Appendix C: Core Logs and Well Construction Diagrams: Wells Installed In 2004 And 2005

When a well was installed at the Site, the standard practice was to collect and describe geologic samples recovered during the drilling process. Most typically these samples were in the form of core, a cylindrical representation of the geology being penetrated, but occasionally only cuttings were available. The resulting description is referred to as a core log (using the Borehole Log form). Following determination that the borehole would meet the construction objectives of the proposed monitoring well, a monitoring well was constructed within the borehole. Documentation generated as a part of this activity is referred to as a well construction diagram (using the Monitoring Well Installation Report form). These forms were generally completed in the field.

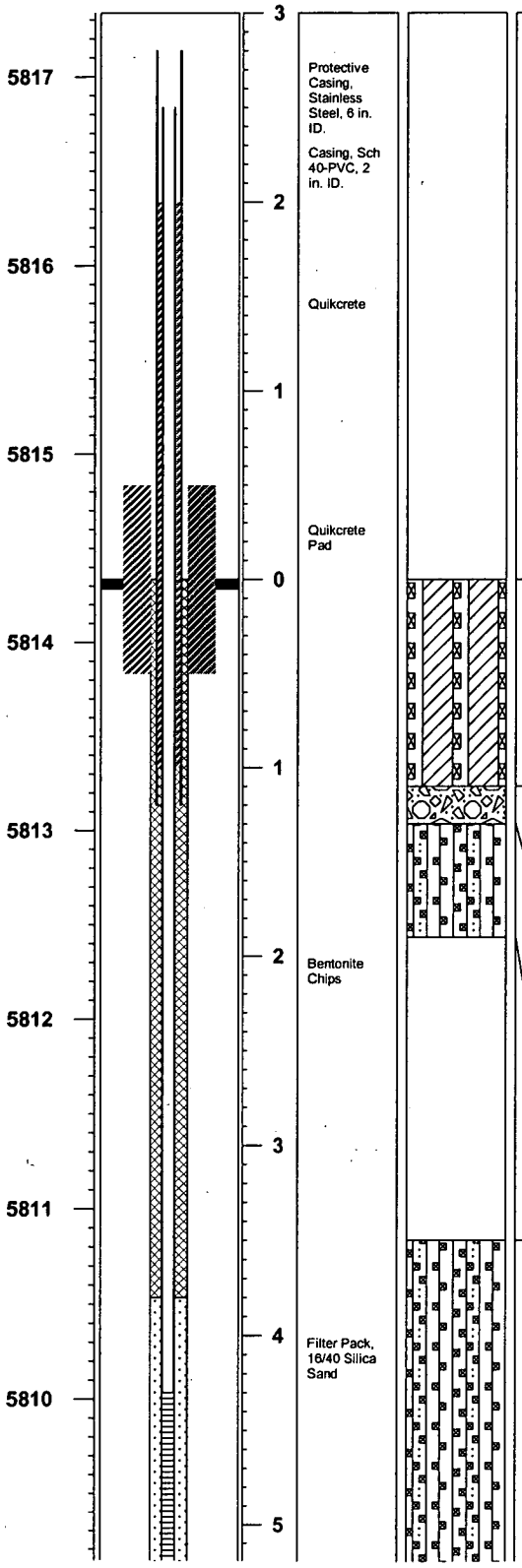
Upon returning to the office, information on these forms was input and a computer-generated form including selected material from each field form was generated.

All three of these components are represented in this appendix.

C.1 Calendar Year 2004

STATE PLANE COORDINATES AREA:	GRND ELEV. (FT): 5814.335	CASING DIA (IN): 2"	LOG OF BORING NUMBER:
NORTH: 747890.97	TOTAL DEPTH (FT): 21.0	BH DIA. (IN): 6.0"	10304
EAST: 2086512.29	COMPLETION DATE: 7/1/04	GRID LOCATOR:	
PROJECT:	GEOLOGIST: E. Warp		

REMARKS:
Woman Creek, downgradient of Ryan's Pit



Unified Soils Classification or Rock Type	Lithologic Description
	OL/CL: Organic-rich Clay, dark brown (7.5YR3/2), trace sand. Roots common, very dense and firm, moist.
	GW: Gravel, red (2.5Y4/8). 1" - 1-1/2" diameter angular clasts. Possibly broken cobble of Fountain Formation (fluvial sandstone).
	GM/SM: Silty, Sandy Gravel, brown (7.5YR5/4). ~55% gravel (1/2" - 1" diameter, subangular, predominately quartzite), ~30% sand (medium grained to coarse grained, subrounded to subangular), some caliche disseminated throughout interval, moist.
	No recovery.
	GM/SM: Silty, Sandy Gravel, brown (7.5YR5/4). ~55% gravel (1/2" - 1.5" diameter, subangular to subrounded). ~30% sand (medium grained to coarse grained, subangular to subrounded), wet.

Elev (Ft)	Well or Piezometer Construction and Materials	Depth (Ft)	Lithology	Unified Soils Classification or Rock Type	Lithologic Description
					LOG OF BORING NUMBER: 10304
5809					SM/SC: Clayey, Silty Sand, yellowish brown (10YR5/4). 60 - 70% sand (very fine grained to fine grained, subrounded), 30 - 40% silt/clay, very uniform, poorly graded, wet.
		6	Screen, Sch 40 PVC, 2 in. ID., 0.010 in. slots		No recovery.
5808					
		7			
5807					
		8			CLAYSTONE: TOP OF BEDROCK - Silty Claystone, yellowish brown (10YR5/8), mottled with light brownish gray (10YR6/2). Iron oxidized claystone bedrock. 3 - 8% black organic stringers throughout and patchy bleaching. Weak to moderately friable. Fairly dense and firm, wet.
5806					
		9			CLAYSTONE: Silty Claystone, dark grayish brown (10YR4/2) mottled with yellowish brown (10YR5/8). Iron oxidized claystone bedrock. Color of un-oxidized claystone is slightly darker than interval above from 7.5' to 9.0'. Slight decrease in silt. Weakly friable, iron nodules and fragments at 12.8'. Wet.
5805					
		10			
5804					
		11			
5803					
		12			
5802					
		13			
5801					
		14			CLAYSTONE: Claystone, dark grayish brown (10YR4/2) with yellowish brown (10YR5/6). Iron oxidation mottled throughout. Decreased overall iron oxidation to patchy/weak, dense/firm,
5800					

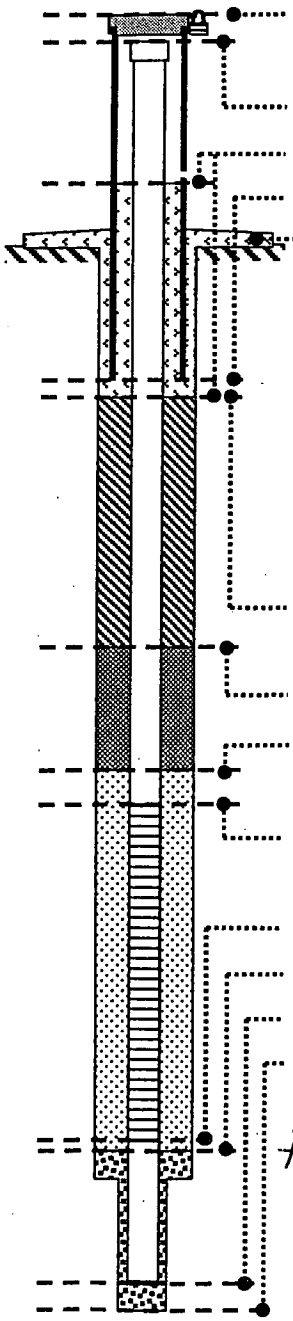
Elev (Ft)	Well or Piezometer Construction and Materials	Depth (Ft)	Lithology	Unified Soils Classification or Rock Type	Lithologic Description
					wet/moist (slightly decreased moisture).
		15			No recovery.
5799					
		16			CLAYSTONE: Claystone, very dark grayish brown (10YR3/2). Unweathered claystone bedrock, very dense and firm, uniform. Trace iron oxide stringers at 17.4' and 17.8'. Decreased overall moisture to moist.
5798					
		17			
5797					
		18			CLAYSTONE: Claystone, black (10YR2/1) to very dark brown (10YR2/2). Very dense and firm, uniform appearance - massive. No distinguishing characteristics. Decreased moisture to slightly moist.
5796					
		19			
5795	Threaded Conical End Cap				
		20			No recovery.
5794	Native Material				Overdrilled and backfilled.
		21			

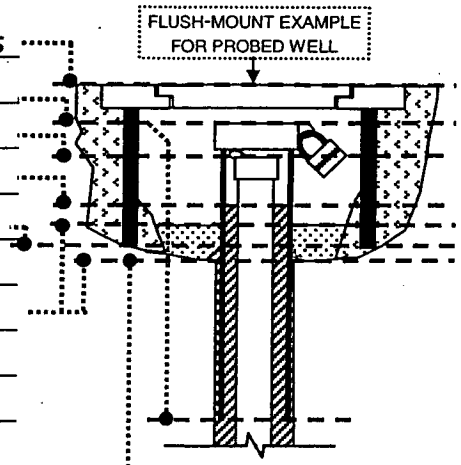
GROUNDWATER MONITORING WELL AND PIEZOMETER REPORT: Form PRO.118A

LOCATION CODE: 10304 PROJECT NAME: CY04 Well Installation PROGRAM: Water Programs
SCREENED FORMATION: Al/Bdrk DRILLING CONTRACTOR: NWE BORING METHOD: geoprobe/Auger overdrill
DATE DRILLED: 7/1/04 DATE COMPLETED: 7/1/04 TOTAL DEPTH: 21.0' COMPLETED DEPTH: 19.75'
ESTIMATED DEPTH TO BEDROCK: 7.5' RIG GEOLOGIST: E. Warp LOGGING GEOLOGIST: E. Warp
BOREHOLE DIAMETER IN SCREENED INTERVAL: 6.0" QUANTITY OF FLUIDS LOST DURING DRILLING: N/A
INITIAL WATER LEVEL (FT, DATE): 5.78' fm TOC - 7/6/04 COMPLETED WATER LEVEL (FT, DATE): 6.05' fm. TOC on 7/19/04
DIAMETER & TYPE OF INSTALLATION (WELL/PIEZOMETER/WELL POINT/ETC.): 2.0" I.D. Sch. 40 - PVC
TYPE OF PROTECTION (FLUSH-MOUNT VS. ABOVE GROUND, ASEPTIC, ETC.): 6.0" I.D. Steel Protective casing - Stick-up

ALL MEASUREMENTS WILL BE MADE IN FEET FROM GROUND SURFACE

* DENOTES ITEMS THAT MAY NOT BE APPLICABLE, DEPENDING ON BORING METHOD, WELL PROTECTION & PURPOSE





PROTECTIVE CASING TOP (STICKUP OR FLUSH-MOUNT): 2.8' ags
*SECONDARY CASING TOP: N/A BOTTOM: TYPE:
SURFACE CASING TOP: 2.5' ags ID (IN): 2.0"
SURFACE SEAL TOP: N/A BOTTOM: N/A TYPE: N/A
PROTECTIVE CASING BOTTOM, ID (IN), TYPE: 1.2' bgs. - 6.0" I.D. Steel
*WELL PAD DIMENSIONS, TYPE: 3'x3' QUIKCRETE PAD
*ADD'L CASING FILL TOP: 2.0" ags BOTTOM: -1.0" bgs TYPE: quikcrete
*SURFACE ISOLATION CASING TOP: N/A BOTTOM: N/A
*SURFACE ISOLATION CASING ID (IN): N/A TYPE: N/A
*OTHER (E.G., ASEPTIC) CASING TOP: N/A BOTTOM: N/A
*OTHER CASING ID (IN): N/A TYPE, PURPOSE: N/A
*CENTRALIZER(S) OD (IN): N/A NUMBER USED: N/A TYPE: N/A
*CENTRALIZER(S) DEPTH(S): N/A
*GROUT TOP: N/A MEASURED DENSITY (LBS/GAL): N/A TYPE: N/A
*GRANULAR BENTONITE TOP: g.s. = 0.0' TYPE: Bentonite chips - PDSCO
*BENTONITE SEAL TOP: N/A TYPE: N/A
BENTONITE SEAL OR GRANULAR BENTONITE BOTTOM (= FILTER PACK TOP): 3.8'
FILTER PACK TYPE: 16/40 Silica Sand BRAND: CSSI
SURFACE CASING BOTTOM (=SCREEN TOP): 4.3' TYPE: Sch. 40 - PVC
SCREEN ID (IN): 2.0" SLOT SIZE (IN): 0.01" TYPE: Sch 40 - PVC
SCREEN BOTTOM (= SUMP, TOP): 19.3' SUMP TYPE: Threaded, conical end-cap
FILTER PACK BOTTOM (= *BACKFILL TOP): 19.75' *BACKFILL TYPE: Native material
SUMP BOTTOM (= WELL COMPLETED DEPTH): 19.75' *PILOT HOLE TOP, DIAMETER: 6.0"
TOTAL BOREHOLE DEPTH (= *PILOT HOLE AND *BACKFILL BOTTOM): 21.0'

REMARKS: 2.5" geoprobe for core logging, then overdrill w/ 6.0" Augers. Had to auger twice to recover tape end + wood plug initially stuck w/in augers. V. Wet during well installation

COMPLETED BY: E. Warp Ellen S. Warp DATE: 7/6/04.
CHECKED BY: Josh Rosen DATE: 10/21/04

Installed protective casing (6.0" Steel Stick-up) and well pad on 7/6/04

ROCKY FLATS ENVIRONMENTAL TECHNOLOGY SITE BOREHOLE LOG

Borehole Number: 10304
Location - North: _____ East: _____
Date: 7/1/04
Geologist: E. WARD
Drilling Equip.: AMS POWER PROBE

Surface Elevation: _____
Area: WOMAN CRK - DOWNGRAD. OF RYAN'S PIT
Total Depth: 20.0'
Company: URS / NWE Project No.: HAD 51300
Sample Type: Push-continuous Core

RMRS LOGGING SUPERVISOR APPROVAL [signature] DATE 7/22/04

TOP/BOTTOM OF CORE IN BOX	TOP/BOTTOM OF INTERVAL	FEET OF CORE IN INTERVAL (FIELD MEASUREMENT)	SAMPLE NUMBER	FRACTURE ANGLE	BEDDING ANGLE	GRAIN SIZE DISTRIBUTION	USCS SYMBOL	DEPTH IN FEET	SOIL/LITHOLOGIC LOG	SAMPLE DESCRIPTION
Box #1 of 2 (0.0 → 13.0')	Run #1 (0.0 → 3.5')	Rec. = 1.9'					CL	1.0		0.0-1.1' - Organic Rich CLAY - Dk. Brn. (7.5 YR 3/2). Tr sand. Roots common V. dense and firm. MOIST.
							GW	1.1 / 1.3		1.1-1.3' - GRAVEL - Red (2.5 Y 4/8) 1.0-1.5" dia - ang. clasts - Possibly broken cobble of Fountain Fm. (fluvial Ss).
							GM/SM	1.9		1.3-1.9' - Silty, Sandy GRAVEL - Brn. (7.5YR 5/4). ~55% gravel: 1/2-1.0" dia., sub-ang, predominately qtzite, ~30% sand; m.g. to c.g., sub-rounded to sub-ang. Some caliche diss. throughout interval. MOIST.
	3.5	3.5					ESW	2.0 / 3.0 / 3.5'		1.9-3.5' = No Recovery
	Run #2 (3.5-7.5')	Rec. = 2.0'					GM/SM	4.0 / 5.0		3.5-5.3 = Silty Sandy GRAVEL (7.5YR 5/4) Brn. ~55% gravel: 1/2" → 1.5" dia., sub-ang. to sub-rounded. ~30% sand: m.g to c.g. sub-ang. to sub-rounded - WET
							SM/SC	5.3 / 5.5		5.3-5.5' - Clayey, Silty SAND - Yell'sh Brn (10YR 5/4). 60-70% Sand: v. f.g. to f.g., sub-rounded w/30-40% silt/clay. V. uniform, ESW poorly graded. WET.
	7.5	2.5	(ESTIMATED) BEDROCK CONTACT @ 7.5'			whoop! ESW 7/2/04	NR / SC	6.0 / 7.0 / 7.5		5.5-7.5' = No Recovery ESTIMATE BEDROCK CONTACT @ 7.5'
	Run #3 (7.5-11.5')	Rec. = 4.0'					Silty Claystone	8.0 / 9.0 / 10.0		7.5-9.0 = Silty CLAYSTONE - Yell'sh Brn (10YR 5/8) mottled w/ H. Brn'sh Gry (10YR 6/2). FeOx'd claystone bedrock. 3-8% blk. org. stringers throughout and patchy bleaching. Weak to moderately friable. Fairly dense/firm. WET.

NOTES: General: USCS is modified for this log as follows:
Materials amounts are estimated by % volume instead of % weight.
(1) Badly broken core, accurate footage measurements not possible.
(2) Core breaks cannot be matched, accurate footage measurements not possible.

Procedure No. RMRS/OPS-PRO.101
Revision 0
Date effective: 12/31/98

14011-930-0134-930X Form GT.1A (03/01.92)

ROCKY FLATS ENVIRONMENTAL TECHNOLOGY SITE BOREHOLE LOG

Borehole Number: 10304
Location - North: East:
Date: 7/1/04
Geologist: E. WARP
Drilling Equip.: AMS Power Probe

Surface Elevation:
Area: Woman Crk. - Downgradient of Ryan's Pit, CY04 Well Installation
Total Depth: 20.0
Company: URS
Project No. HAD5130.0
Sample Type: Continuous Core - Push

RMRS LOGGING SUPERVISOR APPROVAL [signature] DATE 7/22/04

TOP/BOTTOM OF CORE IN BOX	TOP/BOTTOM OF INTERVAL	FEET OF CORE IN INTERVAL (FIELD MEASUREMENT)	SAMPLE NUMBER	FRACTURE ANGLE	BEDDING ANGLE	GRAIN SIZE DISTRIBUTION	USCS SYMBOL	DEPTH IN FEET	SOIL/LITHOLOGIC LOG	SAMPLE DESCRIPTION
Box #2 of 2 (13.0 → 20.0')	Run #3 cont. 11.5	Rec. 4.0' 11.5					Silty Claystone	11		9.0-14.0' - Silty CLAYSTONE - Dk. Grysh Brn (10YR 4/2) mottled with Yellsh Brn (10YR 5/8), FeOxd claystone bedrock. Color of un-oxd claystone is slightly darker than interval above fm 9.5-9.0'. Sl. decr. in Silt. Weakly friable. Fe nodules and frags @ 12.8'. WET
	Run #4 (11.5-15.5') 15.5	Rec. = 3.7' 15.5					Silty Claystone	12		
							Silty Claystone	13		14.0-14.8' - CLAYSTONE - Dk. grysh Brn. (10YR 4/2) w/ Yellsh Brn. (10YR 5/6) mottling FeOxin mottled throughout. Decr. overall FeOxin to patchy/wk. Dense/firm. WET/MOIST (sl. decr. moisture)
							Silty Claystone	14		
							Claystone	14.8'		14.8-15.5' = No Recovery
							Claystone	15		15.5-17.8' - Claystone - V. dk. Grysh Brn. (10YR 3/2). Unweathered claystone bedrock. V. dense and firm. Uniform. Tr FeOx stringers @ 17.4' and 17.8'. Decr. overall moisture to moist.
							Claystone	15.5'		
	Run #5 (15.5→18.0') 18.0	Rec = 4.0' 18.0					Claystone	16		
							Claystone	17		
							Claystone	17.8'		17.8-19.7' - Claystone - Black (10YR 2/1) to V. dk. Brn (10YR 2/2) V. dense and firm. Uniform appearance - massive. No distinguishing characteristics. Decr. moisture to sl. moist.
							Claystone	18		
	Run #6 20.0	Rec. = 1.7 20.0'	T.D. @ 20.0'				Claystone	19		
							Claystone	19.7'		19.7-20.0 = No Recovery 20.0 = T.D.

NOTES: General: USCS is modified for this log as follows:
Materials amounts are estimated by % volume instead of % weight.
(1) Badly broken core, accurate footage measurements not possible.
(2) Core breaks cannot be matched, accurate footage measurements not possible.

Procedure No. RMRS/OPS-PRO.101
Revision 0
Date effective: 12/31/98

(4011-930-0134-930)(Form GT.1A)(03/01.V2)

STATE PLANE COORDINATES AREA: GRND ELEV. (FT): 5921.104 CASING DIA (IN): 1"
NORTH: 747537.535 TOTAL DEPTH (FT): 20.0 BH DIA. (IN): 3.25"
EAST: 2082754.663 COMPLETION DATE: 7/20/04 GRID LOCATOR:
PROJECT: GEOLOGIST: E. Warp
REMARKS:
Replaces 00197, Woman Creek, East OLF

LOG OF BORING NUMBER: 11104

Elev (Ft)	Well or Piezometer Construction and Materials	Depth (Ft)	Lithology	Unified Soils Classification or Rock Type	Lithologic Description
5924	Protective Casing, PVC with locking steel lid, 8 in. ID.	3			
5923	Casing, Sch 80-PVC, 1 in. ID.	2			
5922	Quikcrete Pad	1			
5921		0			OL/CL: Silty Clay with trace sand and trace gravel, very dark brown (7.5YR2.5/2). Trace sand (coarse grained, subangular to subrounded), trace - 2% gravel (1/8" - 1/4" diameter, subangular to subrounded) of granitic and quartzite composition. Roots common/organic rich. Trace caliche (disseminated and stringers). Moist.
5920		1			
5919	Granular Bentonite	2			GM: Silty Gravel with trace to some sand. Matrix is very dark brown (7.5YR2.5/2). 60 - 75% gravel (1/4" - 2" diameter, subangular to subrounded, predominately pegmatitic granite and quartzite, moist.
5918		3			CL: Silty Clay with trace sand and trace gravel, very dark brown (10YR2/2) to dark grayish brown (10YR4/2). Trace disseminated caliche, moist.
5917	Filter Pack, 16/40 Silica Sand	4			CL: Clay with trace to some gravel, trace to some silt, and trace sand. Brown (10YR4/3) to dark yellowish brown (10YR4/4). Trace to 5% gravel (1/4" - 3/4" diameter, subangular to subrounded, predominately quartzite and granite composition). Sandy lense at 4.0'. Trace white caliche stringers from 4.0' to 4.5'. Possibly re-worked claystone. 1" diameter quartzite cobble at 4.5'. Moist.
					GC/CL: Clayey Gravel, yellowish brown (10YR5/4) to light olive

Elev (Ft)	Well or Piezometer Construction and Materials	Depth (Ft)	Lithology	Unified Soils Classification or Rock Type	Lithologic Description
5916	Screen, Sch 80 PVC, 1 in. ID., 0.010 in. slots	5			brown (2.5Y5/3). 45 - 60% gravel (1/8" - 1.5" diameter, subangular to subrounded, quartzite). Large angular clasts of pink fine-grained sandstone (Fountain Formation?), 3/4" - 1.5" diameter. From 4.9' to 5.5' is definitely re-worked claystone. Moderate pervasive iron oxidation from 4.5' to 4.7'. Black organics common in claystone clasts from 5.7' to 5.8'. Gravelly basal contact with claystone bedrock, iron oxidized, moist.
5915		6			SILTY CLAYSTONE: TOP OF BEDROCK - Silty Claystone, light brownish gray (10YR6/2), black organic nodule (bleb) at 6.7', otherwise trace black organic stringers. Trace iron oxidation. Interval fairly competent/dense, moist.
5914		7			SILTY CLAYSTONE: Silty Claystone (iron oxidized), light yellowish brown (10YR6/4) to dark yellowish brown (10YR4/6). Trace black organic stringers. Competent to 7.2', then moderately friable to 8.0' with moderate pervasive iron oxidation. Strong pervasive iron oxidation and extremely friable between 8.0' and 8.9'. Weak to moderate iron oxidation from 8.9' to 11.2'. Moderately friable between 10.5' and 10.8', otherwise fairly competent between 8.9' and 11.2'. Black organic material at 11.1'. Between 11.2' and 11.3', at base of interval, increased iron oxidation (pervasive). Increased moisture from very moist to wet at 11.3'.
5913		8			
5912		9			
5911		10			
5910		11			
5909		12			SILTY CLAYSTONE: Silty Claystone, yellowish brown (10YR5/6) to dark yellowish brown (10YR4/6). Strong pervasive iron oxidation. Strongly weathered, crumbly/friable. Possible fluvial channel in claystone or incipient ironstone, wet.
					SILTY CLAYSTONE: Silty Claystone, yellowish brown (10YR5/6). Weak to moderate pervasive iron oxidation. Black organic nodules (~1/4" diameter) and stringers common. Weakly friable but crumbly at base (12.4'). Moist, but no free water.
5908		13			CLAYSTONE: Claystone, grayish brown (10YR5/2) to gray (10YR5/1). Organic-rich, black nodules very common. Extremely friable and crumbly. Slightly moist.
		14			CLAYSTONE: Claystone, grayish brown (10YR5/2) to dark gray (10YR4/1). Decreased black organics to trace (blebs and stringers). Trace iron oxidation as fracture filling at 14.0'. Weakly to moderately

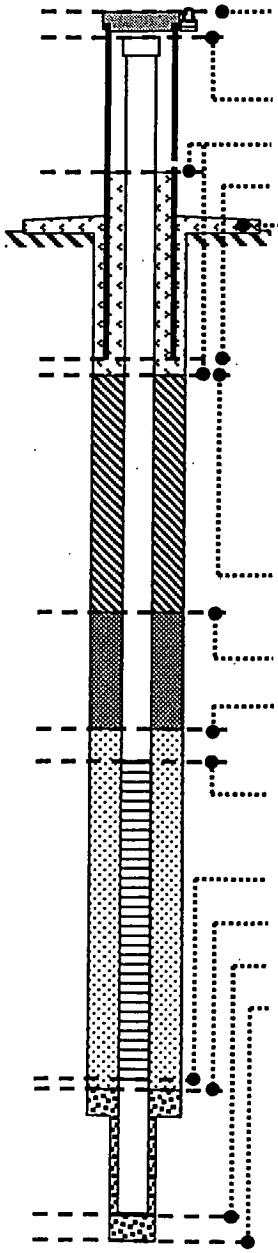
Elev (Ft)	Well or Piezometer Construction and Materials	Depth (Ft)	Lithology	Unified Soils Classification or Rock Type	Lithologic Description
5907					friable, very uniform, massive texture, very slightly moist.
5906		15			No recovery.
5905		16			CLAYSTONE: Claystone, grayish brown (10YR5/2) to dark gray (10YR4/1). Decreased black organics to trace (blebs and stringers). Trace iron oxidation as fracture filling at 17.4'. Weakly to moderately friable, very uniform, massive texture, very slightly moist.
5904		17			
5903		18			CLAYSTONE: Claystone, brown (10YR4/3) with yellowish brown (10YR5/4) mottling. Patchy iron oxidation throughout. Iron oxidation as fracture fill along vertical internal fractures between 18.5' and 18.6'. Moderately friable and crumbly, trace moisture.
5902		19			CLAYSTONE: Claystone, very dark grayish brown (10YR3/1), trace iron oxidation along internal fractures. Moderately friable/crumbly. Trace moisture.
	Threaded End Cap				CLAYSTONE: Claystone, very dark gray (10YR3/1), very friable/crumbly. Iron oxidation along vertical, internal fractures between 19.8' and 20.0'.
	Granular Bentonite	20			

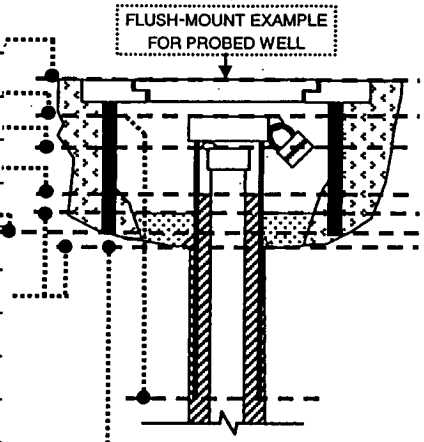
GROUNDWATER MONITORING WELL AND PIEZOMETER REPORT: Form PRO.118A

LOCATION CODE: 11104 PROJECT NAME: CY04 Well Installation PROGRAM: Water Programs
SCREENED FORMATION: Al/Bdrk. DRILLING CONTRACTOR: RTG BORING METHOD: Geoprobe
DATE DRILLED: 7/20/04 DATE COMPLETED: 7/20/04 TOTAL DEPTH: 20.0' COMPLETED DEPTH: 19.5'
ESTIMATED DEPTH TO BEDROCK: 5.9' RIG GEOLOGIST: E. Warp LOGGING GEOLOGIST: E. Warp
BOREHOLE DIAMETER IN SCREENED INTERVAL: 3.25" QUANTITY OF FLUIDS LOST DURING DRILLING: N/A
INITIAL WATER LEVEL (FT, DATE): 7/20/04 = DRY COMPLETED WATER LEVEL (FT, DATE): 13.72 (fm. TOC), 7/28/04
DIAMETER & TYPE OF INSTALLATION (WELL/PIEZOMETER/WELL POINT/ETC.): 1.0" PVC WELL
TYPE OF PROTECTION (FLUSH-MOUNT VS. ABOVE GROUND, ASEPTIC, ETC.): Above ground - 8.0" PVC w/ locking steel lid.

ALL MEASUREMENTS WILL BE MADE IN FEET FROM GROUND SURFACE

* DENOTES ITEMS THAT MAY NOT BE APPLICABLE, DEPENDING ON BORING METHOD, WELL PROTECTION & PURPOSE





PROTECTIVE CASING TOP (STICKUP OR FLUSH-MOUNT): 3.0' ags
*SECONDARY CASING TOP: N/A BOTTOM: N/A TYPE: N/A
SURFACE CASING TOP: 2.75' ags ID (IN): 1.0"
SURFACE SEAL TOP: N/A BOTTOM: N/A TYPE: N/A
PROTECTIVE CASING BOTTOM, ID (IN), TYPE: ?
*WELL PAD DIMENSIONS, TYPE: 2.5' x 2.5' - Quikrete
*ADD'L CASING FILL TOP: N/A BOTTOM: N/A TYPE: N/A
*SURFACE ISOLATION CASING TOP: N/A BOTTOM: N/A
*SURFACE ISOLATION CASING ID (IN): N/A TYPE: N/A
*OTHER (E.G., ASEPTIC) CASING TOP: N/A BOTTOM:
*OTHER CASING ID (IN): N/A TYPE, PURPOSE: N/A
*CENTRALIZER(S) OD (IN): N/A NUMBER USED: N/A TYPE: N/A
*CENTRALIZER(S) DEPTH(S): N/A
*GROUT TOP: N/A MEASURED DENSITY (LBS/GAL): TYPE:
*GRANULAR BENTONITE TOP: 0.0 TYPE: Granular bentonite
*BENTONITE SEAL TOP: N/A TYPE: N/A
BENTONITE SEAL OR GRANULAR BENTONITE BOTTOM (= FILTER PACK TOP): 3.8'
FILTER PACK TYPE: 16/40 Silica Sand BRAND: CSSI
SURFACE CASING BOTTOM (=SCREEN TOP): 4.35' TYPE: 1.0" - Sch. 80 - PVC
SCREEN ID (IN): 1.0" SLOT SIZE (IN): 0.01" TYPE: Sch. 80 - PVC
SCREEN BOTTOM (= SUMP, TOP): 19.4' SUMP TYPE: Threaded End Cap
FILTER PACK BOTTOM (= *BACKFILL TOP): 19.5' *BACKFILL TYPE: Granular Bentonite
SUMP BOTTOM (= WELL COMPLETED DEPTH): 19.5' *PILOT HOLE TOP, DIAMETER: 3.25"
TOTAL BOREHOLE DEPTH (= *PILOT HOLE AND *BACKFILL BOTTOM): 20.0'
REMARKS: This was the 2nd offset fm. 11104-T.H. "A". Completed well ~4' East and 3' North of 11104 T.H. "A". Dry during well installation (core used fm. 11.3 to 11.7)
H_2O in well when measured on 7/28/04 → W.L. = 13.72' (fm. TOC)
COMPLETED BY: Ellen S. Warp Ellen S. Warp DATE: 7/28/04
CHECKED BY: DATE:

ROCKY FLATS ENVIRONMENTAL TECHNOLOGY SITE BOREHOLE LOG

Borehole Number: 11104
Location, North: _____ East: _____
Date: 7/19/04
Geologist: E. Ward
Drilling Equip.: DT 66 Geoprobe

Surface Elevation: _____
Area: Replacement for 00197 - Woman Crk. - E. Ong. Landfill
Total Depth: 20.0' C404 WELL INSTALLATION
Company: URS/RTG Project No.: HAD51300
Sample Type: Continuous Core - Push

RMRS LOGGING SUPERVISOR APPROVAL: Josh Rosen DATE: 7/21/04

TOP/BOTTOM OF CORE IN BOX	TOP/BOTTOM OF INTERVAL	FEET OF CORE IN INTERVAL (FIELD MEASUREMENT)	SAMPLE NUMBER	FRACTURE ANGLE	BEDDING ANGLE	GRAIN SIZE DISTRIBUTION	USCS SYMBOL	DEPTH IN FEET	SOIL LITHOLOGIC UNIT	SAMPLE DESCRIPTION
	Run #1 (0.0→4.0')	Rec. = 4.0'			Combination of OL and CL		OL, CL	1.0, 2.0		0.0-2.1' - Silty CLAY w/Tr sand and Tr gravel. V. Dk. Brn. (7.5YR2.5/2). Tr sand (c.g., sub-ang. to sub-rounded). Tr-2% gravel (1/8-1/4" dia., sub-ang. to sub-rounded) of granite and qtzite composition. Roots common, org. rich. Tr caliche (diss. + stringers). MOIST.
					error on GM lithology pattern SSW 11/23/04		GM	2.1, 2.5		2.1-2.5' - Silty GRAVEL w/Tr to some sand. Matrix is V. Dk. Brn. (7.5YR2.5/2). 60-75% GRAVEL (1/4-2.0" dia., sub-ang. to sub-rounded, predominately pegmatitic granite and qtzite. MOIST.
							CL	3.0		2.5-3.0' - Silty CLAY w/Tr sand and Tr gravel. V. Dk. Brn. (10YR2/2) to Dk. Gry'sh Brn. (10YR4/2). Tr+ diss. caliche. MOIST.
4.0'		4.0'					CL	4.0		3.0-4.5' - ~~Silty~~ CLAY w/Tr to some gravel, Tr to some silt and Tr sand. Brn. (10YR4/3) to Dk. Yellsh Brn. (10YR4/4). Tr-5% gravel (1/4-3/4" dia., sub-ang. to sub-rounded, pred. qtzite and granite composition). Sandy lense @ 4.0'. Tr+ caliche stringers fm. 4.0-4.5'. Possibly reworked claystone. 1" dia. qtzite cobble @ 4.5'. MOIST.
	Run #2 (4.0→7.0')	Rec. = 4.0'		Top of Bedrock @ 5.9'			GC, CL	5.0, 5.9', 6.0		4.5-5.9' - Clayey GRAVEL - Yellsh Brn (10YR5/4) to Lt. Olive Brn. (2.5Y5/3). 45-60% Gravel (1/8" to 1.5" dia., sub-ang. to sub-rounded, qtzite, large, angular clasts of pink fine-grained Ss (Fountain Fm?) 3/4" to 1.5" dia. @ fm. 4.9-5.5'. Definitely reworked claystone. Mod. + perv. FeOx'n fm. 4.5-4.7'. Blk. organics common in claystone clasts fm. 5.7-5.8'. Gravelly basal contact w/claystone bedrock (FeOxd). Moist. Top of BEDROCK @ 5.9'
7.0'		7.0'						7.0		5.9-6.9' - Silty CLAYSTONE - Lt. Grlsh Gry (10YR6/2) Blk. organic module (b/cb) @ 6.7', otherwise Tr blk organic stringers. Tr FeOx'n. Interval fairly competent/dense. MOIST.
	Run #3 (7.0'→10.0')	Rec. = 4.0'						8.0, 9.0		6.9-11.3' - Silty CLAYSTONE (FeOxd) - Lt. Yellsh Brn. (10YR6/4) to Dk. Yellsh Brn. (10YR4/6). Tr blk organic stringers. Competent to 7.2' then moderately + friable to 8.0' open w/fm. mod. perv. FeOx'n. Strong perv. FeOx'n and extremely friable between 8.0→8.9'. W/M FeOx'n fm. 8.9→11.2'. Moderately friable between 10.5-10.8' otherwise fairly competent. Blk. organic material @ 11.1'. between 8.9 to 11.2'
10.0'		10.0'						10.0		

NOTES: General: USCS is modified for this log as follows:
Materials amounts are estimated by % volume instead of % weight.
(1) Badly broken core, accurate footage measurements not possible.
(2) Core breaks cannot be matched, accurate footage measurements not possible.

Procedure No. RMRS/OPS-PRO.101
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Between 11.2-11.3 @ base of interval inars'd FeOx'n (perv.) and increased moisture fm. v. moist to wet @ 11.3'.

U.S. DEPARTMENT OF ENERGY ROCKY FLATS PLANT FORM PRO.101A

ROCKY FLATS ENVIRONMENTAL TECHNOLOGY SITE BOREHOLE LOG

PAGE 2 OF 2

Borehole Number: 11104
Location - North: _____ East: _____
Date: 7/19/04
Geologist: E. WARP
Drilling Equip.: 66 DT Geoprobe

Surface Elevation: _____
Area: Woman Creek - E. of Original Landfill
Total Depth: 20.0'
Company: URS/RTG
Project No.: HAD51300
Sample Type: Continuous Core - Push

CY04 WELL INSTALLATION

RMRS LOGGING SUPERVISOR APPROVAL Josh Rosen DATE 7/21/04

TOP/BOTTOM OF CORE IN BOX	TOP/BOTTOM OF INTERVAL	FEET OF CORE IN INTERVAL (FIELD MEASUREMENT)	SAMPLE NUMBER	FRACTURE ANGLE	BEDDING ANGLE	GRAIN SIZE DISTRIBUTION	USCS SYMBOL	DEPTH IN FEET	SOIL/LITHOLOGIC LOG	SAMPLE DESCRIPTION
	10.0	10.0						10.0		cont. Silty CLAYSTONE (see previous page for description).
	Run #4	Rec = 2.8			WET @ 11.3-11.7'			11		11.3-11.7 - Silty CLAYSTONE - Yellish Brn. (10YR5/6) to Dk Yellish Brn (10YR 4/6). S. Perv. FeOx'n. Strongly weathered - crumbly/friable. Possible fluvial channel in claystone or Incipient ironstone? WET [11.3 to 11.7']
								11.3		
								11.7		
	12.0'	12.0'						12		11.7 - 12.4' - Silty CLAYSTONE - Yellish Brn. (10YR5/6). N/M perv. FeOx'n. Blk organic nodules (~1/4" dia.) and Stringers commen. Wkly. Friable but crumbly @ base (12.4'). Moist - No free water
	Run #5	Rec. = 4.0'						12.4'		
								13		12.4 - 13.0' - CLAYSTONE - Gry'sh Brn. (10YR5/2) to Gry (10YR 5/1). Organic rich - blk. nodules v. commen. Extremely friable and crumbly. Sl. moist.
	14.0'	14.0'						14		
	Run #6	Rec. = 0.9'						14.9'		13.0 - 17.9' - CLAYSTONE - Gry'sh Brn (10YR 5/2) to Dk Gry. (10YR 4/1). Decr. blk. organics to Tr (blebs & stringers). Tr FeOx as frac. filling @ 14.0' and 17.4'. N/M friable. V. uniform massive texture. V. sl. moist.
								15		
	16.0'	16.0'		add NO RECOVERY FM. 14.9 → 16.0' ESW 7/20/04				16		
								17		17.9 - 18.9 - CLAYSTONE - Brn. (10YR 4/3) w/Yell'sh Brn. (10YR 5/4) mottling. Patchy FeOx'n throughout. FeOx'n as frac. fill along vertical internal fracs. between 18.5 - 18.6'. Mod. friable and crumbly. Tr moisture.
	17.4	17.4'						17.9'		
								18		
								18.9'		18.9 - 19.5' - CLAYSTONE - V. Dk. Gry'sh Brn (10YR 3/1) Tr FeOx'n along internal fracs. M+ friable/crumbly. Tr moisture
								19		19.5 - 20.0' - CLAYSTONE - V. Dk. Gry. (10YR 3/1) V. friable/crumbly. FeOx'n along vertical internal fracs between 19.8 - 20.0'

H_2O 11.3 → 11.7'

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Materials amounts are estimated by % volume instead of % weight.
(1) Badly broken core, accurate footage measurements not possible.
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T.D. @ 20.0'

ROCKY FLATS ENVIRONMENTAL TECHNOLOGY SITE BOREHOLE LOG

Borehole Number: 11104-TEST HOLE "A"
Location - North: _____ East: _____
Date: 7/7/04
Geologist: E. WARP
Drilling Equip.: 66 DT GEOPROBE

Surface Elevation: _____
Area: TEST HOLE FLR 00197 REPLACEMENT - WOMAN CRK ORIG. LANDFILL
Total Depth: 21.0'
Company: URS/RTG
Project No.: HAD51300 CY04 WELL INSTALLATION
Sample Type: CONTINUOUS CORE - PUSH

RMRS LOGGING SUPERVISOR APPROVAL: Elaine Kahlert
DATE: 7-21-04

TOP/BOTTOM OF CORE IN BOX	TOP/BOTTOM OF INTERVAL	FEET OF CORE IN INTERVAL (FIELD MEASUREMENT)	SAMPLE NUMBER	FRACTURE ANGLE	BEDDING ANGLE	GRAIN SIZE DISTRIBUTION	USCS SYMBOL	DEPTH IN FEET	SOIL/LITHOLOGIC LOG	SAMPLE DESCRIPTION
Box #1 of (0.0-	Run #1 (0.0-4.0')	REC. = 3.1'					CL	1.0		0.0-1.8' - Silty CLAY w/ Tr to some c.g. sand and gravel. V. Dk. Brn. (7.5YR 2.5/2). Organic-rich, roots commen. 5-10% gravel (1/2"-1" dia., sub-ang., predominately qtzite) fm. 1.3 to 1.8'. V. sl. damp.
								1.8'		1.8-2.4' - Silty CLAY w/some sand and gravel. Brn. (7.5YR 4/2). 5-10% Sand (c.g., sub-ang.). 3-5% gravel (1/4-1/2" dia., sub-ang. to sub-rounded). V. sl. damp.
								2.0		
				Top of BEDROCK @ 2.7'			GC	2.4'		2.4-2.7' - GRAVEL - 2.0-2.5" dia., sub-ang. clasts of qtzite - shattered by geoprobe. Top of BEDROCK @ 2.7' (?) V. sl. damp.
						ESN	GC	2.7'		
								3.0		2.7-3.1 - CLAY (Claystone) ESN - Lt. Yell'sh Brn. (2.5Y 6/3) to Gry'sh Brn. (2.5Y 5/2). Mottled. Tr blk. organic stringers. Tr patchy caliche and as stringers. Re-worked (?) claystone. V. sl. damp.
	4.0'	4.0'						4.0		3.1-4.0 = NO RECOVERY
	Run #2 (4.0-8.0')	REC. = 4.0'						5.0		4.0-7.5' - CLAYSTONE - Gry (10YR 6/1) w/ Yell'sh Brn (10YR 5/6) mottling - Patchy FeOx'n and bleaching. Tr diss. caliche. Dense and firm. Damp. to moist. Scattered silty stringers
								6.0		7.5-8.0' - Silty CLAYSTONE - Lt. Yell'sh Brn (10YR 6/4) to Yell'sh Brn. (10YR 5/6). Mottled. Wk to Mod. FeOx'n. Silty lense @ 7.9'. Moist. 8' ▽0
								7.0		
								7.5'		8.0-10.0' - Silty CLAYSTONE (Re-worked (??). Dk. Yell'sh Brn. (10YR 4/6). Strong perv. FeOx'n. Strongly weathered and crumbly. WET. Possible fluvial channel in claystone?? Re-worked claystone?? Appears to be incipient ironstone, massive.
	8.0'	8.0'						8.0		
	Run #3 (8.0→11.5')	REC. = 4.0'						9.0		
								10.0		

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(1) Badly broken core, accurate footage measurements not possible.
(2) Core breaks cannot be matched, accurate footage measurements not possible.

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ROCKY FLATS ENVIRONMENTAL TECHNOLOGY SITE BOREHOLE LOG

Borehole Number: 11104 - TEST HOLE "A"
Location - North: _____ East: _____
Date: 7/7/04
Geologist: E. WARP
Drilling Equip.: 66 DT GEOPROBE

Surface Elevation: _____
Area: TEST HOLE FOR 00197 REPLACEMENT - WOMAN CREEK/ORIG. LANDFILL
Total Depth: 21.0'
Company: 21RS/RTG
Project No.: HAD51300
CY04 WELL INSTALLATION.
Sample Type: Continuous Core - Push

RMRS LOGGING SUPERVISOR APPROVAL: E Kohlert
DATE: 7-21-04

TOP/BOTTOM OF CORE IN BOX	TOP/BOTTOM OF INTERVAL	FEET OF CORE IN INTERVAL (FIELD MEASUREMENT)	SAMPLE NUMBER	FRACTURE ANGLE	BEDDING ANGLE	GRAIN SIZE DISTRIBUTION	USCS SYMBOL	DEPTH IN FEET	SOIL/LITHOLOGIC LOG	SAMPLE DESCRIPTION
	Run #3 (cont.) 8.0 – 11.5'	Rec. = 4.0'						10.0'		10.0 – 11.5' – SILTSTONE (ox'd) – Lt. yell'sh Brn (10YR 6/4). Wk/Mod. perv. FeOx'n. Patchy bleaching. Tr blk. organic stringers. Moist. To clayey siltstone
	11.5'	11.5'						11		
	Run #4 (11.5 – 14.0')	Rec. = 4.0'						11.5'		11.5 – 14.3 – CLAYSTONE. Lt. Brn'sh Gry (10YR 6/2) w/ Lesser Brn'sh Yellow (10YR 6/6) mottling. Organic blk. stringers commen. Wk. perv. FeOx'n fm. 11.8 – 12.0'. Interval fairly dense. Moist.
	14.0'	14.0'						12		
	Run #5 (14.0 – 16.0')	Rec. = 4.0'						13		
	16.0'	16.0'						14		14.3 – 17.4 – ~~Silty~~ CLAYSTONE w/ tr. some silt (JAB 7/12/04) – Lt. Brn'sh Gry (10YR 6/2) to Gry (10Y 6/1) to Gry'sh Brn (10YR 5/2). ~~Incr. overall silt.~~ (JAB 7/12/04) Tr patchy wk. FeOx'n. Tr to some blk. organic stringers. Friable/crumbly. Nodule (~1/4" dia.) of blk. organic material @ 15.2' and FeOx on fracs. Tr moisture.
	Run #6 (16.0 – 17.0')	Rec. = 2.8'						14.3		NOTE: JUST USE CLAYSTONE PATTERN ZSW 7/
	17.0'	17.0'						15		
	Run #7 (17.0 – 18.0')	Rec. = 3.0'						16		17.4 – 19.1' – CLAYSTONE – Yell'sh Brn. (10YR 5/4). Wk. perv. FeOx'n. Incr. FeOx'n on fracs. (frequently vertical fracs) Between 18.5 – 19.1'. Interval fairly dense, wkly. friable. Sl. moist to moist.
	18.0'	18.0'						17		
	Run #8 (18.0 – 19.2')	Rec. = 2.8'						17.4'		
	19.2	19.2'						18		19.1 – 21.0' – CLAYSTONE – Dk. Gry (10YR 4/1). Interval much darker – Gry ~~(incr. overall organics perv ??)~~ (JAB 7/12/04). Siltier. Tr spotty wht. caliche and bleaching along internal fracs. Tr FeOx on internal fracs. Wkly. friable. VSl. moist – decr. moisture.
	Run #9 (19.2 – 21.0')	Rec. = 4.0'						19		
								19.1'		

NOTES: General: USCS is modified for this log as follows:
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(1) Badly broken core, accurate footage measurements not possible.
(2) Core breaks cannot be matched, accurate footage measurements not possible.

(4011-930-0134-930)(Form GT.1A)(03/01.92)

ROCKY FLATS ENVIRONMENTAL TECHNOLOGY SITE BOREHOLE LOG

Borehole Number: 11104 - TEST HOLE "A"
Location - North: _____ East: _____
Date: 7/7/04
Geologist: E. WARP
Drilling Equip.: 66 DT GEOPROBE

Surface Elevation: _____
Area: TEST HOLE FOR 00197 REPLACEMENT - WOMAN CREEK/ ORIGINAL LANDFILL
Total Depth: 21.0'
Company: 2125/R76 Project No. HAD51300
Sample Type: CONTINUOUS CORE - PUSH

RMRS LOGGING SUPERVISOR APPROVAL E Kahlert DATE 9-21-04

TOP/BOTTOM OF CORE IN BOX	TOP/BOTTOM OF INTERVAL	FEET OF CORE IN INTERVAL (FIELD MEASUREMENT)	SAMPLE NUMBER	FRACTURE ANGLE	BEDDING ANGLE	GRAIN SIZE DISTRIBUTION	USCS SYMBOL	DEPTH IN FEET	SOIL/ LITHOLOGIC LOG	SAMPLE DESCRIPTION
Run #9 cont.	R.e. =1.0'							20.0'		
21.0'	21.0'	21.0'						21		T.D. @ 21.0'
								22		
								23		
								24		
								25		
								26		
								27		
								28		
								29		

NOTES: General: USCS is modified for this log as follows:
Materials amounts are estimated by % volume instead of % weight.
(1) Badly broken core, accurate footage measurements not possible.
(2) Core breaks cannot be matched, accurate footage measurements not possible.

ROCKY FLATS ENVIRONMENTAL TECHNOLOGY SITE BOREHOLE LOG

Borehole Number: 11104 - ~~B~~ ESW TEST HOLE "B"
Location - North: _____ East: _____
Date: 7/6/04
Geologist: E. WARP
Drilling Equip.: 66 DT GEOPROBE

Surface Elevation: _____
Area: Original LANDFILL/Woman Crk. - Test Hole for 00197 Replacement
Total Depth: 21.5'
Company: URS/RTE Project No.: HAD57300
Sample Type: CONTINUOUS CORE - PUSH

RMRS LOGGING SUPERVISOR APPROVAL: Josh Rosen DATE: 7/7/04

TOP/BOTTOM OF CORE IN BOX	TOP/BOTTOM OF INTERVAL	FEET OF CORE IN INTERVAL (FIELD MEASUREMENT)	SAMPLE NUMBER	FRACTURE ANGLE	BEDDING ANGLE	GRAIN SIZE DISTRIBUTION	USCS SYMBOL	DEPTH IN FEET	SOIL/LITHOLOGIC LOG	SAMPLE DESCRIPTION
Box #1 of ~~5~~ ESW Core not Kept	Run #1 (0.0-4.0')	Recovery = 2.5'					CL	0.0		0.0-0.8 - CLAY w/some gravel. V. Dk. Brn (10YR 2/2). 5-10% gravel (1/2-1" dia., sub-arg. to sub-rounded, predominately qtzite). Organic rich, roots commen. V. slightly damp.
							GW	0.8' 1		0.8-1.1' - Gravel - large cobble of qtzite shattered by geoprobe.
							CL	2		1.1-2.4' - CLAY w/Tr to some gravel. Lt. Olive Brn. (2.5Y 5/4). Tr - 7% gravel (1/4-3/4" dia., sub-arg. to sub-rounded, pred. qtzite).
								2.4' 3		2.4-4.0' - No Recovery
	4.0'	4.0'						4		4.0-~~6.9~~ ESW 6.9' - CLAY w/Tr sand and gravel. Brn. (10YR 5/3). Tr caliche disseminated throughout interval. Tr org. - blk. stringers. Caliche w/some c.g. sand and gravel fm. 6.3-6.5'. 2" dia. qtzite cobble @ 6.3' and 6.9'. Tr patchy FeOxn.
	Run #2 (4.0-7.0')	Rec. = 3.3'					CL	5		
								6		6.9-7.8' - Gravel/Silty CLAY MIXTURE Brn. (10YR 5/3) to Yell'sh Brn. (10YR 5/4). 60% gravel and cobbles (1/2"-2" dia., sub-arg. to sub-rounded, ESW pr. qtzite and granitic composition Tr patchy FeOxn. V. slightly damp.
	7.0'	7.0'					CL GM	6.9'		
	Run #3 (7.0-11.0')	Rec. = 4.0'		Top of Bedrock = 7.8'				7.8'		Bedrock Contact @ 7.8'
										7.8-11.2' - Silty CLAYSTONE - Gry'sh Brn. (10YR 5/2) mottled w/yell'sh Brn (10YR 7/6). patchy FeOxn. Massive textured, v. uniform claystone. Friable/crumbly. Tr bleach'd/wht. stringers. LESS friable between 10.8-11.2'.

NOTES: General: USCS is modified for this log as follows:
Materials amounts are estimated by % volume instead of % weight.
(1) Badly broken core, accurate footage measurements not possible.
(2) Core breaks cannot be matched, accurate footage measurements not possible.

Procedure No. RMRS/OPS-PRO.101
Revision 0
Date effective: 12/31/98

(401 1-930-01 34-930)(Form GT.1A)(03/01.V2)

ROCKY FLATS ENVIRONMENTAL TECHNOLOGY SITE BOREHOLE LOG

Borehole Number: 11104 (b) - TEST HOLE "B"
Location - North: ESW East:
Date: 7/6/04
Geologist: E. WARP
Drilling Equip.: 66 DT GEOPROBE

Surface Elevation:
Area: Original Landfill
Total Depth: 21.5'
Company: URS/RTG
Project No.: HAD51300
Sample Type: Con

CY04 WELL INSTALLATION

RMRS LOGGING SUPERVISOR APPROVAL JDR

DATE 7/7/04

TOP/BOTTOM OF CORE IN BOX	TOP/BOTTOM OF INTERVAL	FEET OF CORE IN INTERVAL (FIELD MEASUREMENT)	SAMPLE NUMBER	FRACTURE ANGLE	BEDDING ANGLE	GRAIN SIZE DISTRIBUTION	USCS SYMBOL	DEPTH IN FEET	SOIL/LITHOLOGIC LOG	SAMPLE DESCRIPTION
	Run #3 cont. 11.0'	Rec. = 4.0' 11.0'						10.0		Silty CLAYSTONE (cont. fm. previous page. 7-8' to 11.2'.
	ESW Run #6 (11.0-14.0') Run #4 14.0'	Rec. = 4.0' 14.0'						11.2 11.8 13 14		11.2-11.8' - Silty CLAYSTONE. Yell'sh Brn. (10YR 5/6) - Ox'd claystone. Wk to Mod. perv. FeOx'n and as coating on internal fracs. Tr organic blk. stringers. Wk to moderately friable V. slightly damp. 11.8-14.7' - Silty CLAYSTONE. Gry'sh Brn. (10YR 5/2). Decr. overall FeOx'n to Tr. Zone of perv. FeOx'n @ 13.4'. Interval fairly dense, less crumbly. V. slightly damp. some organic mat'l
	Run #5 (14.0-16.0') 16.0'	Rec. = 3.6' 16.0'						14.7 15 15.7' 16		14.7-15.7' - CLAYSTONE - V. Dk. Gry'sh Brn (10YR 3/2). Dense/less friable, Abundant blk. organic material between 15.0-15.3', 1" round dia. "concretion" of blk. organic material within the claystone. Dense and firm. V. slightly damp. 15.7-18.3' - Silty CLAYSTONE. Lt. Brn'sh Gry (10YR 6/2) w/ Tr patchy FeOx'n. V. uniform claystone, massive textured. V. friable/crumbly fm. 16.0'-18.3'. Patchy FeOx'n @ 16.3'.
	Run #6 (16.0-18.0') 18.0'	Rec. = 4.0' 18.0'						17'		
	Run #7 (18.0-19.5') 19.5'	Rec. = 4.0' 19.5'						18.3' 19 19.5'		18.3-19.5 - Silty CLAYSTONE - Lt. Yell'sh Brn (10YR 6/4) to Yell'sh Brn (10YR 5/6) with Gry (10YR 6/1) mottling. Wk. perv. FeOx'n fm 18.3 to 19.0'. Patchy FeOx'n as stringers and on fracs. fm. 19.0 to 19.8'.
	Run #8	Rec. 4.0'								

NOTES: General: USCS is modified for this log as follows:
Materials amounts are estimated by % volume instead of % weight.
(1) Badly broken core, accurate footage measurements not possible.
(2) Core breaks cannot be matched, accurate footage measurements not possible.

(4011-930-0134-930)(Form CT:1A)(03/01/92)

ROCKY FLATS ENVIRONMENTAL TECHNOLOGY SITE BOREHOLE LOG

Borehole Number: 11104 (6) SW - Test Hole "B"
Location - North: _____ East: _____
Date: 7/6/04
Geologist: E. Warp
Drilling Equip.: 66 DT Geoprobe

Surface Elevation: _____
Area: Original Landfill
Total Depth: 21.5'
Company: URS/RTE
Project No.: HAD51300 CY04 Well Installation
Sample Type: Continuous Core - push

RMRS LOGGING SUPERVISOR APPROVAL JDR

DATE 7/7/04

TOP/BOTTOM OF CORE IN BOX	TOP/BOTTOM OF INTERVAL	FEET OF CORE IN INTERVAL (FIELD MEASUREMENT)	SAMPLE NUMBER	FRACTURE ANGLE	BEDDING ANGLE	GRAIN SIZE DISTRIBUTION	USCS SYMBOL	DEPTH IN FEET	SOIL/LITHOLOGIC LOG	SAMPLE DESCRIPTION
	Run #8 20.5	Rec. ≈4.0' 20.5'						20.0		20.0-21.5' - Silty CLAYSTONE Gray (10YR 6/1). Massive textured. Tr patchy FeOx'n. Crumbly, friable. Dry. T.D. @ 21.5'
	Run #9	Rec. ≈3.5'		T.D. @ 21.5'				21		
								21.5'		

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Materials amounts are estimated by % volume instead of % weight.
(1) Badly broken core, accurate footage measurements not possible.
(2) Core breaks cannot be matched, accurate footage measurements not possible.

Procedure No. RMRS/OPS-PRO.101
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ROCKY FLATS ENVIRONMENTAL TECHNOLOGY SITE BOREHOLE LOG

PAGE 1 OF 3

Borehole Number: 11104 - TEST HOLE "C"
Location - North: _____ East: _____
Date: 7/8/04
Geologist: E. WARP
Drilling Equip.: 66 DT GEOPROBE

Surface Elevation: _____
Area: Test Hole for 00197 Replacement - Woman Crk.
Total Depth: 21.0'
Company: URS/RTG
Project No.: HAD51300
Sample Type: Continuous Core - PUSH

CY04 WELL INSTALLATION

RMRS LOGGING SUPERVISOR APPROVAL: Elaine Kahlert
DATE: 7-21-04

N/A ESW 7/21/04

TOP/BOTTOM OF CORE IN BOX	TOP/BOTTOM OF INTERVAL	FEET OF CORE IN INTERVAL (FIELD MEASUREMENT)	SAMPLE NUMBER	FRACTURE ANGLE	BEDDING ANGLE	GRAIN SIZE DISTRIBUTION	USCS SYMBOL	DEPTH IN FEET	SOIL/LITHOLOGIC LOG	SAMPLE DESCRIPTION
~~Box #1~~ of	Run #1 (0.0→4.0')	Rec. = 3.4'					CL	1.0		0.0-1.2' - CLAY w/ Tr Sand and gravel Brn (7.5YR 4/2). Tr-5% gravel (1/4-1.0" dia., sub-rounded to sub-ang.). Tr-3% sand (c.g., sub-ang.). Organic-rich, roots common. DRY.
							CL	1.2' 2.0		1.2-2.6' - Gravelly, sandy, silty clay. Strng. Brn (7.5YR 4/6). 7-10% sand (c.g., sub-ang.). 3-5% gravel (1/8-1/2" dia., sub-ang. to sub-rounded, qtzite and granitic comp.). Spotty CALICHE. Tr roots. Tr moisture.
							CL	2.6' 3.0		2.6-3.4' - Silty CLAY - Lt. yell'sh Brn. (2.5Y 6/3) Re-worked claystone. Spotty bleaching and caliche. Bleached wht. stringers. Wkly friable. Tr moisture.
	4.0'	4.0'		Bedrock Contact @ 4.2'			CL	3.4' 4.0		3.4-4.0 = NO RECOVERY
	Run #2 (4.0-8.0')	Rec. = ~~3.~~ 4.0'						4.2' 5.0		4.0-4.2 - Silty CLAY - as above 2.6-3.4'. C.g. sand @ 4.2' - Bedrock contact ?? Tr moisture to v. sl. damp. Top of Bedrock @ 4.2'
								6.0		4.2-6.0 - CLAY {stone} - Lt. Brn'sh Gry (2.5Y 6/2). Possibly re-worked bedrock ?? Caliche diss. throughout and on internal fracs. + stringers. M/S Friable-crumbly. Tr moisture v. sl. damp. ESW 7/12/04 w/ Tr to some silt.
								7.0		6.0-8.3 - ~~Silty~~ CLAYSTONE - Brn'sh Yellow (10YR 6/6). W/M perv. FeOx'n. Tr Fe-stone nodules and fragments. Spotty bleaching. Tr moisture. Scattered blk. carbonaceous flecks.
	8.0'	8.0'						8.0 8.3		8.3-9.8' - ~~Silty~~ CLAYSTONE - Gry (10YR 6/1). Tr FeOx'n. Strongly friable-crumbly. Caliche @ 8.3'. Tr moisture w/ Tr to some silt
	Run #3 (8.0-11.0')	Rec. = 4.0'						9.0 9.8' 10.0		9.8-15.9' - CLAYSTONE w/ Pale Yellow (2.5Y 7/3) to Gry'sh Brn. (2.5Y 5/2). Wk. perv. FeOx'n, throughout interval. FeOx along vert. fracs between 14.0' and 15.9'. Tr moisture

NOTES: General: USCS is modified for this log as follows:
Materials amounts are estimated by % volume instead of % weight.
(1) Badly broken core, accurate footage measurements not possible.
(2) Core breaks cannot be matched, accurate footage measurements not possible.

Procedure No. RMRS/OPS-PRO.101
Revision 0
Date effective: 12/31/98
Page 27 of 28

(4011-930-0134-930)(Form GT.1A)(03/01.92)

ROCKY FLATS ENVIRONMENTAL TECHNOLOGY SITE BOREHOLE LOG

Borehole Number: 11104-TEST HOLE "C"
Location - North: _____ East: _____
Date: 7/8/04
Geologist: E. WARP
Drilling Equip.: 66 DT GEOPROBE

Surface Elevation: _____
Area: TEST HOLE FOR 00197 REPLACEMENT
Total Depth: 21.0'
Company: URS/RFG
Project No.: HAD51300
Sample Type: CONTINUOUS PRE-PUSH

C/04 WELL INSTALLATION.

RMRS LOGGING SUPERVISOR APPROVAL Elaine Kuhlert DATE 7-21-04

TOP/BOTTOM OF CORE IN BOX	TOP/BOTTOM OF INTERVAL	FEET OF CORE IN INTERVAL (FIELD MEASUREMENT)	SAMPLE NUMBER	FRACTURE ANGLE	BEDDING ANGLE	GRAIN SIZE DISTRIBUTION	USCS SYMBOL	DEPTH IN FEET	SOIL/ LITHOLOGIC TOC	SAMPLE DESCRIPTION
	Run #3 cont. 8.0–11.0' 11.0'	Rec = 4.0' 11.0'						11		(cont.) CLAYSTONE w/ Tr-some silt. (see description on previous page)
	Run #4 (11.0–14.0') 14.0'	Rec. = 4.0' 14.0'						12, 13, 14		
	Run #5 (14.0–16.0') 16.0'	Rec. = 3.8' 16.0'						15, 15.9', 16		15.9–20.0' — CLAYSTONE w/ Tr silt. Grysh Brn (10YR 5/2). Mod. friable. Tr-some blk organic blebs between 18.0 and 19.0. Tr moisture.
	Run #6 (16.0–18.0') 18.0'	Rec. = ~~3.0~~ 4.0' 18.0'						17, 18		
	Run #7 (18.0–19.5') 19.5'	Rec. = 3.0' 19.5'						19		
	Run #8	Rec. = 4.0'								

NOTES: General: USCS is modified for this log as follows:
Materials amounts are estimated by % volume instead of % weight.
(1) Badly broken core, accurate footage measurements not possible.
(2) Core breaks cannot be matched, accurate footage measurements not possible.

Procedure No. RMRS/OPS-PRO.101
Revision 0
Date effective: 12/31/98

(4011-930-0134-930)(Form GT.1A)(03/01.V2)

ROCKY FLATS ENVIRONMENTAL TECHNOLOGY SITE BOREHOLE LOG

Borehole Number: 11104-TEST HOLE "C"
Location - North: East:
Date: 7/20/04
Geologist: E. WAMP
Drilling Equip.: 66 DT GEOPROBE

Surface Elevation:
Area:
Total Depth: 21.0'
Company: URS/RFG
Sample Type: Continuous Core-Push

CY04 WELL INSTALLATION
Project No.: HAD57300

RMRS LOGGING SUPERVISOR APPROVAL Elaine Cahlert DATE 7-21-04

TOP/BOTTOM OF CORE IN BOX	TOP/BOTTOM OF INTERVAL	FEET OF CORE IN INTERVAL (FIELD MEASUREMENT)	SAMPLE NUMBER	FRACTURE ANGLE	BEDDING ANGLE	GRAIN SIZE DISTRIBUTION	USCS SYMBOL	DEPTH IN FEET	SOIL/ LITHOLOGIC LOG	SAMPLE DESCRIPTION
	Run #8 cont. 19.5-21.0' 21.0'	Rec.: 21.0'						20.0		20.0 – 21.0 – CLAYSTONE w/ ≈ silt. V. Dk. Gry (10YR 3/1). Wkly friable. V. sl. moist. Blk. organic mottling throughout interval.
								21		T.D. @ 21.0'
								22		
								23		
								24		
								25		
								26		
								27		
								28		
								29		

NOTES: General: USCS is modified for this log as follows:
Materials amounts are estimated by % volume instead of % weight.
(1) Badly broken core, accurate footage measurements not possible.
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ROCKY FLATS ENVIRONMENTAL TECHNOLOGY SITE BOREHOLE LOG

Borehole Number: 11104-Test Hole "D"
Location - North: _____ East: _____
Date: 7/13/04
Geologist: E. Warp
Drilling Equip.: 6/6 DT Geoprobe

Surface Elevation: _____
Area: Test Hole for 00197 Replacement - Woman Creek Original Landfill
Total Depth: 21.9'
Company: URS/RTG
Project No.: HAD51300 CY04 Well Installation
Sample Type: Continuous Core - Push

RMRS LOGGING SUPERVISOR APPROVAL Elaine Kahlert DATE 7-21-04

TOP/BOTTOM OF CORE IN BOX	TOP/BOTTOM OF INTERVAL	FEET OF CORE IN INTERVAL (FIELD MEASUREMENT)	SAMPLE NUMBER	FRACTURE ANGLE	BEDDING ANGLE	GRAIN SIZE DISTRIBUTION	USCS SYMBOL	DEPTH IN FEET	SOIL/LITHOLOGIC LOG	SAMPLE DESCRIPTION
	Run #1 (0.0→4.0')	Rec = 2.8'					CL	1.0		0.0-1.0' - Silty CLAY w/ Tr sand and gravel. Brn. (7.5YR4/3). Tr c.g. sand (sub-ang.). Tr gravel (1/8-1/4" dia., sub-rounded). Roots common fm. 0.0-0.35'; Tr FeOx but incrs's @ base fm. 0.8-1.0' to mod-perv. Fairly dense fm. 0.3'-0.8'. Sl. moist.
							CL	2.0		1.0-2.8' - CLAY w/some silt, Tr gravel and sand. Gry'sh Brn. (2.5Y5/2) to Lt. Olive Brn. (2.5Y5/3). Tr FeOx. Tr caliche (diss. and stringers). Crumbly. Sl. moist.
								2.8'		2.8-4.0' = NO RECOVERY
								3.0		
	4.0'	4.0'		Top of Bedrock @ 4.2'			CL	4.0		4.0-4.2 - CLAY w/some sand. Olive Brn. (2.5Y4/3) to Dk. Gry'sh Brn. (2.5Y4/2). 3 ±5% sand (c.g., sub-ang.). Undulating bedrock contact @ 4.2'. Top of Bedrock @ 4.2'.
	Run #2 (4.0-8.0')	Rec. = 4.0'						4.2'		4.2'-6.5' - CLAYSTONE w/ Tr to some silt. Dk. Gry'sh Brn. (10YR4/2) w/patchy Dk. Yellow'sh Brn. (10YR4/4) FeOx'n mottled throughout. Fairly dense. Sl. moist.
								5.0		
								6.0		6.5-7.9' - CLAYSTONE w/ Tr Silt. V. Dk. Gry'sh Brn. (10YR3/2) to Gry'sh Brn. (10YR5/2). Mottled. Decr. FeOx to Tr. Tr blk. organic frags. Wkly. friable, fairly dense. Sl. moist.
								6.5'		
								7.0		
	8.0	8.0'						7.9'		7.9-9.0' - CLAYSTONE. Lt. Brn'sh Gry (10YR6/2) w/ Yell'sh Brn. (~~mottled FeOx~~ 10YR5/4). mottled FeOx'n throughout. Spotty caliche fm. 8.2-9.0'. Weathered. Mod. friable. Sl. moist.
								8.0		
	Run #3 (8.0-11.0')	Rec.: 4.0'						9.0		9.0-10.8' - CLAYSTONE - Gray (10YR6/1). Tr FeOx'n on internal fracs. Spotty caliche @ 9.5' and 10.8'. M/S friable, crumbly. Sl. moist.
								10.0		

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Procedure No. RMRS/OPS-PRO.101
Revision 0
Date effective: 12/31/98

(4011-930-0134-930)(Form GT.1A)(03/01/92)

ROCKY FLATS ENVIRONMENTAL TECHNOLOGY SITE BOREHOLE LOG

Borehole Number: 11104 - TEST HOLE "D"
Location - North: _____ East: _____
Date: 7/13/04
Geologist: E. WARP
Drilling Equip.: 6610 DT GEOPROBE

Surface Elevation: _____
Area: TEST HOLE FOR 00197 REPLACEMENT - WOMAN CREEK ORIGINAL LANDFILL CY04 WELL INSTALLATION
Total Depth: 21.9'
Company: URS/RTG Project No.: HAD51300
Sample Type: CONTINUOUS CORE-PUSH

RMRS LOGGING SUPERVISOR APPROVAL E. Gahlert DATE 7-21-04

TOP/BOTTOM OF CORE IN BOX	TOP/BOTTOM OF INTERVAL	FEET OF CORE IN INTERVAL (FIELD MEASUREMENT)	SAMPLE NUMBER	FRACTURE ANGLE	BEDDING ANGLE	GRAIN SIZE DISTRIBUTION	USCS SYMBOL	DEPTH IN FEET	SOIL/LITHOLOGIC LOG	SAMPLE DESCRIPTION
	Run #3 cont. 8.0-11.0'	Rec. = 4.0'						10.8'		CLAYSTONE (cont. fm. 9.0 - see previous page for description). w/some silt
	Run #4 (11.0-13.5') 13.5'	Rec. = 4.0'						11, 12, 13		10.8-15.2' - CLAYSTONE - Gry'sh Brn. (10YR5/2) Massive texture. M/s friable, v. crumbly. Ø moisture
	Run #5 (13.5-15.5') 15.5'	Rec. = 4.0'						14, 15, 15.2		15.2-15.6' - CLAYSTONE - Gry'sh Brn. (10YR5/2). Massive textured. Mod. Friable. Ø to slightly moist.
	Run #6 (15.5-17.5') 17.5'	Rec. = 4.0'						15.6, 16, 17		15.6-19.8' - CLAYSTONE - V. Dk. Gry'sh Brn (10YR3/2). Ø diss. FeOx. Caliche as frac. fill @ 16.5'. Mod. friable. Ø to Sl. moist.
	Run #7 17.5-18.5'	Rec. = 3.2'						17.8, 18, 18.1		17.8-18.1' - CLAYSTONE. Yell'sh Brn. (10YR5/6). M/s perv. FeOx. W/m friable. Ø to sl. moist.
	Run #8 18.5-19.5'	Rec. = 3.3'						19		18.1-20.5 - CLAYSTONE. V. Dk. Gry'sh Brn. (10YR3/2). Decr. FeOx'n to Ø which occurs along internal fracs. W/m friable. Wht. caliche stringers @ 19.5 to 19.6'. FeOx along internal fracs @ 19.9'. Slight color change between 20.0 to 20.5' to Gry'sh Brn (10YR5/2). Ø moisture
	Run #9 19.5-20.5'	Rec. = 3.0'								

Run #9 = 19.5 to 20.5'

NOTES: General: USCS is modified for this log as follows:
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Procedure No. RMRS/OPS-PRO.101
Revision 0
Date effective: 12/31/98

(4011-930-0134-930)(Form GT.1A)(03/01.V2)

ROCKY FLATS ENVIRONMENTAL TECHNOLOGY SITE BOREHOLE LOG

PAGE 3 OF 3

Borehole Number: 11104- TEST HOLE "D"
Location - North: _____ East: _____
Date: 7/13/04
Geologist: E. WARP
Drilling Equip.: 66 DT Geoprobe

Surface Elevation: _____
Area: TEST HOLE FOR 00197 REPLACEMENT - WOMAN CREEK Original Landfill
Total Depth: 21.9'
Company: URS/RTG
Project No.: HAD51300 CY04 WELL INSTALLATION
Sample Type: CONTINUOUS CORE - PUSH

RMRS LOGGING SUPERVISOR APPROVAL E Kahlert DATE 7-21-04

TOP/BOTTOM OF CORE IN BOX	TOP/BOTTOM OF INTERVAL	FEET OF CORE IN INTERVAL (FIELD MEASUREMENT)	SAMPLE NUMBER	FRACTURE ANGLE	BEDDING ANGLE	GRAIN SIZE DISTRIBUTION	USCS SYMBOL	DEPTH IN FEET	SOIL/ LITHOLOGIC LOG	SAMPLE DESCRIPTION
										CLAYSTONE (cont. fm. 18.1'-description on previous page).
	20.5	20.5						20.5		20.5-21.0 - CLAYSTONE - Dk. Yell'sh Brn. (10YR4/6). Mod. perv. FeOx'n W/M friable. Tr moisture
	Run #10	Rec.: 3.8'						21		21.0-21.5 - CLAYSTONE - V. Dk. Gry'sh Brn. (10YR3/2). Decr. FeOx to Tr (on internal frac. surfs). Tr caliche (frac) @ 21.1'. W/M friable. Tr moisture.
21.9'	21.9'							21.5'		21.5-21.9' - CLAYSTONE - Fe-oxid - Dk. Yell'sh Brn (10YR4/6) mottled W/ Dk. Gry'sh Brn (10YR4/2). Mod. FeOx'n as frac. fill. W/M friable. Tr moisture. T.D. @ 21.9'
		T.D @ 21.9'						22		
								23		
								24		
								25		
								26		
								27		
								28		
								29		

NOTES: General: USCS is modified for this log as follows:
Materials amounts are estimated by % volume instead of % weight.
(1) Badly broken core, accurate footage measurements not possible.
(2) Core breaks cannot be matched, accurate footage measurements not possible.

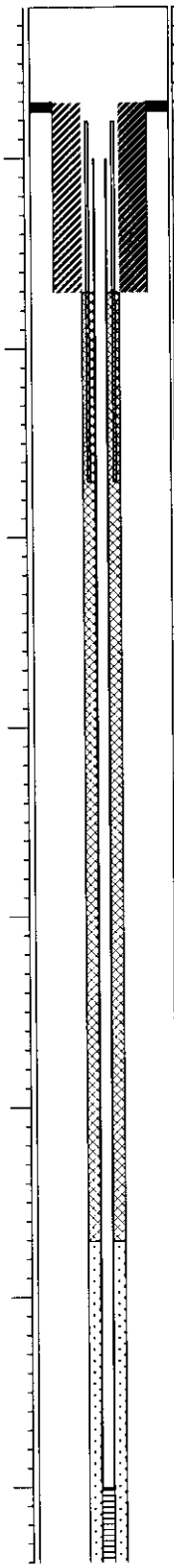
(4011-930-0134-930)(Form GT.1A)(03/01/92)

STATE PLANE COORDINATES AREA:
NORTH: 750000.056
EAST: 2082101.184
PROJECT: 2004 WARP
REMARKS:

GRND ELEV. (FT): 6016.293
TOTAL DEPTH (FT): 30.0
COMPLETION DATE: 6/8/04
GEOLOGIST: J. Rosen

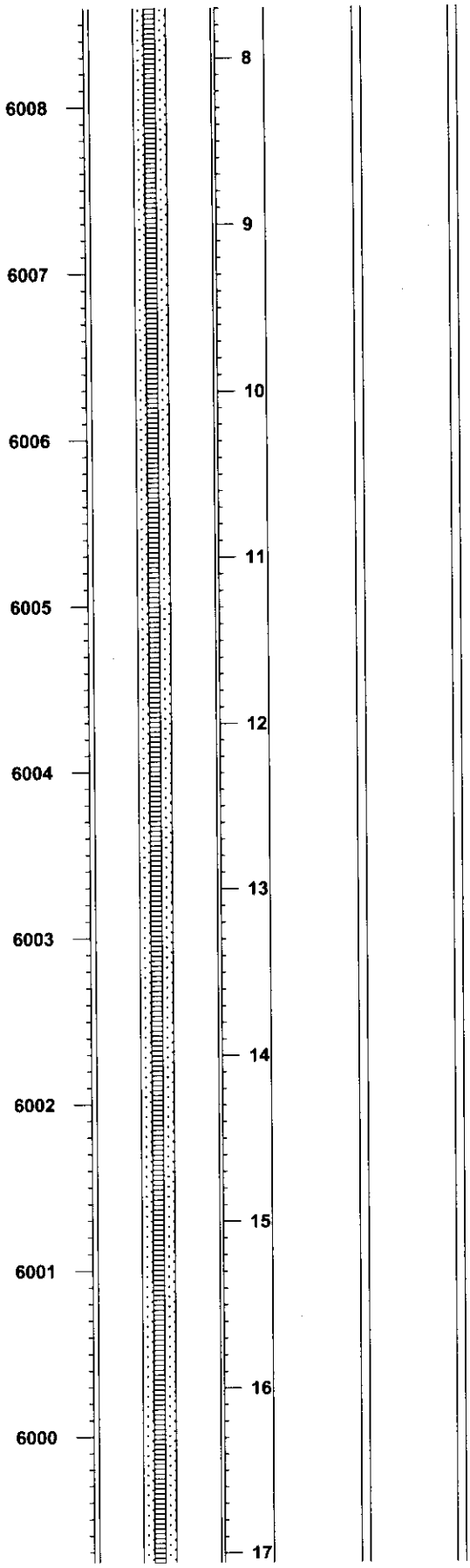
CASING DIA (IN): 1"
BH DIA. (IN): 3.75"
GRID LOCATOR:

LOG OF BORING NUMBER: 33604

Elev (Ft)	Well or Piezometer Construction and Materials	Depth (Ft)	Lithology	Unified Soils Classification or Rock Type	Lithologic Description
6016		0			Core not logged. See well 33603 for lithology.
6015		1			
6014		2			
6013		3			
6012		4			
6011		5			
6010		6			
6009		7			

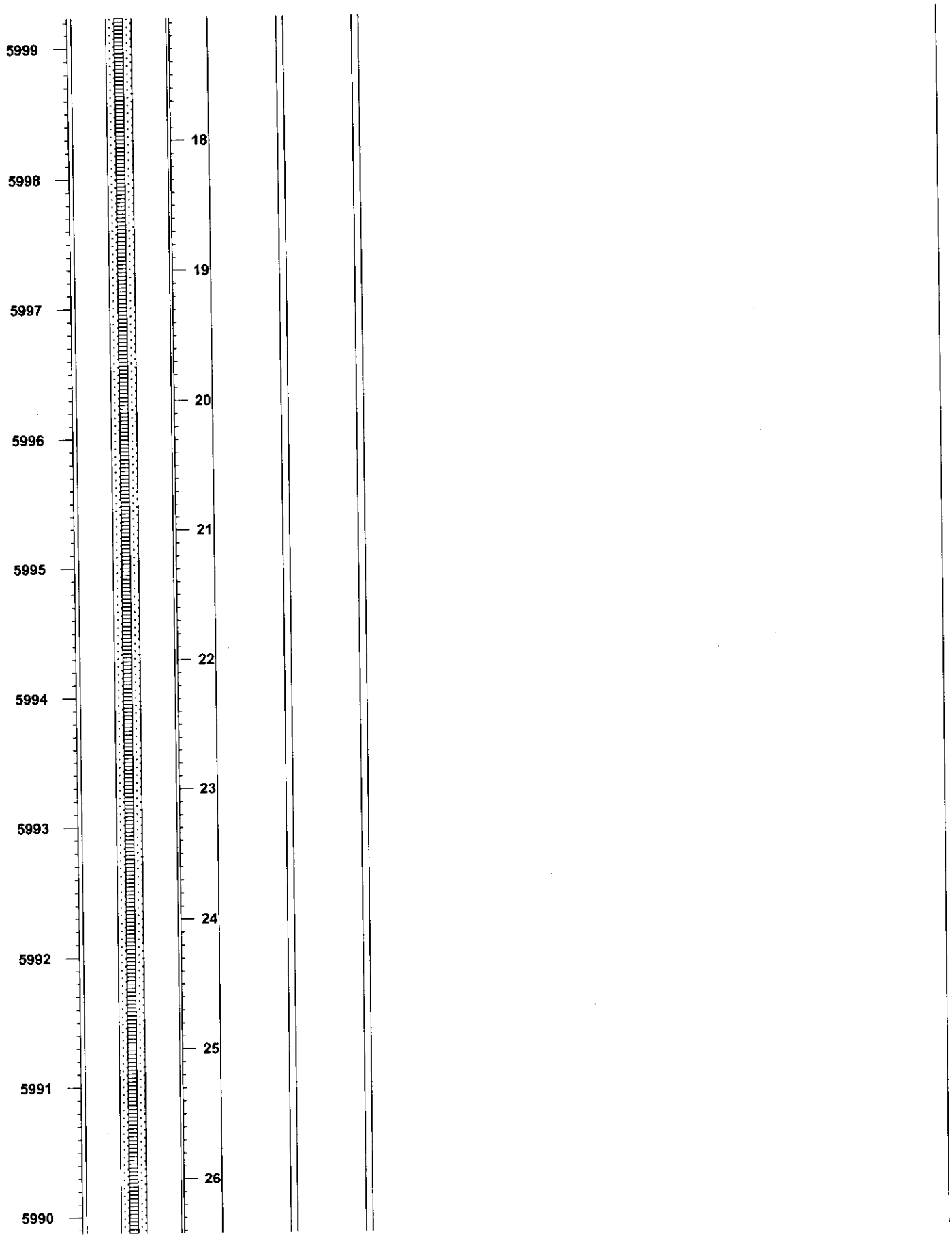
Elev (Ft)	Well or Piezometer Construction and Materials	Depth (Ft)	Lithology	Unified Soils Classification or Rock Type	Lithologic Description

LOG OF BORING NUMBER:
33604



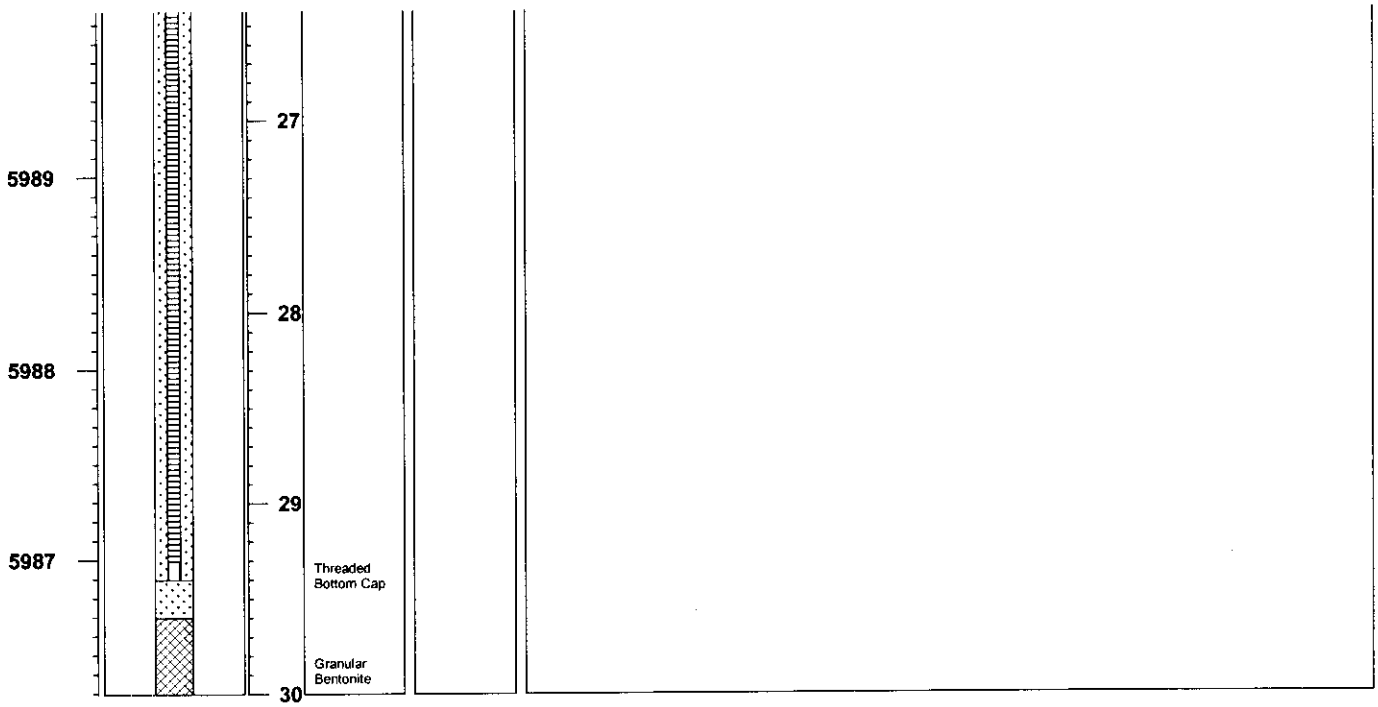
Elev (Ft)	Well or Piezometer Construction and Materials	Depth (Ft)	Lithology	Unified Soils Classification or Rock Type	Lithologic Description

LOG OF BORING NUMBER:
33604



Elev (Ft)	Well or Piezometer Construction and Materials	Depth (Ft)	Lithology	Unified Soils Classification or Rock Type	Lithologic Description

LOG OF BORING NUMBER:
33604

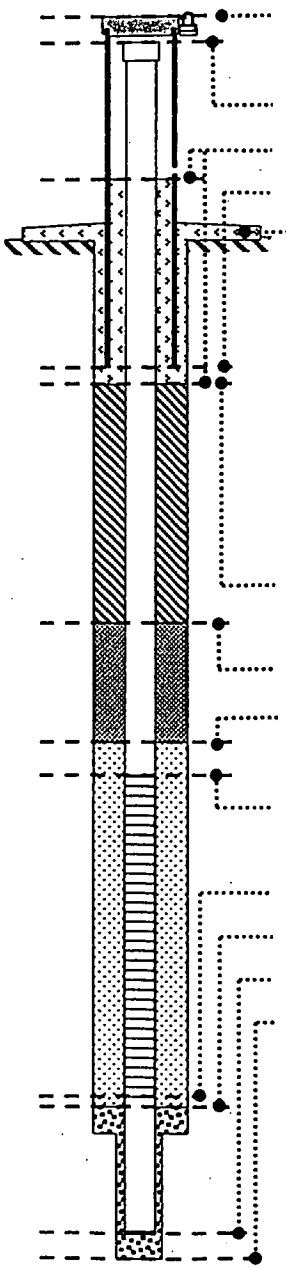


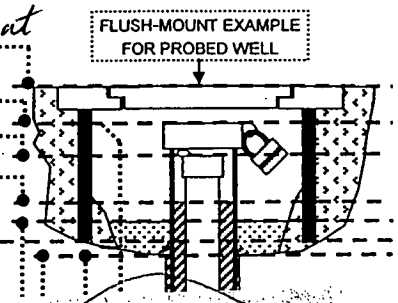
MONITORING WELL INSTALLATION REPORT: Form PRO.118

LOCATION CODE: 33604 PROJECT NAME: '04 WARP PROGRAM: '04 WARP
SCREENED FORMATION: VFA/Fill DRILLING CONTRACTOR: RTG BORING METHOD: Geoprobe
DATE DRILLED: 6/8/04 DATE COMPLETED: 6/8/04 TOTAL DEPTH: 29.5 COMPLETED DEPTH: 29.3
ESTIMATED DEPTH TO BEDROCK: 20-21' RIG GEOLOGIST: J. Rosen LOGGING GEOLOGIST: None
BOREHOLE DIAMETER IN SCREENED INTERVAL: 3.75" QUANTITY OF FLUIDS LOST DURING DRILLING: None
INITIAL WATER LEVEL (FT, DATE): not measured COMPLETED WATER LEVEL (FT, DATE): not measured
DIAMETER & TYPE OF INSTALLATION (WELL/PIEZOMETER/WELL POINT/ETC.): 1" stainless steel well
TYPE OF PROTECTION (FLUSH-MOUNT VS. ABOVE GROUND, ASEPTIC, ETC.): flush mount

ALL MEASUREMENTS WILL BE MADE IN FEET FROM GROUND SURFACE

* DENOTES ITEMS THAT MAY NOT BE APPLICABLE, DEPENDING ON BORING METHOD, WELL PROTECTION & PURPOSE





PROTECTIVE CASING TOP (STICKUP OR FLUSH-MOUNT): flush mount
*SECONDARY CASING TOP: -.1' BOTTOM: -2' TYPE: 2" PVC
SURFACE CASING TOP: 1" ID (IN): -0.3' bgs
SURFACE SEAL TOP: GS on outside BOTTOM: -1' TYPE: Concrete
PROTECTIVE CASING BOTTOM, ID (IN), TYPE: 8" flush mt, -1'
*WELL PAD DIMENSIONS, TYPE: flush mount annular space
*ADD'L CASING FILL TOP: X BOTTOM: X TYPE: X
*SURFACE ISOLATION CASING TOP: X BOTTOM: X
*SURFACE ISOLATION CASING ID (IN): X TYPE: X
*OTHER (E.G., ASEPTIC) CASING TOP: X BOTTOM: X
*OTHER CASING ID (IN): X TYPE, PURPOSE: X
*CENTRALIZER(S) OD (IN): X NUMBER USED: X TYPE: X
*CENTRALIZER(S) DEPTH(S): X
*GROUT TOP: NA MEASURED DENSITY (LBS/GAL): X TYPE: X
*GRANULAR BENTONITE TOP: X TYPE: X
*BENTONITE SEAL TOP: 1 ~~0~~ 5' bgs TYPE: granular (hydrated)
BENTONITE SEAL OR GRANULAR BENTONITE BOTTOM (= FILTER PACK TOP): 6' bgs
FILTER PACK TYPE: 16-40 BRAND: CO silica
SURFACE CASING BOTTOM (=SCREEN TOP): 7.3 TYPE: stainless steel 1"
SCREEN ID (IN): 1" SLOT SIZE (IN): .010 TYPE: Stainless Steel 1"
SCREEN BOTTOM (= SUMP, TOP): 29.3 SUMP TYPE: none; threaded bottom cap
FILTER PACK BOTTOM (= *BACKFILL TOP): 29.6 *BACKFILL TYPE: gran. bent.
SUMP BOTTOM (= WELL COMPLETED DEPTH): 29.4 *PILOT HOLE TOP, DIAMETER: NA
TOTAL BOREHOLE DEPTH (= *PILOT HOLE AND *BACKFILL BOTTOM): 30'

Cores Not Logged See 33603 for lithology

REMARKS: Did not have 25' of screen as WP specified.

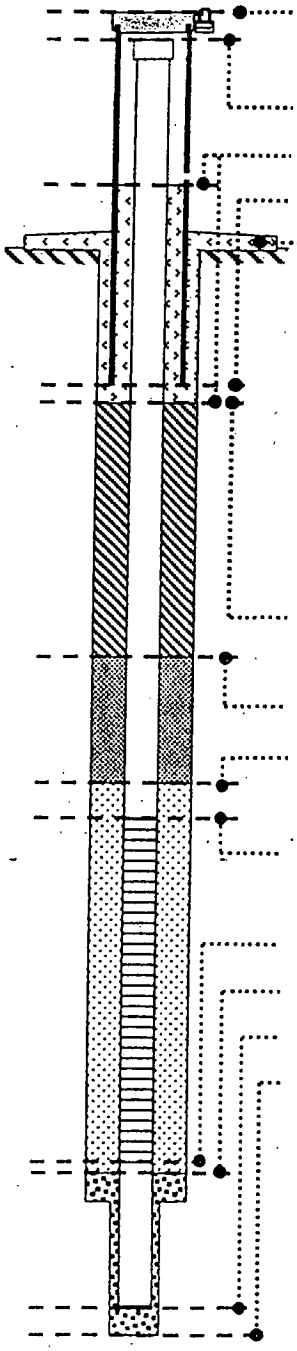
COMPLETED BY: Josh Rosen DATE: 6/9/04
CHECKED BY: DATE:

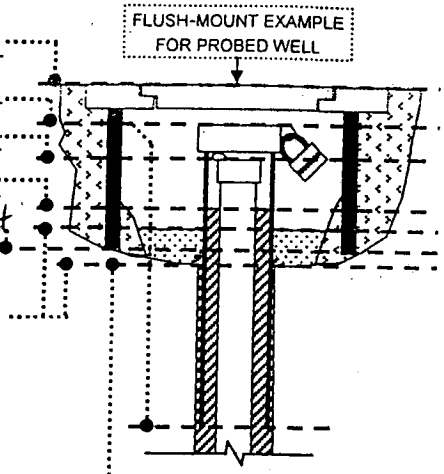
33604 → **MONITORING WELL INSTALLATION REPORT: Form PRO.118**

LOCATION CODE: 33603 ESW PROJECT NAME: C404 WARP-WELL INSTALLATION PROGRAM: WATER PROGRAMS
SCREENED FORMATION: Al/Brk. DRILLING CONTRACTOR: RTG BORING METHOD: GEOPROBE
DATE DRILLED: 6/8/04 DATE COMPLETED: 6/8/04 TOTAL DEPTH: 30.0' COMPLETED DEPTH: 29.4'
ESTIMATED DEPTH TO BEDROCK: 25.3 RIG GEOLOGIST: J. Rosen LOGGING GEOLOGIST: Not LOGGED
BOREHOLE DIAMETER IN SCREENED INTERVAL: 3.75" QUANTITY OF FLUIDS LOST DURING DRILLING: N/A
INITIAL WATER LEVEL (FT, DATE): 8.55' below TOC 6/22/04 COMPLETED WATER LEVEL (FT, DATE): 4.05' (fm TOC) on 7/21/04
DIAMETER & TYPE OF INSTALLATION (WELL/PIEZOMETER/WELL POINT/ETC.): 1.0" I.D. Stainless Steel well.
TYPE OF PROTECTION (FLUSH-MOUNT VS. ABOVE GROUND, ASEPTIC, ETC.): Flushmount Prot. Casing

ALL MEASUREMENTS WILL BE MADE IN FEET FROM GROUND SURFACE

* DENOTES ITEMS THAT MAY NOT BE APPLICABLE, DEPENDING ON BORING METHOD, WELL PROTECTION & PURPOSE





PROTECTIVE CASING TOP (STICKUP OR FLUSH-MOUNT): 0.0'
*SECONDARY CASING TOP: 0.1' bgs BOTTOM: 2.0 TYPE: PVC
SURFACE CASING TOP: 0.3' bgs ID (IN): 1.0"
SURFACE SEAL TOP: N/A BOTTOM: ____ TYPE: ____
PROTECTIVE CASING BOTTOM, ID (IN), TYPE: 1.0' bgs, 8" steel flushmount
*WELL PAD DIMENSIONS, TYPE: CONCRETE - AROUND EXTERIOR OF 8" I.D. flushmount.
*ADD'L CASING FILL TOP: N/A BOTTOM: ____ TYPE: ____
*SURFACE ISOLATION CASING TOP: N/A BOTTOM: ____
*SURFACE ISOLATION CASING ID (IN): N/A TYPE: ____
*OTHER (E.G., ASEPTIC) CASING TOP: N/A BOTTOM: ____
*OTHER CASING ID (IN): N/A TYPE, PURPOSE: ____
*CENTRALIZER(S) OD (IN): N/A NUMBER USED: ____ TYPE: ____
*CENTRALIZER(S) DEPTH(S): N/A
*GROUT TOP: N/A MEASURED DENSITY (LBS/GAL): ____ TYPE: ____
*GRANULAR BENTONITE TOP: N/A TYPE: ____
*BENTONITE SEAL TOP: 1.0' bgs TYPE: Granular Bentonite (hydrated)
BENTONITE SEAL OR GRANULAR BENTONITE BOTTOM (= FILTER PACK TOP): 6.0'
FILTER PACK TYPE: 16/40 Silica Sand BRAND: CSSI.
SURFACE CASING BOTTOM (=SCREEN TOP): 7.3' TYPE: Stainless Steel
SCREEN ID (IN): 1.0" SLOT SIZE (IN): 0.01" TYPE: Stainless Steel
SCREEN BOTTOM (= SUMP, TOP): 29.3' SUMP TYPE: Stainless Steel - Threaded end cap
FILTER PACK BOTTOM (= *BACKFILL TOP): 29.4' *BACKFILL TYPE: Granular Bentonite
SUMP BOTTOM (= WELL COMPLETED DEPTH): 29.4' *PILOT HOLE TOP, DIAMETER: N/A
TOTAL BOREHOLE DEPTH (= *PILOT HOLE AND *BACKFILL BOTTOM): 30.0'
REMARKS: Well #33604 is a 1.0" I.D. Stainless Steel replacement of #33603 (prev. installed 1.0" I.D. PVC). Geoprobe w/a solid pt. - Not cored (no log). See 33603 for log.
COMPLETED BY: Ellen S. Warp DATE: 3/14/05
CHECKED BY: J. Boylan DATE: 3/14/05

STATE PLANE COORDINATES AREA:
NORTH: 750159.639
EAST: 2082683.283
PROJECT: CY04 WARP
REMARKS:
207 Tanks/B374

GRND ELEV. (FT): 6006.866
TOTAL DEPTH (FT): 35.4'
COMPLETION DATE: 6/15/04
GEOLOGIST: E. Warp

CASING DIA (IN): 1"
BH DIA. (IN): 3.75"
GRID LOCATOR:

LOG OF BORING NUMBER: 33904

Elev (Ft)	Well or Piezometer Construction and Materials	Depth (Ft)	Lithology	Unified Soils Classification or Rock Type	Lithologic Description
6009	Protective Casing, Sch 40 PVC, 4 in. ID. Casing, Sch 80-PVC, 1 in. ID.	2			
6008		1			
6007	Quikcrete-Triangular Pad	0			
6006	Granular Bentonite	1			GC/CL: Sandy Gravel/Clay mixture, strong brown (7.5YR5/6). ~50% clay, 30 - 40% gravel (1/8 - 3/4" diameter, subangular to angular), 10 - 20% sand (medium grained to coarse grained, angular to sub-rounded), slightly moist. Increased gravel to 60% from 1.0' to 2.0' (1-2" diameter, predominately quartzite with lesser granite. 2.0" diameter quartzite cobble at 2.0'.
6005		2			SC/ML: Sand/Silt and Clay mixture with trace to some gravel, strong brown (7.5YR5/6). ~65% silt/clay, 20 - 30% sand (fine grained to coarse grained, subangular to subrounded), trace to 10% gravel (1/4" to 1" diameter, predominately quartzite), slightly moist.
6004		3			No recovery.
6003		4			SC/ML: Sand/Silt and Clay with trace gravel, as above from 2.0' to 3.0', slightly moist.
6002		5			CL: Silty Clay with some gravel and sand, dark yellowish brown (10YR4/4). Predominately re-worked claystone with 5-7% sand and 5% gravel (1/4" to 1" diameter, subangular to subrounded), slightly moist.

Elev (Ft)	Depth (Ft)	Well or Piezometer Construction and Materials	Lithology	Unified Soils Classification or Rock Type	Lithologic Description
6001	6				GC/ML: Sandy Gravel/Silt mixture, very dark grayish brown (10YR3/2) to very dark brown (10YR2/2). 65% silt, 20 - 25% gravel (1/4" to 1/2" diameter, subangular), 10 - 15% sand (subangular). Dark brown to black coating on some gravel clasts - possible asphalt?? Asphalt odor. Moist.
6000	7	Filter Pack. 16/40 Silica Sand			CL: Silty Clay with trace to some sand and gravel. Predominately re-worked claystone with black organic stringers. Brown (10YR4/3) with yellowish brown (10YR5/4) mottling. Trace to 7% sand (medium grained, subangular). Gravel lenses (clasts are 1/2" diameter, subangular to subrounded) at 6.9' and 7.5'. Moist.
5999	8				GW: Gravel, broken dark gray quartzite and mica schist clasts (1/2" to 1-1/2" diameter, subangular), moist.
5998	9				SC/ML: Gravelly Sand/Silt mixture, strong brown (7.5YR4/6) to brown (7.5YR4/3). 5-15% sand (medium grained to coarse grained, subangular to subrounded). 5-10% gravel (subangular) predominately quartzite. Patchy iron oxidation throughout interval. 1-1/2" quartzite fragment at 8.8'. Note: from 9.4' to 9.6', black manganese oxide (?) coating on fragments and a white, drusy coating also on fragments (possible carbonate?). Moist.
5997	10	Screen, Sch 80 PVC, 1 in. ID., 0.010 in. slots			
5996	11				CL: Silty Clay with trace sand and gravel, dark grayish brown (10YR4/6) with patchy light olive brown (2.5Y5/6). Iron oxidation throughout, moist. At 10.8': 1.5" diameter iron oxidized siltstone clast, angular.
5995					No recovery.
	12				CL: Silty Clay with trace sand and gravel, dark grayish brown (10YR4/6) with patchy light olive brown (2.5Y5/6). Iron oxidation throughout, moist.
5994	13				SC/ML: Gravelly Sand/Silt mixture, strong brown (7.5YR4/6). 15 - 20% sand (medium grained to coarse grained, subangular to subrounded), 5 - 10% gravel (1/4" to 1" diameter, subangular) quartzite and schist composition. Pervasive iron oxidation in silt matrix, moist.
5993	14				No recovery.
5992					

Elev (Ft)	Well or Piezometer Construction and Materials	Depth (Ft)	Lithology	Unified Soils Classification or Rock Type	Lithologic Description
		15			
5991		16			SC/ML: Gravelly Sand/Silt mixture, same as above from 12.6' to 13.75'. Moist.
5990		17			
5989		18			ML: Sandy Silt, strong brown (7.5YR5/6). ~70% silt, 25-30% sand (very fine grained to fine grained, subrounded to subangular). At 18.2': patchy reddish brown (5YR4/4) iron oxidation, otherwise pervasive iron oxidation, strong brown.
5988		19			CL/ML: Sandy Silt/Clay mixture with trace gravel, strong brown (7.5YR5/6). 5-15% sand (medium grained, subangular to subrounded), trace subangular gravel. Pervasive iron oxidation in matrix.
					No recovery.
5987		20			CL/ML: Sandy Silt/Clay mixture with some gravel, strong brown (7.5YR4/6) with lesser patchy light olive brown (2.5Y5/3) mottling, which is probably re-worked claystone clasts. 10-15% sand (medium grained, subangular to subrounded), 5-10% gravel (1/4" to 3/4" diameter, subangular to subrounded), predominately quartzite with lesser K-spar granitic clasts. 1.5" diameter quartzite clasts (subangular) at 22.0', 22.7', and 23.5'. Gravel increasing to 10-15% between 22.0' and 23.5'. Slightly moist.
5986		21			
5985		22			
5984		23			
5983		24			SC/CL: Clay with some sand, yellowish brown (10YR5/6) with light gray (5Y7/1) mottling. Re-worked claystone. Sandy gravel lense/layer at 23.7'. Slightly moist.
					CL: Clay, yellowish brown (10YR5/6) with light olive gray (5Y6/2)

Elev (Ft)	Depth (Ft)	Lithologic Description
		mottling. Re-worked (?) claystone. Trace - 3% black organic stringers. Very competent and dense, moist.
5982	25	
5981	26	CL/ML: Silty Clay, yellowish brown (10YR5/6) with trace olive gray (5Y6/2) mottling. Re-worked silty claystone. Pervasive iron oxidation, moist.
		CL/ML: Silty Clay, light olive gray (5Y6/2) with trace to some brownish yellow (10YR6/6) mottling. Re-worked silty claystone. 7-10% black organic stringers.
5980	27	SC/ML: Sand/Silt mixture with trace gravel, strong brown (7.5YR5/6). 20-25% sand (medium grained to coarse grained, subangular to subrounded). Strong pervasive iron oxidation.
5979	28	CL/ML: Sandy Silt/Clay, light olive gray (5Y6/2) to strong brown (7.5YR5/8). 15% sand (fine grained to medium grained, subrounded). Patchy iron oxidation. At 27.5': 2.0" granitic clast (subrounded).
		SC/ML: Clayey Sand/Silt with gravel, strong brown (7.5YR4/6) to yellowish brown (10YR5/6). 30-35% sand (fine grained to medium grained, subrounded to subangular), trace to 7% gravel (1/4" to 1/2" diameter, subrounded), granitic and quartzite composition. Pervasive iron oxidation, moist to wet.
5978	29	CL: Clay, yellowish brown (10YR5/8). Re-worked claystone (oxidized). 5-8% black organic stringers, very soft and pliable. Rock in Geoprobe shoe, so sample appears as "ribbons" of oxidized claystone.
5977	30	No recovery.
		No recovery.
5976	31	
		CL: Clay with trace gravel, brownish yellow (10YR6/6). Re-worked claystone. Pervasive iron oxidation. Soft, pliable, and very moist. Note: Geoprobe is pushing a rock from 31.2' to 33.0'. Bedrock contact is estimated.
5975	32	CLAYSTONE: TOP OF BEDROCK - Claystone, brownish yellow (10YR6/8). Pervasive iron oxidation. Soft, pliable, and moist. Pushing a rock in Geoprobe shoe until 33.0'.
5974	33	CLAYSTONE: Claystone, light brownish gray (10YR6/2). 10% black organic stringers. Decreasing iron oxidation from interval above. Dense/firm, moist.

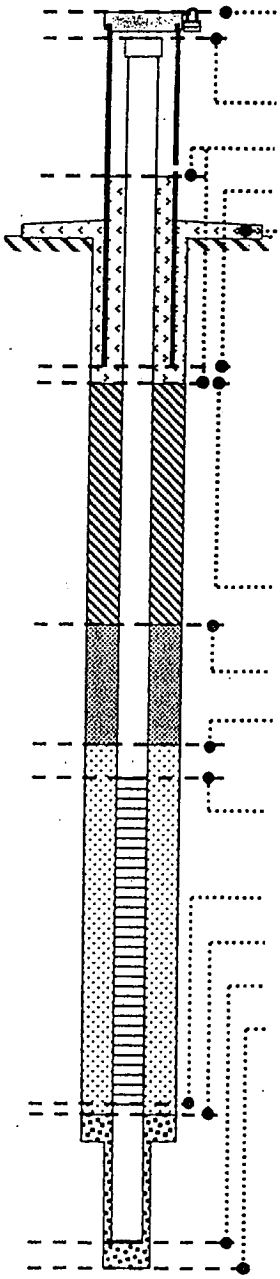
Elev (Ft)	Well or Piezometer Construction and Materials	Depth (Ft)	Lithology	Unified Soils Classification or Rock Type	Lithologic Description
5973		34			SILTSTONE: Siltstone, dark yellowish brown (10YR4/6). Strong pervasive iron oxidation, moderately friable, moist.
5972	Threaded End Cap Bentonite Pellets	35			CLAYSTONE: Claystone, brownish yellow (10YR4/6) with dark grayish brown (10YR4/2) mottling. Oxidized claystone, moderately friable, moisture decreases to slightly moist. CLAYSTONE: Claystone, very dark grayish brown (10YR3/2). Iron oxidation, yellow brown (10YR5/8) along internal fractures only. Friable and crumbly, decreasing moisture to slightly damp.

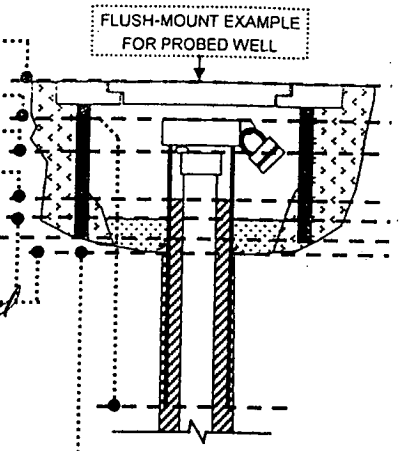
MONITORING WELL INSTALLATION REPORT: Form PRO.118

LOCATION CODE: 33904 PROJECT NAME: CY04 WARP/WELL INSTALLATION PROGRAM: WATER PROGRAMS
SCREENED FORMATION: Ql/Bdrk DRILLING CONTRACTOR: RTG BORING METHOD: GEOPROBE
DATE DRILLED: 6/14/04 DATE COMPLETED: 6/15/04 TOTAL DEPTH: 35.4' COMPLETED DEPTH: 34.9'
ESTIMATED DEPTH TO BEDROCK: 32.0' RIG GEOLOGIST: E. WARP LOGGING GEOLOGIST: E. WARP
BOREHOLE DIAMETER IN SCREENED INTERVAL: 3.75" QUANTITY OF FLUIDS LOST DURING DRILLING: N/A
INITIAL WATER LEVEL (FT, DATE): Dry on 6/15/04 COMPLETED WATER LEVEL (FT, DATE): 19.48 fm. TOC - 6/23/04
DIAMETER & TYPE OF INSTALLATION (WELL/PIEZOMETER/WELL POINT/ETC.): 1.0" Sch. 80 PVC - Well
TYPE OF PROTECTION (FLUSH-MOUNT VS. ABOVE GROUND, ASEPTIC, ETC.): 4.0" above ground PVC w/locking steel lid.

ALL MEASUREMENTS WILL BE MADE IN FEET FROM GROUND SURFACE

* DENOTES ITEMS THAT MAY NOT BE APPLICABLE, DEPENDING ON BORING METHOD, WELL PROTECTION & PURPOSE





PROTECTIVE CASING TOP (STICKUP OR FLUSH-MOUNT): 2.5' ags
*SECONDARY CASING TOP: N/A BOTTOM: N/A TYPE: N/A
SURFACE CASING TOP: 2.2' ags ID (IN): 1.0"
SURFACE SEAL TOP: N/A BOTTOM: N/A TYPE: N/A
PROTECTIVE CASING BOTTOM, ID (IN), TYPE: 0.35', 4" PVC-Sch. 40
*WELL PAD DIMENSIONS, TYPE: TRIANGULAR (~1.5' sides) - QUIK CRETE
*ADD'L CASING FILL TOP: 0.3' ags BOTTOM: 0.35' bgs TYPE: 16/40 Silica Sand
Between 1.0" + 4.0" PVC casings
*SURFACE ISOLATION CASING TOP: N/A BOTTOM: N/A
*SURFACE ISOLATION CASING ID (IN): N/A TYPE: N/A
*OTHER (E.G., ASEPTIC) CASING TOP: N/A BOTTOM: N/A
*OTHER CASING ID (IN): N/A TYPE, PURPOSE: N/A
*CENTRALIZER(S) OD (IN): N/A NUMBER USED: ____ TYPE: ____
*CENTRALIZER(S) DEPTH(S): N/A
*GROUT TOP: N/A MEASURED DENSITY (LBS/GAL): ____ TYPE: ____
*GRANULAR BENTONITE TOP: N/A TYPE: ____
*BENTONITE SEAL TOP: 0.35' TYPE: Granular Bentonite
BENTONITE SEAL OR GRANULAR BENTONITE BOTTOM (= FILTER PACK TOP): 7.55'
FILTER PACK TYPE: 16/40 Silica Sand BRAND: CSSI
SURFACE CASING BOTTOM (=SCREEN TOP): 9.65' TYPE: PVC-Sch. 80
SCREEN ID (IN): 1.0" SLOT SIZE (IN): 0.01" TYPE: PVC-Sch. 80
SCREEN BOTTOM (= SUMP, TOP): 34.8 SUMP TYPE: Threaded End Cap - Sch. 80 PVC
FILTER PACK BOTTOM (= *BACKFILL TOP): 34.9 *BACKFILL TYPE: Bentonite Pellets
SUMP BOTTOM (= WELL COMPLETED DEPTH): 34.9' *PILOT HOLE TOP, DIAMETER: N/A
TOTAL BOREHOLE DEPTH (= *PILOT HOLE AND *BACKFILL BOTTOM): 35.4'

REMARKS: Depth to bedrock contact estimated @ 32.0' due to pushing a rock fragment fm. 29.7 → 33.0' causing poor recovery. Well installation went smooth.

COMPLETED BY: Ellen S. Warp DATE: 6/16/04
CHECKED BY: ____ DATE: ____

ROCKY FLATS ENVIRONMENTAL TECHNOLOGY SITE BOREHOLE LOG

Borehole Number: 33904
Location - North: East:
Date: 6/14/04
Geologist: E. WARP
Drilling Equip.: 66 DT GEOPROBE

Surface Elevation:
Area: 207 Tanks / B374
Total Depth: 35.4'
Company: URS/RTG Project No.:
Sample Type: Push-Continuous Core

RMRS LOGGING SUPERVISOR APPROVAL: [signature] DATE 6/23/04

TOP/BOTTOM OF CORE IN BOX	TOP/BOTTOM OF INTERVAL	FEET OF CORE IN INTERVAL (FIELD MEASUREMENT)	SAMPLE NUMBER	FRACTURE ANGLE	BEDDING ANGLE	GRAIN SIZE DISTRIBUTION	USCS SYMBOL	DEPTH IN FEET	SOIL/LITHOLOGIC LOG	SAMPLE DESCRIPTION
Box #1 of 4 (0.0→10.0')	Run #1 (0.0-4.0')	Rec. = 3.0'					GC CL	0.0		0.0-2.0'- Sandy GRAVEL/CLAY Mixture. Strong Brn. (7.5YR 5/6). ± 50% Clay. 30-40% Gravel (1/8-3/4" dia., sub-ang. to ang.). 10-20% Sand (m.g. to c.g., ang. to sub-rounded). Sl. moist.
								1.0		Incr. gravel to 60% fm. 1.0-2.0' (1-2" dia., predominately qtzite w/lesser granite.
								2.0		2.0" dia. qtzite cobble @ 2.0'
						CL	SC ML			2.0-3.0'- SAND/SILT and clay MIXTURE, w/Tr to some gravel. Strong Brn (7.5YR 5/6). ~65% Silt/clay. 20-30% Sand (f.g. to c.g., sub-ang. to sub-rounded). Tr to 10% Gravel (1/4-1" dia., predominately qtzite). Sl. moist.
								3.0		3.0-4.0 = No Recovery
	4.0	4.0'						4.0		4.0-4.2'- SAND/Silt and clay w/Tr gravel - as above. Sl. moist. fm. 3.0-3.0'
	Run #2 (4.0-8.0')	Rec. = 4.1'				CL	SC ML	4.2		4.2-6.0'- Silty CLAY w/some gravel and sand. Dk. Yellsh Brn. (10YR 4/4). Predominately re-worked claystone w/5-7% Sand and 5% Gravel (1/4-1.0" dia., sub-ang. to sub-rounded). Sl. moist.
							CL	5.0		
							GC ML	6.0		6.0-6.2'- Sandy GRAVEL/SILT Mixture. V. Dk. Gry'sh Brn. (10YR 3/2) to V. Dk. Brn. (10YR 2/2). 65% Silt. 20-25% Gravel (1/4-1/2" dia., sub-ang.). 10-15% Sand (sub-ang.). Dk. brn to blk. coating on some gravel clasts - possible asphalt?? Asphalt odor. MOIST. [PID = 2.2 ppm].
							CL	7.0		6.2-8.0'- Silty CLAY w/Tr to some sand and gravel. Predominately re-worked claystone, w/blk. org. stringers. Brn (10YR 4/3) w/Yellsh Brn. (10YR 5/4) mottling. Tr-7% Sand (m.g., sub-ang.). Gravel lenses (clasts are 1/2" dia., sub-ang. to sub-rounded) @ 6.9' and 7.5'. MOIST.
	8.0'	8.0'				GP?	GW	8.0		8.0-8.2- Gravel - Broken, dk. gry qtzite and mica schist clasts (1/2" to 1 1/2" dia., sub-ang.) MOIST
	Run #3 (8.0-12.0')	Rec. = 2.9'					SC ML			8.2-10.8- Gravelly SAND/SILT Mixture. Strong Brn. (7.5YR 4/6) to Brn. (7.5YR 4/3). 5-15% Sand (m.g. to c.g., sub-ang. to sub-rounded). 5-10% Gravel (sub-ang.) predominately qtzite. Patchy FeOx throughout interval.

NOTES: General: USCS is modified for this log as follows:
Materials amounts are estimated by % volume instead of % weight.
(1) Badly broken core, accurate footage measurements not possible.
(2) Core breaks cannot be matched, accurate footage measurements not possible.

Procedure No. RMRS/OPS-PRO.101
Revision 0
Date effective: 12/31/98

(401 1-930-0134-930)(Form GT.1A)(03/01.V2)

1 1/2" qtzite, frag. @ 8.8'. NOTE: fm. 9.4-9.6'. Blk. MnOx (?) coating on frags and a wht., drusy coating also on frags (poss. carbonate?). MOIST.

ROCKY FLATS ENVIRONMENTAL TECHNOLOGY SITE BOREHOLE LOG

Borehole Number: 33904
Location - North: _____ East: _____
Date: 6/14/04
Geologist: E. WARP
Drilling Equip.: 66 DT Geoprobe

Surface Elevation: _____
Area: 207 Tanks / B374
Total Depth: 35.4
Company: UPS/RTG Project No.: _____
Sample Type: Push-continuous core

RMRS LOGGING SUPERVISOR
APPROVAL [signature] DATE 6/23/04

TOP/BOTTOM OF CORE IN BOX	TOP/BOTTOM OF INTERVAL	FEET OF CORE IN INTERVAL (FIELD MEASUREMENT)	SAMPLE NUMBER	FRACTURE ANGLE	BEDDING ANGLE	GRAIN SIZE DISTRIBUTION	USCS SYMBOL	DEPTH IN FEET	SOIL/LITHOLOGIC LOG	SAMPLE DESCRIPTION
Box #2 of 4 (10.0-22.9')	cont. Run #3 (8.0-12.0') 12.0'	Rec. = 2.9' 12.0'					SC ML	10.0 10.5 10.8 10.9 11.0		cont. Gravelly SAND/SILT Mixture fm. previous page. 10.8-10.9 - Silty CLAY w/ TR sand and gravel. (see description below for 12.0-12.6') @ 10.8'-1.5" dia., FeOx'd siltstone clast-ang. MOIST 10.9-12.0 = No Recovery
	Run #4 (12.0-16.0') 16.0	Rec. = 1.75' 16.0					CL	12.0 12.6		12.0-12.6' - Silty CLAY w/ TR Sand and gravel. Dk. Grysh Brn. (10YR 4/6) w/patchy Lt. Olive Brn. (2.5Y 5/6) FeOx'n throughout. MOIST
							SC ML	13.0 13.75 14 15 16		12.6-13.75' - Gravelly SAND/SILT Mixture Strong Brn. (7.5YR 4/6). 15-20% Sand (m.g. to c.g., sub-ang. to sub-rounded). 5-10% Gravel (1/4-1" dia., sub-ang.) qtzite and schist composition. Perv. FeOx'n in silt matrix. MOIST. 13.75-16.0' = No Recovery 16.0-18.0' - Gravelly SAND/SILT Mixture. Same as above fm. 12.6-13.75'. MOIST
	Run #5 (16.0-20.0') 20.0	Rec. = 3.1' 20.0					SC ML	17 18		18.0-18.4' - Sandy SILT. Strong Brn. (7.5YR 5/6). ~70% Silt. 25-30% Sand (v.f.g to f.g., sub-rounded to sub-ang.). @ 18.2' patchy Red'sh Brn. (5YR 4/4) FeOx'n, otherwise perv. FeOx (Strng. Brn).
							ML	18.4		18.4-19.1 - Sandy SILT/CLAY Mixture w/ TR gravel. Strng. Brn (7.5YR 5/6). 5-15% Sand (m.g., sub-ang. to sub-rounded) TR sub-ang. gravel. Perv. FeOx'n in matrix
							ML CL	19.1		19.1-20.0 = No Recovery

NOTES: General: USCS is modified for this log as follows:
Materials amounts are estimated by % volume instead of % weight.
(1) Badly broken core, accurate footage measurements not possible.
(2) Core breaks cannot be matched, accurate footage measurements not possible.

Procedure No. RMRS/OPS-PRO.101
Revision 0
Date effective: 12/31/98

14011-930-0134-930X Form GT.1A (03/01/92)

ROCKY FLATS ENVIRONMENTAL TECHNOLOGY SITE BOREHOLE LOG

Borehole Number: 33904
Location - North: _____ East: _____
Date: 4/14/04
Geologist: E. Woop
Drilling Equip.: 66 DT GEOPROBE

Surface Elevation: _____
Area: 207 Tanks / B374
Total Depth: 35.4
Company: URS/RTG Project No.: _____
Sample Type: Push - Continuous Core

RMRS LOGGING SUPERVISOR APPROVAL _____ DATE 6/23/04

TOP/BOTTOM OF CORE IN BOX	TOP/BOTTOM OF INTERVAL	FEET OF CORE IN INTERVAL (FIELD MEASUREMENT)	SAMPLE NUMBER	FRACTURE ANGLE	BEDDING ANGLE	GRAIN SIZE DISTRIBUTION	USCS SYMBOL	DEPTH IN FEET	SOIL/LITHOLOGIC LOG	SAMPLE DESCRIPTION
Box #2 of 4 (20.0-22.9')	Run #6 (20.0-23.8')	Rec. = 4.2'					ML, CL	20.0, 21, 22, 23		20.0-23.5' - Sandy SILT/CLAY Mixture. w/some Gravel. Strng. Brn. (7.5YR 4/6) w/lesser patchy Lt. Olive Brn. (2.5Y 5/3) mottling - which is probably re-worked claystone clasts. 10-15% Sand (m.g., sub-ang. to sub-rounded) 5-10% Gravel (1/4-3/4" dia., sub-ang. to sub-rounded) predominately gneiss w/lesser K-spar granitic clasts. 1.5" dia. gneiss clasts (sub-ang.) @ 22.0, 22.7 and 23.5'. Gravel increasing to 10-15% between 22.0-23.5' Sl. moist
22.9										
	23.8	23.8					SC, CL	23.5, 23.7		23.5-23.7' - CLAY w/some sand - Yellsh Brn. (10YR 5/6) w/Lt. Olive Gry. (5Y 7/1) mottling. Re-worked claystone, Sandy gravel lense/layer @ 23.7'. Sl. moist.
Box #3 of 4 (22.9 to 28.2')	Run #7 (23.8-25.7')	Rec. = 4.2'					CL	25		23.7-25.6' - CLAY - Yellsh Brn. (10YR 5/6) w/Lt. Olive Gry. (5Y 6/2) mottling. Re-worked (?) claystone. Tr-3% Blk. organic stringers. V. competent and dense. MOIST.
	25.7	25.7						25.6		
	Run #8 (25.7-27.2')	Rec. = 2.8'					ML, CL	25.8, 26.5		25.6-25.8 - SILTY CLAY. Yellsh Brn. (10YR 5/6) w/Tr Olive Gry (5Y 6/2) mottling. Re-worked silty claystone. Perv. FeOx'n. MOIST+
	27.2'	27.2'					SC, ML	27		25.8-26.5 - SILTY CLAY. Lt. Olive Gry (5Y 6/2) w/Tr to some Brn'sh Yellow (10YR 6/6) mottling. Re-worked silty claystone. 7-10% Blk. organic stringers
							CL, ML	27.5		26.5-27.0 - SAND/SILT Mixture. w/Tr gravel. Strng. Brn (7.5YR 5/6). 20-25% Sand (m.g. to c.g., sub-ang. to sub-rounded). Strong perv. FeOx'n.
28.2'							SC, ML	28.5		27.0-27.5 - Sandy SILT/CLAY - Lt. Olive Gry (5Y 6/2) to Strng. Brn (7.5YR 5/8). 15% Sand (f.g. to m.g., sub-rounded). Patchy FeOx'n. @ 27.5' - 2.0" granitic clast (sub-rounded)
Box #4 of 4 (28.2-35.4)	Run #9 (29.2-29.7')	Rec. = 1.8'					CL	29		27.5-28.5 - Clayey SAND/SILT w/gravel. Strng. Brn (7.5YR 4/6) to Yellsh Brn (10YR 5/6). 30-35% Sand (f.g. to m.g. sub-rounded to sub-ang.)
	29.7	29.7								

NOTES: General: USCS is modified for this log as follows:
Materials amounts are estimated by % volume instead of % weight.
(1) Badly broken core, accurate footage measurements not possible.
(2) Core breaks cannot be matched, accurate footage measurements not possible.

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Tr-7% Gravel (1/4-1/2" dia., sub-rounded) - granitic and gneiss composition - Perv. FeOx'n. MOIST TO WET.

28.5-29.0' - CLAY - Yellsh Brn (10YR 5/8). Re-worked claystone (ox'd). 5-8% blk. organic stringers. V. soft/pliable. Rock in Geoprobe shoe so sample appears as "ribbons" of ox'd claystone.

29.0-30.0 = NO RECOVERY

ROCKY FLATS ENVIRONMENTAL TECHNOLOGY SITE BOREHOLE LOG

Borehole Number: 33904
Location - North: _____ East: _____
Date: 6/14/04
Geologist: E. WARP
Drilling Equip.: 66 DT GEOPROBE

Surface Elevation: _____
Area: 207 TANKS / B374
Total Depth: 35.4'
Company: URS / RTG Project No.: HAD51300
Sample Type: Push-Continuous Core

RMRS LOGGING SUPERVISOR APPROVAL [signature] DATE 6/23/04

TOP/BOTTOM OF CORE IN BOX	TOP/BOTTOM OF INTERVAL	FEET OF CORE IN INTERVAL (FIELD MEASUREMENT)	SAMPLE NUMBER	FRACTURE ANGLE	BEDDING ANGLE	GRAIN SIZE DISTRIBUTION	USCS SYMBOL	DEPTH IN FEET	SOIL/LITHOLOGIC LOG	SAMPLE DESCRIPTION
Box #4 of 4 (28.2-35.4')	Run #10 29.7-31.2'	Rec. = 0.0'						30.0		30.0-31.2 = No Recovery
	31.2'	31.2'						31		31.2-32.0 - CLAY w/ Gravel. Brn'sh Yellow (10YR 4/6). Re-worked claystone. Perv. FeOx'n. Soft, pliable and V. MOIST. NOTE: Geoprobe is pushing a rock fm. 31.2 → 33.0'. Bedrock contact is estimated.
							CL	31.2		
				Bedrock @ 32.0'				32		BEDROCK CONTACT @ 32.0'
	Run #11 (31.2-34.2')	Rec. = 4.0'								32.0-33.0 - CLAYSTONE. Brn'sh Yellow (10YR 4/8). Perv. FeOx'n. Soft, pliable, MOIST + (pushing a rock in geoprobe shoe until 33.0').
								33		
								33.9		33.0-33.9 - CLAYSTONE. Lt. Brn'sh Gry (10YR 4/2). 10% blk. organic stringers. Decr. FeOx'n fm. above interval. Dense/firm. MOIST.
	34.2'	34.2'						34.2'		
	Run #12 34.2-35.4'	Rec. = 4.0'						34.5		33.9-34.2 - SILTSTONE. Dk. yell'sh Brn. (10YR 4/6). Strong perv. FeOx'n. Moderately friable. MOIST.
35.4'	35.4	35.4'		T.D.				35		34.2-34.5 - CLAYSTONE - Brn'sh Yellow (10YR 4/6). w/ Dk. Gry'sh Brn. (10YR 4/2) mottling. Ox'd claystone. Mod. friable. Decr. H_2O to sl. moist.
										34.5-35.4' - CLAYSTONE. V. Dk. Gry'sh Brn. (10YR 3/2). FeOx'n (Yellow Brn. 10YR 5/8) along internal fracs. only. Friable and crumbly. Decr. H_2O to sl. damp.
										T.D. @ 35.4'

NOTES: General: USCS is modified for this log as follows:
Materials amounts are estimated by % volume instead of % weight.
(1) Badly broken core, accurate footage measurements not possible.
(2) Core breaks cannot be matched, accurate footage measurements not possible.

Procedure No. RMRS/OPS-PRO.101
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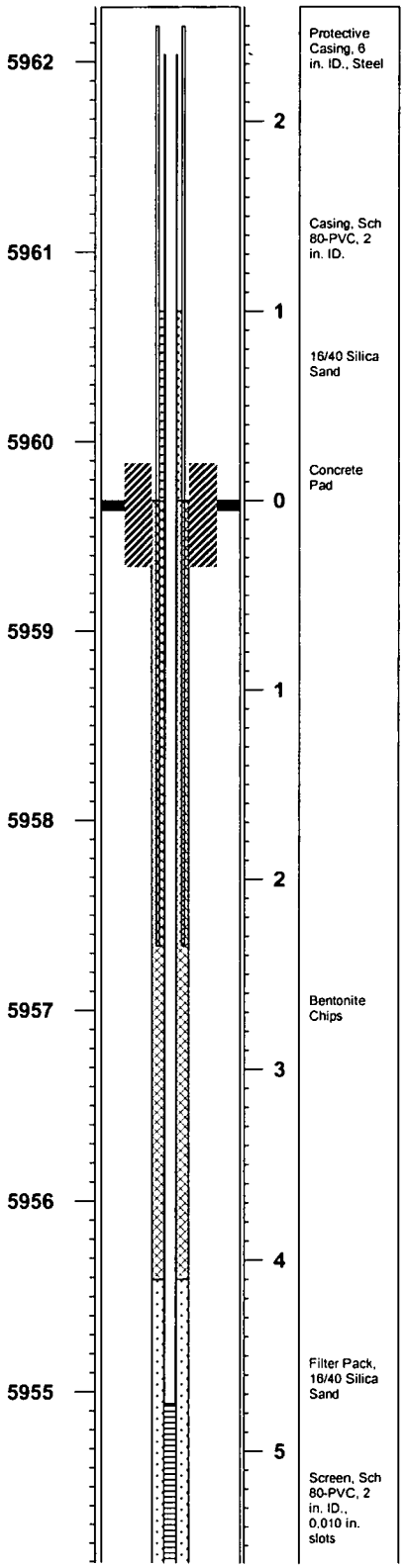
Date effective: 12/31/98

(4011-930-0134-930)(Form GT.1A)(03/01.V2)

STATE PLANE COORDINATES AREA:	GRND ELEV. (FT): 5959.688	CASING DIA (IN): 2.0"	**LOG OF BORING NUMBER:**
NORTH: 748027.933	TOTAL DEPTH (FT): 30.6	BH DIA. (IN): 8.0"	**88104**
EAST: 2084062.934	COMPLETION DATE: 1/11/05	GRID LOCATOR:	
PROJECT:	GEOLOGIST: E. Warp		
REMARKS:			
881 Hillside			

OIC ESW 9/12/05



Lithology	Unified Soils Classification or Rock Type	Lithologic Description
		CL: Silty Clay with trace gravel, brown (7.5YR4/2). Abundant roots, 1/4" diameter, angular clast of Fountain Formation. 1.5" subrounded clast of quartzite at 0.3'. Medium to high plasticity, very moist.
		CL/ML: Silt/Clay mixture, yellowish brown (10YR5/4) with light brownish gray (10YR6/2) mottling. Sub-horizontal lenses of silt throughout interval. Black organic material along internal bedding planes at 1.2'. Medium plasticity, moist.
		No recovery.
		CL/ML: Silt/Clay mixture as from 0.3' to 1.6'.
		CL/ML: Clayey Silt, light yellowish brown (10YR6/4) with some gray (10YR6/1) mottling. 70 - 75% silt. Weak pervasive iron oxidation throughout interval. Un-oxidized silt lense from 2.4' to 2.7'. Black organic material (bleb) along bedding planes at 2.8', moist.
		ML: Sandy Silt, light yellowish brown (10YR6/4). 30 - 35% sand, very fine grained, subrounded to subangular, crumbly, moist.
		CL/ML: Clayey Silt with some sand, yellowish brown (10YR5/6). moderate to strong pervasive iron oxidation. ~15% sand, very fine grained, subrounded. Cohesive, moist.
		CL: Clay with trace to some silt, brown (10YR5/3) to yellowish brown (10YR5/4). Weak to moderate pervasive iron oxidation. Decreased silt to trace, possibly re-worked claystone. Slightly mottled texture, trace black stringers. White caliche blebs at 5.1'. Moist.
		CLAYSTONE: TOP OF BEDROCK - Claystone, grayish brown (10YR5/2). Trace white stringers, competent, slightly moist.

Elev (Ft)	Well or Piezometer Construction and Materials	Depth (Ft)	Lithology	Unified Soils Classification or Rock Type	Lithologic Description
5954					No recovery.
		6			SILTY CLAYSTONE: Silty Claystone, oxidized, yellowish brown (10YR5/4). Moderate pervasive iron oxidation, moist.
5953		7			CLAYSTONE: Claystone, oxidized, grayish brown (10YR5/2) with brownish yellow (10YR6/6) mottling. Black organic stringers along internal bedding, competent, moist.
5952		8			CLAYSTONE: Claystone, light brownish gray (10YR6/2) to grayish brown (10YR5/2). Black organic stringers throughout. Moist to slightly moist.
5951					No recovery.
5950		9			CLAYSTONE: Claystone, light brownish gray (10YR6/2) to grayish brown (10YR5/2), same as above from 7.2' to 8.4'. Iron oxidized zone from 9.7' to 9.9' with black organic stringers and blebs. Competent and firm, slightly moist.
5949		10			
		11			No recovery.
5948		12			CLAYSTONE: Claystone, dark grayish brown (10YR4/2). Iron oxide, strong brown (7.5YR5/8) coating vertical fractures from 11.8' to 12.6'. Bleached white stringers and trace black stringers. Dense interval except for zone with vertical fractures, slightly moist.
5947		13			
5946					No recovery.
5945		14			CLAYSTONE: Claystone, dark grayish brown (10YR4/2) to light olive brown (2.5Y5/3). 45 deg open fractures with iron oxide coating, strong brown (7.5YR5/8), otherwise interval is dense and competent, very slightly moist.

Elev (Ft)	Well or Piezometer Construction and Materials	Depth (Ft)	Lithology	Unified Soils Classification or Rock Type	Lithologic Description
		15			CLAYSTONE: Claystone, grayish brown (10YR5/2), massive texture, competent. Trace iron oxide along internal fractures only. Very slightly moist to dry.
5944					
		16			
5943					No recovery.
		17			CLAYSTONE: Claystone, dark grayish brown (10YR4/2). Vertical fractures with iron oxide coating, strong brown (7.5YR5/8). Interval broken along vertical fractures otherwise is dense and competent, very slightly moist to dry.
5942					
		18			
5941					CLAYSTONE: Claystone, grayish brown (10YR5/2) to brown (10YR5/3). Trace spotty iron oxidation, trace black organic stringers. Interval fairly competent, trace moisture to dry.
		19			
5940					
		20			
5939					
		21			
5938					
		22			
5937					
		23			
5936					
		24			

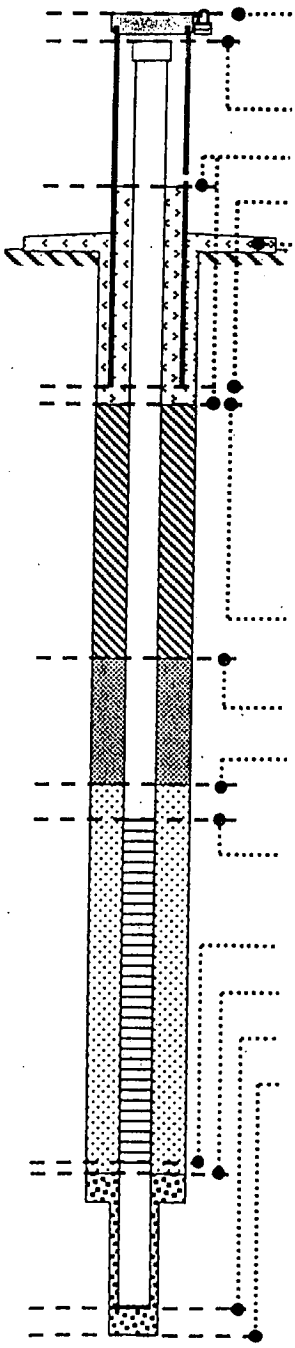
Elev (Ft)	Well or Piezometer Construction and Materials	Depth (Ft)	Lithology	Unified Soils Classification or Rock Type	Lithologic Description
5935		25			
5934		26			CLAYSTONE: Claystone, yellowish brown (10YR5/8). Moderate pervasive iron oxidation, trace ironstone fragments, weakly friable, trace moisture. Caliche lense at 26.4' to 26.5' and traces disseminated caliche elsewhere.
5933		27			
5932		28			CLAYSTONE: Claystone, dark grayish brown (10YR4/2). Trace iron oxidation along internal fracture surfaces, massive textured, weakly friable, trace moisture.
5931		29			
5930	Threaded End Cap - Sump, Sch 80-PVC Bentonite Chips Backfill	30			Not cored between 30.0' and 30.6'.

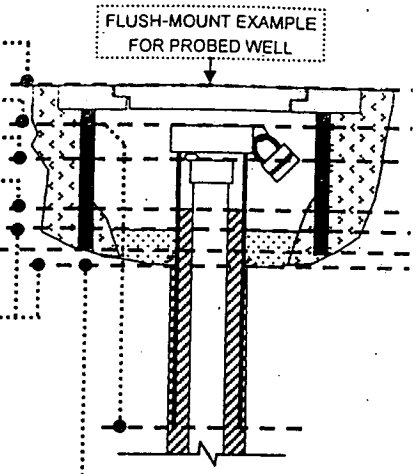
MONITORING WELL INSTALLATION REPORT: Form PRO.118

LOCATION CODE: 88104 PROJECT NAME: CY04 Well Replacement PROGRAM: Water Programs - WARP
SCREENED FORMATION: BR DRILLING CONTRACTOR: High Plains BORING METHOD: Hollow Stem Auger
DATE DRILLED: 1/11/05 DATE COMPLETED: 1/11/05 TOTAL DEPTH: 30.6' COMPLETED DEPTH: 30.0'
ESTIMATED DEPTH TO BEDROCK: 5.1' RIG GEOLOGIST: E. Warp LOGGING GEOLOGIST: E. Warp
BOREHOLE DIAMETER IN SCREENED INTERVAL: 8.0" QUANTITY OF FLUIDS LOST DURING DRILLING: N/A
INITIAL WATER LEVEL (FT, DATE): Dry on 1/11/05 COMPLETED WATER LEVEL (FT, DATE): 32.0' on 2/22/05 - Development Started
DIAMETER & TYPE OF INSTALLATION (WELL/PIEZOMETER/WELL POINT/ETC.): 2.0" PVC Well
TYPE OF PROTECTION (FLUSH-MOUNT VS. ABOVE GROUND, ASEPTIC, ETC.): Above Ground, 6.0" Steel Prot. Casing - Locking

ALL MEASUREMENTS WILL BE MADE IN FEET FROM GROUND SURFACE

* DENOTES ITEMS THAT MAY NOT BE APPLICABLE, DEPENDING ON BORING METHOD, WELL PROTECTION & PURPOSE





PROTECTIVE CASING TOP (STICKUP/OR FLUSH-MOUNT): 2.5' ags
*SECONDARY CASING TOP: N/A BOTTOM: N/A TYPE: N/A
SURFACE CASING TOP: 2.35' ID (IN): 2.0"
SURFACE SEAL TOP: 1.0' ags BOTTOM: ~~0.35~~ 0.0 ESW TYPE: 16/40 Silica Sand
PROTECTIVE CASING BOTTOM, ID (IN), TYPE: 2.35' bgs, 6" Steel
*WELL PAD DIMENSIONS, TYPE: 3x3' Concrete Pad. Sm. 0.2' ags to 0.35 bgs
*ADD'L CASING FILL TOP: ESW ~~1.0' ags~~ BOTTOM: ~~0.35~~ ESW bgs TYPE: ~~14/40~~
*SURFACE ISOLATION CASING TOP: N/A BOTTOM: N/A
*SURFACE ISOLATION CASING ID (IN): N/A TYPE: N/A
*OTHER (E.G., ASEPTIC) CASING TOP: N/A BOTTOM: N/A
*OTHER CASING ID (IN): N/A TYPE, PURPOSE: N/A
*CENTRALIZER(S) OD (IN): N/A NUMBER USED: N/A TYPE: N/A
*CENTRALIZER(S) DEPTH(S): N/A
*GROUT TOP: N/A MEASURED DENSITY (LBS/GAL): N/A TYPE: N/A
*GRANULAR BENTONITE TOP: N/A TYPE: ~~ESW~~ 1/11/05 N/A
*BENTONITE SEAL TOP: 0.0 TYPE: ~~ESW~~ CETCO-Med. bentonite chips
BENTONITE SEAL OR GRANULAR BENTONITE BOTTOM (= FILTER PACK TOP): 4.1'
FILTER PACK TYPE: 16/40 Silica Sand BRAND: Norton Daylebay
SURFACE CASING BOTTOM (=SCREEN TOP): 4.75' TYPE: Sch. 80 PVC
SCREEN ID (IN): 2.0" SLOT SIZE (IN): 0.010" TYPE: Sch. 80 PVC
SCREEN BOTTOM (= SUMP, TOP): 29.75' SUMP TYPE: Sch. 80 PVC - Threaded End Cap
FILTER PACK BOTTOM (= *BACKFILL TOP): 30.0' *BACKFILL TYPE: CETCO-med. bentonite chips
SUMP BOTTOM (= WELL COMPLETED DEPTH): 30.0' *PILOT HOLE TOP, DIAMETER: 8.0"
TOTAL BOREHOLE DEPTH (= *PILOT HOLE AND *BACKFILL BOTTOM): 30.6'
REMARKS: Routine Well Installation - No Problems.

COMPLETED BY: Ellen S. Warp Ellen S. Warp DATE: 1/12/05
CHECKED BY: _____ DATE: _____

ROCKY FLATS ENVIRONMENTAL TECHNOLOGY SITE BOREHOLE LOG

Borehole Number: 88104
Location - North: _____ East: _____
Date: 1/11/05
Geologist: E. WARP
Drilling Equip. Hollow Stem Auger - CME - 75-HT

Surface Elevation: _____
Area: 881 Hillside
Total Depth: 30.6'
Company: 2IRS
Project No. HAD51300
Sample Type: Split spoon

RMRS LOGGING SUPERVISOR APPROVAL [signature] DATE 3/21/05

TOP/BOTTOM OF CORE IN BOX	TOP/BOTTOM OF INTERVAL	FEET OF CORE IN INTERVAL (FIELD MEASUREMENT)	SAMPLE NUMBER	FRACTURE ANGLE	BEDDING ANGLE	GRAIN SIZE DISTRIBUTION	USCS SYMBOL	DEPTH IN FEET	SOIL/LITHOLOGIC LOG	SAMPLE DESCRIPTION
	Run #1 0.0→2.0'	Rec.=1.6'					CL	0.3'		0.0→0.3' - Silty CLAY w/ Tr gravel. Brn. (7.5YR4/2). Abundant roots. 1/4" dia. - angular clast of Fountain Fm. 1.5" sub-rounded clast of qtzite. @ 0.3'. Med. to high plasticity. V. Moist
							CL ML	1.0		0.3-1.6' - SILT/clay mixture - Yell'sh Brn (10YR5/4) w/Lt. Brn'sh Gry. (10YR6/2) mottling. Sub-horizontal lenses of silt throughout interval. Blk. organic material along internal bedding planes @ 1.2'. Medium plasticity. Moist.
	2.0'	2.0'						1.6'		1.6-2.0' - No Recovery
	Run #2 (2.0→4.0')	Rec.=2.0'					CL ML	2.0		2.0-2.3' - SILT/CLAY MIXTURE - as above 0.3-1.6'.
							CL ML	2.3		2.3-3.3 - Clayey SILT. Lt. Yell'sh Brn (10YR6/4) w/some Gry. (10YR6/1) mottling. 70-75% silt. Wk. perv. FeOx'n throughout interval. Un-ox'd silt lense fm. 2.4-2.7'. Blk. organic material (bl&b) along bedding planes @ 2.8'. Moist.
	4.0'	4.0'					ML	3.0		
							CL ML	3.3		3.3-3.75 - Sandy SILT - Lt. yell'sh Brn (10YR6/4) 30-35% sand - v.f.g., sub-rounded to sub ang. Crumbly. Moist.
	Run #3 (4.0→6.0')	Rec.=1.3'		Top of Bdrk @ 5.1'			CL	3.75'		3.75-4.4' - Clayey SILT. w/some sand. Yell'sh Brn. (10YR5/6). M/S perv. FeOx'n. ±15% sand - v.f.g., sub-rounded. Cohesive. Moist.
	6.0'	6.0'		EXTREMELY SUBTLE CONTACT - MAY BE HIGHER				4.0		4.4-5.1' - Clay w/ Tr to some silt, Brn (10YR5/3) to yell'sh Brn (10YR5/4). W/M perv. FeOx'n. Decr. silt to Tr. Possibly re-worked claystone. Sl. mottled texture. Tr blk. stringers. Wht. caliche blebs @ 5.1'. Moist. Top of Bedrock 5.1'
	Run #4 (6.0→9.0')	Rec.=2.4'						4.4'		5.1-5.3' - CLAYSTONE - Gry'sh Brn (10YR5/2). Tr wht. stringers. Competent. Sl. moist.
								5.0		5.3-6.0' = No Recovery
	9.0'	9.0'						5.3'		6.0-6.2' - Silty Claystone - Ox'd. - Yell'sh Brn. (10YR5/4). Mod. perv. FeOx'n. Moist.
	Run #5 9.0→11.0'	Rec.=1.8'						6.0		6.2-7.2' - CLAYSTONE - Ox'd. Gry'sh Brn (10YR5/2) w/Brn'sh Yellow (10YR6/6) mottling. Blk. organic stringers along internal bedding. Competent. Moist.
								7.0		
								8.0		
								8.4'		
								9.0		
								10.0		

NOTES: General: USCS is modified for this log as follows:
Materials amounts are estimated by % volume instead of % weight.
(1) Badly broken core, accurate footage measurements not possible.
(2) Core breaks cannot be matched, accurate footage measurements not possible.

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7.2-8.4' - CLAYSTONE - Lt. Brn'sh Gry (10YR6/2) to Gry'sh Brn. (10YR5/2). Blk. organic stringers throughout. Moist to sl. moist.
8.4-9.0' = No Recovery

COULDN'T FIND LAST BOX OF CORE (3/21/05)

ROCKY FLATS ENVIRONMENTAL TECHNOLOGY SITE BOREHOLE LOG

Borehole Number: 88104
Location - North: _____ East: _____
Date: 1/11/05
Geologist: E. WARP
Drilling Equip.: Hollow Stem Auger - CME-75-HT

Surface Elevation: _____
Area: 881 Hillside
Total Depth: 30.6'
Company: URS
Project No.: HAD57300
Sample Type: SPLIT SPOON

RMRS LOGGING SUPERVISOR APPROVAL _____ DATE 3/21/05

TOP/BOTTOM OF CORE IN BOX	TOP/BOTTOM OF INTERVAL	FEET OF CORE IN INTERVAL (FIELD MEASUREMENT)	SAMPLE NUMBER	FRACTURE ANGLE	BEDDING ANGLE	GRAIN SIZE DISTRIBUTION	USCS SYMBOL	DEPTH IN FEET	SOIL/ LITHOLOGIC MX	SAMPLE DESCRIPTION
	RUN #5 Cont. 9.0-11.0'	REC = 1.8'						10.8'		9.0-10.8' - CLAYSTONE. Lt. Brn'sh Gry (10YR6/2) to Gry'sh Brn (10YR5/2). Same as above 7.2 to 8.4' w/FeOxid zone fm. 9.7-9.9' with blk. organic stringers and blebs. Competent and firm. Mo Sl. moist.
		11.0'						11		10.8-11.0' = No Recovery
	RUN #6 11.0' → 14.0'	REC = 2.3'			Fractures 3/21/05			12		11.0-13.3' - CLAYSTONE. Dk. gry'sh brn. (10YR4/2) FeOx (strong brn - 7.5YR5/8) coating vertical fractures fm. 11.8 to 12.6'. Bleached wht stringers and fr blk stringers. Dense interval except for zone w/vertical fractures. Sl. moist.
								13		13.3-14.0' = No Recovery
								13.3'		
	14.0'							14		14.0-14.9 - CLAYSTONE - Dk. gry'sh brn (10YR4/2) to Lt. Olive Brn. (2.5Y5/3). 45° open fractures w/ FeOx coating (strong brn. - 7.5YR5/8) otherwise interval is dense and competent. V. Slightly moist.
	RUN #7 14.0' → 17.0'	REC = 2.7'						14.9'		
								15		14.9-16.7' - CLAYSTONE - Gry'sh Brn (10YR5/2). Massive texture. Competent. fr FeOx along internal fracs only. V. Sl moist to dry.
								16		
								16.7'		16.7-17.0' = No Recovery.
	17.0'							17		17.0-18.7 - CLAYSTONE. Dk. gry'sh brn. (10YR4/2). Vertical fractures w/FeOx (strong brn - 7.5YR5/8) coating. Interval broken along vertical fractures otherwise is dense and competent. V. Sl. moist to dry.
	RUN #8 17.0' → 19.0'	REC. = 2.0'						18		
								18.7		18.7 - 25.2' CLAYSTONE. Gry'sh brn (10YR5/2) to brn. (10YR5/3). fr spotty FeOxfn. fr blk. organic stringers. Interval fairly competent. fr moisture to dry.
	19.0'							19		
	RUN #9 19 → 22.0'	REC. = 3.0'								
	22.0							20.0		

NOTES: General: USCS is modified for this log as follows:
Materials amounts are estimated by % volume instead of % weight.
(1) Badly broken core, accurate footage measurements not possible.
(2) Core breaks cannot be matched, accurate footage measurements not possible.

Procedure No. RMRS/OPS-PRO.101
Revision 0
Date effective: 12/31/98

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U.S. DEPARTMENT OF ENERGY ROCKY FLATS PLANT

FORM PRO.101A

ROCKY FLATS ENVIRONMENTAL TECHNOLOGY SITE BOREHOLE LOG

Borehole Number: 88104
Location - North: _____ East: _____
Date: 1/11/05
Geologist: E. Wamp
Drilling Equip.: Hollow Stem Auger-CME-75-HT

Surface Elevation:
Area: ~~Downgradient of Rocky's Pit~~ 881 Hillside 3/23/05
Total Depth: 30.6
Company: URS
Project No.: HAD51300
Sample Type: Split Spoon

RMRS LOGGING SUPERVISOR APPROVAL _____ DATE 3/21/05

TOP/BOTTOM OF CORE IN BOX	TOP/BOTTOM OF INTERVAL	FEET OF CORE IN INTERVAL (FIELD MEASUREMENT)	SAMPLE NUMBER	FRACTURE ANGLE	BEDDING ANGLE	GRAIN SIZE DISTRIBUTION	USCS SYMBOL	DEPTH IN FEET	SOIL LITHOLOGIC LOG	SAMPLE DESCRIPTION
	Run #9 (cont.) 19.0 → 22.0' 22.0	Rec = 3.0'						26.0' 21 22		(cont. CLAYSTONE - see previous page for description).
	Run #10 (22.0 → 24.0') 24.0'	Rec = 2.0'						23 24		
	Run #11 (24.0 → 27.0') 27.0'	Recovery = 3.0'						25 25.2' 26		25.2-27.9' - CLAYSTONE, yellish Brn. (10YR 5/8). Moderate pervasive FeOXn. Tr IRONSTONE FRAGMENTS. Wkly. Friable. Tr moisture. Caliche lens @ 26.4-26.5', and traces disseminated caliche elsewhere
	Run #12 (27.0 → 30.0') 30.0'	Rec. = 3.0'						27 27.9' 28 29		27.9 → 30.0' - CLAYSTONE. DK. Gry'sh Brn (10YR 4/2). Tr FeOXn along internal fracture surfaces. Massive textured. Wkly. friable. Tr moisture. T.D. of borehole = 30.6' (Not cored between 30.0 → 30.6').

NOTES: General: USCS is modified for this log as follows:
Materials amounts are estimated by % volume instead of % weight.
(1) Badly broken core, accurate footage measurements not possible.
(2) Core breaks cannot be matched, accurate footage measurements not possible.

Procedure No. RMRS/OPS-PRO.101
Revision 0
Date effective: 12/31/98

(4011-930-0134-930)(Form GT.1A)(03/01/92)

STATE PLANE COORDINATES AREA:
NORTH: 747640.564
EAST: 2085012.571
PROJECT:
REMARKS:
Downgradient of OU-1

GRND ELEV. (FT): 5855.924
TOTAL DEPTH (FT): 20.5
COMPLETION DATE: 1/6/05
GEOLOGIST: E. Warp

CASING DIA (IN): 2.0"
BH DIA. (IN): 8.0"
GRID LOCATOR:

LOG OF BORING NUMBER: 89104

08/16/05

Elev (Ft)	Depth (Ft)	Well or Piezometer Construction and Materials	Lithology	Unified Soils Classification or Rock Type	Lithologic Description
5858	2	Protective Casing, 6 in. ID., Steel; Casing, Sch 80-PVC, 2 in. ID.			
5857	1	16/40 Silica Sand			
5856	0	Concrete Pad			CL: Silty Clay with trace sand and gravel, dark brown (7.5YR3/2). Sand is coarse grained, subangular, gravel is ~1/8" diameter, subangular. Trace disseminated caliche, roots common. Medium plasticity, 1/2" - 1" diameter, angular quartzite and granite clasts at 0.9'. Moist.
5855	1	Bentonite Chips			
5854	2				No recovery.
					CL: Silty Clay with trace sand, very dark brown (7.5YR2.5/2). Sand is coarse grained, subangular. Medium plasticity, decreasing roots to trace, moist
5853	3				CL: Silty Clay with trace sand and trace gravel, brown (7.5Y4/2). Sand is coarse grained to medium grained, subangular. Gravel is subangular, trace disseminated caliche. 1/2" to 3/4" subangular clasts of granite and quartzite at 2.9'. Medium plasticity, moist.
					No recovery.
5852	4	Filter Pack, 16/40 Silica Sand			SC/CL: Sandy Clay with some gravel, light olive brown (2.5Y5/4), ~20% sand (fine grained, subangular to subrounded), 5 - 10% gravel (1/4" - 3/4" diameter, subrounded). Gravel predominately quartzite, patchy caliche, slightly moist.
5851	5				CL: Clay with trace gravel, light olive brown (2.5Y5/4) to grayish brown (2.5Y5/2). Gravel is 1/8" - 1/4" diameter, subangular. Weak iron oxidation mottled throughout, trace to 5% disseminated caliche nodules, slightly moist.

Elev (Ft)	Well or Piezometer Construction and Materials	Depth (Ft)	Lithology	Unified Soils Classification or Rock Type	Lithologic Description
					No recovery.
5850		6			CL: Clay with trace gravel, same as 4.25' - 5.7', with roots at 6.2'.
	Screen, Sch 80-PVC, 2 in. ID., 0.010 in. slots				CLAYSTONE: TOP OF BEDROCK - Claystone, possibly re-worked, grayish brown (10YR5/2). Massive textured, trace white caliche stringers, weakly to moderately friable, slightly moist.
5849		7			
5848		8			CLAYSTONE: Claystone, oxidized bedrock, yellowish brown (10YR5/4). Weak to moderate pervasive iron oxidation, trace black organic stringers, slightly moist.
					CLAYSTONE: Claystone, un-oxidized, dark grayish brown (10YR4/2). Black organic stringers and nodules throughout, slightly moist.
5847		9			CLAYSTONE: Claystone, oxidized, yellowish brown (10YR5/4) with grayish brown (10YR5/2) mottling. Trace black organic nodules, slightly moist.
					No recovery.
5846		10			CLAYSTONE: Claystone, grayish brown (10YR5/2) with yellowish brown (10YR5/4) mottling. Slightly friable, black organic nodules and stringers throughout, slightly moist.
5845		11			CLAYSTONE: Silty Claystone, oxidized, brownish yellow (10YR6/6). Weak pervasive iron oxidation, trace patchy iron oxidation, strong brown (7.5YR5/6) from 10.1' to 10.3'. Decreasing black organic stringers to trace. Interval competent, slightly moist. Spotty/patchy bleaching at 11.2'.
5844		12			CLAYSTONE: Claystone, dark grayish brown (10YR4/2), massive textured. Slight pervasive bleaching at 12.4' to 12.7'. Weak iron oxidation from 12.7' to 13.6'. Black organic nodule at 12.9'. Slightly moist to dry.
5843		13			
					No recovery.
5842		14			CLAYSTONE: Claystone, same as from 11.2' to 13.6'.

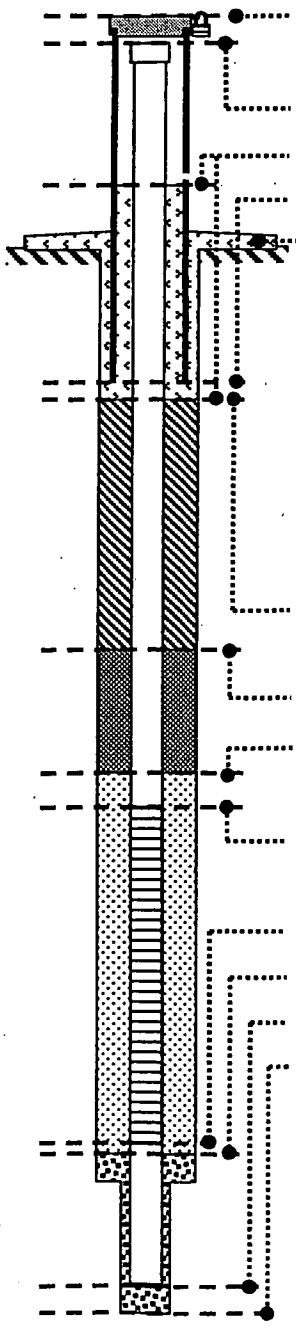
Elev (Ft)	Well or Piezometer Construction and Materials	Depth (Ft)	Lithology	Unified Soils Classification or Rock Type	Lithologic Description
5841		15			
					CLAYSTONE: Claystone, grayish brown (10YR5/2), abundant black organic stringers and blebs throughout. Black organics common along internal bedding planes, slightly moist to dry.
5840		16			
5839		17			No recovery.
					CLAYSTONE: Claystone, grayish brown (10YR5/2) with brown (10YR5/3) mottling. Some black organic stringers and blebs throughout interval. Occasional 1/8" thick black organic coating along internal bedding planes. Patchy weak iron oxidation. Moderately friable, slightly moist to dry.
5838		18			
5837		19			
5836	Threaded End Cap - Sump, Sch 80-PVC Bentonite Chips Backfill	20			Not cored between 20.0' and 20.5'.

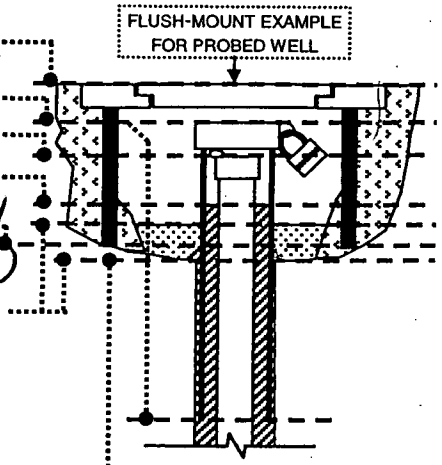
GROUNDWATER MONITORING WELL AND PIEZOMETER REPORT: Form PRO.118A

LOCATION CODE: 89104 PROJECT NAME: CY04 Well Replacement PROGRAM: Water Programs - WARP
SCREENED FORMATION: Q/Bdrk. DRILLING CONTRACTOR: High Plains BORING METHOD: Hollow Stem Auger
DATE DRILLED: 1/6/05 DATE COMPLETED: 1/6/05 TOTAL DEPTH: 20.5 COMPLETED DEPTH: 20.0'
ESTIMATED DEPTH TO BEDROCK: 6.3' RIG GEOLOGIST: E. Warp LOGGING GEOLOGIST: E. Warp
BOREHOLE DIAMETER IN SCREENED INTERVAL: 8" QUANTITY OF FLUIDS LOST DURING DRILLING: N/A
INITIAL WATER LEVEL (FT, DATE): Dry on 1/6/05 COMPLETED WATER LEVEL (FT, DATE): 20.73' on 2/16/05 - Dev. started
DIAMETER & TYPE OF INSTALLATION (WELL/PIEZOMETER/WELL POINT/ETC.): 2.0" Sch. 80 PVC
TYPE OF PROTECTION (FLUSH-MOUNT VS. ABOVE GROUND, ASEPTIC, ETC.): 6.0" Steel Protective Casing - Stickup

ALL MEASUREMENTS WILL BE MADE IN FEET FROM GROUND SURFACE

* DENOTES ITEMS THAT MAY NOT BE APPLICABLE, DEPENDING ON BORING METHOD, WELL PROTECTION & PURPOSE





PROTECTIVE CASING TOP (STICKUP OR FLUSH-MOUNT): 2.5' ags.
*SECONDARY CASING TOP: N/A BOTTOM: N/A TYPE: N/A
SURFACE CASING TOP: 2.1' ID (IN): 2.0"
SURFACE SEAL TOP: 1.0 ags BOTTOM: 0.0 TYPE: 16/40 Silica Sand
PROTECTIVE CASING BOTTOM, ID (IN), TYPE: ~~2.75~~ 2.35' bgs, 6.0", steel
*WELL PAD DIMENSIONS, TYPE: 3'x3' Concrete (0.3' bgs - 0.2' ags)
*ADD'L CASING FILL TOP: N/A BOTTOM: N/A TYPE: N/A
*SURFACE ISOLATION CASING TOP: N/A BOTTOM: N/A
*SURFACE ISOLATION CASING ID (IN): N/A TYPE: N/A
*OTHER (E.G., ASEPTIC) CASING TOP: N/A BOTTOM: N/A
*OTHER CASING ID (IN): N/A TYPE, PURPOSE: N/A
*CENTRALIZER(S) OD (IN): N/A NUMBER USED: N/A TYPE: N/A
*CENTRALIZER(S) DEPTH(S): N/A
*GROUT TOP: N/A MEASURED DENSITY (LBS/GAL): N/A TYPE: N/A
*GRANULAR BENTONITE TOP: N/A TYPE: N/A
*BENTONITE SEAL TOP: 0.0' TYPE: CETCO Bentonite chips
BENTONITE SEAL OR GRANULAR BENTONITE BOTTOM (= FILTER PACK TOP): 4.0'
FILTER PACK TYPE: 16/40 Silica Sand BRAND: Norton Oagkbury
SURFACE CASING BOTTOM (=SCREEN TOP): 4.75' TYPE: Sch. 80-PVC
SCREEN ID (IN): 2.0" SLOT SIZE (IN): 0.010" ~~0.010~~ TYPE: Sch. 80 - PVC
SCREEN BOTTOM (= SUMP, TOP): 19.75' SUMP TYPE: Sch. 80-PVC-Threaded end cap
FILTER PACK BOTTOM (= *BACKFILL TOP): 20.0' *BACKFILL TYPE: Bentonite chips
SUMP BOTTOM (= WELL COMPLETED DEPTH): 20.0' *PILOT HOLE TOP, DIAMETER: ~8"
TOTAL BOREHOLE DEPTH (= *PILOT HOLE AND *BACKFILL BOTTOM): 20.5'

REMARKS: Smooth Well installation. No free water encountered. H.P. Drilling crew borrowed 16 bags of 16/40 Silica Sand from Water Programs.

COMPLETED BY: Ellen S. Warp Ellen S. Warp DATE: 1/6/05
CHECKED BY: _____ DATE: _____

ROCKY FLATS ENVIRONMENTAL TECHNOLOGY SITE BOREHOLE LOG

Borehole Number: 89104
Location - North: _____ East: _____
Date: 1/6/05
Geologist: E. Wamp
Drilling Equip.: Hollow Stem Auger - CME-75-HT

Surface Elevation: _____
Area: Downgradient of OU-1
Total Depth: ~~Sw 20.6~~ 20.5'
Company: URS
Project No. HAD51300
Sample Type: SPLIT SPOON

RMRS LOGGING SUPERVISOR APPROVAL _____ DATE _____

TOP/BOTTOM OF CORE IN BOX	TOP/BOTTOM OF INTERVAL	FEET OF CORE IN INTERVAL (FIELD MEASUREMENT)	SAMPLE NUMBER	FRACTURE ANGLE	BEDDING ANGLE	GRAIN SIZE DISTRIBUTION	USCS SYMBOL	DEPTH IN FEET	SOIL LITHOLOGIC LOG	SAMPLE DESCRIPTION
	Run #1 0.0'→2.0' 2.0'	Rec = 1.8' 2.0'					CL	1.0, 1.8', 2.0		0.0-1.8'- Silty CLAY w/Tr sand and gravel. Dark Brn. (7.5 YR 3/2). Sand is c.g., sub-ang. gravel is ~1/8" dia. sub-ang. Tr diss. caliche. Roots commen. Med. plasticity. 1/2" to 1" dia. ang. qtzite and granite clasts at 0.9'. Moist.
										1.8-2.0' = No Recovery
	Run #2 2.0'→4.0' 4.0'	Rec = 1.2' 4.0'						2.2', 3.0, 3.2'		2.0-2.2'- Silty CLAY w/Tr sand. V. Dk Brn. (7.5YR 2.5/2). Sand is c.g. sub-ang. Med. plasticity. Decr. roots to Tr. Moist.
										2.2-3.2'- Silty CLAY w/Tr sand and Tr gravel. Brn. (7.5 Y 4/2). Sand is c.g. to med. grained sub-ang. Gravel is sub-ang. Tr diss. caliche. 1/2 to 3/4" sub-ang. clasts of granite and qtzite at 2.9'. Medium plasticity. Moist.
										3.2-4.0' = No Recovery
	Run #3 4.0'→6.0' 6.0'	Rec = 1.7' 6.0'					CL SC	4.0, 4.25'		4.0-4.25'- Sandy CLAY w/some gravel. Lt. Olive Brn. (2.5Y 5/4). ~20% sand (f.g., sub-ang to sub-rounded). 5-10% gravel (1/4 - 3/4" dia., sub-rounded). Gravel predominately qtzite. Patchy caliche. Sl. moist.
							CL	5.0, 5.7', 6.0		4.25-5.7'- CLAY w/Tr gravel. Lt. Olive Brn. (2.5Y 5/4) to Gry'sh Brn. (2.5Y 5/2). Gravel is 1/8-1/4" dia., sub-ang. Wk. FeOx'n mottled throughout. Tr-5% diss. caliche nodules. Sl. moist.
				Top of Bedrock @ 6.3'				6.3'		5.7-6.0' = No Recovery
	Run #4 (6.0-9.0') 9.0'	Rec = 2.9' 9.0'						7.0, 7.6', 8.0, 8.1', 8.9', 9.0		6.0-6.3'- CLAY w/Tr gravel - same as 4.25-5.7' with roots @ 6.2'. ← Top of Bedrock @ 6.3'.
										6.3-7.6'- CLAYSTONE (poss. reworked). Gry'sh Brn. (10 YR 5/2). Massive textured. Tr wht. caliche stringers, W/Mod. friable. Sl. moist.
	Run #5 9.0-11.0'	Rec = 2.0'						9.8', 10.0		7.6-8.1'- CLAYSTONE - ox'd Bedrock. Yell'sh Brn (10YR 5/4). W/Mod. Perv. FeOx'n. Tr Blk. organic stringers. Sl. moist.
										8.1-8.9'- CLAYSTONE (un-ox'd) - Dk. Gry'sh Brn (10YR 4/2) Blk. organic stringers and nodules throughout. Sl. moist.

NOTES: General: USCS is modified for this log as follows:
Materials amounts are estimated by % volume instead of % weight.
(1) Badly broken core, accurate footage measurements not possible.
(2) Core breaks cannot be matched, accurate footage measurements not possible.

Procedure No. RMRS/OPS-PRO.101
Revision 0
Date effective: 12/31/98
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(4011-930-0134-930)(Form CT:1A)(03/01.V2)

ROCKY FLATS ENVIRONMENTAL TECHNOLOGY SITE BOREHOLE LOG

Borehole Number: 89104
Location - North: _____ East: _____
Date: 1/6/05
Geologist: E. WARP
Drilling Equip.: Auger (Hollow Stem) - CME-75HT

Surface Elevation: _____
Area: Downgradient of OU-1
Total Depth: ~~20.0'~~ 220.5'
Company: URS
Project No.: HAD51300
Sample Type: SPLIT SPOON

RMRS LOGGING SUPERVISOR
APPROVAL _____ DATE _____

TOP/BOTTOM OF CORE IN BOX	TOP/BOTTOM OF INTERVAL	FEET OF CORE IN INTERVAL (FIELD MEASUREMENT)	SAMPLE NUMBER	FRACTURE ANGLE	BEDDING ANGLE	GRAIN SIZE DISTRIBUTION	USCS SYMBOL	DEPTH IN FEET	SOIL/LITHOLOGIC LOG	SAMPLE DESCRIPTION
	Run #5 cont. 9.0-11.0 / 11.0	Rec. = 2.0' / 11.0'						11 / 11.2'		Cont. fm. page #1 - 8.7-8.9' - CLAYSTONE (Oxd). Yellsh Brn. (10YR5/4) w/Gry'sh Brn. (10YR5/2) mottling. Tr blk. org. nodules. Sl. moist. 8.9-9.0 = No Recovery. 9.0-9.8' - CLAYSTONE - Gry'sh Brn (10YR5/2) w/Yellsh Brn. (10YR5/4) mottling. Sl. friable. Blk. organic nodules and stringers throughout. Sl. moist.
	Run #6 11.0-14.0' / 14.0'	Rec. = 2.6' / 14.0'						12 / 13 / 13.6' / 14		9.8-11.2' - Silty CLAYSTONE (Oxd) - Brn'sh Yellow (10YR4/6). Wk. perv. FeOx'n. Tr patchy FeOx'n (Strong Brn. - 7.5YR5/6) fm. 10.1 to 10.3'. Decr. blk. organic stringers to Tr. Interval competent. Spotty/patchy bleaching @ 11.2'. Sl. moist.
	Run #7 14.0-17.0' / 17.0'	Rec. = 2.8' / 17.0'						15 / 15.3' / 16 / 16.8' / 17		11.2-13.6' - CLAYSTONE - Dk. Gry'sh Brn. (10YR4/2) Massive textured. Sl. perv. bleaching @ 12.4-12.7'. Wk. FeOx'n fm. 12.7-13.6'. Blk. organic nodule @ 12.9'. Sl. moist to dry. 13.6-14.0' = NO RECOVERY. 14.0-15.3' - CLAYSTONE - same as 11.2-13.6'. 15.3-16.8' - CLAYSTONE - Gry'sh Brn. (10YR5/2). Abundant Blk. organic stringers and blebs throughout. Blk organics common along internal bedding planes. Sl. moist to dry. 16.8-17.0' = NO RECOVERY
	Run #8 (17.0-~~20~~ 20.5') / 20.5'	Rec. = 3.0' / 20.0'						18 / 19		17.0-20' - CLAYSTONE - Gry'sh Brn. (10YR5/2) with Brn (10YR5/3) mottling. Some blk. org. stringers and blebs throughout interval. Occasional 1/8" thick blk. organic coating along internal bedding planes. Patchy Wk. FeOx'n. Mod. friable. Sl. moist to dry. ~~T.D. @ 20.0' BW~~ Cored to 20.0'. T.D. boring = ~~20.0'~~ 20.5'

NOTES: General: USCS is modified for this log as follows:
Materials amounts are estimated by % volume instead of % weight.
(1) Badly broken core, accurate footage measurements not possible.
(2) Core breaks cannot be matched, accurate footage measurements not possible.

Procedure No. RMRS/OPS-PRO.101
Revision 0
Date effective: 12/31/98

(4011-930-0134-930)(Form GT.1A)(03/01, V2)

STATE PLANE COORDINATES AREA:
NORTH: 748302.255
EAST: 2086390.649
PROJECT:
REMARKS:
Downgradient of Ryan's Pit

GRND ELEV. (FT): 5892.414
TOTAL DEPTH (FT): 50.6
COMPLETION DATE: 1/13/05
GEOLOGIST: E. Warp

CASING DIA (IN): 2.0"
BH DIA. (IN): 8.0"
GRID LOCATOR:

LOG OF BORING NUMBER: 90804

Elev (Ft)	Well or Piezometer Construction and Materials	Depth (Ft)	Lithology	Unified Soils Classification or Rock Type	Lithologic Description
5895	Protective Casing, 6 in. ID., Steel; Casing, Sch 80-PVC, 2 in. ID.; 16/40 Silica Sand; Concrete Pad	3, 2, 1, 0			
5892					CL: Clay with some gravel, dark brown (7.5YR3/3), 5 - 7% gravel (1/2" - 1-1/2" diameter, subangular), predominately quartzite. Roots abundant from 0.0' to 0.2'. Moist.
5891	Pre-mixed Portland Cement with 5% Bentonite	1			ML: Gravelly Silt, brown (7.5YR5/3), ~10% gravel (1/4" - 1" diameter, subangular, predominately quartzite). Some disseminated caliche, moist.
					No recovery.
5890		2			ML: Gravelly Silt, brown (7.5YR5/3), 5 - 10% gravel (1/4" - 1-1/2" diameter, subangular to subrounded, predominately quartzite. ~10% caliche as spotty blebs and stringers throughout, slightly moist.
5889		3			ML: Silt with trace gravel, brown (7.5YR5/3). Very similar to above interval except decreased gravel to trace to 3%. Gravel is 1/4" diameter and subrounded. 10 - 15% caliche as stringers and blebs. Broken at 3.5' with abundant powdery white caliche. Also fractured between 4.6' to 4.8' with 1" subrounded quartzite clasts coated with powdery white caliche. Slightly moist.
5888		4			
5887		5			

Elev (Ft)	Well or Piezometer Construction and Materials	Depth (Ft)	Lithology	Unified Soils Classification or Rock Type	Lithologic Description
					No recovery.
5886		6			ML: Silt with some gravel, brown (7.5YR5/3). 3 - 7% gravel (1/4" - 1/2" diameter, subrounded to subangular). Abundant white stringers and disseminated caliche throughout. Powdery, white caliche in broken/fractured zones from 6.7' to 6.9'. and 7.5' to 8.1'. Slightly moist.
5885		7			
		8			No recovery.
5884					
5883		9			ML: Silt with trace to some gravel and sand, brown (7.5YR5/4). Gravel is 1/4" - 1/2" diameter, subrounded. Sand is coarse grained, subrounded. Abundant white disseminated caliche (tiny white fragments) and white stringers. Strong fracturing from 10.0' to 10.4' (~80 deg from horizontal), fracture surfaces coated with powdery white caliche. Slightly moist.
		10			
5882					ML: Silt with trace gravel, strong brown (7.5YR4/6). Decrease gravel to trace to 5% (1/8" - 1/4", subrounded, quartzite and granite composition). Abundant white caliche disseminated and as stringers throughout. Trace black organic nodules (1/8" - 1/4" in length). Fairly competent interval, trace moisture.
		11			
5881					No recovery.
					ML: Silt with trace gravel, same as interval from 10.4' to 10.7'.
		12			
5880					
		13			GM/ML: Silt/Gravel mixture, same as interval from 10.4' to 10.7', except increase gravel to 50%. Gravel is up to 1-1/2" diameter, predominately quartzite. Gravel clasts coated with caliche. Trace moisture.
5879					No recovery.
		14			GM/ML: Sandy, Silty Gravel, light brown (7.5YR6/4). ~50% gravel (1/4" - 1-1/2" diameter, subrounded to subangular, composed of quartzite or K-spar-rich granite). ~30% silt and ~20% sand. ~10% caliche coating gravel and in patchy zones throughout interval. Very crumbly and unconsolidated, very slightly moist.
5878					
		15			CL: Clay with trace gravel, light brownish gray (2.5Y6/2) to light olive brown (2.5Y5/3) with olive yellow (2.5Y6/6) mottling. Appears to be re-worked claystone. 5 - 10% black organic stringers, 5 - 7% caliche (disseminated and as stringers). Patchy weak iron oxidation. Very
5877					

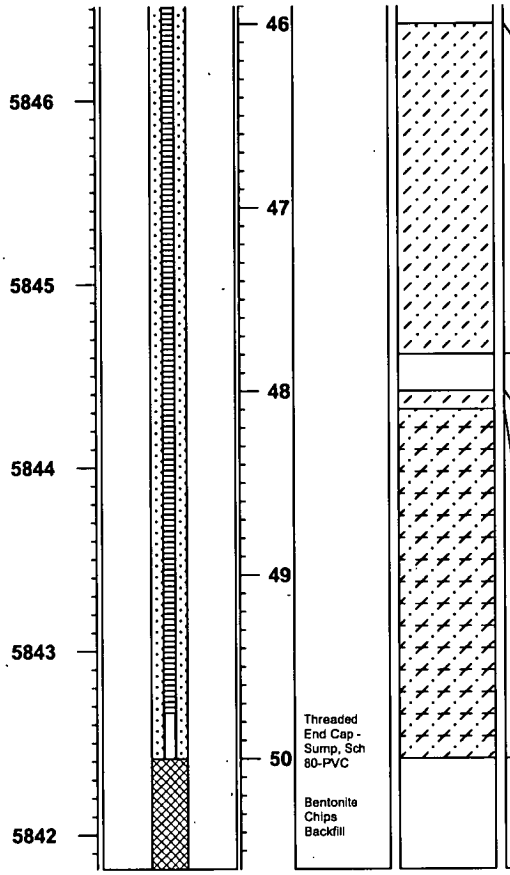
Elev (Ft)	Well or Piezometer Construction and Materials	Depth (Ft)	Lithology	Unified Soils Classification or Rock Type	Lithologic Description
					slightly moist.
		16			
5876	Bentonite Chips				No recovery.
		17			CL: Clay, same as interval from 14.75' to 16.4'. Strong fracturing and caliche lense at 18.3'. Pervasive iron oxidation from 18.3' to 18.7' with abundant powdery white caliche. Trace gravel at base of interval.
5875					
		18			
5874					No recovery.
		19			CL: Clay with trace gravel, same as from 14.75' to 16.4' and 17.0' to 18.7'. Re-worked claystone. Lense of powdery white caliche from 19.2' to 19.4'. Very slightly moist.
5873	Filter Pack, 16/40 Silica Sand				
		20			ML: Silt with trace gravel, clay and trace sand, brown (7.5YR5/3). Gravel is 1/4" - 3/4" diameter, subangular to subrounded. Sand is medium grained and subrounded to subangular. Abundant white caliche stringers throughout interval. ~5% black manganese oxide (?) nodules (possibly organics). Black nodules are 1/8" - 1/4" diameter, frequent square to rectangular and easily smeared. Low to medium plasticity, slightly moist.
5872	Screen, Sch 80-PVC, 2 in. ID., 0.010 in. slots				
		21			
5871					
					No recovery.
		22			ML: Silt, same as interval from 19.5' to 21.7'. Moist.
5870					
		23			
5869					
					No recovery.
		24			ML: Silt, same as interval from 19.5' to 21.7'. Moist. Very plastic and broken from 25.8' to 26.3', otherwise interval is cohesive. 2.0" diameter elongate quartzite clast at 26.3'. 1.0" diameter, subangular quartzite clast at 29.4'. 1.5" diameter, subangular quartzite clast at 29.8'.
5868					
		25			
5867					

Elev (Ft)	Well or Piezometer Construction and Materials	Depth (Ft)	Lithology	Unified Soils Classification or Rock Type	Lithologic Description
		26			
5866					
		27			
5865					
		28			
5864					
		29			
5863					
		30		GM/MH:	Silt/Gravel mixture with clay and some sand, reddish brown (5YR5/4). 30 - 40% gravel (1/4" - 3/4" diameter, subangular to subrounded, predominately quartzite with lesser granite composition), 5 - 10% sand, coarse-grained. Silt is moist with medium to high plasticity. Spotty and patchy caliche throughout interval. 1.5" diameter angular clasts of quartzite at 30.1'.
5862					
		31			
5861					No recovery.
		32		GM/MH:	Silt/Gravel mixture, reddish brown (5YR5/4) with some clay and sand. 50% gravel (1/2" - 2" diameter, subrounded to subangular), 10 -20% sand (coarse-grained, subangular to subrounded). Silt is moist with medium to high plasticity.
5860					
		33			
5859					No recovery.
		34		GM/MH:	Silt/Gravel mixture with some sand, same as interval from 32.0' to 33.5'. Gravel at base of interval appears to be red Fountain Formation.
5858					
		35			
5857				CL:	Clay, light brownish gray (2.5Y6/2) to light yellowish brown

Elev (Ft)	Well or Piezometer Construction and Materials	Depth (Ft)	Lithology	Unified Soils Classification or Rock Type	Lithologic Description
		36			(2.5Y6/3). Re-worked claystone, mottled texture. Black organic stringers common, blebs of white caliche throughout. Caliche lense at 36.1'. Moist.
5856					MH: Silt with trace gravel, brown (7.5YR4/4). ~5% gravel (1/2" diameter, subrounded). Disseminated white caliche, moist.
		37			No recovery.
5855					CL: Clay, gray (2.5Y5/1) to light olive brown (2.5Y5/4) with yellow brown (10YR5/6) mottling. Black organic stringers common. Tiny white caliche blebs throughout, abundant caliche at base from 39.1' to 39.5'. 1/2" diameter subangular gravel clast at 39.3'. Interval is firm and dense. Re-worked claystone. Slightly moist. Base of slump block.
		38			
5854					
		39			
5853					CLAYSTONE: TOP OF BEDROCK - Claystone, grayish brown (10YR5/2). Trace black stringers (organic material), trace patchy iron oxidation, dense and firm. Caliche coating fracture surfaces at 40.0' (fracture at ~ 10 deg from horizontal). Slightly moist.
		40			
5852					CLAYSTONE: Claystone, yellowish brown (10YR5/6) with brown (10YR5/3) mottling. Oxidized claystone bedrock, dense and firm, slightly moist. Caliche blebs and stringers at 42.7' to 42.8'. Subhorizontal caliche (possible fracture fill) at 44.4' to 44.5'.
		41			
5851					
		42			
5850					
		43			
5849					
		44			
5848					
		45			SANDSTONE: Silty Sandstone, very pale brown (10YR7/3). ~60% sandstone (very fine grained, subrounded), ~40% silt, friable. Silty, sandy lense within the Laramie. Slightly moist, friable.
5847					

Elev (Ft)	Well or Piezometer Construction and Materials	Depth (Ft)	Lithology	Unified Soils Classification or Rock Type	Lithologic Description

LOG OF BORING NUMBER: 90804



No recovery.

SILTSTONE: Sandy Siltstone with some interbedded claystone. ~65% siltstone, ~30% sand (very fine grained, subrounded). Weak pervasive iron oxidation, slightly moist.

No recovery.

SILTSTONE: Sandy Siltstone, same as interval from 46.0' to 47.8', slightly moist.

SILTY CLAYSTONE: Silty Claystone, gray (10YR6/1) to grayish brown (10YR5/2) with patchy yellowish brown (10YR5/4) iron oxidation. Firm, dense, slightly moist.

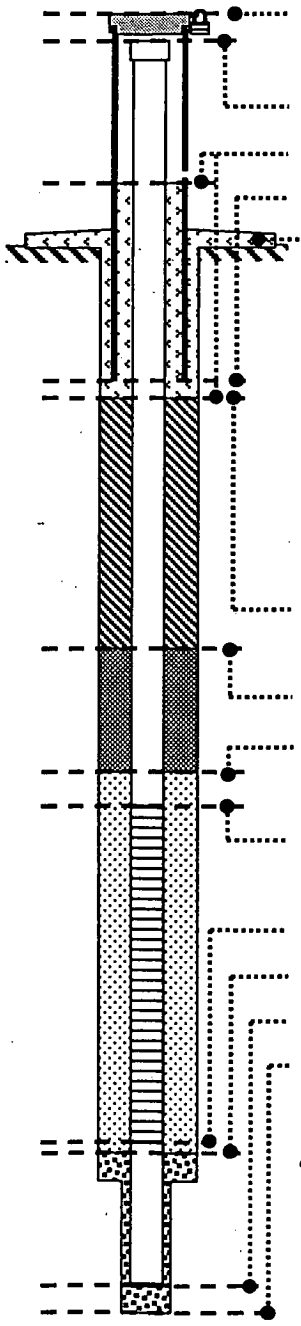
Boring extended to 50.6' to pick up auger cutting shoe. Not sampled, or cored, or logged.

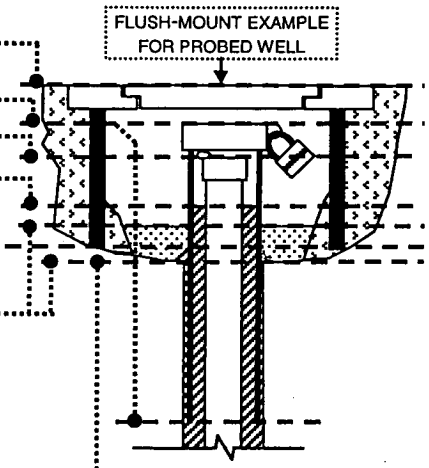
GROUNDWATER MONITORING WELL AND PIEZOMETER REPORT: Form PRO.118A

LOCATION CODE: 90804 PROJECT NAME: CY04 Well Replacement PROGRAM: Water Provisions-WARP
SCREENED FORMATION: Al/Bdrk DRILLING CONTRACTOR: High Plains BORING METHOD: Hollow Stem Auger
DATE DRILLED: 1/12/05 DATE COMPLETED: 1/13/05 TOTAL DEPTH: 50.6' COMPLETED DEPTH: 50.0'
ESTIMATED DEPTH TO BEDROCK: 39.5' RIG GEOLOGIST: E. Warp LOGGING GEOLOGIST: E. Warp
BOREHOLE DIAMETER IN SCREENED INTERVAL: 8" QUANTITY OF FLUIDS LOST DURING DRILLING: N/A
INITIAL WATER LEVEL (FT, DATE): 45.35' bgs 1/13/05 COMPLETED WATER LEVEL (FT, DATE): 43.23' on 1/17/05 - Devel. started
DIAMETER & TYPE OF INSTALLATION (WELL/PIEZOMETER/WELL POINT/ETC.): Well - 2.0" PVC Stick-up
TYPE OF PROTECTION (FLUSH-MOUNT VS. ABOVE GROUND, ASEPTIC, ETC.): Steel - 6.0" Above Ground Prot. Casing.

ALL MEASUREMENTS WILL BE MADE IN FEET FROM GROUND SURFACE

* DENOTES ITEMS THAT MAY NOT BE APPLICABLE, DEPENDING ON BORING METHOD, WELL PROTECTION & PURPOSE





PROTECTIVE CASING TOP (STICKUP OR FLUSH-MOUNT): 3.22 → 3.2' ags
*SECONDARY CASING TOP: N/A BOTTOM: N/A TYPE: N/A
SURFACE CASING TOP: 2.75' ags ID (IN): 2.0"
SURFACE SEAL TOP: 1.0' ags BOTTOM: ~~0.3' bgs~~ 0.0' ESW TYPE: 16/40 Silica Sand
PROTECTIVE CASING BOTTOM, ID (IN), TYPE: 1.65' bgs, 6.0" Steel
*WELL PAD DIMENSIONS, TYPE: 3'x3' Concrete pad - fm. 0.3 ags to 0.3 bgs.
*ADD'L CASING FILL TOP: N/A BOTTOM: N/A TYPE:
*SURFACE ISOLATION CASING TOP: N/A BOTTOM: N/A
*SURFACE ISOLATION CASING ID (IN): N/A TYPE: N/A
*OTHER (E.G., ASEPTIC) CASING TOP: N/A BOTTOM: N/A
*OTHER CASING ID (IN): N/A TYPE, PURPOSE: N/A
*CENTRALIZER(S) OD (IN): N/A NUMBER USED: N/A TYPE: N/A
*CENTRALIZER(S) DEPTH(S): N/A
*GROUT TOP: 0.0' MEASURED DENSITY (LBS/GAL): ~12 to 13 lb/gall. TYPE: Pre-mixed Portland Cement w/ 5% bentonite
*GRANULAR BENTONITE TOP: N/A TYPE: N/A
*BENTONITE SEAL TOP: 16.0' TYPE: Cetco - Med. Bentonite Chips
BENTONITE SEAL OR GRANULAR BENTONITE BOTTOM (= FILTER PACK TOP): 19.0'
FILTER PACK TYPE: 16/40 Silica Sand BRAND: Norton-Oaglebay
SURFACE CASING BOTTOM (=SCREEN TOP): 19.75' TYPE: Sch. 80-PVC
SCREEN ID (IN): 2.0" SLOT SIZE (IN): 0.010" TYPE: Sch. 80-PVC
SCREEN BOTTOM (= SUMP, TOP): 49.75 SUMP TYPE: Sch. 80 PVC - Threaded End Cap
FILTER PACK BOTTOM (= *BACKFILL TOP): 50.0' *BACKFILL TYPE: Cetco - Med. Bent. Chips
SUMP BOTTOM (= WELL COMPLETED DEPTH): 50.0' *PILOT HOLE TOP, DIAMETER: 8.0"
TOTAL BOREHOLE DEPTH (= *PILOT HOLE AND *BACKFILL BOTTOM): 50.6'

REMARKS: Well 90804 ~~INSTAL~~ ESW penetrates a slump block. V. moist, plastic silt/gravel mixture fm. 30.0 to 35.6' is probable slump block "gouge" material.

COMPLETED BY: Ellen S. Warp *Ellen S. Warp* DATE: 1/13/05
CHECKED BY: DATE:

Drilled and installed well and protective casing on 1/12/05.
Concrete well pad installed on 1/13/05.

ROCKY FLATS ENVIRONMENTAL TECHNOLOGY SITE BOREHOLE LOG

Borehole Number: 90804
Location - North: _____ East: _____
Date: 1/12/05
Geologist: E. Wnep
Drilling Equip. Hollow Stem Auger - CME-75-HT

Surface Elevation: _____
Area: Downgradient of Ryan's Pit
Total Depth: 50.6'
Company: URS/HighPlains Drilling Project No. WAD 57300
Sample Type: Split Spoon

RMRS LOGGING SUPERVISOR APPROVAL _____ DATE 3/21/05

TOP/BOTTOM OF CORE IN BOX	TOP/BOTTOM OF INTERVAL	FEET OF CORE IN INTERVAL (FIELD MEASUREMENT)	SAMPLE NUMBER	FRACTURE ANGLE	BEDDING ANGLE	GRAIN SIZE DISTRIBUTION	USCS SYMBOL	DEPTH IN FEET	SOIL/ LITHOLOGIC LOG	SAMPLE DESCRIPTION
	Run #1 0.0→2.0'	Rec.= 1.2'					CL	0.9'		0.0-0.9'- CLAY w/some gravel. Dk. brn. (7.5YR 3/3). 5-7% gravel- 1/2 to 1.5" dia, sub-ang., predominately qtzite. Roots abundant fm. 0.0 to 0.2'. Moist.
							ML	1.0 / 1.2'		0.9-1.2'- Gravelly SILT. Brn. (7.5YR 5/3). ~10% gravel (0.25-1.0" dia., sub-ang., predominately qtzite). Some disseminated caliche. Moist.
	2.0'							2.0		1.2-2.0' = No Recovery
	Run #2 2.0→4.0'	Rec.= 2.0'					ML	2.8'		2.0-2.8'- Gravelly SILT. Brn. (7.5YR 5/3). 5-10% gravel (0.25-1.5" dia., sub-ang. to sub-rounded, predominately qtzite. ~10% caliche as spotty blebs throughout and stringers. Sl. moist.
	4.0'						ML	3.0 / 4.0 / 5.0		2.8-5.4'- SILT w/Tr gravel. Brn. (7.5YR 5/3). V. similar to above interval except decreased gravel to Tr-3%. Gravel is 0.25" dia. and sub-rounded. 10-15% caliche as stringers and blebs. Broken @3.5' w/abundant powdery wht. caliche. Also fractured between 4.6 to 4.8' with 1.0" sub-rounded qtzite clasts coated w/powdery, wht. caliche, Sl. moist.
	Run #3 4.0→6.0'	Rec.=1.4'						5.4'		5.4-6.0' = No Recovery
	6.0'						ML	6.0 / 7.0 / 8.0		6.0-8.1'- SILT w/some gravel. Brn. (7.5YR 5/3). 3-7% gravel (1/4-1/2" dia., sub-rounded to sub-ang.). Abundant wht. stringers and diss. caliche throughout. Powdery, wht. caliche in broken/fractured zones fm. 6.7 to 6.9' and 7.5 to 8.1', Sl. moist.
	Run #4 6.0'-9.0'	Rec.= 2.1'						8.1'		8.1-9.0' = No Recovery
	9.0'							9.0		9.0-10.4'- SILT w/Tr to some gravel and sand. Brn (7.5YR 5/4). Gravel is 1/4-1/2" dia., sub-rounded. Sand is c.g., sub-rounded. Abundant wht. disseminated caliche (w/tiny wht. frags?) and wht. stringers. S. fracturing fm. 10.0-10.4' (~80° fm. horizontal). Fracture surfaces coated w/powdery, wht. caliche, Sl. moist.
	Run #5 9.0-10.0'	Rec.= 1.7'						10.0		
10.0'										

NOTES: General: USCS is modified for this log as follows:
Materials amounts are estimated by % volume instead of % weight.
(1) Badly broken core, accurate footage measurements not possible.
(2) Core breaks cannot be matched, accurate footage measurements not possible.

Procedure No. RMRS/OPS-PRO.101
Revision 0
Date effective: 12/31/98

(4011-930-0134-920)(Form GT:1A)(03/01.V2)

ROCKY FLATS ENVIRONMENTAL TECHNOLOGY SITE BOREHOLE LOG

Borehole Number: 90804
Location - North: _____ East: _____
Date: 1/12/05
Geologist: B. WARP
Drilling Equip.: Hollow Stem Auger - CME-75HT

Surface Elevation: _____
Area: Downgradient of Ryan's Pit
Total Depth: 50.0' (Cored to 50.0')
Company: _____ Project No. HAD51300
Sample Type: Split Spoon

RMRS LOGGING SUPERVISOR APPROVAL _____ DATE 3/21/05

TOP/BOTTOM OF CORE IN BOX	TOP/BOTTOM OF INTERVAL	FEET OF CORE IN INTERVAL (FIELD MEASUREMENT)	SAMPLE NUMBER	FRACTURE ANGLE	BEDDING ANGLE	GRAIN SIZE DISTRIBUTION	USCS SYMBOL	DEPTH IN FEET	SOIL/LITHOLOGIC LOG	SAMPLE DESCRIPTION
	Run #5 (Cont.) 9.0-11.0'	Rec.=1.7'					ML	10.0'		10.4-10.7' - SILT w/Tr gravel. Strong Brn. (7.5YR 4/6). Decrease gravel to Tr-5% (1/8-1/4" sub-rounded, qtzite and granite composition). Abundant wht. caliche disseminated and as stringers throughout. Tr blk. organic nodules (1/8-1/4" in length). Fairly competent interval. Tr moisture.
								10.7'		10.7-11.0' = No Recovery
								11		
	Run #6 (11.0-14.0')	Rec. = 2.0'					ML	12		11.0-12.8' - SILT w/Tr gravel (same as above interval fm. 10.4 to 10.7').
							GM ML	12.8'		12.8-13.0' - SILT / GRAVEL MIXTURE Same as 10.4-10.7' except increase gravel to 50%. Gravel is up to 1.5" dia. predominately granite. Gravel clasts coated with caliche. Tr moisture.
								13		
	14.0'							14		13.0-14.0' = No Recovery.
	Run #7 (14.0-17.0')	Rec. = 2.4'					GM ML	14.75'		14.0-14.75' - Sandy, Silty GRAVEL, Lt. Brn (7.5YR 6/4) ~50% gravel (0.25-1.5" dia., sub-rounded to sub-ang., composed of granite or K-spar rich granite). ~30% Silt and ~20% sand. ~10% caliche (SW) coating gravel and in patchy zones throughout interval. V. crumbly and un-consolidated. V. sl. moist.
								15		
							CL	16		
	17.0'							16.4		14.75-18.7 - CLAY w/Tr gravel. Lt. Brnish gray (2.5Y 6/2) to Lt. Olive Brn (2.5Y 5/3) w/olive yellow (2.5Y 6/6) mottling. Appears to be re-worked claystone. 5-10% blk. organic stringers. 5-7% caliche (disseminated and as stringers). Patchy wk. FeOx'n. V. sl. moist. S. fracturing and caliche lense @ 18.3'. Perv. FeOx'n fm. 18.3-18.7' w/abundant powdery, wht. caliche. Tr gravel @ base of interval.
	Run #8 (17.0-19.0')	Rec. = 1.7'					CL	17	no recovery - 16.4-17.0'	
								18		
	19.0'							18.7'		
	Run #9 19.0-22.0'	Rec. = 2.7'					CL	19		18.7-19.0' = No RECOVERY
							ML			19.0-19.5 - CLAY w/Tr gravel (same as above 14.75-18.7). ~~Lense of~~ (SW) Re-worked claystone.
20.0'										

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Procedure No. RMRS/OPS-PRO.101
Revision 0
Date effective: 12/31/98
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(4011-930-0134-930)(Form GT.1A)(03/01.V2)

Lense of powdery, wht. caliche fm. 19.2 to 19.4'. V sl. moist.

19.5-21.7 - SILT w/Tr gravel (see next page for description).

ROCKY FLATS ENVIRONMENTAL TECHNOLOGY SITE BOREHOLE LOG

Borehole Number: 90804
Location - North: East:
Date: 1/12/05
Geologist: E. Wamp
Drilling Equip.: Hollow Stem Auger - CME-75-HT

Surface Elevation:
Area: Downgradient of Ryan's Pit
Total Depth: 50.6'
Company: URS Project No. HA051300
Sample Type: SPLIT SPOON

RMRS LOGGING SUPERVISOR APPROVAL DATE 3/21/05

TOP/BOTTOM OF CORE IN BOX	TOP/BOTTOM OF INTERVAL	FEET OF CORE IN INTERVAL (FIELD MEASUREMENT)	SAMPLE NUMBER	FRACTURE ANGLE	BEDDING ANGLE	GRAIN SIZE DISTRIBUTION	USCS SYMBOL	DEPTH IN FEET	SOIL/ LITHOLOGIC LOG	SAMPLE DESCRIPTION
	Run #9 (cont.) 19.0→22.0	Rec. = 2.7'					ML	21		19.5-21.7' - SILT w/ tr gravel, clay and tr sand. Brown (7.5YR 5/3). Gravel is 1/4 to 3/4" dia., sub-ang. to sub-rounded. Sand is m.g. and sub-rounded to sub-ang. Abundant wht. caliche stringers throughout interval. ~5% blk. Mn Ox (?) nodules (possibly organics). Blk. nodules are ~~sub~~ 1/8-1/4" dia., freq. square to rectangular and easily smeared, low to medium plasticity. Sl. moist.
22.0								21.7' / 22		
	Run #10 (22.0→24.0')	Rec. = 1.7'					ML	23		
24.0'								23.7' / 24		
	Run #11 (24.0→27.0')	Rec. = 3.0'					ML	25		21.7'-22.0' = No Recovery
								26		22.0-23.7' - SILT (same as above fm. 19.5-21.7'). Moist.
27.0'										23.7-24.0' = No Recovery
	Run #12 (27.0→29.0')	Rec. = 2.0'						27		24.0-30.0' - SILT (same as above fm. 19.5 to 21.7'). Moist. V. plastic and broken between 25.8 to 26.3', otherwise interval is cohesive.
29.0'								28		2.0" dia. elongate qtzite clast @ 26.3'.
	Run #13 (29→32.0)	Rec. = 2.3'						29		1.0" dia, sub-angular qtzite clast @ 29.4'.
30.0'										1.5" dia, sub-angular qtzite clast @ 29.8'.

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Materials amounts are estimated by % volume instead of % weight.
(1) Badly broken core, accurate footage measurements not possible.
(2) Core breaks cannot be matched, accurate footage measurements not possible.

U.S. DEPARTMENT OF ENERGY ROCKY FLATS PLANT

FORM PRO.101A

ROCKY FLATS ENVIRONMENTAL TECHNOLOGY SITE BOREHOLE LOG

PAGE 4 OF 5

Borehole Number: 90804
Location - North: _____ East: _____
Date: 1/12/05
Geologist: E. WARP
Drilling Equip.: Hollow Stem Auger-CME-75-HT

Surface Elevation: _____
Area: Downgradient of Ryan's Pit
Total Depth: 50.6 (core to only 50.0')
Company: URS Project No.: HAD51300
Sample Type: Split Spoon

RMRS LOGGING SUPERVISOR APPROVAL [signature] DATE 3/21/05

TOP/BOTTOM OF CORE IN BOX	TOP/BOTTOM OF INTERVAL	FEET OF CORE IN INTERVAL (FIELD MEASUREMENT)	SAMPLE NUMBER	FRACTURE ANGLE	BEDDING ANGLE	GRAIN SIZE DISTRIBUTION	USCS SYMBOL	DEPTH IN FEET	SOIL/LITHOLOGIC LOG	SAMPLE DESCRIPTION
	Run #13 (cont.) 29.0→32.0'	Rec.=2.3'					GM MH	30.0		30.0-31.3 - SILT/GRAVEL MIXTURE w/clay & w/some sand. 30-40% gravel (1/4-3/4" dia., sub-ang. to sub-rounded, predominately qtzite with lessor granite composition.) 5-10% sand-c.g. Silt is moist w/med. to high plasticity. Spotty and patchy caliche throughout interval. 1.5" dia. angular clasts of qtzite @ 30.1'.
								31		
								31.3'		
	32.0'							32		31.3-32.0 = No Recovery
	Run #14 32.0-34.0'	Rec.=1.5'					GM MH	33		32.0-33.5' - SILT/GRAVEL MIXTURE w/some clay and sand. 50% gravel (0.5-2" dia. sub-rounded to sub-ang). 10-20% sand (c.g., sub-ang. to sub-rounded). SILT is moist w/med. to high plasticity. ~~Gravel at base of interval appears to be red, Fountain Fm.~~ ESW 1/12/05
								33.5'		
	34.0'							34		33.5-34.0 = No Recovery
	Run #15 34.0-37.0'	Rec.=2.2'					GM MH	35		34.0-35.6' - SILT/GRAVEL MIXTURE w/some sand (same as above 32.0-33.5). Gravel at base of interval appears to be red, Fountain Fm. - ~~Bottom~~ ESW 1/12/05
							CL	35.6'		
						MH		36		35.6-36.1 - CLAY - Lt. brn'sh gry. (2.5Y 6/2) to lt. yell'sh brn. (2.5Y 6/3). Re-worked claystone. Mottled texture. Blk organic stringers commen. Blebs of wht. caliche throughout. Caliche lense @ 36.1'. Moist.
								36.1 36.2'		
	37.0'							37		36.1-36.2' - SILT w/ Tr gravel. Brn. (7.5YR 4/4). ~5% gravel (1/2" dia., sub-rounded). Disseminated wht. caliche. Moist
	Run #16 37.0-39.0'	Rec=2.0'					CL	38		36.2-37.0 = No Recovery
	39.0'							39		37.0-39.5 - CLAY. Gry (2.5Y 5/1) to Lt. Olive Brn. (2.5Y 5/4) w/yellow brn. (10YR 5/6) mottling. Blk. organic stringers commen. Tiny wht. caliche blebs throughout. Abundant caliche @ base fm. 39.1-39.5'. 0.5" dia. sub-ang. gravel clast @ 39.3'. Interval is firm and dense. Re-worked claystone. Sl. moist. Top of Bedrock @ 39.5' (=bottom of slump block).
	Run #17 39.0-42.0'	Rec.=3.0'			Top of Bedrock @ 39.5'			39.5'		
40.0								40.0'		

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Procedure No. RMRS/OPS-PRO.101
Revision 0
Date effective: 12/31/98
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(4011-930-0134-930)(Form GT.1A)(03/01/92)

ROCKY FLATS ENVIRONMENTAL TECHNOLOGY SITE BOREHOLE LOG

Borehole Number: 98804
Location - North: _____ East: _____
Date: 1/12/05
Geologist: E. WARP
Drilling Equip.: Hollow Stem Auger

Surface Elevation: _____
Area: Downgradient of Ryan's Pit
Total Depth: 50.6' (cored to 50.0')
Company: URS Project No. HAD 51300
Sample Type: Split Spoon

RMRS LOGGING SUPERVISOR APPROVAL [signature] DATE 3/21/05

TOP/BOTTOM OF CORE IN BOX	TOP/BOTTOM OF INTERVAL	FEET OF CORE IN INTERVAL (FIELD MEASUREMENT)	SAMPLE NUMBER	FRACTURE ANGLE	BEDDING ANGLE	GRAIN SIZE DISTRIBUTION	USCS SYMBOL	DEPTH IN FEET	SOIL/LITHOLOGIC LOG	SAMPLE DESCRIPTION
	Run #17 39.0→42.0	Rec. = 3.0'		3/21/05				40.0'		(cont fm. page 4/5) 39.5 - 40.4' - CLAYSTONE. Gry'sh Brn. (10YR 5/2). Tr blk. stringers (organic material). Tr patchy FeOx'n. Dense and firm. Caliche coating fracture surfaces @ 40.0' (frac. @ ~10° fm. horizontal). Sl. moist.
	42.0							40.4		
	Run #18 42.0 - 44.0'	Rec. = 2.0'						41		
	44.0'							42		40.4 - 44.8' - CLAYSTONE - Yell'sh Brn. (10YR 5/6) w/ Brn (10YR 5/3) mottling. Ox'd claystone bedrock. Dense and Firm. Sl. moist. Caliche blebs, stringers at 42.7-42.8', subhoriz. (poss. fracture fill), 44.4-44.5'. 3/21/05
	Run #19 44.0 - 46.0'	Rec. = 1.8'						43		
	46.0							44		
	Run #20 46.0 - 48.0	Rec. = 1.8'						44.8'		44.8 - 45.8 - Silty Sandstone - V. pale brn. (10YR 7/3), ~60% sandstone (v.f.g. sub-rounded) ~40% silts Friable. Silty, sandy lense within the Laramie. Sl. moist. Friable.
	48.0'							45		
	Run #21 48.0→50.0'	Rec. = 2.0'						45.8'		45.8 - 46.0 = No Recovery
	50.0'	50.0'						46		46.0 - 47.8' — Sandy Siltstone. w/ some interbedded claystone. ~65% siltstone, ~30% sand (v.f.g., sub-rounded). ~~Some inter~~ ESW. Weak perv. FeOx'n. Sl. moist 1/12/05
								47		
								47.8		47.8 - 48.0' = No Recovery
								48		48.0 - 48.1 (~~47.8 - 47.9~~ SW 1/12/05 - Sandy Siltstone (same as above fm. 46.0 - 47.8'). Sl. moist
								48.1		
								49		48.1 - 50.0 - Silty CLAYSTONE Gry (10YR 6/1) to Gry'sh Brn (10YR 5/2) w/ patchy Yell'sh Brn (10YR 5/4) FeOx'n. Firm/Dense. Sl. moist.
								50.0'		

NOTES: General: USCS is modified for this log as follows:
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(2) Core breaks cannot be matched, accurate footage measurements not possible.

Procedure No. RMRS/OPS-PRO.101
Revision 0
Date effective: 12/31/98

(4011-930-0134-930)(Form GT.1A)(03/01/92)

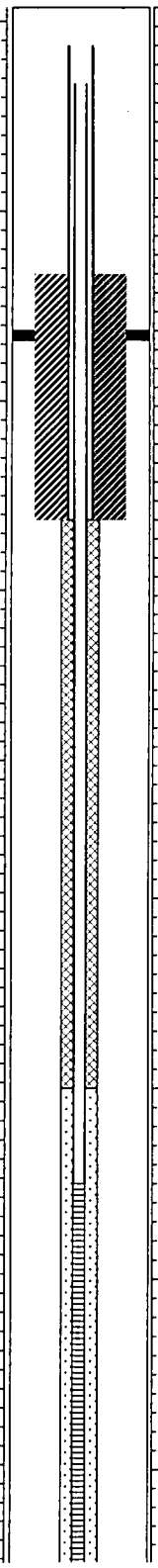
Boring extended to 50.6' to pick up auger lifting shoe. Not sampled or cored or logged.

STATE PLANE COORDINATES AREA:
NORTH: 749628.225
EAST: 2085960.646
PROJECT: 2004 WARP
REMARKS:

GRND ELEV. (FT): 5956.372
TOTAL DEPTH (FT): 20.0
COMPLETION DATE: 6/7/04
GEOLOGIST: J. Rosen

CASING DIA (IN): 1"
BH DIA. (IN): 3.75"
GRID LOCATOR:

LOG OF BORING NUMBER: 91104

Elev (Ft)	Well or Piezometer Construction and Materials	Depth (Ft)	Lithology	Unified Soils Classification or Rock Type	Lithologic Description
5958					
5957		1			
5956		0			Core not logged. See well 91103 for lithology.
5955		1			
5954		2			
5953		3			
5952		4			
5951		5			
5950		6			

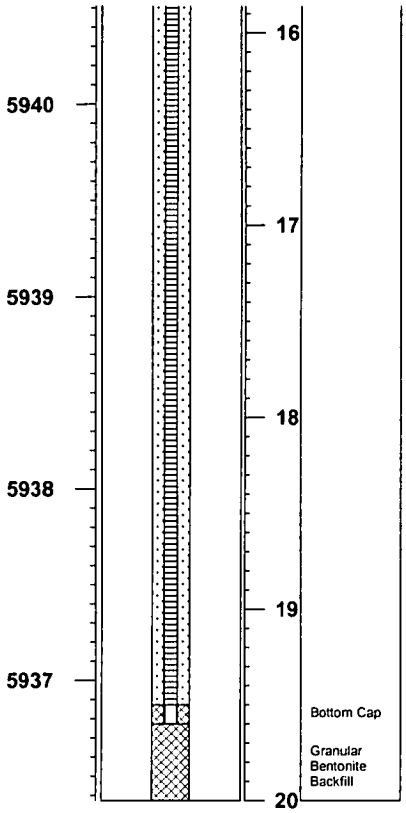
Elev (Ft)	Well or Piezometer Construction and Materials	Depth (Ft)	Lithology	Unified Soils Classification or Rock Type	Lithologic Description

LOG OF BORING NUMBER:
91104

Elev (Ft)	Depth (Ft)
5949	7
5948	8
5947	9
5946	10
5945	11
5944	12
5943	13
5942	14
5941	15

Elev (Ft)	Well or Piezometer Construction and Materials	Depth (Ft)	Lithology	Unified Soils Classification or Rock Type	Lithologic Description

LOG OF BORING NUMBER:
91104

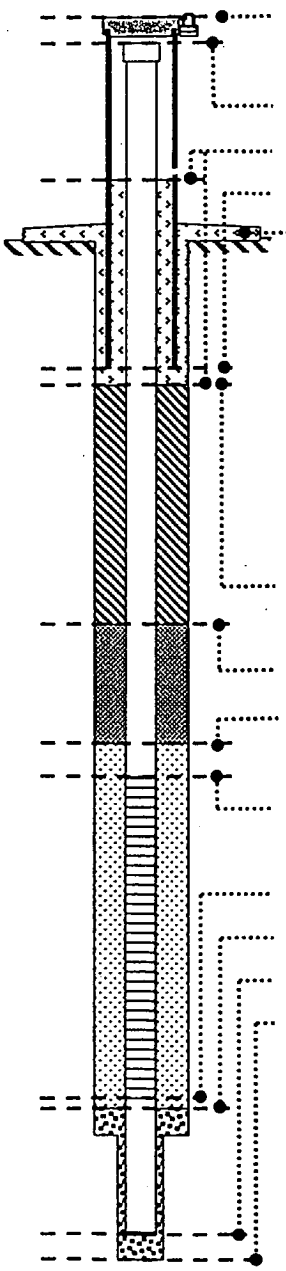


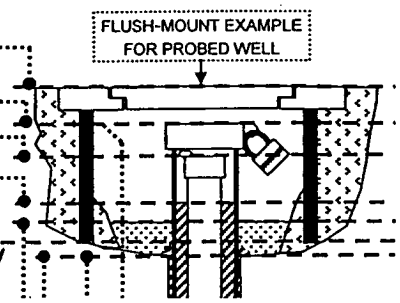
MONITORING WELL INSTALLATION REPORT: Form PRO.118

LOCATION CODE: 91104 PROJECT NAME: '04 WARP PROGRAM: '04 WARP
SCREENED FORMATION: RFA DRILLING CONTRACTOR: RTG BORING METHOD: Geoprobe
DATE DRILLED: 6/7/04 DATE COMPLETED: 6/7/04 TOTAL DEPTH: 20 COMPLETED DEPTH: 19.5
ESTIMATED DEPTH TO BEDROCK: 0' RIG GEOLOGIST: JDR LOGGING GEOLOGIST: N/A
BOREHOLE DIAMETER IN SCREENED INTERVAL: 3.75" QUANTITY OF FLUIDS LOST DURING DRILLING: None
INITIAL WATER LEVEL (FT, DATE): not measured COMPLETED WATER LEVEL (FT, DATE): not measured
DIAMETER & TYPE OF INSTALLATION (WELL/PIEZOMETER/WELL POINT/ETC.): 1" stainless steel well
TYPE OF PROTECTION (FLUSH-MOUNT VS. ABOVE GROUND, ASEPTIC, ETC.): 2" aboveground PVC

ALL MEASUREMENTS WILL BE MADE IN FEET FROM GROUND SURFACE

* DENOTES ITEMS THAT MAY NOT BE APPLICABLE, DEPENDING ON BORING METHOD, WELL PROTECTION & PURPOSE





PROTECTIVE CASING TOP (STICKUP OR FLUSH-MOUNT): S.U. = 1.5' ags.
*SECONDARY CASING TOP: X BOTTOM: X TYPE: X
SURFACE CASING TOP: 1" ID (IN): 1.3' ags
SURFACE SEAL TOP: +.3' BOTTOM: -1' TYPE: concrete
PROTECTIVE CASING BOTTOM, ID (IN), TYPE: 1' bgs, 2" PVC
*WELL PAD DIMENSIONS, TYPE: No pad, concrete mound
*ADD'L CASING FILL TOP: X BOTTOM: X TYPE: X
*SURFACE ISOLATION CASING TOP: X BOTTOM: X
*SURFACE ISOLATION CASING ID (IN): X TYPE: X
*OTHER (E.G., ASEPTIC) CASING TOP: X BOTTOM: X
*OTHER CASING ID (IN): X TYPE, PURPOSE: X
*CENTRALIZER(S) OD (IN): X NUMBER USED: X TYPE: X
*CENTRALIZER(S) DEPTH(S): X
*GROUT TOP: NA MEASURED DENSITY (LBS/GAL): X TYPE: X
*GRANULAR BENTONITE TOP: X TYPE: X
*BENTONITE SEAL TOP: 1' bgs TYPE: granular (hydrated)
BENTONITE SEAL OR GRANULAR BENTONITE BOTTOM (= FILTER PACK TOP): 4' bgs
FILTER PACK TYPE: 16-40 BRAND: CO silica
SURFACE CASING BOTTOM (=SCREEN TOP): 4.5 TYPE: stainless steel 1"
SCREEN ID (IN): 1" SLOT SIZE (IN): .010 TYPE: stainless steel 1"
SCREEN BOTTOM (= SUMP, TOP): 19.5' SUMP TYPE: none; bottom cap
FILTER PACK BOTTOM (= *BACKFILL TOP): 19.5' *BACKFILL TYPE: gran. bent.
SUMP BOTTOM (= WELL COMPLETED DEPTH): 19.6' *PILOT HOLE TOP, DIAMETER: NA
TOTAL BOREHOLE DEPTH (= *PILOT HOLE AND *BACKFILL BOTTOM): 20'

Core Not Logged See 91103 for Lithology

REMARKS: high Mini-Rae readings, even through sealed drive casing. Pegged once screen exposed.

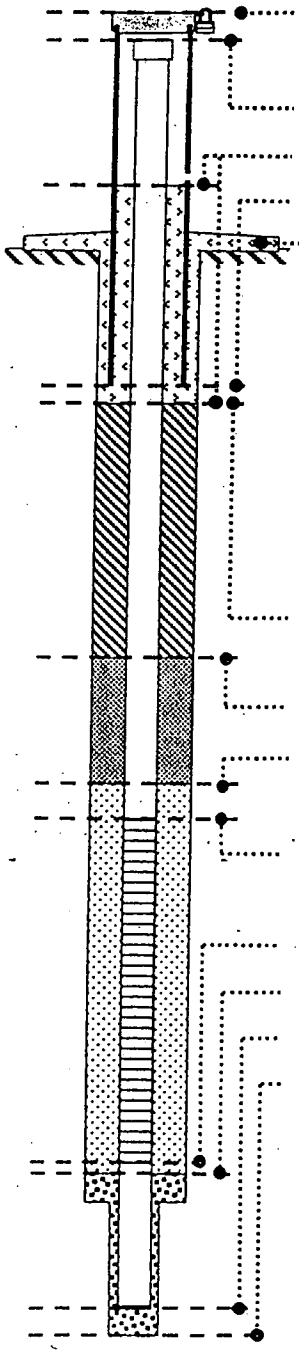
COMPLETED BY: Josh Rosen DATE: 6/9/04
CHECKED BY: DATE:

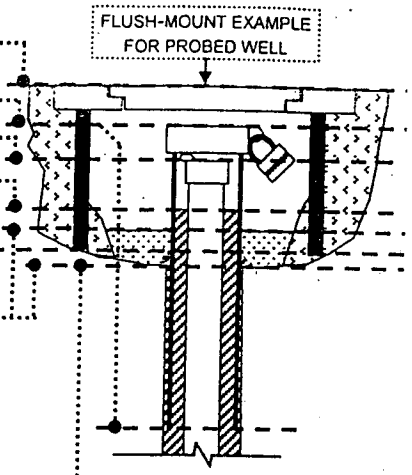
MONITORING WELL INSTALLATION REPORT: Form PRO.118

LOCATION CODE: 91104 PROJECT NAME: CY04 WARP WELL INSTALLATION PROGRAM: WATER PROGRAMS
SCREENED FORMATION: Bdrk. DRILLING CONTRACTOR: RTG BORING METHOD: GEOPROBE
DATE DRILLED: 6/7/04 DATE COMPLETED: 6/7/04 TOTAL DEPTH: 20.0' COMPLETED DEPTH: 19.6'
ESTIMATED DEPTH TO BEDROCK: ~1.0' RIG GEOLOGIST: J. Rosen LOGGING GEOLOGIST: NOT LOGGED
BOREHOLE DIAMETER IN SCREENED INTERVAL: 3.75" QUANTITY OF FLUIDS LOST DURING DRILLING: N/A
INITIAL WATER LEVEL (FT, DATE): Not Measured COMPLETED WATER LEVEL (FT, DATE): 10.02' on 6/22/04 (below TOC)
DIAMETER & TYPE OF INSTALLATION (WELL/PIEZOMETER/WELL POINT/ETC.): 1" I.D. STAINLESS STEEL WELL
TYPE OF PROTECTION (FLUSH-MOUNT VS. ABOVE GROUND, ASEPTIC, ETC.): 2" I.D. PVC

ALL MEASUREMENTS WILL BE MADE IN FEET FROM GROUND SURFACE

* DENOTES ITEMS THAT MAY NOT BE APPLICABLE, DEPENDING ON BORING METHOD, WELL PROTECTION & PURPOSE





PROTECTIVE CASING TOP (STICKUP OR FLUSH-MOUNT): 1.5' ags.
*SECONDARY CASING TOP: N/A BOTTOM: N/A TYPE:
SURFACE CASING TOP: ESW ~~N/A~~ 1.3' ags ID (IN): 1.0"
SURFACE SEAL TOP: 0.3' ags BOTTOM: 1.0' bgs TYPE: CONCRETE
PROTECTIVE CASING BOTTOM, ID (IN), TYPE: 1.0' bgs, 2" I.D. PVC sch 40
*WELL PAD DIMENSIONS, TYPE: 3' x 3' (tm. 1.0' bgs to 0.3' ags)
*ADD'L CASING FILL TOP: 0.3' ags BOTTOM: 1.0' bgs TYPE: 16/40 Silica Sand between 2.0" PVC and 1.0" SS. Well casing
*SURFACE ISOLATION CASING TOP: N/A BOTTOM:
*SURFACE ISOLATION CASING ID (IN): N/A TYPE:
*OTHER (E.G., ASEPTIC) CASING TOP: N/A BOTTOM:
*OTHER CASING ID (IN): N/A TYPE, PURPOSE:
*CENTRALIZER(S) OD (IN): N/A NUMBER USED: TYPE:
*CENTRALIZER(S) DEPTH(S): N/A
*GROUT TOP: N/A MEASURED DENSITY (LBS/GAL): TYPE:
*GRANULAR BENTONITE TOP: N/A TYPE:
*BENTONITE SEAL TOP: 1.0' TYPE: Granular Bentonite
BENTONITE SEAL OR GRANULAR BENTONITE BOTTOM (= FILTER PACK TOP): 4.0'
FILTER PACK TYPE: 16/40 Silica Sand BRAND: CSSI
SURFACE CASING BOTTOM (=SCREEN TOP): 4.5 TYPE: STAINLESS STEEL
SCREEN ID (IN): 1.0" SLOT SIZE (IN): 0.010" TYPE: STAINLESS STEEL
SCREEN BOTTOM (= SUMP, TOP): 19.5 SUMP TYPE: THREADED END CAP
FILTER PACK BOTTOM (= *BACKFILL TOP): 19.6' *BACKFILL TYPE: Granular bentonite
SUMP BOTTOM (= WELL COMPLETED DEPTH): 19.6' *PILOT HOLE TOP, DIAMETER: N/A
TOTAL BOREHOLE DEPTH (= *PILOT HOLE AND *BACKFILL BOTTOM): 20.0'
REMARKS: #91104 REPLACED WELL #91103. Lithology not logged.
V. HIGH PID READINGS (OFF-SCALE).

COMPLETED BY: ELLEN S. WARP DATE: 3/14/05
CHECKED BY: J. Boylen DATE: 3/14/05

C.2 Calendar Year 2005

STATE PLANE COORDINATES AREA: GRND ELEV. (FT):5924.167 CASING DIA (IN): 2

NORTH: 748015.243 TOTAL DEPTH (FT): 19.87 BH DIA. (IN):

EAST: 2084773.265 COMPLETION DATE: 8/1/05 GRID LOCATOR:

PROJECT: Replaces well 891COLWEL GEOLOGIST: E. Warp

REMARKS:

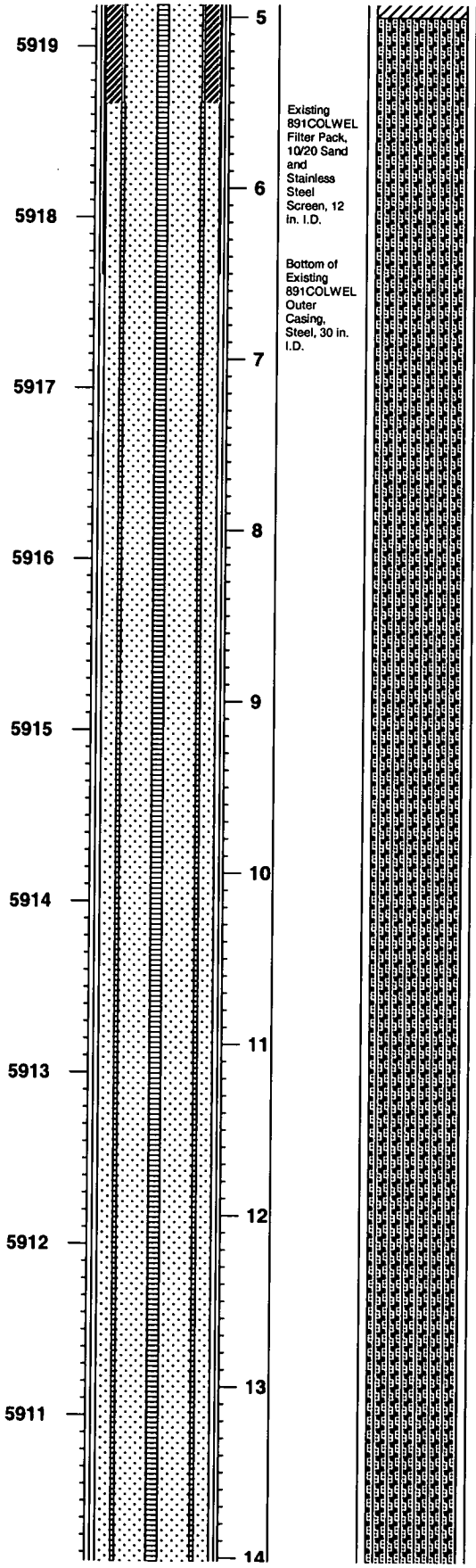
Installed inside 891COLWEL

LOG OF BORING NUMBER: 891WEL

Elev (Ft)	Well or Piezometer Construction and Materials	Depth (Ft)	Lithology	Unified Soils Classification or Rock Type	Lithologic Description
5927	Protective Casing, Steel, 6 in. ID. Casing, Sch 40-PVC, 2 in. ID.	3			This is a 2" PVC well installed inside existing 12" I.D. Steel 891COLWEL to assumed T.D. of constructed 891COLWEL. Details of lithology and construction of 891COLWEL are estimated from records for "CW001" (February and March 1992).
5926	Existing 891COLWEL Casing, Steel, 12 in. I.D.	2			
5925	Concrete Fill between 2 in. PVC Casing and 12 in. Steel Casing Existing 891COLWEL Casing, Steel, 30 in. I.D.	1			
5924		0			CL: Dark brown to black Clay with gravels, cobbles, and roots to surface. Topsoil, sandy black.
5923	Existing 891COLWEL-Concrete between 30 in. Casing and 12 in. Casing	1			
5922	Hydrated Granular Bentonite	2			CL: Dark brown Sandy Clay with gravel, trace caliche scattered throughout; less organic than above.
5921		3			
5920	Filter Pack, 16/40 Silica Sand Screen, Sch 40-PVC, 2 in. ID., 0.010 in. slots	4			CL: Sandy Clay, light to red orange brown, scatter limonite stain throughout. Note: Pitless Adapter Unit at 4.5' - 6.0'.

Elev (Ft)	Well or Piezometer Construction and Materials	Depth (Ft)	Lithology	Unified Soils Classification or Rock Type	Lithologic Description

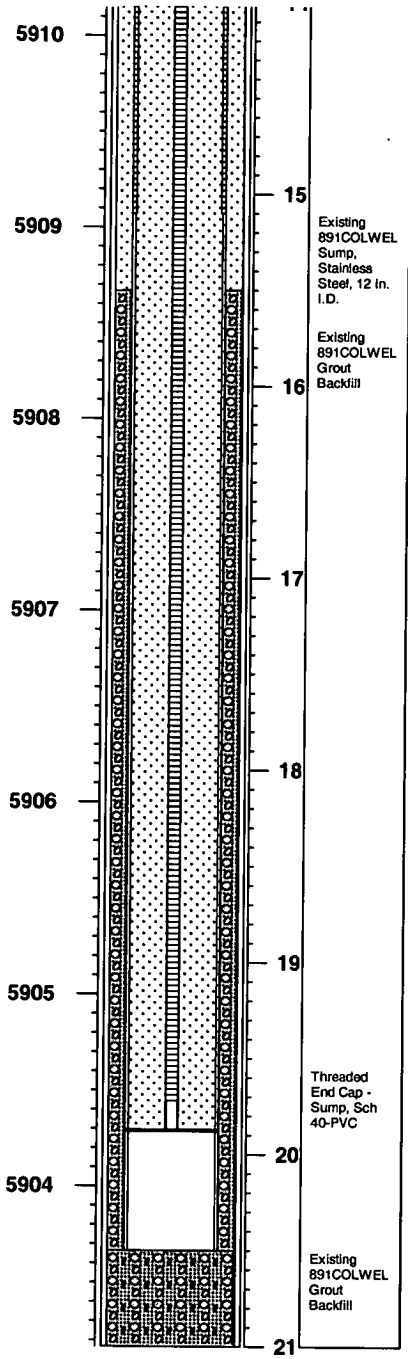
LOG OF BORING NUMBER:
891WEL



SM: Silty Sand, very fine grained to fine grained, trace mica; some cobbles, trace carbonaceous material. At 7.0' gray green clay with sand, trace organics, scattering of iron stain; abundant cobbles.

Elev (Ft)	Well or Piezometer Construction and Materials	Depth (Ft)	Lithology	Unified Soils Classification or Rock Type	Lithologic Description

LOG OF BORING NUMBER: 891WEL



TOP OF BEDROCK. (Log for "CW001" does not describe bedrock.) Note: void from 19.87' to 20.5' is not real: either due to errors on CW001 documentation or unrecognized sediment accumulation in sump.

MONITORING WELL INSTALLATION REPORT: Form PRO.118

LOCATION CODE: 891WEL PROJECT NAME: CY05 Well Replacements PROGRAM: Water Programs-WARP

SCREENED FORMATION: Al/Bdrk. DRILLING CONTRACTOR: N/A BORING METHOD: N/A

DATE ~~DRILLED~~ INSTALLED: 8/1/05 ESW 9/1/05 DATE COMPLETED: 8/1/05 TOTAL DEPTH: 19.87 COMPLETED DEPTH: 19.87

ESTIMATED DEPTH TO BEDROCK: _____ RIG GEOLOGIST: E. Warp LOGGING GEOLOGIST: N/A

BOREHOLE DIAMETER IN SCREENED INTERVAL: 1.09' QUANTITY OF FLUIDS LOST DURING DRILLING: N/A

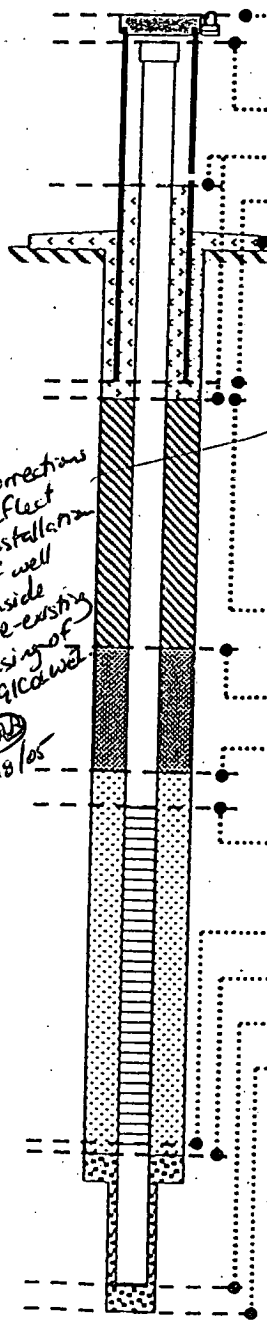
INITIAL WATER LEVEL (FT, DATE): 10.51 TOC 1.09' SS COMPLETED WATER LEVEL (FT, DATE): 10.2' TOC 2" PVC

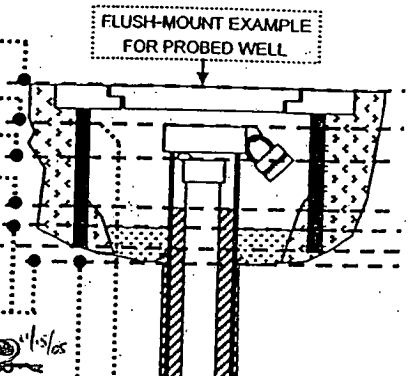
DIAMETER & TYPE OF INSTALLATION (WELL/PIEZOMETER/WELL POINT/ETC.): 2.0" PVC Well within existing SS. Well

TYPE OF PROTECTION (FLUSH-MOUNT VS. ABOVE GROUND, ASEPTIC, ETC.): Above Ground Steel Protective Casing

ALL MEASUREMENTS WILL BE MADE IN FEET FROM GROUND SURFACE

*DENOTES ITEMS THAT MAY NOT BE APPLICABLE, DEPENDING ON BORING METHOD, WELL PROTECTION & PURPOSE





PROTECTIVE CASING TOP (STICKUP OR FLUSH-MOUNT): 2.78' ags

*SECONDARY CASING TOP: 2.05' ags BOTTOM: 19.87' TYPE: STEEL-PREVIOUS 891 COLWEL 1.09' ID

SURFACE CASING TOP: 2.23' ags ID (IN): 2.0"

SURFACE SEAL TOP: 0.68' ags BOTTOM: 1.17' bgs TYPE: CONCRETE FILL BETWEEN 2" PVC + 1.09' Steel

PROTECTIVE CASING BOTTOM, ID (IN), TYPE: 1.22' bgs, 6" Steel

*WELL PAD DIMENSIONS, TYPE: use previous pad which is a 2.5' ID steel casing filled w/ concrete fm. 0.45' ags to g.s.

*ADD'L CASING FILL TOP: N/A BOTTOM: N/A TYPE: N/A

*SURFACE ISOLATION CASING TOP: 0.45 ags ~~N/A~~ BOTTOM: ~~N/A unknown~~ ? JRB 1/5/05

*SURFACE ISOLATION CASING ID ~~(IN)~~: ~~N/A~~ 2.5 ft. TYPE: ~~N/A~~ Steel

*OTHER (E.G., ASEPTIC) CASING TOP: ~~N/A~~ 2.05 ags BOTTOM: ~~N/A~~ unknown

*OTHER CASING ID ~~(IN)~~: ~~N/A~~ 1.09 ft TYPE, PURPOSE: ~~N/A~~ component of former collection well (891COLWEL)

*CENTRALIZER(S) OD (IN): N/A NUMBER USED: N/A TYPE: N/A

*CENTRALIZER(S) DEPTH(S): N/A

*GROUT TOP: N/A MEASURED DENSITY (LBS/GAL): N/A TYPE: N/A

*GRANULAR BENTONITE TOP: 1.17' bgs TYPE: "CETCO" - Granular bentonite - hydrated

*BENTONITE SEAL TOP: N/A TYPE: N/A

BENTONITE SEAL OR GRANULAR BENTONITE BOTTOM (= FILTER PACK TOP): 4.17'

FILTER PACK TYPE: 16/40 Silica Sand BRAND: C.S.S.I.

SURFACE CASING BOTTOM (=SCREEN TOP): 4.67' TYPE: Sch. 40 PVC

SCREEN ID (IN): 2.0" SLOT SIZE (IN): 0.010" TYPE: Sch. 40 PVC

SCREEN BOTTOM (= SUMP, TOP): 19.72 SUMP TYPE: Sch. 40 PVC-Threaded End Cap

FILTER PACK BOTTOM (= *BACKFILL TOP): 19.87 *BACKFILL TYPE: N/A

SUMP BOTTOM (= WELL COMPLETED DEPTH): 19.87 *PILOT HOLE TOP, DIAMETER: N/A

TOTAL BOREHOLE DEPTH (= *PILOT HOLE AND *BACKFILL BOTTOM): N/A

REMARKS: Install a 2" PVC well inside existing 1.09' I.D. steel 891ColWel, to TD of constructed 891COLWEL. Detailed diagram of that well not available, ~~above "unknowns" above.~~ JRB 1/5/05

COMPLETED BY: Ellen S. Warp Ellen S. Warp DATE: 8/1/05

CHECKED BY: JOHN BOYLAN JB DATE: 10/18/05

Corrections reflect installation of well inside pre-existing casing of 891ColWel JRB 10/18/05

See records for "CW001", Feb-Mar 1992, for lithology and construction information for 891COLWEL.

Groundwater Monitoring Well and Piezometer Report

PROJECT NAME _____

LOCATION _____

DATE COMPLETED _____ TOTAL HOLE DEPTH (FT) 21.5'

CHECKED BY _____ DATE 3/19/92

WELL NO. CW 001

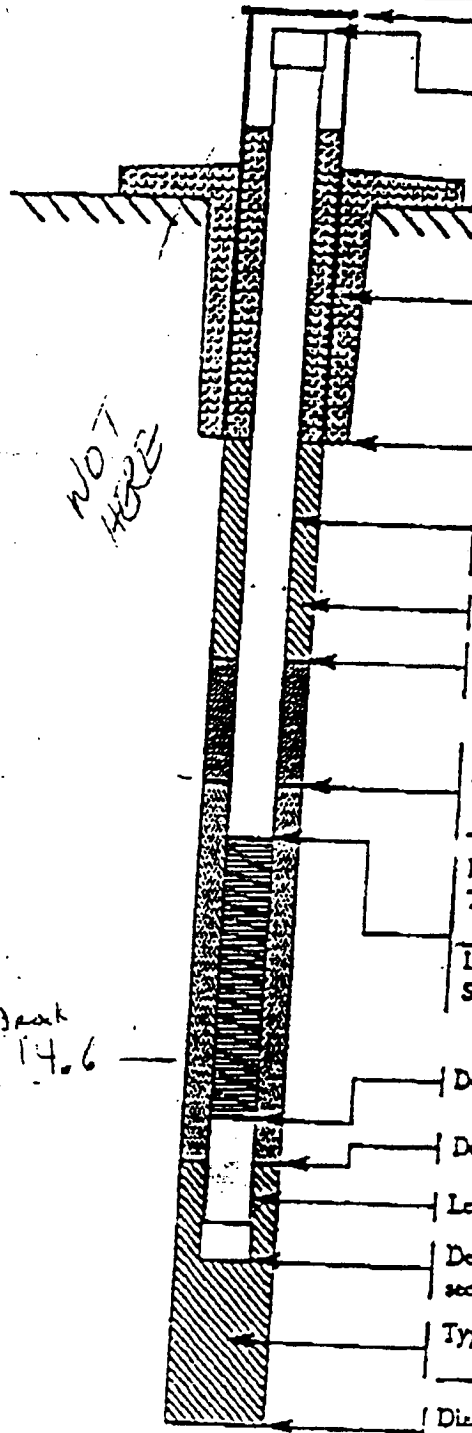
SCREENED INTERVAL

DEPTH (FT) 6.0' to 15.6' 7.

LITHOLOGY 5.55 (14.65-15.05)

NOTE: All measurements will be from ground surface. Centralizer depths (when applicable) will also be shown.

Surface Casing Used (Check 1): ____ Yes ____ No (If Yes, See Form GT.3A for specific information)

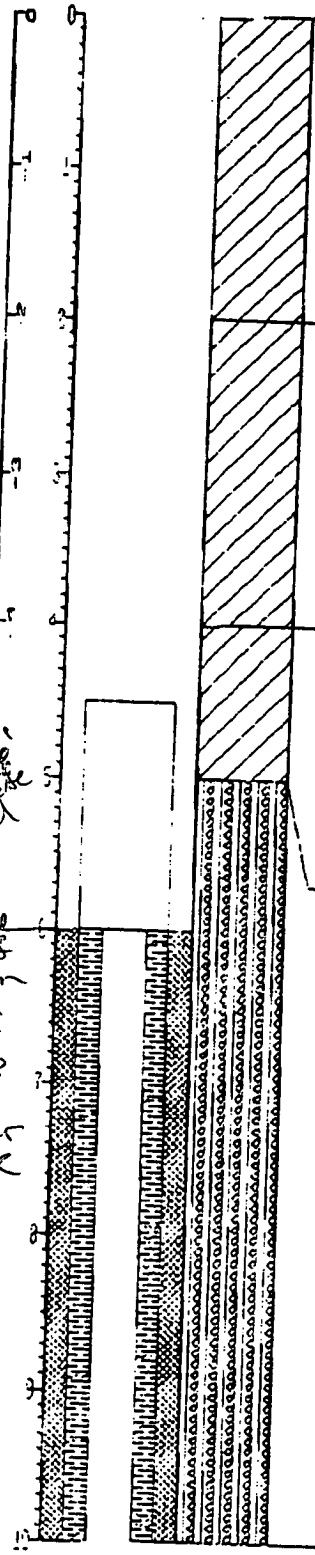


Height of top of protective casing (Ft)	0	0.45 agl
Height of top of well casing (Ft).		
Ground Elevation (Ft)		
I.D. of protective casing (In)		
Type of protective casing: 30" Steel		
Depth of protective casing (Ft)	7	6.55 bgl
Depth of surface seal (Ft)		
Type of surface seal: Concrete		
I.D. of well casing (In)	12.0"	
Type of well casing:		
Type of backfill:		
Depth of top of seal (Ft)		
Type of seal: N/A		
Depth of top of filter pack / bottom of seal (Ft)	6.0'	7.0 5.55
Type of filter pack: 10/20 sand		
Depth of top of screened section (Ft)	6.0'	6.0 5.55
Type of screened section: Stainless steel		
I.D. of screened section (In)	12"	
Size of screen openings (In)		
Depth of bottom of screened section (Ft)	15.6'	15.05
Depth of bottom of filter pack (Ft)	16.0'	15.55
Length of plugged blank section - Sump (Ft)	5.0'	
Depth of bottom of plugged blank section - Sump (Ft)	21.0'	20.55
Type of backfill below filter pack: Cement		
Diameter of hole (In)	36"	
Depth of hole (Ft)	21.5'	21.05

Generalized Stratigraphy and Water Level Summary (Based on Rig Geologist Notes)

STATE PLANE COORDINATE	TOTAL DEPTH (FT): 21.50	GROUND ELEVATION (FT): 0.00	PROJECT NUMBER: 001-RFI/RI	LOG OF BORING NUMBER	
NORTH: 748015	AREA 001	CASING DIAMETER (IN): 12.00	GEOLOGIST: M.S. BUDDY	CW001	
EAST: 2084773	LOCATOR NUMBER: LT	BOREHOLE DIAMETER (IN): 36.00	DATE DRILLED: 03/19/92		
REMARKS: COLLECTION WELL					

CHEMICAL SAMPLE DEPTH / GRADATIONAL SAMPLE DEPTH | SAMPLE NUMBER | SAMPLE GRAIN SIZE | PERCENT RECOVERY | RECOVERY/INTERVAL | DATUM (FT) | DEPTH (FT) | WELL OR PIEZOMETER CONSTRUCTION | LITHOLOGY | UNIFIED SOILS CLASSIFICATION OR ROCK TYPE | DESCRIPTION



Unified Soils Classification or Rock Type	Description
CL	0.0-2.0' Clay: dark brown to black clay with gravels, cobbles, and roots to surface; topsoil; sandy black.
CL	2.0-4.0' Clay: dark brown sandy clay with gravel, trace caliche scattered throughout; less organic than above.
CL	4.0-5.0' Sandy clay: light to red orange brown, scatter limonite stain throughout. NOTE: Pitless Adapter Unit at 4.5-6.0'
SM	5.0-14.6' Silty Sand: v.f.g. to f.g., trace mica; some cobbles, trace carbonaceous material. @7.0' gray green clay with sand, trace organics, scattering of iron stain; abundant cobbles. Top of Bedrock = 14.6'

STATE PLANE COORDINATE
NORTH: 748015
EAST: 2084773
REMARKS -- COLLECTION WELL

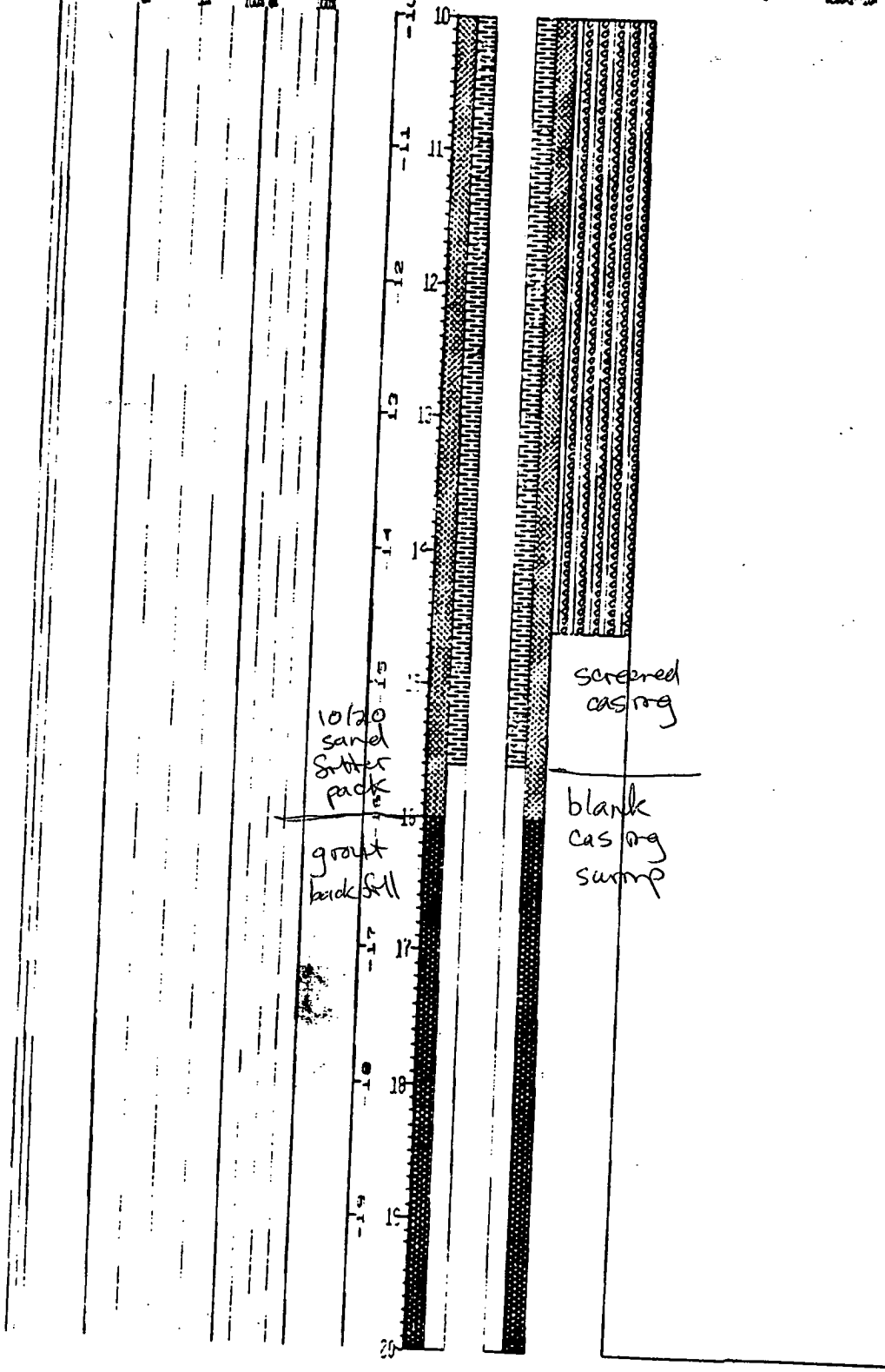
TOTAL DEPTH (FT): 21.50
AREA 001
LOCATOR NUMBER: 17

GROUND ELEVATION (FT): 0.00
CASING DIAMETER (IN): 12.00
BOREHOLE DIAMETER (IN): 36.00

PROJECT NUMBER: 001-RFI/RI
GEOLOGIST: M.S. GUDDY
DATE DRILLED: 03/19/92

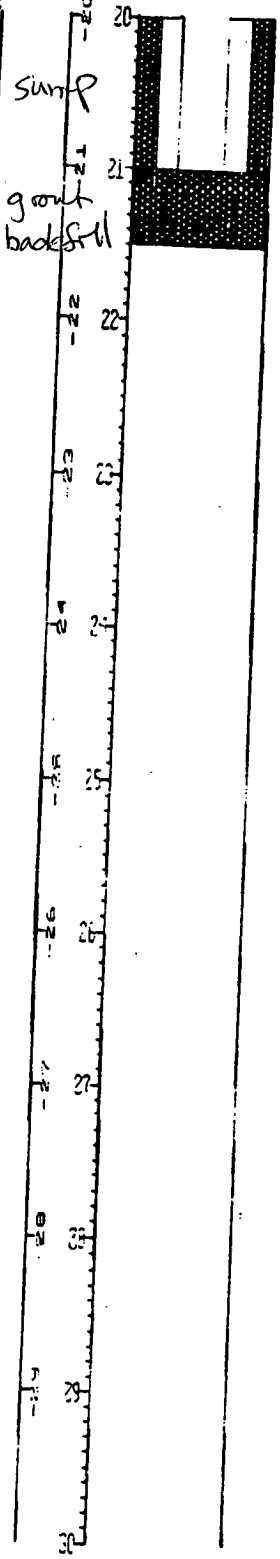
LOG OF BORING NUMBER:
CW001

CHEMICAL SAMPLE DEPTH
GRADATIONAL SAMPLE DEPTH
SAMPLE NUMBER
SAMPLE GRAIN SIZE
PERCENT RECOVERY
RECOVERY/INTERVAL
DATUM (FT)
DEPTH (FT)
WELL OR PIEZOMETER CONSTRUCTION
LITHOLOGY
UNIFIED SOILS CLASSIFICATION OR ROCK TYPE
DESCRIPTION



STATE PLANE COORDINATE	TOTAL DEPTH (FT) 21.50	GROUND ELEVATION (FT): 0.00	PROJECT NUMBER	OLI-RFI/PI	LOG OF BORING NUMBER
NORTH 748015	AREA: GUL	CASING DIAMETER (IN): 12.00	GEOLOGIST	M.S. BUDDY	CW001
EAST: 2084773	LOCATOR NUMBER: 17	BOREHOLE DIAMETER (IN): 36.00	DATE DRILLED:	03/19/92	
REMARKS: COLLECTION WELL					

CHEMICAL RAMPS, DEPTH GRADATIONAL SAMPLE DEPTH | SAMPLE NUMBER | SAMPLE GRAIN SIZE | PERCENT RECOVERY | RECOVERY/ INTERVAL | DATUM (FT) | DEPTH (FT) | WELL OR PIEZOMETER CONSTRUCTION | LITHOLOGY | UNIFIED SOILS CLASSIFICATION OR ROCK TYPE | DESCRIPTION



Total Depth Drilled: 21.50
Bottom of Filter Pack: 16.00
Total Depth Casing: 21.00
Top of Seal: 0.00

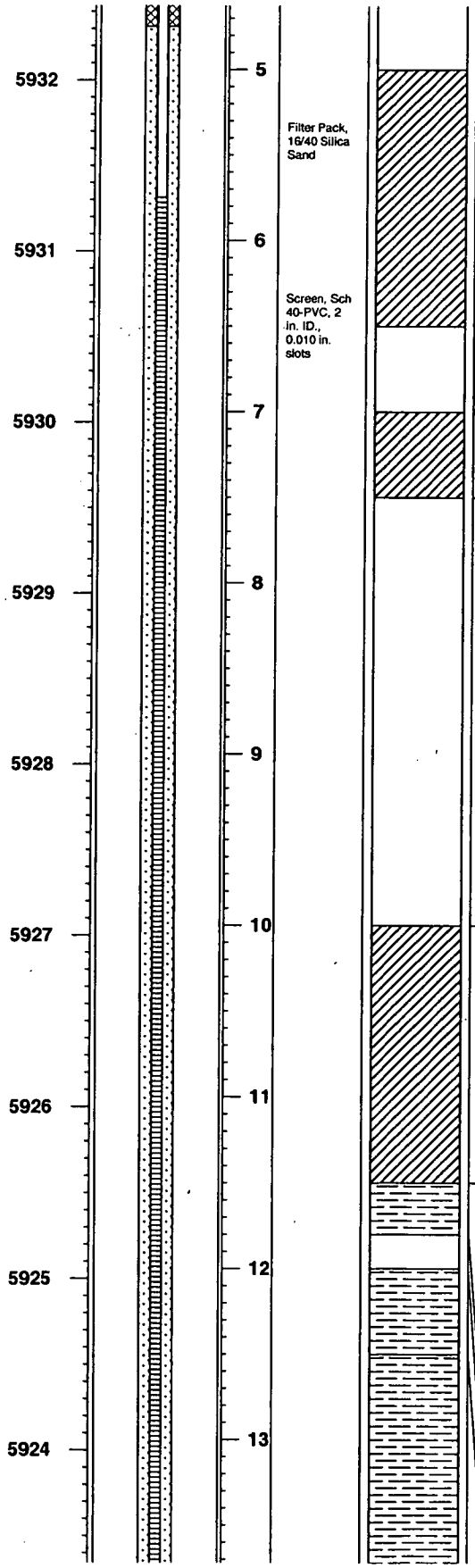
US DOE RFETS Rec Mgmt
8823463

STATE PLANE COORDINATES AREA:	GRND ELEV. (FT):5937.062	CASING DIA (IN): 2	LOG OF BORING NUMBER:
NORTH: 751284.969	TOTAL DEPTH (FT): 21.0	BH DIA. (IN): 8	20205
EAST: 2084050.378	COMPLETION DATE: 4/16/05	GRID LOCATOR:	
PROJECT:	GEOLOGIST: E. Warp		
REMARKS: replaces 20298			

Elev (Ft)	Depth (Ft)	Well or Piezometer Construction and Materials	Lithologic Description
5940	3	Protective Casing, 6 in. ID., Steel; Casing, Sch 40-PVC, 2 in. ID.	
5939	2		
5938	1	Concrete Seal; Concrete Pad	
5937	0		CL: Clay with trace sand and trace gravel, brown (7.5YR5/2) with gray (7.5YR6/1) and trace strong brown (7.5YR5/6) mottling. Medium to high plasticity, soft and very moist. Laminar, horizontal mottling. 1/2" subrounded clast of quartzite at 0.6'.
5936	1		No recovery.
5935	2	Bentonite Chips	CL: Clay with trace sand and trace gravel, same as from 0.0 to 1.2'. Mottled clay, medium to high plasticity, very moist. Laminar horizontal mottling.
5934	3		SC: Silty Sand with some gravel, brown (7.5YR5/3), ~80% sand (fine grained to coarse grained, subrounded to subangular), unconsolidated, well graded. 5 - 10% gravel (1/8" to 1/2" diameter, subangular) composed of granite and quartzite. 1" diameter subangular clast of quartzite at 2.5'. Wet at base of sand (3.0').
5933	4		GC/CL: Clay/Gravel mixture, strong brown (7.5YR4/6) to brown (7.5YR4/3). ~10 - 15% gravel (1/4" to 3/4" diameter, subrounded), composed of granite and quartzite. Clay has medium plasticity and is soft. Spotty iron oxidation, decreased gravel at base of interval from 3.6' to 3.9' to trace. Clay becomes mottled from 3.6' to 3.9'. Decreasing moisture from wet to very moist.

Elev (Ft)	Well or Piezometer Construction and Materials	Depth (Ft)	Lithology	Unified Soils Classification or Rock Type	Lithologic Description

LOG OF BORING NUMBER: 20205



No recovery.

CL: Clay with trace gravel and trace sand, olive brown (2.5Y4/3) with yellowish brown (10YR5/6) mottling. Weak iron oxidation horizontally mottled throughout. Clay is cohesive yet soft and very moist. 3/4" diameter shattered clast of granite at 6.1'.

No recovery.

CL: Clay with trace gravel and trace sand, same as from 5.0' to 6.5'. Soft and very moist. Extremely poor recovery.

No recovery.

CL: Clay with trace gravel and trace sand, same as from 7.0' to 7.5'. 1/2" gravel (possible ironstone fragment) at 11.4'

CLAYSTONE: TOP OF BEDROCK. Clay[stone], olive brown (2.5Y4/3). Bedrock contact very, very subtle. Very uniform clay - possible claystone. Trace gravel (1.0" diameter, subangular) composed of broken granite cobble at 10.2'. 3/4" ironstone fragment at 11.6'. Trace white caliche stringers from 11.0' to 11.8'. Interval very massive, dense, and cohesive yet very pliable, very moist.

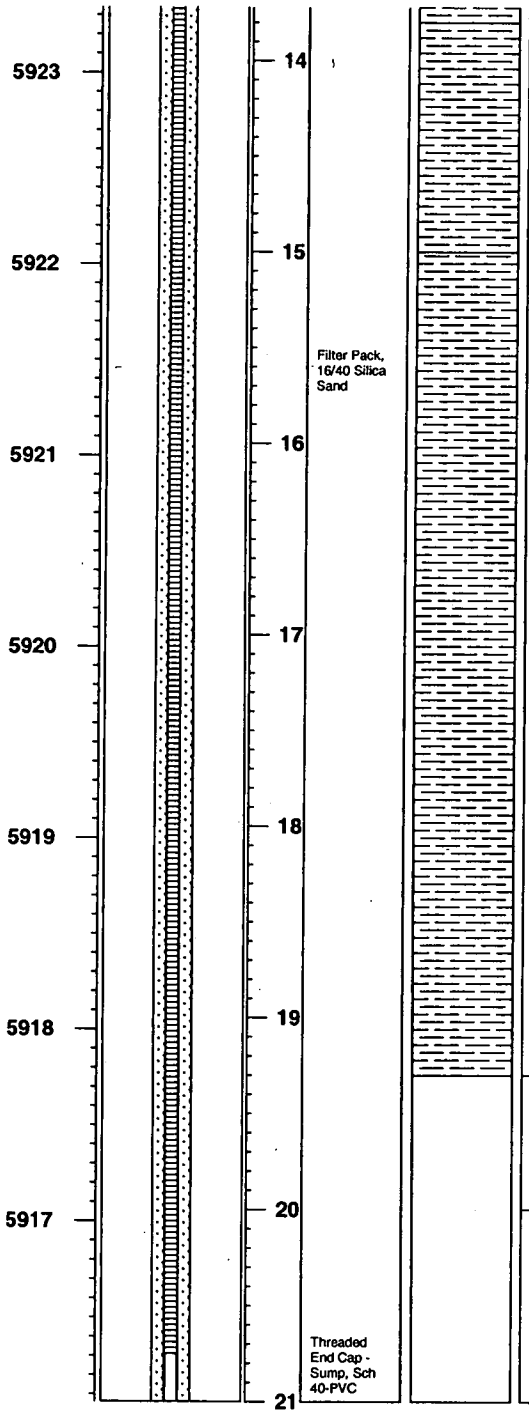
No recovery.

CLAYSTONE: Clay[stone], same as from 11.5' to 11.8', decreased moisture to moist.

CLAYSTONE: Claystone, grayish brown (10YR5/2) with yellowish brown (10YR5/6) mottling. Very slightly silty, caliche-filled white

Elev (Ft)	Well or Piezometer Construction and Materials	Depth (Ft)	Lithology	Unified Soils Classification or Rock Type	Lithologic Description

LOG OF BORING NUMBER: 20205



minor horizontal fracture at 13.0'. Interval is firm and dense, moist. Trace caliche stringers along internal bedding, massive textured, occasional carbonaceous flecks.

CLAYSTONE: Claystone, yellowish brown (10YR5/6) with lesser brown (10YR5/3) mottling. Increasing iron oxidation to moderate. Firm and dense interval, moist.

CLAYSTONE: Claystone, grayish brown (10YR5/2), predominately un-weathered claystone bedrock. Weak pervasive iron oxidation from 18.0' to 19.3'. Interval dense but friable, decreasing moisture to very slightly moist.

No recovery.

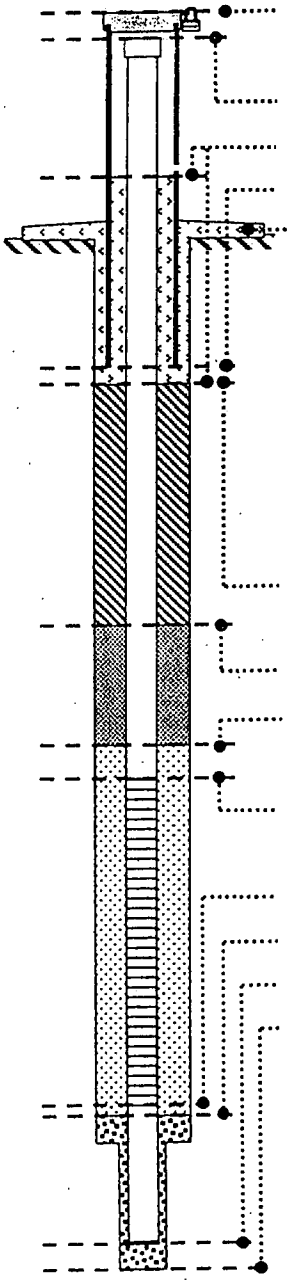
Reamed borehole with augers, not sampled or cored from 20.0' to 21.0'.

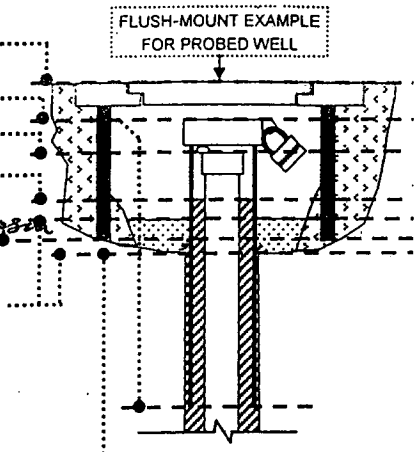
MONITORING WELL INSTALLATION REPORT: Form PRO.118

LOCATION CODE: 20205 PROJECT NAME: CY05 WELL REPLACEMENTS PROGRAM: WATER PROGRAMS-WARP
SCREENED FORMATION: Al/Bdrk DRILLING CONTRACTOR: HIGH PLAINS BORING METHOD: Hollow Stem Auger
DATE DRILLED: 4/16/05 DATE COMPLETED: 4/16/05 TOTAL DEPTH: 21.0' COMPLETED DEPTH: 21.0'
ESTIMATED DEPTH TO BEDROCK: 11.5 RIG GEOLOGIST: E. WARP LOGGING GEOLOGIST: E. WARP
BOREHOLE DIAMETER IN SCREENED INTERVAL: 8" QUANTITY OF FLUIDS LOST DURING DRILLING: N/A
INITIAL WATER LEVEL (FT, DATE): Dry on 4/16/05 COMPLETED WATER LEVEL (FT, DATE):
DIAMETER & TYPE OF INSTALLATION (WELL/PIEZOMETER/WELL POINT/ETC.): 2.0" I.D. SCH. 80 PVC WELL
TYPE OF PROTECTION (FLUSH-MOUNT VS. ABOVE GROUND, ASEPTIC, ETC.): STEEL PROTECTIVE CASING-STICK-UP

ALL MEASUREMENTS WILL BE MADE IN FEET FROM GROUND SURFACE

* DENOTES ITEMS THAT MAY NOT BE APPLICABLE, DEPENDING ON BORING METHOD, WELL PROTECTION & PURPOSE





PROTECTIVE CASING TOP (STICKUP OR FLUSH-MOUNT): 3.1'
*SECONDARY CASING TOP: N/A BOTTOM: ____ TYPE: ____
SURFACE CASING TOP: 2.5' ags ID (IN): 2.0"
SURFACE SEAL TOP: 0.9' ags BOTTOM: 0.0 TYPE: CONCRETE
PROTECTIVE CASING BOTTOM, ID (IN), TYPE: 1.8' bgs, 6" steel protective casing
*WELL PAD DIMENSIONS, TYPE: 3'x3' - CONCRETE PAD fm. 0.0 to 0.5' ags.
*ADD'L CASING FILL TOP: N/A BOTTOM: ____ TYPE: ____
*SURFACE ISOLATION CASING TOP: N/A BOTTOM: ____
*SURFACE ISOLATION CASING ID (IN): N/A TYPE: ____
*OTHER (E.G., ASEPTIC) CASING TOP: N/A BOTTOM: ____
*OTHER CASING ID (IN): N/A TYPE, PURPOSE: ____
*CENTRALIZER(S) OD (IN): N/A NUMBER USED: ____ TYPE: ____
*CENTRALIZER(S) DEPTH(S): N/A
*GROUT TOP: N/A MEASURED DENSITY (LBS/GAL): ____ TYPE: ____
*GRANULAR BENTONITE TOP: N/A TYPE: N/A
*BENTONITE SEAL TOP: 0.0' TYPE: MED. BENTONITE CHIPS
BENTONITE SEAL OR GRANULAR BENTONITE BOTTOM (= FILTER PACK TOP): 4.75'
FILTER PACK TYPE: 16/40 SILICA SAND BRAND: CSSI
SURFACE CASING BOTTOM (=SCREEN TOP): 5.75 TYPE: SCH. ~~80~~ 40 ESW 5/2/05 PVC
SCREEN ID (IN): ~~0.01'~~ 2.0" ESW SLOT SIZE (IN): 0.01' TYPE: SCH. ~~80~~ 40 ESW 5/2/05 PVC
SCREEN BOTTOM (= SUMP, TOP): 20.75' SUMP TYPE: THREADED END CAP - PVC
FILTER PACK BOTTOM (= *BACKFILL TOP): 21.0' *BACKFILL TYPE: N/A
SUMP BOTTOM (= WELL COMPLETED DEPTH): 21.0' *PILOT HOLE TOP, DIAMETER: N/A
TOTAL BOREHOLE DEPTH (= *PILOT HOLE AND *BACKFILL BOTTOM): 21.0'

REMARKS: NORMAL WELL INSTALLATION. BOREHOLE LOGGED TO 20.0'. REAMED OUT W/AUGERS TO 21.0' TO ADJUST WELL CONSTRUCTION.

COMPLETED BY: ELLEN S. WARP Ellen S Warp DATE: 4/16/05
CHECKED BY: [signature] DATE: 6/29/05

U.S. DEPARTMENT OF ENERGY ROCKY FLATS PLANT

FORM PRO.101A

ROCKY FLATS ENVIRONMENTAL TECHNOLOGY SITE BOREHOLE LOG

PAGE 1 OF 2

Borehole Number: 20205
Location - North: _____ East: _____
Date: 4/16/05
Geologist: E. WARD
Drilling Equip. Hollow Stem Auger - CME-75-HT

Surface Elevation: _____
Area: Replacement of Well # 20298
Total Depth: 21.0'
Company URS/HIGH PLAINS Project No. HAD 51300
Sample Type: _____

RMRS LOGGING SUPERVISOR APPROVAL [signature] DATE 4/19/05

TOP/BOTTOM OF CORE IN BOX	TOP/BOTTOM OF INTERVAL	FEET OF CORE IN INTERVAL (FIELD MEASUREMENT)	SAMPLE NUMBER	FRACTURE ANGLE	BEDDING ANGLE	GRAIN SIZE DISTRIBUTION	USCS SYMBOL	DEPTH IN FEET	SOIL/LITHOLOGIC LOG	SAMPLE DESCRIPTION
	Run #1	Rec. = 1.2'					CL	0.0'		0.0→1.2' - CLAY w/ Tr sand and Tr gravel. Brn. (7.5YR 5/2) w/ Gry (7.5YR 6/1) and Tr Strong Brn (7.5YR 5/6) mottling. Med to high plasticity, SOFT + V. Moist. Laminar, horizontal mottling. 1/2" sub-rounded clast of qtzite @ 0.6'.
	2.0'	3.0'						1.2'		1.2'-2.0' = No Recovery
	Run #2	Rec. = 1.9'					CL	2		2.0'-~~2.5~~ 2.3'. CLAY w/ Tr sand & Tr gravel (same as above fm. 0.0→1.2'). Mottled clay. Med to high plasticity. Laminar horizontal mottling. 1" dia., sub-ang. clast of qtzite @ 2.5'. V. MOIST.
							SC	2.3 ~~2.5~~ 4/19/05		
							CL GC	3 4/19/05		2.3' ~~2.6'~~ 4/19/05 - 3.1' - Silty SAND w/ some gravel Brn (7.5YR 5/3). Sand (~80% sand (f.g. to c.g., sub-rounded to sub-ang.) Unconsolidated, well graded. 5-10% gravel (1/8 to 1/2" dia., sub-ang) composed of granite and qtzite. WET @ base of sand (3.0').
	5.0'	5.0'						3.9 4		
	Run #3	Rec. = 1.5'					CL	5		3.1' ~~3.0'~~ 3.9' - CLAY / GRAVEL MIXTURE. Strong Brn. ~~FSW~~ (7.5YR 4/6) to Brn (7.5YR 4/3) ~10% gravel (1/4-3/4" dia., sub-rounded) composed of granite and qtzite. Clay has med plasticity and soft. Spotty FeOx'n. Decr. gravel @ base of interval fm. 3.6 to 3.9' to Tr. Clay becomes mottled fm. 3.6'-3.9'. Decr. moisture fm. WET to V. MOIST.
	7.0'	7.0'						6 6.5		
	Run #4	Rec. = 0.5'					CL	7 7.5'		3.9-5.0 = No Recovery
								8		5.0'-6.5' - CLAY w/ Tr gravel and Tr sand. Olive Brn (2.5Y 4/3) w/ yellish Brn (10YR 5/6) mottling. Wk. FeOx'n horizontally mottled throughout. Clay is cohesive yet soft and V. Moist. 3/4" dia. shattered clast of granite @ 6.1'.
								9		6.5-7.0' = No Recovery
	10.0'	10.0'						10.0		7.0-7.5 - CLAY w/ Tr gravel and Tr sand. Same as fm. 5.0' to 6.5'. Soft and V. Moist. EXTREMELY POOR RECOVERY.

NOTES: General: USCS is modified for this log as follows:
Materials amounts are estimated by % volume instead of % weight.
(1) Badly broken core, accurate footage measurements not possible.
(2) Core breaks cannot be matched, accurate footage measurements not possible.

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7.5-10.0' = No Recovery

(4011-930-0134-930)(Form GT.1A)(03/01/92)

ROCKY FLATS ENVIRONMENTAL TECHNOLOGY SITE BOREHOLE LOG

Borehole Number: 20205
Location - North: _____ East: _____
Date: 4/16/05
Geologist: E. WARP
Drilling Equip.: Hollow Stem Auger - CME-75-HT

Surface Elevation: _____
Area: REPLACEMENT OF WELL # 20298
Total Depth: 21.0'
Company: URS/HIGH PLAINS Project No. 11AD51300
Sample Type: _____

RMRS LOGGING SUPERVISOR APPROVAL [signature] DATE 4/19/05

TOP/BOTTOM OF CORE IN BOX	TOP/BOTTOM OF INTERVAL	FEET OF CORE IN INTERVAL (FIELD MEASUREMENT)	SAMPLE NUMBER	FRACTURE ANGLE	BEDDING ANGLE	GRAIN SIZE DISTRIBUTION	USCS SYMBOL	DEPTH IN FEET	SOIL/LITHOLOGIC LOG	SAMPLE DESCRIPTION
Box #1 of 2	10.0	10.0						10.0		10.0-11.5' - Same as above, 7.0-7.5
	Run #5	Rec. = 1.8'			Use CL symbol		CL	11		11.5 (4/19/05) V. Very subtle Bedrock Contact @ 10.0 (?) ESTIMATED DUE TO NO RECOVERY.
	12.0'	12.0'						11.5		11.8 - CLAY [stone?] - Olive Brn (2.5Y 4/3) V. Uniform clay - possible claystone(?). Tr gravel (1.0" dia, sub-ang) composed of broken granite cobble @ 10.2', 3 1/2" gravel (poss. Festone frag?) @ 11.4', ~~Incr.~~ and 3/4" Fe-stone frag @ 11.6'. Tr wht. caliche stringers fm. 11.0 to 11.8'. Interval v. massive, dense but and cohesive yet v. pliable, V. MOIST.
								12		11.8-12.0' - No Recovery
								12.5		12.0-12.5 - CLAY [stone] - Same as above fm. 10.0-11.8. Decr. Moisture to Moist.
13.8	Run #6	Rec. = 2.6'						13		12.5-13.8 - CLAYSTONE - Gry'sh Brn (10YR 5/2) w/ yell'sh Brn (10YR 5/6) mottling. V. slightly silty, caliche filled (4/19/05) ~~Bleached~~ wht. minor horizontal fracture @ 13.0'. Interval is firm and dense. Tr caliche stringers along internal bedding. Massive textured. Moist. Occasional carbonaceous flecks
								14		
								14.6'		
								15		
Box #2 of 2	Run #7	Rec. 1.9'						16		13.8'-15.0' - CLAYSTONE - yellowish Brn (10YR 5/6) w/ lesser Brn (10YR 5/3) mottling. Incr. FeOx'n to moderate. Firm and dense interval. Moist.
								16.9'		
								17		15.0-19.3' ~~20.0~~ CLAYSTONE - Gry'sh Brn (10YR 5/2). Predominately un-weathered claystone bedrock. Wk. perv. FeOx'n fm. 18.0-19.3'. Interval dense but friable. Decr. moisture to V. Sl. moist.
	Run #8	Rec. = 2.3'						18		
								19		19.3 → 20.0 = No Recovery
								19.3'		
	20.0'									

4/19/05 10.0' BEDROCK CONTACT @ 11.5'

NOTES: General: USCS is modified for this log as follows:
Materials amounts are estimated by % volume instead of % weight.
(1) Badly broken core, accurate footage measurements not possible.
(2) Core breaks cannot be matched, accurate footage measurements not possible.

Procedure No. RMRS/OPS-PRO.101
Revision 0
Date effective: 12/31/98

(4011-930-0134-930)(Form GT:1A)(03/01/92)

Ream-out borehole (not sampled or cored) fm. 20.0 to 21.0' - T.D. @ 21.0'

STATE PLANE COORDINATES AREA:
NORTH: 751287.886
EAST: 2083761.808
PROJECT:
REMARKS:
replaces 20598

GRND ELEV. (FT):5939.474
TOTAL DEPTH (FT): 26.0
COMPLETION DATE: 4/15/05
GEOLOGIST: E. Warp

CASING DIA (IN): 2
BH DIA. (IN): 8
GRID LOCATOR:

LOG OF BORING NUMBER: 20505

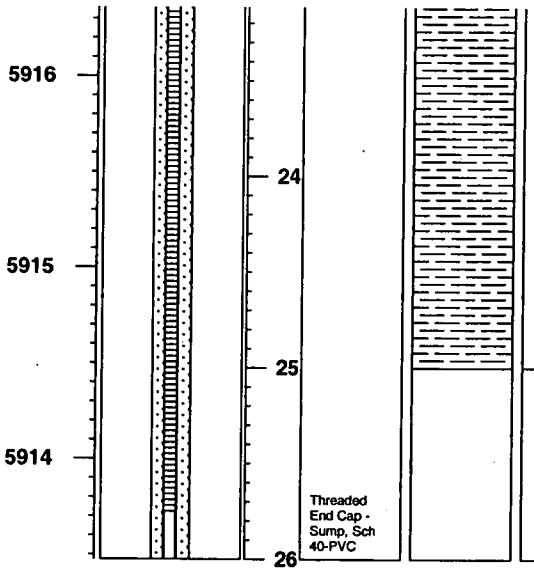
Elev (Ft)	Well or Piezometer Construction and Materials	Depth (Ft)	Lithology	Unified Soils Classification or Rock Type	Lithologic Description
5942	Protective Casing, 6 in. ID., Steel; Casing, Sch 40-PVC, 2 in. ID.; Concrete Seal	3			
5941		2			
5940	Concrete Pad	1			
5939		0		SC	SC: Gravelly Sand with some clay, brown (7.5YR5/2). Fill material with trace roots, ~25% gravel (1/8" - 3/4" diameter, subangular), moist.
5938		1		GC	GC: Clayey Gravel, dark grayish brown (2.5Y4/2) clay, ~65% gravel (1/4" to 1-1/2" diameter, subangular to subrounded) composed of granite, quartzite and asphalt. Low plasticity, moist.
5937	Bentonite Chips	2		CL	CL: Clay with abundant gravel, dark gray (5Y4/1) to dark olive gray (5Y3/2). Distinct color change. ~35% gravel (1/8" - 1/2" diameter, subangular), composed of amphibolite or basalt with lesser quartzite. Low plasticity, moist.
5936		3		GC/CL	GC/CL: Gravel/Clay mixture with some sand, brown (7.5YR4/3). ~25% gravel (1/8" - 1/2" diameter, subangular), granitic composition, ~15% sand (coarse grained, subangular). Weak, patchy iron oxidation throughout, moist.
5935		4			No recovery.
				GW	GW: Gravel, gray (7.5YR5/1). Shattered quartzite cobble (1" - 2" diameter, subangular). Moist.
				GC/CL	GC/CL: Gravel/Sandy Clay mixture, dark yellowish brown (10YR4/6) to dark grayish brown (10YR4/2). ~35% gravel (1/4" - 1" diameter, subangular, granite and quartzite). Sandy clay from 2.3' to 2.5' with weak to moderate pervasive iron oxidation. Dark grayish brown from 2.5' to 3.3'; gravel/clay mixture, moist. Caliche grains common throughout.
				CL	CL: Silty Clay with trace sand and trace gravel, olive gray (5Y5/2) with yellowish brown (10YR5/6) mottling. Clast of silty claystone.

Elev (Ft)	Well or Piezometer Construction and Materials	Depth (Ft)	Lithology	Unified Soils Classification or Rock Type	Lithologic Description
		5			Moist.
	Filter Pack, 16/40 Silica Sand				No recovery.
5934					CL: Silty Clay with sand and gravel. Silty clay as above with 20% gravel from 5.0' to 5.4'. Gravel is 1" - 2" diameter, subangular quartzite clasts. Decrease gravel and increase sand at base of interval from 6.0' to 6.5'. Sand is coarse grained, subangular, with caliche fragments common. Interval crumbly, moist.
	Screen, Sch 40-PVC, 2 in. ID., 0.010 in. slots	6			
5933					No recovery.
		7			GC/CL: Silty Clay/Gravel mixture. Silty clay is olive gray (5Y5/2) grading to dark brown (7.5YR3/3) at base of interval. ~60% silty clay and ~40% gravel (1/2" to 1-1/2" diameter, subangular, granite and quartzite), moist.
5932					
		8			CL: Silty Clay, very pale brown (10YR7/3) with some dark yellowish brown (10YR4/6) mottling, very moist.
5931					CL: Silty Clay, very dark brown (7.5YR2.5/2) to black (7.5YR2.5/1). Roots common, distinct color change, organic-rich (possible pond sediment). 5-8% gravel (1/4" - 1/2" diameter, subrounded), increased moisture to wet.
		9			No recovery.
5930					
		10			CL: Silty Clay with trace gravel, same as interval from 7.8' to 8.2'. Shattered quartzite cobble at base of interval between 10.7' to 10.8'. Very poor recovery, probably pushing a cobble, which makes sample "ribboned". Very plastic, roots common, wet.
5929					
		11			No recovery.
5928					
		12			GC/CL: Gravel/Clay mixture, very dark brown (7.5YR2.5/2) clay, 40 - 50% gravel (1/4" - 1/2" diameter, subangular) composed of granite and quartzite. Clay has medium plasticity. Decreased moisture to very moist. Caliche grains common.
5927					
		13			SM: Silty Sand with some gravel, strong brown (7.5YR5/6). Sand is fine grained and subrounded, very uniform, poorly graded. Pervasive iron oxidation of silty sand. Very moist, but not saturated or flowing. Trace caliche. 1-1/2" diameter broken quartzite cobble at 12.5'.
5926					
		14			GC/CL: Clay/Gravel mixture, brown (7.5YR4/3) clay. ~50 - 55%

Elev (Ft)	Well or Piezometer Construction and Materials	Depth (Ft)	Lithology	Unified Soils Classification or Rock Type	Lithologic Description
					gravel (1/2" to 1-1/2" diameter, subangular), composed of broken
5925					CL: Clay, yellowish brown (10YR5/6) with grayish brown (10YR5/2) mottling. Re-worked claystone. Sandy-silty lense with pervasive iron oxidation from 13.6' to 13.7'. Iron oxidation decreases to trace at base of interval, moist.
		15			No recovery.
5924					CL: Clay with some gravel and some sand, grayish brown (10YR5/2). 5 - 8% gravel (1/4" - 1" diameter, subrounded). Caliche disseminated throughout. 1-1/2" diameter (subangular) broken quartzite cobbles at 15.4' and 16.1'. Trace iron oxidation of clay. Massive texture of clay. Interval cohesive except in zones of shattered cobbles, moist.
		16			
5923					CLAYSTONE: TOP OF BEDROCK. Claystone with trace to some silt, grayish brown (10YR5/2). Subtle contact, massive textured. Trace iron oxidation at base, trace caliche blebs, moist.
		17			No recovery.
5922					CLAYSTONE: Claystone, gray (10YR5/1) with abundant pale brown (10YR8/2) caliche, moist.
		18			CLAYSTONE: Silty Claystone, grayish brown (10YR5/2), massive textured claystone. Weak pervasive iron oxidation. Trace white blebs and stringers from 17.2' to 17.6'. Interval cohesive and firm, decreased moisture to slightly moist.
5921					
		19			
5920					
		20			CLAYSTONE: Claystone to Silty Claystone, grayish brown (10YR5/2) with patchy yellowish brown mottling. Weak patchy iron oxidation throughout. Massive textured. Interval dense, firm, weakly friable. Decrease overall moisture to very slightly moist. Decreased silt below 22.0'.
5919					
		21			
5918					
		22			
5917					
		23			

Elev (Ft)	Well or Piezometer Construction and Materials	Depth (Ft)	Lithology	Unified Soils Classification or Rock Type	Lithologic Description

LOG OF BORING NUMBER: 20505



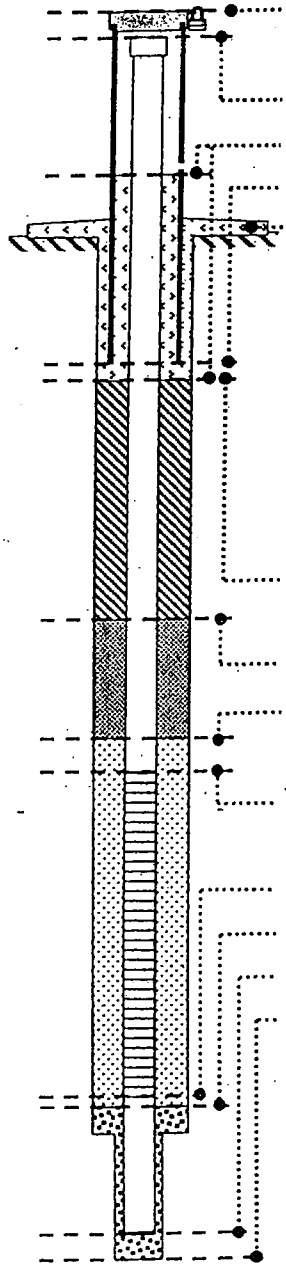
Augers advanced to 26.0' to adjust well construction, but no sample collected.

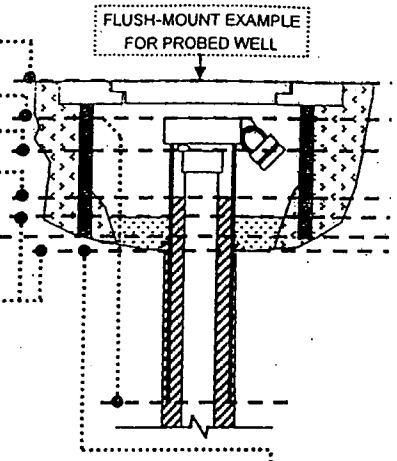
MONITORING WELL INSTALLATION REPORT: Form PRO.118

LOCATION CODE: 20505 PROJECT NAME: FY05 Well Replacement PROGRAM: Water Programs-WARP
SCREENED FORMATION: Al/Bdrk. DRILLING CONTRACTOR: High Plains BORING METHOD: Hollow Stem Auger w/split spoon.
DATE DRILLED: 4/15/05 DATE COMPLETED: 4/15/05 TOTAL DEPTH: 26.0' COMPLETED DEPTH: 26.0'
ESTIMATED DEPTH TO BEDROCK: 16.1 RIG GEOLOGIST: E. Warp LOGGING GEOLOGIST: E. Warp
BOREHOLE DIAMETER IN SCREENED INTERVAL: 8.0" QUANTITY OF FLUIDS LOST DURING DRILLING: N/A
INITIAL WATER LEVEL (FT, DATE): Dry on 4/15/05 COMPLETED WATER LEVEL (FT, DATE):
DIAMETER & TYPE OF INSTALLATION (WELL/PIEZOMETER/WELL POINT/ETC.): 2.0" I.D.-PVC
TYPE OF PROTECTION (FLUSH-MOUNT VS. ABOVE GROUND, ASEPTIC, ETC.): Above ground Steel Protective Casing.

ALL MEASUREMENTS WILL BE MADE IN FEET FROM GROUND SURFACE

* DENOTES ITEMS THAT MAY NOT BE APPLICABLE, DEPENDING ON BORING METHOD, WELL PROTECTION & PURPOSE





PROTECTIVE CASING TOP (STICKUP OR FLUSH-MOUNT): 2.8' ags
*SECONDARY CASING TOP: N/A BOTTOM: N/A TYPE: N/A
SURFACE CASING TOP: 2.2 ID (IN): 2.0"
SURFACE SEAL TOP: 1.8' ags BOTTOM: 0.2' bgs TYPE: Concrete
PROTECTIVE CASING BOTTOM, ID (IN), TYPE: 2.0' bgs, 6" I.D. Steel
*WELL PAD DIMENSIONS, TYPE: 3'x3'-Concrete 8in 0.2' bgs to 0.3' ags
*ADD'L CASING FILL TOP: N/A BOTTOM: N/A TYPE: N/A
*SURFACE ISOLATION CASING TOP: N/A BOTTOM: N/A
*SURFACE ISOLATION CASING ID (IN): N/A TYPE: N/A
*OTHER (E.G., ASEPTIC) CASING TOP: N/A BOTTOM: N/A
*OTHER CASING ID (IN): N/A TYPE, PURPOSE: N/A
*CENTRALIZER(S) OD (IN): N/A NUMBER USED: N/A TYPE: N/A
*CENTRALIZER(S) DEPTH(S): N/A
*GROUT TOP: N/A MEASURED DENSITY (LBS/GAL): N/A TYPE: N/A
*GRANULAR BENTONITE TOP: N/A TYPE:
*BENTONITE SEAL TOP: 0.2' bgs. TYPE: Med Bentonite Chips- Pure Gold Brand hydrated w/5 gall. of Distilled H_2O
BENTONITE SEAL OR GRANULAR BENTONITE BOTTOM (= FILTER PACK TOP): 5.0'
FILTER PACK TYPE: 16/40 Silica Sand BRAND: C.S.S.I.
SURFACE CASING BOTTOM (=SCREEN TOP): 5.75 TYPE: Sch. ~~80~~ 40 PVC
SCREEN ID (IN): 2.0" SLOT SIZE (IN): 0.01" TYPE: Sch. ~~80~~ 40 PVC
SCREEN BOTTOM (= SUMP, TOP): 25.75 SUMP TYPE: Threaded End cap- Sch 80 PVC
FILTER PACK BOTTOM (= *BACKFILL TOP): 26.0' *BACKFILL TYPE: N/A
SUMP BOTTOM (= WELL COMPLETED DEPTH): 26.0 *PILOT HOLE TOP, DIAMETER: N/A
TOTAL BOREHOLE DEPTH (= *PILOT HOLE AND *BACKFILL BOTTOM): 26.0'

REMARKS: Routine well installation

COMPLETED BY: Ellen S. Warp DATE: 4/20/05
CHECKED BY: [signature] DATE: 4/22/05

U.S. DEPARTMENT OF ENERGY, ROCKY FLATS PLANT

FORM PRO.101A

ROCKY FLATS ENVIRONMENTAL TECHNOLOGY SITE BOREHOLE LOG

PAGE 1 OF 3

Borehole Number: 20505
Location - North: _____ East: _____
Date: 4/15/05
Geologist: E. WARD
Drilling Equip.: Hollow Stem Auger - CME-75-HT

Surface Elevation: _____
Area: REPLACEMENT OF WELL 20598
Total Depth: 26.0'
Company: URS/HIGH PLAINS Project No. HAD51300
Sample Type: _____

RMRS LOGGING SUPERVISOR APPROVAL [signature]

DATE 4/22/05

TOP/BOTTOM OF CORE IN BOX	TOP/BOTTOM OF INTERVAL	FEET OF CORE IN INTERVAL (FIELD MEASUREMENT)	SAMPLE NUMBER	FRACTURE ANGLE	BEDDING ANGLE	GRAIN SIZE DISTRIBUTION	USCS SYMBOL	DEPTH IN FEET	SOIL/LITHOLOGIC LOG	SAMPLE DESCRIPTION
	Run #1 2.0'	Rec.=1.8 2.0'					SC	0.3'		0.0-0.3' - Gravelly SAND w/some clay. Brn. (7.5YR 5/2) FILL MATERIAL w/ TR roots. ~25% gravel (1/8-3/4" dia., sub-ang.). MOIST.
							GC	1 1.2'		0.3-1.2' - Clayey GRAVEL. Dk. Gry'sh Brn. (2.5Y 4/2) clay. ~65% gravel (1/4-1 1/2" dia., sub-ang. to sub-rounded) composed of granite, qtzite and asphalt. Low plasticity. MOIST.
							CL	1.3'		1.2-1.3' - CLAY w/abundant gravel. Dk. Gry (5Y 4/1) to Dk. Olive gry. (5Y 3/2). Distinct color change. ~35% gravel (1/8-1/2" dia., sub-ang.) composed of amphibolite or basalt w/lesser qtzite. Low plasticity. MOIST.
							GC CL	1.8'		
							GW	2 2.3		1.3-1.8 - GRAVEL/CLAY MIXTURE. Brn. (7.5YR 4/3). ~25% gravel w/some sand. (1/8-1/2" dia., sub-ang.), granitic composition. ~15% sand (c.g., sub-ang.). Wk. patchy FeOx'n throughout. MOIST.
	Run #2 5.0	Rec.=1.6' 5.0'					GC CL	3 3.3		1.8-2.0' = No Recovery
							CL	3.6'		2.0-2.3' - GRAVEL: Gry (7.5YR 5/1). Shattered cobble of qtzite (1-2" dia., sub-ang). MOIST.
								4		2.3-3.3' - GRAVEL/Sandy CLAY MIXTURE. Dk. Yell'sh brn. (10YR 4/6) to Dk. Gry'sh Brn. (10YR 4/2). ~35% gravel (1/4-1" dia., sub-ang. granite and qtzite). Sandy clay fm. 2.3 to 2.5' with Wk/Mod. perv. FeOxn. ~~Predominantly~~ Dk. Gry'sh brn. fm. 2.5-3.3 gravel/clay mixture. MOIST. Caliche grains common throughout.
								5		
	Run #3 7.0'	Rec.=1.5' 7.0'					CL	6 6.5'		3.3-3.6' - Silty CLAY w/ TR sand and TR gravel. Olive Gry (5Y 5/2) with Yell'sh Brn. (10YR 5/6) mottling. Clast of silty claystone. MOIST.
										3.6-5.0' = No Recovery
								7		5.0-6.5' - Silty CLAY w/sand and gravel. Silty clay as above w/20% gravel fm. 5.0-5.4'. Gravel is 1-2" dia., sub-ang. clasts of qtzite. Decrease gravel and increase sand at base of interval fm. 6.0-6.5'. Sand is c.g., sub-ang. with ~~bleached~~ fragments common. Interval crumbly. MOIST.
							CL GC	7.5		
						STET	CL	7.8'		
	Run #4 10.0'	Rec.=1.2' 10.0'					CL	8 8.2'		6.5-7.0' = No Recovery
								STET 9		7.0-~~7.8~~ 7.5 - Silty CLAY/GRAVEL MIXTURE. Silty clay is olive gry (5Y 5/2) grading to Dk. Brn (7.5YR 3/3) @ base of interval. ~60% silty clay and ~40% gravel (1/2-1 1/2" dia., sub-ang. granite and qtzite). MOIST.
								10.0		(7.8) ~~7.8~~ 8.2 - Silty CLAY. V. Dk. Brn. (7.5YR 2.5/2) to Black (7.5YR 2.5/1). Roots common. Distinct color change. organic-rich (possible pond sediment). 5-8% gravel (1/4-1/2" dia., sub-rounded). Incr. moisture to WET.

NOTES: General: USCS is modified for this log as follows:
Materials amounts are estimated by % volume instead of % weight.
(1) Badly broken core, accurate footage measurements not possible.
(2) Core breaks cannot be matched, accurate footage measurements not possible.

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7.5-7.8' - Silty clay - Pale Brn (10YR 7/3) w/some Dk Yellsh Brn (10YR 4/6) mottling. V. Moist.

8.2 - 10.0 No recovery.

(4011-930-0134-930)(Form GT.1A)(03/01/92)

ROCKY FLATS ENVIRONMENTAL TECHNOLOGY SITE BOREHOLE LOG

Borehole Number: 20505
Location - North: East:
Date: 4/15/05
Geologist: E. Wapp
Drilling Equip.: Hollow Stem Auger - ~~CME 75~~ CME-75-HT

Surface Elevation:
Area: Replacement of 20588
Total Depth: 26.0'
Company: URS/HEW Plains Project No.: HAD51300
Sample Type:

RMRS LOGGING SUPERVISOR APPROVAL: [signature] DATE: 4/22/05

TOP/BOTTOM OF CORE IN BOX	TOP/BOTTOM OF INTERVAL	FEET OF CORE IN INTERVAL (FIELD MEASUREMENT)	SAMPLE NUMBER	FRACTURE ANGLE	BEDDING ANGLE	GRAIN SIZE DISTRIBUTION	USCS SYMBOL	DEPTH IN FEET	SOIL/LITHOLOGIC LOG	SAMPLE DESCRIPTION
	Run #5	Rec. = 1.8'					CL	10.8, 11		10.0-10.8 - Silty CLAY w/ Tr gravel. Same as fm. 7.8 to 8.2'. Shattered gneiss cobble at base of interval between 10.7 to 10.8'. V. poor recovery, probably pushing a cobble which makes sample "ribboned". V. plastic, roots common. WET
										10.8-12.0' = No Recovery
	12.0'	12.0'					CL/GC	12, 12.5'		12.0-12.5 - GRAVEL/CLAY MIXTURE. V. Dk. Brn. (7.5YR 2.5/2) clay, 40-50% gravel (¼-½" dia, sub-ang.) composed of granite and gneiss. Clay has med. plasticity. Decr. moisture to V. moist. Caliche grains common. 4/27/05
	Run #6	Rec. = 2.0'					SM	12.8'		12.5-12.8' - Silty SAND w/ some gravel. Strong Brn. (7.5YR 5/6). Sand is f.g. and sub-rounded. V. uniform, poorly graded. Perv. FeOxn of silty sand. 1½" dia. broken cobble of gneiss @ 12.5'. V. moist but not saturated or flowing. Tr caliche. 4/27/05
							CL/GC	13, 13.3		12.8-13.3' - CLAY/GRAVEL MIXTURE. Brn. (7.5YR 4/3) clay. ~50-55% gravel (½-1½" dia, sub-ang.). Gravel composed of broken cobbles of gneiss and schist. V. MOIST. Tr caliche. 4/27/05
	15.0'	15.0'					CL	14, 15		13.3-14.0' - CLAY. Yellsh Brn (10YR 5/6) w/ Gry'sh Brn. (10YR 5/2) mottling. Reworked claystone. Sandy-silty lense w/ perv. FeOxn fm. 13.6-13.7'. FeOxn decreases to Tr at base of interval. MOIST.
	Run #7	Rec. = 1.7'		Bedrock contact @ 16.1'				16, 16.1'		
								16.7'		14.0-15.0' = No Recovery
	17.0'	17.0'		Bedrock Contact @ 17.2'				17, 17.2'		15.0-16.7' - CLAY w/ some gravel and some sand. Gry'sh Brn (10YR 5/2). 5-8% gravel (¼ to 1" dia sub-rounded). Caliche disseminated throughout. 1½" dia. (sub-ang.) broken cobbles of gneiss @ 15.4' and 16.1'. Tr FeOxn of clay. Massive texture of clay. Interval cohesive except in zones of shattered cobbles. MOIST.
	Run #8	Rec. = 3.0'						18, 19		16.7-17.0 = No Recovery
										17.0-17.2 - Clay zone Gry (10YR 5/1) w/ abundant pale brn (10YR 8/2) ~~bleaching~~ ~~Possible altered zone~~ ~~bedrock - insitu?~~ (caliche?) MOIST.

NOTES: General: USCS is modified for this log as follows:
Materials amounts are estimated by % volume instead of % weight.
(1) Badly broken core, accurate footage measurements not possible
(2) Core breaks cannot be matched, accurate footage measurements not possible.

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16.1-16.7 - CLAY/STONE - Gry'sh Brn (10YR 5/2). Subtle contact, massive textured. Tr FeOx @ base. Tr caliche blebs, MOIST. 4/27/05

Bedrock Contact @ ~~17.2~~ 16.1

17.2-20.0 Silty CLAYSTONE (BEDROCK). Gry'sh Brn. (10YR 5/2) Massive textured claystone, Wk. perv. FeOxn Tr wht. blebs and stringers fm. 17.2-17.6'. Interval cohesive and firm. Decr. moisture to sl. most. 4/27/05

(4011-930-0134-930)(Form GT.1A)(03/01.V2)

U.S. DEPARTMENT OF ENERGY ROCKY FLATS PLANT

FORM PRO.101A

ROCKY FLATS ENVIRONMENTAL TECHNOLOGY SITE BOREHOLE LOG

PAGE 3 OF 3

Borehole Number: 20505
Location - North: _____ East: _____
Date: 4/15/05
Geologist: E. Warp
Drilling Equip.: Hollow Stem Auger - CME 75-HT

Surface Elevation: _____
Area: Replacement of Well # 20598
Total Depth: 26.0'
Company: URS/High Plains Project No. NAD51300
Sample Type: _____

RMRS LOGGING SUPERVISOR APPROVAL [signature] DATE 4/27/05

TOP/BOTTOM OF CORE IN BOX	TOP/BOTTOM OF INTERVAL	FEET OF CORE IN INTERVAL (FIELD MEASUREMENT)	SAMPLE NUMBER	FRACTURE ANGLE	BEDDING ANGLE	GRAIN-SIZE DISTRIBUTION	USCS SYMBOL	DEPTH IN FEET	SOIL/LITHOLOGIC LOG	SAMPLE DESCRIPTION
	Run #9	Rec. = 2.0'						21		20.0-25.0 - Claystone to silty claystone Gry'sh Brn. (10YR 5/2) with patchy Yellow'sh brn. mottling. Wk. patchy FeOxn throughout. Massive textured. Interval dense, firm, wkly friable. Decrease overall moisture to V. sl. moist, Decr. silt below 22'. [initials] 4/27/05
	22.0'	22.0'						22		
	Run #10	Rec. = 3.0'						23		
								24		
	25.0'	25.0'						25		25.0'-26.0' - Augers advanced to adjust well construction but no sample collected.
26.0'	26.0'	26.0'						26		T.D. = 26.0'
								27		
								28		
								29		

NOTES: General: USCS is modified for this log as follows:
Materials amounts are estimated by % volume instead of % weight.
(1) Badly broken core, accurate footage measurements not possible.
(2) Core breaks cannot be matched, accurate footage measurements not possible.

Procedure No. RMRS/OPS-PRO.101
Revision 0
Date effective: 12/31/98
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(4011-930-0134-930)(Form GT.1A)(03/01/92)

STATE PLANE COORDINATES AREA:
NORTH: 751283.636
EAST: 2083589.939
PROJECT: Downgradient of B771
REMARKS:
replaces 20798

GRND ELEV. (FT):5940.552
TOTAL DEPTH (FT): 32.0
COMPLETION DATE: 4/19/05
GEOLOGIST: E. Warp

CASING DIA (IN): 2
BH DIA. (IN): 8
GRID LOCATOR:

LOG OF BORING NUMBER: 20705

Elev (Ft)	Well or Piezometer Construction and Materials	Depth (Ft)	Lithology	Unified Soils Classification or Rock Type	Lithologic Description
5943	Protective Casing, 6 in. ID., Steel; Casing, Sch 40-PVC, 2 in. ID.	3			
5942	Concrete Seal	2			
5941	Concrete Pad	1			
5940		0			CL: Silty Clay with trace sand and trace gravel, brown (10YR5/3). 3 - 5% gravel (1/8" - 1/4" diameter, subangular), 1 - 3% coarse grained sand. Moderate pervasive iron oxidation, trace disseminated caliche. 1/4" diameter vug, filled with sparry calcite at 0.6'. Clay is soft and moist.
5939		1			CL: Silty Clay, yellowish brown (10YR5/4). Moderate pervasive iron oxidation. Clay is soft and moist. Very poor recovery. Sample appears "ribboned" due to a cobble stuck in cutting shoe. Moist.
					No recovery.
5938	Hydrated Bentonite Chips	2			CL: Silty Clay, same as interval from 0.7' to 0.9'. 2.0" diameter cobble at 2.3'. Very poor recovery. Sample appears "ribboned" due to a cobble stuck in cutting shoe. Moist.
					No recovery.
5937		3			
5936		4			

Elev (Ft)	Well or Piezometer Construction and Materials	Depth (Ft)	Lithology	Unified Soils Classification or Rock Type	Lithologic Description
		5			
5935					CL: Silty Clay, dark yellowish brown (10YR4/6) with occasional dark grayish brown (10YR4/2) mottling. Trace gravel. Moderate to strong pervasive iron oxidation. Interval cohesive from 5.0' to 5.3', crumbly from 5.3' to 6.0'. Caliche lense at 5.3'. Moist. Ironstone fragments common below ~5.5'.
		6	Filter Pack, 16/40 Silica Sand		
5934	Screen, Sch 40-PVC, 2 in. ID., 0.010 in. slots				No recovery.
		7			CL: Silty Clay, same as interval from 5.3' to 6.0'. Crumbly and moist. Ironstone fragments to ~7.7'. Lense of silt from 8.0' to 8.1'.
5933					
		8			
5932					No recovery.
		9			CL: Silty Clay with trace gravel, yellowish brown (10YR4/6) with occasional dark grayish brown (10YR4/2) mottling. Moderate pervasive iron oxidation. Clay is soft and pliable, very moist. Occasional ironstones, more common from 10.0' to 10.4'.
5931					
		10			
5930					No recovery.
		11			CL: Clay with trace to some silt, yellowish brown (10YR5/4) to gray (10YR5/1), mottled. Decreased iron oxidation to weak/patchy oxidation. Clay is soft and pliable, moisture increases to very moist.
5929					
		12			
5928					CL: Gravelly Clay with some sand, dark gray (2.5Y3/1) with lesser olive brown (2.5Y4/3) mottling. Distinct color change. 5 - 7% gravel (1/8" - 1/4" diameter, subangular). Shattered cobbles at 12.2' and 12.9'. Clay has medium plasticity, is soft and pliable. Moisture increases to wet. Disseminated caliche at 12.3' to 12.6'.
		13			
5927					No recovery.

Elev (Ft)	Well or Piezometer Construction and Materials	Depth (Ft)	Lithology	Unified Soils Classification or Rock Type	Lithologic Description
		14			CL: Gravelly Clay with some sand, very dark gray (2.5Y3/1) to very dark grayish brown (2.5Y3/2). Very similar to interval from 12.2' to 12.9'. Roots common, also possible pond sediments? Disseminated caliche throughout. Shattered cobbles (1/2" to 1-1/2" diameter, angular, schist) at 14.6'. Clay is soft and pliable, wet. Caliche most prevalent below 15'.
5926		15			
5925					No recovery.
		16			CL: Clay with some sand and gravel, dark yellowish brown (10YR4/4). 5 - 15% sand (medium grained, subrounded), 5 - 8% gravel (1/2" - 1" diameter, subrounded to subangular). Clay is soft and pliable. Very poor recovery. Interval is completely saturated.
5924		17			No recovery.
5923		18			
5922		19			CL: Clay with trace sand and trace gravel, light olive brown (2.5Y5/3) to yellowish brown (10YR5/4). Decreased sand and gravel to trace. Clay is soft and pliable, saturated. Roots at 20.1'.
5921		20			No recovery.
5920		21			CL: Clay with trace sand and trace gravel, brown (10YR7/3). Interval completely saturated and unconsolidated, basically mud.
5919		22			
5918					No recovery.

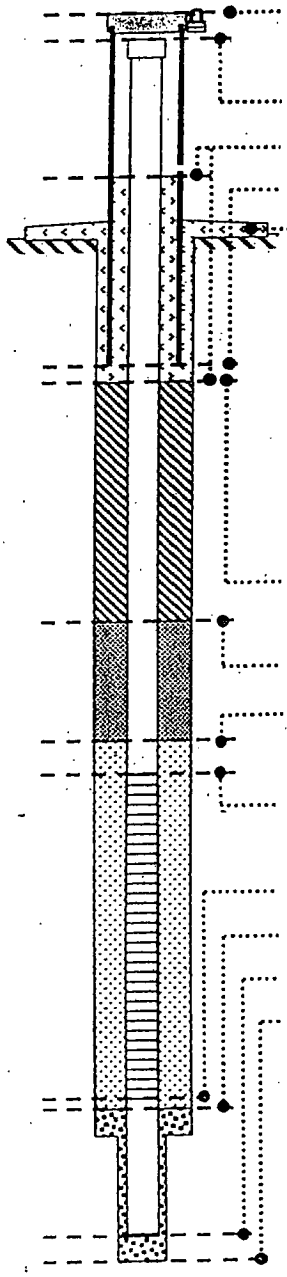
Elev (Ft)	Well or Piezometer Construction and Materials	Depth (Ft)	Lithology	Unified Soils Classification or Rock Type	Lithologic Description
		23			
5917					
		24			CL: Clay with trace gravel, light olive brown (2.5Y5/3). Appears to be re-worked claystone, saturated. 3/4" angular cobble (granitic) at base of interval.
5916					No recovery.
		25			
5915					
		26			CL: Clay with trace gravel, same as interval from 24.0' - 24.5'. Unconsolidated, muddy, clay material; saturated. 1-1/2" diameter quartzite cobble at 26.4'.
5914					CLAYSTONE: TOP OF BEDROCK. Claystone, grayish brown (10YR5/2). Very subtle contact. Weak iron oxidation - low angle, along bedding planes/fracture planes. Interval is firm and dense. Distinct decrease in moisture to moist. Becoming slightly moist at base of interval.
		27			
5913					
		28			No recovery.
5912					
		29			CLAYSTONE: Claystone, iron oxidized bedrock, yellowish brown (10YR5/4) with lesser grayish brown (10YR5/2) mottling. Moderate iron oxidation, patchy and along bedding planes/fractures (sub-horizontal).
5911					
		30			CLAYSTONE: Claystone, un-weathered, gray (10YR5/1) to dark grayish brown (10YR4/2). Decreased iron oxidation to trace. Firm and dense, dry.
5910					
		31			No recovery.
					Interval reamed-out with augers, no core.
5909					
		32	Threaded End Cap - Sump, Sch 40-PVC		

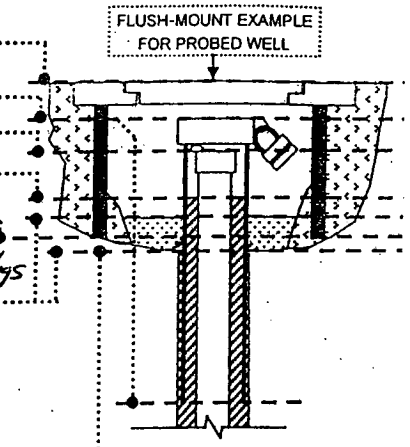
MONITORING WELL INSTALLATION REPORT: Form PRO.118

LOCATION CODE: 20705 PROJECT NAME: FY05 Well Replacements PROGRAM: Water Programs-WARP
SCREENED FORMATION: Al/Bdrk DRILLING CONTRACTOR: High Plains BORING METHOD: Hollow Stem Auger w/ Split Spoon
DATE DRILLED: 4/19/05 DATE COMPLETED: 4/19/05 TOTAL DEPTH: 32.0' COMPLETED DEPTH: 32.0'
ESTIMATED DEPTH TO BEDROCK: 26.4 RIG GEOLOGIST: E. WARP LOGGING GEOLOGIST: E. WARP
BOREHOLE DIAMETER IN SCREENED INTERVAL: 8.0" QUANTITY OF FLUIDS LOST DURING DRILLING: N/A
INITIAL WATER LEVEL (FT, DATE): ESW 17.21 below TOC on 4/19/05 COMPLETED WATER LEVEL (FT, DATE):
DIAMETER & TYPE OF INSTALLATION (WELL/PIEZOMETER/WELL POINT/ETC.): 2.0" I.D. - PVC Well
TYPE OF PROTECTION (FLUSH-MOUNT VS. ABOVE GROUND, ASEPTIC, ETC.): Above ground 6.0" I.D. Steel Prot. casing

ALL MEASUREMENTS WILL BE MADE IN FEET FROM GROUND SURFACE

* DENOTES ITEMS THAT MAY NOT BE APPLICABLE, DEPENDING ON BORING METHOD, WELL PROTECTION & PURPOSE





PROTECTIVE CASING TOP (STICKUP OR FLUSH-MOUNT): 2.95' ags
*SECONDARY CASING TOP: N/A BOTTOM: N/A TYPE:
SURFACE CASING TOP: 2.4' ags ID (IN): 2.0"
SURFACE SEAL TOP: 1.55' BOTTOM: 0.1' bgs TYPE: ~~Cement~~ Concrete ESW
PROTECTIVE CASING BOTTOM, ID (IN), TYPE: 1.85' bgs
*WELL PAD DIMENSIONS, TYPE: 3'x3' - Concrete, fm 0.1' bgs to 0.15' ags
*ADD'L CASING FILL TOP: N/A BOTTOM: N/A TYPE: N/A
*SURFACE ISOLATION CASING TOP: N/A BOTTOM: N/A
*SURFACE ISOLATION CASING ID (IN): N/A TYPE: N/A
*OTHER (E.G., ASEPTIC) CASING TOP: N/A BOTTOM: N/A
*OTHER CASING ID (IN): N/A TYPE, PURPOSE: N/A
*CENTRALIZER(S) OD (IN): N/A NUMBER USED: N/A TYPE: N/A
*CENTRALIZER(S) DEPTH(S): N/A
*GROUT TOP: N/A MEASURED DENSITY (LBS/GAL): N/A TYPE: N/A
*GRANULAR BENTONITE TOP: N/A TYPE: N/A
*BENTONITE SEAL TOP: 0.1' TYPE: Med. Bentonite Chips - Pure Gold Brand - hydrated w/ 5 gall. of Dist. H_2O.
BENTONITE SEAL OR GRANULAR BENTONITE BOTTOM (= FILTER PACK TOP): 6.0'
FILTER PACK TYPE: 16/40 Silica Sand BRAND: C.S.S.I.
SURFACE CASING BOTTOM (=SCREEN TOP): 6.75' TYPE: Sch. ~~80~~ 40 PVC 5/2/05
SCREEN ID (IN): 2.0" SLOT SIZE (IN): 0.010" 5/2/05 TYPE: Sch. ~~80~~ 40 PVC 40 5/2/05
SCREEN BOTTOM (= SUMP, TOP): 31.75' SUMP TYPE: Threaded end cap - Sch. ~~80~~ PVC
FILTER PACK BOTTOM (= *BACKFILL TOP): 32.0' *BACKFILL TYPE: N/A
SUMP BOTTOM (= WELL COMPLETED DEPTH): 32.0' *PILOT HOLE TOP, DIAMETER: N/A
TOTAL BOREHOLE DEPTH (= *PILOT HOLE AND *BACKFILL BOTTOM): 32.0'

REMARKS: Routine Well Installation. V. poor recovery due to cobbles clogging shoe (bit). V. wet conditions. No PID hits but sheen observed on water surrounding augers at the surface

COMPLETED BY: ELLEN S. WARP Ellen S. Warp DATE: 4/20/05
CHECKED BY: J. Baylor DATE: 5/2/05

ROCKY FLATS ENVIRONMENTAL TECHNOLOGY SITE BOREHOLE LOG

PAGE 1 OF 4

Borehole Number: 20705
Location - North: _____ East: _____
Date: 4/19/05
Geologist: E. WARP
Drilling Equip.: Hollow Stem Auger - CME-75-HT

Surface Elevation: _____
Area: Downgrad. of B771 - Replacement of Well # 20798
Total Depth: 32.0'
Company: URS/HIGH PLAINS Project No. HAD51300
Sample Type: _____

RMRS LOGGING SUPERVISOR APPROVAL [signature] DATE 4/27/05

TOP/BOTTOM OF CORE IN BOX	TOP/BOTTOM OF INTERVAL	FEET OF CORE IN INTERVAL (FIELD MEASUREMENT)	SAMPLE NUMBER	FRACTURE ANGLE	BEDDING ANGLE	GRAIN SIZE DISTRIBUTION	USCS SYMBOL	DEPTH IN FEET	SOIL/LITHOLOGIC LOG	SAMPLE DESCRIPTION
Box #1	Run #1 2.0'	Rec = 0.9'					CL	0.7' 0.9' 1		Silty 0.0-0.7' - CLAY w/ Tr sand and Tr gravel. Brn. (10YR 5/3). 3-5% gravel (1/8-1/4" dia., sub-ang). 1-3% c.g. sand. Mod. perv. FeOx'n. Tr diss. caliche. 1/4" dia. vug filled w/ sparry calcite @ 0.6'. Clay is soft and MOIST.
										0.7-0.9' - Silty CLAY, yellish brn. (10YR 5/4). Mod. perv. FeOx'n. Clay is soft and moist. V. poor recovery. Sample appears "ribboned" due to a cobble stuck in cutting shoe, MOIST.
	Run #2 5.0'	Rec. = 0.3'					CL	2 2.3' 3 4		0.9-2.0' = No recovery. 2.0-2.3' - Silty CLAY (same as fm. ~~0.7-0.9~~ 0.7' to 0.9'). 2.0" dia. cobble @ 2.3'. V. poor recovery. Sample appears "ribboned" due to a cobble stuck in cutting shoe. MOIST. 2.3-5.0' = No recovery
	Run #3 7.0'	Rec. = 1.6'					CL	5 6 6.6'		5.0-6.6' - Silty CLAY, Dk. yellish Brn. (10YR 4/6) with ~~Resp lesser~~ occasional Dk. grysh Brn (10YR 4/2) mottling. Tr gravel. Mod. to strong perv. FeOx'n. Interval cohesive fm. 5.0 to 5.3', crumbly fm. 5.3 to 6.0'. Caliche lense @ 5.3'. MOIST. Ironstone fragments common below ~5.5'. [initials] 4/27/05
										6.6-7.0' = No recovery
	Run #4 9.0'	Rec. = 1.6'					CL	7 8 8.6' 9		7.0-8.6 - Silty CLAY (same as fm. 5.3-6.0'). Crumbly and MOIST. Fe stone fragments to ~7.7'. Lens of silt, 8.0-8.1. [initials] 4/27/05
										8.6-9.0' = No recovery
							CL	10.0		9.0-10.4 Silty CLAY, w/ Tr gravel. yellsh Brn. (10YR 4/6) with occasional Dk. grysh Brn. (10YR 4/2) mottling. Moderate + perv. FeOx'n. Clay is soft and pliable. V. Moist Occ. Fe stones, more common 10.0-10.4'. [initials] 4/27/05

NOTES: General: USCS is modified for this log as follows:
Materials amounts are estimated by % volume instead of % weight.
(1) Badly broken core, accurate footage measurements not possible.
(2) Core breaks cannot be matched, accurate footage measurements not possible.

(4011-930-0134-930)(Form GT.1A)(03/01/92)

ROCKY FLATS ENVIRONMENTAL TECHNOLOGY SITE BOREHOLE LOG

Borehole Number: 20705
Location - North: _____ East: _____
Date: 4/19/05
Geologist: E. WARP
Drilling Equip.: Hollow Stem Auger - CME-75-HT

Surface Elevation: _____
Area: Downgrad. of 6771. Replacement of 20798
Total Depth: 32.0'
Company: URS/HIGH PLAINS
Project No.: HAD51300
Sample Type: N/A

RMRS LOGGING SUPERVISOR APPROVAL [signature]

DATE 4/27/05

TOP/BOTTOM OF CORE IN BOX	TOP/BOTTOM OF INTERVAL	FEET OF CORE IN INTERVAL (FIELD MEASUREMENT)	SAMPLE NUMBER	FRACTURE ANGLE	BEDDING ANGLE	GRAIN SIZE DISTRIBUTION	USCS SYMBOL	DEPTH IN FEET	SOIL/LITHOLOGIC LOG	SAMPLE DESCRIPTION
										~~10.0~~ ESW See description on previous page.
	Run #5 (cont.) 11.0'	Rec. = 1.4' 11.0'						10.4		10.4-11.0' = No recovery
	Run #6 14.0'	Rec. = 1.9' 14.0'					CL	11		11.0-12.2 - CLAY w/ Tr to some silt. Yell'sh Brn. (10YR5/4) to Gry (10YR5/1). Mottled. Decr. Fe oxn to wk/patchy ox'n. Clay is soft and pliable ~~and~~ Incr. moisture to V. Moist. ESW
								12		12.2-12.9' - Gravelly CLAY w/ some sand. Dk. Gry (2.5Y3/1) w/lesser Olive Brn. (2.5Y4/3) mottling. Distinct color change. 5-7% gravel (1/8-1/4" dia., sub-ang.). Shattered cobbles @ 12.2' + 12.9'. Med. plasticity. Clay is soft and pliable. Incr. moisture to WET. Disseminated caliche @ 12.3-12.6.
								12.2		
								12.9'		12.9-14.0' = No recovery.
	Run #7 16.0'	Rec. = 1.4' 16.0'					CL	14		14.0-15.4' - Gravelly CLAY w/ some sand. V. Dk. Gry (2.5Y3/1) to V. Dk. Gry'sh Brn. (2.5Y3/2). V. Similar to 12.2'-12.9' interval. Roots common. Possible pond sediments? Diss. caliche throughout. Shattered cobbles (1/2-1 1/2" dia., ang., schist) @ 14.6'. CLAY is soft and pliable. WET. Caliche most prevalent below 15'.
								15		
								15.4'		15.4-16.0' = No recovery.
	Run #8 19.0'	Rec. = 1.1' 19.0'					CL	16		16.0-17.1' - CLAY w/ some sand and gravel. Dk. Yell'sh Brn. (10YR4/4). 5-15% sand (m.g., sub-rounded). 5-8% gravel (1/2"-1" dia., sub-rounded to sub-ang.) Clay is soft and pliable. V. poor recovery. Interval is completely saturated.
								17		
								17.1'		17.1-19.0' = No recovery.
								18		
	Run #9 (19.0-21.0')	Rec. = 1.1'					CL	19		19.0-20.1' - CLAY w/ Tr sand and Tr gravel. Lt. Olive brn. (2.5Y5/3) to Yell'sh brn. (10YR5/4). Decreased sand and gravel to Tr. Clay is soft and pliable. Roots @ 20.1'. SATURATED

NOTES: General: USCS is modified for this log as follows:
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(1) Badly broken core, accurate footage measurements not possible.
(2) Core breaks cannot be matched, accurate footage measurements not possible.

(4011-930-0134-930)(Form GT:1A)(03/01/92)

U.S. DEPARTMENT OF ENERGY ROCKY FLATS PLANT

FORM PRO.101A

ROCKY FLATS ENVIRONMENTAL TECHNOLOGY SITE BOREHOLE LOG

Borehole Number: 20705
Location - North: East:
Date: 4/19/05
Geologist: E. WARP
Drilling Equip.: Hollow Stem Auger - CME-75-HT

Surface Elevation:
Area: Downgrad. of B771 - Replacement of #20798
Total Depth: 32.0'
Company: RMRS/HIGH PLAINS Project No. HAD51300
Sample Type:

RMRS LOGGING SUPERVISOR APPROVAL

DATE 4/27/05

TOP/BOTTOM OF CORE IN BOX	TOP/BOTTOM OF INTERVAL	FEET OF CORE IN INTERVAL (FIELD MEASUREMENT)	SAMPLE NUMBER	FRACTURE ANGLE	BEDDING ANGLE	GRAIN SIZE DISTRIBUTION	USCS SYMBOL	DEPTH IN FEET	SOIL LITHOLOGIC LOG	SAMPLE DESCRIPTION
	Run #9 (cont.) 21.0'	Rec. = 1.1' 21.0'					CL	20.1		20.0-20.1 - CLAY w/ fr sand and fr gravel (see description on page 2)
										20.1-21.0' = No recovery
								21		21.0-22.7 - CLAY w/ fr sand and fr gravel. Brn. (10YR 7/3). Interval completed saturated and unconsolidated, basically mud.
	Run #10	Rec = 1.7'					CL	22		
								22.7'		22.7-24.0' = No recovery
								23		
	24.0'	24.0'						24		24.0-24.5' - CLAY w/ fr gravel. Lt. Olive Brn. (2.5Y 5/3). Appears to be re-worked claystone. 3/4" avg. cobble (granitic) @ base of interval. Saturated.
	Run #11	Rec = 0.5'						25		24.5-26.0' = No recovery
	26.0'	26.0'						26		26.0-26.4' - CLAY w/ fr gravel. Same as 8m. 24.0-24.5'. Unconsolidated, muddy clay material. 1½" dia. cobble of gtite @ 26.4'. SATURATED. Top of bedrock @ 26.4' (v. subtle contact)
				Top of Bedrock @ 26.4'				26.4'		
	Run #12	Rec. = 1.7'						27		
								27.7'		26.4-27.7' - CLAYSTONE (BEDROCK) Grysh Brn. (10YR 5/2). Wk. FeOxn - low angle, along bedding planes/fracture planes. Interval is firm and dense. Distinct decrease in moisture to MOIST. Sl. moist by base of interval.
								28		
	29.0'	29.0						29		27.7-29.0' = No recovery
	Run #13 (29.0-31.0')	Rec. = 1.8'						29.6'		29.0-29.6' - CLAYSTONE - FeOxd Bedrock

NOTES: General: USCS is modified for this log as follows:
Materials amounts are estimated by % volume instead of % weight.
(1) Badly broken core, accurate footage measurements not possible.
(2) Core breaks cannot be matched, accurate footage measurements not possible.

Procedure No. RMRS/OPS-PRO.101
Revision 0
Date effective: 12/31/98

Yellowish-brn. (10YR 5/4) w/ lesser Grysh Brn. (10YR 5/2) mottling. Moderate FeOxn - patchy and along bedding planes/fractures (subhoriz.)

JAA 4/27/05

(4011-930-0134-930)(Form GT.1A)(03/01/92)

U.S. DEPARTMENT OF ENERGY ROCKY FLATS PLANT

FORM PRO.101A

ROCKY FLATS ENVIRONMENTAL TECHNOLOGY SITE BOREHOLE LOG

Borehole Number: 20705
Location - North: _____ East: _____
Date: 4/19/05
Geologist: E. WAMP
Drilling Equip. Hollow Stem Auger-CME-75-HT

Surface Elevation: _____
Area: Downgrad. of B771-Replacement of #20798
Total Depth: 32.0'
Company: UDS/HIGH PLAINS Project No.: HAD51300
Sample Type: _____

RMRS LOGGING SUPERVISOR APPROVAL _____ DATE 4/27/05

TOP/BOTTOM OF CORE IN BOX	TOP/BOTTOM OF INTERVAL	FEET OF CORE IN INTERVAL (FIELD MEASUREMENT)	SAMPLE NUMBER	FRACTURE ANGLE	BEDDING ANGLE	GRAIN SIZE DISTRIBUTION	USCS SYMBOL	DEPTH IN FEET	SOIL/ LITHOLOGIC LOG	SAMPLE DESCRIPTION
Box #2 of 2	Run #3 (cont.) 31.0'	Rec. = 1.8 31.0'						30.0'		29.6-30.8'- CLAYSTONE (Unweathered) Gry (10YR5/1) to Dk. Gry'sh Brn. (10YR4/2). Decr. FeOx'n to Tr. Firm and dense. Dry
								30.8'		
								31'		31.0-32.0- Ream-out w/Auger- No core.
32.0'	32.0'	32.0'						32.0'		T.D. = 32.0'

NOTES: General: USCS is modified for this log as follows:
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(1) Badly broken core, accurate footage measurements not possible.
(2) Core breaks cannot be matched, accurate footage measurements not possible.

Procedure No. RMRS/OPS-PRO.101
Revision 0
Date effective: 12/31/98

(4011-930-0134-930)(Form GT.1A)(03/01/92)

STATE PLANE COORDINATES AREA:
NORTH: 750684.189
EAST: 2083257.531
PROJECT: N. 6th St.
REMARKS:
Replaces well 21398

GRND ELEV. (FT): 5963.689
TOTAL DEPTH (FT): 20.0
COMPLETION DATE: 9/15/05
GEOLOGIST: E. Warp

CASING DIA (IN): 1
BH DIA. (IN): 3.5
GRID LOCATOR:

LOG OF BORING NUMBER: 21305

Elev (Ft)	Well or Piezometer Construction and Materials	Depth (Ft)	Lithology	Unified Soils Classification or Rock Type	Lithologic Description
5967	Protective Casing, Steel, 6 in. ID.				
	Casing, Sch 80-PVC, 1 in. ID.	3			
5966		2			
5965		1			
5964	Concrete Seal	0			
	Concrete Pad				GC: Gravel with some sandy clay. Fill. Brown (7.5YR5/4) sandy clay matrix. 80 - 90% gravel and shattered cobbles (1/2" to 1-1/2" diameter, subangular, predominately quartzite and some fine grained sandstone). Unconsolidated. Dry.
5963		1			GC/CL: Gravel/Sandy Clay mixture - fill material. Strong brown (7.5YR5/6) to brown (7.5YR5/4) matrix. 60 - 65% sandy clay matrix with some to abundant coarse grained angular white fragments. 35 - 40% gravel (1/8" - 3/4" diameter, subangular to subrounded, predominately quartzite with less schist). Low plasticity. Weakly consolidated. Slightly moist.
5962	Hydrated Granular Bentonite	2			
5961		3			No recovery.
					GC/CL: Gravel/Sandy Clay mixture, same as interval from 0.8' to 2.5'. Shattered quartzite cobbles at top of interval. Slightly moist.
5960		4			CL: Silty Clay with trace sand and trace gravel, dark brown (7.5YR3/2). Distinct color change. Trace organic material (twigs and roots). Probably original ground surface. Medium to high plasticity. Moisture increases to moist. Interval is crumbly from 3.4' to 4.3'

Elev (Ft)	Well or Piezometer Construction and Materials	Depth (Ft)	Lithology	Unified Soils Classification or Rock Type	Lithologic Description
5959					(higher silt, sand content) then cohesive and firm from 4.3' to 6.9' (higher clay content).
5958	Filter Pack, 16/40 Silica Sand; Screen, Sch 80-PVC, 1 in. ID., 0.010 in. slots	5, 6			
5957		7			No recovery.
5956		8			CL: Clay/Silty Clay with trace sand and trace gravel. Dark yellowish brown (10YR4/4). Distinct color change. Some portions appear to be re-worked claystone. Trace black organic stringers. Trace white caliche as stringers and blebs. Occasional sandy zones. Interval is firm, dense and cohesive. 1" to 1-1/2" diameter angular quartzite clasts at 8.0', 8.6', and 11.2'. Moist.
5955		9			
5954		10			
5953		11			
5952		12			CL: Clay with some sand and some gravel. Strong brown (7.5YR5/6). Moderate to strong pervasive iron oxidation of clay. Appears to be re-worked claystone with sandy lenses common from 12.5' to 13.1'. Sandy lenses are poorly graded with coarse grained, subangular to subrounded sand. Disseminated white coarse grained fragments (caliche?) throughout sandy lenses with some caliche blebs. 2" diameter, angular clast of quartzite at 12.9' and 1"
5951		13			

Elev (Ft)	Well or Piezometer Construction and Materials	Depth (Ft)	Lithology	Unified Soils Classification or Rock Type	Lithologic Description
5950		14			diameter, subrounded clasts of quartzite at 13.0'. Re-worked claystone with sandy lenses appears fluvial in origin. Sharp contact with claystone bedrock at 13.1'. Moist.
5949		15			CLAYSTONE: TOP OF BEDROCK. Claystone to claystone with silt. Mottled with diffuse carbonaceous content (13.3' - 13.4' and 15.0' - 15.1'). Iron oxides. Predominately grayish brown (2.5Y5/2) to ~15.2', then dark gray (2.5Y4/1) to ~16.4', then mottled grays with light yellowish brown (2.5Y6/4), light olive brown (2.5Y5/4), and olive brown (2.5Y4/3). Pocket of sparry calcareous precipitate at 16.0'. Discrete iron-stained streaks and blebs below 17.8'. The claystone with silt is from ~16.0' to 17.8'. Slightly moist.
5948		16			
5947		17			
5946		18			
5945		19			
5944	Threaded End Cap - Sump, Sch 80-PVC Granular Bentonite Backfill	20			

ROCKY FLATS ENVIRONMENTAL TECHNOLOGY SITE BOREHOLE LOG

Borehole Number: 21305
Location - North: _____ East: _____
Date: 9/15/05
Geologist: E. Warp
Drilling Equip.: 66 D7 Geoprobe

Surface Elevation: _____
Area: Replacement of well #21398; N. 6th St.
Total Depth: 20.0'
Company: URS/RTG
Project No.: HAD51300
Sample Type: Continuous Core

RMRS LOGGING SUPERVISOR APPROVAL [signature]

DATE 9/20/05

TOP/BOTTOM OF CORE IN BOX	TOP/BOTTOM OF INTERVAL	FEET OF CORE INTERVAL (FIELD MEASUREMENT)	SAMPLE NUMBER	FRACTURE ANGLE	BEDDING ANGLE	GRAIN SIZE DISTRIBUTION	USCS SYMBOL	DEPTH IN FEET	SOIL/LITHOLOGIC LOG	SAMPLE DESCRIPTION
								0.0		Fill. [initials] 9/20/05
	Run #1	Rec. = 2.5'					GC	0.8'		0.0-0.8' - GRAVEL w/some sandy clay Brn. (7.5YR 5/4) sandy clay matrix. 80-90% gravel and shattered cobbles (1/2-1 1/2" dia. sub-ang., predominately qtzite and some f.g. sandstone). Unconsolidated. Dry.
							GC CL	1, 2, 2.5		0.8-2.5' - GRAVEL/Sandy CLAY MIXTURE - FILL material. Strng. brn. (7.5YR 5/6) to brn. (7.5YR 5/4) matrix. 60-65% sandy clay matrix w/some to abundant c.g. ~~wht~~ ang. wht. frags. 35-40% gravel (1/8-3/4" dia., sub-ang. to sub-rounded, predominately qtzite w/less schist). Low plasticity. Wkly. consolidated. Slightly moist. [initials] 9/20/05
								2.5		2.5-3.0' = No recovery
	3.0'						GC CL	3, 3.4		3.0-3.4' - GRAVEL/Sandy CLAY Mixture. Same as above fm. 0.8-2.5'. Shattered qtzite cobbles @ top of interval. Sl. moist. [initials] 9/20/05
	Run #2	Rec. = 3.9'					CL	4, 5, 6, 6.9'		3.4-6.9' - silty CLAY w/ TR sand and TR gravel. Dk. brn. (7.5YR 3/2). Distinct color change. TR organic material (twigs and roots). Probably original ground surface. Med. to high plasticity. Increase moisture to MOIST. Interval is crumbly fm. 3.4-4.3' then cohesive and firm fm. 4.3-6.9'. (higher silt, sand content) (higher clay content)
								7		6.9'-8.0' = No recovery (Clay/silty clay w/TR...)
	8.0'							8		silty clay [initials] 9/20/05
	Run #3 (8.0→12.0')	Rec. = 4.0'					CL	9, 10.0		8.0-12.0' - CLAY w/ TR sand and TR gravel. Dk. yellowish brn. (10YR 4/4). Distinct color change. ~~Appears to be~~ ESW Re-worked claystone. TR blk. organic stringers. TR wht. caliche as stringers and blobs. Occasional sandy zones. Interval is firm, dense and cohesive. 1-1 1/2" dia. angular qtzite clasts @ 8.0', 8.6', and 11.2'. MOIST. Some portions appear to be [initials] 9/20/05

NOTES: General: USCS is modified for this log as follows:
Materials amounts are estimated by % volume instead of % weight.
(1) Badly broken core, accurate footage measurements not possible.
(2) Core breaks cannot be matched, accurate footage measurements not possible.

(4011-930-0134-930)(Form GT.1A)(03/01/92)

ROCKY FLATS ENVIRONMENTAL TECHNOLOGY SITE BOREHOLE LOG

Borehole Number: 21305
Location - North: East:
Date: 9/14/05
Geologist: E. Warp / J. Boylan
Drilling Equip.: 66 DT Geoprobe

Surface Elevation:
Area: Replacement of Well #21398, N. 6th St.
Total Depth: 20.0'
Company: URS/RTG Project No. HAD51300
Sample Type: Continuous Core

RMRS LOGGING SUPERVISOR
APPROVAL [signature] DATE 9/20/05

TOP/BOTTOM OF CORE IN BOX	TOP/BOTTOM OF INTERVAL	FEET OF CORE IN INTERVAL (FIELD MEASUREMENT)	SAMPLE NUMBER	FRACTURE ANGLE	BEDDING ANGLE	GRAIN SIZE DISTRIBUTION	USCS SYMBOL	DEPTH IN FEET	SOIL/ LITHOLOGIC LOG	SAMPLE DESCRIPTION
	Run #3 (cont.) 12.0'	Rec. = 4.0'					CL	10, 11		Silty clay [signature] 9/20/05 Clay w/ Fe sand and Fe gravel (see description on page 1). 12.0-13.1 - Clay w/some sand and some gravel. Strong brn (7.5YR 5/6). Mod. to Strong perv. FeOx'n of clay. Appears to be re-worked claystone w/sandy lenses common ~~between~~ from 12.5 to 13.1'. Sandy lenses are poorly graded with c.g., sub-ang. to sub-rounded sand. Diss. Wht. c.g. fragments (caliche?) throughout sandy lenses w/some caliche blebs. 2" dia., ang. clast of ~~gtrite~~ @ 12.9' and 1" dia., sub-rounded clasts of ~~gtrite~~ @ 13.0'. Re-worked claystone w/sandy lenses appears fluvial in origin. Sharp contact w/claystone bedrock @ 13.1'. MOIST.
	Run #4 14.0'	Rec. = 4.0'	Bedrock Contact @ 13.1'				CL	12, 13		Bedrock Contact @ 13.1'
	Run #5 16.5'	Rec. = 4.0'						14, 15, 16		13.1 - T.D. Claystone to claystone w/silt - mottled w/diffuse carbonaceous content (13.3-13.4, 15.0-15.1), Fe-oxides. Predominantly ~~yellowish~~ grayish brn ~~10YR 5/6~~ (2.5Y 5/2) to ~15.2, then dark gray (2.5Y 4/1) to ~16.4', then mottled grays with light yellowish brn, light olive brn, and olive brn (2.5Y 6/4, 5/4, 4/3 respectively). Pocket of sparry calcareous precipitate @ 16.0'. Discrete Fe-stained streaks & blebs @ below 17.8'. The claystone w/silt is @ ~16.0' - 17.8'. Sl. moist.
	Run #6 19.0'	Rec. = 3.8'						17, 18		[signature] 9/20/05
	Run #7	1.0'						19, 20.0		T.D @ 20.0'

NOTES: General: USCS is modified for this log as follows:
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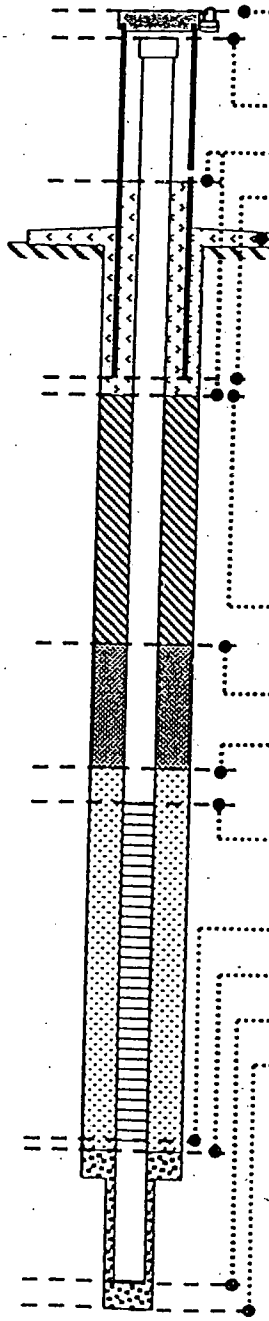
(1) Badly broken core, accurate footage measurements not possible.
(2) Core breaks cannot be matched, accurate footage measurements not possible.

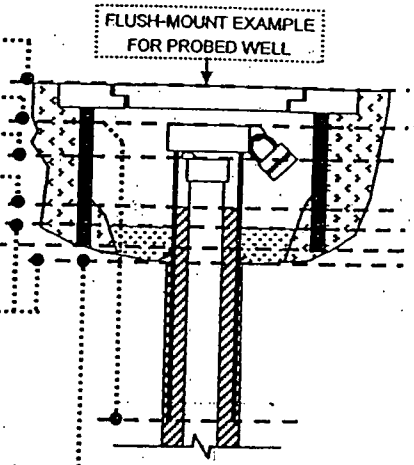
MONITORING WELL INSTALLATION REPORT: Form PRO.118

LOCATION CODE: 21305 PROJECT NAME: 04/05 Well Replacements PROGRAM: Water Programs-WARP
SCREENED FORMATION: Al/Bdrk. DRILLING CONTRACTOR: RTG BORING METHOD: Geoprobe
DATE DRILLED: 9/14/05 DATE COMPLETED: 9/16/05 TOTAL DEPTH: 20.0' COMPLETED DEPTH: 19.5'
ESTIMATED DEPTH TO BEDROCK: 13.1' RIG GEOLOGIST: E. Warp LOGGING GEOLOGIST: E. Warp
BOREHOLE DIAMETER IN SCREENED INTERVAL: 3.5" QUANTITY OF FLUIDS LOST DURING DRILLING: N/A
INITIAL WATER LEVEL (FT, DATE): Dry on 9/14/05 COMPLETED WATER LEVEL (FT, DATE): Dry on 9/19/05
DIAMETER & TYPE OF INSTALLATION (WELL/PIEZOMETER/WELL POINT/ETC.): 1.0" PVC Well
TYPE OF PROTECTION (FLUSH-MOUNT VS. ABOVE GROUND, ASEPTIC, ETC.): 6.0" Above ground steel protect. casing

ALL MEASUREMENTS WILL BE MADE IN FEET FROM GROUND SURFACE

*DENOTES ITEMS THAT MAY NOT BE APPLICABLE, DEPENDING ON BORING METHOD, WELL PROTECTION & PURPOSE





PROTECTIVE CASING TOP (STICKUP OR FLUSH-MOUNT): 3.64' ags
*SECONDARY CASING TOP: N/A BOTTOM: N/A TYPE: N/A
SURFACE CASING TOP: 3.29' ags ID (IN): 1.0"
SURFACE SEAL TOP: 0.1' ags BOTTOM: 0.36 bgs TYPE: Concrete
PROTECTIVE CASING BOTTOM, ID (IN), TYPE: 0.36' bgs, 6" Steel
*WELL PAD DIMENSIONS, TYPE: 3'x3' concrete fm. 0.1' ags to 0.25' bgs
*ADD'L CASING FILL TOP: N/A BOTTOM: N/A TYPE: N/A
*SURFACE ISOLATION CASING TOP: N/A BOTTOM: N/A
*SURFACE ISOLATION CASING ID (IN): N/A TYPE: N/A
*OTHER (E.G., ASEPTIC) CASING TOP: N/A BOTTOM: N/A
*OTHER CASING ID (IN): N/A TYPE, PURPOSE: N/A
*CENTRALIZER(S) OD (IN): N/A NUMBER USED: N/A TYPE: N/A
*CENTRALIZER(S) DEPTH(S): N/A
*GROUT TOP: N/A MEASURED DENSITY (LBS/GAL): N/A TYPE: N/A
*GRANULAR BENTONITE TOP: 0.36' TYPE: Gran. bentonite "CETCO" hydrated w/2 gall. of distilled H_2O
*BENTONITE SEAL TOP: N/A TYPE: N/A
BENTONITE SEAL OR GRANULAR BENTONITE BOTTOM (= FILTER PACK TOP): 5.0'
FILTER PACK TYPE: 16/40 Silica Sand BRAND: C.S.S.I.
SURFACE CASING BOTTOM (=SCREEN TOP): 5.62' TYPE: Sch ~~40~~ 80-PVC 11/15/05
SCREEN ID (IN): 1.0" SLOT SIZE (IN): 0.010" TYPE: Sch ~~40~~ 80-PVC 11/15/05
SCREEN BOTTOM (= SUMP, TOP): 19.4' SUMP TYPE: Threaded end cap - Sch. 40-PVC
FILTER PACK BOTTOM (= *BACKFILL TOP): 19.5' *BACKFILL TYPE: ~~N/A~~ Granular bentonite 9/19/05
SUMP BOTTOM (= WELL COMPLETED DEPTH): 19.5' *PILOT HOLE TOP, DIAMETER: 3.5"
TOTAL BOREHOLE DEPTH (= *PILOT HOLE AND *BACKFILL BOTTOM): 20.0'
REMARKS: Replacement of well #21398. Well installed 9/14/05, Protective casing and well pad installed on 9/16/05
COMPLETED BY: Ellen S. Warp Ellen S. Warp DATE: 9/19/05
CHECKED BY: JOHN BOYLAN DATE: 10/19/05

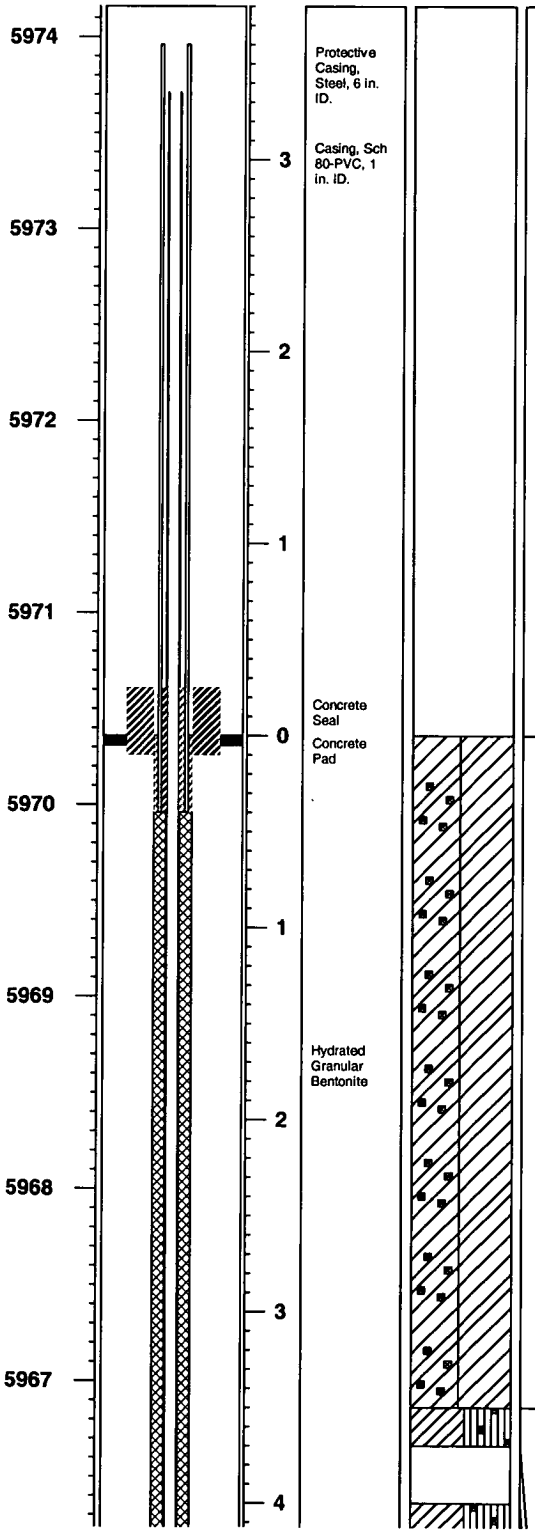
STATE PLANE COORDINATES AREA:
NORTH: 750541.405
EAST: 2083138.987
PROJECT: N. 6th St.
REMARKS:
Replaces well 21598

GRND ELEV. (FT): 5970.36
TOTAL DEPTH (FT): 21.0
COMPLETION DATE: 9/15/05
GEOLOGIST: E. Warp

CASING DIA (IN): 1
BH DIA. (IN): 3.5
GRID LOCATOR:

LOG OF BORING NUMBER: 21505

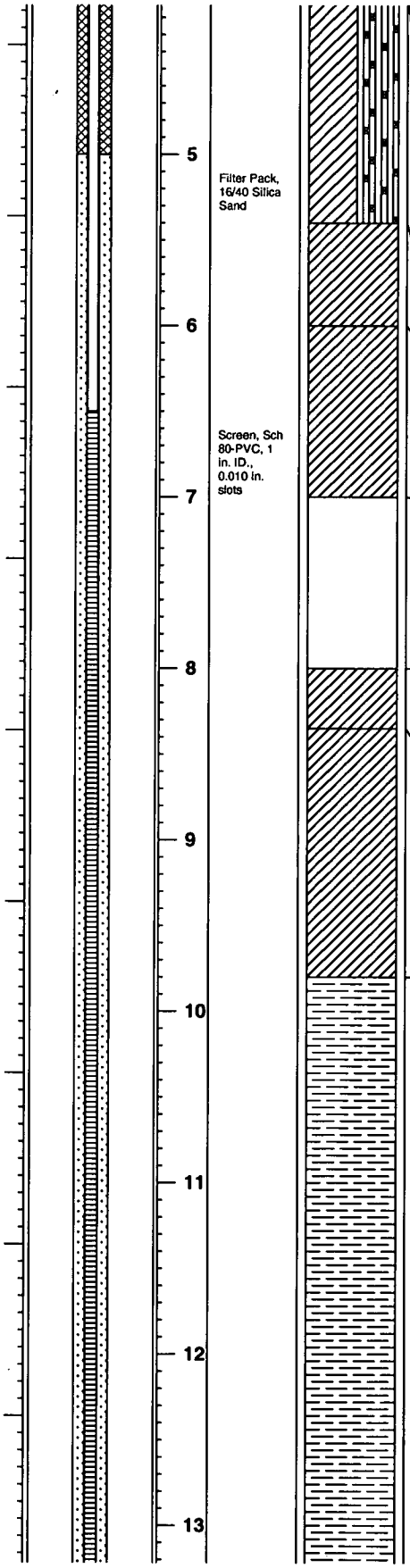
Elev (Ft)	Well or Piezometer Construction and Materials	Depth (Ft)	Lithology	Unified Soils Classification or Rock Type	Lithologic Description
5974					
5973		3			
5972		2			
5971		1			
5970		0			
5969		1			
5968		2			
5967		3			
		4			



GC/CL: Gravel/Sandy, Silty Clay mixture - fill material. Strong brown (7.5YR5/6 to 7.5YR4/6). 60 - 80% sandy, silty clay matrix (some coarse grained, subangular sand) with low to medium plasticity. 20 - 40% gravel and shattered cobbles (1/4" to 1-1/4" diameter, subrounded to subangular, predominately quartzite). Unconsolidated with 40% gravel from 0.0' to 0.8'. Loosely consolidated from 0.8' to 3.7'. Trace caliche. Trace roots. Slightly moist.

CL/SM: Clay with some silt, sand, and gravel to clayey silt with sand and gravel. Brown (7.5YR4/3) to dark brown (7.5YR3/2). Distinct color change. ~5% sand (medium grained to coarse grained,

Elev (Ft)	Well or Piezometer Construction and Materials	Depth (Ft)	Lithology	Unified Soils Classification or Rock Type	Lithologic Description
5966					subangular to subrounded). ~5% gravel (1/8" - 1/4" diameter, subangular to subrounded). Probably original ground surface. Roots common. Cohesive. Slightly moist to moist.
					No recovery.
5965		5			CL/SM: Clay with some sand and gravel to clayey silt with sand and gravel. Same as interval from 3.5' to 3.7'. Decrease roots/organics to trace. Weakly consolidated. Moist. 2" diameter cobble of quartzite at 5.4'.
		6			CL: Clay with trace sand and gravel. Dark brown (7.5YR3/2) with brown (7.5YR4/4) mottling. Interval is firm and dense. Moist.
5964					CL: Clay with trace sand and gravel. Gray (10YR5/1) with some yellowish brown (10YR5/6) iron oxidation mottling. Displaced claystone clast. Trace black organic stringers. Firm and dense. Moist. 1" thick iron oxidized lense (subhorizontal) of coarse grained sand at 6.5'.
		7			No recovery.
5963					
		8			CL: Clay with trace sand and gravel. Same as interval from 6.0' to 7.0'. Trace caliche blebs at 8.35'. Moist.
5962					CL: Clay with some gravel and some sand (abrupt coarsening). Brown (10YR5/3) to yellowish brown (10YR5/6). 5 - 7% gravel (1/4" - 1" diameter, subangular to subrounded, quartzite and schist) from 8.35' to 8.8', then decreasing to trace in lower interval. Caliche blebs at 9.3'. Interval is cohesive, soft, and pliable. Moist. 1-1/2" coarse grained sandy lense at base of interval on top of bedrock contact.
		9			
5961					
		10			CLAYSTONE: TOP OF BEDROCK. Claystone (bedrock). Gray (10YR5/1) with yellowish brown (10YR5/6) mottling. Very uniform claystone. Firm, dense, and cohesive. Trace black organic stringers throughout. Trace ironstone fragments (1/8" - 1/4" diameter) from 11.2' to 11.5'. Weak iron oxidation mottling from 9.8' to 13.5'. Slight increase in iron oxidation to moderate (pervasive) from 13.5' to 15.0'. Moist. Increased silt below 11.5' to 14.5' in this interval (claystone with trace to some silt).
5960					
		11			
5959					
		12			
5958					
		13			



Elev (Ft)	Well or Piezometer Construction and Materials	Depth (Ft)	Lithology	Unified Soils Classification or Rock Type	Lithologic Description
5957					
		14			
5956					
		15			CLAYSTONE: Claystone, grayish brown (10YR5/2) to gray (10YR5/1) with yellowish brown (10YR5/6) mottling. Moderate pervasive iron oxidation and occasional rip-up clasts from 15.0' to 16.0'. Some to abundant black organic material along subhorizontal bedding planes from 15.9' to 16.0'. Decreased overall iron oxidation from 16.0' to 21.0' with iron oxidation predominately confined to subhorizontal bedding planes. Healed 45 deg fracture at 16.5' with iron oxidation coating. Trace black organic stringers. Overall, interval is moderately friable/crumbly. Dense and firm from 20.8' to 21.0' with iron oxidation along undulating bedding planes. Slightly moist. Core is heavily damaged from ~16.0' to ~18.6', and 19.1' to 20.8'.
5955					
		16			
5954					
		17			
5953					
		18			
5952					
		19			
5951					
		20			
5950	Threaded End Cap - Sump, Sch 80-PVC Granular Bentonite Backfill				
		21			

ROCKY FLATS ENVIRONMENTAL TECHNOLOGY SITE BOREHOLE LOG

PAGE 1 OF 3

Borehole Number: 21505
Location - North: _____ East: _____
Date: 9/15/05
Geologist: E. Warp
Drilling Equip.: 66 DT Geoprobe

Surface Elevation: _____
Area: Replacement of Well # 21598; N. 6th St.
Total Depth: _____
Company: URS/RTG Project No.: HAD 51300
Sample Type: Continuous Core

RMRS LOGGING SUPERVISOR APPROVAL [signature] DATE 9/20/05

TOP/BOTTOM OF CORE IN BOX	TOP/BOTTOM OF INTERVAL	FEET OF CORE IN INTERVAL (FIELD MEASUREMENT)	SAMPLE NUMBER	FRACTURE ANGLE	BEDDING ANGLE	GRAIN SIZE DISTRIBUTION	USCS SYMBOL	DEPTH IN FEET	SOIL/ LITHOLOGIC LOG	SAMPLE DESCRIPTION
	Run #1	Rec.=3.7'					GC CL	0.0		0.0-3.5'-GRAVEL / Sandy silty CLAY Mixture (FILL MATERIAL). Strong brn. (7.5YR 5/6 to 4/6). 60-80% sandy silty clay matrix (some c.g., sub-ang. sand) w/low to medium plasticity. 20-40% gravel and shattered cobbles (1/4-1 1/4" dia., sub-rounded to sub-ang., predominately qtzite). Unconsolidated w/40% gravel fm. 0.0 → 0.8'. Loosely consolidated fm. 0.8 to 3.7'. Tr caliche. Tr roots. Sl. moist. (JAB 9/20/05)
								1		
								2		
								3		3.5-3.7'- CLAY w/some silt, sand and gravel to clayey silt w/sand & gravel. Brn. (7.5YR 4/3) to Dk. brn. (7.5YR 3/2). Distinct color change. ~5% sand (m.g. to c.g., sub-ang. to sub-rounded). ~5% gravel (1/8-1/4" dia., sub-ang. to sub-rounded). Probably original ground surface. Roots common. Cohesive. Sl. moist to MOIST. (JAB 9/20/05)
				(JAB 9/20/05)	Right half of soil/lith. log should be SM symbol		CL/SM	3.5 3.7'		
	4.0'							4		3.7-4.0' = No recovery to clayey silt w/sand and gravel.
	Run #2	Rec.=3.0'					CL/SM	5		4.0-5.4'- CLAY w/some sand and gravel. Same as above fm. 3.5-3.7'. Decr. roots/organics to Tr. Wkly consolidated. MOIST. 2" dia. cobble of qtzite @ 5.4'. (JAB 9/20/05)
								5.4'		5.4-6.0'- CLAY w/Tr sand and gravel. Dk. brn. (7.5YR 3/2) w/brn. (7.5YR 4/4) mottling. Interval is firm and dense. MOIST.
							CL	6		
							CL	7		6.0-7.0'- CLAY w/Tr sand and gravel. Gry (10YR 5/1) w/some yellowish brn (10YR 5/6) FeOx'n mottling. Displaced claystone clast. Tr blk. organic stringers. Firm and dense. MOIST. 1" thick FeOx'd lense (sub-horizontal) of c.g. sand @ 6.5'.
										7.0-8.0' = No recovery
	8.0'						CL	8		8.0-8.35- CLAY w/Tr sand and gravel. Same as above fm. 6.0-7.0'. Tr caliche blebs @ 8.35'. MOIST. (JAB 9/20/05)
	Run #3 (8.0→12.0')	Rec.=					CL	9		8.35-9.8'- CLAY w/some gravel and some sand (abrupt coarsening). Brn. (10YR 5/3) to yellowish brn. (10YR 5/6). 5-7% gravel (1/4-1" dia., sub-ang. to sub-rounded, qtzite and schist). fm 8.35-8.8' then decreasing to Tr in lower interval. Caliche blebs @ 9.3'. Interval is cohesive, soft and pliable. MOIST. 1 1/2" c.g. sandy lense @ base of interval on top of bedrock contact.
				Bedrock Contact @ 9.8'				9.8' 10.0'		

NOTES: General: USCS is modified for this log as follows:
Materials amounts are estimated by % volume instead of % weight.
(1) Badly broken core, accurate footage measurements not possible.
(2) Core breaks cannot be matched, accurate footage measurements not possible.

Procedure No. RMRS/OPS-PRO.101
Revision 0
Date effective: 12/31/98

(4011-930-0134-930)(Form GT.1A)(03/01/92)

ROCKY FLATS ENVIRONMENTAL TECHNOLOGY SITE BOREHOLE LOG

PAGE 2 OF 3

Borehole Number: 21505
Location - North: _____ East: _____
Date: 9/15/05
Geologist: E. Warp
Drilling Equip.: 66 DT Geoprobe

Surface Elevation: _____ SW 9/15/05
Area: Replacement of well # ~~21698~~ 21598; N. 6th St.
Total Depth: 21.0'
Company: URS / RTG Project No.: HAD51300
Sample Type: Continuous Core

RMRS LOGGING SUPERVISOR APPROVAL [signature] DATE 9/20/05

TOP/BOTTOM OF CORE IN BOX	TOP/BOTTOM OF INTERVAL	FEET OF CORE IN INTERVAL (FIELD MEASUREMENT)	SAMPLE NUMBER	FRACTURE ANGLE	BEDDING ANGLE	GRAIN SIZE DISTRIBUTION	USCS SYMBOL	DEPTH IN FEET	SOIL/ LITHOLOGIC LOG	SAMPLE DESCRIPTION
	Run #3 (8.0→12.0') 12.0'	Rec.: 4.0'						10.0' 11 12		9.8-15.0' - CLAYSTONE - Bedrock. Gry (10YR 5/1) w/ Yellowish brn. (10YR 5/6) mottling, V. uniform claystone, Firm, dense and cohesive. Tr blk. organic stringers throughout. Tr Fe-stone frags. (1/8-1/4" dia.) fm. 11.2-11.5'. Wk. FeOx'n mottling fm. 9.8-13.5'. Slight incr. FeOx'n to moderate (pervasive) fm. 13.5 to 15.0'. MOIST. Increased silt below 11.5' to 14.5'; in this interval, it's claystone w/ tr-some silt. [initials] 9/20/05
	Run #4 15.0'	Rec.: 4.0'						13 14 15		
	Run #5 17.0'	Rec. 4.0'		45°				16 17		15.0-21.0' - CLAYSTONE. Gry'sh brn (10YR 5/2) to gry (10YR 5/1) w/ Yellowish brn (10YR 5/6) mottling. Mod. perv. FeOx'n and occasional rip-up clasts fm. 15.0-16.0'. Some to abundant blk organic material along sub-horizontal bedding planes fm. 15.9-16.0'. Decr. overall FeOx'n fm 16.0-21.0' with FeOx'n predominately confined to sub-horizontal bedding planes. Healed 45° fracture @ 16.5' w/ FeOx'n coating. Tr blk. organic stringers. Overall, interval is moderately friable/crumbly. Dense and firm fm. 20.8-21.0' w/ FeOx'n along undulating bedding planes. Sl. moist. Heavily damaged from ~16.0' to ~18.6', and 19.1' to 20.8'. [initials] 9/20/05
	Run #6 19.0'	Rec.: 4.0'								
	Run #7 19.0-21.0'	Rec.: 4.0'								

NOTES: General: USCS is modified for this log as follows:
Materials amounts are estimated by % volume instead of % weight.
(1) Badly broken core, accurate footage measurements not possible.
(2) Core breaks cannot be matched, accurate footage measurements not possible.

(4011-930-0134-930)(Form GT.1A)(03/01/92)

ROCKY FLATS ENVIRONMENTAL TECHNOLOGY SITE BOREHOLE LOG

PAGE 3 OF 3

Borehole Number: 21505
Location - North: _____ East: _____
Date: 9/15/05
Geologist: E. Warp
Drilling Equip.: 66 DT Geoprobe

Surface Elevation: _____
Area: Replacement of well # 21598, N. 6th St.
Total Depth: 21.0'
Company: URS/RTG Project No.: HAD51360
Sample Type: Continuous Core

RMRS LOGGING SUPERVISOR APPROVAL [signature] DATE 9/20/05

TOP/BOTTOM OF CORE IN BOX	TOP/BOTTOM OF INTERVAL	FEET OF CORE IN INTERVAL (FIELD MEASUREMENT)	SAMPLE NUMBER	FRACTURE ANGLE	BEDDING ANGLE	GRAIN SIZE DISTRIBUTION	USCS SYMBOL	DEPTH IN FEET	SOIL/ LITHOLOGIC LOG	SAMPLE DESCRIPTION
	Run #7 (cont.) 21.0'	Rec. = 4.0'						20.0		CLAYSTONE (See description on pg. 2)
								21.0		T.D. @ 21.0'

NOTES: General: USCS is modified for this log as follows:
Materials amounts are estimated by % volume instead of % weight.
(1) Badly broken core, accurate footage measurements not possible.
(2) Core breaks cannot be matched, accurate footage measurements not possible.

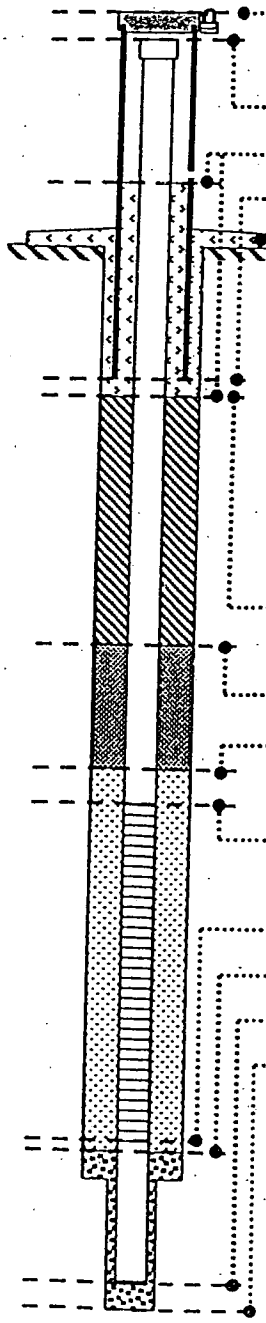
(4011-930-0134-930)(Form GT.1A)(03/01/92)

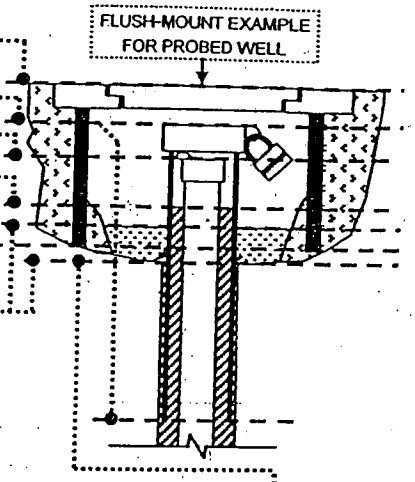
MONITORING WELL INSTALLATION REPORT: Form PRO.118

LOCATION CODE: 21505 PROJECT NAME: CY05 Well Replacements PROGRAM: Water Programs-WARP
SCREENED FORMATION: Q1/Bdrk. DRILLING CONTRACTOR: RT6 BORING METHOD: Geoprobe
DATE DRILLED: 9/15/05 DATE COMPLETED: 9/16/05 TOTAL DEPTH: ~~19.8~~ 21.0 COMPLETED DEPTH: ~~19.2~~ 20.5'
ESTIMATED DEPTH TO BEDROCK: 9.8' RIG GEOLOGIST: E. Warp LOGGING GEOLOGIST: E. Warp
BOREHOLE DIAMETER IN SCREENED INTERVAL: 3.5" QUANTITY OF FLUIDS LOST DURING DRILLING: N/A
INITIAL WATER LEVEL (FT, DATE): Dry on 9/15/05 COMPLETED WATER LEVEL (FT, DATE): Dry on 9/19/05
DIAMETER & TYPE OF INSTALLATION (WELL/PIEZOMETER/WELL POINT/ETC.): 1" PVC Well
TYPE OF PROTECTION (FLUSH-MOUNT VS. ABOVE GROUND, ASEPTIC, ETC.): 6" Steel Protective Casing - above ground

ALL MEASUREMENTS WILL BE MADE IN FEET FROM GROUND SURFACE

*DENOTES ITEMS THAT MAY NOT BE APPLICABLE, DEPENDING ON BORING METHOD, WELL PROTECTION & PURPOSE





PROTECTIVE CASING TOP (STICKUP OR FLUSH-MOUNT): 3.60' ags
*SECONDARY CASING TOP: N/A BOTTOM: N/A TYPE: N/A
SURFACE CASING TOP: 3.35' ags ID (IN): 1.0"
SURFACE SEAL TOP: 0.25' ags BOTTOM: 0.4' bgs TYPE: Concrete
PROTECTIVE CASING BOTTOM, ID (IN), TYPE: 0.4' bgs 6" steel
*WELL PAD DIMENSIONS, TYPE: 2'x2', concrete fm. 0.25' ags to 0.1' bgs
*ADD'L CASING FILL TOP: N/A BOTTOM: N/A TYPE: N/A
*SURFACE ISOLATION CASING TOP: N/A BOTTOM: N/A
*SURFACE ISOLATION CASING ID (IN): N/A TYPE: N/A
*OTHER (E.G., ASEPTIC) CASING TOP: N/A BOTTOM: N/A
*OTHER CASING ID (IN): N/A TYPE, PURPOSE: N/A
*CENTRALIZER(S) OD (IN): N/A NUMBER USED: N/A TYPE: N/A
*CENTRALIZER(S) DEPTH(S): N/A
*GROUT TOP: N/A MEASURED DENSITY (LBS/GAL): N/A TYPE: N/A
*GRANULAR BENTONITE TOP: 0.4' bgs. TYPE: CETCO granular bentonite hydrated w/ 2 gall. of distilled H_2O.
*BENTONITE SEAL TOP: N/A TYPE: N/A
BENTONITE SEAL OR GRANULAR BENTONITE BOTTOM (= FILTER PACK TOP): 5.0'
FILTER PACK TYPE: 16/40 Silica Sand BRAND: C.S.S.I.
SURFACE CASING BOTTOM (=SCREEN TOP): 6.5' TYPE: Sch. ~~40~~ 80 PVC 11/1/05
SCREEN ID (IN): 1.0" SLOT SIZE (IN): 0.01" TYPE: Sch. ~~40~~ 80 PVC 11/1/05
SCREEN BOTTOM (= SUMP, TOP): 20.4 SUMP TYPE: Threaded end cap-Sch. 40 PVC
FILTER PACK BOTTOM (= *BACKFILL TOP): 20.5' *BACKFILL TYPE: Granular bentonite
SUMP BOTTOM (= WELL COMPLETED DEPTH): 20.5' *PILOT HOLE TOP, DIAMETER: ~~N/A~~ 3.5"
TOTAL BOREHOLE DEPTH (= *PILOT HOLE AND *BACKFILL BOTTOM): 21.0'

REMARKS: Replacement of well #21598. Well installed on 9/15/05. Well pad and protective casing installed on 9/16/05

COMPLETED BY: Ellen S. Warp Ellen S. Warp DATE: 9/19/05
CHECKED BY: _____ DATE: _____

STATE PLANE COORDINATES AREA:
NORTH: 750447.438
EAST: 2083049.87
PROJECT: N. 6th St.
REMARKS:
Replaces well 21698

GRND ELEV. (FT):5973.218
TOTAL DEPTH (FT): 19.8
COMPLETION DATE: 9/15/05
GEOLOGIST: E. Warp

CASING DIA (IN): 1
BH DIA. (IN): 3.5
GRID LOCATOR:

LOG OF BORING NUMBER: 21605

Elev (Ft)	Well or Piezometer Construction and Materials	Depth (Ft)	Lithology	Unified Soils Classification or Rock Type	Lithologic Description
5976, 5975, 5974, 5973, 5972, 5971, 5970, 5969	Casing, Sch 80-PVC, 1 in. ID.; Concrete Seal; Concrete Pad; Granular Bentonite	3, 2, 1, 0, 1, 2, 3, 4			
					GC/CL: Gravel/Sandy, Silty Clay mixture - fill material. Brown (7.5YR5/4) to strong brown (7.5YR5/6) sandy clay matrix with 15 - 30% gravel (1/4" to 1" diameter, subrounded to subangular, predominately quartzite). Low plasticity. Loosely consolidated. Slightly moist.
					CL: Clay with silt, trace gravel and trace sand. Dark brown (7.5YR3/2). Distinct color change. Probably old ground surface. Trace roots. Medium to high plasticity. Interval is soft, pliable and cohesive. Moist.
					No recovery.
					CL: Clay with silt, trace gravel and trace sand. Same as interval from 2.6' to 3.4'. Moist.

Elev (Ft)	Well or Piezometer Construction and Materials	Depth (Ft)	Lithology	Unified Soils Classification or Rock Type	Lithologic Description
5968	Filter Pack, 16/40 Silica Sand	5			CL: Silty Clay with trace sand and trace gravel. Brown (7.5YR5/4). Distinct color change. Low to medium plasticity. 1-1/2" diameter shattered quartzite cobbles at 5.2' and 5.7'. Interval is cohesive and moist.
5967	Screen, Sch 80-PVC, 1 in. ID., 0.010 in. slots	6			GC/CL: Sandy, Silty Clay/Gravel mixture, strong brown (7.5YR5/6). 5 - 15% gravel (1/4" - 3/4" diameter, subangular). 2" diameter shattered quartzite cobbles at 6.7'. Sandy lenses throughout. Clasts of light yellowish brown (2.5Y6/3) claystone from 7.3' to 8.2'. Loosely consolidated. Clay has low plasticity. Trace caliche blebs. Moist.
5966		7			
5965		8			
5964		9			CL: Clay with trace sand and trace gravel. Yellowish brown (10YR5/6) to brown (10YR5/4) grading into light olive gray (5Y6/2) from 11.0' to 12.0'. Re-worked claystone. Black organic stringers common throughout. Interval is firm and dense. Sandy, coarse grained lense from 11.6' to 12.0' on top of bedrock contact. Moist to very moist.
5963		10			
5962		11			
5961		12			CLAYSTONE: TOP OF BEDROCK. Claystone (oxidized bedrock). Yellowish brown (10YR5/8) with some gray (10YR5/1) and some olive gray (5Y5/2) mottling. Strong pervasive iron oxidation. Rip-up clasts (?) or immature ironstone fragments with manganese oxide coating at 13.8' and 14.3'. Rip-ups also indicated by small lenses of silty clay, e.g. at 14.1'. Black organic stringers common. Firm, dense, and cohesive. Weakly friable from 14.7' to 16.0'. Moist from 12.0' to 14.5'. Slightly moist from 14.5' to 16.0'.
5960		13			

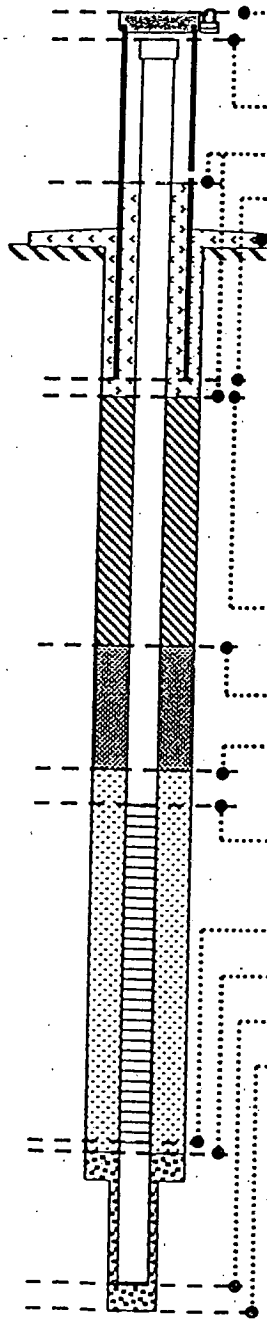
Elev (Ft)	Well or Piezometer Construction and Materials	Depth (Ft)	Lithology	Unified Soils Classification or Rock Type	Lithologic Description
5959		14			
5958		15			
5957		16			CLAYSTONE: Claystone, grayish brown (10YR5/2) to light brownish gray (10YR6/2) with yellowish brown (10YR5/6) mottling. Black organic stringers from 16.9' to 17.0'. Zone of strong pervasive iron oxidation from 18.2' to 18.3' with possible immature ironstone fragments. Silty rip-up clasts at 16.1', 16.6', 17.0', 17.1, etc. Interval is predominately dense and firm except for crumbly zone from 18.8' to 19.3'. Marked decrease in moisture from slightly moist at top to trace moisture at the base of the interval. Soft sediment deformation (ball and pillow) evident at 19.5' to 19.8' beneath subvertical iron oxide filled, rough-surfaced fracture-like feature at ~19.2' to 19.5'.
5956		17			
5955		18			
5954	Threaded End Cap - Sump, Sch 80-PVC Granular Bentonite Backfill	19			

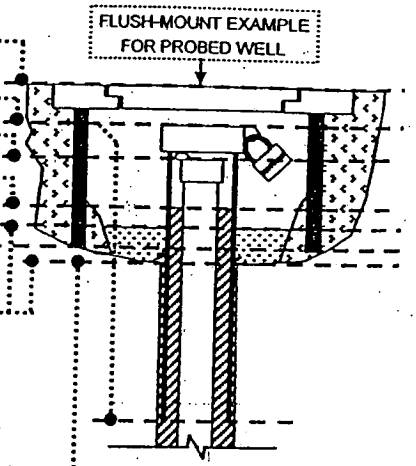
MONITORING WELL INSTALLATION REPORT: Form PRO.118

LOCATION CODE: 21605 PROJECT NAME: CY05 Well Replacements PROGRAM: Water Programs-WARP
SCREENED FORMATION: al/Bdrk. DRILLING CONTRACTOR: RTG BORING METHOD: Geoprobe
DATE DRILLED: 9/15/05 DATE COMPLETED: 9/16/05 TOTAL DEPTH: 19.8' COMPLETED DEPTH: 19.2'
ESTIMATED DEPTH TO BEDROCK: 12.0' RIG GEOLOGIST: E. Warp LOGGING GEOLOGIST: E. Warp
BOREHOLE DIAMETER IN SCREENED INTERVAL: 3.5" QUANTITY OF FLUIDS LOST DURING DRILLING: N/A
INITIAL WATER LEVEL (FT, DATE): Dry on 9/15/05 COMPLETED WATER LEVEL (FT, DATE): Dry on 9/19/05
DIAMETER & TYPE OF INSTALLATION (WELL/PIEZOMETER/WELL POINT/ETC.): 1" PVC Well
TYPE OF PROTECTION (FLUSH-MOUNT VS. ABOVE GROUND, ASEPTIC, ETC.): 6" Above ground Steel Protective Casing

ALL MEASUREMENTS WILL BE MADE IN FEET FROM GROUND SURFACE

*DENOTES ITEMS THAT MAY NOT BE APPLICABLE, DEPENDING ON BORING METHOD, WELL PROTECTION & PURPOSE





PROTECTIVE CASING TOP (STICKUP OR FLUSH-MOUNT): 3.36' ags
*SECONDARY CASING TOP: N/A BOTTOM: N/A TYPE: N/A
SURFACE CASING TOP: 3.21' ags ID (IN): 1.0"
SURFACE SEAL TOP: 0.76' ags BOTTOM: 0.64' TYPE: Concrete
PROTECTIVE CASING BOTTOM, ID (IN), TYPE: 0.64' bgs, 6" I.D. Steel
*WELL PAD DIMENSIONS, TYPE: 2.85' X 2.6', concrete 5in 0.2' ags to 0.1' bgs
*ADD'L CASING FILL TOP: N/A BOTTOM: N/A TYPE: N/A
*SURFACE ISOLATION CASING TOP: N/A BOTTOM: N/A
*SURFACE ISOLATION CASING ID (IN): N/A TYPE: N/A
*OTHER (E.G., ASEPTIC) CASING TOP: N/A BOTTOM: N/A
*OTHER CASING ID (IN): N/A TYPE, PURPOSE: N/A
*CENTRALIZER(S) OD (IN): N/A NUMBER USED: N/A TYPE: N/A
*CENTRALIZER(S) DEPTH(S): N/A
*GROUT TOP: N/A MEASURED DENSITY (LBS/GAL): N/A TYPE: N/A
*GRANULAR BENTONITE TOP: ~~5.0~~ 0.64 TYPE: CETCO-granular bentonite
*BENTONITE SEAL TOP: N/A TYPE: N/A
BENTONITE SEAL OR GRANULAR BENTONITE BOTTOM (= FILTER PACK TOP): 5.0'
FILTER PACK TYPE: 16/40 Silica Sand BRAND: CSSI 80 11/15/05
SURFACE CASING BOTTOM (=SCREEN TOP): 6.2' TYPE: Sch. ~~40~~ 80-PVC
SCREEN ID (IN): 1.0" SLOT SIZE (IN): 0.01" TYPE: Sch. ~~40~~ 80-PVC 11/15/05
SCREEN BOTTOM (= SUMP, TOP): 19.1' SUMP TYPE: Threaded end cap-Sch. 40 PVC
FILTER PACK BOTTOM (= *BACKFILL TOP): 19.2' *BACKFILL TYPE: Granular bentonite-CETCO
SUMP BOTTOM (= WELL COMPLETED DEPTH): 19.2' *PILOT HOLE TOP, DIAMETER: N/A
TOTAL BOREHOLE DEPTH (= *PILOT HOLE AND *BACKFILL BOTTOM): 19.8' (3.5" I.D.)
REMARKS: Replacement of well #21698. Well installed on 9/15/05. Prot. casing and well pad installed on 9/16/05
COMPLETED BY: Ellen S. Warp Ellen S. Warp DATE: 9/19/05
CHECKED BY: DATE:

U.S. DEPARTMENT OF ENERGY ROCKY FLATS PLANT

FORM PRO.101A

ROCKY FLATS ENVIRONMENTAL TECHNOLOGY SITE BOREHOLE LOG

Borehole Number: ~~21698~~ 21605 9/20/05
Location - North: _____ East: _____
Date: 9/15/05
Geologist: E. WARP
Drilling Equip.: 66 DT Geoprobe

Surface Elevation: _____
Area: Replacement of 21698; N. 6th St.
Total Depth: 19.8'
Company: URS/RTG Project No.: HAD51300
Sample Type: Continuous Core

RMRS LOGGING SUPERVISOR APPROVAL _____ DATE 9/20/05

TOP/BOTTOM OF CORE IN BOX	TOP/BOTTOM OF INTERVAL	FEET OF CORE IN INTERVAL (FIELD MEASUREMENT)	SAMPLE NUMBER	FRACTURE ANGLE	BEDDING ANGLE	GRAIN SIZE DISTRIBUTION	USCS SYMBOL	DEPTH IN FEET	SOIL LITHOLOGIC LOG	SAMPLE DESCRIPTION
0.0	0.0	0.0						0.0		0.0-2.6' - GRAVEL/ Sandy silty CLAY Mixture (Fill) Brn. (7.5YR5/4) to Strong brn. (7.5YR5/6). Sandy clay matrix w/15-30% gravel (1/4-1" dia., sub-rounded to sub-ang., predominately qtzite). Low plasticity. Loosely consolidated. Sl. MOIST. 9/20/05
	Run #1	Rec.= 3.4'				45°	GC CL	1		
								2		
								2.6'		2.6-3.4' - CLAY w/Tr gravel and Tr sand. Dk. brn. (7.5YR3/2). Distinct color change. Probably old ground surface. Tr roots. Medium to high plasticity. Interval is soft, pliable and cohesive. MOIST. silt, 9/20/05
							CL	3		
								3.4'		3.4-4.0' = No recovery, silt, 9/20/05
	4.0'							4		4.0-4.45' - CLAY w/Tr gravel and Tr sand. Same as above fm. 2.6-3.4'. MOIST.
							CL	4.45'		4.45-5.7' Silty CLAY w/Tr sand and Tr gravel. Brn. (7.5YR5/4). Distinct color change. Low to medium plasticity. 1 1/2" dia. shattered qtzite cobbles @ 5.2 and 5.7'. Interval cohesive and MOIST. 9/20/05
							CL	5		
								5.7'		5.7-9.0' - Sandy silty CLAY/GRAVEL Mixture Strong brn. (7.5YR5/6). 5-15% gravel (1/4-3/4" dia., sub-ang.) 2" dia. shattered qtzite cobbles @ 6.7'. Sandy lenses throughout. Clasts of yellowish brn (2.5Y 6/3) claystone fm. 7.3-8.2'. Loosely consolidated. Clay has low plasticity. Tr caliche blebs. MOIST.
	Run #2	Rec.= 4.0'					GC CL	6		
								7		
	8.0'							8		
										9.0-12.0' - CLAY w/Tr Sand and Tr gravel. Yellowish brn. (10YR5/6) to brn (10YR5/4) grading into Lt. Olive gry (5Y 6/2) fm. 11.0-12.0'. Re-worked claystone. Blk. organic stringers common throughout. Interval is firm and dense. Sandy, e.g.
	Run #3	Rec.= 4.0'						9		
							CL	12.0'		

NOTES: General: USCS is modified for this log as follows:
Materials amounts are estimated by % volume instead of % weight.
(1) Badly broken core, accurate footage measurements not possible.
(2) Core breaks cannot be matched, accurate footage measurements not possible.

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Dense fm. 11.6 to 12.0' on top of bedrock contact. MOIST to V. MOIST.

U.S. DEPARTMENT OF ENERGY ROCKY FLATS PLANT

FORM PRO.101A

ROCKY FLATS ENVIRONMENTAL TECHNOLOGY SITE BOREHOLE LOG

Borehole Number: 21605
Location - North: _____ East: _____
Date: 9/15/05
Geologist: E. WARP
Drilling Equip.: 66 DT Geoprobe

Surface Elevation: _____
Area: Replacement of 21698; N. 6th St.
Total Depth: 19.8'
Company: URS/RTG Project No.: HAD51300
Sample Type: Continuous

RMRS LOGGING SUPERVISOR APPROVAL _____ DATE 9/20/05

TOP/BOTTOM OF CORE IN BOX	TOP/BOTTOM OF INTERVAL	FEET OF CORE IN INTERVAL (FIELD MEASUREMENT)	SAMPLE NUMBER	FRACTURE ANGLE	BEDDING ANGLE	GRAIN SIZE DISTRIBUTION	USCS SYMBOL	DEPTH IN FEET	SOIL LITHOLOGIC LOG	SAMPLE DESCRIPTION
	Run #3 (Cont.) 8.0→12.0' 12.0'	Rec.=4.0'					CL	10.0 11 12		10.0→12.0 - Described on previous page. Bedrock Contact @ 12.0'
	Run #4 14.5'	Rec.=3.9'						13 14 14.5'		12.0-16.0' - CLAYSTONE - OX'D BEDROCK, Yellow'sh brn (10YR 5/8) w/ some gry (10YR 5/1) and some olive gry (5Y 5/2) mottling. Strong pervasive FeOxn. Rip-up clasts (?) immature ironstone frags w/ min Ox coating @ 13.8 and 14.3'. Blk. organic stringers common. Firm, dense, and cohesive. Wkly friable fm. 14.7-16.0', MOIST fm. 12.0-14.5'. Sl. moist fm. 14.5-16.0' 9/20/05
	Run #5 16.0'	Rec.=2.0'						15 16		Rip-ups also indicated by small lenses of silty clay, e.g. ~~@ 16.1, 16.6,~~ 14.1'. 9/20/05
	Run #6 18.0'	Rec.=4.0'						17 18		16.0-19.8' - CLAYSTONE. Gry'sh Brn (10YR 5/2) to lt. brn'sh gry (10YR 6/2) w/ yellow'sh brn. (10YR 5/6) mottling. Blk. organic stringers. fm. 16.9-17.0'. Zone of strong perv. ~~Interval is dense and firm @ SW~~ FeOxn fm. 18.2-18.3 with possible immature ironstone fragments. Silty rip-up clasts @ 16.1, 16.6, 17.2, 17.1 etc. Interval is predominately dense and firm except for crumbly zone fm. 18.8 to 19.3'. Marked decr. in moisture fm. Sl. moist @ top to Dr moisture at the base of the interval. Soft sediment deformation evident @ 19.5-19.8 beneath T.D. @ 19.8 sub-vertical Fe-Ox-filled rough-surfaced fracture-like feature @ ~14.2-14.5'. 9/20/05 9/20/05 9/20/05
	Run #7 19.8'	Rec.=4.0' 19.8'						19 19.8' 20.0		(ball-and-pillow)

NOTES: General: USGS is modified for this log as follows:
Materials amounts are estimated by % volume instead of % weight.
(1) Badly broken core, accurate footage measurements not possible.
(2) Core breaks cannot be matched, accurate footage measurements not possible.

Procedure No. RMRS/OPS-PRO.101
Revision 0
Date effective: 12/31/98

(4011-930-0134-930)(Form GT.1A)(01/01/92)

STATE PLANE COORDINATES AREA:
NORTH: 751287.882
EAST: 2084431.628
PROJECT: Former B774
REMARKS:
replaces 22298

GRND ELEV. (FT): 5932.248
TOTAL DEPTH (FT): 20.0
COMPLETION DATE: 4/6/05
GEOLOGIST: E. Warp

CASING DIA (IN): 2
BH DIA. (IN): 8
GRID LOCATOR:

LOG OF BORING NUMBER: 22205

Elev (Ft)	Well or Piezometer Construction and Materials	Depth (Ft)	Lithology	Unified Soils Classification or Rock Type	Lithologic Description
5935	Protective Casing, 6 in. ID., Steel; Casing, Sch 80-PVC, 2 in. ID.	3			
5934		2			
5933	Concrete Seal	1			
5932	Concrete Pad; Bentonite Chips	0			CL: Clay with some gravel and sand, olive brown (2.5Y4/3), black (2.5Y2.5/1), and gray (2.5Y6/1). Clay is laminated and multi-colored. ~5% gravel (1/2" to 1-1/2" diameter, subangular), broken cobbles of quartzite and granite, moist.
5931		1			No recovery.
5930		2			GC/CL: Gravelly Clay with some sand, olive brown (2.5Y4/3) to brown (7.5YR4/2) clay. ~20% gravel (1/8" to 3/4" diameter, subrounded to subangular), ~10 - 15% sand (coarse grained, subangular). Some disseminated caliche, moist.
5929		3			GC/CL: Clayey Gravel with some sand, brown (7.5YR4/2), ~65% gravel (1/8" to 1" diameter, subrounded to subangular), predominately quartzite. ~25% clay and ~10% coarse grained sand, some asphalt chunks. Unconsolidated, well graded, moist. Spar/carbonate druse at 4.1'.
5928	Filter Pack, 16/40 Silica Sand	4			CL: Silty Clay with trace gravel, olive brown (2.5Y4/3) to dark brown (7.5YR3/2) to brownish yellow (10YR6/6). Color changes throughout this interval - olive brown from 4.1' to 4.4', dark brown from 4.4' to

Elev (Ft)	Well or Piezometer Construction and Materials	Depth (Ft)	Lithology	Unified Soils Classification or Rock Type	Lithologic Description
		5			4.7', brownish yellow from 4.7' to 5.3', dark brown (7.5YR3/2) from 5.3' to 5.7'. Appears to be re-worked claystone and siltstone. Interval fairly cohesive and firm, moist.
5927	Screen, Sch 80-PVC, 2 in. ID., 0.010 in. slots				
		6			GW: Gravel with some sand, light brownish gray (10YR6/2), predominately shattered cobbles of quartzite and granite (up to 1-1/2" diameter), moist.
5926					No recovery.
		7			GC: Gravel with some sand and clay, brown (7.5YR5/4). ~70% gravel (1/8" to 3/4" diameter, subangular), predominately composed of quartzite, granitic, and trace schist, moist.
5925					No recovery.
		8			
5924					
		9			GC: Sandy, Clayey Gravel, brown (7.5YR5/4), very moist.
5923					CL: Silty Clay, yellowish brown (10YR5/4), moderate pervasive iron oxidation. White caliche blebs of white stringers throughout. Appears to be re-worked claystone, very moist.
		10			
5922					ML: Clayey, Sandy Silt, yellowish brown (10YR5/6). Moderate and pervasive iron oxidation. Appears to be interval of re-worked sandy siltstone, cohesive. Occasional white stringers throughout. Sand is very fine grained, very moist.
		11			
5921					No recovery.
		12			GC/ML: Sandy Silt and Sandy Clayey Gravel, yellowish brown (10YR5/6) Sandy Silt and strong brown (7.5YR4/6) Sandy Clayey Gravel. Silt and gravel are vertically divided. Sandy silt has strong, pervasive iron oxidation. Gravel zone is ~40% gravel (1/8" to 3/4" diameter, subangular), ~40% clay, ~20% sand (coarse grained, subangular), very moist to wet (no free water).
5920					
		13			SILTSTONE: TOP OF BEDROCK - Sandy, Clayey Siltstone, yellowish brown (10YR5/6). Moderate to strong pervasive iron oxidation. ~50 - 60% silt, ~20 - 30% clay, balance is very fine grained sand (subrounded). Occasional thin clayey laminations and
5919					

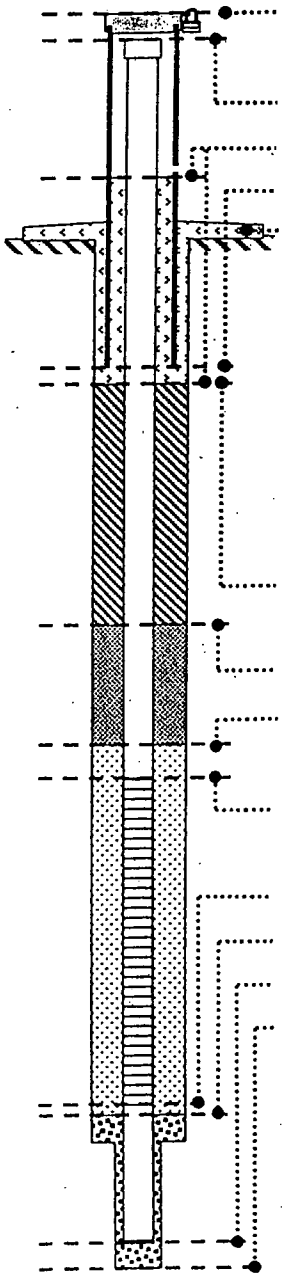
Elev (Ft)	Well or Piezometer Construction and Materials	Depth (Ft)	Lithology	Unified Soils Classification or Rock Type	Lithologic Description
		14			trace black organic laminations. Interval is cohesive but very moist to wet.
5918					CLAYSTONE: Claystone, gray (10YR5/1) to grayish brown (10YR5/2). Ironstone nodule/lense at 14.5'. Thinly laminated un-oxidized claystone with some black organic laminae. Trace iron oxide stringers. Decreasing moisture to slightly moist.
		15			
5917	Filter Pack, 16/40 Silica Sand				
		16			
5916					
					No recovery.
		17			
5915					CLAYSTONE: Claystone, gray (10YR5/1) to grayish brown (10YR5/2). Thinly laminated un-oxidized claystone as above from 14.3' to 16.5'. Thin lense of yellowish brown (10YR5/6) sandy siltstone from 17.2' to 17.4'. Trace iron oxide along internal bedding planes. 45 deg fracture with caliche fill at 18.4'. Interval dense and firm, except at siltstone lense, very slightly moist.
		18			
5914					
		19			
5913					
	Threaded End Cap - Sump, Sch 80-PVC	20			No recovery.

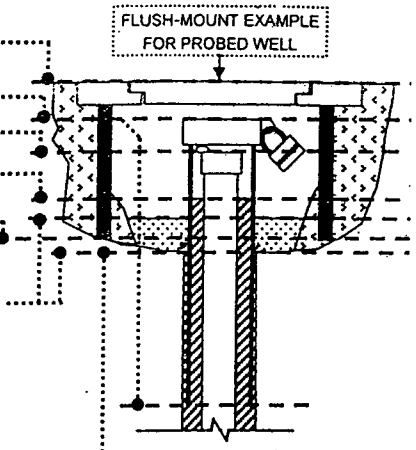
MONITORING WELL INSTALLATION REPORT: Form PRO.118

LOCATION CODE: 22205 PROJECT NAME: FY05 Well Replacements PROGRAM: Water Programs - WARP
SCREENED FORMATION: Al/Bdrk. DRILLING CONTRACTOR: High Plains BORING METHOD: Hollow Stem Auger w/split spoon
DATE DRILLED: 4/6/05 DATE COMPLETED: 4/6/05 TOTAL DEPTH: 20.0' COMPLETED DEPTH: 20.0'
ESTIMATED DEPTH TO BEDROCK: 12.8' RIG GEOLOGIST: E. Warp LOGGING GEOLOGIST: E. Warp
BOREHOLE DIAMETER IN SCREENED INTERVAL: 8" QUANTITY OF FLUIDS LOST DURING DRILLING: N/A
INITIAL WATER LEVEL (FT, DATE): Dry on 4/6/05 COMPLETED WATER LEVEL (FT, DATE):
DIAMETER & TYPE OF INSTALLATION (WELL/PIEZOMETER/WELL POINT/ETC.): 2.0" I.D. PVC Well
TYPE OF PROTECTION (FLUSH-MOUNT VS. ABOVE GROUND, ASEPTIC, ETC.): Above-ground 6.0" I.D. Steel

ALL MEASUREMENTS WILL BE MADE IN FEET FROM GROUND SURFACE

* DENOTES ITEMS THAT MAY NOT BE APPLICABLE, DEPENDING ON BORING METHOD, WELL PROTECTION & PURPOSE





PROTECTIVE CASING TOP (STICKUP OR FLUSH-MOUNT): 3.0' ags.
*SECONDARY CASING TOP: N/A BOTTOM: N/A TYPE:
SURFACE CASING TOP: 2.5' ags. ID (IN): 2.0"
SURFACE SEAL TOP: 1.2' ags BOTTOM: 0.3' bgs TYPE: Concrete
PROTECTIVE CASING BOTTOM, ID (IN), TYPE: 1.8', 6.0" I.D. Steel
*WELL PAD DIMENSIONS, TYPE: 3'x3' - Concrete fm. 0.3' bgs to 0.3' ags.
*ADD'L CASING FILL TOP: N/A BOTTOM: N/A TYPE: N/A
*SURFACE ISOLATION CASING TOP: N/A BOTTOM: N/A
*SURFACE ISOLATION CASING ID (IN): N/A TYPE: N/A
*OTHER (E.G., ASEPTIC) CASING TOP: N/A BOTTOM: N/A
*OTHER CASING ID (IN): N/A TYPE, PURPOSE: N/A
*CENTRALIZER(S) OD (IN): N/A NUMBER USED: N/A TYPE: N/A
*CENTRALIZER(S) DEPTH(S): N/A
*GROUT TOP: N/A MEASURED DENSITY (LBS/GAL): N/A TYPE: N/A
*GRANULAR BENTONITE TOP: N/A TYPE: N/A
*BENTONITE SEAL TOP: 0.3' bgs. TYPE: Med. Bentonite Chips - Pure Gold Brand
BENTONITE SEAL OR GRANULAR BENTONITE BOTTOM (= FILTER PACK TOP): 4.2'
FILTER PACK TYPE: 16/40 Silica Sand BRAND: CSSI
SURFACE CASING BOTTOM (=SCREEN TOP): 4.75' TYPE: Sch. 80 - PVC
SCREEN ID (IN): 2.0" SLOT SIZE (IN): 0.010" TYPE: Sch. 80 - PVC
SCREEN BOTTOM (= SUMP, TOP): 19.75 SUMP TYPE: Threaded End Cap - Sch. 80 PVC
FILTER PACK BOTTOM (= *BACKFILL TOP): 20.0' *BACKFILL TYPE: N/A
SUMP BOTTOM (= WELL COMPLETED DEPTH): 20.0' *PILOT HOLE TOP, DIAMETER: N/A
TOTAL BOREHOLE DEPTH (= *PILOT HOLE AND *BACKFILL BOTTOM): 20.0'
REMARKS: Routine well installation

COMPLETED BY: Ellen S. Warp Ellen S. Warp DATE: 4/25/05
CHECKED BY: J. Boylan DATE: 6/29/05

U.S. DEPARTMENT OF ENERGY ROCKY FLATS PLANT

FORM PRO.101A

ROCKY FLATS ENVIRONMENTAL TECHNOLOGY SITE BOREHOLE LOG

PAGE 1 OF 2

Borehole Number: 22205
Location - North: _____ East: _____
Date: 4/6/05
Geologist: E. WARP
Drilling Equip.: CME-HT-75 AUGER RIG

Surface Elevation: _____
Area: FORMER B 774/REPLACEMENT OF WELL # 22298
Total Depth: 20.0'
Company: URS/HIGH PLAINS Project No. HAD51300
Sample Type: N/A

RMRS LOGGING SUPERVISOR APPROVAL [signature] DATE 4/12/05

TOP/BOTTOM OF CORE IN BOX	TOP/BOTTOM OF INTERVAL	FEET OF CORE IN INTERVAL (FIELD MEASUREMENT)	SAMPLE NUMBER	FRACTURE ANGLE	BEDDING ANGLE	GRAIN SIZE DISTRIBUTION	USCS SYMBOL	DEPTH IN FEET	SOIL/LITHOLOGIC LOG	SAMPLE DESCRIPTION
	Run #1	Rec = 1.2'					CL	1, 1.2'		0.0 → 1.2' - CLAY - w/some gravel and sand. Olive brn (2.5Y 4/3), Black (2.5Y 2.5/1) and Gry (2.5Y 6/1). CLAY is laminated and multi-colored. ~5% gravel (1/2" to 1 1/2" dia, sub-ang., broken cobbles of qtzite and granite. MOIST.
	2.0'	2.0'						2		1.2-2.0' = NO RECOVERY
	Run #2	Rec = 2.0'					CL, GC	3		2.0 - 3.2' - Gravelly CLAY w/some sand. Olive Brn (2.5Y 4/3) to Brn (7.5YR 4/2) clay. ~20% gravel (1/8-3/4" dia., sub-rounded to sub-ang.) & ~10-15% sand (SW) (c.g., sub-ang.). Some disseminated caliche. MOIST.
	4.0	4.0'					GC, CL	4		3.2-4.1' - Clayey GRAVEL. Brn (7.5YR 4/2) ~65% Gravel (1/8" to 1" dia) w/some sand. (sub-rounded to sub-ang) predominately qtzite. ~25% Clay. ~10% c.g. sand. Some asphalt chunks. Unconsolidated, well-graded. MOIST. Spar/carbonate drase @ 4.1'
	Run #3	Rec = 2.1'					CL	5, 5.7'		4.1-5.7 - Silty CLAY w/ Tr-SW gravel. Olive Brn (2.5Y 4/3) to Dk. Brn (7.5YR 3/2) to Brn'sh Yellow (10YR 6/6). Color changes throughout this interval - Olive Brn fm. 4.1 to 4.4, Dk Brn. fm. 4.4 to 4.7, Brn'sh Yellow fm. 4.7 to 5.3, Dk Brn (7.5YR 3/2) fm. 5.3 to 5.7'. Appears to be re-worked claystone and siltstone. Interval fairly cohesive and firm. MOIST.
	7.5'						GW	6, 6.1		
	Run #4	Rec = 0.6'					GC	7, 8		5.7-6.1' - GRAVEL w/some sand. Lt. Brn'sh Gry (10YR 6/2), Predominately shattered cobbles of qtzite and granite. MOIST. (up to 1 1/2" dia.)
	9.0'							9		6.1-7.0 = NO RECOVERY
	Run #5	Rec = 2.2				4/12/05	GC, ~~GC~~ CL	9.2, 10.0		7.0-7.2 - GRAVEL w/some sand and clay Brn. (7.5YR 5/4). ~70% gravel (1/8" to 3/4" dia, sub-ang, predominately composed of qtzite, granite + Tr schist. MOIST
										7.2-9.0' = NO RECOVERY
										9.0-9.2' - Sandy, clayey GRAVEL. Brn. (7.5YR 5/4) V. Moist.

NOTES: General: USCS is modified for this log as follows:
Materials amounts are estimated by % volume instead of % weight.
(1) Badly broken core, accurate footage measurements not possible.
(2) Core breaks cannot be matched, accurate footage measurements not possible.

Symbol from 9.2-10.2 should be CL w/occasional caliche symbols (+) exp 9.3-9.6

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9.2-10.2 - Silty CLAY - Yellish Brn (10YR 5/4) - Mod. Perv. Fe Xn. Wht. caliche blebs + wht. stringers throughout. Appears to be reworked claystone. V. moist.

(4011-930-0134-930)(Form GT.1A)(03/01/92)

U.S. DEPARTMENT OF ENERGY ROCKY FLATS PLANT

FORM PRO.101A

ROCKY FLATS ENVIRONMENTAL TECHNOLOGY SITE BOREHOLE LOG

PAGE 2 OF 2

Borehole Number: 22205
Location - North: _____ East: _____
Date: 4/6/05
Geologist: E. Wamp
Drilling Equip.: CME-HT 75 Auger Rig

Surface Elevation: _____
Area: Former B774/Bowman's Pond - REPLACEMENT OF 22298
Total Depth: 20.0'
Company: LBS/High Plains Project No.: HAD57300
Sample Type: N/A

RMRS LOGGING SUPERVISOR APPROVAL _____ DATE 4/12/05

TOP/BOTTOM OF CORE IN BOX	TOP/BOTTOM OF INTERVAL	FEET OF CORE IN INTERVAL (FIELD MEASUREMENT)	SAMPLE NUMBER	FRACTURE ANGLE	BEDDING ANGLE	GRAIN SIZE DISTRIBUTION	USCS SYMBOL	DEPTH IN FEET	SOIL/LITHOLOGIC LOG	SAMPLE DESCRIPTION
							CL	10.0		4/12/05 Symbol to 10.2 = CL
Box #2 of 2	Run #5 (cont.)	Rec. = 2.2'					ML	10.2		10.2-11.2 - Clayey, Sandy Silt - Yellsh Brn (10YR5/6) Mod. + perv. FeOxn. Appears to be interval of reworked sandy siltstone. Cohesive. Occasional Wht. stringers throughout. Sand is v.f.g. V. MOIST
								11		
								11.2		11.2-12.0 = NO RECOVERY
	12.0'	12.0'						12		
	Run #6	Rec. = 2.0'		Top of Bedrock @12.8'			ML / GC	12.6		12.6-12.8' - Sandy SILT AND Sandy Clayey GRAVEL Yellsh Brn (10YR5/6) Sandy SILT and Strong Brn. (7.5YR4/6) Sandy Clayey GRAVEL. Vertically divided. Sandy Silt is HAS STRONG, PERV. FeOxn. Gravel Zone = ~40% gravel (1/8" to 3/4" dia., sub-ang.), ~40% Clay, ~20% Sand (c.g., sub-ang.). V. MOIST TO WET (NO FREE H_2O).
								12.8		
								13		
	14.0'	14.0'						14		
								14.3		12.8-14.3 - Sandy Clayey SILT - Yellsh Brn (10YR5/6). M/S Perv. FeOxn. ~50% Silt and ~50% v.f.g. Sand (sub-rounded). Occasional thin clayey laminations and tr blk. org. laminations. Interval is cohesive but V. Moist to Wet.
	Run #7	Rec. = 2.5'		Visual + by feel approximation: ~50-60% silt, ~20-30% clay, balance v.f.g. sand				15		
								16		14.3-16.5 - Claystone gry (10YR5/1) to Grysh Brn (10YR5/2). Fe-stone nodule/lense @ 14.5'. Thinly laminated un-oxid Claystone w/ blk. organic laminae. tr FeOx stringers. Some Decr. moisture to Sl. moist.
								16.5'		
	17.0'							17		
								17.3		
								17.6		16.5-19.5' = NO RECOVERY
	Run #8	Rec. = 2.5'						18		17.0-19.5 - Claystone - Gry (10YR5/1) to Grysh Brn. (10YR5/2). Thinly laminated un-oxid Claystone as above fm. 14.3-16.5'. Thin lense of siltstone (sandy) fn 17.2-17.4 (color = Yellsh Brn. 10YR5/6). tr FeOx along internal bedding planes. 45° frac. @ 18.4'. Interval dense and firm except @ Siltstone lense, V. Slightly moist.
								19		
								19.5'		
								20.0'		

NOTES: General: USCS is modified for this log as follows:
Materials amounts are estimated by % volume instead of % weight.
(1) Badly broken core, accurate footage measurements not possible.
(2) Core breaks cannot be matched, accurate footage measurements not possible.

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19.5 → 20.0' = NO RECOVERY
T.D. @ 20.0'

STATE PLANE COORDINATES AREA:
NORTH: 750153.196
EAST: 2082692.526
PROJECT:
REMARKS:
Replaces well 33904

GRND ELEV. (FT): 6004.758
TOTAL DEPTH (FT): 33.0
COMPLETION DATE: 9/21/05
GEOLOGIST: E. Warp

CASING DIA (IN): 1
BH DIA. (IN): 3.5
GRID LOCATOR:

LOG OF BORING NUMBER: 33905

Elev (Ft)	Well or Piezometer Construction and Materials	Depth (Ft)	Lithology	Unified Soils Classification or Rock Type	Lithologic Description
6008	Protective Casing, Steel, 6 in. ID.	3			
	Casing, Sch 80-PVC, 1 in. ID.				
6007		2			
6006		1			
6005	Concrete Pad				
	Concrete Seal	0			GC/CL: Gravel/Sandy Clay mixture - fill material. Brown (7.5YR5/4) with trace reddish brown (5YR4/4) Rocky Flats Alluvium with occasional clast of grayish brown (10YR5/2) claystone. 50 - 55% gravel and cobbles (1/4" - 2" diameter, subangular to subrounded, predominately quartzite). 45 - 50% sandy clay. Clay matrix has low to medium plasticity with angular, very coarse grained white fragments common. Trace disseminated blebs of caliche. Chunks of asphalt from 1.8' to 2.0'. Loosely consolidated. Slightly moist.
6004		1			
6003	Granular Bentonite	2			
6002		3			No recovery.
6001		4			CL: Sandy, Silty Clay with trace gravel (fill material). Brown

Elev (Ft)	Well or Piezometer Construction and Materials	Depth (Ft)	Lithology	Unified Soils Classification or Rock Type	Lithologic Description
6000	Filter Pack, 16/40 Silica Sand	5			(7.5YR4/3). Similar to interval from 0.0' to 2.6' but gravel decreases to ~5%. Trace to some sand (coarse grained, subangular). White, angular, very coarse grained fragments common in clay. Loosely consolidated. Asphalt chunks from 5.5' to 5.8' and smaller clasts disseminated to base of interval. Moist. Occasional shattered
5999	Screen, Sch 80-PVC, 1 in. ID., 0.010 in. slots	6			
5998		7			No recovery.
5997		8			CL: Silty Clay with trace to some sand and trace gravel. Brown (7.5YR5/4). Sand is coarse grained, subangular. ~5% gravel (1/8" - 1/2" diameter, subangular). Occasional 1-1/2" diameter shattered cobbles (predominately quartzite). Trace disseminated blebs of caliche. Loosely consolidated. Increasing moisture throughout interval from very moist at top to wet (but not flowing) at base.
5996		9			
5995		10			No recovery.
5994		11			
5993		12			CL: Silty Clay with sand and gravel. Brown (7.5YR5/4). Very similar to interval from 8.0' to 10.1'. Loosely consolidated. Wet, but not flowing.
5992		13			

Elev (Ft)	Well or Piezometer Construction and Materials	Depth (Ft)	Lithology	Unified Soils Classification or Rock Type	Lithologic Description
5991		14			
5990		15			No recovery.
5989		16			CL: Silty Clay with gravel and sand. Brown (7.5YR4/3) grading into very dark gray (7.5YR3/1). Distinct color change. Very soft, pliable and plastic. Saturated, but not flowing.
5988		17			CL: Gravelly Clay with trace sand. Reddish brown (2.5YR4/4) matrix. Distinct color change. 7 - 10% gravel (1/4" - 1" diameter, subangular, quartzite, schist, granite). Very soft, pliable with high plasticity. Saturated, but not flowing.
5987		18			No recovery.
5986		19			SC/CL: Gravelly, Sandy Clay, strong brown (7.5YR5/6). Distinct color change. 40 - 45% sand (medium grained to coarse grained, subrounded to subangular). ~45% clay, ~10% gravel and cobbles (1/2" to 1-1/2" diameter, subrounded). Trace caliche blebs. Abundant coarse grain-sized, angular white fragments throughout. Iron oxidized matrix. Weakly cohesive. Low plasticity. Saturated, but not flowing.
5985		20			SC/CL: Gravelly, Sandy Clay to Gravelly, Clayey Sand. Light yellowish brown (10YR6/4) to brown (10YR5/3) with some yellowish brown (10YR5/6) mottling. Very similar to interval from 18.2' to 20.0' with decreased iron oxidation of clay matrix. 10 - 20% gravel from 20.0' to 21.0' with some blebs of caliche, unconsolidated. Decreasing gravel to trace from 21.0' to 21.9'. Lower interval from 21.0' to 21.9' is consolidated and appears to be re-worked sandy claystone/siltstone with yellowish brown (10YR5/6) and brownish gray (2.5Y6/2) mottling. Decreasing overall moisture to very moist.
5984		21			
5983		22			No recovery.

Elev (Ft)	Well or Piezometer Construction and Materials	Depth (Ft)	Lithology	Unified Soils Classification or Rock Type	Lithologic Description
5982		23			
5981		24			CL: Clay to Silty Clay (displaced block of claystone, probably slump block). Light brownish gray (2.5Y6/2) and strong brown (7.5YR5/6), mottled. Black organic material (easily smeared when core was split). Cobbles (2" diameter, subangular) of schist at base of interval. Very moist to moist.
5980		25			
5979		26			CL/SM: Clayey, Silty Sand to Sandy, Silty Clay. Re-worked sandy siltstone, part of slump block. Brown (7.5YR5/4). Cohesive. 2" cobble of schist at top of interval. Very moist.
5978		27			SM: Clayey, Silty Sand with some gravel. Strong brown (7.5YR4/6). Sand is fine grained to coarse grained, subangular to subrounded. 5 - 8% gravel and cobbles (1/2" to 1-1/2" diameter, subangular to subrounded, quartzite and schist). Strong pervasive iron oxidation of clay/silt matrix. Loosely consolidated to unconsolidated. Saturated, but not flowing.
5977		28			CL: Clay with trace silt and gravel. Yellowish brown (10YR5/6) with trace to some gray (10YR6/1) mottling. Displaced claystone. Trace black organic stringers. Weak to moderate iron oxidation mottled throughout. Cohesive and firm. 2" diameter cobble (sandstone) at 28.9'. Slight decrease in moisture to very moist.
5976		29			CLAYSTONE: TOP OF BEDROCK. Claystone with trace silt (iron-oxidized bedrock). Brownish yellow (10YR6/8) with gray (10YR5/1) mottling. Strong pervasive iron oxidation from 29.0' to 29.5', then mottled from 29.5' to 31.0'. Thin (1/4" thick) siltstone lense (possible ironstone?) with strong pervasive iron oxidation at 30.0'. Rip-up clasts and associated silty lenses common causing crumbly zones, otherwise claystone is firm and dense. Soft-sediment deformation ball and pillow structure common from ~29.7' to 30.8', with laminae sub-vertical, arcuate as a result. Distinct drop in moisture from very moist to slightly moist. Ironstone clasts to 1/2" at 29.1', 29.5', and possibly others.
5975		30			
5974		31			CLAYSTONE: Claystone, dark gray (10YR4/1) with trace yellowish brown (10YR5/6). Decrease iron oxidation to trace. Friable/crumbly. Caliche stringers and weak pervasive iron oxidation from 31.3' to

Elev (Ft)	Well or Piezometer Construction and Materials	Depth (Ft)	Lithology	Unified Soils Classification or Rock Type	Lithologic Description
5973					31.4'. Moisture decreases to trace.
		32	Threaded End Cap - Sump, Sch 80-PVC Granular Bentonite Backfill		
5972		33			

LOG OF BORING NUMBER:
33905

ROCKY FLATS ENVIRONMENTAL TECHNOLOGY SITE BOREHOLE LOG

PAGE 1 OF 4

Borehole Number: 33905
Location - North: _____ East: _____
Date: 9/21/05
Geologist: E. WARP
Drilling Equip.: 66 DT Geoprobe

Surface Elevation: _____
Area: Replacement of Well # 33904
Total Depth: 33.0' gw
Company: URS/ ~~RFG~~ Golder Project No.: HAD51300
Sample Type: Continuous Core

RMRS LOGGING SUPERVISOR APPROVAL [signature] DATE 9/27/05

TOP/BOTTOM OF CORE IN BOX	TOP/BOTTOM OF INTERVAL	FEET OF CORE IN INTERVAL (FIELD MEASUREMENT)	SAMPLE NUMBER	FRACTURE ANGLE	BEDDING ANGLE	GRAIN SIZE DISTRIBUTION	USCS SYMBOL	DEPTH IN FEET	SOIL/ LITHOLOGIC LOG	SAMPLE DESCRIPTION
	Run #1	Rec.= 2.6'					GC CL	0.0 – 2.6'		0.0-2.6' - GRAVEL/Sandy CLAY Mixture - Fill Material. Brn.(7.5YR 5/4) w/ Tr reddish brn (5YR 4/4) Rocky Flats Alluvium with occasional clast of grysh brn. (10YR 5/2) claystone. 50-55% gravel and cobbles (1/4 to 2" dia., sub-ang. to sub-rounded, predominately qtzite). 45-50% Sandy Clay. Clay matrix has low to medium plasticity with angular, v.c.g. wht fragments common. Tr diss. blebs of caliche Chunks of asphalt fm. 1.8-2.0'. Loosely Consolidated. Sl. moist.
	4.0'							2.6' – 4		2.6-4.0' = No recovery 9/27/05
	Run #2	Rec.= 2.8'					CL	4 – 6.8'		4.0-6.8' - Sandy silty CLAY w/ Tr gravel - Fill Material. Brn. (7.5YR 4/3). Similar to above fm. 0.0 → 2.6' but decrease gravel to ~5%, Tr to some sand (c.g., sub-ang.). Wht., angular, v.c.g. fragments common in clay. Loosely consolidated. Asphalt chunks fm. 5.5-5.8', and Occasional 1-1½" dia. shattered cobbles. MOIST smaller clasts disseminated to 6.8' 9/27/05
	8.0'							6.8' – 8		6.8-8.0' = No recovery 9/27/05
	Run #3 (8.0→12.0')	Rec.= 2.1'					CL	8 – 10.0		8.0-10.1' - silty CLAY w/ Tr to some sand and Tr gravel. Brn. (7.5YR 5/4). Sand is c.g., sub-ang. ~5% gravel (1/8-1/2" dia., sub-ang.). Occasional 1½" dia. shattered cobbles (predominately qtzite), Tr diss. blebs of caliche. Loosely consolidated. Increasing moisture throughout interval fm. V. Moist @ top to WET (but not flowing) @ base.

NOTES: General: USCS is modified for this log as follows:
Materials amounts are estimated by % volume instead of % weight.
(1) Badly broken core, accurate footage measurements not possible.
(2) Core breaks cannot be matched, accurate footage measurements not possible.

(4011-930-0134-930)(Form GT.1A)(03/01/92)

ROCKY FLATS ENVIRONMENTAL TECHNOLOGY SITE BOREHOLE LOG

PAGE 2 OF 4

Borehole Number: 33905
Location - North: _____ East: _____
Date: 9/21/05
Geologist: E. Warp
Drilling Equip.: 66 DT Geoprobe

Surface Elevation: _____
Area: Replacement of well # 33904
Total Depth: 33.0'
Company: URS/Golder Project No.: HAD51300
Sample Type: Continuous Core

RMRS LOGGING SUPERVISOR APPROVAL [signature] DATE 9/27/05

TOP/BOTTOM OF CORE IN BOX	TOP/BOTTOM OF INTERVAL	FEET OF CORE IN INTERVAL (FIELD MEASUREMENT)	SAMPLE NUMBER	FRACTURE ANGLE	BEDDING ANGLE	GRAIN SIZE DISTRIBUTION	USCS SYMBOL	DEPTH IN FEET	SOIL/LITHOLOGIC LOG	SAMPLE DESCRIPTION
							CL	10.0		see page 1 for description
	Run #3 (cont.) 12.0'	Rec. = 2.1						10.1' 11		10.1-12.0' = No recovery
	Run #4 16.0'	Rec. = 2.0'					CL	12 13 14 15		12.0-14.0' silty CLAY w/ ~~R~~ sand and ~~R~~ gravel. Brn. (7.5YR 5/4). V. similar to above fm. 8.0' to 10.1'. Loosely consolidated. WET (but not flowing). 9/27/05 9/27/05
										14.0-16.0' = No recovery
	Run #5 18.2'	Rec. = 1.9'					CL	16 17 17.9'		16.0-17.0' silty CLAY w/ ~~R~~ gravel and ~~R~~ sand. Brn. (7.5YR 4/3) grading into V. Dk. gry (7.5YR 3/1). Distinct color change. V. soft, pliable and plastic. SATURATED (but not flowing) 9/27/05 9/27/05
							CL			17.0-17.9' - Gravelly CLAY w/ ~~R~~ sand. Reddish-brn. (2.5YR 4/4) matrix. Distinct color change. 7-10% gravel (1/4-1" dia., sub-ang., qtzite, schist, granite). V. soft, pliable with high plasticity. SATURATED (but not flowing)
								18 18.2'		17.9 - 18.2' = No recovery
	Run #6 (18.2-24.0')	Rec. = 3.7					SC CL	19 20.0'		18.2-20.0' - Gravelly, Sandy CLAY. Strong brn. (7.5YR 5/6). Distinct color change. 40-45% sand (m.g. to c.g., sub-rounded to sub-ang.) ~45% clay ~10% gravel and cobbles (1/2-1 1/2" dia., sub-rounded). ~~R~~ caliche blebs. Abundant c.g., sized ang. wht. fragments throughout FeOx'd matrix. Wkly. cohesive, low plasticity. SATURATED (but not flowing).

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Materials amounts are estimated by % volume instead of % weight.
(1) Badly broken core, accurate footage measurements not possible.
(2) Core breaks cannot be matched, accurate footage measurements not possible.

Procedure No. RMRS/OPS-PRO.101
Revision 0
Date effective: 12/31/98

(4011-930-0134-930)(Form GT.1A)(03/01/92)

ROCKY FLATS ENVIRONMENTAL TECHNOLOGY SITE BOREHOLE LOG

PAGE 3 OF 4

Borehole Number: 33905
Location - North: _____ East: _____
Date: 9/21/05
Geologist: E. Warp
Drilling Equip.: 66 DT Geoprobe

Surface Elevation: _____
Area: Replacement of Well #33904
Total Depth: 33.0'
Company: URS/Golder Project No. HAD51300
Sample Type: Continuous Core

RMRS LOGGING SUPERVISOR APPROVAL [signature] DATE 9/27/05

TOP/BOTTOM OF CORE IN BOX	TOP/BOTTOM OF INTERVAL	FEET OF CORE IN INTERVAL (FIELD MEASUREMENT)	SAMPLE NUMBER	FRACTURE ANGLE	BEDDING ANGLE	GRAIN SIZE DISTRIBUTION	USCS SYMBOL	DEPTH IN FEET	SOIL/LITHOLOGIC LOG	SAMPLE DESCRIPTION
	Run # 6 (cont.) 18.2 → 24.0'	Rec = 3.7'					SC CL	20.0 21 21.9' 22 23		20.0-21.9' - Gravelly, Sandy CLAY to Gravelly Clayey SAND. Lt. Yellowish brn (10YR 6/4) to Brn. (10YR 5/3) w/some Yellowish brn (10YR 5/6) mottling. V. similar to above fm. 18.2-20.0' w/decreased FeOx'n of clay matrix, 10-20% gravel fm. 20.0-21.0' w/some blebs of caliche, unconsolidated. Decr. gravel to Tr fm. 21.0-21.9'. Lower interval fm. 21.0-21.9' is consolidated and appears to be ~~displaced~~ reworked sandy claystone/siltstone with Yellowish brn. (10YR 5/6) and brn'sh gry (2.5Y 6/2) mottling. Decr. overall moisture to V. Moist. 9/27/05
	24.0'									21.9-24.0' = No recovery
	Run #7	Rec. = 4.0'					CL	24 25 26		24.0-26.2 - CLAY to silty clay - Displaced block of claystone - probable slump block. Lt. brn'sh gry (2.5Y 6/2) and Strong brn. (7.5YR 5/6), mottled. Blk. organic material (easily smeared when core was split). Cobbles, (2" dia., sub-ang.) of schist @ base of interval. V. moist to moist. 9/27/05 9/27/05
	26.2'						SM CL	26.2 26.6'		26.2-26.6' - Clayey, Silty SAND to sandy silty clay ~~Displaced~~ Reworked sandy siltstone, part of slump block. Brn. (7.5YR 5/4), Cohesive. 2" cobble of schist @ top of interval. V. MOIST.
	Run #8	Rec. = 4.0'					SM	27 28 28.1'		26.6-~~28.1~~ 28.1' Clayey, silty SAND w/some gravel. Strong brn. (7.5YR 4/6). Sand is f.g. to c.g, sub-ang. to sub-rounded. 5-8% gravel and cobbles (1/2-1 1/2" dia., sub-ang. to sub-rounded, qtzite and schist). Strong perv. FeOx'n of clay/silt matrix. Loosely consolidated to unconsolidated, SATURATED (but not flowing).
	29.0'						CL	29 29.9 30.0		28.1-~~29.0~~ 29.0' - CLAY w/ Tr silt and gravel. Yellish brn. (10YR 5/6) w/ Tr to some gry (10YR 6/1) mottling. Displaced claystone. Tr blk organic stringers. Wk. to moderate FeOx'n mottled throughout. Cohesive and firm. 2" dia. Cobble (Ss.) @ 28.9'. Sl. decr. in moisture to V. MOIST. 9/27/05 29.0

Change right half of lith. log to CL 9/27/05

Lith log, 29.0-29.9, should be claystone

Bedrock Contact ~~@ 29.0'~~ ~~29.9~~ 29.0 9/27/05

Oops! original call, 29.0 is correct.

Bedrock Contact @ 29.0'

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Materials amounts are estimated by % volume instead of % weight.
(1) Badly broken core, accurate footage measurements not possible.
(2) Core breaks cannot be matched, accurate footage measurements not possible.

Procedure No. RMRS/OPS-PRO.101
Revision 0
Date effective: 12/31/98
Page 27 of 28

(4011-930-0134-930)(Form GT.1A)(03/01/92)

ROCKY FLATS ENVIRONMENTAL TECHNOLOGY SITE BOREHOLE LOG

Borehole Number: 33905
Location - North: _____ East: _____
Date: 9/21/05
Geologist: E. Warp
Drilling Equip.: 66 DT Geoprobe

Surface Elevation: _____
Area: Replacement of Well # 33904
Total Depth: 33.0'
Company: URS/Golder Project No. HAD51300
Sample Type: Continuous Core

RMRS LOGGING SUPERVISOR APPROVAL [signature] DATE 9/27/05

TOP/BOTTOM OF CORE IN BOX	TOP/BOTTOM OF INTERVAL	FEET OF CORE IN INTERVAL (FIELD MEASUREMENT)	SAMPLE NUMBER	FRACTURE ANGLE	BEDDING ANGLE	GRAIN SIZE DISTRIBUTION	USCS SYMBOL	DEPTH IN FEET	SOIL/ LITHOLOGIC LOG	SAMPLE DESCRIPTION
	30.0' Run #9 cont. 31.0'	Rec.= 4.0'			29.7			30.0		29.0-31.0'- CLAYSTONE w/Tr silt. FeOx'd Bedrock. Brn'sh Yellow (10YR 6/8) w/gry (10YR 5/1) mottling. Strong perv. FeOx'n fm. 29.0-29.5" then mottled fm. 29.5-31.0". Thin (1/4" thick) siltstone lense (possible ironstone?) w/ Strong perv. FeOx'n @ 30.0'. Rip-up clasts and associated silty lenses commen causing crumbly zones, otherwise, claystone is firm and dense. Distinct drop in moisture fm. V. moist to Sl. moist. Ironstone clasts, to 1/2" @ 29.1, 29.5, poss. others.
	Run #10 32.0'	Rec.= 4.0'						31		
	Run #11 33.0'	Rec.= 4.0'						32		
								33		31.0-33.0'- CLAYSTONE. Dk gry (10YR 4/1) w/Tr Yellow'sh brn (10YR 5/6). Decr. FeOx'n to Tr. Friable/crumbly. Caliche stringers and wk. perv. FeOx'n fm. 31.3 to 31.4'. Decrease moisture to Tr.
										T.D. @ 33.0'

Soft-sediment deformation ball & pillow structure common, ~29.7-30.8, w/laminae sub-vertical, arcuate as a result.

NOTES: General: USCS is modified for this log as follows:
Materials amounts are estimated by % volume instead of % weight.
(1) Badly broken core, accurate footage measurements not possible.
(2) Core breaks cannot be matched, accurate footage measurements not possible.

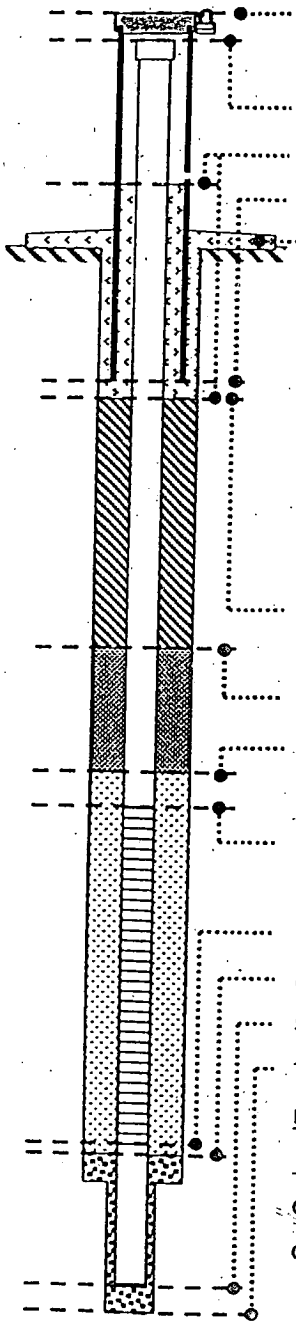
(4011-930-0134-930)(Form GT.1A)(03/01/02)

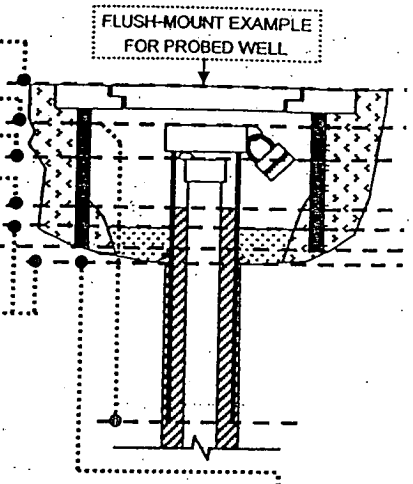
MONITORING WELL INSTALLATION REPORT: Form PRO.118

LOCATION CODE: 33905 PROJECT NAME: CY05 Well Replacements PROGRAM: Water Programs-WPRP
SCREENED FORMATION: Al/Bdrk. DRILLING CONTRACTOR: Golder BORING METHOD: Geoprobe
DATE DRILLED: 9/21/05 DATE COMPLETED: 9/21/05 [9/21/05] TOTAL DEPTH: 33.0' COMPLETED DEPTH: 32.0'
ESTIMATED DEPTH TO BEDROCK: 29.0' RIG GEOLOGIST: E. Warp LOGGING GEOLOGIST: E. Warp
BOREHOLE DIAMETER IN SCREENED INTERVAL: 3.50 QUANTITY OF FLUIDS LOST DURING DRILLING: N/A
INITIAL WATER LEVEL (FT, DATE): Dry on 9/21/05 COMPLETED WATER LEVEL (FT, DATE): 32.62 on 9/23/05
DIAMETER & TYPE OF INSTALLATION (WELL/PIEZOMETER/WELL POINT/ETC.): 1" PVC Well
TYPE OF PROTECTION (FLUSH-MOUNT VS. ABOVE GROUND, ASEPTIC, ETC.): Above ground Steel Protective Casing

ALL MEASUREMENTS WILL BE MADE IN FEET FROM GROUND SURFACE

*DENOTES ITEMS THAT MAY NOT BE APPLICABLE, DEPENDING ON BORING METHOD, WELL PROTECTION & PURPOSE





PROTECTIVE CASING TOP (STICKUP OR FLUSH-MOUNT): 3.35 ags
*SECONDARY CASING TOP: N/A BOTTOM: N/A TYPE: N/A
SURFACE CASING TOP: 2.75' ags ID (IN): 1"
SURFACE SEAL TOP: 0.05' ags BOTTOM: 0.65' bgs TYPE: Concrete
PROTECTIVE CASING BOTTOM, ID (IN), TYPE: 0.65' bgs, 6" Steel
*WELL PAD DIMENSIONS, TYPE: 2.8' x 2.8' Concrete - Am 0.35' ags to 0.1' bgs
*ADD'L CASING FILL TOP: N/A BOTTOM: N/A TYPE: N/A
*SURFACE ISOLATION CASING TOP: N/A BOTTOM: N/A
*SURFACE ISOLATION CASING ID (IN): N/A TYPE: N/A
*OTHER (E.G., ASEPTIC) CASING TOP: N/A BOTTOM: N/A
*OTHER CASING ID (IN): N/A TYPE, PURPOSE: N/A
*CENTRALIZER(S) OD (IN): N/A NUMBER USED: N/A TYPE: N/A
*CENTRALIZER(S) DEPTH(S): N/A
*GROUT TOP: N/A MEASURED DENSITY (LBS/GAL): N/A TYPE: N/A
*GRANULAR BENTONITE TOP: 0.65' bgs TYPE: CETCO - Granular Bentonite
*BENTONITE SEAL TOP: N/A TYPE: N/A
BENTONITE SEAL OR GRANULAR BENTONITE BOTTOM (= FILTER PACK TOP): 4.5'
FILTER PACK TYPE: #6/40 Silica Sand BRAND: C.S.S.I. ~~40~~ 80 AB 11/15/05
SURFACE CASING BOTTOM (=SCREEN TOP): 5.15 TYPE: Sch. ~~40~~ PVC 80
SCREEN ID (IN): 1.0" SLOT SIZE (IN): 0.01" TYPE: Sch ~~40~~ PVC
SCREEN BOTTOM (= SUMP, TOP): 31.9' SUMP TYPE: Threaded end cap
FILTER PACK BOTTOM (= *BACKFILL TOP): 32.0' *BACKFILL TYPE: Granular bentonite
SUMP BOTTOM (= WELL COMPLETED DEPTH): 32.0' *PILOT HOLE TOP, DIAMETER: 3.5"
TOTAL BOREHOLE DEPTH (= *PILOT HOLE AND *BACKFILL BOTTOM): 33.0'
REMARKS: Routine well installation on 9/21/05. ~~Protective~~ ESW

COMPLETED BY: Ellen S. Warp Ellen S. Warp DATE: 9/22/05
CHECKED BY: J. Boylan DATE: 9/27/05

STATE PLANE COORDINATES AREA: GRND ELEV. (FT):6011.494 CASING DIA (IN): 2
NORTH: 750496.75 TOTAL DEPTH (FT): 32.5 BH DIA. (IN): 9
EAST: 2081939.818 COMPLETION DATE: 10/5/05 GRID LOCATOR:
PROJECT: Former B371 GEOLOGIST: E. Warp
REMARKS:
Replaces well 37101.

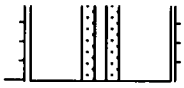
LOG OF BORING NUMBER: 37105

Elev (Ft)	Well or Piezometer Construction and Materials	Depth (Ft)	Lithology	Unified Soils Classification or Rock Type	Lithologic Description
6014	Protective Casing, 6" square Steel; Casing, Sch 40-PVC, 2 in. ID.	3			
6013	Concrete Seal	2			
6012	Concrete Pad	1			
6011		0		GC/CL	GC/CL: Gravel/Silty, Sandy Clay mixture. Fill. Light yellowish brown (10YR6/4) silty, sandy clay matrix. 65 - 70% gravel and cobbles (1/2" - 3" diameter, subangular to subrounded, quartzite and pegmatitic quartz). 30 - 35% silty, sandy clay (to clayey, silty sand) matrix. Sand is fine grained to coarse grained, subrounded. Unconsolidated. Very slightly moist.
6010		1			
6009	Hydrated Bentonite Chips; Hydrated Bentonite Pellets	2			
6008		3			
6007		4			

Elev (Ft)	Well or Piezometer Construction and Materials	Depth (Ft)	Lithology	Unified Soils Classification or Rock Type	Lithologic Description
6006		5			
6005	Filter Pack, 16/40 Silica Sand	6			GC/CL: Gravel/Silty, Sandy Clay mixture. Fill (original B371 fill material). Light olive gray (5Y6/2) to light brown (7.5YR6/3) with some brownish yellow (10YR6/6) silty, sandy clay matrix with occasional clay lenses. Some to abundant (15 - 35%) gravel and cobbles (1/2" - 3" diameter, subangular to subrounded, quartzite and schist). Abundant caliche (disseminated and as blebs) throughout matrix. Low to moderate plasticity. Loosely consolidated. Increased sand toward base of interval. Moist.
6004	Screen, Sch 40-PVC, 2 in. ID., 0.010 in. slots	7			
6003		8			
6002		9			
6001		10			
6000		11			
5999		12			
5998		13			GC/CL: Silty, Sandy Clay/Gravel mixture. Fill. Light brown (7.5YR6/3) to reddish yellow (7.5YR6/6). 50 - 60% gravel and cobbles (1" - 3" diameter, subangular). Very loosely consolidated. Moist.

Elev (Ft)	Well or Piezometer Construction and Materials	Depth (Ft)	Lithology	Unified Soils Classification or Rock Type	Lithologic Description
5997		14			
		15			
5996					
		16			CLAYSTONE: TOP OF BEDROCK. Claystone (weathered bedrock). Yellowish brown (10YR5/6) with gray (10YR6/1) to light brownish gray (10YR6/2) mottling. Moderate iron oxidation mottled throughout. Trace to some black organic stringers. Massive texture. Weakly friable. Moist from 16.0' to 17.0'. Slightly moist from 17.0' to 19.0'. Moderate to strong iron oxidation from 17.0' to 19.0'. Occasional silty zones. Bedrock contact estimated within composite sample.
5995					
		17			
5994					
		18			
5993					
		19			SILTY CLAYSTONE: Silty Claystone, weathered bedrock. Pale brown (10YR6/3) with some brownish yellow (10YR6/6) mottling. Massive texture. Firm and dense. Trace black organic stringers. Moisture decreases to slightly moist.
5992					
		20			
5991					
		21			
5990					
		22			
5989					
		23			

Elev (Ft)	Well or Piezometer Construction and Materials	Depth (Ft)	Lithology	Unified Soils Classification or Rock Type	Lithologic Description
5988		24			
5987		25			
5986		26			CLAYSTONE: Claystone to claystone with silt (weathered bedrock). Yellowish brown (10YR5/6). Strong pervasive iron oxidation. Firm and dense. Slightly moist. Occasional silty zones.
5985		27			
5984		28			CLAYSTONE: Claystone to claystone with silt (weathered bedrock). Light brownish gray (10YR6/2) with yellowish brown (10YR5/6). Decreased overall iron oxidation from above interval. Slightly moist.
5983		29			
5982		30			CLAYSTONE: Claystone to claystone with silt (weathered bedrock). Yellowish brown (10YR5/4) to dark yellowish brown (10YR4/6). Moderate to strong pervasive iron oxidation. Moderately friable. Slightly moist to moist.
5981		31			
5980		32 Threaded			CLAYSTONE: Claystone with silt (unweathered bedrock). Gray (10YR6/1) with some light brownish gray (10YR6/2). Massive texture. Firm and dense. Trace moisture.

Elev (Ft)	Well or Piezometer Construction and Materials	Depth (Ft)	Lithology	Unified Soils Classification or Rock Type	Lithologic Description
5979			End Cap, Conical - Sump, Sch 40-PVC		

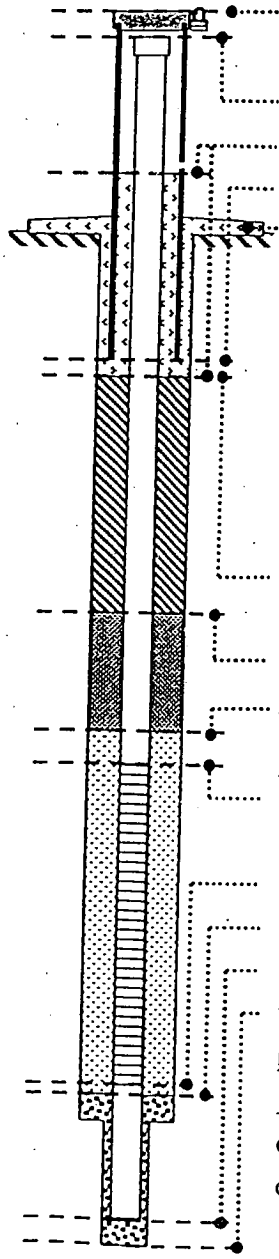
LOG OF BORING NUMBER:
37105

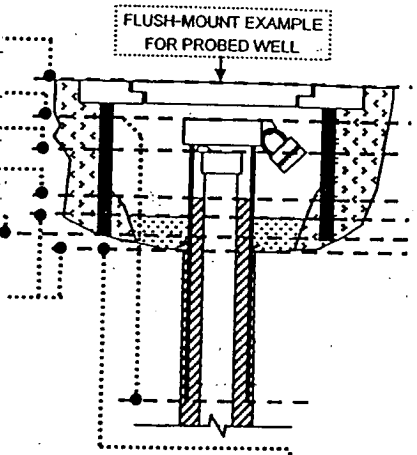
MONITORING WELL INSTALLATION REPORT: Form PRO.118

LOCATION CODE: 37105 PROJECT NAME: CY05 Well Replacements PROGRAM: Water Programs-Warp
SCREENED FORMATION: Al/Bdrk. DRILLING CONTRACTOR: Layne BORING METHOD: Perc. Hammer - Rev. Circ.
DATE DRILLED: 10/5/05 DATE COMPLETED: 10/6/05 TOTAL DEPTH: 32.5' COMPLETED DEPTH: 32.5'
ESTIMATED DEPTH TO BEDROCK: 16.0' RIG GEOLOGIST: E. Warp LOGGING GEOLOGIST: E. Warp
BOREHOLE DIAMETER IN SCREENED INTERVAL: 9" QUANTITY OF FLUIDS LOST DURING DRILLING: N/A
INITIAL WATER LEVEL (FT, DATE): Dry on 10/5/05 COMPLETED WATER LEVEL (FT, DATE): 33.93' (Am. TOC)
DIAMETER & TYPE OF INSTALLATION (WELL/PIEZOMETER/WELL POINT/ETC.): 2" PVC Well
TYPE OF PROTECTION (FLUSH-MOUNT VS. ABOVE GROUND, ASEPTIC, ETC.): 6" steel protective casing - above ground

ALL MEASUREMENTS WILL BE MADE IN FEET FROM GROUND SURFACE

*-DENOTES ITEMS THAT MAY NOT BE APPLICABLE, DEPENDING ON BORING METHOD, WELL PROTECTION & PURPOSE





PROTECTIVE CASING TOP (STICKUP OR FLUSH-MOUNT): 2.99' ags.
*SECONDARY CASING TOP: N/A BOTTOM: N/A TYPE: N/A
SURFACE CASING TOP: 2.58' ags ID (IN): 2.0"
SURFACE SEAL TOP: 1.58' BOTTOM: 0.1' bgs TYPE: Concrete
PROTECTIVE CASING BOTTOM, ID (IN), TYPE: 2.01' bgs, 6" steel
*WELL PAD DIMENSIONS, TYPE: 3' x 3' (square) - Concrete Am. 0.1' bgs to 0.4' ags
*ADD'L CASING FILL TOP: N/A BOTTOM: N/A TYPE: N/A
*SURFACE ISOLATION CASING TOP: N/A BOTTOM: N/A
*SURFACE ISOLATION CASING ID (IN): N/A TYPE: N/A
*OTHER (E.G., ASEPTIC) CASING TOP: N/A BOTTOM: N/A
*OTHER CASING ID (IN): N/A TYPE, PURPOSE: N/A
*CENTRALIZER(S) OD (IN): N/A NUMBER USED: N/A TYPE: N/A
*CENTRALIZER(S) DEPTH(S): N/A
*GROUT TOP: N/A MEASURED DENSITY (LBS/GAL): N/A TYPE: N/A
*GRANULAR BENTONITE TOP: 0.1' bgs TYPE: Enviroplug - Medium Bentonite Chips hydrated w/ 3 gall. of dist. H_2O
*BENTONITE SEAL TOP: 2.0' TYPE: Bentonite Pellets - CETCO - hydrated w/ 1 gall. of dist. H_2O
BENTONITE SEAL OR GRANULAR BENTONITE BOTTOM (= FILTER PACK TOP): 5.9'
FILTER PACK TYPE: 16/40 Silica Sand BRAND: C.S.S.I.
SURFACE CASING BOTTOM (=SCREEN TOP): 7.00' TYPE: Sch. 40-PVC
SCREEN ID (IN): 2.0" SLOT SIZE (IN): 0.01" TYPE: Sch. 40-PVC
SCREEN BOTTOM (= SUMP, TOP): 32.0 SUMP TYPE: Conical Threaded End Cap
FILTER PACK BOTTOM (= *BACKFILL TOP): 32.5' *BACKFILL TYPE: N/A
SUMP BOTTOM (= WELL COMPLETED DEPTH): 32.5' *PILOT HOLE TOP, DIAMETER: N/A
TOTAL BOREHOLE DEPTH (= *PILOT HOLE AND *BACKFILL BOTTOM): 32.5'
REMARKS: Routine well installation on 10/5/05. Well pad poured on 10/6/05
COMPLETED BY: Ellen S. Warp Ellen S. Warp DATE: 10/6/05
CHECKED BY: JOHN BOYLAN DATE: 10/18/05

ROCKY FLATS ENVIRONMENTAL TECHNOLOGY SITE BOREHOLE LOG

PAGE 1 OF 4

Borehole Number: 37105
Location - North: East:
Date: 10/5/05
Geologist: E. Warp
Drilling Equip.: AP1000-Perc. Hammer-Rev. Circ.

Surface Elevation:
Area: Former B371-Replacement of well #37101
Total Depth: 32.5'
Company: URS/Layne Project No. HAD51300
Sample Type: Composite Sampling for Lithologic Sampling only

RMRS LOGGING SUPERVISOR APPROVAL: DATE 10/18/05

TOP/BOTTOM OF CORE IN BOX	TOP/BOTTOM OF INTERVAL	FEET OF CORE IN INTERVAL (FIELD MEASUREMENT)	SAMPLE NUMBER	FRACTURE ANGLE	BEDDING ANGLE	GRAIN SIZE DISTRIBUTION	USCS SYMBOL	DEPTH IN FEET	SOIL/ LITHOLOGIC LOG	SAMPLE DESCRIPTION (HAB 10/18/05)
	0.0							0.0		0.0-6.0'-GRAVEL/silty Sandy CLAY Mixture-Fill. Lt. Yellow'sh brn. (10YR 6/4) silty Sandy Clay matrix. 65-70% gravel and cobbles (1/2" to 3" dia., sub-ang. to sub-rounded, qtzite and pegmatitic qtz). 30-35% silty Sandy clay (to clayey silty sand) matrix. Sand is f.g. to c.g., sub-rounded. Unconsolidated. V. slightly moist. (HAB 10/18/05)
	Composite Sample #1							1		
	2.0'							2		
	#2						GC CL	3		
	4.0'							4		
	#3							5		
	6.0'							6		6.0-13.0'-GRAVEL/silty Sandy CLAY Mixture-Fill. Original B371 fill material. Lt. olive gray (5Y 6/2) to lt. brn. (7.5YR 6/3) w/some brn'sh yellow (10YR 6/6) silty Sandy Clay matrix w/occ. Clay lenses. Some to abundant (15-35%) gravel and cobbles (1/2" to 3" dia., sub-ang. to sub-rounded, qtzite and schist). Abundant caliche (disseminated and as blebs) throughout matrix. Low to moderate plasticity. Loosely consolidated. Increased sand toward base of interval. MOIST. (HAB 10/18/05)
	#4							7		
	8.0'						GC CL	8		
	#5							9		
	9.0'									
	#6							10.0'		

NOTES: General: USCS is modified for this log as follows:
Materials amounts are estimated by % volume instead of % weight.
(1) Badly broken core, accurate footage measurements not possible.
(2) Core breaks cannot be matched, accurate footage measurements not possible.

Procedure No. RMRS/OPS-PRO.101
Revision 0
Date effective: 12/31/98

(4011-930-0134-930)(Form GT.1A)(03/01/92)

ROCKY FLATS ENVIRONMENTAL TECHNOLOGY SITE BOREHOLE LOG

PAGE 2 OF 4

Borehole Number: 37105
Location - North: _____ East: _____
Date: 10/5/05
Geologist: E. Warp
Drilling Equip: ESW ~~DT~~ AP 1000 - Perc. Hammer - Rev. Circ.

Surface Elevation: _____
Area: Former B371 - Replacement of well #37101
Total Depth: 32.5'
Company: URS/Layne Project No.: HAD51300
Sample Type: Composite sampling for lithologic logging only

RMRS LOGGING SUPERVISOR APPROVAL [signature] DATE 10/18/05

TOP/BOTTOM OF CORE IN BOX	TOP/BOTTOM OF INTERVAL	FEET OF CORE IN INTERVAL (FIELD MEASUREMENT)	SAMPLE NUMBER	FRACTURE ANGLE	BEDDING ANGLE	GRAIN SIZE DISTRIBUTION	USCS SYMBOL	DEPTH IN FEET	SOIL/LITHOLOGIC LOG	SAMPLE DESCRIPTION
	Composite sample #6							10.0		10.0-13.0' - GRAVEL/Sandy CLAY Mixture - Fill. (see description on page #1).
	11.0' #7						GC CL	11		
								12		
	13.0' #8							13		16.0 [initials] 10/18/05 13.0-~~15.5'~~ - Silty, sandy CLAY/GRAVEL mixture. Fill Lt. brn. (7.5YR 6/3) to reddish yellow (7.5YR 6/6) 50-60% gravel and cobbles (1-3" dia., subrng.) V. loosely consolidated. MOIST.
							GC CL ESW GC	14		
	15.0' #9							15		Bedrock contact estimated ~~due to~~ ESW within composite sample. Definite lithologic change.
								16		Bedrock Contact (estimated) @ 16.0'
	17.0' #10							17		16.0-19.0' - CLAYSTONE - Weathered Bedrock. Yell'sh brn. (10YR 5/6) w/gry. (10YR 6/1) to lt. brn'sh gry. (10YR 6/2) mottling. Moderate FeOx'n mottled throughout. R- some blk. organic stringers. Massive texture. Wkly. friable. MOIST fm. 16.0 to 17.0'. Decrease moisture to sl. moist fm. 17.0-19.0'. Moderate to strong FeOx'n fm. 17.0-19.0'. Occ. silty zones. [initials] 10/18/05
								18		
	19.0' #11							19		19.0-25.5' - Silty CLAYSTONE - Weathered Bedrock. [initials] 10/18/05 (see description on page 3).
								20.0'		

NOTES: General: USCS is modified for this log as follows:
Materials amounts are estimated by % volume instead of % weight.
(1) Badly broken core, accurate footage measurements not possible.
(2) Core breaks cannot be matched, accurate footage measurements not possible.

(4011-930-0134-930)(Form GT.1A)(03/01/92)

ROCKY FLATS ENVIRONMENTAL TECHNOLOGY SITE BOREHOLE LOG

PAGE 3 OF 4

Borehole Number: 37105
Location - North: _____ East: _____
Date: 10/5/05
Geologist: E. Warp
Drilling Equip.: AP1000-Perc. Hammer-Rev. Circ.

Surface Elevation: _____
Area: Former B371-Replacement of well #37101
Total Depth: 32.5'
Company: URS/Layne Project No.: HAD51300
Sample Type: Composite sampling for lithologic sampling only.

RMRS LOGGING SUPERVISOR APPROVAL [signature] DATE 10/18/05

TOP/BOTTOM OF CORE IN BOX	TOP/BOTTOM OF INTERVAL	FEET OF CORE IN INTERVAL (FIELD MEASUREMENT)	SAMPLE NUMBER	FRACTURE ANGLE	BEDDING ANGLE	GRAIN SIZE DISTRIBUTION	USCS SYMBOL	DEPTH IN FEET	SOIL/LITHOLOGIC LOG	SAMPLE DESCRIPTION
	Composite Sample #11							20.0		~~to~~ silty claystone. [initials] 10/18/05
	21.0' #12							21		19.0-25.5' - ~~CLAYSTONE~~ Weathered Bedrock. Pale brn. (10YR 6/3) w/some brn'sh yellow (10YR 6/6) mottling. Massive texture. Firm and dense. Tr blk. organic stringers. Decreased moisture to Sl. moist.
								22		
	23.0 #13							23		
								24		
	25.0' #14							25		[initials] 10/18/05
								25.5'		25.5'-27.5' - CLAYSTONE to claystone w/silt Weathered bedrock. Yellowish brn. (10YR 5/6). Strong pevv. FeOx'n. Firm and dense. Slightly moist. Dec. silty zones. [initials] 10/18/05
								26		
	27.0' #15							27		
								27.5'		27.5-29.0' - CLAYSTONE to claystone w/silt Weathered bedrock. Lt. brn'sh gry (10YR 6/2) w/yellow'sh brn. (10YR 5/6). Decr. overall FeOx'n fm. above interval. Sl. moist. [initials] 10/18/05
								28		
	29.0' #16							29		[initials] 10/18/05 29.0-31.0 - CLAYSTONE to claystone w/silt Weathered bedrock. Yellowish brn. (10YR 5/4) to dk. yellow'sh brn. (10YR 4/6). Moderate to strong pevv. FeOx'n. Moderately friable. Sl. moist to moist.
								30.0'		

NOTES: General: USCS is modified for this log as follows:
Materials amounts are estimated by % volume instead of % weight.
(1) Badly broken core, accurate footage measurements not possible.
(2) Core breaks cannot be matched, accurate footage measurements not possible.

(4011-930-0134-930)(Form GT.1A)(03/01/92)

ROCKY FLATS ENVIRONMENTAL TECHNOLOGY SITE BOREHOLE LOG

PAGE 4 OF 4

Borehole Number: 37105
Location - North: _____ East: _____
Date: 10/5/05
Geologist: E. Warp
Drilling Equip.: AP1000 - Perc. Hammer - Rev. Circ.

Surface Elevation: _____
Area: Former B371 - Replacement of well #37101
Total Depth: 32.5'
Company: URS/Layne Project No.: HAD51300
Sample Type: Composite samples for lithologic logging only

RMRS LOGGING SUPERVISOR APPROVAL [signature] DATE 10/18/05

TOP/BOTTOM OF CORE IN BOX	TOP/BOTTOM OF INTERVAL	FEET OF CORE IN INTERVAL (FIELD MEASUREMENT)	SAMPLE NUMBER	FRACTURE ANGLE	BEDDING ANGLE	GRAIN SIZE DISTRIBUTION	USCS SYMBOL	DEPTH IN FEET	SOIL/ LITHOLOGIC LOG	SAMPLE DESCRIPTION
3	30.0							30.0		w/silt [initials] 10/18/05 30.0-31.0 - CLAYSTONE Weathered Bedrock. (see page 3 for description).
	Composite Sample #16							31		[initials] 10/18/05
	#17							32		w/silt 31.0-32.5' - CLAYSTONE Un-weathered bedrock. Gry (10YR6/1) w/some lt. brnish gry (10YR6/2). Massive texture. Firm and dense. Tr moisture.
32.5'	32.5'							32.5		T.D. @ 32.5'

NOTES: General: USCS is modified for this log as follows:
Materials amounts are estimated by % volume instead of % weight.
(1) Badly broken core, accurate footage measurements not possible.
(2) Core breaks cannot be matched, accurate footage measurements not possible.

Procedure No. RMRS/OPS-PRO.101
Revision 0
Date effective: 12/31/98

(4011-930-0134-930)(Form GT.1A)(03/01/92)

STATE PLANE COORDINATES AREA:
NORTH: 750660.545
EAST: 2082593.074
PROJECT: Former B371/374
REMARKS:
Replaces well 37402, 37401

GRND ELEV. (FT):6007.304
TOTAL DEPTH (FT): 43.2
COMPLETION DATE: 10/4/05
GEOLOGIST: E. Warp

CASING DIA (IN): 2
BH DIA. (IN): 9
GRID LOCATOR:

LOG OF BORING NUMBER: 37405

Elev (Ft)	Well or Piezometer Construction and Materials	Depth (Ft)	Lithology	Unified Soils Classification or Rock Type	Lithologic Description
6010, 6009, 6008, 6007, 6006, 6005, 6004, 6003	Protective Casing, Steel, 6 in. square; Casing, Sch 40-PVC, 2 in. ID.; Concrete Seal; Concrete Pad; Hydrated Bentonite Chips; Hydrated Bentonite Pellets	3, 2, 1, 0, 1, 2, 3, 4			
				GC/CL	GC/CL: Clay/Gravel mixture, fill. Brown (7.5YR4/4) clay with 65 - 70% gravel and cobbles (1/2" - 3" diameter, subangular to subrounded, predominately quartzite with some schist and trace red sandstone). Loosely consolidated to unconsolidated. Trace moisture to very slightly moist.
				SC/GC	SC/GC: Clayey Sand/Gravel, fill. Brown (7.5YR5/3) to light brown (7.5YR6/3) with some reddish-yellow (7.5YR6/6) clayey sand matrix.

Elev (Ft)	Well or Piezometer Construction and Materials	Depth (Ft)	Lithology	Unified Soils Classification or Rock Type	Lithologic Description
6002, 6001, 6000, 5999, 5998, 5997, 5996, 5995, 5994	Filter Pack, 16/40 Silica Sand; Screen, Sch 40-PVC, 2 in. ID., 0.010 in. slots	5, 6, 7, 8, 9, 10, 11, 12, 13			~70% gravel and cobbles (1/4" - 3" diameter, subangular, quartzite, schist, and trace granite). Disseminated caliche throughout clayey sand. Unconsolidated. Slightly moist.
					GC/CL: Gravelly, Silty Clay with some sand. Original B371 fill material. Light yellowish brown (2.5Y6/3) to pale olive (5Y6/3) silty clay matrix. 10 - 20% gravel (1/4" - 3/4" diameter, subrounded to subangular, quartzite and schist). Some to abundant disseminated white fragments (medium grained, angular) and disseminated caliche throughout matrix. Occasional 1" - 3" diameter quartzite cobbles. Increasing sand throughout interval from 7 - 20% (medium grained to coarse grained, subangular). Loosely consolidated. Slightly moist.
					GC/CL: Gravelly, Silty Clay with some sand. Brown (7.5YR5/4) with some strong brown (7.5YR5/6) sandy, silty clay matrix. ~50% gravel (3/4" to 1-1/2" diameter, subrounded, quartzite and schist). ~50%

Elev (Ft)	Well or Piezometer Construction and Materials	Depth (Ft)	Lithology	Unified Soils Classification or Rock Type	Lithologic Description
5993		14			sandy, silty clay matrix. Occasional clast of pale olive (5Y6/3) gravelly clay with abundant caliche. Loosely consolidated to unconsolidated. Slightly moist.
5992		15			CL: Silty Clay with some sand. Strong brown (7.5YR4/6) with trace light olive gray (5Y6/2) mottling. Distinct color change. Occasional clasts of re-worked/displaced iron oxidized claystone (with black organic stringers). Interval is predominately silty clay clasts with abundant medium grained to coarse grained, white angular fragments. Occasional quartzite cobbles. Single shattered mafic clast (artificial?) at ~18.7'. Moist.
5991		16			
5990		17			
5989		18			
5988		19			SC/CL: Silty, Sandy Clay with trace gravel. Strong brown (7.5YR5/6) with some light olive gray (5Y6/2) mottling. 40 - 50% silty sand (medium grained to coarse grained, subangular to subrounded). 50 - 60% clay with abundant coarse grained, white fragments throughout. Some disseminated caliche. Cohesive. Iron oxidation mottled throughout matrix from 23.0' to 25.0'. Trace subrounded gravel (1/4" - 1" diameter) from 23.0' to 25.0'. Moist.
5987		20			
5986		21			
5985		22			

Elev (Ft)	Well or Piezometer Construction and Materials	Depth (Ft)	Lithology	Unified Soils Classification or Rock Type	Lithologic Description
		23			
5984					
		24			
5983					
		25			CL: Sandy Clay with trace to some gravel. Re-worked claystone with coarse grained sandy lenses with gravel. Yellowish brown (10YR5/8) with trace gray (10YR6/1) mottling. 7 - 15% sand (coarse grained, subangular). Moderate to strong iron oxidation of clay matrix. Blebs of caliche common. Black organic material and possible manganese oxide disseminated within sandy lenses. Moist.
5982					
		26			
5981					
		27			
5980					
		28			CLAYSTONE: TOP OF BEDROCK. Claystone, weathered bedrock, yellowish brown (10YR5/6) with gray (10YR6/1) and grayish brown (10YR5/2) mottling. Black organic stringers common. Firm and dense. Trace white caliche blebs from 29.0' to 31.0'. Silty. Iron oxidized lenses with ironstone fragments from 33.0' to 35.0'. Moist. Bedrock contact estimated within composite sample.
5979					
		29			
5978					
		30			
5977					
		31			
5976					

Elev (Ft)	Well or Piezometer Construction and Materials	Depth (Ft)	Lithology	Unified Soils Classification or Rock Type	Lithologic Description
5975		32			
5974		33			
5973		34			
5972		35			CLAYSTONE: Claystone, weathered bedrock. Same as interval from 27.5' to 35.0', but decreased moisture to slightly moist. Black organic coating fracture (orientation of clast?) at 35.5'. Trace silt (disseminated).
5971		36			
5970		37			CLAYSTONE: Claystone, weathered bedrock, yellowish brown (10YR5/6 to 10YR5/4). Very similar to interval from 35.0' to 37.0', but more massive texture and decrease black organics to trace. Dense and firm. Decreasing moisture to very slightly moist. Trace disseminated silt.
5969		38			
5968		39			CLAYSTONE: Claystone, weathered bedrock, yellowish brown (10YR5/6) with dark gray mottling. Undulatory bedding planes clearly visible. Dense and firm. Moisture decreases to trace.
5967		40			

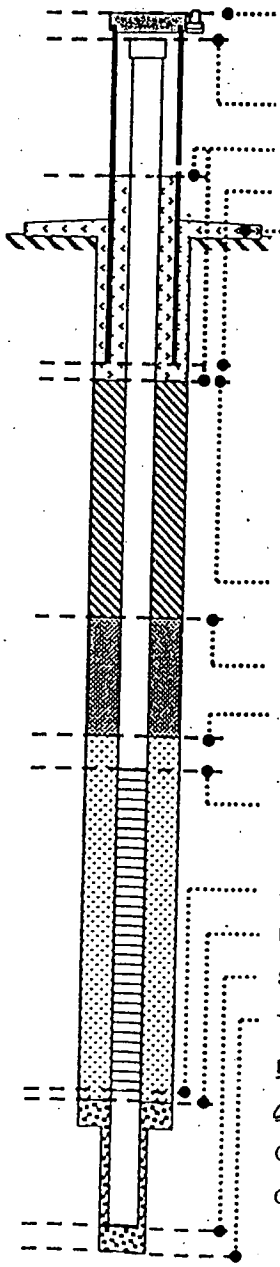
Elev (Ft)	Well or Piezometer Construction and Materials	Depth (Ft)	Lithology	Unified Soils Classification or Rock Type	LOG OF BORING NUMBER: 37405 Lithologic Description	Page 6 of 6
5966		41			CLAYSTONE: Claystone with trace to some silt. Un-weathered to weakly weathered bedrock. Grayish brown (10YR5/2) with trace to some yellowish brown (10YR5/8) mottling. Weakly fissile and friable. Some black organics on undulatory bedding planes. Trace moisture.	
5965		42				
		43	Threaded End Cap - Conical, Sch 40-PVC			

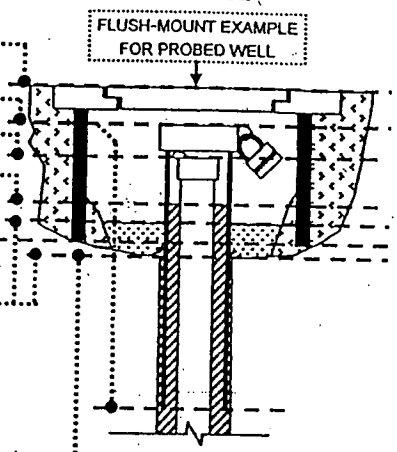
MONITORING WELL INSTALLATION REPORT: Form PRO.118

LOCATION CODE: 37405 PROJECT NAME: CY05 Well Replacements PROGRAM: Water Programs - WARP
SCREENED FORMATION: Al/Bdrk. DRILLING CONTRACTOR: Layne BORING METHOD: Perc. Hammer - Rev. Circ.
DATE DRILLED: 10/4/05 DATE COMPLETED: 10/6/05 TOTAL DEPTH: 43.2' COMPLETED DEPTH: 43.2'
ESTIMATED DEPTH TO BEDROCK: 27.5 RIG GEOLOGIST: E. Warp LOGGING GEOLOGIST: E. Warp
BOREHOLE DIAMETER IN SCREENED INTERVAL: 9.0" QUANTITY OF FLUIDS LOST DURING DRILLING: N/A
INITIAL WATER LEVEL (FT, DATE): Dry on 10/4/05 COMPLETED WATER LEVEL (FT, DATE): Dry on 10/6/05
DIAMETER & TYPE OF INSTALLATION (WELL/PIEZOMETER/WELL POINT/ETC.): 2.0" PVC Well
TYPE OF PROTECTION (FLUSH-MOUNT VS. ABOVE GROUND, ASEPTIC, ETC.): Aboveground Steel protective casing

ALL MEASUREMENTS WILL BE MADE IN FEET FROM GROUND SURFACE

*DENOTES ITEMS THAT MAY NOT BE APPLICABLE, DEPENDING ON BORING METHOD, WELL PROTECTION & PURPOSE





PROTECTIVE CASING TOP (STICKUP OR FLUSH-MOUNT): 3.31' ags
*SECONDARY CASING TOP: N/A BOTTOM: N/A TYPE: N/A
SURFACE CASING TOP: 2.89' ags ID (IN): 2.0"
SURFACE SEAL TOP: 1.44' ags BOTTOM: 0.1' bgs TYPE: Concrete
PROTECTIVE CASING BOTTOM, ID (IN), TYPE: 1.69' bgs, 6" square steel
*WELL PAD DIMENSIONS, TYPE: 3'x3', concrete 8in. 0.1' bgs to 0.4' ags
*ADD'L CASING FILL TOP: N/A BOTTOM: N/A TYPE: N/A
*SURFACE ISOLATION CASING TOP: N/A BOTTOM: N/A
*SURFACE ISOLATION CASING ID (IN): N/A TYPE: N/A
*OTHER (E.G., ASEPTIC) CASING TOP: N/A BOTTOM: N/A
*OTHER CASING ID (IN): N/A TYPE, PURPOSE: N/A
*CENTRALIZER(S) OD (IN): N/A NUMBER USED: N/A TYPE: N/A
*CENTRALIZER(S) DEPTH(S): N/A
*GROUT TOP: N/A MEASURED DENSITY (LBS/GAL): N/A TYPE: N/A
*GRANULAR BENTONITE TOP: 0.1' TYPE: Med Chips - ~~CETCO~~ Enviroplug hydrated w/ 2 gall. dist. H_2O
*BENTONITE SEAL TOP: 3.9 TYPE: Pellets - CETCO - hydrated w/ 3 gall. of dist. H_2O
BENTONITE SEAL OR GRANULAR BENTONITE BOTTOM (= FILTER PACK TOP): 6.9'
FILTER PACK TYPE: 16/40 Silica Sand BRAND: C.S.S.I.
SURFACE CASING BOTTOM (=SCREEN TOP): 7.56 TYPE: Sch. 40-PVC
SCREEN ID (IN): 2.0" SLOT SIZE (IN): 0.01" TYPE: Sch. 40-PVC
SCREEN BOTTOM (= SUMP, TOP): 42.7' SUMP TYPE: Threaded end cap - Conical
FILTER PACK BOTTOM (= *BACKFILL TOP): 43.2' *BACKFILL TYPE: N/A
SUMP BOTTOM (= WELL COMPLETED DEPTH): 43.2' *PILOT HOLE TOP, DIAMETER: N/A
TOTAL BOREHOLE DEPTH (= *PILOT HOLE AND *BACKFILL BOTTOM): 43.2'

REMARKS: Routine well installation on 10/4/05. Well pad installed on 10/6/05.

COMPLETED BY: Ellen S. Warp Ellen S. Warp DATE: 10/6/05
CHECKED BY: JOHN BOYLAN DATE: 10/18/05

U.S. DEPARTMENT OF ENERGY ROCKY FLATS PLANT

FORM PRO.101A

ROCKY FLATS ENVIRONMENTAL TECHNOLOGY SITE BOREHOLE LOG

PAGE 1 OF 5

Borehole Number: 37405
Location - North: _____ East: _____
Date: 10/4/05
Geologist: E. Warp
Drilling Equip.: AP1000 Perc. Hammer - Rev. Circ.

Surface Elevation:
Area: Former B371/374 - Replacement of well #37402, 37401
Total Depth: 43.2'
Company: 2IRS/Layne Project No.: HAD51300
Sample Type: Composite Sampling for Lithologic Logging Only

RMRS LOGGING SUPERVISOR APPROVAL _____ DATE 10/18/05

TOP/BOTTOM OF CORE IN BOX	TOP/BOTTOM OF INTERVAL	FEET OF CORE IN INTERVAL (FIELD MEASUREMENT)	SAMPLE NUMBER	FRACTURE ANGLE	BEDDING ANGLE	GRAIN SIZE DISTRIBUTION	USCS SYMBOL	DEPTH IN FEET	SOIL/LITHOLOGIC LOG	SAMPLE DESCRIPTION
	0.0' Composite Sample #1 2.0' #2 4.0'						GC CL	0.0, 1, 2, 3, 4	Required on orig. also	0.0-4.0' - CLAY / GRAVEL Mixture - FILL. Brn. (7.5YR 4/4) clay w/ 65-70% gravel and cobbles (1/2" to 3" dia., sub-ang. to sub-rounded, predominately qtzite with some schist and tr red Ss.). Loosely consolidated to unconsolidated. Tr moisture to V. slightly moist.
	#3 7.0'						GC SC	4, 5, 6, 7		4.0-9.0' - Clayey SAND/GRAVEL - Fill. Brn. (7.5YR 4/3) to H. brn. (7.5YR 4/3) with some reddish-yellow (7.5YR 6/6) clayey sand matrix. ~70% gravel and cobbles (1/4" to 3" dia., sub-ang., qtzite, schist and tr granite). Disseminated caliche throughout clayey sand. Unconsolidated. Sl. moist. 10/18/05
	#4 9.0'							7, 8, 9		9.0-13.0' - Gravelly silty CLAY w/ some sand. Original B371 fill material. Lt. yellowish brn. (2.5Y 6/3) to pale olive (5Y 6/3) clay matrix. 10-20% gravel (1/4-3/4" dia., sub-rounded to sub-ang., qtzite and schist). Some to abundant diss. wht. fragments (m.g., ang.) and diss. caliche throughout matrix. Occasional 1" to 3" dia. cobbles of qtzite. Increasing sand throughout interval fm. 7-20% (m.g. to c.g., sub-ang.). Loosely consolidated, Sl. moist. 10/18/05
	#5						CL GC	9, 10.0'		

NOTES: General: USCS is modified for this log as follows:
Materials amounts are estimated by % volume instead of % weight.
(1) Badly broken core, accurate footage measurements not possible.
(2) Core breaks cannot be matched, accurate footage measurements not possible.

Procedure No. RMRS/OPS-PRO.101
Revision 0
Date effective: 12/31/98

(4011-93G-0134-930)(Form GT.1A)(03/01/92)

U.S. DEPARTMENT OF ENERGY ROCKY FLATS PLANT

FORM PRO.101A

ROCKY FLATS ENVIRONMENTAL TECHNOLOGY SITE BOREHOLE LOG

PAGE 2 OF 5

Borehole Number: 37405
Location - North: _____ East: _____
Date: 10/4/05
Geologist: E. Warp
Drilling Equip.: AP1000-Perc. Hammer-Rev. Circ.

Surface Elevation: _____
Area: Former B371/374 - Replacement of Well #37402
Total Depth: 43.2'
Company: URS/Layne Project No.: HR005300
Sample Type: Composite Sampling for lithologic logging only

RMRS LOGGING SUPERVISOR APPROVAL _____ DATE 10/18/05

TOP/BOTTOM OF CORE IN BOX	TOP/BOTTOM OF INTERVAL	FEET OF CORE IN INTERVAL (FIELD MEASUREMENT)	SAMPLE NUMBER	FRACTURE ANGLE	BEDDING ANGLE	GRAIN SIZE DISTRIBUTION	USCS SYMBOL	DEPTH IN FEET	SOIL/ LITHOLOGIC LOG	SAMPLE DESCRIPTION
	Composite Sample #5 11.0'						CL	10.0		10.0-13.0 Gravelly CLAY w/some sand. (described on page #1).
	#6 13.0'						CL	11, 12, 13		10/18/05 (+3)
	#7 15.0'						SC	13, 14, 15		13.0-15.0' - GRAVELLY silty CLAY w/some sand. Brn. (7.5YR 5/4) w/some strong brn. (7.5YR 5/6) sandy silty clay matrix. ~50% gravel (3/4" to 1 1/2" dia, subrounded, qtzite and schist), ~50% sandy silty clay matrix. Occasional clast of pale olive (5Y 6/3) gravelly clay w/abundant caliche. Loosely consolidated to unconsolidated. Slightly moist.
	#8 17.0'						CL	15, 16, 17		15.0-19.0' - Silty CLAY w/some sand. Strong brn. (7.5YR 4/6) w/ lt. olive gry (5Y 6/2) mottling. Distinct color change. Occasional clasts of reworked/displaced Fe oxd claystone (w/ blk organic stringers). Interval is predominately silty clay clasts w/abundant m.g. to c.g., wht. ang. fragments. - Occasional qtzite cobbles. Single MOIST. Shattered mafic clast (artificial?) @18.7' 10/18/05
	#9 19.0'							18, 19		
	#10						CL SC	19, 20.0'		19.0-25.0 - Silty, Sandy CLAY w/R gravel (see page #3 for description).

NOTES: General: USCS is modified for this log as follows:
Materials amounts are estimated by % volume instead of % weight.
(1) Badly broken core, accurate footage measurements not possible.
(2) Core breaks cannot be matched, accurate footage measurements not possible.

Procedure No. RMRS/OPS-PRO.101
Revision 0
Date effective: 12/31/98

(4011-930-0134-930)(Form GT.1A)(03/01/92)

U.S. DEPARTMENT OF ENERGY ROCKY FLATS PLANT

FORM PRO.101A

ROCKY FLATS ENVIRONMENTAL TECHNOLOGY SITE BOREHOLE LOG

Borehole Number: 37405
Location - North: _____ East: _____
Date: 10/4/05
Geologist: E. Wurp
Drilling Equip.: AP1000- Perc. Hammer-Rev. Circ.

Surface Elevation: _____
Area: Former B371/374-Replacement of well #37402
Total Depth: 43.2'
Company: URS/Layne Project No. #ND5/300
Sample Type: Composite Sampling for Lithologic Logging Only

RMRS LOGGING SUPERVISOR APPROVAL _____ DATE 10/18/05

TOP/BOTTOM OF CORE IN BOX	TOP/BOTTOM OF INTERVAL	FEET OF CORE IN INTERVAL (FIELD MEASUREMENT)	SAMPLE NUMBER	FRACTURE ANGLE	BEDDING ANGLE	GRAIN SIZE DISTRIBUTION	USCS SYMBOL	DEPTH IN FEET	SOIL/ LITHOLOGIC LOG	SAMPLE DESCRIPTION
	Composite Sample #10 21.0'						CL SC	20.0 21 22 23 24 25		19.0-25.0'- Silty, Sandy CLAY w/ Tr gravel. Strong brn. (7.5YR 5/6) w/some lt. olive gry (5Y 6/2) mottling. 40-50% silty SAND (m.g. to c.g., sub-ang. to sub-rounded). 50-60% clay. w/ abundant c.g. wht. fragments throughout. Some diss. caliche. Cohesive. FeOx'n mottled throughout matrix fm. 23.0-25.0'. Tr sub-rounded gravel (1/4" to 1" dia.) fm. 23.0 to 25.0'. MOIST.
	#11 23.0'									
	#12 25.0'									
	#13 27.0'						CL	26 27 27.5'		25.0-27.5'- Sandy CLAY w/ Tr to some gravel. Re-worked claystone w/ c.g. sandy lenses w/ gravel. Yellow'sh brn. (10YR 5/8) w/ Tr gry. (10YR 6/1) mottling. 7-15% sand (c.g., sub-ang.). Moderate to strong FeOx'n of clay matrix. Blebs of caliche common. Blk. organic material and possible MnOx disseminated w/in sandy lenses. MOIST. Bedrock Contact (estimated) @ 27.5'
	#14 29.0'		Bedrock Contact estimated @ 27.5' due to composite sampling					28 29 30.0'		27.5'-35.0'- CLAYSTONE- Weathered Bedrock. Yellow'sh brn. (10YR 5/6) w/ gry (10YR 6/1) and gry'sh brn. (10YR 5/2) mottling. Blk. organic stringers common. Firm and dense. Tr wht. caliche blebs fm. 29.0-31.0'. Silty, FeOx'd lenses w/ ironstone fragments fm. 33.0-35.0'. MOIST ~~Sample~~ 10/18/05
	#15									

NOTES: General: USCS is modified for this log as follows:
Materials amounts are estimated by % volume instead of % weight.
(1) Badly broken core, accurate footage measurements not possible.
(2) Core breaks cannot be matched, accurate footage measurements not possible.

Procedure No. RMRS/OPS-PRO.101
Revision 0
Date effective: 12/31/98

(4011-930-0134-930)(Form GT.1A)(03/01/92)

U.S. DEPARTMENT OF ENERGY ROCKY FLATS PLANT

FORM PRO.101A

ROCKY FLATS ENVIRONMENTAL TECHNOLOGY SITE BOREHOLE LOG

Borehole Number: 37405
Location - North: _____ East: _____
Date: 10/4/05
Geologist: E. Warp
Drilling Equip.: AP1000 - Perc. Hammer - Rev. Circ.

Surface Elevation: _____
Area: Former B371/374 - Replacement of well #37402
Total Depth: 43.2'
Company: 2LRS/ Layne Project No.: HAD51300
Sample Type: Composite Samples for Lithologic Sampling Only

RMRS LOGGING SUPERVISOR APPROVAL _____ DATE 10/18/05

TOP/BOTTOM OF CORE IN BOX	TOP/BOTTOM OF INTERVAL	FEET OF CORE IN INTERVAL (FIELD MEASUREMENT)	SAMPLE NUMBER	FRACTURE ANGLE	BEDDING ANGLE	GRAIN SIZE DISTRIBUTION	USCS SYMBOL	DEPTH IN FEET	SOIL/ LITHOLOGIC LOG	SAMPLE DESCRIPTION
	Composite Sample #15							30.0		30.0-35.0-CLAYSTONE-Weathered Bedrock (described on page #3).
	31.0'							31		
	#16							32		
	33.0'							33		
	#17							34		
	35.0'							35		35.0-37.0'-CLAYSTONE-Weathered Bedrock. Same as above fm. 27.5' to 35.0' but decreased moisture to slightly MOIST. Blk. organic coating fracture (orientation of clast ?) @ 35.5'. Tr silt (disseminated). JAB 10/18/05
	#18							36		
	37.0'							37		37.0-39.0-CLAYSTONE-Weathered Bedrock. Yellow'sh brn. (10YR5/6 to 5/4). V. similar to above interval fm. 35.0-37.0' but more massive texture and decrease blk. organics to Tr. Dense and firm. Decr. moisture to V. slightly moist. Tr disseminated silt. JAB 10/18/05
	#19							38		
	39.0'							39		39.0-41.0'-CLAYSTONE-Weathered Bedrock. Yellow'sh Brn. (10YR5/6) w/ dk. gry. (10YR mottling. Undulatory bedding planes clearly visible. Dense and firm. Decr. moisture to Tr.
	#20							40.0'		

NOTES: General: USCS is modified for this log as follows:
Materials amounts are estimated by % volume instead of % weight.
(1) Badly broken core, accurate footage measurements not possible.
(2) Core breaks cannot be matched, accurate footage measurements not possible.

Procedure No. RMRS/OPS-PRO.101
Revision 0
Date effective: 12/31/98

(4011-930-0134-930)(Form GT.1A)(03/01/92)

U.S. DEPARTMENT OF ENERGY ROCKY FLATS PLANT

FORM PRO.101A

ROCKY FLATS ENVIRONMENTAL TECHNOLOGY SITE BOREHOLE LOG

Borehole Number: 37405
Location - North: _____ East: _____
Date: 10/4/05
Geologist: E. Warp
Drilling Equip.: AP1000-Perc. Hammer-Rev. Circ.

Surface Elevation: _____
Area: Former B371/374-Replacement of Well # 37402
Total Depth: 43.2'
Company: URS/Layne Project No. HAD51300
Sample Type: Composite Samples for Lithologic Logging Only

RMRS LOGGING SUPERVISOR
APPROVAL _____ DATE _____

TOP/BOTTOM OF CORE IN BOX	TOP/BOTTOM OF INTERVAL	FEET OF CORE IN INTERVAL (FIELD MEASUREMENT)	SAMPLE NUMBER	FRACTURE ANGLE	BEDDING ANGLE	GRAIN SIZE DISTRIBUTION	USCS SYMBOL	DEPTH IN FEET	SOIL/ LITHOLOGIC LOG	SAMPLE DESCRIPTION
	Composite Sample #20							40.0		40.0-41.0- CLAYSTONE-Weathered Bedrock (see description on page #4). 10/6/05
	41.0'							41		41.0-43.2'- CLAYSTONE w/ Tr to some silt. Un-weathered to wkly weathered Bedrock. Gry'sh brn. (10YR 5/2) w/ Tr to some yellow'sh brn. (10YR 4/8) mottling. Wkly fissile and friable. Some blk. organics on undulatory bedding planes. Tr moisture.
	#21							42		
								43		
	43.2'							43.2'		T.D. @ 43.2'

NOTES: General: USCS is modified for this log as follows:
Materials amounts are estimated by % volume instead of % weight.
(1) Badly broken core, accurate footage measurements not possible.
(2) Core breaks cannot be matched, accurate footage measurements not possible.

Procedure No. RMRS/OPS-PRO.101
Revision 0
Date effective: 12/31/98

(4011-930-0134-930)(Form GT.1A)(03/01/92)

STATE PLANE COORDINATES AREA:
NORTH: 750691.557
EAST: 2082412.953
PROJECT: Former B371
REMARKS:
Replaces well 37501

GRND ELEV. (FT): 6009.164
TOTAL DEPTH (FT): 40.8
COMPLETION DATE: 10/3/05
GEOLOGIST: E. Warp

CASING DIA (IN): 2
BH DIA. (IN): 9
GRID LOCATOR:

LOG OF BORING NUMBER: 37505

Elev (Ft)	Well or Piezometer Construction and Materials	Depth (Ft)	Lithology	Unified Soils Classification or Rock Type	Lithologic Description
6012	Protective Casing, Steel, 6 in. square; Casing, Sch 40-PVC, 2 in. ID.	3			
6011		2			
6010	Concrete Seal; Concrete Pad	1			
6009		0		CL	CL: Sandy Clay with trace gravel, fill. Brown (7.5YR5/3 to 7.5YR5/4). Clay matrix with some sand (coarse grained, subangular). Trace gravel (1/4" - 1/2" diameter, subangular, predominately quartzite and schist). Some cobbles present in fill at surface, but not reflected in sample. Clay matrix has low to medium plasticity. Slightly moist.
6008		1			
6007		2			
6006		3			
6005	Hydrated Bentonite Chips; Hydrated Bentonite Pellets	4		GC/CL	GC/CL: Clayey Gravel, brown (10YR5/3) clay matrix with 35 - 40% gravel (1" - 2" diameter, subangular, quartzite, schist, and occasional red sandstone). Clay has low to medium plasticity.

Elev (Ft)	Well or Piezometer Construction and Materials	Depth (Ft)	Lithology	Unified Soils Classification or Rock Type	Lithologic Description
6004		5			
6003		6			CL: Clay with trace sand and gravel. Brown (10YR5/3) to grayish brown. Interval is fill material predominately composed of displaced claystone.
6002		7			
6001		8			GC: Gravel with some sand and clay. Asphalt and road base; asphalt at 8.0' to 9.0' interval. Brown (10YR5/3) clay matrix. 2" - 4" diameter chunks of black asphalt. Gravel is predominately quartzite (1" - 2" diameter, subangular).
6000	Filter Pack, 16/40 Silica Sand	9			
5999	Screen, Sch 40-PVC, 2 in. ID., 0.010 in. slots	10			
5998		11			GC/CL: Sandy, Clayey Gravel, strong brown (7.5YR5/6). Distinct color change. ~50% sandy clay (low plasticity) with pervasive iron oxidation. ~50% gravel (1" - 2" diameter, subangular, schist, quartzite and trace asphalt).
5997		12			
5996		13			

Elev (Ft)	Well or Piezometer Construction and Materials	Depth (Ft)	Lithology	Unified Soils Classification or Rock Type	Lithologic Description
5995		14			
5994		15			GC/CL: Sandy Clay/Gravel mixture, pinkish gray (7.5YR6/2) with strong brown (7.5YR5/6), yellowish brown (10YR5/6), and pale olive (5Y6/3) mottling within clay. Distinct color change. Blebs of caliche common. Appears to be original fill used during construction of B371.
5993		16			
5992		17			GC/CL: Sandy Clay/Gravel mixture. Strong brown (7.5YR5/6) sandy clay. ~65% sandy clay with white, coarse grained, subangular fragments common. Trace to some disseminated white caliche blebs. ~35% gravel (1/2" to 1-1/2" diameter, subangular to subrounded, quartzite, schist, and occasional red sandstone clasts).
5991		18			
5990		19			
5989		20			
5988		21			GC/CL: Sandy Clay/Gravel mixture. Strong brown (7.5YR5/6) sandy clay. Very similar to interval from 17.0' to 21.0'. ~60% gravel (1/4" - 1" diameter, subrounded to subangular, quartzite and schist) from 21.0' to 23.0'. Trace to some gravel from 23.0' to 24.0'. Sandy clay is very sticky and plastic. Very moist (moisture content of fill is questionable since water is periodicaly injected for dust control).
5987		22			

Elev (Ft)	Well or Piezometer Construction and Materials	Depth (Ft)	Lithology	Unified Soils Classification or Rock Type	Lithologic Description
		23			
5986					CL: Refer to description above.
		24			
5985					CLAYSTONE: TOP OF BEDROCK. Claystone, weathered bedrock, yellowish brown (10YR5/8) with trace gray (10YR6/1) mottling. Pervasive iron oxidation. Black organic stringers throughout. Claystone is firm and dense. Moist. Bedrock contact estimated within composite sample.
		25			
5984					
		26			
5983					
		27			
5982					Missed sample.
		28			
5981					
		29			
5980					CLAYSTONE: Claystone, weathered bedrock. Same as interval from 24.0' to 27.0' with trace to some silt. Moisture decreases to slightly moist.
		30			
5979					
		31			
5978					CLAYEY SILTSTONE: Clayey Siltstone, weathered bedrock. Light yellowish brown (10YR6/4) to brownish yellow (10YR6/6). Massive textured. Increasing pervasive iron oxidation throughout interval. Moderate pervasive iron oxidation from 33.0' to 35.0'. Firm and dense. Moisture decreases to trace.

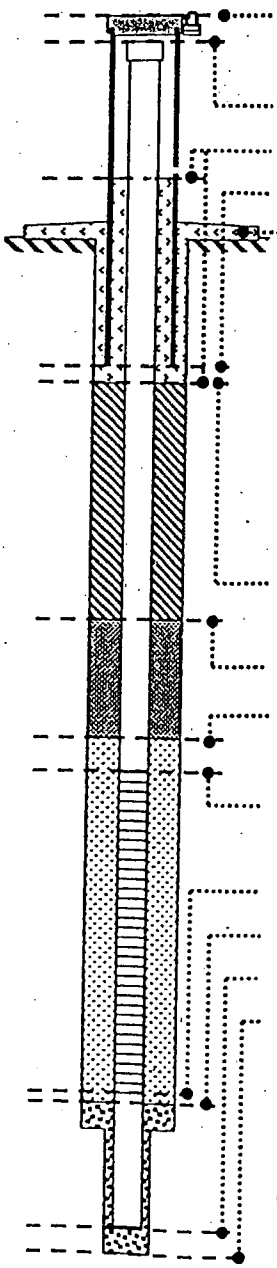
Elev (Ft)	Well or Piezometer Construction and Materials	Depth (Ft)	Lithology	Unified Soils Classification or Rock Type	Lithologic Description
5977		32			
5976		33			
5975		34			
5974		35			SILTY CLAYSTONE: Silty Claystone, weathered bedrock. Brownish yellow (10YR6/6) with trace grayish brown (10YR5/2) mottling. Massive texture. Weak to moderate pervasive iron oxidation. Firm and dense. Trace moisture.
5973		36			
5972		37			CLAYSTONE: Claystone with trace silt. Light brownish gray (10YR6/2) with gray (10YR5/1) mottling. Black organic stringers throughout. Decreased overall iron oxidation to weak - pervasive. Trace small healed fractures with iron oxide coating. Firm and dense.
5971		38			
5970		39			CLAYSTONE: Claystone to claystone with silt, un-weathered bedrock. Gray (10YR5/1). Decreased iron oxidation to trace. Massive texture.
5969		40	Threaded End Cap - Conical, Sch 40-PVC		

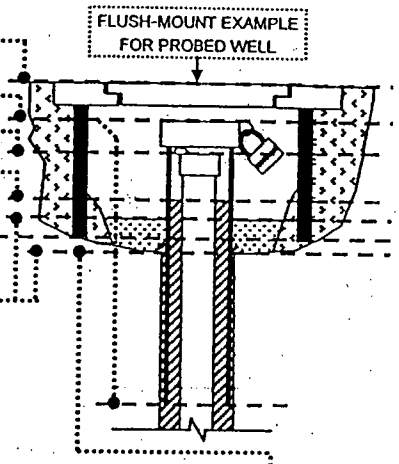
MONITORING WELL INSTALLATION REPORT: Form PRO.118

LOCATION CODE: 37505 PROJECT NAME: 04-05 Well Replacement PROGRAM: Water Programs-WIMP
SCREENED FORMATION: Al/Bdrk. DRILLING CONTRACTOR: Layne BORING METHOD: Perc. Hammer-Rev. Circ.
DATE DRILLED: 10/3/05 DATE COMPLETED: 10/3/05 TOTAL DEPTH: 40.8 COMPLETED DEPTH: 40.8
ESTIMATED DEPTH TO BEDROCK: 24.0 RIG GEOLOGIST: E. Warp LOGGING GEOLOGIST: E. Warp
BOREHOLE DIAMETER IN SCREENED INTERVAL: 9.0" QUANTITY OF FLUIDS LOST DURING DRILLING: N/A
INITIAL WATER LEVEL (FT, DATE): Dry on 10/3/05 COMPLETED WATER LEVEL (FT, DATE): Dry on 10/5/05
DIAMETER & TYPE OF INSTALLATION (WELL/PIEZOMETER/WELL POINT/ETC.): 2.0" PVC Well
TYPE OF PROTECTION (FLUSH-MOUNT VS. ABOVE GROUND, ASEPTIC, ETC.): Aboveground- steel protective casing

ALL MEASUREMENTS WILL BE MADE IN FEET FROM GROUND SURFACE

*DENOTES ITEMS THAT MAY NOT BE APPLICABLE, DEPENDING ON BORING METHOD, WELL PROTECTION & PURPOSE





PROTECTIVE CASING TOP (STICKUP OR FLUSH-MOUNT): 3.17
*SECONDARY CASING TOP: N/A BOTTOM: N/A TYPE: N/A
SURFACE CASING TOP: 2.67 ID (IN): 2.0"
SURFACE SEAL TOP: 0.5' BOTTOM: 1.0' bgs TYPE: Cement
PROTECTIVE CASING BOTTOM, ID (IN), TYPE: 1.83' bgs, 6" square steel
*WELL PAD DIMENSIONS, TYPE: 3'x3', concrete dm. 0.1' bgs, to 0.5' ags.
*ADD'L CASING FILL TOP: N/A BOTTOM: N/A TYPE: N/A
*SURFACE ISOLATION CASING TOP: N/A BOTTOM: N/A
*SURFACE ISOLATION CASING ID (IN): N/A TYPE: N/A
*OTHER (E.G., ASEPTIC) CASING TOP: N/A BOTTOM: N/A
*OTHER CASING ID (IN): N/A TYPE, PURPOSE: N/A
*CENTRALIZER(S) OD (IN): N/A NUMBER USED: N/A TYPE: N/A
*CENTRALIZER(S) DEPTH(S): N/A
*GROUT TOP: N/A MEASURED DENSITY (LBS/GAL): N/A TYPE: N/A w/2 gall. dist. H_2O
*GRANULAR BENTONITE TOP: 1.0' bgs TYPE: Medium chips-hydrated- "Envirosplug"
*BENTONITE SEAL TOP: 4.0' bgs TYPE: Pellets (hydrated w/2 gall. of dist. H_2O) - CETCO
BENTONITE SEAL OR GRANULAR BENTONITE BOTTOM (= FILTER PACK TOP): 9.0'
FILTER PACK TYPE: 16/40 Silica Sand BRAND: C.S.S.F.
SURFACE CASING BOTTOM (=SCREEN TOP): 10.23' TYPE: Sch. 40- PVC
SCREEN ID (IN): 2.0" SLOT SIZE (IN): 0.01" TYPE: Sch. 40- PVC
SCREEN BOTTOM (= SUMP, TOP): 40.3 SUMP TYPE: Conical Threaded end cap
FILTER PACK BOTTOM (= *BACKFILL TOP): 40.8' *BACKFILL TYPE: N/A
SUMP BOTTOM (= WELL COMPLETED DEPTH): 40.8 *PILOT HOLE TOP, DIAMETER: N/A
TOTAL BOREHOLE DEPTH (= *PILOT HOLE AND *BACKFILL BOTTOM): 40.8'
REMARKS: Routine well installation

COMPLETED BY: Ellen S. Warp Ellen S. Warp DATE: 10/3/05
CHECKED BY: JOHN BOYLAN [signature] DATE: 10/18/05

ROCKY FLATS ENVIRONMENTAL TECHNOLOGY SITE BOREHOLE LOG

Borehole Number: 37505
Location - North: _____ East: _____
Date: 10/3/05
Geologist: E. Warp
Drilling Equip.: AP 1000 - Rev. Circulation

Surface Elevation: _____
Area: Former B371 - Replacement of Well #37501
Total Depth: 40.8
Company: URS/Layne Project No. HAD51300
Sample Type: Composite samples for lithologic logging only

RMRS LOGGING SUPERVISOR APPROVAL [signature] DATE 10/18/05

TOP/BOTTOM OF CORE IN BOX	TOP/BOTTOM OF INTERVAL	FEET OF CORE INTERVAL (FIELD MEASUREMENT)	SAMPLE NUMBER	FRACTURE ANGLE	BEDDING ANGLE	GRAIN SIZE DISTRIBUTION	USCS SYMBOL	DEPTH IN FEET	SOIL/LITHOLOGIC LOG	SAMPLE DESCRIPTION
	0.0 #1							0.0		0.0 → 4.0' - Sandy CLAY w/ TR gravel. FILL Brn. (7.5YR 5/3 to 5/4). Clay matrix w/ some Sand (c.g., sub-ang.) TR gravel (1/4-1/2" dia., sub-ang., predominately qtzite and schist). Clay matrix has low to med. plasticity. Sl. moist. Some cobbles present in fill at surface but not reflected in sample.
	1.0 #2	#2	ESW	10/3/05			CL	1, 2, 3		
	4.0' #3	#3					GC CL	4, 5		4.0-6.0 - Clayey GRAVEL - Brn. (10YR 5/3) clay matrix w/ 35-40% gravel (1-2" dia., sub-ang., qtzite, schist and occasional red sandstone). Clay has low to med. plasticity.
	6.0' #4	#4					CL	6, 7		6.0-8.0' - CLAY w/ TR sand and gravel. Brn. (10YR 5/3) to Gry'sh brn. Interval is fill material predominately composed of displaced Claystone.
	8.0' #5	#5					GC	8, 9		8.0-~~9.0~~ 11.0 - GRAVEL w/ some sand and clay. Asphalt and road base; asphalt @ 8-9' interval. Brn (10YR 5/3) clay matrix. 2-4" dia. chunks of blk. asphalt. Gravel is predominately qtzite (1-2" dia., sub-ang.)
	9.0' #6	#6						10.0'		

NOTES: General: USCS is modified for this log as follows:
Materials amounts are estimated by % volume instead of % weight:
(1) Badly broken core, accurate footage measurements not possible.
(2) Core breaks cannot be matched, accurate footage measurements not possible.

Procedure No. RMRS/OPS-PRO.101
Revision 0
Date effective: 12/31/98
Page 27 of 28

(4011-930-0134-930)(Form GT.1A)(03/01/92)

ROCKY FLATS ENVIRONMENTAL TECHNOLOGY SITE BOREHOLE LOG

Borehole Number: 37505
Location - North: _____ East: _____
Date: 10/3/05
Geologist: E. Warp
Drilling Equip. AP 1000 - Rev. Circ.

Surface Elevation: _____
Area: Former B371 - Replacement of well # 37501
Total Depth: 40.0
Company: MRS/Layne Project No. HAD57300
Sample Type: Composite Samples for lithologic logging only

RMRS LOGGING SUPERVISOR APPROVAL _____ DATE 10/18/05

TOP/BOTTOM OF CORE IN BOX	TOP/BOTTOM OF INTERVAL	FEET OF CORE IN INTERVAL (FIELD MEASUREMENT)	SAMPLE NUMBER	FRACTURE ANGLE	BEDDING ANGLE	GRAIN SIZE DISTRIBUTION	USCS SYMBOL	DEPTH IN FEET	SOIL/ LITHOLOGIC LOG	SAMPLE DESCRIPTION
	#6						GC	10.0		OVA 10/18/05
	11.0'							11		11.0-13.0 - Sandy, clayey GRAVEL. Strong Brn. (7.5YR 5/6). Distinct color change. ~50% sandy clay (low plasticity) w/perv. Fe/Mn. ~50% gravel (1-2" dia., sub-ang., schist, qtzite and Tr asphalt).
	#7							12		
	13.0'							13		13.0-15.0 - Sandy, clayey GRAVEL. Same as above fm. 11.0-13.0'.
	#8						GC CL	14		
	15.0'							15		15.0-17.0' - Sandy CLAY/GRAVEL Mixture, Pinkish gry. (7.5YR 4/2) w/strong brn. (7.5YR 5/6), Yellowish brn. (10YR 5/6) and pale olive (5Y 6/3) mottling within clay. Distinct color change. Blebs of caliche common. [Appears to be original fill used during construction of B371].
	#9							16		
	17.0'							17		17.0-21.0' - Sandy CLAY/GRAVEL Mixture Strong brn. (7.5YR 5/6) sandy clay. ~65% sandy clay w/wht., c.g., sub-ang. fragments common, Tr-some Diss. wht. caliche blebs. ~35% gravel (1/2-1 1/2" dia., sub-ang. to sub-rounded, qtzite, schist and occasional red sandstone clasts).
	#10							18		
	19.0'							19		
								20.0'		

NOTES: General: USCS is modified for this log as follows:
Materials amounts are estimated by % volume instead of % weight.
(1) Badly broken core, accurate footage measurements not possible.
(2) Core breaks cannot be matched, accurate footage measurements not possible.

Procedure No. RMRS/OPS-PRO.101
Revision 0
Date effective: 12/31/98

(4011-430-0(34-930)(Form GT.1A)(03/01/92)

ROCKY FLATS ENVIRONMENTAL TECHNOLOGY SITE BOREHOLE LOG

Borehole Number: 37505
Location - North: _____ East: _____
Date: 10/3/05
Geologist: E. Warp
Drilling Equip.: AP 1000 - Rev. Circ.

Surface Elevation: _____
Area: Former B371 - Replacement of well #37501
Total Depth: 40.8'
Company: URS/Layne Project No.: HAD51300
Sample Type: Composite Samples for lithologic logging only

RMRS LOGGING SUPERVISOR APPROVAL [signature] DATE 10/18/05

TOP/BOTTOM OF CORE IN BOX	TOP/BOTTOM OF INTERVAL	FEET OF CORE IN INTERVAL (FIELD MEASUREMENT)	SAMPLE NUMBER	FRACTURE ANGLE	BEDDING ANGLE	GRAIN SIZE DISTRIBUTION	USCS SYMBOL	DEPTH IN FEET	SOIL/LITHOLOGIC LOG	SAMPLE DESCRIPTION
								20.0		
	21.0' #12						GC CL	21		21.0-24.0- Sandy CLAY/GRAVEL Mixture Strong Brn. (7.5YR 5/6) sandy clay, V. similar to above fm. 17.0-21.0', ~60% gravel (1/4-1" dia., sub-rounded to sub-ang., qtzite and schist) fm. 21.0-23.0', Tr some gravel fm. 23.0-24.0. Sandy Clay is V. sticky and plastic. V. Moist [Moisture content of fill is questionable since H_2O is periodically injected for dust control]
								22		
	23.0 #13		Bedrock contact estimated @ 24.0'				CL	23		Bedrock contact estimated @ 24.0'
								24		24.0-27.0' - CLAYSTONE - Weathered Bedrock. Yellowish brn. (10YR 5/8) with Tr gry (10YR 4/1) mottling. Perv. FeOxn. Blk. organic stringers throughout. Claystone is firm and dense. MOIST.
	25.0 #14							25		
								26		
	27.0' #15							27		27.0-29.0 - Missed sample
								28		
	29.0 #16							29		29.0-31.0' - CLAYSTONE, Weathered Bedrock. Same as above fm. 24.0-27.0' w/ Tr to some silt. Decr. moisture to slightly moist.
								30.0		

NOTES: General: USCS is modified for this log as follows:
Materials amounts are estimated by % volume instead of % weight.
(1) Badly broken core, accurate footage measurements not possible.
(2) Core breaks cannot be matched, accurate footage measurements not possible.

(4011-930-0134-930) Form GT.1A(03/01/92)

ROCKY FLATS ENVIRONMENTAL TECHNOLOGY SITE BOREHOLE LOG

Borehole Number: 37505
Location - North: _____ East: _____
Date: 10/3/05
Geologist: E. Warp
Drilling Equip.: AP 1000 - Rev. Circ.

Surface Elevation: _____
Area: Former B371 - Replacement of well #37501
Total Depth: 40.8
Company: URS/Layne Project No. HAD5/300
Sample Type: Composite Samples for lithologic logging only.

RMRS LOGGING SUPERVISOR APPROVAL [signature] DATE 10/18/05

TOP/BOTTOM OF CORE IN BOX	TOP/BOTTOM OF INTERVAL	FEET OF CORE IN INTERVAL (FIELD MEASUREMENT)	SAMPLE NUMBER	FRACTURE ANGLE	BEDDING ANGLE	GRAIN SIZE DISTRIBUTION	USCS SYMBOL	DEPTH IN FEET	SOIL/LITHOLOGIC LOG	SAMPLE DESCRIPTION
	#16 cont							30.0		30.0-31.0' - CLAYSTONE - Weathered Bedrock (cont.) [described on previous page]
	31.0' #17 ESW 10/3/05							31		31.0-35.0' - Clayey SILTSTONE. Weathered bedrock. Lt. yellowish brn. (10YR 6/4) to Brnish Yellow (10YR 6/6). Massive textured. Increasing perv. FeOx'n throughout interval. Moderate perv. FeOx'n fm. 33.0 to 35.0'. Firm and dense. Decreasing moisture to TR.
								32		
	33.0' #18							33		
								34		
	35.0' #19 ESW 10/3/05							35		35.0-37.0' - Silty CLAYSTONE. Weathered bedrock. Brnish yellow (10YR 6/6) w/ TR gry'sh brn. (10YR 5/2) mottling. Massive texture. Wk. to moderate perv. FeOx'n. Firm and dense. TR moisture.
								36		
	37.0' #20							37		37.0-39.0' - CLAYSTONE w/ TR silt. Lt. brnish gry. (10YR 6/2) w/ gry. (10YR 5/1) mottling. Blk organic stringers throughout. Decr. overall FeOx'n to wk.-pervasive. TR small healed fractures w/ FeOx coating. Firm and dense.
								38		
	39.0' #21							39		39.0-40.8' - CLAYSTONE to claystone w/silt Un-weathered bedrock. Gry (10YR 5/1). Decr. FeOx'n to TR. Massive texture 10/18/05

NOTES: General: USCS is modified for this log as follows:
Materials amounts are estimated by % volume instead of % weight.
(1) Badly broken core, accurate footage measurements not possible.
(2) Core breaks cannot be matched, accurate footage measurements not possible.

(4011-930-0134-930) Form GT.1A(03/01.V2)

ROCKY FLATS ENVIRONMENTAL TECHNOLOGY SITE BOREHOLE LOG

Borehole Number: 37505
Location - North: _____ East: _____
Date: 10/3/05
Geologist: E. Warp
Drilling Equip.: AP1000 - Rev. Circ.

Surface Elevation: _____
Area: Former B371 - Replacement of well # 37501
Total Depth: 40.8
Company: URS/Layne Project No. HAD51300
Sample Type: Composite samples for lithologic logging

RMRS LOGGING SUPERVISOR APPROVAL [signature] DATE 10/18/05

TOP/BOTTOM OF CORE IN BOX	TOP/BOTTOM OF INTERVAL	FEET OF CORE IN INTERVAL (FIELD MEASUREMENT)	SAMPLE NUMBER	FRACTURE ANGLE	BEDDING ANGLE	GRAIN SIZE DISTRIBUTION	USCS SYMBOL	DEPTH IN FEET	SOIL/ LITHOLOGIC LOG	SAMPLE DESCRIPTION
										to claystone w/silt [initials] 10/18/05
								40.0		CLAYSTONE (cont.) - described on previous page.
# 40.8	#21 40.8							40.8'		T.D. @ 40.8'

NOTES: General: USCS is modified for this log as follows:
Materials amounts are estimated by % volume instead of % weight.
(1) Badly broken core, accurate footage measurements not possible.
(2) Core breaks cannot be matched, accurate footage measurements not possible.

(4011-930-0134-930)(Form GT.1A)(03/01/02)

STATE PLANE COORDINATES AREA:
NORTH: 750421.945
EAST: 2082673.923
PROJECT: Former B374
REMARKS:
Replaces well 37701.

GRND ELEV. (FT): 6006.849
TOTAL DEPTH (FT): 41.1
COMPLETION DATE: 10/5/05
GEOLOGIST: E. Warp

CASING DIA (IN): 2
BH DIA. (IN): 9
GRID LOCATOR:

LOG OF BORING NUMBER: 37705

Elev (Ft)	Well or Piezometer Construction and Materials	Depth (Ft)	Lithology	Unified Soils Classification or Rock Type	Lithologic Description
6010		3			Location moved to SW to target former foundation drain corridors.
6009	Protective Casing, 6" square, Steel Casing, Sch 40-PVC, 2 in. ID.	2			
6008		1			
6007	Concrete Seal Concrete Pad	0			
6006		1		GC/CL	GC/CL: Gravel/Clay/Sand - fill. Dark yellowish brown (10YR4/4) to brown (10YR4/3). ~70% gravel and cobbles (1/2" - 4" diameter, subrounded to subangular, predominately quartzite and schist). Clay has low to medium plasticity. Unconsolidated. Trace moisture. Sand is very fine grained to coarse grained, subangular, quartz - feldspar.
6005		2			
6004		3			
6003		4			GC/CL: Gravel/Clay/Sand - fill. Brown (10YR4/3) to dark grayish brown (10YR4/2). Very similar to interval from 0.0' to 4.0'., but decrease cobble and gravel size. ~70% gravel (1/4" - 1" diameter, subangular, quartzite, schist, and pink granite). ~30% clay/sand.

Elev (Ft)	Well or Piezometer Construction and Materials	Depth (Ft)	Lithology	Unified Soils Classification or Rock Type	Lithologic Description
6002		5			Very slightly moist.
6001	Hydrated Bentonite Chips Hydrated Bentonite Pellets	6			CL: Clay with trace to some sand and gravel. Yellowish brown (10YR5/6 to 10YR5/4). Predominately displaced iron oxidized claystone used as fill material. Trace to some gravel (5 - 7%) 3/4" to 1-1/2" diameter, subrounded, predominately quartzite. Dark gray (10YR4/1) rip-up clasts (1/4" diameter, subangular) of unweathered claystone present within iron oxidized clay throughout interval. Trace black organics in clay. Slightly moist from 6.0' to 8.0', increasing moisture to moist from 8.0' to 13.0'.
6000		7			
5999		8			
5998		9			
5997	Filter Pack, 16/40 Silica Sand	10			
5996	Screen, Sch 40-PVC, 2 in. ID., 0.010 in. slots	11			
5995		12			
5994		13			GC/CL: Clay with some to abundant gravel. Yellowish brown (10YR5/6) with trace dark gray (10YR4/1). Displaced iron oxidized claystone. Very similar to interval from 6.0' to 13.0', but increased gravel and cobbles. 15 - 25% gravel and cobbles (3/4" - 2" diameter, subrounded, predominately quartzite). Occasional zones of dark

Elev (Ft)	Well or Piezometer Construction and Materials	Depth (Ft)	Lithology	Unified Soils Classification or Rock Type	Lithologic Description
5993		14			gray rip-up clasts (1/4" diameter, subangular, clay) in displaced claystone. Moist. Trace to some sand present in gravelly pockets/lenses.
5992		15			
5991		16			
5990		17			CL: Clay with sand and trace gravel. Yellowish brown (10YR5/6) with gray (10YR5/1) mottling. Displaced claystone. Very similar to interval from 13.0' to 17.0', but decrease gravel to trace, otherwise unchanged. Moist from 17.0' to 21.0', very moist from 21.0' to 23.5'.
5989		18			
5988		19			
5987		20			
5986		21			
5985		22			
5984					

Elev (Ft)	Well or Piezometer Construction and Materials	Depth (Ft)	Lithology	Unified Soils Classification or Rock Type	Lithologic Description
		23			
5983		24			CL: Clay with trace to some gravel and trace sand. Yellowish brown (10YR5/6) clay. Same as interval from 17.0' to 23.5' mixed with dark gray (10YR4/1) clay with trace to some gravel (1/4" - 1" diameter, subrounded). Dark gray clay has medium plasticity. Trace disseminated caliche. Moist.
5982		25			GC/CL: Gravel/Clay mixture. Very dark gray (10YR3/1) clay matrix (plastic) with some very coarse grained, angular pink and white fragments. Occasional twigs and roots. (Color resembles asphalted soil.) 70 - 75% of interval is quartzite cobbles (2" - 4" diameter, subrounded). Possibly original ground surface, dirt road base, or fill for foundation drain corridors. Moist.
5981		26			
5980		27			
5979		28			
5978		29			CL: Silty Clay with trace gravel. Re-worked/displaced iron oxidized claystone. Dark grayish brown (10YR4/2) with dark yellowish brown (10YR4/6) and some light olive brown (2.5Y5/3) mottling. Thinly laminated silty claystone (re-worked) with trace gravel and trace ironstone fragments (1/4" diameter) with black manganese oxide coating. Abundant black organic material on laminated bedding planes. Blebs and stringers of caliche common. Moist.
5977		30			
5976		31			
5975		32			SILTSTONE: TOP OF BEDROCK. Siltstone (weathered bedrock). Dark yellowish brown (10YR4/6). Strong pervasive iron oxidation. Trace ironstone fragments up to 1" diameter with manganese oxide

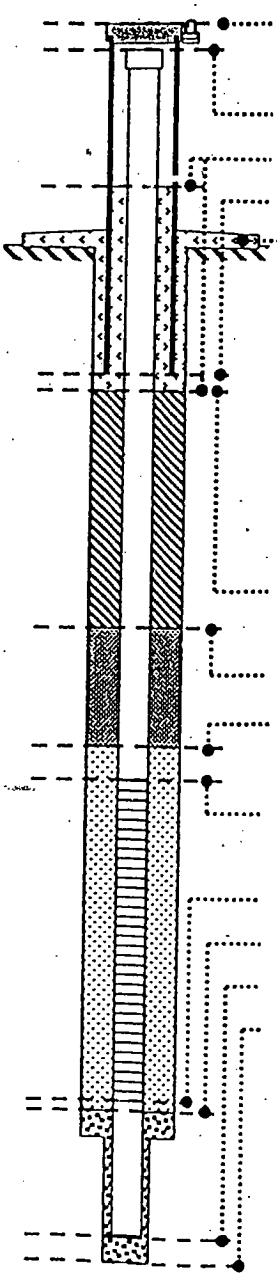
Elev (Ft)	Well or Piezometer Construction and Materials	Depth (Ft)	Lithology	Unified Soils Classification or Rock Type	Lithologic Description
					coating. Strongly friable. Moist. Includes unoxidized gray siltstone rip-up clasts. Bedrock contact estimated within composite sample.
5974		33			SILTSTONE: Siltstone with some clay (weathered bedrock). Brownish yellow (10YR6/6) with trace gray (10YR6/1) mottling. Massive texture at top of interval, grading into laminated texture with increasing interbedded claystone at base of interval. Weakly friable. Moisture decreases to slightly moist. Includes unoxidized gray siltstone rip-up clasts. Increasing clay content below ~36.0'.
5973		34			
5972		35			
5971		36			
5970		37			CLAYSTONE: Claystone with some interbedded siltstone. Weakly weathered bedrock. Brown (10YR5/3) to gray (10YR5/1) with some yellowish brown (10YR5/6). Decreasing iron oxidation to weak. Firm and dense. Very slightly moist.
5969		38			
5968		39			CLAYSTONE: Claystone to silty claystone, unweathered bedrock. Dark gray (10YR4/1) to dark grayish brown (10YR4/2). Trace black organic material. Weakly friable and fissile. Trace moisture.
5967		40			
5966	Threaded End Cap, Conical - Sump, Sch 40-PVC	41			

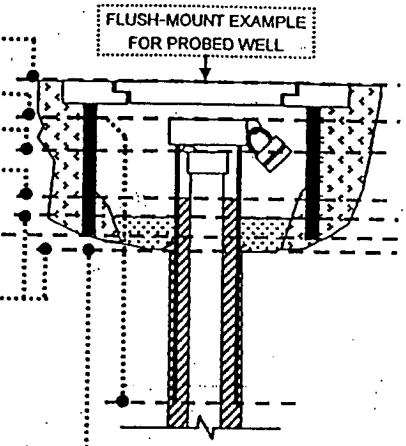
MONITORING WELL INSTALLATION REPORT: Form PRO.118

LOCATION CODE: 37705 PROJECT NAME: C405 Well Replacements PROGRAM: Water Programs-WARP
SCREENED FORMATION: A1/Bdk. DRILLING CONTRACTOR: Layne BORING METHOD: Perc. Hammer-Rev. Circ.
DATE DRILLED: 10/5/05 DATE COMPLETED: 10/6/05 TOTAL DEPTH: 41.1' COMPLETED DEPTH: 41.1'
ESTIMATED DEPTH TO BEDROCK: ____ RIG GEOLOGIST: E. Warp LOGGING GEOLOGIST: E. Warp
BOREHOLE DIAMETER IN SCREENED INTERVAL: 9.0" QUANTITY OF FLUIDS LOST DURING DRILLING: N/A
INITIAL WATER LEVEL (FT, DATE): Dry on 10/5/05 COMPLETED WATER LEVEL (FT, DATE): Dry on 10/6/05
DIAMETER & TYPE OF INSTALLATION (WELL/PIEZOMETER/WELL POINT/ETC.): 2.0" PVC Well
TYPE OF PROTECTION (FLUSH-MOUNT VS. ABOVE GROUND, ASEPTIC, ETC.): Above ground steel protective casing

ALL MEASUREMENTS WILL BE MADE IN FEET FROM GROUND SURFACE

*DENOTES ITEMS THAT MAY NOT BE APPLICABLE, DEPENDING ON BORING METHOD, WELL PROTECTION & PURPOSE





PROTECTIVE CASING TOP (STICKUP OR FLUSH-MOUNT): 3.07 ags
*SECONDARY CASING TOP: N/A BOTTOM: N/A TYPE: N/A
SURFACE CASING TOP: 2.67 ID (IN): 2.0"
SURFACE SEAL TOP: 0.4' ags BOTTOM: 0.2' bgs TYPE: Concrete
PROTECTIVE CASING BOTTOM, ID (IN), TYPE: 1.93', 6" square steel
*WELL PAD DIMENSIONS, TYPE: 3'x3', Concrete fm. 0.2' bgs to 0.4' ags
*ADD'L CASING FILL TOP: N/A BOTTOM: N/A TYPE: N/A
*SURFACE ISOLATION CASING TOP: N/A BOTTOM: N/A
*SURFACE ISOLATION CASING ID (IN): N/A TYPE: N/A
*OTHER (E.G., ASEPTIC) CASING TOP: N/A BOTTOM: N/A
*OTHER CASING ID (IN): N/A TYPE, PURPOSE: N/A
*CENTRALIZER(S) OD (IN): N/A NUMBER USED: N/A TYPE: N/A
*CENTRALIZER(S) DEPTH(S): N/A
*GROUT TOP: N/A MEASURED DENSITY (LBS/GAL): N/A TYPE: N/A
*GRANULAR BENTONITE TOP: 0.2' TYPE: Bent. Med. chips (Enviroplug) - hydrated w/ ~2 gall. dist. H_2O
*BENTONITE SEAL TOP: 5.5' TYPE: Bent. Pellets (CETCO) - Hydrated w/ 2 gall. dist. H_2O
BENTONITE SEAL OR GRANULAR BENTONITE BOTTOM (= FILTER PACK TOP): 9.0"
FILTER PACK TYPE: 16/40 Silica Sand BRAND: C.S.S.I.
SURFACE CASING BOTTOM (=SCREEN TOP): 10.58 TYPE: Sch. 40 - PVC
SCREEN ID (IN): 2.0" SLOT SIZE (IN): 0.01" TYPE: Sch. 40 - PVC
SCREEN BOTTOM (= SUMP, TOP): 40.6' SUMP TYPE: Threaded end cap - Conical
FILTER PACK BOTTOM (= *BACKFILL TOP): 41.1' *BACKFILL TYPE: N/A
SUMP BOTTOM (= WELL COMPLETED DEPTH): 41.1' *PILOT HOLE TOP, DIAMETER: N/A
TOTAL BOREHOLE DEPTH (= *PILOT HOLE AND *BACKFILL BOTTOM): 41.1'
REMARKS: Routine well installation on 10/5/05. Well pad installed on 10/6/05. Offset from original (37701) to be adjacent to foundation drain corridor.
COMPLETED BY: Ellen S. Warp Ellen S. Warp DATE: 10/6/05
CHECKED BY: John Boylan [signature] DATE: 10/10/05

U.S. DEPARTMENT OF ENERGY ROCKY FLATS PLANT

FORM PRO.101A

ROCKY FLATS ENVIRONMENTAL TECHNOLOGY SITE BOREHOLE LOG

PAGE 1 OF 5

Borehole Number: 37705
Location - North: _____ East: _____
Date: 10/5/05
Geologist: E. WARP
Drilling Equip.: AP1000

Surface Elevation:
Area: Former B374 - Replacement of well #37701
Total Depth: B374
Company: URS/Layne Project No.: HA051300
Sample Type: Composite samples for lithologic logging only

RMRS LOGGING SUPERVISOR APPROVAL _____ DATE 10/18/05

TOP/BOTTOM OF CORE IN BOX	TOP/BOTTOM OF INTERVAL	FEET OF CORE IN INTERVAL (FIELD MEASUREMENT)	SAMPLE NUMBER	FRACTURE ANGLE	BEDDING ANGLE	GRAIN SIZE DISTRIBUTION	USCS SYMBOL	DEPTH IN FEET	SOIL/ LITHOLOGIC LOG	SAMPLE DESCRIPTION
	0.0							0.0		0.0-4.0' - GRAVEL/CLAY/sand - FILL. Dk. yell'sh brn. (10YR4/4) to brn. (10YR4/3). ~70% gravel and cobbles (1/2-4" dia., sub-rounded to sub-ang., predominately qtzite and schist). Clay has low to med. plasticity. Unconsolidated. Tr moisture. Sand is vfg-cg, subang, qtz-f'spar. SAB 10/13/05
	Composite Sample #1						GC	1		
	2.0'							2		
	#2						CL			
								3		
	4.0'							4		SAB 10/18/05
	#3						GC			4.0-6.0' - GRAVEL/CLAY/sand - FILL. Brn. (10YR4/3) to dk. gry'sh brn. (10YR4/2). V. similar to above fm. 0.0 to 4.0 but decrease cobble and gravel size. ~70% gravel (1/4-1" dia., sub-ang., qtzite, schist, and pink granite). ~30% clay/sand. V. slightly most. SAB 10/18/05
							CL	5		
	6.0'							6		
	#4									6.0-13.0' - CLAY w/ tr to some sand & gravel. Yellow'sh brn. (10YR5/6 to 5/4). Predominately displaced FeOx'd claystone used as fill material. Tr-some gravel (5-7%) 3/4-1 1/2" dia., sub-rounded, predominately qtzite. Dk. gry (10YR4/1) rip-up clasts (1/4" dia., sub-ang.) of un-weathered claystone present within FeOx'd clay throughout interval. Tr blk. organics in clay. Sl. moist fm. 6.0 to 8.0', increasing moisture to moist fm. 8.0 to 13.0'.
								7		
	8.0'						CL	8		
	#5									
	9.0'							9		
	#6									
								10.0		

NOTES: General: USCS is modified for this log as follows:
Materials amounts are estimated by % volume instead of % weight.
(1) Badly broken core, accurate footage measurements not possible.
(2) Core breaks cannot be matched, accurate footage measurements not possible.

Procedure No. RMRS/OPS-PRO.101
Revision 0
Date effective: 12/31/98

(4011-930-0134-930)(Form GT.1A)(03/01/92)

U.S. DEPARTMENT OF ENERGY ROCKY FLATS PLANT

FORM PRO.101A

ROCKY FLATS ENVIRONMENTAL TECHNOLOGY SITE BOREHOLE LOG

Borehole Number: 37705
Location - North: _____ East: _____
Date: 10/5/05
Geologist: E. Warp
Drilling Equip.: AP1000 - Perc. Hammer, Rev. Circ.

Surface Elevation: _____
Area: Former B371, Replacement of well #37701
Total Depth: 41.1
Company: URS/Layne Project No.: HA051300
Sample Type: Composite Samples for lithologic logging only.

RMRS LOGGING SUPERVISOR APPROVAL [signature] DATE 10/18/05

TOP/BOTTOM OF CORE IN BOX	TOP/BOTTOM OF INTERVAL	FEET OF CORE IN INTERVAL (FIELD MEASUREMENT)	SAMPLE NUMBER	FRACTURE ANGLE	BEDDING ANGLE	GRAIN SIZE DISTRIBUTION	USCS SYMBOL	DEPTH IN FEET	SOIL/ LITHOLOGIC LOG	SAMPLE DESCRIPTION
	Cont. #6 11.0'						CL	10.0 11 12		(Cont.) CLAY w/ Tr to some gravel. [See description on page 1]
	Composite Sample #7 13.0'							13		
	#8 15.0'						CL	14 15 16		13.0-17.0- CLAY w/ some to abundant gravel Yellish brn. (10YR5/6) w/ Tr dk. gry (10YR4/1) Displaced, Fe oxid claystone. V. similar to above interval fm. 6.0-13.0' but increased gravel and cobbles. 15-25% gravel and cobbles (3/4"-2" dia., sub-rounded, predominately qtzite). Occasional zones of dk. gry. rip-up clasts (1/4" dia., subang., clay). MOIST. Also Tr-some sand present in gravelly pockets/lenses. SAD 10/18/05
	#9 17.0'									
	#10 19.0'						CL	17 18 19 20.5		17.0-23.5'- CLAY w/ some sand and Tr gravel. Yellish brn. (10YR5/6) w/ Gry (10YR5/1) mottling. Displaced claystone. V. similar to above fm. 13.0-17.0' but decrease gravel to Tr, otherwise unchanged. MOIST fm. 17.0-21.0, V. Moist fm. 17.0 to 23.5' SAD 10/18/05 21.0' ?

NOTES: General: USCS is modified for this log as follows:
Materials amounts are estimated by % volume instead of % weight.
(1) Badly broken core, accurate footage measurements not possible.
(2) Core breaks cannot be matched, accurate footage measurements not possible.

Procedure No. RMRS/OPS-PRO.101
Revision 0
Date effective: 12/31/98

(4011-930-0134-930)(Form GT.1A)(03/01/92)

U.S. DEPARTMENT OF ENERGY ROCKY FLATS PLANT

FORM PRO.101A

ROCKY FLATS ENVIRONMENTAL TECHNOLOGY SITE BOREHOLE LOG

Borehole Number: 37705
Location - North: _____ East: _____
Date: 10/5/05
Geologist: E. Warp
Drilling Equip.: AP1000 - Rere. Hammer - Rev. Circ.

Surface Elevation:
Area: Former B371/374 - Replacement of well #37701
Total Depth: 41.1'
Company: URS/Layne Project No.: HAD51300
Sample Type: Composite Sampling for Lithologic Logging Only

RMRS LOGGING SUPERVISOR
APPROVAL _____ DATE 10/18/05

TOP/BOTTOM OF CORE IN BOX	TOP/BOTTOM OF INTERVAL	FEET OF CORE IN INTERVAL (FIELD MEASUREMENT)	SAMPLE NUMBER	FRACTURE ANGLE	BEDDING ANGLE	GRAIN SIZE DISTRIBUTION	USCS SYMBOL	DEPTH IN FEET	SOIL/ LITHOLOGIC LOG	SAMPLE DESCRIPTION
	Composite Sample #11 21.0'						CL	20.0 21 22 23		20.0-23.5 - CLAY w/ Tr gravel (described on page #2)
	#12 23.0'									
	#13 25.0'						CL	23.5' 24 25		23.5'-25.0' - CLAY w/ Tr to some gravel and Tr sand, yellowish brn. (10YR 5/6) clay (same as fm. 17.0-23.5') mixed w/ dk. gry. (10YR 4/1) clay w/ Tr to some gravel (1/4 to 1" dia., sub-rounded). Dk. gry. clay has med. plasticity. Tr diss. caliche. MOIST.
	#14 27.0'						GC CL	26 27		25.0-29.0 - GRAVEL/CLAY Mixture. Possibly original ground surface. V. Dk. gry (10YR 3/1) clay matrix (plastic) w/ some v. c. gr., angular pink and wht. fragments, occasional twigs and roots. (Color resembles asphalted soil.) 70-75% of interval are 2-4" dia., sub-rounded cobbles (qtzite) - Possible dirt road base or fill for foundation drain corridors. MOIST. 10/12/05
	#15 29.0'							28 29		29.0-31.5 - Silty CLAY w/ Tr gravel. Reworked/displaced claystone. Dk. gry'sh brn. (10YR 4/2) feord w/ dk. yellow'sh brn. (10YR 4/6) and some lt. olive brn. (2.5Y 5/3) mottling. Thinly laminated silty claystone (reworked) w/ Tr gravel and Tr ironstone fragments (1/4" dia.) w/ blk. Mn Ox coating. Abundant blk. organic material on laminated bedding planes. Blebs and stringers of caliche common. MOIST
	#16						CL	30.0'		

NOTES: General: USCS is modified for this log as follows:
Materials amounts are estimated by % volume instead of % weight.
(1) Badly broken core, accurate footage measurements not possible.
(2) Core breaks cannot be matched, accurate footage measurements not possible.

Procedure No. RMRS/OPS-PRO.101
Revision 0
Date effective: 12/31/98

(4011-930-0134-930)(Form GT.1A)(03/01/92)

U.S. DEPARTMENT OF ENERGY ROCKY FLATS PLANT

FORM PRO.101A

ROCKY FLATS ENVIRONMENTAL TECHNOLOGY SITE BOREHOLE LOG

Borehole Number: 37705
Location - North: _____ East: _____
Date: 10/5/05
Geologist: L. Warp
Drilling Equip.: AP1000 Perc. Hammer - Rev. Circ

Surface Elevation:
Area: Former B371/374 - Replacement of well #37701
Total Depth: 41.1'
Company: URS/Layne Project No.:
Sample Type: Composite Sampling for Lithologic Logging Only

RMRS LOGGING SUPERVISOR APPROVAL _____ DATE 10/18/05

TOP/BOTTOM OF CORE IN BOX	TOP/BOTTOM OF INTERVAL	FEET OF CORE IN INTERVAL (FIELD MEASUREMENT)	SAMPLE NUMBER	FRACTURE ANGLE	BEDDING ANGLE	GRAIN SIZE DISTRIBUTION	USCS SYMBOL	DEPTH IN FEET	SOIL/ LITHOLOGIC LOG	SAMPLE DESCRIPTION
	Composite Sample #16						CL	30.0		29.0 - 31.5' - Silty CLAY w/Tr gravel (cont.) (See description on page #3).
	31.0'							31		(Bedrock contact estimated within composite sample interval)
			Bedrock contact @31.5'					31.5		Bedrock Contact @31.5'
	#17							32		31.5-33.0' - SILTSTONE - weathered Bedrock, Dk. yellowish brn. (10YR 4/6). Strong perv. FeOxn. Tr ironstone fragments, up to 1" dia w/MnOx coating. Strongly friable. MOIST. Includes unoxidized gray siltstone rip-up clasts. 10/18/05
	33.0'							33		33.0-37.0 - SILTSTONE w/some clay. Weathered Bedrock. Brn'sh Yellow (10YR 6/6) w/Tr gry (10YR 6/1) mottling. Massive texture at top of interval grading into laminated texture with increasing interbedded claystone at base of interval. Wkly. friable. Decrease moisture to slightly moist. Includes unoxidized gray siltstone rip-up clasts. Increasing clay content below ~36'. 10/18/05
	#18							34		
	35.0'							35		
	#19							36		~~37.0 - CSW~~
	37.0'							37		37.0-~~41.0~~ 39.0' CSW - CLAYSTONE w/some interbedded siltstone. Wkly. weathered bedrock. Brn. (10YR 4/3) to gry. (10YR 5/1) w/some yellowish brn. (10YR 5/6), Decr. FeOxn towards. Firm and dense. V. slightly moist. ~~silty claystone~~ 10/18/05
	#20							38		
	39.0'							39		39.0-41.1' - CLAYSTONE TO silty claystone ~~Predominately~~ CSW Un-weathered bedrock. Dk gry (10YR 4/1) to dk gry'sh brn. (10YR 4/2). Tr blk. organic material. Wkly friable and fissile. Tr moisture.
	#21							40.0'		

NOTES: General: USCS is modified for this log as follows:
Materials amounts are estimated by % volume instead of % weight.
(1) Badly broken core, accurate footage measurements not possible.
(2) Core breaks cannot be matched, accurate footage measurements not possible.

Procedure No. RMRS/OPS-PRO.101
Revision 0
Date effective: 12/31/98

(4011-930-0134-930)(Form GT.1A)(03/01/92)

U.S. DEPARTMENT OF ENERGY ROCKY FLATS PLANT

FORM PRO.101A

ROCKY FLATS ENVIRONMENTAL TECHNOLOGY SITE BOREHOLE LOG

Borehole Number: 37705
Location - North: _____ East: _____
Date: 10/5/05
Geologist: E. Warp
Drilling Equip.: AP1000-Perc.Hammer-Rev. Circ.

Surface Elevation:
Area: Former B371/374-Replacement of well #37705
Total Depth: 41.1'
Company: URS/Layne Project No.: HAD51300
Sample Type: Composite Sampling for Lithologic Logging Only

RMRS LOGGING SUPERVISOR APPROVAL _____ DATE 10/15/05

TOP/BOTTOM OF CORE IN BOX	TOP/BOTTOM OF INTERVAL	FEET OF CORE IN INTERVAL (FIELD MEASUREMENT)	SAMPLE NUMBER	FRACTURE ANGLE	BEDDING ANGLE	GRAIN SIZE DISTRIBUTION	USCS SYMBOL	DEPTH IN FEET	SOIL/ LITHOLOGIC LOG	SAMPLE DESCRIPTION
	Composite Sample #21 41.1'							40.0 41.1'		10/18/05 40.0-41.1- CLAYSTONE to silty claystone Un-weathered Bedrock (described on page #4)

NOTES: General: USCS is modified for this log as follows:
Materials amounts are estimated by % volume instead of % weight.
(1) Badly broken core, accurate footage measurements not possible.
(2) Core breaks cannot be matched, accurate footage measurements not possible.

Procedure No. RMRS/OPS-PRO.101
Revision 0
Date effective: 12/31/98

(4011-930-0134-930)(Form GT.1A)(03/01/92)

STATE PLANE COORDINATES AREA: GRND ELEV. (FT): 6005.63 CASING DIA (IN): 1

NORTH: 748358.45 TOTAL DEPTH (FT): 21.2 BH DIA. (IN): ~4

EAST: 2083632.71 COMPLETION DATE: 5/24/05 GRID LOCATOR:

PROJECT: GEOLOGIST: E. Warp

REMARKS:

Former B881, replaces 39691, offset ~1.5' NW

LOG OF BORING NUMBER: 39605

Elev (Ft)	Well or Piezometer Construction and Materials	Depth (Ft)	Lithology	Unified Soils Classification or Rock Type	Lithologic Description
6009, 6008, 6007, 6006, 6005, 6004, 6003, 6002	Protective Casing, 5 in. Steel; Casing, Sch 80-PVC, 1 in. ID.; Concrete Seal; Concrete Pad; Granular Bentonite Crumbles; Filter Pack, 16/40 Silica Sand	4, 3, 2, 1, 0, 1, 2, 3, 4			
					CL/SM: Gravelly Clay with some sand to gravelly, sandy silt with clay. Brown (7.5YR5/3). 10 - 20% gravel (1/4" - 3/4" diameter, subrounded to subangular, predominately quartzite). ~5% sand (coarse grained, subangular), trace disseminated caliche. 1" - 2" diameter quartzite cobbles at 0.0' and 0.8'. Clay is stiff (crumbly due to removal from sample tube). Trace moisture.
					GC/CL: Clay with trace sand/gravel mixture, brown (7.5YR3/2) clay. 15 - 25% gravel (1/4" - 3/4" diameter, subrounded to subangular, predominately granitic composition with lesser quartzite and trace sandstone). Trace roots, trace disseminated caliche, very slightly moist.
					GC: Clayey Gravel with trace sand, dark brown (7.5YR3/3) clay. ~80% gravel (1/4" to 1-1/2" diameter, subangular, quartzite). ~20% clay with trace sand. Unconsolidated. Very slightly moist.
					GC/CL: Clay/gravel mixture, reddish brown (5YR4/4) to dark reddish brown (5YR4/3). Distinct color change. Clay has medium plasticity. ~25% gravel (1/8" - 1/2" diameter, subangular to subrounded, quartzite and granitic composition). Trace coarse grained, subangular sand. Very pliable and soft. Caliche blebs common, increasing toward base of interval. 1-1/2" cobble of schist at 4.3'. Very moist.

Elev (Ft)	Well or Piezometer Construction and Materials	Depth (Ft)	Lithology	Unified Soils Classification or Rock Type	Lithologic Description
6001	Screen, Sch 80-PVC, 1 in. ID., 0.010 in. slots	5			CLAYEY SILTSTONE: TOP OF BEDROCK. Clayey Siltstone, gray (10YR6/1) with abundant yellowish brown (10YR5/6) iron oxidation mottling. Abundant caliche with massive caliche from 4.7' to 4.8'. Trace manganese oxide associated with iron oxidation along internal fractures. Very moist, friable. Some zones more clayey, to silty.
6000		6			CLAYSTONE: Claystone (oxidized bedrock), gray (2.5Y5/1) with dark yellowish brown (10YR4/6) iron oxidation mottling. Abundant caliche from 6.0' to 7.0' along near-vertical factures and coating fractures (~30 deg) at 6.9'. Black organic stringers common. Claystone is dense and firm, except in areas of abundant caliche. Very moist at top of interval, decreasing to moist at base. Increasing silt below 8.0'.
5999		7			
5998		8			
5997		9			SILTY CLAYSTONE: Claystone with silt, yellowish brown (10YR5/6) with some gray (10YR6/1) mottling. Iron oxidized claystone, decreasing overall caliche. Caliche occurs along fractures (~20 deg) at 9.0', 10.0', and 14.2'. Fracture at 10.7' to 11.2', vertical, caliche-filled. Trace to some black organic stringers throughout. Ironstone fragments at 12.0'. Dense and firm. Decreasing moisture to slightly moist.
5996		10			
5995		11			
5994		12			
5993		13			
5992		14			

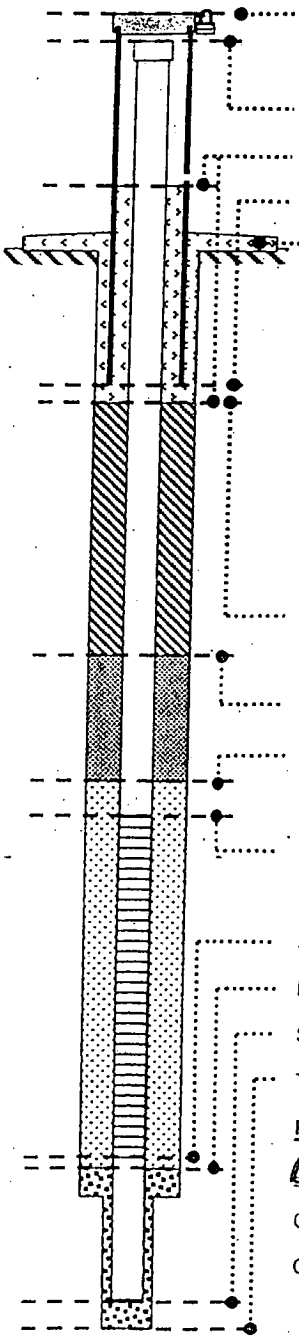
Elev (Ft)	Well or Piezometer Construction and Materials	Depth (Ft)	Lithology	Unified Soils Classification or Rock Type	Lithologic Description
5991		15			SILTY CLAYSTONE: Claystone with silt, brown (10YR5/3) to yellowish brown (10YR5/6). Oxidized claystone, trace black organic stringers. Ironstone fragments with manganese oxide coating at 15.8' and 16.0'. Interval slightly crumbly, very slightly moist.
5990		16			CLAYSTONE: Claystone, gray (10YR6/1) with some yellowish brown (10YR5/4) mottling. Trace black organic stringers. Massive textured. Weak to moderately pervasive iron oxidation from 19.0' to 19.3' and 19.6' to 20.0'. Competent and firm. Very slightly moist. Occasional silty pockets, as at 17.8'.
5989		17			
5988		18			
5987		19			
5986	Threaded End Cap - Sump, Sch 80-PVC Granular Bentonite Backfill	20			
5985		21			

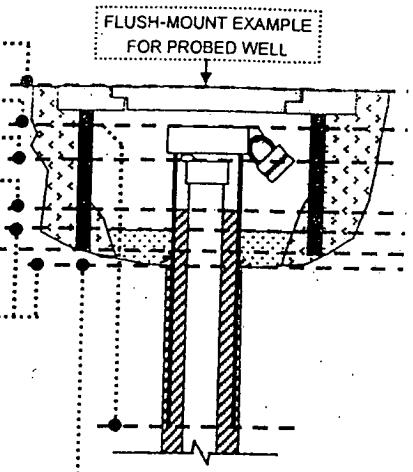
MONITORING WELL INSTALLATION REPORT: Form PRO.118

LOCATION CODE: 39605 bg105 PROJECT NAME: CY05 Well Replacements PROGRAM: Water Programs WARP
SCREENED FORMATION: Bdrk. DRILLING CONTRACTOR: RTG BORING METHOD: Geoprobe
DATE DRILLED: 5/24/05 DATE COMPLETED: 5/25/05 TOTAL DEPTH: 21.2' COMPLETED DEPTH: 19.5'
ESTIMATED DEPTH TO BEDROCK: 9.5' RIG GEOLOGIST: E. Warp LOGGING GEOLOGIST: E. Warp
BOREHOLE DIAMETER IN SCREENED INTERVAL: ~4" QUANTITY OF FLUIDS LOST DURING DRILLING: N/A
INITIAL WATER LEVEL (FT, DATE): Dry on 5/24/05 COMPLETED WATER LEVEL (FT, DATE): 10.09' (fm. TOC) 6/14/05
DIAMETER & TYPE OF INSTALLATION (WELL/PIEZOMETER/WELL POINT/ETC.): 1.0" PVC WELL
TYPE OF PROTECTION (FLUSH-MOUNT VS. ABOVE GROUND, ASEPTIC, ETC.): Above ground steel prot. casing w/lock

ALL MEASUREMENTS WILL BE MADE IN FEET FROM GROUND SURFACE

* DENOTES ITEMS THAT MAY NOT BE APPLICABLE, DEPENDING ON BORING METHOD, WELL PROTECTION & PURPOSE





PROTECTIVE CASING TOP (STICKUP OR FLUSH-MOUNT): 3.85' ags
*SECONDARY CASING TOP: N/A BOTTOM: N/A TYPE: N/A
SURFACE CASING TOP: 3.4' ags ID (IN): 1.0"
SURFACE SEAL TOP: 0.55' ags BOTTOM: 0.5' bgs TYPE: Concrete
PROTECTIVE CASING BOTTOM, ID (IN), TYPE: 0.5' bgs, 5" steel
*WELL PAD DIMENSIONS, TYPE: 2.5' x 2.5', Concrete
*ADD'L CASING FILL TOP: N/A BOTTOM: N/A TYPE: N/A
*SURFACE ISOLATION CASING TOP: N/A BOTTOM: N/A
*SURFACE ISOLATION CASING ID (IN): N/A TYPE: N/A
*OTHER (E.G., ASEPTIC) CASING TOP: N/A BOTTOM: N/A
*OTHER CASING ID (IN): N/A TYPE, PURPOSE: N/A
*CENTRALIZER(S) OD (IN): N/A NUMBER USED: N/A TYPE: N/A
*CENTRALIZER(S) DEPTH(S): N/A
*GROUT TOP: N/A MEASURED DENSITY (LBS/GAL): N/A TYPE: N/A
*GRANULAR BENTONITE TOP: N/A TYPE: N/A
*BENTONITE SEAL TOP: 0.5' TYPE: Granular bentonite - CETCO crumbles #8
BENTONITE SEAL OR GRANULAR BENTONITE BOTTOM (= FILTER PACK TOP): 4.0'
FILTER PACK TYPE: 16/40 Silica Sand BRAND: CSSI
SURFACE CASING BOTTOM (=SCREEN TOP): 4.55' TYPE: Sch. 80 PVC
SCREEN ID (IN): ~~0.01~~ 1.0" SLOT SIZE (IN): 0.010" TYPE: Sch. 80 PVC
SCREEN BOTTOM (= SUMP, TOP): 19.4 SUMP TYPE: Threaded end cap (PVC)
FILTER PACK BOTTOM (= *BACKFILL TOP): 19.5' *BACKFILL TYPE: Granular bentonite
SUMP BOTTOM (= WELL COMPLETED DEPTH): 19.5' *PILOT HOLE TOP, DIAMETER: ~4"
TOTAL BOREHOLE DEPTH (= *PILOT HOLE AND *BACKFILL BOTTOM): 21.2'

REMARKS: Installed WELL on SECOND ATTEMPT. FIRST ATTEMPT INTERCEPTED ABANDONED BOREHOLE/WELL #39691. OFFSET ~1.5' NW of #39691 FOR ULTIMATE LOCATION of 39605.

COMPLETED BY: Ellen S. Warp DATE: 5/26/05
CHECKED BY: [signature] DATE: 6/29/05

U.S. DEPARTMENT OF ENERGY ROCKY FLATS PLANT

FORM PRO.101A

ROCKY FLATS ENVIRONMENTAL TECHNOLOGY SITE BOREHOLE LOG

PAGE 1 OF 3

Borehole Number: 39605
Location - North: _____ East: _____
Date: 5/24/05
Geologist: E. WARP
Drilling Equip.: 66 DT Geoprobe

Surface Elevation: _____
Area: Former B881 - Replacement of 39691
Total Depth: 21.2'
Company: URS/RTG
Project No.: HAD51300
Sample Type: N/A

RMRS LOGGING SUPERVISOR APPROVAL [signature]

DATE 6/8/05

TOP/BOTTOM OF CORE IN BOX	TOP/BOTTOM OF INTERVAL	FEET OF CORE IN INTERVAL (FIELD MEASUREMENT)	SAMPLE NUMBER	FRACTURE ANGLE	BEDDING ANGLE	GRAIN SIZE DISTRIBUTION	USCS SYMBOL	DEPTH, IN FEET	SOIL/LITHOLOGIC LOG	SAMPLE DESCRIPTION
0.0	0.0	0.0						0.0		Right half should be SM symbol (JAD) 6/8/05
	Run #1	Rec. = 4.0'				(JAD) 6/8/05	CL/SM	0.8		0.0-0.8' - Gravelly CLAY w/some sand, Brn. (7.5YR5/3). 10-20% gravel (1/4-3/4" dia., sub-rounded to sub-ang. - predominately qtzite). ~5% sand (c.g., sub-ang.) Tr diss. caliche. 1-2" dia. cobbles (qtzite) @ 0.0 and 0.8'. Clay is stiff (crumbly due to removal fm. sample tube). Tr moisture.
							CL / GC	1		0.8-2.0' - CLAY w/Tr sand / GRAVEL Mixture. Brn. (7.5YR3/2) clay, 15-25% gravel (1/4-3/4" dia., sub-rounded to sub-ang., predominately granitic composition w/lesser qtzite and Tr sandstone). Tr roots. Tr diss. caliche. V. sl. moist.
							GC	2		
								3		0.8-3.2' - Clayey GRAVEL w/Tr sand. Dk. Brn. (7.5YR3/3) clay, ~80% gravel (1/4-1 1/2" dia., sub-ang., qtzite). ~20% clay w/Tr sand, Unconsolidated. V. sl. moist.
							CL / GC	3.2'		
								4		3.2-4.5' - CLAY/GRAVEL Mixture. Reddish-Brn. (5YR4/4) to Dk. Reddish Brn. (5YR4/3). Distinct color change. Clay has med+ plasticity. ~25% gravel (1/8-1/2" dia., sub-ang. to sub-rounded, qtzite and granitic composition). Tr c.g., sub-ang. sand. V. pliable and soft. Caliche blebs commen increasing toward base of interval. 1 1/2" cobble of schist @ 4.3'. V. moist. Bedrock Contact @ 4.5'
	Run #2	Rec. = 4.0'						4.5'		
								5		
								6		4.5-6.0' - Clayey SILTSTONE (BEDROCK). Gry (5/24/05) (10YR6/1) w/abundant yell'sh brn. (10YR5/6) FeOxn mottling. Abundant caliche. massive caliche fm. 4.7-4.8'. Tr MnOx assoc'd with FeOx'n along internal fracs. V. Moist. Friable. Some zones ~~siltier, to clayier, to silty claystone.~~ (JAD) 6/8/05
								7		
								8		6.0-8.8' - CLAYSTONE (Ox'd Bedrock). Gry (2.5Y5/1) w/Dk. Yell'sh Brn. (10YR4/6) FeOxn mottling. Abundant caliche fm. 6.0-7.0' along near vertical fracs and coating frac. (~30°) @ 6.9'. Blk. organic stringers commen. Claystone is dense and firm except in areas of abundant caliche. V. moist at top of interval decrs'g to moist @ base increasing silt below 8.0'. (JAD) 6/8/05
	Run #3	Rec. = 4.0'						8.8		
								9		
								10.0'		8.8-14.2' - Silty CLAYSTONE (see descrip. on next page).

NOTES: General: USCS is modified for this log as follows:
Materials amounts are estimated by % volume instead of % weight.
(1) Badly broken core, accurate footage measurements not possible.
(2) Core breaks cannot be matched, accurate footage measurements not possible.

Procedure No. RMRS/OPS-PRO.101
Revision 0
Date effective: 12/31/98
Page 27 of 28

(4011-930-0134-930)(Form GT.1A)(03/01/92)

ROCKY FLATS ENVIRONMENTAL TECHNOLOGY SITE BOREHOLE LOG

PAGE 2 OF 3

Borehole Number: ~~[illegible]~~ 5/24/05 # 39605
Location - North: _____ East: _____
Date: 5/24/05
Geologist: E. WARP
Drilling Equip.: 66 DT Geoprobe

Surface Elevation: _____
Area: Former B881-Replacement of #39691
Total Depth: 21.2'
Company: 21RS/RTG Project No.: HAD51300
Sample Type: N/A

RMRS LOGGING SUPERVISOR APPROVAL [signature] DATE 6/8/05

TOP/BOTTOM OF CORE IN BOX	TOP/BOTTOM OF INTERVAL	FEET OF CORE IN INTERVAL (FIELD MEASUREMENT)	SAMPLE NUMBER	FRACTURE ANGLE	BEDDING ANGLE	GRAIN SIZE DISTRIBUTION	USCS SYMBOL	DEPTH IN FEET	SOIL/LITHOLOGIC LOG	SAMPLE DESCRIPTION
	Run #3 11.5	Rec. 4.0' 11.5'						10.0 11 11.5		8.8-14.2 - ~~Silty CLAYSTONE~~ to claystone w/silt Yellish-brn. (10YR5/6) w/some gry (10YR6/1) mottling. FeOx'd claystone. Decr. overall caliche. Caliche occurs along fractures (~20°) @ 9.0, 10.0', ~~11.1~~ 6/8/05 and 14.2'. Tr blk organic stringers throughout. to some Ironstone frags. @ 12.0'. Dense and firm. Decr. moisture to sl. moist. [Fracture @ 10.7-11.2 is vertical, caliche-filled. 6/8/05
	Run #4 13.5	Rec. = 4.0' 13.5'						12 13 13.5		
	Run #5 16.0'	Rec. = 4.0' 16.0'						14 14.2' 15 15.8' 16		14.2-16.0' ~~CLAYSTONE~~ silty 6/8/05 to claystone w/silt Brn. (10YR5/3) to Yellish Brn. (10YR5/6). Ox'd claystone. Tr blk. organic stringers. Ironstone frags. w/MnOx coating @ 15.8' and 16.0'. Interval slightly crumbly. V. sl. moist.
	Run #6 18.0'	Rec. = 4.2' 18.0'						17 18		16.0-21.2' - CLAYSTONE. Gry (10YR6/1) w/some yellish brn. (10YR5/4) mottling. Tr blk. org. stringers. Massive textured. Wk. to Mod. perv. FeOx'n fm. 19.0-19.3' and 19.6-20.0'. Competent and firm. V. slightly moist. Occasional silty pockets, as at 17.8'. 6/8/05
	Run #7 19.5'	Rec. = 4.0' 19.5'						19 19.5' 20.0		

NOTES: General: USCS is modified for this log as follows:
Materials amounts are estimated by % volume instead of % weight.
(1) Badly broken core, accurate footage measurements not possible.
(2) Core breaks cannot be matched, accurate footage measurements not possible.

Procedure No. RMRS/OPS-PRO.101
Revision 0
Date effective: 12/31/98

(4011-930-0134-930)(Form GT.1A)(03/01/92)

ROCKY FLATS ENVIRONMENTAL TECHNOLOGY SITE BOREHOLE LOG

Borehole Number: 39605
Location - North: East:
Date: 5/24/05
Geologist: E. Warp
Drilling Equip.: 66 DT Geoprobe

Surface Elevation:
Area: Former B881 - Replacement of # 39691
Total Depth: 21.2'
Company: URS/RFE Project No.: HAD51300
Sample Type:

RMRS LOGGING SUPERVISOR APPROVAL DATE 6/8/05

TOP/BOTTOM OF CORE IN BOX	TOP/BOTTOM OF INTERVAL	FEET OF CORE IN INTERVAL (FIELD MEASUREMENT)	SAMPLE NUMBER	FRACTURE ANGLE	BEDDING ANGLE	GRAIN SIZE DISTRIBUTION	USCS SYMBOL	DEPTH IN FEET	SOIL/LITHOLOGIC LOG	SAMPLE DESCRIPTION
	20.0	20.0						20.0		CLAYSTONE (cont.) - See previous page for description.
	Run #8 (cont.)	Rec. = 4.0'								
21.2'	21.2'	21.2'						21		T.D. @ 21.2'
								21.2'		
								22		
								23		
								24		
								25		
								26		
								27		
								28		
								29		
								30.0		

NOTES: General: USCS is modified for this log as follows:
Materials amounts are estimated by % volume instead of % weight.
(1) Badly broken core, accurate footage measurements not possible.
(2) Core breaks cannot be matched, accurate footage measurements not possible.

Procedure No. RMRS/OPS-PRO.101
Revision 0
Date effective: 12/31/98

(4011-930-0134-930)(Form GT.1A)(03/01.V2)

STATE PLANE COORDINATES AREA:
NORTH: 748703.246
EAST: 2082070.275
PROJECT: Former B444
REMARKS:
Replaces well 40099.

GRND ELEV. (FT): 6035.492
TOTAL DEPTH (FT): 39.6
COMPLETION DATE: 8/16/05
GEOLOGIST: E. Warp

CASING DIA (IN): 2
BH DIA. (IN): 8
GRID LOCATOR:

LOG OF BORING NUMBER: 40005

Elev (Ft)	Well or Piezometer Construction and Materials	Depth (Ft)	Lithology	Unified Soils Classification or Rock Type	Lithologic Description
6039	Protective Casing, 6" Steel; Casing, Sch 40-PVC, 2 in. ID.	3			
6038		2			
6037		1			
6036	Concrete Seal; Concrete Pad	0			
6035		1		GC/CL	Gravel with sandy, silty clay. Fill. Strong brown (7.5YR4/6) silty clay matrix (medium plasticity). 45 - 55% gravel and cobbles (1/4" to 1-1/2" diameter, subangular to subrounded, predominately quartzite and granite). 10 - 20% sand (medium grained to coarse grained, subangular to subrounded). Trace disseminated caliche. Interval is weakly consolidated. Slightly moist.
6034					No recovery.
6033	Bentonite Pellets	2		GC/CL	Gravel with sandy, silty clay, same as interval from 0' to 1.5'. Slightly moist.
6032		3			No recovery.
6031		4		GC/CL	Gravel with sandy, silty clay, same as interval from 0' to 1.5'. Slightly moist.

Elev (Ft)	Well or Piezometer Construction and Materials	Depth (Ft)	Lithology	Unified Soils Classification or Rock Type	Lithologic Description
		5			No recovery.
6030					
		6			
6029					
		7			GC/CL: Gravel with sandy, silty clay, same as interval from 0' to 1.5'. Slightly moist.
6028	Filter Pack, 16/40 Silica Sand				
		8			GM/SM: Clayey, Silty Sand with some gravel. Possibly old road base. Brown (7.5YR4/2). ~80% clayey, silty sand (medium grained to coarse grained, subrounded). ~20% gravel with chunks of asphalt (1/4" - 3/4" diameter, subangular). Unconsolidated. Moisture increases to moist.
6027					
					No recovery.
		9			GM/SM: Clayey, Silty Sand with some gravel. Possibly old road base. Brown (7.5YR4/3). 10 - 20% gravel (1/8" - 1/2" diameter, subangular) with trace asphalt chunks. Abundant caliche from 9.4' to 9.6'. 2" diameter granitic fragments at 10.0'. Unconsolidated. Moist.
6026	Screen, Sch 40-PVC, 2 in. ID., 0.010 in. slots				
		10			GC/CL: Gravel with silty, sandy clay, strong brown (7.5YR5/6) with some reddish yellow (7.5YR6/6). Trace pink (5YR7/3) and trace light gray (5Y7/2) sandy clay matrix. 35 - 50% gravel and cobbles (1/4" - 1" diameter, subangular). 10 - 20% sand (coarse grained, subangular to subrounded) throughout matrix. Some disseminated caliche throughout interval. Loosely consolidated. Slightly moist.
6025					
		11			
6024					No recovery.
		12			GC/CL: Gravel with silty, sandy clay, same as interval from 10.0' to 11.3'. 1-1/2" diameter cobbles (quartzite and granite) at 12.2'. Slightly moist.
6023					
		13			No recovery.
6022					
		14			GC/CL: Gravel with silty, sandy clay, same as interval from 10.0' to

Elev (Ft)	Well or Piezometer Construction and Materials	Depth (Ft)	Lithology	Unified Soils Classification or Rock Type	Lithologic Description
6021					11.3'. Abundant caliche from 14.2' to 14.9', and 15.4'. 1.5" diameter
		15			
6020					No recovery.
		16			
6019					
		17			GC/CL: Gravel with silty, sandy clay, same as interval from 10.0' to 11.3'. Slightly moist.
6018					
		18			
6017					
					No recovery.
		19			GC/CL: Gravel with silty, sandy clay, same as interval from 10.0' to 11.3'. 1" diameter, subangular clasts of shattered reddish brown (2.5YR5/3) conglomerate from 20.7' to 20.8'. Slightly moist.
6016					
		20			
6015					
		21			
6014					CL: Clay with some silt and some gravel. Displaced re-worked claystone. Yellowish brown (10YR5/8) with light olive gray (5Y6/2) mottling. Iron oxidized clay with some un-oxidized mottling. Trace to some black organic stringers. Firm and dense. 1/2" - 3/4" diameter gravel and shattered cobbles at base. Moist.
		22			No recovery.
6013					CL: Clay with some silt, some sand, and trace gravel. Displaced re-worked claystone. Yellowish brown (10YR5/8) to strong brown (7.5YR5/6) with trace olive gray (5Y6/2) mottling. Some black organic stringers. Firm and dense. Silty sand from 23.2' to 23.6'. Moist.
		23			
6012					

Elev (Ft)	Well or Piezometer Construction and Materials	Depth (Ft)	Lithology	Unified Soils Classification or Rock Type	Lithologic Description
		24			
6011					
		25			
6010					
		26			
6009					
		27			
6008					
		28			SM: Silty Sand with some gravel, yellowish red (5YR5/6). Weakly consolidated. Very moist.
6007					CL: Silty Clay with trace sand and trace gravel. Re-worked displaced claystone. Yellowish brown (10YR5/8) with olive gray (5Y6/2) mottling. Very similar to interval from 22.0' to 27.7' with less iron oxidation. Trace black organic stringers. Firm and dense. Very moist.
		29			
6006					
		30			
6005					
		31			GC/CL: Gravel with sandy, silty clay, light gray (7.5YR7/1) and light reddish brown (7.5YR6/3) from 30.8' to 31.4', then brown (7.5YR5/4) from 31.4' to 31.8'. ~10% gravel (1/8" - 1/2" diameter), 10% sand (coarse grained) from 30.8' to 31.4'. Below 31.4', sand increases to ~25 - 30% (coarse grained, subangular). Pervasive iron oxidation from 30.8' to 31.4'. Weakly consolidated. Trace disseminated caliche throughout. Very moist.
6004					
		32			CL: Silty Clay, same as interval from 28.0' to 30.5'. Very moist.
6003					GC/CL: Sandy, Silty Clay with some gravel. Same as interval from 30.8' to 31.8'. Abundant caliche. Saturated, flowing water.
		33			CL: Silty Clay, same as interval from 28.0' to 30.8'. Saturated, flowing water.
6002					No recovery.

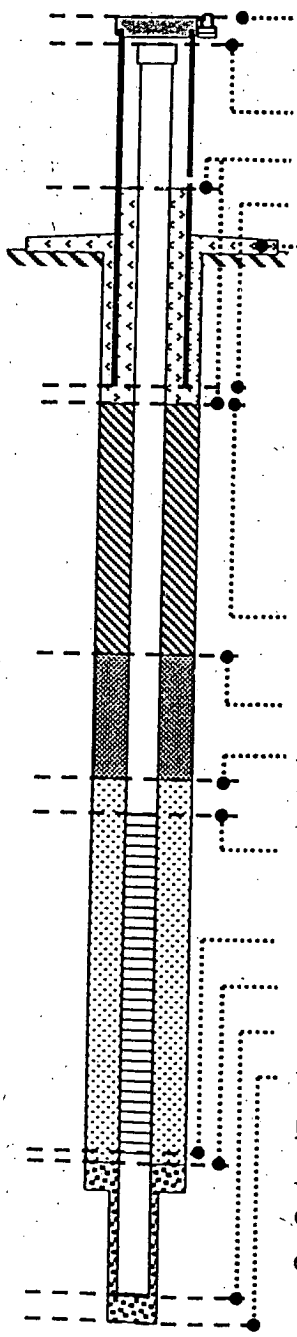
Elev (Ft)	Well or Piezometer Construction and Materials	Depth (Ft)	Lithology	Unified Soils Classification or Rock Type	Lithologic Description
		34			SC/CL: Sandy, Silty Clay with some gravel, brown (5YR5/4). 5 - 10% sand (coarse grained), ~5% gravel. Saturated and flowing. Sandy gravelly base. Pervasive iron oxidation.
6001					
		35			CLAYSTONE: TOP OF BEDROCK. Silty Claystone (bedrock), yellowish brown (10YR5/4) with some light olive gray (5Y6/2) mottling. Strong pervasive iron oxidation. Trace black organic stringers. Abrupt decrease in moisture from 34.8' to 35.0' from flowing water to saturated to very moist at base. Firm and cohesive, but pliable.
6000					
		36			No recovery.
5999					
		37			CLAYSTONE: Claystone (bedrock) light gray (10YR7/1) from 37.0' to 37.6', then pale yellow (2.5Y7/3) from 37.6' to 39.6'. Slight mottling. Trace black organic stringers. Weak pervasive iron oxidation from 37.6' to 39.6'. Interval is firm and dense. Moisture decreases from very moist at top of interval to moist at base. Trace to some silt.
5998					
		38			
5997					
		39	Threaded End Cap, Conical - Sump, Sch 40-PVC		
5996					

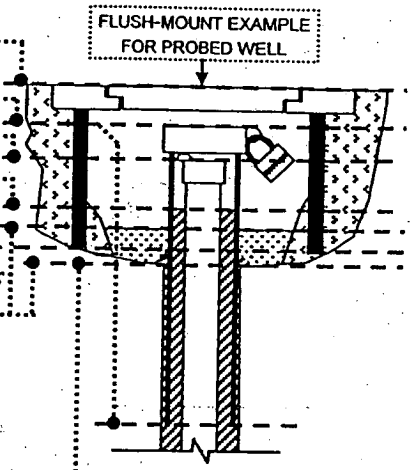
MONITORING WELL INSTALLATION REPORT: Form PRO.118

LOCATION CODE: 40005 PROJECT NAME: CY05 Well Replacements PROGRAM: Water Programs-WARP
SCREENED FORMATION: Al/Bdrk. DRILLING CONTRACTOR: High Plains BORING METHOD: Hollow Stem Auger
DATE DRILLED: 8/16/05 DATE COMPLETED: 8/16/05 TOTAL DEPTH: 39.6' COMPLETED DEPTH: 39.6
ESTIMATED DEPTH TO BEDROCK: 34.8 RIG GEOLOGIST: E. Warp LOGGING GEOLOGIST: E. Warp
BOREHOLE DIAMETER IN SCREENED INTERVAL: 8" QUANTITY OF FLUIDS LOST DURING DRILLING: N/A
INITIAL WATER LEVEL (FT, DATE): 28.99' fm. TOC, 8/16/05 COMPLETED WATER LEVEL (FT, DATE): 29.92' fm TOC, 9/16/05
DIAMETER & TYPE OF INSTALLATION (WELL/PIEZOMETER/WELL POINT/ETC.): 2.0" PVC Well
TYPE OF PROTECTION (FLUSH-MOUNT VS. ABOVE GROUND, ASEPTIC, ETC.): Above ground steel protective casing

ALL MEASUREMENTS WILL BE MADE IN FEET FROM GROUND SURFACE

*DENOTES ITEMS THAT MAY NOT BE APPLICABLE, DEPENDING ON BORING METHOD, WELL PROTECTION & PURPOSE





PROTECTIVE CASING TOP (STICKUP OR FLUSH-MOUNT): 3.5' ags
*SECONDARY CASING TOP: N/A BOTTOM: N/A TYPE: N/A
SURFACE CASING TOP: 2.75' ags ID (IN): 2.0"
SURFACE SEAL TOP: 0.9' ags BOTTOM: 0.35' bgs TYPE: concrete
PROTECTIVE CASING BOTTOM, ID (IN), TYPE: 1.35' bgs, 6" steel
*WELL PAD DIMENSIONS, TYPE: 3'x3' concrete fm. 0.25' ags to 0.35' bgs
*ADD'L CASING FILL TOP: N/A BOTTOM: N/A TYPE: N/A
*SURFACE ISOLATION CASING TOP: N/A BOTTOM: N/A
*SURFACE ISOLATION CASING ID (IN): N/A TYPE: N/A
*OTHER (E.G., ASEPTIC) CASING TOP: N/A BOTTOM: N/A
*OTHER CASING ID (IN): N/A TYPE, PURPOSE: N/A
*CENTRALIZER(S) OD (IN): N/A NUMBER USED: N/A TYPE: N/A
*CENTRALIZER(S) DEPTH(S): N/A
*GROUT TOP: N/A MEASURED DENSITY (LBS/GAL): N/A TYPE: N/A
*GRANULAR BENTONITE TOP: 0.35' TYPE: Enviroplug-No. 8
*BENTONITE SEAL TOP: N/A TYPE: N/A
BENTONITE SEAL OR GRANULAR BENTONITE BOTTOM (= FILTER PACK TOP): 7.5'
FILTER PACK TYPE: 16/40 Silica Sand BRAND: C.S.S.I.
SURFACE CASING BOTTOM (=SCREEN TOP): 9.35' TYPE: Sch. 40-PVC
SCREEN ID (IN): 2.0" SLOT SIZE (IN): 0.01" TYPE: Sch. 40-PVC
SCREEN BOTTOM (= SUMP, TOP): 39.35' SUMP TYPE: Threaded end cap-conical
FILTER PACK BOTTOM (= *BACKFILL TOP): 39.6' *BACKFILL TYPE: N/A
SUMP BOTTOM (= WELL COMPLETED DEPTH): 39.6' *PILOT HOLE TOP, DIAMETER: N/A
TOTAL BOREHOLE DEPTH (= *PILOT HOLE AND *BACKFILL BOTTOM): 39.6'
REMARKS: Routine well installation

COMPLETED BY: Ellen S. Warp Ellen S. Warp DATE: 8/16/05
CHECKED BY: _____ DATE: _____

ROCKY FLATS ENVIRONMENTAL TECHNOLOGY SITE BOREHOLE LOG

Borehole Number: 40005
Location - North: _____ East: _____
Date: 8/16/05
Geologist: E. WARP
Drilling Equip.: CME-75-HT Hollow Stem Auger

Surface Elevation: _____
Area: Former B444 - Replacement of well #40099
Total Depth: 39.6'
Company: URS/High Plains Project No. UMD51300
Sample Type: Continuous Core

RMRS LOGGING SUPERVISOR APPROVAL _____ DATE 8/22/05

TOP/BOTTOM OF CORE IN BOX	TOP/BOTTOM OF INTERVAL	FEET OF CORE IN INTERVAL (FIELD MEASUREMENT)	SAMPLE NUMBER	FRACTURE ANGLE	BEDDING ANGLE	GRAIN SIZE DISTRIBUTION	USCS SYMBOL	DEPTH IN FEET	SOIL/LITHOLOGIC LOG	SAMPLE DESCRIPTION
	Run #1 0.0–2.8	Rec. = 1.5'					GC CL	0.0 – 1.5		0.0-1.5' - GRAVEL w/ Sandy, silty CLAY - Fill. Strong brn. (7.5YR4/6) silty clay matrix (med. plasticity). 45-55% gravel and cobbles (1/4-1 1/2" dia., sub-ang. to sub-rounded, predominately qtzite and granite). 10-20% sand (f.g. to c.g., sub-ang. to sub-rounded). Tr diss. caliche. Interval is weakly consolidated. SL. MOIST.
								1.5 – 2.0		1.5-2.0' = No recovery
	Run #2 2.8–4.0'	Rec. = 1.3'					GC CL	2.0 – 3.3		2.0-3.3' - GRAVEL w/ Sandy, silty clay (same as above fm. 0.0-1.5'). SL. MOIST.
								3.3 – 4.0		3.3-4.0' = No recovery
	Run #3 4.0'–7.0'	Rec. = 0.95'					GC CL	4.0 – 4.95		4.0-4.95' - GRAVEL w/ Sandy, Silty CLAY (same as above fm. 0.0-1.5'). SL. MOIST.
								4.95 – 7.0		4.95-7.0' = No recovery
								7.0 – 7.8		7.0-7.8' - GRAVEL w/ Sandy, Silty CLAY. (same as above fm. 0.0 → 1.5') SL. MOIST.
	Run #4 7.0'–9.0'	Rec. = 1.5'					GC CL SM	7.8 – 8.5		7.8-8.5' - Clayey, SILTY SAND w/ some gravel. Possibly old road base. Brn. (7.5YR4/2). ~80% clayey, silty sand (m.g. to c.g., sub-rounded). ~20% gravel w/ Tr chunks of asphalt (1/4-3/4" dia., sub-ang.). Unconsolidated. Increase moisture to MOIST.
								8.5 – 9.0		8.5-9.0' = No recovery
	Run #5 9.0'–10.0'	Rec. = 2.3'					GM SM	9.0 – 10.0		9.0-10.0' - Clayey, silty SAND w/ some gravel. Possibly old road base. Brn. (7.5YR4/3). 10-20% gravel w/ Tr asphalt chunks (1/8-1/2" dia., sub-ang.) Abundant caliche fm. 9.4-9.6'. 2" dia. granitic fragments @ 10.0'. Unconsolidated. MOIST

NOTES: General: USCS is modified for this log as follows:
Materials amounts are estimated by % volume instead of % weight.
(1) Badly broken core, accurate footage measurements not possible.
(2) Core breaks cannot be matched, accurate footage measurements not possible.

(401 1-930-01 34-9 10)(Form GT.1A X0.10L.VC)

ROCKY FLATS ENVIRONMENTAL TECHNOLOGY SITE BOREHOLE LOG

Borehole Number: 40005
Location - North: _____ East: _____
Date: 8/16/05
Geologist: E. WARP
Drilling Equip.: CME-75-HT-Hollow Stem Auger

Surface Elevation: _____
Area: Former B444-Replacement of well #40099
Total Depth: 39.6'
Company: 21RS/High Plains Project No. HAD51300
Sample Type: Continuous Core

RMRS LOGGING SUPERVISOR APPROVAL [signature] DATE 8/22/05

TOP/BOTTOM OF CORE IN BOX	TOP/BOTTOM OF INTERVAL	FEET OF CORE IN INTERVAL (FIELD MEASUREMENT)	SAMPLE NUMBER	FRACTURE ANGLE	BEDDING ANGLE	GRAIN SIZE DISTRIBUTION	USCS SYMBOL	DEPTH IN FEET	SOIL/LITHOLOGIC LOG	SAMPLE DESCRIPTION
	10.0' Run #5 (cont.) 9.0-12.0'	Rec.= 2.3'					GC CL	10.0' 11 11.3'		10.0-11.3' - GRAVEL w/ Silty, Sandy CLAY Strong brn. (7.5YR 5/6) w/ some reddish yellow (7.5YR 6/6), Tr pink (5YR 7/3) and Tr lt. gry (5Y 7/2) Sandy clay matrix. 35-50% gravel and cobbles (1/4"-1" dia., sub-ang.). 10-20% sand (c.g., sub-ang. to sub-rounded) throughout matrix. Some diss. caliche throughout interval. Loosely consolidated. SL. MOIST.
	12.0' Run #6	Rec.= 0.9'					GC CL	12 12.9' 13		11.3-12.0' = No recovery 12.0-12.9' - GRAVEL w/ Silty SANDY CLAY (same as above fm. 10.0-11.3'). SS 1½" dia. cobbles (qtzite and granite) @ 12.2'. SL. MOIST. 12.9-14.0' = No recovery
	14.0' Run #7	Rec.= 1.6'					GC CL	14 15 15.6' 16		14.0-15.6' - GRAVEL w/ Silty, Sandy CLAY (same as above fm. 10.0-11.3'). Abundant caliche fm. 14.2-14.9'. 1½" dia. cobbles @ 14.5'. SL MOIST. and 15.4'. 15.6-17.0' = No recovery
	17.0' Run #8	Rec.= 1.6'					GC CL	17 18 18.6'		17.0-18.6' - GRAVEL w/ Silty, Sandy CLAY (same as above fm. 10.0-11.3'). SL. MOIST 18.6-19.0' = No recovery
	19.0' Run #9 19+22'	Rec.= 2.8'					GC CL	19 20.0'		19.0-21.3' - GRAVEL w/ Silty, Sandy CLAY (same as above fm. 10.0-11.3'), 1" dia. sub-angular clasts of shattered reddish brn (2.5YR 5/3) conglomerate fm. 20.7-20.8'. SL. MOIST. 8/22/05

NOTES: General: USCS is modified for this log as follows:
Materials amounts are estimated by % volume instead of % weight.
(1) Badly broken core, accurate footage measurements not possible.
(2) Core breaks cannot be matched, accurate footage measurements not possible.

(4011-930-0134-930)(Form GT.1A)(03/01/02)

ROCKY FLATS ENVIRONMENTAL TECHNOLOGY SITE BOREHOLE LOG

Borehole Number: 40005
Location - North: _____ East: _____
Date: 8/16/05
Geologist: E. WARP
Drilling Equip.: CME-75-HT-Hollow Stem Auger

Surface Elevation: _____
Area: Former B444-Replacement of well #40099
Total Depth: 39.6'
Company: URS/High Plains Project No. HAD57300
Sample Type: Continuous Core

RMRS LOGGING SUPERVISOR APPROVAL _____ DATE 8/22/05

TOP/BOTTOM OF CORE IN BOX	TOP/BOTTOM OF INTERVAL	FEET OF CORE IN INTERVAL (FIELD MEASUREMENT)	SAMPLE NUMBER	FRACTURE ANGLE	BEDDING ANGLE	GRAIN SIZE DISTRIBUTION	USCS SYMBOL	DEPTH IN FEET	SOIL/LITHOLOGIC LOG	SAMPLE DESCRIPTION
	Run #9 (cont.) 19.0→22.0'	Rec.=2.8'					CL	20.0		20.0-21.3' - GRAVEL w/ silty SANDY CLAY (same as above fm. 10.0-11.3'). - see description on page 2 of 4. reworked (JAD) 8/22/05
							CL	21		21.3-21.8' - CLAY w/ some silt and some gravel. Displaced, claystone. Yellish brn. (10YR5/8) w/ lt. olive gry (5Y6/2) mottling. Fe ox'd clay w/ some un-ox'd mottling. Tr- some blk. organic stringers. Firm and dense. 1/2-3/4" dia. gravel and shattered cobbles @ base. MOIST.
								21.3'		
								21.8'		21.8-22.0' = No recovery
	Run #10	Rec.=2.3'						22		
								23		22.0-27.7' - CLAY w/ some silt, some sand and Tr gravel. Displaced, reworked claystone. Yellish brn. (10YR5/8) to strong brn (7.5YR5/6) w/ Tr olive gry (5Y6/2) mottling. Some blk. organic stringers. Firm and dense. Silty sand fm. 23.2-23.6'. MOIST (JAD) 8/22/05
								24		
	Run #11	Rec.=3.2'					CL	25		
								26		
								27		
	Run #12	Rec.=2.2'						27.7'		27.7-28.0' - Silty SAND w/ some gravel. Yellowish red (5YR5/6), wkly. consolidated. V. MOIST. (JAD) 8/22/05
							SM	28		
							CL	29		28.0-30.5' - Silty CLAY w/ Tr sand and Tr gravel. Reworked, Displaced claystone. Yellow'sh brn. (10YR 5/8) w/ olive gry (5Y6/2) mottling. V. similar to above fm. 22.0-27.7' w/ less Fe ox'n, Tr blk. organic stringers. Firm and dense. V. MOIST.
	Run #13 29.0-32.0'	Rec.=3.2'						30.0'		

NOTES: General: USCS is modified for this log as follows:
Materials amounts are estimated by % volume instead of % weight.
(1) Badly broken core, accurate footage measurements not possible.
(2) Core breaks cannot be matched, accurate footage measurements not possible.

Procedure No. RMRS/OPS-PRO.101
Revision 0
Date effective: 12/31/98

(401)-930-0134-930 Form GT.1A(0)(0)(L)(2)

ROCKY FLATS ENVIRONMENTAL TECHNOLOGY SITE BOREHOLE LOG

Borehole Number: 40005
Location - North: _____ East: _____
Date: 8/16/05
Geologist: E. WARP
Drilling Equip.: CME-75-HT- Hollow Stem Auger

Surface Elevation: _____
Area: Former B444 - Replacement of well #40099
Total Depth: 39.6'
Company: URS/High Plains Project No. HAD51300
Sample Type: Continuous Core

RMRS LOGGING SUPERVISOR APPROVAL [signature] DATE 8/22/05

TOP/BOTTOM OF CORE IN BOX	TOP/BOTTOM OF INTERVAL	FEET OF CORE IN INTERVAL (FIELD MEASUREMENT)	SAMPLE NUMBER	FRACTURE ANGLE	BEDDING ANGLE	GRAIN SIZE DISTRIBUTION	USCS SYMBOL	DEPTH IN FEET	SOIL/LITHOLOGIC LOG	SAMPLE DESCRIPTION
	Run #13 (cont.) 29.0 → 32.0'	Rec. = 3.2'					CL	30.0		30.0-30.8 - Silty CLAY w/ Tr sand and Tr gravel (see page 3 of 4 for description.
								30.5		
								30.8		30.8-31.8' - GRAVEL w/ sandy, Silty CLAY. Lt. gry (2.5YR 7/1) and lt. reddish brn. (5YR 6/3) fm 30.8 to 31.4 then brn (7.5YR 5/4) fm. 31.4-31.8. ~10% gravel (1/8-1/2" dia.) 10% sand (c.g.) fm 30.8-31.4 then incr. sand to ~25-30% (c.g., sub-ang). Perv. FeOx'n fm. 30.8-31.4'. Wkly consolidated. Tr Diss. caliche throughout. V. MOIST.
							GC CL	31		
								31.8'		
	32.0'						CL	32		
	Run #14	Rec. =					GC CL			31.8-32.0 - Silty CLAY - same as above fm. 28.0-30.5. V. MOIST
							CL	33		32.0-32.5 - Sandy Silty CLAY w/ some gravel. Same as fm. 30.8-31.8'. Abundant caliche, SATURATED FLOWING H_2O.
										32.5-33.0 - Silty CLAY - as above fm. 28.0-30.8 - SATURATED flowing H_2O
	34.0							34		33.0-34.0 = No recovery 8/22/05
	Run #15	Rec. = 1.0'		Bedrock Contact @ 34.8'			GC CL	34.8'		34.0-34.8 - Sandy, Silty CLAY w/ some gravel. Brn. (5YR 5/4). 5-10% sand (c.g.) ~5% gravel. SATURATED - flowing. Sandy gravelly base. Perv. FeOx'n. Bedrock Contact? @ 34.8'
								35		34.8-35.0' - Silty CLAYSTONE (Bedrock) - estimated - poor recovery.) Yellowish brn. (10YR 5/4) w/ some lt. olive gry (5Y 6/2) mottling. Strong perv. FeOx'n. Tr blk. organic stringers. ~~Decr~~ Abrupt decrease in moisture fm. 34.8-35.0' fm. flowing H_2O to saturated to v. moist @ base. Firm and cohesive but pliable.
								36		
	37.0'							37		35.0-37.0 = No recovery
	Run #16	Rec. = 2.0'						38		37.0-39.6 - CLAY STONE - Bedrock Lt. gry (10YR 7/1) fm 37.0-37.6', then Pale Yellow (2.5Y 7/3) fm 37.6-39.6. Sl. mottling. Tr blk organic stringers. Wk. perv. FeOx'n fm. 37.6-39.6. Interval is firm and dense. Decr. moisture fm. V. Moist @ top of interval to moist @ base. Tr - some silt.
	39.0'							39		
	Run #17	Rec. = 0.6'								T.D. @ 39.6'

NOTES: General: USCS is modified for this log as follows:
Materials amounts are estimated by % volume instead of % weight.
(1) Badly broken core, accurate footage measurements not possible.
(2) Core breaks cannot be matched, accurate footage measurements not possible.

(4011-930-0134-930) Form GT.1A (03/01/92)

STATE PLANE COORDINATES AREA: GRND ELEV. (FT):6032.782 CASING DIA (IN): 2

NORTH: 748517.114 TOTAL DEPTH (FT): 39.0 BH DIA. (IN): 8

EAST: 2082198.396 COMPLETION DATE: 8/15/05 GRID LOCATOR:

PROJECT: Former B444 GEOLOGIST: E. Warp

REMARKS:

Replaces well 40299. PID hits to 1.0 ppm from 19.0' to TD.

LOG OF BORING NUMBER: 40205

Elev (Ft)	Well or Piezometer Construction and Materials	Depth (Ft)	Lithology	Unified Soils Classification or Rock Type	Lithologic Description
6037	Protective Casing, 6" Steel; Casing, Sch 40-PVC, 2 in. ID.	4			
6036		3			
6035	Concrete Seal	2			
6034		1			
6033	Concrete Pad	0			
				GC/CL	Sandy, Silty, Gravelly Clay to gravel with sandy, silty clay. Strong brown (7.5YR5/6) silty clay matrix. 7 - 10% gravel (1/8" - 3/4" diameter, subrounded, quartzite and granite). 8 - 15% sand (medium grained to coarse grained, subrounded). Some disseminated caliche. Shattered quartzite cobble at base of interval. Moist.
6032		1			No recovery.
6031		2			
	Hydrated Granular Bentonite				GW: Gravel, shattered quartzite cobble, dark gray (10YR4/1) quartzite. 3/4" to 1-1/2" diameter, subangular fragments of quartzite with <5% fines. Trace moisture.
6030		3			GC/CL: Gravel with sandy, silty clay, same as interval from 0' to 0.7'. Moist.
					No recovery.

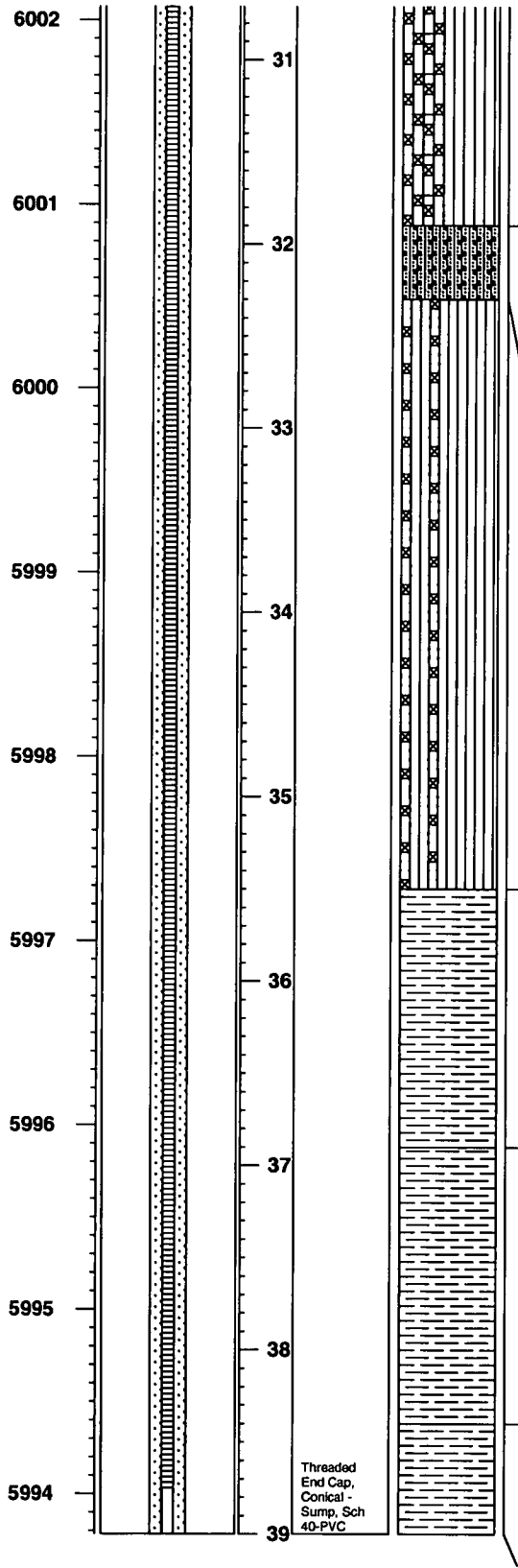
Elev (Ft)	Well or Piezometer Construction and Materials	Depth (Ft)	Lithology	Unified Soils Classification or Rock Type	Lithologic Description
6029					
		4			GC/CL: Gravel with sandy, silty clay., Light brown (7.5YR6/3), pink (7.5YR7/4) to reddish yellow (7.5YR6/6) silty clay matrix (medium plasticity). 55 - 60% gravel and cobbles (1/8" - 2" diameter, subrounded to subangular, predominately quartzite with minor schist). ~20% sand (medium grained to coarse grained, subangular to subrounded). Abundant disseminated caliche. Interval crumbly and unconsolidated due to amount of gravel and cobbles. Moisture decreases to slightly moist.
6028		5			
6027		6			No recovery.
6026		7			GC/CL: Gravel with sandy, silty clay. Brown (7.5YR5/4) to strong brown (7.5YR5/6) silty matrix. 30 - 35% gravel and cobbles (1/4" to 1-1/2" diameter, subangular to subrounded). ~15% sand (coarse grained, subangular). Silty clay matrix has medium plasticity. Some disseminated caliche. Interval is unconsolidated. Slightly moist.
6025	Filter Pack, 16/40 Silica Sand	8			GM/SM: Gravel/Silty Sand mixture (probable old road base). Brown (10YR4/3) silty sand matrix. 15 - 20% gravel and chunks of asphalt (1/4" - 3" diameter, subangular) within silty sand (medium grained to coarse grained, subrounded) matrix. Unconsolidated. Moist.
6024		9			No recovery.
6023	Screen, Sch 40-PVC, 2 in. ID., 0.010 in. slots	10			GC/CL: Gravel with sandy clay, very dark grayish brown (10YR3/2) to brown (10YR4/3). Probable old road base. Sandy clay matrix with 25 - 30% gravel and cobbles (1/4" to 1-1/2" diameter, subangular, quartzite and granite). 15 - 20% sand (coarse grained, subangular). Trace asphalt chunks (1/4" diameter) at top of interval. Some disseminated caliche. Slightly moist.
6022		11			GC/CL: Gravel with sandy, silty clay. Light gray (5Y7/2) with some strong brown (7.5YR4/6) silty clay matrix. 30 - 35% shattered gravel (1/4" - 1" diameter, subangular, predominately quartzite). ~10% sand (coarse grained, subangular). Some to abundant disseminated caliche. Interval is crumbly. Slightly moist.
6021		12			GC/CL: Gravel with silty, sandy clay. Strong brown (7.5YR4/6) silty clay matrix with pervasive iron oxidation. 20 - 30% shattered gravel (1/4" - 1" diameter, subangular, predominately quartzite). 10 - 15% sand (coarse grained, subangular to subrounded). Abundant caliche (disseminated and as blebs) throughout. Weakly consolidated. Slightly moist.

Elev (Ft)	Well or Piezometer Construction and Materials	Depth (Ft)	Lithology	Unified Soils Classification or Rock Type	Lithologic Description
					No recovery.
6020		13			GC/CL: Gravel with silty, sandy clay. Strong brown (7.5YR4/6) silty clay matrix (medium plasticity). 20 - 30% gravel (1/8" - 3/4" diameter, predominately quartzite). 10 - 15% sand. Abundant disseminated caliche. Weakly consolidated. 1" angular quartzite fragment at 13.7'. Moist.
6019					No recovery.
		14			GC/CL: Gravel with silty, sandy clay. Same as interval from 12.0' to 13.7'. Weakly consolidated. Moist.
6018		15			
6017					
		16			ML: Clayey Sand-Silt mixture, yellow (10YR7/8). Pervasive iron oxidation. Moist.
					No recovery.
6016					
		17			GC/CL: Gravel with silty, sandy clay. Same as interval from 12.0' to 13.7'. Weakly consolidated. Moist.
6015					ML: Clayey Sand-Silt mixture, yellow (10YR7/6). Pervasive iron oxidation. Moist.
		18			GC/CL: Gravel with silty, sandy clay. Same as interval from 12.0' to 13.7'. Shattered pegmatitic quartz cobble (1" to 1-1/2" diameter fragments) at base of interval. Moist.
6014					No recovery.
		19			GC/CL: Gravel with silty, sandy clay. Same as interval from 12.0' - 13.7'. Weakly consolidated to unconsolidated. Sandy lens from 20.5' to 20.8'. Moist.
6013		20			
6012		21			GC/CL: Gravel with sandy, silty clay. Strong brown (7.5YR5/8) to brown (7.5YR5/4) to pink (5YR7/3) silty clay matrix. Similar to interval from 12.0' to 13.7' with decreased gravel and sand and

Elev (Ft)	Well or Piezometer Construction and Materials	Depth (Ft)	Lithology	Unified Soils Classification or Rock Type	Lithologic Description
6011		22			slight color change. 15 - 25% gravel (1/8" - 1/2" diameter, subangular to subrounded quartzite, schist, and occasional sandstone clasts). ~10% sand (medium grained). Moderate pervasive iron oxidation of silty clay matrix. Some caliche (disseminated and as blebs). Weakly consolidated. Moist.
					No recovery.
6010		23			GC/CL: Gravel with sandy, silty clay. Same as interval from 21.1' - 21.5', but with increased fines. Moist.
					CL: Clay with trace gravel, light brown (7.5YR6/4) clay with black organic stringers. Interval dense and firm. Moist.
6009		24			No recovery.
					GC/CL: Gravel with sandy, silty clay. Same as interval from 21.1' - 21.5'. Shattered quartzite cobble at 25.2'. Moist.
6008		25			
					GM/SM: Gravelly, Silty Sand, reddish brown (5YR5/4) to yellowish red (5YR5/6) silty sand. 90 - 95% silty sand (coarse grained, subrounded to subangular), 5 - 10% gravel (1/8" - 1/4" diameter, subangular). Some to abundant disseminated caliche. Interval is cohesive. Moist.
6007		26			
6006		27			No recovery.
					GM/ML: Gravel with clayey, sandy silt. Reddish brown (5YR5/4) to reddish yellow(7.5YR6/6). 35 - 45% gravel (1/4" - 1" diameter, subrounded) and cobbles (1" diameter, subrounded) predominately quartzite and granite. 55 - 65% sandy silt matrix (sand is coarse grained, subrounded). Clayey zones from 28.7' to 29.0'. Silt lens from 29.9' - 30.3'. Abundant caliche from 30.3' - 30.9'. Interval is loosely consolidated to unconsolidated. Very moist and wet at 31.9' - 32.0'.
6005		28			
6004		29			
6003		30			

Elev (Ft)	Well or Piezometer Construction and Materials	Depth (Ft)	Lithology	Unified Soils Classification or Rock Type	Lithologic Description

LOG OF BORING NUMBER: 40205



SM: Clayey, Sandy Silt with trace gravel. Light brown (7.5YR6/4) to strong brown (7.5YR5/6). ~60% clayey silt matrix and ~40% sand (medium grained, subrounded). Unconsolidated. Saturated, flowing water.

SM/ML: Clayey, Sandy Silt with trace to some gravel. Brown (7.5YR5/4) to strong brown (7.5YR5/6). 15 - 20% sand (medium grained, subrounded to subangular). 5 - 7% gravel. Loosely consolidated to unconsolidated. Saturated, but not flowing from 32.3' - 34.0'. Flowing water from 34.0' - 35.5'. Pervasive iron oxidation from 34.0' - 35.5'.

CLAYSTONE: TOP OF BEDROCK. Claystone with some silt - weathered bedrock. Gray (10YR7/1) to pale brown (10YR6/3) with yellowish brown (10YR5/6) iron oxidation mottling. Massive texture. Firm and dense. Iron oxidized rip-up clasts from 36.0' - 36.9'. Very moist to moist. Notable decrease in moisture at 35.5'.

CLAYSTONE: Claystone, gray (10YR7/1). Iron oxidation confined to sub-horizontal bedding planes. Black organic stringers common. Dense and firm. Slightly moist. Trace silt.

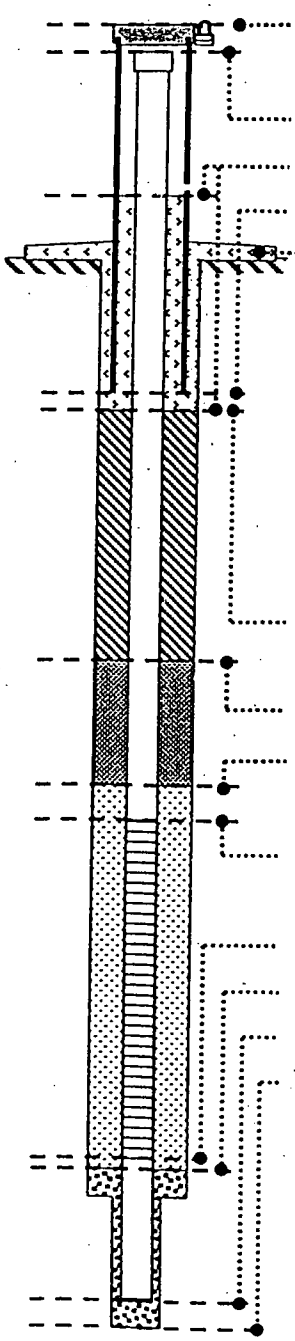
CLAYSTONE: Claystone, unweathered bedrock, very dark grayish brown (10YR3/2) to dark grayish brown (10YR4/2). Black organic material (as stringers and blebs) common. Dense and firm. Slightly moist.

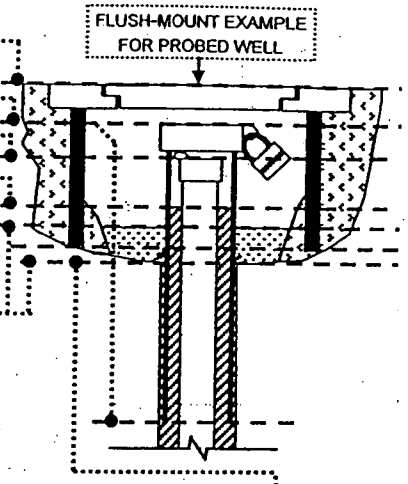
MONITORING WELL INSTALLATION REPORT: Form PRO.118

LOCATION CODE: 40205 PROJECT NAME: CY05 Well Replacements PROGRAM: Water Programs - WARP
SCREENED FORMATION: QJ/Bdrk. DRILLING CONTRACTOR: High Plains BORING METHOD: Hollow Stem Auger
DATE DRILLED: 8/15/05 DATE COMPLETED: 8/15/05 TOTAL DEPTH: 39.0' COMPLETED DEPTH: 39.0
ESTIMATED DEPTH TO BEDROCK: 35.5 RIG GEOLOGIST: E. Warp LOGGING GEOLOGIST: E. Warp
BOREHOLE DIAMETER IN SCREENED INTERVAL: 8" QUANTITY OF FLUIDS LOST DURING DRILLING: N/A
INITIAL WATER LEVEL (FT, DATE): 31.10' (fm. TOC) 8/15/05 COMPLETED WATER LEVEL (FT, DATE): 31.01' (fm TOC) 8/17/05
DIAMETER & TYPE OF INSTALLATION (WELL/PIEZOMETER/WELL POINT/ETC.): 2" PVC WELL
TYPE OF PROTECTION (FLUSH-MOUNT VS. ABOVE GROUND, ASEPTIC, ETC.): Above ground steel protective casing

ALL MEASUREMENTS WILL BE MADE IN FEET FROM GROUND SURFACE

*DENOTES ITEMS THAT MAY NOT BE APPLICABLE, DEPENDING ON BORING METHOD, WELL PROTECTION & PURPOSE





PROTECTIVE CASING TOP (STICKUP OR FLUSH-MOUNT): 4.25' ags.
*SECONDARY CASING TOP: N/A BOTTOM: N/A TYPE: N/A
SURFACE CASING TOP: 3.75' ags ID (IN): 2.0"
SURFACE SEAL TOP: 1.85' ags BOTTOM: 0.35' TYPE: Concrete
PROTECTIVE CASING BOTTOM, ID (IN), TYPE: 0.60' bgs, 6" steel
*WELL PAD DIMENSIONS, TYPE: 3'x3' - concrete fm. 0.25' ags to 0.35' bgs
*ADD'L CASING FILL TOP: N/A BOTTOM: N/A TYPE: N/A
*SURFACE ISOLATION CASING TOP: N/A BOTTOM: N/A
*SURFACE ISOLATION CASING ID (IN): N/A TYPE: N/A
*OTHER (E.G., ASEPTIC) CASING TOP: N/A BOTTOM: N/A
*OTHER CASING ID (IN): N/A TYPE, PURPOSE: N/A
*CENTRALIZER(S) OD (IN): N/A NUMBER USED: N/A TYPE: N/A
*CENTRALIZER(S) DEPTH(S): N/A
*GROUT TOP: N/A MEASURED DENSITY (LBS/GAL): N/A TYPE: N/A
*GRANULAR BENTONITE TOP: 0.35' bgs TYPE: Gran. Bent. - "Enviroplug - No. 8" hydrated w/5 gall. of distilled H_2O
*BENTONITE SEAL TOP: N/A TYPE: N/A
BENTONITE SEAL OR GRANULAR BENTONITE BOTTOM (= FILTER PACK TOP): 7.5'
FILTER PACK TYPE: 16/40 Silica Sand BRAND: C.S.S.I.
SURFACE CASING BOTTOM (=SCREEN TOP): 8.75 TYPE: Sch. 40 - PVC
SCREEN ID (IN): 2.0" SLOT SIZE (IN): 0.01" TYPE: Sch. 40 - PVC
SCREEN BOTTOM (= SUMP, TOP): 38.75' SUMP TYPE: Threaded end cap - conical
FILTER PACK BOTTOM (= *BACKFILL TOP): 39.0' *BACKFILL TYPE: N/A
SUMP BOTTOM (= WELL COMPLETED DEPTH): 39.0' *PILOT HOLE TOP, DIAMETER: N/A
TOTAL BOREHOLE DEPTH (= *PILOT HOLE AND *BACKFILL BOTTOM): 39.0'
REMARKS: Routine well installation

COMPLETED BY: Ellen S. Warp Ellen S. Warp DATE: 8/15/05
CHECKED BY: _____ DATE: _____

ROCKY FLATS ENVIRONMENTAL TECHNOLOGY SITE BOREHOLE LOG

Borehole Number: 40205
Location - North: _____ East: _____
Date: 8/15/05
Geologist: E. WARP
Drilling Equip.: CME-75-HT-Hollow Stem Auger

Surface Elevation:
Area: Former B444 - Replacement of well #40299
Total Depth: 39.0'
Company: URS / High Plains Project No. HAD51300
Sample Type: Continuous Core

RMRS LOGGING SUPERVISOR APPROVAL [signature] DATE 8/29/05

TOP/BOTTOM OF CORE IN BOX	TOP/BOTTOM OF INTERVAL	FEET OF CORE IN INTERVAL (FIELD MEASUREMENT)	SAMPLE NUMBER	FRACTURE ANGLE	BEDDING ANGLE	GRAIN SIZE DISTRIBUTION	USCS SYMBOL	DEPTH IN FEET	SOIL/LITHOLOGIC LOG	SAMPLE DESCRIPTION
	Run #1	Rec. = 0.7'					GC CL	0.0 – 0.7'		Sandy, silty, gravelly clay to [initials] 8/29/05 0.0-0.7' - Gravel w/ Sandy silty CLAY. Strong Brn. (7.5YR 5/6) silty clay matrix. 7-10% gravel (1/8-3/4" dia., sub-rounded, qtzite and granite). 8-15% sand (m.g. to c.g., sub-rounded). Some diss. caliche. Shattered qtzite cobble @ base of interval. MOIST.
	2.0'							0.7' – 2.0'		0.7-2.0' = No recovery
	Run #2	Rec. = 0.9'					GW	2.0 – 2.7'		2.0-2.7' - GRAVEL - Shattered qtzite cobble. Dk. gry (10YR 4/1) qtzite. 3/4 to 1½" dia., sub-ang. ~~clasts~~ fragments of qtzite with < 5% fines. Tr moisture.
							GC CL	2.7' – 2.9'		2.7-2.9' - Gravel w/ Sandy, silty CLAY. (same as above fm. 0.0-0.7'. MOIST.
	4.0'							2.9 – 4.0'		2.9-4.0' = No recovery
	Run #3	Rec. = 1.7'					GC CL	4.0 – 5.7'		4.0-5.7' - Gravel w/ Sandy, silty CLAY. Lt. Brn. (7.5YR 6/3), pink (7.5YR 7/4) to reddish yellow (7.5YR 6/6) silty clay matrix (med. plasticity). 55-60% gravel and cobbles (1/8" to 2" dia., sub-rounded to sub-ang.) predominantly ~~20% sand~~ qtzite ~~and granite~~ w/ minor schist). ~20% sand (m.g. to c.g., sub-ang. to sub-rounded). Abundant diss. caliche. Interval crumbly and unconsolidated due to amount of gravel and cobbles. Decr. moisture to sl. moist. [initials] 8/29/05
	7.0'							5.7' – 7.0'		5.7-7.0' = No recovery
	Run #4	Rec. = 1.6'					GC CL	7.0 – 8.6'		7.0-8.0' - GRAVEL w/ Sandy, silty CLAY. Brn. (7.5YR 5/4) to strong brn. (7.5YR 5/6) silty matrix. 30-35% gravel and cobbles (1/4-1½" dia., sub-ang. to sub-rounded). ~15% sand (c.g., sub-ang.). Silty clay matrix has med. plasticity. Some diss. caliche. Interval is unconsolidated. SL. MOIST.
							GM SM	8.6' – 9.0'		8.0-8.6' - GRAVEL / Silty SAND mixture (probable old road base). Brn. (10YR 4/3) silty sand matrix. 15-20% gravel and chunks of asphalt (1/4 to 3" dia., sub-ang.) w/in silty sand (m.g. to c.g., sub-rounded) matrix. Unconsolidated. MOIST.
	9.0							9.0 – 10.0		8.6-9.0' = No recovery
	Run #5 (9.0-12.0')						GC CL	10.0		

NOTES: General: USCS is modified for this log as follows:
Materials amounts are estimated by % volume instead of % weight.
(1) Badly broken core, accurate footage measurements not possible.
(2) Core breaks cannot be matched, accurate footage measurements not possible.

Procedure No. RMRS/OPS-PRO.101
Revision 0
Date effective: 12/31/98

9.0-10.5 - GRAVEL w/ Sandy CLAY. V.Dk. grysh brn. (10YR 3/2) to brn. (10YR 4/3). Probable old road base. Sandy clay matrix w/ 25-30% gravel and cobbles (1/4-1½" dia., sub-ang., qtzite and granite). 15-20% sand (c.g., sub-ang.). Tr asphalt chunks (1/4" dia.) @ top of interval. Some diss. caliche. SL. MOIST.

(4011-930-0134-930)(Form GT.1A)(03/01/92)

ROCKY FLATS ENVIRONMENTAL TECHNOLOGY SITE BOREHOLE LOG

Borehole Number: 40205
Location - North: _____ East: _____
Date: 8/15/05
Geologist: E. WARP
Drilling Equip. CME-75-HT - Hollow Stem Auger

Surface Elevation: _____
Area: Former B444 - Replacement of #40299
Total Depth: 39.0'
Company: URS/High Plains Project No. HAD51300
Sample Type: Continuous Core

RMRS LOGGING SUPERVISOR APPROVAL _____ DATE 8/29/05

TOP/BOTTOM OF CORE IN BOX	TOP/BOTTOM OF INTERVAL	FEET OF CORE IN INTERVAL (FIELD MEASUREMENT)	SAMPLE NUMBER	FRACTURE ANGLE	BEDDING ANGLE	GRAIN SIZE DISTRIBUTION	USCS SYMBOL	DEPTH IN FEET	SOIL/LITHOLOGIC TEXT	SAMPLE DESCRIPTION
										10.0-10.5' - See page 1 of 4 for description.
	Run #5 (cont.) 9.0'-12.0'	Rec. = 2.6'					GC CL	10.0' 10.5' 11 11.6'		10.5-11.0' - GRAVEL w/ sandy, silty CLAY. Lt. gray (5Y 7/2) w/ some strong brn. (7.5YR 4/6) silty clay matrix. 30-35% gravel (¼ to 1" dia., sub-ang., predominately gtzite). ~10% sand (c.g., sub-ang.) Some to abundant diss. caliche. Interval is crumbly. SL. MOIST. 8/29/05
	12.0'									11.0-11.6' - GRAVEL w/ Silty, Sandy CLAY. Strong brn. (7.5YR 4/6) silty clay matrix w/ perv. Fe Oxn. 20-30% gravel (¼-1" dia., sub-ang., predominately gtzite). 10-15% sand (c.g., sub-ang. to sub-rounded). Abundant caliche (diss. and as blebs) throughout. Wkly. consolidated. SL. MOIST. 8/29/05
	Run #6	Rec. = 1.7'					GC CL	12 13 13.7'		11.6-12.0' = No recovery
	14.0'									12.0-13.7' - GRAVEL w/ silty, Sandy CLAY. Strong brn (7.5YR 4/6) silty clay matrix (med. plasticity). 20-30% gravel (⅛-¾" dia., predominately gtzite). 10-15% sand. Abundant diss. caliche. Wkly consolidated. 1" ang. gtzite frag. @ 13.7'. MOIST. 8/29/05
	Run #7	Rec. = 2.2'					GC CL	14 15 15.9'		13.7-14.0' = No recovery
	17.0'						ML	16 16.2'		14.0-15.9' - GRAVEL w/ silty, sandy CLAY. Same as above fm. 12.0-13.7'. Wk. consolidated. MOIST.
										15.9'-16.2' - Yellow (10YR 7/8). Perv. Fe Oxn. MOIST.
										16.2-17.0' = No recovery — clayey sand-silt mixture 8/29/05
	Run #8	Rec. = 1.8'					GC CL	17 17.6		17.0-17.6' - GRAVEL w/ silty, Sandy CLAY. Same as above fm. 12.0-13.7'. Wkly. consolidated. MOIST.
	19.0'						ML	17.9' 18 18.8'		17.6-17.9' - Yellow (10YR 7/6). Perv. Fe Oxn. MOIST.
										17.9-18.8' - GRAVEL w/ Silty, Sandy CLAY. Same as above fm. 12.0-13.7'. Shattered pegmatitic gtz. cobble (1-1½" dia.) @ base of interval. MOIST.
										18.8-19.0' = No recovery
	Run #9 19.0-22.0'	Rec. = 2.5'					GC CL	19		19.0-21.1' - GRAVEL w/ Silty, Sandy CLAY. Same as above fm. 12.0-13.7'. Wkly. consolidated to unconsolidated. Sandy lense fm. 20.5-20.8'. MOIST

NOTES: General: USCS is modified for this log as follows:
Materials amounts are estimated by % volume instead of % weight.
(1) Badly broken core, accurate footage measurements not possible.
(2) Core breaks cannot be matched, accurate footage measurements not possible.

(4011-930-0134-930)(Form GT.1A)(03/01.V2)

ROCKY FLATS ENVIRONMENTAL TECHNOLOGY SITE BOREHOLE LOG

Borehole Number: 40205
Location - North: _____ East: _____
Date: 8/15/05
Geologist: E. Warp
Drilling Equip.: CME-75-HT - Hollow Stem Auger

Surface Elevation:
Area: Former B444 - Replacement of well #40299
Total Depth: 39.0'
Company: URS/High Plains Project No. HAD51300
Sample Type: Continuous Core

RMRS LOGGING SUPERVISOR APPROVAL _____ DATE 8/29/05

TOP/BOTTOM OF CORE IN BOX	TOP/BOTTOM OF INTERVAL	FEET OF CORE IN INTERVAL (FIELD MEASUREMENT)	SAMPLE NUMBER	FRACTURE ANGLE	BEDDING ANGLE	GRAIN SIZE DISTRIBUTION	USCS SYMBOL	DEPTH IN FEET	SOIL/LITHOLOGIC LOG	SAMPLE DESCRIPTION
	Run #9 (cont.) (19.0→22.0') 22.0'	Rec. = 2.5'	—				CL	20.0		20.0-21.1' - See page 2 of 4 for description.
							CL	21'		21.1-21.5' - GRAVEL w/ Sandy, Silty CLAY. Strong brn. (7.5YR5/8) to brn. (7.5YR5/4) to pink (5YR7/3) Silty clay matrix. Similar to above fm. 12.0-21.1' with decreased gravel and sand and sl. color change. 15-25% gravel (1/8-1/2" dia., sub-ang. to sub-rounded, qtzite, ~~granite~~ schist and occasional Ss. clasts). ~10% sand (m.g.). Moderate perv. FeOx'n of silty clay matrix. Some caliche (diss. and as blebs). Wkly. consolidated. MOIST.
							CL	21.1'		
								21.5		
								22'		
	Run #10 22.0' 24.0'	Rec. = 1.7'					CL	23'		21.5-22.0' = No recovery
								23.4'		22.0-23.4' - GRAVEL w/ Sandy, Silty CLAY. Same as above fm. 21.1-21.5', but with increased fines. MOIST. ~~DISPLACED~~
							CL	23.7'		23.4-23.7' - CLAY w/ ½ gravel, ~~Cast of Silty Claystone~~. Lt. brn. (7.5YR6/4) clay w/ blk. organic stringers. Interval dense and firm. MOIST. 5/29/05
								24'		23.7-24.0' = No recovery
	Run #11 24.0' 27.0'	Rec. = 2.8'					CL	25'		24.0-25.3' - GRAVEL w/ Sandy, Silty CLAY. Same as above fm. 21.1'-21.5'. Shattered qtzite cobble @ 25.2'. MOIST.
								25.3'		
							GM SM	26'		25.3-26.8' - Gravelly, Silty SAND. Reddish brn. (5YR5/4) to Yellowish red (5YR5/6) Silty sand. 90-95% silty sand (c.g., sub-rounded to sub-ang.). 5-10% gravel (1/8-1/4" dia., sub-ang.). Some to abundant diss. caliche. Interval is cohesive. MOIST.
								26.8'		
								27'		26.8-27.0' = No recovery
	Run #12 27.0' 29.0'	Rec. = 2.1'					GM NL	28'		27.0-31.9' - GRAVEL w/ clayey, sandy SILT. Reddish brn (5YR5/4) to reddish yellow (7.5YR6/6). - 35-45% gravel (1/4-1" dia., sub-rounded) and cobbles (1" dia., sub-rounded) predominately qtzite and granite. - 55-65% Sandy silt matrix (sand is c.g., sub-rounded). Clayey zones fm. 28.7 to 29.0'. Silt dense fm.
								29'		
	Run #13 (29.0-32.0')	Rec. = 3.0'						30.0'		

NOTES: General: USCS is modified for this log as follows:
Materials amounts are estimated by % volume instead of % weight.
(1) Badly broken core, accurate footage measurements not possible.
(2) Core breaks cannot be matched, accurate footage measurements not possible.

Procedure No. RMRS/OPS-PRO.101
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29.9-30.3' Abundant caliche fm. 30.3-30.9'
Interval is loosely consolidated to unconsolidated. V. Moist and wet at 31.9-32.0'

(4011-9X0-0(34-9 X0)(Form GT.1A X0)(OL V2)

ROCKY FLATS ENVIRONMENTAL TECHNOLOGY SITE BOREHOLE LOG

Borehole Number: 40205
Location - North: _____ East: _____
Date: 8/15/05
Geologist: E. WARP
Drilling Equip.: CME-75-HT - Hollow Stem Auger

Surface Elevation:
Area: Former B444 - Replacement of well #
Total Depth: 39.0'
Company: URS/High Plains Project No. HAD51300
Sample Type: Continuous Core

RMRS LOGGING SUPERVISOR APPROVAL [signature] DATE 8/29/05

TOP/BOTTOM OF CORE IN BOX	TOP/BOTTOM OF INTERVAL	FEET OF CORE IN INTERVAL (FIELD MEASUREMENT)	SAMPLE NUMBER	FRACTURE ANGLE	BEDDING ANGLE	GRAIN SIZE DISTRIBUTION	USCS SYMBOL	DEPTH IN FEET	SOIL/LITHOLOGIC LOG	SAMPLE DESCRIPTION
	Run #13 (cont.) 32.0'	Rec. = 3.0'					GM / ML	30.0 – 31.9'		30.0-31.9' - GRAVEL w/ Clayey, Sandy SILT. Described on pg. 3 of 4.
	Run #14 34.0'	Rec. = 2.0'					SM / SM / ML	31.9' – 32.3'		31.9-32.3' - Clayey, Sandy SILT w/ Tr gravel. Lt. brn. (7.5YR 6/4) to Strong brn. (7.5YR 5/6). ~60% clayey silt matrix and ~40% sand (m.g., sub-rounded). Unconsolidated. SATURATED - flowing H_2O.
	Run #15 37.0'	Rec. = 3.0'						32.3' – 35.5'		32.3-35.5 - Clayey, Sandy SILT w/ Tr gravel. to some Lt. Brn. (7.5YR 5/4) to Strong Brn. (7.5YR 5/6). 15-20% sand (m.g., sub-rounded to sub-ang.). 5-7% gravel, Loosely consolidated to unconsolidated. SATURATED BUT NOT flowing fm. 32.3-34.0'. Flowing H_2O fm. 34.0-35.5'. Perv. FeOx'n fm. 34.0-35.5'. Bedrock contact @ 35.5'.
	Run #16 39.0'	Rec. = 2.0'						35.5 – 36.9'		35.5-36.9 - CLAYSTONE w/ some silt. Weathered Bedrock Gry (10YR 7/1) to pale brn. (10YR 6/3) w/ yellowish brn. (10YR 5/6) FeOxn mottling. Massive texture. Firm and dense. FeOxd rip-up clasts fm. 36.0-36.9'. V. MOIST TO MOIST. Noteable decrease in moisture @ 35.5'.
								36.9' – 38.4'		36.9-38.4' - CLAYSTONE - Gry (10YR 7/1). FeOxn confined to sub-horizontal bedding planes. Blk organic stringers and blebs common. Dense and firm. Decrease moisture to sl. MOIST. Tr silt.
								38.4 – 39.0'		38.4-39.0' - CLAYSTONE - Un-weathered bedrock V. dk. gry'sh brn. (10YR 3/2) to dk. gry'sh brn. (10YR 4/2). Black organic material (as stringers and blebs) common. Dense and firm. Sl. moist.
								39		T.D. @ 39.0'

NOTE: PID Hits fm. 0.3ppm to 1.0 ppm fm. 19.0 → 39.0' (T.D.)

NOTES: General: USCS is modified for this log as follows:
Materials amounts are estimated by % volume instead of % weight.
(1) Badly broken core, accurate footage measurements not possible.
(2) Core breaks cannot be matched, accurate footage measurements not possible.

(4011-930-0134-930)(Form GT.1AX03/01.V2)

STATE PLANE COORDINATES AREA: GRND ELEV. (FT):6021.549 CASING DIA (IN): 2

NORTH: 748747.718 TOTAL DEPTH (FT): 30.0 BH DIA. (IN): 8

EAST: 2082575.72 COMPLETION DATE: 8/11/05 GRID LOCATOR:

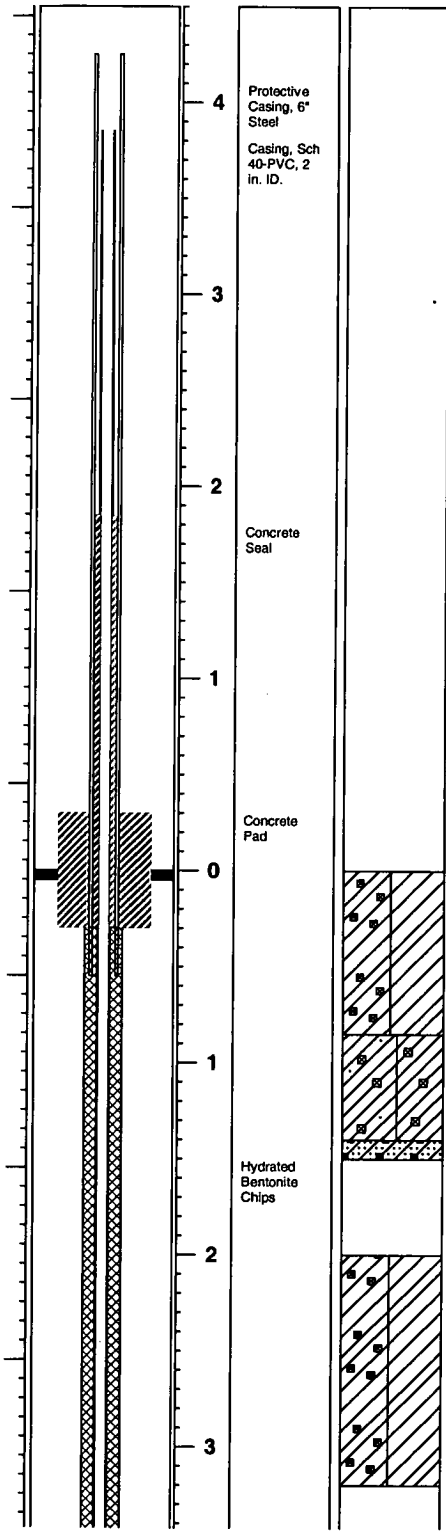
PROJECT: Former B444 GEOLOGIST: E. Warp

REMARKS:

Replaces well 40399. PID hits (17-115ppm) from 17.0 - 22.0'.

LOG OF BORING NUMBER: 40305

Elev (Ft)	Well or Piezometer Construction and Materials	Depth (Ft)	Lithology	Unified Soils Classification or Rock Type	Lithologic Description
6026					
		4			
6025					
		3			
6024					
		2			
6023					
		1			
6022					
		0			GC/CL: Sandy, Gravelly Clay (fill), brown (7.5YR5/4). 15 - 20% gravel (1/4" - 3/4" diameter, subangular, predominately quartzite). 15 - 25% sand (coarse grained, subrounded to subangular). Clay has medium plasticity. 2" quartzite cobble at 0.4'. Very moist. Fill extends to probably 15' to 20'.
6021					
		1			SC/GC: Gravel/Sand mixture (fill). Asphalt/road base. Black (7.5YR2.5/1). 1/2" - 1" diameter chunks of asphalt containing 1/4" - 1/2" diameter clasts of quartzite and granite. ~40% gravel and 60% sand content. Very moist.
6020					
		2			SC: Sand with some gravel (fill), road base. Brown (7.5YR4/2). ~90% sand (medium grained to coarse grained, subrounded), ~10% gravel (1/8" - 1/4" diameter, subangular). Moist.
					No recovery.
6019					
		3			GC/CL: Gravel with sandy clay (fill). Dark brown (7.5YR3/2). 50 - 55% gravel and cobbles (1/4" to 1-1/2" diameter, subangular to subrounded) quartzite and granitic composition with some asphalt chunks. ~25% sand (coarse grained), ~25% clay. Shattered quartzite cobbles (up to 2" diameter) from 2.8' to 3.2'. Moist.



Elev (Ft)	Well or Piezometer Construction and Materials	Depth (Ft)	Lithology	Unified Soils Classification or Rock Type	Lithologic Description
6018					No recovery.
		4			GC/CL: Gravel with sandy clay. Same as interval from 2.0' to 3.2'. Moist. 1-1/2" clasts of quartzite at base.
6017		5			SP: Sand with some gravel and trace clay. Very pale brown (10YR7/3). ~75 - 80% sand (medium grained to coarse grained, subrounded to subangular). ~20 - 25% gravel (1/8" - 1/4" diameter, subangular). Unconsolidated. Moist.
6016					GC/CL: Gravel with sandy clay. Same as interval from 2.0' to 3.2'. Moist.
		6			GC/CL: Gravelly, Sandy Clay with silt. Strong brown (7.5YR4/6). 25 - 30% sand (medium grained to coarse grained, subangular to subrounded). 10 - 15% gravel (1/8" - 1/4" diameter, subangular). Clay has medium plasticity. Cohesive. Moist. 50 - 60% coarse grained, subangular, white/light tan sand at base, with some caliche blebs.
6015					No recovery.
		7			GM/SM: Gravelly, Silty Sand with clay. Strong brown (7.5YR5/6) silty/clay matrix. ~65% sand (medium grained to coarse grained, subrounded to subangular). ~15% gravel (1/8" - 1/4", subrounded). Clay/silt is cohesive. Abundant white/light tan caliche disseminated throughout. Caliche blebs and stringers (and sand-sized rock fragments) common. Zones of shattered quartzite cobbles and gravel at 7.6', 8.1' to 8.3', and 8.8'. Moist.
6014		8	Filter Pack, 16/40 Silica Sand		
6013					
		9			GC/CL: Gravelly, Sandy, Silty Clay. Pinkish gray (7.5YR6/2) silty clay matrix. ~10% gravel, ~10 - 20% sand (coarse grained, subangular) with abundant quartzite cobbles (1" - 2" diameter, subangular). Abundant caliche throughout. Unconsolidated. Moist.
6012					
		10	Screen, Sch 40-PVC, 2 in. ID., 0.010 in. slots		GM/SM: Gravelly, Silty Sand with clay. Same as interval from 7.0' to 9.0'. Moist.
6011		11			GC/CL: Gravel with silty, sandy clay. Light brown (7.5YR6/3) to pinkish gray (7.5YR7/2) to light olive gray (5Y6/2) matrix. 50 - 55% gravel (1/4" - 3/4" diameter, subrounded to subangular) composed of predominately quartzite with less granite. 50 - 55% sandy, silty/clay matrix (multi-colored). Abundant caliche (disseminated and stringers). Crumbly and unconsolidated. Slightly moist.
6010		12			

Elev (Ft)	Well or Piezometer Construction and Materials	Depth (Ft)	Lithology	Unified Soils Classification or Rock Type	Lithologic Description
6009		13			
6008		14		CL/SM:	Gravelly, Sandy Clay/Silt mixture with caliche. Pinkish gray (5YR7/2). Unconsolidated/crumbly lens of caliche. Slightly moist.
6007		15		GC/CL:	Gravel with silty, sandy clay. Very similar to interval from 10.1' to 13.5', except slight color change of silty, sandy clay matrix. Reddish yellow (7.5YR7/6) to pink (5YR7/3) matrix. 50 - 55% gravel and 50 - 55% silty, sandy clay matrix. Abundant caliche. Unconsolidated and crumbly. Moist. Note: PID = 17 ppm in borehole.
6006		16			
6005		17			No recovery.
6004		18		GC/CL:	Gravel with silty, sandy clay. Same as interval from 14.0' to 16.4'. Moist.
6003		19		CL:	Silty Clay, strong brown (7.5YR5/8) with some brown (7.5YR4/4) and trace light olive gray (5Y6/2) mottling. Strong pervasive iron oxidation. Trace black organic stringers. Firm, dense, and cohesive. Moist. Increasing silt, fine grained sand below 18.5'.
6002		20		SM:	Silty, Clayey Sand with trace gravel. Strong brown (7.5YR5/6). Strong pervasive iron oxidation of silty matrix. ~80% sand (medium grained, subrounded). ~20% silty matrix. Abundant disseminated white, coarse grained, sand-sized rock fragments - caliche (?). White, subangular blebs of caliche at 20.0' to 21.0'. Very moist. Note: PID hits up to 115 ppm on soil associated with the augers (outside of borehole). 75 ppm hits within the borehole.
6001		21			
6000					

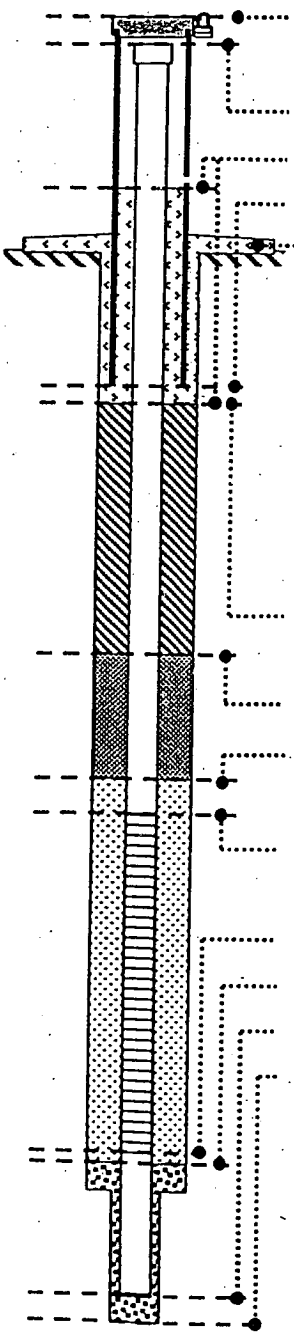
Elev (Ft)	Well or Piezometer Construction and Materials	Depth (Ft)	Lithology	Unified Soils Classification or Rock Type	Lithologic Description
		22			GM/SM: Gravelly, Silty, Clayey Sand, strong brown (7.5YR5/6 to 7.5YR5/8) with some reddish brown (7.5YR6/8). 85 - 90% silty sand (medium grained to coarse grained, subangular to subrounded). 10 - 15% gravel (1/2" -3/4" diameter, subrounded to subangular, composed of quartzite, granite, and minor schist). Similar to interval from 18.8' to 21.5', but less cohesive due to gravel. Disseminated caliche common. Strong pervasive iron oxidation of silty matrix. Increasing moisture from very moist to saturated/flowing water from 22.0' to 24.3'. Caliche lens (1/4" thick) at 22.6'.
5999		23			
5998		24			No recovery.
					GM/SM: Gravelly, Silty Sand. Same as interval from 21.5' to 23.5'. Pink (5YR7/3) sandstone clasts (3/4" - 1" diameter, angular) above bedrock contact. Saturated/flowing water.
5997		25			SILTY CLAYSTONE: TOP OF BEDROCK. Silty Claystone (weathered bedrock). Brownish yellow (10YR6/6) with minor light gray (10YR7/1). Interval is firm and dense with faint bedding planes. Some black organic material throughout. Trace manganese oxide along internal bedding planes. Abrupt decrease in moisture at bedrock contact. Silty claystone is moist.
5996		26			CLAYEY SILTSTONE: Clayey Siltstone, weathered. Light yellowish brown (2.5Y6/3). Massive textured. Very silty from 27.0' to 27.8'. Weak to moderate pervasive iron oxidation. Cohesive yet moderately friable. Moist.
5995		27			
5994		28			CLAYEY SILTSTONE: Clayey Siltstone, gray (10YR6/1). Massive texture. Decreasing iron oxidation to trace on bedding planes. Weakly fissile. Moderately friable. Decreasing moisture to slightly moist.
5993		29			
5992	Threaded End Cap, Conical - Sump, Sch 40-PVC	30			

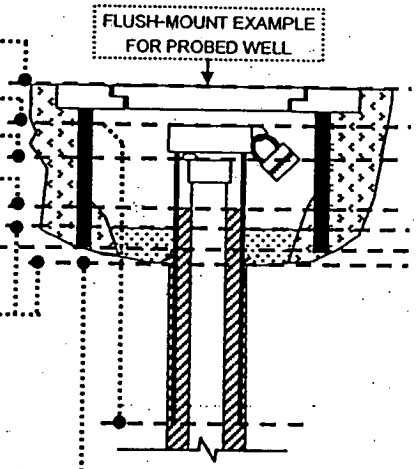
MONITORING WELL INSTALLATION REPORT: Form PRO.118

LOCATION CODE: 40305 PROJECT NAME: CY05 Well Replacements PROGRAM: Water Programs - WARP
SCREENED FORMATION: Al/Bdrk. DRILLING CONTRACTOR: High Plains BORING METHOD: Hollow Stem Auger
DATE DRILLED: 8/11/05 DATE COMPLETED: 8/11/05 TOTAL DEPTH: 30.0' COMPLETED DEPTH: 30.0'
ESTIMATED DEPTH TO BEDROCK: 24.3 RIG GEOLOGIST: E. Warp LOGGING GEOLOGIST: E. Warp
BOREHOLE DIAMETER IN SCREENED INTERVAL: 8" QUANTITY OF FLUIDS LOST DURING DRILLING: N/A
INITIAL WATER LEVEL (FT, DATE): 16.85' (fm. TOC) 8/11/05 COMPLETED WATER LEVEL (FT, DATE): 19.62' (fm TOC) 9/6/05
DIAMETER & TYPE OF INSTALLATION (WELL/PIEZOMETER/WELL POINT/ETC.): 2" I.D. - PVC Well
TYPE OF PROTECTION (FLUSH-MOUNT VS. ABOVE GROUND, ASEPTIC, ETC.): Above ground steel protective casing

ALL MEASUREMENTS WILL BE MADE IN FEET FROM GROUND SURFACE

*DENOTES ITEMS THAT MAY NOT BE APPLICABLE, DEPENDING ON BORING METHOD, WELL PROTECTION & PURPOSE





PROTECTIVE CASING TOP (STICKUP OR FLUSH-MOUNT): 4.25' a.g.s.
*SECONDARY CASING TOP: N/A BOTTOM: N/A TYPE: N/A
SURFACE CASING TOP: 3.85 ags. ID (IN): 2.0"
SURFACE SEAL TOP: 1.85 ags BOTTOM: 0.3' bgs TYPE: Concrete
PROTECTIVE CASING BOTTOM, ID (IN), TYPE: 0.55' bgs, 6" steel
*WELL PAD DIMENSIONS, TYPE: 3'x3' concrete fm. 0.3' ags to 0.3' bgs
*ADD'L CASING FILL TOP: N/A BOTTOM: N/A TYPE: N/A
*SURFACE ISOLATION CASING TOP: N/A BOTTOM: N/A
*SURFACE ISOLATION CASING ID (IN): N/A TYPE: N/A
*OTHER (E.G., ASEPTIC) CASING TOP: N/A BOTTOM: N/A
*OTHER CASING ID (IN): N/A TYPE, PURPOSE: N/A
*CENTRALIZER(S) OD (IN): N/A NUMBER USED: N/A TYPE: N/A
*CENTRALIZER(S) DEPTH(S): N/A
*GROUT TOP: N/A MEASURED DENSITY (LBS/GAL): N/A TYPE: N/A
*GRANULAR BENTONITE TOP: N/A TYPE: N/A
*BENTONITE SEAL TOP: 0.3' bgs TYPE: Med. bentonite chips - "Pure Gold" - hydrated w/5 gall. of distilled H_2O.
BENTONITE SEAL OR GRANULAR BENTONITE BOTTOM (= FILTER PACK TOP): 8.0'
FILTER PACK TYPE: 16/40 Silica Sand BRAND: C.S.S.I.
SURFACE CASING BOTTOM (=SCREEN TOP): 9.75' TYPE: ~~C.S.I.~~ Sch. 40 - PVC
SCREEN ID (IN): 2.0" SLOT SIZE (IN): 0.01" TYPE: Sch. 40 - PVC
SCREEN BOTTOM (= SUMP, TOP): 29.75' SUMP TYPE: Threaded end-cap - conical
FILTER PACK BOTTOM (= *BACKFILL TOP): 30.0' *BACKFILL TYPE: N/A
SUMP BOTTOM (= WELL COMPLETED DEPTH): 30.0' *PILOT HOLE TOP, DIAMETER: N/A
TOTAL BOREHOLE DEPTH (= *PILOT HOLE AND *BACKFILL BOTTOM): 30.0'
REMARKS: P.I.D. H2S fm. 17-115 ppm fm. 17.0'-22.0'. Routine well installation
COMPLETED BY: Ellen S. Warp DATE: 8/11/05
CHECKED BY: DATE:

U.S. DEPARTMENT OF ENERGY ROCKY FLATS PLANT FORM PRO.101A

ROCKY FLATS ENVIRONMENTAL TECHNOLOGY SITE BOREHOLE LOG

PAGE 1 OF 3

Borehole Number: 40305
Location - North: _____ East: _____
Date: 8/11/05
Geologist: E. Warp
Drilling Equip.: CME-75-HT-Hollow Stem

Surface Elevation: _____
Area: Old B444 - Replacement of well #40399
Total Depth: 30.0'
Company: URS/High Plains Project No. HA051300
Sample Type: Continuous Core

RMRS LOGGING SUPERVISOR APPROVAL [signature] DATE 8/15/05

TOP/BOTTOM OF CORE IN BOX	TOP/BOTTOM OF INTERVAL	FEET OF CORE IN INTERVAL (FIELD MEASUREMENT)	SAMPLE NUMBER	FRACTURE ANGLE	BEDDING ANGLE	GRAIN SIZE DISTRIBUTION	USCS SYMBOL	DEPTH IN FEET	SOIL/LITHOLOGIC LOG	SAMPLE DESCRIPTION
	0.0							0.0		0.0 → 0.85 - Sandy, gravelly CLAY. Brn. (7.5YR 5/4). ~~25-25%~~ 15-20% gravel (1/4" - 3/4" dia., sub-ang., predominately qtzite). 15-25% sand (c.g., sub-rounded to sub-ang.). Clay has medium plasticity. 2" qtzite cobble @ 0.4'. V. MOIST. FILL (probably to 15-20')
	Run #1	Rec = 1.5'					GC CL	0.85'		
							GC SC	1		0.85 - 1.4' - GRAVEL/sand mixture - ASPHALT/ROAD BASE. Black (7.5YR 2.5/1). 1/2" to 1" chunks dia. chunks of asphalt containing 1/4" - 1/2" dia. clasts of qtzite and granite. ~40% gravel and 60% sand content. V. MOIST FILL.
						SC → SW 8/11/05	GC SC	1.4 / 1.5		
	2.0'							2		1.4 - 1.5' - Sand w/some gravel - Road base. Brn. (7.5YR 4/2). ~90% sand (m.g. to c.g., sub-rounded) ~10% gravel (1/8 - 1/4" dia., sub-ang.). MOIST. FILL.
	Run #2	Rec = 1.2'					GC CL	3		1.5 - 2.0' = No recovery
								3.2'		2.0 - 3.2' - GRAVEL w/sandy clay. Dk. Brn. (7.5YR 3/2) 50-55% gravel and cobbles (1/4" to 1 1/2" dia., sub-ang. to sub-rounded) qtzite and granitic composition w/some asphalt chunks. 25% sand (c.g.) ~25% clay. Shattered qtzite cobble (up to 2" dia chunks) fm. 2.8 - 3.2'. MOIST. FILL.
	4.0'							4		3.2 - 4.0' = No recovery
	Run #3	Rec = 1.7'					GC CL	4.3		4.0 - 4.3' - GRAVEL w/sandy clay. Same as above fm. 2.0 - 3.2'. MOIST. 1 1/2" clasts of qtzite at base.
							SP	4.6		4.3 - 4.6' - SAND w/some gravel and ~~some sand~~ SW 8/11/05 V. pale brn (10YR 7/3). ~75-80% sand (m.g. to c.g., sub-rounded to sub-ang.). ~20-25% gravel (1/8 - 1/4", sub-ang.). Unconsolidated MOIST.
							GC CL	5		
							GC CL	5.55 / 5.7'		
								6		4.6 - 5.55 - GRAVEL w/sandy clay (same as above fm 2.0 - 3.2'). MOIST.
	7.0'							7		5.55 - 5.7' - Gravelly, sandy CLAY w/silt. Strong Brn. (7.5YR 4/6) 25-30% sand (m.g. to c.g., sub-ang. to sub-rounded). ~10-15% gravel (1/8 - 1/4" dia., sub-ang.). Clay has med. plasticity. Cohesive. MOIST. 50-60% c.g., sub-ang. wht/lt. tan sand at base. w/some caliche blebs.
	Run #4	Rec = 2.0'					GM SM	8		5.7 - 7.0' = No recovery
	9.0'							9'		7.0 - 9.0' - Gravelly, silty SAND w/~~some~~ Clay. Strong brn. (7.5YR 5/6) silty/clay matrix. ~65% sand (m.g. to c.g., sub-rounded to sub-ang.) ~15% gravel (1/8 - 1/4", sub-rounded). Clay/silt is cohesive. Abundant wht/lt. tan caliche diss. throughout. Caliche blebs and stringers (and sand sized rk. frags). Common. Zones of shattered qtzite cobbles and gravel at 7.6, 8.1 → 8.3 and 8.8'. MOIST.
	Run #5 9.0-12.0'	Rec = 3.0'					GC CL	9.4'		
							GM SM	10.0'		

NOTES: General: USCS is modified for this log as follows:
Materials amounts are estimated by % volume instead of % weight.
(1) Badly broken core, accurate footage measurements not possible.
(2) Core breaks cannot be matched, accurate footage measurements not possible.

Procedure No. RMRS/OPS-PRO.101
Revision 0
Date effective: 12/31/98

(4011-930-0134-930)(Form GT.1A)(03/01/92)

SEE PAGE 2 for description

ROCKY FLATS ENVIRONMENTAL TECHNOLOGY SITE BOREHOLE LOG

PAGE 2 OF 3

Borehole Number: 40305
Location - North: _____ East: _____
Date: 8/11/05
Geologist: E. WARP
Drilling Equip.: CME-75-HT - Hollow Stem Auger

Surface Elevation: _____
Area: former B444 - Replacement of well #40399
Total Depth: 30.0'
Company: URS/High Plains Project No. HAD51300
Sample Type: Continuous Core

RMRS LOGGING SUPERVISOR APPROVAL [signature] DATE 8/15/05

TOP/BOTTOM OF CORE IN BOX	TOP/BOTTOM OF INTERVAL	FEET OF CORE IN INTERVAL (FIELD MEASUREMENT)	SAMPLE NUMBER	FRACTURE ANGLE	BEDDING ANGLE	GRAIN SIZE DISTRIBUTION	USCS SYMBOL	DEPTH IN FEET	SOIL/LITHOLOGIC LOG	SAMPLE DESCRIPTION
	Run #5 (cont.) 9.0→12.0'	Rec.= 3.0'					GC, SM, CL	10.0' 10.1 11 12		9.0-9.4' - Gravelly, sandy, silty CLAY. Pinkish-gry (7.5YR 6/2) silty clay matrix. ~10% gravel, ~10-20% sand (c.g., subang) w/abundant qtzite cobbles (1-2" dia., sub-ang.). Abundant caliche throughout. Unconsolidated. MOIST.
	12.0' Run #6	Rec.= 2.0'						13 13.5		9.4-10.1' - Gravelly, silty ~~CLAY~~ SAND w/clay. (same as above fm. 7.0'-9.0'). MOIST.
	14.0' Run #7	Rec.= 2.4'					SM, CL	14		10.1-13.5' - GRAVEL w/silty, sandy CLAY. Lt. brn. (7.5YR 6/3) to pinkish gry. (7.5YR 7/2) to lt. olive gry (5Y 6/2) matrix. 50-55% gravel (1/4-3/4" dia., subrounded to sub-ang.) composed of predominately qtzite w/less granite. 50-55% sandy, silty/clay matrix (multi-colored). Abundant caliche (diss and stringers). Crumbly and unconsolidated. SL. MOIST.
							GC, CL	15 16		13.5-~~14.0~~ 14.0' - Gravelly SANDY/Caliche. Pink'sh gry (5YR 7/2). Unconsolidated/crumbly lense CLAY/silt mixture w/ of caliche.
	17.0' Run #8	Rec.= 2.2'					SM	16.4' 17		14.0-16.4' - Gravel w/silty, sandy CLAY. (V. similar to above fm. 10.1 to 13.5' except slight color change of silty sandy clay matrix). Redd'sh yellow (7.5YR 7/6) to Pink (5YR 7/3) matrix. 50-55% gravel and 50-55% silty sandy clay matrix. Abundant caliche. Unconsolidated and crumbly. MOIST. [PID = 17 ppm in borehole].
							GC, CL	18		16.4-17.0' - No recovery
							CL	18.8		17.0-18.0' - Gravel w/silty, sandy CLAY. Same as above fm. 14.0-16.4'. MOIST.
	19.0' Run #9 (19.0'→22.0')	Rec.= 3.2'					SM	19 20.0'		18.0-~~18.8~~ 18.8 - Silty CLAY ~~(displaced claystone Oxd)~~ Strong brn. (7.5YR 5/8) w/some brn. (7.5YR 4/4) and Tr lt. olive gry (5Y 6/2) mottling. Strong perv. FeOxn. Tr blk. organic stringers. Firm, dense, and cohesive. MOIST. Incr. silt, fg sand below 18.5.
										~~18.5~~ 21.5' - Silty clayey SAND w/Tr gravel. Strong brn (7.5YR 5/6). S. perv. FeOxn of silty matrix. ~80% sand (m.g., sub-rounded). ~20% silty matrix.

Change left half of lith. log to SM w/caliche 8/15/05

NOTES: General: USCS is modified for this log as follows: 8/15/05
Materials amounts are estimated by % volume instead of % weight.
(1) Badly broken core, accurate footage measurements not possible.
(2) Core breaks cannot be matched, accurate footage measurements not possible.

Procedure No. RMRS/OPS-PRO.101
Revision 0
Date effective: 12/31/98

Abundant diss. wht. c.grained sand-sized rock frags. - caliche (?). Wht. sub-ang. blebs of caliche @ 20.0-21.0'. V. MOIST.

(4011-930-0134-930)(Form GT.1A)(03/01/92)

U.S. DEPARTMENT OF ENERGY ROCKY FLATS PLANT

FORM PRO.101A

ROCKY FLATS ENVIRONMENTAL TECHNOLOGY SITE BOREHOLE LOG

Borehole Number: 40305
Location - North: _____ East: _____
Date: 8/11/05
Geologist: E. WARP
Drilling Equip.: CME-75-HT - Hollow Stem Auger

Surface Elevation: _____
Area: 8444 (former) - Replacement of well #40399
Total Depth: 30.0'
Company: URS/High Plains Project No.: HAD51300
Sample Type: Continuous Core

RMRS LOGGING SUPERVISOR APPROVAL _____ DATE 8/15/05

TOP/BOTTOM OF CORE IN BOX	TOP/BOTTOM OF INTERVAL	FEET OF CORE IN INTERVAL (FIELD MEASUREMENT)	SAMPLE NUMBER	FRACTURE ANGLE	BEDDING ANGLE	GRAIN SIZE DISTRIBUTION	USCS SYMBOL	DEPTH IN FEET	SOIL/ LITHOLOGIC LOG	SAMPLE DESCRIPTION
	Run #9 (cont.) 18.0 → 22.0' 22.0	Rec. = 3.2' 22.0'					SM	20.0' 21 21.5'		Silty SAND w/ Tr gravel (described on page 2). [NOTE: PID HITS UP TO 115 ppm on SOIL ASSOCIATED W/THE AUGERS (outside of borehole). 75 ppm HITS WITHIN THE BOREHOLE.]. Jayey 8/15/05
	Run #10 22.0' 24.0'	Rec. = 1.5'					GM SM	22 23 23.5	Flowing H_2O	21.5-23.5' - Gravelly, Silty SAND. Strong Brn (7.5YR 5/6 → 5/8) w/some reddish brn. (7.5YR 4/8). 85-90% silty sand (m.g. to c.g., sub-ang. to sub-rounded). 10-15% gravel (1/2-3/4" dia., sub-rounded to sub-ang., composed of granite, granite and minor schist). Similar to above silty sand fm. 18.5-22.0' but less cohesive due to gravel. Diss. caliche common. S. perv. FeOxh of silty matrix. Increasing moisture fm. V. moist to saturated / flowing H_2O @ 22.0' to 24.3'. Caliche lense (1/4" thick) @ 22.6'.
	Run #11 24.0' 27.0'	Rec. = 3.1' 24.0' 8/11/05	Bedrock Contact @ 24.3'				GM SM	24 24.3' 25 25.2 26 27		23.5-24.0' = No recovery. 24.0-24.3' - Gravelly, Silty SAND (same as above fm. 21.5-23.5') Pink (5YR 7/3) sandstone clasts (3/4"-1" dia., ang.) above bedrock contact. SATURATED / Flowing H_2O. BEDROCK CONTACT @ 24.3' 24.3-25.2' - Silty CLAYSTONE (BEDROCK) - Weathered. Brn'sh Yellow (10YR 6/6) w/minor lt. gry (10YR 7/1). Interval is firm and dense w/faint bedding planes. Some blk. organic material throughout. Tr MnOx along internal bedding planes. Abrupt decrease in moisture @ bedrock contact. Silty claystone is moist.
	Run #12 27.0' 30.0'	Rec. = 3.1'						28 29 30.0'		25.2-27.8' - ~~Silty claystone~~ CLAYSTONE - Weathered. Lt. Yell'sh brn. (2.5Y 6/3). Clayey siltstone. Massive textured. V. silty fm. 27.0-27.8. Wk to Moderate perv. FeOxh. Cohesive yet moderately friable. Moist. 27.8-30.0 - Clayey SILTSTONE. Gry (10YR 6/1). Massive texture. Decr. FeOxh to Tr on ~~fracture~~ bedding planes. Wkly fissile. Mod. friable. Decr. moisture to sl. moist.

TD = 30.0'

NOTES: General: USCS is modified for this log as follows:
Materials amounts are estimated by % volume instead of % weight.
(1) Badly broken core, accurate footage measurements not possible.
(2) Core breaks cannot be matched, accurate footage measurements not possible.

Procedure No. RMRS/OPS-PRO.101
Revision 0
Date effective: 12/31/98

(4011-930-0134-930)(Form GT.1A)(03/01/92)

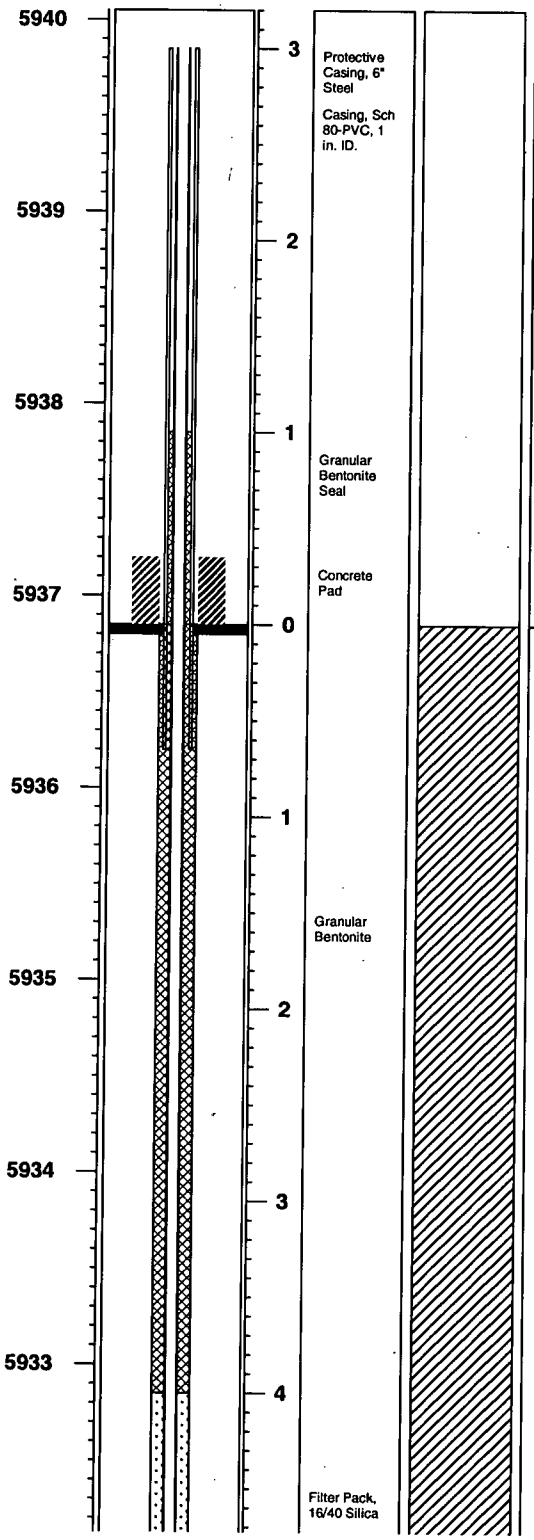
STATE PLANE COORDINATES AREA:
NORTH: 751426.061
EAST: 2083531.023
PROJECT: PACS 3
REMARKS:

GRND ELEV. (FT): 5936.85
TOTAL DEPTH (FT): 22.0
COMPLETION DATE: 8/16/05
GEOLOGIST: J. Boylan

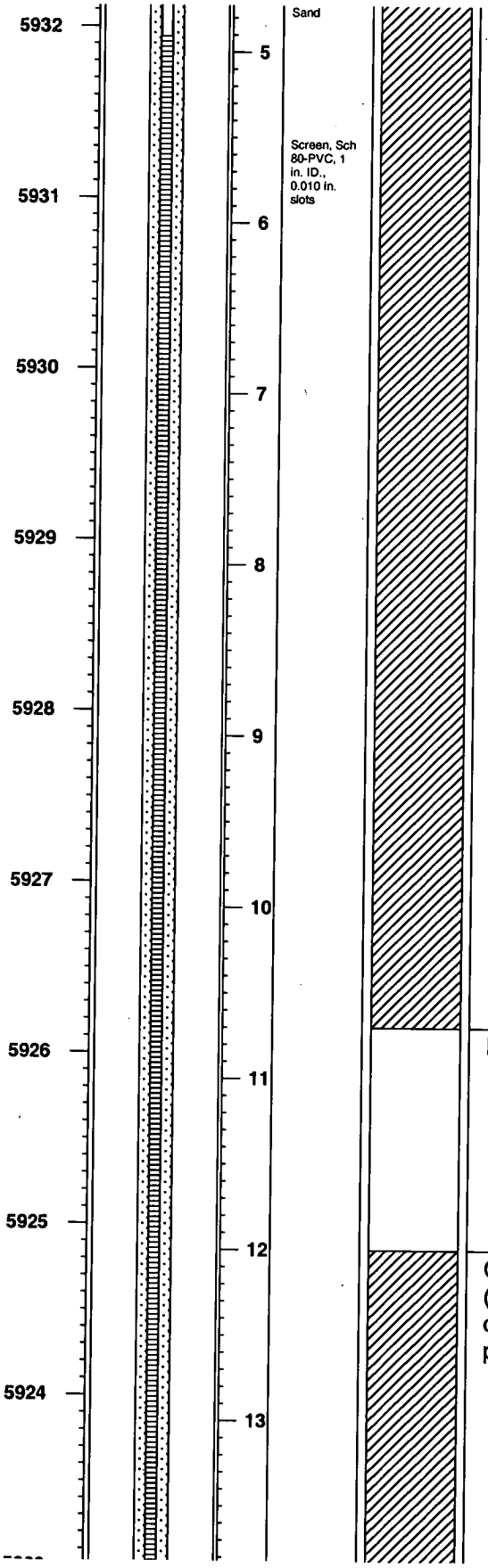
CASING DIA (IN): 2
BH DIA. (IN): 8
GRID LOCATOR:

LOG OF BORING NUMBER: 42505

Elev (Ft)	Well or Piezometer Construction and Materials	Depth (Ft)	Lithology	Unified Soils Classification or Rock Type	Lithologic Description
5940		3			
5939		2			
5938		1			
5937		0			
5936		1			CL: Clay with traces sand, silt, and gravel, very dark gray (10YR3/1) to yellowish brown (10YR5/4) mottled. Scattered gravel clasts to 1", predominately quartzite, also ironstone, Lyons Sandstone, schist, fill, and re-worked claystone. Moist and pliable. Slight increase in gravel (still trace) below 6.0', but not uniformly scattered. Increased moisture below 7.1' to soft, very moist. Clot of organic debris at 8.2' (re-worked). Distinctly different color, light brownish gray (2.5Y6/2), from 10.5' - 10.7' (re-worked claystone).
5935		2			
5934		3			
5933		4			



Elev (Ft)	Well or Piezometer Construction and Materials	Depth (Ft)	Lithology	Unified Soils Classification or Rock Type	Lithologic Description
					LOG OF BORING NUMBER: 42505

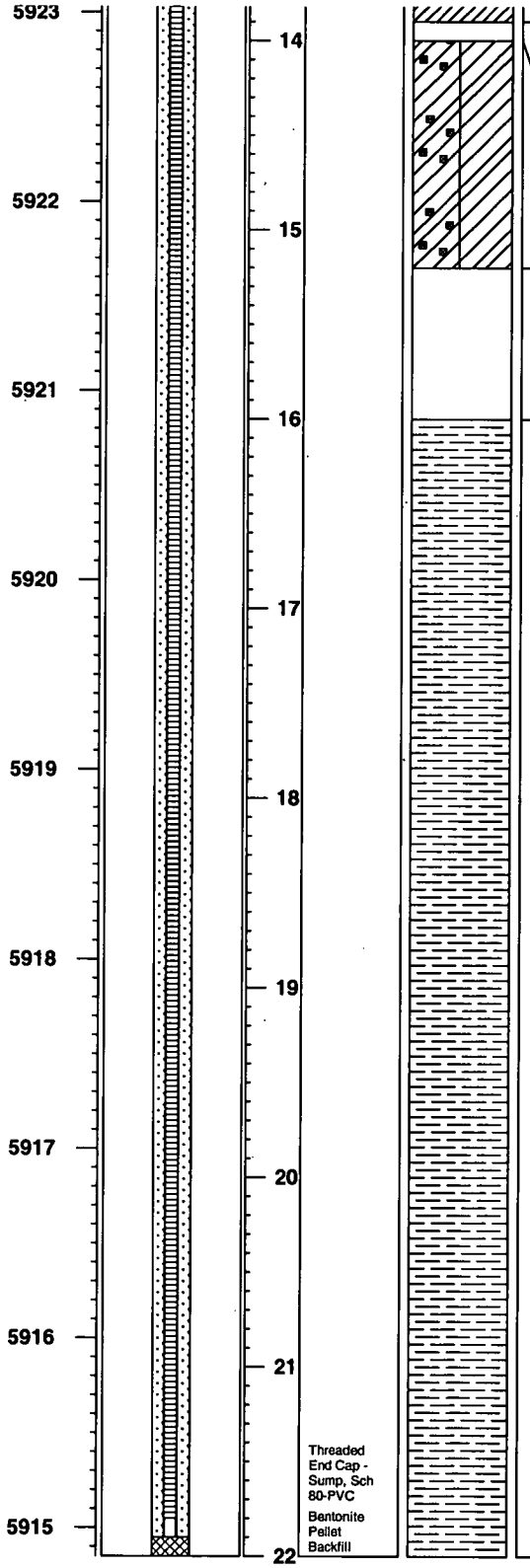


No recovery.

CL: Re-worked claystone from 12.0' to 12.2', light brownish gray (2.5Y6/2). Below 12.2' is same as interval from 0' to 10.5', though occasional small fragments/interval of re-worked claystone is present from 13.3' to 13.4' and at 13.8'. Very moist.

Elev (Ft)	Well or Piezometer Construction and Materials	Depth (Ft)	Lithology	Unified Soils Classification or Rock Type	Lithologic Description

LOG OF BORING NUMBER: 42505



No recovery.

GC/CL: Clayey Gravel-Gravelly Clay, yellowish brown (10YR5/4) to dark yellowish brown (10YR4/4). Gravel to 3/4" diameter, predominately quartzite. Saturated. Shattered larger (1-1/2") quartzite at 15.2'.

No recovery.

CLAYSTONE: TOP OF BEDROCK. Claystone, grayish brown (2.5Y5/2) to light brownish gray (2.5Y6/2). No iron-oxide staining. Moist, pliable. Quartzite clasts at top "pushed". Color change below 18.0' as mottling (iron oxides), with overall color change to light olive brown (2.5Y5/3) to olive brown (2.5Y4/3) below ~18.6'. Core above 18.0' is intact, pliable; below 18.0' is fluffed by Geoprobe, less moist (slightly moist to moist). Iron oxides below 18.0' are disseminated with isolated, scattered, localized concentrations of iron oxides that may be associated with fracture healing, but core is too damaged to confirm. Below 20.0', occasional trace silt, but very minor, possibly as very small rip-up clasts. Core fluffed (damaged) as above.

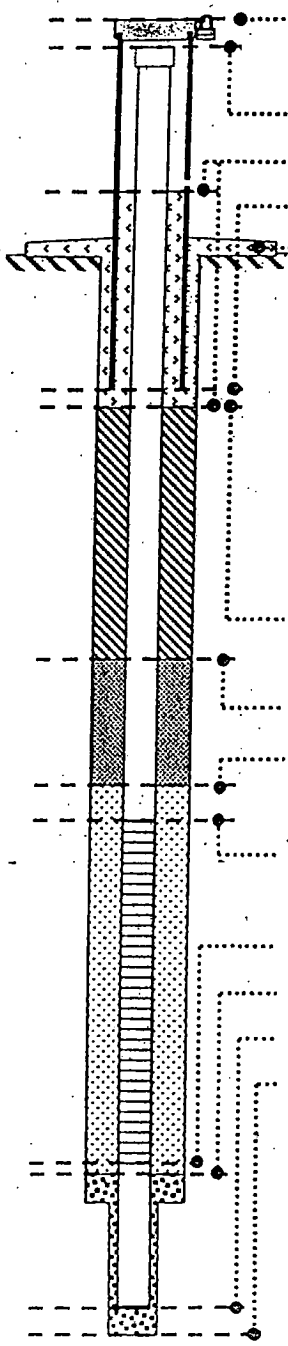
42505 10-17-05

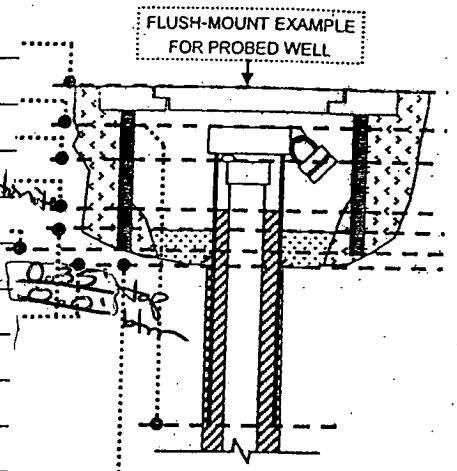
MONITORING WELL INSTALLATION REPORT: Form PRO.118

LOCATION CODE: ~~42502~~ PROJECT NAME: WARP-05 PROGRAM: WARP
SCREENED FORMATION: Fill/A/Br DRILLING CONTRACTOR: RTG BORING METHOD: Geoprobe
DATE DRILLED: 8/16/05 DATE COMPLETED: 8/16/05 TOTAL DEPTH: ~~21.9~~ 22.0 COMPLETED DEPTH: 21.9
ESTIMATED DEPTH TO BEDROCK: 16.0 RIG GEOLOGIST: J. Boylan LOGGING GEOLOGIST: J. Boylan
BOREHOLE DIAMETER IN SCREENED INTERVAL: 3.25 QUANTITY OF FLUIDS LOST DURING DRILLING: N/A
INITIAL WATER LEVEL (FT, DATE): DRY 8/16/05 COMPLETED WATER LEVEL (FT, DATE): DRY 8/17/05
DIAMETER & TYPE OF INSTALLATION (WELL/PIEZOMETER/WELL POINT/ETC.): 1" well
TYPE OF PROTECTION (FLUSH-MOUNT VS. ABOVE GROUND, ASEPTIC, ETC.): Steel above-ground

ALL MEASUREMENTS WILL BE MADE IN FEET FROM GROUND SURFACE

* DENOTES ITEMS THAT MAY NOT BE APPLICABLE, DEPENDING ON BORING METHOD, WELL PROTECTION & PURPOSE





PROTECTIVE CASING TOP (STICKUP OR FLUSH-MOUNT): 3.0
*SECONDARY CASING TOP: N/A BOTTOM: N/A TYPE: N/A
SURFACE CASING TOP: 3.0 ID (IN): 1.0
SURFACE SEAL TOP: 1.0 BOTTOM: 4.0 TYPE: Granular bentonite
PROTECTIVE CASING BOTTOM, ID (IN), TYPE: 0.65, 6" steel
*WELL PAD DIMENSIONS, TYPE: 2' x 1.9' x 0.35' concrete
*ADD'L CASING FILL TOP: N/A BOTTOM: N/A TYPE: N/A
*SURFACE ISOLATION CASING TOP: N/A BOTTOM: N/A
*SURFACE ISOLATION CASING ID (IN): N/A TYPE: N/A
*OTHER (E.G., ASEPTIC) CASING TOP: N/A BOTTOM: N/A
*OTHER CASING ID (IN): N/A TYPE, PURPOSE: N/A
*CENTRALIZER(S) OD (IN): N/A NUMBER USED: N/A TYPE: N/A
*CENTRALIZER(S) DEPTH(S): N/A
*GROUT TOP: N/A MEASURED DENSITY (LBS/GAL): N/A TYPE: N/A
*GRANULAR BENTONITE TOP: 0.0 TYPE: Granular bentonite (CETCO)
*BENTONITE SEAL TOP: N/A TYPE: N/A
BENTONITE SEAL OR GRANULAR BENTONITE BOTTOM (= FILTER PACK TOP): 4.0
FILTER PACK TYPE: 16/40 silica sand BRAND: Ogleby Norton
SURFACE CASING BOTTOM (=SCREEN TOP): 4.91 TYPE: Sch. 80 PVC
SCREEN ID (IN): 1.0 SLOT SIZE (IN): 0.010 TYPE: Sch. 80 PVC USFilter
SCREEN BOTTOM (= SUMP, TOP): 21.80 SUMP TYPE: Threaded end cap
FILTER PACK BOTTOM (= *BACKFILL TOP): 21.90 *BACKFILL TYPE: Bentonite pellets
SUMP BOTTOM (= WELL COMPLETED DEPTH): 21.90 *PILOT HOLE TOP, DIAMETER: N/A
TOTAL BOREHOLE DEPTH (= *PILOT HOLE AND *BACKFILL BOTTOM): 22.0
REMARKS: Located at approximate west edge of former PACS3 parking lot; borehole materials predominantly soft, wet fill.
COMPLETED BY: J. Boylan DATE: 8/16/05
CHECKED BY: DATE:

ROCKY FLATS ENVIRONMENTAL TECHNOLOGY SITE BOREHOLE LOG

Borehole Number: 42505
Location - North: _____ East: _____
Date: 8/16/05
Geologist: J. Boylan
Drilling Equip.: Geoprobe DT66

Surface Elevation: _____
Area: PACS 3
Total Depth: 22.0
Company: URS/RTG Project No.: _____
Sample Type: Continuous core

RMRS LOGGING SUPERVISOR APPROVAL [signature] DATE 8/22/05

TOP/BOTTOM OF CORE IN BOX	TOP/BOTTOM OF INTERVAL	FEET OF CORE IN INTERVAL (FIELD MEASUREMENT)	SAMPLE NUMBER	FRACTURE ANGLE	BEDDING ANGLE	GRAIN SIZE DISTRIBUTION	USCS SYMBOL	DEPTH IN FEET	SOIL/ LITHOLOGIC LOG	SAMPLE DESCRIPTION
	0.0	0.0					CL	0.0		Clay w/traces sand, silt, & gravel - very dark gray to yellowish brown (10YR 3/1 - 10YR 5/4), mottled. Scattered gravel clasts to 1", predom. qtzite, also Festone, Lyons SS, schist. Fill, reworked clays. Moist & pliable. Slight increase in gravel (still trace) below 6.0', but not uniformly scattered. Incr. moisture below 7.1' to soft, v. moist. Cl ot of organic debris @ 8.2' (reworked).
	RUN 1: 0.0-4.0	REC. 4.0						1.0		
								2.0		
								3.0		
	4.0	4.0						4.0		
	RUN 2: 4.0-7.0	REC. 3.3						5.0		
								6.0		
	7.0	7.0						7.0		
	RUN 3: 7.0-9.0	REC. 2.2						8.0		
	9.0	9.0						9.0		
	see next page							10.0		

NOTES: General: USCS is modified for this log as follows:
Materials amounts are estimated by % volume instead of % weight.
(1) Badly broken core, accurate footage measurements not possible.
(2) Core breaks cannot be matched, accurate footage measurements not possible.

(4011-930-0134-930)(Form GT.1A X03/OL92)

ROCKY FLATS ENVIRONMENTAL TECHNOLOGY SITE BOREHOLE LOG

Borehole Number: 42505
Location - North: _____ East: _____
Date: 8/16/05
Geologist: J. Boylan
Drilling Equip.: Geoprobe DT66

Surface Elevation: _____
Area: PACS 3
Total Depth: 22.0
Company: URS/RTG Project No.: _____
Sample Type: Continuous core

RMRS LOGGING SUPERVISOR APPROVAL: Eth S. Wrap DATE: 8/22/05

TOP/BOTTOM OF CORE IN BOX	TOP/BOTTOM OF INTERVAL	FEET OF CORE IN INTERVAL (FIELD MEASUREMENT)	SAMPLE NUMBER	FRACTURE ANGLE	BEDDING ANGLE	GRAIN SIZE DISTRIBUTION	USCS SYMBOL	DEPTH IN FEET	SOIL/LITHOLOGIC LOG	SAMPLE DESCRIPTION
	↑						CL	10.0		Clay, as above (0.0-10.0'). 10.5'-10.7' and 12.0-12.2 is distinctly different color - light brownish gray, 2.5Y 6/2. Reworked claystone. Below 12.2, same as above (0.0-10.5'), though occ. small fragment/interval of reworked claystone is present, as @ 13.3-13.4', 13.8'. Continues to be v. moist.
	Run 4: 9.0-12.0	Rec. 1.7						10.7		NO RECOVERY 10.7-12.0'
	12.0	12.0						11.0		
	Run 5: 12.0-14.0	Rec. 1.9'						12.0		
	14.0	14.0						13.0		
	Run 6: 14.0-16.0	Rec. 1.2					CL/CC	13.9		NO RECOVERY 13.9-14.0' Clayey gravel-gravelly clay - yellowish brn. to dk. yellowish brn (10YR 5/4-10YR 4/4). Gravel to 3/4", Qtzite mainly. Saturated. Larger (1.5") qtzite, shattered, @15.2'.
	16.0	16.0						14.0		
	Run 7: 16.0-18.0	Rec. 3.9						15.0		
	18.0	18.0						15.2		NO RECOVERY 15.2-16.0'
	Run 8: 18.0-20.0	Rec. 2.8						16.0		BEDROCK CONTACT = 16.0' (Qtzite clasts @ top "pushed") Claystone. Moist, pliable. Grayish brown, 2.5Y 5/2, to light brownish gray, ~~to Y~~ 8/16/05 2.5Y 6/2. No Fe-oxide staining. Color change below 18.0' as mottling ~~of~~ (Fe-oxides), w/overall color change to light olive brown-olive brown (2.5Y 5/3, 4/3) below ~18.6'. Core above 18.0' is intact, pliable, below 18.0' is fluffed by Geoprobe, less moist (sl. moist to moist). Fe oxides below 18.0 are disseminated w/isolated, scattered localized concentrations of Fe-oxides that may be associated w/fracture healing, but core too damaged to confirm.
	20.0	20.0						17.0		
								18.0		
								19.0		
								20.0		

NOTES: General: USCS is modified for this log as follows:
Materials amounts are estimated by % volume instead of % weight.
(1) Badly broken core, accurate footage measurements not possible.
(2) Core breaks cannot be matched, accurate footage measurements not possible.

(4011-930-0134-930) Form GT.1A (03/01/92)

ROCKY FLATS ENVIRONMENTAL TECHNOLOGY SITE BOREHOLE LOG

Borehole Number: 42505
Location - North: _____ East: _____
Date: 8/16/05
Geologist: J. Boylan
Drilling Equip.: Geoprobe DT66

Surface Elevation: _____
Area: PACS 3
Total Depth: 22.0
Company: URS/RTG Project No.: _____
Sample Type: Continuous core

RMRS LOGGING SUPERVISOR APPROVAL: [signature] DATE: 8/22/05

TOP/BOTTOM OF CORE IN BOX	TOP/BOTTOM OF INTERVAL	FEET OF CORE IN INTERVAL (FIELD MEASUREMENT)	SAMPLE NUMBER	FRACTURE ANGLE	BEDDING ANGLE	GRAIN SIZE DISTRIBUTION	USCS SYMBOL	DEPTH IN FEET	SOIL/LITHOLOGIC LOG	SAMPLE DESCRIPTION
	20.0	20.0						20.0		Claystone, same as above (below 18.0'). Occ. trace silt, but v. minor, poss. as v. sm. rip-up clasts. Core Fluffed (damaged) as above.
	Run 9: 20.0-22.0	Rec. 3.4						21.0		
	22.0	22.0						22.0		
										TD = 22.0'
								23.0		
								24.0		
								25.0		
								26.0		
								27.0		
								28.0		
								29.0		
								30.0		

NOTES: General: USCS is modified for this log as follows:
Materials amounts are estimated by % volume instead of % weight.
(1) Badly broken core, accurate footage measurements not possible.
(2) Core breaks cannot be matched, accurate footage measurements not possible.

(4011-930-0134-930)(Form GT.1A)(03/01/92)

STATE PLANE COORDINATES AREA:
NORTH: 749633.771
EAST: 2085501.711
PROJECT: South of former B991
REMARKS:
Upgradient of SW056 outfall.

GRND ELEV. (FT): 5964.381
TOTAL DEPTH (FT): 34.5
COMPLETION DATE: 9/30/05
GEOLOGIST: E. Warp

CASING DIA (IN): 1
BH DIA. (IN): 3.5
GRID LOCATOR:

LOG OF BORING NUMBER: 45605

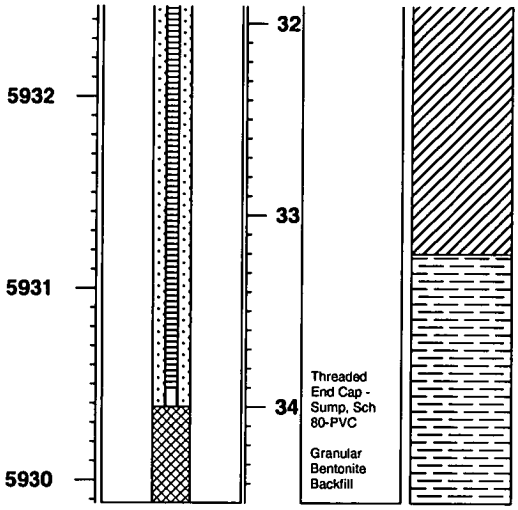
Elev (Ft)	Well or Piezometer Construction and Materials	Depth (Ft)	Lithology	Unified Soils Classification or Rock Type	Lithologic Description
5967, 5966, 5965, 5964, 5963, 5962, 5961, 5960	Protective Casing, 6" Steel; Casing, Sch 80-PVC, 1 in. ID.; Concrete Seal; Concrete Pad; Hydrated Granular Bentonite	3, 2, 1, 0, 1, 2, 3, 4			
				CL	CL: Gravelly Clay with trace sand - fill. Brown (10YR5/3) with some yellowish brown (10YR5/6). Iron oxidation mottled throughout. ~5% - 10% gravel (1/4" - 3/4" diameter, subrounded). Clay has medium plasticity. Abundant 1" - 2" diameter, subrounded cobbles from 0.0' to 0.8'. Cobbles of asphalt at 1.7'. Cohesive. Moist.
					No recovery.
				CL	CL: Silty Clay with trace to some gravel and trace sand - fill. Yellowish brown (10YR5/6) with trace grayish brown (10YR5/2) mottling. Clay matrix (low plasticity) with 3 - 7% gravel (1/4" - 1/2"

Elev (Ft)	Well or Piezometer Construction and Materials	Depth (Ft)	Lithology	Unified Soils Classification or Rock Type	Lithologic Description
5959, 5958, 5957, 5956, 5955, 5954, 5953, 5952, 5951	Filter Pack, 16/40 Silica Sand; Screen, Sch 80-PVC, 1 in. ID., 0.010 in. slots	5, 6, 7, 8, 9, 10, 11, 12, 13			diameter, subangular). Strong pervasive iron oxidation from 4.0' to 4.3'. Pink (7.5YR7/3) to light brown (7.5YR6/3) caliche-rich zone from 5.0' to 6.0', loosely consolidated to unconsolidated. Interval is overall loosely consolidated. 2" diameter, subrounded quartzite cobbles at 4.5' and 4.9'. Thin (1/2" thick) cobble of ironstone in iron oxidized siltstone at 7.0'. Caliche in clay matrix at 7.9'. Caliche blebs common from 9.0' to 9.8'. Moist.
					CL: Silty, Sandy Clay with trace to some gravel - fill. Light yellowish brown (10YR6/4) to brownish yellow (10YR6/6). 7 - 15% sand (medium grained, subangular) with blebs of caliche throughout. ~5% gravel (1/4" - 3/4" diameter, subangular). Low plasticity. Moderately consolidated. Lens of dark reddish brown (7.5YR3/4) clay from 10.0' to 10.2'. Silty lens, brownish yellow (10YR6/6) at base of interval. Moist.
					No recovery.
					CL: Silty Clay with trace gravel and trace sand - fill. Pale brown (10YR6/3) to very pale brown (10YR7/3). Abundant caliche throughout interval. Loosely consolidated. Includes lenses of some dark reddish brown clay at 12.4' to 12.7' (as at 9.8' to 10.4') and asphaltic material from 14.6' to 14.9'. Slightly moist.

Elev (Ft)	Well or Piezometer Construction and Materials	Depth (Ft)	Lithology	Unified Soils Classification or Rock Type	Lithologic Description
		14			
5950					
		15			GC/CL: Gravelly Clay with trace to some sand - fill. Same as interval from 15.6' to 19.2'.
5949					GC: Gravel, asphalt and road base - fill. Very dark brown (10YR2/2) to black (10YR2/1). Unconsolidated.
		16			GC/CL: Gravelly Clay with trace to some sand. Brown (10YR5/6) with grayish brown (2.5Y5/2) mottling. 5 - 20% gravel and cobbles (1/2" to 1-1/2" diameter, subrounded to subangular). Interval is a mixture of Rocky Flats Alluvium and displaced claystone. Moderately consolidated, except in cobbly zones. Some disseminated caliche throughout. Moist.
5948					
		17			
5947					
		18			
5946					
		19			
5945					GC/CL: Clay with some gravel and some sand. Dark brown (10YR3/3) to brown (10YR4/3) with some dark yellowish brown (10YR4/6). Distinct color change. Some gravel and cobbles (1/2" to 1-1/2" diameter, subangular to subrounded, predominately quartzite and schist). Medium plasticity. Moist.
		20			No recovery.
5944					GC/CL: Clay with some gravel and some sand. Same as interval from 19.2' to 19.7'. Disseminated caliche common from 20.0' to 23.9'. Moist. Asphalt cobble at 23.8'.
		21			
5943					
		22			
5942					

Elev (Ft)	Well or Piezometer Construction and Materials	Depth (Ft)	Lithology	Unified Soils Classification or Rock Type	Lithologic Description
		23			
5941					
		24			CL: Clay with trace to some sand and trace gravel. Brown (10YR5/3) with yellowish brown (10YR5/6) and reddish brown (5YR4/4) mottling. Caliche-rich, crumbly zone from 24.8' to 25.2'. Overall, interval is moderately consolidated. Low plasticity. Very moist.
5940					
		25			
5939					
		26			CL: Clay with trace gravel and trace sand. Predominately displaced (re-worked) claystone with gravel and sandy lenses. Gray (10YR5/1) to grayish brown (10YR5/2) with yellowish brown (10YR5/4 to 10YR5/6) mottling. Distinct color change. Overall, interval is firm, dense, and cohesive. Strong pervasive iron oxidation and crumbly from 26.3' to 26.5'. Sandy lens with disseminated caliche from 26.9' to 27.1'. 2" quartzite cobble at 29.0'. Reddish brown (5YR4/3) clay lens with disseminated caliche and gravel at 31.5'. Crumbly lenses of caliche with trace sand and gravel common from 31.5' to 33.2'. Very moist. Weak to moderate plasticity.
5938					
		27			
5937					
		28			
5936					
		29			
5935					
		30			
5934					
		31			
5933					

Elev (Ft)	Well or Piezometer Construction and Materials	Depth (Ft)	Lithology	Unified Soils Classification or Rock Type	Lithologic Description
					LOG OF BORING NUMBER: 45605



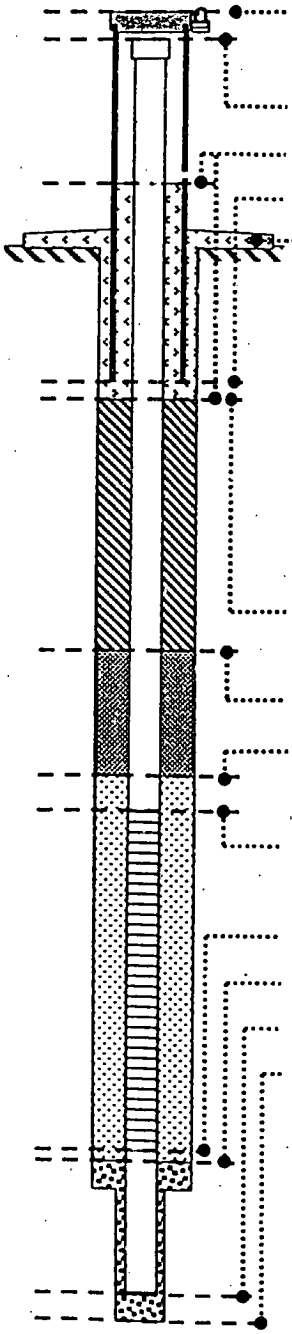
CLAYSTONE: TOP OF BEDROCK. Claystone (bedrock), predominately unweathered. Grayish brown (10YR5/2) to dark grayish brown (10YR4/2). Firm and dense. Black organic stringers common throughout. Trace iron oxide at 33.5' and 33.7'. Moist from 33.2' to 34.0', then slightly moist from 34.0' to 34.5'. Bedrock contact is subtle, distinguished by lack of sand and gravel lenses.

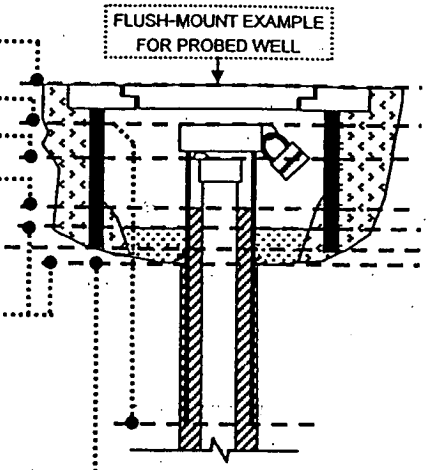
MONITORING WELL INSTALLATION REPORT: Form PRO.118

LOCATION CODE: 45605 PROJECT NAME: CY05 Well Replacements PROGRAM: Water Programs - WARP
SCREENED FORMATION: Al/Bdrk DRILLING CONTRACTOR: RTG BORING METHOD: Geoprobe
DATE DRILLED: 9/30/05 DATE COMPLETED: 10/3/05 TOTAL DEPTH: 34.5 COMPLETED DEPTH: 34.0'
ESTIMATED DEPTH TO BEDROCK: 33.2 RIG GEOLOGIST: E. Warp LOGGING GEOLOGIST: E. Warp
BOREHOLE DIAMETER IN SCREENED INTERVAL: 3.5" QUANTITY OF FLUIDS LOST DURING DRILLING: N/A
INITIAL WATER LEVEL (FT, DATE): Dry on 10/3/05 COMPLETED WATER LEVEL (FT, DATE): Dry on 10/17/05
DIAMETER & TYPE OF INSTALLATION (WELL/PIEZOMETER/WELL POINT/ETC.): 1.0" PVC Well
TYPE OF PROTECTION (FLUSH-MOUNT VS. ABOVE GROUND, ASEPTIC, ETC.): Above ground steel protective casing

ALL MEASUREMENTS WILL BE MADE IN FEET FROM GROUND SURFACE

*DENOTES ITEMS THAT MAY NOT BE APPLICABLE, DEPENDING ON BORING METHOD, WELL PROTECTION & PURPOSE





PROTECTIVE CASING TOP (STICKUP OR FLUSH-MOUNT): 3.05' ~~2.05~~ ags
*SECONDARY CASING TOP: N/A BOTTOM: N/A TYPE: N/A
SURFACE CASING TOP: 2.7' ~~N/A~~ ID (IN): 1.0"
SURFACE SEAL TOP: 0.6 ags BOTTOM: 1.95 ~~0.95~~ ags TYPE: Concrete
PROTECTIVE CASING BOTTOM, ID (IN), TYPE: 0.45' ~~0.95~~ bgs, 6", Steel
*WELL PAD DIMENSIONS, TYPE: 2.5'x2.5' concrete fm 9.5 to 0.5' ags
*ADD'L CASING FILL TOP: N/A BOTTOM: N/A TYPE: N/A
*SURFACE ISOLATION CASING TOP: N/A BOTTOM: N/A
*SURFACE ISOLATION CASING ID (IN): N/A TYPE: N/A
*OTHER (E.G., ASEPTIC) CASING TOP: N/A BOTTOM: N/A
*OTHER CASING ID (IN): N/A TYPE, PURPOSE: N/A
*CENTRALIZER(S) OD (IN): N/A NUMBER USED: N/A TYPE: N/A
*CENTRALIZER(S) DEPTH(S): N/A
*GROUT TOP: N/A MEASURED DENSITY (LBS/GAL): N/A TYPE: N/A
*GRANULAR BENTONITE TOP: N/A TYPE: N/A
*BENTONITE SEAL TOP: 1.95' TYPE: Granular Bentonite - "CETCO" - 1 hydrated w/3 gall. of distilled water.
BENTONITE SEAL OR GRANULAR BENTONITE BOTTOM (= FILTER PACK TOP): 9.0'
FILTER PACK TYPE: 16/40 Silica Sand BRAND: C.S.S.I. 80
SURFACE CASING BOTTOM (=SCREEN TOP): 10.07' ~~14.07~~ TYPE: Sch ~~40~~ 80 PVC (ALL PVC Sch 80)
SCREEN ID (IN): 1.0" SLOT SIZE (IN): 0.01" TYPE: Sch ~~40~~ 80 PVC
SCREEN BOTTOM (= SUMP, TOP): 33.9' SUMP TYPE: Threaded end cap Sch ~~40~~ PVC
FILTER PACK BOTTOM (= *BACKFILL TOP): 34.0' *BACKFILL TYPE: Granular Bentonite - "CETCO"
SUMP BOTTOM (= WELL COMPLETED DEPTH): 34.0' *PILOT HOLE TOP, DIAMETER:
TOTAL BOREHOLE DEPTH (= *PILOT HOLE AND *BACKFILL BOTTOM): 34.5'

REMARKS: Routine well installation on 9/30/05. Well pad and protective casing installed on 10/3/05

COMPLETED BY: Ellen S. Warp Ellen S Warp DATE: 10/25/05
CHECKED BY: DATE:

U.S. DEPARTMENT OF ENERGY ROCKY FLATS PLANT

FORM PRO.101A

ROCKY FLATS ENVIRONMENTAL TECHNOLOGY SITE BOREHOLE LOG

Borehole Number: 45605
Location - North: _____ East: _____
Date: 9/30/05
Geologist: E. Warp
Drilling Equip.: 66 DT Geoprobe

Surface Elevation: _____
Area: So. of former B991 - Upgrad. of SW056 outfall
Total Depth: 34.5
Company: URS/RFG Project No. 40051300
Sample Type: Continuous Core

RMRS LOGGING SUPERVISOR APPROVAL _____ DATE 10/13/05

TOP/BOTTOM OF CORE IN BOX	TOP/BOTTOM OF INTERVAL	FEET OF CORE IN INTERVAL (FIELD MEASUREMENT)	SAMPLE NUMBER	FRACTURE ANGLE	BEDDING ANGLE	GRAIN SIZE DISTRIBUTION	USCS SYMBOL	DEPTH IN FEET	SOIL LITHOLOGIC LOG	SAMPLE DESCRIPTION
	0.0' Run #1	Rec. = 2.6'					CL	0.0 – 2.6'		0.0-2.6' - Gravelly CLAY w/ fg sand - Fill. Brn. (10YR5/3) w/some yellow'sh brn. (10YR5/6) FeOx'n mottled throughout. ~5-10% gravel (1/4-3/4" dia., sub-rounded). Clay has med. plasticity. Abundant 1-2" dia., sub-rounded cobbles fm. 0.0 to 0.8'. Cobbles of asphalt @ 1.7'. Cohesive, MOIST.
	4.0'							2.6' – 4.0'		2.6-4.0' = No recovery
	8.0' Run #2	Rec. = 4.0'					CL	4.0 – 8.0'		4.0-9.8' - Silty CLAY w/ fg to some gravel and fg sand. Yellow'sh brn. (10YR5/6) w/ fg gry'sh brn. (10YR5/2) mottling. Clay matrix (low plasticity) w/3-7% gravel (1/4-1/2" dia., sub-ang.). Strong perv. FeOx'n fm. 4.0-4.3'. Pink (7.5YR7/3) to Lt. brn. (7.5YR6/3) caliche-rich zone fm. 5.0-6.0' - loosely consolidated to unconsolidated. Interval is overall loosely consolidated. 2" dia., sub-rounded cobbles of qtzite @ 4.5 and 4.9'. Thin (1/2" thick) 150° cobble of FeOxid siltstone @ 7.0'. Caliche in clay matrix @ 7.9'. Caliche blebs common fm. 9.0-9.8'. MOIST.
	8.0' Run #3 8.0-12.0'	Rec. = 2.4'						8.0 – 10.0'		

NOTES: General: USCS is modified for this log as follows:
Materials amounts are estimated by % volume instead of % weight.
(1) Badly broken core, accurate footage measurements not possible.
(2) Core breaks cannot be matched, accurate footage measurements not possible.

Procedure No. RMRS/OPS-PRO.101
Revision 0
Date effective: 12/31/98

(4011-930-0134-930)(Form GT.1A)(03/01/92)

U.S. DEPARTMENT OF ENERGY ROCKY FLATS PLANT

FORM PRO.101A

ROCKY FLATS ENVIRONMENTAL TECHNOLOGY SITE BOREHOLE LOG

Borehole Number: 45605
Location - North: _____ East: _____
Date: 9/30/05
Geologist: E. Warp
Drilling Equip.: 6" DT Geoprobe

Surface Elevation: _____
Area: So. of Former B991 - Up-grad. of SW056
Total Depth: 34.5'
Company: URS/RFG Project No. HAD01300
Sample Type: Continuous Core

RMRS LOGGING SUPERVISOR APPROVAL _____ DATE 10/18/05

TOP/BOTTOM OF CORE IN BOX	TOP/BOTTOM OF INTERVAL	FEET OF CORE IN INTERVAL (FIELD MEASUREMENT)	SAMPLE NUMBER	FRACTURE ANGLE	BEDDING ANGLE	GRAIN SIZE DISTRIBUTION	USCS SYMBOL	DEPTH IN FEET	SOIL/ LITHOLOGIC LOG	SAMPLE DESCRIPTION
	Run #3 8.0-12.0'	Rec.=2.4'					CL	10.0		9.8'-10.4' - Silty, Sandy CLAY w/ Tr to some gravel. Lt. Yellowish brn. (10YR 6/4) to Brnish Yellow (10YR 6/6) - 7-15% sand (m.g., sub-ang.) w/ blebs of caliche throughout - 5% gravel (1/4-3/4" dia., sub-ang.) Low plasticity. Moderately consolidated. Lense of dk. reddish brn. (7.5YR 3/4) clay fm. 10.0-10.2'. Silty lense - brnish yellow (10YR 6/6) at base of interval. MOIST.
								10.4		
								11		
	12.0'							12		10.4-12.0' = No recovery
	Run #4	Rec.=9.0'					CL	13		12.0-14.9' - Silty CLAY w/ Tr gravel and Tr sand. Pale brn. (10YR 6/3) to V. Pale brn. (10YR 7/3) Abundant caliche throughout interval. Loosely consolidated. Sl. moist. Includes lenses (12.4'-12.7') of same dark reddish brn clay as 9.8-10.4' interval, and asphaltic material 14.6-14.9'.
								14		
							CL / GC	14.9' / 15		14.9-15.2' - Gravelly CLAY w/ Tr to some sand (see description below fm. 15.6-19.2').
							GC	15.2'		15.2-15.6' - GRAVEL - Asphalt and Road Base. V. Dk. brn. (10YR 2/2) to blk. (10YR 2/1). Unconsolidated
	16.0'							15.6'		
								16		15.6-19.2' - Gravelly CLAY w/ Tr to some sand. Brn. (10YR 5/6) w/ grysh brn. (2.5Y 5/2) mottling. 5-20% gravel and cobbles (1/2 to 1 1/2" dia., sub-rounded to sub-ang.). Interval is a mixture of Rocky Flats Alluvium and displaced claystone. Moderately consolidated except in cobbly zones. Some diss. caliche throughout. MOIST.
	Run #5	Rec.=3.7'					CL / GC	17		
								18		
								19		19.2-19.7' - CLAY w/ some gravel and some sand. Dk. brn. (10YR 3/3) to brn. (10YR 4/3) w/ some dk. yellowish brn. (10YR 4/6) Distinct color change. ~~Clay has med. con plasticity con~~ Some gravel and cobbles (1/2-1 1/2" dia., sub-ang. to sub-rounded; predominately gneiss and schist). Med plasticity. MOIST.
							CL / GC	19.2		
	20.0'							19.7' / 20.0'		

NOTES: General: USCS is modified for this log as follows:
Materials amounts are estimated by % volume instead of % weight.
(1) Badly broken core, accurate footage measurements not possible.
(2) Core breaks cannot be matched, accurate footage measurements not possible.

Procedure No. RMRS/OPS-PRO.101
Revision 0
Date effective: 12/31/98

(4011-930-0134-930)(Form GT.1A)(0/01/92)

U.S. DEPARTMENT OF ENERGY ROCKY FLATS PLANT

FORM PRO.101A

ROCKY FLATS ENVIRONMENTAL TECHNOLOGY SITE BOREHOLE LOG

PAGE 3 OF 4

Borehole Number: 45605
Location - North: _____ East: _____
Date: 9/30/05
Geologist: E. Warp
Drilling Equip. 66 DP Geoprobe

Surface Elevation: _____
Area: So. of former B991 - Up-grad. of SW056 outfall
Total Depth: 34.5
Company: URS/RTG Project No.: NAD51300
Sample Type: Continuous Core

RMRS LOGGING SUPERVISOR APPROVAL [signature] DATE 10/18/05

TOP/BOTTOM OF CORE IN BOX	TOP/BOTTOM OF INTERVAL	FEET OF CORE IN INTERVAL (FIELD MEASUREMENT)	SAMPLE NUMBER	FRACTURE ANGLE	BEDDING ANGLE	GRAIN SIZE DISTRIBUTION	USCS SYMBOL	DEPTH IN FEET	SOIL/LITHOLOGIC LOG	SAMPLE DESCRIPTION
	20.0 – 24.0' Run #6	Rec.=4.2'					CL / GC	20.0, 21, 22, 23		20.0-24.0 - Clay w/some gravel and some sand. Same as fm. 19.2-19.7'. Diss. caliche common fm. 20.0-23.9'. MOIST. Asphalt cobble @ 23.8'. [initials] 10/18/05
	24.0' – 28.0' Run #7	Rec.=4.1'					CL	24, 25, 26, 27, 28		24.0-26.0 - Clay w/ Tr to some sand and Tr gravel. Brn. (10YR5/3) w/yellowish brn (10YR5/6) and reddish brn. (5YR4/4) mottling. Caliche-rich, crumbly zone fm. 24.8 to 25.2'. Overall, interval is moderately consolidated. Low Plasticity. V. Moist.
	28.0' – 29.5' Run #8	Rec.=4.0'					CL	28, 29, 29.5		26.0-33.2' - Clay w/ Tr gravel and Tr sand. Predominately displaced (re-worked) claystone ~~Gry (10YR~~ ESW w/gravel and sandy lenses. Gry (10YR5/1) to Gry'sh brn (10YR5/2) w/yellowish brn (10YR5/4 to 5/6) mottling. Overall, interval is firm, dense, and cohesive. ↖ Distinct color change. - S. perv. FeOx'n + crumbly fm. 26.3 to 26.5'. - Sandy lense w/diss. caliche fm. 26.9 to 27.1'. - 2" cobble of qtzite @ 29.0'. - Reddish-brn (5YR4/3) clay lense w/diss. caliche and gravel @ 31.5'. - Crumbly lenses of caliche w/ Tr sand and gravel ESW common fm. 31.5 to 33.2'. V. Moist. Wk to mod plasticity.
	29.5' – 31.5' Run #9	Rec.=4.0						30.0		

NOTES: General: USCS is modified for this log as follows:
Materials amounts are estimated by % volume instead of % weight.
(1) Badly broken core, accurate footage measurements not possible.
(2) Core breaks cannot be matched, accurate footage measurements not possible.

Procedure No. RMRS/OPS-PRO.101
Revision 0
Date effective: 12/31/98
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(4011-930-0134-930)(Form GT.1A)(03/01/92)

ESW ~~Bedrock contact is subtle, distinguished by~~ ESW tack of sandy and gravel lenses.

U.S. DEPARTMENT OF ENERGY ROCKY FLATS PLANT

FORM PRO.101A

ROCKY FLATS ENVIRONMENTAL TECHNOLOGY SITE BOREHOLE LOG

PAGE 4 OF 4

Borehole Number: 45605
Location - North: _____ East: _____
Date: 9/30/05
Geologist: E. Warp
Drilling Equip.: 66 DT Geoprobe

Surface Elevation: _____
Area: So. of former B991. Upgrad. of SW056 outfall
Total Depth: 34.5'
Company: URS/RTG Project No.: HAD51300
Sample Type: Continuous Core

RMRS LOGGING SUPERVISOR APPROVAL [signature] DATE 10/18/05

TOP/BOTTOM OF CORE IN BOX	TOP/BOTTOM OF INTERVAL	FEET OF CORE IN INTERVAL (FIELD MEASUREMENT)	SAMPLE NUMBER	FRACTURE ANGLE	BEDDING ANGLE	GRAIN SIZE DISTRIBUTION	USCS SYMBOL	DEPTH IN FEET	SOIL/ LITHOLOGIC LOG	SAMPLE DESCRIPTION
	Run #9 (29.5-31.5') 31.5	Rec.=4.0'					CL	30.0		CLAY w/ Tr gravel and Tr sand. (See pg. #3 for description)
								31		
	Run #10 32.7'	Rec.=3.1						32		— Bedrock contact is subtle, distinguished by lack of sand and gravel lenses.
	Run #11 34.5	Rec.=3.5'						33		Bedrock Contact @ 33.2'
								33.2'		33.2-34.5 - CLAYSTONE - Bedrock (predominately un-weathered) gry sh brn (10YR 3/2) to dk. gry sh brn. (10YR 4/2). Firm and dense. Blk organic stringers common throughout. Tr FeOx @ 33.5 and 33.7'. Moist fm. 33.2-34.0' then sl. moist fm 34.0 → 34.5' T.D. @ 34.5'
								34		
								34.5		

NOTES: General: USCS is modified for this log as follows:
Materials amounts are estimated by % volume instead of % weight.
(1) Badly broken core, accurate footage measurements not possible.
(2) Core breaks cannot be matched, accurate footage measurements not possible.

Procedure No. RMRS/OPS-PRO.101
Revision 0
Date effective: 12/31/98

(4011-930-0134-930)(Form GT.1A)(03/01/92)

STATE PLANE COORDINATES AREA:
NORTH: 751856.85
EAST: 2086044.97
PROJECT:

GRND ELEV. (FT): 5839.75
TOTAL DEPTH (FT): 14.7
COMPLETION DATE: 6/28/05
GEOLOGIST: E. Warp

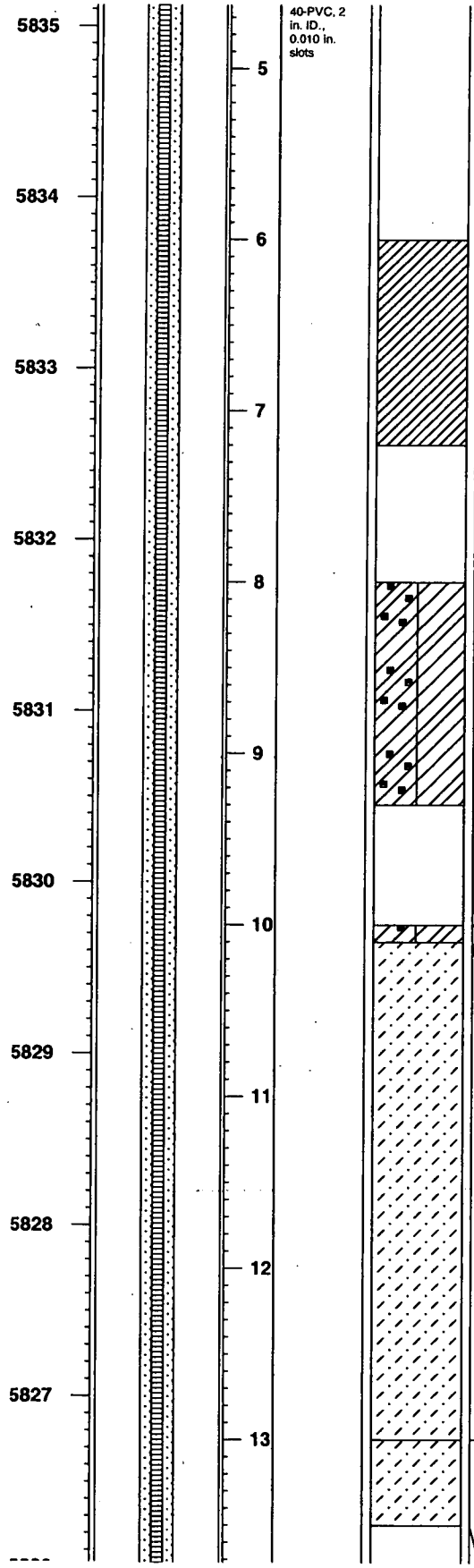
CASING DIA (IN): 2
BH DIA. (IN): 8
GRID LOCATOR:

LOG OF BORING NUMBER: 51605

REMARKS:
Replaces 1386. Routine well installation.

Elev (Ft)	Well or Piezometer Construction and Materials	Depth (Ft)	Lithology	Unified Soils Classification or Rock Type	Lithologic Description
5843	Protective Casing, 5" square Steel	3			
5842	Casing, Sch 40-PVC, 2 in. ID.	2			
5841		1			
5840	Concrete Seal				
	Concrete Pad	0			CL: Clay with some gravel, dark brown (7.5YR3/2). Organic-rich topsoil. 5 - 8% gravel (3/4" - 1" diameter, subrounded, predominately quartzite and granite). Medium to high plasticity. Dry.
5839		1			GC: Gravel with some clay, dark brown (7.5YR3/2) clay. 80% gravel (cobbles 1" - 2" diameter, quartzite and granite). Dry.
					No recovery.
5838		2			
	Hydrated Bentonite Pellets				CL: Clay with trace gravel, trace sand, and trace to some silt. Very dark grayish brown (2.5Y3/2) to dark grayish brown (2.5Y4/2). Weakly mottled. High plasticity. Dense. Trace roots throughout interval. Moist.
5837		3			
					No recovery.
5836		4			
	Filter Pack, 16/40 Silica Sand				GC: Gravel with some clay and silt. Dark grayish brown (2.5Y4/2). Cobbles (1/2" to 1-1/2" diameter, subangular) of quartzite with some clay. Very poor recovery, probably due to clogged split spoon.
	Screen, Sch				

Elev (Ft)	Well or Piezometer Construction and Materials	Depth (Ft)	Lithology	Unified Soils Classification or Rock Type	Lithologic Description
					LOG OF BORING NUMBER: 51605



Slightly moist.
No recovery.

CL: Clay with some silt and sand and trace gravel. Dark grayish brown (2.5Y4/2) with dark gray (2.5Y4/1) and gray (2.5Y5/1) mottling. Medium to high plasticity. Sandy lense (weak iron oxidation) from 6.6' to 6.8', dark grayish brown (2.5Y4/2). Trace disseminated iron oxidation throughout. 45 deg fracture at base of interval with caliche coating, or rock flour at edge of cobbles causing lost recovery. Slightly moist to moist.

No recovery.

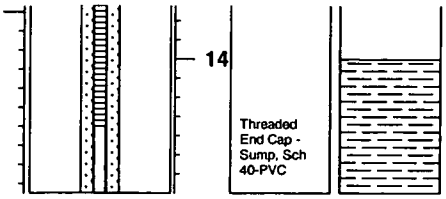
GC/CL: Gravel/Sandy Clay mixture, gray (2.5YR5/1) and grayish brown (2.5Y5/2). 40 - 45% gravel (1/4" - 1" diameter, subangular, predominately quartzite). ~40% clay, moderate plasticity. ~15% sand (coarse grained). Moderate iron oxidation from 8.5' to 8.8'. Ironstone fragments at 8.5'. Clay is slightly "ribboned" at base, probably pushing a cobble. Moisture increases to moist.

No recovery.

GC/CL: Gravel/Sandy Clay mixture, same as interval from 8.0' to 9.3'. 1-1/2" diameter, subangular quartzite cobble at 10.1'. Moist.

SILTSTONE: TOP OF BEDROCK. Clayey Siltstone (bedrock) gray (10YR5/1). Very silty from 10.1' to 11.0', then increasing clay from 11.0' to 13.0'. Trace iron oxidation at 10.1'. Massive texture, faint laminations (bedding planes) visible. Weakly friable. Some black organic material from 11.5' to 12.2'. Abundant black organic material from 12.2' to 12.3', decreasing to some from 12.3' to 13.0'. Slightly moist.

SILTSTONE: Clayey Siltstone, weathered/iron oxidized, yellowish brown (10YR5/6). Moderately pervasive iron oxidation. Weakly friable and slightly fissile. Trace black organic material (possibly manganese oxide) along internal fractures. Slightly moist.

Elev (Ft)	Well or Piezometer Construction and Materials	Depth (Ft)	Lithology	Unified Soils Classification or Rock Type	Lithologic Description
5826		14			No recovery.
					CLAYSTONE: Silty Claystone, brown (10YR5/3) with some yellowish brown (10YR5/6) mottling. Massive texture. Dense and firm. Weak iron oxidation mottling from 14.4' to 14.6' with trace manganese oxide associated with iron oxidation. Some black organic material (blebs) from 14.4' to 14.6'. Moisture decreases to very slightly moist.

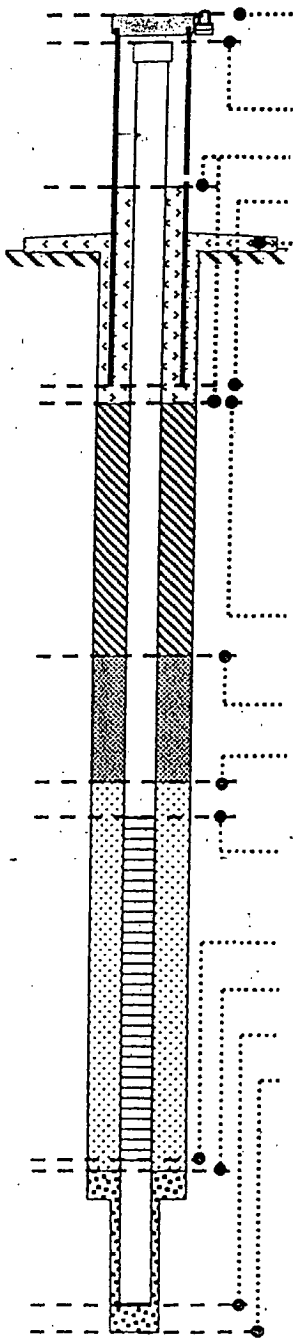
LOG OF BORING NUMBER:
51605

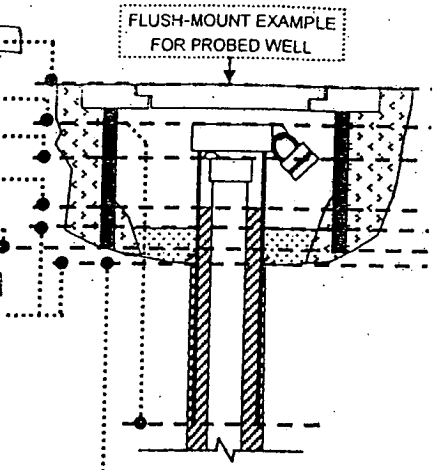
MONITORING WELL INSTALLATION REPORT: Form PRO.118

LOCATION CODE: 51605 PROJECT NAME: CY05 Well Replacements PROGRAM: Water Programs
SCREENED FORMATION: Qal/Bdrk. DRILLING CONTRACTOR: Layne BORING METHOD: Hollow Stem Auger
DATE DRILLED: 6/27/05 DATE COMPLETED: 6/28/05 TOTAL DEPTH: 14.7' COMPLETED DEPTH: 14.7
ESTIMATED DEPTH TO BEDROCK: 10.1' RIG GEOLOGIST: E. Warp LOGGING GEOLOGIST: E. Warp
BOREHOLE DIAMETER IN SCREENED INTERVAL: 8" QUANTITY OF FLUIDS LOST DURING DRILLING: N/A
INITIAL WATER LEVEL (FT, DATE): Dry - 6/27/05 COMPLETED WATER LEVEL (FT, DATE): Dry 8/3/05 16.63 fm. TOC on 7/18/05
DIAMETER & TYPE OF INSTALLATION (WELL/PIEZOMETER/WELL POINT/ETC.): 2.0" I.D. - PVC Well
TYPE OF PROTECTION (FLUSH-MOUNT VS. ABOVE GROUND, ASEPTIC, ETC.): 5" Square Steel

ALL MEASUREMENTS WILL BE MADE IN FEET FROM GROUND SURFACE

* DENOTES ITEMS THAT MAY NOT BE APPLICABLE, DEPENDING ON BORING METHOD, WELL PROTECTION & PURPOSE





PROTECTIVE CASING TOP (STICKUP OR FLUSH-MOUNT): 3.15 ags.
*SECONDARY CASING TOP: N/A BOTTOM: N/A TYPE: N/A
SURFACE CASING TOP: 2.5' ags. ID (IN): 2.0"
SURFACE SEAL TOP: 0.3' ags BOTTOM: 0.2' bgs TYPE: Concrete
PROTECTIVE CASING BOTTOM, ID (IN), TYPE: 1.85', 5" square steel
*WELL PAD DIMENSIONS, TYPE: 3' x 3' - Concrete top 0.3' ags bottom 0.2' bgs
*ADD'L CASING FILL TOP: N/A BOTTOM: N/A TYPE: N/A
*SURFACE ISOLATION CASING TOP: N/A BOTTOM: N/A
*SURFACE ISOLATION CASING ID (IN): N/A TYPE: N/A
*OTHER (E.G., ASEPTIC) CASING TOP: N/A BOTTOM: N/A
*OTHER CASING ID (IN): N/A TYPE, PURPOSE: N/A
*CENTRALIZER(S) OD (IN): N/A NUMBER USED: N/A TYPE: N/A
*CENTRALIZER(S) DEPTH(S): N/A
*GROUT TOP: N/A MEASURED DENSITY (LBS/GAL): N/A TYPE: N/A
*GRANULAR BENTONITE TOP: N/A TYPE: N/A
*BENTONITE SEAL TOP: 0.2' TYPE: 1/4" Bentonite Pellets - BAROID BRAND - Hydrated w/5 gall. of distilled H_2O
BENTONITE SEAL OR GRANULAR BENTONITE BOTTOM (= FILTER PACK TOP): 4.0'
FILTER PACK TYPE: 16/40 Silica Sand BRAND: C.S.S.I.
SURFACE CASING BOTTOM (=SCREEN TOP): 4.3' TYPE: Sch. 40 - PVC
SCREEN ID (IN): 2.0" SLOT SIZE (IN): 0.01 TYPE: Sch. 40 - PVC
SCREEN BOTTOM (= SUMP, TOP): 14.35' SUMP TYPE: Threaded End Cap - Sch. 40 - PVC
FILTER PACK BOTTOM (= *BACKFILL TOP): 14.7' *BACKFILL TYPE: N/A
SUMP BOTTOM (= WELL COMPLETED DEPTH): 14.7' *PILOT HOLE TOP, DIAMETER: N/A
TOTAL BOREHOLE DEPTH (= *PILOT HOLE AND *BACKFILL BOTTOM): 14.7'

REMARKS: Routine well installation on 6/27/05. Well pad installed on 6/28/05

COMPLETED BY: Ellen S. Warp Ellen S. Warp DATE: 6/28/05
CHECKED BY: J. Boylan DATE: 8/3/05

U.S. DEPARTMENT OF ENERGY ROCKY FLATS PLANT

FORM PRO.101A

ROCKY FLATS ENVIRONMENTAL TECHNOLOGY SITE BOREHOLE LOG

PAGE 1 OF 2

Borehole Number: 51605
Location - North: _____ East: _____
Date: 6/27/05
Geologist: E. WARP
Drilling Equip.: CME-750 Auger Rig (Hollow Stem)

Surface Elevation: _____
Area: Replacement of well #1386
Total Depth: 14.7'
Company: URS/Layne
Project No.: HAD51300
Sample Type: Continuous Core-Split Spoon

RMRS LOGGING SUPERVISOR APPROVAL [signature]

DATE 7/19/05

TOP/BOTTOM OF CORE IN BOX	TOP/BOTTOM OF INTERVAL	FEET OF CORE IN INTERVAL (FIELD MEASUREMENT)	SAMPLE NUMBER	FRACTURE ANGLE	BEDDING ANGLE	GRAIN SIZE DISTRIBUTION	USCS SYMBOL	DEPTH IN FEET	SOIL/LITHOLOGIC LOG	SAMPLE DESCRIPTION
0.0	0.0	0.0					CL	0.0		0.0-0.5' - CLAY w/some gravel. Dk. Brn. (7.5YR3/2). Organic-rich topsoil. 5-8% gravel (3/4 to 1" dia., sub-rounded, predominately qtzite and granite). Medium to high plasticity. DRY.
	Run #1	Rec. = 1.0'					GC	0.5		0.5-1.0' - GRAVEL w/some clay. Dk. Brn. (7.5YR3/2) Clay. 80% gravel (cobbles 1 to 2" dia., qtzite and granite). DRY.
	2.0'							1		1.0-2.0' = No recovery
	Run #2	Rec. = 1.4'					CL	2		2.0-3.4' - CLAY w/ Tr gravel and Tr sand and Tr silt. V. Dk. Gry'sh Brn. (2.5Y3/2) to Dk. gry'sh brn. (2.5Y4/2). Wkly. mottled. High plasticity. Dense. Tr roots throughout interval. MOIST.
	4.0'							3		3.4-4.0' = No recovery
	Run #3	Rec. = 0.1'					GC	4		4.0-4.1' - GRAVEL w/some clay and silt. Dk gry'sh brn. (2.5Y4/2). Cobbles (1/2 to 1 1/2" dia., sub-ang.) of qtzite w/some clay. V. poor recovery probably due to clogged split spoon. SL. MOIST.
	6.0'							5		
	Run #4	Rec. = 1.2'		45° NOT CERTAIN - see description			CL	6		6.0-7.2' - CLAY w/some silt and sand and Tr gravel. Dk. Gry'sh Brn. (2.5Y4/2) w/ Dk. gry (2.5Y4/1) and gry (2.5Y5/1) mottling. Med. to high plasticity. Sandy lense (wk. FeOxn) fm. 6.6-6.8'. Dk. Gry'sh Brn. (2.5Y4/2). Tr diss. FeOxn throughout. 45° fracture @ base of interval w/ caliche coating, or rock flour @ edge of cobble causing lost recovery. SL. MOIST to MOIST.
							SC / CL	6.6 / 6.8'		
							CL	7		
								7.2'		7.2-8.0' = No recovery
	Run #5	Rec. = 1.3'	1.3' - ESW 6/28/05				GC / CL	8		8.0-9.3' - GRAVEL/Sandy CLAY MIXTURE. Gry (2.5YR5/1) and Gry'sh Brn (2.5Y5/2). 40-45% gravel (1/4 to 1" dia., sub-ang., predominately qtzite). ~40% clay. Moderate plasticity. ~15% sand (c.g.). Moderate FeOxn fm. 8.5-8.8' (possible ironstone frags @ 8.5'). Clay is slightly "ribbonned" at base - probably pushing a cobble. Incr. moisture to MOIST.
								9		
								9.3'		
								10.0'		9.2-10.0' = No recovery

Box #1 of 2 (0.0 → 14.0')

NOTES: General: USCS is modified for this log as follows:
Materials amounts are estimated by % volume instead of % weight.
(1) Badly broken core, accurate footage measurements not possible.
(2) Core breaks cannot be matched, accurate footage measurements not possible.

Procedure No. RMRS/OPS-PRO.101
Revision 0
Date effective: 12/31/98

(4011-930-0134-930)(Form GT.1A)(03/01/92)

U.S. DEPARTMENT OF ENERGY ROCKY FLATS PLANT

FORM PRO.101A

ROCKY FLATS ENVIRONMENTAL TECHNOLOGY SITE BOREHOLE LOG

PAGE 2 OF 2

Borehole Number: 51605
Location - North: _____ East: _____
Date: 6/27/05
Geologist: E. WARP
Drilling Equip.: CME-750-Hollow Stem Auger

Surface Elevation: _____
Area: Replacement of well #1386
Total Depth: 14.7'
Company: URS/Layne Project No.: HAD51300
Sample Type: Continuous Core-Split Spoon

RMRS LOGGING SUPERVISOR APPROVAL _____ DATE 7/19/05

TOP/BOTTOM OF CORE IN BOX	TOP/BOTTOM OF INTERVAL	FEET OF CORE IN INTERVAL (FIELD MEASUREMENT)	SAMPLE NUMBER	FRACTURE ANGLE	BEDDING ANGLE	GRAIN SIZE DISTRIBUTION	USCS SYMBOL	DEPTH IN FEET	SOIL LITHOLOGIC LOG	SAMPLE DESCRIPTION
	10.0'			Bedrock Contact @ 10.1'			GC/CL	10.0'		10.0-10.1 - GRAVEL/Sandy CLAY MIXTURE, Same as fm. 8.0-9.3'; 1½" dia., sub-angular gtzite cobble @ 10.1'. MOIST.
								10.1 7/19/05		BEDROCK CONTACT @ 10.1'
	Run #6							11		10.1-13.0' - Clayey SILTSTONE (Bedrock). Gry (10YR5/1). V. Silty fm. 10.1 to 11.0', then incr. clay fm. 11.0 to 13.0'. Tr FeOxn @ 10.1'. massive texture, faint laminations (bedding planes) visible. Wkly. friable. Some blk. organic material fm. 11.5 to 12.2'. Abundant blk. organic material fm. 12.2-12.3' decreasing to some fm. 12.3 to 13.0'. SL. MOIST.
	12.0'							12		
								13		13.0-13.5 - CLAYEY SILTSTONE-Weathered/FeOx'd. Yell'sh brn. (10YR5/6). Mod. perv. FeOx'n. Wkly. friable and slightly fissile. Tr blk. organic material (possibly MnOx) along internal fractures. SL. MOIST.
								13.5'		
	14.0'							14		13.5-14.0' = No recovery
Box 2 of 2										14.0-14.7' - Silty CLAYSTONE. Brn. (10YR5/3) w/some Yell'sh brn. (10YR6/6) mottling. Massive texture. Dense and firm. Wk. FeOxn mottling fm. 14.4-14.6' w/Tr MnOx associated with FeOxn. Some blk. organic material (veins) fm. 14.4-14.6'. Decr. moisture to V. Sl. MOIST.
				T.D. @ 14.7'				14.7'		
								15		
								16		T.D. @ 14.7'
								17		
								18		
								19		
								20.0		

NOTES: General: USCS is modified for this log as follows:
Materials amounts are estimated by % volume instead of % weight.
(1) Badly broken core, accurate footage measurements not possible.
(2) Core breaks cannot be matched, accurate footage measurements not possible.

Procedure No. RMRS/OPS-PRO.101
Revision 0
Date effective: 12/31/98

(4011-930-0134-930)(Form GT.1A)(01/01/92)

STATE PLANE COORDINATES AREA:
NORTH: 750877.58
EAST: 2083296.21
PROJECT:
REMARKS:
FC-2, replaces well 1986

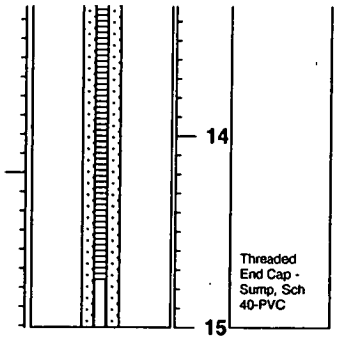
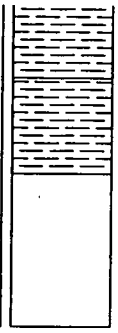
GRND ELEV. (FT): 5943.19
TOTAL DEPTH (FT): 15.0
COMPLETION DATE: 5/16/05
GEOLOGIST: E. Warp

CASING DIA (IN): 2
BH DIA. (IN): 8
GRID LOCATOR:

LOG OF BORING NUMBER: 52505

Elev (Ft)	Well or Piezometer Construction and Materials	Depth (Ft)	Lithology	Unified Soils Classification or Rock Type	Lithologic Description
5946	Protective Casing, Steel, 6 in. ID. Casing, Sch 40-PVC, 2 in. ID.	3			
5945		2			
5944	Concrete Seal	1			
5943	Concrete Pad	0			CL: Silty Clay with some gravel and trace sand, dark brown (10YR3/3) with some brownish yellow (10YR6/6) mottling. 5 - 10% gravel (1/4" - 3/4" diameter, subrounded). 3 - 5% sand (coarse grained, subangular). Weak iron oxidation as mottling in clay and as a coating on some coarse grained sand and gravel. Roots common. Trace disseminated caliche. Pliable, medium plasticity. 1-1/2" diameter quartzite cobble (subangular) at 1.0'. Moist.
5942		1			
5941	Bentonite Chips	2			No recovery.
5940		3			CL: Silty Clay with trace to some gravel and trace sand, brown (10YR4/3) with some dark yellowish brown (10YR4/6) mottling. Very similar to interval from 0.0' to 1.5', decreased gravel and sand. Roots common to 3.6'. Trace to some disseminated caliche. Grades into black clay at base. Very moist and pliable.
5939		4			CL: Silty Clay with trace to some sand and trace to some gravel,

Elev (Ft)	Well or Piezometer Construction and Materials	Depth (Ft)	Lithology	Unified Soils Classification or Rock Type	Lithologic Description
					very dark gray (10YR3/1) with some dark yellowish brown (10YR3/4). Distinct color change. Trace to some sand (coarse grained, angular). Trace caliche, trace roots. Very soft and pliable. Very moist to saturated at 5.0'.
5938	Filter Pack, 16/40 Silica Sand; Screen, Sch 40-PVC, 2 in. ID., 0.010 in. slots	5			
5937		6			GM/SM: Gravel/Silty Sand mixture, very dark gray (10YR3/1). ~70% silty sand (coarse grained, subangular to subrounded). ~30% gravel (1/4" - 3/4" diameter, subrounded to subangular). Unconsolidated, flowing. Saturated.
5936		7			No recovery.
					GM/ML: Clayey Sand/Silt/Gravel mixture, very dark gray (10YR3/1). ~70% clayey, sandy silt, ~30% gravel (1/4" - 1" diameter, subangular to subrounded). 1-1/2" diameter quartzite cobble at 8.2'. Predominately unconsolidated. Saturated.
5935		8			CL: Silty Clay with trace to some sand and gravel, very dark brown (10YR2/2). 3 - 7% gravel (1/4" - 1/2" diameter, subrounded). Trace iron oxidation mottling. Interval cohesive but soft and saturated.
5934		9			CL: Clay with trace gravel, light olive brown (2.5Y5/4) and some dark grayish brown (2.5Y4/2), slightly mottled. Weak pervasive iron oxidation. Appears to be re-worked claystone. Cohesive, saturated.
					No recovery.
5933		10			CLAYSTONE: TOP OF BEDROCK. Claystone, yellowish brown (10YR5/6) with trace gray (10YR6/1) mottling. Strong pervasive iron oxidation. Trace white stringers from 10.0' to 10.2'. Trace black organic stringers at base of interval. Cohesive interval. Decreasing moisture to very moist. Bedrock contact estimated due to poor recovery.
5932		11			No recovery.
5931		12			CLAYSTONE: Claystone, dark grayish brown (10YR4/2) with some yellowish brown (10YR5/6) mottling. Iron oxidation increasing toward base of interval. Trace black organic stringers. Cohesive, firm, moist.
5930		13			

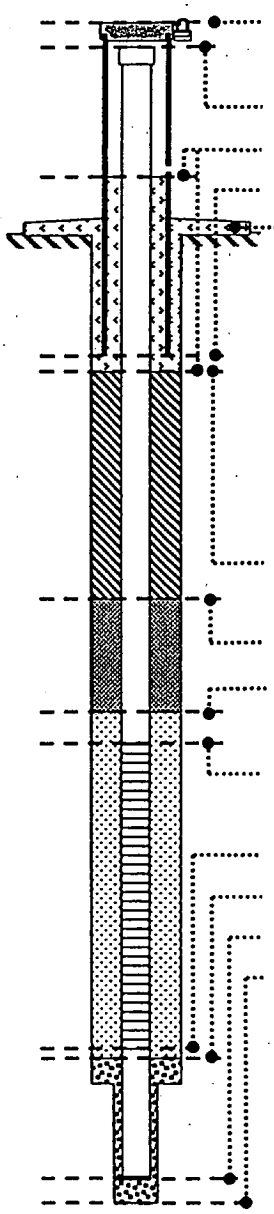
Elev (Ft)	Well or Piezometer Construction and Materials	Depth (Ft)	Lithology	Unified Soils Classification or Rock Type	LOG OF BORING NUMBER: 52505 Lithologic Description	Page 3 of 3
5929		14 15			CLAYSTONE: Claystone, yellowish brown (10YR5/6) with trace grayish brown (10YR5/2) mottling. Strong pervasive iron oxidation. Trace black organic stringers along bedding planes. Interval is firm and dense. Increasing silt (to claystone with silt) below 13.9'. Moist. No recovery.	

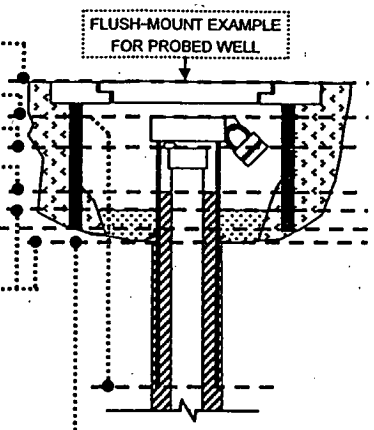
MONITORING WELL INSTALLATION REPORT: Form PRO.118

LOCATION CODE: 52505 PROJECT NAME: C405 Well Replacements PROGRAM: Water Programs
SCREENED FORMATION: Al/Bdrk DRILLING CONTRACTOR: High Plains BORING METHOD: Hollow Stem Auger
DATE DRILLED: 5/16/05 DATE COMPLETED: 5/17/05 TOTAL DEPTH: 15.0' COMPLETED DEPTH: 15.0'
ESTIMATED DEPTH TO BEDROCK: 10.0' RIG GEOLOGIST: E. Warp LOGGING GEOLOGIST: E. Warp
BOREHOLE DIAMETER IN SCREENED INTERVAL: 8" QUANTITY OF FLUIDS LOST DURING DRILLING: N/A
INITIAL WATER LEVEL (FT, DATE): 5.0' bgs 5/16/05 COMPLETED WATER LEVEL (FT, DATE): 0.99' bgs, 5/17/05
DIAMETER & TYPE OF INSTALLATION (WELL/PIEZOMETER/WELL POINT/ETC.): 2.0" PVC Well
TYPE OF PROTECTION (FLUSH-MOUNT VS. ABOVE GROUND, ASEPTIC, ETC.): Aboveground-Steel

ALL MEASUREMENTS WILL BE MADE IN FEET FROM GROUND SURFACE

* DENOTES ITEMS THAT MAY NOT BE APPLICABLE, DEPENDING ON BORING METHOD, WELL PROTECTION & PURPOSE





PROTECTIVE CASING TOP (STICKUP OR FLUSH-MOUNT): 3.5' ags
*SECONDARY CASING TOP: N/A BOTTOM: N/A TYPE: N/A
SURFACE CASING TOP: 3.0' ags ID (IN): 2.0"
SURFACE SEAL TOP: 1.2' ags BOTTOM: 0.5' bgs TYPE: Concrete
PROTECTIVE CASING BOTTOM, ID (IN), TYPE: 1.3', 6.0" Steel
*WELL PAD DIMENSIONS, TYPE: 3'x3', concrete top 0.2ags bottom 0.5' bgs.
*ADD'L CASING FILL TOP: N/A BOTTOM: N/A TYPE: N/A
*SURFACE ISOLATION CASING TOP: N/A BOTTOM: N/A
*SURFACE ISOLATION CASING ID (IN): N/A TYPE: N/A
*OTHER (E.G., ASEPTIC) CASING TOP: N/A BOTTOM: N/A
*OTHER CASING ID (IN): N/A TYPE, PURPOSE: N/A
*CENTRALIZER(S) OD (IN): N/A NUMBER USED: N/A TYPE: N/A
*CENTRALIZER(S) DEPTH(S): N/A
*GROUT TOP: N/A MEASURED DENSITY (LBS/GAL): N/A TYPE: N/A
*GRANULAR BENTONITE TOP: N/A TYPE: N/A
*BENTONITE SEAL TOP: 0.5' TYPE: Bentonite chips-medium. "Pure Gold"
BENTONITE SEAL OR GRANULAR BENTONITE BOTTOM (= FILTER PACK TOP): 4.0'
FILTER PACK TYPE: 16/40 Silica Sand BRAND: C.S.S.I.
SURFACE CASING BOTTOM (=SCREEN TOP): 4.75 TYPE: Sch. 40-PVC
SCREEN ID (IN): 2.0" SLOT SIZE (IN): 0.01" TYPE: Sch. 40-PVC
SCREEN BOTTOM (= SUMP, TOP): 14.75 SUMP TYPE: Threaded end cap
FILTER PACK BOTTOM (= *BACKFILL TOP): 15.0' *BACKFILL TYPE: N/A
SUMP BOTTOM (= WELL COMPLETED DEPTH): 15.0' *PILOT HOLE TOP, DIAMETER: N/A
TOTAL BOREHOLE DEPTH (= *PILOT HOLE AND *BACKFILL BOTTOM): 15.0'
REMARKS: Rountine well installation on 5/16/05. Well pad poured on 5/17/05
COMPLETED BY: Ellen S. Warp Ellen S. Warp DATE: 5/17/05
CHECKED BY: _____ DATE: _____

U.S. DEPARTMENT OF ENERGY ROCKY FLATS PLANT

FORM PRO.101A

ROCKY FLATS ENVIRONMENTAL TECHNOLOGY SITE BOREHOLE LOG

PAGE 1 OF 2

Borehole Number: 52505
Location - North: _____ East: _____
Date: 5/16/05
Geologist: E. WARP
Drilling Equip.: CME-75-HT Auger Rig

Surface Elevation: _____
Area: FC-2, Replacement of well #1986
Total Depth: 15.0'
Company: URS/High Plains Project No.: HAD51300
Sample Type: Auger w/ split spoon

RMRS LOGGING SUPERVISOR APPROVAL _____ DATE 6/8/05

TOP/BOTTOM OF CORE IN BOX	TOP/BOTTOM OF INTERVAL	FEET OF CORE IN INTERVAL (FIELD MEASUREMENT)	SAMPLE NUMBER	FRACTURE ANGLE	BEDDING ANGLE	GRAIN SIZE DISTRIBUTION	USCS SYMBOL	DEPTH IN FEET	SOIL LITHOLOGIC LOG	SAMPLE DESCRIPTION
0.0	0.0	0.0						0.0		0.0 - 1.5' - Silty CLAY w/some gravel and Tr sand. Dk. Brn. (10YR 3/3) w/some Brn'sh Yellow (10YR 6/6) mottling. 5-10% gravel (1/4-3/4" dia., sub-rounded); 3-5% sand. (c.g., sub-ang). Wk. FeOx'n as mottling in clay and as a coating on some c.g. sand and gravel. Roots common. Tr diss. caliche, Pliable-mod. plasticity. 1 1/2" dia. qtzite cobble (sub-ang.) @ 1.0'. MOIST.
	Run #1	Rec = 1.5'					CL	1		
								1.5		1.5-3.0' = No Recovery
								2		
	3.0'	3.0'						3		3.0-3.8' - Silty CLAY w/Tr-some gravel and Tr sand. Brn. (10YR 4/3) w/some yell'sh brn. (10YR 4/6) mottling. V. similar to 0.0-1.5' decr'd gravel and sand. Roots common to 3.6'. Tr-some diss. caliche. Grades into blk. clay at base. V. moist and pliable.
	Run #2	Rec = 2.0'					CL	3.8'		
								4		
	5.0'	5.0'						5		3.8-6.2' - Silty CLAY w/Tr-some sand and Tr-some gravel. V. Dk. gry. (10YR 3/1) w/some dk. yell'sh brn. (10YR 3/4). Distinct color change. Tr-some sand (c.g., ang.) Tr caliche, Tr roots. V. soft and pliable. V. MOIST to saturated @ 5.0'.
	Run #3	Rec = 1.5'					CL			
								6		
							GM SM	6.2'		
								6.5'		6.2-6.5' - Gravel / Silty SAND Mixture. V. Dk. Gry. (10YR 3/1), ~70% silty sand (c.g., sub-ang. to sub-rounded) ~30% gravel (1/4-3/4" dia., sub-rounded to sub-ang.). Unconsolidated, flowing. SATURATED.
								7		6.5-7.0' = No recovery
							GM ML			
								8		7.0-8.2' - Clayey, sandy SILT / GRAVEL mixture. V. Dk. gry. (10YR 3/1), ~70% clayey, sandy silt. ~30% gravel (1/4"-1" dia., sub-ang. to sub-rounded). 1 1/2" dia. Cobble of qtzite @ 8.2'. Predominately unconsolidated. SATURATED.
	Run #4	Rec = 2.0'						8.2		
							CL	8.8'		8.2-8.8' - Silty CLAY w/Tr to some sand and gravel. V. Dk. brn. (10YR 2/2). 3-7% gravel (1/4-1/2" dia., sub-rounded) Tr FeOx'n mottling. Internal cohesive but soft and saturated.
								9		
			Estimated Bedrock Contact @ 10.0'					10.0'		8.8-9.0' - CLAY w/Tr gravel. Lt. Olive brn. (2.5Y 5/4) and some dk. gry'sh brn. (2.5Y 4/2). Slightly mottled, wk. prev. FeOx'n. Appears to be re-worked claystone. Cohesive. SATURATED.

NOTES: General: USCS is modified for this log as follows:
Materials amounts are estimated by % volume instead of % weight.
(1) Badly broken core, accurate footage measurements not possible.
(2) Core breaks cannot be matched, accurate footage measurements not possible.

9.0-10.0 = No recovery

Procedure No. RMRS/OPS-PRO.101
Revision 0
Date effective: 12/31/98
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(4011-930-0134-930)(Form GT.1A)(03/01/92)

U.S. DEPARTMENT OF ENERGY ROCKY FLATS PLANT

FORM PRO.101A

ROCKY FLATS ENVIRONMENTAL TECHNOLOGY SITE BOREHOLE LOG

Borehole Number: 52505
Location - North: _____ East: _____
Date: 6/16/05
Geologist: E. Warp
Drilling Equip.: CME-75-HT

Surface Elevation: _____
Area: FC-2, Replacement of well #1986
Total Depth: 15.0'
Company: WES/High Plains Project No.: HAD51300
Sample Type: Auger w/split spoon

RMRS LOGGING SUPERVISOR APPROVAL _____ DATE 6/8/05

TOP/BOTTOM OF CORE IN BOX	TOP/BOTTOM OF INTERVAL	FEET OF CORE IN INTERVAL (FIELD MEASUREMENT)	SAMPLE NUMBER	FRACTURE ANGLE	BEDDING ANGLE	GRAIN SIZE DISTRIBUTION	USCS SYMBOL	DEPTH IN FEET	SOIL/ LITHOLOGIC LOG	SAMPLE DESCRIPTION
	Run #5	Rec. = 1.1'						10.0		Bedrock Contact @ 10.0' - estimated due to poor recovery.
								11		10.0-11.1' - CLAYSTONE (Bedrock) - Yell'sh Brn. (10YR5/6) w/ Tr Gry (10YR4/1) mottling. Strong perv. FeOx'n. Tr wht. stringers fm. 10.0-10.2'. Tr blk. organic stringers @ base of interval. Cohesive interval. Decr. moisture to V. MOIST.
								11.1		11.1-12.0' = No recovery
	12.0'	12.0'						12		
	Run #6	Rec. = 2.2'						13		12.0-13.7' - CLAYSTONE. Dk. Gry'sh Brn. (10YR4/2) w/ some yell'sh brn. (10YR5/6) mottling. FeOx'n incr'sg toward base of interval. Tr blk. organic stringers. Cohesive, firm. MOIST.
								13.7'		
								14		
								14.2'		13.7-14.2' - CLAYSTONE. Yell'sh brn. (10YR5/6) w/ Tr Gry'sh Brn. (10YR5/2) mottling. S. Perv. FeOx'n. Tr blk. organic stringers along bedding planes. Interval is firm and dense. MOIST.
	15.0'	15.0'		T.D. @ 15.0'				15		14.2-15.0' = No recovery.
								16		T.D. @ 15.0'
								17		Increasing silt (to claystone w/silt) below 13.9'.
								18		6/8/05
								19		
								20.0		

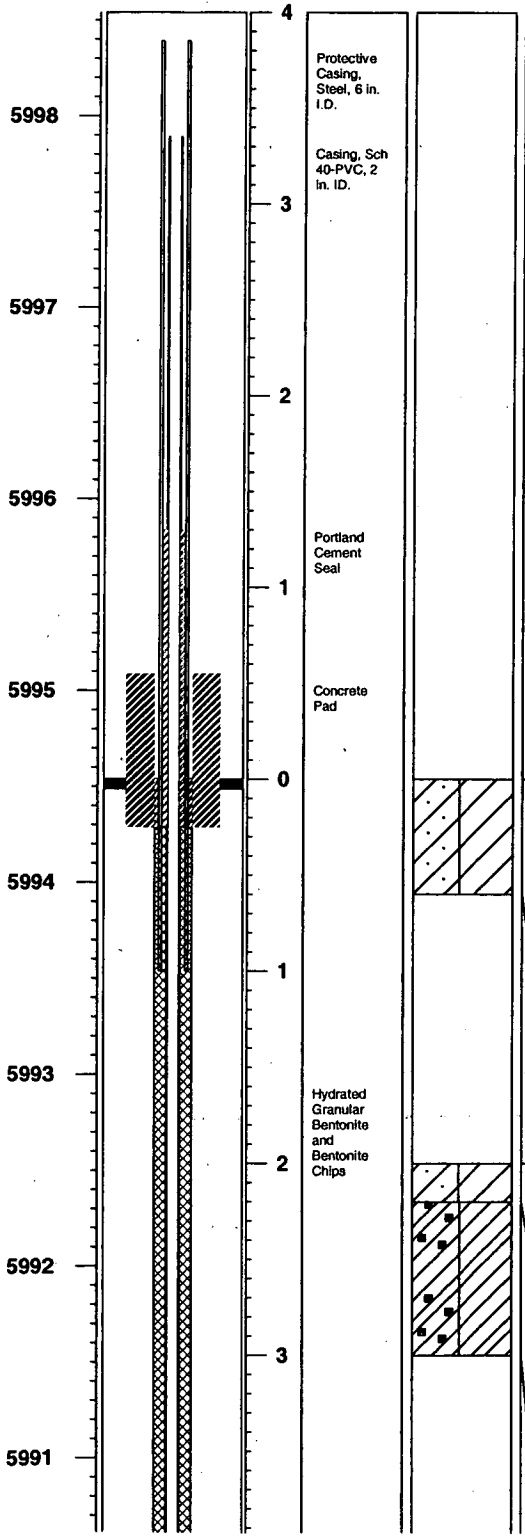
NOTES: General: USCS is modified for this log as follows:
Materials amounts are estimated by % volume instead of % weight.
(1) Badly broken core, accurate footage measurements not possible.
(2) Core breaks cannot be matched, accurate footage measurements not possible.

Procedure No. RMRS/OPS-PRO.101
Revision 0
Date effective: 12/31/98

(4011-930-0134-930)(Form GT.1A)(03/01/92)

STATE PLANE COORDINATES AREA:	GRND ELEV. (FT): 5994.538	CASING DIA (IN): 2	**LOG OF BORING NUMBER:**
NORTH: 750290.711	TOTAL DEPTH (FT): 29.6	BH DIA. (IN): 8	**55905**
EAST: 2083346.613	COMPLETION DATE: 8/23/05	GRID LOCATOR:	
PROJECT: Former B559	GEOLOGIST: E. Warp		

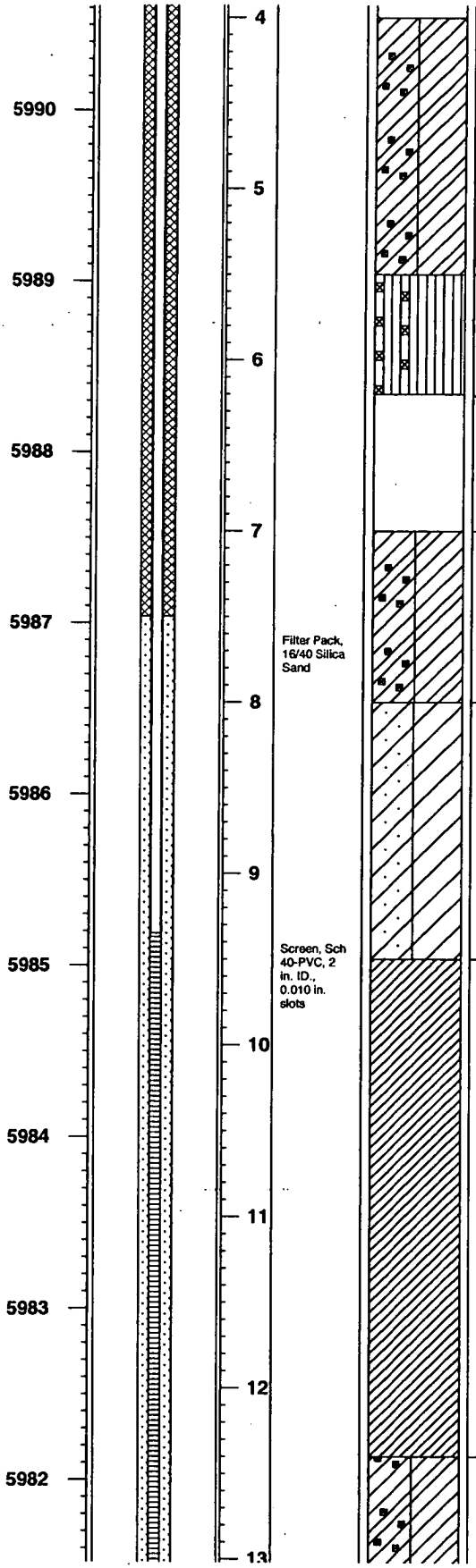
REMARKS:
Replaces well 55901.



Unified Soils Classification or Rock Type	Lithologic Description
	Protective casing destroyed after installation; it, PVC stickup, and pad replaced.
	SC/CL: Silty, Sandy Clay with trace to some gravel. Strong brown (7.5YR4/6) silty clay matrix. Moderate plasticity (very pliable). ~10% sand (coarse grained, subangular). ~5% gravel (1/8" - 1/4" diameter, subangular to subrounded). Weakly consolidated, soft and pliable. Disseminated white, coarse grained, sand-sized fragments throughout. Occasional 3/4" cobbles. Moist.
	No recovery.
	SC/CL: Silty, Sandy Clay. Same as interval from 0.0' to 0.6'. Slight color change to strong brown (7.5YR5/8). Increased gravel to ~10%. Moist.
	GC/CL: Gravel with silty, sandy clay. Brown (7.5YR5/4) to reddish yellow (7.5YR6/6) with some strong brown (7.5YR5/8) silty clay matrix. 15 - 25% shattered gravel (1/8" - 3/4" diameter, subangular, predominately quartzite with trace schist). ~10% sand (medium grained, subangular to subrounded). Cobbles up to 1-1/2" diameter common throughout. Loosely consolidated. Slightly moist.
	No recovery.

Elev (Ft)	Well or Piezometer Construction and Materials	Depth (Ft)	Lithology	Unified Soils Classification or Rock Type	Lithologic Description

LOG OF BORING NUMBER: 55905



GC/CL: Gravel with silty, sandy clay. Same as interval from 2.2' to 3.0'. Moisture increases to moist.

SM/ML: Sandy, Clayey Silt with trace gravel. Brown (7.5YR5/4) grading into light yellowish brown (2.5Y6/3) at 5.8'. 35 - 40% sand (very fine grained). Cohesive. Moist. 1-1/2" cobbles of pegmatitic quartzite at base.

No recovery.

GC/CL: Gravel with silty, sandy clay. Same as interval from 2.2' to 3.0'. Loosely consolidated. Moist. 1-1/2" diameter quartzite cobble at 7.6'. Increasing silt at base.

SC/CL: Silty, Clayey Sand to Silty, Sandy Clay, strong brown (7.5YR5/8 to 7.5YR4/6) silty clay matrix. ~40% sand (medium grained to coarse grained, subrounded to subangular). Some disseminated caliche throughout. Interval is cohesive, but pliable. Moist.

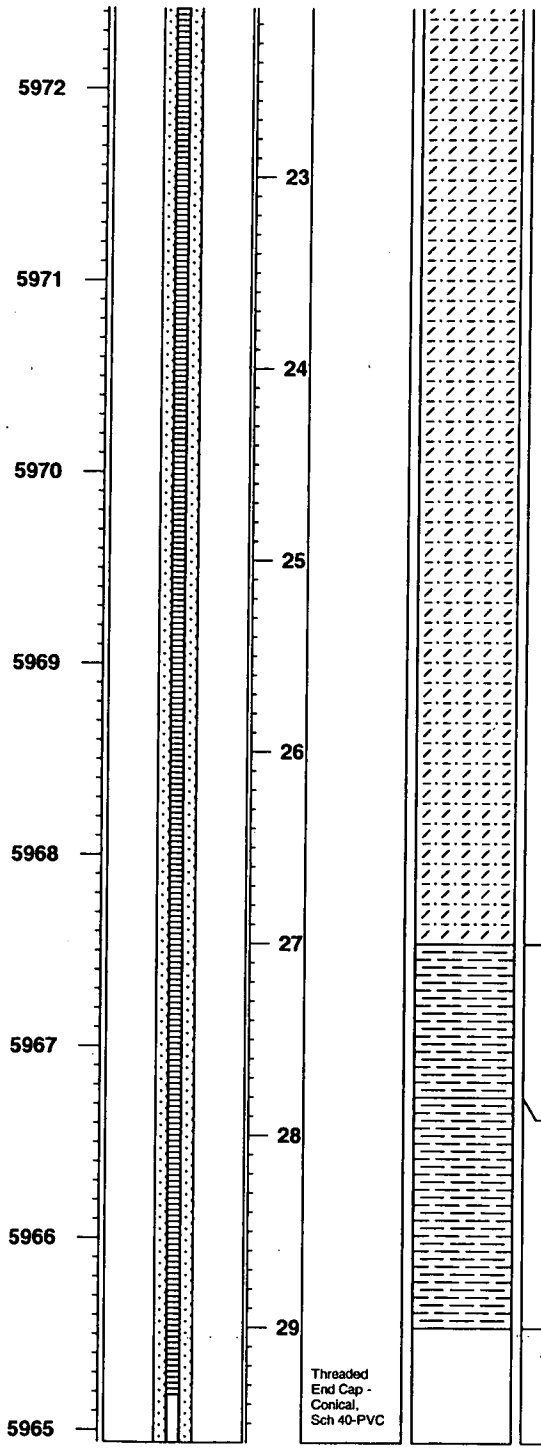
CL: Clay, brown (7.5YR4/4) with trace light olive gray (5Y6/2) mottling. Distinct change in color and soil type. Predominately light olive gray from 12.0' to 12.4'. Black organic stringers common from 10.0' to 11.5'. Dense and firm. Moist.

GC/CL: Gravel with silty, sandy clay. Matrix is pinkish gray (7.5YR6/2) with some light olive gray (5Y6/2) from 12.4' to 13.0', then predominately yellowish brown (10YR5/8). 15 - 25% gravel

Elev (Ft)	Well or Piezometer Construction and Materials	Depth (Ft)	Lithology	Unified Soils Classification or Rock Type	Lithologic Description
5981					(1/4" - 3/4" diameter, subangular, predominately quartzite and granite). 10 - 25% sand (coarse grained, subrounded to subangular). Trace disseminated caliche throughout. Loosely consolidated. Moist.
		14			CL: Clay with trace silt. Displaced claystone (possibly). Yellowish brown (10YR5/4) with light olive gray (5Y6/2) mottling. Trace black organic stringers. Dense and firm. Moist.
5980					
		15			GC/CL: Gravel with silty, sandy clay to silty, sandy clay with gravel. Same as interval from 12.4' to 14.0'. Loosely consolidated. Moist.
5979					
		16			CL: Clay with trace silt. Same as interval from 14.0' to 14.6'. Moist.
5978					GC/CL: Gravel with silty, sandy clay. Same as interval from 12.4' to 14.0'. Abundant sand at base of interval. Increasing moisture throughout interval. Moist from 16.1' to 17.0'. Very moist to wet (not flowing) from 17.0' to 18.8'.
		17			
5977					
		18			
5976					
		19			No recovery.
5975					SC/CL: Silty, Sandy Clay with some gravel. Strong brown (7.5YR4/6) to yellowish brown (10YR5/8). 20 - 25% sand (coarse grained, subrounded). ~15% gravel (1/4" - 3/4" diameter, subangular to subrounded). Silty clay matrix. Unconsolidated. Saturated with flowing water.
		20			CLAYEY SILTSTONE: TOP OF BEDROCK. Clayey Siltstone with trace sand to clayey, sandy siltstone. Weathered bedrock. Pale brown (10YR6/3) with some light gray (10YR7/1) mottling. Yellowish brown (10YR5/8) iron oxidation mottling throughout and along sub-horizontal bedding planes. Trace faint black organic stringers. Dense and cohesive. Notable decrease in moisture at 19.5', from saturated at 19.5' to very moist from 19.5' to 22.0', moist from 22.0' to 24.0'. Slightly moist from 24.0' to 27.0'. Silty/very fine grained sandy lens with pervasive iron oxidation from 23.9' to 24.0'. Caliche-filled fracture from 22.1' to 22.4', near-vertical. Rip-up clasts of coarser material common, especially from 24.7' to 27.0'.
5974					
		21			
5973					
		22			

Elev (Ft)	Well or Piezometer Construction and Materials	Depth (Ft)	Lithology	Unified Soils Classification or Rock Type	Lithologic Description

LOG OF BORING NUMBER: 55905



CLAYSTONE: Claystone with some silt. Weathered bedrock. Yellowish brown (10YR5/6) to light yellowish brown (10YR6/4). Strong pervasive iron oxidation from 27.0' to 27.3'. Black organic stringers common. Dense and firm. Moisture decreases to trace. Silt rip-ups, laminae common.

CLAYSTONE: Claystone with some silt. Unweathered bedrock. Gray (10YR6/1) with trace yellowish brown (10YR5/6). Iron oxidation along healed 45 deg fracture at 28.0'. Very firm and dense. Dry.

Augers advanced to 29.6'. Interval not sampled.

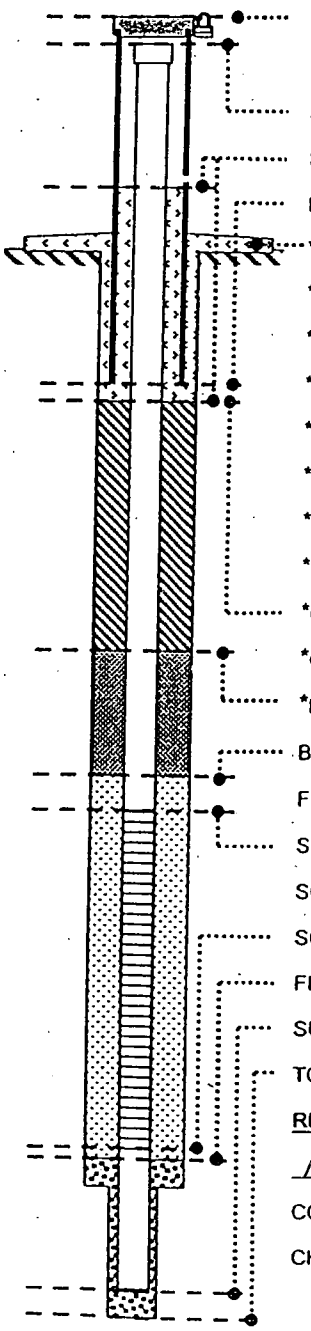
(09/14/00)

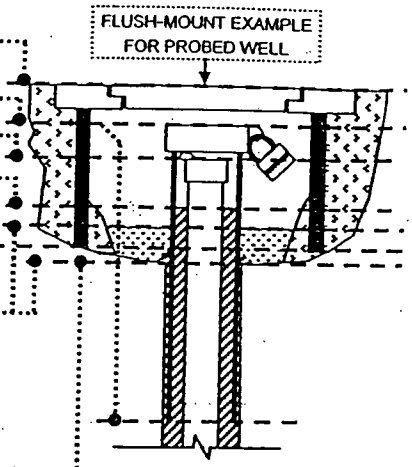
MONITORING WELL INSTALLATION REPORT: Form PRO.118

LOCATION CODE: 55905 PROJECT NAME: CY05 Well Replacements PROGRAM: Water Programs-WAR
SCREENED FORMATION: Al/Bdrk DRILLING CONTRACTOR: High Plains BORING METHOD: Hollow Stem Auger
DATE DRILLED: 8/23/05 DATE COMPLETED: 8/23/05 TOTAL DEPTH: 29.6 COMPLETED DEPTH: 29.6'
ESTIMATED DEPTH TO BEDROCK: 19.5 RIG GEOLOGIST: E. Warp LOGGING GEOLOGIST: E. Warp
BOREHOLE DIAMETER IN SCREENED INTERVAL: 8" QUANTITY OF FLUIDS LOST DURING DRILLING: N/A
INITIAL WATER LEVEL (FT, DATE): wet during install. 8/23/05 COMPLETED WATER LEVEL (FT, DATE): 14.5' fm. TOC on 8/24/05
DIAMETER & TYPE OF INSTALLATION (WELL/PIEZOMETER/WELL POINT/ETC.): 2" I.D. PVC Well
TYPE OF PROTECTION (FLUSH-MOUNT VS. ABOVE GROUND, ASEPTIC, ETC.): Above ground steel protective casing.

ALL MEASUREMENTS WILL BE MADE IN FEET FROM GROUND SURFACE

*DENOTES ITEMS THAT MAY NOT BE APPLICABLE, DEPENDING ON BORING METHOD, WELL PROTECTION & PURPOSE





PROTECTIVE CASING TOP (STICKUP OR FLUSH-MOUNT): 3.85' ags
*SECONDARY CASING TOP: N/A BOTTOM: N/A TYPE: N/A
SURFACE CASING TOP: 3.35 ID (IN): 2.0"
SURFACE SEAL TOP: 1.3 ags BOTTOM: 0.25 bgs TYPE: Portland cement ~~concrete esw~~
PROTECTIVE CASING BOTTOM, ID (IN), TYPE: 1.0' bgs, 6" steel
*WELL PAD DIMENSIONS, TYPE: 3'x3' fm, 0.55 ags to 0.25' bgs (concrete)
*ADD'L CASING FILL TOP: N/A BOTTOM: N/A TYPE: N/A
*SURFACE ISOLATION CASING TOP: N/A BOTTOM: N/A
*SURFACE ISOLATION CASING ID (IN): N/A TYPE: N/A
*OTHER (E.G., ASEPTIC) CASING TOP: N/A BOTTOM: N/A
*OTHER CASING ID (IN): N/A TYPE, PURPOSE: N/A
*CENTRALIZER(S) OD (IN): N/A NUMBER USED: N/A TYPE: N/A
*CENTRALIZER(S) DEPTH(S): N/A
*GROUT TOP: N/A MEASURED DENSITY (LBS/GAL): N/A TYPE: N/A
*GRANULAR BENTONITE TOP: N/A TYPE: N/A
*BENTONITE SEAL TOP: 0.25' TYPE: Med. bentonite chips - "Pure Gold" (3 bags) + granular "ENVIROplug - No. 8" - 1/2 bag) } hydrated w/5 gall of dist. H_2O
BENTONITE SEAL OR GRANULAR BENTONITE BOTTOM (= FILTER PACK TOP): 7.5'
FILTER PACK TYPE: 16/40 Silica Sand BRAND: C.S.S.I.
SURFACE CASING BOTTOM (=SCREEN TOP): 9.35' TYPE: Sch. 40 PVC
SCREEN ID (IN): 2.0" SLOT SIZE (IN): 0.01" TYPE: Sch. 40 PVC
SCREEN BOTTOM (= SUMP, TOP): 29.35' SUMP TYPE: Conical threaded end cap
FILTER PACK BOTTOM (= *BACKFILL TOP): 29.6' *BACKFILL TYPE: N/A
SUMP BOTTOM (= WELL COMPLETED DEPTH): 29.6' *PILOT HOLE TOP, DIAMETER: N/A
TOTAL BOREHOLE DEPTH (= *PILOT HOLE AND *BACKFILL BOTTOM): 29.6'

REMARKS: Routine well installation (annular portland cement surface seal installed on 8/24/05 by WARP crew)

COMPLETED BY: Ellen S. Warp [signature] DATE: 8/23/05
CHECKED BY: _____ DATE: _____

ROCKY FLATS ENVIRONMENTAL TECHNOLOGY SITE BOREHOLE LOG

Borehole Number: 55905
Location - North: _____ East: _____
Date: 8/23/05
Geologist: E. WARP
Drilling Equip.: CME-75-HT-Hollow Stem Auger

Surface Elevation: _____
Area: Former B559-Replacement of well #55901
Total Depth: 29.6'
Company: URS/High Plains Project No. HAD51300
Sample Type: Continuous Core

RMRS LOGGING SUPERVISOR APPROVAL: _____ DATE 8/29/05

TOP/BOTTOM OF CORE IN BOX	TOP/BOTTOM OF INTERVAL	FEET OF CORE IN INTERVAL (FIELD MEASUREMENT)	SAMPLE NUMBER	FRACTURE ANGLE	BEDDING ANGLE	GRAIN SIZE DISTRIBUTION	USCS SYMBOL	DEPTH IN FEET	SOIL/LITHOLOGIC LOG	SAMPLE DESCRIPTION
	0.0' Run #1 2.0'	Rec. = 0.6'	—			—	SC CL	0.0 0.6' 1 2		0.0-0.6 - Silty, Sandy CLAY w/Tr-some gravel. Strong brn. (7.5YR 4/6) silty clay matrix - mod. plasticity (v. pliable). ~10% sand (c.g., sub-ang.). ~5% gravel (1/8-1/4" dia., sub-ang. to sub-rounded). Mdly. consolidated, soft and pliable. Diss. wht c.g. sand-sized fragments throughout. Occasional 3/4" cobbles. MOIST.
										0.6-2.0' = No recovery
	Run #2 4.0'	Rec. = 1.0'					SC CL GC CL	2 2.2' 3		2.0-2.2 - Silty, Sandy CLAY - same as above fm. 0.0-0.6'. Sl. color change to strong brn. (7.5YR 5/8). Incr. gravel to ~10%. MOIST. 2.2-3.0' - GRAVEL w/Silty, Sandy CLAY. Brn. (7.5YR 5/4) to reddish yellow (7.5YR 6/6) w/some strong brn. (7.5YR 5/8) silty clay matrix. 15-25% gravel (1/8-3/4" dia., sub-ang., predominately qtzite with ~~quartzite and~~ Tr schist). ~10% sand (m.g., sub-ang. to sub-rounded). Cobbles up to 1 1/2" dia. common throughout. Loosely consolidated. Sl. MOIST.
										3.0-4.0' = No recovery
	Run #3 7.0'	Rec. = 2.2'					GC CL	4 5 5.5'		4.0-5.5' - GRAVEL w/Silty, Sandy CLAY - same as above fm. 2.2-3.0'. Incr. moisture to MOIST.
							SM ML	6 6.2'		5.5-6.2' - Sandy, clayey SILT w/Tr gravel. Brn. (7.5YR 5/4) grading into lt. yellowish brn. (2.5Y 6/3) @ 5.8'. 35-40% sand (v.f.g.). Cohesive. MOIST. 1 1/2" cobbles of pegmatitic qtz. @ base.
										6.2-7.0' = No recovery
	7.0' Run #4	Rec. = 2.0'					GC CL	7 8		7.0-8.0 - GRAVEL w/Silty, Sandy CLAY - same as above fm. 2.2-3.0'. Loosely consolidated. MOIST. 1 1/2" dia. qtzite cobble @ 7.6'. Increasing silt @ base.
							SC SM CL	9 9.5		8.0-9.5' - Silty, Clayey SAND to silty Sandy CLAY. Strong brn. (7.5YR 5/8-4/6) silty clay matrix. ~40% sand (m.g. to c.g., sub-rounded to sub-ang.). Some diss. caliche throughout. Interval is cohesive but pliable. MOIST.
	Run #5 20-12.2'	Rec. = 3.2'					CL			9.5-12.4 - CLAY - see page 2 of 3 for description

Run 5/2/05

NOTES: General: USCS is modified for this log as follows:
Materials amounts are estimated by % volume instead of % weight.
(1) Badly broken core, accurate footage measurements not possible.
(2) Core breaks cannot be matched, accurate footage measurements not possible.

Procedure No. RMRS/OPS-PRO.101
Revision 0
Date effective: 12/31/98

(4011-4330-01 34-9301 Form GT.1A X0 SOL.V2)

ROCKY FLATS ENVIRONMENTAL TECHNOLOGY SITE BOREHOLE LOG

Borehole Number: 55905
Location - North: _____ East: _____
Date: 8/23/05
Geologist: E. WARP
Drilling Equip.: CME-75-HT Hollow Stem Auger

Surface Elevation: _____
Area: Former B559 - Replacement of well #55901
Total Depth: 29.6'
Company: URS/High Plains Project No. HAD51300
Sample Type: Continuous Core

RMRS LOGGING SUPERVISOR APPROVAL _____ DATE 8/29/05

TOP/BOTTOM OF CORE IN BOX	TOP/BOTTOM OF INTERVAL	FEET OF CORE IN INTERVAL (FIELD MEASUREMENT)	SAMPLE NUMBER	FRACTURE ANGLE	BEDDING ANGLE	GRAIN SIZE DISTRIBUTION	USCS SYMBOL	DEPTH IN FEET	SOIL/LITHOLOGIC LOG	SAMPLE DESCRIPTION (BAB 8/29/05)
	10.0							10.0		9.5-12.4' - CLAY ~~Displaced claystone~~. Brn. (7.5YR4/4) w/ Tr Lt. olive gry (5Y6/2) mottling. Distinct change in color and soil type. Predominately lt. olive gry fm. 12.0-12.4'. Blk. organic stringers common fm. 10.0 to 11.5'. Dense and firm. MOIST.
	Run #5 (cont.) 9.0→12.0'	Rec. = 3.2'					CL	11		
	12.0'							12		
								12.4		12.4-14.0' - GRAVEL w/ Silty, Sandy CLAY. Matrix is pinkish gry. (7.5YR6/2) w/ some Lt. olive gry (5Y6/2) fm. 12.4-13.0' then predominately yellowish brn. (10YR5/6). 15-25% gravel (1/4-3/4" dia., subang. to subrd., predominately gneiss and granite), 10-25% sand (c.g., sub-rounded to subang.) Diss. caliche throughout. Loosely consolidated. MOIST. (BAB 8/29/05)
	Run #6	Rec. = 2.0'					GC CL	13		
	14.0'							14		14.0-14.6' - CLAY w/ Tr silt. Displaced claystone (possibly). Yellowish brn (10YR5/4) w/ lt. olive gry. (5Y6/2) mottling. Tr blk. organic stringers. Dense and firm. MOIST. (BAB 8/29/05)
							CL	14.6		
							GC CL	15		14.6-15.7' - GRAVEL w/ Silty, Sandy CLAY. Silty, sandy clay w/ gravel. as above fm. 12.4-14.0'. Loosely consolidated. MOIST.
	Run #7	Rec. = 3.0'						15.7		15.7-16.1' - CLAY w/ Tr silt. Same as above fm. 14.0-14.6'. MOIST
							CL	16		
								16.1		16.1-18.8' - GRAVEL w/ Silty, Sandy CLAY - same as above fm. 12.4-14.0'. Abundant sand at base of interval. Increasing moisture throughout interval, MOIST fm. 16.1 to 17.0'. V. MOIST to wet (not flowing) fm. 17.0 to 18.8'.
	17.0'							17		
							GC CL			
	Run #8	Rec. = 1.8'						18		18.8-19.0' = No recovery
	19.0'							18.8'		19.0-19.5' - Silty, Sandy CLAY w/ some gravel. Strong brn. (7.5YR4/6) to yellowish brn. (10YR5/6) 20-25% sand (c.g., sub-rounded), ~15% gravel (1/4 to 3/4" dia., sub ang. to sub-rounded). Silty clay matrix. Unconsolidated. SATURATED w/ flowing H_2O. Bedrock Contact @ 19.5'
				Bedrock Contact @ 19.5'			GC CL	19		
	Run #9 19.0-22.0'	Rec. = 3.0'						19.5		
								20.0		

NOTES: General: USCS is modified for this log as follows:
Materials amounts are estimated by % volume instead of % weight.
(1) Badly broken core, accurate footage measurements not possible.
(2) Core breaks cannot be matched, accurate footage measurements not possible.

Procedure No. RMRS/OPS-PRO.101
Revision 0
Date effective: 12/31/98
Page 27 of 28

See page 3 of 3 for 19.5' → description

ROCKY FLATS ENVIRONMENTAL TECHNOLOGY SITE BOREHOLE LOG

Borehole Number: 55905
Location - North: _____ East: _____
Date: 8/23/05
Geologist: E. WARP
Drilling Equip.: CME-75-HT-Hollow Stem Auger

Surface Elevation: _____
Area: Former B559-Replacement of well #55901
Total Depth: 29.6'
Company: URS/High Plains Project No. HAD51300
Sample Type: Continuous Core

RMRS LOGGING SUPERVISOR APPROVAL _____ DATE 8/29/05

TOP/BOTTOM OF CORE IN BOX	TOP/BOTTOM OF INTERVAL	FEET OF CORE IN INTERVAL (FIELD MEASUREMENT)	SAMPLE NUMBER	FRACTURE ANGLE	BEDDING ANGLE	GRAIN SIZE DISTRIBUTION	USCS SYMBOL	DEPTH IN FEET	SOIL/LITHOLOGIC LOG	SAMPLE DESCRIPTION
	Run #9 (cont.) 19.0 → 22.0'	Rec. = 3.0'						20.0'		19.5-27.0' - Clayey SILTSTONE w/Tr sand to clayey sandy siltstone. Weathered bedrock. Pale brn. (10YR 6/3) w/some lt. gry. (10YR 7/1) mottling. Yellsh brn. (10YR 5/8) FeOx'n mottling throughout and along sub-horizontal bedding planes. Tr faint blk organic stringers. Dense and cohesive. Noteable decrease in moisture @ 19.5', fm. saturated @ 19.5' to v. moist ~~by 25.5'~~ @ 8/23/05 fm. 19.5 to 22.0'. Most fm. 22.0'-24.0'. Sl. moist fm. 24.0' to 27.0'. Silty/v.f.g. sandy lense w/perv. FeOx'n fm. 23.9 to 24.0'. Caliche-filled fracture @ 22.1'-22.4' near-vertical. Rip-up clasts of coarser material common, especially from 24.7-27.0'. (SAW) 8/29/05
	Run #10	Rec. = 2.2'		~70	ec (SAW) 8/29/05			21		
								22		
								23		
	Run #11	Rec. = 3.1'						24		
								25		
								26		27.0-27.8' - CLAYSTONE w/some silt. Weathered bedrock. Yellowish brn. (10YR 5/6) to lt. yellowish brn. (10YR 6/4). Strong perv. FeOx'n fm. 27.0 to 27.3'. Blk organic stringers common. Dense and firm. Decrease moisture to Tr. Silt rip ups, laminae common. (SAW) 8/29/05
								27		
	Run #12	Rec. = 2.0'		45°				27.8'		27.8-29.0' - CLAYSTONE w/some silt. - Unweathered bedrock. Gry (10YR 6/1) w/Tr yellowish brn. (10YR 5/6). FeOx'n along healed 45° fracture @ 28.0'. V. firm and dense. Dry.
								28		
								29		Augers advanced to 29.6' - Not sampled. T.D. = 29.6'
			T.D. @ 29.6'					29.6'		

NOTES: General: USCS is modified for this log as follows:
Materials amounts are estimated by % volume instead of % weight.
(1) Badly broken core, accurate footage measurements not possible.
(2) Core breaks cannot be matched, accurate footage measurements not possible.

Procedure No. RMRS/OPS-PRO.101
Revision 0
Date effective: 12/31/98

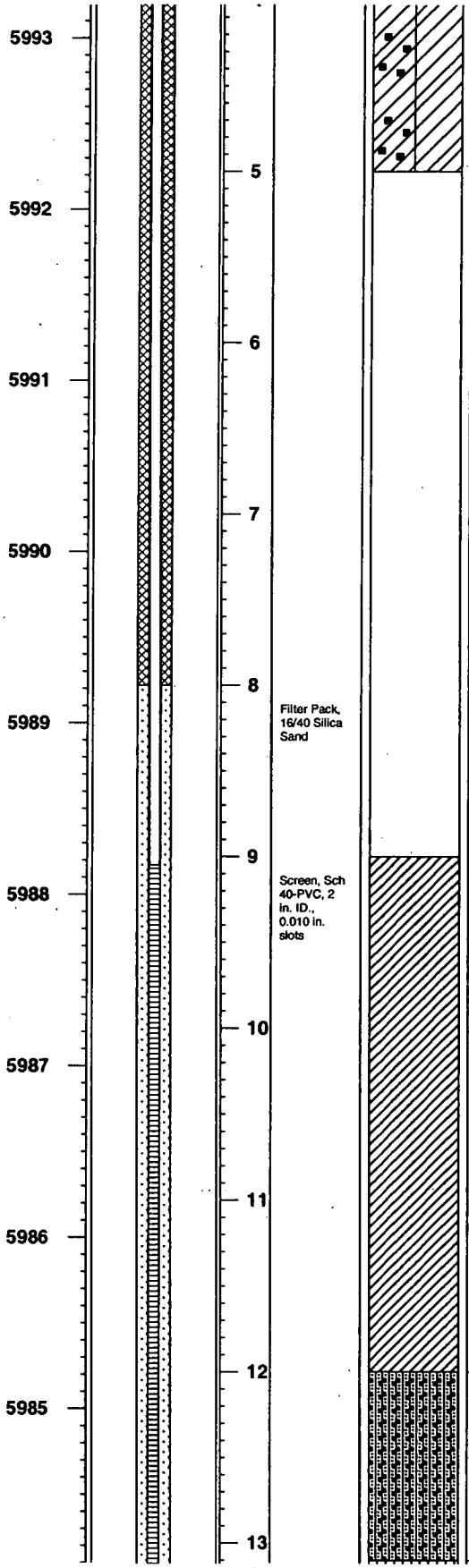
(401)-930-0134-9308 Form GT.1A(03/01.V2)

STATE PLANE COORDINATES AREA:	GRND ELEV. (FT):5997.221	CASING DIA (IN): 2	LOG OF BORING NUMBER:
NORTH: 750184.172	TOTAL DEPTH (FT): 29.3	BH DIA. (IN): 8	56305
EAST: 2083231.088	COMPLETION DATE: 8/18/05	GRID LOCATOR:	
PROJECT: Former B559	GEOLOGIST: E. Warp		
REMARKS:			
Replaces well 56301			

Elev (Ft)	Well or Piezometer Construction and Materials	Depth (Ft)	Lithology	Unified Soils Classification or Rock Type	Lithologic Description
6001	Protective Casing, Steel, 6 in. ID.				
	Casing, Sch 40-PVC, 2 in. ID.	3			
6000					
		2			
5999	Concrete Seal				
		1			
5998	Concrete Pad				
		0			
5997					GC/CL: Gravel with sandy, silty clay, brown (7.5YR5/4). ~75% silty clay matrix. 10 - 15% gravel (1/8" - 1/2" diameter, subangular). ~10% sand (coarse grained, subangular to subrounded). Some disseminated caliche. Weakly consolidated to unconsolidated. Moist. Quartzite cobbles (1-1/2" diameter, subangular) at 0.0' and 0.5'. 1-1/2" diameter cobble (subrounded) of vesicular, lithic-rich material (man-made) at 0.5' (super-porous concrete?). 1-1/2" diameter cobble of schist at 1.0'.
		1			
5996					No recovery.
	Hydrated Granular Bentonite				
		2			
5995					GC/CL: Gravel with sandy, silty clay. Same as interval from 0.0' to 1.0'. Weakly consolidated. Increasing moisture from very moist at 2.0' to saturated (not flowing) at 3.0'.
		3			
5994					No recovery.
		4			

Elev (Ft)	Well or Piezometer Construction and Materials	Depth (Ft)	Lithology	Unified Soils Classification or Rock Type	Lithologic Description

LOG OF BORING NUMBER: 56305



GC/CL: Gravel with sandy, silty clay. Brown (7.5YR5/4) to light brown (7.5YR6/4). Similar to interval from 0.0' to 1.0', except increased gravel. 65 - 70% gravel and cobbles (1/4" - 1" diameter, subangular). ~10% sand. 20 - 25% silty clay matrix. Abundant caliche (disseminated and as blebs) in matrix from 4.5' to 5.0'. Saturated.

No recovery.

No recovery (cutting shoe clogged with cobble).

CL: Silty Clay with some sand and trace gravel. Appears to be re-worked claystone. Light gray (5Y7/2) to light olive gray (5Y6/2) with some yellowish brown (10YR5/6) iron oxidation mottling. Trace black organic stringers. Interval is firm and dense. Decreasing moisture to slightly moist. Sandy gravelly lenses at 10.6' and from 11.0' to 11.3' and from 11.8' to 12.0'. Strong pervasive iron oxidation at 11.3'. Some caliche at base of interval.

SM: Silty, Clayey Sand with some gravel. Strong brown (7.5YR5/8) silty matrix with ~80% sand (fine grained to medium grained, subrounded). Some gravel and some disseminated caliche from 12.0' to 12.6'. Interval is cohesive, but not firm. Increasing moisture to very moist.

Elev (Ft)	Well or Piezometer Construction and Materials	Depth (Ft)	Lithology	Unified Soils Classification or Rock Type	Lithologic Description
5984					SM/ML: Sandy, Clayey Silt with some gravel and cobbles. Strong brown (7.5YR4/6). 20 - 25% sand (coarse grained, subangular). 10 - 15% gravel (1/8" - 1/4" diameter, subangular). 60% clayey silt matrix. Some to abundant disseminated caliche throughout. Weakly consolidated. Very moist at top of interval, decreasing to slightly moist at base. Shattered 1" quartzite cobble fragments at 14.2' and 14.9'. Sandy silt lens from 15.0' to 16.0'.
5983		14			
5982		15			
5981		16			CL: Silty Clay with trace sand. Probably displaced/re-worked claystone. Light olive gray (5Y6/2) with trace to some yellowish brown (10YR5/8) mottling. Black organic stringers common. Dense and firm. Slightly moist.
					No recovery.
5980		17			CL: Silty Clay with trace sand. Same as interval from 16.0' to 16.6'. Slightly moist.
5979		18			GC/CL: Gravel with sandy, silty clay. Strong brown (7.5YR4/6) with light brown (7.5YR6/3) and some light reddish brown (2.5YR6/3). 20 -25% gravel (1/4" - 3/4" diameter, subangular). ~10% sand (coarse grained) in silty clay matrix. Loosely consolidated. Some caliche throughout. Increasing moisture to moist. 1-1/2" cobbles at 17.4' and 19.0'.
5978		19			SM/ML: Clayey, Silty Sand with some gravel. 25 - 30% sand (coarse grained, subangular to subrounded) in clayey silt matrix. 5 - 10% gravel (1/8" - 1/4" diameter, subangular to subrounded). Weakly consolidated. Saturated, flowing water.
5977		20			GC/CL: Gravel with sandy, silty clay. Same as interval from 17.4' to 19.0'. Very moist, not saturated.
5976		21			No recovery.
5975		22			CLAYSTONE: TOP OF BEDROCK. Claystone (bedrock), dark

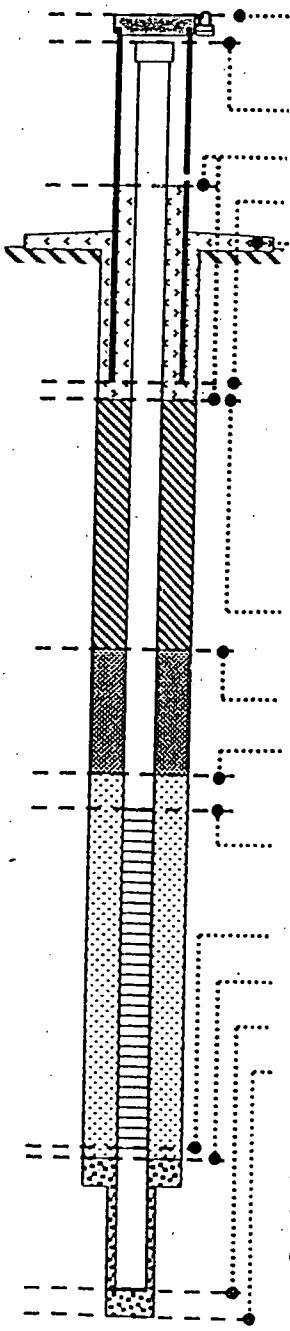
Elev (Ft)	Well or Piezometer Construction and Materials	Depth (Ft)	Lithology	Unified Soils Classification or Rock Type	Lithologic Description
5975					grayish brown (10YR4/2) with some yellowish brown (10YR5/8) iron oxidation. Iron oxidation associated with rip-up clasts from 22.4' to 22.6' and on subhorizontal to subvertical bedding and fracture planes. Very dense and firm. Trace black organic stringers. Decreasing moisture to slightly moist. Iron oxide associated with fractures are most common from 22.3' to 23.6'.
5974		23			
5973		24			CLAYSTONE: Claystone, gray (10YR5/1) to grayish brown (10YR5/2) with some yellowish brown (10YR5/8) iron oxidation. Firm and dense. Iron oxidation along subhorizontal and subvertical bedding and fracture planes. Some black organic stringers. Slightly moist. Trace to some silt. Decreased fracturing. Most iron oxides are on curvilinear bedding planes.
5972		25			
5971		26			
5970		27			
5969		28			
5968		29	Threaded End Cap - Conical, Sch 40-PVC		Reamed with augers, not sampled.

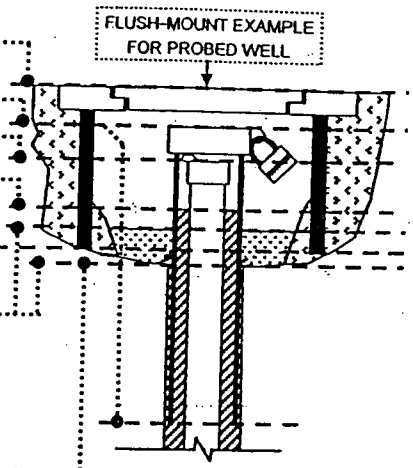
MONITORING WELL INSTALLATION REPORT: Form PRO.118

LOCATION CODE: 56305 PROJECT NAME: CY05 Well Replacements PROGRAM: Water Prog
SCREENED FORMATION: Ogl/Bdrk. DRILLING CONTRACTOR: High Plains BORING METHOD: Hollow Stem Auger
DATE DRILLED: 8/18/05 DATE COMPLETED: 8/18/05 TOTAL DEPTH: 29.3' COMPLETED DEPTH: 29.3
ESTIMATED DEPTH TO BEDROCK: 22.0' RIG GEOLOGIST: E. Warp LOGGING GEOLOGIST: E. Warp
BOREHOLE DIAMETER IN SCREENED INTERVAL: 8" QUANTITY OF FLUIDS LOST DURING DRILLING: N/A
INITIAL WATER LEVEL (FT, DATE): 11.26' fm TOC - 8/22/05 COMPLETED WATER LEVEL (FT, DATE): 11.67' fm TOC, 9/6/05
DIAMETER & TYPE OF INSTALLATION (WELL/PIEZOMETER/WELL POINT/ETC.): 2" PVC WELL
TYPE OF PROTECTION (FLUSH-MOUNT VS. ABOVE GROUND, ASEPTIC, ETC.): Above ground steel protective casing

ALL MEASUREMENTS WILL BE MADE IN FEET FROM GROUND SURFACE

*DENOTES ITEMS THAT MAY NOT BE APPLICABLE, DEPENDING ON BORING METHOD, WELL PROTECTION & PURPOSE





PROTECTIVE CASING TOP (STICKUP OR FLUSH-MOUNT): 3.75' ags
*SECONDARY CASING TOP: N/A BOTTOM: N/A TYPE: N/A
SURFACE CASING TOP: 3.2' ID (IN): 2.0"
SURFACE SEAL TOP: 1.45' ags BOTTOM: 0.35' bgs TYPE: Concrete
PROTECTIVE CASING BOTTOM, ID (IN), TYPE: 1.1' bgs, 6" steel
*WELL PAD DIMENSIONS, TYPE: 3'x3' concrete fm 0.35' ags to 0.35' bgs
*ADD'L CASING FILL TOP: N/A BOTTOM: N/A TYPE: N/A
*SURFACE ISOLATION CASING TOP: N/A BOTTOM: N/A
*SURFACE ISOLATION CASING ID (IN): N/A TYPE: N/A
*OTHER (E.G., ASEPTIC) CASING TOP: N/A BOTTOM: N/A
*OTHER CASING ID (IN): N/A TYPE, PURPOSE: N/A
*CENTRALIZER(S) OD (IN): N/A NUMBER USED: N/A TYPE: N/A
*CENTRALIZER(S) DEPTH(S): N/A
*GROUT TOP: N/A MEASURED DENSITY (LBS/GAL): N/A TYPE: N/A
*GRANULAR BENTONITE TOP: 0.35' bgs TYPE: Enviroplug - No. 8 (gran. bentonite)
*BENTONITE SEAL TOP: N/A ↑ TYPE: N/A
BENTONITE SEAL OR GRANULAR BENTONITE BOTTOM (= FILTER PACK TOP): 8.0'
FILTER PACK TYPE: 16/40 Silica Sand BRAND: C.S.S.I.
SURFACE CASING BOTTOM (=SCREEN TOP): 9.05' TYPE: Sch. 40 PVC
SCREEN ID (IN): 2.0" SLOT SIZE (IN): 0.01" TYPE: Sch. 40 PVC
SCREEN BOTTOM (= SUMP, TOP): 29.05' SUMP TYPE: Conical threaded end cap
FILTER PACK BOTTOM (= *BACKFILL TOP): 29.3' *BACKFILL TYPE: N/A
SUMP BOTTOM (= WELL COMPLETED DEPTH): 29.3' *PILOT HOLE TOP, DIAMETER: N/A
TOTAL BOREHOLE DEPTH (= *PILOT HOLE AND *BACKFILL BOTTOM): 29.3'
REMARKS: Rou

COMPLETED BY: Ellen S. Warp Ellen S. Warp DATE: 9/13/05
CHECKED BY: DATE:

ROCKY FLATS ENVIRONMENTAL TECHNOLOGY SITE BOREHOLE LOG

Borehole Number: 56305
Location - North: _____ East: _____
Date: 8/18/05
Geologist: E. WARP
Drilling Equip.: CME-75-HT Hollow Stem Auger

Surface Elevation: _____
Area: Former B559 - Replacement of well #56301
Total Depth: 29.3
Company: URS/High Plains Project No HAD51300
Sample Type: Continuous Core

RMRS LOGGING SUPERVISOR APPROVAL [signature] DATE 8/29/05

TOP/BOTTOM OF CORE IN BOX	TOP/BOTTOM OF INTERVAL	FEET OF CORE IN INTERVAL (FIELD MEASUREMENT)	SAMPLE NUMBER	FRACTURE ANGLE	BEDDING ANGLE	GRAIN SIZE DISTRIBUTION	USCS SYMBOL	DEPTH IN FEET	SOIL/LITHOLOGIC LOG	SAMPLE DESCRIPTION
	Run #1	Rec.=1.0'					GC CL	0.0		0.0-1.0' - GRAVEL w/ Sandy, silty CLAY. (7.5YR5/4) ~75% Silty clay matrix. 10-15% gravel (1/8-1/2" dia., sub-ang.). ~10% sand (c.g., sub-ang. to sub-rounded). Some diss. caliche. Wkly consolidated to unconsolidated. MOIST. Qtzite cobbles (1½" dia, sub-ang.) @ 0.0 and 0.5'. 1½" dia. cobble (sub-rounded) of vesicular lithic-rich material (man-made) @ 0.5' (Super-Porous concrete?) 1½" dia. cobble of schist @ 1.0'.
	2.0'							1		
	Run #2	Rec.=1.0'					GC CL	2		1.0-2.0' = No recovery (JAB) 8/29/05
								3		2.0-3.0' - GRAVEL w/ Sandy. Silty CLAY. Same as above fm. 0.0-1.0'. Wkly. consolidated. Incr. moisture fm V. Moist @ 2.0' to saturated (not flowing) @ 3.0'.
	4.0'							4		3.0-4.0' = No recovery
	Run #3	Rec.=1.0'					GC CL	5		4.0-5.0 - GRAVEL w/ Sandy. Silty CLAY. Brn. (7.5YR5/4) to lt. brn. (7.5YR6/4). Similar to above fm. 0.0-1.0' except increased gravel. 65-70% gravel and cobbles (1/4-1" dia., sub-ang.). ~10% sand. 20-25% silty clay matrix. Abundant caliche (diss. and as blebs) in matrix fm. 4.5-5.0'. SATURATED.
								6		
	7.0'							7		5.0-7.0' = No recovery
	Run #4	Rec.=0.0'						8		7.0-9.0' = No recovery (cutting shoe clogged w/ cobble.) (JAB) 8/29/05
	9.0'							9		9.0-12.0' - Silty CLAY w/ some sand and Tr gravel. Appears to be ~~displaced~~ reworked claystone. Lt. gry. (5Y7/2) to lt. olive gry (5Y6/2) w/ some yell'sh brn. (10YR5/6) FeOx'n mottling. Tr blk organic stringers. Interval is firm and dense. Decr. moisture to SL MOIST. Sandy gravelly lense @ 10.6 and fm. 11.0-11.3' and fm. 11.8-12.0'. S. perv. FeOx'n @ 11.3'. Some caliche @ base of interval.
	Run #5 9.0-12.0'	Rec.=3.1'					CL	10.0		

NOTES: General: USCS is modified for this log as follows:
Materials amounts are estimated by % volume instead of % weight.
(1) Badly broken core, accurate footage measurements not possible.
(2) Core breaks cannot be matched, accurate footage measurements not possible.

(4011-930-0134-930)(Form GT.1AX03/01.92)

ROCKY FLATS ENVIRONMENTAL TECHNOLOGY SITE BOREHOLE LOG

Borehole Number: 56305
Location - North: _____ East: _____
Date: 8/18/05
Geologist: E. WARP
Drilling Equip.: CME-75-HT - Hollow Stem Auger

Surface Elevation: _____
Area: Former B559 - Replacement of well #56301
Total Depth: 29.3'
Company: URS/High Plains Project No.: HAD51300
Sample Type: Continuous Core

RMRS LOGGING SUPERVISOR APPROVAL [signature] DATE 8/29/05

TOP/BOTTOM OF CORE INBOX	TOP/BOTTOM OF INTERVAL	FEET OF CORE INTERVAL (FIELD MEASUREMENT)	SAMPLE NUMBER	FRACTURE ANGLE	BEDDING ANGLE	GRAIN SIZE DISTRIBUTION	USCS SYMBOL	DEPTH IN FEET	SOIL/LITHOLOGIC LOG	SAMPLE DESCRIPTION
	Run #5 (cont.) 9.0→12.0'	Rec.=3.1'					CL	10.0 – 12.0		10.0-12.0 Silty CLAY w/some sand and Tr gravel. Described on page 1 of 3. SL. MOIST. (SAD) 8/29/05
	12.0' Run #6	Rec.=2.1'					SM	12.0 – 13.1		12.0-13.1' - Silty, clayey SAND w/some gravel. Strong brn. (7.5YR 5/8) silty matrix w/~80% sand (f.g. to m.g., sub-rounded). Some gravel and some diss. caliche fm. 12.0-12.6'. Interval is cohesive but not firm. Increase moisture to V. MOIST.
	14.0' Run #7	Rec.=2.6'					SM, ML	13.1 – 16.0		13.1-16.0 - Sandy, clayey Silt w/some gravel and Cobbles. Strong Brn. (7.5YR 4/6). 20-25% sand (c.g., sub-ang.) 10-15% gravel (1/8"-1/4" dia., sub-ang.) 60-clayey silt matrix. Some to abundant diss. caliche throughout. Wkly. consolidated. V. moist @ top of interval decrsg to sl. moist @ base. Shattered gtz. cobbles fragments @ 14.2' and 14.9'. Sandy Silt lense fm. 15.0-16.0. (SAD) 8/29/05
	17.0' Run #8	Rec.=2.0'					CL	16.0 – 16.6		16.0-16.6' - Silty CLAY w/Tr sand. Probably displaced/reworked claystone. Lt. olive gry (5Y 6/2) w/Tr to some yellish brn. (10YR 5/8) mottling. Blk organic stringers common. Dense and firm. Sl. MOIST.
	19.0' Run #9 19.0-22.0'	Rec.=2.0'					CL, GC, CL	16.6 – 17.0		16.6-17.0' = No recovery
								17.0 – 17.4		17.0-17.4' - Silty CLAY w/Tr sand - Same as above fm. 16.0-16.6'. Sl. moist.
								17.4 – 19.0		17.4-19.0 - GRAVEL w/ Sandy, silty CLAY. Strong brn. (7.5YR 4/6) w/lt. brn. (7.5YR 6/3) and some lt. reddish brn. (2.5YR 6/3). 20-25% gravel (1/4-3/4" dia, sub-ang.) ~10% sand (c.g.) in silty clay matrix. Loosely consolidated. Some caliche throughout. Incr. moisture to MOIST. 1½" cobbles @ 17.4 and 19.0'.
							SM, ML	19.0 – 20.2		19.0-20.2 - Silty SAND w/some gravel. Clayey, 25-30% sand (c.g., sub-ang. to sub-rounded) in clayey silt matrix. 5-10% gravel (1/8"-1/4" dia., sub-ang. to sub-rounded).
								20.0'		

NOTES: General: USCS is modified for this log as follows:
Materials amounts are estimated by % volume instead of % weight.
(1) Badly broken core, accurate footage measurements not possible.
(2) Core breaks cannot be matched, accurate footage measurements not possible.

Procedure No. RMRS/OPS-PRO.101
Revision 0
Date effective: 12/31/98

Wkly. consolidated. SATURATED (flowing H_2O).

(4011-930-0134-930) Form GT.1A (03/01/92)

ROCKY FLATS ENVIRONMENTAL TECHNOLOGY SITE BOREHOLE LOG

Borehole Number: 56305
Location - North: _____ East: _____
Date: 8/18/05
Geologist: E. WARP
Drilling Equip.: CME-75-HT - Hollow Stem Auger

Surface Elevation: _____
Area: Former B559 - Replacement of well #56301
Total Depth: 29.3'
Company: URS/High Plains Project No.: HAD51300
Sample Type: Continuous Core

RMRS LOGGING SUPERVISOR APPROVAL [signature] DATE 8/29/05

TOP/BOTTOM OF CORE IN BOX	TOP/BOTTOM OF INTERVAL	FEET OF CORE IN INTERVAL (FIELD MEASUREMENT)	SAMPLE NUMBER	FRACTURE ANGLE	BEDDING ANGLE	GRAIN SIZE DISTRIBUTION	USCS SYMBOL	DEPTH IN FEET	SOIL/LITHOLOGIC LOG	SAMPLE DESCRIPTION
	Run #9 cont. 22.0	Rec.=2.0'		Bedrock Contact @ 22.0'			SM ML GC CL	20.0' 20.2' 21 22		20.0-20.2- Clayey, Silty SAND (described on pg. 2 of 3) SATURATED. 20.2-21.0'- GRAVEL w/ Sandy, Silty CLAY - Same as above fm. 17.4-19.0'. V. MOIST (not saturated). 21.0-22.0'= No recovery. Bedrock contact @ 22.0'- estimated due to no recovery
	Run #10 24.0'	Rec.=2.0'			8/29/05			23 23.9'		22.0-23.9- CLAYSTONE - Bedrock. Dk. grysh brn (10YR 4/2) w/ some yellowsh brn (10YR 5/8) FeOx'n. FeOx'n assoc'd w/ rip-up clasts fm. 22.4-22.6' and on sub-horizontal ~~bedding planes~~ to sub-vertical bedding and fracture planes. N. dense and firm. Tr blk. organic stringers. Decrease moisture to Sl. MOIST. Fe ox associated w/ fractures are most common @ 22.3-23.6. 8/29/05
	Run #11	Rec.= 3.1'						24 25 26 27		23.9-29.0- CLAYSTONE - Gry (10YR 5/1) to Grysh brn. (10YR 5/2). w/ some yellsh brn. (10YR 5/8) FeOx'n. Firm and dense. FeOx'n along sub-horizontal and sub-vertical bedding and fracture planes. Some blk. organic stringers. Sl. MOIST. Tr - same silt. Decreased fracturing relative to above interval - most Fe oxidizers on curvilinear bedding planes. 8/29/05
	Run #12 29.0	Rec.=2.0'		~75°				28 29		29.0-29.3- Reamed w/ Augers not sampled T.D. @ 29.3'

NOTES: General: USCS is modified for this log as follows:
Materials amounts are estimated by % volume instead of % weight.
(1) Badly broken core, accurate footage measurements not possible.
(2) Core breaks cannot be matched, accurate footage measurements not possible.

(4011-930-0134-930) Form GT.1A(03/01/92)

STATE PLANE COORDINATES AREA:
NORTH: 752980.43
EAST: 2079735.053
PROJECT:
REMARKS:
Rock Creek, replaces 63895

GRND ELEV. (FT):6000.261
TOTAL DEPTH (FT): 20.0
COMPLETION DATE: 3/10/05
GEOLOGIST: E. Warp

CASING DIA (IN): 1"
BH DIA. (IN): 3.25"
GRID LOCATOR:

LOG OF BORING NUMBER: 63805

Elev (Ft)	Well or Piezometer Construction and Materials	Depth (Ft)	Lithology	Unified Soils Classification or Rock Type	Lithologic Description
6002	Protective Casing, Sch 40-PVC, 2 in. ID.				
	Casing, Sch 80-PVC, 1 in. ID.	1			
6001					
		0			CL: Clay with some gravel, very dark brown (7.5YR2.5/2), 5 - 7% gravel (1/2" - 1.5" diameter, subrounded). Roots common, topsoil. Moist.
6000	Granular Bentonite Crumbles				
		1			GC: Sandy, Clayey Gravel, brown (7.5YR4/3). ~50% gravel (1/4" to 1" diameter, subangular, predominately quartzite), ~40% clay, ~10% sand (coarse grained). Clay has medium plasticity. Some patchy iron oxidation and patchy caliche, moist.
5999					
		2			SC: Clayey, Gravelly Sand, strong brown (7.5YR4/6). 70 - 75% sand (medium grained, subangular to subrounded), 25 - 30% gravel (1/4" to 3/4" diameter, subangular, predominately quartzite). Pervasive iron oxidation of clay matrix (yellowish brown). Interval is crumbly. 2" subrounded quartzite cobble at 2.2'. Moist.
5998					
		3			No recovery.
5997					
		4			GM/SM: Sandy Gravel with some clay, strong brown (7.5YR5/6). ~50% gravel (1/4" - 3/4" diameter, subangular, quartzite and granite composition). ~50% silty/clayey sand (medium grained, subangular to subrounded). Pervasive iron oxidation of silty/clayey sand matrix, moist.
5996					
		5			CL: Silty Clay with trace to some sand and gravel, yellowish brown (10YR5/8) to light yellowish brown (2.5Y6/3). Pervasive iron oxidation from 5.0' to 5.2', decreasing iron oxidation (weak and patchy) from 5.2' to 5.7'. Tiny white fragments disseminated throughout with white caliche stringers. Probably re-worked claystone, interval fairly dense and firm. 1" diameter angular clast of quartzite at 5.7'. Moist.
5995					
		6			

Elev (Ft)	Well or Piezometer Construction and Materials	Depth (Ft)	Lithology	Unified Soils Classification or Rock Type	Lithologic Description
5994					CL: Sandy, gravelly clay, light yellowish brown (2.5Y6/3) with some patchy pink (7.5YR7/3) zones. 10 - 15% gravel (1/4" - 1" diameter, subangular to subrounded), 8 - 20% sand (coarse grained, subangular). Patchy bleaching and disseminated caliche throughout. Patchy iron oxidation at 7.0'. Interval crumbly, especially at base, moist.
	Filter Pack, 16/40 Silica Sand	7			
5993	Screen, Sch 80-PVC, 1 in. ID., 0.010 in. slots				SC/GC: Clayey, Gravelly Sand, light brown (7.5YR6/3). 30 - 40% gravel (1/4" - 1-1/2" diameter, subangular), 40% sand (medium grained to coarse grained, subangular). Weak pervasive iron oxidation of clay/sand matrix, crumbly, broken quartzite cobble at top of interval from 7.1' to 7.3'. Wet from 8.5' to 9.0'.
		8			
5992					
		9			CL: Sandy, Gravelly Clay, light yellowish brown (2.5Y6/3) to light olive brown (2.5Y5/3) with patchy, red hematitic staining. 5 - 7% gravel (1/4" - 1" diameter, subangular). 2" subrounded cobbles of quartzite common. Clay matrix is cohesive with medium plasticity. Decreasing water content to very damp, but not wet.
5991					
		10			CL: Sandy, Gravelly Clay, same as above from 9.0' to 10.1', but increased gravel to 10 - 15%. Very crumbly. Pinkish white caliche lense at 10.6'. Moist.
5990					
					No recovery.
		11			SC/GC: Clayey, Sandy Gravel, yellowish brown (10YR5/4) matrix (clayey sand). 40 - 50% gravel (1/4" - 1.5" diameter, subangular, predominately quartzite with lesser granite and schist). 40% sand (medium grained to coarse grained, subangular to subrounded). Shattered cobbles of quartzite common. Patchy pink/white caliche throughout. Unoxidized zone from 13.0' to 13.6', light yellowish brown (2.5Y6/3) with abundant clay and sand. Shattered quartzite cobble at 13.9'. Increased iron oxidation of clayey sand matrix from 14.0' to 15.3'. Interval very crumbly, very moist to wet, but not completely saturated.
5989					
		12			
5988					
		13			
5987					
		14			
5986					
		15			

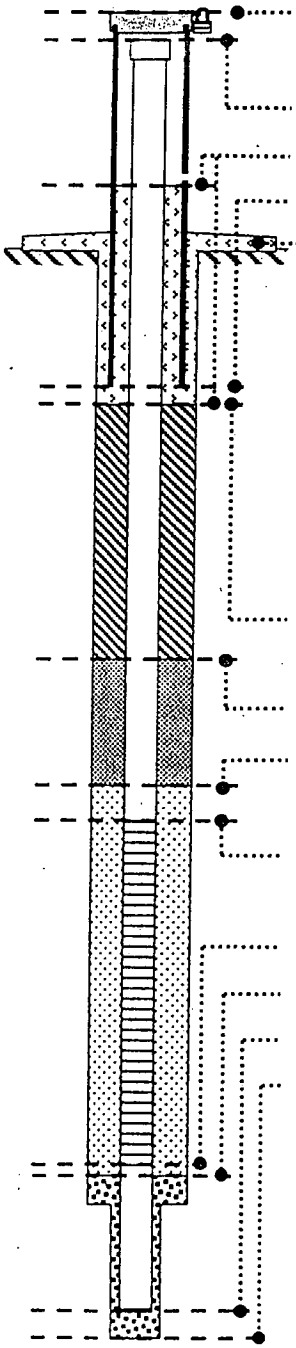
Elev (Ft)	Well or Piezometer Construction and Materials	Depth (Ft)	Lithology	Unified Soils Classification or Rock Type	Lithologic Description
5985					SM: Silty Sand with some gravel, strong brown (7.5YR5/6). 90% silty sand (medium grained to very coarse grained, subrounded to subangular). Pervasive iron oxidation of silty sand matrix. ~10% gravel (1/8" - 3/4" diameter, subangular to subrounded) predominately quartzite with lesser granite and trace schist. Interval very moist from 15.3' to 15.9', wet from 15.9' to 17.3'.
5984		16			
5983		17			No recovery.
5982		18			SM: Silty Sand with some gravel, same as above from 15.3' to 17.3', wet.
5981	Threaded End Cap - Sump, Sch 80-PVC Granular Bentonite Backfill	19			
		20			No recovery.

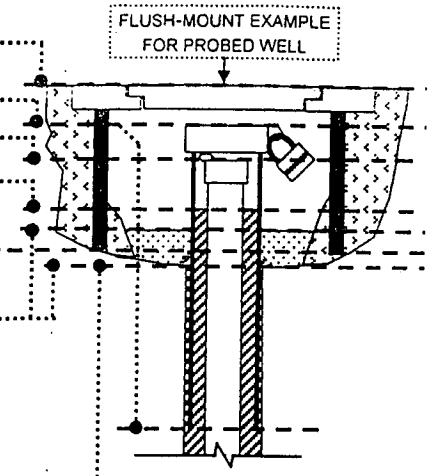
MONITORING WELL INSTALLATION REPORT: Form PRO.118

LOCATION CODE: 63805 PROJECT NAME: FY05 WARP PROGRAM: WATER PROGRAMS
SCREENED FORMATION: Al DRILLING CONTRACTOR: RTG BORING METHOD: GEOPROBE
DATE DRILLED: 3/10/05 DATE COMPLETED: 3/10/05 TOTAL DEPTH: 20.0' COMPLETED DEPTH: 19.5'
ESTIMATED DEPTH TO BEDROCK: N/A RIG GEOLOGIST: E. WARP LOGGING GEOLOGIST: E. WARP
BOREHOLE DIAMETER IN SCREENED INTERVAL: 3.25" QUANTITY OF FLUIDS LOST DURING DRILLING: N/A
INITIAL WATER LEVEL (FT, DATE): 18.75 (below TOC) 3/10/05 COMPLETED WATER LEVEL (FT, DATE): 6.69 (TOC) 3/15/05
DIAMETER & TYPE OF INSTALLATION (WELL/PIEZOMETER/WELL POINT/ETC.): 1" PVC WELL
TYPE OF PROTECTION (FLUSH-MOUNT VS. ABOVE GROUND, ASEPTIC, ETC.): ABOVE GROUND- PVC Stick-up

ALL MEASUREMENTS WILL BE MADE IN FEET FROM GROUND SURFACE

* DENOTES ITEMS THAT MAY NOT BE APPLICABLE, DEPENDING ON BORING METHOD, WELL PROTECTION & PURPOSE





PROTECTIVE CASING TOP (STICKUP OR FLUSH-MOUNT): 1.7' ags
*SECONDARY CASING TOP: N/A BOTTOM: N/A TYPE: N/A
SURFACE CASING TOP: 1.5' ags ID (IN): 1.0"
SURFACE SEAL TOP: N/A BOTTOM: N/A TYPE: N/A
PROTECTIVE CASING BOTTOM, ID (IN), TYPE: 0.4' bgs - Sch 40 PVC 2" diam.
*WELL PAD DIMENSIONS, TYPE: N/A
*ADD'L CASING FILL TOP: N/A BOTTOM: N/A TYPE: N/A
*SURFACE ISOLATION CASING TOP: N/A BOTTOM: N/A
*SURFACE ISOLATION CASING ID (IN): N/A TYPE: N/A
*OTHER (E.G., ASEPTIC) CASING TOP: N/A BOTTOM: N/A
*OTHER CASING ID (IN): N/A TYPE, PURPOSE: N/A
*CENTRALIZER(S) OD (IN): N/A NUMBER USED: N/A TYPE: N/A
*CENTRALIZER(S) DEPTH(S): N/A
*GROUT TOP: N/A MEASURED DENSITY (LBS/GAL): N/A TYPE: N/A
*GRANULAR BENTONITE TOP: N/A TYPE: N/A
*BENTONITE SEAL TOP: 0.0 TYPE: Granular Bentonite - Volclay crumbles
BENTONITE SEAL OR GRANULAR BENTONITE BOTTOM (= FILTER PACK TOP): 6.0'
FILTER PACK TYPE: 16/40 Silica Sand BRAND: CSSI
SURFACE CASING BOTTOM (=SCREEN TOP): 6.5' TYPE: PVC - SCH. 80
SCREEN ID (IN): 1.0" SLOT SIZE (IN): 0.010" TYPE: PVC - SCH. 80
SCREEN BOTTOM (= SUMP, TOP): 19.4 SUMP TYPE: PVC - SCH. 80 THREADED END CAP
FILTER PACK BOTTOM (= *BACKFILL TOP): 19.5' *BACKFILL TYPE: Granular Bentonite
SUMP BOTTOM (= WELL COMPLETED DEPTH): 19.5 *PILOT HOLE TOP, DIAMETER: 3.25"
TOTAL BOREHOLE DEPTH (= *PILOT HOLE AND *BACKFILL BOTTOM): 20.0'

REMARKS: NO BEDROCK ENCOUNTERED. 5 ppm PID HIT @ 18.0' IN BOREHOLE WHICH DISSIPATED IMMEDIATELY. SMOOTH WELL INSTALLATION.

COMPLETED BY: ELLEN S. WARP DATE: 3/10/05
CHECKED BY: [signature] DATE: 3/23/05

ROCKY FLATS ENVIRONMENTAL TECHNOLOGY SITE BOREHOLE LOG

Borehole Number: 63805
Location - North: _____ East: _____
Date: 3/10/05
Geologist: E. Warp
Drilling Equip.: 66 DT Geoprobe

Surface Elevation: _____
Area: Rock Creek - Replacement of #63895
Total Depth: 20.0'
Company: URS / RTG Project No.: HAD 51300
Sample Type: N/A

RMRS LOGGING SUPERVISOR APPROVAL [signature] DATE 3/21/05

TOP/BOTTOM OF CORE IN BOX	TOP/BOTTOM OF INTERVAL	FEET OF CORE IN INTERVAL (FIELD MEASUREMENT)	SAMPLE NUMBER	FRACTURE ANGLE	BEDDING ANGLE	GRAIN SIZE DISTRIBUTION	USCS SYMBOL	DEPTH IN FEET	SOIL/LITHOLOGIC LOG	SAMPLE DESCRIPTION
Box #1 of 2 (0.0→10.1')	(0.0→4.0') Run #1	Rec. = 2.2'					CL	0.0–0.6		0.0 – 0.6 - CLAY w/some gravel. V. dk. brn (7.5YR 2.5/2) 5-7% gravel (1/2" to 1 1/2" dia., sub-rounded). Roots common. TOPSOIL. MOIST
							GC	0.6–1.9'		0.6 – 1.9' - Sandy, clayey GRAVEL. Brn. (7.5YR 4/3) ~50% gravel (1/4 to 1" dia., sub-ang., predominately qtzite). ~40% clay. ~10% sand (c.g.). Clay has med. plasticity. Some patchy FeOx'n and patchy caliche. MOIST.
							SC	1.9'–2.2'		1.9 – 2.2' - Clayey, gravelly SAND. Strong Brn. (7.5YR 4/6). 70-75% sand (m.g., sub-ang. to sub-rnd'd). 25-30% gravel (1/4 to 3/4" dia., sub-ang., predominately qtzite). Perv. FeOx'n of clay matrix (yellish brn). Interval is crumbly. 2" sub-rounded qtzite cobble @ 2.2'. MOIST
	4.0'	4.0'						2.2'–4.0'		2.2 – 4.0' = No Recovery
	(4.0→7.0') Run #2	Rec. = 3.3'					SM/GM	4.0–5.0'		4.0-5.0' - Sandy GRAVEL w/some clay. Strng. brn. (7.5YR 5/6). ~50% gravel (1/4 to 3/4" dia., sub-ang., qtzite and granite composition) ~50% silty/clayey sand. (m.g., sub-ang. to sub-rounded). Perv. FeOx'n of silty/clayey sand matrix. MOIST.
							CL	5.0–5.7'		5.0-5.7' - Silty CLAY w/ 1/2 to some sand and gravel. Yellish brn. (10YR 5/8) to Lt. Yellish brn. (2.5Y 6/3). Perv. FeOx'n fm. 5.0 to 5.2', decr. FeOx'n (wk and patchy) fm. 5.2 to 5.7'. Tiny wht. frags disseminated throughout & wht. caliche stringers. Probably re-worked claystone. Interval fairly dense and firm, 1" dia. ang. clast of qtzite @ 5.7'. MOIST.
	7.0'	7.0'					CL	5.7'–7.0		5.7 – 7.1' - Sandy, gravelly CLAY. Lt. Yellish brn. (2.5Y 6/3) w/some patchy pink (7.5YR 7/3) zones. 10-15% gravel (1/4" to 1" dia., sub-ang. to sub-rounded) 8-20% sand (c.g., sub-ang.). Patchy bleaching and diss. caliche throughout. Patchy FeOx'n. Interval crumbly especially @ base. MOIST @ 7.0'.
	(7.0→11.0') Run #3	Rec. = 3.6'					SC/GC	7.0–9.0	WET	7.1 – 9.0' - Clayey, gravelly SAND Lt. brn. (7.5YR 6/3) 30-40% gravel (1/4 to 1 1/2" dia., sub-ang.) 40% sand (m.g. to c.g., sub-ang). Wk. perv. FeOx'n of clay/sand matrix. Crumbly. Broken qtzite cobble @ top of interval fm. 7.1-7.3'. WET fm 8.5' to 9.0'
							CL	9.0–10.0		9.0 – 10.1' - Sandy, gravelly CLAY. Lt. Yellish brn. (2.5Y 6/3) to Lt. Olive brn. (2.5Y 5/3) with patchy, red hematitic staining. 5-7% gravel (1/4 to 1" dia., sub-ang). 2" sub-rounded cobbles of qtzite common. Clay matrix is cohesive w/med. plasticity. Decr. water content to V. damp but not wet.

NOTES: General: USCS is modified for this log as follows:
Materials amounts are estimated by % volume instead of % weight.
(1) Badly broken core, accurate footage measurements not possible.
(2) Core breaks cannot be matched, accurate footage measurements not possible.

Procedure No. RMRS/OPS-PRO.101
Revision 0
Date effective: 12/31/98

14011-930-0134-930X Form GT:1A(03/01.V2)

ROCKY FLATS ENVIRONMENTAL TECHNOLOGY SITE BOREHOLE LOG

Borehole Number: 63805
Location - North: _____ East: _____
Date: 3/10/05
Geologist: E. WARP
Drilling Equip.: 66 DT GEOPROBE

Surface Elevation: _____
Area: ROCK CREEK - REPLACEMENT OF #63895
Total Depth: 20.0'
Company: URS/RTG Project No.: HAD51300
Sample Type: N/A

RMRS LOGGING SUPERVISOR APPROVAL _____ DATE 3/21/05

TOP/BOTTOM OF CORE IN BOX	TOP/BOTTOM OF INTERVAL	FEET OF CORE IN INTERVAL (FIELD MEASUREMENT)	SAMPLE NUMBER	FRACTURE ANGLE	BEDDING ANGLE	GRAIN SIZE DISTRIBUTION	USCS SYMBOL	DEPTH IN FEET	SOIL/LITHOLOGIC MXS	SAMPLE DESCRIPTION
10.1'							CL	10.1		10.1-10.6' - Sandy, gravelly CLAY. Same as above fm. 9.0 to 10.1' but incr. gravel to 10-15%. v. crumbly. Pinkish wht. caliche lense @ 10.6'. MOIST.
							CL			
	11.0'	11.0'						11		10.6-11.0' = No Recovery
Box #2 of 2 (10.1 → 20.0')	Run #4 (11.0 → 14.0')	Rec. = 3.0'					GC/SC	12		11.0-15.3' - Clayey, sandy GRAVEL. Yellsh brn (10YR 5/4) matrix (clayey sand). 40-50% gravel (1/4 to 1 1/2" dia. SSW sub-ang., predominately gneiss w/lesser granite and schist). ~40% sand (m.g. to c.g., sub-ang. to sub-rounded). Shattered cobbles of gneiss common. Patchy pink/wht caliche throughout.
								13		Un-ox'd zone fm. 13.0 to 13.6' (Lt. Yellsh brn - 2.5Y 6/3) w/abundant clay and sand. Shattered gneiss cobble @ 13.9'. @ 3/21/05
	14.0'	14.0'						14		Increase FeOx'n of clayey sand matrix fm. 14.0 to 15.3'. Interval v. crumbly. V. moist to wet but not completely saturated.
	Run #5 (14.0 → 18.0')	Rec. = 3.6'						15		
								15.3'		15.3-17.3' - Silty SAND w/some gravel. Strong brn. (7.5YR 5/6) 90% silty sand (m.g. to v.c.g., sub-rounded to sub-ang.). Perv. FeOx'n of silty sand matrix. ±10% gravel (1/8 to 3/4" dia., sub-ang. to sub-rounded) predominately gneiss w/lesser granite and schist. Interval v. moist fm. 15.3 to 15.9'. WET fm. 15.9' to 17.3' = pH = 0.05 IN BOREHOLE @ 18.0'
							SM	15.9'		WET @ 15.9'
								16		
								17		
								17.3		
	18.0'	18.0'						18		17.3-18.0' = No Recovery
	Run #6 (18.0 → 20.0')	Rec. = 1.8'					SM	19		18.0 to 19.8' - Silty SAND w/some gravel. (Same as above fm. 15.3-17.3'). WET
								19.8'		19.8-20.0' = No Recovery
	20.0'	20.0'								

Dissipated immediately

NOTES: General: USCS is modified for this log as follows:
Materials amounts are estimated by % volume instead of % weight.
(1) Badly broken core, accurate footage measurements not possible.
(2) Core breaks cannot be matched, accurate footage measurements not possible.

Procedure No. RMRS/OPS-PRO.101
Revision 0
Date effective: 12/31/98
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(4011-930-0134-930)(Form GT.1A)(03/01.V2)

T.D. @ 20.0'

STATE PLANE COORDINATES AREA: GRND ELEV. (FT):5990.644 CASING DIA (IN): 2
NORTH: 750097.540 TOTAL DEPTH (FT): 32.0 BH DIA. (IN): 8
EAST: 2084016.934 COMPLETION DATE: 8/17/05 GRID LOCATOR:
PROJECT: Former B707 GEOLOGIST: E. Warp
REMARKS:
Replaces well 00200.

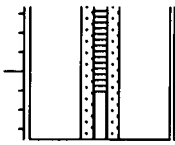
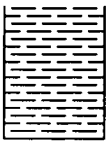
LOG OF BORING NUMBER: 70705

Elev (Ft)	Well or Piezometer Construction and Materials	Depth (Ft)	Lithology	Unified Soils Classification or Rock Type	Lithologic Description
5994	Protective Casing, 6" Steel	3			
5993	Casing, Sch 40-PVC, 2 in. ID.	2			
5992	Concrete Seal	1			
5991	Concrete Pad	0			GC/CL: Gravel with sandy, silty clay. Fill. Strong brown (7.5YR5/6). ~50% shattered gravel (1/2" to 1" diameter, subrounded, quartzite and schist). ~50% sandy, silty clay matrix. Trace disseminated caliche. Unconsolidated. Very poor recovery due to cobbles of the unconsolidated fill clogging split-spoon shoe.Trace moisture.
5990		1			No recovery.
5989		2			GC/CL: Gravel with sandy, silty clay, same as interval from 0.0' to 0.3' with increased gravel and cobbles to ~70% (1/4" - 1" diameter, angular). Weakly consolidated to unconsolidated. Shattered quartzite cobble from 2.0' to 2.1' (up to 1-1/2" diameter fragments). Shattered quartzite and granitic cobbles from 1.5' to 1.6'. Moist.
5988	Hydrated Granular Bentonite and Bentonite Pellets	3			No recovery.
5987		4			

Elev (Ft)	Depth (Ft)	Well or Piezometer Construction and Materials	Unified Soils Classification or Rock Type	Lithologic Description
5986	5			GC/CL: Gravel with silty, sandy clay, brown (7.5YR4/3). Distinct color change. ~25 - 30% gravel (1/8" - 3/4" diameter, subangular). ~20% sand (coarse grained, subangular). Clay has medium plasticity. Trace roots (?). Slightly moist.
5985	6	Filter Pack, 16/40 Silica Sand		No recovery.
5984	7	Screen, Sch 40-PVC, 2 in. ID., 0.010 in. slots		SC/CL: Sandy, Silty Clay with trace to some gravel, brown (7.5YR4/3). Similar to interval from 4.0' - 5.2' with decreased sand and gravel. 15 - 20% sand (medium grained to coarse grained, subangular to subrounded). 5 - 7% gravel (1/8" - 1/4", subangular). Interval is cohesive but soft. Shattered granitic cobble (1" angular clasts) at base of interval. Moisture increases to moist.
5983	8			SC/CL: Sandy, Silty Clay with trace gravel, red (2.5YR5/8). Distinct color change, otherwise similar to interval from 7.0' -7.7'. ~20% sand (fine grained to medium grained, subangular to subrounded). Interval cohesive and soft. Moisture increases to very moist.
5982	9			SC/CL: Sandy, Silty Clay with trace to some gravel, brown (7.5YR4/3). Same as interval from 7.0' - 7.7'. Very moist.
5981	10			No recovery.
5980	11			SC/CL: Sandy, Silty Clay with trace to some gravel, brown (7.5YR4/3). Same as interval from 7.0' - 7.7'. Increased moisture to saturated with flowing water.
5979	12			SC/CL: Sandy, Silty Clay with trace gravel, red (2.5YR5/8). Distinct color change. Same as interval from 7.7' - 8.2'. Trace disseminated caliche. Decreased moisture, saturated but no flowing water.
5978	13			No recovery.
				SC/CL: Sandy, Silty Clay with trace to some gravel, red (2.5YR5/8). Same as interval from 7.7' - 8.2'. Moist and cohesive from 12.0' to 12.6'. Very moist to saturated and crumbly from 12.2' to 13.2'.

Elev (Ft)	Well or Piezometer Construction and Materials	Depth (Ft)	Lithology	Unified Soils Classification or Rock Type	Lithologic Description
5977					SM: Clayey, Silty Sand with some gravel and cobbles, brown (7.5YR4/2). 50 - 55% sand (coarse grained, subangular to subrounded). ~40% clayey silt, 5 - 7% gravel (predominately granite). Unconsolidated. Very moist to saturated, but not flowing.
		14			No recovery.
5976					SM: Clayey, Silty Sand with trace gravel, brown (7.5YR4/2). Same as interval from 13.2' - 13.8', except decreased gravel to trace. Saturated, but not flowing.
		15			SM/ML: Clayey, Silty Sand with trace gravel and silt mixture. Same as interval from 14.0' - 14.3' mixed with brownish yellow silt (reworked siltstone). Saturated, but not flowing.
5975					CLAYEY SILTSTONE: TOP OF BEDROCK. Clayey Siltstone (bedrock), weathered. Light gray (10YR7/1) with brownish yellow (10YR6/8) mottling. Very faint bedding laminations. Interval is firm and dense. Notable decrease in moisture. Moist. Occasional siltstone rip-up.
		16			
5974					
		17			No recovery.
					CLAYEY SILTSTONE: Clayey Siltstone, same as interval from 14.8' to 16.8'. Firm and dense. Moist.
5973					
		18			
5972					SILTY CLAYSTONE: Silty Claystone to Clayey Siltstone, weathered. Brownish yellow (10YR6/8) with pale brown (10YR6/3) and some gray (10YR2/1) mottling. Rip-up clasts from 18.2' to 18.7'. Trace black organic stringers. Silty lenses throughout, particularly between 21.0' and 22.0'. Pervasive iron oxidation from 21.5' to 22.0'. Overall massive texture. Firm and dense. Slightly moist.
		19			
5971					
		20			
5970					
		21			
5969					
		22			

Elev (Ft)	Well or Piezometer Construction and Materials	Depth (Ft)	Lithology	Unified Soils Classification or Rock Type	Lithologic Description
5968		23			
5967		24			CLAYEY SILTSTONE: Clayey Siltstone (weathered bedrock), yellow (10YR7/6) to very pale brown (10YR7/4) with trace light gray (10YR7/1) mottling. Overall massive texture with very faint bedding planes. Dense and firm. Strong pervasive iron oxidation at 25.7'. Weakly friable. Slightly moist.
5966		25			
5965		26			No recovery.
5964		27			SILTY CLAYSTONE: Silty Claystone to Clayey Siltstone (weathered bedrock). Pale brown (10YR6/3) with yellowish brown (10YR5/6) iron oxidation mottling. Massive texture. Firm and dense. Ironstone nodules (1/2" diameter) at 26.2' and from 27.7' to 27.8' (1" diameter, round). 3/4" diameter ironstone nodule at 28.0'. Silty lenses from 27.0' to 27.3'; and from 27.7' to 27.8'. Slightly moist to moist. Fines gradually and irregularly with depth.
5963		28			
5962		29			CLAYSTONE: Claystone (weathered bedrock), yellowish brown (10YR5/6) to yellow (10YR7/6) with trace light brownish gray (10YR6/2) mottling. Pervasive iron oxidation. Decreasing silt to trace. Occasional rip-up clasts. Dense and firm. Slightly moist.
5961		30			
5960		31			CLAYSTONE: Claystone (unweathered), gray (10YR5/1) to grayish brown (10YR5/2) with trace light yellowish brown (10YR6/4) mottling. Decreasing iron oxidation to trace. Trace black organic stringers. Dense and firm.

Elev (Ft)	Well or Piezometer Construction and Materials	Depth (Ft)	Lithology	Unified Soils Classification or Rock Type	Lithologic Description
5959	 Threaded End Cap, Conical - Sump, Sch 40-PVC	32			

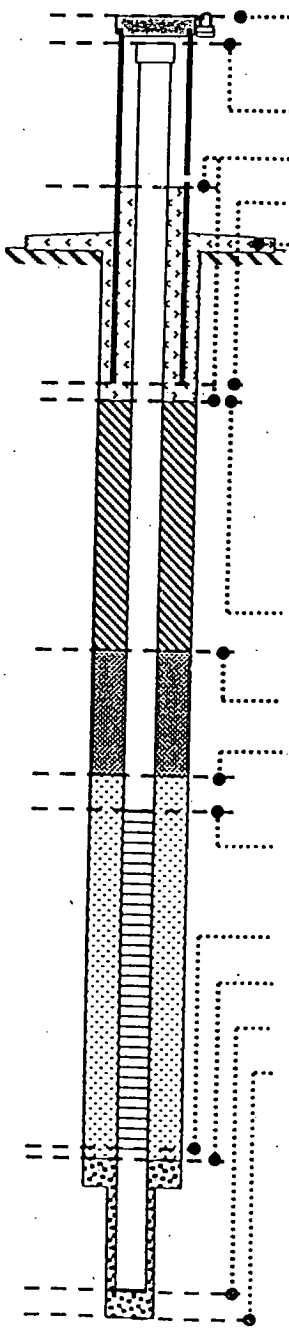
LOG OF BORING NUMBER:
70705

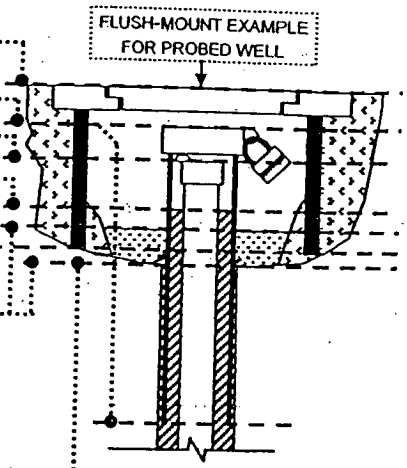
MONITORING WELL INSTALLATION REPORT: Form PRO.118

LOCATION CODE: 70705 PROJECT NAME: CY05 Well Replacements PROGRAM: Water Programs-WARP
SCREENED FORMATION: Al/Bdik. DRILLING CONTRACTOR: High Plains BORING METHOD: Hollow Stem Auger
DATE DRILLED: 8/17/05 DATE COMPLETED: 8/17/05 TOTAL DEPTH: 32.0' COMPLETED DEPTH: 32.0'
ESTIMATED DEPTH TO BEDROCK: 14.8' RIG GEOLOGIST: E. Warp LOGGING GEOLOGIST: E. Warp
BOREHOLE DIAMETER IN SCREENED INTERVAL: 8" QUANTITY OF FLUIDS LOST DURING DRILLING: N/A
INITIAL WATER LEVEL (FT, DATE): 17.50' fm TOC, 8/17/05 COMPLETED WATER LEVEL (FT, DATE): 11.02' (fm. TOC) 9/6/05
DIAMETER & TYPE OF INSTALLATION (WELL/PIEZOMETER/WELL POINT/ETC.): 2.0" PVC Well
TYPE OF PROTECTION (FLUSH-MOUNT VS. ABOVE GROUND, ASEPTIC, ETC.): Above ground steel protective casing

ALL MEASUREMENTS WILL BE MADE IN FEET FROM GROUND SURFACE

*DENOTES ITEMS THAT MAY NOT BE APPLICABLE, DEPENDING ON BORING METHOD, WELL PROTECTION & PURPOSE





PROTECTIVE CASING TOP (STICKUP OR FLUSH-MOUNT): 3.75
*SECONDARY CASING TOP: N/A BOTTOM: N/A TYPE: N/A
SURFACE CASING TOP: 3.25 ags ID (IN): 2.0"
SURFACE SEAL TOP: 1.75' ags BOTTOM: 0.5' ags TYPE: Concrete
PROTECTIVE CASING BOTTOM, ID (IN), TYPE: 1.05' bgs, 6" steel
*WELL PAD DIMENSIONS, TYPE: 3'x3' concrete fm. 0.15' ags to 0.5' bgs
*ADD'L CASING FILL TOP: N/A BOTTOM: N/A TYPE: N/A
*SURFACE ISOLATION CASING TOP: N/A BOTTOM: N/A
*SURFACE ISOLATION CASING ID (IN): N/A TYPE: N/A
*OTHER (E.G., ASEPTIC) CASING TOP: N/A BOTTOM: N/A
*OTHER CASING ID (IN): N/A TYPE, PURPOSE: N/A
*CENTRALIZER(S) OD (IN): N/A NUMBER USED: N/A TYPE: N/A
*CENTRALIZER(S) DEPTH(S): N/A
*GROUT TOP: N/A MEASURED DENSITY (LBS/GAL): N/A TYPE: N/A
*GRANULAR BENTONITE TOP: 0.5' TYPE: Enviroplug-No8 and Pure Gold
*BENTONITE SEAL TOP: N/A TYPE: N/A
BENTONITE SEAL OR GRANULAR BENTONITE BOTTOM (= FILTER PACK TOP): 6.00'
FILTER PACK TYPE: 16/40 Silica Sand BRAND: C.S.S.I.
SURFACE CASING BOTTOM (=SCREEN TOP): 6.75' TYPE: Sch. 40-PVC
SCREEN ID (IN): 2.0" SLOT SIZE (IN): 0.01" TYPE: Sch. 40- PVC
SCREEN BOTTOM (= SUMP, TOP): 31.75' SUMP TYPE: Threaded end cap - conical
FILTER PACK BOTTOM (= *BACKFILL TOP): 32.0' *BACKFILL TYPE: N/A
SUMP BOTTOM (= WELL COMPLETED DEPTH): 32.0' *PILOT HOLE TOP, DIAMETER: N/A
TOTAL BOREHOLE DEPTH (= *PILOT HOLE AND *BACKFILL BOTTOM): 32.0'
REMARKS: Routine well installation

COMPLETED BY: Ellen S. Warp Ellen S. Warp DATE: 8/17/05
CHECKED BY: DATE:

ROCKY FLATS ENVIRONMENTAL TECHNOLOGY SITE BOREHOLE LOG

Borehole Number: 70705
Location - North: _____ East: _____
Date: 8/17/05
Geologist: E. Wamp
Drilling Equip.: CME 75-HT-Hollow Stem Auger

Surface Elevation: _____
Area: Former B707-Replacement of 00200
Total Depth: 32.0'
Company: URS/High Plains Project No.: HAD51300
Sample Type: Continuous Core

RMRS LOGGING SUPERVISOR APPROVAL _____ DATE 8/22/05

TOP/BOTTOM OF CORE IN BOX	TOP/BOTTOM OF INTERVAL	FEET OF CORE IN INTERVAL (FIELD MEASUREMENT)	SAMPLE NUMBER	FRACTURE ANGLE	BEDDING ANGLE	GRAIN SIZE DISTRIBUTION	USCS SYMBOL	DEPTH IN FEET	SOIL/LITHOLOGIC LOG	SAMPLE DESCRIPTION
	0.0 Run #1 2.0'	Rec. = 0.3'					GC CL	0.0 0.3' 1 2		0.0-0.3' - GRAVEL w/Sandy, Silty CLAY. - FILL. Strong brn. (7.5YR5/6). ~50% gravel (1/2-1" dia., sub-rounded, qtzite and (granite). 30% sandy, silty clay matrix. Tr. diss. caliche. Unconsolidated. [V. poor recovery due to cobbles of the unconsolidated fill clogging split spoon shoe]. Tr moisture
										0.3-2.0' = No recovery
	Run #2 4.0'	Rec. = 1.0'					GC CL	2 3		2.0-3.0 - GRAVEL w/Sandy, Silty CLAY. Same as above fm. 0.0-0.3' w/increased gravel and cobbles to ~70% (1/4" dia.-1" dia., ang.). Wkly consolidated to unconsolidated. Shattered qtzite cobble fm. 2.0-2.1' (up to 1 1/2" dia. frags). Shattered qtzite and granitic cobbles fm. 1.5-1.6'. MOIST.
										3.0-4.0' = No recovery
	Run #3 7.0'	Rec. = 1.2'					GC CL	4 5 5.2' 6 7		4.0-5.2' - GRAVEL w/Silty, SANDY CLAY. Brn. (7.5YR4/3) DISTINCT COLOR CHANGE. ~25-30% gravel (1/8-3/4" dia., sub-ang.) ~20% sand (c.g., sub-ang.). Clay has med. plasticity. Tr roots. Decr. moisture to SL. MOIST. (Tr roots (may not be roots - just fine twigs))
										5.2-7.0 = No recovery
	Run #4 9.0'	Rec. = 1.6'					SC CL SC CL SC CL	7.7' 8 8.2' 8.6' 9		7.0-7.7' - Sandy, Silty CLAY w/Tr-some gravel Brn. (7.5YR 4/3). Similar to 4.0-5.2' w/decreased sand and gravel. 15-20% sand (m.g. to c.g., sub-ang. to sub-rounded). 5-7% gravel (1/8-1/4", sub-ang.). Interval is cohesive but soft. Shattered granitic cobble (1" ang. clasts) @ base of interval. Incr. moisture to MOIST.
										7.7-8.2' - Sandy, Silty CLAY w/Tr gravel. Red (2.5YR5/8). Distinct color change, otherwise similar to above fm. 7.0-7.7'. ~20% sand (f.g. to m.g., sub-ang. to sub-rounded). Incr. moisture to V. MOIST. Interval cohesive and soft.
										8.2-8.6 - Sandy, Silty CLAY w/Tr-some gravel. Brn. (7.5YR4/3). Same as above fm. 7.0-7.7. V. MOIST.
										8.6-9.0' = No recovery
	Run #5 9.0-12.0'	Rec. = 1.4'					SC CL SC CL	9.7' 10.4'		9.0-9.7' - Sandy, Silty CLAY w/Tr to some gravel. Brn. (7.5YR 4/3) Same as fm. 7.0-7.7'. Incr. moist. to SATURATED/flowing H_2O.

Procedure No. RMRS/OPS-PRO.101
Revision 0
Date effective: 12/31/98
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NOTES: General: USCS is modified for this log as follows:
Materials amounts are estimated by % volume instead of % weight.
(1) Badly broken core, accurate footage measurements not possible.
(2) Core breaks cannot be matched, accurate footage measurements not possible.

ROCKY FLATS ENVIRONMENTAL TECHNOLOGY SITE BOREHOLE LOG

Borehole Number: 70705
Location - North: _____ East: _____
Date: 8/17/05
Geologist: E. WARP
Drilling Equip.: CME-75-HT-Hollow Stem Auger

Surface Elevation: _____
Area: Former B707-Replacement of well #00200
Total Depth: 32.0'
Company: URS/High Plains Project No. HAD51300
Sample Type: Continuous Core

RMRS LOGGING SUPERVISOR APPROVAL [signature] DATE 8/29/05

TOP/BOTTOM OF CORE IN BOX	TOP/BOTTOM OF INTERVAL	FEET OF CORE IN INTERVAL (FIELD MEASUREMENT)	SAMPLE NUMBER	FRACTURE ANGLE	BEDDING ANGLE	GRAIN SIZE DISTRIBUTION	USCS SYMBOL	DEPTH IN FEET	SOIL/LITHOLOGIC LOG	SAMPLE DESCRIPTION
	10.0'						SC CL	10.0		7 [initials] 8/24/05
	Run #5 (cont.) 9.0→12.0'	Rec = 1.4'						10.4'		9.4-10.4- Sandy, silty CLAY w/ Tr gravel. Red (2.5YR 5/8). Distinct color change. Same as fm. 7.7-8.2'. Tr diss. caliche. Decrease moisture-saturated but not flowing H_2O.
								11		10.4-12.0 = No recovery
	12.0'							12		12.0-13.2'- Sandy, silty CLAY w/ Tr to some gravel. Red (2.5YR 5/8). Same as above fm. 7.7-8.2'. MOIST and cohesive fm. 12.0-12.6'. V. MOIST to saturated and crumbly fm. 12.2' to 13.2'
	Run #6	Rec. = 1.8'					SC CL	13		13.2-13.8'- Clayey, silty SAND w/ some gravel and cobbles. Brn. (7.5YR 4/2). 55-55% sand (c.g., sub-ang. to subrounded) ~40% clayey silt. 5-7% gravel (pred. granite). Un-consolidated. V. MOIST to saturated but not flowing.
							SM	13.2'		
	14.0'							13.8'		
							SM	14		13.8-14.0' = No recovery
							SM ML	14.3'		14.0-14.3- Clayey, silty SAND w/ Tr gravel. Brn. (7.5YR 4/2). Same as above fm. 13.2 to 13.8' except decr. gravel to Tr. SATURATED BUT NOT flowing.
	Run #7	Rec. = 2.8'						14.8		14.3-14.8'- CLAYEY, Silty SAND w/ Tr gravel and SILT MIXTURE. Same as above fm. 14.0-14.3 mixed w/ Brn'sh yellow silt. (re-worked Siltstone) SATURATED but not flowing. Bedrock contact @ 14.8'
								15		
								16		
								16.8'		14.8-16.8- Clayey SILTSTONE (Bedrock)- Weathered Lt. gry (10YR 7/1) w/ brn'sh yellow (10YR 6/8) mottling. V. faint bedding laminations. Interval is firm and dense. Noteable decr. in moisture. MOIST. Occasional siltstone rip-up. [initials] 8/21/05
	17.0'							17		16.8-17.0 = No recovery
	Run #8	Rec. = 2.0'						18		17.0-18.2- Clayey SILTSTONE- Same as above fm. 14.8-16.8'. Firm and dense. MOIST
	19.0'							19		18.2-24.0- Silty CLAYSTONE to clayey siltstone. Weathered. Brn'sh yellow (10YR 6/8) w/ pale brn. (10YR 6/3) and some gry (10YR 2/1) mottling. Rip-up clasts fm. 18.2-18.7'. Tr blk. organic stringers. Silty lenses throughout particularly between 21.0→22.0'. Perv. FeOx'n fm. 21.5→22.0'. Overall massive texture.
	Run #9 19.0-22.0'	Rec. = 3.0'						20.0'		

NOTES: General: USCS is modified for this log as follows:
Materials amounts are estimated by % volume instead of % weight.
(1) Badly broken core, accurate footage measurements not possible.
(2) Core breaks cannot be matched, accurate footage measurements not possible.

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Firm and dense. SL. MOIST.

(4011-930-0134-930)(Form GT.1A)(03/01/92)

ROCKY FLATS ENVIRONMENTAL TECHNOLOGY SITE BOREHOLE LOG

Borehole Number: 70705
Location - North: East:
Date: 8/17/05
Geologist: E. Warp
Drilling Equip.: CME-75-HT - Hollow Stem Auger

Surface Elevation:
Area: Former B707 - Replacement of well # 00200
Total Depth: 32.0'
Company: URS/H.P. Project No. HAD51300
Sample Type: Continuous Core

RMRS LOGGING SUPERVISOR APPROVAL: [signature] DATE 8/29/05

TOP/BOTTOM OF CORE IN BOX	TOP/BOTTOM OF INTERVAL	FEET OF CORE INTERVAL (FIELD MEASUREMENT)	SAMPLE NUMBER	FRACTURE ANGLE	BEDDING ANGLE	GRAIN SIZE DISTRIBUTION	USCS SYMBOL	DEPTH IN FEET	SOIL/LITHOLOGIC MX	SAMPLE DESCRIPTION
	Run #9 (cont.) 19.0→22.0'	Rec. = 3.0'						20.0		20.0→22.0' - Silty CLAYstone (weathered bedrock) (described on pg. 2 of 4).
	22.0'							21		
	Run #10	Rec. = 2.0'						22		
	24.0'							23		
	Run #11	Rec. = 1.7'						24		(Weathered bedrock) 24.0-25.7 - Clayey SILTSTONE, Yellow (10YR7/6) to v. pale brn. (10YR7/4) w/ R lt. gry. (10YR7/1) mottling. Overall, massive texture w/ v. faint bedding planes. Dense and firm. S. pen. FeOx'n. Wkly. friable, Sl. moist.
	26.0'							25		
								25.7		25.7-26.0 = No recovery — rock very siltstone (AND) 8/29/05
	Run #12	Rec. = 3.2'						26		26.0-29.0 - Silty CLAYSTONE (weathered bedrock) Pale brn. (10YR6/3) w/ Yell'sh brn. (10YR5/6) FeOx'n mottling. Massive texture, Firm and dense. Ironstone nodules (1/2" dia.) @ 26.2' and fm. 27.7-27.8 (1" dia., round) & 3/4" dia. ironstone nodule @ 28.0'. Silty lense fm. 27.0-27.3', and fm. 27.7' to 27.8'. Sl. MOIST TO MOIST. Fines gradually & irreg. clayey w/ depth. (AND) 8/29/05 (weathered bedrock)
	29.0'							27		
								28		
								29		29.0-30.5 - CLAYSTONE Yellowish brn. (10YR5/6) to Yellow (10YR7/6) w/ R lt. brn'sh gry (10YR6/2) mottling. Pen. FeOx'n. Decr. silt to R. Occasional rip-up clasts.
	Run #13 29.0→32.0'	Rec. = 3.0'						30.0'		
		30.0'								

NOTES: General: USCS is modified for this log as follows:
Materials amounts are estimated by % volume instead of % weight.
(1) Badly broken core, accurate footage measurements not possible.
(2) Core breaks cannot be matched, accurate footage measurements not possible.

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dense and firm. Sl. MOIST

(401 1-930-01 34-930) Form GT.1A(0)(OL.92)

ROCKY FLATS ENVIRONMENTAL TECHNOLOGY SITE BOREHOLE LOG

Borehole Number: 70705
Location - North: _____ East: _____
Date: 8/17/05
Geologist: E. WARP
Drilling Equip.: CME-~~SPT~~ 75-HT-Hollow Stem Auger

Surface Elevation: _____
Area: Former B707 - Replacement of well #00200
Total Depth: 32.0'
Company: URS/High Plains Project No. HAD51300
Sample Type: Continuous Core

RMRS LOGGING SUPERVISOR
APPROVAL _____ DATE _____

TOP/BOTTOM OF CORE IN BOX	TOP/BOTTOM OF INTERVAL	FEET OF CORE IN INTERVAL (FIELD MEASUREMENT)	SAMPLE NUMBER	FRACTURE ANGLE	BEDDING ANGLE	GRAIN SIZE DISTRIBUTION	USCS SYMBOL	DEPTH IN FEET	SOIL/LITHOLOGIC LOG	SAMPLE DESCRIPTION
	Run #13 (cont.) 29.0→32.0'	Rec. = 3.0'						30.0		30.0-30.5 - CLAYSTONE (weathered bedrock) - described on page 3 of 4.
								30.5		30.5 - 32.0' - Claystone - unweathered. Gry (10YR5/1) to grysh brn. (10YR5/2) w/ TR lt. yellsh brn (10YR6/4) mottling. Decr. FeOx'n to TR. TR blk. organic stringers. Dense and firm.
								31		
	32.0'							32.0'		T.D. @ 32.0'

NOTES: General: USCS is modified for this log as follows:
Materials amounts are estimated by % volume instead of % weight.
(1) Badly broken core, accurate footage measurements not possible.
(2) Core breaks cannot be matched, accurate footage measurements not possible.

(4011-930-0134-930)(Form GT.1A)(03/01/92)

STATE PLANE COORDINATES AREA:	GRND ELEV. (FT):5937.35	CASING DIA (IN): 2	**LOG OF BORING NUMBER:**
NORTH: 753006.65	TOTAL DEPTH (FT): 28.0	BH DIA. (IN): 8	**73005**
EAST: 2084095.22	COMPLETION DATE: 6/22/05	GRID LOCATOR:	
PROJECT: Present Landfill	GEOLOGIST: E. Warp		
REMARKS:			

Elev (Ft)	Well or Piezometer Construction and Materials	Depth (Ft)	Lithology	Unified Soils Classification or Rock Type	Lithologic Description
5940	Protective Casing, 5 in. square, Steel; Casing, Sch 40-PVC, 2 in. ID.	3			
5939	Concrete Seal	2			
5938	Concrete Pad	1			
5937		0			SILTSTONE: Clayey Siltstone, light yellowish brown (10YR6/4). Massive texture, trace roots, dry.
5936		1			SILTSTONE: Clayey Siltstone with trace to some sand in pockets (rip-up?), brownish yellow (10YR6/6) with some light gray (10YR7/1) mottling. Weak to moderate pervasive iron oxidation with some un-oxidized mottling. Massive texture. Weak to moderately friable, trace roots. Slightly moist. Trace to some, very fine grained, sand.
					CLAYSTONE: Silty Claystone, light brownish gray (10YR6/2). Decreased iron oxidation to trace. Strongly friable, crumbly, trace roots, slightly moist.
5935	Hydrated Bentonite Pellets	2			No recovery.
					SILTSTONE: Clayey Siltstone, light yellowish brown (10YR6/4) to light brownish gray (10YR6/2). Weak pervasive iron oxidation from 2.0' to 2.1'. Massive texture, slightly moist. Increasing clay at base of interval. Moderately friable.
5934		3			CLAYSTONE: Claystone with some silt, light brownish gray (10YR6/2). Trace weak iron oxidation, predominately along bedding planes (subhorizontal) and fracture surfaces. Trace white caliche stringers and blebs. Massive texture, moderately friable, slightly moist.
5933	Filter Pack, 16/40 Silica Sand	4			No recovery.
					CLAYSTONE: Claystone with some silt, pale brown (10YR6/3) with some gray (10YR5/1) mottling. Weak pervasive iron oxidation from

Elev (Ft)	Well or Piezometer Construction and Materials	Depth (Ft)	Lithology	Unified Soils Classification or Rock Type	Lithologic Description
		5			4.0' to 4.4'. Gray mottling from 4.4' to 4.8', with iron oxidation on internal fracture surfaces. Massive texture. Slightly moist from 4.0' to 4.4', increase to moist from 4.4' to 4.8'. Friable.
5932	Screen, Sch 40-PVC, 2 in. ID., 0.010 in. slots				CLAYSTONE: Claystone with some silt, gray (10YR5/1) to grayish brown (10YR5/2). Weak iron oxidation along bedding planes. Massive texture, weak to moderately friable, slightly moist.
		6			No recovery.
5931					CLAYSTONE: Claystone with trace silt, same as interval from 4.8' to 5.9'. Slightly moist.
		7			CLAYSTONE: Claystone, gray (10YR6/1), predominately un-oxidized. Faint undulating bedding planes visible. Trace black organic stringers throughout. Weak to moderately friable. Slightly moist.
5930					
		8			No recovery.
5929					CLAYSTONE: Claystone, gray (10YR6/1), predominately un-oxidized. Faint undulating bedding planes visible. Trace black organic stringers throughout. Weak to moderately friable, slightly moist.
		9			
5928					
		10			No recovery.
5927					CLAYSTONE: Claystone, gray (10YR6/1), predominately un-oxidized. Faint undulating bedding planes visible. Trace black organic stringers throughout. Weak to moderately friable, slightly moist. Trace iron oxidation stringers from 10.3' - 10.5'.
		11			CLAYSTONE: Claystone, brown (10YR5/3), slight color change. Faint laminations (bedding planes) visible with trace to some black organic stringers on planes. Trace to some iron oxidation stringers along bedding planes and fracture surfaces. Weak to moderately friable, slightly moist.
5926					
		12			CLAYSTONE: Claystone, gray (10YR5/1 to 10YR6/1). Weak iron oxidation along bedding planes at 11.6' and from 12.2' to 13.0'. Fissile and moderately friable, slightly moist. Iron oxidation along fracture surfaces, especially from 11.6' to 11.8' and 12.2' to 13.0'.
5925					
		13			
5924					

Elev (Ft)	Well or Piezometer Construction and Materials	Depth (Ft)	Lithology	Unified Soils Classification or Rock Type	Lithologic Description
5923		14			SILTSTONE: Clayey Siltstone to silty claystone, pale brown (10YR6/3) to light brownish gray (10YR6/2). Weak iron oxidation on sub-horizontal bedding planes (approximately 4 to 6 iron-oxidized bedding planes per foot) and fracture surfaces. Trace black organic stringers. Notable iron oxidation coating 80 deg fracture from 18.9' to 19.2'. Color of iron oxidation is strong brown (7.5YR5/6). Iron oxidation on 20 deg fracture from 19.5' to 19.6'. Moisture decreasing to trace. Occasional iron oxidation-replaced organic debris fragments. Some intervals to silty claystone, but predominately clayey siltstone.
5922		15			
5921		16			
5920		17			
5919		18			
5918		19			
5917		20			
5916		21			
5915		22			SILTSTONE: Clayey Siltstone to silty claystone, gray (10YR5/1). Notable color change. Decrease iron oxidation to trace as minor fracture coating. Massive texture, moderately friable. Increase moisture to slightly moist.

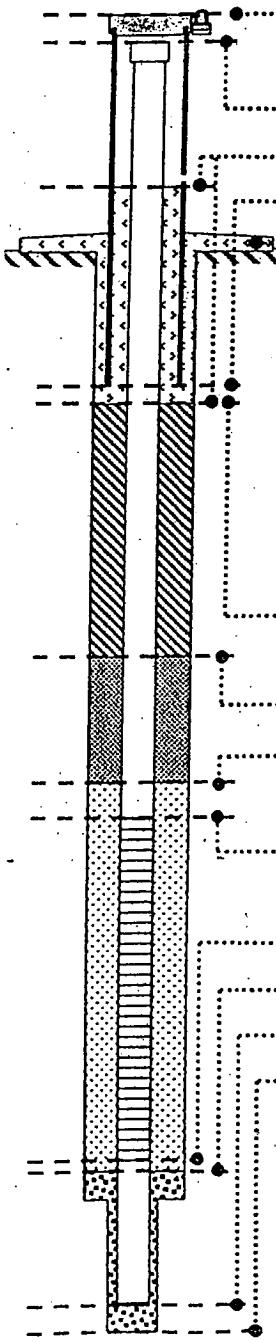
Elev (Ft)	Well or Piezometer Construction and Materials	Depth (Ft)	Lithology	Unified Soils Classification or Rock Type	Lithologic Description
		23			CLAYSTONE: Claystone with some silt, yellowish brown (10YR5/6) and gray (10YR5/1). Weak iron oxidation mottled throughout. Iron oxide coating ~80 deg fracture at 22.9'. Moderate pervasive iron oxidation from 23.7' to 23.8'. Moderately friable from 23.1' to 24.0', corresponding with increased moisture zone. Slightly moist from 22.7' to 23.1', moist from 23.1' to 24.0'.
5914					
		24			CLAYSTONE: Claystone with trace silt, gray (10YR5/1) to light brownish gray (10YR6/2). Decreased iron oxidation to trace along bedding planes and fracture surfaces. Massive textured, moderately friable. Clay-rich (no silt) from 24.0' to 24.2' and slightly darker color (dark gray: 10YR4/1). Moist, decreasing to very slightly moist from 24.2' to 26.0'. Fissile between 24.5' and 25.7'. Trace black organic material.
5913					
	Threaded End Cap - Sump, Sch 40-PVC	25			
	Bentonite Pellet Backfill				
5912					
		26			CLAYSTONE: Claystone, grayish brown (10YR5/2). Massive texture, weakly friable. Iron oxidation along internal fractures at 26.3' and 27.0'. Very slightly moist.
5911	Bentonite Pellet Backfill in Pilot Hole				
		27			CLAYSTONE: Claystone, dark gray (10YR4/1). Notable color change. Fissile and friable, trace moisture.
5910					
		28			No recovery.

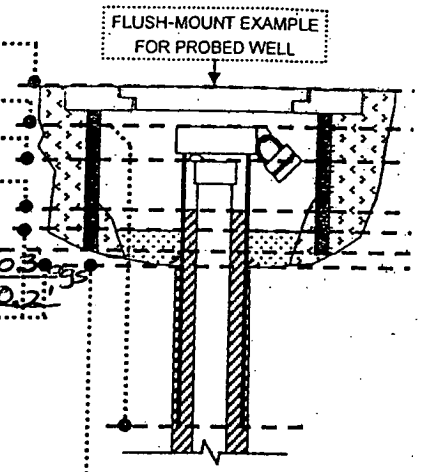
MONITORING WELL INSTALLATION REPORT: Form PRO.118

LOCATION CODE: 73005 PROJECT NAME: CY05 WELL INSTALLATION PROGRAM: PRESENT LANDFILL
SCREENED FORMATION: Bdrk. DRILLING CONTRACTOR: Layne BORING METHOD: Hollow Stem Auger
DATE DRILLED: 6/22/05 DATE COMPLETED: 6/27/05 TOTAL DEPTH: 28.0' COMPLETED DEPTH: 25.0'
ESTIMATED DEPTH TO BEDROCK: 0.0' RIG GEOLOGIST: E. Warp LOGGING GEOLOGIST: E. WARP
BOREHOLE DIAMETER IN SCREENED INTERVAL: 8" QUANTITY OF FLUIDS LOST DURING DRILLING: N/A
INITIAL WATER LEVEL (FT, DATE): Dry, 6/22/05 COMPLETED WATER LEVEL (FT, DATE): Dry, 6/27/05
DIAMETER & TYPE OF INSTALLATION (WELL/PIEZOMETER/WELL POINT/ETC.): 2" PVC WELL
TYPE OF PROTECTION (FLUSH-MOUNT VS. ABOVE GROUND, ASEPTIC, ETC.): ABOVE GROUND STEEL PROTECTIVE CASING

ALL MEASUREMENTS WILL BE MADE IN FEET FROM GROUND SURFACE

* DENOTES ITEMS THAT MAY NOT BE APPLICABLE, DEPENDING ON BORING METHOD, WELL PROTECTION & PURPOSE





PROTECTIVE CASING TOP (STICKUP OR FLUSH-MOUNT): 3.1' a.g.s.
*SECONDARY CASING TOP: N/A BOTTOM: N/A TYPE: N/A
SURFACE CASING TOP: 2.7' ags ID (IN): 2.0
SURFACE SEAL TOP: 1.35' ags BOTTOM: 0.2' ags TYPE: CONCRETE
PROTECTIVE CASING BOTTOM, ID (IN), TYPE: 1.9', 5" x 5" SQUARE STEEL
*WELL PAD DIMENSIONS, TYPE: 3' x 3' square, Concrete top 0.3' ags btm 0.2'
*ADD'L CASING FILL TOP: N/A BOTTOM: N/A TYPE: N/A
*SURFACE ISOLATION CASING TOP: N/A BOTTOM: N/A
*SURFACE ISOLATION CASING ID (IN): N/A TYPE: N/A
*OTHER (E.G., ASEPTIC) CASING TOP: N/A BOTTOM: N/A
*OTHER CASING ID (IN): N/A TYPE, PURPOSE: N/A
*CENTRALIZER(S) OD (IN): N/A NUMBER USED: N/A TYPE: N/A
*CENTRALIZER(S) DEPTH(S): N/A
*GROUT TOP: N/A MEASURED DENSITY (LBS/GAL): N/A TYPE: N/A
*GRANULAR BENTONITE TOP: N/A TYPE: N/A
*BENTONITE SEAL TOP: 0.2' TYPE: 1/4" Bentonite pellets - BARCID AND Pel-Plug } HYDRATED W/ 5 gall. of Distilled H_2O
BENTONITE SEAL OR GRANULAR BENTONITE BOTTOM (= FILTER PACK TOP): 4.0'
FILTER PACK TYPE: 16/40 Silica Sand BRAND: C.S.S.I.
SURFACE CASING BOTTOM (=SCREEN TOP): 4.6' TYPE: Sch. 40-PVC
SCREEN ID (IN): 2.0" SLOT SIZE (IN): 0.01 TYPE: Sch. 40-PVC
SCREEN BOTTOM (= SUMP, TOP): 24.65' SUMP TYPE: Threaded End Cap - Sch. 40 PVC
FILTER PACK BOTTOM (= *BACKFILL TOP): 25.0' *BACKFILL TYPE: 1/4" bentonite pellets - Pel-plug
SUMP BOTTOM (= WELL COMPLETED DEPTH): 25.0' *PILOT HOLE TOP, DIAMETER: 26.0', 2.5"
TOTAL BOREHOLE DEPTH (= *PILOT HOLE AND *BACKFILL BOTTOM): 28.0'

REMARKS: Routine well installation on 6/22/05. Top 2' of bentonite seal and protective casing installed on 6/23/05. Concrete well pad installed on 6/27/05

COMPLETED BY: Ellen S. Warp Ellen S. Warp DATE: 6/27/05
CHECKED BY: J. Boylan J. Boylan DATE: 6/30/05

U.S. DEPARTMENT OF ENERGY ROCKY FLATS PLANT

FORM PRO.101A

ROCKY FLATS ENVIRONMENTAL TECHNOLOGY SITE BOREHOLE LOG

PAGE 1 OF 3

Borehole Number: 73005
Location - North: _____ East: _____
Date: 6/22/05
Geologist: E. WARP
Drilling Equip.: CME-750 Hollow Stem Auger

Surface Elevation: _____
Area: Present Landfill
Total Depth: 28.0'
Company: URS/Layne
Project No.: ~~HAD51300~~ GR201400 SSW 6/22/05
Sample Type: Continuous Core - Split Spoon

RMRS LOGGING SUPERVISOR

APPROVAL _____ DATE _____

TOP/BOTTOM OF CORE IN BOX	TOP/BOTTOM OF INTERVAL	FEET OF CORE IN INTERVAL (FIELD MEASUREMENT)	SAMPLE NUMBER	FRACTURE ANGLE	BEDDING ANGLE	GRAIN SIZE DISTRIBUTION	USCS SYMBOL	DEPTH IN FEET	SOIL/LITHOLOGIC LOG	SAMPLE DESCRIPTION
0.0	0.0	0.0						0.0		0.0-0.1' - Clayey SILTSTONE - Lt. Yell'sh Brn (10YR6/4) Massive texture. Tr roots. DRY 6/29/05 w/ tr-some sand in pockets (rip-up?)
Box #1 (0.0→10.0')	Run #1 2.0'	Rec.=0.8'						0.1		0.1-0.7- Clayey SILTSTONE - Brn'sh Yellow (10YR6/6) w/some Lt. gry (10YR7/1) mottling. Wk to mod. perv. FeOx'n. w/some un-ox'd mottling. Massive texture. Wk. to moderately friable. Tr roots. Sl. MOIST. Tr-some sand (vfg). 6/29/05
								0.7		0.7-0.8- Silty CLAYSTONE - Lt. Brn'sh Gry (10YR6/2). Decr. FeOx'n to Tr. Strongly friable, Crumbly. Tr roots. Sl. MOIST.
	Run #2 4.0'	Rec.=1.8'						2.5		0.8-2.0 = No recovery
								2.8		2.0-2.5'- Clayey SILTSTONE. Lt. Yell'sh brn. (10YR6/4) to Lt. brn'sh gry. (10YR6/2). Wk. perv. FeOx'n fm. 2.0-2.1'. Massive texture. Increasing clay @ base of interval. Moderately friable. Sl. MOIST.
				Misc. high-angle 6/29/05			6/29/05 (continue lith. log to 3.8')	3.8		2.5-~~2.8~~ 3.8 6/29/05 CLAYSTONE w/some silt. Lt. Brn'sh Gry (10YR6/2). Tr wk. FeOx'n predominately along bedding planes (sub-horizontal) & fracture surfaces. Tr wht. caliche stringers and blebs. Massive texture. Moderately friable. Sl. MOIST. 6/29/05
	Run #3 6.0'	Rec.=1.9'						4.8'		3.8 6/29/05 ~~2.8~~ 4.0 = No recovery
								5.9'		4.0-4.8'- CLAYSTONE w/some silt. Pale Brn. (10YR6/3) w/some Gry (10YR5/1) mottling. Wk. perv. FeOx'n fm. 4.0-4.4'. Gry mottling fm. 4.4-4.8' w/FeOx'n on internal fracture surfaces. Massive texture. Sl. moist fm. 4.0-4.4' increase to moist fm. 4.4 to 4.8'. Friable.
	Run #4 8.0'	Rec.=1.9'						6.7		4.8-5.9'- CLAYSTONE w/some silt. Gry (10YR5/1) to Gry'sh brn. (10YR5/2). Wk. FeOx'n along bedding planes. Massive texture. Wk. to moderately friable. Sl. MOIST.
								7.9'		5.9-6.0'- No recovery
	Run #5 10.0'	Rec.=1.9'						9.9		6.0-6.7- CLAYSTONE w/Tr silt. Same as above fm. 4.8-5.9'. Sl. moist.
								10.0'		6.7-7.9'- CLAYSTONE - Gry (10YR6/1) (Predominately Un-ox'd). Faint undulating bedding planes. Visible. Tr blk. organic stringers throughout. Wk. to mod. friable. Tr FeOx'n stringers fm. 10.3-10.5'.

NOTES: General: USCS is modified for this log as follows: No recovery Sl. MOIST. 9.9-10.0' 6/29/05
Materials amounts are estimated by % volume instead of % weight.
(1) Badly broken core, accurate footage measurements not possible.
(2) Core breaks cannot be matched, accurate footage measurements not possible.

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7.9-8.0' = No recovery
8.0-9.9 = CLAYSTONE (same as 6.7-7.9').

(4011-930-0134-930)(Form GT.1A)(03/01/92)

U.S. DEPARTMENT OF ENERGY ROCKY FLATS PLANT

FORM PRO.101A

ROCKY FLATS ENVIRONMENTAL TECHNOLOGY SITE BOREHOLE LOG

PAGE 2 OF 3

Borehole Number: 73005
Location - North: _____ East: _____
Date: 6/22/05
Geologist: E. WARP
Drilling Equip.: CME-750-Hollow Stem Auger

Surface Elevation: _____
Area: Present Landfill
Total Depth: 28.0'
Company: URS/Layne
Project No.: ~~HAD51300~~ GR201400
Sample Type: Continuous Core-Split Spoon ESW 6/29/05

RMRS LOGGING SUPERVISOR APPROVAL _____ DATE 6/29/05

TOP/BOTTOM OF CORE IN BOX	TOP/BOTTOM OF INTERVAL	FEET OF CORE IN INTERVAL (FIELD MEASUREMENT)	SAMPLE NUMBER	FRACTURE ANGLE	BEDDING ANGLE	GRAIN SIZE DISTRIBUTION	USCS SYMBOL	DEPTH IN FEET	SOIL LITHOLOGIC LOG	SAMPLE DESCRIPTION
Box #2 (10.0→	Run #6	Rec. = 2.0'		~20° ~80°				10.0		10.0-10.5-CLAYSTONE - Same as fm. 8.0-9.9'.
								10.5		10.5-11.6' CLAYSTONE - Brn. (10YR5/3). Sl. color change. Faint laminations (bedding planes) visible w/ tr to some blk organic stringers on planes. Tr to some FeOxn stringers along bedding and fracture planes surfaces. Wk. to moderately friable. Sl. MOIST.
								11		
								11.6		
	Run #7	Rec. = 2.0'		subhoriz. to ~70°		6/29/05		12		11.6-13.6-CLAYSTONE-Gry (10YR5/1 to 6/1). Wk. FeOxn along bedding planes @ 11.6' and fm. 12.2 to 13.0'. Fissile and moderately friable. Sl. MOIST. Fe-ox along fracture surfaces, especially @ 11.6-11.8', 12.2-13.0'. 6/29/05
								13		
								13.6		
	Run #8	Rec. = 2.0'			~20-30° 6/29/05			14		13.6-22.0-Clayey SILTSTONE to silty claystone - Pale Brn. (10YR6/3) to Lt. brnish gry. (10YR6/2). Wk. FeOxn on subhorizontal bedding planes (approximately 4 to 6 FeOxd bedding planes per ft.) & frac surfaces. Tr blk organic stringers. Noteable FeOxn coating 80° fracture fm. 18.9' to 19.2'. Color of FeOxn is strong brn. (7.5YR5/6). FeOxn on 20° fracture fm. 19.5 to 19.6'. Moisture decreasing to Tr. Occ. Fe-Ox-replaced organic debris fragments. Some intervals to silty claystone, but predominantly clayey siltstone. 6/30/05
								15		
	Run #9	Rec. = 2.0'						16		
								17		
								18		
	Run #10	Rec. = 2.0'		80° ~20°				19		
								20.0		

6/29/05 6/29/05 6/30/05 6/29/05 6/29/05 6/30/05

NOTES: General: USCS is modified for this log as follows:
Materials amounts are estimated by % volume instead of % weight.
(1) Badly broken core, accurate footage measurements not possible.
(2) Core breaks cannot be matched, accurate footage measurements not possible.

Procedure No. RMRS/OPS-PRO.101
Revision 0
Date effective: 12/31/98

(4011-930-0134-930)(Form GT.1A)(03/01/92)

ROCKY FLATS ENVIRONMENTAL TECHNOLOGY SITE BOREHOLE LOG

Borehole Number: 73005
Location - North: _____ East: _____
Date: 6/22/05
Geologist: E. Warp
Drilling Equip.: CME-750-Hollow Stem Auger

Surface Elevation: _____
Area: Present Landfill
Total Depth: 28.0'
Company: URS/Layne
Project No.: ~~HA051300~~ GR201400
Sample Type: Continuous Core-Split Spoon

RMRS LOGGING SUPERVISOR
APPROVAL _____ DATE _____

TOP/BOTTOM OF CORE IN BOX	TOP/BOTTOM OF INTERVAL	FEET OF CORE IN INTERVAL (FIELD MEASUREMENT)	SAMPLE NUMBER	FRACTURE ANGLE	BEDDING ANGLE	GRAIN SIZE DISTRIBUTION	USCS SYMBOL	DEPTH IN FEET	SOIL/LITHOLOGIC LOG	SAMPLE DESCRIPTION
	20.0' Run #11 22.0'	Rec.=2.0'						20.0 21 22		20.0-22.0- Clayey SILTSTONE-silty claystone (described on pg. 2). 6/30/05 6/30/05 to silty claystone
	Run #12 24.0'	Rec.=2.0'		~80°				22.7' 23 24		22.0-22.7- Clayey SILTSTONE Gry (10YR 5/1) No table color change. Decrease FeOx'n to TR as minor fracture coating. Massive texture. Moderately friable. Increase moisture to SL. MOIST. 22.7-24.0- CLAYSTONE w/some silt. Yellow'sh brn. (10YR 5/6) and gry (10YR 5/1) Wk. FeOx'n mottled throughout. FeOxide coating ~80° fracture @ 22.9'. Moderate perv. FeOx'n fm. 23.7 to 23.8. Moderately friable fm. 23.1 to 24.0, corresponding with increased moisture zone. Sl. moist fm. 22.7 to 23.1', MOIST fm. 23.1 → 24.0'
	Run #13 26.0'	Rec.=2.0'		~80° 0-30°	6/30/05			25 26		24.0-26.0'- CLAYSTONE w/ TR silt. Gry (10YR 5/1) to Lt. brn'sh gry (10YR 6/2). Decr. FeOx'n to TR along bedding planes and frac. surfaces. Massive textured, moderately friable. Clay-rich fm. 24.0-24.2 and slightly darker color (dark gry - 10YR 4/1). SL. MOIST. Decr. moisture to V. slightly moist fm. 24.2 to 26.0'. Fissile between 24.5 to 25.7'. TR blk organic material.
	Run #14 28.0'	Rec.=1.8'						27 27.1 27.8' 28		26.0-27.1'- CLAYSTONE - Gry'sh brn. (10YR 5/2). Massive texture. Wkly. friable. FeOx'n along internal fractures @ 26.3 and 27.0'. V. Sl. moist. 27.1-27.8- CLAYSTONE - Dk Gry (10YR 4/1). Noteable color change. Fissile and friable. TR moisture. 27.8-28.0' = No recovery
								29 30.0		T.D. @ 28.0'

NOTES: General: USCS is modified for this log as follows:
Materials amounts are estimated by % volume instead of % weight.
(1) Badly broken core, accurate footage measurements not possible.
(2) Core breaks cannot be matched, accurate footage measurements not possible.

Procedure No. RMRS/OPS-PRO.101
Revision 0
Date effective: 12/31/98

(4011-930-0134-930) Form GT.1A (03/01/92)

STATE PLANE COORDINATES AREA:
NORTH: 752878.53
EAST: 2084050.53
PROJECT: Present Landfill
REMARKS:

GRND ELEV. (FT): 5925.8
TOTAL DEPTH (FT): 27.7
COMPLETION DATE: 6/27/05
GEOLOGIST: E. Warp

CASING DIA (IN): 2
BH DIA. (IN): 8
GRID LOCATOR:

LOG OF BORING NUMBER: 73105

Elev (Ft)	Depth (Ft)	Well or Piezometer Construction and Materials	Lithology	Unified Soils Classification or Rock Type	Lithologic Description
5929	3	Protective Casing, 5 in. square, Steel; Casing, Sch 40-PVC, 2 in. ID.			
5928	2				
5927	1				
5926	0	Concrete Seal; Concrete Pad			
					GP: Gravel (fill), pea gravel (1/4" diameter, subrounded to subangular), composed of granite and quartzite. Poorly graded, dry.
					CL: Clay with trace sand and gravel, grayish brown (10YR5/2) to gray (10YR5/1). Re-worked claystone. Thin black organic stringers common, moist.
5925	1				
					SC/CL: Gravelly, Sandy Clay to clayey, gravelly sand, strong brown (7.5YR5/6). Imported fill (Qalrf). 60% clay, medium plasticity, 30% sand (medium grained to coarse grained, subrounded to subangular), 10% gravel (1/4" diameter, subrounded to subangular), very moist.
5924	2				No recovery.
		Hydrated Bentonite Pellets			SC/CL: Gravelly, Sandy Clay to clayey, gravelly sand, strong brown (7.5YR4/6). Imported fill (Qalrf). Very similar to interval from 0.4' to 0.8'. 65% clay, medium plasticity, 20 - 25% sand (medium grained to coarse grained, subangular to subrounded), 10 - 15% gravel (1/8" - 1/4" diameter, subrounded, predominately granite and quartzite), saturated, but not flowing.
5923	3				No recovery.
5922	4				SC/CL: Gravelly, Sandy Clay to clayey, gravelly sand, strong brown (7.5YR4/6). Imported fill (Qalrf). Very similar to interval from 2.0' to

Elev (Ft)	Well or Piezometer Construction and Materials	Depth (Ft)	Lithology	Unified Soils Classification or Rock Type	Lithologic Description
					2.9'. 60% clay, medium plasticity, 25% sand (medium grained to coarse grained, subangular to subrounded), 15% gravel (1/4" - 1/2" diameter, subangular, composed of granite, quartzite, and schist), saturated.
5921	Filter Pack, 16/40 Silica Sand	5			No recovery.
5920	Screen, Sch 40-PVC, 2 in. ID., 0.010 in. slots	6			GP: Gravel with trace sandy clay, strong brown (7.5YR4/6) clay. Appears to be pea-gravel (possible slough). Gravel (1/4" - 3/4" diameter, subrounded to subangular), poorly graded. Moisture decreases from saturated to moist.
5919		7			GC/CL: Gravelly, Sandy Clay and shattered quartzite cobble mixture. 45% gravelly, sandy clay, light brown (7.5YR6/4) with 55% shattered cobbles (1/2" to 1-1/2" diameter, angular), moist.
5918					No recovery.
		8			GC/CL: Sandy Clay/Gravel mixture, strong brown (7.5YR5/6) clay. 60 - 70% gravel and cobbles, 20 - 30% clay (medium plasticity), 5 - 10% sand (coarse grained, subangular). Shattered quartzite cobbles from 8.4' to 8.6' (2" diameter) and from 9.2' to 9.5' (2" - 3" diameter). Moist.
5917		9			
5916					No recovery.
		10			GC/CL: Sandy Clay/Gravel mixture, strong brown (7.5YR5/6). 50% clay (medium plasticity), 30% gravel (1/8" - 3/4" diameter, subangular), ~20% sand (coarse grained), moist. Quartzite cobbles (1" - 2" diameter) at 11.2' and 11.7'.
5915		11			
5914		12			No recovery.
					GC/CL: Sandy Clay/Gravel mixture, same as interval from 10.0' to 11.9'.
5913		13			CL: Silty Clay, gray (10YR6/1). Re-worked silty claystone. Poor recovery due to clogged split spoon sampler producing "ribbons" of claystone. Probable cobble lodged in sampler. Moist.
					No recovery.

Elev (Ft)	Well or Piezometer Construction and Materials	Depth (Ft)	Lithology	Unified Soils Classification or Rock Type	Lithologic Description
5912		14			CLAYSTONE: TOP OF BEDROCK. Silty Claystone (weathered bedrock), grayish brown (10YR5/2) with some yellowish brown (10YR5/6) mottling. Massive texture, firm and cohesive. Weak to moderately friable. Weak iron oxidation mottled throughout. Trace black organic material. Moist. Bedrock contact estimated at 12.5'. Estimated by drilling conditions and changes in penetration.
5911		15			No recovery.
5910		16			CLAYSTONE: Silty Claystone, iron oxidized, yellowish brown (10YR5/4), grading to gray (10YR5/1) at base of interval. Moderate pervasive iron oxidation from 16.0' to 16.3', then decreasing at base. Massive texture, weak to moderately friable. Saturated from 16.0' to 16.2', decreasing to moist from 16.2' to 16.3'.
5909		17			CLAYSTONE: Claystone with silt, iron oxidized, yellowish brown (10YR5/8). Strong pervasive iron oxidation. Firm and dense, moist. Black organic material common as stringers and along undulating bedding planes.
5908		18			CLAYSTONE: Claystone with silt, grayish brown (10YR5/2) with some yellowish brown (10YR5/6) mottling. Decreasing overall iron oxidation to weak, mottled. Firm, weakly friable, moist. Black organic stringers common. Faint bedding visible.
					No recovery.
5907		19			CLAYSTONE: Claystone with trace to some silt, gray (10YR5/1) with yellowish brown (10YR5/4) mottling. Weak iron oxidation mottled throughout. Firm/dense. Weakly friable. Black organic stringers common. Black carbonaceous material coating bedding planes at 18.9' and 19.0'. Moist.
5906		20			No recovery.
5905		21			CLAYSTONE: Claystone, light brownish gray (10YR6/2) to gray (10YR6/1). Massive texture, firm/dense. Trace overall iron oxidation. Weak iron oxidation from 21.7' to 22.0'. Trace black organic stringers. Moisture decreases to slightly moist.
5904		22			CLAYSTONE: Claystone, gray (10YR5/1) to dark gray (10YR4/1).

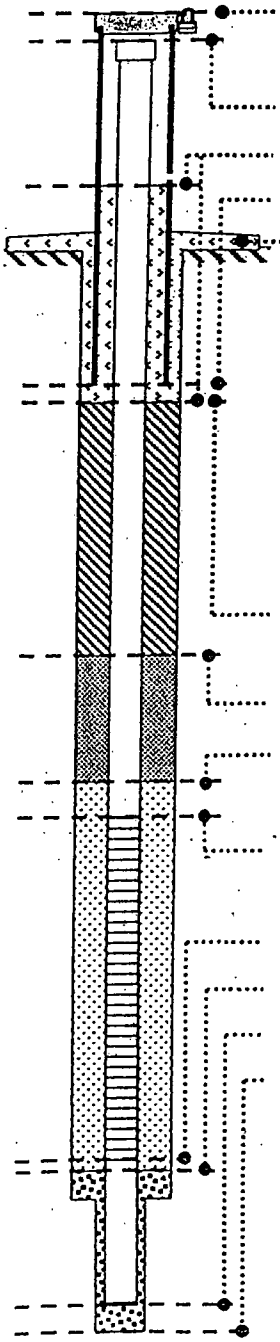
Elev (Ft)	Well or Piezometer Construction and Materials	Depth (Ft)	Lithology	Unified Soils Classification or Rock Type	Lithologic Description
5903		23			Un-oxidized bedrock. Notable color change. Massive texture, firm/dense. Trace black organic material. Moisture decreases to very slightly moist. Abrupt color change at base.
5902		24			CLAYSTONE: Claystone, dark gray (10YR4/1) to very dark gray (10YR3/1). Un-oxidized, un-weathered bedrock. Fissile/friable. Black carbonaceous material common. Decreasing moisture.
5901		25			
5900	Threaded End Cap - Sump, Sch 40-PVC	26			No recovery.
5899	Bentonite Pellet Backfill in Pilot Hole	27			CLAYSTONE: Claystone, dark gray (10YR4/1) to very dark gray (10YR3/1). Un-oxidized, un-weathered bedrock. Fissile/friable. Black carbonaceous material common. Abundant black carbonaceous material from 27.0' to 27.7'. Moisture decreases to trace. Refusal at 27.7'.

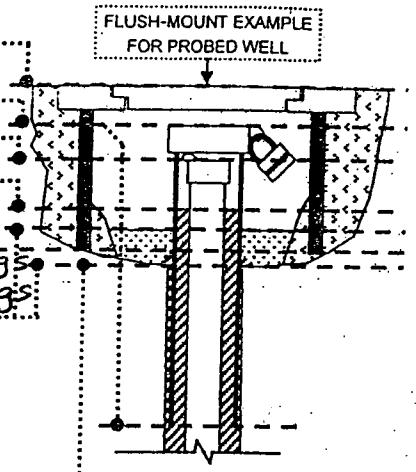
MONITORING WELL INSTALLATION REPORT: Form PRO.118

LOCATION CODE: 73/05 PROJECT NAME: CY05 Well Installation PROGRAM: Present Landfill
SCREENED FORMATION: Al/Bdrk. DRILLING CONTRACTOR: Layne BORING METHOD: Hollow Stem Auger
DATE DRILLED: 6/23/05 DATE COMPLETED: 6/27/05 TOTAL DEPTH: 27.7' COMPLETED DEPTH: 26.0
ESTIMATED DEPTH TO BEDROCK: 12.5' RIG GEOLOGIST: E. Warp LOGGING GEOLOGIST: E. Warp
BOREHOLE DIAMETER IN SCREENED INTERVAL: 8" QUANTITY OF FLUIDS LOST DURING DRILLING: N/A
INITIAL WATER LEVEL (FT, DATE): Dry, 6/23/05 COMPLETED WATER LEVEL (FT, DATE): 25.33', 6/27/05 - Possibly H_2O used to hydrate seal.
DIAMETER & TYPE OF INSTALLATION (WELL/PIEZOMETER/WELL POINT/ETC.): 2.0" PVC Well
TYPE OF PROTECTION (FLUSH-MOUNT VS. ABOVE GROUND, ASEPTIC, ETC.): Above Ground Steel Protective Casing

ALL MEASUREMENTS WILL BE MADE IN FEET FROM GROUND SURFACE

* DENOTES ITEMS THAT MAY NOT BE APPLICABLE, DEPENDING ON BORING METHOD, WELL PROTECTION & PURPOSE





PROTECTIVE CASING TOP (STICKUP OR FLUSH-MOUNT): 3.35' ags
*SECONDARY CASING TOP: N/A BOTTOM: N/A TYPE: N/A
SURFACE CASING TOP: 2.7' ags ID (IN): 2.0
SURFACE SEAL TOP: 0.4' ags BOTTOM: 0.1' bgs TYPE: Concrete
PROTECTIVE CASING BOTTOM, ID (IN), TYPE: 1.65', 5"x5" Square Steel
*WELL PAD DIMENSIONS, TYPE: 3'x3', Concrete top 0.4' ags btm 0.1' bgs
*ADD'L CASING FILL TOP: N/A BOTTOM: N/A TYPE: N/A
*SURFACE ISOLATION CASING TOP: N/A BOTTOM: N/A
*SURFACE ISOLATION CASING ID (IN): N/A TYPE: N/A
*OTHER (E.G., ASEPTIC) CASING TOP: N/A BOTTOM: N/A
*OTHER CASING ID (IN): N/A TYPE, PURPOSE: N/A
*CENTRALIZER(S) OD (IN): N/A NUMBER USED: N/A TYPE: N/A
*CENTRALIZER(S) DEPTH(S): N/A
*GROUT TOP: N/A MEASURED DENSITY (LBS/GAL): N/A TYPE: N/A
*GRANULAR BENTONITE TOP: N/A TYPE: N/A
*BENTONITE SEAL TOP: 0.1' TYPE: 1/4" bentonite pellets-BAROID - Hydrated with 5 gall. of distilled H_2O.
BENTONITE SEAL OR GRANULAR BENTONITE BOTTOM (= FILTER PACK TOP): 4.5'
FILTER PACK TYPE: 16/40 Silica Sand BRAND: C.S.S.I.
SURFACE CASING BOTTOM (=SCREEN TOP): 5.65' TYPE: Sch. 40 PVC
SCREEN ID (IN): 2.0 SLOT SIZE (IN): 0.01 TYPE: Sch. 40 PVC
SCREEN BOTTOM (= SUMP, TOP): 25.65' SUMP TYPE: Threaded End Cap-Sch. 40 PVC
FILTER PACK BOTTOM (= *BACKFILL TOP): 26.0' *BACKFILL TYPE: 1/4" bentonite pellets-BAROID
SUMP BOTTOM (= WELL COMPLETED DEPTH): 26.0' *PILOT HOLE TOP, DIAMETER: 26.0', 2.5"
TOTAL BOREHOLE DEPTH (= *PILOT HOLE AND *BACKFILL BOTTOM): 27.7'

REMARKS: Routine well installation on 6/23/05. Concrete well pad installed on 6/27/05.

COMPLETED BY: Ellen S. Warp DATE: 6/27/05
CHECKED BY: J. Baylor DATE: 6/30/05

U.S. DEPARTMENT OF ENERGY ROCKY FLATS PLANT

FORM PRO.101A

ROCKY FLATS ENVIRONMENTAL TECHNOLOGY SITE BOREHOLE LOG

PAGE 1 OF 3

Borehole Number: 73105
Location - North: _____ East: _____
Date: 6/23/05
Geologist: E. WARP
Drilling Equip.: CME-750-Hollow Stem Auger

Surface Elevation: _____
Area: Present Landfill
Total Depth: 27.7'
Company: URS/Layne
Project No.: ~~HAD51300~~ GR201400
Sample Type: Continuous Core- Split Spoon

RMRS LOGGING SUPERVISOR APPROVAL _____ DATE 6/29/05

TOP/BOTTOM OF CORE IN BOX	TOP/BOTTOM OF INTERVAL	FEET OF CORE IN INTERVAL (FIELD MEASUREMENT)	SAMPLE NUMBER	FRACTURE ANGLE	BEDDING ANGLE	GRAIN SIZE DISTRIBUTION	USCS SYMBOL	DEPTH IN FEET	SOIL/ LITHOLOGIC LOG	SAMPLE DESCRIPTION to clayey, gravelly sand 6/29/05
0.0	0.0	0.0					GP	0.0		0.0-0.2'- GRAVEL (FILL) - Pea gravel (1/4" dia. sub-rounded to sub-ang) composed of granite and qtzite. Poorly graded. DRY.
							CL	0.2		
							CL/SC	0.4'		0.2-0.4'- CLAY w/R sand and gravel. Grysh brn. (10YR 5/2 to Gry (10YR 5/1). Reworked claystone. Thin, blk. organic stringers common. MOIST.
	Run #1	Rec.=0.8'						0.8'		0.4-0.8'- Gravelly, sandy CLAY (1) Strong brn. (7.5YR 5/6). Imported fill (Qal$_{rf}$). 60% clay-med. plasticity. 30% sand (m.g. to c.g., sub-rounded to sub-ang.). 10% gravel (1/4" dia., sub-rounded to sub-ang.) V. MOIST
	2.0'						6/23/05	2		0.8-2.0'=No recovery
							CL/SC	2.9'		2.0-2.9'- Gravelly, sandy CLAY (1) Strong brn. (7.5YR 4/6). Imported fill (Qal$_{rf}$). V. similar to above fm. 0.4' to 0.8'. 65% clay (med.+ plasticity). 20-25% sand (m.g. to c.g., sub-ang. to sub-rounded). 10-15% gravel (1/8" to 1/4" dia., sub-rounded, predominately granite and qtzite.). SATURATED but not flowing.
	Run #2	Rec.=0.9'						3		2.9-4.0'=No recovery
	4.0'							4		4.0-5.2'- Gravelly, sandy CLAY (1) Strong brn. (7.5YR 4/6). Imported fill (Qal$_{rf}$). V. similar to above fm. 2.0' to 2.9'. 60% clay (med.+ plasticity). 25% sand (m.g. to c.g., sub-ang. to sub-rounded). 15% gravel (1/4" to 1/2" dia., sub-ang., composed of granite, qtzite and schist). SATURATED
							CL/SC	6/23/05 5		
	Run #3	Rec.=1.2'						5.2'		5.2-6.0'=No recovery
	6.0'							6		6.0-6.35'- GRAVEL w/R sandy clay. Strong brn. (7.5YR 4/6) clay. Appears to be pea-gravel (possible slough?) gravel (1/4-3/4" dia., sub-rounded to sub-ang). Poorly graded. Decrease moisture fm. Saturated to MOIST.
							GP	6.35		
							CL GC	6.9 7		6.35-6.9'- Gravelly, sandy CLAY and shattered qtzite cobble mixture. (45% gravelly, sandy CLAY (Lt. brn. 7.5YR 6/4) w/45% shattered cobbles (1/2" to 1 1/2" dia., ang.). MOIST. 110%
	Run #4	Rec.=0.9'								
	8.0'							8		6.9-8.0'=No recovery
							CL GC	9		8.0-9.6'- Sandy CLAY/GRAVEL mixture. Strong brn. (7.5YR 5/6) clay. 60-70% gravel and cobbles. 20-30% clay (med. plasticity). 5-10% sand (c.g., sub-ang.) Shattered qtzite. cobble fm. 8.4-8.6' (2" dia.) and fm. 9.2-9.5' (2-3" dia). MOIST.
	Run #5	Rec.=1.6'						9.6'		
	10.0'							10.0'		No recovery

Box #1 (0.0 → 15.1')

NOTES: General: USCS is modified for this log as follows:
Materials amounts are estimated by % volume instead of % weight.
(1) Badly broken core, accurate footage measurements not possible.
(2) Core breaks cannot be matched, accurate footage measurements not possible.

Procedure No. RMRS/OPS-PRO.101
Revision 0
Date effective: 12/31/98

(4011-930-0134-930)(Form GT.1A)(03/01/92)

U.S. DEPARTMENT OF ENERGY ROCKY FLATS PLANT

FORM PRO.101A

ROCKY FLATS ENVIRONMENTAL TECHNOLOGY SITE BOREHOLE LOG

PAGE 2 OF 3

Borehole Number: 73105
Location - North: _____ East: _____
Date: 6/23/05
Geologist: E. WARP
Drilling Equip.: CME-750 - Hollow Stem Auger

Surface Elevation: _____
Area: Present Landfill
Total Depth: 27.7'
Company: URS/Layne
Project No.: ~~HA051300~~ ER201400 ESW 6/23/05
Sample Type: Continuous Core - Split Spoon

RMRS LOGGING SUPERVISOR APPROVAL: [signature]

DATE 6/29/05

TOP/BOTTOM OF CORE IN BOX	TOP/BOTTOM OF INTERVAL	FEET OF CORE IN INTERVAL (FIELD MEASUREMENT)	SAMPLE NUMBER	FRACTURE ANGLE	BEDDING ANGLE	GRAIN SIZE DISTRIBUTION	USCS SYMBOL	DEPTH IN FEET	SOIL/LITHOLOGIC LOG	SAMPLE DESCRIPTION
	10.0 Run #6 12.0	Rec = 1.9'					CL / GC	10.0 11 11.9'		10.0-11.9' - Sandy CLAY/GRAVEL mixture. Strong brn. (7.5YR5/6). 50% clay (med. plasticity). 30% gravel (1/8-3/4" dia., sub-ang.). ~20% sand (c.g.). Cobbles of qtzite (1-2" dia.) @ 11.2' and 11.7'. MOIST.
										11.9-12.0' = No recovery
							CL / GC	12 12.15'		12.0-12.15' - Sandy CLAY/GRAVEL mixture. Same as above fm. 10.0-11.9'.
	Run #7 14.0'	Rec = 0.3'		Bdrk Contact @ 12.5' (estimated)			CL	12.3' 12.5 13		12.15-12.3' - Silty CLAY. Gry. (10YR 6/1). Reworked silty claystone. Poor recovery due to clogged split spoon sampler producing "ribbons" of claystone. MOIST. Probable cobble lodged in sampler.
										12.3-14.0' = No recovery.
										Bedrock contact (estimated) @ 12.5' (Bdrk. contact estimated by drilling conditions/changes in penetration)
	Run #8 16.0'	Rec = 1.3'						14 15 15.3'		14.0-15.3' - Silty CLAYSTONE (Weathered Bedrock). Gry'sh brn. (10YR5/2) w/some yellowish brn. (10YR5/6) mottling. Massive texture. Firm and cohesive. Wk. to moderately friable. Wk. FeOx'n mottled throughout. Tr blk. organic material. MOIST.
										15.3-16.0' = No recovery
	Run #9 18.0	Rec = 1.8'						16 16.2 16.3 16.6' 17 17.8'		16.0-16.6' - Silty CLAYSTONE - FeOx'd - Yell'sh brn. (10YR5/4) grading to Gry (10YR5/1) @ base of interval. Mod. perv. FeOx'n fm. 16.0-16.3' then decrsing @ base. Massive texture. Wk. to moderately friable. SATURATED fm. 16.0-16.2' decreasing to moist fm. 16.2-16.3'. w/silt [initials] 6/29/05
										moisture between 16.3 - 16.6'?
	Run #10 20.0'	Rec = 1.7'						18 19 19.7' 20.0		16.6-17.0' - CLAYSTONE w/silt [initials] 6/29/05 FeOx'd - Yell'sh brn. (10YR5/8). Strong perv. FeOx'n. Firm and dense. Blk. organic material commen as stringers and along undulating bedding planes. MOIST.
										17.0-17.8 - CLAYSTONE w/silt [initials] 6/29/05 Gry'sh brn. (10YR5/2) w/some yell'sh brn. (10YR5/6) mottling. Decr. overall FeOx'n to wk.-mottled. Firm. Wkly. friable. Blk. organic stringers commen. Faint bedding visible. MOIST.

NOTES: General: USCS is modified for this log as follows:
Materials amounts are estimated by % volume instead of % weight.
(1) Badly broken core, accurate footage measurements not possible.
(2) Core breaks cannot be matched, accurate footage measurements not possible.

Procedure No. RMRS/OPS-PRO.101
Revision 0
Date effective: 12/31/98
Page 27 of 28

17.8-18.0' = No recovery
18.0 → 20.0 logged on page 3.

14011-930-0134-930X (Form GT.1A)(03/01/92)

ROCKY FLATS ENVIRONMENTAL TECHNOLOGY SITE BOREHOLE LOG

Borehole Number: 73105
Location - North: _____ East: _____
Date: 6/23/05
Geologist: E. Warp
Drilling Equip.: CME-750 - Hollow Stem Auger

Surface Elevation: _____
Area: Present Landfill
Total Depth: 27.7'
Company: URS/Layne
Project No. HAD51300 GR201400 ESW 6/23/05
Sample Type: Continuous Core - Split Spoon

RMRS LOGGING SUPERVISOR APPROVAL [signature]

DATE 6/29/05

TOP/BOTTOM OF CORE IN BOX	TOP/BOTTOM OF INTERVAL	FEET OF CORE IN INTERVAL (FIELD MEASUREMENT)	SAMPLE NUMBER	FRACTURE ANGLE	BEDDING ANGLE	GRAIN SIZE DISTRIBUTION	USCS SYMBOL	DEPTH IN FEET	SOIL/LITHOLOGIC LOG	SAMPLE DESCRIPTION
	20.0							20.0		w/tr-some silt [initials] 6/29/05
	Run #11	Rec = 2.0'						21		18.0-19.7' - CLAYSTONE, Gry (10YR 5/1) with Yellish brn. (10YR 5/4) mottling. Wk. FeOxn mottled throughout. Firm/dense. Wkly. friable. Blk. organic stringers commen. Blk. carbonaceous material coating bedding planes @ 18.9' and 19.0'. MOIST.
	22.0'							22		19.7-20.0' = No recovery
	Run #12	Rec = 2.0'						22.3'		20.0-22.3 - CLAYSTONE, Lt. brn'sh gry. (10YR 6/2) to gry (10YR 6/1). Massive texture. Firm/dense. Tr overall FeOxn. Wk FeOxn fm. 21.7-22.0'. Tr blk organic stringers. Decrease moisture to SL. MOIST.
	24.0'							23		22.3-24.0' - CLAYSTONE. Gry (10YR 5/1) to Dk. Gry (10YR 4/1). Un-oxidized bedrock. Noteable color change. Massive texture. Firm/dense. Tr blk. organic material. Decrease moisture to V. slightly moist. Abrupt color change @ base.
	Run #13	Rec = 1.7'						24		24.0 → 27.7' - CLAYSTONE. Dk. Gry (10YR 4/1) to V. dk. gry (10YR 3/1). Un-oxidized, un-weathered bedrock. Fissile/friable. Blk. carbonaceous material commen. Abundant blk carbonaceous material fm. 27.0' to 27.7'. Decr. moisture to Tr. [initials] 6/29/05
	26.0'							25.7'		
	Run #14	Rec = 1.7'						26		No recovery fm. 25.7 → 26.0'.
	27.7'							27		REFUSAL @ 27.7'
								27.7'		T.D. @ 27.7'
								28		
								29		
								30.0		

NOTES: General: USCS is modified for this log as follows:
Materials amounts are estimated by % volume instead of % weight.
(1) Badly broken core, accurate footage measurements not possible.
(2) Core breaks cannot be matched, accurate footage measurements not possible.

(4011-930-0134-930) Form GT.1A (03/01/92)

STATE PLANE COORDINATES AREA: GRND ELEV. (FT):5937.12 CASING DIA (IN): 2
NORTH: 752767.53 TOTAL DEPTH (FT): 32.0 BH DIA. (IN): 8
EAST: 2084218.33 COMPLETION DATE: 6/27/05 GRID LOCATOR:
PROJECT: Present Landfill GEOLOGIST: E. Warp
REMARKS:

LOG OF BORING NUMBER: 73205

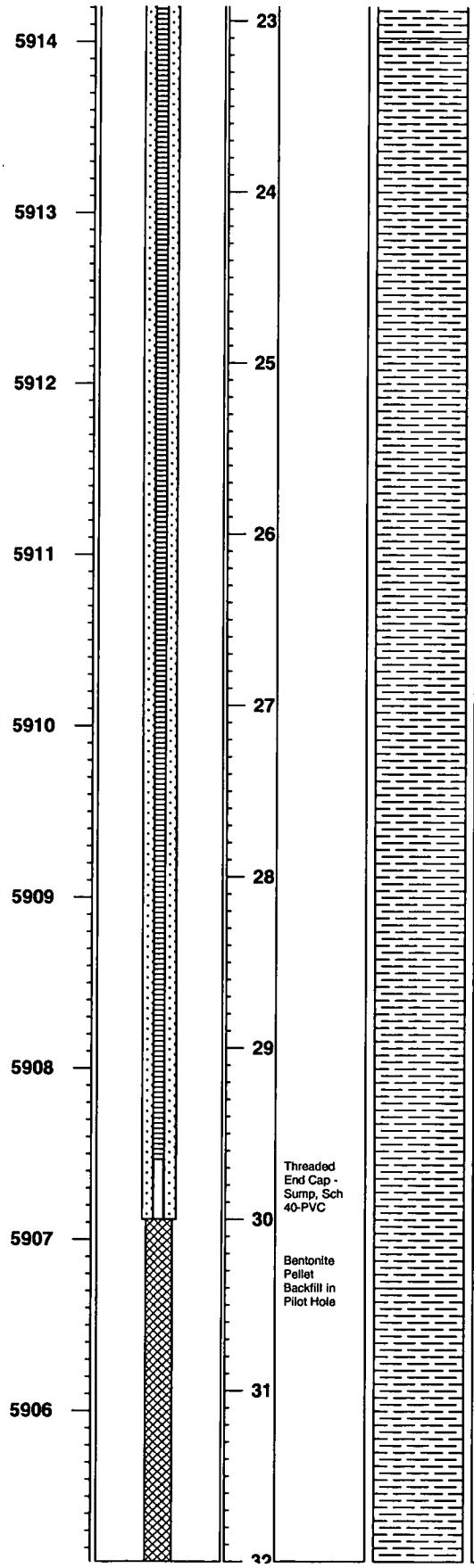
Elev (Ft)	Depth (Ft)	Well or Piezometer Construction and Materials	Lithology	Unified Soils Classification or Rock Type	Lithologic Description
5940	3	Protective Casing, 5 in. square, Steel			
		Casing, Sch 40-PVC, 2 in. ID.			
5939	2				
5938	1				
		Concrete Seal			
5937	0	Concrete Pad			CL: Clay with silt, trace gravel, and trace sand, brown (7.5YR4/3). Medium plasticity and firm. Trace to 3% disseminated caliche. Trace roots. Schist cobble (3/4" diameter, subangular) at 0.3'. Slightly moist to moist.
5936	1				
					No recovery.
5935	2	Hydrated Bentonite Chips			CL: Clay with silt, trace gravel, and trace sand, brown (7.5YR4/4 to 7.5YR4/2). Medium plasticity and firm. Same as interval from 0.0' to 1.5'. Slightly moist.
5934	3				GC/CL: Sandy Gravel/Clay mixture, brown (7.5YR4/4). ~75% sandy gravel and ~25% clay. Gravel (1/4" - 1" diameter, subangular to subrounded, predominately quartzite). Sand (coarse grained, subangular). Weak iron oxidation disseminated throughout clay and as coating on 1/4" gravel clasts. Trace disseminated caliche. 2" diameter quartzite cobble at 2.4'. Shattered quartzite cobble from 3.0' to 3.2'. Poor recovery due to cobbles. Slightly moist.
					No recovery.
5933	4	Filter Pack, 16/40 Silica Sand			CL: Sandy, Gravelly Clay, brown (7.5YR4/4). 5 - 10% gravel (1/4" - 1/2" diameter, subrounded to subangular, predominately quartzite). 5 - 7% sand (coarse grained, subangular). Clay has medium
		Screen, Sch 40-PVC, 2 in. ID., 0.010 in.			

Elev (Ft)	Well or Piezometer Construction and Materials	Depth (Ft)	Lithology	Unified Soils Classification or Rock Type	Lithologic Description
					plasticity. Moisture increases from slightly moist to moist.
5932	slots	5			CLAYSTONE: TOP OF BEDROCK. Claystone, grayish brown (10YR5/2) to gray (10YR5/1). Firm/dense. Black organic stringers common on undulating bedding planes. 1/4" caliche lense at base of interval. Sharp basal contact, color change. Moist.
5931		6			CLAYSTONE: Claystone, iron-oxidized/weathered, yellowish brown (10YR4/6). Moderate to strong pervasive iron oxidation. Moderately friable. 1/4" caliche lense at top of interval and as blebs throughout. Moist.
					CLAYSTONE: Silty Claystone, gray (10YR6/1). Dinstinct color change. Massive texture. Caliche mottled throughout. Friable. Moisture decreases to very slightly moist.
5930		7			No recovery.
					CLAYSTONE: Claystone, iron oxidized/weathered, yellowish brown (10YR5/6 to 10YR5/4). Weak pervasive iron oxidation. Weak to moderately friable. Trace white caliche stringers. Thin caliche lense at 6.8'. Slightly moist.
5929		8			CLAYSTONE: Claystone, grayish brown (10YR5/2). Decreased iron oxidation to trace as stringers. Moderately friable. Massive texture. Slightly moist.
					No recovery.
5928		9			CLAYSTONE: Silty Claystone, iron oxidized, yellowish brown (10YR5/4). Weak to moderate pervasive iron oxidation. Massive texture. Weak to moderately friable. Black manganese oxide (possible organics) bleb at 8.2'. Slightly moist.
5927		10			CLAYSTONE: Claystone, gray (10YR5/1). Decreased iron oxidation to trace. Massive texture, firm yet weakly friable. Trace black organic stringers throughout. Black organic lense (1/8" thick) at 11.2'. Trace iron oxidation stringers from 11.2' to 12.0'. Moisture decreases to very slightly moist. Hard, cryptocrystalline calcareous clast (~3/8") at 9.9'.
5926		11			
5925		12			CLAYSTONE: Claystone, gray (10YR6/1). Massive texture, dense/firm, weakly friable. Trace to some iron oxidation. Abundant black organic material from 12.8' to 13.0'. Very slightly moist.
5924		13			CLAYSTONE: Claystone with silt, gray (10YR6/1). Massive texture as above interval from 12.0' to 13.3'. Un-oxidized bedrock. Trace black organic stringers. Firm/dense. Thin caliche lense along

Elev (Ft)	Well or Piezometer Construction and Materials	Depth (Ft)	Lithology	Unified Soils Classification or Rock Type	Lithologic Description
		14			internal bedding plane at 13.7'. Very slightly moist.
5923					
5922		15			CLAYSTONE: Silty Claystone, gray (10YR6/1). Weak iron oxidation along horizontal bedding planes. Predominately massive texture, firm/dense. Trace black organic stringers and blebs. Weak to moderate pervasive iron oxidation from 17.3' to 17.7'. Near-vertical fracture (~80 deg) from 18.9' to 19.5' with iron oxide coating. 1/4" horizontal lense of carbonate (druse) at 19.7'. Interval slightly moist. Occasional sandy intervals at 17.1', and from 17.6' to 17.7'. Claystone interval from 18.8' to 19.1'. Rip-up clasts, iron oxide-replaced organic debris present. Sand is very fine grained to fine grained.
5921		16			
5920		17			
5919		18			
5918		19			
5917		20			
5916		21			CLAYSTONE: Claystone, grayish brown (10YR5/2). Weak iron oxidation as stringers and along bedding planes. Black organic material along bedding planes. Possible manganese oxide associated with iron oxidation along bedding and fracture surfaces. Dense/firm. Slightly moist.
5915		22			CLAYSTONE: Claystone, gray (10YR6/1 to 10YR5/1). Trace weak iron oxidation as stringers and along bedding/fracture surfaces. Iron oxidation as fracture (~50 deg) coating at 22.6'. Interval weak to moderately friable. Massive texture. Slightly moist.

Elev (Ft)	Well or Piezometer Construction and Materials	Depth (Ft)	Lithology	Unified Soils Classification or Rock Type	Lithologic Description

LOG OF BORING NUMBER: 73205



CLAYSTONE: Claystone, dark gray (10YR4/1). Firm/dense. Trace iron oxidation along bedding planes/fracture surfaces. Bedding planes are faintly visible. Trace black organic material along bedding and as clasts (to 1/2" diameter). Slightly moist from 23.1' to 24.2', decreases to trace moisture from 24.2' to 30.4'. Weak pervasive iron oxidation from 29.1' to 29.3'.

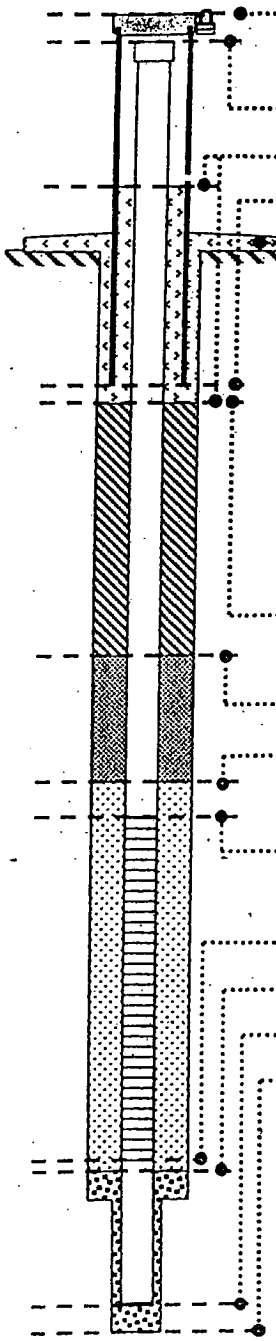
CLAYSTONE: Claystone, un- (iron) oxidized/un-weathered, very dark gray (10YR3/1). Distinct color change. Firm and dense. Trace iron oxidation stringers from 31.8' to 31.9'. Sub-horizontal, undulating bedding faintly visible. Black organic material common along bedding planes and as clasts (to 1/2" diameter). Trace moisture.

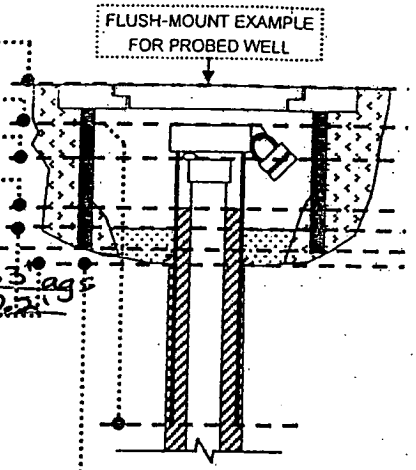
MONITORING WELL INSTALLATION REPORT: Form PRO.118

LOCATION CODE: 73205 PROJECT NAME: CY05 WELL INSTALLATION PROGRAM: PRESENT LANDFILL
SCREENED FORMATION: Al/Bdrk. DRILLING CONTRACTOR: Layne BORING METHOD: Hollow Stem Auger
DATE DRILLED: 6/21/05 DATE COMPLETED: 6/27/05 TOTAL DEPTH: 32.0' COMPLETED DEPTH: 30.0'
ESTIMATED DEPTH TO BEDROCK: 4.2' RIG GEOLOGIST: E. WARP LOGGING GEOLOGIST: E. WARP
BOREHOLE DIAMETER IN SCREENED INTERVAL: 8" QUANTITY OF FLUIDS LOST DURING DRILLING: N/A
INITIAL WATER LEVEL (FT, DATE): Dry, 6/21/05 COMPLETED WATER LEVEL (FT, DATE): Dry, 6/27/05
DIAMETER & TYPE OF INSTALLATION (WELL/PIEZOMETER/WELL POINT/ETC.): 2.0" PVC WELL
TYPE OF PROTECTION (FLUSH-MOUNT VS. ABOVE GROUND, ASEPTIC, ETC.): ABOVE GROUND STEEL PROTECTIVE CASING

ALL MEASUREMENTS WILL BE MADE IN FEET FROM GROUND SURFACE

* DENOTES ITEMS THAT MAY NOT BE APPLICABLE, DEPENDING ON BORING METHOD, WELL PROTECTION & PURPOSE





PROTECTIVE CASING TOP (STICKUP OR FLUSH-MOUNT): 3.1' ags.
*SECONDARY CASING TOP: N/A BOTTOM: N/A TYPE: N/A
SURFACE CASING TOP: 2.3' a.g.s. ID (IN): 2.0
SURFACE SEAL TOP: 0.3' ags BOTTOM: 0.2' bgs TYPE: CONCRETE
PROTECTIVE CASING BOTTOM, ID (IN), TYPE: 1.9', 5"x5" square steel
*WELL PAD DIMENSIONS, TYPE: 3'x3' square, concrete top 0.3' ags bottom 0.2'
*ADD'L CASING FILL TOP: N/A BOTTOM: N/A TYPE: N/A
*SURFACE ISOLATION CASING TOP: N/A BOTTOM: N/A
*SURFACE ISOLATION CASING ID (IN): N/A TYPE: N/A
*OTHER (E.G., ASEPTIC) CASING TOP: N/A BOTTOM: N/A
*OTHER CASING ID (IN): N/A TYPE, PURPOSE: N/A
*CENTRALIZER(S) OD (IN): N/A NUMBER USED: N/A TYPE: N/A
*CENTRALIZER(S) DEPTH(S): N/A
*GROUT TOP: N/A MEASURED DENSITY (LBS/GAL): N/A TYPE: N/A
*GRANULAR BENTONITE TOP: N/A TYPE: N/A
*BENTONITE SEAL TOP: ~~0.3'~~ 0.2' TYPE: Med. bentonite chips - Enviroplug } Hydrated with 5 gall. of dist. H_2O
BENTONITE SEAL OR GRANULAR BENTONITE BOTTOM (= FILTER PACK TOP): 4.0'
FILTER PACK TYPE: 16/40 Silica Sand BRAND: C.S.S.I.
SURFACE CASING BOTTOM (=SCREEN TOP): 4.55 TYPE: SCH. 40-PVC
SCREEN ID (IN): 2.0 SLOT SIZE (IN): 0.01 TYPE: SCH. 40-PVC
SCREEN BOTTOM (= SUMP, TOP): 29.65 SUMP TYPE: THREADED END CAP - SCH 40-PVC
FILTER PACK BOTTOM (= *BACKFILL TOP): 30.0 *BACKFILL TYPE: Med. bentonite pellets
SUMP BOTTOM (= WELL COMPLETED DEPTH): 30.0' *PILOT HOLE TOP, DIAMETER: 30.0', 2.5"
TOTAL BOREHOLE DEPTH (= *PILOT HOLE AND *BACKFILL BOTTOM): 32.0'

REMARKS: Routine well installation (6/21/05). Concrete pad installed on 6/27/05.

COMPLETED BY: Ellen S. Warp DATE: 6/27/05
CHECKED BY: J. Baylor DATE: 6/30/05

U.S. DEPARTMENT OF ENERGY ROCKY FLATS PLANT

FORM PRO.101A

ROCKY FLATS ENVIRONMENTAL TECHNOLOGY SITE BOREHOLE LOG

PAGE 1 OF 4

Borehole Number: 73205
Location - North: East:
Date: 6/21/05
Geologist: E. WARP
Drilling Equip.: CME-750 Hollow Stem Auger

Surface Elevation:
Area: Present Landfill
Total Depth: 32.0'
Company: URS/Layne
Project No.: ~~HAD51300~~ GR201400 ESW 6/28/05
Sample Type: Cont. core - split spoon

RMRS LOGGING SUPERVISOR APPROVAL

DATE 6/29/05

TOP/BOTTOM OF CORE IN BOX	TOP/BOTTOM OF INTERVAL	FEET OF CORE IN INTERVAL (FIELD MEASUREMENT)	SAMPLE NUMBER	FRACTURE ANGLE	BEDDING ANGLE	GRAIN SIZE DISTRIBUTION	USCS SYMBOL	DEPTH IN FEET	SOIL/LITHOLOGIC LOG	SAMPLE DESCRIPTION
0.0	0.0	0.0						0.0		0.0-1.5' - CLAY w/ tr gravel and tr sand. Brn. (7.5YR 4/3). Med. plasticity and firm. Tr-3% diss. caliche. Tr roots. Cobble of schist (3/4" dia., sub-ang.) @ 0.3'. Sl. moist to moist.
	Run #1	Rec.=1.5'					CL	1		1.5-2.0' = No recovery silt, 6/29/05
	2.0'							1.5'		2.0-2.4' - CLAY w/ tr gravel and tr sand. Brn. (7.5YR 4/4 to 7.5YR 4/2). Med. plasticity and firm. (Same as 0.0-1.5'). Sl. moist
							CL	2		
	Run #2	Rec.=1.2'					GC CL	2.4'		2.4-3.2' - Sandy GRAVEL/CLAY Mixture. Brn. (7.5YR 4/4). ~75% sandy GRAVEL and ~25% clay. Gravel (1/4-1" dia.; sub-ang. to sub-rounded, predominately qtzite). Sand (c.g., sub-ang.). Wk. FeOxn diss. throughout clay and as coating on 1/4" gravel clasts. Tr diss. caliche. 2" dia. qtzite cobble at 2.4'. Shattered qtzite cobble fm. 3.0-3.2'. Poor recovery due to cobbles. Sl. moist.
	4.0'			Bedrock Contact @ 4.2'				3		
								3.2'		3.2-4.0' = No recovery
							CL	4		4.0-4.2' - Sandy, gravelly CLAY. Brn. (7.5YR 4/4). 5-10% gravel (1/4-1/2" dia., sub-rounded to sub-ang. pred. qtzite). 5-7% sand (c.g., sub-ang.). Clay has med. plasticity, Incr'd moisture fm. Sl. moist to moist. Bedrock Contact @ 4.2'
								4.2'		
	Run #3	Rec.=1.7'						4.7'		4.2-4.7' - CLAYSTONE (Bedrock). Gry'sh Brn. (10YR 5/2) to Gry. (10YR 5/1). Firm/dense. Blk. organic stringers common on undulating bedding planes. 1/4" Caliche lense at base of interval. MOIST. Sharp basal contact, color change. 6/29/05
								5		
								5.7'		
	6.0'							6		
								6.8'		
								7		4.7-5.0' - CLAYSTONE - FeOxd/weathered. Yellsh. brn. (10YR 4/6). Mod. to strng. perv. FeOxn. Mod. friable. 1/4" caliche lense @ top of interval and as blebs throughout. MOIST.
	Run #4	Rec.=1.7'						7.7'		
	8.0'							8		5.0-5.7' - ~~CLAYSTONE~~ SILTY CLAYSTONE. Gry (10YR 6/1). Distinct color change. Massive texture. Caliche mottled throughout. Friable. Decrease moisture to V. slightly moist. 6/21/05
								8.3		
								9		5.7-6.0 = No recovery
	Run #5	Rec.=2.0'								6.0-7.0' - CLAYSTONE - FeOxd/weathered. Yellsh Brn. (10YR 5/6 to 5/4). Wk. perv. FeOxn. Wk. to moderately friable. Tr wht. caliche stringers.
	10.0'							10.0'		

Box #1 (0.0 → 10.0')

NOTES: General: USCS is modified for this log as follows:
Materials amounts are estimated by % volume instead of % weight.
(1) Badly broken core, accurate footage measurements not possible.
(2) Core breaks cannot be matched, accurate footage measurements not possible.

Procedure No. RMRS/OPS-PRO.101
Revision 0
Date effective: 12/31/98
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14011-930-0134-930X(Form GT.1A)(03/01/92)

Thin caliche lense @ 6.8'. Sl. MOIST.
(See page 2 for 7.0'-10.0' description)

U.S. DEPARTMENT OF ENERGY ROCKY FLATS PLANT FORM PRO.101A

ROCKY FLATS ENVIRONMENTAL TECHNOLOGY SITE BOREHOLE LOG

PAGE 2 OF 4

Borehole Number: 73205
Location - North: _____ East: _____
Date: 6/21/05
Geologist: E. WARP
Drilling Equip. CME-750-Hollow Stem Auger

Surface Elevation: _____
Area: Present Landfill
Total Depth: 32.0'
Company: URS/Layne Project No.: ~~HA051300~~ GR201400 ESW 6/21/05
Sample Type: Cont. core-split spoon

RMRS LOGGING SUPERVISOR APPROVAL [signature] DATE 6/29/05

TOP/BOTTOM OF CORE IN BOX	TOP/BOTTOM OF INTERVAL	FEET OF CORE IN INTERVAL (FIELD MEASUREMENT)	SAMPLE NUMBER	FRACTURE ANGLE	BEDDING ANGLE	GRAIN SIZE DISTRIBUTION	USCS SYMBOL	DEPTH IN FEET	SOIL/LITHOLOGIC LOG	SAMPLE DESCRIPTION
Box #2 (10.0→18.0')	10.0' Run #6 12.0'	Rec.= 2.0'						10.0' 11 12		7.0-7.7 - CLAYSTONE, Gry'sh Brn. (10YR5/2). Decr. FeOx'n to Tr as stringers. Mod. friable. Massive texture. Sl. moist. 7.7-8.0 = No recovery. 8.0-8.3' - Silty CLAYSTONE - FeOx'd. Yell'sh brn. (10YR5/4). Wk to mod. perv. FeOx'n. Massive texture. Wk. to moderately friable. Blk. MnOx (possible organics) bleb @ 8.2'. Sl. moist. 8.3-12.0' - CLAYSTONE - Gry (10YR5/1). Decr. FeOx'n to Tr. Massive texture. Firm yet wkly. friable. Tr blk. organic stringers throughout. Blk. organic lense (1/8" thick) @ 11.2'. Tr FeOx'n stringers fm. 11.2 to 12.0. Decr. moisture to V. sl. moist. Had. cryptocrystalline calcareous clast ~3/8" @ 9.9'. 6/29/05.
	Run #7 14.0'	Rec.= 2.0'						13 13.3		12.0-13.3' - CLAYSTONE - Gry (10YR6/1). Massive texture. Dense/firm, wkly friable. Tr to some FeOx'n. Abundant blk. organic material fm. 12.8 to 13.0'. V. sl. moist. 6/29/05
	Run #8 16.0'	Rec.= 2.0'						14 15		13.3-15.0' - CLAYSTONE w/silt - Gry (10YR6/1). Massive texture as above fm. 12.0-13.3'. Un-oxd bedrock. Tr blk. organic stringers. Firm/dense. Thin caliche lense along internal bedding plane @ 13.7'. V. sl. moist.
	Run #9 18.0'	Rec.= 2.0'						16 17		15.0-20.8' - Silty CLAYSTONE, Gry (10YR6/1). Wk. FeOx'n along horizontal bedding planes. Predominately massive texture. Tr blk. organic stringers and blebs. Firm/dense. Wk. to mod. perv. FeOx'n fm. 17.3 to 17.7'. Near vertical fracture (~80°) fm. 18.9 to 19.5' with FeOx coating. 1/4" horizontal lense of carbonate (druse) @ 19.7'. Interval Sl. MOIST. Occ. sandy intervals, as at 17.1', 17.6-17.7' and claystone intervals, as at 18.8-19.1'. Rip-up clasts, Fe ox. replaced organic debris present. Sand is vfg-fg.
18.0'	Run #10	Rec.= 2.0'						18 19 20.0		6/29/05

NOTES: General: USCS is modified for this log as follows:
Materials amounts are estimated by % volume instead of % weight.
(1) Badly broken core, accurate footage measurements not possible.
(2) Core breaks cannot be matched, accurate footage measurements not possible.

Procedure No. RMRS/OPS-PRO.101
Revision 0
Date effective: 12/31/98
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(4011-930-0134-930)(Form GT.1A)(03/01/92)

ROCKY FLATS ENVIRONMENTAL TECHNOLOGY SITE BOREHOLE LOG

Borehole Number: 73205
Location - North: _____ East: _____
Date: 6/21/05
Geologist: E. Warp
Drilling Equip. CME-750-Hollow Stem Auger

Surface Elevation: _____
Area: Present Landfill
Total Depth: 32.0'
Company: URS/Layne
Project No. ~~HAD51300~~ GR201400 ESW 6/21/05
Sample Type: Continuous Core-Split spoon

RMRS LOGGING SUPERVISOR APPROVAL [signature]

DATE 6/29/05

TOP/BOTTOM OF CORE IN BOX	TOP/BOTTOM OF INTERVAL	FEET OF CORE IN INTERVAL (FIELD MEASUREMENT)	SAMPLE NUMBER	FRACTURE ANGLE	BEDDING ANGLE	GRAIN SIZE DISTRIBUTION	USCS SYMBOL	DEPTH IN FEET	SOIL/LITHOLOGIC LOG	SAMPLE DESCRIPTION
Box #3 (18.0–26.8')	Run #11 22.0'	Rec. = 2.0'		~60°				20.0 20.8' 21 21.6' 22		20.0-20.8- See previous page for description. Silty CLAYSTONE
	Run #12 24.0	Rec. = 2.0'		~50°				22.6 23 23.1		20.8-21.6'-CLAYSTONE-Gry'sh Brn (10YR 5/2) Wk. FeOx'n as stringers and along bedding planes. Blk. organic material along bedding planes. Poss. MnOx associated w/ FeOx'n along bedding surfaces planes. Dense/firm. Sl. moist. fracture 6/29/05
	Run #13 26.0'	Rec. = 1.6'		~80°				24 25 26		21.6-23.1-CLAYSTONE-Gry (10YR 6/1 to 5/1). Tr Wk. FeOx'n as stringers and along bedding surfaces planes. FeOx'n as frac. (~50) coating @ 22.6. Interval wk-moderately friable. Massive texture. Slightly moist. fracture 6/29/05
26.8' Box #4 (26.8'-32.0')	Run #14 28.0'	Rec. = 2.0'		~70°				26.8' 27 28		23.1-30.4-CLAYSTONE-Dk. Gry (10YR 4/1) Firm/Dense. Tr FeOx'n along bedding planes. Bedding planes are faintly visible. Tr Blk. organic material along bedding and as clasts (to 1/2" diam.). Wk. perv. FeOx'n fm. 29.1-29.3. Slightly moist fm. 23.1-24.2', decr. to Tr moisture fm. ~~ESW 23.1~~ 24.2' to 30.4'. fracture surfaces. 6/29/05 6/21/05
	Run #15 30.0'	Rec. = 2.0'		~70°				29 30.0		

NOTES: General: USCS is modified for this log as follows:
Materials amounts are estimated by % volume instead of % weight.
(1) Badly broken core, accurate footage measurements not possible.
(2) Core breaks cannot be matched, accurate footage measurements not possible.

(4011-930-0134-930) Form GT.1A(03/01/92)

ROCKY FLATS ENVIRONMENTAL TECHNOLOGY SITE BOREHOLE LOG

Borehole Number: 73205
Location - North: _____ East: _____
Date: 6/21/05
Geologist: E. WARP
Drilling Equip.: CME-750-Hollow Stem Auger

Surface Elevation: _____
Area: Present Landfill
Total Depth: 32.0'
Company: URS/Layne
Project No. GR201400
Sample Type: Continuous Core - Split Spoon

RMRS LOGGING SUPERVISOR APPROVAL _____ DATE 6/29/05

TOP/BOTTOM OF CORE IN BOX	TOP/BOTTOM OF INTERVAL	FEET OF CORE IN INTERVAL (FIELD MEASUREMENT)	SAMPLE NUMBER	FRACTURE ANGLE	BEDDING ANGLE	GRAIN SIZE DISTRIBUTION	USCS SYMBOL	DEPTH IN FEET	SOIL/LITHOLOGIC LOG	SAMPLE DESCRIPTION
	30.0'							30.0'		30.0-30.4 - CLAYSTONE - SEE PREVIOUS PAGE FOR DESC.
Box #4 (cont.) (26.8-32.0')	Run #6	Rec. = 2.0'						30.4		30.4'-32.0' - CLAYSTONE - Un-FeOx'd/Un-weathered. V. Dk Gry (10YR 3/1). Firm and dense. Tr FeOx stringers @ 31.8-31.9'. Distinct color change. Sub-horizontal, undulatory bedding faintly visible. Blk. organic material / common along bedding planes. Tr moisture.
32.0'	32.0'			T.D.@32.0'				32.0'		T.D. @ 32.0'
										Rand as clasts to 1/2" diam. 6/29/05

NOTES: General: USCS is modified for this log as follows:
Materials amounts are estimated by % volume instead of % weight.
(1) Badly broken core, accurate footage measurements not possible.
(2) Core breaks cannot be matched, accurate footage measurements not possible.

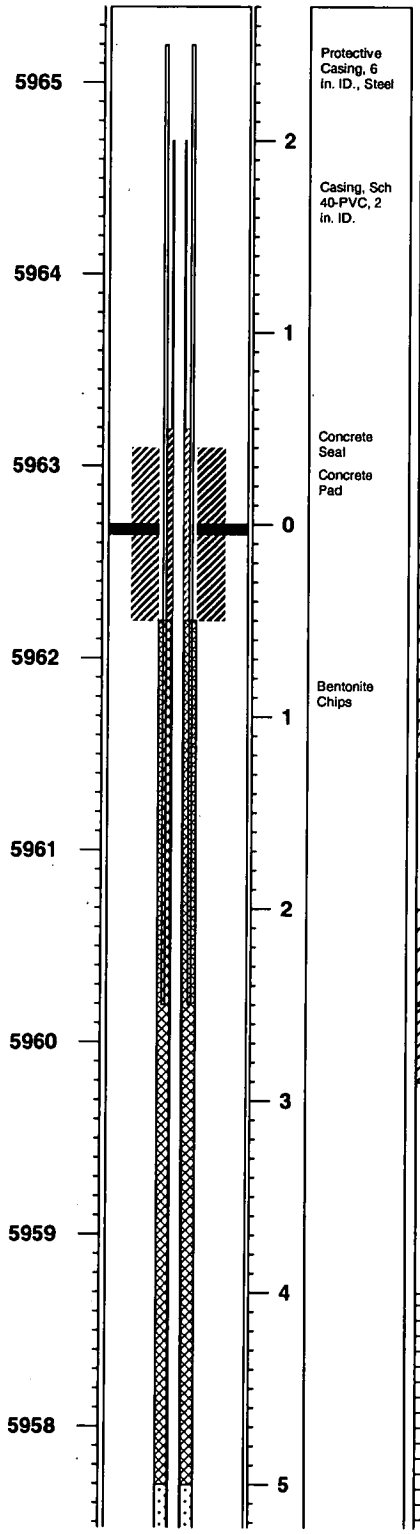
Procedure No. RMRS/OPS-PRO.101
Revision 0
Date effective: 12/31/98

STATE PLANE COORDINATES AREA:
NORTH: 750671.402
EAST: 2085324.852
PROJECT: Former Solar Ponds
REMARKS:
replaces P207989

GRND ELEV. (FT): 5962.694
TOTAL DEPTH (FT): 26.0
COMPLETION DATE: 4/5/05
GEOLOGIST: E. Warp

CASING DIA (IN): 2
BH DIA. (IN): 8
GRID LOCATOR:

LOG OF BORING NUMBER: 79605



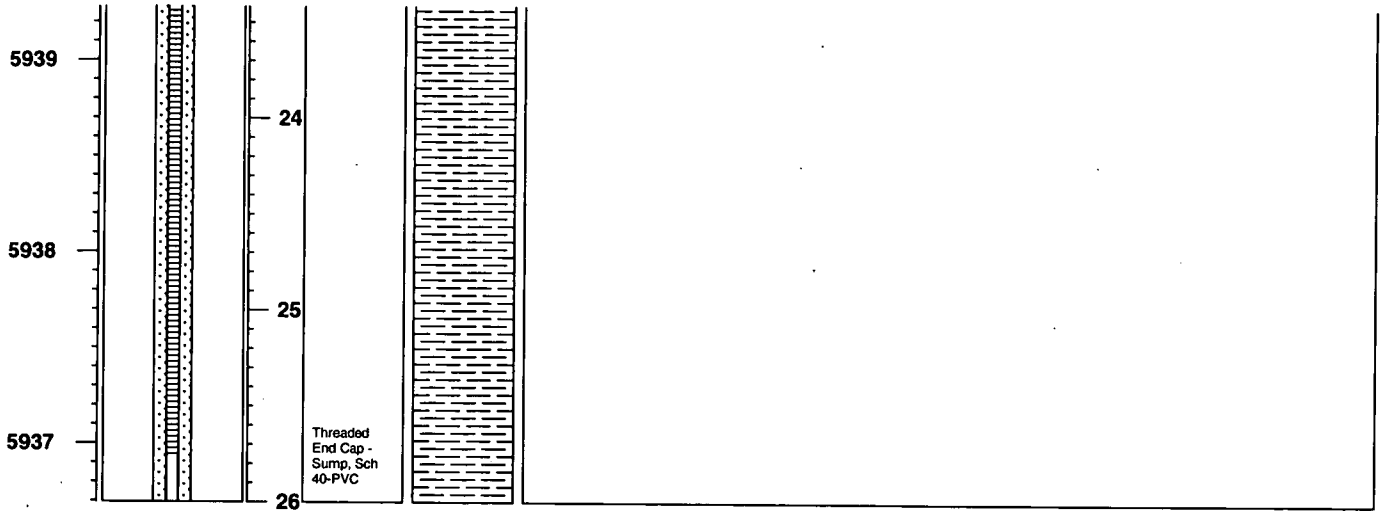
Lithology	Unified Soils Classification or Rock Type	Lithologic Description
		GC/CL: Clay/Gravel mixture with some sand, dark brown (7.5YR3/2). Clay with 30 - 40% gravel (1/8" to 1" diameter, subangular), predominately composed of quartzite and granite. Clay has medium plasticity. Roots common, especially from 0.0' to 0.2'. Some disseminated caliche. trace iron oxide coating on gravel. Very slightly moist.
		No recovery.
		GC/CL: Clay/Gravel mixture, same as 0.0' to 1.2'. 1.5' broken granite cobble at base. Slightly moist.
		CL: Silty, Sandy Clay, light brownish gray (10YR6/2). Sand is coarse grained, subangular. Cobble probably clogged in split spoon, core appears like "ribbons". Patchy zones of white caliche, moist.
		No recovery.
		CLAYSTONE: TOP OF BEDROCK. Claystone, oxidized (weathered), light yellowish brown (10YR6/4) with some light brownish gray (10YR6/2) mottling. Abundant patchy white caliche zones throughout interval. Weak iron oxidation mottled throughout. Trace black stringers . Interval competent except for caliche zones at 4.2', 4.6', and 5.5'. Increased moisture to moist. Bedrock contact estimated due to poor recovery at 4.0'.

Elev (Ft)	Well or Piezometer Construction and Materials	Depth (Ft)	Lithology	Unified Soils Classification or Rock Type	Lithologic Description
	Filter Pack, 16/40 Silica Sand				
5957	Screen, Sch 40-PVC, 2 in. ID., 0.010 in. slots	6			CLAYSTONE: Claystone, oxidized (weathered), yellowish brown (10YR5/6) and gray (10YR6/1), mottled. Iron oxidation mottled throughout. Competent bedrock. Trace black organic stringers, trace to some white caliche (disseminated), moist.
5956		7			No recovery.
5955		8			CLAYSTONE: Claystone, gray (10YR5/1), trace iron oxidation. White caliche common as stringers and blebs. Abundant caliche from 8.0' to 8.55'. Caliche zone also friable and broken.
5954		9			No recovery.
5953		10			CLAYSTONE: Claystone, light brownish gray (10YR6/2) with yellowish brown mottling. Weak to moderate iron oxidation throughout (mottled). Thin lense of white carbonate (very fine sparry calcite) at 9.1'. Interval is dense and firm, moist to slightly moist. Caliche lense at 10.3' is friable/crumbly.
5952		11			CLAYSTONE: Claystone, light gray (10YR7/1), unoxidized. Massive textured, weakly friable. Decreasing moisture to slightly moist.
5951		12			No recovery.
5950		13			CLAYSTONE: Claystone, gray (10YR6/1) with trace light yellowish brown (10YR6/4) mottling. Trace iron oxide mottled throughout. Weakly friable, fairly competent and firm interval. Trace black organic stringers. Massive textured claystone, slightly moist.
5949		14			No recovery.
					CLAYSTONE: Claystone, same as from 12.0' to 13.6'.

Elev (Ft)	Well or Piezometer Construction and Materials	Depth (Ft)	Lithology	Unified Soils Classification or Rock Type	Lithologic Description
5948					
		15			CLAYSTONE: Claystone, light yellowish brown (10YR6/4). Weak pervasive iron oxidation. Black organic stringers and black manganese oxide (?) coating on internal fractures (associated with iron oxide coating on some internal fractures). Weakly friable. Increased moisture to moist.
5947	Filter Pack, 16/40 Silica Sand				
		16			
5946					CLAYSTONE: Claystone, gray (10YR6/1), decreasing iron oxidation to trace. Trace white stringers. Interval is dense and firm. Weak iron oxidation at 18.0' along fractures.Decreased moisture to slightly moist.
		17			
5945					
		18			
5944					
		19			CLAYSTONE: Claystone, oxidized, brownish yellow (10YR6/6). Weak pervasive iron oxidation. Trace black organic stringers. Dense and firm, moist.
5943					
		20			CLAYSTONE: Claystone, grayish brown (10YR5/2), with lesser yellowish brown (10YR5/6) mottling. Predominately un-oxidized claystone with trace weak iron oxidation mottling. Black organic blebs and as coating along internal bedding planes as at 21.5'. Interval firm and dense, moist.
5942					
		21			
5941					
		22			
5940					CLAYSTONE: Claystone, gray (10YR6/1), predominately un-oxidized, un-weathered claystone bedrock. Black organic stringers along internal bedding planes, dense and firm. Vertical fracture from 25.2' to 25.5' with yellowish brown (10YR5/6), iron oxidation coating, slightly moist.
		23			

Elev (Ft)	Well or Piezometer Construction and Materials	Depth (Ft)	Lithology	Unified Soils Classification or Rock Type	Lithologic Description

LOG OF BORING NUMBER:
79605

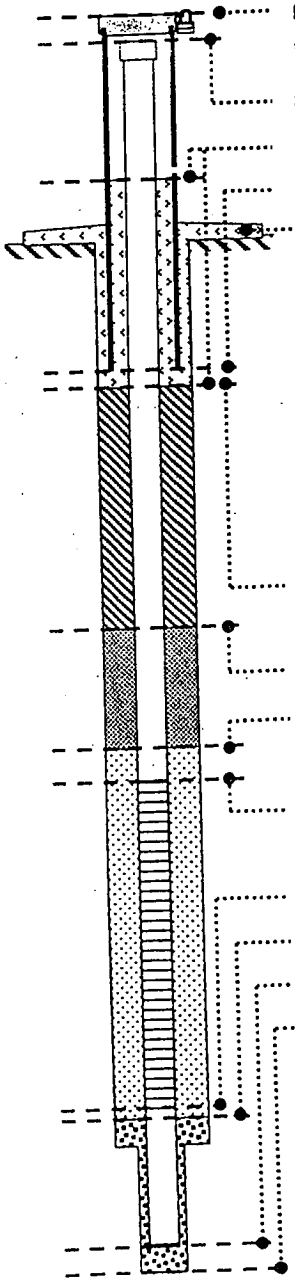


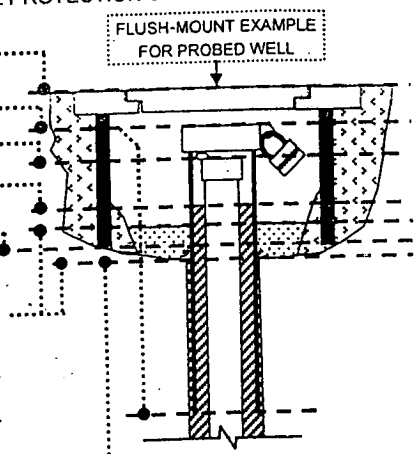
MONITORING WELL INSTALLATION REPORT: Form PRO.118

LOCATION CODE: 79605 PROJECT NAME: FY05 WELL REPLACEMENTS PROGRAM: WARP
SCREENED FORMATION: Bdrk. DRILLING CONTRACTOR: HIGH PLAINS BORING METHOD: AUGER
DATE DRILLED: 4/5/05 DATE COMPLETED: 4/5/05 TOTAL DEPTH: 26.0' COMPLETED DEPTH: 26.0'
ESTIMATED DEPTH TO BEDROCK: 4.0' RIG GEOLOGIST: E. WARP LOGGING GEOLOGIST: E. WARP
BOREHOLE DIAMETER IN SCREENED INTERVAL: 8.0" QUANTITY OF FLUIDS LOST DURING DRILLING: N/A
INITIAL WATER LEVEL (FT, DATE): Dry on 4/6/05 COMPLETED WATER LEVEL (FT, DATE):
DIAMETER & TYPE OF INSTALLATION (WELL/PIEZOMETER/WELL POINT/ETC.): 2.0" PVC WELL
TYPE OF PROTECTION (FLUSH-MOUNT VS. ABOVE GROUND, ASEPTIC, ETC.): 6.0" I.D. STEEL PROTECTION CASING - STICK-UP

ALL MEASUREMENTS WILL BE MADE IN FEET FROM GROUND SURFACE

* DENOTES ITEMS THAT MAY NOT BE APPLICABLE, DEPENDING ON BORING METHOD, WELL PROTECTION & PURPOSE





PROTECTIVE CASING TOP (STICKUP OR FLUSH-MOUNT): 2.5' ags.
*SECONDARY CASING TOP: N/A BOTTOM: N/A TYPE: N/A
SURFACE CASING TOP: 2.0' ags ID (IN): 2.0" I.D.
SURFACE SEAL TOP: 0.5' ags BOTTOM: ~~0.4'~~ 0.5' bgs TYPE: CONCRETE
PROTECTIVE CASING BOTTOM, ID (IN), TYPE: 2.5' bgs, 6.0" Steel
*WELL PAD DIMENSIONS, TYPE: CONCRETE PAD (3'x3') fm. 0.4' ags to 0.5' bgs
*ADD'L CASING FILL TOP: N/A BOTTOM: N/A TYPE: N/A
*SURFACE ISOLATION CASING TOP: N/A BOTTOM: N/A
*SURFACE ISOLATION CASING ID (IN): N/A TYPE: N/A
*OTHER (E.G., ASEPTIC) CASING TOP: N/A BOTTOM: N/A
*OTHER CASING ID (IN): N/A TYPE, PURPOSE: N/A
*CENTRALIZER(S) OD (IN): N/A NUMBER USED: N/A TYPE: N/A
*CENTRALIZER(S) DEPTH(S): N/A
*GROUT TOP: N/A MEASURED DENSITY (LBS/GAL): N/A TYPE: N/A
*GRANULAR BENTONITE TOP: N/A TYPE: N/A
*BENTONITE SEAL TOP: 0.5' bgs TYPE: Medium BENTONITE CHIPS ("Pure Gold")
BENTONITE SEAL OR GRANULAR BENTONITE BOTTOM (= FILTER PACK TOP): 5.0'
FILTER PACK TYPE: 16/40 Silica Sand BRAND: CSSI.
SURFACE CASING BOTTOM (=SCREEN TOP): 5.75' TYPE: SCH. ~~80~~ 40 PVC
SCREEN ID (IN): 2.0" SLOT SIZE (IN): 0.010 TYPE: SCH. ~~80~~ 40 PVC
SCREEN BOTTOM (= SUMP, TOP): 25.75 SUMP TYPE: THREADED END CAP - PVC
FILTER PACK BOTTOM (= *BACKFILL TOP): 26.0' *BACKFILL TYPE: N/A
SUMP BOTTOM (= WELL COMPLETED DEPTH): 26.0' *PILOT HOLE TOP, DIAMETER: N/A
TOTAL BOREHOLE DEPTH (= *PILOT HOLE AND *BACKFILL BOTTOM): 26.0'

REMARKS: Routine well installation on 4/5/05. Concrete well pad poured/installed on 4/6/05

COMPLETED BY: Ellen S. Warp DATE: 4/6/05
CHECKED BY: DATE: 4/6/05

ROCKY FLATS ENVIRONMENTAL TECHNOLOGY SITE BOREHOLE LOG

Borehole Number: ~~26~~ 79605
Location - North: _____ East: _____
Date: 4/5/05
Geologist: B. WARP
Drilling Equip.: CME-AT-75 - AUGER RIG

Surface Elevation: _____
Area: FORMER SOLAR PONDS - REPLACEMENT OF P207989
Total Depth: 26.0'
Company: URS/HIGH PLAINS
Project No. AAD57300
Sample Type: N/A

RMRS LOGGING SUPERVISOR APPROVAL [signature] DATE 4/6/05

TOP/BOTTOM OF CORE IN BOX	TOP/BOTTOM OF INTERVAL	FEET OF CORE IN INTERVAL (FIELD MEASUREMENT)	SAMPLE NUMBER	FRACTURE ANGLE	BEDDING ANGLE	GRAIN SIZE DISTRIBUTION	USCS SYMBOL	DEPTH IN FEET	SOIL/LITHOLOGIC LOG	SAMPLE DESCRIPTION
Box #1 of 3	0.0' Run #1 2.0	Rec = 2.0'					CL GC	0.0 1.0 1.2' 2.0		0.0 - 1.2' - CLAY/GRAVEL Mixture w/some sand. Dk. Brn. (7.5 YR 3/2) Clay w/30-40% Gravel (1/8-1.0" dia., sub-ang.) predominately composed of qtzite and granite. Med. plasticity of clay. Roots commen especially fm. 0.0→0.2'. Some dissemmated caliche. Tr FeOx coating gravel. V. sl. moist
	Run #2 4.0'	Rec = 0.9' 4.0'					CL	2.5' 2.9' 3.0 4.0		1.2 - 2.0' = No Recovery
	Run #3 7.0'	Rec = 2.6' 7.0'						5.0 5.5 6.0 6.6' 7.0		2.0 - 2.5' - CLAY/GRAVEL MIXTURE (same as above fm. 0.0→1.2'). 1.5' Broken granite cobble @ base Sl. moist.
	Run #4 9.0	Rec = 1.55' 9.0'						8.0 8.55 9.0		2.5 - 2.9' - Silty, sandy CLAY. Lt. Brn'sh Gry (10YR 6/2). Sand is c.g., sub-ang. Cobble probably clogged in split spoon - core appears like ribbons". Patchy zones of wht. caliche. Moist.
	Run #5	Rec =						10.0		2.9 - 4.0' = No Recovery
										Bedrock Contact - estimated due to poor recovery @ 4.0'
										4.0 - 5.5' - Claystone - oxidized (weathered) Lt. Yell'sh Brn (10YR 6/4) w/some Lt. brn'sh gry. mottling (10YR 6/2). Abundant patchy wht. caliche zones throughout interval. Wk FeOxn mottled throughout. Tr blk. stringers. Interval competant except for caliche zones @ 4.2, 4.6', and 5.5'. Incr. moisture to MOIST.
										5.5 - 6.6' - CLAYSTONE - Oxidized (weathered) Yellowish Brn (10YR 5/6) and Gry (10YR 6/1) Mottled. FeOxn mottled throughout. Competent bedrock. Tr blk org. stringers. Tr to some wht caliche (dissemmated) Moist.
										6.6 - 7.0 = No Recovery
										7.0 - 8.5 - CLAYSTONE - Gry (10YR 5/1). Tr FeOxn, wht. caliche commen as stringers and blebs. Abundant caliche fm. 8.0 to 8.55 ~~this is~~ also caliche zone. Friable and broken.

NOTES: General: USCS is modified for this log as follows:
Materials amounts are estimated by % volume instead of % weight.
(1) Badly broken core, accurate footage measurements not possible.
(2) Core breaks cannot be matched, accurate footage measurements not possible.

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Revision 0
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8.55 - 9.0' = No Recovery

14011-930-0134-930(Form GT.1A)(03/01/92)

ROCKY FLATS ENVIRONMENTAL TECHNOLOGY SITE BOREHOLE LOG

Borehole Number: 79605
Location - North: _____ East: _____
Date: 4/5/05
Geologist: E. WARP
Drilling Equip.: CME-HT-75 AUGER RIG

Surface Elevation:
Area: FORMER SOLAR PONDS - REPLACEMENT OF P207989
Total Depth: 26.0'
Company: URS/HIGH PLAINS Project No. HAD 57300
Sample Type: N/A

RMRS LOGGING SUPERVISOR APPROVAL [signature] DATE 4/6/05

TOP/BOTTOM OF CORE IN BOX	TOP/BOTTOM OF INTERVAL	FEET OF CORE IN INTERVAL (FIELD MEASUREMENT)	SAMPLE NUMBER	FRACTURE ANGLE	BEDDING ANGLE	GRAIN SIZE DISTRIBUTION	USCS SYMBOL	DEPTH IN FEET	SOIL/LITHOLOGIC LOG	SAMPLE DESCRIPTION
Box #1 of 3	Run #5 (cont.) 12.0'	Rec. = 2.7' 12.0'						10.5, 11, 11.7', 12		9.0-10.5 - CLAYSTONE, Lt. Brn'sh Gry (10YR 6/2) w/ Yell'sh Brn. mottling. Wk to Mod. FeOx'n throughout (mottled). Thin lense of wht. carbonate? @ 9.1'. Interval is dense and firm. Caliche lense @ 10.3' is friable/crumbly. Moist to Sl. moist. v. fine sparry calcite
										10.5 - 11.7' - CLAYSTONE - Lt. Gry (10YR 7/1) Un-ox'd. Massive textured, Wkly friable. Decr. moisture to Sl. moist.
										11.7 - 12.0' = No Recovery
Box #2 of 3	Run #6 14.0'	Rec. = 1.6'						13, 13.6', 14		12.0' - 13.6 - CLAYSTONE - Gry (10YR 6/1) w/ Tr Lt. Yell'sh brn (10YR 6/4) mottling. Tr FeOx mottled throughout. Wkly friable, fairly competent and firm interval. Tr blk organic stringers. Massive textured claystone. Sl. moist.
										13.6 - 14.0' = No Recovery
	Run #7 17.0'	Rec. = 3.0'						14.8', 15, 16, 16.6', 17		14.0 - 14.8' - CLAYSTONE - ~~Un-ox'd~~ SW same as above fm. 12.0 - 13.6'.
										14.8 - 16.6' - CLAYSTONE - Lt. Yell'sh brn (10YR 6/4) wk perv. FeOx'n. Blk. organic stringers and blk MnOx (?) coating on internal fractures (assoc'd w/ FeOx coating on same internal fractures. Wkly friable. Incr. moisture to MOIST.
										16.6 - 19.0' - CLAYSTONE. Gry (10YR 6/1). Decr. FeOx'n to trace. Tr wht. stringers, interval is dense and firm. Wk FeOx'n @ 18.0 along fractures. Decr. moisture to slightly moist.
	Run #8 19.0'	Rec. = 2.0'						18, 19		19.0 - 20.0' - CLAYSTONE - ox'd. Brn'sh Yellow (10YR 6/6). Wk. perv. FeOx'n Tr blk. organic stringers. Dense and firm Moist.
	Run #9	Rec. = 3.0'								

NOTES: General: USCS is modified for this log as follows:
Materials amounts are estimated by % volume instead of % weight.
(1) Badly broken core, accurate footage measurements not possible.
(2) Core breaks cannot be matched, accurate footage measurements not possible.

(4011-930-0134-930)(Form GT.1A)(03/01/92)

ROCKY FLATS ENVIRONMENTAL TECHNOLOGY SITE BOREHOLE LOG

PAGE 3 OF 3

Borehole Number: 79605
Location - North: East:
Date: 4/5/05
Geologist: E. WARP
Drilling Equip.: CME-HT-75 AUGER RIG

Surface Elevation:
Area: FORMER SOLAR PONDS - REPLACEMENT OF P207989
Total Depth: 26.0'
Company: URS/HIGH PLAINS Project No. HAD57300
Sample Type: N/A

RMRS LOGGING SUPERVISOR APPROVAL [signature] DATE 4/6/05

TOP/BOTTOM OF CORE IN BOX	TOP/BOTTOM OF INTERVAL	FEET OF CORE IN INTERVAL (FIELD MEASUREMENT)	SAMPLE NUMBER	FRACTURE ANGLE	BEDDING ANGLE	GRAIN SIZE DISTRIBUTION	USCS SYMBOL	DEPTH IN FEET	SOIL LITHOLOGIC LOG	SAMPLE DESCRIPTION
Box #2 of 3 21.7'	Run #9 (cont.) 22.0'	Rec. = 3.0' 22.0'						20.0 21 22		20.0-22.4- CLAYSTONE, Grysh Brn. (10YR5/2), with lesser Yell'sh Brn (10YR 5/6) mottling. Predominately un-ox'd claystone w/ Tr wk. FeOx'n mottling. Blk. organic blebs and as coating along internal bedding planes. Interval firm and dense. Moist. (as at 21.5')
Box #3 of 3 26.0'	Run #10 24.0'	Rec. = 2.2' 24.0'						23 24		22.4-26.0'- CLAYSTONE. Gry (10YR 6/1). Predominately un-ox'd, un-weathered. Claystone bedrock. Blk org. stringers along internal bedding planes. Dense and firm. Vertical fracture fm. 25.2 to 25.5 w/ Yell'sh Brn. (10YR 5/6) FeOx'n coating. Sl. moist.
	Run #11 26.0'	Rec. = 3.0' 26.0'						25 26		T.D. @ 26.0'
								27 28 29		

NOTES: General: USCS is modified for this log as follows:
Materials amounts are estimated by % volume instead of % weight.
(1) Badly broken core, accurate footage measurements not possible.
(2) Core breaks cannot be matched, accurate footage measurements not possible.

(4011-930-0134-930)(Form GT.1A)(03/01/92)

STATE PLANE COORDINATES AREA:
NORTH: 747489.979
EAST: 2081404.042
PROJECT: Original Landfill
REMARKS:
Routine well installation

GRND ELEV. (FT): 5957.54
TOTAL DEPTH (FT): 21.0
COMPLETION DATE: 8/9/05
GEOLOGIST: E. Warp

CASING DIA (IN): 2"
BH DIA. (IN): 8"
GRID LOCATOR:

LOG OF BORING NUMBER: 80005

Elev (Ft)	Well or Piezometer Construction and Materials	Depth (Ft)	Lithology	Unified Soils Classification or Rock Type	Lithologic Description
5961					
	Protective Casing, Steel, 6 in. ID.	3			
	Casing, Sch 40-PVC, 2 in. ID.				
5960		2			
5959		1			
5958		0			GC/CL: Gravelly, Sandy Clay with silt, brown (7.5YR4/4). 8 - 10% gravel (1/8" - 1/4" diameter, subangular to subrounded, composed of granite, schist, and quartzite). ~8% sand (coarse grained, subrounded to subangular). Clay has medium plasticity. Moist. 1" to 1-1/2" diameter cobbles of quartzite and granite at 0.4'.
5957		1			CL: Clay with trace gravel and sand, dark brown (7.5YR3/2). ~3 - 5% gravel (1/8" - 1/2" diameter, subangular), ~3 - 5% sand. Clay has medium plasticity. Shattered quartzite cobble at 0.6'. Roots at base of interval. Moist.
5956	Hydrated Bentonite Chips	2			CL: Clay with trace gravel and trace sand, brown (10YR4/3) with dark yellowish brown (10YR4/6) mottling. Possibly re-worked claystone with gravel and sand. Weak iron oxidation mottled throughout and disseminated at base. Trace roots. Moist.
5955					No recovery.
		3			CL: Clay with trace gravel and trace sand, same as interval from 0.8' to 1.3'. Moist.
5954					GP: Gravel/Cobbles, schist and quartzite cobbles (3/4" - 2" diameter, subangular) with gravel (1/4" - 1/2" diameter, subangular, composed of amphibolite (?)). Gravel is greenish gray (GLEY5/1).
		4			No recovery
5953					GC/CL: Sandy, Gravelly Clay with silt, dark brown (7.5YR3/2) clay matrix with ~30% gravel (1/4" - 3/4" diameter, subangular, composed of quartzite and schist). 5 - 10% sand (coarse grained,

Elev (Ft)	Well or Piezometer Construction and Materials	Depth (Ft)	Lithology	Unified Soils Classification or Rock Type	Lithologic Description
					subangular to subrounded). Clay has medium plasticity. Moist. Shattered cobbles (1" - 2" diameter) at base of interval from 4.6' to 4.8'.
	Filter Pack, 16/40 Silica Sand	5			SC/CL: Silty, Sandy Clay with some gravel, brown (7.5YR4/3 to 7.5YR4/4). Sand and gravel increase at base of interval. ~35% sand from 5.1' to 5.4', sand is coarse grained, subangular. ~25% gravel (1/4" - 1/2" diameter, subangular) from 5.1' to 5.4'. Moist. Possibly fluvial in origin (?)
5952		6			No recovery.
5951	Screen, Sch 40-PVC, 2 in. ID., 0.010 in. slots	7			SC/CL: Silty, Sandy Clay with some gravel, same as interval from 4.8' to 5.4'. Moist.
5950		8			SILTSTONE: TOP OF BEDROCK. Clayey Siltstone with some fine grained sand. Bedrock is gray (10YR6/1) with abundant yellowish brown (10YR5/6) mottling. Siltstone interbedded with claystone and fine grained sandy lenses. Some caliche as stringers and blebs throughout interval. Strong pervasive iron oxidation from 8.5' to 8.7' with ironstone fragments. Moist.
5949		9			
5948		10			SILTSTONE: Sandy Siltstone, grayish brown (10YR5/2) with light yellowish brown (10YR6/4) iron oxidation mottled throughout. Abundant very fine grained sand in siltstone. Friable. Caliche along internal bedding at 10.7'. Decreasing moisture to slightly moist.
5947					
5946		11			SILTSTONE: Clayey, Sandy Siltstone, yellowish brown (10YR5/6) with gray (10YR6/1) and light brownish gray (10YR6/2) mottling. Clayey lenses at 10.9' and from 11.65' to 11.8'. Black organic stringers associated with clayey lenses. Interval is friable and slightly fissile. Rip-up clasts common. Small healed fracture (45 deg) with iron oxidation at 11.95'. Abundant very fine grained sand from 11.2' to 11.4'. Slightly moist.
		12			
5945		13			SILTSTONE: Clayey Siltstone, yellowish brown (10YR5/6) with gray (10YR5/1) mottling from 12.4' to 13.0'. Color changes to brown (10YR5/3) from 13.0' to 14.0'. Decreasing very fine grained sand to trace. Black organic stringers common from 13.0' to 14.0'. Interval is competent, yet weak to moderately friable. Rip-up clasts common. Weak to moderate iron oxidation throughout. Slightly moist.
5944		14			

Elev (Ft)	Well or Piezometer Construction and Materials	Depth (Ft)	Lithology	Unified Soils Classification or Rock Type	Lithologic Description
5943					CLAYSTONE: Claystone with trace silt, gray (10YR5/1) with grayish brown (10YR5/2) and yellowish brown (10YR5/4) mottling. Weak to moderate pervasive iron oxidation. Some black organic stringers. Interval is firm and dense. Decreased moisture to very slightly moist.
5942		15			
5941		16			
5940		17			CLAYSTONE: Claystone, un-weathered, dark gray (2.5Y4/1) to gray (2.5Y5/1). Trace iron oxidation along internal fractures from 16.8' to 17.0', and at 17.0'. Interval is highly fissile and friable. Dry.
5939		18			
5938		19			No recovery.
5937		20			CLAYSTONE: Claystone, un-weathered, dark gray (2.5Y4/1). Dense and firm, weakly fissile, dry.
	Threaded End Cap - Sump, Sch	21			

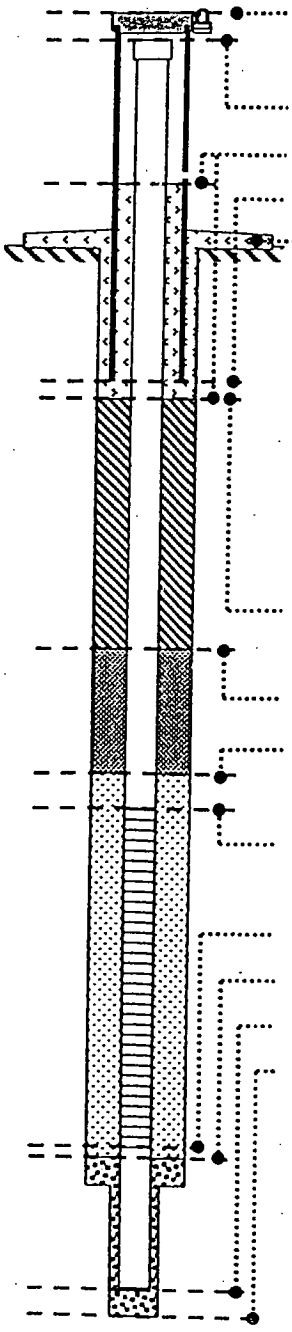
(09/14/00)

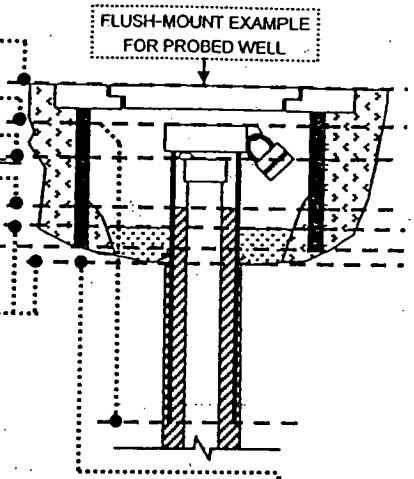
MONITORING WELL INSTALLATION REPORT: Form PRO.118

LOCATION CODE: 80005 PROJECT NAME: CY05 ORIGINAL LANDFILL Well Replacements PROGRAM: Water Programs-WARP
SCREENED FORMATION: Al/Bdrk. DRILLING CONTRACTOR: High Plains BORING METHOD: Hollow Stem Auger
DATE DRILLED: 8/9/05 DATE COMPLETED: 8/9/05 TOTAL DEPTH: 21.0' COMPLETED DEPTH: 21.0'
ESTIMATED DEPTH TO BEDROCK: 7.1' RIG GEOLOGIST: E. Warp LOGGING GEOLOGIST: E. Warp
BOREHOLE DIAMETER IN SCREENED INTERVAL: 8" QUANTITY OF FLUIDS LOST DURING DRILLING: N/A
INITIAL WATER LEVEL (FT, DATE): Dry on 8/9/05 COMPLETED WATER LEVEL (FT, DATE): 10.18 Toc 8-18-05
DIAMETER & TYPE OF INSTALLATION (WELL/PIEZOMETER/WELL POINT/ETC.): 2" I.D.-PVC Well
TYPE OF PROTECTION (FLUSH-MOUNT VS. ABOVE GROUND, ASEPTIC, ETC.): Above-ground steel protective casing

ALL MEASUREMENTS WILL BE MADE IN FEET FROM GROUND SURFACE

*DENOTES ITEMS THAT MAY NOT BE APPLICABLE, DEPENDING ON BORING METHOD, WELL PROTECTION & PURPOSE





PROTECTIVE CASING TOP (STICKUP OR FLUSH-MOUNT): 3.2' ags.
*SECONDARY CASING TOP: N/A BOTTOM: N/A TYPE: N/A
SURFACE CASING TOP: 2.95' ID (IN): 2.0" 8/3/05 ESW
SURFACE SEAL TOP: 0.7' ags BOTTOM: 0.5' ESW TYPE: concrete ~~fm 0.3 ags to 0.5 bgs~~
PROTECTIVE CASING BOTTOM, ID (IN), TYPE: 1.6' bgs, 6", steel
*WELL PAD DIMENSIONS, TYPE: 3'x3', concrete fm 0.3 ags to 0.5 bgs
*ADD'L CASING FILL TOP: N/A BOTTOM: N/A TYPE: N/A
*SURFACE ISOLATION CASING TOP: N/A BOTTOM: N/A
*SURFACE ISOLATION CASING ID (IN): N/A TYPE: N/A
*OTHER (E.G., ASEPTIC) CASING TOP: N/A BOTTOM: N/A
*OTHER CASING ID (IN): N/A TYPE, PURPOSE: N/A
*CENTRALIZER(S) OD (IN): N/A NUMBER USED: N/A TYPE: N/A
*CENTRALIZER(S) DEPTH(S): N/A
*GROUT TOP: N/A MEASURED DENSITY (LBS/GAL): N/A TYPE: N/A
*GRANULAR BENTONITE TOP: N/A TYPE: N/A
*BENTONITE SEAL TOP: 0.5' bgs. TYPE: Med. Bentonite Chips - "Pure Gold" - hydrated w/5 gall. of distilled H_2O
BENTONITE SEAL OR GRANULAR BENTONITE BOTTOM (= FILTER PACK TOP): 4.5'
FILTER PACK TYPE: 16/40 Silica Sand BRAND: C.S.S.I.
SURFACE CASING BOTTOM (=SCREEN TOP): 5.8' TYPE: Sch. 40 PVC
SCREEN ID (IN): 2.0" SLOT SIZE (IN): 0.01" TYPE: Sch. 40 PVC
SCREEN BOTTOM (= SUMP, TOP): 20.8' SUMP TYPE: Threaded end cap
FILTER PACK BOTTOM (= *BACKFILL TOP): 21.0' *BACKFILL TYPE: N/A
SUMP BOTTOM (= WELL COMPLETED DEPTH): 21.0' *PILOT HOLE TOP, DIAMETER: N/A
TOTAL BOREHOLE DEPTH (= *PILOT HOLE AND *BACKFILL BOTTOM): 21.0'
REMARKS: Routine well installation

COMPLETED BY: Ellen S. Warp Ellen S. Warp DATE: 8/9/05
CHECKED BY: Gary Stretesky [signature] DATE: 8-18-05

ROCKY FLATS ENVIRONMENTAL TECHNOLOGY SITE BOREHOLE LOG

Borehole Number: 80005
Location - North: _____ East: _____
Date: 8/9/05
Geologist: E. WARP
Drilling Equip.: CME-75-HT - Auger Rig

Surface Elevation: _____
Area: Original Landfill
Total Depth: 21.0'
Company: URS/High Plains Project No. HAD51300
Sample Type: Continuous Core - split spoon

RMRS LOGGING SUPERVISOR APPROVAL [signature] DATE 8/10/05

TOP/BOTTOM OF CORE IN BOX	TOP/BOTTOM OF INTERVAL	FEET OF CORE IN INTERVAL (FIELD MEASUREMENT)	SAMPLE NUMBER	FRACTURE ANGLE	BEDDING ANGLE	GRAIN SIZE DISTRIBUTION	USCS SYMBOL	DEPTH IN FEET	SOIL/LITHOLOGIC LOG	SAMPLE DESCRIPTION
	0.0	0.0					CL GC	0.0		0.0-0.4 - Gravelly, sandy CLAY w/silt. BRN. (7.5YR 4/4). 8-10% gravel (1/8-1/4" dia., sub-ang. to sub-rounded; composed of granite, schist, & qtzite). ~8% sand (c.g., sub-rounded to sub-ang.). Clay has med. plasticity. MOIST. 1-1½" dia. cobbles of qtzite and granite @ 0.4'.
	Run #1	Rec. = 1.3'					CL	0.4'		0.4-0.8' - CLAY w/ TR gravel and sand. Dk. brn. (7.5YR 3/2). ~3-5% gravel (1/8-1/2" dia., sub-ang.). ~3-5% sand. Clay has med. plasticity. Shattered qtzite cobble @ 0.6'. Roots at base of interval. MOIST.
							CL	0.8'		
								1		
								1.3'		
	2.0'							2		
	Run #2	Rec. = 0.7'					CL	2.1		0.8-1.3' - CLAY w/ TR gravel and TR sand. Brn. (10YR 4/3) w/ Dk. Yellish Brn. (10YR 4/6) mottling. Possibly re-worked claystone, w/ gravel and sand. Wk. FeOx'n mottled throughout and disseminated at base. TR roots. MOIST.
							GP	2.7'		1.3-2.0' = No recovery
								3		2.0-2.1' - CLAY w/ TR gravel and TR sand (same as above fm. 0.8-1.3'). MOIST
	4.0'							4		2.1-2.7 - GRAVEL / COBBLES, ~~Granitic~~ Schist & qtzite cobbles (3/4"-2" dia., sub-ang.) w/ gravel (1/4-1/2" dia., sub-ang., composed of amphibolite (?). Gravel is grn'sh gry (GLEY 1 5/1).
	Run #3	Rec. = 1.4'					GC CL	4.8'		2.7-4.0' = No recovery
							SC CL	5		4.0-4.8' - Sandy, gravelly CLAY w/ silt. Dk. Brn. (7.5YR 3/2) clay matrix w/ ~30% gravel (1/4-3/4" dia., sub-ang., composed of qtzite and schist). 5-10% sand (c.g., sub-ang. to sub-rounded). Clay has med. plasticity. MOIST. SHATTERED cobbles (1-2" dia.) at base of interval fm. 4.6 to 4.8.
								5.4'		
								6		
	7.0'							7		4.8-5.4' - Silty, sandy CLAY w/ some gravel. Brn. (7.5YR 4/3 to 4/4). Sand and gravel increase at base of interval. ~35% sand fm. 5.1 to 5.4' - sand is c.g., sub-ang. ~25% gravel (1/4-1/2" dia., sub-ang.) fm. 5.1-5.4'. MOIST. Possibly fluvial in origin (?)
	Run #4	Rec. = 2.0'		Bedrock Contact @ 7.1'			SC CL	7.1		5.4-7.0 = No recovery
								8		7.0-7.1 - Silty, sandy CLAY w/ some gravel (same as above fm. 4.8-5.4'. MOIST. BEDROCK CONTACT @ 7.1'
	9.0'							9		7.1-9.3' - Clayey SILTSTONE w/ some f.g. sand - Bedrock gry (10YR 6/1) w/ abundant Yellish brn. (10YR 5/6) mottling. Siltstone interbedded w/ claystone and f.g. sandy lenses. Some caliche as stringers and blebs throughout interval. S. perv. FeOx'n fm. 8.5-8.7' with Fe-stone fragments. MOIST.
	Run #5 9.0-12.0'	Rec. = 3.2'						9.3		
								10.0		

NOTES: General: USCS is modified for this log as follows:
Materials amounts are estimated by % volume instead of % weight.
(1) Badly broken core, accurate footage measurements not possible.
(2) Core breaks cannot be matched, accurate footage measurements not possible.

Procedure No. RMRS/OPS-PRO.101
Revision 0
Date effective: 12/31/98

9.3-10.9 - Sandy SILTSTONE - See page #2 for description

(4011-930-0134-930)(Form GT.1A)(03/01/92)

ROCKY FLATS ENVIRONMENTAL TECHNOLOGY SITE BOREHOLE LOG

Borehole Number: 80005
Location - North: _____ East: _____
Date: 8/9/05
Geologist: E. WARP
Drilling Equip.: CME-75-HT Hollow Stem Auger

Surface Elevation: _____
Area: Original Landfill
Total Depth: 21.0'
Company: URS/High Plains Project No.: HAD51300
Sample Type: Continuous Core

RMRS LOGGING SUPERVISOR APPROVAL _____ DATE 8/10/05

TOP/BOTTOM OF CORE IN BOX	TOP/BOTTOM OF INTERVAL	FEET OF CORE IN INTERVAL (FIELD MEASUREMENT)	SAMPLE NUMBER	FRACTURE ANGLE	BEDDING ANGLE	GRAIN SIZE DISTRIBUTION	USCS SYMBOL	DEPTH IN FEET	SOIL/LITHOLOGIC LOG	SAMPLE DESCRIPTION
	10.0 Run #5 (cont.) 9.0→12.0'	Rec = 3.2'						10.0		9.3-10.9' - Sandy SILTSTONE - Gry'sh brn. (10YR5/2) w/Lt. Yell'sh Brn. (10YR6/4) FeOx'n mottled throughout. Abundant v.f.g. sand in Siltstone. Friable. Caliche along internal bedding @ 10.7'. Decr. moisture to slightly MOIST.
								10.9' 11		10.9-12.4 - Clayey, sandy SILTSTONE. Yell'sh Brn. (10YR5/4) w/gry (10YR4/1) and lt. brn'sh gry (10YR6/2) mottling. Clayey lenses at 10.9' and fm. 11.05' to 11.8'. Blk. organic stringers associated w/clayey lenses. Interval is friable and slightly fissile. Rip-up clash common. Small healed fracture (45°) w/FeOx'n at 11.95'. Abundant v.f.g. sand fm. 11.2 to 11.4' SL. MOIST.
	12.0'			~45°	8/10/05			12		
	Run #6	Rec. = 2.0'						12.4		
								13		12.4-14.0' - Clayey SILTSTONE. Yell'sh Brn. (10YR5/4) w/gry (10YR5/1) mottling fm 12.4 to 13.0'. Color changes to Brn. (10YR5/3) fm. 13.0 to 14.0. Decr. v.f.g. sand to Tr. Blk. organic stringers common fm. 13.0' to 14.0'. Interval is competent yet weak to moderately friable. Rip-up clash common. Wk. to mod. FeOx'n throughout. Sl. MOIST.
	14.0'							14		
	Run #7	Rec = 3.0'						15		14.0-16.8' - CLAYSTONE w/Tr silt. Gry (10YR5/1) w/gry'sh brn. (10YR5/2) and Yell'sh Brn (10YR5/4) mottling. Wk. to mod. perv. FeOx'n. Some blk. organic stringers. Interval is firm and dense. Decrease moisture to V. slightly MOIST.
								16		
								16.8'		
	17.0'			~60° Tr	8/10/05			17		16.8-19.0' - CLAYSTONE - Un-weathered Dk. gry (2.5Y4/1) to Gry (2.5Y5/1). Tr FeOx along internal fractures fm. 16.8 to 17.0' and at 17.0'. Interval is highly fissile and friable. DRY.
	Run #8	Rec. = 2.0'						18		
								19		19.0-20.0' = No recovery
	20.0									

NOTES: General: USCS is modified for this log as follows:
Materials amounts are estimated by % volume instead of % weight.
(1) Badly broken core, accurate footage measurements not possible.
(2) Core breaks cannot be matched, accurate footage measurements not possible.

Procedure No. RMRS/OPS-PRO.101
Revision 0
Date effective: 12/31/98

ROCKY FLATS ENVIRONMENTAL TECHNOLOGY SITE BOREHOLE LOG

Borehole Number: 80005
Location - North: _____ East: _____
Date: 8/9/05
Geologist: E. WARP
Drilling Equip.. CME-75-HT Hollow Stem Auger

Surface Elevation: _____
Area: Original Landfill
Total Depth: 21.0'
Company: URS/High Plains Project No.. HAD51300
Sample Type: Continuous Core - split spoon

RMRS LOGGING SUPERVISOR
APPROVAL [signature] DATE 8/10/05

TOP/BOTTOM OF CORE IN BOX	TOP/BOTTOM OF INTERVAL	FEET OF CORE IN INTERVAL (FIELD MEASUREMENT)	SAMPLE NUMBER	FRACTURE ANGLE	BEDDING ANGLE	GRAIN SIZE DISTRIBUTION	USCS SYMBOL	DEPTH IN FEET	SOIL/ LITHOLOGIC LOG	SAMPLE DESCRIPTION
Run #9 21.0'	Rec = 1.5' 20.0 21.0'							20.0		20.0-21.0' - CLAYSTONE - un-weathered. Dk. gry. (2.5Y 4/1). Dense and firm. Wkly. fissile, DRY T.D. @ 21.0'
								21'		
								22'		
								23'		
								24'		
								25'		
								26'		
								27'		
								28'		
								29'		
								30.0'		

NOTES: General: USCS is modified for this log as follows:
Materials amounts are estimated by % volume instead of % weight.
(1) Badly broken core, accurate footage measurements not possible.
(2) Core breaks cannot be matched, accurate footage measurements not possible.

(4011-930-0134-930)(Form GT.1A)(03/01/92)

STATE PLANE COORDINATES AREA:	GRND ELEV. (FT): 5939.29	CASING DIA (IN): 2"	**LOG OF BORING NUMBER:**
NORTH: 747463.414	TOTAL DEPTH (FT): 20.15	BH DIA. (IN): 8"	**80105**
EAST: 2081942.494	COMPLETION DATE: 8/8/05	GRID LOCATOR:	
PROJECT: Original Landfill	GEOLOGIST: E. Warp		
REMARKS: Routine well installation			

Elev (Ft)	Well or Piezometer Construction and Materials	Depth (Ft)	Lithology	Unified Soils Classification or Rock Type	Lithologic Description
5942	Protective Casing, Steel, 6 in. ID. Casing, Sch 40-PVC, 2 in. ID.	3			
5941		2			
5940		1			
5939		0			GC/CL: Gravel/Sandy Clay with silt mixture. Imported Qalrf fill. Strong brown (7.5YR4/6). 20 - 25% gravel (1/8" - 1" diameter, subrounded to subangular), predominately quartzite with less schist and granite. 20% sand (coarse grained, subangular to subrounded). Clay has medium plasticity. Dark brown (7.5YR3/2) clay lense from 0.4' to 0.5'. Disseminated caliche, tiny white specks common throughout interval. Moist.
5938		1			No recovery.
5937		2			GC/CL: Gravel/Sandy Clay with silt mixture, same as interval from 0.0' to 1.2'. Moist.
5936	Hydrated Bentonite Chips	3			No recovery
5935	Filter Pack, 16/40 Silica Sand	4			CL: Gravelly, Sandy Clay, dark brown (7.5YR3/2). Distinct color change. ~10% sand (coarse grained, subangular), 5 - 8% gravel (1/8" - 1/2" diameter, subrounded to subangular). Trace to some

Elev (Ft)	Well or Piezometer Construction and Materials	Depth (Ft)	Lithology	Unified Soils Classification or Rock Type	Lithologic Description
					organic material (woodchips). Medium to high plasticity, very moist. Color change may indicate prior ground surface (before fill added).
		5			GC/CL: Gravelly, Sandy Clay, dark gray (7.5YR4/1) to brown (7.5YR4/4). ~30% sand (coarse grained, subangular), 20 - 25% gravel (1/8" to 1-1/2" diameter, subrounded to subangular). Possible fluvial deposit. Well graded, poorly sorted, very moist.
5934	Screen, Sch 40-PVC, 2 in. ID., 0.010 in. slots				
		6			CL: Silty Clay. Re-worked bedrock. Light gray (10YR6/2) with brownish yellow (10YR6/6) mottling. Weak iron oxidation mottling. Trace caliche. [Very poor recovery, clay has been extruded like a "ribbon" due to a clogged cutting shoe.] Very moist.
5933					No recovery.
		7			CL: Silty Clay. Re-worked bedrock. Light gray (10YR7/1) with some light yellowish brown (10YR6/4) iron oxidation mottling. Trace alluvial clastics indicate not yet bedrock.
5932					
		8			CL: Clay with trace to some sand, gravel, and silt. Dark grayish brown (10YR4/2) with some light brownish gray (10YR6/2). 3 - 5% gravel (1/8" - 1/4" diameter), 3 - 5% sand (coarse grained, subangular). Weak to moderate iron oxidation mottled throughout. Very moist.
5931					
		9			SILTSTONE: TOP OF BEDROCK. Clayey Siltstone, gray (10YR6/1) with yellowish brown (10YR6/4) iron oxidation mottled throughout. Very subtle bedrock contact. [Very poor recovery, cutting shoe is clogged causing siltstone to appear "ribboned" in sample tube.] Very moist.
5930					No recovery.
		10			CLAYSTONE: Claystone, gray (10YR5/1) with yellowish brown (10YR5/6) mottling. Caliche blebs and stringers common throughout. Weak iron oxidation mottling. Massive texture. Moderately friable. Notable decrease in moisture to slightly moist.
5929					
		11			CLAYSTONE: Claystone, very dark gray (10YR3/1) to gray (10YR5/1). Massive texture. Abundant black organic stringers from 10.4' to 10.6'. Very rare caliche stringers. Moderately friable. No iron oxidation. Slightly moist.
5928					
		12			CLAYSTONE: Claystone, grayish brown (10YR5/2). Weak pervasive iron oxidation. Trace caliche blebs. Trace black organic material. Weakly friable. Organics or trace iron oxidation along internal fractures at 12.3', 12.6', and 13.4'. Decreased moisture to very slightly moist.
5927					
		13			
5926					

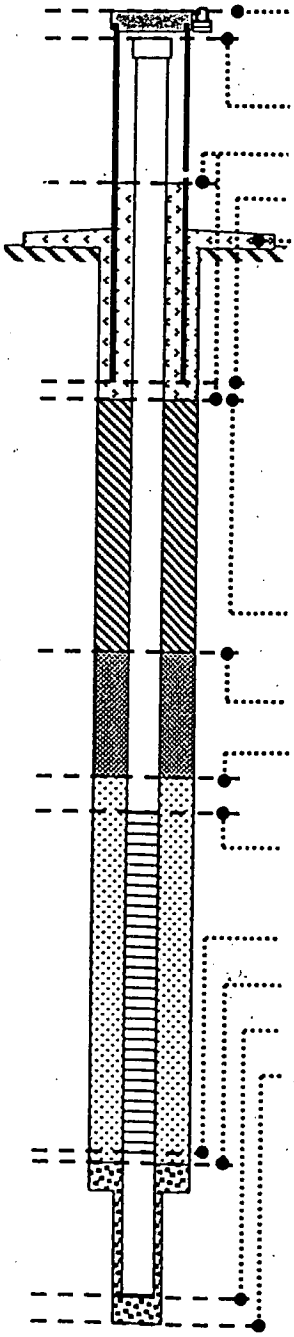
Elev (Ft)	Well or Piezometer Construction and Materials	Depth (Ft)	Lithology	Unified Soils Classification or Rock Type	Lithologic Description
		14			
5925					SILTSTONE: Clayey Siltstone, light brownish gray (10YR6/2) with some light yellowish brown (10YR6/4) iron oxidation mottling throughout. Massive texture. Weakly friable. Trace black organic stringers. Trace iron oxidation on minor internal fractures at 15.1', 15.5', 15.8', and 16.3'. Trace moisture. Occasional rip-up clasts.
		15			
5924					
		16			
5923					
					No recovery.
		17			
5922					CLAYSTONE: Claystone, dark gray (10YR4/1) to very dark gray (10YR3/1). Very fissile, friable, and dry. Abundant black carbonaceous material from 18.0' to 18.5'.
		18			
5921					
		19			
5920					No recovery. Reamed with augers from 19.0' to 20.15'. Did not sample this interval.
		20	Threaded End Cap - Sump, Sch 40-PVC		

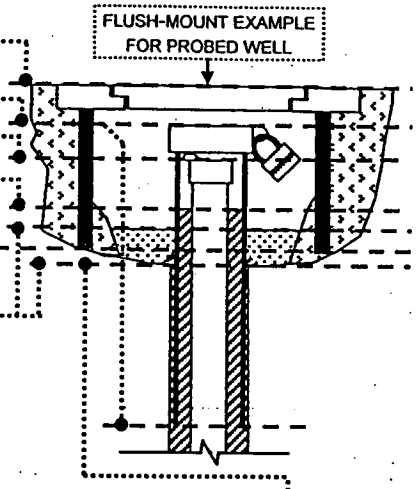
MONITORING WELL INSTALLATION REPORT: Form PRO.118

LOCATION CODE: 80105 PROJECT NAME: ORIGINAL LANDFILL CY05 Well Replacements PROGRAM: Water Programs-WARP
SCREENED FORMATION: Al/Bdrk DRILLING CONTRACTOR: High Plains BORING METHOD: Hollow Stem Auger
DATE DRILLED: 8/8/05 DATE COMPLETED: 8/8/05 TOTAL DEPTH: 20.15' COMPLETED DEPTH: 20.15'
ESTIMATED DEPTH TO BEDROCK: 7.5' RIG GEOLOGIST: E. Warp LOGGING GEOLOGIST: E. Warp
BOREHOLE DIAMETER IN SCREENED INTERVAL: 8" QUANTITY OF FLUIDS LOST DURING DRILLING: N/A
INITIAL WATER LEVEL (FT, DATE): Dry on 8/8/05 COMPLETED WATER LEVEL (FT, DATE): -3.05 TOC (Full to TOC) 8/18/05
DIAMETER & TYPE OF INSTALLATION (WELL/PIEZOMETER/WELL POINT/ETC.): 2" PVC - Well
TYPE OF PROTECTION (FLUSH-MOUNT VS. ABOVE GROUND, ASEPTIC, ETC.): Above Ground Steel Protective Casing

ALL MEASUREMENTS WILL BE MADE IN FEET FROM GROUND SURFACE

*DENOTES ITEMS THAT MAY NOT BE APPLICABLE, DEPENDING ON BORING METHOD, WELL PROTECTION & PURPOSE





PROTECTIVE CASING TOP (STICKUP OR FLUSH-MOUNT): 3.45' ags
*SECONDARY CASING TOP: N/A BOTTOM: N/A TYPE: N/A
SURFACE CASING TOP: 3.05 ID (IN): 2.0"
SURFACE SEAL TOP: 1.04 ags BOTTOM: 0.5' bgs TYPE: Concrete
PROTECTIVE CASING BOTTOM, ID (IN), TYPE: 1.4' bgs, 6" Steel
*WELL PAD DIMENSIONS, TYPE: 3'x3' - Concrete from 0.3' ags to 0.5' bgs.
*ADD'L CASING FILL TOP: N/A BOTTOM: N/A TYPE: N/A
*SURFACE ISOLATION CASING TOP: N/A BOTTOM: N/A
*SURFACE ISOLATION CASING ID (IN): N/A TYPE: N/A
*OTHER (E.G., ASEPTIC) CASING TOP: N/A BOTTOM: N/A
*OTHER CASING ID (IN): N/A TYPE, PURPOSE: N/A
*CENTRALIZER(S) OD (IN): N/A NUMBER USED: N/A TYPE: N/A
*CENTRALIZER(S) DEPTH(S): N/A
*GROUT TOP: N/A MEASURED DENSITY (LBS/GAL): N/A TYPE: N/A
*GRANULAR BENTONITE TOP: N/A TYPE: N/A
*BENTONITE SEAL TOP: 0.5' bgs TYPE: Med. bentonite chips - "Pure Gold" - hydrated w/ 5 gall. of distilled water
BENTONITE SEAL OR GRANULAR BENTONITE BOTTOM (= FILTER PACK TOP): 4.0'
FILTER PACK TYPE: 16/40 Silica Sand BRAND: C.S.S.I.
SURFACE CASING BOTTOM (=SCREEN TOP): 4.95' TYPE: 2" I.D. - Sch. 40 - PVC
SCREEN ID (IN): 2.0" SLOT SIZE (IN): 0.01" TYPE: 2" I.D. - Sch. 40 PVC
SCREEN BOTTOM (= SUMP, TOP): 19.95 SUMP TYPE: Threaded end cap
FILTER PACK BOTTOM (= *BACKFILL TOP): 20.15' *BACKFILL TYPE: N/A
SUMP BOTTOM (= WELL COMPLETED DEPTH): 20.15' *PILOT HOLE TOP, DIAMETER: N/A
TOTAL BOREHOLE DEPTH (= *PILOT HOLE AND *BACKFILL BOTTOM): 20.15'
REMARKS: Routine well installation. Concrete well pad installed on 8/9/05.

COMPLETED BY: Ellen S. Warp Ellen S. Warp DATE: 8/8/05
CHECKED BY: Gary Stretesky Gary Stretesky DATE: 8-18-05

U.S. DEPARTMENT OF ENERGY ROCKY FLATS PLANT

FORM PRO.101A

ROCKY FLATS ENVIRONMENTAL TECHNOLOGY SITE BOREHOLE LOG

PAGE 1 OF 2

Borehole Number: 80105
Location - North: East:
Date: 8/8/05
Geologist: E. WARP
Drilling Equip.: CME-75-HT - Hollow Stem Auger

Surface Elevation:
Area: Original Landfill
Total Depth: 20.15
Company: URS/High Plains Project No.: HAD51300
Sample Type: Continuous Core - push

RMRS LOGGING SUPERVISOR APPROVAL [signature] DATE 8/10/05

TOP/BOTTOM OF CORE IN BOX	TOP/BOTTOM OF INTERVAL	FEET OF CORE IN INTERVAL (FIELD MEASUREMENT)	SAMPLE NUMBER	FRACTURE ANGLE	BEDDING ANGLE	GRAIN SIZE DISTRIBUTION	USCS SYMBOL	DEPTH IN FEET	SOIL LITHOLOGIC LOG	SAMPLE DESCRIPTION
0.0	0.0	0.0						0.0		8/10/05 0.0-1.2' - GRAVEL/Sandy CLAY w/silt mixture. Imported Qal_rf fill. Strong brn. (7.5YR4/6). 20-25% gravel (1/8"-1" dia., sub-rounded to sub-ang.), predominately quartz with less schist and granite. 20% sand (c.g., sub-ang. to sub-rounded). Clay has medium plasticity. Dk. brn. (7.5YR3/2) clay lense fm. 0.4' to 0.5'. Disseminated caliche - tiny, wht specks common throughout interval. MOIST
	Run #1	Rec. = 1.2'					GC CL	1		
	2.0'	4.0'						2		1.2-2.0' = No recovery
	Run #2	Rec. = 0.4'					GC CL	2.4'		2.0-2.4' - GRAVEL/Sandy CLAY w/silt mixture. SAME AS above fm. 0.0-1.2'. MOIST.
								3		2.4-4.0' = No recovery
	4.0'	4.0'						4		4.0-4.3' - Gravelly, sandy CLAY, Dk. Brn. (7.5YR3/2) Distinct color change. ~10% sand (c.g., sub-ang.) 5-8% gravel (1/8-1/2" dia., sub-rounded to sub-ang.). Tr to some organic material (wood chips). Medium to high plasticity. V. MOIST. Color change may indicate prior ground surface (before fill added). 8/10/05
	Run #3	Rec. = 1.6'					CL	4.3'		4.3-4.7' - Gravelly, sandy CLAY - Dk. Gry. (7.5YR4/1) to Brn. (7.5YR4/4). ~30% sand (c.g., sub-ang.). 20-25% gravel (1/8-1 1/2" dia., sub-rounded to sub-ang.). Possible fluvial deposit. Well graded, poorly sorted. V. MOIST.
							GC CL	4.7'		
							CL	5		4.7-5.6' - Silty CLAY. Re-worked bedrock. Lt. gry. (10YR6/2) w/Brn'sh yellow (10YR6/6) mottling. Wk. FeOxn mottling. Tr caliche. [V. poor recovery, clay has been extruded like a "ribbon" due to a clogged cutting shoe.] V. MOIST.
								6		5.6-7.0' = No recovery
	7.0'	7.0'						7		7.0-7.35 - Silty CLAY. Re-worked bedrock. Lt. gry. (10YR7/1) w/some Lt. Yellsh brn. (10YR6/4) mottling. Tr alluvial clastics indicate FeOxn not yet bedrock. 8/10/05
	Run #4	Rec. = 1.0'					CL	7.35		
								7.5		7.35-7.50 - CLAY w/Tr to some sand and gravel and silt. Dk. grysh brn. (10YR4/2) w/some Lt. brnish gry (10YR6/2). 3-5% gravel (1/8-1/4" dia.). 3-5% sand (c.g., sub-ang.). Wk to mod. FeOxn mottled throughout. V. MOIST. Top of Bedrock @ 7.5'. 8/10/05
								8		
9.0	Run #5 9.0'-10.0'	9.0' Rec. = 3.2'						9		7.50-8.0' - Clayey SILTSTONE. Gry (10YR6/1) with Yellsh brn. (10YR4/4) FeOxn mottled throughout. V. Subtle bedrock contact. [V. poor recovery - cutting shoe is clogged causing siltstone to appear "ribboned" in sample tube]. V. MOIST
	10.0'	10.0'						10.0'		

8.0-9.0' = No recovery
9.0-10.4' — see next page for description

NOTES: General: USCS is modified for this log as follows:
Materials amounts are estimated by % volume instead of % weight.
(1) Badly broken core, accurate footage measurements not possible.
(2) Core breaks cannot be matched, accurate footage measurements not possible.

Procedure No. RMRS/OPS-PRO.101
Revision 0
Date effective: 12/31/98
Page 27 of 28

(4011-930-0134-930)(Form GT.1A)(0301/92)

ROCKY FLATS ENVIRONMENTAL TECHNOLOGY SITE BOREHOLE LOG

Borehole Number: 80105
Location - North: _____ East: _____
Date: 8/8/05
Geologist: E. WARP
Drilling Equip.: CME-75-HT-Hollow Stem Auger

Surface Elevation: _____
Area: ORIGINAL LANDFILL
Total Depth: 20.15'
Company: URS/HIGH PLAINS Project No.: _____
Sample Type: Continuous Core

RMRS LOGGING SUPERVISOR APPROVAL [signature] DATE 8/10/05

TOP/BOTTOM OF CORE IN BOX	TOP/BOTTOM OF INTERVAL	FEET OF CORE IN INTERVAL (FIELD MEASUREMENT)	SAMPLE NUMBER	FRACTURE ANGLE	BEDDING ANGLE	GRAIN SIZE DISTRIBUTION	USCS SYMBOL	DEPTH IN FEET	SOIL/LITHOLOGIC LOG	SAMPLE DESCRIPTION
	10.0' Run #5 (cont.) 12.0'	10.0' Rec. = 3.2'						10.0' 10.4' 11		9.0-10.4 - CLAYSTONE. Gry (10YR 5/1) w/ Yellowish brn. (10YR 5/6) mottling. Caliche blebs and stringers commen throughout. Wk. FeOx'n mottling. Massive texture. Moderately friable. Noteable decrse. in moisture to SL. MOIST.
	Run #6 14.0	Rec. = 2.0		~60-80° ~70° ~80°	JAD 8/10/05			12 13		10.4-12.0' - CLAYSTONE. V. Dk. Gry (10YR 3/1) to Gry (10YR 5/1). Massive texture. Abundant blk. organic stringers fm. 10.4' to 10.6'. ~~T~~ Very Rare caliche stringers. Mod. friable. No FeOx'n. SL. MOIST. JAD 8/10/05
	Run #7 17.0	Rec. = 2.5'		~20-30° ~70° ~30, 60° ~10-30°	JAD 8/10/05			14 15 16 16.5'		12.0'-14.0' - CLAYSTONE. Gry'sh brn. (10YR 5/2). Wk. perv. FeOx'n. T caliche blebs. T blk. organic material. Wkly. friable. Organic sor T FeOx'n along internal fractures @ 12.3', 12.6, and 13.4. Decr. moisture to V. SL. MOIST.
	Run #8 19.0	Rec. = 2.0						17 18		14.0-16.5' - Clayey SILTSTONE. Lt. brn'sh gry. (10YR 6/2) w/ some lt. yell'sh brn (10YR 6/4) FeOx'n mottling throughout. Massive texture. Wkly friable. T blk. organic stringers. T FeOx'n on minor internal fractures @ 15.1, 15.5', ~~and~~ 15.8', and 16.3'. T moisture. Occasional rip-up clasts. JAD 8/10/05
	REAMED OUT W/ AUGERS 20.15	Rec. = 0.0	JAD 8/10/05					19 20.15		16.5-17.0' = No recovery
										17.0-19.0 - CLAYSTONE. Dk. Gry (10YR 4/1) to V. Dk. Gry (10YR 3/1). V. fissile, friable and dry. Abundant black carbonaceous material @ 18.0-18.5'. REAMED WITH Augers fm. 19.0 → 20.15 (T.D.) DID NOT SAMPLE THIS INTERVAL
										20.15' = T.D.

NO RECOVERY 19.0-20.15' JAD 8/10/05

NOTES: General: USCS is modified for this log as follows:
Materials amounts are estimated by % volume instead of % weight.
(1) Badly broken core, accurate footage measurements not possible.
(2) Core breaks cannot be matched, accurate footage measurements not possible.

Procedure No. RMRS/OPS-PRO.101
Revision 0
Date effective: 12/31/98

(4011-930-0134-930)(Form GT.1A)(03/01.92)

STATE PLANE COORDINATES AREA:
NORTH: 747535.636
EAST: 2082324.443
PROJECT: Original Landfill
REMARKS:
Routine well installation

GRND ELEV. (FT): 5938.52
TOTAL DEPTH (FT): 20.0
COMPLETION DATE: 8/10/05
GEOLOGIST: E. Warp

CASING DIA (IN): 2"
BH DIA. (IN): 8"
GRID LOCATOR:

LOG OF BORING NUMBER:
80205

Elev (Ft)	Well or Piezometer Construction and Materials	Depth (Ft)	Lithology	Unified Soils Classification or Rock Type	Lithologic Description
5942, 5941, 5940, 5939, 5938, 5937, 5936, 5935	Protective Casing, Steel, 6 in. ID.; Casing, Sch 40-PVC, 2 in. ID.; Bentonite Chips	4, 3, 2, 1, 0, 1, 2, 3, 4			
					GC/CL: Gravel/Sandy Clay with silt, strong brown (7.5YR4/6). 15 - 25% gravel (1/8" - 3/4" diameter, subrounded to subangular, predominately quartzite and granite). 20 - 25% sand (coarse grained, subangular). Clay has medium plasticity. Moist from 0.0' to 1.0'. Saturated, but not flowing, from 1.0' to 1.5'.
					CL: Silty Clay with trace sand and trace gravel, dark brown (7.5YR3/2) with some yellowish brown (10YR5/4) mottling. Clay has medium plasticity. Granite clast (3/4" diameter, angular) at 1.7'. Saturated, but not flowing.
					No recovery
					CL: Clay with trace silt, trace gravel, and trace sand, brown (7.5YR4/3) from 2.0' to 2.2', yellowish brown (10YR5/4) to dark yellowish brown (10YR4/4) from 2.2' to 4.0'. Appears to be re-worked claystone bedrock (?). Interval is firm and dense but pliable due to moisture. Trace black organic stringers. Trace caliche blebs at base of interval. Roots and twigs common throughout. Gravel (1/4" - 1/2", subrounded) from 3.4' to 3.6', and at base of interval. Decreased moisture to very moist.

Elev (Ft)	Well or Piezometer Construction and Materials	Depth (Ft)	Lithology	Unified Soils Classification or Rock Type	Lithologic Description
5934	Filter Pack, 16/40 Silica Sand; Screen, Sch 40-PVC, 2 in. ID., 0.010 in. slots	4, 5			CL: Clay (re-worked claystone), gray (10YR5/1) with trace yellowish brown (10YR5/6) mottling. Roots common throughout interval. Trace caliche blebs. Caliche stringer with iron oxidation halo at 5.1'. Slight color change from 5.9' to 6.7' to light brownish gray (10YR6/2) with faint mottling. Decreased moisture to moist.
5933		6			
5932		7			No recovery.
5931		8			CL: Clay with trace gravel (probably re-worked claystone), grayish brown (10YR5/2). Roots common. Soft and pliable. Saturated, free water from 7.6' to 8.0'. Gravel (1/2" diameter, subrounded) at 7.6' with trace iron oxidation in clay surrounding gravel clast.
5930		9			GC/CL: Gravelly Clay, dark brown (7.5YR3/3) with some strong brown (7.5YR5/6) iron oxidation at 8.15'. Strongly fractured and crumbly. 20 - 25% gravel (1/4" - 3/4" diameter, subrounded to subangular). Composition of gravel (?) - possible conglomerate, coated with iron oxide and manganese oxide. Interval is saturated with free water.
5929		10			CLAYSTONE: TOP OF BEDROCK. Claystone (bedrock) - possibly re-worked. Grayish brown (10YR5/2) to gray (10YR5/1) with minor yellowish brown (10YR5/6) mottling. Roots common. Trace caliche stringers. Interval competent from 8.35' to 9.0'; friable from 9.0' to 9.45'. Distinct decrease in moisture to very moist, further decreasing to moist at base.
5928		11			CLAYSTONE: Claystone, grayish brown (10YR5/2) to gray (10YR5/1) with trace brownish yellow (10YR6/8) iron oxidation mottling throughout. Massive texture. Interval is moderately friable. Slightly moist.
5927		12			No recovery.
5926		13			CLAYSTONE: Claystone, pale brown (10YR6/3). Massive texture. Trace iron oxidation along bedding planes. Silty lense (~1/8" thick) with iron oxidation at 13.8'. Firm and dense. Decreased moisture to very slightly moist. Trace silt at 12.5' and below.

Elev (Ft)	Well or Piezometer Construction and Materials	Depth (Ft)	Lithology	Unified Soils Classification or Rock Type	Lithologic Description
5925					
		14			CLAYSTONE: Claystone, gray (10YR5/1) to dark gray (10YR4/1). Massive textured. Trace iron oxidation along bedding planes (sub-horizontal). Disseminated caliche coating from 15.2' to 15.8' along vertical fracture with iron oxidation. Interval weakly friable. Trace black organic stringers. Decreased moisture to trace.
5924					
		15			
5923					
		16			
5922					
		17			
5921					
		18			CLAYSTONE: Claystone, dark gray (10YR4/1) to very dark gray (10YR3/1). Massive texture. Moderately fissile and friable. No iron oxidation. Trace moisture to dry.
5920					
		19			
5919	Conical Threaded End Cap - Sump, Sch 40-PVC	20			

MONITORING WELL INSTALLATION REPORT: Form PRO.118

LOCATION CODE: 80205 PROJECT NAME: Original Landfill CY05 Well Replacements PROGRAM: Water Programs- WARP

SCREENED FORMATION: Al/Bdrk. DRILLING CONTRACTOR: High Plains BORING METHOD: Hollow Stem Auger

DATE DRILLED: 8/10/05 DATE COMPLETED: 8/10/05 TOTAL DEPTH: 20.0' COMPLETED DEPTH: 20.0

ESTIMATED DEPTH TO BEDROCK: 8.35 RIG GEOLOGIST: E. Warp LOGGING GEOLOGIST: E. Warp

BOREHOLE DIAMETER IN SCREENED INTERVAL: 8" QUANTITY OF FLUIDS LOST DURING DRILLING: N/A

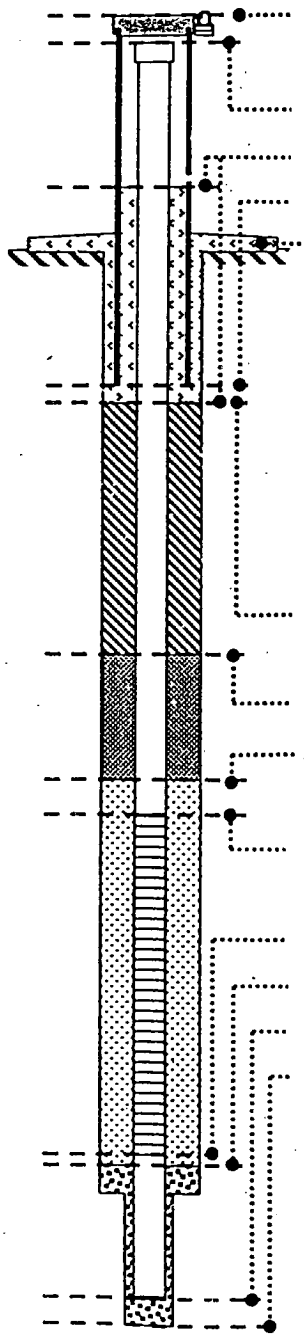
INITIAL WATER LEVEL (FT, DATE): Dry on 8/10/05 COMPLETED WATER LEVEL (FT, DATE): 12.03 TOC 8-18-05

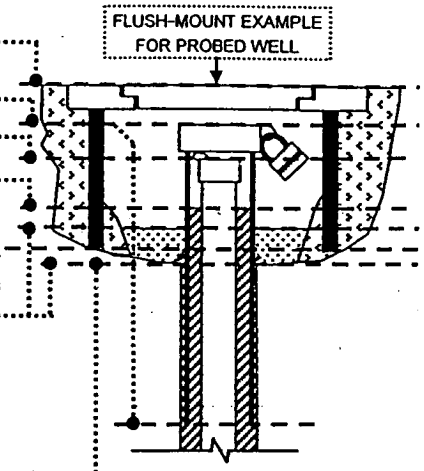
DIAMETER & TYPE OF INSTALLATION (WELL/PIEZOMETER/WELL POINT/ETC.): 2.0" I.D. PVC WELL

TYPE OF PROTECTION (FLUSH-MOUNT VS. ABOVE GROUND, ASEPTIC, ETC.): Above ground steel protective casing

ALL MEASUREMENTS WILL BE MADE IN FEET FROM GROUND SURFACE

*-DENOTES ITEMS THAT MAY NOT BE APPLICABLE, DEPENDING ON BORING METHOD, WELL PROTECTION & PURPOSE





PROTECTIVE CASING TOP (STICKUP/OR FLUSH-MOUNT): 3.93' ags

*SECONDARY CASING TOP: N/A BOTTOM: N/A TYPE: N/A

SURFACE CASING TOP: 3.4' ags ID (IN): 2.0"

SURFACE SEAL TOP: 1.13' ags BOTTOM: 0.4' bgs TYPE: Concrete

PROTECTIVE CASING BOTTOM, ID (IN), TYPE: 0.87' bgs, 6" steel

*WELL PAD DIMENSIONS, TYPE: 3'x3' - Concrete top 0.3' ags bottom 0.4' bgs

*ADD'L CASING FILL TOP: N/A BOTTOM: N/A TYPE: N/A

*SURFACE ISOLATION CASING TOP: N/A BOTTOM: N/A

*SURFACE ISOLATION CASING ID (IN): N/A TYPE: N/A

*OTHER (E.G., ASEPTIC) CASING TOP: N/A BOTTOM: N/A

*OTHER CASING ID (IN): N/A TYPE, PURPOSE: N/A

*CENTRALIZER(S) OD (IN): N/A NUMBER USED: N/A TYPE: N/A

*CENTRALIZER(S) DEPTH(S): N/A

*GROUT TOP: N/A MEASURED DENSITY (LBS/GAL): N/A TYPE: N/A

*GRANULAR BENTONITE TOP: N/A TYPE: N/A

*BENTONITE SEAL TOP: 0.4' bgs TYPE: Med. bentonite chips - "Pure Gold" (used 2 bags)

BENTONITE SEAL OR GRANULAR BENTONITE BOTTOM (= FILTER PACK TOP): 4.2' bgs

FILTER PACK TYPE: 16/40 Silica Sand BRAND: C.S.S.I (used 11 bags)

SURFACE CASING BOTTOM (=SCREEN TOP): 4.75 TYPE: 2.0" I.D. - Sch. 40 PVC

SCREEN ID (IN): 2.0" SLOT SIZE (IN): 0.01" TYPE: 2.0" I.D. - Sch. 40 PVC

SCREEN BOTTOM (= SUMP, TOP): 19.75 SUMP TYPE: Sch. 40 PVC - Conical threaded end cap

FILTER PACK BOTTOM (= *BACKFILL TOP): 20.0' *BACKFILL TYPE: N/A

SUMP BOTTOM (= WELL COMPLETED DEPTH): 20.0' *PILOT HOLE TOP, DIAMETER: N/A

TOTAL BOREHOLE DEPTH (= *PILOT HOLE AND *BACKFILL BOTTOM): 20.0'

REMARKS: Routine well installation

COMPLETED BY: Ellen S. Warp Ellen S. Warp DATE: 8/10/05

CHECKED BY: Gary Stretesky Gary Stretesky DATE: 8-18-05

ROCKY FLATS ENVIRONMENTAL TECHNOLOGY SITE BOREHOLE LOG

Borehole Number: 80205
Location - North: _____ East: _____
Date: 8/10/05
Geologist: E. WARP
Drilling Equip. CME-75-HT Hollow Stem Auger

Surface Elevation: _____
Area: Original Landfill
Total Depth: 20.0'
Company: URS/High Plains Project No. HAD51300
Sample Type: Continuous core

RMRS LOGGING SUPERVISOR APPROVAL [signature] DATE 8/15/05

TOP/BOTTOM OF CORE IN BOX	TOP/BOTTOM OF INTERVAL	FEET OF CORE IN INTERVAL (FIELD MEASUREMENT)	SAMPLE NUMBER	FRACTURE ANGLE	BEDDING ANGLE	GRAIN SIZE DISTRIBUTION	USCS SYMBOL	DEPTH IN FEET	SOIL/LITHOLOGIC LOG	SAMPLE DESCRIPTION
	0.0'							0.0		0.0-1.5' - GRAVEL/Sandy CLAY w/silt. Strong Brn. (7.5YR4/6). 15-25% gravel (1/8-3/4" dia., sub-rounded to sub-ang., predominately qtzite and granite). 20-25% sand (c.g., sub-ang.) Clay has med. plasticity. MOIST fm. 0.0→1.0'. SATURATED but not flowing fm 1.0→1.5'.
	Run #1	Rec. = 1.7'					GC CL	1		
							CL	1.5'		1.5-1.7' - Silty CLAY w/Tr sand and Tr gravel. Dk. brn. (7.5YR3/2) w/some yell'sh brn. (10YR5/4) mottling. Clay has med. plasticity. Granite clast (3/4" dia., ang.) @ 1.7'. SATURATED BUT NOT FLOWING.
	2.0'							1.7'		1.7-2.0' - No recovery
	Run #2	Rec. = 2.1'					CL	2		2.0-4.0 - CLAY w/Tr silt, Tr gravel, and Tr sand. Brn. (7.5YR4/3) fm. 2.0'-2.2'. Yell'sh brn. (10YR5/4) to dk. yell'sh brn (10YR4/4) fm. 2.2 to 4.0'. Appears to be re-worked claystone bedrock (?). Interval is firm and dense but pliable due moisture. Tr blk org. stringers. Tr caliche blebs at base of interval. Roots and twigs common throughout. Gravel (1/4-1/2", sub-rounded) fm. 3.4 to 3.6', and at base of interval. Decr. moisture to V. MOIST.
	4.0'							3		
	Run #3	Rec. = 2.8'					CL	4		4.0-6.8' - CLAY (re-worked claystone). Gry. (10YR5/1) w/Tr yell'sh brn. (10YR5/6) mottling. Roots common throughout interval. Tr caliche blebs. Caliche stringer w/FeOx'n halo @ 5.1'. Sl. color change fm. 5.9-6.7' to lt. brn'sh gry (10YR6/2) w/faint mottling. Decr. moisture to MOIST.
								5		
						grapping error ESW 8/10/05		6		
								6.8'		6.8'-7.0' = No recovery
	7.0'							7		7.0-8.0 - CLAY w/Tr gravel (probably re-worked claystone). Gry'sh brn. (10YR5/2). Roots common. Soft and pliable. SATURATED. Free H_2O fm. 7.6 to 8.0'. Gravel (1/2" dia., sub-rounded) @ 7.6' w/Tr FeOx'n in clay surrounding gravel clast.
	Run #4	Rec. = 2.1'					CL	7.6'		
							GC CL	8		8.0-8.35' - Gravelly CLAY Dk. Brn. (7.5YR3/3) w/some Strng. brn. (7.5YR5/6) FeOx'n @ 8.15'. Strongly fractured and crumbly. 20-25% gravel (1/4 to 3/4" dia., sub-rounded to sub-ang.) Composition of gravel (?) - possible conglomerate coated w/FeOx and MnOx. Interval is saturated with free H_2O
								8.35'		
	9.0'							9		
								9.45'		
								10.0		

Bedrock contact @ 8.35' (?) - v. vague. 8/15/05

NOTES: General: USCS is modified for this log as follows:
Materials amounts are estimated by % volume instead of % weight.
(1) Badly broken core, accurate footage measurements not possible.
(2) Core breaks cannot be matched, accurate footage measurements not possible.

Procedure No. RMRS/OPS-PRO.101 8/15/05
Revision 0
Date effective: 12/31/98
8/15/05

8.35-9.45' - CLAYSTONE (Bedrock?) - possibly re-worked. Gry'sh brn. (10YR5/2) to Gry (10YR5/1) w/minor yell'sh brn. (10YR5/6) mottling. Roots common. Tr caliche stringers. Interval competent fm. 8.35-9.0'; friable fm. 9.0-9.45'. Distinct decr. in moisture to V. MOIST, further decreasing to MOIST @ base.

(4011-930-0134-930)(Form GT.1A)(03/01/92)

ROCKY FLATS ENVIRONMENTAL TECHNOLOGY SITE BOREHOLE LOG

Borehole Number: 80205
Location - North: _____ East: _____
Date: 8/10/05
Geologist: E. WARP
Drilling Equip.: CME-75-HT Hollow Stem Auger

Surface Elevation: _____
Area: Original Landfill
Total Depth: 20.0'
Company: URS/High Plains Project No. HAD51300
Sample Type: Continuous Core

RMRS LOGGING SUPERVISOR APPROVAL [signature] DATE 8/15/05

TOP/BOTTOM OF CORE IN BOX	TOP/BOTTOM OF INTERVAL	FEET OF CORE IN INTERVAL (FIELD MEASUREMENT)	SAMPLE NUMBER	FRACTURE ANGLE	BEDDING ANGLE	GRAIN SIZE DISTRIBUTION	USCS SYMBOL	DEPTH IN FEET	SOIL/LITHOLOGIC LOG	SAMPLE DESCRIPTION
	Run #5 (cont.) 9.0'→12.0'	Rec = 2.8'						11		9.45-11.8 - CLAYSTONE. Gry'sh brn. (10YR5/2) to Gry (10YR5/1) w/ Tr Brn'sh Yellow (10YR6/8) FeOx'n mottling throughout. Massive texture. Interval is moderately friable. SL. MOIST.
	12.0'							11.8' 12		11.8-12.0' = No recovery
	Run #6	Rec = 2.0'						13		12.0-14.0 - CLAYSTONE. ~~Lt. brn~~ Pale Brn. (10YR6/3). Massive texture. Tr FeOx'n along bedding planes. Silty lense (~1/8" thick) w/ FeOx'n @ 13.8'. Firm and dense. Decr. moisture to V. sl. MOIST. Tr. silt, 12.5-deeper. 8/15/05
	14.0'							14		
	Run #7	Rec = 3.0'						15, 16		14.0-17.6 - CLAYSTONE - Gry (10YR5/1) to dk gry (10YR4/1). Massive textured. Tr FeOx along bedding planes (sub-horizontal). Wkl. caliche coating fm. 15.2-15.8 along vertical fracture w/ FeOx'n. Interval wkly friable. Tr blk organic stringers. Decr. moisture to Tr.
	17.0'							17		
	Run #8	Rec = 3.15'						12.6, 18, 19		12.6-20.0 - CLAYSTONE - Dk Gry (10YR4/1) to v. dk. gry (10YR3/1). Massive texture. Mod. fissile and friable. No FeOx'n. Tr moisture to dry.
	20.0'									T.D. @ 20.0'

NOTES: General: USCS is modified for this log as follows:
Materials amounts are estimated by % volume instead of % weight.
(1) Badly broken core, accurate footage measurements not possible.
(2) Core breaks cannot be matched, accurate footage measurements not possible.

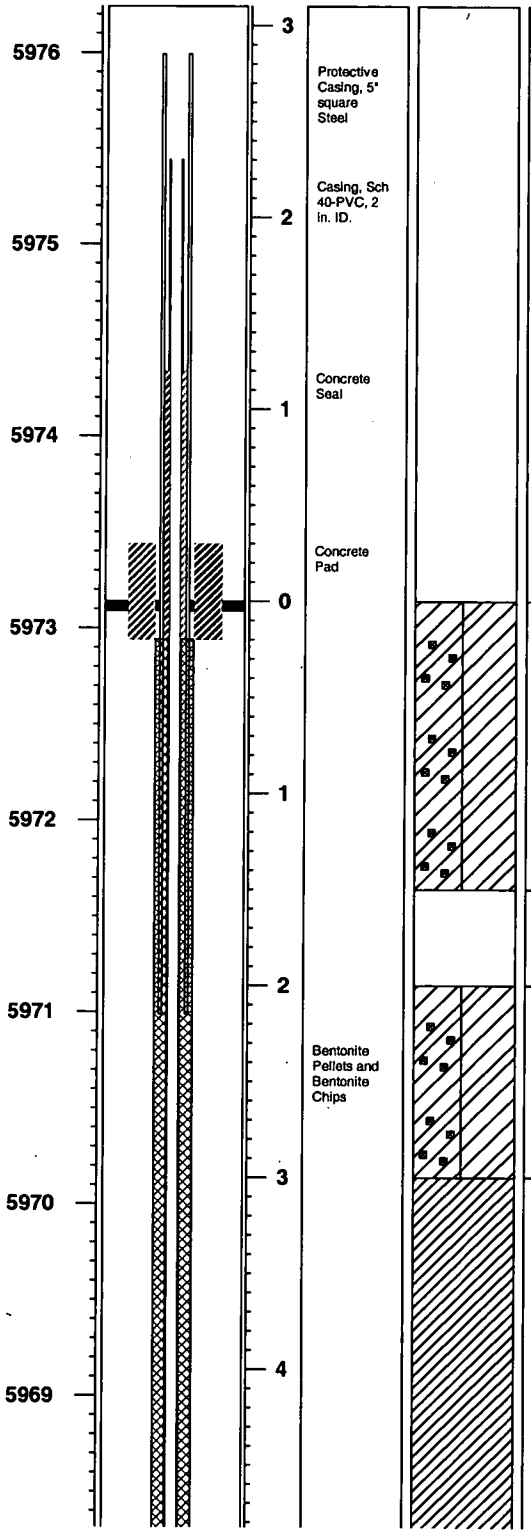
(4011-930-0134-930)(Form GT:1A)(03/01/92)

STATE PLANE COORDINATES AREA:
NORTH: 748104.07
EAST: 2083851.08
PROJECT:
REMARKS:
Replaces 5187. Routine well installation.

GRND ELEV. (FT):5973.14
TOTAL DEPTH (FT): 27.5
COMPLETION DATE: 6/29/05
GEOLOGIST: E. Warp

CASING DIA (IN): 2
BH DIA. (IN): 8
GRID LOCATOR:

LOG OF BORING NUMBER: 88205



Unified Soils Classification or Rock Type	Lithologic Description
	GC/CL: Sandy, Gravelly Clay, brown (7.5YR4/3 to 7.5YR5/3). 60 - 65% clay, medium plasticity, 20 - 25% gravel (1/8" - 1" diameter, subangular), ~15% sand (coarse grained, subangular). Trace to some disseminated caliche throughout interval. 1-1/2" diameter quartzite cobble (subangular) at 0.9'. Moist.
	No recovery
	GC/CL: Sandy, Gravelly Clay, strong brown (7.5YR4/6 to 7.5YR5/6). Slight color change, otherwise unchanged from 0.0' to 1.5' interval. Shattered 1" to 1-1/2" diameter cobbles of quartzite at 2.0', 2.5', and 2.7'. Approximately 45% of interval is shattered cobbles. Moist.
	CL: Clay with trace to some gravel and sand. Yellowish brown (10YR5/4) with trace to some brownish yellow (10YR6/8) mottling. 5 - 8% gravel (1/8" - 1/2" diameter, subrounded to subangular). Clay appears to be derived from claystone (bedrock) material. Weak disseminated iron oxidation. Trace disseminated caliche. Moist.

Elev (Ft)	Well or Piezometer Construction and Materials	Depth (Ft)	Lithology	Unified Soils Classification or Rock Type	Lithologic Description
5968		5			
	Filter Pack, 16/40 Silica Sand			SC/GC:	SC/GC: Silty, Gravelly Sand, grayish brown (10YR5/2). 70 - 75% silty sand (medium grained to coarse grained, subrounded to subangular), 25 - 30% gravel (1/8" - 3/4" diameter, subangular to subrounded). Gravel composed of quartzite, granite, and concrete. Moist. Abundant concrete fragments (grayish-white concrete with angular rock clasts) from 5.6' to 6.0' (1" - 2" diameter).
5967		6		GC:	GC: Silty, Sandy Gravel fill, grayish brown (10YR5/2) to light brownish gray (10YR6/2). Gravel fill composed of manmade and natural material. 65 - 70% of interval composed of gravel and concrete fragments (1/4" - 2" diameter). 1" - 2" diameter cobble-size chunks of vesicular, lithic-rich man-made material at 6.5' and 7.7' to 7.9'. Reddish-brown (5YR4/4) to dark reddish gray (5YR4/2) vesicular matrix with 1/8" to 1/4" diameter, subrounded clasts of medium gray (GLEY) vesicular material. Clasts in material (chunk) at 7.9' are yellowish red (5YR5/8 to 5YR4/6). Some to abundant 1" to 1-1/2" diameter, subangular fragments of concrete from 8.0' to 8.5'. Very moist increasing to saturated (free water) at 9.3'. Very moist clay with sandy lense from 6.4' to 6.7'. Wet in sandy lense from 7.6' to 8.0'. 2" wood fragment at 9.3'.
5966		7			
	Screen, Sch 40-PVC, 2 in. ID., 0.010 in. slots				
5965		8			
5964		9			
					No recovery.
5963		10		SC/GC:	SC/GC: Asphalt Gravel/Sand mixture, black (10YR2/1). ~80% silty sand composed of asphalt and road base with ~20% gravel (1/8" to 3/4" diameter, subrounded) composed of asphlat and road base. Previous ground surface prior to fill being placed on 881 Hillside. Saturated and flowing water.
5962		11		GC/CL:	GC/CL: Gravel/Sandy Clay mixture with some silt. Brown (7.5YR5/4). ~40% gravel (1/8" - 1" diameter, subrounded to subangular, composed of quartzite and granite). ~35% silty clay (medium plasticity), ~30% sand (coarse grained, subangular to subrounded). 2" quartzite clast at 10.7'. 1" concrete clast at 10.8'. Some caliche disseminated throughout. Wet and flowing from 10.5' to 10.6', remainder of interval is saturated but has no flowing water.
5961		12			No recovery.
5960		13		GC/CL:	GC/CL: Gravel/Sandy Clay with some silt. Very similar to above interval from 10.5' to 11.5' with slight color change from brown (7.5YR5/4) to strong brown (7.5YR4/6). Disseminated caliche common. 3" diameter quartzite cobble at 13.1'. Saturated, but not flowing.
					No recovery.

Elev (Ft)	Well or Piezometer Construction and Materials	Depth (Ft)	Lithology	Unified Soils Classification or Rock Type	Lithologic Description
5959		14			GC/CL: Gravelly, Silty Clay with trace to some sand, light brown (7.5YR6/4) to brown (7.5YR5/3) with trace to some strong brown (7.5YR5/8). ~70% silty clay (medium plasticity), 15 - 20% gravel (1/8" - 1/2" diameter, subrounded), 10 - 15% sand (medium grained to coarse grained, subrounded). Weak to moderate iron oxidation mottled throughout. Trace disseminated caliche. Saturated, but not flowing.
5958		15			
					No recovery.
5957		16			GC/CL: Gravelly, Silty Clay with some sand. Same as interval from 14.0' to 15.7'. Saturated, but not flowing.
5956		17			
					No recovery.
5955		18			CL: Gravelly, Silty Clay with some sand, brown (10YR5/3) with trace to some yellowish brown (10YR5/6) mottling and trace to some light olive gray (5Y6/2) mottling. ~80% silty clay (medium plasticity), ~10 - 15% gravel (1/8" - 1/2" diameter, subrounded), 5 - 8% sand (medium grained to coarse grained, subrounded to subangular). Slight decrease in gravel from above interval. Trace disseminated caliche. Saturated, but not flowing.
5954		19			
					No recovery.
5953		20			CL: Gravelly, Silty Clay with trace sand, brown (7.5YR5/4). 75 - 80% silty clay (medium plasticity), ~20% gravel (1/4" - 1" diameter, subrounded, composed of quartzite and granite). Some caliche-coated gravel clasts (1" diameter) at base of interval. Saturated, but not flowing.
5952		21			CLAYSTONE: TOP OF BEDROCK. Claystone (bedrock) with trace to some silt, grayish brown (10YR5/2) to dark grayish brown (10YR4/2). Massive texture. Friable, broken/crumbly. Trace black organic stringers. Definite decrease in moisture from saturated to moist.
					No recovery.
5951		22			CLAYSTONE: Claystone to claystone with silt, dark grayish brown (10YR4/2) to very dark grayish brown (10YR3/2). Firm and dense. Weak to moderate iron oxidation along internal fractures (70 - 90%) at 23.3' to 23.5' and 24.6' to 25.0'. Black organic stringers common from 25.7' to 27.0'. Massive texture. Abundant black organic
		23			

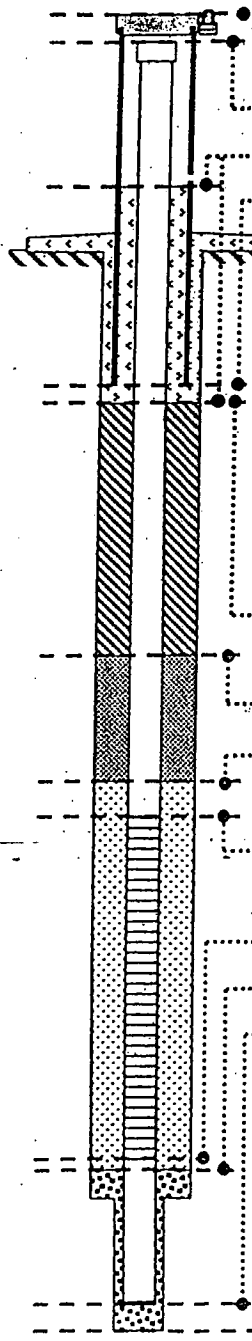
Elev (Ft)	Well or Piezometer Construction and Materials	Depth (Ft)	Lithology	Unified Soils Classification or Rock Type	Lithologic Description
5950					material along sub-horizontal bedding planes from 26.2' to 27.0'.
5949		24			
5948		25			
5947		26			
5946	Threaded End Cap - Sump, Sch 40-PVC	27			Not sampled between 27.0' and 27.5'. Reamed out with augers only.

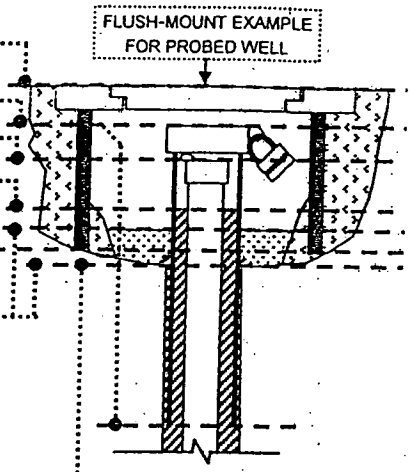
MONITORING WELL INSTALLATION REPORT: Form PRO.118

LOCATION CODE: 88205 PROJECT NAME: CY05 Well Replacements PROGRAM: Water Programs
SCREENED FORMATION: Fill/alluvium/bedrock DRILLING CONTRACTOR: Layne BORING METHOD: Hollow Stem Auger
DATE DRILLED: 6/28/05 DATE COMPLETED: 6/29/05 TOTAL DEPTH: 27.5 COMPLETED DEPTH: 27.5'
ESTIMATED DEPTH TO BEDROCK: 20.3' RIG GEOLOGIST: E. Warp LOGGING GEOLOGIST: E. Warp
BOREHOLE DIAMETER IN SCREENED INTERVAL: 8" QUANTITY OF FLUIDS LOST DURING DRILLING: N/A
INITIAL WATER LEVEL (FT, DATE): Wet during installation on 6/28/05 COMPLETED WATER LEVEL (FT, DATE): 9.47' (fm. TOC) 6/29/05
DIAMETER & TYPE OF INSTALLATION (WELL/PIEZOMETER/WELL POINT/ETC.): 2.0" I.D. - PVC Well
TYPE OF PROTECTION (FLUSH-MOUNT VS. ABOVE GROUND, ASEPTIC, ETC.): Above ground Steel

ALL MEASUREMENTS WILL BE MADE IN FEET FROM GROUND SURFACE

* DENOTES ITEMS THAT MAY NOT BE APPLICABLE, DEPENDING ON BORING METHOD, WELL PROTECTION & PURPOSE





PROTECTIVE CASING TOP (STICKUP OR FLUSH-MOUNT): 2.85' ags.
*SECONDARY CASING TOP: N/A BOTTOM: N/A TYPE: N/A
SURFACE CASING TOP: 2.3' ags ID (IN): 2.0"
SURFACE SEAL TOP: 1.2' ags BOTTOM: 0.2' bgs TYPE: Concrete
PROTECTIVE CASING BOTTOM, ID (IN), TYPE: 2.15' bgs, 5"x5" square steel
*WELL PAD DIMENSIONS, TYPE: 3'x3', Concrete - fm. 0.3' ags to 0.2' bgs
*ADD'L CASING FILL TOP: N/A BOTTOM: N/A TYPE: N/A
*SURFACE ISOLATION CASING TOP: N/A BOTTOM: N/A
*SURFACE ISOLATION CASING ID (IN): N/A TYPE: N/A
*OTHER (E.G., ASEPTIC) CASING TOP: N/A BOTTOM: N/A
*OTHER CASING ID (IN): N/A TYPE, PURPOSE: N/A
*CENTRALIZER(S) OD (IN): N/A NUMBER USED: N/A TYPE: N/A
*CENTRALIZER(S) DEPTH(S): N/A
*GROUT TOP: N/A MEASURED DENSITY (LBS/GAL): N/A TYPE: N/A
*GRANULAR BENTONITE TOP: N/A TYPE: N/A
*BENTONITE SEAL TOP: 0.2' TYPE: Bentonite pellets (1/4") - BAROID and Bentonite Chips (Envirosplug).
BENTONITE SEAL OR GRANULAR BENTONITE BOTTOM (= FILTER PACK TOP): 5.0'
FILTER PACK TYPE: 16/40 Silica Sand BRAND: C.S.S.I.
SURFACE CASING BOTTOM (=SCREEN TOP): 7.05 TYPE: Sch. 40 - PVC
SCREEN ID (IN): 2.0" SLOT SIZE (IN): 0.01 TYPE: Sch. 40 - PVC
SCREEN BOTTOM (= SUMP, TOP): 27.15 SUMP TYPE: Threaded End Cap
FILTER PACK BOTTOM (= *BACKFILL TOP): 27.5' *BACKFILL TYPE: N/A
SUMP BOTTOM (= WELL COMPLETED DEPTH): 27.5' *PILOT HOLE TOP, DIAMETER: N/A
TOTAL BOREHOLE DEPTH (= *PILOT HOLE AND *BACKFILL BOTTOM): 27.5'

REMARKS: Routine well installation on 6/28/05. Logged/sampled fm. 0→27.0'. Ream w/ auger (not sampled) fm. 27.0→27.5'. Well pad installed on 6/29/05

COMPLETED BY: Ellen S. Warp Ellen S. Warp DATE: 7/7/05
CHECKED BY: J. Boylan DATE: 8/3/05

U.S. DEPARTMENT OF ENERGY ROCKY FLATS PLANT

FORM PRO.101A

ROCKY FLATS ENVIRONMENTAL TECHNOLOGY SITE BOREHOLE LOG

Borehole Number: 88205
Location - North: _____ East: _____
Date: 6/28/05
Geologist: E. WARP
Drilling Equip.: CME 750 - Hollow Stem Auger

Surface Elevation: _____
Area: Replacement of well # 5187
Total Depth: 27.5'
Company: URS/Layne Project No.: HAD51300
Sample Type: Continuous Core - Split Spoon Sampler

RMRS LOGGING SUPERVISOR APPROVAL _____ DATE 7/19/05

TOP/BOTTOM OF CORE IN BOX	TOP/BOTTOM OF INTERVAL	FEET OF CORE IN INTERVAL (FIELD MEASUREMENT)	SAMPLE NUMBER	FRACTURE ANGLE	BEDDING ANGLE	GRAIN SIZE DISTRIBUTION	USCS SYMBOL	DEPTH IN FEET	SOIL LITHOLOGIC LOG	SAMPLE DESCRIPTION
0.0	0.0	0.0						0.0		0.0-1.5' - Sandy, gravelly CLAY. Brn. (7.5YR4/3 to 5/3), 60-65% clay-med. plasticity. 20-25% gravel (1/8 to 1" dia., sub-ang., ~15% sand (c.g., sub-ang.). Tr to some diss. Caliche throughout interval, 1½" dia. cobble of gneiss (sub-ang.) @ 0.9'. MOIST.
Box #1 of 3 (0.0→10.0')	Run #1 2.0'	Rec. = 1.5'					CL GC	1		
								1.5		1.5-2.0' = No recovery
								2		2.0-3.0' - Sandy, gravelly CLAY. Strong Brn. (7.5YR4/6 to 5/6). Slight color change otherwise unchanged fm. 0.0-1.5' interval. Shattered 1 to 1½" dia. cobbles of gneiss @ 2.0', 2.5' and 2.7'. Approximately 45% of interval is shattered cobbles. MOIST.
	Run #2 4.0'	Rec. = 2.0'					CL GC			
								3		3.0-5.3' - CLAY w/ Tr to some gravel and sand. Yellowish brn. (10YR5/4) w/ Tr to some brnish yellow (10YR6/8) mottling. 5-8% gravel (1/8-½" dia., sub-rounded to sub-ang.) Clay appears to be derived fm. claystone (bedrock) material. Wk. diss. FeOxin. Tr diss. caliche. MOIST.
							CL	4		
	Run #3 6.0'	Rec. = 2.0'						5		5.3-6.0' - Silty, gravelly SAND - Grnish brn. (10YR5/2). 70-75% silty SAND (m.g. to c.g., sub-rounded to sub-ang.), 25-30% gravel (1/8-3/4" dia., sub-ang. to sub-rounded). Gravel composed of gneiss, granite and concrete. MOIST.
							SC GC	5.3'		
								6		Abundant concrete frags. (grnish-wht concrete w/angular rock clasts) fm. 5.6 to 6.0' (1-2" dia.).
	Run #4 8.0'	Rec. = 2.0'					GC	7		6.0-9.3' - Silty, Sandy GRAVEL FILL. Grnish brn. (10YR5/2) to lt. brnish gry (10YR6/2) Gravel fill composed of manmade and natural material. 65-70% of interval composed of gravel and concrete frags. (1/4" to 2" dia). 1" to 2" dia. cobble-size chunks of vesicular lithic-rich man-made material @ 6.5', 7.7' to 7.9'. Reddish brn. (5YR4/4) to dk. reddish gry (5YR4/2) vesicular matrix w/ 1/8 to 1/4" dia., sub-rounded clasts of med. gry vesicular material. Clasts in material (chunk) @ 7.9' are yellish red (5YR6/8 to 4/6). Abundant 1 to 1½" dia., sub-ang. clasts of concrete fm. 8.0 to 8.5'. Moist increasing to saturated (free water) @ 9.3'. Note: U. moist clay/sandy lense fm. 6.4 to 6.7', Wet in sandy lense fm. 7.6' to 8.0'. 2" frag. of wood @ 9.3'.
								7.6		
								8		
	Run #5 10.0'	Rec. = 1.7'						9		
								9.3'		
							CL	9.7'		
						7/19/05		10.0'		

SRS 7/19/05

NOTES: General: USCS is modified for this log as follows:
Materials amounts are estimated by % volume instead of % weight.
(1) Badly broken core, accurate footage measurements not possible.
(2) Core breaks cannot be matched, accurate footage measurements not possible.

Fines below 9.3 to GC/SC. 2" chunk of wood @ 9.3'.

Procedure No. RMRS/OPS-PRO.101
Revision 0
Date effective: 12/31/98

(4011-930-0134-930)(Form GT.1A)(03/01/92)

U.S. DEPARTMENT OF ENERGY ROCKY FLATS PLANT FORM PRO.101A

ROCKY FLATS ENVIRONMENTAL TECHNOLOGY SITE BOREHOLE LOG

PAGE 2 OF 3

Borehole Number: 88205
Location - North: _____ East: _____
Date: 6/28/05
Geologist: E. WARP
Drilling Equip.: CME-750 - Hollow Stem Auger

Surface Elevation: _____
Area: Replacement of well #5187
Total Depth: 27.5'
Company: URS/Layne Project No.: HAD51300
Sample Type: Continuous Core - Split Spoon

RMRS LOGGING SUPERVISOR APPROVAL [signature] DATE 7/19/05

free water fm. 9.3 to 10.6'. (Pooling on former ground surface) [initials] 7/19/05

TOP/BOTTOM OF CORE IN BOX	TOP/BOTTOM OF INTERVAL	FEET OF CORE IN INTERVAL (FIELD MEASUREMENT)	SAMPLE NUMBER	FRACTURE ANGLE	BEDDING ANGLE	GRAIN SIZE DISTRIBUTION	USCS SYMBOL	DEPTH IN FEET	SOIL LITHOLOGIC LOG	SAMPLE DESCRIPTION
Box #2 of 3 (10.0 → 18.9')	10.0' – 12.0' Run #6	REC. = 1.5'					GC / SC	10.0' – 10.5		10.0 - 10.5' - Asphalt GRAVEL/SAND MIXTURE. Blk (10YR2/1). ~80% silty sand composed of asphalt and road base w/~20% gravel (1/8 to 3/4" dia, subrounded) composed of asphalt and road base, PREVIOUS GROUND SURFACE prior to fill placed on 881 Hillside. SATURATED and FLOWING WATER.
							GC / CL	10.5 – 10.6		10.6 - 11.5' - GRAVEL/Sandy CLAY w/some silt MIXTURE. Brn. (7.5YR5/4). ~40% gravel (1/8" to 1" dia. subrounded to subang, composed of qtzite and granite). ~35% silty clay (med. plasticity). ~30% sand (c.g., sub ang. to subrounded). 2" clast of qtzite @ 10.7'. 1" clast of concrete @ 10.8'. Some caliche disseminated throughout. WET and flowing fm 10.5-10.6'; remainder of interval is saturated but has no flowing H_2O.
								11.5' – 12		11.5-12.0' = No recovery
	12.0' – 14.0' Run #7	REC. = 1.1'					GC / CL	12 – 13		12.0 - 13.1 - GRAVEL/Sandy CLAY w/some silt. v. similar to above fm. 10.5 to 11.5 with sl. color change fm. Brn (7.5YR5/4) to strong brn. (7.5YR4/6). Diss. caliche common. 3" dia. qtzite cobble @ 13.1'. SATURATED but not flowing.
								13.1 – 14		13.1 - 14.0' = No recovery
	14.0' – 16.0' Run #8	Rec. = 1.7'					GC / CL	14 – 15.7'		14.0 - 15.7' - Gravelly, silty CLAY w/ TR to some sand. Lt. Brn. (7.5YR6/4) to Brn. (7.5YR5/3) w/ TR to some strong brn. (7.5YR5/8). ~70% silty clay (med. plasticity). 15-20% gravel (1/8-1/2" dia. subrounded) 10-15% sand (m.g. to c.g., subrounded). Wk. to moderate FLOXn mottled throughout. TR diss. caliche SATURATED but not flowing.
								15.7' – 16		15.7-16.0' = No recovery
	16.0' – 18.0' Run #9	Rec. = 1.6'					GC / CL	16 – 17.6'		16.0 - 17.6' - Gravelly, silty CLAY w/some sand. Same as above fm. 14.0-15.7'. SATURATED BUT not flowing.
								17.6' – 18		17.6-18.0' = No recovery
18.9' Box #3 of 3	18.0' – 20.0' Run #10	Rec. = 1.4'					CL	18 – 19.4'		18.0 - 19.4 - Gravelly, silty CLAY w/some sand. Brn. (10YR5/3) w/ TR to some yellsh brn (10YR5/6) mottling and TR to some lt. olive gry (5Y6/2) mottling. ~80% silty clay (med. plasticity) ~10-15% gravel (1/8" to 1/2" dia. subrounded). 5-8% sand (m.g. to c.g., subrounded to sub-ang.). Slight decrease in % gravel fm. above interval. TR diss. caliche. SATURATED but not flowing.
								19.4' – 20.0		19.4 - 20.0' = No recovery

NOTES: General: USCS is modified for this log as follows:
Materials amounts are estimated by % volume instead of % weight.
(1) Badly broken core, accurate footage measurements not possible.
(2) Core breaks cannot be matched, accurate footage measurements not possible.

Procedure No. RMRS/OPS-PRO.101
Revision 0
Date effective: 12/31/98
Page 27 of 28

(4011-930-0134-930)(Form GT.1A)(03/01/92)

ROCKY FLATS ENVIRONMENTAL TECHNOLOGY SITE BOREHOLE LOG

Borehole Number: 88205
Location - North: _____ East: _____
Date: 6/28/05
Geologist: E. Warp
Drilling Equip.: CME-750-Hollow Stem Auger

Surface Elevation: _____
Area: Replacement of well #5187
Total Depth: 27.5
Company: URS/Layne Project No.: HAD51300
Sample Type: Continuous Core-Split Spoon Sampler

RMRS LOGGING SUPERVISOR APPROVAL [signature] DATE 7/19/05

TOP/BOTTOM OF CORE IN BOX	TOP/BOTTOM OF INTERVAL	FEET OF CORE IN INTERVAL (FIELD MEASUREMENT)	SAMPLE NUMBER	FRACTURE ANGLE	BEDDING ANGLE	GRAIN SIZE DISTRIBUTION	USCS SYMBOL	DEPTH IN FEET	SOIL/LITHOLOGIC LOG	SAMPLE DESCRIPTION
Box #303 (18.9 → 27.5')	Run #11	Rec. = 1.2'		Bedrock Contact @ 20.3'			CL	20.0		20.0-20.3 - Gravelly, silty CLAY w/ Tr sand. Brn. (7.5YR 5/4) 75-80% silty clay (med. plasticity) ~20% gravel (1/4 to 1" dia., sub-rounded, composed of gneiss and granite). Some caliche coated gravel clasts (1" dia.) at base of interval. SATURATED but not flowing. Bedrock contact @ 20.3'.
	22.0'							20.5'		
								21		
								21.2'		20.3-21.2' - CLAYSTONE w/ Tr to some silt (Bedrock) Gry'sh brn. (10YR 5/2) to dk. Gry'sh Brn. (10YR 4/2). Massive texture. Friable, broken/crumbly. Tr blk. organic stringers. Definite decrease in moisture fm. saturated to MOIST.
	Run #12	Rec. = 2.0'						22		
								23		21.2-22.0' = No recovery
	24.0'							24		22.0-27.0 - CLAYSTONE to claystone w/ silt Dk. gry'sh brn. (10YR 4/2) to V. dk. gry'sh brn. (10YR 3/2). Firm and dense. Wk to mod. FeOx'n along internal fractures (70-90%) at 23.3 to 23.5' and 24.6-25.0'. Blk. organic stringers common fm. 25.7 to 27.0'. Massive texture. Abundant blk. organic material along sub-horizontal bedding planes fm. 26.2 to 27.0'.
	Run #13	Rec. = 1.1'						25		
	25.0'							26		
	Run #14	Rec. = 2.0'						27		Note: Not sampled between 27.0 → 27.5'. Reamed out with augers only.
								27.5'		T.D. @ 27.5'
								28		
								29		
								30.0		

NOTES: General: USCS is modified for this log as follows:
Materials amounts are estimated by % volume instead of % weight.
(1) Badly broken core, accurate footage measurements not possible.
(2) Core breaks cannot be matched, accurate footage measurements not possible.

(4011-930-0134-930)(Form GT.1A)(03/01/92)

STATE PLANE COORDINATES AREA:
NORTH: 749692.446
EAST: 2085996.149
PROJECT: Oil Burn Pit #2
REMARKS:
Replaces well 91104, 91103.

GRND ELEV. (FT): 5952.258
TOTAL DEPTH (FT): 18.5
COMPLETION DATE: 5/18/05
GEOLOGIST: E. Warp

CASING DIA (IN): 1
BH DIA. (IN): 3.25
GRID LOCATOR:

LOG OF BORING NUMBER: 91105

Elev (Ft)	Well or Piezometer Construction and Materials	Depth (Ft)	Lithology	Unified Soils Classification or Rock Type	Lithologic Description
5955, 5954, 5953, 5952, 5951, 5950, 5949, 5948	Protective Casing, Steel, 5 in. ID.; Casing, Sch 80-PVC, 1 in. ID.; Concrete Seal; Concrete Pad; Granular Bentonite Crumbles	3, 2, 1, 0, 1, 2, 3, 4			Well replaces 91103 and 91104, but is outside (downgradient of) source removal excavation. Pre-existing wells were within the source area.
					CL: Silty Clay with trace sand and trace gravel. Yellowish brown (10YR5/6) with some light brownish gray (10YR6/2) mottling. Weak pervasive iron oxidation. Firm. Moist.
					GC/CL: Clay/Gravel mixture with some sand. Dark brown (7.5YR3/2) with some strong brown (7.5YR5/6) mottling. 15 - 25% gravel (1/8" - 1/2" diameter, subangular to subrounded). 7 - 15% sand (coarse grained, subangular). Some to abundant coarse grained, angular, white fragments (?). Disseminated caliche common. Clay is very plastic. Consolidated except in zone of shattered quartzite cobbles from 1.7' to 1.9'. Moist.
					CL/ML: Silty Clay with trace to some sand and trace gravel. Yellowish brown (10YR5/6) silty clay matrix with gray (10YR6/1) and pale brown (10YR6/3) clasts of clay (1/4" - 1/2" diameter, subangular). Consolidated, but soft. Very moist. Saturated at 5.5'.

Elev (Ft)	Well or Piezometer Construction and Materials	Depth (Ft)	Lithology	Unified Soils Classification or Rock Type	Lithologic Description
	Filter Pack, 16/40 Silica Sand				
5947	Screen, Sch 80-PVC, 1 in. ID., 0.010 in. slots	5			
5946		6		CL/ML: Silty Clay with trace to some sand and trace gravel.	Yellowish brown (10YR5/6) silty clay matrix with gray (10YR6/1) and pale brown (10YR6/3) clasts of clay (1/4" - 1" diameter, subangular). Very similar to interval from 2.0' to 5.5', but very soft and pliable. Saturated.
5945		7			No recovery.
5944		8		CL/ML: Silty Clay with trace sand and trace gravel.	Same as interval from 5.5' to 6.5'. Shattered quartzite cobble (2" diameter) at 8.5'. Very soft and pliable. Saturated.
5943		9		CL/ML: Sandy, Silty Clay with trace gravel and trace cobbles.	Strong brown (7.5YR4/6) silty clay matrix. Notable color change. Trace gray (7.5YR5/1) clasts of clay. 5 - 10% sand (very coarse grained, subangular). ~5% gravel (1/8" - 1/4" diameter, subangular). Disseminated white caliche ? (tiny angular specks) throughout. 2" quartzite cobble at 9.7'. Very plastic matrix, soft. Saturated. Note: PID 1.2 ppm for this interval.
5942		10			No recovery.
5941		11			
5940		12		CL/ML: Sandy, Silty Clay with trace gravel and cobbles.	Same as interval from 8.8' to 9.9'. 1-1/2" angular quartzite cobble at 12.2'. Saturated.
5939		13		CLAYEY SILTSTONE: TOP OF BEDROCK.	Clayey Siltstone (bedrock). Yellowish brown (10YR5/8). Strong pervasive iron oxidation. Weakly cohesive. Saturated.
				SILTY CLAYSTONE:	Silty Claystone, gray (10YR6/1), unweathered. Strongly friable, weakly fissile. Trace black organic stringers and

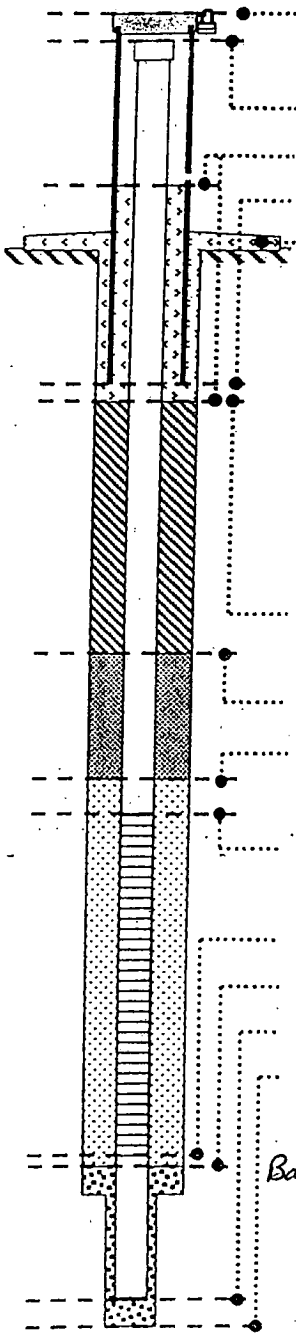
Elev (Ft)	Well or Piezometer Construction and Materials	Depth (Ft)	Lithology	Unified Soils Classification or Rock Type	Lithologic Description
5938		14			blebs. Significant decrease in moisture, very moist from 12.7' to 12.9', slightly moist from 12.9' to 16.5'. Weak iron oxidation from 16.2' to 16.3'. Note: PID (178 ppm) from 12.0' to 14.4' on previous borehole attempt (located 1' east).
5937		15			
5936		16			
5935		17			CLAYEY SILTSTONE: Clayey Siltstone, gray (10YR6/1) with patchy brownish yellow (10YR6/6) iron oxidation mottling throughout. Overall weak iron oxidation. Slightly more cohesive than silty claystone from 12.7' to 16.5', still friable. Very slightly moist.
5934	Threaded End Cap - Sump, Sch 80-PVC Granular Bentonite Backfill	18			CLAYEY SILTSTONE: Clayey Siltstone, gray (10YR6/1). Same as interval from 16.5' to 17.2'. Decreasing iron oxidation to trace. Some black organic stringers and blebs (manganese oxide) from 17.9' to 18.5'. Very slightly moist.

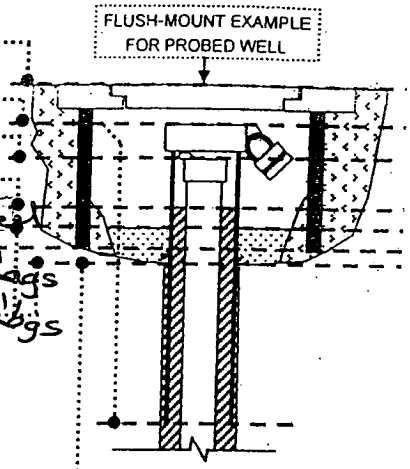
MONITORING WELL INSTALLATION REPORT: Form PRO.118

LOCATION CODE: 91105 PROJECT NAME: CY05 Well Replacements PROGRAM: Water Programs-WARP
SCREENED FORMATION: Al/Bdrk. DRILLING CONTRACTOR: RT6 BORING METHOD: Geoprobe
DATE DRILLED: 5/18/05 DATE COMPLETED: 5/19/05 TOTAL DEPTH: 18.5 COMPLETED DEPTH: 18.0
ESTIMATED DEPTH TO BEDROCK: 12.5' RIG GEOLOGIST: E. Warp LOGGING GEOLOGIST: E. Warp
BOREHOLE DIAMETER IN SCREENED INTERVAL: 3.25" QUANTITY OF FLUIDS LOST DURING DRILLING: N/A
INITIAL WATER LEVEL (FT, DATE): N/A COMPLETED WATER LEVEL (FT, DATE): 8.47' (below TOC) - 5/19/05
DIAMETER & TYPE OF INSTALLATION (WELL/PIEZOMETER/WELL POINT/ETC.): 1" PVC Well
TYPE OF PROTECTION (FLUSH-MOUNT VS. ABOVE GROUND, ASEPTIC, ETC.): Steel Protective Casing (stick-up)

ALL MEASUREMENTS WILL BE MADE IN FEET FROM GROUND SURFACE

* DENOTES ITEMS THAT MAY NOT BE APPLICABLE, DEPENDING ON BORING METHOD, WELL PROTECTION & PURPOSE





PROTECTIVE CASING TOP (STICKUP OR FLUSH-MOUNT): 3.2' ags.
*SECONDARY CASING TOP: N/A BOTTOM: N/A TYPE: N/A
SURFACE CASING TOP: 2.8' ags ID (IN): 1.0"
SURFACE SEAL TOP: 1.8' ags BOTTOM: 0.5' bgs TYPE: Concrete
PROTECTIVE CASING BOTTOM, ID (IN): ? TYPE: 0.8' bgs. 5" ID Steel
*WELL PAD DIMENSIONS, TYPE: 3'x3' Concrete pad top 0.4' ags btm 0.5' bgs
*ADD'L CASING FILL TOP: N/A BOTTOM: N/A TYPE: N/A
*SURFACE ISOLATION CASING TOP: N/A BOTTOM: N/A
*SURFACE ISOLATION CASING ID (IN): N/A TYPE: N/A
*OTHER (E.G., ASEPTIC) CASING TOP: N/A BOTTOM: N/A
*OTHER CASING ID (IN): N/A TYPE, PURPOSE: N/A
*CENTRALIZER(S) OD (IN): N/A NUMBER USED: N/A TYPE: N/A
*CENTRALIZER(S) DEPTH(S): N/A
*GROUT TOP: N/A MEASURED DENSITY (LBS/GAL): N/A TYPE: N/A
*GRANULAR BENTONITE TOP: ~~0.5'~~ N/A SW 5/19/05 TYPE: N/A
*BENTONITE SEAL TOP: 0.5' bgs. TYPE: CETCO-Granular Bentonite - #8 crumbles
BENTONITE SEAL OR GRANULAR BENTONITE BOTTOM (= FILTER PACK TOP): 4.0'
FILTER PACK TYPE: 16/40 Silica Sand BRAND: C.S.S.I.
SURFACE CASING BOTTOM (=SCREEN TOP): 5.0' TYPE: Sch. 80 PVC
SCREEN ID (IN): 1.0" SLOT SIZE (IN): 0.01" TYPE: Sch 80 PVC
SCREEN BOTTOM (= SUMP, TOP): 17.9' SUMP TYPE: Threaded end cap
FILTER PACK BOTTOM (= *BACKFILL TOP): 18.0' *BACKFILL TYPE: Granular bentonite
SUMP BOTTOM (= WELL COMPLETED DEPTH): 18.0' *PILOT HOLE TOP, DIAMETER: ~4.0"
TOTAL BOREHOLE DEPTH (= *PILOT HOLE AND *BACKFILL BOTTOM): 18.5'

REMARKS: Well installed on 3rd attempt. 1st attempt (0.0→18.4) was within Oil Burn Pit #2 Excavation area. Backfilled w/gran. bent. and offset 5' N. Cutting shoe dropped off @ 8.0' - backfill w/bent. and offset 1' W. for ultimate location of well #91105.

COMPLETED BY: Ellen S. Warp Ellen S. Warp DATE: 5/19/05
CHECKED BY: _____ DATE: _____

Well installed on 5/18/05. Protective casing & well pad installed on 5/19/05

U.S. DEPARTMENT OF ENERGY ROCKY FLATS PLANT

FORM PRO.101A

ROCKY FLATS ENVIRONMENTAL TECHNOLOGY SITE BOREHOLE LOG

PAGE 1 OF 2

Borehole Number: 91105
Location - North: _____ East: _____
Date: 5/18/05
Geologist: E. WARP
Drilling Equip.: 66 DT Geoprobe

Surface Elevation: _____
Area: Oil Burn Pit #2 - (downgrad.) - Replacement of 91104
Total Depth: 18.5'
Company: URS/RTG
Project No.: HAD51300
Sample Type: N/A

RMRS LOGGING SUPERVISOR APPROVAL [signature]

DATE 6/8/05

TOP/BOTTOM OF CORE IN BOX	TOP/BOTTOM OF INTERVAL	FEET OF CORE IN INTERVAL (FIELD MEASUREMENT)	SAMPLE NUMBER	FRACTURE ANGLE	BEDDING ANGLE	GRAIN SIZE DISTRIBUTION	USCS SYMBOL	DEPTH IN FEET	SOIL/LITHOLOGIC LOG	SAMPLE DESCRIPTION
	Run #1	Rec. = 4.0'					CL	0.7		0.0-0.7 - Silty CLAY w/ TR sand and TR gravel. Yell'sh Brn. (10YR 5/6) w/some lt. brn'sh gry. (10YR 6/2) mottling. Wk. perv. FeOxn. Firm. V. MOIST.
							CL GC	1, 2		0.7-2.0' - CLAY / GRAVEL MIXTURE w/some sand. Dk. Brn. (7.5YR 3/2) w/some Strong Brn. (7.5YR 5/6) mottling. 15-25% gravel (1/8-1/2" dia., sub-ang. to sub-rounded). 7-15% sand (c.g., sub-ang. Some to abundant c.g., ang. wht. frags. (?). Diss. caliche commen. Clay is v. plastic. Consolidated except in zone of shattered qtzite cobbles fm. 1.7-1.9'. MOIST.
	4.0'	4.0'					ML CL	3, 4		2.0-5.5' - Silty CLAY w/ TR - some sand and TR gravel. Yell'sh brn. (10YR 5/6) silty clay matrix w/gry (10YR 6/1) and pale brn. (10YR 6/3) clasts of clay (sub-ang., 1/4-1/2" dia.). Consolidated but soft. V. MOIST. SATURATED @ 5.5'.
	Run #2	Rec. = 2.5'						5, 5.5, 6, 6.5		5.5-6.5' - Silty CLAY w/ TR sand and TR gravel. Yell'sh brn. (10YR 5/6) silty clay matrix w/gry (10YR 6/1) and pale brn. (10YR 6/3) clasts of clay (1/4" to 1" dia., sub-ang.). V. similar to interval fm. 2.0-5.5' but V. soft and pliable. SATURATED.
								7		6.5-8.0' = No recovery
	8.0'	8.0'						8		8.0-8.8' - Silty CLAY w/ TR sand and TR gravel. Same as fm. 5.5-6.5'. Shattered qtzite cobble (2" dia.) @ 8.5'. V. soft and pliable. SATURATED.
	Run #3 (fm. 8.0-12.0')	Rec. = 1.9'				?	ML CL	8.8, 9, 9.9, 10.0		8.8-9.9' - Sandy, Silty CLAY w/ TR gravel and TR cobbles. Strong brn. (7.5YR 4/6) silty clay matrix. Noteable color change. TR gry (7.5YR 5/1) clasts of clay. 5-10% sand (v. c.g., sub-ang.) + 5% gravel (1/8-1/4" dia., sub-ang.). Diss. wht. caliche? (tiny, ang. specks) throughout. V. plastic matrix, soft. SATURATED.

NOTES: General: USCS is modified for this log as follows:
Materials amounts are estimated by % volume instead of % weight.
(1) Badly broken core, accurate footage measurements not possible.
(2) Core breaks cannot be matched, accurate footage measurements not possible.

2" cobble of qtzite @ 9.7'.
9.9-10.0 = No recovery

Procedure No. RMRS/OPS-PRO.101
Revision 0
Date effective: 12/31/98

borehole PID 1.2 ppm for this interval

(4011-930-0134-930)(Form GT.1A)(03/01/92)

U.S. DEPARTMENT OF ENERGY ROCKY FLATS PLANT

FORM PRO.101A

ROCKY FLATS ENVIRONMENTAL TECHNOLOGY SITE BOREHOLE LOG

PAGE 2 OF 2

Borehole Number: 91105
Location - North: _____ East: _____
Date: 5/18/05
Geologist: E. WARP
Drilling Equip.: 66 DT Geoprobe

Surface Elevation: _____
Area: Oil Burn Pit #2-downgrad., Replacement of 91104
Total Depth: 18.5'
Company: URS/RTG
Project No.: HAD51300
Sample Type: N/A

RMRS LOGGING SUPERVISOR APPROVAL _____ DATE _____

TOP/BOTTOM OF CORE IN BOX	TOP/BOTTOM OF INTERVAL	FEET OF CORE IN INTERVAL (FIELD MEASUREMENT)	SAMPLE NUMBER	FRACTURE ANGLE	BEDDING ANGLE	GRAIN SIZE DISTRIBUTION	USCS SYMBOL	DEPTH IN FEET	SOIL/LITHOLOGIC LOG	SAMPLE DESCRIPTION
	Run #3 (cont.)	Rec. = 1.9'						10.0		10.0—12.0 = No recovery
								11		graphing error fm. 12.0-12.5 ESW
	12.0	12.0'						12		12.0-12.5 - Sandy, silty clay w/ Tr gravel and cobbles Same as fm. 8.8' to 9.9'. 1½" ang. qtzite cobble @ 12.2' SATURATED.
			Bedrock Contact @ 12.5'				HL/CL	12.5		Bedrock Contact @ 12.5'
								12.7'		12.5-12.7' - Clayey SILTSTONE - BEDROCK Yellsh Brn. (10YR 5/8). Strng. perv. FeOxn. SATURATED (Wkly cohesive).
	Run #4	Rec. = 4.0'						13		12.7-16.5 - Silty Claystone. Gry (10YR 6/1) Unweathered. Strongly friable, wkly. fissile. Tr blk organic stringers and blebs. Significant decr. in moisture. V. Moist fm. 12.7-12.9'. Slightly moist fm. 12.9' to 16.5'. Wk. FeOxn fm. 16.2-16.3
								14		
								15		NOTE: PID (178 ppm) HITS FM. 12.0-14.4 on previous borehole attempt (on 5/18/05)
	16.0'	16.0'						16		
	Run #5	Rec. = 4.0'						16.5		16.5-17.2' - Clayey SILTSTONE. Gry (10YR 6/1) w/ patchy Brn'sh Yellow (10YR 6/6) mottling throughout. Overall wk. FeOxn. Slightly ~~less friable~~ more cohesive than silty claystone fm. 12.7-16.5, still friable. V. slightly moist.
	16.8'	16.8'						17		
	Run #6	Rec. = 4.0'						17.2'		FeOxn
								18		
18.5'	18.5	18.5'		T.D. @ 18.5'				18.5		17.2-18.5 - Clayey Siltstone - Gry (10YR 6/1). As above fm. 16.5-17.2'. Decr. FeOxn to Tr. Some blk. organic stringers and blebs (MnOx) fm. 17.9 to 18.5. V. slightly moist.
								19		
								20.0		

NOTES: General: USCS is modified for this log as follows:
Materials amounts are estimated by % volume instead of % weight.
(1) Badly broken core, accurate footage measurements not possible.
(2) Core breaks cannot be matched, accurate footage measurements not possible.

Procedure No. RMRS/OPS-PRO.101
Revision 0
Date effective: 12/31/98

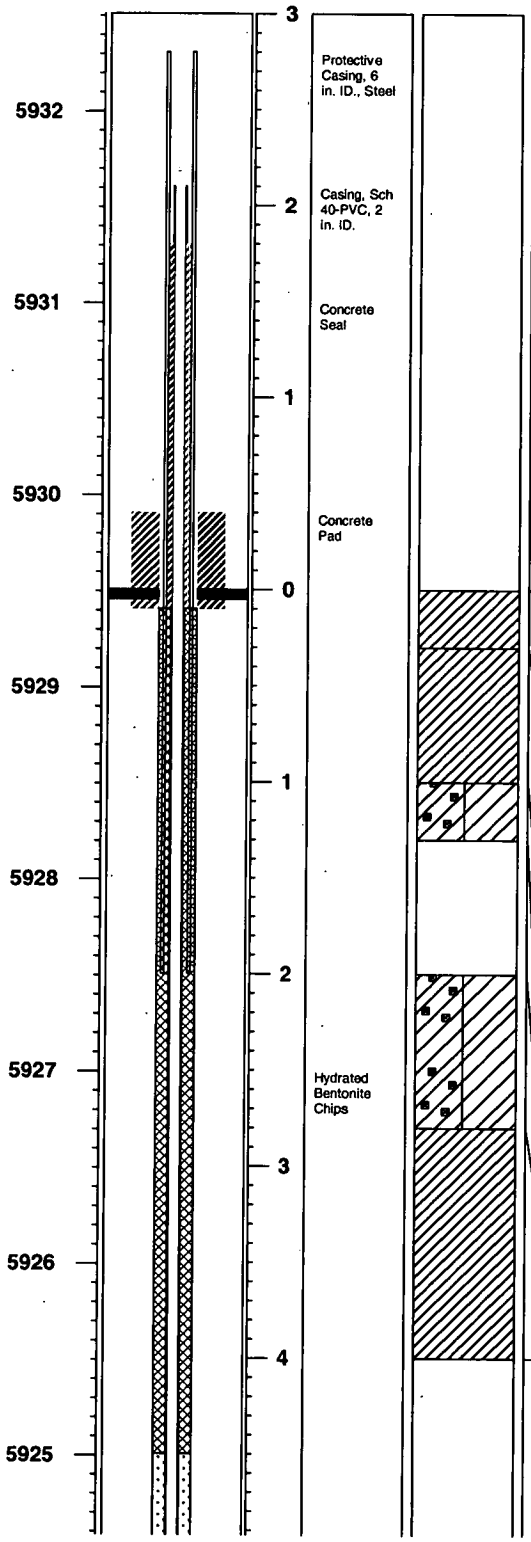
(4011-930-0134-930)(Form GT.1A)(03/01/92)

STATE PLANE COORDINATES AREA:
NORTH: 749915.187
EAST: 2085822.672
PROJECT: FC-4/5
REMARKS:
replaces 2187

GRND ELEV. (FT): 5929.51
TOTAL DEPTH (FT): 30.65
COMPLETION DATE: 4/18/05
GEOLOGIST: E. Warp

CASING DIA (IN): 2
BH DIA. (IN): 8
GRID LOCATOR:

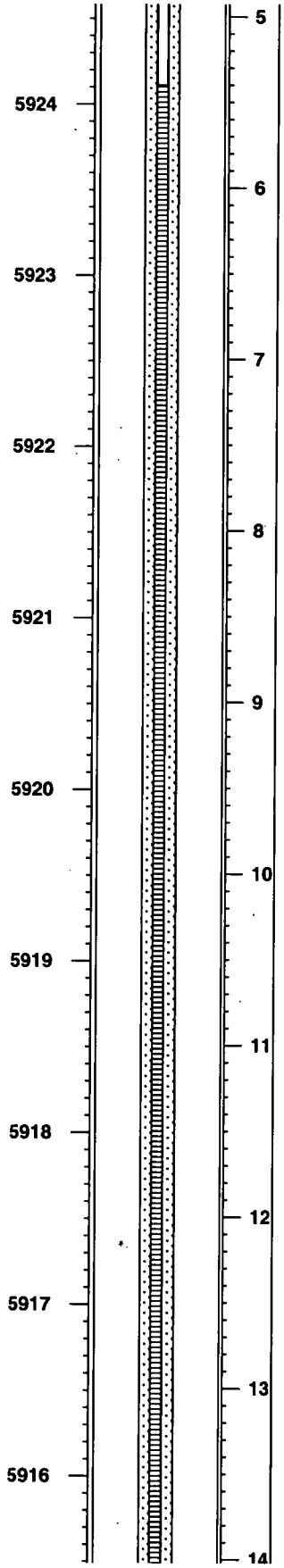
LOG OF BORING NUMBER: 91305



Lithology	Unified Soils Classification or Rock Type	Lithologic Description
		CL: Clay with trace sand and trace gravel, brown (7.5YR4/2), ~5% gravel (1/4" to 1/2" diameter, subangular), granitic. ~3% sand (coarse grained, subrounded), trace roots, trace disseminated caliche, slightly moist.
		CL: Gravelly, Sandy Clay, strong brown (7.5YR4/6), 15 - 20% sand (coarse grained, subangular), 5 - 7% gravel (1/8" to 1/2" diameter, subrounded to subangular). Shattered quartzite cobble (1-1/2" diameter, subangular) at 0.3'. Some to trace disseminated caliche. Crumbly interval, slightly moist.
		GC/CL: Gravel/Sandy Clay mixture, very dark brown (7.5YR2.5/2), ~60% gravel (1/2" to 1-1/2" diameter, subangular, predominately quartzite), ~40% sandy clay, 1-1/2" diameter shattered quartzite cobble at 1.3'. Disseminated caliche throughout, slightly moist.
		No recovery.
		GC/CL: Gravel/Sandy Clay mixture, same as from 1.0' to 1.3'. Shattered granite cobble at 2.8'. Slightly moist.
		CL: Clay, dark grayish brown (10YR4/2), trace gravel. Sample appears "ribboned" at base due to a cobble stuck in the bit. Caliche lense, yellow, at 3.4'. Increased moisture to moist.
		No recovery.

Elev (Ft)	Well or Piezometer Construction and Materials	Depth (Ft)	Lithology	Unified Soils Classification or Rock Type	Lithologic Description

LOG OF BORING NUMBER: 91305



CL: Clay, same as from 2.8' to 4.0'. 2.0" diameter quartzite cobble at 5.7'. Poor recovery due to cobble stuck in bit. Moist.

No recovery.

CL: Clay with trace gravel, brown (10YR5/3) to yellowish brown (10YR5/4), mottled. Weak to moderate pervasive iron oxidation. Caliche stringers at 8.6' and 9.8'. Interval is cohesive, soft, and pliable. Medium plasticity, moist.

CL: Clay with trace gravel, grayish brown (10YR5/2) to gray (10YR5/1). Massive texture. Decreasing iron oxidation to trace, trace caliche stringers, medium plasticity. Interval is cohesive and soft, very moist. Very silty at 11.0'.

No recovery.

CL: Clay, same as from 10.8' to 11.3'. Medium plasticity, clay is soft and pliable. Increasing moisture, totally saturated at 13.2'.

CL: Silty Clay, yellowish brown (10YR5/6), very silty, trace gravel (scattered, up to 1/4" diameter). Strong pervasive iron oxidation, trace disseminated white caliche. Interval is cohesive, yet soft and pliable, saturated.

Elev (Ft)	Well or Piezometer Construction and Materials	Depth (Ft)	Lithology	Unified Soils Classification or Rock Type	Lithologic Description
5915					CL: Silty Clay, dark gray (10YR4/1), distinct color change. Decreasing iron oxidation to trace. Twigs, roots at 14.2' and 14.5' (possibly original ground surface?). Crumbly lense of caliche at base. Interval is cohesive, yet soft and pliable, saturated.
		15			CL: Silty Clay with sand, yellowish brown (10YR5/6), distinct color change. Increased pervasive iron oxidation. Roots at 15.8'. Silty, clayey, very fine grained sand at base of interval. Very crumbly, saturated.
5914			Filter Pack, 16/40 Silica Sand		
		16			SILTY CLAYSTONE: TOP OF BEDROCK. Silty Claystone to Clayey Siltstone, yellowish brown (10YR5/6), strong, pervasive iron oxidation, massive texture. Bedrock contact very subtle. Interval cohesive, soft, and pliable; saturated. Some lenses of very fine grained sand.
5913					
		17			No recovery.
5912					SILTSTONE: Sandy, Clayey Siltstone, yellowish brown (10YR5/6), strong, pervasive iron oxidation, massive texture. Bedrock contact very subtle. Interval cohesive, soft, and pliable; saturated. Some lenses of very fine grained sand.
		18			CLAYSTONE: Claystone, dark gray (10YR4/1), un-weathered claystone, distinct color change. Decreasing iron oxidation to trace, massive textured. Very dense and firm. Bleached fracture with caliche fill at 19.7'. Decreasing moisture to slightly moist. Silty at 19.9' to 20.1'.
5911					
		19			
5910					
		20			SILTSTONE: Clayey Siltstone, yellowish brown (10YR5/6), distinct color change. Moderate to strong pervasive iron oxidation, totally saturated (flowing), very soft and pliable.
5909					
		21			CLAYSTONE: Claystone with silt, gray (10YR5/1), distinct color and lithology change. Very massive texture, decreasing iron oxidation to trace, trace black organic stringers. Very firm and dense/hard, decreasing moisture to very slightly moist.
5908					
		22			
5907					
		23			

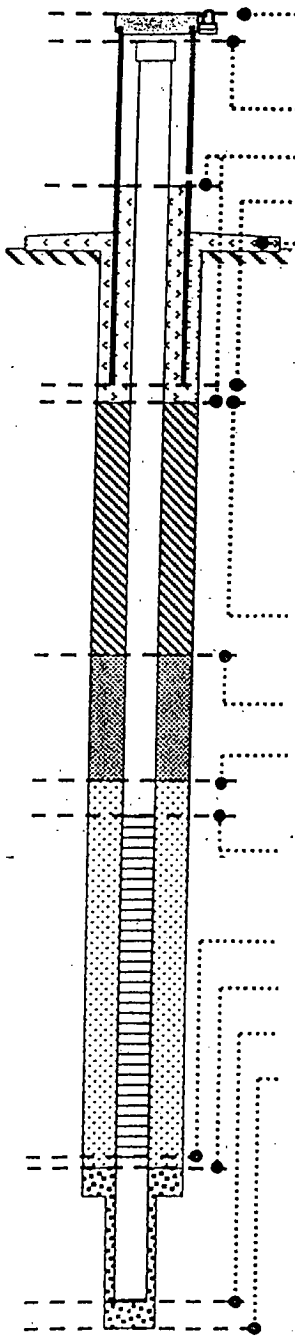
Elev (Ft)	Well or Piezometer Construction and Materials	Depth (Ft)	Lithology	Unified Soils Classification or Rock Type	Lithologic Description
					LOG OF BORING NUMBER: 91305
5906		24			
5905					No recovery.
		25			CLAYSTONE: Claystone with silt, gray (10YR5/1), same as from 21.1' to 24.5', except increased iron oxidation along bedding planes from 27.3' to 29.1'. Dry. 1/8" thick sandy lenses, and possible rip-up clasts, at 26.4', 27.3', and 29.0'. Iron oxide-healed fractures at 27.8', 28.0', 28.2', 28.5', 28.6', 28.9' to 29.1'; all subhorizontal to ~45 deg.
5904		26			
5903		27			
5902		28			
5901		29			
5900					No recovery.
		30			Reamed borehole with augers 30.0' to 30.65'.
5899	Threaded End Cap - Sump, Sch 40-PVC				

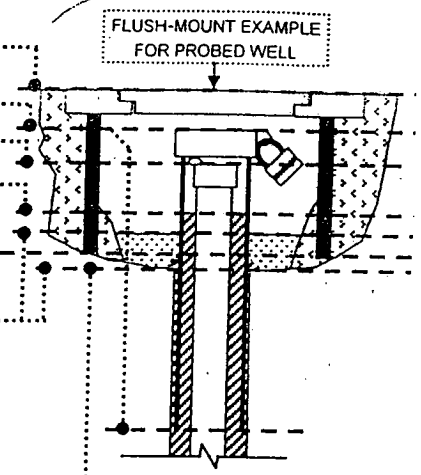
MONITORING WELL INSTALLATION REPORT: Form PRO.118

LOCATION CODE: 91305 PROJECT NAME: FY05 Well Replacements PROGRAM: Water Programs
SCREENED FORMATION: Al/Bdrk DRILLING CONTRACTOR: High Plains BORING METHOD: Hollow Stem Auger w/split spoon.
DATE DRILLED: 4/18/05 DATE COMPLETED: 4/18/05 TOTAL DEPTH: 30.65' COMPLETED DEPTH: 30.65'
ESTIMATED DEPTH TO BEDROCK: 160' RIG GEOLOGIST: E. Wamp LOGGING GEOLOGIST: E. Wamp
BOREHOLE DIAMETER IN SCREENED INTERVAL: 8.0" QUANTITY OF FLUIDS LOST DURING DRILLING: N/A
INITIAL WATER LEVEL (FT, DATE): Dry on 4/18/05 COMPLETED WATER LEVEL (FT, DATE): 5.98' fm TOC, 5/9/05
DIAMETER & TYPE OF INSTALLATION (WELL/PIEZOMETER/WELL POINT/ETC.): 2.0" PVC well
TYPE OF PROTECTION (FLUSH-MOUNT VS. ABOVE GROUND, ASEPTIC, ETC.): Steel-above ground protective casing.

ALL MEASUREMENTS WILL BE MADE IN FEET FROM GROUND SURFACE

* DENOTES ITEMS THAT MAY NOT BE APPLICABLE, DEPENDING ON BORING METHOD, WELL PROTECTION & PURPOSE





PROTECTIVE CASING TOP (STICKUP OR FLUSH-MOUNT): 2.8' ags
*SECONDARY CASING TOP: N/A BOTTOM: N/A TYPE: N/A
SURFACE CASING TOP: 2.1' ID (IN): 2.0"
SURFACE SEAL TOP: 1.8' BOTTOM: 0.1' TYPE: Concrete
PROTECTIVE CASING BOTTOM, ID (IN), TYPE: 2.0' bgs, 6.0" Steel
*WELL PAD DIMENSIONS, TYPE: 3' x 3' - Concrete fm 0.1' bgs to 0.4' ags.
*ADD'L CASING FILL TOP: N/A BOTTOM: N/A TYPE: N/A
*SURFACE ISOLATION CASING TOP: N/A BOTTOM: N/A
*SURFACE ISOLATION CASING ID (IN): N/A TYPE: N/A
*OTHER (E.G., ASEPTIC) CASING TOP: N/A BOTTOM: N/A
*OTHER CASING ID (IN): N/A TYPE, PURPOSE: N/A
*CENTRALIZER(S) OD (IN): N/A NUMBER USED: N/A TYPE: N/A
*CENTRALIZER(S) DEPTH(S): N/A
*GROUT TOP: N/A MEASURED DENSITY (LBS/GAL): N/A TYPE: N/A
*GRANULAR BENTONITE TOP: N/A TYPE: N/A
*BENTONITE SEAL TOP: 0.1' bgs. TYPE: Med. Bentonite Chips - Pure Gold Brand - hydrated w/5 gall. of Dist. H_2O
BENTONITE SEAL OR GRANULAR BENTONITE BOTTOM (= FILTER PACK TOP): 4.5'
FILTER PACK TYPE: 16/40 Silica Sand BRAND: C.S.S.I.
SURFACE CASING BOTTOM (=SCREEN TOP): 5.4' TYPE: Sch. ~~80~~ 40 PVC
SCREEN ID (IN): 2.0" SLOT SIZE (IN): 0.01" TYPE: Sch. ~~80~~ 40 PVC
SCREEN BOTTOM (= SUMP, TOP): 30.4 SUMP TYPE: Threaded end cap - Sch. 80 PVC
FILTER PACK BOTTOM (= *BACKFILL TOP): 30.65' *BACKFILL TYPE: N/A
SUMP BOTTOM (= WELL COMPLETED DEPTH): 30.65' PILOT HOLE TOP, DIAMETER: N/A
TOTAL BOREHOLE DEPTH (= *PILOT HOLE AND *BACKFILL BOTTOM): 30.65'
REMARKS: Routine well installation on 4/18/05. Concrete well pad poured on 4/19/05. Pad poured "high", anticipate an additional 0.2' to 0.5' fill to final grade.
COMPLETED BY: Ellen S. Wamp DATE: 4/25/05
CHECKED BY: _____ DATE: _____

ROCKY FLATS ENVIRONMENTAL TECHNOLOGY SITE BOREHOLE LOG

Borehole Number: 91305
Location - North: _____ East: _____
Date: 4/18/05
Geologist: E. WARP
Drilling Equip. Hollow Stem Auger-CME-75-HT

Surface Elevation: _____
Area: FC-4/5 - REPLACEMENT OF WELL #2187
Total Depth: 30.5
Company: URS/HIGH PLAINS Project No HAD51300
Sample Type: _____

RMRS LOGGING SUPERVISOR APPROVAL [signature] DATE 4/19/05

TOP/BOTTOM OF CORE IN BOX	TOP/BOTTOM OF INTERVAL	FEET OF CORE IN INTERVAL (FIELD MEASUREMENT)	SAMPLE NUMBER	FRACTURE ANGLE	BEDDING ANGLE	GRAIN SIZE DISTRIBUTION	USCS SYMBOL	DEPTH IN FEET	SOIL/LITHOLOGIC LOG	SAMPLE DESCRIPTION
Box #1 of 3	Run #1	Rec. = 1.3'					CL	0.3'		0.0-0.3' - CLAY w/ Tr sand and Tr gravel. Brn. (7.5YR 4/2). ~5% gravel (1/4-1/2" dia., sub-ang. granitic. ~3% sand (c.g., sub-rounded). Tr roots. Tr diss. caliche. Sl. moist.
							CL	1.0		0.3-1.0' - Gravelly, Sandy, CLAY, Strong Brn (7.5YR 4/6). 15-20% sand (c.g., sub-ang.). 5-7% gravel (1/8-1/2" dia., sub-rounded to sub-ang.) Shattered cobble of qtzite (1 1/2" dia., sub-ang.) @ 0.3'. Some to Tr diss. caliche. Crumbly interval. Sl. moist.
	2.0	2.0					GC/CL	1.3'		
	Run #2	Rec. = 2.0'					GC/CL	2.0		1.0-1.3 - GRAVEL/Sandy CLAY MIXTURE. V. Dk. Brn. (7.5YR 2.5/2). ~60% gravel (1/2-1 1/2" dia., sub-ang., predominately qtzite). ~40% sandy clay. 1 1/2" dia. shattered cobble of qtzite @ 1.3'. Diss. caliche throughout. Sl. moist.
							CL	2.8'		1.3-2.0' = No Recovery
								3.0		2.0-2.8' - GRAVEL/Sandy CLAY MIXTURE. Same as fm. 1.0-1.3'. SHATTERED cobble of granite @ 2.8'. Sl. moist.
	5.0	5.0'						4.0		2.8-4.0' - CLAY. Dk. Gry'sh Brn. (10YR 4/2) Tr gravel. Sample appears "Ribboned" at base due to a cobble stuck in the bit. Caliche lense, yellow, @ 3.4'. Incr. moisture to MOIST.
	Run #3	Rec. = 0.7'					CL	5.0		4.0-5.0' = No recovery.
								5.7		5.0-5.7' - CLAY - Same as fm. 2.8-4.0'. 2.0" dia. qtzite cobble @ 5.7'. Poor recovery due to cobble stuck in bit. MOIST.
	7.0'	7.0'						6.0		5.7-7.0' = No recovery
	Run #4	Rec. = 3.0'					CL	7.0		7.0-10.8 - CLAY w/ Tr gravel. Brn. (10YR 5/3) to Yellowish-brn (10YR 5/4). Mottled. Wk to moderate perv. FeOx'n. Caliche stringers @ 8.6'. Interval is cohesive, soft and pliable. Med. plasticity. Moist.
								8.0		
								9.0		
	10.0'	10.0'						10.0		

NOTES: General: USCS is modified for this log as follows:
Materials amounts are estimated by % volume instead of % weight.
(1) Badly broken core, accurate footage measurements not possible.
(2) Core breaks cannot be matched, accurate footage measurements not possible.

14011-930-0134-930)(Form GT:1A)(03/01/92)

U.S. DEPARTMENT OF ENERGY ROCKY FLATS PLANT

FORM PRO.101A

ROCKY FLATS ENVIRONMENTAL TECHNOLOGY SITE BOREHOLE LOG

PAGE 2 OF 3

Borehole Number: 91305
Location - North: _____ East: _____
Date: 4/18/05
Geologist: E. Wang
Drilling Equip. Hollow Stem Auger - CME-75-HT

Surface Elevation:
Area: FC-4/5. Replacement of Well #2187
Total Depth: 30.
Company: URS/HIGH PLAINS Project No.: HAD51300
Sample Type:

RMRS LOGGING SUPERVISOR APPROVAL [signature] DATE 4/19/05

TOP/BOTTOM OF CORE IN BOX	TOP/BOTTOM OF INTERVAL	FEET OF CORE IN INTERVAL (FIELD MEASUREMENT)	SAMPLE NUMBER	FRACTURE ANGLE	BEDDING ANGLE	GRAIN SIZE DISTRIBUTION	USCS SYMBOL	DEPTH IN FEET	SOIL/LITHOLOGIC LOG	SAMPLE DESCRIPTION
Box #1 of 3	Run #5	REC. = 1.3'					CL	10.0		10.0-10.8-CLAY (see description on page 1)
								10.8'		10.8-11.3' - CLAY w/ Tz gravel. Gry'sh Brn. (10YR5/2) to Gry (10YR5/1). Massive texture. Decr. FeOx'n to Tz, Tz caliche stringers. Med. plasticity. Interval is cohesive and soft. V. MOIST. V. silty @ 11.0'
								11		
								11.3'		11.3-12.0' = No recovery
	12.0	12.0						12		12.0-13.3 - CLAY. Same as fm. 10.8-11.3'. Med. plasticity. Clay is soft and pliable. Increasing moisture - totally saturated @ 13.2'.
13.2'	Run #6	REC. = 3.0'					CL	13		(scattered, to 1/4")
								13.3'		▽ H_2O @13.2' 13.3-14.0' - Silty CLAY. Yell'sh Brn. (10YR5/6). V. Silty. Tz gravel. Strong perv. FeOx'n. Tz diss. wht. caliche. Interval is cohesive yet soft and pliable. SATURATED.
								14		
								14.6'		14.0-14.6 - Silty CLAY. Dk. Gry (10YR4/1). Distinct color change. Decr. FeOx'n to Tz. Twigs/roots @ 14.2 and 14.5 (possibly original ground surface?). Crumbly lense of caliche at base. Interval is cohesive yet soft and pliable. SATURATED.
	15.0	15.0						15		
Box #2 of 3	Run #7	REC. = 1.8'						16		14.6-16.0 ~~16.7'~~ - ~~Sandy~~ Silty CLAY w/ sand. Yell'sh Brn. (10YR5/6). Distinct color change. Incr. perv. FeOx'n. Roots @ 15.8'. V. Silty and silty clayey v.f.g. sand at base of interval. V. crumbly. SATURATED.
			Bedrock Contact (?)					16.7'		
			V. SUBTLE @ ~~16.0'~~ 16.0'					16.8'		
	17.0	17.0						17		16.0 4/19/05 Bedrock contact @ ~~16.7'~~ (?) - V. Subtle.
	Run #8	REC. = 3.0'		16.0-16.7: silty claystone - clayey siltstone. Otherwise as logged.				18		16.7-16.8 - Sandy, Clayey Siltstone Bedrock. Yell'sh Brn. (10YR5/6). Strong perv. FeOx'n. Massive texture. Interval cohesive, soft and pliable. Some lenses of v.f.g. sand. SATURATED.
								18.1		16.8-17.0 = No Recovery
								19		17.0-18.1' - Sandy, Clayey SILTSTONE Described above fm. 16.7-16.8'. SATURATED.
				20°						18.1-20.1 - CLAYSTONE, DK. Gry (10YR4/1) Un-weathered claystone. Tz esp. Distinct color change. Decr. FeOx'n to Tz. Massive textured.
	20.0'	20.0'						20.0'		

NOTES: General: USCS is modified for this log as follows:
Materials amounts are estimated by % volume instead of % weight.
(1) Badly broken core, accurate footage measurements not possible.
(2) Core breaks cannot be matched, accurate footage measurements not possible.

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V. Dense and firm. Bleached fracture w/ caliche fill @ 19.7'. Decr. Moisture to sl. MOIST. Silty @ 19.9-20.1.

ROCKY FLATS ENVIRONMENTAL TECHNOLOGY SITE BOREHOLE LOG

PAGE 3 OF 3

Borehole Number: 91305
Location - North: East:
Date: 4/18/05
Geologist: E. WARP
Drilling Equip. Hollow Stem Auger - CME-75-HT

Surface Elevation:
Area: FC-4/5 - REPLACEMENT OF WELL 2187
Total Depth: 30.6'
Company: URS/HIGH PLAINS Project No. HAD51300
Sample Type:

RMRS LOGGING SUPERVISOR APPROVAL _____ DATE 4/19/05

TOP/BOTTOM OF CORE IN BOX	TOP/BOTTOM OF INTERVAL	FEET OF CORE IN INTERVAL (FIELD MEASUREMENT)	SAMPLE NUMBER	FRACTURE ANGLE	BEDDING ANGLE	GRAIN SIZE DISTRIBUTION	USCS SYMBOL	DEPTH IN FEET	SOIL LITHOLOGIC LOG	SAMPLE DESCRIPTION
Box # 3 of 3	20.0'	20.0'						20.1		H_2O fm. 20.1' to 21.1' 20.0-20.1 - CLAYSTONE (see description ~~on page 2~~) for 18.1-20.1; silties.
	Run #9	Rec. = 2.0'						21		20.1-21.1' - Clayey SILTSTONE - Yellish Brn. (10YR5/6). DISTINCT COLOR CHANGE, Moderate to strong perv. FeOxn. TOTALLY SATURATED - V. soft and pliable. FLOWING.
	22.0'	22.0'						21.1		
								22		
								23		21.1-24.5 - CLAYSTONE w/silt Gry (10YR5/1) DISTINCT COLOR AND LITHOLOGY CHANGE. V. massive texture. Decr. FeOxn to Tr. Tr blk. organic stringers. V. firm and dense/hard. Decr. moisture to V. sl. moist.
	Run #10	Rec. = 2.5'						24		
	25.0'	25.0'						25		24.5-25.0 = No Recovery
								26		25.0-29.1 - CLAYSTONE w/silt Gry (10YR5/1) Same as fm. 21.1-24.5 except incr. FeOxn along bedding planes fm. 27.3 to 29.1'. DRY. 1/8" thick sandy lenses, and possible ripup clasts, at 26.4', 27.3', 29.0'. Fe-ox-healed frac's @ 27.8', 28.0', 28.2', 28.5', 28.6', 28.9'-29.1' - all subhorz. to ~45°.
	Run #11	Rec. = 2.0'						27		
	27.0'	27.0'						28		
	Run #12	Rec. = 2.1'		30° 0-10° 45°				29		29.1-30.0 = No Recovery
										Reamed borehole w/augers to 30.65'. T.D. = 30.65'

NOTES: General: USCS is modified for this log as follows:
Materials amounts are estimated by % volume instead of % weight.
(1) Badly broken core, accurate footage measurements not possible.
(2) Core breaks cannot be matched, accurate footage measurements not possible.

STATE PLANE COORDINATES AREA:	GRND ELEV. (FT): 5937.44	CASING DIA (IN): 2	**LOG OF BORING NUMBER:**
NORTH: 749977.951	TOTAL DEPTH (FT): 28.0	BH DIA. (IN): 8	**99305**
EAST: 2085632.932	COMPLETION DATE: 4/7/05	GRID LOCATOR:	
PROJECT: B991	GEOLOGIST: E. Warp		

REMARKS:
replaces 99301; this well located ~2' north of 99301.

Elev (Ft)	Well or Piezometer Construction and Materials	Depth (Ft)	Lithology	Unified Soils Classification or Rock Type	Lithologic Description
5940, 5939, 5938, 5937, 5936, 5935, 5934, 5933	Protective Casing, 6 in. ID., Steel; Casing, Sch 40-PVC, 2 in. ID.; Concrete Seal; Concrete Pad; Hydrated Bentonite Chips; Filter Pack,	3, 2, 1, 0, 1, 2, 3, 4, 5			
					CL: Clay with some gravel and some sand, brown (10YR4/3), ~5% gravel (1/8" to 1/2" diameter, subrounded to subangular), ~5% sand (coarse grained, subrounded to subangular). Clay has medium plasticity. Broken quartzite cobble from 1.0' to 1.2'. Moist.
					No recovery. Original hole's core (located ~2' to west) is CL to GC. (Offset due to refusal at 5'.)
					CL: Clay with some gravel and sand, grayish brown (10YR5/2) to yellowish brown (10YR5/4), ~5% gravel (1/8" to 1/4" diameter, subrounded), ~5% sand (coarse grained). Clay is laminated with alternating colors. Broken quartzite cobble at top (3.0'), moist. Traces roots at ~3.6' and deeper.
					No recovery.
					CL: Clay with some gravel and sand, dark grayish brown (10YR4/2)

Elev (Ft)	Well or Piezometer Construction and Materials	Depth (Ft)	Lithology	Unified Soils Classification or Rock Type	Lithologic Description
5932	16/40 Silica Sand				and yellowish brown (10YR5/4), laminated clay with iron oxidation (yellowish brown) mottled throughout. ~5% gravel (1/8" to 3/4" diameter, subrounded), quartzite and granite composition with trace Fountain Formation. Clay has low plasticity. ~5% sand (medium grained, subangular), occasional black organic stringers noticeable, probably re-worked claystone, moist. Trace roots in approximately
		6			
5931	Screen, Sch 40-PVC, 2 in. ID., 0.010 in. slots				
		7			No recovery.
5930					
		8			CL: Clay with some gravel and sand, same as interval from 5.0' to 7.0', increasing moisture to very moist.
5929					SC: Clayey, Gravelly Sand, brown (10YR5/3), ~50% sand is medium grained to coarse grained (subrounded to subangular), ~10% gravel (1/8" to >1" diameter, subrounded), ~40% clay. Wet.
		9			CL: Clay as above (from 5.0' to 7.0'), wet.
5928					No recovery.
		10			CL: Clay with some silt, gray (10YR6/1) and light brownish gray (10YR6/2), and yellowish brown (10YR5/6), mottled texture. Yellowish brown is weak to moderate iron oxidation mottled throughout interval. Appears to be re-worked claystone. Interval is firm and dense, decreasing moisture to moist. Sharp color change at base.
5927					
		11			CL: Silty Clay, black (10YR2/1) to very dark grayish brown (2.5Y3/2), very plastic clay, trace gravel, trace coarse grained sand, trace roots, cohesive. Graded color from black at top of interval to very dark grayish brown at base, very moist.
5926					
		12			No recovery.
					CL: Clay, black (10YR2/1), like above. Very plastic clay, trace to some silt, trace sand, very moist.
5925					
		13			CL: Clay with some sand, olive gray (5Y5/3), 5-10% sand (medium grained to coarse grained, subrounded to subangular). Appears to be re-worked claystone, very moist.
5924					CL: Clay with trace to some sand, gray (10YR6/1), trace to 5% sand (coarse grained, subangular) in patchy zones. Re-worked claystone bedrock. ~5% white stringers and caliche blebs throughout, patchy zones of yellowish brown (10YR5/6) iron oxidation. Moderate iron oxidation (pervasive at 13.6'). Very moist.
		14			CLAYSTONE: TOP OF BEDROCK. Claystone (oxidized bedrock), yellowish brown (10YR5/6) to brown (10YR5/3), weathered, iron oxidized claystone bedrock. Moderate to strong pervasive iron oxidation. Slightly mottled, weakly friable, trace black organic stringers, very moist. Bedrock contact very subtle, could be as
5923					

Elev (Ft)	Well or Piezometer Construction and Materials	Depth (Ft)	Lithology	Unified Soils Classification or Rock Type	Lithologic Description
		15			shallow as ~12.9'.
5922	Filter Pack, 16/40 Silica Sand				
		16			CLAYSTONE: Claystone, dark gray (10YR4/1), dense and firm, slightly fissile, moderately friable, un-oxidized, non-weathered, decreasing moisture to slightly moist.
5921					
		17			No recovery.
					CLAYSTONE: Claystone, gray (10YR5/1), dense and firm, trace iron oxidation from 17.6' to 18.0'. Trace bleaching along internal fractures at 19.5' and 19.7'. Slightly moist.
5920					
		18			
5919					
		19			
5918					
		20			No recovery.
					CLAYSTONE: Claystone, un-weathered, gray (10YR5/1), weakly fissile, weakly to moderately friable, trace iron oxidation, trace patchy bleaching at 20.1', dense and firm, very slightly moist to dry.
5917					
		21			
5916					
		22			
5915					
		23			
5914					
		24			No recovery.
5913					

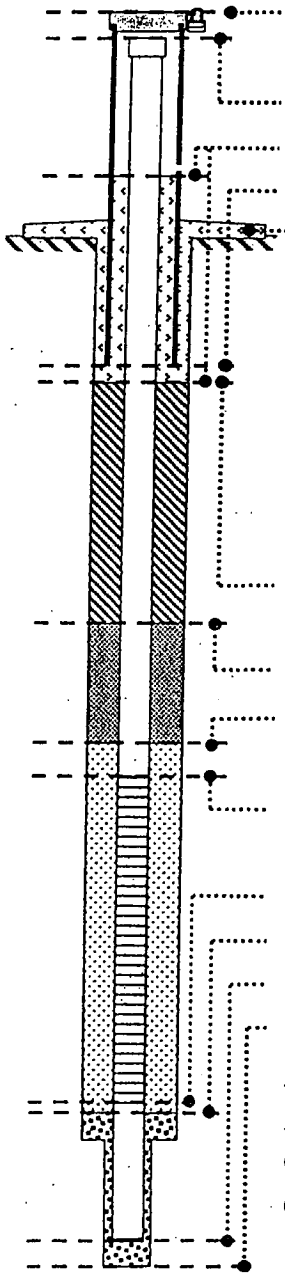
Elev (Ft)	Well or Piezometer Construction and Materials	Depth (Ft)	Lithology	Unified Soils Classification or Rock Type	Lithologic Description
		25			CLAYSTONE: Claystone, gray (10YR5/1) to light grayish brown (10YR6/2), predominately un-weathered claystone bedrock. Trace iron oxidation and bleaching along horizontal fracture at 25.7'. Weak iron oxidized stringers at 26.3' to 26.5'. Trace black organic stringers throughout interval, weakly fissile, weakly friable, dry.
5912					
		26			
5911	Threaded End Cap - Sump, Sch 40-PVC				
		27			
	Native Material Backfill				
5910					No recovery. Borehole augered to 26.5'. Drove split-spoon from 26.5' to 28.0'. Backfilled pilot hole with native material.
		28			

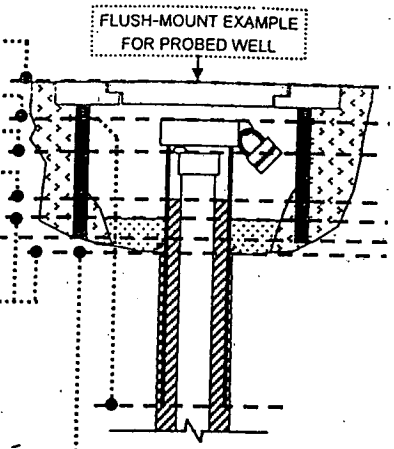
MONITORING WELL INSTALLATION REPORT: Form PRO.118

LOCATION CODE: 99305 PROJECT NAME: FY05 Well Replacements PROGRAM: Water Programs-WARP
SCREENED FORMATION: Cal/Bdrk. DRILLING CONTRACTOR: High Plains BORING METHOD: Hollow Stem Auger w/split spoon.
DATE DRILLED: 4/7/05 DATE COMPLETED: 4/7/05 TOTAL DEPTH: 28.0' COMPLETED DEPTH: 26.5'
ESTIMATED DEPTH TO BEDROCK: 13.6' RIG GEOLOGIST: E. WARP LOGGING GEOLOGIST: E. WARP
BOREHOLE DIAMETER IN SCREENED INTERVAL: 8.0" QUANTITY OF FLUIDS LOST DURING DRILLING: N/A
INITIAL WATER LEVEL (FT, DATE): Dry on 4/7/05 COMPLETED WATER LEVEL (FT, DATE): 11.90' fm TOC, 5/10/05
DIAMETER & TYPE OF INSTALLATION (WELL/PIEZOMETER/WELL POINT/ETC.): 2.0" I.D. - PVC Well
TYPE OF PROTECTION (FLUSH-MOUNT VS. ABOVE GROUND, ASEPTIC, ETC.): Above ground-Steel Prot. casing.

ALL MEASUREMENTS WILL BE MADE IN FEET FROM GROUND SURFACE

* DENOTES ITEMS THAT MAY NOT BE APPLICABLE, DEPENDING ON BORING METHOD, WELL PROTECTION & PURPOSE





PROTECTIVE CASING TOP (STICKUP OR FLUSH-MOUNT): 2.9' ags
*SECONDARY CASING TOP: N/A BOTTOM: N/A TYPE: N/A
SURFACE CASING TOP: 2.4' ags ID (IN): 2.0"
SURFACE SEAL TOP: 1.4' BOTTOM: 0.2' bgs TYPE: Concrete
PROTECTIVE CASING BOTTOM, ID (IN), TYPE: 1.9' bgs, 6" steel
*WELL PAD DIMENSIONS, TYPE: 3'x3' - Concrete pad fm. 0.2' bgs to 0.3' ags 0.3' ESW
*ADD'L CASING FILL TOP: N/A BOTTOM: N/A TYPE: N/A
*SURFACE ISOLATION CASING TOP: N/A BOTTOM: N/A
*SURFACE ISOLATION CASING ID (IN): N/A TYPE: N/A
*OTHER (E.G., ASEPTIC) CASING TOP: N/A BOTTOM: N/A
*OTHER CASING ID (IN): N/A TYPE, PURPOSE: N/A
*CENTRALIZER(S) OD (IN): N/A NUMBER USED: N/A TYPE: N/A
*CENTRALIZER(S) DEPTH(S): N/A
*GROUT TOP: N/A MEASURED DENSITY (LBS/GAL): N/A TYPE: N/A
*GRANULAR BENTONITE TOP: N/A TYPE: N/A
*BENTONITE SEAL TOP: 0.2' TYPE: Med. Bentonite chips-Pure gold-Hydrated w/5 gall. of Distilled H_2O.
BENTONITE SEAL OR GRANULAR BENTONITE BOTTOM (= FILTER PACK TOP): 5.0'
FILTER PACK TYPE: 16/40 Silica Sand BRAND: C.S.S.I.
SURFACE CASING BOTTOM (=SCREEN TOP): 6.25' TYPE: Sch. ~~80~~ 40 ESW 5/2/05 PVC
SCREEN ID (IN): 2.0" SLOT SIZE (IN): 0.01" TYPE: Sch. ~~80~~ 40 ESW 5/2/05 PVC
SCREEN BOTTOM (= SUMP, TOP): 26.25' SUMP TYPE: Threaded end cap - Sch. ~~80~~ 40 ESW 5/2/05 PVC
FILTER PACK BOTTOM (= *BACKFILL TOP): 26.5' *BACKFILL TYPE: Native material
SUMP BOTTOM (= WELL COMPLETED DEPTH): 26.5' *PILOT HOLE TOP, DIAMETER: 26.5', 2.0" dia. pilot hole
TOTAL BOREHOLE DEPTH (= *PILOT HOLE AND *BACKFILL BOTTOM): 28.0'

REMARKS: Augered to 26.5'. Drive split spoon only fm. 26.5 to 28.0'. Backfilled pilot hole with native material, ~~fm~~ ESW Borehole stopped shallower than Work Plan due to completed Well installation objectives (Sufficient penetration within un-weathered bedrock and depth is below basement of former B991). Note: this was the second borehole attempt. Hit refusal at 5.0' on first borehole attempt. Completed well location is approx. 2 ft. No. of original well #99301 location.

COMPLETED BY: ELLEN S. WARP Ellen S. Warp DATE: 4/15/05
CHECKED BY: [signature] DATE: 6/29/05

U.S. DEPARTMENT OF ENERGY ROCKY FLATS PLANT

FORM PRO.101A

ROCKY FLATS ENVIRONMENTAL TECHNOLOGY SITE BOREHOLE LOG

PAGE 1 OF 3

Borehole Number: 99305 (OFFSET)
Location - North: _____ East: _____
Date: 4/1/05
Geologist: E. WARP
Drilling Equip.: CME-HT-75 AUGER RIG

Surface Elevation: _____
Area: B991-REPLACEMENT OF #99301
Total Depth: 28.0 / 26.5
Company: URS/HIGH PLAINS Project No.: HAD51300
Sample Type: N/A

RMRS LOGGING SUPERVISOR APPROVAL _____ DATE 4/12/05

TOP/BOTTOM OF CORE IN BOX	TOP/BOTTOM OF INTERVAL	FEET OF CORE IN INTERVAL (FIELD MEASUREMENT)	SAMPLE NUMBER	FRACTURE ANGLE	BEDDING ANGLE	GRAIN SIZE DISTRIBUTION	USCS SYMBOL	DEPTH IN FEET	SOIL LITHOLOGIC LOG	SAMPLE DESCRIPTION
	Run #1 3.0'	Rec. = 1.2' 3.0'					CL	1 1.2' 2 3		0.0-1.2' - Clay w/some Gravel. Brn. (10YR 4/3) ~5% gravel (1/8-1/2" dia., sub-rounded to sub-ang.) ~5% sand (c.g., sub-rounded to sub-ang.). Clay has med. plasticity, Broken qtzite cobble fm. 1.0'-1.2'. MOIST.
										1.2-3.0' = NO RECOVERY - original hole's core (located ~2 to W) is CL to GC. (Offset due to refusal @ 5')
										3.0-4.6' - Clay w/some gravel and sand. Gry'sh Brn. (10YR 5/2) to Yell'sh Brn (10YR 5/4) ~5% gravel (1/8-1/4" dia., sub-rounded) ~5% sand (c.g.). Clay is laminated w/alternating colors. Broken cobble of qtzite @ top (3.0') MOIST. Traces roots, ~3.6 and deeper.
	Run #2 5.0'	Rec. = 1.6'					CL	4 4.6'		4.6-5.0' = NO RECOVERY
	Run #3 8.0'	Rec. = 2.0'					CL	5 6 7		5.0-7.0' - Clay w/some gravel and sand Dk. Gry'sh Brn (10YR 4/2) and Yell'sh Brn (10YR 5/4) laminated clay w/ FeOx'n (Yell'sh brn.) mottled throughout. ~5% gravel (1/8-3/4" dia., sub-rounded) - qtzite and granite decomposition. Trace Fe staining. Clay has low plasticity. ~5% sand (m.g., sub-ang.) Occasional blk. organic stringers noticeable. Probably re-worked claystone. MOIST. Trace roots in upper ~1'.
										7.0-8.0' = NO RECOVERY
	Run #4 10.0'	Rec. = 1.1'				▽	CL SC CL	8 8.5 8.7 9 9.1 10.0		8.0-8.5' - Clay w/some gravel and sand, Same as above fm. 5.0-7.0'. Incr. Moisture to V. MOIST.
										8.5-8.7 - Clayey gravelly SAND. Brn (10YR 5/3) ~50% Sand is m.g. to c.g. (sub-rounded to sub-ang.) ~10% gravel (1/8 to 1/4" dia., sub-rounded) ~40% Clay. THIS SAND LENSE IS WET!

NOTES: General: USCS is modified for this log as follows:
Materials amounts are estimated by % volume instead of % weight.
(1) Badly broken core, accurate footage measurements not possible.
(2) Core breaks cannot be matched, accurate footage measurements not possible.

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9.1-10.0 = No Recovery

8.7-9.1 - Clay (as above fm. 5.0-7.0') WET.

U.S. DEPARTMENT OF ENERGY ROCKY FLATS PLANT

FORM PRO.101A

ROCKY FLATS ENVIRONMENTAL TECHNOLOGY SITE BOREHOLE LOG

Borehole Number: 99305
Location - North: _____ East: _____
Date: 4/7/05
Geologist: E. WARP
Drilling Equip.: CME-#7-75 Auger Rig

Surface Elevation: _____
Area: B991 - REPLACEMENT OF #99301
Total Depth: _____
Company: _____ Project No.: HAD51300
Sample Type: N/A

RMRS LOGGING SUPERVISOR APPROVAL [signature] DATE 4/12/05

TOP/BOTTOM OF CORE IN BOX	TOP/BOTTOM OF INTERVAL	FEET OF CORE IN INTERVAL (FIELD MEASUREMENT)	SAMPLE NUMBER	FRACTURE ANGLE	BEDDING ANGLE	GRAIN SIZE DISTRIBUTION	USCS SYMBOL	DEPTH IN FEET	SOIL/LITHOLOGIC LOG	SAMPLE DESCRIPTION
	Run #5	Rec = 1.7'					CL	10.0		10.0 - 10.8 - CLAY w/some silt. Gry (10YR 6/1) and Lt. Brn'sh gry (10YR 6/2) and Yell'sh Brn. (10YR 5/6). Mottled texture. Yell'sh Brn. is Wk/Mod. FeOx'n mottled throughout interval. Appears to be re-worked claystone. Interval firm and dense. Decr. moisture to MOIST. Sharp color change at base
							CL	10.8'		10.8 - 11.7' - Silty CLAY. Blk (10YR 2/1) to V. Dk Gry'sh Brn (2.5Y 3/2). V. PLASTIC CLAY. Tr gravel and Tr c.g. sand. Tr roots. Graded ~~for~~ esw color fm. Blk. at top of interval to V. Dk Gry'sh brn. at base. MOIST. = very moist. Cohesive.
	12.0'						~~CL~~ ESW	11.7		11.7-12.0 = NO RECOVERY
	Run #6	Rec. = 3.0'		ESW 4/7/05 ~~Bedrock Contact~~ @ 12.6'			CL	12.2		12.0-12.2 - CLAY. Blk. (10YR 2/1) - LIKE ABOVE. V. PLASTIC CLAY. Tr silt, Tr sand. V. MOIST.
				Very subtle (could be higher) Bedrock Contact @ 13.6'			CL	13.6		12.2 - 12.6' - CLAY w/some sand. Olive Gry (5Y 5/3), 5-10% sand (m.g. to c.g. sub-rounded to sub-ang.). Appears to be re-worked claystone. ~~Diss. wht.~~ V. MOIST ESW ~~Bedrock Contact @ 12.6'~~
	15.0'							14		12.6 - 13.6' - CLAY ~~[illegible]~~ ESW w/ Tr-some sand - Gry (10YR 5/1) Tr-5% sand (c.g., sub-ang.) in patchy zones. Re-worked claystone bedrock. ~5% wht. stringers and caliche blebs throughout. Patchy zones of Yell'sh Brn. (10YR 5/6) FeOx'n. Mod. FeOx'n (perv. @ 13.6'). V. Moist.
	Run #7	Rec. =						15		13.6 - 15.9' TOP OF BEDROCK @ 13.6' CLAYSTONE - OX'D. BEDROCK Yell'sh BRN. (10YR 5/6) to Brn (10YR 5/3) Weathered FeOx'd Claystone Bedrock. Moderate to Strong perv. FeOx'n. Slightly mottled. Wkly friable. Tr blk organic stringers. V. MOIST. Bedrock contact v. subtle - could be as shallow as ~12.9'.
								16		
								16.8		
	Run #8							17		15.9 - 16.8 - CLAYSTONE - Dk. Gry (10YR 4/1) Dense and firm. Slightly fissile. ~~Wkly friable~~ ESW Mod. Moderately friable. Un-ox'd, non-weathered. Decr. moisture to slightly moist.
								18		
								19		16.8 - 17.0 = NO RECOVERY
								19.8'		17.0 - 19.8' - CLAYSTONE - Gry (10YR 5/1) Dense + firm. Tr FeOx'n fm. 17.6 - 18.0'. ~~Decr.~~ ESW
								20.0'		

NOTES: General: USCS is modified for this log as follows:
Materials amounts are estimated by % volume instead of % weight.
(1) Badly broken core, accurate footage measurements not possible.
(2) Core breaks cannot be matched, accurate footage measurements not possible.

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~~Tr bleaching~~ SW Tr bleaching along internal fracs @ 19.5 + 19.7'. ~~Decr.~~ Sl. moist.

U.S. DEPARTMENT OF ENERGY ROCKY FLATS PLANT

FORM PRO.101A

ROCKY FLATS ENVIRONMENTAL TECHNOLOGY SITE BOREHOLE LOG

Borehole Number: 99305
Location - North: _____ East: _____
Date: 4/7/05
Geologist: E. WARP
Drilling Equip.: CME-HT-75 AUGER RIG

Surface Elevation: _____
Area: B991 - REPLACEMENT OF #99301
Total Depth: 28.0 PILOT HOLE / 26.5' OF AUGER HOLE
Company: URS/HIGH Project No. H#051300
Sample Type: _____

RMRS LOGGING SUPERVISOR APPROVAL _____ DATE 4/12/05

TOP/BOTTOM OF CORE IN BOX	TOP/BOTTOM OF INTERVAL	FEET OF CORE IN INTERVAL (FIELD MEASUREMENT)	SAMPLE NUMBER	FRACTURE ANGLE	BEDDING ANGLE	GRAIN-SIZE DISTRIBUTION	USCS SYMBOL	DEPTH IN FEET	SOIL/ LITHOLOGIC LOG	SAMPLE DESCRIPTION
Box #2 of 3	Run #9 22.0'							21, 22		20.0-24.1 - CLAYSTONE - Un-weathered. Gry (10YR 5/1). Wkly Fissile. W/M FRIABLE Tr FeOxn. Tr patchy bleaching @ 20.1'. Dense and firm. V. slightly moist to Dry
22.9								23, 24		
Box #3 of 3	Run #10 25.0'	Rec. =						25	X	24.1-25.0' = NO RECOVERY
	Run #11 28.0'	Rec. = 2.3'		—				25.7, 26, 27, 27.3		25.0-27.3 - CLAYSTONE - Gry (10YR 5/1) to Lt. Grish Brn (10YR 6/2). Predominately Un-weathered Claystone Bedrock. Tr FeOxn and bleaching along horizontal fracture @ 25.7'. Wk. FeOxd stringers @ 26.3' to 26.5'. Tr blk organic stringers throughout interval. Wkly fissile, Wkly friable. DRY.
28.0'									X	27.3 to 28.0' = NO RECOVERY T.D. of Pilot Hole = 28.0'
								28, 29		T.D. of Auger Borehole @ 26.5'

NOTES: General: USCS is modified for this log as follows:
Materials amounts are estimated by % volume instead of % weight.
(1) Badly broken core, accurate footage measurements not possible.
(2) Core breaks cannot be matched, accurate footage measurements not possible.

Procedure No. RMRS/OPS-PRO.101
Revision 0
Date effective: 12/31/98

(4011-930-0134-930)(Form GT.1A)(03/01/92)

U.S. DEPARTMENT OF ENERGY ROCKY FLATS PLANT

FORM PRO.101A

ROCKY FLATS ENVIRONMENTAL TECHNOLOGY SITE BOREHOLE LOG

PAGE 1 OF 1

Borehole Number: 99305 - 1st attempt.
Location - North: _____ East: _____
Date: 4/7/05
Geologist: E. WAMP
Drilling Equip.: CME-HT-75 AUGER

Surface Elevation: _____
Area: B991 - REPLACEMENT
Total Depth: 5.0'
Company: URS/HIGH PLAINS Project No.: HAD5T300
Sample Type: N/A

RMRS LOGGING SUPERVISOR APPROVAL _____ DATE _____

TOP/BOTTOM OF CORE IN BOX	TOP/BOTTOM OF INTERVAL	FEET OF CORE IN INTERVAL (FIELD MEASUREMENT)	SAMPLE NUMBER	FRACTURE ANGLE	BEDDING ANGLE	GRAIN SIZE DISTRIBUTION	USCS SYMBOL	DEPTH IN FEET	SOIL/ LITHOLOGIC LOG	SAMPLE DESCRIPTION
	0.0						CL	0.0'		0.0-0.8' - CLAY w/ some gravel, Yell'sh BRN. (10YR 5/4), to Dk. Gry'sh Brn. (10YR 4/2). 5-10% gravel (1/2-1" dia., sub-rounded to sub-ang.). Clay HAS med. plasticity, GRAVEL predominately quartzite and granite. MOIST.
								0.8' 1		0.8-2.9' - GRAVELLY CLAY - Strong Brn. (7.5YR 4/6). Sandy, 30% gravel (1/4" to 1" dia., sub-rounded to sub-ang.). Patchy FeOxn. ~10% sand (c.g., sub-ang.). Tr Diss caliche, Broken clast (cobble) of quartzite @ 2.6' (1 1/2" ang. clasts).
	Run #1 2.0'	Rec. = 2.0'					CL	2		
								2.9' 3		2.9-3.8' - Clay w/ same gravel (same as 0.0 → 0.8')
	Run #2 5.0'	Rec. = 1.8'					CL	4		3.8-5.0' = NO RECOVERY UNABLE TO AUGER PAST 5.0', WILL OFFSET 2.0' EAST (~~THIS WILL~~ ESW).
		5.0'			T.D.			5		T.D. @ 5.0' BACKFILL w/ Bentonite Chips
								6		
								7		
								8		
								9		
								10.0		

NOTES: General: USCS is modified for this log as follows:
Materials amounts are estimated by % volume instead of % weight.
(1) Badly broken core, accurate footage measurements not possible.
(2) Core breaks cannot be matched, accurate footage measurements not possible.

Procedure No. RMRS/OPS-PRO.101
Revision 0
Date effective: 12/31/98

(4011-930-0134-930)(Form GT.1A)(03/01/92)

STATE PLANE COORDINATES AREA: GRND ELEV. (FT): 5932.366 CASING DIA (IN): 2

NORTH: 749862.721 TOTAL DEPTH (FT): 25.5 BH DIA. (IN): 8

EAST: 2085584.839 COMPLETION DATE: 4/13/05 GRID LOCATOR:

PROJECT: B991 GEOLOGIST: E. Warp

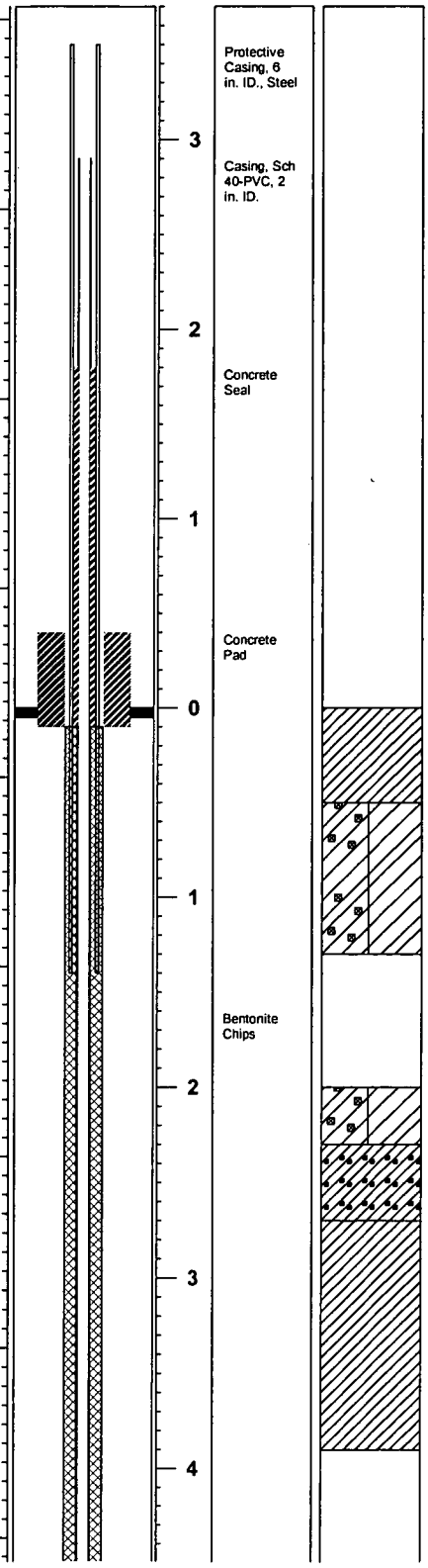
REMARKS:

replaces 99401; 99405 is 2 feet west of original well 99401.

LOG OF BORING NUMBER: 99405

Elev (Ft)	Depth (Ft)	Lithologic Description
5936		
5935	3	
5934	2	
5933	1	
5932	0	CL: Gravelly, Sandy Clay, strong brown (7.5YR5/6), ~10% sand (coarse grained, subangular), 5 - 10% gravel (1/8" to 1/4" diameter, subangular to subrounded). Clay has medium plasticity. Wet, ground saturated due to recent precipitation (snow).
5931	1	GC/CL: Calcareous Gravel/Sandy Clay mixture, brown (7.5YR4/2), ~20% gravel (1/4" to 1" diameter, subrounded to subangular, predominately quartzite), ~25% sand (medium grained to coarse grained, subrounded to subangular). Wet, saturated due to recent snow.
		No recovery.
5930	2	GC/CL: Gravel/Sandy Clay mixture (same as 0.5' to 1.3'), wet.
		GC: Gravel with some clay, dark grayish brown (10YR4/2) clay matrix. Gravel (1/2" to 1-1/2" diameter, subangular) is a shattered quartzite cobble. Wet
5929	3	CL: Clay with some gravel, grayish brown (10YR5/2) to gray (10YR5/1), mottled. "Ribbons" of sample from 2.7' to 3.2' due to clogged bit. Dense from 3.2' to 3.9'. Re-worked claystone, wet.
5928	4	No recovery.

Well or Piezometer Construction and Materials



Lithology

Unified Soils Classification or Rock Type

Elev (Ft)	Well or Piezometer Construction and Materials	Depth (Ft)	Lithology	Unified Soils Classification or Rock Type	Lithologic Description
	Filter Pack, 16/40 Silica Sand	5			CL: Clay with trace sand and gravel, grayish brown (2.5Y5/2) with lesser gray (2.5Y5/1), mottling, trace sand (coarse grained, subangular), trace gravel (1/4" diameter, subangular), 1-1/2" diameter broken quartzite cobble at 5.4'. Re-worked claystone, wet. Note: this interval could be slough.
5927	Screen, Sch 40-PVC, 2 in. ID., 0.010 in. slots				
		6			CL: Clay, gray (2.5Y5/1) to grayish brown (2.5Y5/2), mottled. Re-worked claystone, wet. Trace to some fine grained sand.
5926					CL: Silty Clay, brown (10YR4/3), distinct color change. ~5% sand (coarse grained, subangular to subrounded), wet.
		7			CLAYSTONE: TOP OF BEDROCK. Claystone, gray (10YR5/1) with yellowish brown (10YR5/4), mottling. Weak, patchy iron oxidation. Bedrock contact very subtle. Interval competent but soft and wet. Trace white stringers.
5925					No recovery.
		8			CLAYSTONE: Claystone, gray (10YR5/1) to grayish brown (10YR5/2), trace iron oxidation increasing to weak iron oxidation as stringers along internal fractures from 11.4' to 11.7'. Trace to some black stringers and blebs along bedding planes. Competent, dense, and firm. Decreasing moisture to slightly moist. Bleached, caliche-filled seam at 11.2' to 11.3'.
5924					
		9			
5923					
		10			
5922					
		11			
5921					
		12			
5920					
					No recovery.
		13			CLAYSTONE: Claystone to Claystone with silt below 16.2'. Very dark gray (10YR3/1) changing to gray (10YR5/1) at base of interval. Predominately un-weathered, un-oxidized claystone bedrock. Trace iron oxidation, massive textured. Some black organic stringers throughout. Lenses of black carbonaceous material along bedding
5919					

Elev (Ft)	Well or Piezometer Construction and Materials	Depth (Ft)	Lithology	Unified Soils Classification or Rock Type	Lithologic Description
		14			planes at 15.9', 17.0', and 17.4'. Abundant black carbonaceous material from 18.2' to 18.4', with patchy, associated iron oxidation. Very competent and dense interval, decreasing moisture; very slightly moist to dry.
5918					
		15			
5917					
		16			
5916					
		17			
5915					
		18			
5914					
		19			
5913					CLAYSTONE: Claystone to Claystone with silt, gray (10YR5/1) with yellowish brown (10YR5/6) iron oxidation along bedding planes. Pervasive iron oxidation from 19.9' to 20.0', very silty, trace to some black organic stringers throughout. Weakly friable, very slightly moist to dry.
		20			
5912					CLAYSTONE: Claystone with silt, very dark grayish brown (10YR3/2), dense and firm, very slightly moist to dry.
		21			CLAYSTONE: Claystone with silt, gray (10YR5/1) with weak to moderate yellowish brown (10YR5/6) iron oxidation along fractures and bedding planes. Trace manganese oxide coating associated with iron oxidation, very firm and dense, many fractures, all iron oxide-healed, generally ~30 deg - 60 deg, below 20.8' to 23.0', then rare. Decreased moisture to dry.
5911					
		22			
5910					
		23			

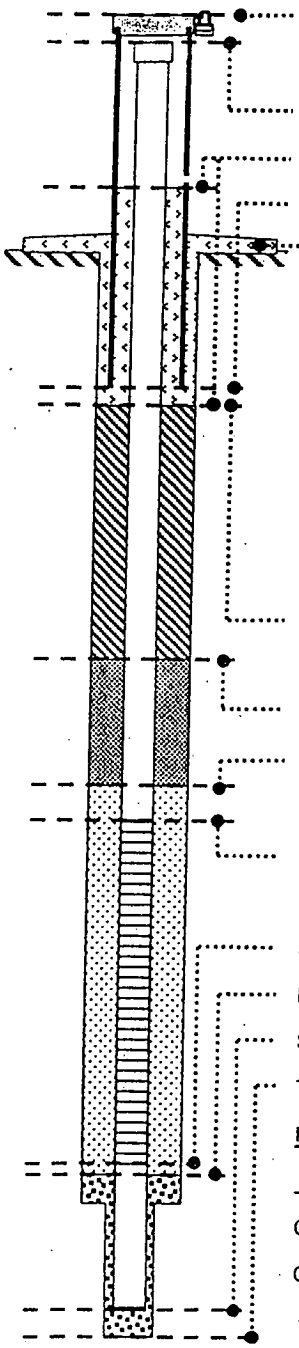
Elev (Ft)	Well or Piezometer Construction and Materials	Depth (Ft)	Lithology	Unified Soils Classification or Rock Type	Lithologic Description
5909					
		24			
5908					
		25			Augers advanced to 25.5', no core collected.
5907	Threaded End Cap - Sump, Sch 40-PVC				

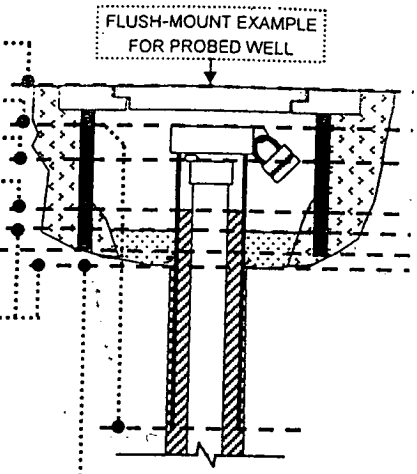
MONITORING WELL INSTALLATION REPORT: Form PRO.118

LOCATION CODE: 99405 PROJECT NAME: FY05 WELL REPLACEMENTS PROGRAM: WATER PROGRAMS - WARP
SCREENED FORMATION: Al/Bdrk DRILLING CONTRACTOR: HIGH PLAINS BORING METHOD: Hollow Stem Auger w/ split spoon
DATE DRILLED: 4/13/05 DATE COMPLETED: 4/13/05 TOTAL DEPTH: 25.5' COMPLETED DEPTH: 25.5'
ESTIMATED DEPTH TO BEDROCK: 5.6 RIG GEOLOGIST: E. Warp LOGGING GEOLOGIST: E. Warp
BOREHOLE DIAMETER IN SCREENED INTERVAL: 8.0" QUANTITY OF FLUIDS LOST DURING DRILLING: N/A
INITIAL WATER LEVEL (FT, DATE): Dry on 4/13/05 COMPLETED WATER LEVEL (FT, DATE): ~~25.55~~ ESW 26.22' bmTOC, 5/12/05
DIAMETER & TYPE OF INSTALLATION (WELL/PIEZOMETER/WELL POINT/ETC.): 2.0" - PVC WELL
TYPE OF PROTECTION (FLUSH-MOUNT VS. ABOVE GROUND, ASEPTIC, ETC.): 6.0" I.D. Steel Protective Casing - above ground

ALL MEASUREMENTS WILL BE MADE IN FEET FROM GROUND SURFACE

* DENOTES ITEMS THAT MAY NOT BE APPLICABLE, DEPENDING ON BORING METHOD, WELL PROTECTION & PURPOSE





PROTECTIVE CASING TOP (STICKUP OR FLUSH-MOUNT): 3.5' ags
*SECONDARY CASING TOP: N/A BOTTOM: N/A TYPE: N/A
SURFACE CASING TOP: 2.9' ags ID (IN): 2.0"
SURFACE SEAL TOP: 1.8' ags BOTTOM: 0.1' bgs TYPE: CONCRETE
PROTECTIVE CASING BOTTOM, ID (IN), TYPE: 1.4', 6" I.D., Steel
*WELL PAD DIMENSIONS, TYPE: 3'x3' - CONCRETE - Sm. 0.1 bgs to 0.4' ags
*ADD'L CASING FILL TOP: N/A BOTTOM: N/A TYPE: N/A
*SURFACE ISOLATION CASING TOP: N/A BOTTOM: N/A
*SURFACE ISOLATION CASING ID (IN): N/A TYPE: N/A
*OTHER (E.G., ASEPTIC) CASING TOP: N/A BOTTOM: N/A
*OTHER CASING ID (IN): N/A TYPE, PURPOSE: N/A
*CENTRALIZER(S) OD (IN): N/A NUMBER USED: N/A TYPE: N/A
*CENTRALIZER(S) DEPTH(S): N/A
*GROUT TOP: N/A MEASURED DENSITY (LBS/GAL): N/A TYPE: N/A
*GRANULAR BENTONITE TOP: N/A TYPE: N/A
*BENTONITE SEAL TOP: 0.1' bgs TYPE: Med. Bentonite Chips - Pure Gold
BENTONITE SEAL OR GRANULAR BENTONITE BOTTOM (= FILTER PACK TOP): 4.5'
FILTER PACK TYPE: 16/40 Silica Sand BRAND: C.S.S.I.
SURFACE CASING BOTTOM (=SCREEN TOP): 5.25 TYPE: Sch. ~~80~~ 40 PVC ESW 5/12/05
SCREEN ID (IN): 2.0" SLOT SIZE (IN): 0.01" TYPE: Sch. ~~80~~ 40 PVC
SCREEN BOTTOM (= SUMP, TOP): 25.25' SUMP TYPE: THREADED END CAP - Sch. 80, PVC
FILTER PACK BOTTOM (= *BACKFILL TOP): 25.5' *BACKFILL TYPE: N/A
SUMP BOTTOM (= WELL COMPLETED DEPTH): 25.5' *PILOT HOLE TOP, DIAMETER: N/A
TOTAL BOREHOLE DEPTH (= *PILOT HOLE AND *BACKFILL BOTTOM): 25.5'

REMARKS: Normal Well Installation on 4/13/05. Concrete Well Pad installed on 4/18/05.

COMPLETED BY: Ellen S. Warp DATE: 4/19/05
CHECKED BY: [signature] DATE: 6/29/05

U.S. DEPARTMENT OF ENERGY ROCKY FLATS PLANT

FORM PRO.101A

ROCKY FLATS ENVIRONMENTAL TECHNOLOGY SITE BOREHOLE LOG

PAGE 1 OF 3

Borehole Number: 99405
Location - North: _____ East: _____
Date: 4/13/05
Geologist: E. WARP
Drilling Equip.: Hollow Stem Auger - CME-75-HT

Surface Elevation: _____
Area: B991-Replacement of 99401
Total Depth: 25.5'
Company: 2RS/HIGH PLAINS Project No. HAD51300
Sample Type: N/A

RMRS LOGGING SUPERVISOR APPROVAL _____ DATE 4/19/05

TOP/BOTTOM OF CORE IN BOX	TOP/BOTTOM OF INTERVAL	FEET OF CORE IN INTERVAL (FIELD MEASUREMENT)	SAMPLE NUMBER	FRACTURE ANGLE	BEDDING ANGLE	GRAIN SIZE DISTRIBUTION	USCS SYMBOL	DEPTH IN FEET	SOIL/ LITHOLOGIC LOG	SAMPLE DESCRIPTION
Box #1 of 3	0.0	0.0					CL	0.0		0.0-0.5 - Gravelly, Sandy CLAY. Strong Brn. (7.5YR5/6). ~10% Sand (c.g., sub-ang). 5-10% gravel (1/8 to 1/4" dia., sub-ang. to sub-rounded). Clay has med. plasticity. WET - ground saturated due to recent precipitation - SNOW)
	Run #1	Rec. = 1.3'					GC / CL	0.5' / 1 / 1.3'		0.5-1.3' - GRAVEL / Sandy CLAY Mixture. Brn. (7.5YR4/2). ~20% gravel (1/4 to 1" dia., sub-rounded to sub-ang., predominately qtzite). ~25% Sand (m.g. to c.g., sub-rounded to sub-ang.) WET - saturated due to recent SNOW.
	2.0'	2.0'								1.3-2.0' = No Recovery
							GC / CL	2 / 2.3		2.0-2.3' - GRAVEL / Sandy CLAY MIXTURE (same as above fm. 0.5 to 1.3'). WET
							GC	2.7'		2.3-2.7' - GRAVEL w/ some CLAY. Dk. Gry'sh Brn. (10YR4/2) clay matrix. Gravel (1/2 to 1 1/2" dia., sub-ang) is a shattered qtzite cobble. WET.
	Run #2	Rec. = 1.9'					CL	3 / 3.9 / 4		2.7-3.9' - CLAY w/ some gravel. Gry'sh Brn. (10YR5/2) to Gry (10YR5/1). Mottled. "Ribbons" of sample fm. 2.7' to 3.2' due to clogged bit. Dense fm. 3.2 to 3.9'. Re-worked claystone. WET.
	5.0'	5.0'								3.9-5.0' = No Recovery
				(UNCERTAIN) Bedrock Contact @ 5.6'			CL	5 / 5.4 / 5.6		5.0-5.4' - CLAY w/ Tr sand and gravel. Gry'sh Brn. (2.5Y5/2) w/ lesser Gry (2.5Y5/1) mottling. Tr Sand (c.g., sub-ang.). Tr gravel (1/4" dia., sub-ang.) 1 1/2" dia. broken cobble of qtzite @ 5.4'. Re-worked claystone. Note: this interval could be slough? WET
	Run #3	Rec. = 1.9'						6 / 6.9 / 7		5.4-5.5' - CLAY. Gry (2.5Y5/1) to Gry'sh Brn. (2.5Y5/2) Mottled. Reworked claystone. WET. Tr-some fg sand.
										5.5-5.6 - Silty CLAY. Brn (10YR4/3). Distinct color change. ~5% sand (c.g., sub-ang. to sub-rounded. WET
	8.0	8.0						8		Bedrock Contact @ 5.6' 5.6-6.9' - CLAYSTONE (BEDROCK) - V. Subtle contact. Gry (10YR5/1) w/ yell'sh Brn. (10YR5/4) mottling. Wk. patchy FeOx'n. Interval competent but soft and WET. Tr wht. stringers.
	Run #4	Rec. = 2.2'						9		6.9-8.0' = No Recovery
	10.0'	10.0						10.0		8.0-12.7 - CLAYSTONE. Gry (10YR5/1) to Gry'sh Brn. (10YR5/2). Tr FeOx'n increasing to wk FeOx'n as stringers along internal fracs fm 11.4 to 11.7'. Tr to some blk. Stringers and blebs along bedding planes. Competent, dense and firm. Decr. moisture to Sl. MOIST.

NOTES: General: USCS is modified for this log as follows:
Materials amounts are estimated by % volume instead of % weight.
(1) Badly broken core, accurate footage measurements not possible.
(2) Core breaks cannot be matched, accurate footage measurements not possible.

Procedure No. RMRS/OPS-PRO.101
Revision 0
Date effective: 12/31/98

(4011-930-0134-930)(Form GT.1A)(03/01/95)

ROCKY FLATS ENVIRONMENTAL TECHNOLOGY SITE BOREHOLE LOG

Borehole Number: 99405
Location - North: _____ East: _____
Date: 4/13/05
Geologist: E. WARP
Drilling Equip.: Hollow Stem Auger-CME-75-HT

Surface Elevation: _____
Area: B991-Replacement of 99401
Total Depth: 25.5'
Company: URS/HIGH PLAINS Project No. HAD51300
Sample Type: N/A

RMRS LOGGING SUPERVISOR APPROVAL _____ DATE 4/19/05

TOP/BOTTOM OF CORE IN BOX	TOP/BOTTOM OF INTERVAL	FEET OF CORE IN INTERVAL (FIELD MEASUREMENT)	SAMPLE NUMBER	FRACTURE ANGLE	BEDDING ANGLE	GRAIN SIZE DISTRIBUTION	USCS SYMBOL	DEPTH IN FEET	SOIL/ LITHOLOGIC LOG	SAMPLE DESCRIPTION
	10.0	10.0'								CLAYSTONE (cont.) - ~~see page 1 of 3~~ 8.0-12.7' for description. Bleached, caliche-filled seam @ 11.2-11.3'. 4/19/05
	Run #5	Rec = 2.7'						11		
								12		
	13.0'	13.0'						12.7' 13		12.7-13.0' = No Recovery 4/19/05
	Run #6	Rec = 2.2'						14		13.0-19.4 - CLAYSTONE (to claystone w/silt below 16.2') - V. Dk Gry (10YR3/1) changing to Gry (10YR5/1) at base of interval. Predominately un-weathered, un-ox'd claystone bedrock. Tr FeOxn. Massive textured. Some blk. organic stringers throughout. Lenses of blk. carbonaceous material along bedding planes @ 15.9, 17.0' and 17.4'. Abundant blk. carbonaceous material ~~between~~ from 18.2 to 18.4 w/patchy, assoc'd. FeOxn. V. competent and dense interval. Pecr. moisture; ~~fm.~~ V. sl. moist to dry.
	15.0'	15.0'						15		
	Run #7	Rec = 3.0'						16		
								17		
	18.0'	18.0'						18		
	Run #8	Rec = 2.0'						19		19.4-20' - CLAYSTONE (to claystone w/silt) Gry (10YR5/1) with yellsh brn. (10YR5/6) FeOxn along bedding planes. Perv. FeOxn f.m. 19.9 to 20.0, v silty. Tr - some blk. organic stringers throughout.
	20.0'	20.0'								

NOTES: General: USCS is modified for this log as follows:
Materials amounts are estimated by % volume instead of % weight.
(1) Badly broken core, accurate footage measurements not possible.
(2) Core breaks cannot be matched, accurate footage measurements not possible.

Procedure No. RMRS/OPS-PRO.101
Revision 0
Date effective: 12/31/98

(4011-930-0134-930)(Form GT.1A)(03/01.V2)

Wkly. friable. V. sl. moist to dry.

ROCKY FLATS ENVIRONMENTAL TECHNOLOGY SITE BOREHOLE LOG

Borehole Number: 99405
Location - North: _____ East: _____
Date: 4/13/05
Geologist: E. WARP
Drilling Equip.: Hollow Stem Auger - CME-75-HT

Surface Elevation: _____
Area: B991 - Replacement of Well # 99401
Total Depth: 25.5'
Company: URS/High Plains Project No: HAD51300
Sample Type: N/A

RMRS LOGGING SUPERVISOR APPROVAL _____ DATE 4/19/05

TOP/BOTTOM OF CORE IN BOX	TOP/BOTTOM OF INTERVAL	FEET OF CORE IN INTERVAL (FIELD MEASUREMENT)	SAMPLE NUMBER	FRACTURE ANGLE	BEDDING ANGLE	GRAIN-SIZE DISTRIBUTION	USCS SYMBOL	DEPTH IN FEET	SOIL LITHOLOGIC LOG	SAMPLE DESCRIPTION
	Run #9 23.0'	Rec. = 3.0' 23.0'		(1)				21 22 23		20.0-20.4 - CLAYSTONE w/silt V. DK Gry'sh Brn (10YR 3/2). Dense and firm. V. sl. moist to dry. 4/19/05
	Run #10 25.0'	Rec. = 2.0' 25.0'		(1)				24 25 25.5'		20.4-25.0 - CLAYSTONE w/silt Gry (10YR 5/1) with Wk. to Mod. Yellsh Brn. (10YR 5/6) FeOxn along fracture and bedding planes. 4/19/05 Tr MnOx coating assoc'd w/FeOxn. Decr. moisture to dry. V. firm and dense. Many fractures, all Fe-ox-healed, generally ~30°-60°, below 20.8' to 23.0', then rare. Note: Augers advanced to 25.5' No core collected. T.D. @ 25.5'
								26 27 28 29		Note: #99405 is located 2' West of original well # 99401.

NOTES: General: USCS is modified for this log as follows:
Materials amounts are estimated by % volume instead of % weight.
(1) Badly broken core, accurate footage measurements not possible.
(2) Core breaks cannot be matched, accurate footage measurements not possible.

Procedure No. RMRS/OPS-PRO.101
Revision 0
Date effective: 12/31/98

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