

WELL COMPLETION DIAGRAM

PROJECT: Topock Alternative Freshwater Source Evaluation

LOCATION: 1 mi north I-40 & HWY 10, Golden Shores, AZ

DRILLING METHOD/EQUIPMENT: Exploratory boring dual air rotary, Foster DR-24, 8" dia; reamed to construct well, Foster DR-40

DRILLING CONTRACTOR: Layne Christensen

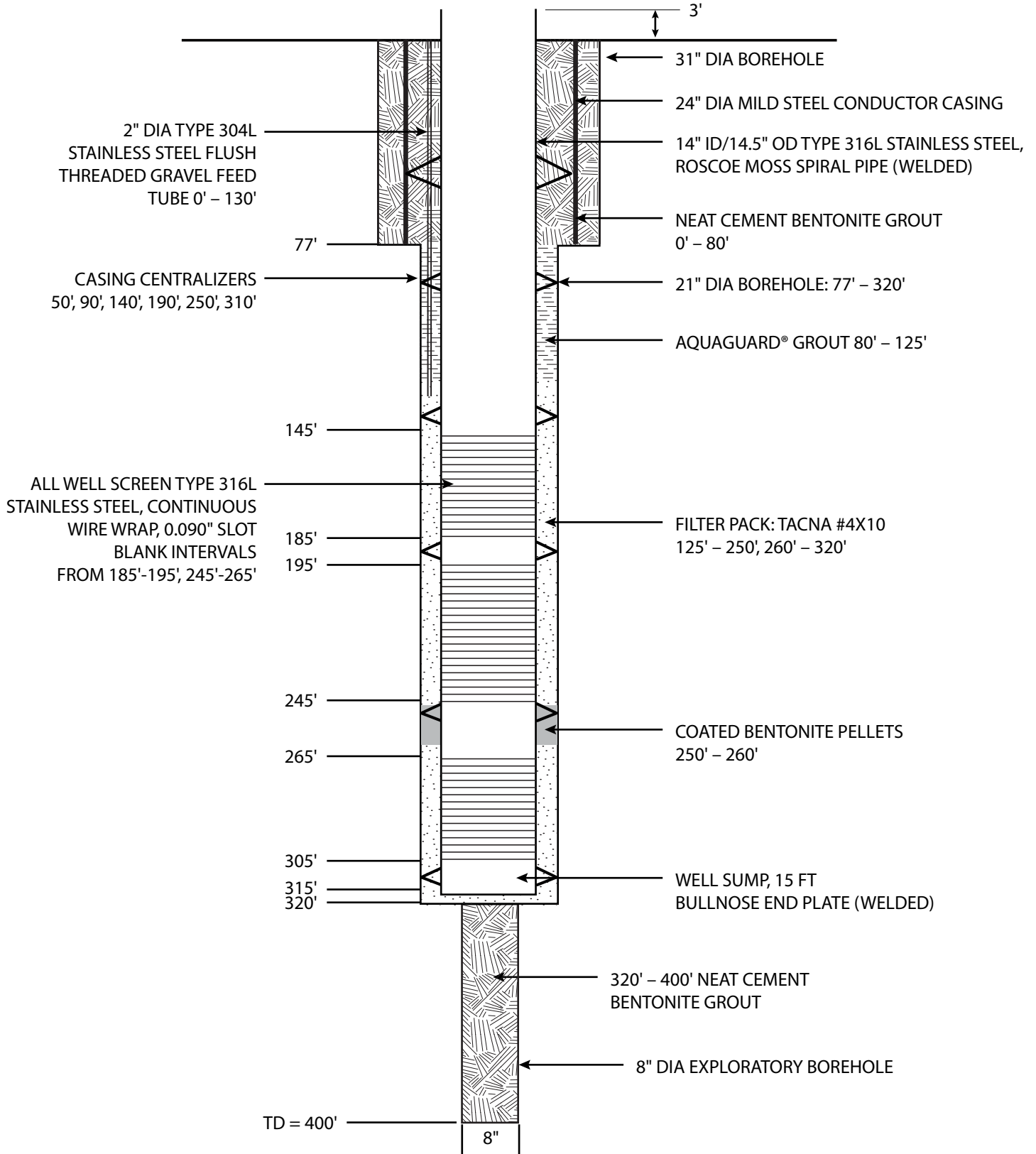
START: 11/20/2013 END: 1/23/2014

LOGGER: E. Ludwig, G. Frey (Groundwater Partners, Inc.)

34° 43' 57.19", 114° 28' 41.07"

SURFACE ELEVATION (FT): 473

DEPTH TO WATER (FT BGS): 21





PROJECT NUMBER:
428373.FS.06

WELL ID:
SITE B

SHEET: **1** OF: **14**

SOIL BORING LOG

PROJECT:	<i>Topock Alternative Freshwater Source Evaluation</i>	LOCATION:	<i>Site B: 1.5 miles north of I-40 and HWY 10, Golden Shores, AZ</i>
DRILLING METHOD AND EQUIPMENT:	<i>Pilot borehole drilled with dual rotary, DR-24, 8-inch diameter drive casing. Reamed borehole with DR-40, 20-inch diameter drive casing.</i>		
GROUND SURFACE ELEVATION (FT):	473	DRILLING CONTRACTOR:	<i>Layne Christensen; Driller: S. Walker</i>
LATITUDE:	34° 43' 57.19"	START:	10/4/13
		WELL INFO:	14" SS Steel, 0.090", Screen: CWW
LONGITUDE:	114° 28' 41.07"	FINISH:	10/15/13
		LOGGER:	<i>E. Ludwig P.G., Garrett Frey</i>
			WATER LEVEL (FT BGS): 21
			TOTAL DEPTH (FT BGS): 400

DEPTH (FT) BELOW SURFACE	WELL CONSTRUCTION	USCS GROUP SYMBOL	SOIL DESCRIPTION	COMMENTS
			SOIL NAME, USCS GROUP SYMBOL, COLOR, RELATIVE DENSITY, CONSISTENCY, GRAIN SIZE, GRAIN SHAPE, PLASTICITY	DEPTH OF CASING, PENETRATION RATE, DATE AND TIME
0	10.3 SAND SACK SLURRY CEMENT GROUT (WITHIN 24 INCH CONDUCTOR CASING) 14" DIAMETER BLANK, STAINLESS STEEL TYPE 316 L CASING	ML	SILT WITH GRAVEL (ML) - Dark grayish brown (10YR 4/2), 90% non-plastic silt, 10% gravel, gravel is coarse to fine, subangular, dry	Soil samples were collected using a 5-gallon bucket and/or shovel from the cyclone.
5				
10		SM	SILTY SAND (SM) - Dark grayish brown (10YR 4/2), 70% fine to medium poorly graded sand, 30% non-plastic silt, subangular, dry	Increase in gravel at 15' Slightly moist
15				
20	GW	WELL GRADED GRAVEL WITH SAND (GW) - Reddish brown (5YR 4/4), 70% gravel, 25% coarse sand, 5% fine sand, subangular, loose, moist	1446 10/04/2013	
25			1540 10/04/2013	
30				



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SOIL BORING LOG

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GROUND SURFACE ELEVATION (FT): 473	DRILLING CONTRACTOR: <i>Layne Christensen; Driller: S. Walker</i>		
LATITUDE: 34° 43' 57.19"	START: 10/4/13	WELL INFO: 14" SS Steel, 0.090", Screen: CWW	WATER LEVEL (FT BGS): 21
LONGITUDE: 114° 28' 41.07"	FINISH: 10/15/13	LOGGER: E. Ludwig P.G., Garrett Frey	TOTAL DEPTH (FT BGS): 400

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30	10.3 SAND SACK SLURRY CEMENT GROUT (WITHIN 24 INCH CONDUCTOR CASING) 14" DIAMETER BLANK, STAINLESS STEEL TYPE 316 L CASING	GW	WELL GRADED SAND WITH GRAVEL (GW) - Reddish brown (5YR 4/4), 70% gravel, 25% coarse sand, 5% fine sand, subangular, loose, moist	Hose plugged (1530) Hose unplugged (1700)
35		SP-SM	POORLY GRADED SAND WITH SILT (SP-SM) - Dark yellowish-brown (10YR 4/4) 90% very fine to fine sands, 10% silt, subangular, wet	All sample are saturated below 35 ft
40		GW	WELL GRADED GRAVEL (GW) - 95% subangular gravel up to 3/4", 5% coarse sand	1717 10/04/2013 0800 10/05/2013 0750 Tagged static at 20 ft
45		GW	WELL GRADED GRAVEL WITH SAND (GW) - 85% subangular gravel, 15% coarse subangular sand, 5% fine sand, subangular, loose, moist	
55		SP	POORLY GRADED SAND WITH SILT (SP) - 95% subangular medium to coarse sands, 5% gravel up to 1/8"	
60				



PROJECT NUMBER: 428373.FS.06	WELL ID: SITE B	SHEET: 3 OF: 14
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SOIL BORING LOG

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GROUND SURFACE ELEVATION (FT): 473	DRILLING CONTRACTOR: <i>Layne Christensen; Driller: S. Walker</i>		
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LONGITUDE: 114° 28' 41.07"	FINISH: 10/15/13	LOGGER: E. Ludwig P.G., Garrett Frey	TOTAL DEPTH (FT BGS): 400

DEPTH (FT) BELOW SURFACE	WELL CONSTRUCTION	USCS GROUP SYMBOL	SOIL DESCRIPTION	COMMENTS
			SOIL NAME, USCS GROUP SYMBOL, COLOR, RELATIVE DENSITY, CONSISTENCY, GRAIN SIZE, GRAIN SHAPE, PLASTICITY	DEPTH OF CASING, PENETRATION RATE, DATE AND TIME
60	10.3 SAND SACK SLURRY CEMENT GROUT (BOTTOM OF CONDUCTOR CASING AT 75 FEET) 14" DIAMETER BLANK, STAINLESS STEEL TYPE 316 L CASING	SP	POORLY GRADED SAND WITH SILT (SP) - 95% subangular medium to coarse sands, 5% gravel up to 1/8"	
65		GW	WELL GRADED GRAVEL (GW) - 95% subangular gravel up to 1", 5% coarse sand	
70		CL	LEAN CLAY (CL) - Dark grayish brown (10YR 4/2), medium plasticity, stiff, 95% clay, 5% silt	
75		ML	SILT (ML) - Dark grayish brown (10YR 4/2), poorly graded, low plasticity, silt is coarse	
80				
85				
90				



PROJECT NUMBER: 428373.FS.06	WELL ID: SITE B	SHEET: 4 OF: 14
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SOIL BORING LOG

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GROUND SURFACE ELEVATION (FT): 473	DRILLING CONTRACTOR: <i>Layne Christensen; Driller: S. Walker</i>		
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LONGITUDE: 114°28' 41.07"	FINISH: 10/15/13	LOGGER: E. Ludwig P.G., Garrett Frey	TOTAL DEPTH (FT BGS): 400

DEPTH (FT) BELOW SURFACE	WELL CONSTRUCTION	USCS GROUP SYMBOL	SOIL DESCRIPTION	COMMENTS
			SOIL NAME, USCS GROUP SYMBOL, COLOR, RELATIVE DENSITY, CONSISTENCY, GRAIN SIZE, GRAIN SHAPE, PLASTICITY	DEPTH OF CASING, PENETRATION RATE, DATE AND TIME
90	BENTONITE-AQUAGUARD GROUT (BOREHOLE DIAMETER: 20 INCHES FROM 75 TO 320 FEET) 14" DIAMETER BLANK, STAINLESS STEEL TYPE 316L CASING	ML	SILT (ML) - Dark grayish brown (10YR 4/2), poorly graded, low plasticity, silt is coarse	
95				
100				
105		GW	WELL GRADED GRAVEL WITH SAND (GW) - 70% rounded to subrounded gravel up to 2", 30% fine to very fine sand	1200 10/6/2013
110				
115				
120		MH	ELASTIC SILT (MH) - Brown (7.5YR 4/4), low to medium elasticity	



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GROUND SURFACE ELEVATION (FT): 473	DRILLING CONTRACTOR: <i>Layne Christensen; Driller: S. Walker</i>		
LATITUDE: 34° 43' 57.19"	START: 10/4/13	WELL INFO: 14" SS Steel, 0.090", Screen: CWW	WATER LEVEL (FT BGS): 21
LONGITUDE: 114°28' 41.07"	FINISH: 10/15/13	LOGGER: E. Ludwig P.G., Garrett Frey	TOTAL DEPTH (FT BGS): 400

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			SOIL NAME, USCS GROUP SYMBOL, COLOR, RELATIVE DENSITY, CONSISTENCY, GRAIN SIZE, GRAIN SHAPE, PLASTICITY	DEPTH OF CASING, PENETRATION RATE, DATE AND TIME
120	7ACH14X10 FILTER PACK 14" DIAMETER BLANK, STAINLESS STEEL TYPE 316 L CASING	SP	POORLY GRADED SAND WITH GRAVEL (SP) - 60% fine to medium sand, 40% well graded rounded to subrounded gravel up to 2"	1218 10/7/2013 1250 10/7/2013
130		GW	WELL GRADED GRAVEL WITH SAND (GW) - Dark reddish gray (2.5YR 4/1) and dark greenish gray (GLEYS 2 4/1), 70-90% rounded to subangular gravel up to 2", 10-30% poorly graded subangular medium sand	
140				
145				
150				



PROJECT NUMBER:
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WELL ID:
SITE B

SHEET: **8** OF: **14**

SOIL BORING LOG

PROJECT: *Topock Alternative Freshwater Source Evaluation* LOCATION: *Site B: 1.5 miles north of I-40 and HWY 10, Golden Shores, AZ*

DRILLING METHOD AND EQUIPMENT: *Pilot borehole drilled with dual rotary, DR-24, 8-inch diameter drive casing. Reamed borehole with DR-40, 20-inch diameter drive casing.*

GROUND SURFACE ELEVATION (FT): **473** DRILLING CONTRACTOR: *Layne Christensen; Driller: S. Walker*

LATITUDE: **34° 43' 57.19"** START: **10/4/13** WELL INFO: **14" SS Steel, 0.090", Screen: CWW** WATER LEVEL (FT BGS): **21**

LONGITUDE: **114°28' 41.07"** FINISH: **10/15/13** LOGGER: **E. Ludwig P.G., Garrett Frey** TOTAL DEPTH (FT BGS): **400**

DEPTH (FT) BELOW SURFACE	WELL CONSTRUCTION	USCS GROUP SYMBOL	SOIL DESCRIPTION	COMMENTS
			SOIL NAME, USCS GROUP SYMBOL, COLOR, RELATIVE DENSITY, CONSISTENCY, GRAIN SIZE, GRAIN SHAPE, PLASTICITY	DEPTH OF CASING, PENETRATION RATE, DATE AND TIME
210	<p>70-MESH STAINLESS STEEL WELL SCREEN 70-MESH STAINLESS STEEL FILTER PACK</p>	GW	WELL GRADED GRAVEL WITH SAND (GW) - Dark reddish gray (2.5YR 4/1) and dark greenish gray (GLE 2 4/1), 70-90% rounded to subangular gravel up to 2", 10-30% poorly graded subangular medium sand	1542 10/8/2013
215				1625 10/8/2013
220				
225				
230				
235				
240				



PROJECT NUMBER: 428373.FS.06	WELL ID: SITE B	SHEET: 9	OF: 14
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SOIL BORING LOG

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240	<p style="text-align: center;">14" DIAMETER BLANK, STAINLESS STEEL TYPE 316 L CASING</p> <p style="text-align: center;">COATED BENTONITE PELLETS 1/4</p>	GW	WELL GRADED GRAVEL WITH SAND (GW) - Dark reddish gray (2.5YR 4/1) and dark greenish gray (GLE Y 2 4/1), 70-90% rounded to subangular gravel up to 2", 10-30% poorly graded subangular medium sand	1542 10/8/2013
245				1200 10/9/2013
250				
255				
260				
265				
270				1235 10/9/2013



PROJECT NUMBER:
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WELL ID:
SITE B

SHEET: **10** OF: **14**

SOIL BORING LOG

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GROUND SURFACE ELEVATION (FT): **473** DRILLING CONTRACTOR: *Layne Christensen; Driller: S. Walker*

LATITUDE: **34° 43' 57.19"** START: **10/4/13** WELL INFO: **14" SS Steel, 0.090", Screen: CWW** WATER LEVEL (FT BGS): **21**

LONGITUDE: **114°28' 41.07"** FINISH: **10/15/13** LOGGER: **E. Ludwig P.G., Garrett Frey** TOTAL DEPTH (FT BGS): **400**

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270	<p>7.625" DIA FILTER PACK 14" DIA 14' 0" SS STEEL W/ 0.090" SCREEN 20" DIA DRILL RODS</p>	GW	WELL GRADED GRAVEL WITH SAND (GW) - Dark reddish gray (2.5YR 4/1) and dark greenish gray (GLE Y 2 4/1), 70-90% rounded to subangular gravel up to 2", 10-30% poorly graded subangular medium sand	Drilling is very slow
275				1456 10/9/2013 1530 10/9/2013
280				
285				
290				
295				
300				1608 10/9/2013



PROJECT NUMBER: 428373.FS.06	WELL ID: SITE B	SHEET: 11	OF: 14
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300	<p>14" DIAMETER BLANK, STAINLESS STEEL TYPE 316 L CASING</p> <p>FROM 300' TO 315' GRAVEL PACK</p>	GW	WELL GRADED GRAVEL WITH SAND (GW) - Dark reddish gray (2.5YR 4/1) and dark greenish gray (GLEYS 2 4/1), 70-90% rounded to subangular gravel up to 2", 10-30% poorly graded subangular medium sand	0910 10/10/2013
305				0928 10/10/2013 0949 10/10/2013
310				
315				
320	<p>NEAT CEMENT GROUT (BOREHOLE DIAMETER FROM 320 TO 400 FEET IS 8.5 INCHES)</p>			
325				
330				



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WELL ID:

SITE B

SHEET:

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OF:

14

SOIL BORING LOG

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330	NEAT CEMENT GROUT (BOREHOLE DIAMETER FROM 320 TO 400 FEET IS 8.5 INCHES)	GW	WELL GRADED GRAVEL WITH SAND (GW) - Dark reddish gray (2.5YR 4/1) and dark greenish gray (GLEYS 2 4/1), 70-90% rounded to subangular gravel up to 2", 10-30% poorly graded subangular medium sand	
335				
340				1016 10/10/2013 1055 10/10/2013
345				
350				1102 10/10/2013 0710 10/15/2013
355				
360				



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SHEET:

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OF:

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360	NEAT CEMENT GROUT (BOREHOLE DIAMETER FROM 320 TO 400 FEET IS 8.5 INCHES)	GW	WELL GRADED GRAVEL WITH SAND (GW) - Dark reddish gray (2.5YR 4/1) and dark greenish gray (GLEYS 2 4/1), 70-90% rounded to subangular gravel up to 2", 10-30% poorly graded subangular medium sand	
365				
370				0740 10/15/2013 0815 10/15/2013
375				
380				
385				
390				0920 10/15/2013



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14

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SOIL BORING LOG

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LONGITUDE: 114° 28' 41.07" FINISH: 10/15/13 LOGGER: E. Ludwig P.G., Garrett Frey TOTAL DEPTH (FT BGS): 400

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390	NEAT CEMENT GROUT (BOREHOLE DIAMETER FROM 320 TO 400 FEET IS 8.5 INCHES)	GW	WELL GRADED GRAVEL WITH SAND (GW) - Dark reddish gray (2.5YR 4/1) and dark greenish gray (GLEY 2 4/1), 70-90% rounded to subangular gravel up to 2", 10-30% poorly graded subangular medium sand	Total depth of pilot borehole: 400 ft. 0928 10/15/2013
395				
400				