

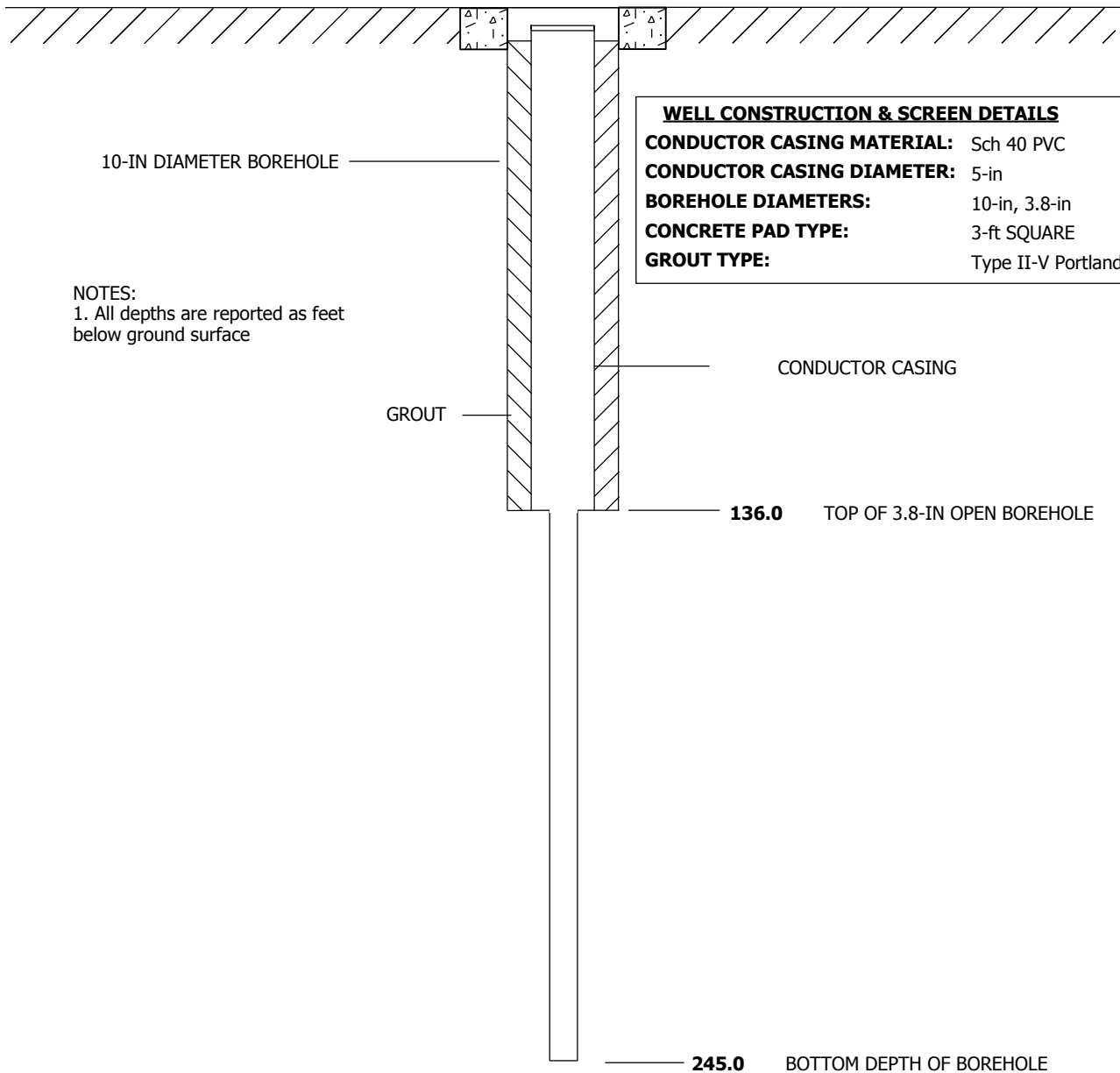
WELL COMPLETION DIAGRAM

PROJECT NO: 417981.ER.02.FW	PROJECT: ER-TCS Groundwater Investigation	WELL NO: <i>MW-60BR-245</i>
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LOCATION: Site F

DRILLING CONTRACTOR: Boart Longyear (R. Sawrey)	DRILLING START: 6/28/2011
DRILLING METHOD: Rotosonic/Wireline Rotary Core	DRILLING END: 7/28/2011
LOGGER: C. Keller (Northstar)	WELL COMPLETION DATE: 7/28/2011
GROUND SURFACE ELEVATION (NAVD 88): 555.9 ft AMSL	GENERAL REMARKS: Open 3.8" diameter borehole from 136 to 245 feet bgs. Centralizers at 10, 30, 50, 70, 90, and 110 ft bgs.
NORTHING (CCS NAD 83 Z 5): 2100495.02	

12-in DIAMETER WELL VAULT (FLUSH WITH GRADE)



WELL DIAGRAM IS NOT TO SCALE



PROJECT NUMBER: 417981.ER.02.FW	BORING NUMBER: BH-60	SHEET 2 OF 6
ROCK CORE LOG		

PROJECT : PG&E Topock, ER-TCS Investigation LOCATION : Site F (2100495.0 N, 7616444.4 E)
 ELEVATION : 555.9 ft DRILLING CONTRACTOR : Boart Longyear (R. Sawrey)
 CORING EQUIPMENT AND METHOD : HQ Wire-Line Rotary ORIENTATION : Vertical
 WATER LEVELS : Approx. 99 ft BGS START : 6/24/2011 END : 7/28/2011 LOGGER : C. Kreller (Northstar)

DEPTH BELOW SURFACE (ft)	CORE RUN LENGTH AND RECOVERY (%)	DISCONTINUITIES				SYMBOLIC LOG	LITHOLOGY	COMMENTS		
		R Q D (%)	FRACTURES PER FOOT	DESCRIPTION						
				DEPTH, TYPE, ORIENTATION, ROUGHNESS, PLANARITY, INFILLING MATERIAL AND THICKNESS, SURFACE STAINING, AND TIGHTNESS						
160	R5 5 ft 100%	80	2	157.2, 157.9' - Joint, 10 deg and 10 deg, rough, undulating, iron staining, narrow			Metadiorite dusky yellow green, (5GY 5/2), predominantly sodium feldspar and amphibole, phaneritic, fresh, hard, no foliation, highly fractured and healed with chlorite cement, massive.	Run 5: 15 min 20 sec		
			1	158.9' - Joint, 50 deg, smooth, undulating, iron staining, tight						
			0							
165	R6 5 ft 100%	100	1	160.5' - Joint, 40 deg, rough, undulating, <2mm calcite infilling, iron staining, tight						Run 6: 15 min 0 sec
			1	161.7' - Mechanical fracture						Run 6: 15 min 0 sec
			1	162.8' - Joint, 40 deg, smooth, undulating, iron staining, tight						
			1	163.7' - Joint, 20 deg, smooth, undulating, iron staining, tight						
			0							
			2	165.3, 165.7, 165.8' - Joint (3), 50, 60, and 60 deg, rough, undulating, iron staining, narrow						
170	R7 5 ft 100%	86	1	167.1' - Joint, horizontal, smooth, undulating, iron staining, moderately narrow				Run 7: 17 min 52 sec		
			1	167.8' - Joint, 10 deg, smooth, undulating, iron staining, tight						
			1	168.8' - Joint, 20 deg, smooth, undulating, minor iron staining, moderately narrow						
			0							
			2	170.8' - Joint, 40 deg, smooth, undulating, iron staining, narrow, no calcite infill						
175	R8 5 ft 100%	86	1	171.7' - Mechanical fracture				Run 8: 60 min 0 sec, water pump issues on rig.		
			1	172.6' - Mechanical fracture						
			1	173.8' - Joint, 20 deg, smooth, undulating, minor iron staining, narrow						
			0							
			0							
			2							



PROJECT NUMBER: 417981.ER.02.FW	BORING NUMBER: BH-60	SHEET 3 OF 6
ROCK CORE LOG		

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 ELEVATION : 555.9 ft DRILLING CONTRACTOR : Boart Longyear (R. Sawrey)
 CORING EQUIPMENT AND METHOD : HQ Wire-Line Rotary ORIENTATION : Vertical
 WATER LEVELS : Approx. 99 ft BGS START : 6/24/2011 END : 7/28/2011 LOGGER : C. Kreller (Northstar)

DEPTH BELOW SURFACE (ft)	CORE RUN LENGTH AND RECOVERY (%)	DISCONTINUITIES				SYMBOLIC LOG	LITHOLOGY	COMMENTS	
		R Q D (%)	FRACTURES PER FOOT	DESCRIPTION					
				DEPTH, TYPE, ORIENTATION, ROUGHNESS, PLANARITY, INFILLING MATERIAL AND THICKNESS, SURFACE STAINING, AND TIGHTNESS					
180	R9 5 ft 100%	93	1	176.2, 176.7' - Joint, 20 deg and 30 deg, rough, minor iron staining, stepped, narrow, no calcite infill		Metadiorite dusky yellow green, (5GY 5/2), predominantly sodium feldspar and amphibole, phaneritic, fresh, hard, no foliation, highly fractured and healed with chlorite cement, massive.	Run 9: 20 min 10 sec		
			1	177.9' - Mechanical fracture					
			1	178.8' - Joint, 30 deg, rough, undulating, iron staining, moderately narrow					
			1	179.3, 179.6' - Joint, 35 deg, smooth, undulating, no iron staining, tight, no calcite infill					
			1	180.4' - Joint, 60 deg, smooth, undulating, minor iron staining, tight, no calcite infill					
185	R10 5 ft 100%	91	1	181.3' - Mechanical fracture along a plane of weakness, <2mm calcite infilling			Metadiorite dusky yellow green, (5GY 5/2), predominantly sodium feldspar and amphibole, phaneritic, fresh, hard, no foliation, highly fractured and healed with chlorite cement, massive.	Run 10: 17 min 37 sec	
			1	182' - Mechanical fracture along a plane of weakness, <2mm calcite infilling				Run 10: 17 min 37 sec	
			1	183.5' - Mechanical fracture					
			0						
			2	185.5' - Joint, 50 deg, smooth, undulating, slight iron staining, tight					
190	R11 5 ft 100%	60	6	185.9' - Joint, 50 deg, smooth, undulating, slight iron staining, narrow, chlorite present				Metadiorite dusky yellow green, (5GY 5/2), predominantly sodium feldspar and amphibole, phaneritic, fresh, hard, no foliation, highly fractured and healed with chlorite cement, massive.	Run 11: 15 min 31 sec
			2	186.4-186.9' - Joint, 50 deg, smooth, undulating, slight iron staining, narrow to tight. Some mechanical fracturing associated with retrieving core out of barrel, chlorite present					
			1	187.4' - Joint, 45 deg, smooth, undulating, slight iron staining, tight					
			0	187.9' - Joint, 60 deg, smooth, undulating, slight iron staining, tight, chlorite present					
			1	188.5' - Joint, 25 deg, smooth, undulating, slight iron staining, tight, chlorite present					
			1	190.8' - Joint, 35 deg, smooth, undulating, iron staining, tight					
			1	191.9' - Mechanical fracture					
			0						
			3	193.1' - Joint, 30 deg, smooth, undulating, iron staining, tight					
			2	193.5' - Mechanical fracture					
195	R12 5 ft 100%	78	2	193.9' - Joint, 30 deg, smooth, undulating, iron staining, tight		Metadiorite dusky yellow green, (5GY 5/2), predominantly sodium feldspar and amphibole, phaneritic, fresh, hard, no foliation, highly fractured and healed with chlorite cement, massive.	Run 12: 29 min 30 sec		
			1	194.3' - Mechanical fracture along a plane of weakness, <2mm calcite infilling					
			1	194.5' - Joint, 35 deg, smooth, undulating, slight iron staining, tight					
			0	195.4' - Joint, 60 deg, smooth, undulating, slight iron staining, tight					



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ROCK CORE LOG		

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 ELEVATION : 555.9 ft DRILLING CONTRACTOR : Boart Longyear (R. Sawrey)
 CORING EQUIPMENT AND METHOD : HQ Wire-Line Rotary ORIENTATION : Vertical
 WATER LEVELS : Approx. 99 ft BGS START : 6/24/2011 END : 7/28/2011 LOGGER : C. Kreller (Northstar)

DEPTH BELOW SURFACE (ft)	CORE RUN LENGTH AND RECOVERY (%)	DISCONTINUITIES			SYMBOLIC LOG	LITHOLOGY	COMMENTS	
		R Q D (%)	FRACTURES PER FOOT	DESCRIPTION				
				DEPTH, TYPE, ORIENTATION, ROUGHNESS, PLANARITY, INFILLING MATERIAL AND THICKNESS, SURFACE STAINING, AND TIGHTNESS				
200	R13 5 ft 100%	92	1	196.8' - Mechanical fracture	~	Metadiorite dusky yellow green, (5GY 5/2), predominantly sodium feldspar and amphibole, phaneritic, fresh, hard, no foliation, highly fractured and healed with chlorite cement, massive.	Run 13: 23 min 30 sec	
			0	197.9' - Mechanical fracture, calcite present (<2mm)			Run 14: 39 min 38 sec	
			1	199.5' - Joint, 20 deg, smooth, undulating, slight iron staining, no calcite present			Run 14: 39 min 38 sec	
			1	200.9' - Mechanical fracture				
205	R14 5 ft 100%	90	1	201.9' - Mechanical fracture				
			1	202.6' - Mechanical fracture				
			2	203.2' - Mechanical fracture				
			1	203.8' - Mechanical fracture				
			1	204.4' - Mechanical fracture				
210	R15 5 ft 100%	93	0	206' - Mechanical fracture				Run 15: unknown
			2	206.9' - Mechanical fracture				
			0	208' - Mechanical fracture				
			2	208.6' - Mechanical fracture				
			0					Run 15: unknown
			0					Run 16: 15 min 0 sec
215	R16 5 ft 100%	93	2	210.4' - Mechanical fracture along a preferential plane, <2mm calcite infilling				
			0	210.9' - Mechanical fracture along a preferential plane, <2mm calcite infilling				
			2	212' - Mechanical fracture along a preferential plane, <2mm calcite infilling				
			0	212.9' - Mechanical fracture				
			0	214.3' - Mechanical fracture				
			0	214.7' - Mechanical fracture				
			1	215.1' - Mechanical fracture along a preferential plane, <2mm calcite infilling		Run 16: 15 min 0 sec		
			0			Run 17: 12 min 29 sec		



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ROCK CORE LOG		

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 ELEVATION : 555.9 ft DRILLING CONTRACTOR : Boart Longyear (R. Sawrey)
 CORING EQUIPMENT AND METHOD : HQ Wire-Line Rotary ORIENTATION : Vertical
 WATER LEVELS : Approx. 99 ft BGS START : 6/24/2011 END : 7/28/2011 LOGGER : C. Kreller (Northstar)

DEPTH BELOW SURFACE (ft)	CORE RUN LENGTH AND RECOVERY (%)	DISCONTINUITIES			SYMBOLIC LOG	LITHOLOGY	COMMENTS	
		R Q D (%)	FRACTURES PER FOOT	DESCRIPTION				
				DEPTH, TYPE, ORIENTATION, ROUGHNESS, PLANARITY, INFILLING MATERIAL AND THICKNESS, SURFACE STAINING, AND TIGHTNESS				
220	R17 5 ft 100%	88	1	217.5' - Joint, 30 deg, smooth, undulating, <2mm calcite infilling, no iron staining, tight	Metadiorite dusky yellow green, (5GY 5/2), predominantly sodium feldspar and amphibole, phaneritic, fresh, hard, no foliation, highly fractured and healed with chlorite cement, massive.	Run 17: 12 min 29 sec		
			1	218.7' - Mechanical fracture				
			1	219.4' - Mechanical fracture				
225	R18 5 ft 100%	95	0				Run 18: 17 min 10 sec	
			1	221.3' - Mechanical fracture			Run 18: 17 min 10 sec	
			1	222' - Mechanical fracture				
			1	223.5' - Mechanical fracture along a plane of weakness, <2mm calcite infilling				
230	R19 5 ft 100%	100	1	224.3' - Mechanical fracture along a plane of weakness, <2mm calcite infilling				
			0					Run 19: 21 min 30 sec
			0					
			1	227.3' - Mechanical fracture				
			1	228.8' - Mechanical fracture		Run 19: 21 min 30 sec		
235	R20 5 ft 100%	70	2	230.0-230.7' - Joint, 45 deg, smooth, undulating, <2mm calcite infilling, iron staining, narrow	230.0-230.7' - cemented, breccia zone.	Run 20: 20 min 6 sec, increase in water production (230-231' bgs)		
			2	230.9' - Joint, 45 deg, smooth, undulating, <2mm calcite infilling, iron staining, tight				
			1	231.2, 231.4' - Mechanical fracture along a preferential plane, iron staining, <2mm calcite infilling				
			1	232.4' - Joint, 15 deg, smooth, undulating, <2mm calcite infilling, iron staining, narrow				
			1	233.4' - Joint, 20 deg, smooth, undulating, <2mm calcite infilling, iron staining, narrow				
			0					Run 20: 20 min 6 sec
			0			Run 21: 12 min 20 sec		
			1					



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ROCK CORE LOG		

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DEPTH BELOW SURFACE (ft)	CORE RUN LENGTH AND RECOVERY (%)	DISCONTINUITIES				SYMBOLIC LOG	LITHOLOGY	COMMENTS
		R Q D (%)	FRACTURES PER FOOT	DESCRIPTION				
				DEPTH, TYPE, ORIENTATION, ROUGHNESS, PLANARITY, INFILLING MATERIAL AND THICKNESS, SURFACE STAINING, AND TIGHTNESS				
240	R21 5 ft 100%	78	1	236.4' - Mechanical fracture along a plane of weakness, <2mm calcite infilling		~	Metadiorite dusky yellow green, (5GY 5/2), predominantly sodium feldspar and amphibole, phaneritic, fresh, hard, no foliation, highly fractured and healed with chlorite cement, massive.	Run 21: 12 min 20 sec
			1	237.1' - Joint, 30 deg, smooth, undulating, <2mm calcite infilling, minor iron staining, presence of copper colored infill in the joint, tight				
			>10	238.8' - Joint, 25 deg, smooth, undulating, <2mm calcite infilling, tight 239.4' - Highly fractured zone				
	R22 5 ft 100%	0	0	240.1' - Mechanical fracture along a preferential plane, <2mm calcite infilling				
			0	240.8' - Joint, 40 deg, smooth, undulating, <2mm calcite infilling, no iron staining				
			2	242.2' - Joint, 50 deg, rough, undulating, <2mm calcite infilling, minor iron staining				
			>10	242.4' - Mechanical fracture 243' - Joint, 45 deg, smooth, undulating, <2mm calcite infilling, minor iron staining				
			0					
245	245.0					End Drilling on 7/28/2011 Total Borehole Depth: 245.0 ft bgs	This borehole was converted into the following monitoring well(s): MW-60BR-245	
250								
255								