

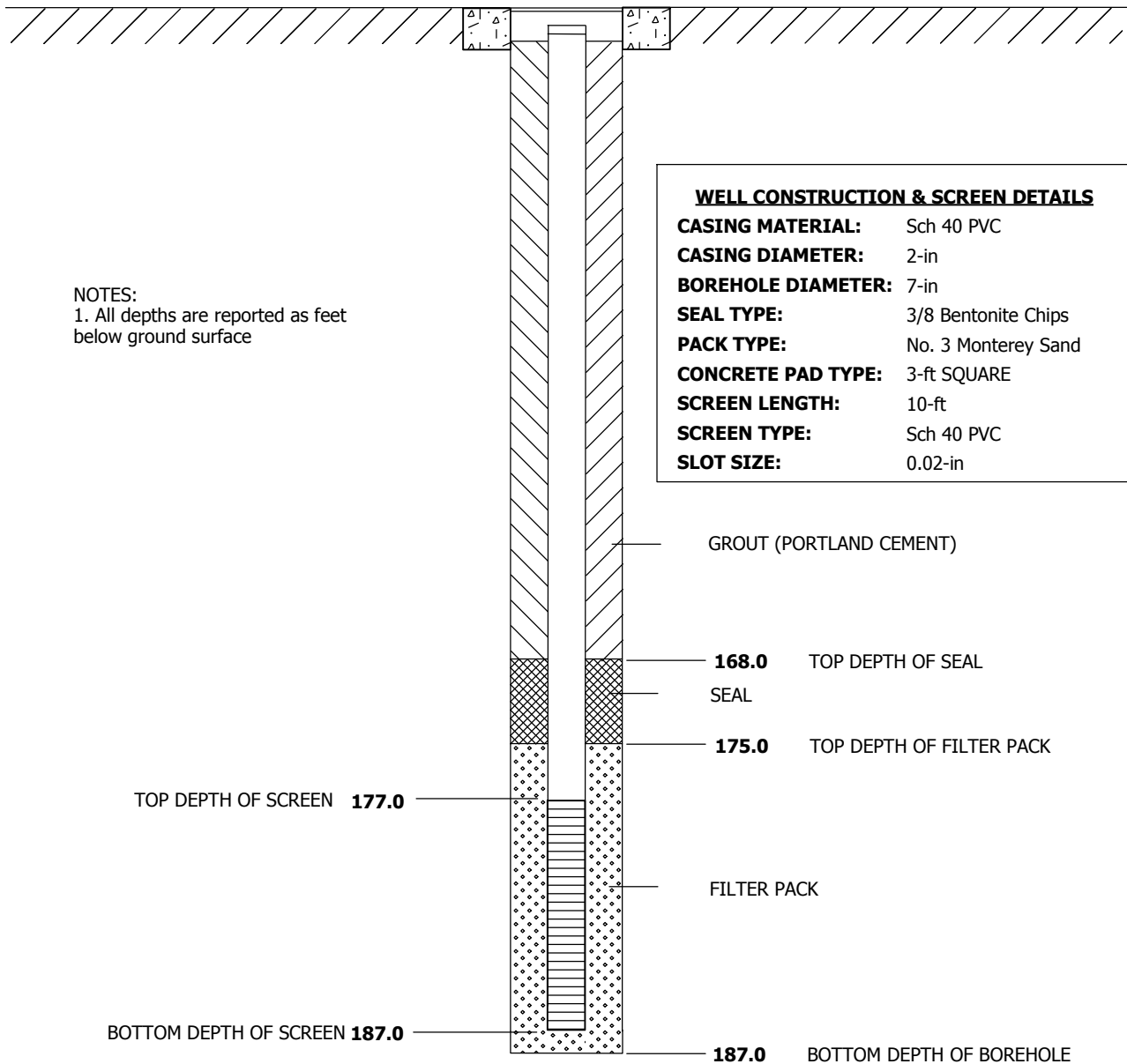
WELL COMPLETION DIAGRAM

PROJECT NO: 417981.ER.02.FW	PROJECT: ER-TCS Groundwater Investigation	WELL NO: <i>MW-67-185</i>
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LOCATION: Site 2

DRILLING CONTRACTOR: Boart Longyear (R. Sawrey)	DRILLING START: 9/22/2011
DRILLING METHOD: Rotosonic/Wireline Rotary Core	DRILLING END: 9/23/2011
LOGGER: A. Brewster (Northstar)	WELL COMPLETION DATE: 9/23/2011
GROUND SURFACE ELEVATION (NAVD 88): 626.2 ft AMSL	GENERAL REMARKS: Centralizers at 15, 35, 55, 75, 95, 115, 135, and 155 ft bgs.
NORTHING (CCS NAD 83 Z 5): 2101040.21	

12-IN DIAMETER WELL VAULT (FLUSH WITH GRADE)



WELL DIAGRAM IS NOT TO SCALE



PROJECT NUMBER: 417981.ER.02.FW	BORING NUMBER: BH-67	SHEET 3 OF 14
SOIL BORING LOG		

PROJECT : PG&E Topock, ER-TCS Investigation LOCATION : Site 2 (2101040.2 N, 7615335.5 E)
 ELEVATION : 626.2 ft DRILLING CONTRACTOR : Boart Longyear (R. Sawrey)
 DRILLING EQUIPMENT AND METHOD : RS-350, Rotosonic ORIENTATION : Vertical
 WATER LEVELS : Approx. 170 ft BGS START : 4/29/2011 END : 5/3/2011 LOGGER : A. Brewster (Northstar)

DEPTH BELOW EXISTING GRADE (ft)	INTERVAL (ft)		RECOVERY (in)	LAB SAMPLE	USCS CODE/ LITHOLOGY	SOIL DESCRIPTION	SYMBOLIC LOG	COMMENTS
	RECOVERY (in)							
	LAB SAMPLE							
45			COMPLETE		SP	Poorly Graded Sand (SP) 40.0-47.0' - yellowish brown, (10YR 5/4), dry, loose, 5% gravel, 90% sand, 5% fines, subangular to subrounded, poorly graded, predominantly quartz.		
50	49.0	50.0		10209	SM	Silty Sand With Gravel (SM) 47.0-52.0' - yellowish brown, (10YR 5/4), dry, loose, 15% gravel, 65% sand, 20% fines, subangular to angular, poorly graded, no predominant mineral.		Soil sample collected between 49.0 and 50.0 ft bgs.
55					SP	Poorly Graded Sand (SP) 52.0-53.0' - light yellowish brown, (10YR 6/4), dry, loose, subangular to subrounded, poorly graded, predominantly quartz.		
60	59.0	60.0		10210	CL	Lean Clay (CL) 53.0-63.0' - brown, (7.5YR 4/4), moist, stiff, slow dilatancy, poorly graded		Soil sample collected between 59.0 and 60.0 ft bgs.



PROJECT NUMBER: 417981.ER.02.FW	BORING NUMBER: BH-67	SHEET 6 OF 14
SOIL BORING LOG		

PROJECT : PG&E Topock, ER-TCS Investigation LOCATION : Site 2 (2101040.2 N, 7615335.5 E)
 ELEVATION : 626.2 ft DRILLING CONTRACTOR : Boart Longyear (R. Sawrey)
 DRILLING EQUIPMENT AND METHOD : RS-350, Rotasonic ORIENTATION : Vertical
 WATER LEVELS : Approx. 170 ft BGS START : 4/29/2011 END : 5/3/2011 LOGGER : A. Brewster (Northstar)

DEPTH BELOW EXISTING GRADE (ft)		RECOVERY (in)	LAB SAMPLE	USCS CODE/ LITHOLOGY	SOIL DESCRIPTION	SYMBOLIC LOG	COMMENTS
INTERVAL (ft)	DEPTH BELOW EXISTING GRADE (ft)						
		COMPLETE			Well Graded Gravel (GW) 92.0-197.0' - dark greyish brown, (10YR 4/2), dry, loose to partially consolidated, 40% gravel, 40% sand, 20% fines, angular to subangular, poorly graded, no dominant mineralogy.		DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS, AND INSTRUMENTATION
105							
109.0 110.0			10215	GW			
115							
119.0 120.0			10216				Soil sample collected between 119.0 and 120.0 ft bgs.



PROJECT NUMBER: 417981.ER.02.FW	BORING NUMBER: BH-67	SHEET 7 OF 14
SOIL BORING LOG		

PROJECT : PG&E Topock, ER-TCS Investigation LOCATION : Site 2 (2101040.2 N, 7615335.5 E)
 ELEVATION : 626.2 ft DRILLING CONTRACTOR : Boart Longyear (R. Sawrey)
 DRILLING EQUIPMENT AND METHOD : RS-350, Rotasonic ORIENTATION : Vertical
 WATER LEVELS : Approx. 170 ft BGS START : 4/29/2011 END : 5/3/2011 LOGGER : A. Brewster (Northstar)

DEPTH BELOW EXISTING GRADE (ft)		RECOVERY (in)	LAB SAMPLE	USCS CODE/ LITHOLOGY	SOIL DESCRIPTION	SYMBOLIC LOG	COMMENTS	
INTERVAL (ft)								
		COMPLETE			Well Graded Gravel (GW) 92.0-197.0' - dark greyish brown, (10YR 4/2), dry, loose to partially consolidated, 40% gravel, 40% sand, 20% fines, angular to subangular, poorly graded, no dominant mineralogy.		DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS, AND INSTRUMENTATION	
125								
129.0	130.0		10217	GW				Stop 04/29/2011 at 1645 at 127 ft bgs. Resume on 4/30/2011 at 0700. Soil sample collected between 129.0 and 130.0 ft bgs.
139.0	140.0		10218, 50007					Soil sample collected between 139.0 and 140.0 ft bgs.



PROJECT NUMBER: 417981.ER.02.FW	BORING NUMBER: BH-67	SHEET 9 OF 14
SOIL BORING LOG		

PROJECT : PG&E Topock, ER-TCS Investigation LOCATION : Site 2 (2101040.2 N, 7615335.5 E)
 ELEVATION : 626.2 ft DRILLING CONTRACTOR : Boart Longyear (R. Sawrey)
 DRILLING EQUIPMENT AND METHOD : RS-350, Rotosonic ORIENTATION : Vertical
 WATER LEVELS : Approx. 170 ft BGS START : 4/29/2011 END : 5/3/2011 LOGGER : A. Brewster (Northstar)

DEPTH BELOW EXISTING GRADE (ft)	INTERVAL (ft)	RECOVERY (in)	LAB SAMPLE	USCS CODE/ LITHOLOGY	SOIL DESCRIPTION	SYMBOLIC LOG	COMMENTS
					SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY		DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS, AND INSTRUMENTATION
165		COMPLETE			Well Graded Gravel (GW) 92.0-197.0' - dark greyish brown, (10YR 4/2), dry, loose to partially consolidated, 40% gravel, 40% sand, 20% fines, angular to subangular, poorly graded, no dominant mineralogy, matrix-supported. 160.5-161.0' - Metadiorite boulder.		
170				GW	169' - Change to saturated, color change to brown (10YR 5/3).		
175							
180							



PROJECT NUMBER: 417981.ER.02.FW	BORING NUMBER: BH-67	SHEET 10 OF 14
SOIL BORING LOG		

PROJECT : PG&E Topock, ER-TCS Investigation LOCATION : Site 2 (2101040.2 N, 7615335.5 E)
 ELEVATION : 626.2 ft DRILLING CONTRACTOR : Boart Longyear (R. Sawrey)
 DRILLING EQUIPMENT AND METHOD : RS-350, Rotosonic ORIENTATION : Vertical
 WATER LEVELS : Approx. 170 ft BGS START : 4/29/2011 END : 5/3/2011 LOGGER : A. Brewster (Northstar)

DEPTH BELOW EXISTING GRADE (ft)	INTERVAL (ft)			USCS CODE/ LITHOLOGY	SOIL DESCRIPTION	SYMBOLIC LOG	COMMENTS
	RECOVERY (in)	LAB SAMPLE					
		DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS, AND INSTRUMENTATION					
185	COMPLETE			GW	Well Graded Gravel (GW) 92.0-197.0' - dark greyish brown, (10YR 4/2), dry, loose to partially consolidated, 40% gravel, 40% sand, 20% fines, angular to subangular, poorly graded, no dominant mineralogy.		Grab groundwater sample collected from borehole between 187.0 and 197.0 ft bgs.
187.0							
190				ML	Silt With Gravel (ML) 197.0-211.0' - dark brown, (7.5YR 3/4), saturated, stiff, 15% gravel, 10% sand, 75% fines, moderate dilatancy, subangular to subrounded, poorly graded, no dominant mineralogy.		Stop 04/30/2011 at 1700 at 197 ft bgs. Resume on 05/01/2011 at 0730.
195							
197.0							
200							



PROJECT NUMBER: 417981.ER.02.FW	BORING NUMBER: BH-67	SHEET 11 OF 14
SOIL BORING LOG		

PROJECT : PG&E Topock, ER-TCS Investigation LOCATION : Site 2 (2101040.2 N, 7615335.5 E)
 ELEVATION : 626.2 ft DRILLING CONTRACTOR : Boart Longyear (R. Sawrey)
 DRILLING EQUIPMENT AND METHOD : RS-350, Rotosonic ORIENTATION : Vertical
 WATER LEVELS : Approx. 170 ft BGS START : 4/29/2011 END : 5/3/2011 LOGGER : A. Brewster (Northstar)

DEPTH BELOW EXISTING GRADE (ft)	INTERVAL (ft)			USCS CODE/ LITHOLOGY	SOIL DESCRIPTION	SYMBOLIC LOG	COMMENTS
	RECOVERY (in)	LAB SAMPLE					
205	COMPLETE			ML	Silt With Gravel (ML) 197.0-211.0' - dark brown, (7.5YR 3/4), saturated, stiff, 15% gravel, 10% sand, 75% fines, moderate dilatancy, subangular to subrounded, poorly graded, no dominant mineralogy.		
210				SW	Well Graded Sand With Gravel (SW) 211.0-221.0' - dark brown, (7.5YR 3/4), saturated, loose, 35% gravel, 55% sand, 10% fines, subangular to subrounded, no dominant mineralogy.		
215							
217.0							Drilling very slow (<0.1 FPM) Grab groundwater sample collected from borehole between 217.0 and 227.0 ft bgs.
220							



PROJECT NUMBER: 417981.ER.02.FW	BORING NUMBER: BH-67	SHEET 12 OF 14
SOIL BORING LOG		

PROJECT : PG&E Topock, ER-TCS Investigation LOCATION : Site 2 (2101040.2 N, 7615335.5 E)
 ELEVATION : 626.2 ft DRILLING CONTRACTOR : Boart Longyear (R. Sawrey)
 DRILLING EQUIPMENT AND METHOD : RS-350, Rotosonic ORIENTATION : Vertical
 WATER LEVELS : Approx. 170 ft BGS START : 4/29/2011 END : 5/3/2011 LOGGER : A. Brewster (Northstar)

DEPTH BELOW EXISTING GRADE (ft)	INTERVAL (ft)			USCS CODE/ LITHOLOGY	SOIL DESCRIPTION	SYMBOLIC LOG	COMMENTS
	RECOVERY (in)	LAB SAMPLE					
225	COMPLETE	BH-67-20202		SW	Well Graded Sand With Gravel (SW) 211.0-221.0' - dark brown, (7.5YR 3/4), saturated, loose, 35% gravel, 55% sand, 10% fines, subangular to subrounded, no dominant mineralogy. Silt With Gravel (ML) 221.0-258.5' - dark brown, (7.5YR 3/4), saturated, stiff, 40% gravel, 5% sand, 55% fines, slow to moderate dilatancy, subangular to angular, poorly graded, no dominant mineralogy. 225' - increase in proportion of metadiorite gravel.		DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS, AND INSTRUMENTATION
227.0				ML			
230							
235							
240							



PROJECT NUMBER: 417981.ER.02.FW	BORING NUMBER: BH-67	SHEET 13 OF 14
SOIL BORING LOG		

PROJECT : PG&E Topock, ER-TCS Investigation LOCATION : Site 2 (2101040.2 N, 7615335.5 E)
 ELEVATION : 626.2 ft DRILLING CONTRACTOR : Boart Longyear (R. Sawrey)
 DRILLING EQUIPMENT AND METHOD : RS-350, Rotosonic ORIENTATION : Vertical
 WATER LEVELS : Approx. 170 ft BGS START : 4/29/2011 END : 5/3/2011 LOGGER : A. Brewster (Northstar)

DEPTH BELOW EXISTING GRADE (ft)	INTERVAL (ft)			USCS CODE/ LITHOLOGY	SOIL DESCRIPTION	SYMBOLIC LOG	COMMENTS
	RECOVERY (in)	LAB SAMPLE					
245	COMPLETE			ML	Well Graded Sand With Gravel (SW) 258.5-259.5' - dark brown, (7.5YR 3/4), saturated, loose, 40% gravel, 50% sand, 10% fines, subangular to subrounded, predominantly quartz sand and metadiorite gravel.		Grab groundwater sample collected from borehole between 247.0 and 257.0 ft bgs.
247.0							
250							
255	BH-67-20203			SW	Silt With Gravel (ML) 221.0-258.5' - dark brown, (7.5YR 3/4), saturated, stiff, 40% gravel, 5% sand, 55% fines, slow to moderate dilatancy, subangular to angular, poorly graded, no dominant mineralogy.		Stop 05/01/2011 at 1700 at 257 ft bgs. Resume 05/02/2011 at 1400.
257.0							
260							
				ML	Well Graded Sand With Gravel (SW) 258.5-259.5' - dark brown, (7.5YR 3/4), saturated, loose, 40% gravel, 50% sand, 10% fines, subangular to subrounded, predominantly quartz sand and metadiorite gravel.		



PROJECT NUMBER: 417981.ER.02.FW	BORING NUMBER: BH-67	SHEET 14 OF 14
SOIL BORING LOG		

PROJECT : PG&E Topock, ER-TCS Investigation LOCATION : Site 2 (2101040.2 N, 7615335.5 E)
 ELEVATION : 626.2 ft DRILLING CONTRACTOR : Boart Longyear (R. Sawrey)
 DRILLING EQUIPMENT AND METHOD : RS-350, Rotosonic ORIENTATION : Vertical
 WATER LEVELS : Approx. 170 ft BGS START : 4/29/2011 END : 5/3/2011 LOGGER : A. Brewster (Northstar)

DEPTH BELOW EXISTING GRADE (ft)	INTERVAL (ft)			USCS CODE/ LITHOLOGY	SOIL DESCRIPTION	SYMBOLIC LOG	COMMENTS
	RECOVERY (in)	LAB SAMPLE					
			COMPLETE	ML	Silt With Gravel (ML) 259.5-264.0' - dark brown, (7.5YR 3/4), saturated, stiff to moderately stiff, 40% gravel, 5% sand, 55% fines, moderate dilatancy, subangular to angular, poorly graded, predominantly metadiorite gravel.		
265				Tmc	Conglomerate (Tmc) 264.0-271.0' - Miocene conglomerate; yellowish red (5YR 4/6) from 264.0-265.0', red (2.5YR 4/6) from 265.0-271.0'.		Stop 05/02/2011 at 1600 at 264 ft bgs, refusal with 6" conductor at 254.0 ft bgs. Resume 05/03/2011 at 1330.
270				pTbr	Metadiorite (pTbr) 271.0-272.5' - Metadiorite bedrock.		
275					End Drilling on 5/3/2011 Total Borehole Depth: 272.5 ft bgs		This borehole was converted into the following monitoring well(s): MW-67-185, MW-67-225, and MW-67-260
280							