FEATURE: Groundwater Monitoring LOCATION: Reach 1B, River Bank Left, Fresno County BEGUN: 10/24/09 FINISHED: 10/24/09 DEPTH AND ELEVATION OF WATER LEVEL

PROJECT: San Joaquin River Restoration Project COORDINATES: N 2,182,805.1 E 6,252,472.3 (NAGD83) TOTAL DEPTH: 57.5 ft.

STATE: California

GROUND SURFACE ELEVATION: 226.6 ft. (NAVD88) T.O.C ELEVATION: 226.5 ft. (NAVD88) HOLE LOGGED BY: G. Turlington REVIEWED BY: J. Vauk

AND DATE MEASURED: 32.0 ft. (El. 194.45 ft.) 10/24/2009

			- ,													
					LAB	ORAT	ORY	DATA	٩		×∩		NO		μ	
NOTEO	E	≻						۸Т	Y	%	CATIC	/ z	CATIC	/z	L CN	CLASSIFICATION AND
NOTES	DEPTH	% CORE RECOVERY	н	A	FINES	SAND	GRAVEL	LIQUID LIMIT	PLASTICITY INDEX	MOISTURE CONTENT %	LABORATORY CLASSIFICATION	ELEVATION	VISUAL CLASSIFICATION	EVATION	EOLOGIC UNIT SYMBOL	PHYSICAL CONDITION
		RECO	% SILT	% CLAY	% FIN	% SA	% GR	rigui	PLAS	MOIS	CLA		CLA	ELEV	GEOL	
ALL MEASUREMENTS ARE IN FEET FROM THE GROUND SURFACE.	-	72									AS	SPHALT	SP/SM (SW)g	226.1 226.0 225.5		SOIL DESCRIPTIONS CHARACTERIZE SAMPLES FROM DRILL HOLE MW-09-21B.
MW-09-21 was drilled and completed as a well on 10/03/2009 using hollow stem flight augers and	-												SP/SM			0.0 to 1.0 feet RECENT FILL (Fill)
a wooden plug. MW-09-21B was drilled and continuously sampled on 10/24/2009 about five feet to the east from the MW-09-21.	5-	70												223.0	-	<ul> <li>0.0 to 0.4 ft, FILL - POORLY GRADED <u>SAND WITH SILT, SP/SM</u>: About 80% fine to coarse sand, (coarse sand is angular to sub-angular); about 10% non-plastic fines with rapid dilatancy; about 10% fine, hard to very hard gravel; maximum size: 1/2 inches; dry, light brown, no reaction with HCI; soft</li> </ul>
PURPOSE OF HOLE: To recover core, collect data to determine geologic and hydrologic site conditions, and install a	-															Overlying road base material.
groundwater monitoring well. <b>DRILLED BY:</b> USGS Drill Crew James Huckaby, Driller Jim Rauman, Helper Sam Cummings, Helper		78	23.3	7.2	30.5	65.2	4.3	NP	NP	3.7	SM		SM			<ul> <li>0.5 to 1.0 ft. FILL - WELL GRADED SAND</li> <li>WITH GRAVEL, (SW)g: About 60% fine to coarse sand; about 35% fine, hard to very</li> <li>hard, rounded to subrounded gravel; about 5% non-plastic fines with rapid dilatancy; maximum size: 1/2 inches; dry, light brown, no reaction with HCl; very soft consistency;</li> </ul>
DRILL RIG: CME-550												215.6		215.6		road base material.
DRILLING & SAMPLING METHODS: Drill hole DH-09-21 was advanced	-	_														1.0 to 57.5 ft. — QUATERNARY ALLUVIUM (Qal)
using hollow stem flight augers (FADC) and a wooden plug from the ground surface to a total depth of 52.5 feet. The system uses 7-5/8-inch O.D, 4-1/4-inch hollow stem augers and a wooden	- - 15 <del>-</del>	60	3.0	1.2	4.2	53.6	42.2	NP	NP	1.0	(SP)g	211.5	(SP)g	211.5		1.0 to 3.5 ft. <u>POORLY GRADED SAND</u> <u>WITH SILT. SP/SM</u> : About 80% fine to coarse sand; about 10% fine, hard to very hard gravel; about 10% non-plastic fines with rapid dilatancy; maximum size: 3/4 inches; dry, light brown, no reaction with HCl; very soft consistency.
(knock-out) plug.			19.0	3.3	22.3	77.3	0.4	NP	NP	4.8	SM	210.4	SM	210.4	Qal	,
Interval Method 0.0 to 52.5 ft. FADC with wooden plug Drill hole DH-09-21B was advanced using hollow stem flight augers with	-	-										210.4		210.4		<ul> <li>3.5 to 10.9 ft. <u>SILTY SAND, (SM)</u>: About 70% fine to coarse sand; about 30% fines with low plasticity, toughness and dry strength, and rapid dilatancy; maximum size: 3/4 inches; moist, reddish brown, no reaction</li> <li>with HCl; very soft consistency.</li> </ul>
continuous dry core sampling system (FADC) from the ground surface to a total depth of 57.5 feet. FADC uses 7-5/8-inch O.D., 4-1/4-inch I.D. hollow stem augers,	-	72														Laboratory Data Interval 3.5 to 10.9 ft. 10.9 to 15.0 ft. POORLY GRADED SAND
with a 5-foot-long 3-inch I.D. split sample barrel. Interval Method 0.0 to 57.5 ft FADC	-															WITH GRAVEL (SP)g: About 70% fine to coarse sand; about 25% fine to coarse, rounded to subrounded gravel; about 5% non-plastic fines with rapid dilatancy;
DRILLING CONDITIONS AND DRILLER'S COMMENTS:			3.3	2.0	5.3	94.0	0.7	NP	NP	1.7	SP-SN	И	SP			<ul> <li>maximum size: 1.75 inches, dry; tan; no reaction with HCl; very soft consistency.</li> <li>Laboratory Data Interval</li> </ul>
<u>MW-09-21</u>																10.9 to 15.0 ft.
0.0 to 52.5 ft blind drilled 52.5 ft knocked out wooden plug and set well	25-	78														15.0 to 16.1 ft. <u>SILTY SAND, SM</u> : About 80% fine to coarse sand, about 20% − non-plastic fines with rapid dilatancy; maximum size: coarse sand; dry, light brown, no reaction with HCl; very soft consistency.
	-	-													-	Laboratory Data Interval — 15.0 to 16.1 ft.
	-	100										197.6		197.6		16.1 to 28.9 ft. <u>POORLY GRADED SAND</u> , <u>SP</u> : About 100% fine to coarse sand; trace of fines; maximum size: coarse sand; dry, tan to white, no reaction with HCl; very soft
	30-		33.8	7.4	41.2	58.8	0.0	NP	NP	16.1	SM	195.7	SM	195.7		consistency. <u>Laboratory Data Interval</u> 16.1 to 28.9 ft.
COMMENTS: FADC = Flig										•		Well co		n inform	ation i	s provided in attached Well
HSA = Hollov NP = Non-pli NR = No Rec NA = Not ap G.S. = Grour b.g.s. = Belo	astic covery plicabl nd sur w the	, le face groun	d surf	ace								Compl	etion Dia	agram.		
T.O.C. = Top	o of we	ell cas	ing													SHEET 1 OF 2 DRILL HOLE MW-09-21

STATE: California

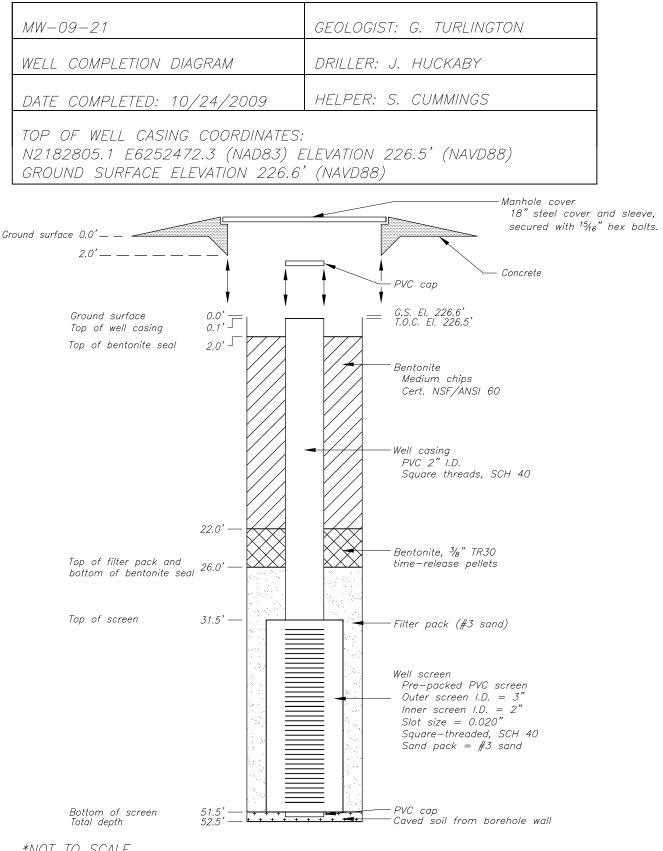
SHEET 2 OF 2

FEATURE: Groundwater Monitoring LOCATION: Reach 1B, River Bank Left, Fresno County BEGUN: 10/24/09 FINISHED: 10/24/09 DEPTH AND ELEVATION OF WATER LEVEL PROJECT: San Joaquin River Restoration Project COORDINATES: N 2,182,805.1 E 6,252,472.3 (NAGD83) TOTAL DEPTH: 57.5 ft.

GROUND SURFACE ELEVATION: 226.6 ft. (NAVD88) T.O.C ELEVATION: 226.5 ft. (NAVD88) HOLE LOGGED BY: G. Turlington REVIEWED BY: J. Vauk

AND DATE MEASURED: 32.0 ft. (El. 194.45 ft.) 10/24/2009

AND DATE MEASURED: 32.0	ft. (El.	194.4	5 ft.) 1	0/24/2	009									REVIEW	ED BY: J. Vauk	
					LAB	ORAT	ORY	DATA	Ą		×°		NO /	L I		
NOTES	DEPTH	<u>چ</u>					Е	MIT	T	RE T %	LABORATORY CLASSIFICATION	/ z	VISUAL CLASSIFICATION	SYMBOL	CLASSIFI	CATION AND
NOTES	DEF	% CORE RECOVERY	SILT	% CLAY	FINES	SAND	% GRAVEL	LIQUID LIMIT	PLASTICITY INDEX	MOISTURE CONTENT %	ABOR ASSIF	ELEVATION	VISUA CLASSIFICA ELEVATION	DLOG SYMB	PHYSICA	L CONDITION
		REC REC			%	%	-							GEG		
MW-09-21B 0.0 to 1.0 ft refusal at 1.0 foot	-	100	52.2	18.4	70.6	29.4	0.0	NP	NP	30.8		195.3	(ML)s 195.3		28.9 to 30.8 ft. <u>SILT</u> 70% fine to medium	TY SAND, SM: About sand; about 30%
b.g.s. 1.0 to 2.5 ft pilot bit added 2.5 to 7.5 ft clay, sands, and	-										32.0 ft. (El. 1	94.45 fL)				h rapid dilatancy; lium sand; moist; brown, l; very soft consistency.
gravel 7.5 to 17.5 ft material disturbed	-	-													Laboratory Data	
due to gravel rolling in sampler, 17.5 to 21.5 ft very rough drilling,	-	-													28.9 to 30.8 ft.	
cobble in bottom of bit 21.5 to 22.5 ft refusal, pilot bit added	35-	88												-	<ul> <li>About 75% fines wit toughness, high dry</li> </ul>	WITH SAND, (ML)s: h low plasticity and strength, and slow
22.5 to 32.5 ft clay, sands, and gravel	-	-													dilatancy; about 25%	6 fine sand; maximum st, brown, no reaction with
32.4 to 57.5 ft saturated sand, difficult drilling recovery conditions	_	-													HCI; hard consisten	cy.
DRILL FLUID, RETURN AND COLOR:	-		-												Laboratory Data 30.8 to 31.2 ft.	Interval
MW-09-21	_														<ul> <li>50% non-plastic fine</li> </ul>	IDY SILT, s(ML): About es with rapid dilatancy;
0.0 to 52.5 ft None 52.5 ft Water was used to fill hole	40-	76													size: medium sand;	
before plug was knocked out and well installed.	40															nations from 43.0 to 48.0 h HCl; soft consistency.
<u>MW-09-21B</u> 0.0 to 17.5 ft None 17.5 to 57.5 ft Water, no return			47.1	5.0	52.1	47.9	0.0	NP	NP	29.2	s(ML)		s(ML)		Laboratory Data 31.2 to 52.0 ft.	Interval
WATER LEVEL:			-													DRLY GRADED SAND, to coarse sand; about
32.0 ft. b.g.s. on 10/24/2009 (MW-09-21)															5% non-plastic fines	with rapid dilatancy; se sand; wet, brown, no
REASON FOR HOLE TERMINATION:	45	54												Qal	Laboratory Data	
The holes were terminated upon successful completion to the target depths.	45-	54													52.0 to 57.5 ft.	. = 57.5 ft.
HOLE COMPLETION:	_															
<u>MW-09-21</u> Well Casing - 0.1 to 31.5 ft. (T.O.C.	_		1												-	
El. 276.46 ft.) Dual Pre-pack Screen - 31.5 to 51.5																
ft. (Slotted 0.020-inch) Well Screen Filter Pack - #3 Sand															-	
Filter Pack - 26.0 to 51.5 ft. (#3 Sand) Bottom Backfill - 51.5 to 52.5 ft.	50-	28													-	
(Native material caved) Bentonite Seal - 2.0 to 26.0 ft.	-														-	
Well Protection - flush-mounted 18-inch manhole (15/16-inch	-		-									174.5	174.5			
hexbolts) MW-09-21B	-													-	-	
MW-09-21B was backfilled with bentonite hole plug from 1.0 to 57.5	-															
feet b.g.s. Drill cuttings were backfilled the hole from ground	55-	62	6.5	0.7	7.2	92.8	0.0	NP	NP	22.2	SP-SM		SP		-	
surface to 1.0 feet b.g.s.	_	-													-	
	_															
							E	вотто	M OF H	HOLE		169.0	169.0		_	
COMMENTS: FADC = Fligh HSA = Hollow				;									ompletion inform etion Diagram.	ation is	provided in attached	I Well
NP = Non-pla NR = No Rec	astic covery		-													
NA = Not app G.S. = Groun	olicabl	e face														
b.g.s. = Belov T.O.C. = Top				ace												
1															SHEET 2 OF 2	DRILL HOLE MW-09-21



\*NOT TO SCALE

NOTES:

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

Excellent well completion with sand around entire screened interval. Sand backfills the well above the top of bentonite seal, inside the manhole.

FEATURE: Groundwater Monitoring LOCATION: Reach 1B, River Bank Left, Fresno County BEGUN: 10/22/09 FINISHED: 10/22/09 DEPTH AND ELEVATION OF WATER LEVEL

AND DATE MEASURED: NA

PROJECT: San Joaquin River Restoration Project COORDINATES: N 2,183,840.4 E 6,252,462.2 (NAGD83) TOTAL DEPTH: 57.5 ft.

STATE: California

GROUND SURFACE ELEVATION: 222.8 ft. (NAVD88) T.O.C ELEVATION: 222.73 ft. (NAVD88) HOLE LOGGED BY: G. Turlington

REVIEWED BY: J. Vauk

					LAB	ORAT	ORY	DATA	۹		×õ			⊨	
NOTES	DEPTH							MIT	≿	ш%	ATOF ICATI	z	UAL ICATI		CLASSIFICATION AND
INOTES	DEF	% CORE RECOVERY	5	CLAY	FINES	SAND	% GRAVEL	LIQUID LIMIT	PLASTICITY INDEX	MOISTURE CONTENT %	LABORATORY CLASSIFICATION	ELEVATION	VISUAL CLASSIFICATION ELEVATION	SYMBOL	PHYSICAL CONDITION
		REO	% SILT	% C	% FI	S %	9 %	LIQL	PLA	NON NON NON	בר	ELE	CL/	GEO	
ALL MEASUREMENTS ARE IN FEET FROM THE GROUND SURFACE.	_	88											Fill 222.3	-	SOIL DESCRIPTIONS CHARACTERIZE SAMPLES FROM DRILL HOLE - MW-09-22B.
MW-09-22 was drilled and	_														0.0 to 0.4 feet
completed as a well on 10/03/2009 using hollow stem flight augers and a pilot bit.	_		36.1	5.0	41.1	57.3	1.6	NP	NP	3.1	SM		SM		RECENT FILL (Fill) – 0.0 to 0.2 ft. <u>FILL - SILTY SAND, SM</u> Soil
MW-09-22B was drilled and continuously sampled on														Fill	graded dirt road, with grass, and roots.
10/22/2009 about five feet to the south from the MW-09-22.	5-	90									2	17.8	217.8		<ul> <li>0.2 to 0.4 ft. <u>ASPHALT</u></li> <li>0.4 to 57.5 ft.</li> </ul>
PURPOSE OF HOLE:		90													QUATERNARY ALLUVIUM (Qal)
To recover core, collect data to determine geologic and hydrologic site conditions, and install a groundwater monitoring well. DRILLED BY:	-		-												<ul> <li>0.4 to 4.9 ft. <u>SILTY SAND, SM</u>: About 65% fine to coarse sand; about 30% non-plastic fines with rapid dilatancy; about 5% fine, hard to very hard, round to subrounded gravel; maximum size: 1/2 inches; dry, light brown, no reaction with HCI; very soft consistency.</li> </ul>
USGS Drill Crew James Huckaby, Driller Jim Rauman, Helper	-		27.3	6.9	34.2	65.2	0.6	NP	NP	3.2	SM		SM		Laboratory Data Interval     0.4 to 4.9 ft.
Sam Cummings, Helper DRILL RIG:	10—	82													4.9 to 11.9 ft. <u>SILTY SAND, SM</u> : About 85% fine to coarse sand (mostly fine to
CME-550 DRILLING & SAMPLING	-	-													<ul> <li>medium); about 15% non-plastic fines with</li> <li>rapid dilatancy; maximum size: coarse sand;</li> <li>drv. brown, no reaction with HCl: very soft</li> </ul>
METHODS: Drill hole DH-08-22 was advanced	_	-									2	10.8	210.8	-	consistency.
using hollow stem flight augers (FADC) and a pilot bit from the	_		1												<u>Laboratory Data Interval</u> 4.9 to 11.9 ft.
ground surface to a total depth of 57.5 feet. FADC uses 7-5/8-inch O.D., 4-1/4-inch I.D. hollow stem	_	76													11.9 to 22.6 ft. POORLY GRADED GRAVEL WITH SAND, (GP)s: About 50%
augers and a tri-cone pilot bit.	15-														fine to coarse, hard to very hard, round to subrounded gravel; about 45% fine to coarse
Interval Method 0.0 to 57.5 ft FADC with pilot bit Drill hole DH-08-22B was advanced	-	72													sand; about 5% non-plastic fines with rapid dilatancy; maximum size: 2.5 inches; dry, light brown, no reaction with HCl; very soft consistency.
using hollow stem flight augers with continuous dry core sampling system (FADC) from the ground surface to a total depth of 57.5 feet.	-		6.5	1.9	8.4	40.2	51.4	NP	NP	1.7	(GP-GM)	S	(GP)s		<ul> <li><u>Laboratory Data Interval</u></li> <li>11.9 to 22.6 ft.</li> </ul>
FADC uses 7-5/8-inch O.D., 4-1/4-inch I.D. hollow stem augers,	-	1													22.6 to 27.5 ft. <u>SANDY SILT, s(ML)</u> : About 60% fines with low plasticity, toughness and
with a 5-foot-long, 3-inch I.D. split sample barrel.	-	1													<ul> <li>dry strength, and slow dilatancy; about 40% fine to coarse sand (mostly fine and medium); maximum size: coarse sand: moist to wet.</li> </ul>
Interval Method 0.0 to 57.5 ft FADC	20-	40													brown, no reaction with HCl; very soft to soft consistency.
DRILLING CONDITIONS AND DRILLER'S COMMENTS:														Qal	
MW-09-22 0.0 to 52.5 ft blind drilled											2	00.1	200.1	-	27.5 to 32.5 ft. <u>SILT, ML</u> : About 90% fines with low plasticity, toughness and dry
52.5 to 57.5 ft pilot bit temporarily stuck in augers	-	1													strength, and rapid dilatancy; about 10% fine sand; maximum size: fine sand; moist to wet,
MW-09-22B 0.0 to 22.5 ft smooth drilling	-														<ul> <li>brown, no reaction with HCI; very soft to soft consistency.</li> </ul>
22.5 to 27.5 ft cobble encountered 27.5 to 42.5 ft smooth drilling 42.5 to 52.5 ft core dropped out of	25-	100	50.8	13.1	63.9	36.1	0.0	20.5	4.3	18.5	s(CL-ML)		s(ML)		Laboratory Data Interval 27.5 to 32.5 ft.
sample barrel 52.5 to 57.5 ft smooth drilling															32.5 to 42.5 ft. <u>SILT WITH SAND, (ML)s</u> : About 85% fines with low plasticity, toughness
		<u> </u>									1	95.2	195.2		<ul> <li>and dry strength, and rapid dilatancy; about 15% fine sand; maximum size: fine sand; moist to wet, brown, no reaction with HCl;</li> </ul>
	-	1													very soft to soft consistency.
	-	1													_
COMMENTS: FADC = Fligh HSA = Hollov NP = Non-pla NR = No Rec NA = Not app G.S. = Grour	w Ster astic covery plicabl	n Aug , le		)		1	1	1			Co	omple	etion Diagram. \	Nell de	s provided in attached Well welopment information is ng Well Development form.
b.g.s. = Belov T.O.C. = Top	w the	groun		ace											
	-	-	-												SHEET 1 OF 2 DRILL HOLE MW-09-22

FEATURE: Groundwater Monitoring LOCATION: Reach 1B, River Bank Left, Fresno County BEGUN: 10/22/09 FINISHED: 10/22/09 DEPTH AND ELEVATION OF WATER LEVEL

AND DATE MEASURED: NA

PROJECT: San Joaquin River Restoration Project COORDINATES: N 2,183,840.4 E 6,252,462.2 (NAGD83) TOTAL DEPTH: 57.5 ft.

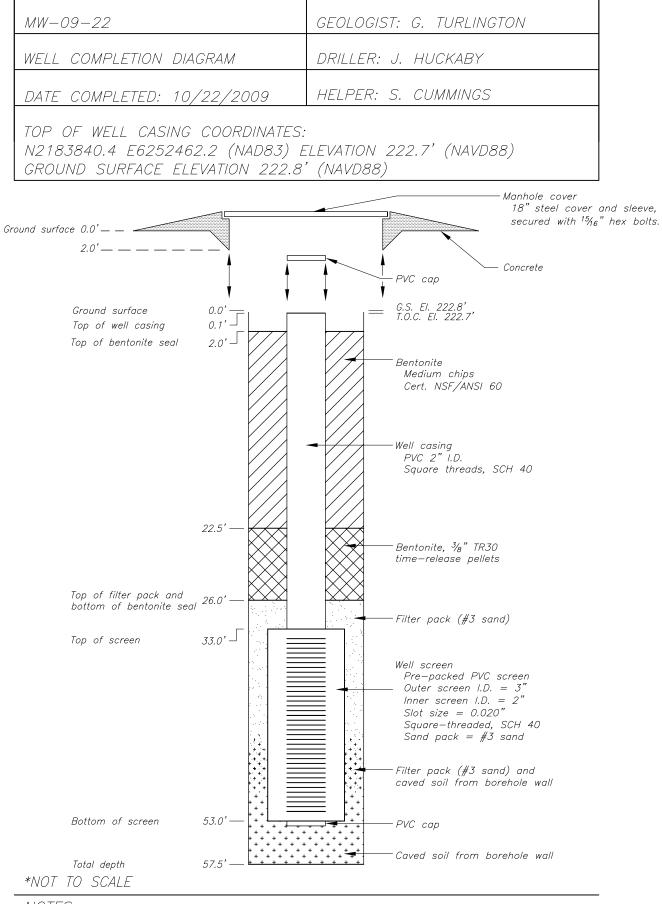
STATE: California

GROUND SURFACE ELEVATION: 222.8 ft. (NAVD88) T.O.C ELEVATION: 222.73 ft. (NAVD88)

HOLE LOGGED BY: G. Turlington

REVIEWED BY: J. Vauk

			-			LABO		ORY	DATA	<u>م</u>	1	R√ ION	/	NOI	/	Ę		
NOTES		DEPTH	% CORE RECOVERY	% SILT	% CLAY	% FINES	% SAND	% GRAVEL	LIQUID LIMIT	PLASTICITY INDEX	MOISTURE CONTENT %	LABORATORY CLASSIFICATION	ELEVATION	VISUAL CLASSIFICATION	ELEVATION	GEOLOGIC UNIT SYMBOL		CATION AND _ CONDITION
DRILL FLUID, RETURN AND	D				_	-	-										42.5 to 57.1 ft. POO WITH SILT, SP/SM:	RLY GRADED SAND
<u>MW-09-22</u> 0.0 to 57.5 ft None 57.5 ft Water was used to fi before pilot bit was retracted a during well installation.		_	100	75.3	13.3	88.6	11.4	0.0	NP	NP	23.7	ML	190.2	ML	190.2		coarse sand; about rapid dilatancy; trace hard, subrounded gr inches; moist, brown very soft consistency	10% non-plastic fines wit e of fine, hard to very avel; maximum size: 1/2 , no reaction with HCl; /.
<u>/W-09-22B</u> 0.0 to 27.5 ft None 17.5 to 57.5 ft Water, no rei	turn	_														-	Laboratory Data 42.5 to 57.1 ft. 57.1 to 57.5 ft. LEA	N CLAY WITH SAND,
VATER LEVEL: Not Recorded	3	35-	100														<ul> <li>(CL)s: About 85% fi plasticity, low toughr slow dilatancy; abou (mostly fine to mediu)</li> </ul>	ness and dry strength, t 15% fine to coarse san
REASON FOR HOLE FERMINATION: The drill holes were terminate upon successful completion to		_												(ML)s			coarse sand; moist, reaction with HCl; fir	reddish brown, no m consistency.
arget depths.		-															57.1 to 57.5 ft.	
HOLE COMPLETION:		+															T.D.	= 57.5 ft.
Well Casing - 0.1 to 33.0 ft. ( <sup>-</sup> El. 222.73 ft.)	4	40—	100															
Dual Pre-pack Screen - 33.0 t. (Slotted 0.020-inch) Vell Screen Filter Pack - #3 § Filter Pack - 26.0 to 57.5 ft. (# Sand and Native material cav	Sand #3	_																
Bentonite Seal - 2.0 to 26.0 ft Vell Protection - flush-mount 8-inch manhole (15/16-inch lexbolts)	t. Í	_													180.2			
<u>MW-09-22B</u> MW-09-22B was backfilled with the hole plug from 1.0 to the b.g.s. Drill cuttings were	to 57.5	15—	32															
backfilled the hole from grour grour surface to 1.0 feet b.g.s.																Qal		
		_																
		_																
	5	50-	0	6.1	4.6	10.7	87.5	1.8	NP	NP	22.5	SW-SM	I	SP/SM				
			-															
		_																
		_																
	5	55-	100															
		-																
		_		57.8	15.6	73.4	26.6	0.0	33.8	9.6	26.1	(ML)s	165.6 165.2	(CL)s	165.6 165.2	-	-	
								В	οττοι	M OF H	HOLE							
HSA NP = NR = NA = G.S.	C = Flight A = Hollow S Non-plasti No Recov Not applic = Ground s	Stem ic very cable surfa	Augo e ace	er								(	Compl	etion Dia	gram. V	Vell dev	provided in attached elopment informatior g Well Development	n is
	. = Below t C. = Top of				ace													



NOTES:

T.O.C. = Top of well casing, I.D. = Inner Diameter, G.S. = Ground Surface, EI. = Elevation Sand backfills the well above the top of bentonite seal, inside the manhole.

FEATURE: Groundwater Monitoring LOCATION: Reach 1B, River Bank Left, Fresno County BEGUN: 10/21/09 FINISHED: 10/22/09 DEPTH AND ELEVATION OF WATER LEVEL PROJECT: San Joaquin River Restoration Project COORDINATES: N 2,184,135.4 E 6,252,440.0 (NAGD83) TOTAL DEPTH: 37.5 ft. STATE: California

GROUND SURFACE ELEVATION: 210.6 ft. (NAVD88) T.O.C ELEVATION: 210.48 ft. (NAVD88) HOLE LOGGED BY: G. Turlington REVIEWED BY: J. Vauk

SHEET 1 OF 2

AND DATE MEASURED: 10.5 ft. (El. 199.98 ft.) 10/21/2009

AND DATE MEASURED: 10.5	1. (E.		1	0/21/2												VED BY: J. Vauk
						ORAT					ORY ∧TION		TION		TINL	CLASSIFICATION AND
NOTES	DEPTH	% CORE RECOVERY	% SILT	% CLAY	% FINES	% SAND	% GRAVEL	LIQUID LIMIT	PLASTICITY INDEX	MOISTURE CONTENT %	LABORATORY CLASSIFICATION	ELEVATION	VISUAL CLASSIFICATION	ELEVATION	GEOLOGIC UNIT SYMBOL	PHYSICAL CONDITION
ALL MEASUREMENTS ARE IN FEET FROM THE GROUND SURFACE	_		22.4	3.8	26.2	73.0	0.8	NP	NP	0.5	SM		SM			SOIL DESCRIPTIONS CHARACTERIZE SAMPLES FROM DRILL HOLE MW-09-23B.
MW-09-23 was drilled and completed as a well on 10/02/2009 using hollow stem flight augers and	_	100		0.0	20.2	10.0	0.0			0.0		208.3		208.3		0.0 to 37.5 ft. QUATERNARY ALLUVIUM (Qal)
a pilot bit. MW-09-23B was drilled, continuously sampled, and completed as a well on 10/21/2009 about five feet to the west from MW-09-23. PURPOSE OF HOLE:																<ul> <li>0.0 to 2.2 ft. <u>SILTY SAND, SM</u> About 85% medium sand; about 15% non-plastic fines</li> <li>with rapid dilatancy; trace of fine, hard to very hard, rounded to subrounded gravel; maximum size: 1/2 inches; dry, tan, no reaction with HCl; soft consistency; material has been disturbed by road grading, and soil contains landscaping bark from 0.0 to 0.1 feet of depth.</li> </ul>
To recover core, collect data to determine geologic and hydrologic site conditions, and install a groundwater monitoring well.		20	3.2	0.9	4.1	25.9	70.0	NP	NP	1.5	(GW)s		(GP)s			Laboratory Data Interval 0.1 to 2.2 ft.
DRILLED BY: USGS Drill Crew James Huckaby, Driller Jim Rauman, Helper Sam Cummings, Helper	-		-													2.2 to 9.0 ft, <u>POORLY GRADED GRAVEL</u> <u>WITH SAND, (GP)s</u> : About 70% fine to coarse (mostly coarse), hard to very hard, rounded to subrounded gravel; about 25% fine to coarse sand; about 5% non-plastic fines; maximum size: 3 inches; dry, light brown; no reaction with HCl; very soft
DRILL RIG: CME-550 DRILLING & SAMPLING	-	48										201.5		201.5		consistency. <u>Laboratory Data Interval</u> 2.2 to 9.0 ft.
METHODS: Drill hole DH-09-23 was advanced using hollow stem flight augers (FADC) and a pilot bit from the ground surface to a total depth of 37.0 feet. FADC uses 7-5/8-inch O.D., 4-1/4-inch I.D. hollow stem augers and a tri-cone pilot bit.	10— — —	16	5.6	2.3	7.9	66.9	25.2	NP	NP	7.0	10.5 ft. (El. (SW-SI	199.98 ft.)	(SP)g		Qal	<ul> <li>9.0 to 13.5 ft. POORLY GRADED SAND <u>WITH GRAVEL. (SP)g</u>: About 80% fine to coarse sand; about 15% fine to coarse (mostly fine), hard to very hard, subrounded to rounded gravel; about 5% non-plastic fines; maximum size: 1/2 inches; moist to wet, light brown, no reaction with HCl; very soft consistency.</li> </ul>
Interval Method 0.0 to 37.0 ft FADC with pilot bit	-															Laboratory Data Interval - 0.9 to 13.5 ft.
Drill hole DH-09-23B was advanced using hollow stem flight augers with continuous dry core sampling system (FADC) from the ground surface to a total depth of 37.5 feet. FADC uses 7-5/8-inch I.D., 4-1/4-inch hollow stem augers, with a 5-foot-long, 3-inch I.D. split sample barrel.	 15	12										197.0		197.0		<ul> <li>13.5 to 21.5 ft. <u>POORLY GRADED</u></li> <li><u>GRAVEL WITH SAND, (GP)</u>s:About 60% fine to coarse, hard to very hard, rounded to subrounded gravel; about 35% fine to coarse sand; about 5% fines; maximum size: 3.5 inches; wet, light brown, no reaction with HCI; very soft consistency.</li> </ul>
Interval Method 0.0 to 37.5 ft FADC	-	32														Laboratory Data Interval 13.5 to 21.5 ft.
DRILLING CONDITIONS AND DRILLER'S COMMENTS: <u>MW-09-23</u> 0.0 to 37.0 ft blind drilled 37.0 ft material sluffed into open hole while retracting pilot bit, bottom 10 feet was drilled again and a full water column was maintained while pilot bit was retracted. <u>MW-09-22B</u>	_  20_	62	2.0	0.4	2.4	19.3	78.3	NP	NP	4.2	(GP)s		(GP)s			<ul> <li>21.5 to 22.8 ft. <u>SILTY SAND, SM</u>: About 55% fine to coarse sand (mostly medium to coarse); about 45% non-plastic fines; trace of fine, hard to very hard, rounded to subrounded gravel; maximum size: 1/2 inches: wet, dark brown, no reaction with HCl; very soft consistency.</li> <li><u>Laboratory Data Interval</u> 21.5 to 22.8 ft.</li> <li>22.8 to 24.0 ft. <u>LEAN CLAY, CL</u>: About 90% fines with low plasticity, dry strength, and</li> </ul>
0.0 to 15.0 ft moderately rough drilling 15.0 to 17.5 ft rough drilling, material stuck in shoe	-											189.0		189.0		<ul> <li>toughness, and slow dilatancy; about 10% fine sand; maximum size: fine sand; wet, brown, no reaction with HCl; firm consistency.</li> </ul>
17.5 to 21.5 ft moderately rough drilling 21.5 to 37.5 ft smooth drilling			35.9	6.4	42.3	56.4	1.3	NP	NP	21.3	SM	187.7	SM	187.7		Laboratory Data Interval 22.8 to 24.0 ft.
		100	54.5	38.4	92.9	7.1	0.0	NP	NP	26.9	ML	186.5	CL	186.5		
COMMENTS: FADC = Fligh HSA = Hollow NP = Non-pla	w Sten astic	n Aug		9						Well		pment	informati			n attached Well Completion Diagram. d in attached Monitoring Well
NR = No Rec NA = Not app G.S. = Grour b.g.s. = Belo T.O.C. = Top	olicabl nd surf w the	e face groun		ace						TOC		inates:	= N 2184 = 210.6			2446.1 (NAGD83) El. 210.53 (NAVD88)
1.0.0. = Top	U WE	an cas	шy													SHEET 1 OF 2 DRILL HOLE MW-09-23

FEATURE: Groundwater Monitoring LOCATION: Reach 1B, River Bank Left, Fresno County BEGUN: 10/21/09 FINISHED: 10/22/09 DEPTH AND ELEVATION OF WATER LEVEL PROJECT: San Joaquin River Restoration Project COORDINATES: N 2,184,135.4 E 6,252,440.0 (NAGD83) TOTAL DEPTH: 37.5 ft. STATE: California

GROUND SURFACE ELEVATION: 210.6 ft. (NAVD88) T.O.C ELEVATION: 210.48 ft. (NAVD88) HOLE LOGGED BY: G. Turlington REVIEWED BY: J. Vauk

AND DATE MEASURED: 10.5 ft. (El. 199.98 ft.) 10/21/2009

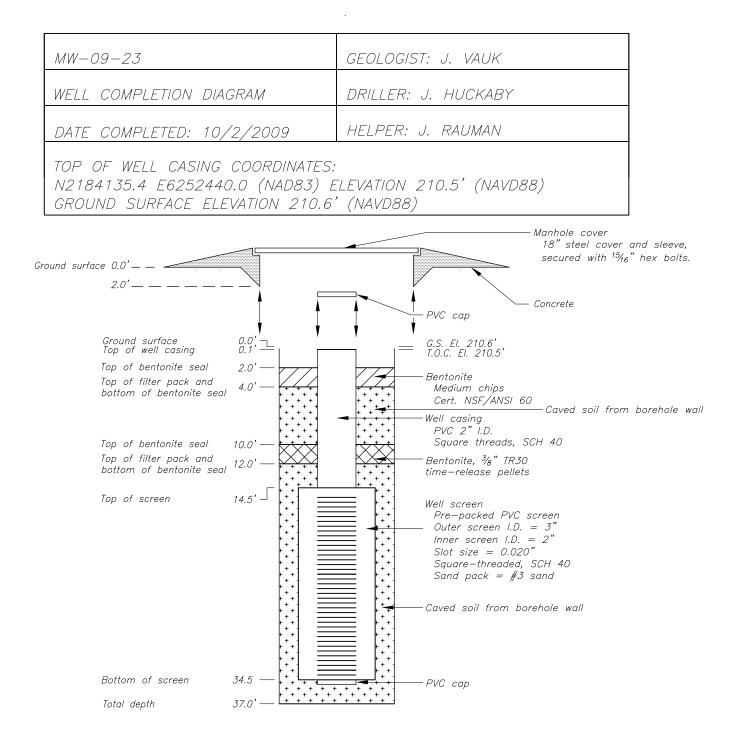
					LAB	ORAT	ORY	DATA	4		₹۲ ION		NOI		μ	
NOTES	DEPTH	۲. ۲.						ΜΙ	≧	T%	RATOF FICAT	/ z	ILAL FICAT	/z	Ser UN	CLASSIFICATION AND
	DE	% CORE RECOVERY	SILT	% CLAY	% FINES	% SAND	% GRAVEL	LIQUID LIMIT	PLASTICITY INDEX	MOISTURE CONTENT %	LABORATORY CLASSIFICATION	ELEVATION	VISUAL	ELEVATION	GEOLOGIC UNIT SYMBOL	PHYSICAL CONDITION
		RE%	%	) %	8	%	%	LIC	2-	80 80	- <u>-</u> ,		<u></u>	EL	В	
DRILL FLUID, RETURN AND COLOR:																24.0 to 32.8 ft. <u>SILTY SAND, SM</u> : About 80% fine to medium sand; about 20% non-plastic fines with rapid dilatancy;
<u>MW-09-23</u> 0.0 to 37.0 ft None	25-															maximum size: medium sand; wet, no reaction with HCl; soft consistency.
37.0 ft Water added to retract pilot bit and install well, no return	-	80														<ul> <li><u>Laboratory Data Interval</u></li> <li>24.0 to 32.8 ft.</li> </ul>
<u>MW-09-23B</u> 0.0 to 10.0 ft None																<ul> <li>– 32.8 to 37.5 ft. <u>POORLY GRADED SAND</u>,</li> </ul>
10.0 to 37.5 ft Water, no return.			-													<b>SP:</b> About 95% fine to coarse sand; about 5% non-plastic fines with rapid dilatancy;
WATER LEVEL: Not Recorded	-	1	10.3	2.5	12.8	84.2	3.0	NP	NP	13.9	SM		SM			trace of fine, hard to very hard, rounded to subrounded gravel; maximum size: 1/2 inches; moist, brown, no reaction with HCI,
REASON FOR HOLE TERMINATION:	-	-											-			soft consistency.
The drill holes were terminated upon successful completion to the		100														T.D. = 37.5 ft.
target depths.	30-	100														Γ
<u>MW-09-23</u>	-	-													Qal	_
Well Casing - 0.1 to 14.5 ft. (T.O.C. El. 210.48 ft.)	_															_
Dual Pre-pack Screen - 14.5 to 34.5 ft. (Slotted 0.020-inch) Well Screen Filter Pack - #3 Sand												177.7		177.7		
Filter Pack - 12.0 to 37.0 ft. (Native material caved)	-	1														-
Bentonite Seal - 10.0 to 12.0 ft. Backfill - 4.0 to 10.0 ft. (Native material caved)	-	-														_
Backfill - 2.0 to 4.0 ft. (Bentonite) Well Protection - flush-mounted	35-	64														
18-inch manhole (15/16-inch hexbolts)			52.9	18.9	71.8	28.2	0.0	NP	NP	24.5	(ML)s		SP			
<u>MW-09-23B</u> Well Casing - 0.1 to 12.0 ft. (T.O.C.	-	-														-
El. 210.53 ft.) Dual Pre-pack Screen - 12.0 to 22.0	-	-														_
ft. (Slotted 0.020-inch) Well Screen Filter Pack - #3 Sand Filter Pack - 9.0 to 22.0 ft. (#3 Sand)	L						E	вотто	M OF H	HOLE		173.0		173.0		
Bentonite Bottom Seal - 22.0 to 37.5 ft. (Bentonite and Native material																
caved) Bentonite Seal - 2.0 to 9.0 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.

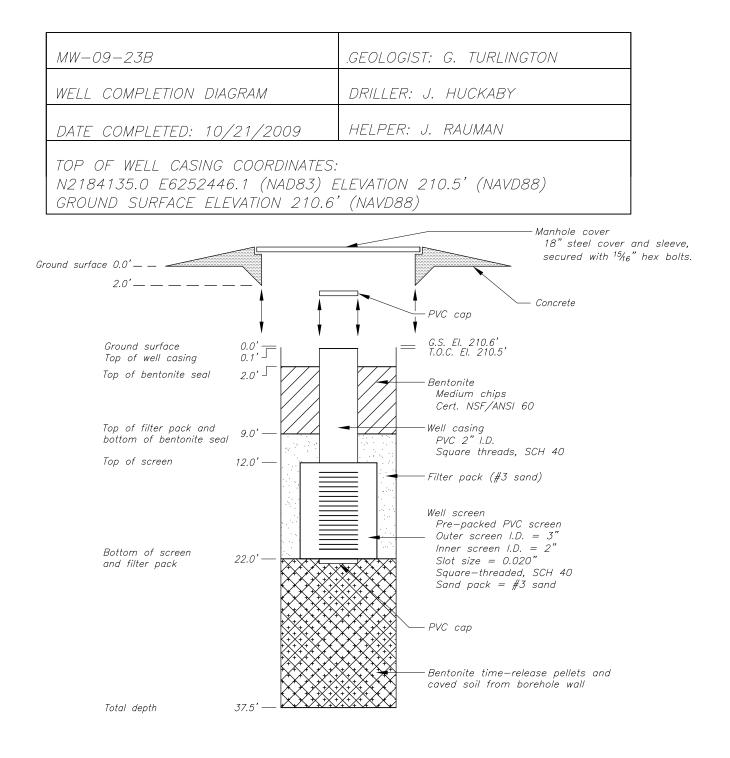
MW-09-23B

TOC Coordinates= N 2184135.0 E 6252446.1 (NAGD83) El. 210.53 (NAVD88) Groundsurface El.= 210.6 (NAVD88)



\*NOT TO SCALE

NOTES: T.O.C. = Top of well casing, I.D. = Inner Diameter, G.S. = Ground Surface, EI. = Elevation Well was advanced with a pilot bit from 0.0' to 37.0'. Caving problems at bottom during center rod pull and at top 8' to 12'. Sand backfills the well above the top of bentonite seal, inside the manhole.



#### \*NOT TO SCALE

NOTES: T.O.C. = Top of well casing, I.D. = Inner Diameter, G.S. = Ground Surface, EI. = Elevation Sand backfills the well above the top of bentonite seal, inside the manhole.

FEATURE: Groundwater Monitoring LOCATION: Reach 1B, River Bank Right, Madera County BEGUN: 10/1/09 FINISHED: 10/1/09 DEPTH AND ELEVATION OF WATER LEVEL

AND DATE MEASURED: 26.8 ft. (El. 198.10 ft.) 10/1/2009

PROJECT: San Joaquin River Restoration Project COORDINATES: N 2,184,611.9 E 6,252,453.4 (NAGD83) TOTAL DEPTH: 47.0 ft. STATE: California

GROUND SURFACE ELEVATION: 224.9 ft. (NAVD88) T.O.C ELEVATION: 224.9 ft. (NAVD88) HOLE LOGGED BY: G. Turlington

REVIEWED BY: J. Vauk

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						DRAT	UKY	UATA	<b>،</b> ا		NUN /	LION	/	Ц	
NOTES	DEPTH	۲ ۳					Ш	IMIT	È	R T %	ON	FICA	vo	SC U	CLASSIFICATION AND
	DE	% CORE RECOVERY	% SILT	% CLAY	% FINES	% SAND	% GRAVEL	LIQUID LIMIT	PLASTICITY INDEX	MOISTURE CONTENT %	LABORATORY CLASSIFICATION ELEVATION	VISUAL CLASSIFICATION	ELEVATION	GEOLOGIC UNIT SYMBOL	PHYSICAL CONDITION
ALL MEASUREMENTS ARE IN FEET FROM THE GROUND SURFACE.	_	95									/	(SM)g		Fill	0.0 to 1.8 feet RECENT FILL (Fill)
PURPOSE OF HOLE:													223.1		0.0 to 1.8 ft. FILL - SILTY SAND WITH GRAVEL, (SM)g: About 45% fine to coarse
To recover core, collect data to determine geologic and hydrologic site conditions, and install a groundwater monitoring well.	-	-										SM	221.6		sand (mostly fine to medium); about 35% non-plastic fines with rapid dilatancy; about 20% fine to coarse, subrounded to subangular gravel; maximum size: 1 inch; dry, light brown,
DRILLED BY: USGS Drill Crew James Huckaby, Driller	-	100										ML	220.7	-	no reaction with HCI; soft consistency; soil is a combination of native soil and road base material.
Jim Rauman, Helper	5-	1													
DRILL RIG: CME-550	-	1													– QUATERNARY ALLUVIUM (Qal)
DRILLING & SAMPLING METHODS: Drill hole MW-09-25 was advanced using hollow stem flight augers with continuous dry core sampling system (FADC) from the ground surface to a total depth of 47.0 feet.	-	100	36.7	11.7	48.4	51.6	0.0	21.1	3.5	11.5	SM	s(ML)			<ul> <li>1.8 to 3.3 ft. <u>SILTY SAND, SM</u>: About 55% fine to coarse sand (mostly fine to medium); about 35% non-plastic fines with rapid</li> <li>dilatancy; about 10% fine, hard, subrounded gravel; maximum size: 1/2 inches; dry, reddish-brown, no reaction with HCl; soft</li> <li>consistency.</li> </ul>
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.	10	-									213.4		213.4	•	3.3 to 4.2 ft. <u>SILT, ML</u> : About 90% fines with low plasticity, toughness, and dry strength, and rapid dilatancy; about 10% fine sand; maximum size: fine sand; dry, light gray, strong reaction with HCl; firm consistency.
Interval Method 0.0 to 47.0 ft FADC	-		53.2	16.6	69.8	30.2	0.0	23.5	5.4	14.5	s(CL-ML) 212.2	s(ML)	212.2	-	4.2 to 11.5 ft. <u>SANDY SILT, s(ML)</u> : About 60% fines with low plasticity, toughness, and
DRILLING CONDITIONS AND DRILLER'S COMMENTS: 0.0 to 32.0 ft smooth drilling 32.0 to 37.0 ft encountered hard	-										212.2	(ML)s	212.2		<ul> <li>dry strength, and rapid dilatancy; about 40%</li> <li>fine to coarse sand; maximum size: coarse sand; dry, medium brown, no reaction with</li> <li>HCl; firm consistency.</li> </ul>
sand layer 37.0 to 47.0 ft smooth drilling	15-	94										-		-	Laboratory Data Interval 4.2 to 11.5 ft.
DRILL FLUID, RETURN AND COLOR: 0.0 to 27.0 ft None 27.0 to 47.0 ft Water, no return WATER LEVEL:	-	-	-											Qal .	<ul> <li>11.5 to 12.7 ft. <u>SANDY SILT, s(ML)</u>: About 55% fines with low plasticity, toughness, and dry strength, and rapid dilatancy; about 45% fine sand; maximum size: fine sand; dry, light brown, no reaction with HCl; soft consistency.</li> </ul>
26.8 ft. on b.g.s. 10/24/2009 at 10:00 AM	-	-												-	Laboratory Data Interval     11.5 to 12.7 ft.
REASON FOR HOLE TERMINATION: The hole was terminated upon successful completion to the target depth.	20-	70												•	12.7 to 14.1 ft. SILT WITH SAND, (ML)s: About 85% fines with low plasticity, toughness, and dry strength, and slow dilatancy; about 15% fine sand; maximum size: fine sand; dry, medium brown, no reaction with HCl; firm
HOLE COMPLETION: Well Casing - 0.0 to 26.5 ft. (T.O.C.			6.7	1.3	8.0	92.0	0.0	NP	NP	1.6	SP-SM	SM			consistency.
El. 224.89 ft.) Dual Pre-pack Screen - 26.5 to 46.5 ft. (Slotted 0.020-inch) Well Screen Filter Pack - #3 Sand Filter Pack - 26.0 to 47.0 ft. (Native material caved) Filter Pack - 23.5 to 26.0 ft. (#3	-														<ul> <li>14.1 to 28.2 ft. <u>SILTY SAND, SM</u>: About 85% fine to medium sand; about 15% non-plastic fines with rapid dilatancy; maximum size: fine sand; dry and wet from 26.8 to 28.2 feet of depth, light brown and light gray, no reaction with HCl; soft consistency.</li> </ul>
Sand) Bentonite Seal - 2.0 to 23.5 ft.	25—	46													Laboratory Data Interval 14.9 to 28.2 ft.
Well Protection - flush-mounted 18-inch manhole (15/16-inch hexbolts)	-										26.8 ft. (El. 198.10 ft.				<ul> <li>28.2 to 28.6 ft. <u>SILT, ML</u>: About 95% fines with low plasticity, toughness, and dry strength, and slow dilatancy; about 5% fine</li> <li>sand; maximum size: fine sand; dry, light gray, strong reaction with HCl; firm consistency.</li> </ul>
	-	1	60.3	34.4	94.7	5.3	0.0	30.4	5.9	15.0	196.7 ML 196.3		196.7 196.3		Laboratory Data Interval     28.2 to 28.6 ft.
	-	32													28.6 to 32.0 ft. <u>No Recovery</u>
COMMENTS: FADC = Fligh HSA = Hollow NP = Non-pla NR = No Rec NA = Not app G.S. = Groun	w Ster astic covery olicabl nd surf	n Aug le face	er								Comp	etion Diagi	ram. V	Vell de	s provided in attached Well evelopment information is ng Well Development form.
b.g.s. = Belov T.O.C. = Top				ace											SHEET 1 OF 2 DRILL HOLE MW-09-25

FEATURE: Groundwater Monitoring LOCATION: Reach 1B, River Bank Right, Madera County BEGUN: 10/1/09 FINISHED: 10/1/09 DEPTH AND ELEVATION OF WATER LEVEL PROJECT: San Joaquin River Restoration Project COORDINATES: N 2,184,611.9 E 6,252,453.4 (NAGD83) TOTAL DEPTH: 47.0 ft. STATE: California

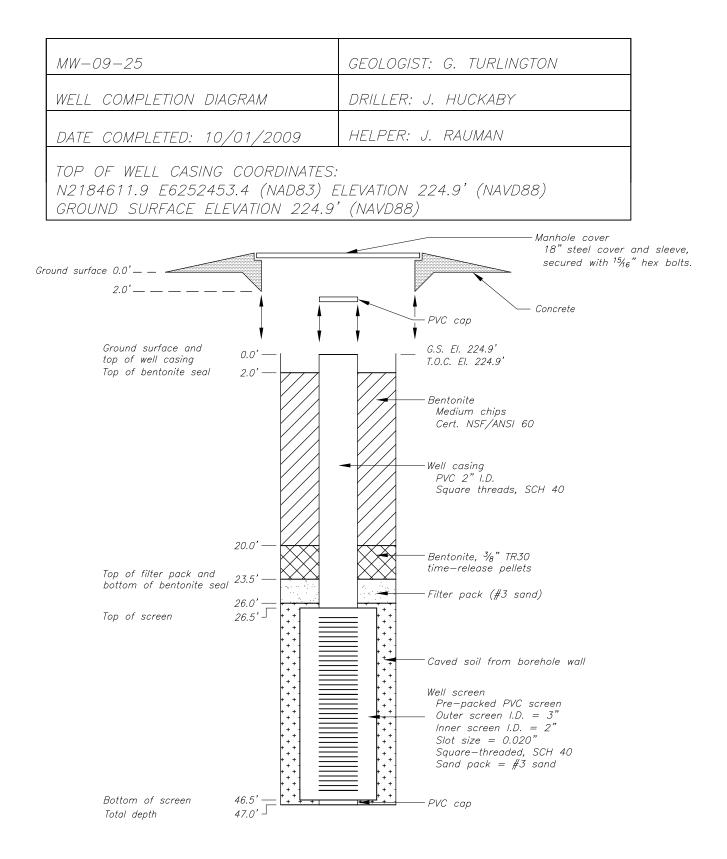
GROUND SURFACE ELEVATION: 224.9 ft. (NAVD88) T.O.C ELEVATION: 224.9 ft. (NAVD88) HOLE LOGGED BY: G. Turlington REVIEWED BY: J. Vauk

AND DATE MEASURED: 26.8 ft. (El. 198.10 ft.) 10/1/2009

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					LABO	ORAT	ORY	DATA	۹.		×NO		NO		F	
NOTES	DEPTH	2						ΜΤ	≿	ш%	ATOR	/ z	ICATI	/z	or C UN	CLASSIFICATION AND
NOTES	DEF	% CORE RECOVERY	5	% CLAY	% FINES	% SAND	% GRAVEL	LIQUID LIMIT	PLASTICITY INDEX	MOISTURE CONTENT %	LABORATORY CLASSIFICATION	ELEVATION	VISUAL	ELEVATION	GEOLOGIC UNIT SYMBOL	PHYSICAL CONDITION
		% (	% SILT	% C	% FI	S %	9 %	LIQL	PLA	MON	<u>קר</u>	ELE	G	ELE	GEO	
													NR			32.0 to 37.0 ft. POORLY GRADED SAND WITH SILT, SP/SM: About 90% fine to
	-	1														<ul> <li>medium sand; about 10% non-plastic fines with rapid dilatancy; maximum size: medium sand; wet, no reaction with HCI; soft</li> </ul>
	-													192.9		consistency;
	-														-	<ul> <li><u>Laboratory Data Interval</u></li> <li>32.0 to 37.0 ft.</li> </ul>
	-	24	7.6	0.0	7.6	92.4	0.0	NP	NP	19.6	SP-SM		SP/SM			<ul> <li>37.0 to 39.4 ft. <u>SILTY SAND, SM</u>: About 80% fine to coarse sand (mostly fine to</li> </ul>
	35-															<ul> <li>medium); about 20% non-plastic fines with rapid dilatancy; maximum size: coarse sand; wet, medium brown, no reaction with HCl; soft</li> <li>consistency.</li> </ul>
												187.9		187.9		Laboratory Data Interval
																<ul> <li>37.0 to 39.4 ft.</li> <li>39.4 to 47.0 ft. <u>SILT, ML</u>: About 90% fines</li> </ul>
		63	35.3	2.0	37.3	62.7	0.0	NP	NP	24.1	SM		SM		Qal	with low plasticity, toughness, and dry strength, and rapid dilatancy, about 10% fine
	-	1										185.5		185.5		<ul> <li>sand; maximum size: fine sand; moist, medium brown, no reaction with HCl; firm consistency.</li> </ul>
	40-															Laboratory Data Interval
	-	100														- 39.4 to 47.0 ft.
	-															- T.D. = 47.0 ft.
	-	-	75.3	10.6	85.9	14.1	0.0	22.2	1.8	25.9	ML		ML			_
	-	100														_
	45-	-														_
	-	-														-
							F	BOTTO				177.9		177.9		_
									01 1							

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.

SHEET 2 OF 2 DRILL HOLE MW-09-25



#### \*NOT TO SCALE

NOTES:

T.O.C. = Top of well casing, I.D. = Inner Diameter, G.S. = Ground Surface, EI. = Elevation Sand backfills the well above the top of bentonite seal, inside the manhole.

FEATURE: Groundwater Monitoring LOCATION: Reach 1B, River Bank Right, Madera County BEGUN: 9/29/09 FINISHED: 9/30/09 DEPTH AND ELEVATION OF WATER LEVEL

PROJECT: San Joaquin River Restoration Project COORDINATES: N 2,185,090.0 E 6,252,468.2 (NAGD83) TOTAL DEPTH: 57.5 ft.

STATE: California

GROUND SURFACE ELEVATION: 228.6 ft. (NAVD88) T.O.C ELEVATION: 228.54 ft. (NAVD88) HOLE LOGGED BY: G. Turlington REVIEWED BY: J. Vauk

SHEET 1 OF 3

AND DATE MEASURED: 33.3 ft. (El. 195.24 ft.) 9/30/2009

	-												/		
					LABO	ORAT	ORY	DATA	4		×NO	/		E	
	王	≻						Ę	≻	%	LABORATORY CLASSIFICATION	/ z	VISUAL CLASSIFICATION		CLASSIFICATION AND
NOTES	DEPTH	L H H	Ι.	≻	ŝ		VEL		NGT N	N.	SIFIC			SYMBOL	PHYSICAL CONDITION
		% CORE RECOVERY	SILT	CLAY	% FINES	SAND	% GRAVEL	LIQUID LIMIT	PLASTICITY INDEX	MOISTURE CONTENT %	LAB	ELEVATION	VISUA CLASSIFICA ELEVATION	SY	I III SICAL CONDITION
		°.₽	%	%	%	%	%	Ĕ	۲ ۲	žö	°/		<u> </u>	ÜÜ	
ALL MEASUREMENTS ARE IN FEET FROM THE GROUND													(SM)g 227.6		0.0 to 0.9 feet RECENT FILL (Fill)
SURFACE.	-	80											SP/SM	Fill	. ,
PURPOSE OF HOLE:	-												226.0		_ 0.0 to 0.9 ft. FILL - SILTY SAND WITH GRAVEL, (SM)g: About 40% fine to coarse
To recover core, collect data to determine geologic and hydrologic	-	-											(SM)g		<ul> <li>sand; about 40% fines low plasticity, toughness, and toughness, and rapid</li> </ul>
site conditions, and install a groundwater monitoring well.	-	-											224.4	-	_ dilatancy; about 20% fine to coarse (mostly fine), hard, subangular gravel; maximum size:
5	5-	84													2 inches; dry, light brown, no reaction with
DRILLED BY: USGS Drill Crew	_												s(ML)		HCl; firm consistency; roots; soil is a _ combination of native soil and road base
James Huckaby, Driller Jim Rauman, Helper			82.3	11.2	93.5	6.5	0.0	19.6	1.7	20.3	ML	221.3	222.0 ML 221.3		material.
DRILL RIG:	-		- 02.0		00.0	0.0	0.0	10.0		20.0		221.3	(ML)s & SM	-  [	 0.9 to 57.5 feet
CME-550	-	1											220.2	-  †	QUATERNARY ALLUVIUM (Qal)
DRILLING & SAMPLING	-	1													0.9 to 2.5 ft. POORLY GRADED SAND
METHODS: Drill hole MW-09-26 was advanced	10-	96													WITH SILT, SP/SM: About 85% fine to coarse sand; about 10% non-plastic fines with
using hollow stem flight augers with continuous dry core sampling	-	-	36.2	14.4	50.6	40.4	0.0	17.8	2.8	11.0	o(ML)		o(ML)		_ rapid dilatancy; about 5% fine, hard, subrounded gravel; maximum size: 1/4
system (FADC) from the ground	_		30.2	14.4	50.6	49.4	0.0	17.6	2.8	11.9	s(ML)		s(ML)		_ inches; dry, light brown, no reaction with HCI;
surface to a total depth of feet. FADC uses 7-5/8-inch O.D.,			-												soft consistency.
4-1/4-inch I.D. hollow stem augers, with a 5-foot-long, 3-inch I.D. split															2.5 to 4.1 ft. <u>SILTY SAND WITH GRAVEL</u> , (SM)g: About 70% fine to coarse sand
sample barrel.	-	1										214.2	(CL/ML)s 213.4		<ul> <li>(mostly fine to medium); about 15% non-plastic fines with rapid dilatancy; about</li> </ul>
Interval Method 0.0 to 57.5 ft FADC	15-	100											o(ML)		15% fine, hard, subrounded to subangular gravel; maximum size: 1.5 inches; dry, light
	-	1											212.5	-	brown, no reaction with HCl.
DRILLING CONDITIONS AND DRILLER'S COMMENTS:	-	-	11.4	4.3	15.7	84.3	0.0	NP	NP	3.4	SM		SM		4.1 to 6.5 ft. <u>SANDY SILT, s(ML</u> ): About
0.0 to 31.0 ft smooth drilling 31.0 to 47.5 ft encountered hard	-	-													55% non-plastic fines with rapid dilatancy; about 45% fine sand; maximum size: fine
clay, adjust shoe position 47.5 to 57.5 ft encountered very	-	-										209.8	209.8 s(ML) 209.4	1	_ sand; dry, light gray, no reaction with HCI; soft consistency.
hard clay, near refusal	20-	76											SM		,
DRILL FLUID, RETURN AND													207.7	Qal	6.5 to 7.2 ft. <u>SILT, ML</u> : About 95% fines with low plasticity, toughness, and dry
COLOR: 0.0 to 37.5 ft None															strength, and rapid dilatancy; about 10% fine sand; maximum size: fine sand; dry, light
37.5 to 57.5 ft Water, no return	-	<u> </u>	-												gray, no reaction with HCl; firm consistency.
WATER LEVEL: Not Recorded	-	1													<ul> <li><u>Laboratory Data Interval</u></li> <li>6.5 to 7.2 ft.</li> </ul>
REASON FOR HOLE	-	1													7.2 to 8.3 ft. INTERBEDDED SILT WITH
TERMINATION: The hole was terminated upon	25-	66	4.3	1.0	5.3	94.6	0.1	NP	NP	1.9	SP-SN	1	SP/SM		<ul> <li>SAND, (ML)s, AND SILTY SAND (SM)six laminations 0.1- to 0.5-inch-thick. (ML)s -</li> </ul>
successful completion to the target	-	1													<ul> <li>About 80% fines with low plasticity,</li> </ul>
depth.	-	-													toughness, and dry strength, and rapid dilatancy; about 20% fine sand; maximum
HOLE COMPLETION: Well Casing - 0.1 to 37.0 ft. (T.O.C.	-		1												size: fine sand; dry, light brown, no to weak reaction HCl soft consistency. SM - About
El. 228.54 ft.) Dual Pre-pack Screen - 37.0 to 57.0	-	-	<u> </u>									199.6	199.6	-	60% fine to medium (mostly fine) sand; about 40% non-plastic fines with rapid dilatancy;
ft. (Slotted 0.020-inch) Well Screen Filter Pack - #3 Sand	30-	84											SM 198.8	-	<ul> <li>maximum size: medium sand; dry, light</li> <li>brown, no to weak reaction with HCl; soft</li> </ul>
Filter Pack - 32.0 to 57.5 ft. (#3	<sup>-</sup> -												s(ML) 197.6	_	consistency.
Sand and Native material caved) Bentonite Seal - 1.8 to 32.0 ft.															8.3 to 14.3 ft. SANDY SILT, s(ML): About
Well Protection - flush-mounted 18-inch manhole (15/16-inch		<u> </u>	55.4	23.9	79.3	20.7	0.0	NP	NP	28.0	(ML)s	_	(ML)s		<ul> <li>60% fines with medium plasticity, low toughness, medium dry strength, and no</li> </ul>
hexbolts)	-	1							-		33.3 ft. (El	_ 195.2	195.2	-	<ul> <li>dilatancy; about 40% fine to medium sand; maximum size: medium sand; dry, medium</li> </ul>
	-	1											s(ML) 194.1	╡┟	<ul> <li>brown, no to strong reaction with HCI (calcium carbonate veins encountered from 11.0 to</li> </ul>
	35-	98													<ul> <li>12.5 ft.); firm consistency and very firm at calcium carbonate veins.</li> </ul>
	-	-											ML		_
	-	-											191.7	-	<ul> <li><u>Laboratory Data Interval</u></li> <li>8.3 to 14.3 ft.</li> </ul>
	-		77.2	20.0	97.2	2.8	0.0	29.2	6.7	29.4	ML		(CL/ML)s		_
												189.6	189.6		
COMMENTS: FADC = Fligh HSA = Hollow				9											s provided in attached Well evelopment information is
NP = Non-pla	astic														ng Well Development form.
NR = No Rec NA = Not app	olicab	le													
G.S. = Groun b.g.s. = Belo			d surf	ace											
T.O.C. = Top	of we	ell cas	ing												SHEET 1 OF 3 DRILL HOLE MW-09-26
															SHEET 1 01 3 DIVILETIOLE WW-09-20

FEATURE: Groundwater Monitoring LOCATION: Reach 1B, River Bank Right, Madera County BEGUN: 9/29/09 FINISHED: 9/30/09 DEPTH AND ELEVATION OF WATER LEVEL

PROJECT: San Joaquin River Restoration Project COORDINATES: N 2,185,090.0 E 6,252,468.2 (NAGD83) TOTAL DEPTH: 57.5 ft.

STATE: California

GROUND SURFACE ELEVATION: 228.6 ft. (NAVD88) T.O.C ELEVATION: 228.54 ft. (NAVD88) HOLE LOGGED BY: G. Turlington REVIEWED BY: J. Vauk

AND DATE MEASURED: 33.3 ft. (El. 195.24 ft.) 9/30/2009

					LABC	ORAT	ORY	DATA	٩		≻S		NC		Ŧ	
	E	<u>≻</u>						ШТ	×	%	LABORATORY CLASSIFICATION		VISUAL	/ z	GEOLOGIC UNIT SYMBOL	CLASSIFI
NOTES	DEPTH	VER		≻	ŝ	Ģ	GRAVEL		E E E	ERE	ORA		VISU SIFIC	ATIO	MBC	PHYSICA
		% CORE RECOVERY	SILT	CLAY	FINES	% SAND	GRV	LIQUID LIMIT	PLASTICITY INDEX	MOISTURE CONTENT %	LAB CLAB	ELEVATION		ELEVATION	εοι	
	_	° ~	%	%	%	%	%		₫	≥o	<u> </u>	Ξ		Ξ	U	
	40-	80	42.8	3.3	46.1	53.9	0.0	NP	NP	27.6	SM		SM			(CL/ML)s: About 85
	10		42.0	3.5	40.1	55.9	0.0	INF		27.0	5101		-			plasticity, toughness rapid dilatancy; abou
	_											187.2		187.2		sand; maximum size medium brown, no re
	-															consistency.
	-															15.1 to 16.0 ft. <u>SAN</u>
	-	-	64.9	40.7	77.0	00.4	0.0	22.0	10	07.0	(ML)s		ML			<ul> <li>55% non-plastic fine about 45% fine to me</li> </ul>
	45-	98	64.9	12.7	77.6	22.4	0.0	23.6	1.6	27.6	(IVIL)5		IVIL			size: medium sand; reaction with HCI; so
	_															,
																16.0 to 18.7 ft. <u>SILT</u> 80% fine to medium
	_	<b></b>										181.0		181.0		<ul> <li>20% non-plastic fine maximum size: med</li> </ul>
	-														Qal	brown, no reaction w
	-		40.0	2.4	42.4	57.6	0.0	NP	NP	24.8	SM		SM			
	50-	54														16.0 to 18.7 ft.
	_											177.7		177.7		18.7 to 19.1 ft. <u>SAN</u>
													(0) (0)			<ul> <li>70% non-plastic fine about 30% fine to me</li> </ul>
	_		66.4	27.1	93.5	6.5	0.0	25.2	2.0	24.1	ML		(CL/ML)s			<ul> <li>size: medium sand; reaction with HCl; so</li> </ul>
	-											175.2		175.2		
	-															<ul> <li>19.1 to 20.8 ft. <u>SILT</u></li> <li>to 85% fine to mediu</li> </ul>
	55-	66														<ul> <li>fines with no to low p</li> <li>dry strength with rap</li> </ul>
	_		6.6	2.6	9.2	90.8	0.0	NP	NP	18.9	SP-SM		SM			size: medium sand;
																<ul> <li>reaction with HCl; so percentage decrease</li> </ul>
	-	1										171.0		171.0		 20.8 to 28.9 ft. POO

BOTTOM OF HOLE

## **ICATION AND AL CONDITION**

SHEET 2 OF 3

TY CLAY WITH SAND, 5% fines with medium ss, and dry strength, and out 15% fine to medium e: medium sand; dry, reaction with HCI; firm

**NDY SILT, s(ML):** About nes with rapid dilatancy; medium sand; maximum ; dry, light brown, no soft consistency.

TY SAND, SM: About m sand (mostly fine); about nes with rapid dilatancy; dium sand; dry, light with HCI; soft consistency.

a Interval

NDY SILT, s(ML): About nes with rapid dilatancy; medium sand; maximum ; dry, medium brown, no soft consistency.

TY SAND, SM: About 70 lium sand; about 15 to 30% v plasticity, toughness, and apid dilatancy; maximum ; dry, light brown, no soft consistency; sand ases with depth.

20.8 to 28.9 ft. POORLY GRADED SAND WITH SILT, SP/SM: About 90% fine to medium sand; about 10% non-plastic fines with rapid dilatancy; maximum size: medium sand; wet, banded light brown, off-white, and orange, no reaction with HCI; soft consistency.

Laboratory Data Interval 20.8 to 28.9 ft.

28.9 to 29.7 ft. SILTY SAND, SM: About 70% fine to medium sand; about 30% fines with low plasticity, toughness and dry strength, and rapid dilatancy; maximum size: medium sand; dry, no reaction with HCl; soft consistency.

29.7 to 30.9 ft. <u>SANDY SILT, s(ML)</u>: About 50% non-plastic fines with rapid dilatancy; about 50% fine to medium sand (mostly fine); maximum size: medium sand; dry, no reaction with HCI; firm consistency.

# 30.9 to 33.3 ft. <u>SILT WITH SAND, (ML)s</u>: About 80% fines with medium plasticity,

toughness and dry strength, and rapid dilatancy; about 20% fine sand; maximum size: fine sand; moist, medium brown, no to HCI; firm consistency.

Laboratory Data Interval 30.9 to 33.3 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.

FEATURE: Groundwater Monitoring LOCATION: Reach 1B, River Bank Right, Madera County BEGUN: 9/29/09 FINISHED: 9/30/09 DEPTH AND ELEVATION OF WATER LEVEL AND DATE MEASURED: 33.3 ft. (El. 195.24 ft.) 9/30/2009 PROJECT: San Joaquin River Restoration Project COORDINATES: N 2,185,090.0 E 6,252,468.2 (NAGD83) TOTAL DEPTH: 57.5 ft.

STATE: California GROUND SURFACE ELEVATION: 228.6 ft. (NAVD88) T.O.C ELEVATION: 228.54 ft. (NAVD88) HOLE LOGGED BY: G. Turlington REVIEWED BY: J. Vauk

# CLASSIFICATION AND PHYSICAL CONDITION

33.3 to 34.4 ft. SANDY SILT, s(ML): About 70% fines with low plasticity, toughness, and dry strength, and rapid dilatancy; about 30% fine sand; maximum size: fine sand; moist to wet, medium brown, no reaction with HCI; soft consistency.

34.4 to 36.8 ft. SILT, ML: About 95% fines with low plasticity, toughness, and dry strength, and rapid dilatancy; about 5% fine sand; maximum size: fine sand; moist, medium brown, no to HCl; firm consistency.

36.8 to 38.9 ft. <u>SILTY CLAY WITH SAND</u>, (<u>CL/ML)s</u>: About 85% fines with medium plasticity, toughness and dry strength, and rapid dilatancy; about 15% fine to medium sand; maximum size: medium sand; dry, medium brown, no reaction with HCl; firm consistency.

Laboratory Data Interval 36.8 to 38.9 ft.

38.9 to 41.3 ft. SILTY SAND, SM: About 55% fine sand; about non-plastic 45% fines with rapid dilatancy; maximum size: fine sand; wet, medium brown, no reaction with HCl; firm consistency.

Laboratory Data Interval 38.9 to 41.3 ft.

41.3 to 47.5 ft. SILT, ML: About 90% fines with medium plasticity, toughness and dry strength, and rapid dilatancy; about 10% fine sand; maximum size: fine sand; wet, medium brown, no to HCI; firm consistency; about 10% avpsum.

Laboratory Data Interval 41.3 to 47.5 ft.

47.5 to 50.8 ft. <u>SILTY SAND, SM</u>: About 55% fine sand; about 45% non-plastic fines with rapid dilatancy; maximum size: fine sand; wet, medium brown, no reaction with HCI; soft consistency.

Laboratory Data Interval 47.5 to 50.8 ft.

50.8 to 53.3 ft. <u>SILTY CLAY WITH SAND,</u> (CL/ML)s: About 85% fines with medium

plasticity, toughness, and dry strength, and slow dilatancy; about 15% fine sand; maximum size: fine sand; moist, medium brown, no reaction with HCI; firm consistency.

Laboratory Data Interval 50.8 to 53.3 ft.

53.3 to 57.5 ft. SILTY SAND, SM: About 85% fine to medium sand; about 15% non-plastic fines rapid dilatancy; maximum size: medium sand; moist, no reaction with HCI; soft consistency.

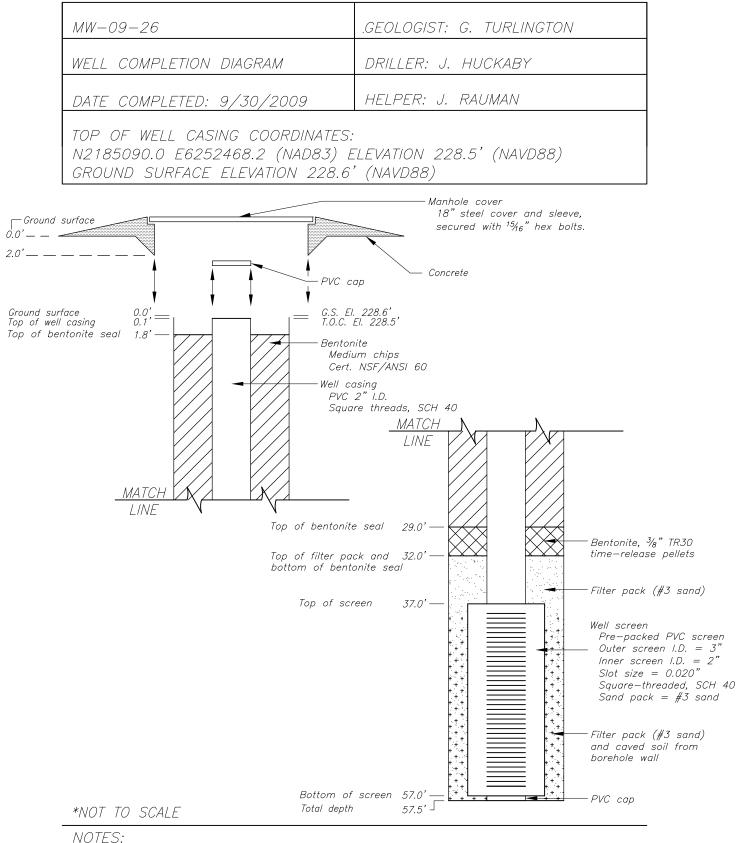
Laboratory Data Interval 53.3 to 57.5 ft.

T.D. = 57.5 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.

SHEET 3 OF 3 DRILL HOLE MW-09-26



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

Well is set on SM material at 57.5'. The screen interval is from about 57.0' to 37.0' below the ground surface. Screen interval is mostly through S(ML) and (ML)s material.

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

FEATURE: Groundwater Monitoring LOCATION: Reach 1B, River Bank Right, Madera County BEGUN: 9/28/09 FINISHED: 9/29/09 DEPTH AND ELEVATION OF WATER LEVEL PROJECT: San Joaquin River Restoration Project COORDINATES: N 2,185,701.8 E 6,252,474.6 (NAGD83) TOTAL DEPTH: 77.0 ft. STATE: California

GROUND SURFACE ELEVATION: 236.8 ft. (NAVD88) T.O.C ELEVATION: 236.77 ft. (NAVD88) HOLE LOGGED BY: J. Vauk REVIEWED BY: A. Warren

AND DATE MEASURED: 49.7 ft. (El. 187.07 ft.) 9/29/2009

AND DATE MEROORED. 43.7	n. (Ei	. 107.0	/ 11.) 3	/23/200	00											
					LABO	ORAT	ORY	DATA	Ą		×No		Z O	/	F	
NOTES	DEPTH	% CORE RECOVERY	% SILT	% CLAY	EINES	% SAND	% GRAVEL	LIQUID LIMIT	PLASTICITY INDEX	MOISTURE CONTENT %	LABORATORY CLASSIFICATION	ELEVATION	VISUAL	ELEVATION	GEOLOGIC UNIT SYMBOL	CLASSIFICATION AND PHYSICAL CONDITION
ALL MEASUREMENTS ARE IN FEET FROM THE GROUND SURFACE.		Ľ.	~	8	%	~	~		<u>م</u>	20		ш	SM	<u> </u>	0	0.0 to 2.1 feet RECENT FILL (Fill)
PURPOSE OF HOLE: To recover core, collect data to determine geologic and hydrologic site conditions, and install a groundwater monitoring well.	-	100											(SM)g	235.6	Fill	<ul> <li>0.0 to 1.2 ft. FILL - SILTY SAND, SM: About 70% fine to coarse sand (mostly fine to medium); about 20% non-plastic fines with rapid dilatancy; about 10% fine, hard, subangular to subrounded gravel; maximum size: 1/2 inches; dry, light brown, weak</li> </ul>
DRILLED BY: USGS Drill Crew James Huckaby, Driller	-													233.9	-	reaction with HCl; soft consistency; roots; material was disturbed by road graded. 1.2 to 2.1 ft. FILL - SILTY SAND WITH
Jim Rauman, Helper DRILL RIG: CME-550	-	-											(ML)s		-	GRAVEL, (SM)g: About 60% fine to coarse sand; about 20% non-plastic fines rapid dilatancy; about 20% fine, soft, angular gravel; maximum size: 1/2 inches; dry.
DRILLING & SAMPLING METHODS: Drill hole MW-09-27 was advanced	5-	94											2	231.7	-	<ul> <li>medium brown, no reaction with HCl; firm</li> <li>consistency; soil is a combination of native soil and road base material.</li> </ul>
using hollow stem flight augers with continuous dry core sampling system (FADC) from the ground	-	-											SM		-	2.1 to 77.0 feet QUATERNARY ALLUVIUM (Qal)
surface to a total depth of 77.0 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.	-												2	229.0	-	<ul> <li>2.1 to 2.9 ft. <u>SILTY SAND, SM</u>: About 85% fine to medium sand; about 15% non-plastic fines with rapid dilatancy; maximum size: medium sand; dry, light brown, no reaction</li> <li>with HCl; soft consistency.</li> </ul>
Interval Method 0.0 to 77.0 ft FADC																2.9 to 5.1 ft. <u>SILT WITH SAND, (ML)s</u> : About 85% fines with low plasticity,
DRILLING CONDITIONS AND DRILLER'S COMMENTS: 0.0 to 52.0 ft smooth drilling 52.0 to 57.0 ft encountered very	10-	100	62.4	35.3	97.7	2.3	0.0	23.3	4.5	25.8	CL-ML		CL/ML		-	<ul> <li>toughness, and dry strength, and rapid dilatancy; about 15% fine sand; maximum size: fine sand; moist, light brown, no reaction with HCl; firm consistency.</li> </ul>
hard clay layer 57.0 to 72.5 ft slow and smooth drilling 72.5 to 77.0 ft core barrel stuck	_											226.2	2	226.2	-	5.1 to 7.8 ft. <u>SILTY SAND, SM</u> : About 85% fine to medium sand; about 15% non-plastic fines with rapid dilatancy; maximum size:
DRILL FLUID, RETURN AND COLOR: 0.0 to 62.5 ft None	-												SP/SM 2 (ML)s2	224.9	Qal	medium sand; moist from 5.1 to 5.5 feet and dry from 5.5 to 7.5 feet, light brown, no reaction with HCl; soft consistency.
62.5 to 77.0 ft Water, no return WATER LEVEL: Not Recorded	-												SM 2	223.6	-	7.8 to 10.6 ft. <u>SILTY CLAY, CL/ML</u> : About 95% fines with medium plasticity, toughness, and dry strength, and no dilatancy; about 5% fine sand; maximum size: fine sand; moist, light gray, no reaction with HCI.
REASON FOR HOLE TERMINATION: The hole was terminated upon successful completion to the target	-	-	7.3	0.6	7.9	92.1	0.0	NP	ND	3.6	SD SM		SD/SM		-	<u>Laboratory Data Interval</u> 7.8 to 10.6 ft.
depth. HOLE COMPLETION: Well Casing - 0.0 to 50.0 ft. (T.O.C.	15—	90	7.5	0.0	1.5	32.1	0.0			3.0	SP-SM		SP/SM		-	10.6 to 11.9 ft. <u>POORLY GRADED SAND</u> <u>WITH SILT, SP/SM</u> : About 85% fine to coarse sand; about 10% non-plastic fines with rapid dilatancy; about 5% fine, hard,
El. 236.77 ft.) Dual Pre-pack Screen - 50.0 to 70.0 ft. (Slotted 0.020-inch)	-											221.1	2	21.1	-	subrounded gravel; maximum size: 1/4 – inches; dry, light brown, no reaction with HCl; soft consistency.
Well Screen Filter Pack - #3 Sand Filter Pack - 48.0 to 70.0 ft. (#3 Sand and native material) Bottom Bentonite Seal - 70.0 to 77.0	-		51.3	7.9	59.2	40.7	0.1	NP	NP	11.9	s(ML)	219.3			-	11.9 to 12.1 ft. <u>SILT WITH SAND. (ML)s</u> : About 80% fines with low plasticity, toughness, and dry strength, and rapid
ft. Bentonite Seal - 2.0 to 48.0 ft. Well Protection - flush-mounted 18-inch manhole (15/16-inch	-	-											s(ML)		-	dilatancy; about 20% fine sand; maximum size: fine sand; dry, light brown, no reaction with HCI; soft consistency.
hexbolts)	-	-													-	12.1 to 13.2 ft. <u>SILTY SAND, SM</u> : About 85% fine sand; about 15% non-plastic fines with rapid dilatancy; maximum size: fine sand; dry, banded light brown and orange, no reaction with HCl; soft consistency.
	20-	96											2	216.2		<ul> <li>13.2 to 15.7 ft. <u>POORLY GRADED SAND</u> <u>WITH SILT, SP/SM</u>: About 90 to 95% fine to medium (mostly fine) sand; about 5 to 10%</li> </ul>
COMMENTS: FADC = Fligh HSA = Hollow NP = Non-pla NR = No Rec NA = Not app G.S. = Groun b.g.s. = Below	w Ster astic covery blicabl nd sur w the	n Aug / le face groun	er d surf:								(	Compl	etion Diagra	am. W	/ell de	s provided in attached Well velopment information is ng Well Development form.
T.O.C. = Top	of we	ell cas	ng													SHEET 1 OF 4 DRILL HOLE MW-09-27

SHEET 1 OF 4

FEATURE: Groundwater Monitoring LOCATION: Reach 1B, River Bank Right, Madera County BEGUN: 9/28/09 FINISHED: 9/29/09 DEPTH AND ELEVATION OF WATER LEVEL PROJECT: San Joaquin River Restoration Project COORDINATES: N 2,185,701.8 E 6,252,474.6 (NAGD83) TOTAL DEPTH: 77.0 ft. STATE: California

GROUND SURFACE ELEVATION: 236.8 ft. (NAVD88) T.O.C ELEVATION: 236.77 ft. (NAVD88) HOLE LOGGED BY: J. Vauk REVIEWED BY: A. Warren

AND DATE MEASURED: 49.7 ft. (El. 187.07 ft.) 9/29/2009

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					LABO	ORAT	ORY	DATA	4		'ION		NOI		μ	
NOTES	DEPTH	Ш. К					Ē	TIMIT	Ĕ	AR 41%	RATO IFICAT	/ <u>v</u>	SUAL	NO	BOL U	CLASSIFICATION AND
	<sup>B</sup>	% CORE RECOVERY	% SILT	CLAY	FINES	SAND	GRAVEL	LIQUID LIMIT	PLASTICITY INDEX	MOISTURE CONTENT %	LABORATORY CLASSIFICATION		VISUAL	ELEVATION	GEOLOGIC UNIT SYMBOL	PHYSICAL CONDITION
	-	°`₽2	%	%	%	%	%	5	₫	Ξŏ	- 0		s(ML)		Ū	non-plastic fines with rapid dilatancy;
													. ,	14.9		maximum size: medium; dry, banded light brown, off-white, and orange, no reaction with
	-															<ul> <li>HCI; soft consistency.</li> <li>Laboratory Data Interval</li> </ul>
	-	-	61.9	10.1	72.0	28.0	0.0	20.1	2.4	18.9	(ML)s		s(ML)			13.2 to 15.7 ft.
																15.7 to 20.6 ft. <u>SANDY SILT, s(ML)</u> : About 50 to 60% fines with low plasticity, toughness, and dry strength, and rapid dilatancy; about
	-	1										212.7	2 SP/SM	12.7		40 to 50% fine to medium sand; maximum size: medium sand; dry, off-white, light brown
	25-	96	40.0	1.0	41.8	58.2	0.0	NP	NP	13.2	SM			12.0		and medium brown, no to weak reaction with HCl; firm consistency.
			40.0	1.8	41.8	58.2	0.0	NP	NP	13.2	SIVI	211.2	SM2	11.2		Laboratory Data Interval 15.7 to 17.5 ft.
																20.6 to 21.9 ft. <u>SANDY SILT, s(ML)</u> : About 65% fines with medium plasticity, toughness,
	-	-	6.2	0.6	6.8	93.1	0.1	NP	NP	1.5	SP-SI	M	SP/SM			<ul> <li>and dry strength, and slow dilatancy; about</li> <li>35% fine to medium sand; maximum size:</li> </ul>
			1													medium sand; dry, medium brown, strong reaction with HCl; firm consistency.
	-	1										208.6	2	08.6		21.9 to 24.1 ft. <u>SANDY SILT, s(ML)</u> : About 70% non-plastic fines with rapid dilatancy,
	-	-														<ul> <li>about 30% fine sand; maximum size: fine</li> <li>sand; dry, medium gray, no reaction with HCl; soft consistency.</li> </ul>
	30-	86											SM			Laboratory Data Interval 21.9 to 24.1 ft.
																24.1 to 24.8 ft. <u>POORLY GRADED SAND</u> WITH SILT, SP/SM: About 90% fine to
	-	1													Qal	medium sand (mostly fine); about 10% non-plastic fines with rapid dilatancy;
	_												2	205.0	Qai	maximum size: medium sand; dry, light gray and light brown, no reaction with HCI; soft
			-										SP/SM			consistency. 24.8 to 25.6 ft. <u>SILTY SAND, SM</u> : About
	-	1											2	03.6		<ul> <li>55% fine to medium sand (trace of medium); about 45% fines with no to low plasticity,</li> </ul>
	_												(ML)s			toughness, and dry strength, and rapid dilatancy; maximum size: medium sand; dry, light brown and light gray, no reaction with
													2	202.2		HCl; soft consistency.
	35-	100											s(ML)	01.5		Laboratory Data Interval 24.8 to 25.6 ft.
	_															25.6 to 28.2 ft. POORLY GRADED SAND WITH SILT, SP/SM: About 90% fine to
													(ML)s			coarse sand (trace of coarse); about 10% non-plastic fines with rapid dilatancy;
	-	-	<u> </u>										1	99.8		maximum size: coarse sand; dry, light brown, – no reaction with HCl; soft consistency.
	_		1													Laboratory Data Interval 25.6 to 28.2 ft.
																28.2 to 31.8 ft. <u>SILTY SAND, SM</u> : About 80% fine to medium sand (mostly fine); about
	-	-	32.1	4.4	36.5	63.5	0.0	NP	NP	11.0	SM		SM			<ul> <li>20% non-plastic fines with rapid dilatancy; maximum size: medium sand; dry, light brown, no reaction with HCl; soft consistency.</li> </ul>
	40-	96														_ 31.8 to 33.2 ft. POORLY GRADED SAND
																WITH SILT, SP/SM: About 90% fine to medium sand; about 10% non-plastic fines with rapid dilatancy; maximum size: medium
	-	1										195.5	1	95.5		<ul> <li>sand; dry, light brown, no reaction with HCl; soft consistency.</li> </ul>
																33.2 to 34.6 ft. <u>SILT WITH SAND, (ML)s</u> :
COMMENTS: FADC = Flig HSA = Hollo	w Stei			9								Compl	etion Diagra	am. W	/ell de	s provided in attached Well velopment information is
NP = Non-pl NR = No Re	covery											provide	ed in attach	ed Mo	onitori	ng Well Development form.
NA = Not ap G.S. = Grou b.g.s. = Belo	nd sur	face	d surf	ace												
T.O.C. = Top																SHEET 2 OF 4 DRILL HOLE MW-09-27

FEATURE: Groundwater Monitoring LOCATION: Reach 1B, River Bank Right, Madera County BEGUN: 9/28/09 FINISHED: 9/29/09 DEPTH AND ELEVATION OF WATER LEVEL

PROJECT: San Joaquin River Restoration Project COORDINATES: N 2,185,701.8 E 6,252,474.6 (NAGD83) TOTAL DEPTH: 77.0 ft.

STATE: California

GROUND SURFACE ELEVATION: 236.8 ft. (NAVD88) T.O.C ELEVATION: 236.77 ft. (NAVD88) HOLE LOGGED BY: J. Vauk REVIEWED BY: A. Warren

SHEET 3 OF 4

AND DATE MEASURED: 49.7 ft. (El. 187.07 ft.) 9/29/2009

	DEPTH				LABORATORY DATA				4				NOL	Ļ	
NOTES		п К	SILT	CLAY	FINES		GRAVEL	IMIT	Ĕ	MOISTURE CONTENT %	LABORATORY CLASSIFICATION		SUAL FICAT		CLASSIFICATION AND
		% CORE RECOVERY				SAND		LIQUID LIMIT	PLASTICITY INDEX			ELEVATION	VISUAL CLASSIFICATION ELEVATION	GEOLOGIC UNIT SYMBOL	PHYSICAL CONDITION
		<u>ي بر</u>	%	%	%	%	%	<u> </u>		žŭ	0		0/ ⊒	0	About 80% fines with medium plasticity,
															toughness, and low dry strength, and rapid dilatancy; about 20% fine sand; maximum
													SP/SM		<ul> <li>size: fine sand; dry, light brown, no reaction with HCl; soft consistency.</li> </ul>
	_	100						33.4					192.8	_	<b>34.6 to 35.3 ft. <u>SANDY SILT, s(ML)</u>:</b> About 70% fines with low plasticity, toughness, and
													ML		dry strength, and rapid dilatancy; about 30% fine sand; maximum size: fine sand; dry, light brown, no reaction with HCl; soft consistency.
	45-								6.1				191.8 SM		35.3 to 37.0 ft. <u>SILT WITH SAND. (ML)s</u> :
	-	-	67.5	22.7	90.2	9.8	0.0			24.7	ML		191.1 s(ML)		About 80% fines with medium plasticity, toughness, and low dry strength, and rapid dilatancy; about 20% fine sand; maximum size: fine sand; dry, light brown, no reaction with HCl; soft consistency.
					00.2	0.0	0.0		0.1			190.2	190.2 s(ML)		
															37.0 to 41.3 ft. <u>SILTY SAND, SM</u> : About
	-	-										Ľ	188.7		55% fine to medium sand (mostly fine); about 45% non-plastic fines with rapid dilatancy; maximum size: medium sand; moist, medium brown, no reaction with HCl; soft consistency.
	-		62.2	29.8	92.0	8.0	0.0	36.4	7.1	32.6	_		s(ML) 186.8		Laboratory Data Interval 37.0 to 41.3 ft.
	50-	100									49.7 ft. (E	l. 187.07 ft.) 186.8		_	<ul> <li>41.3 to 44.0 ft. <u>POORLY GRADED SAND</u></li> <li><u>WITH SILT, SP/SM</u>: About 90% fine to medium sand; about 10% non-plastic fines with rapid dilatancy; maximum size: medium sand; dry, light brown and off-white, no</li> </ul>
	-	1	51.4	2.9	54.3	45.7	0.0	NP	NP	31.1	s(ML)		(ML)s		<ul> <li>reaction with HCI; soft consistency.</li> </ul>
	_	-										184.6	184.6		44.0 to 45.0 ft. <u>SILT, ML</u> : About 90% fines with medium plasticity, toughness, and dry strength, and rapid dilatancy, about 10% fine
														Qal	sand; maximum size: fine sand; moist, light brown, no reaction with HCl; firm consistency.
	-	1											(ML)s		45.0 to 45.7 ft. <u>SILTY SAND, SM</u> : About 70 to 85% fine to medium sand; about 15 to 30%
	_	-											183.1		non-plastic fines with rapid dilatancy; maximum size: medium sand; dry, off-white
			24.9	6.2	31.1	68.9	0.0	NP	NP	29.4	SM	182.1	SM 182.1		and light brown, no reaction with HCl; soft consistency; increased percentage of medium sand with depth.
	55-	100	40.5	21.5	62.0	38.0	0.0	24.8	3.3	24.1	s(ML)	181.4	s(ML) 181.4	_	45.7 to 46.6 ft. <u>SANDY SILT, s(ML)</u> : About 70% non-plastic fines with rapid dilatancy; about 30% fine sand; maximum size: fine sand; moist, light brown, no reaction with HCI; soft consistency.
	_	-											SM		
													180.1		
							0.0						s(ML) 179.3		<u>Laboratory Data Interval</u> 45.7 to 46.6 ft.
	_														<b>46.6 to 48.1 ft. <u>SANDY SILT, s(ML</u>):</b> About 50% non-plastic fines with rapid dilatancy;
						30.2									about 50% fine sand; maximum size: fine sand; dry, off white, no reaction with HCl; soft consistency.
	-	1			69.8			NP							48.1 to 50.0 ft. <u>SANDY SILT, s(ML)</u> : About
	60— 1	100	53.2	16.6					NP	29.0	s(ML)				60% fines with low plasticity, toughness, and dry strength, and rapid dilatancy, about 40% fine sand; maximum size: fine sand; dry,
															medium brown, no reaction with HCl; firm consistency.
	-														Laboratory Data Interval 48.1 to 50.0 ft.
	_														<ul> <li>– 50.0 to 52.2 ft. <u>SILT WITH SAND, (ML)s</u>:</li> </ul>
												174.3			About 85% non-plastic fines with rapid dilatancy; about 15% fine sand; maximum
COMMENTS:     FADC = Flight Auger Dry Core     Well completion information is provided in attached Well															
HSA = Hollow Stem Auger     Completion Diagram. Well development information is       NP = Non-plastic     provided in attached Monitoring Well Development form.															
NR = No Recovery NA = Not applicable G.S. = Ground surface															
b.g.s. = Belo T.O.C. = Top	w the	groun		ace											r
			.9												SHEET 3 OF 4 DRILL HOLE MW-09-27

FEATURE: Groundwater Monitoring LOCATION: Reach 1B, River Bank Right, Madera County BEGUN: 9/28/09 FINISHED: 9/29/09 DEPTH AND ELEVATION OF WATER LEVEL

PROJECT: San Joaquin River Restoration Project COORDINATES: N 2,185,701.8 E 6,252,474.6 (NAGD83) TOTAL DEPTH: 77.0 ft.

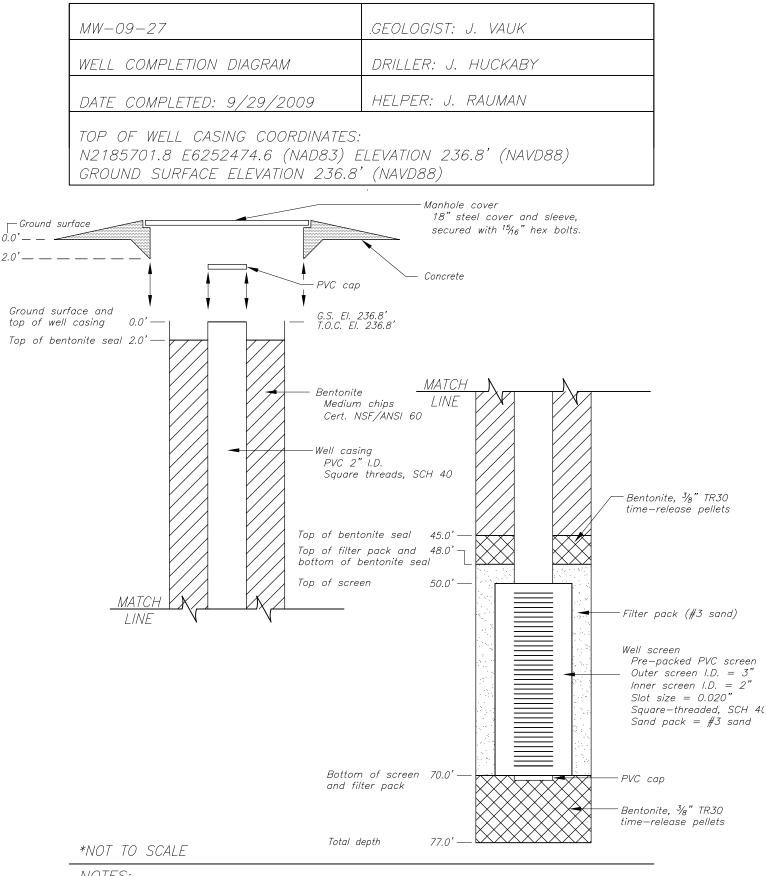
STATE: California

SHEET 4 OF 4

GROUND SURFACE ELEVATION: 236.8 ft. (NAVD88) T.O.C ELEVATION: 236.77 ft. (NAVD88) HOLE LOGGED BY: J. Vauk REVIEWED BY: A. Warren

AND DATE MEASURED: 49.7 ft. (El. 187.07 ft.) 9/29/2009

AND DATE MEASURED: 49.7 ft. (EI. 187.07 ft.) 9/29/2009 REVIEWED BY: A. Warren																	
					LABO	ORAT	ORY	DATA	١		≻N	/		Z	7	⊢	
NOTES	DEPTH						н	MIT	T	r%	LABORATORY CLASSIFICATION	/ ਵ		VISUAL CLASSIFICATION	z	GEOLOGIC UNIT SYMBOL	CLASSIFICATION AND
NOTES	DEF	% CORE RECOVERY	SILT	% CLAY	% FINES	SAND	GRAVEL	LIQUID LIMIT	PLASTICITY INDEX	MOISTURE CONTENT %	ABOR ASSIF			VIS ASSIF	ELEVATION	OLOG	PHYSICAL CONDITION
		RE(	\$ %	%	Ч%	%	8	ГQ	린	Q Q Q Q	5			ರ/	ELE	ĞĒ	
																	reaction with HCI; soft consistency; contains gypsum veins.
	-													(ML)s			<ul> <li><u>Laboratory Data Interval</u></li> <li>50.0 to 52.2 ft.</li> </ul>
	65— — —	100	55.4	20.5	75.9	24.1	0.0	24.2	2.7	29.1	(ML)s					-	52.2 to 53.7 ft. <u>SILT WITH SAND, (ML)s</u> : About 80% fines with low plasticity, toughness, and dry strength, and rapid dilatancy; about 20% fine sand; maximum size: fine sand; dry, medium brown, no reaction with HCl; firm consistency; contains gypsum veins.
															-	53.7 to 54.7 ft. <u>SILTY SAND, SM</u> : About 65% fine sand; about 35% non-plastic fines with rapid dilatancy; maximum size: fine sand; moist, medium brown, no reaction with HCl; soft consistency; contains gypsum veins.	
															166.3	Qal -	Laboratory Data Interval 53.7 to 54.7 ft.
	- 70-											166.3	3				<ul> <li>54.7 to 55.4 ft. <u>SANDY SILT, s(ML)</u>: About 60% fines with low plasticity, toughness, and dry strength, and rapid dilatancy; about 40% fine sand; maximum size: fine sand; dry, medium brown, no reaction with HCl; firm consistency; contains gypsum veins.</li> </ul>
	-																<ul> <li><u>Laboratory Data Interval</u></li> <li>54.7 to 55.4 ft.</li> </ul>
	-		48.1	15.1	63.2	36.8	0.0	26.2	4.0	23.6	s(ML)	161.8		s(ML)	161.8		<ul> <li>55.4 to 56.7 ft. <u>SILTY SAND, SM</u>: About</li> <li>65% fine sand; about 35% non-plastic fines with rapid dilatancy; maximum size: fine sand; moist, medium brown, no reaction with HCl; soft consistency; contains gypsum veins.</li> </ul>
		100															<b>56.7 to 57.5 ft.</b> <u>SANDY SILT, s(ML)</u> : About 60% fines with low plasticity, toughness, and _ dry strength, and rapid dilatancy; about 40% fine sand; maximum size: fine sand; dry, medium brown, no reaction with HCl; firm consistency; contains gypsum veins.
	75—	1										101.0	,		101.0		<ul> <li><u>Laboratory Data Interval</u></li> <li>56.7 to 62.5 ft.</li> </ul>
	_						E	OTTO	M OF H	HOLE				(ML)s	159.8	-	<ul> <li>57.5 to 70.5 ft. <u>SILT WITH SAND, (ML)s</u>: About 85% fines with low plasticity, toughness, and dry strength, and rapid dilatancy; about 15% fine sand; maximum size: fine sand; dry, medium brown, no reaction with HCl; firm consistency; gypsum vein lattice bind the soil between 56.7 to 62.5 feet of depth.</li> </ul>
																	Laboratory Data Interval
62.5 to 70.5 ft. 70.5 to 75.0 ft. <u>SANDY SILT. s(ML</u> ): About 70% fines with low plasticity, toughness, and dry strength, and rapid dilatancy; about 30% fine sand; maximum size: fine sand; dry, reddish-brown, no reaction with HCl; very firm consistency; gypsum vein lattice and iron oxide bind the soil.																	
																	Laboratory Data Interval 70.5 to 75.0 ft.
																	<b>75.0 to 77.0 ft. <u>SILT WITH SAND, (ML)s</u>:</b> About 80% fines with medium plasticity, low toughness, and dry strength, and no dilatancy; about 20% fine sand; maximum size: fine sand; dry, reddish-brown, no reaction with HCl; very firm consistency; gypsum vein lattice bind the soil.
T.D. = 77.0 ft.																	
HSA = Hollow Stem Auger       Weil Completion Information is provided in attached Weil         NP = Non-plastic       Completion Diagram. Well development information is         NR = No Recovery       provided in attached Monitoring Well Development form.         NA = Not applicable       G.S. = Ground surface																	
	b.g.s. = Below the ground surface T.O.C. = Top of well casing												SHEET 4 OF 4 DRILL HOLE MW-09-27				



NOTES:

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

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