


SHEET 1 of 5				PROJECT NUMBER: 354948.FP.05				BORING NUMBER: MW-52			
SOIL BORING LOG											
PROJECT NAME: PG&E Topock				HOLE DEPTH (ft): 158.0				DRILLING CONTRACTOR: Prosonic/Boart Longyear - Phoenix, AZ			
SURFACE ELEVATION: 461.9 ft. MSL		NORTHING (CCS NAD 27 Z 5): 2,101,738.98		EASTING (CCS NAD 27 Z 5): 7,616,776.33		DATE STARTED: 2/23/2007		DATE COMPLETED: 2/27/2007			
DRILLING METHOD: Rotosonic-continuous 4-inch core				DRILLING EQUIPMENT: Track Mounted Rig - up to 7-inch drive casing				SB County Permit No. 2007020134			
LOCATION: South of I-40 on the west bank of the river				LOGGED BY: R. Tweidt/C Kreller				DRILLER NAME: Denzel Roberts			
DRILL DEPTH (feet)	SAMPLE					USCS CODE	SOIL DESCRIPTION	COMMENTS			
	INTERVAL	RECOVERY (ft)		Isoflow Sample	SOIL SAMPLE		SOIL NAME, USCS GROUP SYMBOL, COLOR, GRAIN SIZE DISTRIBUTION, MINERALOGY, MOISTURE CONTENT, RELATIVE DENSITY OR CONSISTENCY, SOIL STRUCTURE				
							ORGANIC SURFACE MATERIAL	Boring drilled at azimuth 087 and dip of 40 degrees from horizontal (beneath the Colorado River). Grab groundwater samples (GGW) and discrete soil samples (CS) were collected at the depths indicated. All depths expressed as length drilled (ft) and must be corrected for angle to derive elevation. Collect MW52-CS-9-10' No recovery from 10' to 12'			
5							POORLY GRADED SAND (SP) - yellowish brn (10YR 5/6), 95% fn sand, 5% subrnd gravel (up to 3/4 inch), moist, loose, trace organic  100% fn sand				
							SP AS ABOVE: dk olive brn (2.5YR 3/3) SP AS ABOVE: yellowish brn (10YR 5/6) SP AS ABOVE: dk olive brn (2.5YR 3/3), saturated				
10							SP AS ABOVE: 100% fn sand, saturated  SP AS ABOVE: yellowish brn (10YR 5/6) and dk olive brn (2.5Y 3/3) mottled appearance, 100% fn sand, saturated				
15							SP AS ABOVE: dk olive brn (2.5Y 3/3), mottling absent, 100% fn sand, organics present				
20							SP AS ABOVE: dk gray (2.5YR 4/3), 100% med sand, loose, moist				
							SP AS ABOVE: dk grayish brn (10YR 5/4), 100% fn-med sand, trace organics  SP AS ABOVE: yellowish brn (10YR 5/4)				
25							SP AS ABOVE: 100% fn-med sand SP AS ABOVE: dk grayish brn (10YR 4/2)				
30											
35											


SHEET 2 of 5				PROJECT NUMBER: 354948.FP.05				BORING NUMBER: MW-52			
SOIL BORING LOG											
PROJECT NAME: PG&E Topock				HOLE DEPTH (ft): 158.0				DRILLING CONTRACTOR: Prosonic/Boart Longyear - Phoenix, AZ			
SURFACE ELEVATION: 461.9 ft. MSL		NORTHING (CCS NAD 27 Z 5): 2,101,738.98		EASTING (CCS NAD 27 Z 5): 7,616,776.33		DATE STARTED: 2/23/2007		DATE COMPLETED: 2/27/2007			
DRILLING METHOD: Rotasonic-continuous 4-inch core				DRILLING EQUIPMENT: Track Mounted Rig - up to 7-inch drive casing				SB County Permit No. 2007020134			
LOCATION: South of I-40 on the west bank of the river				LOGGED BY: R. Tweidt/C Kreller				DRILLER NAME: Denzel Roberts			
DRILL DEPTH (feet)	SAMPLE					USCS CODE	SOIL DESCRIPTION	COMMENTS			
	INTERVAL	RECOVERY (ft)		Isoflow Sample	SOIL SAMPLE		SOIL NAME, USCS GROUP SYMBOL, COLOR, GRAIN SIZE DISTRIBUTION, MINERALOGY, MOISTURE CONTENT, RELATIVE DENSITY OR CONSISTENCY, SOIL STRUCTURE				
40				MW-52-GGW-43		SP	POORLY GRADED SAND (SP) - yellowish brn (10YR 5/6), 95% fn sand, 5% subrnd gravel (up to 3/4 inch), moist, loose, trace organic				
							SP AS ABOVE: 100% fn sand				
45							SP AS ABOVE: dk grayish brn (10YR 4/2), 100% fn sand, moist, loose, trace organics	No recovery from 43' to 45'			
								Collect MW52-CS-45-46'			
50							SP AS ABOVE: 100% fn sand, trace med sand component	Collect MW52-CS-51-52'			
							SP AS ABOVE: 100% fn sand, trace med sand component				
55				MW-52-GGW-63		SP	SP AS ABOVE: brn (10YR 5/3), organic material present (plant material)				
60							POORLY GRADED SAND WITH GRAVEL (SP) - brn (10YR 5/3), 85% fn sand, 15% subrnd to rnd gravel (up to 3.5 inches), brn (10YR 5/3)	Collect carbon samples			
							SP AS ABOVE: 5% gravel, large pieces of organic (plant) material	Collect MW52-CS-60-61'			
							SP AS ABOVE: trace fines	No recovery from 63' to 67'			
65							POORLY GRADED SAND (SP) - dk yellowish brn (10YR 4/4), trace fines, 95% fn sand, 5% subrounded to round gravel (up to 1 inch), saturated, loose, trace organics				
70							SP AS ABOVE: trace med sand component				

SHEET 3 of 5				PROJECT NUMBER: 354948.FP.05				BORING NUMBER: MW-52			
<b>SOIL BORING LOG</b>											
PROJECT NAME: PG&E Topock						HOLE DEPTH (ft): 158.0			DRILLING CONTRACTOR: Prosonic/Boart Longyear - Phoenix, AZ		
SURFACE ELEVATION: 461.9 ft. MSL		NORTHING (CCS NAD 27 Z 5): 2,101,738.98		EASTING (CCS NAD 27 Z 5): 7,616,776.33			DATE STARTED: 2/23/2007		DATE COMPLETED: 2/27/2007		
DRILLING METHOD: Rotosonic-continuous 4-inch core						DRILLING EQUIPMENT: Track Mounted Rig - up to 7-inch drive casing				SB County Permit No. 2007020134	
LOCATION: South of I-40 on the west bank of the river						LOGGED BY: R. Tweidt/C Kreller			DRILLER NAME: Denzel Roberts		
DRILL DEPTH (feet)	SAMPLE					USCS CODE	SOIL DESCRIPTION	COMMENTS			
	INTERVAL	RECOVERY (ft)		Isoflow Sample	SOIL SAMPLE		SOIL NAME, USCS GROUP SYMBOL, COLOR, GRAIN SIZE DISTRIBUTION, MINERALOGY, MOISTURE CONTENT, RELATIVE DENSITY OR CONSISTENCY, SOIL STRUCTURE	DRILLING OBSERVATIONS AND OPERATIONS, DRILL RATE, REFUSALS, SAMPLING AND TESTING NOTES.			
75				MW-52-GGW-83		SP	POORLY GRADED SAND (SP) - yellowish brn (10YR 5/6), 95% fn sand, 5% subrnd gravel (up to 3/4 inch), moist, loose, trace organic	Collect MW52-CS-71-72'			
						GW	WELL GRADED GRAVEL WITH SAND (GW) - brn (10YR 5/5), 65% subrnd to rnd gravel (up to 2.5 inches), 35% fn to med sand, trace fines, saturated, loose				
80						SP	POORLY GRADED SAND (SP) - brn (10YR 5/3), 85% fn sand, 10% med subrnd sand, 5% subrnd to rnd gravel (up to 1/2 inch), wet, loose	Collect MW52-CS-77-78'			
85						SW	WELL GRADED SAND WITH GRAVEL (SW) - 60% fn-cse sand, 40% subrnd to rnd gravel (up to 3 inches)				
90				MW-52-GGW-103		SP	POORLY GRADED SAND (SP) - dk grayish brn (2.5YR 4/2), 100% fn sand, trace subrnd to rnd gravel, trace fines, wet, loose	Driller indicates borehole collapses with casing withdrawal  Collect MW52-CS-101-102'  No recovery from 103' to 107'			
95							SP AS ABOVE: 100% fn sand, trace fines, gravel component absent				
100							SP AS ABOVE: 100% fn sand				
105											

SHEET 4 of 5				PROJECT NUMBER: 354948.FP.05		BORING NUMBER: MW-52	
SOIL BORING LOG							
PROJECT NAME: PG&E Topock				HOLE DEPTH (ft): 158.0		DRILLING CONTRACTOR: Prosonic/Boart Longyear - Phoenix, AZ	
SURFACE ELEVATION: 461.9 ft. MSL		NORTHING (CCS NAD 27 Z 5): 2,101,738.98		EASTING (CCS NAD 27 Z 5): 7,616,776.33		DATE STARTED: 2/23/2007	
DATE COMPLETED: 2/27/2007		DRILLING METHOD: Rotasonic-continuous 4-inch core				DRILLING EQUIPMENT: Track Mounted Rig - up to 7-inch drive casing	
LOCATION: South of I-40 on the west bank of the river				LOGGED BY: R. Tweidt/C Kreller		DRILLER NAME: Denzel Roberts	
DRILL DEPTH (feet)	SAMPLE					USCS CODE	SOIL DESCRIPTION
	INTERVAL	RECOVERY (ft)		Isoflow Sample	SOIL SAMPLE		SOIL NAME, USCS GROUP SYMBOL, COLOR, GRAIN SIZE DISTRIBUTION, MINERALOGY, MOISTURE CONTENT, RELATIVE DENSITY OR CONSISTENCY, SOIL STRUCTURE
110						SP	POORLY GRADED SAND (SP) - dk grayish brn (2.5YR 4/2), 100% fn sand, trace subrnd to rnd gravel, trace fines, wet, loose
115							POORLY GRADED SAND (SP) - dk brn (2.5YR 4/1), 100% fn-med sand (25% med sand), trace subrnd to rnd gravel (up to 2.5 inches), moist, loose
120						SP	SP AS ABOVE: It olive brn (2.5Y 4/1), decrease in med grained component, increased fn grained component
125							SP AS ABOVE: 100% fn sand, trace med sand, trace fines, gravel absent
130						SP	POORLY GRADED SAND WITH GRAVEL(SP) - yellowish brn (10YR 5/4), 80% cse sand, 20% subrnd to rnd gravel (up to 2 inches), moist, loose
135						GW	WELL GRADED GRAVEL WITH SAND (GW) - 65% subrnd to well rnd gravel (up to 6 inches), 30% fn-cse subrnd sand, 5% fn sand
140						BR	MIOCENE CONGLOMERATE (BR) - dk red (2.5YR 3/6), 65% sand, 25% fns, 10% gravel, dry, moderate to strongly cemented
<div>  <b>CH2MHILL</b> </div>							

SHEET 5 of 5				PROJECT NUMBER: 354948.FP.05				BORING NUMBER: MW-52			
SOIL BORING LOG											
PROJECT NAME: PG&E Topock				HOLE DEPTH (ft): 158.0				DRILLING CONTRACTOR: Prosonic/Boart Longyear - Phoenix, AZ			
SURFACE ELEVATION: 461.9 ft. MSL		NORTHING (CCS NAD 27 Z 5): 2,101,738.98		EASTING (CCS NAD 27 Z 5): 7,616,776.33		DATE STARTED: 2/23/2007		DATE COMPLETED: 2/27/2007			
DRILLING METHOD: Rotasonic-continuous 4-inch core				DRILLING EQUIPMENT: Track Mounted Rig - up to 7-inch drive casing				SB County Permit No. 2007020134			
LOCATION: South of I-40 on the west bank of the river				LOGGED BY: R. Tweidt/C Kreller				DRILLER NAME: Denzel Roberts			
DRILL DEPTH (feet)	SAMPLE					USCS CODE	SOIL DESCRIPTION	COMMENTS  DRILLING OBSERVATIONS AND OPERATIONS, DRILL RATE, REFUSALS, SAMPLING AND TESTING NOTES.			
	INTERVAL	RECOVERY (ft)		Isoflow Sample	SOIL SAMPLE		SOIL NAME, USCS GROUP SYMBOL, COLOR, GRAIN SIZE DISTRIBUTION, MINERALOGY, MOISTURE CONTENT, RELATIVE DENSITY OR CONSISTENCY, SOIL STRUCTURE				
145						BR	<b>MIocene CONGLOMERATE (BR)</b> - dk red (2.5YR 3/6), 65% sand, 25% fns, 10% gravel, dry, moderate to strongly cemented				
150											
155											
							<i>Total Drilled Depth = 158 ft bgs as defined at the top of the borehole.</i>  <b>ABBREVIATIONS</b> <i>brn = brown</i> <i>lt = light</i> <i>dk = dark</i> <i>vf = very fine-grained</i> <i>fn = fine-grained</i> <i>med = medium-grained</i> <i>cse = coarse-grained</i> <i>ang = angular</i> <i>subang = subangular</i> <i>subrnd = subrounded</i> <i>rnd = rounded</i>				

SHEET 1 of 8				PROJECT NUMBER: 354948.FP.05				BORING NUMBER: MW-53			
<b>SOIL BORING LOG</b>											
PROJECT NAME: PG&E Topock						HOLE DEPTH (ft): 265.0			DRILLING CONTRACTOR: Prosonic/Boart Longyear - Phoenix, AZ		
SURFACE ELEVATION: 461.0 ft. MSL		NORTHING (CCS NAD 27 Z 5): 2,101,761.47		EASTING (CCS NAD 27 Z 5): 7,616,788.39		DATE STARTED: 3/12/2007			DATE COMPLETED: 3/25/2007		
DRILLING METHOD: Rotosonic-continuous 4-inch core						DRILLING EQUIPMENT: Track Mounted Rig - up to 7-inch drive casing				SB County Permit No. 2007020135	
LOCATION: South of I-40 on the west bank of the river				LOGGED BY: R. Tweidt			DRILLER NAME: Denzel Roberts				
DRILL DEPTH (feet)	SAMPLE					USCS CODE	SOIL DESCRIPTION	COMMENTS			
	INTERVAL	RECOVERY (ft)		Isoflow Sample	SOIL SAMPLE		SOIL NAME, USCS GROUP SYMBOL, COLOR, GRAIN SIZE DISTRIBUTION, MINERALOGY, MOISTURE CONTENT, RELATIVE DENSITY OR CONSISTENCY, SOIL STRUCTURE				
5						SM	<b>SILTY SAND (SM)</b> - It yellowish brn (2.5YR 6/4), 80% fn grained (up to 1.5 cm), sand (trace cse), 20% fines, well sorted, slightly moist, no odor, plant roots,  SM AS ABOVE: It olive brn (2.5YR 5/3), saturated	Boring drilled at azimuth 090 and dip of 30 degrees from horizontal. Grab groundwater samples (GGW) and depth discrete soil samples (CS) were collected at depths indicated. All depths expressed as length drilled (ft) and must be corrected for angle to derive elevation.			
10		15					<b>SAND (SP)</b> - It olive brn (2.5YR 5/4), 5% gravel [minor subrnd to rnd gravel and cobble (up to 5.5 cm)], 90% fn sand, 5% fines, well sorted, wet, no odor, cobble is locally derived diorite that is subrnd.  SP AS ABOVE: gravel is absent, micaceous, tree roots				
15						SP	SP AS ABOVE: trace gravel (up to 0.1 cm) SP AS ABOVE: dk grayish brn (2.5YR 4/2)				
20		10					SP AS ABOVE: trace gravel (up to 0.2 cm)				
25							SP AS ABOVE: very dk gray brn (10YR 3/2) SP AS ABOVE: abundant tree roots SP AS ABOVE: dk organic material present SP AS ABOVE: 98% med sand, trace fines, trace gravel (up to 0.1 cm)				
30		7					No Recovery from 25 - 28'  Collect wood sample MW-53-30' Collect sample MW-53-CS-31.5-32'				
35											

SHEET 2 of 8				PROJECT NUMBER: 354948.FP.05				BORING NUMBER: MW-53			
SOIL BORING LOG											
PROJECT NAME: PG&E Topock				HOLE DEPTH (ft): 265.0				DRILLING CONTRACTOR: Prosonic/Boart Longyear - Phoenix, AZ			
SURFACE ELEVATION: 461.0 ft. MSL		NORTHING (CCS NAD 27 Z 5): 2,101,761.47		EASTING (CCS NAD 27 Z 5): 7,616,788.39		DATE STARTED: 3/12/2007		DATE COMPLETED: 3/25/2007			
DRILLING METHOD: Rotasonic-continuous 4-inch core				DRILLING EQUIPMENT: Track Mounted Rig - up to 7-inch drive casing				SB County Permit No. 2007020135			
LOCATION: South of I-40 on the west bank of the river				LOGGED BY: R. Tweidt				DRILLER NAME: Denzel Roberts			
DRILL DEPTH (feet)	SAMPLE					USCS CODE	SOIL DESCRIPTION		COMMENTS  DRILLING OBSERVATIONS AND OPERATIONS, DRILL RATE, REFUSALS, SAMPLING AND TESTING NOTES.		
	INTERVAL	RECOVERY (ft)		Isoflow Sample	SOIL SAMPLE		SOIL NAME, USCS GROUP SYMBOL, COLOR, GRAIN SIZE DISTRIBUTION, MINERALOGY, MOISTURE CONTENT, RELATIVE DENSITY OR CONSISTENCY, SOIL STRUCTURE				
40						SP	SAND (SP) - lt olive brn (2.5YR 5/4), 5% gravel [minor subrnd to rnd gravel and cobble (up to 5.5 cm)], 90% fn sand, 5% fines, well sorted, wet, no odor, cobble is locally derived diorite that is subrnd.		Collect sample MW53-CS-52.5-53'		
45		20					POORLY GRADED SAND (SP) - dk yellowish brn (10YR 4/4), 90% fn sand, 5% med sand, 5% fines				
50							SP AS ABOVE				
55							SP AS ABOVE				
60		0					SP AS ABOVE				
65							SP AS ABOVE: 85% fn sand, 10% med sand, 5% fines				
70		11									
<div> CH2MHILL</div>											

SHEET 3 of 8				PROJECT NUMBER: 354948.FP.05				BORING NUMBER: MW-53			
SOIL BORING LOG											
PROJECT NAME: PG&E Topock				HOLE DEPTH (ft): 265.0				DRILLING CONTRACTOR: Prosonic/Boart Longyear - Phoenix, AZ			
SURFACE ELEVATION: 461.0 ft. MSL		NORTHING (CCS NAD 27 Z 5): 2,101,761.47		EASTING (CCS NAD 27 Z 5): 7,616,788.39		DATE STARTED: 3/12/2007		DATE COMPLETED: 3/25/2007			
DRILLING METHOD: Rotosonic-continuous 4-inch core				DRILLING EQUIPMENT: Track Mounted Rig - up to 7-inch drive casing				SB County Permit No. 2007020135			
LOCATION: South of I-40 on the west bank of the river				LOGGED BY: R. Tweidt				DRILLER NAME: Denzel Roberts			
DRILL DEPTH (feet)	SAMPLE				USCS CODE	SOIL DESCRIPTION		COMMENTS			
	INTERVAL	RECOVERY (ft)		Isoflow Sample		SOIL SAMPLE	SOIL NAME, USCS GROUP SYMBOL, COLOR, GRAIN SIZE DISTRIBUTION, MINERALOGY, MOISTURE CONTENT, RELATIVE DENSITY OR CONSISTENCY, SOIL STRUCTURE			DRILLING OBSERVATIONS AND OPERATIONS, DRILL RATE, REFUSALS, SAMPLING AND TESTING NOTES.	
75				MW53-GGW-75'		<p><b>SAND (SP)</b> - lt olive brn (2.5YR 5/4), 5% gravel [minor subrnd to rnd gravel and cobble (up to 5.5 cm)], 90% fn sand, 5% fines, well sorted, wet, no odor, cobble is locally derived diorite that is subrnd.</p> <p>becoming more cse-grained</p>		<p>Collect wood sample MW-83ft</p>			
80						<p><b>POORLY GRADED SAND (SP)</b> - dk gray (10YR 4/1), 5% gravel (up to 1.75 cm), well rnd, (70% fn sand, 15% med sand, 5% cse sand), 5% fines, chert and sandstone</p>					
85		20				<p>SP AS ABOVE: dk organic-rich layer with abundant, 2% gravel, 95% sand (2% cse sand, 25% med sand, 73% fn sand), 3% fines, wood pieces and plant roots, moderate organic/sulfur odor</p> <p>minor cse gravel, dioritic, angular to subangular</p>					
90				MW53-GGW-95'		<p>SP AS ABOVE: 98% sand (2% cse sand, 10% med sand, 88% fn sand), 2% fines, abundant plant roots, slightly more fn grained sand</p> <p>SP AS ABOVE: brn (10YR 5/3), 2% gravel (up to 2 cm), rnd to subrnd, 95% sand (2% cse sand, 95% med sand, 3% fn sand), 3% fines, chert</p>					
95						<p>SP AS ABOVE: 5% gravel (up to 2.5 cm), rnd to subrnd, 93% sand, (5% cse sand, 40% med sand, 55% fn sand), 2% fines</p>					
100		0				<p>SP AS ABOVE</p>		<p>No Recovery from 95 - 97'</p>			
105						<p>SP AS ABOVE: 2% gravel, 96% sand (5% cse sand, 40% med sand, 55% fn sand), 2% fines</p>					
					SP	<p><b>POORLY GRADED SAND WITH GRAVEL (SP)</b> - dk grayish brn (10YR 4/2), 20% gravel [fn to cse gravel (up to 6.5 cm)], 78% sand (5% cse sand, 60% med sand, 35% fn sand), 2% fines, mod to well sorted, wet, no odor, subrnd to rnd, volcanogenic origin (rhyolitic to andesitic) and limestone.</p>					

SHEET 4 of 8				PROJECT NUMBER: 354948.FP.05				BORING NUMBER: MW-53			
SOIL BORING LOG											
PROJECT NAME: PG&E Topock				HOLE DEPTH (ft): 265.0				DRILLING CONTRACTOR: Prosonic/Boart Longyear - Phoenix, AZ			
SURFACE ELEVATION: 461.0 ft. MSL		NORTHING (CCS NAD 27 Z 5): 2,101,761.47		EASTING (CCS NAD 27 Z 5): 7,616,788.39		DATE STARTED: 3/12/2007		DATE COMPLETED: 3/25/2007			
DRILLING METHOD: Rotosonic-continuous 4-inch core				DRILLING EQUIPMENT: Track Mounted Rig - up to 7-inch drive casing				SB County Permit No. 2007020135			
LOCATION: South of I-40 on the west bank of the river				LOGGED BY: R. Tweidt				DRILLER NAME: Denzel Roberts			
DRILL DEPTH (feet)	SAMPLE					USCS CODE	SOIL DESCRIPTION	COMMENTS			
	INTERVAL	RECOVERY (ft)		Isoflow Sample	SOIL SAMPLE		SOIL NAME, USCS GROUP SYMBOL, COLOR, GRAIN SIZE DISTRIBUTION, MINERALOGY, MOISTURE CONTENT, RELATIVE DENSITY OR CONSISTENCY, SOIL STRUCTURE				
110		18		MW53-GGW-115'		SP	SAND (SP) - dk yellowish brn (10YR 4/4), 98% fn sand, 2% fines, well sorted, wet, no odor,  SP AS ABOVE: 5% gravel (up to 4 cm), subrnd to rnd, 93% sand (20% med sand, 80% fn sand), 2% fines	No Recovery from 115 - 120'			
115							SP AS ABOVE: 30% med sand, 70% fn sand				
120		0				SP	SP AS ABOVE: 10% med sand, 90% fn sand				
125				MW53-GGW-135'			SP AS ABOVE: 5% gravel(up to 4 cm), rnd to subrnd, 93% sand, 2% fines  SP AS ABOVE: 98% sand (10% med sand, 90% fn sand), 2% fines				
130		15					SP AS ABOVE: appearance of cse gravel (up to 12 cm), rnd to subrnd  SP AS ABOVE: 98% sand, (5% cse sand, 20% med sand, 75% fn sand), 2% fines  coarsening of sand				
135							SP AS ABOVE: 5% cse sand, 40% med sand, 55% fn sand				
140							wood pieces present SP AS ABOVE: 15% gravel (up to 8 cm), subang to rnd, 83% sand (5% cse sand, 70% med sand, 25% fn sand), 2% fines, composed of metasediments, granite, limestone	Collect wood MW-53-137' Collect MW-53-CS-137.5-138'			

SHEET 5 of 8				PROJECT NUMBER: 354948.FP.05				BORING NUMBER: MW-53			
SOIL BORING LOG											
PROJECT NAME: PG&E Topock				HOLE DEPTH (ft): 265.0				DRILLING CONTRACTOR: Prosonic/Boart Longyear - Phoenix, AZ			
SURFACE ELEVATION: 461.0 ft. MSL		NORTHING (CCS NAD 27 Z 5): 2,101,761.47		EASTING (CCS NAD 27 Z 5): 7,616,788.39		DATE STARTED: 3/12/2007		DATE COMPLETED: 3/25/2007			
DRILLING METHOD: Rotosonic-continuous 4-inch core				DRILLING EQUIPMENT: Track Mounted Rig - up to 7-inch drive casing				SB County Permit No. 2007020135			
LOCATION: South of I-40 on the west bank of the river				LOGGED BY: R. Tweidt				DRILLER NAME: Denzel Roberts			
DRILL DEPTH (feet)	SAMPLE					USCS CODE	SOIL DESCRIPTION	COMMENTS			
	INTERVAL	RECOVERY (ft)		Isotflow Sample	SOIL SAMPLE		SOIL NAME, USCS GROUP SYMBOL, COLOR, GRAIN SIZE DISTRIBUTION, MINERALOGY, MOISTURE CONTENT, RELATIVE DENSITY OR CONSISTENCY, SOIL STRUCTURE		DRILLING OBSERVATIONS AND OPERATIONS, DRILL RATE, REFUSALS, SAMPLING AND TESTING NOTES.		
145		20				SP	SAND (SP) - dk yellowish brn (10YR 4/4), 98% fn sand, 2% fines, well sorted, wet, no odor,  wood chips	Collect wood sample MW-53-142.5' Collect sample MW-53-CS-143.5-144' Collect wood sample MW-53-144'			
					SW	WELL GRADED SAND WITH GRAVEL (SW) dk grayish brn (10YR 4/2)  SP AS ABOVE: 40% gravel (up to 6 cm), subrnd to rnd, 60% sand (5% cse sand, 45% med sand, 50% fn sand), composed of chert, limestone, volcanic and granitic rocks  SP AS ABOVE: 40% gravel (up to 6 cm), 60% sand (20% cse sand, 60% med sand, 20% fn sand)					
150					SP	SP AS ABOVE: 5% gravel (up to 6 cm), subrnd to rnd, 95% sand (50% med sand, 50% fn sand), limestone & granite composition					
155					SW	WELL GRADED SAND WITH GRAVEL SAND (SW) - dk grayish brn (10YR 4/2), 30% gravel [fn to cse gravel (up to 5 cm)], subang to well rnd, 70% sand (20% cse sand, 50% med sand, 30% fn sand), mod sorted, wet, no odor, sandstone, chert, limestone, granite SP AS ABOVE: 30% gravel (up to 4 cm), 70% sand (10% cse sand, 30% med sand, 60% fn sand) clay lens with silt, yellowish brn (10YR 5/4), med stiff, slow dilatancy, high to moderate plasticity, mod to high dry strength					
160						SP	SAND (SP) - dk yellowish brn (10YR 4/4), 20% gravel (up to 8 cm), subrnd to rnd, 80% sand, (15% cse sand, 70% med sand, 15% fn sand), well sorted, wet, no odor, limestone, chert, diorite  SP AS ABOVE: 20% gravel (up to 5 cm), 80% sand (15% cse sand, 70% med sand, 15% fn sand)  SP AS ABOVE: 5% gravel (up to 3 cm), 95% sand (12% cse sand, 78% med sand, 10% fn sand)				
165		20			SP AS ABOVE: 10% cse sand, 80% med sand, 10% fn sand						
170					SP AS ABOVE: gravel (up to 5 cm) subang to rnd, composed of chert, quartz, granitics, 5% cse sand, 35% med sand, 60% fn sand SP AS ABOVE: 5% gravel (up to 3 cm), 95% sand (5% cse sand, 35% med sand, 60% fn sand) gravel is absent						
175					SP AS ABOVE: 70% med sand, 30% fn sand						

SHEET 6 of 8				PROJECT NUMBER: 354948.FP.05				BORING NUMBER: MW-53			
SOIL BORING LOG											
PROJECT NAME: PG&E Topock				HOLE DEPTH (ft): 265.0				DRILLING CONTRACTOR: Prosonic/Boart Longyear - Phoenix, AZ			
SURFACE ELEVATION: 461.0 ft. MSL		NORTHING (CCS NAD 27 Z 5): 2,101,761.47		EASTING (CCS NAD 27 Z 5): 7,616,788.39		DATE STARTED: 3/12/2007		DATE COMPLETED: 3/25/2007			
DRILLING METHOD: Rotosonic-continuous 4-inch core				DRILLING EQUIPMENT: Track Mounted Rig - up to 7-inch drive casing				SB County Permit No. 2007020135			
LOCATION: South of I-40 on the west bank of the river				LOGGED BY: R. Tweidt				DRILLER NAME: Denzel Roberts			
DRILL DEPTH (feet)	SAMPLE					USCS CODE	SOIL DESCRIPTION	COMMENTS			
	INTERVAL	RECOVERY (ft)		Isoflow Sample	SOIL SAMPLE		SOIL NAME, USCS GROUP SYMBOL, COLOR, GRAIN SIZE DISTRIBUTION, MINERALOGY, MOISTURE CONTENT, RELATIVE DENSITY OR CONSISTENCY, SOIL STRUCTURE				
180							SAND (SP) - dk yellowish brn (10YR 4/4), 20% gravel (up to 8 cm), subrnd to rnd, 80% sand, (15% cse sand, 70% med sand, 15% fn sand), well sorted, wet, no odor, limestone, chert, diorite				
185		20					SP AS ABOVE: 5% gravel (up to 3 cm), subrnd to rnd, 95% sand (3% cse sand, 68% med sand, 24% fn sand), granite, diorite, quartz, chert				
190							SP AS ABOVE: 5% cse sand, 70% med sand, 25% fn sand				
195							SP AS ABOVE: 5% gravel (up to 2.5 cm), subang to subrnd, 95% sand (30% med sand, 70% fn sand)				
200							SP AS ABOVE: 5% gravel (up to 3 cm), subrnd to well rnd , 95% sand (5% cse sand, 70% med sand, 25% fn sand), gravel composed of chert, silicified silt & sandstone				
205							SP AS ABOVE: It-gray mottling patches within the sand. Slight musty organic odor	Collect sample MW-53-CS-192-193'			
210		0					SP AS ABOVE: 20% med sand, 80% fn sand	No Recovery from 195 - 205'			

SHEET 7 of 8				PROJECT NUMBER: 354948.FP.05				BORING NUMBER: MW-53			
<b>SOIL BORING LOG</b>											
PROJECT NAME: PG&E Topock				HOLE DEPTH (ft): 265.0				DRILLING CONTRACTOR: Prosonic/Boart Longyear - Phoenix, AZ			
SURFACE ELEVATION: 461.0 ft. MSL		NORTHING (CCS NAD 27 Z 5): 2,101,761.47		EASTING (CCS NAD 27 Z 5): 7,616,788.39		DATE STARTED: 3/12/2007		DATE COMPLETED: 3/25/2007			
DRILLING METHOD: Rotosonic-continuous 4-inch core				DRILLING EQUIPMENT: Track Mounted Rig - up to 7-inch drive casing				SB County Permit No. 2007020135			
LOCATION: South of I-40 on the west bank of the river				LOGGED BY: R. Tweidt				DRILLER NAME: Denzel Roberts			
DRILL DEPTH (feet)	SAMPLE				USCS CODE	SOIL DESCRIPTION		COMMENTS			
	INTERVAL	RECOVERY (ft)		Isoflow Sample		SOIL SAMPLE	SOIL NAME, USCS GROUP SYMBOL, COLOR, GRAIN SIZE DISTRIBUTION, MINERALOGY, MOISTURE CONTENT, RELATIVE DENSITY OR CONSISTENCY, SOIL STRUCTURE		DRILLING OBSERVATIONS AND OPERATIONS, DRILL RATE, REFUSALS, SAMPLING AND TESTING NOTES.		
215		10		MW53-GGW-215'		SW	GRAVELLY SAND (SW) - dk yellowish brn (10YR 4/4), 40% gravel (up to 8 cm), rnd to well rnd, 60% sand, (10% cse sand, 30% med sand, 60% fn sand), moderately sorted, gravel composition is granite, diorite and chert, wet, no odor,	No Recovery from 228 - 237'			
						GM	SANDY GRAVEL WITH SILT (GM) - dk reddish brn (2.5YR 2.5/3), 30% gravel (up to 12 cm), very ang to subrnd, 20% sand, (50% fines, 30% cse sand, 30% med sand, 40% fn sand), poorly sorted, wet, gravel composition is granite, diorite, vesicular rhyolite, miocene conglomerate fragments, no odor				
						SW	GRAVELLY SAND (SW) - reddish brn (5YR 4/3), 40% gravel (up to 10 cm), subrnd to well rnd, 58% sand, 2% fines, poorly sorted, wet, gravel composition is granite, diorite, chert, calcified sandstone, no odor				
220						GM	SANDY GRAVEL WITH SILT (GM) - dk grayish brn (10YR 4/2), 40% gravel (up to 11 cm), very ang to well rnd, 30% sand (30% cse sand, 30% med sand, 40% fn sand), 30% fines, poorly sorted, wet, mixture of metamorphic, volcanic and sedimentary rock assemblage, no odor				
225		13									
230				MW53-GGW-235'			GRAVELLY SAND (SW) - dk yellowish brn (10yr 4/4), 40% gravel (up to 8 cm), rnd to well rnd, 60% sand (10% cse sand, 30% med sand, 60% fn sand), moderately sorted, wet, volcanic and sedimentary with minor metamorphic rock assemblage, no odor  increased metamorphic rocks present	No Recovery from 228 - 237'			
						SW	SW AS ABOVE: 30% gravel (up to 8 cm), 70% sand (40% cse sand, 40% med sand, 20% fn sand) SW AS ABOVE: 40% gravel, 60% sand				
235		0									
240											
245						SP	SAND (SP) - dk yellowish brn (10YR 4/4), 40% med sand, 60% fn sand, well sorted, wet, no odor				

SHEET 8 of 8				PROJECT NUMBER: 354948.FP.05				BORING NUMBER: MW-53			
SOIL BORING LOG											
PROJECT NAME: PG&E Topock				HOLE DEPTH (ft): 265.0				DRILLING CONTRACTOR: Prosonic/Boart Longyear - Phoenix, AZ			
SURFACE ELEVATION: 461.0 ft. MSL		NORTHING (CCS NAD 27 Z 5): 2,101,761.47		EASTING (CCS NAD 27 Z 5): 7,616,788.39		DATE STARTED: 3/12/2007		DATE COMPLETED: 3/25/2007			
DRILLING METHOD: Rotosonic-continuous 4-inch core				DRILLING EQUIPMENT: Track Mounted Rig - up to 7-inch drive casing				SB County Permit No. 2007020135			
LOCATION: South of I-40 on the west bank of the river				LOGGED BY: R. Tweidt				DRILLER NAME: Denzel Roberts			
DRILL DEPTH (feet)	SAMPLE				USCS CODE	SOIL DESCRIPTION		COMMENTS			
	INTERVAL	RECOVERY (ft)		Isoflow Sample		SOIL SAMPLE	SOIL NAME, USCS GROUP SYMBOL, COLOR, GRAIN SIZE DISTRIBUTION, MINERALOGY, MOISTURE CONTENT, RELATIVE DENSITY OR CONSISTENCY, SOIL STRUCTURE		DRILLING OBSERVATIONS AND OPERATIONS, DRILL RATE, REFUSALS, SAMPLING AND TESTING NOTES.		
250		18		MW53-GGW-255'	SW	GRAVELLY SAND (SW) - very dk grayish brn (10YR3/2), 30% gravel (up to 7 cm), subrnd to well rnd, 70% sand (20% cse sand, 40% med sand, 30% fn sand), moderately sorted, wet, sedimentary & metamorphic rock assemblage, no odor					
255					GM	SILTY GRAVEL WITH SAND (GM) - dk grayish brn (10YR4/2), 50% gravel (up to 12 cm), ang to well rnd, 30% sand (30% cse sand, 30% med sand, 40% fn sand), 20% fines, poorly sorted, wet, sedimentary, volcanic, metamorphic rock assemblage, no odor  decomposed metamorphics					
260					GC	CLAYEY GRAVEL WITH SAND (SP) - dk brn (7.5YR 3/3), 40% gravel (up to 9 cm), ang to rnd, 20% sand (30%cse sand, 30% med sand, 40% fn sand), 40% fines, poorly sorted, slightly moist, combination of fluvial and reworked miocene conglomerate, no odor MIOCENE CONGLOMERATE					
265		10		BR							
						Total Drilled Depth = 265 ft bgs as defined at the top of the borehole.					
<b>ABBREVIATIONS</b> brn = brown lt = light dk = dark vf = very fine-grained fn = fine-grained med = medium-grained cse = coarse-grained ang = angular subang = subangular subrnd = subrounded rnd = rounded											

% Gravel	% Sand	% Sand	% Sand	% Fine	USCS
--	Cse	Med	Fne	--	
5			95 100 100	20	SP
		100 50	50		SP
			100		SP
		2	98		
15 5			85 95		
5 5		5	93 88	2 2	
63		18	17	2	GW
5		10	85		SP
40	20	20	20		SW
2			96	2	SP
			98	2	
					NR
2		49	49		SP
					NR
20	80	2	96	2	SP
65	10	10	10	5	GW
					BR

Contacts are generalized. Refer to boring log for precise depths and descriptions.

LEGEND

<div></div> SM	<div></div> GW
<div></div> SP	<div></div> GM
<div></div> SW	<div></div> BR
<div></div> SP/GW	<div></div> NR - No Recovery
<div></div> SP/SW	

Well Construction Information

Drilling Contractor: Prosonic/Boart-Longyear (Driller-Denzil Roberts)  
Drilling Method: Rotosonic  
Drilling Start: February 23, 2007  
Drilling End: February 27, 2007  
Well Installation Complete: March 10, 2007  
Logged By: Rob Tweldt, P.G.

Borehole Diameter: 6 inches  
Borehole Angle: 40 Degrees from Horizontal  
Borehole Azimuth: 087 Degrees  
Drilled Borehole Depth: 158 feet  
Annular Materials:  
Native Formation – Native sands and gravels as logged.  
Intermediate Seal – Native sands and gravels with bentonite slurry grout (approx. 5 gallons) placed every 10 feet.  
Surface Seal – Bentonite slurry grout.  
Completion Type: 10" steel monument casing placed at an angle within 3'x3'x4" concrete pad.

Notes:

- Drawing scale is approximate.
- Lithology is conceptual. Color bands should not be interpreted as laterally extensive stratigraphic units.
- River bed depth estimated from "Transect B" of July 2005 Riverbed Survey.

MULTI-LEVEL MONITORING WELL  
CONSTRUCTION DIAGRAM  
MW-52 LOCATION  
PG&E TOPOCK COMPRESSOR STATION  
NEEDLES, CALIFORNIA

	% Gravel	% Sand	% Sand	% Sand	% Fine	USCS
--	Cse	Med	Fne	--		
0	2	0	78	20		SM
5	0	0	90	5		SP
0	0	68	30	2		
0	0	2	93	5		
						NR
5	5	15	70	5		
5	1	24	67	3		
5	4	38	51	2		
20	4	49	25	2		SP/GW
0	0	1	98	2		SP
5	0	25	68	2		
0	3	40	55	2		
15	2	61	20	2		
40	2	24	34	0		SP/SW
5	0	47	48	0		SP
20	10	60	10	0		SP/SW
						SP
5	9	78	8	0		
0	0	70	30	0		
5	3	68	24	0		
5	4	68	23	0		
						NR
0	0	20	80	0		
40	6	18	36	0		GW
30	6	6	8	50		GM
40	9	9	12	30		
40	6	18	36	0		SW
30	21	28	21	0		
50	9	9	12	20		GM
						BR

Contacts are generalized.  
Refer to boring log for precise depths  
and description.

LEGEND

<div></div> SM	<div></div> GW
<div></div> SP	<div></div> GM
<div></div> SW	<div></div> BR
<div></div> SP/GW	<div></div> NR - No Recovery
<div></div> SP/SW	

Well Construction Information

Drilling Contractor: Prosonic/Boart-Longyear (Driller-Denzil Roberts)  
Drilling Method: Rotasonic  
Drilling Start: March 12, 2007  
Drilling End: March 25, 2007  
Well Installation Complete: March 29, 2007  
Logged By: Rob Tweidt, P.G.

Borehole Diameter: 6 inches  
Borehole Angle: 30 Degrees from Horizontal  
Borehole Azimuth: 090 Degrees  
Drilled Borehole Depth: 265 feet  
Annular Materials:  
Native Formation – Native sands and gravels as logged.  
Intermediate Seal – Native sands and gravels with bentonite slurry grout (approx. 5 gallons) placed every 10 feet.  
Surface Seal – Bentonite slurry grout.  
Completion Type: 10" steel monument casing placed at an angle within 3'x3'x4" concrete pad.

Notes:  
1. Drawing scale is approximate.  
2. Lithology is conceptual. Color bands should not be interpreted as laterally extensive stratigraphic units.  
3. River bed depth estimated from "Transect B" of July 2005 Riverbed Survey.

MULTI-LEVEL MONITORING  
WELL CONSTRUCTION DIAGRAM  
MW-53 LOCATION  
PG&E TOPOCK COMPRESSOR STATION  
NEEDLES, CALIFORNIA

## DO NOT FILL IN

Permit Number 2007020134  
 Record ID WP 3564  
 Expiration 08-09-07  
 FF \_\_\_\_\_  
 FA \_\_\_\_\_  
 SN \_\_\_\_\_

County of San Bernardino  
 DEPARTMENT OF PUBLIC HEALTH  
 ENVIRONMENTAL HEALTH SERVICES  
 385 N. Arrowhead Ave., 2nd Floor  
 San Bernardino, CA 92415-0160  
 (909) 884-4056  
 www.sbcounty.gov/dehs

# WELL PERMIT

(Please Print)

## DO NOT FILL IN

Date 02-09-07  
 Amount \$ 233.00  
 Check # 2027477  
 Receipt Number 60927  
 Paid by CH2M HILL  
 City Code 71

1. OWNER: Name Pacific Gas & Electric Co. Attn: Curt Russell  
PG&E TO ROCK COMPRESSOR STATION  
 Site Address OFF I-40 @ PARK MOABI EXIT  
 City NEEDLES Zip 92363  
 Mailing Address PO BOX 337  
 City NEEDLES Zip 92363  
 Telephone Number (760) 326-5582

2. WELL DRILLER: PROSONIC / BOART-LONGTEAR  
Business Name  
2/19/2007 4/30/2007  
Start Date Completion Date

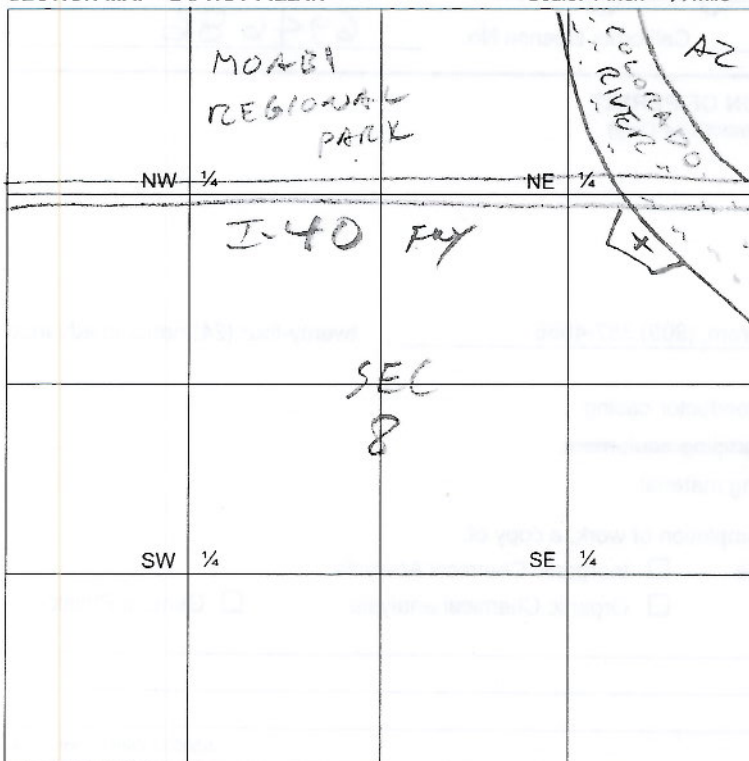
3. INTENDED WELL USE (check):  
☐ Agricultural ☐ Horizontal ☐ Test  
☐ Cathodic ☒ Monitoring/Observation ☐ Dairy  
☐ Ind/Domestic ☐ Community/PWS/City ☐ Other

NOTE: WELL TO BE INSTALLED ON ANGLE BETWEEN 30°-40° FROM HORIZONTAL.  
 ALL DEPTHS INDICATED ARE EXPRESSED AS LINEAR DEPTH DRILLED.

4. TYPE OF WORK (check):  
☒ New ☐ Reconstruction ☐ Destruction  
(MW-52)

## SECTION MAP - DO NOT FILL IN

Scale: 1 inch = 1/4 mile



Items 6 through 9 to be estimated for new wells, exact for all other wells

5. ANNULAR SEAL: Seal Depth 90' ft.  
 Furnished by: ☐ Owner ☒ Contractor  
☐ Driven Conductor Dia. 6 1/2" in., Wall (Gage) 0.25"  
☐ Sealing Material VELLAY GRANT, Thickness min. 2" in.

6. DEPTH OF WELL (feet): (NESTED MONITORING WELL)  
 Proposed 200' Existing \_\_\_\_\_  
 DIAMETER OF BORE (in.): 6"

7. CASING INSTALLED:  
☐ Steel ☒ Plastic ☐ Other

From (ft.)	To (ft.)	Dia. (in.)	Wall (Gage)
SURFACE	200'	1" (MAX)	SCH. 40

Gravel Pack: ☐ Yes ☒ No  
 From \_\_\_\_\_ to \_\_\_\_\_ ft.

8. PERFORATIONS (if applicable): 3 ZONES: 100'-103' (APPX.)  
 From \_\_\_\_\_ to \_\_\_\_\_ ft. 150'-153'  
197'-200'  
 Pumping rate (gpm) \_\_\_\_\_

9. SEALED ZONES (if applicable):  
 From 0' to 90' ft.

10. LOCATION INFORMATION 352 C11  
 (a) TOWNSHIP:  
 Tier 7 N/S Range 24 E/W Section 8  
 (b) Assessor's Parcel No. IMMED. South of 1650-161-14  
(BLM LAND)  
 (c) Latitude and Longitude  
 Lat: \_\_\_\_\_ ° \_\_\_\_\_ ' \_\_\_\_\_ " N/S  
 Long: \_\_\_\_\_ ° \_\_\_\_\_ ' \_\_\_\_\_ " N/S  
 (d) Solid or Liquid Disposal Site within Two Miles  
☐ Yes ☒ No  
 Location \_\_\_\_\_

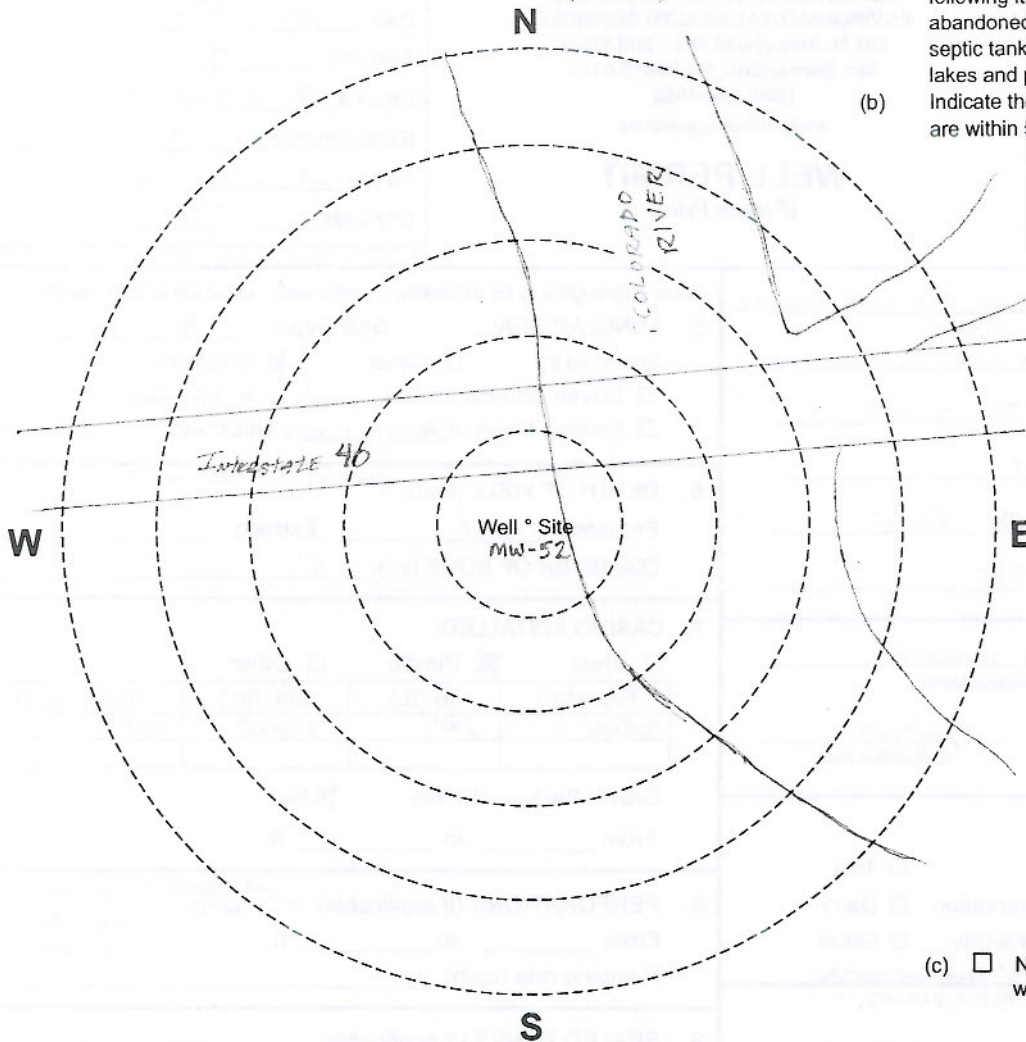
## DO NOT FILL IN

Seal \_\_\_\_\_  
 Cap \_\_\_\_\_  
 Check Valve \_\_\_\_\_  
 Electricals \_\_\_\_\_  
 Stab \_\_\_\_\_  
 Tag \_\_\_\_\_  
 Building & Safety Notified \_\_\_\_\_

Assessor's Parcel No. IMMED. SOUTH OF 0650-161-14  
(BLM LAND)

11. PLOT PLAN:

- (a) In perspective to the well site, sketch and label the following items: well lot property lines, other wells (include abandoned wells), sewage disposal systems (sewers, septic tanks, leaching fields, seepage pits, cesspools), lakes and ponds, watercourses and animals or fowl kept.
- (b) Indicate the distance, in feet, of any of the following which are within 500 ft. of the well site:



Other	_____
Sewers	_____
Septic tanks	_____
Leaching fields	_____
Seepage pits	_____
Cesspools	_____
Lakes and ponds	_____
Watercourses	<u>25'</u>
Animal or fowl kept	_____

- (c) ☐ None of the above are within 500 feet of the well site.

Scale: 1/2 inch = 100 feet

12. I have read this application and agree to comply with all laws regulating the type of work being performed

C-57 Contractor's Signature [Signature]

Date 2-7-07

County Registration No. 161

California License No. 694686

**DISPOSITION OF PERMIT**  
(For Department Use Only)

- ☐ Sent to Water Agency for review.
- ☐ Water Agency conditions or recommendations attached.
- ☐ Denied
- ☒ Approved subject to the following:

A. ☒ Notify the Department, Safe Drinking Water Program, (909) 387-4666, twenty-four (24) hours in advance to make an inspection of the following operations:

- ☐ Prior to sealing of the annular space or filling of the conductor casing.
- ☒ After installation of the surface protective slab and pumping equipment.
- ☐ During destruction of wells, prior to pouring the sealing material.

B. ☒ Submit to the Department, within thirty (30) days after completion of work, a copy of:

- |   |   |  |
|---|---|--|
| <input checked="" type="checkbox"/> Water Well Driller's Report | <input type="checkbox"/> Bacterial Analysis | <input type="checkbox"/> Inorganic Chemical Analysis |
| <input type="checkbox"/> Radiological Analysis                  | <input type="checkbox"/> General Mineral    | <input type="checkbox"/> Organic Chemical analysis   |
|   |   | <input type="checkbox"/> General Physical            |

Comments \_\_\_\_\_

## DO NOT FILL IN

Permit Number 2007020135  
 Record ID WP3565  
 Expiration 08-09-07  
 FF \_\_\_\_\_  
 FA \_\_\_\_\_  
 SN \_\_\_\_\_

County of San Bernardino  
 DEPARTMENT OF PUBLIC HEALTH  
 ENVIRONMENTAL HEALTH SERVICES  
 385 N. Arrowhead Ave., 2nd Floor  
 San Bernardino, CA 92415-0160  
 (909) 884-4056  
 www.sbcounty.gov/dehs

# WELL PERMIT

(Please Print)

## DO NOT FILL IN

Date 02-09-07  
 Amount \$ 233.00  
 Check # 2027477  
 Receipt Number 60927  
 Paid by CH2M HILL  
 City Code 71

1. OWNER: Name Pacific Gas & Electric Co. - ATTN: CURT RUSSELL  
PAGE TO ROCK COMPRESSOR STATION  
 Site Address OFF I-40 @ PARK MODEL EXIT  
 City NEEDLES Zip 92363  
 Mailing Address PO BOX 337  
 City NEEDLES Zip 92363  
 Telephone Number (760) 326-5582

2. WELL DRILLER: PRO SOUND / BOART-LOAN-TEAR  
Business Name  
2/19/2007 4/30/2007  
Start Date Completion Date

3. INTENDED WELL USE (check):  
☐ Agricultural ☐ Horizontal ☐ Test  
☐ Cathodic ☒ Monitoring/Observation ☐ Dairy  
☐ Ind/Domestic ☐ Community/PWS/City ☐ Other

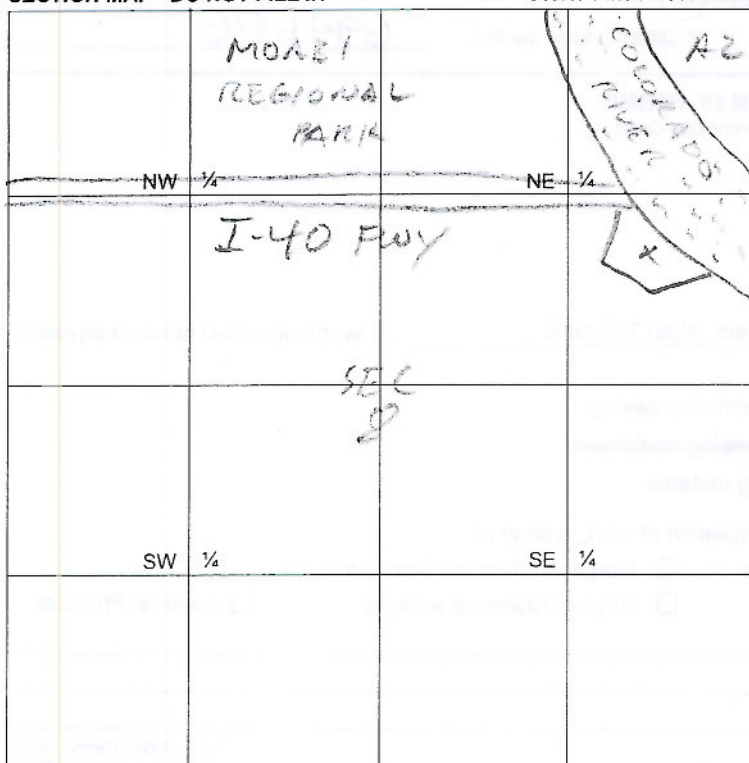
NOTE: WELL TO BE INSTALLED ON ANGLE BETWEEN 30°-40° FROM HORIZONTAL.  
 ALL DEPTHS INDICATED ARE EXPRESSED AS LINEAR DEPTH DRILLED.

4. TYPE OF WORK (check):  
☒ New ☐ Reconstruction ☐ Destruction

(MW-53)

## SECTION MAP - DO NOT FILL IN

Scale: 1 inch = 1/4 mile



Items 6 through 9 to be estimated for new wells, exact for all other wells

5. ANNULAR SEAL: Seal Depth 150' ft.  
 Furnished by: ☐ Owner ☒ Contractor  
☐ Driven Conductor Dia. 6 1/2" in., Wall (Gage) 0.75"  
☐ Sealing Material VOLCLAY GROUT, Thickness MIN. 2" in.

6. DEPTH OF WELL (feet): (NESTED MONITORING WELL)  
 Proposed 300' Existing \_\_\_\_\_  
 DIAMETER OF BORE (in.): 6"

7. CASING INSTALLED:  
☐ Steel ☒ Plastic ☐ Other  

From (ft.)	To (ft.)	Dia. (in.)	Wall (Gage)
SURFACE	300'	1" (MAX)	SCH. 40

Gravel Pack: ☐ Yes ☒ No  
 From \_\_\_\_\_ to \_\_\_\_\_ ft.

8. PERFORATIONS (if applicable): 3 ZONES: 197'-200'  
247'-250'  
297'-300'  
 From \_\_\_\_\_ to \_\_\_\_\_ ft.  
 Pumping rate (gpm) \_\_\_\_\_

9. SEALED ZONES (if applicable):  
 From 0 to 150' ft.

## 10. LOCATION INFORMATION

(a) TOWNSHIP: 352 C11  
 Tier 7 (N/S Range 24 (E/W Section 8)  
 (b) Assessor's Parcel No. IMMED. SOUTH OF 0650-161-14  
 (c) Latitude and Longitude  
 Lat: \_\_\_\_\_ ° \_\_\_\_\_ ' \_\_\_\_\_ " N/S  
 Long: \_\_\_\_\_ ° \_\_\_\_\_ ' \_\_\_\_\_ " N/S  
 (d) Solid or Liquid Disposal Site within Two Miles  
☐ Yes ☒ No  
 Location \_\_\_\_\_

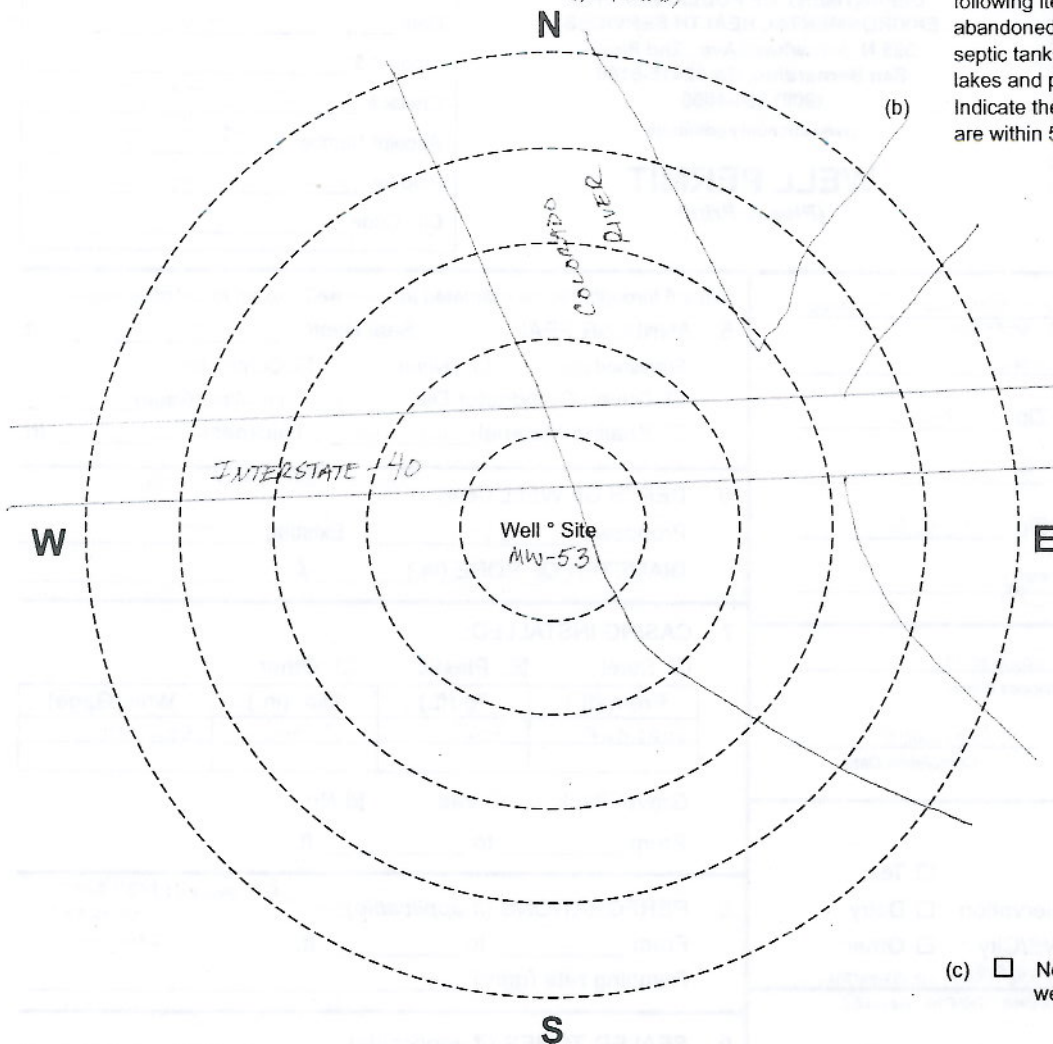
## DO NOT FILL IN

Seal \_\_\_\_\_  
 Cap \_\_\_\_\_  
 Check Valve \_\_\_\_\_  
 Electricals \_\_\_\_\_  
 Stab \_\_\_\_\_  
 Tag \_\_\_\_\_  
 Building & Safety Notified \_\_\_\_\_

Assessor's Parcel No. IMMED. SOUTH OF D650-161-14  
(BLM LAND)

11. PLOT PLAN:

- (a) In perspective to the well site, sketch and label the following items: well lot property lines, other wells (include abandoned wells), sewage disposal systems (sewers, septic tanks, leaching fields, seepage pits, cesspools), lakes and ponds, watercourses and animals or fowl kept.
- (b) Indicate the distance, in feet, of any of the following which are within 500 ft. of the well site:



Other \_\_\_\_\_

Sewers \_\_\_\_\_

Septic tanks \_\_\_\_\_

Leaching fields \_\_\_\_\_

Seepage pits \_\_\_\_\_

Cesspools \_\_\_\_\_

Lakes and ponds \_\_\_\_\_

Watercourses 25'

Animal or fowl kept \_\_\_\_\_

- (c) ☐ None of the above are within 500 feet of the well site.

Scale: 1/2 inch = 100 feet

12. I have read this application and agree to comply with all laws regulating the type of work being performed

C-57 Contractor's Signature [Signature]

Date 2-7-07

County Registration No. 161

California License No. 694686

**DISPOSITION OF PERMIT**  
(For Department Use Only)

- ☐ Sent to Water Agency for review.
- ☐ Water Agency conditions or recommendations attached.
- ☐ Denied
- ☒ Approved subject to the following:

A. ☒ Notify the Department, Safe Drinking Water Program, (909) 387-4666, twenty-four (24) hours in advance to make an inspection of the following operations:

- ☐ Prior to sealing of the annular space or filling of the conductor casing.
- ☒ After installation of the surface protective slab and pumping equipment.
- ☐ During destruction of wells, prior to pouring the sealing material.

B. ☒ Submit to the Department, within thirty (30) days after completion of work, a copy of:

- ☒ Water Well Driller's Report ☐ Bacterial Analysis ☐ Inorganic Chemical Analysis
- ☐ Radiological Analysis ☐ General Mineral ☐ Organic Chemical analysis ☐ General Physical

Comments \_\_\_\_\_







File Original with DWR

State of California

# Well Completion Report

Refer to Instruction Pamphlet

No. e057269

Page 1 of 1

Owner's Well Number MW-53

Date Work Began 3/12/07 Date Work Ended 3/29/07

Local Permit Agency San Bernadino County

Permit Number 2004020135 Permit Date

DWR Use Only - Do Not Fill In

State Well Number/Site Number

Latitude

Longitude

APN/TRS/Other

## Geologic Log

Orientation ☐ Vertical ☐ Horizontal ☒ Angle Specify  
Drilling Method Sonic Drilling Fluid

Depth from Surface Description  
Feet to Feet Describe material, grain size, color, etc

0	9	SM
9	143	SP
143	148	SW
148	151	SP
151	155	SW
155	210	SP
210	212	SW
212	214	GM
214	217	SW
217	227	GM
227	244	SW
244	245	SP
245	248	SW
248	257	GM
257	258	GC
258	265	BR

Total Depth of Boring 265 Feet

Total Depth of Completed Well See attached Feet

## Well Owner

Name Pacific Gas and Electric

Mailing Address P.O. Box 337

City Needles State CA Zip 92363

## Well Location

Address

City Topock County San Bernardino

Latitude Dec. Min. Sec. N Longitude Dec. Min. Sec. W

Datum Decimal Lat. Decimal Long.

APN Book 650 Page 161 Parcel 14

Township 7N Range 24E Section 8

## Location Sketch

(Sketch must be drawn by hand after form is printed.)

North

West

East

South

Illustrate or describe distance of well from roads, buildings, fences, rivers, etc. and attach a map. Use additional paper if necessary. Please be accurate and complete.

## Activity

- ☒ New Well  
☐ Modification/Repair  
☐ Deepen  
☐ Other  
☐ Destroy

Describe procedures and materials under "GEOLOGIC LOG"

## Planned Uses

- ☐ Water Supply  
☐ Domestic ☐ Public  
☐ Irrigation ☐ Industrial  
☐ Cathodic Protection  
☐ Dewatering  
☐ Heat Exchange  
☐ Injection  
☒ Monitoring  
☐ Remediation  
☐ Sparging  
☐ Test Well  
☐ Vapor Extraction  
☐ Other

## Water Level and Yield of Completed Well

Depth to first water (Feet below surface)

Depth to Static

Water Level (Feet) Date Measured

Estimated Yield \* (GPM) Test Type

Test Length (Hours) Total Drawdown (Feet)

\*May not be representative of a well's long term yield.

## Casings

Depth from Surface Feet to Feet	Borehole Diameter (Inches)	Type	Material	Wall Thickness (Inches)	Outside Diameter (Inches)	Screen Type	Slot Size if Any (Inches)
			SEE ATTACHED				
			CONSTRUCTION				
			DIAGRAM				

## Annular Material

Depth from Surface Feet to Feet	Fill	Description

## Attachments

- ☒ Geologic Log  
☒ Well Construction Diagram  
☐ Geophysical Log(s)  
☐ Soil/Water Chemical Analyses  
☐ Other

Attach additional information, if it exists.

## Certification Statement

I, the undersigned, certify that this report is complete and accurate to the best of my knowledge and belief

Name Prosonic/Boart Longyear

Person, Firm or Corporation

7773 W. Seldon Address

Signed [Signature]

C-57 Licensed Water Well Contractor

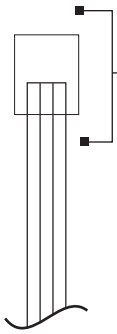
Phoenix Peoria City

AZ State

85345 Zip

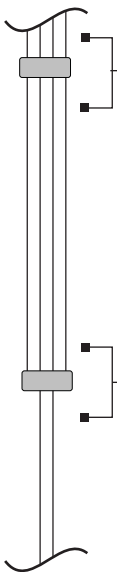
Date Signed

C-57 License Number



Completed wellheads MW-52 (near) and MW-53 (far).

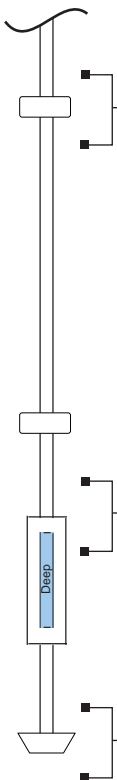
Transducer pipes with centralizer and small support rod.



A. Transition centralizer attached to transducer pipes. Compression fittings for sample tubing exposed.



B. Top of transition centralizer without transducer pipes attached.



Centralizer with bundled tremie pipe and sounding conduit. Sample tubing recess is being packed with bentonite.



Top of sample filter in protective housing. Sample conveyance tubing attached and channeled in support riser recess.



Anchor centralizer with left-hand threaded subs for tremie pipe and sounding conduit. White pins are driven into assembly to join.



Rotosonic drill rig set up on an angle.

**PHOTOGRAPHS OF SLANT WELLS  
MW-52 AND MW-53  
ASSEMBLY & INSTALLATION**  
PG&E TOPOCK COMPRESSOR STATION  
NEEDLES, CALIFORNIA

# Procedure for Reconditioning the Filter in Slant Well MW-53S

---

## Introduction

The filter in the shallow interval of MW-53S is clogged with bentonite and will not produce sufficient water for sampling. It may be possible to back-flush the filter and regain the use of this well for water level measurement and sample collection. We propose the following procedures be implemented in an attempt to clear this clogged filter. Plan A involves using nitrogen gas to back-flush the filter and dislodge the bentonite that may have built up on the surface of the filter. Nitrogen is used rather than air because being inert it will not disrupt the geochemistry of the aquifer. Plan B involves introduction of a dispersant commonly used in well development and designed to break up bentonite drilling muds. The dispersant (NuWell 220) is a non-phosphatic polymer compound that is NSF certified for use in potable wells. The procedures we propose are detailed below.

## Plan A – Back-flushing with nitrogen gas

1. Glue a male threaded coupling on the top of the 1" well casing and allow the PVC cement to dry for at least 24 hours.
2. Fabricate a female threaded cap with a fitting to allow connection to a flow manifold for a nitrogen gas supply (complete with flow regulator). The flow manifold will be constructed with adequate valves and a pressure gauge such that the well can be alternately pressurized and vented with while monitoring pressure in the well.
3. Pump the well dry using a peristaltic pump. All of the purged water (anticipated to be less than 5 gallons) will be stored in a container for possible later use in Plan B.
4. Connect the regulated supply of nitrogen gas and flow manifold to the well head. Set regulator to 5 psi.
5. Open the nitrogen supply gas valve to pressurize the well casing. Observe and record pressure change in the well.
6. After pressure in the well stabilizes at 5 psi, gradually increase pressure on the nitrogen regulator to 15 psi in 5 psi steps, waiting for pressure in the well to stabilize with each step. Check for leaks around the cap, valves, and fittings with a soapy water solution
7. After the pressure in the well stabilizes, valve-off the nitrogen supply gas. Record the time lapsed between valving off the nitrogen supply gas and the stabilization of in-well pressure, where the rate of pressure-drop drastically slows or remains stable. Record the equilibrium pressure.

Note: If there are no leaks in the casing, the pressure in the well should stabilize when gas is no longer able to overcome the water pressure at the depth of the filter and ceases bubbling out through the filter. If the filter were free flowing, this equilibrium pressure would be about 11 psi.

8. Repressurize the casing to 15 psi. After the pressure stabilizes at 15 psi, increase the pressure on the regulator in 5 psi steps to 25 psi.
9. Repeat step 7.
10. Open the valve to pressurize the casing. After the pressure stabilizes at 25 psi, increase the pressure on the regulator in 5 psi steps to 40 psi.
11. Repeat step 7.
12. Continue cycling the pressure in the well by repeatedly and rapidly pressurizing the well up to 40 psi and then valving-off the nitrogen supply gas. Record the time for in-well pressure stabilization and equilibrium pressure for each pressurization cycle.
13. Compare the stabilization times with each cycle noting any decreases.

Note: A decrease in stabilization time indicates a more conductive well filter allowing gas to flow more freely out of the well.
14. Continue pressurization cycles until no further decrease in stabilization time is observed.
15. Valve-off the nitrogen supply gas and open the flow manifold valve to the atmosphere to release the pressure in the well. Disconnect the nitrogen supply gas from the flow manifold and then remove the flow manifold from the well head. Remove the threaded PVC cap.
16. Immediately begin measurement of the water level in the well for a period of at least one hour to determine if the water level is recovering. If the water level does not recover to near the static levels observed in other MW-53 intervals within one hour, go to Plan B. If water level does sufficiently recover, begin development of MW-53S.

## **Plan B – Introduction of dispersant followed by nitrogen back-flush**

1. Per the manufacturer's instructions, mix a 500:1 solution of dispersant (NuWell 220) by adding 0.5 tablespoon of dispersant to one gallon of water pumped from the well in Step 3 of Plan A.

Note: When preparing the solution, care should be taken to siphon purged water away from any bentonite that has settled-out. If additional water required for injection and cannot be obtained from MW-53S, it will be collected from MW-52S.
2. Pour or pump the one gallon of dispersant solution into the well.
3. Pressurize the well using the nitrogen supply gas and the flow manifold from Plan A to 2 psi below the equilibrium pressure measured in Step 7 of Plan A.

Note: This will force most of the dispersant solution through the filter where it can disperse the bentonite but keep some solution in the bottom of the well to provide a seal against gas escape.

4. Leave the well under pressure for a minimum of 12 hours.
5. Agitate the well by repeatedly and rapidly pressurizing the well up to 40 psi and then valving-off the nitrogen supply gas. Record the time for in-well pressure stabilization and equilibrium pressure for each pressurization cycle.
6. Compare the stabilization times with each cycle noting any decreases.
7. Note: A decrease in stabilization time indicates a more conductive well filter allowing gas to flow more freely out of the well.
8. Continue pressurization cycles until no further decrease in stabilization time is observed.
9. Valve-off the nitrogen supply gas and open the flow manifold valve to the atmosphere to release the pressure in the well. Disconnect the nitrogen supply gas from the flow manifold and then remove the flow manifold from the well head. Remove the threaded PVC cap.
10. Immediately begin measurement of the water level in the well for a period of at least one hour to determine if the water level is recovering. If water level does sufficiently recover, begin development of MW-53S.