

**GEOLOGIC LOG OF DRILL HOLE NO. MW-09-1**

FEATURE: Groundwater Monitoring  
 LOCATION: Reach 1A, River Bank Right, Madera County  
 BEGUN: 9/24/09 FINISHED: 9/26/09  
 DEPTH AND ELEVATION OF WATER LEVEL  
 AND DATE MEASURED: 13.3 ft. (257.33 ft.) 9/26/2009

PROJECT: San Joaquin River Restoration Project  
 COORDINATES: N 2,203,695.3 E 6,330,622.4 (NAGD83)  
 TOTAL DEPTH: 40.5 ft.

STATE: California  
 GROUND SURFACE ELEVATION: 270.7 ft. (NAVD88)  
 T.O.C ELEVATION: 270.63 ft. (NAVD88)  
 HOLE LOGGED BY: J. Vauk  
 REVIEWED BY: A. Warren

| NOTES   | DEPTH | LABORATORY DATA |        |        |         |        |          |              |                  | LABORATORY CLASSIFICATION | ELEVATION | VISUAL CLASSIFICATION | ELEVATION   | GEOLOGIC UNIT SYMBOL | CLASSIFICATION AND PHYSICAL CONDITION |
|---|-------|-----------------|--------|--------|---------|--------|----------|--------------|------------------|---------------------------|-----------|-----------------------|---|----------------------|---------------------------------------|
|   |       | % CORE RECOVERY | % SILT | % CLAY | % FINES | % SAND | % GRAVEL | LIQUID LIMIT | PLASTICITY INDEX |                           |           |                       |   |                      |                                       |
| <p><b>ALL MEASUREMENTS ARE IN FEET FROM THE GROUND SURFACE.</b></p> <p><b>PURPOSE OF HOLE:</b><br/>To recover core, collect data to determine geologic and hydrologic site conditions, and install a groundwater monitoring well.</p> <p><b>DRILLED BY:</b><br/>USGS Drill Crew<br/>James Huckaby, Driller<br/>Jim Rauman, Helper</p> <p><b>DRILL RIG:</b><br/>CME-550</p> <p><b>DRILLING &amp; SAMPLING METHODS:</b><br/>Drill hole MW-09-1 was advanced using hollow stem flight augers with continuous dry core sampling system (FADC) from the ground surface to a total depth of 40.5 feet. FADC uses 7-5/8-inch O.D., 4-1/4-inch I.D. hollow stem augers, with a 5-foot-long 3-inch I.D. split sample barrel. A pilot bit was inserted inside the augers to advance through cobble- and boulder-sized material from 22.2 to 25.0 feet, from 28.0 to 28.5 feet, and from 29.0 to 32.5 feet of depth.</p> <p><u>Interval Method</u><br/>                     0.0 to 22.2 ft. FADC<br/>                     22.2 to 25.0 ft. FADC with Pilot Bit<br/>                     25.0 to 28.0 ft. FADC<br/>                     28.0 to 28.5 ft. FADC with Pilot Bit<br/>                     28.5 to 29.0 ft. FADC<br/>                     29.0 to 32.5 ft. FADC with Pilot Bit<br/>                     32.5 to 40.5 ft. FADC</p> <p><b>DRILLING CONDITIONS AND DRILLER'S COMMENTS:</b><br/>                     0.0 to 2.5 ft. - gravels<br/>                     2.5 to 5.0 ft. - rough drilling, samples not staying in barrel<br/>                     5.0 to 15.5 ft. - rough drilling, sand and gravel<br/>                     15.5 to 20.0 ft. - add water to hole<br/>                     20.0 to 25.0 ft. - encountered cobbles<br/>                     25.0 to 28.0 ft. - gravels<br/>                     28.0 to 28.5 ft. - encountered cobbles<br/>                     28.5 to 29.0 ft. - attempt to recover sample<br/>                     29.0 to 32.0 ft. - encountered cobbles<br/>                     32.0 to 37.0 ft. - sand with clay at bottom of sample<br/>                     37.0 to 40.5 ft. - 3-foot core sample with near completed recovery</p> <p><b>DRILL FLUID, RETURN AND COLOR:</b><br/>                     0.0 to 15.5 ft. None<br/>                     15.5 to 40.5 ft. Water, no return</p> <p><b>WATER LEVEL:</b><br/>                     13.3 ft. b.g.s. on 9/26/2009</p> | 68    |                 |        |        |         |        |          |              |                  |                           | (SM)g     | 268.1                 | <p><b>0.0 to 40.5 feet</b><br/><b>QUATERNARY ALLUVIUM (Qal)</b></p> <p><b>0.0 to 2.5 ft. SILTY SAND WITH GRAVEL, (SM)g:</b> About 60% fine to medium sand (trace of coarse); about 25% non-plastic fines with rapid dilatancy; about 15% fine, hard, rounded and flat gravel; maximum size: 3/4 inches; dry, light brown, no reaction with HCl; soft consistency; with organics encountered near the surface.</p> <p><b>2.5 to 7.5 ft. SILTY SAND WITH GRAVEL, (SM)g:</b> About 65% fine to coarse sand (mostly fine to medium); about 20 to 25% fine to coarse, hard, rounded gravel; about 10 to 15% non-plastic fines with rapid dilatancy; maximum size: 1.25 inches; dry, light brown, no reaction with HCl; soft consistency.</p> <p><u>Laboratory Data Interval</u><br/>2.5 to 7.5 ft.</p> <p><b>7.5 to 9.8 ft. POORLY GRADED SAND WITH SILT, SP/SM:</b> About 80% fine to coarse sand (mostly fine to medium); about 10% fine, hard, rounded gravel; about 10% non-plastic fines with rapid dilatancy; maximum size: 1 inch; dry, light brown, no reaction with HCl; soft consistency; material was recovered disturbed from drilling action.</p> <p><b>9.8 to 14.0 ft. SILTY SAND WITH GRAVEL, (SM)g:</b> About 60% fine to coarse sand (mostly fine to medium); about 20% non-plastic fines with rapid dilatancy; about 20% fine, hard, rounded gravel; maximum size: 1.5 inches; moist, no reaction with HCl; soft consistency.</p> <p><b>14.0 to 15.5 ft. SILTY GRAVEL WITH SAND, (GM)s:</b> About 45% fine to coarse, hard, rounded gravel; about 40% fine to coarse sand (mostly fine to medium); about 15% non-plastic fines with rapid dilatancy; maximum size: 3 inches (cobble stuck in bottom of shoe 2" by 3" by 4"); wet; light brown, no reaction with HCl; soft consistency.</p> <p><u>TOTAL SAMPLE (BY VOLUME):</u> Trace 3- to 5-inch hard, cobbles (recovered as gravel-sized fragments and a cobble stuck in bottom of the drilling shoe).</p> <p><b>15.5 to 21.4 ft. POORLY GRADED GRAVEL WITH SAND AND COBBLES, (GP/GM)sc:</b> About 50% fine to coarse, hard, rounded gravel; about 40% fine to coarse sand; about 10% non-plastic fines with rapid dilatancy; maximum size: 4 inches; wet; light and medium brown, no reaction with HCl; soft consistency.</p> <p><u>TOTAL SAMPLE (BY VOLUME):</u> Trace 3- to 5-inch hard cobbles.</p> <p><u>Laboratory Data Interval</u><br/>15.5 to 21.4 ft.</p> <p><b>21.4 to 22.2 ft. SILTY GRAVEL WITH SAND, (GM)s:</b> About 45% fine to coarse, hard, rounded gravel; about 35% fine to coarse sand; about 20% non-plastic fines with rapid dilatancy; maximum size: 1.5 inches; wet; light brown, no reaction with HCl; firm consistency.</p> |                      |                                       |
|   | 5     | 24              | 11.7   | 1.9    | 13.6    | 56.4   | 30.0     | NP           | NP               | 2.7                       | (SM)g     | (SM)g                 |   | 263.1                | 263.1                                 |
|   | 10    | 48              |        |        |         |        |          |              |                  |                           |           | SP/SM                 |   | 260.8                |                                       |
|   | 15    | 57              |        |        |         |        |          |              |                  |                           |           | (SM)g                 |   | 256.6                |                                       |
|   |       |                 |        |        |         |        |          |              |                  |                           |           | (GM)s                 |   | 255.1                |                                       |
|   |       | 65              |        |        |         |        |          |              |                  |                           |           |                       |   |                      | Qal                                   |
|   | 20    | 35              | 3.6    | 0.3    | 3.9     | 30.9   | 65.2     | NP           | NP               | 5.1                       | (GP)s     | (GP/GM)sc             |   |                      |                                       |
|   |       | 100             |        |        |         |        |          |              |                  |                           |           |                       |   | 249.2                | 249.2                                 |
|   |       | 100             |        |        |         |        |          |              |                  |                           |           |                       |   |                      | 248.4                                 |
|   |       | 0               |        |        |         |        |          |              |                  |                           |           | (GM)sc                |   |                      | 245.6                                 |
|   | 25    | 24              | 7.5    | 3.2    | 10.7    | 40.0   | 49.3     | NP           | NP               | 9.1                       | (GW-GM)s  | (GP/GM)s              |   | 243.1                | 243.1                                 |
|   |       | 100             |        |        |         |        |          |              |                  |                           |           |                       |   | 242.6                | 242.6                                 |
|   |       | 0               |        |        |         |        |          |              |                  |                           |           | (GM)sc                |   | 242.1                | 242.1                                 |
|   |       | 100             |        |        |         |        |          |              |                  |                           |           | (SM)g                 |   | 241.6                | 241.6                                 |
|   | 30    | 0               |        |        |         |        |          |              |                  |                           |           | (GM)sc                |   |                      | 238.1                                 |

**COMMENTS:** FADC = Flight Auger Dry Core  
 HSA = Hollow Stem Auger  
 NP = Non-plastic  
 NR = No Recovery  
 NA = Not applicable  
 G.S. = Ground surface  
 b.g.s. = Below the ground surface  
 T.O.C. = Top of well casing

Well completion information is provided in attached Well Completion Diagram. Well development information is provided in attached Monitoring Well Development form.

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 AND DATE MEASURED: 13.3 ft. (257.33 ft.) 9/26/2009

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 TOTAL DEPTH: 40.5 ft.

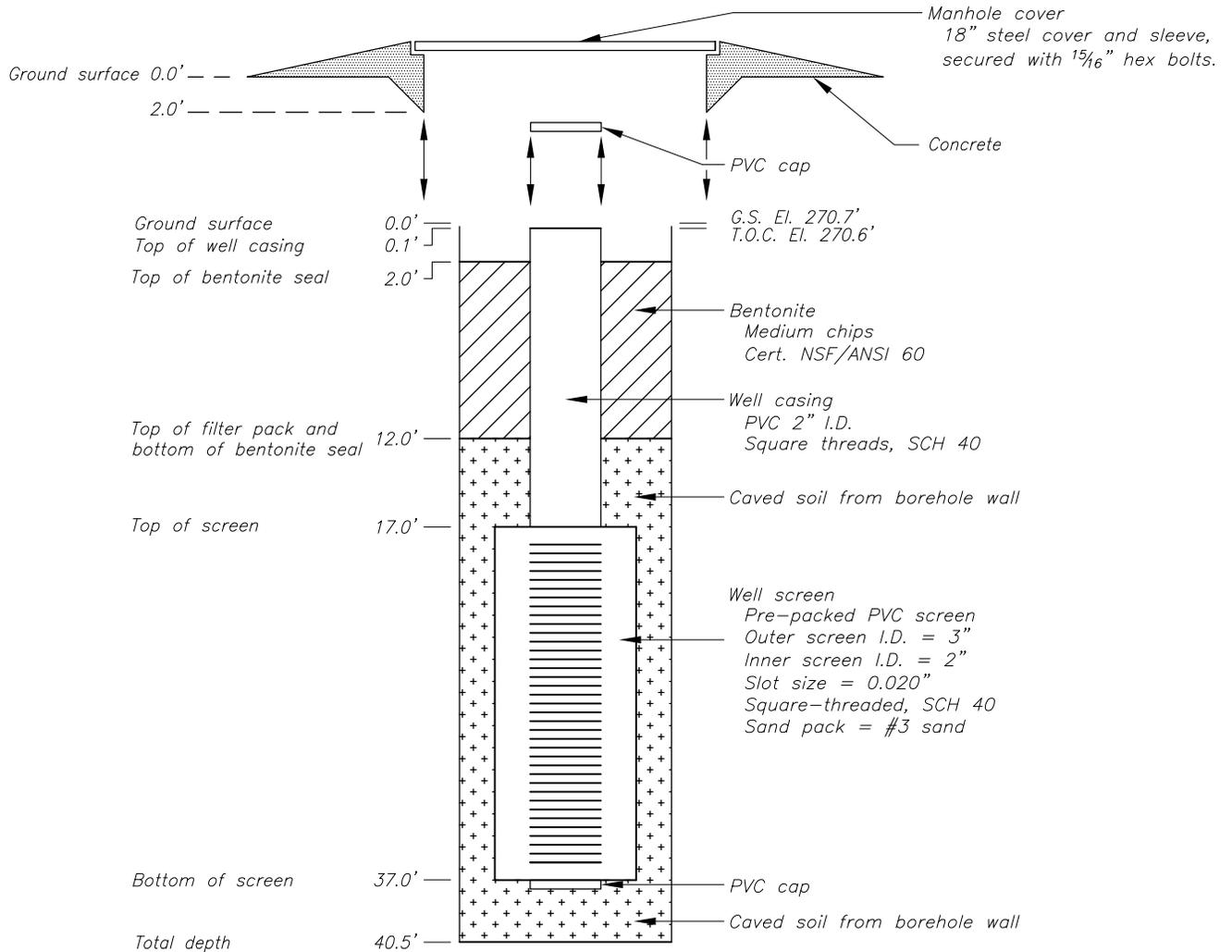
STATE: California  
 GROUND SURFACE ELEVATION: 270.7 ft. (NAVD88)  
 T.O.C ELEVATION: 270.63 ft. (NAVD88)  
 HOLE LOGGED BY: J. Vauk  
 REVIEWED BY: A. Warren

| NOTES   | DEPTH | LABORATORY DATA |        |        |         |        |          |              |                  |                    | LABORATORY CLASSIFICATION | ELEVATION | VISUAL CLASSIFICATION | ELEVATION | GEOLOGIC UNIT SYMBOL | CLASSIFICATION AND PHYSICAL CONDITION  |
|---|-------|-----------------|--------|--------|---------|--------|----------|--------------|------------------|--------------------|---------------------------|-----------|-----------------------|-----------|----------------------|--|
|   |       | % CORE RECOVERY | % SILT | % CLAY | % FINES | % SAND | % GRAVEL | LIQUID LIMIT | PLASTICITY INDEX | MOISTURE CONTENT % |                           |           |                       |           |                      |  |
| <p><b>REASON FOR HOLE TERMINATION:</b><br/>                     The hole was terminated upon successful completion to the target depth.</p> <p><b>HOLE COMPLETION:</b><br/>                     Well Casing 0.1 to 17.0 ft. (T.O.C. El. 270.63 ft.)<br/>                     Dual Pre-pack Screen 17.0 to 37.0 ft. (Slotted 0.020-inch)<br/>                     Well Screen Filter Pack - #3 Sand Filter Pack 2.0 to 40.5 ft. (Native material caved)<br/>                     Bentonite Seal 2.0 to 12.0 ft.<br/>                     Well Protection flush-mounted 18-inch manhole (15/16-inch hexbolts)</p> | 35    | 92              | 10.5   | 3.2    | 13.7    | 84.4   | 1.9      | NP           | NP               | 22.0               | SM                        | SM        |                       |           |                      | <p><b>22.2 to 25.0 ft. SILTY GRAVEL WITH SAND AND COBBLES. (GM)sc:</b> No Recovery, soil description based on drilling conditions.</p> <p><b>25.0 to 27.5 ft. POORLY GRADED GRAVEL WITH SILT. (GP/GM)s:</b> About 50% fine, hard, rounded gravel; about 40% fine to coarse sand (mostly fine to medium); about 10% non-plastic fines with rapid dilatancy; maximum size: 3/4 inches; wet; medium brown, no reaction with HCl; soft consistency.</p> <p><u>Laboratory Data Interval</u><br/>                     25.0 to 27.5 ft.</p> <p><b>27.5 to 28.0 ft. SILTY SAND WITH GRAVEL. (SM)g:</b> About 65% fine to coarse sand (mostly fine); about 20% non-plastic fines with rapid dilatancy; about 15% fine, hard, rounded gravel; maximum size: 1/2 inches; wet, light brown, no reaction with HCl; soft consistency.</p> <p><b>28.0 to 28.5 ft. SILTY GRAVEL WITH SAND AND COBBLES. (GM)sc:</b> No Recovery, soil description based on drilling conditions.</p> <p><b>28.5 to 29.0 ft. SILTY SAND WITH GRAVEL. (SM)g:</b> About 65% fine to coarse sand (mostly fine); about 20% non-plastic fines with rapid dilatancy; about 15% fine, hard, rounded gravel; maximum size: 1/2 inches; wet, light brown, no reaction with HCl; soft consistency.</p> <p><b>29.0 to 32.5 ft. SILTY GRAVEL WITH SAND AND COBBLES. (GM)sc:</b> No Recovery, soil description based on drilling conditions.</p> <p><b>32.5 to 36.9 ft. SILTY SAND, SM:</b> About 85% fine to medium sand; about 15% non-plastic fines with rapid dilatancy; maximum size: medium sand; wet, light brown, no reaction with HCl; soft consistency.</p> <p><u>Laboratory Data Interval</u><br/>                     32.5 to 36.9 ft.</p> <p><b>36.9 to 37.5 ft. SILT WITH SAND. (ML)s:</b> About 85% fines with low plasticity, toughness, and dry strength, and slow dilatancy, about 15% fine sand; maximum size: fine sand; wet, medium brown, no reaction with HCl; firm consistency.</p> <p><b>37.5 to 38.3 ft. SILTY CLAY, CL/ML:</b> About 90% fines with medium plasticity, low toughness, and dry strength, and slow dilatancy, about 10% fine sand; maximum size: fine sand; wet, light brown, no reaction with HCl; soft consistency.</p> <p><u>Laboratory Data Interval</u><br/>                     37.5 to 38.3 ft.</p> <p><b>38.3 to 40.5 ft. SANDY SILT, s(ML):</b> About 60% fines with low plasticity, toughness, and dry strength, and rapid dilatancy, about 40% fine sand; maximum size: fine sand; wet, light brown, no reaction with HCl; soft consistency.</p> <p><u>Laboratory Data Interval</u><br/>                     38.3 to 40.5 ft.</p> <p style="text-align: right;"><b>T.D. = 40.5 ft.</b></p> |
|   |       |                 |        |        |         |        |          |              |                  |                    |                           |           | 233.7                 | 233.7     |                      |  |
|   |       |                 |        | 62.1   | 18.2    | 80.3   | 19.7     | 0.0          | 33.5             | 7.7                | 38.2                      | (ML)s     | 232.3                 | CL/ML     | 232.3                |  |
|   |       | 40              |        | 53.7   | 4.4     | 58.1   | 41.3     | 0.6          | NP               | NP                 | 36.3                      | s(ML)     |                       | s(ML)     |                      |  |
| BOTTOM OF HOLE  |       |                 |        |        |         |        |          |              |                  |                    |                           |           |                       |           |                      |  |

**COMMENTS:** FADC = Flight Auger Dry Core  
 HSA = Hollow Stem Auger  
 NP = Non-plastic  
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 NA = Not applicable  
 G.S. = Ground surface  
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 T.O.C. = Top of well casing

Well completion information is provided in attached Well Completion Diagram. Well development information is provided in attached Monitoring Well Development form.

|  |                     |
|--|---------------------|
| MW-09-1  | GEOLOGIST: J. VAUK  |
| WELL COMPLETION DIAGRAM  | DRILLER: J. HUCKABY |
| DATE COMPLETED: 9/26/2009  | HELPER: J. RAUMAN   |
| TOP OF WELL CASING COORDINATES:<br>N2203695.3 E6330622.4 (NAD83) ELEVATION 270.6' (NAVD88)<br>GROUND SURFACE ELEVATION 270.7' (NAVD88) |                     |



\*NOT TO SCALE

NOTES:

T.O.C. = Top of well casing, I.D. = Inner Diameter, G.S. = Ground Surface, El. = Elevation

Augers were pulled up to 37.0'. Material caved to 37.0' Screen set at 37.0'. Sand backfills the well above the top of bentonite seal, inside the manhole.

**GEOLOGIC LOG OF DRILL HOLE NO. MW-09-2**

FEATURE: Groundwater Monitoring  
 LOCATION: Reach 1A, River Bank Right, Madera County  
 BEGUN: 9/26/09 FINISHED: 9/27/09  
 DEPTH AND ELEVATION OF WATER LEVEL  
 AND DATE MEASURED: 15.0 ft. (El. 255.05 ft.) 9/26/2009

PROJECT: San Joaquin River Restoration Project  
 COORDINATES: N 2,204,153.9 E 6,330,105.2 (NAGD83)  
 TOTAL DEPTH: 32.5 ft.

STATE: California  
 GROUND SURFACE ELEVATION: 270.2 ft. (NAVD88)  
 T.O.C ELEVATION: 270.05 ft. (NAVD88)  
 HOLE LOGGED BY: J. Vauk  
 REVIEWED BY: A. Warren

| NOTES   | DEPTH | LABORATORY DATA |        |        |         |        |          |              |                  | LABORATORY CLASSIFICATION | ELEVATION                          | VISUAL CLASSIFICATION | ELEVATION  | GEOLOGIC UNIT SYMBOL | CLASSIFICATION AND PHYSICAL CONDITION |
|---|-------|-----------------|--------|--------|---------|--------|----------|--------------|------------------|---------------------------|------------------------------------|-----------------------|--|----------------------|---------------------------------------|
|   |       | % CORE RECOVERY | % SILT | % CLAY | % FINES | % SAND | % GRAVEL | LIQUID LIMIT | PLASTICITY INDEX |                           |                                    |                       |  |                      |                                       |
| <p><b>ALL MEASUREMENTS ARE IN FEET FROM THE GROUND SURFACE.</b></p> <p><b>PURPOSE OF HOLE:</b><br/>To recover core, collect data to determine geologic and hydrologic site conditions, and install a groundwater monitoring well.</p> <p><b>DRILLED BY:</b><br/>USGS Drill Crew<br/>James Huckaby, Driller<br/>Jim Rauman, Helper</p> <p><b>DRILL RIG:</b><br/>CME-550</p> <p><b>DRILLING &amp; SAMPLING METHODS:</b><br/>Drill hole MW-09-2 was advanced using hollow stem flight augers with continuous dry core sampling system (FADC) from the ground surface to a total depth of 32.5 feet. FADC uses 7-5/8-inch O.D., 4-1/4-inch I.D. hollow stem augers, with a 5-foot-long 3-inch I.D. split sample barrel. A pilot bit was inserted inside the augers to advance through cobble- and boulder-sized material from 1.0 to 2.5 feet; from 21.5 to 22.5 feet; and from 29.0 to 32.5 feet of depth b.g.s.</p> <p><u>Interval Method</u><br/>0.0 to 1.0 ft. - FADC<br/>1.0 to 2.5 ft. - FADC with Pilot Bit<br/>2.5 to 21.5 ft. - FADC<br/>21.5 to 22.5 ft. - FADC with Pilot Bit<br/>22.5 to 29.0 ft. - FADC<br/>29.0 to 32.5 ft. - FADC with Pilot Bit</p> <p><b>DRILLING CONDITIONS AND DRILLER'S COMMENTS:</b><br/>0.0 to 1.0 ft. - refusal at 1.0 ft.<br/>1.0 to 2.5 ft. - pilot bit added<br/>2.5 to 7.5 ft. - clay, sands, and gravels<br/>7.5 to 17.5 ft. - material disturbed due to gravels rolling in sampler<br/>17.5 to 21.5 ft. - very rough drilling, cobble in bottom of bit<br/>21.5 to 22.5 ft. - refusal pilot bit added<br/>22.5 to 32.5 ft. - clay, sands, and gravel</p> <p><b>DRILL FLUID, RETURN AND COLOR:</b><br/>0.0 to 17.5 ft. - None<br/>17.5 to 32.5 ft. - Water, no return</p> <p><b>WATER LEVEL:</b><br/>32.0 ft. b.g.s. on 10/24/2009</p> <p><b>REASON FOR HOLE TERMINATION:</b><br/>The hole was terminated upon successful completion to the target depth.</p> | 100   |                 |        |        |         |        |          |              |                  |                           | (SM)g                              | 269.1                 | <p><b>0.0 to 32.5 feet</b><br/><b>QUATERNARY ALLUVIUM (Qal)</b></p> <p><b>0.0 to 1.0 ft. SILTY SAND WITH GRAVEL, (SM)g:</b> About 35% fine to coarse sand (mostly fine); about 35% fine to coarse, hard, rounded gravel; about 30% non-plastic fines with rapid dilatancy; maximum size: 1.25 inches; dry, light brown, no reaction with HCl.</p> <p><b>1.0 to 2.5 ft. No Recovery</b></p> <p><b>2.5 to 3.4 ft. SILT, ML:</b> About 90% fines with medium plasticity, low toughness, and dry strength, and slow dilatancy, about 10% fine sand; maximum size: fine sand; dry, light brown, no reaction with HCl; soft consistency.</p> <p><b>3.4 to 9.3 ft. POORLY GRADED SAND WITH SILT, SP/SM:</b> About 90% fine to medium sand (trace of coarse); about 10% non-plastic fines with rapid dilatancy; maximum size: coarse sand; dry, very light brown; soft consistency.</p> <p><u>Laboratory Data Interval</u><br/>3.4 to 9.3 ft.</p> <p><b>9.3 to 12.5 ft. SILTY GRAVEL WITH SAND, (GM)s:</b> About 40% fine to coarse, hard, rounded gravel; about 35 to 40% fine to coarse sand (mostly fine to medium); about 20 to 25% non-plastic fines with rapid dilatancy; maximum size: 2.75 inches; wet; light brown, no reaction with HCl; sample is recovered disturbed.</p> <p><b>12.5 to 17.5 ft. SILTY GRAVEL WITH SAND, (GM)s:</b> About 60% fine to coarse, hard, rounded gravel; about 25 to 30% fine to coarse sand (mostly fine to medium); about 10 to 15% non-plastic fines with rapid dilatancy; maximum size: 3.5 inches (gravel dimensions 1.75" by 2.75" by 3.5"); wet; medium brown, no reaction with HCl; sample is recovered disturbed.</p> <p><u>Laboratory Data Interval</u><br/>12.5 to 17.5 ft.</p> <p><b>17.5 to 21.5 ft. POORLY GRADED SAND WITH SILT AND GRAVEL, (SP/SM)g:</b> About 55% fine to coarse sand (mostly fine to medium); about 35% fine hard, rounded gravel; about 10% non-plastic fines with rapid dilatancy; maximum size: 1.5 inches; wet; light brown, no reaction with HCl; sample is recovered disturbed.</p> <p><u>Laboratory Data Interval</u><br/>17.8 to 21.5 ft.</p> <p><b>21.5 to 22.5 ft. SILTY GRAVEL WITH SAND, (GM)s:</b> No Recovery, soil description based on drilling conditions.</p> <p><b>22.5 to 25.5 ft. SILTY GRAVEL WITH SAND, (GM)s:</b> About 65% fine to coarse, hard, rounded gravel; about 20% fine to coarse sand; about 15% non-plastic fines with rapid dilatancy; maximum size: 3 inches (gravel dimension 2" by 2.25" by 3"); wet; medium brown, no reaction with HCl; sample is recovered disturbed.</p> |                      |                                       |
|   | 0     |                 |        |        |         |        |          |              |                  |                           |                                    | NR                    |  | 267.6                |                                       |
|   | 5     | 80              |        |        |         |        |          |              |                  |                           |                                    | ML                    |  | 266.7                |                                       |
|   | 10    | 48              | 2.7    | 1.8    | 4.5     | 95.3   | 0.2      | NP           | NP               | 2.9                       | SP                                 | SP/SM                 |  | 260.8                |                                       |
|   | 15    | 22              | 2.4    | 1.0    | 3.4     | 28.9   | 67.7     | NP           | NP               | 6.3                       | 15.0 ft. (El. 255.05 ft.)<br>(GP)s | (GM)s                 |  | 257.6                |                                       |
|   | 20    | 35              | 3.5    | 1.3    | 4.8     | 57.0   | 38.2     | NP           | NP               | 10.0                      | (SP)g                              | (SP/SM)g              |  | 248.6                |                                       |
|   |       |                 |        |        |         |        |          |              |                  |                           |                                    |                       |  | 252.6                |                                       |
|   |       |                 |        |        |         |        |          |              |                  |                           |                                    |                       |  | 260.8                |                                       |
|   |       |                 |        |        |         |        |          |              |                  |                           |                                    |                       |  | 269.1                |                                       |
|   |       |                 |        |        |         |        |          |              |                  |                           |                                    |                       |  | 270.2                |                                       |

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 REVIEWED BY: A. Warren

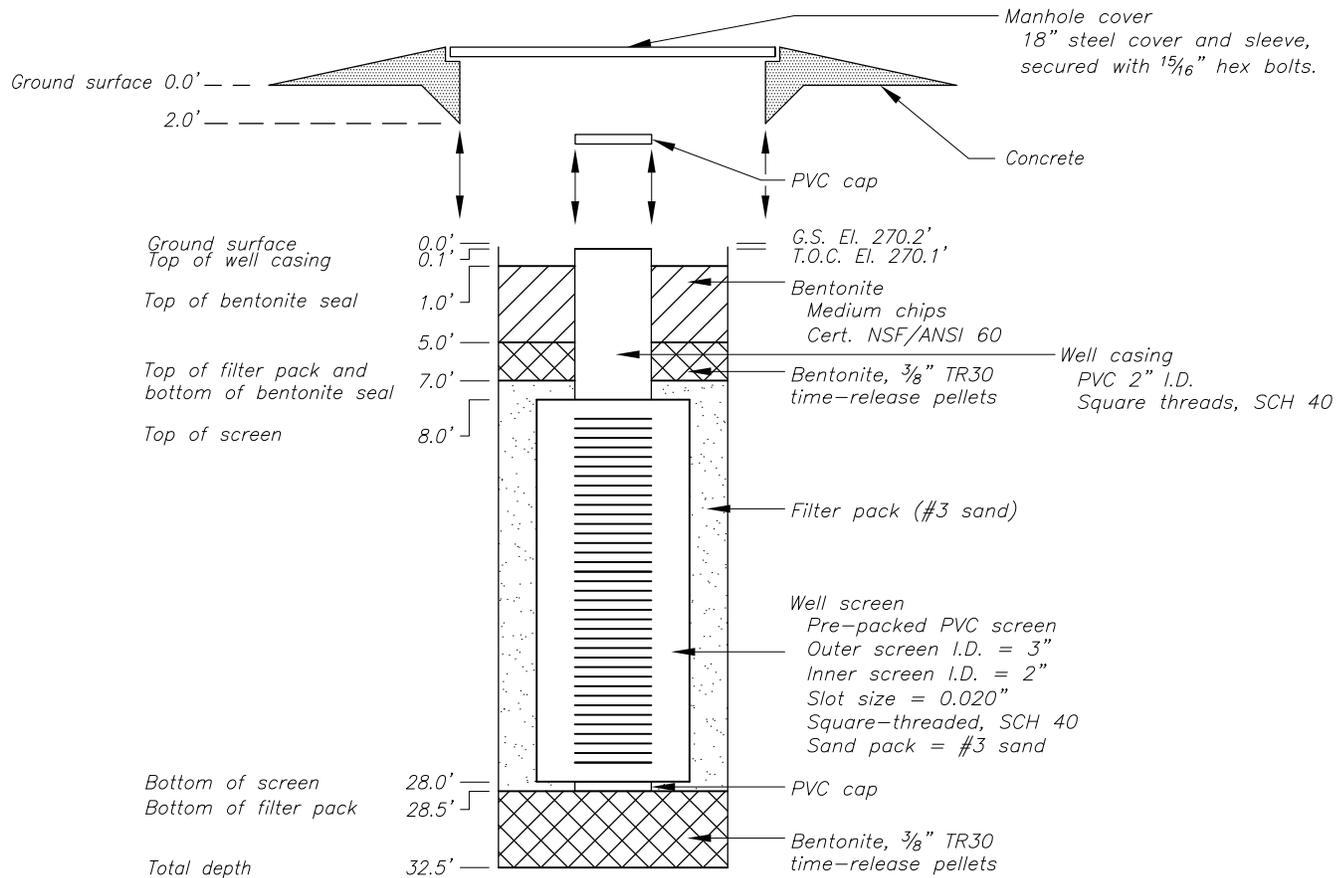
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|---|----------------|-----------------|--------|--------|---------|--------|----------|--------------|------------------|---------------------------|-----------|-----------------------|---|---|--|--------------------|
|   |                | % CORE RECOVERY | % SILT | % CLAY | % FINES | % SAND | % GRAVEL | LIQUID LIMIT | PLASTICITY INDEX |                           |           |                       |   |   |  | MOISTURE CONTENT % |
| <b>HOLE COMPLETION:</b><br>Well Casing - 0.1 to 8.0 ft. (T.O.C. El. 270.05 ft.)<br>Dual Pre-pack Screen - 8.0 to 28.0 ft. (Slotted 0.020-inch)<br>Well Screen Filter Pack - #3 Sand Filter Pack 7.0 to 28.5 ft. (#3 Sand)<br>Bentonite Bottom Seal - 28.5 to 32.5 ft.<br>Bentonite Seal - 1.0 to 7.0 ft.<br>Well Protection - flush-mounted 18-inch manhole (15/16-inch hexbolts) | 40             |                 |        |        |         |        |          |              |                  |                           |           | (GM)s                 | 247.6   | <b>25.5 to 26.4 ft. SILTY SAND WITH GRAVEL, (SM)g:</b> About 50% fine to coarse sand; about 25% non-plastic fines with rapid dilatancy; about 25% fine to coarse, hard, rounded gravel; maximum size: 4 inches (gravel dimensions 2" by 2.5' by 4"); wet, medium brown, no reaction with HCl.<br><br><b>26.4 to 27.8 ft. SILTY SAND, SM:</b> About 80% fine to medium sand; about 20% non-plastic fines with rapid dilatancy; maximum size: medium sand; wet, light brown banded with orange-brown and black sand, no reaction with HCl; soft consistency.<br><br><u>Laboratory Data Interval</u><br>26.4 to 27.5 ft. |  |                    |
|   | 25             |                 |        |        |         |        |          |              |                  |                           |           | (GM)s                 | 244.6   |   |  |                    |
|   | 100            |                 |        |        |         |        |          |              |                  |                           |           | (SM)g                 | 243.7   |   |  |                    |
|   |                |                 | 5.0    | 7.6    | 12.6    | 87.4   | 0.0      | NP           | NP               | 25.9                      | SM        | 242.6                 | <b>27.8 to 28.0 ft. SILTY SAND WITH GRAVEL, (SM)g:</b> About 35% fine to coarse sand; about 35% gravel; about 30% fines with medium plasticity, dry strength, and toughness, and slow dilatancy; maximum size: 1/2 inch; wet, reddish brown, no reaction with HCl; firm consistency.  |   |  |                    |
|   |                |                 |        |        |         |        |          |              |                  |                           |           | (SM)g                 |   | 242.3<br>242.1  |  |                    |
|   |                | 93              | 81.0   | 9.5    | 90.5    | 9.5    | 0.0      | 34.2         | 4.7              | 33.7                      | ML        | 240.7                 | <b>28.0 to 31.2 ft. SILT WITH SAND, (ML)s:</b> About 75 to 85% fines with low plasticity, toughness, and dry strength, and rapid dilatancy, about 15 to 25% fine sand; maximum size: fine sand; moist, medium brown with orange, gray and green-gray layers, no reaction with HCl; firm consistency; slight decomposed organic odor.<br><br><u>Laboratory Data Interval</u><br>28.0 to 29.4 ft.<br>29.4 to 31.2 ft. |   |  |                    |
|   |                | 30              | 65.9   | 10.0   | 75.9    | 24.1   | 0.0      | 28.6         | 5.1              | 35.5                      | (ML)s     | 238.9                 |   |   |  |                    |
|   |                | 100             |        |        |         |        |          |              |                  |                           |           | SM                    |   | 238.8<br>238.2  |  |                    |
|   |                |                 | 63.2   | 17.0   | 80.2    | 19.8   | 0.0      | 34.6         | 8.9              | 36.2                      | (ML)s     | 238.2                 | CL/ML   | 237.8<br>237.6  | <b>31.2 to 31.3 ft. SILTY SAND, SM:</b> About 65% fine sand; about 35% non-plastic fines with rapid dilatancy; maximum size: fine sand; wet, green-gray, no reaction with HCl; soft consistency.<br><br><b>31.3 to 31.9 ft. SILTY CLAY, CL/ML:</b> About 90% fines with medium plasticity, low toughness and dry strength, and no dilatancy; about 10% fine sand; maximum size: fine sand; wet, green-gray, no reaction with HCl; soft consistency; slight decomposed organic odor.<br><br><u>Laboratory Data Interval</u><br>31.3 to 31.9 ft. |                    |
|   |                |                 |        |        |         |        |          |              |                  |                           |           | SM                    | 237.8<br>237.6  |   |  |                    |
|   |                |                 |        |        |         |        |          |              |                  |                           |           | ML                    | 237.6   | <b>31.9 to 32.3 ft. SILTY SAND, SM:</b> About 85% fine to medium sand; about 15% non-plastic fines with rapid dilatancy; maximum size: medium sand; wet, light brown, no reaction with HCl; soft consistency.<br><br><b>32.3 to 32.5 ft. SILT, ML:</b> About 95% fines with low plasticity, toughness and dry strength, and rapid dilatancy; about 5% fine sand; maximum size: fine sand; moist, green-gray, no reaction with HCl; soft consistency; slight decomposed organic odor.  |  |                    |
|   | BOTTOM OF HOLE |                 |        |        |         |        |          |              |                  |                           |           |                       |   |   |  |                    |

T.D. = 32.5 ft.

**COMMENTS:** FADC = Flight Auger Dry Core  
 HSA = Hollow Stem Auger  
 NP = Non-plastic  
 NR = No Recovery  
 NA = Not applicable  
 G.S. = Ground surface  
 b.g.s. = Below the ground surface  
 T.O.C. = Top of well casing

Well completion information is provided in attached Well Completion Diagram. Well development information is provided in attached Monitoring Well Development form.

|  |                     |
|--|---------------------|
| MW-09-2  | GEOLOGIST: J. VAUK  |
| WELL COMPLETION DIAGRAM  | DRILLER: J. HUCKABY |
| DATE COMPLETED: 9/27/2009  | HELPER: J. RAUMAN   |
| TOP OF WELL CASING COORDINATES:<br>N2204153.9 E6330105.2 (NAD83) ELEVATION 270.1' (NAVD88)<br>GROUND SURFACE ELEVATION 270.2' (NAVD88) |                     |



\*NOT TO SCALE

NOTES:

T.O.C. = Top of well casing, I.D. = Inner Diameter, G.S. = Ground Surface, El. = Elevation

Sand backfills the well above the top of bentonite seal, inside the manhole.