DEPARTMENT OF THE AIR FORCE
HEADQUARTERS 377TH AIR BASE WING (AFMC)

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JAN 2011
NMED Hazardous Waste Bureau

Colonel Robert L. Maness
377 ABW/CC
2000 Wyoming Blvd SE
Kirtland AFB NM 87117-5000

Mr. John Kieling
Hazardous Waste Bureau
New Mexico Environment Dept
2905 Rodeo Park Dr East, Bldg 1
Santa Fe NM 87505-6303

Mr. Kieling

Kirtland AFB is submitting a well completion report for the installation of two groundwater monitor wells at Kirtland Air Force Base restoration site ST-105 TCE as an electronic copy as requested.

Groundwater monitor wells KAFB-2008 and 2009 were installed to investigate groundwater upgradient and downgradient of the site. Monitoring of the groundwater will be conducted on a quarterly basis as proposed in the approved workplan, with reports of the analytical results submitted as separate documents.

If you have any questions with regard to this submittal, please contact Mr. Mark Holmes, 377 MSG/CEANR, (505) 846-9005.

Sincerely

ROBERT L. MANESS, Colonel, USAF
Commander

Attachment:
Electronic copy of the Well Completion Report

Attachments for Distribution:
1. Well Completion Report (Atch 1)
2. Electronic copy of the Well Completion Report (Atch 2)

KAFB3544

cc:
NMED HWB, Mr. McDonald, w/ Atchs 1 and 2
NMED HWB-Chief, Mr. Bearzi, w/o Atchs
USEPA-Region 6 (6PD-N), Ms. King, w/o Atchs
HQ AFMC/A7CVQ, Mr. Fort, w/o Atchs
AFCEE/EXEC, Mr. Litman, w/o Atchs
CH2M Hill, Ms. Jarocki, w/o Atchs
Admin Record, CNM Montoya Campus, w/ Atch 2 only
AR/IR, w/ Atch 2 only
File

KIRTLAND AIR FORCE BASE, NEW MEXICO

Well Completion Report for Monitoring Wells KAFB-2008 and KAFB-2009, Installed at Area of Concern ST-105, Trichloroethene-Contaminated Groundwater

December 2010

377 MSG/CEANR
2050 Wyoming Blvd. SE
Kirtland AFB, New Mexico 87117-5670

CH2M HILL
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4041 Jefferson Plaza NE
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Tel 505.884.5600
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CH2MHILL

8 December 2010

Mr. Mark Holmes
KAFB 377 MSG/CEANR
2050 Wyoming Boulevard, S.E.
Kirtland Air Force Base, NM 87117-5270

Subject: Well Completion Report for Groundwater Monitoring Wells KAFB-2008 and KAFB-2009 Installed at Area of Concern ST-105, Trichloroethene-Contaminated Groundwater at Kirtland Air Force Base, New Mexico

Dear Mr. Holmes:

From 27 September through 2 November 2010, CH2M HILL installed, developed, and surveyed two groundwater monitoring wells associated with Area of Concern ST-105, Trichloroethene-Contaminated Groundwater located within the Central Training Academy Area of Kirtland Air Force Base. This letter and its attachments make up the Well Completion Report for monitoring wells KAFB-2008 and KAFB-2009.

Monitoring wells KAFB-2008 and KAFB-2009 were installed in accordance with the *Installation Restoration Program Voluntary Corrective Measure Sampling and Analysis Plan for Area of Concern ST-105, TCE-Contaminated Groundwater* (2006) and the *Voluntary Corrective Measure Sampling and Analysis Plan Addendum July 2009, Area of Concern ST-105, Trichloroethene-Contaminated Groundwater* (2009). These work plans were approved by the New Mexico Environment Department (NMED)-Hazardous Waste Bureau (HWB) in letters dated 16 May 2006 and 25 November 2009.

Lithologic logs were prepared by the onsite geologist during borehole drilling and are included as Attachment 1. Well completion diagrams were prepared by the onsite geologist and are included as Attachment 2. Well development logs were prepared by the onsite geologist and are included as Attachment 3. Monitoring wells KAFB-2008 and KAFB-2009 were surveyed by a New Mexico Licensed Surveyor; survey results are included as Attachment 4.

The information included in this Well Completion Report was prepared under my direction according to a system designed to assure that qualified personnel properly gather and evaluate the information submitted and that the document received appropriate senior technical review. Please feel free to contact me if you have any questions or comments regarding this letter or its attachments.

Sincerely,
CH2M HILL, Inc.

Karen E. Jarocki, P.G.
Project Manager

Attachments:

1 Lithologic Logs for Groundwater Monitoring Wells KAFB-2008 and KAFB-2009
2 Well Completion Diagrams for Groundwater Monitoring Wells KAFB-2008 and KAFB-2009
3 Well Development Logs for Groundwater Monitoring Wells KAFB-2008 and KAFB-2009
4 Survey Results for Groundwater Monitoring Wells KAFB-2008 and KAFB-2009

cc: Mr. Michael Litman/AFCEE
file

Attachment 1
Lithologic Logs for Groundwater Monitoring Wells
KAFB-2008 and KAFB-2009

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PROJECT NUMBER	BORING NUMBER	
407243	KAFB-2008	SHEET 1 OF 12

SOIL BORING LOG

PROJECT :	ST-105, TCE-Contaminated Groundwater	LOCATION :	Central Training Academy
ELEVATION :	5539.37 ft (ground surface)	COORDINATES :	N1,457,382.7969; E1,562,425.4298
DRILLING METHOD AND EQUIPMENT USED :	ARCH Speedstar 50K	DRILLING CONTRACTOR :	WDC Wells & Exploration, Del Leavitt (driller)
WATER LEVEL :	652' bgs	START : 09/28/2010 END : 10/15/2010	LOGGER : Eli Ludwig/CH2M HILL

DEPTH BELOW SURFACE (FT)	INTERVAL (FT)	RECOVERY (FT/IN)	NUMBER AND TYPE	DRILL PIPE/ CASING (FT)	SOIL DESCRIPTION: SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY, CONSISTENCY, SOIL STRUCTURE, MINERALOGY.	COMMENTS: DEPTH OF CASING, DRILLING RATE, TESTS, INSTRUMENTATION, SAMPLE ID, AND ORGANIC VAPOR READING (PID)
0			GS-01		Well graded gravel with sand (GW), yellowish brown (10 YR 5/4), dry, loose, 60% fine gravel, subrounded, 40% fine to medium sand, some silt.	09/28/2010 1130 Started drilling with 13" tooth drill bit with 13 3/8" drive casing (ARCH) to a depth of 240' bgs.
10	DC-01 (0-20')	good		13 3/8" drive casing		
			GS-02		Sandy silt (ML), yellowish brown (10 YR 5/4), dry, loose, 60% silt, 40% fine to medium sand, silt is low to medium plasticity.	DC-01 no hammer.
20						1143 DC-01 down
			GS-03		Well graded gravel (GW), light yellowish brown (10 YR 6/4), dry, loose, 70% fine gravel, 20% coarse gravel, 10% medium sand, gravel is subangular.	1156 DC-02 start DC-02 some hammering
30	DC-02 (20'-40')	good		13 3/8" drive casing		
			GS-04		Well graded gravel (GW), light yellowish brown (10 YR 6/4), dry, loose 70% coarse gravel, 30% fine gravel, 10% sand, subangular.	
40						1225 DC-02 down
			GS-05		Same as above.	1235 DC-03 start
50	DC-03 (40'-60')	good		13 3/8" drive casing		
			GS-06		Sandy silt with gravel (ML), brownish yellow (10 YR 6/6), dry, loose, 5% silt, 30% fine to medium sand, 20% fine gravel, subangular, low plasticity.	
60						1242 DC-03 down

CH2MHILL

PROJECT NUMBER	BORING NUMBER	
407243	KAFB-2008	SHEET 2 OF 12

SOIL BORING LOG

PROJECT :	ST-105, TCE-Contaminated Groundwater	LOCATION :	Central Training Academy
ELEVATION :	5539.37 ft (ground surface)	COORDINATES :	N1,457,382.7969; E1,562,425.4298
DRILLING METHOD AND EQUIPMENT USED :	ARCH Speedstar 50K	DRILLING CONTRACTOR :	WDC Wells & Exploration, Del Leavitt (driller)
WATER LEVEL :	652' bgs	START : 09/28/2010 END : 10/15/2010	LOGGER : Eli Ludwig/CH2M HILL

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60			GS-07		Same as above.	1250 DC-04 start
70	DC-04 (60'-80')	good		13 3/8" drive casing		
			GS-08		Well graded sand (SW), very pale brown (10 YR 7/3), dry, loose, 80% fine sand, 15% medium sand, 5% gravel.	
80						1300 DC-04 down
			GS-09		Well graded gravel (GW), very pale brown (10 YR 7/3), dry, loose, 60% coarse gravel, 30% fine gravel, 10% sand, gravel is angular to subangular.	1313 DC-05 start
90	DC-05 (80'-100')	good		13 3/8" drive casing		
			GS-10		Well graded sand (SW), pale brown (10 YR 6/3), dry, loose, 70% fine sand, 25% silt, 5% gravel.	
100						1329 DC-05 down
			GS-11		Well graded sand with gravel (SW), pale yellow brown (10 YR 6/3), dry, loose, 50% fine sand, 20% medium to coarse sand, 10% silt, 10% gravel.	1339 DC-06 start
110	DC-06 (100'-120')	good		13 3/8" drive casing		
			GS-12			
120						1345 DC-06 down

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PROJECT NUMBER	BORING NUMBER	
407243	KAFB-2008	SHEET 3 OF 12

SOIL BORING LOG

PROJECT :	ST-105, TCE-Contaminated Groundwater	LOCATION :	Central Training Academy
ELEVATION :	5539.37 ft (ground surface)	COORDINATES :	N1,457,382.7969; E1,562,425.4298
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WATER LEVEL :	652' bgs	START : 09/28/2010 END : 10/15/2010	LOGGER : Eli Ludwig/CH2M HILL

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120			GS-13		Same as above.	1355 DC-07 start
130	DC-07 (120'-140')	good	GS-14	13 3/8" drive casing		
140						1408 DC-07 down
			GS-15		Well graded sand with gravel (SW), light yellowish brown (10 YR 6/4), dry, loose, 60% fine sand, 20% gravel, 10% silt, 10% medium to coarse sand.	1418 DC-08 start
150	DC-08 (140'-160')	good	GS-16	13 3/8" drive casing	Same as above.	
160						1425 DC-08 down
			GS-17			1435 DC-09 start
170	DC-09 (160'-180')	good	GS-18	13 3/8" drive casing	Well graded gravel with sand (GW), brownish yellow, (10 YR6/6), dry, loose, 60% fine to coarse gravel, 30% medium sand, 10% silt, gravel is subangular.	
180						1444 DC-09 down

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PROJECT NUMBER	BORING NUMBER	
407243	KAFB-2008	SHEET 4 OF 12

SOIL BORING LOG

PROJECT :	ST-105, TCE-Contaminated Groundwater	LOCATION :	Central Training Academy
ELEVATION :	5539.37 ft (ground surface)	COORDINATES :	N1,457,382.7969; E1,562,425.4298
DRILLING METHOD AND EQUIPMENT USED :	ARCH Speedstar 50K	DRILLING CONTRACTOR :	WDC Wells & Exploration, Del Leavitt (driller)
WATER LEVEL :	652' bgs	START : 09/28/2010	END : 10/15/2010
			LOGGER : Eli Ludwig/CH2M HILL

DEPTH BELOW SURFACE (FT)	INTERVAL (FT)	RECOVERY (FT/IN)	NUMBER AND TYPE	DRILL PIPE/ CASING (FT)	SOIL DESCRIPTION: SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY, CONSISTENCY, SOIL STRUCTURE, MINERALOGY.	COMMENTS: DEPTH OF CASING, DRILLING RATE, TESTS, INSTRUMENTATION, SAMPLE ID, AND ORGANIC VAPOR READING (PID)
180			GS-19		Well graded sand with gravel, pale brow (10 YR 6/3), dry, loose, 70% fine to medium sand, 30% fine gravel.	1453 DC-10 start
190	DC-10 (180'-200')	good		13 3/8" drive casing		
			GS-20			
200						1505 DC-10 down
			GS-21		Poorly graded sand (SP), yellowish brown (10 YR 5/4), dry, loose, 80% fine sand, 10% medium sand, 5% silt, 5% fine gravel.	1514 DC-11 start
210	DC-11 (200'-220')	good		13 3/8" drive casing		
			GS-22		Well graded gravel, light yellowish brown (10 YR 6/4), dry, loose, 70% coarse gravel, 20% fine gravel, 10% fine sand, subangular.	
220						1526 DC-11 down
			GS-23		Silt with gravel (ML), very pale brown (10 YR 7/4), dry, loose, 70% coarse silt, 20% fine gravel, 10 % fine sand, low to medium plasticity.	1540 DC12 start
230	DC-12 (220'-240')	good		13 3/8" drive casing		
			GS-24			
240						09/28/2010 1554 DC-12 down

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PROJECT NUMBER	BORING NUMBER	
407243	KAFB-2008	SHEET 5 OF 12

SOIL BORING LOG

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WATER LEVEL :	652' bgs	START : 09/28/2010 END : 10/15/2010	LOGGER : Eli Ludwig/CH2M HILL

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240					Well graded sand with gravel, pale brown (10 YR 6/3), dry, loose, 70% fine sand, 10% medium sand, <10% silt, 15% gravel.	09/29/2010 1210 DC-13 start 13 3/8" drive casing landed at 240' bgs. Started drilling with 11 1/4" mill tooth bit with 11 3/4" drive casing advancement to a depth of 450'.
			GS-25			
250	DC-13 (240'-260')	good		11 3/4" drive casing		
			GS-26			
260						1235 DC-13 down
			GS-27		Well graded gravel with sand, pale brown (10 YR 6/3), dry, 60% fine gravel, 10% fine gravel, 10% fine sand, 10% silt, 10% medium sand.	1242 DC-14 start
270	DC-14 (260'-280')	good		11 3/4" drive casing		
			GS-28			
280						1250 DC-14 down
			GS-29		Sandy silt (ML), brown (10 YR 5/3), dry, loose, 70% coarse silt, 20% fine sand, 10% fine gravel, low plasticity.	1300 DC-15 start
290	DC-15 (280'-300')	good		11 3/4" drive casing		
			GS-30			
300						1308 DC-15 down

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PROJECT NUMBER	BORING NUMBER	
407243	KAFB-2008	SHEET 6 OF 12

SOIL BORING LOG

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ELEVATION :	5539.37 ft (ground surface)	COORDINATES :	N1,457,382.7969; E1,562,425.4298
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WATER LEVEL :	652' bgs	START : 09/28/2010 END : 10/15/2010	LOGGER : Eli Ludwig/CH2M HILL

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300			GS-31		Silt with sand (ML), yellowish brown (10 YR 5/4), dry, 50% coarse silt, 15% fine sand, 5% fine gravel, silt is low to medium plasticity.	1314 DC-16 start
310	DC-16 (300'-320')	good	GS-32	11 3/4" drive casing		
320						1324 DC-16 down
		good	GS-33		Well graded gravel (GW), very pale brown (10 YR 7/3), dry, loose, 60% fine gravel, 30% coarse gravel, 10% medium to coarse sand, subangular.	1330 DC-17 start
330	DC-17 (320'-340')	poor	GS-34	11 3/4" drive casing		Poor recovery due to air leak in hammer. Rig shut down from 1342 to 1428 for repairs. Welding done on rig Poor recovery due to air leak in hammer. Rig shut down from 1342 to 1428 for repairs. Welding done on rig hot permit notified.
340						1342 DC-17 down
350	DC-18 (340'-360')		GS-35	11 3/4" drive casing	Silt (ML), brown (10 YR 5/3), dry, loose, 85% coarse silt, 10% fine sand, 5% coarse sand, low plasticity.	1434 DC-18 start
			GS-36			
360						1447 DC-18 down

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PROJECT NUMBER	BORING NUMBER	
407243	KAFB-2008	SHEET 7 OF 12

SOIL BORING LOG

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360			GS-37		Silt with gravel (ML), yellowish brown (10 YR 5/4), dry, loose, 60% coarse silt, 30% fine to coarse gravel, 10% fine sand, low plasticity.	1459 DC-19 start
370	DC-19 (360'-380')		GS-38	11 3/4" drive casing		
380						1508 DC-19 down
			GS-39		Same as above.	1517 DC-20 start
390	DC-20 (380'-400')	good	GS-40	11 3/4" drive casing		
400						1526 DC-20 down
			GS-41		Silty sand (SM), pale brown (10 YR 6/3), dry, loose, 70% fine to medium sand, 20% coarse silt, 10% fine gravel, low plasticity.	1533 DC-21 start
410	DC-21 (400'-420')	good	GS-42	11 3/4" drive casing		
420						1548 DC-21 down

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PROJECT NUMBER	BORING NUMBER	
407243	KAFB-2008	SHEET 8 OF 12

SOIL BORING LOG

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420		fair	GS-43		Poorly graded sand (SP), light gray (10 YR 7/2), dry, loose, 80% fine to medium sand, 10% coarse sand, 5% fine gravel, 5% silt.	1602 DC-22 start
430	DC-22 (420'-440')	fair	GS-44	11 3/4" drive casing		
440						1625 DC-22 down
			GS-45		Poorly graded sand (SP), light gray (10 YR 7/1), loose, dry, 90% fine to medium sand, 10% coarse sand to fine gravel, angular,appears to be bedrock: quartz, feldspar (both k-spar and plagioclase), some dark minerals (biotite), igneous type of rock.	1635 DC-23 start Slow drilling.
450	DC-23 (440'-460')	fair	GS-46	11 3/4" drive casing		1700 Slow drilling 09/29/2010 1730 Stopped drilling, bedrock is at 445' bgs. 9/30/2010 1300 Started drilling with 11" button bit, Bottom of drive casing at 450' bgs, driller removed 5' from 20' drive casing
460						1310 DC-23 down
		poor	GS-47		Poorly sorted sand (SP), yellowish brown (10 YR 5/4), dry, fine grained sand.	1455 Start open hole at 450' bgs Driller completed several "wiper passes"
470	DC-24 (460'-480')	poor	GS-48	open hole		Driller often loses air circulation, thus recovery is poor. Medium to hard drilling.
480						1520 down

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PROJECT NUMBER	BORING NUMBER	
407243	KAFB-2008	SHEET 9 OF 12

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480		poor	GS-49		Drill cuttings from 460' to 510' vary during different phases of work as driller had problem during open hole drilling. Had problems during open hole drilling. It is difficult to determine if the lithology is unconsolidated material or weathered rock from 460' to 510' as both types of cuttings have been collected from the cyclone. It is possible that we are or have drilled through the Sandia Fault from 460' to 510' bgs.	1530 start
490	DC-25 (480'-500')	poor	GS-50	open hole		Poor air circulation. 1600 Driller having a hard time, bit seems stuck at around 490' bgs.
500	DC-26 (500'-510')		GS-51	9 5/8" drive casing	Cuttings from 500' to 510' are primarily gravel pack material that the driller added to the hole on previous days to unstick the drill bit.	09/30/2010 to 10/06/2010 Bit stuck. 10/07/2010 0830 Started drilling using 9 5/8" drive casing since open hole was not working well, rock is unconsolidated. Driller takes his time so that all cuttings are removed from hole.
510						0940 DC-26 down
520	DC-27 (510'-530')	good	GS-52		Weathered granite, well graded sand with silt and gravel (SW-SM), light yellowish brown (10 YR 6/4), dry, loose, 50% fine-medium sand, 30% silt, coarse, cohesive, 20% well graded gravel, broken, angular pieces of granite.	0956 DC-27 started Dry to 522' bgs.
		good	GS-53		Same as above, except moist, dark yellowish brown (6 YR 4/4).	Moist at 522' bgs.
530						1030 DC-27 down
540	DC-27 (530'-550')	poor	GS-54	9 5/8" drive casing		1035 DC-28 start 1115 Driller reports issues with bit rotation due to coars of granite getting stuck between bit and borehole. Driller adds water to hole.

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PROJECT NUMBER	BORING NUMBER	
407243	KAFB-2008	SHEET 10 OF 12

SOIL BORING LOG

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540		good	GS-55	9 5/8" drive casing	Well graded sand with silt and gravel (SW-SM), dark yellowish brown (10YR 4/4), moist-wet, loose, 50% well graded sand, 10% coarse silt, 40% well graded gravel, gravel is crushed up granite.	1250 drilling resumes Moist
550						1310 DC-28 down
			GS-56		Same as above except: 25% silt, 25% fine gravel.	1318 DC-29 start Moist
560	DC-29 (550'-570')			9 5/8" drive casing		
			GS-57			Moist
570						1340 DC-29 down
		good	GS-58		Same as above.	1352 DC-30 start Moist
580	DC-30 (570'-590')			9 5/8" drive casing		Moist
		good	GS-59		Granite, light gray (10 YR 7/2), dry, crushed granite, sand, 1" sized cuttings.	Dry
590					Well graded sand with silt and gravel (SW-SM), pale yellowish brown (10 YR 4/4), moist, loose, 50% well graded sand, 30% silt-coarse, 20% gravel-well graded coarse sand and granite, pulverized granite.	Moist 1413 DC-30 down
		good	GS-60	9 5/8" drive casing	Weathered granite.	Moist
600	DC-30 (590'-610')					

CH2MHILL

PROJECT NUMBER	BORING NUMBER	
407243	KAFB-2008	SHEET 11 OF 12

SOIL BORING LOG

PROJECT :	ST-105, TCE-Contaminated Groundwater	LOCATION :	Central Training Academy
ELEVATION :	5539.37 ft (ground surface)	COORDINATES :	N1,457,382.7969; E1,562,425.4298
DRILLING METHOD AND EQUIPMENT USED :	ARCH Speedstar 50K	DRILLING CONTRACTOR :	WDC Wells & Exploration, Del Leavitt (driller)
WATER LEVEL :	652' bgs	START : 09/28/2010 END : 10/15/2010	LOGGER : Eli Ludwig/CH2M HILL

DEPTH BELOW SURFACE (FT)	INTERVAL (FT)	RECOVERY (FT/IN)	NUMBER AND TYPE	DRILL PIPE/ CASING (FT)	SOIL DESCRIPTION SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY, CONSISTENCY, SOIL STRUCTURE, MINERALOGY.	COMMENTS DEPTH OF CASING, DRILLING RATE, TESTS, INSTRUMENTATION, SAMPLE ID, AND ORGANIC VAPOR READING (PID)
600		good	GS-61	9 5/8" drive casing	Same as above.	Moist
610						1440 DC-31 down
		good	GS-62		Well graded with silt and sand (GW-GM), dark yellowish brown (10 YR 4/6), moist, loose, 50% well graded gravel, 35% medium-fine sand, 15% silt, pieces of broken granite 0.5" to 1".	1445 DC-32 start
620	DC-32 (610'-630')	good	GS-63			
630						1504 DC-32 down
		good	GS-64		well graded sand (SW), dark brown (10 YR 3/3), moist, loose, 80% fine to coarse sand, 15% fine gravel, 5 % silt, does not appear to be decomposed granite.	1515 DC-33 start
640	DC-33 (630'-650')	good	GS-65			Moist
650						1542 DC-33 down
		poor	GS-66	9 5/8" drive casing	Silt with sand (ML), dark brown (10 YR 3/3), wet 80% medium plasticity silt, 20% medium sand.	1555 DC-34 start Wet (water tagged at 652' bgs on 10/13/2010). Driller started adding water.
660	DC-34 (650'-670')					

CH2MHILL

PROJECT NUMBER	BORING NUMBER	
407243	KAFB-2008	SHEET 12 OF 12

SOIL BORING LOG

PROJECT :	ST-105, TCE-Contaminated Groundwater	LOCATION :	Central Training Academy
ELEVATION :	5539.37 ft (ground surface)	COORDINATES :	N1,457,382.7969; E1,562,425.4298
DRILLING METHOD AND EQUIPMENT USED :	ARCH Speedstar 50K	DRILLING CONTRACTOR :	WDC Wells & Exploration, Del Leavitt (driller)
WATER LEVEL :	652' bgs	START : 09/28/2010 END : 10/15/2010	LOGGER : Eli Ludwig/CH2M HILL

DEPTH BELOW SURFACE (FT)	INTERVAL (FT)	RECOVERY (FT/IN)	NUMBER AND TYPE	DRILL PIPE/ CASING (FT)	SOIL DESCRIPTION: SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY, CONSISTENCY, SOIL STRUCTURE, MINERALOGY.	COMMENTS: DEPTH OF CASING, DRILLING RATE, TESTS, INSTRUMENTATION, SAMPLE ID, AND ORGANIC VAPOR READING (PID)
660		fair	GS-67	9 5/8" drive casing	Weathered bedrock as poorly graded gravel (GP), light gray (10 YR 7/1), fine grained gravel, gravel is fragments of weathered granite, subangular to angular, some fragments have fresh surfaces due to drill bit pulverizing rock, minerals includequartz, plagioclase, k-feldspar, biotite, some green colored minerals, some silt noted with	PID = 0.0 Driller only drills 2' then cleans hole by circulating water. Driller does not have a feel on how hard the rock is.
670						1640 DC-34 down
		good	GS-68			1647 DC-35 start
680	DC-35 (670'-690')			9 5/8" drive casing		
		good	GS-69			
					Total depth	Total depth = 688' bgs 10/07/2010 1735 DC-35 down
690						
700						
700						

CH2MHILL

PROJECT NUMBER	BORING NUMBER	
407243	KAFB-2009	SHEET 1 OF 2

SOIL BORING LOG

PROJECT :	ST-105, TCE-Contaminated Groundwater	LOCATION :	Manzano Weapons Storage Area
ELEVATION :	5,650.83 ft (ground surface)	COORDINATES :	N1,457,611.0004; E1,564,508.2147
DRILLING METHOD AND EQUIPMENT USED :	ARCH/Open hole, down hole hammer	DRILLING CONTRACTOR :	WDC Wells & Exploration, Del Leavitt (driller)
WATER LEVEL :	79 ft bgs	START : 10/15/2010	END : 10/15/2010
LOGGER :	Eli Ludwig/CH2M HILL		

DEPTH BELOW SURFACE (FT)	INTERVAL (FT)	RECOVERY (FT/IN)	NUMBER AND TYPE	DRILL PIPE/ CASING (FT)	SOIL DESCRIPTION SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY, CONSISTENCY, SOIL STRUCTURE, MINERALOGY.	COMMENTS DEPTH OF CASING, DRILLING RATE, TESTS, INSTRUMENTATION, SAMPLE ID, AND ORGANIC VAPOR READING (PID)
0					Well graded sand with gravel, (10 YR 6/2) light brownish gray, dry, loose, 60% well graded sand, 40% fine to coarse gravel, gravel is granitic.	1010 Started Drilling
					Weathered bedrock, light gray (10 YR 7/2), dry, loose.	
10	DC-01 (0-20')	good		9 5/8" drill casing		
					Bedrock, light gray (10 YR 7/1), competent rock, dry, quartz, plagioclase, k-feldspar, biotite, cuttings as well graded gravel with sand.	Bedrock. Driller wants to advance 20' of drive casi down but slow drilling.
20						1055 DC-01 down
						1105 DP-02 start
30	DP-02 (20'-40')	good		8 1/2" drill pipe open hole	Bedrock, same as above.	
40						1125 DP-02 down
						1132 DP-03 start
50	DP-03 (40'-60')	good		8 1/2" drill pipe open hole		
60						1155 DP-03 down

CH2MHILL

PROJECT NUMBER	BORING NUMBER	
407243	KAFB-2009	SHEET 2 OF 2

SOIL BORING LOG

PROJECT :	ST-105, TCE-Contaminated Groundwater	LOCATION :	Manzano Weapons Storage Area
ELEVATION :	5,650.83 ft (ground surface)	COORDINATES :	N1,457,611.0004; E1,564,508.2147
DRILLING METHOD AND EQUIPMENT USED :	ARCH/Open hole, down hole hammer	DRILLING CONTRACTOR :	WDC Wells & Exploration, Del Leavitt (driller)
WATER LEVEL :	79 ft bgs	START : 10/15/2010 END : 10/15/2010	LOGGER : Eli Ludwig/CH2M HILL

DEPTH BELOW SURFACE (FT)	INTERVAL (FT)	RECOVERY (FT/IN)	NUMBER AND TYPE	DRILL PIPE/ CASING (FT)	SOIL DESCRIPTION: SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY, CONSISTENCY, SOIL STRUCTURE, MINERALOGY.	COMMENTS: DEPTH OF CASING, DRILLING RATE, TESTS, INSTRUMENTATION, SAMPLE ID, AND ORGANIC VAPOR READING (PID)
60					Bedrock, same as above.	1203 DP-04 start
70	DP-04 (60'-80')	good		8 1/2" drill pipe open hole		
						Cuttings wet at 79 ' bgs.
80						1230 DP-04 down
						1237 DP-05 start
90	DP-05 (80'-100')	good		8 1/2" drill pipe open hole		
						Hole produces significant water during drilling.
100						1310 DP-05 down
						1340 DP-06 start
	DP-06 (100'-110')	good		8 1/2" drill pipe open hole		PID=0.0
						Total depth: 110' ft bgs
110						1400 DP-06 down 10/15/2010
120						

Attachment 2
Well Completion Diagrams for Groundwater Monitoring Wells
KAFB-2008 and KAFB-2009

CH2MHILL	PROJECT NUMBER 407243	WELL NUMBER KAFB-2008	SHEET 1 OF 1

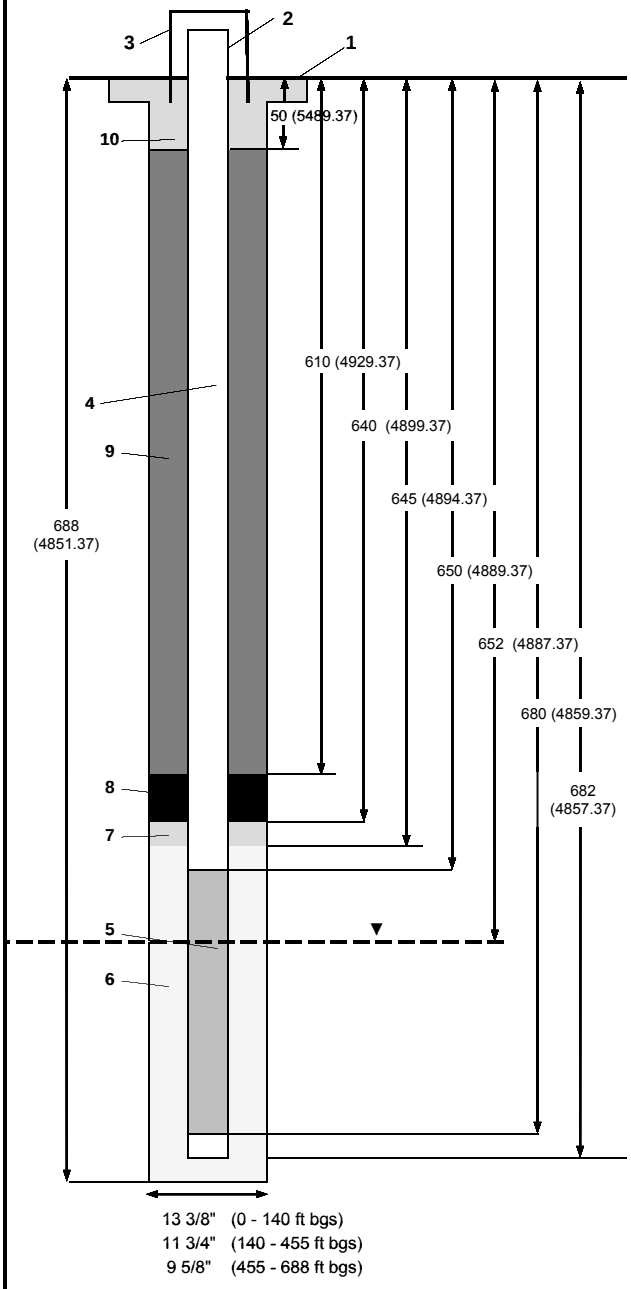
WELL COMPLETION DIAGRAM

PROJECT : ST-105, TCE-Contaminated Groundwater — LOCATION : Central Training Academy

DRILLING CONTRACTOR : WDC-Peralta, New Mexico — COORDINATES : N1,457,382.7969, E1,562,425.4298

DRILLING METHOD AND EQUIPMENT USED : ARCH Speed Star 50K — DRILLER: Del Leavitt/WDC

WATER LEVEL : 652' — START : 9/28/2010 — END : 10/15/2010 — LOGGER : Eli Ludwig/CH2M HILL



Not to scale

1-	Ground elevation at well	5,539.37
2-	Top of PVC casing elevation	5,541.77
	a) protective cover elevation	5,542.33
3-	Wellhead protection cover type	monument completion, padlock
	a) weep hole?	no
	b) concrete pad dimensions	4' x 4'
4-	Dia./type of well casing	5" schedule 80 PVC, flush thread
5-	Type/slot size of screen	5" schedule 80 PVC, 0.010" slot, flush thread
6-	Type screen filter	10/20 Colorado Silica Sand
	a) calculated volume	21.74 cubic feet
	b) actual volume installed	31 cubic feet
	c) placement	tremie pipe
7-	Transition sand	20/40 Colorado Silica Sand
	a) calculated volume	2.53 cubic feet
	b) actual volume installed	3 cubic feet
	c) placement	tremie pipe
8-	Type of seal	hydrated bentonite chips
	a) calculated volume	15.17 cubic feet
	b) actual volume installed	23 cubic feet
	c) placement	tremie pipe
9-	Type of seal	bentonite slurry
	a) calculated volume	405.7 cubic feet
	b) actual volume installed	462 cubic feet
	c) placement	tremie pipe
10-	Cement	
	a) cement mix used	portland cement grout
	b) calculated volume	49.07 cubic feet
	c) actual volume installed	162 cubic feet
	d) placement	tremie pipe
	Development method	swabbing, bailing, pumping
	Estimated purge volume	96 gallons
	Development time	11 hours

Comments: Borehole drilled to 688' bgs. Depths are provided in feet (ft) below ground surface (bgs) and in elevation above sea level. Wet drill cuttings at 650 ft bgs, water came up to 593 ft bgs at the start of well development indicating the well is under confined conditions.

CH2MHILL	PROJECT NUMBER 407243	WELL NUMBER KAFB-2009	SHEET 1 OF 1

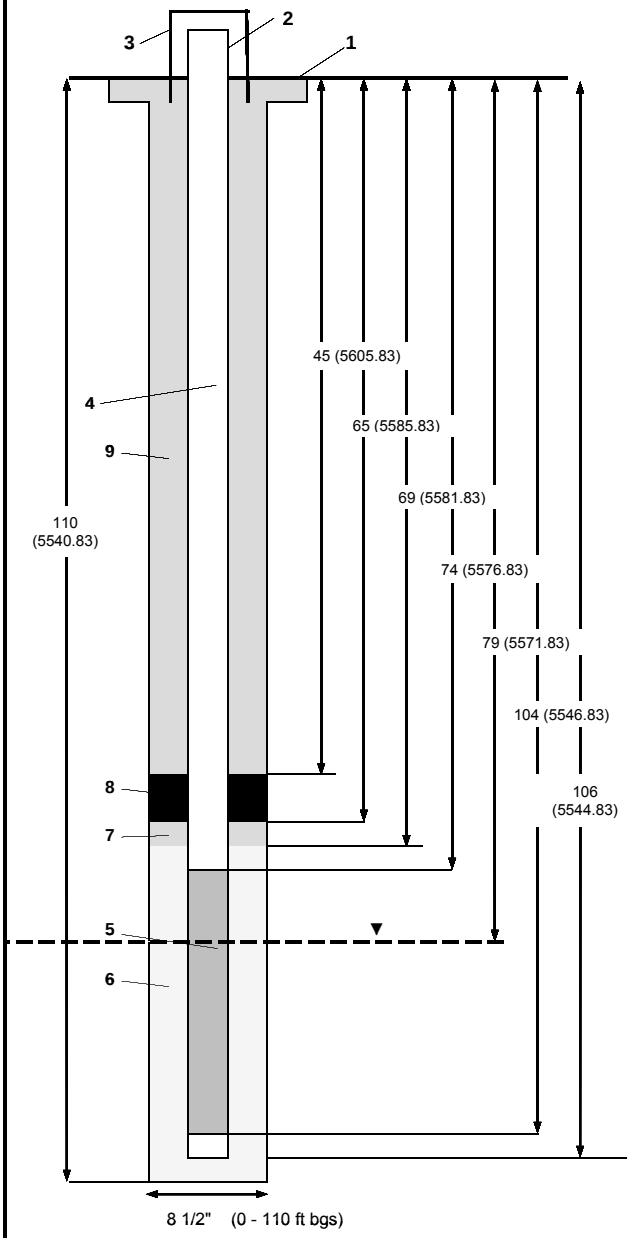
WELL COMPLETION DIAGRAM

PROJECT : ST-105, TCE-Contaminated Groundwater — LOCATION : Manzano Weapons Storage Area

DRILLING CONTRACTOR : WDC-Peralta, New Mexico — COORDINATES : N1,457,611.0004; E1,564,508.2147

DRILLING METHOD AND EQUIPMENT USED : Down-hole hammer Speed Star 50K — DRILLER: Del Leavitt/WDC

WATER LEVEL : 79' — START : 10/15/2010 — END : 10/15/2010 — LOGGER : Eli Ludwig/CH2M HILL



Not to scale

1-	Ground elevation at well	5,650.83
2-	Top of casing elevation	5,652.96
	a) protective cover elevation	5,653.57
3-	Wellhead protection cover type	monument completion, padlock
	a) weep hole?	no
	b) concrete pad dimensions	4' x 4'
4-	Dia./type of well casing	4" schedule 80 PVC, flush thread
5-	Type/slot size of screen	4" schedule 80 PVC, 0.010" slot, flush thread
6-	Type screen filter	10/20 Colorado Silica Sand
	a) calculated volume	16.25 cubic feet
	b) actual volume installed	24 cubic feet
	c) placement	tremie pipe
7-	Transition sand	20/40 Colorado Silica Sand
	a) calculated volume	1.59 cubic feet
	b) actual volume installed	2 cubic feet
	c) placement	tremie pipe
8-	Type of seal	hydrated bentonite chips
	a) calculated volume	7.93 cubic feet
	b) actual volume installed	12 cubic feet
	c) placement	tremie pipe
9-	Type of seal	portland cement grout
	a) calculated volume	17.84 cubic feet
	b) actual volume installed	27 cubic feet
	c) placement	tremie pipe
	Development method	swabbing, bailing, pumping
	Estimated purge volume	52 gallons
	Development time	4 hours

Comments: Borehole drilled to 110' bgs.
Depths provided in feet (ft) below ground surface (bgs) and in elevation above sea level.

Attachment 3
Well Development Logs for Groundwater Monitoring Wells
KAFB-2008 and KAFB-2009

CH2MHILL

PROJECT NUMBER	WELL ID
407243	KAFB-2008

WELL DEVELOPMENT FIELD DATA SHEET

PROJECT: ST-105 TCE Contaminated Groundwater LOCATION: Central Training Academy

WEATHER (wind/temp/ppt): cool, partly cloudy OTHER NOTABLE FIELD CONDITIONS:

INITIAL ORGANIC VAPOR METER READINGS:

INITIAL DEPTH TO WATER: 593.5' btoc TOTAL DEPTH OF WELL 682' bgs SCREENED INTERVAL: 650'-680' bgs

PURGE VOLUME CALCULATIC 96 gallons

METHOD OF PURGING: Submersible pump

DISPOSITION OF DISCHARGE WATER: Temporarily staged in polyethylene storage tank near monitoring well KAFB-2007

MONITORING EQUIPMENT USED: U-22 CH #C101991, Turbidimeter CH #C102246

Well Purging Information

Date 10/18/2010 Time	Total volume (gals)	± 2° Temp (°C)	± 0.1 pH	3% Conductivity (mS/cm)	10% or <10 Turbidity (NTU)	± 0.3 DO	± 10 mv ORP	Remarks (color, odor, sheen, sediment, etc.)
0820	tag DTW and TD							
	DTW = 593.5' btoc (pvc)		TD = 681.5' btoc (pvc)					
	2'5" of pvc (2.4' ~ 2'5")							
	682 + 2.4 = 684.4';		684.4' - 681.5' = 2.9' of sand/mud in hole					
	100 gallons bailed from well							
1436	pump on							
1443	start of water							
1449	measured flow second time at 19 sec/gal; ~3gpm							
1500	at 1gpm							
1520	very low flow							
1521	pump off							50 gallons pumped from well

Sample Information

SAMPLE DATE: SAMPLE TYPE: grab composite SAMPLE MATRIX:

SAMPLING PERSONNEL: SPLIT SAMPLES OBTAINED BY:

SAMPLING METHOD: SAMPLE TEMP/pH/EC/TURB/DO:

SAMPLE ID(s): DUPLICATE/BLANK SAMPLE ID(s):

NOTABLE OBSERVATIONS (color, odor, sand, headspace, etc.):

Sample ID	Sample Time	Sample Containers No.	Sample Containers Volume/Type	Preservatives (ice, acids, bases, others)	Analytical Method	Laboratory	Comments

Initials of sampling personnel: MB

CH2MHILL

PROJECT NUMBER	WELL ID
407243	KAFB-2008

WELL DEVELOPMENT FIELD DATA SHEET

PROJECT: ST-105 TCE Contaminated Groundwater LOCATION: Central Training Academy

WEATHER (wind/temp/ppt): cool, partly cloudy OTHER NOTABLE FIELD CONDITIONS:

INITIAL ORGANIC VAPOR METER READINGS:

INITIAL DEPTH TO WATER: 593.5' btoc TOTAL DEPTH OF WELL 682' bgs SCREENED INTERVAL: 650'-680' bgs

PURGE VOLUME CALCULATIC 96 gallons

METHOD OF PURGING: Submersible pump

DISPOSITION OF DISCHARGE WATER: Temporarily staged in polyethylene storage tank near monitoring well KAFB-2007

MONITORING EQUIPMENT USED: U-22 CH #C101991, Turbidimeter CH #C102246

Well Purging Information

Date 10/19/2010 Time	Total volume (gals)	± 2° Temp (°C)	± 0.1 pH	3% Conductivity (mS/cm)	10% or <10 Turbidity (NTU)	± 0.3 DO	± 10 mv ORP	Stabilization Requirements Remarks (color, odor, sheen, sediment, etc.)
0730	0	pump turned on, flow set to 0.5 gpm						
0749	9	totalizer at 264802 (not sure it measures <1gmp flow)						
0845	37				790			
0915	52				142			0.5 gpm
0933	61				81.3			set up U-22
0943	66	23.61	7.71	0.486	47.8	0.63	181	
0955	72	23.98	8.00	0.485	44.0	0.58	158	
1010	80	23.98	8.04	0.486	29.4	0.55	155	0.5 gpm (2:08 to fill 1 gal)
1020	85	24.24	8.06	0.488	29.0	0.49	147	
1030	90	24.46	8.04	0.483	26.6	0.52	147	0.5 gpm (2:09 to fill 1 gal)
1040	95	24.56	8.06	0.481	30.2	0.45	141	Stable except for turbidity
1050	100	25.07	8.04	0.485	33.8	0.45	142	0.5 gmp (2:10 to fill 1 gal)
1100	105	25.19	8.06	0.486	43.3	0.40	136	
1104	107	25.33	8.04	0.490	44.2	0.42	138	
1110	Sample collected							
1112	Field duplicate collected							
1145	Trip blank collected							
			Note: Calibration error for DO, [6] according to manual - deteriaration of the diagram and internal solution of DO sensor, or DO sensor is unstable. No remedy taken; readings may be compromised.					

Sample Information

SAMPLE DATE: 10/19/2010 SAMPLE TYPE: grab SAMPLE MATRIX: H_2O

SAMPLING PERSONNEL: M. Brislen SPLIT SAMPLES OBTAINED BY: none

SAMPLING METHOD: submersible pump SAMPLE TEMP/pH/EC/TURB/DO: see 1104 readings

SAMPLE ID(s): ST105-GW-2008-19102010 DUPLICATE/BLANK SAMPLE ID(s): ST105-GW-2008-19102010-99

NOTABLE OBSERVATIONS (color, odor, sand, headspace, etc.):

Sample ID	Sample Time	Sample Containers No.	Sample Containers Volume/Type	Preservatives (ice, acids, bases, others)	Analytical Method	Laboratory	Comments
GW-2008	1110	3	VOA 40ml	HCl	8260	PEL	
		1	250ml poly	unpreserved	300.1	PEL	Bromide, Fluoride, Chloride, Sulfate, Nitrate
GW-2008-99	1112	3	VOA 40ml		8260	PEL	
		1	250ml poly	unpreserved	300.1	PEL	Bromide, Fluoride, Chloride, Sulfate, Nitrate
TB-19102010	1145	2	VOA 40ml	HCl	8260	PEL	trip blank

Initials of sampling personnel: MB

CH2MHILL

PROJECT NUMBER	WELL ID
407243	KAFB-2009

WELL DEVELOPMENT FIELD DATA SHEET

PROJECT: ST-105 TCE Contaminated Groundwater LOCATION: Monzano Weapons Storage Area

WEATHER (wind/temp/ppt): clear, windy OTHER NOTABLE FIELD CONDITIONS:

INITIAL ORGANIC VAPOR METER READINGS:

INITIAL DEPTH TO WATER: 65.8 btoc TOTAL DEPTH OF WELL: 106' bgs SCREENED INTERVAL: 74' to 104' bgs

PURGE VOLUME CALCULATIO 52 gallons

METHOD OF PURGING: Submersable pump

DISPOSITION OF DISCHARGE WATER: Temporarily staged in polyethylene storage tank near monitoring well KAFB-2007

MONITORING EQUIPMENT USED: U-22 CH #C101991, Turbidimeter CH #C102246

Well Purging Information

Date 10/19/2010 Time	Total volume (gals)	± 2° Temp (°C)	± 0.1 pH	3% Conductivity (mS/cm)	10% or <10 Turbidity (NTU)	± 0.3 DO	± 10 mv ORP	Remarks (color, odor, sheen, sediment, etc.)
	50 gallons bailed from well							
1609	Pump set at 106' btoc (pvc)							
1615	Pump on at 2.5 gpm							
1622	Flow adjusted to 2 gpm							
1625	Flow adjusted to 1 gpm				106.00			
1631	30				97.40			1 gpm
1640	39				83.90			
1648	47				73.10			1 gpm
1654	53				63.80			
1658	57				68.40			1 gpm
1700	Pump off							

Sample Information

SAMPLE DATE: SAMPLE TYPE: grab composite SAMPLE MATRIX:

SAMPLING PERSONNEL: SPLIT SAMPLES OBTAINED BY:

SAMPLING METHOD: SAMPLE TEMP/pH/EC/TURB/DO:

SAMPLE ID(s): DUPLICATE/BLANK SAMPLE ID(s):

NOTABLE OBSERVATIONS (color, odor, sand, headspace, etc.):

Sample ID	Sample Time	Sample Containers No.	Sample Containers Volume/Type	Preservatives (ice, acids, bases, others)	Analytical Method	Laboratory	Comments

Initials of sampling personnel MB

CH2MHILL

PROJECT NUMBER	WELL ID
407243	KAFB-2009

WELL DEVELOPMENT FIELD DATA SHEET

PROJECT: ST-105 TCE Contaminated Groundwater LOCATION: Monzano Weapons Storage Area

WEATHER (wind/temp/ppt): clear, windy OTHER NOTABLE FIELD CONDITIONS:

INITIAL ORGANIC VAPOR METER READINGS:

INITIAL DEPTH TO WATER: 65.8 btoc TOTAL DEPTH OF WELL: 106' bgs SCREENED INTERVAL: 74' to 104' bgs

PURGE VOLUME CALCULATIO 52 gallons

METHOD OF PURGING: Submersable pump

DISPOSITION OF DISCHARGE WATER: Temporarily staged in polyethylene storage tank near monitoring well KAFB-2007

MONITORING EQUIPMENT USED: U-22 CH #C101991, Turbidimeter CH #C102246

Well Purging Information

Date 10/20/2010 Time	Total volume (gals)	± 2° Temp (°C)	± 0.1 pH	3% Conductivity (mS/cm)	10% or <10 Turbidity (NTU)	± 0.3 DO	± 10 mv ORP	Remarks (color, odor, sheen, sediment, etc.)
0715	Pump on, flow set to 0.75 gpm							
0720	3.75				49.60			0.75 gpm
0730	11				122.00			
0740	19				22.30			Connected U-22
0745	22	22.75	7.66	0.563	17.10	4.29	156	
0750	26	23.23	7.59	0.557	13.60	4.40	152	
0755	30	23.5	7.57	0.557	10.20	4.57	151	Water tagged at 66.15'
0800	34	23.73	7.57	0.550	9.46	4.91	149	
0805	37	23.97	7.57	0.550	7.83	5.07	149	
0810	41	24.16	7.57	0.556	6.62	5.11	145	
0815	45	24.25	7.57	0.552	6.52	5.24	144	
0820	49							Sample collected

Sample Information

SAMPLE DATE: 10/20/2010 SAMPLE TYPE: grab SAMPLE MATRIX: Groundwater

SAMPLING PERSONNEL: M. Brislen SPLIT SAMPLES OBTAINED BY: None

SAMPLING METHOD: Submersible pump SAMPLE TEMP/pH/EC/TURB/DO: see 0815 readings

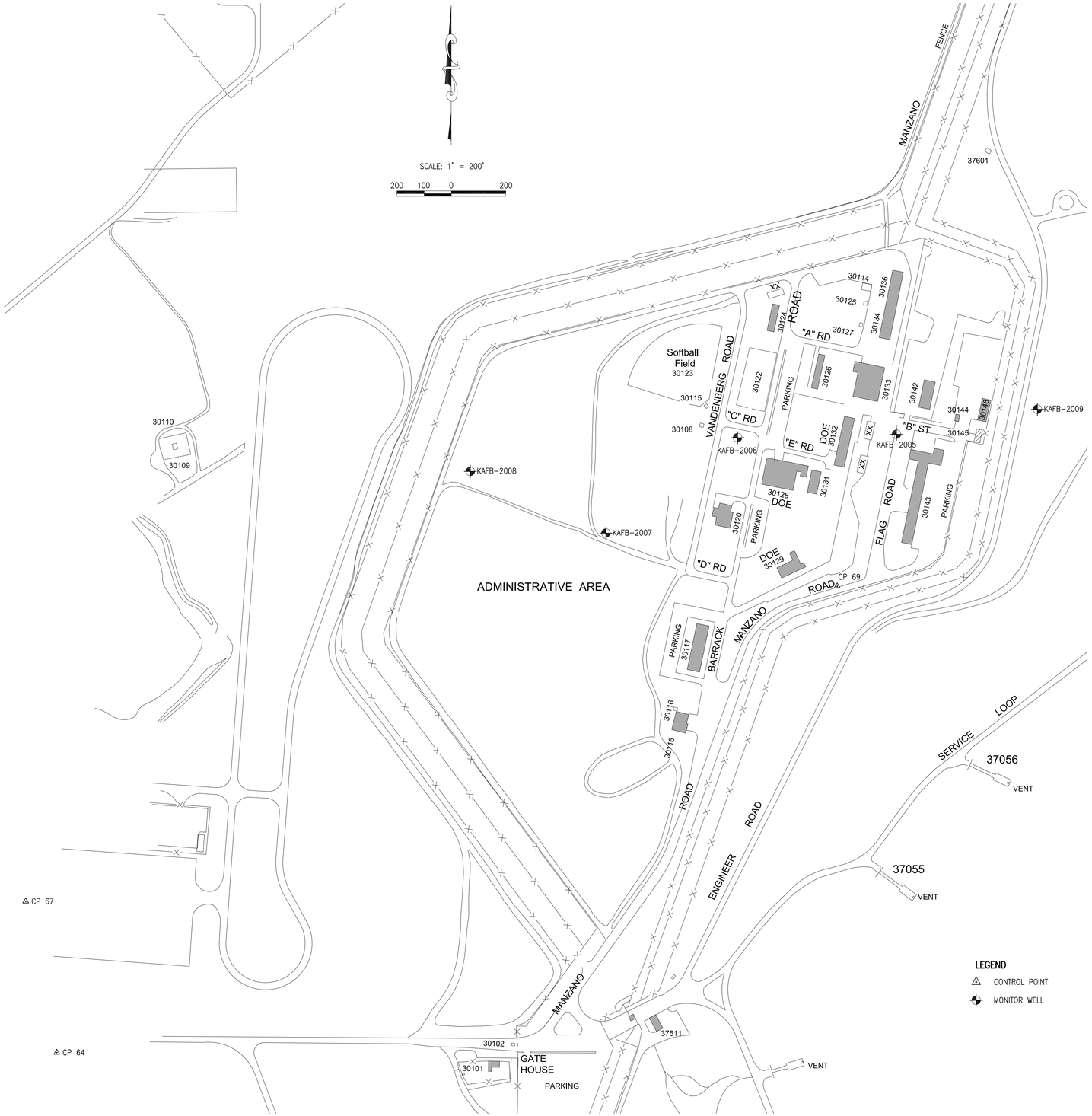
SAMPLE ID(s): ST105-GW-2009-20102010 DUPLICATE/BLANK SAMPLE ID(s):

NOTABLE OBSERVATIONS (color, odor, sand, headspace, etc.): Trip blank: ST105-TB-20102010

Sample ID	Sample Time	Sample Containers No.	Sample Containers Volume/Type	Preservatives (ice, acids, bases, others)	Analytical Method	Laboratory	Comments
GW-2009	0820	3	40 ml VOA	HCl	8260	PEL	
		1	250 ml Poly	unpreserved	300.1	PEL	Bromide, Fluoride, Chloride, Sulfate, Nitrate
TB-20102010	0:00	2	VOA 40ml	HCl	8260	PEL	trip blank

Initials of sampling personnel MB

Attachment 4
Survey Results for Groundwater Monitoring Wells
KAFB-2008 and KAFB-2009



SURVEY OF
MONITORING WELLS
KIRTLAND AIR FORCE BASE
ALBUQUERQUE, BERNALILLO COUNTY, NEW MEXICO
NOVEMBER 2010

KIRTLAND AFB, ALBUQUERQUE, BERNALILLO COUNTY, NEW MEXICO
GROUND COORDINATES

MONITORING WELLS SURVEYED 06/2006

Pnt.#	Northing	Easting	Elevation	Description
309	1,458,019.4165	1,564,527.3926	5,624.30	KAFB-2005 PVC
310	1,458,019.7611	1,564,527.5540	5,624.67	KAFB-2005 STEEL RING
311	1,458,020.3018	1,564,527.6633	5,624.55	KAFB-2005 EOA
312	1,458,006.5939	1,563,943.4835	5,590.91	KAFB-2006 PVC
313	1,458,006.9171	1,563,943.4051	5,591.21	KAFB-2006 STEEL RING
314	1,458,007.4688	1,563,943.2898	5,590.98	KAFB-2006 EOC
315	1,457,656.2315	1,563,459.6546	5,564.51	KAFB-2007 PVC
316	1,457,656.2928	1,563,459.5600	5,565.40	KAFB-2007 STEEL COV.
317	1,457,657.2028	1,563,459.7409	5,562.70	KAFB-2007 BR.CAP
318	1,457,658.0476	1,563,459.8591	5,562.06	KAFB-2007 GROUND

CONTROL POINTS SURVEYED 6/2006

Pnt.#	Northing	Easting	Elevation	Description	
64	1,455,748.2581	1,561,442.3036		SNL	2-Q17
66	1,450,598.3803	1,561,419.7409		SNL	2-Q17
67	1,456,303.7697	1,561,327.9334		SNL	1-Q17
69	1,457,461.1258	1,564,309.5633	5,624.00	SNL	MB-21
72	1,452,158.6596	1,570,887.8772		SNL	1-Q22

NOTES-6/2006

1. GRID COORDINATES ARE BASED ON NEW MEXICO STATE PLANE COORDINATE SYSTEM, CENTRAL ZONE, NAD 83 DATUM. BASIS OF COORDINATES ARE PUBLISHED VALUES OF KAFB AND SNL CONTROL STATIONS SHOWN IN THE COORDINATE TABLE, SHIFTED TO NAD83 DATUM FROM NAD27 DATUM USING N+62.56 AND E+1,140,245.62 SHIFTS. BOTH CONVENTIONAL TOTAL STATION, AND GPS/RTK SURVEY METHODS WERE USED TO DETERMINE COORDINATES OF MONITORING WELLS. GROUND COORDINATES WERE DETERMINED BY APPLYING GRID-TO-GROUND SCALE FACTOR = 1.000343197744.
2. ELEVATIONS ARE NAVD88 VALUES BASED ON ELEVATIONS OF KAFB AND SNL CONTROL STATIONS SHOWN IN THE COORDINATE TABLE, CONVERTED FROM SLD29 BY APPLYING +2.70 FEET SHIFT. BOTH CONVENTIONAL LEVEL LOOPS, AND GPS/RTK SURVEY METHODS WITH GEOID99 MODEL WERE USED TO DETERMINE ELEVATIONS OF MONITORING WELLS AND OTHER SURVEYED POINTS.

KIRTLAND AFB, ALBUQUERQUE, BERNALILLO COUNTY, NEW MEXICO
GRID COORDINATES

MONITORING WELLS SURVEYED 06/2006

Pnt.#	Northing	Easting	Elevation	Description
309	1,457,519.1992	1,563,990.6346	5,624.30	KAFB-2005 PVC
310	1,457,519.5437	1,563,990.7959	5,624.67	KAFB-2005 STEEL RING
311	1,457,520.0842	1,563,990.9052	5,624.55	KAFB-2005 EOA
312	1,457,506.3810	1,563,406.9258	5,590.91	KAFB-2006 PVC
313	1,457,506.7041	1,563,406.8474	5,591.21	KAFB-2006 STEEL RING
314	1,457,507.2556	1,563,406.7322	5,590.98	KAFB-2006 EOC
315	1,457,156.1388	1,562,923.2629	5,564.51	KAFB-2007 PVC
316	1,457,156.2001	1,562,923.1683	5,565.40	KAFB-2007 STEEL COV.
317	1,457,157.1097	1,562,923.3492	5,562.70	KAFB-2007 BR.CAP
318	1,457,157.9542	1,562,923.4673	5,562.06	KAFB-2007 GROUND

CONTROL POINTS SURVEYED 06/2006

Pnt.#	Northing	Easting	Elevation	Description	
64	1,455,248.8200	1,560,906.6040		SNL	2-Q17
66	1,450,100.7090	1,560,884.0490		SNL	2-Q17
67	1,455,804.1410	1,560,792.2730		SNL	1-Q17
69	1,456,961.1000	1,563,772.8800	5,624.00	SNL	MB-21
72	1,451,660.4530	1,570,348.9370		SNL	1-Q22

KIRTLAND AFB, ALBUQUERQUE, BERNALILLO COUNTY, NEW MEXICO
GROUND COORDINATES

MONITORING WELLS SURVEYED 11/2010

Pnt.#	Northing	Easting	Elevation	Description
127	1,458,113.1647	1,565,045.8256	5,650.83	KAFB-2009 NATURAL GROUND
128	1,458,112.8722	1,565,045.7049	5,651.11	KAFB-2009 NORTH CONCRETE
129	1,458,111.4888	1,565,045.3073	5,651.20	KAFB-2009 CONCRETE AT CASING
130	1,458,111.4571	1,565,045.1616	5,653.57	KAFB-2009 NORTH CASING
131	1,458,111.2492	1,565,045.1504	5,652.96	KAFB-2009 NORTH PVC
136	1,457,884.3566	1,562,962.9936	5,539.37	KAFB-2008 NATURAL GROUND
137	1,457,884.1729	1,562,962.7838	5,539.58	KAFB-2008 NORTH CONCRTET
138	1,457,883.0890	1,562,961.8117	5,539.63	KAFB-2008 CONCRETE AT CASING
139	1,457,883.0608	1,562,961.7050	5,542.33	KAFB-2008 NORTH CASING
140	1,457,882.9674	1,562,961.6507	5,541.77	KAFB-2008 NORTH PVC

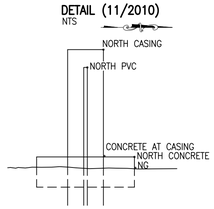
CONTROL POINTS SURVEYED 11/2010

Pnt.#	Northing	Easting	Elevation	Description
11	1,472,327.9093	1,571,713.0983	5,991.67	ABQ "9_M23"
12	1,471,449.9811	1,566,794.1197	5,743.12	ABQ "S 34,35,2,3"
13	1,471,500.3393	1,563,337.4178	5,589.72	ABQ "TIJERAS2"
16	1,443,323.9456	1,567,550.9254	5,693.59	NGS "WORKMAN"
67	1,456,303.7697	1,561,327.9334	5,499.64	SNL "1-Q17"
93	1,475,383.2253	1,539,740.5499	5,343.43	NGS "HANGAR"
403	1,458,910.0974	1,559,061.0907	5,441.76	NGS BM "T 336"
405	1,469,457.9616	1,549,271.2995	5,374.32	NGS BM "S 336"

NOTES-11/2010

1. GRID COORDINATES ARE BASED ON NEW MEXICO STATE PLANE COORDINATE SYSTEM, CENTRAL ZONE, NAD 83 DATUM. BASIS OF COORDINATES ARE PUBLISHED VALUES OF KAFB/SNL, NGS AND CITY OF ALBUQUERQUE CONTROL STATIONS SHOWN IN THE COORDINATE TABLE. GPS/RTK SURVEY METHODS WERE USED TO DETERMINE COORDINATES AND ELEVATIONS OF MONITORING WELLS. GROUND COORDINATES WERE DETERMINED BY APPLYING GRID-TO-GROUND SCALE FACTOR = 1.000343197744 TO GRID COORDINATES.
2. ELEVATIONS ARE NAVD-88 DATUM VALUES BASED ON ELEVATIONS OF KAFB/SNL, NGS AND CITY OF ALBUQUERQUE CONTROL STATIONS SHOWN IN THE COORDINATE TABLE. CONVENTIONAL DIFFERENTIAL LEVELLING AND GPS/RTK SURVEY METHODS WITH GEOID99 MODEL WERE USED TO DETERMINE ELEVATIONS OF MONITORING WELLS AND OTHER SURVEYED POINTS.

DETAIL (11/2010)
NTS



KIRTLAND AFB, ALBUQUERQUE, BERNALILLO COUNTY, NEW MEXICO
GRID COORDINATES

MONITORING WELLS SURVEYED 11/2010

Pnt.#	Northing	Easting	Elevation	Description
127	1,457,612.9152	1,564,508.8897	5,650.83	KAFB-2009 NATURAL GROUND
128	1,457,612.6228	1,564,508.7690	5,651.11	KAFB-2009 NORTH CONCRETE
129	1,457,611.2399	1,564,508.3716	5,651.20	KAFB-2009 CONCRETE AT CASING
130	1,457,611.2082	1,564,508.2259	5,653.57	KAFB-2009 NORTH CASING
131	1,457,611.0004	1,564,508.2147	5,652.96	KAFB-2009 NORTH PVC
136	1,457,384.1856	1,562,426.7723	5,539.37	KAFB-2008 NATURAL GROUND
137	1,457,384.0020	1,562,426.5625	5,539.58	KAFB-2008 NORTH CONCRETE
138	1,457,382.9185	1,562,425.5908	5,539.63	KAFB-2008 CONCRETE AT CASING
139	1,457,382.8903	1,562,425.4841	5,542.33	KAFB-2008 NORTH CASING
140	1,457,382.7969	1,562,425.4298	5,541.77	KAFB-2008 NORTH PVC

CONTROL POINTS SURVEYED 11/2010

Pnt.#	Northing	Easting	Elevation	Description
11	1,471,822.7830	1,571,173.8750	5,991.67	ABQ "9_M23"
12	1,470,945.1560	1,566,256.5840N	5,743.12	ABQ "S 34,35,2,3"
13	1,470,995.4970	1,562,801.0680	5,589.72	ABQ "TIJERAS2"
16	1,442,828.7700	1,567,013.1300	5,693.59	NGS "WORKMAN"
67	1,455,804.1410	1,560,792.2730	5,499.64	SNL "1-Q17"
93	1,474,877.0508	1,539,212.2957	5,343.43	NGS "HANGAR"
403	1,458,409.5745	1,558,526.2080	5,441.76	NGS BM "T 336"
405	1,468,953.8200	1,548,739.7755	5,374.32	NGS BM "S 336"

Plat & Survey By:
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