Type: Flush					
D	Project Number: 140705 Date Started: 2/18/2015 Date TD Reached: 2/25/2015 Date Completed: 3/20/2015						ime of	Drilli Drillin	s BGS (ft): ng: 477.69 g: Not Recorded 76.75		
Y	Ground Elevation AMSL (ft): Not Recorded Y Coordinate: X Coordinate:						Method	l: Air	National Drilling Rotary Casing Hanson/T. Richards	ammer Page 15 of 18	
C Depth (ft)	Sample Type	Number	Headspace PID	Lithologic Log	Material Description		U.S.C.S.		Well Diagram	Remarks	
720	-				Well graded SAND with Gravel ( light brown (7.5YR 6/3); moist; 7 to very coarse sand; 20% gravel subrounded to rounded; 5% silt. gravel is quartz and mafics.	5% fine to 1";		· · · · · · · · · · · · · · · · · ·	•       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •	PID - 0.0 ppm @ cyclone and breathing zone. Windy.	
425	5				Same as above (420 ft).			•••	- Top of Bentonite Seal	Hammering. No water added.	
<u>43</u> (	- - - -				Same as above (420 ft).					PID - 0.0 ppm @ cyclone and breathing zone. Windy.	
43					Same as above (420 ft).		SW			Kelly down @ 1429. new 20' connection @ 1434.	
44(	- - - -				Same as above (420 ft).				- Bentonite Seal	PID - 0.0 ppm @ cyclone and breathing zone. Windy.	
<u>44</u> {	5				Same as above (420 ft).						
450	- - )				Same as above (420 ft); very mo	oist.				Hammering. No water added.	

	C	BI				Bore	ehol	e ID: KAFB-	106219	
Pro Pro	ojec ojec	ct Loca ct Nam	ation ie: K	: KÁI (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				
Da Da Da Gro Y (	te S te T te C oun Coo	Comple d Elev ordinate	d: 2/ ache eted: vatior e:	18/20 d: 2/2 3/20		<ul> <li>✓ At T</li> <li>▼ At E</li> <li>▼ Afte</li> <li>✓ Afte</li> <li>Drilling</li> <li>Drilling N</li> </ul>	ime of nd of I r Drillir Contra Aethoc	Levels BGS (ft): Drilling: 477.69 Drilling: Not Recorded ng: 476.75 Inctor: National Drilling I: Air Rotary Casing H	ammer	
XO		ordinat				Logged	By: M	I. Johnson/T. Richards	Page 16 of 18	
65 Depth (ft)	Sample Type	Number	Headspace	Lithologic Log	Material Description		U.S.C.S.	Well Diagram	Remarks	
	_				Well graded SAND with Gravel ( light brown (7.5YR 6/3); moist; 7 to very coarse sand; 20% gravel subrounded to rounded; 5% silt. gravel is quartz and mafics.	5% fine to 1";			PID - 0.0 ppm @ cyclone and breathing zone. Windy.	
455	_				Same as above (450 ft).		SW	- Bentonite Seal	Kelly down @ 1442. New 20' connection @ 1450.	
460	-				Same as above (450 ft).			- Top of 20/40 Sand - Top of 10/20 Sand	PID - 0.0 ppm @ cyclone	
465	-				Sandy lean CLAY with Gravel (C reddish brown (5YR 5/4); moist; clay; 20% very fine to fine sand; gravel; rounded.	60%		- Top of 5" Schedule 80 PVC 0.010" Slot Screen	and breathing zone. Windy.	
405	-				Same as above (462 ft).		CL		Hammering. No water added.	
<u>470</u>	-				Poorly graded SAND (SP); reddi yellow (7.5YR 7/6); moist to wet; fine to medium sand.				PID - 0.0 ppm @ cyclone and breathing zone. Very windy.	
475					Same as above (470 ft). ⊈ ∑		SP		Kelly down @ 1458. New 20' connection @ 1505.	
480	_									

	C	BI				Bore	ehol	e ID:	KAFB-1	106219
Pro Pro	ojec ojec	t Loca t Nam	ation ie: K	: Káf (AFB I	s of Engineers 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: Flush				
Da Da	ite S ite T	tarted D Rea	l: 2/ ache	1407 18/20 d: 2/2 3/20	15 25/2015	👤 At E	ime of nd of l	Drilling:	477.69 Not Recorded	
YO	Coor	d Elev rdinate rdinate	e:	n AMS	L (ft): Not Recorded	Drilling N	/lethoo	I: Air Ro	ational Drilling otary Casing Ha on/T. Richards	ammer Page 17 of 18
8 Depth (ft)	Sample Type	ample Type       Aumber       Lithologic       Log       PID       Variation   Material Description					U.S.C.S.	We	II Diagram	Remarks
	-				Poorly graded SAND (SP); reddi yellow (7.5YR 7/6); moist to wet; fine to medium sand.				5" Schedule 80 PVC 0.010" Slot Screen	PID - 0.0 ppm @ cyclone and breathing zone. Very windy.
485	-				Poorly graded SAND with Grave reddish yellow (7.5YR 7/6); very 80% very fine to fine; 20% grave rounded.	moist;	SP			
490	-				Well graded SAND with Gravel ( brown (7.5YR 5/4); wet; 80% ver very coarse sand; 20% fine grav subrounded to rounded. Same as above (488 ft).	ry fine to			- Bottom of Screen	PID - 0.0 ppm @ cyclone and breathing zone. Very windy. Kelly down @ 1515. New
495	-				Same as above (488 ft).		SW		- Sump	20' connection @ 1525.
500					Same as above (488 ft); grading Poorly graded SAND.	to			Sump	PID - 0.0 ppm @ cyclone and breathing zone.
505	-				Poorly graded SAND with Grave brown (7.5YR 5/4); very wet; 809 medium sand; trace coarse sand gravel; 5% silt.	% fine to	SP			

	C	BI				Bore	Borehole ID: KAFB-106219				
Pro	ojec ojec	t Loca t Nam	ation ne: k	: Káf (AFB I	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					
Da Da	te S te T	tarteo D Rea	l: 2/ ache			⊥ At T ▼ At E	ime of nd of I	evels BGS (ft): Drilling: 477.69 Drilling: Not Recorded ng: 476.75			
Y	Cool	d Elev rdinate rdinate	e:	n AMS	L (ft): Not Recorded	Drillling Drilling	Contra ⁄Iethoc	ictor: National Drilling 1: Air Rotary Casing Ha 1. Johnson/T. Richards	ammer Page 18 of 18		
0 Depth (ft)					Material Description		U.S.C.S.	Well Diagram	Remarks		
					Poorly graded SAND with Grave brown (7.5YR 5/4); very wet; 80° medium sand; trace coarse sand gravel; 5% silt.	% fine to			PID - 0.0 ppm @ cyclone and breathing zone.		
515	-				Same as above (510 ft).				Kelly down @ 1535. New 20' connection @ 1545.		
520	-				Same as above (510 ft).		SP		PID - 0.0 ppm @ cyclone and breathing zone.		
525	-				Same as above (510 ft).						
530	-				Same as above (510 ft).				PID - 0.0 ppm @ cyclone and breathing zone.		
535	-							Bottom of Hole	Total depth = 533 ft. Reached total depth on 2/25/15.		
540											

## Monitoring Well Completion Diagram KAFB-106219



140705.CB020403.A13.ai



#### Well Development Record

Project Name: KAFB BFF		
Location: Continental Dr.		Well/Piez. No.: KAFB-106219
Personnel: T. Richards		Date Installed: 3/20/15
Date: 3/16/15		Csg. Diameter (I.D.): 5 "
Samplers: N/A		Total Depth (ft. bgs): <u>497.9</u>
Method of Development: X Surging	X Bailing	X Pumping
X Original Development	Redevelopment	Other

Development Date: 3/16/15

Depth to Water Before Developing Well (ft. btoc): 476.28 (476.75 ft. bgs)

 $V=(B * r_c^2 * L_c * 7.48)+(B * (r_w^2 - r_c^2) * L_s * \phi_s * 7.48)+(H_2O added during drilling/installation) = 265.5 gallons$ 

Depth Purging From: 479 - 491 feet	Time Purging Begins: 1422, 3/16/15
Weather: Sunny, Calm, 50s	Screened Interval (ft bgs): 464.35 - 494.35
Equipment Nos.: pH Meter: YSI 6820	EC Meter: YSI 6820 Turbidity Meter: HACH 21000Q

Equipment Decontaminated Prior to Development: Y X N

Describe: Steam Cleaned

Collected Sample of Water Added to Well: Y N X Describe: N/A

Comment: Approximately 200 gallons of water added during drilling/well installation activities

		Water Level (ft	Volume Removed				Turbidity	
Date	Time	bTOC)	(gal.)	Temp. (°C)	рН	EC (mS/cm)	(NTU)	Comments
3/16/2015	1000	476.28	0					Begin bailing. Water is very cloudy.
3/16/2015	1030		20					Continue bailing.
3/16/2015	1038		20					Begin surging.
3/16/2015	1145		20					Finish surging.
3/16/2015	1148		20					Begin bailing. Water is very cloudy.
3/16/2015	1220		110					Continue bailing.
3/16/2015	1422	476.28	110	20.06	8.64	0.476	195	Start pumping at 492 feet.
3/16/2015	1430	477.50	125	19.88	8.09	0.457	38.7	Continue pumping.
3/16/2015	1440	477.51	170	20.37	7.94	0.454	30.4	Continue pumping.
3/16/2015	1450	477.51	212	20.32	7.84	0.450	8.11	Move pump up to 485 feet. Purging at 4.25 GPM

Notes:

\* Water Levels - Reported to the nearest 0.01 foot

\* pH - Reading rounded to 0.1 pH units \* Water temperature - Reported to nearest 0.1 °C °C = Degree Celsius

EC = Electric Conductivity

ft bgs = Feet Below Ground Surface

ft btoc = Feet Below Top of Casing

gal. = Gallon GPM = Gallons Per Minute

I.D. = Inner Diameter

N/A = Not Applicable

NR = Not Recorded

NTU = Nephelometric Turbidity Unit

S/m = Seimens per Meter

Where:

B=3.14

Øs= porosity of the sand pack

 $r_{c}\text{=}$  radius of the well casing and screen in feet Lc= length of water column inside the casing and screen in feet

rw= radius of the well bore in feet

 $\overset{"}{\mbox{l}}\mbox{=}$  length of saturated portion of the sand pack in feet

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

Pg 1 of 2



## Well Development Record

Project: KAFB BFF

Project Number: 140705

Date: 3/16/15

Time Start: 1000, 3/16/2015

Well No: KAFB-106219

Samplers: N/A

Checked By:

Time Finish: <u>1530</u>, <u>3</u>/16/2015

Field Chemistry (cont'd)

Date	Time	Water Level (ft. Below TOC)	Volume Removed (gal.)	Temp. (°C)	рН	EC (mS/cm)	Turbidity (NTU)	Comments
3/16/2015	1500	477.51	254	20.36	7.73	0.451	4.04	Continue pumping.
3/16/2015	1510	477.50	296	20.26	7.71	0.449	5.20	Continue pumping.
3/16/2015	1515	477.50	317	20.26	7.69	0.449	2.08	Lower pump to 491 feet.
3/16/2015	1520	477.50	338	20.25	7.68	0.447	1.12	Continue pumping.
3/16/2015	1530	477.50	359	20.24	7.68	0.446	0.86	Finish pumping. Well development complete.

Was well sampled after development? YES NO X

Sample Method: N/A

\_\_\_\_

Sample Name: N/A

Analyses: N/A

Pg 2 of 2

## KAFB 106220

Pro	ojec	ct Loc ct Nar	cation me: k	1: KAR	ps of Engineers FB, Albuquerque, NM BFF SWMU ST-106 and SS-111 705	Hole Di Hole Di	) iameter	r Upper r Lower	(in.): 11-3/4 (in.): 9-5/8 ype: Flush	CONTESSIONAL CONTESSIONAL CONTESSION
Da Da Da Gr Y ( X (	ate S ate T ate C round Cool	Starte TD Re Comp nd Ele ordina ordina	ed: 3/ eache pleted: evatior ate:	/2/201 ed: 3/9 : 3/20			Time of End of I er Drillir Contra Method	f Drilling Drilling: ng: 477 actor: N	National Drilling Rotary Casing H	8681903-2250 STATE OF UNIT
Depth (ft)	Sample Type	Number	Headspace PID	Lithologic Log	Material Description		U.S.C.S.	w	ell Diagram	Remarks
	-				Road base (0.25 ft - 2.0 ft).	A	*SPHAL	T	- Top of Casing/	Location was potholed and water jetted to 10'.
- - - - - - - - - - - - - - - - - - -	-				Well graded SAND with Gravel (S brown (7.5YR 4/4); moist; 75% fir very coarse sand; 25% gravel to subangular to rounded. Note: gra	SW); ne to 1":				Kelly down @ 1452. New
<u>15</u> 20					quartz and feldspar. Same as above (10 ft).				- Cement Seal	20' connection @ 1504.
					Same as above (10 ft).		SW			PID - 0.0 ppm @ cyclone and breathing zone. Windy.
25					Same as above (10 ft).					PID - 0.0 ppm @ cyclone and breathing zone.

KAFB\_BOREHOLE\_LOG - SHAW\_DRILLING.GDT - 3/27/15 09:20 - Z:KAFB BFFIGINTIKAFB\_PROJECTIKAFB\_BFF.GPJ

	C	RI				Bore	eho	le II	D: KAFB	-106220
Pi Pi	rojec rojec	t Loca t Nam	ation: ne: K	: Kaf (Afb i	s of Engineers FB, Albuquerque, NM BFF SWMU ST-106 and SS-111	Hole Dia	ameter	Lowe	er (in.): 11-3/4 er (in.): 9-5/8 Type: Flush	
Da	ate S ate T		d: 3/2 ache	2/2018 d: 3/9		🕎 At T	ime of Ind of	f Drilli Drillin	8 BGS (ft): ng: 477.00 g: Not Recorde 77 45	ed
Y	Coo	d Elev rdinat rdinat	e:	AMS	L (ft): Not Recorded	Drillling	Contra Method	actor: d: Air	National Drillin Rotary Casing	
S Depth (ft)		Number	Headspace PID	Lithologic Log	Material Description		U.S.C.S.		Well Diagram	Remarks
	-				Well graded SAND with Gravel brown (7.5YR 4/4); moist; 75% f very coarse sand; 25% gravel to subangular to rounded. Note: gr quartz and feldspar.	ine to 1";		· · · · · · · · · · · · · · · · · · ·	Top of High     Solids     Bentonite     Grout	Kelly down @ 1512. New 20' connection @ 1529. Hammering. No water added.
35	5				Same as above (30 ft).				· · · · · · · · · · · · · · · · · · ·	PID - 0.0 ppm @ cyclone and breathing zone.
40	- - ) -				Same as above (30 ft).				<ul> <li>•</li> <li>•&lt;</li></ul>	
45	-				Same as above (30 ft).		SW		<ul> <li>High Solids</li> <li>Bentonite</li> <li>Grout</li> </ul>	PID - 0.0 ppm @ cyclone and breathing zone.
50					Same as above (30 ft).				<ul> <li>•</li> <li>•&lt;</li></ul>	Kelly down @ 1528. New 20' connection @ 1541.
55					Same as above (30 ft).				<ul> <li>•</li> <li>•&lt;</li></ul>	PID - 0.0 ppm @ cyclone and breathing zone.
60	)							• • • • • • • • • •	• • • • • • • •	

Pr Pr Pr Da Da	ojec ojec ojec ate S	t Loc	ation	Corp						
Da Da	ate S	τηση	ne: K	: Kaf (Afb e	s of Engineers B, Albuquerque, NM BFF SWMU ST-106 and SS-111	Hole Dia	ametei	r Low	er (in.): 11-3/4 er (in.): 9-5/8 n Type: Flush	
Da		Starteo D Re	d: 3/2 ache	2/2015	5 )/2015	🕎 At T	ime of	f Drilli Drillin	s BGS (ft): ng: 477.00 ng: Not Recorde 177.45	ed
Y	Coo	d Elev rdinat rdinat	e:	AMS	L (ft): Not Recorded	Drillling	Contra Method	actor: d: Aii	National Drillin r Rotary Casing	g Hammer Page 3 of 18
g Depth (ft)	Sample Type	Number	Headspace PID	Lithologic Log	Material Description		U.S.C.S.	,	Well Diagram	Remarks
	-				Well graded SAND with Gravel ( brown (7.5YR 4/4); moist; 75% fi very coarse sand; 25% gravel to subangular to rounded. Note: gra quartz and feldspar.	ine to 1";		•         •           •         •           •         •           •         •           •         •           •         •           •         •           •         •           •         •           •         •           •         •           •         •           •         •           •         •           •         •	•       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •	PID - 0.0 ppm @ cyclone and breathing zone.
65	-				Same as above (60 ft).		SW		•       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •	
70	-				Same as above (60 ft). Poorly graded SAND with Grave				<ul> <li>•</li> <li>•&lt;</li></ul>	Kelly down @ 1549. New 20' connection @ 1555.
75	-				yellowish red (5YR 4/6); moist; 8 fine to fine sand; 20% fine grave rounded. Same as above (72 ft).	80% very :l;	SP		- High Solids Bentonite Grout	PID - 0.0 ppm @ cyclone and breathing zone.
80	-				Well graded SAND (SW); reddis (5YR 4/4); moist; 90% fine to ver				•       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •	Downhole hammering. No water added.
85	-				coarse sand; 10% fine gravel.			•     •       •     •       •     •       •     •       •     •       •     •       •     •       •     •       •     •       •     •       •     •       •     •       •     •		
90	-				Same as above (80 ft).		SW			PID - 0.0 ppm @ cyclone and breathing zone.

	C	BI				Bore	eho	le I	D: KAFB-′	106220
Pro Pro	ojec ojec	t Loca Nam	ation ne: K	: KÁF (AFB	s of Engineers <sup>-</sup> B, Albuquerque, NM BFF SWMU ST-106 and SS-111	Hole Dia	ametei	Low	er (in.): 11-3/4 er (in.): 9-5/8 1 Type: Flush	
Da Da	ite S ite T		d: 3/2 ache	2/201 d: 3/9		🕎 At T	ime of nd of	f Drill Drillir	s BGS (ft): ing: 477.00 ng: Not Recorded 477.45	
Y	Cool	d Elev rdinat rdinat	e:	n AMS	SL (ft): Not Recorded	Drillling ( Drilling N Logged	/lethoo	iA :b	National Drilling r Rotary Casing Ha nards	ammer Page 4 of 18
g Depth (ft)	Sample Type	Number	Headspace PID	Lithologic Log	Material Description		U.S.C.S.		Well Diagram	Remarks
					Well graded SAND (SW); reddis (5YR 4/4); moist; 90% fine to ve coarse sand; 10% fine gravel.	sh brown ry		· · · · · · · · · · · · · · · · ·		Kelly down @ 1604. New 20' connection @ 1609.
95	-				Same as above (90 ft).					PID - 0.0 ppm @ cyclone and breathing zone.
100	-				Same as above (90 ft).					No water added.
105	-				Same as above (90 ft).		SW		- High Solids Bentonite Grout	PID - 0.0 ppm @ cyclone and breathing zone.
110					Same as above (90 ft).					Kelly down @ 1619. New 20' connection @ 1625.
115					Same as above (90 ft).					PID - 0.0 ppm @ cyclone and breathing zone.
120								•••	• • • • • •	

		BI				Bore	ehol	le II	D: KAFB-′	106220
Pro Pro	ojec ojec	t Loca t Nam	ation: ne: K	Corp KAF AFB E 1407	s of Engineers FB, Albuquerque, NM 3FF SWMU ST-106 and SS-111 205	Hole Dia	ameter	Lowe	er (in.): 11-3/4 er (in.): 9-5/8 Type: Flush	
Da Da	te S te T	tarteo D Re	d: 3/2 ache	2/2015	5 9/2015	🕎 At T	ime of Ind of I	<sup>f</sup> Drillir Drilling	BGS (ft): ng: 477.00 g: Not Recorded 77.45	
Y	Cool	d Elev rdinat rdinat	e:	AMS	L (ft): Not Recorded		Method	d: Air	National Drilling Rotary Casing Ha ards	ammer Page 5 of 18
10 Depth (ft)	Sample Type	Number	Headspace PID	Lithologic Log	Material Description		U.S.C.S.	v	Vell Diagram	Remarks
	_				Well graded SAND with Gravel ( reddish brown (5YR 4/3); moist; fine to very corase sand; 30% fir coarse gravel; angular to rounde gravel is quartz and feldspar.	70% ne to		• • • • • • • • • • • • • •	• • • • • • • • • •	
125	-				Same as above (120 ft).		SW	· · · · · · · · · · · · · · · · · · ·	• • • • • • • • • • • •	PID - 0.0 ppm @ cyclone and breathing zone.
130	-				Same as above (120 ft).				· · · · · · · · · · · · · · · · · · ·	Kelly down @ 1635. new 20' conneciton @ 1646.
135	-				Well graded SAND (SW); reddis (5YR 5/4); moist; 95% very fine to coarse sand; 5% silt. No recovery (135 ft - 139 ft); larg boulder obstructing drive casing	to je		· · · · · · · · · · · · · · · · · · ·	- High Solids Bentonite Grout	PID - 0.0 ppm @ cyclone and breathing zone.
140	-				Well graded GRAVEL (GW); 90 coarse gravel; angular to rounde medium to coarse sand.		GW	· · · · · ·	<pre></pre>	
145	-				Fat CLAY with Gravel (CH); brow (7.5YR 5/4); moist; 80% clay; 20 gravel.		СН		<ul> <li>•</li> <li>•&lt;</li></ul>	PID - 0.0 ppm @ cyclone and breathing zone.
150								••	••	

	C	BI				Bore	eho	le II	D: KAFB-1	106220
Pr Pr	ojec ojec	t Loca	ation: e: K	: Káf (AFB I	s of Engineers FB, Albuquerque, NM BFF SWMU ST-106 and SS-111	Hole Dia	ameter	Lowe	er (in.): 11-3/4 er (in.): 9-5/8 Type: Flush	
Da Da	ate S ate T	started	l: 3/2 acheo	2/2018 d: 3/9	5 9/2015	🕎 At T	ime of nd of	f Drillin Drillin	BGS (ft): ng: 477.00 g: Not Recorded 77.45	
Y	Cooi	d Elev rdinate rdinate	e:	I AMS	L (ft): Not Recorded		/lethoo	d: Air	National Drilling Rotary Casing Ha ards	ammer Page 6 of 18
15 Depth (ft)	Sample Type	Number	Headspace PID	Lithologic Log	Material Description		U.S.C.S.	\ \	Well Diagram	Remarks
	-				Fat CLAY with Gravel (CH); brov (7.5YR 5/4); moist; 80% clay; 20 gravel.	wn 1% fine	СН	• • • • • • • • • • • •	• • • • • • • • • •	Kelly down @ 1720. End of 3/2/15. Resumed drilling @ 0800 on 3/3/15. New 20' connection.
155				· · · · · · · · · · · · · · · · · · ·	Well graded SAND (SW); brown 5/4); moist; 100% fine to coarse	(7.5YR sand.	SW	••• ••• •••	• • • • • •	
					Fat CLAY (CH); reddish brown ( 5/4); moist; medium plasticity; 10 clay.		СН		<ul> <li>•</li> <li>•&lt;</li></ul>	PID - 0.1 ppm @ cyclone and 0.0 ppm @ breathing zone.
160	-				Well graded SAND (SW); brown 4/3); moist; 90% fine to very coa sand; 5% fine gravel; 5% silt.				<ul> <li>•</li> <li>•&lt;</li></ul>	No water added.
165	-				Same as above (160 ft).		SW		<ul> <li>High Solids</li> <li>Bentonite</li> <li>Grout</li> </ul>	PID - 0.3 ppm @ cyclone and 0.0 ppm @ breathing zone.
170	-				Same as above (160 ft).				<ul> <li>•</li> <li>•&lt;</li></ul>	Kelly down @ 0824. New 20' connection @ 0834.
4					Fat CLAY (CH); reddish brown ( 4/3); moist; medium plasticity. Fat CLAY with Gravel (CH); redd			• • • • • • • • • •	• • • • • • • •	
175					brown (5YR 4/4); medium plastic clay; 20% fine gravel; angular to rounded. Note: gravel appears b	city; 80%	СН		•     •       •     •       •     •       •     •       •     •       •     •       •     •       •     •       •     •       •     •       •     •       •     •       •     •       •     •	Lost circulation due to clay plug in drive casing. Will change to 9-5/8" casing. Pull 9-5/8" casing as it won't drop through the bottom of the 11-3/4"
180					Same as above (174 ft).			••	• • • • • •	casing. Resume drilling

(	C	BI	<b>N</b>			Bore	eho	le IC	): KAFB-1	106220
Pr Pr	ojec ojec	t Loca t Nam	ation ie: k	: KÁF (AFB	s of Engineers <sup>-</sup> B, Albuquerque, NM BFF SWMU ST-106 and SS-111	Hole Dia	ametei	r Lowe	r (in.): 11-3/4 r (in.): 9-5/8 Type: Flush	
Da Da	ite S ite T	tarteo D Rea	l: 3/ ache			🕎 At T	ime of	f Drillin Drilling	BGS (ft): g: 477.00 : Not Recorded '7.45	
Y	Cooi	d Elev rdinate rdinate	e:	ו AMS	SL (ft): Not Recorded	Drillling	Contra /lethoo	actor: d: Air	National Drilling Rotary Casing Ha	ammer Page 7 of 18
08 Depth (ft)	Sample Type	Number	Headspace PID	Lithologic Log	Material Description		U.S.C.S.	v	/ell Diagram	Remarks
	_				Poorly graded SAND (SP); stror (7.5YR 5/6); moist; 95% fine to r sand; 5% fine gravel; rounded. N approximately 75% of the sand i grained.	nedium Note:				@ 0808 on 3/5/15 @ 175 ft. No water added.
185	-				Same as above (180 ft).					PID - 0.0 ppm @ cyclone and breathing zone.
<u>190</u>	-				Same as above (180 ft).					
195	-				Same as above (180 ft).		SP		- High Solids Bentonite Grout	Kelly down @ 0812. New 20' connection @ 1403.
200					Same as above (180 ft).					PID - 0.0 ppm @ cyclone and breathing zone.
<u>205</u>					Same as above (180 ft).					
210								••	• •	

	0	BI				Bore	eho	le l	D: KAFB-1	06220
Pro Pro	ojec ojec	t Loca t Nam	ation ne: K	: KÁF (AFB I	s of Engineers FB, Albuquerque, NM BFF SWMU ST-106 and SS-111	Hole Dia	ametei	r Low	er (in.): 11-3/4 er (in.): 9-5/8 1 Type: Flush	
Da Da	te S te T	tarteo D Rea	d: 3/2 ache			🕎 At T	ime of	f Drilli Drillir	s BGS (ft): ing: 477.00 ig: Not Recorded 177.45	
YO	Cool	d Elev rdinate rdinate	e:	n AMS	L (ft): Not Recorded		Nethod	d: Ai	National Drilling r Rotary Casing Ha nards	ammer Page 8 of 18
0 Depth (ft)	Sample Type	Number	Headspace PID	Lithologic Log	Material Description		U.S.C.S.		Well Diagram	Remarks
-	-				Poorly graded SAND (SP); stron (7.5YR 5/6); moist; 90% fine to n sand; 10% fine gravel; rounded. approximately 75% of the sand is grained.	nedium Note:				PID - 0.0 ppm @ cyclone and breathing zone.
215	-				Same as above (210 ft).		SP	· · · · · · · · · · · · · · · · · ·	<ul> <li>•</li> <li>•&lt;</li></ul>	Kelly down @ 1408. New 20' connection @ 1413.
220	-				Clayey SAND (SC); reddish brov 4/4); moist; 70% very fine sand; clay.		SC		•       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •	PID - 0.0 ppm @ cyclone and breathing zone.
225					Same as above (220 ft).	(7.5VD		- • • • • • • • • • • • • • •	- High Solids Bentonite Grout	Hammering. No water added.
230	-				Well graded SAND (SW); brown 5/4); moist; 95% very fine to coa sand; 5% fine gravel.	rse				PID - 0.0 ppm @ cyclone and breathing zone.
235	-				Same as above (227 ft).		SW			
-					Same as above (227 ft).			•       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •	•     •       •     •       •     •       •     •       •     •       •     •       •     •       •     •       •     •       •     •       •     •       •     •       •     •       •     •       •     •	Kelly down @ 1435. New 20' connection @ 1441.
240								•••	• •   • •   • •	

(	C	BI				Bore	eho	le IC	): KAFB-1	106220
Pro Pro	ojec ojec	t Loca t Nan	ation ne: k	: KÁF (AFB I	s of Engineers FB, Albuquerque, NM BFF SWMU ST-106 and SS-111	Hole Dia	mete	r Lower	· (in.): 11-3/4 · (in.): 9-5/8 Гуре: Flush	
Da Da	te S ate T	Starteo D Re	d: 3/ ache	1407 2/201 d: 3/9 3/20	5 9/2015		ime o <sup>.</sup> nd of	f Drilling Drilling	g: 477.00 Not Recorded	
Y	Cool	d Elev rdinat rdinat	e:	ו AMS	L (ft): Not Recorded	Drillling ( Drilling N Logged I	/letho	d: Air F	National Drilling Rotary Casing Ha rds	ammer Page 9 of 18
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 5/4); moist; 95% very fine to coa sand; 5% fine gravel.	rse	SW		•	PID - 0.0 ppm @ cyclone and breathing zone.
<u>245</u> 250	-				Poorly graded SAND (SP); light (7.5YR 6/4); moist; 95% fine to n sand; 5% fine gravel. Same as above (242 ft).	brown nedium	SP			Hammering. PID - 0.0 ppm @ cyclone
255	-				Poorly graded GRAVEL (GP); br (7.5YR 5/4); moist; 95% fine gra rounded; 5% sand. Note: gravel mafics and quartz.	vel;			- High Solids Bentonite Grout	Kelly down @ 1449. New 20' connection @ 1455.
260	-				Same as above (253 ft).		GP		•	PID - 0.0 ppm @ cyclone and breathing zone.
<u>265</u>	-				Same as above (253 ft).					
270	-				Same as above (253 ft).				• • •	

		RI				Bore	eho	le l	D: KAFB-1	106220
Pro Pro	ojec ojec	t Loca t Nam	ation: ne: K	: Káf (AFB	s of Engineers FB, Albuquerque, NM BFF SWMU ST-106 and SS-111	Hole Dia	ametei	r Low	oer (in.): 11-3/4 /er (in.): 9-5/8 n Type: Flush	
Da Da	te S te T	Starteo D Re	d: 3/2 ache			🕎 At T	ime of	f Drill Drillir	ls BGS (ft): ing: 477.00 ng: Not Recorded 477.45	
Y	Cool	d Elev rdinat rdinat	e:	I AMS	L (ft): Not Recorded		Method	d: Ai	National Drilling ir Rotary Casing Ha hards	ammer Page 10 of 18
02 Depth (ft)	Sample Type	Number	Headspace PID	Lithologic Log	Material Description		U.S.C.S.		Well Diagram	Remarks
-	-				Poorly graded GRAVEL (GP); bi (7.5YR 5/4); moist; 95% fine gra rounded; 5% sand. Note: gravel mafics and quartz.	vel;	GP	· · · · · · · · · · · · · · · · · · ·	· · · · · · · · · · · · · · · · · · ·	PID - 0.0 ppm @ cyclone and breathing zone.
275	-				Poorly graded SAND (SP); light (7.5YR 6/3); moist; 95% fine to r sand; 5% fine gravel; rounded.	brown nedium		· · · · · · · · · · · · · · · · · · ·		Kelly down @ 1503. New 20' Connection @ 1601. Driller fixed plugged
280	-				Same as above (273 ft).		SP	· · · · · · · · · · · · · · · · · · ·		discharge. PID - 0.0 ppm @ cyclone and breathing zone.
285	-				Same as above (273 ft).					
-	-				Well graded SAND with Gravel ( brown (7.5YR 4/3); moist; 80% f coarse sand; 20% fine to coarse to 1". Note: gravel is mafics and	ine to gravel			- High Solids Bentonite Grout	
<u>290</u>					Same as above (285 ft).		sw	• • • • • • • • • • • •		PID - 0.0 ppm @ cyclone and breathing zone.
295	-				Same as above (285 ft).					Kelly down @ 1615. New 20' connection @ 1626.
300								• • • • • •	• • • • • •	

	C	RI				Bore	eho	le I	D:	KAFB-	106220
Pro Pro	ojec ojec	t Loca t Nam	ation ne: K	: KAF (AFB	s of Engineers <sup>-</sup> B, Albuquerque, NM BFF SWMU ST-106 and SS-111	Hole Dia	ametei	Low	er (ii	n.): 11-3/4 n.): 9-5/8 pe: Flush	
Da Da	ite S ite T	tarteo D Re	d: 3/2 ache				Time of End of	f Drill Drillir	ing: ng: l	477.00 Not Recorded	
Y (	Coor	d Elev rdinat rdinat	e:	AMS	L (ft): Not Recorded	Drillling	Contra Method	actor: d: Ai	Na r Ro	tional Drilling tary Casing H	ammer Page 11 of 18
00 Depth (ft)	Sample Type	Number	Headspace PID	Lithologic Log	Material Description		U.S.C.S.		Wel	l Diagram	Remarks
				· · · · · · · · · · · · · · · · · · ·	Well graded SAND with Gravel ( brown (7.5YR 4/3); moist; 80% f coarse sand; 20% fine to coarse to 1". Note: gravel is mafics and	ine to gravel	sw	• • • • • • • •	• • • • • • • •		PID - 0.0 ppm @ cyclone and breathing zone.
305	-				Clayey SAND (SC); light reddish (5YR 6/4); medium plasticity; 70 sand; 30% clay.	brown	SC	· · · · · · · · · · · · · · · · · · ·			Hammering.
210	_				Same as above (302 ft).		30				
310					Well graded SAND with Gravel ( brown (7.5YR 4/4); moist; 80% v to coarse sand; 20% fine gravel; rounded.	very fine					PID - 0.2 ppm @ cyclone and 0.0 ppm @ breathing zone.
315					Same as above (310 ft).					- High Solids Bentonite Grout	Kelly down @ 1637. New 20' connection @ 1641.
320	-				Same as above (310 ft).		SW		<ul> <li>•</li> <li>•&lt;</li></ul>		PID - 0.3 ppm @ cyclone and 0.0 ppm @ breathing zone.
325	-				Same as above (310 ft).						
330	-							• • • • • • • • • •	• • • • • • • • • •		

	C	BI	<b>N</b>			Bore	eho	le ID	: KAFB-′	106220
Pro Pro	ojec ojec	t Loca t Nam	ation ne: K	: KÁF (AFB I	s of Engineers FB, Albuquerque, NM BFF SWMU ST-106 and SS-111	Hole Dia	ameter	Lower	(in.): 11-3/4 (in.): 9-5/8 ype: Flush	
Da Da	ite S ite T	Started D Re	d: 3/2 ache				ime of nd of	<sup>f</sup> Drilling Drilling:	: 477.00 Not Recorded	
Y (	Cool	d Elev rdinat rdinat	e:	n AMS	L (ft): Not Recorded	Drillling Drilling N Logged	<b>Nethoo</b>	d: Air F	lational Drilling totary Casing Ha	ammer Page 12 of 18
05 Depth (ft)	Sample Type	Number	Headspace PID	Lithologic Log	Material Description		U.S.C.S.	w	ell Diagram	Remarks
	_				Well graded SAND with Gravel brown (7.5YR 4/4); moist; 80% v to coarse sand; 20% fine gravel rounded.	ery fine			•	End of 3/5/15 @ 1649. Resumed drilling @ 0748 on 3/6/15. PID - 0.0 ppm @ cyclone and breathing zone.
335	-				Same as above (330 ft).				•	Kelly down @ 0752. New 20' connection @ 0758.
340	-				Same as above (330 ft).				•	PID - 0.2 ppm @ cyclone and 0.0 ppm @ breathing zone.
345	-				Same as above (330 ft).		SW		- High Solids Bentonite Grout	
350	-				Same as above (330 ft).					PID - 0.4 ppm @ cyclone and 0.0 ppm @ breathing zone.
355	-				Same as above (330 ft).				- - - - - - - - - -	Kelly down @ 0828. New 20' connection @ 0834.
360	-									Driller added 25 gallons of water.

		BI				Bore	eho	le l	D: KAFB-1	106220	
Pro Pro	ojec ojec	t Loca t Nam	ation: ne: K	KAF AFB I	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					
Da Da	Project Number: 140705 Date Started: 3/2/2015 Date TD Reached: 3/9/2015 Date Completed: 3/20/2015						ime o Ind of	f Drill Drillir	s BGS (ft): ing: 477.00 ng: Not Recorded 477.45		
YO	Cooi	d Elev rdinat rdinat	e:	AMS	L (ft): Not Recorded	Drillling	Contra Methoo	actor: d: Ai	National Drilling r Rotary Casing Ha	ammer Page 13 of 18	
90 Depth (ft)	Sample Type	Number	Headspace PID	Lithologic Log	Material Description		U.S.C.S.		Well Diagram	Remarks	
	_				Well graded SAND with Gravel ( brown (7.5YR 4/4); moist; 80% v to coarse sand; 20% fine gravel; rounded.	ery fine		· · · · · · · · · · · · · · ·	· · · · · · · · · · · · · · · · · · ·	Hammering. PID - 0.0 ppm @ cyclone and breathing zone.	
365	-				Same as above (360 ft).			· · · · · · · · · · · · · · · · ·		Driller added 25 gallons of water.	
370	-				Same as above (360 ft).			· · · · · · · · · · · · · · · · · · · ·		PID - 0.0 ppm @ cyclone and breathing zone.	
375	-				Same as above (360 ft).		SW		- High Solids Bentonite Grout	Kelly down @ 0904. New 20' connection @ 1341. Casing is tight. Driller pulled up 80' of casing and redrove pipe to free	
380	-				Same as above (360 ft).					it up. PID - 0.2 ppm @ cyclone and 0.0 ppm @ breathing zone.	
385	-				Same as above (360 ft).						
390									<pre>   •   •   •   •   •   •   •   •   •</pre>		

(	C	RI				Bore	ehol	e ID	: KAFB-1	06220	
Pr Pr	ojec ojec	t Loca t Nam	ation: ne: K	: Káf (AFB I	s of Engineers <sup>-</sup> 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: Flush					
Da Da	ate S ate T	Started D Re	d: 3/2 ache			🕎 At T	ime of ind of l	Drilling Drilling:	3GS (ft): g: 477.00 Not Recorded 7.45		
Y	Coo	d Elev rdinat rdinat	e:	I AMS	L (ft): Not Recorded	Drillling	Contra Methoo	ctor: N I: Air F	National Drilling Rotary Casing Ha	ammer Page 14 of 18	
06 Depth (ft)	Sample Type	Number	Headspace PID	Lithologic Log	Material Description		U.S.C.S.	w	ell Diagram	Remarks	
	-				Well graded SAND with Gravel brown (7.5YR 4/4); moist; 80% v to coarse sand; 20% fine gravel; rounded.	very fine			•	PID - 0.0 ppm @ cyclone and breathing zone. Hammering. No water added.	
<u>395</u>	-				Same as above (390 ft).					Kelly down @ 1357. New 20' connection @ 1403.	
400	-				Same as above (390 ft).					PID - 0.4 ppm @ cyclone and 0.0 ppm @ breathing zone.	
<u>405</u>	_				Same as above (390 ft).		SW		- High Solids Bentonite Grout	Hammering at approximately 60 times per hour. No water added.	
<u>410</u>	-				Same as above (390 ft).				•	PID - 0.0 ppm @ cyclone and breathing zone.	
415					Same as above (390 ft).					Kelly down @ 1423. New 20' connection @ 1428.	
420	-								• • •		

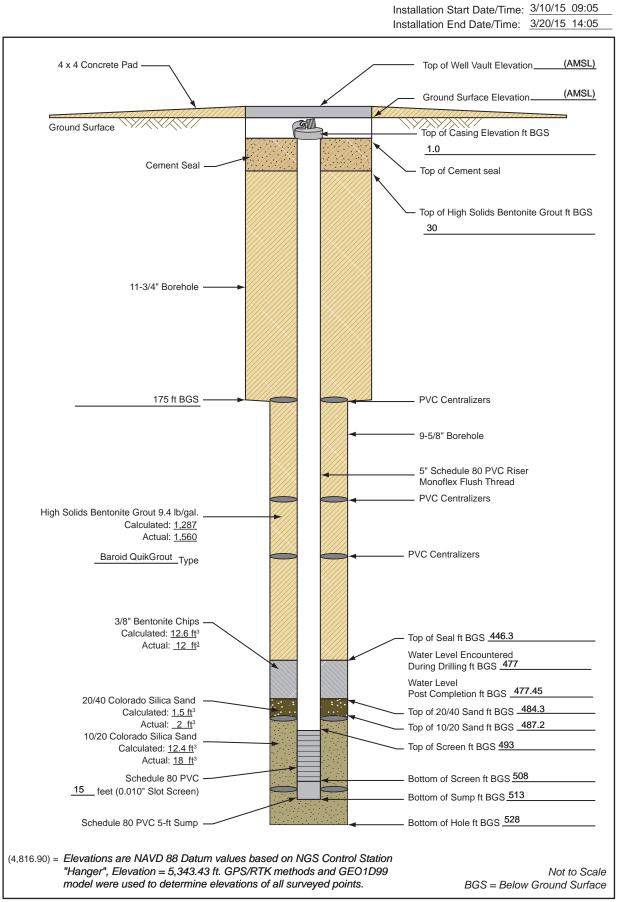
	C	BI				Bore	eho	le I	D: KAFB-′	106220	
Pro Pro	ojec ojec	t Loca t Nam	ation: ne: K	: Káf (AFB I	s of Engineers FB, Albuquerque, NM BFF SWMU ST-106 and SS-111	Hole Diameter Upper (in.): 11-3/4 Hole Diameter Lower (in.): 9-5/8 Surface Completion Type: Flush					
Da Da	ite S ite T	tarteo D Re	d: 3/2 acheo			🕎 At T	ime of Ind of	<sup>:</sup> Drilli Drillin	s BGS (ft): ng: 477.00 ig: Not Recorded 177.45		
Y (	Cooi	d Elev dinat	e:	I AMS	L (ft): Not Recorded	Drillling	Contra Method	ictor: 1: Aii	National Drilling r Rotary Casing H	ammer Page 15 of 18	
5 Depth (ft)	Sample Type	Number	Headspace PID	Lithologic Log	Material Description		U.S.C.S.		Well Diagram	Remarks	
	_				Well graded SAND with Gravel brown (7.5YR 4/4); moist; 80% v to coarse sand; 20% fine gravel rounded.	very fine				PID - 0.3 ppm @ cyclone and 0.0 ppm @ breathing zone.	
425	-				Same as above (420 ft).						
430	-				Same as above (420 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	PID - 0.0 ppm @ cyclone and breathing zone. Driller added 25 gallons of water.	
435	-				Same as above (420 ft).		SW		- High Solids Bentonite Grout	Kelly down @ 1448. New 20' connection @ 1453.	
440	-				Same as above (420 ft).					PID - 0.6 ppm @ cyclone and 0.0 ppm @ breathing zone.	
445					Same as above (420 ft).				- Top of Bentonite Seal	Driller added 25 gallons of water.	
450											

	7	RI				Bore	ehol	e ID: KAFB-′	106220		
Pro Pro	ojec ojec	t Loca Nam	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					
Da Da	te S te T		d: 3/2 ache	2/201 d: 3/9		⊥ At T ▼ At E	ime of Ind of [	evels BGS (ft): Drilling: 477.00 Drilling: Not Recorded ng: 477.45			
YC	Cool	rdinate	e:	n AMS	SL (ft): Not Recorded	Drillling Drilling I	Contra ⁄Iethod	ctor: National Drilling : Air Rotary Casing H Richards	ammer Page 16 of 18		
5 Depth (ft)	X Coordinate: Number Number Headspace Headsbace Naterial Description Material Description						U.S.C.S.	Well Diagram	Remarks		
	-				Well graded SAND with Gravel ( brown (7.5YR 4/4); moist; 80% v to coarse sand; 20% fine gravel; rounded.	very fine	SW		PID - 0.2 ppm @ cyclone and 0.0 ppm @ breathing zone.		
455	-				Sandy lean CLAY with Gravel (C reddish brown (5YR 5/4); moist; clay; 20% very fine sand; 20% g subangular to rounded.	60%			Kelly down @ 1516. New 20' connection @ 1521.		
460	-				Same as above (453 ft).		CL		PID - 0.4 ppm @ cyclone and 0.0 ppm @ breathing		
465	-				Same as above (453 ft).			- Bentonite Seal	zone.		
-	-				Poorly graded SAND (SP); brow (7.5YR 5/3); moist; 100% fine to sand. Note: majority of sand is fi grained.	medium		- Bentonite Seal			
470	-				Same as above (466 ft).		SP		PID - 0.2 ppm @ cyclone and 0.0 ppm @ breathing zone.		
475					Same as above (466 ft).				Kelly down @ 1546. New 20' connection @ 1551.		
480	-				✓Well graded SAND with Gravel ( brown (7.5YR 5/4); moist; 80% v to coarse sand; 20% fine gravel; subangular to rounded. Note: gravel	very fine	SW				

	Borehole ID: KAFB-106220										
Pro Pro	oject oject	t Loca t Nam	ition e: K	: KAF	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					
Da Da	te S te T	tarted D Rea	: 3/2 ache			⊥ At T ▼ At E	ime of Ind of		477.00 Not Recorded		
YC	Coor	d Elev dinate dinate	e:	n AMS	L (ft): Not Recorded		Method	d: Air Ro	ational Drilling otary Casing Ha ds	ammer Page 17 of 18	
8 Depth (ft)	Lithologic Legan (II) Log Debut (II) Log Debut (II) Material Description						U.S.C.S.	We	II Diagram	Remarks	
485					quartz and mafics. Well graded SAND with Gravel ( brown (7.5YR 5/4); wet; 80% ver coarse sand; 20% fine gravel; subangular to rounded. Note: gra quartz and mafics. Same as above (480 ft).	ry fine to			- Bentonite Seal - Top of 20/40 Sand	PID - 0.4 ppm @ cyclone and 0.0 ppm @ breathing zone.	
- - - <u>490</u> -					Same as above (480 ft).		SW		- Top of 10/20 Sand	PID - 0.0 ppm @ cyclone and breathing zone.	
495					Well graded GRAVEL with Silt a (GW-GM); pinkish gray (7.5YR 6 gravel; subangular to subrounde fine to coarse sand; 10% silt. No gravel is mafics and quartz. Cali layer from 494.8 ft - 495.2 ft.	6)/2); 60% ed; 30% ote: che	GW- GM		- Top of 5" Schedule 80 PVC 0.010" Slot Screen	Stop drilling @ 1615 on 3/6/15 @ 493'. Run BLN sampler on 3/9/15 from 493 ft - 502.5 ft. End with BLN sampler @ 1042 on 3/9/15.	
-					Poorly graded SAND (SP); reddi yellow (7.5YR 6/6); wet; 95% find	e sand;	SP				
<u>500</u>					5% silt. Note: mica observed in s Well graded SAND with Gravel ( reddish brown (5YR 5/3); wet; 70 fine to coarse sand; 30% gravel subrounded to rounded. Note: gr mafics and quartz. @ 501.2 ft: Well graded SAND ( 90% fine to coarse sand; 10% fir gravel; rounded. Same as above (501.2 ft).	(SW); 0% very to 1.5"; ravel is SW);	SW			Began reaming and drill out borehole to 520' @ 1155.	
510									- Bottom of Screen		

	Borehole ID: KAFB-106220											
Pro Pro	ojec ojec	t Loca t Nam	ation: ie: K	: Káf (AFB I	s of Engineers B, Albuquerque, NM BFF SWMU ST-106 and SS-111	Hole Dia	ameter	Upper (in.): 11-3/4 Lower (in.): 9-5/8 letion Type: Flush				
Da Da	te S te T	t Num tarted D Rea comple										
YC	Coor	d Elev dinate dinate	e:	AMS	L (ft): Not Recorded	Drilling I	Method	ictor: National Drilling I: Air Rotary Casing Ha Richards	ammer Page 18 of 18			
0 Depth (ft)	Sample Type	Number	Headspace PID	Lithologic Log	Material Description		U.S.C.S.	Well Diagram	Remarks			
-					Well graded SAND (SW); 90% f coarse sand; 10% fine gravel; ro		sw	- Sump	PID - 0.0 ppm @ cyclone and breathing zone.			
515					Poorly graded SAND (SP); brow (7.5YR 5/3); wet; 100% fine to m sand; trace silt. Note: mica obse sand. Same as above (512 ft).	nedium		- Bottom of Sump	Kelly down @ 1303. New 10' connection @ 1402. Having issues with drive casing.			
520					Same as above (512 ft).		SP		PID - 0.0 ppm @ cyclone and breathing zone. Kelly down @ 1418. New 5' connection @ 1428.			
-					Same as above (512 ft).			Bottom of Hole				
530									Total depth = 528 ft. Reached total depth on 3/9/15.			
535												
540												

# Monitoring Well Completion Diagram KAFB-106220



140705.CB020403.A14.ai



## Well Development Record

Project Name: KAFB BFF			
Location: Continental Dr.		Well/Piez. No.: KAFB-106220	
Personnel: T. Richards		Date Installed: 3/20/15	
Date: 3/17/15		Csg. Diameter (I.D.): 5 "	
Samplers: N/A		Total Depth (ft. bgs): 513	_
Method of Development: X Surging	X Bailing	X Pumping	
X Original Development	Redevelopment	Other	
Development Date: 3/17/15			

Depth to Water Before Developing Well (ft. btoc): 476.91 (477.45 ft. bgs)

 $V=(B * r_c^2 * L_c * 7.48)+(B * (r_w^2 - r_c^2) * L_s * \phi_s * 7.48)+(H_2O added during drilling/installation) = 911 gallons$ 

Depth Purging From: 493 - 510 feet	Time Pu	Time Purging Begins: 1208, 3/17/15				
Weather: Cloudy, Windy, 40s	Screene	d Interval (ft bgs) <u>: 493 - 508</u>				
Equipment Nos.: pH Meter: YSI 6820	EC Meter: YSI 6820	Turbidity Meter: HACH 21000Q				

Equipment Decontaminated Prior to Development: Y X N

Describe: Steam Cleaned

Collected Sample of Water Added to Well: Y N X Describe: N/A

Comment: Approximately 840 gallons of water added during drilling/well installation activities

		Water Level (ft	Volume Removed				Turbidity	
Date	Time	bTOC)	(gal.)	Temp. (°C)	рН	EC (mS/cm)	(NTU)	Comments
3/17/2015	0847	476.91	0					Begin bailing. Water is very cloudy.
3/17/2015	0917		55					Finish bailing.
3/17/2015	0920		55					Begin surging.
3/17/2015	1020		55					Finish surging.
0/17/00/15	400.4							Begin bailing. Water is very cloudy; trace of
3/17/2015	1024		55					fine sand.
3/17/2015	1054		165					Finish bailing. Water is slightly cloudy.
								Begin pumping at 510 feet (2.6 feet above
3/17/2015	1208	476.91	165					bottom of well).
3/17/2015	1210	478.35	173	18.92	7.81	0.428	>1000	Continue pumping. Water is very cloudy.
3/17/2015	1220	478.21	215	19.42	7.83	0.420	320	Continue pumping. Water is slightly cloudy.
3/17/2015	1230	478.26	257	19.42	7.92	0.420	127	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 0.1 °C °C = Degree Celsius EC = Electric Conductivity ft bgs = Feet Below Ground Surface ft btoc = Feet Below Top of Casing gal. = Gallon GPM = Gallons Per Minute I.D. = Inner Diameter N/A = Not Applicable NR = Not Recorded NTU = Nephelometric Turbidity Unit S/m = Seimens per Meter

Where: B=3.14

 $Ø_s$ = porosity of the sand pack

rc= 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

 $\ddot{L}_{s}$ = 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: 3/17/15

Time Start: 0847, 3/17/2015

Samplers: <u>N/A</u>
Checked By: \_\_\_\_\_
Time Finish: <u>1506, 3/17/2015</u>

Well No: KAFB-106220

Field Chemis	Field Chemistry (cont'd)											
Date	Time	Water Level (ft. Below TOC)	Volume Removed (gal.)	Temp. (°C)	рН	EC (mS/cm)	Turbidity (NTU)	Comments				
3/17/2015	1240	478.31	299	19.08	7.95	0.419	91.6	Continue pumping.				
3/17/2015	1250	478.29	341	19.05	7.95	0.414	76.1	Continue pumping.				
3/17/2015	1300	478.29	383	18.84	7.95	0.413	60.4	Continue pumping.				
3/17/2015	1310	478.28	425	18.55	7.95	0.412	57.3	Continue pumping.				
3/17/2015	1320	478.28	467	18.83	7.94	0.411	50.2	Continue pumping.				
3/17/2015	1340	478.28	551	18.38	7.95	0.410	32.6	Change readings frequency to every 20 minutes.				
3/17/2015	1400	478.28	635	18.40	7.96	0.409	7.55	Raise pump to top of screen.				
3/17/2015	1420	478.27	719	18.41	7.99	0.410	1.73	Change readings frequency to every 10 minutes.				
3/17/2015	1430	478.27	761	18.40	7.99	0.410	1.79	Lower pump to mid-screen.				
3/17/2015	1440	478.28	803	18.39	8.00	0.409	1.07	Continue pumping.				
3/17/2015	1450	478.29	845	18.38	8.00	0.408	1.14	Continue pumping.				
3/17/2015	1500	478.29	887	18.39	8.01	0.408	1.17	Continue pumping.				
3/17/2015	1506	478.29	913	18.38	8.01	0.407	1.13	Finish pumping. Well development complete.				

Was well sampled after development? YES NO X

Sample Method: N/A

Sample Name: N/A

Analyses: N/A

# KAFB 106221

Pre	ojec	t Loc t Nan	ation ne: k	: KAF	s of Engineers 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: Flush Groundwater Levels BGS (ft):						
Project Number: 140705 Date Started: 5/8/2015 Date TD Reached: 5/11/2015 Date Completed: 6/18/2015 Ground Elevation AMSL (ft): Not Recorded Y Coordinate:						Groundwater Levels BGS (ft):						
Depth (tt) X	sample Type 0	rdinat		Lithologic Log	Material Description	Logged B	sy: № NS.C.S.	I. Gile	es/K	. OʻLeary/T. R I Diagram	Remarks	
<u>0</u> 5	-				No lithologic description.					Top of Casing/Top of Cement Seal	Borehole cleared with water jet to 9 ft. Began drilling @ 0814 on 5/8/15 with 11-3/4" casing.	
<u>10</u>	-				Poorly graded SAND (SP); yello brown (10YR 5/6); 95% fine san subangular; sand is quartz; 5% Same as above (10 ft).	nd;	SP			- Cement Seal	Kelly down @ 0824, new 20' connection. Resume drilling @ 0827.	
20	-			00000000000000000000000000000000000000	Poorly graded GRAVEL with Sil Sand (GP-GM); reddish yellow ( 7/6); 50% fine gravel to 1/2"; su gravel is mafics; 40% fine to me sand; trace coarse sand; sand i 10% silt.	(5YR bangular; edium	GP- GM				1	
25 30				610	Poorly graded SAND (SP); yello brown (10YR 5/6); 95% fine sar subangular; sand is quartz, maf quartzite; 5% silt.	nd;	SP					

KAFB\_BOREHOLE\_LOG - SHAW\_DRILLING.GDT - 7/21/15 16:01 - Z:)KAFB BFFIGINTIKAFB\_PROJECTIKAFB\_BFF.GPJ

	C	BI				Bore	ehol	e I	D: KAFB-	106221	
P P	rojeo rojeo	ct Loca ct Nam	ation: ne: K	KAF AFB I	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					
	Project Number: 140705 Date Started: 5/8/2015 Date TD Reached: 5/11/2015 Date Completed: 6/18/2015						ime of	<sup>:</sup> Drilli Drillin	s BGS (ft): ing: 476.00 ng: Not Recorde 74.00	b	
Y	Ground Elevation AMSL (ft): Not Recorded Y Coordinate: X Coordinate:						Method	l: Aiı	National Drilling r Rotary Casing F es/K. O'Leary/T. F	lammer	
6 Denth (ft)		Number	Headspace PID	Lithologic Log	Material Description		U.S.C.S.	,	Well Diagram	Remarks	
3	-				Silty SAND (SM); reddish brown 5/4); 90% coarse sand; trace fine medium sand; subangular; sand quartz and mafics; 5% fine grave 3/8"; subangular to subrounded; is quartzite; 15% silt.	e and is el to	SM	<ul> <li>•</li> <li>•&lt;</li></ul>	Top of High     Solids     Bentonite     Grout     Grout		
	_				Poorly graded GRAVEL with Silt Sand (GP-GM); reddish yellow ( 6/6); 60% fine gravel to 1/2"; sub to subrounded; gravel is quartzit mafics; 30% fine to coarse sand quartz; 15% silt.	7.5YR bangular e and	GP- GM		· · · · · · · · · · · · · · · · · · ·	Kelly down @ 0843, new 20' connection. Resume drilling @ 0850.	
4	_			60	Poorly graded SAND with Silt (S reddish yellow (7.5YR 6/6); 90% sand; trace medium and coarse subangular; sand is quartz and r 10% silt.	fine sand;	SP- SM				
5	_				Poorly graded GRAVEL with Silt Sand (GP-GM); brown (7.5YR 5/ fine gravel to 3/8"; subangular to subrounded; 40% fine sand; trac medium and coarse sand; subar 10% silt; sand and gravel are qu quartzite.	/4); 50% ce ngular;	GP- GM		<ul> <li>High Solids</li> <li>Bentonite</li> <li>Grout</li> </ul>		
	-				Silty SAND with Gravel (SM); str brown (7.5YR 5/6); 60% fine to c sand; subangular; sand is quartz quartzite, and mafics; 25% fine g trace coarse gravel; angular to subangular; gravel is mafics; 15%	coarse <u>z,</u> gravel;					
5	5				Same as above (50 ft).		SM			Kelly down @ 0903, new 20' connection. Resume drilling @ 0908.	
6	0							••	••		

	~	RI	N.			Bore	ho	le II	D: KAFB-1	106221
Pro Pro	ojec ojec	ct Loc ct Nan	ation ne: k	: KAF	s of Engineers <sup>F</sup> B, Albuquerque, NM BFF SWMU ST-106 and SS-111	Hole Dia	meter	r Lowe	er (in.): 11-3/4 er (in.): 9-5/8 Type: Flush	
Da Da Da Gre	ite S ite T ite C oun	Starte TD Re Comp	d: 5/ eache leted: vatior	6/18			me of nd of Drilli Contra	f Drillin Drillin ng: 47 actor:	BGS (ft): ng: 476.00 g: Not Recorded 4.00 National Drilling Rotary Casing Ha	ammer
		ordinat		. I					s/K. O'Leary/T. Ri	
영 Depth (ft)	Sample Type	Number	Headspace PID	Lithologic Log	Material Description		U.S.C.S.	\ \	Well Diagram	Remarks
65	_				Silty SAND with Gravel (SM); str brown (7.5YR 5/6); 60% fine to c sand; subangular; sand is quartz quartzite, and mafics; 25% fine c trace coarse gravel; angular to subangular; gravel is mafics; 15	coarse z, gravel;	SM	• • • • • • • • • • • • • • • • • •	• • • • • • • • • • • • • •	
70	-				Well-graded SAND with Silt and (SW-SM); strong brown (7.5YR + 75% fine to coarse sand; subang sand is quartz, quartzite, and ma 15% fine gravel to 3/4"; angular subrounded; gravel is mafics an quartzite; 10% silt. Same as above (65 ft).	5/6); gular; afics; to	SW- SM		<ul> <li>.</li> <li>.&lt;</li></ul>	
75 - - 80	-				Poorly graded SAND (SP); reddi yellow (7.5YR 6/6); 95% fine sar subangular; sand is quartz; 5% s Same as above (75 ft).	nd;	SP		- High Solids Bentonite Grout	Kelly down @ 0926, new 20' connection. Resume drilling.
85					Poorly graded SAND with Silt (S reddish yellow (7.5YR 7/6); 85% sand; trace medium and coarse subangular to subrounded; sand quartz; 5% fine gravel to 3/8";	fine sand; t is	SP- SM			
90					subangular to subrounded; grav quartzite and mafics; 10% silt.			•••	• • • • • •	

	C	BI				Bore	eho	le I	D:	KAFB-1	06221
Pro Pro	oject oject	t Loca t Nam	ation ne: k	: KÁF (AFB I	s of Engineers FB, Albuquerque, NM BFF SWMU ST-106 and SS-111	Hole Dia	ameter	Low	er (i	n.): 11-3/4 n.): 9-5/8 pe: Flush	
Da Da	te S te T	tarteo D Rea	d: 5/ ache			Groundv ∑ At T ▼ At E ▼ At E	ime of ind of l	<sup>f</sup> Drilli Drillin	ing: ig:	476.00 Not Recorded	
Y	Coor	d Elev dinat	e:	n AMS	L (ft): Not Recorded	Drilling N	Nethod	d: Ai	r Ro	tional Drilling tary Casing Ha . O'Leary/T. Rig	
ଞ Depth (ft)	Sample Type	Number	Headspace PID	Lithologic Log	Material Description		U.S.C.S.		Wel	l Diagram	Remarks
95	-				Poorly graded SAND with Silt (S reddish yellow (7.5YR 7/6); 85% sand; trace medium and coarse subangular to subrounded; sand quartz; 5% fine gravel to 3/8"; subangular to subrounded; grave quartzite and mafics; 10% silt.	fine sand; is	SP- SM				
-					Poorly graded GRAVEL (GP); re yellow (7.5YR 7/6); 85% fine gra 1/2"; subangular; gravel is black granite, and quartzite; 10% medi sand; subangular; sand is quartz silt.	vel to mafics, ium	GP				Kelly down @ 1003, new 20' connection. Resume drilling @ 1007.
100	-				Poorly graded SAND (SP); stron (7.5YR 5/8); 90% fine sand; trac medium and coarse sand; subar sand is quartz; 5% fine gravel to subangular; gravel is quartz; 5%	e ngular; 3/8";					
105	-						SP			- High Solids Bentonite Grout	
<u>110</u>											
115	-				Well-graded GRAVEL with Silt a (GW-GM); light brown (7.5YR 6/- fine to coarse gravel to 1 1/2"; subangular; gravel is mafics; 200 sand; trace medium and coarse sand is quartz; 10% silt.	4); 70% % fine	GW- GM				Kelly down @ 1031, new 20' connection. Resume drilling @ 1036.

(	C	BI	S			Bore	ehol	e IC	): KAFB-1	106221
Pr Pr	ojec ojec	t Loca t Nam	ation ne: k	: Káf (Afb i	s of Engineers FB, Albuquerque, NM BFF SWMU ST-106 and SS-111	Hole Dia	ameter	Lower	<sup>-</sup> (in.): 11-3/4 <sup>-</sup> (in.): 9-5/8 Type: Flush	
Da Da	ate S ate T	tarteo D Re	d: 5/ ache			👳 At T	ime of nd of l	Drillin Drilling	BGS (ft): g: 476.00 : Not Recorded .00	
Y	Cooi	d Elev rdinat rdinat	e:	n AMS	L (ft): Not Recorded	Drilling N	/lethoo	l: Air I	National Drilling Rotary Casing Ha /K. O'Leary/T. Ri	ammer chards Page 5 of 27
05 Depth (ft)	Sample Type	Number	Headspace PID	Lithologic Log	Material Description		U.S.C.S.	W	/ell Diagram	Remarks
125	-				Well-graded SAND with Gravel ( strong brown (7.5YR 5/6); 70% f coarse sand; subangular; sand is 25% fine gravel to 3/8"; subangu subrounded; gravel is mafics; 5%	ine to s quartz; llar to	SW		•	
130	-				Poorly graded SAND (SP); stron (7.5 YR 5/6); 95% fine sand; trac medium and coarse sand; subar sand is quartz; 5% silt.	xe	SP			
130	-				Well-graded GRAVEL with Silt a (GW-GM); strong brown (7.5YR 50% fine to coarse gravel to 1 1/ subangular; gravel is mafics; 40 <sup>c</sup> coarse sand; subangular; sand is 10% silt.	5/6); /2"; % fine to				
135	-				Same as above (130 ft).		GW- GM		- High Solids Bentonite Grout	Kelly down @ 1057, new 20' connection. Resume drilling @ 1103.
140	-				Clayey GRAVEL (GC); dark yello brown (10YR 4/4); 75% fine to co gravel to 1 1/2"; subangular to subrounded; gravel is mafics; 25 medium plasticity.	oarse	GC		•	
150	-				Plastic CLAY (CH); yellowish rec 5/6); slightly firm; high plasticity; clay.		СН		• • • • •	Poor return.

	C	BI				Bore	ehol	le I	D: KAFB-1	106221
Pr Pr	ojeci ojeci	t Loca t Nam	ation: ne: K	: Káf (AFB I	s of Engineers FB, Albuquerque, NM BFF SWMU ST-106 and SS-111	Hole Dia	meter	Low	er (in.): 11-3/4 er (in.): 9-5/8 i Type: Flush	
Da Da	ite S ite T	tarteo D Re	d: 5/8 ache			👳 At T	ime of nd of l	<sup>f</sup> Drilli Drillin	BGS (ft): ng: 476.00 g: Not Recorded 74.00	
Y	Coor	d Elev dinat	e:	n AMS	L (ft): Not Recorded	Drillling ( Drilling N	Contra /lethoo	actor: d: Air	National Drilling Rotary Casing Hassing Hassing K. O'Leary/T. Ri	ammer chards Page 6 of 27
05 Depth (ft)	Sample Type	Number	Headspace PID	Lithologic Log	Material Description		U.S.C.S.	,	Well Diagram	Remarks
	_				Plastic CLAY (CH); yellowish rec 5/6); slightly firm; high plasticity; clay.			<ul> <li>•</li> <li>•&lt;</li></ul>		Poor return.
155	-				Same as above (150 ft).		СН		•       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •	Kelly down @ 1142, new 20' connection. Resume drilling @ 1158. Poor return.
160	-				Poorly graded SAND with Silt (S strong brown (7.5YR 4/6); 90% f sand; trace medium and coarse subangular; sand is quartz; 10%	ine sand;	SP- SM		•       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •	
165	-				Poorly graded GRAVEL with Cla Sand (GP-GC); strong brown (7. 4/6); 75% fine gravel to 1/2"; sub gravel is mafics; 15% fine sand; quartz; 10% clay; low plasticity.	.5YR bangular;			<ul> <li>High Solids</li> <li>Bentonite</li> <li>Grout</li> <li>•</li> <li>•&lt;</li></ul>	
170	-				Same as above (165 ft).		GP- GC		•       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •	
175	-				Sandy lean CLAY (CL); strong b (7.5YR 5/6); 60% clay; 40% fine		CL		•       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •	Kelly down @ 1244, new 20' connection. Resume drilling @ 1249.
180								••	• • • •	

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Pro Pro	ojec ojec	ct Loc ct Nan	ation ne: K	: KAF	s of Engineers FB, Albuquerque, NM BFF SWMU ST-106 and SS-111	Hole Dia	ametei	Low	er (in	.): 11-3/4 .): 9-5/8 e: Flush	
Da Da	te S ite T		d: 5/a ache	8/201 d: 5/ <i>1</i>		Groundv ∑ At T ▼ At E ▼ At E	ime of nd of	f Drilli Drillin	ing: 4 ig: N	76.00 lot Recorded	
Y	Coo	nd Elev ordinat ordinat	e:	n AMS	L (ft): Not Recorded	Drilling ( Drilling N	Contra Aethoo	actor: d: Ai	Nati r Rota	ional Drilling ary Casing Ha O'Leary/T. Ri	ammer chards Page 7 of 27
8 Depth (ft)	Sample Type	Number	Headspace PID	Lithologic Log	Material Description		U.S.C.S.		Well	Diagram	Remarks
185	_				Sandy lean CLAY (CL); strong b (7.5YR 5/6); 60% clay; 40% fine		CL				
	_				Silty SAND (SM); brown (7.5YR 80% fine sand; subangular; sand quartz; 5% fine gravel to 3/8"; gr mafics and quartzite; 15% silt.	dis	SM		<ul> <li>•</li> <li>•&lt;</li></ul>		
190	_				Well-graded SAND (SW); brown 5/4); 95% fine to coarse sand; subangular; sand is quartz and r 5% silt.		SW		· · · · · · · · · · · · · · · · · · · ·		
195	_				Lean CLAY with Sand (CL); stro brown (7.5YR 4/6); slightly firm; plasticity; 75% clay; 20% fine sa subangular; 5% fine gravel to 1/2 gravel is quartzite and mafics.	medium nd;	CL			High Solids Bentonite Grout	Kelly down @ 1331.
200	_				Poorly graded SAND (SP); brow (7.5YR 5/4); slightly moist; 95% medium sand; subangular; 5% c	fine to	SP				Stop drilling with 11-3/4" casing @ 1530 on 5/8/15. Resume drilling with 9-5/8" casing @ 0930 on 5/9/15.
205	_				Well-graded SAND (SW); brown 5/3); slightly moist; 95% fine to o sand; subangular; 5% fine grave trace silt.	oarse	SW				
			1	0 0 0 0				<u> </u> ▼ ▼	<u>  </u>		

(	C	BI	)			Bore	ehol	e ID	: KAFB-′	106221
Pro Pro	ojec ojec	ct Loc ct Nan	ation ne: k	: Káf (Afb i	s of Engineers FB, Albuquerque, NM BFF SWMU ST-106 and SS-111	Hole Dia	ameter	Lower	(in.): 11-3/4 (in.): 9-5/8 ype: Flush	
Da Da Da Gr	ate S ate 1 ate 0 oun	Starte TD Re Compl	d: 5/ ache eted: /atior	6/18			ime of nd of l r Drillin Contra	Drilling: Drilling: ng: 474.0 nctor: N	: 476.00 Not Recorded	ammor
	Coo	ordinat				Logged	By: N	I. Giles/ł	K. O'Leary/T. Ri	chards Page 8 of 27
0 Depth (ft)	Sample Type	Number	Headspace PID	Lithologic Log	Material Description		U.S.C.S.	We	ell Diagram	Remarks
215	_				Poorly graded SAND (SP); light (7.5YR 6/3); dry; 100% fine sand subangular.		SP			Very easy drilling.
220	-				Poorly graded SAND with Silt (S brown (7.5YR 5/3); slightly moist fine to medium sand; subangula silt.	t; 90%	SP- SM			
	-				Well-graded SAND (SW); brown 5/3); slightly moist; 95% fine to c sand; subangular; 5% silt.					
225	-				Well-graded SAND with Gravel ( brown (7.5YR 5/4); slightly moist fine to coarse sand; subangular; gravel to 1"; subangular.	i; 80%	SW		- High Solids Bentonite Grout	Large cobble retrieved, approximately 2.5".
230	-				Lean CLAY (CL); brown (7.5YR slightly moist; soft; low plasticity; clay; trace fine sand.		CL			Casing hammer repair @
235	-				Poorly graded SAND (SP); brow (7.5YR 5/4); slightly moist; 95% medium sand; subangular; 5% s	fine to	SP			0955. Resume drilling @
240								••	•	

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Pr Pr	ojec ojec	t Loc Nan	ation: ne: K	Corp KAF AFB I 1407	s of Engineers FB, Albuquerque, NM BFF SWMU ST-106 and SS-111	Hole Dia	ametei	Low	er (in.): 11-3/4 er (in.): 9-5/8 Type: Flush	
Da Da	ate S ate T	Starte ID Re	d: 5/8 acheo	8/201: d: 5/1		👳 At T	ime of	f Drilli Drillir	s BGS (ft): ing: 476.00 ng: Not Recorded 74.00	I
Y	Coo	d Elev rdinat rdinat	e:	AMS	L (ft): Not Recorded	Drilling N	Nethod	i: Ai	National Drilling r Rotary Casing H es/K. O'Leary/T. R	ammer Lichards Page 9 of 27
05 Depth (ft)	Sample Type	Num	Headspace PID	Lithologic Log	Material Description		U.S.C.S.		Well Diagram	Remarks
	_				Well-graded SAND with Gravel ( brown (7.5YR 5/4); slightly moist sand; subangular; 15% gravel to subrounded.	; 80%		• • • • • • • • • • • • • • • •		PID = 0.0 ppm from hopper.
245	-				Well-graded SAND (SW); brown 5/4); slightly moist; 95% sand; subangular; 5% gravel to 1"; subrounded.	(7.5YR	SW			
250	-				Same as above (245 ft); 100% s trace fine gravel.	and;				
255	-				Lean CLAY with Sand (CL); brow (7.5YR 5/4); moist; very firm; low plasticity; 75% clay; 20% fine to sand; subangular; 5% fine grave	<i>ı</i> medium	CL		- High Solids Bentonite Grout	
260	) 				Poorly graded SAND (SP); brow (7.5YR 5/4); moist; 100% fine to sand; subangular.			- · · · · · · · · · · · · · · · · · · ·		
265	-				Same as above (260 ft).		SP			
270								• • • • • •	• • • • • •	

(	C	BI				Bore	eho	le I	D: KAFB-′	106221
Pr Pr	ojec ojec	t Loc Nan	ation: ne: K	Corp KAF AFB I 1407	s of Engineers FB, Albuquerque, NM BFF SWMU ST-106 and SS-111	Hole Dia	ameter	Low	er (in.): 11-3/4 er (in.): 9-5/8 n Type: Flush	
Da Da	ate S ate T	Starteo D Re	d: 5/a ache	8/201 d: 5/1		🕎 At T	ime of nd of	<sup>f</sup> Drilli Drillir	s BGS (ft): ing: 476.00 ng: Not Recorded 74.00	
Y	Coo	d Elev rdinat rdinat	e:	AMS	L (ft): Not Recorded	Drillling Drilling	Contra Method	actor: d: Ai	National Drilling r Rotary Casing H es/K. O'Leary/T. R	ammer ichards Page 10 of 27
2 Depth (ft)	Sample Type	Num	Headspace PID	Lithologic Log	Material Description		U.S.C.S.		Well Diagram	Remarks
	_				Poorly graded SAND (SP); brow (7.5YR 5/4); moist; 100% fine to sand; subangular.	n medium	SP			PID = 0.0 ppm from hopper.
275					Well-graded SAND (SW); brown 5/4); slightly moist; 90% fine to o sand; 10% gravel to 3/4"; suban subrounded.	oarse		· · · · · · · · · · · · · · · · · · ·		
280					Same as above (275 ft); 100% fi coarse sand.	ne to			•       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •	
285	-				Same as above (275 ft); 100% fi coarse sand.	ne to	SW		- High Solids Bentonite Grout	
<u>290</u>					Same as above (275 ft); 100% fi coarse sand.	ne to		<ul> <li>.</li> <li>.&lt;</li></ul>		
295					Same as above (275 ft); 100% fi coarse sand.	ne to				
300								•••	• •   • •   • •	

	C	RI	N			Bore	eho	le l	D:	KAFB-1	06221
Pro Pro	ojec ojec	t Loca t Nan	ation ne: k	: KÁF (AFB I	s of Engineers FB, Albuquerque, NM BFF SWMU ST-106 and SS-111	Hole Dia	ametei	Low	/er (ir	n.): 11-3/4 n.): 9-5/8 be: Flush	
Da Da	ite S ite T	Starteo FD Re	d: 5/ ache			Groundv ∑ At T ▼ At E ▼ At E	ime of nd of	f Drill Drillir	ling: 4 ng: N	476.00 Not Recorded	
Y	Coo	d Elev ordinat ordinat	e:	n AMS	L (ft): Not Recorded	Drilling N	<b>Jethoo</b>	iA :b	ir Rot	tional Drilling ary Casing Ha O'Leary/T. Ri	ammer chards Page 11 of 27
00 Depth (ft)	Sample Type	Number	Headspace PID	Lithologic Log	Material Description		U.S.C.S.		Well	Diagram	Remarks
	_				Lean CLAY (CL); brown (7.5YR moist; soft; medium plasticity; 95 5% fine sand.	5/3); 5% clay;		• • • • • • • • • • • • • • • • • •	<ul> <li>•</li> <li>•&lt;</li></ul>		PID = 0.0 ppm from hopper.
<u>305</u> 310	-				Same as above (300 ft).		CL				
315	-				Well-graded SAND (SW); brown 5/4); miost; 90% fine to coarse s subangular; 10% gravel to 1/2"; subangular.		SW	  		Llich Solido	
320	-				Poorly graded SAND (SP); light (7.5YR 6/3); slightly moist; 100% sand; subangular.	brown 5 fine	SP	<ul> <li>•</li> <li>•&lt;</li></ul>		High Solids Bentonite Grout	
325	-				Well-graded SAND (SW); brown 5/3); slightly moist; 95% fine to c sand; subangular; 5% silt.		SW				
330	-				Well-graded SAND with Silt (SW brown (7.5YR 5/3); slightly moist fine to coarse sand; subangular; silt.	t; 90%	SW- SM				

	C	BI	)			Bore	eho	le	D:	KAFB-1	106221
Pro Pro	ojec ojec	ct Loc ct Nan	ation: ne: K	: Káf (AFB I	s of Engineers FB, Albuquerque, NM BFF SWMU ST-106 and SS-111	Hole Dia	amete	r Lov	ver (i	n.): 11-3/4 n.): 9-5/8 pe: Flush	
Da Da	te S ite T		d: 5/8 ache	8/201: d: 5/1		Groundv ∑ At T ▼ At E ▼ At E	ime o <sup>.</sup> Ind of	f Dril Drilli	ling: ng:	476.00 Not Recorded	
YO	Coo	nd Elev ordinat ordinat	e:	I AMS	L (ft): Not Recorded	Drilling I	Metho	d: A	ir Ro	tional Drilling tary Casing Ha . O'Leary/T. Ri	ammer chards Page 12 of 27
00 Depth (ft)	Sample Type	Number	Headspace PID	Lithologic Log	Material Description		U.S.C.S.		Wel	l Diagram	Remarks
	_				Well-graded SAND with Silt (SW brown (7.5YR 5/3); slightly moist fine to coarse sand; subangular; silt.	t; 90%		•       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •			PID = 0.0 ppm from hopper.
335	-				Same as above (330 ft).		SW- SM				
340	-				Same as above (330 ft).						
345	-				Well-graded SAND (SW); brown 5/3); slightly moist; 95% fine to c sand; subangular; 5% silt.	o (7.5YR coarse				- High Solids Bentonite Grout	
350					Same as above (345 ft); 95% fin coarse sand; subangular; 5% gra 1/2".		SW				
355					Same as above (345 ft); 90% fin coarse sand; 10% gravel to 1/2"; subangular to subrounded.						
360								•••	••		

	C	BI	)			Bore	eho	le ID	: KAFB-1	06221
Pro Pro	ojec ojec	ct Loc ct Nan	ation ne: k	: KÁF (AFB I	s of Engineers B, Albuquerque, NM BFF SWMU ST-106 and SS-111	Hole Dia	ametei	Lower	(in.): 11-3/4 (in.): 9-5/8 ype: Flush	
Da Da Da Gro Y (	ite S ite T ite C oun Coo	Compl	d: 5/ ache eted: vatior e:	8/2019 d: 5/1 6/18	5  1/2015		ime of nd of r Drilli Contra Methoo	f Drilling Drilling: ng: 474. actor: N d: Air R	: 476.00 Not Recorded 00 lational Drilling totary Casing Ha	ammer chards Page 13 of 27
90 Depth (ft)	ample Type		Headspace	Lithologic Log	Material Description	Logged	By. ₪ N.S.C.S.		K. OʻLeary/T. Ri ell Diagram	Remarks
	_				Well-graded SAND with Gravel ( light brown (7.5YR 6/3); slightly i 70% fine to coarse sand; 30% gi 1"; subrounded.	moist;			• • • • • •	PID = 0.0 ppm from hopper.
365	_				Same as above (360 ft).				• • • • • • •	
370	_				Same as above (360 ft); 80% fin coarse sand; 20% gravel.	e to	SW		• • • • • • • •	
375	_				Same as above (360 ft); 80% fin coarse sand; 20% gravel.	e to			- High Solids Bentonite Grout	
380	_				Poorly graded SAND (SP); brow (7.5YR 5/3); slightly moist; 100% medium sand; trace silt.	n o fine to	SP		• • • • • • •	
385	_				Well-graded SAND (SW); brown 5/3); slightly moist; 100% fine to sand.		SW			

	C	BI				Bore	eho	le I	D: KAFB-′	106221
Pro Pro	ojec ojec	t Loca t Nan	ation ne: k	: KAF	s of Engineers FB, Albuquerque, NM BFF SWMU ST-106 and SS-111	Hole Dia	ameter	Low	er (in.): 11-3/4 er (in.): 9-5/8 1 Type: Flush	
Da Da	ite S ite T	Starteo D Re	d: 5/ ache			👳 At T	ime of Ind of	<sup>f</sup> Drilli Drillin	s BGS (ft): ing: 476.00 ng: Not Recorded 74.00	
Y	Coo	d Elev rdinat rdinat	e:	n AMS	L (ft): Not Recorded	Drilling I	Method	d: Ai	National Drilling r Rotary Casing Ha es/K. O'Leary/T. R	ammer ichards Page 14 of 27
6 Depth (ft)	Sample Type	Number	Headspace PID	Lithologic Log	Material Description		U.S.C.S.		Well Diagram	Remarks
	-				Well-graded SAND (SW); browr 5/3); slightly moist; 100% fine to sand; subangular.					PID = 0.0 ppm from hopper.
395	-				Same as above (390 ft).				•       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •	
400	-				Same as above (390 ft).					
405	-				Well-graded SAND with Gravel light brown (7.5YR 6/3); slightly 70% fine to coarse sand; subang 30% gravel to 3/4"; subrounded.	moist; gular;	SW		- High Solids Bentonite Grout	
410	-				Same as above (405 ft); gravel t	to 1/2".				
415	-				Same as above (405 ft); 60% fin coarse sand; 40% gravel to 1 1/2					
420								••		

(	C	BI	S			Bore	ehol	e IC	D: KAFB-1	106221	
Pro	ojec ojec	ct Loca ct Nam	ation ne: k	: KÁF (AFB	s of Engineers <sup>-</sup> B, Albuquerque, NM BFF SWMU ST-106 and SS-111	Hole Diameter Upper (in.): 11-3/4 Hole Diameter Lower (in.): 9-5/8 1 Surface Completion Type: Flush					
Da Da Da	ate S ate T ate C	Compl	d: 5/ ache eted:	8/201 d: 5/1 6/18	5 11/2015 5/2015	⊻ At T ▼ At E ▼ Afte	ime of nd of l r Drillin	Drillin Drilling ng: 474			
Y	Coo	nd Elev ordinat ordinat	e:	ו AMS	L (ft): Not Recorded	Drilling N	<b>Nethoo</b>	l: Air	National Drilling Rotary Casing Ha s/K. O'Leary/T. Ri	ammer chards Page 15 of 27	
5 Depth (ft)	Sample Type	Number	Headspace PID	Lithologic Log	Material Description		U.S.C.S.	v	Vell Diagram	Remarks	
	_				Well-graded SAND with Gravel light brown (7.5YR 6/3); 85% find coarse sand; 15% gravel to 1"; subrounded.					PID = 0.0 ppm from hopper.	
425	-				Same as above (420 ft); gravel t	o 1/2".					
430	-				Same as above (420 ft); gray (7. 6/1); 70% fine to coarse sand; 3 gravel to 1".						
435	-				Same as above (420 ft); gray (7. 6/1); 80% fine to coarse sand; 20 gravel to 1/2".		SW		- High Solids Bentonite Grout		
440	_				Same as above (420 ft); gravel t	o 1/2".					
445	-				Same as above (420 ft); gravel t	o 3/4".					
450	-							•••	• • • • • •	End of ARCH drilling @ 450 ft.	

	C	BI	N			Bore	eho	le l	D: KAFB-′	106221-Sonic
Pro Pro	ojec ojec	t Loca t Nam	ation ne: K	: KÁI (AFB	s of Engineers <sup>-</sup> B, Albuquerque, NM BFF SWMU ST-106 and SS-111	Hole Dia	amete	r Low	er (in.): 11-3/4 er (in.): 9-5/8 ı Type: Flush	
Da Da	te S ate 7		d: 5/ ache	12/20 d: 5/ <sup>/</sup>		👳 At T	ime o nd of	f Drilli Drillin	s BGS (ft): ng: 476.00 g: Not Recorded 74.00	
Y (	Coo	d Elev rdinat	e:	n AMS	iL (ft): Not Recorded	Drilling N	/lethoo	d: Sc	National Drilling onic Coring s/K. O'Leary/T. Ri	chards Page 16 of 27
5 Depth (ft)	Sample Type	Number	Headspace PID	Lithologic Log	Material Description		U.S.C.S.		Well Diagram	Remarks
	_				Lean CLAY (CL); reddish brown 4/3); moist; nonplastic to low pla 90% clay; 10% sand.		CL	<ul> <li>•••</li> <li>••</li> <li>••</li></ul>	•       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •	Begin Sonic coring @ 450 ft on 5/12/15. 25 gallons of water added at the start.
455	-				<ul> <li>@ 453.4 ft: Same as above (450 reddish brown (5YR 5/4); trace g 0.12'; subangular.</li> <li>@ 454.0 ft: Sandy lean CLAY wi Gravel (CL); reddish brown (5YF moist; low plasticity; 65% clay; 2 sand; 15% fine gravel; subround rounded.</li> <li>SILT (ML); strong brown (7.5YR moist; 95% silt; 5% fine sand; tragravel.</li> </ul>	gravel to th R 4/4); 0% fine led to 4/6);	ML		<ul> <li>High Solids</li> <li>Bentonite</li> <li>Grout</li> </ul>	@ 454.0 ft. gravel is mafics, quartz, and feldspar.
<u>460</u>	-				Lean CLAY (CL); reddish brown 4/3); slightly moist; 90% clay; 10 sand.		CL		Grout	@ 460.5 ft. clay is blocky and crumbles. Trace calcareous inclusions.
465	_				Poorly graded SAND with Silt (S \ pinkish gray (7.5YR 7/2); dry; 90		SP- SM		• • • • • • • • • •	@ 464.3 ft. core is blocky and crumbles.

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(	C	BI				Bore	eho	le IC	D: KAFB-1	106221-Sonic
Pi Pi	rojeo rojeo	ct Loc	ation: ne: K	: KAF AFB I	s of Engineers FB, Albuquerque, NM BFF SWMU ST-106 and SS-111	Hole Dia	ametei	r Lowe	r (in.): 11-3/4 r (in.): 9-5/8 Type: Flush	
Da	ate S ate T	Starte	d: 5/ <sup>,</sup> ache	12/20 <i>°</i> d: 5/1	15  4/2015	👳 At T	ime of	f Drillin Drilling	BGS (ft): g: 476.00 : Not Recorded 74.00	
Y	Coo	nd Elev ordinat ordinat	e:	AMS	L (ft): Not Recorded	Drilling N	/lethoo	d: Sor	National Drilling hic Coring s/K. O'Leary/T. Ri	chards Page 17 of 27
50 Depth (ft)		Number	Headspace PID	Lithologic Log	Material Description		U.S.C.S.	v	Vell Diagram	Remarks
					∫fine to fine sand; 10% silt. @ 464.7 ft: Lean CLAY (CL); rec	dish	CL		• • • •	Calcareous cement present.
	-				brown (5YR 4/3); slightly moist; nonplastic; 90% clay; 10% fine s @ 465 ft: Sandy lean CLAY (CL) reddish brown (5YR 4/3); slightly nonplastic; 70% clay; 30% fine s Poorly graded SAND with Clay ( brown (7.5YR 5/3); very moist to nonplastic to low plasticity; 90% sand; 10% clay.	and. ); / moist; and. SP-SC); wet; fine	SP- SC			@ 464.7 ft. core crumbles.
470	)				SILT with Gravel (ML); pinkish g (7.5YR 7/2); dry; loose; 75% silt; fine gravel; rounded.		ML			
475	5				Poorly graded SAND (SP); light (7.5YR 6/3); dry; loose; 100% fin medium sand; trace very fine an sand. ✓ Same as above (471.2 ft); brown 4/4); wet. ✓ Well-graded SAND (SW); brown 5/4); wet; loose; 90% very fine to coarse sand; 10% fine to coarse subangular to subrounded; trace	n (7.5YR o (7.5YR o very gravel;	SP		- High Solids Bentonite Grout	@ 480 ft. gravel is mafics, quartz, and feldspar.
480	)							••	 • •	

## Parahala ID: KAEP 106221 Conio

	C	BI				Bore	eho	le I	D: KAFB-1	06221-Sonic
Pro Pro	ojec ojec	t Loca Nam	ation ne: K	: KÁF (AFB I	s of Engineers FB, Albuquerque, NM BFF SWMU ST-106 and SS-111	Hole Dia	ameter	Low	ber (in.): 11-3/4 ver (in.): 9-5/8 n Type: Flush	
Da Da	te S ate T	Started	1: 5/ ache	1407 12/20 d: 5/1 6/18	15 14/2015	🕎 At T	ime of nd of	<sup>r</sup> Drill Drillir	s BGS (ft): ing: 476.00 ng: Not Recorded	
Y	Cool	d Elev rdinat rdinat	e:	n AMS	L (ft): Not Recorded	Drillling O Drilling N	Contra Method	actor: d: So	National Drilling onic Coring es/K. O'Leary/T. Ri	chards Page 18 of 27
8 Depth (ft)	Sample Type	Number	Headspace PID	Lithologic Log	Material Description		U.S.C.S.		Well Diagram	Remarks
	_				Well-graded SAND (SW); brown 5/4); wet; loose; 90% very fine to coarse sand; 10% fine to coarse subangular to subrounded; trace	very gravel;	SW	<ul> <li></li> <li></li></ul>	•       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •	@ 480 ft. gravel is mafics, quartz, and feldspar.
	-				Well-graded SAND with Clay and (SW-SC); brown (7.5YR 4/4); we 70% very fine to very coarse sar fine to coarse gravel; subangular rounded; 10% clay.	et; loose; nd; 20% r to	SW- SC			@ 482.3 ft. gravel is mafics and quartz. Core has blocky structure.
<u>485</u>	_				Poorly graded SAND (SP); brow (7.5YR 4/4); wet; loose; 100% m sand; trace fine and coarse sand Well-graded SAND (SW); brown 4/3); wet; loose; 100% very fine coarse sand.	edium I. (7.5YR	SP SW		<pre></pre>	
	-				Well-graded SAND with Silt and (SW-SM); brown (7.5YR 4/4); we 65% very fine to very coarse sar fine to coarse gravel to 1 1/2"; subangular to rounded; 10% silt.	et; loose; id; 25%	SW- SM		- High Solids Bentonite Grout	@ 487.1 ft. gravel is mafics, quartz, and feldspar.
490	-				Lean CLAY (CL); yellowish red ( 4/6); dry; loose; 100% clay.		CL		· · · · · · · · · · · · · · · · · · ·	@ 489.8 ft. clay is in nodules to 0.35' and are coated with powdery layer that is pinkish white (5YR 8/2).
495	-				Poorly graded SAND (SP); brow (7.5YR 4/4); wet; loose; 95% me sand; trace fine and coarse sand gravel; subrounded to rounded.	dium	SP		•       •         •       •	@491.2 ft. gravel is mafics and quartz.

(	C	BI				Bore	ehol	e l	D: KAFB-1	06221-Sonic
Pr Pr	ojec ojec	t Loca t Nam	ation ie: k	: KAF	s of Engineers FB, Albuquerque, NM BFF SWMU ST-106 and SS-111	Hole Dia	ameter	Low	er (in.): 11-3/4 er (in.): 9-5/8 1 Type: Flush	
Da Da	te S ate T	t Num Started D Rea Comple	l: 5/ ache	12/20 <sup>-</sup> d: 5/ <i>1</i>	15 14/2015	👳 At T	ime of nd of l	Drilli Drillin	s BGS (ft): ng: 476.00 ng: Not Recorded	
Y	Cooi	d Elev rdinate rdinate	e:	n AMS	L (ft): Not Recorded	Drillling Drilling N	Contra Aethoo	ictor: I: Sc	National Drilling onic Coring es/K. O'Leary/T. Ri	chards Page 19 of 27
(ft) (ft) (ft)	Sample Type	Number	Headspace PID	Lithologic Log	Material Description		U.S.C.S.	,	Well Diagram	Remarks
					Poorly graded SAND (SP); brow (7.5YR 4/4); wet; loose; 95% me	n dium	SP	•••	•• ••	@ 495 ft. gravel is mafics and quartz.
	-				sand; trace fine and coarse sand gravel; subrounded to rounded. Poorly graded SAND with Silt (S brown (7.5YR 4/4); wet; loose; 8 medium sand; 5% gravel; subrour rounded; 10% silt.	t; 5% P-SM); 5% unded to	SP- SM		•       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •	
<u>500</u>	-				Poorly graded SAND (SP); brow (7.5YR 4/4); wet; loose; 95% me sand; trace gravel; 5% silt.		SP	•       •         •       •	<ul> <li>•</li> <li>•&lt;</li></ul>	
	-				Well-graded SAND (SW); brown 5/3) wet; loose; 95% fine to coar 5% fine gravel; subrounded to ro trace silt.	se sand; bunded;	SW		- High Solids Bentonite Grout	@ 501.7 ft; gravel is quartz.
<u>505</u>	_				Poorly graded SAND (SP); brow (7.5YR 5/3); wet; loose; 100% m sand; trace fine sand; trace silt.		SP			
					Clayey SAND (SC); reddish brov (2.5YR 4/3); moist; 85% fine to c sand; 15% clay.		SC			
					Lean CLAY (CL); olive (5Y 5/3); moist; 100% clay.		CL	•••		
510					@ 509.1 ft: See description on n page.	ext	SP	• • • • • •	•     •       •     •       •     •       •     •	

	C	BI				Bore	ehol	e ID: KAFB-1	06221-Sonic
Pro Pro	ojec ojec	t Loca t Nan	ation ne: K	: KÁF (AFB	s of Engineers FB, Albuquerque, NM BFF SWMU ST-106 and SS-111	Hole Dia	ameter	Upper (in.): 11-3/4 Lower (in.): 9-5/8 letion Type: Flush	
Da Da	ate S ate T	Starteo D Re	d: 5/ ache			⊥ At T ▼ At E	ime of Ind of [	evels BGS (ft): Drilling: 476.00 Drilling: Not Recorded ng: 474.00	
Y	Coo	d Elev rdinat rdinat	e:	n AMS	L (ft): Not Recorded	Drilling Drilling	Contra Method	ctor: National Drilling I: Sonic Coring . Giles/K. O'Leary/T. Ri	chards Page 20 of 27
01 Depth (ft)	Sample Type	Number	Headspace PID	Lithologic Log	Material Description		U.S.C.S.	Well Diagram	Remarks
	-				<ul> <li>@ 509.1 ft: Poorly graded SAND brown (7.5YR 4/4); moist to wet; 95% medium sand; trace fine sa trace fine gravel; 5% clay.</li> <li>@ 513.8 ft: Same as above (509 05% fine sand; trace medium sa</li> </ul>	loose; ind; 0.1 ft);	SP	••• • Top of Bentonite Seal	
515	_				<ul> <li>95% fine sand; trace medium sa</li> <li>@ 515 to 516.4 ft, cuttings were together during core retrieval. Comixture of fine to coarse sand.</li> </ul>	mixed			
	_				Poorly graded SAND (SP); brow (7.5YR 4/4); moist to wet; loose; medium sand; trace fine sand; tr gravel; 5% clay.	95%	SP	- Bentonite Seal	
<u>520</u>	-				Well-graded SAND (SW); brown		SW		
525	-				5/3); wet; loose; 100% fine to co sand; trace fine gravel; trace silt. Poorly graded SAND (SP); brow (7.5YR 4/4); wet; loose; 100% fir trace medium sand.	/ 'n	SP		

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	C	BI				Bore	ehol	e ID: KAFB-′	106221-Sonic
Pro Pro	ojec ojec	t Loca Nam	ation ie: k	: KÁF (AFB I	s of Engineers FB, Albuquerque, NM BFF SWMU ST-106 and SS-111	Hole Dia	ameter	Upper (in.): 11-3/4 Lower (in.): 9-5/8 etion Type: Flush	
Da Da	ite S ite T	t Num Startec D Rea Comple	l: 5/ ache	12/20 <i>°</i> d: 5/1	15  4/2015	⊥ At T T At E	ime of Ind of D	evels BGS (ft): Drilling: 476.00 Drilling: Not Recorded g: 474.00	
Y (	Cool	d Elev rdinate rdinate	e:	n AMS	L (ft): Not Recorded	Drilling Drilling	Contra Method	ctor: National Drilling : Sonic Coring . Giles/K. O'Leary/T. R	ichards Page 21 of 27
52 Depth (ft)	Sample Type	Number	Headspace PID	Lithologic Log	Material Description		U.S.C.S.	Well Diagram	Remarks
	_			· · · · · · · · · · · · · · · · · · ·	Well-graded SAND with Gravel ( brown (7.5YR 4/3); wet; loose; 8 to coarse sand; 15% fine to coar gravel; subrounded to rounded.	5% fine	SW		@ 525 ft. gravel is mafics and quartz.
	_				Poorly graded SAND (SP); brow (7.5YR 4/3); wet; loose; 100% m sand; trace fine sand.		SP		
<u>530</u>	-				Well-graded SAND (SW); brown 5/3); wet; loose; 100% fine to co sand; trace fine gravel; subanglu rounded.	arse	SW		
	-							-Bentonite Seal	
<u>535</u>	-				Clayey SAND with Gravel (SC); (7.5YR 4/3); moist; loose; 50% fi coarse sand; 30% fine to coarse to 0.3'; subangular to rounded; 2	ne to gravel	SC		
540	_				Well-graded SAND (SW); brown 5/2); wet; loose; 90% fine to coa sand; 10% fine to coarse gravel subangular to rounded.	rse	sw		@ 540 ft. gravel is mafics, quartz, and feldspar.

	C	BI				Bore	ehol	e ID: KAFB-′	106221-Sonic
Pro Pro	ojec ojec	ct Loca ct Nam	ation ne: k	: Káf (Afb i	s of Engineers FB, Albuquerque, NM BFF SWMU ST-106 and SS-111	Hole Dia	ameter	Upper (in.): 11-3/4 Lower (in.): 9-5/8 letion Type: Flush	
Da Da	ite S ite T	<b>ct Num</b> Started FD Re Compl	d: 5/ ache	12/20 <sup>7</sup> d: 5/1	15 14/2015	⊥ At T T At E	ime of Ind of [	evels BGS (ft): Drilling: 476.00 Drilling: Not Recorded ng: 474.00	
Y (	Coo	d Elev ordinationation	e:	n AMS	L (ft): Not Recorded	Drilling N	Method	ctor: National Drilling : Sonic Coring . Giles/K. O'Leary/T. R	ichards Page 22 of 27
6 Depth (ft)	Sample Type	Number	Headspace PID	Lithologic Log	Material Description		U.S.C.S.	Well Diagram	Remarks
540	_				Well-graded SAND (SW); brown 5/2); wet; loose; 90% fine to coa sand; 10% fine to coarse gravel subangular to rounded.	rse to 0.2';	sw		@ 540 ft. gravel is mafics, quartz, and feldspar.
	_				Poorly graded SAND (SP); brow (7.5YR 4/3); wet; loose; 100% fir trace medium sand. Well-graded SAND (SW); brown 4/2); wet; loose; 95% fine to very sand; 5% fine gravel; subrounder rounded.	ne sand; (7.5YR (coarse	SP		@ 542.4 ft. gravel is mafics and quartz.
545	_				<ul> <li>@ 545 ft: Same as above (542.4 coarse sand.</li> <li>@ 546.4 ft: Same as above (542.4 coarse sand.)</li> </ul>		SW		
<u>550</u>	-				@ 547.9 ft: Same as above (542 very wet; trace silt. @ 548.6 ft: Same as above (542				
	_				Lean CLAY with Gravel (CL); bro (7.5YR 4/4); moist; low plasticity clay; 25% fine to coarse gravel; subrounded to rounded. Well-graded SAND with Gravel ( brown (7.5YR 5/2); wet; loose; 8	; 75% (SW);	CL	- Top of 20/40 Sand	<ul> <li>@ 550.5 ft. gravel is mafics, quartz, and feldspar.</li> <li>@ 555 ft. gravel is mafics, quartz, and feldspar.</li> </ul>
555	-				to coarse sand; 20% fine to coar gravel; subrounded to rounded.		SW	- Top of 10/20 Sand	

	C	BI				Bore	ehol	e ID: KAFB-	106221-Sonic		
Pro Pro	ojec ojec	t Loca t Nam t Num	ation: ne: K	KAF AFB I	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					
Da Da	ate S ate T	Started D Rea	d: 5/² acheo	12/20 <sup>-</sup> d: 5/1			ime of Ind of I	evels BGS (ft): Drilling: 476.00 Drilling: Not Recorded ng: 474.00	I		
Y	Cool	d Elev rdinate rdinate	e:	AMS	L (ft): Not Recorded	Drilling N	Method	ctor: National Drilling I: Sonic Coring . Giles/K. O'Leary/T. R	lichards Page 23 of 27		
55 Depth (ft)	Sample Type	Number	Headspace PID	Lithologic Log	Material Description		U.S.C.S.	Well Diagram	Remarks		
560	-				Well-graded SAND with Gravel ( brown (7.5YR 5/2); wet; loose; 8 to coarse sand; 20% fine to coar gravel; subrounded to rounded. @ 555.8 to 556.9 ft: lense of gra 0.3'.	0% fine se			<ul> <li></li></ul>		
	-				@ 561 to 562 ft: lense of gravel Same as above (555 ft).	to 0.3'.	SW	- Top of 5" Schedule 80 PVC 0.010" Slot Screen	@ 561 to 562 ft, gravel is mafics, sandstone, quartz, and feldspar.		
<u>565</u> 570	_				Same as above (555 ft).						

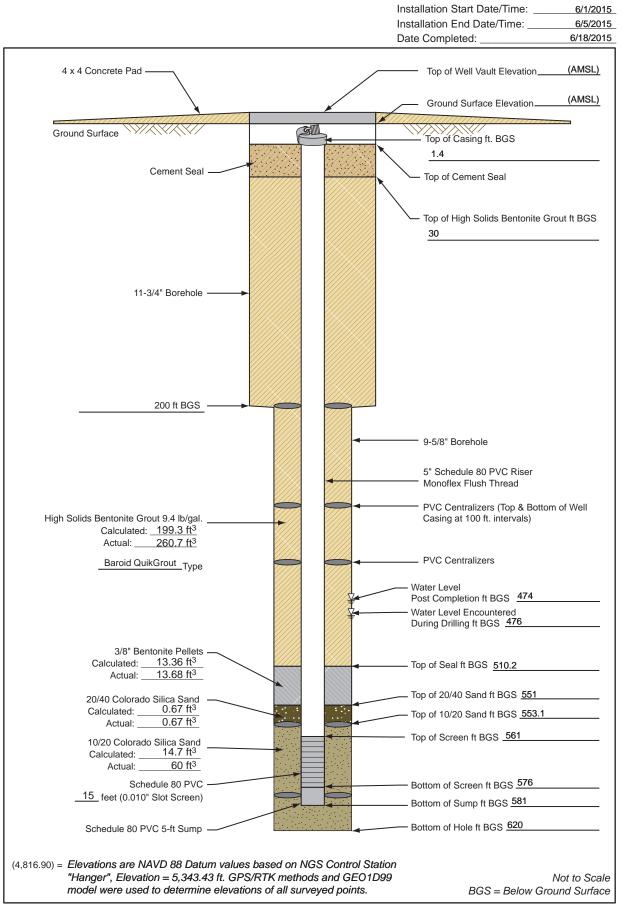
	C	BI				Bore	ehol	e ID: KAFB	-106221-Sonic			
Pro Pro	ojec ojec	ct Loca	ation ne: K	: KAF AFB	s of Engineers FB, Albuquerque, NM BFF SWMU ST-106 and SS-111	Hole Diameter Upper (in.): 11-3/4 Hole Diameter Lower (in.): 9-5/8 1 Surface Completion Type: Flush						
Da Da	ate S ate 1	<b>ct Nun</b> Starteo TD Re Compl	1: 5/ ache	12/20 d: 5/~	15 14/2015	⊥ At T ▼ At E	ime of Ind of I	evels BGS (ft): Drilling: 476.00 Drilling: Not Recorde ng: 474.00	d			
Y	Coo	nd Elev ordinat ordinat	e:	AMS	L (ft): Not Recorded	Drillling Drilling	Contra Methoc	ctor: National Drilling : Sonic Coring . Giles/K. O'Leary/T.				
02 Depth (ft)	Sample Type	Number	Headspace PID	Lithologic Log	Material Description		U.S.C.S.	Well Diagram	Remarks			
575					End of continuous coring. No lith description.	nologic		-Bottom of Screen -Bottom of Sump	End continuous coring @ 570 ft on 5/14/15.			

	C	BI				Borehole ID: KAFB-106221-Sonic						
Pr Pr	ojeo ojeo	ct Loca ct Nam	ation: ne: K	KAF AFB I	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 1 Surface Completion Type: Flush						
Da Da	ate S ate T	TD Re	d: 5/² acheo	Groundwater Levels BGS (ft):5/12/2015☑ At Time of Drilling: 476.00ied: 5/14/2015☑ At End of Drilling: Not Recordedd: 6/18/2015☑ After Drilling: 474.00								
Gr Y (	oun Coo	-	/ation e:		L (ft): Not Recorded	Drilling C Drilling M	Contra lethoc	ctor: National Drilling : Sonic Coring . Giles/K. O'Leary/T. Ric	chards Page 25 of 27			
56 Depth (ft)	Sample Type	Number	Headspace PID	Lithologic Log	Material Description		U.S.C.S.	Well Diagram	Remarks			
	_				No lithologic description.							
	-											
	-											
590	-											
	-											
	-											
	-											
595	_											
	-											
	-											
600												

CBI		Borehole ID: KAFB-106221-Sonic						
Client: US Army Corp Project Location: KAF Project Name: KAFF I	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: Flush						
Project Number: 1407 Date Started: 5/12/20 Date TD Reached: 5/1 Date Completed: 6/18	15  4/2015	Groundwater Levels BGS (ft): ∑ At Time of Drilling: 476.00 ▼ At End of Drilling: Not Recorded ▼ After Drilling: 474.00						
Ground Elevation AMS Y Coordinate: X Coordinate:	L (ft): Not Recorded	Drilling Contractor: National Drilling Drilling Method: Sonic Coring Logged By: M. Giles/K. O'Leary/T. Richards Page 26 of 27						
<ul> <li>Depth (ft)</li> <li>Sample Type</li> <li>Number</li> <li>Headspace</li> <li>PID</li> <li>Lithologic</li> <li>Log</li> </ul>	Material Description	U.S.C.S.	Well Diagram	Remarks				
	No lithologic description.							

(	Ċ	BI				Bore	ehol	e ID: KAFB-1	06221-Sonic
Pr   Pr	ojec ojec	: US at Loca at Nam at Num	ation: ne: K	: Kai (AFB	os of Engineers FB, Albuquerque, NM BFF SWMU ST-106 and SS-111 705	Hole Dia	ameter	Upper (in.): 11-3/4 Lower (in.): 9-5/8 letion Type: Flush	
Da Da	ate S ate T	Starteo FD Re	d: 5/ <sup>,</sup> acheo	12/20 d: 5/			ime of Ind of [	evels BGS (ft): Drilling: 476.00 Drilling: Not Recorded og: 474.00	
Y	Coo	d Elev rdinat rdinat	e:	AMS	SL (ft): Not Recorded	Drilling N	Method	ctor: National Drilling : Sonic Coring . Giles/K. O'Leary/T. Rid	chards Page 27 of 27
Depth (ft)	Sample Type	Number	Headspace PID	Lithologic Log	Material Description		U.S.C.S.	Well Diagram	Remarks
	,				No lithologic description.				
	_								
620	)							-Bottom of Filter Pack/	
	-							Bottom of hole.	
	-								
	-								
	-								
625	5								
	-								
	-								
630	)								

# Monitoring Well Completion Diagram KAFB-106221



140705.CB020403.A20



## Well Development Record

Project Name: KAFB BFF			
Location: Continental Dr.		Well/Piez. No.: KAFB-106221	
Personnel: T. Richards		Date Installed: 6/18/15	
Date: 6/11/15, 6/18/15 - 6/19/15		Csg. Diameter (I.D.): 5 "	
Samplers: N/A		Total Depth (ft. bgs): 581	
Method of Development: X Surging	X Bailing	X Pumping	
X Original Development	Redevelopment	Other	
Development Date: 6/11/15, 6/1	8/15 - 6/19/15		
Depth to Water Before Developi	ing Well (ft. btoc): 474		

 $V=(B * r_c^2 * L_c * 7.48)+(B * (r_w^2 - r_c^2) * L_s * \phi_s * 7.48)+(H_2O added during drilling/installation) = 2664 gallons$ 

Depth Purging From: 561 - 576 feet	Time Purging Begins: 1046, 6/18/2015
Weather: Clear and Calm, 90s	Screened Interval (ft bgs): 561 - 576
Equipment Nos.: pH Meter: YSI 650 MDS	EC Meter: YSI 650 MDS Turbidity Meter: HACH 21000Q

Equipment Decontaminated Prior to Development: Y X N

Describe: Steam Cleaned

Collected Sample of Water Added to Well: Y N X Describe: N/A

Comment: Approximately 2,500 gallons of water added during drilling/well installation activities.

		Water Level (ft	Volume Removed				Turbidity	
Date	Time	bTOC)	(gal.)	Temp. (°C)	рН	EC (mS/cm)	(NTU)	Comments
6/11/2015	1130	473.50	0					Begin bailing; water is dark brown/cloudy.
6/11/2015	1155		6					Finish bailing; very little solids.
6/11/2015	1130		6					Begin surging; break in surge block.
6/11/2015	1140		6					Pull surge block and trim.
6/11/2015	1215		6					Begin surging lower 5 feet of screen.
6/11/2015	1240		6					Surge middle section of screen.
6/11/2015	1330		6					Surge upper 5 feet of screen.
6/11/2015	1355		6					Surge entire 15 feet of screen.
6/11/2015	1405		6					Finish surging.
6/11/2015	1410		6					Begin bailing.

\* Turbidity readings were collected from YSI, not the turbidity meter.

Notes: Water Levels - Reported to the nearest 0.01 foot pH - Reading rounded to 0.1 pH units Water temperature - Reported to nearest 0.1 °C °C = Degree Celsius EC = Electric Conductivity ft bgs = Feet Below Ground Surface ft btoc = Feet Below Top of Casing gal. = Gallon GPM = Gallons Per Minute I.D. = Inner Diameter N/A = Not Applicable NR = Not Recorded NTU = Nephelometric Turbidity Unit S/m = Seimens per Meter

### Where:

B=3.14 Ø<sub>s</sub>= porosity of the sand pack

 $r_{c}\text{=}$  radius of the well casing and screen in feet  $L_{\rm c}\text{=}$  length of water column inside the casing and screen in feet

r<sub>w</sub>= radius of the well bore in feet

 $L_s$ = 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: 6/11/15, 6/18/15 - 6/19/15

Time Start: 1046, 6/18/2015

-

Well No: KAFB-106221
Samplers: N/A
Checked By:
Time Finish: <u>1235, 6/19/2015</u>

Field Chemis	try (cont'd)							
Date	Time	Water Level (ft. Below TOC)	Volume Removed (gal.)	Temp. (°C)	рН	EC (mS/cm)	Turbidity (NTU)	Comments
6/11/2015	1500		20					Finish bailing; water is cloudy with little to no fines.
6/18/2015	1046	475.20	50	23.59	6.18	0.441		Begin pumping @ 575.5 feet bgs; water is slightly cloudy.
6/18/2015	1050	475.79	69	20.95	6.04	0.438	>1,000	Continue pumping.
6/18/2015	1100	475.90	116	21.24	6.79	0.432	20.0	Continue pumping.
6/18/2015	1110	475.90	163	21.38	7.31	0.418	8.29	Continue pumping.
6/18/2015	1120	475.88	210	21.45	7.58	0.409	5.15	Continue pumping.
6/18/2015	1130	475.88	257	21.43	7.70	0.401	4.74	Continue pumping @ 565.5 feet bgs.
6/18/2015	1140	475.88	304	21.42	7.84	0.399	9.75	Continue pumping.
6/18/2015	1150	475.88	351	21.40	7.89	0.394	2.27	Continue pumping.
6/18/2015	1200	475.87	398	21.67	7.94	0.392	1.80	Continue pumping.
6/18/2015	1210	475.86	445	21.76	7.99	0.389	1.60	Move pump to mid-point in screen.
6/18/2015	1220	475.86	492	21.99	8.02	0.388	1.94	Continue pumping.
6/18/2015	1230	475.87	539	22.03	8.02	0.387	1.38	Continue pumping.
6/18/2015	1300	475.88	680	22.00	8.07	0.385	1.46	Continue pumping.
6/18/2015	1330	475.87	821	21.99	8.08	0.382	1.27	Continue pumping.

Was well sampled after development? YES NO X

Sample Method: N/A

Sample Name: N/A

Analyses: N/A

Pg 2 of 3



## Well Development Record

Project: KAFB BFF

Project Number: 140705

Date: 6/11/15, 6/18/15 - 6/19/15

Time Start: 1046, 6/18/2015

 Well No: \_KAFB-106221

 Samplers: \_N/A

 Checked By: \_\_\_\_\_\_

 Time Finish: 1235, 6/19/2015

Field Chemis	try (cont'd)							
Date	Time	Water Level (ft. Below TOC)	Volume Removed (gal.)	Temp. (°C)	рН	EC (mS/cm)	Turbidity (NTU)	Comments
6/18/2015	1430	475.82	1103	22.00	8.02	0.380	1.23	Continue pumping.
6/18/2015	1448	475.82	1188	21.99	8.03	0.379	1.11	Stop pumping; offload water.
6/18/2015	1630	475.73	1292	21.88	8.03	0.379	2.04	Continue pumping.
6/18/2015	1700	475.70	1433	21.82	8.08	0.379	1.20	Continue pumping.
6/18/2015	1715	475.70	1502	21.81	8.18	0.379	1.16	Stop pumping; end of 6/18/15.
6/19/2015	0830	475.87	1528	20.20	8.28	0.377	8.01	Resume pumping on 6/19/15.
6/19/2015	0840	475.99	1575	20.61	8.28	0.374	1.88	Continue pumping.
6/19/2015	0850	475.84	1622	20.72	8.24	0.374	0.80	Continue pumping.
6/19/2015	0900	475.82	1669	20.79	8.26	0.375	0.65	Continue pumping.
6/19/2015	1000	475.87	1951	21.30	8.27	0.375	0.50	Continue pumping.
6/19/2015	1100	475.86	2233	21.43	8.02	0.375	0.38	Continue pumping.
6/19/2015	1200	475.83	2515	21.69	8.12	0.374	0.40	Continue pumping.
6/19/2015	1230	475.82	2656	21.71	8.10	0.375	0.42	Continue pumping.
6/19/2015	1235	475.82	2680	21.70	8.09	0.375	0.36	Finish pumping; well development complete.

Was well sampled after development? YES NO X

Sample Method: N/A

Sample Name: N/A

Analyses: N/A

# KAFB 106222

Cli	ient:	US t Loc	Army	/ Col	rps AFI B B	of Engineers B, Albuquerque, NM FF SWMU ST-106 and SS-111	Hole Dia Hole Dia	ameter ameter	Upper Lower	): KAFB-1 (in.): 11-3/4 (in.): 9-5/8 Type: Flush	
Pro Dai Dai Dai	ojec ate S ate T ate C	t Num Startec D Rei Comple	nber: d: 12 eacheo leted:	140 2/10/2 ed: 1 : 1/1	070 /201 12/1 14/2	05 14 16/2014	Groundv ∑ At T ▼ At E ▼ Afte	water L Fime of End of D er Drillin	evels I Drilling Drilling: ng:	rype: Trush BGS (ft): g: 476.85 : 470.88 Yellow Jacket 🥢	State of Utah Licensed Pofessian Geologist 8881903 - 2250 Virginia Bracht
10	Coor	rdinat	te:	17	0.	(h). Horrisonal	Drilling N Logged	Method	I: ARC	CH	Page 1 of 17
	Sample Type	Number	Headspace	Lithologic		Material Description		U.S.C.S.		/ell Diagram	Remarks
<u>.</u>	-					Sandy SILT (ML); reddish yellow 7/6); dry; loose; 80% silt; 20% sa odor; occasional gravel (1/2" to 3 subangular; 4.5' - 5.0' cobble lay subrounded.	3/4");	SPHAL	T	Top of Casing Top of Cement Seal	Begin @ 1110 on 12-10-14, hand auger to 8.5'. 0 - 8.5' disrupted from hand auger cutting.
5						Same as above (0.3 ft).		ML		- Cement Seal	End hand auger @ 8.5' on 12/10/14. Begin drilling ARCH @ 0923 on 12/11/14. Using water for surface dust control.
<u>15</u>						Well graded GRAVEL with Silt (GW-GM); reddish yellow (7.5YF 90% gravel, 3/8" to 3/4", angular subangular; 10% silt.	R 7/6); r to	GW- GM			Kelly down @ 0926. Resume 0948.
20						Well graded GRAVEL with Sand 80% well graded gravel, 3/8" to angular to subrounded, quartz, f fragments; 20% coarse grained	1/2", feldspar				Hard drilling @ 20'.
25 - - 30						Same as above (20 ft). Occasion cobble, subrounded.	nal	GW			

KAFB\_BOREHOLE\_LOG - SHAW\_DRILLING.GDT - 1/29/15 15:04 - Z: WAFB BFFIGINTIKAFB\_PROJECTIKAFB\_BFF.GPJ

Pro	ject	t Loc t Nan	ation ne: h	: KAF	s of Engineers B, Albuquerque, NM 3FF SWMU ST-106 and SS-111	Hole Dia Hole Dia	ameter ameter	Uppe	<b>D: KAFB-</b> er (in.): 11-3/4 er (in.): 9-5/8 i Type: Flush	100222
Dat	te S te T	tarte D Re	d: 12 ache	2/10/20	014 /16/2014	∑ At T	ime of Ind of I	Drilli Drillin	s BGS (ft): ng: 476.85 g: 470.88	
YC	Coor	d Eler dinat rdinat	te:	n AMS	L (ft): Not Recorded	Drillling Drilling I Logged	Method	: AF		Page 2 of 17
Depth (ft)	Sample Type	Number	Headspace	Lithologic Log	Material Description		U.S.C.S.		Well Diagram	Remarks
30					Well graded SAND with Silt (SW yellowish red (5YR 5/6); loose; subrounded; 90% fine to coarse sand; 10% fines.		SW- SM	••••		
35					Silty SAND (SM); yellowish red ( 5/6); well graded; loose; subrout 75% fine to coarse grained sand silt.	nded;	SM			Kelly down @ 1005. Resume @ 1020.
40					Poorly graded SAND (SP); dark (7.5YR 3/4); 80% coarse grained loose, 20% medium grained sar	d sand;	SP	•••		
45	1 1 1				Well graded SAND with Silt (SV brown (7.5YR 4/4); 90% coarse grained sand; loose; subrounde angular; 10% silt.	to fine	SW- SM		- Bentonite Grout	
50					Silty SAND (SM); brown (7.5YR 80% coarse to fine grained sand to subangular; 20% silt; loose.		SM			
55					Well graded SAND with Gravel 60% coarse grained to medium sand; 40% gravel from 3/8" to 1	grained	sw			Kelly down @ 1039. Resume @ 1048.

KAFB\_BOREHOLE\_LOG - SHAW\_DRILLING.GDT - 1/29/15 15:04 - Z:WAFB BFFIGINTIKAFB\_PROJECTIKAFB\_BFF.GPJ

Pro	ojec ojec	t Loc t Nan	ation ne: h	: KAF	s of Engineers B, Albuquerque, NM 3FF SWMU ST-106 and SS-111	Hole Dia Hole Dia	ameter	Uppe	D: KAFB- er (in.): 11-3/4 er (in.): 9-5/8 Type: Flush	106222
Da Da	te S te T	Starte D Re	d: 12 eache	1407 2/10/20 d: 12 1/14	)14 /16/2014	☑ At T	ime of ind of I	Drillin Drillin	BGS (ft): ng: 476.85 g: 470.88	
YC	Coo	d Ele rdina rdina	te:	n AMS	L (ft): Not Recorded	Drillling Drilling N Logged	Nethod	I: AR		Page 3 of 17
Depth (ft)	Sample Type	Number	Headspace	Lithologic Log	Material Description		U.S.C.S.	N	Well Diagram	Remarks
30	-				Silty SAND (SM); brown (7.5YR 80% coarse to fine grained sand subrounded to subangular; 15% gravel is 1/2' to 3/4", black.	1;	SM	•••		
35	-				Poorly graded SAND with Grave 60% coarse grained sand with t medium grained sand; subangu subrounded; 40% gravel, 3/8" to subangular, black.	race of lar to		•••		
70					Same as above (65 ft). Occasio cobble fragment. Granite with q seen.	nal uartz	SP	••••		
75					Silty SAND (SM); brown (7.5 YF 80% coarse to mediuim grained subrounded to subangular; 15% gravel, sub angular, black.	I sand;			-Bentonite Grout	Kelly down @ 1108. Resume @ 1121.
30	-				Same as above (75 ft).		SM	•••		
<u>85</u>	1 1 1 1				Well graded SAND with Silt and (SW-SM); brown (7.5YR 4/6); 7 coarse grained to fine grained s subangular to subrounded; loos gravel, angular to subangular, f quartz and feldspar, 10% silt.	0% sand, se; 20%	SW- SM			

KAFB\_BOREHOLE\_LOG - SHAW\_DRILLING: GDT - 1/29/15 15:04 - Z:WAFB BFFIGINTIKAFB\_PROJECTIKAFB\_BFF.GPJ

	J	BI				Bore	ho	le l	D: KAFB-	106222	
Cli Pro	ent: ojeci	US t Loca	Army ation:	Corps KAF	s of Engineers B, Albuquerque, NM 3FF SWMU ST-106 and SS-111	Hole Dia	meter	Low	er (in.): 11-3/4 er (in.): 9-5/8 n Type: Flush		
Pro Da Da	te S te T	tarteo D Re	nber: d: 12 ache	1407 /10/20	05 )14 '16/2014	Groundw ⊈ At Ti ▼ At E	vater l ime of nd of	_evel f Drill Drillir	s BGS (ft): ing: 476.85 ng: 470.88		
Y ( X (	Coor Coor	dinat dinat	e:	AMS	L (ft): Not Recorded						
Depth (ft)	Sample Type	Number	Headspace	Lithologic Log	Material Description		U.S.C.S.		Well Diagram	Remarks	
<u>90</u> 95 <u>100</u>					Well graded GRAVEL with Sand strong brown (7.5YR 4/6); 60% grained gravel, 3/8" to 3/4", sub to subangular, flat, feldspar and 35% coarse to fine grained sand predominately quartz, subround subangular; 5% trace silt. Well graded GRAVEL with Sand strong brown (7.5YR 4/6); 60% fine grained gravel, subangular, generally flat, quartz and feldsp coarse to medium grained sand subangular to subrounded, loos trace silt. Same as above (95 ft). Same as above (95 ft).	fine rounded quartz, d, led to d (GW); coarse to ar; 35%	GW		-Bentonite Grout	Kelly down @ 1148. Resume drilling @ 1527. Driller repairs hose.	
<u>110</u>	-				Poorly graded SAND with Grav 80% coarse grained sand, subr to subangular; quartz and felds gravel, flat, angular to sub angu silt. Same as above (110 ft).	ounded par; 20%	SP			Kelly down @ 1350. Resume @ 1402.	
120								•••			

KAFB\_BOREHOLE\_LOG - SHAW\_DRILLING.GDT - 1/29/15 15:04 - Z:WAFB BFFIGINTIKAFB\_PROJECTIKAFB\_BFF.GFJ

Pro Pro Pro	jeci jeci	t Loc t Nan t Nun	ation ne: k nber:	: KAF AFB 1 1407		Hole Dia Hole Dia Surface	ameter ameter Comp	Uppe Lowe letion	D: KAFB-' rr (in.): 11-3/4 rr (in.): 9-5/8 Type: Flush BGS (ft):	106222
Dat	te T	D Re	ache	d: 12	/16/2014	⊻ AtT ▼ AtE	ime of ind of I	Drillin Drilling	ng: 476.85 g: 470.88	
Gro	ound		vatior te:	1/14 n AMS	L (ft): Not Recorded		Contra Method	ctor: I: AR	Yellow Jacket CH s	Page 5 of 17
Depth (ft)	Sample Type	Number	Headspace	Lithologic Log	Material Description		U.S.C.S.	١	Vell Diagram	Remarks
-					Poorly graded SAND with Grave 80% coarse grained sand, subre to subangular; quartz and feldsp gravel, flat, angular to sub angu silt.	ounded bar; 20%	SP	••••		
25					SILT with Sand (ML); light yellow brown (10YR 6/4); 80% silt; 20% grained sand.	wish % coarse				
30	-				Same as above (125 ft).				- Bentonite Grout	
35	-				Same as above (125 ft).		ML	•••		Kelly down @ 1418. Resume @ 1435.
40					Same as above (125 ft).			•••		
45	-				Same as above (125 ft). Some gravel. 75% silt; 20% sand; 5%	fine gravel.				
150	-		-					•••		

KAFB\_BOREHOLE\_LOG - SHAW\_DRILLING.GDT - 1/29/15 15:04 - Z:WAFB BFFIGINTIKAFB\_PROJECTIKAFB\_BFF.GPJ

Proj	ect	Loca Nam	ation: ne: K	AFB E	s of Engineers B, Albuquerque, NM BFF SWMU ST-106 and SS-111	Hole Diar Hole Diar	neter neter	Uppe	<b>D: KAFB-</b> er (in.): 11-3/4 er (in.): 9-5/8 Type: Flush	106222
Date Date Date	e Si e Ti e C	tarteo D Re ompl	d: 12 acheo eted:	1/14	14 16/2014		me of nd of I Drillin Contra	Drillin Drilling ng: ctor:	BGS (ft): ng: 476.85 g: 470.88 Yellow Jacket	
YC	oor	dinat	e:			Drilling M Logged E	lethoo 3y: M	I: AR	s S	Page 6 of 17
05 Depth (ft)	Sample Type	Number	Headspace	Lithologic Log	Material Description		U.S.C.S.	,	Well Diagram	Remarks
50					Lean CLAY with Gravel (CL); lig yellowish brown (10YR 6/4); low plasticity; 85% clay; 15% fine to grained gravel, subangular; flat.	coarse		•••		Can smear some clay fragments.
55					Same as above (150 ft) with su coarse gravel.	brounded				Kelly down @ 1502.
160					Same as above (150 ft).		CL		- Bentonite Grout	Resume @ 1512.
165					Same as above (150 ft).					
170					Same as above (150 ft).					
175	1 1 1 1				suprounded, line pieces are ge	ine % of Ily	GP			Driller calls 174'. Fines flush through the strains Kelly down @ 1524. Resume drilling @ 1534
180					SILT with Sand (ML); light yelle brown (10YR 6/4); 80% silt; 20 medium grained sand.	owish )%	ML			Driller calls the bottom or gravel @ 178'.

KAFB\_BOREHOLE\_LOG - SHAW\_DRILLING.GDT - 1/29/15 15:04 - Z:WAFB BFFIGINTIKAFB\_PROJECTIKAFB\_BFF.GPJ

(	C	BI	0						D: KAFB-	106222
Pro	oiec	t Loc	ation	: KAF	s of Engineers FB, Albuquerque, NM BFF SWMU ST-106 and SS-111	Hole Diar	nete	Low	er (in.): 11-3/4 er (in.): 9-5/8 i Type: Flush	
Pro Da Da	ojec ite S ite T	t Nur Starte	nber: d: 1: eache	1407 2/10/20	705 014 /16/2014	Groundw	ater I ne o id of	Levels f Drilli Drillin	s BGS (ft): ng: 476.85 g: 470.88	
Y	Coo	d Ele rdina rdina	te:	n AMS	L (ft): Not Recorded	-	ontra	actor: d: AF	Yellow Jacket RCH es	Page 7 of 17
Depth (ft)	Sample Type	Number	Headspace	Lithologic Log	Material Description		U.S.C.S.	3	Well Diagram	Remarks
180	-				SILT with Sand (ML); light yellow brown (10YR 6/4); 80% silt; 20% medium grained sand.	wish %		•••		
<u>185</u>					Same as above (180 ft).		ML			
<u>190</u>				a china ang na	Silty SAND (SM); light yellowish (10YR 6/4); 70% medium to coa grained sand; black feldspar an quartz; 30% silt.	arse			- Bentonite Grout	
<u>195</u>				and a state of the	Same as above (190 ft).		SM			Kelly down @ 1556. 11 3/4" casing to 200'. 9 5/8' drilling from 200' to total
200	- )				Lean CLAY (CL); brown (10YR 90% clay, soft, medium plastici medium grained sand; trace gra	ty; 10%				depth. 950 gallons of water used. Begin drilling @ 1505 on 12/12/14.
205					Same as above (200 ft).		CL			
210	5							••••		

KAFB\_BOREHOLE\_LOG - SHAW\_DRILLING.GDT - 1/29/15 15:04 - Z:/KAFB BFFIGINTIKAFB\_PROJECTIKAFB\_BFF.GPJ

Pro	ojec ojec	t Loca t Nam	ation: ne: K	AFB E	s of Engineers B, Albuquerque, NM 3FF SWMU ST-106 and SS-111	Hole Dia Hole Dia	meter	Uppe Lowe	<b>D: KAFB-</b> r (in.): 11-3/4 r (in.): 9-5/8 Type: Flush	106222
Da Da Da	te S te T te C	tarteo D Re compl	d: 12 ache leted:	1/14	014 (16/2014 /2015	⊻ At T ▼ At E ▼ After	ime of nd of I r Drillin	Drillin Drilling ng:	BGS (ft): ig: 476.85 j: 470.88	
YC	Cool	d Elev dinat	e:	AMS	L (ft): Not Recorded	Drilling N Logged	Aethod	: AR		Page 8 of 17
05 Depth (ft)	Sample Type	Number	Headspace	Lithologic Log	Material Description	4	U.S.C.S.	V	Vell Diagram	Remarks
	-				Lean CLAY with Gravel (CL); br (10YR 5/3); 80% lean clay; low j soft; 15% coarse gravel, angula subangular, black feldspar; 5% coarse sand.	plasticity; r to	CL			
215	-				SILT (ML); brownish yellow (10 90% silt; 10% coarse grained sa black feldspar sand.		ML			Kelly down @ 1520. Resume @ 1528.
220			Constant Sciences		Well graded GRAVEL with Silt a (GW-GM); 70% fine to coarse g fine is angular to subangular; co generally subrounded to rounde feldspar; larger gravel is granite coarse to medium grained sand silt. Same as above (220 ft).	ravel, barse is ed; some ; 20%	GW- GM	•••••••••••••••••••••••••••••••••••••••	- Bentonite Grout	
230					Well graded GRAVEL with Sam 60% fine gravel; angular to sub mostly black feldspar; 40% coa medium grained sand; subangu subrounded; black feldspar and and reddish granite.	angular; rse to Ilar to				
235					Same as above (230 ft). Trace rounded granite.	coarse,	GW			Kelly down @ 1535. Resume drilling @ 1552

Pro	olec	t Loc	ation	KAF	s of Engineers B, Albuquerque, NM 3FF SWMU ST-106 and SS-111	Hole Dia Hole Dia	ameter	Uppe Lowe	<b>D: KAFB-</b> er (in.): 11-3/4 er (in.): 9-5/8 Type: Flush	106222
Pro Da Da	ojec ite S ite T	t Nun Startee D Re	nber: d: 12 eache	1407 2/10/20	05 )14 /16/2014	Groundw	vater l ime of nd of	_evels Drillin Drilling	BGS (ft): ng: 476.85 g: 470.88	
YC	Cool	d Elev rdinat rdinat	e:	AMS	L (ft): Not Recorded		Contra Aethod	actor: d: AR		Page 9 of 17
05 Depth (ft)	Sample Type	Number	Headspace	Lithologic Log	Material Description		U.S.C.S.	V	Vell Diagram	Remarks
					Well graded GRAVEL with Sand 60% fine gravel; angular to suba mostly black feldspar; 40% coar medium grained sand; subangu subrounded; black feldspar and and reddish granite.	angular; se to lar to	GW			
245					Well graded SAND with Silt and (SW-SM); 70% mostly coarse to grained sand, black feldspar and quartz; 20% fine gravel, subrour granite; 10% silt.	o medium d clear				
250					Same as above (245 ft).		SW- SM		- PVC Centralizer	
255					Same as above (245 ft).			•••••	-Bentonite Grout	Kelly down @ 1558. Stop @ 257' for the day. Used
260	-				Well graded GRAVEL with Sand 60% gravel, fine to coarse, fine subangular, coarse is subround feldspar and granite; 40% coarse	is ed, se to		•••		150 gallons of water today. 1100 gallons to date. Resume drilling @ 0920 on 12.15.14 @ 257'.
265					medium grained sand, subangu mostly clear quartz sand. Same as above (260 ft).	nar,	GW	•••		
270	-									

KAFB\_BOREHOLE\_LOG - SHAW\_DRILLING.GDT - 1/29/15 15:04 - Z:KAFB BFFIGINTIKAFB\_PROJECTIKAFB\_BFF.GPJ

Proje	ect Lo	catio	n: KA	KAF AFB E	s of Engineers B, Albuquerque, NM BFF SWMU ST-106 and SS-111	Hole Dia Hole Dia Surface	ameter ameter Comp	Upp Low	<b>D: KAFB-</b> er (in.): 11-3/4 er (in.): 9-5/8 n Type: Flush	106222
Date Date	Start TD F	ed: teach	12/ ned	10/20		∑ At T	ime of nd of	f Drill Drillir	s BGS (ft): ing: 476.85 ng: 470.88	
Y Co	nd El ordin ordin	ate:	on	AMS	L (ft): Not Recorded	Drillling Drilling N Logged	<b>Aetho</b>	A I	Page 10 of 1	
02 Depth (ft) Samnle Tyne	Number	Headspace	DId	Lithologic	Material Description		U.S.C.S.		Well Diagram	Remarks
-			1. 1. 1. 1. 1. 1. 1. 1. 1. 1. 1. 1. 1. 1		Poorly graded SAND with Grave 75% sand, very coarse to coarse grained; generally subrounded b subangular; 25% coarse to fine gravel, subangular.	e out some				
75			AND TANK TANG		Same as above (270 ft).		SP			Kelly down @ 0935. Resume @ 0946.
30					Well graded SAND with Silt (SW dark brown (7.5YR 3/3); 80% co fine grained sand; 10% coarse g subangular to subrounded; 10%	parse to gravel,	SW- SM			
35			6 0 0		SILT (ML); light yellowish brown 6/4); 95% silt; 5% medium grain	(10YR ed sand.			I - Bentonite Grout	
20					Same as above (285 ft).		ML			
95					Same as above (285 ft). Trace of grained sand. Some gravel @ 297' to 300'.	coarse				Kelly down @ 1007.
00									•••	

KAFB\_BOREHOLE\_LOG - SHAW\_DRILLING.GDT - 1/29/15 15:04 - Z.WAFB BFFIGINTIKAFB\_PROJECTIKAFB\_BFF.GPJ

t Loca t Nam	ation: ne: K	KAF AFB E	SFF SWMU ST-106 and SS-111	Hole Dia Hole Dia	meter meter	Uppe Lowe		106222
t Num Started D Re	nber: d: 12 ache	1407 1/10/20 d: 12/	05 14 16/2014	⊻ At Ti ▼ At Er ⊻ After	me of nd of I Drillir	Drillin Drilling ng:	ng: 476.85 g: 470.88	
rdinat	e:	AMS	L (ft): Not Recorded	Drilling N	lethod	I: AR	CH	Page 11 of 17
Number	Headspace	Lithologic Log	Material Description		U.S.C.S.	١	Well Diagram	Remarks
			60% gravel, fine 3/8" to coarse a granite with some black feldspa subrounded; 40% coarse to me grained sand, subangular to	1/2" r, dium	GW			
			85% coarse to fine grained sand subangular to subrounded, grar guartz, and feldspar; 15% most	d, nite, ly coarse	SW			
			gravel, coarse to fine, subangul subrounded granite, feldspar ar	ar to nd some		· · · · · · · · · · · · · · · · · · ·	- Bentonite Grout	Driller reports gravel @ 310'.
			70% coarse to fine grained graves subangular, flat, fine is subround	vel, ided; 30%	GW	•••		Kelly down @ 1035. Resume at 1041.
			Poorly graded GRAVEL (GP); 1 gravel, subangular to subround granite, feldspar and quartz.	100% fine led,	GP			
			gravel, mostly fine to coarse gravel subangular to subrounded, gra	ained, nite,	GW			
	t Loca t Nam t Num tarted D Re compl d Elev rdinat	t Location: t Name: K t Number: D Reacher completed: d Elevation dinate: rdinate:	Location: KAF Name: KAFB E Number: 1407 tarted: 12/10/20 D Reached: 12/ completed: 1/14/ d Elevation AMSI clinate: rdinate: rdinate: uagumN uagumN uagumN	t Location: KAFB, Albuquerque, NM Name: KAFB BFF SWMU ST-106 and SS-111 t Number: 140705 tarted: 12/10/2014 D Reached: 12/16/2014 completed: 1/14/2015 d Elevation AMSL (ft): Not Recorded rdinate:	t Location: KAFB, Albuquerque, NM       Hole Dia         Name: KAFB BFF SWMU ST-106 and SS-111       Surface 0         t Number: 140705       Groundw         tarted: 12/10/2014       Y At Ti         D Reached: 12/16/2014       Y At Ti         completed: 1/14/2015       Y After         d Elevation AMSL (ft): Not Recorded       Drilling O         drinate:       Drilling O         uinate:       Logged E         well graded GRAVEL with Sand (GW);       60% gravel, fine 3/8" to coarse 1/2",         granite with some black feldspar,       subrounded; 40% coarse to medium         granite with some black feldspar,       subrounded; 40% coarse to medium         granite with some black feldspar,       subrounded; and subangular to         subrounded; dramed granite, and quartz.       Well graded GRAVEL (GW); 95%         gravel, coarse to fine grained sand,       subrounded granite, feldspar and some         quartz; 5% coarse to fine grained sand.       Subrounded; 30%         coarse to fine grained gravel, subangular to       subrounded; 30%         subrounded       gravel, fiat, fine is subrounded; 30%         coarse to fine grained sand, subangular to       subrounded, 30%         coarse to fine grained sand, subangular to       subrounded, 30%         gravel, subangular, flat, fine is subrounded; 30%<	t Location:       KAFB, Albuquerque, NM       Hole Diameter         Name:       KAFB BFF SWMU ST-106 and SS-111       Groundwater L         Surface Comp       Groundwater L         Surface Comp       Groundwater L         D Reached:       12/10/2014       Y At Time of         D Reached:       12/16/2014       Y At End of I         D Reached:       12/16/2014	E Location: KAFB B/F SWMU ST-106 and SS-111       Hole Diameter Lowes         Number: KAFB BFF SWMU ST-106 and SS-111       Surface Completion         Itumber: 140705       Groundwater Levels         tarted: 12/10/2014       Y At Time of Drilling:         D Reached: 12/16/2014       Y At End of Drilling:         Time of Drilling: The of Drilling: Contractor:       Drilling Contractor:         Drilling: Gord Contractor:       GW         Gord Contractor:       Swithsconded: Gravel:         Well graded GRAVEL with Sand (GW);       GW         Swithsconded gravel, subangular.       SW         Well graded GRAVEL (GW); 95%       Gravel, coarse to fine grained gravel, subangular to subrounded, 30%         Coarse to fine grained sand, subangular to subrounded, granite, feldspar and some quartz, 5% coarse to subrounded, 30%       GW     <	t Location. KAFB, Albüquerque, NM Name: KAFB BFF SVMU ST-106 and SS-111 Surface Completion Type: Flush Surface Completion Type: Flush Groundwater Levels BGS (ft): ∑ At Time of Drilling: 476.85 ¥ Atter of Drilling: 476.85 ¥ Atter Drilling: 476.85 ¥ Well graded GRAVEL (GW); 95% gravel, coarse to fine grained sand, Well graded GRAVEL (GW); 95% gravel, coarse to fine grained sand, Well graded GRAVEL (GW); 95% Grout

KAFB\_BOREHOLE\_LOG - SHAW\_DRILLING.GDT - 1/29/15 15:04 - Z:)KAFB BFFIGINTIKAFB\_PROJECTIKAFB\_BFF.GPJ

Pro	biec	t Loc	ation	KAF	s of Engineers B, Albuquerque, NM 3FF SWMU ST-106 and SS-111	Hole Dia Hole Dia	meter	Uppe Lowe	<b>D: KAFB-</b> er (in.): 11-3/4 er (in.): 9-5/8 Type: Flush	106222
Pro Da Da	te S te T	t Nun Starte D Re	nber: d: 12 ache	1407 2/10/20	05 )14 '16/2014	∑ At T	ime of nd of l	Drillin Drilling	BGS (ft): ng: 476.85 g: 470.88	
YC	Cool	d Ele rdinat rdinat	te:	AMS	L (ft): Not Recorded	Drillling ( Drilling N Logged I	Aethod	: AR	Yellow Jacket CH s	Page 12 of 17
Depth (ft)	Sample Type	Number	Headspace	Lithologic Log	Material Description		U.S.C.S.	N	Well Diagram	Remarks
335	-				Well graded GRAVEL (GW); 10 gravel, mostly fine to coarse gra subangular to subrounded, gran feldspar, quartz, some sandstor slightly more coarse gravel. Well graded GRAVEL (GW); 80 coarse reddish granite from 1" to 10% fine grained gravel, 10% co grained sand, subangular, clear	iined, iite, ne; % o 2", oarse		•••••••••••••••••••••••••••••••••••••••		Kelly down @ 1059. Resume @ 1113.
40					Well graded GRAVEL with Sand 80% gravel; mostly fine with sor coarse; subangular, pink quartz and granite; 20% coarse graine	ne , feldspar	GW		- Bentonite Grout	
350	-				Same as above (340 ft). Trace to Lean CLAY (CL); pale brown (1 soft, low plasticity.				-PVC	
355					Lean CLAY (CL); pale brown (1 soft to semi firm; medium plasti gravel. Lean CLAY (CL); pale olive (5Y 90% clay; soft; medium plasticit medium grained sand; occasion	city; trace R 6/3); y; 10% of	CL		Centralizer	Kelly down @ 1127. Resume @ 1147.
360	-				of fine gravel.					

KAFB\_BOREHOLE\_LOG - SHAW\_DRILLING.GDT - 1/29/15 15:04 - Z:WAFB BFFIGINTIKAFB\_PROJECTIKAFB\_BFF.GPJ

Pro	ojec ojec	t Loc t Nan	ation ne: h	: KAF	s of Engineers FB, Albuquerque, NM BFF SWMU ST-106 and SS-111	Hole Dia Hole Dia	amete amete	r Uppe r Lowe	<b>D: KAFB-</b> r (in.): 11-3/4 r (in.): 9-5/8 Type: Flush	106222
Da Da Da	ite S ite T ite C	Started D Re Compl	d: 12 ache eted:	2/10/20 d: 12 1/14	014 /16/2014 /2015	⊻ At T ▼ At E ▼ Afte	ime o nd of r Drilli	f Drillin Drilling ng:	BGS (ft): g: 476.85 : 470.88	
Y	Cool	d Elev rdinat rdinat	e:	n AMS	L (ft): Not Recorded	Drilling O Drilling N Logged	Aetho	d: AR		Page 13 of 17
Depth (ft)	Sample Type	Number	Headspace	Lithologic Log	Material Description		U.S.C.S.	v	Vell Diagram	Remarks
60	-				Well graded GRAVEL with Sand 80% fine gravel; subrounded to subangular; feldspar and granite coarse to medium grained sand; subrounded to subangular; film o	; 20% of clay.	GW			
70	-				Well graded GRAVEL with Sand 60% gravel, fine with some coars feldspar and granite; 40% coarse medium grained sand, subangul subrounded; film of clay.	se, e to				
-					Well graded SAND with Gravel ( 70% well graded coarse to fine g sand, subrounded with some subangular; 30% gravel, subang flat, feldspar with some granite.	grained				
75					Same as above (370 ft).		SW		- Bentonite Grout	Kelly down @ 1151. Resume @ 1202.
30					Poorly graded SAND (SP); brow. (7.5YR 5/3); 90% medium to fine sand with some coarse, subroun quartz and feldspar; 5% trace of gravel; 5% trace silt.	e grained ded,	SP			
90					Well graded GRAVEL with Sand 60% fine gravel; subangular to subrounded; black feldspar and granite with occasional quartz; 4 coarse grained sand; subangular silt.	reddish 0%	GW			

KAFB\_BOREHOLE\_LOG + SHAW\_DRILLING: GDT - 1/29/15 15:04 - Z: WAFB BFFIGINTIKAFB\_PROJECTIKAFB\_BFF.GPJ

Pre	hier	fl oc	ation	KAF	s of Engineers <sup>-</sup> B, Albuquerque, NM 3FF SWMU ST-106 and SS-111	Hole Dia Hole Dia	meter meter	Uppe Lowe	er (in er (in	.): 11-3/4 .): 9-5/8 e: Flush	06222
Pro Da Da	te S te T	t Nun tarte D Re	nber: d: 12 eache	1407 2/10/20 d: 12	05	Groundw ∑ At Ti ▼ At Ei ▼ At Ei	vater L ime of nd of I	evels Drillin Drilling	BG ng:	S (ft): 476.85	
Y ( X (	Cooi Cooi	rdina rdina	te:	AMS	L (ft): Not Recorded	Drillling ( Drilling M Logged I	lethoo	: AR	CH	ow Jacket	Page 14 of 17
Depth (ft)	Sample Type	Number	Headspace	Lithologic Log	Material Description		U.S.C.S.	v	Vell	Diagram	Remarks
					Well graded SAND with Gravel 60% sand; coarse to fine graine subangular to subrounded; 40% gravel; subangular; feldspar and	d; fine	sw	••••		5" Schedule 80 PVC Riser	
95	-				Well graded GRAVEL with Sand 65% mostly fine to coarse grave subrounded feldspar and granite	el;	GW			Bentonite Grout	
00					coarse to medium grained sand subangular to subrounded; 5% a Poorly graded SAND (SP); yello brown (10YR 5/4); 100% mediu grained sand, clear quartz and b feldspar; trace silt. Poorly graded SAND (SP); coar grained sand; subangular to subrounded; mostly feldspar; gr some quartz. Same as above (400 ft).	; silt. wwish m black rse	SP			Top of Bentonite Seal Bentonite Seal	Kelly down @ 1212. Resume @ 1336.
10	1 1 1										
110	-				Well graded GRAVEL with Silt a (GW-GM); 70% gravel; fine; and subrounded; generally subangu feldspar and granite; 20% medi coarse grained sand; subangula silt. Same as above (410 ft). Less a	gular to ılar, um to ar; 10%	GW- GM			Native Backfill	
420					Same as above (410 it). Less a	mgulai.	GIVI				Kelly down @ 1348. Resume @ 1402.

Projec	fl.oca	ation	KAF	s of Engineers B, Albuquerque, NM 3FF SWMU ST-106 and SS-111	Hole Diar Hole Diar	neter neter	Upper Lower	(in.): 11-3/4 (in.): 9-5/8 ype: Flush	06222
Projec Date S Date T Date C	t Num Started D Re Compl	hber: 1: 12 ache eted:	1407 2/10/20 d: 12 1/14	05 )14 /16/2014 /2015	Groundwa ⊻ At Tir ▼ At En ⊻ After	ater L ne of d of I Drillir	evels E Drilling Drilling: ng:	3GS (ft): :: 476.85 470.88	
Ground Y Cool X Cool	rdinat	e:	n AMS	L (ft): Not Recorded	Drillling C Drilling M Logged B	ethoc	: ARC	′ellow Jacket H	Page 15 of 17
Sample Type	Number	Headspace	Lithologic Log	Material Description		U.S.C.S.	w	ell Diagram	Remarks
-				Well graded SAND (SW); 90% of fine grained sand; subangular to subrounded; feldspar, quartz an granite; 10% gravel; subangular feldspar.	o id	sw		- Bentonite Seal	
125 - - 130 -				Poorly graded SAND (SP); light yellowish brown (10YR 6/4); me fine grained sand, some coarse generally subrounded with some subangular, clear and frosted qu some feldspar; some fines. Same as above (425 ft).	dium to , e	SP		A A A - Native Backfill	
135				Silty SAND (SM); yellowish brow 5/4); 60% poorly graded mediur grained sand; 40% silt.	wn (10YR m to fine	SM			Kelly down @ 1413. Resume @ 1422.
140			12 (2) (2) (2) (2) (2) (2) (2) (2) (2) (2) (2) (2)	No recovery on SILT (SM) as re by driller.	ported			- Bentonite Seal	Driller calls @ 438' to 443' as clayey silt. No recovery in strainer. Geologist believes it is silt. Fines washed through strainer.
445				Gravelly SILT (ML); light brown 6/4); percentages unknown. Gra fine to coarse, subangular.		ML		- Top of 20/40 Sand	Silt blown through scree and in the hopper as

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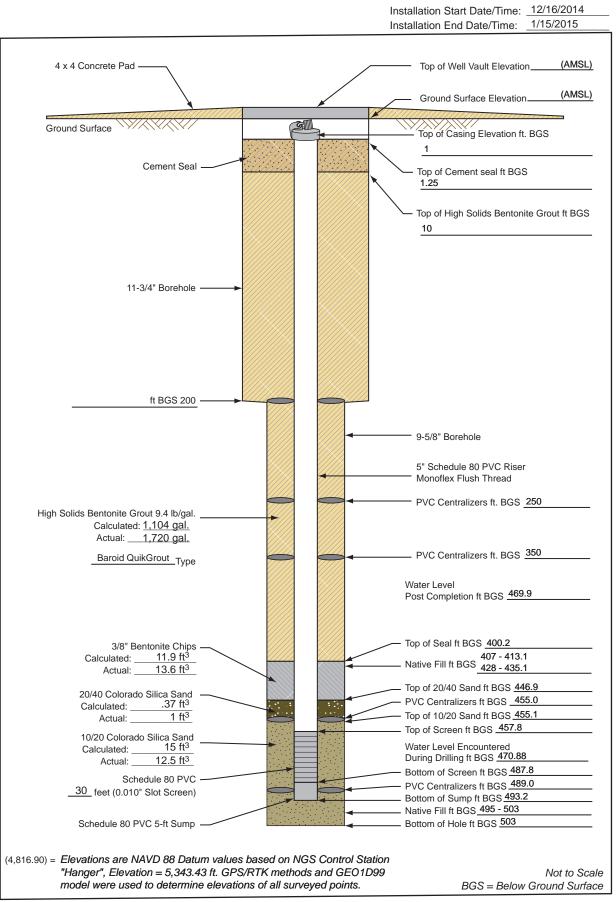
0		BI	)			Bore	ehol	le ID	: KAFB-	106222
Proj Proj	ect	Loc Nan	ation ne: I	: KAI (AFB	s of Engineers FB, Albuquerque, NM BFF SWMU ST-106 and SS-111	Hole Dia	meter	Lower	(in.): 11-3/4 (in.): 9-5/8 ype: Flush	
Date	e S	tarte D Re	d: 12 ache			Groundv ☑ At T	vater L ime of nd of I	evels E Drilling Drilling:		
Y Co X Co	oor	dinat dinat	e:	n AMS	L (ft): Not Recorded	Drilling N	ling Contractor: Yellow Jacket ing Method: ARCH ged By: M. Giles			Page 16 of 17
05 Depth (ft)	sample lype	Number	Headspace	Lithologic Log	Material Description		U.S.C.S.	W	ell Diagram	Remarks
450					Gravelly Lean CLAY (CL); light y brown (10YR 6/4); 60% soft to s clay, medium plasticity; 40% find coarse gravel, subangular, felds granite.	emi firm e to	CL		-	
455					Sandy SILT (ML); light brown (7 6/3); percentages unknown; coa medium grained sand.	.5YR arse to			- PVC Centralizer Top of 10/20 Sand - Top of 5" Schedule 80	Kelly down @ 1442. Resume @ 1502. Fines wash through strainer.
<u>160</u>					SILT (ML); light brown (7.5YR 6.	/3).	ML		PVC 0.010" Slot Screen	Very soupy returns.
465					Same as above (460 ft).					Very soupy returns.
470					Poorly graded SAND with Silt (S 90% sand; medium to fine grain medium grained is mostly clear fine grained is feldspar; 10% silt	ed; quartz;				Water table encountered @ 470.88' after 1 hour static reading.
475					<u>v</u>		SP- SM			Kelly down @ 1515. Stop @ 477' for 12/15/14.
480									* 	

KAFB\_BOREHOLE\_LOG - SHAW\_DRILLING.GDT - 1/29/15 15:04 - Z/KAFB BFFIGINTIKAFB\_PROJECTIKAFB\_BFF.GPJ

(	d	BI	)			Bore	ehol	e ID	: KAFB-	106222
Pro	oject	t Loc t Nan	ation ne: k	: KAF	s of Engineers FB, Albuquerque, NM BFF SWMU ST-106 and SS-111	Hole Dia	ameter	Lower	(in.): 11-3/4 (in.): 9-5/8 ype: Flush	
Da Da	te S te T	tarte D Re	d: 12 eache				ime of ind of I	Drilling Drilling:	GS (ft): : 476.85 470.88	
YO	Coor	d Eler dinat	te:	AMS	L (ft): Not Recorded	Drillling Drilling N Logged	<b>Method</b>	: ARC	ellow Jacket H	Page 17 of 17
8 Depth (ft)	Sample Type	Number	Headspace	Lithologic Log	Material Description		U.S.C.S.	We	ell Diagram	Remarks
	-				Well graded SAND (SW); 90% of medium grained sand; subround subangular; feldspar, quartz, min fine gravel; angular to subangula feldspar and quartz.	ded to ca; 10%	sw			
485	-			* * * * * * * * * * * * * * *	Silty SAND (ML); brown (7.5YR poorly graded, medium grained subrounded to subangular, mica Unable to determine percentage	sand, a, quartz.	ML		- Boltom of 5"	Fines washed through strainer.
490					Poorly graded GRAVEL (GP); 9 gravel, subangular to subrounde feldspar, quartz; 10% coarse ga sand, subangular, feldspar, mica quartz. Poorly graded SAND (SP); med	ed, ined a and /	GP		Schedule 80 PVC 0.010" Slot Screen PVC Centralizer - Sump	
	-				grained to fine grained sand; so coarse grained; quartz, mica and feldspar; occasional gravel; sub	me d	SP		- Bottom of Sump	
495	-				Sandy SILT (ML); brown (7.5YR unable to determine percentage Coarse to medium grained sand Decreased percentage of sand depth.	s. I.	ML			Returns run through strainer.
500									- Native Backfill	
505					TD = 503'			<u>187288</u>		Driller over-drilled to give potential heaving sands a place to fall back into. Used 100 gal from 477' to 503'. Add 500 gal to pull drill stem. Note: When bottom of sump is on bottom we have 10' of heaving sands inside borehole
510			J.,							borehole.

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# Monitoring Well Completion Diagram KAFB-106222



<sup>140705.</sup>CB020403.A1



Project Name: KAFB BFF		
Location: Kentucky St.		Well/Piez. No.: KAFB-106222
Personnel: V. Bracht, E. Pere	ez	Date Installed: 1/15/15
Date: 1/19/15 - 1/21/15		Csg. Diameter (I.D.): 5 "
Samplers: N/A		Total Depth (ft. bgs): 493.2
Method of Development:		
X Surging	X Bailing	X Pumping
X Original Development	Redevelopment	Other
Development Date: 1/19/15		
Depth to Water Before Deve	loping Well (ft. btoc): 470.96	
V=(B * r <sub>c</sub> <sup>2</sup> * L <sub>c</sub> * 7.48)+(B * (r <sub>w</sub>	$r_{c}^{2} - r_{c}^{2}$ ) * L <sub>s</sub> * Ø <sub>s</sub> * 7.48)+(H <sub>2</sub> O added	d during drilling/installation) = 1,743 gallons

Depth Purging From: 486 feet	Time Purging Begins: 1550, 1/19/15
Weather: Sunny, 40's	Screened Interval (ft bgs): 457.8 - 487.8
Equipment Nos.: pH Meter: YSI 650 MDS	EC Meter: YSI 650 MDS Turbidity Meter: HACH 21000Q

Equipment Decontaminated Prior to Development: Y X N

Describe: Steam Cleaned

Collected Sample of Water Added to Well: Y \_\_\_\_ N X Describe: N/A

Comment: Approximately 1,700 gallons of water added during drilling/well installation activities

		Water Level (ft	Volume Removed				Turbidity	
Date	Time	bgs)	(gal.)	Temp. (°C)	рН	EC (mS/cm)	(NTU)	Comments
1/19/2015	1025	470.96	0					Begin bailing. Water is muddy.
1/19/2015	1052		20					Begin swabbing.
1/19/2015	1120							Finish swabbing.
1/19/2015	1142							Begin bailing. Water is muddy.
1/19/2015	1152		35					Finish swabbing. Water is muddy.
1/19/2015	1550		35					Begin Pumping at 8 GPM.
1/19/2015	1600	NR*	100	18.71	7.98	0.496	>1000	Continue pumping. Water is brown.
1/19/2015	1610	NR*	200	18.51	7.92	0.492	1.61	Continue pumping. Water is cloudy.
1/19/2015	1620	NR*	250	18.73	7.96	0.495	28.9	Continue pumping. Water is slightly cloudy.
1/19/2015	1625	NR*	275	19.06	7.57			Stop pumping. End of day.

\* Water Level tape is stuck. Unable to collect readings. Notes:

Water Levels - Reported to the nearest 0.01 foot pH - Reading rounded to 0.1 pH units Water temperature - Reported to nearest 0.1 °C

°C = Degree Celsius

EC = Electric Conductivity

ft bgs = Feet Below Ground Surface ft btoc = Feet Below Top of Casing

gal. = Gallon

GPM = Gallons Per Minute

- I.D. = Inner Diameter N/A = Not Applicable
- NR = Not Recorded

NTU = Nephelometric Turbidity Unit

S/m = Seimens per Meter

Where:

B=3.14

 $\mathcal{O}_{s}$ = porosity of the sand pack r<sub>c</sub>= radius of the well casing and screen in feet

 $L_{c}\text{=}$  length of water column inside the casing and screen in feet

 $r_w$ = radius of the well bore in feet  $L_s$ = length of saturated portion of the sand pack in feet

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

Pg 1 of 4



## Well Development Record

Project: KAFB BFF

Project Number: 140705

Date: 1/19/15

Time Start: 1025, 1/19/2015

Well No: KAFB-106222

\_\_\_\_\_

\_\_\_\_\_

Samplers: N/A \_\_\_\_\_\_

Time Finish: 1002, 1/21/2015

Date	Time	Water Level (ft. bgs)	Volume Removed (gal.)	Temp. (°C)	рН	EC (mS/cm)	Turbidity (NTU)	Comments
1/20/2015	1040	470.74	275					Initial water level reading.
1/20/2015	1049	471.43	275	17.49	7.65	0.518	>1000	Begin pumping at 6 GPM. Pump set at 487 feet.
1/20/2015	1059	471.46	350	18.12	7.90	0.524	64.2	Continue pumping. Water is slightly cloudy.
1/20/2015	1109	471.85	425	18.28	7.79	0.526	9.61	Continue pumping. Water is clear.
1/20/2015	1119	471.70	475	17.50	7.82	0.525	30.5	Continue pumping. Water is slightly cloudy.
1/20/2015	1120		475					Stop pumping.
1/20/2015	1309	470.64	475					Initial water level reading.
1/20/2015	1313	471.32	475	18.31	8.00	0.534	151	Begin pumping at 8 GPM. Pump set at 479 feet.
1/20/2015	1323	471.32	525	19.07	7.95	0.541	4.00	Continue pumping. Water is clear.
1/20/2015	1333	471.34	625	19.31	7.89	0.533	0.91	Continue pumping. Water is clear.
1/20/2015	1343	471.37	725	19.21	7.86	0.531	0.76	Continue pumping. Water is clear.
1/20/2015	1353	471.37	775	19.13	7.85	0.532	0.62	Continue pumping. Water is clear.
1/20/2015	1403	471.37	825	19.22	7.84	0.532	0.25	Continue pumping. Water is clear.
1/20/2015	1413	471.37	900	19.13	7.84	0.532	0.88	Continue pumping. Water is clear.
1/20/2015	1423	471.37	950	19.09	7.85	0.534	0.42	Continue pumping. Water is clear.

Was well sampled after development? YES NO X

Sample Method: N/A

Sample Name: N/A

Analyses: N/A

Pg 2 of 4



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## Well Development Record

Project: KAFB BFF

Project Number: 140705

Date: 1/19/15

Time Start: 1025, 1/19/2015

Well No: KAFB-106222
Samplers: N/A
Checked By:
Time Finish: 1002, 1/21/2015

Date	Time	Water Level (ft. bgs)	Volume Removed (gal.)	Temp. (°C)	рН	EC (mS/cm)	Turbidity (NTU)	Comments
1/20/2015	1428		1000					Stop pumping.
1/20/2015	1525	470.66	1000					Initial water level reading.
1/20/2015	1530	471.36	1000	17.85	7.84	0.537	36.3	Begin pumping at 8 GPM. Pump set at 475 feet.
1/20/2015	1540	471.38	1050	19.15	7.84	0.543	9.47	Continue pumping. Water is clear.
1/20/2015	1550	471.38	1150	19.19	7.83	0.539	2.72	Continue pumping. Water is clear.
1/20/2015	1600	471.38	1250	18.94	7.86	0.538	0.89	Continue pumping. Water is clear.
1/20/2015	1610	471.39	1300	18.93	7.84	0.538	0.5	Continue pumping. Water is clear.
1/20/2015	1620	471.39	1375	18.88	7.86	0.539	0.47	Continue pumping. Water is clear.
1/20/2015	1630	471.41	1425	18.83	7.75	0.539	0.41	Continue pumping. Water is clear.
1/20/2015	1640	471.42	1475	18.74	7.84	0.539	0.34	Continue pumping. Water is clear.
1/20/2015	1643		1525					Stop pumping. End of day.
1/21/2015	0841	470.65	1525					Initial water level reading.
1/21/2015	0846	470.92	1525	15.06	6.51	0.513	61.6	Begin pumping at 8 GPM. Pump set at 487 feet.
1/21/2015	0856	471.29	1600	16.67	7.47	0.548	17.1	Continue pumping. Water is clear.
1/21/2015	0906	471.30	1675	15.87	7.59	0.549	3.30	Continue pumping. Water is clear.

Was well sampled after development? YES NO X

Sample Method: N/A

Sample Name: N/A

Analyses: N/A

Pg 3 of 4



Project: KAFB BFF

Project Number: 140705

Date: 1/19/15

Time Start: 1025, 1/19/2015

# Field Chemistry (cont'd) Water Volume

Well No: KAFB-106222
Samplers: N/A
Checked By:
Time Finish: 1002, 1/21/2015

Turkidity

Date	Time	Level (ft. bgs)	Removed (gal.)	Temp. (°C)	рН	EC (mS/cm)	Turbidity (NTU)	Comments
1/21/2015	0910		1750					Raise pump to 479 feet.
1/21/2015	0916	471.33	1750	15.55	7.03	0.545	1.73	Continue pumping. Water is clear.
1/21/2015	0926	471.34	1825	14.40	7.26	0.545	3.33	Continue pumping. Water is clear.
1/21/2015	0936	471.34	1875	15.24	7.73	0.544	0.78	Continue pumping. Water is clear.
1/21/2015	0946	471.34	1950	15.13	5.91	0.545	0.65	Continue pumping. Water is clear.
1/21/2015	0951	471.34	1975	15.05	7.79	0.545	0.71	Continue pumping. Water is clear.
1/21/2015	0956	471.33	2000	14.94	7.58	0.545	0.55	Continue pumping. Water is clear.
1/21/2015	1001	471.34	2025	15.03	7.75	0.546	0.74	Continue pumping. Water is clear.
1/21/2015	1002		2030					Finish pumping. Well development complete.

### Was well sampled after development? YES NO X

Sample Method: N/A

Sample Name: N/A

Analyses: N/A

Pg 4 of 4

# KAFB 106223

Pro Pro Da Da Da Gro Y (	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: 2/5/2015 Date TD Reached: 2/10/2015 Date Completed: 2/20/2015 Ground Elevation AMSL (ft): Not Recorded Y Coordinate: X Coordinate:						Borehole ID: KAFB-106223 Hole Diameter Upper (in.): 11-3/4 Hole Diameter Lower (in.): 9-5/8 Surface Completion Type: Flush Groundwater Levels BGS (ft): ☑ At Time of Drilling: 471.50 ☑ At End of Drilling: Not Recorded ☑ After Drilling: 470.59 Drilling Contractor: Yellow Jacket Drilling Method: ARCH Logged By: T. Richards						
, Depth (ft)	Sample Type	Number	Headspace	Lithologic Log	Material Description		U.S.C.S.		We	ll Diagram	Remarks		
0					No lithologic description (0.5 ft -	A: 10 ft).	<u>SPHA</u>	T		Top of Casing/Top of Cement Seal	Water jetted borehole from 0.5 ft to 9 ft. No lithologic description possible. Began drilling @ 1150 on 2/5/15.		
<u>10</u>					Well graded GRAVEL with Silt a (GW-GM); reddish yellow (5YR loose; 70% gravel to 3"; subrou rounded; 20% fine to medium s silt. Note: gravel is sandstone, f and mafics. Same as above (10 ft).	6/6); dry; nded to and; 10%				- Cement Seal	Hammering. No water added. PID - 0.0 ppm @ cyclone and breathing zone. No hammering. No water added. Kelly down @ 1155. New 20' connection @ 1205. No water added.		
<u>20</u>			L. Tanking		Same as above (10 ft); reddish (5YR 5/4); 70% gravel to 3"; any subrounded; 20% very fine to co sand; 10% silt.	gular to	GW- GM				PID - 0.0 ppm @ cyclone and breathing zone.		
<u>25</u> 30					Same as above (10 ft); reddish (5YR 5/4); 70% gravel to 3"; any subrounded; 20% very fine to co sand; 10% silt.	gular to					Very little hammering. No water added.		

KAFB\_BOREHOLE\_LOG - SHAW\_DRILLING.GDT - 3/18/15 12:02 - Z:/KAFB BFFIGINTIKAFB\_PROJECTIKAFB\_BFF.GPJ

	C	BI				Bore	eho	le ID	: KAFB-1	106223			
Pro Pro	ojec ojec	t Loc Nan	ation ne: k	: Káf (Afb i	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							
Da Da	ite S ite T	Starteo FD Re	d: 2/ ache	1407 5/2015 d: 2/1 2/20	5 10/2015	👤 At E	ime of	f Drilling	: 471.50 Not Recorded				
Y	Coo	d Elev rdinat rdinat	e:	n AMS	L (ft): Not Recorded	-	Contra Method	actor: Y d: ARC	ellow Jacket H	Page 2 of 18			
ଟି Depth (ft)	Sample Type	Number	Headspace PID	Lithologic Log	Material Description		U.S.C.S.	We	ell Diagram	Remarks			
35	_				Well graded GRAVEL with Silt a (GW-GM); reddish brown (5YR s loose; 70% gravel to 3"; angular subrounded; 20% very fine to co sand; 10% silt. Note: gravel is sandstone, feldspar, and mafics Same as above (30 ft).	5/4); dry; to barse			- Top of High Solids Bentonite Grout	PID - 0.0 ppm @ cyclone and breathing zone. No water added. Kelly down @ 1211. New 20' connection @ 1219.			
40	-				Same as above (30 ft).		GW-			Driller added 25 gallons of water. PID - 0.0 ppm @ cyclone and breathing zone.			
50	-				Same as above (30 ft). Same as above (30 ft).		GM		- High Solids Bentonite Grout	Driller added 25 gallons of water. Little hammering. PID - 0.0 ppm @ cyclone and breathing zone.			
55					Same as above (30 ft).					Kelly down @ 1231. New 20' connection @ 1241.			
60								••• ••• •••	•				

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	C	BI				Bore	eho	le I	D:	KAFB-1	06223	
Pro Pro	oject oject	t Loca t Nam	ation: ne: K	: Káf (AFB I	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						
Da Da	te S ite T	tartec D Rea	1: 2/ ache				ime of	f Drill Drillir	ing: ng:	471.50 Not Recorded		
Y	Coor	d Elev dinat	e:	n AMS	L (ft): Not Recorded	-	Contra Method	actor: d: Af	Ye RCH	llow Jacket	Page 3 of 18	
g Depth (ft)	Sample Type	Number	Headspace PID	Lithologic Log	Material Description		U.S.C.S.		Wel	l Diagram	Remarks	
65					Well graded GRAVEL with Silt a (GW-GM); reddish brown (5YR § loose; 70% gravel to 3"; angular subrounded; 20% very fine to co sand; 10% silt. Note: gravel is sandstone, feldspar, and mafics Same as above (60 ft).	5/4); dry; to parse					PID - 0.0 ppm @ cyclone and breathing zone. Driller added 25 gallons	
70					Same as above (60 ft).						of water. Little hammering. PID - 0.1 ppm @ cyclone and breathing zone.	
75	-				Same as above (60 ft).		GW- GM	<ul> <li>•</li> <li>•&lt;</li></ul>	<ul> <li>•</li> <li>•&lt;</li></ul>	- High Solids Bentonite Grout	Kelly down @ 1249. New 20' connection @ 1258.	
80					Same as above (60 ft).						PID - 0.0 ppm @ cyclone and breathing zone.	
85					Same as above (60 ft).						Driller added 25 gallons of water. Hammering.	
90								••	•••			

	2	BI				Bore	eho	le l	D:	KAFB-1	06223	
Pro Pro	ojec Djec	t Loca t Nam	ation ie: K	: KÁF (AFB I	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						
Da Da	te S te T	tartec D Rea	l: 2/s ache	1407 5/201 d: 2/1 2/20	5 10/2015	Groundwater Levels BGS (ft):						
YC	Cool	d Elev rdinate rdinate	e:	n AMS	L (ft): Not Recorded	-	Contra Method	actor: d: A	: Yell RCH	low Jacket	Page 4 of 18	
ଓ Depth (ft)	Sample Type	Number	Headspace PID	Lithologic Log	Material Description		U.S.C.S.		Well	Diagram	Remarks	
-	-				Well graded GRAVEL with Silt a (GW-GM); reddish brown (5YR 5 loose; 70% gravel to 3"; angular subrounded; 20% very fine to co sand; 10% silt. Note: gravel is sandstone, feldspar, and mafics	5/4); dry; to parse					PID - 0.3 ppm @ cyclone and 0.0 ppm @ breathing zone. Driller added 25 gallons of water.	
95	-				Same as above (90 ft).		GW-				Hammering. Kelly down @ 1312. New 20' connection @ 1324.	
<u>100</u>	-				Same as above (90 ft).		GM				PID - 0.0 ppm @ cyclone and breathing zone.	
<u>105</u>	-				Same as above (90 ft).				• •	- High Solids Bentonite Grout	Driller added 25 gallons of water.	
- - - -					Silty SAND (SM); light reddish bi (5YR 6/4); 85% very fine to coar 15% silt. Note: cuttings are mois driller adding water.	se sand;	SM		<ul> <li>•</li> <li>•&lt;</li></ul>		Driller added 25 gallons of water. Hammering. PID - 0.2 ppm @ cyclone	
-					Well graded SAND with Gravel (	(SW):					and 0.0 ppm @ breathing zone.	
<u>115</u>					reddish brown (5YR 5/3); 75% fi coarse sand; 25% gravel; round silt.	ne to	SW				Kelly down @ 1337. New 20' connection @ 1346. Hammering. Slow drilling.	
120	-				Same as above (113 ft).				· · · · · ·			

(	C	BI				Bore	eho	e I	D: KAFB-1	06223
Pr Pr	ojec ojec	t Loca Nam	ation ne: k	: KÁF (AFB	s of Engineers FB, Albuquerque, NM BFF SWMU ST-106 and SS-111	Hole Dia	ameter	Low	er (in.): 11-3/4 er (in.): 9-5/8 ı Type: Flush	
Da Da	ate S ate T	Started	l: 2/ ache			👳 At T	ime of Ind of	<sup>:</sup> Drilli Drillin	BGS (ft): ng: 471.50 g: Not Recorded .70.59	
Y	Cool	d Elev rdinat rdinat	e:	ו AMS	iL (ft): Not Recorded	Drillling Drilling I Logged	Method	1: AF		Page 5 of 18
Depth (ft)	Sample Type	Number	Headspace PID	Lithologic Log	Material Description		U.S.C.S.	,	Well Diagram	Remarks
	-				Well graded SAND with Gravel ( reddish brown (5YR 5/3); 75% fi coarse sand; 25% gravel; round silt.	ne to			•     •       •     •       •     •       •     •       •     •       •     •       •     •       •     •       •     •       •     •       •     •       •     •       •     •       •     •       •     •	Driller added 25 gallons of water. PID - 0.0 ppm @ cyclone and breathing zone.
125	-				Same as above (120 ft).		0.04		•       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •	Hammering. Slow drilling.
<u>130</u>	-				Same as above (120 ft).		SW		<ul> <li>•</li> <li>•&lt;</li></ul>	Driller added 25 gallons of water. PID - 0.0 ppm @ cyclone and breathing zone.
135	-				Same as above (120 ft).				<ul> <li>High Solids</li> <li>Bentonite</li> <li>Grout</li> </ul>	Kelly down @ 1358. New 20' connection @ 1408.
<u>140</u>					Well graded SAND with Silt (SW yellowish red (5YR 5/6); moist; 9 to coarse sand; 10% silt. Note: c are moist due to driller adding w	0% fine			•     •       •     •       •     •       •     •       •     •       •     •       •     •       •     •       •     •       •     •       •     •       •     •       •     •       •     •       •     •       •     •	Driller added 25 gallons of water. Hammering. PID - 0.0 ppm @ cyclone and breathing zone.
<u>145</u>	-				Same as above (138 ft).		SW- SM		•       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •	
150								••	••	

	C	BI				Bore	eho	le	D: KAFB-1	106223
Pro Pro	ojec ojec	t Loca t Nam	ation ne: K	: KAF	s of Engineers FB, Albuquerque, NM BFF SWMU ST-106 and SS-111	Hole Dia	amete	r Low	ber (in.): 11-3/4 ver (in.): 9-5/8 n Type: Flush	
Da Da	te S te T		d: 2/s ache	5/201 d: 2/ <i>1</i>		🕎 At T	ime o Ind of	f Drill Drilliı	ls BGS (ft): ling: 471.50 ng: Not Recorded 470.59	
YC	Cool	d Elev rdinate rdinate	e:	n AMS	L (ft): Not Recorded		Contra Methoo	actor: d: A	: Yellow Jacket RCH	Page 6 of 18
05 Depth (ft)	Sample Type	Number	Headspace PID	Lithologic Log	Material Description		U.S.C.S.		Well Diagram	Remarks
	-				Well graded SAND with Silt (SW yellowish red (5YR 5/6); 90% fin coarse sand; 10% silt. Note: cutt moist due to driller adding water	e to tings are			•     •       •     •       •     •       •     •       •     •       •     •       •     •       •     •       •     •       •     •       •     •       •     •       •     •       •     •       •     •       •     •	PID - 0.0 ppm @ cyclone and breathing zone.
155	-				Same as above (150 ft).		SW- SM		<ul> <li>•</li> <li>•&lt;</li></ul>	Kelly down @ 1417. New 20' connection @ 1425.
<u>160</u>	-				Same as above (150 ft); trace fir gravel. Same as above (150 ft).	ne			<ul> <li>•</li> <li>•&lt;</li></ul>	Driller added 25 gallons of water. Hammering. PID - 0.2 ppm @ cyclone and 0.0 ppm @ breathing zone.
<u>165</u>	-				Clayey SAND (SC); light reddish (5YR 6/4); 70% fine sand; 30% of Note: cuttings are moist due to o adding water.	clay.	SC		<ul> <li>High Solids</li> <li>Bentonite</li> <li>Grout</li> </ul>	Driller added 25 gallons of water.
170	-				Poorly graded SAND (SP); brow (7.5YR 5/4); 100% fine to mediu trace silt.				· · · · · · · · · · · · · · · · ·	PID - 0.0 ppm @ cyclone and breathing zone.
175	-				Same as above (168 ft). Same as above (168 ft).		SP		<ul> <li></li> <li></li></ul>	Kelly down @ 1437. End of 2/5/15. Total depth with 11-3/4" casing. Resumed drilling with
180	-							• • • • • • • •	• • • • • • • • • •	9-5/8" casing @ 1330 on 2/6/15. Driller added 25 gallons

	C	BI	Y			Bore	eho	le l	D: KAFB-	106223
Pro Pro	ojec ojec	ct Loca ct Nam	ation ne: k	: KAF	s of Engineers FB, Albuquerque, NM BFF SWMU ST-106 and SS-111	Hole Dia	ameter	r Low	er (in.): 11-3/4 er (in.): 9-5/8 n Type: Flush	
Da Da	te S ite T	Starteo FD Re	d: 2/ ache	5/2015	5 10/2015	🕎 At T	ime of	f Drilli Drillir	s BGS (ft): ing: 471.50 ig: Not Recorded i70.59	I
YO	Coo	d Elev ordinat ordinat	e:	1 AMS	L (ft): Not Recorded	Drillling ( Drilling N Logged I	/lethoo	d: AF		Page 7 of 18
8 Depth (ft)	Sample Type	Number	Headspace PID	Lithologic Log	Material Description		U.S.C.S.		Well Diagram	Remarks
185	_				Poorly graded SAND (SP); brown (7.5YR 5/4); 100% fine to mediun trace silt.					of water. Hammering. PID - 0.0 ppm @ cyclone and breathing zone.
190	-				Same as above (180 ft).		SP			Driller added 25 gallons of water. No hammering.
195	-				Same as above (180 ft).					PID - 0.0 ppm @ cyclone and breathing zone. No hammering.
100	-				Same as above (180 ft). Well graded SAND with Gravel (				- High Solids Bentonite Grout	Kelly down @ 1344. New 20' connection @ 1356.
200					brown (7.5YR 5/3); 85% fine to c sand; 15% gravel; rounded. Note cuttings are moist due to driller a water. Gravel is mafics. Poorly graded SAND with Silt (Sil	e: Idding	SW			PID - 0.1 ppm @ cyclone
00-	-   -   -				light brown (7.5YR 6/4); 90% fine medium sand; 10% silt. Note: cu are moist due to driller adding wa	e to ttings	05			and 0.0 ppm @ breathing zone.
205	-				Same as above (200 ft).		SP- SM			Driller added 25 gallons of water.
210								••	••	

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	C	BI	<b>N</b>			Bore	eho	le l	D: KAFB-1	106223
Pr Pr	ojec ojec	t Loca t Nam	ation: ne: K	: KAI (AFB	s of Engineers FB, Albuquerque, NM BFF SWMU ST-106 and SS-111	Hole Dia	ameter	Low	ber (in.): 11-3/4 ver (in.): 9-5/8 n Type: Flush	
Da	ite S ite T		d: 2/s ache	5/201 d: 2/		🕎 At T	ime of Ind of	f Drill Drilliı	ls BGS (ft): ling: 471.50 ng: Not Recorded 470.59	
Y	Cool	d Elev rdinat rdinat	e:	AMS	SL (ft): Not Recorded		Contra Method	actor: d: A	: Yellow Jacket RCH	Page 8 of 18
Depth (ft)	Sample Type	Number	Headspace PID	Lithologic Log	Material Description		U.S.C.S.		Well Diagram	Remarks
	_				Poorly graded SAND with Silt (S light brown (7.5YR 6/4); 90% find medium sand; 10% silt. Note: cu are moist due to driller adding w	e to ittings		· · · · · · · · · · · · · · · ·	•       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •	PID - 0.0 ppm @ cyclone and breathing zone.
215					Same as above (210 ft).		SP- SM		<ul> <li>•</li> <li>•&lt;</li></ul>	Kelly down @ 1405. New 20' connection @ 1415.
220	-				Same as above (210 ft); trace co sand.	oarse			<ul> <li>•</li> <li>•&lt;</li></ul>	No hammering. PID - 0.0 ppm @ cyclone and breathing zone.
225	-				Poorly graded SAND with Grave light brown (7.5YR 6/3); 80% fine medium sand; 20% fine gravel; i Note: cuttings are moist due to c adding water.	e to rounded.			- High Solids Bentonite Grout	Driller added 25 gallons of water.
230	_				Same as above (223 ft).			· · · · · · · · · · · · · · · · · · ·	• • • • • • • • • • • •	No hammering. PID - 0.1 ppm @ cyclone
					Same as above (223 ft).		SP		• • • • • • • • • • • • • •	and 0.0 ppm @ breathing zone.
235								<ul> <li>•</li> <li>•&lt;</li></ul>	<ul> <li>•</li> <li>•&lt;</li></ul>	Kelly down @ 1425. New 20' connection @ 1437.
240	-				Same as above (223 ft); 60% fin medium sand; 40% fine gravel; i	e to rounded.		<ul> <li>•</li> <li>•&lt;</li></ul>	• • • • • • • •	

	C	BI				Bore	eho	le II	D: KAFB-1	06223
Pro Pro	ojec ojec	t Loca t Nam	ation ne: k	: Káf (AFB I	s of Engineers FB, Albuquerque, NM BFF SWMU ST-106 and SS-111	Hole Dia	ametei	Lowe	er (in.): 11-3/4 er (in.): 9-5/8 Type: Flush	
Da Da	te S ite T	tarteo D Re	d: 2/ ache			👳 At T	ime of	f Drillin Drillin	BGS (ft): ng: 471.50 g: Not Recorded 70.59	
Y	Coor	d Elev dinat dinat	e:	n AMS	L (ft): Not Recorded	Drillling ( Drilling N Logged I	/lethoo	1: AR		Page 9 of 18
05 Depth (ft)	Sample Type	Number	Headspace PID	Lithologic Log	Material Description		U.S.C.S.	\ \	Well Diagram	Remarks
	-				Poorly graded SAND with Grave light brown (7.5YR 6/3); 60% fine medium sand; 40% fine gravel; i Note: cuttings are moist due to c adding water.	e to rounded.			•     •       •     •       •     •       •     •       •     •       •     •       •     •       •     •       •     •       •     •       •     •       •     •       •     •	PID - 0.3 ppm @ cyclone and 0.0 ppm @ breathing zone.
245	-				Same as above (240 ft); 80% fin medium sand; 20% fine gravel.	ie to			• • • • • • • • • • • • • • • •	No hammering.
250	-				Same as above (240 ft); 80% fin medium sand; 20% fine gravel.	ie to			• • • • • • • • • • • • • • • •	PID - 0.0 ppm @ cyclone and breathing zone. Driller added 25 gallons of water.
255	-				Same as above (240 ft); 80% fin medium sand; 20% fine gravel.	ie to	SP	<ul> <li>.</li> <li>.&lt;</li></ul>	- High Solids Bentonite Grout	Top seal on drill rig is leaking. Driller repairs. Kelly down @ 1441. New 20' connection. End of 2/6/15. Resumed drilling @ 1215 on 2/9/15.
<u>260</u>	-				Same as above (240 ft); 80% fin medium sand; 20% fine gravel.	ie to			•       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •	PID - 0.0 ppm @ cyclone and breathing zone.
265	-				Same as above (240 ft); 80% fin medium sand; 20% fine gravel.	ie to			•       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •	Driller added 25 gallons of water.
270								••• ••• •••	• • • • • •	Hammering, slow drilling.

#### . . . . . \_ \_ \_ \_

	C	BI				Bore	eho	le l	D: KAFB-1	06223
Pro Pro	ojec ojec	t Loca t Nam	ation ne: k	: KAF	s of Engineers FB, Albuquerque, NM BFF SWMU ST-106 and SS-111	Hole Dia	ametei	r Low	er (in.): 11-3/4 er (in.): 9-5/8 1 Type: Flush	
Da Da	ite S ite T	Started D Rea	l: 2/ ache			👳 At T	ime of	f Drilli Drillir	s BGS (ft): ing: 471.50 ig: Not Recorded 170.59	
Y	Cool	d Elev rdinate rdinate	e:	ו AMS	SL (ft): Not Recorded	Drillling Drilling I Logged	Nethod	d: AF		Page 10 of 18
05 Depth (ft)	Sample Type	Number	Headspace PID	Lithologic Log	Material Description		U.S.C.S.		Well Diagram	Remarks
				× × × ×	Poorly graded SAND with Grave light brown (7.5YR 6/3); 80% fin medium sand; 20% fine gravel; i	e to rounded.	SP	• • • • • • • •	• • • • • • • •	PID - 0.2 ppm @ cyclone and 0.0 ppm @ breathing zone.
<u>275</u> 280	-				Note: cuttings are moist due to c adding water. Well graded SAND with Gravel ( light brown (7.5YR 6/4); 75% fin- coarse sand; 25% fine to mediu rounded. Note: gravel is quartz a feldspar. Cuttings are moist due adding water. Same as above (272 ft).	(SW); e to m gravel; and			0       0         0       0	Kelly down @ 1230. New 20' connection @ 1240. PID - 0.0 ppm @ cyclone and breathing zone. Driller added 25 gallons of water. Hammering,
<u>285</u>	-				Same as above (272 ft).		SW		- High Solids Bentonite Grout	drilling is hard and slow.
<u>290</u>	-				Same as above (272 ft); higher percentage of coarse gravel to 1	I" <u>.</u>				Hammering. PID - 0.2 ppm @ cyclone and 0.0 ppm @ breathing zone.
<u>295</u>	-				Same as above (272 ft); higher percentage of coarse gravel to 1	I".			•       •         •       •	Kelly down @ 1250. New 20' connection @ 1300.
300								• • • • • • • •	<ul> <li>•</li> <li>•&lt;</li></ul>	Driller added 25 gallons of water.

	C	BI				Bore	eho	le I	D: KAFB-1	06223
Pro Pro	ojec ojec	t Loca t Nam	ation ne: k	: KÁF (AFB	s of Engineers FB, Albuquerque, NM BFF SWMU ST-106 and SS-111	Hole Dia	ametei	Lowe	er (in.): 11-3/4 er (in.): 9-5/8 Type: Flush	
Da Da	ite S ite T	Started D Rea	l: 2/ ache			👳 At T	ime of nd of	f Drilli Drillin	BGS (ft): ng: 471.50 g: Not Recorded 70.59	
Y (	Cool	d Elev rdinate rdinate	e:	n AMS	SL (ft): Not Recorded	Drillling Drilling N Logged	/lethoo	d: AF		Page 11 of 18
00 Depth (ft)	Sample Type	Number	Headspace PID	Lithologic Log	Material Description		U.S.C.S.	,	Well Diagram	Remarks
305					Well graded SAND with Gravel light brown (7.5YR 6/4); 75% fin coarse sand; 25% fine to mediu rounded. Note: gravel is quartz a feldspar. Cuttings are moist due adding water. Same as above (300 ft).	e to m gravel; and			•       •         •       •	PID - 0.0 ppm @ cyclone and breathing zone. Hammering.
<u>310</u>					Same as above (300 ft); coarse 1".	gravel to			<ul> <li>•</li> <li>•&lt;</li></ul>	PID - 0.0 ppm @ cyclone and breathing zone.
315	-				Same as above (300 ft); coarse 1".	gravel to	SW		<ul> <li>High Solids</li> <li>Bentonite</li> <li>Grout</li> </ul>	Kelly down @ 1313. New 20' connection @ 1322.
320	-				Same as above (300 ft); coarse 1".	gravel to			•     •       •     •       •     •       •     •       •     •       •     •       •     •       •     •       •     •       •     •       •     •       •     •       •     •       •     •       •     •	PID - 0.2 ppm @ cyclone and 0.0 ppm @ breathing zone.
325	-				Same as above (300 ft); coarse 1".	gravel to			•       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •	Driller added 25 gallons of water. Hammering.
330								•••	• • • • • •	

	C	BI				Bore	eho	le l	D:	KAFB-1	06223
Pro Pro	ojec ojec	t Loca t Nam	ation ne: k	: Káf (Afb i	s of Engineers FB, Albuquerque, NM BFF SWMU ST-106 and SS-111	Hole Dia	ametei	r Low	ver (İl	n.): 11-3/4 n.): 9-5/8 pe: Flush	
Da Da	te S te T	Started D Rea	d: 2/ ache	1407 5/201 d: 2/1 2/20	5 10/2015	Groundv ∑ At T ▼ At E ▼ At E	ime of nd of	f Drill Drillir	ing: 1g: l	471.50 Not Recorded	
Y (	Cool	d Elev rdinate rdinate	e:	n AMS	L (ft): Not Recorded	Drillling Drilling N Logged	/lethoo	d: Al	RCH		Page 12 of 18
05 Depth (ft)	Sample Type	Number	Headspace PID	Lithologic Log	Material Description		U.S.C.S.		Wel	l Diagram	Remarks
335					Well graded SAND with Gravel ( light brown (7.5YR 6/4); 75% fin- coarse sand; 25% fine to mediu rounded. Note: gravel is quartz a feldspar. Cuttings are moist due adding water. Same as above (330 ft).	e to m gravel; and	SW				PID - 0.0 ppm @ cyclone and breathing zone. Kelly down @ 1335. New 20' connection @ 1344.
340	-				Same as above (330 ft).						PID - 0.0 ppm @ cyclone and breathing zone.
345	-				Well graded GRAVEL with Sand light brown (7.5YR 6/4); loose; 7 gravel; rounded; 30% fine to me sand; trace silt. Note: gravel is q feldspar, and mafics.	0% dium				- High Solids Bentonite Grout	Hammering. Driller added 25 gallons of water.
350	-				Same as above (343 ft).		GW				PID - 0.3 ppm @ cyclone and 0.0 ppm @ breathing zone.
355	-				Same as above (343 ft).			<ul> <li></li> /ul>			Kelly down @ 1359. New 20' connection @ 1413.
360								•••	•••		

	C	RI				Bore	eho	le I	D:	KAFB-1	06223
Pro Pro	ojec ojec	t Loca t Nan	ation ne: k	: Káf (Afb i	s of Engineers B, Albuquerque, NM BFF SWMU ST-106 and SS-111	Hole Dia	ameter	r Low	er (in	n.): 11-3/4 n.): 9-5/8 pe: Flush	
Da Da	ite S ite T	Starteo D Re	d: 2/ ache	1407 5/2015 d: 2/1 2/20	5 10/2015	Groundv ∑ At T ▼ At E ▼ At E	ime of nd of	f Drill Drillir	ing: ng: N	471.50 Not Recorded	
Y	Coo	d Elev rdinat rdinat	e:	n AMS	L (ft): Not Recorded	Drillling ( Drilling N Logged I	<b>Nethoo</b>	l: Al	RCH	low Jacket	Page 13 of 18
g Depth (ft)	Sample Type	Number	Headspace PID	Lithologic Log	Material Description		U.S.C.S.		Well	Diagram	Remarks
500	-				Well graded GRAVEL with Sand light brown (7.5YR 6/4); loose; 7 gravel; rounded; 30% fine to coa sand; trace silt. Note: gravel is q feldspar, and mafics.	0% arse	GW				PID - 0.0 ppm @ cyclone and breathing zone.
365	-				Same as above (360 ft).	(	000				Driller added 25 gallons of water. Hammering.
370	-				Well graded SAND (SW); brown 5/3); 90% fine to coarse sand; 10 gravel. Note: cuttings are moist of driller adding water.	0% fine	SW				PID - 0.0 ppm @ cyclone and breathing zone. Driller added 25 gallons of water.
375	-				Lean Clay (CL); lense. Well graded SAND (SW); brown 5/3); 90% fine to coarse sand; 10 gravel. Note: cuttings are moist of driller adding water.	0% fine	SW			High Solids Bentonite Grout	Driller added 50 gallons of water. Kelly down @ 1440. New 20' connection @ 1450.
<u>380</u>	-				Poorly graded SAND with Silt (S brown (7.5YR 5/4); 90% fine san coarse sand; 10% silt.		SP- SM				PID - 0.0 ppm @ cyclone and breathing zone.
385					Silty SAND with Gravel (SM); bro (7.5YR 5/4); 70% very fine to fine 15% gravel; subrounded; 10% si clay.	e sand;	SM				Driller added 25 gallons of water.
390	-				Well graded SAND with Gravel ( brown (7.5YR 5/3); 70% fine to c sand; 30% fine gravel to 1.5"; tra	oarse	SW	* * * * * * * *			Driller added 25 gallons of water. Cuttings are very wet.

		BI	)			Bore	eho	le I	D: KAFB-1	06223
Pro Pro	ojec ojec	t Loca t Nam	ation ne: k	: Káf (Afb i	s of Engineers FB, Albuquerque, NM BFF SWMU ST-106 and SS-111	Hole Dia	ametei	Low	er (in.): 11-3/4 er (in.): 9-5/8 1 Type: Flush	
Da Da	te S te T	tarteo D Re	d: 2/ ache	1407 5/201 d: 2/1 2/20	5 10/2015	🕎 At T	Time of End of	f Drilli Drillin	s BGS (ft): ing: 471.50 ig: Not Recorded 170.59	
Y (	Coor	d Elev dinat	e:	n AMS	L (ft): Not Recorded	Drillling Drilling I Logged	Methoo	d: AF		Page 14 of 18
66 Depth (ft)	Sample Type	Number	Headspace PID	Lithologic Log	Material Description		U.S.C.S.		Well Diagram	Remarks
	-				Well graded SAND with Gravel ( brown (7.5YR 5/3); 70% fine to o sand; 30% fine gravel to 1.5"; tra	coarse		· · · · · · · · · · · · · · · · · · ·	•     •       •     •       •     •       •     •       •     •       •     •       •     •       •     •	PID - 0.0 ppm @ cyclone and breathing zone.
395	-				Same as above (390 ft).		sw		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	Driller added 25 gallons of water. Hammering. Slow drilling. Kelly down @ 1521. New 20' connection @ 1535.
400	-				Same as above (390 ft). Poorly graded GRAVEL with Sa	nd (GP);			•       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •	PID - 0.0 ppm @ cyclone and breathing zone.
405	-				brown (7.5YR 5/4); 60% fine to r gravel; 40% coarse sand; trace s Same as above (402 ft).	nedium			- High Solids Bentonite Grout	Driller added 25 gallons of water.
410	-				Same as above (402 ft).		GP		•       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •	Driller added 25 gallons of water. Very slow drilling.
415					Same as above (402 ft).			•       •         •       •	•       •         •       •	Driller added 25 gallons of water. Kelly down @ 1606. End of 2/9/15. Resumed drilling @ 0930 on 2/10/15.
420								•••	• • • • • •	

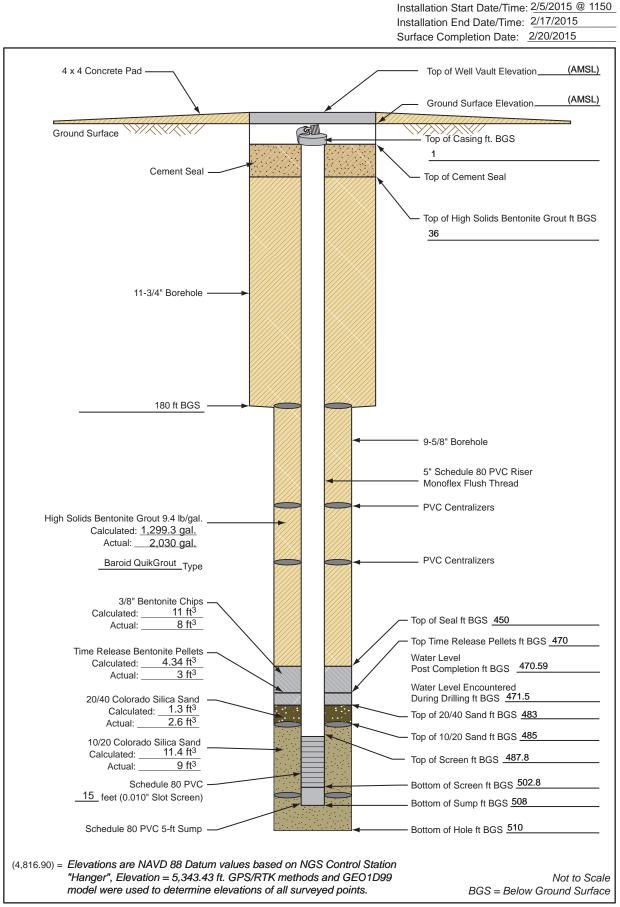
		BI				Bore	ehol	e I	D: KAFB-1	06223
Pro Pro	ojec ojec	t Loca t Nam	ation: ne: K	: Kaf (Afb i	s of Engineers FB, Albuquerque, NM BFF SWMU ST-106 and SS-111	Hole Dia	ameter	Lowe	er (in.): 11-3/4 er (in.): 9-5/8 ı Type: Flush	
Da Da	te S te T	tarteo D Re	d: 2/s ache			👳 At T	ime of ind of l	Drilli Drillin	BGS (ft): ng: 471.50 g: Not Recorded .70.59	
Y	Cooi	d Elev rdinat rdinat	e:	AMS	L (ft): Not Recorded	Drillling Drilling I Logged	Nethod	I: AF		Page 15 of 18
5 Depth (ft)	Sample Type	Number	Headspace PID	Lithologic Log	Material Description		U.S.C.S.		Well Diagram	Remarks
	_				Well graded SAND (SW); brown 4/3); 100% very fine to very coal trace fine gravel; trace silt. Note: are wet due to driller adding wat	rse sand; cuttings		· · · · · · · · · · ·	<ul> <li>•</li> <li>•&lt;</li></ul>	PID - 0.0 ppm @ cyclone and breathing zone.
425	-				Same as above (420 ft).			• • • • • • • • • • • • • •	<ul> <li>•</li> <li>•&lt;</li></ul>	Driller added 25 gallons of water. Slow drilling.
430	-				Same as above (420 ft).				•       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •	PID - 0.0 ppm @ cyclone and breathing zone. Driller added 50 gallons of water. Slow drilling.
435	-				Same as above (420 ft).		SW	<ul> <li>•</li> <li>•&lt;</li></ul>	<ul> <li>High Solids</li> <li>Bentonite</li> <li>Grout</li> </ul>	Cuttings are very wet from added water. Kelly down @ 1003. New 20' connection @ 1022.
440	-				Same as above (420 ft).				•       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •	PID - 0.0 ppm @ cyclone and breathing zone. Driller added 25 gallons
445	-				Same as above (420 ft).			<ul> <li>•</li> <li>•&lt;</li></ul>	•     •       •     •       •     •       •     •       •     •       •     •       •     •       •     •       •     •       •     •       •     •       •     •       •     •       •     •       •     •	of water.
450	-							<ul> <li>•</li> <li>•&lt;</li></ul>	• • • • • • • •	Driller added 25 gallons

	C	BI				Bore	ehol	e ID: KAFB-1	106223
P   P	rojec rojec	t Loca t Nam	ation ne: K	: KÁI (AFB	s of Engineers <sup>-</sup> B, Albuquerque,  NM BFF SWMU ST-106 and SS-111	Hole Dia	ameter	Upper (in.): 11-3/4 Lower (in.): 9-5/8 letion Type: Flush	
D	ate S ate T		d: 2/ ache	5/201 d: 2/1		⊥ At T ▼ At E	ime of nd of [	evels BGS (ft): Drilling: 471.50 Drilling: Not Recorded ng: 470.59	
Y	Coo	d Elev rdinat	e:	n AMS	SL (ft): Not Recorded	Drilling ( Drilling N	Contra /lethod	ctor: Yellow Jacket : ARCH Richards	Page 16 of 18
5 Denth (ft)		Num	Headspace PID	Lithologic Log	Material Description		U.S.C.S.	Well Diagram	Remarks
-10	-				Well graded SAND (SW); brown 4/3); 100% very fine to very coar trace fine gravel; trace silt. Note: are wet due to driller adding wat	se sand; cuttings	SW	`Top of Bentonite Seal	of water. PID - 0.0 ppm @ cyclone and breathing zone.
45	- 5 -				Poorly graded SAND with Silt (S light reddish brown (5YR 6/4); 90 fine to fine sand; trace gravel; 10 Note: cuttings are very wet due t adding water.	P-SM); 0% very 0% silt.			Kelly down @ 1058. New 20' connection @ 1108.
46	- - ) - -				Same as above (452 ft).		SP- SM		Driller added 25 gallons of water. PID - 0.0 ppm @ cyclone and breathing zone.
46	5				Same as above (452 ft).			- 5" Schedule 80 PVC Riser	Driller added 25 gallons of water.
47	<u> </u>				Well graded SAND with Silt (SW pinkish gray (5YR 6/2); 90% fine coarse sand; trace fine gravel; 1 <b>⊉</b> Same as above (467 ft).	to		- Top of Time Release Pellets	PID - 0.0 ppm @ cyclone and breathing zone.
47	5				Ϋ́.		SW- SM		
	-				Same as above (467 ft). Poorly graded SAND with Silt (S		00		Kelly down @ 1152. New 20' connection @ 1212.
48	0				dark reddish gray (5YR 4/2); wet fine to medium sand; trace fine g	; 90%	SP- SM		

		BI				Bore	ehol	e ID: KA	Borehole ID: KAFB-106223						
Pro Pro	oject oject	t Loca t Nam	ation: ie: K	: Káf (AFB	s of Engineers FB, Albuquerque, NM BFF SWMU ST-106 and SS-111	Hole Dia	meter	Upper (in.): 1 Lower (in.): 9 letion Type: Fl	9-5/8						
Da <sup>:</sup> Da	te S te T	t <b>Num</b> tartec D Rea comple	l: 2/! acheo	): 50 tecorded											
YC	Coor	d Elev dinate dinate	e:	AMS	L (ft): Not Recorded	Drilling ( Drilling N	▼ After Drilling: 470.59Drilling Contractor: Yellow JacketDrilling Method: ARCHLogged By: T. RichardsPage 17 of 18								
8 Depth (ft)	Sample Type	Number	Headspace PID	Lithologic Log	Material Description		U.S.C.S.	Well Diag	gram Remarks						
-	-				10% silt. Poorly graded SAND with Silt (S dark reddish gray (5YR 4/2); wet fine to medium sand; trace fine g	t; 90%	SP- SM	Ter of	PID - 0.0 ppm @ cycle and breathing zone.	one					
<u>485</u>					10% silt. Well graded SAND (SW); dark r gray (5YR 4/2); wet; 100% fine to sand; trace silt.	eddish o coarse	SW	- Top of Sand - Top of Sand	f 20/40 No water added. f 10/20						
- 490 -					Well graded SAND with Silt (SW dark reddish gray (5YR 4/2); wet fine to coarse sand; trace fine gr 10% silt.	t; 90%	SW- SM	- Top of Sched PVC 0 Slot So	dule 80 0.010"	one					
495					Poorly graded SAND (SP); pink 7/4); wet; dense; 97% fine to me sand; 3% silt. Same as above (492 ft).	(5YR :dium			Kelly down @ 1317. N 20' connection @ 132	Jew 7.					
- 500 -					Same as above (492 ft).		SP		No water added. PID - 0.0 ppm @ cycle and breathing zone.	one					
505					Same as above (492 ft).			- Bottom Screer - Sump	n Division de la company	ns					
510								- Botton Sump							

	C	BI				Borehole ID: KAFB-106223						
Pro Pro	ojec ojec	t Loca t Nam	ation ne: k	: KÁF (AFB I	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						
Da Da	ite S ite T	tarteo D Re	d: 2/ ache			Groundwater Levels BGS (ft): ∑ At Time of Drilling: 471.50 ▼ At End of Drilling: Not Recorded ▼ After Drilling: 470.59						
Y (	Cool	d Elev rdinat rdinat	e:	n AMS	L (ft): Not Recorded	Drilling N	Method	ictor: Yellow Jacket I: ARCH . Richards	Page 18 of 18			
10 Depth (ft)	Sample Type	Number	Headspace PID	Lithologic Log	Material Description		U.S.C.S.	Well Diagram	Remarks			
	-				Poorly graded SAND (SP); pink 7/4); wet; dense; 97% fine to me sand; 3% silt.	(5YR edium		Filter Pack	PID - 0.0 ppm @ cyclone and breathing zone.			
515	-				Same as above (510 ft).		SP	- Native Backfill	Driller added 25 gallons of water.			
520	-								Total depth = 520 ft. Reached total depth @ 1447 on 2/10/15.			
525	-											
530												
535	-											
540												

### Monitoring Well Completion Diagram KAFB-106223



140705.CB020403.A9



Project Name: KAFB BFF			
Location: Kentucky St.		Well/Piez. No.: KAFB-106223	
Personnel: R. Wortman		Date Installed: 2/17/15	
Date: 2/26/15		Csg. Diameter (I.D.): 5 "	
Samplers: N/A		Total Depth (ft. bgs): 508	
Method of Development: X Surging	X Bailing	X Pumping	
X Original Development	Redevelopment	Other	
Development Date: 2/26/15, 3/ Depth to Water Before Develop			
	2		

 $V = (B * r_{c}^{2} * L_{c} * 7.48) + (B * (r_{w}^{2} - r_{c}^{2}) * L_{s} * \phi_{s} * 7.48) + (H_{2}O \text{ added during drilling/installation}) = 1.087.41 \text{ gallons}$ 

Depth Purging From: 502.8 feet	Time Purging Begins: 1415, 2/26/15
Weather: Windy	Screened Interval (ft bgs): 487.8 - 502.8
Equipment Nos.: pH Meter: YSI 650 MDS	EC Meter: YSI 650 MDS Turbidity Meter: HACH 21000Q

Equipment Decontaminated Prior to Development: Y X N

Describe: Steam Cleaned Collected Sample of Water Added to Well: Y \_\_\_\_ N X Describe: N/A

Comment: Approximately 1,050 gallons of water added during drilling/well installation activities

Date	Time	Water Level (ft bTOC)	Volume Removed	Tomp (°C)	рH	EC (mS/cm)	Turbidity (NTU)	Comments
Date	Time	0100)	(gal.)	Temp. (°C)	рп	EC (m3/cm)	(010)	Comments
2/26/2015	1002	469.98	0					Begin bailing.
2/26/2015	1009	469.98	0					Continue bailing. Water is dark brown.
2/26/2015	1040		100	17.43	7.23	0.494	>1000	Finish bailing and begin swabbing.
2/26/2015	1100		100					Swab first 5 feet of screen.
2/26/2015	1123		100					Continue swabbing next 5 feet of screen.
2/26/2015	1140		100					Continue swabbing last 5 feet of screen.
2/26/2015	1200		100					Finish swabbing. Set up bailer.
2/26/2015	1205		100					Begin bailing.
2/26/2015	1220		135	17.83	7.75	0.514	>1000	Continue bailing.
2/26/2015	1233		190					Finish bailing.

Notes:

Water Levels - Reported to the nearest 0.01 foot pH - Reading rounded to 0.1 pH units Water temperature - Reported to nearest 0.1 °C °C = Degree Celsius EC = Electric Conductivity ft bgs = Feet Below Ground Surface ft btoc = Feet Below Top of Casing gal. = Gallon GPM = Gallons Per Minute I.D. = Inner Diameter N/A = Not Applicable NR = Not Recorded NTU = Nephelometric Turbidity Unit S/m = Seimens per Meter

Where: B=3.14

Øs= porosity of the sand pack

 $r_c$ = radius of the well casing and screen in feet

 $\mathsf{L}_\mathsf{c}\mathsf{=}\mathsf{length}$  of water column inside the casing and screen in feet

 $r_w$ = radius of the well bore in feet  $L_s$ = length of saturated portion of the sand pack in feet

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



Project: KAFB BFF

Project Number: 140705

Date: 2/26/15

Time Start: 1002, 2/26/2015

Well No: KAFB-106223

Samplers: N/A Checked By:

Time Finish: 1045, 3/2/2015

try (cont'd)	ield Chemistry (cont'd)											
Time	Water Level (ft. bTOC)	Volume Removed (gal.)	Temp. (°C)	рН	EC (mS/cm)	Turbidity (NTU)	Comments					
1257		190					Begin tripping in pipe.					
1409	470.01	190					Pump set at 501.8 feet.					
1415	470.61	200	16.73	7.83	0.526	>1000	Begin pumping at 4 GPM.					
1430	470.70	250	19.80	7.86	0.566	786	Continue pumping.					
1445	470.75	300	20.13	7.79	0.598	331	Continue pumping.					
1452							Stop pumping.					
1500	470.70	325	19.62	7.75	0.616	262	Resume pumping at 501.8 feet.					
1515	470.70	375	20.36	7.73	0.632	203	Continue pumping.					
1530	470.71	420	20.07	7.70	0.651	109	Continue pumping.					
1545	470.82	470	20.16	7.68	0.677	25.1	Continue pumping.					
1600	470.91	500	19.97	7.67	0.691	11.2	Continue pumping.					
1610	470.96	550	19.96	7.66	0.699	10.4	Continue pumping.					
1620	470.93	625	20.03	7.66	0.705	10.1	Continue pumping.					
1626							Stop pumping. End of day.					
	Time 1257 1409 1415 1430 1445 1452 1500 1515 1530 1545 1600 1610 1620	Water Level (ft. bTOC)           1257            1409         470.01           1415         470.61           1430         470.70           1445         470.75           1452            1500         470.70           1515         470.70           1515         470.70           1515         470.70           1516         470.70           1517         470.70           1518         470.70           1519         470.70           1510         470.70           1510         470.70           1520         470.70           1530         470.70           1545         470.82           1600         470.91           1610         470.96           1620         470.93	Water Level (ft. bTOC)         Volume Removed (gal.)           1257          190           1409         470.01         190           1409         470.01         200           1415         470.61         200           1430         470.70         250           1445         470.75         300           1452             1500         470.70         325           1515         470.70         375           1530         470.71         420           1545         470.82         470           1600         470.91         500           1610         470.93         625	Water Level (ft. bTOC)         Volume Removed (gal.)         Temp. (°C)           1257          190            1409         470.01         190            1415         470.61         200         16.73           1430         470.70         250         19.80           1445         470.75         300         20.13           1452              1500         470.70         325         19.62           1515         470.70         375         20.36           1530         470.71         420         20.07           1545         470.82         470         20.16           1600         470.91         500         19.97           1610         470.96         550         19.96           1620         470.93         625         20.03	Water Level (ft. bTOC)         Volume Removed (gal.)         Temp. (°C)         pH           1257          190             1409         470.01         190             1415         470.61         200         16.73         7.83           1430         470.70         250         19.80         7.86           1445         470.75         300         20.13         7.79           1452               1500         470.70         325         19.62         7.75           1515         470.70         375         20.36         7.73           1530         470.71         420         20.07         7.70           1545         470.82         470         20.16         7.68           1600         470.91         500         19.97         7.67           1610         470.96         550         19.96         7.66           1620         470.93         625         20.03         7.66	Water Level (ft. bTOC)Volume Removed (gal.)Temp. (°C) $pH$ EC (mS/cm)12571901409470.011901415470.6120016.737.830.5261430470.7025019.807.860.5661445470.7530020.137.790.59814521500470.7032519.627.750.6161515470.7037520.367.730.6321530470.7142020.077.700.6511545470.8247020.167.680.6771600470.9150019.977.670.6911610470.9655019.967.660.6991620470.9362520.037.660.705	Water Level (ft. bTOC)Volume Removed (gal.)Temp. (°C) $pH$ EC (mS/cm)Turbidity (NTU)12571901409470.011901415470.6120016.737.830.526>10001430470.7025019.807.860.5667861445470.7530020.137.790.59833114521500470.7032519.627.750.6162621515470.7037520.367.730.6322031530470.7142020.077.700.6511091545470.8247020.167.680.67725.11600470.9150019.977.670.69111.21610470.9655019.967.660.69910.41620470.9362520.037.660.70510.1					

Was well sampled after development? YES NO X

Sample Method: N/A

Sample Name: N/A

Analyses: N/A

Pg 2 of 3



Project: KAFB BFF

Project Number: 140705

Date: 2/26/15

Time Start: 1002, 2/26/2015

Well No: KAFB-106223

Samplers: N/A
Checked By:

Time Finish: 1045, 3/2/2015

Field Chemistry (cont'd)

		Water	Volume					
Date	Time	Level (ft. bTOC)	Removed (gal.)	Temp. (°C)	pН	EC (mS/cm)	Turbidity (NTU)	Comments
Date	THE	5100)	(gail)	Temp. ( 0)	pri		(1110)	Comments
3/2/2015	0845	469.98	625					Set pump at 501.8 feet.
3/2/2015	0850	469.89	625	17.88	7.06	0.667	6.22	Begin pumping at 3.7 GPM.
3/2/2015	0900	469.86	665	19.71	7.67	0.683	1.47	Continue pumping.
3/2/2015	0910	469.89	695	20.00	7.66	0.696	0.59	Raise pump to 487.9 feet.
3/2/2015	0920	470.98	750	20.17	7.53	0.736	2.55	Continue pumping.
3/2/2015	0930	470.97	780	19.90	7.67	0.719	1.04	Continue pumping.
3/2/2015	0940	470.98	805	20.09	7.65	0.723	0.38	Lower pump to 495.4 feet.
3/2/2015	0955	470.99	870	20.11	7.65	0.728	0.68	Continue pumping.
3/2/2015	1005	470.97	925	20.18	7.64	0.732	0.98	Continue pumping.
3/2/2015	1015	470.95	955	20.09	7.64	0.733	0.72	Continue pumping.
3/2/2015	1035	470.94	1030	20.35	7.60	0.736	0.30	Continue pumping.
3/2/2015	1045	470.99	1075	20.24	7.59	0.739	0.76	Finish pumping. Well development complete.
3/2/2015	1050							Start to pull pump and break down equipment.

Was well sampled after development? YES NO X

Sample Method: N/A

Sample Name: N/A

Analyses: N/A

# KAFB 106224

Projec Projec Projec Date S Date T Date T	t Loca t Nam t Num tarted D Re compl d Elev rdinat	ation ne: k nber: d: 4/ ache eted: vatior e:	: KAF (AFB 1407 17/20 d: 4/3 5/22	15 30/15	Borehole ID: KAFB-106224 Hole Diameter Upper (in.): 11-3/4 Hole Diameter Lower (in.): 9-5/8 Surface Completion Type: Flush Groundwater Levels BGS (ft):				
Oepth (ft) Sample Type	Number	Headspace PID	Lithologic Log	Material Description		U.S.C.S.	Well	Diagram	Remarks
-				Silty SAND with Gravel (SM); str brown (7.5YR 4/6); 50% fine to c sand; 25% fine gravel; subround rounded; 25% silt.	ong	EPHAI Road Base SM	T	Top of Casing/Top of Cement Seal	Start Drilling @ 1030 on 4/17/15 with 11 3/4" OD casing.
5				Silty GRAVEL with Sand (GM); s moist; 50% gravel to 3"; subangu subrounded; gravel is mafics and sandstone; 25% fine to coarse s 25% silt	ular to d	GM			
10				Well-graded SAND with Gravel ( 80% very fine to coarse sand; 20 gravel; subrounded to rounded. Well-graded SAND (SW); strong (7.5YR 5/8); 90% fine to coarse 10% fine gravel; rounded.	)% fine 1 brown	SW			PID = 0.0 ppm @ cyclone and breathing zone.
15				Well-graded GRAVEL with Silt a (GW-GM); yellowish red (5YR 5/ gravel to 3"; subrounded to roun gravel is mafics, sandstone, and 20% fine to medium sand; trace sand; 10% silt.	/6); 70% ded; I quartz;			- Cement Seal	No Hammering. No water added down hole.
20				Same as above (13 ft).		GW- GM			Kelly down @ 1048, new 20' connection @ 1057. PID = 0.0 ppm @ cyclone and breathing zone.
25				Same as above (13 ft).					No hammering. No water added down hole.

	C	BI				Borehole ID: KAFB-106224					
Pro Pro	ojec ojec	t Loc Nan	ation	: KÁI (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					
Da Da	ate S ate T	Starte ID Re	d: 4/ ache	1407 17/20 d: 4/3 5/22	15	⊥ At T ▼ At E	Time of End of	Levels BGS (ft): f Drilling: N/A Drilling: Not Recorded ng: 470.42			
Y	Coo	d Elev rdinat rdinat	e:	n AMS	L (ft): Not Recorded	Drilling Drilling	Contra Method	actor: National Drilling d: Air Rotary Casing H . Richards/ M. Giles	ammer Page 2 of 25		
ଟ Depth (ft)	Sample Type Number Headspace PID Lithologic Log				Material Description		U.S.C.S.	Well Diagram	Remarks		
35	-				Well-graded GRAVEL with Silt a (GW-GM); yellowish red (5YR 5, gravel to 3"; subrounded to roun gravel is mafics, sandstone, and 20% fine to medium sand; trace sand; 10% silt. Same as above (30 ft).	/6); 70% ided; I quartz;	GW-	- Cement Seal	<ul><li>PID = 0.0 ppm @ cyclone and breathing zone. Hammering.</li><li>No water added down hole.</li></ul>		
40	-				Same as above (30 ft).		GM	•     •     •       •     •     •       •     •       •     •       •     •       •     •       •     •       •     •       •     •       •     •       •     •       •     •       •     •       •     •       •     •       •     •       •     •       •     •       •     •       •     •       •     •	Kelly down @ 1124, new 20' connection @ 1133. PID = 0.1 ppm @ cyclone and 0.0 ppm @ breathing zone.		
45	-				Poorly graded SAND (SP); yello (5YR 4/6); 100% fine sand.	wish red	SP	- High Solids Bentonite Grout	Some hammering.		
50	-				Same as above (43 ft).				PID = 0.2 ppm @ cyclone and 0.0 ppm @ breathing zone.		
55					Well-graded SAND with Gravel strong brown (7.5YR 5/6); moist 75% very fine to very coarse sau fine gravel; subangular to subro gravel is mafics and quartz; 5% Same as above (52 ft).	to dry; nd; 20% unded;	SW		Some hammering. Kelly down @ 1154, new 20' connection @ 1202.		
60	]										

	C	RI				Bore	eho	le I	D: KAFB-′	106224	
Pi Pi	rojec rojec	t Loc Nan	ation: ne: K	: Káf (AFB	s of Engineers <sup>-</sup> 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: Flush					
D D	ate S ate T	<b>t Nun</b> Startee D Re Compl	d: 4/ <sup>,</sup> acheo	17/20 <sup>-</sup> d: 4/3	15	🕎 At T	ime of	<sup>f</sup> Drilli Drillin	s BGS (ft): ng: N/A ng: Not Recorded 170.42		
Y	Coo	d Elev rdinat rdinat	e:	AMS	L (ft): Not Recorded	Drillling Drilling	Contra Method	actor: d: Aii	National Drilling r Rotary Casing Hanards/ M. Giles	ammer Page 3 of 25	
9 Depth (ft)		Number	Headspace PID	Lithologic Log	Material Description		U.S.C.S.	,	Well Diagram	Remarks	
	-				Well-graded SAND with Gravel strong brown (7.5YR 5/6); moist 75% very fine to very coarse sar fine gravel; subangular to subro gravel is mafics and quartz; 5%	to dry; nd; 20% unded;				PID = 0.1 ppm @ cyclone and 0.0 ppm @ breathing zone.	
65	-				Same as above (60 ft).				•       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •		
70	- - ) -				Same as above (60 ft).				•       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •	PID = 0.2 ppm @ cyclone and 0.0 ppm @ breathing zone.	
75	5				Same as above (60 ft).		SW		- High Solids Bentonite Grout	Hammeirng. No water added down hole. Kelly down @ 1222, new 20' connection @ 1230.	
80	- ) -				Same as above (60 ft).				<ul> <li>•</li> <li>•&lt;</li></ul>	PID = 0.0 ppm @ cyclone and breathing zone.	
85	- - -				Same as above (60 ft).				•       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •		
90	- - )							<ul> <li>•</li> <li>•&lt;</li></ul>	<ul> <li>•</li> <li>•&lt;</li></ul>		

(	C	BI				Bore	eho	le I	D: KAFB-	106224		
Pr Pr	ojec ojec	t Loca	ation: ne: K	: Kaf (Afb i	s of Engineers FB, Albuquerque, NM BFF SWMU ST-106 and SS-111 205	Hole Diameter Upper (in.): 11-3/4 Hole Diameter Lower (in.): 9-5/8 Surface Completion Type: Flush						
Da Da	ate S ate T	Starteo	d: 4/ ache	17/20 <i>°</i> d: 4/3	15	🕎 At T	ime of Ind of	f Drill Drillir	ls BGS (ft): ing: N/A ng: Not Recordec 470.42	1		
Y	Coo	d Elev rdinat rdinat	e:	AMS	L (ft): Not Recorded	Drilling N	<b>Nethoo</b>	iA :b	National Drilling ir Rotary Casing H hards/ M. Giles	lammer Page 4 of 25		
g Depth (ft)		Number	Headspace PID	Lithologic Log	Material Description		U.S.C.S.		Well Diagram	Remarks		
	_				Well-graded SAND with Gravel strong brown (7.5YR 5/6); moist 75% very fine to very coarse sar fine gravel; subangular to subro gravel is mafics and quartz; 5%	to dry; nd; 20% unded;		<ul> <li>.</li> <li>.&lt;</li></ul>	· · · · · · · · · · · · · · · · · · ·	PID = 0.0 ppm @ cyclone and breathing zone. Hammering.		
95	5				Same as above (90 ft).					No water added down hole. Kelly down @ 1330, new 20' connection @ 1342.		
100	- - - -				Same as above (90 ft).					PID = 0.1 ppm @ cyclone and 0.0 ppm @ breathing zone.		
105	-				Same as above (90 ft).		SW	<ul> <li>•</li> <li>•&lt;</li></ul>	- High Solids Bentonite Grout			
110	_ ) _				Same as above (90 ft).					PID = 0.0 ppm @ cyclone and breathing zone.		
										Hammering.		
<u>115</u>	5	Same as above (90 ft).								No water added down hole to this depth. Kelly down @ 1401, new		
120	- - )							• • • • • •	• • • • • • • •	20' connection @ 1423.		

	C	BI				Bore	eho	le I	D: KAFB-	106224	
Pro	ojec ojec	US t Loca t Nam t Num	ation: e: K	KAF AFB E	s of Engineers B, Albuquerque, NM 3FF SWMU ST-106 and SS-111 05	Hole Diameter Upper (in.): 11-3/4 Hole Diameter Lower (in.): 9-5/8 Surface Completion Type: Flush					
Da Da	te S te T	tarted D Rea Comple	l: 4/ <sup>,</sup> acheo	17/201 d: 4/3	15 30/15	🕎 At T	ime of	f Drill Drillir	s BGS (ft): ing: N/A ng: Not Recorded 470.42		
Y	Cooi	d Elev rdinate rdinate	e:	AMS	L (ft): Not Recorded	Drilling I	Method	iA :b	National Drilling r Rotary Casing Ha hards/ M. Giles	ammer Page 5 of 25	
Depth (ft)	Sample Type	Number	Headspace PID	Lithologic Log	Material Description		U.S.C.S.		Well Diagram	Remarks	
					Well-graded SAND with Gravel of strong brown (7.5YR 5/6); moist 75% very fine to very coarse sar fine gravel; subangular to subrou gravel is mafics and quartz; 5%	to dry; nd; 20% unded;		· · · · · · · · · · · · ·	•       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •	PID = 0.1 ppm @ cyclone and 0.0 ppm @ breathing zone.	
125	-				Same as above (120 ft).			· · · · · · · · · · · · · · · · · · ·		Hammering.	
<u>130</u>	-				Same as above (120 ft).		SW			PID = 0.2 ppm @ cyclone and 0.0 ppm @ breathing zone.	
135	-				Same as above (120 ft).				- High Solids Bentonite Grout	Hammering. No water added down hole to this depth.	
140	-				Same as above (120 ft).					Kelly down @ 1445, new 20' connection @ 1505. PID = 0.1 ppm @ cyclone and 0.0 ppm @ breathing	
145	-				Lean CLAY with Sand (CL); yello red (5YR 4/6); low plasticity; moi clay; 15% fine sand; 5% fine gra rounded.	st; 80%				zone.	
150	-						CL		<ul> <li>•</li> <li>•&lt;</li></ul>		

	6		RI					Bore	eho	le	ID: KAFB-1	06224	
P	Proje Proje	ect ect	: Loca : Nam	ation: ie: K	: ł Af	≺A FB	s of Engineers <sup>-</sup> 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: Flush					
	)ate Date	St TI		l: 4/ <sup>,</sup> acheo	17/ d:	/20 4/		Groundwater Levels BGS (ft): ∑ At Time of Drilling: N/A ▼ At End of Drilling: Not Recorded ▼ After Drilling: 470.42					
Y	′ Co	or	l Elev dinate dinate	e:	A	MS	SL (ft): Not Recorded	Drilling Contractor: National Drilling Drilling Method: Air Rotary Casing Hammer Logged By: T. Richards/ M. Giles Page 6 of 25					
(#) qfue(1	Sample Type		Number	Headspace PID	Lithologic	Log	Material Description		U.S.C.S.		Well Diagram	Remarks	
	-						Lean CLAY with Sand (CL); yello red (5YR 4/6); low plasticity; moi clay; 15% fine sand; 5% fine gra rounded.	ist; 80%	CL	••• ••• ••• •••	• • • • • • • •	PID = 0.0 ppm @ cyclone and breathing zone. Hammering.	
15	5						SILT (ML); strong brown (7.5YR moist; 90% silt; 10% fine sand.	4/6);				No water added to this depth.	
16	0								ML			Kelly down @ 1531, new 20' connection @ 1541.	
	-					0 0	Same as above (153 ft).			· · · · · · · · · · · · · · · · · · ·		PID = 0.0 ppm @ cyclone and breathing zone.	
16	5						Well-graded SAND with Silt (SW yellowish red (5YR 4/6); 90% ve coarse sand; trace fine gravel; re 10% silt.	ry fine to	SW- SM		- High Solids Bentonite Grout		
17	0				••••		Poorly graded SAND (SP); mois	t; 90%			• • • • • •	PID = 0.2 ppm @ cyclone	
	-						very fine to fine sand; 5% fine gr rounded; 5% silt.				· · · · · · · · · · · · · · · · · · ·	and 0.0 ppm @ breathing zone. Hammering.	
17	5						Same as above (171 ft).		SP			No water added down hole to this depth.	
10										•       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •	• • • • • • • •	Kelly down @ 1557, new 20' connection @ 1605.	
18						·				••			

CBI							Borehole ID: KAFB-106224					
Pro Pro	oject oject	t Loca t Nam	ation: e: K	KAF	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						
Da <sup>:</sup> Da	te S te T	tartec D Rea	l: 4/ <sup>,</sup> acheo	17/201 d: 4/3	15	Groundwater Levels BGS (ft):						
YC	Coor	d Elev dinate	e:	AMS	L (ft): Not Recorded	Drilling Contractor: National Drilling Drilling Method: Air Rotary Casing Hammer Logged By: T. Richards/ M. Giles Page 7 of 25						
08 Depth (ft)	Sample Type	Number	Headspace PID	Lithologic Log	Material Description		U.S.C.S.		Well Diagram	Remarks		
-	-				Poorly graded SAND (SP); mois very fine to fine sand; 5% fine gr rounded; 5% silt.				· · · · · · · · · · · · · · · · · · ·	PID = 0.0 ppm @ cyclone and breathing zone.		
185	-				Same as above (180 ft).					Hammering.		
- 190 - -	-				Same as above (180 ft).					PID = 0.1 ppm @ cyclone and 0.0 ppm @ breathing zone.		
195	-				Same as above (180 ft).		SP		<ul> <li>High Solids</li> <li>Bentonite</li> <li>Grout</li> </ul>	No water added down hole to this depth.		
- 200 - - - 205					Poorly graded SAND with Grave strong brown (7.5YR 5/6); 65% f medium sand; trace coarse sand fine gravel; subangular to subro gravel is mafics and feldspar; 5%	ine to d; 30% unded;		•       •         •		Kelly down @ 1419, add added 10' connection to drive casing flush. Stop drilling for day on 4/17/15. Begin drilling with 9-5/8" OD casing at 1345 on 4/20/15.		
205	-				Poorly graded SAND (SP); pink 7/4); 100% fine sand.	(7.5YR			· · · · · · · · · · · · · · · · · · ·			

	C	BI				Borehole ID: KAFB-106224					
Pro Pro	ojec ojec	t Loca t Nam	ation ne: k	: KÁF (AFB I	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					
Da Da	ite S ite T	Starteo D Re	d: 4/ ache	1407 17/20 d: 4/3 5/22	15	Groundwater Levels BGS (ft):					
Y	Cool	d Elev rdinat rdinat	e:	National Drilling ir Rotary Casing Ha hards/ M. Giles	ammer Page 8 of 25						
0 Depth (ft)	Sample Type	Number	Headspace PID	Lithologic Log	Material Description		U.S.C.S.		Well Diagram	Remarks	
-	_				Poorly graded SAND (SP); mois very fine to fine sand; 5% fine gr rounded; 5% silt. Poorly graded SAND (SP); pink 7/4); 100% fine sand.	ravel;	SP		•     •       •     •       •     •       •     •       •     •       •     •       •     •       •     •	PID = 0.0 ppm @ cyclone and breathing zone.	
215					Lean CLAY with Sand (CL); rede brown (5YR 5/3); nonplastic to lo plasticity; 85% clay; 15% fine sa	w	CL		<ul> <li></li> /ul>	Kelly down @ 1405, new 20' connection. PID = 0.0 ppm @ cyclone and breathing zone.	
225	-				Poorly graded SAND (SP); brow (7.5YR 5/4); 100% fine sand; tra medium sand.		SP		- High Solids Bentonite Grout		
230					Well-graded SAND with Gravel light brown (7.5YR 6/4); 85% fin- coarse sand; 15% fine gravel; subangular to subrounded; grav mafics, quartz, and feldspar.	e to	SW		<ul> <li>•</li> <li>•&lt;</li></ul>		
235					Same as above (227 ft).				<ul> <li></li> /ul>	Kelly down @ 1430, new 20' connection @ 1436. Hammering.	

KAFB\_BOREHOLE\_LOG - SHAW\_DRILLING.GDT - 7/16/15 08:56 - Z\KAFB BFF\GINT\KAFB\_PROJECT\KAFB\_BFF.GPJ

	C	BI				Bore	eho	le I	D: KAFB-′	106224
Pro Pro	ojec ojec	t Loca t Nam	ation ne: K	Corp KAF AFB 1407	s of Engineers FB, Albuquerque, NM BFF SWMU ST-106 and SS-111	Hole Dia	ametei	r Low	er (in.): 11-3/4 er (in.): 9-5/8 n Type: Flush	
Da Da	ate S ate T	tarteo D Re	d: 4/ ache	17/20 d: 4/3	15	🕎 At T	ime of Ind of	f Drilli Drillin	s BGS (ft): ng: N/A lg: Not Recorded 170.42	
Y	Cool	d Elev rdinat rdinat	e:	AMS	L (ft): Not Recorded	Drilling I	Vethoo	d: Ai	National Drilling r Rotary Casing Ha nards/ M. Giles	ammer Page 9 of 25
5 Depth (ft)	Sample Type	Number	Headspace PID	Lithologic Log	Material Description		U.S.C.S.		Well Diagram	Remarks
	-				Well-graded SAND with Gravel light brown (7.5YR 6/4); 85% fin- coarse sand; 15% fine gravel; subangular to subrounded; grav mafics, quartz, and feldspar.	e to		• • • • • • • • • • • • • • • •		Hammering.
<u>245</u>	-				Same as above (240 ft).					
250	-				Same as above (240 ft).		SW			
255	_				Same as above (240 ft).				- High Solids Bentonite Grout	Kelly down @ 1500, new 20' connection @ 1506.
260	-				Same as above (240 ft).			· · ·         · · ·		
<u>265</u> 270	-				Poorly graded GRAVEL (GP); payellow (5Y 8/4); 85% fine gravel subangular to subrounded; grav mafics, quartzite, and granite; 10 sand; sand is quartz and biotite;	to 1/2"; el is )% fine	GP		•       •         •       •	

	C	BI				Bore	eho	le I	D: KAFB-′	106224
Pro Pro	ojec ojec	t Loca t Nam	ation ie: K	: Káf (Afb i	s of Engineers FB, Albuquerque, NM BFF SWMU ST-106 and SS-111	Hole Dia	ameter	Low	oer (in.): 11-3/4 /er (in.): 9-5/8 n Type: Flush	
Da Da	ate S ate T	Started D Rea	l: 4/ ache	1407 17/20 d: 4/3 5/22	15	👳 At T	ime of ind of l	<sup>r</sup> Drill Drillir	ls BGS (ft): ing: N/A ng: Not Recorded 470.42	
Y	Coo	d Elev rdinate rdinate	e:	n AMS	L (ft): Not Recorded	Drilling N	Nethod	iA :b	National Drilling ir Rotary Casing Ha hards/ M. Giles	ammer Page 10 of 25
02 Depth (ft)	Sample Type	Number	Headspace PID	Lithologic Log	Material Description		U.S.C.S.		Well Diagram	Remarks
275	_				Well-graded SAND with Gravel of pale yellow (5Y 8/4); 60% fine to sand; subrounded; sand is quark mafics; 35% fine gravel to 3/4"; a to subrounded; gravel is mafics sandstone; 5% silt.	coarse z and angular	SW		· · · · · · · · · · · · · · · · · · ·	
210	-				Poorly graded SAND with Silt (S pale yellow (5Y 8/4); 85% fine sa trace medium and coarse sand; quartz; 5% fine gravel; subround gravel is mafics; 10% silt.	and; sand is				
<u>280</u>	-				Same as above (275 ft).					
285	-				Same as above (275 ft).		SP- SM	· ·	<ul> <li>High Solids</li> <li>Bentonite</li> <li>Grout</li> </ul>	
<u>290</u>	-				Same as above (275 ft).					
<u>295</u> 300	-				Poorly graded SAND (SP); light yellowish brown (2.5YR 6/3); 90' and coarse sand; trace medium subangular; fine sand is quartz; sand is mafics and granite; 5% f gravel to 3/8"; gravel is mafics a granite; 5% silt.	sand; coarse ine	SP			

	C	BI	Ŋ			Bore	eho	le I	D: KAFB-1	06224
Pro Pro	ojec ojec	t Loca t Nan	ation ne: k	: KÁF (AFB I	s of Engineers FB, Albuquerque, NM BFF SWMU ST-106 and SS-111	Hole Dia	ameter	r Low	er (in.): 11-3/4 er (in.): 9-5/8 1 Type: Flush	
Da Da	ite S ite T	Starteo D Re	d: 4/ ache	1407 17/20 d: 4/3 5/22	15 30/15	🕎 At T	ime of	f Drill Drillir	s BGS (ft): ing: N/A ng: Not Recorded 170.42	
Y (	Coo	d Elev rdinat rdinat	e:	ו AMS	L (ft): Not Recorded	Drilling I	Metho	d: Ai	National Drilling r Rotary Casing Ha nards/ M. Giles	ammer Page 11 of 25
60 Depth (ft)	Sample Type	Number	Headspace PID	Lithologic Log	Material Description		U.S.C.S.		Well Diagram	Remarks
	-				Poorly graded SAND (SP); light yellowish brown (2.5Y 6/4); 95% sand; subangular; sand is quart silt.	fine		• • • • • • • • • • • • • • • •		
305	-				Same as above (300 ft).			· · · · · · · · · · · · ·	<ul> <li>•</li> <li>•&lt;</li></ul>	
310	-				Same as above (300 ft).				<ul> <li>•</li> <li>•&lt;</li></ul>	
315	-				Same as above (300 ft); trace co sand; sand is quartzite and mafi	oarse cs.	SP		- High Solids Bentonite Grout	
320					Same as above (300 ft).					
325					Same as above (300 ft).					
330								• • • • • •	• • • • • •	

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	C	BI	S			Bore	eho	le l	ID: KAFB-1	06224
Pr Pr	ojec ojec	t Loca	ation ne: K	: KAF	s of Engineers FB, Albuquerque, NM BFF SWMU ST-106 and SS-111	Hole Dia	mete	r Low	ber (in.): 11-3/4 ver (in.): 9-5/8 n Type: Flush	
Da Da	te S ate T	Starteo	l: 4/ ache	17/20 d: 4/3	15	👳 At T	ime o <sup>.</sup> nd of	f Drill Drilliı	ls BGS (ft): ling: N/A ng: Not Recorded 470.42	
Y	Coo	d Elev rdinat rdinat	e:	AMS	SL (ft): Not Recorded	Drilling N	/letho	d: A	: National Drilling ir Rotary Casing Ha hards/ M. Giles	Ammer Page 12 of 25
05 Depth (ft)	Sample Type	Number	Headspace PID	Lithologic Log	Material Description		U.S.C.S.		Well Diagram	Remarks
335	_				Poorly graded SAND with Grave light yellowish brown (2.5Y 6/3); fine sand; trace medium and coa sand; subangular; sand is quartz fine gravel to 3/4"; subrounded; g mafics and quartzite; 5% silt.	65% arse z; 30%	SP			
340	-				Poorly graded GRAVEL with Sar light yellowish brown (2.5Y 6/4); fine gravel to 1/2"; angular to subangular; gravel is mafics, gra and quartzite; 25% fine sand; subangular; sand is quartz; 5% s	70%	GP		<ul> <li>•</li> <li>•&lt;</li></ul>	
345	-			<u>~ U</u>	Poorly graded SAND with Grave light yellowish brown (2.5Y 6/4); fine sand; subangular; sand is qu 40% gravel; angular to subround to elongated shape; gravel is ma silt.	55% uartz; led; flat		- · · · · · · · · · · · · · · · · · · ·	<ul> <li>•</li> <li>•&lt;</li></ul>	
545	-				Poorly graded SAND (SP); light yellowish brown (2.5Y 6/4); 95% medium sand; subangular; sand quartz; 5% silt.				<ul> <li>High Solids</li> <li>Bentonite</li> <li>Grout</li> </ul>	
350	-				Same as above (345 ft).		SP		<ul> <li>•</li> <li>•&lt;</li></ul>	
355	-				Same as above (345 ft).				<ul> <li>•</li> <li>•&lt;</li></ul>	
360								••	••	

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		BI				Bore	eho	le l	D: KAFB-1	106224
Pro Pro	ojec ojec	t Loca t Nam	ation ne: K	: KAF	s of Engineers FB, Albuquerque, NM BFF SWMU ST-106 and SS-111	Hole Dia	ametei	r Low	er (in.): 11-3/4 er (in.): 9-5/8 1 Type: Flush	
Da Da	te S te T	Starteo D Re	d: 4/ ache	1407 17/20 d: 4/3 5/22	15	👳 At T	ime of nd of	f Drilli Drillir	s BGS (ft): ing: N/A ng: Not Recorded 170.42	
Y	Cool	d Elev rdinat rdinat	e:	n AMS	SL (ft): Not Recorded	Drilling N	<b>Nethoo</b>	d: Ai	National Drilling r Rotary Casing Ha nards/ M. Giles	ammer Page 13 of 25
8 Depth (ft)	Sample Type	Number	Headspace PID	Lithologic Log			U.S.C.S.		Well Diagram	Remarks
365 370 375 380 385					Poorly graded SAND with Grave pale yellow (2.5Y 8/4); 50% fine subangular; fine sand is quartz; coarse sand; subangular to subr coarse sand is mafics; 45% fine to 1/2"; subangular to subrounde gravel is mafics and granite; 5% Poorly graded SAND with Grave light yellowish brown (2.5Y 6/3); medium sand; trace fine and coa sand; angular to subangular; sar quartz, mafics, and granite; 15% angular to subrounded; gravel is quartzite and mafics; 5% silt. Poorly graded SAND (SP); light yellowish brown (2.5Y 6/3); 95% medium sand; trace coarse sand subangular; sand is quartz, quar and granite; 5% fine gravel to 3/8 gravel is quartz and granite; 5% Poorly graded SAND with Grave brown (10YR 5/3); 60% fine sand medium and coarse sand; suba subrounded; sand is quartz, maf granite; 35% fine gravel to 3/8"; mafics, quartzite, and granite; 59 Same as above (375 ft).	sand; trace ounded; gravel ed; silt. I (SP); 80% arse nd is gravel; fine to d; tzite, 8"; silt. I (SP); d; trace ngular to ics, and gravel is % silt.	SP		- High Solids Bentonite Grout	
390								••	• •   • •   • •	

(	C	BI				Bore	eho	le	ID: KAFB-1	06224
Pr Pr	ojec ojec	t Loca t Nam	ation ne: k	: KAF	s of Engineers FB, Albuquerque, NM BFF SWMU ST-106 and SS-111	Hole Dia	mete	r Lov	per (in.): 11-3/4 ver (in.): 9-5/8 n Type: Flush	
Da Da	ite S ite T	Started D Rea	d: 4/ ache	1407 17/20 d: 4/3 5/22	15	👳 At T	ime o <sup>.</sup> nd of	f Dril Drilli	els BGS (ft): ling: N/A ng: Not Recorded 470.42	
Y	Cooi	d Elev rdinate rdinate	e:	n AMS	L (ft): Not Recorded	Drilling N	/letho	d: A	: National Drilling ir Rotary Casing Ha hards/ M. Giles	mmer Page 14 of 25
06 Depth (ft)	Sample Type	Number	Headspace PID	Lithologic Log	Material Description		U.S.C.S.		Well Diagram	Remarks
395					Poorly graded GRAVEL with Sat light brownish gray (10YR 6/2); & gravel to 1/2"; subangular; grave mafics, granite, and quartzite; 1& to coarse sand; subangular; san quartz; 5% silt. Same as above (390 ft).	30% fine el is 5% fine	GP			
<u>400</u> 405	-				Poorly graded SAND with Grave light brownish gray (10YR 6/2); 6 sand; trace coarse sand; subang sand is quartz, quartzite, and ma 35% fine gravel to 3/8"; subangu subrounded; gravel is mafics an granite; 5% silt.	50% fine gular; afics; ılar to				
	-				Same as above (400 ft); very pa (10YR 7/3); 35% coarse gravel; subrounded.	le brown			<ul> <li>High Solids</li> <li>Bentonite</li> <li>Grout</li> </ul>	
410					Poorly graded SAND with Grave pale yellow (2.5Y 7/4); 80% fine trace medium and coarse sand; quartz and mafics; 15% fine grav 3/4"; gravel is mafics and quartz silt.	sand; sand is vel to	SP		<ul> <li>•</li> <li>•&lt;</li></ul>	
415					Same as above (410 ft).				<ul> <li>•</li> <li>•&lt;</li></ul>	
420								••	••	

	C	BI	Ŋ			Bore	eho	le l	D: KAFB-1	106224
Pr Pr	ojec ojec	t Loca t Nam	ation ne: k	: KÁF (AFB I	s of Engineers FB, Albuquerque, NM BFF SWMU ST-106 and SS-111	Hole Dia	ametei	r Low	er (in.): 11-3/4 er (in.): 9-5/8 1 Type: Flush	
Da Da	ite S ite T	tarteo D Re	d: 4/ ache	1407 17/20 d: 4/3 5/22	15	🕎 At 1	Time of End of	f Drilli Drillir	s BGS (ft): ing: N/A ng: Not Recorded 170.42	
Y	Сооі	d Elev rdinat rdinat	e:	ו AMS	L (ft): Not Recorded	Drilling I	Metho	d: Ai	National Drilling r Rotary Casing Ha nards/ M. Giles	ammer Page 15 of 25
5 Depth (ft)	Sample Type	Number	Headspace PID	Lithologic Log	Material Description		U.S.C.S.		Well Diagram	Remarks
	_				Poorly graded SAND with Grave pale yellow (2.5Y 7/4); 80% fine trace medium and coarse sand; quartz and mafics; 15% fine grav 3/4"; gravel is mafics and quartz silt.	sand; sand is vel to		• • • • • • • • • • • • • • • •		
425	-				Same as above (420 ft); 75% fin trace medium and coarse sand; fine gravel to 3/4".					
430	-				Same as above (420 ft).		SP	•     •       •     •       •     •       •     •       •     •       •     •       •     •       •     •       •     •       •     •       •     •       •     •       •     •       •     •       •     •       •     •       •     •       •     •       •     •	•       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •	
<u>435</u>					Same as above (420 ft).				- High Solids Bentonite Grout	
440	-				SILT (ML); reddish yellow (7.5Yf hard; 100% silt.	R 6/6);	ML			
<u>445</u> 450					Poorly graded SAND (SP); pink 8/4); 95% fine sand; subangular quartz; 5% silt.		SP			End of ARCH drilling @ 450 ft.

(	C	BI	)			Bore	eho	le l	ID: KAFB-1	106224-Sonic
Pro Pro	ojeo ojeo	ct Loca ct Nam	ation ne: K	: KAF	s of Engineers FB, Albuquerque, NM BFF SWMU ST-106 and SS-111	Hole Dia	metei	Low	ber (in.): 11-3/4 ver (in.): 9-5/8 n Type: Flush	
Da Da	ate S ate T	<b>ct Nun</b> Starteo TD Re Compl	d: 4/ ache	17/20 <i>°</i> d: 4/3	15 30/15	👳 At T	ime of nd of	f Drill Drilliı	ls BGS (ft): ling: N/A ng: Not Recorded 470.42	
Y	Coo	nd Elev ordinat ordinat	e:	n AMS	L (ft): Not Recorded		/lethoo	d: S	: National Drilling onic Coring Buerkle	Page 16 of 25
65 Depth (ft)	Sample Type	Number	Headspace PID	Lithologic Log	Material Description		U.S.C.S.		Well Diagram	Remarks
	-				No Recovery.			· · · · · · · · ·	• • • • • • • • •	Begin Sonic coring @ 450 ft.
	-				Clayey SAND (SC); brown (7.5Y dry, dense; 60% fine sand; trace gravel; 40% clay.	(R 5/4); fine	SC		• • • • • • • • • • • • • •	@ 451.5 ft clay is in lenses.
	-				Silty SAND (SM); brown (7.5YR dry; dense; 80% fine sand; 5% fi gravel; 10% silt; 5% clay.	ine	SM	<ul> <li>•</li> <li>•&lt;</li></ul>	<ul> <li>•</li> <li>•&lt;</li></ul>	
455					Clayey SAND (SC); brown (7.5Y dry; dense; 70% fine sand; 10% coarse gravel to 3 cm; subangula subrounded; 10% clay; 10% silt.	fine to ar to	SC	· · · · · · · · · · · · · · · · · · ·	<ul> <li>High Solids</li> <li>Bentonite</li> <li>Grout</li> </ul>	@ 454.5 ft gravel is sandstone and mafics.
	_				Silty SAND (SM); brown (7.5YR dry; dense; 80% fine sand; 5% c gravel to 3 cm; angular to subrou 15% silt.	oarse	SM		<ul> <li>•</li> </ul>	@ 456 ft gravel is quartzite and mafics.
					Well-graded SAND with Gravel ( brown (7.5YR 5/4); dry; dense; 7		SW	•••	• •	@ 459 ft gravel is quartzite, mafics, and
460	-				to coarse sand; 20% fine to coar gravel to 3 cm; angular to subrou 5% silt. Silty SAND (SM); brown (7.5YR dry; very dense; 85% fine to med sand; 15% silt. Poorly graded SAND (SP); brow (7.5YR 4/3); moist; loose; 90% fi medium sand; trace coarse sand fine gravel; 5% silt; trace clay. @ 462.5 ft. Same as above (460 fine to medium sand; 5% silt.	5/4); 5/4); dium ne to d; 5% 0 ft); 95%	SM		<ul> <li>v</li> <li>v&lt;</li></ul>	<ul> <li>@ 460 to 465 ft, 30 gallons of water added.</li> <li>@ 463.5 ft, soil is wet.</li> </ul>
465					@ 464.4 ft. See description on n page.	exi	SM	••• ••• •••	• • • • • •	

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Cli	ent <sup>.</sup>									106224-Sonic
Pro	oject oject	t Loca t Nam	ation ne: K	: KAF	s of Engineers FB, Albuquerque, NM BFF SWMU ST-106 and SS-111	Hole Dia	meter	Low	er (in.): 11-3/4 er (in.): 9-5/8 n Type: Flush	
Da Da	te S te T	tarteo D Re	d: 4/ ache	17/20 <sup>-</sup> d: 4/3	15	🕎 At T	ime of nd of l	f Drilli Drillin	s BGS (ft): ng: N/A ig: Not Recorded 170.42	
YC	Coor	d Elev rdinat rdinat	e:	n AMS	L (ft): Not Recorded		lethoo	d: So	National Drilling onic Coring Buerkle	Page 17 of 25
5 Depth (ft)	Sample Type	Number	Headspace PID	Lithologic Log	Material Description		U.S.C.S.	,	Well Diagram	Remarks
-	_				Silty SAND (SM); brown (7.5YR wet; loose; 85% fine to medium s 15% silt.		SM		•       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •	
-	-				Poorly graded SAND (SP); brown (7.5YR 4/3); wet; loose; 100% fir medium sand.		SP	• • • • • • • • • •		
470					Silty SAND with Gravel (SM); bro (7.5YR 4/3); wet; medium dense fine to medium sand; trace coars	; 65% se sand;	SM	•••	• • • • • •	@ 469 ft gravel is quartzite and mafics.
-					15% fine gravel to 1.5 cm; subar subrounded; 20% silt. Well-graded SAND with Gravel ( brown (7.5YR 5/3); wet; loose; 7 to coarse sand; 20% fine to coarse	SW); 5% fine se	SW		<ul> <li>- High Solids</li> <li>Bentonite</li> <li>Grout</li> </ul>	@ 470 ft gravel is quartzite and granite.
-	-				gravel to 4 cm; subrounded; 5% Clayey GRAVEL with Sand (GC) (7.5YR 5/3); wet; medium dense fine to coarse gravel to 8 cm; sub to subrounded; 30% fine to coars 10% clay; 5% silt.	; brown ; 55% bangular	GC			@ 471.8 ft gravel is quartzite, granite, and mafics.
475	-			¢	Poorly graded SAND (SP); brown (7.5YR 5/3); wet; loose; 95% fine 5% silt.				•       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •	
480	-				<ul> <li>@ 476.3 ft. Same as above (474 95% fine to medium sand.</li> <li>@ 476.9 ft. Same as above (474</li> </ul>	,	SP		-       -         -       -         -       -         -       -         -       -         -       -         -       -         -       -         -       -         -       -         -       -         -       -         -       -         -       -         -       -         -       -         -       -         -       -         -       -	

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(	C	BI				Bore	ehol	le I	D: KAFB-1	06224-Sonic
Pr Pr	ojeo ojeo	ct Loca ct Nam	ation ie: k	: Káf (AFB I	s of Engineers FB, Albuquerque, NM BFF SWMU ST-106 and SS-111	Hole Dia	ameter	Low	er (in.): 11-3/4 er (in.): 9-5/8 n Type: Flush	
Da Da	ate s ate	<b>ct Num</b> Startec TD Rea Comple	l: 4/ ache	17/20 <i>°</i> d: 4/3	15 30/15	👳 At T	ime of nd of l	<sup>r</sup> Drill Drillir	s BGS (ft): ing: N/A ng: Not Recorded 470.42	
Y	Coc	nd Elev ordinate ordinate	e:	n AMS	L (ft): Not Recorded	Drillling	Contra Aethoo	actor: d: So	National Drilling	Page 18 of 25
8 Depth (ft)		Number	Headspace PID	Lithologic Log	Material Description		U.S.C.S.		Well Diagram	Remarks
	-				Poorly graded SAND (SP); brow (7.5YR 5/3); wet; loose; 95% fine 5% silt. Same as above (480 ft); 95% fin medium sand.	e sand;	SP			
485	-				Poorly graded SAND with Clay ( brown (7.5YR 4/2); wet; loose; 9 sand; 10% clay.		SP- SC			
	_				Poorly graded SAND (SP); brow (7.5YR 4/2); wet; loose; 95% fine 5% silt. @ 485.9 ft. Same as above (485 fine to medium sand; trace coars @ 486.5 ft. Same as above (485 trace medium sand.	e sand; 5 ft); 95% se sand.	SP	· · ·       · · ·	- High Solids Bentonite Grout	
	_				Well-graded SAND with Gravel ( brown (7.5YR 4/3); wet; loose; 7 to coarse sand; 20% fine to coar gravel to 3 cm; subangular to	5% fine	SW			@ 488.2 ft gravel is mafics and quartzite.
490	) 				subrounded; 5% silt. Poorly graded SAND with Grave brown (7.5YR 4/3); wet; loose; 8 sand; 15% fine to coarse gravel subrounded; 5% silt. @ 490.5 ft. Poorly graded SAND brown (7.5YR 4/3); wet; loose; 9 sand; trace medium sand; 5% si	0% fine to 3 cm; 0 (SP); 5% fine	SP			@ 489.6 ft gravel is mafics and quartzite.
495	5							••		

	C	BI	N			Bore	ho	le l	D:	KAFB-1	106224-Sonic
Pro Pro	ojec ojec	ct Loca ct Nam	ation ne: k	: KÁF (AFB I	s of Engineers FB, Albuquerque, NM BFF SWMU ST-106 and SS-111	Hole Dia	imetei	Low	/er (	in.): 11-3/4 in.): 9-5/8 rpe: Flush	
Da Da	ite S ite T	<b>ct Nun</b> Starteo FD Re Compl	d: 4/ ache	17/20 <sup>7</sup> d: 4/3	15	Groundv ∑ At T ▼ At E ▼ At E	ime of nd of	<sup>r</sup> Drill Drilliı	ing: ng:	N/À Not Recorded	
Y	Coo	d Elev ordinat ordinat	e:	n AMS	L (ft): Not Recorded	-	Contra /lethoo	actor: d: Se	Na Na	ational Drilling Coring	Page 19 of 25
6 Depth (ft)	Sample Type	Number	Headspace PID	Lithologic Log	Material Description		U.S.C.S.		We	ll Diagram	Remarks
					Poorly graded SAND (SP); brow (7.5YR 4/3); wet; loose; 95% fine trace medium sand; 5% silt.	e sand;	SP	••• ••• •••	• • • • • •		
	_				Poorly graded SAND with Clay ( brown (7.5YR 4/3); wet; loose; 9 sand; trace medium sand; 10% (	0% fine	SP- SC			- High Solids Bentonite Grout	
					Poorly graded SAND (SP); brow (7.5YR 4/3); wet; loose; 95% find trace medium sand; 5% clay.	e sand;	SP			- Top of Bentonite Seal	
500	-				Poorly graded SAND with Clay ( brown (7.5YR 4/3); wet; loose; 9 to medium sand; 10% clay.		SP- SC				
	-				Clayey SAND with Gravel (SC); (7.5YR 4/3); wet; medium dense fine to coarse sand; 30% fine to gravel to 4 cm; angular to subro 30% clay. @ 501.7 ft. Clayey SAND (SC); (7.5YR 4/2); wet; loose; 80% fine 20% clay.	; 40% coarse unded; brown	SC			- Bentonite Seal	@ 500.6 ft gravel is quartzite and sandstone.
	-			1111	Poorly graded SAND (SP); brow (7.5YR 4/2); wet; loose; 95% fine medium sand; 5% clay.		SP	-			
505					Sandy CLAY (CL); reddish brow 4/3); wet; stiff; nonplastic to low plasticity; 50% clay; 40% fine to pand: 10% fine ground to 1.5 pm	coarse	CL SC				
					sand; 10% fine gravel to 1.5 cm. Clayey SAND (SC); brown (7.5Y wet; medium dense; 75% fine to sand; trace coarse sand; 25% cl	R 4/2); medium	CL SP				@ 506 ft gravel is quartzite.
510	_				<ul> <li>@ 505.5 ft. Same as above (505 fine to medium sand; 45% clay.</li> <li>Sandy lean CLAY (CL); brown (74/2); wet; stiff; nonplastic to low plasticity; 60% clay; 30% fine to sand; 10% fine gravel to 2 cm; subrounded.</li> <li>Poorly graded SAND (SP); brow</li> </ul>	5 ft); 55% 7.5YR coarse	SC				

(	C	BI				Bore	ehol	e ID: KAFB-′	106224-Sonic
Pr Pr	ojec ojec	ct Loca ct Nam	ation ne: k	: Káf (AFB I	s of Engineers FB, Albuquerque, NM BFF SWMU ST-106 and SS-111	Hole Dia	meter	Upper (in.): 11-3/4 Lower (in.): 9-5/8 etion Type: Flush	
Da Da	ate S ate T	<b>ct Num</b> Starteo TD Re Compl	l: 4/ ache	17/20 <sup>7</sup> d: 4/3	15 30/15	⊥ At T T At E	ime of nd of E	evels BGS (ft): Drilling: N/A Drilling: Not Recorded g: 470.42	
Y	Coo	nd Elev ordinati ordinat	e:	n AMS	L (ft): Not Recorded	Drilling N	/lethod	ctor: National Drilling : Sonic Coring nris Buerkle	Page 20 of 25
01 Depth (ft)		Number	Headspace PID	Lithologic Log	Material Description		U.S.C.S.	Well Diagram	Remarks
	-				(7.5YR 4/2); wet; loose; 95% fine 5% clay. @ 507.5 ft. Clayey SAND (SC); I (7.5YR 4/3); wet; loose; 80% fine 20% clay. Poorly graded SAND with Clay (	brown e sand; SP-SC);	SP- SC		
	-				90% fine to medium sand; trace gravel; 10% clay. Silty SAND (SM); brown (7.5YR wet; medium dense; 70% fine sa silt; 5% clay.	4/3);			
515	_				Same as above (512 ft); 80% fin trace medium sand; 15% silt. @ 515.7 ft. Same as above (512 fine sand; 15% silt.		SM		
	-				Poorly graded SAND with Silt (S wet; loose; 90% fine sand; trace sand; 10% silt. @ 518.5 ft. Same as above (517	medium	SP- SM	-Bentonite Seal	
520	_				brown (7.5YR 4/3); 90% fine to r sand; trace fine gravel. Poorly graded SAND with Grave brown (7.5YR 4/3); wet; loose; 7 to medium sand; 25% fine to coa	nedium I (SP); 5% fine	SP		@ 519 ft gravel is mafics and quartzite.
	_				gravel to 3 cm; angular to subrou Clayey GRAVEL with Sand (GC) (7.5YR 4/3); wet; medium dense fine to coarse gravel to 4.5 cm; a to subrounded; 30% fine to coarse	); brown ; 50% angular	GC		@ 520.5 ft gravel is quartzite, sandstone, and mafics.
	-				20% clay. Sandy lean CLAY with Gravel (C brown (7.5YR 4/3); stiff; nonplas clay; 30% fine to medium sand; to coarse gravel to 3 cm; subang subrounded.	CL); tic; 40% 30% fine	CL		@ 522 ft gravel is quartzite, mafics, and sandstone.
525									

	C	BI				Borehole ID: KAFB-106224-Sonic					
Pro Pro	ojec ojec	t Loca Nam	ation: ne: K	: Káf (AFB I	s of Engineers FB, Albuquerque, NM BFF SWMU ST-106 and SS-111	Hole Dia	ameter	Upper (in.): 11-3/4 Lower (in.): 9-5/8 etion Type: Flush			
Da Da	ite S ite T	<b>t Num</b> Started D Re Compl	d: 4/ ache	17/20 <i>°</i> d: 4/3	15	⊻ At T ▼ At E	ime of ind of D	evels BGS (ft): Drilling: N/A Drilling: Not Recorded g: 470.42			
Y	Coo	d Elev rdinat rdinat	e:	I AMS	L (ft): Not Recorded	Drilling ( Drilling N	Contra Method	ctor: National Drilling : Sonic Coring nris Buerkle	Page 21 of 25		
55 Depth (ft)	Sample Type	Number	Headspace PID	Lithologic Log	Material Description		U.S.C.S.	Well Diagram	Remarks		
					Poorly graded SAND with Clay ( brown (7.5YR 4/3); wet; loose; 8 to medium sand; 5% fine gravel	5% fine	SP- SC				
	_				cm; subrounded; 10% clay. Poorly graded SAND with Grave brown (7.5YR 4/3); wet; loose; 8 to medium sand; 15% fine to coa gravel to 3 cm; angular to subrou 5% clay.	0% fine arse	SP		@ 526 ft gravel is mafics, granite, and quartzite.		
<u>530</u>	-				Poorly graded SAND with Clay ( brown (7.5YR 4/3); wet; loose; 8 to medium sand; 10% fine to coa gravel to 4 cm; subangular to subrounded; 10% clay. @ 529.5 ft. Same as above (528 fine sand; trace medium sand; n	0% fine arse 6 ft); 90%	SP- SC		@ 528 ft gravel is mafics and quartzite.		
	_				Clayey SAND with Gravel (SC); (7.5YR 4/3); wet; dense; 40% fin coarse sand; 30% fine to coarse to 3 cm; subangular to subround clay.	e to gravel	SC	- Bentonite Seal	@ 530.5 ft gravel is mafics and quartzite.		
<u>535</u>	-				Same as above (530.5 ft); mediu dense; 45% fine to coarse sand; fine to coarse gravel to 4 cm; 15	40%					
				 	Poorly graded SAND with Grave brown (7.5YR 4/3); wet; loose; 6 to medium sand; 30% fine to coa gravel to 2.5 cm; angular to subr 5% clay.	5% fine arse rounded;	SP		@ 537 ft gravel is mafics and quartzite.		
540					@ 538.3 ft. See description on n page.	ext	SC	Top of 20/40 Sand			

	C	BI	S			Bore	Borehole ID: KAFB-106224-Sonic					
Pro Pro	ojec ojec	ct Loca ct Nam	ation ne: k	: KÁF Kafb e	s of Engineers 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: Flush						
Da Da	ate S ate 1	Starteo TD Re	d: 4/ ache	1407 17/20 d: 4/3 5/22	15 30/15	Groundwater Levels BGS (ft): ∑ At Time of Drilling: N/A ▼ At End of Drilling: Not Recorded ▼ After Drilling: 470.42						
Y ( X (	Coo Coo	ordinat ordinat	e:	n AMS	L (ft): Not Recorded	Drillling ( Drilling N Logged I	/lethoo	I: Sonio		Page 22 of 25		
5 Depth (ft)	Sample Type	Number	Headspace PID	Lithologic Log	Material Description		U.S.C.S.	We	ell Diagram	Remarks		
	_				@ 538.3 ft. Clayey SAND with G (SC); brown (7.5YR 4/3); wet; me dense; 45% fine to coarse sand; fine to coarse gravel to 7 cm; sub to subrounded; 10% clay; 5% silt	edium 40% pangular t.	SC		· · ·			
545	_				Poorly graded SAND with Gravel brown (7.5YR 4/3); wet; loose; 80 to medium sand; trace coarse sa 15% fine to coarse gravel to 6 cm subangular to subrounded; 5% c	0% fine ind; n;	SP		- Top of 10/20 Sand	@ 541.9 ft gravel is mafics and quartzite.		
	_				Well-graded SAND with Gravel ( brown (7.5YR 4/3); wet; loose; 80 to coarse sand; 15% fine to coars gravel to 3 cm; subrounded; 5% Sandy lean CLAY (CL); grayish t (10YR 5.2); wet; stiff; low plastici clay; 20% fine sand.	0% fine se clay. prown ty; 80%	SW CL SW			<ul> <li>@ 545.4 ft gravel is mafics and quartzite.</li> <li>@ 546.5 ft gravel is quartzite and mafics.</li> </ul>		
<u>550</u>	_				Well-graded SAND with Gravel ( brown (7.5YR 4/3); wet; loose; 55 to coarse sand; 40% fine to coars gravel to 4 cm; angular to subrou 5% clay. Poorly graded SAND (SP); brown (7.5YR 4/3); 90% fine to medium 5% fine gravel; 5% silt.	5% fine se unded n ı sand;	SP		4			
555	-				Well-graded SAND with Gravel ( brown (7.5YR 4/3); wet; medium 55% fine to coarse sand; 40% fir coarse gravel to 4 cm; subround silt. Clayey SAND with Gravel (SC); I (7.5YR 4/3); wet; medium dense fine to coarse sand; 30% fine to o gravel to 7 cm; angular to subrou 20% clay.	dense; ne to ed; 5% brown ; 50% coarse	SW			@ 551 ft gravel is mafics and quartzite.		

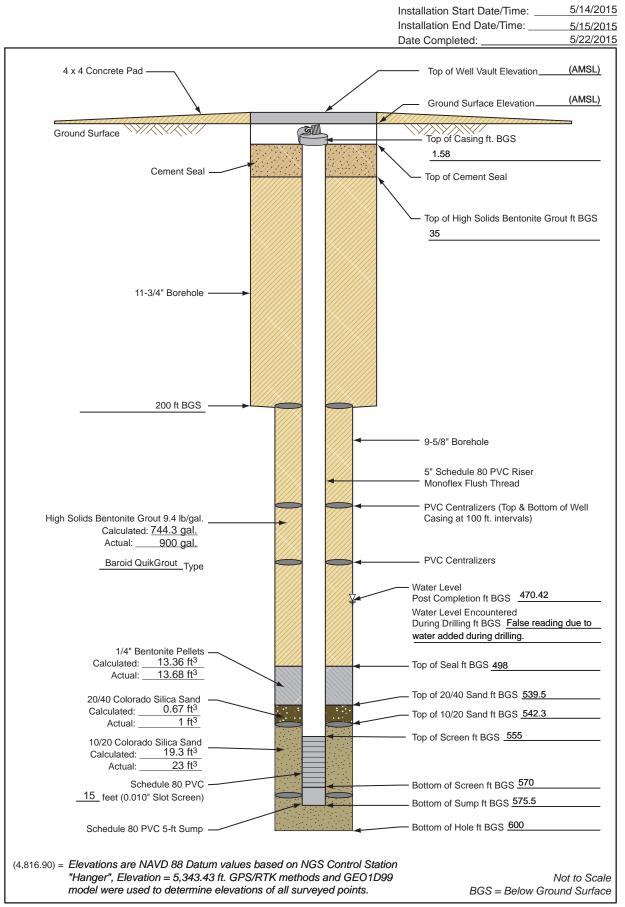
	C	RI				e ID	: KAFB-1	06224-Sonic		
Pro Pro	ojec ojec	ct Loca ct Nam	ation ne: k	: Káf (Afb i	s of Engineers B, Albuquerque, NM BFF SWMU ST-106 and SS-111	Hole Dia	ameter	Lower	(in.): 11-3/4 (in.): 9-5/8 ype: Flush	
Da Da	te S ite T	<b>ct Num</b> Starteo FD Re Compl	d: 4/ ache	17/20 <sup>7</sup> d: 4/3	15	Groundv ∑ At T ▼ At E ▼ At E	ime of Ind of [	Drilling Drilling:	: N/À Not Recorded	
Y (	Coo	d Elev ordinat ordinat	e:	n AMS	L (ft): Not Recorded	-	Contra Method	ctor: N : Sonio	ational Drilling Coring	Page 23 of 25
G Depth (ft)	Sample Type	Number	Headspace PID	Lithologic Log	Material Description		U.S.C.S.	We	ell Diagram	Remarks
					Clayey SAND with Gravel (SC); (7.5YR 4/3); wet; medium dense fine to coarse sand; 30% fine to gravel to 7 cm; angular to subrou	; 50% coarse	SC		- Top of 5" Schedule 80 PVC 0.010" Slot Screen	@ 555 ft gravel is mafics and quartzite.
	_				20% clay. Poorly graded SAND (SP); brow (7.5YR 5/3); wet; loose; 95% fine medium sand; trace fine gravel;	e to 5% cla <del>y.</del>	SP			@ 557.5 ft gravel is
					Well-graded SAND with Silt and (SW-SM); brown (7.5YR 5/3); we medium dense; 60% fine to coar 30% fine to coarse gravel to 5 cr	et; se sand; n;       _	SW- SM			mafics, quartzite, and sandstone.
560	-				angular to subrounded; 10% silt. Poorly graded SAND (SP); brow (7.5YR 5/3); wet; loose; 95% fine trace medium sand; 5% silt.	n	SP			
	_			•••	@ 560.8 ft. Poorly graded SAND Gravel (SP); brown (7.5YR 5/3); fine sand; trace medium and coa sand; 20% fine to coarse gravel	75% arse				@ 560.8 ft gravel is mafics, quartzite, and granite. @ 561.8 ft gravel in
	_				subangular to subrounded; 5% c Well-graded SAND with Clay and (SW-SC); brown (7.5YR 5/3); we 70% fine to coarse sand; 20% fir coarse gravel to 3.5 cm; angular subrounded; 10% clay.	d Gravel d Gravel et; loose; ne to	SW- SC			@ 561.8 ft gravel is mafics, granite, and quartzite.
565	-									
					Clayey SAND with Gravel (SC); (7.5YR 5/3); wet; medium dense fine to coarse sand; 20% fine to gravel to 3 cm; angular to subrou 20% clay.	; 60% coarse	SC			@ 566 ft gravel is quartzite and mafics.
					Sandy lean CLAY (CL); brown (7 5/3); wet; hard; nonplastic to low plasticity; 80% clay; 20% fine to sand. Note: sand is a lense.	,	CL			@ 568.7 ft gravel is
570					Well-graded SAND with Silt (SW brown (7.5YR 5/3); wet; medium 80% fine to coarse sand; 10% fir	dense;	SW- SM			mafics and quartzite.

Othert: US Amy Corps of Engineers Project Nume: KAFB BFF SWMU ST-106 and SS-111 Project Nume: KAFB BFF SWMU ST-106 and SS-111 Date Santed: 4/172015 Date Santed: 4/172015 Date Complete: 5/222015     Hole Diameter Upper (in.): 11-3/4 Hole Diameter Lawer (in.): 9-2/3 Groundwater Levels BGS (ft): Valkes Completion Type: Flush Groundwater Levels BGS (ft): Valkes Completion Sonic Coring X Coordinate:       Ground Elevation AMSL (ft): Not Recorded V Coordinate:     Valkes Completion Sonic Coring Coged By: Chris Buerkle     Page 24 of 25       Ground Elevation AMSL (ft): Not Recorded V Coordinate:     Material Description     G G G G G G G G G G G G G G G G G G G	(	C	RI				Bore	hol	Borehole ID: KAFB-106224-Sonic						
Date Started: 4/17/2015       Image: Although of the problem of sump of sum of sump of	Pi Pi	roje roje	ct Loc ct Nan	ation ne: k	: KÁI (AFB	FB, Albuquerque, NM BFF SWMU ST-106 and SS-111	Hole Diameter Lower (in.): 9-5/8								
Ground Elevation AMSL (ft): Not Recorded Y Coordinate:       Drilling Contractor: National Drilling Drilling Drilling Drilling Drilling Method: Sonic Coring Logged By: Chris Buerkle       Page 24 of 25         Image: State of the	D	ate ate	Starteo TD Re	d: 4/ ache	17/20 d: 4/:	15 30/15	∑ At T ▼ At E	ime of nd of [	Drilling: N/A Drilling: Not Recorded						
570     -     Bottom of Screen     End continuous coring @ 570 ft on 4/30/15.       -     -     -     -       -     -	Y	Coo	ordinat	e:	n AMS	SL (ft): Not Recorded	Drillling ( Drilling N	Contra /lethoc	ctor: National Drilling I: Sonic Coring	Page 24 of 25					
575     -     -     Bottom of Screen     End continuous coring @ 570 ft on 4/30/15.       575     -     -     -     -		Sample Type	Number	Headspace PID	Lithologic Log	Material Description		U.S.C.S.	Well Diagram	Remarks					
585	575	- - - - - -				silt. End of continuous coring. No lith			- Bottom of	End continuous coring @ 570 ft on 4/30/15.					

		31	)			Borehole ID: KAFB-106224-Sonic						
Pro Pro	oject oject	Loca Nam	ation: ie: K	Corp KA KAFB 140	os of Engineers FB, Albuquerque, NM BFF SWMU ST-106 and SS-111 705	Hole Dia Surface	ameter Comp	Upper (in.): 11-3/4 Lower (in.): 9-5/8 letion Type: Flush				
Da Da	te TI te Co	D Rea omple	ache eted:	5/22	30/15 2/2015	⊻ At T ▼ At E ⊻ Afte	ime of nd of r Drillin	Levels BGS (ft): Drilling: N/A Drilling: Not Recorded ng: 470.42				
Y C X C	Coor Coor	dinate	e:		SL (ft): Not Recorded	Drilling N	<b>Nethoo</b>	actor: National Drilling d: Sonic Coring hris Buerkle	Page 25 of 25			
G Depth (ft)	Sample Type	Number	Headspace PID	Lithologic Log	Material Description		U.S.C.S.	Well Diagram	Remarks			
590								- Bottom of Filter Pack/ Bottom of				
600								hole.				

### . \_ \_

# Monitoring Well Completion Diagram KAFB-106224



140705.CB020403.A17



## Well Development Record

Project Name: KAFB BFF		
Location: Kentucky St.		Well/Piez. No.: KAFB-106224
Personnel: R. Wortman		Date Installed: 2/17/15
Date: 5-20-15		Csg. Diameter (I.D.): 5 "
Samplers: N/A		Total Depth (ft. bgs): 575.5
Method of Development: X Surging	X Bailing	X Pumping
X Original Development	Redevelopment	Other
Development Date: 5/20/15	- 5/22/15	
Depth to Water Before Deve	loping Well (ft. btoc): 470.42	
V=(B * r <sub>c</sub> <sup>2</sup> * L <sub>c</sub> * 7.48)+(B * (r <sub>w</sub>	<sup>2</sup> - r <sub>c</sub> <sup>2</sup> ) * L <sub>s</sub> * Ø <sub>s</sub> * 7.48)+(H <sub>2</sub> O added	d during drilling/installation) = 240 gallons
Dopth Burging From: 560 fo	ot	Time Durging Bogins: 1527 5/21/15

Depth Purging From: 569 feet Time Purging Begins: <u>1537, 5/21/15</u> Weather: Clear, Sunny Screened Interval (ft bgs): 555 - 570

Equipment Nos.: pH Meter: YSI 650 MDS EC Meter: YSI 650 MDS Turbidity Meter: HACH 21000Q

Equipment Decontaminated Prior to Development: Y X N

Describe: Steam Cleaned Collected Sample of Water Added to Well: Y \_\_\_\_ N X Describe: N/A

Comment: Approximately 100 gallons of water added during drilling/well installation activities

		Water Level (ft	Volume Removed				Turbidity	
Date	Time	bTOC)	(gal.)	Temp. (°C)	рН	EC (mS/cm)	(NTU)	Comments
5/20/2015	1355	470.42	0					Set up bailer.
5/20/2015	1420		0					Begin bailing.
5/20/2015	1435		55				>1,000	Finish bailing.
5/20/2015	1453		55					Begin swabbing top 5 feet of screen.
5/20/2015	1513		55					Move swab to middle section of screen.
5/20/2015	1523		55					Stop swabbing.
5/20/2015	1604		55					Continue swabbing middle section.
5/20/2015	1614		55					Swab bottom 5 feet of screen.
5/20/2015	1635		55					Stop swabbing.
5/20/2015	1640		55					Swab came off of cable.

Notes:

Water Levels - Reported to the nearest 0.01 foot pH - Reading rounded to 0.1 pH units Water temperature - Reported to nearest 0.1 °C °C = Degree Celsius EC = Electric Conductivity ft bgs = Feet Below Ground Surface ft btoc = Feet Below Top of Casing gal. = Gallon GPM = Gallons Per Minute I.D. = Inner Diameter N/A = Not Applicable NR = Not Recorded NTU = Nephelometric Turbidity Unit S/m = Seimens per Meter

Where:

B=3.14 Øs= porosity of the sand pack

 $r_c$ = radius of the well casing and screen in feet

 $\mathsf{L}_\mathsf{c}\mathsf{=}\mathsf{length}$  of water column inside the casing and screen in feet

 $r_w$ = radius of the well bore in feet  $L_s$ = length of saturated portion of the sand pack in feet

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

Pg 1 of 3



# Well Development Record

Project: KAFB BFF

Project Number: 140705

Date: 5/20/15 - 5/22/2015

Time Start: 1537, 5/21/2015

Well No: KAFB-106224
Samplers: <u>N/A</u>
Checked By:

Time Finish: 0945, 5/22/2015

Field Chemistry (cont'd)           Water         Volume									
Date	Time	Level (ft. bTOC)	Removed (gal.)	Temp. (°C)	рН	EC (mS/cm)	Turbidity (NTU)	Comments	
5/20/2015	1730		55					End of 5/20/15.	
5/21/2015	1100		55					Swabber removed from hole.	
5/21/2015	1115		55					Swab bottom 5 feet of screen.	
5/21/2015	1140		55					Finish swabbing.	
5/21/2015	1143		55					Begin bailing.	
5/21/2015	1150		65	21.58	7.73	0.563	>1,000	Continue bailing; water is brown.	
5/21/2015	1212		110	19.35	7.18	0.526	>1,000	Continue bailing; water is brown.	
5/21/2015	1226		165	19.47	7.24	0.526	>1,000	Continue bailing; water is brown.	
5/21/2015	1230		170					Finish bailing.	
5/21/2015	1525	469.83	170					Pump set @ 569 feet bgs.	
5/21/2015	1537	469.83	170					Start pump @ 4 gpm.	
5/21/2015	1546	NR	180	19.16	7.31	0.489	>1,000	Continue pumping; water is brown.	
5/21/2015	1554	470.73	230	19.38	7.30	0.467	299	Continue pumping; water is cloudy.	
5/21/2015	1600	470.80	260	19.49	7.36	0.457	164.00	Continue pumping; water is cloudy.	

Was well sampled after development? YES NO X

Sample Method: N/A

Sample Name: N/A

Analyses: N/A



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# Well Development Record

Project: KAFB BFF

Project Number: 140705

Date: 5/20/15 - 5/22/15

Time Start: 1537, 5/21/2015

Date	Time	Water Level (ft. bTOC)	Volume Removed (gal.)	Temp. (°C)	рН	EC (mS/cm)	Turbidity (NTU)	Comments
5/21/2015	1610		300					Shutdown due to high winds.
5/22/2015	0837	469.83	300					Begin pump @ 4 gpm.
5/22/2015	0845	470.69	335	18.90	7.22	0.463	49.5	Continue pumping; water is cloudy.
5/22/2015	0850	470.69	360	19.19	7.35	0.443	12.5	Continue pumping; water is fairly cloudy.
5/22/2015	0855	470.69	383	19.34	7.45	0.441	2.90	Continue pumping; water is clear.
5/22/2015	0900	470.78	405	19.46	7.52	0.439	1.84	Continue pumping; water is clear.
5/22/2015	0905	470.67	430	19.50	7.60	0.434	1.41	Continue pumping; water is clear.
5/22/2015	0908		444					Move pump up to 555 feet bgs.
5/22/2015	0910	470.67	455	19.38	7.64	0.432	1.38	Continue pumping; water is clear.
5/22/2015	0915	470.73	460	19.39	7.62	0.478	2.54	Continue pumping; water is clear.
5/22/2015	0920	470.71	495	19.44	7.59	0.430	3.14	Lower pump; water is clear.
5/22/2015	0925	470.68	520	19.50	7.64	0.426	1.30	Pump set @ 562 feet bgs.
5/22/2015	0935	470.69	555	19.43	7.67	0.422	4.08	Continue pumping; water is clear.
5/22/2015	0945	470.69	630	19.51	7.72	0.42	1.33	Pump off; water is clear. Development complet

Was well sampled after development? YES NO X

Sample Method: N/A

Sample Name: N/A

Analyses: N/A

# KAFB 106225

1	~	RI				Bore	eho	le ID	: KAFB-	106225
Pri Pri Da Da Da Gr	ojec ojec ojec ite S ite T ite C oun	t Loc t Nan t Nun Starte TD Re Comp d Ele ordinal	ation ne: h nber: d: 12 eache leted: vatior te:	: KAF (AFB 1407 2/11/2 d: 12 1/16		Hole Dia Surface Ground ↓ At T ↓ At E ↓ Afte Drilling Drilling	ameter Comp ime o ind of r Drilli Contra Vethoo	r Lower bletion T Levels B f Drilling Drilling: ng: 463 actor: Y d: ARC	: 462.00 464.98 61 ellow Jacket H	VIRGINIA BRACHT 8881903-2250 STATE OF UT Page 1 of 17
Depth (ft) >					Material Description	Logged	n.S.C.S.	-	ell Diagram	Remarks
					Road base. Silty SAND (SM); ye (10YR 7/6); dry; soft; loose; coho 70% fine sand; 15% silt; 5% clay gravel; subrounded; no odor; no	esive; y; 10%	SPHA SM	T	- Top of Casing/ Top of Cement Seal	Hand augered to 9'. No headspace requirement at this location. Multiple close underground utilities.
5					staining. Well graded GRAVEL with Silt a (GW-GM); very pale brown (10Y dry; loose; slightly cohesive; 70% coarse gravel to 0.4'; subrounde fine sand; 10% silt. Note: gravel quartzite and sandstone	/R 7/4); % fine to ed; 20%	GW- GM			Spud well at 1527 on 12/11/14.
10					Same as above (3 ft).					PID - 0.0 ppm @ Cyclone and breathing zone.
15					Silty GRAVEL with Sand (GM); s brown (7.5YR 5/6); dry; loose; co 50% gravel; 35% fine sand; 15%	ohesive;	GM		-Cement Seal	Kelly down. New 20' connection.
<u>20</u> - -					Well graded GRAVEL with Sand very pale brown (10YR 7/4); dry; slightly cohesive; 70% fine to co gravel; 30% fine sand.	; loose;				PID - 0.0 ppm @ Cyclone and breathing zone.
25					Same as above (20 ft). Some ob seen.	osidian	GW			

KAFB\_BOREHOLE\_LOG - SHAW\_DRILLING.GDT - 2/17/15 08:11 - N:/KAFB BFFIGINT/KAFB\_PROJECT/KAFB\_BFF.GPJ

	C	BI	X			Bore	eho	le I	D: KAFB-	106225	
Pro Pro	ojec ojec	ct Loc ct Nan	ation ne: ł	: Kaf Kafb I	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					
Da Da Da	ite S ite T ite C	Starte TD Re Compl	d: 12 ache leted:	: 1/16	014 /17/2014	⊻ At T ▼ At E ⊻ Afte	ime of nd of r Drilli	f Drill Drillin ng: 4	ls BGS (ft): ling: 462.00 ng: 464.98 463.61 : Yellow Jacket		
Y	Coo	ordinat ordinat	e:		. ,	Drilling I Logged	Method	d: A	RCH	Page 2 of 17	
ଞ Depth (ft)	Sample Type	Number	Headspace	Lithologic Log	Material Description		U.S.C.S.		Well Diagram	Remarks	
	_				Well graded GRAVEL with Sanc very pale brown (10YR 7/4); dry slightly cohesive; 70% fine to co gravel; 30% fine sand.	; loose;	GW	• • • • • • • •	Top of High     Solids     Bentonite     Grout	PID - 0.0 ppm @ cyclone and breathing zone.	
35	-				Poorly graded GRAVEL with Sal pinkish gray (7.5YR 7/2); dry; loc slightly cohesive; 80% gravel; 20 sand.	ose;	GP	· · · · · · · · · · · · · · · · · · ·	· · · · · · · · · · · · · · · · · · ·		
	-				Well graded GRAVEL with Silt a (GW-GM); very pale brown (10Y dry; loose; slightly cohesive; 70% coarse gravel; subrounded; 20% sand; 10% silt. Note: gravel is qu and sandstone.	'R 7/4); % fine to 5 fine			· · · · · · · · · · · · · · · · ·	Kelly down @ 1553. New 20' connection @ 1603.	
40	-				Same as above (35 ft).				· · · · · · · · · · · · · · · · · · ·	PID - 0.0 ppm @ Cyclone and breathing zone.	
45	-				Same as above (35 ft).		GW- GM	<ul> <li>•</li> <li>•&lt;</li></ul>	<ul> <li>High Solids</li> <li>Bentonite</li> <li>Grout</li> </ul>		
50					Same as above (35 ft).				<pre></pre>	PID - 0.0 ppm @ Cyclone and breathing zone.	
55					Same as above (35 ft).					Kelly down @ 1615. New connection. Stop drilling for day.	
60								••	••		

	6	ÌP	RI				Bore	eho	le I	D: KAFB-	106225
	Proje Proje	ect l ect l	Loca Nam	ation: e: K	KAF AFB I	s of Engineers <sup>F</sup> B, Albuquerque, NM BFF SWMU ST-106 and SS-111	Hole Dia	ametei	Low	er (in.): 11-3/4 er (in.): 9-5/8 1 Type: Flush	
	- Date Date	Sta TD	arted Rea	l: 12 acheo			🕎 At T	ime of	f Drilli Drillir	s BGS (ft): ing: 462.00 ng: 464.98 463.61	
`	Grou Y Co X Co	ord	inate	e:	AMS	L (ft): Not Recorded	Drillling Drilling I Logged	Nethod	d: AF		Page 3 of 17
	Sample Tvne		Number	Headspace PID	Lithologic Log	Material Description		U.S.C.S.		Well Diagram	Remarks
	<u>-</u> - - - - - - - - - - - - - - - - - -					Well graded GRAVEL with Silt a (GW-GM); very pale brown (10Y dry; loose; slightly cohesive; 70% coarse gravel; subrounded; 20% sand; 10% silt. Note: gravel is qu and sandstone. Same as above (60 ft).	R 7/4); % fine to 6 fine	GW- GM		•       •         •       •	PID - 0.0 ppm @ Cyclone and breathing zone. Begin drilling @ 0900 on 12/12/14.
	- - 70 - - -					Clayey GRAVEL (GC); brown (7 5/4); soft; cohesive; sticky to slig loose; 60% well to poorly graded gravel; 20% clay; 20% silt. Poorly graded GRAVEL (GP); lig brown (7.5YR 6/3); soft; loose; 9 medium to coarse gravel; 10% n to coarse sand.	htly I coarse oht 0%	GC			Added 200 gallons of water while drilling at 67' to lift cuttings. PID - 0.0 ppm @ Cyclone and breathing zone.
	75					Well graded GRAVEL with Silt a (GW-GM); strong brown (7.5YR loose; soft; slightly cohesive; 70 <sup>6</sup> coarse gravel; subrounded to subangular; 20% fine sand; 10% Note: gravel is quartzite and san	5.8); % fine to 5 silt.	GW- GM		- High Solids Bentonite Grout	
						Poorly graded SAND with Silt (S strong brown (7.5YR 4/6); soft; lo slightly cohesive; 90% medium t sand; 10% silt.	oose;		<ul> <li>• •</li> </ul>		Kelly down @ 0920. 20' connection @ 0950. (change top seal on hammer). PID = 0.0 ppm @ Cyclone and breathing zone.
	35					Same as above (80 ft).		SP- SM			

		BI				Bore	eho	le I	D: KAFB-	106225
Pro Pro	ojec ojec	t Loca t Nam	ation: ne: K	: KAF	s of Engineers FB, Albuquerque, NM BFF SWMU ST-106 and SS-111	Hole Dia	ametei	r Low	er (in.): 11-3/4 er (in.): 9-5/8 n Type: Flush	
Da Da	te S te T	Started D Rea	d: 12 ache	2/11/20 d: 12		🕎 At T	ime of ind of	f Drilli Drillin	s BGS (ft): ng: 462.00 ıg: 464.98 l63.61	
Y	Cooi	d Elev rdinate rdinate	e:	n AMS	L (ft): Not Recorded	Drillling Drilling N Logged	<b>Nethod</b>	d: AF		Page 4 of 17
g Depth (ft)	Sample Type	Number	Headspace PID	Lithologic Log	Material Description		U.S.C.S.		Well Diagram	Remarks
	_				Poorly graded GRAVEL with Sat brown (7.5YR 5/3); dry; loose; noncohesive; 70% fine gravel; 3 medium to fine sand. Note: grav quartz.	0%	GP	· · · · · · · · · · · · · · · · · · ·		PID - 0.0 ppm @ Cyclone and breathing zone.
95	-				Poorly graded SAND (SP); reddi yellow (7.5YR 7/6); dense; slight cohesive; 70% fine and 30% me sand.	ly	SP	<ul> <li></li></ul>		
100	-				Poorly graded GRAVEL with Satstrong brown (7.5YR 4/6); loose; non to slightly cohesive; 70% fin 30% medium to coarse sand.	; soft;				Hard drilling. Kelly down at 1010. Dump hopper and change whip check. New connection 20'. Start drilling at 1030. PID 0.1 ppm at Cyclone. 0.0 ppm at breathing zone.
105	-				Same as above (100 ft).		GP		- High Solids Bentonite Grout	
110	-				Same as above (100 ft).			• • • • • • • •	• • • • • • • •	
115	-				Lean CLAY with Sand (CL); redo brown; soft to firm; cohesive; 80 15% fine to coarse sand; 5% fine	% clay;	CL			PID = 0.2 ppm @ Cyclone. 0.0 ppm @ breathing zone.
120									•       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •	

	C	BI	5			Bore	ho	le IC	): KAFB-′	106225
Pro Pro	ojec ojec	t Loca t Nam	ation ne: k	: KÁI (AFB	s of Engineers FB, Albuquerque, NM BFF SWMU ST-106 and SS-111	Hole Dia	imetei	Lowe	r (in.): 11-3/4 r (in.): 9-5/8 Type: Flush	
Da Da	ite S ite T	Starteo D Re	d: 12 ache			🕎 At T	ime of nd of	f Drillin Drilling	BGS (ft): ig: 462.00 j: 464.98 53.61	
Y	Cool	d Elev rdinat rdinat	e:	n AMS	SL (ft): Not Recorded	-	Contra /lethoo	actor: d: AR	Yellow Jacket CH	Page 5 of 17
05 Depth (ft)	Sample Type	Number	Headspace PID	Lithologic Log	Material Description		U.S.C.S.	v	Vell Diagram	Remarks
	-				Lean CLAY with Sand (CL); rede brown; soft to firm; cohesive; 80 15% fine to coarse sand; 5% fine	% clay;				Kelly down @ 1057. New 20' connection @ 1107. PID = 0.1 ppm @ Cyclone and 0.0 ppm @ breathing zone.
125	-				Same as above (120 ft).		CL			
130	-				Lean CLAY (CL); pink (5YR 7/3) firm; low to medium plasticity; 98 2% fine gravel.	; soft to 3% clay;				PID = 0.0 ppm @ Cyclone and breathing zone. Added 100 gallons of water, stiff drilling.
140	-				Same as above (130 ft).		CL		- High Solids Bentonite Grout	
145	-				Poorly graded SAND with Silt (S pink (5YR 7/3); soft; 90% fine sa silt; noncohesive.		SP-			Kelly down @ 1130. New 20' connection @ 1150. PID = 0.0 ppm @ Cyclone and in breathing zone.
150	-				Same as above (140 ft).		SM			

	C	BI				Bore	eho	le I	D: KAFB-	106225
Pro Pro	ojec ojec	US t Loca t Nam t Num	ation: ne: K	: KAF	s of Engineers FB, Albuquerque, NM BFF SWMU ST-106 and SS-111	Hole Dia	ametei	Low	oer (in.): 11-3/4 /er (in.): 9-5/8 n Type: Flush	
Da Da	te S te T	Started D Re	d: 12 ache	2/11/20 d: 12		🛛 At T	ime of	f Drill Drillir	s BGS (ft): ing: 462.00 ng: 464.98 463.61	
YO	Cool	d Elev rdinat rdinat	e:	AMS	L (ft): Not Recorded	-	Contra Method	actor: d: Al	Yellow Jacket RCH	Page 6 of 17
05 Depth (ft)	Sample Type	Number	Headspace PID	Lithologic Log	Material Description		U.S.C.S.		Well Diagram	Remarks
155	-				Poorly graded SAND with Silt (S pink (5YR 7/3); soft; 90% fine sa silt; noncohesive.	P-SM); and, 10%	SP- SM	<ul> <li>.</li> <li>.&lt;</li></ul>	· · · · · · · · · · · · · · · · · · ·	PID = 0.0 ppm @ Cyclone and breathing zone.
	-				Silty GRAVEL (GM); dark reddis (5YR 3/4); soft; loose; non cohes 90% fine to coarse gravel, subro to subangular; 5% silt; 5% clay. gravel is quartz, feldspar and sa	sive; ounded Note:				50 gallons of water added to lift.
<u>160</u>	-				Same as above (155 ft).			· · · · · · · · · · · · · · · · · ·	· · · · · · · · · · · · · · · · · · ·	Kelly down @ 1202. New 20' connection @ 1221.
165	-				Same as above (155 ft).		GM		<ul> <li>High Solids</li> <li>Bentonite</li> <li>Grout</li> </ul>	added.
<u>170</u>	-				Same as above (155 ft).					PID = 0.0 ppm at Cyclone and breathing zone. Water added.
175	-				Poorly graded SAND with Grave	el (SP);		•     •       •     •       •     •       •     •       •     •       •     •       •     •       •     •       •     •       •     •       •     •       •     •       •     •       •     •		50 gallons of water added.
180	-				yellowish brown (10YR 5/6); loos cohesive; 75% fine and coarse s 25% gravel; subrounded; trace s clay. Note: becoming well grade	se; non sand; silt and	SP	<ul> <li>•</li> <li>•&lt;</li></ul>	· · · · · · · · · ·	Kelly down @ 1236.

(	C	BI				Bore	eho	le IC	): KAFB-′	106225
Pr Pr	ojec ojec	t Loca t Nan	ation ne: K	: KAF	s of Engineers FB, Albuquerque, NM BFF SWMU ST-106 and SS-111 205	Hole Dia	ameter	Lowe	r (in.): 11-3/4 r (in.): 9-5/8 Type: Flush	
Da Da	ate S ate T	Starteo D Re	d: 12 ache	2/11/20 d: 12		👳 At T	ime of Ind of	<sup>f</sup> Drillin Drilling	BGS (ft): g: 462.00 j: 464.98 53.61	
Y	Cool	d Elev rdinat rdinat	e:	n AMS	L (ft): Not Recorded	Drillling Drilling I Logged	Methoo	1: AR		Page 7 of 17
B Depth (ft)	Sample Type	Number	Headspace PID	Lithologic Log	Material Description		U.S.C.S.	v	Vell Diagram	Remarks
	-				Poorly graded SAND with Grave yellowish brown (10YR 5/6); loos cohesive; 75% fine and coarse s 25% gravel; subrounded; trace s clay. Note: becoming well grade	se; non and; ilt and				New 20' connection @ 1253. PID = 0.0 ppm. Added 100 gallons of water.
185	-				Same as above (180 ft).					Slow/hard drilling.
190					Same as above (180 ft).		SP			PID = 0.1 ppm at Cyclone and 0.0 ppm at breathing zone.
195	-				Same as above (180 ft).				- High Solids Bentonite Grout	
200	-				Well graded SAND with Gravel ( strong brown (7.5YR 5/6); loose; moist; slightly cohesive; 80% fine coarse sand; 20% fine gravel; subrounded to rounded.	soft;				Kelly down @ 1331. Total depth with 11 3/4" casing. End of 12-12-14. New 20' connection with 9 5/8" casing at 0846 on 12-16-14.
205					Same as above (200 ft).		SW			No water added. Casing dropped - no hammer to 220'. PID = 0.0 ppm @ Cyclone and breathing zone.
210								••	••	

	C	BI	<b>)</b>			Bore	eho	le I	D: KAFB-	106225
Pro Pro	ojec ojec	t Loca t Nam	ation ne: k	: KÁF (AFB I	s of Engineers FB, Albuquerque, NM BFF SWMU ST-106 and SS-111	Hole Dia	ametei	Low	er (in.): 11-3/4 er (in.): 9-5/8 n Type: Flush	
Da Da	ite S ite T	tarteo D Re	d: 12 ache			🕎 At T	ime of	f Drill Drillir	s BGS (ft): ing: 462.00 ig: 464.98 i63.61	
Y	Cool	d Elev rdinat rdinat	e:	n AMS	L (ft): Not Recorded	-	Contra Method	actor: d: Af	Yellow Jacket RCH	Page 8 of 17
Depth (ft)	Sample Type	Number	Headspace PID	Lithologic Log	Material Description		U.S.C.S.		Well Diagram	Remarks
	_				Well graded SAND with Gravel strong brown (7.5YR 5/6); loose moist; slightly cohesive; 80% fin coarse sand; 20% fine gravel; subrounded to rounded.	; soft;		· · · · · · · · · · · · · · ·	•       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •	PID = 0.0 ppm at Cyclone and breathing zone.
215	-				Same as above (210 ft).					
220	-				Same as above (210 ft).					Kelly down @ 0857. New 20' connection @ 0906. PID = 0.0 @ Cyclone and breathing zone.
225	-				Same as above (210 ft).		SW	<ul> <li>•</li> <li>•&lt;</li></ul>	- High Solids Bentonite Grout	Soft drilling. No water added. No hammer.
230	-				Same as above (210 ft).					PID = 0.0 @ Cyclone and breathing zone.
235	35 Same as above (210 ft).				Same as above (210 ft).					Kelly down @ 0916. New connection @ 0923.
240								• • • • • • • •	• •   • •   • •   • •	

CBI		Bore	ehol	e IC	): KAFB-′	106225
Client: US Army Corp Project Location: KA Project Name: KAFB Project Number: 140	FB, Albuquerque, NM BFF SWMU ST-106 and SS-111	Hole Dia	ameter	Lower	r (in.): 11-3/4 r (in.): 9-5/8 Type: Flush	
Date Started: 12/11/2 Date TD Reached: 12 Date Completed: 1/10	014 2/17/2014	🕎 At T	ime of Ind of I	Drillin Drilling	BGS (ft): g: 462.00 : 464.98 :3.61	
Ground Elevation AMS Y Coordinate: X Coordinate:	SL (ft): Not Recorded	Drillling Drilling I Logged	Methoo	I: ARC		Page 9 of 17
075 Depth (ft) Sample Type Number Headspace PID Lithologic Log	Material Description		U.S.C.S.	W	/ell Diagram	Remarks
	Well graded SAND with Gravel ( strong brown (7.5YR 5/6); loose; moist; slightly cohesive; 80% fine coarse sand; 20% fine gravel; subrounded to rounded.	; soft;				PID = 0.1 ppm @ Cyclone and 0.0 ppm @ breathing zone.
245	Same as above (240 ft).				<pre>&gt; 0 &gt; 0</pre>	
250	Same as above (240 ft).		SW			PID = 0.0 ppm @ Cyclone and 0.0 @ breathing zone.
255	Same as above (240 ft).				- High Solids Bentonite Grout	
260	Poorly graded SAND (SP); reddi yellow (7.5YR 7/6); moist; loose; slightly cohesive to noncohesive medium to fine sand; trace silt; 5 gravel; rounded.	; soft; e; 95%				Kelly down @ 0932. New 20' connection @ 0947. Dumped bin of cuttings. Soft drilling. No water added.
	Same as above (260 ft).		SP			PID= 0.0 ppm @ Cyclone and breathing zone.
270					<ul> <li>•</li> <li>•</li> <li>•</li> <li>•</li> <li>•</li> </ul>	

	C	BI				Bore	eho	le l	D: KAFB-	106225
Pro Pro	ojec ojec	t Loca t Nam	ation: ie: K	: KAF (AFB E	s of Engineers FB, Albuquerque, NM BFF SWMU ST-106 and SS-111	Hole Dia	amete	r Low	er (in.): 11-3/4 er (in.): 9-5/8 n Type: Flush	
Da Da	te S te T	tarted D Rea	l: 12 ache	1407 2/11/20 d: 12 1/16	014 /17/2014	🕎 At T	ime o Ind of	f Drill Drillir	s BGS (ft): ing: 462.00 ig: 464.98 i63.61	
Y (	Cooi	d Elev rdinate rdinate	e:	n AMS	L (ft): Not Recorded	Drillling Drilling I Logged	Metho	d: AF		Page 10 of 17
05 Depth (ft)	Sample Type	Number	Headspace PID	Lithologic Log	Material Description		U.S.C.S.		Well Diagram	Remarks
	-				Poorly graded SAND (SP); redd yellow (7.5YR 7/6); moist; loose slightly cohesive to noncohesive medium to fine sand; trace silt; 5 gravel; rounded.	; soft; e; 95%		* * * * * * * * * * * * * *	•       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •	PID= 0.0 ppm @ Cyclone and breathing zone.
275	-				Same as above (270 ft).		SP			Soft drilling. No hammer. No water added.
280	-				Well graded SAND (SW); light y brown (10YR 6/4); moist; soft; lo noncohesive; 95% fine to coarse 5% fine gravel; subrounded to ro Note: gravel is quartz, feldspar a sandstone.	oose; e sand; ounded.				Kelly down @ 0955. New 20' connection @ 1003. PID = 0.0 ppm at Cyclone and breathing zone.
285	-				Same as above (280 ft).				- High Solids Bentonite Grout	
290	-				Same as above (280 ft).		SW			PID = 0.0 ppm at Cyclone and breathing zone.
295	-				Same as above (280 ft).					Soft drilling. No hammer. No water added.
300								••	••	

(	C	BI				Bore	eho	le l	D: KAFB-1	106225
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	ametei	r Low	oer (in.): 11-3/4 /er (in.): 9-5/8 n Type: Flush	
Da Da	te S ate T	Starteo D Re	d: 12 ache			🕎 At T	ime of	f Drill Drillir	ls BGS (ft): ling: 462.00 ng: 464.98 463.61	
Y (	Cool	d Elev rdinat rdinat	e:	ו AMS	L (ft): Not Recorded	Drillling Drilling N Logged	Nethod	d: Al		Page 11 of 17
60 Depth (ft)	Sample Type	Number	Headspace PID	Lithologic Log	Material Description		U.S.C.S.		Well Diagram	Remarks
305	_				Well graded SAND (SW); light y brown (10YR 6/4); moist; soft; lo noncohesive; 95% fine to coarse 5% fine gravel; subrounded to ro Note: gravel is quartz, feldspar a sandstone.	ose; e sand; ounded.	SW		· · · · · · · · · · · · · · · · · · ·	Kelly down @ 1014. New 20' connection @ 1021. PID = 0.1 ppm @ Cyclone and 0.0 ppm @ breathing zone.
	_				Clayey SAND (SC); brown (7.5Y moist; stiff; cohesive; low plastic medium to fine sand; 30% clay.		SC			Added 50 gallons of water @ 307'.
310	_				Well graded GRAVEL (GW); brc (7.5YR 5/2); non cohesive; 95% coarse gravel to 1.5"; subrounde subangular; 2.5% fine sand; 2.5 Note: gravel is quartz and feldsp	fine to ed to % silt.				PID = 0.0 ppm at Cyclone and breathing zone. Using hammer @ 310'.
315	_				Same as above (310 ft).		GW		<ul> <li>High Solids</li> <li>Bentonite</li> <li>Grout</li> </ul>	
320	-				Same as above (310 ft).				• • • • • • • • • •	Kelly down @ 1034. New 20' connection @ 1021. PID = 0.2 ppm @
325					Poorly graded SAND (SP); light (7.5YR 6/4); soft; 100% medium sand; non cohesive.		SP	• • • • • • • • • • • •		Cyclone and 0.0 ppm @ breathing zone.
	-   -				Well graded GRAVEL (GW); bro (7.5YR 5/2); hard; 95% fine to co gravel to 2"; subrounded to suba 5% silt.	barse	GW	<ul> <li>•</li> <li>•&lt;</li></ul>		Using hammer at 325'. Hard drilling. 50 gallons of water added.
330								•••	• • • • • •	

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(	C	BI				Bore	eho	le I	D: I	KAFB-	106225
Pr Pr	ojec ojec	t Loca Nan	ation: ne: K	: KAF	s of Engineers FB, Albuquerque, NM BFF SWMU ST-106 and SS-111	Hole Dia Hole Dia Surface	ametei	r Low	er (in.)		
Da Da	ate S ate T	Started D Re	d: 12 acheo	2/11/20	014 /17/2014	Groundv ∑ At T ▼ At E ▼ Afte	ime of	f Drill Drillir	ing: 4 1g: 46	62.00 64.98	
Y	Cool	d Elev rdinat rdinat	e:	I AMS	L (ft): Not Recorded	-	Contra Method	actor: d: Al	Yello RCH	w Jacket	Page 12 of 17
Sc Depth (ft)		Number	Headspace PID	Lithologic Log	Material Description		U.S.C.S.		Well [	Diagram	Remarks
	-				Well graded GRAVEL (GW); bro (7.5YR 5/2); hard; 95% fine to co gravel to 2"; subrounded to suba 5% silt.	oarse		· · · · · · · · · · · · ·			PID = 0.2 ppm @ Cyclone and 0.1 ppm @ breathing zone.
335					Same as above (330 ft).		GW		•     •       •     •       •     •       •     •       •     •       •     •       •     •       •     •       •     •       •     •       •     •       •     •       •     •       •     •       •     •       •     •       •     •       •     •       •     •		
340	-				Poorly graded SAND (SP); dark yellowish brown (10YR 4/4); 98% sand; 2% fine gravel; trace medi sand; trace silt; non cohesive.	% fine					Kelly down @ 1057. New 20' connection @ 1106. Using hammer, added water. PID = 0.1 ppm at Cyclone and breathing zone.
345	-				Same as above (340 ft).				B	igh Solids entonite irout	
350	-				Same as above (340 ft).		SP				PID = 0.0 ppm at Cyclone and breathing zone. Added 100 gallons of water.
355					Same as above (340 ft).				<ul> <li>•</li> <li>•&lt;</li></ul>		Hammering; slow drilling. Added water.
360								•••	• • • • • •		

(	C	BI	S			Bore	ehol	e ID	: KAFB-′	106225
Pr Pr	ojec ojec	t Loca Nan	ation ne: k	: KÁF (AFB I	s of Engineers FB, Albuquerque, NM BFF SWMU ST-106 and SS-111	Hole Dia	meter	Lower	(in.): 11-3/4 (in.): 9-5/8 ype: Flush	
Da Da	ate S ate T	Starteo D Re	d: 12 ache				ime of nd of l	Drilling Drilling:	: 462.00 464.98	
Y	Cool	d Elev rdinat rdinat	e:	n AMS	L (ft): Not Recorded	Drillling ( Drilling N Logged I	/lethoo	I: ARC		Page 13 of 17
00 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); 98% sand; 2% fine gravel; trace medi sand; trace silt; non cohesive.	6 fine	SP		•	Kelly down @ 1124. New 20' connection @ 1137. Empty bin into rolloff. Added 50 gallons of water.
365	-				Poorly graded GRAVEL with Silt (GP-GM); gray (7.5YR 5/1); dens cohesive; 90% fine gravel to 0.2 silt; trace clay. Note: gravel is qu feldspar.	se; non 5"; 10%			•	PID = 0.1 ppm @ Cyclone and 0.0 ppm @ breathing zone. Hammering. Slow drilling. Water added.
370	-				Same as above (365 ft).		GP- GM		•	PID = 0.2 ppm at Cyclone and 0.0 ppm at breathing zone.
375	-			2.44	Poorly graded SAND (SP); light (7.5YR 6/3); loose; 98% fine san fine gravel; noncohesive.		SP		- High Solids Bentonite Grout	Hammered to 380'. Slow drilling. 50 gallons of water added.
<u>380</u>	-				Well graded GRAVEL (GW); bro (7.5YR 4/4); dense; non cohesiv fine to coarse gravel; angular to subrounded; trace silt and clay. I gravel is quartz and feldspar.	e; 100%				Kelly down @ 1158. New 20' connection @ 1335. Empty bin into rolloff. PID = 0.1 ppm @ Cyclone and 0.0 ppm @ breathing zone.
<u>385</u>	-				Same as above (378 ft).		GW		• • • • • • • •	
390								••• ••• •••	• •	

(	C	RI				Bore	eho	le	D: KAFB-	106225
Pro Pro	ojec ojec	ct Loca ct Nam	ation ne: ł	: Kaf (Afb	s of Engineers FB, Albuquerque, NM BFF SWMU ST-106 and SS-111	Hole Dia	ametei	Low	ber (in.): 11-3/4 ver (in.): 9-5/8 n Type: Flush	
Da Da	te S ite T	Starteo FD Re	d: 12 ache	1407 2/11/2( d: 12 : 1/16	014 /17/2014	👳 At T	ime of	f Drill Drilli	ls BGS (ft): ling: 462.00 ng: 464.98 463.61	
Y	Coo	d Elev ordinat ordinat	e:	n AMS	L (ft): Not Recorded	Drillling Drilling N Logged	Method	d: A		Page 14 of 17
6 Depth (ft)	Sample Type	Number	Headspace	Lithologic Log	Material Description		U.S.C.S.		Well Diagram	Remarks
0.90	-				Well graded SAND (SW); light b (7.5YR 6/3); dense; non cohesiv fine to coarse sand; 3% fine grav silt. Note: gravel is quartz.	re; 95%			• • • • • • • • • • • • • • • •	Hard drilling. Hammering. 50 gallons of water added.
395	-				Same as above (390 ft).		SW		- Top of	
400	-				Same as above (390 ft).				Bentonite Seal	Kelly down @ 1356. New connection @ 1410. PID = 0.2 ppm @ Cyclone and 0.0 ppm @ breathing zone.
405	-				Poorly graded SAND (SP); brow (7.5YR 5/3); dense; non cohesiv fine sand; trace silt and clay.			_		Slow drilling. Hammering. Added 100 gallons of water.
<u>410</u>	-				Same as above (405 ft).		SP		- Bentonite Seal	PID = 0.0 ppm @ Cyclone and breathing zone.
415	-				Well graded SAND (SW); brown 4/3); dense; non cohesive; 100% coarse sand; trace silt.		SW			Very slow drilling. Kelly down @ 1447. New connection @ 1502. Empty bin into rolloff.
420	]									

Γ

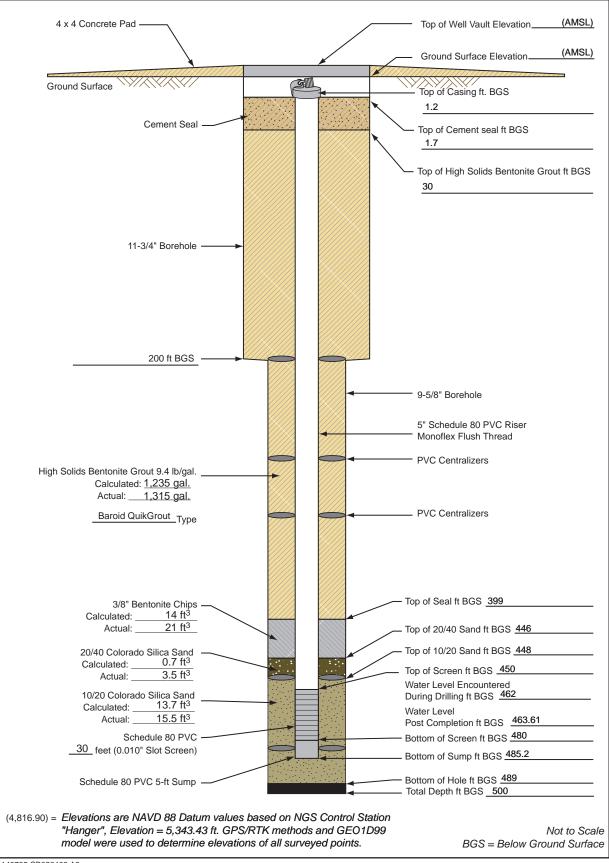
(	C	BI	5			Bore	ehol	e ID: KAFB-1	106225
P P	rojec rojec	t Loca t Nan	ation: ne: K/	KÁF AFB E	s of Engineers FB, Albuquerque, NM BFF SWMU ST-106 and SS-111	Hole Dia	ameter	Upper (in.): 11-3/4 Lower (in.): 9-5/8 letion Type: Flush	
	ate S ate T	Starteo D Re	<b>hber:</b> d: 12/ ached eted:	11/20 : 12/	014 /17/2014	∑ At T T At E	ime of nd of I	evels BGS (ft): Drilling: 462.00 Drilling: 464.98 ng: 463.61	
Y	Coo	d Elev rdinat rdinat	e:	AMS	L (ft): Not Recorded	Drilling Orilling	Contra /lethoc	ctor: Yellow Jacket I: ARCH Richards	Page 15 of 17
5 Denth (ft)		Number	Headspace PID	Lithologic Log	Material Description		U.S.C.S.	Well Diagram	Remarks
	-				Fat CLAY (CH); light brown (7.5 dense; stiff; medium plasticity; tr sand and silt.				PID = 0.0 ppm @ Cyclone and breathing zone. Hammering. 100 gallons of water added.
42	- 5 - -				Same as above (420 ft).		СН		
43	)				Poorly graded SAND (SP); pinki (7.5YR 6/2); dense; 100% fine s noncohesive; rounded to subrou	and;			PID = 0.3 ppm @ cyclone and 0.0 ppm @ breathing zone.
43	-				Same as above (430 ft).			- Bentonite Seal	
44	)				Poorly graded SAND (SP); brow (7.5YR 5/4); dense; 95% fine sa fine gravel; 3% silt; non cohesive	nd; 2%	SP		Kelly down @ 1528. New 20' connection @ 1536. PID = 0.1ppm @ Cyclone and 0.0 ppm @ breathing zone. Slow drilling. Hammering. Added 50
44	5				Same as above (440 ft).			- Top of 20/40 Sand - Top of 10/20 Sand	gallons of water. PID = 0.0 ppm @ cyclone and breathing zone.
45	)								

(	C	RI				Bore	ehol	e ID: ł	KAFB-′	106225
Pro Pro	ojec ojec	t Loca t Nan	ation ne: ł	: KAF	s of Engineers <sup>-</sup> B, Albuquerque, NM BFF SWMU ST-106 and SS-111	Hole Dia	ameter	Upper (in.) Lower (in.) letion Type	): 9-5/8	
Da Da	te S ate T	Starteo	d: 12 ache	1407 2/11/2( d: 12 : 1/16	014 /17/2014	⊻ At T ▼ At E	ime of nd of I	evels BGS Drilling: 4 Drilling: 46 ng: 463.61	62.00 64.98	
Y	Cool	d Elev rdinat rdinat	e:	n AMS	SL (ft): Not Recorded	Drilling N	/lethoo	ctor: Yello I: ARCH Richards	w Jacket	Page 16 of 17
65 Depth (ft)	Sample Type	Number	Headspace	Lithologic Log	Material Description		U.S.C.S.	Well D	Diagram	Remarks
455	_				Well graded SAND (SW); brown 5/2); dense; 95% fine to coarse s 5% fine gravel (quartz, feldspar); cohesive.	sand;	SW	Si P'	op of 5" chedule 80 VC 0.010" lot Screen	PID = 0.2 ppm @ Cyclone and 0.0 ppm @ breathing zone.
	-				Well graded GRAVEL (GW); bro (7.5YR 5/3), dense; 98% fine to o gravel; subangular to subrounde fine sand; trace silt and clay; noncohesive.	coarse				
460	-				Same as above (455 ft). ∑ ⊻		GW			Kelly down @ 1602. New 20' connection @ 1609. Top of water at 462' at time of drilling.
465	-				∑ Same as above (455 ft).					Top of water at 463.61' measured on 1/6/2015. Top of water at 464.8' at end of drilling. Measured on 12/17/14.
470	-				Poorly graded SAND (SP); brow (7.5YR 5/4); dense; non cohesive fine sand; trace silt and clay.					PID = 0.0 ppm @ Cyclone and breathing zone.
475	-				Same as above (470 ft).		SP			Kelly down @ 1634. Stop drilling for 12-16-14. Add 50 gallons of water after 470'.
480										

(	C	RI				Bore	eho	e ID: KAFB-	106225
Pr Pr	ojec ojec	t Loca t Nan	ation: ne: K	: KÁF (AFB E	s of Engineers FB, Albuquerque, NM BFF SWMU ST-106 and SS-111	Hole Dia	ameter	Upper (in.): 11-3/4 Lower (in.): 9-5/8 letion Type: Flush	
Da Da	ite S ite T	tarteo D Re	d: 12 acheo	1407 /11/20 d: 12/ 1/16	014 /17/2014	⊥ At T ▼ At E	ime of nd of	evels BGS (ft): Drilling: 462.00 Drilling: 464.98 ng: 463.61	
Y	Cooi	d Elev rdinat rdinat	e:	AMS	L (ft): Not Recorded	Drilling N	/lethoo	ictor: Yellow Jacket I: ARCH . Richards	Page 17 of 17
08 Depth (ft)	Sample Type	Number	Headspace PID	Lithologic Log	Material Description		U.S.C.S.	Well Diagram	Remarks
	_				Poorly graded SAND (SP); brow (7.5YR 5/4); dense; non cohesiv fine sand; trace silt and clay.		SP	- Sump	Start drilling on 12-17-14. new 20' connection @ 1017. Hammering. Water added, ~ 25 gallons.
485	-				Well graded SAND (SW); brown 5/2); wet; dense; non cohesive; fine to coarse sand.		SW	- Bottom of Sump	PID = 0.0 ppm @ Cyclone and 0.0 ppm @ breathing zone.
490	-				Poorly graded SAND (SP); pinkis (7.5YR 7/2); dense; wet; non col 100% fine sand; trace silt and cla	nesive;	SP	Filter Pack	Hammering. Hard drilling. Light rain. PID = 0.4 ppm @ Cyclone and 0.1ppm @ breathing zone.
495	-				Poorly graded SAND (SP); pinki (7.5YR 6/2); dense; wet; non col 100% very fine sand (flowing sa Well graded SAND with Gravel (	nesive; nd).		- Native Backfill	PID = 0.1 ppm at Cyclone and breathing zone. Kelly down @ 1100. Prep
500	-				brown (7.5YR 4/2); dense; wet; r cohesive; 80% fine to coarse sat fine to coarse gravel to 1.5"; Not is quartz and feldspar.	non nd; 20%	SW		for measurement of depth to groundwater. end of drilling on 12-17-14 and for well.
	-				TD = 500'				
505	-								
510									

### Monitoring Well Completion Diagram KAFB-106225

Installation Start Date/Time: 1/7/2015 @ 0930 Installation End Date/Time: 1/19/2015 @ 1112



140705.CB020403.A3



Project Name: KAFB BFF			
Location: Georgia Street		Well/Piez. No.: KAFB-106225	
Personnel: V. Bracht, E. Perez		Date Installed: 1/19/15	
Date: 1/21/15 - 1/23/15		Csg. Diameter (I.D.): 5 "	
Samplers: N/A		Total Depth (ft. bgs): <u>485.2</u>	
Method of Development: X Surging	X Bailing	X Pumping	
X Original Development	Redevelopment	Other	
Development Date: 1/21/2015 - 1/23	/2015		
Depth to Water Before Developing V	Vell (ft. btoc): 463.22		

 $V = (B * r_c^{2} * L_c * 7.48) + (B * (r_w^{2} - r_c^{2}) * L_s * \phi_s * 7.48) + (H_2O \text{ added during drilling/installation}) = 1,215.6 \text{ gallons}$ 

Depth Purging From: 480 feet	Time Purging Begins: <u>1207, 1/22/2015</u>
Weather: Partly Cloudy, Windy	Screened Interval (ft bgs): 450 - 480
Equipment Nos.: pH Meter: YSI 650 MDS	EC Meter: YSI 650 MDS Turbidity Meter: HACH 21000Q

Equipment Decontaminated Prior to Development: Y X N

Describe: Steam Cleaned

Collected Sample of Water Added to Well: Y N X Describe: N/A

Comment: Approximately 1,175 gallons of water added during drilling/well installation activities

		Water Level (ft	Volume Removed				Turbidity	
Date	Time	bTOC)	(gal.)	Temp. (°C)	рН	EC (µS/cm)	(NTU)	Comments
1/21/2015	1515	463.22	0					Initial Water Level
1/21/2015	1528		0					Begin Bailing
1/21/2015	1536		0					Water is Muddy
1/21/2015	1605		25					Complete Bailing; Water is Muddy
1/21/2015	1609		25					Begin Swabbing
1/21/2015	1630		25					Complete Swabbing. End of Day
1/22/2015	0847		25					Begin Bailing; Water is Muddy
1/22/2015	0917		50					Complete Bailing; Water is Muddy
1/22/2015	1200	463.61	50					Water Level Prior to Pumping
1/22/2015	1207		50					Begin Pumping @ 7.5 GPM. Pump Set @480 feet bgs. Water is Brown/Muddy

Notes: \* Water Levels - Reported to the nearest 0.01 foot

\* pH - Reading rounded to 0.1 pH units \* Water temperature - Reported to nearest 0.1 °C

°C = Degree Celsius

EC = Electric Conductivity

ft bgs = Feet Below Ground Surface

ft btoc = Feet Below Top of Casing

gal. = Gallon GPM = Gallons Per Minute

I.D. = Inner Diameter

N/A = Not Applicable

NR = Not Recorded NTU = Nephelometric Turbidity Unit

S/m = Seimens per Meter

Where: B=3.14

 $Ø_s$ = porosity of the sand pack

 $r_c$ = radius of the well casing and screen in feet

 $L_{\rm c}\text{=}$  length of water column inside the casing and screen in feet rw= radius of the well bore in feet

 $L_s$ = length of saturated portion of the sand pack in feet

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



Project: KAFB BFF

Project Number: 140705

Date: 1/21/2015 - 1/23/2015

Time Start: 1528, 1/21/2015

Well No: KAFB-106225

Samplers: N/A

Checked By:

Time Finish: 1040, 1/23/2015

Field Chemis	stry (cont'd)							
Date	Time	Water Level (ft. Below TOC)	Volume Removed (gal.)	Temp. (°C)	рН	EC (μS/cm)	Turbidity (NTU)	Comments
1/22/2015	1226	464.78	175	16.27	5.49	0.395	12.40	Continue Pumping; Clear
1/22/2015	1233	464.80	250	14.45	7.13	0.400	11.70	Continue Pumping; Clear
1/22/2015	1240	464.82	300	10.55	7.34	0.400	12.70	Continue Pumping; Clear
1/22/2015	1247	464.82	335	10.10	7.24	0.399	13.90	Continue Pumping; Clear
1/22/2015	1254	464.80	390	12.01	6.97	0.394	8.74	Continue Pumping; Clear
1/22/2015	1300	NR	425					Pump Raised to 468 feet bgs
1/22/2015	1301	464.88	450	11.29	6.61	0.396	6.31	Continue Pumping; Clear
1/22/2015	1308		450					Water Stopped Flowing through YSI
1/22/2015	1311	464.88	490	13.94	6.98	0.398	32.2	Continue Pumping; Slightly Cloudy
1/22/2015	1313		500					Stopped Pumping; End of Day
1/23/2015	0850	463.56	500					Initial Daily Water Level Reading
1/23/2015	0900		500					Pump Set at 468 feet bgs
1/23/2015	0901	464.76	550	14.72	5.28	0.410	261	Continue Pumping @ 7.5 GPM; Cloudy
1/23/2015	0908	464.81	600	11.76	7.12	0.402	248	Continue Pumping; Cloudy
1/23/2015	0915	464.82	650	11.00	7.31	0.404	160	Continue Pumping; Cloudy

Was well sampled after development? YES NO X

Sample Method: N/A

Sample Name: N/A

Analyses: N/A

Pg 2 of 3



Project: KAFB BFF

Project Number: 140705

Date: 1/21/2015 - 1/23/2015

Time Start: 1528, 1/21/2015

Well No: <u>KAFB-106225</u>
Samplers: <u>N/A</u>

Checked By:

Time Finish: 1040, 1/23/2015

Field	Chemistry	(cont'd	)
1 1010	Onioniony	(oon a	/

Date	Time	Water Level (ft. Below TOC)	Volume Removed (gal.)	Temp. (°C)	рН	EC (μS/cm)	Turbidity (NTU)	Comments
1/23/2015	0922	464.83	700	7.06	4.62	0.402	52.5	Continue Pumping; Slightly Cloudy
1/23/2015	0929	464.83	775	6.40	4.54	0.403	23.9	Continue Pumping; Clear
1/23/2015	0936	464.86	825	5.68	4.79	0.397	13.2	Continue Pumping; Clear
1/23/2015	0943	464.90	875	5.64	5.35	0.397	9.10	Continue Pumping; Clear
1/23/2015	0950	464.92	925	5.85	5.25	0.396	5.75	Continue Pumping; Clear
1/23/2015	0956	NR	925					Pump Lowered to 470 feet bgs
1/23/2015	0957	464.91	960	5.40	5.00	0.398	4.39	Continue Pumping; Clear
1/23/2015	1004	464.90	1000	5.61	4.89	0.396	2.61	Continue Pumping; Clear
1/23/2015	1011	464.93	1050	5.44	4.79	0.398	2.04	Continue Pumping; Clear
1/23/2015	1016		1050					Pump Lowered to 472 feet bgs
1/23/2015	1018	464.94	1110	18.28	5.89	0.402	0.91	Increase Flow Rate due to Freezing Temperatures
1/23/2015	1025	464.88	1150	17.19	7.28	0.404	7.10	Continue Pumping; Clear
1/23/2015	1030	464.87	1200	15.45	7.29	0.401	7.74	Continue Pumping; Clear
1/23/2015	1035	464.88	1250	14.54	7.22	0.401	1.44	Continue Pumping; Clear
1/23/2015	1040	464.88	1275	14.12	7.04	0.401	0.98	Complete Pumping; Water is Clear

Was well sampled after development? YES NO X

Sample Method: N/A

Sample Name: N/A

Analyses: N/A

Pg 3 of 3

# KAFB 106226

Pro	ject	t Loca Nam	ation: ne: K	: KA	FB, Albuquerque, NM Hole BFF SWMU ST-106 and SS-111 Surfa 705	Diamete	r Low	er (i n Ty	n.): 11-3/4 n.): 9-5/8 pe: Flush	STATESSIONAL CRIMINA BRACHT DES
Da Da	te T te C	D Re ompl	ache eted:	2/10	15 ⊈ A 26/2015 ¥ A 1/2015 ½ A	t Time c t End of fter Drill	f Drilli Drillin ing: 4	ng: g: 64.	465.00 Not Recorded 02	8881903-2250
YC	coor	dinat	e:		Drillin	Drilling Contractor: Yellow Jacket Drilling Method: ARCH Logged By: T. Richards				3/ 6/15 Page 1 of 18
Depth (ft)	Sample Type	Number	Headspace	Lithologic Log	Material Description	U.S.C.S.		We	ll Diagram	Remarks
0					No description recorded. Asphalt from 0' - 0.5'. No description recorded. Road Base from 0.5' - 2'. No description recorded. Borehole was water jetted. Silt with sand and gravel		LT		- Top of Casing/ Top of Cement Seal	Water knife and pothole to 9' on 1/7/15.
5				. 4 1	were observed down hole. Well graded GRAVEL with Silt and Sar	bd				Began ARCH drilling @
15					(GW-GM); very pale brown (10YR 7/4); dry; loose; 70% gravel to 0.4'; subrounded; 20% fine sand; 10% silt and clay. Note: gravel is quartzite and sandstone.	GW-			- Cement Seal	0915 on 1/21/15. PID @ cyclone and breathing zone = 0.0 ppm.
					Same as above (10 ft).	GM				Kelly down @ 0931 on 1/21/15. New 20' connection @ 0944. No water added and no hammering.
20					Well graded GRAVEL with Sand (GW); very pale brown (10YR 7/4); dry to mois loose; 70% fine to coarse gravel to 2"; 30% fine sand.					PID @ cyclone and breathing zone = 0.0 ppm.
25					Same as above (20 ft).	GW				
30					Description on following page.	SP			- Top of High Solids	PID @ cyclone and breathing zone = 0.0 ppm. Windy

KAFB\_BOREHOLE\_LOG - SHAW\_DRILLING.GDT - 3/6/15 11:11 - ZNKAFB BFFIGINTIKAFB\_PROJECTIKAFB\_BFF.GPJ

	C	BI				Bore	eho	le l	ID: KAFB-	·106226
Pro Pro	ojec ojec	ct Loc ct Nan	ation ne: k	: Kaf Kafb I	s of Engineers FB, Albuquerque, NM BFF SWMU ST-106 and SS-111	Hole Dia	amete	r Low	per (in.): 11-3/4 ver (in.): 9-5/8 on Type: Flush	
Da Da	ite S ite T	Starte ID Re	d: 1/ ache	1407 21/20 d: 1/2 : 2/10	15 26/2015	🕎 At T	ime of	f Drill Drilliı	els BGS (ft): ling: 465.00 ng: Not Recorde 464.02	d
YO	Coo	id Ele ordinat ordinat	e:	n AMS	L (ft): Not Recorded	Drilling Drilling N Logged	Nethod	d: A		Page 2 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); very brown (10YR 7/4); moist; soft; lo 95% fine to medium sand; 5% fi gravel.	ose;			Bentonite     Grout	No water added and very little hammering.
35	-				Same as above (30 ft).		SP			Kelly down @ 1000. New 20' connection @ 1018. PID @ cyclone and breathing zone = 0.0 ppm.
40	_				Same as above (30 ft).				<ul> <li>•</li> <li>•&lt;</li></ul>	No water added and very little hammering.
45	-				Silty GRAVEL with Sand (GM); brown (10YR 7/4); dry to moist; to coarse gravel; subrounded; 1 sand; 15% silt. Note: gravel is qu and sandstone.	70% fine 5% fine			- High Solids Bentonite Grout	No water added. Began hammering.
50					Same as above (45 ft).		GM		<ul> <li>•</li> <li>•&lt;</li></ul>	PID @ cyclone and breathing zone = 0.0 ppm.
55	-				Same as above (45 ft).				<ul> <li>•</li> <li>•&lt;</li></ul>	Kelly down @ 1026. New 20' connection @ 1039.
60				, , , , , , , , , , , , , , , , , , ,				••	•••	

(	C	BI				Bore	eho	le I	D: KAFB-	106226		
Pr Pr	ojec ojec	t Loca t Nam	ation: ie: K	KAF AFB I	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						
Da	ate S ate T		I: 1/2 acheo	21/20 <sup>-</sup> d: 1/2		🕎 At T	ime of	f Drill Drillir	ls BGS (ft): ing: 465.00 ng: Not Recorded 464.02			
Y	Coor	d Elev dinate	e:	AMS	L (ft): Not Recorded	-	Contra Method	actor: d: Al	Yellow Jacket RCH	Page 3 of 18		
9 Depth (ft)	Sample Type	Number	Headspace PID	Lithologic Log	Material Description		U.S.C.S.		Well Diagram	Remarks		
	-				Silty GRAVEL with Sand (GM); y brown (10YR 7/4); dry to moist; to coarse gravel; subrounded; 1 sand; 15% silt. Note: gravel is qu and sandstone.	70% fine 5% fine		· · · · · · · · · · · · · · ·	· · · · · · · · · · · · · · · · · · ·	PID @ cyclone and breathing zone = 0.0 ppm.		
65	-				Same as above (60 ft).					No water added, hammering.		
70	-				Same as above (60 ft).					PID @ cyclone and breathing zone = 0.0 ppm.		
75	-				Same as above (60 ft).		GМ	<ul> <li>•</li> <li>•&lt;</li></ul>	- High Solids Bentonite Grout	Kelly down @ 1100. New 20' connection @ 1110. No water added, hammering.		
80	-				Same as above (60 ft).					PID @ cyclone and breathing zone = 0.0 ppm.		
85					Same as above (60 ft).					No water added, hammering. PID @ cyclone and breathing zone = 0.0 ppm.		
90								•••	• • • • • •			

	C	BI				Bore	eho	le I	D: KAFB-1	06226
Pro Pro	ojeci ojeci	t Loca t Nam	ation: ie: K	: Káf (AFB	s of Engineers FB, Albuquerque, NM BFF SWMU ST-106 and SS-111	Hole Dia	ameter	Low	er (in.): 11-3/4 er (in.): 9-5/8 ı Type: Flush	
Da Da	te S ite T	tartec D Rea	l: 1/2 acheo			👳 At T	ime of nd of	f Drilli Drillin	BGS (ft): ng: 465.00 g: Not Recorded 64.02	
YC	Coor	d Elev dinate	e:	AMS	L (ft): Not Recorded	Drillling Drilling N Logged	/lethoo	d: AF		Page 4 of 18
ଓ Depth (ft)	Sample Type	Number	Headspace PID	Lithologic Log	Material Description		U.S.C.S.		Well Diagram	Remarks
95					Silty GRAVEL with Sand (GM); v brown (10YR 7/4); dry to moist; to coarse gravel; subrounded; 19 sand; 15% silt. Note: gravel is qu and sandstone. Same as above (90 ft).	70% fine 5% fine	GM	•     •       •     •	0       0         0       0	Kelly down @ 1130. New 20' connection @ 1140. Stop drilling @ 1145. Added 50 gallons of water due to hard drilling.
100				24	Poorly graded SAND with Grave light brown (7.5YR 6/3); 80% ver coarse sand; angular; 20% fine t medium gravel. Same as above (100 ft).	ry	SP		<ul> <li>High Solids</li> <li>Bentonite</li> <li>Grout</li> </ul>	PID @ cyclone = 0.1 ppm. PID @ breathing zone = 0.0 ppm.
110					Poorly graded SAND with Clay ( brown (7.5YR 4/3); 80% fine to r sand; 10% clay; 5% silt; 5% fine	nedium	SP- SC		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	PID @ cyclone and breathing zone = 0.0 ppm.
115					Lean CLAY (CL); brown (7.5YR moist; soft; low to medium plasti 100% clay; trace silt and gravel.		CL		•       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •	Kelly down @ 1305. New 20' connection @ 1318. Hammering. PID @ cyclone and breathing zone = 0.0 ppm.

	C	BI	<b>)</b>			Bore	eho	le II	D: KAFB-1	106226
Pro Pro	ojec ojec	t Loca Nan	ation ne: k	: KÁF (AFB	s of Engineers FB, Albuquerque, NM BFF SWMU ST-106 and SS-111	Hole Dia	ametei	r Lowe	er (in.): 11-3/4 er (in.): 9-5/8 Type: Flush	
Da Da	ite S ite T	Started D Re	d: 1/ ache			🛛 At T	ime of	f Drillir Drilling	BGS (ft): ng: 465.00 g: Not Recorded 64.02	
Y (	Cool	d Elev rdinat rdinat	e:	ו AMS	SL (ft): Not Recorded	-	Contra Aethoo	actor: d: AR	Yellow Jacket	Page 5 of 18
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 moist; soft; low to medium plasti 100% clay; trace silt and gravel.	icity;			· · · · · · · · · · · · · · · · · · ·	Added 50 gallons of water.
125	-				Same as above (120 ft).				· · · · · · · · · · · · · · ·	Hammering.
130	-				Same as above (120 ft).			<ul> <li>•</li> <li>•&lt;</li></ul>	· · · · · · · · · · · · · · · · ·	PID @ cyclone = 0.2 ppm. PID @ breathing zone = 0.0 ppm.
135	-				Same as above (120 ft).		CL	<ul> <li>•</li> <li>•&lt;</li></ul>	- High Solids Bentonite Grout	Kelly down @ 1337. New connection @ 1348.
140					Same as above (120 ft).				<ul> <li>•</li> <li>•&lt;</li></ul>	PID @ cyclone = 0.1 ppm. PID @ breathing zone = 0.0 ppm. Added 50 gallons of water.
<u>145</u> 150	-				Same as above (120 ft).					Hammering.

	C	BI				Bore	eho	le l	D: KAFB-1	106226
Pro Pro	ojec ojec	t Loca t Nam	ation ne: k	: KÁI (AFB	s of Engineers FB, Albuquerque, NM BFF SWMU ST-106 and SS-111	Hole Dia	ametei	r Lów	ver (in.): 11-3/4 ver (in.): 9-5/8 n Type: Flush	
Da Da	ate S ate T	Starteo D Rea	d: 1/ ache			🛛 🛛 🛛 🔤	ime of Ind of	f Drill Drillir	s BGS (ft): ing: 465.00 ng: Not Recorded 464.02	
Y	Coo	d Elev rdinate rdinate	e:	n AMS	SL (ft): Not Recorded		Contra Method	actor: d: Al	Yellow Jacket RCH	Page 6 of 18
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 moist; soft; low to medium plasti 100% clay; trace silt and gravel.	city;	CL	••• ••• •••	• • • • • • • •	PID @ cyclone and breathing zone = 0.0 ppm.
<u>155</u> <u>160</u>					Poorly graded GRAVEL with Cla Sand (GP-GC); strong brown (7 5/6); 75% fine gravel; angular; 1 sand; 10% clay. Same as above (152 ft).	.5YR	GP- GC			Kelly down @ 1359. New 20' connection @ 1415. PID @ cyclone and breathing zone = 0.0 ppm. Added 50 gallons of water.
170	-				Well graded SAND (SW); light b (7.5YR 6/3); 95% fine to coarse 5% fine gravel. Same as above (165 ft).		sw		- High Solids Bentonite Grout	PID @ cyclone = 0.3
<u>175</u>					Poorly graded SAND (SP); light (7.5YR 6/4); moist; 95% fine to r sand; 5% silt.		SP			ppm. PID @ breathing zone = 0.1 ppm. Added 100 gallons of water. Kelly down @ 1430. Total depth with 11-3/4" casing. End of 1/21/15. Resumed drilling with 9-5/8" casing @ 1457 on 1/22/15.
180	-							• • • • • • • •	• • • • • • • • • •	

(	C	BI				Bore	eho	le I	D: KAFB-1	106226
Pr Pr	ojec ojec	t Loca Nan	ation ne: k	: Káf (Afb i	s of Engineers FB, Albuquerque, NM BFF SWMU ST-106 and SS-111	Hole Dia	ametei	r Low	er (in.): 11-3/4 er (in.): 9-5/8 ı Type: Flush	
Da Da	ite S ite T	Starteo D Re	d: 1/ ache	1407 21/20 d: 1/2 2/10	15 26/2015	👳 At T	ime of	f Drilli Drillin	s BGS (ft): ng: 465.00 ng: Not Recorded 164.02	
Y	Cool	d Elev rdinat rdinat	e:	ו AMS	L (ft): Not Recorded	Drillling Drilling N Logged	<b>Netho</b>	d: AF		Page 7 of 18
08 Depth (ft)	Sample Type	Number	Headspace PID	Lithologic Log	Material Description		U.S.C.S.		Well Diagram	Remarks
	_				Poorly graded SAND (SP); light (7.5YR 6/4); moist; 95% fine to r sand; 5% silt.			<ul> <li></li> /ul>	•       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •	PID @ cyclone and breathing zone = 0.0 ppm.
<u>185</u>	-				Same as above (180 ft).		SP		<ul> <li>•</li> <li>•&lt;</li></ul>	Little hammering. Soft drilling.
190	-				Clayey SAND (SC); brown (7.5Y moist; low plasticity; 60% fine to sand; 40% clay.	′R 5/3); medium		· · · · · · · · · · · · · · · · · · ·	•       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •	Added 50 gallons of water. PID @ cyclone and breathing zone = 0.0 ppm.
195	-				Same as above (190 ft).		SC		- High Solids Bentonite Grout	Kelly down @ 1504. New 20' connection @ 1517. No water added, soft drilling.
200	-				Same as above (190 ft).			<ul> <li>•</li> <li>•&lt;</li></ul>	•       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •	PID @ cyclone and breathing zone = 0.0 ppm.
205					Same as above (190 ft).			• • • • • • • • • •		No water added, soft drilling.
210					Poorly graded SAND (SP); brow (7.5YR 5/3); moist; soft; 95% find medium sand; 5% silt.	n e to	SP	· · · · · · · · · · · · · · · · · · ·	· · · · · · · · · · · · · · · · · · ·	PID @ cyclone and breathing zone = 0.0 ppm

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Pr Pr	ojec ojec	t Loca t Nam	ation: ne: K	: Káf (AFB I	s of Engineers FB, Albuquerque, NM BFF SWMU ST-106 and SS-111	Hole Dia	ametei	r Low	er (in.): 11-3/4 er (in.): 9-5/8 n Type: Flush	
Da	ate S ate T	Started D Re	d: 1/2 ache			🕎 At T	ime of nd of	f Drill Drillir	s BGS (ft): ing: 465.00 ng: Not Recorded 464.02	
Y	Coo	d Elev rdinat rdinat	e:	n AMS	L (ft): Not Recorded	Drillling Drilling N Logged	<b>Nethoo</b>	d: Al		Page 8 of 18
Depth (ft)	Sample Type	Number	Headspace PID	Lithologic Log	Material Description		U.S.C.S.		Well Diagram	Remarks
	-				Poorly graded SAND with Grave brown (7.5YR 4/3); soft; 80% me sand; 20% fine gravel; rounded. gravel is mafic and white plagiod	edium Note:		· · · · · · · · · · · · · · · · · · ·	• • • • • • • • • •	No water added, soft drilling. No hammer.
215	-				Same as above (210 ft).			· · · · · · · · · · · · · · ·		Kelly down @ 1524. New 20' connection @ 1535.
220	-				Same as above (210 ft).					PID @ cyclone and breathing zone = 0.0 ppm.
225	-				Same as above (210 ft).		SP		- High Solids Bentonite Grout	No water added. Soft drilling, no hammer.
230	-				Same as above (210 ft).					PID @ cyclone and breathing zone = 0.0 ppm.
<u>235</u>	-				Same as above (210 ft).			<ul> <li>•</li> <li>•&lt;</li></ul>		No water added. No hammer, soft drilling. Kelly down @ 1541. new 20' connection @ 1552.
240								•••	• • • • • •	

	C	BI	\ \			Bore	eho	le II	D: KAFB-′	106226
Pro Pro	ojec ojec	t Loca t Nan	ation ne: K	: KAF	s of Engineers FB, Albuquerque, NM BFF SWMU ST-106 and SS-111	Hole Dia	ameter	Lowe	er (in.): 11-3/4 er (in.): 9-5/8 Type: Flush	
Da	ite S ite T	Started D Re	d: 1/: ache			🕎 At T	ime of nd of	f Drillir Drilling	BGS (ft): ng: 465.00 g: Not Recorded 54.02	
Y (	Cool	d Elev rdinat rdinat	e:	n AMS	L (ft): Not Recorded	-	Contra Method	actor: d: AR	Yellow Jacket CH	Page 9 of 18
5 Depth (ft)	Sample Type	Number	Headspace PID	Lithologic Log	Material Description		U.S.C.S.	V	Vell Diagram	Remarks
240	-				Poorly graded SAND with Grave brown (7.5YR 4/3); soft; 80% me sand; 20% fine gravel; rounded. gravel is mafic and white plagion	edium Note:			• • • • • • • • • •	No water added. No hammer, soft drilling. PID @ cyclone = 0.2 ppm. PID @ breathing zone = 0.0 ppm.
245					Same as above (240 ft).			· · · · · · · · · · · · · · · · · · ·	• • • • • • • • • • • •	
250	-				Same as above (240 ft).				· · · · · · · · · · · · · · · · · · ·	PID @ cyclone and breathing zone = 0.0 ppm.
255	-				Same as above (240 ft).		SP	· · · · · · · · · · · · · · · · · · ·	- High Solids Bentonite Grout	Kelly down @ 1555. New 20' connection @ 1606.
260	-				Same as above (240 ft).			· ·		PID @ cyclone and breathing zone = 0.0 ppm.
265	-				Same as above (240 ft).				<ul> <li>•</li> <li>•&lt;</li></ul>	No water added. Soft drilling, little hammering.
270								• • • • • •	• • • • • •	

	C	BI	5			Bore	eho	le I	D: KAFB-1	06226
Pro Pro	ojec ojec	t Loca Nan	ation ne: k	: KÁF (AFB I	s of Engineers FB, Albuquerque, NM BFF SWMU ST-106 and SS-111	Hole Dia	amete	r Low	er (in.): 11-3/4 er (in.): 9-5/8 ı Type: Flush	
Da Da	ite S ite T	Starteo D Re	d: 1/ ache	1407 21/20 d: 1/2 d: 1/2	15 26/2015	🕎 At T	Time of End of	f Drilli Drillin	s BGS (ft): ng: 465.00 g: Not Recorded .64.02	
Y (	Cool	d Elev rdinat rdinat	e:	ו AMS	L (ft): Not Recorded	Drillling Drilling I Logged	Metho	d: AF		Page 10 of 18
02 Depth (ft)	Sample Type	Number	Headspace PID	Lithologic Log	Material Description		U.S.C.S.		Well Diagram	Remarks
	_				Poorly graded SAND with Grave brown (7.5YR 4/3); soft; 80% me sand; 20% fine gravel; rounded. gravel is mafic and white plagio	edium Note:		<ul> <li>•</li> <li>•&lt;</li></ul>	•     •       •     •       •     •       •     •       •     •       •     •       •     •       •     •       •     •       •     •       •     •       •     •       •     •	Some hammering. No water added. PID @ cyclone and breathing zone = 0.0 ppm.
275	-				Same as above (270 ft).				<ul> <li>•</li> <li>•&lt;</li></ul>	Kelly down @ 1612. New 20' connection @ 1620. No water added. Hammering.
280	-				Same as above (270 ft).			•       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •	<ul> <li>•</li> <li>•&lt;</li></ul>	PID @ cyclone and breathing zone = 0.0 ppm.
285	-				Same as above (270 ft).		SP		<ul> <li>High Solids</li> <li>Bentonite</li> <li>Grout</li> </ul>	No water added. Hammering.
<u>290</u>	-				Same as above (270 ft).			<ul> <li>•</li> <li>•&lt;</li></ul>	<ul> <li>•</li> <li>•&lt;</li></ul>	PID @ cyclone and breathing zone = 0.0 ppm.
<u>295</u> 300	-				Same as above (270 ft).				•       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •	Kelly down @ 1631. New 20' connection @ 1638. End of 1/22/15. Resumed drilling @ 0918 on 1/23/15. Hammering. No water added.

	C	BI				Bore	eho	le I	D: Kaf	B-106226
Pro Pro	ojec ojec	t Loca t Nam	ation ne: K	: KÁF	s of Engineers FB, Albuquerque, NM BFF SWMU ST-106 and SS-111 205	Hole Dia	ameter	Low	er (in.): 11-3 er (in.): 9-5/ n Type: Flus	8
Da Da	ate S ate T	tarteo D Re	d: 1/2 ache	21/20 <sup>7</sup> d: 1/2		👳 At T	ime of nd of	f Drilli Drillin	s BGS (ft): ng: 465.00 g: Not Reco 64.02	orded
Y	Cooi	d Elev rdinat rdinat	e:	n AMS	L (ft): Not Recorded	Drillling Drilling N Logged	Nethod	d: AF		Ret Page 11 of 18
00 Depth (ft)	Sample Type	Number	Headspace PID	Lithologic Log	Material Description		U.S.C.S.		Well Diagrar	n Remarks
	-				Poorly graded SAND with Grave brown (7.5YR 4/3); soft; 80% me sand; 20% fine gravel; rounded. gravel is mafic and white plagiou	edium Note:	0.5	· · · · · · · · · · · · · · · · · · ·		Hammering due to hard drilling. No water added. PID @ cyclone and breathing zone = 0.0
305					Poorly graded SAND (SP); dark (7.5YR 4/1); moist; 100% mediu		SP	• • • • • • • • • • • •		ppm.
	-				Well graded GRAVEL (GW); 900 very coarse gravel; rounded; 100 medium sand. Note: gravel is qu quartzite, and feldspar.	%	GW			
310	-				Poorly graded SAND with Grave brown (7.5YR 5/4); moist; 80% f medium sand; 20% fine gravel; r trace silt. Note: intervals of very gravel.	ine to rounded;				Hammering, hard drilling. PID @ cyclone and breathing zone = 0.0 ppm.
315	-				Same as above (310 ft).				- High Solid Bentonite Grout	
320	-				Same as above (310 ft).		SP			Hammering, hard drilling. No water added. PID @ cyclone and breathing zone = 0.0 ppm.
325					Same as above (310 ft).					Hard drilling. No water added.
330	-				Same as above (310 ft); 30% to gravel.	35%		• • • • • • • • • •	• • • • • • • • • •	

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Pr   Pr	ojec ojec	t Loca t Nan	ation: ne: K	: KAF	s of Engineers <sup>F</sup> B, Albuquerque, NM BFF SWMU ST-106 and SS-111 205	Hole Dia	ametei	Lowe	er (in.): 11-3/4 er (in.): 9-5/8 Type: Flush	
Da Da	ate S ate T	Starteo D Re	d: 1/2 ache	21/20 <sup>-</sup> d: 1/2		👳 At T	ime of	f Drillir Drilling	BGS (ft): ng: 465.00 g: Not Recorded 64.02	
Y	Coo	d Elev rdinat rdinat	e:	I AMS	SL (ft): Not Recorded	Drillling Drilling N Logged	Nethod	1: AR		Page 12 of 18
00 Depth (ft)	Sample Type	Number	Headspace PID	Lithologic Log	Material Description		U.S.C.S.	V	Vell Diagram	Remarks
	-				Poorly graded SAND with Grave brown (7.5YR 5/4); moist; 80% fi medium sand; 20% fine gravel; r trace silt. Note: intervals of very gravel.	ine to ounded;		• • • • • • • • • • • • • •	• • • • • • • • • • • •	No water added. PID @ cyclone = 0.3 ppm. PID @ breathing zone = 0.0 ppm.
335	-				Same as above (330 ft).				• • • • • • • • • • • • •	Kelly down @ 1013. New 20' connection @ 1043.
<u>340</u>	-				Same as above (330 ft); gravel t	o 1".		<ul> <li>.</li> <li>.&lt;</li></ul>	• • • • • • • • • • • • • • • • • • • •	No water added. PID @ cyclone and breathing zone = 0.0 ppm.
345	-				Same as above (330 ft); gravel t	o 1".	SP	· · · · · · · · · · · · · · · · ·	- High Solids Bentonite Grout	
<u>350</u>	-				Same as above (330 ft); gray (7. 6/1); dry. Poorly graded SAND with Grave brown (7.5YR 5/4); moist; 80% ff medium sand; 20% fine gravel; r trace silt. Note: intervals of very gravel.	I (SP); ine to ounded;		· · · · · · · · · · · · · · · · · · ·		No water added, hammering.
<u>355</u>	-				Same as above (350 ft).				<pre></pre>	Kelly down @ 1103. New 20' connection @ 1111. Hammering. No water added.
360								••	• •	

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Pro Pro	ojec ojec	t Loca t Nam	ation ne: k	: KÁF (AFB I	s of Engineers FB, Albuquerque, NM BFF SWMU ST-106 and SS-111	Hole Dia	amete	r Low	er (in.): 11-3/4 er (in.): 9-5/8 n Type: Flush	
Da Da	ite S ite T	Starteo	d: 1/. ache			🕎 At T	ime of	f Drill Drillir	s BGS (ft): ing: 465.00 ng: Not Recorded 464.02	
Y (	Coo	d Elev rdinat rdinat	e:	n AMS	L (ft): Not Recorded	_	Contra Method	actor: d: Af	Yellow Jacket RCH	Page 13 of 18
8 Depth (ft)	Sample Type	Number	Headspace PID	Lithologic Log	Material Description		U.S.C.S.		Well Diagram	Remarks
365					Poorly graded SAND (SP) brown 5/4); moist; 100% fine to mediur trace silt. Same as above (360 ft).		SP			Hammering due to hard drilling. No water added. PID @ cyclone = 0.2 ppm. PID @ breathing zone = 0.0 ppm.
<u>370</u>	-				Same as above (360 ft). Well graded SAND (SW); brown 5/2); moist; 100% very fine to ve coarse sand; trace silt.		sw			No water added. PID @ cyclone and breathing zone = 0.0 ppm.
375	-				Poorly graded SAND with Grave brown (7.5YR 5/4); moist; 75% f medium sand; 25% fine to medi gravel. Note: gravel is quartz an feldspar.	ine to um			- High Solids Bentonite Grout	Kelly down @ 1131. New 20' connection @ 1145. Stop drilling. Began drilling @ 1303. No water added, hammering.
380	-				Same as above (375 ft).		SP			PID @ cyclone and breathing zone = 0.0 ppm.
<u>385</u> 390					Same as above (375 ft).					Hard drilling. No water added.

	C	BI				Bore	ho	le II	D: KAFB-1	106226
Pro Pro	ojec ojec	t Loc t Nan	ation ne: k	: Káf (AFB I	s of Engineers FB, Albuquerque, NM BFF SWMU ST-106 and SS-111	Hole Dia	imetei	Lowe	er (in.): 11-3/4 er (in.): 9-5/8 Type: Flush	
Da Da	te S ate T	Starteo D Re	d: 1/. ache	1407 21/20 <sup>7</sup> d: 1/2 2/10	15 26/2015	🕎 At T	ime of nd of	<sup>f</sup> Drillir Drilling	BGS (ft): ng: 465.00 g: Not Recorded 54.02	
Y	Cool	d Elev rdinat rdinat	e:	n AMS	L (ft): Not Recorded	-	Contra Iethoo	actor: d: AR	Yellow Jacket CH	Page 14 of 18
6 Depth (ft)	Sample Type	Number	Headspace PID	Lithologic Log	Material Description		U.S.C.S.	v	Vell Diagram	Remarks
330	-				Poorly graded SAND with Grave brown (7.5YR 5/4); moist; 75% f medium sand; 25% fine to mediu gravel. Note: gravel is quartz and feldspar.	ine to um		· · · · · · · · · · · · · · · · · · ·	• • • • • • • •	No water added. PID @ cyclone = 0.3 ppm. PID @ breathing zone = 0.0 ppm.
395	-				Same as above (390 ft).		SP	• • • • • • • • • • • • • • • • • •		Kelly down @ 1332. New 20' connection @ 1342.
400	-				Well graded SAND with Gravel ( brown (7.5YR 5/2); dry to moist; very fine to coarse sand; 15% fir medium gravel.	85%		· · · · · · · · · · · · · · · · · · ·	<pre>   •   •   •   •   •   •   •   •   •</pre>	PID @ cyclone and breathing zone = 0.0 ppm.
405	-				Same as above (400 ft).		SW		- High Solids Bentonite Grout	No water added, hammering.
<u>410</u>	-				Same as above (400 ft). Same as above (400 ft); trace cl	ay.				PID @ cyclone = 0.4 ppm. PID @ breathing zone = 0.0 ppm.
<u>415</u> 420	_				Lean CLAY with Sand (CL); redo brown (5YR 5/4); slightly moist; plasticity; 80% clay; 15% fine sa silt.	low	CL			No water added. Hard drilling, hammering. Kelly down @ 1405. New 20' connection. Stop drilling in order to make repairs on drill rig. End of 1/23/15. Resume @

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Pr Pr	ojec ojec	t Loca t Nam	ation: ne: K	: Kaf (Afb	s of Engineers FB, Albuquerque, NM BFF SWMU ST-106 and SS-111	Hole Dia	ametei	Lowe	r (in.): 11-3/4 r (in.): 9-5/8 Type: Flush	
Da	ate S ate T		d: 1/2 acheo	21/20 <sup>-</sup> d: 1/2		🕎 At T	ime of Ind of	f Drillin Drilling	BGS (ft): g: 465.00 : Not Recorded :4.02	
Y	Coo	d Elev rdinat rdinat	e:	AMS	L (ft): Not Recorded	Drillling Drilling I Logged	Method	d: AR(		Page 15 of 18
5 Depth (ft)	Sample Type	Num	Headspace PID	Lithologic Log	Material Description		U.S.C.S.	M	/ell Diagram	Remarks
	-				Poorly graded SAND with Silt (S reddish yellow (5YR 6/6); dry to moist; 90% fine sand; 10% silt.	P-SM); slightly				1230 on 1/26/15. Hammering and slow drilling. No water added. PID @ cyclone and breathing zone = 0.0 ppm.
425	-				Same as above (420 ft).		SP- SM	••	- High Solids Bentonite Grout	
430	-				Same as above (420 ft); slightly sand.	coarser				PID @ cyclone = 0.2 ppm. PID @ breathing zone = 0.0 ppm.
435	-				Well graded SAND (SW); light re brown (5YR 6/4); slightly moist; very fine to very coarse sand.		sw			Kelly down @ 1300. New 20' connection @ 1315. No water added.
440	-				Poorly graded SAND with Silt (S reddish yellow (5YR 6/6); slightly 90% fine sand; 10% silt.					PID @ cyclone and breathing zone = 0.0 ppm.
445	-				Same as above (440 ft).		SP- SM		- Top of Bentonite Seal	No water added.
450										

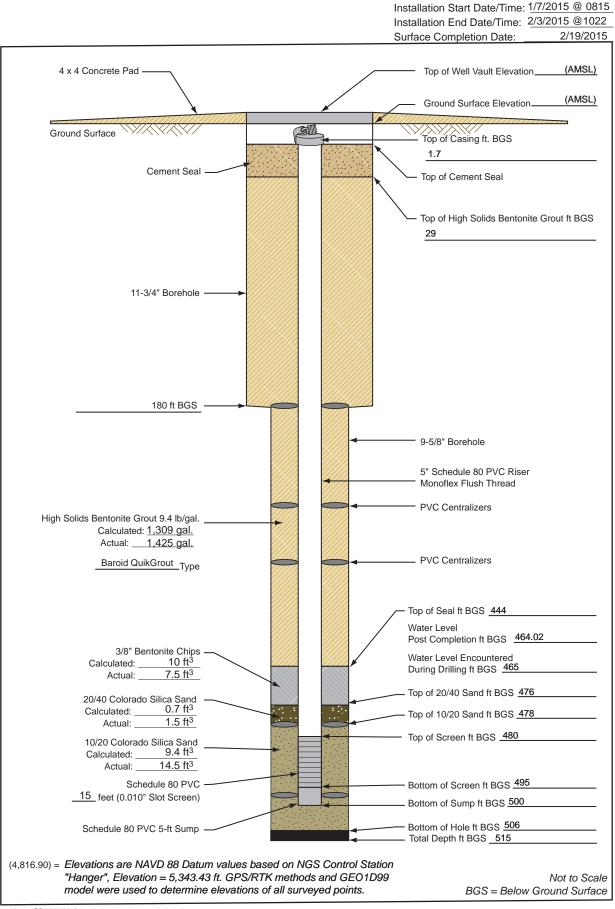
(	C	BI				Bore	ehol	e ID: I	KAFB-1	06226		
Pr Pr	ojeci ojeci	t Loca t Nam	ation ne: K	: KÁF (AFB	s of Engineers FB, Albuquerque, NM BFF SWMU ST-106 and SS-111	Hole Diameter Upper (in.): 11-3/4 Hole Diameter Lower (in.): 9-5/8 Surface Completion Type: Flush						
Da Da	te S ite T	tarteo D Re	1: 1/: ache			⊥ At T T At E	ime of Ind of [	evels BGS Drilling: 4 Drilling: No g: 464.02	65.00 ot Recorded			
Y	Coor	d Elev dinat dinat	e:	n AMS	L (ft): Not Recorded	Drillling Drilling	Contra ⁄Iethod	ctor: Yello : ARCH Richards		Page 16 of 18		
05 Depth (ft)	Sample Type	Number	Headspace	Lithologic Log	Material Description		U.S.C.S.	Well [	Diagram	Remarks		
					Poorly graded SAND with Silt (S reddish yellow (5YR 6/6); slightly 90% fine sand; 10% silt.		SP- SM			PID @ cyclone and breathing zone = 0.0 ppm.		
455	-				Well graded SAND with Gravel ( light reddish brown (5YR 6/3); dr slightly moist; 80% very fine to c sand; 20% fine gravel; subround round. Note: gravel is quartz and	ry to oarse led to	SW			Kelly down @ 1338. New 20' connection @ 1355.		
460	-				Well graded GRAVEL with Sand brown (7.5YR 5/4); moist; loose; fine gravel to 1"; round; 40% fine medium sand.	60%				No water added. PID @ cyclone and breathing zone = 0.0 ppm.		
465	-				⊻ ∑ Same as above (459 ft).			- B	entonite Seal	Top of water measured @ 465'.		
470					Same as above (459 ft).		GW			No water added. PID @ cyclone and breathing zone = 0.0 ppm.		
475	-				Same as above (459 ft).			S	op of 20/40 Sand	Kelly down @ 1416. New 20' connection @ 1430.		
480									op of 10/20 Sand			

	C	BI				Bore	eho	le ID: KAFB	-106226			
Pro Pro	oject oject	t Loca t Nam	ation ie: k	: KÁF (AFB I	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						
Da Da	te S te T	tarteo D Rea	l: 1/. ache	1407 21/20 <sup>7</sup> d: 1/2 2/10	15 26/2015	Groundwater Levels BGS (ft):						
Y	Coor	d Elev dinat	e:	n AMS	L (ft): Not Recorded	Drilling N	<b>Nethoo</b>	actor: Yellow Jacket d: ARCH . Richards	Page 17 of 18			
8 Depth (ft)	Sample Type	Number	Headspace PID	Lithologic Log	Material Description		U.S.C.S.	Well Diagram	Remarks			
	_				Poorly graded SAND with Grave yellowish red (5YR 5/6); moist to 85% fine to medium sand; 15% gravel; rounded. Note: gravel is	wet;		- Top of 5" Schedule 80 PVC 0.010" Slot Screen	No water added. PID @ cyclone and breathing zone = 0.0 ppm.			
485					Same as above (480 ft).							
<u>490</u>	-				Same as above (480 ft).				No water added. PID @ cyclone and breathing zone = 0.0 ppm.			
<u>495</u>	-				Same as above (480 ft).		SP	- Botton of Screen - Sump	Kelly down @ 1500. New 20' connection @ 1524.			
500	-				Same as above (480 ft).			- Bottom of Sump	PID @ cyclone and breathing zone = 0.0 ppm.			
505					Same as above (480 ft).			- Bottom of Filter Pack/ Top of Native Backfill				
510	1											

KAFB\_BOREHOLE\_LOG - SHAW\_DRILLING.GDT - 3/6/15 11:11 - Z:KAFB BFFIGINTIKAFB\_PROJECTIKAFB\_BFF.GPJ

	C	BI				Bore	ehol	e ID: KAFB-1	06226
Pro Pro	ojec ojec	t Loca t Nam	ation ie: K	: Káf (AFB I	s of Engineers FB, Albuquerque, NM BFF SWMU ST-106 and SS-111	Hole Dia	ameter	Upper (in.): 11-3/4 Lower (in.): 9-5/8 letion Type: Flush	
Da Da	te S te T		l: 1/: ache	21/20 <sup>7</sup> d: 1/2		⊻ At T ▼ At E	ime of Ind of I	evels BGS (ft): Drilling: 465.00 Drilling: Not Recorded ng: 464.02	
Y	Cool	d Elev rdinate rdinate	e:	I AMS	L (ft): Not Recorded	Drilling N	<b>Method</b>	ictor: Yellow Jacket I: ARCH . Richards	Page 18 of 18
0 Depth (ft)	Sample Type	Number	Headspace PID	Lithologic Log	Material Description		U.S.C.S.	Well Diagram	Remarks
-	-				Poorly graded SAND with Grave yellowish red (5YR 5/6); moist to 85% fine to medium sand; 15% gravel; rounded. Note: gravel is	wet; fine	SP	Native Backfill	No water added. PID @ cyclone and breathing zone = 0.0 ppm.
515								<u> 2008-2009</u>	Total depth = 515 ft reached @ 1600 on 1/26/15. Added 25 gallons of water to prepare hole for well installation.
520	-								Note: due to the addition of water during drilling, moisture was not logged in those intervals.
525	-								
530	-								
<u>535</u> 540	-								

### Monitoring Well Completion Diagram KAFB-106226



140705.CB020403.A4



Project Name: KAFB BFF			
Location: Georgia St.		Well/Piez. No.: KAFB-106226	
Personnel: E. Perez		Date Installed: 2/3/15	
Date: 2/13/15		Csg. Diameter (I.D.): <u>5 "</u>	
Samplers: N/A		Total Depth (ft. bgs): 500	
Method of Development: X Surging	X Bailing	X Pumping	
X Original Development	Redevelopment	Other	
Development Date: 2/13/15,	2/17/15		
Depth to Water Before Deve	loping Well (ft. btoc): 463.6		
V=(B * r <sub>c</sub> <sup>2</sup> * L <sub>c</sub> * 7.48)+(B * (r <sub>w</sub>	<sup>2</sup> - r <sub>c</sub> <sup>2</sup> ) * L <sub>s</sub> * Ø <sub>s</sub> * 7.48)+(H <sub>2</sub> O added	during drilling/installation) = 561.8 gallons	

Depth Purging From: 492 feet Time Purging Begins: 1127, 2/17/15 Weather: Sunny, 50's \_\_\_\_\_ Screened Interval (ft bgs): 480 - 495 Equipment Nos.: pH Meter: YSI 650 MDS EC Meter: YSI 650 MDS Turbidity Meter: HACH 21000Q

Equipment Decontaminated Prior to Development: Y X N

Describe: Steam Cleaned Collected Sample of Water Added to Well: Y\_\_\_\_ N X Describe: N/A

Comment: Approximately 500 gallons of water added during drilling/well installation activities

		Water Level (ft	Volume Removed				Turbidity	
Date	Time	bTOC)	(gal.)	Temp. (°C)	рН	EC (mS/cm)	(NTU)	Comments
2/13/2015	1125	463.60	0					Measured total depth = 499.70 ft btoc.
2/13/2015	1138							Begin swabbing.
2/13/2015	1200							Finish swabbing.
2/13/2015	1203							Begin bailing. Water is brown.
2/13/2015	1240		55					Finish bailing. Water is brown.
2/13/2015	1243		55					Begin swabbing.
2/13/2015	1300		55					Finish swabbing.
2/13/2015	1303		55					Begin bailing. Water is light brown.
2/13/2015	1350		125					Finish bailing. Water is very light brown.
2/17/2015	1018		125					Pump set at 492 feet.

Notes:

Water Levels - Reported to the nearest 0.01 foot pH - Reading rounded to 0.1 pH units Water temperature - Reported to nearest 0.1 °C °C = Degree Celsius EC = Electric Conductivity ft bgs = Feet Below Ground Surface ft btoc = Feet Below Top of Casing gal. = Gallon GPM = Gallons Per Minute I.D. = Inner Diameter N/A = Not Applicable NR = Not Recorded NTU = Nephelometric Turbidity Unit S/m = Seimens per Meter

Where:

B=3.14 Ø<sub>e</sub>= porosity of the sand pack

 $r_c$ = radius of the well casing and screen in feet

 $\mathsf{L}_\mathsf{c}\mathsf{=}\mathsf{length}$  of water column inside the casing and screen in feet

 $r_w$ = radius of the well bore in feet  $L_s$ = length of saturated portion of the sand pack in feet

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

Pg 1 of 3



Project: KAFB BFF	Well No: KAFB-106226
Project Number: 140705	Samplers: N/A
Date: 2/13/15	Checked By:
Time Start: 1125, 2/13/2015	Time Finish: 1403, 2/17/2015

Field Chemist	try (cont'd)	Water	Volume					
Date	Time	Level (ft. bTOC)	Removed (gal.)	Temp. (°C)	рН	EC (mS/cm)	Turbidity (NTU)	Comments
2/17/2015	1118	464.20	125					Initial water level reading.
2/17/2015	1123		125					Pump set at 492 feet at 6 GPM.
2/17/2015	1127	465.79	150	16.16	7.93	0.496		Begin pumping. Water is cloudy and there are bubbles in tubing and YSI. Pump raised to 491 feet.
2/17/2015	1137	465.79	200	18.19	7.79	0.452	16.9	Continue pumping. Water is clear with many small bubbles.
2/17/2015	1147	465.76	250	18.84	7.84	0.467	6.82	Water is clear with many small bubbles.
2/17/2015	1157	465.75	300	18.87	7.87	0.450	4.65	Water is clear with many small bubbles.
2/17/2015	1207	465.75	375	19.01	7.89	0.440	4.03	Water is clear with many small bubbles.
2/17/2015	1211		375					Pump raised to 482 feet. Continue pumping at 6 GPM.
2/17/2015	1217	465.75	425	18.45	7.87	0.438	2.60	Water is clear with many small bubbles.
2/17/2015	1227	465.75	475	18.60	7.87	0.439	2.54	Water is clear with many small bubbles.
2/17/2015	1237	465.73	525	18.16	7.89	0.438	2.03	Water is clear with few small bubbles.
2/17/2015	1239		525					Pump lowered to 487 feet. Continue pumping at 6 GPM.
2/17/2015	1247	465.70	575	18.76	7.89	0.441	1.74	Water is clear with few small bubbles.
2/17/2015	1250		600					Stop pumping.
2/17/2015	1326	464.05	600					Water level reading.

Was well sampled after development? YES NO X

Sample Method: N/A

Sample Name: N/A

Analyses: N/A

Pg 2 of 3



Project: KAFB BFF	Well No: KAFB-106226
Project Number: <u>140705</u>	Samplers: N/A
Date: 2/13/15	Checked By:
Time Start: 1125, 2/13/2015	<b>Time Finish</b> : <u>1403</u> , <u>2/17/2015</u>

Field Chemistry (cont'd) Water Volume Turbidity Level (ft. Removed Date Time bTOC) (gal.) Temp. (°C) рΗ EC (mS/cm) (NTU) Comments 2/17/2015 1327 ---600 ------------Pump on. 2/17/2015 1332 465.78 625 17.86 7.86 0.477 13.3 Water is clear with very few small bubbles. 2/17/2015 1342 465.70 700 18.82 7.95 0.460 5.92 Water is clear. No bubbles. 2/17/2015 465.68 18.82 7.92 0.462 3.94 Water is clear. No bubbles. 1352 750 2/17/2015 1402 465.67 18.28 800 7.83 0.462 2.93 Water is clear with very few small bubbles. 2/17/2015 1403 ---800 ---Finish pumping. Well development complete. ---------

Was well sampled after development? YES NO X

Sample Method: N/A

Sample Name: N/A

Analyses: N/A

Pg 3 of 3

# KAFB 106227

Pro Pro Pro	jec jec	t Loca t Nan t Nun	ation: ne: K nber:	KAF AFB E 1407	B, Albuquerque, NM H BFF SWMU ST-106 and SS-111 S 05	Hole Dian Surface C Groundwa	neter Comp ater I	Lower Detion T Levels E	GS (ft):	VIRGINIA BRACHT 8881903-2250
Dat Dat Gro	e T e C ound	D Re compl	ache leted: vation e:	13/201 d: 4/2 5/19, n AMS	/4/15 /2015 L (ft): Not Recorded E		d of Drillin ontra ethod	Drilling: ng: 463 actor: N d: Air R	Not Recorded .11 lational Drilling otary Casing Ha	ammer Page 1 of 25
Oepth (ft)	Sample Type	Number	Headspace	Lithologic Log	Material Description		U.S.C.S.	W	ell Diagram	Remarks
5					SILT with Gravel (ML); color not recorded; dry; 70% silt; 15% clay; gravel; angular to subangular; ma and white quartz.	15%	PHA	T	Top of Casing/Top of Cement Seal	Location was cleared with a water jet (potholed) to 10 ft bgs prior to drilling. Began drilling at 1520 on 4/15/15 with 11' 3/4" OD casing.
10					STIL (ML); reddish yellow (5YR 6/ 100% silt.		ML		- Cement Seal	Kelly down @ 1528; new 20' connection. Resume drilling @ 1533.
20 - - 25					Same as above (10 ft). Well-graded SAND with Gravel (S Strong Brown (7.5YR 5/6); dry; 85 fine to coarse sand; 15% fine grav subrounded to rounded.	5% very				PID = 0.0 ppm @ cyclone and breathing zone.
30							SW			

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	C	BI				Bore	eho	le l	D: KAFB-1	106227		
Pro Pro	ojec ojec	t Loc Nan	ation: ne: K/	KÁF AFB I	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						
Da Da	ite S ite T	Starteo FD Re	n <b>ber:</b> d: 4/1 ached eted:	3/20 <sup></sup> : 4/2	15 24/15	Groundwater Levels BGS (ft):						
Y	Coo	d Elev rdinat ordinat	e:	AMS	L (ft): Not Recorded	Drillling	Contra Metho	actor: d: Ai	National Drilling r Rotary Casing Ha	ammer Page 2 of 25		
ଟି Depth (ft)	Sample Type	Number	Headspace PID	Lithologic Log	Material Description		U.S.C.S.		Well Diagram	Remarks		
35	-				Well-graded SAND with Gravel Strong Brown (7.5YR 5/6); dry; 8 fine to coarse sand; 15% fine gra subrounded to rounded.	35% very			- Cement Seal	PID = 0.0 ppm @ cyclone and breathing zone. Some hammering. No water added.		
40	-				Same as above (30 ft).				- Top of High Solids Bentonite Grout	Kelly down @ 1545; new 20' connection. Resume drilling @ 1552. PID = 0.0 ppm @ cyclone		
45	-						sw		•       •         •       •	and breathing zone.		
50					Same as above (30 ft).				•       •         •       •	PID = 0.0 ppm @ cyclone and breathing zone.		
<u>55</u> 60	-								•       •         •       •	Kelly down @ 1606, new 20' connection. Resume drilling @ 1611.		

(	C	RI				Bore	eho	le I	D: KAFB-1	106227	
Pr Pr	ojec ojec	t Loca Nam	ation: ne: K	: KÁF (AFB	s of Engineers <sup>-</sup> 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: Flush					
Da Da	ate S ate T	t Num Started D Re Compl	d: 4/ ache	13/20 d: 4/2	15	🕎 At T	ime of	f Drilli Drillir	s BGS (ft): ng: 464.00 ng: Not Recorded 63.11		
Y	Coo	d Elev rdinat rdinat	e:	AMS	L (ft): Not Recorded	Drillling	Contra Aethoo	actor: d: Ai	National Drilling r Rotary Casing Ha	ammer Page 3 of 25	
g Depth (ft)	Sample Type	Number	Headspace PID	Lithologic Log	Material Description		U.S.C.S.		Well Diagram	Remarks	
	-				Well-graded SAND with Gravel Strong Brown (7.5YR 5/6); dry; 8 fine to coarse sand; 15% fine gra subrounded to rounded.	35% very		· · · · · · · · · · · · · · ·	•       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •	PID = 0.0 ppm @ cyclone and breathing zone. Hammering. No water added.	
65					Same as above (60 ft). Gravel to	0 2".			<ul> <li>•</li> <li>•&lt;</li></ul>		
_70	-				Same as above (60 ft). 80% san gravel to 2".	ıd; 20%		<ul> <li>•</li> <li>•&lt;</li></ul>	•       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •	PID = 0.1 ppm @ cyclone and 0.0 ppm @ breathing zone. Hammering	
75	-						SW	· · · · · · · · · · · · · · · · · · ·	- High Solids Bentonite Grout	Kelly down @ 1623, new	
80	-				Same as above (60 ft). 80% san gravel to 2".	ıd; 20%		<ul> <li>•</li> <li>•&lt;</li></ul>		20' connection. Resume drilling @ 1628. No water added. PID = 0.1 ppm @ cyclone and 0.0 ppm @ breathing	
85	-									zone.	
00	-							· · · · · · · · · · · · · · · · ·		Hammering, no water added. PID = 0.0 ppm @ cyclone and breathing zone.	
90	-							••	• • • • • •		

		BI				Bore	eho	le I	D: KAFB-	106227	
Pro Pro	ojec ojec	t Loca t Nam	ation ne: K	: KAF	s 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					
Da	ite S ite T	tarteo D Re	d: 4/ ache	13/20 d: 4/2	15	🕎 At T	ime of Ind of	<sup>:</sup> Drilli Drillir	s BGS (ft): ing: 464.00 ng: Not Recordeo 63.11	b	
Y (	Coor	d Elev rdinat rdinat	e:	n AMS	SL (ft): Not Recorded		Method	l: Ai	National Drilling r Rotary Casing F nards		
g Depth (ft)	Sample Type	Number	Headspace PID	Lithologic Log	Material Description		U.S.C.S.		Well Diagram	Remarks	
95	-				Well-graded SAND with Gravel ( Strong Brown (7.5YR 5/6); dry; 8 fine to coarse sand; 20% fine gra 2"; subrounded to rounded. @ 92 ft. Well-graded SAND (SW Brown (7.5YR 6/3); dry; 100% ve to coarse sand.	80% very avel to /); Light			•       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •	Hammering. No water added to this depth.	
					Well-graded SAND with Gravel ( Brown (7.5YR 4/4); 85% fine to coarse sand; angular; 15% fine g subrounded to rounded.	very				Kelly down @ 1649; new 20' connection. Resume drilling @ 1653.	
100	-				Same as above (96 ft).					PID = 0.0 ppm @ cyclone and breathing zone.	
105	-						SW		- High Solids Bentonite Grout		
110					Same as above (96 ft).						
<u>115</u>										Kelly down @ 1710. End of day on 4/13/15. New 20' connection and resume drilling with 11 2/4" OD gaing @ 0000	
120								••	• • • • • •	3/4" OD casing @ 0800 on 4/14/15.	

Borehole ID: KAFB-106227										106227	
Pro Pro	ojec ojec	t Loca Nam	ation ne: K	: Káf (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					
Project Number: 140705 Date Started: 4/13/2015 Date TD Reached: 4/24/15 Date Completed: 5/19/2015							Groundwater Levels BGS (ft): ∑ At Time of Drilling: 464.00 ▼ At End of Drilling: Not Recorded ▼ After Drilling: 463.11				
Ground Elevation AMSL (ft): Not Recorded Y Coordinate: X Coordinate:							Drillling Contractor: National Drilling Drilling Method: Air Rotary Casing Hammer Logged By: T. Richards Page 5 of 25				
05 Depth (ft)	Sample Type	Number Headspace PID Lithologic Log		Lithologic Log	Material Description		U.S.C.S.	Well Diagram		Remarks	
125	-				Well-graded SAND with Gravel Brown (7.5YR 4/4); 85% fine to coarse sand; angular; 15% fine subrounded to rounded.	very			<ul> <li>•</li> <li>•&lt;</li></ul>		
<u>130</u> 135	_				Same as above (120 ft).		SW		- High Solids Bentonite Grout	Hammering. PID = 0.2 ppm @ cyclone and 0.0 ppm at breathing zone. No water added down hole at this depth. Water added at cyclone.	
140	-				Same as above (120 ft).				<ul> <li>•</li> <li>•&lt;</li></ul>	Kelly down @ 0810; new 20' connection. Resume drilling @ 0813. PID = 0.1 ppm @ cyclone and 0.0 ppm @ breathing zone.	
<u>145</u> 150	_								<ul> <li></li></ul>	Hammering.	

	~	RI				Bore	eho	le l	D: KAFB-1	106227
Pro Pro	ojec ojec	t Loca t Nam	ation: ne: K	: Káf (AFB I	s of Engineers <sup>F</sup> B, Albuquerque, NM BFF SWMU ST-106 and SS-111	Hole Dia	amete	r Low	ver (in.): 11-3/4 ver (in.): 9-5/8 n Type: Flush	
Da Da	ite S ite T	tarteo D Re	d: 4/ ache	1407 13/20 <i>1</i> d: 4/2 5/19	15	Groundwater Levels BGS (ft):				
Y	Cool	d Elev rdinat rdinat	e:	AMS	L (ft): Not Recorded		<b>Netho</b>	d: Ai	National Drilling r Rotary Casing Ha hards	ammer Page 6 of 25
05 Depth (ft)	Sample Type	Number	Headspace PID	Lithologic Log	Material Description		U.S.C.S.		Well Diagram	Remarks
	-				Well-graded SAND with Gravel ( Brown (7.5YR 4/4); 85% fine to v coarse sand; angular; 15% fine g subrounded to rounded. Note: fr fine sand is increasing.	very gravel;			· · · · · · · · · · · · · · · · · · ·	PID = 0.2 ppm @ cyclone and 0.0 ppm @ breathing zone. No water added down hole.
<u>155</u>	-				Well-graded SAND (SW); Browr 4/4); moist; 100% very fine to co sand.	n (7.5YR arse	SW			Kelly down @ 0822, new 20' connection. Resume drilling @ 0828. PID = 0.1 ppm @ cyclone and 0.0 ppm @ breathing zone.
165	-				Poorly graded SAND (SP); Stror (7.5YR 5/6); 100% medium to co sand; angular.	barse	SP		- High Solids Bentonite Grout	Hammering.
<u>170</u>	-				Well-graded SAND (SW); Browr 5/4); 100% fine to coarse sand; subrounded to rounded.	1 (7.5YK	SW			PID = 0.0 ppm @ cyclone and breathing zone. No water added down hole to this depth.
175	-				Poorly graded SAND (SP); Light	Brown				Kelly down @ 0845, new
180	_				(7.5YR 6/3); 100% fine sand.	2.5	SP		<ul> <li>•</li> <li>•&lt;</li></ul>	20' connection. Resume drilling @ 0856.

(		RI				Bore	eho	le I	D: KAFB-1	06227
Pro Pro	ojec ojec	t Loca Nan	ation ne: K	: KÁF (AFB I	s of Engineers FB, Albuquerque, NM BFF SWMU ST-106 and SS-111	Hole Dia	ameter	r Low	er (in.): 11-3/4 er (in.): 9-5/8 n Type: Flush	
Da Da	ite S ite T	Starteo D Re	d: 4/ ache	1407 13/20 d: 4/2 5/19	15	🕎 At T	ime of	f Drilli Drillir	s BGS (ft): ing: 464.00 ng: Not Recorded 63.11	
Y	Cool	d Elev rdinat rdinat	e:	ו AMS	L (ft): Not Recorded		<b>Netho</b>	d: Ai	National Drilling r Rotary Casing Ha nards	Ammer Page 7 of 25
8 Depth (ft)	Sample Type	Number	Headspace PID	Lithologic Log	Material Description		U.S.C.S.		Well Diagram	Remarks
185	-				Poorly graded SAND (SP); Light (7.5YR 6/3); 100% fine sand.	Brown	SP		•       •         •       •	PID = 0.0 ppm @ cyclone and breathing zone. Hammering, no water added down hole to this depth.
<u>190</u>	-				Well-graded SAND with Gravel ( brown (7.5YR 5/4) 75% fine to ca sand; 25% gravel; subangular to subrounded; gravel is mafics and quartz.	oarse d white	SW		•       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •	PID = 0.2 ppm @ cyclone and 0.0 ppm @ breathing zone.
195	-				Lean CLAY (CL); pink (5YR 7/3) low plasticity; 100% clay.	; moist;			- High Solids Bentonite Grout	Kelly down @ 0913, change to 9 5/8" OD casing. Resume drilling
<u>200</u>					Same as above (193 ft).		CL			@ 1349.
<u>205</u>					Gravelly Lean CLAY (CL); Light brown (5YR 6/3); 60% clay; 10% fine sand; 30% gravel to 1"; subi to rounded; gravel is mafics and	o very rounded				
210					Well-graded SAND with Gravel ( pinkish grey (7.5YR 6/2); 80% ve to coarse sand; 20% fine gravel; subangular to subrounded.	ery fine	SW	• • • • • • • • • • • • • •	•       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •	

	C	BI				Bore	eho	le I	D: KAFB-1	106227
Pro Pro	ojec ojec	t Loca Nam	ation: ne: K	: Káf (AFB	s of Engineers FB, Albuquerque, NM BFF SWMU ST-106 and SS-111	Hole Dia	amete	r Low	er (in.): 11-3/4 er (in.): 9-5/8 n Type: Flush	
Da Da	ite S ite T	<b>t Num</b> Started D Re Compl	1: 4/ <sup>,</sup> acheo	13/20 <sup>-</sup> d: 4/2	15	🕎 At T	Time of End of	f Drill Drillir	s BGS (ft): ing: 464.00 ng: Not Recorded 63.11	
Y (	Coo	d Elev rdinat rdinat	e:	AMS	L (ft): Not Recorded		Vethoo	d: Ai	National Drilling r Rotary Casing Ha nards	ammer Page 8 of 25
0 Depth (ft)	Sample Type	Number	Headspace PID	Lithologic Log	Material Description		U.S.C.S.		Well Diagram	Remarks
215	_				Well-graded SAND with Gravel pinkish grey (7.5YR 6/2); 80% v to coarse sand; 20% fine gravel subangular to subrounded.	ery fine				PID = 0.0 ppm @ cyclone and breathing zone. No hammering. No water added downhole.
220	-				Same as above (210 ft).					Kelly down @ 1405; new 20' connection. Resume drilling @ 1413. Added water @ cyclone. PID = 0.2 ppm @ cyclone and 0.0 ppm @ breathing zone.
225	-						SW	• • • • • • • • • • • • • • • • • • • •	- High Solids Bentonite Grout	No hammering.
230	-				Same as above (210 ft).					No water added downhole. PID = 0.0 ppm @ cyclone and breathing zone. No hammering.
235 240	-								•       •         •       •	Kelly down @ 1425, new 20' connection. Resume drilling @ 1434.

	C	BI				Bore	eho	le l	D: KAFB-1	06227
Pro Pro	ojec ojec	t Loca t Nam	ation: ne: K	: KÁF (AFB I	s of Engineers FB, Albuquerque, NM BFF SWMU ST-106 and SS-111	Hole Dia	amete	r Low	oer (in.): 11-3/4 /er (in.): 9-5/8 n Type: Flush	
Da Da	te S te T	Started D Re	d: 4/ ache	1407 13/20 <sup>:</sup> d: 4/2 5/19	15	🕎 At T	Time of End of	f Drill Drilliı	ls BGS (ft): ling: 464.00 ng: Not Recorded 463.11	
Y (	Cool	d Elev rdinat rdinat	e:	n AMS	L (ft): Not Recorded	Drillling Drilling I Logged	Metho	d: A	National Drilling ir Rotary Casing Ha hards	ammer Page 9 of 25
Depth (ft)	Sample Type	Number	Headspace PID	Lithologic Log	Material Description		U.S.C.S.		Well Diagram	Remarks
	-				Well-graded SAND with Gravel pinkish grey (7.5YR 6/2); 80% v to coarse sand; 20% fine gravel subangular to subrounded.	ery fine				PID = 0.0 ppm @ cyclone and breathing zone. No hammering.
245	-									No water added down hole. Begin hammering.
250	-				Same as above (240 ft).		0.04			PID = 0.0 ppm @ cyclone and breathing zone.
260	-						SW		<ul> <li>High Solids</li> <li>Bentonite</li> <li>Grout</li> </ul>	Kelly down @ 1456, new 20' connection. Resume drilling @ 1507.
-	-				Same as above (240 ft).					PID = 0.2 ppm @ cyclone
265										No water added down hole. Hammering.

	C	BI				Bore	eho	le I	D: KAFB-1	106227
Pro Pro	ojec ojec	t Loca t Nam	ation: ie: K	KAF AFB I	s of Engineers FB, Albuquerque, NM BFF SWMU ST-106 and SS-111	Hole Dia	ameter	Low	oer (in.): 11-3/4 /er (in.): 9-5/8 n Type: Flush	
Da Da	ite S ite T	t Num Started D Rea Comple	l: 4/ <sup>,</sup> acheo	13/20 <sup>-</sup> d: 4/2	15	🕎 At T	ime of Ind of	<sup>r</sup> Drill Drillir	ls BGS (ft): ing: 464.00 ng: Not Recorded 463.11	
YC	Cool	d Elev rdinate rdinate	e:	AMS	L (ft): Not Recorded	Drillling	Contra Method	actor: d: Ai	National Drilling	ammer Page 10 of 25
02 Depth (ft)	Sample Type	Number	Headspace PID	Lithologic Log	Material Description		U.S.C.S.		Well Diagram	Remarks
275	-				Well-graded SAND with Gravel pinkish grey (7.5YR 6/2); 80% ve to coarse sand; 20% fine gravel; subangular to subrounded.	ery fine			•       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •	PID = 0.1 ppm @ cyclone and 0.0 ppm @ breathing zone. Hammering.
280					Same as above (270 ft).		SW			Kelly down @ 1518, new 20' connection. Resume drilling @ 1526. PID = 0.0 ppm @ cyclone and breathing zone.
285 					Poorly graded SAND (SP); Redo Yellow (7.5YR 6/6); 100% fine to medium sand.				- High Solids Bentonite Grout	Hammering. No water added down hole. PID = 0.2 ppm @ cyclone and 0.0 ppm @ breathing zone.
295							SP			Kelly down @ 1534, new 20' connection. Resume drilling @ 1542.

(	C	BI				Bore	eho	le I	D: KAFB-	106227	
Pr Pr	ojec ojec	t Loca t Nan	ation: ne: K	Corp KAF AFB I 1407	s of Engineers FB, Albuquerque, NM BFF SWMU ST-106 and SS-111	Hole Dia	ametei	Low	er (in.): 11-3/4 er (in.): 9-5/8 n Type: Flush		
Da Da	ate S ate T	Starteo D Re	d: 4/ ache	13/20 <sup>7</sup> d: 4/2	15	Groundwater Levels BGS (ft): ∑ At Time of Drilling: 464.00 ▼ At End of Drilling: Not Recorded ▼ After Drilling: 463.11					
Y	Cool	d Elev rdinat rdinat	e:	AMS	SL (ft): Not Recorded	Drillling	Contra Method	actor: d: Aii	National Drilling Rotary Casing H	ammer Page 11 of 25	
00 Depth (ft)	Sample Type	Number	Headspace PID	Lithologic Log	Material Description		U.S.C.S.		Well Diagram	Remarks	
305	-				Poorly graded SAND (SP); Redo Yellow (7.5YR 6/6); 100% fine to medium sand.	dish D	SP		•       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •	PID = 0.0 ppm @ cyclone and breathing zone. Hammering.	
310	-				Well-graded SAND with Gravel Brown (7.5YR 5/3); 80% fine to coarse sand; 20% fine gravel to subrounded to rounded; gravel is and white to rosy quartz.	very 1/2 ";			•       •         •       •	PID = 0.2 ppm @ cyclone and 0.1 ppm @ breathing zone. No water added down hole.	
<u>315</u> <u>320</u>	-				Same as above (308 ft).		SW		- High Solids Bentonite Grout	Kelly down @ 1552, new 20' connection. Resume drilling @ 1558. PID = 0.0 ppm @ cyclone and breathing zone.	
<u>325</u> 330	-								•       •         •       •	Hammering. No water added down hole.	

(	C	BI				Bore	eho	le l	D: KAFB-1	06227	
Pro Pro	ojec ojec	t Loca t Nam	ation: ne: K	: Káf (AFB I	s of Engineers FB, Albuquerque, NM BFF SWMU ST-106 and SS-111	Hole Dia	amete	r Low	oer (in.): 11-3/4 /er (in.): 9-5/8 n Type: Flush		
Da Da	ite S ite T	<b>t Num</b> Startec D Rea Comple	l: 4/ ache	13/20 <sup>7</sup> d: 4/2	15	Groundwater Levels BGS (ft): ∑ At Time of Drilling: 464.00 ▼ At End of Drilling: Not Recorded ▼ After Drilling: 463.11					
Y	Cool	d Elev rdinate rdinate	e:	I AMS	L (ft): Not Recorded	Drillling Drilling I Logged	<b>Netho</b>	d: Ai	National Drilling ir Rotary Casing Ha hards	ammer Page 12 of 25	
65 Depth (ft)	Sample Type	Number	Headspace PID	Lithologic Log	Material Description		U.S.C.S.		Well Diagram	Remarks	
<u>330</u> <u>335</u> <u>340</u> <u>345</u>	-				Well-graded SAND with Gravel Brown (7.5YR 5/3); 80% fine to coarse sand; 20% fine gravel to subrounded to rounded; gravel is and white to rosy quartz.	very 1/2 ";	SW		<ul> <li>High Solids</li> <li>Bentonite</li> <li>Grout</li> </ul>	PID = 0.1 ppm @ cyclone and 0.0 ppm @ breathing zone. Hammering. Kelly down @ 1626, new 20' connection. Resume drilling @ 1632. PID = 0.0 ppm @ cyclone and breathing zone.	
<u>350</u> 355	-				Same as above (330 ft).				<ul> <li></li></ul>	PID = 0.0 ppm @ cyclone and breathing zone. Hammering. No water added down hole.	
360	-								• • • • • • • • • • • • • •	Kelly down @ 1647, new 20' connection. Resume drilling @ 1652.	

	Client: US Army Corps of Engineers Hole Diameter Upper (in.): 11-3/4											
Pro Pro	ojec ojec	t Loca Nam	ation ne: k	: KÁF (AFB	B, Albuquerque, NM BFF SWMU ST-106 and SS-111	Hole Dia	amete	r Low	oer (in.): 11-3/4 ver (in.): 9-5/8 n Type: Flush			
Da Da	te S ite T	<b>t Num</b> Started D Re Compl	d: 4/ ache	13/20 <sup>-</sup> d: 4/2	15	🕎 At T	ime o nd of	f Drill Drilliı	ls BGS (ft): ling: 464.00 ng: Not Recorded 463.11			
Y	Coo	d Elev rdinat rdinat	e:	n AMS	L (ft): Not Recorded	Drillling Drilling I Logged	<b>Netho</b>	d: Ai	National Drilling ir Rotary Casing Ha hards	ammer Page 13 of 25		
g Depth (ft)	Sample Type	Number	Headspace PID	Lithologic Log	Material Description		U.S.C.S.		Well Diagram	Remarks		
365	-				Well-graded SAND with Gravel Brown (7.5YR 5/3); 80% fine to coarse sand; 20% fine gravel to subrounded to rounded; gravel i and white to rosy quartz.	very 1/2 ";			•       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •	PID = 0.1 ppm @ cyclone and 0.0 ppm @ breathing zone.		
370	-				Same as above (360 ft).				<ul> <li>•</li> <li>•&lt;</li></ul>	Hammering. PID = 0.0 ppm @ cyclone and breathing zone.		
<u>375</u> <u>380</u>					Same as above (360 ft).		SW		<ul> <li>High Solids</li> <li>Bentonite</li> <li>Grout</li> </ul>	Kelly down @ 1700. End of day on 4/14/15. New 20' connection and resume drilling @ 0800 on 4/15/15.		
<u>385</u> 390									<ul> <li>•</li> <li>•&lt;</li></ul>	Hammering. No water added down hole to this depth.		

(	C	BI				Bore	eho	le l	D: KAFB-1	06227	
Pr Pr	ojec ojec	t Loca Nam	ation: ie: K	: Káf (AFB	s of Engineers FB, Albuquerque, NM BFF SWMU ST-106 and SS-111	Hole Dia	amete	r Low	er (in.): 11-3/4 er (in.): 9-5/8 1 Type: Flush		
Da	ate S ate T	t Num Startec D Rea Comple	l: 4/ ache	13/20 <sup>-</sup> d: 4/2	15	Groundwater Levels BGS (ft): ∑ At Time of Drilling: 464.00 ▼ At End of Drilling: Not Recorded ▼ After Drilling: 463.11					
Y	Coo	d Elev rdinate rdinate	e:	I AMS	L (ft): Not Recorded	Drillling Drilling N Logged	/lethoo	d: Ai	National Drilling r Rotary Casing Ha nards	ammer Page 14 of 25	
06 Depth (ft)	Sample Type	Number	Headspace PID	Lithologic Log	Material Description		U.S.C.S.		Well Diagram	Remarks	
395	-				Well-graded SAND with Gravel ( Brown (7.5YR 5/3); 80% fine to v coarse sand; 20% fine gravel to subrounded to rounded; gravel is and white to rosy quartz.	very 1/2 ";				PID = 0.2 ppm @ cyclone and 0.0 ppm @ breathing zone. Hammering.	
<u>400</u>	-				Same as above (390 ft).				•       •         •       •	Kelly down @ 0812, new 20' connection. Resume drilling @ 0820. PID = 0.0 ppm @ cyclone and breathing zone.	
<u>405</u>	-						SW	<ul> <li>•</li> <li>•&lt;</li></ul>	- High Solids Bentonite Grout		
<u>410</u>	-				Same as above (390 ft).					Hammering. PID = 0.1 ppm @ cyclone and 0.0 ppm @ breathing zone.	
<u>415</u> 420	-							•       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •	-       -         <	Kelly down @ 0832, new 20' connection. Resume drilling @ 0842.	

(	Borehole ID: KAFB-106227         Client: US Army Corps of Engineers       Hole Diameter Upper (in.): 11-3/4										
Pr Pr	ojec ojec	t Loca Nan	ation ne: k	: KAF	B, Albuquerque, NM BFF SWMU ST-106 and SS-111	Hole Dia	ameter	Low	er (in.): 11-3/4 er (in.): 9-5/8 n Type: Flush		
Da Da	ate S ate T	Starteo D Re	d: 4/ ache	1407 13/20 d: 4/2 5/19	15	🕎 At T	ime of nd of l	<sup>:</sup> Drill Drillir	s BGS (ft): ing: 464.00 ng: Not Recorded 63.11		
Y	Cool	d Elev rdinat rdinat	e:	ו AMS	L (ft): Not Recorded		<b>Nethoo</b>	l: Ai	National Drilling r Rotary Casing Ha nards	ammer Page 15 of 25	
5 Depth (ft)	Sample Type	Number	Headspace PID	Lithologic Log	Material Description		U.S.C.S.		Well Diagram	Remarks	
425	-				Well-graded SAND with Gravel ( Brown (7.5YR 5/3); 80% fine to v coarse sand; 20% fine gravel to subrounded to rounded; gravel is and white to rosy quartz. Lean CLAY (CL); reddish brown 5/3); firm to hard; slightly moist; s clay; 10% very fine sand.	very 1.5 "; s mafics (5YR	SW		•       •         •       •	PID = 0.2 ppm @ cyclone and 0.0 ppm @ breathing zone. Hammering.	
430					Poorly graded SAND (SP); Brow (7.5YR 5/4); moist; 100% fine sa trace medium sand; trace fine gr rounded.	ind;			- Top of 3/8" Bentonite Chip Seal	PID = 0.2 ppm @ cyclone and 0.0 ppm @ breathing zone.	
435							SP			No water added down hole to this depth. Kelly down @ 0853, new 20' connection. Resume drilling @ 0906.	
440	-				Same as above (427 ft).					PID = 0.1 ppm @ cyclone and 0.0 ppm @ breathing zone.	
<u>445</u> 450	-				Well-graded SAND (SW); Browr 4/4); 90% very fine to very coars 10% fine gravel; subrounded to gravel is mafics and quartz.	e sand;	SW			No water added down hole to this depth. Kelly down. End ARCH drilling at 450 feet bgs @ 0912 on 4/15/15.	

	C	BI				Bore	ehol	e ID: KAFB-1	106227-Sonic
Pro Pro	ojec ojec	ct Loca ct Nam	ation: K ne: KAF	AF BB	s of Engineers B, Albuquerque, NM BFF SWMU ST-106 and SS-111	Hole Dia	ameter	Upper (in.): 11-3/4 Lower (in.): 9-5/8 etion Type: Flush	
Da Da	ite S ite T	Starteo FD Re	<b>1ber:</b> 14 d: 4/20/2 ached: eted: 5/	201 4/2	5 4/15	∑ At T T At E	ime of Ind of E	evels BGS (ft): Drilling: 464.00 Drilling: Not Recorded ig: 463.11	
Y (	Coo	d Elev ordinat ordinat	e:	MSL	_ (ft): Not Recorded	Drillling Drilling N	Contra Method	ctor: National Drilling : Sonic Coring nris Buerkle	Page 16 of 25
65 Depth (ft)	Sample Type	Number	Headspace PID Lithologic	Log	Material Description		U.S.C.S.	Well Diagram	Remarks
455	_				@ 450 ft. Silty SAND (SM); brow (7.5YR 4/3); dry, dense, 70% find 5% medium to coarse sand; 20% 5% fine gravel to 2 cm; angular to subrounded.	e sand; % silt;	SM	- Bentonite Chip Seal	Begin sonic coring at 450 feet bgs @ 1420 on 4/21/15. @ 450 - 457 ft core disturbed due to 3 attempts made to retrieve this depth.
460	_				@ 458 ft. Well-graded GRAVEL and Sand (GW-GM); brown (7.5' dry; dense; 55% fine to coarse g 5 cm; subangular to rounded; 30 sand; 5% medium to coarse san silt.	YR 4/3); ravel to % fine	GW- GM		@ 458 ft gravel is quartz and mafics. Core disturbed.
465	-			19	@ 462 ft. Silty GRAVEL with Sar brown (7.5YR 4/3); moist; very d 40% fine to coarse gravel to 5 cr subangular to subrounded; 25% sand; 5% medium to coarse san silt; 5% clay.	ense; n; fine	GM	- Top of Bentonite Pellet Seal	<ul> <li>@ 462 ft gravel is quartzite, mafics, and granite. Core slightly disturbed.</li> <li>@ 464 ft core is wet.</li> </ul>

(	C	BI				Bore	ehol	e ID: KAFB-1	106227-Sonic
P P	rojeo rojeo	ct Loca ct Nam	ation ne: k	: KÁF (AFB I	s of Engineers FB, Albuquerque, NM BFF SWMU ST-106 and SS-111	Hole Dia	ameter	Upper (in.): 11-3/4 Lower (in.): 9-5/8 letion Type: Flush	
D D D G	ate s ate <sup>-</sup> ate ( rour		d: 4// ache eted: /atior	20/20 <sup>7</sup> d: 4/2 5/19	15 24/15		ime of nd of E r Drillin Contra	evels BGS (ft): Drilling: 464.00 Drilling: Not Recorded Ig: 463.11 ctor: National Drilling	
		ordinat ordinat				Drilling N Logged	Viethod By: Cl	: Sonic Coring hris Buerkle	Page 17 of 25
50 Depth (ft)			Headspace PID	Lithologic Log	Material Description		U.S.C.S.	Well Diagram	Remarks
	_				@ 465 ft. Poorly graded SAND ( brown (7.5YR 4/3); wet; loose; 9 to medium sand; 5% coarse san coarse gravel to 1 cm; subangul subrounded.	0% fine d; 5% ar to	SP		
47(	)				@ 468 ft. Poorly graded SAND v (SP-SM); brown (7.5YR 4/3); we 90% fine to medium sand; 10% s	t; loose; silt.	SP- SM	- Bentonite	
					@ 470 ft. Poorly graded SAND ( brown (7.5YR 4/3); wet; loose; 9 to medium sand; 5% silt.		SP	Pellet Seal	
47	5				@ 475 ft. Poorly graded SAND v (SP-SM); brown (7.5YR 5/3); we 70% fine sand; 20% medium san silt.	t; loose;	SP- SM		
	_				@ 476.9 ft. Silty GRAVEL with S (GM); brown (7.5YR 5/3); wet; do 50% fine to coarse gravel to 4 cr angular; 30% fine sand; 20% silt	ense; n;	GM		@ 476.9 ft gravel is quartzite.
480	וו			5 Nol					

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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       Hole Diameter Upper (in.): 11- Hole Diameter Lower (in.): 9-5 Surface Completion Type: Flue Groundwater Levels BGS (ft): Date TD Reached: 4/24/15 Date Completed: 5/19/2015         Ground Elevation AMSL (ft): Not Recorded Y Coordinate: X Coordinate:       At End of Drilling: 463.11 Drilling Contractor: National D Drilling Method: Sonic Coring Logged By: Chris Buerkle         (i) (i) (i) (i) (i) (i) (i) (i) (i) (i)	FB-106227-Sonic					
Date Started: 4/20/2015       Groundwater Levels BGS (ft):         Date TD Reached: 4/24/15       At Time of Drilling: 464.00         Date Completed: 5/19/2015       At End of Drilling: Not Recorded         Ground Elevation AMSL (ft): Not Recorded       After Drilling: 463.11         Drilling Contractor: National D       Drilling Method: Sonic Coring         X Coordinate:       Difficult         (#)       adv         adv       adv	Diameter Lower (in.): 9-5/8					
Ground Elevation AMSL (ft):       Not Recorded       Drilling Contractor:       National D         Y Coordinate:       Drilling Method:       Sonic Coring Logged By:       Chris Buerkle         (t)       ad       ag       ag       bg       Chris Buerkle         (t)       ad       ag       bg       Chris Buerkle       O         (t)       ag       ag       bg       Chris Buerkle       O         (t)       ag       ag       bg       Chris Buerkle       O         (t)       ag       ag       bg       O       O       O         (t)       ag       ag       bg       O       O       O       O         (t)       ag       ag       Bg       O <t< td=""><td></td></t<>						
480 0 GM 480 ft. Silty GRAVEL with Sand (GM); brown (7.5YR 5/3); wet; dense; 50% fine GM to coarse gravel to 4 cm; angular; 30%	Drilling Page 18 of 25					
brown (7.5YŘ 5/3); wet; dense; 50% fine	am Remarks					
\fine sand; 20% silt.         @ 480.6 ft. Silty SAND with Gravel (SM);         brown (7.5YR 5/2); wet; dense; 50% fine         to medium sand; 30% fine to coarse         gravel to 4 cm; angular; 20% silt.         @ 481.2 ft. Silty SAND (SM); brown         (7.5YR 5/3); wet; medium dense; 80%         fine to medium sand; 15% silt; 5% clay.         @ 483.4 ft. Same as above (481.2 ft);         80% fine to coarse sand; 20% silt.	<ul> <li>@ 480.6 ft gravel is quartzite.</li> <li>@ 482 ft a 1" sandy clay lense is observed.</li> </ul>					
485 (@ 484.2 ft. Gravelly Lean CLAY with Sand (CL); reddish brown (5YR 4/4): moist; hard; nonplastic to low plasticity; 50% clay; 30% fine to coarse gravel to 3 cm; subangular; 20% fine to coarse sand. (CL) Pellet So SP						
reddish brown (5YR 4/4); moist; very stiff; no to low plasticity; 80% clay; 20% fine sand. @ 485.8 ft. Poorly graded SAND (SP); brown (7.5YR 5/3); wet; loose; 85% fine to medium sand; trace coarse sand; 15% fine gravel to 1 cm; subrounded. @ 486.3 ft. Well-graded SAND (SW); brown (7.5YR 5/3); wet; loose; 100% fine to coarse sand.						
@ 488 ft. Poorly graded SAND (SP); brown (7.5YR 5/3); wet; loose; 80% fine sand; 15% medium sand; 5% silt.         @ 491 ft. Poorly graded SAND with Silt (SP-SM); brown (7.5YR 5/3); wet; loose; 90% fine sand; 10% silt.         SP- SM         @ 494.5 ft. See description on next page.						

(	C	BI	Ň			Bore	ehol	e ID: KAFB-1	06227-Sonic		
Pr Pr	ojec ojec	t Loca Nam	ation ie: k	: KAF	s of Engineers <sup>-</sup> 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: Flush					
Da Da	ate S ate T	<b>t Num</b> Startec D Rea Comple	l: 4/ ache	20/20 d: 4/2	15	⊻ At T ▼ At E	ime of nd of E	evels BGS (ft): Drilling: 464.00 Drilling: Not Recorded g: 463.11			
Y	Coo	d Elev rdinate rdinate	e:	n AMS	SL (ft): Not Recorded	Drilling ( Drilling N	Contra /lethod	ctor: National Drilling Sonic Coring rris Buerkle	Page 19 of 25		
65 Depth (ft)		Number	Headspace PID	Lithologic Log	Material Description		U.S.C.S.	Well Diagram	Remarks		
	_				<ul> <li>@ 494.5 ft. Poorly graded SAND and Gravel (SP-SM); brown (7.5 wet; medium dense; 75% fine to sand; 15% fine gravel to 1.5 cm; subrounded; 10% silt.</li> <li>@ 495.5 ft. Silty SAND with Grav brown (7.5YR 5/2); wet; medium 45% fine to medium sand; 35% ft</li> </ul>	YR 5/3); medium /el (SM); dense;	SP- SM SM		@ 495.5 ft gravel is mafics, quartzite, and sandstone.		
500	-				coarse gravel to 4 cm; subround silt. @ 497.6 ft. Poorly graded SAND and Gravel (SP-SM); wet; mediu dense; 75% fine to medium sand fine to coarse gravel to 2.5 cm; subrounded; 10% silt.	ed; 20% with Silt m	SP- SM SM		@ 499 ft gravel is mafics, quartzite, and sandstone.		
	-				<ul> <li>@ 499 ft. Silty SAND with Grave brown (7.5YR 5/2); wet; medium 50% fine to coarse sand; 35% fir coarse gravel to 4 cm; subround silt; 5% clay.</li> <li>@ 500 ft. Well-graded SAND wit and Gravel (SW-SM); brown (7.5 5/2); wet; medium dense; 65% fi</li> </ul>	dense; ne to ed; 10% h Silt 5YR	SW- SM	- Bentonite Pellet Seal	@ 500 ft gravel is mafics, quartzite, and sandstone.		
505	-				coarse sand; 25% fine to coarse to 4 cm; subrounded; 10% silt. @ 502.4 ft. Lean CLAY (CL); bro (7.5YR 5/3); moist; firm; medium plasticity; 90% clay; 5% fine to co gravel to 3 cm; subrounded; 5% sand.	gravel wn barse fine	CL		@ 503 ft gravel is mafics, quartzite, and sandstone.		
					<ul> <li>@ 503 ft. Sandy Lean CLAY with (CL); brown (7.5YR 5/3); moist; h nonplastic to low plasticity; 50% 30% fine to medium sand; 20% ft coarse gravel to 2.5 cm; subange subrounded.</li> <li>@ 505 ft. Silty SAND with Grave brown (7.5YR 5/3); wet; medium 50% fine to medium sand; 30% ft coarse gravel to 4 cm; subrounder rounded; 15% silt; 5% clay.</li> <li>@ 505.7 ft. Same as above (505 fine to medium sand; 25% fine to gravel to 3 cm; subrounded; no compared to 3 cm; subrounded; no compared to a cm; subrounded; no compared to 3 cm; subrounded; no compare</li></ul>	nard; clay; ine to ular to I (SM); dense; ine to ed to ft); 60% o coarse_	SM		@ 505 ft gravel is mafics, quartzite, and sandstone.		
510					@ 509 ft. See description on nex		SW- SM				

	C	RI				Bore	ehol	e ID: KAFB-′	106227-Sonic			
Pi Pi	rojec rojec	ct Loca	ation: ne: K	KAF AFB	s of Engineers <sup>-</sup> 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: Flush						
Da Da	ate S ate T	<b>ct Num</b> Starteo TD Re Compl	d: 4/2 acheo	20/20 d: 4/2	15 24/15	∑ At T ▼ At E	ime of Ind of D	evels BGS (ft): Drilling: 464.00 Drilling: Not Recorded ag: 463.11				
Y	Coo	nd Elev ordinate ordinat	e:	AMS	L (ft): Not Recorded	Drilling N	<b>Nethod</b>	ctor: National Drilling : Sonic Coring hris Buerkle	Page 20 of 25			
Depth (ft)	Sample Type	Num	Headspace PID	Lithologic Log	Material Description		U.S.C.S.	Well Diagram	Remarks			
	-				@ 509 ft. Well-graded SAND wit and Gravel (SW-SM); brown (7.5 5/3); wet; medium dense; 50% ft coarse sand; 40% fine to coarse to 5 cm; subrounded to rounded silt.	5YR ine to gravel			@ 509 ft gravel is mafics, quartzite, and sandstone.			
	-				@ 512.5. Same as above (509 f fine to coarse sand; 15% fine to gravel to 4 cm; subrounded.		SW- SM					
515	5				@ 515 ft. Well-graded SAND wit (SW); brown (7.5YR 4/2); wet; lo 80% fine to coarse sand; 15% fil gravel to 1.5 cm; subrounded; 5	oose ne		- Bentonite Pellet Seal				
	-				@ 516.5 ft. Same as above (515 fine to coarse sand; 30% fine to gravel to 5 cm; subangular to subrounded.		SW		@ 516.5 ft gravel is quartzite and mafics.			
520	)				@ 519 ft. Lean CLAY with Sand brown (7.5YR 4/3); moist; firm; r plasticity; 75% clay; 15% fine to	nedium coarse	CL					
	_				sand; 10% fine to coarse gravel subrounded. @ 520 ft. Well-graded SAND wit (SW); brown (7.5YR 4/2); wet; lo 65% fine to coarse sand; 30% fil	th Gravel bose ne to	SW		@ 520 ft gravel is quartzite and mafics.			
525	-				coarse gravel to 5 cm; subangul subrounded; 5% silt. @ 521.8 ft. Silty SAND (SM); bro (7.5YR 4/3); wet; medium dense fine to medium sand; 5% fine to gravel to 3 cm; subrounded; 15%	own e; 80% coarse	SM					

	0	BI				Bore	ehol	e ID	: <b>KAFB-</b> 1	06227-Sonic		
Pro Pro	ojec ojec	t Loca Nam	ation ne: k	: Kaf Kafb I	s of Engineers FB, Albuquerque, NM BFF SWMU ST-106 and SS-111	Hole Dia	e Diameter Upper (in.): 11-3/4 e Diameter Lower (in.): 9-5/8 ace Completion Type: Flush					
Da Da	te S te T	Started D Re	d: 4/ ache	1407 20/20 d: 4/2 5/19	15 24/15		ime of nd of [	Drilling Drilling:	g: 464.00 Not Recorded			
Y	Cool	d Elev rdinat rdinat	e:	ו AMS	L (ft): Not Recorded		/lethod	l: Son	National Drilling ic Coring erkle	Page 21 of 25		
55 Depth (ft)	Sample Type	Number	Headspace PID	Lithologic Log	Material Description		U.S.C.S.	w	'ell Diagram	Remarks		
525	-				<ul> <li>@ 525 ft. Silty SAND (SM); brow (7.5YR 4/3); wet; medium dense fine to medium sand; 5% fine to gravel to 5 cm; subrounded; 15%</li> <li>@ 526.5 ft. Silty SAND with Gravel to 5 cm; subrounded; 15%</li> </ul>	; 80% coarse ⁄⁄silt.	SM			@ 526.5 ft gravel is		
					brown (7.5YR 4/2); wet; dense; to coarse sand; 30% fine to coar gravel to 4 cm; subangular to subrounded; 10% silt; 5% clay.	55% finé rse	Sim			mafics and quartzite.		
		@ 528.5 ft. Clayey SAND with Gravel (SC); brown (7.5YR 4/2); wet; very dense; 55% fine to coarse sand; 25%								@ 528.5 ft gravel is mafics and quartzite.		
<u>530</u>	-				fine to coarse gravel to 3 cm; subrounded; 15% clay; 5% silt. @ 529.5 ft. Silty SAND with Grav brown (7.5YR 4/2); wet; dense; 6		SM		-Bentonite Pellet Seal	<ul><li>@ 529.5 ft gravel is mafics and quartzite.</li><li>@ 531 ft cobbles present.</li></ul>		
	-				to coarse sand; 20% fine to coar gravel to 4 cm; subangular to subrounded; 10% silt; 5% clay. @ 531 ft. Well-graded SAND wit and Gravel (SW-SM); brown (7.5 5/3); wet; medium dense; 60% fi coarse sand; 30% fine to coarse to 6 cm; subangular to subround	th Silt 5YR ine to gravel	SW- SM			Driller unable to advance "flapper bit" due to cobbles, changed to regular bit. @ 531 ft gravel is quartzite, mafics, and sandstone.		
535	-				<ul> <li>b) b) b</li></ul>	vel (SM); dense; ne to	SM		- Top of 20/40 Sand	@ 533.3 ft gravel is quartzite, mafics, and sandstone.		
					subrounded; 15% silt. @ 535 ft. Well-graded SAND wit (SW-SM); brown (7.5YR 5/3); we 80% fine to coarse sand; 10% fir coarse gravel; subangular to subrounded; 10% silt.	th Silt et; loose;	SW- SM		-Top of 10/20 Sand			
540					<ul> <li>@ 538 ft. Silty SAND (SM); brow (7.5YR 5/3); wet; medium dense fine sand; 20% silt; 5% clay.</li> <li>@ 539 ft. See description on nex</li> </ul>	; 75%	SM					

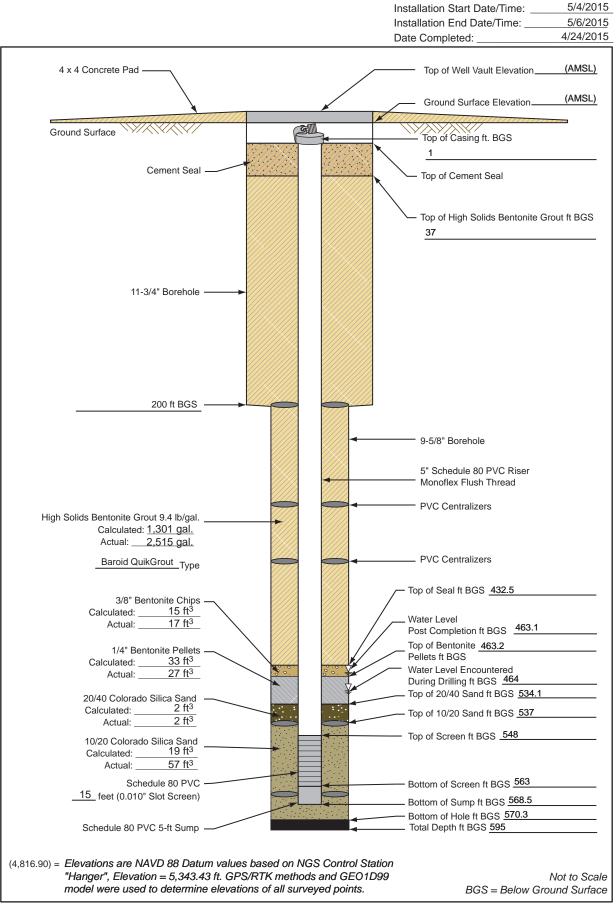
(	C	RI			Bore	hol	e ID	: KAFB-1	106227-Sonic
Pr Pr	ojec ojec	t Loca t Nan	ation: KAI ne: KAFB	os of Engineers FB, Albuquerque, NM BFF SWMU ST-106 and SS-111	Hole Dia	meter	Lower (	in.): 11-3/4 in.): 9-5/8 /pe: Flush	
Da Da	ate S ate T	Starteo D Re	n <b>ber:</b> 1407 d: 4/20/20 ached: 4/2 eted: 5/19	15 24/15		ime of nd of [	Drilling: Drilling:	464.00 Not Recorded	
Y	Coo	d Elev rdinat rdinat	e:	SL (ft): Not Recorded	Drillling ( Drilling M Logged E	/lethod	: Sonic		Page 22 of 25
05 Depth (ft)	Sample Type	Number	Headspace PID Lithologic Log	Material Description		U.S.C.S.	We	ell Diagram	Remarks
	-			@ 539 ft. Silty SAND with Grave brown (7.5YR 5/3); wet; medium 60% fine to coarse sand; 20% fir coarse gravel to 5 cm; subangula subrounded; 20% silt.	dense; ne to	SM		· · · ·	@ 539 ft gravel is quartzite and mafics.
	_			@ 543 ft. Poorly graded SAND v Gravel (SP); brown (7.5YR 5/3); loose; 80% fine to medium sand fine to coarse gravel to 5 cm; an subrounded; 5% silt.	wet; ; 15%	SP		· · · ·	<ul> <li>@ 543 ft gravel is mafics, quartzite, and sandstone.</li> <li>@544 ft gravel is quartzite and mafics.</li> </ul>
545	_			<ul> <li>@ 544 ft. Well-graded GRAVEL Sand (GW); brown (7.5YR 5/3); loose; 55% fine to coarse gravel angular to subrounded; 40% fine coarse sand; 5% silt.</li> <li>@ 545 ft. Well-graded SAND (SV brown (7.5YR 4/3); wet; loose; 8 to coarse sand; 10% fine to coar gravel to 3 cm; subrounded to ro 5% silt.</li> </ul>	wet; to 4 cm; to W); 5% fine se ounded;	sw		- Top of 5" Schedule 80 PVC 0.010" Slot Screen	@ 545 ft gravel is mafics and quartzite.
				@ 550 ft. Clayey SAND (SC); br (7.5YR 5/3); wet; medium dense fine to medium sand; trace coars	; 65% se sand;	SC			
				<ul> <li>5% fine to coarse gravel; subrou 30% clay.</li> <li>© 551 ft. Well-graded SAND wit</li> </ul>	h Clay	SW- SC			
555	-			(SW-SC); brown (7.5YR 5/3); we medium dense; 85% fine to coar 5% fine to coarse gravel to 3 cm subangular to subrounded; 10% @ 552 ft. Silty SAND (SM); brow (7.5YR 5/3); wet; dense; 70% fin 25% silt; 5% clay.	rse sand; ; clay. /n	SM			

	C	RI	Ň			Bore	ehol	e ID:	<b>KAFB-</b> 1	106227-Sonic	
Pro Pro	ojec ojec	t Loca t Nam	ation ie: k	: KÁI (AFB	s of Engineers <sup>-</sup> B, Albuquerque, NM BFF SWMU ST-106 and SS-111	Hole Dia	Hole Diameter Upper (in.): 11-3/4 Hole Diameter Lower (in.): 9-5/8 Surface Completion Type: Flush				
Da Da	ite S ite T	t Num Started D Re Compl	l: 4/2 ache	20/20 d: 4/2	15		ime of nd of I	Drilling: Drilling:	464.00 Not Recorded		
Y (	Cool	d Elev rdinat rdinat	e:	AMS	SL (ft): Not Recorded	-	Contra /lethoo	ctor: Na I: Sonic	ational Drilling Coring	Page 23 of 25	
G Depth (ft)	Sample Type	Number	Headspace PID	Lithologic Log	Material Description		U.S.C.S.	We	II Diagram	Remarks	
560	-				No recovery from 555 to 555.3 ft @ 555.3 ft. Well-graded SAND w Gravel (SW); brown (7.5YR 5/4); loose; 70% fine to coarse sand; 2 to coarse gravel to 6 cm; subang subrounded; 5% silt. @ 557.2 ft. Well-graded SAND ( brown (7.5YR 5/4); wet; loose; 10 to coarse sand. @ 558.5 ft. Poorly graded SAND brown (7.5YR 5/4); wet; loose; 95 to medium sand; 5% silt. @ 559.8 ft. Same as above (558 trace gravel to 4 cm.	vith ; wet; 25% fine jular to SW); 00% fine (SP); 5% fine	SW			@ 555.3 ft gravel is quartzite and mafics.	
	-				<ul> <li>@ 561.2 ft. Clayey SAND (SC); t (7.5YR 5/3); 70% fine to medium trace coarse sand; trace fine gra 20% clay; 10% silt.</li> <li>@ 562.5 ft. Sandy Lean CLAY w Gravel (CL); brown (7.5YR 5/3);</li> </ul>	i sand; vel; ith wet;	SC		- Bottom of	@ 562.5 ft gravel is mafics and quartzite.	
565	-				firm; nonplastic to low plasticity; clay; 30% fine to coarse sand; 20 to coarse gravel to 4 cm; subang subrounded.	0% fine	CL		Screen		
	-				@ 566.1 ft. Well-graded SAND w and Gravel (SW-SC); brown (7.5 wet; medium dense; 50% fine to sand; 40% fine to coarse gravel subangular; 10% clay.	SYR 5/3); coarse	SW- SC			<ul> <li>@ 566 ft flat sandstone cobble fragment observed, 4".</li> <li>@ 567.4 to 567.5 ft flat</li> </ul>	
570	-				<ul> <li>@ 567.5 ft. Poorly graded SAND brown (7.5YR 5/3); wet; loose; 98 to medium sand; 5% silt.</li> </ul>	(SP); 5% fine	SP		- Bottom of Sump	sandstone cobble fragments observed to 4".	

(	C	BI				Bore	eho	e ID:	KAFB-1	06227-Sonic			
Pi Pi	oje oje	ct Loc	ation: ne: 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							
Da Da	ate ate	<b>ct Nun</b> Started TD Re Compl	d: 4/2 ache	20/20 d: 4/2	15 24/15	⊥ At T ▼ At E	ime of Ind of I		464.00 Not Recorded				
Y X	Co Co	ordinat ordinat	e:	AMS	SL (ft): Not Recorded	Drilling N	Method	ictor: Na I: Sonic hris Bue		Page 24 of 25			
22 Depth (ft)	Sample Type	Number	Headspace PID	Lithologic Log	Material Description		U.S.C.S.	We	ll Diagram	Remarks			
575					<ul> <li>Transformation (CL); brown (C</li></ul>	n fine 9 595	NO		- Native Backfill	@ 570 ft flat sandstone cobble fragment observed, 4". End collection of continuous core at 570.3 feet bgs.			

	C	B				Bore	ehol	e ID: KAFB-1	06227-Sonic		
P P	roje roje	ect Lo ect Na	cation me: k	: KAF KAFB E	s of Engineers 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: Flush					
	ate ate	Start TD R	ed: 4/ eache	1407 20/201 d: 4/2 5/19/	5 4/15		ime of nd of I	evels BGS (ft): Drilling: 464.00 Drilling: Not Recorded ng: 463.11			
Y	Со	nd El ordina ordina	ate:	n AMSI	L (ft): Not Recorded	Drillling Drilling N	Contra Aethoo	ictor: National Drilling I: Sonic Coring hris Buerkle	Page 25 of 25		
20 Denth (ft)		Number	Headspace	Lithologic Log	Material Description		U.S.C.S.	Well Diagram	Remarks		
59	0 - - - - 5				No core recovered from 570.3 to feet. Overdrill for heaving sand.		NO	- Native Backfill Bottom of Rat Hole			
60											

# Monitoring Well Completion Diagram KAFB-106227



140705.CB020403.A16



Project Name: KAFB BFF		
Location: Georgia and Ross		Well/Piez. No.: KAFB-106227
Personnel: R. Wortman		Date Installed:
Date: 5/7/15		Csg. Diameter (I.D.): 5 "
Samplers: N/A		Total Depth (ft. bgs): <u>568.5</u>
Method of Development:	V Deilie -	
X Surging	X Bailing	X Pumping
X Original Development	Redevelopment	Other
Development Date: <u>5/7/15, 5</u> Depth to Water Before Devel		3.11
V=(B * r <sub>c</sub> <sup>2</sup> * L <sub>c</sub> * 7.48)+(B * (r <sub>w</sub>	<sup>2</sup> - r <sub>c</sub> <sup>2</sup> ) * L <sub>s</sub> * Ø <sub>s</sub> * 7.48)+(H <sub>2</sub>	20 added during drilling/installation) = 320 gallons
Depth Purging From: 562 fe	et	Time Purging Begins: <u>1110, 5/11/15</u>
Weather: Clear, Sunny		Screened Interval (ft bgs): 548 - 563
Equipment Nos.: pH Meter:	YSI 650 MDS EC	C Meter: YSI 650 MDS Turbidity Meter: HACH 21000Q
Equipment Decontaminated	Prior to Development: Y	′ <u>X N</u>
Describe: Steam Cleaned		

Collected Sample of Water Added to Well: Y \_\_\_\_ N X \_\_\_\_ Describe: N/A

Comment:

Date	Time	Water Level (ft bTOC)	Volume Removed (gal.)	Temp. (°C)	pН	EC (mS/cm)	Turbidity (NTU)	Comments
5/7/2015	1445		-					Arrive onsite.
5/7/2015	1500	463.00	1					Tagged bottom of well at 568.75 feet bgs.
5/7/2015	1517							Begin bailing.
5/7/2015	1529		35				787	Continue bailing.
5/7/2015	1532		55					Finish bailing.
5/7/2015	1544		55					Begin swabbing from 563 - 558 feet bgs.
5/7/2015	1604		55					Begin swabbing from 558 - 553 feet bgs.
5/7/2015	1624		55					Begin swabbing from 553 - 548 feet bgs.
5/7/2015	1644		55					Finish swabbing. End of 5/7/15.
5/11/2015	0815		55					Set up bailer.

Notes:

Water Levels - Reported to the nearest 0.01 foot pH - Reading rounded to 0.1 pH units Water temperature - Reported to nearest 0.1 "C °C = Degree Celsius EC = Electric Conductivity ft bgs = Feet Below Ground Surface ft btoc = Feet Below Top of Casing gal. = Gallon GPM = Gallons Per Minute I.D. = Inner Diameter N/A = Not Applicable NR = Not Recorded NTU = Nephelometric Turbidity Unit S/m = Seimens per Meter

Where:

B=3.14  $Ø_s$ = porosity of the sand pack

 $r_c$ = radius of the well casing and screen in feet  $L_c$ = length of water column inside the casing and screen in feet

 $r_w$ = radius of the well bore in feet  $L_s$ = length of saturated portion of the sand pack in feet

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

Pg 1 of 4



Project: KAFB BFF

Project Number: 140705

Date: 5/7/15, 5/11/15 - 5/12/2015

Time Start: 1110, 5/11/2015

### Well No: KAFB-106227 \_\_\_\_\_ Samplers: N/A Checked By:

Time Finish: 1048, 5/12/2015

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Date	Time	Water Level (ft. bTOC)	Volume Removed (gal.)	Temp. (°C)	рН	EC (mS/cm)	Turbidity (NTU)	Comments
5/11/2015	0850	463.09	55					Begin bailing.
5/11/2015	0908		100				839	Continue bailing; water is dark brown.
5/11/2015	0935		150				>1,000	Finish bailing. Start pump.
5/11/2015	1110	463.10	150					Start pumping; pump set @ 562 feet bgs.
5/11/2015	1115	463.74	150	19.07	6.40	0.436	831	Continue pumping; water is dark brown.
5/11/2015	1125	463.70	197	19.64	7.12	0.408	310	Continue pumping @ 4.70 gpm.
5/11/2015	1135	463.71	244	19.74	7.33	0.403	106	Continue pumping; water is light brown.
5/11/2015	1145	463.68	291	19.83	7.43	0.399	75.9	Continue pumping.
5/11/2015	1155	463.68	338	19.86	7.48	0.396	48.9	Continue pumping.
5/11/2015	1205	463.68	385	19.89	7.47	0.395	39.9	Continue pumping.
5/11/2015	1215	463.65	432	19.92	7.51	0.394	32.3	Continue pumping.
5/11/2015	1225	463.66	479	20.01	7.53	0.393	39.4	Continue pumping.
5/11/2015	1235	463.64	526	19.98	7.54	0.392	40.2	Continue pumping.
5/11/2015	1245	463.64	573	20.03	7.53	0.392	40.0	Continue pumping.
5/11/2015	1255	463.64	620	20.05	7.52	0.391	35.5	Continue pumping.

Was well sampled after development? YES NO X

Sample Method: N/A

Sample Name: N/A

Analyses: N/A



Project: KAFB BFF

Project Number: 140705

Date: 5/7/15, 5/11/15 - 5/12/2015

Time Start: 1110, 5/11/2015

Well No: KAFB-106227
Samplers: N/A
Checked By:
Time Finish: 1048, 5/12/2015

Date	Time	Water Level (ft. bTOC)	Volume Removed (gal.)	Temp. (°C)	рН	EC (mS/cm)	Turbidity (NTU)	Comments
5/11/2015	1305	463.65	667	20.08	7.61	0.391	27.7	Continue pumping.
5/11/2015	1315	463.63	714	20.08	7.55	0.390	33.5	Continue pumping.
5/11/2015	1325	463.63	761	20.16	7.52	0.391	27.5	Continue pumping.
5/11/2015	1335	463.61	808	20.18	7.53	0.391	39.0	Continue pumping.
5/11/2015	1345	463.62	855	20.22	7.59	0.391	31.3	Continue pumping.
5/11/2015	1355	463.61	902	20.24	7.56	0.389	34.3	Continue pumping.
5/11/2015	1405	463.58	949	20.22	7.58	0.390	38.0	Continue pumping; set pump @ 548 feet bgs.
5/11/2015	1415	463.59	1006	20.11	7.53	0.392	60.3	Continue pumping.
5/11/2015	1425	463.58	1053	20.12	7.56	0.390	24.0	Continue pumping.
5/11/2015	1435	463.56	1100	20.14	7.56	0.389	22.4	Continue pumping.
5/11/2015	1445	463.58	1147	20.14	7.59	0.389	31.5	Continue pumping.
5/11/2015	1455	463.59	1194	20.21	7.60	0.389	21.2	Continue pumping.
5/11/2015	1505	463.58	1241	20.20	7.55	0.389	21.6	Continue pumping.
5/11/2015	1515	463.59	1288	20.13	7.58	0.390	23.0	Continue pumping.
5/11/2015	1515		1288					End of 5/11/15.

Was well sampled after development? YES NO X

Sample Method: N/A

Sample Name: N/A

Analyses: N/A



Project: KAFB BFF

Project Number: 140705

Date: 5/7/15, 5/11/15 - 5/12/2015

Time Start: 1110, 5/11/2015

### Field Chemistry (cont'd)

Date	Time	Water Level (ft. bTOC)	Volume Removed (gal.)	Temp. (°C)	pН	EC (mS/cm)	Turbidity (NTU)	Comments
		5100,			P.,		(	
5/12/2015	0805		1288					Set up at site.
5/12/2015	0850	463.06	1288					Tagged water line.
5/12/2015	0905	463.66	1288	17.84	7.03	0.433	25.7	Begin pumping; set pump @ 555.5 feet bgs.
5/12/2015	0915	463.64	1335	19.05	7.47	0.391	1.45	Continue pumping; moved pump to 562 feet bgs.
5/12/2015	0925	463.63	1382	19.16	7.52	0.394	0.64	Continue pumping.
5/12/2015	0935	463.62	1429	19.23	7.59	0.389	0.69	Continue pumping.
5/12/2015	0945	463.63	1476	19.44	7.65	0.389	0.44	Continue pumping; moved pump to 548 feet bgs.
5/12/2015	0955	463.62	1523	19.14	7.55	0.395	2.55	Continue pumping.
5/12/2015	1005	463.61	1570	19.21	7.59	0.389	0.35	Continue pumping.
5/12/2015	1015	463.61	1517	19.34	7.61	0.389	0.38	Continue pumping; moved pump to 555.5 feet bgs.
5/12/2015	1025	463.62	1564	19.40	7.62	0.389	0.32	Continue pumping.
5/12/2015	1035	463.62	1611	19.50	7.62	0.388	0.18	Continue pumping.
5/12/2015	1045	463.62	1658	19.52	7.63	0.389	0.29	Continue pumping.
5/12/2015	1048		1665					Finish pumping; Well development complete.

Was well sampled after development? YES NO X

Sample Method: N/A

Sample Name: N/A

Analyses: N/A

Pg 4 of 4

# KAFB 106230

Pro Pro Pro Dat Dat Dat Crc Y C	ojectojectojectojectojectojecto te Ste T te C ounc	t Loc t Nan t Nun tarte D Re compl	ation ne: k nber: d: 8/ eache leted: vatior te:	: KAF 5004 11/20 d: 8/ 9/1/2	s of Engineers Hole Dia FB, Albuquerque, NM Hole Dia RAPID SWMU ST-106 and SS-111Surface 133 Ground 15 \ \ At T 18/15 \ \ At E 2015 \ \ At E 2015 \ \ After 14 (ft): Not Recorded Drillling	amete amete Comp water Time o End of er Drilli Contra Vetho	r Upp r Low oletion Level f Drill Drillir ing: 4 actor: d: Ai	ber (i ver (i n Ty ls B( ing: ng: 458. Na r Ro	SS (ft): 456.00 Not Recorded 67 ational EWP tary Casing H	VIRGINIA BRACHT 8881903-2250
Depth (ft)	Sample Type	Number	Headspace	Lithologic Log	Material Description	U.S.C.S.		Wel	ll Diagram	Remarks
0					A No Lithologic Description.	SPHA	T		Top of Casing/Top of Cement Seal	Borehole was water knifed from 0-10 ft. Silt, sand, gravel, and cobbles observed.
10					SILT (ML); reddish brown (5YR 5/4); 100% silt.	ML			- Cement Seal	Large cobble @ 8'. Approximately 10" across. Began drilling @ 1420 or 8/11/15 with 11-/3/4" drive casing.
20					Well-graded SAND with Gravel (SW); light reddish brown (5YR 6/4); dry; 60% fine to coarse sand; subangular to rounded; 40% fine to coarse gravel; angular to rounded. Note: sand is quartz, feldspar, and mafics. Gravel is quartz and mafics.					Kelly down @ 1426, new 20' connection @ 1431. PID = 0.0 ppm @ cyclone and breathing zone.
25					Same as above (16 ft).	SW				No water added down hole. Some hammering.

KAFB\_BOREHOLE\_LOG - SHAW\_DRILLING.GDT - 10/19/15 14:41 - Z:KAFB RAPID/GINTIKAFB\_RAPID.GPJ

		BI							KAFB-	106230	
Pro Pro	ojec ojec	t Loc Nan	ation ne: K	: KÁF (AFB	B, Albuquerque, NM Ho RAPID SWMU ST-106 and SS-111 <sub>SU</sub>	ole Diar ole Diar urface (	meter meter Comp	Upper (i Lower (i letion Ty	n.): 11-3/4 n.): 9-5/8 pe: Flush		
Da Da	Project Number: 500433       Groundwater Levels BGS (ft):         Date Started: 8/11/2015										
YO	Coo	d Elev ordinat ordinat	e:	n AMS	Dri	rilling M	ethoo		itional EWP tary Casing H s	ammer Page 2 of 24	
සි Depth (ft)	Sample Type	Number	Headspace PID	Lithologic Log	Material Description		U.S.C.S.	Wel	l Diagram	Remarks	
-	-				Well-graded SAND with Gravel (SW light reddish brown (5YR 6/4); dry; ( fine to coarse sand; subangular to rounded; 40% fine to coarse gravel; angular to rounded. Note: sand is qu feldspar, and mafics. Gravel is quar and mafics.	60% ; uartz,				PID = 0.0 ppm @ cyclone and breathing zone. Occasional hammering.	
35 40	-				Same as above (30 ft).				- Cement Seal - Top of High Solids Bentonite	Kelly down @ 1441, new 20' connection @ 1450. PID = 0.0 ppm @ cyclone and breathing zone.	
45	-				Same as above (30 ft).		SW		Grout	Water added in cyclone for dust control. No water down hole.	
50	-				Same as above (30 ft).				- High Solids Bentonite Grout	PID = 0.0 ppm @ cyclone and breathing zone.	
55					Same as above (30 ft).					No water added down hole.	
60	-									Kelly down @ 1501, new 20' connection @ 1507.	

		BI	)			Bore	eho	le I	D: KAFB-′	106230
Pro Pro	ojec ojec	t Loc Nan	ation: ne: K/	KÁF AFB I	s of Engineers FB, Albuquerque, NM RAPID SWMU ST-106 and SS-1	Hole Dia Hole Dia 11Surface	ameter ameter Comp	· Upp · Low letior	er (in.): 11-3/4 er (in.): 9-5/8 n Type: Flush	
Da Da Da	te S te T te C	Starte ID Re Compl	n <b>ber:</b> d: 8/1 ached eted: vation	1/201 : 8/1 9/1/2	15 18/15	⊻ At T ▼ At E ▼ Afte	ime of nd of r Drilli	f Drill Drillin ng: 4	s BGS (ft): ing: 456.00 ig: Not Recorded i58.67 National EWP	
ΥC	Coo	rdinat	e:				Nethod	iA :b	r Rotary Casing Ha	Ammer Page 3 of 24
영 Depth (ft)	Sample Type	Number	Headspace PID	Lithologic Log	Material Description		U.S.C.S.		Well Diagram	Remarks
65	-				Well-graded SAND with Grave light reddish brown (5YR 6/4); of fine to coarse sand; subangula rounded; 40% fine to coarse gr angular to rounded. Note: sand feldspar, and mafics. Gravel is and mafics.	dry; 60% r to avel; l is quartz,				PID = 0.0 ppm @ cyclone and breathing zone. No water added down
70	-				Same as above (60 ft). Note: g 2" across.	ravel to >				hole. PID = 0.0 ppm @ cyclone and breathing zone.
75	-		0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0		Same as above (60 ft). Note: g 2" across.	ravel to >	SW		- High Solids Bentonite Grout	Hammering to 80'.
80	-				Same as above (60 ft). Note: g 2" across.	ravel to >				Kelly down @ 1540, new 20' connection @ 1545. PID = 0.0 ppm @ cyclone and breathing zone.
85	-				Same as above (60 ft). Note: g 2" across.	ravel to >		<ul> <li>•</li> <li>•&lt;</li></ul>		Bit very hot. Steam coming out of cyclone. No water added down hole.
90			0 0 0 0 0 0 0 0 0 0 0 0 0						•     •       •     •       •     •       •     •       •     •       •     •       •     •       •     •       •     •       •     •       •     •       •     •       •     •	Hammering.

		BI	)		В	oreh	o	e II	D: KAFB-1	06230	
Pro Pro	ojec ojec	t Loca Nam	ation ne: K	: KÁF (AFB	B, Albuquerque, NM Ho RAPID SWMU ST-106 and SS-111Su	le Diam	eter		er (in.): 11-3/4 er (in.): 9-5/8 Type: Flush		
Da Da	Project Number: 500433       Groundwater Levels BGS (ft):         Date Started: 8/11/2015										
Y	Coo	d Elev rdinat	e:	n AMS	L (ft): Not Recorded Dril Dril	illling Co	ntra thoc	ictor: I: Air	National EWP Rotary Casing Ha	ammer Page 4 of 24	
g Depth (ft)	Sample Type	Number	Headspace PID	Lithologic Log	Material Description	(	U.S.C.S.	\ \	Well Diagram	Remarks	
95	-				Well-graded SAND with Gravel (SW light reddish brown (5YR 6/4); dry; c 60% fine to coarse sand; subangular rounded; 40% fine to coarse gravel t angular to rounded. Note: sand is qu feldspar, and mafics. Gravel is quart and mafics.	dry; ir to to 2"; uartz,		·     ·       ·     ·       ·     ·       ·     ·       ·     ·       ·     ·       ·     ·       ·     ·       ·     ·       ·     ·       ·     ·       ·     ·       ·     ·       ·     ·       ·     ·       ·     ·       ·     ·       ·     ·       ·     ·	<pre></pre>	PID = 0.0 ppm @ cyclone and breathing zone. Hammering. Hard drilling.	
100					Same as above (90 ft).	S	SW	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	<ul> <li>.</li> <li>.&lt;</li></ul>	Kelly down @ 1614, new 20' connection @ 1624. PID = 0.0 ppm @ cyclone and breathing zone.	
105	-			· · · · · ·	SILT (ML); reddish yellow (5YR 7/6); 90% silt; 10% fine gravel; rounded.	N	ЛL		<ul> <li>High Solids</li> <li>Bentonite</li> <li>Grout</li> </ul>		
110	-				Lean CLAY (CL); reddish yellow (5Y 6/6); moist; non to low plasticity; 90% clay; 10% silt; trace fine sand.	%	CL	<ul> <li>•</li> <li>•&lt;</li></ul>	• • • • • • • • • • • • • • • • • • •	Hammering, stiff drilling. PID = 0.0 ppm @ cyclone	
115	-				SILT with Gravel (ML); yellowish red (5YR 5/6); 80% silt; 20% fine to med gravel; subangular to rounded. Note gravel is quartz and mafics.	dium e:			<ul> <li>.</li> <li>.&lt;</li></ul>	and breathing zone.	
120	-					N	ЛL		<ul> <li>•</li> <li>•&lt;</li></ul>	Hammering continuously. Kelly down @ 1643, new 20' connection @ 1656.	

	C	BI				Bore	eho	le ID	): <b>KAFB-</b> 1	06230
Pro Pro	ojec ojec	t Loca t Nam	ation: ne: K	KA AFB	os of Engineers FB, Albuquerque, NM RAPID SWMU ST-106 and SS-11	Hole Dia	ametei	lower	· (in.): 11-3/4 · (in.): 9-5/8 Гуре: Flush	
Da Da Da	ite S ite T ite C	t Num Startec D Re Compl d Elev	d: 8/ acheo eted:	11/20 d: 8/ 9/1/	15 18/15		ime of nd of r Drilli	f Drilling Drilling: ng: 45	BGS (ft): g: 456.00 : Not Recorded 8.67 National EWP	
Y (	Cool	rdinat rdinat	e:				Nethod	d: Air F	Rotary Casing Ha	ammer Page 5 of 24
05 Depth (ft)	Sample Type	Number	Headspace PID	Lithologic Log	Material Description		U.S.C.S.	w	/ell Diagram	Remarks
	_				SILT with Gravel (ML); yellowish (5YR 5/6); 80% silt; 20% fine to gravel; subangular to rounded. I gravel is quartz and mafics.	medium			•	PID = 0.0 ppm @ cyclone and breathing zone.
125	-				Same as above (120 ft).				• • • • •	Hammering continuously.
130	-				Same as above (120 ft).		ML		•	PID = 0.0 ppm @ cyclone and breathing zone.
135	-				Same as above (120 ft).				- High Solids Bentonite Grout	Kelly down @ 1702, new 20' connection @ 1708.
140					Same as above (120 ft).				• • • • • •	PID = 0.0 ppm @ cyclone and breathing zone.
145	-				Well-graded SAND with Gravel light brown (7.5YR 6/4); 60% fin coarse sand; subrounded to rou 40% fine to coarse gravel; angu rounded. Note: sand and gravel quartz and mafics.	e to inded; lar to	SW		•	Hammering.

	C	BI	<u>}</u>			Bore	eho	le I	D: KAFB-1	106230
Pro Pro	ojec ojec	t Loca t Nan	ation: ne: K	KAF AFB I	s of Engineers FB, Albuquerque, NM RAPID SWMU ST-106 and SS-11	Hole Dia	ametei		er (in.): 11-3/4 er (in.): 9-5/8 1 Type: Flush	
Da Da Da Gr Y (	te S te T te C oun Coo	rdinat	d: 8/1 acheo eted: /ation e:	1/20 <i>1</i> 1: 8/1 9/1/2	15 18/15	⊥ At T ▼ At E ▼ Afte Drillling Drilling I	ime of nd of r Drillin Contra Methoo	f Drilli Drillir ng: 4 actor: d: Ai	National EWP r Rotary Casing Ha	ammer
X ((II) Depth (II)	Sample Type	Number Number	Headspace <sup>a</sup> PID	Lithologic Log	Material Description	Logged	By: T S.O.S. N		nards Well Diagram	Page 6 of 24 Remarks
155	-				Well-graded SAND with Gravel light brown (7.5YR 6/4); 60% fin coarse sand; subrounded to rou 40% fine to coarse gravel; angu rounded. Note: sand and gravel quartz and mafics.	ie to inded; lar to				PID = 0.0 ppm @ cyclone and breathing zone. Hammering. No water added down hole.
160					Same as above (150 ft).					Kelly down @ 1734, new 20' connection @ 1739. PID = 0.0 ppm @ cyclone and breathing zone.
165					Same as above (150 ft).		sw		- High Solids Bentonite Grout	Hammering, stiff drilling.
170					Same as above (150 ft).			<ul> <li>•</li> <li>•&lt;</li></ul>		PID = 0.0 ppm @ cyclone and breathing zone.
175					Same as above (150 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	Kelly down @ 1748, new 20' connection @ 1753.

	C	BI	<b>N</b>			Bore	eho	le I	D: KAFB-′	106230
Pro Pro	ojec ojec	t Loca t Nam	ation: ne: K	KAF AFB I	s of Engineers B, Albuquerque, NM RAPID SWMU ST-106 and SS-11	Hole Dia	ameter		er (in.): 11-3/4 er (in.): 9-5/8 Type: Flush	
Da Da Da Gr	te S ite T ite C oun	<b>t Nun</b> Started ID Re Compl d Elev ordinat	d: 8/1 acheo eted: /ation	11/201 d: 8/1 9/1/2	15  8/15		ime of nd of r Drillin Contra	f Drilli Drillir ng: 4 actor:	s BGS (ft): ing: 456.00 ng: Not Recorded 458.67 National EWP r Rotary Casing Ha	ammer
		ordinat				Logged				Page 7 of 24
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 light brown (7.5YR 6/4); 60% fin coarse sand; subrounded to rou 40% fine to coarse gravel; angu rounded. Note: sand and gravel quartz and mafics.	ne to inded; ilar to				PID = 0.0 ppm @ cyclone and breathing zone. Hammering.
190					Same as above (180 ft).					PID = 0.0 ppm @ cyclone and breathing zone.
<u>195</u>	-				Same as above (180 ft).		SW	• • • • • • • • • • • •	- High Solids Bentonite Grout	Hammering.
200					Same as above (180 ft).					Kelly down @ 1802. Stop drilling @ 200' with 11-3/4" drive casing on 8/11/15. Begin drilling with 9-5/8" drive casing @ 1045 on 8/12/15.
205					Same as above (180 ft).			• • • • • • • • • •		No Hammering.
210								<ul> <li>•</li> <li>•&lt;</li></ul>	•       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •	No water added down hole.

	C	BI			В	oreh	ol	e ID:	KAFB-1	106230
Pro Pro	ojec ojec	t Loca Nam	ation ne: k	: KÁF (AFB I	<sup>-</sup> B, Albuquerque, NM Ho RAPID SWMU ST-106 and SS-111 <sub>Su</sub>	le Diame	əter	lower (	in.): 11-3/4 in.): 9-5/8 ⁄pe: Flush	
Da Da	te S te T	Started	d: 8/ ache	5004 11/20 d: 8/1 9/1/2	15 18/15 ▼	oundwate At Time At End After D	e of of [	Drilling: Drilling:	456.00 Not Recorded	
YO	Cool	d Elev rdinat rdinat	e:	n AMS	L (ft): Not Recorded Dril Dril	Illing Cor	ntra hod	ctor: Na : Air Ro	ational EWP otary Casing Ha	ammer Page 8 of 24
0 Depth (ft)	Sample Type	Number	Headspace PID	Lithologic Log	Material Description	C	0.0.0.0	We	ll Diagram	Remarks
215	-				Well-graded SAND with Gravel (SW light brown (7.5YR 6/4); 60% fine to coarse sand; subrounded to rounded 40% fine to coarse gravel; angular to rounded. Note: sand and gravel are quartz and mafics.	d; o	W			PID = 0.0 ppm @ cyclone and breathing zone. Hammering for the last
220	-				Lean CLAY (CL); light reddish browr (5YR 6/4); non plastic to low plasticit 100% clay.					7'. Kelly down @ 1054, new 20' connection @ 1107.
225	-				Same as above (216 ft). Same as above (216 ft).	c	Ľ		- High Solids Bentonite Grout	<ul><li>PID = 0.0 ppm @ cyclone and breathing zone.</li><li>Hammering continuously.</li><li>No water added down hole.</li></ul>
230					Well-graded SAND with Gravel (SW brown (7.5YR 5/4); 70% fine to coars sand; subrounded to rounded; 30% t to coarse gravel; subrounded to rounded. Note: sand is quartz, feldsp and mafics. Gravel is quartz and ma	se fine par,	W			PID = 0.0 ppm @ cyclone and breathing zone. Hammering.
240	-									Kelly down @ 1118, new 20' connection @ 1133 working 9-5/8" to prevent sand lock with 11-3/4"

	2	BI				Bore	eho	le I	D: KAFB-1	06230
Pro Pro	ojec ojec	t Loca t Nam	ation: ne: K	: KAF (AFB	s of Engineers FB, Albuquerque, NM RAPID SWMU ST-106 and SS-11	Hole Dia	ametei		ver (in.): 11-3/4 ver (in.): 9-5/8 n Type: Flush	
Da Da	te S te T	t Num Started D Re Compl	d: 8/ ache	11/20 d: 8/1	15 18/15	🕎 At T	ime of	f Drill Drillir	s BGS (ft): ing: 456.00 ng: Not Recorded 458.67	
Y (	Cool	d Elev rdinat rdinat	e:	n AMS	L (ft): Not Recorded	Drillling Drilling I Logged	Vethoo	iA :b	National EWP r Rotary Casing Ha hards	ammer Page 9 of 24
Depth (ft)	Sample Type	Number	Headspace PID	Lithologic Log	Material Description		U.S.C.S.		Well Diagram	Remarks
245	-				Well-graded SAND with Gravel brown (7.5YR 5/4); 70% fine to sand; subrounded to rounded; 3 to coarse gravel; subrounded to rounded. Note: sand is quartz, f and mafics. Gravel is quartz and	coarse 30% fine eldspar,				drive casing. PID = 0.0 ppm @ cyclone and breathing zone. Hammering continuously. No water added down hole.
250	-				Same as above (240 ft).					PID = 0.0 ppm @ cyclone and breathing zone.
255	-				Same as above (240 ft.)		SW		- High Solids Bentonite Grout	Kelly down @ 1145, new 20' connection @ 1155.
260	-				Same as above (240 ft).					PID = 0.0 ppm @ cyclone and breathing zone.
265 270	-				Same as above (240 ft).			•     •       •     •		Hammering. No water added down hole.

	C	BI			E	Bore	hol	le I	D: KAFB-1	06230
Pro Pro	ojec ojec	t Loca t Nam	ation: ne: KA	kaf FB F	B, Albuquerque, NM H RAPID SWMU ST-106 and SS-111S	lole Diai	meter		er (in.): 11-3/4 er (in.): 9-5/8 ı Type: Flush	
Da Da Da Gr	ite S ite T ite C oun	Starteo D Rea Comple d Elev		1/201 8/1 9/1/2	15 G 8/15 2 2015 2	⊈ At Tii ⊈ At Er ⊈ After	me of nd of l Drillir	<sup>r</sup> Drilli Drillin ng: 4	s BGS (ft): ng: 456.00 g: Not Recorded 58.67 National EWP	
		rdinat rdinat			D		lethoo	d: Aiı	<sup>-</sup> Rotary Casing Ha	Ammer Page 10 of 24
05 Depth (ft)	Sample Type	Number	Headspace PID		Material Description		U.S.C.S.		Well Diagram	Remarks
	-				Well-graded SAND with Gravel (SV brown (7.5YR 5/4); 70% fine to coa sand; subrounded to rounded; 30% to coarse gravel; subrounded to roundeded. Note: sand is quartz, feldspar, and mafics. Gravel is qua and mafics.	arse 6 fine				PID = 0.0 ppm @ cyclone and breathing zone. Hammering.
275	-								•       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •	Kelly down @ 1230, new 20' connection @ 1251.
280	-				Same as above (270 ft).				•       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •	PID = 0.0 ppm @ cyclone and breathing zone.
285	-				Same as above (270 ft).		SW		- High Solids Bentonite Grout	Hammering.
<u>290</u>	-				Same as above (270 ft).				•       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •	PID = 0.0 ppm @ cyclone and breathing zone.
295					Same as above (270 ft).					Hammering - slow drilling, no water added down hole.
300									•       • <t< td=""><td>Kelly down @ 1318. End of 8/12/15.</td></t<>	Kelly down @ 1318. End of 8/12/15.

	C	BI			Bo	orel	no	le I	D: KAFB-1	106230
Pro Pro	ojec ojec	t Loca t Nam	ation: ne: K	KÁF AFB I	B, Albuquerque, NM Hole RAPID SWMU ST-106 and SS-111Surfa	Dian	netei	l ow	er (in.): 11-3/4 er (in.): 9-5/8 ı Type: Flush	
Da Da Da	ite S ite T ite C	t Num Startec D Rea Comple	d: 8/1 ached eted:	1/20 <i>1</i> 1: 8/1 9/1/2	15 ⊈ /  8/15 ¥ / 2015 ¥ /	At Tin At En After I	ne of d of Drilli	f Drilli Drillin ng: 4	s BGS (ft): ng: 456.00 g: Not Recorded 58.67 National EWP	
Y	Cool	rdinate	e:		Drilli		ethoo	d: Ai	<sup>-</sup> Rotary Casing Ha	Ammer Page 11 of 24
S Depth (ft)	Sample Type	Number	Headspace PID	Lithologic Log	Material Description		U.S.C.S.		Well Diagram	Remarks
305	-				Well-graded SAND with Gravel (SW); brown (7.5YR 5/4); 70% fine to coarse sand; subrounded to rounded; 30% fir to coarse gravel; subrounded to roundeded. Note: sand is quartz, feldspar, and mafics. Gravel is quartz and mafics.	e ne			•       •         •       •	Started drilling @ 1335 on 8/14/15. PID = 0.6 ppm @ cyclone and 0.0 ppm @ breathing zone. Continuous hammering, no water added down hole.
<u>310</u> 315	-				Same as above (300 ft); gravel to 2".		SW			PID = 0.2 ppm @ cyclone and 0.0 ppm @ breathing zone.
	-				Same as above (300 ft); gravel to 2".			<ul> <li>•</li> <li>•&lt;</li></ul>	<ul> <li>High Solids</li> <li>Bentonite</li> <li>Grout</li> </ul>	Kelly down @ 1353, new 20' connection @ 1357.
320					Same as above (300 ft); gravel to 2".					PID = 0.0 ppm @ cyclone and breathing zone.
325					Same as above (300 ft); gravel to 2".					Hammering.
330					SILT (ML); reddish brown (5YR 5/4); d 100% silt.		ML	••• ••• •••	• • • • • •	

	Borehole ID: KAFB-106230											
Pro Pro	Client: US Army Corps of Engineers Project Location: KAFB, Albuquerque, NM Project Name: KAFB RAPID SWMU ST-106 and SS-111Surface Completion Type: Flush Project Number: 500433											
Da Da	te S te T	Startec D Rea Comple	1: 8/ <sup>,</sup> acheo	11/20 <i>′</i> d: 8/1	15 18/15	🕎 At Ti	ime of nd of	f Drilli Drillin	BGS (ft): ng: 456.00 g: Not Recorded 58.67			
YC	Coo	d Elev rdinate rdinate	e:	I AMS	C		lethoo	d: Air	National EWP Rotary Casing Ha ards	ammer Page 12 of 24		
00 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	4); dry;	ML	•••	••	PID = 0.0 ppm @ cyclone and breathing zone.		
<u>335</u> 340					<ul> <li>Well-graded SAND (SW); light red brown (5YR 6/4); dry; 90% fine to a sand; angular to rounded; 10% fine coarse gravel; subrounded to roun Note: sand is quartz, feldspar, and mafics. Gravel is mafics and quart</li> <li>Same as above (331 ft).</li> </ul>	coarse e to ided. I	SW		<ul> <li>High Solids Bentonite Grout</li> </ul>	Hard and slow drilling. No water added down hole. Kelly down @ 1419, new 20' connection @ 1531. PID = 0.0 ppm @ cyclone and breathing zone.		
350					Poorly graded SAND (SP); light re- brown (5YR 6/4); dry; 90% fine sar trace medium to coarse sand; ang rounded; 10% fine to coarse grave subrounded to rounded. Note: san quartz, feldspar, and mafics. Grave mafics and quartz.	nd; ular to el; id is	SP	•       •         •       •	<ul> <li>•</li> <li>•&lt;</li></ul>	PID = 0.0 ppm @ cyclone and breathing zone. Hammering, slow driling.		
360	-				Same as above (348 ft).				<ul> <li>•</li> <li>•&lt;</li></ul>	Kelly down @ 1543, new 20' connection @ 1547.		

	Borehole ID: KAFB-106230												
Pro Pro	Client: US Army Corps of Engineers       Hole Diameter Upper (in.): 11-3/4         Project Location: KAFB, Albuquerque, NM       Hole Diameter Lower (in.): 9-5/8         Project Name: KAFB RAPID SWMU ST-106 and SS-111Surface Completion Type: Flush												
Da Da	Project Number: 500433       Groundwater Levels BGS (ft):         Date Started: 8/11/2015												
Y	Coo	d Elev rdinate rdinate	e:	n AMS	L (ft): Not Recorded Drii Drii	Illing C	Contra ethoo	actor: d: Air	National EWP Rotary Casing Ha	ammer Page 13 of 24			
g Depth (ft)	Sample Type	Number	Headspace PID	Lithologic Log	Material Description		U.S.C.S.		Well Diagram	Remarks			
365	-				Poorly graded SAND (SP); light redo brown (5YR 6/4); dry; 90% fine sand trace medium to coarse sand; angula rounded; 10% fine to coarse gravel; subrounded to rounded. Note: sand quartz, feldspar, and mafics. Gravel mafics and quartz.	l; ar to is			•       •         •       •	PID = 0.0 ppm @ cyclone and breathing zone. Hammering - slow drilling. No water added down hole.			
370 375					Same as above (360 ft). Same as above (360 ft).		SP	•       •         •       •	- High Solids Bentonite Grout	PID = 0.0 ppm @ cyclone and breathing zone.			
380					Same as above (360 ft).			•       •	•       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •	Kelly down @ 1559, new 20' connection @ 1633. PID = 0.0 ppm @ cyclone and breathing zone.			
385					Well-graded SAND with Gravel (SW brown (7.5YR 5/3); dry; 60% fine to coarse sand; subrounded to rounded 40% fine to coarse gravel; angular to rounded; trace silt. Note: sand is qua feldspar, and mafics. Gravel is quart and mafics.	d; o artz,	SW		•       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •	Hammering.			
390								••	• • • • • •				

	Borehole ID: KAFB-106230										
Pro Pro	ojec ojec	t Loca Nan	ation ne: k	: KÁF (AFB	<sup>-</sup> B, Albuquerque, NM Hole RAPID SWMU ST-106 and SS-111Surf	e Diam	eter	r Upper (in.): 11-3/4 r Lower (in.): 9-5/8 pletion Type: Flush			
Da Da	ite S ite T	Starteo	d: 8/ ache	5004 11/20 d: 8/1 9/1/2	Groi 15 18/15 ▼	At Tim At End	ie of d of l	Levels BGS (ft): f Drilling: 456.00 Drilling: Not Record ng: 458.67	ed		
Y (	Coo	d Elev rdinat rdinat	e:	n AMS	Drilli	ing Me	thoo	actor: National EWF d: Air Rotary Casing Richards			
66 Depth (ft)	Sample Type	Number	Headspace PID	Lithologic Log	Material Description		U.S.C.S.	Well Diagram	Remarks		
395	-				Well-graded SAND with Gravel (SW); brown (7.5YR 5/3); dry; 60% fine to coarse sand; subrounded to rounded; 40% fine to coarse gravel; angular to rounded; trace silt. Note: sand is quar feldspar, and mafics. Gravel is quartz and mafics.	; rtz, <u>2</u>	SW		PID = 0.0 ppm @ cyclone and breathing zone. Hammering. No water added down hole.		
400	-				Same as above (390 ft).				Kelly down @ 1644, new 20' connection @ 1647. PID = 0.1 ppm @ cyclone and 0.0 ppm @ breathing zone.		
405					Poorly graded SAND with Gravel (SP brown (7.5YR 5/4); dry; 70% fine sand trace coarse sand; rounded; 30% fine coarse gravel; subrounded to rounded Note: gravel is quartz and mafics.	d; e to		- High Solids Bentonite Grout			
<u>410</u>	-				Same as above (402 ft).	Ş	SP	•     •     •       •     •     •       •     •     •       •     •     •       •     •     •       •     •     •       •     •     •       •     •     •       •     •     •       •     •     •       •     •     •       •     •     •       •     •     •       •     •     •       •     •     •       •     •     •	PID = 0.0 ppm @ cyclone and breathing zone.		
415	-				Same as above (402 ft).				Hammering.		
420								v     v     v       v     v     v       v     v     v       v     v     v       v     v     v       v     v     v       v     v     v       v     v     v       v     v     v       v     v     v       v     v     v       v     v     v       v     v     v       v     v     v       v     v     v	Kelly down @ 1658, new 20' connection @ 1701.		

(	C	BI			В	orehole ID: KAFB-106230				
Pr Pr	ojec ojec	t Loca t Nam	ation ne: K	: KÁF (AFB I	B, Albuquerque, NM Ho RAPID SWMU ST-106 and SS-111Su	le Diar	neter		er (in.): 11-3/4 er (in.): 9-5/8 n Type: Flush	
Da Da Da	ate S ate T ate C	Starteo D Re Compl	d: 8/ ache eted:	5004 11/20 d: 8/1 9/1/2	15 ⊈ 18/15 ₹ 2015 ₹	At Tir At En After	me of Id of I Drillir	<sup>:</sup> Drill Drillir ng: 4		
Y	Coo	rdinat rdinat	e:		Dri		ethoo	l: Ai	National EWP r Rotary Casing Ha nards	ammer Page 15 of 24
5 Depth (ft)	Sample Type	Number	Headspace PID	Lithologic Log	Material Description		U.S.C.S.		Well Diagram	Remarks
425	_				Poorly graded SAND (SP); light brov (7.5YR 6/3); dry; 100% fine sand; rounded; trace silt.	wn				PID = 0.0 ppm @ cyclone and breathing zone.
<u>430</u>	-				Same as above (420 ft).		SP		- High Solids Bentonite Grout	Hammering. No water added down hole. PID = 0.0 ppm @ cyclone and breathing zone.
435	-				Well-graded SAND with Gravel (SW reddish yellow (7.5YR 6/6); dry; 70% to coarse sand; subrounded to round 30% fine gravel; subrounded to round Note: sand is quartz, feldspar, and mafics. Gravel is quartz and mafics.	6 fine ded; nded.	SW			PID = 0.0 ppm @ cyclone and breathing zone.
<u>440</u>	-							•••		Kelly down @ 1712. End of ARCH drilling @ 440' on 8/14/15.
<u>445</u>	-									

		RI	Ň		Bore	sho	le ID: KAF	B-106230-Sonic
Pro Pro	ojec ojec	t Loca	ation: ne: K	: KÁ (AFB	FB, Albuquerque, NM Hole Dia RAPID SWMU ST-106 and SS-111Surface	ameter	r Upper (in.): 11-( r Lower (in.): 9-5/ bletion Type: Flus	18
Da Da	te S te T	Startec D Rea Comple	d: 8/ ache	17/20 d: 8/	Ground 15 ∑ At T 18/15 ¥ At E	Time of End of	Levels BGS (ft): f Drilling: 456.00 Drilling: Not Reco ng: 458.67	orded
Y ( X (	Cooi Cooi	rdinat rdinat	e:	n AMS		Metho	actor: National E\ d: Sonic Coring 1. Giles	NP Page 16 of 24
5 Depth (ft)	Sample Type	Number	Headspace	Lithologic Log	Material Description	U.S.C.S.	Well Diagrar	n Remarks
440					<ul> <li>@ 440 ft. Poorly graded SAND (SP); brown (7.5YR 4/3); dry; loose; 95% fine sand; subangular; 5% silt; trace clay.</li> <li>@ 443.1 ft. Silty SAND (SM); brown (7.5YR 4/3); 85% fine sand; 15% silt.</li> <li>@ 444.4 ft. Poorly graded SAND (SP); brown (7.5YR 4/3); moist; 95% fine sand; 5% silt.</li> <li>@ 444.7 ft. Poorly graded SAND with Silt (SP-SM); brown (7.5YR 4/3); 90% fine sand; trace medium sand; subangular; 10% silt.</li> <li>@ 445.2 ft. Same as above (444.7 ft); moist; 90% fine to medium sand.</li> <li>@ 447.8 ft. Same as above (444.7 ft); trace coarse gravel to 1-1/2"; subrounded.</li> </ul>	SP SM SP- SM	-High Solid Benotonit Grout	Begin sonic coring at 440 feet bgs on 8/16/15. @ 440 ft sand is quartz. Silt and clay occur in small pockets, <1/4". @ 443.1 to 450 ft, sand is quartz and occasional biotite. @ 443.1 ft driller added water during drilling. @ 445.3 - 446.1 ft sand is wet possibly from driller adding water. @ 447.8 ft gravel is mafics. @ 449 ft sediment is dry.

	C	BI	<u> </u>		Bore	eho	e ID: KAFB-1	106230-Sonic
Pro Pro	ojec ojec	t Loca t Nam	ation ne: k	: KÁF (AFB	FB, Albuquerque, NM Hole Dia RAPID SWMU ST-106 and SS-111Surface	ameter	Upper (in.): 11-3/4 Lower (in.): 9-5/8 letion Type: Flush	
Da Da	ite S ite T	<b>t Nun</b> Starteo ID Re Compl	d: 8/ ache	17/20 d: 8/ <i>*</i>	Grounds 15 ∑ At T 18/15 ₹ At E	ime of nd of	evels BGS (ft): Drilling: 456.00 Drilling: Not Recorded	
Gr Y (	oun Coo	-	/atior e:		L (ft): Not Recorded Drilling	Contra Method	ictor: National EWP	Page 17 of 24
5 Depth (ft)	Sample Type	Number	Headspace PID	Lithologic Log	Material Description	U.S.C.S.	Well Diagram	Remarks
	_				@ 450 ft. Poorly graded SAND with Silt (SP-SM); brown (7.5YR 4/3); 90% fine sand; trace medium sand; subangular; 10% silt. @ 450.4 ft. Well-graded SAND with Silt_	SP- SM SW- SM		<ul> <li>@ 450 to 465 ft, sand is quartz with occasional quartzite, granite, biotite, and microcline.</li> <li>@ 450.4 to 465 ft gravel</li> </ul>
	_				and Gravel (SW-SM); brown (7.5YR 5/3); 60% fine to coarse sand; subangular to subrounded; 30% coarse gravel; 10% silt. @ 451.6 ft. Silty SAND with Gravel (SM); brown (7.5YR 4/4); 40% fine to medium sand; 30% fine to coarse gravel; 30% silt.	SM	- High Solids Benotonite Grout	is mafics with occasional quartz, quartzite, and microcline.
455	-				@ 454.4 ft. Silty GRAVEL with Sand (GM); brown (7.5YR 5/3); 50% fine to coarse gravel to 2"; angular to subrounded; 20% fine sand; trace ∑medium and coarse sand; 30% silt.	GM		@ 454.6 ft trace reddish silt.
	-				<ul> <li>@ 456.2 ft. Silty SAND with Gravel (SM); brown (7.5YR 4/2); 60% fine to coarse sand; subangular to subrounded; 25% coarse gravel to 1-1/2"; subrounded; 15% silt.</li> <li>@ 457 ft. Silty GRAVEL with Sand (GM); brown (7.5YR 4/4); 60% coarse gravels);</li> </ul>	SM GM	- Top of Bentonite Seal	@ 457 ft gravel is elongated.
460	-				brown (7.5YR 4/4); 60% coarse gravel; voccassional cobble to 4"; subrounded; 25% fine to coarse sand; subangular; 15% silt; trace clay. @ 458.4 ft. Poorly graded GRAVEL with Silt provide the same content of the same conte	GP- GM SP- SM		@ 450.9 ft groupl in fining
	-				Silt and Sand (GP-GM); brown (7.5YR 4/4); 60% fine gravel to 3/8"; 30% fine to coarse sand; 10% silt. @ 459.1 ft. Poorly graded SAND with Silt (SP-SM); brown (7.5YR 4/4); 80% fine to medium sand; 10% coarse gravel to 3"; subrounded; 10% silt.	GW- GM		@ 459.8 ft gravel is fining downwards.
					<ul> <li>@ 459.8 ft. Well-graded GRAVEL with Silt and Sand (GW-GM); brown (7.5YR 4/4); 60% fine to coarse gravel to 2-1/2"; subangular to subrounded; 30% fine to coarse sand; 10% silt.</li> <li>@ 463.7 ft. Lean CLAY (CL); reddish</li> </ul>			@ 463.7 ft occassional lenses of silt.
465					brown (5YR 4/3); stiff; medium plasticity; 100% clay.	CL		

	C	BI			Bore	ehol	e ID: KAFB-′	106230-Sonic
Pro	ojec ojec	t Loca Nam	ation: ie: K	: Kaf (Afb i	FB, Albuquerque, NM Hole Di RAPID SWMU ST-106 and SS-111Surface	ameter	Upper (in.): 11-3/4 Lower (in.): 9-5/8 letion Type: Flush	
Da Da	te S te T	<b>t Num</b> Started D Rea Comple	l: 8/ ache	17/20 <i>°</i> d: 8/1	Ground 15 ♀ At 1 18/15 ♀ At 2 ▼ At E	Time of End of I	evels BGS (ft): Drilling: 456.00 Drilling: Not Recorded ng: 458.67	
Y	Coo	d Elev rdinate rdinate	e:	AMS	L (ft): Not Recorded Drilling	Contra Methoc	ctor: National EWP	Page 18 of 24
5 Depth (ft)	Sample Type	Number	Headspace PID	Lithologic Log	Material Description	U.S.C.S.	Well Diagram	Remarks
					<ul> <li>@ 465 ft. Lean CLAY (CL); reddish brown (5YR 4/3); stiff; medium plasticity; 100% clay.</li> <li>@ 465.3 ft. Silty GRAVEL with Sand (GM); brown (7.5YR 4/4); 40% fine gravel to 1/2"; subangular to</li> </ul>	GM		@ 465.3 to 480 ft, sand is quartz with occasional microcline and biotite. @ 465.3 ft gravel is mafics, quartzite, and quartz.
-	-				<ul> <li>glavor to '1/2', ouscaligation to subrounded; 40% fine to coarse sand; 20% silt.</li> <li>@ 466.6 ft. Sandy fat CLAY (CH); reddish brown (5YR 4/3); firm; high plasticity; 60% clay; 40% fine sand.</li> </ul>	СН		@ 466.6 ft percentage of sand decreases with depth of sample.
470	-				@ 469.2 ft. Clayey SAND (SC); reddish brown (5YR 4/3); 80% fine sand; 20% clay.	SC ML		
	-				<ul> <li>@ 469.6 ft. SILT with Sand (ML); light brown (7.5YR 6/3); firm; 70% silt; 20% fine sand; subangular; 10% clay.</li> <li>@ 470.6 ft. Silty SAND (SM); reddish brown (5YR 5/4); 85% fine sand; 15% silt.</li> </ul>		Dentanita Carl	
	-						- Bentonite Seal	
475					@ 475 ft. Same as above (470.6 ft).	SM		
	-				@ 477 ft. Same as above (470.6 ft); brown (7.5YR 4/3); 80% fine sand; trace medium sand; subangular; 20% silt.			@ 477 ft end of drilling for 8/17/15. Resume drilling on 8/18/15.
480					@ 478.4 ft. Same as above (470.6 ft); brown (7.5YR 4/3); 70% fine sand; trace medium sand; 30% silt.			

KAFB\_BOREHOLE\_LOG - SHAW\_DRILLING.GDT - 10/19/15 16:36 - Z\KAFB RAPID\GINTIKAFB\_RAPID.GPJ

	Borehole ID: KAFB-106230-Sonic											
Pro Pro	ojec ojec	t Loca Nam	ation ne: k	: Káf (AFB I	<sup>-</sup> B, Albuquerque,  NM	le Diai	neter	Upper (in.): 11-3/4 Lower (in.): 9-5/8 letion Type: Flush				
Da Da	ite S ite T	<b>t Num</b> Started D Re Compl	l: 8/ ache	17/20 <i>′</i> d: 8/1	15 \\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\	At Tii At Er	me of nd of I	evels BGS (ft): Drilling: 456.00 Drilling: Not Recorded ng: 458.67				
Gr Y (	oun Cool	•	vatior e:		L (ft): Not Recorded Dril Dril	llling C lling M	contra ethoc	ctor: National EWP I: Sonic Coring I. Giles	Page 19 of 24			
8 Depth (ft)	Sample Type	Number	Headspace PID	Lithologic Log	Material Description		U.S.C.S.	Well Diagram	Remarks			
480					<ul> <li>@ 480 ft. Silty SAND (SM); brown (7.5YR 4/3); 70% fine sand; trace medium sand; 30% silt.</li> <li>@ 480.6 ft. Same as above (480 ft); reddish brown (5YR 5/4); 85% fine sa 15% silt.</li> <li>@ 482.3 ft. Same as above (480 ft); brown (7.5YR 4/4); 85% fine to medi sand.</li> </ul>		SM		@ 480 to 495 ft, sand is quartz with occasional biotite.			
485	-				<ul> <li>@ 484 ft. Poorly graded SAND with S (SP-SM); brown (7.5YR 5/4); 90% fir sand; 10% silt.</li> <li>@ 490 ft. Same as above (484 ft).</li> <li>@ 491 ft. Same as above (484 ft); tramedium sand.</li> </ul>	ne	SP- SM	- Top of 20/40 Sand - Top of 10/20 Sand	<ul> <li>@ 484 ft Occasional 2" lenses with higher percentages of silt.</li> <li>@ 493.7 ft occasional thin lense of clayey sand; less than 1/4"; very dark greenish grey (GLEY1 3/1 5GY).</li> </ul>			
495												

(	C	RI			Bore	eho	le ID: KAFB-	106230-Sonic
Pr Pr	ojec ojec	ct Loca	ation ne: K	: KÁF (AFB	FB, Albuquerque, NM Hole Dia RAPID SWMU ST-106 and SS-111Surface	ametei	<sup>r</sup> Upper (in.): 11-3/4 <sup>r</sup> Lower (in.): 9-5/8 Iletion Type: Flush	
Da Da	ate S ate T	<b>ct Num</b> Startec TD Rea Comple	1: 8/ ache	17/20 <sup>-</sup> d: 8/ <i>1</i>	Groundv 15 ∑ At T 18/15 ▼ At E	ime of nd of	_evels BGS (ft): f Drilling: 456.00 Drilling: Not Recordeo ng: 458.67	I
Y	Coo	nd Elev ordinate ordinate	e:	n AMS		<b>Nethoo</b>	actor: National EWP d: Sonic Coring 1. Giles	Page 20 of 24
65 Depth (ft)	Sample Type	Number	Headspace PID	Lithologic Log	Material Description	U.S.C.S.	Well Diagram	Remarks
	_				<ul> <li>@ 495 ft. Poorly graded SAND with Silt (SP-SM); brown (7.5YR 5/4); 90% fine sand; trace medium sand; 10% silt.</li> <li>@ 496.6 ft. Same as above (495 ft); 90%</li> </ul>	SP- SM		@ 495 to 510 ft sand is quartz and biotite with occasional microcline and granite.
				<u></u>	fine to medium sand.			
	-				<ul> <li>@ 497 ft. No core recovered.</li> <li>@ 497.5 ft. Poorly graded SAND with Silt (SP-SM); brown (7.5YR 5/4); 90% fine to medium sand; 10% silt.</li> </ul>	SP- SM		
500	_				@ 498.8 ft. Silty GRAVEL with Sand (SM); brown (7.5YR 5/3); 50% fine to coarse gravel to 2"; angular to subrounded; 35% fine to coarse sand; 15% silt.	GM		@ 498.8 to 507 ft gravel is mafics, quartzite, and granite.
	_				@ 500.2 ft. Silty SAND with Gravel (SM); brown (7.5YR 5/3); 70% fine to coarse sand; 15% fine to coarse gravel to 3"; angular to subrounded; 15% silt.		- Top of 5" Schedule 80 PVC 0.010" Screen	
	-				@ 501.9 ft. Same as above (500.2 ft); 15% coarse gravel to 3".	SM		
505	_				@ 504.4 ft. Silty GRAVEL with Sand (GM); brown (7.5YR 5/3); 50% fine to coarse gravel to 3"; subangular to subrounded; 35% fine to coarse sand; 15% silt.	GM		@ 506.5 ft percentage of
	$\left  \right $			rg P	@ 507 ft. No core recovered.			gravel decreases.
	-				@ 507.3 ft. Poorly graded SAND with Silt (SP-SM); brown (7.5YR 4/4); 90% fine to medium sand; subangular; 10% silt; trace fine gravel.	SP- SM		@ 507.3 ft Occasional thin lense of clay less than 1/4".
510								

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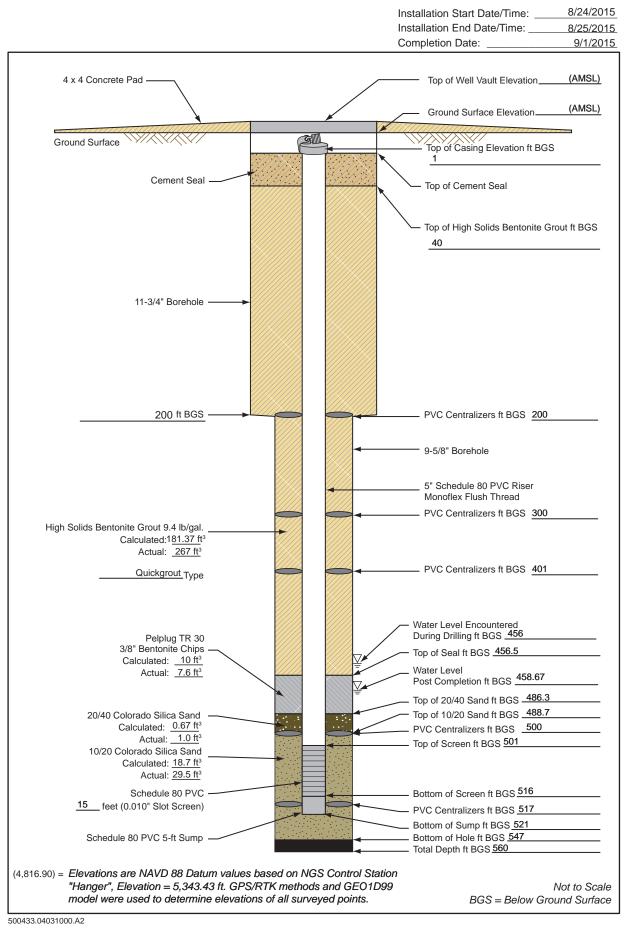
	C	BI			Bore	eho	le ID: KAFB-	106230-Sonic
Pro Pro	ojeci ojeci	t Loca t Nam	tion: e: K	: KAF	FB, Albuquerque, NM Hole Dia RAPID SWMU ST-106 and SS-111Surface	ametei	r Upper (in.): 11-3/4 r Lower (in.): 9-5/8 oletion Type: Flush	
Da Da	ite S ite T	t Num tarted D Rea comple	l: 8/ ache	17/20 <sup>-</sup> d: 8/ <i>1</i>	Groundv 15 ∑ At T 18/15 ₹ At E	ime of	Levels BGS (ft): f Drilling: 456.00 Drilling: Not Recordec ng: 458.67	I
YO	Coor	d Elev dinate rdinate	e:	AMS	L (ft): Not Recorded Drilling	Contra Method	actor: National EWP d: Sonic Coring	Page 21 of 24
0 Depth (ft)	Sample Type	Number	Headspace PID	Lithologic Log	Material Description	U.S.C.S.	Well Diagram	Remarks
					@ 510 ft. Poorly graded SAND with Silt (SP-SM); brown (7.5YR 4/4); 90% fine to medium sand; subangular; 10% silt; trace fine gravel.	SP- SM		<ul> <li>@ 510 to 525 ft sand is quartz with biotite and occasional microcline. @ 510 ft occasional thin lense of clay less than 1/4".</li> </ul>
	_			• • •	@ 511.8 ft. Poorly graded SAND (SP); brown (7.5YR 4/4); 95% medium sand; trace fine and coarse sand; trace fine gravel; 5% silt.	SP		<ul> <li>@ 511.5 ft trace fine to coarse gravel, subrounded.</li> <li>@ 511.8 ft occasional lense of black clay.</li> </ul>
515	_				<ul> <li>@ 513.3 ft. Well-graded SAND (SW);</li> <li>brown (7.5YR 4/4); 95% fine to coarse / sand; subangular to subrounded; 5% şilt.</li> <li>@ 513.7 ft. Poorly graded SAND (SP);</li> <li>brown (7.5YR 4/4); 95% fine to medium</li> </ul>	SW SP		lense of black clay.
	_				sand; trace coarse sand; subangular; 5% silt. @ 515 ft. Well-graded SAND (SW); brown (7.5YR 5/3); 90% fine to coarse sand; subangular to subrounded; 5%	SW	- Bottom of Screen	@ 515 ft gravel is quartz.
	-				fine to gravel to 3/8"; 5% silt. @ 516.6 ft. Clayey GRAVEL with Sand (GC); pink (7.5YR 7/4); 50% coarse gravel to 3"; trace fine gravel; angular to	GC CH GC		@ 516.6 to 525 ft gravel is mafics with occasional granite and conglomerate.
520	-				<ul> <li>subrounded; 30% fine sand; 20% clay.</li> <li>@ 517.3 ft. Fat CLAY (CH); light brown (7.5YR 6/4); firm; high plasticity; 100% clay.</li> <li>@ 517.5 ft. Clayey GRAVEL with Sand (GC); pink (7.5YR 7/4); 60% fine to coarse gravel; angular to rounded; 25% fine to coarse sand; subangular; 15% clay.</li> <li>@ 518 ft. Silty SAND (SM); brown (7.5YR 1/4); 50% for same same same same same same same same</li></ul>	SM	-Bottom of Sump	
525	-				<ul> <li>(7.5YR 4/4); 75% fine sand; 25% silt.</li> <li>@ 518.7 ft. Same as above (518 ft); 85% fine sand; 15% silt.</li> <li>@ 520.8 ft. Silty SAND with Gravel (SM); brown (7.5YR 4/4); 70% fine to coarse sand; 15% coarse gravel to 1"; subrounded; 15% silt.</li> <li>@ 521.8 ft. Well-graded SAND (SW); brown (7.5YR 4/4); 85% fine to coarse sand; subangular; 10% coarse gravel; subangular to subrounded; 5% silt.</li> </ul>	SW		

	C	BI			Во	reho	ole I	D: KAFB-′	106230-Sonic
Pro Pro	ojec ojec	t Loca t Nam	ation: ne: K	KAF AFB I	FB, Albuquerque, NM Hole RAPID SWMU ST-106 and SS-111Surfa	Diamet	erlow	er (in.): 11-3/4 er (in.): 9-5/8 ı Type: Flush	
Da Da	ite S ite T	<b>t Num</b> Startec ID Rea Comple	d: 8/ <sup>,</sup> acheo	17/20 <sup>-</sup> d: 8/ <i>1</i>	Grou 15 ⊈ A 18/15 ▼ A	t Time	of Drilli f Drillir	s BGS (ft): ng: 456.00 g: Not Recorded 58.67	
Y	Coo	d Elev rdinato rdinato	e:	AMS	Drillir	ng Con g Meth ed By:	od: So	National EWP onic Coring es	Page 22 of 24
5 Depth (ft)	Sample Type	Number	Headspace PID	Lithologic Log	Material Description	U.S.C.S.		Well Diagram	Remarks
	_				@ 525 ft. Silty SAND with Gravel (SM) brown (7.5YR 4/4); 70% fine to coarse sand; subangular; 15% fine to coarse gravel; subangular to subrounded; 15%	SN	_		<ul> <li>@ 525 to 540 ft sand is quartz with biotite and occasional microcline.</li> <li>Gravel is mafics.</li> </ul>
					silt. @ 526.1 ft. Lean CLAY (CL); light gray	/ CL / SV	i		
					(10YR 7/2); firm; medium plasticity; 100% clay; trace silt. @ 526.6 ft. Well-graded SAND (SW); brown (7.5YR 4/4); 90% fine to coarse sand; subangular; 5% fine gravel to 3/	SP SN			
	_			· · · · · · ·	and, subangular, 5% inte graver to 5, subangular to subrounded; 5% silt. @ 527 ft. Poorly graded SAND with Sil	SW			
520					(SP-SM); brown (7.5YR 5/3); 90% fine medium sand; trace coarse gravel; 10	to CH	_		
530				· · · · · · · · · · · · · · · · · · ·	silt. @ 528.6 ft. Well-graded SAND with Si (SW-SM); brown (7.5YR 4/4); 85% fine	sv	/		
					to coarse sand; subangular to subrounded; 5% fine gravel to 3/8"; subangular; 10% silt. @ 529.2 ft. Fat CLAY (CH); light brown	CL			
535	-				<ul> <li>(7.5YR 6/4); hard; high plasticity; 100% clay.</li> <li>(2529.8 ft. Well-graded SAND (SW); brown (7.5YR 4/4); 85% fine to coarse sand; subangular to subrounded; 10% fine gravel to 3/4"; subangular to subrounded; 5% silt.</li> <li>(2530.9 ft. Lean CLAY with Sand (CL light brown (7.5YR 6/4); firm; low plasticity; 70% clay; trace silt; 30% fine sand; subangular.</li> <li>(2532 ft. Poorly graded SAND with Sil (SP-SM); brown (7.5YR 4/4); 90% fine medium sand; trace fine gravel; 10% s</li> </ul>	; SP SN to			
540	-				<ul> <li>@ 535 ft. Same as above (532 ft); trac coarse sand.</li> <li>@ 538.9 ft. Silty SAND (SM); brown (7.5YR 4/4); 85% fine to medium sand 15% silt; trace gravel.</li> </ul>	e			

		BI			Bor	eho	le ID:	KAFB-1	06230-Sonic
Pro Pro	ojec ojec	ct Loca ct Nam	ation ie: k	: KÁI (AFB	<sup>-</sup> B, Albuquerque, NM Hole D RAPID SWMU ST-106 and SS-111Surfac	)iamete	r Upper (in r Lower (in pletion Type	. 9_5/8	
Da Da	te S te T	<b>ct Num</b> Started ID Rea Comple	l: 8/ ache	17/20 d: 8/′	Groun 15 ♀ At 18/15 ♀ At	Time o End of	Levels BGS f Drilling: 4 Drilling: N ng: 458.6	456.00 lot Recorded	
Gro Y (	oun Coo	-	vatior e:		L (ft): Not Recorded Drilling	g Contra Metho	actor: Nati d: Sonic C /. Giles	ional EWP	Page 23 of 24
50 Depth (ft)	Sample Type	Number	Headspace PID	Lithologic Log	Material Description	U.S.C.S.	Well	Diagram	Remarks
	_				<ul> <li>@ 540 ft. Silty SAND (SM); brown (7.5YR 4/4); 85% fine to medium sand; 15% silt; trace gravel.</li> <li>@ 540.3 ft. Same as above (540 ft); 80% fine to medium sand; 20% silt.</li> </ul>	∕₀ SM			@ 540 ft sand is quartz and biotite.
545	-				No core recovered from 542 to 560 ft. Overdrill for heaving sand.			Bottom of Filter Pack	End of continuous coring @ 542 ft on 8/18/15.

CBI			Borel	hol	e ID: KAFB-1	06230-Sonic
Project Loca Project Nam	ation: KAI ne: KAFB	os of Engineers FB, Albuquerque, NM RAPID SWMU ST-106 and SS-11	Hole Dian Hole Dian 1Surface C	neter neter Compl	Upper (in.): 11-3/4 Lower (in.): 9-5/8 etion Type: Flush	
Project Num Date Started Date TD Rea Date Complete	d: 8/17/20 ached: 8/′	15 18/15		ne of d of [	evels BGS (ft): Drilling: 456.00 Drilling: Not Recorded Ig: 458.67	
Ground Elev Y Coordinate X Coordinate	e:	SL (ft): Not Recorded	Drillling C Drilling Me Logged B	ethod	ctor: National EWP : Sonic Coring . Giles	Page 24 of 24
55 Depth (ft) Sample Type Number	Headspace PID Lithologic Log			U.S.C.S.	Well Diagram	Remarks
-		No core recovered from 542 to 5 Overdrill for heaving sand.	560 ft.		- Native Backfill	
560				-	-Bottom of Rat Nole	
-						
565						
570						

## Monitoring Well Completion Diagram KAFB-106230





### Well Development Record

Project Nam	ne: KAFB RAI	PID						
Location: G	eorgia and Ar	nderson				Well/Piez. No	<b>.</b> : <u>KAFB-1062</u>	30
Personnel:	R. Wortman					Date Installe	<b>d</b> : <u>9/1/15</u>	
Date: 8/27/1	15					Csg. Diamet	er (I.D.): <u>5 "</u>	
Samplers: 1	N/A					Total Depth	(ft. bgs): <u>521</u>	
	Development							
X Surging			X Bailing			X Pumping		
X Original Develo	opment		Redevelopmen	t		Other		
Developme	nt Date: 8/27	/15						
Depth to Wa	ater Before D	eveloping W	/ell (ft. btoc)	458.67				
Weather: <u>H</u> Equipment	ing From: <u>5</u> ot, Clear Nos.: pH Me Decontamina	ter: <u>YSI 650</u>			Screened Ir	ng Begins: <u>14</u> nterval (ft bgs <u>S</u> Turbi	•	ACH 21000Q
•••	Steam Cleane		•					
Collected S Describe: N	ample of Wa	ter Added to	Well: Y	N X		-		
Comment:								
Date	Time	Water Level (ft bTOC)	Volume Removed (gal.)	Temp. (°C)	pН	EC (mS/cm)	Turbidity (NTU)	Comments
8/27/2015	0859	457.66	15				> 1,000	Begin bailing; water is dark brow
8/27/2015			55					Stop bailing; set up for swabbin
8/27/2015			55					Begin swabbing bottom 5 feet of
5.2.72010	0010							

8/27/2015	0859	457.66	15				> 1,000	Begin bailing; water is dark brown; no odor.
8/27/2015	0914		55				> 1,000	Stop bailing; set up for swabbing.
8/27/2015	0940		55					Begin swabbing bottom 5 feet of screen.
8/27/2015	1000		55					Swab next 5 feet of screen.
8/27/2015	1020		55					Swab top 5 feet of screen.
8/27/2015	1040		55					Finish swabbing; set up bailer.
8/27/2015	1050		55					Resume bailing.
8/27/2015	1135		225				> 1,000	Finish bailing.
8/27/2015	1447	457.57	225					Set pump at 514.5 feet bgs.
8/27/2015	1450	458.20	225	22.32	6.87	0.521	> 1,000	Start pumping from 514.5 feet bgs.

Notes:

Water Levels - Reported to the nearest 0.01 foot pH - Reading rounded to 0.1 pH units Water temperature - Reported to nearest 0.1 °C °C = Degree Celsius EC = Electric Conductivity ft bgs = Feet Below Ground Surface ft btoc = Feet Below Top of Casing gal. = Gallon GPM = Gallons Per Minute I.D. = Inner Diameter N/A = Not Applicable NR = Not Recorded NTU = Nephelometric Turbidity Unit S/m = Seimens per Meter

Where:

B=3.14  $Ø_s$ = porosity of the sand pack

 $D_{a=}$  porosity of the sand pack  $r_c=$  radius of the well casing and screen in feet  $L_c=$  length of water column inside the casing and screen in feet  $r_w=$  radius of the well bore in feet  $L_s=$  length of saturated portion of the sand pack in feet

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

Pg 1 of 3



# Well Development Record

Project: KAFB RAPID	Well No: KAFB-106230
Project Number: 140705	Samplers: N/A
Date: 8/27/15	Checked By:
Time Start: 0 <u>859, 8/27/2015</u>	<b>Time Finish</b> : <u>1830</u> , <u>8/27/2015</u>

Field Chemistr	y (cont'd)							
Date	Time	Water Level (ft. bTOC)	Volume Removed (gal.)	Temp. (°C)	рН	EC (mS/cm)	Turbidity (NTU)	Comments
8/27/2015	1500	458.20	270	21.66	6.78	0.510	184	Continue pumping from 514.5 feet bgs.
8/27/2015	1510	458.19	315	22.15	7.27	0.507	89.4	Continue pumping from 514.5 feet bgs.
8/27/2015	1520	458.19	360	22.06	7.33	0.507	80.5	Continue pumping from 514.5 feet bgs.
8/27/2015	1530	458.20	405	22.17	7.41	0.507	75.3	Continue pumping from 514.5 feet bgs.
8/27/2015	1540	458.20	440	21.91	7.44	0.506	71.1	Continue pumping from 514.5 feet bgs.
8/27/2015	1550	458.20	480	21.71	7.47	0.506	75.2	Continue pumping from 514.5 feet bgs.
8/27/2015	1600	458.18	520	21.57	7.52	0.504	78.1	Continue pumping from 514.5 feet bgs.
8/27/2015	1610	458.18	560	21.49	7.53	0.505	74.0	Continue pumping from 514.5 feet bgs.
8/27/2015	1620	458.18	600	21.50	7.59	0.505	76.9	Continue pumping from 514.5 feet bgs.
8/27/2015	1630	458.18	640	21.42	7.62	0.504	55.4	Continue pumping from 514.5 feet bgs.
8/27/2015	1640	458.17	670	21.58	7.63	0.504	56.1	Continue pumping from 514.5 feet bgs.
8/27/2015	1650	458.20	710	21.57	7.65	0.504	45.8	Move pump up to 501.5 feet bgs.
8/27/2015	1700	458.17	750	21.39	7.65	0.503	6.97	Continue pumping from 501.5 feet bgs.
8/27/2015	1710	458.19	790	21.60	7.68	0.504	6.03	Continue pumping from 501.5 feet bgs.
8/27/2015	1720	458.18	835	21.52	7.67	0.504	3.39	Continue pumping from 501.5 feet bgs.

Was well sampled after development? YES NO X

Sample Method: N/A

Sample Name: N/A

Analyses: N/A

Pg 2 of 3



# Well Development Record

Project: KAFB RAPID	Well No: KAFB-106230
Project Number: 140705	Samplers: N/A
Date: 8/27/15	Checked By:
Time Start: 0859, 8/27/2015	<b>Time Finish</b> : <u>1830</u> , <u>8/27/2015</u>

Tield Chemistr	Time	Water Level (ft. bTOC)	Volume Removed (gal.)	Temp. (°C)	рН	EC (mS/cm)	Turbidity (NTU)	Comments
8/27/2015	1730	458.18	880	21.30	7.68	0.504	1.02	Move pump back down to 514.5 feet bgs.
8/27/2015	1740	458.18	925	21.29	7.70	0.503	0.64	Continue pumping from 514.5 feet bgs.
8/27/2015	1750	458.18	970	21.36	7.71	0.503	1.35	Continue pumping from 514.5 feet bgs.
8/27/2015	1800	458.18	1015	21.32	7.72	0.500	2.21	Move pump to 508.5 feet bgs.
8/27/2015	1810	458.18	1060	21.19	7.70	0.503	1.02	Continue pumping from 508.5 feet bgs.
8/27/2015	1820	458.18	1105	21.16	7.72	0.503	1.02	Continue pumping from 508.5 feet bgs.
8/27/2015	1830	458.18	1150	21.20	7.73	0.504	0.74	Well development complete. Finish pumping.

Was well sampled after development? YES NO X

Sample Method: N/A
Sample Name: N/A
Analyses: N/A

Pg 3 of 3

# KAFB 106231

Projec Projec Projec Date S Date S Date C Grour Y Coc	ct Loc ct Nar ct Nur Starte TD Re Comp	cation me: k mber: ed: 9/ eache oleted: evatior ite:	: KAF (AFB F 5004 2/2015 d: 9/3 9/15/	a of Engineers Hole Dia B, Albuquerque, NM Hole Dia RAPID SWMU ST-106 and SS-111Surface 33 Groundw 5 ⊈ At T /15 ⊈ At E /2015 ⊈ After (ft): Not Recorded Drillling (	imeter Comp vater L ime of nd of I r Drillir Contra Aethod	Uppe Lowe letion Drillin Drilling ng: 46 ctor: I: Air	r (in.): r (in.): Type: BGS g: 46 g: No 51.36 Nation Rotar	11-3/4 9-5/8 Flush (ft):	ATE OF STAN
Sample Type	Number	Headspace	Lithologic Log	Material Description	U.S.C.S.	V	Vell D	iagram	Remarks
0 0 - - 5 - -				A ithologic desciption.	SPHAL FILL	T	Ca	op of asing/Top of ement Seal	Borehole was waterknifed from 0.4' to 10'. No recovery.
<u>10</u> - 1 <u>5</u>				Well-graded SAND with Gravel (SW); light brown (7.5YR 6/3); dry; 80% fine to coarse sand; subangular to rounded; 15% fine gravel; subrounded to rounded; 5% silt. Note: sand is quartz, feldspar, and mafics. Gravel is quartz and mafics. SILT with Sand (ML); strong brown (7.5YR 5/6); dry; 80% silt; 20% fine to medium sand; rounded.	SW		-c	ement Seal	Began drilling @ 1032 on 9/2/15 with 11-3/4" drive casing. No hammering. No water added down hole. Kelly down @ 1036, new 20' connection @ 1042.
20				Same as above (12 ft).					PID = 0.0 ppm @ cyclone and breathing zone.
25				Well-graded SAND with Silt and Gravel (SW-SM); brown (7.5YR 5/4); 70% fine to coarse sand; subangular to rounded; 20% fine gravel; subrounded to rounded; 10% silt. Note: sand is quartz and feldspar. Gravel is quartz and mafics.	SW- SM		•• B	op of High colids Sentonite Grout	No hammering. No water added down hole.

KAFB\_BOREHOLE\_LOG - SHAW\_DRILLING.GDT - 10/21/15 13:52 - Z:\KAFB RAPID\GINT\KAFB\_RAPID.GPJ

		BI				eho	le l	D: KAFB-	106231			
Pro Pro	Client: US Army Corps of Engineers       Hole Diameter Upper (in.): 11-3/4         Project Location: KAFB, Albuquerque, NM       Hole Diameter Lower (in.): 9-5/8         Project Name: KAFB RAPID SWMU ST-106 and SS-111Surface Completion Type: Flush         Project Number: 500433											
Date Started:9/2/2015Groundwater Levels BGS (ft):Date TD Reached:9/3/15✓ At Time of Drilling:460.00Date Completed:9/15/2015✓ At End of Drilling:Not Recorded✓ After Drilling:461.36												
Y	Coo	d Elev rdinat rdinat	e:	n AMS		Metho	d: Ai	National EWP r Rotary Casing H nards	ammer Page 2 of 17			
ଟି Depth (ft)	Sample Type	Number	Headspace PID	Lithologic Log	Material Description	U.S.C.S.		Well Diagram	Remarks			
	_				Well-graded SAND with Silt and Gravel (SW-SM); brown (7.5YR 5/4); 70% fine to coarse sand; subangular to rounded; 20% fine gravel; subrounded to rounded 10% silt. Note: sand is quartz and	;		· · · · · · · · · · · · · · · · · · ·	PID = 0.0 ppm @ cyclone and breathing zone. No hammering.			
35	-				feldspar. Gravel is quartz and mafics. Same as above (30 ft).				No water added down hole.			
40	-				Same as above (30 ft); 20% fine to coarse gravel to 2".	SW- SM	<ul> <li>•</li> /ul>		Kelly down @ 1047, new 20' connection @ 1052. PID = 0.0 ppm @ cyclone and breathing zone.			
45	-				Same as above (30 ft); 20% fine to coarse gravel to 2".			- High Solids Bentonite Grout				
50	-				Same as above (30 ft); 20% fine to coarse gravel to 2".				PID = 0.0 ppm @ cyclone and breathing zone.			
55	-				SILT with Sand (ML); strong brown (7.5YR 4/6); dry; 80% silt; 20% fine to coarse sand; angular to subrounded. Note: sand is quartz and feldspar.	ML			No hammering. No water added down hole.			
60	_								Kelly down @ 1105, new 20' connection @ 1441. Top seal out for repair.			

		BI				Во	oreł	10	le l	D: KAFB-′	106231	
Pro Pro	ojec ojec	t Loca Nam	ation: ne: K	: K (AF	AF B F	B, Albuquerque, NM Hole RAPID SWMU ST-106 and SS-111Surfa	Diam	ete	rlow	er (in.): 11-3/4 er (in.): 9-5/8 1 Type: Flush		
Da Da	Project Number: 500433       Groundwater Levels BGS (ft):         Date Started: 9/2/2015											
Y	Coo	d Elev rdinat rdinat	e:	n AN	/ISI	L (ft): Not Recorded Drillin Drillin	ing Co	ontra	actor: d: Ai	National EWP r Rotary Casing Ha	ammer Page 3 of 17	
g 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); dry; 80% silt; 20% fine to coarse sand; angular to subrounded. Note: sand is quartz and feldspar.			• • • • • • • • • • • • • • • •	•     •       •     •       •     •       •     •       •     •       •     •       •     •       •     •       •     •       •     •       •     •       •     •       •     •	PID = 0.0 ppm @ cyclone and breathing zone.	
65	-					Same as above (60 ft).	r	ИL				
70	-					Same as above (60 ft). Lean CLAY (CL); reddish brown (5YR 5/4); low to medium plasticity; 90% cla					PID = 0.0 ppm @ cyclone and breathing zone.	
75	-					10% fine sand. Same as above (72 ft).		CL		- High Solids Bentonite Grout	No hammering. No water added down hole. Kelly down @ 1446, new	
80	-					Same as above (72 ft).					20' connection @ 1452.	
	-					SILT with Sand (ML); strong brown (7.5YR 5/6); 80% silt; 20% fine sand; trace medium sand; rounded.	1	МL			PID = 0.0 ppm @ cyclone and breathing zone.	
85						Well-graded SAND (SW); reddish yello (7.5YR 6/6); 90% fine to coarse sand; subrounded to rounded; 10% fine grav rounded. Note: sand is quartz and feldspar. Gravel is quartz and mafics.	vel;	SW			No hammering. No water added down hole.	
90									•••			

		BI			Bo	oreł	າວ	le ID	: KAFB-1	06231		
Pro Pro	Client:US Army Corps of EngineersHole Diameter Upper (in.):11-3/4Project Location:KAFB, Albuquerque, NMHole Diameter Lower (in.):9-5/8Project Name:KAFB RAPID SWMU ST-106 and SS-111Surface Completion Type:FlushProject Number:500433Groundwater Levels BGS (ft):											
Da Da	te S te T	Starteo D Rea	1: 9/: ache	2/2018 d: 9/3	5 ∑ /	At Tin At En	ne of d of	f Drilling	: 460.00 Not Recorded			
YC	Coo	d Elev rdinate rdinate	e:	n AMS	L (ft): Not Recorded Drilli Drilli	ling Co	ontra etho	actor: N	lational EWP Rotary Casing Ha	nmmer Page 4 of 17		
ଓ Depth (ft)	Sample Type	Number	Headspace PID	Lithologic Log	Material Description		U.S.C.S.	W	ell Diagram	Remarks		
-	-				Well-graded SAND (SW); reddish yell (7.5YR 6/6); 90% fine to coarse sand; subrounded to rounded; 10% fine grav rounded. Note: sand is quartz and feldspar. Gravel is quartz and mafics.	vel;			•	PID = 0.0 ppm @ cyclone and breathing zone. No hammering.		
95	-				Same as above (90 ft).				•	Kelly down @ 1456, new 20' connection @ 1502.		
<u>100</u>					Same as above (90 ft).		SW		•	PID = 0.0 ppm @ cyclone and breathing zone.		
105					Same as above (90 ft).				- High Solids Bentonite Grout	No hammering. No water added down hole.		
<u>110</u>	-				Same as above (90 ft).				•	PID = 0.0 ppm @ cyclone and breathing zone.		
<u>115</u>					SILT (ML); strong brown (7.5YR 5/8); 90% silt; 10% fine to coarse sand.		ML		- - - - - - - - - - - - - - - - - - -	Kelly down @ 1506, new		
120	-				Description on next page.		SW- SM		•	20' connection @ 1513.		

	Borehole ID: KAFB-106231										
Pro Pro	Client: US Army Corps of Engineers       Hole Diameter Upper (in.): 11-3/4         Project Location: KAFB, Albuquerque, NM       Hole Diameter Lower (in.): 9-5/8         Project Name: KAFB RAPID SWMU ST-106 and SS-111Surface Completion Type: Flush										
Da Da Da	Project Number:       500433       Groundwater Levels BGS (ft):         Date Started:       9/2/2015										
Y	Cool	rdinat rdinat	e:				<b>Nethoo</b>	d: Ai	National EWP Rotary Casing Ha nards	ammer Page 5 of 17	
05 Depth (ft)	Sample Type	Number	Headspace PID	Lithologic	Material Description		U.S.C.S.		Well Diagram	Remarks	
	_				Well-graded SAND with Silt and (SW-SM); strong brown (7.5YR 70% fine to coarse sand; 20% fi gravel; 10% silt.	5/6);	SW- SM	• • • • • • • • • •		PID = 0.0 ppm @ cyclone and breathing zone.	
125	-				Sandy SILT with Gravel (ML); st brown (7.5YR 5/8); 60% silt; trac clay; 20% fine to coarse sand; a rounded; 20% fine to coarse gra rounded. Note: sand is quartz an feldspar. Gravel is quartz and m	ce fat ingular to avel; nd			•       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •	No hammering. No water added down hole.	
130	-				Same as above (123 ft).				•       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •	PID = 0.0 ppm @ cyclone and breathing zone.	
135	-				Same as above (123 ft).		ML	<ul> <li>•</li> <li>•&lt;</li></ul>	- High Solids Bentonite Grout	Kelly down @ 1520, new 20' connection @ 1525.	
140	-				SILT (ML); strong brown (7.5YR 90% silt; 10% fine to medium sa					PID = 0.0 ppm @ cyclone and breathing zone.	
145					Same as above (140 ft).					No Hammering.	
150	-								•       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •	No water added down hole.	

	Borehole ID: KAFB-106231											
Pro Pro	Client:       US Army Corps of Engineers       Hole Diameter Upper (in.):       11-3/4         Project Location:       KAFB, Albuquerque, NM       Hole Diameter Lower (in.):       9-5/8         Project Name:       KAFB RAPID SWMU ST-106 and SS-111Surface Completion Type:       Flush											
Da Da	Project Number: 500433       Groundwater Levels BGS (ft):         Date Started: 9/2/2015											
YO	Cool	d Elev rdinat rdinat	e:	N AN	ISL (ft): Not Recorded	- Drillling Contra	actor: d: Ai	National EWP r Rotary Casing Ha	ammer Page 6 of 17			
05 Depth (ft)	Sample Type	Number	Headspace PID	Lithologic	Material Description	U.S.C.S.		Well Diagram	Remarks			
	-				SILT (ML); strong brown (7.5YR 5/ 90% silt; 10% fine to medium sand	/6); 1.	* * * * * * * *	• • • • • • • • • •	PID = 0.0 ppm @ cyclone and breathing zone. No Hammering.			
155	-				Same as above (150 ft).	ML			No water added down hole.			
<u>160</u>	-				Poorly graded SAND with Silt (SP- brown (7.5YR 4/4); 90% fine sand; medium sand; 10% silt.				Kelly down @ 1536, new 20' connection @ 1541. PID = 0.0 ppm @ cyclone and breathing zone.			
165	-				Well-graded SAND (SW); brown ( 5/4); 90% fine to coarse sand; 5% gravel; rounded; 5% silt.	7.5YR fine SW		- High Solids Bentonite Grout	Hammering. No water added down			
170					Same as above (170 ft).	300			hole. PID = 0.0 ppm @ cyclone and breathing zone.			
175	-				Lean CLAY with Sand (CL); reddis brown (5YR 4/4); medium plasticity clay; 10% fine to coarse sand; 10% gravel.	y; 80%			Hammering.			
180	-				Description on next page.	ML		• •   • •   • •   • •   • •   • •	Kelly down @ 1554, new 20' connection @ 1600.			

(	C	RI			Bor	eho	le II	D: KAFB-′	106231		
Pr Pr	ojec ojec	ct Loc ct Nan	ation ne: k	: K/ (AFE	AFB, Albuquerque, NM Hole D B RAPID SWMU ST-106 and SS-111Surface	iamete	rlowe	er (in.): 11-3/4 er (in.): 9-5/8 Type: Flush			
Da Da	Project Number:       500433       Groundwater Levels BGS (ft):         Date Started:       9/2/2015										
Y	Coo	nd Elev ordinat ordinat	e:	א AM	SL (ft): Not Recorded Drilling Drilling Logged	Metho	d: Air	National EWP Rotary Casing Ha ards	ammer Page 7 of 17		
8 Depth (ft)	Sample Type	Number	Headspace PID	Lithologic	Material Description	U.S.C.S.	N	Vell Diagram	Remarks		
185	_				SILT with Sand (ML); reddish brown (5YR 4/4); 85% silt; 15% fine to medium sand.	ML		• • • • • • • • • • • • • • • • • •	No water added down hole. PID = 0.0 ppm @ cyclone and breathing zone.		
190	-				Poorly graded SAND with Silt (SP-SM); brown (7.5YR 5/4); 90% fine sand; trace medium sand; trace fine gravel; 10% silt			· · · · · · · · · · · · · · · · · · ·	PID = 0.0 ppm @ cyclone and breathing zone.		
195	-				Well-graded SAND (SW); brown (7.5YR 5/3); 100% fine to coarse sand; subangular to rounded. Note: sand is quartz, feldspar, and mafics.			- High Solids Bentonite Grout	Kelly down @ 1608. End		
200	-				Same as above (192 ft).	sw		<pre></pre>	of 9/2/15. Began drilling @ 1000 on 9/3/15 with 9-5/8" drive casing.		
<u>205</u>	-				Same as above (192 ft).			<ul> <li>•</li> <li>•&lt;</li></ul>	No hammering.		
210	-						•••	• • • • • •			

	Borehole ID: KAFB-106231										
Pro Pro	Client: US Army Corps of Engineers       Hole Diameter Upper (in.): 11-3/4         Project Location: KAFB, Albuquerque, NM       Hole Diameter Lower (in.): 9-5/8         Project Name: KAFB RAPID SWMU ST-106 and SS-111Surface Completion Type: Flush										
Da Da	Project Number: 500433       Groundwater Levels BGS (ft):         Date Started: 9/2/2015										
YC	Coor	d Elev dinate	e:	n AMS	L (ft): Not Recorded	Drillling	Contra Method	actor: d: Ai	National EWP	ammer Page 8 of 17	
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 5/3); 100% fine to coarse sand; subangular to rounded. Note: sar quartz, feldspar, and mafics. @ 212 ft. Well-graded SAND with (SW); light brown (7.5YR 6/4); 80 to coarse sand; angular to rounded fine to coarse gravel; subrounded rounded; trace silt. Note: sand is feldspar, and mafics. Gravel is qui mafics, and red feldspar.	nd is h Gravel 0% fine ed; 20% d to quartz,			•       •         •       •	PID = 0.0 ppm @ cyclone and breathing zone. No hammering. No water added down hole. Kelly down @ 1005, new	
220	-				Same as above (212 ft).					20' connection @ 1009. PID = 0.0 ppm @ cyclone and breathing zone.	
225	-				Same as above (212 ft).		sw		- High Solids Bentonite Grout	No hammering. Fast drilling. No water added down hole.	
<u>230</u>	-				Same as above (212 ft).					PID = 0.0 ppm @ cyclone and breathing zone.	
235	-				Same as above (212 ft).				<pre></pre>	Kelly down at 1013, new 20' connection @ 1019.	

KAFB\_BOREHOLE\_LOG - SHAW\_DRILLING.GDT - 10/21/15 13:52 - Z\KAFB RAPID\GINTIKAFB\_RAPID.GPJ

	Borehole ID: KAFB-106231										
Pro	Client: US Army Corps of Engineers       Hole Diameter Upper (in.): 11-3/4         Project Location: KAFB, Albuquerque, NM       Hole Diameter Lower (in.): 9-5/8         Project Name: KAFB RAPID SWMU ST-106 and SS-111Surface Completion Type: Flush										
Pro Da Da Da Gr	Project Number: 500433       Groundwater Levels BGS (ft):         Date Started: 9/2/2015										
		rdinat				Logged				Page 9 of 17	
05 Depth (ft)	Sample Type	Number	Headspace PID	Lithologic Log	Material Description		U.S.C.S.		Well Diagram	Remarks	
245	-				Well-graded SAND with Gravel light brown (7.5YR 6/4); 80% fir coarse sand; angular to rounde fine to coarse gravel; subround rounded; trace silt. Note: sand i feldspar, and mafics. Gravel is mafics, and red feldspar.	ne to d; 20% ed to is quartz,			•       •           •       • <t< td=""><td><ul> <li>PID = 0.0 ppm @ cyclone and breathing zone.</li> <li>No hammering.</li> <li>Fast drilling.</li> <li>No water added down hole.</li> </ul></td></t<>	<ul> <li>PID = 0.0 ppm @ cyclone and breathing zone.</li> <li>No hammering.</li> <li>Fast drilling.</li> <li>No water added down hole.</li> </ul>	
250	-				Same as above (240 ft); gravel	to 2".			<ul> <li>•</li> <li>•&lt;</li></ul>	PID = 0.0 ppm @ cyclone and breathing zone.	
255	-				Same as above (240 ft); gravel	to 2".	sw	<ul> <li>•</li> <li>•&lt;</li></ul>	- High Solids Bentonite Grout	No hammering.	
<u>260</u>					Same as above (240 ft); gravel	to 2".				Kelly down @ 1025, new 20' connection @ 1029. PID = 0.0 ppm @ cyclone and breathing zone.	
265					Same as above (240 ft); gravel	to 2".			•       •         •	Hammering intermittently.	
270								••			

KAFB\_BOREHOLE\_LOG - SHAW\_DRILLING.GDT - 10/21/15 13:52 - Z:\KAFB RAPID\GINT\KAFB\_RAPID.GPJ

	Borehole ID: KAFB-106231											
Pro Pro	Client: US Army Corps of Engineers       Hole Diameter Upper (in.): 11-3/4         Project Location: KAFB, Albuquerque, NM       Hole Diameter Lower (in.): 9-5/8         Project Name: KAFB RAPID SWMU ST-106 and SS-111Surface Completion Type: Flush											
Da Da	Project Number:       500433         Date Started:       9/2/2015         Date TD Reached:       9/3/15         Date Completed:       9/15/2015											
Y	Cooi	d Elev rdinate rdinate	e:	AMS	Drill		ethoo	d: Ai	National EWP Rotary Casing Hanards	ammer Page 10 of 17		
02 Depth (ft)	Sample Type	Number	Headspace PID	Lithologic Log	Material Description		U.S.C.S.		Well Diagram	Remarks		
275	-				Well-graded SAND with Gravel (SW) light brown (7.5YR 6/4); 80% fine to coarse sand; angular to rounded; 20% fine to coarse gravel; subrounded to rounded; trace silt. Note: sand is quar feldspar, and mafics. Gravel is quartz mafics, and red feldspar.	% rtz,	SW			PID = 0.0 ppm @ cyclone and breathing zone. Hammering. No water added down hole.		
280	-				Well-graded SAND with Silt and Grav (SW-SM); light brown (7.5YR 6/4); 70 fine to coarse sand; subrounded to rounded; 20% fine gravel; trace coars gravel; subrounded to rounded; 10% Note: sand is quartz, feldspar, and mafics.	)% se			•       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •	Kelly down @ 1033, new 20' connection @ 1036. PID = 0.0 ppm @ cyclone and breathing zone.		
285	-				Same as above (277 ft).		SW-	• • • • • • • • • • • • • • • • • • • •	- High Solids Bentonite Grout	Hammering.		
290	-				Same as above (277 ft).		SM			PID = 0.0 ppm @ cyclone and breathing zone.		
<u>295</u>					Same as above (277 ft).					Hammering. Kelly down @ 1042, new		
300								· · · · · · · · · · ·		20' connection @ 1042, new		

	Borehole ID: KAFB-106231										
Pro Pro	Client: US Army Corps of Engineers       Hole Diameter Upper (in.): 11-3/4         Project Location: KAFB, Albuquerque, NM       Hole Diameter Lower (in.): 9-5/8         Project Name: KAFB RAPID SWMU ST-106 and SS-111Surface Completion Type: Flush										
Da Da	Project Number: 500433       Groundwater Levels BGS (ft):         Date Started: 9/2/2015										
Y (	Cool	d Elev rdinate rdinate	e:	AMS	L (ft): Not Recorded		Metho	d: Ai	National EWP r Rotary Casing Ha nards	ammer Page 11 of 17	
S Depth (ft)	Sample Type	Number	Headspace PID	Lithologic Log	Material Description		U.S.C.S.		Well Diagram	Remarks	
	-				Well-graded SAND with Silt and (SW-SM); light brown (7.5YR 6/4 fine to coarse sand; subrounded rounded; 20% fine gravel; trace gravel; subrounded to rounded; Note: sand is quartz, feldspar, and	4); 70% l to coarse 10% silt.		• • • • • • • • • • • • • • • •		PID = 0.0 ppm @ cyclone and breathing zone. Hammering.	
305	-				mafics.					No water added down hole.	
310	-				Same as above (300 ft).					PID = 0.0 ppm @ cyclone and breathing zone.	
315	-				Same as above (300 ft).		SW- SM		- High Solids Bentonite Grout	Kelly down @ 1053, new 20' connection @ 1057.	
320					Same as above (300 ft).					PID = 0.0 ppm @ cyclone and breathing zone.	
325	-				Same as above (300 ft).					Steady hammering, stiff drilling. No water added down hole.	
330								•••	• • • • • •		

	Borehole ID: KAFB-106231										
Pro Pro	Client: US Army Corps of Engineers       Hole Diameter Upper (in.): 11-3/4         Project Location: KAFB, Albuquerque, NM       Hole Diameter Lower (in.): 9-5/8         Project Name: KAFB RAPID SWMU ST-106 and SS-111Surface Completion Type: Flush										
Da Da	Project Number: 500433       Groundwater Levels BGS (ft):         Date Started: 9/2/2015										
Gro Y (	oun Coo	-	vation e:		SL (ft): Not Recorded	Drillling	Contra Method	actor: d: Ai	National EWP r Rotary Casing Ha	ammer Page 12 of 17	
60 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 (SW-SM); light brown (7.5YR 6/ fine to coarse sand; subrounded rounded; 40% fine gravel; trace gravel; subrounded to rounded; Note: sand is quartz, feldspar, a mafics.	4); 50% d to coarse 10% silt.			•       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •	PID = 0.0 ppm @ cyclone and breathing zone. Hammering. Stiff and slow drilling. No water added down hole.	
340	-				Same as above (330 ft).				•       •         •	Kelly down @ 1114, new 20' connection @ 1122. PID = 0.0 ppm @ cyclone and breathing zone.	
345	-				Same as above (330 ft).		SW- SM		- High Solids Bentonite Grout	Steady hammering. No water added down	
350	-									hole. PID = 0.0 ppm @ cyclone and breathing zone.	
355					Same as above (330 ft); 70% fir coarse sand; 20% fine to coarse to 2".				•       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •	Kelly down @ 1133, new 20' connection @ 1147.	
360								••• ••• •••	<pre> • • • • • • • • • • • • • • • • • • •</pre>		

	Borehole ID: KAFB-106231										
Pro Pro	Client: US Army Corps of Engineers       Hole Diameter Upper (in.): 11-3/4         Project Location: KAFB, Albuquerque, NM       Hole Diameter Lower (in.): 9-5/8         Project Name: KAFB RAPID SWMU ST-106 and SS-111Surface Completion Type: Flush										
Da Da	Project Number: 500433       Groundwater Levels BGS (ft):         Date Started: 9/2/2015										
Y (	Cool	d Elev rdinate rdinate	e:	n AMS	[		/lethoo	d: Ai	National EWP Rotary Casing Hanards	ammer Page 13 of 17	
g Depth (ft)	Sample Type	Number	Headspace PID	Lithologic Log	Material Description		U.S.C.S.		Well Diagram	Remarks	
	_				Well-graded SAND with Silt and C (SW-SM); light brown (7.5YR 6/4) fine to coarse sand; subrounded t rounded; 20% fine to coarse grave subrounded to rounded; 10% silt. sand is quartz, feldspar, and mafie	; 70% :o el to 2"; Note:				PID = 0.0 ppm @ cyclone and breathing zone.	
365	-				Same as above (360 ft).				•       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •	Hammering steady. Slow drilling.	
370	-				Same as above (360 ft).				•       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •	PID = 0.0 ppm @ cyclone and breathing zone.	
<u>375</u>	-				Same as above (360 ft).		SW- SM		- High Solids Bentonite Grout	hole. Kelly down @ 1158, new	
<u>380</u>	-				Same as above (360 ft).					20' connection @ 1204. PID = 0.0 ppm @ cyclone and breathing zone.	
<u>385</u>	-				Same as above (360 ft).					Hammering. Slow drilling.	
390								• • • • • • • •	<ul> <li>•</li> <li>•&lt;</li></ul>	No water added down hole.	

	Borehole ID: KAFB-106231										
Pr Pr	oject oject	t Loca t Nam	ation: ie: K	: KÁI (AFB	s of Engineers FB, Albuquerque, NM RAPID SWMU ST-106 and SS-11	Hole Dia	meter		er (in.): 11-3/4 er (in.): 9-5/8 n Type: Flush		
Da Da	Project Number:       500433       Groundwater Levels BGS (ft):         Date Started:       9/2/2015       ☑ At Time of Drilling:       460.00         Date TD Reached:       9/3/15       ☑ At End of Drilling:       Not Recorded         Date Completed:       9/15/2015       ☑ After Drilling:       461.36										
Y	Coor	d Elev dinate dinate	e:	I AMS	SL (ft): Not Recorded		<b>Netho</b>	iA :b	National EWP r Rotary Casing Ha nards	ammer Page 14 of 17	
06 Depth (ft)	Sample Type	Number	Headspace PID	Lithologic Log	Material Description		U.S.C.S.		Well Diagram	Remarks	
	-				Well-graded SAND with Silt and (SW-SM); light brown (7.5YR 6/4 fine to coarse sand; subrounded rounded; 20% fine to coarse gra- subrounded to rounded; 10% silt sand is quartz, feldspar, and mat	4); 70% to vel to 2"; t. Note:		• • • • • • • • • • • • • • • •	- High Solids Bentonite Grout	PID = 0.0 ppm @ cyclone and breathing zone. Hammering.	
395					Same as above (390 ft).					No water added down hole. Kelly down @ 1220, new 20' connection @ 1314.	
400	-				Same as above (390 ft).					PID = 0.0 ppm @ cyclone and breathing zone.	
405	-				Same as above (390 ft).		SW- SM	••	• • Bentonite Ship Seal		
410	-				Same as above (390 ft).				- 3/8" Bentonite Chip Seal	PID = 0.0 ppm @ cyclone and breathing zone.	
415					Same as above (390 ft).					Kelly down @ 1329, new 20' connection @ 1334.	
420											

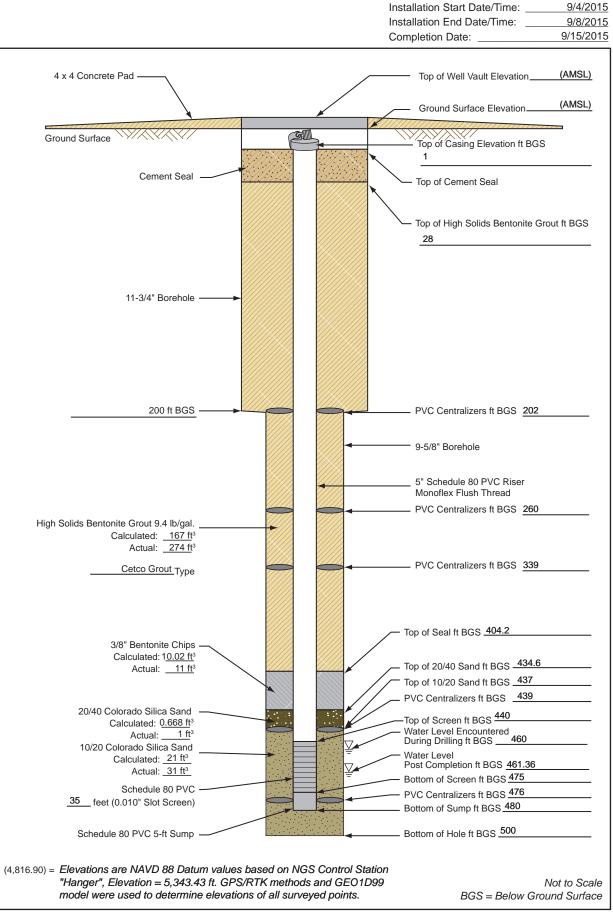
	Borehole ID: KAFB-106231										
Pro Pro	Client: US Army Corps of Engineers       Hole Diameter Upper (in.): 11-3/4         Project Location: KAFB, Albuquerque, NM       Hole Diameter Lower (in.): 9-5/8         Project Name: KAFB RAPID SWMU ST-106 and SS-111Surface Completion Type: Flush         Project Number: 500433										
Da Da	ate S ate T	Starteo D Rea	l: 9/2 acheo	2/2018 d: 9/3	5 ∑ At 2/15 ¥ At	Time o End of	Levels BGS (ft): f Drilling: 460.00 Drilling: Not Recorded ing: 461.36				
Y	Cool	d Elev rdinate rdinate	e:	AMS	L (ft): Not Recorded Drilling Drilling	Contra Metho	actor: National EWP d: Air Rotary Casing Ha	ammer Page 15 of 17			
05 Depth (ft)	Sample Type	Number	Headspace PID	Lithologic Log	Material Description	U.S.C.S.	Well Diagram	Remarks			
425	_				Well-graded SAND with Silt and Gravel (SW-SM); light brown (7.5YR 6/4); 70% fine to coarse sand; subrounded to rounded; 20% fine to coarse gravel to 2' subrounded to rounded; 10% silt. Note: sand is quartz, feldspar, and mafics.	,		PID = 0.0 ppm @ cyclone and breathing zone.			
430	_				Same as above (420 ft).	SW- SM	- 3/8" Bentonite Chip Seal	Hammering. Slow drilling.			
435	-				Same as above (420 ft).		- Top of 20/40 Sand	PID = 0.0 ppm @ cyclone and breathing zone. No water added down hole.			
	-				Poorly graded SAND with Silt (SP-SM); reddish brown (5YR 5/4); 90% fine sand trace medium sand; 10% silt.	;	- Top of 10/20 Sand	Kelly down @ 1347, new 20' connection @ 1350.			
440	-				Same as above (436 ft).	SP- SM	- Top of 5" Schedule 80 PVC 0.010" Slot Screen	PID = 0.0 ppm @ cyclone and breathing zone.			
<u>445</u> 450	-				Well-graded SAND (SW); light brown (7.5YR 6/4); 95% fine to coarse sand; rounded; trace fine gravel; 5% silt.	sw		Hammering.			

Borehole ID: KAFB-106231											
Proj Proj	Client: US Army Corps of Engineers       Hole Diameter Upper (in.): 11-3/4         Project Location: KAFB, Albuquerque, NM       Hole Diameter Lower (in.): 9-5/8         Project Name: KAFB RAPID SWMU ST-106 and SS-111Surface Completion Type: Flush										
Date Date	Project Number:       500433         Date Started:       9/2/2015         Date TD Reached:       9/3/15         Date Completed:       9/15/2015										
YC	und Elev oordinat oordinat	e:	AMS	Drilling	Metho	ractor: National EWP od: Air Rotary Casing H T. Richards	ammer Page 16 of 17				
05 Depth (ft)	Sample Type Number	Headspace PID	Log	Material Description	U.S.C.S.	Well Diagram	Remarks				
_			· · · · · · · · · · · · · · · · · · ·	Well-graded SAND (SW); light brown (7.5YR 6/4); moist; 85% fine to coarse sand; rounded; 10% fine to coarse gravel; 5% silt. Note: gravel is predominantly mafics.			PID = 0.0 ppm @ cyclone and breathing zone.				
455				Same as above (450 ft).			Hammering. No water added down hole.				
- - - - - - - -				$rac{\nabla}{2}$ Same as above (450 ft); wet; 90% fine t ${f v}$ coarse sand; no silt.	D		Kelly down @ 1405, new 20' connectin @ 1413. PID = 0.1 ppm @ cyclone and 0.0 @ breathing zone. Depth to groundwater measured @ 460 feet				
<u>465</u> - -				Same as above (450 ft); wet; 90% fine t coarse sand; no silt.	sw		bgs.				
470				Same as above (450 ft); wet; 90% fine t coarse sand; no silt.	D		PID = 0.2 ppm @ cyclone and 0.0 @ breathing zone.				
475				Same as above (450 ft); wet; 90% fine t coarse sand; no silt.	D	- Bottom of Screen	Hammering. Slow drilling. No water added down hole. Kelly down @ 1432, new 20' connection.				

Client: US Army Corps of Engineers Borehole ID: KAFB-106231 Hole Diameter Upper (in.): 11-3/4									
Project Location:       KAFB, Albuquerque, NM       Hole Diameter Lower (in.): 9-5/8         Project Name:       KAFB RAPID SWMU ST-106 and SS-111Surface Completion Type: Flush         Project Number:       500433       Groundwater Levels BGS (ft):         Date Started:       9/2/2015       ☑ At Time of Drilling: 460.00         Date TD Reached:       9/3/15       ☑ At End of Drilling: Not Recorded									
Date Completed: 9/15/2015       Image: Act End of Drining: Not Recorded         Ground Elevation AMSL (ft): Not Recorded       Image: Act End of Drining: Act Recorded         Y Coordinate:       Drilling Contractor: National EWP         X Coordinate:       Drilling Method: Air Rotary Casing Hammer         X Coordinate:       Logged By: T. Richards									
	ample Type			Lithologic Log	Material Description	n.S.C.S.	Well Diagram		Remarks
	-				Well-graded SAND (SW); light brown (7.5YR 6/4); wet; 90% fine to coarse sand; 10% fine to coarse gravel. Note: gravel is predominantly mafics.	SW		`Bottom of Sump	PID = 0.1 ppm @ cyclone and 0.0 @ breathing zone.
<u>485</u>	-				Poorly graded SAND (SP); brown (7.5YR 4/4); wet; 95% fine sand; trace medium sand; 5% fine to coarse gravel subrounded to rounded.	;			
490	_				Same as above (483 ft).	SP			PID = 0.1 ppm @ cyclone and 0.0 @ breathing zone.
<u>495</u> 500	-				Same as above (483 ft).				
505	-			<u></u>				Bottom of Kilter Pack	Total depth = 500 ft. Reached total depth @ 1503 on 9/3/15.
510	-								

KAFB\_BOREHOLE\_LOG - SHAW\_DRILLING.GDT - 10/21/15 13:52 - Z\KAFB RAPID\GINTIKAFB\_RAPID.GPJ

### Monitoring Well Completion Diagram KAFB-106231



500433.04031000.A3



### Well Development Record

Project Name: KAFB RAPID		
Location: Kathryn and Indiana		Well/Piez. No.: KAFB-106231
Personnel: T. Richards		Date Installed: 9/15/15
Date: 9/9/15		Csg. Diameter (I.D.): 5 "
Samplers: N/A		Total Depth (ft. bgs): <u>480</u>
Method of Development: X Surging	X Bailing	X Pumping
X Original Development	Redevelopment	Other
Development Date: <u>9/9/2015 - 9/10/</u> Depth to Water Before Developing V V=(B * $r_c^2$ * $L_c$ * 7.48)+(B * $(r_w^2 - r_c^2)$ *	Well (ft. btoc): ·	461.36 •(H <sub>2</sub> O added during drilling/installation) =467 gallons
Depth Purging From: 472.8 feet	_	Time Purging Begins: <u>1007, 9/10/2015</u>
Weather: Clear, Cool, Breezy	_	Screened Interval (ft bgs): 440 - 475
Equipment Nos.: pH Meter: YSI 65	0 MDS	EC Meter: YSI 650 MDS Turbidity Meter: HACH 21000Q
Equipment Decontaminated Prior to Describe: <u>Steam Cleaned</u> Collected Sample of Water Added to Describe: N/A	•	

Comment:

		Water Level (ft	Volume Removed				Turbidity	
Date	Time	bTOC)	(gal.)	Temp. (°C)	рН	EC (mS/cm)		Comments
9/9/2015	0802	461.36						Collect initial water level reading.
9/9/2015	0822						> 1,000	Begin bailing.
9/9/2015	0852		55				> 1,000	Stop bailing. Set up swab.
9/9/2015	0909		55					Begin swabbing bottom 5 feet of screen.
9/9/2015	0929		55					Swab next 5 feet of screen.
9/9/2015	0953		55					Swab top 5 feet of screen.
9/9/2015	1015		55					Swab entire 15 foot screen.
9/9/2015	1020		55					Finish swabbing.
9/9/2015	1025		55					Begin bailing.
9/9/2015	1055		150				> 1,000	Finish bailing. Start setting up pump.

Notes:

Water Levels - Reported to the nearest 0.01 foot pH - Reading rounded to 0.1 pH units Water temperature - Reported to nearest 0.1 °C °C = Degree Celsius EC = Electric Conductivity ft bgs = Feet Below Ground Surface ft btoc = Feet Below Top of Casing gal. = Gallon GPM = Gallons Per Minute I.D. = Inner Diameter N/A = Not Applicable NR = Not Recorded NTU = Nephelometric Turbidity Unit S/m = Seimens per Meter

Where: B=3.14

 $Ø_s$ = porosity of the sand pack

 $D_{a=}$  porosity of the sand pack  $r_c=$  radius of the well casing and screen in feet  $L_c=$  length of water column inside the casing and screen in feet  $r_w=$  radius of the well bore in feet  $L_s=$  length of saturated portion of the sand pack in feet

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

Pg 1 of 2



## Well Development Record

Project: KAFB RAPID	Well No: KAFB-106231
Project Number: 140705	Samplers: N/A
Date: 9/9/15 - 9/10/15	Checked By:
Time Start: 0802, 9/9/2015	Time Finish: <u>1146, 9/10/2015</u>
Field Chemistry (cont'd)	

		Water Level (ft.	Volume Removed				Turbidity	
Date	Time	bTOC)	(gal.)	Temp. (°C)	рН	EC (mS/cm)	(NTU)	Comments
9/9/2015	1335		150					Pump set at 472.8 feet bgs.
9/10/2015	0835		150					Begin installing sounding tube.
9/10/2015	0950		150					Finish placing sounding tube.
9/10/2015	1005	461.45	150					Sound well.
9/10/2015	1007	461.45	150					Begin Pumping at 472.8 feet bgs at 4.5 gpm.
9/10/2015	1015	462.40	175	20.40	6.41	1.052	5.66	Continue pumping from 472.8 feet bgs.
9/10/2015	1025	462.42	220	20.40	6.45	1.052	5.49	Continue pumping from 472.8 feet bgs.
9/10/2015	1035	462.42	265	20.43	6.73	1.065	4.42	Continue pumping from 472.8 feet bgs.
9/10/2015	1045	462.43	310	20.49	6.82	1.194	12.70	Move pump up to 468.8 feet bgs.
9/10/2015	1055	462.39	355	20.58	6.94	1.090	1.44	Continue pumping from 468.8 feet bgs.
9/10/2015	1105	462.41	400	20.68	6.98	1.102	2.02	Move pump up to 464.8 feet bgs.
9/10/2015	1115	462.41	445	20.72	6.99	1.112	0.92	Continue pumping from 464.8 feet bgs.
9/10/2015	1125	462.41	490	20.67	6.96	1.120	4.55	Move pump down to 468.8 feet bgs.
9/10/2015	1135	462.42	535	20.65	6.95	1.130	2.49	Continue pumping from 468.8 feet bgs.
9/10/2015	1145	462.43	580	20.65	6.95	1.130	0.85	Continue pumping from 468.8 feet bgs.
9/10/2015	1146							Well development complete. Turn off pump.

Was well sampled after development? YES NO X

Sample Method: N/A

Sample Name: N/A

Analyses: N/A

Pg 2 of 2

# KAFB 106232

Proj Proj	ect	t Loc t Nan	ation	y Corp : KA (AFB 5004	os of Engineers Hole Di FB, Albuquerque, NM Hole Di RAPID SWMU ST-106 and SS-111Surface	iamete iamete e Com	er Upp er Lov pletio	ber (ir ver (ir n Typ		VIRGINIA VIRGINIA BRACHT
Date Date Grou Y Co	e Ti e C unc	D Re comp d Ele dina	eache leted: vatior te:		15     ☑ At       28/15     ☑ At       5/2015     ☑ After       SL (ft): Not Recorded     Drillling	Time c End of er Drill Contr	of Drill Drilling: actor	ling: ng: 1 460.9 : Na	458.07 Not Recorded	ammer 10(21)
1	Sample Type 0	Number	Headspace PID	Lithologic Log	Logged Material Description			hards		Remarks
				****	A No lithologic desciption.	FILL	T		Top of Casing/Top of Cement Seal	Borehole was waterknifed from 0.4' to 10.3'. No recovery.
5										Began drilling @ 1420 with 11-3/4" drive casing on 8/27/15.
5					Well-graded SAND with Silt (SW-SM); strong brown (7.5YR 4/6); slightly moist; 90% fine to coarse sand; angular to rounded; 10% silt. Note: sand is quartz and mafics. Same as above (10 ft).				Cement Seal	
0					Same as above (10 ft).	SW- SM				Kelly down @ 1429, new 20' connection @ 1435. PID = 0.0 @ cyclone and
25					Same as above (10 ft).					breathing zone. No hammering. No water added.
30					Description on next page.	sw				

KAFB\_BOREHOLE\_LOG - SHAW\_DRILLING.GDT - 10/21/15 15:19 - Z: KAFB RAPID/GINT/KAFB\_RAPID.GPJ

	2	BI	N		Во	ret	10	le I	D: Kafb-	106232
Pro Pro	ojec ojec	t Loc Nan	ation: ne: K/	KÁF AFB I	B, Albuquerque, NM Hole RAPID SWMU ST-106 and SS-111Surfa	Diam	ete	rlow	er (in.): 11-3/4 er (in.): 9-5/8 ı Type: Flush	
Da Da Da	ite S ite T ite C	Starte ID Re Compl	n <b>ber:</b> d: 8/2 ached eted: vation	27/20 <i>′</i> I: 8/2 9/15	15 ⊈ A 28/15 ¥ A /2015 ¥ A	at Tim at Enc after D	e o l of Drilli	f Drilli Drillin ng: 4	s BGS (ft): ng: 458.07 ig: Not Recorde 60.90 National EWP	d
		rdinat			Drillin				r Rotary Casing H hards	lammer Page 2 of 19
ର Depth (ft)	Sample Type	Number	Headspace PID	Lithologic Log	Material Description		U.S.C.S.		Well Diagram	Remarks
-	_		0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0		Well-graded SAND with Gravel (SW); light brown (7.5YR 6/3); 80% fine to coarse sand; angular to subrounded; 20% fine to coarse gravel. Note: sand i quartz and mafics, gravel is quartz,				- Top of High	PID = 0.0 @ cyclone and breathing zone. No hammering.
35	-		0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0		feldspar, and mafics.		SW		<ul> <li>Solids</li> <li>Bentonite</li> <li>Grout</li> </ul>	No water added.
40	-		0 8 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0		Well-graded SAND with Silt (SW-SM); light brown (7.5YR 6/4); 80% fine to coarse sand; angular to rounded; 10% fine gravel; angular to rounded; 10% si Note: sand and gravel are quartz and mafics.					Kelly down @ 1447, new 20' connection @ 1457. PID = 0.0 @ cyclone and
	-							•     •       •     •       •     •       •     •       •     •       •     •       •     •       •     •       •     •       •     •       •     •       •     •       •     •       •     •       •     •       •     •       •     •		breathing zone. No hammering. Fast drilling.
45			0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0		Same as above (37 ft).		W- SM	• • • • • • • • • • • •	- High Solids Bentonite Grout	No water added.
50					Same as above (37 ft).					PID = 0.0 @ cyclone and breathing zone.
55					Same as above (37 ft).					Kelly down @ 1458, new
60	-				Description on next page.	(	CL		• • • • • •	20' connection @ 1504.

	Borehole ID: KAFB-106232									
Pro Pro	Client: US Army Corps of Engineers       Hole Diameter Upper (in.): 11-3/4         Project Location: KAFB, Albuquerque, NM       Hole Diameter Lower (in.): 9-5/8         Project Name: KAFB RAPID SWMU ST-106 and SS-111Surface Completion Type: Flush									
Da Da	Project Number: 500433       Groundwater Levels BGS (ft):         Date Started: 8/27/2015									
YO	Cool	d Elev rdinat rdinat	e:	ו AMS		Drillling ( Drilling N Logged E	1ethoo	d: Air	National EWP Rotary Casing Ha ards	ammer Page 3 of 19
g Depth (ft)	Sample Type	Number	Headspace PID	Lithologic Log	Material Description		U.S.C.S.	1	Vell Diagram	Remarks
-	_				Lean CLAY (CL); yellowish red (5 4/6); moist; non plastic to low plas 100% clay; trace silt; trace sand.			<ul> <li></li></ul>	· · · · · · · · · · ·	PID = 0.0 @ cyclone and breathing zone.
65	-				Same as above (60 ft).					No hammering.
70	-				Same as above (60 ft).		CL		· · · · · · · · · · · · · · · · ·	No water added. PID = 0.0 @ cyclone and breathing zone.
75	-				Same as above (60 ft).			<ul> <li>•</li> <li>•&lt;</li></ul>	- High Solids Bentonite Grout	Kelly down @ 1509, new 20' connection @ 1513.
80	-				Same as above (60 ft).				· · · · · · · · · · · · · · · · · · ·	PID = 0.0 @ cyclone and breathing zone.
85					Silty SAND (SM); strong brown (7 5/6); slightly moist; 80% fine to co sand; subrounded to rounded; 20	oarse	SM	•       • <t< td=""><td><ul> <li>•</li> <li>•&lt;</li></ul></td><td></td></t<>	<ul> <li>•</li> <li>•&lt;</li></ul>	

	Borehole ID: KAFB-106232									
Pro Pro	Client: US Army Corps of Engineers       Hole Diameter Upper (in.): 11-3/4         Project Location: KAFB, Albuquerque, NM       Hole Diameter Lower (in.): 9-5/8         Project Name: KAFB RAPID SWMU ST-106 and SS-111Surface Completion Type: Flush									
Da Da Da	Project Number: 500433       Groundwater Levels BGS (ft):         Date Started: 8/27/2015									
Y	Coo	d Elev ordinat ordinat	e:	I AMS	L (ft): Not Recorded		Metho	d: Air	National EWP Rotary Casing Ha ards	ammer Page 4 of 19
g Depth (ft)	Sample Type	Number	Headspace PID	Lithologic Log	Material Description		U.S.C.S.	,	Well Diagram	Remarks
					Silty SAND (SM); strong brown ( 5/6); slightly moist; 80% fine to co sand; subrounded to rounded; 20	oarse		· · · · · · · · · · ·	•     •       •     •       •     •       •     •       •     •       •     •       •     •       •     •	PID = 0.0 @ cyclone and breathing zone.
95	-				Same as above (90 ft).				• • • • • • • • • • • • • •	No hammering. No water added down hole.
100	-				Same as above (90 ft).		SM		•       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •	Kelly down @ 1520, new 20' connection @ 1526. PID = 0.0 @ cyclone and breathing zone.
105	-				Same as above (90 ft).				<ul> <li>High Solids</li> <li>Bentonite</li> <li>Grout</li> </ul>	Fast drilling.
110	-				Same as above (90 ft).				<ul> <li>•</li> <li>•&lt;</li></ul>	PID = 0.0 @ cyclone and breathing zone.
115				<u>···</u> <u>··</u> <u>··</u> <u>··</u> <u>··</u> <u>··</u> <u>··</u> <u>··</u>	SILT (ML); strong brown (7.5YR moist; 90% silt; 10% medium to o sand; trace fine gravel.	4/6); coarse	ML		•       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •	Kelly down @ 1530, new 20' connection @ 1538.
120								•••	• • • • • •	

	Borehole ID: KAFB-106232										
Pro Pro	Client:       US Army Corps of Engineers       Hole Diameter Upper (in.):       11-3/4         Project Location:       KAFB, Albuquerque, NM       Hole Diameter Lower (in.):       9-5/8         Project Name:       KAFB RAPID SWMU ST-106 and SS-111Surface Completion Type:       Flush         Project Number:       500433										
Da Da	Project Number: 500433       Groundwater Levels BGS (ft):         Date Started: 8/27/2015										
Ground Elevation AMSL (ft): Not Recorded Y Coordinate: Drilling Contractor: National EWP Drilling Method: Air Rotary Casing Hammer										ammer Page 5 of 19	
05 Depth (ft)	Sample Type	Number	Headspace PID	Lithologic Log	Material Description		U.S.C.S.		Well Diagram	Remarks	
	_				SILT (ML); strong brown (7.5YF moist; 90% silt; 10% medium to sand; trace fine gravel.			· · · · · · · · · · ·	· · · · · · · · · · · · · · · · · · ·	PID = 0.0 @ cyclone and breathing zone.	
125	-				Same as above (120 ft).					Some hammering. No water added.	
130	-				Same as above (120 ft). Same as above (120 ft); 95% si fine sand.	ilt; 5%	ML	<ul> <li>•</li> <li>•&lt;</li></ul>		PID = 0.0 ppm @ cyclone and breathing zone.	
135					Same as above (120 ft); 95% si fine sand.	llt; 5%			- High Solids Bentonite Grout	Kelly down @ 1547, new 20' connection @ 1551. PID = 0.0 ppm @ cyclone and breathing zone.	
145	-				Poorly graded SAND with Grave strong brown (7.5YR 5/8); 80% sand; 20% fine gravel; angular rounded; trace silt.	fine	SP			Hammering intermittenly. No water added.	
150								••• ••• •••	• •   • •   • •   • •		

	Borehole ID: KAFB-106232									
Pro Pro	ojec ojec	t Loca t Nam	ation ne: k	: KÁI (AFB	FB, Albuquerque, NM RAPID SWMU ST-106 and SS-111S	Iole Dia	meter		er (in.): 11-3/4 er (in.): 9-5/8 1 Type: Flush	
Project Number: 500433       Groundwater Levels BGS (ft):         Date Started: 8/27/2015										
Y (	Cool	rdinate rdinate	e:		D		lethoo	d: Ai	r Rotary Casing Ha	ammer Page 6 of 19
05 Depth (ft)	Sample Type	Number	Headspace PID	Lithologic Log	Material Description		U.S.C.S.		Well Diagram	Remarks
	_				Poorly graded SAND with Gravel ( strong brown (7.5YR 5/8); 80% fine sand; 20% fine gravel; angular to rounded; trace silt.			• • • • • • • • • • • •		PID = 0.0 ppm @ cyclone and breathing zone. Steady hammering.
155	-				Same as above (150 ft).		SP			No water added.
160							01	· · · · · · · · · · · · ·	•       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •	Kelly down @ 1604, new 15' connection @ 1608.
	_				Same as above (150 ft). Lean CLAY with Sand (CL); reddis	h			•     •       •     •       •     •       •     •       •     •       •     •       •     •       •     •	PID = 0.0 ppm @ cyclone and breathing zone.
165					brown (5YR 5/4); low to medium plasticity; 80% clay; 20% fine to me sand.	edium		· · · · · · · · · · · · · · · · · · ·	- High Solids Bentonite Grout	Steady hammering. No water added.
170					Same as above (163 ft).		CL			PID = 0.2 ppm @ cyclone and 0.0 ppm @ breathing zone. Kelly down @ 1619, new 20' connection @ 1623.
175					Poorly graded SAND (SP); brown (7.5YR 5/4); 95% fine sand; trace f gravel; 5% silt.	fine	SP	· · · · · · · · · · · · · · · · · · ·		Steady hammering.
180								••• ••• •••	•       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •	No water added.

(	Borehole ID: KAFB-106232										
Pro	Client: US Army Corps of Engineers       Hole Diameter Upper (in.): 11-3/4         Project Location: KAFB, Albuquerque, NM       Hole Diameter Lower (in.): 9-5/8         Project Name: KAFB RAPID SWMU ST-106 and SS-111Surface Completion Type: Flush										
Da Da Da	Project Number:       500433       Groundwater Levels BGS (ft):         Date Started:       8/27/2015										
Y	Ground Elevation AMSL (ft):Not RecordedDrilling Contractor:National EWPY Coordinate:Drilling Method:Air Rotary Casing HammerX Coordinate:Logged By:T. RichardsPage 7 of 19										
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 5/4); 95% fine sand; trace fine gravel; 5% silt.	SP	· · · · · · · · · · · · · · · · · · ·	• • • • • •	PID = 0.0 ppm @ cyclone and breathing zone.		
185	-				Well-graded SAND with Gravel (SW); brown (7.5YR 4/4); 80% fine to coarse sand; angular to rounded; 20% fine to coarse gravel; subrounded to rounded. Note: Sand is quartz, feldspar, and			· · · · · · · · · · · · · · · · · · ·	Steady hammering.		
<u>190</u>					mafics. Gravel is mafics and quartz. Same as above (182 ft).			<ul> <li></li> /ul>	PID = 0.0 ppm @ cyclone and breathing zone.		
<u>195</u>	-				Same as above (182 ft).	sw		<ul> <li>High Solids</li> <li>Bentonite</li> <li>Grout</li> </ul>	Kelly down @ 1629. Add 5' connection @ 1633.		
200	-				Same as above (182 ft).			<ul> <li>•</li> <li>•&lt;</li></ul>	PID = 0.0 ppm @ cyclone and breathing zone. Stop drilling @ 1629 on 8/27/15. Reached total depth with 11-3/4" casing. Resumed drilling with 9-5/8" casing @ 0815 on 8/28/15.		
205	-				Same as above (182 ft).			<pre>&gt; * * * * * * * * * * * * * * * * * * *</pre>	No Hammering and no water added.		

	Borehole ID: KAFB-106232										
Pro Pro	ojec ojec	t Loca t Nam	ation: ne: K	KÁF AFB I	s of Engineers B, Albuquerque, NM RAPID SWMU ST-106 and SS-11	Hole Dia	ameter		er (in.): 11-3/4 er (in.): 9-5/8 n Type: Flush		
Da Da Da Gr	Project Number:       500433       Groundwater Levels BGS (ft):         Date Started:       8/27/2015       ☑ At Time of Drilling:       458.07         Date TD Reached:       8/28/15       ☑ At End of Drilling:       Not Recorded         Date Completed:       9/15/2015       ☑ After Drilling:       460.90         Ground Elevation AMSL (ft):       Not Recorded       Drilling Contractor:       National EWP										
		rdinat rdinat				Drilling I Logged			r Rotary Casing Ha nards	ammer Page 8 of 19	
0 Depth (ft)	Sample Type	Number	Headspace PID	Lithologic Log	Material Description		U.S.C.S.		Well Diagram	Remarks	
215	-				Well-graded SAND with Gravel brown (7.5YR 4/4); 80% fine to sand; angular to rounded; 20% coarse gravel; subrounded to ro Note: Sand is quartz, feldspar, a mafics. Gravel is mafics and qua	coarse fine to punded. and		• • • • • • • • • • • • • • • • • •		PID = 0.0 ppm @ cyclone and breathing zone. No hammering, fast drilling.	
220	-				Same as above (210 ft).					Kelly down @ 0821, new 20' connection @ 0826.	
225	-				Same as above (210 ft). Same as above (210 ft).		sw	<ul> <li>•</li> <li>•&lt;</li></ul>	- High Solids Bentonite Grout	PID = 0.0 ppm @ cyclone and breathing zone.	
230	-				Same as above (210 ft); 20% fir coarse gravel to 2".	ne to		<ul> <li>•</li> <li>•&lt;</li></ul>		No hammering; no water added. PID = 0.0 ppm @ cyclone and breathing zone.	
235	-				Same as above (210 ft); 20% fir coarse gravel to 2".	ne to				Kelly down @ 0837, new 20' connection @ 0842.	
240								• • • • • •			

	C	BI	)			Bore	eho	le l	D: KAFB-′	106232
Pro Pro	ojec ojec	t Loca t Nam	ation ne: k	: KÁF (AFB I	s of Engineers FB, Albuquerque, NM RAPID SWMU ST-106 and SS-1	Hole Di	ametei	r I ow	er (in.): 11-3/4 /er (in.): 9-5/8 n Type: Flush	
Da Da Da Gre	te S te T te C oun	Starteo D Re Compl	d: 8/ ache eted: /atior		15		Time of End of er Drilli Contra	f Drill Drillir ng: 4 actor:	National EWP	
		rdinat		1		Logged			r Rotary Casing Hands	Page 9 of 19
5 Depth (ft)	Sample Type	Number	Headspace PID	Lithologic Log	Material Description		U.S.C.S.		Well Diagram	Remarks
245	-				Well-graded SAND with Gravel brown (7.5YR 4/4); 80% fine to sand; angular to rounded; 20% coarse gravel to 2"; subrounded rounded. Note: Sand is quartz, and mafics. Gravel is mafics an Same as above (240 ft).	coarse fine to d to feldspar,			•       •         •       •	No hammering; no water added.
250	-				Same as above (240 ft). Note: I percentage of fine sand.	higher				PID = 0.0 ppm @ cyclone and breathing zone.
255	-				Same as above (240 ft). Note: I percentage of fine sand.	higher	SW		- High Solids Bentonite Grout	Kelly down @ 0848, new 20' connection @ 0853.
260	-				Same as above (240 ft). Note: I percentage of fine sand.	higher		•       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •		PID = 0.0 ppm @ cyclone and breathing zone. Hammering.
265	-				Same as above (240 ft). Note: I percentage of fine sand.	higher				No water added.

(	Borehole ID: KAFB-106232									
Pr Pr	Client: US Army Corps of Engineers Project Location: KAFB, Albuquerque, NM Project Name: KAFB RAPID SWMU ST-106 and SS-111Surface Completion Type: Flush Project Number: 500433									
Da Da Da	ate S ate T ate C	Startec D Rea Comple	l: 8/2 ache eted:	27/20 <sup>7</sup> d: 8/2 9/15	15 28/15 /2015	⊻ At T ▼ At E ▼ Afte	ime of nd of r Drillin	f Drill Drillir ng: 4		
Y	Cool	d Elev rdinat rdinat	e:	I AMS		Drillling Drilling N Logged	/lethoo	iA :t	National EWP r Rotary Casing Ha nards	ammer Page 10 of 19
02 Depth (ft)	Sample Type	Number	Headspace PID	Lithologic Log	Material Description		U.S.C.S.		Well Diagram	Remarks
	_				Well-graded SAND with Gravel (S brown (7.5YR 4/4); 80% fine to co sand; angular to rounded; 20% fin coarse gravel to 2"; subrounded t rounded. Note: Sand is quartz, fe and mafics. Gravel is mafics and	barse ne to to Idspar,				PID = 0.0 ppm @ cyclone and breathing zone. Hammering.
275	-				Same as above (270 ft).					No water added. Kelly down @ 0858, new 20' connection @ 0902.
280	-				Same as above (270 ft).					PID = 0.0 ppm @ cyclone and breathing zone.
285	-				Same as above (270 ft).		SW	· · · · · · · · · · · · · · · · ·	- High Solids Bentonite Grout	Steady hammering; fairly quick drilling.
<u>290</u>	-				Same as above (270 ft); 20% fine	e gravel.				No water added. PID = 0.0 ppm @ cyclone and breathing zone.
<u>295</u>					Same as above (270 ft); 20% fine	e gravel.				Kelly down @ 0907, new 20' connection @ 0911.
300								••	••	

	Borehole ID: KAFB-106232									
Pro Pro	ojec ojec	t Loca t Nam	ation ie: k	: KÁF (AFB	FB, Albuquerque, NM RAPID SWMU ST-106 and SS-111	Hole Dia	motor	· 1 0w	er (in.): 11-3/4 er (in.): 9-5/8 1 Type: Flush	
Da Da	ite S ite T	tartec D Rea	l: 8/. ache	5004 27/20 <sup>-</sup> d: 8/2 9/15	15	🕎 At Ti	me of nd of	<sup>:</sup> Drilli Drillin	s BGS (ft): ing: 458.07 ig: Not Recorded i60.90	
Y	Coor	d Elev dinate	e:	n AMS		Drillling ( Drilling M Logged E	1ethoo	l: Ai	National EWP r Rotary Casing Ha nards	ammer Page 11 of 19
S Depth (ft)	Sample Type	Number	Headspace PID	Lithologic Log	Material Description		U.S.C.S.		Well Diagram	Remarks
	_				Well-graded SAND with Gravel (S brown (7.5YR 4/4); 80% fine to co sand; angular to rounded; 20% fir gravel; subrounded to rounded. N Sand is quartz, feldspar, and maf Gravel is mafics and quartz.	oarse ne lote:				PID = 0.0 ppm @ cyclone and breathing zone. Hammering.
305					Same as above (300 ft).				•       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •	No water added.
<u>310</u>	-				Same as above (300 ft).				•       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •	PID = 0.0 ppm @ cyclone and breathing zone.
<u>315</u>	-				Same as above (300 ft).		SW	•       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •	- High Solids Bentonite Grout	Kelly down @ 0920, new 20' connection @ 0927.
320	-				Same as above (300 ft).					PID = 0.0 ppm @ cyclone and breathing zone.
325	-				Same as above (300 ft).					Hammering.
330	-							• • • • • • • •	• • • • • • • •	No water added.

B							Borehole ID: KAFB-106232				
Pro Pro	ojec ojec	t Loca t Nam	ation ne: k	: KAF	B, Albuquerque, NM Hole RAPID SWMU ST-106 and SS-111Surfa	Diame	ter	IOW	er (in.): 11-3/4 er (in.): 9-5/8 ı Type: Flush		
Da Da	te S te T	Started	d: 8/. ache	5004 27/20 <sup>-</sup> d: 8/2 9/15	Grou 15 ⊈ A 28/15 ₹ A	At Time	of of E	Drilli Drillin	s BGS (ft): ng: 458.07 g: Not Recorded .60.90		
YC	Cool	d Elev rdinat rdinat	e:	n AMS	L (ft): Not Recorded Drilli Drillir	ng Con	tra iod	ctor: I: Aiı	National EWP Rotary Casing Ha	ammer Page 12 of 19	
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); brown (7.5YR 4/4); 80% fine to coarse sand; angular to rounded; 20% fine gravel; subrounded to rounded. Note: Sand is quartz, feldspar, and mafics. Gravel is mafics and quartz.			• • • • • • • • • • • • • • • •		PID = 0.0 ppm @ cyclone and breathing zone. Hammering.	
335	-				Same as above (330 ft).	SV	v	<ul> <li>•</li> <li>•&lt;</li></ul>	•       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •	No water added. Kelly down @ 0940, new 20' connection @ 0944.	
340	-				Same as above (330 ft). Poorly graded SAND (SP); light brown			<ul> <li>•</li> <li>•&lt;</li></ul>	•       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •	PID = 0.0 ppm @ cyclone and breathing zone.	
345	-				(7.5YR 6/4); dry; loose; 95% fine sand subrounded to rounded; 5% silt. Note: sand is quartz, feldspars, and mafics.		5	<ul> <li>•</li> <li>•&lt;</li></ul>	- High Solids Bentonite Grout	Hammering.	
<u>350</u>	-				Same as above (342 ft).			• • • • • • • • • • • •	• • • • • • • • • • • •	PID = 0.0 ppm @ cyclone and breathing zone.	
355	-				Well-graded SAND (SW); brown (7.5Y 5/4); loose; 90% fine to coarse sand; subangular to rounded; 10% fine grave Note: sand is quartz, feldspar, and mafics. Gravel is mafics.		v		•       •         •       •	Kelly down @ 0958, new 20' conneciton @ 1004.	
360								• • • • • •	•     •       •     •       •     •       •     •		

(	C	BI	S			Bore	eho	le l	D: KAFB-1	106232
Pi Pi	ojec ojec	ct Loca ct Nam	ation ne: k	: KAF	s of Engineers FB, Albuquerque, NM RAPID SWMU ST-106 and SS-11	Hole Dia	ametei	rlow	ber (in.): 11-3/4 /er (in.): 9-5/8 n Type: Flush	
Da	ate S ate T	<b>ct Nun</b> Starteo TD Re Compl	d: 8/ ache	27/20 <sup>-</sup> d: 8/2	15 28/15	🕎 At T	ime of	f Drill Drillir	s BGS (ft): ing: 458.07 ng: Not Recorded 460.90	
Y	Coc	nd Elev ordinat ordinat	e:	ו AMS	L (ft): Not Recorded		Metho	d: Ai	National EWP r Rotary Casing Ha hards	ammer Page 13 of 19
90 Depth (ft)		Number	Headspace PID	Lithologic Log	Material Description		U.S.C.S.		Well Diagram	Remarks
	-				Well-graded SAND (SW); brown 5/4); loose; 90% fine to coarse s subangular to rounded; 10% fine Note: sand is quartz, feldspar, a mafics. Gravel is mafics.	and; e gravel.			· · · · · · · · · · · · · · · · · · ·	PID = 0.0 ppm @ cyclone and breathing zone.
<u>365</u>	-				Same as above (360 ft).					Hammering. No water added.
370	- ) - -				Same as above (360 ft).					PID = 0.0 ppm @ cyclone and breathing zone.
375	5				Well-graded SAND with Gravel	(\$\\\)	SW	• • • • • • • •	<ul> <li>High Solids</li> <li>Bentonite</li> <li>Grout</li> </ul>	Hammering.
380	- - - )				light brown (7.5YR 6/4); 60% fine coarse sand; 40% fine to coarse subrounded to rounded; trace si sand is quartz, feldspar, and ma Gravel is quartz and mafics.	e to gravel; lt. Note:				Kelly down @ 1016, new 20' connection @ 1021.
	-				Same as above (376 ft).					PID = 0.0 ppm @ cyclone and breathing zone.
385	5				Same as above (376 ft).					Hammering.
0.00								• • • • • • • •	• • • • • • • • • •	No water added.
390	<u>'</u>							••	••	

Borehole ID: KAFB-106232								06232		
Pro Pro	ojec ojec	t Loca t Nam	ation: ne: K	KAF AFB I	B, Albuquerque, NM RAPID SWMU ST-106 and SS-111	Hole Dia	meter		er (in.): 11-3/4 er (in.): 9-5/8 Type: Flush	
Da Da Da	te S te T te C	•	d: 8/2 acheo eted:	27/20 <i>1</i> d: 8/2 9/15	15 28/15 /2015	<ul> <li>∑ At Ti</li> <li>▼ At Er</li> <li>▼ After</li> </ul>	me of nd of l Drillin	Drilli Drillir ng: 4		
Y (	Cool	d Elev rdinate rdinate	e:		Γ	Drilling C Drilling M Logged E	lethoo	l: Ai	National EWP r Rotary Casing Ha nards	ammer Page 14 of 19
6 Depth (ft)	Sample Type	Number	Headspace PID	Lithologic Log	Material Description		U.S.C.S.		Well Diagram	Remarks
	_				Well-graded SAND with Gravel (S light brown (7.5YR 6/4); 60% fine to coarse sand; 40% fine to coarse g to 2"; subrounded to rounded; trac Note: sand is quartz, feldspar, and mafics. Gravel is quartz and mafic	to gravel ce silt. d			•       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •	PID = 0.0 ppm @ cyclone and breathing zone. Hammering. No water added.
<u>395</u> 400	-				Same as above (390 ft). Same as above (390 ft).				•       •         •       •	Kelly down @ 1033, new 20' connection @ 1038. PID = 0.0 ppm @ cyclone
405	-				Same as above (390 ft).		SW		- High Solids Bentonite Grout	and breathing zone. Hammering. No water added.
410	-				Same as above (390 ft).			<ul> <li>•</li> <li>•&lt;</li></ul>	•       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •	PID = 0.0 ppm @ cyclone and breathing zone.
415	-				Same as above (390 ft).					Hammering.
420									•     •       •     •       •     •       •     •       •     •       •     •       •     •       •     •       •     •       •     •       •     •       •     •	Kelly down @ 1050, new 20' connection @ 1053.

	C	BI			I	Bore	Borehole ID: KAFB-106232				
Pr Pr	ojec ojec	t Loca t Nam	ation: ne: K	: KÁF (AFB	FB, Albuquerque, NM RAPID SWMU ST-106 and SS-111	Hole Dia	meter	·Iow	er (in.): 11-3/4 er (in.): 9-5/8 n Type: Flush		
Da Da Da	ite S ite T ite C		d: 8/2 acheo eted:	27/20 d: 8/2 9/15	15 28/15 /2015	<ul> <li>☑ At Ti</li> <li>☑ At Er</li> <li>☑ After</li> </ul>	me of nd of Drillii	<sup>r</sup> Drilli Drillin ng: 4			
Y	Cool	d Elev rdinate rdinate	e:		Γ		lethoo	t: Ai	National EWP r Rotary Casing Ha nards	ammer Page 15 of 19	
5 Depth (ft)	Sample Type	Number	Headspace PID	Lithologic Log	Material Description		U.S.C.S.		Well Diagram	Remarks	
	-				Well-graded SAND with Gravel (S light brown (7.5YR 6/4); 60% fine coarse sand; 40% fine to coarse g to 2"; subrounded to rounded; trac Note: sand is guartz, feldspar, and	to gravel ce silt.	SW	· · · · · · · · · · · · · · · · · · ·	• • • • • • • • • •	PID = 0.0 ppm @ cyclone and breathing zone.	
425	-				mafics. Gravel is quartz, icidspar, and Poorly graded SAND (SP); light br (7.5YR 6/4); 95% fine sand; trace coarse gravel; rounded; 5% silt. N gravel is quartz.	rown fine to			<ul> <li>N</li> <li>N&lt;</li></ul>	Hammering No water added.	
<u>430</u> 435	-				Same as above (423 ft); very mois	st.	SP		- High Solids Bentonite	PID = 0.0 ppm @ cyclone and breathing zone. Possible water zone @ 430'. Water was encountered 27' higher than well installed one block to the south.	
	-				Lean CLAY (CL); reddish yellow ( 6/6); moist; low plasticity; 100% cl	lay.	CL		Grout	Kelly down @ 1109, new 20' connection @ 1114.	
440	-				Poorly graded SAND (SP); reddisl brown (5YR 5/4); very moist to we 100% fine sand; trace silt. Same as above (438 ft); trace coa sand.	et;				PID = 0.0 ppm @ cyclone and breathing zone.	
<u>445</u> 450	-				Same as above (438 ft); trace coa sand.	arse	SP		•       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •	Hammering.	

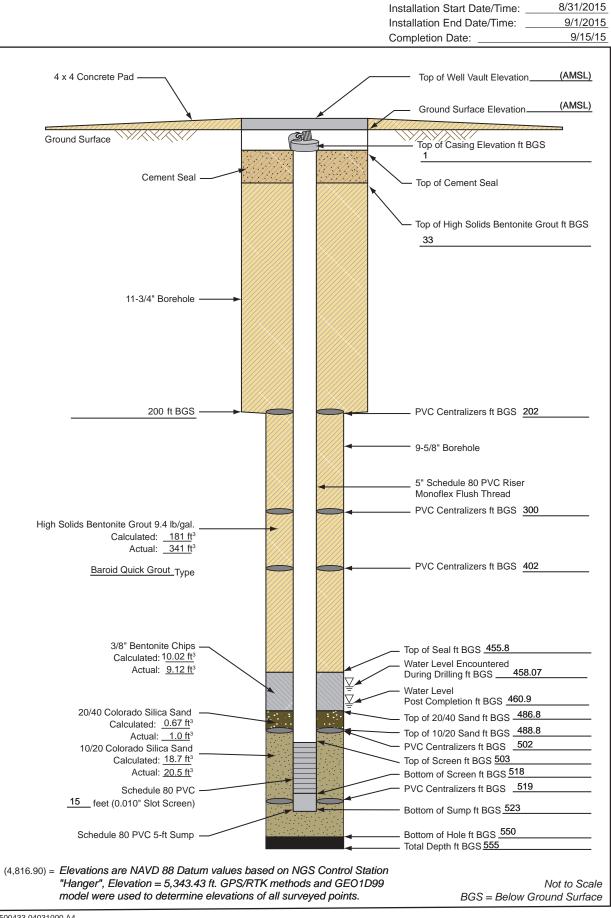
(	Borehole ID: KAFB-106232								
Pr Pr	Client: US Army Corps of Engineers       Hole Diameter Upper (in.): 11-3/4         Project Location: KAFB, Albuquerque, NM       Hole Diameter Lower (in.): 9-5/8         Project Name: KAFB RAPID SWMU ST-106 and SS-111Surface Completion Type: Flush         Project Number: 500433								
Da Da	ate S ate T	Starteo	d: 8/ ache	27/20 d: 8/2	Ground 15 ∑ At T	ime of	f Drill Drillir	ls BGS (ft): ing: 458.07 ng: Not Recorded 460.90	
Y	Coo	d Elev ordinat	e:	ו AMS		Metho	d: Ai	National EWP ir Rotary Casing H hards	ammer Page 16 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); reddish brown (5YR 5/4); very moist to wet; 100% fine sand; trace coarse sand; trace silt.	SP	· · · · · · · · · · · · · · · · · · ·	- High Solids	PID = 0.0 ppm @ cyclone and breathing zone. Hammering.
<u>455</u>	-				<ul> <li>Well-graded SAND with Gravel (SW); brown (7.5YR 5/3); wet; 80% fine to coarse sand; subrounded to rounded; 20% fine gravel; trace coarse gravel; subrounded to rounded. Note: sand is quartz, mafics, and feldspar. Gravel is mafics and quartz.</li> <li>✓</li> <li>Same as above (453 ft).</li> </ul>	SW		<ul> <li>Bentonite</li> <li>Grout</li> <li>Top of 3/8"</li> <li>Bentonite Chip Seal</li> </ul>	Kelly down @ 1124, new 20' connection @ 1128. PID = 0.0 ppm @ cyclone and breathing zone.
<u>465</u>	-				Poorly graded SAND (SP); brown (7.5YR 5/4); wet; 95% fine sand; 5% fine gravel; rounded.		-	- 3/8" Bentonite	Hammering.
<u>470</u>	-				Same as above (463 ft).	SP		Chip Seal	PID = 0.0 ppm @ cyclone and breathing zone.
<u>475</u> 480	-				Well-graded SAND with Gravel (SW); strong brown (7.5YR 5/6); wet; 80% fine to coarse sand; 20% fine to coarse gravel to 2"; subrounded to rounded.	SW	-		Kelly down @ 1143, new 20' connection @ 1511.

	C	BI			E	Borehole ID: KAFB-106232					
Pro Pro	ojec ojec	t Loca t Nam	ation ne: K	: Káf (AFB I	B, Albuquerque, NM H RAPID SWMU ST-106 and SS-111S	lolo Diar	motor	Upper (in.): 11-3/4 Lower (in.): 9-5/8 letion Type: Flush			
Da Da	ite S ite T	<b>t Nun</b> Starteo FD Re Compl	1: 8/2 ache	27/20 <sup>7</sup> d: 8/2	15 G 28/15 J	☑ At Tir ▼ At En	me of 1d of [	evels BGS (ft): Drilling: 458.07 Drilling: Not Recorded ng: 460.90			
Y	Coo	d Elev rdinat rdinat	e:	n AMS	Di	rilling M	ethod	ctor: National EWP : Air Rotary Casing H Richards	ammer Page 17 of 19		
8 Depth (ft)	Sample Type	Number	Headspace PID	Lithologic Log	Material Description		U.S.C.S.	Well Diagram	Remarks		
	-				Well-graded SAND with Gravel (SV strong brown (7.5YR 5/6); wet; 80% to coarse sand; 20% fine to coarse gravel to 2"; subrounded to rounded	% fine		- 3/8" Bentonite	PID = 0.0 ppm @ cyclone and breathing zone.		
<u>485</u>	_				Same as above (480 ft).			Chip Seal - Top of 20/40 Sand	Steady hammering; slow drilling. No water added.		
<u>490</u>	_				Same as above (480 ft).		SW	- Top of 10/20 Sand	PID = 0.0 ppm @ cyclone and breathing zone.		
495	-				Same as above (480 ft).				Hammering.		
<u>500</u>	-				Same as above (480 ft).				Kelly down @ 1530, new 20' connection @ 1535. Added 25 gallons of water. PID = 0.0 ppm @ cyclone and breathing zone.		
<u>505</u>	-				Poorly graded SAND with Silt (SP-S brown (7.5YR 5/3); wet; 90% fine s trace medium sand; 10% silt.	and;	SP- SM	- Top of 5" Schedule 80 PVC 0.010" Slot Screen	Hammering.		
510	-				See description on next page.		SW				

C	BI	Ň		Bore	eho	le ID: KAFB-	106232
Proje Proje	ect Loca	ation: ie: K	: KÁI (AFB	<sup>-</sup> B, Albuquerque, NM Hole Dia RAPID SWMU ST-106 and SS-111Surface	ametei	<sup>r</sup> Upper (in.): 11-3/4 <sup>r</sup> Lower (in.): 9-5/8 Iletion Type: Flush	
Date Date Date Grou Y Co	ordinat	d: 8/2 ache eted: vatior e:	27/20 d: 8/2 9/15	15 28/15 5/2015 SL (ft): Not Recorded Ground: ▼ At E ▼ After Drilling Drilling	ime of nd of r Drillin Contra Methoo	Levels BGS (ft): f Drilling: 458.07 Drilling: Not Recorded ng: 460.90 actor: National EWP d: Air Rotary Casing H	ammer
	ordinat			Logged	By: T	. Richards	Page 18 of 19
01 01 Depth (ft) Samnle Tyne	Number	Headspace PID	Lithologic Log	Material Description	U.S.C.S.	Well Diagram	Remarks
_				Well-graded SAND with Gravel (SW); brown (7.5YR 5/4); wet; 80% fine to			PID = 0.0 ppm @ cyclone and breathing zone.
-				coarse sand; subrounded to rounded; 20% fine to coarse gravel; subangular to rounded; trace silt. Note: gravel is mafics and quartz.			Hammering; slow drilling.
<u>515</u> _ _				Same as above (510 ft).		-Bottom of	Kelly down @ 1555, new 20' connection @ 1602.
<u>520</u> - -				Same as above (510 ft). Note: a larger percentage of the sand is coarse.		Screen	Add 25 gallons of water downhole. PID = 0.0 ppm @ cyclone and breathing zone.
525 - - -				Same as above (510 ft). Note: a larger percentage of the sand is coarse.	SW	- Bottom of Sump	
<u>530</u> -				Same as above (510 ft).			PID = 0.0 ppm @ cyclone and breathing zone.
535				Same as above (510 ft).			Hammering; slow drilling.
-							Kelly down @ 1622, new 20' connection @ 1627.
540							Add 25 gallons of water.

		BI			E	Borehole ID: KAFB-106232						
Pro Pro	ojec ojec	: US :t Loca :t Nam :t Num	ation: ne: K	: KÁF (AFB	E, Albuquerque, NM RAPID SWMU ST-106 and SS-111S	lole Dia lole Dia Surface (	ole Diameter Upper (in.): 11-3/4 ole Diameter Lower (in.): 9-5/8 urface Completion Type: Flush					
Da Da	te S te T	Starteo	d: 8/2 ache	27/20 d: 8/2	15	∑ At Ti ▼ At Er	me of 1d of [	evels BGS (ft): Drilling: 458.07 Drilling: Not Recorded ng: 460.90				
YC	Coo	d Elev rdinate rdinate	e:	AMS	L (ft): Not Recorded D		Contra lethod	ctor: National EWP I: Air Rotary Casing H Richards	ammer Page 19 of 19			
65 Depth (ft)	Sample Type	Number	Headspace PID	Lithologic Log	Material Description		U.S.C.S.	Well Diagram	Remarks			
	-				Well-graded SAND with Gravel (SV brown (7.5YR 5/4); wet; 80% fine to coarse sand; subrounded to round 20% fine to coarse gravel; subange rounded; trace silt. Note: gravel is and quartz.	io led; ular to			PID = 0.0 ppm @ cyclone and breathing zone.			
545	-				Same as above (540 ft).		SW		Hammering; slow drilling.			
550	-				Same as above (540 ft).			- Bottom of Filter Pack	PID = 0.0 ppm @ cyclone and breathing zone.			
560	-			<u></u>				Bottom of Hole	Kelly down @ 1652 on 8/28/15. Total depth = 555 ft bgs. Flood borehole with approximately 1,300 gallons of water.			
565	-											
570	-											

### Monitoring Well Completion Diagram KAFB-106232



<sup>500433.04031000.</sup>A4



### **Well Development Record**

Project Name: KAFB RAPID		
Location: Kathryn and Georgia		Well/Piez. No.: KAFB-106232
Personnel: R. Wortman		Date Installed: 9/15/15
Date: 9/3/15		Csg. Diameter (I.D.): <u>5 "</u>
Samplers: N/A		Total Depth (ft. bgs): 523
Method of Development: X Surging	X Bailing	X Pumping
X Original Development	Redevelopment	Other
Development Date: 9/3/2015 - 9/4/2	2015	
Depth to Water Before Developing	Well (ft. btoc): 460.90	

 $V=(B * r_c^2 * L_c * 7.48)+(B * (r_w^2 - r_c^2) * L_s * \phi_s * 7.48)+(H_2O added during drilling/installation) = 740 \text{ gallons}$ 

Depth Purging From: 516.5 feet	Time Purging Begins: 0945, 9/4/2015
Weather: Hot, Clear	Screened Interval (ft bgs): 503 - 518
Equipment Nos.: pH Meter: YSI 650 MDS	EC Meter: YSI 650 MDS Turbidity Meter: HACH 21000Q

Equipment Decontaminated Prior to Development: Y X N

Describe: Steam Cleaned

Collected Sample of Water Added to Well: Y N X Describe: N/A

Comment: Driller added 600 gallons of water during drilling and well installation.

Date	Time	Water Level (ft bTOC)	Volume Removed (gal.)	Temp. (°C)	pН	EC (mS/cm)	Turbidity (NTU)	Comments
Duto		2100,	(gui)	10mp. ( 0)	PII	20 (110/011)	(110)	Commente
9/3/2015	1332	460.95						Initial water level reading.
9/3/2015	1355							Begin bailing.
9/3/2015	1410		55				> 1,000	Stop bailing. Set up swab.
9/3/2015	1440		55					Begin swabbing bottom 5 feet of screen.
9/3/2015	1500		55					Swab next 5 feet of screen.
9/3/2015	1520		55					Swab top 5 feet of screen.
9/3/2015	1540		55					Finish swabbing. Set up bailer.
9/3/2015	1555		55					Begin bailing.
9/3/2015	1630		150				> 1,000	Continue bailing.

Notes:

Water Levels - Reported to the nearest 0.01 foot pH - Reading rounded to 0.1 pH units Water temperature - Reported to nearest 0.1 °C °C = Degree Celsius EC = Electric Conductivity ft bgs = Feet Below Ground Surface ft btoc = Feet Below Top of Casing gal. = Gallon GPM = Gallons Per Minute I.D. = Inner Diameter N/A = Not Applicable NR = Not Recorded NTU = Nephelometric Turbidity Unit S/m = Seimens per Meter

Where: B=3.14

 $\mathcal{Q}_{s}$ = porosity of the sand 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<sub>w</sub>= radius of the well bore in feet

 $L_{\rm s}\text{=}$  length of saturated portion of the sand pack in feet

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

Pg 1 of 2



## Well Development Record

Project: KAFB RAPID	Well No: KAFB-106232
Project Number: 140705	Samplers: N/A
Date: 9/3/15 - 9/4/15	Checked By:
Time Start: 1332, 9/3/2015	<b>Time Finish</b> : <u>1</u> 141, <u>9</u> /4/2015

Date	Time	Water Level (ft. bTOC)	Volume Removed (gal.)	Temp. (°C)	рН	EC (mS/cm)	Turbidity (NTU)	Comments
9/3/2015	1640		240				> 1,000	Finish bailing.
9/4/2015	0805		240					Start setting up pump.
9/4/2015	0935	460.96	240					Set pump at 516.5 feet bgs.
9/4/2015	0945	462.05	240	24.00	7.12	0.554	42.9	Begin pumping at 516.5 feet bgs at 4.8 gpm.
9/4/2015	0955	462.02	288	20.39	6.35	0.551	101	Continue pumping from 516.5 feet bgs.
9/4/2015	1005	462.02	336	20.47	6.71	0.556	48.6	Continue pumping from 516.5 feet bgs.
9/4/2015	1015	462.02	384	20.53	6.91	0.558	36.4	Continue pumping from 516.5 feet bgs.
9/4/2015	1025	462.02	432	20.57	7.02	0.560	4.37	Continue pumping from 516.5 feet bgs.
9/4/2015	1035	462.03	480	20.58	7.09	0.561	2.24	Continue pumping from 516.5 feet bgs.
9/4/2015	1045	462.02	528	20.58	7.13	0.562	2.00	Continue pumping from 516.5 feet bgs.
9/4/2015	1055	462.02	568	20.62	7.17	0.568	7.67	Move pump up to 503.5 feet bgs.
9/4/2015	1105	462.02	608	20.87	7.21	0.565	1.16	Continue pumping from 503.5 feet bgs.
9/4/2015	1110	462.02	658	20.85	7.22	0.565	1.30	Continue pumping from 503.5 feet bgs.
9/4/2015	1120	462.02	706	20.78	7.22	0.564	1.09	Move pump down to 510.5 feet bgs.
9/4/2015	1130	462.02	754	20.67	7.23	0.567	1.29	Continue pumping from 510.5 feet bgs.
9/4/2015	1135	462.02	778	20.68	7.22	0.567	1.02	Continue pumping from 510.5 feet bgs.
9/4/2015	1140	462.02	802	20.71	7.24	0.567	0.98	Continue pumping from 510.5 feet bgs.
9/4/2015	1141		806					Well development complete. Turn off pump.

Was well sampled after development? YES NO X

Sample Method: N/A

Sample Name: N/A

Analyses: N/A

Pg 2 of 2

# KAFB 106234

Pro Pro Da Da Da Gro	ojec ojec ate S ate T ate C round Coor	ct Loca ct Nam ct Num Started TD Re Compl	ation: me: K mber: d: 9/2 eached leted: vation te:	: KAF KAFB F 5004 /2/2015 ed: 10/	FB, Albuquerque, NM Hole Dia RAPID SWMU ST-106 and SS-111Surface 433 Ground 5 ∑ At T 0/1/2015 Ţ At E Ţ Afte SL (ft): Not Recorded Drillling Drilling	iameter e Comp Jwater L Time of End of I er Drillir I Contra Method	r Upper (in.): 16 r Lower (in.): 14-3/4 bletion Type: Flush Levels BGS (ft): f Drilling: 459.00 Drilling: Not Recorded ng: 458.90 actor: National Drilling d: Mud Rotary David Kessler	ATEOF
Oepth (ft)	Sample Type	Number	Headspace PID	Lithologic Log	Material Description	U.S.C.S.	Well Diagram	Remarks
5	-				A No lithologic description.	<u>SPHA</u>	- Top of	Borehole was air knifed from 0.5 - 8.7 ft for utility clearance on 8/31/15. Sand, silt, and gravel observed.
<u>10</u> 15					SILT (ML); brown (10YR 4/3); hard; 100% silt. SILT with Sand (ML); reddish brown (5YR 5/4); 80% silt; 20% fine sand. Same as above (10 ft).	ML	Casing/Cement Seal	Begin ARCH drilling with 3/4" O.D. bit @ 1715 on 9/2/15. PID = 0.0 ppm @ breathing zone. Resume drilling @ 0835 on 9/3/15 @ 12 ft. PID = 0.0 ppm @ cyclone and breathing zone.
20					Silty SAND (SM); dark reddish brown (5YR 3/3); 70% fine to medium sand; subangular to subrounded; 30% silt. Note: sand is biotite. @ 17 ft. Same as above (16 ft); trace gravel. Well-graded SAND with Gravel (SW); reddish brown (5YR 4/3); dry; 75% fine	SM		Injected water to control dust. Depth of stabilization. Begin drilling with mud @ 1705.
<u>25</u> 30					to coarse sand; subangular to rounded; 20% gravel; angular to rounded; 5% silt. Note: sand is quartz, feldspars, and mafics. Same as above (18 ft); sand is subrounded to rounded.	sw	• • • • Top of • • Portland • • • • • • • • • • • • • • • • • • •	<ul> <li>PID = 0.0 ppm @ breathing zone.</li> <li>Rig bouncing and chattering.</li> <li>Color cannot be determined.</li> </ul>

KAFB\_BOREHOLE\_LOG - SHAW\_DRILLING.GDT - 12/2/15 15:49 - Z\WAFB RAPID\GINTIKAFB\_RAPID.GPJ

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	C	BI	Y		Во	ore	hol	le l	D:	KAFB-1	06234
Pro Pro	ojec ojec	t Loc Nan	ation ne: k	: KAF	FB, Albuquerque, NM Hole RAPID SWMU ST-106 and SS-111Surfa	Diar	neter	·Iow	er Ìi	n.): 16 n.): 14-3/4 pe: Flush	
Da Da	te S te T	Starte	d: 9/ ache		5 ⊊ A /1/2015 Grou	At Tir At En	ne of	<sup>:</sup> Drilli Drillir	ing: ig: l	SS (ft): 459.00 Not Recorded 90	
Y	Cool	d Elev rdinat rdinat	e:	ו AMS		ng M	ethoo	d: M	ud R	tional Drilling otary sler	Page 2 of 24
ଝ Depth (ft)	Sample Type	Number	Headspace PID	Lithologic Log	Material Description		U.S.C.S.		Wel	l Diagram	Remarks
	-				Well-graded SAND with Gravel (SW); 75% fine to coarse sand; subrounded rounded; 20% gravel; 5% silt. Note: sa is quartz, feldspar, and mafics.	to					Occasional chatter from drill stem.
35	-				Same as above (30 ft). Same as above (30 ft); dark reddish brown (5YR 3/3); 55% fine to very coarse sand; 40% coarse gravel; angular.						End of 9/3/15 @ 34 ft. Resume drilling @ 0905 on 9/4/15. PID = 0.0 ppm @ breathing zone. Gravel layer observed from 35 - 37 ft. Significant drill chatter.
40					Same as above (30 ft); dark reddish brown (5YR 3/3); 55% fine to very coarse sand; 40% coarse gravel; angular.		SW			Portland Bentonite Cement	Hard drilling. Add 150 gallons of water.
50	-				Same as above (30 ft); dark reddish brown (5YR 3/3); 55% fine to very coarse sand; 40% coarse gravel; angular.						PID = 0.0 ppm @ breathing zone.
55	-				Same as above (30 ft); dark reddish brown (5YR 3/3); dense; 55% fine to very coarse sand; 40% coarse gravel; angular; 5% silt.						Added stabilizing collar @ 1140. Hole sloughted approximately 8 ft @ 1230. Continuous chatter from 55 - 58 ft.
60								• • • • • •	• • • • • •		

	C	BI			I	Bore	ho	le II	D: KAFB-1	06234
Pro Pro	ojec ojec	t Loca Nan	ation ne: K	: KÁI (AFB	E, Albuquerque, NM RAPID SWMU ST-106 and SS-1115	Hole Dia	meter	r L owe	er (in.): 16 er (in.): 14-3/4 Type: Flush	
Da Da	ite S ite T	t Num Started D Re Compl	d: 9/2 ache							
YO	Cool	d Elev rdinat rdinat	e:	n AMS	C		lethoo	d: Mu	National Drilling Id Rotary Kessler	Page 3 of 24
g Depth (ft)	Sample Type	Number	Headspace PID	Lithologic Log	Material Description		U.S.C.S.		Well Diagram	Remarks
65					Poorly graded SAND with Gravel ( dark reddish brown (5YR 3/3); 60% to medium sand; subrounded to rounded; 35% fine gravel; subangu rounded; 5% silt. Note: sand is qua and mafics. Gravel is quartz, felds and mafics. Same as above (60 ft).	% fine ular to artz			•       •         •       •	Collection of very coarse gravel in sieve from mud tub.
70	-				Same as above (60 ft); Note: perce of mafics in gravel increases.	entage	SP		<ul> <li>.</li> <li>.&lt;</li></ul>	Stopped drilling due to low circulation.
75	-				Same as above (60 ft).				- Portland Bentonite Cement	Borehole collapsed due to inability to remove fine gravel. Backfill borehole with 8/12-grade sand from 61.7 - 18.1 ft. Added third 20' collar @ 75 ft. Resume drilling with
80	-				Same as above (60 ft); gravel to 1 angular.	",			•       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •	ARCH @ 1430 on 9/12/15. Very hard drilling from 76 - 84.6 ft. Drill stem bouncing and chattering. PID = 0.0 ppm @ breathing zone. Continue advancing
90	-				Well-graded SAND with Gravel (S' dark reddish brown (5YR 3/3); 60% fine to coarse sand; subrounded to rounded; 35% fine gravel; subang rounded; 5% silt. Note: sand is qua and mafics. Gravel is quartz, felds and mafics.	% very o ular to artz	SW		<ul> <li>•</li> <li>•&lt;</li></ul>	casing using ARCH to 83 ft on 9/14/15. Could not advance any further.

	C	BI	S		Во	reh	0	le I	D: KAFB-1	06234
Pro Pro	ojec ojec	t Loca t Nam	ation ne: k	: KÁF (AFB I	B, Albuquerque, NM Hole RAPID SWMU ST-106 and SS-111Surfa	Diame	oter		oer (in.): 16 /er (in.): 14-3/4 n Type: Flush	
Da Da Da	ojec ite S ite T ite C									
Y (	Cool	d Elev rdinat rdinat	e:	n AMS	Drillir	ng Met	hoo	d: M	National Drilling ud Rotary Kessler	Page 4 of 24
g Depth (ft)	Sample Type	Number	Headspace PID	Lithologic Log	Material Description		o'		Well Diagram	Remarks
95					Well-graded SAND with Gravel (SW); dark reddish brown (5YR 3/3); 60% ve fine to coarse sand; subrounded to rounded; 35% fine gravel; subangular rounded; 5% silt. Note: sand is quartz and mafics. Gravel is quartz, feldspar, and mafics. Same as above (90 ft); 50% very fine t coarse sand; 45% coarse gravel to 3 c angular. Note: sand is quartz, mafics,	to S <sup>1</sup> .o	w			Begin drilling using mud @ 0835 on 9/15/15. PID = 0.0 ppm @ breathing zone.
100					and feldspar. Well-graded GRAVEL with Sand (GW) dark reddish brown (5YR 3/3); 60% fin to coarse gravel; angular to rounded; 35% very fine to medium sand; subrounded to rounded; 5% silt. Note: gravel is quartz and feldspar. Sand is quartz.	e	W	•       •         •       •		
105	-				Same as above (97 ft).				<ul> <li>Portland</li> <li>Bentonite</li> <li>Cement</li> </ul>	
110					Clayey GRAVEL with Sand (GC); dark reddish brown (5YR 3/4); 50% fine to coarse gravel; angular to rounded; 30% very fine sand; rounded; 20% clay. No gravel is quartz and feldspar.	%	C			
115					Same as above (107 ft); 50% very fine coarse gravel; 20% very fine sand; 30° clay.	to	~			
120					Clayey GRAVEL (GC); strong brown (7.5YR 5/6); 50% gravel; angular to rounded; 10% very fine sand; rounded	,		•••	• • • • • • • •	

(		RI	Ň		Bor	eho	le	ID: KAFB-1	106234			
Pro Pro	ojec ojec	t Loca t Nam	ation ne: ł	: KAI (AFB	FB, Albuquerque, NM Hole Di RAPID SWMU ST-106 and SS-111Surface	amete	rlow	ber (in.): 16 ver (in.): 14-3/4 n Type: Flush				
Da Da	Project Number: 500433       Groundwater Levels BGS (ft):         Date Started: 9/2/2015											
Y	Ground Elevation AMSL (ft): Not Recorded       Drilling Contractor: National Drilling         Y Coordinate:       Drilling Method: Mud Rotary         X Coordinate:       Logged By: David Kessler											
05 Depth (ft)	Sample Type	Number	Headspace	Lithologic Log	Material Description	U.S.C.S.		Well Diagram	Remarks			
	-				40% clay. Note: gravel is quartz and feldspar. Clayey GRAVEL (GC); strong brown	GC	•••					
<u>125</u> 130	-				<ul> <li>(7.5YR 5/6); 50% gravel; angular to rounded; 10% very fine sand; rounded; 40% clay. Note: gravel is quartz and feldspar.</li> <li>Gravelly fat CLAY with Sand (CH); strong brown (7.5YR 5/6); 50% clay; 30% fine to coarse gravel; subrounded; 20% very fine sand.</li> <li>Fat CLAY with Gravel (CH); brown (7.5YR 4/3); 70% clay; 20% fine to coarse gravel; angular to subrounded; 10% very fine sand. Note: sand is quartz.</li> <li>Fat CLAY (CH); brown (7.5YR 4/3); 90% clay; 10% very fine sand; subrounded to rounded.</li> </ul>	СН		• • • • • • • • • • • • • • • • • • •	PID = 0.0 ppm @ breathing zone.			
140					Clayey SAND (SC); brown (7.5YR 5/4); 60% very fine sand; subrounded; 40% clay. Same as above (135 ft).	SC		Bentonite     Cement	Kelly down, new 20' connection.			
<u>145</u>	-				Sandy fat CLAY (CH); brown (7.5YR 5/3); 60% clay; 40% very fine sand.	СН		<ul> <li>•</li> <li>•&lt;</li></ul>	PID = 0.0 ppm @ breathing zone.			

KAFB\_BOREHOLE\_LOG - SHAW\_DRILLING.GDT - 12/2/15 15:49 - Z:\KAFB RAPID\GINT\KAFB\_RAPID.GPJ

	C	RI			Bor	eho	le l	ID: KAFB-1	106234
Pro Pro	ojec ojec	t Loc Nan	ation ne: k	: Káf (AFB I	FB, Albuquerque, NM Hole D RAPID SWMU ST-106 and SS-111Surface	iamete	rIow	oer (in.): 16 ver (in.): 14-3/4 n Type: Flush	
Da Da	te S ate T	<b>t Nun</b> Starteo ID Re Compl	d: 9/. ache						
Y	Coo	d Elev rdinat rdinat	e:	458.90 : National Drilling lud Rotary Kessler	Page 6 of 24				
05 Depth (ft)		Number	Headspace PID	Lithologic Log	Material Description	U.S.C.S.		Well Diagram	Remarks
155	_				Sandy fat CLAY (CH); brown (7.5YR 5/3); 60% clay; 40% very fine sand. Same as above (150 ft).	СН		<ul> <li>•</li> <li>•&lt;</li></ul>	
<u>160</u>	-				Same as above (150 ft). Well-graded SAND with Gravel (SW); brown (7.5YR 4/3); 60% very fine to coarse sand; 35% fine to coarse gravel;	-			Kelly down @ 1345, new 20' connection. Difficult drilling and chatter.
165	-				subrounded to rounded; 5% silt. Note: gravel is quartz, feldspar, and mafics. Same as above (161 ft).			<ul> <li>Portland</li> <li>Bentonite</li> <li>Cement</li> </ul>	
<u>170</u>	-				Same as above (161 ft).	SW		<ul> <li>V</li> <li>V&lt;</li></ul>	PID = 0.0 ppm @ breathing zone.
175	-				Same as above (161 ft); 35% coarse gravel.			<ul> <li>•</li> <li>•&lt;</li></ul>	
180							••	• • • •	Kelly down @ 1447, new

(	C	BI			Во	reh	0	le I	D:	KAFB-1	06234
Pro Pro	ojec ojec	t Loca t Nam	ation ne: k	: KÁI (AFB	FB, Albuquerque, NM Hole RAPID SWMU ST-106 and SS-111Surfa	Diame	eter		er (i	n.): 16 n.): 14-3/4 pe: Flush	
Da Da	Project Number:       500433         Date Started:       9/2/2015         Date TD Reached:       10/1/2015         Date Completed:       ✓										
Y	Cool	d Elev rdinat rdinat	e:	ו AMS	Drillin	ng Cor g Met ed By:	hoo	d: Mu	ld F		Page 7 of 24
08 Depth (ft)	Sample Type	Number	Headspace PID	Lithologic Log	Material Description	0 0 1 1	0.0.0.0	,	Wel	l Diagram	Remarks
	_				Well-graded SAND with Gravel (SW); brown (7.5YR 4/3); 60% very fine to coarse sand; 35% coarse gravel; angular to rounded; 5% silt. Note: grav is feldspar and mafics.	el S'	W		<ul> <li></li></ul>		20' connection. Bit chatter.
<u>185</u>	-				Poorly graded SAND with Gravel (SP); brown (7.5YR 4/3); 55% very fine sand 40% fine gravel; subrounded to rounde 5% silt. Note: gravel is quartz, feldspar and mafics.	; ed;	Р				PID = 0.0 ppm @ breathing zone.
<u>190</u>	-				Same as above (184 ft); 65% very fine sand; 30% fine gravel.			• • • • • • • • • • • •	• • • • • • • • • • • • • •		
<u>195</u>	-				Poorly graded GRAVEL with Sand (GF brown (7.5YR 4/3); 60% fine gravel; subrounded to rounded; 35% very fine sand; rounded; 5% silt. Note: gravel is quartz, fedspar, and mafics.	'); G	iΡ	•     •       •     •       •     •       •     •       •     •       •     •       •     •       •     •       •     •       •     •       •     •       •     •       •     •       •     •       •     •       •     •       •     •       •     •       •     •		- Portland Bentonite Cement	
200	-				Same as above (192 ft); 60% coarse gravel.						Kelly down @ 1540, new 20' connection.
<u>205</u> 210	_				Well-graded SAND with Gravel (SW); brown (7.5YR 4/4); 60% very fine to coarse sand; 35% medium gravel; subrounded to rounded; 5% clay. Note sand is quartz. Gravel is quartz and feldspar.		W				

Proj Proj Proj Date Date Gro	jec jec e S e T e C oor	t Loca t Nam t Num tarted D Rea comple	ation ne: k nber: 1: 9/ ache	: KAF	B, Albuquerque, NM H RAPID SWMU ST-106 and SS-111S	lole Dian lole Dian	neter		er Ìi		
Date Date Date Grou	e S e T e C ounc oor	tarteo D Rea omple	d: 9/ ache				Comp	letior	ı Ty	n.): 14-3/4 pe: Flush	
	oor	d Elev	elea.								
		dinat dinat	e:	n AMS	L (ft): Not Recorded Di	✓ After rilling C rilling Me ogged B	ontra ethoc	ictor: I: Mu	Na Jd R	tional Drilling totary	Page 8 of 24
01 Depth (ft)	Sample Type	Number	Headspace PID	Lithologic Log	Material Description		U.S.C.S.	,	Wel	l Diagram	Remarks
215					Well-graded SAND with Gravel (SV brown (7.5YR 4/4); 60% very fine to coarse sand; 35% medium gravel; subrounded to rounded; 5% clay. N sand is quartz. Gravel is quartz and feldspar. Same as above (210 ft); 70% very to	o Note: d fine to					
  220  					coarse sand; 25% fine to medium g Note: gravel is quartz, feldspar, and mafics. Same as above (215 ft).			•       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •			Kelly down @ 1620, new 20' connection.
_ 225 _ _ _ _					Same as above (215 ft).		SW			- Portland Bentonite Cement	
230 - - -					Same as above (215 ft).						Hammer chatter.
235					Same as above (215 ft).			<ul> <li>•</li> <li>•&lt;</li></ul>			Kelly down @ 1719, new

Borehole ID: KAFB-106234										
Client: US Army Corps of Engineers Project Location: KAFB, Albuquerque, NM Project Name: KAFB RAPID SWMU ST-106 and SS-111Surface Completion Type: Flush Project Number: 500433										
Date Started:9/2/2015Image: Groundwater Levels BGS (ft):Date TD Reached:10/1/2015Image: At End of Drilling:459.00Date Completed:Image: At End of Drilling:Not RecordedImage: At End of Drilling:Image: At End of Drilling:458.90										
Ground Elevation AMSL (ft):Not RecordedDrilling Contractor:National DrillingY Coordinate:Drilling Method:Mud RotaryX Coordinate:Logged By:David KesslerPage 9 of 24										Page 9 of 24
5 Depth (ft)	Sample Type	Num Num Heads PIC			Material Description		U.S.C.S.	Well Diagram		Remarks
245	-				Well-graded SAND with Gravel (SW); brown (7.5YR 4/4); 60% very fine to coarse sand; subrounded to rounded; 35% fine to coarse gravel; subrounded to rounded; 5% clay. Note: gravel is quartz, feldspar, and mafics. Same as above (240 ft).	1			•       •         •       •	20' connection.
250	-				Same as above (240 ft); 35% fine grav	vel.		•       • <t< td=""><td>•       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •</td><td></td></t<>	•       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •         •       •	
255	-				Same as above (240 ft); 35% fine grav	vel.	SW		- Portland Bentonite Cement	Drill stem chattering.
260					Same as above (240 ft); 35% coarse gravel.					Kelly down, new 20' connection. End of 9/15/15 @ 1817. Resume drilling @ 0820 on 9/16/15.
265	-				Same as above (240 ft); 35% fine grav	vel.		<ul> <li>•</li> <li>•&lt;</li></ul>		PID = 0.0 ppm @ breathing zone.
270								••	••	

(	Borehole ID: KAFB-106234										
Pro Pro	Client: US Army Corps of Engineers       Hole Diameter Upper (in.): 16         Project Location: KAFB, Albuquerque, NM       Hole Diameter Lower (in.): 14-3/4         Project Name: KAFB RAPID SWMU ST-106 and SS-111Surface Completion Type: Flush         Project Number: 500/133										
Da Da	Project Number: 500433       Groundwater Levels BGS (ft):         Date Started: 9/2/2015										
Y	Cool	d Elev rdinat rdinat	e:	n AMS	Dri	illing Me	ethoo	d: M	National Drilling ud Rotary Kessler	Page 10 of 24	
02 Depth (ft)	Sample Type	Number	Headspace PID	Lithologic Log	Material Description		U.S.C.S.		Well Diagram	Remarks	
275	_				Well-graded SAND with Gravel (SW brown (7.5YR 4/3); 55% very fine to coarse sand; subrounded to rounder 40% fine to coarse gravel; rounded; silt. Note: gravel is quartz, feldspar, mafics. Same as above (270 ft).	ed; ; 5% and	SW			PID = 0.0 ppm @ breathing zone.	
<u>280</u> 285	-				Silty SAND with Gravel (SM); brown (7.5YR 4/2); 50% very fine to coarse sand; subrounded to rounded; 20% to coarse gravel; angular to subroun 30% silt. Note: gravel is quartz, felds and mafics. Same as above (279 ft).	e fine nded; spar,	SM		- Portland Bentonite Cement	Kelly down @ 281 ft, new 20' connection.	
<u>290</u>	-				Well-graded SAND with Gravel (SW brown (7.5YR 4/3); 60% very fine to coarse sand; subrounded to rounder 35% fine to medium gravel; subrour to rounded; 5% silt. Note: gravel is quartz, feldspar, and mafics.	o :d; nded	SW		0       0         0       0		
<u>295</u> 300	-				Same as above (287 ft).			•     •       •     •       •     •       •     •       •     •       •     •       •     •       •     •       •     •       •     •       •     •       •     •       •     •       •     •       •     •       •     •       •     •       •     •       •     •	•       •         •       •	Rig chatter.	

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KAFB\_BOREHOLE\_LOG - SHAW\_DRILLING.GDT - 12/2/15 15:49 - Z:\KAFB RAPID\GINT\KAFB\_RAPID.GPJ

(	Borehole ID: KAFB-106234										
Pr Pr	ojec ojec	t Loca t Nam	ation ne: K	: KÁF (AFB	FB, Albuquerque, NM Hole RAPID SWMU ST-106 and SS-111Surfa	Dian	neter	·LOW	ver (ii	n.): 16 n.): 14-3/4 be: Flush	
Da Da	Project Number:       500433       Groundwater Levels BGS (ft):         Date Started:       9/2/2015       ☑ At Time of Drilling:       459.00         Date TD Reached:       10/1/2015       ☑ At End of Drilling:       Not Recorded         Date Completed:       ☑ After Drilling:       458.90										
Y	Coo	d Elev rdinat rdinat	e:	n AMS	Drillir		ethoo	d: M	lud R	tional Drilling otary sler	Page 11 of 24
00 Depth (ft)	Sample Type	Number	Headspace PID	Lithologic Log	Material Description		U.S.C.S.		Wel	Diagram	Remarks
305	-				Well-graded SAND with Gravel (SW); brown (7.5YR 4/3); 60% very fine to coarse sand; subrounded to rounded; 35% fine to coarse gravel; subrounded to rounded; 5% silt. Note: sand is quar and mafics. Gravel is quartz, feldspar, and mafics.	d (	SW	<ul> <li>•</li> <li>•&lt;</li></ul>			Kelly down @ 301 ft, new 20' connection.
	-				Poorly graded GRAVEL with Sand (GF brown (7.5YR 4/3); 60% coarse gravel subrounded to rounded; 35% very fine coarse sand; subrounded to rounded; 5% silt. Note: gravel is quartz, feldspan and mafics.	l; e to r,	GP				Constant rig chatter.
<u>310</u>	-				Well-graded SAND with Gravel (SW); dark brown (7.5YR 3/3); 60% very fine coarse sand; subrounded to rounded; 35% fine to coarse gravel; subrounded to rounded; 5% silt. Note: sand is quar Gravel is quartz, feldspar, and mafics.	e to d					PID = 0.0 ppm @ breathing zone.
315	-				Same as above (309 ft).					Portland Bentonite Cement	
320	-				Same as above (309 ft).		SW				Bit chatter. Kelly down @ 1045, new 20' connection.
325					Same as above (309 ft); 55% very fine coarse sand; 40% fine gravel.	e to					
330								••	• • • • • •		

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(	Borehole ID: KAFB-106234											
Pr Pr	ojec ojec	t Loca Nan	ation ne: k	: KÁF (AFB	FB, Albuquerque, NM Ho RAPID SWMU ST-106 and SS-111 <sub>SU</sub>	he Diar	meter		er (in.): 16 /er (in.): 14-3/4 n Type: Flush			
Da Da	Project Number: 500433       Groundwater Levels BGS (ft):         Date Started: 9/2/2015											
Y	Coo	d Elev rdinat rdinat	e:	n AMS	Dr	illing M	lethoo	d: M	National Drilling ud Rotary Kessler	Page 12 of 24		
05 Depth (ft)	Sample Type	Number	Headspace PID	Lithologic Log	Material Description		U.S.C.S.		Well Diagram	Remarks		
<u>330</u> <u>335</u> <u>340</u> <u>345</u> <u>355</u>					<ul> <li>Well-graded SAND with Gravel (SM dark brown (7.5YR 3/4); 60% very fi coarse sand; subrounded to rounde 35% fine to coarse gravel; angular t rounded; 5% silt. Note: sand and gra are quartz, feldspar, and mafics.</li> <li>Same as above (330 ft); 35% coarse gravel.</li> </ul>	e e e	SW		- Portland Bentonite Cement	PID = 0.0 ppm @         breathing zone.         Rig chatter.         Kelly down @ 1334, new 20' connection.         Rig chatter.         Rig chatter.         Rig chatter.         Rig chatter.         Rig chatter.         Rig chatter.		
360								••	••			

and being z bei	Borehole ID: KAFB-106234											
Date Started:       9/2/2015       Image: Construction of the start of th	Project Location: KAFB, Albuquerque, NM Hole Diameter Lower (in.): 14-3/4 Project Name: KAFB RAPID SWMU ST-106 and SS-111Surface Completion Type: Flush											
Y Coordinate:       Drilling Method: Mud Rotary Logged By: David Kessler         (1)       1       1         (2)       1       1         (3)       1       1         (3)       1       1         (3)       1       1         (4)       1       1         (5)       1       1         (6)       1       1         (7)       1       1         (8)       1       1         (9)       1       1         (10)       1       1         (11)       1       1         (11)       1       1         (11)       1       1         (11)       1       1         (11)       1       1         (11)       1       1         (11)       1       1         (11)       1       1         (11)       1       1         (11)       1       1         (11)       1       1         (11)       1       1         (11)       1       1         (11)       1       1         (11)	Content Started:       9/2/2015       Image: Started Started:       9/2/2015         Content TD Reached:       10/1/2015       Image: Started S											
380       Well-graded SAND with Gravel (SW); dark brown (7.5YR 3/4); 60% very fine to coarse sand; subrounded to rounded; 35% fine to coarse gravel; angular to rounded; 5% silt. Note: sand is quartz and mafics. Gravel is quartz, feldspar, and mafics.       SW         365       Same as above (360 ft); 35% coarse gravel.       SW         9001       Poorly graded SAND with Gravel (SP); brown (7.5YR 4/2); 60% fine sand; trace coarse sand; subrounded to rounded; 35% fine to coarse gravel; angular to rounded; 5% silt. Note: sand is quartz and mafics. Gravel is quartz, mafics, and feldspar.       - Top of 3/8" Bentonite Chip Seal         370       Same as above (368 ft); trace medium to coarse sand.       - Top of 3/8" Bentonite Chip Seal         375       Same as above (368 ft); trace medium to coarse sand.       - Top of 3/8" Bentonite Chip Seal         380       Poorly graded SAND (SP); brown (7.5YR 4/2); 85% very fine to fine sand; wherewhere the very fine to fine sand;	Page 13 of 24											
380       Well-graded SAND with Gravel (SW); dark brown (7.5YR 3/4); 60% very fine to coarse sand; subrounded to rounded; 35% fine to coarse gravel; angular to rounded; 5% silt. Note: sand is quartz and mafics. Gravel is quartz, feldspar, and mafics.       SW       SW         365       Same as above (360 ft); 35% coarse gravel.       SW       SW         9001/1       Same as above (360 ft); 35% coarse gravel.       SW       SW         9001/2       Same as above (360 ft); 35% coarse gravel.       SW         9001/2       So (7.5YR 4/2); 60% fine sand; trace coarse sand; subrounded to rounded; 35% fine to coarse gravel; angular to rounded; 5% silt. Note: sand is quartz and mafics. Gravel is quartz, mafics, and feldspar.       -Top of 3/8" Bentonite Chip Seal         375       Same as above (368 ft); trace medium to coarse sand.       SP         380       Poorly graded SAND (SP); brown (7.5YR 4/2); 85% very fine to fine sand; unwinded to rounded; 00 fine sand; unwinded to rounded; 00 fine sand;       SP	Remarks											
370       gravel.         370       Poorly graded SAND with Gravel (SP); brown (7.5YR 4/2); 60% fine sand; trace coarse sand; subrounded to rounded; 35% fine to coarse gravel; angular to rounded; 5% silt. Note: sand is quartz and mafics. Gravel is quartz, mafics, and feldspar.         375       Same as above (368 ft); trace medium to coarse sand.         380       Poorly graded SAND (SP); brown (7.5YR 4/2); 85% very fine to fine sand; coarse sand.         seal       SP         Bentonite Chip Seal       End of 9/ Begin dril bit mud ro coarse sand.	n @ 1459, new ection.											
380       Same as above (368 ft); trace medium to coarse sand.         9       SP         1       Poorly graded SAND (SP); brown (7.5YR 4/2); 85% very fine to fine sand; outprovided to rounded; 10% fine gravel;												
380       Poorly graded SAND (SP); brown       Begin drill         (7.5YR 4/2); 85% very fine to fine sand;       0901.												
Angular to rounded; 5% silt. Note: gravel is quartz, feldspar, and mafics.	16/15 @ 379 ft. ling with 12 1/4" otary on 9/17/15 m @ 381 ft, new ection.											
385												

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(	Borehole ID: KAFB-106234											
Pr Pr	Client:       US Army Corps of Engineers       Hole Diameter Upper (in.):       16         Project Location:       KAFB, Albuquerque, NM       Hole Diameter Lower (in.):       14-3/4         Project Name:       KAFB RAPID SWMU ST-106 and SS-111Surface Completion Type:       Flush											
Da	Project Number: 500433       Groundwater Levels BGS (ft):         Date Started: 9/2/2015											
Y	Coo	d Elev rdinat rdinat	e:	n AMS	I	Drilling M	lethod	ctor: Nation: Nation Mud Ro Avid Kesslo		Page 14 of 24		
065 Depth (ft)		Number	Headspace PID	Lithologic Log	Material Description		U.S.C.S.	Well I	Diagram	Remarks		
395	_				Poorly graded SAND (SP); brown (7.5YR 4/2); 85% very fine to fine subrounded to rounded; 10% fine angular to rounded; 5% silt. Note: is quartz, feldspar, and mafics. @ 391 ft. Poorly graded SAND wi Gravel (SP); brown (7.5YR 5/3); 7 fine sand; subrounded to rounded fine to coarse gravel; angular to subangular; 5% silt. Note: sand is and mafics. Gravel is quartz, felds and mafics.	sand; gravel; gravel th 70% d; 25%			3/8" Bentonite Chip Seal	Rig chatter.		
400					Same as above (391 ft); 60% fine 35% fine to coarse gravel. Same as above (391 ft); brown (7 4/3); 60% fine sand; 35% fine to c gravel.	'.5YR				Rig chatter; slowed drilling rate. PID = 0.0 ppm @ breathing zone. Kelly down @ 1002, new 20' connection.		
<u>405</u>	-						SP		Fop of 10/20			
410					Same as above (391 ft); brown (7 4/3); 60% fine sand; trace mediun coarse sand; 35% fine to coarse g	n to 🔰			Sand			
415	_				Same as above (391 ft); brown (7 4/3); 60% fine sand; trace mediun coarse sand; 35% fine to coarse g	n to 🔰			Fop of 8/12 Sand			
420								<u> 19 19 19 1</u>				

KAFB\_BOREHOLE\_LOG - SHAW\_DRILLING.GDT - 12/2/15 15:49 - Z:\KAFB RAPID\GINT\KAFB\_RAPID.GPJ

	Borehole ID: KAFB-106234										
Pro Pro	ojec ojec	t Loca t Nam	ation ne: k	: Káf (Afb i	<sup>-</sup> B, Albuquerque, NM RAPID SWMU ST-106 and SS-111 <sub>S</sub>	lole Diar lole Diar Surface (	meter meter Comp	Upper (in.): 16 Lower (in.): 14-3/4 letion Type: Flush			
Da Da	Project Number: 500433       Groundwater Levels BGS (ft):         Date Started: 9/2/2015										
Y	Cool	d Elev rdinate rdinate	e:	n AMS	L (ft): Not Recorded D	) rillling C )rilling M	contra ethod	ctor: National Drilling : Mud Rotary avid Kessler	Page 15 of 24		
05 Depth (ft)	Sample Type	Number	Headspace PID	Lithologic Log	Material Description		U.S.C.S.	Well Diagram	Remarks		
	_				Poorly graded SAND with Gravel (5 brown (7.5YR 4/2); 75% fine sand; subrounded to rounded; 20% fine g subrounded to rounded; 5% silt. No sand is quartz and mafics. Gravel is quartz, mafics, and feldspar.	gravel; ote:	SP				
425	-				Well-graded SAND with Gravel (SV brown (7.5YR 4/2); 65% fine to coa sand; subrounded to rounded; 30% to coarse gravel; angular to rounde silt. Note: sand is quartz and mafice	arse % fine ed; 5%	SW	- 8/12 Sand	PID = 0.0 ppm @		
430	-				Silty SAND (SM); 60% fine sand; subrounded to rounded; 10% fine g angular to subrounded; 30% silt. N sand is quartz and mafics. Gravel is quartz, feldspar, and mafics.	lote:	SM		breathing zone.		
435	-							<u>홍  동</u>	End of mud rotary drilling @ 435 ft on 9/17/15.		
440											
445											
450											

(	Borehole ID: KAFB-106234											
Pr Pr	Client: US Army Corps of Engineers       Hole Diameter Upper (in.): 16         Project Location: KAFB, Albuquerque, NM       Hole Diameter Lower (in.): 14-3/4         Project Name: KAFB RAPID SWMU ST-106 and SS-111Surface Completion Type: Flush         Project Number: 500433											
Da	Date Started:       9/18/2015         Date TD Reached:       10/1/2015         Date Completed:       ✓											
Y	Ground Elevation AMSL (ft): Not Recorded       Drilling Contractor: National Drilling         Y Coordinate:       Drilling Method: Mud, 94 mm core barrel         X Coordinate:       Logged By: David Kessler											
(ft) 5 Depth (ft)	Sample Type	Number	Headspace PID	Lithologic Log	Material Description	U.S.C.S.	We	II Diagram	Remarks			
440	-				<ul> <li>@ 435 ft. Poorly graded SAND (SP); brown (7.5YR 5/3); 95% fine sand; subrounded to rounded; trace fine gravel; 5% silt.</li> <li>@ 435.5 ft. Fat CLAY (CH); reddish brown (5YR 5/4); high plasticity; 100% clay.</li> <li>@ 436.2 ft. Poorly graded SAND with Silt (SP-SM); brown (7.5YR 5/3); 90% very fine to fine sand; subrounded to rounded; 10% silt.</li> <li>@ 436.6 ft. Well-graded SAND with Gravel (SW); brown (7.5YR 5/3); 60% fine to coarse sand; subrounded to rounded; 35% fine to coarse gravel; subrounded to rounded; 5% silt.</li> <li>@ 437 ft. No recovery.</li> </ul>	SP CH SP- SW SW		- Top of 8" Stainless Steel 0.050 Slot Screen	Begin coring with core barrel on 9/18/15 with 6" O.D. bit. @ 435 - 449 ft sand is quartz with occasional mafics. @ 436.6 - 437 ft gravel is quartz, mafics, and feldspar. @ 440 - 442.8 ft sediments are fining			
	-				<ul> <li>@ 440 ft. Poorly graded SAND (SP); brown (7.5YR 4/4); 95% fine sand; subrounded to rounded; 5% silt.</li> <li>@ 442.8 ft. Well-graded GRAVEL with Silt and Sand (GW-GM); brown (7.5YR 4/4); 50% fine to coarse gravel; subrounded; 40% fine to coarse sand;</li> </ul>	SP GW- GM/			<ul> <li>upwards and laminated.</li> <li>@ 440.52 ft cobble to 1-5/8"; subangular; sandstone.</li> <li>@ 442.8 - 449 ft gravel is quartz, mafics, and feldspars with occasional granite and quartzite.</li> </ul>			
<u>445</u>					<ul> <li>angular to rounded; 10% silt.</li> <li>@ 443.1 ft. No recovery.</li> <li>@ 445 ft. Silty GRAVEL (GM); brown (7.5YR 5/3); 60% fine to coarse gravel; subrounded; 10% fine to coarse sand; subrounded to rounded; 30% silt.</li> <li>@ 446.7 ft. No recovery.</li> </ul>	GM			@ 445 - 446.7 ft the percentage of silt decreases with depth.			
450	-				<ul> <li>@ 447.5 ft. Poorly graded SAND with Gravel (SP); brown (7.5YR 5/3); 80% fine to medium sand; trace coarse sand; subrounded to rounded; 15% fine to coarse gravel; subrounded to rounded; 5% silt.</li> <li>@ 449 ft. No recovery.</li> </ul>	SP						

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Pro Pro	ojec ojec	t Loca Nam	ation ne: K	: KÁI (AFB	<sup>-</sup> B, Albuquerque, NM Hole D RAPID SWMU ST-106 and SS-111Surface	ameter	r Upper (in.): 16 r Lower (in.): 14-3/4 bletion Type: Flush	
Da Da Da Gro	te S te T te C oun	Compl	d: 9/ ache eted: vatior	18/20 d: 10	15 ♀ At 17/2015 ♀ At 17/2015 ♀ At 17/2015 ♀ At 17/2015 ♀ At 17/2015 ♀ At 17/2015 ♀ At	Time of End of er Drilli Contra	Levels BGS (ft): f Drilling: 459.00 Drilling: Not Recorded ng: 458.90 actor: National Drilling d: Mud, 94 mm core ba	
ХС		rdinat					David Kessler	Page 17 of 24
5 Depth (ft)	Sample Type	Number	Headspace PID	Lithologic Log	Material Description	U.S.C.S.	Well Diagram	Remarks
					@ 450 ft. Well-graded SAND with Silt and Gravel (SW-SM); brown (7.5YR	SW- SM		End of 9/18/15 @ 450 ft. Resume coring @ 1030
-	-				<ul> <li>5/3); 70% fine to coarse sand; 20% coarse gravel; 10% silt.</li> <li>@ 450.7 ft. Silty SAND with Gravel (SM) brown (7.5YR 5/4); 50% fine to coarse sand; subrounded to rounded; 20% gravel; 30% silt; trace clay.</li> <li>@ 451.7 ft. Same as above (450.7 ft); 20% very coarse gravel to 40 mm; subrounded to rounded.</li> <li>@ 452 ft. Same as above (450.7 ft);</li> </ul>			on 9/23/15. @ 450 - 464.2 ft sand is quartz with occasional granite, mafics, and feldspar. Gravel is quartz with occasional mafics.
455	-				brown (7.5YR 4/4); 60% fine to coarse sand; 15% coarse gravel to 40 mm; 25% silt. @ 453.9 ft. No recovery. @ 455 ft. Silty SAND with Gravel (SM); brown (7.5YR 4/4); 70% fine to coarse sand; subrounded to rounded; 15% coarse gravel to 40 mm; 15% silt.	SM SP- SM		
460	-				<ul> <li>@ 455.8 ft. Poorly graded SAND with Sil (SP-SM); brown (7.5YR 5/3); 90% fine sand; subrounded to rounded; trace fine gravel; 10% silt.</li> <li>@ 456.5 ft. No recovery.</li> </ul>	t	- 8" Stainless Steel 0.050 Slot Screen	@ 456.5 ft driller states that coring feels like gravel. Gravel was likely pushed aside instead of recovered, causing loss of core sample.
_					@ 461.4 ft. Poorly graded SAND (SP); brown (7.5YR 5/3); 95% fine sand; trace	SP		
					medium sand; subrounded to rounded; 5% silt.	GM		
-					@ 461.9 ft. Silty GRAVEL with Sand (GM); brown (7.5YR 5/4); 50% fine to coarse gravel; subrounded to rounded 35% fine to coarse sand; subrounded to rounded; 15% silt.	SP		
465					@ 462.5 ft. Poorly graded SAND (SP); dark brown (7.5YR 3/3); 95% fine sand;			

	C	BI			Bor	eho	le ID	: KAFB-	106234			
Pro Pro	ojec ojec	t Loca t Nam	ation ne: k	: KÁI (AFB	<sup>-</sup> B, Albuquerque, NM Hole D RAPID SWMU ST-106 and SS-111Surfac 433	iameter e Comp	letion Ty	in.): 14-3/4 /pe: Flush				
Da	Project Number: 500433       Groundwater Levels BGS (ft):         Date Started: 9/18/2015											
Y	Ground Elevation AMSL (ft): Not Recorded       Drilling Contractor: National Drilling         Y Coordinate:       Drilling Method: Mud, 94 mm core barrel         X Coordinate:       Logged By: David Kessler											
5 Depth (ft)		Number	Headspace PID	Lithologic Log	Material Description	U.S.C.S.	We	II Diagram	Remarks			
470	_				trace coarse sand; trace fine gravel; subrounded to rounded; 5% silt. @ 466.2 ft. Well-graded GRAVEL with Silt and Sand (GW-GM); brown (7.5YR 4/3); 60% fine to coarse gravel; subrounded to rounded; 30% fine to coarse sand; 10% silt. @ 466.5 ft. No recovery. @ 467.5 ft. Well-graded SAND with Gravel (SW); brown (7.5YR 4/3); 80% fine to coarse sand; 15% fine to coarse gravel; 5% silt. @ 468 ft. Well-graded GRAVEL with Silt				<ul> <li>@ 465 - 479.4 ft sand is quartz with occasional mafics. Gravel is quartz with occasional mafics.</li> <li>@ 468.4 ft driller reported drilling in gravel, which likely caused loss of core.</li> </ul>			
475	-				and Sand (GW-GM); brown (7.5YR 4/3); 70% fine to coarse gravel to 40 mm; subrounded to rounded; 20% coarse sand; trace fine and medium sand; 10% silt. @ 468.4 ft. No recovery. @ 472.5 ft. Poorly graded SAND with Si (SP-SM); brown (7.5YR 4/3); 90% fine sand; subrounded; trace gravel; 10% silt @ 474.7 ft. No recovery. @ 475 ft. Silty SAND (SM); brown (7.5YR 4/3); 80% fine sand; subrounded to rounded; trace coarse gravel; 20% silt	lt SP- t. SM		- 8" Stainless Steel 0.050 Slot Screen	@ 474.6 - 474.7 ft clay lense. End of 9/23/15 @ 475 ft. Resume drilling on 9/24/15. @ 476.1 ft silt lense, 7 mm thick			
480	-				<ul> <li>@ 476.6 ft. No recovery.</li> <li>@ 477.5 ft. Silty SAND (SM); brown (7.5YR 4/3); 85% fine sand; subrounded to rounded; 15% silt.</li> <li>@ 478.4 ft. Fat CLAY (CH); yellowish brown (10YR 5/4); hard; medium plasticity; 100% clay.</li> <li>@ 478.7 ft. Lean CLAY (CL); reddish</li> </ul>	SM CH CL SM			mm thick. @ 476.5 ft silt lense, 5 mm thick. Two 5 mm clay nodules.			

	C	BI					le ID: KAFB	-106234				
Pr Pr	ojec ojec	t Loca t Nam	ation: ie: k	: KÁI (AFB	FB, Albuquerque, NM Hole Dia RAPID SWMU ST-106 and SS-111Surface 433	ameter Comp						
Da Da	Project Number: 500433       Groundwater Levels BGS (ft):         Date Started: 9/18/2015											
Y	Ground Elevation AMSL (ft): Not Recorded       Drilling Contractor: National Drilling         Y Coordinate:       Drilling Method: Mud, 94 mm core barrel         X Coordinate:       Logged By: David Kessler											
8 Depth (ft)	Sample Type	Number	Headspace PID	Lithologic Log	Material Description	U.S.C.S.	Well Diagram	Remarks				
					brown (2.5YR 4/3); low plasticity; 95% clay; 5% gravel. @ 479 ft. Silty SAND (SM); brown	SM CL		@ 480 - 494.8 ft sand is quartz with occasional mafics.				
	_				<ul> <li>(7.5YR 4/3); 80% fine sand; subrounded to rounded; 20% silt.</li> <li>@ 479.4 ft. No recovery.</li> <li>@ 480 ft. Silty SAND (SM); brown</li> <li>(7.5YR 5/3); 80% fine to coarse sand; subrounded to rounded; 20% silt.</li> <li>@ 480.7 ft. Lean CLAY with Sand (CL); reddish brown (5YR 5/4); low plasticity; 80% clay; 20% very fine sand; rounded.</li> </ul>	SP		@ 483.5 - 484 ft sediment is laminated.				
<u>485</u>	-				<ul> <li>@ 480.8 ft. No recovery.</li> <li>@ 482.5 ft. Poorly graded SAND (SP); brown (7.5YR 5/3); 95% fine sand; subrounded to rounded; 5% silt.</li> <li>@ 484.3 ft. No recovery.</li> <li>@ 485 ft. Poorly graded SAND (SP); brown (7.5YR 5/3); 95% fine sand; subrounded to rounded; 5% silt.</li> <li>@ 486.1 ft. No recovery.</li> </ul>	SP	- 8" Stainless	<ul> <li>@ 485.65 - 485.7 ft laminations observed.</li> <li>@ 486 ft drilling through gravels; weathered sandstone; white (10YR 8/1).</li> </ul>				
	-				@ 487.6 ft. Poorly graded SAND with Silt (SP-SM); brown (7.5YR 5/3); 90% fine sand; subrounded to rounded; 10% silt. @ 488 ft. Lean CLAY with Sand (CL); reddish brown (2.5YR 4/4); low plasticity; 80% clay; 20% fine sand; trace gravel to 30 mm.	SM CL SP-	Steel 0.050 Slot Screen	@ 488 ft texture is blocky.				
490	-				<ul> <li>@ 489.3 ft. Poorly graded SAND with Silt (SP-SM); brown (7.5YR 5/3); 90% fine sand; subrounded to rounded; 10% silt.</li> <li>@ 489.9 ft. No recovery.</li> <li>@ 490 ft. Silty SAND with Gravel (SM); dark brown (7.5YR 3/3); 65% fine to coarse sand; subrounded to rounded;</li> </ul>	SM		@ 490 - 494.8 ft sediment is fining upward.				
495	_				<ul> <li>15% fine to coarse gravel; rounded; 20% silt.</li> <li>@ 491.8 ft. No recovery.</li> <li>@ 492.5 ft. Poorly graded SAND with Silt (SP-SM); brown (7.5YR 4/3); 90% fine to medium sand; trace coarse sand; subrounded to rounded; trace gravel to 45 mm; 10% silt.</li> </ul>			@ 492.6 ft cobble.				

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Pr Pr	ojec ojec	ct Loca	ation: ne: K	KAF AFB	<sup>-</sup> B, Albuquerque, NM Hole D RAPID SWMU ST-106 and SS-111Surface 433	iameter e Comp		
Da Da Da	ate S ate T ate C	Starteo TD Re Compl	d: 9/2 acheo eted:	18/20 d: 10	15 ⊈ At /1/2015 ⊈ At ⊈ At	Time of End of	_evels BGS (ft): Drilling: 459.00 Drilling: Not Recordeng: 458.90	ed
Y	Coo	nd Elev ordinat ordinat	e:	AMS	Drilling	Method	ictor: National Drillin I: Mud, 94 mm core avid Kessler	
6 Depth (ft)		Number	Headspace PID	Lithologic Log	Material Description	U.S.C.S.	Well Diagram	Remarks
500	-				<ul> <li>@ 494.8 ft. No recovery.</li> <li>@ 495 ft. Well-graded SAND with Silt (SW-SM); brown (7.5YR 4/2); 90% fine to coarse sand; subrounded to rounded; trace gravel; 10% silt.</li> <li>@ 496.2 ft. Poorly graded SAND with Sil (SP-SM); brown (7.5YR 4/2); 90% fine sand; subrounded to rounded; trace gravel; 10% silt.</li> <li>@ 496.3 ft. No recovery.</li> <li>@ 497.5 ft. Well-graded GRAVEL (GW); 100% fine to coarse gravel to 24 mm.</li> <li>@ 497.7 ft. No recovery.</li> </ul>	GW		<ul> <li>@ 495 - 507.8 ft sand is quartz with occasional mafics.</li> <li>@ 496.3 ft lost what appeared to be saturated sands.</li> <li>@ 497.5 ft sand and silt likely washed out from core sample.</li> <li>@ 497.7 ft drilling through gravels. All core lost during core rod and drill stem removal.</li> </ul>
505	_				<ul> <li>@ 502.5 ft. Well-graded GRAVEL (GW); 100% gravel; rounded.</li> <li>@ 502.7 ft. SILT (ML); light reddish brown (2.5YR 6/3); hard; low plasticity; 85% silt; trace clay; 10% fine sand; rounded; 5% fine gravel; rounded.</li> <li>@ 503.1 ft. Well-graded SAND with Silt (SW-SM); 90% sand; trace gravel; 10% silt.</li> <li>@ 503.5 ft. Poorly graded SAND (SP); 95% sand; 5% silt.</li> <li>@ 504.1 ft. No recovery.</li> <li>@ 505 ft. Poorly graded GRAVEL with Sand (GP); brown (7.5YR 4/3); 60% fine to coarse sand; 5% silt.</li> <li>@ 507.5 ft. Poorly graded GRAVEL with Sand (GP); brown (7.5YR 4/3); 60% fine gravel to 25 mm; subrounded; 35% fine to coarse sand; 5% silt.</li> <li>@ 507.5 ft. Poorly graded GRAVEL with Sand (GP); brown (7.5YR 4/3); 60% fine gravel to 25 mm; subrounded; 35% fine to coarse sand; 5% silt.</li> </ul>	GP	-8" Stainless Steel 0.050 Slot Screen	End of 9/24/15 @ 502.5 ft. Resume drilling on 9/25/15. Silt and sand fraction washed away. @ 504.1 ft gravel encountered. @ 505.6 ft gravel encountered. @ 507.8 ft gravel encountered.
510					@ 507.8 ft. No recovery.			

C	Borehole ID: KAFB-106234											
Proje Proje	Client:       US Army Corps of Engineers       Hole Diameter Upper (in.):       16         Project Location:       KAFB, Albuquerque, NM       Hole Diameter Lower (in.):       14-3/4         Project Name:       KAFB RAPID SWMU ST-106 and SS-111Surface Completion Type:       Flush											
Date Date Date Groun Y Coo	Project Number: 500433       Groundwater Levels BGS (ft):         Date Started: 9/18/2015       ✓ At Time of Drilling: 459.00         Date TD Reached: 10/1/2015       ✓ At End of Drilling: Not Recorded         Date Completed:       ✓ After Drilling: 458.90         Ground Elevation AMSL (ft): Not Recorded       Drilling Contractor: National Drilling         Y Coordinate:       Drilling Method: Mud, 94 mm core barrel         X Coordinate:       David Kessler											
1 Depth (ft) Sample Type			Lithologic Log	Material Description	N.S.C.S.	Well Diagram	Remarks					
-			<u>_</u> (	<ul> <li>@ 510 ft. Poorly graded GRAVEL with Sand (GP); brown (7.5YR 4/3); 60% fine gravel; subrounded; 35% fine to coarse sand; 5% silt.</li> <li>@ 510.2 ft. No recovery.</li> </ul>	GP		@ 510.2 ft gravel encountered.					
515			000	<ul> <li>@ 512.5 ft. Poorly graded GRAVEL with Sand (GP); brown (7.5YR 4/3); 60% fine gravel; subrounded; 35% fine to coarse sand; 5% silt.</li> <li>@ 512.8 ft. No recovery.</li> </ul>	GP		@ 512.8 ft very coarse pebble in shoe of core barrel.					
520				<ul> <li>@ 517.5 ft. Poorly graded GRAVEL (GP); brown (7.5YR 4/2); 95% fine gravel to 4 mm; subangular to subrounded; 5% silt.</li> <li>@ 518.1 ft. Poorly graded SAND with Silt and Gravel (SP-SM); brown (7.5YR 4/2); 60% fine sand; rounded; 30% coarse gravel; 10% silt.</li> </ul>	GP SP- SM	- 8" Stainless Steel 0.050 Slot Screen	End of 9/25/15 @ 517.5 ft. Resume coring on 9/26/15. @ 518.1 - 520.6 ft sand is quartz.					
				<ul> <li>@ 518.3 ft. No recovery.</li> <li>@ 520.1 ft. SILT (ML); brown (7.5YR 4/2); nonplastic; 90% silt; 10% very fine to fine sand.</li> <li>@ 520.2 ft. Well-graded SAND with Gravel (SW); brown (7.5YR 5/4); 65% fine to coarse sand; subrounded to rounded; 30% fine to coarse gravel; subangular to subrounded; 5% silt.</li> <li>@ 520.6 ft. No recovery.</li> </ul>	ML SW		<ul> <li>@ 520 ft gravel encountered.</li> <li>@ 520.6 ft loose, wet sand and gravel encountered.</li> <li>@ 522.5 ft gravel within coring interval caused core barrel thread sheering.</li> </ul>					
525												

KAFB\_BOREHOLE\_LOG - SHAW\_DRILLING.GDT - 12/2/15 15:54 - Z:\KAFB RAPID\GINT\KAFB\_RAPID.GPJ

	0	BI			Bor	eho	le ID: KAFB	-106234
Pro Pro	ojec ojec	t Loca t Nam	ation: ne: K	: KÁI (AFB	<sup>-</sup> B, Albuquerque, NM Hole D RAPID SWMU ST-106 and SS-111Surfac	iamete	r Upper (in.): 16 r Lower (in.): 14-3/4 oletion Type: Flush	
Da Da	te S te T	<b>t Nur</b> Startec D Rea Comple	d: 9/ ache	18/20 d: 10	15 ∑ At /1/2015 ∑ At	Time o End of	Levels BGS (ft): f Drilling: 459.00 Drilling: Not Recorde ing: 458.90	d
Y	Cool	d Elev rdinate rdinate	e:	n AMS	L (ft): Not Recorded Drilling Drilling	Contra Metho	actor: National Drilling d: Mud, 94 mm core i David Kessler	
55 Depth (ft)	Sample Type	Number	Headspace PID	Lithologic Log	Material Description	U.S.C.S.	Well Diagram	Remarks
	_				<ul> <li>@ 525 ft. Poorly graded GRAVEL with Silt and Sand (GP-GM); brown (7.5YR 4/2); 60% fine gravel to 8 mm; subangular to subrounded; 30% fine to coarse sand; 10% silt.</li> <li>@ 525.6 ft. Poorly graded SAND with Sil (SP-SM); brown (7.5YR 4/2); dense;</li> </ul>	GP- GM SP- SM/		<ul> <li>@ 525 - 537.2 ft gravel is quartz, mafics, and occasional granite.</li> <li>@ 525.6 - 537.2 ft sand is quartz and mafics.</li> <li>@ 525.9 ft gravel encountered.</li> </ul>
530	-				90% fine sand; subangular to subrounded; 10% silt. @ 525.9 ft. No recovery. @ 527.5 ft. Poorly graded GRAVEL with Sand (GP); brown (7.5YR 4/2); loose; 70% fine gravel to 4 mm; subrounded to rounded; 25% fine to coarse sand; subrounded to rounded; 5% silt.			@ 528.5 ft gravel encountered.
	-				* * * * * * * * * * * * * * * * * *	<ul> <li>@ 528.5 ft. No recovery.</li> <li>@ 530 ft. Well-graded SAND with Grave (SW); dark brown (7.5YR 3/3); 65% very fine to coarse sand; subrounded to rounded; 30% fine to coarse gravel to 35 mm; subrounded; 5% silt.</li> <li>@ 530.4 ft. No recovery.</li> </ul>	,	
	-				<ul> <li>@ 532.5 ft. Well-graded GRAVEL with Sand (GW); gray (7.5YR 6/1); 50% fine to coarse gravel; subrounded to rounded; 45% fine to coarse sand; subrounded to rounded; 5% silt.</li> <li>@ 533.7 ft. No recovery.</li> </ul>	GW	- 8" Stainless Steel 0.050 Slot Screen	End of 9/26/15 @ 532.5 ft. Resume drilling on 9/28/15. @ 532.5 ft portions of the gravel are cemented with calcium carbonate.
535	_			, • •	@ 535 ft. Well-graded GRAVEL with Sand (GW); gray (7.5YR 6/1); 50% fine to coarse gravel; subrounded to rounded; 45% fine to coarse sand;	GW		<ul> <li>@ 533.7 ft sand was washed away and gravel not recovered.</li> <li>@ 535 ft hard to very hard conglomerate rock; calcite-cemented.</li> </ul>
	-				subrounded to rounded; 5% silt. @ 535.2 ft. No recovery. @ 536.5 ft. Well-graded SAND with Silt and Gravel (SW-SM); dark brown (7.5YR 3/2); 60% very fine to coarse sand; subrounded to rounded; 30% fine to coarse gravel to 35 mm; subrounded; 10% silt. @ 537.2 ft. No recovery.	SW- SM		@ 536.5 - 536.55 ft silt lense; gray (7.5YR 5/1). @ 537.2 ft gravel obstructed sample collection.
540							- Bottom of	

E						Borehole ID: KAFB-106234			
Pro Pro	Client:       US Army Corps of Engineers       Hole Diameter Upper (in.):       16         Project Location:       KAFB, Albuquerque, NM       Hole Diameter Lower (in.):       14-3/4         Project Name:       KAFB RAPID SWMU ST-106 and SS-111Surface Completion Type:       Flush								
Da Da	Project Number: 500433       Groundwater Levels BGS (ft):         Date Started: 9/18/2015								
Y	Ground Elevation AMSL (ft):       Not Recorded       Drilling Contractor:       National Drilling         Y Coordinate:       Drilling Method:       Mud, 94 mm core barrel         X Coordinate:       Logged By:       David Kessler       Page 23 of 24								
5 Depth (ft)	Sample Type	Number	Headspace PID Lithologic Log	Material Description		U.S.C.S.	Well Diagram	Remarks	
	_			@ 540 ft. Poorly graded GRAVEL Sand (GP); dark brown (7.5YR 3/ fine gravel; angular to subrounde very fine to coarse sand; angular subrounded; 5% silt.	/2); 55% ed; 40%		Screen	End of continuous coring @ 540 ft on 9/28/15. @ 540 - 556 ft sand is quartz and mafics. Gravel is quartz, mafics, and granite.	
545	-			@ 545 ft. Same as above (540 ft) fine gravel to 6 mm; angular.	); 55%	GP	- Bottom of Sump	Very hard drilling from 547 - 556 ft.	
<u>550</u>	-			@ 550 ft. Same as above (540 ft) fine gravel; angular; 20% very fin coarse sand.				Reamed borehole using 12-1/4" bit from 435 - 550 ft on 9/26/15 through 9/28/15.	

KAFB\_BOREHOLE\_LOG - SHAW\_DRILLING.GDT - 12/2/15 15:54 - Z:\KAFB RAPID\GINT\KAFB\_RAPID.GPJ

CBI					Во	Borehole ID: KAFB-106234					
Pro Pro	Client: US Army Corps of Engineers       Hole Diameter Upper (in.): 16         Project Location: KAFB, Albuquerque, NM       Hole Diameter Lower (in.): 14-3/4         Project Name: KAFB RAPID SWMU ST-106 and SS-111Surface Completion Type: Flush										
Project Number: 500433 Date Started: 9/18/2015 Date TD Reached: 10/1/2015 Date Completed:					15 ♀ A 17 ♀ A 17 ♀ A 17 ♀ A 17 ♀ A	Groundwater Levels BGS (ft):					
YC	Ground Elevation AMSL (ft): Not Recorded Dri Y Coordinate: Dri						Drilling Contractor: National Drilling Drilling Method: Mud, 94 mm core barrel Logged By: David Kessler Page 24 of 24				
55 Depth (ft)	Sample Type	Number	Headspace PID	Lithologic Log	Material Description	U.S.C.S.	Well Diagram	Remarks			
					@ 555 ft. Poorly graded GRAVEL with Sand (GP); dark brown (7.5YR 3/2); 80 fine gravel; angular; 20% very fine to	% GP					
-	-				∖coarse sand; angular to subrounded. /		Bottom of Filter Pack/Bottom of Hole	Total depth = 556 ft bgs. Reached total depth on 10/1/15. Reamed borehole using 14-3/4" bit from 83 - 556 ft on 9/30/15 through 10/1/15.			
560											
-	_										
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565	-										
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570											