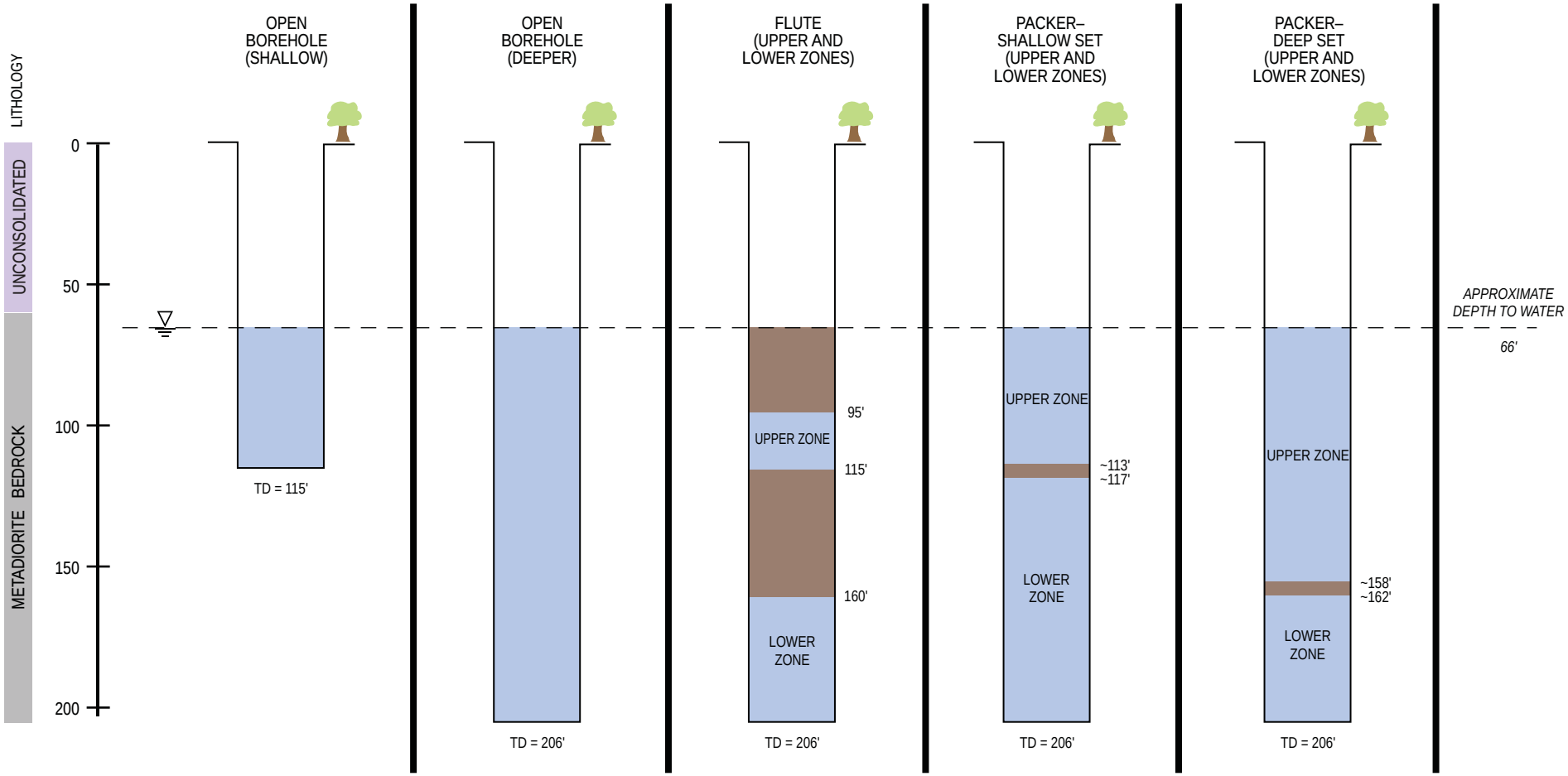

LEGEND

- Portion of borehole exposed during sample collection
- Portion of borehole sealed during sample collection

NOTES:
– Scale is approximate.
– All depths presented as feet below ground surface.

MW-58BR Sampling Configurations
PG&E Topock Compressor Station
Needles, California

CH2MHILL.

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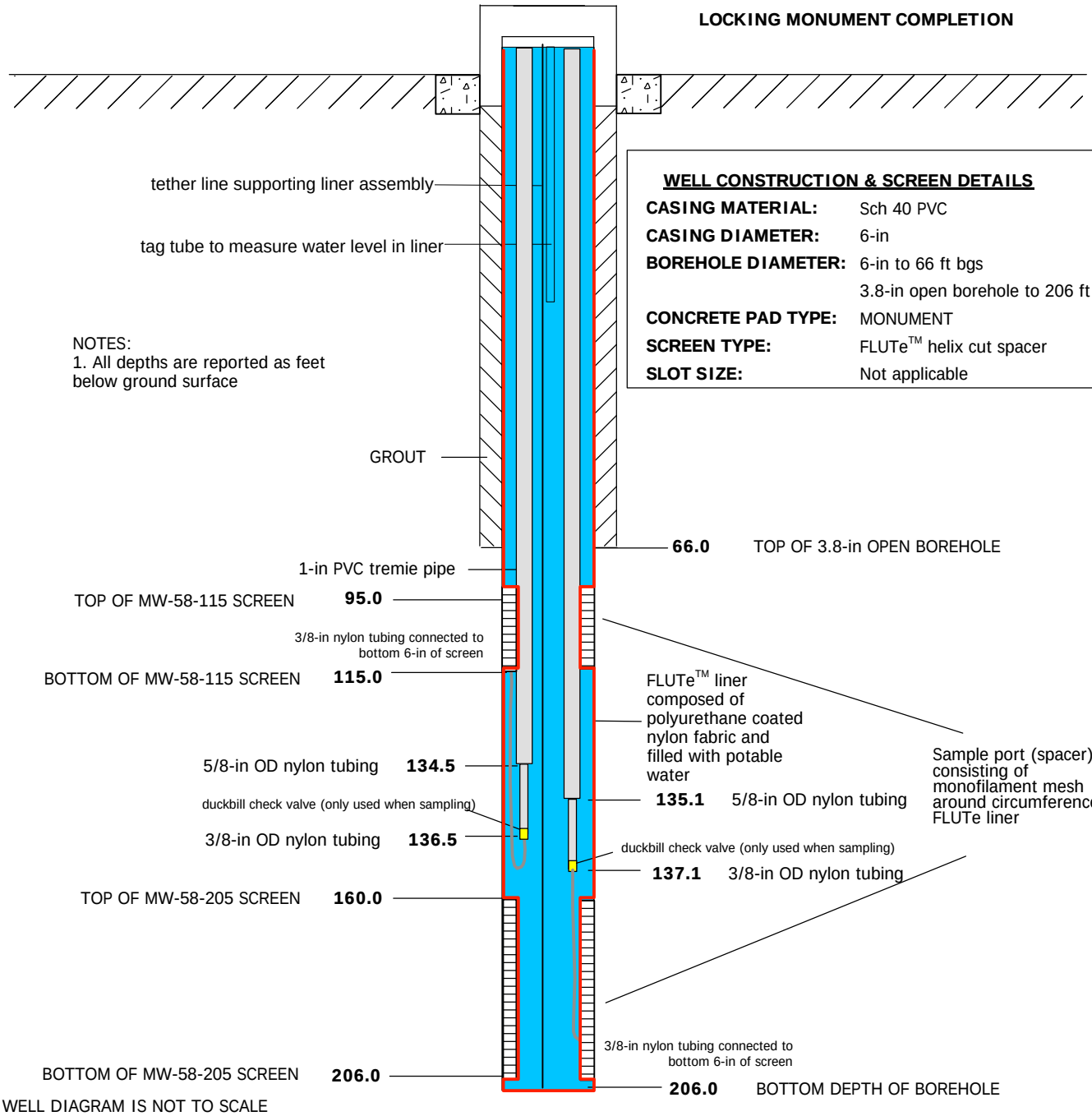
WELL COMPLETION DIAGRAM

PROJECT NO: 382653.FP.04.FW	**PROJECT:** PG&E Topock - ERGI	**WELL NO's:** ***MW-58-115*** ***MW-58-205***
LOCATION: Site A		

DRILLING CONTRACTOR: Boart Longyear (D. Roberts)	**DRILLING START:** 1/29/2009
DRILLING METHOD: Rotosonic	**DRILLING END:** 2/12/2009
LOGGER: A. Brewster (Northstar) and I. Wood	**WELL COMPLETION DATE:** 7/8/2009
GROUND SURFACE ELEVATION (NAVD 88): 521.78 ft AMSL	**GENERAL REMARKS:** 4-inch diameter, 2-port Guelph Water FLUTe™ multi-level system with helical screens installed into open 3.8-inch HQ borehole
NORTHING (CCS NAD 83 Z 5): 2100612.06 / **EASTING (CCS NAD 83 Z 5):** 7616131.80	



NOTES:
1. All depths are reported as feet below ground surface

WELL CONSTRUCTION & SCREEN DETAILS

CASING MATERIAL:	Sch 40 PVC
CASING DIAMETER:	6-in
BOREHOLE DIAMETER:	6-in to 66 ft bgs
	3.8-in open borehole to 206 ft bgs
CONCRETE PAD TYPE:	MONUMENT
SCREEN TYPE:	FLUTe™ helix cut spacer
SLOT SIZE:	Not applicable

WELL DIAGRAM IS NOT TO SCALE

CH2MHILL

FLUTe™ Flexible Liner Underground Technologies, Ltd. L.C.
For a medley of innovative designs
6 Easy St., Santa Fe, NM 87506
505-455-1300, www.flut.com

As-Built Information

Job # 968-1

General:

Job Description:	206' 4"dia. 2 Port Guelph Water FLUTe
Customer:	CH2M Hill
Location:	155 Grand Ave. Suite 1000 Oakland, CA 94612
Well Designation:	MW-58BR
Hole Depth:	206'
Water Table:	67'
Drilling Method:	N/A
Casing Information:	N/A
Installation Method:	Water eversion
Bubbler / Tag:	67'

Liner:

Material:	210d Orange d/c 2 sleeve
Diameter:	4"
Material Above Casing:	3'
Uneverted Material:	4'
Rough Fabrication Legnth:	216'
Termination:	End Seal Knot
Knot Diameter Allowance:	2"
Markings on Liner:	Ink stamp indicating FLUTe TOC & FLUTe Job# 968-1
Spacer Design:	2 Material helix cut spacer Design (orange mesh) and Mylar

Spacer #	Spacer Bottom [ft]	Spacer Top [ft]
1	115'	95'
2	206'	160'

Tubing & Ports:							
			Tubing In Bundle:	NYLON			
			Tubing In Sleeves:	NYLON			
			Bubbler Details:	1/4 NYLON			
			Port Design:	Superthane feed thru			
			Port Locations:	6" @ bottom of spacer			
			Vent Design:	1/4 Superthane feed thru w/ 3/8 tygon tubing connected to duct			
			Vent Location:	210'			
Pump Assembly:							
Port #:	**Transducer Serial #:**	**Transducer Pressure Rating [psi]:**	**Diaphragm Depth [ft. btoc]**	**Cable Serial #:**	**Cable Length [ft.]**	**5/8 x 3/8**	**3/8 x 1/4**
1						134'.5"	136'.5"
2						135'	137'

Other Info:	
Transducer Type:	N/A
Kellum Design:	1" Friction Kellum wrap Below Unions 1" Webbing with blue hig
Kellum Locations:	1st kellum @ 18' btoc: others every 40 there afte
Tether:	1/4"
Marking on Tubing:	Port #'s and color code
Marking on Cables:	Port #'S
Bundle Sheating:	White 2.25" starting @ 134'
Marks on Bundle:	E.P. markings @ every 40'
Pump Tube:	216'
Reel / Packaging:	SF FLUTe
Casing Adapter Info:	ABQ FLUTe
Wellhead Info:	ABQ FLUTe
Vent Tube:	n/a
Clamps:	ABQ FLUTe
Shipped Via:	ABQ FLUTe
Other Notes:	Port # 1 Protrudes @ 134'.5"' Top Of Tube @ 131" W/ red cap
	Port # 2 Protrudes @ 135' Top Of Tube @ 133' W/ red cap

PROJECT NUMBER:	BORING NUMBER:
382653.FP.04.FW	MW-58 SHEET 1 OF 11

SOIL BORING LOG

PROJECT : PG&E Topock - ERGI
LOCATION : Site A (2100612.1 N, 7616131.8 E)
ELEVATION : 521.8 ft
DRILLING CONTRACTOR : Boart Longyear (D. Roberts)
DRILLING EQUIPMENT AND METHOD : Track-mounted Rig, Rotosonic drill head and tools
ORIENTATION : Vertical
WATER LEVELS : Approx. 66 ft BGS
START : 1/29/2009
END : 3/27/2009
LOGGER : A. Brewster (Northstar)

DEPTH BELOW EXISTING GRADE (ft)	INTERVAL (ft)	RECOVERY (in)	LAB SAMPLE	USCS CODE/ LITHOLOGY	SOIL DESCRIPTION: SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY	SYMBOLIC LOG	COMMENTS: DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS, AND INSTRUMENTATION
	1.5 2.0	COMPLETE	14:00	ML	**Silt With Sand(ML)** 0.0-2.0' - brown, (7.5YR 4/4), dry, loose, 0% gravel, 20% sand, 80% fines, sand is angular to subangular, poorly graded, no dominant mineralogy		Boring initially drilled to 65.5' bgs using Rotosonic tools up to 10-in in diameter. Permanent 6-in PVC conductor casing installed from ground surface to 65.5' bgs (portland cement grout). Boring drilled from 65.5' bgs to an initial total depth of 115' bgs using diamond bit rotary core tools (HQ-size, 3.8-in diameter). Following testing, boring was deepend to a total depth of 206' bgs using rotary core tools.
5 10 15				GM	**Silty Gravel With Sand(GM)** 2.0-17.0' - brown, (7.5YR 4/3), dry, loose, 40% gravel, 30% sand, 30% fines, gravel is angular to subangular, poorly graded, no dominant mineralogy, matrix supported, max clast size = 90 mm.		
20	19.0 20.0		14:50	SM	**Silty Sand With Gravel(SM)** 16.0-51.0' - brown, (7.5YR 4/3), dry, loose, 15% gravel, 60% sand, 25% fines, gravel is angular to subrounded, poorly graded, no dominant mineralogy, matrix supported, max clast size = 100 mm		

PROJECT NUMBER:	BORING NUMBER:
382653.FP.04.FW	MW-58 SHEET 2 OF 11

SOIL BORING LOG

PROJECT : PG&E Topock - ERGI
LOCATION : Site A (2100612.1 N, 7616131.8 E)
ELEVATION : 521.8 ft
DRILLING CONTRACTOR : Boart Longyear (D. Roberts)
DRILLING EQUIPMENT AND METHOD : Track-mounted Rig, Rotosonic drill head and tools
ORIENTATION : Vertical
WATER LEVELS : Approx. 66 ft BGS
START : 1/29/2009
END : 3/27/2009
LOGGER : A. Brewster (Northstar)

DEPTH BELOW EXISTING GRADE (ft)	INTERVAL (ft)	RECOVERY (in)	LAB SAMPLE	USCS CODE/ LITHOLOGY	SOIL DESCRIPTION: SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY	SYMBOLIC LOG	COMMENTS: DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS, AND INSTRUMENTATION
25		COMPLETE			**Silty Sand With Gravel (SM)** 16.0-51.0' - brown, (7.5YR 4/3), dry, loose, 15% gravel, 60% sand, 25% fines, gravel is angular to subrounded, poorly graded, no dominant mineralogy, matrix supported, max clast size = 100 mm		
	29.0		15:10				
30	30.0			SM			
35							
	39.0		16:30				
40	40.0						

PROJECT NUMBER:	BORING NUMBER:
382653.FP.04.FW	MW-58 SHEET 3 OF 11

SOIL BORING LOG

PROJECT : PG&E Topock - ERGI
LOCATION : Site A (2100612.1 N, 7616131.8 E)
ELEVATION : 521.8 ft
DRILLING CONTRACTOR : Boart Longyear (D. Roberts)
DRILLING EQUIPMENT AND METHOD : Track-mounted Rig, Rotosonic drill head and tools
ORIENTATION : Vertical
WATER LEVELS : Approx. 66 ft BGS
START : 1/29/2009
END : 3/27/2009
LOGGER : A. Brewster (Northstar)

DEPTH BELOW EXISTING GRADE (ft)	INTERVAL (ft)	RECOVERY (in)	LAB SAMPLE	USCS CODE/ LITHOLOGY	SOIL DESCRIPTION: SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY	SYMBOLIC LOG	COMMENTS: DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS, AND INSTRUMENTATION
45		COMPLETE		SM	**Silty Sand With Gravel (SM)** 16.0-51.0' - brown, (7.5YR 4/3), dry, loose, 15% gravel, 60% sand, 25% fines, gravel is angular to subrounded, poorly graded, no dominant mineralogy, matrix supported, max clast size = 100 mm		
50	49.0 50.0		17:10				
				ML	**Silt (ML)** 51.0-53.0' - dark brown, (7.5YR 3/2), dry, stiff, 0% gravel, 0% sand, 100% fines, no apparent structure, max clast size = 20 mm. Occurrence of lenses of white clayey silt up to 10 mm thick, cohesive.		
55				SP	**Poorly Graded Sand With Gravel (SP)** 53.0-60.0' - dark yellowish brown, (10YR 4/6), dry, loose to medium dense, 30% gravel, 65% sand, 5% fines, sand is fine to medium grained, subangular to subrounded, poorly graded, no dominant mineralogy, matrix supported, max clast size = 30 mm.		
60	59.0 60.0		17:30				Total depth of Rotosonic boring is 65.5 ft bgs. Install permanent 6-in conductor casing (portland cement grout). See rock core log for 60.0-65.5 lithlologic description.
					Begin rock coring from 65.5 ft bgs See the next page for the rock core log.		

PROJECT NUMBER:	BORING NUMBER:
382653.FP.04.FW	MW-58 SHEET 4 OF 11

ROCK CORE LOG

PROJECT : PG&E Topock - ERGI
LOCATION : Site A (2100612.1 N, 7616131.8 E)
ELEVATION : 521.8 ft
DRILLING CONTRACTOR : Boart Longyear (D. Roberts)
CORING EQUIPMENT AND METHOD : Track-mounted Rig, LF-70 Drill Head and HQ-sized tools (diamond bit)
ORIENTATION : Vertical
WATER LEVELS : Approx. 66 ft BGS
START : 1/29/2009
END : 3/27/2009
LOGGER : A. Brewster (Northstar)

DEPTH AND ELEVATION BELOW SURFACE (ft)	CORE RUN, LENGTH, AND RECOVERY (%)	R Q D (%)	FRACTURES PER FOOT	DISCONTINUITIES – DESCRIPTION: DEPTH, TYPE, ORIENTATION, ROUGHNESS, PLANARITY, INFILLING MATERIAL AND THICKNESS, SURFACE STAINING, AND TIGHTNESS	SYMBOLIC LOG	LITHOLOGY: ROCK TYPE, COLOR, MINERALOGY, TEXTURE, HARDNESS, WEATHERING, AND ROCK MASS CHARACTERISTICS	COMMENTS: SIZE AND DEPTH OF CASING, FLUID LOSS, CORING RATE AND SMOOTHNESS, CAVING ROD DROPS, TEST RESULTS, ETC.
	60.0					**Metadiorite (pTbr)** 60.0-62.0' - Metadiorite.Highly weathered.	
						Metadiorite (pTbr) 62.0-65.5' - Metadiorite. Rock is competent, but shattered and partially pulverized by Rotosonic drilling method.	
65							
	65.5		>10	65.5-70.0' - core recovered, but largely broken by drilling.		**Metadiorite (pTbr)** 65.5-206.0' - dusky yellowish green, (10GY 3/2), intermediate (dioritic) mineralogy, medium grained, strong (R4), unweathered, massive to foliated	65.5': Begin rotary core drilling General Note: The metadiorite bedrock exhibits many small healed fractures (1-3 mm) of somewhat random orientation. These healed fractures create weaknesses in the rock. It can be difficult to determine if the metadiorite is jointed in-situ, or if the discontinuities are caused by the drilling method. Intervals with fracture per foot counts >10 are likely caused by drilling.
	R1 3 ft 100%	13	>10				
			>10				
	68.5 R2 1 ft 100%	0	1	68.5' - Joint, 50 deg, rough, undulating, < 1 mm calcite infilling, no staining, tight			
	69.5 R3 0.5 ft 100%	0	>10				
70	70.0						
			1				
			0	70.9' - Joint, 30 deg, rough, undulating, < 1 mm calcite infilling, no staining, tight			
	R4 5.5 ft 95%	100	3	72.2' - Joint, 35 deg, rough, undulating, < 1 mm calcite infilling, no staining, tight			R1 = 11.5 min R2 = 13.2 min R3 = 8.0 min
			1	72.7' - Joint (2), 40 deg and 60 deg, rough, undulating, < 1 mm calcite infilling, yellowish staining on 40 deg face, tight			
			0	73.9' - Joint, 40 deg, rough, undulating, yellowish silty infill (< 1 mm) and < 1 mm calcite infilling, yellowish staining, tight			
75							
	75.5		3	75.2' - Joint, 40 deg, rough, undulating, < 1 mm calcite infilling, no staining, tight			R4 = 23.3 min
			0	75.7, 76.0' - Joint, 60 deg, rough, undulating, < 1 mm calcite infilling, no staining, tight			
			1	77.2' - Joint, 60 deg, rough, undulating, < 1 mm calcite infilling, no staining, tight			
			2	78.3' - Joint, 40 deg, rough, stepped, no staining, tight			
	R5 8.5 ft 100%	67	2	78.8' - Joint, 60 deg, rough, undulating, no staining, tight			
80							

PROJECT NUMBER:	BORING NUMBER:
382653.FP.04.FW	MW-58 SHEET 5 OF 11

ROCK CORE LOG

PROJECT : PG&E Topock - ERGI
LOCATION : Site A (2100612.1 N, 7616131.8 E)
ELEVATION : 521.8 ft
DRILLING CONTRACTOR : Boart Longyear (D. Roberts)
CORING EQUIPMENT AND METHOD : Track-mounted Rig, LF-70 Drill Head and HQ-sized tools (diamond bit)
ORIENTATION : Vertical
WATER LEVELS : Approx. 66 ft BGS
START : 1/29/2009
END : 3/27/2009
LOGGER : A. Brewster (Northstar)

DEPTH AND ELEVATION BELOW SURFACE (ft)	CORE RUN, LENGTH, AND RECOVERY (%)	DISCONTINUITIES: R Q D (%)	DISCONTINUITIES: FRACTURES PER FOOT	DISCONTINUITIES: DESCRIPTION (DEPTH, TYPE, ORIENTATION, ROUGHNESS, PLANARITY, INFILLING MATERIAL AND THICKNESS, SURFACE STAINING, AND TIGHTNESS)	SYMBOLIC LOG	LITHOLOGY (ROCK TYPE, COLOR, MINERALOGY, TEXTURE, HARDNESS, WEATHERING, AND ROCK MASS CHARACTERISTICS)	COMMENTS (SIZE AND DEPTH OF CASING, FLUID LOSS, CORING RATE AND SMOOTHNESS, CAVING ROD DROPS, TEST RESULTS, ETC.)
			1	79.3, 79.6' - Joint, 40 deg, rough, undulating, no staining, tight		**Metadiorite (pTbr)** 65.5-206.0' - dusky yellowish green, (10GY 3/2), intermediate (dioritic) mineralogy, medium grained, strong (R4), unweathered, massive to foliated	
			>10	80.4' - Joint, 15 deg, rough, undulating, some red staining, tight			
			2	81.1' - Joint, 15 deg, rough, undulating, < 0.5 mm calcite infilling, no staining, tight			
			1	81.4-82.1' - Fracture zone, rough, undulating, < 1 mm calcite infilling, no staining, tight, 60 deg dip at 82.1'			
	84.0			82.5-84.0' - Joint, near 90 deg, rough, undulating, < 2 mm calcite infilling, no staining, tight			R5 = 39.2 min
85	R6 1.5 ft 100%	80	1				
	85.5		2	84.9' - Joint, 25 deg, rough, undulating, < 1 mm calcite infilling, no staining, tight			R6 = 4.5 min
	R7 4.4 ft 100%	32	>10	85.3, 85.5' - Joint, 40 deg, rough, stepped, < 0.5 mm calcite infilling, no staining, tight			
			>10	86' - Joint, 10 deg, rough, undulating, < 1 mm calcite infilling, no staining, tight			
			>10	86.4' - Joint, 40 deg, rough, undulating, < 1 mm calcite infilling, yellowish staining, tight, 86.4-88.9' multiple fractures, rough, undulating, minor calcite growth (< 1 mm), some yellowish staining, tight. 60 deg dip at 88.9'.			
			>10				R7 = 19.6 min
90	89.9						
	R8 4.5 ft 100%	51	>10	90.3' - Joint, 30 deg, rough, undulating, no staining, tight			
			2	90.5-90.9' - Fracture zone, rough, undulating, no staining, tight, 60 deg dip at 90.9'			
			2	91.0' - Joint, 60 deg, rough, undulating, reddish staining, tight; 91.5' - Joint, 30 deg, rough, undulating, reddish staining, tight			
			>10	92.4' - Joint, 10 deg, rough, undulating, calcite infilling, no staining, tight			
	94.4 R9 1 ft 100%	33	>10	92.8' - Joint, 40 deg, rough, undulating, reddish staining, tight; 93.4-93.9' - Fracture zone, rough, undulating, brownish-grey microcrystalline infill (< 1 mm), reddish-yellow staining, tight, no reaction to HCl			R8 = 30.5 min
95	95.4		>10	94.6-97.8' - Multiple healed fractures, rough, undulating, > 3 mm black infill, some rust-colored staining, tight.			R9 = 4.5 min
	R10 4.6 ft 100%	17	>10	96.1' - Joint, 40 deg, rough, undulating, < 1 mm calcite infilling, no staining, tight			
			>10	97.0, 97.9' - Joint, 60 deg, rough, undulating, no staining, tight			
			>10	97.9-100.0' - Fracture zone, rough, undulating, < 1 mm black infill, reddish staining			
			>10				R10 = 23.3 min
100	100.0						

PROJECT NUMBER:	BORING NUMBER:
382653.FP.04.FW	MW-58 SHEET 6 OF 11

ROCK CORE LOG

PROJECT : PG&E Topock - ERGI
LOCATION : Site A (2100612.1 N, 7616131.8 E)
ELEVATION : 521.8 ft
DRILLING CONTRACTOR : Boart Longyear (D. Roberts)
CORING EQUIPMENT AND METHOD : Track-mounted Rig, LF-70 Drill Head and HQ-sized tools (diamond bit)
ORIENTATION : Vertical
WATER LEVELS : Approx. 66 ft BGS
START : 1/29/2009
END : 3/27/2009
LOGGER : A. Brewster (Northstar)

DEPTH AND ELEVATION BELOW SURFACE (ft)	CORE RUN, LENGTH, AND RECOVERY (%)	DISCONTINUITIES: R Q D (%)	DISCONTINUITIES: FRACTURES PER FOOT	DISCONTINUITIES: DESCRIPTION (DEPTH, TYPE, ORIENTATION, ROUGHNESS, PLANARITY, INFILLING MATERIAL AND THICKNESS, SURFACE STAINING, AND TIGHTNESS)	SYMBOLIC LOG	LITHOLOGY (ROCK TYPE, COLOR, MINERALOGY, TEXTURE, HARDNESS, WEATHERING, AND ROCK MASS CHARACTERISTICS)	COMMENTS (SIZE AND DEPTH OF CASING, FLUID LOSS, CORING RATE AND SMOOTHNESS, CAVING ROD DROPS, TEST RESULTS, ETC.)
	R11 5.5 ft 100%	100	1	100.4' - Joint, 40 deg, rough, undulating, no staining, tight		**Metadiorite (pTbr)** 65.5-206.0' - dusky yellowish green, (10GY 3/2), intermediate (dioritic) mineralogy, medium grained, strong (R4), unweathered, massive to foliated	
			0				
			0				
			2	103.1' - Joint, 20 deg, rough, undulating, < 0.5 mm calcite infilling, no staining, tight			
			1	103.9' - Joint, 40 deg, rough, undulating, < 0.5 mm calcite infilling, no staining, tight			
105	105.5		0	104.2' - Joint, 40 deg, rough, undulating, < 0.5 mm calcite infilling, some red staining, tight			R11 = 21.9 min
	R12 9.7 ft 100%	79	1	106.4' - Joint, 40 deg, rough, undulating, no staining, tight			
			0				
			>10	108.3-108.7' - Fracture zone, rough, undulating, no staining, tight			
110			0				
			0				
			1	111.1' - Joint, 30 deg, rough, undulating, no staining, tight			
			0				
			1	113' - Joint, 60 deg, rough, undulating, < 1 mm calcite infilling, reddish staining, tight			
			2	114.1' - Joint, 40 deg, rough, undulating, < 2 mm calcite infilling, no staining, tight			R12 = 36.7 min
115	115.2			114.7' - Joint, 15 deg, rough, undulating, < 1 mm calcite infilling, reddish staining, tight			
			1	115.3, 116.7, 116.8' - Joint, 35 deg, rough, undulating, < 2 mm calcite infilling, no staining, tight			Drilling to 115.2 ft bgs ends on 2/4/2009, following testing, drilling resumes on 3/25/2009.
			2				
			0				
			1	118.5' - Joint, 55 deg, rough, undulating, < 5 mm calcite infilling, no staining, tight			
120			0				

PROJECT NUMBER:	BORING NUMBER:
382653.FP.04.FW	MW-58 SHEET 7 OF 11

ROCK CORE LOG

PROJECT : PG&E Topock - ERGI
LOCATION : Site A (2100612.1 N, 7616131.8 E)
ELEVATION : 521.8 ft
DRILLING CONTRACTOR : Boart Longyear (D. Roberts)
CORING EQUIPMENT AND METHOD : Track-mounted Rig, LF-70 Drill Head and HQ-sized tools (diamond bit)
ORIENTATION : Vertical
WATER LEVELS : Approx. 66 ft BGS
START : 1/29/2009
END : 3/27/2009
LOGGER : A. Brewster (Northstar)

DEPTH AND ELEVATION BELOW SURFACE (ft)	CORE RUN, LENGTH, AND RECOVERY (%)	DISCONTINUITIES: R Q D (%)	DISCONTINUITIES: FRACTURES PER FOOT	DISCONTINUITIES: DESCRIPTION (DEPTH, TYPE, ORIENTATION, ROUGHNESS, PLANARITY, INFILLING MATERIAL AND THICKNESS, SURFACE STAINING, AND TIGHTNESS)	SYMBOLIC LOG	LITHOLOGY (ROCK TYPE, COLOR, MINERALOGY, TEXTURE, HARDNESS, WEATHERING, AND ROCK MASS CHARACTERISTICS)	COMMENTS (SIZE AND DEPTH OF CASING, FLUID LOSS, CORING RATE AND SMOOTHNESS, CAVING ROD DROPS, TEST RESULTS, ETC.)
	R13 10.8 ft 100%	100	1	120.7' - Joint, 35 deg, rough, undulating, < 2 mm calcite infilling, no staining, tight		**Metadiorite (pTbr)** 65.5-206.0' - dusky yellowish green, (10GY 3/2), intermediate (dioritic) mineralogy, medium grained, strong (R4), unweathered, massive to foliated	
			0				
			0				
			2	123.4, 123.5' - Joint, 35 deg and 45 deg, rough, undulating, < 1 mm calcite infilling, no staining, tight			
			1	124.5' - Joint, 70 deg, rough, undulating, < 1 mm calcite infilling, no staining, moderately tight			
125			0				
	126.0						R13 = 25.1 min
			0				
			1	127.2' - Joint, 65 deg, rough, undulating, < 2.5-inch dark reddish brown (10R 3/4) consolidated fine sediment infilling, no staining, tight			
	R14 6.5 ft 100%	65	0				
			0				
130							
			>10	130.2-132.5' - Fracture zone, rough, undulating to stepped, < 2 mm calcite infilling, reddish staining, no dominant orientation		130.2-132.5' - slightly weathered	
			>10				
	132.5		>10				R14 = 20.3 min
	R15 3.7 ft 100%	100	0				
			0				
135							
	136.2		1	135.7' - Joint, 15 deg, rough, undulating, < 1 mm calcite infilling, no staining, tight			R15 = 14.5 min
			0				
			0				
			0				
140			0				

PROJECT NUMBER:	BORING NUMBER:
382653.FP.04.FW	MW-58 SHEET 8 OF 11

ROCK CORE LOG

PROJECT : PG&E Topock - ERGI
LOCATION : Site A (2100612.1 N, 7616131.8 E)
ELEVATION : 521.8 ft
DRILLING CONTRACTOR : Boart Longyear (D. Roberts)
CORING EQUIPMENT AND METHOD : Track-mounted Rig, LF-70 Drill Head and HQ-sized tools (diamond bit)
ORIENTATION : Vertical
WATER LEVELS : Approx. 66 ft BGS
START : 1/29/2009
END : 3/27/2009
LOGGER : A. Brewster (Northstar)

DEPTH AND ELEVATION BELOW SURFACE (ft)	CORE RUN, LENGTH, AND RECOVERY (%)	DISCONTINUITIES: R Q D (%)	DISCONTINUITIES: FRACTURES PER FOOT	DISCONTINUITIES: DESCRIPTION (DEPTH, TYPE, ORIENTATION, ROUGHNESS, PLANARITY, INFILLING MATERIAL AND THICKNESS, SURFACE STAINING, AND TIGHTNESS)	SYMBOLIC LOG	LITHOLOGY (ROCK TYPE, COLOR, MINERALOGY, TEXTURE, HARDNESS, WEATHERING, AND ROCK MASS CHARACTERISTICS)	COMMENTS (SIZE AND DEPTH OF CASING, FLUID LOSS, CORING RATE AND SMOOTHNESS, CAVING ROD DROPS, TEST RESULTS, ETC.)
	R16 10.2 ft 100%	100	0			**Metadiorite (pTbr)** 65.5-206.0' - dusky yellowish green, (10GY 3/2), intermediate (dioritic) mineralogy, medium grained, strong (R4), unweathered, massive to foliated	
			0				
			0				
			1				
			1	143.9, 144.6' - Joint, 40 deg, rough, undulating to stepped, < 5 mm calcite infilling, no staining, moderately tight			
145			3	145.1, 145.3, 145.5' - Joint, 40 deg, rough, undulating, < 5 mm calcite infilling, reddish staining, tight to moderately tight			
	146.4		0				R16 = 33.0 min
			1	147.4' - Joint, 40 deg, rough, undulating, < 1 mm calcite infilling, no staining, tight			
			2	148.1, 148.3, 149.6' - Joint, 65 deg, rough, undulating, < 5 mm calcite infilling, reddish staining, tight			
			1				
150							
	R17 9.8 ft 100%	90	1	150.1, 152.9, 153.4, 154.5' - Joint, 25, 25, 25, and 65 deg, rough, undulating, < 1 mm calcite infilling, no staining, tight			
			0				
			1				
			1				
			1				
155							
			1	155.0, 156.1, 156.4, 156.7' - Joint, 30 deg, rough, undulating, < 1 mm calcite infilling, dark red to black staining, tight			
	156.2		3				R17 = 37.8 min
			0				
			1	158.5' - Joint, 85 deg, rough, undulating, < 1 mm calcite infilling, reddish staining, tight			
			0				
160							

PROJECT NUMBER:	BORING NUMBER:
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ROCK CORE LOG

PROJECT : PG&E Topock - ERGI
LOCATION : Site A (2100612.1 N, 7616131.8 E)
ELEVATION : 521.8 ft
DRILLING CONTRACTOR : Boart Longyear (D. Roberts)
CORING EQUIPMENT AND METHOD : Track-mounted Rig, LF-70 Drill Head and HQ-sized tools (diamond bit)
ORIENTATION : Vertical
WATER LEVELS : Approx. 66 ft BGS
START : 1/29/2009
END : 3/27/2009
LOGGER : A. Brewster (Northstar)

DEPTH AND ELEVATION BELOW SURFACE (ft)	CORE RUN, LENGTH, AND RECOVERY (%)	DISCONTINUITIES: R Q D (%)	DISCONTINUITIES: FRACTURES PER FOOT	DISCONTINUITIES: DESCRIPTION (DEPTH, TYPE, ORIENTATION, ROUGHNESS, PLANARITY, INFILLING MATERIAL AND THICKNESS, SURFACE STAINING, AND TIGHTNESS)	SYMBOLIC LOG	LITHOLOGY (ROCK TYPE, COLOR, MINERALOGY, TEXTURE, HARDNESS, WEATHERING, AND ROCK MASS CHARACTERISTICS)	COMMENTS (SIZE AND DEPTH OF CASING, FLUID LOSS, CORING RATE AND SMOOTHNESS, CAVING ROD DROPS, TEST RESULTS, ETC.)
	R18 10 ft 100%	80	0			**Metadiorite (pTbr)** 65.5-206.0' - dusky yellowish green, (10GY 3/2), intermediate (dioritic) mineralogy, medium grained, strong (R4), unweathered, massive to foliated	
			0				
			0				
			0				
			>10	164.5-166.7' - Fracture zone, rough, undulating, < 1 mm calcite infilling, reddish staining, no dominant orientation, moderately tight			
165			>10				
	166.2						R18 = 39.0 min
	R19 7 ft 100%	57	>10				
			1	167.4' - Joint, 65 deg, rough, undulating, < 3 mm calcite infilling, no staining, moderately tight			
			>10	168.2-169.0' - Fracture zone, rough, undulating, < 5 mm calcite infilling, no staining, no dominant orientation, tight			
170			1	169.5, 170.5' - Joint, 65 deg, rough, undulating, < 3 mm calcite infilling, no staining, tight			
			1				
			1	171.5' - Joint, 30 deg, rough, undulating, < 1 mm calcite infilling, reddish staining, tight		171.7-172.2' - medium to coarse grained	
			>10	171.7-178.0' - Fracture zone, rough, undulating, reddish staining, tight		172.2-177.4' - yellowish gray, (5Y 8/1), largely felsic mineralogy, fine grained, unweathered	
	173.2						R19 = 38.0 min
	R20 2 ft 100%	40	>10				
			>10				
175	175.2						R20 = 11.3 min
	R21 2 ft 100%	20	>10				
			>10				
	177.2						R21 = 12.2 min
	R22 4.3 ft 100%	81	>10			177.4-179.4' - light grey (N7), largely felsic mineralogy, coarse grained, unweathered	
			3	178.1, 178.3, 178.7' - Joint, 45, 45, 85 deg, rough, undulating, < 1 mm fine-grained white sediment/silt (no reaction to HCl) infilling, no staining, moderately tight			
180			1			179.4' - fine grained	

PROJECT NUMBER:	BORING NUMBER:
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ROCK CORE LOG

PROJECT : PG&E Topock - ERGI
LOCATION : Site A (2100612.1 N, 7616131.8 E)
ELEVATION : 521.8 ft
DRILLING CONTRACTOR : Boart Longyear (D. Roberts)
CORING EQUIPMENT AND METHOD : Track-mounted Rig, LF-70 Drill Head and HQ-sized tools (diamond bit)
ORIENTATION : Vertical
WATER LEVELS : Approx. 66 ft BGS
START : 1/29/2009
END : 3/27/2009
LOGGER : A. Brewster (Northstar)

DEPTH AND ELEVATION BELOW SURFACE (ft)	CORE RUN, LENGTH, AND RECOVERY (%)	DISCONTINUITIES: R Q D (%)	DISCONTINUITIES: FRACTURES PER FOOT	DISCONTINUITIES: DESCRIPTION (DEPTH, TYPE, ORIENTATION, ROUGHNESS, PLANARITY, INFILLING MATERIAL AND THICKNESS, SURFACE STAINING, AND TIGHTNESS)	SYMBOLIC LOG	LITHOLOGY (ROCK TYPE, COLOR, MINERALOGY, TEXTURE, HARDNESS, WEATHERING, AND ROCK MASS CHARACTERISTICS)	COMMENTS (SIZE AND DEPTH OF CASING, FLUID LOSS, CORING RATE AND SMOOTHNESS, CAVING ROD DROPS, TEST RESULTS, ETC.)
			1	179.7, 180.7' - Joint, 60 deg, rough, undulating, < 1 mm calcite infilling, reddish staining, tight		**Metadiorite (pTbr)** 65.5-206.0' - dusky yellowish green, (10GY 3/2), intermediate (dioritic) mineralogy, medium grained, strong (R4), unweathered, massive to foliated	
	181.5		>10	181.2-181.5' - Fracture zone, rough, undulating, reddish staining, no dominant orientation, tight			R22 = 24.0 min
			0			182.3-183.2' - coarse grained	
	R23 4.5 ft 100%	100	0				
			3	184.0, 184.1, 184.5' - Joint, 60 deg, rough, undulating, < 3 mm white silt/clay infilling (no HCl reaction, greasy when wet), no staining, tight		184.5-185.0' - increase in felsic minerals	
185			1				
	186.0			185.6, 186.8, 186.9' - Joint, 25, 25, and 55 deg, rough, undulating, < 2 mm calcite infilling, no staining, tight			R23 = 17.8 min
			2				
			>10	187.2-187.9' - Fracture zone, rough, undulating, < 1 mm calcite infilling, reddish staining, no dominant orientation, moderately tight		187.0-195.2' - medium grained	
	R24 6.5 ft 100%	62	3	188.3, 2 at 188.7' - Joint, 60, 85, and 85 deg, rough, undulating, < 1 mm calcite infilling, rusty staining, tight			
			2	189.1, 189.6, 190.3' - Joint, 75, 15, and 75 deg, rough, undulating, < 2 mm calcite infilling, rusty staining, moderately tight			
190			1				
			>10	191.5-192.5' - Fracture zone, rough, undulating, rusty staining, no dominant orientation, tight			
	192.5		>10				R24 = 39.0 min
			1	193.3, 194.1, 194.3, 194.7' - Joint, 25 deg, rough to smooth, undulating, rusty staining, tight			
	R25 3.5 ft 100%	57	3				
195			>10	195.0-198.8' - Fracture zone, rough, undulating, reddish staining, no dominant orientation, tight		195.2-197.3' - yellowish grey (5Y 8/1), largely felsic minerals, fine grained, unweathered	
	196.0						R25 = 13.0 min
			>10				
	R26 2.6 ft 100%	23	>10				
	198.6		>10	198.1, 199.4, 199.7' - Joint, 30 deg, rough, stepped to undulating, < 1 mm calcite infilling, reddish staining, tight			R26 = 17.7 min
			3				
200							

PROJECT NUMBER:	BORING NUMBER:
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ROCK CORE LOG

PROJECT : PG&E Topock - ERGI

LOCATION : Site A (2100612.1 N, 7616131.8 E)

ELEVATION : 521.8 ft

DRILLING CONTRACTOR : Boart Longyear (D. Roberts)

CORING EQUIPMENT AND METHOD : Track-mounted Rig, LF-70 Drill Head and HQ-sized tools (diamond bit)

ORIENTATION : Vertical

WATER LEVELS : Approx. 66 ft BGS

START : 1/29/2009

END : 3/27/2009

LOGGER : A. Brewster (Northstar)

DEPTH AND ELEVATION BELOW SURFACE (ft)	CORE RUN, LENGTH, AND RECOVERY (%)	DISCONTINUITIES: R Q D (%)	DISCONTINUITIES: FRACTURES PER FOOT	DISCONTINUITIES: DESCRIPTION (DEPTH, TYPE, ORIENTATION, ROUGHNESS, PLANARITY, INFILLING MATERIAL AND THICKNESS, SURFACE STAINING, AND TIGHTNESS)	SYMBOLIC LOG	LITHOLOGY (ROCK TYPE, COLOR, MINERALOGY, TEXTURE, HARDNESS, WEATHERING, AND ROCK MASS CHARACTERISTICS)	COMMENTS (SIZE AND DEPTH OF CASING, FLUID LOSS, CORING RATE AND SMOOTHNESS, CAVING ROD DROPS, TEST RESULTS, ETC.)
	R27 4.4 ft 100%	39	3	200.1, 200.6, 200.9' - Joint, 60, 30, and 30 deg, rough, undulating to stepped, < 1 mm calcite infilling, reddish staining, moderately tight		**Metadiorite (pTbr)** 199.1-206.0' - greenish gray, (5GY 6/1), intermediate (dioritic) mineralogy, medium grained, strong (R4), unweathered, massive to foliated	
			0				
			>10	202.0-206.0' - Fracture zone, rough, undulating to stepped, < 3 mm calcite infilling, reddish staining, moderately tight			R27 = 27.0 min
	203.0						
	R28 3 ft 100%	17	>10				
			>10				
205							
			>10				
	206.0						
						End Drilling on 3/27/2009 Total Borehole Depth: 206.0 ft bgs	
210							
215							
220							