

Date Started:	12/04/2019	Surface Elevation:	478.39 ft amsl	<b>Well ID: MW-81-43, MW-81-98</b>
Date Completed:	01/09/2020	Shallow Well Elevation:	478.02 ft amsl	
Drilling Co.:	Cascade	Deep Well Elevation:	477.91 ft amsl	Client: PG&E
Drilling Method:	Sonic Drilling	Northing (NAD83):	2102850.62	Project: Final GW Remedy Phase 1
Driller Name:	Eddie Ramos	Easting (NAD83):	7615928.21	Location: PG&E Topock, Needles, California
Drilling Asst:	F. Sandoval/J. Candelaria	Borehole Diameter:	10-12 inches	
Logger:	KK / SM / GW	Static Water Level:	See Log for Depths	Project Number: RC000753.0051
Editor:	Sean McGrane	Development End Date:	1/8/2020	
Total Depth:	180 ft bgs	Well Completion:	<input checked="" type="checkbox"/> Flush <input type="checkbox"/> Stick-up <input type="checkbox"/> To Be Completed in Well Vault	

Depth (ft)	Groundwater Sample ID	Geologic Formation	USCS Code	USCS Class	Well Construction	Calculated Material Volumes	Material Volumes Installed Note: percentages are the actual volume vs the calculated volume
0					(+0.2 - 2.3') Surface completion		(+0.2 - 2.3') 14 bags Note: 30" diameter concrete pad with 18" diameter lockable vault, King Kon-Crete 4000 PSI
1					(0.5 - 78.0') 2" PVC Sch 80 Casing		
2					(0.4 - 22.8') 2" PVC Sch 80 Casing		
3							
4		Topock - Fill	SP-SC				
5							
6							
7							
8		Topock - Fluvial Deposits	SC		(2.0 - 15.0') Portland Cement 6% Bentonite Type I, II and V and Hydrogel (8.5 - 9.5') Centralizer	(2.0 - 15.0') 72.1 gallons	(2.0 - 15.0') 135 gallons (187%) Note: Grout seal. Used >20% of the calculated volume due to potential voids that formed during drilling and grout migration into the formation.
9							
10		Topock - Fluvial Deposits	SP-SC		(0.0 - 23.0') 12.0" Borehole		
11							
12							
13							
14							
15							
16							
17		Topock - Fluvial Deposits	SP		(15.0 - 21.0') Cemex #0/30 MESH (30x50) Lapis Lustre Sand	(15.0 - 21.0') 8.9	(15.0 - 21.0') 9 (101%) Note: Transition sand between filter pack and grout seal
18							
19							

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Drilling Method: Sonic Drilling	Northing (NAD83): 2102850.62	Project: Final GW Remedy Phase 1
Driller Name: Eddie Ramos	Easting (NAD83): 7615928.21	Location: PG&E Topock, Needles, California
Drilling Asst: F. Sandoval/J. Candelaria	Borehole Diameter: 10-12 inches	
Logger: KK / SM / GW	Static Water Level: See Log for Depths	Project Number: RC000753.0051
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Depth (ft)	Groundwater Sample ID	Geologic Formation	USCS Code	USCS Class	Well Construction	Calculated Material Volumes	Material Volumes Installed Note: percentages are the actual volume vs the calculated volume
20					(0.4 - 22.8') 2" PVC Sch 80 Casing	(0.5 - 78.0') 2" PVC Sch 80 Casing	(15.0 - 21.0') 8.9
21		Topock - Fluvial Deposits	SP			(0.0 - 23.0') 12.0" Borehole	
22							
23							
24		Topock - Fluvial Deposits	SW		(22.8 - 42.8') 2" 0.020-Slot Sch 80 PVC Screen		
25							
26		Topock - Fluvial Deposits	SW-SC				
27							
28		Topock - Fluvial Deposits	SP				
29	IRZ-19-VAS-27-32 (<0.033 U ppb) 9/6/2019 08:35						
30		Topock - Fluvial Deposits	SM		(21.0 - 47.0') Cemex #3 MESH (8x10) Lapis Lustre Sand		
31							
32		Topock - Fluvial Deposits	SM			(23.0 - 180.0') 10.0" Borehole	
33							
34		Topock - Fluvial Deposits	SM				
35							
36							
37		Topock - Alluvium Deposits	SW-SM				
38	IRZ-19-VAS-37-42 (<0.033 U ppb) 9/6/2019 14:10						
39		Topock - Alluvium Deposits	SW				

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Drilling Co.:	Cascade	Deep Well Elevation:	477.91 ft amsl	Client: PG&E
Drilling Method:	Sonic Drilling	Northing (NAD83):	2102850.62	Project: Final GW Remedy Phase 1
Driller Name:	Eddie Ramos	Easting (NAD83):	7615928.21	Location: PG&E Topock, Needles, California
Drilling Asst:	F. Sandoval/J. Candelaria	Borehole Diameter:	10-12 inches	
Logger:	KK / SM / GW	Static Water Level:	See Log for Depths	Project Number: RC000753.0051
Editor:	Sean McGrane	Development End Date:	1/8/2020	
Total Depth:	180 ft bgs	Well Completion:	<input checked="" type="checkbox"/> Flush <input type="checkbox"/> Stick-up <input type="checkbox"/> To Be Completed in Well Vault	

Depth (ft)	Groundwater Sample ID	Geologic Formation	USCS Code	USCS Class	Well Construction		Calculated Material Volumes	Material Volumes Installed Note: percentages are the actual volume vs the calculated volume
40	IRZ-19-VAS-37-42 ( $<0.033$ U ppb) 9/6/2019 14:10	Topock - Alluvium Deposits	SW		(22.8 - 42.8') 2" 0.020-Slot Sch 80 PVC Screen		(0.5 - 78.0') 2" PVC Sch 80 Casing	(21.0 - 47.0') 47 bags (166%) Note: Filter Pack. Used $>20\%$ of the calculated volume due to potential voids forming during drilling.
41								
42								
43								
44								
45								
46								
47								
48								
49								
50								
51								
52								
53								
54								
55								
56								
57								
58								
59								

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Drilling Method:	Sonic Drilling	Northing (NAD83):	2102850.62	Project: Final GW Remedy Phase 1
Driller Name:	Eddie Ramos	Easting (NAD83):	7615928.21	Location: PG&E Topock, Needles, California
Drilling Asst:	F. Sandoval/J. Candelaria	Borehole Diameter:	10-12 inches	
Logger:	KK / SM / GW	Static Water Level:	See Log for Depths	Project Number: RC000753.0051
Editor:	Sean McGrane	Development End Date:	1/8/2020	
Total Depth:	180 ft bgs	Well Completion:	<input checked="" type="checkbox"/> Flush <input type="checkbox"/> Stick-up <input type="checkbox"/> To Be Completed in Well Vault	

Depth (ft)	Groundwater Sample ID	Geologic Formation	USCS Code	USCS Class	Well Construction	Calculated Material Volumes	Material Volumes Installed Note: percentages are the actual volume vs the calculated volume
60					(0.5 - 78.0') 2" PVC Sch 80 Casing		
61		Topock - Alluvium Deposits	SM				
62							
63		Topock - Alluvium Deposits	ML				
64							
65		Topock - Alluvium Deposits	SM		(64.5 - 65.5') Centralizer (47.0 - 71.0') Bentonite seal pellets Pel-Plug (TR30) 3/8"	(47.0 - 71.0') 20.1 buckets	(47.0 - 71.0') 22 buckets (109%) Note: Intermediate seal
66							
67							
68							
69		Topock - Alluvium Deposits	SM		(23.0 - 180.0') 10.0" Borehole		
70							
71							
72							
73					(71.0 - 76.0') Cemex #0/30 MESH (30x50) Lapis Lustre Sand	(71.0 - 76.0') 5.2 bags	(71.0 - 76.0') 6 bags (115%) Note: Transition sand between filter pack and intermediate seal
74							
75			NR				
76							
77							
78		Topock - Alluvium Deposits	ML		(76.0 - 105.2') Cemex #3 MESH (8x10) Lapis Lustre Sand	(76.0 - 105.2') 30.8 bags	(76.0 - 105.2') 43 bags (140%) Note: Filter pack. Used >20% of the calculated volume due to potential voids forming during drilling.
79					(78.0 - 98.0') 2" 0.020-Slot Sch 80 PVC Screen		

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# Well Construction Log

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Drilling Co.:	Cascade	Deep Well Elevation:	477.91 ft amsl	Client: PG&E
Drilling Method:	Sonic Drilling	Northing (NAD83):	2102850.62	Project: Final GW Remedy Phase 1
Driller Name:	Eddie Ramos	Easting (NAD83):	7615928.21	Location: PG&E Topock, Needles, California
Drilling Asst:	F. Sandoval/J. Candelaria	Borehole Diameter:	10-12 inches	
Logger:	KK / SM / GW	Static Water Level:	See Log for Depths	Project Number: RC000753.0051
Editor:	Sean McGrane	Development End Date:	1/8/2020	
Total Depth:	180 ft bgs	Well Completion:	<input checked="" type="checkbox"/> Flush <input type="checkbox"/> Stick-up <input type="checkbox"/> To Be Completed in Well Vault	

Depth (ft)	Groundwater Sample ID	Geologic Formation	USCS Code	USCS Class	Well Construction		Calculated Material Volumes	Material Volumes Installed Note: percentages are the actual volume vs the calculated volume
80	IRZ-19-VAS-82-87 (<0.033 U ppb) 9/7/2019 14:10	Topock - Alluvium Deposits	ML			(78.0 - 98.0') 2" 0.020-Slot Sch 80 PVC Screen		
81								
82								
83								
84		Topock - Alluvium Deposits	SM					
85								
86								
87								
88		Topock - Alluvium Deposits	SM					
89								
90								
91								
92		Topock - Alluvium Deposits	CL					
93								
94								
95								
96		Topock - Alluvium Deposits	ML					
97								
98								
99								
					(98.5 - 99.5') Centralizer			

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Drilling Method:	Sonic Drilling	Northing (NAD83):	2102850.62	Project: Final GW Remedy Phase 1
Driller Name:	Eddie Ramos	Easting (NAD83):	7615928.21	Location: PG&E Topock, Needles, California
Drilling Asst:	F. Sandoval/J. Candelaria	Borehole Diameter:	10-12 inches	
Logger:	KK / SM / GW	Static Water Level:	See Log for Depths	Project Number: RC000753.0051
Editor:	Sean McGrane	Development End Date:	1/8/2020	
Total Depth:	180 ft bgs	Well Completion:	<input checked="" type="checkbox"/> Flush <input type="checkbox"/> Stick-up <input type="checkbox"/> To Be Completed in Well Vault	

Depth (ft)	Groundwater Sample ID	Geologic Formation	USCS Code	USCS Class	Well Construction	Calculated Material Volumes	Material Volumes Installed Note: percentages are the actual volume vs the calculated volume
100		Topock - Alluvium Deposits	SM				
101							
102		Topock - Alluvium Deposits	SW-SM		(76.0 - 105.2') Cemex #3 MESH (8x10) Lapis Lustre Sand	(76.0 - 105.2') 30.8 bags	(76.0 - 105.2') 43 bags (140%) Note: Filter pack. Used >20% of the calculated volume due to potential voids forming during drilling.
103							
104		Topock - Alluvium Deposits	SM				
105			NR				
106		Topock - Alluvium Deposits	SW				
107							
108							
109							
110					(23.0 - 180.0') 10.0" Borehole		
111							
112							
113		Topock - Alluvium Deposits	SM		(105.2 - 180.0') Bentonite seal pellets Pel-Plug (TR30) 3/8"	(105.2 - 180.0') 65.2 buckets	(105.2 - 180.0') 85.5 buckets (131%) Note: Decommissioned rathole, used >20% of the calculated volume due to potential voids forming during drilling.
114							
115							
116							
117							
118							
119							

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Driller Name:	Eddie Ramos	Easting (NAD83):	7615928.21	Location: PG&E Topock, Needles, California
Drilling Asst:	F. Sandoval/J. Candelaria	Borehole Diameter:	10-12 inches	
Logger:	KK / SM / GW	Static Water Level:	See Log for Depths	Project Number: RC000753.0051
Editor:	Sean McGrane	Development End Date:	1/8/2020	
Total Depth:	180 ft bgs	Well Completion:	<input checked="" type="checkbox"/> Flush <input type="checkbox"/> Stick-up <input type="checkbox"/> To Be Completed in Well Vault	

Depth (ft)	Groundwater Sample ID	Geologic Formation	USCS Code	USCS Class	Well Construction	Calculated Material Volumes	Material Volumes Installed Note: percentages are the actual volume vs the calculated volume
120		Topock - Alluvium Deposits	SM				
121							
122							
123							
124	IRZ-19-VAS-122-127 (<0.17 U ppb) 9/8/2019 13:45	Topock - Alluvium Deposits	SM				
125							
126							
127							
128							
129							
130		Topock - Alluvium Deposits	SM		(105.2 - 180.0') Bentonite seal pellets Pel-Plug (TR30) 3/8"	(23.0 - 180.0') 10.0" Borehole	(105.2 - 180.0') 65.2 buckets
131							
132							
133	IRZ-19-VAS-131-136 (<0.17 U ppb) 9/9/2019 10:35	Topock - Alluvium Deposits	ML				
134		Topock - Alluvium Deposits	ML				
135		Topock - Alluvium Deposits	ML				
136							
137		Topock - Alluvium Deposits	SM				
138							
139		Topock - Alluvium Deposits	ML				

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Drilling Method:	Sonic Drilling	Northing (NAD83):	2102850.62	Project: Final GW Remedy Phase 1
Driller Name:	Eddie Ramos	Easting (NAD83):	7615928.21	Location: PG&E Topock, Needles, California
Drilling Asst:	F. Sandoval/J. Candelaria	Borehole Diameter:	10-12 inches	
Logger:	KK / SM / GW	Static Water Level:	See Log for Depths	Project Number: RC000753.0051
Editor:	Sean McGrane	Development End Date:	1/8/2020	
Total Depth:	180 ft bgs	Well Completion:	<input checked="" type="checkbox"/> Flush <input type="checkbox"/> Stick-up <input type="checkbox"/> To Be Completed in Well Vault	

Depth (ft)	Groundwater Sample ID	Geologic Formation	USCS Code	USCS Class	Well Construction	Calculated Material Volumes	Material Volumes Installed Note: percentages are the actual volume vs the calculated volume
140							
141							
142							
143		Topock - Alluvium Deposits	ML				
144	IRZ-19-VAS-142-147 ( $<0.17$ U ppb) 9/9/2019 16:40						
145							
146							
147		Topock - Alluvium Deposits	SM				
148							
149							
150					(105.2 - 180.0') Bentonite seal pellets Pel-Plug (TR30) 3/8"	(23.0 - 180.0') 10.0" Borehole	(105.2 - 180.0') 65.2 buckets
151							
152		Topock - Alluvium Deposits	ML				
153							
154	IRZ-19-VAS-152-157 ( $<0.17$ U ppb) 9/10/2019 12:00						
155		Topock - Alluvium Deposits	SM				
156							
157							
158		Topock - Alluvium Deposits	SW-SM				
159							

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160							
161							
162							
163							
164	IRZ-19-VAS-162-167 (<0.17 U ppb) 9/11/2019 11:25	Topock - Alluvium Deposits	SW-SM				
165							
166							
167							
168							
169		Topock - Alluvium Deposits	SM				
170					(105.2 - 180.0') Bentonite seal pellets Pel-Plug (TR30) 3/8"	(23.0 - 180.0') 10.0" Borehole	(105.2 - 180.0') 65.2 buckets
171							
172							
173							
174							
175		Topock - Alluvium Deposits	ML				
176							
177							
178	IRZ-19-VAS-177-182 (<0.17 U ppb) 9/12/2019 10:38						
179		Topock - Weathered Bedrock - conglomerate	ML				

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Editor:	Sean McGrane	Development End Date:	1/8/2020		
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Depth (ft)	Groundwater Sample ID	Geologic Formation	USCS Code	USCS Class	Well Construction	Calculated Material Volumes	Material Volumes Installed Note: percentages are the actual volume vs the calculated volume
180					End of Boring at 180.0 ft bgs.		
181							
182							
183							
184							
185							
186							
187							
188							
189							
190							
191							
192							
193							
194							
195							
196							
197							
198							
199							



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Date Started:	11/21/2019	Surface Elevation:	478.39 ft amsl	<b>Boring No.: MW-81</b>	
Date Completed:	12/05/2019	Northing (NAD83):	2102850.62		
Drilling Co.:	Cascade	Easting (NAD83):	7615928.21	Client:	PG&E
Drilling Method:	Sonic Drilling	Total Depth:	180 ft bgs	Project:	Final GW Remedy Phase 1
Drill Rig Type:	Boart Longyear Track	Conductor Casing Diameter:	12 inches	Location:	PG&E Topock, Needles, California
Driller Name:	Eddie Ramos	Drill Casing Diameter:	10 inches		
Drilling Asst:	F. Sandoval/J. Candelaria	Drill Bit:	N/A	Project Number:	RC000753.0051
Tool-Pusher:	NA	Depth to First Water:	24.1 ft bgs		
Rig Geologist:	KK / SM / GW	Converted to Well:	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No		

Depth (ft)	Drilling Run (ft) and Average Penetration Rate	USCS Code	USCS Class	Casing Diameter	Description (See Pilot boring log for full geologic descriptions)	Drilling notes and observations confirming presence of temporary backfill material in drill cuttings	Drilling Fluid
1					(0.0 - 8.0') Topock - Fill; Poorly graded sand with clay (SP-SC); light brown (7.5YR 6/3)	(1.0') Confirmed 12-inch conductor casing was lined up on pilot borehole, observed wildcat plastering sand at surface.	(0.0 - 180.0') 1500 gallons of water used; 1350 gallons of water recovered; 150 gallons of water lost
2							(0.1 - 105.0') 1200 gallons of water used; 1080 gallons of water recovered; 120 gallons of water lost
3							
4		SP-SC					
5							
6							
7							
8							
9		SC			(8.0 - 9.5') Topock - Fluvial Deposits; Clayey sand (SC); light brown (7.5YR 6/3)	(8.5') 12-inch conductor casing dropped approximately 10 ft. when drilling to 37 ft. with 10-inch casing.	
10	(0.0 - 23.0) 0.00 mins/ft			(0.0 - 23.0') 12.0" Steel Casing	(9.5 - 15.7') Topock - Fluvial Deposits; Poorly graded sand with clay (SP-SC); brown (7.5YR 5/4) and brown (7.5YR 5/3)		
11							
12							
13		SP-SC					
14							
15							
16					(15.7 - 23.5') Topock - Fluvial Deposits; Poorly graded sand (SP); brown (7.5YR 5/3)	(16.0 - 17.0') Observed Cemex #3 Lapis Lustre Sand in drill cuttings.	
17							
18		SP					
19							
20							

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Date Started:	11/21/2019	Surface Elevation:	478.39 ft amsl	<b>Boring No.: MW-81</b>
Date Completed:	12/05/2019	Northing (NAD83):	2102850.62	
Drilling Co.:	Cascade	Easting (NAD83):	7615928.21	Client: PG&E
Drilling Method:	Sonic Drilling	Total Depth:	180 ft bgs	Project: Final GW Remedy Phase 1
Drill Rig Type:	Boart Longyear Track	Conductor Casing Diameter:	12 inches	Location: PG&E Topock, Needles, California
Driller Name:	Eddie Ramos	Drill Casing Diameter:	10 inches	
Drilling Asst:	F. Sandoval/J. Candelaria	Drill Bit:	N/A	Project Number: RC000753.0051
Tool-Pusher:	NA	Depth to First Water:	24.1 ft bgs	
Rig Geologist:	KK / SM / GW	Converted to Well:	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No	

Depth (ft)	Drilling Run (ft) and Average Penetration Rate	USCS Code	USCS Class	Casing Diameter	Description (See Pilot boring log for full geologic descriptions)	Drilling notes and observations confirming presence of temporary backfill material in drill cuttings	Drilling Fluid
21	(0.0 - 23.0) 0.00 mins/ft	SP		(0.0 - 23.0') 12.0" Steel Casing			
22							
23	(23.0 - 180.0) mins/ft	SW		(23.0 - 180.0') 10.0" Steel Casing	(23.5 - 24.0') Topock - Fluvial Deposits; Well graded sand with gravel (SW); light brown (7.5YR 6/3)	(23.0') Total depth of conductor casing once it was retrieved and reset.	
24							
25							
26							
27							
28							
29							
30							
31							
32							
33							
34							
35							
36							
37							
38							
39							
40							

Abbreviations: USCS = Unified Soil Classification System, ft = feet, bgs = below ground surface, amsl = above mean sea level, GW = groundwater, NR = no recovery; Notes: water level collected during the first VAS interval of the IRZ-19 pilot borehole

Date Started:	11/21/2019	Surface Elevation:	478.39 ft amsl	<b>Boring No.: MW-81</b>
Date Completed:	12/05/2019	Northing (NAD83):	2102850.62	
Drilling Co.:	Cascade	Easting (NAD83):	7615928.21	Client: PG&E
Drilling Method:	Sonic Drilling	Total Depth:	180 ft bgs	Project: Final GW Remedy Phase 1
Drill Rig Type:	Boart Longyear Track	Conductor Casing Diameter:	12 inches	Location: PG&E Topock, Needles, California
Driller Name:	Eddie Ramos	Drill Casing Diameter:	10 inches	
Drilling Asst:	F. Sandoval/J. Candelaria	Drill Bit:	N/A	Project Number: RC000753.0051
Tool-Pusher:	NA	Depth to First Water:	24.1 ft bgs	
Rig Geologist:	KK / SM / GW	Converted to Well:	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No	

Depth (ft)	Drilling Run (ft) and Average Penetration Rate	USCS Code	USCS Class	Casing Diameter	Description (See Pilot boring log for full geologic descriptions)	Drilling notes and observations confirming presence of temporary backfill material in drill cuttings	Drilling Fluid
41					(41') reddish brown (5YR 4/3)		
42							
43							
44		SW					
45							
46							
47						(46.0 - 47.0') Observed trace amounts of Cemex #3 Lapis Lustre Sand in drill cuttings.	
48					(47.0 - 55.0') Topock - Alluvium Deposits; Silty sand with gravel (SM); brown (7.5YR 4/3)		
49							
50	(23.0 - 180.0) mins/ft			(23.0 - 180.0') 10.0" Steel Casing	(50') brown (7.5YR 4/4)		
51		SM					
52							
53							
54							
55							
56		SW			(55.0 - 57.0') Topock - Alluvium Deposits; Well graded sand with silt and gravel (SW); brown (7.5YR 4/3)	(56.0 - 57.0') Observed trace amounts of Cemex #3 Lapis Lustre Sand in drill cuttings.	
57							
58		SM			(57.0 - 62.4') Topock - Alluvium Deposits; Silty sand with gravel (SM); brown (7.5YR 4/4)	(57.0 - 63.0') Core barrel cutting easy, driller states because of pilot borehole.	
59							
60							

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Date Started:	11/21/2019	Surface Elevation:	478.39 ft amsl	<b>Boring No.: MW-81</b>
Date Completed:	12/05/2019	Northing (NAD83):	2102850.62	
Drilling Co.:	Cascade	Easting (NAD83):	7615928.21	Client: PG&E
Drilling Method:	Sonic Drilling	Total Depth:	180 ft bgs	Project: Final GW Remedy Phase 1
Drill Rig Type:	Boart Longyear Track	Conductor Casing Diameter:	12 inches	Location: PG&E Topock, Needles, California
Driller Name:	Eddie Ramos	Drill Casing Diameter:	10 inches	
Drilling Asst:	F. Sandoval/J. Candelaria	Drill Bit:	N/A	Project Number: RC000753.0051
Tool-Pusher:	NA	Depth to First Water:	24.1 ft bgs	
Rig Geologist:	KK / SM / GW	Converted to Well:	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No	

Depth (ft)	Drilling Run (ft) and Average Penetration Rate	USCS Code	USCS Class	Casing Diameter	Description (See Pilot boring log for full geologic descriptions)	Drilling notes and observations confirming presence of temporary backfill material in drill cuttings	Drilling Fluid
61		SM					
62							
63		ML			(62.4 - 63.1') Topock - Alluvium Deposits; Sandy silt (ML); brown (7.5YR 4/4)		
64					(63.1 - 67.0') Topock - Alluvium Deposits; Silty sand with gravel (SM); brown (7.5YR 4/4)		
65		SM					
66						(66.0 - 67.0') Observed large amount of Cemex #3 Lapis Lustre Sand in drill cuttings.	
67					(67.0 - 72.5') Topock - Alluvium Deposits; Silty sand with gravel (SM); brown (7.5YR 4/3)		
68							
69							
70	(23.0 - 180.0) mins/ft	SM		(23.0 - 180.0') 10.0" Steel Casing			
71							
72							
73					(72.5 - 77.0') No recovery (NR)		
74							
75		NR					
76							
77					(77.0 - 84.0') Topock - Alluvium Deposits; Sandy silt with gravel (ML); brown (7.5YR 4/4)		
78		ML					
79							
80							

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Date Started:	11/21/2019	Surface Elevation:	478.39 ft amsl	<b>Boring No.: MW-81</b>
Date Completed:	12/05/2019	Northing (NAD83):	2102850.62	
Drilling Co.:	Cascade	Easting (NAD83):	7615928.21	Client: PG&E
Drilling Method:	Sonic Drilling	Total Depth:	180 ft bgs	Project: Final GW Remedy Phase 1
Drill Rig Type:	Boart Longyear Track	Conductor Casing Diameter:	12 inches	Location: PG&E Topock, Needles, California
Driller Name:	Eddie Ramos	Drill Casing Diameter:	10 inches	
Drilling Asst:	F. Sandoval/J. Candelaria	Drill Bit:	N/A	Project Number: RC000753.0051
Tool-Pusher:	NA	Depth to First Water:	24.1 ft bgs	
Rig Geologist:	KK / SM / GW	Converted to Well:	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No	

Depth (ft)	Drilling Run (ft) and Average Penetration Rate	USCS Code	USCS Class	Casing Diameter	Description (See Pilot boring log for full geologic descriptions)	Drilling notes and observations confirming presence of temporary backfill material in drill cuttings	Drilling Fluid
81					(80') brown (7.5YR 4/3)		
82		ML					
83							
84					(84.0 - 87.0') Topock - Alluvium Deposits; Silty sand with gravel (SM); brown (7.5YR 4/3)		
85		SM					
86						(86.0 - 87.0') Observed very trace amounts of Cemex #3 Lapis Lustre Sand in drill cuttings.	
87					(87.0 - 92.1') Topock - Alluvium Deposits; Silty sand with gravel (SM); reddish brown (5YR 4/3) to reddish brown / moderate brown (5YR 4/4)		
88							
89		SM					
90	(23.0 - 180.0) mins/ft			(23.0 - 180.0') 10.0" Steel Casing			
91							
92							
93		CL			(92.1 - 93.7') Topock - Alluvium Deposits; Sandy lean clay (CL); reddish brown / moderate brown (5YR 4/4)		
94							
95		ML			(93.7 - 96.1') Topock - Alluvium Deposits; Sandy silt with gravel (ML); reddish brown (5YR 4/3)		
96							
97					(96.1 - 101.0') Topock - Alluvium Deposits; Silty sand with gravel (SM); reddish brown / moderate brown (5YR 4/4) to reddish brown (5YR 4/3)	(96.0 - 97.0') Observed large amounts of Cemex #3 Lapis Lustre Sand in drill cuttings.	
98		SM					
99							
100							

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Date Started:	11/21/2019	Surface Elevation:	478.39 ft amsl	<b>Boring No.: MW-81</b>	
Date Completed:	12/05/2019	Northing (NAD83):	2102850.62		
Drilling Co.:	Cascade	Easting (NAD83):	7615928.21	Client:	PG&E
Drilling Method:	Sonic Drilling	Total Depth:	180 ft bgs	Project:	Final GW Remedy Phase 1
Drill Rig Type:	Boart Longyear Track	Conductor Casing Diameter:	12 inches	Location:	PG&E Topock, Needles, California
Driller Name:	Eddie Ramos	Drill Casing Diameter:	10 inches		
Drilling Asst:	F. Sandoval/J. Candelaria	Drill Bit:	N/A	Project Number:	RC000753.0051
Tool-Pusher:	NA	Depth to First Water:	24.1 ft bgs		
Rig Geologist:	KK / SM / GW	Converted to Well:	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No		

Depth (ft)	Drilling Run (ft) and Average Penetration Rate	USCS Code	USCS Class	Casing Diameter	Description (See Pilot boring log for full geologic descriptions)	Drilling notes and observations confirming presence of temporary backfill material in drill cuttings	Drilling Fluid
101		SM					
102		SW-SM			(101.0 - 104.0') Topock - Alluvium Deposits; Well graded sand with silt and gravel (SW-SM); dark reddish brown / moderate brown (5YR 3/4)		
103							
104		SM			(104.0 - 104.5') Topock - Alluvium Deposits; Silty sand (SM); reddish brown / moderate brown (5YR 4/4)		
105		NR			(104.5 - 106.0') No recovery (NR)		
106		SW			(106.0 - 107.0') Topock - Alluvium Deposits; Well graded sand with gravel (SW); reddish brown / moderate brown (5YR 4/4)	(106.0 - 107.0') Core fell out of core barrel and was retrieved with a flapper bit. Observed large amounts of Cemex #3 Lapis Lustre Sand in the retrieved drill cuttings.	
107					(107.0 - 121.3') Topock - Alluvium Deposits; Silty sand with gravel (SM); reddish brown / moderate brown (5YR 4/4)		
108							
109							
110	(23.0 - 180.0) mins/ft			(23.0 - 180.0') 10.0" Steel Casing			
111							
112							
113							
114		SM					
115							
116						(116.0 - 117.0') Observed large amounts of Cemex #3 Lapis Lustre Sand in drill cuttings.	
117					(117') reddish brown (5YR 4/3)		
118					(118') reddish brown (2.5YR 4/3) to reddish brown / moderate brown (5YR 4/4)		
119							
120							

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Date Started:	11/21/2019	Surface Elevation:	478.39 ft amsl	<b>Boring No.: MW-81</b>
Date Completed:	12/05/2019	Northing (NAD83):	2102850.62	
Drilling Co.:	Cascade	Easting (NAD83):	7615928.21	Client: PG&E
Drilling Method:	Sonic Drilling	Total Depth:	180 ft bgs	Project: Final GW Remedy Phase 1
Drill Rig Type:	Boart Longyear Track	Conductor Casing Diameter:	12 inches	Location: PG&E Topock, Needles, California
Driller Name:	Eddie Ramos	Drill Casing Diameter:	10 inches	
Drilling Asst:	F. Sandoval/J. Candelaria	Drill Bit:	N/A	Project Number: RC000753.0051
Tool-Pusher:	NA	Depth to First Water:	24.1 ft bgs	
Rig Geologist:	KK / SM / GW	Converted to Well:	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No	

Depth (ft)	Drilling Run (ft) and Average Penetration Rate	USCS Code	USCS Class	Casing Diameter	Description (See Pilot boring log for full geologic descriptions)	Drilling notes and observations confirming presence of temporary backfill material in drill cuttings	Drilling Fluid
121		SM					
122					(121.3 - 127.0') Topock - Alluvium Deposits; Silty sand (SM); reddish brown / moderate brown (5YR 4/4) to reddish brown (5YR 4/3)		
123							
124		SM					
125							
126						(126.0 - 127.0') Observed some Cemex #3 Lapis Lustre Sand in drill cuttings.	
127					(127.0 - 133.7') Topock - Alluvium Deposits; Silty sand with gravel (SM); reddish brown / moderate brown (5YR 4/4)		
128							
129							
130	(23.0 - 180.0) mins/ft	SM		(23.0 - 180.0') 10.0" Steel Casing			
131							
132							
133							
134		ML			(133.7 - 134.4') Topock - Alluvium Deposits; Sandy silt with gravel (ML); brown (7.5YR 4/4)		
135		ML			(134.4 - 137.0') Topock - Alluvium Deposits; Gravelly silt with sand (ML); reddish brown (5YR 5/3)		
136						(136.0 - 137.0') Observed some Cemex #3 Lapis Lustre Sand in drill cuttings.	
137							
138		SM			(137.0 - 138.1') Topock - Alluvium Deposits; Silty sand with gravel (SM); reddish brown (5YR 4/3)	(137.0 - 147.0') Core fell out of core barrel retrieved with flapper bit.	
139		ML			(138.1 - 146.1') Topock - Alluvium Deposits; Sandy silt with gravel (ML); reddish brown / moderate brown (5YR 4/4)		
140							

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Date Started:	11/21/2019	Surface Elevation:	478.39 ft amsl	<b>Boring No.: MW-81</b>	
Date Completed:	12/05/2019	Northing (NAD83):	2102850.62		
Drilling Co.:	Cascade	Easting (NAD83):	7615928.21	Client:	PG&E
Drilling Method:	Sonic Drilling	Total Depth:	180 ft bgs	Project:	Final GW Remedy Phase 1
Drill Rig Type:	Boart Longyear Track	Conductor Casing Diameter:	12 inches	Location:	PG&E Topock, Needles, California
Driller Name:	Eddie Ramos	Drill Casing Diameter:	10 inches		
Drilling Asst:	F. Sandoval/J. Candelaria	Drill Bit:	N/A	Project Number:	RC000753.0051
Tool-Pusher:	NA	Depth to First Water:	24.1 ft bgs		
Rig Geologist:	KK / SM / GW	Converted to Well:	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No		

Depth (ft)	Drilling Run (ft) and Average Penetration Rate	USCS Code	USCS Class	Casing Diameter	Description (See Pilot boring log for full geologic descriptions)	Drilling notes and observations confirming presence of temporary backfill material in drill cuttings	Drilling Fluid	
141	(23.0 - 180.0) mins/ft	ML		(23.0 - 180.0') 10.0" Steel Casing				
142								
143								
144								
145								
146								
147		SM			(146.1 - 150.6') Topock - Alluvium Deposits; Silty sand (SM); dark reddish brown (5YR 3/3) to reddish brown (5YR 4/3)	(146.0 - 147.0') Observed little to some Cemex #3 Lapis Lustre Sand in drill cuttings.		
148						(147.0 - 157.0') Core fell out of core barrel retrieved with flapper bit.		
149								
150								
151		ML			(150.6 - 154.4') Topock - Alluvium Deposits; Sandy silt (ML); dark reddish brown (5YR 3/3) to dark reddish brown / grayish brown (5YR 3/2)			
152								
153								
154								
155		SM			(154.4 - 157.0') Topock - Alluvium Deposits; Silty sand with gravel (SM); dark reddish brown (5YR 3/3) to dark reddish brown / moderate brown (5YR 3/4)			
156						(156.0 - 157.0') Observed little to some Cemex #3 Lapis Lustre Sand in drill cuttings.		
157		SW-SM			(157.0 - 167.5') Topock - Alluvium Deposits; Well graded sand with silt and gravel (SW-SM); dark reddish brown (5YR 3/3)			
158								
159								
160								

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Date Started:	11/21/2019	Surface Elevation:	478.39 ft amsl	<b>Boring No.: MW-81</b>
Date Completed:	12/05/2019	Northing (NAD83):	2102850.62	
Drilling Co.:	Cascade	Easting (NAD83):	7615928.21	Client: PG&E
Drilling Method:	Sonic Drilling	Total Depth:	180 ft bgs	Project: Final GW Remedy Phase 1
Drill Rig Type:	Boart Longyear Track	Conductor Casing Diameter:	12 inches	Location: PG&E Topock, Needles, California
Driller Name:	Eddie Ramos	Drill Casing Diameter:	10 inches	
Drilling Asst:	F. Sandoval/J. Candelaria	Drill Bit:	N/A	Project Number: RC000753.0051
Tool-Pusher:	NA	Depth to First Water:	24.1 ft bgs	
Rig Geologist:	KK / SM / GW	Converted to Well:	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No	

Depth (ft)	Drilling Run (ft) and Average Penetration Rate	USCS Code	USCS Class	Casing Diameter	Description (See Pilot boring log for full geologic descriptions)	Drilling notes and observations confirming presence of temporary backfill material in drill cuttings	Drilling Fluid
161							
162							
163							
164		SW-SM					
165							
166						(166.0 - 167.0') Observed little to some Cemex #3 Lapis Lustre Sand in drill cuttings.	
167							
168					(167.5 - 171.1') Topock - Alluvium Deposits; Silty sand with gravel (SM); reddish brown / moderate brown (5YR 4/4)		
169		SM					
170	(23.0 - 180.0) mins/ft			(23.0 - 180.0') 10.0" Steel Casing			
171							
172					(171.1 - 178.5') Topock - Alluvium Deposits; Sandy silt (ML); reddish brown / moderate brown (5YR 4/4) with dark reddish brown (2.5YR 3/4)		
173							
174							
175		ML					
176						(176.0 - 177.0') Observed little to some Cemex 2/12 Lapis Lustre Sand in drill cuttings.	
177							
178							
179					(178.5 - 180.0') Topock - Weathered Bedrock - conglomerate; Sandy silt (ML); dark reddish brown / moderate brown (5YR 3/4) with reddish	(179.0 - 180.0') Observed abundant Cemex #2/12 Lapis Lustre Sand in drill cuttings.	
180		ML					

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Date Started:	11/21/2019	Surface Elevation:	478.39 ft amsl	<b>Boring No.: MW-81</b>	
Date Completed:	12/05/2019	Northing (NAD83):	2102850.62		
Drilling Co.:	Cascade	Easting (NAD83):	7615928.21	Client:	PG&E
Drilling Method:	Sonic Drilling	Total Depth:	180 ft bgs	Project:	Final GW Remedy Phase 1
Drill Rig Type:	Boart Longyear Track	Conductor Casing Diameter:	12 inches	Location:	PG&E Topock, Needles, California
Driller Name:	Eddie Ramos	Drill Casing Diameter:	10 inches		
Drilling Asst:	F. Sandoval/J. Candelaria	Drill Bit:	N/A	Project Number:	RC000753.0051
Tool-Pusher:	NA	Depth to First Water:	24.1 ft bgs		
Rig Geologist:	KK / SM / GW	Converted to Well:	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No		

Depth (ft)	Drilling Run (ft) and Average Penetration Rate	USCS Code	USCS Class	Casing Diameter	Description (See Pilot boring log for full geologic descriptions)	Drilling notes and observations confirming presence of temporary backfill material in drill cuttings	Drilling Fluid
181					brown (2.5YR 4/4) End of Boring at 180.0 ft bgs.		
182							
183							
184							
185							
186							
187							
188							
189							
190							
191							
192							
193							
194							
195							
196							
197							
198							
199							
200							

Abbreviations: USCS = Unified Soil Classification System, ft = feet, bgs = below ground surface, amsl = above mean sea level, GW = groundwater, NR = no recovery; Notes: water level collected during the first VAS interval of the IRZ-19 pilot borehole



Date Started:	09/04/2019	Surface Elevation:	478.40 ft amsl	<b>Boring No.: MW-81/IRZ-19 Pilot</b>
Date Completed:	09/12/2019	Northing (NAD83):	2102850.39	
Drilling Co.:	Cascade	Easting (NAD83):	7615927.95	Client: PG&E
Drilling Method:	Sonic Drilling	Total Depth:	192 ft bgs	Project: Final GW Remedy Phase 1
Drill Rig Type:	Boart Longyear Track	Borehole Diameter:	6-12 inches	Location: PG&E Topock, Needles, California
Driller Name:	Eddie Ramos	Depth to First Water:	24.1 ft bgs	
Drilling Asst:	F. Sandoval/J. Colon	Sampling Method:	4 inch x 10 ft Core Barrel	Project Number: RC000753.0051
Logger:	Kendra Keon	Sampling Interval:	Continuous	
Editor:	Grant Willford	Converted to Well:	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No	

Depth (ft)	Recovery (in)	Sieve Sample ID	Groundwater Sample ID	Geologic Formation	USCS Code	USCS Class	Soil Description	Drilling Notes	Drilling Fluid
1							(0.0 - 8.0') Topock - Fill; Poorly graded sand with clay (SP-SC); light brown (7.5YR 6/3); very fine grained to medium grained, subangular to subround; little clay; trace silt; dry to moist	(0.0 - 8.0') Advanced conductor casing, the core was not collected the material was logged from cuttings collected from the hopper.	(0.0 - 192.0') No water used
2									
3									
4				Topock - Fill	SP-SC				
5									
6									
7									
8									
9				Topock - Fluvial Deposits	SC		(8.0 - 9.5') Topock - Fluvial Deposits; Clayey sand (SC); light brown (7.5YR 6/3); very fine grained to medium grained, subangular to subround; some clay; little silt; dry to moist; bentonite from mud tub seal found throughout		
10									
11									
12				Topock - Fluvial Deposits	SP-SC		(9.5 - 15.7') Topock - Fluvial Deposits; Poorly graded sand with clay (SP-SC); brown (7.5YR 5/4) and brown (7.5YR 5/3); very fine grained to medium grained, subangular to subround; little silt; little clay; dry to moist		
13	108								
14									
15									
16									
17									
18	54			Topock - Fluvial Deposits	SP		(15.7 - 23.5') Topock - Fluvial Deposits; Poorly graded sand (SP); brown (7.5YR 5/3); very fine grained to medium grained, subangular to subround; trace small to large pebbles, angular to subangular; trace coarse grained sand, angular to subangular; trace silt; trace clay; moist; bentonite at 17 ft	(17.0 - 27.0') Poor recovery, air in the core barrel resulted in the loss of part of core sample in the hopper. The additional no recovery is	
19									
20									

Abbreviations: USCS = Unified Soil Classification System, ft = feet, bgs = below ground surface, amsl = above mean sea level, GW = groundwater, ppb = parts per billion, U = not detected above the laboratory reporting limit, NR = no recovery; Notes: blue water table symbol represents depth to water measured during the first VAS interval; apparent partial recoveries can be the result of potential compaction of sediments in the core bag; wells MW-81-43, MW-81-98 installed in borehole

Date Started:	09/04/2019	Surface Elevation:	478.40 ft amsl	<b>Boring No.: MW-81/IRZ-19 Pilot</b>
Date Completed:	09/12/2019	Northing (NAD83):	2102850.39	
Drilling Co.:	Cascade	Easting (NAD83):	7615927.95	Client: PG&E
Drilling Method:	Sonic Drilling	Total Depth:	192 ft bgs	Project: Final GW Remedy Phase 1
Drill Rig Type:	Boart Longyear Track	Borehole Diameter:	6-12 inches	Location: PG&E Topock, Needles, California
Driller Name:	Eddie Ramos	Depth to First Water:	24.1 ft bgs	
Drilling Asst:	F. Sandoval/J. Colon	Sampling Method:	4 inch x 10 ft Core Barrel	Project Number: RC000753.0051
Logger:	Kendra Keon	Sampling Interval:	Continuous	
Editor:	Grant Willford	Converted to Well:	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No	

Depth (ft)	Recovery (in)	Sieve Sample ID	Groundwater Sample ID	Geologic Formation	USCS Code	USCS Class	Soil Description	Drilling Notes	Drilling Fluid
21	54	IRZ-19-SS-20-25 9/17/2019 10:10		Topock - Fluvial Deposits	SP			believed to be from core barrel clogging up.	
22								(21.5') Logged from core that was lost in the hopper.	
23									
24				Topock - Fluvial Deposits	SW		(23.5 - 24.0') Topock - Fluvial Deposits; Well graded sand with gravel (SW); light brown (7.5YR 6/3); very fine grained to very coarse grained; little granules to very large pebbles, angular to subangular; trace small cobbles, angular to subangular; trace silt; trace clay		
25		IRZ-19-SS-25-28 9/17/2019 10:15		Topock - Fluvial Deposits	SW-SC		(24.0 - 27.0') Topock - Fluvial Deposits; Well graded sand with clay (SW-SC); brown (7.5YR 5/4); very fine grained to coarse grained, angular to subround; little clay; trace silt	(23.5') Logged from material collected during the clean out run highly disturbed.	
26									
27									
28				Topock - Fluvial Deposits	SP		(27.0 - 29.0') Topock - Fluvial Deposits; Poorly graded sand (SP); light brown (7.5YR 6/4); very fine grained to medium grained, angular to subangular; trace granules to large pebbles, angular to subangular; trace silt; moist	(27.0 - 32.0') Soft drilling. Sample interval had poor water production, sample was collected without complete purge.	
29		IRZ-19-VAS-27-32 (<0.033 U ppb) 9/6/2019 08:35		Topock - Fluvial Deposits	SM		(29.0 - 31.0') Topock - Fluvial Deposits; Silty sand (SM); light brown (7.5YR 6/4); very fine grained to medium grained, subangular to subround; some silt; moist to wet		
30									
31				Topock - Fluvial Deposits	SM		(31.0 - 33.0') Topock - Fluvial Deposits; Silty sand with gravel (SM); light brown (7.5YR 6/3); very fine grained to very coarse grained, angular to subround; some silt; little granules to very large pebbles, angular to subround; trace small cobbles, angular to subangular; trace clay; moist		
32									
33		IRZ-19-SS-28-35 9/17/2019 10:20		Topock - Fluvial Deposits	SM		(33.0 - 36.2') Topock - Fluvial Deposits; Silty sand (SM); light brown (7.5YR 6/3); very fine grained to very coarse grained, angular to subround; and silt; little granules to very large pebbles, angular to subround; moist		
34									
35				Topock - Fluvial Deposits	SM		(34.5') brown (7.5YR 5/4); trace granules to large pebbles, subangular to subround; moist; increase in silt		
36									
37	240	IRZ-19-SS-33-37 9/17/2019 10:33		Topock - Alluvium Deposits	SW-SM		(36.2 - 38.0') Topock - Alluvium Deposits; Well graded sand with silt (SW-SM); brown (7.5YR 4/3); very fine grained to very coarse grained, angular to subangular; little silt; trace granules to very large pebbles, angular to subangular; trace clay; moist to wet		
38									
39				Topock - Alluvium Deposits	SW		(38.0 - 47.0') Topock - Alluvium Deposits; Well graded sand (SW); brown (7.5YR 4/3); very fine grained to very coarse grained, angular to subangular; little granules to very large pebbles, angular to subangular; trace small cobbles, angular to subangular; trace silt; wet	(32.0 - 37.0') Soft drilling	
40									
								(37.0 - 57.0') Soft drilling	

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Date Started:	09/04/2019	Surface Elevation:	478.40 ft amsl	<b>Boring No.: MW-81/IRZ-19 Pilot</b>
Date Completed:	09/12/2019	Northing (NAD83):	2102850.39	
Drilling Co.:	Cascade	Easting (NAD83):	7615927.95	Client: PG&E
Drilling Method:	Sonic Drilling	Total Depth:	192 ft bgs	Project: Final GW Remedy Phase 1
Drill Rig Type:	Boart Longyear Track	Borehole Diameter:	6-12 inches	Location: PG&E Topock, Needles, California
Driller Name:	Eddie Ramos	Depth to First Water:	24.1 ft bgs	
Drilling Asst:	F. Sandoval/J. Colon	Sampling Method:	4 inch x 10 ft Core Barrel	Project Number: RC000753.0051
Logger:	Kendra Keon	Sampling Interval:	Continuous	
Editor:	Grant Willford	Converted to Well:	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No	

Depth (ft)	Recovery (in)	Sieve Sample ID	Groundwater Sample ID	Geologic Formation	USCS Code	USCS Class	Soil Description	Drilling Notes	Drilling Fluid
41			IRZ-19-VAS-37-42 (<0.033 U ppb) 9/6/2019 14:10				(41') reddish brown (5YR 4/3); wet		
42		IRZ-19-SS-37-45 9/17/2019 10:48		Topock - Alluvium Deposits	SW				
43									
44									
45									
46									
47		IRZ-19-SS-45-50 9/17/2019 10:56		Topock - Alluvium Deposits	SM		(47.0 - 55.0') Topock - Alluvium Deposits; Silty sand with gravel (SM); brown (7.5YR 4/3); very fine grained to very coarse grained, angular to subround; little granules to very large pebbles, angular to subangular; little silt; moist to wet		
48									
49	240								
50									
51							(50') brown (7.5YR 4/4); moist to wet		
52		IRZ-19-SS-50-55 9/17/2019 11:04		Topock - Alluvium Deposits	SW		(55.0 - 57.0') Topock - Alluvium Deposits; Well graded sand with silt and gravel (SW); brown (7.5YR 4/3); very fine grained to very coarse grained, angular to subangular; little granules to very large pebbles, angular to subround; little silt; moist to wet		
53									
54									
55									
56									
57		IRZ-19-SS-55-60 9/17/2019 11:09		Topock - Alluvium Deposits	SM		(57.0 - 62.4') Topock - Alluvium Deposits; Silty sand with gravel (SM); brown (7.5YR 4/4); very fine grained to very coarse grained, angular to subangular; little granules to very large pebbles, angular to subangular; little silt; trace small cobbles, angular to subangular; moist to wet (58'); some silt; moist to wet; increase in granules to small cobbles, decrease in sand		
58	120								
59									
60									

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Date Started:	09/04/2019	Surface Elevation:	478.40 ft amsl	<b>Boring No.: MW-81/IRZ-19 Pilot</b>	
Date Completed:	09/12/2019	Northing (NAD83):	2102850.39		
Drilling Co.:	Cascade	Easting (NAD83):	7615927.95	Client:	PG&E
Drilling Method:	Sonic Drilling	Total Depth:	192 ft bgs	Project:	Final GW Remedy Phase 1
Drill Rig Type:	Boart Longyear Track	Borehole Diameter:	6-12 inches	Location:	PG&E Topock, Needles, California
Driller Name:	Eddie Ramos	Depth to First Water:	24.1 ft bgs		
Drilling Asst:	F. Sandoval/J. Colon	Sampling Method:	4 inch x 10 ft Core Barrel	Project Number:	RC000753.0051
Logger:	Kendra Keon	Sampling Interval:	Continuous		
Editor:	Grant Willford	Converted to Well:	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No		

Depth (ft)	Recovery (in)	Sieve Sample ID	Groundwater Sample ID	Geologic Formation	USCS Code	USCS Class	Soil Description	Drilling Notes	Drilling Fluid
61	120	IRZ-19-SS-60-65 9/17/2019 11:13		Topock - Alluvium Deposits	SM		(61'); little silt; moist to wet; decrease in granules to small cobbles, increase in sand		
62				Topock - Alluvium Deposits	ML		(62.4 - 63.1') Topock - Alluvium Deposits; Sandy silt (ML); brown (7.5YR 4/4); low plasticity; some very fine to fine grained sand, subangular to subround; moist		
63				Topock - Alluvium Deposits	SM		(63.1 - 67.0') Topock - Alluvium Deposits; Silty sand with gravel (SM); brown (7.5YR 4/4); very fine grained to very coarse grained, angular to subangular; little granules to very large pebbles, angular to subangular; little silt; trace small cobbles, angular to subangular; moist to wet		
64									
65	66	IRZ-19-SS-65-70 9/17/2019 11:16		Topock - Alluvium Deposits	SM		(67.0 - 72.5') Topock - Alluvium Deposits; Silty sand with gravel (SM); brown (7.5YR 4/3); very fine grained to very coarse grained, angular to subangular; little granules to very large pebbles, angular to subangular; little silt; wet; material logged from clean out run, highly disturbed	(67.0 - 77.0') Core barrel needed to be vibed to free from formation. During vibing material in core barrel was lost down hole. Retrieved material with a flapper bit on a second run. Recovered some material that was highly disturbed.	
66									
67									
68									
69	IRZ-19-SS-70-75 9/17/2019 11:21			NR		(72.5 - 77.0') No recovery (NR); see drilling notes			
70									
71									
72									
73	120	IRZ-19-SS-75-80 9/17/2019 11:26		Topock - Alluvium Deposits	ML		(77.0 - 84.0') Topock - Alluvium Deposits; Sandy silt with gravel (ML); brown (7.5YR 4/4); angular to subround; no plasticity; some very fine to very coarse grained sand, angular to subround; little granules to very large pebbles, angular to subangular; trace small cobbles, angular; moist	(77.0 - 84.0') Soft drilling	
74									
75									
76									
77									
78									
79									
80									

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Date Started:	09/04/2019	Surface Elevation:	478.40 ft amsl	<b>Boring No.: MW-81/IRZ-19 Pilot</b>	
Date Completed:	09/12/2019	Northing (NAD83):	2102850.39		
Drilling Co.:	Cascade	Easting (NAD83):	7615927.95	Client:	PG&E
Drilling Method:	Sonic Drilling	Total Depth:	192 ft bgs	Project:	Final GW Remedy Phase 1
Drill Rig Type:	Boart Longyear Track	Borehole Diameter:	6-12 inches	Location:	PG&E Topock, Needles, California
Driller Name:	Eddie Ramos	Depth to First Water:	24.1 ft bgs		
Drilling Asst:	F. Sandoval/J. Colon	Sampling Method:	4 inch x 10 ft Core Barrel	Project Number:	RC000753.0051
Logger:	Kendra Keon	Sampling Interval:	Continuous		
Editor:	Grant Willford	Converted to Well:	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No		

Depth (ft)	Recovery (in)	Sieve Sample ID	Groundwater Sample ID	Geologic Formation	USCS Code	USCS Class	Soil Description	Drilling Notes	Drilling Fluid
81							(80') brown (7.5YR 4/3); moist; decrease in silt, increase in granules to small cobbles and sand		
82		IRZ-19-SS-80-85 9/17/2019 11:36		Topock - Alluvium Deposits	ML				
83	120								
84			IRZ-19-VAS-82-87 (<0.033 U ppb) 9/7/2019 14:10						
85				Topock - Alluvium Deposits	SM		(84.0 - 87.0') Topock - Alluvium Deposits; Silty sand with gravel (SM); brown (7.5YR 4/3); very fine grained to very coarse grained, subangular to subround; some silt; little granules to very large pebbles, angular to subangular; moist		
86									
87		IRZ-19-SS-85-90 9/17/2019 11:42							
88									
89				Topock - Alluvium Deposits	SM		(87.0 - 92.1') Topock - Alluvium Deposits; Silty sand with gravel (SM); reddish brown (5YR 4/3) to reddish brown / moderate brown (5YR 4/4); very fine grained to very coarse grained, angular to subangular; little granules to very large pebbles, angular to subangular; little silt; trace clay; wet to moist		
90									
91									
92	120	IRZ-19-SS-90-95 9/17/2019 11:45							
93				Topock - Alluvium Deposits	CL		(92.1 - 93.7') Topock - Alluvium Deposits; Sandy lean clay (CL); reddish brown / moderate brown (5YR 4/4); low plasticity; some silt; little granules to very large pebbles, angular to subangular; little very fine to very coarse grained sand, angular to subangular; moist		
94									
95				Topock - Alluvium Deposits	ML		(93.7 - 96.1') Topock - Alluvium Deposits; Sandy silt with gravel (ML); reddish brown (5YR 4/3); no plasticity; some very fine to very coarse grained sand, angular to subangular; little granules to very large pebbles, angular to subangular; trace small cobbles, angular to subangular; trace clay; moist		
96									
97		IRZ-19-SS-95-100 9/17/2019 12:52							
98				Topock - Alluvium Deposits	SM		(96.1 - 101.0') Topock - Alluvium Deposits; Silty sand with gravel (SM); reddish brown / moderate brown (5YR 4/4) to reddish brown (5YR 4/3); very fine grained to very coarse grained, angular to subangular; little granules to very large pebbles, angular to subangular; little silt; trace clay; wet		
99	210								
100									

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Date Started:	09/04/2019	Surface Elevation:	478.40 ft amsl	<b>Boring No.: MW-81/IRZ-19 Pilot</b>
Date Completed:	09/12/2019	Northing (NAD83):	2102850.39	
Drilling Co.:	Cascade	Easting (NAD83):	7615927.95	Client: PG&E
Drilling Method:	Sonic Drilling	Total Depth:	192 ft bgs	Project: Final GW Remedy Phase 1
Drill Rig Type:	Boart Longyear Track	Borehole Diameter:	6-12 inches	Location: PG&E Topock, Needles, California
Driller Name:	Eddie Ramos	Depth to First Water:	24.1 ft bgs	
Drilling Asst:	F. Sandoval/J. Colon	Sampling Method:	4 inch x 10 ft Core Barrel	Project Number: RC000753.0051
Logger:	Kendra Keon	Sampling Interval:	Continuous	
Editor:	Grant Willford	Converted to Well:	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No	

Depth (ft)	Recovery (in)	Sieve Sample ID	Groundwater Sample ID	Geologic Formation	USCS Code	USCS Class	Soil Description	Drilling Notes	Drilling Fluid
101				Topock - Alluvium Deposits	SM				
102		IRZ-19-SS-100-105 9/17/2019 12:59		Topock - Alluvium Deposits	SW-SM		(101.0 - 104.0') Topock - Alluvium Deposits; Well graded sand with silt and gravel (SW-SM); dark reddish brown / moderate brown (5YR 3/4); very fine grained to very coarse grained, angular to subangular; little granules to very large pebbles, angular to subangular; little silt; trace small cobbles, angular; wet		
103									
104				Topock - Alluvium Deposits	SM		(104.0 - 104.5') Topock - Alluvium Deposits; Silty sand (SM); reddish brown / moderate brown (5YR 4/4); very fine grained to very coarse grained, angular to subangular; some silt; little granules, angular to subangular; wet		
105					NR		(104.5 - 106.0') No recovery (NR); see drilling notes	(104.5 - 106.0') Missing approximately 1.5 ft of material due to a ripped core bag.	
106				Topock - Alluvium Deposits	SW		(106.0 - 107.0') Topock - Alluvium Deposits; Well graded sand with gravel (SW); reddish brown / moderate brown (5YR 4/4); very fine grained to very coarse grained, angular to subangular; little granules to very large pebbles, angular to subangular; trace silt; trace clay; wet		
107		IRZ-19-SS-105-110 9/17/2019 13:03					(107.0 - 121.3') Topock - Alluvium Deposits; Silty sand with gravel (SM); reddish brown / moderate brown (5YR 4/4); very fine grained to very coarse grained, angular to subangular; little granules to very large pebbles, angular to subangular; little silt; trace small cobbles, angular to subangular; wet		
108	210								
109									
110									
111									
112		IRZ-19-SS-110-115 9/17/2019 13:08		Topock - Alluvium Deposits	SM		(112.7'); some silt; moist to wet; decrease in sand, no cobbles		
113									
114									
115									
116									
117		IRZ-19-SS-115-120 9/17/2019 13:13					(117') reddish brown (5YR 4/3); wet	(117.0 - 127.0') Normal drilling	
118							(118') reddish brown (2.5YR 4/3) to reddish brown / moderate brown (5YR 4/4); some silt; wet; decrease in sand, increase in silt		
119	120								
120									

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Date Started:	09/04/2019	Surface Elevation:	478.40 ft amsl	<b>Boring No.: MW-81/IRZ-19 Pilot</b>
Date Completed:	09/12/2019	Northing (NAD83):	2102850.39	
Drilling Co.:	Cascade	Easting (NAD83):	7615927.95	Client: PG&E
Drilling Method:	Sonic Drilling	Total Depth:	192 ft bgs	Project: Final GW Remedy Phase 1
Drill Rig Type:	Boart Longyear Track	Borehole Diameter:	6-12 inches	Location: PG&E Topock, Needles, California
Driller Name:	Eddie Ramos	Depth to First Water:	24.1 ft bgs	
Drilling Asst:	F. Sandoval/J. Colon	Sampling Method:	4 inch x 10 ft Core Barrel	Project Number: RC000753.0051
Logger:	Kendra Keon	Sampling Interval:	Continuous	
Editor:	Grant Willford	Converted to Well:	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No	

Depth (ft)	Recovery (in)	Sieve Sample ID	Groundwater Sample ID	Geologic Formation	USCS Code	USCS Class	Soil Description	Drilling Notes	Drilling Fluid
121				Topock - Alluvium Deposits	SM				
122		IRZ-19-SS-120-125 9/17/2019 13:17					(121.3 - 127.0') Topock - Alluvium Deposits; Silty sand (SM); reddish brown / moderate brown (5YR 4/4) to reddish brown (5YR 4/3); very fine grained to very coarse grained, angular to subangular; some silt; little granules to very large pebbles, angular to subangular; wet		
123									
124	120		IRZ-19-VAS-122-127 ( $<0.17$ U ppb) 9/8/2019 13:45	Topock - Alluvium Deposits	SM				
125									
126									
127		IRZ-19-SS-125-130 9/17/2019 13:23					(127.0 - 133.7') Topock - Alluvium Deposits; Silty sand with gravel (SM); reddish brown / moderate brown (5YR 4/4); very fine grained to very coarse grained, angular to subangular; some silt; little granules to very large pebbles, angular to subangular; trace small cobbles, angular; wet		
128									
129									
130				Topock - Alluvium Deposits	SM				
131									
132	120	IRZ-19-SS-130-135 9/17/2019 13:34	IRZ-19-VAS-131-136 ( $<0.17$ U ppb) 9/9/2019 10:35				(132.7'); moist to wet		
133									
134				Topock - Alluvium Deposits	ML		(133.7 - 134.4') Topock - Alluvium Deposits; Sandy silt with gravel (ML); brown (7.5YR 4/4); no plasticity; some very fine to very coarse grained sand, angular to subangular; little small to very large pebbles, angular to subangular; moist to wet		
135				Topock - Alluvium Deposits	ML		(134.4 - 137.0') Topock - Alluvium Deposits; Gravelly silt with sand (ML); reddish brown (5YR 5/3); no plasticity; some granules to very large pebbles, angular to subround; little small cobbles, angular to subround; little very fine to very coarse grained sand, angular to subangular; moist to wet (135.3'); moist		
136									
137		IRZ-19-SS-135-140 9/17/2019 13:44		Topock - Alluvium Deposits	SM		(137.0 - 138.1') Topock - Alluvium Deposits; Silty sand with gravel (SM); reddish brown (5YR 4/3); very fine grained to very coarse grained, angular to subangular; little granules to very large pebbles, angular to subangular; little silt; moist to wet		
138	120			Topock - Alluvium Deposits	ML		(138.1 - 146.1') Topock - Alluvium Deposits; Sandy silt with gravel (ML); reddish brown / moderate brown (5YR 4/4); no plasticity; some very fine to very coarse grained sand, angular to subangular; little granules to very large pebbles, angular to subangular; moist to wet		
139									
140									

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Date Started:	09/04/2019	Surface Elevation:	478.40 ft amsl	<b>Boring No.:</b> <u>MW-81/IRZ-19 Pilot</u>	
Date Completed:	09/12/2019	Northing (NAD83):	2102850.39		
Drilling Co.:	Cascade	Easting (NAD83):	7615927.95	Client:	PG&E
Drilling Method:	Sonic Drilling	Total Depth:	192 ft bgs	Project:	Final GW Remedy Phase 1
Drill Rig Type:	Boart Longyear Track	Borehole Diameter:	6-12 inches	Location:	PG&E Topock, Needles, California
Driller Name:	Eddie Ramos	Depth to First Water:	24.1 ft bgs		
Drilling Asst:	F. Sandoval/J. Colon	Sampling Method:	4 inch x 10 ft Core Barrel	Project Number:	RC000753.0051
Logger:	Kendra Keon	Sampling Interval:	Continuous		
Editor:	Grant Willford	Converted to Well:	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No		

Depth (ft)	Recovery (in)	Sieve Sample ID	Groundwater Sample ID	Geologic Formation	USCS Code	USCS Class	Soil Description	Drilling Notes	Drilling Fluid
141							(140.5'); wet; decrease in granules to very large pebbles and silt, increase sand		
142									
143	120	IRZ-19-SS-140-146 9/17/2019 13:51		Topock - Alluvium Deposits	ML		(143.4'); moist		
144			IRZ-19-VAS-142-147 ( $<0.17$ U ppb) 9/9/2019 16:40						
145									
146									
147							(146.1 - 150.6') Topock - Alluvium Deposits; Silty sand (SM); dark reddish brown (5YR 3/3) to reddish brown (5YR 4/3); very fine grained to very coarse grained, angular to subangular; some silt; little granules to large pebbles, angular to subangular; moist to wet	(147.0 - 157.0') Soft drilling	
148		IRZ-19-SS-146-150 9/17/2019 13:55		Topock - Alluvium Deposits	SM				
149									
150									
151									
152	120	IRZ-19-SS-150-155 9/17/2019 13:59		Topock - Alluvium Deposits	ML		(150.6 - 154.4') Topock - Alluvium Deposits; Sandy silt (ML); dark reddish brown (5YR 3/3) to dark reddish brown / grayish brown (5YR 3/2); no plasticity; some very fine to very coarse grained sand, angular to subangular; little granules to large pebbles, angular to subangular; moist to wet		
153									
154			IRZ-19-VAS-152-157 ( $<0.17$ U ppb) 9/10/2019 12:00						
155				Topock - Alluvium Deposits	SM		(154.4 - 157.0') Topock - Alluvium Deposits; Silty sand with gravel (SM); dark reddish brown (5YR 3/3) to dark reddish brown / moderate brown (5YR 3/4); very fine grained to very coarse grained, angular to subround; some silt; little granules to very large pebbles, angular to subangular; wet to moist		
156									
157									
158	120	IRZ-19-SS-155-160 9/17/2019 14:04		Topock - Alluvium Deposits	SW-SM		(157.0 - 167.5') Topock - Alluvium Deposits; Well graded sand with silt and gravel (SW-SM); dark reddish brown (5YR 3/3); very coarse grained to very coarse grained; little granules to very large pebbles, angular to subangular; little silt; wet	(157.0 - 167.0') Soft drilling	
159							(158.5') dark reddish brown / moderate brown (5YR 3/4)		
160									

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Date Started:	09/04/2019	Surface Elevation:	478.40 ft amsl	<b>Boring No.: MW-81/IRZ-19 Pilot</b>	
Date Completed:	09/12/2019	Northing (NAD83):	2102850.39		
Drilling Co.:	Cascade	Easting (NAD83):	7615927.95	Client:	PG&E
Drilling Method:	Sonic Drilling	Total Depth:	192 ft bgs	Project:	Final GW Remedy Phase 1
Drill Rig Type:	Boart Longyear Track	Borehole Diameter:	6-12 inches	Location:	PG&E Topock, Needles, California
Driller Name:	Eddie Ramos	Depth to First Water:	24.1 ft bgs		
Drilling Asst:	F. Sandoval/J. Colon	Sampling Method:	4 inch x 10 ft Core Barrel	Project Number:	RC000753.0051
Logger:	Kendra Keon	Sampling Interval:	Continuous		
Editor:	Grant Willford	Converted to Well:	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No		

Depth (ft)	Recovery (in)	Sieve Sample ID	Groundwater Sample ID	Geologic Formation	USCS Code	USCS Class	Soil Description	Drilling Notes	Drilling Fluid
161									
162									
163	120	IRZ-19-SS-160-165 9/17/2019 14:09		Topock - Alluvium Deposits	SW-SM				
164			IRZ-19-VAS-162-167 ( $<0.17$ U ppb) 9/11/2019 11:25						
165									
166									
167									
168		IRZ-19-SS-165-171 9/17/2019 14:16		Topock - Alluvium Deposits	SM		(167.5 - 171.1') Topock - Alluvium Deposits; Silty sand with gravel (SM); reddish brown / moderate brown (5YR 4/4); very fine grained to very coarse grained, angular to subround; and silt; little granules to very large pebbles, angular to subround; trace small cobbles, angular to subangular; wet	(167.0 - 177.0') Soft drilling	
169									
170									
171									
172	120						(171.1 - 178.5') Topock - Alluvium Deposits; Sandy silt (ML); reddish brown / moderate brown (5YR 4/4) with dark reddish brown (2.5YR 3/4); no plasticity; and very fine to very coarse grained sand, angular to subround; little granules to very large pebbles, angular to subround; wet		
173									
174		IRZ-19-SS-171-177 9/17/2019 14:24		Topock - Alluvium Deposits	ML		(173.8'); moist		
175									
176									
177									
178	84		IRZ-19-VAS-177-182 ( $<0.17$ U ppb) 9/12/2019 10:38					(177.0 - 184.0') Contacts adjusted based on QC review of photo log and notes.	
179				Topock - Weathered Bedrock - conglomerate	ML		(178.5 - 184.0') Topock - Weathered Bedrock - conglomerate; Sandy silt (ML); dark reddish brown / moderate brown (5YR 3/4) with reddish brown (2.5YR 4/4); no plasticity; some very fine to very coarse grained sand, angular to subangular; little small to large pebbles, angular to subangular; wet to moist		
180									

Abbreviations: USCS = Unified Soil Classification System, ft = feet, bgs = below ground surface, amsl = above mean sea level, GW = groundwater, ppb = parts per billion, U = not detected above the laboratory reporting limit, NR = no recovery; Notes: blue water table symbol represents depth to water measured during the first VAS interval; apparent partial recoveries can be the result of potential compaction of sediments in the core bag; wells MW-81-43, MW-81-98 installed in borehole

Date Started:	09/04/2019	Surface Elevation:	478.40 ft amsl	<b>Boring No.: MW-81/IRZ-19 Pilot</b>
Date Completed:	09/12/2019	Northing (NAD83):	2102850.39	
Drilling Co.:	Cascade	Easting (NAD83):	7615927.95	Client: PG&E
Drilling Method:	Sonic Drilling	Total Depth:	192 ft bgs	Project: Final GW Remedy Phase 1
Drill Rig Type:	Boart Longyear Track	Borehole Diameter:	6-12 inches	Location: PG&E Topock, Needles, California
Driller Name:	Eddie Ramos	Depth to First Water:	24.1 ft bgs	
Drilling Asst:	F. Sandoval/J. Colon	Sampling Method:	4 inch x 10 ft Core Barrel	Project Number: RC000753.0051
Logger:	Kendra Keon	Sampling Interval:	Continuous	
Editor:	Grant Willford	Converted to Well:	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No	

Depth (ft)	Recovery (in)	Sieve Sample ID	Groundwater Sample ID	Geologic Formation	USCS Code	USCS Class	Soil Description	Drilling Notes	Drilling Fluid
181			IRZ-19-VAS-177-182 (<0.17 U ppb) 9/12/2019 10:38	Topock - Weathered Bedrock - conglomerate	ML				
182								(182.0 - 185.0') Rough drilling	
183	84								
184							(184.0 - 192.0') Topock - Competent Bedrock - conglomerate; dry, friable, pulverized by drilling process		
185								(185.0 - 187.0') Really rough drilling and chattering, tight formation, needed to vibrate out	
186							(186.5'); moist		
187							(187'); moist; moisture from exposure to water in the casing overnight	(187.0 - 192.0') Rough drilling	
188				Topock - Competent Bedrock - conglomerate			(188.1'); dry		
189	60								
190									
191									
192									
End of Boring at 192.0 ft bgs.									
193									
194									
195									
196									
197									
198									
199									
200									

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Date Started:	09/17/2019	Surface Elevation:	478.40 ft amsl	Well ID: MW-81/IRZ-19 Pilot
Date Completed:	09/18/2019	Northing (NAD83):	2102850.39	
Drilling Co.:	Cascade	Easting (NAD83):	7615927.95	Client: PG&E
Drilling Method:	Sonic Drilling	Total Depth:	192 ft bgs	Project: Final GW Remedy Phase 1
Driller Name:	Eddie Ramos	Borehole Diameter:	6-12 inches	Location: PG&E Topock, Needles, California
Drilling Asst:	F. Sandoval/J. Colon	Depth to First Water:	24.1 ft bgs	
Logger:	Kendra Keon	Editor:	Grant Willford	Project Number: RC000753.0051

Depth (ft)	Groundwater Sample ID	Geologic Formation	USCS Code	USCS Class	Well Construction	Calculated Material Volumes	Material Volumes Installed Note: percentages are the actual volume vs the calculated volume
1					(0.0 - 0.5') Temporary well vault		Note: BMPs in place
2							
3					(0.5 - 5.0') Wildcat Washed Plastering Sand	(0.5 - 5.0') 7.9	(0.5 - 5.0') 7 (89%) Note: Surface seal sand
4		Topock - Fill	SP-SC				
5					(0.0 - 8.0') 12.0" Borehole		
6							
7							
8							
9		Topock - Fluvial Deposits	SC				
10							
11							
12		Topock - Fluvial Deposits	SP-SC		(5.0 - 170.0') Cemex #3 MESH (8x10) Lapis Lustre Sand Lapis	(5.0 - 170.0') 72.6 bags	(5.0 - 170.0') 81 bags (112%) Note: Backfill sand
13							
14					(8.0 - 187.0') 6.0" Borehole		
15							
16							
17							
18		Topock - Fluvial Deposits	SP				
19							
20							

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Date Started:	09/17/2019	Surface Elevation:	478.40 ft amsl	Well ID: MW-81/IRZ-19 Pilot
Date Completed:	09/18/2019	Northing (NAD83):	2102850.39	
Drilling Co.:	Cascade	Easting (NAD83):	7615927.95	Client: PG&E
Drilling Method:	Sonic Drilling	Total Depth:	192 ft bgs	Project: Final GW Remedy Phase 1
Driller Name:	Eddie Ramos	Borehole Diameter:	6-12 inches	Location: PG&E Topock, Needles, California
Drilling Asst:	F. Sandoval/J. Colon	Depth to First Water:	24.1 ft bgs	
Logger:	Kendra Keon	Editor:	Grant Willford	Project Number: RC000753.0051

Depth (ft)	Groundwater Sample ID	Geologic Formation	USCS Code	USCS Class	Well Construction	Calculated Material Volumes	Material Volumes Installed Note: percentages are the actual volume vs the calculated volume
21		Topock - Fluvial Deposits	SP				
22							
23							
24		Topock - Fluvial Deposits	SW				
25							
26		Topock - Fluvial Deposits	SW-SC				
27							
28		Topock - Fluvial Deposits	SP				
29	IRZ-19-VAS-27-32 ( $<0.033$ U ppb) 9/6/2019 08:35						
30		Topock - Fluvial Deposits	SM		(5.0 - 170.0') Cemex #3 MESH (8x10) Lapis Lustre Sand Lapis	(8.0 - 187.0') 6.0" Borehole	(5.0 - 170.0') 81 bags (112%) Note: Backfill sand
31							
32		Topock - Fluvial Deposits	SM				
33							
34							
35		Topock - Fluvial Deposits	SM				
36							
37		Topock - Alluvium Deposits	SW-SM				
38	IRZ-19-VAS-37-42 ( $<0.033$ U ppb) 9/6/2019 14:10						
39		Topock - Alluvium Deposits	SW				
40							

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Date Started:	09/17/2019	Surface Elevation:	478.40 ft amsl	Well ID: MW-81/IRZ-19 Pilot
Date Completed:	09/18/2019	Northing (NAD83):	2102850.39	
Drilling Co.:	Cascade	Easting (NAD83):	7615927.95	Client: PG&E
Drilling Method:	Sonic Drilling	Total Depth:	192 ft bgs	Project: Final GW Remedy Phase 1
Driller Name:	Eddie Ramos	Borehole Diameter:	6-12 inches	Location: PG&E Topock, Needles, California
Drilling Asst:	F. Sandoval/J. Colon	Depth to First Water:	24.1 ft bgs	
Logger:	Kendra Keon	Editor:	Grant Willford	Project Number: RC000753.0051

Depth (ft)	Groundwater Sample ID	Geologic Formation	USCS Code	USCS Class	Well Construction			Calculated Material Volumes	Material Volumes Installed Note: percentages are the actual volume vs the calculated volume
41	IRZ-19-VAS-37-42 (<0.033 U ppb) 9/6/2019 14:10								
42									
43		Topock - Alluvium Deposits	SW						
44									
45									
46									
47		Topock - Alluvium Deposits	SM			(5.0 - 170.0') Cemex #3 MESH (8x10) Lapis Lustre Sand Lapis	(8.0 - 187.0') 6.0" Borehole	(5.0 - 170.0') 72.6 bags	(5.0 - 170.0') 81 bags (112%) Note: Backfill sand
48									
49									
50									
51									
52									
53	Topock - Alluvium Deposits	SW							
54									
55	Topock - Alluvium Deposits	SM							
56									
57									
58									
59	Topock - Alluvium Deposits	SM							
60									

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Date Started:	09/17/2019	Surface Elevation:	478.40 ft amsl	<b>Well ID: MW-81/IRZ-19 Pilot</b>
Date Completed:	09/18/2019	Northing (NAD83):	2102850.39	
Drilling Co.:	Cascade	Easting (NAD83):	7615927.95	Client: PG&E
Drilling Method:	Sonic Drilling	Total Depth:	192 ft bgs	Project: Final GW Remedy Phase 1
Driller Name:	Eddie Ramos	Borehole Diameter:	6-12 inches	Location: PG&E Topock, Needles, California
Drilling Asst:	F. Sandoval/J. Colon	Depth to First Water:	24.1 ft bgs	
Logger:	Kendra Keon	Editor:	Grant Willford	Project Number: RC000753.0051

Depth (ft)	Groundwater Sample ID	Geologic Formation	USCS Code	USCS Class	Well Construction	Calculated Material Volumes	Material Volumes Installed Note: percentages are the actual volume vs the calculated volume
61		Topock - Alluvium Deposits	SM				
62							
63		Topock - Alluvium Deposits	ML				
64							
65		Topock - Alluvium Deposits	SM				
66							
67							
68							
69							
70		Topock - Alluvium Deposits	SM		(5.0 - 170.0') Cemex #3 MESH (8x10) Lapis Lustre Sand Lapis	(8.0 - 187.0') 6.0" Borehole	(5.0 - 170.0') 81 bags (112%) Note: Backfill sand
71							
72							
73							
74							
75			NR				
76							
77							
78		Topock - Alluvium Deposits	ML				
79							
80							

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Date Started:	09/17/2019	Surface Elevation:	478.40 ft amsl	Well ID: MW-81/IRZ-19 Pilot
Date Completed:	09/18/2019	Northing (NAD83):	2102850.39	
Drilling Co.:	Cascade	Easting (NAD83):	7615927.95	Client: PG&E
Drilling Method:	Sonic Drilling	Total Depth:	192 ft bgs	Project: Final GW Remedy Phase 1
Driller Name:	Eddie Ramos	Borehole Diameter:	6-12 inches	Location: PG&E Topock, Needles, California
Drilling Asst:	F. Sandoval/J. Colon	Depth to First Water:	24.1 ft bgs	
Logger:	Kendra Keon	Editor:	Grant Willford	Project Number: RC000753.0051

Depth (ft)	Groundwater Sample ID	Geologic Formation	USCS Code	USCS Class	Well Construction	Calculated Material Volumes	Material Volumes Installed Note: percentages are the actual volume vs the calculated volume
81	IRZ-19-VAS-82-87 ( $<0.033$ U ppb) 9/7/2019 14:10	Topock - Alluvium Deposits	ML				
82							
83							
84							
85		Topock - Alluvium Deposits	SM		(5.0 - 170.0') Cemex #3 MESH (8x10) Lapis Lustre Sand Lapis	(8.0 - 187.0') 6.0" Borehole	(5.0 - 170.0') 81 bags (112%) Note: Backfill sand
86							
87							
88							
89		Topock - Alluvium Deposits	SM				
90							
91							
92							
93		Topock - Alluvium Deposits	CL				
94							
95							
96							
97		Topock - Alluvium Deposits	ML				
98							
99							
100							

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Date Started:	09/17/2019	Surface Elevation:	478.40 ft amsl	Well ID: MW-81/IRZ-19 Pilot
Date Completed:	09/18/2019	Northing (NAD83):	2102850.39	
Drilling Co.:	Cascade	Easting (NAD83):	7615927.95	Client: PG&E
Drilling Method:	Sonic Drilling	Total Depth:	192 ft bgs	Project: Final GW Remedy Phase 1
Driller Name:	Eddie Ramos	Borehole Diameter:	6-12 inches	Location: PG&E Topock, Needles, California
Drilling Asst:	F. Sandoval/J. Colon	Depth to First Water:	24.1 ft bgs	
Logger:	Kendra Keon	Editor:	Grant Willford	Project Number: RC000753.0051

Depth (ft)	Groundwater Sample ID	Geologic Formation	USCS Code	USCS Class	Well Construction	Calculated Material Volumes	Material Volumes Installed Note: percentages are the actual volume vs the calculated volume
101		Topock - Alluvium Deposits	SM				
102		Topock - Alluvium Deposits	SW-SM				
103		Topock - Alluvium Deposits	SM				
104		Topock - Alluvium Deposits	NR				
105		Topock - Alluvium Deposits	SW				
106		Topock - Alluvium Deposits	SM				
107		Topock - Alluvium Deposits	SM				
108		Topock - Alluvium Deposits	SM				
109		Topock - Alluvium Deposits	SM				
110		Topock - Alluvium Deposits	SM		(5.0 - 170.0') Cemex #3 MESH (8x10) Lapis Lustre Sand Lapis	(8.0 - 187.0') 6.0" Borehole	(5.0 - 170.0') 81 bags (112%) Note: Backfill sand
111		Topock - Alluvium Deposits	SM				
112		Topock - Alluvium Deposits	SM				
113		Topock - Alluvium Deposits	SM				
114		Topock - Alluvium Deposits	SM				
115		Topock - Alluvium Deposits	SM				
116		Topock - Alluvium Deposits	SM				
117		Topock - Alluvium Deposits	SM				
118		Topock - Alluvium Deposits	SM				
119		Topock - Alluvium Deposits	SM				
120		Topock - Alluvium Deposits	SM				

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Date Started:	09/17/2019	Surface Elevation:	478.40 ft amsl	Well ID: MW-81/IRZ-19 Pilot
Date Completed:	09/18/2019	Northing (NAD83):	2102850.39	
Drilling Co.:	Cascade	Easting (NAD83):	7615927.95	Client: PG&E
Drilling Method:	Sonic Drilling	Total Depth:	192 ft bgs	Project: Final GW Remedy Phase 1
Driller Name:	Eddie Ramos	Borehole Diameter:	6-12 inches	Location: PG&E Topock, Needles, California
Drilling Asst:	F. Sandoval/J. Colon	Depth to First Water:	24.1 ft bgs	
Logger:	Kendra Keon	Editor:	Grant Willford	Project Number: RC000753.0051

Depth (ft)	Groundwater Sample ID	Geologic Formation	USCS Code	USCS Class	Well Construction	Calculated Material Volumes	Material Volumes Installed Note: percentages are the actual volume vs the calculated volume
121		Topock - Alluvium Deposits	SM				
122							
123							
124	IRZ-19-VAS-122-127 (<0.17 U ppb) 9/8/2019 13:45	Topock - Alluvium Deposits	SM				
125							
126							
127							
128							
129							
130		Topock - Alluvium Deposits	SM		(5.0 - 170.0') Cemex #3 MESH (8x10) Lapis Lustre Sand Lapis	(8.0 - 187.0') 6.0" Borehole	(5.0 - 170.0') 81 bags (112%) Note: Backfill sand
131							
132							
133	IRZ-19-VAS-131-136 (<0.17 U ppb) 9/9/2019 10:35						
134		Topock - Alluvium Deposits	ML				
135		Topock - Alluvium Deposits	ML				
136							
137		Topock - Alluvium Deposits	SM				
138							
139		Topock - Alluvium Deposits	ML				
140							

Abbreviations: USCS = Unified Soil Classification System, ft = feet, bgs = below ground surface, amsl = above mean sea level, GW = groundwater, ppb = parts per billion, BMP = Best Management Practices for stormwater, U = not detected above the laboratory reporting limit, NR = no recovery; Notes: blue water table symbol represents depth to water measured during the first VAS interval; granular backfill material was removed during overdrilling of the pilot borehole

Date Started:	09/17/2019	Surface Elevation:	478.40 ft amsl	Well ID: MW-81/IRZ-19 Pilot
Date Completed:	09/18/2019	Northing (NAD83):	2102850.39	
Drilling Co.:	Cascade	Easting (NAD83):	7615927.95	Client: PG&E
Drilling Method:	Sonic Drilling	Total Depth:	192 ft bgs	Project: Final GW Remedy Phase 1
Driller Name:	Eddie Ramos	Borehole Diameter:	6-12 inches	Location: PG&E Topock, Needles, California
Drilling Asst:	F. Sandoval/J. Colon	Depth to First Water:	24.1 ft bgs	
Logger:	Kendra Keon	Editor:	Grant Willford	Project Number: RC000753.0051

Depth (ft)	Groundwater Sample ID	Geologic Formation	USCS Code	USCS Class	Well Construction	Calculated Material Volumes	Material Volumes Installed Note: percentages are the actual volume vs the calculated volume
141							
142							
143		Topock - Alluvium Deposits	ML				
144	IRZ-19-VAS-142-147 ( $<0.17$ U ppb) 9/9/2019 16:40						
145							
146							
147		Topock - Alluvium Deposits	SM				
148							
149							
150					(5.0 - 170.0') Cemex #3 MESH (8x10) Lapis Lustre Sand Lapis	(8.0 - 187.0') 6.0" Borehole	
151							
152		Topock - Alluvium Deposits	ML			(5.0 - 170.0') 72.6 bags	(5.0 - 170.0') 81 bags (112%) Note: Backfill sand
153							
154	IRZ-19-VAS-152-157 ( $<0.17$ U ppb) 9/10/2019 12:00						
155		Topock - Alluvium Deposits	SM				
156							
157							
158		Topock - Alluvium Deposits	SW-SM				
159							
160							

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Date Started:	09/17/2019	Surface Elevation:	478.40 ft amsl	Well ID: MW-81/IRZ-19 Pilot
Date Completed:	09/18/2019	Northing (NAD83):	2102850.39	
Drilling Co.:	Cascade	Easting (NAD83):	7615927.95	Client: PG&E
Drilling Method:	Sonic Drilling	Total Depth:	192 ft bgs	Project: Final GW Remedy Phase 1
Driller Name:	Eddie Ramos	Borehole Diameter:	6-12 inches	Location: PG&E Topock, Needles, California
Drilling Asst:	F. Sandoval/J. Colon	Depth to First Water:	24.1 ft bgs	
Logger:	Kendra Keon	Editor:	Grant Willford	Project Number: RC000753.0051

Depth (ft)	Groundwater Sample ID	Geologic Formation	USCS Code	USCS Class	Well Construction	Calculated Material Volumes	Material Volumes Installed Note: percentages are the actual volume vs the calculated volume
161	IRZ-19-VAS-162-167 ( $<0.17$ U ppb) 9/11/2019 11:25	Topock - Alluvium Deposits	SW-SM		(5.0 - 170.0') Cemex #3 MESH (8x10) Lapis Lustre Sand Lapis	(5.0 - 170.0') 72.6 bags	(5.0 - 170.0') 81 bags (112%) Note: Backfill sand
162							
163							
164							
165							
166	IRZ-19-VAS-177-182 ( $<0.17$ U ppb) 9/12/2019 10:38	Topock - Alluvium Deposits	SM		(8.0 - 187.0') 6.0" Borehole		
167							
168		Topock - Alluvium Deposits	ML		(170.0 - 180.0') Cemex # 2/12 MESH (16x30) Lapis Lustre Sand	(170.0 - 180.0') 4.2 bags	(170.0 - 180.0') 6 bags (143%) Note: Indicator sand, used >20% of the calculated volume due to potential voids forming during drilling.
169							
170							
171							
172							
173							
174							
175							
176							
177							
178		Topock - Weathered Bedrock - conglomerate	ML				
179							
180							

Abbreviations: USCS = Unified Soil Classification System, ft = feet, bgs = below ground surface, amsl = above mean sea level, GW = groundwater, ppb = parts per billion, BMP = Best Management Practices for stormwater, U = not detected above the laboratory reporting limit, NR = no recovery; Notes: blue water table symbol represents depth to water measured during the first VAS interval; granular backfill material was removed during overdrilling of the pilot borehole

Date Started:	09/17/2019	Surface Elevation:	478.40 ft amsl	Well ID: MW-81/IRZ-19 Pilot
Date Completed:	09/18/2019	Northing (NAD83):	2102850.39	
Drilling Co.:	Cascade	Easting (NAD83):	7615927.95	Client: PG&E
Drilling Method:	Sonic Drilling	Total Depth:	192 ft bgs	Project: Final GW Remedy Phase 1
Driller Name:	Eddie Ramos	Borehole Diameter:	6-12 inches	Location: PG&E Topock, Needles, California
Drilling Asst:	F. Sandoval/J. Colon	Depth to First Water:	24.1 ft bgs	
Logger:	Kendra Keon	Editor:	Grant Willford	Project Number: RC000753.0051

Depth (ft)	Groundwater Sample ID	Geologic Formation	USCS Code	USCS Class	Well Construction	Calculated Material Volumes	Material Volumes Installed Note: percentages are the actual volume vs the calculated volume
181	IRZ-19-VAS-177-182 (<0.17 U ppb) 9/12/2019 10:38	Topock - Weathered Bedrock - conglomerate	ML				
182							
183							
184					(8.0 - 187.0') 6.0" Borehole		
185							
186					(180.0 - 192.0') Bentonite seal chips Puregold medium chips	(180.0 - 192.0') 2.6 bags	(180.0 - 192.0') 2.5 bags (96%) Note: Decommissioned rathole
187							
188		Topock - Competent Bedrock - conglomerate					
189							
190					(187.0 - 192.0') 4.0" Borehole		
191							
192							

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