

Mr. Aaron Yue
Project Manager
California Department of Toxic Substances Control
5796 Corporate Avenue
Cypress, CA 90630

Ms. Pamela S. Innis
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ENVIRONMENT

Subject:
Well Decommissioning Report for Monitoring Well MW-D-46
Pacific Gas and Electric Company
Topock Compressor Station, Needles, California

Date:
June 1, 2020

Contact:
Fred Stanin

Phone:
925-296-7842

Email:
Fred.Stanin@arcadis.com

Our ref:
30019125

Dear Mr. Yue and Ms. Innis:

Pacific Gas and Electric Company (PG&E) is implementing a groundwater remedy at the Topock Compressor Station (TCS or Site) in Needles, California. Monitoring wells installed for the Final Groundwater Remedy at the Site are nested, when possible, to reduce the number of boreholes at the Site. The nested pair of wells installed in borehole MW-77s (formerly MW-Ds) included:

- MW-77-046 (formerly MW-D-046), screened from 26 to 46 feet (ft) below ground surface (bgs); and
- MW-77-102 (formerly MW-D-102) screened from 82 to 102 ft bgs.

Formation sand and filter pack sand was observed on September 26, 2019 during development of monitoring well MW-77-046. Development was paused to create an approach to assess the well condition. The assessment included additional development and video logging. The assessment concluded that MW-77-046 should be decommissioned, and MW-77-102 should be used as a monitoring well following development. The purpose of this memo is to document the field observations, regulatory discussions, and to summarize the agency-approved decommissioning procedures for MW-77-046.

FIELD OBSERVATIONS

Well development for MW-77-046 and MW-77-102 began on September 26, 2019 using site-specific well development procedures. Prior to the start of development of MW-77-046, the total depth of the well was measured at 36.26 ft. bgs. The measured depth was approximately 12 feet above the installed total depth of 48.3 ft bgs. During the initial bail of the well, a mixture of formation and filter pack sand was removed. This resulted in a decrease of the total depth by 0.24 ft. During subsequent bails, a higher percentage of filter pack to formation sand was observed without a significant change in the total depth of the well. The stabilization of sand levels inside the well following bailing suggested that the casing was compromised. A downhole video survey of the well was conducted on October 3, 2019 to aid in evaluating the condition of the well.

On September 26, 2019, the total depth of well MW-77-102 was measured at the approximate depth of the final well construction log depth. During the initial bail, filter pack was not observed, and the well was determined to be intact. Development continued October 1 and was completed on October 2, 2019.

VIDEO LOG RESULTS

A video log survey was completed on October 3, 2019 by Cascade to evaluate the condition of MW-77-046 well casing. The results are summarized below.

- First casing joint was encountered at approximately 6.8 feet bgs and appeared intact.
- Second casing joint was encountered at approximately 16.8 feet bgs and appeared intact.
- Third casing joint was encountered at approximately 26.8 feet bgs and appeared intact.

The visible portion of the well casing and screen did not show evidence of compromise to the well casing and was consistent with the as-built well construction log. Sand was observed in the well screen at approximately 36.4 ft bgs, above the joint connecting the well casing and the two 10-foot sections of screen. The Designer of Record and Cascade determined the compromise to the well was likely at or below the joint between the two screens and that the well would have to be decommissioned in place to save the adjacent deeper well MW-77-102 located in the same borehole.

AGENCY DISCUSSIONS AND APPROVAL

Based on observations during well development, Arcadis proposed to decommission well MW-77-046. PG&E and the agencies (Department of Toxic Substances Control, California State Water Board, U.S. Department of the Interior, U.S. Bureau of Reclamation, and others) approved decommissioning procedures in a subsequent discussion summarized below.

- October 3, 2019 – Arcadis, on behalf of PG&E, suggested that MW-77-046 would need to be permanently decommissioned in place in a manner that would not affect the integrity of MW-77-102. Following decommissioning of MW-77-046, a replacement well would be installed by drilling and setting a well approximately 10 to 15 ft. to the north. The Agencies approved the decommissioning plan.

WELL DECOMMISSIONING

On October 15, 2019, decommissioning of well MW-77-046 was completed according the Well Decommissioning Plan (Attachment 1). The final decommissioning log is presented in Attachment 2 and the photo log presenting decommissioning activities is included as Attachment 3. The decommissioned well was renamed to MW-77-046d following decommissioning. The replacement well was drilled and named MW-77-046.

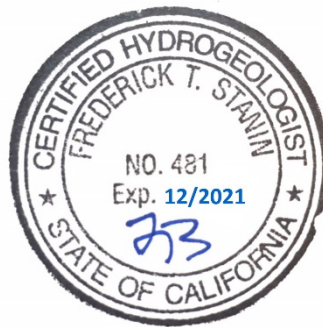
The other well in the original borehole, MW-77-102, was subsequently developed and has been incorporated in the site-wide groundwater monitoring program.

Sincerely,

Arcadis U.S., Inc.



Frederick T. Stanin, P.G., C. Hg
Principal Hydrogeologist



Copies:

Curt Russell/PG&E
Kevin Sullivan/PG&E
Iain Baker/PG&E
Dan Bush/Arcadis
Richard Orens/Arcadis
Frank Lenzo/Arcadis
Greg Foote/Arcadis

Enclosures:

Attachments

- 1 Well Decommissioning Plan for MW-77-046 (MW-D-046)
- 2 Well Decommissioning Log: MW-77-046d
- 3 Well Decommissioning Photo Log: MW-77-046d

ATTACHMENT 1

Well Decommissioning Plan: MW-77-046 (MW-D-046)

WELL DECOMMISSIONING PLAN FOR MW-77-046 (MW-D-046)

Well Decommissioning Procedures

1. Measure and document the depth to water and the depth to the sand in the well. Additional bailing is not recommended to prevent more annular material from entering the well.
2. Backfill the remaining screen zone of the well from the top of the sand pack to up to 2 above the top of the screen (well bottom approximately 36 to 24 feet bgs) with pea stone. Tag and document the depth of the top of the peas stone. The total volume of installed pea stone will be recorded and compared to a volume calculation for a 2-inch well (~0.5 of a 50 lbs bag). The purpose of the pea stone is to prevent significant lateral migration of grout out the well screen.
3. Measure and document the depth to water in the well. If there is still water in the well, follow step number 4.
4. Manage IDW purged from the well by attaching a well diverter tool to the top well casing. Run tubing from the diverter to the purge water tank and secure the tubing to the containment vessel (Wastewater tank or 55-gal drums as directed by the Construction Manager). Containerize the displaced water in the purge water tank and direct Cascade to transfer the collected purge water to a black wastewater tank. Insert the tremie pipe through the top of the diverter down to approximately 1 to 2 feet above the pea stone.
5. Mix neat cement with up to 5% bentonite. The grout should contain a high percentage of solids so that when applied the likelihood of significant lateral migration is minimized. Calculate the expected grout usage based on a 2-inch well (~4 gallons) plus a 100% factor (~8 gallons) to account for loss into the sand and pea gravel backfilled screen.
6. Pay close attention to the about of grout being applied. Start by applying approximately 50% of the calculated amount (4 to 5 gallons). Pull tremie pipe to avoid grouting the tremie pipe in place. Let grout cure overnight for the first lift. Measure top of grout from first lift and compare to volume calculation. Let water used to clean out the pump from grouting will be containerized in a drum and used to mix the grout that will be required for the installation of MW-D-46R

Assess if more than one additional lift of grout is needed. This decision will be made by Arcadis after assessing the amount of grout lost to the borehole and formation. Apply additional lifts of grout as necessary until grout is observed at top of well. Remove tremie pipe from well.

The next day, measure inside well to see if any settling of grout has occurred. "Top off" grout as necessary.

Once grouting is completed cap the top of the well.

7. Record all grout volume measurements and lift measurements on well abandonment log. Stop work and notify the QC geologist if the calculated volume exceeds the well volume plus the 100% factor.
8. Once the well has been grouted install a J-plug in the well.

9. The following day check the grout level and top off as needed. This can be done when grout is being mixed for the installation of the seal at one of the monitoring well. Once the well has been grouted to the top of the well casing a PVC cap will be glued to the top of the well.

ATTACHMENT 2

Well Decommissioning Log: MW-77-046d

Date Started:	09/08/2019	Surface Elevation:	478.74 ft amsl	Well ID: MW-77-046d, MW-77-102
Date Completed:	01/10/2020	Shallow Well Elevation:	NA	
Drilling Co.:	Cascade	Deep Well Elevation:	478.65 ft amsl	Client: PG&E
Drilling Method:	Sonic Drilling	Northing (NAD83):	2102928.26	Project: Final GW Remedy Phase 1
Driller Name:	Dan O' Mara	Easting (NAD83):	7615965.22	Location: PG&E Topock, Needles, California
Drilling Asst:	Jimmy Candelaria	Borehole Diameter:	10-12 inches	
Logger:	J. Latham / G. Willford	Static Water Level:	See Log for Depths	Project Number: RC000753.0051
Editor:	Grant Willford	Development End Date:	10/2/2019	
Total Depth:	107 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 - 2.2') Surface completion		(+0.2 - 2.2') 15 bags Note: 30" diameter concrete pad with 18" diameter lockable vault, King Kon-Crete 4000 PSI
1					(0.1 - 82.0') 2" PVC Sch 40 Casing		
2					(1.6 - 26.0') Decommissioned Well Casing		
3							Note: Capped decommissioned well casing covered with concrete inside the well vault during the installation of the surface completion.
4							
5							
6					(1.6 - 24.0') 100% Portland Cement I, II and V	(1.6 - 24.0') 3.58 gallons	(1.6 - 24.0') 4 gallons (112%) Note: Grout decommissioning seal. Installed on 11/16/19 to top of casing settled to 2 ft. bgs by 10/17/19. PVC casing was cut and a slip cap glued to the top of casing.
7							
8					(2.2 - 15.0') Portland Cement 6% Bentonite I, II and V with Benseal	(2.2 - 15.0') 72.1 gallons	(2.2 - 15.0') 98 gallons (136%) Note: Grout Seal. Type I, II and V and Benseal, used >20% of the calculated volume due to potential voids forming during drilling and grout migration
9							
10					(9.5 - 10.5') Centralizer		
11							
12							
13							
14							
15							
16							
17					(15.0 - 21.0') Cemex #0/30 MESH (30x50) Lapis Lustre Sand	(15.0 - 21.0') 8.9 bags	(15.0 - 21.0') 8 bags (90%) Note: Transition sand
18							
19							

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: groundwater samples collected during the drilling of MW-77d; solid blue water table marks represent depth to water (ft. bgs.) measured post development; installed in MW-77s

Date Started:	09/08/2019	Surface Elevation:	478.74 ft amsl	Well ID: MW-77-046d, MW-77-102
Date Completed:	01/10/2020	Shallow Well Elevation:	NA	
Drilling Co.:	Cascade	Deep Well Elevation:	478.65 ft amsl	Client: PG&E
Drilling Method:	Sonic Drilling	Northing (NAD83):	2102928.26	Project: Final GW Remedy Phase 1
Driller Name:	Dan O' Mara	Easting (NAD83):	7615965.22	Location: PG&E Topock, Needles, California
Drilling Asst:	Jimmy Candelaria	Borehole Diameter:	10-12 inches	
Logger:	J. Latham / G. Willford	Static Water Level:	See Log for Depths	Project Number: RC000753.0051
Editor:	Grant Willford	Development End Date:	10/2/2019	
Total Depth:	107 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
20					(15.0 - 21.0') Cemex #0/30 MESH (30x50) Lapis Lustre Sand	(15.0 - 21.0') 8.9 bags	(15.0 - 21.0') 8 bags (90%) Note: Transition sand
21					(0.1 - 82.0') 2" PVC Sch 40 Casing		
22							
23			NR				
24							
25							
26							
27							
28		Topock - Fluvial Deposits	SP		(24.0 - 36.2') Decommissioned with a combination of Cal-Silica 3/8" x 1/4" pea gravel and 100 % Portland Cement Type I, II and V	(24.0 - 46.0') 2 gallons	(24.0 - 36.2') 4 gallons (200%) Note: 0.5 bags of Cal-Silica 3/8 x 1/4" pea gravel to a depth of 24 ft. bgs. Portland Cement installed on 10/15/19 to top of casing and settled to 24 ft. bgs by 10/16/19. Used >20% of the calculated volume due to migration into the filter pack.
29							
30		Topock - Fluvial Deposits	CL		(21.0 - 50.0') Cemex #3 MESH (8x10) Lapis Lustre Sand	(21.0 - 50.0') 31.4 bags	(21.0 - 50.0') 45 bags (143%) Note: Filter pack. Used >20% of the calculated volume due to potential voids forming during drilling.
31							
32	MW-D-VAS-30-35 (<0.17 U ppb) 8/10/2019 14:39						
33		Topock - Fluvial Deposits	ML				
34							
35							
36							
37							
38		Topock - Fluvial Deposits	CL				
39			GM				
					(1.6 - 26.0') Decommissioned Well Casing		
					(0.0 - 27.0') 12.0" Borehole		
					(26 - 46.0') Decommissioned Screen interval		
					(27.0 - 107.0') 10.0" Borehole		
					(36.2 - 48.3') The well screen was potentially compromised at or below the joint between the two well screens allowing the formation and filter pack sand to enter the well screen		Note: Attempts to remove the formation and filter pack sand prior to decommissioning were unsuccessful and material was decommissioned in place.

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Date Completed:	01/10/2020	Shallow Well Elevation:	NA	
Drilling Co.:	Cascade	Deep Well Elevation:	478.65 ft amsl	Client: PG&E
Drilling Method:	Sonic Drilling	Northing (NAD83):	2102928.26	Project: Final GW Remedy Phase 1
Driller Name:	Dan O' Mara	Easting (NAD83):	7615965.22	Location: PG&E Topock, Needles, California
Drilling Asst:	Jimmy Candelaria	Borehole Diameter:	10-12 inches	
Logger:	J. Latham / G. Willford	Static Water Level:	See Log for Depths	Project Number: RC000753.0051
Editor:	Grant Willford	Development End Date:	10/2/2019	
Total Depth:	107 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					(0.1 - 82.0') 2" PVC Sch 40 Casing		
41							
42		Topock - Fluvial Deposits	GM				
43							
44		Topock - Fluvial Deposits	ML				
45		Topock - Fluvial Deposits	GM		(21.0 - 50.0') Cemex #3 MESH (8x10) Lapis Lustre Sand	(21.0 - 50.0') 31.4 bags	(21.0 - 50.0') 45 bags (143%) Note: Filter pack. Used >20% of the calculated volume due to potential voids forming during drilling.
46							
47					(46.5 - 47.5') Centralizer		
48	MW-D-VAS-46-51 (0.47 ppb) 8/11/2019 12:59						
49							
50							
51							
52							
53							
54							
55					(50.0 - 80.0') Bentonite seal chips Puregold Medium Chips	(50.0 - 80.0') 21.8 bags	(50.0 - 80.0') 24 bags (110%) Note: Intermediate Seal
56							
57							
58							
59							

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Date Completed:	01/10/2020	Shallow Well Elevation:	NA	
Drilling Co.:	Cascade	Deep Well Elevation:	478.65 ft amsl	Client: PG&E
Drilling Method:	Sonic Drilling	Northing (NAD83):	2102928.26	Project: Final GW Remedy Phase 1
Driller Name:	Dan O' Mara	Easting (NAD83):	7615965.22	Location: PG&E Topock, Needles, California
Drilling Asst:	Jimmy Candelaria	Borehole Diameter:	10-12 inches	
Logger:	J. Latham / G. Willford	Static Water Level:	See Log for Depths	Project Number: RC000753.0051
Editor:	Grant Willford	Development End Date:	10/2/2019	
Total Depth:	107 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					(0.1 - 82.0') 2" PVC Sch 40 Casing		
61					(60.5 - 61.5') Centralizer		
62							
63							
64							
65							
66							
67							
68							
69							
70			NR		(50.0 - 80.0') Bentonite seal chips Puregold Medium Chips	(27.0 - 107.0') 10.0" Borehole	(50.0 - 80.0') 21.8 bags
71							(50.0 - 80.0') 24 bags (110%) Note: Intermediate Seal
72							
73							
74							
75							
76							
77							
78							
79							

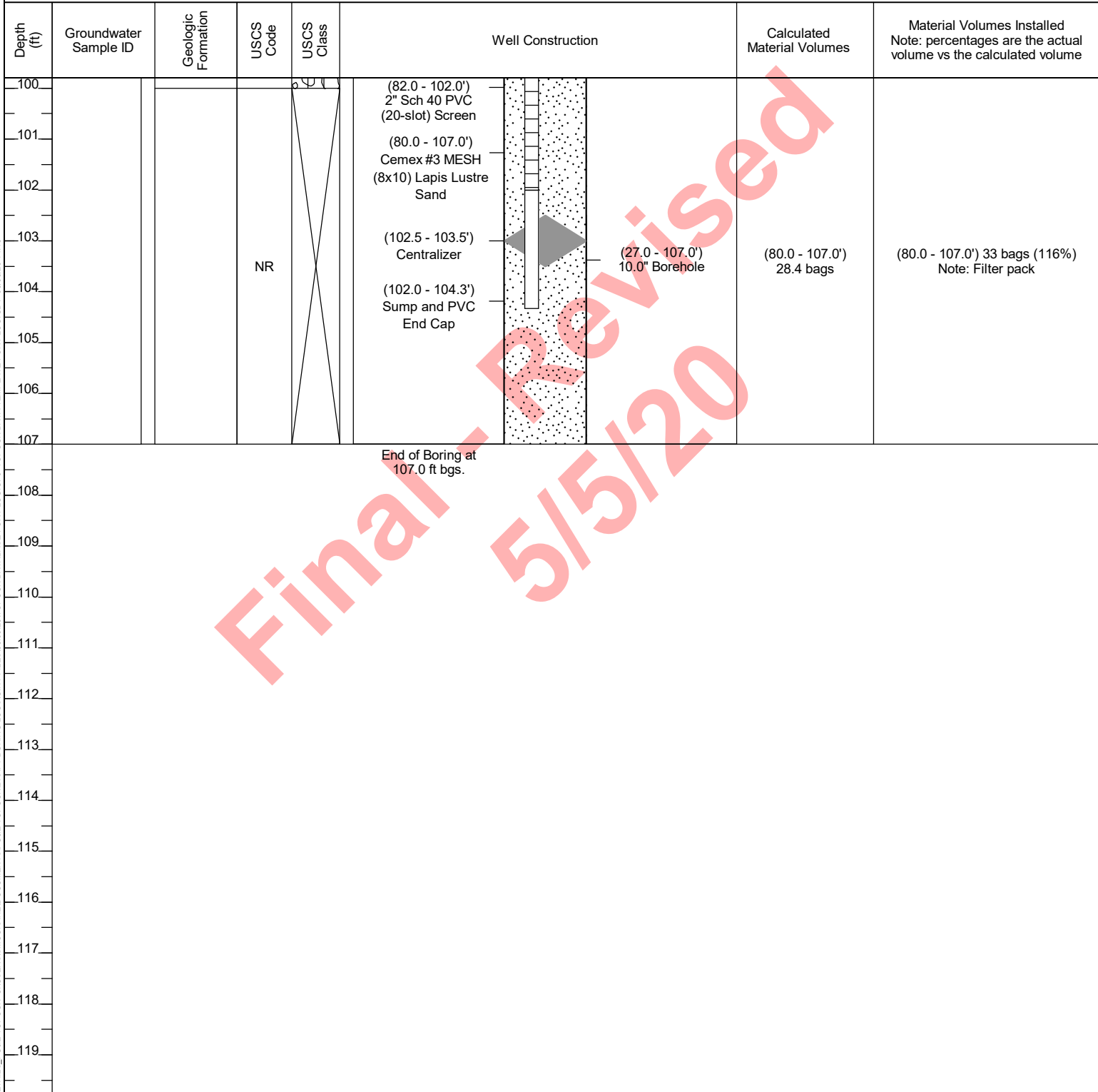
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Date Completed: 01/10/2020	Shallow Well Elevation: NA	
Drilling Co.: Cascade	Deep Well Elevation: 478.65 ft amsl	Client: PG&E
Drilling Method: Sonic Drilling	Northing (NAD83): 2102928.26	Project: Final GW Remedy Phase 1
Driller Name: Dan O' Mara	Easting (NAD83): 7615965.22	Location: PG&E Topock, Needles, California
Drilling Asst: Jimmy Candelaria	Borehole Diameter: 10-12 inches	
Logger: J. Latham / G. Willford	Static Water Level: See Log for Depths	Project Number: RC000753.0051
Editor: Grant Willford	Development End Date: 10/2/2019	
Total Depth: 107 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					(0.1 - 82.0') 2" PVC Sch 40 Casing		
81							
82							
83			NR		(82.0 - 102.0') 2" Sch 40 PVC (20-slot) Screen		
84							
85							
86							
87		Topock - Alluvium Deposits	SM				
88							
89							
90					(80.0 - 107.0') Cemex #3 MESH (8x10) Lapis Lustre Sand	(80.0 - 107.0') 28.4 bags	(80.0 - 107.0') 33 bags (116%) Note: Filter pack
91							
92							
93	MW-D-VAS-91-96 (<0.033 U ppb) 8/12/2019 10:38	Topock - Alluvium Deposits	GM				
94							
95							
96							
97							
98							
99							

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Date Completed: 01/10/2020	Shallow Well Elevation: NA	
Drilling Co.: Cascade	Deep Well Elevation: 478.65 ft amsl	Client: PG&E
Drilling Method: Sonic Drilling	Northing (NAD83): 2102928.26	Project: Final GW Remedy Phase 1
Driller Name: Dan O' Mara	Easting (NAD83): 7615965.22	Location: PG&E Topock, Needles, California
Drilling Asst: Jimmy Candelaria	Borehole Diameter: 10-12 inches	
Logger: J. Latham / G. Willford	Static Water Level: See Log for Depths	Project Number: RC000753.0051
Editor: Grant Willford	Development End Date: 10/2/2019	
Total Depth: 107 ft bgs	Well Completion: <input checked="" type="checkbox"/> Flush <input type="checkbox"/> Stick-up <input type="checkbox"/> To Be Completed in Well Vault	



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ATTACHMENT 3

Well Decommissioning Photo Log: MW-77-046d

WELL DECOMMISSIONING PHOTO LOG

Client Name	PG&E
Project Name/Location	Final Groundwater Remedy, PG&E Topock Compressor Station, Needles, CA
Arcadis Project Number	RC000753.0051
Well ID	MW-77-046D

	<p>10/15/2019 Adding pea gravel into well screen (photo-20191015-221233.jpg)</p>
	<p>10/15/2019 Cal-Silica pea gravel (photo-20191015-205216.jpg)</p>
	<p>10/15/2019 Grout (photo-20191015-222625.jpg)</p>

Client Name	PG&E
Project Name/Location	Final Groundwater Remedy, PG&E Topock Compressor Station, Needles, CA
Arcadis Project Number	RC000753.0051
Well ID	MW-77-046D

	<p>10/15/2019 Installing grout in casing to decommission well (photo-20191015-223018.jpg)</p>
	<p>10/15/2019 Tremie pipe used while installing grout (photo-20191015-222856.jpg)</p>
	<p>1/10/2020 Well capped before surface completion (photo-3644e851c4634a62940c86d04a35f89b.jpg)</p>

Client Name	PG&E
Project Name/Location	Final Groundwater Remedy, PG&E Topock Compressor Station, Needles, CA
Arcadis Project Number	RC000753.0051
Well ID	MW-77-046D



1/10/2020
PVC riser and slip cap concreted during installation of surface completion
 (photo-ed9909549cd24e52bab71c683b350317.jpg)