## 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:** 9/28/09  
**TOTAL DEPTH:** 40.5 ft.  
**GROUND SURFACE ELEVATION:** 270.7 ft. (NAVD88)  
**T.O.C. ELEVATION:** 270.83 ft. (NAVD88)  
**HOLE LOGGED BY:** J. Vauk  
**REVIEWED BY:** A. Warren  

### WATER LEVEL:
- **15.5 to 40.5 ft.** Water, no return  
- **0.0 to 15.5 ft.** None  

### DRILL FLUID, RETURN AND MEASURE CONTENT:
- **37.0 to 40.5 ft.** - 3-foot core sample  
- **32.0 to 37.0 ft.** - sand with clay at cobble  
- **29.0 to 32.0 ft.** - encountered  
- **28.0 to 28.5 ft.** - encountered  
- **15.5 to 20.0 ft.** - add water to hole  

### DRILLING CONDITIONS AND DRILLER'S COMMENTS:
- **0.0 to 2.5 ft.** FADC  
- **2.5 to 5.0 ft.** - rough drilling, samples not staying in barrel  
- **5.0 to 15.5 ft.** - rough drilling, sand and gravel  
- **15.5 to 20.0 ft.** - add water to hole  
- **20.0 to 25.0 ft.** - encountered cobble  
- **25.0 to 28.0 ft.** - gravel  
- **28.0 to 29.0 ft.** - encountered cobbles  
- **29.0 to 32.0 ft.** - encountered cobbles  
- **32.0 to 37.0 ft.** - sand with clay at bottom of sample  

### DRILL FLUID, RETURN AND COLOR:
- **0.0 to 15.5 ft.** - None  
- **15.5 to 40.5 ft.** - Water, no return  

### WATER LEVEL:
- **13.3 ft.** b.g.s. on 9/26/2009
## 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  
**AND DATE MEASURED:** 13.3 ft. (257.33 ft.) 9/26/09  
**PROJECT:** San Joaquin River Restoration Project  
**COORDINATES:** N 2,203,695.3 E 6,330,622.4 (NAD83)  
**TOTAL DEPTH:** 40.5 ft.  
**GROUND SURFACE ELEVATION:** 270.7 ft. (NAVD88)  
**T.O.C ELEVATION:** 270.83 ft. (NAVD88)  
**HOLE LOGGED BY:** J. Vauk  
**REVIEWED BY:** A. Warren

### CLASSIFICATION AND PHYSICAL CONDITION

<table>
<thead>
<tr>
<th>DEPTH</th>
<th>% SILT</th>
<th>% CLAY</th>
<th>% SAND</th>
<th>% GRAY</th>
<th>LIQUID LIMIT</th>
<th>PLASTICITY INDEX</th>
<th>MOISTURE CONTENT %</th>
<th>VISIBLE CLASSIFICATION</th>
<th>LABORATORY CLASSIFICATION</th>
<th>GEOLOGIC UNIT SYMBOL</th>
</tr>
</thead>
<tbody>
<tr>
<td>35-92</td>
<td>10.5</td>
<td>3.2</td>
<td>13.7</td>
<td>84.4</td>
<td>1.9 NP NP</td>
<td>22.0</td>
<td>SM</td>
<td>Cal/ML s</td>
<td>SM</td>
<td>(ML)s</td>
</tr>
<tr>
<td>87</td>
<td>62.1</td>
<td>18.2</td>
<td>80.3</td>
<td>19.7</td>
<td>0.0 33.5 7.7</td>
<td>38.2 (ML)s</td>
<td>233.7</td>
<td>Cal/ML s</td>
<td>(ML)s</td>
<td>s(ML)</td>
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<tr>
<td>40</td>
<td>53.7</td>
<td>4.4</td>
<td>58.1</td>
<td>41.3</td>
<td>0.6 NP NP</td>
<td>36.3 s(ML)</td>
<td>230.1</td>
<td>Cal/ML s</td>
<td>s(ML)</td>
<td>s(ML)</td>
</tr>
</tbody>
</table>

**REASON FOR HOLE TERMINATION:** The hole was terminated upon successful completion to the target depth.

**HOLE COMPLETION:**
- **Well Casing 0.1 to 17.0 ft. (T.O.C. El. 270.63 ft.)**
- **Dual Pre-pack Screen 17.0 to 37.0 ft. (Slotted 0.020-inch)**
- **Well Screen Filter Pack #3 Sand Filter Pack 2.0 to 40.5 ft. (Native material caved).**
- **Bentonite Seal 2.0 to 12.0 ft.**
- **Well Protection flush-mounted 18-inch manhole (15/16-inch hexbolts).**

**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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**DEPTH AND ELEVATION OF WATER LEVEL**

- **GROUND SURFACE ELEVATION:** 270.7 ft. (NAVD88)
- **T.O.C ELEVATION:** 270.83 ft. (NAVD88)

**T.D. = 40.5 ft.**
**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
AND DATE MEASURED: 15.0 ft. (El. 255.05 ft.) 9/26/09

NOTES

<table>
<thead>
<tr>
<th>DEPTH</th>
<th>% CORE RECOVERY</th>
<th>% SILT</th>
<th>% CLAY</th>
<th>% FINE</th>
<th>% SAND</th>
<th>% GRAVEL</th>
<th>LIQUID LIMIT</th>
<th>PLASTICITY</th>
<th>MOISTURE CONTENT</th>
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<tbody>
<tr>
<td>0.0</td>
<td>100</td>
<td>0</td>
<td>4.5</td>
<td>95.3</td>
<td>0.2</td>
<td>NP</td>
<td>2.9</td>
<td>SP</td>
<td>SP/SM</td>
</tr>
<tr>
<td>0.0 to 1.0 ft.</td>
<td>FADC</td>
<td></td>
<td></td>
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<td></td>
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<td></td>
</tr>
<tr>
<td>1.0 to 2.5 ft.</td>
<td>FADC with Pilot Bit</td>
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<tr>
<td>2.5 to 21.5 ft.</td>
<td>FADC</td>
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<td></td>
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<tr>
<td>21.5 to 22.5 ft.</td>
<td>FADC with Pilot Bit</td>
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<tr>
<td>22.5 to 32.5 ft.</td>
<td>FADC</td>
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</tr>
</tbody>
</table>

Laboratory Data

0.0 to 32.5 ft
QUATERNARY ALLUVIUM (Qal)

0.0 to 1.0 ft. SILTY SAND WITH GRAVEL, (SM): About 35% fine to coarse sand (modestly 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.

1.0 to 2.5 ft. No Recovery

2.5 to 3.4 ft. SILT, ML: About 90% fines with medium plasticity, low toughness, and slow strength, and slow dilatancy; about 10% fine sand; maximum size: fine sand; dry, light brown, no reaction with HCl; soft consistency.

3.4 to 9.3 ft. POORLY GRADED SAND WITH SILT, SP/SM: 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.

Laboratory Data Interval
3.4 to 3.4 ft.

3.4 to 9.3 ft.

9.3 to 12.5 ft. SILTY GRAVEL WITH SAND, (GM): About 40% fine to coarse, hard, rounded gravel; about 35 to 40% fine to coarse sand (modestly 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.

12.5 to 17.5 ft. SILTY GRAVEL WITH SAND, (GM): About 60% fine to coarse, hard, rounded gravel; about 25 to 30% fine to coarse sand (modestly 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.

Laboratory Data Interval
12.5 to 17.5 ft.

17.5 to 21.5 ft. POORLY GRADED SAND WITH SILT AND GRAVEL, (SP/SM): About 25% fine to coarse sand (modestly finely 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.

Laboratory Data Interval
17.5 to 21.5 ft.

21.5 to 22.5 ft. SILTY GRAVEL WITH SAND, (GM): No Recovery, soil description based on drilling conditions.

Laboratory Data Interval
21.5 to 22.5 ft.

Well completion information is provided in attached Well Completion Diagram. Well development information is provided in attached Monitoring Well Development form.
### GEOLOGIC LOG OF DRILL HOLE NO. MW-09-2

**FEATURE:** Groundwater Monitoring  
**PROJECT:** San Joaquin River Restoration Project  
**LOCATION:** Reach 1A, River Bank Right, Madera County  
**BEGUN:** 9/26/09  
**FINISHED:** 9/27/09  
**TOTAL DEPTH:** 32.5 ft.  
**AND DATE MEASURED:** 15.0 ft. (El. 255.05 ft.) 9/28/2009

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**NOTES**

**HOLE COMPLETION:**  
Well Casing - 0.1 to 8.0 ft. (T.O.C. El. 270.05 ft.)  
Dual Pre-pack Screen - 8.0 to 28.0 ft. (Slotted 0.020-inch)  
Well Screen Filter Pack - #3 Sand  
Filter Pack 7.0 to 28.5 ft. (#3 Sand)  
Bentonite Bottom Seal - 28.5 to 32.5 ft.  
Bentonite Seal - 1.0 to 7.0 ft.  
Well Protection - flush-mounted 18-inch manhole (15/16-inch hexbolts)

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**LABORATORY DATA**

<table>
<thead>
<tr>
<th>DEPTH</th>
<th>% CORE RECOVERY</th>
<th>% SILT</th>
<th>% CLAY</th>
<th>% FINE S</th>
<th>% SAND</th>
<th>% GRAVEL</th>
<th>LIQUID LIMIT</th>
<th>PLASTICITY INDEX</th>
<th>MOISTURE CONTENT %</th>
<th>VISUAL CLASSIFICATION</th>
<th>ELEVATION</th>
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<td>25.0</td>
<td></td>
<td>40</td>
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<td></td>
<td></td>
<td>(GM)s</td>
<td>247.6</td>
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<td></td>
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<tr>
<td>50.0</td>
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<td>100</td>
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<td>(GM)s</td>
<td>244.6</td>
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<tr>
<td>25.5</td>
<td></td>
<td></td>
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<td></td>
<td></td>
<td>(SM)g</td>
<td>25.5 to 26.4 ft.</td>
<td>25.5 to 26.4 ft.</td>
<td>26.4 to 27.8 ft.</td>
<td>SM</td>
<td></td>
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<tr>
<td>26.4</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>SM</td>
<td>26.4 to 27.8 ft.</td>
<td>26.4 to 27.8 ft.</td>
<td>SILTY SAND, (SM)g:</td>
<td>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.</td>
<td>26.4 to 27.8 ft.</td>
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<tr>
<td>27.8</td>
<td></td>
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<td></td>
<td></td>
<td></td>
<td></td>
<td>(SM)s</td>
<td>27.8 to 28.0 ft.</td>
<td>27.8 to 28.0 ft.</td>
<td>SILTY SAND WITH GRAVEL, (SM)g:</td>
<td>About 35% fines 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.</td>
<td>27.8 to 28.0 ft.</td>
</tr>
<tr>
<td>30.0</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>(MG)s</td>
<td>30.0 to 31.2 ft.</td>
<td>30.0 to 31.2 ft.</td>
<td>SILT WITH SAND, (ML)s:</td>
<td>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.</td>
<td>30.0 to 31.2 ft.</td>
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<tr>
<td>31.2</td>
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<td></td>
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<td></td>
<td></td>
<td></td>
<td>(MGL)s</td>
<td>31.2 to 31.9 ft.</td>
<td>31.2 to 31.9 ft.</td>
<td>SILTY SAND, SM:</td>
<td>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.</td>
<td>31.2 to 31.9 ft.</td>
</tr>
<tr>
<td>31.9</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>(MGL)s</td>
<td>31.9 to 32.3 ft.</td>
<td>31.9 to 32.3 ft.</td>
<td>SILTY SAND, SM:</td>
<td>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.</td>
<td>31.9 to 32.3 ft.</td>
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<tr>
<td>32.3</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>(ML)s</td>
<td>32.3 to 32.5 ft.</td>
<td>32.3 to 32.5 ft.</td>
<td>SILT, ML:</td>
<td>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.</td>
<td>32.3 to 32.5 ft.</td>
</tr>
</tbody>
</table>

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**COMMENTS:**  
FADC = Flight Auger Dry Core  
HSA = Hollow Stem Auger  
NP = Non-plastic  
NR = No Recovery  
NA = Not applicable  
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


TOP OF WELL CASING COORDINATES:
N2204153.9 E6330105.2 (NAD83) ELEVATION 270.1' (NAVD88)
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.