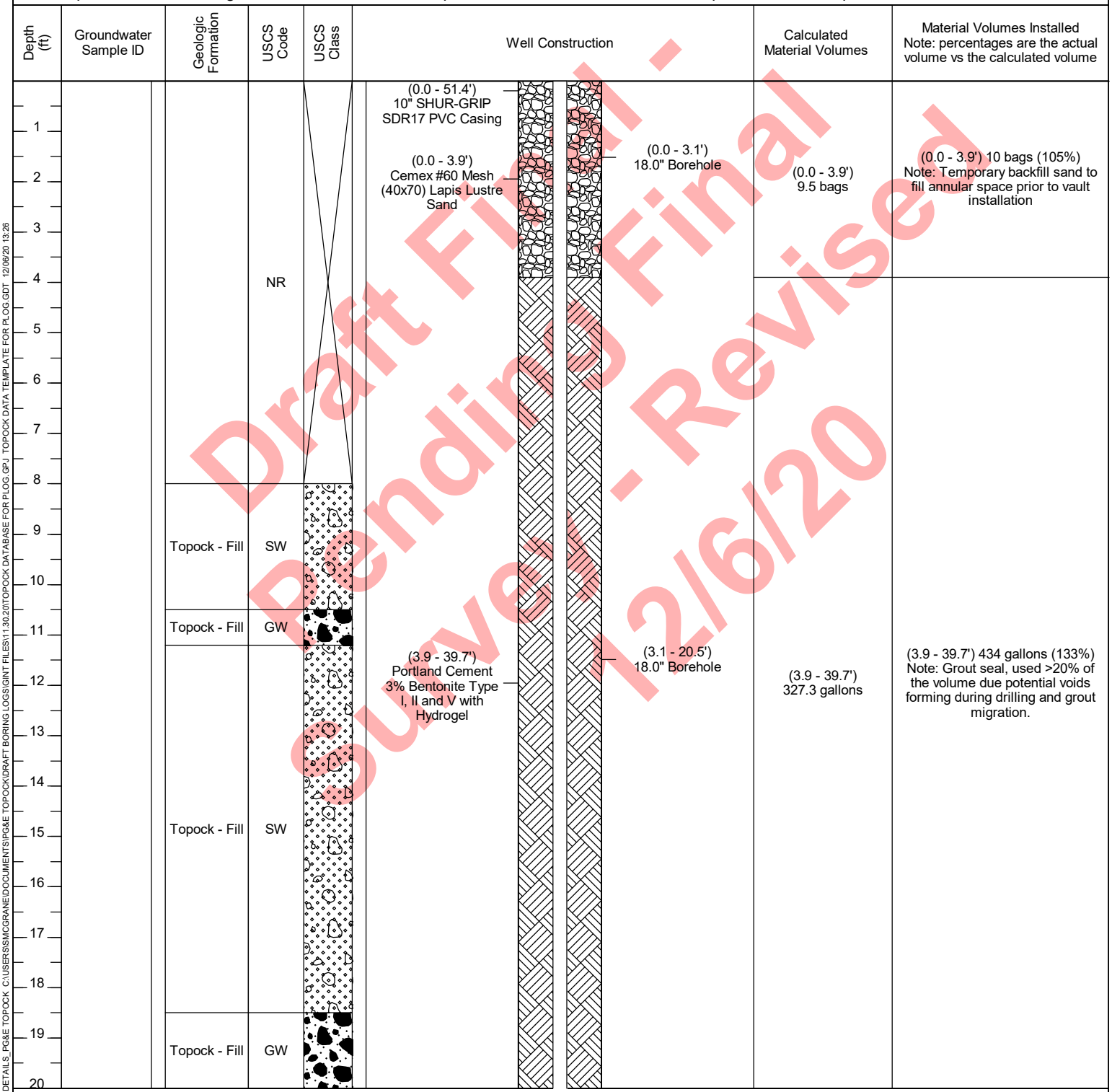
Well Construction Log

ARCADIS Design & Consultancy for natural and built assets

Date Started:	03/18/2020	Surface Elevation:	502.67 ft amsl	**Well ID: IRZ-33**	
Date Completed:	03/22/2020	Shallow Well Elevation:	N/A		
Drilling Co.:	Cascade	Deep Well Elevation:	N/A	Client:	PG&E
Drilling Method:	Dual Rotary	Northing (NAD83):	2101792.01	Project:	Final GW Remedy Phase 1
Driller Name:	Jon Martinez	Easting (NAD83):	7615827.86	Location:	PG&E Topock, Needles, California
Drilling Asst:	A. & H. Amezguita	Borehole Diameter:	16-18 inches		
Logger:	K. Keon / E. Redner	Static Water Level:	See Log for Depths	Project Number:	RC000753.0051
Editor:	Sean McGrane	Development End Date:	7/13/2020		
Total Depth:	119.53 ft bgs	Well Completion:	☐ Flush ☐ Stick-up ☒ To Be Completed in Well Vault		



Abbreviations: USCS = Unified Soil Classification System, ft = feet, bgs = below ground surface, amsl = above mean sea level, GW = groundwater, ppb = parts per billion, NR = no recovery; Notes: solid blue water table marks represent depth to water (ft. bgs.) measured pre-specific capacity for the shallow and deep screens

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Drilling Co.:	Cascade	Deep Well Elevation:	N/A	Client:	PG&E
Drilling Method:	Dual Rotary	Northing (NAD83):	2101792.01	Project:	Final GW Remedy Phase 1
Driller Name:	Jon Martinez	Easting (NAD83):	7615827.86	Location:	PG&E Topock, Needles, California
Drilling Asst:	A. & H. Amezguita	Borehole Diameter:	16-18 inches		
Logger:	K. Keon / E. Redner	Static Water Level:	See Log for Depths	Project Number:	RC000753.0051
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Total Depth:	119.53 ft bgs	Well Completion:	☐ Flush ☐ Stick-up ☒ 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
21		Topock - Fill	GW		(0.0 - 51.4') 10" SHUR-GRIP SDR17 PVC Casing		
22							
23							
24							
25							
26							
27		Topock - Fill	SW				
28							
29							
30					(3.9 - 39.7') Portland Cement 3% Bentonite Type I, II and V with Hydrogel	(3.9 - 39.7') 327.3 gallons	(3.9 - 39.7') 434 gallons (133%) Note: Grout seal, used >20% of the volume due potential voids forming during drilling and grout migration.
31							
32							
33							
34		Topock - Fill	SW-SM				
35							
36							
37		Topock - Fill	SW		(20.5 - 41.3') 18.0" Borehole		
38							
39					(38.0 - 39.0') Centralizer		
40		Topock - Alluvium Deposits	SM SM				

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Drilling Co.:	Cascade	Deep Well Elevation:	N/A	Client:	PG&E
Drilling Method:	Dual Rotary	Northing (NAD83):	2101792.01	Project:	Final GW Remedy Phase 1
Driller Name:	Jon Martinez	Easting (NAD83):	7615827.86	Location:	PG&E Topock, Needles, California
Drilling Asst:	A. & H. Amezguita	Borehole Diameter:	16-18 inches		
Logger:	K. Keon / E. Redner	Static Water Level:	See Log for Depths	Project Number:	RC000753.0051
Editor:	Sean McGrane	Development End Date:	7/13/2020		
Total Depth:	119.53 ft bgs	Well Completion:	☐ Flush ☐ Stick-up ☒ 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
41		Topock - Alluvium Deposits	SM		(0.0 - 51.4') 10" SHUR-GRIP SDR17 PVC Casing; (39.7 - 42.6') Cemex #60 Mesh (40x70) Lapis Lustre Sand; (20.5 - 41.3') 18.0" Borehole	(39.7 - 42.6') 6.1 bags	(39.7 - 42.6') 6 bags (98%) Note: Transition sand
42							
43							
44							
45							
46		Topock - Alluvium Deposits	ML				
47							
48		Topock - Alluvium Deposits	SM				
49							
50							
51	IRZ-33-VAS-49-54 (2100 ppb) 1/21/2020 13:05				(42.6 - 119.5') Cemex #30 Mesh (30x70) Lapis Lustre Sand; (41.3 - 60.7') 16.0" Borehole	(42.6 - 119.5') 133.7 bags	(42.6 - 119.5') 160 bags (120%) Note: Filter pack, swabbed upper screen for approximately 127 minutes and the lower for approximately 125 minutes.
52							
53		Topock - Alluvium Deposits	SW-SM		(51.4 - 77.3') 10" 10-Slot 316L SS Wire Wrap Screen		
54							
55							
56							
57							
58		Topock - Alluvium Deposits	SM				
59							
60							

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ARCADIS Design & Consultancy for natural and built assets

Well Construction Log

Sheet: 4 of 6

Date Started:	03/18/2020	Surface Elevation:	502.67 ft amsl	**Well ID: IRZ-33**	
Date Completed:	03/22/2020	Shallow Well Elevation:	N/A		
Drilling Co.:	Cascade	Deep Well Elevation:	N/A	Client:	PG&E
Drilling Method:	Dual Rotary	Northing (NAD83):	2101792.01	Project:	Final GW Remedy Phase 1
Driller Name:	Jon Martinez	Easting (NAD83):	7615827.86	Location:	PG&E Topock, Needles, California
Drilling Asst:	A. & H. Amezguita	Borehole Diameter:	16-18 inches		
Logger:	K. Keon / E. Redner	Static Water Level:	See Log for Depths	Project Number:	RC000753.0051
Editor:	Sean McGrane	Development End Date:	7/13/2020		
Total Depth:	119.53 ft bgs	Well Completion:	☐ Flush ☐ Stick-up ☒ 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
61					(51.4 - 77.3') 10" 10-Slot 316L SS Wire Wrap Screen; (41.3 - 60.7') 16.0" Borehole		
62							
63		Topock - Alluvium Deposits	SM				
64							
65							
66							
67							
68							
69							
70					(42.6 - 119.5') Cemex #30 Mesh (30x70) Lapis Lustre Sand; (60.7 - 80.5') 16.0" Borehole	(42.6 - 119.5') 133.7 bags	(42.6 - 119.5') 160 bags (120%) Note: Filter pack, swabbed upper screen for approximately 127 minutes and the lower for approximately 125 minutes.
71							
72		Topock - Alluvium Deposits	SM				
73							
74	IRZ-33-VAS-72-77 (1600 ppb) 1/22/2020 09:40						
75							
76							
77							
78		Topock - Alluvium Deposits	SM		(77.3 - 87.2') 10" SHUR-GRIP SDR17 PVC Casing		
79							
80							

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Well Construction Log

Sheet: 5 of 6

Date Started:	03/18/2020	Surface Elevation:	502.67 ft amsl	**Well ID: IRZ-33**	
Date Completed:	03/22/2020	Shallow Well Elevation:	N/A		
Drilling Co.:	Cascade	Deep Well Elevation:	N/A	Client:	PG&E
Drilling Method:	Dual Rotary	Northing (NAD83):	2101792.01	Project:	Final GW Remedy Phase 1
Driller Name:	Jon Martinez	Easting (NAD83):	7615827.86	Location:	PG&E Topock, Needles, California
Drilling Asst:	A. & H. Amezguita	Borehole Diameter:	16-18 inches		
Logger:	K. Keon / E. Redner	Static Water Level:	See Log for Depths	Project Number:	RC000753.0051
Editor:	Sean McGrane	Development End Date:	7/13/2020		
Total Depth:	119.53 ft bgs	Well Completion:	☐ Flush ☐ Stick-up ☒ 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
81–100		Topock - Alluvium Deposits	SW-SM		(77.3 - 87.2') 10" SHUR-GRIP SDR17 PVC Casing; (81.5 - 82.5') Centralizer; (87.2 - 111.0') 10" 10-Slot 316L SS Wire Wrap Screen; (42.6 - 119.5') Cemex #30 Mesh (30x70) Lapis Lustre Sand; (80.5 - 100.4') 16.0" Borehole	(42.6 - 119.5') 133.7 bags	(42.6 - 119.5') 160 bags (120%) Note: Filter pack, swabbed upper screen for approximately 127 minutes and the lower for approximately 125 minutes.
87–100		Topock - Alluvium Deposits	SM				

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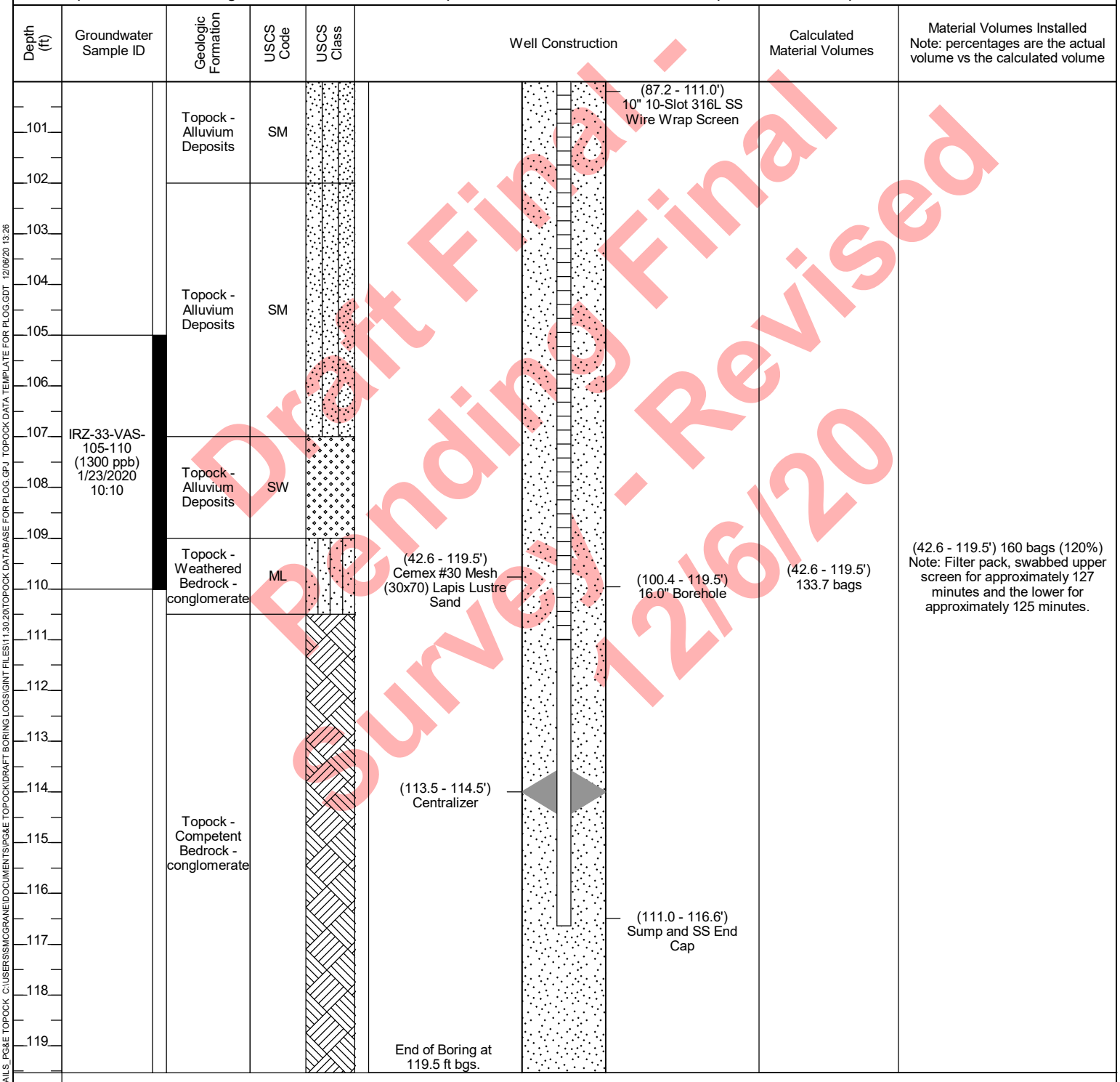
Well Construction Log

Sheet: 6 of 6

ARCADIS Design & Consultancy for natural and built assets

Date Started:	03/18/2020	Surface Elevation:	502.67 ft amsl	**Well ID: IRZ-33**	
Date Completed:	03/22/2020	Shallow Well Elevation:	N/A		
Drilling Co.:	Cascade	Deep Well Elevation:	N/A	Client:	PG&E
Drilling Method:	Dual Rotary	Northing (NAD83):	2101792.01	Project:	Final GW Remedy Phase 1
Driller Name:	Jon Martinez	Easting (NAD83):	7615827.86	Location:	PG&E Topock, Needles, California
Drilling Asst:	A. & H. Amezguita	Borehole Diameter:	16-18 inches		
Logger:	K. Keon / E. Redner	Static Water Level:	See Log for Depths	Project Number:	RC000753.0051
Editor:	Sean McGrane	Development End Date:	7/13/2020		
Total Depth:	119.53 ft bgs	Well Completion:	☐ Flush ☐ Stick-up ☒ To Be Completed in Well Vault		



Abbreviations: USCS = Unified Soil Classification System, ft = feet, bgs = below ground surface, amsl = above mean sea level, GW = groundwater, ppb = parts per billion, NR = no recovery; Notes: solid blue water table marks represent depth to water (ft. bgs.) measured pre-specific capacity for the shallow and deep screens

Drilling Log

Sheet: 1 of 6

Boring No.: IRZ-33

Date Started:	03/10/2020	Surface Elevation:	502.67 ft amsl
Date Completed:	03/17/2020	Northing (NAD83):	2101792.01
Drilling Co.:	Cascade	Easting (NAD83):	7615827.86
Drilling Method:	Dual Rotary	Total Depth:	119.5 ft bgs
Drill Rig Type:	Foremost DR-24HD	Conductor Casing Diameter:	18 inches
Driller Name:	Jon Martinez	Drill Casing Diameter:	16 inches
Drilling Asst:	A. & H. Amezguita	Drill Bit:	15.5 & 17.5 Tricone
Tool-Pusher:	A. Lamon	Depth to First Water:	49.6 ft bgs
Rig Geologist:	K. Keon / E. Redner	Converted to Well:	[X] Yes [ ] No

Client: PG&E
Project: Final GW Remedy Phase 1
Location: PG&E Topock, Needles, California
Project Number: RC000753.0051

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 - 3.1) 1.64 mins/ft	NR		(0.0 - 3.1') 18.0" Steel Casing	(0.0 - 8.0') No recovery (NR)	(0.0 - 3.1') Confirmed presence of Cemex #60 temporary backfill material at ground surface and that rig was lined up on pilot borehole. Stopped drilling to add sub.	(0.0 - 3.1') No water used
2							
3						(3.0') Observed some Cemex #60 Mesh (40x70) Lapis Luster Sand in drill cuttings.	(3.1 - 20.5') 200 gallons of water used; 25 gallons of water recovered; 175 gallons of water lost
4							
5							
6							
7							
8		SW			(8.0 - 10.5') Topock - Fill; Well graded sand with gravel (SW); dark yellowish brown (10YR 4/4)		
9							
10						(10.0') Observed trace amounts of Cemex #3 Mesh (8x20) Lapis Luster Sand in drill cuttings.	
11	(3.1 - 20.5) 0.92 mins/ft	GW		(3.1 - 20.5') 18.0" Steel Casing	(10.5 - 11.2') Topock - Fill; Well graded gravel with sand (GW); brown (10YR 5/3)		
12		SW			(11.2 - 18.5') Topock - Fill; Poorly graded sand with gravel (SW); yellowish brown / moderate yellowish brown (10YR 5/4)		
13							
14							
15							
16							
17							
18							
19		GW			(18.5 - 21.7') Topock - Fill; Well graded gravel with sand (GW); yellowish brown / moderate yellowish brown (10YR 5/4) trace grayish green		
20							

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Drilling Log

ARCADIS Design & Consultancy for natural and built assets

Boring No.: IRZ-33

Date Started:	03/10/2020	Surface Elevation:	502.67 ft amsl		
Date Completed:	03/17/2020	Northing (NAD83):	2101792.01		
Drilling Co.:	Cascade	Easting (NAD83):	7615827.86	Client:	PG&E
Drilling Method:	Dual Rotary	Total Depth:	119.5 ft bgs	Project:	Final GW Remedy Phase 1
Drill Rig Type:	Foremost DR-24HD	Conductor Casing Diameter:	18 inches	Location:	PG&E Topock, Needles, California
Driller Name:	Jon Martinez	Drill Casing Diameter:	16 inches		
Drilling Asst:	A. & H. Amezguita	Drill Bit:	15.5 & 17.5 Tricone	Project Number:	RC000753.0051
Tool-Pusher:	A. Lamon	Depth to First Water:	49.6 ft bgs		
Rig Geologist:	K. Keon / E. Redner	Converted to Well:	☒ Yes ☐ 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		GW			(GLEY1 5/5G)	(20.0') Observed trace amounts of Cemex #3 Mesh (8x20) Lapis Luster Sand in drill cuttings.	(20.5 - 41.3') 200 gallons of water used; 20 gallons of water recovered; 180 gallons of water lost
22					(21.7 - 33.0') Topock - Fill; Well graded sand with gravel (SW); yellowish brown / moderate yellowish brown (10YR 5/4)		
23							
24							
25							
26							
27		SW					
28							
29							
30	(20.5 - 41.3) 1.25 mins/ft			(20.5 - 41.3') 18.0" Steel Casing		(30.0') Observed trace amounts of Cemex #3 Mesh (8x20) Lapis Luster Sand in drill cuttings.	
31							
32						(32.0 - 33.0') Hard noisy drilling	
33					(33.0 - 34.5') Topock - Fill; Well graded sand with silt and gravel (SW-SM); grayish brown (10YR 5/2)		
34		SW-SM				(34.0 - 35.0') Hard noisy drilling	
35					(34.5 - 39.0') Topock - Fill; Well graded sand with gravel (SW); yellowish brown / moderate yellowish brown (10YR 5/4)		
36							
37		SW					
38							
39		SM					
40		SM			(39.0 - 39.2') Topock - Alluvium Deposits; Silty sand with gravel (SM); olive gray / light olive gray		

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Drilling Co.:	Cascade	Easting (NAD83):	7615827.86	Client:	PG&E
Drilling Method:	Dual Rotary	Total Depth:	119.5 ft bgs	Project:	Final GW Remedy Phase 1
Drill Rig Type:	Foremost DR-24HD	Conductor Casing Diameter:	18 inches	Location:	PG&E Topock, Needles, California
Driller Name:	Jon Martinez	Drill Casing Diameter:	16 inches		
Drilling Asst:	A. & H. Amezguita	Drill Bit:	15.5 & 17.5 Tricone	Project Number:	RC000753.0051
Tool-Pusher:	A. Lamon	Depth to First Water:	49.6 ft bgs		
Rig Geologist:	K. Keon / E. Redner	Converted to Well:	☒ Yes ☐ 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	(20.5 - 41.3) 1.25 mins/ft	SM		(20.5 - 41.3') 18.0" Steel Casing	(5Y 5/2) (39.2 - 46.0') Topock - Alluvium Deposits; Silty sand with gravel (SM); yellowish brown / moderate yellowish brown (10YR 5/4) (40.3') dark yellowish brown (10YR 4/4)	(40.0') Observed little amounts of Cemex #3 Mesh (8x20) Lapis Luster Sand in drill cuttings.	(41.3 - 60.7') 267 gallons of water used; 100 gallons of water recovered; 167 gallons of water lost
42							
43							
44							
45							
46		ML			(46.0 - 46.5') Topock - Alluvium Deposits; Sandy silt (ML); dark grayish brown (2.5Y 4/2)		
47		SM			(46.5 - 51.0') Topock - Alluvium Deposits; Silty sand with gravel (SM); yellowish brown / moderate yellowish brown (10YR 5/4)		
48							
49							
50						(50.0') Observed trace to little amounts of Cemex #3 Mesh (8x20) Lapis Luster Sand in drill cuttings.	
51	(41.3 - 60.7) 1.34 mins/ft			(41.3 - 60.7') 16.0" Steel Casing			
52		SW-SM			(51.0 - 56.0') Topock - Alluvium Deposits; Well graded sand with silt and gravel (SW-SM); yellowish brown / moderate yellowish brown (10YR 5/4)		
53							
54							
55							
56							
57		SM			(56.0 - 67.0') Topock - Alluvium Deposits; Silty sand with gravel (SM); light olive brown (2.5Y 5/3) (57') brown (7.5YR 5/4)		
58							
59							
60							

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Drilling Log

Sheet: 4 of 6

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Date Completed:	03/17/2020	Northing (NAD83):	2101792.01		
Drilling Co.:	Cascade	Easting (NAD83):	7615827.86	Client:	PG&E
Drilling Method:	Dual Rotary	Total Depth:	119.5 ft bgs	Project:	Final GW Remedy Phase 1
Drill Rig Type:	Foremost DR-24HD	Conductor Casing Diameter:	18 inches	Location:	PG&E Topock, Needles, California
Driller Name:	Jon Martinez	Drill Casing Diameter:	16 inches		
Drilling Asst:	A. & H. Amezguita	Drill Bit:	15.5 & 17.5 Tricone	Project Number:	RC000753.0051
Tool-Pusher:	A. Lamon	Depth to First Water:	49.6 ft bgs		
Rig Geologist:	K. Keon / E. Redner	Converted to Well:	☒ Yes ☐ 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
60	(41.3 - 60.7) 1.34 mins/ft					(60.0') Observed trace amounts of Cemex #3 Mesh (8x20) Lapis Luster Sand in drill cuttings.	
61							(60.7 - 80.5') 100 gallons of water used; 380 gallons of water recovered; 280 gallons of water gained
62							
63		SM					
64							
65						(65.0 - 70.0') Hard drilling	
66					(65.5') yellowish brown / moderate yellowish brown (10YR 5/4)		
67					(67.0 - 77.0') Topock - Alluvium Deposits; Silty sand (SM); brown (7.5YR 5/4)		
68							
69					(69') yellowish brown / moderate yellowish brown (10YR 5/4)		
70	(60.7 - 80.5) 1.27 mins/ft			(60.7 - 80.5') 16.0" Steel Casing		(70.0') Observed trace amounts of Cemex #3 Mesh (8x20) Lapis Luster Sand in drill cuttings.	
71							
72		SM					
73							
74					(74') brown (7.5YR 5/4)		
75							
76							
77					(77.0 - 80.0') Topock - Alluvium Deposits; Silty sand with gravel (SM); brown (7.5YR 5/4)		
78							
79		SM					
80							

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Drilling Log

Sheet: 5 of 6

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Drilling Co.:	Cascade	Easting (NAD83):	7615827.86	Client:	PG&E
Drilling Method:	Dual Rotary	Total Depth:	119.5 ft bgs	Project:	Final GW Remedy Phase 1
Drill Rig Type:	Foremost DR-24HD	Conductor Casing Diameter:	18 inches	Location:	PG&E Topock, Needles, California
Driller Name:	Jon Martinez	Drill Casing Diameter:	16 inches		
Drilling Asst:	A. & H. Amezguita	Drill Bit:	15.5 & 17.5 Tricone	Project Number:	RC000753.0051
Tool-Pusher:	A. Lamon	Depth to First Water:	49.6 ft bgs		
Rig Geologist:	K. Keon / E. Redner	Converted to Well:	☒ Yes ☐ 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					(80.0 - 87.0') Topock - Alluvium Deposits; Well graded sand with silt and gravel (SW-SM); brown (7.5YR 5/4)	(80.0') Observed trace amounts of Cemex #3 Mesh (8x20) Lapis Luster Sand in drill cuttings.	(80.5 - 100.4') 100 gallons of water used; 450 gallons of water recovered; 350 gallons of water gained
82						(82.0 - 85.0') Rough drilling	
83		SW-SM					
84							
85							
86							
87					(87.0 - 102.0') Topock - Alluvium Deposits; Silty sand with gravel (SM); yellowish brown / moderate yellowish brown (10YR 5/4)		
88							
89							
90	(80.5 - 100.4) 1.39 mins/ft			(80.5 - 100.4') 16.0" Steel Casing		(90.0') Observed trace amounts of Cemex #3 Mesh (8x20) Lapis Luster Sand in drill cuttings.	
91					(91') brown (7.5YR 5/4)		
92							
93							
94		SM					
95							
96					(95.5') yellowish brown / moderate yellowish brown (10YR 5/4)		
97							
98						(98.0 - 102.0') Rough drilling	
99							
100							

Abbreviations: USCS = Unified Soil Classification System, ft = feet, bgs = below ground surface, amsl = above mean sea level, GW = groundwater, NR = no recovery; Notes: depth to water measured during the collection of the first VAS interval

Drilling Log

ARCADIS Design & Consultancy for natural and built assets

Sheet: 6 of 6

Boring No.: IRZ-33

Date Started:	03/10/2020	Surface Elevation:	502.67 ft amsl		
Date Completed:	03/17/2020	Northing (NAD83):	2101792.01		
Drilling Co.:	Cascade	Easting (NAD83):	7615827.86	Client:	PG&E
Drilling Method:	Dual Rotary	Total Depth:	119.5 ft bgs	Project:	Final GW Remedy Phase 1
Drill Rig Type:	Foremost DR-24HD	Conductor Casing Diameter:	18 inches	Location:	PG&E Topock, Needles, California
Driller Name:	Jon Martinez	Drill Casing Diameter:	16 inches		
Drilling Asst:	A. & H. Amezguita	Drill Bit:	15.5 & 17.5 Tricone	Project Number:	RC000753.0051
Tool-Pusher:	A. Lamon	Depth to First Water:	49.6 ft bgs		
Rig Geologist:	K. Keon / E. Redner	Converted to Well:	☒ Yes ☐ 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			(100') brown (7.5YR 5/4)	(100.0') Observed trace amounts of Cemex #3 Mesh (8x20) Lapis Luster Sand in drill cuttings.	(100.4 - 119.5') 200 gallons of water used; 502 gallons of water recovered; 302 gallons of water gained
102							
103		SM			(102.0 - 107.0') Topock - Alluvium Deposits; Silty sand (SM); brown (7.5YR 5/4)		
104							
105							
106							
107		SW			(107.0 - 109.0') Topock - Alluvium Deposits; Well graded sand (SW); dark yellowish brown (10YR 4/4)		
108							
109		ML			(109.0 - 110.5') Topock - Weathered Bedrock - conglomerate; Sandy silt (ML); brown (7.5YR 4/4)		
110	(100.4 - 119.5') 2.46 mins/ft			(100.4 - 119.5') 16.0" Steel Casing		(110.0') Observed trace amounts of Cemex #3 Mesh (8x20) Lapis Luster Sand in drill cuttings.	
111					(110.5 - 119.5') Topock - Competent Bedrock - conglomerate		
112							
113							
114							
115							
116							
117							
118						(118.0') Observed trace amounts of Cemex #2/12 Mesh (16x30) Lapis Luster Sand in drill cuttings.	
119							
120					End of Boring at 119.5 ft bgs.		

Abbreviations: USCS = Unified Soil Classification System, ft = feet, bgs = below ground surface, amsl = above mean sea level, GW = groundwater, NR = no recovery; Notes: depth to water measured during the collection of the first VAS interval

ARCADIS Design & Consultancy for natural and built assets

Boring Log

Sheet: 1 of 6

Date Started:	01/16/2020	Surface Elevation:	502.67 ft amsl	**Boring No.:**	**IRZ-33-Pilot**
Date Completed:	01/23/2020	Northing (NAD83):	2101792.01		
Drilling Co.:	Cascade	Easting (NAD83):	7615827.86	Client:	PG&E
Drilling Method:	Sonic Drilling	Total Depth:	116 ft bgs	Project:	Final GW Remedy Phase 1
Drill Rig Type:	Boart Longyear Track Mount	Borehole Diameter:	6-10 inches	Location:	PG&E Topock, Needles, California
Driller Name:	Eddie Ramos	Depth to First Water:	49.6 ft bgs		
Drilling Asst:	J. Candelaria / F. Sandoval	Sampling Method:	4 inch x 10ft Core Barrel	Project Number:	RC000753.0051
Logger:	Joe Latham	Sampling Interval:	Continuous		
Editor:	Grant Willford	Converted to Well:	☒ Yes ☐ No		

Depth (ft)	Recovery (in)	Sieve Sample ID	Groundwater Sample ID	Geologic Formation	USCS Code	USCS Class	Soil Description	Drilling Notes	Drilling Fluid
1–8	0				NR		(0.0 - 8.0') No recovery (NR); see drilling notes	(0.0 - 8.0') Core not collected drilled with 10-inch conductor casing to 8 ft. bgs.	(0.0 - 116.0') No water used
8–10	108			Topock - Fill	SW		(8.0 - 10.5') Topock - Fill; Well graded sand with gravel (SW); dark yellowish brown (10YR 4/4); very fine grained to very coarse grained, angular to round; little granules to very large pebbles, subangular to round; trace silt; little coarser clasts composed of metadiorite; moist	(8.0 - 27.0') Soft drilling	
10–11				Topock - Fill	GW		(10.5 - 11.2') Topock - Fill; Well graded gravel with sand (GW); brown (10YR 5/3); granules to very large pebbles, angular to subround; and very fine to very coarse grained sand, angular to subround; trace silt; and coarser clasts composed of metadiorite; dry		
11–17				Topock - Fill	SW		(11.2 - 18.5') Topock - Fill; Poorly graded sand with gravel (SW); yellowish brown / moderate yellowish brown (10YR 5/4); very fine grained to very coarse grained, angular to round; some granules to very large pebbles, angular to round; trace silt; some coarser clasts composed of metadiorite; dry to moist (14.5'); moist; increase in granules and pebbles, decrease in sand (16.5'); dry to moist (17'); increase in sand, decrease in granules and pebbles		
17–18	120								
18–20				Topock - Fill	GW		(18.5 - 21.7') Topock - Fill; Well graded gravel with sand (GW); yellowish brown / moderate yellowish brown (10YR 5/4) trace grayish green (GLEY1 5/5G); granules to very large pebbles, angular to subround; and very fine to very coarse grained sand, angular to subround; trace silt; and coarser clasts composed of		

Abbreviations: USCS = Unified Soil Classification System, ft = feet, bgs = below ground surface, amsl = above mean sea level, GW = groundwater, ppb = parts per billion, 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

ARCADIS Design & Consultancy for natural and built assets

Boring Log

Boring No.: IRZ-33-Pilot

Date Started:	01/16/2020	Surface Elevation:	502.67 ft amsl	Client:	PG&E
Date Completed:	01/23/2020	Northing (NAD83):	2101792.01	Project:	Final GW Remedy Phase 1
Drilling Co.:	Cascade	Easting (NAD83):	7615827.86	Location:	PG&E Topock, Needles, California
Drilling Method:	Sonic Drilling	Total Depth:	116 ft bgs		
Drill Rig Type:	Boart Longyear Track Mount	Borehole Diameter:	6-10 inches		
Driller Name:	Eddie Ramos	Depth to First Water:	49.6 ft bgs		
Drilling Asst:	J. Candelaria / F. Sandoval	Sampling Method:	4 inch x 10ft Core Barrel	Project Number:	RC000753.0051
Logger:	Joe Latham	Sampling Interval:	Continuous		
Editor:	Grant Willford	Converted to Well:	☒ Yes ☐ No		

Depth (ft)	Recovery (in)	Sieve Sample ID	Groundwater Sample ID	Geologic Formation	USCS Code	USCS Class	Soil Description	Drilling Notes	Drilling Fluid
21				Topock - Fill	GW		metadiorite; trace mica; moist		
22							(21.5'); lens of pulverized grey rock and silt		
23	120						(21.7 - 33.0') Topock - Fill; Well graded sand with gravel (SW); yellowish brown / moderate yellowish brown (10YR 5/4); very fine grained to very coarse grained, angular to subround; and granules to very large pebbles, angular to subround; trace silt; and coarser clasts composed of metadiorite; trace sandstone; dry to moist		
24									
25									
26							(26'); some granules to very large pebbles, angular to subround; trace quartzite; moist; increase in sand, decrease in granules and pebbles		
27				Topock - Fill	SW			(27.0 - 37.0') Rough drilling	
28									
29							(29'); dry to moist		
30							(30'); moist		
31									
32	120								
33									
34				Topock - Fill	SW-SM		(33.0 - 34.5') Topock - Fill; Well graded sand with silt and gravel (SW-SM); grayish brown (10YR 5/2); very fine grained to very coarse grained, angular to subround; and granules to large pebbles, angular to subround; little silt; and coarser clasts composed of metadiorite; dry		
35							(34.5 - 39.0') Topock - Fill; Well graded sand with gravel (SW); yellowish brown / moderate yellowish brown (10YR 5/4); very fine grained to coarse grained, angular to subround; little granules to very large pebbles, angular to subangular; trace silt; little coarser clasts composed of metadiorite; dry to moist		
36									
37				Topock - Fill	SW			(37.0 - 57.0') Normal drilling	
38									
39	120								
40				Topock - Alluvium Deposits	SM / SM		(39.0 - 39.2') Topock - Alluvium Deposits; Silty sand with gravel (SM); olive gray / light olive gray (5Y 5/2); very fine grained to medium grained, subangular to subround; little granules to very		

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Boring Log

ARCADIS Design & Consultancy for natural and built assets

Boring No.: IRZ-33-Pilot

Date Started:	01/16/2020	Surface Elevation:	502.67 ft amsl	Client:	PG&E
Date Completed:	01/23/2020	Northing (NAD83):	2101792.01	Project:	Final GW Remedy Phase 1
Drilling Co.:	Cascade	Easting (NAD83):	7615827.86	Location:	PG&E Topock, Needles, California
Drilling Method:	Sonic Drilling	Total Depth:	116 ft bgs		
Drill Rig Type:	Boart Longyear Track Mount	Borehole Diameter:	6-10 inches		
Driller Name:	Eddie Ramos	Depth to First Water:	49.6 ft bgs		
Drilling Asst:	J. Candelaria / F. Sandoval	Sampling Method:	4 inch x 10ft Core Barrel	Project Number:	RC000753.0051
Logger:	Joe Latham	Sampling Interval:	Continuous		
Editor:	Grant Willford	Converted to Well:	☒ Yes ☐ No		

Depth (ft)	Recovery (in)	Sieve Sample ID	Groundwater Sample ID	Geologic Formation	USCS Code	USCS Class	Soil Description	Drilling Notes	Drilling Fluid
41							large pebbles, angular to subangular; little silt; little coarser clasts composed of metadiorite; dry		
42							(39.2 - 46.0') Topock - Alluvium Deposits; Silty sand with gravel (SM); yellowish brown / moderate yellowish brown (10YR 5/4); very fine grained to very coarse grained, angular to subround; and granules to large pebbles, angular to subangular; little silt; and coarser clasts composed of metadiorite; moist		
43	120			Topock - Alluvium Deposits	SM		(40.3') dark yellowish brown (10YR 4/4); dry; increase in sand, decrease in granules and pebbles		
44									
45									
46		IRZ-33-SS-45-47 1/24/2020 08:30							
47				Topock - Alluvium Deposits	ML		(46.0 - 46.5') Topock - Alluvium Deposits; Sandy silt (ML); dark grayish brown (2.5Y 4/2); low plasticity; some very fine to fine grained sand, subangular to subround; trace granules to medium pebbles, subangular; trace coarser clasts composed of metadiorite; dry		
48							(46.5 - 51.0') Topock - Alluvium Deposits; Silty sand with gravel (SM); yellowish brown / moderate yellowish brown (10YR 5/4); very fine grained to very coarse grained, angular to subround; some silt; little granules to very large pebbles, angular; little coarser clasts composed of metadiorite; moist to wet; iron oxide staining		
49		IRZ-33-SS-47-51 1/24/2020 08:34		Topock - Alluvium Deposits	SM				
50									
51			IRZ-33-VAS-49-54 (2100 ppb) 1/21/2020 13:05						
52	120						(51.0 - 56.0') Topock - Alluvium Deposits; Well graded sand with silt and gravel (SW-SM); yellowish brown / moderate yellowish brown (10YR 5/4); very fine grained to very coarse grained, angular to subangular; some granules to very large pebbles, angular to subangular; little silt; some coarser clasts composed of metadiorite; dry to moist; iron oxide staining		
53		IRZ-33-SS-51-56 1/24/2020 08:38		Topock - Alluvium Deposits	SW-SM				
54							(54'); moist		
55							(55'); dry to moist		
56									
57							(56.0 - 67.0') Topock - Alluvium Deposits; Silty sand with gravel (SM); light olive brown (2.5Y 5/3); very fine grained to very coarse grained, subangular to subround; some silt; little granules to very large pebbles, angular to subangular; little coarser clasts composed of metadiorite; dry	(57.0 - 77.0') Rough drilling	
58	120	IRZ-33-SS-56-60 1/24/2020 08:42		Topock - Alluvium Deposits	SM		(57') brown (7.5YR 5/4); some granules to very large pebbles, angular to subangular; moist; iron oxide staining; increase in sand, decrease in silt		
59							(59'); moist to wet		
60									

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ARCADIS Design & Consultancy for natural and built assets

Boring Log

Boring No.: IRZ-33-Pilot

Date Started:	01/16/2020	Surface Elevation:	502.67 ft amsl	Client:	PG&E
Date Completed:	01/23/2020	Northing (NAD83):	2101792.01	Project:	Final GW Remedy Phase 1
Drilling Co.:	Cascade	Easting (NAD83):	7615827.86	Location:	PG&E Topock, Needles, California
Drilling Method:	Sonic Drilling	Total Depth:	116 ft bgs		
Drill Rig Type:	Boart Longyear Track Mount	Borehole Diameter:	6-10 inches		
Driller Name:	Eddie Ramos	Depth to First Water:	49.6 ft bgs		
Drilling Asst:	J. Candelaria / F. Sandoval	Sampling Method:	4 inch x 10ft Core Barrel	Project Number:	RC000753.0051
Logger:	Joe Latham	Sampling Interval:	Continuous		
Editor:	Grant Willford	Converted to Well:	☒ Yes ☐ No		

Depth (ft)	Recovery (in)	Sieve Sample ID	Groundwater Sample ID	Geologic Formation	USCS Code	USCS Class	Soil Description	Drilling Notes	Drilling Fluid
61							(61'); moist		
62		IRZ-33-SS-60-65 1/24/2020 08:45							
63							(62.5'); dry		
				Topock - Alluvium Deposits			(63'); moist to wet		
64	120				SM		(64'); dry to moist; iron oxide staining		
65									
66							(65.5') yellowish brown / moderate yellowish brown (10YR 5/4); little silt; moist to wet; iron oxide staining; increase in sand, increase in granules and pebbles		
67		IRZ-33-SS-65-70 1/24/2020 08:50							
68							(67.0 - 77.0') Topock - Alluvium Deposits; Silty sand (SM); brown (7.5YR 5/4); very fine grained to very coarse grained, angular to subround; some silt; little granules to very large pebbles, angular to subangular; little coarser clasts composed of metadiorite; wet		
69							(69') yellowish brown / moderate yellowish brown (10YR 5/4); dry to moist		
70									
71									
72	120	IRZ-33-SS-70-75 1/24/2020 09:00		Topock - Alluvium Deposits	SM				
73									
74			IRZ-33-VAS-72-77 (1600 ppb) 1/22/2020 09:40				(74') brown (7.5YR 5/4); moist to wet		
75									
76		IRZ-33-SS-75-77 1/24/2020 09:04							
77									
78							(77.0 - 80.0') Topock - Alluvium Deposits; Silty sand with gravel (SM); brown (7.5YR 5/4); very fine grained to very coarse grained, angular to subround; some silt; little granules to very large pebbles, angular to subangular; wet; iron oxide staining	(77.0 - 87.0') Soft drilling	
79	120	IRZ-33-SS-77-80 1/24/2020 09:09		Topock - Alluvium Deposits	SM				
80									

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Boring Log

ARCADIS Design & Consultancy for natural and built assets

Boring No.: IRZ-33-Pilot

Date Started:	01/16/2020	Surface Elevation:	502.67 ft amsl	Client:	PG&E
Date Completed:	01/23/2020	Northing (NAD83):	2101792.01	Project:	Final GW Remedy Phase 1
Drilling Co.:	Cascade	Easting (NAD83):	7615827.86	Location:	PG&E Topock, Needles, California
Drilling Method:	Sonic Drilling	Total Depth:	116 ft bgs		
Drill Rig Type:	Boart Longyear Track Mount	Borehole Diameter:	6-10 inches		
Driller Name:	Eddie Ramos	Depth to First Water:	49.6 ft bgs		
Drilling Asst:	J. Candelaria / F. Sandoval	Sampling Method:	4 inch x 10ft Core Barrel	Project Number:	RC000753.0051
Logger:	Joe Latham	Sampling Interval:	Continuous		
Editor:	Grant Willford	Converted to Well:	☒ Yes ☐ No		

Depth (ft)	Recovery (in)	Sieve Sample ID	Groundwater Sample ID	Geologic Formation	USCS Code	USCS Class	Soil Description	Drilling Notes	Drilling Fluid
81	120	IRZ-33-SS-80-84 1/24/2020 09:13		Topock - Alluvium Deposits	SW-SM		(80.0 - 87.0') Topock - Alluvium Deposits; Well graded sand with silt and gravel (SW-SM); brown (7.5YR 5/4); very fine grained to very coarse grained, angular to subround; some granules to very large pebbles, angular to subangular; little silt; trace clay; some coarser clasts composed of metadiorite; wet; iron oxide staining	(87.0 - 107.0') Normal drilling	
82									
83							(82.5'); green staining		
84		IRZ-33-SS-84-87 1/24/2020 09:17							
85									
86									
87									
88	120	IRZ-33-SS-87-90 1/24/2020 09:22		Topock - Alluvium Deposits	SM		(87.0 - 102.0') Topock - Alluvium Deposits; Silty sand with gravel (SM); yellowish brown / moderate yellowish brown (10YR 5/4); very fine grained to very coarse grained, angular to subround; some granules to very large pebbles, angular to subangular; some silt; trace clay; some coarser clasts composed of metadiorite; moist; iron oxide staining		
89							(88'); dry to moist (89'); moist		
90									
91		IRZ-33-SS-90-95 1/24/2020 09:27					(91') brown (7.5YR 5/4); and granules to very large pebbles, angular to subangular; little silt; wet; decrease in clay		
92									
93									
94									
95									
96							(95.5') yellowish brown / moderate yellowish brown (10YR 5/4); some granules to very large pebbles, angular to subangular; dry; increase in silt and sand, green staining		
97		IRZ-33-SS-95-99 1/24/2020 09:32					(97'); some silt; little granules to very large pebbles, angular to subangular; trace clay; moist; decrease in sand		
98	120						(98'); and silt; moist; increase in sand, decrease in granules and pebbles		
99		IRZ-33-SS-99-102 1/24/2020					(99'); dry to moist		
100									

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Boring Log

Sheet: 6 of 6

ARCADIS Design & Consultancy for natural and built assets

Date Started:	01/16/2020	Surface Elevation:	502.67 ft amsl	**Boring No.:**	**IRZ-33-Pilot**
Date Completed:	01/23/2020	Northing (NAD83):	2101792.01		
Drilling Co.:	Cascade	Easting (NAD83):	7615827.86	Client:	PG&E
Drilling Method:	Sonic Drilling	Total Depth:	116 ft bgs	Project:	Final GW Remedy Phase 1
Drill Rig Type:	Boart Longyear Track Mount	Borehole Diameter:	6-10 inches	Location:	PG&E Topock, Needles, California
Driller Name:	Eddie Ramos	Depth to First Water:	49.6 ft bgs		
Drilling Asst:	J. Candelaria / F. Sandoval	Sampling Method:	4 inch x 10ft Core Barrel	Project Number:	RC000753.0051
Logger:	Joe Latham	Sampling Interval:	Continuous		
Editor:	Grant Willford	Converted to Well:	☒ Yes ☐ No		

Depth (ft)	Recovery (in)	Sieve Sample ID	Groundwater Sample ID	Geologic Formation	USCS Code	USCS Class	Soil Description	Drilling Notes	Drilling Fluid
101	120	09:37 IRZ-33-SS-99-102 1/24/2020 09:37		Topock - Alluvium Deposits	SM		(100') brown (7.5YR 5/4); iron oxide staining; red and white mottling present		
102									
103							(102.0 - 107.0') Topock - Alluvium Deposits; Silty sand (SM); brown (7.5YR 5/4); very fine grained to very coarse grained, angular to subround; some silt; little granules to very large pebbles, angular to subangular; little coarser clasts composed of metadiorite; wet; iron oxide staining		
104		IRZ-33-SS-102-107 1/24/2020 09:42		Topock - Alluvium Deposits	SM				
105									
106							(106'); dry to moist; red and white mottling present		
107			IRZ-33-VAS-105-110 (1300 ppb) 1/23/2020 10:10						
108	60	IRZ-33-SS-107-109 1/24/2020 09:48		Topock - Alluvium Deposits	SW		(107.0 - 109.0') Topock - Alluvium Deposits; Well graded sand (SW); dark yellowish brown (10YR 4/4); very fine grained to very coarse grained, angular to subround; trace small to very large pebbles, angular to subangular; trace silt; trace coarser clasts composed of metadiorite; wet	(107.0 - 112.0') Very rough drilling, drill rods chattering, bedrock contact at 110.5 ft bgs.	
109									
110		IRZ-33-SS-109-111 1/24/2020 09:53		Topock - Weathered Bedrock - conglomerate	ML		(109.0 - 110.5') Topock - Weathered Bedrock - conglomerate; Sandy silt (ML); brown (7.5YR 4/4); no plasticity; and very fine to very coarse grained sand, angular to subround; little granules to large pebbles, angular to subangular; little coarser clasts composed of metadiorite; moist to wet		
111							(110.5 - 116.0') Topock - Competent Bedrock - conglomerate; dry, friable, pulverized bedrock		
112									
113	48			Topock - Competent Bedrock - conglomerate				(112.0 - 116.0') Very rough drilling, drill rods chattering, 6 inches of slough from 112 to 112.5 ft bgs.	
114									
115									
116							End of Boring at 116.0 ft bgs.		
117									
118									
119									
120									

Abbreviations: USCS = Unified Soil Classification System, ft = feet, bgs = below ground surface, amsl = above mean sea level, GW = groundwater, ppb = parts per billion, 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

ARCADIS Design & Consultancy for natural and built assets

Temporary Backfill Log

Sheet: 1 of 6

Date Started:	01/23/2020	Surface Elevation:	502.67 ft amsl	**Well ID: IRZ-33-Pilot**	
Date Completed:	01/23/2020	Northing (NAD83):	2101792.01		
Drilling Co.:	Cascade	Easting (NAD83):	7615827.86	Client:	PG&E
Drilling Method:	Sonic Drilling	Total Depth:	116 ft bgs	Project:	Final GW Remedy Phase 1
Driller Name:	Eddie Ramos	Borehole Diameter:	6-10 inches	Location:	PG&E Topock, Needles, California
Drilling Asst:	J. Candelaria / F. Sandoval	Depth to First Water:	49.6 ft bgs		
Logger:	Joe Latham	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
0					(0.0 - 0.5') Steel Plate		Note: Steel plates with BMPs in place
1–4			NR		(0.5 - 5.0') Cemex #60 Mesh (40x70) Lapis Lustre Sand; (0.0 - 8.0') 10.0" Borehole	(0.5 - 5.0') 5.5 bags	(0.5 - 5.0') 6 bags (109%) Note: Surface seal sand
8–9		Topock - Fill	SW				
10–11		Topock - Fill	GW				
12–15		Topock - Fill	SW		(5.0 - 106.0') Cemex #3 MESH (8x20) Lapis Lustre Sand; (8.0 - 116.0') 6.0" Borehole	(5.0 - 106.0') 41.7 bags	(5.0 - 106.0') 50 bags (120%) Note: Backfill sand
19–20		Topock - Fill	GW				

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, 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

ARCADIS Design & Consultancy for natural and built assets

Temporary Backfill Log

Sheet: 2 of 6

Date Started:	01/23/2020	Surface Elevation:	502.67 ft amsl	**Well ID: IRZ-33-Pilot**	
Date Completed:	01/23/2020	Northing (NAD83):	2101792.01		
Drilling Co.:	Cascade	Easting (NAD83):	7615827.86	Client:	PG&E
Drilling Method:	Sonic Drilling	Total Depth:	116 ft bgs	Project:	Final GW Remedy Phase 1
Driller Name:	Eddie Ramos	Borehole Diameter:	6-10 inches	Location:	PG&E Topock, Needles, California
Drilling Asst:	J. Candelaria / F. Sandoval	Depth to First Water:	49.6 ft bgs		
Logger:	Joe Latham	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 - Fill	GW				
22							
23							
24							
25							
26							
27		Topock - Fill	SW				
28							
29							
30					(5.0 - 106.0') Cemex #3 MESH (8x20) Lapis Lustre Sand; (8.0 - 116.0') 6.0" Borehole	(5.0 - 106.0') 41.7 bags	(5.0 - 106.0') 50 bags (120%) Note: Backfill sand
31							
32							
33							
34		Topock - Fill	SW-SM				
35							
36							
37		Topock - Fill	SW				
38							
39		Topock - Alluvium Deposits	SM				
40			SM				

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, 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

Temporary Backfill Log

ARCADIS Design & Consultancy for natural and built assets

Date Started:	01/23/2020	Surface Elevation:	502.67 ft amsl	**Well ID: IRZ-33-Pilot**	
Date Completed:	01/23/2020	Northing (NAD83):	2101792.01		
Drilling Co.:	Cascade	Easting (NAD83):	7615827.86	Client:	PG&E
Drilling Method:	Sonic Drilling	Total Depth:	116 ft bgs	Project:	Final GW Remedy Phase 1
Driller Name:	Eddie Ramos	Borehole Diameter:	6-10 inches	Location:	PG&E Topock, Needles, California
Drilling Asst:	J. Candelaria / F. Sandoval	Depth to First Water:	49.6 ft bgs		
Logger:	Joe Latham	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
41–60	IRZ-33-VAS-49-54 (2100 ppb) 1/21/2020 13:05	Topock - Alluvium Deposits	SM		(5.0 - 106.0') Cemex #3 MESH (8x20) Lapis Lustre Sand; (8.0 - 116.0') 6.0" Borehole	(5.0 - 106.0') 41.7 bags	(5.0 - 106.0') 50 bags (120%) Note: Backfill sand
46–47		Topock - Alluvium Deposits	ML				
48–49		Topock - Alluvium Deposits	SM				
51–54		Topock - Alluvium Deposits	SW-SM				
57–60		Topock - Alluvium Deposits	SM				

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ARCADIS Design & Consultancy for natural and built assets

Temporary Backfill Log

Well ID: IRZ-33-Pilot

Date Started:	01/23/2020	Surface Elevation:	502.67 ft amsl		
Date Completed:	01/23/2020	Northing (NAD83):	2101792.01		
Drilling Co.:	Cascade	Easting (NAD83):	7615827.86	Client:	PG&E
Drilling Method:	Sonic Drilling	Total Depth:	116 ft bgs	Project:	Final GW Remedy Phase 1
Driller Name:	Eddie Ramos	Borehole Diameter:	6-10 inches	Location:	PG&E Topock, Needles, California
Drilling Asst:	J. Candelaria / F. Sandoval	Depth to First Water:	49.6 ft bgs		
Logger:	Joe Latham	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							
62							
63		Topock - Alluvium Deposits	SM				
64							
65							
66							
67							
68							
69							
70					(5.0 - 106.0') Cemex #3 MESH (8x20) Lapis Lustre Sand; (8.0 - 116.0') 6.0" Borehole	(5.0 - 106.0') 41.7 bags	(5.0 - 106.0') 50 bags (120%) Note: Backfill sand
71							
72		Topock - Alluvium Deposits	SM				
73							
74	IRZ-33-VAS-72-77 (1600 ppb) 1/22/2020 09:40						
75							
76							
77							
78		Topock - Alluvium Deposits	SM				
79							
80							

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ARCADIS Design & Consultancy for natural and built assets

Temporary Backfill Log

Well ID: IRZ-33-Pilot

Date Started:	01/23/2020	Surface Elevation:	502.67 ft amsl		
Date Completed:	01/23/2020	Northing (NAD83):	2101792.01		
Drilling Co.:	Cascade	Easting (NAD83):	7615827.86	Client:	PG&E
Drilling Method:	Sonic Drilling	Total Depth:	116 ft bgs	Project:	Final GW Remedy Phase 1
Driller Name:	Eddie Ramos	Borehole Diameter:	6-10 inches	Location:	PG&E Topock, Needles, California
Drilling Asst:	J. Candelaria / F. Sandoval	Depth to First Water:	49.6 ft bgs		
Logger:	Joe Latham	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		Topock - Alluvium Deposits	SW-SM		(5.0 - 106.0') Cemex #3 MESH (8x20) Lapis Lustre Sand; (8.0 - 116.0') 6.0" Borehole	(5.0 - 106.0') 41.7 bags	(5.0 - 106.0') 50 bags (120%) Note: Backfill sand
82							
83							
84							
85							
86							
87							
88							
89							
90							
91							
92							
93		Topock - Alluvium Deposits	SM				
94							
95							
96							
97							
98							
99							
100							

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ARCADIS Design & Consultancy for natural and built assets

Temporary Backfill Log

Sheet: 6 of 6

Date Started:	01/23/2020	Surface Elevation:	502.67 ft amsl	**Well ID: IRZ-33-Pilot**	
Date Completed:	01/23/2020	Northing (NAD83):	2101792.01		
Drilling Co.:	Cascade	Easting (NAD83):	7615827.86	Client:	PG&E
Drilling Method:	Sonic Drilling	Total Depth:	116 ft bgs	Project:	Final GW Remedy Phase 1
Driller Name:	Eddie Ramos	Borehole Diameter:	6-10 inches	Location:	PG&E Topock, Needles, California
Drilling Asst:	J. Candelaria / F. Sandoval	Depth to First Water:	49.6 ft bgs		
Logger:	Joe Latham	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		(5.0 - 106.0') Cemex #3 MESH (8x20) Lapis Lustre Sand	(5.0 - 106.0') 41.7 bags	(5.0 - 106.0') 50 bags (120%) Note: Backfill sand
102							
103							
104		Topock - Alluvium Deposits	SM				
105							
106							
107	IRZ-33-VAS-105-110 (1300 ppb) 1/23/2020 10:10						
108		Topock - Alluvium Deposits	SW		(8.0 - 116.0') 6.0" Borehole		
109							
110		Topock - Weathered Bedrock - conglomerate	ML				
111					(106.0 - 116.0') Cemex # 2/12 Mesh (16x30) Lapis Lustre Sand	(106.0 - 116.0') 3.9 bags	(106.0 - 116.0') 4 bags (103%) Note: Indicator sand
112							
113		Topock - Competent Bedrock - conglomerate					
114							
115							
116							
117							
118							
119							
120							

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